GENERAL COMMENTS

Fisheries and Oceans Canada

Husky Energy has indicated, for numerous DFO comments, *"Comment Noted. Thank you."* While this type of response may be appropriate in cases where DFO is offering advice related to regulatory responsibilities or next steps in the review process, it is not appropriate where DFO has addressed errors, asked for additional information or clarification. Each comment should be appropriately addressed.

Environment Canada

In its response, Husky Energy has often indicated "Comment Noted" in response to Environment Canada commentary. The meaning of this response is not clear and reviewers were unable to evaluate how or whether their concern has been addressed. Environment Canada has identified such cases with "Non-Responsive" and requests a proper response (see specific comments).

The species "Greater Shearwater" should be changed to updated common name of "Great Shearwater" throughout the text.

Husky Response: Comment noted. Thank you.

EC Response: *Non-Responsive*

SPECIFIC COMMENTS

Fish, Food and Allied Workers

1. Establishing a Fisheries Liaison Committee with adequate fish harvester representation will be key in the coming months to enable appropriate consultation with the affected harvesters as the project proceeds (Section 6.2.1.3 and 9.5.1.2). Involving harvesters in the development of a near-shore Environmental Effects Monitoring program prior to the start of construction at the site will also provide opportunity for collaboration (Section 15.2.1). The FFAW and the harvesters whom it represents are looking forward to future consultations regarding the deepwater mating location as committed to by the Partners (Section 2.7.5)

Husky Response: Husky agrees that the Fisheries Liaison Committee (FLC) is key to successful cooperation between marine users. The FLC will be established prior to the start of marine construction activities. For clarification, Section 15.2.1 discusses an Environmental Protection Plan (EPP) to be implemented during construction activities at Argentia. The EPP will outline the testing requirements to ensure compliance with regulations and guidelines. The EPP will be prepared and submitted to the provincial Department of Environment and Conservation for review and approval. Husky is committed to holding further consultations with the FFAW once the deep-water site has been confirmed.

> ***FFAW Response****: The Fisheries Liaison Committee should not have to wait on the commencement of marine construction activities. Seeing that all activity will have some impact/involvement from/to the marine environment. Constituting the Fisheries Liaison Committee at the earliest convenience would largely be a beneficial venture, rather than holding off until activity happens. Early constitution will be conducive to enhance the positive approach to the mitigation efforts relating to the WREP. Looking at the response, the FFAW feels that there needs to be a definition of what prior to the start of marine construction activity is warranted.*

3. Possible construction of the proposed Wellhead Platform structure in Placentia Bay will have an impact on the environment in the bay and more specifically fish habitat. Concerns from fish harvesters have been noted in the report with respect to dredging, debris, discharges, dumping, accidental spills, construction related noise and lighting. It needs to be reiterated however that construction activity will also impact catchability, and therefore profitability, for fish harvesters.

Husky Response: The WREP EA assesses the potential impact of all project activities on fish and fish habitat in Chapter 8. Potential impacts to Fisheries, including catchability, are assessed in Chapter 9. Husky has included an extensive list of mitigations to minimize potential impact to fish harvesters in Section 9.5.

> ***FFAW Response****: The FFAW feels that using only the interior of Placentia Bay excludes the headland communities. The WREP would have been better served using the whole of 3Psc as study area. This relates back to the fact that mitigation needs to include consideration of whole bay as a complex ecosystem and socio-economic environment. Activity in a single area can/will have economic and social implications for whole of bay.*

4. The future fisheries were nominally encountered in this Environmental Assessment. With significant environmental changes it is anticipated that there will be a change in the biomass composition in Newfoundland & Labrador waters. With the environment readjusting to more stable/normal state there is an expectance of an increased presence of finfish (such as Cod). Therefore, although Figure 9-23 shows a drastic decrease around 1990 and since stability, there are indicators that this is about to change again. The likelihood is that harvesting patterns will change and there will be a significantly increased level of fishing activity throughout the Grand Banks. Potentially that activity could rival the time prior to the cod moratorium. The White Rose Partners should consult with the fishing industry on a regular basis to keep up to date with the fishing trends for the various species.

Husky Response: Husky intends to continue regular consultation with fishery representatives and the FFAW through One Ocean to remain current knowledge of trends and changes in both the nearshore and offshore fisheries environment. Husky provides annual updates to the FFAW and One Ocean on planned future activities. There is also ongoing liaison with the fishing industry through regular meetings of the One Ocean Technical Working Group. The C-NLOPB requires that all active environmental assessments are updated annually with the most current fisheries data available. Consultation with One Ocean and the FFAW are conducted as part of those environmental assessment updates.

> ***FFAW Response****: The response provided by Husky Energy does not suffice in the context of the comment. As relating to Comment #6, 20 years is an inadequate timeframe in view of the FFAW. Historical data should/must include considerations of patterns pre-moratorium.*

6. The FFAW feels that the fisheries statistics contained in the Environmental Assessment are insufficient in that they do not give any reflection of the historical harvest for groundfish on the Grand Banks. With the changing environment it would be pertinent for the Environmental Assessment to contain indicators of where and how groundfish harvest was pursued on the Grand Banks, especially the formerly important codfish. Effectively, a five year horizon for past fisheries is not sufficient and does not provide a good enough perspective of the activities for the members of the FFAW.

Husky Response: WREP EA Section 9.3.2.1 - Historical Overview of Regional Fisheries (Placentia Bay) provides a broad overview of historical trends in the nearshore fisheries in Placentia Bay during the past 20 to 25 years. Section 9.3.3.1 - Historical Overview of Regional Fisheries (Eastern Grand Banks) provides a 20-year perspective of fisheries

harvesting trends in NAFO 3LMN. As noted above, Husky will continue to consult on a regular basis with offshore fisher representatives, FFAW managers and One Ocean in order to keep apprised of future trends and changes in the offshore fisheries environment.

> ***FFAW Response****: The response aptly manages to quote and specify exactly what the FFAW comment identified as insufficient. The FFAW indicated that the data should go back past 1990, for a proper perspective of the potential harvesting patterns – particularly in the offshore.*

7. Looking at the various discussions on habitat through out the Environmental Assessment there are some mishaps, such as a subheading in Section 8.5.2.1 being Change of Habitat Quality, the lead sentence then reads. "Habitat quantity may be reduced as a result of lighting, discharges, sedimentation and increased noise occurring due to the above activities." There obviously is a disconnect between what is written and what was intended written. It is further worth to note that the final paragraph of Section 8.5.1.3 suggests that in a worst case scenario of an accidental event the impact would be such to only affect abundance or distribution of one generation of fish, and to be re-established to previous levels within several generations. This is a significant statement as with the state of the Newfoundland & Labrador fisheries any impact on the biomass or resource availability is significant.

Husky Response: Comment noted. Thank you. The heading for Section 8.5.2.1 should read Change in Habitat Quantity. Section 8.5.1.3 assesses the effect of an accidental event on fish and fish habitat.

> ***FFAW Response****: It is clear that the reviewer is aware of what the sections contain. Therefore, merely re-citing the section number as it is in the comment is the same as not providing an answer or response to the comment.*

8. *In the responses prepared by Husky Energy, Comment #8 was collapsed in with Comment #7.*

9.The establishment of a Safety Zone (Section 9.5.1.1 and 9.5.1.2) at the locations in Placentia Bay will result in a loss of fishing grounds to harvesters in Placentia Bay. This is significant for inshore harvesters in Placentia Bay as previously discussed.

Husky Response: While the establishment of a deep-water mating site safety zone will create a temporary loss of access to fishing grounds within these areas, it will serve as a key mitigation to avoid or prevent interaction and to help ensure the safety of workers, fishers and other marine users. Husky has committed to several mitigation measures in Section 9.5.1.2 to mitigate the impact of the WREP on fish harvesters. Details of these mitigations will be further discussed during the Fisheries Liaison Committee meetings.

> ***FFAW Response****: It is prudent to recognize that any displacement of harvesting effort will have a broader impact than only the immediate area. Husky should not wait to engage harvesters – why not engage harvesters fully before the decision on the deep-water mating site. The mitigation*

> *efforts should not be confined to having consultations inside the project area, as stated elsewhere Placentia Bay is a whole. Further it is suggested in the Mitigations section that the Fisheries Compensation Program would already have been discussed at the Fisheries Liaison Committee – a committee not yet constituted (to the best of my knowledge).*

11. With regards to socio-economic considerations there is a mention that "90 percent of the nickel processing plant's construction workforce live outside of the Argentia area and commute to the WREP site on a daily basis, and a similar situation is expected with the WREP." It is unfortunate that this was not caught before the document was sent out for review. In addition who is to say that the WREP will have access to the potential labour supply surplus resulting from the completion of the nickel processing plant, there are two other major industrial projects taking place in the province at the same time that the Wellhead Platform is expected to be constructed.

