Eastern Newfoundland Offshore Geophysical, Geochemical, Environmental and Geotechnical Programs 2015-2024

2018 Environmental Assessment Update

FINAL REPORT

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Appendix B Mitigation Measures Identified and Committed to in the EA Report and EA Addendum and Amendment

1 INTRODUCTION

ExxonMobil Canada Ltd. (ExxonMobil) is undertaking a marine petroleum exploration program, including geophysical, geochemical, environmental and geotechnical survey activities, in the eastern portion of the Canada-Newfoundland and Labrador Offshore Area (hereinafter also referred to as the Project). The Project has and will require authorizations from the Canada – Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), pursuant to Section 138 (1)(b) of the *Canada – Newfoundland Atlantic Accord Implementation Act* and Section 134(1)(b) of the *Canada – Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* (the Accord Acts).

As part of these required regulatory review and approval processes, ExxonMobil filed an Environmental Assessment (EA) in relation to the proposed marine exploration program in 2015. This assessment was planned, prepared and submitted in compliance with the associated EA requirements and processes of the C-NLOPB, including a Project-specific EA Scoping Document issued by the C-NLOPB on March 2, 2015. ExxonMobil's EA Report for the Project (Eastern Newfoundland Offshore Geophysical, Geochemical, Environmental and Geotechnical Programs 2015-2024 Environmental Assessment, prepared by Amec Foster Wheeler, July 2015) was submitted to the C-NLOPB on July 14, 2015. ExxonMobil's EA Report concluded that:

> *Each of the potential environmental issues and effects that could be associated with the proposed Project can be avoided or otherwise mitigated through the use of good planning and proven operational practices and procedures, supported by Project-specific and industry standard mitigations that are well established and outlined in relevant regulatory procedures and guidelines, and which have been identified by ExxonMobil as part of this Environmental Assessment…Overall, the proposed Project will entail a very localized, short-term and transient disturbance in the marine environment at any one location and time throughout the operational life of the exploration program. It is therefore not anticipated to displace or otherwise affect marine fish, birds, mammals, turtles, fisheries or other marine activities in such a way that causes negative and detectable effects to populations, species at risk or human activities in the region...The proposed Project is therefore not likely to result in significant adverse environmental effects.* (Section 6.0).

The EA Report was published on the Board website for governmental, stakeholder and public review and comment, with the C-NLOPB inviting comments on the EA Report until September 4, 2015. On September 30, 2015 the Board provided ExxonMobil with the consolidated comments received during that review.

In February 2016, ExxonMobil submitted an EA Addendum and Amendment for the Project. That document was intended as a supplement to the original EA Report and provided responses that addressed the various questions and associated requests for information and clarification that were submitted by government departments and agencies and other organizations as part of the EA review, as consolidated and provided to ExxonMobil by the C-NLOPB in September 2015. This document also described a proposed modification to the Project as compared to that which was described and assessed in the original (July 2015) EA Report, which involved a slight expansion of the northeastern portion of the proposed Project Area. Following review by the C-NLOPB and the above noted review organizations, a revised version of that EA Addendum and Amendment was prepared and submitted by ExxonMobil in May 2016.

On June 9, 2016 the C-NLOPB issued its EA determination related to the Project, which stated that:

> *The C-NLOPB has completed its EA determination respecting the Project. The EA Report, Addendum, and Amendment…describes the Project in sufficient detail and provides an acceptable assessment of the potential environmental effects of the Project. We have considered this information and the advice of the Boards' advisory agencies and have determined that the proposed project, following the application of mitigation measures, is not likely to cause significant adverse environmental effects….*
>
> *At the time of application for subsequent program authorizations in the Project Area, ExxonMobil Canada Ltd. will be required to provide information to the C-NLOPB. This information should outline the proposed activities, confirm that the proposed program activities fall within the scope of the previously assessed program, and indicate if, with this information, the EA predictions remain valid.*

This document provides the 2018 EA Update for the Project. It includes an overview of planned Project activities for the upcoming year, and updates any applicable environmental baseline information for key environmental components that has become available since the original EA Report and EA Addendum and Amendment were produced. In doing so, the EA Update evaluates and confirms that the nature and scope of the planned activities are within the scope of those assessed and approved in the EA review, including the appropriateness and adequacy of the associated environmental effects predictions and mitigation measures.

2 PROJECT DESCRIPTION

The following provides a brief overview of the original Project Description (as provided in the initial EA Report) for background and context, followed by a description of ExxonMobil's planned 2018 Project activities.

2.1 Overview of the Original Project Description

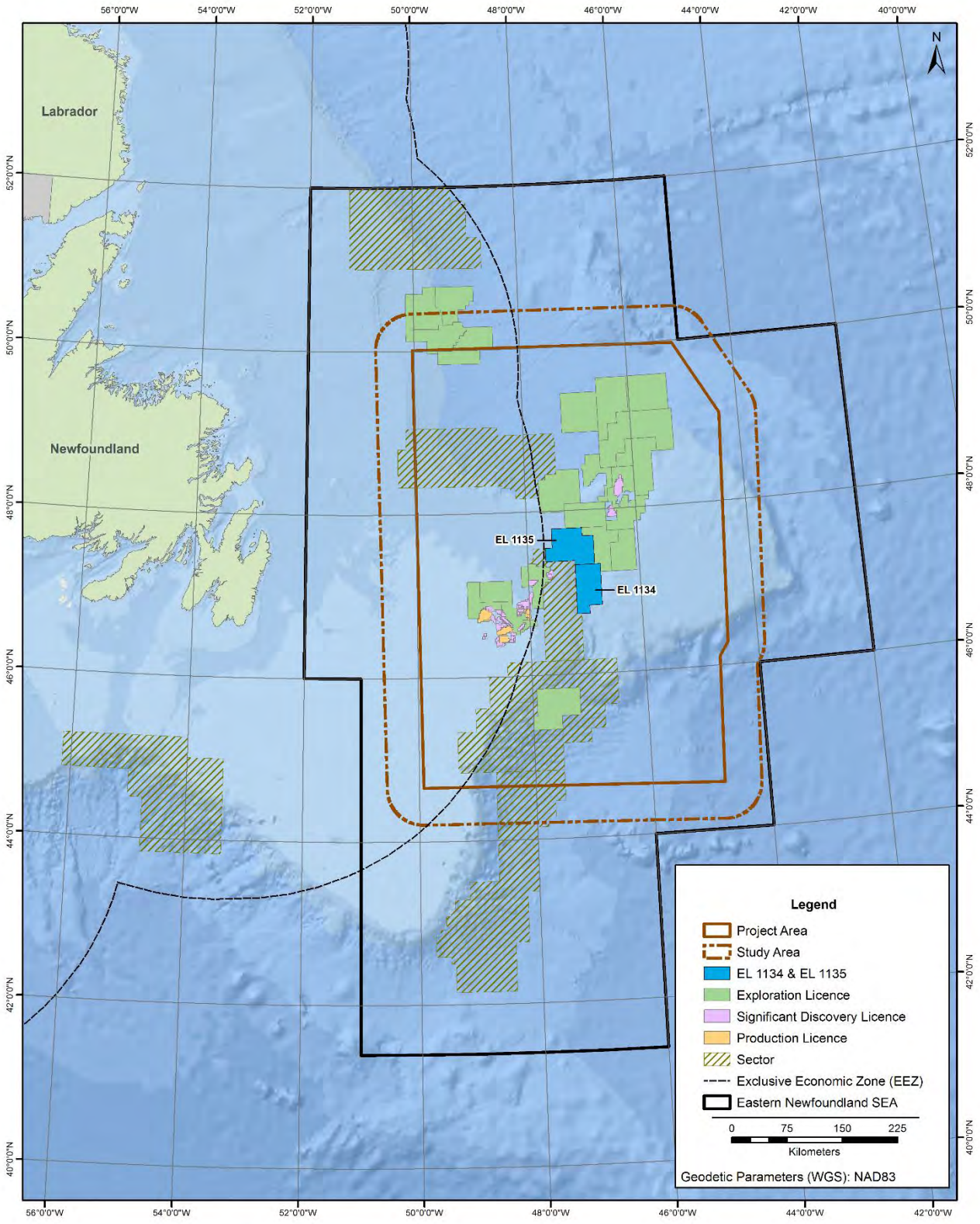
As described in the original EA Report (July 2015), the Project includes the proposed conduct of offshore exploration activities over ExxonMobil Exploration Licences (ELs) and other areas of interest within the Project Area (Figure 2.1) annually over the 2015-2024 period.

The Project Area encompasses the overall marine area within which all Project-related survey equipment use and data-acquisition activity will take place, and is located off the eastern coast of the Island of Newfoundland. The Project Area covers an area of 243,787 km^2, and as illustrated in Figure 2.1, portions of the Project Area are located within Canada's Exclusive Economic Zone (EEZ), whereas over half is located beyond the 200 nautical mile limit. All Project survey activities and operations, including survey equipment deployment, use and recovery, testing, other data acquisition and seismic survey line turns, will be completed within the identified Project Area boundary. Water depths in the Project Area range from approximately 100 m to 4,700 m.

Planned Project activities include 2D and 3D seismic surveys, as well as wellsite geohazard, geochemical, geotechnical and environmental survey activities. These are described in some detail in Chapter 2 of the EA Report (July 2015), With specific reference to the types of activities being planned for 2018, Section 2.4.2 (Wellsite Geohazard, Geochemical and Environmental) of the EA Report states that:

> *Wellsite geohazard, geochemical and environmental survey activities will also be conducted in order to collect additional information to help determine the hydrocarbon potential of, and/or environmental conditions within, relevant parts of the Project Area.*
>
> *These survey programs involve a variety of activities, the underlying purpose and timing of which is variable. Geochemistry is often associated with exploration for hydrocarbon prospects, wellsite-geohazard and environmental work is undertaken to complete site investigation prior to exploratory drilling. The specific nature, location and timing of these activities in any year will be subject to regulatory approvals, as well as such factors as weather and ice conditions, the location of other marine activities in the region and other considerations. With the exception of geochemical surveys, which are an exploration tool, the timing of these activities will all be dependent upon the exploration results and the number of potential exploration well prospects identified from the 3D seismic data.*

Figure 2.1 Project Area and EA Study Area



The main components of the wellsite geohazard, geochemical and environmental surveys associated with this Project will include:

- *A site-survey acquisition vessel;*
- *Engineering geophysical equipment including 2D HR seismic;*
- *Seabed and water column sampling equipment; and*
- *Shallow seabed geotechnical sampling equipment.*

The geochemical and associated bathymetric surveys are associated with exploration for prospects. Geochemical and environmental data acquisition may be collected using a towed or ROV mounted seabed camera / video system, grab samplers, gravity or piston core, box corer and water sampler.

Site investigation[s] prior to exploratory drilling [will include] geohazard and engineering geophysical data...[collection] using 2D high-resolution reflection seismic, sub-bottom profilers (possibly involving deep tow, mid water tow, hull-mounted or over the side mounted equipment), side-scan sonar, multi-beam echosounder and magnetometers. Core, grab and seabed samples may also be acquired to determine seabed sediment characteristics. For each of these activities, the survey vessel could be either a dedicated survey ship, or involve the equipment being deployed from a vessel of opportunity.

Environmental surveys could include metocean water column characterization and environmental effects characterization and environmental baseline studies. Instrumentation could include water samplers, CTD, current meters and wave rider buoy for metocean and seabed grab and core samples for environmental baseline survey. Environmental characterization may also include a biological survey of commercial fish using fish sampling gear such as a commercial groundfish trawl.

Section 2.5 of the EA Report outlines applicable logistical and personnel requirements for such a survey, whereas Section 2.6 (Project Schedule) notes that:

The proposed Project activities will occur within the May 1 to November 30 period for each and all years of the proposed exploration program, which will potentially extend from 2015 to 2024.

It is anticipated that all proposed seismic survey activities would occur within these months each year, with the actual timing of data acquisition in any given year being determined at that time based on factors such as local weather, sea state and ice conditions, the nature, timing and intensity of commercial fisheries, and required coordination with other marine activities in this area and elsewhere.

2.2 Planned 2018 Project Activities

Project activities in 2018 will include the completion of seabed survey activities within two ExxonMobil operated ELs in the Project Area, specifically EL 1134 and EL 1135 (see Figure 2.1). These surveys will be completed at identified locations in the Sackville Spur and Flemish Pass areas off the eastern Grand Bank, and will include:

- Pre-drilling site-investigation / geohazard determination;
- Fisheries and cold water corals habitat identification surveys; and
- Seabed characterization

It is anticipated that the planned 2018 survey activities will commence in mid July and they are expected to be completed by late August or early September 2018, for a total planned duration of approximately 45 days depending on final scope and weather conditions.

