Scotian Basin Exploration Drilling Project

Environmental Impact Statement - Summary

October 2016

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Acronyms

ADW	Approval to Drill a Well
AFNCNB	Assembly of First Nations' Chiefs in New Brunswick
BAOAC	Bonn Agreement Oil Appearance Code
BOP	Blowout Preventer
CEA Agency	Canadian Environmental Assessment Agency
CEAA, 2012	*Canadian Environmental Assessment Act, 2012*
CEPA, 1999	*Canadian Environmental Act, 1999*
CNSOPB	Canada-Nova Scotia Offshore Petroleum Board
COSEWIC	Committee on the Status of Endangered Wildlife of Canada
CRA	Commercial, Recreational and Aboriginal
CWS	Canadian Wildlife Services
DFO	Fisheries and Oceans Canada
DP	Dynamic Positioning
DWH	Deepwater Horizon
EA	Environmental Assessment
EBSA	Ecologically and Biologically Significant Areas
ECA	Emission Control Areas
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EL	Exploration Licence
ENGO	Environmental Non-governmental Organizations
EPP	Environmental Protection Plan
FSC	Food, Social and Ceremonial
GBR	Geohazard Baseline Review
IBA	Important Bird Area
IMP	Incident Management Plan
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
LAA	Local Assessment Area
MAPC	Maritime Aboriginal Peoples Council
MARPOL	*International Convention for the Prevention of Pollution from Ships*
MBCA	*Migratory Birds Convention Act*
MGS	Membertou Geomatics Solutions
MMO	Marine Mammal Observer
MODU	Mobile Offshore Drilling Unit
MPA	Marine Protected Area
MTI	Mi'gmawe'l Tplu'taqnn Incorporated
NAFO	Northwest Atlantic Fisheries Organization
NB	New Brunswick
NBAPC	New Brunswick Aboriginal Peoples Council
NCNS	Native Council of Nova Scotia
NCPEI	Native Council of Prince Edward Island

NEBA	Net Environmental Benefit Analysis
NS	Nova Scotia
NS ESA	Nova Scotia *Endangered Species Act*
OA	Operations Authorization
OCNS	Offshore Chemical Notification Scheme
OCSG	Offshore Chemical Selection Guidelines
OSCAR	Oil Spill Contingency and Response
OSPAR	Oslo and Paris Commission
OWTG	Offshore Waste Treatment Guidelines
PAM	Passive Acoustic Monitoring
PEI	Prince Edward Island
PLONOR	Pose Little or No Risk
PSV	Platform Supply Vessel
RAA	Regional Assessment Area
ROV	Remotely Operated Vehicle
SAR	Species at Risk
SARA	*Species at Risk Act*
SBM	Synthetic-based Mud
SCAT	Shoreline Clean-up Assessment Technique
SOCC	Species of Conservation Concern
SOCP	Statement of Canadian Practice
SOEP	Sable Island Offshore Energy Project
SRP	Spill Response Plan
TD	Total Depth
THC	Total Hydrocarbons
TSS	Total Suspended Solids
TUS	Traditional Use Study
UINR	Unama'ki Institute of Natural Resources
VC	Valued Component
VSP	Vertical Seismic Profiling
WATS	Wide Azimuth Towed Streamer
WBM	Water-based Mud

1.0 INTRODUCTION AND ENVIRONMENTAL ASSESSMENT CONTEXT

BP Canada Energy Group ULC (BP Canada Energy Group ULC and/or any of its affiliates are hereafter generally referred to as "BP") is proposing to conduct an exploration drilling program on Exploration Licences (ELs) 2431, 2432, 2433, and 2434 known as the Scotian Basin Exploration Drilling Project (the Project) (refer to Figure 1.1). BP holds a 40% interest in the Nova Scotia Offshore ELs and will operate the exploration program. Partners, Hess Canada Oil and Gas ULC and Woodside Energy International (Canada) Limited, hold a 40% and 20% interest, respectively.

Offshore exploration drilling is a designated activity under the *Canadian Environmental Assessment Act, 2012* (CEAA, 2012). An environmental impact statement (EIS) has been prepared to fulfill requirements for an environmental assessment (EA) pursuant to CEAA, 2012 as well as environmental assessment (EA) requirements of the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) pursuant to the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act* and the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act* (hereafter referred to as the "Accord Acts"). This document is a summary of the EIS, and has been prepared to facilitate public, stakeholder, and Aboriginal review and consultation on the Project.

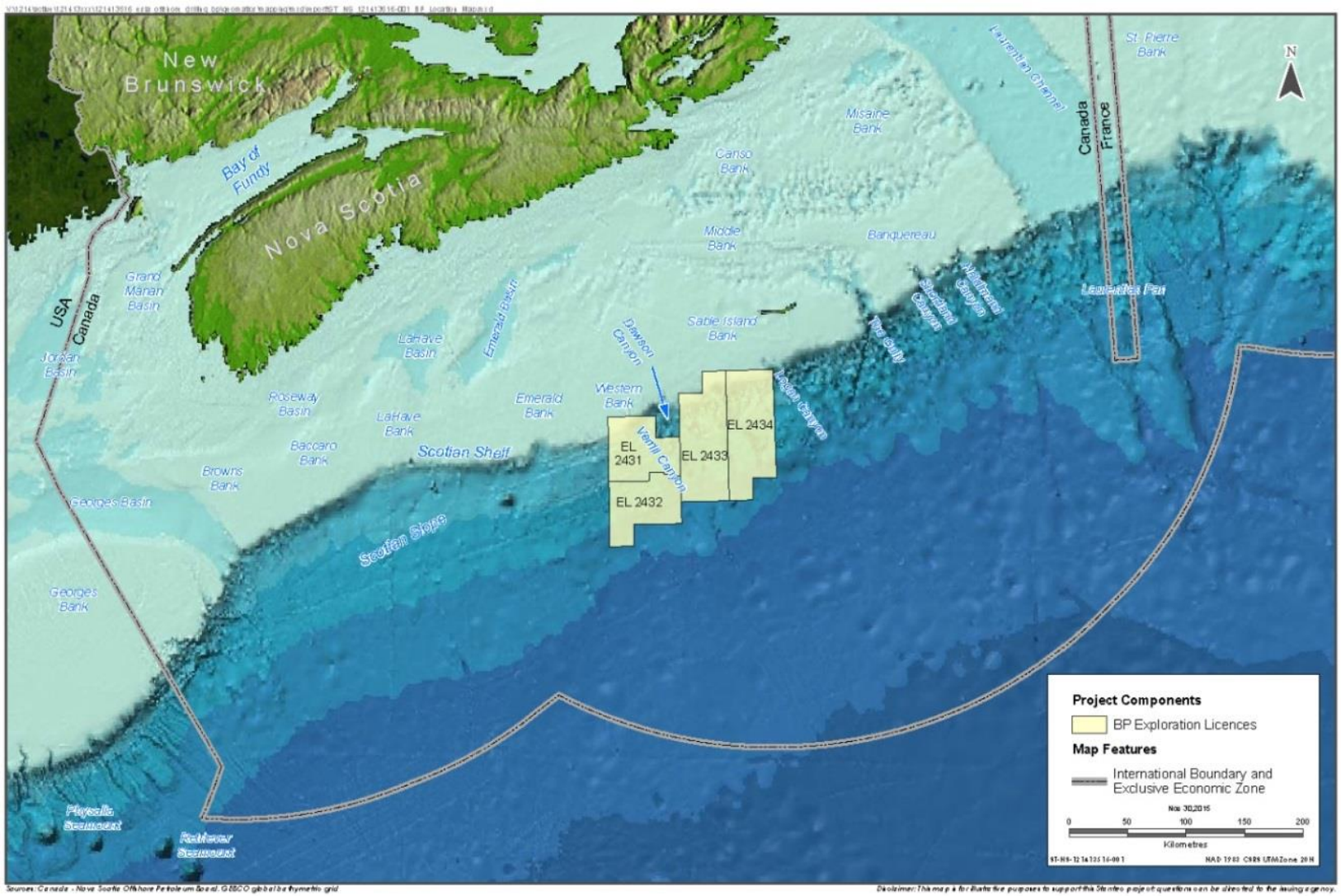


Figure 1.1 Scotian Basin Exploration Drilling Project Location

2.0 PROJECT OVERVIEW

On January 15, 2013, BP was awarded exploration rights to ELs 2431, 2432, 2433 and 2434 from the CNSOPB with a total work expenditure bid (*i.e.*, amount of money proposed to be spent on exploration activity in the licences) of approximately $1.05 billion. In 2014, following an EA and authorization process under the Accord Acts, BP carried out a 3D Wide Azimuth Towed Streamer (WATS) seismic survey known as the Tangier 3D Seismic Survey.

Exploration drilling is required to determine the presence, nature and quantities of the potential hydrocarbon resources within the ELs further to the information gathered and analyzed as part of the WATS seismic survey. The exploration drilling program also presents an opportunity for the interest holders, including BP to fulfill their work expenditure commitments that must be met over the term of the licence period.

BP will drill up to seven exploration wells in phases over the term of the licences, from 2018 to 2022. A Mobile Offshore Drilling Unit (MODU) will be contracted to drill wells within the ELs. Logistics support will be provided through a fleet of platform supply vessels (PSVs) and helicopters. A supply base in Halifax Harbour will be used to store materials and equipment. It is expected that drilling activity for the first well in the program will commence in 2018. It is anticipated that exploration drilling will be carried out in multiple phases so that initial well results can be analyzed to inform the strategy for subsequent wells.

2.1 PROJECT LOCATION

BP proposes to drill up to seven wells on ELs 2431, 2432, 2433, and 2434 (the Project Area). These licences cover 13,982 square kilometres (km^2) and, at their shortest distance, are approximately 230 kilometres (km) southeast of Halifax and 48 km from Sable Island National Park Reserve. Sable Island is also the nearest permanent, seasonal or temporary residence to the Project Area except for workers inhabiting offshore platforms at the Sable Offshore Energy Project and the Deep Panuke developments. Water depths in the ELs range from 100 metres (m) to more than 3,000 m. Potential exploration well locations within the ELs are being identified based on information gathered during the 3D Wide Azimuth Towed Streamer (WATS) seismic survey known as the Tangier 3D Seismic Survey.

2.2 PROJECT COMPONENTS

The Project includes two main physical components: the drilling vessel and the offshore exploration wells. The Project also includes components for logistics support for servicing and supplying offshore activity.

The offshore exploration wells are the only new pieces of infrastructure that need to be constructed as part of the Project. All other Project components, including the drilling vessel,

supply vessels, helicopters and supply base are pre-existing and will be used by the Project on a temporary basis through contractual arrangements.

2.2.1 Drilling Vessel

Within Atlantic Canadian waters, three main types of exploration drilling vessels, also referred to as mobile offshore drilling units (MODUs) are typically used. The selection of the drilling vessel generally depends on physical characteristics of the well site, including water depth and oceanographic conditions, and logistical considerations (*e.g.*, rig availability). In consideration of the water depths in the ELs (up to approximately 3,000 m), it is expected that either a semi-submersible rig or a drillship will be used. The MODU will be equipped with:

- drilling derrick;
- ballast system for stability and dynamic positioning (DP) system for maintaining position;
- diesel generated power system and emergency power system;
- subsea equipment including a blowout preventer (BOP) for well control, and a riser;
- helicopter deck and refueling equipment;
- storage space and cranes;
- waste management facilities for hazardous and non-hazardous waste;
- emergency and lifesaving equipment (*e.g.*, for firefighting and emergency evacuation); and
- accommodation for up to 200 persons on board.

Additional detail on the types of MODUs currently under consideration for use by BP, is presented in Section 2.3.1 of the EIS.

2.2.2 Offshore Exploration Wells

BP will drill up to seven exploration wells within ELs 2431, 2432, 2433, and 2434 over the term of the licences, from 2018 to 2022. The well design and location for the proposed wells have not yet been finalized. Once confirmed, these details for the wells will be provided for review and approval to the CNSOPB as part of the Operations Authorization (OA) and Approval to Drill a Well (ADW) for each well submitted in association with the Project.

2.2.3 Supply and Servicing Components

Offshore drilling operations will be supported by logistics arrangements for supply and servicing activity for the transportation and movement of equipment and personnel between the MODU and land. Supply and servicing components and activities included in the scope of assessment include:

- platform supply vessel (PSV) operations (*e.g.*, loading, transit and unloading of vessels); and
- helicopter support (*e.g.*, crew transport and delivery of supplies and equipment).

In accordance with the *Final Guidelines for the Preparation of an Environmental Impact Statement* issued to BP by the CEA Agency (CEA Agency 2015), activity within the supply base is not considered within the scope of this EIS.

2.3 ROUTINE PROJECT ACTIVITIES

2.3.1 Presence and Operation of the MODU

Once the MODU has been identified, it will be subject to a BP internal rig intake process. The rig intake process provides the means to identify and effectively manage risks for rig start-ups and verify that contracted rigs conform to specified BP practices and industry standards.

Pursuant to the Accord Acts and the requirements of an OA, a Certificate of Fitness for the MODU will be required which will be issued by a recognized Certifying Authority prior to approval for use. BP will obtain a Certificate of Fitness from an independent third party Certifying Authority for the MODU prior to the commencement of drilling operations in accordance with the *Nova Scotia Offshore Certificate of Fitness Regulations*.

The MODU used to support the Project will be stationed in the Project Area during drilling, testing and abandonment activities.

In accordance with the *Nova Scotia Offshore Drilling and Production Regulations*, a 500-m safety (exclusion) zone will be established around the MODU within which non-Project vessels (*e.g.*, fishing vessels) will be prohibited entry. The safety (exclusion) zone, which is designed to prevent collisions between the MODU and other vessels operating in the area, will be monitored by the standby vessel at the MODU at all times. No persons other than Project or CNSOPB personnel will be allowed within the safety zone without the permission of the Offshore Installation Manager. The boundaries of the safety (exclusion) zone will be communicated formally through a Notice to Mariners and a Notice to Shipping. Details of the safety (exclusion) zone will also be communicated during ongoing consultations with commercial and Aboriginal fishers.

Prior to drilling, BP will conduct an imagery based seabed survey in the vicinity of wellsites to ground-truth the findings of the geohazard baseline review. The geohazard baseline review, along with the seabed survey, will be used to identify potential wellsite locations. The seabed survey will also confirm the absence of shipwrecks, debris on the seafloor, unexploded ordnance and sensitive environmental features, such as habitat-forming corals or species at risk.If any environmental or anthropogenic sensitivities are identified during the survey, BP will move the wellsite to avoid affecting them if it is feasible to do so. If it is not feasible, BP will consult with the CNSOPB to determine an appropriate course of action.

2.3.2 Drilling

Designs for Project wells have not been finalized. Detailed plans will be provided and approved by the CNSOPB before drilling operations commence as part of the OA and ADW processes.

The drilling of each well can be broken down into two phases: riserless drilling and riser drilling. During riserless drilling, the well is drilled using an open system with no direct drill fluid return connection to the MODU. Riserless drilling is typically only carried out in the shallow sections of the well to enable the equipment which allows the riser to be anchored to the seafloor to be installed. Once a wellhead has been installed, a blowout preventer and a riser can be installed. The riser is a conduit which allows fluids and solids from the wellbore to be returned from the well to the MODU for treatment. During riserless drilling, water-based mud (WBM) is typically used as the drilling fluid and cuttings cannot be returned to the MODU for treatment and are discharged directly to the water column in accordance with regulatory guidelines. Once a riser is attached, cuttings can be returned to the MODU for treatment; therefore WBM or an alternative drilling fluid such as synthetic-based mud (SBM) can be used.

It is anticipated that Project wells will be drilled in line with the sequence illustrated in Figure 2.1.

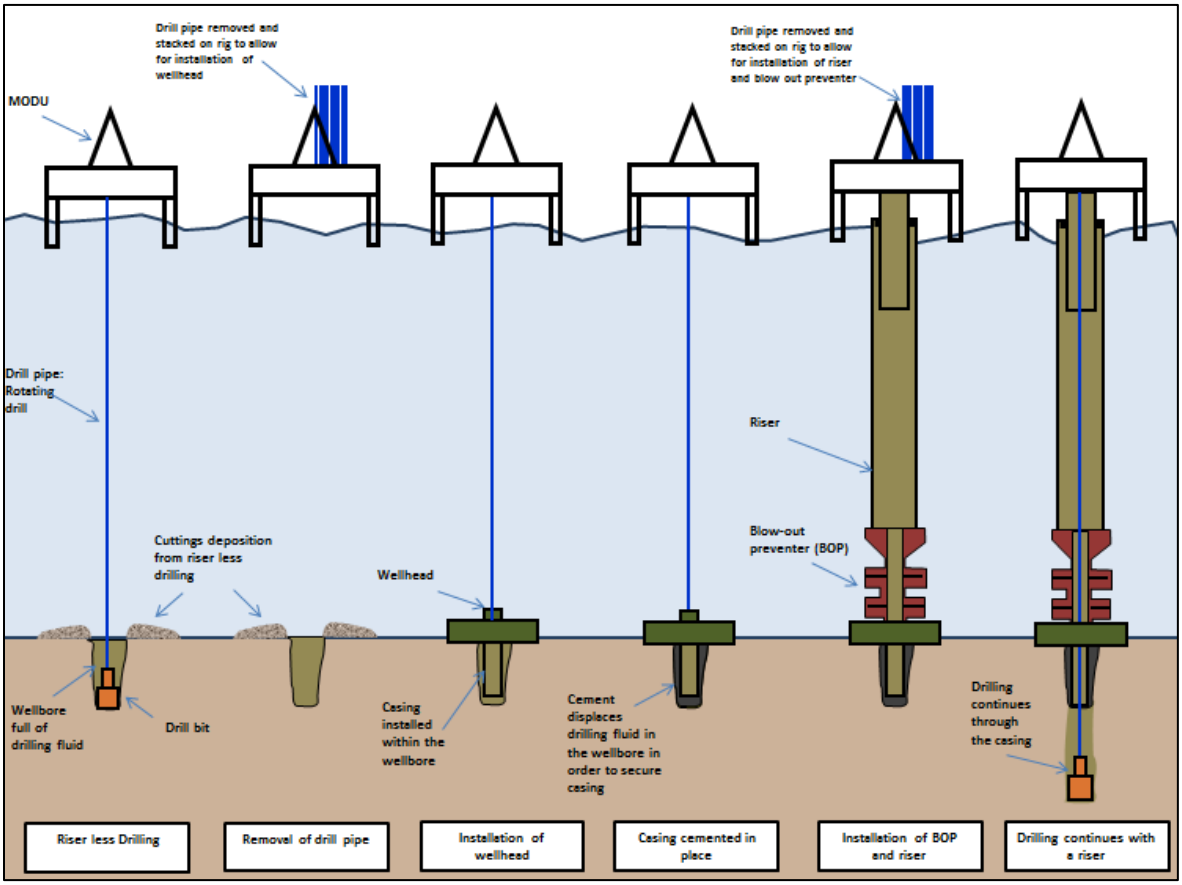


Figure 2.1 Initial Drilling Sequence

The selection of drilling chemicals will be in accordance with the *Offshore Chemical Selection Guidelines* (OCSG) (NEB *et al.* 2009) that provides a framework for chemical selection to reduce potential for environmental effects. During drilling activities, where technically feasible, lower

toxicity drilling muds and biodegradable and environmentally friendly additives within muds and cements will be preferentially used.

2.3.3 Well Control

A number of barriers are used in drilling operations to manage formation pressure, including the drilling fluid and casing, and dedicated pressure control equipment. Formation pressures are managed in order to prevent a blowout incident, which is an uncontrolled flow of formation fluids. A blowout incident can occur when the well control measures have failed.

Blowout incidents are prevented in the first instance using primary well control measures and procedures. This includes monitoring the formation pressure and controlling the density of the drilling fluid accordingly. In the event that a primary control system fails, the next line of defense is a blowout preventer (BOP) system, which is a secondary well control measure. A BOP is a mechanical device, which is designed to seal off a well at the wellhead when required. The system is made up of a series of different types of closing mechanisms.

The BOPs that will be used will comply with American Petroleum Institute (API) standards, specifically API53 (Blowout Prevention Equipment Systems for Drilling Wells). For each well drilled as part of the Project, a BOP rated to 15,000 psi working pressure, which will be able to accommodate the anticipated formation pressures, will be installed and pressure tested. Prior to installation on the well, the BOP stack will be pressure tested on the MODU deck, and then again following installation on the well to test the wellhead connection with the BOP. It is expected that the BOP will be function tested every 7 days in accordance with API Standard 53, and pressure tested every 21 days while connected to the wellhead. Additionally, when the BOP is initially installed, the remotely operated vehicle (ROV) intervention capability for operating the BOP if necessary will be tested. This is done by physically engaging the ROV control panel to function the controls (refer to Section 2.5 of the EIS for additional information).

The BOP will only be removed once the well has been plugged and abandoned and the casing pressure tested above the abandonment plugs to confirm plug integrity.

2.3.4 Waste Management

Project activities will generate various waste streams. Offshore waste discharges and emissions associated with the Project (*i.e.*, operational discharges and emissions from the MODU and PSVs) will be managed in accordance with relevant regulations and municipal bylaws as applicable, including the *Offshore Waste Treatment Guidelines* (OWTG) and the *International Convention for the Prevention of Pollution from Ships* (MARPOL), of which Canada has incorporated provisions under various sections of the *Canada Shipping Act*. Waste discharges not meeting legal requirements will not be discharged to the sea and will be brought to shore for disposal.

Atmospheric emissions are anticipated to be generated as part of the Project as a result of combustion from the MODU and PSV diesel engines, and fixed and mobile deck equipment,

and helicopters; and flaring during well test activity, in the event that well testing is required (refer to Section 2.4.3.3 of the EIS for information about well testing).

The initial sections of the well (before the riser is installed) will be drilled using WBM or seawater. It is proposed that drill muds and cuttings, used in the initial well sections will be disposed to the seabed as permitted by the OWTG. Once the riser is installed, providing a conduit to allow drill cuttings and fluid to return to the MODU for treatment, either WBM or SBM will be used. Additional treatment of cuttings will be required when SBM is used as the drilling fluid to enable disposal in accordance with the OWTG.

Cement is used in drilling operations to secure casing in the well, and to prevent the escape of hydrocarbons around the outside of the well casing. Small volumes of cement may be discharged to the seabed during the initial phases of the well until the riser has been installed, and then all cement waste will be returned to the MODU and transported to shore for disposal in an approved facility.

Liquid wastes generated by the MODU and/or PSVs will be discharged to the marine environment in accordance with MARPOL and/or the OWTG, as applicable. These liquid wastes include bilge, deck drainage, ballast water, and grey (*i.e.*, laundry) and black (*i.e.*, sewage) water, cooling water, BOP testing fluids. Liquid wastes not approved for discharge at sea (*e.g.*, waste chemicals, cooking oils or lubricating oils), will be transported onshore for transfer to an approved disposal facility.

Some solid and liquid hazardous wastes are likely to be produced as part of the Project, including oily wastes (*e.g.*, filters, rags and waste oil), waste chemicals and containers, batteries, biomedical waste and spent drilling fluids. Hazardous wastes will be stored in designated areas on the MODU and will be transferred to shore on a PSV for disposal by a third party contractor at an approved facility.

2.3.5 Vertical Seismic Profiling

As part of well evaluation activities, vertical seismic profiling (VSP) may be conducted. VSP operations can be carried out in a number of ways. For the BP exploration wells it is likely that a stationary acoustic sound source will be deployed from the MODU while a number of receivers, positioned at different levels within the drilled hole, will measure the travel time of the sound generated at the source as it arrives at those receivers. VSP operations are typically short duration, normally taking no more than a day to complete the profiling. Longer duration VSP operations for additional characterization may be run, which could extend the duration of the VSP by a few additional days.

2.3.6 Supply and Servicing Operations

The existing facility at the Woodside Terminal is the preferred supply base location to support logistical requirements for offshore operations. Supply base activities will be conducted by a third-party contractor and are considered outside the scope of the EIS.

2.3.6.1 Platform Supply Vessel Operations

The rig will be supported by a fleet of PSVs to re-supply the drilling vessel with fuel, equipment, drilling mud, and other supplies during the drilling program, as well as removing waste. It is anticipated that two to three PSVs will be required, with one vessel on stand-by at the drilling vessel at all times. It is estimated that the PSVs will make two to three round trips per week between the MODU and the supply base.

Typically PSVs travel at approximately 12 knots at service speed. It is expected that a PSV could take approximately 16 hours to reach the furthest point of the Project Area from Halifax. PSVs travelling from mainland Nova Scotia will follow established shipping lanes in proximity to shore.

2.3.6.2 Helicopter Operations

Helicopters will be used for crew changes on a routine basis and to support medical evacuation from the MODU and search and rescue activities in the area, if required. It is anticipated that approximately one helicopter trip per day would be required to transfer crew and any supplies not carried by the PSV to the MODU. The MODU will be equipped with a helideck for safe landings. Helicopter operations will be run out of Halifax Stanfield International Airport (YHZ). The maximum flight time is expected to be 90 minutes, including taxi time.

2.3.7 Well Abandonment

Once wells have been drilled to total depth (TD) and well evaluation programs completed (if necessary), the well will be plugged and abandoned in line with applicable BP practices and CNSOPB requirements. Plugs will be placed above and between any hydrocarbon bearing intervals at appropriate depths in the well, as well as at the surface. The final well abandonment program has not been finalized; however, these details will be confirmed to the CNSOPB as planning for the Project continues.

A seabed survey will be conducted at the end of the drilling program using an ROV to survey the seabed for debris.

2.4 PROJECT SCHEDULE

BP plans to commence exploration drilling in 2018 pending regulatory approval to proceed. At this time, it is anticipated that exploration drilling will be carried out in multiple phases so that initial well results can be analyzed to inform the strategy for subsequent wells. It is anticipated that each well will take approximately 120 days to drill.