Husky Response: Husky will work with its contractors, who will work directly with the appropriate trade unions, to offer a competitive wage and benefits package to attract and retain the required workers for the Project. A competitive wage and benefits package, in addition to the location of the project site, will support recruitment of qualified persons from the local area, throughout Newfoundland and Labrador, as well as nationally and internationally as required.

> ***FFAW Response****: There is no question that the WREP will have to be competitive to attract the workforce. "90 percent of the nickel processing plant's construction workforce live outside the Argentia area and commute to the WREP (Sic) site on a daily basis." It remains doubtful that the construction crew at Long Harbour travels to Argentia daily; this is what was meant to be pointed out from the quoted text.*

13. With regards to the concerns that were raised in the context of the SWRX (Page 6-10), the issue at hand was that the Safety Zone depicted in the consultation slide differed from that which is in place out in the field. The map which was used included a zonal change, which Husky subsequently went on to apply to get implemented. At the September 20th, 2012 consultation meeting the submission to change the Safety Zone had not been made. However, at the follow-up meeting on October s". 2012 Husky indicated that the application for changing the Safety Zone had been submitted. The issue was not that the FFAW and One Ocean were not consulted on the SWRX, but rather that said consultation had not had any mention of a change to the White Rose Safety Zone. This approach was not conducive to the enhancement of mutual trust between the two industries. The FFAW does realize that at the time of submitting the original Environmental Assessment for the subsea drill centres Husky did not know the exact location where they would be drilling. But when the proponent knows where the drill centres will be, there needs to be further consultation if there is going to be an impact on the fishing vessels that use the area.

Husky Response: Husky makes every effort to inform stakeholders of planned activities once schedules have been confirmed. We continue to ensure that consultation meetings are held with the FFAW and One Ocean in a timely manner.

> ***FFAW Response****: The foundation of this comment is that Husky Energy used a map reflecting a Safety Zone which had not been submitted to Transport Canada at the time of the consultation with harvesters.*

Environment Canada

Section 3.6.1.1 Blowouts During Drilling, *Quote:* "Up to 2011, four development-drilling blowouts have produced spills in the very large spill category (Table 3-48, including the recent incident in Australia, and including the spill in the extremely large category)."

Unclear. The description could be reworded to something like, "From Table 3-48, there are four large spills from development well blowouts, giving a spill frequency of (4/67,703) x 5.9 x 10-5 / well drilled = 1 spill / 17,000 wells drilled."

Husky Response: Comment noted. Thank you.

EC Response*: Non-Responsive.*

Section 4.2.4 Sea Ice and Icebergs, *Page 4-112, Figure 4-75:* Typo – The x and y axes are labelled identically as"Annual Total Number of Icebergs Observed South of 48N". The label is correct for the x-axis, but the y-axis should simply be labelled "Year".

Husky Response: Comment noted. Thank you.

EC Response*: Non-Responsive*.

Section 4.2.4.1 Sea Ice Conditions in Placentia Bay, Page 4-112, Sentence 3:
Two errors:
The ice that enters the Bay in February is generally grey or grey-white ice (less than 30cm thick), and is not first-year ice (>30cm thick). First-year ice incursions into Placentia Bay only take place from March onwards.

- First-year ice is >30 cm thick. Contrary to indicated, it can be >120cm thick. First-year ice that is >120 cm is called "thick first-year" ice. Ice that is 30-70cm is thin first-year ice, and ice that is 70-120cm is medium first-year ice.

Page 4-114, Paragraph 2, Sentence 2 and Page 4-115, Figure 4-78:
Error with respect to the upper limit for the standard ice types – In Figure 4-78, the thickness of thin first-year ice (e.g., Mar 19, Mar 26, Apr 02) is given as 50 cm. This is the average thickness for this ice type, not the upper limit as indicated. The upper limit for this ice type is 70 cm.

Husky Response: Comment noted. Thank you.

EC Response*: Non-Responsive.*

Section 4.3 Offshore, *Page 4-201*: Figure caption is missing – The sea ice chart on this page has no figure number (it should be Figure 4-121). There should also be a reference to the Canadian Ice Service in the caption, as the chart was obtained from its archives.

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive.*

Section 4.3.1.2 Wind Climatology, The caption for Table 4-44 has the word "anemometer", which should be replaced by MSC50

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Section 4.3.1.5 Icing, This section includes only potential sea-spray icing. EC recommends that the EIS include analysis of observed freezing spray and icing accumulation measured on the platforms.

Husky Response: Ice accumulation on stationary offshore platforms is a rare event. Freezing spray is more common on ships transiting rough seas. Data on ice accumulation are not recorded in either case.

> ***EC Response**: Not Satisfactory. "EC had recommended that the EIS include analysis of observed freezing spray and icing accumulation measured on the platforms. This would augment the modeled potential icing results. Knowledge gained through direct experience and observations of ice accretion (whether formally reported or not) from years of winter operations in this area by station keeping production vessels, mobile drilling platforms, and supply vessels should be used to help characterize this significant environmental hazard."*

Section 4.3.4.1 Sea Ice, *Page 4-204, Paragraph 3, last sentence*: Clarity – This sentence could easily be misunderstood as written. To make it clearer, it is suggested that it be rewritten as two sentences: "**Thin** first-year or white ice becomes the dominant ice form in areas off Newfoundland beginning in March, just before water temperatures rise above the freezing level. **In April and May, during years when ice lingers in the area, medium to thick first-year ice are the dominant ice forms.**"

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Section 4.3.4.1 Sea Ice, *Page 4-204, Paragraph 4, first sentence*: Clarity + Typo – For clarity, it is suggested that this sentence be rewritten as: "By the end of July, the ice pack **has retreated** northward, with substantial ice concentrations confined north of Labrador."

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Section 4.3.4.1 Sea Ice*, Page 4-205, Paragraph 1, Sentence 1 and Figure 4-12*2: Slight error – In the first sentence, it says the mid-month Frequency of Presence of Sea Ice charts (taken from the CIS atlas) are shown January through May. All the charts shown are indeed for the middle of the months, except for the one for January. The chart shown for January is that of the week of January 08, when really, to be consistent with the statement and the other months, it should be that for January 15.

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Section 4.3.4.1 Sea Ice*, Page 4-209, Paragraph 1, Sentence 1*: Clarity – For greater clarity, it is suggested that the phrase "annual timing of all ice incursions" in the first sentence of this paragraph be replaced, since that is not exactly what the bar graph in Figure 4-127 shows. The sentence should rewritten as: "The **average ice coverage during the initial period of** ice incursions near the White Rose field, **between end of November and mid- February**, from 1980 to 2012, is shown in Figure 4-127."

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Section 4.3.4.1 Sea Ice*, Page 4-209, Paragraph 1, Sentence 2*: Clarity, as in Sentence 1 – Suggested revision of this sentence: "These data show the years of higher-than-average **ice coverage during the initial period of ice** incursions (1983 to 1995, 2000 and 2008)."

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Section 4.3.4.1 Sea Ice*, Page 4-209, Paragraph 1, Sentence 3*: Clarity – as in Sentences 1 and 2 Inconsistency – The incursion period shown in Figure 4-127 spans Nov 26 – Feb 19. But the representative chart shown for 1993 is for March 01. Suggested revision of sentence 3: "The maximum recorded **amount of ice during the initial period of** incursion of sea ice for east Newfoundland waters occurred in 1993 **(Figure 4-127). The 1993 ice coverage chart for the second week following the incursion period** is illustrated in Figure 4-128."

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Section 4.3.4.2 Icebergs Origins and Controlling Factors: *Page 4-217, Paragraph 1, Sentence 4*, Correction – Since the Humboldt Glacier and Jacobshavn Isbrae are two of the major sources of icebergs, the sentence should read, "…primarily from 20 major

glaciers between **and including** the Jacobshavn and Humboldt glaciers". Also, note that there is no "e" in Jacobshaven.

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Page 4-217, Paragraph 4, Additional explanation could be added here – It could be explained that the reason why there is a positive correlation between iceberg numbers and pack ice extent is that the pack ice protects the icebergs from melt and wave-induced deterioration during their trip southwards. Because of this, many more bergs survive the trip to Newfoundland during winters with extensive pack ice.

Husky Response: Comment noted. Thank you.

***EC Response:** Non-Responsive*

Page 4-217, Paragraph 5, Sentence 1, Inconsistency – It is stated that according to the data (Figure 4-133) **iceberg counts of zero occurred in 1966**, 2006 and 2011, **however the bar chart in Figure 4-133 only goes back to 1981**. If a low of zero bergs did occur in 1966, a bracket after this year saying "(not shown)" should be added to the sentence.

