Response to Conformity Review of Information Requirements and Clarifications from Environmental Impact Statement Review

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Husky Energy

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Husky Control Doc No.

ED-HSE-RP-0038

File No: 121413837

June 21, 2019

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1.0 RESPONSES TO INFORMATION REQUIREMENTS

1.1 MIGRATORY BIRDS

1.1.1 Information Requirement: IR-39

Reference to EIS:

Section 4.2.7 Migratory Birds; Section 4.2.7.2 Data Sources; Section 4.2.7.4 Significant Areas of Bird Habitat

Context and Rationale

Environment and Climate Change Canada (ECCC) advises that in addition to the Eastern Canada Seabirds at Sea (ECSAS) database and Fifield et al. (2009), there are a number of additional recent scientific studies of tracking data that reveal the project area (specifically the Grand Banks) as an important area for breeding and over-wintering birds regionally, nationally, and internationally. These references are: Fort et al. 2013, Frederiksen et al. 2016, Hedd et al. 2011, Hedd et al. 2018 and McFarlane Tranquilla et al. 2013.

Also, ECCC notes that the statement in Section 4.2.7 of the EIS that "*ECSAS data obtained from EC-CWS cannot be used to calculate densities because they have not been corrected for detectability"* is incorrect. ECCC advised that the capabilities of the ECSAS database have been incorrectly interpreted. The data can be used to calculate densities because distance sampling methods are used. The data allows the proponent to correct for detectability.

References

Fort, J., Moe, B., Strom, H., Grémillet, D., Welcker, J., Schultner, J., Jerstad, K., Johansen, K.L., Phillips, R.A., and Mosbech, A. (2013). Multicolony tracking reveals potential threats to little auks wintering in the North Atlantic from marine pollution and shrinking sea ice cover. *Diversity Distributions.* **19**: 1322-1332.

Fredericksen, M., Descamps, S., Erikstad, K.E., Gaston, A.J., Gilchrist, H.G., Grémillet, D., Johansen, K.L., Kolbeinsson, Y., Linnebjerg, J.F., Mallory, M.L., McFarlane Tranquilla, L.A., Merkel, F.R., Montevecchi, W.A., Mosbech, A., Reiertsen, T.K., Robertson, G.J., Steen, H., Strom, H., and Thorarinsson, T.L. (2016). Migration and wintering of a declining seabird, the thick-billed murre *Uria lomvia*, on an ocean basin scale: Conservation Implications. *Biological Conservation*. **200**: 26-35.

Hedd, A., Montevecchi, W.A., McFarlane Tranquilla, L.A., Burke, C.M., Fifield, D.A., Robertson, G.J., Phillips, R.A., Gjerdrum, C., and Regular, P.M. (2011). Reducing uncertainty on the Grand Bank: tracking and vessel surveys indicate mortality risks for common murres in the North-West Atlantic. *Animal Conservation.* **14**: 630-641.

Hedd, A., Pollett, I.L., Mauck, R.A., Burke, C.M., Mallory, M.L., McFarlane Tranquilla, L.A., Montevecchi, W.A., Robertson, G.J., Ronconi, R.A., Shutler, D., Wilhelm, S.I., and Burgess, N.M. (2018). Foraging areas, offshore habitat use, and colony overlap by incubating Leach's Storm-petrels *Oceanodroma leucorhoa* in the Northwest Atlantic. *PLoS One*. **13**(5): e0194389. https://doi.org/10.1371/journal.pone.0194389

McFarlane Tranquilla, L.A., Montevecchi, W.A., Hedd, A., Fifield, D.A., Burke, C.M., Smith, P.A., Robertson, G.J., Gaston, A.J., Phillips, R.A. (2013). Multiple-colony winter habitat use by murres *Uria* spp. In the Northwest Atlantic Ocean: implications for marine risk assessment. *Marine Ecology Progress Series.* **472**:287-303.

Specific Question of Information Requirement

Taking into account the references and information provided, provide further information on the potential effects of the Project on birds.

Update the effects predictions, potential mitigation and follow-up, as well as significance predictions, as applicable.

Response

Husky appreciates the references to recent scientific studies. These studies focus on Auks (including little auks (dovekie), thick-billed murre, common murres), and Leach's storm petrels. Murres are discussed generally Section 4.2.7.3 of the EIS, and more specifically in EIS Appendix D, Section 4.1.9. The seasonal distribution of murres within the Study Area is shown in EIS Appendix D, Figure 29. The information in these sections indicates that murres occur throughout the Study Area in all seasons, which is reinforced by the new studies on murres (Hedd et al. 2011; McFarlane Tranquilla et al. 2013; Frederiksen et al. 2016). The dovekie is also discussed in Section 4.2.7.3 of the EIS, and in EIS Appendix D, Section 4.1.8. The EIS indicates that dovekies regularly occur in spring, fall and winter, and are typically absent from the area in the fall. The study by Fort et al. (2013) identified a hot spot for dovekies off the eastern coast of Newfoundland during the non-breeding season, which confirms the information presented in the EIS.

Although these studies provide a greater level of detail regarding species distributions than what was presented in the EIS, they do not provide new information regarding when or if these species are present within the Study Area. As a result, the effects predictions, mitigations, and significance predictions remain valid and do not need to be updated.

Leach's storm-petrel are discussed generally in Section 4.2.7.3 of the EIS, and more specifically in EIS Appendix D, Section 4.1.3. The EIS indicates that this species is present in the waters of eastern Newfoundland in the spring, summer and fall, with few records from the winter. Effects determination, mitigation measures, and significance determination were based on this information. Hedd et al. (2018) provides a more detailed description of foraging areas and off-shore habitat use by Leach's storm-petrels in the Northwest Atlantic. This paper indicates that individual birds travelled, on average, 400 to 830 km from breeding colonies during the incubation period. This range indicates that Leach's storm-petrels from coastal colonies are very likely to occur in the Study Area during the spring incubation period. Figures also indicate that storm-petrels from the Baccalieu and Gull Island colonies are the most likely to be found in the Study Area during the incubation period (Hedd et al. 2018). This information does not change effects assessments, mitigations and significance predictions; therefore, this information in the EIS remains valid.

It is recognized that the statement in Section 4.2.7 of this EIS that "ECSAS data obtained from EC-CWS cannot be used to calculate densities because they have not been corrected for detectability" is incorrect. The ECSAS data were incorrectly interpreted.

The data used for bird distribution maps in Appendix D of the EIS were raw values indicating sightings and were not corrected for detectability. New figures (Figures 1 to 13) have been created using the Atlas of Seabirds at Sea in Eastern Canada 2006-2016 (Bolduc et al. 2017) available on the Government of Canada open data portal. The data provide seabird density represented in 100-km hexagonal cells for species groups by predefined seasons: April to July; August to October; and November to March. Density was calculated using distance sampling, which accounts for variation in detection rates among observers and survey conditions. The descriptions of seasonal species distributions in Appendix D remain valid.

References

Bolduc, F., F. Rousseu, C. Gjerdrum, D. Fifield and S. Christin. 2017. Atlas of Seabirds at Sea in Eastern Canada 2006-2016. Available at: http://data.ec.gc.ca/data/species/assess/atlas-of-seabirds-at-sea-in-eastern-canada-2006-2016/SeabirdAtlas-AtlasOiseauxMarins_2006-2016.pdf

Fort, J., B. Moe, H. Strom, D. Grémillet, J. Welcker, J. Schultner, K. Jerstad, K.L. Johansen, R.A Phillips and A. Mosbech. 2013. Multi-colony tracking reveals potential threats to little auks wintering in the North Atlantic from marine pollution and shrinking sea ice cover. Diversity Distributions, 19: 1322-1332.

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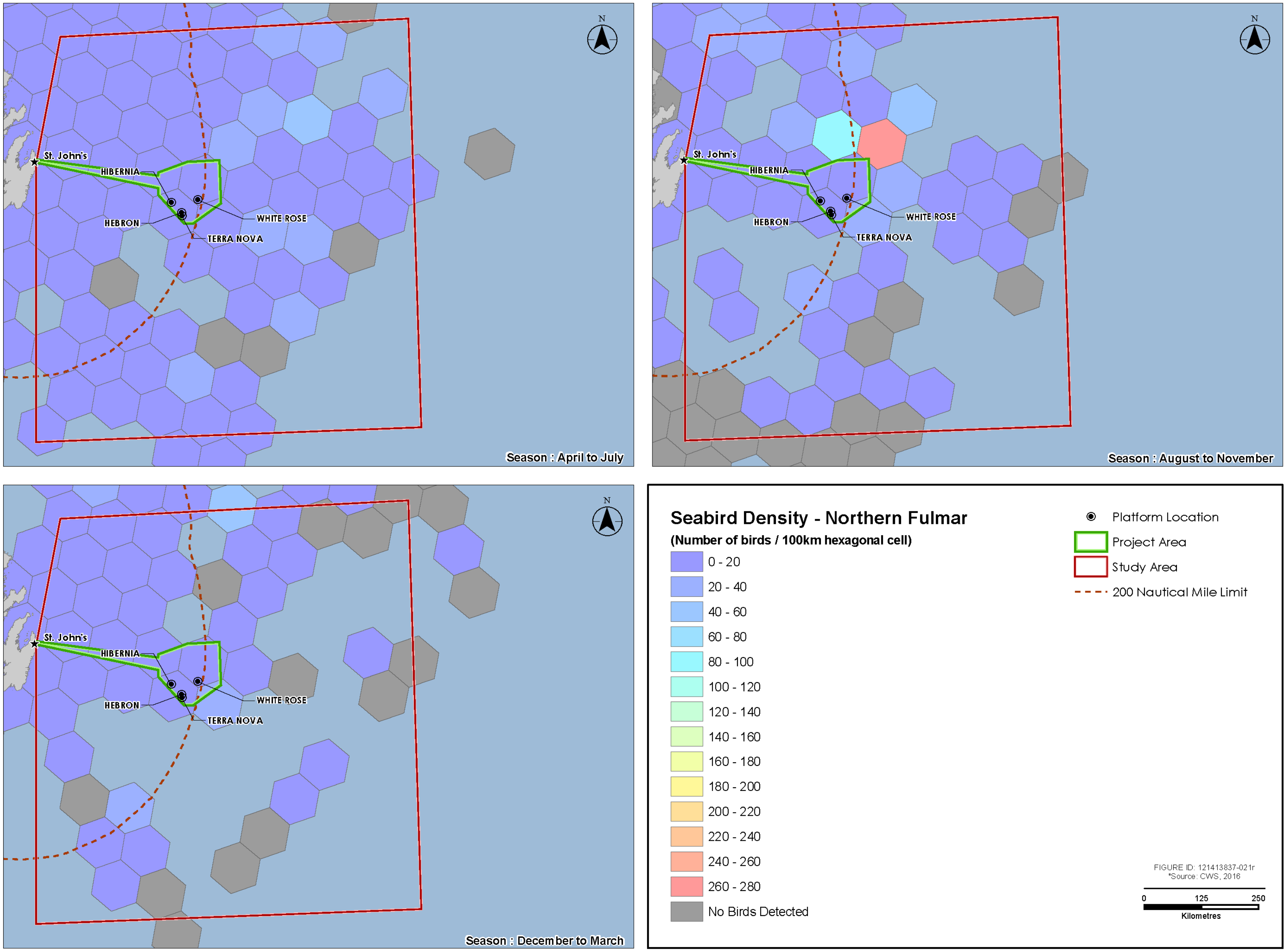

