Tilt Cove Exploration Drilling Project

Chapter 12: Special Areas

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12.0 ASSESSMENT OF POTENTIAL EFFECTS ON SPECIAL AREAS

12.1 Scope of Assessment

The Special Areas VC addresses potential effects upon areas of the marine environment that have been identified due to biological and ecological importance or sensitivity. These areas may be identified and/or protected by legislation or other applicable processes by international, Canadian, and Newfoundland and Labrador agencies. Special areas have been selected as a VC due to these designations, their presence within and near the Project Area, and concerns regarding Project activities that may potentially affect these areas. This Chapter focusses on special areas in the LAA, which encompasses the zone of influence for routine Project activities including supply and servicing traffic. Information on special areas within the RAA is presented and illustrated in Section 6.4. The effects of potential accidental events on special areas are described in Section 15.5.4.

As stated above, special areas have been identified and/or protected based on their ecological and biological features including marine species and their habitats. Thus, the effects assessment for special areas is closely linked to the assessment of effects upon marine fish and fish habitat (Chapter 9), marine and migratory birds (Chapter 10) and marine mammals and sea turtles (Chapter 11). These sections are cross-referenced throughout the effects assessment of special areas as relevant. The marine biological VCs also address effects upon species of conservation concern that may also be inherent to special areas in the LAA. Chapters 9 (Marine Fish and Fish Habitat) and 11 (Marine Mammals and Sea Turtles) includes any identified critical habitat for sensitive species.

12.1.1 Regulatory and Policy Setting

IAAC (the CEA Agency) released *Guidelines for the Preparation of an Environmental Impact Statement* under the *Canadian Environmental Assessment Act, 2012* for the Tilt Cove Exploration Drilling Project issued on June 28, 2019 (Appendix A); Sections 7.1.9.1, 7.3.8.3 and 7.6.3 provide guidance on the assessment of environmental effects on special areas. The Guidelines indicate that the effects assessment is to describe special areas at the Project site and within areas that could be affected by routine Project operations. The EIS should include distances between the edge of the Project Area and special areas and describe cumulative effects and the effects of accidental events.

The governments of Canada and NL have enacted various legislation to protect special areas within their respective jurisdictions. Table 12.1 provides a summary of legislation applicable to special areas in the RAA. Relevant special areas are described in Section 6.4. The effects assessment for routine Project activities will focus on those special areas in the LAA.

Table 12.1 Federal and Provincial Legislation to Establish Canadian Protected Areas

Legislation / Regulation	Type of Special Area	Department / Agency
Federal Legislation		
Oceans Act, 1996, c.31	Marine Protected Areas	DFO
Fisheries Act, 1985, c.43	Fisheries Closure Areas, Marine Refuges	DFO
Canada Wildlife Act, R.S., 1985, c. W-9	Migratory Bird Sanctuaries	ECCC
Canada National Marine Conservation Areas Act, 2002, c. 18	National Marine Conservation Areas	Parks Canada
Canada National Parks Act, 2000, c.32	National Parks	Parks Canada
Canada Wildlife Act, R.S., 1985, c. W-9	National Wildlife Areas	ECCC
SARA	Protected critical habitat	DFO, Parks Canada, and ECCC
Provincial Legislation		
Provincial Parks Act (1970)	Provincial Parks	Parks Division, NL Department of Tourism, Culture, Arts and Recreation
Wilderness and Ecological Reserves Act (1980)	Ecological Reserves	NL Department of Environment and Climate Change

12.1.2 The Influence of Consultation and Engagement on the Assessment

Suncor has engaged with government regulators, stakeholder organizations and Indigenous groups (see Chapter 3 for detailed descriptions of these activities and outcomes). To date, no issues were raised regarding special areas.

12.1.3 Potential Effects, Pathways and Measurable Parameters

Section 7.3.8.3 of the Guidelines indicates that the EIS is to discuss potential effects on special areas including “use of dispersants; change to habitat quality (e.g., noise, light, water, sediment quality); and change to the environmental features that define the special area (e.g., physical features, species assemblages, species abundance)”. Use of dispersants is described in Chapter 16, Accidental Events. Potential effects on ecological and biological features that define special areas are addressed in Chapters 8, 9, and 10 and referenced in this Chapter as relevant to special areas in the LAA. The assessment of routine Project-related effects on special areas is focused on change in habitat quality. The effects pathways and measurable parameters are provided in Table 12.2.

Table 12.2 Potential Effects, Pathways and Measurable Parameters for Special Areas

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in Habitat Quality	• Interactions between the extent, duration, or timing of Project activities that could result in direct loss or alteration of habitat • Change in use of special areas due to physical disturbance, destruction of benthic habitats or deposition of cuttings/drill muds • Increase of underwater sound at levels capable of causing behavioural disturbance for species that use special areas	• Area of habitat affected (m^2) • Change in chemical composition of sediment and water (unit depends on the contaminant) • Sound level (dB) and extent (km from sound source) of underwater sound affecting marine fish, marine mammals, and/or sea turtles

12.1.4 Boundaries

The spatial and temporal boundaries for the assessment of effects on a change in habitat quality in special areas are presented in the following sections.

12.1.4.1 Spatial Boundaries

Project Area: The Project Area (Figure 12-1) encompasses the immediate area in which Project activities may occur. Well locations have not been identified but will occur within the Project Area. The Project Area includes EL 1161 and an approximate 40-km wide buffer around the EL to account for the potential effects of sound on special areas.

Local Assessment Area: The LAA (Figure 12-1) encompasses the Project's zones of influence and includes the maximum area where environmental effects from routine Project activities and components can be predicted or measured with a reasonable degree of accuracy and confidence. It consists of the Project Area and adjacent areas within an approximate 40-km buffer where Project-related environmental effects are reasonably expected to occur based on available information, including effects thresholds, predictive modelling, and professional judgement. The LAA also includes transit routes to and from the Project Area with a 10-km buffer.

Regional Assessment Area: The RAA (Figure 12-1) is the area within which residual environmental effects from operational activities may interact with special areas including accidental events, which are assessed in Section 16.5.5.4. The RAA also encompasses the area of residual environmental effects from routine activities that could interact cumulatively with the residual environmental effects of other past, present, and future (certain or reasonably foreseeable) physical activities.