Husky Response: Comment noted. Thank you.

***EC Response:** Non-Responsive*

Size Distributions: ***Page 4-226, Table 4-80:***
Height / Length – The ranges of heights and lengths for each category should begin one increment higher than that of the previous category. So if a Bergy Bit has a length range of 5-15 m, then a Small Iceberg has a length range of 16-60 m (not 15-60 m). Ditto for height. This needs to be corrected for the small, medium and large iceberg categories in the table. See MANICE, Tables 2.3 and 4.8.
Approximate Mass – Although ranges for the masses of medium and large icebergs are given in Table 4-80, the cited source of information does not give ranges for these categories. According to MANICE (Table 2.3), a Medium berg has an approximate mass of 2,000,000 tons and a Large berg has a mass of 10,000,000 tons.

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Iceberg Length: ***Pages 4-227 to 4-228, Figure 4-140***, Figure is split across 2 pages – This is a little confusing because the Figure has two panels. The panels should either be labelled "a)" and "b)" with descriptions of these in the Figure caption so that it is clear these panels both belong to "Figure 4-140" or the Figure should be published on a single page and not split across pages.

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Page 4-227, Paragraph 3, <u>Last Sentence, Clarification</u> – It should be stated that the Petermann Glacier is in northwest Greenland, north of the 20 greatest sources of icebergs noted earlier, which lie between and include Jacobshavn Isbrae and the Humboldt Glacier. It could also be noted that the Petermann Glacier has a history of calving large tabular ice islands as opposed to hundreds of smaller bergs, the way the other glaciers do.

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Iceberg Draft: ***Pages 4-228 to 4-229, Figure 4-141**, Figure is split across 2 pages – This is a little confusing because the Figure has two panels. The panels should either be labelled "a)" and "b)" with descriptions of these in the Figure caption so that it is clear these panels both belong to "Figure 4-141" or the Figure should be published on a single page and not split across pages.*

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

***Page 4-227, Paragraph 4, First Sentence**, Inconsistency – It is stated here that the data used in Figure 4-141 were derived from observations and measurements made from **2000 to 2012**, but the source under Figure 4-141 says the PAL data span **2000-2011**. According to our iceberg expert here at CIS, the 2012 data are not yet available.*

Husky Response: Comment noted. Thank you

***EC Response**: Non-Responsive*.

Section 4.3.9.1 Sea Level Rise

***EC Response:** the climate change aspects are sufficient. The proponents may want to expand their discussion to include impacts of vertical land motion on local sea level.*

Section 10.3.1 Nearshore Overview, *Quote:* "It contains the largest Northern Gannet nesting colony (14,696 pairs (2011) (CWS unpublished data)), the largest Thick-billed Murre colony and third largest Common Murre colony (14,789 pairs (2009) (CWS unpublished data)) in Newfoundland and Labrador (Table 10-2)."

The largest Thick-billed Murre colonies are located in Labrador. The colony mentioned above is the largest colony on the Island of Newfoundland, but is also the most southerly colony of the Thick-billed Murre's breeding range.

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Section 10.3.5 Marine Bird Nesting Colonies Along Southeastern Newfoundland, *Quote:* "More than 4.6 million pairs nest at these three locations alone (Table 10-2; Figure 10-1). This number includes the largest Atlantic Canada colonies of Leach's Storm-Petrel (3,336,000 pairs on Baccalieu Island), Black-legged Kittiwake (23,606 pairs on Witless Bay Islands), Thick-billed Murre (1,000 pairs at Cape St. Mary's) and Atlantic Puffin (272,729 pairs on Witless Bay Islands) (Cairns et al. 1989; Rodway et al. 2003; Robertson et al. 2004)." It should be noted here that two of the three Northern Gannet colonies in the province of Newfoundland and Labrador are on the Avalon Peninsula.

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Section 10.3.6.8 Alcidae (Atlantic Puffin), *Quote:* "Grand Colombier in St. Pierre et Miquelon is the only breeding colony near Placentia Bay; approximately 400 pairs nest there." The number of pairs breeding at the Grand Colombier colony should be updated to 9,543 pairs breeding pairs (Lormee et al. unpublished data).

Husky Response: Comment noted. Thank you.

***EC Response**: Non-Responsive*

Section 14.4.6 Sea Ice and Iceberg, *Sentence 2*: *Same comments as in Section 4.2.4.1 Two errors:*
The ice that enters the Bay in February is generally grey or greywhite ice (less than 30cm thick), and is not first-year ice (>30cm thick). First-year ice incursions into Placentia Bay only take place from March onwards;
First-year ice is >30 cm thick. Contrary to indicated, it can be >120cm thick. First-year ice that is >120 cm is called "thick first-year" ice. Ice that is 30-70cm is thin first-year ice, and ice that is 70-120cm is medium first-year ice.

Husky Response: Comments noted. Thank you.

***EC Response**: Non-Responsive*

Section 14.5.8 Climate Change (New Comment) The proponents should also consider and/or provide more information about projected changes in precipitation (what is the source of the projections in section 14.5.8?) and extremes (e.g. heavy precipitation

events). The “annual precipitation increases projected for Atlantic Canada between years 2020 and 2080 range from 18 to 21” (no units here but it is assumed to be %). This range is very high.

Fisheries and Oceans Canada

Section 3.4 Drill Cuttings Deposition, P. 3-39 Figures in this section should include finer scale images such as 0-1 km scale. Based on recent ROV surveys at a nearby oil development, it appears that accumulation of drill cuttings in proximity to offshore oil drilling sites may be greater than predicted during the EA. As such, DFO may require Husky Energy, as well as operators of other existing and future oil developments, to provide additional monitoring adjacent to the drill centers in order to verify these predictions. It should be noted that in the past, DFO has recognized that drill cuttings deposition with thicknesses of greater than 10 cm are considered harmful to benthic organisms. Predictions provided in this section suggest that maximum thicknesses could reach approximately 8.6 cm within 100 m from the deposition area.

Husky Response: The four cuttings plan view figures in this section consist of base case and fast settling of fines sensitivity runs for two views: a 28-km view, and a 5-km view. A new pair of "1.5 km" views have been prepared. An additional figure shows the model run over a finer scale is presented in Figure 3-16a and is provided as Figure 27 at the end of the DFO comment tables.

> ***DFO Response****: DFO would like to discuss monitoring of drill cutting dispersion for the EEM Program.*

Section 5.3.1 Step 1 – Scoping Issues and Selecting Valued Environmental Components, P. 5-7 The EA states "Populations of marine mammals and some sea turtle species migrate to the Offshore Study Area primarily to forage for food". It should be noted that some marine mammal species and the Leatherback Sea Turtle also migrate to the nearshore study area to feed in the summer and fall. The draft Critical Habitat for the Leatherback Sea Turtle may encompass part of the southern Placentia Bay area so this may require further mitigation and monitoring.

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Will Husky apply additional mitigations to reduce potential impacts on Leatherback Sea Turtles?*

Section 8.3.1.5 Fish and Shellfish – Capelin, P. 8-22. "The statement: "…*migrate to deeper waters to spawn offshore at depths up to 125 m (likely when conditions for beach spawning are not ideal*" is incorrect. Nakashima and Wheeler (2002) indicate that spawning occurs subtidally when water temperatures at the beach are too warm. Furthermore, this redirected spawning occurs in coastal waters generally at depths considerably less than 125m. Please adjust the statement appropriately." *The statement that eggs "…remain in the sediment for 14 to 52 days…" is not supported by Scott and Scott (1988) as indicated in the document. Scott and Scott (1988) indicate that eggs hatched in the beach from 9 to 24 days depending on where they were in the intertidal zone. If this statement is in reference to demersal spawning on the Southeast Shoal where water temperatures are much cooler, 52 days may be acceptable.*

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Are revisions to the text accepted?*

Section 8.4.4 Summary of Potential Environmental Effects, Table 8-5, P. 8-43: 1. Under Subsea Drill Center Installation, installation of subsea equipment: "x/+" should be depicted under Change in Habitat Quantity, as habitat is being lost as a result of the placement of equipment on the seafloor; 2. Under Potential Future Activities, excavation of drill centers: "-"should be depicted under Potential Mortality, as there will likely be loss of benthic organisms as a result of the excavation and disposal of dredge spoils. 3. Under Wellhead Platform Installation/Commissioning, Dredging and disposal of dredge material should have "X" for Potential Mortality. 4. Under Potential Future Activities, Installation of Pipeline(s) and Testing from Drill Centres to FPSO, including Flowline Protection should have an "X" for Potential Mortality.