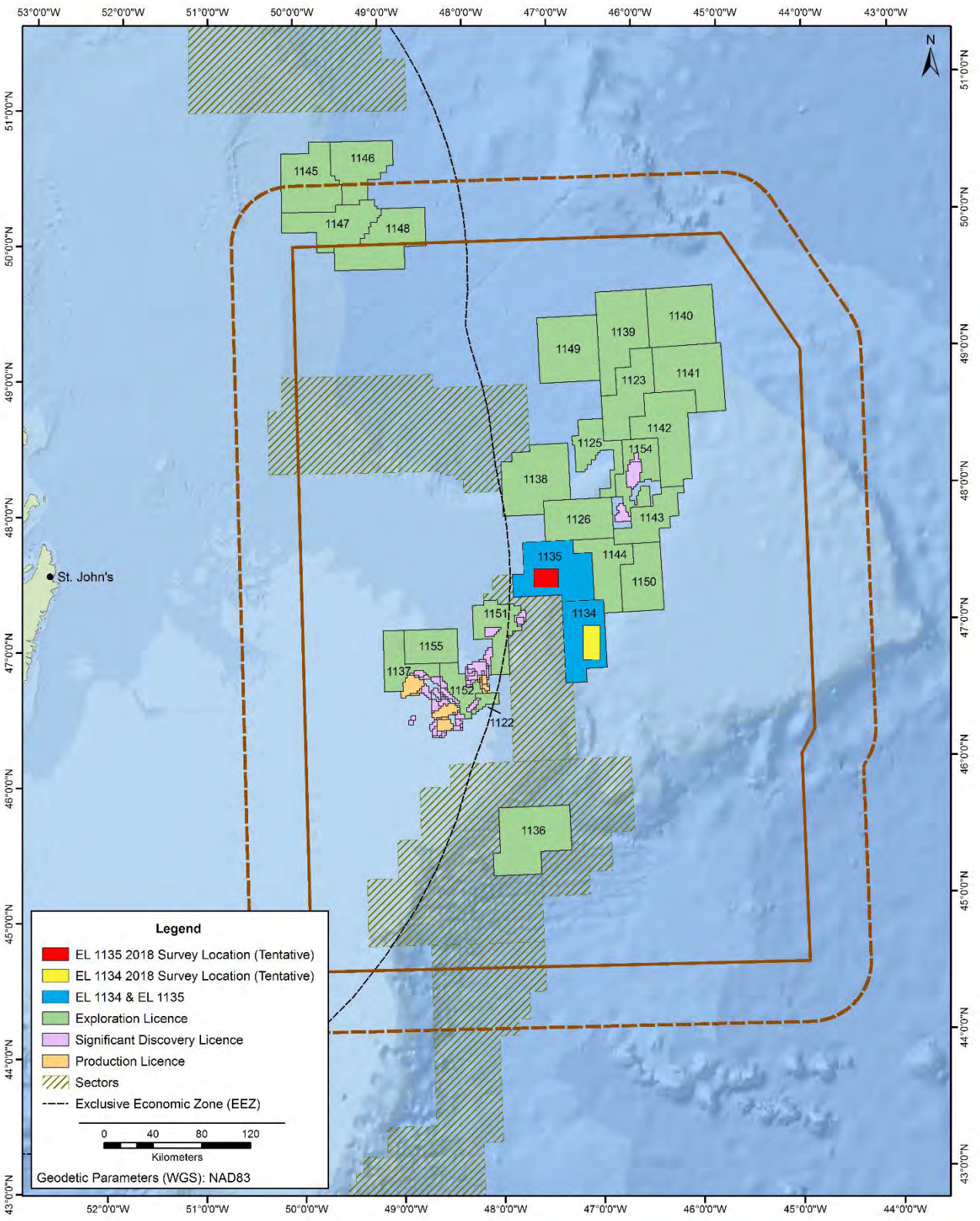
Current plans are for one 5 km x 5 km site survey on EL 1134 (in approximately 1,200 m water depth) and up to two 5 km x 5 km site surveys on EL 1135 (in approximately 300 m water depth). The exact location and orientation of these surveys has yet to be finalized, but will be within the red and yellow polygons shown in Figure 2.2. These polygons correspond to the areal extent of 3 Dimensional Short Offset (3DSO) volumes currently being processed to determine whether shallow gas accumulations and/or faulting will occur in the shallow subsurface.

The key components of the planned 2018 survey activities include the survey vessel, Autonomous Underwater Vehicle (AUV), digital high resolution seismic equipment, towed and vessel mounted engineering geophysical equipment, geotechnical, fisheries and cold water corals habitat survey equipment, and seabed characterization sampling equipment.

The site-investigation / geohazard survey seismic acquisition equipment suite will consist of:

- Two Dimensional High Resolution Digital Seismic (2DHR);
- Singlebeam Echosounder (SBES);
- Multibeam Echosounder (MBES);
- Vessel Mounted Sub-Bottom Profiler (SBP1);
- Deep-Towed Sub-Bottom Profiler (SBP2);
- Sidescan Sonar (SSS);
- Magnetometer (Mag);
- Water Column - Sound Velocity Profiler (CTD/SVP), either deployed from the vessel or Moving Vessel Profiler (MVP);
- Ultra Short Base Line subsea instrument navigation (USBL); and
- Water sampler

Figure 2.2 Project Area and Approximate Locations for 2018 Surveys



In order to obtain high resolution engineering geophysical data for cold water coral habitat identification in deeper water locations, an AUV, instrumented with MBES, SBP1, SSS and a high resolution camera is currently being considered.

The equipment planned to be used for associated site-investigation / geohazard survey seabed characterization consists of small volume grab sampler (GS) and seabed cameras. Cameras would be mounted on either a seabed frame, an inspection Remotely Operated Vehicle (ROV) or AUV mounted camera.

To fully utilize the survey vessel, some environmental data acquisition is also being considered, consisting of a number of water samples in EL 1134 and EL 1135.

Specific survey methodologies, survey locations and survey extents are currently being developed and refined as Project planning progresses, and will be detailed in ExxonMobil's forthcoming applications to the C-NLOPB for the various authorizations and/or approvals required to complete the program. Key overall survey components and activities are summarized below:

- *Pre-drilling site-investigation / geohazard determination*: This would involve the completion of surveys over approximately 5 km x 5 km areas, centered over identified well-site locations within the EL in question. The survey would involve a line spacing of approximately 100 m - 250 m primary and 500 m secondary. In the case of planned AUV use, the data would be acquired at various AUV altitudes ranging from 6-45 m above the seabed, with the survey equipment including MBES, SBP2, SSS and camera in conjunction with vessel deployed equipment including SVP/CTD, SBES and SBP1. Alternatively, the survey will be completed using a vessel based equipment suite consisting of SBES, MBES, SBP1, SSS, CTD/SVP.

  The AUV navigation system, obstacle avoidance and predetermined altitude prevent seabed interaction and allow the experienced operator to program and complete the survey to acquire full seabed coverage. The AUV will be battery operated and not use a fuel cell, which will avoid any associated environmental risk. In the very unlikely event of a failure and resulting equipment loss, a recovery plan would be implemented.

- *Fisheries and cold water corals habitat identification surveys*: This will involve acquiring towed / drift video transect or ROV video transects over the identified well site locations and the modelled drill cuttings dispersal areas. In water depths less than 500 m where the eventual drill rig may be anchored, the anchor locations will also be surveyed and the survey area will be an approximately 5 km x 5 km area centered over the proposed well-site location.

- *Seabed characterization*: This will involve grab sampling and drift video transects at representative areas and in close proximity to the identified drill site location, using an equipment suite consisting of GS and underwater camera.

A number of EL specific survey options are also summarized below:

EL 1134 Site Investigation / Geohazard Survey (Water depth approximately 1,200 m)

- Primary focus is to acquire DFO / C-NLOPB mandated high-resolution survey of cold water corals distribution in area classified as Vulnerable Marine Ecosystem (VME).

- Reprocessed 3-D seismic will be used for geohazard identification. Reprocessing will be discussed with C-NLOPB prior to reprocessing.
- Survey will acquire MBES, SBP, SSS, seafloor video and GS.
- Upon reviewing options, AUV acquisition currently preferred.
- Cold water corals survey methodology to be presented to and approved by C-NLOPB and Department of Fisheries and Oceans (DFO) prior to survey implementation.
- Other survey methods being considered are:
    - Vessel mounted MBES and SBP with towed SSS with seabed characterization by camera and GS,
    - Vessel mounted MBES and SBP with detailed inspection ROV video survey

EL 1135 Site Investigation / Geohazard Survey (Water depth approximately 300 m)

- Primary focus is to acquire C-NLOPB mandated 5 km x 5 km site-investigation / geohazard survey(s) at the Harp site location and a possibly a second Harp prospect site; location of second site currently under discussion with EL partners.
- 2DHR required by regulations, will attempt to leverage 3DSO to reduce or replace 2DHR.
- Survey will acquire MBES, SBP, SSS, CAM, and GS.
- Seabed characterization will focus on cold water corals distribution and abundance.
- Camera data will be acquired by either camera frame, inspection ROV or AUV mounted camera.

As noted above, for EL 1135 ExxonMobil is currently seeking permission to utilize reprocessed 3DSO data to map the upper section. If permission is granted then no 2DHR will be acquired. If 2DHR is required, it would be acquired across the survey area using an air source array (approximately 160 cubic inch total capacity), a seismic streamer with 600 meter active length, and using a digital recording system. A tail buoy will be used, equipped with a radar reflector and strobe light, as well as a separate GPS tracking system.

The geophysical source output would be as follows:

- 4 x 40 cu in array – 224.6 dB re 1 uPa rms
- 200/400kHz MBES – 210 dB re uPa rms (Seabat 8124)
- 70 kHz MBES – 232 dB re uPa rms (Simrad EM710)
- 30 kHz MBES – 241 dB re uPa rms (Simrad EM300)
- Parametric SES SBP – 220 dB re uPa (Innomar SES2000)
- Huntec SBP – 205 dB re uPa rms
- 200/400 kHz SSS – 224 dB re uPa rms (Benthos C3D)

Survey Vessel

The survey vessel to be used has yet to be identified and contracted, but it will be suited to the environmental conditions of the Project Area and the planned survey activities, and will comply with applicable regulatory requirements.

The survey vessel will use existing shore base facilities in St. John’s and a shore based representative will be located in St. John’s for the duration of the Project. The crew will be made up of seismic crew (technical and scientific personnel) and vessel crew (ships officers and marine crew). Additionally, there

will be two client representatives on-board for the duration of the survey as well as Marine Mammal Observers (MMOs) and a Fisheries Liaison Officer (FLO) as outlined in the EA Report. All on board personnel will have the required certifications specified by applicable legislation and the C-NLOPB.

2.3 Consultations

As part of its on-going and planned operations off Eastern Newfoundland, ExxonMobil regularly consults with relevant individuals and stakeholders through existing and relevant forums (such as the One Ocean initiative), and conducts additional and specific engagements with applicable persons and groups if and as particular issues and requirements arise.

Details on the various 2018 activities that are described in this EA Update were communicated to the Fish, Food and Allied Workers Union (FFAW-Unifor), One Ocean and fish harvesters during a meeting with ExxonMobil representatives on December 12, 2017. Further communications and updates on the planned wellsite survey activities occurred through the One Ocean initiative in January 2018, with a follow-up meeting being planned for the week of April 9, 2018.

Information on the Project and its 2018 activities will continue to be communicated to and discussed with applicable groups through the above described forums.

2.4 Evaluation of Planned 2018 Activities in Relation to the Overall Project and EA Scope

As noted above, each of the planned 2018 activities described earlier in this Chapter are in keeping with the nature and scope of the Project as described, assessed and approved under the EA process for the Project.

Chapter 2 (Project Description) of the EA Report (July 2015) and the associated EA Addendum and Amendment (May 2016), for example, included and described the equipment and associated activities that would be associated with the completion of wellsite geohazard, geochemical and environmental surveys (Section 2.4.2), as well as outlining the associated schedule and logistics, and associated environmental discharges, emissions and environmental management systems. Each of these components and activities were also considered and addressed through the associated environmental effects assessment in the EA Report (Chapter 6) and the EA Addendum and Amendment, including the identification and proposal of associated mitigation measures to avoid or reduce any negative environmental effects resulting from these activities.

Each of these environmental effects and associated mitigations measures (as reflected in the EA Report and EA Addendum and Amendment) remain applicable to the nature and scope of the planned 2018 Project activities, and will be implemented in accordance with the Operator’s commitments and obligations pursuant to the Project’s EA approval and other applicable legislative and regulatory requirements.

3 EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS ASSESSMENT

The original EA Report (July 2015) and subsequent EA Addendum and Amendment (May 2016) provided a detailed overview of the existing (baseline) environment within and around the proposed Project and Study Areas, including relevant aspects of the existing physical, biological and socioeconomic environments, and an assessment of the potential environmental effects of the Project.

This Chapter of the 2018 EA Update provides an updated overview of the existing environmental setting for the Project. This includes a description of any new or additional information for the EA Study Area that has become available since the original EA Report was completed, with a particular focus (where possible) on ELs 1134 and 1135 themselves. It also provides an analysis of any implications of this new information and the specific nature and scale of the planned 2018 Project activities for the EA's predicted environmental effects, the mitigation measures that have been identified and proposed by ExxonMobil for the Project, and thus for the overall findings and conclusions of the original EA documents referenced above. This discussion is focussed on and structured according to the various Valued Environmental Components (VECs) that were considered and addressed in the original EA Report, namely:

1) Marine Fish and Fish Habitat
2) Marine / Migratory Birds
3) Marine Mammals and Sea Turtles
4) Species at Risk
5) Protected and Sensitive Areas, and
6) Marine Fisheries and Other Activities.

In the interests of efficiency and brevity it does not repeat all of the detailed environmental information and analysis provided in the original EA documentation, which should therefore also be referred to as required and relevant.

3.1 Marine Fish and Fish Habitat (Including Species at Risk)

Marine ecosystems are comprised of biological and physical elements that interact to form complex and variable patterns across a seascape. Biological ecosystem elements span primary producers such as phytoplankton to consumers such as zooplankton, benthic invertebrates and fish. In the Study Area many of these species are of ecological, cultural, commercial and/or of conservation importance and may rely on specific habitats to fulfil parts of their life cycle. The EA Report presented a detailed overview of marine fish and fish habitat within the Study Area, including plankton, algae, benthic invertebrates and fish (Section 4.2.1), based on existing and applicable information that was available at the time of writing.

3.1.1 Existing Environment

For the most part, the information and datasets that were used in the original EA Report represent the most recent and relevant information on marine fish and fish habitat in the overall Study Area. In some instances, new information has become available on particular fish species within the region, which include important commercial species and species that have been identified as being of conservation

concern. Key data sources used in this EA Update are presented in Table 3.1, which are summarized in the subsections that follow.

