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G1. The project description and environmental assessment is focused primarily on drilling activities. The environmental assessment must include production activities, as well as those activities listed above. Information from the Hibernia EIS is only relevant for the life of the Hibernia project, which in 1985 was predicted to end in 2017. Therefore, the EA must consider and address all activities up to 2036, the predicted life of this project.	The original Hibernia project was delayed with startup only occurring in 1997 which was beyond the date contemplated in the 1985 time frame. This project delay coupled with increased recoverable reserves would extend the field life. The Temporal Boundaries section of the Hibernia EIS (Vol. IIIb, Section 4.1.3.2, pg 8) references project schedule in Figures 2.0-3 and 2.0-4. Those figures illustrate that production will continue past 1993; no specific end date is identified. The Hibernia Project Description (Vol. II, Section 8.1, pg 100) states "When the Hibernia Field has been depleted to the level at which further production is uneconomic, procedures for abandonment and site restoration will be initiated in accordance with legislation to be implemented pursuant to *The Atlantic Accord* ."	**CNLOPB:** Regarding comment G1, it should be clearly stated in the EA report, if determined by HMDC, that production related discharges or effects with the proposed project do not alter predictions made in the original EIS.	The following paragraphs will be added to Section 2.6 Discharges and Emissions; "As noted in Section 2.2, air emissions and wastewater (including produced water) discharge rates are not anticipated to be greatly affected by this Project. The Project will extend the life of the field and therefore the total mass of air emissions and wastewater released over the life of the field will increase. These aspects of production operations were assessed in the original Hibernia Environmental Impact Assessment and the associated predictions are concluded to remain valid (Mobil 1985). In 2006, an environmental assessment on the effects of produced water discharges up to 40,000 m^3/d (having a maximum allowable limit of 40 mg/l for the 30 day volume weighted rolling average) was conducted. The report prediction of no significant effects remains applicable and therefore valid (HMDC 2006). Thus, the effects assessment for this report are focused primarily on potential effects associated with drilling operations and subsea development."	DFO: With respect to HMDC June 17, 2009 response to G1,G8 and S12. DFO does not consider the response to be entirely adequate. Based on the 2006 EA conducted for Produced Water discharges up to 40,000 m3/day, can the proponent claim/ demonstrate that there will be no significant effects resulting from the continuous discharge of produced water for the extended duration of the Hibernia field (i.e. until 2036). If this is the case, it should be clearly stated in the text of the current EA document.	The PW EA (March 2005) states: **"6.1 Environmental Effects Assessment , 6.1.1 Boundaries** The temporal boundary for the environmental effects assessment is from first oil (1997) and encompasses the production life of the Hibernia platform. **10.0 Summary and Conclusions** This environmental assessment on the effects of increased water production at Hibernia incorporated current scientific literature, actual monitoring data from both the Hibernia EEM programs and compliance monitoring required under the Offshore Waste Treatment Guidelines, discussions and data provided by regional experts, the incorporation of the model results for produced water, a review of the original findings of the Hibernia EIS. This environmental assessment of the potential environmental effects of increased produced water production at the Hibernia site has assessed this activity as not significant and that the original Hibernia EIS conclusions remain valid." The following will be added to Section 2.6 Discharges and Emissions; "The environmental assessment of the potential	Page 154, Section 6.1.3.1 and Page 230, Section 7.3.1 – results from a 2002 EM study were described which indicated that hydrocarbon concentrations in sediment have decreased post-injection of drill cuttings. A conclusion is made that the "biological effects of drilling are considered reversible". This statement is unfounded as there is no indication of the hydrocarbon concentration within any biological components and it does not prove that they are reversible.	Both statements have been removed from the sections noted.

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					environmental effects of increased produced water production at the Hibernia site was assessed as not significant for the life of the project."		
G2. The project description does not include the required description of the installation, operation, maintenance, modification, decommissioning and abandonment of subsea flowlines/umbilicals and associated equipment. The analysis of accidents and malfunctions should include incidents related to this equipment.	A description of subsea flowlines/umbilicals and associated equipment is provided in the following sections: • Installation- Section 2.1.4 • Operations/Maintenance/ Modification- Section 2.2.1. • Decommissioning/Abandonment- Section 2.4.2.2. In general, all work offshore is approved and conducted under a Work Authorization approved by the C-NLOPB. Each program if fully documented and mitigations are developed for each specific activity undertaken. At this time, we do not have the specific project activities identified, work plans developed or the contractors/equipment selected to provide more detail. In the event of an issue on the platform all present and future control systems are designed to fail in a safe position. Analysis of this project has indicated limited changes to the facilities that may contribute to accidents and malfunctions. As of this time we have identified methanol and hydraulic fluid as being						

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	the only chemicals that may be released due to a possible loss of subsea structure containment The following text is to be added to Section 8.4.3 – Flowline and Umbilical Accidents. "The type of hydraulic fluid anticipated for use is called Transaqua, or an equivalent. This type of hydraulic fluid is a water-based fluid specifically formulated for use as the control medium in subsea production control systems It is soluble in water in any proportion and is readily biodegradable (Logichem 2002). These fluids are miscible in water, are not expected to bioaccumulate through food chains in the environment and are unlikely to be harmful to aquatic organisms (Logichem 2002). Methanol or methyl alcohol is a clear colorless liquid at room temperature. It will rise through the water column if released from the seafloor, but is completely soluble in water and will dissolve It is biodegradable at concentrations below 1,000 ppm (above which it is toxic to aquatic life and microorganisms) (Laubenheimer et al., 1991). The toxicity of methanol will quickly diminish from the point of release and have a limited area of effect due to the mitigations inherent in project design."						

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	A number of mitigative measures will be used to prevent and minimize loss of containment incidents. Ice management plans (see Section 2.7.3) will be amended to detect iceberg incursions into the area. If icebergs cannot be safely moved out of the area the pipeline can be shut in until the threat passes. Weak links will be installed on the pipelines and umbilicals to limit the amount of damage if encountered by an iceberg. If for some reason a line in operation is impacted, low pressure alarms and shutdowns will be used to alert operations personnel and cease operation. In the case of production lines, if it is determined that an iceberg may enter the area, the oil production may be curtailed and the line flushed with seawater and the oil in the line displaced back into the Hibernia GBS process equipment. Dropped objects are another hazard to subsea equipment. In addition to having proper lifting procedures in place, flowlines approaching the GBS which may be located under the operating zone of cranes will be protected with concrete mattresses or some other equivalent means of protection. Safety zones extending out 500 m in all directions will be established to limit access by other						

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	vessels. Maintenance strategies will be developed to ensure the integrity of the pipelines. In the case of oil production flowlines, piping would be designed on the platform to allow equipment to be run through the line to remove deposits that can affect flow through the line or create environments in which corrosion may be initiated. Inspection equipment can also be run though the line to check for any anomalies to the pipe wall thickness and plan for repairs if necessary.						
G3. The project description does not include the required description of dredge spoils disposal.	The following text will be added to Section 2.1.1. "The location of the dredge spoils disposal site was selected to ensure spoils would not re-enter the glory hole, pose no hazard to navigation and no obstruction to future operations. The dredge vessel approaches the centre of the disposal area, comes to a near complete stop and and releases the material via gates on the underside of the vessel. A description of dredge spoil disposal is provided in Section 6.1.3.2."						
G4. In general, the biological/environmental risk issues have been covered and the conclusions are mostly in agreement with available literature, including past monitoring programs that have been carried	Modelling of drilling waste was deemed unnecessary given the EEM data to support actual drilling waste dispersion. EEM data was used in addition to modeling results from other projects to conduct the affects assessment. Please see Section 2.6.1.1 for a summary	**DFO:** This does not answer the question of characterization and quantification of discharges nor does it address modeling of wastes from multiple sources versus the single source used for the GBS.	Discharges from this Project will be of typical quantity, volume and composition experienced in the area from previous project activities. The value of modeling multiple waste sources is questionable. Hibernia has been in operation since late				

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out on the Grand Banks, several major reviews as well as specific studies dealing with exploration drilling on the Banks. Despite this however, the document is lacking in a number of areas and does not adequately address the issues outlined in the scoping document, particularly with respect to identification, characterization, quantification and modeling of discharges.	of existing data and models. As noted to response to G1, discharges associated with the GBS have been assessed in the original Hibernia EIS including produced water discharges and air emissions. Produced water rates in excess of present discharge limits levels have been assessed in the *Hibernia Development Project Increased Production and Produced Water Environmental Assessment Report* (HMDC 2006).		1997 and has conducted field programs to monitor environmental effects. No significant effects were predicted nor have any been detected. The two principle waste streams that have been the focus of many similar environmental assessments are drill cuttings and produced water. The produced water waste stream was modeled in 2005 and an assessment conducted for a discharge rate of 40,000m^3 /day when the OWTG limit for the 30 day volume weighted rolling average was 40 mg/l. Drill cutting modeling has been conducted on several occasions (see section 2.6.1.1), all having similar conclusions. This in conjunction with EEM data provides sufficient information for the purposes of this EA.				
G5. It is noted that the existing EEM program will be amended to incorporate monitoring of the drill centers as appropriate both spatially and temporally, including consideration of possible inter-center cumulative effects. That being said, the requirement for baseline data is neither included nor discussed. Given the proposed project timelines, it is essential that this be addressed in a timely fashion, well in advance of the start of any new	The collection of baseline data is planned to follow the EEM program amendment but in advance of drilling activities.						