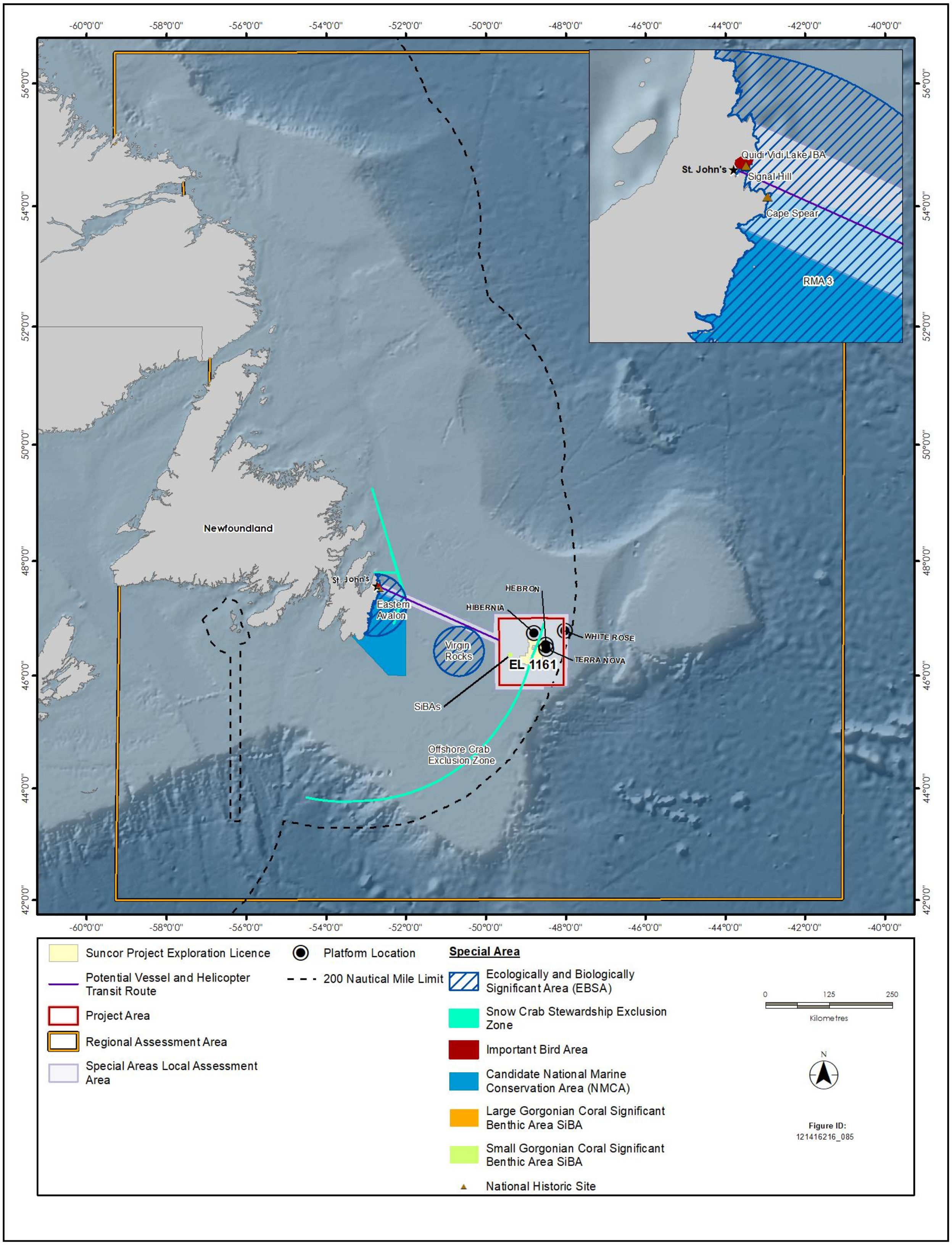

Figure 12-1 Special Areas in the LAA

12.1.4.2 Temporal Boundaries

The temporal boundaries for the assessment of potential Project-related environmental effects on special areas encompass all Project phases, including drilling, well decommissioning, suspension and abandonment, and supply and servicing. For this exploration campaign, Suncor is proposing to drill up to 12 to 16 wells on EL 1161 over the term of the Project with an initial well starting as early as Q2 2024, pending regulatory approvals. The drilling of each well is expected to take up to 120 days and drilling activities may occur year-round. The temporal scope of the Project extends to end of 2029 to cover off activities that could carry over following the last year of the EL. While drilling activities may occur at any time of the year, well-drilling is typically conducted during ice-free months.

Depending on the special area, it may provide important marine habitat at any time of the year or year-round. Some special areas are more sensitive during seasonal activities such as feeding, mating, breeding, migrating or overwintering. Refer to Section 6.4 for detailed information on special areas and the species that access these habitats.

12.1.5 Residual Environmental Effects Characterization

Environmental effects descriptors are outlined in Table 12.3. These descriptors will be used to characterize residual environmental effects on special areas.

Table 12.3 Characterization of Residual Effects on Special Areas

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual environmental effect relative to baseline	**Positive** – a residual environmental effect that moves measurable parameters in a direction beneficial to special areas relative to baseline **Adverse** – a residual environmental effect that moves measurable parameters in a direction detrimental to special areas relative to baseline **Neutral** – no net change in measurable parameters for special areas relative to baseline
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible** – no measurable change **Low** – a detectable change but within the range of natural variability **Moderate** – a detectable change beyond the range of natural variability, but with no associated adverse effect on the viability of the affected population **High** – A detectable change that is beyond the range of natural variability, with an adverse effect on the viability of the affected population
Geographic Extent	The geographic area in which a residual effect occurs	**Project Area –** residual environmental effects are restricted to the Project Area **LAA –** residual environmental effects extend into the LAA **RAA –** residual environmental effects extend into the RAA

Table 12.3 Characterization of Residual Effects on Special Areas

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Frequency	Identifies how often the residual effect occurs and how often during the Project	**Unlikely event** – effect is unlikely to occur **Single event** – effect occurs once **Multiple irregular event** – effect occurs at no set schedule **Multiple regular event** – effect occurs at regular intervals **Continuous** – effect occurs continuously
Duration	The period required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short term** - for duration of the activity, or for duration of accidental event **Medium term** - beyond duration of activity up to end of Project, or for duration of threshold exceedance of accidental event – weeks or months **Long term** - beyond Project duration of activity, or beyond the duration of threshold exceedance for accidental events - years **Permanent** - recovery to baseline conditions unlikely
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** will recover to baseline conditions before or after Project completion **Irreversible –** permanent
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Undisturbed** – The VC is relatively undisturbed in the LAA, not adversely affected by human activity, or is likely able to assimilate the additional change **Disturbed** – The VC has been substantially previously disturbed by human development or human development is still present in the LAA, or the VC is likely not able to assimilate the additional change