Figure 1 Northern Fulmar Density

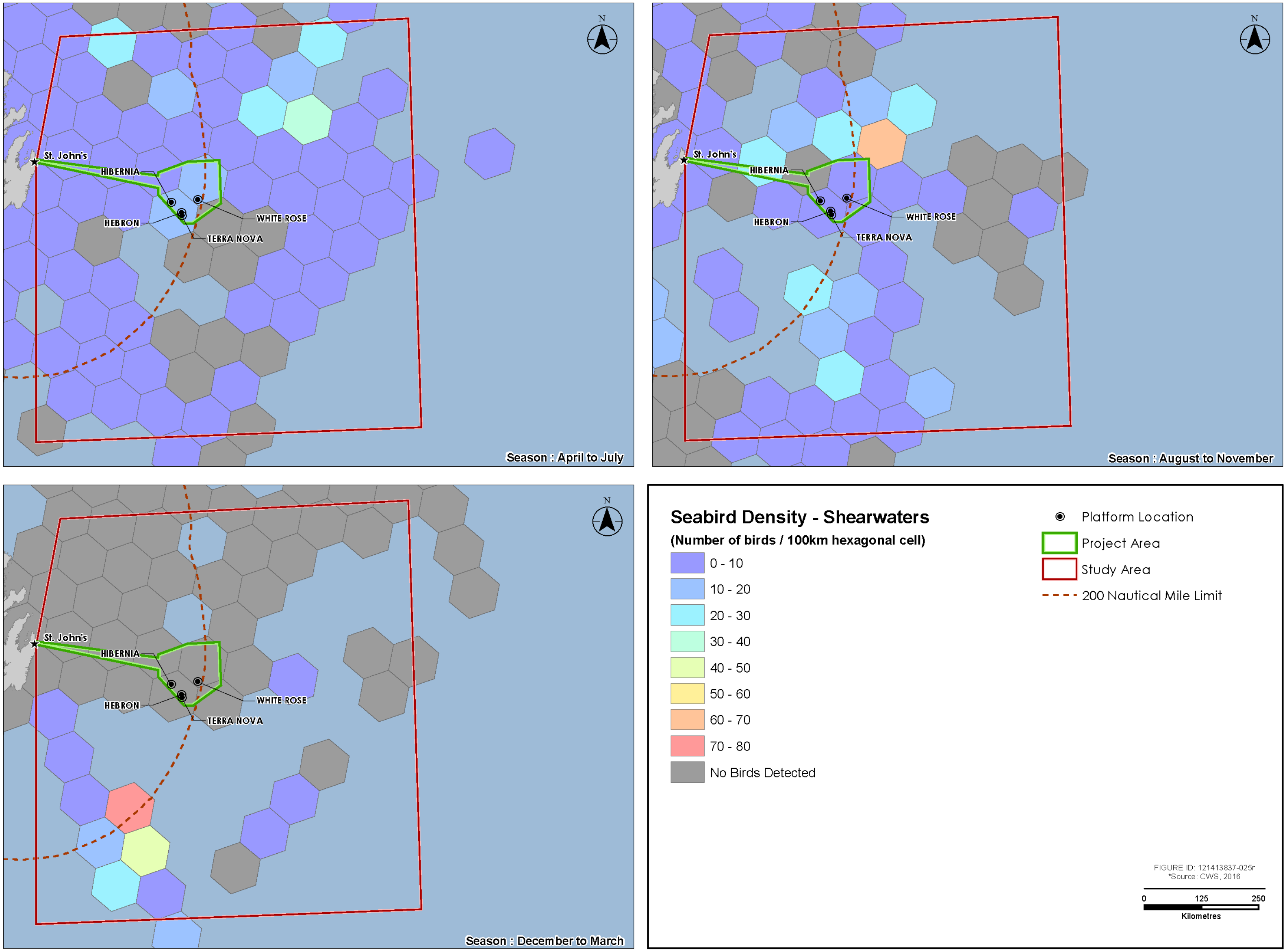

Figure 2 Shearwater Density

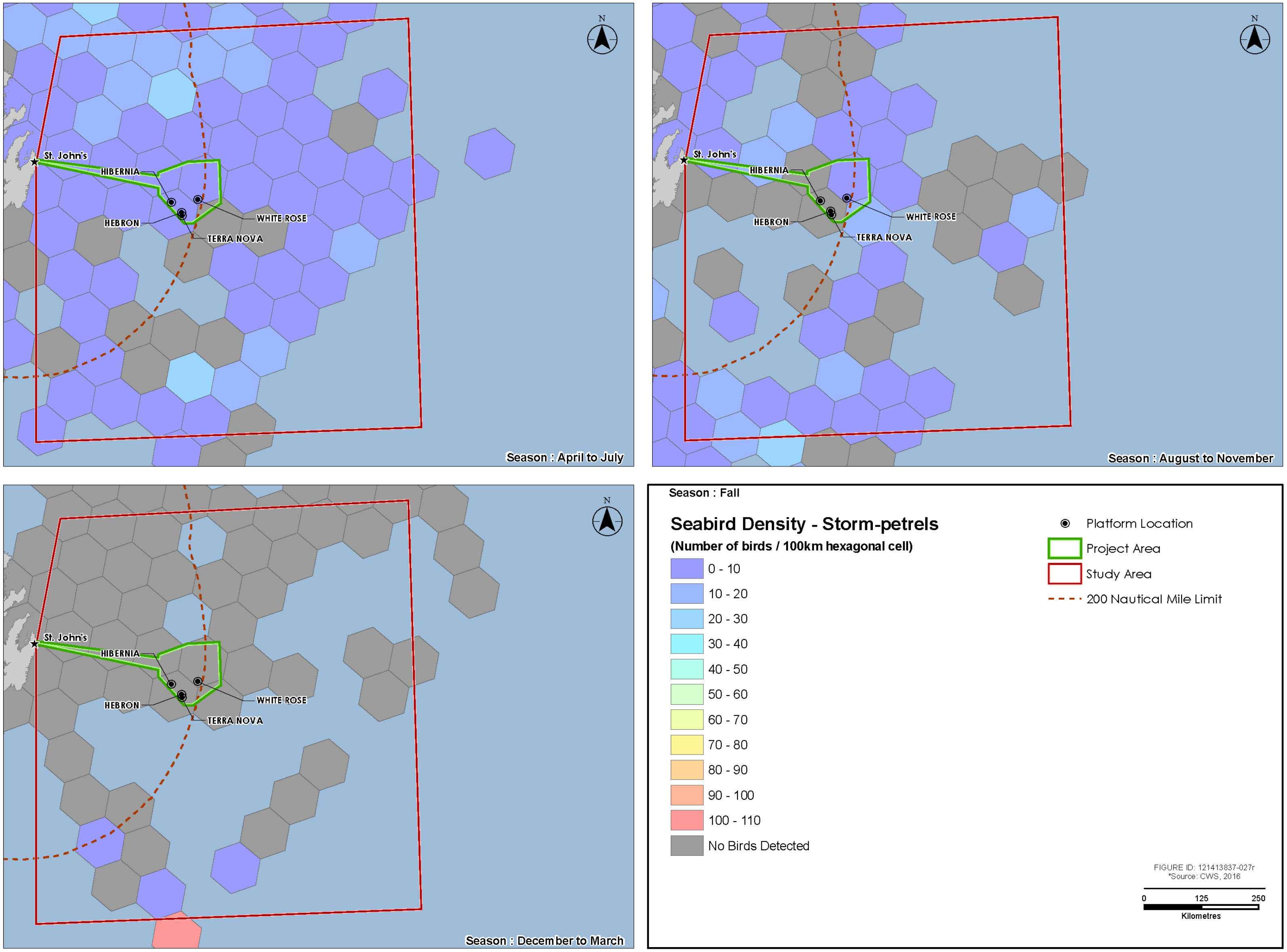

Figure 3 Storm-petrel Density

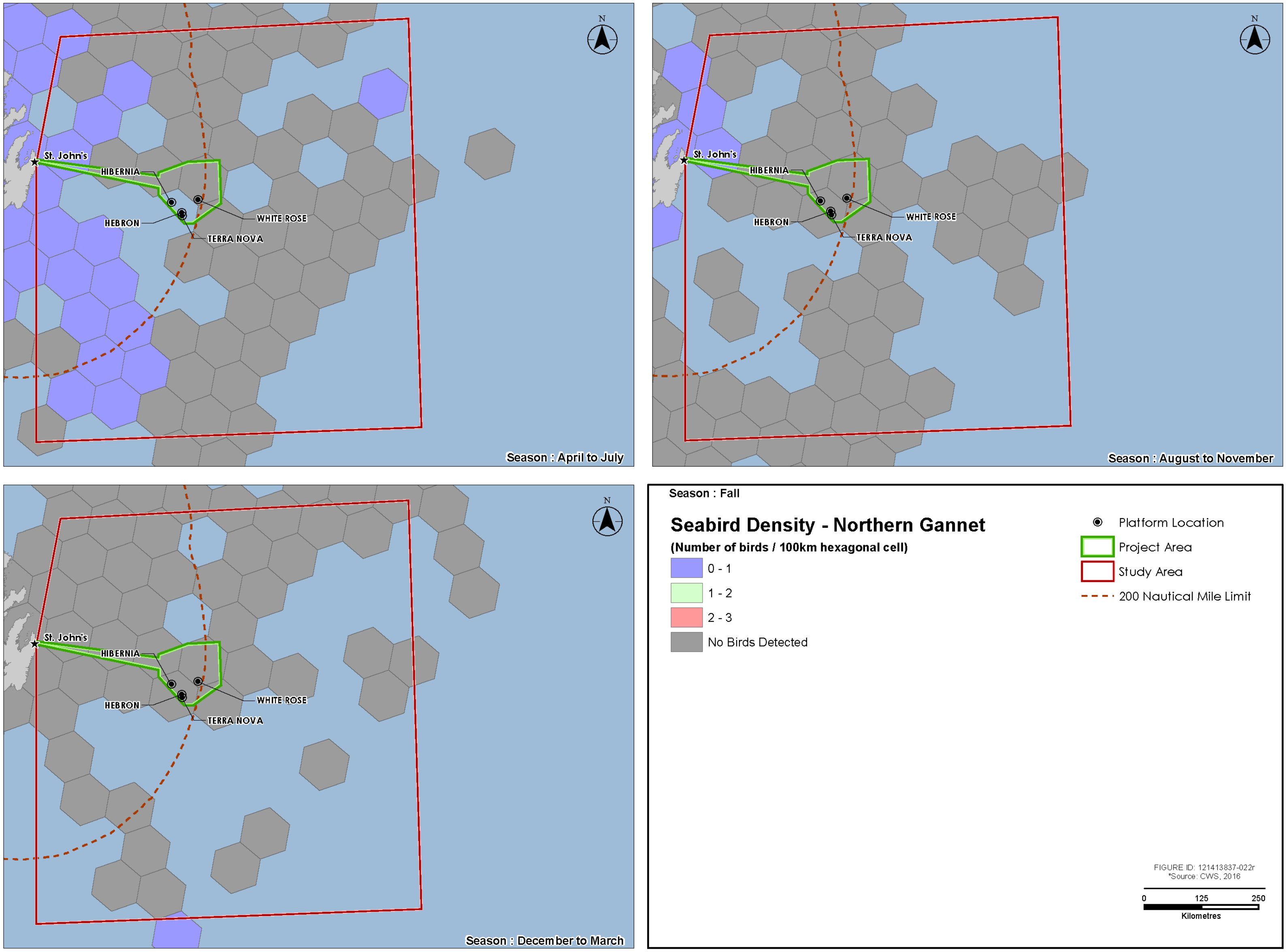

Figure 4 Northern Gannet Density

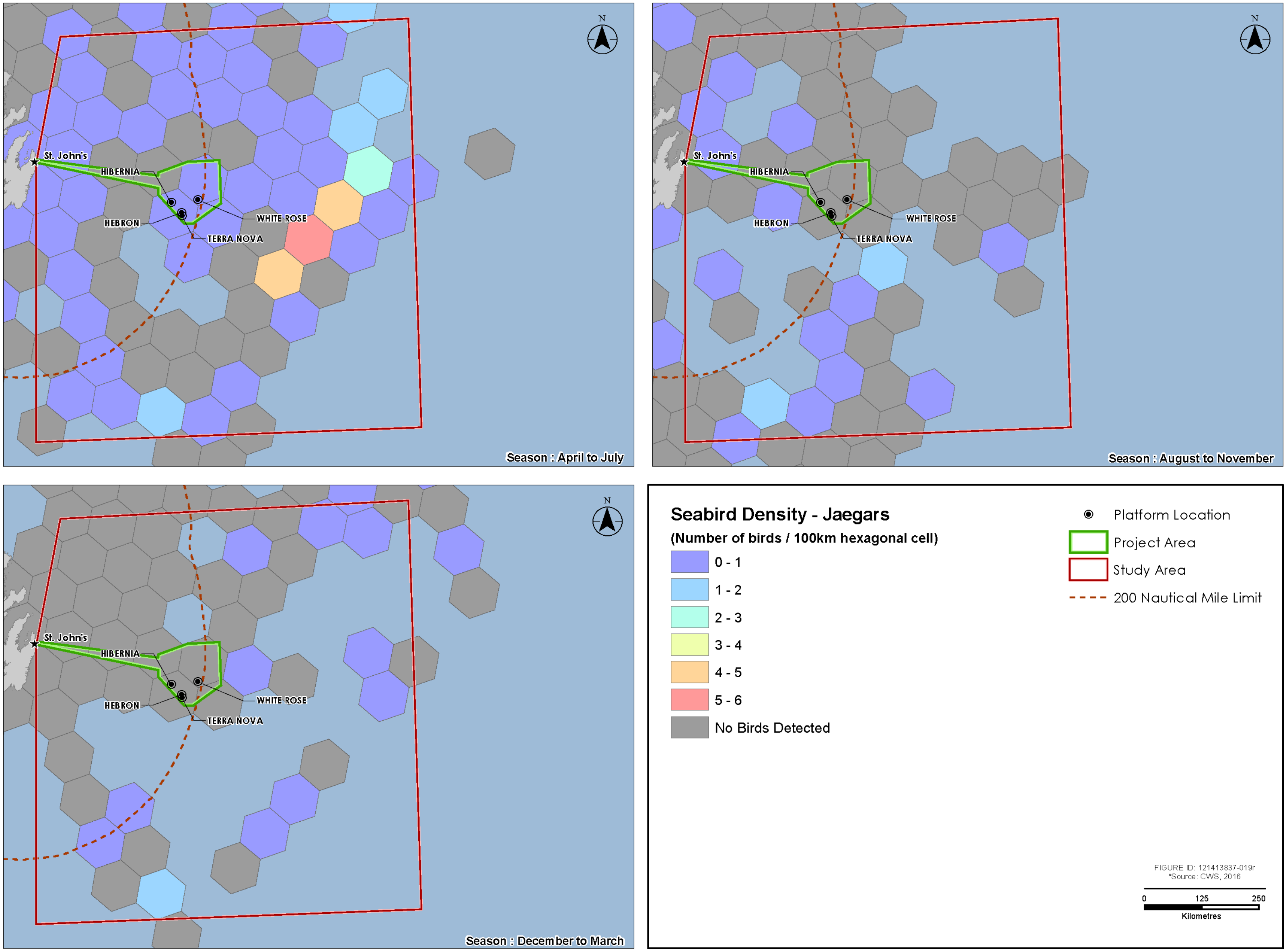

Figure 5 Jaeger Density