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project activities.							
G6. Caution must be taken when making assumptions about the magnitude of acoustic affects as this depends on the sound propagation characteristics of the environment as well as the activity. A number of recent studies have shown that even the best multivariate acoustic models do not always provide adequate prediction of sound propagation. Consideration should be given to carrying out field measurements of sound propagation prior to and during the activities of concern to confirm the results of *a priori* modeling efforts and as a means to mitigate potential impacts.	HMDC agrees that modeling assumptions must be treated with caution when conducting environmental effects assessment. As mitigation to the potential effects of sound propagation, the protocols as outlined in the Geophysical, Geological, Environmental and Geotechnical Program Guidelines" (C-NLOPB 2008a) will be followed.						
G7. Hibernia has been re-injecting drill cuttings at the GBS since 2002 which has proven to be a measurably effective means of reducing the environmental footprint of drilling activities. Why is this mitigation not being considered for the proposed expansion?	There are no plans to stop cuttings reinjection from the GBS. SBM cuttings generated from wells drilled from the GBS will continue to be recovered and disposed of by cuttings reinjection.SBM cuttings from the MODU will be disposed of according to the OWTGs.						
G8. The proponent suggests that since there will be no increase in the overall rate of produced water	See response to G1. The original EIS did not reflect an end of project date of 2017. Production related discharges were assessed in the original	**DFO:**This assumes that the effects of produced water discharges are transient and not a function of the total amount of produced water	Noted. See HMDC response dated June 17 to G1 above.				

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discharge from the GBS, it does not need to be discussed in this assessment. Although rates of discharge may not change, which has not been demonstrated in the document, the total amount of produced water discharged will be increased significantly. Therefore, the effects of this discharge should in fact be assessed in this document.	EIS. There is some potential for produced water rates to exceed current maximum daily discharge limits however any increase is not expected to be significant and certainly not expected to exceed the rates assessed in the *Hibernia Development Project Increased Production and Produced Water Environmental Assessment Report* (HMDC 2006). Section 2.2 states that produced water production will not be "greatly affected" as a result of this project. Text in sections 6.1.3, 6.2.3, 6.4.3, 6.5.3, and 6.6.3 will be added or revised as follows to state that "As the Project is not predicted to result in an increase in Hibernia oil production rates (only an extension in the field life), discharge rates of air emissions and wastewater, including produced water, will not be greatly affected. Potential Project effects during the operation/production stage are therefore consistent with those effects already assessed for the overall Hibernia project".	discharged.					
G9. The cumulative effects assessment provided assumes that if there is no direct overlap of physical effects on fish habitat, then there are no cumulative effects, which is incorrect as it	In Section 7.2.1, the cumulative effects assessment of Fish Habitat did assume there is no direct overlap of physical effects on fish habitat as a worst case scenario. The assessment						

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is the overall reduction in habitat that should be assessed. Additionally, the proponent assumes that if an individual activity has an effect that is below current detection limits or of short duration, then there will be no cumulative effects.	was based on the maximum potential in overall reduction of fish habitat with the sentence "This cumulative area represents less than 1% of the Project Area". By definition, a cumulative effect has to be measureable in order to act cumulatively and the reversibility of effects also minimizes the cumulative potential.						
SPECIFIC COMMENTS S1. **Pg. v** - The following statement *"Whales are opportunistic feeders and have adapted to the variability in prey abundance, so usually are not reliant on any single location for food"* is not entirely correct. There is evidence that some whale stocks (e.g., blue whales in the Gulf of St. Lawrence, possibly humpback and fin whales on the SE Grand Banks in winter) return year-after-year to predictable aggregations of prey. Alteration of such an aggregation could have significant impacts, particularly for a *SARA*-listed species.	Sentence is deleted.						
S2. **Pg. vi** - Abandonment could be a greater source of disturbance and injury for mammals and leatherbacks than	Agreed. List of mitigations in text and tables has been amended to state "Any blasting that may be required will comply with						

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vessel operations if explosive well severance methods are used.	DFO's Guidelines for Use of Explosives in Canadian Fisheries Waters, and /or current guidelines and regulations applicable at the time of abandonment."						
S3. **Pg. vi** - The statement that leatherback sea turtles will not likely be significantly affected by an oil-spill is not accurate, as leatherback turtles could potentially be affected if they eat contaminated jellyfish.	Leatherback turtles could potentially be affected if they eat contaminated jellyfish, but we stand by the statement that leatherback sea turtles will not likely be significantly affected by an oil spill. Text has been amended to state "Leatherback turtles could potentially be affected by an oil spill if they eat contaminated jellyfish."						
S4. **Figure 1.1, pg. 3** – The figure should also show the Study area for the project.	The figure is meant to illustrate the Project Area as part of the Project Description. The Study Area for each VEC is provided in the assessment sections.						
S5. **Figure 1.2, pg. 4** – Where is the location of the drill centre and the location of the dump zone?	These locations have been added to Figure 1.1 since they are within the Project Area. Revised figure is attached in Appendix A,						
S6. **§1.4, Regulatory Context, pg. 5** – A development plan amendment, pursuant to the Accord Acts is also required.	The following text will be added in Section 1.4. "In addition, Hibernia's existing Development Plan will have to be amended and approved as per Section 135 and 139 of the Federal and Provincial Accord Acts respectively".						
S7. **§2.1.1 Glory Hole Construction, pg. 8** - Is it likely that boulders could be encountered that are too large for the	To date there has been very few instances where boulders encountered were not able to be retrieved by the suction head. If necessary, the vessel would move the						

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suction dredge to handle? If so, there should be a contingency plan and possible inclusion in the disposal at sea permit.	boulders out of the glory hole by "dragging" the boulders with the drag head up the side of the glory hole. It is not common but can be done if necessary. There would be no intention of taking such boulders to the disposal site.						
S8. **§2.1.3 Geohazard and Vertical Seismic Profile Surveys, pg. 11** – The last paragraph of this section does not belong in the project description.	Paragraph removed.						
S9. **Figure 2.4, pg. 15** – The scale and direction should be included in figure.	Approximate scale and direction have been included in Figure 2.4. Revised figure is attached in Appendix A,						
S10. **§2.6 Discharge and Emissions, pg. 22** – The discussion in this section is focused primarily on anticipated discharges associated with drilling activities. Little, if no discussion is provided for production operations. This section must address all discharges and emissions from drilling and production activities. While sections in the report indicate that production related discharges have been addressed in the Hibernia EIS, the Hibernia EIS addressed discharges	Please See Response to comment G1.						

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up to 2017 (predicted life of Hibernia). This production operation is now extended to at least 2036. The project description sections and the effects assessment (in later section of the EA report) must address production discharges up to 2036. This discussion must address whether currently approved levels are anticipated to increase from those previously assessed in the Hibernia EIS.							
S11. **§2.6.1.1, Drill Mud and Cuttings Dispersion, pg. 24, 2nd paragraph** – In the discussion of the cuttings modelling dispersion, the Hurley and Ellis (2004) report is referenced. Recent and historical data from EEM programs (White Rose, Petro-Canada, and Hibernia) should also be referenced.	The following text has been added to Section 2.6.1.1 "At the White Rose project, the zone of effects on the benthic invertebrates extended to 1 to 5 km from source, beyond the 500 m zone of effects predicted in the White Rose EIS. Hydrocarbon contamination in sediments extended to 6 km from source and barium contamination extended to 2 km (Husky Energy 2007). At the Terra Nova Project, concentrations of barium decreased to background levels within 1 to 2 km from drill centres. Effects on the benthic community could not be quantified from the 2006 Terra Nova EEM Program (Petro-Canada 2007)." See response to Comment G4.						
S12. **§2.6.2, Produced**	Please see response to	**DFO:** This should be clarified	See June 17, 2009 HMDC				

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Water, pg. 25 – The discussion of produced water is focussed on drilling activities. There is no discussion of produced water from production operations. The section must address anticipated volumes of produced water for the life of production, and if there are any expected changes to currently approved discharge limits for produced water at the Hibernia Platform.	Comments G1, G4 and G8	in the document. Also, see comment above regarding G8.	response to G1 above.				
S13. **§2.6.11, Air Emissions, pg. 27** – Air emissions from the production platform are not addressed. Why? The section must address air emissions associated with the production operations, beyond those assessed in the Hibernia EIS. What are the annual average rates of emissions for the life of the project?	Please see response to Comments G1, G4 and G8. Hibernia air emissions data are posted on Environment Canada's NPRI website. http://www.ec.gc.ce/inrp-npri/default.asp?lang=En&n=4A577BB9-1. The annual average emission rates are not expected to change appreciably. The platform is presently constrained by available power and will continue to be. Thus air emissions are predicted to remain relatively constant. Emissions will conform to all regulatory controls.						
S14. The discussion on page 29 includes effects assessment. For example "emissions from the project will be temporary…", "the large distance to the nearest non-related	Text related to effects assessment will be removed from the section. "Temporary" refers to the emissions and releases associated with drill centre development. As noted previously, the primary focus						