12.1.6 Significance Definition

A threshold has been established to define a significant adverse residual environmental effect on special areas. For the purposes of this effects assessment, the threshold for a significant adverse residual effect on special areas is defined as a Project-related environmental effect that:

- Alters the valued habitat physically, chemically or biologically, in quality or extent, resulting in a decline in abundance of key species (for which the special area was designated) that lasts more than one generation or a change in community structure, beyond which natural recruitment (i.e., reproduction and immigration from unaffected areas) would not sustain the population or community in the special area such that it would not return to its original level within one generation; or
- Results in permanent and irreversible loss of critical habitat (if present) as defined in a recovery plan or an action strategy

12.2 Summary of Existing Conditions for Special Areas

Section 7.1.9.1 of the EIS Guidelines indicate that the EIS is to provide “the distances between the edge of the Project Area (i.e., drill sites and marine transportation routes) and special areas”. Several special areas intersect with EL 1161, the Project Area or LAA including the supply vessel route where marine vessels and aircraft are anticipated to transit. Summaries of the defining features of special areas in the LAA along with the distance between Project components and these special areas are included in Table 12.4.

EL 1161 intersects with the Snow Crab Stewardship Exclusion Zone in Crab Fishing Area 8Bx. The Project Area intersects with the same crab fishing closure and two SBAs. Thus, those special areas intersecting the Project in the offshore are all identified for marine fish and fish habitat. The LAA also encompasses an IBA, two EBSAs, a Candidate NMCA, another Snow Crab Stewardship Exclusion Zone, and two NHS. These special areas are primarily designated for marine and marine fish and fish habitat, migratory bird habitat, and / or marine mammal and sea turtle habitat. The Quidi Vidi Lake IBA and two NHS (Signal Hill NHS and Cape Spear NHS) are onshore, within the transit route LAA near the entrance to the Port of St. John’s.

Table 12.4 Special Areas in the LAA

Special Area	Defining Features	Nearest Distance (km)		
		EL 1161	Project Area	LAA (50 / 10 km)*
Quidi Vidi Lake IBA	Winter daytime resting site for herring, great black-backed, Iceland, glaucous and common black-headed gulls. Locally rare ring-billed gull, mew gull, lesser black-backed gull and waterfowl (e.g., American black ducks, mallards and northern pintails) also common in winter.	300	235	Overlap**
Virgin Rocks EBSA	Identified for unique geomorphological features and habitat that hosts aggregations of sand lance, American plaice, capelin, sooty shearwater, thick-billed murre and killer whales.	69	29	Overlap
Eastern Avalon Canadian EBSA	Feeding area for seabirds (e.g., Atlantic puffin, common murre, thick-billed murre, razorbill, northern fulmar), cetaceans, leatherback turtles and seals from spring to fall.	234	177	Overlap
Small Gorgonian Coral SBA	DFO modelling shows high predicted presence probability of indicated species.	14	Overlap	Overlap
Large Gorgonian Coral SBA		22	Overlap	Overlap
East Avalon / Grand Banks Candidate NMCA	Detailed description not available. Intersects Eastern Avalon EBSA, Witless Bay Ecological Reserve and Witless Bay Islands IBA. Assumed to be an important area for cetaceans and seabirds (likely Atlantic puffin, Leach's storm petrel, common murre, thick-billed murre, northern fulmar, razorbill, black-legged kittiwake, herring gull, great black-backed gull, black guillemot, sea ducks) based on other special areas.	219	219	Overlap
8Bx Snow Crab Stewardship Exclusion Zone	Areas closed to crab fishing.	Overlap	Overlap	Overlap
Near Shore Snow Crab Stewardship Exclusion Zone		250	185	Overlap
Signal Hill NHS	Cultural history.	301	236	Overlap
Cape Spear NHS		295	230	Overlap

All distances are calculated in NAD83 UTM Zone 23N Projection
* The LAA is a 50 km buffer around the Project Area and 10 km on either side of the supply vessel route.
** The Project component (i.e., EL 1161, Project Area or LAA) overlaps spatially with the special area.

12.3 Project Interactions with Special Areas

Physical activities related to the Project may interact with special areas and result in environmental effects (Table 12.5). Potential interactions are indicated by check marks. Potential residual effects are discussed in detail in Section 12.4 within the context of effects potential pathways and including the application of standard, and any Project-specific, mitigation / enhancements. A justification for no effects interaction is provided following the table.

Table 12.5 Project-Environment Interactions with Special Areas

Physical Activities	Environmental Effects
	Change in Habitat Quality
Presence and operation of a MODU (including drilling, associated safety zone, lights, and sound)	✓
Geophysical (including VSP), Geological, Geotechnical, and Environmental Surveys	✓
Discharges (e.g., drill muds / cuttings, liquid discharges)	✓
Well Testing and Flaring (including air emissions)	–
Well Decommissioning, Suspension and Abandonment	✓
Supply and Servicing Operations (including helicopter transportation and Project supply vessel operations)	✓
Notes: ✓ = Potential interaction – = No interaction	

Well testing and flaring, if required for this Project (see Section 2.4.3), are not anticipated to interact with special areas. Produced water is not predicted to have effects on marine fish and fish habitat as it will be flared, treated, and disposed in accordance with regulatory guidelines, or shipped to shore. Atmospheric, lighting, and thermal emissions associated with flaring will occur above the water surface and are not predicted to interact with special areas identified for marine fish and fish habitat (Section 9.3). Well testing and flaring could potentially interact with marine and migratory birds but special areas identified as marine and migratory bird habitat occur between 29 and 235 km from the Project Area (Table 12.1). Seabird species (i.e., sooty shearwaters and thick-billed murres) are identified as present in the Virgin Rocks EBSA, which is 29 km from the Project Area. The zone of influence for bird attraction to flaring is estimated to be up to 15 km for sensitive species (Section 10.3). Well testing and flaring is not anticipated to interact with special areas identified for marine and migratory birds. Well testing and flaring is not anticipated to interact with special areas identified for marine mammals and sea turtles (Section 11.3). Thus, the following discussion of potential residual effects does not address well testing and flaring.

12.4 Assessment of Residual Environmental Effects on Special Areas

Project activities with the potential to result in residual environmental effects include presence and operation of a MODU, discharges, well decommissioning, suspension and abandonment, and supply and servicing. These potential residual effects are discussed in the following sections as relevant to special areas within the LAA. Effects on species including species at risk and SOCC that occur within these special areas are assessed within the biological VC chapters: Section 9.3 (Marine Fish and Fish Habitat); Section 10.3 (Marine and Migratory Birds); and Section 11.3 (Marine Mammals and Sea Turtles). These sections are referenced throughout as relevant.