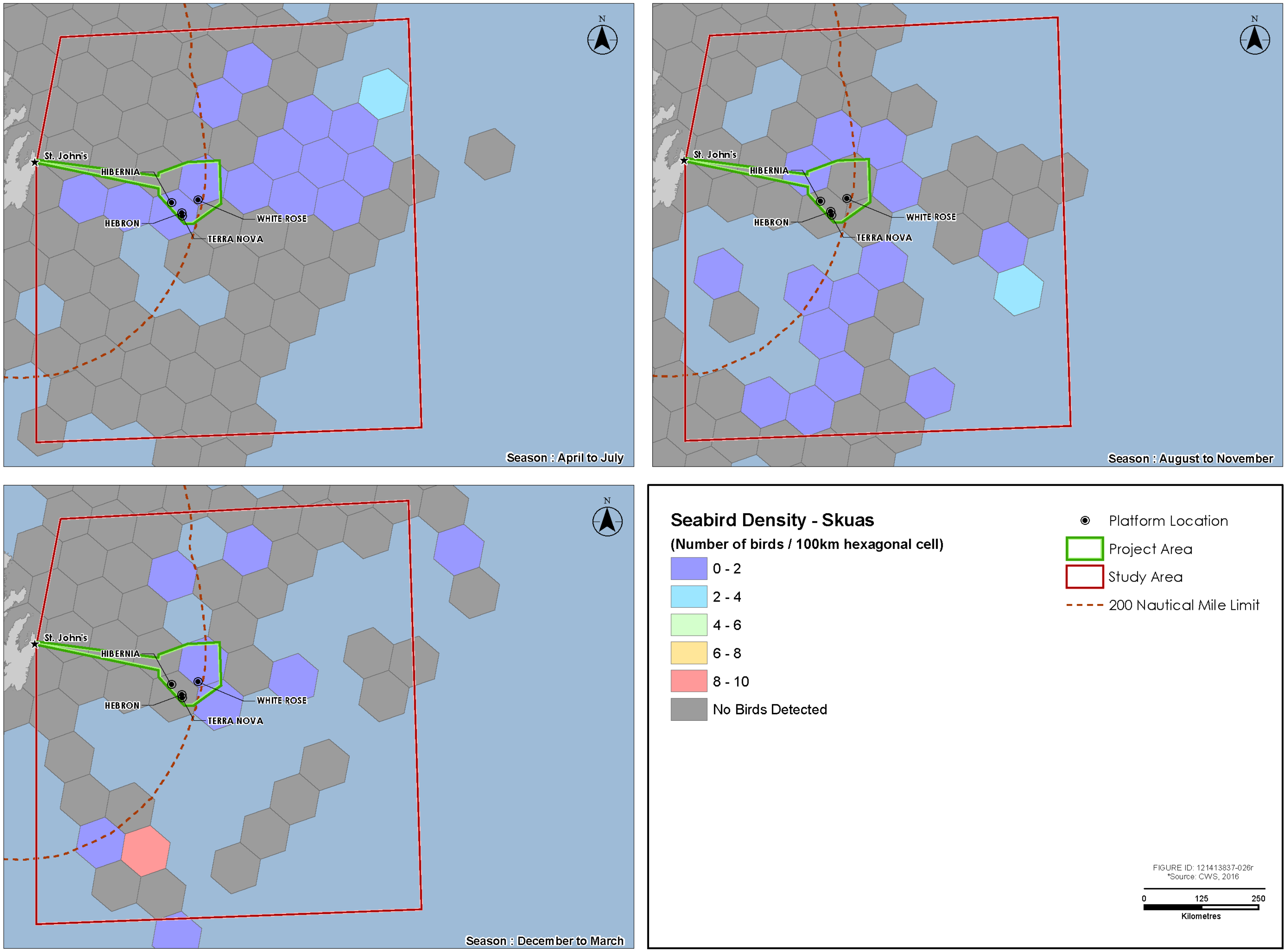

Figure 6 Skua Density

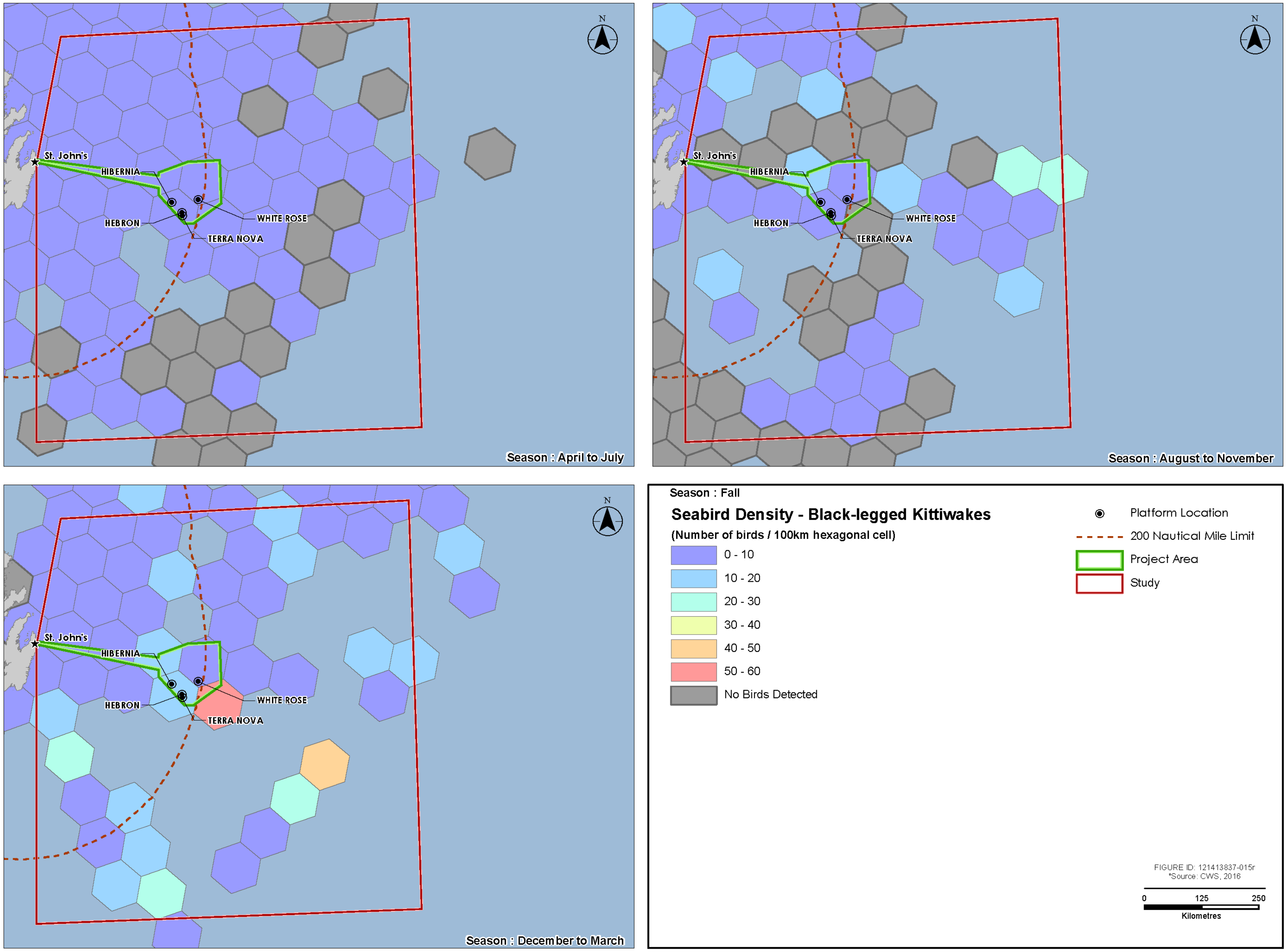

Figure 7 Black-legged Kittiwake Density

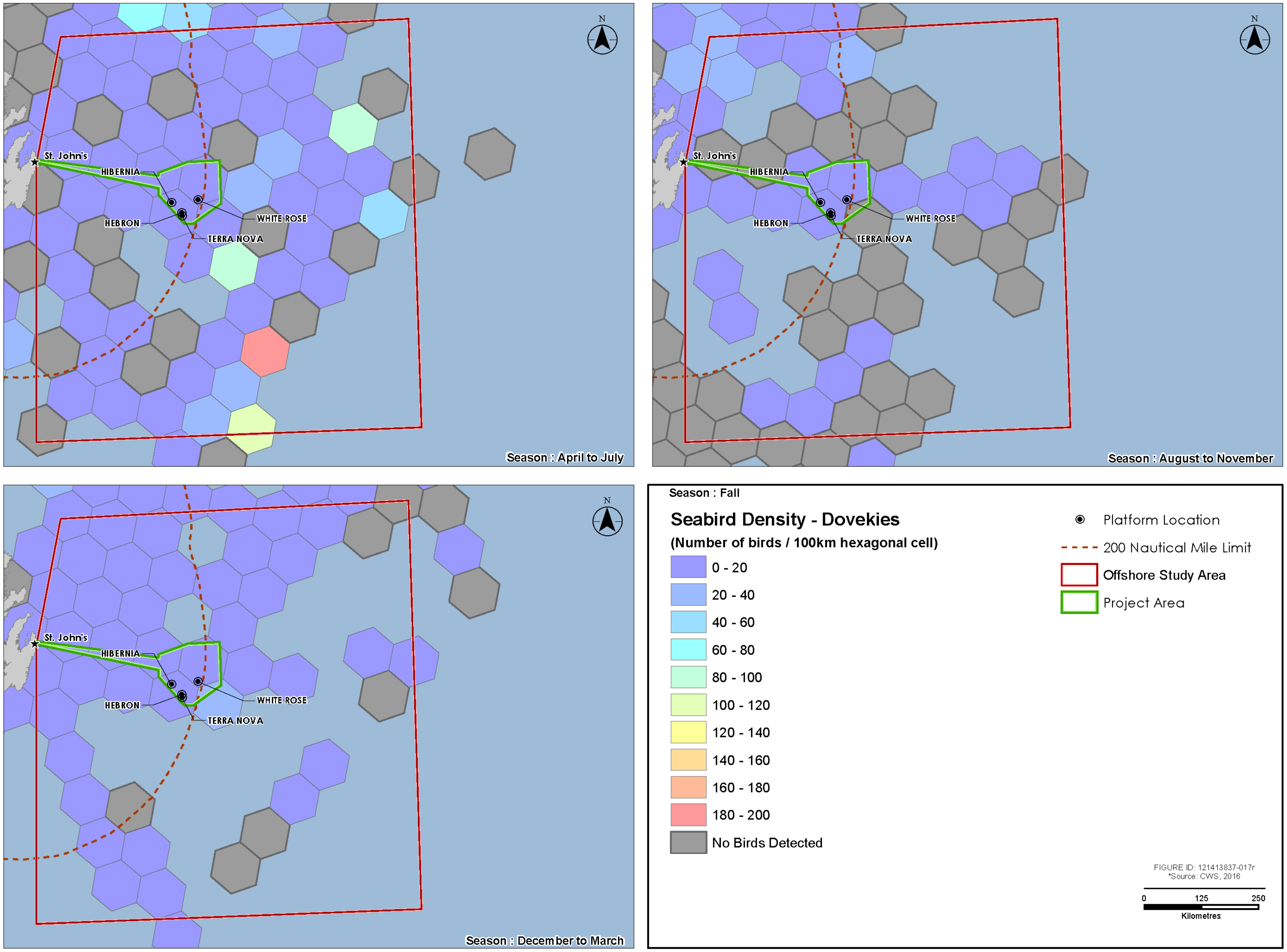

Figure 8 Dovekie Density

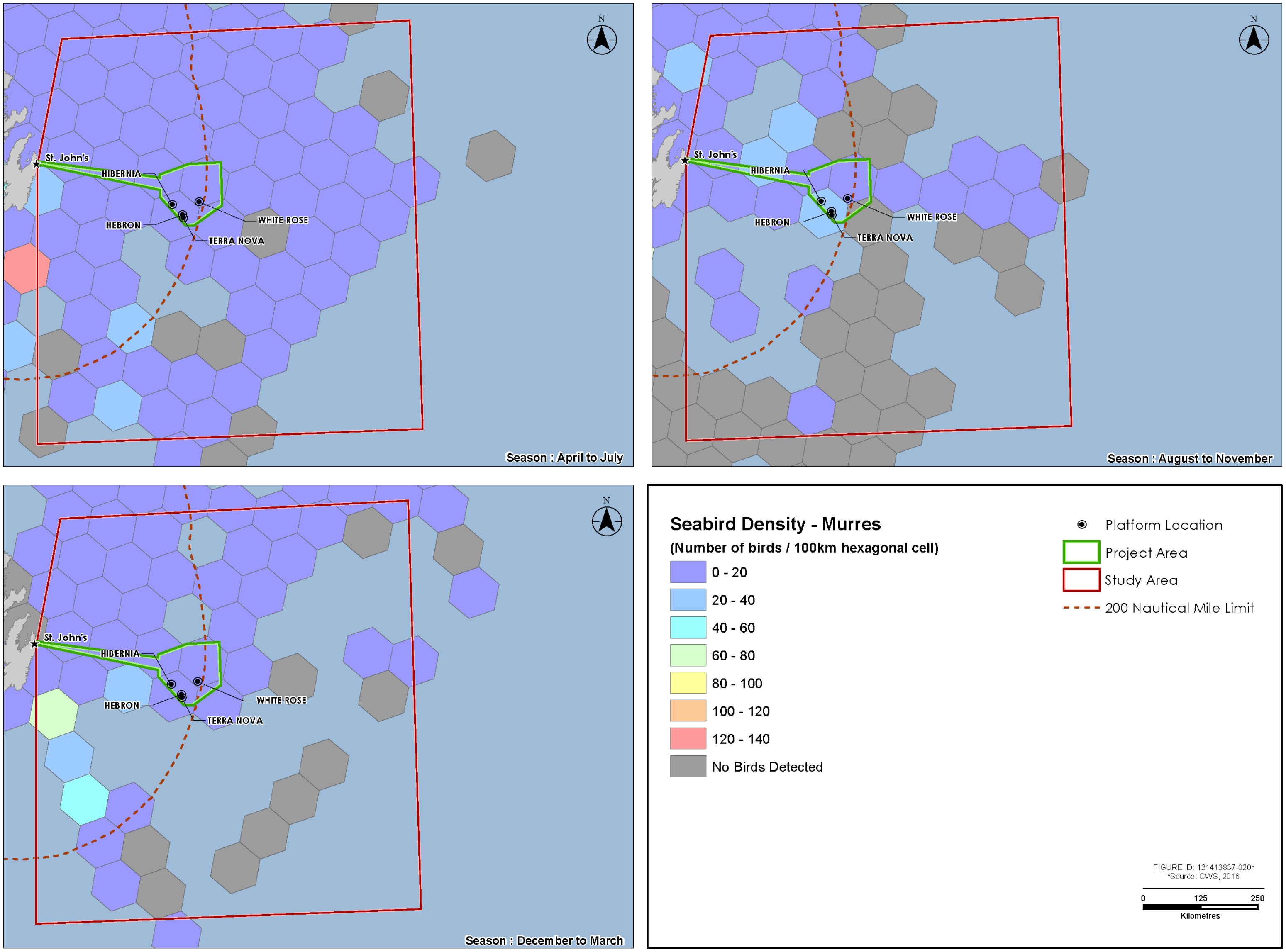

Figure 9 Murre Density

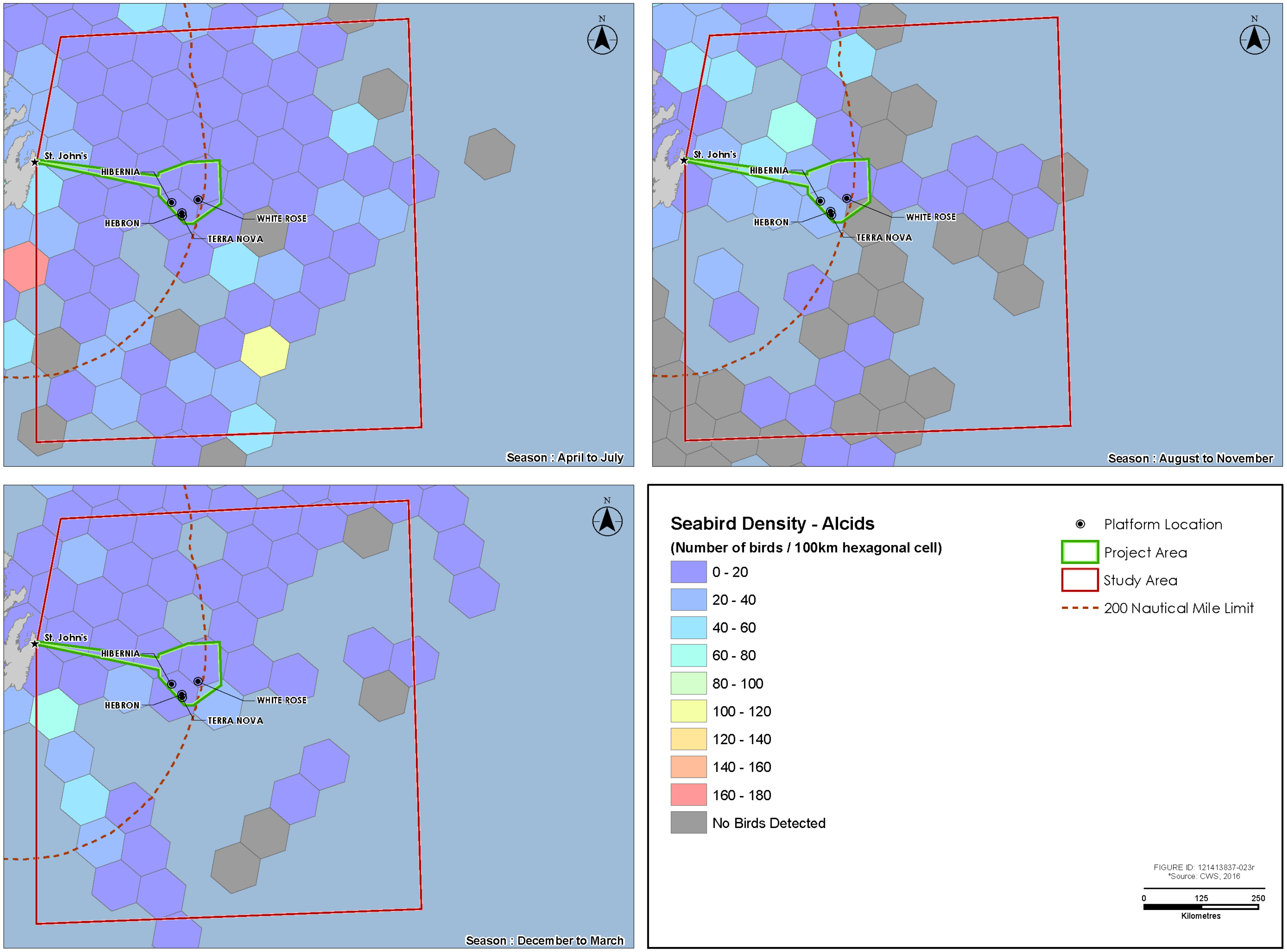