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emissions sources makes the potential for cumulative effects …low". Statements such as these should be included in the effects assessment sections, not in the description emissions. In addition, air emissions from the project will not be temporary. Project life is up to 2036, and perhaps beyond.	of this EA is development drilling since the original Hibernia EIS assessed production related activity.						
S15. There are no major concerns from an air quality point of view. The emission estimates for the diesel engines provided in Table 2.6 on page 29 appear reasonable and the document also provides flaring estimates for GHGs during well tests. However, in addition to the GHGs, it would be useful to provide an estimate of CAC emissions from flaring and well testing, recognizing that these estimates would have greater range of uncertainty associated with them. The proponent mentions that GHGs are reported to the C-NLOPB as per the OWTG. The OWTG also require reporting of VOC emissions to the C-NLOPB so	VOC's and CAC's are predominately a concern in urbanized areas where they contribute to smog formation. Information on GHGs are presented here given current discussion on climate change and potential future regulatory impacts. The original Hibernia EIS (Vol. III3b pg 40) states impacts associated with atmospheric emissions are negligible and that dispersion will reduce contaminant concentrations to back ground levels. Hibernia air emissions are posted on Environment Canada's NPRIs website. The Hibernia platform is currently power limited. See response to comment S13.						

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these should also be estimated							
S16. **§2.6.11.1 Noise, pg. 29** – While it may be "unlikely" that explosives will be used to remove wellheads, it should be included as an alternative means, and assessed in the environmental assessment.	Although it is unlikely that explosives will be used, the following text has been added in Sections 6.2.6.4. "The noise generated by abandonment activities may cause avoidance if any marine fish species were in the area. If blasting is required, there is a risk of fish mortality and a decrease in habitat quality. The noise from blasting is expected to radiate into the marine environment and cause a startle response and temporary avoidance of the area by some marine fish species. Overpressure in excess of 100 kilopascals (kPa) can result in the mortality or injury of marine fish species, as well as their eggs and larvae. Marine fish species are susceptible to the effects of underwater blasting. In finfish, the swimbladder is the most likely site of damage, but the kidney, liver and spleen may also be ruptured." Section 6.4.6.1. "Although underwater blasting will be restricted in duration, the detonation of explosives may be lethal to marine mammals, cause auditory damage (under certain conditions) and may induce changes in behaviour (Richardson et al. 1995; Wright and Hopky 1998). In marine mammals, organs						

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	containing gas are most affected by underwater detonation of explosions (Keevin and Hempen 1997). The estimate of safe ranges from underwater explosions for marine mammals is dependent on both size and depth of the animal and type of explosive charge (Richardson et al. 1995). It has been calculated that slight injuries to lungs and intestines of marine mammals may occur at distances greater than 500 m under certain blasting conditions (Wright and Hopky 1998). One of the physiological effects of in-water blasting on marine mammals is temporary or permanent reductions in hearing sensitivity. Since marine mammals rely heavily on acoustic cues for communication and navigation, the effects of acoustic trauma have been well studied." Work authorizations/permits will be required for abandonment activities. All regulations in force at the time related to blasting activities will be met should this option be considered.						
S17. **§2.7.4 Safety Zones, pg. 32** – The potential spatial area to be affected if all 6 drill centres are constructed should be included, to the extent possible.	Concurrent MODU operations at more than one drill centre are unlikely. The likely scenario is that drill centres will be developed consecutively. Hypothetically, if all 6 drill centres were in operation at once and their safety zones did not overlap,						

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	the total area of all safety zones would be approximately 50 km^2. (See response to comment S109 for more detail).						
S18. **§3.1 Climate, pg. 35** - In many respects the description of the climate including winds and waves and climate variability was very well done. However, the data sources used to develop the wind and wave climate were less complete than required to ensure a full understanding of the climatology, especially of the extremes.	It is clear from the feedback provided to Comments S18 and S30 that a comprehensive review has been completed and the suggested improvements are duly noted. The level of analysis completed for this environmental assessment is deemed to be sufficient and satisfactorily addresses the EA requirements. It must be recognized that this project does not involve the design of a MODU or a production platform. Trained and experienced weather observers collect data in real time and provide it to marine and aviation operators. Limitations of the data, if any, are understood by the users of the data and are factored in when making decisions on field operations on a daily basis. Operational limits have been established, based on the capabilities of equipment and humans, and are intended to ensure the safety of those involved. Using the climate data collected by industry in the past ten years instead of MSC50 hindcast approach in an attempt to increase focus on a couple of extreme weather events in the last five years is a topic which is beyond the scope of this EA. Such a shift would require						

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	input and approval of the CNLOPB safety group and those involved with setting engineering design standards and practices. Industry data was considered and used in the development of the MSC50 dataset by Ocean Weather for Environment Canada. In a report titled *The MSC50 Wind and Wave Reanalysis* Swail et al state the following; *This study describes the second generation engineering-quality 50-year wind and wave hindcast produced for the entire North Atlantic Ocean using a long term, consistent wind field forcing based on improvement on the AES40 hindcast.* *In situ and satellite observations have been used to evaluate the wind and wave hindcast. The hindcast compares well against the available buoy, platform, ocean weather ship and satellite measurements in all parts of the North Atlantic, not only in terms of bias and scatter, but over the entire frequency distribution out to and beyond the 99th percentiles of both winds and waves. Comparisons of in situ data over the full 1954-2005 period show that the hindcast has remained consistent with the observations. The wind and wave data are considered to be sufficiently high quality to*						

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	be used in the analysis of long return period statistics, and other engineering applications." Ref: The MSC50 Wind and Wave Reanalysis. 9th International Workshop On Wave Hindcast and Forecasting September 25-29, 2006 Victoria, B.C Canada. V.R. Swail, Cardone V.J., Ferguson.M, Gummer D.J., Harris E.L., Orelup E.A., Cox, A.T. http://www.oceanweather.com/about/papers/The%20MSC50%20Wind%20and%20Wave%20Reanalysis.pdf						
S19. The report makes insufficient use of the more than 10 year nearly continuous record of meteorological and wave measurements from platforms in the Northern Grand Banks, contained in industry archives, and in a more limited set in government archives (Fisheries and Oceans, for wave measurements) or university archives (ICOADS: International Comprehensive Ocean Atmosphere Dataset). There is no analysis of freezing spray and icing accumulation, even though it is noted as a	Please see response to Comment S18 and Section 9.3 for identification of the hazards associated with freezing spray and icing accumulation.						

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hazard in Section 9 Effects of the Environment on the Project.							
S20. **§3.1.4 Wind Climatology, pg. 39** - The wind analysis by Oceans Ltd (2008), referenced in this Screening Report, primarily uses modelled winds from the MSC50 dataset. For measurements, it uses the 10 minute mean winds reported every 3 hours in ship format (referred to as Hibernia MANMAR in Table 3.3 and Table 3.4), and the 3-hourly reports from ships and platforms in the area as archived in ICOADS. It does not use or reference industry archives of hourly measurements of sustained and gust wind speeds measured for use in helicopter operations, which would be of great value for this study. QuikScat satellite-sensed winds, calibrated to the 10-m level, are another important data source that is not used in this report although it has been used to a limited extent by Oceans Ltd in other studies. These would be of value in assessing and validating other	Please see response to Comment S18 and S22.						

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sources of wind information in extreme storms.							
S21. As noted in the report, the collection of wind observations in ICOADS is inhomogeneous, coming from ships and platforms with different observing methods and measurement heights. However, no attempt was made to homogenize the winds through adjusting to a standard height, using available information about anemometer heights from platforms in the area, and the quality control method was overly simplistic and restrictive. ICOADS includes trimming flags which indicate the degree to which the observed value exceeds the monthly climatological mean for the area. The analysis used a trimming flag of 3 which excludes valid extreme winds from extreme storms, including extreme winds reported by the Hibernia platform. This is apparent in Table 3.4 of monthly maximum wind speeds which has 49.4 m/s (MANMAR) in February and 38.1	ICOADS Data does not include actual anemometer heights from the various sources and therefore adjusting to a standard height is not possible. Anemometers above the surface boundary layer, like the anemometer at Hibernia, cannot be adjusted to a reference level within the surface boundary level. See response to Comment S22 below. The analysis used a trimming flag of 3.5 standard deviations, which includes 99.95% of all observations. The trimming flag is designed to remove erroneous data however may remove extreme events as well. A trimming flag of 4.5 standard deviations (99.999%) can be used to further reduce the rejection of valid data however a quick analysis shows that it still would not include the wind speeds from the Hibernia platform mentioned in the review comment.						