12.4.1 Change in Habitat Quality

The following standard practices and mitigation measures will be implemented to reduce any potential effects. As special areas are intrinsically linked to the marine species that use them, mitigation measures for marine fish and fish habitat, marine and migratory birds, and marine mammals and sea turtles will also reduce potential adverse effects on special areas.

12.4.1.1 Mitigation

The following mitigation measures will be employed to reduce the potential environmental effects of the Project on special areas.

Presence and Operation of a MODU

- Suncor will conduct a pre-drilling, ROV imagery-based seabed survey at proposed drilling locations to confirm the presence / absence of sensitive environmental features such as habitat-forming corals, sponges). Surveys will also be used to confirm the absence of shipwrecks, debris on the seafloor, and unexploded ordnances. The results of surveys will be shared with the C-NLOPB and DFO to inform discussions about well planning and mitigation for future exploration drilling.
- Artificial lighting will be reduced, where possible with due regard to safety and associated operational requirements.

Discharges

- Selection and screening of chemicals including drill fluids, to be discharged into the marine environment, will be in accordance with the OCSG (NEB et al. 2009). Where feasible, muds and cements will be chosen for lower toxicity, biodegradability and environmentally friendly properties. Where feasible, drilling fluids will be chosen based on ratings for least hazardous chemical components under the OCNS and Pose Little or No Risk to the Environment by the Convention for the Protection of the Marine Environment of the North-East Atlantic (Section 2.9.3 provides more information on chemical selection).

- Prior to release into the marine environment, operational discharges will be treated in accordance with the OWTG and other applicable regulations and standards such as MARPOL, which has been incorporated into the *Canada Shipping Act, 2001*. Waste discharges that do not meet regulatory requirements will be delivered to the shore base for appropriate disposal at approved facilities. Project-specific EPP and WMP will be designed to prevent unauthorized waste discharges (Section 2.7 provides additional information on waste discharges and management).
- SBM drill cuttings will be returned to the MODU and treated in accordance with the OWTG, before being discharged into the marine environment. The concentration of SBM on cuttings will be monitored onboard the MODU, and in accordance with OWTG, no excess or spent SBM will be discharged, and excess or spent SBM that cannot be reused will be returned to the shore base for disposal. In keeping with OWTG, WBM drill cuttings will be discharged without treatment.
- Food waste generated on the MODU and supply vessels will be disposed according to OWTG and MARPOL requirements. Kitchen waste will be macerated in accordance with MARPOL and the OWTG. No macerated food waste will be discharged within 3 nautical miles (nm) of land.
- Transfer of hazardous wastes will be managed in accordance with *Transportation of Dangerous Goods Act*. Suncor will obtain all required approvals for transportation, handling, and temporary storage of hazardous waste.

Well Decommissioning, Suspension and Abandonment

- Well decommissioning, suspension and abandonment will be conducted in accordance with Suncor's Well Integrity Standard, as well as applicable industry practice and in compliance with relevant regulatory requirements. These activities will adhere to the requirements of the *Newfoundland Offshore Petroleum Drilling and Production Regulations* (or subsequent amended regulations).

Supply and Servicing Operations

- Suncor will seek advice from the regional ECCC-CWS office, for appropriate altitudes for helicopters transiting to and from the MODU and separation distances from migratory bird nesting colonies, as per CWS guidelines (Government of Canada 2018). Transit routes will be selected to comply with provincial *Seabird Ecological Reserve Regulations, 2015*. Specific details will be provided in the EPP.
- Supply vessel routes transiting to and from the MODU will be selected to avoid passing within 300 m of migratory bird nesting colonies during the nesting period and will comply with provincial *Seabird Ecological Reserve Regulations, 2015* and federal guidelines to reduce disturbance to colonies (ECCC 2017a). Specific details will be provided in the EPP.
- Lighting on supply vessels will be reduced to an extent that will not compromise safety of operations. This may include avoiding use of unnecessary lighting, shading lights, and directing lights towards the deck.
- Suncor, in consultation with ECCC-CWS, will develop a protocol for daily searches and record keeping for seabirds stranded on the MODU and supply vessels. Any discovered seabirds will be recovered, rehabilitated, released and documented in accordance with the methods in Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada (ECCC 2017b). Suncor will provide staff training in these protocols and procedures. A Seabird Handling Permit will be obtained from ECCC-CWS annually. In accordance with ECCC requirements, Suncor will submit an annual report including all records of stranded and / or seabird handling occurrences.

12.4.1.2 Characterization of Residual Project-related Environmental Effects

The potential effects of Project activities on a change in habitat quality in special areas depends upon the activity, the location and type of special area, and a variety of other factors including ocean conditions, species present, stage of life cycle, and reproductive activity. Therefore, the effects on special areas are linked to effects on marine fish and fish habitat (Section 9.3), marine and migratory birds (Section 10.3), and marine mammals and sea turtles (Section 11.3).

Presence and Operation of a MODU

Special Areas Identified for Marine Fish and Fish Habitat: The potential effects of the presence and operation of a MODU on change in habitat quality for marine fish and fish habitat are discussed in detail in Section 9.3.2 and summarized in this section as relevant to special areas. With the implementation of appropriate mitigation measures, the overall magnitude of effects of the presence and operation of a drilling installation on marine fish and fish habitat are anticipated to be low.

The Project Area and EL 1161 intersect the 8Bx Snow Crab Exclusion Zone (closed to crab fishing). The Project Area intersects two SBAs, one identified for large gorgonian corals and one for small gorgonian corals, but neither of these special areas intersects EL 1161. Lighting from a MODU is expected to be mainly detected near the surface (<10 m water depth) and to a distance of less than 1.5 km from the light source (Keenan et al. 2007; Simonsen 2013; Foss 2016). Thus, light is not anticipated to reach subsea habitat such as that found in the Snow Crab Exclusion Zone. As sound from the MODU could result in disturbance to fish species up to an estimated 522 m from the source (Alavizadeh and Deveau 2020), the effects of such sound emissions could be realized by fish species in Snow Crab Exclusion Zone. Continuous sounds may result in behavioural effects such as avoidance, attraction, or startle responses by individual fish, but such responses are dependent upon motivational state (e.g., foraging, reproduction, migration, predator avoidance) (Marchesan et al. 2005; Stoner et al. 2008; de Robertis and Handegard 2013; Oak 2020). Fishes and invertebrates remaining in the area will likely habituate to continuous sound such that avoidance and startle responses decrease over time during drilling activities. Short-term localized turbidity from placement of MODU anchors could cause disturbance to gorgonian corals within tens of metres of the anchor site (Heery et al. 2017) but special areas identified for benthic species are at least 14 km from EL 1161.