A tentative Project schedule is presented in Figure 2.2.

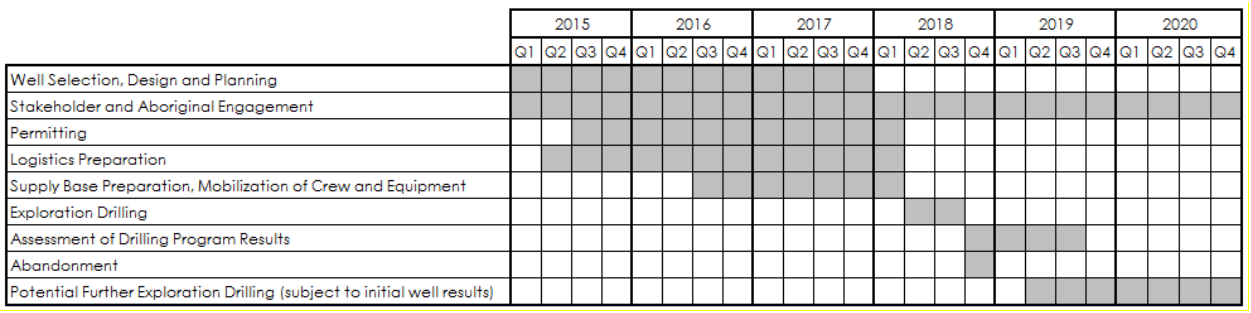


Figure 2.2 Proposed Project Schedule

2.5 ACCIDENTAL EVENTS

2.5.1 Risk Management

BP manages, monitors, and reports on the principal risks and uncertainties that could potentially arise during their global activities, to deliver safe, compliant and reliable operations. A risk is the measure of the likelihood of occurrence of an undesirable event (*i.e.*, an incident) and of the potentially adverse consequences that this event may have upon people, the environment or economic resources (IAGC-OGP 1999). An undesirable event can occur as a consequence of a hazard, which is a situation with the potential to cause adverse effects.

BP uses management systems, organizational structures, processes, standards, behaviours and its code of conduct to form a system of internal control to govern the way in which BP operates, and manages its risks. One of the key tools that BP uses to manage risk is the barrier philosophy. Multiple preventative and response barriers are put in place to manage the risk, both in terms of the incident arising in the first place, and to mitigate and respond to incidents to manage the potential consequences.

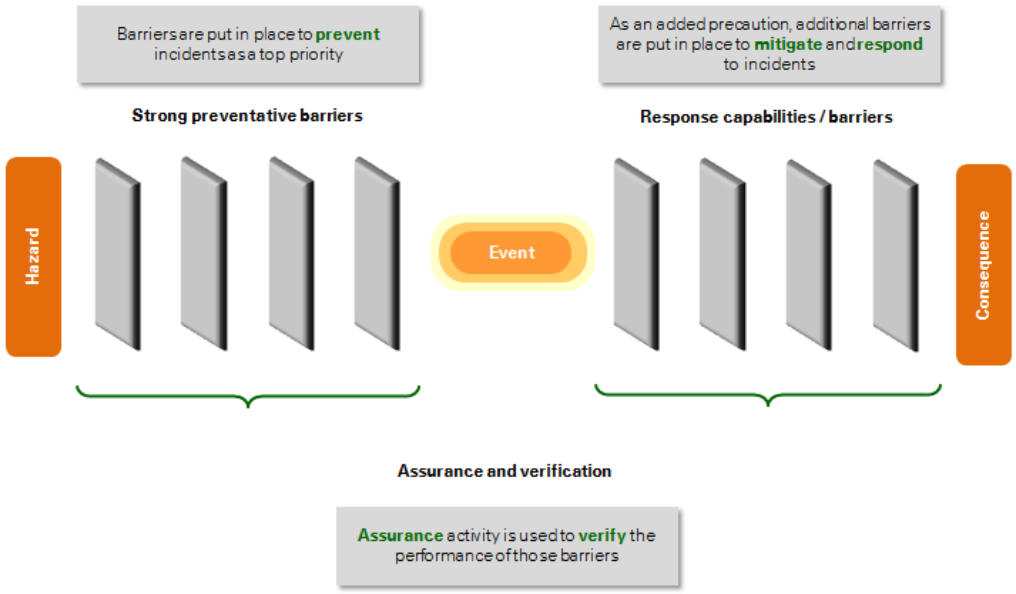
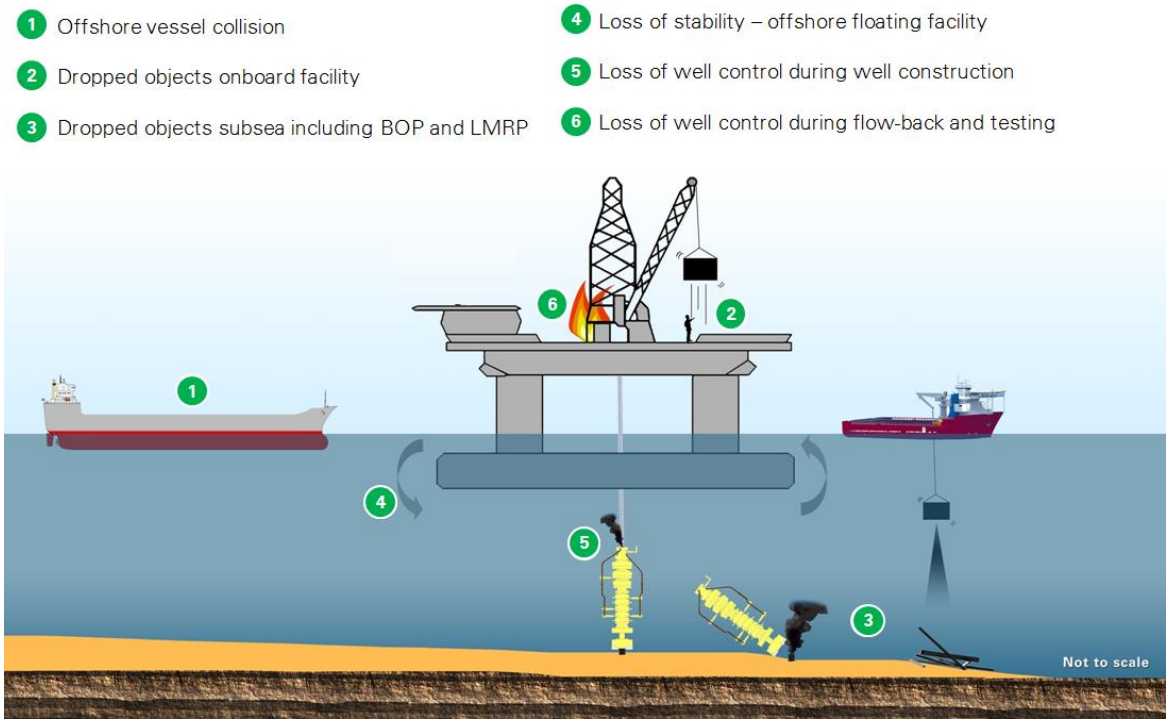


Figure 2.3 Risk Barrier Philosophy

BP has worked, along with industry partners, to improve the strength of the barriers used in deepwater drilling risk prevention and management. These improvements are built on the lessons learned as a result of the Deepwater Horizon (DWH) incident and response in 2010. Standardized global requirements for well design and construction are used by BP to reduce risk of a major accident. Additional and strengthened preventative and response barriers to manage risk have been embedded in the following key areas: people (*e.g.*, competency and training); procedures (*e.g.*, inspections and audits against established standards); and process and equipment (*e.g.*, technological innovation, monitoring).

2.5.2 Potential Accidental Event Scenarios

A number of potential accidental risk events that could occur during drilling activity have been identified as illustrated in Figure 2.4.



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

Figure 2.4 Exploration Drilling Accidental Risks

In consideration of accidental risk events that could result in a discharge to the marine environment, the following potential accidental event scenarios were selected for assessment:

- instantaneous spill of marine diesel from the MODU including 10 bbl and 100 bbl volume scenarios;
- spill of 10 bbl of marine diesel from a PSV in a nearshore environment;
- continuous 30-day well blowout incident including 733,000 bbl [24,890 bpd] and 1,056,000 bbl [35,914 bpd] scenarios; and
- an instantaneous spill of SBM from the MODU (surface release [377 bbl] and subsea release [3,604 bbl]).

Spill modelling results upon which the assessment is based, are for unmitigated events (*i.e.*, no emergency response measures to contain or recover oil), which adds another element of conservatism to the effects assessment. BOP intervention is estimated to take between 2 and 5 days and it is estimated that the well could be capped between 13 and 25 days. Meanwhile considerable efforts would be underway to control and minimize any impacts as detailed in Section 8.3 of the EIS.

2.5.3 Emergency Response and Spill Management

BP prioritizes activities and takes measures to reduce the probability of incidents, including oil spills from occurring through the use of prevention barriers. Additionally, as a precaution, BP prepares response barriers to mitigate adverse consequences should an incident occur.

The Project will operate under an Incident Management Plan (IMP) which will include a number of specific contingency plans for responding to specific emergency events, including potential spill or well control events. The IMP and supporting specific contingency plans, such as a Spill Response Plan (SRP), will be submitted to the CNSOPB prior to the start of any drilling activity as part of the OA process.

The IMP will describe the overarching response measures to respond to an emergency event, irrespective of the size, complexity or type of incident. Specifically, it will define the response organization and roles and responsibilities, and will include notification and reporting procedures. It will be designed to ensure an efficient and timely response. The SRP will clarify tactical response methods, procedures and strategies for safely responding to different spill scenarios. Tactical response methods that will be considered following a spill incident include, but are not limited to: offshore containment and recovery; surveillance and tracking; dispersant application; in-situ burning; shoreline protection; shoreline clean up; and oiled wildlife response.

The selection of appropriate response methods and equipment will be determined by the specific nature of the incident and the environmental conditions at the time of the incident. Any response effort for a well control event will comprise well intervention (*i.e.*, source control) strategies including direct BOP intervention, mobilizing and installing a capping stack, and drilling a relief well, if required. If a blowout incident were to occur, BP would immediately commence the mobilization of the primary capping stack from Stavanger, Norway. It is estimated that cap mobilization to the well site will take 12 to 19 days after an incident, with the well capped between 13 and 25 days after an incident.

Tactical response strategies will also be implemented to manage the containment and recovery of oil. Chemical dispersants (*i.e.*, solvents that break up an oil slick into small droplets by reducing the interfacial tension between oil and water) may be mobilized to help reduce surface or shoreline oiling. Dispersants will not be used by BP without prior regulatory approval. BP will undertake a net environmental benefit analysis (NEBA) to evaluate the risks and benefits associated with different spill response strategies including dispersant application.

BP will work with a number of local and federal government bodies in the event of a spill. These government bodies would be notified of a spill event, engaged to support response efforts and provide regulatory oversight, as required. Additionally, BP has access to support organizations and agencies that can provide resources to support a spill response effort. Different organizations and resources are in place within the region and may be mobilized depending on the extent and scale of a spill to support a response. Further information about these organizations will be provided in the SRP.

2.5.4 Spill Fate and Behavior

Spill fate modelling has been carried out to evaluate the effects of potential spill scenarios that could arise as part of the Project (refer to Appendix H of the EIS). The primary objective of spill modelling carried out for the Project was to assess transport, fates and effects of oil associated with each scenario. Oil spill trajectory and fate modelling was conducted using the SINTEF Oil Spill Contingency and Response model (OSCAR). Assumptions used in the modelling are conservative (*e.g.*, 30 days to cap the well) and consider no other emergency response measures to contain or recover oil. BOP intervention could actually be implemented within 2 to 5 days and the well could be capped between 13 and 25 days. An unmitigated release (*i.e.*, no deployment of other emergency response measures) is highly unlikely as it precludes consideration of oil containment and recovery measures, which would be implemented following an actual release.

Stochastic simulations were conducted for winter season (November to April) and summer season (May to October) for two potential well sites within the Project Area. Site 1 represented a smaller volume and shallower water release of modelled spilled oil (24,890 bpd at a water depth of 2,104 m, approximately 105 km from Sable Island), while Site 2 was a larger volume of modelled spilled oil at a greater water depth (35,914 bpd at a depth of 2,652 m, approximately 170 km from Sable Island).

The stochastic modelling (where a summary of individual modelled runs are presented to show probabilistic affected locations) for an unmitigated spill predicted that the majority of oil will remain in offshore waters with a <20% probability that surface oil exceeding the 0.04 µm (Bonn Agreement Oil Appearance Code (BAOAC) "sheen") will enter nearshore waters of Nova Scotia for both the summer and winter scenarios. In the event that surface oil was to enter the nearshore area of Nova Scotia, it would take a minimum of between 30 to 50 days to arrive. The duration of surface exposure for nearshore waters of Nova Scotia was 0 to 2 days. Some seasonal variation in the movement of oil following a release is expected (oil is more likely to be transported further towards the south and southwest under winter conditions, due to the stronger southwesterly surface currents in winter. The higher wind speeds and associated waves in winter result in significantly more entrainment of oil in the water column and reducing the spatial extent of oil on the sea surface.

There is also potential for surface oil to intersect Special Areas. For Sable Island there is a 28% probability of surface oiling exceeding the 0.04 µm sheen thickness threshold, based on stochastic modelling results for Site 1 (summer season) which is the worst-case credible scenario. The average minimal arrival time for the oil to reach Sable Island using this threshold is predicted to be 8 days with an average maximum exposure time at the 0.04 µm threshold of 4 days.

The average probability of surface oiling (exceeding a thickness of 0.04 µm) reaching the Gully marine protected area (MPA) is 61% during the summer season (worst-case credible scenario). The maximum exposure time for surface oil exceeding the 0.04 µm threshold in the Gully is 4 to 7 days. There is a moderate probability of surface oiling (in excess of 0.04 µm) reaching the

Emerald Basin (45 to 58%) and Georges Bank (0 to 30%). Predictive modelling indicates that the length of time for an unmitigated blowout incident to reach threshold concentrations at Emerald Basin or Georges Bank would range between approximately 6 to 20 days for Emerald Basin and 30 to 42 days for George's Bank.

The in-water dispersed and dissolved oil threshold exceedance of 58 ppb for total hydrocarbons (THC) is expected to remain in offshore waters with a smaller areal extent than for surface oil. The modelling results indicate that the in-water oil exceedance will not reach the nearshore waters of mainland Nova Scotia.

Applying the 58 ppb THC threshold for effects to fish (an in-water concentration of dissolved and entrained oil in the top 100 m), these levels are most likely to be encountered on the Scotian Slope, with 7 to 11% average probability of these levels occurring in the Haddock Box and 9 to 13% average probability of these levels reaching the Emerald, Western, and Sable Banks on the shelf.

There are several coastline areas (including those outside of the RAA) that could potentially be exposed to shoreline oiling above the 1.0 g/m^2 threshold. At Sable Island shoreline oiling is possible for both scenarios (Sites 1 and 2) for both seasons (summer and winter), with the summer season resulting in the most oil stranded. The earliest arrival time for shoreline oil exceeding the threshold for Site 1 (worst-case) occurs during the summer with an arrival time of approximately 3.8 days to the nearest shoreline (Sable Island). In the winter season, the earliest arrival time is approximately 5.8 days to Sable Island.

Stochastic modelling indicates a low potential (0 to10%) for shoreline oiling along the Nova Scotia coastline, with most predicted contact locations being less than 1% probability. A higher probability for shoreline emulsion mass exceeding 1 µm ("stain/film" oiling) is predicted to occur during the summer season (May to October). It is expected that the oil would be highly weathered, as the minimal arrival time for this coastline interaction ranges from 20 to 100 days. This timeframe would provide sufficient time to mobilize spill response in these areas.

Shoreline oiling may occur along portions of the Eastern Shore and Southern tip of Nova Scotia including the Yarmouth, Barrington, Shelburne region, Brier Island and the Canso Coastal Barrens although the likelihood of this occurring is low (less than 5% in most cases). The only heavy oiling (>10 mm thickness of emulsified oil on the shoreline), that potentially occurs on the mainland is associated with the Site 2 scenario in the summer season, with occurrences in southwest Nova Scotia.

Some in-water column and surface oiling, as well as moderate to light stranded oiling occurrences or beaching of isolated weathered tar balls may also occur outside the RAA and Canadian jurisdiction) in the summer season from both Site 1 and Site 2 scenarios although the probability of oiling was low (<5%). This probability would be decreased further with the implementation of spill response measures.

A single worst-case credible scenario was selected from the stochastic results based on the maximum shoreline oiling for both well sites from the stochastic modelling analyses. Deterministic trajectory models were run using these worst-case credible scenarios to establish near-field and far-field fate and effects and illustrate the spatial area and degree of surface, water column, and shoreline oiling that may occur and which cannot be assessed using stochastic models.

Modelling results indicated that the accidental batch release of marine diesel from the MODU would have limited effects. The results show that the location of threshold exceedances for surface effects are expected to occur over a greater area if a spill occurs during the summer than for winter. For a 100 bbl spill, the locations for oiling in excess of 0.04 µm could extend approximately 100 km to the west and southeast and 30 km in all other directions, with a small portion of weathered diesel continuing beyond these distances. The maximum time-averaged emulsified oil thickness on the sea surface exceeding the 0.04 µm threshold for both spill scenarios ranged from 0.04 µm to 50 µm. In-water dispersed and dissolved oil threshold exceedance of 58 ppb for total hydrocarbons (THC) was not exceeded in any of the simulations and no oil from the batch spills reached the coastline of Sable Island or Nova Scotia. Deterministic simulations indicate that approximately 65% of the spill evaporates from the surface within three days following the release, with remaining proportions dispersing or biodegrading within the same period.

In the unlikely event of an SBM spill, the water column is predicted to return to ambient conditions (<1 mg/L) within 30 hours of the release (RPS ASA 2014 in Stantec 2014). The potential for adverse environmental effects, given the limited spatial and temporal footprint of the affected area is therefore low.

3.0 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

As required under Section 19(1) (g) of CEAA, 2012, every environmental assessment of a designated project must take into account alternative means of carrying out the project that are considered technically and economically feasible, and consider the environmental effects of any such alternative means.

Consistent with the *Operational Policy Statement: Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012* (CEA Agency 2013), the process for consideration of alternative means of carrying out the Project includes the following steps:

- consideration of legal compliance, technical feasibility, and economic feasibility of alternative means of carrying out the Project;
- description of each identified alternative to the extent needed to identify and compare potential environmental effects;
- consideration of the environmental (including socio-economic) effects of the identified technically and economically feasible alternatives of carrying out the Project; this includes potential adverse effects on potential or established Aboriginal and Treaty rights and related interests (where this information has been provided); and
- selection of the preferred alternative means of carrying out the Project, based on the relative consideration of effects.

As per the EIS Guidelines, the analysis of alternative means considers the following alternative means of carrying out the Project:

- drilling fluid selection (*e.g.*, WBM or SBM);
- drilling waste management; and
- platform lighting and flaring options.

A summary of the alternative means of carrying out the Project is provided in Table 3.1 and includes a consideration of legal compliance, technical feasibility and economic feasibility, as well as the environmental effects (where applicable) of each alternative means.

Table 3.1 Summary of Alternatives Analysis

Option	Legally acceptable?	Technically feasible?	Economically feasible?	Environmental issues	Preferred option
Drilling Fluid					
WBM only	Yes	Yes – potential challenges with borehole stability	Yes – potential increased cost from non-productive time and losses	No substantial difference between either option. Both are considered acceptable provided that appropriate controls are in place and chemicals are selected in line with OCSG.	A preferred option has not yet been identified as well planning is still underway. It is likely both drilling fluid types will be used and both are assessed in the EIS.
WBM / SBM hybrid for different sections	Yes	Yes	Yes		
Drilling Waste Management					
Discharge to water column (following treatment)	Yes	Yes	Yes	Some localized impact is expected on the seafloor from discharge of cuttings.	
Offshore Reinjection	Yes	No – technology not proven in water depths greater than 1000 ft (305 m) or from a MODU	Not considered as option has been identified as unfeasible.		
Ship to shore	Yes	Yes	Yes – but increased costs from increased transportation and operational delays	Some limited offshore effects are expected from increased transportation, and some onshore effects from transportation and onshore disposal of waste	
Lighting					
No lighting	No – lighting is required by local and international law	Not considered as option has been identified as legally unacceptable			
Standard MODU lighting	Yes	Yes	Yes	Some localized visual effect is expected which could affect migratory birds	

Table 3.1 Summary of Alternatives Analysis

Option	Legally acceptable?	Technically feasible?	Economically feasible?	Environmental issues	Preferred option
Spectral modified lighting	Yes	No – not considered ready for commercial use yet	No - not considered as commercially viable yet	Not considered as option has been identified as unfeasible	
Flaring					
No flaring	No	Not considered as option; current regulatory practice requires DST/Flaring to secure Significant Discovery Licence. Industry continues to advocate for alternative methods.			
Reduced flaring (*i.e.* no flaring during night time or inclement weather)	Yes	Yes – although activity could give result to compromised data	Yes – but increased MODU costs and risk of delays	Reduced flaring would still result in some measure of light and atmospheric emissions	
Flaring as required	Yes	Yes	Yes	Some limited offshore impacts are expected from the light and atmospheric emissions generated during flaring. These are expected to be intermittent and brief in duration over a temporary period at the end of drilling.	

Where preferred options are noted, these alternatives were carried forward as the basis for the environmental assessment for the Project.

In addition to the alternatives listed above, BP will consider potential options for chemical selection and management. The details of chemicals to be used in the Project have not yet been confirmed and potential alternatives have not yet been identified. BP will define chemical management and selection processes to identify the ways in which chemicals will be chosen and used as part of the Project. These processes will be written, at a minimum, to comply with applicable legislation and guidelines including the Offshore Chemical Selection Guidelines (NEB *et al.* 2009).

4.0 ENVIRONMENTAL ASSESSMENT APPROACH

4.1 SCOPE OF THE ASSESSMENT

The Project under assessment is an offshore exploratory drilling program comprising the drilling, testing and abandonment of up to seven exploration wells within a Project Area encompassing ELs 2431, 2432, 2433, and 2434. The scope of the Project to be assessed under CEAA, 2012 includes the following Project activities and components which have been defined in the EIS Guidelines and represent physical activities that would occur throughout the life of the Project:

- presence and operation of MODU;
  - establishment of a safety (exclusion) zone, and light and sound emissions associated with MODU presence and operation; and
  - well drilling and testing operations
- waste management;
  - discharge of drill muds and cuttings; and
  - other discharges and emissions (including drilling and well flow testing emissions);
- VSP operations;
- supply and servicing operations;
  - helicopter transportation; and
  - PSV operations (including transit and transfer activities);
- well abandonment.

Malfunctions and accidental events, which are unlikely to occur, were also assessed.

4.2 OVERVIEW OF APPROACH

The method used to conduct the EA for the Project is based on a structured approach that is consistent with CEAA, 2012 and international best practices for conducting environmental impact assessments and serves to:

- identify the issues and potential effects that are likely to be important;
- 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.

This method is focused on the identification and assessment of potential adverse environmental effects of the Project on Valued Components (VCs). VCs are environmental attributes associated with the Project that are of particular value or interest because they have been

identified to be of concern to Aboriginal peoples, regulatory agencies, BP, resource managers, scientists, key stakeholders, and/or the general public.

"Environment" is defined to include not only ecological systems but also human, social, cultural, and economic conditions that are affected by changes in the biophysical environment. VCs therefore include ecological, social, and economic systems that comprise the environment.

The potential environmental effects of Project activities and components are assessed using a standard framework to facilitate assessment of each VC. Evaluation tables and matrices are used to document the assessment. Residual Project-related environmental effects (*i.e.*, those environmental effects that remain after the planned mitigation measures have been applied) are characterized for each individual VC using specific analysis criteria (*i.e.*, direction, magnitude, geographic extent, duration, frequency, reversibility, and context). The significance of residual Project-related environmental effects is then determined based on pre-defined standards or thresholds (*i.e.*, significance rating criteria). Where pre-established standards or thresholds do not exist, significance criteria have been defined qualitatively and justifications for the criteria provided. VC-specific significance thresholds are provided in Section 7 of the EIS.

4.3 IDENTIFICATION OF VCS

The following six VCs were selected to facilitate a focused and effective EA process:

- Fish and Fish Habitat;
- Marine Mammals and Sea Turtles;
- Migratory Birds;
- Special Areas;
- Commercial Fisheries; and
- Current Aboriginal Use of Lands and Resources for Traditional Purposes.

This list of VCs is consistent with other recent offshore exploration drilling EAs (*e.g.*, Shelburne Basin Venture Exploration Drilling Project [Stantec 2014]). Additional information on the VC selection process is provided in Table 6.2.1 of the EIS.

4.4 SPATIAL AND TEMPORAL BOUNDARIES

Environmental effects are evaluated within defined spatial and temporal boundaries. The spatial and temporal boundaries may vary among VCs, depending on the nature of potential environmental effects. The spatial boundaries must reflect the geographic range over which the Project's potential environmental effects may occur, recognizing that some environmental effects will extend beyond the Project Area. Temporal boundaries identify when an environmental effect may occur. The 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 are developed for each VC in consideration of:

- timing/scheduling of Project activities for all Project phases;
- known 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
- potential for cumulative environmental effects.

The temporal boundaries for the Project to be assessed encompass all Project phases, including well drilling, testing and abandonment. Up to seven exploration wells will be drilled over the term of the ELs, with Project activities at each well taking approximately 120 days to drill. It is assumed that Project activities could occur year-round.

The spatial boundaries for the Project to be assessed are defined below and illustrated in Figure 4.1 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 includes the area within which direct physical disturbance to the marine benthic environment may occur. Well locations have not yet been identified, but will occur within the Project Area. The Project Area is consistent for all VCs and includes ELs 2431, 2432, 2433, and 2434 as depicted on Figure 4.1.