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m/s (ICOADS), even though ICOADS includes the Hibernia MANMAR observations.							
S22. Comments on the scoping document indicated that platform winds from various anemometer heights need to be adjusted to a standard level, using accepted methods in industry and the scientific community (e.g. see ICOADS Release 2 documentation). In response to that, the report states that "methods to reduce wind speeds from anemometer level to 10 m have proven ineffective due to atmospheric stability issues". This claim is repeated in Section 3.1.6.1 on Wind Extremes. Height adjustment models do have more uncertainty in stable marine boundary conditions. However, neutral to unstable conditions, which are better modelled, are fairly prevalent between the months of September to February (as shown by Figure 3.1: monthly mean air temperatures are about 1° less than sea surface	The logarithmic profile and the methods developed using air and sea surface temperature observations were developed to reduce winds in the surface boundary layer (the layer closest to earth where frictional forces play a role in wind speeds). Located at a height of 139 metres, the Hibernia anemometer is above the surface boundary layer and therefore the methods referenced above cannot be used for wind adjustment. The fact that the adjusted wind of 38.0 m/s is 8 knots greater (a 27% increase) than the MSC50 database suggests proof that these winds should not be adjusted downward from anemometer. With respect to helicopter operations, aviation weather data including wind data is provided to the aviation contractor before and during flights. Wind data is collected at 139 – 140 m from the top of one of the drill rig derricks and an anemometer is also located at the helideck (70m). Experience has shown measurements at both the helideck and at 139 m are influenced by the surrounding structures and therefore neither can be used as a sole source of information when making decisions.						

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temperatures in those months). One method that assumes neutral stability is the logarithmic profile developed for Norwegian platforms in the North Sea and implemented in World Meteorological Organization-supported TurboWin software. More sophisticated methods that use air and sea temperature observations to account for atmospheric stability are also widely used, and could be used for the offshore platforms. Wind measured at 139 m at Hibernia would be reduced by a factor 0.77 to adjust to 10 m using the TurboWin formula, in neutral conditions. It may be more appropriate for the purposes of this study to adjust all winds to a difference reference level such a typical helideck level for a particular platform, than 10 m. Using the factor of 0.77 would reduce the extreme wind of 49.4 m/s to 38.0 m/s at 10 m (74 kt). This is still greater than the 30.2 m/s in the MSC50 dataset (32.0 m/s after adjusting from a maximum one-	At the helideck level updrafts caused by the impact of winds on the southwesterly facing wall of M50 are well know to affect measurements. Experience has also shown that the positioning of the drill rigs (which shift positions as needed over the various well slots) affect measured winds at both 139m and helideck anemometers due to updrafts and wind funneling. Both of these structural issues could result in gusts, the magnitude of which is undoubtedly related to wind direction, reported in the aviation observations in conditions where gusts would normally not be observed. The point is that no single data point is used to make operational decisions in the field. Any number of facility specific factors will affect measured winds and gusts measured at one platform may not be representative of those at another platform. Experienced personnel have to assimilate all available data and base don professional judgement and experience make the appropriate decisions. This becomes most important when operational limits, as measured at 139m, are approached. Any effort to adjust the measured wind data will not necessarily result in more accurate readings due to site specific factors that are not accounted for. In fact adjusting data at this point, even if a technically						

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hour mean to a 10 minute mean). This discrepancy is large enough to indicate the importance of using measurements to supplement modeled winds, where sufficient measurements exist.	sound approach to adjustment could be agreed upon, would negate much of the experience developed over the past ten years undercurrent operating conditions.						
S23. **§3.1.5 Wave Climatology, pg. 43** - This section relies entirely on the MSC50 hindcast data set for significant wave height, even though, as noted in Section 3.1.6.2 on Wave Extremes, there is a near continuous waverider data set extending back to early 1999. It is recommended that these be analyzed and presented in this section also.	Industry data was considered and used in the development of the MSC50 dataset by Ocean Weather for Environment Canada. See response to Comment S18.						
S24. **§3.1.6 Wind and Wave Extremes, pg. 46** - The extremal wave analysis was performed using the long-term MSC50 dataset. It is generally less desirable to perform an extremal analysis on a 10 year dataset. However, it may be worth considering, in addition to the long-term analysis, an extremal analysis of the available wind and wave measurements, given the intrinsic value of	It is possible to do an extreme gumble analysis on the 10-year dataset, however the return period should not extend out further than twice the length of the data set. In this case, the largest return period would only be 20-years. The recent extreme events would have been included in the MSC50 dataset. There have been no extreme events since December 2005 that would further influence these results. See response to Comment S18.						

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measurements, and considering the occurrence of some recent extreme events and the possibility of climate trends.							
S25. **§3.1.6.1 Wind Extremes, pg. 47** - As noted above, platform measurements of extreme wind speeds in extreme storms of the past decade were not adjusted to a standard reference level. The discrepancy between MSC50 extremal analysis (10 to 100 year return period) winds and recent, stronger, extreme measurements from a 10 year dataset is not discussed or resolved. Reference to Quikscat satellite-sensed wind images in particular storms may be helpful.	The discrepancy was not discussed because we are unable to adjust winds to the same level with any measure of reliability. See notes above on wind adjustment from above the surface boundary layer. Quickscat satellite sensed wind images are not archived at Oceans Ltd. and to our knowledge, online archives are not available.						
S26. Various standard adjustment factors from a 1979 reference were used to adjust extremal analysis results from one-hour mean values to shorter interval sustained winds of 10 minutes and 1 minute. Results could be compared to one or two minute sustained wind datasets collected in support of	Results at 139 metres should not be compared to results in the extremal analysis. Please see response to Comment 22 and 18. Oceans Ltd agrees that the existence of 10 minute and 2 minute winds at Hibernia could be used to improve on standard adjustment factors, however this is outside of the scope of this report and more suitable for a research project.						

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helicopter operations at the platforms. Given the existence of continuous measurements of one to 10 minute sustained winds and gusts in extreme storms in this location, these measurements could be used to validate or improve on the standard adjustment factors.	Oceans Ltd is uncertain whether adjustment factors calculated at 139 metres can be used at lower levels.						
S27. **§3.1.6.2 Wave Extremes, pg. 49** - The report notes that recent extreme wave measurements are such that if more occurrences of events of those magnitudes are observed, the calculated statistics would begin to increase. In particular, the highest waverider measurement of 14.7 m in the 10 year dataset exceeds the 10 year return period value by 2 m, and is close to the 100 year return period value of 14.5 m. Estimates made using the measured wave dataset may help to develop understanding of how the statistics might change.	Since the dataset is only 10 years in length, estimates beyond 20 years (twice the length of the dataset) would be unreliable. The wave rider measurement of 14.7 metres was a 10-minute average whereas the 100-year value of 14.5 metres is a 3 hour average.						
S28. **§3.1.8 Climate Variability, pg. 55** - The analysis of the North Atlantic	The analysis of North Atlantic Oscillation index was done for the long-term and relatively homogeneous MSC50 wind						

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Oscillation index for winter and summer is interesting. It is recommended that a similar seasonal analysis be performed for the long-term and relatively homogeneous MSC50 wind and wave dataset.	and wave dataset.						
S29. **§3.2.1 General Description of the Major Currents, pg. 57** - The Labrador Current has strong inter-annual variability, related to the North Atlantic Oscillation (see: Han, G and C.L. Tang 2001: Interannual Variations of Volume Transport in the Western Labrador Sea Based on TOPEX/Poseidon and WOCE Data. J. Phys. Oceano. **31(1):** 199-211; Häkkinen, S and P.B. Rhines 2004: Decline of Subpolar North Atlantic Circulation During the 1990s. Science **304(5670):** 555 – 559). Some discussion from the climatic perspective would be useful.	The following text will be added at the end of section 3.2.1: "The velocities of the Labrador Current can be directly correlated to sea level pressures created by the pattern of atmospheric pressure systems. For instance, the Labrador Current has higher velocities when there is a low pressure system situated near Greenland and a high pressure system south of the Grand Banks. Similarly, there is an interannual variability in the volume transport of the Labrador Current that can be correlated to the difference in sea level pressure between the Azores high and Icelandic low. Han and Tang (2001) compared the interannual variations of volume transport in the western Labrador Sea using six years of TOPEX/Poseidon altimeter data plus density data from the World Ocean Circulation Experiment hydrographic section across the Labrador Sea. They found an above average southward transport during years 1993, 94, 95, and 97 when the fall/winter						

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	NAO Index was above or near normal, and a below average southward transport in 1996 and 1998 when the fall/winter NAO was below normal. Häkkinen and Rhines (2004) also reported a declining North Atlantic circulation during the 1990's from geostrophic current calculations derived from altimeter data. This declining circulation was compared to the shift in the NAO Index. In the early 1990's the NAO Index was above normal with its highest winter values in 1995. There was a shift in the NAO Index in 1996 from positive to negative, and remained below normal for the remainder of the decade. In recent years the winter NAO Index has been negative for years 2001, 02, 03, 04, 06 and 09 and positive for years 2000, 05, 07, 08. Bases on the fall/winter NAO index, the volume transport of the Labrador Current is expected to have the greatest increase during years 2000 and 2008 and the greatest decrease during years 2003 and 2006."						
S30. **§3.2.3 Water Properties in the Project Area, pg. 64** - Fig. 3.17 (and Fig. 3.18). The units for temperature and salinity should be provided.	Units for temperature and salinity are provided in the figure title.						
S31. **§3.3 Sea Ice and Icebergs, pg. 67, Para.1** - The word	Text amended to include "interannual".						