Husky Response: All comments are noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes to Table 8-5? Will the table be revised?*

Section 8.5.2.2, Production/Operation and Maintenance Table 8-8 / P. 8-64: 1. The Ecological/Socio/Cultural/Economic Significance should be given a lower rating of 2 = evidence of existing adverse activity. In fact, this would apply for any of the potential effects assessment summary tables; 2. The change in habitat quantity for flowline rock berms is Negative as well as Positive.

Husky Response: Both comments are noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes to Table 8-8? Will the table be revised?*

Sections 11.4.4 Summary Table 11-9 / Pg 11-57 AND 12.4.1.5 Summary Table 12-4 / Pg 12-61: 1. Avoidance should be considered a Change in Habitat Quantity associated with seismic activities. 2. Collisions should be considered as Potential Mortality associated with Cumulative Effects.

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes to Table 11-9 and Table 12-4? Will the tables be revised?*

Section 12.3 Existing Environment, Table 12-3, P. 12-5, For Smooth Skate, Table 12-3 should also state "Southern NF population has moderate potential for occurrence in Nearshore Study Area". This addition also applies to **Page 12-25 (para. 4)**. The second most common skate species caught in the inshore NF/Subdiv. 3Ps skate fishery is Smooth

Skate (Malacoraja senta), all discarded at sea; albeit not SAR population of the Funk Island Deep DU.

Husky Response: Both comments noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes to Table 12-3? Will the table be revised?*

Section 12.3 Existing Environment, Table 12-3, P. 12-7, For Basking Shark, Table 12-3 should read "Low to moderate potential for occurrence in Nearshore Study Area during summer"; not "Low". Also, the table should read "Usually present in surface waters of Newfoundland bays feeding on plankton from May to September." This correction also applies to Page 12-40 (para. 2).

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes to Table 12-3? Will the table be revised?*

12.3 Existing Environment, Table 12-3, P. 12-7, For Thorny Skate, Table 12-3 should read "Moderate to high potential for occurrence in Nearshore Study Area; not "Moderate" as suggested. This correction also applies to **Page 12-44 (para. 2)**.

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes to Table 12-3? Will the table be revised?*

Section 12.3.1.2 Wolffish, page 12-9, Regarding the following statement, "No wolffish were observed during the nearshore ROV habitat survey of Argentia and area", any conclusions are dependent upon the date(s), time of day, survey depth(s), and remotely operated vehicle (ROV) proximity to bottom topographic features. The ROV survey was conducted "outside" of the Atlantic Wolffish (Anarhichas lupus) spawning/nesting season; therefore, it is not unexpected to find low/no observations of adults "near shore". If this ROV survey was conducted "within" the wolffish spawning/nesting season, this conclusion may change. Therefore, the specifics of the ROV survey are crucial for the validation of conclusions in regard to wolffish in the proposed Argentia Peninsula (i.e., Nearshore) development.

Husky Response: Comment noted. Thank you.

> ***DFO Response****: What were the specifics of the ROV survey?*

Section 12.3.1.2 Wolffish, page 12-11, "The following statement, "*Females guard the nests*", is incorrect and the cited references do not support those statements. For all three

wolffish species, the adult male of each mated pair guards and aerates the resultant egg mass (i.e., "nest") until hatching."

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes?*

Section 12.3.1 Marine Fish Species at Risk, Figures 12-1 to 12- 7, 12-9 to12-12, 12-14 to 12-16, and 12-18, Please update the figures as more recent data is available.

Husky Response: Figures 12-1, 12-2, 12-3, 12-6, 12-7, 12-12, 12-14, 12-15 and 12-18 have been updated and are provided as Figures 28 to 36 at the end of the DFO comment tables. Figures 12-5, 12-9, 12-10, 12-11 and 12-16 are up to date.

> ***DFO Response****: Recent data is available for Roughhead Grenadier. It was last assessed for NAFO 2+3 in 2010 by NAFO and interim reports have been issued for 2011 and 2012. Update Figures 12-1 to 12-7, 12-9 to12-12, 12-14 to 12-16, and 12-18.*

Section 12.3.1.5 Porbeagle Shark, page 12-22, "The statement, "*Porbeagle are also caught as bycatch in other fisheries…of the 57 mt of discards annually*" (based on Campana et al. 2011), underestimates fishing bycatch mortality for this species. A more realistic estimate/fisheries overview can be obtained from Benjamins et al. (2010). This paper also considers several other SAR shark species including Shortfin Mako, Spiny Dogfish, Blue Shark, and Basking Shark."

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes? Will the text be updated?*

Section 12.3.1.8 Redfish, Figure 12-9, P. 12-27, The distribution plots for redfish indicate very low relative abundance except for an occasional hot spot. This was not expected and should be reviewed for accuracy. In addition, the low abundance of the distribution plots for redfish appear to contradict the results of the DFO RV survey in Div. 3L for 2010 and 2011 where Deepwater Redfish (Sebastes mentella) is the dominant species by weight both years (**Page 8-34**).

Husky Response: The figure is from Kulka et al. (2003). Comment noted. Thank you.

> ***DFO Response****: Will this section be reviewed in light of the reference to DFO RV survey in Div. 3L for 2010 and 2011.*

Section 12.3.1.12 Atlantic Salmon, P. 12-44, "For the south coast of Newfoundland, Atlantic salmon (*Salmo salar*) remain in the river until age three or four, not "*age two*". The species is no longer valued as "commercial fisheries" (also delete sentence 2 of ***para. 6***). The third sentence of para. 2 should be revised because salmon breed in other areas

besides the southeast tip. In ***para. 5,*** the last sentence should state "*20 percent for small salmon and by 11 percent for large salmon.*" Note that the small salmon are adults. In Figure 12-13, "*post-smelt*" should be post-smolt."

Husky Response: Comment noted. Thank you.

> ***DFO Response:*** *Does Husky Energy accept the proposed changes? Will the text be updated?*

Section 12.3.1.18 Thorny Skate, P. 12-44,"The statement, "*Simon and Frank (2000) found that in the skate fishery on the eastern Scotian Shelf…majority was Winter Skate*", is irrelevant to this EA study. Instead, scientific papers reporting on the annual Newfoundland skate fishery - in which *95%* of the skate catch is Thorny Skate (*Amblyraja radiata*) - should have been used. This fact, "*95% of the skate catch is Thorny Skate*", also applies to the skate fishery in Placentia Bay; rather than the ambiguous EA statement, "*is thought to be Thorny Skate*" (Simpson and Miri, 2012)."

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes? Will the text be updated?*

Section 12.5.1.1 Nearshore, P. 12-120, "The EA states that "*Although effects of the* Exxon Valdez *oil spill were substantial on killer whales, killer whales are uncommon in Placentia Bay, and no population-level effects would be expected.*" This conclusion may be incorrect based on the apparent small size of the Northwest (NW) Atlantic Killer Whale population. Even if the number of known individuals reaches 100, loss of one or two animals would represent a "*population-level effect*"."

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes?*

Section 13.3 Existing Environment, P. 13-5,Please provide consistency in reference to the CPAWS Special Marine Areas. There are three areas not two areas, as specified in the EA. These three Special Marine Areas should be depicted on a map as they are currently not shown in the document.

Husky Response: Revised Figure 13-1, with the three CPAWS special Marine Areas identified is provided in Attachment 2.

> ***DFO Response****: Figure 13-1 is not included in the Attachment*

Section 13.3.1 Nearshore, P. 13-6, "The EA states: *"…The Placentia Bay Extension EBSA (which includes all of Placentia Bay) is ranked second by DFO (2007b) in priority among the 11 identified EBSAs within the PBGB LOMA as candidate sites for*

designation as an MPA…". The Placentia Bay Extension EBSA was not ranked second in relation to priority for Marine Protected Area designation. The area scored second out of the 11 EBSAs in relation to the criteria evaluated to determine the ecological or biological significance of the areas examined by DFO Science. The EA document refers to these criteria on p.13-16 in Section 13.3.2.1.

The identification of EBSAs is not restricted to considerations for MPA designation. While portions of EBSAs may be potentially considered for MPA designation, there are a suite of potential management measures that may be established for EBSAs, not just strict protection. It is suggested that the proponent refer to Appendix 1 of the Southern Newfoundland Strategic Environmental Assessment http://www.cnlopb.nl.ca/pdfs/snsea/snseaapp1.pdf where DFO submitted a clarification of the purpose for identifying EBSAs.

References framing EBSAs solely in the context of MPA designation should be corrected (ex. P. 13-6 and third paragraph P. 13-16).

Husky Response: Both comments are noted. Thank you.