Figure 10 Other Alcids Density

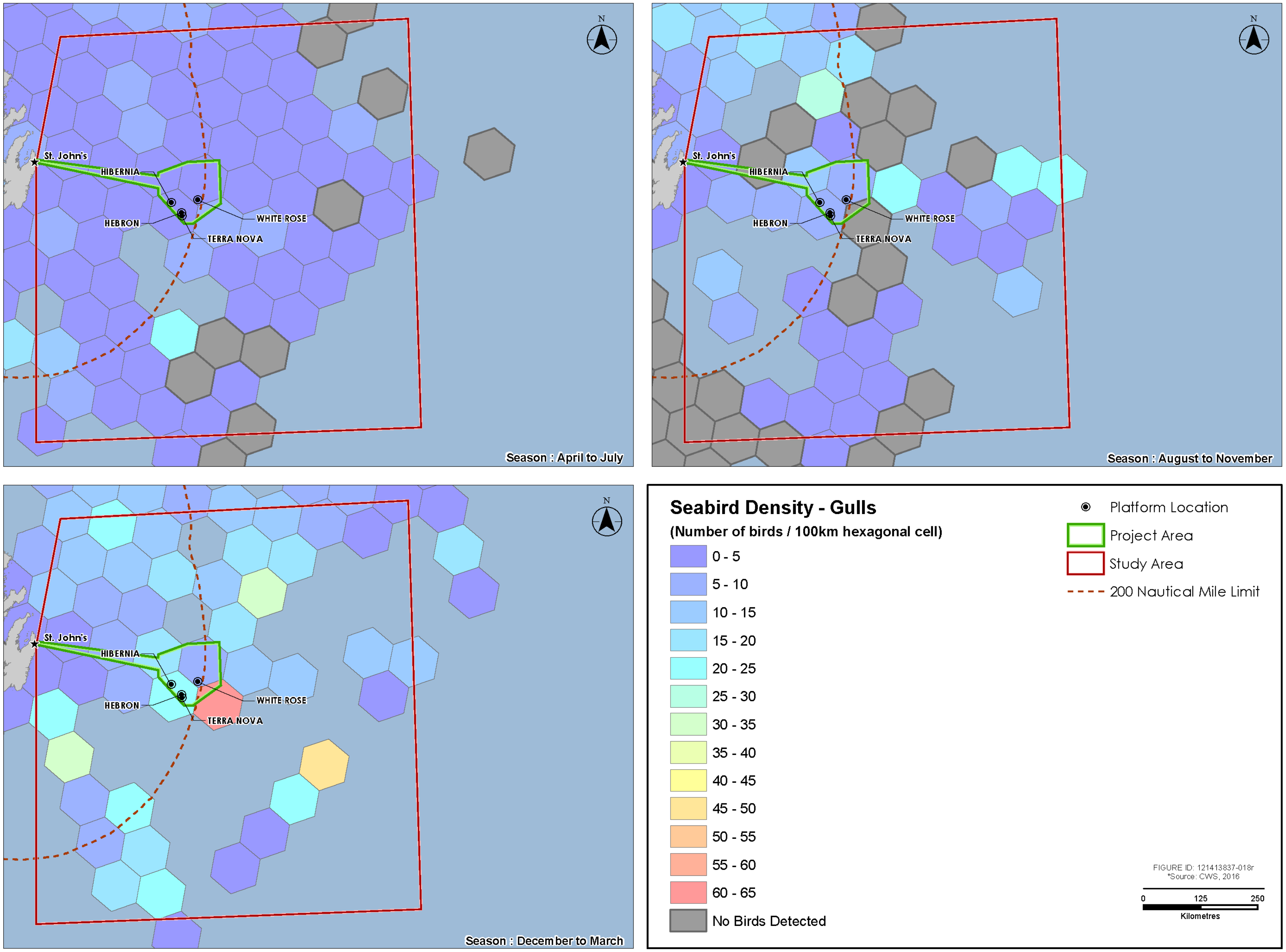

Figure 11 Gull Density

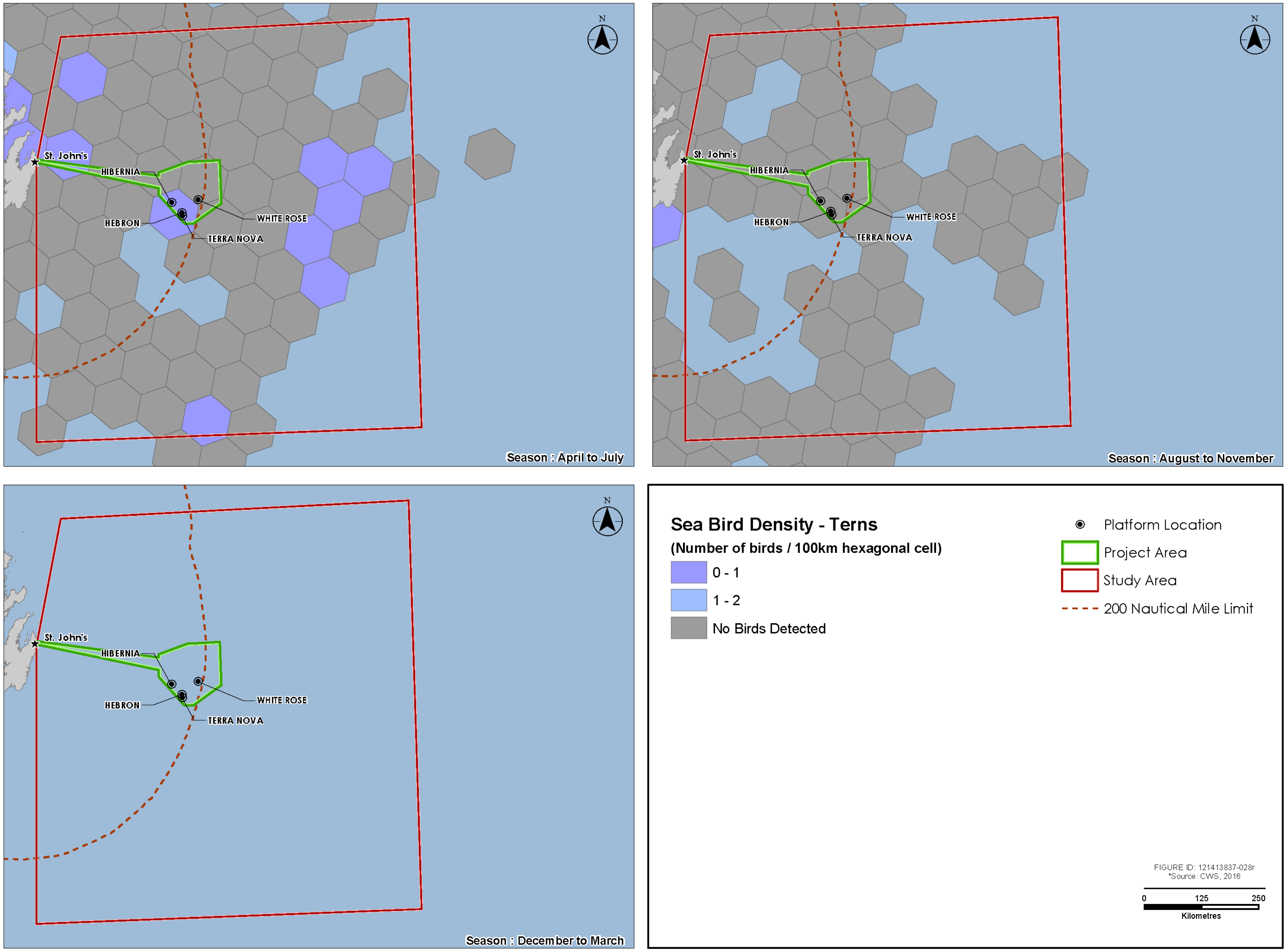

Figure 12 Tern Density

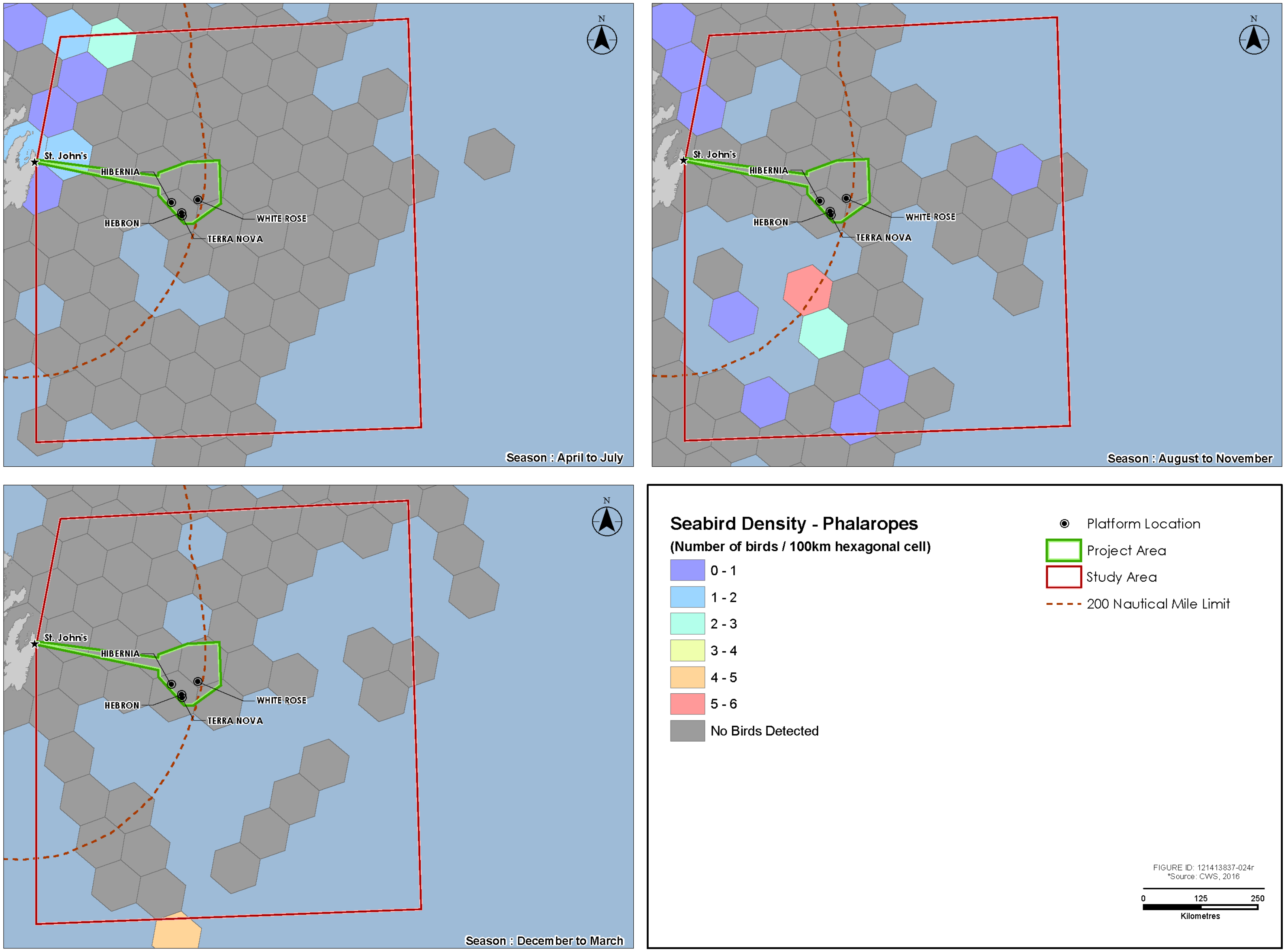

Figure 13 Phalarope Density

1.2 SPECIAL AREAS

1.2.1 Information Requirement: IR-52

Reference to EIS:

Section 4.2.9 Special Areas; Section 6.5.8 Summary of Existing Conditions for Special Areas

Context and Rationale

The EIS provides information on a total of 24 special areas that may occur in the study area. The Agency and Fisheries and Oceans Canada noted that several special areas that have been updated (e.g. governing bodies have revised the boundaries) are not identified and that some information presented is incorrect, therefore requiring clarification and revision including:

- areas closed to lobster fishing as conditions of fishing licenses, Marine Refuges, and Ecologically and Biologically Significant Areas within the Placentia Bay/Grand Banks Large Ocean Management Area have been updated but the EIS does not include these updates;
- additional Ecologically and Biologically Significant Areas identified by the Conference of the Parties to the Convention on Biological Diversity located outside Canada's Exclusive Economic Zone in the Northwest Atlantic, some of which overlap the Project and study area, are not included (https://www.cbd.int/ebsa/);
- special areas identified as important to marine birds, including nearshore areas (e.g. Eastern Avalon Ecologically and Biologically Significant Area and Baccalieu Island) and offshore areas (e.g. Seabird Foraging Zone in the Southern Labrador Sea Ecologically and Biologically Significant Area), have not been included;
- the location of canyons identified by NAFO (see Section 4.2.9.2.1 Canyons) in an updated figure;
- the statement in section 4.2.9.4 that "there are five marine refuges within the Newfoundland and Labrador Shelves bioregion…" is incorrect; there are ten, including four Lobster Closures and the Hatton Basin Conservation Area (refer to: http://www.dfo-mpo.gc.ca/oceans/oeabcm-amcepz/refuges/index-eng.html); and
- the Bonavista Cod Box is not a coral and sponge closure and should be removed.

In addition, the Agency and Fisheries and Oceans Canada note the following discrepancies:

- Figure 4-34 indicates that the Orphan Spur Ecologically and Biologically Significant Area is located in the study area, however it is not listed as one of the five Ecologically and Biologically Sensitive Areas in the study area in Section 4.2.9.1. Additionally, the Southwest Shelf Edge and Slope Ecologically and Biologically Sensitive Area is listed as within the study area in Section 4.2.9.1, however there is no overlap illustrated in Figure 4-34;
- Section 4.2.9.2.2 of the EIS states that the Beothuk Knoll is in the project area but the corresponding figure (Figure 4-34) shows it as being located in the study area. The EIS also states the "Beothuk Knoll, located southwest of Flemish Cap and approximately 60 km from the nearest EL occupies 183 km² of the project area (Figure 4-34)." Figure 4-34 also shows this special area as being in the study area and not the project area. Table 6.24 lists Beothuk Knoll as being in the study area and a certain distance from the project area. It is not clear whether the Beothuk Knoll is located in the project area; and
- NAFO closures listed in Table 6.24 of the EIS, including Vulnerable Marine Ecosystems, do not align with the description given in section 4.2.9.2 Vulnerable Marine Ecosystems.

Specific Question of Information Requirement

Provide a comprehensive table and related figures with appropriate resolution that identify all special areas by type (e.g. Ecologically and Biologically Significant Areas identified by the Conference of the Parties to the Convention of Biological Diversity, Marine Refuges, Snow Crab Stewardship Exclusion Zones, Preliminary Representative Marine Areas, Canyons identified by NAFO, etc.) that could be affected by the Project. Include information on the distance from special areas to ELs and terminus of the transit route. The table and related figures should include the following:

- all special areas that occur within the study area including those previously not identified in the EIS;
- special areas that are identified in the EIS but have been updated;
- special areas important to marine birds;
- clarification of whether Orphan Spur and Southwest Shelf Edge and Slope Ecologically and Biologically Significant Areas are located in the study area;
- canyons identified by NAFO;
- clarification of whether the Beothuk Knoll Vulnerable Marine Ecosystem is located in and overlapping with the study area;
- the number of marine refuges in the Newfoundland and Labrador Shelves bioregion and what they are;
- removal of the Bonavista Cod Box as a coral and sponge closure area; and
- NAFO closures including Vulnerable Marine Ecosystems.

With respect to special areas that have not been included in the EIS or have been revised, provide a description, conduct an assessment of potential effects, proposed mitigation and follow-up, for routine activities and potential accidental events.

Response

Special areas that are found within the Study Area are presented below in Table 1 and depicted in Figure 1.

Since the November 2018 submission of the EIS, several types of special areas in the Newfoundland and Labrador offshore have been identified or revised. These included Ecologically and Biologically Significant Areas (EBSAs) identified by the United Nations Convention on Biological Diversity (CBD) outside of Canada's Exclusive Economic Zone (EEZ) and Snow Crab Exclusion Zones. There have also been draft revisions to EBSAs identified by Fisheries and Oceans Canada (DFO) within the EEZ. These updates are discussed below.

Table 1 Special Areas within the Study Area and their Proximity to the Project Area and Project ELs

Special Area Name	Special Area Type	Nearest Distance (km)		Inclusion in EIS	EIS Section
		Project ELs	Project Area[1]		
Slopes of the Flemish Cap and Grand Bank	CBD EBSA	27	7	New	-
Seabird Foraging Zone in the Southern Labrador Sea	CBD EBSA	263	232	New	-
Orphan Knoll	CBD EBSA	311	282	New	-
Southeast Shoal and Adjacent Areas on the Grand Bank	CBD EBSA	199	177	New	
Northeast Shelf and Slope	DFO EBSA	Within	Within	Included in EIS	4.2.9.1.3
Virgin Rocks	DFO EBSA	87	41	Included in EIS	4.2.9.1.5
Lilly Canyon - Carson Canyon	DFO EBSA	109	87	Included in EIS	4.2.9.1.4
Southeast Shoal and Tail of the Banks	DFO EBSA	177	155	Included in EIS	4.2.9.1.1
Orphan Spur	DFO EBSA	240	209	Omitted in EIS - described below	-
Eastern Avalon	DFO EBSA	283	Within	Omitted in EIS – described below	-
Southwest Shelf Edge and Slope	DFO EBSA	406	294	Included in EIS	4.2.9.1.2
Northeast Newfoundland Slope	Marine Refuge	83	63	Included in EIS	4.2.9.4 (Table 4.37)
Division 3O Coral (area inside the 200 mile EEZ)	Marine Refuge	439	333	Included in EIS	4.2.9.4 (Table 4.37)
Flemish Pass / Eastern Canyon	NAFO Closure Area	47	23	Included in EIS	4.2.9.3 (Table 4.36)
Northwest Flemish Cap	NAFO Closure Area	87	65	Included in EIS	4.2.9.3 (Table 4.36)
Northwest Flemish Cap	NAFO Closure Area	108	78	Included in EIS	4.2.9.3 (Table 4.36)
Northwest Flemish Cap	NAFO Closure Area	161	129	Included in EIS	4.2.9.3 (Table 4.36)
Sackville Spur	NAFO Closure Area	133	100	Included in EIS	4.2.9.3 (Table 4.36)
Beothuk Knoll	NAFO Closure Area	140	107	Included in EIS	4.2.9.3 (Table 4.36)
Beothuk Knoll	NAFO Closure Area	144	112	Included in EIS	4.2.9.3 (Table 4.36)
Northern Flemish Cap	NAFO Closure Area	196	164	Included in EIS	4.2.9.3 (Table 4.36)
Northern Flemish Cap	NAFO Closure Area	207	176	Included in EIS	4.2.9.3 (Table 4.36)
Northern Flemish Cap	NAFO Closure Area	222	190	Included in EIS	4.2.9.3 (Table 4.36)
Tail of the Bank	NAFO Closure Area	242	220	Included in EIS	4.2.9.3 (Table 4.36)

Table 1 Special Areas within the Study Area and their Proximity to the Project Area and Project ELs

Special Area Name	Special Area Type	Nearest Distance (km)		Inclusion in EIS	EIS Section
		Project ELs	Project Area[1]		
Eastern Flemish Cap	NAFO Closure Area	272	247	Included in EIS	4.2.9.3 (Table 4.36)
Eastern Flemish Cap	NAFO Closure Area	274	252	Included in EIS	4.2.9.3 (Table 4.36)
Northeast Flemish Cap	NAFO Closure Area	274	244	Included in EIS	4.2.9.3 (Table 4.36)
Orphan Knoll	NAFO Closure Area	300	275	Included in EIS	4.2.9.3 (Table 4.36)
Newfoundland Seamounts	NAFO Closure Area	302	284	Included in EIS	4.2.9.3 (Table 4.36)
3O Coral Closure	NAFO Closure Area	439	333	Included in EIS	4.2.9.3 (Table 4.36)
Steep Flanks	NAFO Closure Area	224	194	New	
South of Flemish Cap	NAFO Closure Area	169	136	New	
Tail of Grand Banks Spawning Grounds	NAFO Closure Area	246	223	New	
Fogo Seamounts	NAFO Closure Area	558	534	New	
8X Exclusion Zone	Snow Crab Exclusion Zone	Within	Within	New	-
6C Exclusion Zone	Snow Crab Exclusion Zone	242	Within	New	-
6B Exclusion Zone	Snow Crab Exclusion Zone	261	26	New	-
8A Exclusion Zone	Snow Crab Exclusion Zone	262	64	New	-

1 The shortest distance from the boundary of the Special Area to the Project Area represents the distance to the 'terminus of the transit route"
CBD = Convention on Biological Diversity
DFO = Fisheries and Oceans Canada
EBSA = Ecologically and Biological Significant Area
NAFO = Northwest Atlantic Fisheries Organization

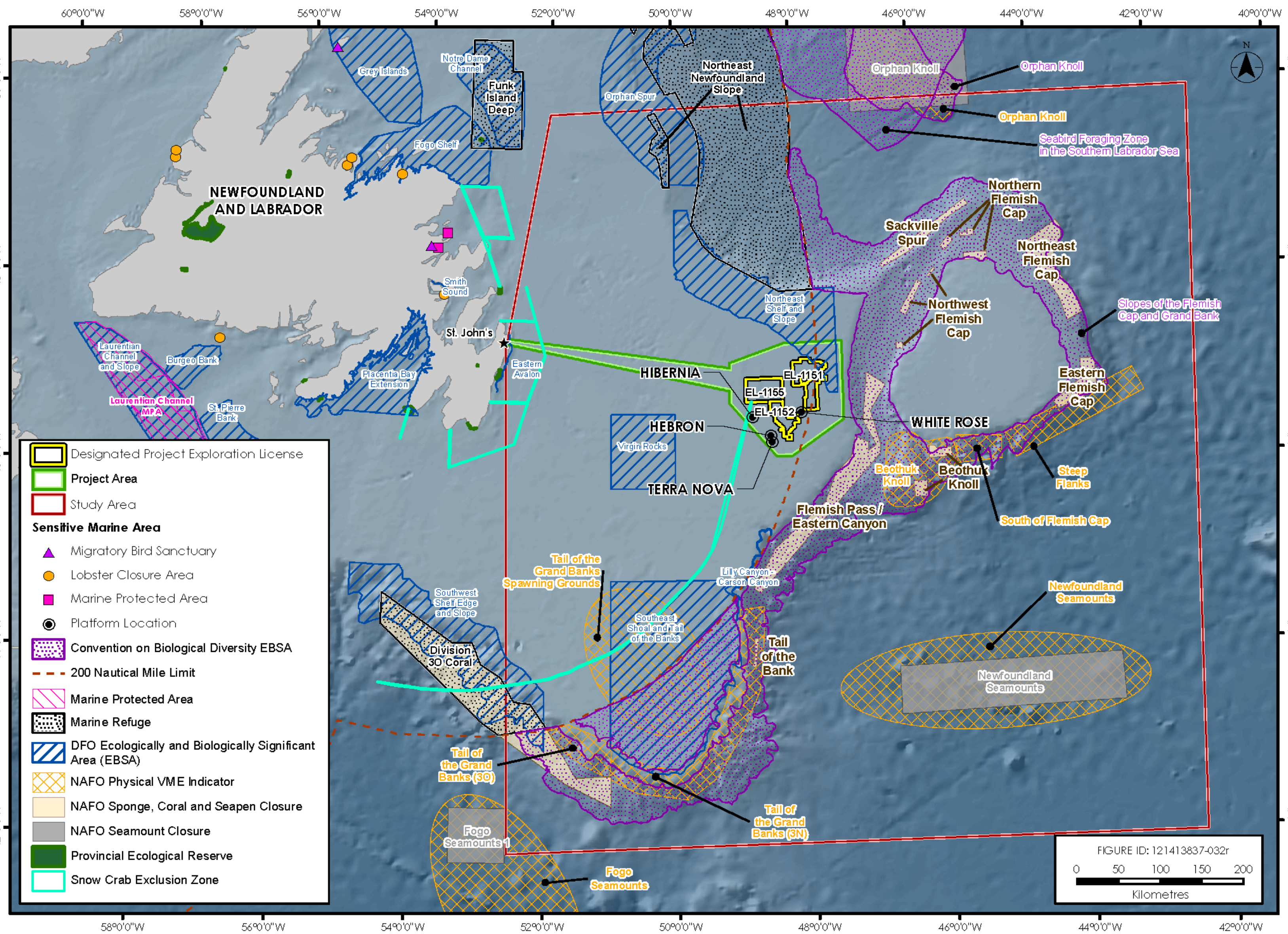

Figure 1 Special Areas in Proximity to the Project

Newly Identified Special Areas

UN Convention on Biological Diversity EBSAs

In 1992 Canada ratified the CBD. The CBD is an important step towards conservation of global biodiversity. Identified EBSAs under the CBD include ocean habitat areas of eastern Newfoundland and Labrador (CBD 2017) (Table 2). The Project Area overlaps with the Seabird Foraging Zone in the Southern Labrador Sea and Slopes of the Flemish Cap and Grand Bank CBD EBSAs. The vessel traffic routes overlap with the Slopes of the Flemish Cap and Grand Bank CBD EBSA.