Local Assessment Area (LAA): The LAA is the maximum area within which environmental effects from routine Project activities and components can be predicted or measured with a reasonable degree of accuracy and confidence. It consists of the Project Area and adjacent areas where Project-related environmental effects are reasonably expected to occur based on available information including effects thresholds, predictive modelling and professional judgement. The LAA has also been defined to include PSV routes to and from the Project Area. Figure 4.1 depicts the applicable LAA for each VC.

Regional Assessment Area (RAA): The RAA is the area within which residual environmental effects from Project activities and components may interact cumulatively with the residual environmental effects of other past, present, and future (*i.e.*, certain or reasonably foreseeable) physical activities. The RAA is restricted to the 200 nm limit of Canada's Exclusive Economic Zone (EEZ), including offshore marine waters of the Scotian Shelf and Slope within Canadian jurisdiction. The RAA is consistent for all VCs and is depicted on Figure 4.1.

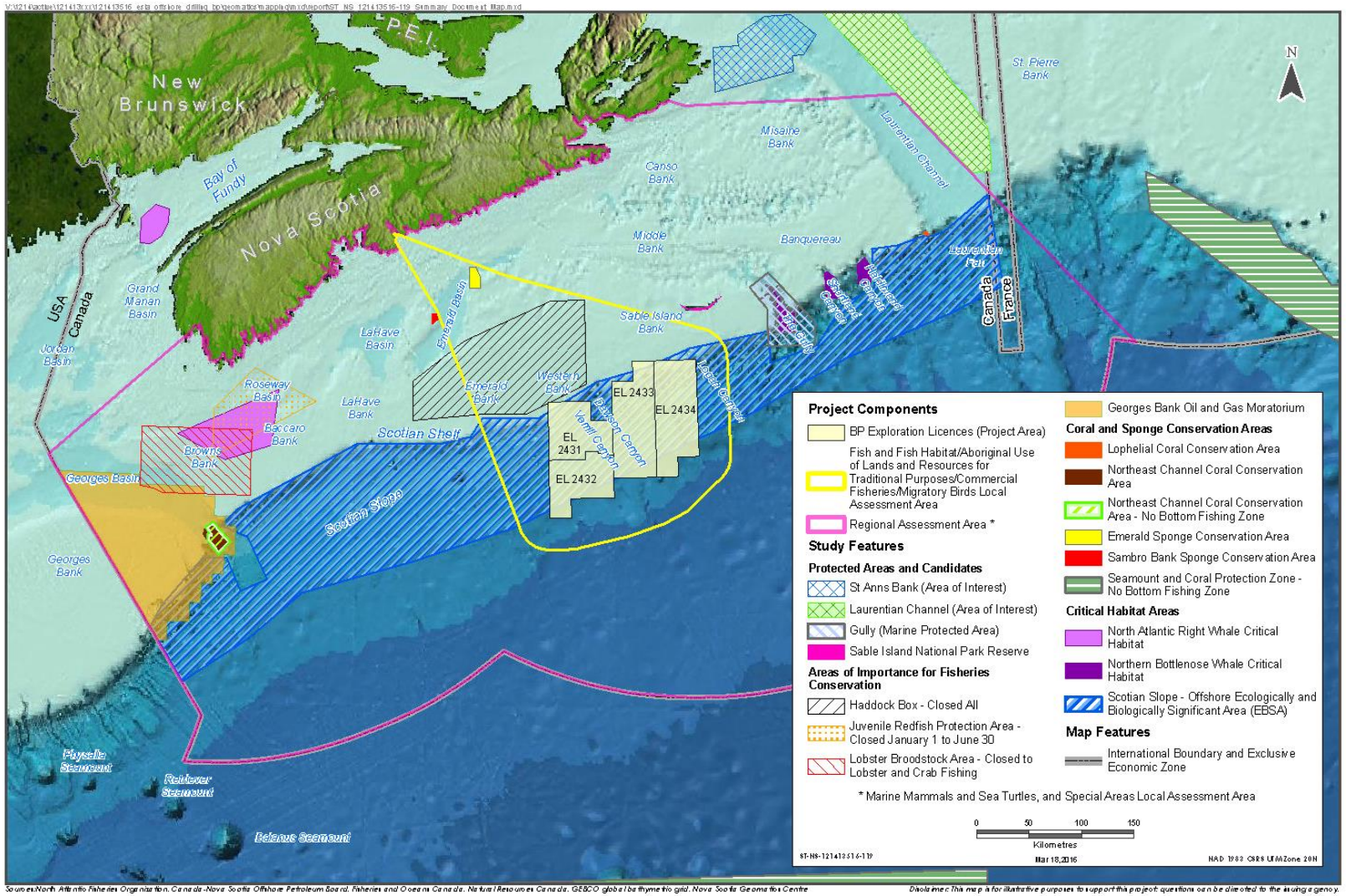


Figure 4.1 Spatial Boundaries for Environmental Assessment

5.0 STAKEHOLDER ENGAGEMENT

BP recognizes the importance of early and ongoing stakeholder engagement that continues over the life of the Project. BP's key objectives for stakeholder engagement are to:

- provide appropriate information in a timely manner to relevant, interested and affected parties based on the nature, location and duration of the Project;
- create an understanding of BP's proposed drilling operations and address questions and concerns that arise; and
- provide feedback to stakeholders so that they are satisfied, or if not satisfied, that they understand how BP has represented and responded to their input.

BP employs a broad definition of stakeholders to include fisheries organizations, environmental non-governmental organizations (ENGOs), industry associations, government, and the interested public.

5.1 STAKEHOLDER ENGAGEMENT ACTIVITIES

BP's stakeholder consultation and engagement activities on the Project have been ongoing since December 2014. BP will continue with its consultation and engagement activities over the lifetime of the Project. Engagement activities to date include face-to-face meetings with identified stakeholders, emails and telephone calls. BP will continue to provide information and opportunities for dialogue to stakeholders as Project planning or activity milestones are nearing or achieved. Engagement will continue throughout the CEAA, 2012 and drilling program authorization processes, through to Project completion.

Table 5.1 summarizes the stakeholders engaged to date for the Project (as of October 2016).

Table 5.1 Summary of Stakeholders Engaged for the Project (as of October 2016)

Stakeholder Group	Organization
Government Agencies/Departments	Canadian Environmental Assessment Agency Canada-Nova Scotia Offshore Petroleum Board Fisheries and Oceans Canada Environment and Climate Change Canada Nova Scotia Department of Energy Nova Scotia Office of Aboriginal Affairs Nova Scotia Emergency Management Office
Fisheries	Fisheries Advisory Committee Guysborough County Inshore Fishermen's Association Seafood Producers of Nova Scotia
Other Interest Groups	Maritime Energy Association
Note: See Table 3.3.1 of the EIS for complete list of activities.	

Stakeholder engagement will continue beyond the EIS, throughout the full project life-cycle. BP is committed to listening and responding to stakeholder concerns if and as they arise.

5.2 STAKEHOLDER QUESTIONS AND COMMENTS

Questions and comments raised during engagement, including comments raised during the public comment periods held thus far under CEAA, 2012, have been taken into consideration during the preparation of the EIS. In general, questions and comments include those related to: potential environmental, health and safety implications of an accidental spill; the current regulatory framework and industry response to an accidental spill; potential environmental effects on marine life and fisheries; and economic development opportunities. Specific questions and concerns raised, as well as BP's response, are included in Appendix A of this document.

6.0 ABORIGINAL ENGAGEMENT

There are 13 First Nations in Nova Scotia. The General Assembly of Nova Scotia Mi'kmaq Chiefs represents the governance for the Mi'kmaq of Nova Scotia. The Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO) represents the General Assembly of Nova Scotia Mi'kmaq Chiefs with respect to consultation on Mi'kmaq Aboriginal or treaty rights. Sipekne'katik First Nation and Millbrook First Nation are members of the Assembly of Nova Scotia Mi'kmaq Chiefs but chooses to represent themselves in consultation.

In New Brunswick, there are 15 First Nations communities, six are from the Maliseet (Wolastoqiyik) nation and nine are from the Mi'kmaw nation (NBDAA 2015). The six Maliseet communities have their own organization to conduct their administrative affairs and the Mi'gmawe' Tplu'taqn Incorporated (MTI) represents the Mi'kmaq First Nations of New Brunswick.

There are two First Nation communities in Prince Edward Island (PEI): Lennox Island Mi'kmaq First Nation and Abegweit Mi'kmaq First Nation. The Mi'kmaq Confederacy of PEI is a tribal council and provincial territorial organization which provides a common forum for the two First Nations of PEI.

The Maritime Aboriginal Peoples Council (MAPC) is a regional Aboriginal Peoples Leaders Institution established by the Native Council of Nova Scotia (NCNS), the Native Council of Prince Edward Island (NCPEI), and the New Brunswick Aboriginal Peoples Council (NBAPC). MAPC represents the Traditional Ancestral Homeland of the Mi'kmaq, Maliseet, and Passamaquoddy Aboriginal Peoples of Canada who live off-reserve. In Nova Scotia, the NCNS advocates for all off-reserve Mi'kmaq and Aboriginal people throughout traditional Mi'kmaw territory (NCNS 2015) and has established 13 geographic zones encompassing the province of Nova Scotia to administer their affairs. In New Brunswick, the NBAPC constitutes a community of off-reserve Aboriginal people residing in New Brunswick, and provides programs and services, including advocacy services. Similar to the NCNS, the NBAPC has organized off-reserve Aboriginal communities into seven zones. In PEI, NCPEI is the self-governing authority for all off-reserve Aboriginal people living on PEI. The NCPEI has organized off-reserve Aboriginal communities into three zones.

6.1 ABORIGINAL ENGAGEMENT ACTIVITIES

BP's engagement with the Mi'kmaq of Nova Scotia began in October 2013 when BP was planning the Tangier 3D Seismic Survey Project. Since then, their engagement program has expanded in recognition of a potentially larger regional area of influence associated with the exploration drilling program and has included engagement of Mi'kmaq and Maliseet in New Brunswick in addition to the Mi'kmaq of Nova Scotia. BP has also commenced engagement with the First Nations in Prince Edward Island.

Engagement methods used by BP to provide Project information and obtain feedback have included:

- face to face meetings;
- provision of information packages; and
- phone calls and emails.

Aboriginal organizations engaged by BP as of October 2016 include the following:

- Kwilmu'kq Maw-Klusuaqn Negotiation Office (NS);
- Whycocomagh First Nation (NS);
- Wagmatcook First Nation (NS);
- Membertou First Nation (NS);
- Eskasoni First Nation (NS);
- Chapel Island (Potlotek) First Nation (NS);
- Pictou Landing First Nation (NS);
- Millbrook First Nation (NS);
- Acadia First Nation (NS);
- Paq'tnkek First Nation (NS);
- Bear River First Nation (NS);
- Annapolis Valley First Nation (NS);
- Glooscap First Nation (NS);
- Sipekne'katik First Nation (NS);
- Native Council of Nova Scotia (NCNS)/Netukulimkewe'l Commission (NS);
- Kingsclear First Nation (NB);
- Woodstock First Nation (NB);
- Tobique First Nation (NB);
- Oromocto First Nation (NB);
- St. Mary's First Nation (NB);
- Mi'gmawe'l Tplu'taqnn Incorporated (MTI)(formerly Assembly of First Nation Chiefs of New Brunswick) (NB);
- Madawaska First Nation - Wolastoqiyik (Maliseet) Nation (NB);
- Lennox Island First Nation (PEI); and
- Abegweit First Nation (PEI).

BP will continue to reach out to Aboriginal organizations in Nova Scotia, New Brunswick, and Prince Edward Island to share Project information and obtain feedback on issues and concerns. Information sessions focussed on topics or concerns expressed about the proposed Project will be conducted.

In an effort to better understand traditional use of marine areas and resources by Aboriginal peoples and potential effects on Aboriginal and Treaty rights, Membertou Geomatics Solutions (MGS) and Unama'ki Institute of Natural Resources (UINR) were commissioned to undertake a Traditional Use Study (TUS) (see Appendix B of the EIS). Based on knowledge of fishing interests obtained from Fisheries and Oceans Canada (DFO) and/or through consultation with the Canadian Environmental Assessment Agency (CEA Agency), the TUS targeted interviews with the NCNS and all 13 First Nation Bands in Nova Scotia, and Fort Folly, St. Mary's, and Woodstock First Nations in New Brunswick. Interviews with fisheries managers, captains and fishers, along with a literature review and review of DFO licencing information were used to help characterize communal commercial and/or food, social and ceremonial (FSC) fisheries that could be occurring in the RAA. Organizations that were interested and available to participate are included in the study results. The TUS is not intended to represent an exhaustive inventory of Aboriginal resource use occurring in the RAA but provides a reasonable characterization of potential interactions with the Project.

6.2 ABORIGINAL QUESTIONS AND COMMENTS

Questions and comments raised during Aboriginal engagement, including comments submitted to the CEA Agency during the public comment periods held thus far under CEAA, 2012, have been taken into consideration during the preparation of the EIS.

Key concerns raised by various Aboriginal organizations were a perceived lack of funding, limited duty to consult, and limited engagement scope. On December 8, 2015, the CEA Agency announced the allocation of federal funding through the Participant Funding Program to assist public and Aboriginal groups in their participation in the EA process. Federal funding was allocated to 10 applicants; all are Aboriginal organizations in Nova Scotia or New Brunswick.

In addition to concerns raised about the consultation and engagement process, Aboriginal organizations raised questions and concerns about the collection and integration of traditional knowledge for the EIS, and potential effects of the Project on potential or established Aboriginal and Treaty rights, through effects on marine resources and/or through potential obstruction to these resources.

Specific questions and concerns raised, as well as the associated response, are included in Appendix A.

7.0 SUMMARY OF ENVIRONMENTAL EFFECTS ASSESSMENT

7.1 FISH AND FISH HABITAT

Fish and Fish Habitat was selected as a VC in consideration of the ecological value of marine ecosystems, the socio-economic importance of fisheries resources (*i.e.*, target fish species), the EIS Guidelines, and the potential for interactions with Project activities and components. Fish and fish habitat are regulated under the federal *Fisheries Act*, which includes provisions to protect the productivity of commercial, recreational and Aboriginal (CRA) fisheries. For the purposes of this assessment, fish habitat is assessed in accordance with definitions of "fish habitat" under the *Fisheries Act* comprising all aspects of the physical marine environment, including the benthic environment and water quality. Routine Project activities are not predicted to interact with marine plants which are primarily found in nearshore environments.

Key issues raised during stakeholder and Aboriginal engagement for the Project to date include general concerns related to potential Project effects (and cumulative effects) on the marine environment including fish species at risk, commercial fish species, and/or fish species that have been identified as having significance to Mi'kmaq and/or Maliseet culture.

7.1.1 Baseline Conditions

The Project Area is located to the south of Sable Island and Western Banks in an area partly on the Scotian Shelf but primarily on the Scotian Slope. Water depths in the Project Area range from approximately 100 m to over 3,000 m. At water depths of 2,000 to 3,000 m, the slope is more gradual and known as the Continental Rise. Notable bathymetric features present within or adjacent to the Project Area include the Verrill Canyon, which extends into the Project Area, and Dawson and Logan Canyons that are immediately adjacent to the Project Area (Figure 4.1). The eastern Scotian Shelf (east of the Project Area) hosts a series of deepwater canyons, including the Gully and Shortland and Haldimand canyons, which originate on the outer edge of the Scotian Shelf and continue down the slope (Figure 4.1).

Several deepwater benthic surveys have been undertaken along the Scotian Slope in 2001 and 2002 in former licence blocks near and overlapping the Scotian Basin Project Area. The areas previously surveyed are within the depth range of the Project Area and the habitat among the adjacent blocks is consistent and provides supporting evidence to suggest that similar habitat may occur within the Project Area.

Overall, the benthic fauna across the two blocks surveyed earlier (former ELs 2381 and 2382) was low in abundance and diversity, and no regions contained substantial coral development (JWEL 2003). Refer to Section 5.2.2 of the EIS for additional information on the habitat of the previously surveyed blocks within and adjacent to the Project Area.

There are 24 fish species at risk (SAR) and species of conservation concern (SOCC) that may be present on the Scotian Shelf or Slope at various times of the year. A complete list of species, their status and presence near the Project is presented in Table 7.1. Details on life history characteristics (*i.e.*, mating, spawning and potential times and locations of species' larvae and eggs) are provided in Section 5.2 and Table 5.2.3 of the EIS.

As noted in Table 7.1, five fish species are listed under Schedule 1 and formally protected under *Species at Risk Act* (SARA). These species include:

- Atlantic salmon (Inner Bay of Fundy population);
- Atlantic wolffish;
- Northern wolffish;
- Spotted wolffish; and
- White shark.

Atlantic salmon are expected to be transient, and individuals from the Inner Bay of Fundy population are not expected to occur in the Project Area. Unlike all other salmon in North America, evidence suggests that inner Bay of Fundy Atlantic Salmon have very limited migration, staying within the Bay of Fundy and the Gulf of Maine for extended periods (SARA 2015). Atlantic wolffish are typically found inhabiting the seafloor in water depths of 150 to 350 m and have been found as deep as 918 m (COSEWIC 2012b).

An examination of wolffish landings in Northwest Atlantic Fisheries Organization (NAFO) Division 4X revealed that Atlantic wolffish were concentrated on the western peak of Browns Bank, west of German Bank and in three isolated areas inshore of the 100-m isobath contour line (LGL 2014). Northern wolffish are found in deep water up to 1,500 m and prefer a narrow temperature range of 3 to 5ºC; it is believed that temperature is a limiting factor in their distribution (COSEWIC 2012d). Spotted wolffish prefer a broader water temperature range of 2 to 8ºC and are often found in shallower water than their Northern counterparts. Both benthic fish species could be found in low numbers on the Scotian Shelf and prefer sand or a mix of sand and shell substrate. The potential occurrence of any of these wolffish species in the Project Area is deemed low based on habitat preferences (COSEWIC 2012d, COSEWIC 2012e).

The white shark is rare in the northwest Atlantic (32 records in 132 years), as it is the northern edge of their range. Recorded sightings near the Project include the Bay of Fundy, Laurentian Channel, and Sable Island Bank. They are predominantly pelagic and can range in water depth from the surface to 1,300 m. These fish are highly mobile and migrate seasonally (COSEWIC 2006b).

Within and surrounding the Project Area, the socio-economic setting is dominated by commercial fisheries activity. Groundfish, pelagic, and invertebrate fisheries occur on the Scotian Shelf and Slope, with large pelagics (*e.g.*, swordfish, tuna, and shark) as the most commonly harvested fish in the Project Area. Following the collapse of the traditional groundfish stocks (*e.g.*, cod, flatfish and Pollock), shellfish stocks have grown significantly in their

contribution to revenue and profitability of the Scotian Shelf fishery. CRA fish species with the potential to occur in the Project Area are listed in Table 7.2.

Table 7.1 Fish Species at Risk and/or of Conservation Concern Potentially Occurring on the Scotian Shelf and Slope

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation[1]	Potential for Occurrence in the Project Area[2]	Timing of Presence
Acadian redfish (Atlantic population)	*Sebastes fasciatus*	Not Listed	Threatened	Low	Year-round
American eel	*Anguilla rostrate*	Not Listed	Threatened	Transient	November -Silver eel out migration from NS March to July - Larvae and glass eels on the Slope and Shelf
American plaice (Maritime population)	*Hippoglossus platessoides*	Not Listed	Threatened	Low	Year-round
Atlantic bluefin tuna	*Thunnus thynnus*	Not Listed	Endangered	High	June to October
Atlantic cod (Laurentian South population)	*Gadus morhua*	Not Listed	Endangered	Low	Year-round
Atlantic cod (Southern population)		Not Listed	Endangered	Low	Winter – Deep water of Browns and LaHave Banks Summer- Southern Northeast Channel, shallow waters of Browns and LaHave Banks
Atlantic salmon (Outer Bay of Fundy population)	*Salmo salar*	Not Listed	Endangered	Transient	March to November
Atlantic salmon (Inner Bay of Fundy population)		Endangered	Endangered	Transient	March to November

Table 7.1 Fish Species at Risk and/or of Conservation Concern Potentially Occurring on the Scotian Shelf and Slope

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation[1]	Potential for Occurrence in the Project Area[2]	Timing of Presence
Atlantic salmon (Eastern Cape Breton population)		Not Listed	Endangered	Transient	March to November
Atlantic salmon (Nova Scotia Southern Upland population)		Not Listed	Endangered	Transient	March to November
Atlantic sturgeon (Maritimes population)	*Ancipenser oxyrinchus*	Not Listed	Threatened	Low	Year-round
Atlantic wolffish	*Anarhichas lupus*	Special Concern	Special Concern	Low	Year-round
Basking shark (Atlantic population)	*Cetorhinus maximus*	Not Listed	Special Concern	Low to Moderate	Year-round
Blue shark (Atlantic population)	*Priomace glauca*	Not Listed	Special Concern	Moderate to High	June to October
Cusk	*Brosme brosme*	Not Listed	Endangered	Low to Moderate	Year-round
Deepwater redfish (Northern population)	*Sebastes mentalla*	Not Listed	Threatened	Low	Year-round
Northern wolffish	*Anarhichas denticulatus*	Threatened	Threatened	Low	Year-round
Porbeagle shark	*Lamna nasus*	Not Listed	Endangered	High	Year-round
Roughhead grenadier	*Macrourus berglax*	Not Listed	Special Concern	Moderate	Year-round
Roundnose grenadier	*Coryphaenoides rupestris*	Not Listed	Endangered	Moderate to High	Year-round

Table 7.1 Fish Species at Risk and/or of Conservation Concern Potentially Occurring on the Scotian Shelf and Slope

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation[1]	Potential for Occurrence in the Project Area[2]	Timing of Presence
Shortfin mako	*Isurus oxyrinchus*	Not Listed	Threatened	Moderate	July to October
Smooth skate (Laurentian-Scotian population)	*Malacoraja senta*	Not Listed	Special Concern	Moderate	Year-round
Spiny dogfish (Atlantic population)	*Squalus acanthias*	Not Listed	Special Concern	High	Year-round
Spotted wolffish	*Anarhichas minor*	Threatened	Threatened	Low	Year-round
Striped bass (Southern Gulf of St. Lawrence population)	*Morone saxatilis*	Not Listed	Special Concern	Low	June to October
Striped bass (Bay of Fundy population)		Not Listed	Endangered	Low	
Thorny skate	*Amblyraja radiate*	Not Listed	Special Concern	Low to Moderate	Year-round
White shark	*Carcharodon Carcharias*	Endangered	Endangered	Low	June to November
White hake	*Urophycis tenuis*	Not Listed	Special	Moderate	Year-round

[1]Species of conservation concern (SOCC) listed as endangered, threatened, or of special concern by COSEWIC and not listed on Schedule 1 of SARA.
[2] This is based on the analysis of habitat preferences during various life-history stages, distribution mapping, and catch data for each species within the Project Area

Source: BIO 2013; Campana *et al.* 2013; COSEWIC 2006a, 2006b, 2007, 2008, 2009a, 2009b, 2010a, 2010b, 2010c, 2010d, 2011, 2012a, 2012b, 2012c, 2012d, 2012e, DFO 2013b, 2013c, 2013d, 2013e, 2013f; Horseman and Shackell 2009; Maguire and Lester 2012; NOAA2013; SARA 2015

Table 7.2 Fish Species of Commercial, Recreational or Aboriginal Value Found in the RAA

Common Name	Scientific Name	Potential for Occurrence in the Project Area[1]	Timing of Presence
Groundfish Species			
Acadian redfish[2]	*Sebastes fasciatus*	Low	Year-Round
American plaice[2]	*Hippoglossoides platessoides*	Low	Year-Round
Atlantic cod[2]	*Gadus morhua*	Low	Year-Round
Atlantic halibut	*Hippoglossus Hippoglossus*	Moderate	Year-Round
Deepwater redfish[2]	*Sebastes mentalla*	Low	Year-Round
Haddock	*Melanogrammus aeglefinus*	Low	Year-Round
Hagfish	*Myxine glutinosa*	Moderate	Year-Round
Monkfish	*Lophius americanus*	Low	Year-Round
Pollock	*Pollachius virens*	Low	Year-Round
Red hake	*Urophycis chuss*	Low	Year-Round
Sand lance	*Ammodytes dubius*	Low	Year-Round
Silver hake	*Merluccius bilinearis*	Low	Year-Round
Turbot – Greenland flounder	*Reinhardtius hippoglossoides*	Moderate to High	Year-Round
White hake[2]	Urophycis tenuis	Moderate	Year-Round
Witch flounder	*Glyptocephalus cynoglossus*	Low	Year-Round
Yellowtail founder	*Limanda ferruginea*	Low	Year-Round
Pelagic Species			
Albacore tuna	*Thunnys alalunga*	Low	July to November
Alewife	*Alosa pseudolarengus and A. aestivalis*	Low	July to February
Atlantic herring	*Clupea harengus*	Low	Year-round
Atlantic mackerel	*Scomber scombrus*	Low	Winter – deep water on the Shelf Spring/Summer – Migrate to shallower coastal zones
Bigeye tuna	*Thunnus obesis*	Low	July to November
Black dogfish	*Centroscyllium fabricii*	Low	Year-round
Bluefin tuna[2]	*Thunnus thynnus*	Low	June to October
Blue shark[2]	*Prionace glauce*	Moderate	June to October
Capelin	*Mallotus villosus*	Low	Year-round
Porbeagle shark[2]	*Lamna nasus*	Moderate	Year-round
Shortfin mako shark[2]	*Leurus oxyringus*	Moderate	July to October
Swordfish	*Xiphias gladuis*	Moderate	July to October

Table 7.2 Fish Species of Commercial, Recreational or Aboriginal Value Found in the RAA

Common Name	Scientific Name	Potential for Occurrence in the Project Area[1]	Timing of Presence
White marlin	*Tetrapturus albidus*	Moderate	July to October
Yellowfin tuna	*Thunnus albacares*	Low	July to October
Invertebrates			
American lobster	*Homarus americanus*	Low	Year-round
Jonah crab	*Cancer borealis*	Low	Year-round
Atlantic sea scallop	*Placopecten magellanicus*	Low	Year-round
Clams (Atlantic Surf, Soft-shelled, quahaugs)	*Spisula solidissima, Mya areniaria, Mercenaria mercenaria.*	Low	Year-round
Green sea urchin	*Strongylocentrotus droebachiensis*	Low	Year-round
Northern shrimp	*Pandalus borealis*	Low	October - April – Nearshore May - September- Offshore
Shortfin squid	*Illex illecebrosus*	High	April – November[3]
Snow crab	*Chionoecetes opilio*	Low	Year-round
Red crab	*Chaceon quinquedens*	Low	Year-round

Note:
[1] Based on the analysis of habitat preferences during various life-history stages, distribution mapping, and catch data for each species within the Project Area
[2] Species at Risk or Species of Conservation Concern
[3] Based on assumed spawning times

7.1.2 Anticipated Changes to the Environment

Routine Project activities and components have the potential to interact with Fish and Fish Habitat, primarily due to underwater sound emissions from MODU operation, PSV traffic, and VSP surveys. Operational solid and liquid discharges from the MODU (*e.g.*, drill muds and cuttings, cooling water, ballast water, bilge and deck water, grey/black water and process water) can interact with Fish and Fish Habitat.