Special Areas Identified for Marine and Migratory Birds: The potential effects of the presence and operation of a MODU on change in habitat quality for marine and migratory birds are discussed in detail in Section 10.3.2 and summarized in this section as relevant to special areas. With the implementation of appropriate mitigation measures, the overall magnitude of effects of the presence and operation of a drilling installation on marine and migratory birds are anticipated to be low.

The nearest special area identified for marine and migratory birds is the Virgin Rocks EBSA located 29 km from the Project Area. Data on the distance at which birds can be affected by light from a MODU or vessel are limited. The zone of influence varies with factors such as weather, intensity and position (height) of the light source, and ambient light conditions (Montevecchi 2006). Bruinzeel and van Belle (2010) found that the distance at which birds become disoriented ranges from 200 m in dense fog to 1,000 to 1,400 m in lighter fog to light rain, to up to 4.5 km in overcast skies with no celestial cues and otherwise good visibility. Poot et al. (2008) showed that 30 kilowatts of electric lighting affects migrating land birds out to at least

5 km, but greater distances cannot be ruled out (Poot et al. 2008; Hedd et al. 2011; Ronconi et al. 2015). Large numbers of fledgling short-tailed shearwaters were attracted to intense, temporary artificial lighting separated by 15 km of sea from the nearest nesting colony (Rodríguez et al. 2014). Thus, the zone of influence for attraction of birds found in this EBSA (i.e., murres and shearwaters) is not well understood, but in the available literature does not support likely effects on the Virgin Rocks EBSA.

Special Areas Identified for Marine Mammals and Sea Turtles: The potential effects of the presence and operation of a MODU on change in habitat quality for marine mammals and sea turtles are discussed in detail in Section 11.3.2 and summarized in this section as relevant to special areas. With the implementation of appropriate mitigation measures, the overall magnitude of effects of the presence and operation of a MODU on marine mammals and sea turtles are anticipated to be low.

The nearest special area identified for marine mammals is the Virgin Rocks EBSA (noted for killer whales) located 29 km from the Project Area. There have been few studies of marine mammal behaviour in relation to drilling activity. However, available information suggests that effects are localized and temporary. Kapel (1979) reported several different species of baleen whales – mainly fin, minke, and humpback whales – within sight of active drill ships off West Greenland. Offshore California, grey whales responded when closer than 1 km around a semi-submersible drilling unit (Malme et al. 1983, 1984). Marine mammals are frequently sighted around oil and gas installations in the North and Irish seas (Todd et al. 2016; Delefoss et al. 2018). Based on available scientific modelling and observations, some localized and short-term behavioural effects (change in presence and abundance) are likely to occur, with some species potentially being displaced from the immediate area around the MODU. Marine mammals (i.e., humpback and minke whales) have been observed within hundreds of metres of the operating platforms on the Grand Banks (Section 11.3.2.3). Thus, disturbances from presence and operation of the MODU are not anticipated to extend to the Virgin Rocks EBSA.

As special areas that intersect the Project Area are identified for marine fish and fish habitat (i.e., snow crab and gorgonian corals), the description of residual effects on special areas is based on the conclusions from change in habitat quality for marine fish and fish habitat. The residual effects of presence and operation of a MODU on special areas are predicted to be adverse, low in magnitude, restricted to the Project Area, medium-term in duration, to occur at irregular intervals, and reversible.

Geophysical (including VSP), Geological, Geotechnical and Environmental Surveys

Special areas intersecting with the Project Area are identified for benthic habitats, including the Snow Crab Stewardship Exclusion Zone in 8Bx and SBAs for small and large gorgonian corals. With the exception of the 8Bx Snow Crab Stewardship Exclusion Zone, no special areas overlap with EL 1161. Geophysical (including VSP), geological, geotechnical and environmental surveys will occur within EL 1161. The Virgin Rocks EBSA, which is identified for seabirds, is 29 km from the Project Area; therefore, VSP for this Project is not anticipated to result in effects on marine and migratory birds in the Virgin Rocks EBSA. The nearest special area identified for marine mammals is the Virgin Rocks EBSA (noted for killer whales) located 29 km from the Project Area’ therefore, due to distance VSP is not likely to result in effects on marine mammals in the Virgin Rocks EBSA.

Most of these planned and potential marine survey activities will not result in physical contact with the seabed and will therefore not directly interact with or disturb benthic animals or their habitats. Therefore, the following discussion of potential residual effects focuses on special areas identified for marine fish and fish habitat and the effects of geophysical (including VSP) surveys.

The potential effects of VSP on change in habitat quality for marine fish and fish habitat are discussed in detail in Section 9.3.2 and summarized in this section as relevant to special areas. With the implementation of appropriate mitigation measures, the overall magnitude of effects of VSP on marine fish and fish habitat are anticipated to be low.

A variety of fish species are known to exhibit localized and temporary avoidance behaviours from exposure to impulsive underwater sounds, such as those generated during VSP. Scientific modelling has shown that sound levels from VSP could result in behavioural responses up to 19.2 km from a source for sensitive fish species (Alavizadeh and Deveau 2020). Field studies on the Grand Banks with seismic sound from a 2D seismic array did not result in changes to catch rates of snow crab over days or weeks. Other special areas identified for marine fish species are a minimum of 29 km from the Project Area. The received sound pressure levels from VSP activities are predicted to have no effects on the special areas in the Project Area.

As special areas that intersect the Project Area are identified for fish and fish habitat (i.e., snow crab and gorgonian corals) the description of residual effects on special areas is based on the conclusions from change in habitat quality for marine fish and fish habitat. Geological and geotechnical surveys may involve collecting seabed samples. They are typically limited to the MODU and anchor locations (if used). The majority of the environmental survey activities will have no physical contact with the seabed; therefore, there will be no direct interaction with or disturbance to benthic animals or their habitats.

Discharges

Special Areas Identified for Marine Fish and Fish Habitat: The potential effects of discharges on change in habitat quality for marine fish and fish habitat are discussed in detail in Section 9.3.2 and summarized in this section as relevant to special areas. With the implementation of appropriate mitigation measures, the overall magnitude of the effects of discharges on marine fish and fish habitat are anticipated to be low.