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"*seasonal*" is confusing. Does the sentence actually mean ice seasons were different from year to year? If so "*interannual*" would be more appropriate. *S32.* **§3.3 Sea Ice and Icebergs, pg. 67** - "*The mean annual number of icebergs within the ice monitoring zone around the Hibernia platform is 54 based on the past 26 years of data and 45 icebergs per year since the GBS was installed in 1997. However, there are large seasonal variations in the numbers of icebergs each year. There have been several years where no icebergs were recorded within the ice monitoring zone. On average, 1 in every 4 years are iceberg free (P. Rudkin, pers. comm.).*" From 2004-2008, the average date on which icebergs first drifted south of 49N was March 4, and the average date on which icebergs permanently retreated back north of 49N was August 10. Southerly berg extents ranged from	The additional information is much appreciated. The suggested text has been included.						

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41.3N in 2008 to 48N in 2006. Easterly berg extents reached as far as 41W in 2004, but only reached 47W in 2005. (See table in Appendix A.)							
S33. "*Pack ice incursions into the ice monitoring zone around Hibernia have been recorded in two years (2003 and 2008) since the installation of the Platform (P. Rudkin, pers. comm.)*." According to the CIS weekly ice charts, unusually large incursions occurred in 1973, 1990+1991, and 2008. These extreme events appear to be spaced roughly 18-19 years apart. Time series of Total Accumulated Ice Coverage (TAC) for the Grand Banks area (see Figure 1 Appendix A) show that the years with large incursions correlate with years of high average ice coverage in the region. Years with large TACs generally also have large iceberg numbers because sea ice protects icebergs from melt/erosion as they drift southwards. Also, the same winds/currents that drive the sea ice into	The additional information is much appreciated. The suggested text has been included.						

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the Grand Banks area also drive the icebergs into the GB area.							
S34. "*Icebergs can have drafts larger than 150 m in off-shelf areas, but while in on-shelf areas, icebergs drafts are restricted to 20 to 100 m because of water depth. For water depths less than 100 m the mean iceberg mass was 125,000 tonnes (LGL 2008b). Iceberg drift speeds in the area show a correlation with sub-surface currents. Iceberg drift speeds measured from various drilling operations on the Grand Banks show speeds ranging from 0 to 1.3m/s, with a mean drift speed equal to 0.3 m/s (LGL 2008b)*." Ice islands (very large, flat, tabular ice bergs) sometimes reach the Grand Banks. In summer 2008, such an ice island broke off the Petermann Glacier in northwest Greenland and drifted south into Baffin Bay, where it was tagged with a beacon. At the time it was tagged, it was ~8km long, 20 km^2, had a draft of 50-55m, and massed 1 billion tonnes. It passed Cape Dyer at	The additional information is much appreciated. The suggested text has been included. The current expectation is that the Petermann Glacier ice island will not approach the northern Grand Banks, but will 1) be entrained in the Hudson strait; 2) be directed north back towards Greenland or 3) break-up (P. Barron PAL, pers comm.)						

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the southern end of Baffin Island on January 29, 2009, at which time it measured 5km long and 13.75 km^2 (see Figure 2 Appendix A). This ice island may reach the Grand Banks in the summer 2009 season.							
S35. **§3.3.1 2008 Ice Season, pg. 67** - "In *2008, the pack ice reached the White Rose oil field on the 1st of April and remained until April 26th. The pack consisted of 20% - 80% ice cover of thin, medium and thick first-year ice with thickness up to 150 cm.*" Ice > 120 cm is termed "thick" first-year ice.	The suggested text has been amended.						
S36. "*The iceberg distribution over the 2008 season was extensive. The first iceberg of the 2008 season was tracked on March 22, 2008 and the last iceberg was tracked on April 28??, 2008. The ice season was officially closed on June 27th??, 2008. During that time, 82 icebergs were tracked, of those, 28 required management operations*." The dates should be revisited. CIS logs show IIP's last day of	The criteria for end of ice season, as defined by the oil and gas industry offshore is no ice within 100 nautical miles (nm) of a facility and the forecast is also for no ice to approach within 100 nm. April 28th 2008 is when the last iceberg was tracked by contractors to the oil and gas industry. CIS reports do not form the primary basis for industry ice management. Data collected by industry is the primary data source for ice management. The CIS drift model retains the presence of an iceberg for a time period equivalent to the						

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the season was **July 15**, 2008 and CIS iceberg charts indicate extensive iceberg sightings in the area until ~July 12, 2008).	time required for the iceberg to melt 200%. Thus the CIS database may reflect the presence of an iceberg when it in fact does not exist. When actual observations are conducted by industry and verifies an iceberg is not present, the industry data set will then differ from the CIS dataset. Observations on June 26th verified the absence of ice within 100 nm and the season was closed the next day. Additional flights were conducted for non oil and gas clients afterward which verified these observations.						
FOR COMMENTS S37 to S39 TEXT in RED FONT are EDITORIAL COMMENTS							
S37. **§3.3.2 Recent Past Ice Seasons, pg. 68** - "*The pack ice cover over the 2004/05 season was light, although not as light as the 2003/04 season (see Figure 1 Appendix A of these comments). The maximum southerly extent of the pack occurred on March 14th, which is typical of the maximum extent of pack ice over the past thirty years. The pack ice was 51 miles northwest of Hibernia and consisted of only 40 percent ice cover. The 2005 IIP iceberg season opened*	"season" is referring to the oil and gas industries season as described in the response to comment S36.						

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February 28th as the pack encroached on the top of the Banks and closed with the last iceberg being dropped from the tracking system 07 April 2005. Over those 38 days a total of 1 iceberg was tracked, its course did not require any management operations."							
S38. "*In 2006, the IIP iceberg season did not officially open, as no ice (of any form) crossed south of 48° N. While this is an unusual situation, it is not without equal. The 1966 ice season also saw no ice recorded south of 48N and again in 1999 and 2005 only one iceberg was recorded below 48N. Based on the icebergs recorded, the 2006 iceberg season equals the lightest year on record and active ice management operations were not required.*" The reason for the low iceberg numbers in 2005 and especially in 2006 is that during the winter unusual periods of prolonged easterly winds drove the icebergs onto the Labrador coast, where they became	The additional information is much appreciated. The suggested text has been included.						

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grounded. Because of this, the majority of the bergs could no longer drift southwards towards the Grand Banks.							
S39. "*The pack ice cover during the 2007 season was typical when compared to previous years. The maximum southerly extent of the pack was reached on March 14th when it was 82 miles northwest of Hibernia and consisting of 50 percent ice cover. The iceberg distribution over the 2007 season was moderate. The IIP season was opened on the 23rd of February and closed July 27, 2007. Over the course of the 155 day season, a total of 11 icebergs were tracked, of those, 7 required management operations. The most common management operation (82%) was either an iceberg net or a single vessel tow. The water cannon was used for two operations during this season, which is equivalent to 12% of the total operations. Ice management operations were successful with no downtime related to*	"Season" is referring to the oil and gas industries season as described in the response to comment S36.						

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ice."							
S40. **§3.5.1 Seabed Morphology, pg. 70, Para.1** - What is the reference for the duration of sand waves in this environment? The mobile and transient nature of sandy substrates in this environment is particularly relevant for evaluating the extent and duration of benthic habitat impacts. This issue should be explicitly addressed both in the description of the environment and in the assessment of potential project specific and cumulative environmental effects.	The following text has been added to Section 3.5.1 for clarification. "Bedforms within the region (including sand wave scale features) appear relatively unchanged over periods of at least 10 to 20 years, based on examples of repetitive mapping in the Jeanne D'Arc Basin (E. Cumming pers. comm.)"						
S41. **§4.1 Fish and Fish Habitat, pg. 76** – The numbering of the sections referenced in the first paragraph are not correct.	Reference to sections 3.6.1, 3.6.2, and 3.3.3.2 has been changed to 3.5.1, 3.5.2, and 3.2.3.2.						
S42. **§4.1.4 Shellfish, pg. 78** - The text refers to Stimpson's surf clam and Greenland cockle being fished in the area, yet they are not included in the species profiles. Please revisit and discuss.	Species profiles for the Stimpson's surf clam and Greenland cockle have been added as follows: "Stimpson's Surf Clam The Stimpson's surf clam (Mactromeris polynyma) is a deep water bivalve mollusc that can be found in sand, mud, or gravel, from low-tide line to water 107 m deep (Harald A. Rehder 1981). They are found in the northern Pacific and the						