Table 2 Convention on Biological Diversity EBSAs

EBSA	Rationale for Identification/Designation	Area
Labrador Sea Deep Convection Area	The only Northwest Atlantic site where winter convection exchanges surface and deep ocean waters. Provides mid-water overwintering refuge for pre-adult *Calanus finmarchicus*, a key species for zooplankton populations of the Labrador Shelf and downstream areas. Annual variability in convection results in significant yearly change through ecosystems of the Northwest Atlantic.	Approximately 43,278 km². Not a fixed geographic area but delineated annually by physical oceanographic properties
Seabird Foraging Zone in the Southern Labrador Sea	Supports globally important populations of marine vertebrates, including an estimated 40 million seabirds annually. Important foraging habitat for seabirds, including 20 populations of over-wintering black-legged kittiwakes (*Rissa tridactyla*), thick-billed murres (*Uria lombia*) and breeding Leach's storm-petrels (*Oceanodroma leucorhoa*). Encompasses the pelagic zone of the Orphan Basin, continental shelf, slope and offshore waters inside and outside the Canadian EEZ.	152,841 km²
Orphan Knoll	Seamounts typically support endemic populations and unique faunal assemblages. This seamount is an island of hard substratum with uniquely complex habitats that rise from the seafloor of the surrounding deep, soft sediments of the Orphan Basin. Although close to the adjacent continental slopes, Orphan Knoll is much deeper and appears to have distinctive fauna. Fragile and long-lived corals and sponges have been observed and a Taylor Cone circulation provides a mechanism for retention of larvae.	12,742 km²
Slopes of the Flemish Cap and Grand Bank	Contains most of the aggregations of indicator species for VMEs in the NAFO Regulatory Area. Includes NAFO closures to protect corals and sponges and a component of Greenland halibut fishery grounds in international waters. A high diversity of marine taxa, including threatened and listed species, are found within the EBSA.	87,817 km²
Southeast Shoal and Adjacent Areas on the Grand Bank	The Southeast Shoal and Adjacent Areas on the Grand Banks is a productive ecosystem based around an ancient beach relic. This area is characterized by a shallow habitat that provides a unique offshore capelin-spawning ground. Other species that spawn in the area include striped wolffish, Atlantic cod and American plaice; yellowtail flounder use the area as a nursery ground. The area supports populations of wedge clams and blue mussels. The presence of these various fish species creates an important feeding area for humpback and fin whales and seabirds.	16,334 km²
Source: CBD 2017		

Snow Crab Exclusion Areas

Areas closed to snow crab fishing have been established through consultation using a co-management approach with fleet committees in various crab management areas, known as the Snow Crab Stewardship. Snow crab exclusion zones of 0.5 or 1 nm-wide corridors have been identified extending along portions of Crab Fishing Area boundaries. These exclusion zones were established to improve delineation between adjacent Crab Management Areas and to establish no fishing / crab refuge corridors for resource conservation (DFO 2017). The exclusion areas have been included on Figure 1. Table 3 indicates whether the snow crab exclusion zone is located within the Study Area or Project Area.

Table 3 Snow Crab Exclusion Zones and their Presence in the Study Area or Project Area

Exclusion Zone	Overlaps Project Area	Overlaps Study Area
6A Exclusion Zone (Trinity Bay)	No	No
6B Exclusion Zone (Conception Bay)	No	Yes
6C Exclusion Zone (Eastern Avalon)	Yes	Yes
8A Exclusion Zone	No	Yes
5A Exclusion Zone	No	No
9A Exclusion Zone	No	No
8 Bx Exclusion Zone (Offshore)	Yes	Yes

NAFO Physical VME Indicator

NAFO Identified several vulnerable marine ecosystem (VME) physical indicator elements that are located outside the Canadian EEZ in international waters along the Newfoundland and Labrador shelves region, including the Grand Banks and Flemish Cap. These VME physical indicator elements are generalized areas often identified by the colloquial name of the bathymetric feature that they fall within and include locations of seamounts, canyons, knolls, spawning grounds, and steep flanks (Table 4). Those not previously discussed in the EIS as identified in Figure 1 are: Steep Flanks, South of Flemish Cap, Tail of Grand Banks Spawning Grounds, and Fogo Seamounts.

Table 4 VME Physical Indicator Elements

Physical Indicator Element	Representative VME
Seamounts	Fogo Seamounts (Divisions 3O, 4Vs) Newfoundland Seamounts (Division 3MN) Corner Rise Seamounts (Division 6GH) New England Seamounts (Division 6EF)
Canyons	Shelf-indenting canyon; Tail of the Grand Bank (Division 3N) Canyons with head >400 m depth; South of Flemish Cap and Tail of the Grand Bank (Division 3MN) Canyons with heads >200 m depth; Tail of the Grand Bank (Division 3O)
Knolls	Orphan Knoll (Division 3K) Beothuk Knoll (Division 3 LMN)
Southeast Shoal	Tail of the Grand Bank Spawning grounds (Division 3N)
Steep flanks >6.4°	South and Southeast of Flemish Cap (Division 3LM)

Revised Special Areas

In 2015, DFO undertook a process to re-evaluate the Placentia Bay / Grand Banks Large Ocean Management Area (PB / GB LOMA [now known as an integrated management area, or IMA]) EBSAs to align with the rest of the Newfoundland and Labrador Shelves Bioregion EBSAs. The 2017 revised PB / GB IMA EBSA areas have not yet been released publicly (DFO, pers. comm. 2019).

Based on available information, the existing PB / GB IMA EBSAs have generally increased in area, five new EBSAs have been delineated, two areas are no longer listed as EBSAs and the total combined EBSA area has been increased by 26% (Table 5). The Southeast Shoal EBSA has been reduced in area as a large portion was outside of the EEZ prior to the refinement exercise. Portions of the Northeast Slope and the Lilly Canyon-Carson Canyon EBSAs, beyond the EEZ, are now also considered to be outside of DFO EBSA boundaries, although the overall size of these EBSAs have been increased within the EEZ. Detailed descriptive information is not yet available for the following newly identified EBSAs: Haddock Channel Sponges, South Coast, St. Mary's Bay, Bonavista Bay and Baccalieu Island.

Table 5 Revised EBSAs in the PB/GB IMA

EBSA	Approximate Delineated Area (km²)	
	2007	2017 (Draft)
Northeast Slope (currently Northeast Shelf and Slope)	13,885	19,731
Virgin Rocks	6,843	7,294
Lilly Canyon-Carson Canyon	1,145	2,180
Southeast Shoal (currently Southeast Shoal and Tail of the Banks)	30,935	15,402
Eastern Avalon	1,683	5,948
Southwest Slope	16,644	25,181
Smith Sound	148	547
Placentia Bay	7,693	13,539
Laurentian Channel	17,140	19,545
Haddock Channel Sponges	N/A	490
South Coast	N/A	6,876
St. Mary's Bay	N/A	3,989
Bonavista Bay	N/A	3,141
Baccalieu Island	N/A	6,922

Of the five new EBSAs, only Baccalieu Island EBSA occurs within the Study Area. Important areas for sea ducks and almost half of all Newfoundland and Labrador tern colonies are found in this EBSA. Throughout this EBSA, there are important areas for capelin spawning along beaches and large patches of eelgrass are present. The area around Newman Sound is an important nursery area for demersal fishes.

Clarifications and Corrections

Clarifications on specific special areas within the Study Area as identified above in the IR question are outlined in the following sections.

NAFO Canyons

The canyons discussed in Section 4.2.9.2.1 of the EIS are contained within the VME physical indicator elements (see Table 4), as identified on Figure 1: Tail of the Grand Bank (3N), South of Flemish Cap, and Tail of the Grand Bank (3O).

Marine Refuges and Lobster Closure Areas

Section 4.2.9.4 of the EIS states that: “there are five marine refuges within the Newfoundland and Labrador Shelves bioregion”. As Lobster Closure Areas are identified as marine refuges, there are actually 10 marine refuges in the bioregion: six Marine Refuge Areas (Division 3O Coral Area, Funk Island Deep Closure, Hopedale Saddle Closure, Hatton Basin Closure, Hawke Channel, and Northeast Newfoundland Slope Closure); and four Lobster Closure Areas (Gander Bay, Gooseberry Island, Glover’s Harbour, and Mouse Island). As indicated in Table 1 and Figure 1, only the Division 3O Coral Area and Northeast Newfoundland Slope Closure marine refuges are within the Study Area.

Bonavista Cod Box

There is no mention of the Bonavista Cod Box in the Special Areas section of the EIS. It is an historic experimental closure area and is not currently recognized as a formal protected area.

Beothuk Knoll

Beothuk Knoll (refer to Section 4.2.9.2.2 of the EIS) is located within the Study Area, not the Project Area (see Figure 1).

Eastern Avalon EBSA

Eastern Avalon EBSA is labelled on Figure 4-34 of the EIS (and included on Figure 1 within this IR response) but a description was omitted from the EIS. The Eastern Avalon is an important foraging area for many breeding marine bird species from spring to fall. Cetaceans, leatherback turtles, and seals also feed in the area from spring to fall. As noted in Table 4, the boundaries of this EBSA have been recently expanded by DFO.

Orphan Spur EBSA

The Orphan Spur EBSA is within the Study Area and was labelled on Figure 4-34 of the EIS (and included on Figure 1 within this IR response) but a description was omitted from the EIS. The Orphan Spur EBSA comprises an area that extends along the Labrador Slope around the Orphan Basin. A portion of this EBSA overlaps with the Study Area and is approximately 210 km from the Project Area. Water depths within this EBSA range from approximately 400 m to 2,000 m (Wells et al. 2017). The rationale for the designation of this EBSA is primarily due to high concentrations of corals, and densities of sharks and species of conservation concern (e.g., northern, spotted, and striped wolffish, skates, roundnose grenadier, American plaice, redfish). Marine birds, such as murre, storm-petrels, black-legged kittiwake, gulls, skuas and jaegers, northern fulmar, shearwaters, and dovekies have been known to be present in the area. Hooded seals can inhabit the area from August to September, while harp seals are known to feed during the winter (Wells et al. 2017).

Southwest Shelf Edge and Slope

The Southwest Shelf Edge and Slope EBSA, described in Section 4.2.9.1.2 of the EIS, overlaps with the Study Area, not the Project Area.

Assessment of Environmental Effects of Additional Special Areas

As evidenced by the descriptions in Section 4.2.9 of the EIS and the descriptions presented within this response, the defining features of various marine special areas include the presence of species and sensitive habitats for marine fish and marine and migratory birds (in some cases also marine mammals and sea turtles). Effects on these biological components from Project activities (e.g., due to underwater sound, light emissions, or drilling discharges) can therefore potentially change the quality of habitat of special areas.

The assessment of environmental effects for those additional special areas not previously discussed in the EIS are an extension of the assessment of environmental effects presented in Section 6.5 of the EIS. Of the three new CBD EBSAs identified within the Study Area, routine Project activities are only likely to potentially affect the Slopes of the Flemish Cap and Grand Bank EBSA given its proximity to the Project Area (refer to Table 1). Offshore supply vessels will transit through the Eastern Avalon EBSA, potentially resulting in underwater and atmospheric sound emissions and physical disturbance to birds, marine mammals and sea turtles which may be present in the EBSA. Project activities are not predicted to affect the quality of habitat of Snow Crab Exclusion Zones that overlap the Project Area to the extent that resource conservation in these areas would be adversely affected.

As acknowledged in Section 6.5.10.2 of the EIS, mitigation measures implemented to reduce adverse environmental effects on biological components are also applicable to special areas (including those special areas not previously identified in the EIS). Applicable mitigation measures for special areas is presented below:

- Lighting on the MODU is designed to comply with requirements stipulated in the *Petroleum Occupational Safety and Health Regulations* to provide safe operations. There is no extraneous lighting.
- All chemicals used will be screened as per the Offshore Chemical Selection Guidelines (National Energy Board [NEB] et al. 2009) and Husky's chemical management system and chemical screening program.
- Routine discharges from the MODU will be in accordance with the Offshore Waste Treatment Guidelines (OWTG) (NEB et al. 2010) and the C-NLOPB-approved Environmental Protection Plan (EPP). Discharges from vessels will be in accordance with the Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals under the *Canada Shipping Act, 2001* and the International Convention for the Prevention of Pollution from Ships (MARPOL).
    - Sewage will be macerated to a particle size of <6 mm and discharged as per the OWTG. − Waste discharges not meeting EPP requirements and domestic garbage will be transported to shore for disposal or recycled. Garbage is segregated as required and in compliance with waste disposal requirement and Husky Waste Management Plan.
    - Concentration of SBM on cuttings will be monitored on the MODU for compliance with the EPP.
    - All foreign vessels operating in Canadian jurisdiction must comply with the *Ballast Water Control and Management Regulations* of the *Canada Shipping Act, 2001* during ballasting and de-ballasting activities.
- Vertical seismic profiling activity will be conducted in consideration of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP) (DFO 2007), according to Husky Procedure EC-M-99-X-PR-00121-001 Vertical Seismic Profiles and Well Site Surveys - Environmental Requirements.