The Project Area intersects special areas identified for fish species including the Snow Crab Exclusion Zone and SBAs for gorgonian corals. While the Snow Crab Exclusion Zone overlaps with EL 1161, the two SBAs in the Project Area are 14 and 22 km from the nearest edge of EL 1161. Drilling mud and cuttings discharges may result in a temporary increase in suspended particulate matter and turbidity in the water column. These changes are anticipated to last from minutes to days and return to background levels within hours after cessation of discharges (Smit et al. 2006; Koh and Teh 2011; IOGP 2016). Most marine fish species are anticipated to experience effects of drill cutting deposition within tens of metres and within 550 m for sensitive species such as corals and sponges (Norsk Olje og Gass 2013). Setbacks should be applied to SBAs to protect ecological integrity and functionality of the habitat (Oak 2020). Cordes et al. (2016, in Oak 2020) suggested setback are 200 m and 2 km from seafloor infrastructure and surface discharge points, respectively. However, no effects are expected on coral and sponge SBAs as the closest is 14 km from EL 1161.

Special Areas Identified for Marine and Migratory Birds: The potential effects of discharges on change in habitat quality for marine and migratory birds are discussed in detail in Section 10.3.2 and summarized in this section as relevant to special areas. With the implementation of appropriate mitigation measures, the overall magnitude of the effects of discharges on marine and migratory birds are anticipated to be low.

Seabird species are identified as present in the Virgin Rocks EBSA, which is 29 km from the Project Area. The presence of sheens from routine discharges will be unusual given adherence to the OWTG and MARPOL requirements for waste management. However, if they do occur, this could result in avoidance and/or attraction of marine birds. Northern fulmar, shearwater species and storm-petrel species are attracted to sheens. The visual appearance of a hydrocarbon sheen would resemble a sheen of biological origin and may occasionally attract such species (Nevitt 1999). However, these species also search for food by olfaction, relying on the smell of chemicals found in their foods, such as dimethyl sulfide (e.g., Leach's storm-petrel; Nevitt and Haberman 2003). Such species distinguish between sheen of oils derived from animals and sheen of petroleum oils by their odours (Hutchison and Wenzel 1980). As a result, these birds would be unlikely to encounter a sheen during foraging. Other birds may not be attracted at all and may temporarily avoid the localized affected area. The release of discharges from operations could result in changes to habitat quality for birds (with avoidance or attraction behaviours) but with appropriate management and adherence to regulations and guidelines, such effects on birds are considered to be short-term and localized. Thus, discharges are not likely to affect seabirds in the Virgin Rocks EBSA.

Special Areas Identified for Marine Mammals and Sea Turtles: The potential effects of discharges on change in habitat quality for marine mammals and sea turtles are discussed in detail in Section 11.3.2 and summarized in this section as relevant to special areas. With the application of mitigation measures, including adherence to regulations and guidelines for management of substances and wastes from operations, the overall magnitude of effects of discharges on marine mammals and sea turtles are anticipated to be negligible.

The nearest special area identified for marine mammals is the Virgin Rocks EBSA (noted for killer whales) located 29 km from the Project Area. Drilling wastes such as cement, WBM, and cuttings released at the seafloor are unlikely to affect marine mammals and sea turtles. Water depths in the EL where exploration drilling would occur range from approximately 61 to 87 m. Drilling activities are unlikely to produce concentrations of heavy metals in muds and cuttings that could be harmful to marine mammals (Neff et al. 1980, in Hinwood et al. 1994). These activities are expected to have minimal effects on marine mammals and sea turtles. With screening and selection of chemicals (including use of non-toxic drilling fluids) in accordance with the OCSG, and proper disposal of drill muds and cuttings in accordance with the OWTG, potential effects on marine mammals and sea turtles due to disposal of drill muds and cuttings and associated waste materials are considered unlikely. Thus, discharges are not anticipated to result in effects on the Virgin Rocks EBSA.

As the special area that intersects the Project Area is identified for fish and fish habitat (i.e., snow crab) the description of residual effects on special areas is based on the conclusions from change in habitat quality for marine fish and fish habitat. Special areas identified for the presence of marine and migratory birds and marine mammals and sea turtles intersect the supply vessel route (minimum of 177 km from the Project Area) and any effects are addressed in Supply and Servicing. Residual environmental effects of discharges on special areas are predicted to be adverse, low in magnitude, restricted to the Project Area, medium-term in duration, occur at irregular intervals, and reversible.

Well Decommissioning, Suspension and Abandonment

Special Areas Identified for Marine Fish and Fish Habitat: The potential effects of well decommissioning, suspension and abandonment on change in habitat quality for marine fish and fish habitat are discussed in detail in Section 9.3.2 and summarized in this section as relevant to special areas. With the implementation of appropriate mitigation measures, the overall magnitude of the effects of well decommissioning, suspension and abandonment on marine fish and fish habitat are anticipated to be low.

The Project Area and EL 1161 intersect the 8Bx Snow Crab Stewardship Exclusion Zone. The Project Area also intersects two SBAs, one identified for large gorgonian corals and one for small gorgonian corals. Removal of wellheads could result in temporary localized disturbances (e.g., sound and turbidity) as discussed under presence and operation of a MODU. If wellheads are left in place, they will provide hard substrate for colonization by benthic communities with potential beneficial effects (Cordes et al. 2016; Lacey and Hayes 2019).

Special Areas Identified for Marine and Migratory Birds: The potential effects of well decommissioning, suspension and abandonment on change in habitat quality for marine and migratory birds are discussed in detail in Section 10.3.2 and summarized in this section as relevant to special areas. With the implementation of appropriate mitigation measures, the overall magnitude of effects of well decommissioning, suspension and abandonment on marine and migratory birds are anticipated to be negligible.

Seabird species (i.e., sooty shearwaters and thick-billed murres) are identified as present in the Virgin Rocks EBSA, which is 29 km from the Project Area. The potential for marine and migratory birds to interact with well decommissioning, suspension and abandonment activities is low because the activities will take place within the Project Area and below the diving depths of all seabird species that are likely to be present, except the razorbill and common and thick-billed murres, as discussed in Section 10.3.1.3. However, movement and presence of vessels supporting well decommissioning, suspension and abandonment activities have the potential to displace murres and other alcids from the localized area due to alcids' avoidance of vessel traffic (Ronconi and St. Clair 2002; Bellefleur et al. 2009). Thus, the effects of well decommissioning, suspension abandonment are not likely to reach the Virgin Rocks EBSA.