> ***DFO Response:*** *Does Husky Energy accept the proposed changes? Will the text be updated?*

Section 15.1.2 Environment Effects Monitoring Sampling Design, P. 15-3, Additional sampling will likely be required to verify predictions made during the EA regarding dispersion and subsequent accumulation of drill cuttings and therefore should be included in the monitoring program.

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Response adequate. However, DFO would like to discuss monitoring of drill cutting dispersion for the EEM Program.*

Section 15.2.1 Nearshore Environmental Compliance Monitoring, P. 15-4, "The proponent should also specify that a Section 35(2) *Fisheries Act* Authorization will likely be required for the nearshore dredging component."

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes? Will the text be updated?*

DFO Comments: Husky Energy White Rose Extension Project Drill Cuttings and WBM Operational Release Modelling

Section 4.0 Drilling Mud Properties and Discharge Characteristics, P. 38, "It should be noted that another environmental effect of released WBMs is the smothering of benthic organisms that should be included."

Husky Response: Comment noted. Thank you.

> ***DFO Response****: Does Husky Energy accept the proposed changes? Will the text be updated?*

Transport Canada

EPP – White Rose Extension Project – Argentia Site, Section 6.4 Page 61 – Contingency Procedures No. 1 – states '…in accordance with CCG regulations.". TC suggests updating this statement to "…in accordance with CCG and TC regulations." because TC is responsible for the *Canada Shipping Act* and the *Navigable Waters Protection Act*.

Canada-Newfoundland and Labrador Offshore Petroleum Board

Page 1-11, Section 1.5.2: Need temporal scope.

Husky Response: The WREP schedule has been revised since the environmental assessment was prepared. The changes to the schedule do not affect the environmental assessment significance predictions nor the mitigations planned for the project. In the case of the WHP development option, site preparation, installation of the WHP and initial production/maintenance will occur in 2017. The WHP will be decommissioned and abandoned in accordance with standard practices at the end of its production life, which is anticipated to be 25 years. The subsea drill centre option is scheduled to begin construction in 2014, with first oil expected in 2016. Under this option, the wells will be plugged and abandoned at the end of its production life (anticipated to be 20 years), and the subsea infrastructure removed or abandoned in accordance with relevant regulations.

> ***C-NLOPB Response****: While this response is generally acceptable, we note that the temporal scope for operations offshore exceeds the original White Rose temporal scope. The SeaRose FPSO and original subsea infrastructure have not been assessed for a life beyond 2020.*

Page 2-9, Table 2-4: WHP Life of Field/Structure is up to 25 Years and Subsea Drill centre productive life is up to 20 years. Is this consistent with the original White Rose Environmental Assessment? Is it the proponent's intent to revise the project temporal scope?

Husky Response: The original White Rose Environmental Assessment (Husky Energy 2001) contemplated 3 to 4 subsea drill centres being constructed within the White Rose field. Three drill centres (Centre, Southern and Northern), were constructed prior to an assessment of five additional drill centres in the Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment - EA Addendum (LGL 2007). To date, only the North Amethyst and South White Rose Extension drill centres have been constructed of the five assessed during the period from 2007 to 2015.

The current WREP Environmental Assessment re-assessed the effects of construction and operation of up to three drill centres during the life of the project. The productive life of the subsea infrastructure is estimated at 20 years, the productive life of the WHP is estimated at 25 years. The potential environmental effects of the operation of the *SeaRose FPSO* have not been assessed past 2020, the original projected life of the White Rose field.

Husky Energy will complete environmental assessments as required to review potential effects and mitigation opportunities prior to the expiry of current approvals.

> ***C-NLOPB Response****: This response is generally acceptable. We note that the current "Approvals" include the DPA, which doesn't expire per say, but which will be made inactive by expiry of the original project EA scope. The C-NLOPB won't be able to issue any "Authorizations" for production operations at the SeaRose FPSO beyond 2020 until the environmental assessment issue is resolved.*

Page 2-12 – Discussion of Subsea Drill Centre, The MODU and its subsystems have been omitted and should be included here

Husky Response: Comment noted. Thank you.

> ***C-NLOPB Response****: Not an acceptable response. Provide information on the MODU and its subsystems at a level comparable to the WHP*.

Page 2-49 White Rose Extension Project Operations Section 2.9 – It is stated that if the WHP development option is selected, then SBM cuttings will be reinjected. How will the SBM cuttings be dealt with before the cuttings reinjection well is drilled?

Husky Response: The base plan is to drill two cuttings reinjection wells for cuttings disposal purposes. In addition, the WHP design currently envisions a secondary cuttings dryer system to lower synthetic based mud on cuttings (SOC) to a target level of 6.9 percent SOC. This is consistent with technology currently employed by MODUs operating in the area. This secondary dryer would be employed until the cuttings reinjection (CRI) system is functional. This secondary system would also be employed in the event of difficulties with the CRI system. Prior to having a CRI system in place, and in the event of CRI system failure, following processing with the secondary dryer, cuttings would be discharged overboard.

Current drilling authorizations allow for the discharge of cuttings while drilling with an SBM fluid, at discharge limits specified in the facilities Environmental Protection Plan. The discharge of mud and cuttings and their limits for the WREP will be described in the WREP Environmental Protection Compliance and Monitoring Plan and submitted as part of the authorization application. While using an SBM fluid system, the WHP intends to handle cuttings in a similar manner as a MODU until the CRI system is operable, as well as in the event the CRI system experiences a failure. Once the CRI system is operable, these cuttings will be reinjected downhole.

> **C-NLOPB Response**: *The Proponent should model these discharges or explain why modeling is considered not necessary.*

Page 2-53, Section 2.15 says "Regardless of the development drilling option selected, potential future activities include excavating and installing up to two additional drill centres within the White Rose field. Note that these drill centres have been previously assessed (LGL 2007a), but are included in this environmental assessment in order to extend the temporal scope of these activities." Is this consistent with the original White

Rose Environmental Assessment? The production project temporal scope extends only to 2020. Is it the proponent's intent to revise the project temporal scope?

Husky Response: The original White Rose Environmental Assessment (Husky Energy 2001) contemplated three to four subsea drill centres being constructed within the White Rose field. Three drill centres (Centre, Southern and Northern), were constructed prior to an assessment of five additional drill centres in the Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment - EA Addendum (LGL 2007). To date, only the North Amethyst and South White Rose Extension drill centres have been constructed of the five assessed during the period from 2007 to 2015.

The current WREP Environmental Assessment re-assessed the effects of construction and operation of up to three drill centres during the life of the project. The productive life of the subsea infrastructure is estimated at 20 years, the productive life of the WHP is estimated at 25 years. The potential environmental effects of the operation of the *SeaRose FPSO* have not been assessed past 2020, the original projected life of the White Rose field.

Husky will complete environmental assessments as required to review potential effects and mitigation opportunities prior to the expiry of current approvals.

> **C-NLOPB Response**: *Acceptable response. We note that only the drill centres identified in the WHP EA will be reviewed in this regard.*

Page 3-39, Section 3.4 and subsections: Page 3-40 lists a number of assumptions about cuttings size distributions…Husky has been drilling in the Jeanne d'Arc basin for some time now and should be able to provide an average particle size distribution from SBM drilling operations.

Husky Response: Neither Husky nor its drilling contractor records particle size distribution from SBM drilling operations. AMEC used sieve analysis results from modeling of the Hibernia well K-18 (AGAT Laboratories 1993), which is the same information used for the Hibernia, Terra Nova and White Rose cuttings modeling (Hodgins 1993; Hodgins and Hodgins 1998, 2000). Hebron drill cutting models also used these grain size data as inputs (AMEC 2010). These estimates of percentage pebbles, coarse sand, medium sand and fines are the best available source of information.

> **C-NLOPB Response**: *Husky could have collected the data but chose not to. Using data from the current White Rose drilling program would have been more representative of the grain size. Husky should remodel using more applicable data.*

Page 3-57 says "Other sources used, notably Scandpower (2000), and NAS (2002), have not been updated." The proponent is directed to two studies referenced in the Hebron Comprehensive Study Scandpower Risk Management AS. 2006. *Blow-out and Well*

Release Frequencies – based on SINTEF Offshore Blow-out Database, 2006. Report No. 90.005.001/R2 IAOGP (International Association of Oil & Gas Producers). 2010. *Blow-out Frequencies*. Report No. 434-2.

Husky Response: IAOGP (2010) is referenced in this report, and is used as a primary source for data. Scandpower (2000) is not used as a primary source of data so the 2006 update was not included.