- The frequency and duration of flaring events will continue to be restricted to the amount necessary to characterize the well potential (drill stem test (DST)) and as required to maintain safe operations. Flaring will occur in accordance with the Drilling and Production Guidelines (C-NLOPB and CNSOPB 2017), which requires a DST not begin at night. A high pressure spray of seawater between the MODU and the flare is routinely used as a heat dissipating curtain, which will also act as a deterrent to seabirds in the area.
- Routine checks for stranded birds will continue to be conducted on the MODU and OSVs and appropriate procedures for release will be implemented. If stranded birds are found during inspections, they will be handled using the protocol outlined in Best Practices for Stranded Birds Encountered Offshore Atlantic Canada (Environment Canada 2015) and the Leach's Storm Petrel: General Information and Handling Instructions (Williams and Chardine 1999), including obtaining the associated permit from the Canadian Wildlife Service (CWS). Activities will comply with the requirements for documenting and reporting any stranded birds (or bird mortalities) to CWS during the drilling program.
- Project-related vessel traffic will avoid concentrations of marine mammals and sea turtles whenever possible. Vessels will maintain a steady course and safe vessel speed whenever possible, as sudden changes in these factors are known to increase behavioural effects in marine mammals. Helicopters will typically only reduce altitude on approach for landing.
- Mechanical means of wellhead severance will be preferential; should blasting be required to sever the wellhead, shape charges will be set below the sediment surface, minimizing the amount of explosive used.

With the implementation of proposed mitigation measures, the Project is not anticipated to result in significant adverse effects on marine fish, birds, mammals, sea turtles, species at risk or their habitats, nor is it predicted to result in significant adverse effects in locations that are designated as special areas (including special areas identified above which were not previously discussed in the EIS).

References

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DFO (Fisheries and Oceans Canada). 2017. Integrated Fisheries Management Plan, Snow Crab (*Chionoecetes opilio*) - Newfoundland and Labrador Region Effective February 6, 2015. Available at: http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/snow-crab-neige/snow-crab-neiges2009-eng.htm

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1.3 COMMERCIAL FISHERIES

1.3.1 Information Requirement: IR-67

Reference to EIS:

Section 6.2.10.3.1.5 Well Abandonment

Context and Rationale

Section 2.5.5 (Decommissioning and Abandonment) of the EIS indicates that following drilling, wells may be suspended or abandoned. If suspended, the suspension cap protrudes above the seabed.

Section 6.2.10.3.1.5 of the EIS discusses wellhead abandonment, and the potential effects on commercial fisheries, however there is no discussion on the potential effects on commercial fisheries if the well is suspended.

Specific Question of Information Requirement

Discuss the potential effects of a suspended wellhead on commercial fisheries, as well as any mitigation measures that may be implemented to minimize effects.

Response

Once wells are drilled, they are temporarily suspended or permanently abandoned as per the *Newfoundland Offshore Petroleum Drilling and Production Regulations* (Government of Canada 2014) and in compliance with the requirements of the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB). A well may be temporarily suspended if there is a perceived requirement for well testing or further evaluation at a later period in the project schedule. An operator of a well must submit a Notification to Suspend / Abandon (C-NLOPB 2016) to the C-NLOPB, as well as detailed plans for monitoring suspended wells and information regarding the methods used to suspend or abandon a well so that they are adequately isolated to prevent the release of hydrocarbons into the environment. The C-NLOPB must provide approval for the planned “as-left” condition before the drilling rig can move off the well.

A suspended well would have wellhead infrastructure protruding from the seabed (approximately 1 m^2 on the seafloor and approximately 5 m high), which could potentially present a snagging hazard to fisheries activities potentially resulting in gear loss or damage, depending on the water depth of the well location and types of fisheries occurring in the area. Depending on the fishing gear (e.g., bottom trawl), superficial damage could occur to the wellhead infrastructure as a result of contact by fishing gear. However, this would not compromise the integrity of the well or result in the release of hydrocarbons into the environment given that the well would be plugged to isolate hydrocarbons within the wellbore below the seabed. The locations of suspended wells are communicated to appropriate authorities, commercial fishers and other ocean users through Notices to Shipping and Notices to Mariners. Fishers are then likely to avoid the area to reduce risk of interaction with well infrastructure, therefore a more likely adverse effect on commercial fisheries due to well suspension relates to a temporary and localized loss of access to fisheries resources in the vicinity of the suspended well. Although there is no regulated safety (exclusion) zone around a suspended well, fishers will exercise precaution and reduce use of mobile gear in the area. The majority of bottom trawl fishing which is the type of fishing to be most impacted in this situation, occurs north of the Project Area (EIS Figure 4-43). No effect is predicted to occur to fixed gear fishing activities.

Husky is not aware of any specific concerns raised by fishing industry participants (during consultation and engagement related specifically to this or other Projects) related to notifications about wellheads temporarily left in place.

References

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2016. Notification to Abandon / Suspend. Available online: http://www.cnlopb.ca/pdfs/forms/notif_ab_sus.doc. Accessed April 2018.

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1.4 ACCIDENTS AND MALFUNCTIONS – DESCRIPTIONS, BLOWOUTS

1.4.1 Information Requirement: IR-73

Reference to EIS:

Section 7.2.1 Oil Spill Risk and Probabilities

Context and Rationale

Section 7.2.1 of the EIS, includes a categorization of hydrocarbon spill sizes in Table 7.2, defined as:

- extremely large – greater than 23,850 cubic metres
- very large – greater than 1,590 cubic metres
- large – greater than 159 cubic metres
- small – less than 0.159 cubic metres.

However, the EIS does not discuss the sources and causes of large spills.

Specific Question of Information Requirement

With respect to large spills as defined in the EIS, discuss the following:

- the sources and causes of large spills, based on records for Atlantic Canada; and
- the plausible worst-case scenario release volume for each of crude oil, hydraulic oil, diesel and formation fluids, and mixed oil.

Response

Categories of spill size are often used in environmental assessments and risk assessments to help provide context and facilitate discussion of spill statistics. However, there is not one standard spill classification system that is used universally in these discussions. The spill classification system presented in Section 7.2.1 of the EIS is generally consistent with spill categories defined by the United States Bureau of Safety and Environmental Enforcement (BSEE). The BSEE considers a "large" hydrocarbon spill as a spill greater than 1000 bbl and a "small" hydrocarbon spill as a spill less than 1000 bbl (e.g., see ABS Consulting Inc 2016). Table 7.2 from the EIS has been updated accordingly (Table 1). However, as noted below, to be able to provide more granularity to small spill statistics, sometimes subcategories are used (e.g., 50 to 999 bbl; 1 to 49 bbl; 1 L to 1 bbl).

The discussion of spill statistics in Section 7.2.1.1 and 7.2.1.2 of the EIS focuses on extremely large and very large spills (well blowout events). Section 7.2.1.3 of the EIS presents spill statistics from the C-NLOPB for what is generally classified as small and medium platform spills. Although the spill category classifications used in these discussions may be arbitrary, they are generally used to help provide context around the discussion of frequency and probability of spills. The C-NLOPB does not present spill data by spill size classifications, nor are these spill size classifications used by industry or government in spill response planning (C-NLOPB 2019a, 2019b).

Table 1 EIS Table 7.2: (Updated) Classification of Hydrocarbon Spill Sizes

Spill Size	m^3	L	bbl
Extremely Large	>23,850	>2,385,000	>150,000
Very Large	>1,590	>1,590,000	>10,000
Large	>159	>159,000	>1,000
Small	<0.159 – 159	159-159,000	1-999
(1) The top three categories are cumulative; for example, the large spill category (>1,000 bbl) includes the very large and extremely large spills, and the very large category includes extremely large spills. For the small category, more detailed statistics are available, and a further breakdown is made with discrete size ranges, specifically: 50 to 999 bbl; 1 to 49 bbl; 1 L to 1 bbl (159 L); and less than 1 L (2) The petroleum industry usually uses the oil volume unit of petroleum barrel (bbl), which is different than a US bbl and a British bbl. There are 6.29 bbl in 1 m^3 and there are approximately 7.5 bbl per tonne. Most spill statistics used here are taken from publications that use the oil volume units of bbl, and bbl are used in the subsequent statistical analysis. The statistics relating to small spills uses litres (L); 1 bbl = 159 L.			

Adopting these classifications shown above in Table 1, the only “large” spill on record for Atlantic Canada was the accidental release of approximately 250,000 L of oil from a subsea flowline to the South West Rose Drill Centre which occurred on November 16, 2018 from production operations. There have been no other “large” spills on record by the C-NLOPB or the Canada-Nova Scotia Offshore Petroleum Board occurring as a result of exploration or production activities in Atlantic Canada. Most spills on record in Atlantic Canada would be classified as small spills.

However, worldwide statistics do show that “large”, “very large”, and “extremely large” spills can happen (refer to Table 7.3 of the EIS) and with respect to exploration drilling, these incidents relate primarily to well blowout incidents. Operators plan accordingly to prevent these incidents from occurring and plan response strategies to reduce environmental consequences (refer to Section 7.1 of the EIS for a discussion of Husky’s spill prevention and response strategies).

Although the EIS (Section 7.2.3) considered a worst-case scenario of two supply vessels colliding and losing all diesel fuel onboard (5,000 m^3), this would not be considered a plausible scenario for the Project given the low likelihood of the vessels colliding and standard fuel storage and containment measures to prevent full loss of fuel cargo from the vessel. A more plausible worst case scenario for a diesel (or aviation fuel) spill would be a spill that occurs during fuel transfer operations at the mobile offshore drilling unit (MODU) where up to 4.5 m^3 could be lost before a leak is detected and the fuel transfer system is shut down.

The plausible worst-case scenario for a crude oil spill, which would include formation fluids, is the 6,435 m^3/day resulting from an uncontrolled blowout at an exploration well.

The worst-case scenario for a loss of hydraulic oil and mixed oil would be 4 m^3 and 13 m^3, respectively, as these are the maximum volumes on board the MODU at any given time. However, given spill prevention and response measures, total loss of product would not be likely to occur.

All of these scenarios (including the supply vessel fuel loss scenario) fall within the scope of modelling and effects assessment presented in the EIS.

References

ABS Consulting Inc. 2016 Update of Occurrence Rates for Offshore Oil Spills. Prepared for Bureau of Safety and Environmental Enforcement (BSEE), United Statues Bureau of Ocean Management (BOEM). Available at: https://www.bsee.gov/sites/bsee.gov/files/osrr-oil-spill-response-research/1086aa.pdf. Accessed June 10, 2019.

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2019a. Oil Spill Incident Data: NL Offshore Area. Available at: https://www.cnlopb.ca/wp-content/uploads/spill/spgt1l.pdf. Accessed February 5, 2019

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1.5 ACCIDENTS AND MALFUNCTIONS – EMERGENCY PLANNING AND RESPONSE

1.5.1 Information Requirement: IR-81

Reference to EIS:

Section 7.3 Accidental Events Environmental Effects Assessment

Context and Rationale

Section 7.3 of the EIS describes the potential environmental effects of diesel batch spills, hydrocarbon blowouts and synthetic-based mud spills.

Section 7.1.2 of the EIS states that spill response options include surveillance and monitoring, testing and application of a spill treating agent, mechanical dispersion, containment and recovery, and wildlife measures. However, any differences in the applicability of the identified response options to the three accidental event scenarios (i.e. diesel batch spills, hydrocarbon blowouts and synthetic-based mud spills), is not described.

The EIS states that Husky has an established corporate Incident Coordination and Response Management Plan (EC-M-99-X-PR-00003-001) and an Oil Spill Response Procedure - East Coast Oil Spill Response Plan (EC-M-99-X-PR-00125-001). It is not clear whether these are existing documents for the existing Husky development project or documents that will be prepared for the proposed exploratory project.

Specific Question of Information Requirement

Describe the spill response tactics to be utilized in the event of a synthetic-based mud spill.

Discuss the differences in spill response equipment and strategies to be utilized in the event of a diesel spill versus a hydrocarbon spill vs a synthetic-based mud spill.

Clarify what emergency management documents will be individually prepared or the proposed Project versus documents that exist for the proponent in a broader sense.

Response

Husky's primary emergency management documents (Oil Spill Response Plan and Incident Coordination and Response Management Plan) are existing documents that apply to all offshore operations conducted under authorization from the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB). Risk assessments are conducted to identify and address potential hazards to personnel, environment, assets, and the public for each separate activity. The Oil Spill Response Plan describes Husky's overall spill response strategy and presents various spill response tactics that may be employed in the event of a spill. Spill response tactics may include surveillance and monitoring, testing and application of a spill treating agent, mechanical dispersion, containment and recovery, and wildlife response measures. The level of response and specific tactics to be employed are incident-specific and can vary depending on:

- oil volume spilled and at risk of release
- oil type, chemical properties and spill situation details
- environmental and operational conditions at the time of the spill (including sensitive environmental components)
- event priorities, resource availability / location and hazards present

A combination of response tactics may be employed depending on consideration of these components. An incident-specific situation assessment will allow responders to determine the best course of action to safely respond and reduce the impact of the spill on the physical environment. This assessment may be revisited over the course of the response period and adjusted accordingly as circumstances change. For example, a small diesel spill from the MODU may warrant a Tier 1 response, requiring only in situ equipment and personnel to respond effectively. However, a well blowout may warrant a Tier 3 resource, drawing on local, regional, and international resources and equipment and may involve implementing all of the response tactics to some extent over the course of the incident. If there was a risk to shorelines from a diesel spill or well blowout, countermeasures to divert hydrocarbons from impacting environmentally sensitive coastal shorelines and socio-economic sensitive coastal areas will be initiated.