Special Areas Identified for Marine Mammals and Sea Turtles: The potential effects of well decommissioning, suspension and abandonment on change in habitat quality for marine mammals and sea turtles are discussed in detail in Section 11.3.2 and summarized in this section as relevant to special areas. With the application of appropriate mitigation measures, the overall magnitude of effects of well decommissioning, suspension and abandonment on marine mammals and sea turtles are anticipated to be negligible.

The nearest special area identified for marine mammals and sea turtles is the Virgin Rocks EBSA (noted for killer whales) at 29 km from the Project Area. There is some potential that marine mammals may temporarily avoid a localized area during mechanical separation of the wellhead from the seabed due to underwater sound and other disturbance (Section 11.3.2.3) which would only occur during decommissioning, suspension and abandonment at the end of the Project, if at all. These effects are not likely to reach the Virgin Rocks EBSA.

Supply and Servicing

There are two NHS (Signal Hill NHS and Cape Spear NHS) within the transit corridor LAA. These areas are on land and will not be affected by routine activities associated with supply and servicing.)

Special Areas Identified for Marine Fish and Fish Habitat: The potential effects of supply and servicing on change in habitat quality for marine fish and fish habitat are discussed in detail in Section 9.3.2 and summarized below as relevant to special areas. With the application of appropriate mitigation measures, the overall magnitude of effects of supply vessels and helicopters on marine fish and fish habitat are anticipated to be low.

The LAA intersects with special areas identified for fish species: 8Bx Snow Crab Stewardship Exclusion Zone, SBAs for large and small gorgonian corals, and the Virgin Rocks EBSA, which is identified for the presence of sand lance, American plaice, and capelin. Mobile fishes would potentially respond to sound and move away from a vessel within tens of metres though behavioural responses may vary due to inter- and intraspecific differences in sound detection and associated effects, and motivational state (e.g., foraging, reproduction, migration, predator avoidance) (Marchesan et al. 2005; Stoner et al. 2008; de Robertis and Handegard 2013). Changes to habitat quality from supply vessel traffic are predicted to represent a small increment over similar effects from existing levels of marine traffic in the RAA.

Special Areas Identified for Marine and Migratory Birds: The potential effects of supply and servicing on change in habitat quality for marine and migratory birds are discussed in detail in Section 10.3.2 and summarized below as relevant to special areas. With the application of appropriate mitigation measures, the overall magnitude of effects of supply vessels and helicopters on marine and migratory birds are anticipated to be low.

Four special areas identified for the presence of marine and migratory bird species intersect the supply vessel route within the LAA. These include the Virgin Rocks EBSA, Eastern Avalon EBSA, the East Avalon / Grand Banks Candidate NMCA, and Quidi Vidi Lake IBA. Vessel traffic may interact with seabirds through lighting, atmospheric and underwater sound, and other associated environmental emissions and discharges. The various bird species that occupy the LAA will not likely be affected by supply vessel activity due to its transitory nature and thus, its short-term presence at any one location, and because it is generally consistent with the overall marine traffic that has occurred throughout the region for years.

Helicopters may interact with the marine and migratory birds through aircraft overflights and potential disturbance of normal nesting, foraging or resting activities. Possible disturbance effects include increased energy expenditure of birds due to escape reactions, increased heart rate, decreased food intake due to interruptions, and temporary loss of suitable habitat (Ellis et al. 1991; Trimper et al. 2003; Komenda-Zehnder et al. 2003). For example, helicopter atmospheric sound emissions can disturb seabirds at nesting colonies. However, seabird reactions to helicopters and other aircraft are variable due to several factors including species, previous exposure levels, and the location, altitude, and number of flights (Hoang 2013). One of the most conspicuous behavioural effects of helicopter atmospheric sound on birds is flushing of breeding birds from their nests, which can have immediate negative effects such as predation of eggs or nestlings, and reduced time spent incubating eggs or brooding nestlings (Burger 1981; Brown 1990; Bolduc and Guillemette 2003; Beale 2007; Burger et al. 2010). Eggs and nestlings may also be vulnerable to hypothermia. During flushing, adults may inadvertently knock eggs and nestlings from the nest, upon which they may fall from a cliff or be exposed to attacks by neighboring nesting pairs (Burger 1981; Carney and

Sydeman 1999). Disturbance may disrupt rates of foraging and feeding of nestlings or fledglings (Davis and Wiseley 1974; Lynch and Speake 1978; Belanger and Bedard 1990; Delaney et al. 2002; Goudie 2006). Unfamiliar atmospheric sound may deter birds from using preferred habitats and may alter migration routes, causing affected birds to expend greater energy (Larkin 1996; Beale 2007). Visible behavioural responses to aircraft operations, such as flushing, may be prompted at a distance of 366 m for common murre (Rojek et al. 2007), although there is variability in between and within species (Blumstein et al. 2005; Hoang 2013). The various bird species that occupy the Project Area and transit route will not likely be affected by helicopter activity due to its transitory nature and thus, its short-term presence at any one location, and because of mitigation measures in place (see below). Similar to presence of the MODU, when supply vessels are on location (e.g., the standby vessel monitoring the safety zone at the MODU), vessel lighting at night can attract fish to the surface, which in turn attracts great black-backed gull and other gull species (Montevecchi et al. 1999; LGL 2017).

The various bird species that occupy special areas in the LAA will not likely be affected by supply vessel activity or associated aircraft use, due to its transitory nature and thus, its short-term presence at any one location. The potential effects due to nocturnal artificial lighting sources on the supply vessels are anticipated to be similar, but lower magnitude, to those discussed under presence and operation of a MODU, as discussed above. In addition, vessel traffic for this Project is anticipated to be a minor contribution to overall marine traffic that has occurred throughout the region for many years (Section 10.3.1.3).

Special Areas Identified for Marine Mammals and Sea Turtles: The potential effects of supply and servicing on change in habitat quality for marine mammals and sea turtles are discussed in detail in Section 11.3.2 and summarized below as relevant to special areas. With the application of appropriate mitigation measures, the overall magnitude of effects of supply vessels and helicopters on marine mammals and sea turtles are anticipated to be low.

Three special areas identified for the presence of marine mammals and sea turtles intersect the supply vessel route within the LAA. These include the Virgin Rocks EBSA, Eastern Avalon EBSA, and the East Avalon / Grand Banks Candidate NMCA. Marine mammal responses to vessels are variable and range from avoidance at long distances to little or no response or approach (Richardson et al. 1995). Seals often show limited or no response to vessels but have also shown signs of displacement in response to vessel traffic. Odontocetes sometimes show no avoidance reactions and occasionally approach vessels. However, some species, such as the harbour porpoise, are displaced by vessels or otherwise change their behaviour in response to vessel sounds (e.g., Wisniewska et al. 2018; Roberts et al. 2019). While baleen whales often swim rapidly away from vessels that have strong or changing sound emission characteristics, stationary vessels or slow-moving vessels generally elicit little response from baleen whales.