> **C-NLOPB Response**: This is not an acceptable answer. Scandpower (2000) is used as a primary source of data, as the EA report says on page 3-62, "All three issues are covered thoroughly in Scandpower (2000), and this source is used in the following analysis" and by reference as primary source in Table 3-50, Table 3-52, Table 3-53.
>
> The proponent is directed to Scandpower (2011), *Blowout and well release frequencies based on SINTEF offshore blowout database 2010 (revised). Scandpower report No. 19.101.001-3009/2011/R3*

Page 3-60… the section is inserted below in its entirety: With respect to the WREP, there will be approximately 70 development wells drilled, and an estimated 300 well-years of production. Using the above world-wide spill frequency statistics as a basis for prediction, the spill frequencies estimated for the WREP would be as follows:

- Predicted frequency of extremely large hydrocarbon spills from blowouts during a drilling operation, based on an exposure of wells drilled: 70 x 1.5 x 10-5 = 1.1 x 10-3, or a 0.11 percent chance over the life of the WREP
- Predicted frequency of very large hydrocarbon spills from drilling blowouts based on an exposure of wells drilled: 70 x 5.9 x 10-5 = 4.1 x 10-3 or a 0.41 percent chance over the life of the WREP.
- Predicted frequency of extremely large hydrocarbon spills from production/workover blowouts, based on an exposure of well-years = 300 x 5.7 x 10-6 = 1.7 x 10-3 or a 0.17 percent chance over the life of the WREP.
- Predicted frequency of very large hydrocarbon spills from production/workover blowouts, based on an exposure of well-years = 300 x 1.4 x 10-5 = 4.2 x 10-3 or a 0.42 percent chance over the life of the WREP.

The content above is wrong, the following corrections are provided. With respect to the WREP, there will be approximately 70 development wells drilled, and an estimated 300 well-years of production. Using the above world-wide spill frequency statistics as a basis for prediction, the spill frequencies estimated for the WREP would be as follows:

- The frequency of an extremely large hydrocarbon spill from a blowout during development drilling operations is 1/85,796 = 1.16×10^{-5} spills/well
- The predicted number of extremely large hydrocarbon spills from blowouts during a drilling operation, based on an exposure of wells drilled: 70 wells $x1.16x10^{-5}$ spills/well = 8.2×10^{-4} spills

- The frequency of very large hydrocarbon spills (including the extremely large category) from a blowout during development drilling operations is (4/85,796) = 4.66×10^{-5} spills/well
- The predicted number of very large hydrocarbon spills from blowouts during a drilling operation, based on exposure of wells drilled: 70 wells x 4.66×10^{-5} spills/well= 3.26×10^{-3} spills

- The frequency of extremely large hydrocarbon spills from production/workover blowouts is 2/350,000 = 5.71×10^{-6} spills/well-year
- The predicted number of extremely large hydrocarbon spills from the WREP based on well-years is calculated as 300 well-year x 5.71×10^{-6} spills/well-year=1.7×10^{-3} spills

- The frequency of very large hydrocarbon spills (including extremely large) from production/workover blowouts is 8/350,000 = 2.28×10^{-5} blowouts/well-year,
- The predicted number of very large hydrocarbon spills (including extremely large) based on an exposure of well-years = 300 well-years x 2.28×10^{-5} blowouts/well-year = 6.8×10^{-3} spills

I also provide the following note by way of explanation and not for inclusion in a response from the operator…

Of course you can't have 6.8×10^{-3} spills, which is what makes someone who didn't carry units through their equation think that they've calculated a probability. However, the problem is that the calculation of a probability for such an event is more complex.

Having a blow-out is a yes or no event (i.e. you either have one or you don't) and events of this type are typically viewed as being binomially distributed. If you model blow-outs as binomially distributed data using historical frequencies you find that you can use the Binomial Probability Formula to generate probabilities of x number of events occurring (where x has a value from 1 to n, and n is the total number of trials: 70 wells-drilled or 300 well-years as appropriate. If you do that and take the sum of probabilities for potential x (1,2,3,4,5...n) as the "probability of at least one event"; then for low probability events that sum is very close to (i.e. the same as) the number calculated using the formula used by the proponent, but, as the likelihood of the event increases, the numbers become increasingly different.

For example, to model the likelihood of a very large blowout spill during development drilling where the frequency is 4.66×10^{-5} spills/well. The binomial probability of any discrete number of spills ***k*** *(1 to 70) in* ***n*** *trials (70) can be modeled using the binomial probability function*

$$P = \binom{n}{k} p^k q^{n-k}$$

Where n = number of trials (wells)

k = number of successes (spills)
p =probability of success in one trial (spills per well)
q =1-p

k	***P***
1	*0.00325153*
2	0.00000523
3	0.00000001
4	0.00000000
Sum	0.00325

One can see that the value of P is vanishingly small with larger k (i.e. the probability of 4 [or more] very large spills in 70 wells is very small). The probability of at least one very large spill in 70 wells is the sum of the calculated values ≈ 0.00325.

Or you could use $P_{k\geq 1} = 1 - (1-p)^n$ *to directly calculate a P value for probability that there will be at least one very large spill in n=70 wells. Which, for the example above, yields P =0.00325.*

The formula used by the proponent to calculate "frequency over the life of the project" is both mathematically incorrect (as it does not preserve units) and will fail to produce a "statistically reasonable" answer for higher frequency events since the calculated probability will be greater than 100 percent.

Husky Response: The above bullet list provided by the reviewer is correct, however, the following edits are made to reflect 60 wells rather than 70:

With respect to the WREP, there will be approximately ~~70~~ 60 development wells drilled, and an estimated 300 well-years of production. Using the above world-wide spill frequency statistics as a basis for prediction, the spill frequencies estimated for the WREP would be as follows:

- The frequency of an extremely large hydrocarbon spill from a blowout during development drilling operations is 1/85,796 = 1.16 x 10^{-5} spills/well;
- The predicted number of extremely large hydrocarbon spills from blowouts during a drilling operation, based on an exposure of wells drilled: ~~70~~ 60 wells x1.16 x 10^{-5} spills/well = ~~8.2~~ 7.0 x 10^{-4} spills;
- The frequency of very large hydrocarbon spills (including the extremely large category) from a blowout during development drilling operations is (4/85,796) = 4.66 x 10^{-5} spills/well;
- The predicted number of very large hydrocarbon spills from blowouts during a drilling operation, based on exposure of wells drilled: ~~70~~ 60 wells x 4.66 x 10^{-5} spills/well= ~~3.26~~ 2.8 x 10^{-3} spills;
- The frequency of extremely large hydrocarbon spills from production/workover blowouts is 2/350,000 = 5.71 x 10^{-6} spills/well-year;

- The predicted number of extremely large hydrocarbon spills from the WREP based on well-years is calculated as 300 well-year x 5.71 x 10^{-6} spills/well-year= 1.7 x 10^{-3} spills;
- The frequency of very large hydrocarbon spills (including extremely large) from production/workover blowouts is 6~~8~~/350,000 = ~~2.28~~ 1.71x 10^{-5} blowouts/well-year; and
- The predicted number of very large hydrocarbon spills (including extremely large) based on an exposure of well-years = 300 well-years x ~~2.28~~ 1.71 x 10^{-5} blowouts/well-year = ~~6.8~~ 5.1 x 10^{-3} spills

Indeed, binomial probability could be used as an alternate method to make the calculations, but we believe that the calculation of spill frequency is an acceptable quantification of the risk of blowouts and spills, as required in the WREP Scoping Document (C-NLOPB 2012), and as previously deemed acceptable. We acknowledge there were inconsistencies in the well count used and that there is some confusion in the presentation of results. The probabilities in Table 3-60 have been corrected to reflect re-calculation using the binomial probability proposed by the reviewer. Revised Table 3-60 is provided as Table 7.

C-NLOPB Response: *In the previous round of comments the binomial probability approach and the simpler use of the formula* $P_{k\geq 1} = 1 - (1-p)^n$ *was posited to calculate the probabilities of spills, not as an alternative method but as the correct method. As previously stated, for low probability events the practice of multiplying historical frequency by exposure calculates the predicted number of occurrences, which approximates, numerically, the likelihood of occurrence over the project life but which is mathematically and statistically insupportable as a calculation of probability.*

For additional clarity, the last column of table 3-60 as calculated in the original report did not contain the probability of occurrence of a spill but the most likely number of spills over the life of the project, as becomes evident in lines 10, 11 and 12 of that table. I have revisited the table again with appropriate edits and notes below.