Table 3.1 Marine Fish and Fish Habitat: Additional or Updated Data Sources Used in the EA Update

Environmental Component	Additional or Updated Data Sources Used in the EA Update
Assemblages	Murillo et al (2016), Nogueira et al (2014, 2016, 2017, 2018)
Plankton	Melle et al (2014); Pepin et al (2015)
Plants and Macroalgae	Hernandez-Kantun et al (2017)
Benthic Invertebrates	Kenchington et al (2014); Barrio Froján et al (2015); Beazley and Kenchington (2015); Beazley et al (2015), Greenan et al (2016), Guijarro et al (2016), Howell et al (2016); Mullowney et al (2017); Murillo et al (2016a, 2016b); Buhl-Mortensen et al (2017); Kenchington et al (2017)
Marine Fish	Curtis et al (2014); Nogueira et al (2014, 2015, 2017,2018); Parzanini et al (2017); Vaudo et al (2017)
Species at Risk	COSEWIC (2016); Simpson et al (2016); Government of Canada (2017, 2018)

3.1.1.1 Assemblages and Taxonomic Groups

Environmental conditions including habitats are key drivers in the presence, distribution and abundance of flora and fauna, as organisms persist in and seek out conditions that suit their physiology and maximize their ecological fitness. Often such environmental preferences cause species to be associated with particular areas and times, and overlap and interact with other species, forming an assemblage (Haedrich and Merritt 1990; Amec 2014). These assemblages are associated with particular habitats resulting from a combination of environmental parameters including depth, temperature, pressure, light levels, oceanographic processes, productivity, and substrate type (Gomes et al 1992; Mahon et al 1998; Murillo et al 2016a; Nogueira et al 2017). Assemblages across much of the Study Area, as detailed in the EA Report and by Amec (2014), remain relevant. However, since the original EA was completed and submitted there have been updated descriptions of certain fish (Nogueira et al 2014, 2015, 2017, 2018) and invertebrate (Murillo et al 2016a) depth assemblages across the Study Area, as described below.

3.1.1.2 Plankton, Plants and Macroalgae

The plankton community is comprised of small, free-floating microscopic marine plants (phytoplankton), invertebrates (zooplankton), vertebrate eggs and larvae, bacteria, fungi and viruses. These organisms make up the dominant group in the ocean, both in terms of diversity and biomass, and consequently, they play an important role as the base layers of most food webs (primary and secondary production).

Recent studies indicate that bathymetry is a dominant factor that influences zooplankton community distribution, with a shift in community composition from the continental shelf to the shelf edge (Pepin et al 2015). In Atlantic Canada waters, zooplankton communities in shallow shelf areas are dominated by *Pseudocalanus spp, Temora longicornis*, and larvaceans, whereas deeper waters are dominated by *Oithona atlantica, Microcalanus spp, Calanus finmarchicus* and Ostracods (Pepin et al 2015). *Calanus finmarchicus* is, for example, considered one of the most important copepods in the North Atlantic due to its abundance and role in food webs (Melle et al 2014). A review of environmental factors that influence this species indicated that *C. finmarchicus* recruitment in the western North Atlantic was

delayed relative to the timing of phytoplankton bloom (Melle et al 2014). Low temperatures in the western North Atlantic were suggested to cause a mismatch in copepod recruitment and the phytoplankton bloom (Melle et al 2014).

Macroalgae (including *Laminaria sp., Agarum clathratum*) and sea grasses (*Zostera marina*) are important habitats for marine biota in coastal areas of Newfoundland where they provide enhanced productivity, and access to refuge (Amec 2014). However, as plants and macroalgae are dependent on sunlight, their distribution is typically limited to depths shallower than 50 m (Dayton 1985; Gregory and Anderson 1997; Anderson et al 2002). In Newfoundland waters, the depth boundary where various species will not grow is approximately 75 m (Mathieson and Dawes 2017).

Since the original EA Report was completed, recent reviews of distributions of red coralline algae in the North Atlantic indicate that they may occupy habitats from intertidal zones to 60 m depths (Hernandez-Kantun et al 2017). *Lithothamnion glaciale* and *Lithothamnion tophiforme*, are the primary species distributed in Newfoundland and Labrador waters with *L. glaciale* generally occupying intertidal to moderately deep waters (less than 25 m) and *L. tophiforme* occurring in deeper areas (25-39 m) (Hernandez-Kantun et al 2017).

3.1.1.3 Marine Invertebrates

Benthic Invertebrates

Benthic invertebrates represent a very broad group of animals that associate with the seafloor for at least part of their life cycle. These taxa play a variety of ecological and socioeconomic roles in the ecosystem, and collectively form an important part of the food chain (Templeman 2010), generate habitat heterogeneity (Hasemann and Soltwedel 2011), are part of important commercial fisheries (Dawe et al 2012). Their limited mobility and sensitivity to anthropogenic disturbance makes benthic communities particularly relevant to assessing potential effects related to offshore developments (DeBlois et al 2014; Barrio Frojàn et al 2015; Bell et al 2015; Cordes et al 2016; Clark et al 2016; Murillo et al 2016a, 2016b). An overview of the biology, ecology, and distribution of key benthic and pelagic invertebrate species in the Study Area were detailed in the EA Report (Section 4.2.1.5) and in the Eastern Newfoundland SEA (Amec 2014).

Updated and additional information on benthic invertebrates in the overall Study Area come mainly from surveys on the Flemish Cap and the southeastern shelf and slope of the Grand Banks (Murillo et al 2016a), Flemish Pass (Barrio Frojàn et al 2015, Beazley et al 2015), and the Orphan Basin (Carter et al 1979, d'Entremont et al 2008). Murillo et al (2016a) recently assessed the composition and distribution of benthic assemblages on the tail of the Grand Bank and the Flemish Cap. Assemblages on continental shelf of the tail of the Grand Bank, including the southeastern shelf and slope, were associated with coarse sediments and freshwater associated with the Labrador Current. These areas were typically dominated by orange footed sea cucumber (*Cucumaria frondosa*) and sand dollars (*Echinarachnius parma*). On the upper slope of the Grand Bank (650-700 m depth), benthic invertebrate assemblages were dominated by sponges that had a wide bathymetric and geographic range.

Invertebrate assemblages on the Flemish Cap at depths less than 500 m typically included the sponge *Lophon piceum*, and crustacean *Sabinea sarsii*. Echinoderms (*Ceramaster granularis, Ponaster tenuispinus, Ctenodiscus crispatus, Brisaster fragilis*) and sea anemones (*Hormathia digitata*) were characteristic species on the Flemish Cap from 200-500 m and were associated with silt, sand and

gravel bottoms (Murillo et al 2016a). Within the 500-900 m depth range on the Flemish Cap, on primarily sandy-silt bottoms, deep-sea coral assemblage were observed that were characterized by a variety of coral species (black corals, cup corals, soft corals, sea pens, gorgonian corals). Deepwater invertebrate assemblages (700-1,400 m) were similar among the tail of the Grand Bank and the Flemish Cap with the macrofauna assemblages become increasingly characterized by various species of sea pens, sponges and echinoderms (sea urchins and seastars) (Murillo et al 2016a).

In the Flemish Pass and western Flemish Cap, some 527 epifaunal species / morphotypes were identified from 400-1,400 m depths (Beazley et al 2015, Greenan et al 2016). Sponges and cnidarians represented the highest number of taxa, followed by arthropods echinoderms and molluscs (Beazley et al 2015). Infaunal assemblages in the Flemish Pass are characterized by polychaetes, nematodes, brittle stars, sponges, and hydrozoans (Barrio Frojàn et al 2015).

The Orphan Basin lies in the northern part of the overall Study Area and is an area that exhibits relatively little habitat complexity in deep areas (from 2,000 m to over 3,000 m). The area is dominated by species that can thrive in silt habitats including polychaetes, molluscs, sand dollars, brittlestars and brachiopods (Carter et al 1979). Sponges are also distributed in deep areas of the Orphan Basin. In preliminary surveys of the Orphan Basin, unidentified hydroids, sponges, anemones, brittlestars, sea urchins, and crabs were observed (d'Entremont et al 2008).

Snow crab was identified as a commercially important benthic invertebrate species in the EA Report. Mullowney et al (2017) used survey and tagging data to further characterize the inshore and offshore movements of snow crab. This species migrates to deeper waters as they transition to adults with average movements ranging from 54-72 km for male and female crab (Mullowney et al 2017). These movements down-slope are associated with temperature as the juveniles search for warmer waters. Seasonal migrations where crab move towards shallow waters for mating and molting range from 43-46 km on the Grand Bank and 25 km in an inshore bay (Notre Dame Bay) (Mullowney et al 2017). Overall, this recent study indicates that individual snow crab demonstrate high levels of mobility in the Study Area.

Corals and Sponges

Deep-sea corals, sea pens and sponges are a subset of benthic invertebrates that are of particular conservation interest due to their habitat-forming capacity and their relative sensitivity to certain types of anthropogenic stressors (Murillo et al 2011; Beazley et al 2013). There are at least 57 species of corals and sea pens distributed within and around the Study Area on the Flemish Cap, Flemish Pass and the Grand Banks based on bottom trawling and video surveys (Gilkinson and Edinger 2009; Wareham 2009; Murillo et al 2012; Beazley et al 2013, Vàzquez et al 2013; Baillon et al 2014a, 2014b; Kenchington et al 2014, Beazley and Kenchington 2015). Along shelf and slope areas, depth along with other associated environmental parameters is considered the greatest predictor for coral presence as determined by distribution models (Guijarro et al 2016). This supports the association of coral species to specific depth ranges, particularly on shelf slopes. In the Study Area, soft corals are mainly distributed on shelf areas, whereas black wire corals, gorgonian corals and stony cup corals are distributed on the shelf slopes (Murillo et al 2011). Sea pens are also well distributed in the Flemish Pass outside the Canadian Economic Exclusion Zone (EEZ).

There are also at least 60 sponge species found within the Study Area (Murillo et al 2012; Beazley et al 2013; Knudby et al 2013; Beazley and Kenchington 2015; Beazley et al 2015, Murillo et al 2016b).

Due to their fragile nature, sponges are not always identifiable to species from such surveys, and therefore sponge diversity may be under represented in published reports (Knudby et al 2013). Sponges exhibit a wide depth range (100-1,500 m) with the higher sponge biomass being located on the Flemish Cap, followed by the Flemish Pass and the tail of the Grand Banks. Sponges are well distributed on shelf areas east of Newfoundland with lower distributions on the southern Grand Banks (Guijarro et al 2016). Murillo et al (2016b), for example, identified deep areas of the Flemish Cap and the Grand Bank as areas of high biomass for *Geodia sp*. Distribution modelling indicates that summer primary production minimum, silicate concentration, temperature, depth and particular organic carbon availability were the primary parameters in predicting sponge distribution (Guijarro et al 2016, Howell et al 2016).

A number of environmental components and associated indicators, including sea pens, large gorgonian corals and small gorgonian corals, have been evaluated to determine areas of key ecological importance and to identify associated Vulnerable Marine Ecosystems (VMEs, see later Section 3.4) (Kenchington et al 2014) based on EU Spanish and Canadian survey data. The summary data from the EU Spanish trawl survey (Kenchington et al 2017) has been utilized here to further evaluate coral presence inside the particular areas of interest for the 2018 survey work (EL 1134 and EL 1135) inside the Study Area (Table 3.2), and is supplemented with Canadian RV survey information from relevant publications.

Within EL 1134 and EL 1135, sea pens have been the main coral group observed, with higher densities on the slopes and bottoms of the Flemish Pass (Figure 3.1). Key species in this group included *Anthoptilum grandiflorum, Halipteris finmarchica,* and *Pennatula aculeata* (Murillo et al 2011; Kenchington et al 2014). This coral group was present in 77 percent and 36 percent of trawls in EL 1134 and EL 1135, respectively.

Gorgonian corals were not well distributed across the two ELs based on the EU Spanish trawl data. In EL 1134, small and large gorgonian corals were present in 19 percent and 16 percent of trawls, respectively, whereas in EL 1135, small and large gorgonian corals were present in two percent and nine percent, respectively. The primary occurrence of small (*Acanella arbuscular* and *Radicipes gracilis*) (Figure 3.2) and large (*Acanthogorgia spp, Keratoisis spp, Paragorgia aborea, P. johnsoni, Paramuricea spp,* and *Primnoa resedaeformis*) (Figure 3.3) gorgonian corals were on the bottom and lower slopes of the Flemish Pass in EL 1134 and EL 1135 (Murillo et al 2011; Kenchington et al 2014).

Canadian RV surveys indicate the occurrence of soft corals, comprised of *Gersemia sp., Duva sp.* and *Nephtheidae* species, on the Newfoundland shelf and slope in EL 1135. Soft corals are not well distributed on the bottom of the Flemish pass in EL 1134. There was also an observed occurrence of stony cup corals in EL 1134, however distribution was limited (Murillo et al 2011).

Table 3.2 Coral Percent Presence in Trawls in the Study Area based on EU Spanish Surveys (2004-2013)

Coral Species	EL 1134 Total Trawls: 81 Depth Range: 732-1,252 m		EL 1135 Total Trawls: 93 Depth Range: 216-1158 m	
	No. of Trawl Species present	% of Trawls Species Present	No. of Trawl Species present	% of Trawls Species Present
Large Gorgonian	13	16	2	2
Small Gorgonian	15	19	8	9
Sea pen	62	77	33	36

Coral Species	EL 1134 Total Trawls: 81 Depth Range: 732-1,252 m		EL 1135 Total Trawls: 93 Depth Range: 216-1158 m	
	No. of Trawl Species present	% of Trawls Species Present	No. of Trawl Species present	% of Trawls Species Present
Adapted from Kenchington et al (2017).				

Sponges were well distributed in EL 1134 and EL 1135 based on EU Spanish data (Table 3.3, Figure 3.4). Although sponges were not consistently identified to species, the observed and identified species were primarily from the families Geodiidae and Ancorinidae (Murillo et al 2012; Kenchington et al 2014). Sponges were present on the Newfoundland Shelf in EL 1135, and along the bottom and slopes of the Flemish Pass in EL 1134 and EL 1135. These species were present in 83 percent and 73 percent of trawls in EL 1134 and EL 1135, respectively.