As a result of these considerations, and the policies put in place to protect fish and their habitat outlined in the *Fisheries Act,* SARA, and *Canadian Environmental Protection Act* (CEPA), the assessment of Project-related environmental effects on Fish and Fish Habitat is focused on the following potential environmental effects:

- Change in Risk of Mortality or Physical Injury; and
- Change in Habitat Quality and Use.

7.1.3 Potential Effects from Routine Operations

Change in Risk of Mortality or Physical Injury

A Change in Risk of Mortality or Physical Injury for marine fish could result from underwater sound associated with the presence and operation of the MODU and VSP. Drilling operations and station-keeping (*i.e.*, use of dynamic positioning thrusters) during MODU operations will generate underwater sound, affecting the quality of the underwater acoustic environment for fish species in the Project Area. VSP will also result in increased sounds levels in the marine environment. Sound levels in close proximity to the airgun array may result in physical injury or mortality from acute changes in pressure.

Based on acoustic modelling conducted for the Project (Zykov 2016; refer to Appendix D of the EIS), underwater sound generated by the MODU could potentially cause physical injury or mortality to fish at close range (*i.e.*, within 1-2 m of the sound source). Mobile fish species are expected to avoid underwater sound at lower levels than those at which injury or mortality may occur, therefore physical harm and potential effects on fish populations are unlikely. VSP is expected to generate the most intensive underwater sound associated with the Project although it will be over a relatively short period of time (no more than a day per well). Based on acoustic modelling and reported effects thresholds, injury or mortality to fish (if exposed to sound pressure levels greater than 206 dB re 1 µPa peak) SPL would be restricted to less than 140 m from the VSP sound source.

Mortality or physical injury could also occur to benthic species (*e.g.,* fish, shellfish, sponges and corals) from smothering or crushing as a result of waste management activities (particularly the discharging of drill muds and cuttings). Drill waste dispersion modelling conducted for the Project (refer to Appendix C of the EIS) predicts the thickest drill cutting deposition (>500 mm) will be confined to an area within 15 m of the discharge point. Sediment thicknesses greater than 10 mm (a conservative thickness to predict mortality by smothering) will extend up to a radius of 116 m with a maximum footprint of 0.53 ha per well.

Routine liquid discharges (cooling water, ballast water, bilge and deck water, grey/black water and small amounts of process water during well testing) will be in accordance with the OWTG and/or MARPOL as applicable, which are designed to be protective of the marine environment and will not be at levels that would cause mortality or physical injury to fish species.

Change in Habitat Quality and Use

A Change in Habitat Quality and Use for marine fish could occur as a result of Project activities affecting the marine environment including the presence and operation of the MODU (light and sound emissions into the water column), waste management (discharge of drill muds and cuttings affecting water and sediment quality), VSP (underwater sound), supply and servicing operations (PSV operations and underwater sound associated with vessel movement), and well abandonment (potential underwater sound associated with removal of wellhead infrastructure

and/or a change in benthic habitat associated with leaving the wellhead in place). All of these changes are predicted to be of low magnitude and reversible.

Underwater sound from the MODU could result in potential behavioral changes within a limited area (sound levels will decrease to less than 150 dB re 1 µPa peak SPL approximately 0.4 km from the MODU and PSV). Artificial light in the water column could result in physiological stress in marine fish, potentially altering behavior of some species in the vicinity of the MODU during the drilling program.

Changes in sediment quality as a result of drill waste discharges are expected to be localized and reversible. Drill waste dispersion modelling for the Project predicts sediment thicknesses at or above 1 mm will extend up to 563 m from the discharge site and occupy a maximum areal extent of 9.91 ha per well.

A Change in Habitat Quality and Use as a result of VSP operations is expected to be short-term (no more than a day per well) with effects reversible once underwater sound emissions from the VSP cease. A Change in Habitat Quality as a result of underwater sound from PSV traffic would represent a small increment over similar effects currently associated with high levels of shipping activity throughout the RAA. Well abandonment would result in a very localized Change in Habitat Quality. If the wellhead is left in place, it may provide hard substrate for recolonization by benthic communities.

7.1.4 Potential Effects from Accidental Events

All of the identified spill scenarios have potential to result in a Change in Risk of Mortality or Physical Injury and/or Change in Habitat Quality and Use for Fish and Fish Habitat. The extent of the potential effects will depend on how the spill trajectory and the VC overlap in both space and in time. Potential effects pathways for a Change in Risk of Mortality or Physical Injury and/or Change in Habitat Quality and Use for Fish and Fish Habitat due to an oil spill include: reduction of water and/or sediment quality; reduced primary productivity due to a reduction in air-water gas exchange and light penetration; and lethal and sub-lethal effects from acute or chronic exposure to water-soluble fractions of hydrocarbons.

The risk of exposure of fish and invertebrates to an oil spill depends on the type of oil and 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. Fish kills are typically brief and localized following a discrete spill event due to the rapid loss of the acutely lethal low-molecular weight components of oil due to dilution and weathering (Lee *et al*. 2015), the ability of mobile species to detect and avoid impacted areas, and the ability of phytoplankton, zooplankton, and adult fish to metabolize hydrocarbons (Wolfe *et al.* 1996; Graham *et al.* 2010).

Potential effects pathways for a Change in Risk of Mortality or Physical Injury and/or Change in Habitat Quality and Use for Fish and Fish Habitat due to an accidental SBM release include:

smothering of sessile or slow-moving individuals and food sources for fish and shellfish; sedimentation; and potential for contamination. Elevated total suspended solid (TSS) levels can have detrimental effects on fish including physiological stresses, reduced growth, and adverse effects on survival, with the severity of these effects dependent on various factors including life-history stage and risk of exposure (*e.g.,* ability of fish to avoid undesirable conditions).

Effects from a MODU or PSV diesel spill on Fish and Fish Habitat are predicted to be limited due to high evaporation rates (for the 100 bbl spill scenario approximately 65% of the spill is predicted to evaporate within three days).

The 100 bbl diesel spill, PSV diesel spill, and well blowout incident scenarios have the potential for oil to reach spawning areas on the Scotian Shelf and/or nearshore. However, most species spawn in multiple locations within the RAA or over long time scales, therefore it is not likely that an entire year class (*i.e.*, fish born in the same year; cohort) would be lost due to the toxic effects of oil on early life stages of fish species. Furthermore, none of the spill scenarios are expected to result in permanent alteration or irreversible loss of critical habitat.

A Change in Risk of Mortality or Physical Injury in the case of an unintended bulk release of SBM would be restricted to smothering effects on highly immobile individuals and benthic prey species within tens of metres from the spill site. A temporary and reversible Change in Habitat Quality and Use would also be limited to within tens of metres from the spill site, thereby limiting the magnitude of potential effects on Fish and Fish Habitat.

7.2 MARINE MAMMALS AND SEA TURTLES

Marine Mammals and Sea Turtles was selected as a VC in recognition of the ecological value they provide to marine ecosystems, specific regulatory requirements of the *Fisheries Act* and SARA, requirements of the EIS Guidelines, and potential interactions with the Project. This VC considers secure species as well as species of marine mammals and sea turtles listed under SARA (*i.e.,* SAR) or considered at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (*i.e.,* SOCC).

Key issues raised during stakeholder and Aboriginal engagement for the Project to date include concerns about potential effects of drilling sounds on marine mammals, and the proximity of Project activities to important habitat for marine mammals and sea turtles, including the endangered North Atlantic right whale, northern bottlenose whale, and leatherback sea turtle. Whales were also identified as being spiritually important to the Mi'kmaq.

7.2.1 Baseline Conditions

Marine mammals and sea turtles found on the Scotian Shelf and Slope include six species of mysticetes (baleen whales), eleven species of odontocetes (toothed whales), five species of phocids (seals), and four species of sea turtles. Six of these species are designated at risk by

SARA (three species of mysticetes, two species of odontocetes, and one species of sea turtles; see Table 7.3). No phocid populations on the Scotian Shelf are listed as SAR or SOCC.

Table 7.3 Marine Mammal and Sea Turtle Species at Risk and Species of Conservation Concern Found in the RAA

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	Potential for Occurrence in the Project Area[1]	Timing of Presence
Mysticetes (Toothless or Baleen Whales)					
Blue whale (Atlantic population)	*Balaenoptera musculus*	Endangered	Endangered	Moderate	Summer to Fall
Fin whale (Atlantic Population)	*Balaenoptera physalus*	Special Concern	Special Concern	High	Year- round (highest concentrations in Summer)
North Atlantic right whale	*Eubalaena glacialis*	Endangered	Endangered	Low	Summer
Odontocetes (Toothed Whales)					
Harbour porpoise (Northwest Atlantic population)	*Phocoena phocoena*	Not Listed	Special Concern	Low	Summer to Fall
Killer whale	*Orcinus orca*	Not Listed	Special Concern	Low to Moderate	Summer
Northern bottlenose whale (Scotian Shelf Population)	*Hyperoodon ampullatus*	Endangered	Endangered	Low	Year-round
Sowerby's beaked whale	*Mesoplodon bidens*	Special Concern	Special Concern	Low	Year-round
Sea Turtles					
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	Endangered	High	April to December
Loggerhead sea turtle	*Caretta caretta*	Not Listed	Endangered	High	April to December

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

Most species of baleen whale are migratory, and are present on the Scotian Shelf and Slope from late spring through fall. Only the fin whale is present year-round. While odontocetes are also present in greatest diversity during the spring through fall months, their timing is more variable, with multiple species present in the winter or year-round. Critical habitat for the endangered North Atlantic right whale has been identified in Roseway Basin on the Scotian Shelf within the RAA (Brown *et al.* 2009). Critical habitat for the endangered northern bottlenose whale has been

designated in the Gully and in the Shortland and Haldimand Canyons on the east of the Scotian Shelf and Slope (DFO 2010).

In the waters off Nova Scotia, seals are most commonly found over the Scotian Shelf, particularly north of the Project Area, in the nearshore waters around Sable Island. They are less common in the open waters over the Scotian Slope, where the Project Area is located. Sable Island is an important area for phocids as it hosts breeding populations of harbour seals (*Phoca vitulina*), and the world's largest breeding colony of grey seals (*Halichoerus grypus*; DFO 2011a; Freedman 2014). Smaller breeding colonies have also been found on coastal islands along southwestern Nova Scotia at Flat, Mud, Noddy, and Round Islands (Bowen *et al.* 2011). Other species of phocids known to forage on the Scotian Shelf include harp (*Pagophilus groenlandica*), hooded (*Cystophora cristata*) and ringed (*Pusa hipsida*) seals. Generally, these species have only occasionally been observed foraging offshore Nova Scotia and are considered infrequent visitors to these waters; however, for a few hours or days during the winter and early spring, hundreds of harp and hooded seals and one or two ringed seals come ashore on Sable Island (DFO 2011a).

Four species of sea turtle can be found migrating and foraging on the Scotian Shelf and Slope waters. Of these, the leatherback (*Dermochelys coriacea*) and loggerhead (*Caretta caretta*) sea turtles are the most likely to occur, and both species are listed as endangered by COSEWIC (only the leatherback sea turtle is currently designated under SARA). Leatherback and loggerhead sea turtles, and a few green sea turtles (*Chelonia mydas*) were observed over the course of BP's 2014 wildlife monitoring program (RPS 2014), Shell's 2013 Shelburne Basin 3D Seismic Survey and BP's 2014 Tangier 3D Seismic Survey (LGL 2014). The presence of Kemp's ridley sea turtle (*Lepidochelys kempii*) in the Project Area is considered unlikely.

Critical habitat was not identified in the 2006 Recovery Strategy for the leatherback sea turtle; however, DFO has been using satellite tracking data to define important habitat for leatherback turtles in Atlantic Canada for the purpose of identifying critical habitat for designation under SARA (DFO 2011b). Research has identified three primary areas of important habitat for leatherback turtles foraging in Atlantic Canadian water (DFO 2013g) which are now being considered for designation as critical habitat under SARA through an amended draft Recovery Strategy for the species (DFO 2015). These include: waters east and southeast of Georges Bank, along the southwestern Scotian Shelf near the southwest boundary of the Atlantic Canadian Exclusive Economic Zone; the southeastern Gulf of St. Lawrence and waters off western and eastern Cape Breton Island; and waters south and east of the Burin Peninsula, Newfoundland and Labrador.

7.2.2 Anticipated Changes to the Environment

Routine Project activities and components have the potential to interact with marine mammals and sea turtles as well as their habitat. These interactions could result from underwater sound emissions produced by operation of the MODU, PSV, and helicopter, as well as during VSP surveys. PSV traffic presents a risk of collision with marine mammals and seas turtles, potentially

resulting in physical injury or mortality to individuals. The Project could also result in changes in availability, distribution, or quality of prey items and habitat for marine mammals and sea turtles as a result of underwater sound or operation discharges.

In consideration of these potential interactions, the assessment of Project-related environmental effects on Marine Mammals and Sea Turtles is focused on the following potential environmental effects:

- Change in Risk of Mortality or Physical Injury; and
- Change in Habitat Quality and Use.

7.2.3 Potential Effects from Routine Operations

Change in Risk of Mortality or Physical Injury

A Change in Risk of Mortality or Physical Injury for marine mammals and sea turtles could potentially occur as a result of the combined underwater sounds produced by MODU and PSV presence (*i.e.*, use of dynamic positioning thrusters during station keeping) and operation (*i.e.,* drilling), or during VSP operations. Exposure to underwater sound of sufficient intensity can result in hearing loss, whether temporary or permanent (*i.e.,* Temporary Threshold Shifts or Permanent Threshold Shift), or, in extreme circumstances, mortality (*e.g.*, under prolonged and very intense sound emissions when the receiver is very close to the source) (Richardson *et al.* 1995; Nowacek *et al.* 2007; Southall *et al.* 2007).

Acoustic modelling conducted for the Project (refer to Appendix D of the EIS) predicts that threshold levels associated with potential injury for cetaceans would occur at distances between less than 100 m and 470 m from the MODU (depending on species group). Sound levels predicted for VSP operations that could result in permanent auditory injury to marine mammals and sea turtles occur at distances between approximately 40 to 160 m depending on species group. Marine mammals and sea turtles are considered unlikely to approach (or remain) close enough to the VSP sound source to be exposed to sound levels capable of causing auditory injury. VSP activity will be planned and conducted in consideration of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP; DFO 2007b) (refer to Table 8.1 of this report for more specific mitigation measures to reduce adverse environmental effects associated with underwater sound).

There is also the potential for vessel collisions with marine mammals and sea turtles during PSV operations. During transit to/from the Project Area, PSVs will travel at vessel speeds not exceeding 22 km/hour (12 knots). In order to reduce the potential for vessel collisions during transiting activities outside the Project Area, vessels will reduce speed in the event that a marine mammal or sea turtle is noted in proximity to the vessel. Project PSVs will avoid currently-identified critical habitat for the North Atlantic right whale (Roseway Basin) and northern bottlenose whale (the Gully, and Shortland and Haldimand canyons), during transiting activities within the LAA and outside the Project Area. Should critical habitat be formally designated for

leatherback sea turtle or other SAR within the RAA over the term of the exploration licences, BP will comply with applicable restrictions or mitigations developed for the marine shipping industry to reduce the risks of vessel strikes in these areas.

Change in Habitat Quality and Use

A Change in Habitat Quality and Use for marine mammals and sea turtles could potentially occur as a result of Project activities that generate underwater sound. Underwater sounds introduced by the presence and operation of the MODU and VSP, helicopter transportation, and PSV transits may affect the quality of the underwater acoustic environment for marine mammals and sea turtles. Biological effects on marine organisms may occur when introduced anthropogenic sounds overlap in frequency with the hearing range of species present in the area of sound exposure. A sound is considered audible if the receiver is able to detect it over background sound. Possible marine mammal or sea turtle responses to increased underwater sound levels include: habitat avoidance, communication masking, discomfort, and behavioural disturbance (*e.g.*, changes in diving/breathing rate or foraging efficiency).

Potential changes in the chemical composition of water may also result from the discharge of drill muds and cuttings and other discharges and emissions. Change in Habitat Quality and Use as a result of physical disturbance may also occur during well abandonment. There are no predicted changes that would result in permanent or irreversible loss of critical habitat.

7.2.4 Potential Effects from Accidental Events

The effects of oil on marine mammals and sea turtles depend on the extent of exposure to toxic components of oil. Exposure may be derived from external coatings of oil (*e.g.*, interaction with surface slicks when animals surface for air, clogging of baleen plates), inhalation of aerosols of particulate oil and hydrocarbons, and ingestion of contaminated prey (Lee *et al*. 2015).

Depending on the location and extent of a diesel spill, it could directly and indirectly reduce the amount of habitat available to marine mammals and sea turtles for foraging and other life history activities. These effects would be short-term in duration until the slick disperses. A batch spill of diesel is not expected to create permanent or irreversible changes to Habitat Quality and Use. Since diesel fuel disperses faster than crude oil, surface exposure is limited. Marine mammals and sea turtles are not considered to be at high risk from a diesel spill, due to the fact that it is probable that only a small proportion of a species population would be within the area affected by the spill which is expected to be limited in size.

A well blowout incident has the potential to result in a Change in Risk of Mortality or Physical Injury and Change in Habitat Quality and Use for Marine Mammals and Sea Turtles. The extent of the potential effects will depend on how the spill trajectory and Marine Mammals and Sea Turtles overlap in both space and in time. In a worst-case credible scenario, where a group of non-fur-bearing individuals (*e.g.*, cetaceans) were to come in contact with surface oil, the risk of mortality is considered low. However, based on an understanding of critical habitat for species

at risk and important breeding locations in the RAA for certain marine mammals and predicted well blowout incident modelling results, there is potential for population level effects to occur in the unlikely event of a well blowout.

Stochastic modelling predicts the average probability of surface oiling exceeding a thickness of 0.04 µm (which is below the threshold for biological effects) reaching the Gully marine protected area (MPA) (designated critical habitat for the northern bottlenose whale) to be approximately 61% during the summer season (worst-case credible scenario) (May to October). The maximum exposure time for surface oil exceeding the 0.04 µm threshold in the Gully is 4 to 7 days. The likelihood of fur-bearing seals coming into contact with oil from a Project-related spill is low except for seals inhabiting Sable Island where there is a 28% probability of surface oiling (characterized by a 0.04 µm-thick oil layer) and 55% average probability of stranded oil (1 µm) on the coastline, based on stochastic modelling results for a well blowout incident at Site 1 (summer season) (worst-case credible scenario). The average minimal arrival time for the oil to reach Sable Island using this threshold is predicted to be five days. Spill trajectory modelling for the Project (refer to Appendix H of the EIS) assumed 30-day unmitigated releases. The geographic extent and magnitude of effects are expected to be less than predicted given the conservatism of the model and spill response measures undertaken in the event of an actual spill.

Any interaction between an SBM whole mud spill and marine mammals and sea turtles would be limited given the scale of effects in the water column and low toxicity of the material, resulting in a temporary reduction in habitat quality. Any risk of physical injury would be limited to individuals in the immediate vicinity of the spill. A subsea release of SBM at the wellsite would have no expected effects on sea turtles given the water depth.

7.3 MIGRATORY BIRDS

Migratory Birds was selected as a VC due to their ecological value to marine and coastal ecosystems, potential interaction with Project activities and components, regulatory considerations, and requirements in the EIS Guidelines. The Migratory Birds VC includes pelagic (*i.e.*, offshore) and neritic (*i.e.*, inshore) seabirds, waterfowl, and shorebirds that are protected under the *Migratory Birds Convention Act* (MBCA) and additional marine-related birds not protected under the Act (*e.g.*, cormorants). This VC also considers all migratory birds listed under Schedule 1 of SARA, COSEWIC, and/or the Nova Scotia *Endangered Species Act* (NS ESA).

Birds have traditionally played and continue to play an important role in Mi'kmaq culture, providing cues for traditional harvesting activities along the coast and also providing a food source. Accordingly, potential effects on migratory birds (primarily as a result of a spill) have been raised as an issue during Aboriginal engagement.

7.3.1 Baseline Conditions

An estimated 30 million seabirds use the eastern Canadian waters each year including breeding marine birds and migrating birds from the southern hemisphere and northeastern Atlantic (Fifield *et al*. 2009). The combination of northern hemisphere and southern hemisphere birds results in peak diversity during spring and summer months (Fifield *et al*. 2009). Significant numbers of overwintering birds, including alcids, gulls, and Northern Fulmars can also be found in Atlantic Canadian waters during the fall and winter (Brown 1986), whereas species assemblages are dominated by shearwaters, storm-petrels, Northern Fulmars and gulls in summer (Fifield *et al.* 2009).

The waters of the RAA are known to support approximately 19 species of pelagic seabirds, 14 species of neritic seabirds, 18 species of waterfowl and loons and 22 shorebird species (see Table 7.7), with more occurring in the area as rare vagrants or incidentals. It is important to note, however, that many of these species have a coastal affinity and would be unlikely to regularly occur in waters of the Project Area. Six marine bird species listed as either SAR or SOCC are known to occur in waters of the Scotian Shelf and Slope and could potentially occur within the RAA: Ivory Gull, Piping Plover, Roseate Tern, Red Knot, Harlequin Duck, and Barrow's Goldeneye. A number of breeding, migrant, and vagrant landbirds also occur within the RAA, including two SAR species which have coastal affinities: Peregrine Falcon and Savannah Sparrow.