Unauthorized discharges of synthetic-based drilling mud (SBM) are not considered to be oil spills and historically, oil spill response plans have not been implemented to respond to these incidents. SBM is authorized for discharge under certain conditions as per the Offshore Waste Treatment Guidelines (National Energy Board [NEB] et al. 2010). Components of SBM are selected in accordance with the Offshore Chemical Selection Guidelines (NEB et al. 2009), which promote the selection of lower toxicity chemicals to reduce environmental effects of a discharge where technically feasible. SBM is a dense fluid which sinks rapidly in the water column. As the discharged SBM sinks through the water column, trace amounts may disperse through the water column, with the majority of the SBM settling on the seafloor (Canada-Nova Scotia Offshore Petroleum Board [CNSOPB] 2018). Environmental effects are generally observed as a localized change in sediment quality and potential smothering of sessile benthic organisms if present, within the general zone of influence of routine drilling discharges deposition. Based on authorized SBM discharge incidents that have occurred in Atlantic Canada, the general course of action involves an investigation by the operator and applicable offshore petroleum board, which includes a fate and effects analysis.

References

CNSOPB (Canada-Nova Scotia Offshore Petroleum Board). 2018. Incident Bulletin June 26, 2018 - Drilling Mud Questions and Answers. Available at: https://www.cnsopb.ns.ca/sites/default/files/pdfs/Drilling_Mud_Questions_and_Answers.pdf

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1.6 ACCIDENTS AND MALFUNCTIONS – DISPERSANTS, CAPPING STACK, RELIEF WELL AND OTHER RESPONSE OPTIONS

1.6.1 Information Requirement: IR-92

Reference to EIS:

Section 7.1.9.4.1 Dispersant Effects

Context and Rationale

Fisheries and Oceans Canada advises that deep-water corals have not fully recovered following the Macondo blowout (Girard and Fisher 2018). Many of the observed effects are attributed to the use of dispersants, but such effects have not been addressed in the EIS.

Specific Question of Information Requirement

Discuss potential effects of dispersants on sensitive benthic habitat/species.

Response

Dispersants are spill-treating agents comprised of surfactants and emulsifiers, which, when applied to a hydrocarbon spill, increase the surface area of oil exposed to the environment and accelerate the dilution and degradation of hydrocarbons in the water column. Dispersants are often applied in scenarios where it is desirable to reduce the extent of surface slicks and risk of shoreline oiling. Chemical dispersants can be applied at the surface (e.g., from a vessel or aircraft) or injected subsea in the case of a subsurface release (e.g., well blowout). By dispersing the oil into the water as small oil droplets, it allows rapid colonization by petroleum degrading microorganisms that naturally occur in ocean environments and microorganisms therefore will substantially biodegrade the majority of the oil within days and weeks (International Petroleum Industry Environmental Conservation Association and the International Association of Oil and Gas Producers [IPIECA and IOGP] 2015).

Effective dispersant use involves transferring more of the oil into the water column than would otherwise be the case. The oil droplets entering the water will be smaller in size, enhancing the rate of transfer of the water-soluble compounds from the oil into the water because the oil-water surface area is increased with smaller oil droplets resulting in higher concentrations of dispersed oil (very small oil droplets) and water-soluble compounds in the water in close proximity to the release (IPIECA and IOGP 2015).

Although the benefits of reducing surface slicks and risk of shoreline oiling with dispersant use are not generally refuted, the effects of dispersed oil on marine fish and sensitive benthic habitat and species has been debated in the years following dispersant use in the spill response for the Deepwater Horizon oil spill (Macondo blowout) in the Gulf of Mexico in 2010.

Some studies have suggested that dispersed oil is more toxic to fish due to the increase in availability and subsequent exposure to hydrocarbons (Tjeerdema et al. 2013; Adams et al. 2014). The National Academies of Sciences, Engineering and Medicine (NASEM) (2019) recently commissioned a Consensus Study Report to synthesize new information on dispersant use and effects in light of the expansive literature published since the Deepwater Horizon oil spill. Part of this evaluation included a comparison of chemically dispersed oil with the fate and effects of untreated oil. In a review of studies on the toxicity of dispersed oil, the Consensus Study Report concluded that the toxicity of physically and chemically dispersed oil are essentially the same provided field relevant concentrations of dispersants are used. While dispersants temporarily increase the bioavailability of oil, the acute toxicity from dispersants resulted only at much higher concentrations than would be expected in the water column following an application of dispersant (NASEM 2019).

The exposure of fish to oil, either naturally or chemically dispersed, can result in lethal and/or sub-lethal effects (e.g., physiological, immune, structural, and behavioural responses). Sublethal effects of oil exposure can include impairment of cardiac function, larval developmental anomalies, reduced physiological performance, compromised sensory systems and behavior, altered immune function, DNA damage and compromised reproduction effects (NASEM 2019). In some cases, sublethal effects can result in negative outcomes that can affect mortality risk. For example, exposure of fish to oil following a spill has the potential to affect the development, structure, and function of the cardiac system in fish embryos leading to impaired swimming stamina (Lee et al. 2015). The onset of lethal and sublethal effects depends on several factors including concentrations of dissolved hydrocarbon fractions, exposure duration and species / life stage sensitivity to oil. Slow moving or immobile aquatic species and life stages that are entrained within water masses containing physically or chemically dispersed oil may be at greater risk of exposure to dissolved oil fractions (NASEM 2019).

During the Deepwater Horizon blowout, both the use of dispersants and the physics of the release resulted in much of the oil remaining at depth, forming a deep-water plume that persisted for months (Girard and Fisher 2018). The surfaced oil contributed to a large marine snow formation event, which may have also been affected by the presence of dispersants. Both the large plume of oil and the sinking marine snow had the potential to affect vulnerable deep-sea communities (Girard and Fisher 2018).

Groundfish would likely be affected by the marine snow formation event, as well as the benthic habitat from the precipitation and deposition of hydrocarbon compounds. Following the Deepwater Horizon release, an assessment on demersal fish was conducted on three species with varying use of benthic habitat. The burrow-forming golden tilefish (*Lopholatilus chamaeleonticeps*), the mud-dwelling king snake eel (*Ophichthus rex*), and the reef fish, red snapper (*Lutjanus campechanus*). Golden tilefish were likely to be most heavily associated with sediments, king snake eel likely being moderately associated with the sediments, and red snapper being more distantly associated with sediments (Snyder et al. 2015). The assessment revealed elevated polycyclic aromatic hydrocarbon (PAH) in the bile of these common benthic fish species. The PAH in the fish bile contained a composition similar to that from the Deepwater Horizon oil (Snyder et al. 2015). PAH exposure may result in a variety of immunotoxicity population-level effects, including impaired growth, increased disease susceptibility, reduced larval survival, and reduced net population fecundity. Red snapper and king snake eels showed signs of recovery in 2012 and 2013, while golden tilefish, which burrows into sediments and likely had a longer exposure to PAHs, still had elevated biliary PAH metabolites in 2013 (Snyder et al. 2015).

Benthic macrofauna communities within 10 km of the Deepwater Horizon blowout remained impaired four years following the blowout. Macrofauna richness and diversity were still significantly lower within 10 km of the site. The benthic macrofauna communities indicated signs of recovery; however, these communities had not fully recovered from the hydrocarbon contamination as the taxonomic richness remained significantly lower (Reuscher et al. 2017). Observations from 2011 to 2017 illustrated that overall recovery of corals from the Deepwater Horizon spill was slow. The recovery of coral is a complex process that can be influenced by a combination of factors including environment, predation, competition, size, age, and morphology (Girard and Fisher 2018). The ability of individual coral branches to recover is dependent on the degree to which the colonies were impacted, indicating a long-term, non-acute effect from the spill (Girard and Fisher 2018).

As described in the Environmental Impact Statement (EIS), Fisheries and Oceans Canada has identified five Ecologically and Biologically Significant Areas, two Vulnerable Marine Ecosystems, eight sponge, coral and sea pen closures, and one marine refuge in the Study Area (see also revised response to IR-52). The location of these areas including the species and habitat within are described in Section 4.2.9 of the EIS.

In addition to supporting habitat for pelagic fish, marine mammals and marine birds, these areas support sensitive life stages or high densities of benthic species including:

- Groundfish (yellowtail flounder, Atlantic wolfish, monkfish, pollock, white hake, Atlantic cod, Atlantic redfish, spotted wolfish, Greenland halibut, American plaice)
- Shellfish (Iceland scallop)
- Corals (sea pens, cup corals, black corals, soft corals, sea fans) and sponges

Independent testing commissioned by Husky has confirmed that White Rose field crudes can be dispersed with Corexit 9500A using dispersant spray application technologies. Similarly, other Jeanne D'Arc basin operators have confirmed their crudes are amenable to dispersion by Corexit 9500A, indicating that potential crudes from the ELs 1151, 1152 and 1152 would likely be amenable to dispersion. A Net Environmental Benefit Analysis (NEBA) of dispersant use for responding to oil spills from oil and gas facilities on the Grand Banks has been commissioned through a collaboration of several operators, including Husky Energy. This NEBA will provide a basis for operator-specific NEBAs or spill impact mitigation assessments (SIMAs), which will be required as part of the authorization process with the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB). The NEBA / SIMA will consider advantages and drawbacks of dispersant use for various spill scenarios in light of local environmental and socio-economic conditions, including, but not limited to, the vulnerability of sensitive benthic habitat.

Lethal and sublethal effects on benthic species may occur as a result of exposure of chemically and physically dispersed oil in the water column. The magnitude of these effects may vary depending on the timing and location of the spill, the method of dispersant application, and proximity of dispersant application to sensitive benthic areas. A NEBA / SIMA will be conducted to help identify priorities and tactics for spill response which may or may not include the application of dispersants.

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1.7 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

1.7.1 Information Requirement: IR-102

Reference to EIS:

Section 8.2.1 Marine Geology - Sediment and Seafloor Instability

Context and Rationale

Section 8.2.1 of the EIS discusses slope instability, seismicity, sediment loading, venting of shallow gas, gas hydrates, seabed instabilities and ice scour; however, Natural Resources Canada advises that the importance of elevated or excess pore pressure in slope stability is not included. Examples of slope instability are provided for the Orphan Basin, Flemish Pass, and the Storegga slide in Norway on page 8.2. The connection the between Storegga slide and the proposed Project is unclear.

Specific Question of Information Requirement

Discuss the role of elevated or excess pore pressure in slope stability for the proposed Project. Clarify the applicability of the examples of slope instability at the Orphan Basin, Flemish Pass, and the Storegga slide in Norway for proposed Project.

Response

Elevated or excess pore pressure can, in general, contribute to slope failures, although the area of Exploration Licences (ELs) 1151, 1152, and 1155 is one of general minimal seabed slope (approximately 0.2° to 0.5° slope angle) so slope stability is not a widespread hazard. In total, these ELs comprise more than 333,000 ha of land and at this stage of Project planning, specific wellsites have not yet been identified. After prospective exploration targets have been identified within the ELs, a site survey will be conducted in advance for each proposed wellsite to address any shallow hazard issues including bathymetry (slope) and potential for seabed instability, interpreted in the context of local and regional datasets. Pre-drill pore pressure predictions will also be developed at a future stage to support well design once a specific exploration target is identified within the ELs.

The example areas of slope stability risk on the south side of the Orphan Basin, the northern Flemish Pass, and the Storegga slide area in Norway are not analogous to the relatively flat EL area under review and therefore are not relevant to the proposed Project. These example areas from prior assessment areas should have been characterized as relevant to more highly dipping slope regions rather than the low-dipping areas covered by ELs 1151, 1152, and 1155.

References

N/A

1.7.2 Information Requirement: IR-103

Reference to EIS:

Section 8.2.1 Marine Geology - Sediment and Seafloor Instability

Context and Rationale

Section 8.2.1 of the EIS discusses seafloor stability, however Natural Resources Canada advises that post slope failure where the sediment may appear to be stable has not been considered. There are numerous instances where these failures have been re-mobilized. In order to assess the slope stability, the proponent should determine the slope angle, unit weight and shear strength of the sediment at a minimum.

NRCan has provided a paper (Loloi, 2004) which presents an analysis of sediment slope instability of the southern part of the Orphan Basin for consideration.

Specific Question of Information Requirement

Discuss the probability of any re-mobilization of the slope failures and present information on the slope stability. Discuss factors including slope angle, unit weight and shear strength of the sediment expected at the proposed drilling sites.

Response

As discussed in the revised response to IR-102, the seabed in within Exploration Licences (ELs) 1151, 1152, and 1155 occurs within the very low-dipping shelf region of the Grand Banks. ELs 1151, 1152, and 1155 are located in areas of general minimal seabed slope (approximately 0.2° to 0.5° slope angle) so slope stability is not a widespread hazard and the probability of any re-mobilization of sediment due to slope failure is considered to be low. However, seafloor stability will be evaluated at specific wellsites as Project planning advances beyond the environmental assessment phase. ELs 1151, 1152, and 1155 comprise more than 333,000 ha of land and at this stage of Project planning, specific wellsites have not yet been identified. It is not feasible to conduct site-specific, local geohazard assessments across the entire area of the ELs. After prospective exploration targets have been identified within the ELs, a site survey will be conducted for each specific wellsite in advance to address any shallow hazard issues, including bathymetry (slope) and potential for seabed instability, interpreted in the context of local and regional datasets. Pre-drill pore pressure predictions will also be developed at a future stage to support well design once a specific exploration target is identified within the ELs.

Husky is aware of studies on slope stability on the Orphan Basin and Northern Flemish Pass, including Loloi (2004) and will take these results into consideration for the broader regional context. However, the applicability of these studies is expected to be minimal given differences in geography within the Project ELs. For example, Loloi (2004, p. 43) analyzed the effect of multi-degree slopes: "… the slope of the seabed in the vicinity of the core 019 is about 3°. A maximum slope angle of approximately 6° exists upslope of the core site and a range of slope angles of 1° to 6° will be used for slope stability analyses". Slope angles within the Project ELs range from approximately 0.2° to 0.5°.

References

Loloi, M. 2004. Slope Instability Analysis of a Part of Orphan Basin Off Newfoundland. PhD Thesis, Dalhousie University, Dalhousie, NS. 220 pp.