No.	*Event*	*Historical Frequency*	*White Rose Exposure*	*Most Probable Number of Events (n) over project life* [1]	*Likelihood of Occurrence over project Life* [2] *(i.e. n≥1)*
Blowouts					
1	*Deep blowout during development*	*4.8 x 10^{-5} / wells-drilled*	*60 wells-drilled*	*0.0029*	*0.0029*
2	*Blowout during production involving some hydrocarbon discharge >1 bbl*	*2.8 x 10-5 / well-years*	*300 well-years*	*0.0084*	*0.0084*
3	*Development drilling*	*4.7 x 10^{-5} /*	*60*	*0.0028*	*0.0028*

	blowout with hydrocarbon spill >10,000 bbl	*wells-drilled*	*wells-drilled*		
4	*Development drilling blowout with hydrocarbon spill >150,000 bbl*	*1.2 x 10^{-5} / wells-drilled*	*60 wells-drilled*	*0.00072*	*0.00072*
5	*Production / workover blowout with hydrocarbon spill >10,000 bbl (3)*	*1.7 x 10^{-5} / well-year*	*300 well-years*	*0.0051*	*0.0051*
6	*Production / workover blowout with hydrocarbon spill >150,000 bbl*	*5.7 x 10^{-6} / well-year*	*300 well-years*	*0.0017*	*0.0017*
Platform Spills (including blowouts)					
7	*Hydrocarbon spill > 10,000 bbl (3)*	*5.5 x 10^{-6} / well-year*	*300 well-years*	*0.0017*	*0.0017*
8	*Hydrocarbon spill >1,000 bbl*	*1.5 x 10^{-5} / well-year*	*300 well-years*	*0.0045*	*0.0045*
9	*Hydrocarbon spill 50 to 999 bbl*	*4.8 x 10-4 / Well-year*	*300 well-years*	*0.14*	*0.13*
10	*Hydrocarbon spill 1 to 49 bbl*	*1.2 x 10^{-2} / well-year*	*300 well-years*	*3.6*	*0.97*
11	*Hydrocarbon spill 1 L to 1 bbl (159 L)*	*0.23 / well-year*	*300 well-years*	*69*	*1*
12	*Hydrocarbon spill less than 1 L*	*0.46 / well-year*	*300 Well-years*	*138*	*1*

Notes:

(1) Calculated as (Historical Frequency) x (Exposure) = Most Probable Number of Events.

(2) Calculated as $P_{k\geq 1} = 1 - (1-p)^n$, the probability of at least one event.

(3) The reader should note that the frequency presented for platform spills >10,000 bbl (i.e., 5.5 x 10^{-6} spills/well-year) is almost four times smaller than the frequency for production blowout spills >10,000 bbl (i.e., 1.7 x 10^{-5}). This is a practical impossibility because the platform spills include the blowout spills. However, the data for platform spills >10,000 bbl is from the US record, which includes only oil wells and not gas wells. The source of the production blowouts was the world-wide record, which includes events that would not be counted in the US record.

Additionally, the reader should note that for scenarios where the probability of an event is higher and the predicted most probable number of events is greater than 1, the calculated number of events represents the central position of a spill probability distribution. Based on an assessment of the cumulative distribution of probabilities, the 95% confidence interval around that central position for spills between 1 litre and 159 litres is between 54 and 83 events over the life of the WHP. For spills of 1 litre or less the 95% confidence interval is 121 to 154 spill events.

Page 5-12, Section 5.3.2.2 Temporal Boundaries, and
Page 7-6, Table 7-2
Page 8-2, Table 8-1
Page 9-5, Table 9-1
Page 10-2, Table 10-1

The temporal boundaries of the WHP and subsea option are not consistent with the temporal boundaries for the original White Rose Project, including the operation of the SeaRose FPSO.

Husky Response: The original White Rose Environmental Assessment (Husky Energy 2001) contemplated three to four subsea drill centres being constructed within the White Rose field. Three drill centres (Centre, Southern and Northern), were constructed prior to an assessment of five additional drill centres in the Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment - EA Addendum (LGL 2007). To date, only the North Amethyst and South White Rose Extension drill centres have been constructed of the five assessed during the period from 2007 to 2015.

The current WREP Environmental Assessment re-assessed the effects of construction and operation of up to three drill centres during the life of the project. The productive life of the subsea infrastructure is estimated at 20 years, the productive life of the WHP is estimated at 25 years. The potential environmental effects of the operation of the *SeaRose FPSO* have not been assessed past 2020, the original projected life of the White Rose field.

Husky Energy will complete environmental assessments as required to review potential effects and mitigation opportunities prior to the expiry of current approvals.

> ***C-NLOPB Response****: This response is generally acceptable. We note that the current "Approvals" include the DPA, which doesn't expire per say, but which will be made inactive by expiry of the original project EA temporal scope. The C-NLOPB won't be able to issue any "Authorizations" beyond 2020 until that issue is resolved.*

C-NLOPB Comments
Supporting Document: Drill Cuttings and WBM Operational Release Modelling (AMEC June 2012)

G1 Throughout the document it is stated that the release of mud and cuttings will be in accordance with the Offshore Waste Treatment Guidelines (OWTG). The OWTG outline "…the goals, objectives and requirements of the applicable acts and regulations, and to explain the expectations of the Boards regarding the management of waste material …". For an operator, the governing document with respect to management of discharges to the natural environment is the Environmental Protection Plan (EPP) submitted as part of the authorization application (OWTG page 2). The document should describe the discharge of cuttings and mud expected for the project (e.g. mud types, discharge locations, oil on cuttings).

Husky Response: A description of expected mud and cuttings volume and release locations are provided on the tables 2-2 and 2-3 of the Drill Cuttings and WBM Operational Release Modelling (AMEC 2012). The discharge of mud and cuttings and their limits for the WREP will be described in the WREP Environmental Protection Compliance and Monitoring Plan and submitted as part of the authorization application.

> ***C-NLOPB Response****: The tables do not show any release of SBM, leaving the assumption that there will be no release of SBM even if a MODU is used. If there is to be SBM released from a MODU then a response to this comment is still required.*

G2 There are a number of assumptions made, such as particle size and distribution, well depths and aggregation of cuttings. It is difficult to say if the assumption is valid. The basis on which all model assumptions are based should be provided.

Husky Response: Cuttings particle size, distribution and the aggregations used are presented in Section 3.2.2, including the basis for their selection and corresponding references. For well depths, please see comment "Section 2 Drilling Program, pg 3 – "Well lengths assumed.

> ***C-NLOPB Response****: Current drilling discharges at White Rose would be more indicative of the White Rose Field than one Hibernia well. Husky should use information from actual drilling at White Rose or show that the difference between the Hibernia well and the well to be drilled for the White Rose Extension are similar.*

Executive Summary, pgs i-ii – "These will be almost exclusively the fast-settling pebbles and coarse sand (a very small percentage of the fines will drift for a time and ultimately settle near the WHP…". Please provide the reference for the grain sizing.

Husky Response: Neither Husky nor its drilling contractor records particle size distribution from SBM drilling operations. AMEC used sieve analysis results from

modeling of the Hibernia well K-18 (AGAT Laboratories 1993) . Which is the same information used for the Hibernia, Terra Nova and White Rose cuttings modeling (Hodgins 1993; Hodgins and Hodgins 1998, 2000). Hebron drill cutting models also used these grain size data as model inputs (AMEC 2010). These estimates of percentage pebbles, coarse sand, medium sand and fines is the best available source of information.

> ***C-NLOPB Response****: Husky could have collected the data but chose not to. Using data from the current White Rose drilling program would have been more representative of the grain size. Husky should remodel using more applicable data.*

Executive Summary, pg ii – "Under the subsea drill centre option, the majority of SBM cuttings are deposited quite close to the drill centre, due to the large percentage of large cuttings pieces having fast settling speeds." Please provide the reference for both the grain sizes expected for cutting and settling rates, and how they were determined.

Husky Response: Neither Husky nor its drilling contractor records particle size distribution from SBM drilling operations. AMEC used sieve analysis results from modeling of the Hibernia well K-18 (AGAT Laboratories 1993) . Which is the same information used for the Hibernia, Terra Nova and White Rose cuttings modeling (Hodgins 1993; Hodgins and Hodgins 1998, 2000). Hebron drill cutting models also used these grain size data as inputs (AMEC 2010). These estimates of percentage pebbles, coarse sand, medium sand and fines is the best available source of information. Please see Section 3.2.2 of the AMEC for an explanation of settling rates used.

> ***C-NLOPB Response****: Husky could have collected the data but chose not to. Using data from the current White Rose drilling program would have been more representative of the grain size. Husky should remodel using more applicable data.*

Section 2 Drilling Program, pg 2 – "For drilling of the deeper intermediate and main hole sections - for both WHP and MODU drilling - SBM will be used. Under the WHP option the base case is to use two cuttings reinjection wells into which treated SBM and cuttings will be reinjected (*i.e.*, no return of materials to the sea)". The discharge of SBM cuttings will not be permitted until the cutting reinjection system is operative. This would mean no drilling with SBM.