Table 7.4 Migratory Birds Found in the RAA[1]

Common Name	Species Name
Pelagic Seabirds	
Northern Fulmar	*Fulmarus glacialis*
Cory's Shearwater	*Calonectris diomedea borealis*
Great Shearwater	*Puffinus gravis*
Sooty Shearwater	*Puffinus griseus*
Manx Shearwater	*Puffinus puffinus*
Wilson's Storm-Petrel	*Oceanites oceanicus*
Leach's Storm-Petrel	*Oceanodroma leucorhoa*
Northern Gannet	*Morus bassanus*
Pomarine Jaeger	*Stercorarius pomarinus*
Parasitic Jaeger	*Stercorarius parasiticus*
Long-tailed Jaeger	*Stercorarius longicaudus*
Great Skua	*Stercorarius skua*
South Polar Skua	*Stercorarius maccormicki*
Black-legged Kittiwake	*Rissa tridactyla*
Dovekie	*Alle alle*
Common Murre	*Uria aalge*
Thick-Billed Murre	*Uria lomvia*

Table 7.4 Migratory Birds Found in the RAA[1]

Common Name	Species Name
Razorbill	*Alca torda*
Atlantic Puffin	*Fratercula arctica*
Neritic Seabirds	
Great Cormorant	*Phalacrocorax carbo*
Double-Crested Cormorant	*Phalacrocorax auritus*
Black-headed Gull	*Larus ridibundus*
Bonaparte's Gull	*Larus philadelphia*
Ring-billed Gull	*Larus delawarensis*
Herring Gull	*Larus argentatus*
Iceland Gull	*Larus glaucoides*
Glaucous Gull	*Larus hyperboreus*
Great Black-backed Gull	*Larus marinus*
Ivory Gull[2]	*Pagophila eburnea*
Roseate Tern[3]	*Sterna dougallii*
Common Tern	*Sterna hirundo*
Arctic Tern	*Sterna paradisaea*
Black Guillemot	*Cepphus grylle*
Waterfowl and Loons	
Red-throated Loon	*Gavia stellata*
Common Loon	*Gavia immer*
Canada Goose	*Branta Canadensis*
American Green-winged Teal	*Anas crecca*
American Black Duck	*Anas rubripes*
Mallard	*Anas platyrhynchos*
Greater Scaup	*Aythya marila*
Lesser Scaup	*Aythya affinis*
Common Eider	*Somateria mollissima*
Harlequin Duck[4]	*Histrionicus histrionicus*
Long-tailed Duck	*Clangula hyemalis*
Black Scoter	*Melanitta nigra*
Surf Scoter	*Melanitta perspicillata*
White-winged Scoter	*Melanitta fusca*
Common Goldeneye	*Bucephala clangula*
Barrows Goldeneye[5]	*Bucephala islandica*
Bufflehead	*Bucephala albeola*
Red-breasted Merganser	*Mergus serrator*

Table 7.4 Migratory Birds Found in the RAA[1]

Common Name	Species Name
Shorebirds	
Black-bellied Plover	*Pluvialis squatarola*
American Golden-Plover	*Pluvialis dominica*
Semipalmated Plover	*Charadrius semipalmatus*
Piping Plover (melodus subspecies)[6]	*Charadrius melodus melodus*
Killdeer	*Charadrius vociferus*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Willet	*Tringa semipalmata*
Spotted Sandpiper	*Actitis macularius*
Whimbrel	*Numenius phaeopus*
Ruddy Turnstone	*Arenaria interpres*
Red Knot rufa ssp[7]	*Calidris canutus rufa*
Sanderling	*Calidris alba*
Semipalmated Sandpiper	*Calidris pusilla*
Least Sandpiper	*Calidris minutilla*
White-rumped Sandpiper	*Calidris fuscicollis*
Pectoral Sandpiper	*Calidris melanotos*
Purple Sandpiper	*Calidris maritima*
Dunlin	*Calidris alpina*
Short-billed Dowitcher	*Limnodromus griseus*
Red-necked Phalarope[8]	*Phalaropus lobatus*
Red Phalarope	*Phalaropus fulicarius*
Terrestrial (Land) Birds	
Peregrine Falcon[9]	*Falco perigrinus anatum/tundrius*
Savannah Sparrow (*princeps* subspecies)[10]	*Passerculus sandwichensis*

Note:
[1]Excludes rare transients / vagrants, except for species at risk which are known to occasionally occur (*e.g.*, Ivory Gull).
[2]Ivory gull is designated as *endangered* under SARA (Schedule 1) and by COSEWIC.
[3]Roseate Tern is designated as *endangered* under SARA (Schedule 1), the NS ESA, and by COSEWIC.
[4]Harlequin Duck is designated as a species of *special concern* under SARA (Schedule 1) and by COSEWIC; and is listed as *endangered* under the NS ESA.
[5]Barrows Goldeneye is designated as a species of *special concern* under SARA (Schedule 1) and by COSEWIC.
[6]Piping Plover (melodus subspecies) is designated as *endangered* under SARA (Schedule 1), the NS ESA, and by COSEWIC.
[7]Red Knot rufa ssp is designated as *endangered* under SARA (Schedule 1), the NS ESA, and by COSEWIC.
[8]Red-necked Phalarope is designated as a species of *special concern* by COSEWIC.
[9]Peregrine Falcon is designated as a species of *special concern* under SARA (Schedule 1) and by COSEWIC; and is listed as *vulnerable* under the NS ESA.
[10]Savannah Sparrow (*princeps* subspecies) is designated as a species of *special concern* under SARA (Schedule 1) and by COSEWIC

Throughout the summer months, the coastline of the RAA supports over two hundred colonies of nesting marine birds. These colonies are known to support Atlantic Puffins, Black-legged Kittiwakes, Common Eiders, cormorants, Leach's Storm-petrels, Great Black-backed Gulls, Herring Gulls, Razorbills and terns. Leach's Storm-petrel is the most numerous breeding seabird in the RAA. Sable Island, which is migratory bird sanctuary and contains SARA-designated critical habitat for the Roseate Tern, is also an important breeding area for colonial marine birds, including gulls, terns, cormorants, as well as other migratory birds.

Within the RAA there are 14 coastal Important Bird Areas (IBAs), including Sable Island. These IBAs are scattered throughout the RAA and have been designated as IBAs for a variety of reasons including the presence of breeding habitat for species at risk, important shorebird migration habitat, important coastal waterfowl habitat, and/or the occurrence of regionally significant colonial water bird colonies. Nine of the fourteen IBAs are considered to be globally significant.

7.3.2 Anticipated Changes to the Environment

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

As a result of these considerations, the assessment of Project-related environmental effects on Migratory Birds is focused on the following potential environmental effects:

- Change in Risk of Mortality or Physical Injury; and
- Change in Habitat Quality and Use.

7.3.3 Potential Effects from Routine Operations

Change in Risk of Mortality or Physical Injury

The presence and operation of the MODU and PSVs has the greatest potential to result in Changes to Risk of Mortality or Physical Injury for migratory birds because they are known to aggregate around drilling features as a result of night lighting, food, and other visual cues, potentially making them subject to increased risk of mortality due to physical impacts with structures, predation by other marine bird species, and incineration from flares (Wiese *et al.* 2001; Ronconi *et al*. 2015). In addition to direct (*e.g.*, collisions) and indirect interactions with the MODU and PSVs, the Project has potential to result in a Change in Risk of Mortality or Physical Injury of migratory birds through exposure to residual hydrocarbons associated with drill muds, cuttings, and other discharges and emissions; through exposure to underwater sound caused by VSP operations; and disturbance from and collisions with transiting helicopters.

Change in Habitat Quality and Use

A Change in Habitat Quality and Use for migratory birds could potentially occur as a result of: the influence of sound, lights, and flaring from the MODU and PSVs on habitat conditions, the presence of hydrocarbons and TSS within the water column from the discharge of drill muds and cuttings; the release of other discharges and emissions (including cooling water, ballast water, bilge and deck water, grey/black water and small quantities of process water); exposure of migratory (diving) birds to underwater sound from VSP operations; and disturbance from helicopter transportation.

7.3.4 Potential Effects from Accidental Events

A Change in Risk of Mortality or Physical Injury for Migratory Birds exposed to hydrocarbons can occur through three main pathways: external exposure to oil (resulting in coating of oil on feathers); inhalation of particulate oil and volatile hydrocarbons; and ingestion of oil. The probability of lethal effects to birds primarily depends on the probability of exposure, which is influenced by behaviour, including the percentage of the time an animal spends on the water or shoreline as well as any oil avoidance behaviour (French-McCay 2009).

With respect to a Change in Habitat Quality and Use for Migratory Birds, hydrocarbon spills are not likely to permanently alter the quality of marine bird habitat. Prey availability may be reduced or migratory birds may avoid affected habitat. However, spill cleanup and natural weathering processes are likely to result in the eventual recovery of such habitat.

In assessing environmental effects of spills on migratory birds, threshold concentrations for surface exposure and shoreline exposure were considered. Environmental effects are anticipated to occur over the greatest area if a spill was to occur during summer months when the oil is less likely to be naturally dispersed by wind and waves.

The majority of diesel from a spill from either the MODU or PSV will evaporate and disperse within the first three days following the release, with the maximum exposure time for oil on the surface with a thickness greater than 0.04 µm being one day.

Deterministic modelling results predicts that surface oiling from an unmitigated blowout incident could exceed a surface thickness threshold of 10 µm over a total area of 91,778 km^2. There are several coastline areas that could potentially be exposed to shoreline oiling in the event of a well blowout. For both Site 1 and Site 2 (both winter and summer seasons) Sable Island could be expected to receive heavy oiling (>10 mm thickness of emulsified oil on the shoreline). Stochastic modelling results for Site 2 (summer season) show more extensive shoreline oiling ranging from a stain/film (0.1 to 0.001 mm) to heavy oiling (>10 mm) in some locations along the Nova Scotia mainland coastline. Several seabird colonies and IBAs along the coast (including small coastal islands) could potentially be affected by a well blowout. The average minimum timeframe required for oil to potentially reach these areas at a threshold of 1 µm (minimum approximately 30 days for mainland) would allow for response measures and containment

equipment to be placed in advance to avoid or mitigate adverse effects. A shorter arrival time for oil to reach the Sable Island shoreline predicted (minimum average was 5 days for Site 1 in the summer) which would reduce the time-frame for implementation of response measures to avoid or mitigate adverse effects on birds nesting there.

A release of SBM would result in elevated levels of TSS in the water column and possibly a small thin sheen on the surface, with effects potentially similar to those discussed above for hydrocarbon spills, but more limited in magnitude given the comparative volume and physical property of the SBM.

As noted in Section 2.4.3, BP will implement multiple preventative and response barriers. Of particular relevance to migratory birds are the commitments related to shoreline protection and clean up, and oiled wildlife response. In the event that oil reaches the shoreline, a shoreline clean-up and remediation team will be mobilized to the affected areas. A shoreline clean-up assessment technique (SCAT) survey will be conducted to inform shoreline clean-up and remediation as applicable. BP will also engage specialized expertise to deflect oil from sensitive areas, and recover and rehabilitate wildlife).

7.4 SPECIAL AREAS

Special Areas has been selected as a VC due to ecological and/or socio-economic importance, stakeholder and regulatory interests, and potential Project interactions. Special Areas provide important habitat that may be relatively more vulnerable to Project-related effects than other areas. Special Areas includes consideration of areas noted for their biological and ecological significance including, but not limited to, protected areas and Ecologically and Biologically Significant Areas (EBSAs).

Key issues raised during stakeholder and Aboriginal engagement for the Project to date include concerns about possible effects on species at risk and their habitat such as the potential effects of underwater sound on marine life. Concerns were raised regarding the proximity of the Project to Sable Island, the Gully and northern bottlenose whale critical habitat.

7.4.1 Baseline Conditions

There are several Special Areas located within the RAA (refer to Figure 4.1). The Scotian Slope EBSA and Haddock Box are partially located within the Project Area. The Scotian Slope EBSA is an area recognized for: high primary productivity; species diversity and richness; unique and sensitive benthic communities; migratory routes; overwintering habitat; foraging area for leatherback sea turtles; and habitat for Greenland sharks (Doherty and Horsman 2007; DFO 2014). Approximately 87% of the Project Area falls within the Scotian Slope EBSA. However, the EBSA is very large (approximately 72,568 km^2); the Project Area constitutes only about 17% of the total area of the EBSA.

The Haddock Box is an important nursery area for the protection of juvenile haddock, and is closed year-round by DFO to the commercial groundfish fishery. Scallop fishing continues to occur on the eastern-most part of the closed area (O'Boyle 2011). Approximately 153 ha of the Haddock Box is within the Project Area (representing 0.01% of the Haddock Box area). No Project well locations will be located within the Haddock Box. The LAA for the PSV route crosses through the Haddock Box and encompasses the Sambro Bank Sponge Conservation Area and Emerald Sponge Conservation Area located 130 km and 126 km, respectively, from the Project Area.

Table 7.5 lists the Special Areas in the RAA and the approximate distance (in order of proximity) to the Project Area.

Table 7.5 Proximity of Special Areas to the Project Area

Special Area	Distance from Project Area
Scotian Slope EBSA	0 km
Haddock Nursery Closure, Emerald/Western Bank (Haddock Box)	0 km
Sable Island National Park Reserve	48 km
The Gully Marine Protected Area	71 km
Northern Bottlenose Whale Critical Habitat (Sanctuaries): the Gully, Shortland Canyon, Haldimand Canyon	81 km, 139 km, 171 km
Sambro Bank and Emerald Basin Sponge Conservation Areas	130 km, 126 km
Redfish Nursery Closure Area (Bowtie)	221 km
Lophelia Conservation Area (LCA)	248 km
North Atlantic Right Whale Critical "Habitat/Area to be Avoided"	264 km
Lobster Fishing Area 40 (Georges Bank)	284 km
Georges Bank Oil and Gas Moratorium Area	300 km
Northeast Channel Coral Conservation Area	306 km
Hell Hole (Northeast Channel)	336 km

Given the relative distance of most of the identified Special Areas from the Project Area, the consideration of potential Project-VC interactions (and resulting environmental effects) focuses primarily on the Scotian Slope EBSA, the Haddock Box, and the Gully MPA. PSV transit activities could potentially cross the Emerald Basin Sponge Conservation Area, and to a lesser likely extent, the Sambro Bank Sponge Conservation Area. Although Sable Island National Park Reserve is closer than some Special Areas, routine Project activities are not predicted to interact with this Special Area.

7.4.2 Anticipated Changes to the Environment

Routine Project activities and components could potentially interact with Special Areas, which could affect the ability of the Special Area to continue to provide important biological and ecological functions on which marine species and/or fisheries depend. Accordingly, the assessment of Project-related environmental effects on Special Areas is focused on the following potential environmental effect:

- Change in Habitat Quality.

7.4.3 Potential Effects from Routine Operations

Change in Habitat Quality

A Change in Habitat Quality for Special Areas could potentially occur as a result of Project activities affecting the marine environment including the presence and operation of the MODU (light and sound emissions affecting underwater environment), discharge of drill muds and cuttings (reduction of water and sediment quality), other emissions and discharges (effects on water quality), VSP (underwater sound), helicopter transportation (sound emissions), PSV operations (underwater sound associated with vessel movement), and well abandonment (potential underwater sound associated with removal of wellhead infrastructure and/or a change in benthic habitat associated with leaving the wellhead in place).

Based on acoustic modeling conducted for the Project, it is predicted that the Scotian Slope EBSA, Haddock Box, the Gully and Shortland Canyon could potentially experience a temporary change in habitat quality due to the propagation of underwater sound associated with the presence and operation of the MODU. The geographic extent and magnitude of these effects depends on a variety of factors including water temperature and depth of drilling location. Changes from underwater sound associated with VSP are expected to be restricted to the Scotian Slope EBSA.

The discharge of drill muds and cuttings as well as other discharge and emissions from the MODU and PSV have the potential to cause a temporary change in water and sediment quality within the portion of the Scotian Slope EBSA that falls within the Project Area. Although PSVs may transit through or in close proximity to the Sambro Bank and Emerald Bank Sponge Closure Areas, this interaction is not predicted to result in any change that would affect the biological or ecological integrity of these Special Areas. Helicopter and PSV traffic could potentially affect habitat quality of Special Areas as a result of sound disturbance, particularly in the vicinity of migratory bird colonies (*e.g.*, Sable Island). As noted in Table 8.1, helicopters will avoid flying at altitudes less than 300 m (with the exception of approach and landing activities) and a later distance of 2 km around active bird colonies, when possible. Helicopters will avoid flying over Sable Island (a 2 km buffer will be recognized).

Well abandonment activities are expected to have little interaction with the Scotian Slope EBSA and the Haddock Box outside the immediate vicinity of the wellsite. No other Special Areas are predicted to be affected by well abandonment.

7.4.4 Potential Effects from Accidental Events

Special Areas provide important habitat and may be comparatively more vulnerable to Project-related effects, including effects from accidental events, than other areas. Adverse effects on Special Areas could degrade the ecological integrity of the Special Area so that it is not capable of providing the same ecological function for which it was designated (*e.g.*, protection of sensitive or commercially important species). The assessment of Special Areas is therefore closely linked to all of the other VCs considered in this assessment.

Based on spill trajectory modelling conducted for the Project (refer to Appendix H of the EIS), it is expected that a 10 bbl batch spill from the MODU will be limited to a small portion of the Scotian Slope EBSA. Surface oiling from a 100 bbl spill could migrate to the Haddock Box and the Gully MPA. Due to the limited (patchiness) and temporary nature of any surface oiling, it is not expected to result in permanent alteration or destruction of habitat in these Special Areas. A vessel spill could potentially occur anywhere along the transit route between the MODU and the supply base in Halifax Harbour and therefore has the potential to affect the following Special Areas, in addition to the ones discussed above: Sambro Bank Sponge Conservation Area, Emerald Sponge Conservation Area, and shoreline habitat (if a spill should occur close to port). Dissolved hydrocarbons from spilled diesel would be limited to the surface and mixed layer of the water column, therefore the potential for deeper sponges to be exposed is considered low. The relatively limited zone of influence of a vessel spill would prevent any wider spread and potentially significant adverse effects from occurring, and adverse effects would be considered temporary and reversible.

A well blowout incident represents the accidental event with the potential for the most widespread effects. In a worst-case credible scenario, with no mitigation or emergency response, the greatest probabilities of surface oiling exceeding 0.04 µm are estimated for offshore protected areas such as the Gully MPA (61%), and Sable Island National Park Reserve (28%). There are lower probabilities (<2%) for surface oiling exceeding 0.04 µm in coastal protected areas within Nova Scotia. Surface oiling can also be expected to occur within the Haddock Box (55% probability) and sponge/coral conservation areas (17 to 26% probability) based on stochastic modelling results. Exposure to oil within these areas would be mostly limited to the surface and mixed layer of the water column; therefore, the potential for sponges and corals on the seafloor to be exposed to in-water oil is considered low. While haddock is a demersal species, sub-lethal and lethal effects to eggs and larvae that drift in the mixed surface layer of the water column may result following exposure to in-water oil, above the 58 ppb and 200 ppb in-water concentrations, respectively.

Stranded oil is of primary relevance to Special Areas with shorelines. Sable Island National Park Reserve has the highest probability of stranded oil exceeding a 1 g/m^2 threshold (55.5%), with

other designated protected areas on the Nova Scotia coastline having a low (<5%) probability of stranded oil interaction. Stochastic modelling for an unmitigated blowout incident at Sites 1 and 2 during winter and summer conditions predict areas of heavy oiling (>10 mm thickness of emulsified oil) for Sable Island, with a minimum arrival time to reach 1 µm thickness threshold of 5 to 10 days.

7.5 COMMERCIAL FISHERIES

Commercial Fisheries is included as a VC because of the commercial and cultural importance of commercial fisheries to the region, regulatory protection of fish and fish habitat under the *Fisheries Act*, requirements of the EIS Guidelines, and the potential for Project activities and components to interact with fisheries. This VC addresses potential effects on non-Aboriginal commercial fisheries, focusing on those interactions that could have an effect on the success of commercial fisheries.

Key issues raised during stakeholder and Aboriginal engagement for the Project to date consists of concerns related to potential Project effects on the marine environment including commercially fished species and the possible effects to the fishing industry. Aboriginal engagement identified concern of possible obstruction of Mi'kmaq and Maliseet fishing areas as a result of the Project as well as potential effects on nearshore and inshore resources as a result of a spill (refer to Section 7.6 for an assessment of effects on Aboriginal fishing). Questions and concerns were raised with respect to effects of routine discharges and spills on fish populations and migration, feeding, and spawning activities that could be occurring in the affected area.

7.5.1 Baseline Conditions

Within and surrounding the Project Area, the socio-economic setting is dominated by commercial fisheries activity. Groundfish, pelagic, and invertebrate fisheries occur on the Scotian Shelf and Slope, with large pelagics (*e.g.*, swordfish, tuna, and shark) as the most commonly harvested fish in the Project Area. The Project Area is located within Commercial Fisheries Management Areas for lobster, shrimp, scallop and crab, and within NAFO Unit Area 4Wm, 4Wj, 4Wg and 4Wf.

There is notable fishing effort within the northern portion of the Project Area along the Shelf break including the harvesting of Atlantic halibut, Greenland halibut, hagfish, swordfish, shark species, white hake, cusk, monkfish and redfish as well as some flatfish, bluefin tuna, herring, other tuna, red hake and silver hake. Based on previous data (*e.g.*, as presented in LGL 2014) it can be surmised that the primary commercial species likely harvested in the Project Area by landing weight include sea scallops (33%), swordfish (~20%), herring (~14%), Atlantic halibut (~10%), silver hake (~8%), cusk (~3%) and white hake (~3%) (LGL 2014). As presented in Table 5.3.6 of the EIS, in terms of catch value, large pelagics accounted for about 50% with swordfish accounting for about 45% of landings values and an average annual landings value of about $1.25 million (2005 to 2010) (LGL 2014).

Productive groundfish harvesting occurs north of the Project Area near Western Bank and northwest of the Project Area near Emerald Basin. There is an active snow crab fishing area to the northeast of the Project Area, near Middle Bank.

Commercial fisheries can occur year-round for most species, although it is understood that the majority of fishing near the Project Area occurs between February and October with peak fishing efforts for pelagic and groundfish species occurring from July to September.

7.5.2 Anticipated Changes to the Environment

Routine Project activities and components have potential to interact with fisheries resources by direct or indirect effects on commercially fished species and/or effects on fishing activity from displacement from fishing areas, gear loss or damage that may result in a demonstrated financial loss to commercial fishing interests.

As a result of these considerations, the assessment of Project-related environmental effects on Commercial Fisheries is focused on the following potential environmental effect:

- Change in Availability of Fisheries Resources.

7.5.3 Potential Effects from Routine Operations

Change in Availability of Fisheries Resources

A Change in Availability of Fisheries Resources for commercial fisheries could potentially occur as a result of Project activities affecting the marine environment including the presence and operation of the MODU (fisheries exclusions and underwater sound effects on fisheries species), discharge of drill muds and cuttings (effects on water and sediment quality on fisheries species), other discharges and emissions (effects on water quality), VSP (underwater sound), PSV operations (underwater sound associated with vessel movement potentially causing behavioural effects on fisheries species; effects on water quality), and well abandonment (potential underwater sound associated with removal of wellhead infrastructure and/or a change in benthic habitat associated with leaving the wellhead in place).

As noted in Section 7.1, effects on fish species are expected to be temporary and of low magnitude so that indirect effects on commercial fisheries activities would be negligible.

A 500-m safety (exclusion) zone will be established around the MODU in accordance with the Nova Scotia Offshore Petroleum Drilling and Production Regulations, within which fisheries activities will be excluded while the MODU is in operation. This will result in localized fisheries exclusion within an area of approximately 0.8 km^2 (80 ha) for approximately 120 days per well. Neither the Project Area nor the offshore LAA includes any unique fishing grounds or concentrated fishing effort; similar alternative sites are readily available within the immediate area.

The operation of PSVs will result in a minor increase in existing vessel traffic in the LAA (it is anticipated that two to three PSVs will be required to support the Project with two to three round trips per week being made for transport purposes). PSVs will use existing shipping routes when travelling to and from the MODU where applicable and will adhere to standard navigation procedures, thereby reducing potential conflicts with commercial fisheries.

The final well abandonment program has not been finalized; however, all well plugging and abandonment activity will be carried out in line with CNSOPB guidelines. Prior to well abandonment, a survey will be completed to confirm the location of the well and details will be submitted to the CNSOPB. The well location will be marked on nautical charts as applicable. Regardless of whether the wellhead is removed or left in place on the seafloor, interactions with commercial fisheries would be limited given the water depths in the Project Area.

BP will continue to engage commercial fishers to share Project details as applicable and facilitate coordination of information sharing. A Fisheries Communication Plan will be used to facilitate coordinated communication with fishers. 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).

7.5.4 Potential Effects from Accidental Events

Project-related accidental events could potentially affect commercial fisheries with respect to a Change in Availability of Fisheries Resources. Adverse effects could be realized by fishers as a result of reduced access to fishing grounds (*e.g.*, fisheries exclusion), reduced catches, and/or reduced marketability of fish products. Fishing gear or cultivation gear may also be lost or damaged as a result of an accidental event.

Fishery closures may be imposed after a spill to prevent gear from being contaminated and to protect or reassure seafood consumers. Fishery closures are usually implemented in areas (including a buffer) where: a visible sheen exists on the ocean surface; in areas (including a buffer) with detectable levels of subsurface oil; and, as a precautionary measure, in areas where surface oil is predicted to occur based on trajectory modelling (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling 2011). The threshold of 0.04 µm (visible sheen threshold) was used to present spill trajectory modelling results for surface oiling in recognition of the possibility of a fisheries closure occurring at this threshold.

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 (Yender *et al.* 2002). However, given the high evaporation rates, exposure of fisheries resources to the diesel would be short-term, thereby reducing risk of contamination of fisheries resources. In the case of a PSV diesel spill, this risk of exposure and subsequent contamination could be greater where there could be a higher density of fisheries resources.

Predictive spill trajectory modelling indicates that the length of time for an unmitigated blowout incident to reach threshold concentrations (0.04 µm for surface oiling) at Emerald Basin or Georges Bank, where fishing effort is considerably more concentrated, would be between approximately 6 to 20 days for Emerald Basin and 30 to 50 days for George's Bank. This would provide an opportunity to notify fishers of the spill and preventing the setting or hauling of gear in the affected area. Fouling of gear and/or catch of contaminated resources would therefore be reduced or avoided. Depending on the duration and volume of the release following a blowout incident, and the effectiveness of mitigation measures, closure areas may not be widespread and fishers may also be able to fish in alternative areas. Given the very low probability of a well blowout incident or other release, and that the predictive modelling referred to above assumes an unmitigated release, the likelihood of effects to these important fisheries areas is considered low.

Modelled blowout incident scenarios during the summer resulted in the potential for shoreline oiling, including the portions of the Eastern Shore and Southern Nova Scotia, although the likelihood of this occurring was low (less than 5% in most cases). These coastal areas are known to support aquaculture operations that could also be affected by oiling from either an unlikely blowout incident scenario or a diesel spill from a PSV travelling to Halifax Harbour. While the effects of oil on aquaculture are similar to other commercial fisheries (*i.e.*, potential for fouling of cultivation gear, tainting of fish and temporary shutdown of operations), 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 and the transfer of stock to areas unlikely to be affected).

An SBM spill would have limited effects on commercial fisheries since the predicted affected area would be limited to within the LAA (up to 9.6 km), any measurable effect on water quality would be temporary (up to 30 hours), and the product is considered to be of low toxicity. A fisheries closure would not likely be necessary, and fouling of gear would be unlikely given the relatively small spatial and temporal footprint of the spill event and limited harvested activity within the offshore LAA.

7.6 CURRENT ABORIGINAL USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES

Current Aboriginal Use of Lands and Resources for Traditional Purposes refers to communal commercial, as well as FSC fishing activities by Aboriginal peoples that could potentially interact with the Project. It is included as a VC in recognition of the cultural and economic importance of marine life and fishing to Aboriginal peoples and in recognition of potential or established Aboriginal and Treaty rights.

Aboriginal engagement identified concern of possible obstruction of Mi'kmaq and Maliseet fishing areas as a result of the Project as well as potential effects on nearshore and inshore resources as a result of a spill. In particular, concerns were raised by Aboriginal organizations around potential adverse effects from planned Project activities or accidental events on fish

identified as being traditionally or commercially significant to the Mi'kmaq and/or Maliseet including American eel, Atlantic sturgeon, bluefin tuna, swordfish, herring, gaspereau (alewife), lobster, crab and shrimp. Concern was also raised with regards to potential spills affecting migration, spawning and/or feeding grounds of species of significance to Mi'kmaq culture.