Table 3.3 Sponge Percent Presence in Trawls in the Study Area based on EU Spanish Surveys (2004-2013)

Sponge Species	EL 1134 Total Trawls: 81 Depth Range: 732-1,252 m		EL 1135 Total Trawls: 93 Depth Range: 216-1158 m	
	No. of Trawl Species present	% of Trawls Species Present	No. of Trawl Species present	% of Trawls Species Present
Sponge Species	67	83	68	73
*Presence data only available for Canadian RV Survey. Adapted from Kenchington et al (2017).				

Pelagic Invertebrates

Pelagic macroinvertebrates include animals that live exclusively in the pelagic environment or swim up from the benthos to feed. A review of trawl data on the Flemish Cap (Vázquez et al 2013) indicated that squid (e.g., *Illex illecebrosus, Histoteuthis sp., Gonatus sp.*), octopus (*Bathypolypus arcticus*), shrimp (e.g., *Pandalus borealis. Acanthephyra pelagica, Pasiphaea tarda*) were commonly captured. *Gonatus sp.* squid are suggested to be particularly abundant along the slopes of the Newfoundland Shelf in the Study Area (NAFO areas 3LMN) due to their prevalence in the stomachs of Greenland halibut, and are considered an important prey species (CBD 2014).

Figure 3.1 Sea Pen Distributions based on European Union-Spanish (2004-2013) RV Surveys

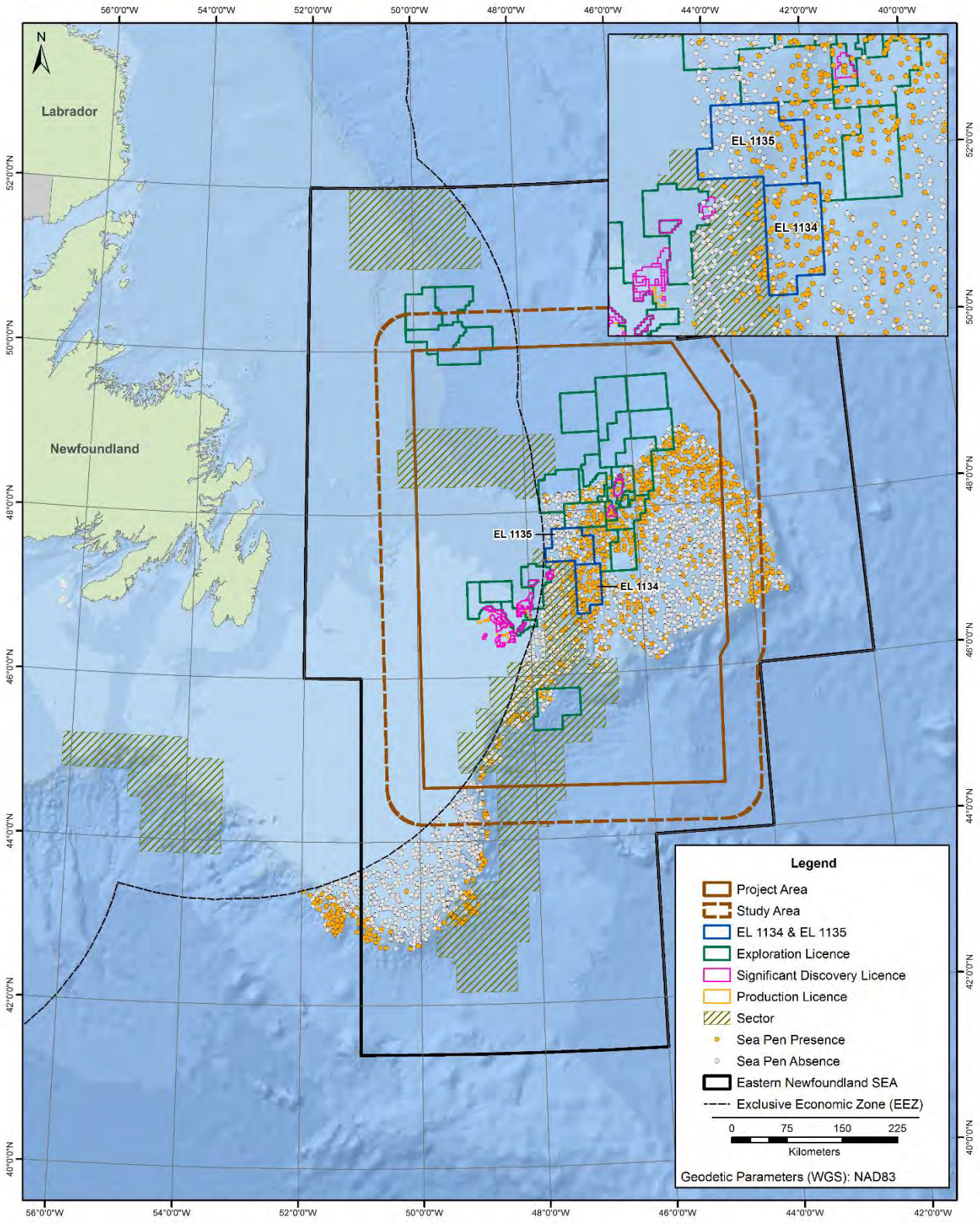


Figure 3.2 Small Gorgonian Coral Distributions based on European Union-Spanish (2004-2013) RV Surveys

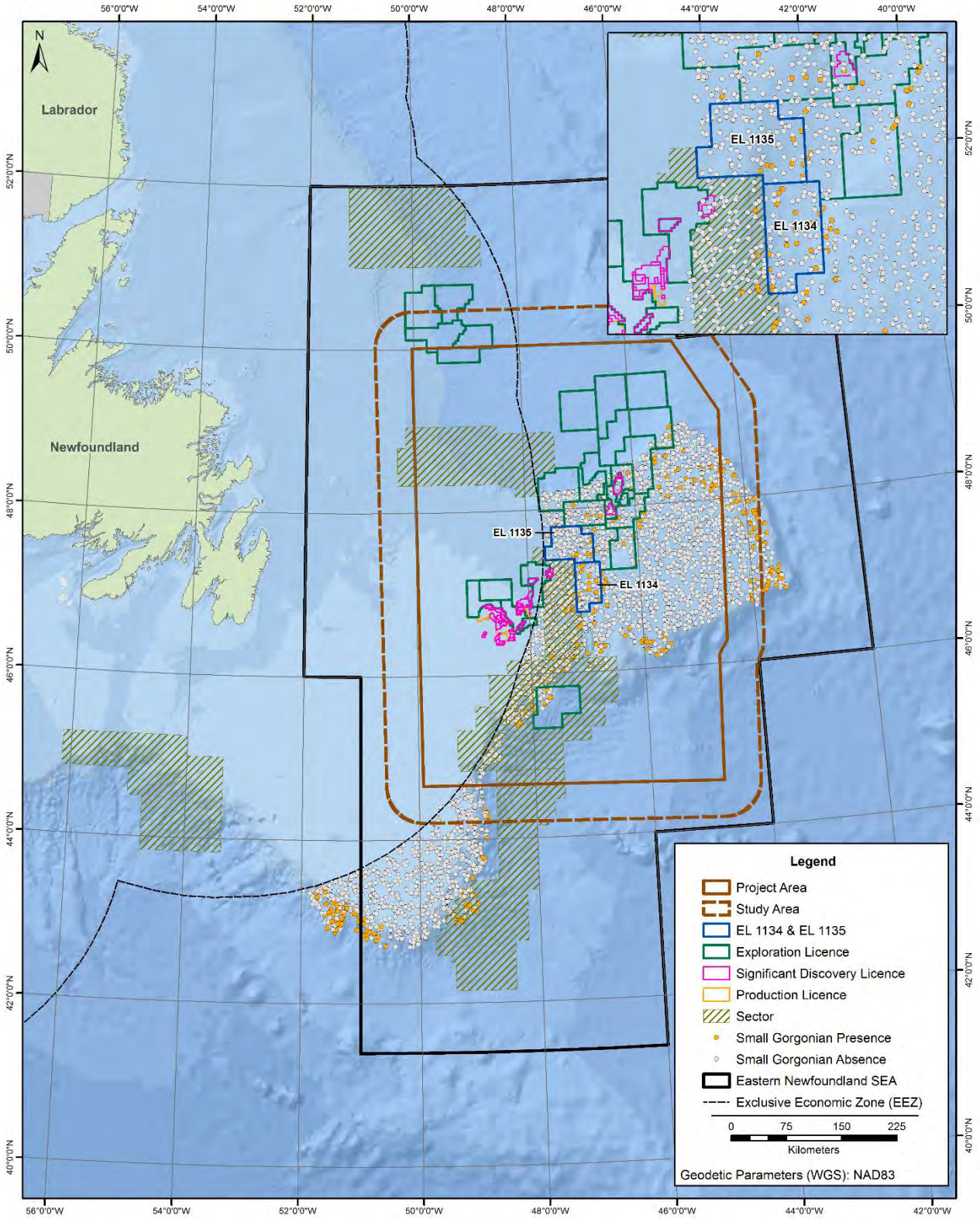


Figure 3.3 Large Gorgonian Coral Distributions based on European Union-Spanish (2004-2013) RV Surveys

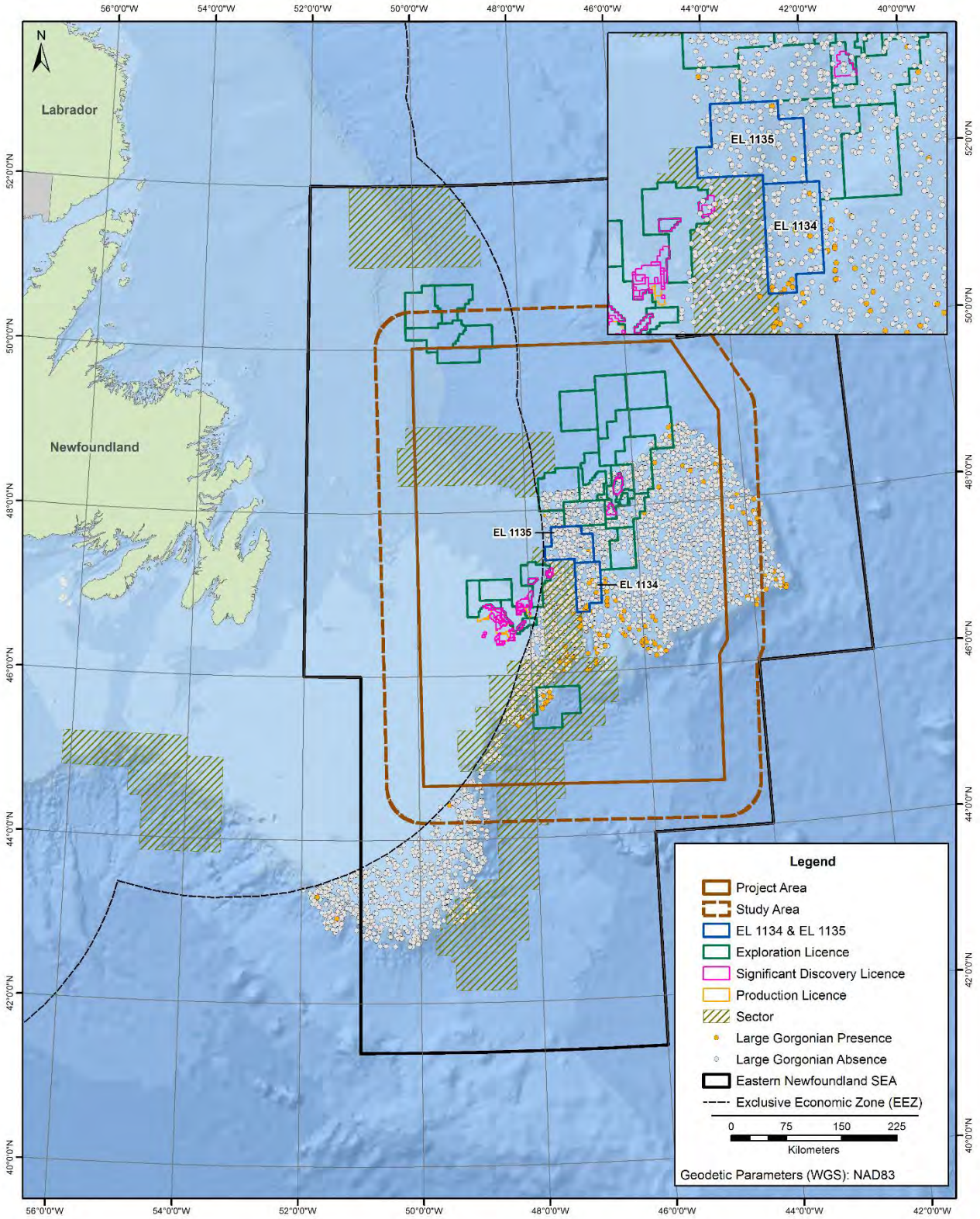
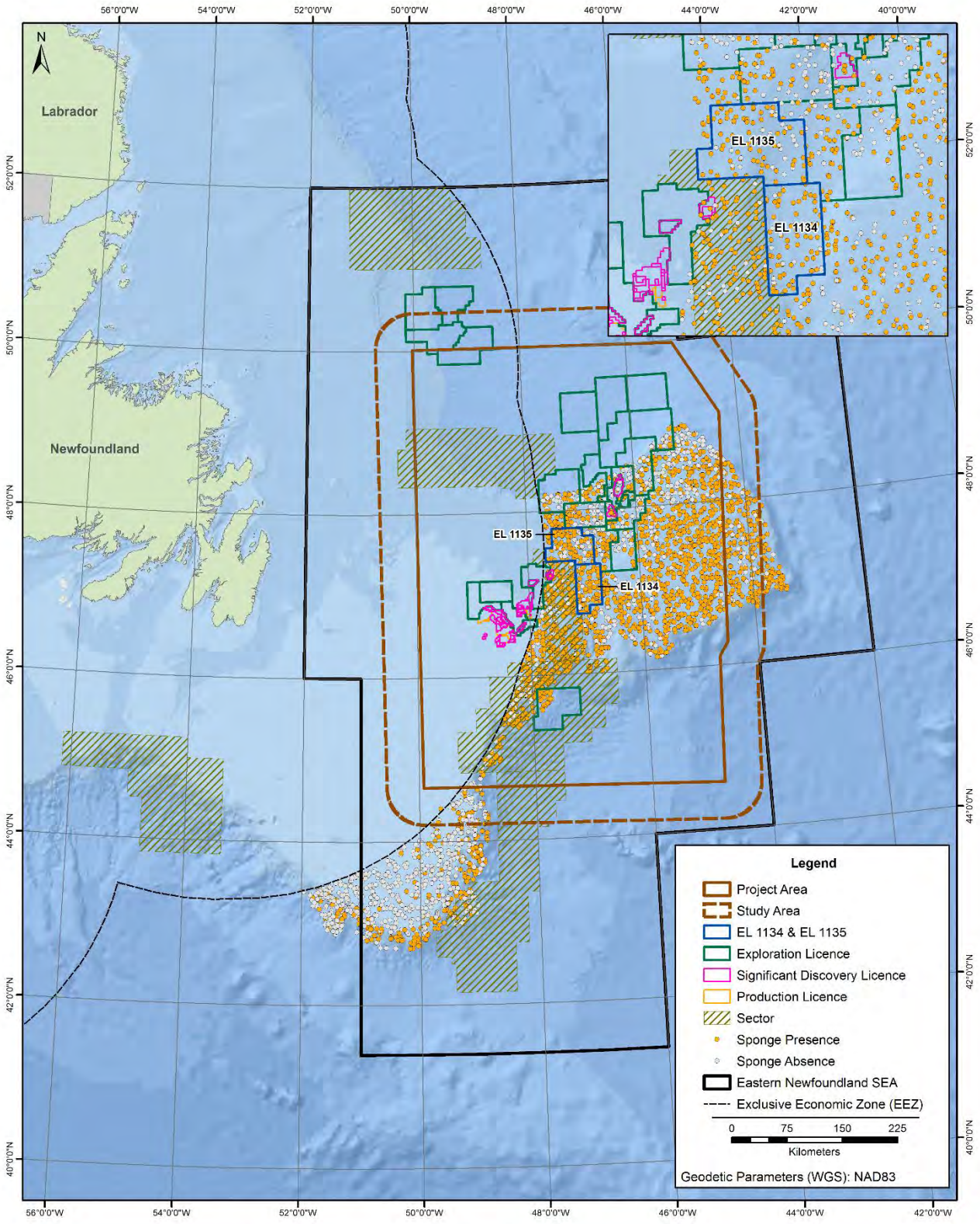