Husky Response: The base plan is to drill two cuttings reinjection wells for cuttings disposal purposes. In addition, the WHP design currently envisions a secondary cuttings dryer system to lower synthetic-based mud on cuttings (SOC) to a target level of 6.9 percent SOC. This is consistent with technology currently employed by MODUs operating in the area. This secondary dryer would be employed until the cuttings reinjection (CRI) system is functional. This secondary system would also be employed in the event of difficulties with the CRI system. Prior to having a CRI system in place, and in the event of CRI system failure, following processing with the secondary dryer, cuttings would be discharged overboard. Current drilling authorizations allow for the discharge of cuttings while drilling with an SBM fluid, at discharge limits specified in the

facilities Environmental Protection Plan. The discharge of mud and cuttings and their limits for the WREP will be described in the WREP Environmental Protection Compliance and Monitoring Plan and submitted as part of the authorization application. While utilizing an SBM fluid system, the WHP intends to handle cuttings in a similar manner as a MODU until the CRI system is operable, as well as in the event the CRI system experiences a failure. Once the CRI system is operable, these cuttings will be reinjected downhole.

> ***C-NLOPB Response****: The Proponent should model these discharges or explain why modeling is considered not necessary.*

Section 3.1.1 Advection Dispersion Model Description, pg 6 - "For the purposes of predicting their physical deposition on the seabed, the cuttings are considered as a composition of particle types or sizes; typically larger cuttings pieces pebbles coarse sand, medium sand and fines. These particle sizes are assumed to be generally representative of the materials likely to be encountered in the area and generated using WBM or WBM." Please provide the percentage of each particle size and reference the source of the composition. It is inappropriate to make assumptions and where assumptions are made the rational for that assumption needs to be described.

Husky Response: Neither Husky nor its drilling contractor records particle size distribution from SBM drilling operations. AMEC used sieve analysis results from modeling of the Hibernia well K-18 (AGAT Laboratories 1993) . Which is the same information used for the Hibernia, Terra Nova and White Rose cuttings modeling (Hodgins 1993; Hodgins and Hodgins 1998, 2000). Hebron drill cutting models also used these grain size data as inputs (AMEC 2010). These estimates of percentage pebbles, coarse sand, medium sand and fines is the best available source of information.

> ***C-NLOPB Response****: Husky could have collected the data but chose not to. Using data from the current White Rose drilling program would have been more representative of the grain size. Husky should remodel using more applicable data.*

Section 3.2.1 Scenarios, Well Sequences, Well Types, Table 3-1, pg 8 – Please provide the information on the duration for drilling each well section. Duration should be based on actual time to drill a well in the White Rose field.

Husky Response: Average durations are as follows, based upon average duration for seven recent Husky subsea wells, and used as the basis for WHP time estimations. Durations are inclusive of skidding, drilling, casing, cementing, completions and associated ancillary operations:

- Conductor section (1,067 mm hole OD) = 5.0 days;
- Surface section (406 mm hole OD) = 12.5 days;
- Production section (311 mm hole OD) = 22.2 days;
- Production liner section/completion (216 mm hole OD) = 43.5 days;

Considering only durations in which cuttings are being generated, the following average times apply. Note that there are periods within these times provided that cuttings are not returned;

- Conductor section (1,067 mm hole OD) = 2.0 days;
- Surface section (406 mm hole OD) = 8.9 days;
- Production section (311 mm hole OD) = 17.3 days;
- Production liner section/completion (216 mm hole OD) = 22.1 days.

***C-NLOPB Response**: These durations are much longer than described in Table 3-1. The Proponent should consider if the durations described in Table 3-1 are representative of the times over which cuttings are discharged and adjust the model accordingly.*

Section 3.2.2 Cuttings Particle Characterization, pg 9 - "Information for the Hibernia K-18 well is available from a sieve analysis performed by AGAT Laboratories (1993) and details depths of 900 to 5,010 m. This has been employed in the previous cuttings modelling for Hibernia, Terra Nova and White Rose (Hodgins 1993; Hodgins and Hodgins 1998, 2000), and Hebron (AMEC 2010), with estimates of percentage pebbles, coarse sand, medium sand and fines, and is the best available source of information." Information on particle size could be obtained through Husky's current drilling program and would be more representative of particles sizes while drilling with SBM.

Husky Response: Neither Husky nor its drilling contractor records particle size distribution from drilling operations. The quoted sources are currently the best available data for modelling inputs.

> ***C-NLOPB Response**: Husky could have collected the data but chose not to. Using data from the current White Rose drilling program would have been more representative of the grain size. Husky should remodel using more applicable data*

Section 3.2.2 Cuttings Particle Characterization, pg 9 – "Experience with both SBM and WBM has shown that SBM systems are not dispersive; cuttings are large, and they remain intact until deposited on the seabed." Whose experience and what is the basis of that experience? For SBM cuttings, the more the cuttings are processed the more the particle size decreases and remain suspended in the water column. This increases the affected area. In addition, as cuttings get drier, the amount of oil decreases. Please see Brandsma, 1996 which states that "The explanation for this apparent conundrum is that while treatments other than centrifugation also reduce oil content (from an untreated level of 15.8% [w/w] to a range of 0.3% to 5.1%, these treatments also generate cuttings with finer particle sizes. Thus, according to the model, the untreated and centrifuged OBF-cuttings would not reach the 1000 m mark to the same extent that the treated OBF-cuttings would because the finer particles created by the treatment have lower settling velocities and are transported farther in the water column."

US EPA. 2000. Environmental Assessment Of Final Effluent Limitations Guidelines And Standards For Synthetic-Based Drilling Fluids And Other Non-Aqueous Drilling Fluids In The Oil And Gas Extraction Point Source Category, December 2000, report number EPA-821-00- 014 Page 4-4.

Brandsma, M.G. 1996. Computer simulations of oil based mud cuttings discharge in the North Sea. In: The Physical and Biological Effects of Processed Oily Frill Cuttings. E&P Forum Report No.2.61/202. April 1996. Pages 25-40.

Husky Response: a) In response to the question "Whose experience and what is the basis of that experience?", as noted with the personal communication reference at end of that paragraph it is the experience of Chris Mazerolle, Drilling Engineer Advisor, Chevron Canada Resources, Calgary, AB. b) In response to "Please see Brandsma, 1996 ..." Comment noted. Thank you.

> ***C-NLOPB Response****: The Proponent needs to revisit its assumptions on cuttings dispersion and adjust the model accordingly.*

Section 3.2.2 Cuttings Particle Characterization, pg 9 – "Cuttings drilled with SBM will be large, on the order of 2.5" in length, 1" wide, and 1/8" thick. To characterize these large cuttings as spherical particles for the model, their volume corresponds to a particle diameter of about 1 to 3 cm. This large cutting size type was added to the pebbles, coarse sand, medium sand and fines types used to characterize the WBM-cuttings noted above. It was assumed that most (approximately 70 percent) of the cuttings will be large, approximately 20 percent 0.5 to 1 cm, 5 percent 0.1 cm, with the remaining 5 percent being very fine particles, with diameters of 0.01 cm (Table 3-3)." Provide the reference for the data source.

Husky Response: Reference for cuttings drilled with SBM (first sentence, paragraph before Table 3-2) is (pers. comm. with Suncor drilling superintendent and MI Swaco personnel, January 2011).

> ***C-NLOPB Response****: The reference provided does not appear in the first sentence before Table 3-2. Husky should explain where the precise numbers provided in the paragraphs, as per the personal communications, came from.*

C-NLOPB Comments
Supporting Document: SBM Accidental Release and Dispersion Modelling (AMEC June 2012)

7.1 General Comment: The proponent does not understand the current regulatory environment and should familiarize themselves with the difference between regulation and guidance. The OWTG is not regulation, it is guidance. The OWTG states "…the goals, objectives and requirements of the applicable acts and regulations, and to explain the expectations of the Boards regarding the management of waste material…" For an operator, the governing document with respect to management of discharges to the natural environment is the Environmental Protection Plan (EPP) submitted as part of the authorization application." (OWTG page 2). The document should describe the discharge of cuttings and mud for the project which would include, mud types, discharge locations, and oil on cuttings as expected for the project.

Husky Response: The discharge of mud and cuttings and their limits for the WREP will be described in the WREP Environmental Protection Compliance and Monitoring Plan and submitted as part of the authorization application.

> ***C-NLOPB Response****: Husky could have collected the data but chose not to. Using data from the current White Rose drilling program would have been more representative of the grain size. Husky should remodel using more applicable data.*