7.6.1 Baseline Conditions

Section 6 describes the Aboriginal groups in Nova Scotia and New Brunswick that could potentially be affected by the Project. In the DFO Maritimes Region, communal FSC licences are held by 16 First Nations and the NCNS. Eleven of these communal FSC licences are held by groups in Nova Scotia while the remaining five are held by groups in New Brunswick. There are 22 Aboriginal organizations that hold licences issued by the DFO Maritimes Region and 12 Aboriginal organizations that hold licences issued by DFO Gulf Region that have communal commercial fishing access in the RAA including in or near the Project Area.

BP commissioned MGS and UINR to undertake a TUS to obtain information from the Aboriginal fisheries occurring in and around the Project Area. The TUS scope of work included conducting a background review of commercial licences and FSC agreements, and interviews with elders, fishers and fisheries managers from a representative subset of First Nations in Nova Scotia and New Brunswick, and the NCNS. The TUS includes information on target species, general fishing areas, and fishing seasons, along with any additional information pertaining to fish or sensitive areas.

As reported in the TUS (Appendix B of the EIS), all 13 Mi'kmaq First Nation communities in Nova Scotia currently have communal commercial fishing licences for various species that may be harvested from the RAA. There are 25 species being fished by Mi'kmaq First Nation communities under commercial communal fisheries access within the RAA and 15 species fished within the LAA. The TUS includes tables identifying all of the species that are accessible within the RAA, LAA and Project Area under these communal commercial licences, as well as the timing of fishing activity for each species. Many of these fisheries occur year-round. The following eight species are targeted within the Project Area: Atlantic cod, bluefin tuna, haddock, mahi-mahi, northern shrimp, snow crab, shark, and swordfish. Cusk, halibut, and silver hake are harvested as by-catch within the Project Area.

The NCNS has a communal commercial licence granting access to 19 species (including by-catch species) within the RAA. Nine of these species may also be harvested by NCNS within the LAA. The following seven species may be harvested by NCNS within the Project Area: albacore tuna, bluefin tuna, bigeye tuna, halibut (by-catch), mahi-mahi (by-catch), swordfish, and yellowfin tuna (MGS and UINR 2016).

The TUS (Appendix B) indicates that Fort Folly Mi'kmaq First Nation and St. Mary's and Woodstock Wolastoqiyik (Maliseet) First Nations in New Brunswick hold communal commercial fishing licences for various species that may be harvested from the RAA. Under these licences, these communities report fishing 16 species within the RAA, ten of which may also be harvested within

the LAA. Silver hake and swordfish are the only species that may also be harvested within the Project Area (MGS and UINR 2016). The TUS (Appendix B) includes a table identifying all of the species that that are accessible within the RAA, LAA and Project Area under these communal commercial licences, as well as the timing of fishing activity for each species.

According to the TUS, 44 species (34 fish species and 10 invertebrate species) were identified as being harvested for FSC purposes by Mi'kmaq First Nations throughout Nova Scotia. In particular, they reported harvesting seven fish species and three invertebrate species within the RAA, and one invertebrate species (lobster) within the LAA for FSC purposes. None of the species identified are known to be harvested for FSC purposes within the Project Area (MGS and UINR 2016).

Forty-three species (31 fish species and 12 invertebrate species) were identified as being harvested for FSC purposes by the NCNS. FSC fisheries for 22 of these species are known to occur in the RAA, FSC fisheries for five of these species are known to occur in the LAA (*i.e.*, Atlantic herring, Atlantic mackerel, Greenland halibut, redfish, and silver hake), and no FSC fisheries are known to occur in the Project Area (MGS and UINR 2016).

Lobster is the only species identified as being harvested for FSC purposes by New Brunswick's Fort Folly, St. Mary's and/or Woodstock First Nations, and it is harvested outside of the RAA, in the Bay of Fundy.

7.6.2 Anticipated Changes to the Environment

The selection of environmental effects for this VC reflects the variations in fishing locations by Aboriginal Groups, which include nearshore areas and offshore areas. It also reflects the multiple purposes for the use of marine resources, which includes communal commercial fisheries and FSC fisheries and the economic or cultural aspects of each fishery. Similar to Commercial Fisheries (refer to Section 7.5), the Project could have an effect on fisheries resources by direct or indirect effects on fished species and/or effects on fishing activity from displacement from fishing areas, gear loss or damage.

The assessment of Project-related environmental effects on the Current Aboriginal Use of Lands and Resources for Traditional Purposes is therefore focused on the following potential environmental effect:

- Change in Traditional Use.

7.6.3 Potential Effects from Routine Operations

Change in Traditional Use

A Change in Traditional Use for Current Aboriginal Use of Lands and Resources for Traditional Purposes could potentially occur as a result of Project activities affecting the marine environment including the presence and operation of the MODU (fisheries exclusions and underwater sound effects on fisheries species), discharge of drill muds and cuttings (effects on

water and sediment quality on fisheries species), other discharges and emissions (effects on water quality), VSP (underwater sound), PSV operations (underwater sound associated with vessel movement causing fisheries species to avoid the area), and well abandonment (potential underwater sound associated with removal of wellhead infrastructure and/or a change in benthic habitat associated with leaving the wellhead in place).

As noted in Section 7.1, effects on fish species are expected to be temporary and of low magnitude so that indirect effects on Aboriginal fisheries activities would be negligible.

A 500-m safety (exclusion) zone will be established around the MODU in accordance with the Nova Scotia Offshore Petroleum Drilling and Production Regulations, within which fisheries activities will be excluded while the MODU is in operation. This will result in localized fisheries exclusion within an area of approximately 0.8 km^2 (80 ha) for approximately 120 days per well. Neither the Project Area nor the offshore LAA is known to include any unique fishing grounds or concentrated fishing effort; similar alternative sites are readily available within the immediate area.

The operation of PSVs will result in a minor increase in existing vessel traffic in the LAA (it is anticipated that two to three PSVs will be required to support the Project with two to three round trips per week being made for transport purposes). PSVs will use existing shipping routes when travelling to and from the MODU where applicable and will adhere to standard navigation procedures, thereby reducing potential conflicts with Aboriginal fisheries.

The final well abandonment program has not been finalized; however all well plugging and abandonment activity will be carried out in line with CNSOPB guidelines. Prior to well abandonment, a survey will be completed to confirm the location of the well and details will be submitted to the CNSOPB. The well location will be marked on nautical charts as applicable. Regardless of whether the wellhead is removed or left in place on the seafloor, interactions with commercial fisheries would be limited given the water depths in the Project Area.

BP will continue to engage Aboriginal fishers to share Project details as applicable and facilitate coordination of information sharing. A Fisheries Communication Plan will be used to facilitate coordinated communication with fishers. 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).

7.6.4 Potential Effects from Accidental Events

An accidental event could have an effect on the fisheries resource (direct or indirect effects on fished species affecting fisheries success) and/or fishing activity (displacement from fishing areas, gear loss or damage) resulting in a Change in Traditional Use. Although the TUS indicates that FSC fisheries were not currently identified to occur in the vicinity of the Project Area, in the event of a spill, there could be effects on offshore FSC activities should they be taking place, nearshore fisheries, and/or on FSC species that could be migrating through or otherwise using

the affected area. An effect on species fished for traditional (*e.g.*, communal gathering of fish for feasts) or commercial purposes, a change in habitat traditionally fished by Aboriginal peoples, and/or area closures could affect traditional use of marine waters and resources.

The summary of spill trajectory modelling presented above for commercial fisheries in Section 7.5.4 is also applicable for Aboriginal fisheries. Given the very low probability of a well blowout event or other release, and that the predictive modelling assumes an unmitigated release, the likelihood of effects to these traditional use areas is considered low.

7.7 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Section 9 of the EIS considers how local environmental conditions and natural hazards (*e.g.*, extreme weather) could adversely affect the Project and thus result in potential effects on the environment (*e.g.*, accidental events). Potential adverse effects of the environment on a project are typically a function of project design and environmental conditions that could affect the project. These effects are generally mitigated through engineering and environmental design criteria, industry standards, and environmental monitoring.

The key environmental factors that may affect the Project include reduced visibility, high winds and waves, and geohazards. The primary means of mitigating adverse effects of the environment on the Project is through detailed engineering and use of environmental design criteria, compliance with industry codes of practice, and avoidance of environmental hazards where possible. Engineering design, operational procedures, geohazard assessments, and other mitigation measures will reduce the potential adverse effects on, and risks to, the Project. Potential effects from sea ice, seismic activity and tsunamis are unlikely given their low probabilities of occurrence, the distance offshore and water depths at which Project activities and components will be located, the limited duration of offshore activities (*i.e.*, approximately 120 days to drill each individual well (up to seven) between 2018 and 2022), and the absence of fixed offshore infrastructure for the Project. Extreme weather conditions and superstructure icing are also unlikely to adversely affect the Project given that the MODU will be designed for harsh weather conditions, meteorological conditions will be monitored, and stop-work procedures would be implemented should conditions become unsafe.

7.8 CUMULATIVE ENVIRONMENTAL EFFECTS

In addition to assessing Project-specific environmental effects, section 19(1)(a) of CEAA, 2012 requires that the EA of a designated project consider "any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out". This includes identifying past, present, and certain or reasonably foreseeable future physical activities (*i.e.*, projects or activities) with residual environmental effects that could interact cumulatively with the residual environmental effects of the Project, and assesses the significance of the associated potential cumulative environmental effects on the affected VCs. Physical activities within the RAA to have potential to cause

residual environmental effects that overlap spatially and temporally with the residual environmental effects of the Project include:

- offshore gas development projects on the Scotian Shelf (*e.g.*, SOEP and Deep Panuke);
- offshore petroleum exploration projects (*e.g.*, Shelburne Basin Venture Exploration Drilling Project);
- commercial, recreational, and Aboriginal fisheries; and
- other ocean uses, such as shipping, scientific research, and military activities.

Of particular relevance to the cumulative effects assessment is the Shelburne Basin Venture Exploration Drilling Project given its proximity (approximately 8 km from the Scotian Basin Project Area and respective LAAs overlap in some areas), similarities in predicted residual effects, and potentially overlapping schedules (drilling could occur concurrently or sequentially on the two projects). However, both projects are strictly regulated and involve routine activities managed by standard mitigation and industry practices which will reduce adverse residual effects and potential for cumulative adverse effects. Both proponents are also committed to ongoing stakeholder and Aboriginal engagement throughout the life of their projects which will reduce potential adverse effects on fisheries.

Although there is little spatial overlap between the residual environmental effects of the Project and the residual environmental effects of offshore gas development projects (limited to nearshore PSV traffic), certain VCs may be affected by sequential exposure to the residual environmental effects of the Project, SOEP, and Deep Panuke. Life cycles of several species of fish, marine mammals, sea turtles, and migratory birds include long-distance movement within the RAA (refer to Section 5.2 of the EIS), and there is potential for individuals of these species to be affected by the combined residual environmental effects of the Project and other physical activities (including offshore gas development projects) (*i.e.*, the same individuals may be exposed to the residual environmental effects of multiple physical activities during the course of their migrations within the RAA). Similarly, commercial or Aboriginal fishing grounds may encompass a broad area or multiple areas potentially subject to environmental effects of multiple physical activities during the course of their harvesting activities within the RAA.

Fisheries and other ocean users (*e.g.*, shipping) have potential for a broader spatial and temporal overlap with residual effects of the Project given their regular occurrence (past, present and future) and far-reaching geographic extent of activity on the Scotian Shelf and Slope.

In summary, residual effects from the Project as well as from other third party physical activities could combine to result in cumulative adverse effects including changes in risk of mortality or physical injury and/or a change in habitat quality and use for marine fish, migratory birds, marine mammals, and sea turtles. Given the generally low magnitude and temporary nature of Project residual effects, the Project's contribution to cumulative adverse effects is low. It is concluded therefore that no additional mitigation measures beyond those in place to mitigate the Project's

direct effects are needed to address potential cumulative effects on marine fish, migratory birds, marine mammals, and sea turtles.

Due to industry practices (*e.g.*, avoidance of Sable Island by the oil and gas industry), regulatory restrictions (*e.g.*, seasonal avoidance of the Roseway Basin; fishing restrictions within the Haddock Box), there is a low potential for cumulative adverse effects on Special Areas resulting in a change in habitat quality. Therefore, it is concluded that no additional mitigation measures beyond those in place to mitigate the Project's direct effects are needed to address potential cumulative effects on Special Areas.

Cumulative effects on availability of fisheries resources and traditional use will also be of low magnitude given the nature of residual effects (*e.g.*, small safety/exclusion zone) and ongoing communications with commercial and Aboriginal fishers to reduce the Project's contribution to adverse cumulative effects. Therefore, no additional mitigation measures beyond those in place to mitigate the Project's direct effects are considered necessary to address potential cumulative effects.

The environmental effects of accidents and malfunctions must be considered in the assessment of cumulative environmental effects if they are likely to result from the designated project in combination with other third party physical activities that have been or will be carried out (CEA Agency 2013). Most accidental event scenarios described in Section 2.4 are not likely to occur. The most likely accidental events which could occur are small batch spills from the MODU (*i.e.*, spills less than 10 bbl). Spill prevention and response procedures will be in place to reduce the risk of all spills, including small spills, and associated environmental effects. Other operators will implement spill prevention and response measures in accordance with regulatory requirements. Given the low likelihood of a spill event occurring for even one physical activity in the RAA, the likelihood of spills occurring from multiple physical activities in such a way that residual environmental effects have potential to overlap spatially or temporally is remote. Therefore, it is concluded that no additional mitigation measures beyond those in place to mitigate the Project's direct effects are needed to address potential cumulative effects from accidental events.

8.0 MITIGATION MEASURES AND COMMITMENTS

Mitigation is proposed to reduce or eliminate adverse environmental effects. Most potential environmental effects will be addressed by mitigation measures for each VC. Design features and mitigation measures have been incorporated into the Project to prevent or reduce potential environmental effects. A summary of mitigation, monitoring and follow-up commitments set out in the EIS is provided in Table 8.1.

Table 8.1 Summary of Commitments

No.	Proponent Commitments	EIS Section Reference
General		
1	Contractors and subcontractors shall be required to demonstrate conformance with the requirements that have been established, including HSSE standards and performance requirements.	12.1
2	As part of the CNSOPB authorization process for exploration drilling, BP will submit the following plans to the CNSOPB for review and approval: • an Environmental Protection Plan (EPP); • a Safety Plan; • an Incident Management Plan; • a Spill Response Plan; and • a Canada-Nova Scotia Benefits Plan.	12.1
3	BP will obtain a Certificate of Fitness from an independent third party Certifying Authority for the MODU prior to commencement of drilling operations in accordance with the *Nova Scotia Offshore Certificate of Fitness Regulations*.	9.2
4	The observation, forecasting and reporting of physical environment data will be conducted in accordance with the *Offshore Physical Environment Guidelines* (NEB *et al.* 2008).	9.2
5	BP and contractors working on the Project will regularly monitor weather forecasts to forewarn PSVs, helicopters and the MODU of inclement weather or heavy fog before it poses a risk to their activities and operations. Extreme weather conditions that are outside the operating limits of PSVs or helicopters will be avoided if possible. Captains/Pilots will have the authority and obligation to suspend or modify operations in case of adverse weather or poor visibility that compromises the safety of PSV, helicopter, or MODU operations.	9.2
6	Icing conditions and accumulation rates on PSVs, helicopters, and the MODU will be monitored during fall and winter operations, particularly when gale-force winds may be combined with air temperatures below -2°C (DFO 2012c).	9.2
7	Safe work practices will be implemented to reduce exposure of personnel to lightning risk (*e.g.*, restriction of access to external areas on the MODU or PSV during thunder and lightning events).	9.2
8	Prior to any drilling activity, BP will conduct a comprehensive regional geohazard baseline review (GBR), followed by detailed geohazard assessments for each proposed wellsite.	2.2, 9.2

Table 8.1 Summary of Commitments

No.	Proponent Commitments	EIS Section Reference
9	The well design and location for the proposed wells have not yet been finalized. Once confirmed, these details for the wells will be provided for review and approval to the CNSOPB as part of the OA and ADW for each well submitted in association with the Project.	2.3.2
10	Prior to installation on the well, the BOP stack will be pressure tested on the MODU deck, and then again following installation on the well to test the wellhead connection with the BOP.	2.5
11	BP will continue to engage commercial and Aboriginal fishers to share Project details as applicable and facilitate coordination of information sharing. A Fisheries Communication Plan will be used to facilitate coordinated communication with fishers.	3.4, 4.5, 7.6, 7.7
12	BP will provide details of the safety (exclusion) zone to the Marine Communication and Traffic Services for broadcasting and publishing in the Notices to Shipping and Notices to Mariners. Details of the safety (exclusion) zone will also be communicated during ongoing consultations with commercial fishers.	7.6, 7.7
13	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, 8.5.5.2, 8.5.6.2
Presence and Operation of MODU		
14	To maintain navigational safety at all times during the Project, obstruction lights, navigation lights and foghorns will be kept in working condition on board the MODU and PSVs. Radio communication systems will be in place and in working order for contacting other marine vessels as necessary.	2.4, 7.6, 7.7, 9.2
15	The MODU will be equipped with local communication equipment to enable radio communication between the PSVs and the MODU's bridge. Communication channels will also be put in place for internet access, and enable communication between the MODU and shore.	2.4
16	In accordance with the Nova Scotia Offshore Drilling and Production Regulations, a safety (exclusion) zone (estimated to be a 500-m wide radius) will be established around the MODU within which non-Project related vessels are prohibited.	2.4.1, 8.1.3.1
17	BP will conduct an imagery based seabed survey in the vicinity of wellsites to ground-truth the findings of the GBR. This includes confirming the absence of shipwrecks, debris on the seafloor, unexploded ordnance and sensitive environmental features, such as habitat-forming corals or species at risk. The survey will be carried out prior to drilling. If any environmental or anthropogenic sensitivities are identified during the survey, BP will move the wellsite to avoid affecting them if it is feasible to do so. If it is not feasible, BP will consult with the CNSOPB to determine an appropriate course of action.	1.4, 2.2, 7.2, 7.5, 9.2, 11.2
18	No Project well locations will be located within the Haddock Box.	7.2, 7.5
19	Lighting will be reduced to the extent that worker safety and safe operations is not compromised. Reduction of light may include avoiding use of unnecessary lighting, shading, and directing lights towards the deck.	7.2, 7.4
20	PSV and MODU contractors will have a Maintenance Management System designed to ensure that the vessels and MODU, and all equipment, are well maintained and operated efficiently.	7.3

Table 8.1 Summary of Commitments

No.	Proponent Commitments	EIS Section Reference
21	Routine checks for stranded birds will be conducted on the MODU and PSVs 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), including obtaining the associated permit from CWS. Activities will comply with the requirements for documenting and reporting any stranded birds (or bird mortalities) to CWS during the drilling program.	7.4
Waste Management		
22	Air emissions from the Project will adhere to applicable regulations and standards including the Nova Scotia *Air Quality Regulations* under the Nova Scotia *Environment Act,* the National Ambient Air Quality Objectives (SO_2, NO_2, total suspended PM, and CO) and the Canadian Ambient Air Quality Standards (fine PM).	2.8
23	Ultra-low sulphur diesel (ULSD) fuel will be used for the Project wherever practicable and available.	2.8.1
24	Offshore waste discharges and emissions associated with the Project (*i.e.*, operational discharges and emissions from the MODU and PSVs) will be managed in accordance with relevant regulations and municipal bylaws as applicable, including the OWTG and International Convention for the Prevention of Pollution from Ships (MARPOL), of which Canada has incorporated provisions under various sections of the *Canada Shipping Act*. Waste discharges not meeting legal requirements will not be discharged to the ocean and will be brought to shore for disposal.	2.8, 7.2, 7.3, 7.4, 7.5
25	Selection of drilling chemicals will be in accordance with the OCSG which provides a framework for chemical selection to reduce potential for environmental effects. During planning of drilling activities, where feasible, lower toxicity drilling muds and biodegradable and environmentally friendly additives within muds and cements will be preferentially used. Where feasible the chemical components of the drilling fluids will be those that have been rated as being least hazardous under the OCNS scheme and as PLONOR by OSPAR.	2.8, 7.2, 7.3, 7.4, 7.5
26	Discharges of SBM mud and cuttings will be managed in accordance with the OWTG. SBM cuttings will only be discharged once the performance targets in OWTG of 6.9 g/100 g retained "synthetic on cuttings" on wet solids can be satisfied. The concentration of SBM on cuttings will be monitored on the MODU for compliance with the OWTG. In accordance with OWTG, no excess or spent SBM will be discharged to the sea. Spent or excess SBM that cannot be re-used during drilling operations will be brought back to shore for disposal.	2.8, 7.2, 7.3, 7.4, 7.5
27	Excess cement may be discharged to the seabed during the initial phases of the well, which will be drilled without a riser. Once the riser has been installed, all cement waste will be returned to the MODU. Cement waste will then be transported to shore for disposal in an approved facility.	2.8, 7.2, 7.3, 7.4, 7.5
28	Small amounts of produced water may be flared. If volumes of produced water are large, some produced water may be brought onto the MODU for treatment so that it can be discharged in line with the OWTG.	2.8, 7.2, 7.3, 7.4, 7.5
29	Deck drainage and bilge water will be discharged according to the OWTG which state that deck drainage and bilge water can only be discharged if the residual oil concentration of the water does not exceed 15 mg/L.	2.8, 7.2, 7.3, 7.4, 7.5

Table 8.1 Summary of Commitments

No.	Proponent Commitments	EIS Section Reference
30	Ballast water will be discharged according to IMO *Ballast Water Management Regulations* and Transport Canada's *Ballast Water Control and Management Regulations.* The MODU will carry out ballast tank flushing prior to arriving in Canadian waters.	2.8, 7.2, 7.3, 7.4, 7.5
31	Sewage will be macerated prior to discharge. In line with the OWTG and International Convention for the Prevention of Pollution from Ships (MARPOL) requirements, sewage will be macerated so that particles are less than 6 mm in size prior to discharge.	2.8, 7.2, 7.3, 7.4, 7.5
32	Cooling water will be discharged in line with the OWTG which states that any biocides used in cooling water are selected in line with a chemical management system developed in line with the OCSG.	2.8, 7.2, 7.3, 7.4, 7.5
33	BOP fluids and any other discharges from the subsea control equipment will be discharged according to OWTG and OCSG.	2.8, 7.2, 7.3, 7.4, 7.5
34	Any hydrocarbons, such as gas, oil or formation water that are brought to surface as part of well test activity will be flared to enable their safe disposal. All flaring will be via one of two horizontal burner booms, to either a high efficiency burner head for liquids, or simple open ended gas flare tips for gases to minimize fall out of uncombusted hydrocarbons. Flaring will be optimized to the amount necessary to characterize the well potential and as necessary for the safety of the operation.	2.8, 7.2, 7.3, 7.4, 7.5
35	Liquid wastes, not approved for discharge in OWTG such as waste chemicals, cooking oils or lubricating oils, will be transported onshore for transfer to an approved disposal facility.	2.8, 7.2, 7.3, 7.4, 7.5
36	All waste generated offshore on the MODU and PSVs will be handled and disposed of in accordance with relevant regulations and municipal bylaws. Waste management plans and procedures will be developed and implemented to prevent unauthorized waste discharges and transfers.	2.8, 7.2, 7.3, 7.4, 7.5
37	Putrescible solid waste, specifically food waste generated offshore on the MODU and PSVs, will be disposed of according to OWTG and MARPOL requirements. In particular, food waste will be macerated so that particles are less than 6 mm in diameter and then discharged. There will be no discharge of macerated food waste within 3 nm from land.	2.8, 7.2, 7.3, 7.4, 7.5
38	Biomedical waste will be collected onboard by the doctor and stored in special containers before being sent to land for incineration.	2.8
39	Transfer of hazardous wastes will be conducted according to the *Transportation of Dangerous Goods Act.* Any applicable approvals for the transportation, handling and temporary storage, of these hazardous wastes will be obtained as required.	2.8, 7.2, 7.3, 7.4, 7.5
40	Information on the releases, wastes and discharges will be reported as part of a regular environmental reporting program in accordance with regulatory requirements as described in the OWTG.	2.8
Vertical Seismic Profiling		
41	VSP activity will be planned and conducted in consideration of the Statement of *Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment* (SOCP, DFO 2007b).	2.4.3.2, 7.2, 7.3, 7.5