There are few systematic studies on sea turtle responses to vessels. Hazel et al. (2007) examined behavioural responses of green sea turtles to a research vessel approaching at slow, moderate, or fast speeds. Fewer sea turtles fled from an approaching vessel as speed increased; turtles that fled from moderate to fast approaches did so at significantly shorter distances from the vessel than those that fled from slow approaches. Hazel et al. (2017) concluded that sea turtles may not be able to avoid vessels with speeds greater than 4 km/h. Tyson et al. (2017) reported that a juvenile green sea turtles dove during vessel passes and remained still near the sea floor. Lester et al. (2013) reported that behavioural responses of semi-aquatic turtles to boat sounds are variable.

The potential for masking of marine mammal calls or important environmental cues is considered low from supply vessels given the relatively low source level. Harbour seals have been reported to increase the minimum frequency and amplitude of their calls in response to vessel noise (Matthews 2017). However, harp seals may not increase the frequencies of their calls in areas with increased low-frequency sounds (Terhune and Bosker 2016).

Routine transportation activities associated with helicopter support have potential to cause changes in habitat quality or use for marine mammals and sea turtles due to disturbance. Available information indicates that single or occasional aircraft overflights will cause no more than brief behavioural responses in cetaceans and pinnipeds (summarized in Richardson et al. 1995). The majority of behavioural responses elicited in beluga and bowhead whales by an overhead helicopter traveling over the Beaufort Sea occurred when the aircraft flew at altitudes and lateral distances less than 150 m and 250 m, respectively (Patenaude et al. 2002). As with other underwater sound sources, the degree of sensitivity of cetaceans to sounds produced by aircrafts depend on their activity state at the time of exposure; individuals in a resting state appear to have the highest sensitivity to such disturbances (Würsig et al. 1998; Luksenburg and Parsons 2009). Cetaceans most commonly react to sounds from overhead aircrafts by diving (Luksenburg and Parsons 2009). Other reported behavioural responses include decreased surfacing periods, changes in activity state, and breaching (Luksenburg and Parsons 2009). It is uncertain how sea turtles would respond, but single or occasional overflights by helicopters would likely elicit only brief behavioural responses. Some localized and short-term behavioural effects are likely to occur, with some species possibly being displaced from the immediate area around a supply vessel or helicopter. The localized, transient, and short-term nature of these disturbances at one location and time during the Project considerably reduces the potential for adverse effects on marine mammals and sea turtles (Section 11.3.2.3).

As special areas that intersect the Project Area are identified for marine fish and fish habitat, marine and migratory birds, and marine mammals and sea turtles, residual effects on special areas are based on the most conservative conclusions from the biological VCs, which is change in habitat quality for marine mammals and sea turtles. The residual environmental effects associated with supply and servicing operations on special areas is predicted to be low in magnitude, within the LAA, short- to medium-term in duration, occurring irregularly, and reversible.

12.4.1.3 Summary of Project Residual Environmental Effects

This section provides a summary and prediction of residual environmental effects resulting from interactions between the Project and special areas (Table 12.6). The Project has potential to result in residual adverse effects through a change in habitat quality for special areas within the LAA. This includes a Snow Crab Exclusion Zone and two SBAs for gorgonian corals that intersect the Project Area. A second Snow Crab Exclusion Zone, two EBSAs, an IBA, a candidate NMCA and two NHS (Signal Hill NHS and Cape Spear NHS) also exist along the supply vessel route between the Project Area and the shore base. As Suncor will comply with regulations and industry standards for offshore oil and gas activities in Newfoundland and Labrador and employ various mitigation measures (Section 12.4.1.1), the residual adverse environmental effects would be low in magnitude for most Project components and activities. These effects would primarily occur within the Project Area, be short- to medium-term occurring irregularly, reversible and occur within disturbed ecological and socio-economic settings.

The residual environmental effects of a change in habitat quality on special areas are considered reversible. Though the recovery rate of corals from drill cutting sedimentation would be slow, recovery begins relatively quickly after drilling stops and benthic habitats are expected to recover in one to two years. This combined with mitigation to reduce potential effects on benthic habitats, indicates that effects will not likely result in permanent habitat loss. This is supported by the environmental effects monitoring programs conducted in the eastern NL offshore area.

Table 12.6 Project Residual Effects on Special Areas

Residual Effect	Residual Effects Characterization						
	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Change in Habitat Quality							
Presence and Operation of a MODU	A	L	PA	MT	IR	R	D
Geophysical (including VSP) Surveys	A	L	PA-LAA	ST	IR	R	D
Geological, Geotechnical and Environmental Surveys	A	L	PA	ST	IR	R	D
Discharges	A	L	PA	MT	IR	R	D
Well Evaluation and Testing	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Well Decommissioning, Suspension and Abandonment	N-A	L	PA	ST	IR	R-IR	D
Supply and Servicing	A	L	LAA	ST-MT	IR	R	D

KEY
See Table 12.3 for detailed definitions
N/A: Not applicable

Direction:
P: Positive
A: Adverse
N: Neutral

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

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

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

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

Reversibility:
R: Reversible
I: Irreversible

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

12.5 Determination of Significance

With mitigation and environmental protection measures established and applied to Project activities, residual environmental effects on special areas are predicted to be not significant.

12.6 Prediction Confidence

This conclusion has been determined with a moderate to high level of confidence, based on predictive modelling (e.g., sound and drill cuttings deposition) for this Project, the results of EEM programs for similar activities in the Newfoundland offshore area, and extensive scientific literature review of similar activities.

12.7 Follow-up and Monitoring

As noted in Section 9.3.2, Suncor will conduct an imagery-based seabed survey at the proposed wellsite(s) to identify sensitive environmental features, such as habitat-forming corals or sponges, prior to drilling. If any environmental sensitivities are identified during the survey, Suncor will notify the C-NLOPB to discuss an appropriate course of action. This may involve further investigation and/or moving the wellsite if feasible. If sensitive environmental features are found during the pre-drill survey, a follow-up program will be determined in consultation with the C-NLOPB and DFO. Results will be posted on the internet and indigenous groups informed of the posting.

12.8 References

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