Figure 3.4 Sponge Distribution based on European Union-Spanish (2004-2013) RV Surveys



3.1.1.4 Marine Fish

Marine fish are found throughout the Study Area and, of the 188 species known to occur in Newfoundland waters (Templeman 2010), many are of ecological, commercial, conservation and/or cultural importance. These species collectively reflect a diversity of morphologies, life histories, habitat requirements and their presence within the Study Area varies according to environmental conditions, habitat, and life history stage. The overlap in fish presence based on their environmental requirements and preferences again results in distinct assemblages of fish species. An overview of the biology, ecology, and distribution of key demersal and pelagic fish species in the Study Area is detailed in the EA Report (Section 4.2.1.6) and in the Eastern Newfoundland SEA (Amec 2014).

Demersal Fish

Since the completion of the original EA documentation for the Project, key groundfish assemblages in the Study Area in general – including in ELs 1134 and 1135 - have been further characterized with European Union Research Vessel (RV) data for the Flemish Cap and the tail of the Grand Banks (Nogueira et al 2014, 2015, 2017, 2018) (Table 3.4). Groundfish assemblages have been observed to associate with depth, but this may be a proxy for other associated environmental parameters including temperature, productivity, oceanographic processes and oxygen levels (Nogueira et al 2017). In groundfish assemblages, biomass and abundance was observed to decline with depth and diversity was observed to increase with depth (Nogueira et al 2015, 2017). Therefore, at shallower depths the areas are often dominated by a few species with high abundance, whereas deeper water fish assemblages are dominated by several species with low abundance. Across areas, Atlantic cod, American plaice, and Atlantic wolffish were characteristic species in the shelf assemblages, transitioning to redfish species, Arctic eelpout, longfin hake, and wolffish species in the upper-slope assemblage. The lower medium assemblage was characterized by a variety of species including Greenland halibut, blue hake, grenadier species and black dogfish (Nogueira et al 2014, 2015, 2017, 2018).

Table 3.4 Generalized Fish Assemblages According to Depth for the Tail of the Grand Banks and Flemish Cap

Tail of the Grand Banks	Flemish Cap
Shelf Assemblage (38-300 m)	**Shelf Assemblage (129-250 m)**
• Yellowtail flounder, *Limanda ferruginea* • American plaice, *Hippoglossoides platessoides* • Northern sand lance, *Ammodytes dubius* • Moustache sculpin, *Triglops murrayi* • Capelin, *Mallotus villosus* • Atlantic cod, *Gadus morhua* • Sea raven, *Hemitripterus americanus* • Atlantic wolffish, *Anarhichas lupus* • Thorny skate, *Ambylaraja radiata* • Monkfish, *Lophius americanus*	• American plaice, *Hippoglossoides platessoides* • Witch flounder, *Glyptocephalus cynoglossus* • Atlantic cod, *Gadus morhua* • Atlantic wolffish, *Anarhichas lupus* • Golden redfish, *Sebastes norvegicus* • Spotted wolffish, *Anarhichas minor*
Upper slope assemblage (301-600 m)	**Upper slope assemblage (251-600 m)**
• Redfish, *Sebastes* spp. • Spotted wolffish, *Anarhichas minor* • Arctic eelpout, *Lycodes reticulatus* • Northern wolffish, *Anarhichas denticulatus*	• Acadian redfish, *Sebastes fasciatus* • Deepwater redfish, *Sebastes mentella* • Arctic eelpout, *Lycodes reticulatus* • Thorny skate, *Amblyraja radiata*

Tail of the Grand Banks	Flemish Cap
• Witch flounder, *Glyptocephalus cynoglossus* • Longfin hake, *Phycis chesteri*	• Longfin hake, *Phycis chesteri* • Spinytail skate, *Bathyraja spinicauda* • Northern wolffish, *Anarhichas denticulatus*
Lower-medium Assemblage (601-1,460 m)	**Lower-medium Assemblage (601-1,460 m)**
• Greenland halibut, *Reinhardtius hippoglossoides* • Blue hake, *Antimora rostrata* • Roughhead grenadier, *Macrourus berglax* • Marlin-spike, *Nezumia bairdii* • Black dogfish, *Centroscyllium fabricii* • Roundnose grenadier, *Coryphaenoides rupestris* • Northern cutthroat eel, *Synaphobranchus kaupii* • Arctic skate, *Amblyraja hyperborea* • Snubnosed spiny eel, *Notacanthus chemnitzii* • Spinytail skate, *Bathyraja spinicauda* • Longnose chimera, *Harriotta raleighana*	• Greenland halibut, *Reinhardtius hippoglossoides* • Blue hake, *Antimora rostrata* • Roughhead grenadier, *Macrourus berglax* • Marlin-spike, *Nezumia bairdii* • Black dogfish, *Centroscyllium fabricii* • Roundnose grenadier, *Coryphaenoides rupestris* • Northern cutthroat eel, *Synaphobranchus kaupii* • Arctic skate, *Amblyraja hyperborea* • Snubnosed spiny eel, *Notacanthus chemnitzii* • Sloane's viperfish, *Chauliodus sloani* • Vahl's eelpout, *Lycodes vahlii* • Scaly dragonfish, *Stomias boa* • Bean's sawtoothed eel, *Serrivomer beanii* • Threadfin rockling, *Gaidropsarus ensis* • Demon catshark, *Apristurus* sp. • Lanternfish, *Lampanyctus* sp.
Source: Adapted from Nogueira et al (2014, 2015, 2017, 2018).	

Pelagic Fish

Pelagic fish species in the Study Area undertake extensive seasonal migrations to spawning, nursery and foraging areas (Trenkel et al 2014). This includes seasonal spawning migrations between freshwater and marine habitats (e.g. Atlantic salmon, American eel), summer feeding migrations from southerly latitudes by migratory warm water pelagic fishes (e.g., tunas, swordfish, sharks), and seasonal inshore offshore migrations (e.g., Atlantic cod, capelin) as detailed in the original EA Report and in the Eastern Newfoundland SEA (Amec 2014). Temperature is considered a key environmental parameter for controlling distributions of various small to medium pelagic species (e.g., herring, mackerel, capelin) (Trenkel et al 2014). In large pelagic species such as tuna and swordfish, temperature, oxygen levels, population density, and oceanographic processes are important for determining spatial distributions (Trenkel et al 2014).

Recent tagging and fishing surveys focussed on sharks have further characterized their habitat utilization and distribution in Canadian waters. Early, juvenile and adult life stages of porbeagle sharks are abundant on or near the continental shelf in Canadian waters and are rarely captured at the surface or at depths greater than 200 m (COSEWIC 2014a). Conversely, shortfin mako migration routes are mainly in offshore areas outside the continental shelf, including the Newfoundland Shelf and Flemish Cap in summer to winter seasons (Vaudo et al 2017). White sharks have seasonal distribution ranges, where in winter months they frequent areas off the southeastern United States and in spring to summer months expand to northern parts of their range (Curtis et al 2014), as evidenced by female white sharks that have been tracked to the southern Newfoundland shelf and slopes and to the Flemish Cap (Ocearch 2018).

3.1.1.5 Species at Risk

There are a number of fish species that have been designated as being at risk, or which have otherwise been identified as being of special conservation concern, that are known or likely to occur in the Study Area, including several that are designated and formally protected under the federal *Species at Risk* Act (SARA) and/or the Newfoundland and Labrador *Endangered Species Act* (NL ESA) (Table 3.5). Since the EA Report was completed and submitted there have been changes in species at risk designations for several species, as follows (see shaded rows in Table 3.5):

- Blue shark (*Prionace glauca):* Designation was changed during the November 2016 COSEWIC assessment from “Special Concern” to “Not at Risk” (COSEWIC 2016, Government of Canada 2017);

- Shortfin mako (*Isurus oxyrinchus):* Designation was changed during the April 2017 COSEWIC assessment from “Threatened” to “Special concern”(COSEWIC 2017a); and

- Common lumpfish (*Cyclopterus lumpus):* Designated as “Threatened” during the November 2017 COSEWIC assessment (Simpson et al 2016, Government of Canada 2017.

Table 3.5 Fish Species at Risk or Otherwise of Special Conservation Concern.

Species		Status / Designation [1,2]				Relevant Population (Where Applicable)
Common Name	Scientific Name	*NL ESA*	*SARA*	COSEWIC	IUCN	
Atlantic wolffish	*Anarhichas lupus*		SC	SC		
Northern wolffish	*Anarhichas denticulatus*		T	T		
Spotted wolffish	*Anarhichas minor*		T	T		
American eel	*Anguilla rostrata*	V		T	E	Global (IUCN)
Blue shark	*Prionace glauca*			NR	NT	Atlantic (COSEWIC); Global (IUCN)
Basking shark	*Cetorhinus maximus*			SC	V	Atlantic (COSEWIC); Global (IUCN)
Common lumpfish	*Cyclopterus lumpus*			T		Atlantic (COSEWIC)
Alewife	*Alosa pseudoharengus*				LC	Global (IUCN)
Black dogfish	*Centroscyllium fabricii*				LC	Global (IUCN)
Atlantic cod	*Gadus morhua*			E	V	Newfoundland and Labrador (COSEWIC); Global (IUCN)
Cusk	*Brosme brosme*			E		
Haddock	*Melanogrammus aeglefinus*				V	Global (IUCN)
White hake	*Urophycis tenuis*			T		Atlantic and Northern Gulf of St. Lawrence (COSEWIC)
Porbeagle	*Lamna nasus*			E	V	Global (IUCN)
Shortfin mako	*Isurus oxyrinchus*			SC	V	Atlantic (COSEWIC); Global (IUCN)

Species		Status / Designation [1,2]				Relevant Population (Where Applicable)
Common Name	Scientific Name	*NL ESA*	*SARA*	COSEWIC	IUCN	
White shark	*Carcharodon carcharias*		E	E	V	Atlantic (COSEWIC/SARA); Global (IUCN)
Roughhead grenadier	*Macrourus berglax*			SC		
Roundnose grenadier	*Coryphaenoides rupestris*			E		
Lanternfish	Myctophidae				LC	Global (IUCN)
Atlantic hagfish	*Myxine glutinosa*				LC	Global (IUCN)
American plaice	*Hippoglossoides platessoides*			T		Newfoundland and Labrador (COSEWIC)
Atlantic halibut	*Hippoglossus hippoglossus*			NR	E	Global (IUCN)
Barndoor skate	*Dipturus laevis*				E	Global (IUCN)
Smooth skate	*Malacoraja senta*			E	E	Funk Island Deep (COSEWIC); Global (IUCN)
Spinytail skate	*Bathyraja spinicauda*				NT, V	Global, Northwest Atlantic (IUCN)
Thorny skate	*Amblyraja radiata*			SC	V	Canada, Global (IUCN)
Winter skate	*Leucoraja ocellata*			E	E	Eastern Scotian Shelf – Newfoundland (COSEWIC); Global (IUCN)
Atlantic salmon	*Salmo salar*			NR, T, SC, E	LC	South Newfoundland, Gaspe-Southern Gulf of St. Lawrence, Eastern Cape Breton, Nova Scotia Southern Upland (COSEWIC); Global (IUCN)
Albacore tuna	*Thunnus alalunga*				NT	Global (IUCN)
Atlantic bluefin tuna	*Thunnus thynnus*			E	E	Global (IUCN)
Bigeye tuna	*Thunnus obesus*				V	Global (IUCN)
Acadian redfish	*Sebastes fasciatus*			T	E	Atlantic (COSEWIC); Global (IUCN)
Deepwater redfish	*Sebastes mentella*			T	LC	Northern (COSEWIC); Global (IUCN)
Greenland shark	*Somniosus microcephalus*				NT	Global (IUCN)
Spiny dogfish	*Squalus acanthias*			SC	V	Atlantic (COSEWIC); Global (IUCN)

[1] Not at Risk (NR), Least Concern (LC), Vulnerable (V), Near Threatened (NT), Special Concern (SC), Threatened (T), Endangered (E)

[2] Multiple designations refer to multiple populations or sub-populations

With particlar reference to the recent COSEWIC designation of common lumpfish, Canadian RV spring and fall surveys indicate that this species is distributed mainly on shelf areas off Newfoundland to the south (NAFO area 3Ps) and east (NAFO areas 3KLO). This semi-pelagic species occupies shallow coastal waters at depths less than 20 m to areas over 300 m (Simpson et al 2016). In Newfoundland waters, common lumpfish spawn in subtidal waters between May-June and move to deeper waters in late summer and early fall (Simpson et al 2016). Common lumpfish hatch from male guarded nests and occupy coastal nursery areas with sea grasses and macroalgae (Simpson et al 2016). Adult lumpfish feed on pelagic and benthic prey, including fish eggs, larvae, ctenophores, crustaceans, small fish, polychaetes and molluscs (Simpson et al 2016). Current threats to this species are to include changes in water temperature and salinity, destruction and pollution of spawning and nesting habitat, and directed and bycatch fishing adults. Although no critical habitats have been established for this species to date, shallow coastal spawning and nursery areas around Newfoundland are important aspects of this species life history.