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	northwestern Atlantic oceans. Stimpson's surf clam are sedentary, benthic, filterfeeder molluscs found from Baffin Island to Rhode Island (DFO 2002). This species of mollusc has a slow growth rate and a life span of 30 to 40 years (DFO 1996). The distribution of Stimpson's surf clam is restricted to benthic substrates with medium to large grain sediments and where water temperatures are less than 15°C (DFO 1996). This species of clam is particularly vulnerable to overfishing because the clam's slow growth rate and sedentary nature. Overfishing may also increase because of the lack of protective measures for spawners (DFO 2002). This species of clam spawns in July, and juveniles settle on the seabed a few weeks later. Greenland Cockle The Greenland cockle (Serripes groenlandicus) has a circumpolar distribution in the northern hemisphere however little is known about most aspects of the biology of this species. Belonging to the family Cardiidae, this species is an infaunal suspension feeder (Kilada et al. 2007). In the northwest Atlantic, its distribution extends from Greenland south to New England and in the Pacific from Puget Sound, WA, to the Bering Sea, Aleutian Islands						

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	and south to Japan (Kilada et al. 2007). The Greenland cockle is a very important prey species for the Atlantic walrus (Odobenus rosmarus rosmarus) in the Northwest Territories in Canada. In the last five years, the Greenland cockle has become a valuable bycatch in the Arctic surfclam fishery in eastern Canada (Kilada et al. 2007). This species is found in subtidal waters of nine meters and deeper (Gosner 1978). Few studies have been done on this species and there is a lack of information about the general biology, in particular the growth rate and size and age at sexual maturity."						
S43. **§4.1.6 Sensitive/Special Areas, pg. 84** – A figure illustrating the proximity of the Bonavista 'Cod Box' (and other Sensitive/Special areas) to the Project Area would be informative. Other marine conservation measures could be included under international initiatives. For example, the NAFO Ecosystem Working Group has proposed a number of Vulnerable Marine Ecosystems (VME) that include many of the canyons along the shelf edge of the	A figure illustrating the "Cod Box" and the VMEs has been added as Figure 4.3 and is attached in Appendix A. The following text has been added to Section 4.1.6 "The NAFO Ecosystem Working Group has proposed a number of Vulnerable Marine Ecosystems (VME) that includes many of the canyons along the shelf edge, seamounts and knolls, the Southeast Shoal, and cold seeps, carbonate mounds and hydrothermal vents in the NAFO regulatory area (NRA). These areas are considered vulnerable because they support unique and vulnerable habitats and ecosystems (Figure 4.3). For example, the Southeast Shoal						

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Grand Banks, including the SE Shoal where many fish and marine mammals feed in the summer and apparently overwinter.	attracts many fish and marine mammal species that feed in summer and apparently overwinter. For further information on the NAFO Ecosystem Working Group and potential VME's refer to the Report of the NAFO Scientific Council (NAFO SCS Doc. 08/10) and to Figure 20 of the document. The document is available online at: http://archive.nafo.int/open/sc/2008/scs08-10.pdf. Refer to Figure 4.3 for locations of proposed EBSAs and VMEs."						
S44. **§4.2 Commercial Fisheries (and §6.3.2), pg. 85** - The list of NAFO unit areas encompassed by the Study Area should also include 3Mc.	Correct. 3Mc has been added to the sentence as follows: "This section describes the current commercial fisheries in the areas nearest the proposed Project. For the purpose of this description, the commercial fisheries Study Area is encompassed by NAFO Unit Areas (UAs), 3Lh, 3Li, 3Lr, 3Lt, 3Ld, 3Le, 3Ma, 3Mb, 3Mc, 3Md, 3Na, 3Nb, 3Nc and 3Nd"						
S45. **§4.2.3.2 Northern Shrimp, pg. 91** - The Proponent states that DFO has not yet provided the 2008 shrimp quotas. This must be a typo (2009 not 2008) as shrimp quotas for 2008 would have been available at time of writing, particularly on the species quota report (SQR) available on-line.	The statement has been removed.						

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Furthermore, an Integrated Fisheries Management Plan (IFMP) would have been issued prior to the (2008) fishery.							
S46. **§4.3.2 Baleen Whales, pg. 103** - This section should include a discussion on fin whales as a species likely to be encountered in the Project Area, more likely than sei whales anyway. This would be supported by the discussion in Section 4.5.2.2.	Fin Whale discussion is covered under Species at Risk section.						
S47. **§4.3.2.1 Humpback Whale, pg. 103** - Humpback whales have been sighted frequently in the eastern slopes of the southern Grand Banks during winter months, so it is likely that a portion of the Newfoundland and Labrador humpback population occupies the Grand Banks in and around the project area all year round.	The following text has been added to Section 4.3.2.1 "Humpback whales have been sighted frequently in the eastern slopes of the southern Grand Banks during winter months, so it is likely that a portion of the Newfoundland and Labrador humpback population occupies the Grand Banks in and around the project area all year round".						
S48. **§4.4 Marine Birds, pg. 107** - There are two spelling mistakes in this section. Please correct the spelling of Glaucous Gull and Wilson's Storm-Petrel.	Text amended.						
S49. **Table 4.7 Foraging Strategy and Prey of Seabirds in the Study Area, pg. 108**	Text amended. "relatively" is added for comparison to the Alcids.						

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- Hydrobaridae should be replaced with Hydrobatidae. The time with head under water is listed as brief for all species, with no frame of reference. The term brief should be quantified. The maximum depth for Northern Gannets is listed in the table as 10m, however, this should be changed to 22m. Reference: Garthe, S., S. Benvenuti and W.A. Montevecchi. 2000. Pursuit plunging by northern gannets (*Sula bassana)* feeding on capelin (*Mallotus villosus*). Proc. R. Soc. Lond. 267: 1717-1722.							
S50. **§4.4.2 Seasonal Abundance, pg. 109** - Leach's Storm-Petrel's Latin name is incorrect. It should be replaced with *Oceanodroma leucorhoa.* The statement that gull species may occur in the winter months is correct, but they are more common at other times of the year (See Figure 4.18). A reference should be provided for the statement that Puffins winter mostly south of the project area. The exact wintering area for NL	Text amended. The statement that Puffins winter mostly south of the project area has been removed.						

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breeding Puffins is poorly known.							
S51. **Table 4.8 Predicted Monthly Abundances, pg. 110** - There are several spelling mistakes in the table. The following scientific names should be changed: Greater Shearwater should be *Puffinus gravis*, Sooty Shearwater should be *Puffinus griseus*, and South Polar Skua should be *Stercorarius maccormicki.* The common name for Lesser Blk-backed Gull should be Lesser Black-backed Gull.	Text amended.						
S52. **Pg. 113** - It is indicated that the project area is beyond the range of most Northern Gannets. This is unsupported and should be rewritten. Just because a species is not common does not mean that the project area is beyond their range. For example, Northern Gannets from NL have been tracked to Africa and back (Fifield and Montevecchi, unpub.).	The following statement has been removed from Section 4.4.2. "The Project Area is beyond the range of most Northern Gannets".						
S53. **Pg. 116** – It is stated that concentrations of Alcids are contracted to the northern Grand	Text amended. The following sentence has been removed: "Concentrations are contracted to the northern						

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Banks and coastal areas during the summer, however a lack of survey data makes this statement unsupported. This statement should be rewritten. The same sentence goes on to say that there are large aggregations near the southwest shoal of the Grand Banks during the fall and winter, however survey data shows that in the winter the largest concentrations are on the northeast Grand Banks. This should also be changed. This paragraph also states that Atlantic Puffins are not likely to occur during the winter months. However, from survey data, Puffins appear to be widely distributed in small numbers across the northern Grand Banks at that time.	Grand Banks and coastal areas during the summer, with large aggregations near the southwest shoal of the Grand Banks during the fall and winter." The following sentence has been added: "Survey data shows large concentrations are on the northeast Grand Banks during the winter." The following sentence has been changed to read" Common Murre is probably present through the winter months as well, but little is known of the wintering grounds of Atlantic puffins."						
S54. **Pg. 118, 2nd para.** - In the last sentence of the second paragraph, Witless Bay Island should be replaced with Witless Bay Islands.	Text has been amended as follows. "It appears the number of Atlantic Puffins on Great Island (and probably off Newfoundland in general) is increasing, as puffins expand to inland areas of the Witless Bay Islands (Rodway et al. 1996)."						
S55. **Pg. 118, last para.** – It is stated that the project area is well beyond the foraging range of breeding	The following text has been added:" Leach's Storm-Petrel and Northern Gannet's foraging ranges may overlap the Project Area as they have						