Table 8.1 Summary of Commitments

No.	Proponent Commitments	EIS Section Reference
42	BP will use the minimum amount of energy necessary to achieve operational objectives; reduce the energy at frequencies above those necessary for the purpose of the survey; and will reduce the proportion of energy that propagates horizontally.	7.2
43	BP will consult with DFO regarding relevant findings from the 2014 CSAS review (DFO 2015), including additional recommended mitigation that would be appropriate for implementation during VSP prior to Project commencement.	7.3
44	Marine Mammal Observers (MMOs) will be used to monitor and report on marine mammal and sea turtle sightings during VSP surveys to enable shutdown or delay actions to be implemented 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 (see also Section 7.3.10).	7.3
45	A ramp-up procedure (*i.e.*, gradually increasing seismic source elements over a period of approximately 30 minutes until the operating level is achieved) will be implemented before any VSP activity begins.	7.2, 7.3, 7.4
46	Shutdown procedures (*i.e.,* shutdown of source array) will be implemented if a marine mammal or sea turtle species listed on Schedule 1 of SARA, as well as all other baleen whales (*i.e*., mysticetes) and sea turtles are observed within 650 m of the wellsite.	7.3
47	Passive acoustic monitoring (PAM) will be used to detect vocalizing marine mammals during conditions of low visibility (*e.g.*, fog and darkness). The technical specifications and operational deployment configuration of the PAM system will be optimized within the bounds of operational and safety constraints in order to maximize the likelihood of detecting cetacean species anticipated being in the area.	7.3
Supply and Servicing Operations		
48	Helicopters transiting to and from the MODU will fly at altitudes greater than 300 m (with the exception of approach and landing activities) and at a lateral distance of 2 km around active bird colonies when possible. Helicopters will avoid flying over Sable Island (a 2 km buffer will be recognized) except as needed in the case of an emergency.	2.4, 7.3, 7.4, 7.5
49	To reduce the risk of marine mammal vessel strikes, Project PSVs will avoid currently-identified critical habitat for the North Atlantic right whale (Roseway Basin) and northern bottlenose whale (the Gully, and Shortland and Haldimand canyons), during transiting activities within the LAA and outside the Project Area except as needed in the case of an emergency.	7.3, 7.5
50	PSVs travelling from mainland Nova Scotia will follow established shipping lanes in proximity to shore. During transit to/from the Project Area, PSVs will travel at vessel speeds not exceeding 22 km/hour (12 knots) except as needed in the case of an emergency.	7.3, 7.4, 7.6, 7.7
51	In order to reduce the potential for vessel collisions during transiting activities outside the Project Area, vessels will reduce speed in the event that a marine mammal or sea turtle is noted in proximity to the vessel.	7.3
52	In the event that a vessel collision with a marine mammal or sea turtle occurs, BP will contact the Marine Animal Response Society or the Canadian Coast Guard to relay incident information.	7.3
53	PSVs will maintain a 2 km avoidance buffer around Sable Island and associated bird colonies in that area except in the case of an emergency.	7.4

Table 8.1 Summary of Commitments

No.	Proponent Commitments	EIS Section Reference
54	Should critical habitat be formally designated for leatherback sea turtle or other SAR within the RAA over the term of the exploration licences, BP will comply with applicable restrictions or mitigations developed for the marine shipping industry to reduce the risks of vessel strikes in these areas.	7.3
55	Lighting on PSVs will be reduced to the extent that worker safety and safe operations is not compromised. Reduction of light may include avoiding use of unnecessary lighting, shading, and directing lights towards the deck.	7.4
56	The PSVs selected for this Project will be equipped for safe all-weather operations, including stability in rough sea conditions and inclement weather. In addition, measures to reduce superstructure icing hazards on PSVs will be implemented as necessary and may include (DFO 2012c): • reducing vessel speed in heavy seas; • placing gear below deck and covering deck machinery, if possible; • moving objects that may prevent water drainage from the deck; • making the ship as watertight as possible; and • manual removal of ice if required under severe icing conditions.	9.2
57	APSV will remain on standby at the MODU at all times in the event that operational assistance or emergency response support is required.	2.3.3
58	PSVs will undergo BP's internal verification process as well as additional external inspections/audits inclusive of the CNSOPB pre-authorization inspection process in preparation for the Project.	2.4.5.1, 9.2
Well Abandonment		
59	A seabed survey will be conducted at the end of the drilling program using an ROV to survey the seabed for debris.	2.4
60	Once wells have been drilled to TD and well evaluation programs completed (if applicable), the well will be plugged and abandoned in line with applicable BP practices and CNSOPB requirements. The final well abandonment program has not yet been finalized; however, these details will be confirmed to the CNSOPB as planning for the Project continues.	2.4, 7.1, 7.2, 7.3, 7.5, 7.6, 7.7
Accidental Events		
61	Procedures will be put in place to ensure that hoses are inspected and operated correctly to minimize the risk of an unintended release. The vessels, MODU and supply base will be equipped with primary spill contingency equipment to deal with spills in the unlikely event that they occur.	2.4
62	BP will implement multiple preventative and response barriers to manage risk of incidents occurring and mitigate potential consequences. The Project will operate under an Incident Management Plan (IMP) which will include a number of specific contingency plans for responding to specific emergency events, including potential spill or well control events. The IMP and supporting specific contingency plans, such as a Spill Response Plan (SRP), will be submitted to the CNSOPB prior to the start of any drilling activity as part of the OA process. The SRP will set out tactical response methods, procedures and strategies for safely responding to different spill scenarios. Tactical response methods that will be considered following a spill incident include: offshore containment and recovery; surveillance and tracking; dispersant application; in-situ burning; shoreline protection; shoreline clean up; and oiled wildlife response.	8.5.1, 8.5.2, 8.5.3, 8.5.4, 8.5.5, 8.5.6

Table 8.1 Summary of Commitments

No.	Proponent Commitments	EIS Section Reference
63	BP will undertake a NEBA as part of the OA process with the CNSOPB to evaluate the risks and benefits of dispersing oil into the water column, and will obtain regulatory approval for any use of dispersants as required.	8.5.1, 8.5.2, 8.5.3, 8.5.4
64	In the event that oil does reach the shoreline, a shoreline clean-up and remediation team will be mobilized to the affected areas. A SCAT survey will be conducted to inform shoreline clean-up and remediation as applicable. BP will also engage specialized expertise to deflect oil from sensitive areas, and recover and rehabilitate wildlife species as needed.	8.5.3
65	BP will include procedures for informing fishers of an accidental event and appropriate response within the Fisheries Communication Plan. Emphasis is on timely communication, thereby providing fishers with the opportunity to haul out gear from affected areas, reducing potential for fouling of fishing gear.	8.5.5, 8.5.6
66	In the unlikely event of a spill, specific monitoring (*e.g.*, environmental effects monitoring) and follow up programs may be required and will be developed in consultation with applicable regulatory agencies.	8.5.5, 8.5.6
67	Incidents will be reported in accordance with the Incident Reporting and Investigation Guidelines (C-NLOPB and CNSOPB 2012). BP will submit a report to the CNSOPB documenting the implementation schedule (prior to drilling) and the outcome of follow-up and monitoring programs (post-abandonment) of each well, along with any additional conditions of approval, as applicable. The implementation schedule and results will be made available online for public information.	8.3
Follow-up and Monitoring		
68	BP will submit a report to the CNSOPB documenting the implementation schedule (prior to drilling) and the outcome of follow-up and monitoring programs (post-abandonment) of each well, along with any additional conditions of approval, as applicable. The implementation schedule and results will be made available online for public information.	12.2
69	BP will conduct a visual survey (using an ROV) of the seafloor during and after drilling activities to assess the extent of sediment dispersion.	7.2
70	BP will assess in consultation with the appropriate authorities the potential for undertaking an acoustic monitoring program during the drilling program to collect field measurements of underwater sound in order to verify predicted underwater sound levels. The objectives of such a program will be identified in collaboration with DFO and the CNSOPB and in consideration of lessons learned from the underwater sound monitoring program to be undertaken by Shell as part of the Shelburne Basin Venture Exploration Drilling Project in 2016.	7.2, 7.3, 7.5

9.0 SIGNIFICANCE OF RESIDUAL EFFECTS

Sections 7 and 8.5 of the EIS present the residual environmental effects (*i.e.*, after mitigation has been applied) for each VC. Table 9.1 summarizes the residual effect findings for each VC and indicates the significance of these effects. Where an effect is predicted to be significant (refer to Section 7 of the EIS for predefined criteria for each VC), the likelihood of that effect occurring is also presented.

With the implementation of proposed mitigation measures (refer to Table 8.1), residual adverse environmental effects of routine Project activities and components are predicted to be not significant for all VCs.

In the highly unlikely event of a Project-related accidental event resulting in the large-scale release of oil, effects to Marine Mammals and Sea Turtles, Migratory Birds, Special Areas, Commercial Fisheries, and Current Aboriginal Land and Resource Use for Traditional Purposes have potential to be significant if the spill trajectory overlaps spatially and temporally with sensitive receptors. However, with the implementation of proposed well control, spill response, contingency, and emergency response plans significant residual adverse environmental effects are unlikely to occur.

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

Table 9.1 Summary of Residual Effects for Routine Operations

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization					Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Extent	Duration	Frequency	Reversibility			
Fish and Fish Habitat	s. 5(1)(a)(i)	Change in Risk of Mortality or Physical Injury	Presence and Operation of MODU (including well drilling and testing operations and associated lights, safety zone and underwater sound)	see Table 8.1	L	PA	MT	C	R	D	N	N/A
			Waste Management (including discharge of drill muds and cuttings and other drilling and testing emissions)		L	PA	MT	R	R	D	N	N/A
			Vertical Seismic Profiling		L	LAA	ST	IR	R	D	N	N/A
		Change in Habitat Quality and Use	Presence and Operation of MODU (including well drilling and testing operations and associated lights, safety zone and underwater sounds)		L	LAA	MT	C	R	D	N	N/A
			Waste Management (including discharge of drill muds and cuttings and other drilling and testing emissions)		L	PA	MT	R	R	D	N	N/A
			Vertical Seismic Profiling		L	LAA	ST	IR	R	D	N	N/A
			Supply and Servicing Operations (including helicopter transportation and PSV operations)		L	LAA	MT	R	R	D	N	N/A
			Well Abandonment		L	PA	ST	IR	R	D	N	N/A
Marine Mammals and Sea Turtles	s. 5(1)(a)(ii)	Change in Risk of Mortality or Physical Injury	Presence and Operation of MODU (including lights, safety zone and underwater sound)	see Table 8.1	L	PA	MT	C	R	D	N	N/A
			Vertical Seismic Profiling		L	PA	ST	IR	R	D	N	N/A
			Supply and Servicing (PSV Operations)		L	LAA	MT	R	R	D	N	N/A
		Change in Habitat Quality and Use	Presence and Operation of MODU (including well drilling and testing operations and associated lights, safety zone and underwater sound)		M	RAA	MT	C	R	D	N	N/A
			Waste Management (including discharge of drill muds and cuttings and other drilling and testing emissions)		L	PA	MT	IR	R	D	N	N/A
			Vertical Seismic Profiling		L	PA	ST	IR	R	D	N	N/A
			Supply and Servicing (including helicopter transportation and PSV operations)		L	LAA	MT	R	R	D	N	N/A
			Well Abandonment		L	PA	ST	IR	R	D	N	N/A

Table 9.1 Summary of Residual Effects for Routine Operations

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization					Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Extent	Duration	Frequency	Reversibility			
Migratory Birds	s. 5(1)(a)(iii)	Change in Risk of Mortality or Physical Injury	Presence and Operation of MODU (including drilling and testing operations and associated lights, safety zone and underwater sound)	see Table 8.1	L-M	PA	MT	C	R	U	N	N/A
			Waste Management (including discharge of drill muds and cuttings and other drilling and testing emissions)		N	PA	MT	R	R	U	N	N/A
			Vertical Seismic Profiling		N	PA	ST	IR	R	U	N	N/A
			Supply and Servicing (including helicopter transportation and PSV operations)		L	LAA	MT	R	R	U-D	N	N/A
		Change in Habitat Quality and Use	Presence and Operation of MODU (including drilling and testing operations and associated lights, safety zone and underwater sound)		L	PA	MT	C	R	U	N	N/A
			Waste Management (including discharge of drill muds and cuttings and other drilling and testing emissions)		N	PA	MT	R	R	U	N	N/A
			Vertical Seismic Profiling		L	PA	ST	IR	R	U	N	N/A
			Supply and Servicing Operations (including helicopter transportation PSV operations)		N-L	LAA	MT	R	R	U-D	N	N/A
Special Areas	s. 5(1)(b)(i)	Change in Habitat Quality	Presence and Operation of MODU (including drilling and testing operations and associated lights, safety zone and underwater sound)	see Table 8.1	L-M	LAA	ST-MT	C	R	D	N	N/A
			Waste Management (including discharge of drill muds and cuttings and other drilling and testing emissions)		L	PA	MT	R	R	U	N	N/A
			Vertical Seismic Profiling		L	LAA	ST	IR	R	D	N	N/A
			Supply and Servicing Operations (including helicopter transportation and PSV operations)		L	LAA	MT	R	R	D	N	N/A
			Well Abandonment		L	PA	ST	IR	R	U	N	N/A

Table 9.1 Summary of Residual Effects for Routine Operations

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization					Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Extent	Duration	Frequency	Reversibility			
Commercial Fisheries	s. 5(2)(b)(i)	Change in Availability of Fisheries Resources	Presence and Operation of MODU (including well drilling and testing operations and associate lights, safety zone and underwater sound)	see Table 8.1	L	LAA	MT	C	R	U	N	N/A
			Waste Management (including discharge of drill muds and cuttings and other drilling and testing emissions)		L	PA	MT	R	R	U	N	N/A
			Vertical Seismic Profiling		L	LAA	ST	IR	R	U	N	N/A
			Supply and Servicing Operations (including helicopter transportation and PSV operation)		L	LAA	MT	R	R	U	N	N/A
			Well Abandonment		L	PA	ST	IR	R	U	N	N/A
Current Aboriginal Use of Lands and Resources for Traditional Purposes	s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Traditional Use	Presence and Operation of MODU (including well drilling and testing operations and associate lights, safety zone and underwater sound)	see Table 8.1	L	LAA	MT	C	R	U	N	N/A
			Waste Management		L	PA	MT	R	R	U	N	N/A
			Vertical Seismic Profiling		L	LAA	ST	IR	R	U	N	N/A
			Supply and Servicing Operations (including helicopter transportation and PSV operations)		L	LAA	MT	R	R	U	N	N/A
			Well Abandonment		L	PA	ST	IR	R	U	N	N/A

Key/Note:
Environmental Effects under CEAA, 2012:
5(1)
(a) a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:
(i) fish as defined in section 2 of the *Fisheries Act* and fish habitat as defined in subsection 34(1) of that Act,
(ii) aquatic species as defined in subsection 2(1) of the *Species at Risk Act*,
(iii) migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act*, 1994, and
(iv) any other component of the environment that is set out in Schedule 2 of [CEAA, 2012];
(b) a change that may be caused to the environment that would occur
(i) on federal lands,
(ii) in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or
(iii) outside Canada; and
(c) with respect to Aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on
(i) health and socio-economic conditions,
(ii) physical and cultural heritage,
(iii) the current use of lands and resources for traditional purposes, or

Magnitude:
N: Negligible
L: Low
M: Moderate
H: High

Geographic Extent:
PA: Project Area
LAA: Local Assessment Area
RAA: Regional Assessment Area

Duration:
ST: Short-term
MT: Medium-term
LT: Long-term

Frequency:
S: Single event
IR: Irregular event
R: Regular event
C: Continuous

Reversibility:
R: Reversible
I: Irreversible

Ecological/Socio-Economic Context:
D: Disturbed
U: Undisturbed

Significance:
S: Significant
N: Not Significant

Likelihood:
U: Unlikely
L: Likely
N/A: Not applicable

Table 9.1 Summary of Residual Effects for Routine Operations

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization					Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Extent	Duration	Frequency	Reversibility			
(iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. Certain additional environmental effects must be considered under section 5(2) of CEAA, 2012 where the carrying out of the physical activity, the designated project, or the project requires a federal authority to exercise a power or perform a duty or function conferred on it under any Act of Parliament other than CEAA, 2012. 5(2) (a) a change, other than those referred to in paragraphs (1)(a) and (b), that may be caused to the environment and that is directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of the physical activity, the designated project or the project; and (b) an effect, other than those referred to in paragraph (1)(c), of any change referred to in paragraph (a) on (i) health and socio-economic conditions, (ii) physical and cultural heritage, or (iii) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.											

Table 9.2 Summary of Residual Effects for Accidental Events

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Accidental Event Scenario	Mitigation	Residual Effect Characterization					Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Extent	Duration	Frequency	Reversibility			
Fish and Fish Habitat	s. 5(1)(a)(i)	Change in Risk of Mortality or Physical Injury / Change in Habitat Quality and Use	10 bbl Diesel Spill	see Table 8.1	L	LAA	ST	S	R	U	N	N/A
			100 bbl Diesel Spill		M	RAA	ST	S	R	U	N	N/A
			PSV Diesel Spill		M	RAA	ST-MT	S	R	U	N	N/A
			Well Blowout Incident		M	RAA*	ST-MT	S	R	U	N	N/A
			SBM Spill		L	LAA	ST	S	R	U	N	N/A
Marine Mammals and Sea Turtles	s. 5(1)(a)(ii)	Change in Risk of Mortality or Physical Injury / Change in Habitat Quality and Use	10 bbl Diesel Spill	see Table 8.1	L	LAA	ST	S	R	U	N	N/A
			100 bbl Diesel Spill		M	LAA	ST	S	R	U	N	N/A
			PSV Diesel Spill		M	LAA	ST-MT	S	R	U	N	N/A
			Well Blowout Incident		H	RAA*	ST-MT	S	R	U	S	U
			SBM Spill		L	LAA	ST	S	R	U	N	N/A
Migratory Birds	s. 5(1)(a)(iii)	Change in Risk of Mortality or Physical Injury / Change in Habitat Quality and Use	10 bbl Diesel Spill	see Table 8.1	L	LAA	ST	S	R	U	N	N/A
			100 bbl Diesel Spill		M	RAA	ST	S	R	U	S	U
			PSV Diesel Spill		M	RAA	ST-MT	S	R	U	S	U
			Well Blowout Incident		H	RAA*	ST-MT	S	R	U	S	U
			SBM Spill		L	LAA	ST	S	R	U	N	N/A

Table 9.2 Summary of Residual Effects for Accidental Events

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Accidental Event Scenario	Mitigation	Residual Effect Characterization					Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Extent	Duration	Frequency	Reversibility			
Special Areas	s. 5(1)(b)(i)	Change in Habitat Quality	10 bbl Diesel Spill	see Table 8.1	L	LAA	ST	S	R	U	N	N/A
			100 bbl Diesel Spill		M	LAA	ST	S	R	U	N	N/A
			PSV Diesel Spill		L-M	LAA	ST-MT	S	R	U	N	N/A
			Well Blowout Incident		H	RAA*	ST-MT	S	R	U	S	U
			SBM Spill		L	LAA	ST	S	R	U	N	N/A
Commercial Fisheries	s. 5(2)(b)(i)	Change in Availability of Fisheries Resources	10 bbl Diesel Spill	see Table 8.1	L	LAA	ST	S	R	U	N	N/A
			100 bbl Diesel Spill		M	RAA	MT	S	R	U	S	U
			PSV Diesel Spill		H	RAA	MT	S	R	U	S	U
			Well Blowout Incident		H	RAA*	LT	S	R	U	S	U
			SBM Spill		L	LAA	ST	S	R	U	N	N/A
Aboriginal Use of Lands and Resources for Traditional Purposes	s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Traditional Use	10 bbl Diesel Spill	see Table 8.1	L	LAA	ST	S	R	U	N	N/A
			100 bbl Diesel Spill		M	RAA	MT	S	R	U	S	U
			PSV Diesel Spill		H	RAA	MT	S	R	U	S	U
			Well Blowout Incident		H	RAA*	LT	S	R	U	S	U
			SBM Spill		L	LAA	ST	S	R	U	N	N/A

Note:
See Table 9.1 for key.
In certain scenarios, effects may extend beyond the RAA as indicated by an "".

10.0 FOLLOW-UP AND MONITORING PROGRAMS PROPOSED

Under CEAA, 2012, a follow-up program is defined as a program for "verifying the accuracy of the environmental assessment of a designated project" and "determining the effectiveness of any mitigation measures." In most cases, the effects of routine exploration drilling activities and effectiveness of mitigation measures are well-understood (refer to Section 8). Where the level of confidence in effects prediction is not high or an interest has been expressed by regulatory, public or Aboriginal stakeholders for additional information, follow-up and monitoring has been proposed.

In particular, BP is proposing to implement the following monitoring programs to address uncertainty and/or confirm effects predictions related to effects on the marine benthos, marine mammals and sea turtles, migratory birds, and Special Areas. The implementation schedule and program details will be developed in consultation with the CNSOPB, DFO and Environment Canada (EC) / Canadian Wildlife Services (CWS), as applicable. In some cases, as noted below, relevant information from other recent monitoring programs will be factored into the design of BP's monitoring program.

Table 10.1 summarizes the proposed follow-up and monitoring programs.

Table 10.1 Summary of Follow-up and Monitoring Programs for the Scotian Basin Exploration Drilling Project

Follow-up or Monitoring Program	Objective	Applicable VC(s)	Proposed Intervention/Adaptive Management	Schedule	Reporting
Sediment Survey	BP will conduct a visual (using a remote operated vehicle [RoV]) survey of the seafloor to assess the extent of sediment dispersion.	Fish and Fish Habitat	Survey is for data gathering purposes.	Drilling and Post-Drilling	BP will report observations of sedimentation noting radial extent from drill site. Reports will be provided to the CNSOPB within 90 days of well abandonment of the initial well.
Acoustic Monitoring Survey	BP will assess in consultation with the appropriate authorities the potential for undertaking an acoustic monitoring program during the first phase of the drilling program to collect field measurements to verify predicted underwater sound levels. The objectives of such a program will be identified in collaboration with DFO and the CNSOPB and in consideration of lessons learned from the underwater sound monitoring program that will be undertaken by Shell as part of the Shelburne Basin Venture Exploration Drilling Project.	Fish and Fish Habitat Marine Mammals and Sea Turtles Special Areas	Survey is for data gathering purposes.	Drilling	BP will report monitoring results to DFO and CNSOPB within 30 days of data collection.
Marine Mammal and Sea Turtle Monitoring Program	Monitor and report on sightings of marine mammals and sea turtles during VSP surveys. Monitoring will include visual observations and use of passive acoustic monitoring (PAM) to inform decisions related to mitigation actions required during VSP operations when baleen whales, sea turtles, or any marine mammal listed on Schedule 1 of SARA are detected within a minimum 650-m predetermined exclusion zone.	Marine Mammals and Sea Turtles	Shutdown or delay of VSP operations when baleen whales, sea turtles, or any marine mammal listed on Schedule 1 of SARA are detected within a minimum 650-m predetermined exclusion zone	VSP Survey	In the event that a vessel collision with a marine mammal or sea turtle occurs, BP will contact the Marine Animal Response Society or the Canadian Coast Guard to relay incident information. Following the program, copies of the marine mammal and sea turtle observer reports will be provided to DFO and the CNSOPB. Following the program, recorded PAM data will be provided to DFO so that this information can be used to help inform understanding of marine mammals in the area.
Migratory Bird Mortality Monitoring	Carry out routine checks for stranded birds or bird mortality on the MODU and PSVs and compliance with the requirements for documenting and reporting any stranded birds (or bird mortalities) to the CWS during the drilling program.	Migratory Birds	Survey is for data gathering purposes.	Mobilization to Well Abandonment	If a Species at Risk (SAR) is found alive (stranded) or dead on the MODU or PSV, a report will be sent to CWS within 24 hours of identification. Reporting of live migratory seabirds captured and released will be recorded in accordance with a Migratory Bird Permit issued by CWS. A bird monitoring report will be submitted to the CNSOPB within 90 days of well abandonment.