There have been no new management plans for species recovery for any at risk marine fishes in the Study Area since the EA Report was completed (Government of Canada 2018).

3.1.2 Environmental Effects Assessment

As illustrated previously in Section 2.2, the 2018 survey activities that will be undertaken as part of the Project are in keeping with the nature and scope of those described and assessed in the original EA., and will occur well within the previously defined and considered EA Study Area.

While the particular marine areas that will be the subject of the 2018 surveys (within ELs 1134 and 1135) would be expected to contain specific fish species and habitats that are characteristic of the particular environmental conditions present at these locations, and their relative location within the overall EA Study Area, the updated information presented in the preceding section does not suggest that the 2018 survey areas are likely to contain new or different species, habitats - and thus, potential environmental issues or interactions – that were not considered and addressed in the original EA. This includes no likely increases or other changes in the Project's potential to interact with, or have negative effects upon, key or particularly sensitive species (including any that are designated as being species at risk) or habitats. All of the mitigation measures and commitments outlined in the original EA Report (see Section 5.3, with further details on some measures in the subsequent EA Addendum and Amendment) would remain applicable and will continue to be implemented and adhered to by ExxonMobil in planning and implementing this Project.

Many of the offshore survey activities that will be undertaken as part of this Project - including those planned for 2018 - will not result in any direct contact with the seabed, and will therefore not physically disturb sensitive benthic habitats such as corals and sponges. Although some seabed sampling may occur in 2018, those surveys which involve contact with the seabed will have a very small footprint. As referenced in the EA Report and further described in the EA Addendum and Amendment, ExxonMobil will undertake representative seabed reconnaissance prior to any intrusive seabed sampling work in areas that have been identified as having a high probability of occurrence of corals and sponges, and will implement appropriate mitigations in any cases where these sensitive benthic organisms are found to be present at these locations. It should also be emphasized that the planned cold water corals surveys that are being implemented as part of the 2018 Project activities are intended to help further mitigate possible effects on these species resulting from any future exploration drilling activity that may be undertaken within these ELs by ExxonMobil.

The nature and scale of the planned 2018 activities and the updated baseline information provided above therefore do not change the results of the original (2015) environmental effects assessment for this VEC, and the Project is still not likely to result in significant adverse environmental effects on marine fish and fish habitat.

3.2 Marine / Migratory Birds (Including Species at Risk)

Marine and migratory birds are important aspects and indicators of ecosystem health, and are of socioeconomic importance in Newfoundland and Labrador both in terms of tourism (e.g. the Witless Bay and Cape St. Mary's Ecological Reserves) and as a food source (murres, known locally as "turrs", are hunted locally). The coastline of Eastern Newfoundland and the waters offshore provide important habitat for various species of marine-associated birds. The Grand Banks and Flemish Cap regions are important feeding areas for dozens of marine bird species, and are of particular importance to planktivorous seabirds such as storm-petrels, shearwaters and Dovekies (Barrett et al 2006; Fort et al 2012, 2013). Nesting grounds for tens of millions of seabirds representing some 20 species are found along the coast of Eastern Newfoundland, including some of the largest seabird colonies in eastern North America south of the Hudson Strait (Lock et al 1994). Several Important Bird Areas (IBAs) and other sites of regional significance to migratory birds have been designated in Eastern Newfoundland because they provide important habitat for large numbers of birds for at least part of the year and/or because they support avian species of conservation concern.

Marine-associated birds may be classified as: 1) seabirds, 2) waterfowl and divers, and 3) shorebirds. As well, a number of landbird species may also interact with planned Project activities, as they are associated with coastal habitats and/or migrate nocturnally over marine waters.

3.2.1 Existing Environment

Updated information on marine and migratory bird presence and abundance within the Study Area was obtained from the Canadian Wildlife Service (CWS) branch of Environment and Climate Change Canada. The CWS was also consulted for information on seabird colonies in Eastern Newfoundland, as well as for recent data on seasonal and spatial trends in seabird abundance from the Eastern Canadian Seabirds at Sea (ECSAS) program. Records from the Atlantic Canada Shorebird Survey (ACSS) and the IBA of Canada programs were also used to provide further information on species presence, and to identify areas and times of particular importance to avifauna in and around the Study Area.

3.2.1.1 Seabirds

Seabirds are relatively long-lived species with low fecundity, delayed recruitment and relatively low rates of population growth. Fifield et al (2009) explored seasonal trends in abundance of seabirds off Eastern Canada and found that the largest concentration of seabirds in the offshore waters off Eastern Newfoundland was from March to August, while seabirds were least abundant in the area in the fall (September - October). Within the Study Area, data are relatively sparse for the fall months due to lack of survey coverage, but seabird abundance was consistent throughout the rest of the year with an average of approximately 18 to 25 birds / km^2 (Fifield et al 2009). The seasonal trends observed largely correspond with earlier PIROP (Programme Intégré des Recherches sur les Oiseaux Pélagiques) seabird survey data summarized in Lock et al (1994). In both of these data sets, the geographical survey

coverage was considerably greater in the spring and summer months than in the fall and winter, as the survey program relies heavily on the use of vessels of opportunity rather than dedicated survey vessels.

A diverse assemblage of seabirds can be found in the marine waters off Eastern Newfoundland (Table 3.6), and many of these taxa nest along the coastline of Eastern Newfoundland. Detailed accounts of seabirds of Eastern Newfoundland (including general life history information) can be found in the original EA Report (Section 4.2.2.1) and in the Eastern Newfoundland SEA (Amec 2014), with a brief overview being provided below.

Table 3.6 Overview of Seabirds that are Known or Likely to Occur in the Study Area

Type	Species
Phalacrocoracidae – Cormorants	Great Cormorant (*Phalacrocorax carbo*)
	Double-crested Cormorant (*Phalacrocorax auritus*)
Suliidae – Gannets	Northern Gannet (*Morus bassanus*)
Scolopacidae – Phalaropes	Red Phalarope (*Phalaropus fulicarius*)
	Red-necked Phalarope (*Phalaropus lobatus*)
Laridae – Gulls	Herring Gull (*Larus argentatus*)
	Iceland Gull (*Larus glaucoides*)
	Glaucous Gull (*Larus hyperboreus*)
	Great Black-backed Gull (*Larus marinus*)
	Ring-billed Gull (*Larus delawarensis*)
	Black-headed Gull (*Chroicocephalus ridibundus*)
	Sabine‘s Gull (*Xema sabini*)
	Ivory Gull (*Pagophila eburnea*)
	Black-legged Kittiwake (*Rissa tridactyla*)
Sternidae – Terns	Common Tern (*Sterna hirundo*)
	Arctic Tern (*Sterna paradisaea*)
	Caspian Tern (*Hydroprogne caspia*)
Alcidae – Alcids	Dovekie (*Alle alle*)
	Razorbill (*Alca torda*)
	Common Murre (*Uria aalge*)
	Thick-billed Murre (*Uria lomvia*)
	Atlantic Puffin (*Fratercula arctica*)
	Black Guillemot (*Cepphus grylle*)
Stercorariidae – Jaegers and Skuas	Pomarine Jaeger (*Stercorarius pomarinus*)
	Parasitic Jaeger (*Stercorarius parasiticus*)
	Long-tailed Jaeger (*Stercorarius longicaudus*)
	Great Skua (*Stercorarius skua*)
	South Polar Skua (*Stercorarius maccormicki*)
Procellariidae – Fulmars and Shearwaters	Northern Fulmar (*Fulmarus glacialis*)
	Great Shearwater (*Ardenna gravis*)
	Sooty Shearwater (*Ardenna grisea*)
	Manx Shearwater (*Puffinus puffinus*)
	Cory’s Shearwater (*Calonectris borealis*)
Hydrobatidae – Storm-petrels	Leach’s Storm-petrel (*Oceanodroma leucorhoa*)
	Wilson’s Storm-petrel (*Oceanites oceanicus*)

For the purpose of this EA Update, updated ECSAS data within the Study Area (covering 2006 to 2017) were obtained from CWS (see Appendix A for detailed information and mapping). While these survey data cannot be used to calculate densities as they have not been corrected for detectability (unlike the data in Fifield et al 2009), they provide valuable information on seasonal and spatial trends in abundance for the different seabird groups. Figures A.1 to A.13 in Appendix A were developed for seabird taxa that were commonly observed in the ECSAS surveys to illustrate these survey data for the spring (March to April), summer (May to August), fall (September to October) and winter (November to February) seasons. The seasons as defined here are consistent with those used by Fifield et al (2009) and correspond to seabirds' migratory (spring and fall), breeding (summer for northern hemisphere breeders; winter for southern hemisphere breeders) and non-breeding (winter for northern hemisphere breeders; summer for southern hemisphere breeders) seasons.

Cormorants

Cormorants generally feed within a few kilometers of their colony or roost location and rarely venture far from the coast at any time of year, and so their abundance in the Study Area is low. ECSAS sightings for cormorants off Eastern Newfoundland, including the Study Area, are presented in Figure A.1 (Appendix A). Few of the cormorant sightings were far from shore and all of those were in the winter months, with none within the Study Area. Two sightings were identified as Great Cormorants, and the rest were not identified to species level. CWS records indicate that there are eight known cormorant colonies in Eastern Newfoundland (Table A.1 in Appendix A); cormorants often form mixed colonies (Hatch et al 2000), and species composition of these colonies was not determined.

Gannets

Gannets are most likely to be present in the Study Area from March to November, as the majority of the population overwinters in the Gulf of Maine and further south (Mowbray 2002; Montevecchi et al 2012); however, they have been observed in the waters off Newfoundland at all times of year. ECSAS sightings for Northern Gannets within and near the Study Area are shown in Figure A.2 (Appendix A). CWS survey data for the two colonies of Northern Gannet in Eastern Newfoundland are shown in Table A.2.

Phalaropes

Phalaropes breed in Arctic tundra during the summer months and typically overwinter south of Canada, occurring most frequently in the Study Area during migration. The Red-necked Phalarope has been assessed by COSEWIC as a species of Special Concern. ECSAS sightings for Phalaropes within the Study Area are presented in Figure A.3 (Appendix A); phalarope sightings were infrequent in summer and fall and even rarer in winter, and no sightings were reported in the region during the spring surveys. Although most of the sightings were not identified to species level, of those that were identified, most were Red Phalarope which is known to be the more pelagic of the two species (Tracy et al 2002).

Gulls

Herring, Great Black-backed and Ring-billed Gulls and Black-legged Kittiwakes occur in temperate areas year-round, while Sabine's, Ivory, Iceland and Glaucous Gulls nest in the Arctic and are found in the Study Area only outside the breeding season. Newfoundland supports more than two-thirds of Atlantic Canada's breeding gull population, with Black-legged Kittiwakes accounting for almost half of this number (Cotter et al 2012). Laughing, Black-headed and Lesser Black-backed Gulls may occur

infrequently in the Study Area. The Ivory Gull is listed as Endangered under both NL ESA and SARA. Gulls breeding in the region have suffered population declines due to reduced food availability associated with fisheries collapse and closure of municipal dumps, although recent census data indicates that populations are showing some signs of recovery (Cotter et al 2012). Outside of the breeding season, most gull species are associated with coastal areas, while Sabine's Gull, Ivory Gull and Black-legged Kittiwake are more pelagic.

A tracking study of Black-legged Kittiwakes has shown that the northwest Atlantic, particularly the shelf edge off Newfoundland, is a particularly important wintering area for kittiwakes, with most of the Atlantic population overwintering in this region (Frederiksen et al 2012). ECSAS sightings for Black-legged Kittiwakes and Large Gulls (i.e., all other gull species) within the Study Area are presented in Appendix A in Figures A.4 and A.5, respectively. As illustrated, gulls and kittiwakes were both commonly observed in the area year-round. Most of the large gulls identified to species level were Great Black-backed Gull, Herring Gull, and in the winter months, Iceland Gull and Glaucous Gull. No endangered Ivory Gulls were identified in the ECSAS surveys within the Study Area. CWS records of gull colonies in Eastern Newfoundland are shown in Table A.3 (Appendix A), and the colony locations are shown in the associated Figure. Herring Gull, Great Black-backed Gull and Black-legged Kittiwake colonies are abundant and widespread along the coast, while Ring-billed Gull colonies are fewer in number.

Terns

All three species of terns found in the Study Area are migratory, and are present only during the breeding season. Terns are typically found in coastal environments and seldom seen far from shore, except for Arctic Terns which tend to be highly pelagic during migration (Cuthbert and Wires 1999; Hatch 2002; Nisbet 2002). ECSAS sightings for terns within and near the Study Area are presented in Figure A.6 (Appendix A). They were infrequently observed in the spring and summer, and essentially absent in the fall and winter. While most tern sightings could not be identified to species level, both Common and Arctic Terns have been observed in the waters of Eastern Newfoundland. CWS records for tern colonies in Eastern Newfoundland are provided in Table A.4 in Appendix A; species composition of the colonies was not reported.