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birds in the breeding season. This is not true and should be rewritten. For example, Leach's Storm-Petrel and Northern Gannet foraging ranges likely overlap the project area as they have been reported feeding greater than 200 km from the nest.	been reported feeding greater than 200 km from the nest (Huntington et al. 1996; Garthe et al. 2007). "						
S56. (*Sources: Birds of North America online, and Garthe, S., W.A. Montevecchi, G. Chapdelaine, J.F. Rail, A. Head. 2007. Contrasting foraging tactics by northern Gannets (Sula bassana) breeding in different oceanographic domains with different prey fields. Mar Biol 151: 687-694.)*	Assumed to refer to Comment S55.						
S57. **§4.5 Species at Risk, pg. 120, Table 4.10** - For the marine mammal species, the last column suggests that the project area is not critical habitat. While this may be true, there is, as yet, no evidence to support this supposition so this statement should be omitted.	Text in Table 4.10 amended as follows, "Occurs but area is not likely critical habitat for the species."						
S58. **Table 5.1 Potential Issues Identified in the Scoping Document, pg. 133 –** Under "Marine Resources", Sections	The modeling prediction of the dredge spoil disposal is presented in Section 6.1.3.2. The quantification of the actual area of seabed affected will be measured						

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2.1.1, 3.5.1, and 3.5.2 do not address "quantification…. of spatial area of seabed affected by … dredge spoils disposal…" as indicated in the table. The quantification of dredge spoil disposal is required.	post dredge spoil discharge.						
S59. **§5.6.1 Boundaries, pg. 140** - The rationale for choosing each different study area is not provided. Why are there so many Study Areas? For instance, why are interactions between the project and commercial fisheries expected to go 10 n mile outside the Project Area, yet for fish habitat it is within the Project Area? What is the rationale for including all of the Avalon Peninsula in the Study Area for marine mammals, for marine birds, etc.? The study area, as per the scoping document, must include a consideration for project-environment interactions as well as areas potential affected by project discharges (operational and accidental). Therefore, the study area should be defined based on a	The Study Areas are analogous to the Regional Area definition of the Scoping Document "The "Regional Area" boundary will also vary with the component being considered (e.g., boundaries suggested by bathymetric and/or oceanographic considerations). Study Areas and Regional Area are used interchangeably within the Scoping Document. The Study Areas are defined based on consideration of spill modeling, known drill cuttings dispersion and the potential for project interactions with individual VECs. Study Areas vary in size between VECs to reflect the difference in potential home range for species with each VEC.						

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consideration of spill and drill cuttings modelling and project-environment interactions. Spill trajectory modelling, as described in Chapter 8, indicates that petroleum will not reach the shoreline. Why then is the coast of the Avalon peninsula and parts of the Burin peninsula included? The Study Area must be revisted and revised accordingly.							
S60. While it is convenient at this stage to define "*project boundaries*" and "*affected areas*", it should be noted that these boundaries will likely change once specific operations begin. That is, the affected area as it applies to baleen whales might be quite large for sound effects arising from seismic or VSP operations when sound propagation characteristics are good (for example, see: McQuinn, I.H., and D. Carrier 2005: Far-field measurements of seismic airgun array pulses in the Nova Scotia Gully Marine Protected Area. Can. Tech. Rep. Fish. Aquat. Sci. **2615**: v + 20 p). Furthermore,	Boundaries were selected based on some modeling reports, but also from the spatial extent of affected areas as reported from numerous monitoring surveys and primary literature. Mitigations and best practices for seismic operations as outlined in the Statement of Canadian Practice (SOCP) will be followed.						

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sound measurements and/or sound propagation modeling should be considered as mitigation measures for some activities when they are proposed.							
S61. **§5.6.1.1 Spatial Boundaries, pg. 141 -** If the Study Area is "reflective of the area potentially affected by an accidental event…" what is this area? It should be included in a figure.	The Study Area figures are provided in the appropriate VEC chapters.						
S62. **Section 6.0 Environmental Effects Assessment, pg. 149** - For each VEC, why has an effects assessment for production activities not been included? Production activities were addressed in the Hibernia EIS, however, they only covered project life up to approximately 2017. The timeframe for the drill centres project is up to 2036 (at least). Production activities need to be addressed from the 2017 (1985 predicted end of Hibernia) to the end of the proposed extension – 2036.	See responses to Comments G1, G4 and G8.						
S63. **§6.1.3 Potential Interactions and Existing Knowledge, pg. 151, Para.3** - The proponent confuses	See responses to Comments G1, G4 and G8.						

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no change in rate of delivery of produced water with no change in amount. This confusion is continued throughout the document and leads to the incorrect conclusion that produced water effects do not need to be assessed in this screening. While the project may not result in an increase in discharges beyond that assessed in the Hibernia EIS, it should be assessed for the longer project life. The cumulative effects of these discharges in consideration of other ongoing projects and the extended project life (up to 2036) which were not considered in the Hibernia EIS should also be addressed.							
S64. **§6.1.3.1 Discharge of Drill Muds and Cuttings, pg. 151** - The statement that metals do not accumulate in benthic species is incorrect. Mercury, arsenic, cadmium, copper and lead do have the potential to accumulate in benthic organisms and some (e.g. Hg) may even be biomagnified.	The binding of metals with organic particulate and ions in seawater creates compounds which prevent the simple uptake and accumulation of metals by biota. Additives to WBMs are screened in accordance with the Offshore Chemical Selection Guidelines (NEB et al. 1999), which ensures that the additives selected have an acceptable level of risk to the environment. Metals from WBMs and cuttings have not been demonstrated to cause						

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	biological effects (CAPP 2001; Hurley and Ellis 2004).						
S65. **Pg. 151, Para.1** - Why is only Hurley and Ellis (2004) quoted regarding EEM results. The EEM data from the three production projects should be used in discussion of project effects.	Hurley and Ellis (2004) were tasked to review all EEM reports available at the time and produce a summary report that could be considered in the discussion to remove exploration drilling from the CEAA Comprehensive Study List. Therefore the Hurley and Ellis report directly reflects the results of various EEM programs. Additional information has been added which reflects EEM data collected after the Hurley and Ellis work was completed. See response to S11.						
S66. **Pg. 152, Para.2** - Please clarify whether the assumption that the wells will be drilled to a similar depth as those at White Rose is accurate. In addition, there is also an assumption that there is no cladding of the deposited material. What is the evidence for this from existing cuttings piles on the Grand Banks?	Well volume is considered a more accurate indication of the amount of waste generated than the well length. The waste volume provided in Section 2.6.1 should be considered an estimate based on a typical well on the Grand Banks and is similar to the waste volume indicated for a typical well in the White Rose Drill Center EA. After cuttings reinjection commenced at Hibernia, a two drill rig operation, sediments chemistry rapidly returned to 1998 and background levels. This suggests the cuttings are amenable to dispersion and/or degradation.						
S67. **Pg. 152, Para.3** - Other risks to the benthic habitat that should be discussed include increased	Risks to benthic habitat are considered and monitored through the operators EEM program. The r1esults of these programs have	**DFO:** has not seen any EEM results for projects where drilling has ceased. The existing EEM projects for the Grand Banks can and should	Hibernia began rejection of synthetic based cuttings 2001 and 2002. The reduction in the concentration of the synthetic fluid in sediments	DFO: In regards to HMDC June 17, 2009 response to DFO comment S67, the text of the EA document should be modified to include the	The onset of cuttings reinjection at Hibernia can be viewed as equivalent to the cessation of drilling, after which , a rapid recovery of		

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depth of the pile; cladding and permanent change of substrate characteristics; organic enrichment of the sediments; and shift in community composition.	demonstrated that the effects of drilling waste are limited to the near field and reversible once drilling ceases.	be used to assess the potential zone of influence of this activity.	was substantial. The EEM program will continue to include a sediment sampling component with focus on sediment chemistry and toxicity. Effects associated with drill cuttings have been predicted to be insignificant and reversible in several similar environmental assessments. The mitigations in place under the Offshore Waste treatment Guidelines have been demonstrated to be effective.	information provided in their response. Please note, however, that although HMDC references to the effectiveness of cuttings reinjection as a mitigation for waste dispersal at the current Hibernia site in their, there is no commitment to reinjection for this expansion.	sediment quality was observed. Cuttings reinjection at Hibernia is presented in the Drill Center EA to demonstrate potential recovery rates not to suggest it is a mitigation for drill centers. The following text, found on page 228, 3rd para will also be placed in section 6.1.3.1 page 152; *"At Hibernia, partial reinjection of SBM drill cuttings commenced in March 2000; when two drill rigs and a production facility were in operation (partial meaning the reinjection of coarse cuttings occurred while fine cuttings continued to be discharged). Full reinjection capacity was established in September 2002.* *In the 2002 EEM field study, which was conducted before full reinjection capacity was established, a substantial reduction in hydrocarbon concentrations in sediment was observed. The concentration of hydrocarbons was comparable to levels found in 1998 and concentrations of barium were comparable to 1999 levels; 1998 and 1999 concentration levels reflected 1 and 2 years of drilling and production operations respectively. Therefore, the biological effects of drilling are considered reversible."*		
S68. **Pg. 153, top of pg.** – Is there a reference	The sentence is referring to the 5 EEM programs						

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for the sentence "…detected in EEM programs"? Hibernia, prior to the reinjection of cuttings, discharged cuttings from a single point on the platform. A better comparison would be Terra Nova and White Rose, where cuttings were discharged from MODUs at the drill centres.	conducted at the Hibernia field so the reference is HMDC 2008. Three of the five EEM programs were conducted prior to cuttings reinjection and therefore provide useful results for effects assessment. In terms of potential effects, Hibernia can be considered a worse case scenario in that two drilling rigs operated simultaneously, and discharged at essentially the same location. MODU's used at both Terra Nova and White Rose operate a single drilling system. Also, the average volume of waste discharged per well is likely higher than that for Terra Nova and White Rose given both use multiple drill centers thereby reducing the distance to targets of interest within the reservoir.						
S69. **§6.1.3.2 Dredging and Disposal, pg. 153, Para.5** - This paragraph contains a number of inaccuracies and misapprehensions. Is the size of the turbidity plume really going to be large enough to affect phytoplankton? Phytoplankton will not "*drift*" out of the plume as reported. There is no evidence that all species of phytoplankton would go into a resting phase when they encounter an increase in	The decrease in light penetration caused by turbidity may affect productivity in the local area, as stated. Overall a measureable effect on plankton abundance is not expected. We acknowledge that some plankton may become entrained with the turbidity plume, but depending on their depth in the water column, plankton may drift separately from the plume. A reference is provided for the resting stage comment.						