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APPENDIX A

Summary of Stakeholder and Aboriginal Engagement Comments and Responses

Table A.1 Summary of Key Issues Raised During Public Stakeholder Engagement

Question or Comment	Response	EIS Reference
What has BP learned since the Deepwater Horizon (DWH) incident in the Gulf of Mexico?	BP's internal investigation of the DWH incident, which culminated in the Bly Report (BP 2010), involved a team of over 50 internal and external specialists from a variety of fields, including safety, operations, subsea, drilling, well control, cementing, well flow dynamic modelling, BOP systems, and process hazard analysis. Eight key findings relating to the causal chain of events were made, with 26 associated recommendations to enable the prevention of a similar accident and aimed at further reducing risk across BP's global drilling activities. The Bly Report recommended a number of measures to strengthen BPs operational practices, and these are being addressed through the implementation of enhanced drilling requirements. Key requirements that have been captured in guidance documents and engineering technical practices. Key areas that have been addressed include: cementing and zonal isolation practices; process safety management through the life cycle of a well; well casing design; and rig audit and verification. In addition to these technical requirements, BP has focused on enhancement of capability and competency; verification, assurance and audit; and process safety performance management. An account of lessons learned from the DWH incident and information about progress against recommendations in the Bly Report are presented in the EIS (refer to Section 8.3.4).	• *Section 8.3.4:* Information about lessons from the DWH incident
Request for more information on BP's environmental management, spill prevention and incident management plans	BP works in line with its operating management system (OMS), a framework which sets out requirements on a range of criteria, such as health and safety, security, environmental management, social responsibility and operational reliability. Contractors, such as drilling and well services contractors, will be accountable for the development and delivery of their safety and environmental management systems. Contractors will be responsible for carrying out self-verification activity to assess conformance with their contractual requirements. Contractor safety performance is typically assessed and reviewed by BP throughout the duration of the contract. Further information will be presented in the Environment Protection Plan which will be submitted to CNSOPB as part of the OA process. The Project will operate under an incident management plan (IMP) which will	• *Section 1.3.1*: Information about how BP operates, including information about management systems and working with contractors • *Section 8.3.1*: Information about the incident management plan and spill response plan • *Section 12*: Information about environmental management plans for the Project

Table A.1 Summary of Key Issues Raised During Public Stakeholder Engagement

Question or Comment	Response	EIS Reference
	be a comprehensive document including practices and procedures for responding to an emergency event. The IMP will include, or reference, a number of specific contingency plans for responding to specific emergency events, including potential spill or well control events. The IMP and supporting specific contingency plans, such as the spill response plan (SRP) will be aligned with applicable regulations, industry practice and BP standards and will include response strategies, arrangements and procedures. These plans will be submitted to CNSOPB prior to the start of any drilling activity as part of the OA process.	
Concern raised about length of time for a capping stack response to a well blowout incident	If a blowout incident were to occur, BP would immediately commence the mobilization of the primary capping stack from Stavanger. Analysis indicates that the cap mobilization to the wellsite will take 12 to 19 days with the well capped between 13 and 25 days after an incident. BP has included information in the EIS about spill response and well intervention strategies that would be deployed in the event of a spill.	• *Section 2.5*: Well control measures • *Section 8.3.3.2*: Well intervention response
Concern raised about environmental effects of dispersant use	Dispersants will not be used by BP without prior approval. BP will prepare a net environmental benefit analysis (NEBA) for dispersant use which will be used to support any application for dispersant use. Dispersed oil can cause harm to some marine organisms, particularly coral and plankton. Dispersants are generally non -toxic at the concentrations used for response. In the event that they are used, exposure to any dispersants and dispersed oil is likely to be brief as they are quickly diluted into the marine environment. The NEBA will analyze the trade-off between the toxic effects of the dispersed oil relative to the advantages of removing oil from the surface and preventing shoreline effects.	• *Section 8.3.3.3:* Overview of dispersants
Concern raised about possible effects on species at risk and critical habitat	Several species at risk (SAR) and species of conservation concern (SOCC) are known to occur in the vicinity of the Project Area. Potential Project-related effects on SAR, SOCC and critical habitat are assessed in Section 7 of the EIS. In recognition of best management practices and mitigation measures proposed by BP, residual adverse effects on SAR and critical habitat, significant residual adverse effects are predicted to be not likely.	• *Section 5.2.9*: Summary of marine SAR and SOCC that could be affected by the Project • *Section 7.2:* Assessment of Project-related environmental effects on fish (SAR and SOCC) • *Section 7.3:* Assessment of Project-related environmental effects on marine mammal (SAR

Table A.1 Summary of Key Issues Raised During Public Stakeholder Engagement

Question or Comment	Response	EIS Reference
		and SOCC) • *Section 7.3:* Assessment of Project-related environmental effects on sea turtle (SAR and SOCC) • *Section 7.4: Assessment of* Project-related environmental effects on marine bird (SAR and SOCC) • *Section 8.5:* Environmental effects of potential accidental events • *Section 10:* Cumulative environmental effects
Concern raised about possible effects on the fishing industry	Routine Project activities and components have potential to interact with fisheries resources by direct or indirect effects on commercially fished species and/or effects on fishing activity from displacement from fishing areas, gear loss or damage that could potentially result in a demonstrated financial loss to commercial fishing interests. For the most part, effects on the fishery will be limited to a 500-m safety (exclusion) zone from the MODU that is standard for the offshore industry. BP has committed to employing mitigation measures and standard practices to reduce Project-related effects on fish and fish habitat, as well as fisheries activities. BP will continue to engage commercial and Aboriginal fishers to share Project details as applicable and facilitate coordination of information sharing. A Fisheries Communication Plan will be used to facilitate coordinated communication with fishers. A Fisheries Communication Plan will facilitate communication of Project updates, issues and concerns as the Project moves past the EA process and into the implementation stage.	• *Section 5.3.5:* Existing conditions regarding commercial fisheries • *Section 7.6*: Project-related environmental effects on commercial fisheries • *Section 8.5*: Environmental effects of potential accidental events • *Section 10:* Cumulative environmental effects
Concern raised about possible effects on the tourism industry	The Project is not predicted to interact with the provincial tourism industry. Most tourism and recreational activities occur in coastal or nearshore areas and would not interact with routine Project activities (the Project Area is located more than 200 km offshore and 48 km from Sable Island National Park Reserve). In the event of a large spill (*e.g.*, blowout incident), there could potentially be an interaction with coastal resources which could be related to	• *Section 5.3.4.4:* Existing conditions regarding tourism and recreational activities • *Section 7.2:* Project-related environmental effects on fish and fish habitat

Table A.1 Summary of Key Issues Raised During Public Stakeholder Engagement

Question or Comment	Response	EIS Reference
	local tourism and recreation. As discussed in Section 8, the likelihood of such a spill event is extremely low, and BP would implement spill response measures to reduce interactions with coastal resources.	• *Section 8.5:* Environmental effects of potential accidental events
Concern raised about effect of underwater sound and preventative measures to mitigate effects on marine life	Underwater sound will be generated by the MODU and PSVs, as well as during VSP operations. The extent to which sound travels is determined by environmental conditions, including water depths, water salinity and temperature. The sound generated by the MODU will be continuous throughout the drilling program, whereas underwater sound generated during the VSP operations are typically impulsive in nature, occurring over a short duration (*e.g.*, up to one day per well). BP has commissioned an acoustic modelling study to inform the assessment of underwater sound effects on marine life. BP will assess in consultation with the appropriate authorities the potential for undertaking an acoustic monitoring program during the drilling program to collect field measurements of underwater sound in order to verify predicted underwater sound levels. The objectives of such a program will be identified in collaboration with DFO and the CNSOPB and in consideration of lessons learned from the underwater sound monitoring program to be undertaken by Shell as part of the Shelburne Basin Venture Exploration Drilling Project in 2016.	• *Section 2.8.5:* Information about potential underwater sound sources • *Section 7.2:* Project-related environmental effects on fish and fish habitat • *Section 7.3:* Assessment of project-related environmental effects on marine mammals and sea turtles • *Section 7.6:* Project-related environmental effects on commercial fisheries • *Section 10:* Cumulative environmental effects • *Section 11:* A summary of effects • *Appendix D:* Acoustic Modelling Study
Concern raised about effects of drilling discharges and emissions	Drilling activities give rise to a range of wastes, discharges and emissions. All emissions, wastes and discharges will be disposed in accordance with applicable legislation and guidelines including MARPOL and the OWTG. In accordance with regulatory requirements, some wastes will be managed and disposed of directly offshore from the MODU and the PSVs, whereas some wastes will be brought to shore for disposal. The effect of drilling waste, discharges and emissions is considered as part of the EIS. Drilling waste discharges have been quantified and modelled as part of the EIS.	• *Section 2.8*: Overview of emissions, discharges and waste management • *Section 7.2:* Assessment of Project-related environmental effects on fish and fish habitat • *Section 7.3:* Assessment of Project-related environmental effects on marine mammals and sea turtles • *Section 7.4:* Assessment of Project-related environmental

Table A.1 Summary of Key Issues Raised During Public Stakeholder Engagement

Question or Comment	Response	EIS Reference
		effects on migratory birds • *Section 7.5:* Assessment of Project-related environmental effects on Special Areas • *Section 7.6:* Assessment of Project-related environmental effects on commercial fisheries • *Section 7.7*: Assessment of Project-related environmental effects on Aboriginal use of lands and resources for traditional purposes • *Section 10:* Cumulative environmental effects
Concern raised about proximity to Sable Island, the Gully, and northern bottlenose whale critical habitat	The EIS assesses potential Project-related (and cumulative) effects on Special Areas which include, among other areas, Sable Island, the Gully and SARA-designated critical habitat. Routine Project activities and components could potentially interact with Special Areas, which could affect the ability of the Special Area to continue to provide important biological and ecological functions on which marine species and/or fisheries depend. These potential interactions most closely relate to concerns with the changes to the existing quality and use of natural habitats within these Special Areas. To reduce potential adverse effects on Special Areas, BP has committed to implementing best management practices and mitigation measures including avoidance of Sable Island, the Gully and northern bottlenose whale critical habitat. Mitigation measures identified for Fish and Fish Habitat, Marine Mammals and Sea Turtles, and Migratory Birds will be implemented to reduce the potential environmental effects of the Project on Special Areas. BP will also implement multiple preventative and response barriers to manage risk of incidents occurring and mitigate potential consequences (refer to Section 8.3 of the EIS for details on plans and specific response strategies).	• *Section 5.2.10:* Existing conditions regarding Special Areas • *Section 7.5:* Project-related environmental effects on Special Areas • *Section 8.5:* Environmental effects of potential accidental events • *Section 10:* Cumulative environmental effects
Concern raised about geohazards including slope	Prior to any drilling activity, BP will conduct a comprehensive regional geohazard baseline review (GBR), followed by detailed geohazard	• *Section 2.2:* Information about well location selection criteria,

Table A.1 Summary of Key Issues Raised During Public Stakeholder Engagement

Question or Comment	Response	EIS Reference
failure	assessments for each proposed wellsite to identify potential geohazards that may affect drilling operations. The GBR and detailed wellsite assessments will be based primarily on reprocessed 3D Wide Azimuth Towed Streamer (WATS) seismic data acquired by BP in 2014. Existing regional data, such as geotechnical cores and offset wells, will be incorporated where available. The geohazard assessments will focus on identifying potential drilling hazards at the seabed and subsurface. This work will be conducted by a BP geohazards specialist following internal guidelines that either meet or exceed local regulatory requirements.	including geohazards • *Section 9.1.6*: Information about geohazards • *Section 9.2*: Information about mitigation measures for geohazard management
General concern regarding use of fossil fuels and implications for climate change	Energy demand is forecast to increase globally over the next 20 years. Population growth and increases in per capita income are the key drivers behind the growth in energy demand. Energy production and consumption patterns vary and emphasize the need for secure, sustainable energy supplies. Nova Scotia's 2009 Energy Strategy – *Toward a Greener Future* (NSDOE 2009b), highlights the importance of a sustainable energy mix, and the role that offshore hydrocarbon exploration and development plays within the province's ongoing energy strategy. In the strategy, Nova Scotia commits to "encourage renewed offshore exploration and development, with its enormous potential for building future prosperity". In order to achieve their stated goal, the province has stated that it will invest revenues from offshore hydrocarbon activity into expenditures that offer enduring benefits.	• *Section 1.4:* Benefits of the Project, including information about energy diversification and sustainability
Request for information on management of drilling waste, including waste minimization	It is likely that the initial, shallow sections of the well will be drilled without a riser and that deeper sections will be drilled with a drilling riser attached. During riserless drilling, WBM will be used as the drilling fluid and cuttings are discharged directly to the water column in accordance with regulatory guidelines. Once a riser is attached, cuttings can be returned to the MODU for treatment; therefore, WBM or an alternative drilling fluid such as SBM can be used. The MODU will be equipped with specialized solids control equipment for cuttings management. Treatment technology will include shale shakers which recover drilling fluids from the cuttings to minimize the amount of waste fluids. Additional treatment of cuttings will be required when SBM is used to enable disposal in accordance with the OWTG. SBM cuttings will only be discharged once the performance targets in OWTG of 6.9 g/100 g retained "synthetic on cuttings" on wet solids can be satisfied. The concentration of	• *Section 2.3.2*: Information about cuttings • *Section 2.8.2*: Information about drilling waste discharges • *Section 7.1.2.1*: Summary of drill waste discharges and modelling results • *Section 7.2:* Assessment of Project-related environmental effects on fish and fish habitat • *Section 7.3:* Assessment of Project-related environmental

Table A.1 Summary of Key Issues Raised During Public Stakeholder Engagement

Question or Comment	Response	EIS Reference
	SBM on cuttings will be monitored on the MODU to achieve compliance with the OWTG. BP has modelled the dispersion of predicted drilling waste (refer to Appendix C of the EIS); this modelling study has been used to inform the assessment of effects of drilling waste on marine life. Overall, the dispersion of sediments associated with drill waste discharges is predicted to be limited to approximately 1,367 m (for a minimum deposition thickness of 0.1 mm). Using a threshold of 9.6 mm to assume burial of benthic species, it is predicted that this sediment thickness could extend approximately 116 m from the discharge point, or cover an area of approximately 0.54 ha per well.	effects on marine mammals and sea turtles • *Section 7.4:* Assessment of Project-related environmental effects on migratory birds • *Section 7.5:* Assessment of Project-related environmental effects on Special Areas • *Section 7.6* Assessment of Project-related environmental effects on commercial fisheries • *Section 7.7* Assessment of Project-related environmental effects on Aboriginal use of lands and resources for traditional purposes • *Section 10:* Cumulative environmental effects • *Appendix C:* Drilling Waste Dispersion Modelling Study
Request for information on anticipated greenhouse gas emissions related to Project activities	Key Project activities resulting in atmospheric emissions are: • Combustion from the MODU and PSV diesel engines, and fixed and mobile deck equipment and helicopter engines; and • Flaring during well test activity, in the event that well testing is required. It is currently anticipated that well testing (and associated flaring) will not be carried out on the first two wells drilled as part of the Project. When well testing is required, these emissions will be short-term and intermittent (*e.g.*, flaring from a few hours up to three days). In terms of GHG emissions, the Project is predicted to emit approximately 295.8 tonnes of CO_2 per day. ECCC reports an annual GHG emissions value for the province of Nova Scotia of 17,000 kilotonnes of CO_2 equivalent per year (ECCC 2016). BP's predicted daily CO_2 emissions for the Project therefore represent approximately 0.59 % of Nova Scotia's average daily emission. Atmospheric emissions, including GHGs, will be variable over the lifetime of	• *Section 2.8.1:* Information about atmospheric emissions from Project activities

Table A.1 Summary of Key Issues Raised During Public Stakeholder Engagement

Question or Comment	Response	EIS Reference
	the Project as activity varies.	
Request that the EIS considers how local conditions and natural hazards can affect the Project and result in environmental effects	Aspects of the environment that could potentially affect the Project include: fog; sea ice and superstructure icing; seismic events and tsunamis; extreme weather conditions; and sediment and seafloor stability. The EIS includes information about local conditions and natural hazards which could potentially affect the Project and mitigation measures to manage these.	• *Section 9.1:* Environmental conditions which could affect the Project • *Section 9.2*: Mitigation measures which will be put in place to manage environmental conditions
Request for information on well abandonment including monitoring or inspection	Once wells have been drilled to total depth and well evaluation programs completed, the well will be plugged and abandoned according to applicable BP practices and CNSOPB requirements. Wells drilled in association with the Project cannot be used for production, and therefore will be plugged and abandoned even in the event of well success. Plugs will be placed above and between any hydrocarbon bearing intervals at appropriate depths in the well, as well as at the surface. The final well abandonment program has not yet been finalized; however, these details will be confirmed as planning for the Project continues and will be submitted to CNSOPB as part of the OA process. A seabed survey will be conducted at the end of the drilling program using an ROV to survey the seabed for debris. Inspection and monitoring of abandoned wellheads will be conducted according to CNSOPB requirements.	• *Section 2.4.4:* Overview of plan for well abandonment

Table A.2 Summary of Key Issues Raised During Aboriginal Engagement

Question or Comment	Summary of Response	EIS Reference
Recommendation to complete a TUS and Mi'kmaq Fisheries Communication Plan	A TUS has been commissioned by BP to assess the extent and timing of traditional use of the RAA by the Mi'kmaq and Wolastoqiyik (Maliseet). This activity primarily includes fisheries use. The TUS has been completed by MGS and UINR. The results of the TUS have been used to inform the EIS. BP has commenced engagement with community fishery directors, fishers and fisheries organizations. BP will continue to engage commercial and Aboriginal fishers to share Project details as applicable and facilitate coordination of information sharing. A Fisheries Communication Plan will be used to facilitate coordinated communication with fishers.	• *Section 5.3.6:* Description of Aboriginal fishing activities • *Section 7.7*: Assessment of Project-related environmental effects on aboriginal use of lands and resources • *Appendix B*: Traditional Use Study
Concern about scope of TUS, particularly as it pertains to involvement of First Nations in New Brunswick	The TUS includes First Nations from the Mi'kmaq and Wolastoqiyik (Maliseet) communities in Nova Scotia and New Brunswick. Prior to the commencement of the TUS, the First Nation communities as well as the NCNS, were solicited for their participation because of known existing fishing activity. The communities who were invited to participate in the TUS include: Acadia First Nation, Glooscap First Nation, Membertou First Nation, Millbrook First Nation, Sipekne'katik (Indian Brook) First Nation, Woodstock First Nation, St. Mary's First Nation, Fort Folly First Nation, Eskasoni First Nation, Potlotek First Nation, Wagmatcook First Nation, We'koqma'q (Whycocomagh) First Nation, Paq'tnkek (Afton) First Nation, Pictou Landing First Nation, Annapolis Valley First Nation and Bear River First Nation. Sipekne'katik (Indian Brook) First Nation declined to participate in the TUS. As of April 2016, Annapolis Valley First Nation and Bear River First Nation had not been included in the TUS for EIS submission. The area considered by the TUS is consistent with the RAA defined in the EIS.	• *Section 5.3.6:* Description of Aboriginal fishing activities • *Section 7.7*: Assessment of project-related environmental effects on aboriginal use of lands and resources • *Appendix B*: Traditional Use Study
Request to include off-reserve Status and Non Status Indian/Mi'kmaq/Aboriginal Peoples in the TUS	BP has engaged with the NCNS, which represents off-reserve Aboriginal peoples in Nova Scotia, and the NCNS participated in the TUS.	• *Section 5.3.6:* Description of Aboriginal fishing activities • *Section 7.7*: Assessment of project-related environmental effects on

Table A.2 Summary of Key Issues Raised During Aboriginal Engagement

Question or Comment	Summary of Response	EIS Reference
		aboriginal use of lands and resources • *Appendix B*: Traditional Use Study
Concern that an oil spill could reach the Bay of Fundy and affect species at risk, migratory waterfowl, and tidal salt marshes	Safe operations are BP's priority. BP will implement multiple preventative and response barriers to manage risk of incidents occurring and mitigate potential consequences (refer to Section 8.3 of the EIS for details on plans and specific response strategies). BP has conducted spill trajectory modelling to determine the likely fate and behavior of a blowout in the extremely unlikely event one should occur over the life of the Project. The results of this modelling indicate that, if left unmitigated (*i.e.*, with no oil spill response measures to manage or contain spilled oil), oil from a blowout incident could potentially reach the Bay of Fundy under certain oceanographic conditions. However, the probability of oil reaching the Bay of Fundy at levels where environmental effects could be detected is 0 to 5% (if left unmitigated). Furthermore, the length of time it would take to reach the Bay of Fundy at these concentrations is in excess of 50 days, which would be considerable time to implement spill response measures to further reduce the probability of interaction of oil and sensitive receptors.	• *Section 8.3:* Emergency response and spill management • *Section 8.5:* Environmental effects of potential accidental events • Appendix H: Oil Spill Modelling Study
Concern that a spill could affect migration, spawning and/or feeding grounds of species of significance to Mi'kmaq culture including American eel, Atlantic sturgeon, Bluefin tuna, herring and gaspereau, whales, and migratory birds	Safe operations are BP's priority. BP will implement multiple preventative and response barriers to manage risk of incidents occurring and mitigate potential consequences. BP's oil spill response plan will contain specific details of response methods which could be used in the event of an oil spill (refer to Section 8.3 of the EIS for details on plans and specific response strategies). The EIS has used oil spill modelling (refer to Appendix H of the EIS) to inform the assessment of effects on valued components of the marine environment (refer to Section 8.5 of the EIS).	• *Section 8.3:* Emergency response and spill management • *Section 8.5:* Environmental effects of potential accidental events • *Appendix H*: Oil Spill Modelling Study
Concern of potential cumulative effects with proposed TransCanada marine terminal and shipping in the Bay of Fundy	Routine Project activities will not interact with the Bay of Fundy, therefore the proposed TransCanada marine terminal and associated shipping was not considered as a foreseeable activity with effects that would likely interact spatially and temporally with effects of the Project. Shipping in general within the RAA is considered in the cumulative effects assessment.	*Section 10:* Cumulative Effects Assessment

Table A.2 Summary of Key Issues Raised During Aboriginal Engagement

Question or Comment	Summary of Response	EIS Reference
Concern that the Project will result in obstruction of Mi'kmaq fishing areas	Similar to commercial fisheries, the Project could have an effect on fisheries resources by direct or indirect effects on fished species and/or effects on fishing activity from displacement from fishing areas, gear loss or damage. Routine Project activities are not expected to interact with nearshore fishing activities. A 500-m safety (exclusion) zone will be established around the MODU, in accordance with the *Nova Scotia Offshore Petroleum Drilling and Production Regulations*, within which Aboriginal (and commercial) fishing activities will be excluded while the MODU is in operation. This will result in localized Aboriginal fisheries exclusion within an area of approximately 0.8 km^2 (80 ha) for an expected maximum of 120 days for each well to be drilled. Although fishing efforts may be disrupted within this safety (exclusion) zone, it is anticipated to be a temporary and localized fishing exclusion and is not likely to have a substantial effect on Aboriginal fishing activities and fisheries resources. The Project Area does not include any unique fishing grounds or concentrated fishing effort; similar alternative sites are readily available within the immediate area.	• *Section 7.7:* Assessment of project-related effects on aboriginal use of lands and resources • *Appendix B:* Traditional Use Study
Recommendation for compensation and/or accommodation for impacts to fish and fish habitat	The Canada Nova Scotia Offshore Petroleum Board provides guidelines respecting damages relating to offshore petroleum activity. BP adheres to and complies with the principles outlined within the guidelines. Specified concerns regarding BP activity resulting in gear loss or damage will be investigated.	• *Section 7.6:* Assessment of project-related effects on commercial fisheries • *Section 7.7:* Assessment of project-related effects on aboriginal use of lands and resources
Question about PSV fuelling and fuel transfer to the MODU	Fuel will be transferred to the PSV for PSV fuelling and for transfers to the MODU using closed piping systems (*e.g.*, pumps and hoses). Procedures will be implemented for the safe management and use of fuelling systems to minimize the risk of an unintended release. The vessels, MODU and fuelling base will be equipped with primary spill contingency equipment to deal with spills in the unlikely event that they occur. The PSVs will transfer diesel fuel, also referred to as marine gas oil to the MODU from shore. Fuel is required offshore to power the MODU, including drilling equipment and thrusters. Fuel will be loaded from an existing field distribution facility within Halifax Harbour according to standard vessel fuelling procedures up to two to three times per week	• *Section 2.4.5.1*: Information about platform supply vessels and fuelling operations

Table A.2 Summary of Key Issues Raised During Aboriginal Engagement

Question or Comment	Summary of Response	EIS Reference
	by a third party contractor.	
Request for more information on drill waste dispersion modelling exercise and effects on marine life	It is likely that the initial, shallow sections of the well will be drilled without a riser and that deeper sections will be drilled with a drilling riser attached. During riserless drilling, WBM will be used as the drilling fluid and cuttings are discharged directly to the water column in accordance with regulatory guidelines. Once a riser is attached, cuttings can be returned to the MODU for treatment. SBM cuttings will only be discharged once the performance targets in OWTG of 6.9 g/100 g retained "synthetic on cuttings" on wet solids can be satisfied. The concentration of SBM on cuttings will be monitored on the MODU to achieve compliance with the OWTG. BP has modelled the dispersion of predicted drilling waste (refer to Appendix C of the EIS); this modelling study has been used to inform the assessment of effects of drilling waste on marine life. Overall, the dispersion of sediments associated with drill waste discharges is predicted to be limited to approximately 1,367 m (for a deposition thickness of 0.1 mm). Using a threshold of 9.6 mm to assume burial of benthic species, it is predicted that this sediment thickness could extend approximately 116 m from the discharge point, or cover an area of approximately 0.54 ha per well.	• *Section* 2.3.2: Information about cuttings • *Section* 2.8.2: Information about drilling waste discharges • *Section* 7.1.2.1: Summary of drill waste discharges and modelling results • *Section 7.2:* Assessment of Project-related effects on fish and fish habitat • Section 7.3: Assessment of Project-related effects on marine mammals and sea turtles • Section 7.4: Assessment of Project-related effects on migratory birds • Section 7.5: Assessment of Project-related effects on Special Areas • Section 7.6 Assessment of Project-related effects on commercial fisheries • *Section 7.6:* Assessment of Project-related effects on Aboriginal use of lands and resources for traditional purposes commercial fisheries • *Section 10:* Cumulative effects • *Appendix C:* Drilling Waste Dispersion Modelling Study
Question about whether drill wastes will contain naturally occurring radioactive material (NORM) and if so, how it will be managed	NORM is not expected to occur in the drilling waste. NORM typically is created in the production process, when the produced water may create sulfate scale on the wall of production tubing and surface equipment.	None
Request for more information on predictive spill modelling	BP has conducted stochastic and deterministic modelling to predict the fate and behavior of an oil spill in the unlikely event that one occurs	• *Section 8.3:* Emergency response and

Table A.2 Summary of Key Issues Raised During Aboriginal Engagement

Question or Comment	Summary of Response	EIS Reference
exercise and spill effects on nearshore and inshore resources	(refer to Appendix H of the EIS). The results of the modelling have been used to inform the assessment of effects of accidental spills on the marine environment (refer to Section 8.5 of the EIS). As part of stakeholder and Aboriginal engagement efforts, BP intends to present an overview of spill modelling results, as well as spill prevention and response measures that will be implemented to reduce adverse environmental effects from a spill.	spill management • *Section 8.5:* Environmental effects of potential accidental events • *Appendix H*: Oil Spill Modelling Study
Request for more information on Project effects on sensitive and protected areas (Special Areas)	The EIS assesses potential Project-related (and cumulative) effects on Special Areas which includes sensitive and protected areas including, but not limited to, Sable Island, the Gully and SARA-designated critical habitat. Routine Project activities and components could potentially interact with Special Areas (*e.g.*, drilling and VSP), which could affect habitats in Special Areas. Special Areas could also be affected in the unlikely event of large spills. To reduce potential adverse effects on Special Areas, BP has committed to implementing best management practices and mitigation measures including avoidance of Sable Island, the Gully and northern bottlenose whale critical habitat. Mitigation measures identified for Fish and Fish Habitat, Marine Mammals and Sea Turtles, and Migratory Birds will be implemented to reduce the potential environmental effects of the Project on Special Areas. BP will also implement multiple preventative and response barriers to manage risk of incidents occurring and mitigate potential consequences (refer to Section 8.3 for details on plans and specific response strategies).	• *Section 5.2.8:* Existing conditions regarding Special Areas • *Section 7.5:* Project-related effects on Special Areas • *Section 8.3:* Emergency response and spill management • *Section 8.5:* Environmental effects of potential accidental events • *Section 10:* Cumulative effects