Alcids

Five of the six alcid species found in the Study Area breed in Eastern Newfoundland, while the Dovekie is a largely arctic-nesting species. Among seabirds, murres and Dovekies spend a particularly large proportion of their time on the water relative to more aerial species (Wiese and Ryan 2003; Wilhelm et al 2007; Fifield et al 2009) and congregate over relatively small, productive areas such as around the Grand Banks (Gaston et al 2011; Hedd et al 2011; Montevecchi et al 2012). The core winter distribution of the world's Dovekie population lies within the waters off Eastern Newfoundland (Fort et al 2013). Most of the Eastern Canadian population of Common Murres and over a third of the region's Thick-billed Murres also congregate in this region in the winter months (McFarlane Tranquilla et al 2013). Alcids are rendered flightless for several weeks each year during the fall moulting period (Gaston and Hipfner 2000; Ainley et al 2002; Lavers et al 2009; Montevecchi and Stenhouse 2002). Atlantic Puffins tend to disperse widely and well offshore in the winter months (Fifield et al 2009), while Razorbills are believed to concentrate in the Bay of Fundy in winter (Huettman et al 2005), and Black Guillemots tend to be associated with coastal environments year-round (Butler and Buckley 2002).

ECSAS sightings for alcids within and near the Study Area are presented in Appendix A, Figure A.7 (Dovekies), Figure A.8 (Murres) and Figure A.9 (Other alcids, i.e. Razorbills, Black Guillemots and Atlantic Puffins). All six species have been reported in ECSAS surveys year-round, although Black Guillemots are relatively infrequently observed in the Study Area. The eastern coast of Newfoundland supports numerous alcid colonies, the largest at Funk Island, Baccalieu Island, the Witless Bay islands and Cape St. Mary's; CWS records for alcid colonies in eastern Newfoundland are provided in Table A.5 (Appendix A).

Jaegers and Skuas

Jaegers and skuas do not breed in Newfoundland and Labrador; however, non-breeding individuals are found offshore year-round. In the winter months, the waters off Eastern Canada support a large proportion of the Icelandic population of Great Skuas (Magnusdottir et al 2012). ECSAS sightings for jaegers and skuas within and near the Study Area are presented in Figure A.10 (Appendix A). While most sightings could not be identified to species level, all five have been observed in the waters of Eastern Newfoundland. Great Skuas were much more numerous than South Polar Skuas, and Pomarine Jaegers were identified more often than Parasitic or Long-tailed Jaegers.

Fulmars and Shearwaters

Outside the breeding season, fulmars and shearwaters are highly pelagic and spend most of their time in the air, at or near the water's surface. The Northern Fulmar is common year-round in the offshore waters of Eastern Newfoundland, while shearwaters are most common in offshore Newfoundland in the summer and fall months, particularly on the east and northeast Grand Banks (Fifield et al 2009). Most of the world's population of Great Shearwaters is found in the northwest Atlantic in the summer months, outside of their austral breeding season (Brown 1986). ECSAS sightings for fulmars and shearwaters within and near the Study Area are presented in Figures A.11 and A.12, respectively, in Appendix A. Of the shearwaters that could be identified in the surveys, Great Shearwater was the most commonly identified species in the Study Area, followed by Sooty, Manx and Cory's. Northern Fulmar and Manx Shearwater nest in Newfoundland (Lee and Haney 1996; Mallory et al 2012), while the other three species of shearwater (Great, Sooty and Cory's) do not. CWS records for Northern Fulmar colonies in eastern Newfoundland are provided in Table A.6 in Appendix A; the Manx Shearwater is known to nest in one small colony at Middle Lawn Island, off the Burin Peninsula, the only known regular nesting site for the species in North America (Lee and Haney 1996).

Storm-petrels

Storm-petrels are highly pelagic, often following ships and fishing boats, and are attracted to artificial light sources (Huntington et al 1996). The Leach's Storm-petrel is the most abundant breeding seabird in Newfoundland, while the Wilson's Storm-petrel is an Antarctic breeder and uncommon visitor in the northwest Atlantic. The largest Leach's Storm-petrel colony in the world, Baccalieu Island, supports approximately one third of the species' population (Huntington et al 1996; Barrett et al 2006; CWS 2017). ECSAS sightings for storm-petrels within the Study Area are presented in Figure A.13 (Appendix A); they are commonly observed in the summer months and regularly seen in the spring and fall, but are uncommon in winter. CWS records for Leach's Storm-petrel colonies in Eastern Newfoundland are provided in Table A.7 (Appendix A).

3.2.1.2 Waterfowl

Waterfowl and divers (loons and grebes) spend much of their time on the water's surface. Waterfowl occur in large numbers in marine habitats off Eastern Newfoundland, especially during the winter months; however, they tend to prefer more coastal habitats and are unlikely to occur frequently in the Study Area. More than 30 species of waterfowl and divers occur in the province during at least part of the year (Table 3.7), including two species of conservation concern, the Barrow's Goldeneye and Harlequin Duck.

Broadly, waterfowl may be categorized as geese and ducks; the latter includes dabbling ducks (primarily inland breeders), diving ducks, and sea ducks; most species of sea ducks spend much of the year at sea (generally close to shore). Although loons and grebes are not closely related to waterfowl, they are behaviourally and functionally similar, and have therefore been combined in this section.

Table 3.7 Overview of Waterfowl that are Known or Likely to Occur in the Study Area

Type	Species
Anserinae – Geese	Canada Goose (*Branta canadensis*)
Anatinae – Dabbling Ducks	Wood Duck (*Aix sponsa*)
	Gadwall (*Anas strepera*)
	Eurasian Wigeon (*Anas penelope*)
	American Wigeon (*Anas americana*)
	American Black Duck (*Anas rubripes*)
	Mallard (*Anas platyrhynchos*)
	Blue-winged Teal (*Anas discors*)
	Northern Shoveler (*Anas clypeata*)
	Northern Pintail (*Anas acuta*)
	Green-winged Teal (*Anas crecca*)
Aythyinae – Diving Ducks	Ring-necked Duck (*Aythya collaris*)
	Tufted Duck (*Aythya fuligula*)
	Greater Scaup (*Aythya marila*)
	Lesser Scaup (*Aythya affinis*)
Merginae – Sea Ducks	King Eider (*Somateria spectabilis*)
	Common Eider (*Somateria mollissima*)
	Harlequin Duck (Eastern pop.) (*Histrionicus histrionicus*)
	Surf Scoter (*Melanitta perspicillata*)
	White-winged Scoter (*Melanitta fusca*)
	Black Scoter (*Melanitta americana*)
	Long-tailed Duck (*Clangula hyemalis*)
	Bufflehead (*Bucephala albeola*)
	Common Goldeneye (*Bucephala clangula*)
	Barrow's Goldeneye (Eastern pop.) (*Bucephala islandica*)
	Hooded Merganser (*Lophodytes cucullatus*)
	Common Merganser (*Mergus merganser*)
	Red-breasted Merganser (*Mergus serrator*)

Type	Species
Gaviidae – Loons	Red-throated Loon (*Gavia stellata*)
	Common Loon (*Gavia immer*)
Podicipedidae – Grebes	Pied-billed Grebe (*Podilymbus podiceps*)
	Red-necked Grebe (*Podiceps grisegena*)

The most abundant species of waterfowl in coastal Newfoundland waters at all times of year is the Common Eider, which breeds in several small colonies along the coast (Locke et al 1994). Common Eiders and other sea ducks such as scoters and Long-tailed Ducks occur in large flocks (“rafts”) off the coast from autumn to spring. Large wintering congregations occur at Witless Bay IBA, between the Cape Freels coastline and nearby Wadham Islands, Grates Point, Cape St. Francis, Mistaken Point, Cape St. Mary’s and Placentia Bay (Bird Studies Canada 2017). Small numbers of Barrow’s Goldeneye have been reported wintering in eastern Newfoundland at Port Blandford and Newman Sound in Terra Nova National Park, as well as Traytown Bay, St. Mary’s Bay, and Spaniard’s Bay (Schmelzer 2006).

ECSAS sightings of waterfowl and divers were scarce within and near the Study Area (Figure A.14 in Appendix A). The most frequently observed species was Common Eider, followed by Long-tailed Duck; loons (Common and Red-throated), scoters (White-winged, Surf and Black) and a handful of other duck species were infrequently observed.

3.2.1.3 Shorebirds

Marine shoreline habitats such as sandy mudflats and coastal barrens are utilized by foraging shorebirds during migration. However, due to the great distance of the Study Area from the coastline, it is unlikely that shorebirds will occur there with any regularity (other than phalaropes, which are taxonomically shorebirds but due to their pelagic habitat preferences have been discussed along with the seabirds in this report). Due to their preference for coastal habitats, shorebirds are very infrequent visitors in the Study Area, primarily in the fall months during migration. More than 25 species of shorebirds occur in the province for at least part of the year (Table 3.8). Least Sandpiper, Spotted Sandpiper, Greater Yellowlegs, Piping Plover, Semipalmated Plover and Killdeer nest in Newfoundland, while others are present only during migration (Warkentin and Newton 2009).

On the eastern coast of Newfoundland, shorebirds are most abundant during their fall migration, when many species move southward from their Arctic breeding grounds. Atlantic Canada Shorebird Survey data show that the eastern coast of the Avalon Peninsula has several important migration stopovers (e.g., Witless Bay, Renews, Long Beach, St. Shotts, Spaniard’s Bay, Bellevue Beach, etc.); other major stopovers in eastern Newfoundland include Big Barasway, Grand Bay West to Cheeseman Provincial Park, Codroy Valley Estuary, Cape Freels and Cape Bonavista (Environment Canada 2009; Bird Studies Canada 2017). In the winter months, generally from November to April, Purple Sandpipers are present along rocky shorelines and offshore ledges and islands of southern and eastern Newfoundland, including at Cape Spear, Witless Bay, Ferryland, Cape St. Francis and Mistaken Point in Eastern Newfoundland (Environment Canada 2009; Bird Studies Canada 2017). At Mistaken Point, far north of the rest of the species’ usual wintering range, a small number of Ruddy Turnstones regularly overwinters (Bird Studies Canada 2017).

Table 3.8 Overview of Shorebirds that are Known or Likely to Occur in the Study Area

Type	Species
Charadriidae – Plovers	Black-bellied Plover (*Pluvialis squatarola*)
	American Golden-plover (*Pluvialis dominica*)
	Semipalmated Plover (*Charadrius semipalmatus*)
	Piping Plover (melodus ssp.) (*Charadrius melodus*)
	Killdeer (*Charadrius vociferus*)
Scolopacidae – Sandpipers	Spotted Sandpiper (*Actitis macularius*)
	Solitary Sandpiper (*Tringa solitaria*)
	Greater Yellowlegs (*Tringa melanoleuca*)
	Willet (*Tringa semipalmata*)
	Lesser Yellowlegs (*Tringa flavipes*)
	Whimbrel (*Numenius phaeopus*)
	Hudsonian Godwit (*Limosa haemastica*)
	Ruddy Turnstone (*Arenaria interpres*)
	Red Knot (rufa ssp.) (*Calidris canutus*)
	Sanderling (*Calidris alba*)
	Semipalmated Sandpiper (*Calidris pusilla*)
	Least Sandpiper (*Calidris minutilla*)
	White-rumped Sandpiper (*Calidris fuscicollis*)
	Baird's Sandpiper (*Calidris bairdii*)
	Pectoral Sandpiper (*Calidris melanotos*)
	Purple Sandpiper (*Calidris maritima*)
	Dunlin (*Calidris alpina*)
	Stilt Sandpiper (*Calidris himantopus*)
	Buff-breasted Sandpiper (*Calidris subruficollis*)
	Short-billed Dowitcher (*Limnodromus griseus*)
	Wilson's Snipe (*Gallinago delicata*)
	American Woodcock (*Scolopax minor*)

3.2.1.4 Other Marine-Associated Avifauna

Many passerines, raptors and other landbirds breed in Newfoundland. Although most do not regularly occur in the marine environment, some species of landbirds are associated with coastal habitats including the Bank Swallow (*Riparia riparia*), Savannah Sparrow (*Passerculus sandwichensis*) and Short-eared Owl (*Asio flammeus*), which typically nest along the coast, as well as some raptor species such as the Peregrine Falcon (*Falco peregrinus*) that prey upon concentrations of shorebirds during migration. Further, many landbirds fly long distances over water during migration, and nocturnal migrants (including most passerines) may be attracted to artificial light sources at sea, particularly in foggy conditions during the late summer to fall months (July to early November). Landbirds are considered to be very infrequent visitors in the Study Area.

3.2.1.5 Species at Risk

Very few avian species at risk or species of conservation concern are likely to occur in the Study Area. The Ivory Gull is found almost exclusively in marine environments, and although its breeding distribution (and critical habitat) is in the Arctic, it regularly occurs in small numbers in the waters off Eastern Newfoundland, typically around pack ice. Two waterfowl species at risk, the Barrow’s Goldeneye and

Harlequin Duck, both occur in the marine environment, particularly outside of the breeding season. Like other waterfowl species, they prefer coastal areas and so are considered unlikely to occur in the Study Area. Red-necked Phalaropes, assessed by COSEWIC as a species of conservation concern, were seen in small numbers during ECSAS surveys in offshore waters from April to December. Other avian SAR that occur in Newfoundland are shorebirds and landbirds, and are unlikely to be found in the Study Area except on a transient basis during the fall months.

Species of conservation concern in Newfoundland and Labrador that do not inhabit coastal or offshore environments, or that only migrate over the ocean in the daytime, are not assessed further in this section. These include the Red Crossbill (*percna* subspecies), which is a non-migratory forest dweller (Environment Canada 2006); and three diurnally migrating landbirds, the Rusty Blackbird (Avery 2013), Chimney Swift (Steeves et al 2014) and Barn Swallow (Brown and Brown 1999).

An updated summary of avian species that occur in the province, including information on their habitat preferences and potential to occur in the Study Area, is provided in Table 3.9. Since the EA Report was completed and submitted there have been changes in species designations for several species, as follows (see shaded rows in Table 3.9).

Table 3.9 Avian Species at Risk and their Likelihood of Occurrence in the Study Area

Species	Provincial Status	Federal Status		Habitat and Distribution in Newfoundland	Potential Presence in Study Area
		SARA Schedule 1 Listing	COSEWIC Assessment		
Barrow's Goldeneye (Eastern pop.)	Vulnerable	Special Concern	Special Concern	• May breed in Newfoundland. Moults and winters in small numbers off the coast of Eastern Canada, often in groups with Common Goldeneye. Small numbers have been reported wintering at Port Blandford and Newman Sound in Terra Nova National Park, as well as Traytown Bay, St. Mary's Bay, and Spaniard's Bay (Schmelzer 2006). • Known to congregate in relatively small geographic areas in important shipping corridors, therefore considered to be particularly vulnerable to being affected by accidental spills (Schmelzer 2006).	Unlikely, due to their affinity for coastal habitats.
Harlequin Duck (Eastern pop.)	Vulnerable	Special Concern	Special Concern	• Breeds in fast-flowing streams, and congregate in moulting sites in the late summer to fall. May breed in Bay du Nord River in	Unlikely, due to their affinity for coastal habitats.

Species	Provincial Status	Federal Status		Habitat and Distribution in Newfoundland	Potential Presence in Study Area
		SARA Schedule 1 Listing	COSEWIC Assessment		
				southeastern Newfoundland (Bird Studies Canada 2017). • Found in coastal marine environments throughout fall and winter along rocky coastlines, subtidal ledges, and exposed headlands. Non-breeding individuals may be found year round at Cape St. Mary's, one of few known moulting sites in the province (Bird Studies Canada 2017; NLDEC 2017).	
Ivory Gull	Endangered	Endangered	Endangered	• Breeds in the far north and winters offshore. • Spend almost all of their time in the marine environment, including within the Study Area. • Present in small numbers in the waters off Eastern Newfoundland, usually among pack ice. • Rarely seen on the coast of the Northern Peninsula and ashore (Stenhouse 2004; NLDEC 2017).	Potentially present. Because they are typically found among pack ice, interactions with Project activities are unlikely.
Piping Plover (*Melodus* ssp.)	Endangered	Endangered	Endangered	• During the nesting season, found on sandy beaches along the coast. • In Newfoundland, breeding population is concentrated in the southwest and western portions of the Island (NLDEC 2017); major breeding areas include Grand Bay West to Cheeseman Provincial Park and Big Barasway, and nesting has also been observed in Codroy Valley Estuary (Bird Studies Canada 2017). Has been reported at Deadman's Bay near the Cape Freels Coastline IBA in northeastern Newfoundland.	Unlikely, due to their affinity for coastal habitats.

Species	Provincial Status	Federal Status		Habitat and Distribution in Newfoundland	Potential Presence in Study Area
		SARA Schedule 1 Listing	COSEWIC Assessment		
				• Unlikely to be affected by typical project activities, although accidental spills near breeding habitat could potentially be harmful.	
Red Knot (*Rufa* ssp.)	Endangered	Endangered	Endangered	• Found on open sandy inlets, coastal mudflats, sand flats, salt marshes, sandy estuaries and areas with rotting kelp deposits during fall migration, from August 1st to October 30th (Garland and Thomas 2009; NLDEC 2017). • Sightings have been reported around almost the entire coast of Newfoundland, mostly on the west coast (Baker et al 2013). • In Atlantic Canada Shorebird Survey, they are considered regular or occasional species during fall migration at Bellevue Beach, Cape Freels, and around the Codroy Valley Estuary, and they are rare visitors at other survey sites (Environment Canada 2009).	Unlikely, due to their affinity for coastal habitats.
Buff-breasted Sandpiper	none	none	Special Concern	• Arctic breeders; during fall migration, considered to be a rare migrant in the province (COSEWIC 2012a). • Occasionally observed in Atlantic Canada Shorebird Surveys at St. Shott's Sod Farm near the southern shore of the Avalon Peninsula and at Cape Bonavista. Reported in small numbers at other survey sites (Environment Canada 2009).	Unlikely, due to their affinity for coastal habitats.
Red-necked Phalarope	none	none	Special Concern	• Outside the breeding season, found in coastal marine environment (Rubega et al 2000). • Surface feeders, often congregating in areas such as	Potentially present. Seen in small numbers during ECSAS surveys within

Species	Provincial Status	Federal Status		Habitat and Distribution in Newfoundland	Potential Presence in Study Area
		SARA Schedule 1 Listing	COSEWIC Assessment		
				upwellings with higher prey densities. • In the Atlantic Canada Shorebird Survey, considered rare visitors at Cape Spear and at Bonavista/ Cape Bonavista (Environment Canada 2009).	the Study Area, although scarce in the winter and spring (CWS 2017).
Peregrine Falcon	Vulnerable	Special Concern	Not At Risk	• Migrates along the coast of Newfoundland during the fall (particularly the west coast), preying on concentrations of migrating shorebirds. • Peregrine Falcon sightings have been reported in the fall near Port-aux-Basques, St. Pierre et Miquelon, and on the Bonavista Peninsula, and year-round (most frequently during the fall) on the Avalon Peninsula (White et al 2002).	Unlikely to occur regularly in the Study Area. May be an occasional vagrant during fall migration.
Common Nighthawk	Threatened	Threatened	Threatened	• Nests in open areas (e.g. coastal sand dunes and beaches, logged or slashburned areas of forest sites, woodland clearings, grassland habitat, farm fields, open forests, rock outcrops, and flat gravel rooftops). • Does not breed in insular Newfoundland (Brigham et al 2011), but migrates through province.	Unlikely to occur regularly in the Study Area. May be an occasional vagrant during fall migration.
Bank Swallow	none	Threatened	Threatened	• Bank Swallows are colonial, often nesting in sandy banks created through coastal erosion; therefore, potentially in close proximity to the marine environment during the breeding season. • Diurnal migrants (Garrison 1999). • Within the province, breeds primarily in southwestern Newfoundland (Warkentin and Newton 2009); however,	Unlikely, due to their affinity for coastal habitats. As diurnal migrants, they are less susceptible to disorientation from offshore artificial light sources.

Species	Provincial Status	Federal Status		Habitat and Distribution in Newfoundland	Potential Presence in Study Area
		SARA Schedule 1 Listing	COSEWIC Assessment		
				sightings have also been reported in eastern Newfoundland (Garrison 1999).	
Gray-cheeked Thrush (*minimus* ssp.)	Threatened	none	Candidate Species (low priority)	• Nests in dense coniferous forest habitat throughout insular Newfoundland and overwinters in South America, migrating nocturnally (Lowther et al 2001). • Most common on the Northern Peninsula and along the northeast coast, as well as the northern Avalon Peninsula (Endangered Species and Biodiversity Section 2010). • Has also been reported in Placentia Bay (Endangered Species and Biodiversity Section 2010) and breeds in Terra Nova National Park (Bird Studies Canada 2017). • An inland species, therefore unlikely to be affected by offshore activities at most times of year.	Unlikely to occur regularly in the Study Area. May be an occasional vagrant during fall migration.
Olive-sided Flycatcher	Threatened	Threatened	Threatened	• Found in boreal forest habitat, particularly open areas such as wetlands with tall trees and snags. • Migrates to south and central America to overwinter (Altman and Sallabanks 2012). • Breeds throughout insular Newfoundland and Southern Labrador (COSEWIC 2007), and in Eastern Newfoundland it has been reported at several locations on the Avalon Peninsula as well as at Terra Nova National Park (Altman and Sallabanks 2012).	Unlikely to occur regularly in the Study Area. May be an occasional vagrant during fall migration.

Species	Provincial Status	Federal Status		Habitat and Distribution in Newfoundland	Potential Presence in Study Area
		SARA Schedule 1 Listing	COSEWIC Assessment		
Bobolink	Vulnerable	Threatened	Threatened	• Nests in agricultural and natural grasslands, and migrates to South America in the fall (Renfrew et al 2015). • Breeding has been reported at Codroy Valley (Bird Studies Canada 2017), and there have been sightings on the Avalon Peninsula and Terra Nova National Park (Renfrew et al 2015).	Unlikely to occur regularly in the Study Area. May be an occasional vagrant during fall migration.
Short-eared Owl	Vulnerable	Special Concern	Special Concern	• Typically nests in coastal barrens and grasslands (Wiggins et al 2006), and suitable habitat occurs in much of coastal Newfoundland. • Sightings have been reported throughout the eastern portion of the Island from Wadham Islands to the Avalon and Burin Peninsulas, and near Port-aux-Basques and Codroy Valley in southwestern Newfoundland, mostly in the summer months (Schmelzer 2005; Wiggins et al 2006).	Unlikely, due to their affinity for coastal habitats.

3.2.1.6 Key Times for Marine and Migratory Birds in the Study Area

Although seabirds utilize the Study Area throughout the year, the abundance, distribution and species composition vary considerably. Some taxa (such as large gulls and kittiwakes, many alcid species, fulmars and shearwaters) are abundant year-round, while other groups are absent or scarce during part of the year. Areas of importance for marine and migratory birds include designated key habitats and breeding colonies; these are found in coastal areas and inland, far from the Study Area, although birds that use these areas may forage in the Project Area.

Figure 3.5 illustrates the overall seasonal presence of marine-associated bird species in the Study Area. In the summer months, the greatest abundance of seabird species in Newfoundland is concentrated around nesting colonies (Fifield et al 2009). However, seabirds are relatively long-lived and in many species, individuals do not breed until four or five years of age; therefore, even during the breeding season large numbers of non-breeding birds may be found far offshore. Some Southern Hemisphere-

breeding species spend the summer months (austral non-breeding season) in the northwest Atlantic, including most of the world's Great Shearwaters (Brown 1986).

The fall months are a sensitive time for Leach's Storm-petrels and migrating landbirds (particularly passerines, which tend to be nocturnal migrants), as these species are vulnerable to disorientation from artificial light sources. The Leach's Storm-petrel is the species most frequently found stranded on platforms and vessels in and near the Study Area (Ellis et al 2013; Environment Canada 2015), with the vast majority of strandings occurring in September and October, following the departure of fledglings from nearby breeding colonies (Huntington et al 1996). At all times of year, but especially outside the breeding season, alcids are considered particularly vulnerable to the potential effects of marine pollution because they spend a large proportion of their time on the water relative to more aerial species (Fifield et al 2009) and congregate over relatively small, productive areas such as around the Grand Banks (Gaston et al 2011; Hedd et al 2011; Montevecchi et al 2012; Fort et al 2013; McFarlane Tranquilla et al 2013). Alcid vulnerability in the region is at its highest during the post-breeding season moulting period (Gaston and Hipfner 2000; Ainley et al 2002; Montevecchi and Stenhouse 2002; Lavers et al 2009).

Certain groups such as gannets, terns, cormorants and phalaropes, are most common during the breeding season and are absent or scarce in the winter months. Waterfowl (including Harlequin Duck and Barrow's Goldeneye) and Arctic-nesting species such as Ivory Gulls are most abundant outside of the breeding season, and so the greatest potential for presence in the Study Area is in the winter months.

During the winter months, tens of millions of Dovekies travel several thousand kilometers from their breeding grounds to their core winter distribution within the highly productive waters off eastern Newfoundland (Fort et al 2012, 2013). In the winter months, the waters off eastern Canada support a large proportion of the Icelandic population of Great Skuas (Magnusdottir et al 2012). A tracking study of Black-legged Kittiwakes has shown that the northwest Atlantic, particularly the shelf edge off Newfoundland, is a particularly important wintering area for kittiwakes, with most of the Atlantic population overwintering in this region (Frederiksen et al 2012). Most of Eastern Canada's population of Common Murres and approximately a third of the region's Thick-billed Murres overwinter in the waters off Eastern Newfoundland (McFarlane Tranquilla et al 2013).

3.2.2 Environmental Effects Assessment

As illustrated previously in Section 2.2, the 2018 survey activities that will be undertaken as part of the Project are in keeping with the nature and scope of those described and assessed in the original EA., and will occur within the previously defined and considered Project Area and surrounding EA Study Area. The survey area for the planned 2018 activities (within ELs 1134 and 1135) are located several hundred kilometers from shore, beyond Canada's 200 nautical mile EEZ.

The updated avifauna presence and distribution information summarized above and presented in detail in Appendix A indicates that although a number of taxa have been observed to occur in this particular part of the Study Area at least seasonally, the planned 2018 survey area is again not known or likely to be used by different species or to contain particularly important or sensitive habitats that were not considered and addressed in the original EA. Many seabird groups such as cormorants and terns tend to have a more coastal distribution, and are therefore rarely observed this far offshore. Waterfowl occur in large numbers in marine habitats off Eastern Newfoundland, especially during the winter months, but

they prefer open water in coastal areas and are thus not likely to frequent this portion of the Study Area. Due to the great distance between this area and the eastern coastline of the Island of Newfoundland, this area is also unlikely to be utilized by most shorebirds or by migrating landbirds. Also, identified special and sensitive areas such as Important Bird Areas (IBAs) and breeding colonies are found in coastal areas and inland, far from the offshore environment that will be the subject of the planned 2018 Project activities. All of the mitigation measures and commitments outlined in the EA Report and described further in the EA Addendum and Amendment remain applicable, and will continue to be implemented and adhered to by ExxonMobil in planning and implementing this Project.

The nature and scale of the planned 2018 activities and the updated baseline information provided above therefore do not change the results of the original (2015) environmental effects assessment for this VEC, and the Project is still not likely to result in significant adverse environmental effects on marine / migratory birds.

Figure 3.5 General Summary of the Seasonal Presence of Marine-associated Birds in the Study Area