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suspended sediment. What about an increase in primary productivity due to a decrease in photo inhibition in the upper water column?							
S70. **§6.1.3.4 Waste and Wastewater, pg. 155** - The potential for eutrophication from waste and wastewater discharges should be considered and discussed. The effects may be transient for individual activities or discharges, but may have longer term or cumulative effects.	Eutrophication potential from the projects waste and wastewater is considered negligible given the limited spatial and temporal scales of any measureable effect.						
S71. **§6.1.4 Mitigations, pg. 157** - Why is reinjection of cuttings not considered as a mitigation measure? It has proven very successful in this regard at the GBS.	See response to Comment G7						
S72. **§6.1.4 Mitigations, pg. 158, Para.2** - There is no explanation to substantiate the claim that the drilling for this project will result in effects well below those projected for the White Rose project. Please re-visit and discuss.	The claim has been removed.						
S73. **§6.1.4 Mitigations, pg. 158, Para.3** - How long does the WBM remain in the benthic boundary layer (BBL)? What	Data from 20 case studies reviewed by Hurley and Ellis (2004) indicate that WBMs have a pattern of detectable contaminants (bentonite and barite) and biological effects.						

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are the references for the thickness of the BBL at this site? What are the consequences of storm mixing or other disturbance to the BBL for dispersal and eventual fate of the WBM?	Using barium as a tracer, the zone of detection for both single and multiple wells using WBMs found that background levels for barium were achieved at 1,000 to 3,000 m from the drill source. For example, while effects were predicted to extend out to several km, no effects were found in scallops caged in the hundreds of meters range around the Hibernia site (Cranford, 2004). These studies assessed chronic toxicity impacts on growth. The fraction of WBM reaching the benthic boundary layer can vary strongly with location depending on local oceanographic conditions and storm events. The missing reference for the 1 m thickness is Wimbush and Munk 1970. Wimbush, A.H.M.H and W. Munk. 1970. The benthic boundary layer. Pp. 3-10. In: A.E. Maxwell (ed.).The Sea, Volume 4. Wiley & Sons, Inc., New York, NY. The statement refers to a typical benthic boundary layer thickness. Muschenheim and Milligan (1996) have noted that a near-seabed velocity in excess of 20 cm/s was sufficient to re-suspend drilling cuttings. The implication of this information and its applicability to the Hibernia site is not necessarily clear cut. Hibernia bottom current speeds are generally between 5 to 14 cm/s, with currents greater than 23 cm/s						

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	occurring approximately 8 percent of the time (Seaconsult 1994). Regardless, this indicates that for 8 percent of the time, even heavy particulate matter associated with the drilling discharges can be transported due to bottom current velocities. Furthermore, the bottom current velocities are such that transport of fine particulates may well occur on a regular basis at the Hibernia site.						
S74. **§6.1.6.2 Synthetic-based Muds and Cuttings, pg. 158, Para.5** - The recovery time could also be affected by changes in grain size, organic matter content, redox, cladding, etc. These should also be considered in this assessment.	The studies referenced (MMS 2000; CAPP 2001; NEB et al. 2002; Hurley and Ellis 2004) were largely based on field data, thus accounting for all factors affecting recovery time.						
S75. **§6.1.6.7 Abandonment, pg. 160** - A statement that fish habitat considerations will be incorporated in the selection of decommissioning options should be included here.	Abandonment plans are outlined in Section 2.4.2. The following text has been added to Section 6.1.6.7. “Any blasting that may be required will comply with DFO’s Guidelines for Use of Explosives in Canadian Fisheries Waters, and/or current guidelines and regulations applicable at the time of abandonment. “						
S76. **§6.1.8 Summary of Potential and Residual Environmental Effects, pg. 161, Table. 6.1** -	Please see response to Comment G7.						

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Mitigation: Cuttings reinjection is not listed as a mitigation option. Why?							
S77. Duration: Mud and cuttings effects last longer than 128 days during which drilling takes place. The duration of the activity is not the same as the duration of the effect.	Agreed. Text amended as follows, " 128 days" will be replaced with "less than one year", as indicated (MMS 2000; CAPP 2001; NED et al. 2002; Hurley and Ellis 2004).						
S78. Follow up: When will the current Hibernia EEM be modified and what are the plans for collection of baseline data? This needs to be completed prior to commencing any new drilling activities.	The collection of baseline data is planned to follow the EEM program amendment but in advance of drilling activities.						
S79. **§6.2.3 Potential Interactions and Existing Knowledge, pg. 164** - Why is produced water not included here? Again, the proponent uses a "*no change in rate*" argument to exclude it from consideration.	See responses to G1, G4 and G8.						
S80. **§6.2.3.3 Noise, pg. 168, Para.3** - Recent studies carried out by DFO indicate that there is potential for seismic effects on fish and shellfish beyond the tens of meters range as stated in this document.	Section 6.2.3.3 text amended as follows, "Some fish within hundreds of meters of a seismic survey operation will exhibit startle responses, changes in swimming speed or direction, and changes in vertical distribution. Recovery is likely within minutes to hours after exposure (Worcester 2006). Seismic activity is considered unlikely to result in adult mortality; however, sublethal physical damage and physiological impairment may occur close						

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	to source and potentially result in delayed mortality or chronic effects. Additional research is required to assess the intensity of sound levels or typical ranges from a seismic source required to produce these types of effects (Worcester 2006). “						
S81. **§6.2.6.1 Water-based Muds and Cuttings, pg. 170, Para.5** - What is the reference for the thickness of the BBL and the extent of spread of the WBM (200m diameter) in the BBL?	See response to Comment S73.						
S82. **§6.4.2.4 Technical Boundary, pg. 183, Para.3** - It could be argued that the existing marine mammal data, while reflective of the difficulties in collection, may not be “*sufficient to support the assessment*.” It would be better to conduct additional visual and acoustic surveys near the project area, particularly during the winter period when relatively little data has been collected.	Availability of marine mammal data for the Grand Banks has consistently improved for the environmental assessment of each project since the original Hibernia EIS in 1985.						
S83. **§6.4.3 Potential Interactions and Existing Knowledge, pg. 185** - The international NAFO candidate vulnerable marine ecosystems (VMEs) identified on	See response to Comment S43.						

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and near the Grand Banks should also be considered here. A number of these candidate VMEs have been established based on the presence and activities of marine mammals.							
S84. **§6.4.3.2 Vessel Collisions, pg. 187 (and §6.4.6.2)** - There have been reports of vessel strikes of large whales by supply vessels traversing the Grand Banks. In the cases reported, the fate of the animal is unknown. Monitoring and mitigation procedures should be considered during certain times and areas where marine mammals have an above-average expectation of being present and possibly struck by vessels. This could be in the form of reduced vessel speeds when whales are present, or posting of an observer specifically tasked with looking for whales, particularly in areas where there may be higher probabilities of encountering whales. At the very least, when a whale is sighted on shipping routes or near	Vessel operators are aware that whales occur in the area, especially during the summer months. However, there is no indication that there are more whales in the Project Area than in other areas of the Grand Banks. Vessel operators are always observing for marine hazards including whales.						

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operations, its presence should be communicated to other vessels in the area.							
S85. **§6.4.3.6 Presence of Structures, Lights and Flares, pg. 189** - On the Grand Banks, there have been reports of northern bottlenose whales entering and remaining in large vessels' thruster plumes, so it cannot be assumed that all marine mammals will move away from loud anthropogenic sound sources.	The following text has been added: "However, there have been reports of northern bottlenose whales entering and remaining in large vessels' thruster plumes."						
S86. **§6.4.4 Mitigations, pg. 189** - Note previous comment regarding vessel watches and notification procedures for large whales.	See response to Comment S84						
S87. **§6.4.6.1 Noise, pg. 190** - Based on the literature and several comments above, it is likely that not all marine mammals "*will avoid an area of noise*." Given that some will not, appropriate monitoring and mitigation procedures should be adopted depending on the type of activity being conducted.	Mitigations and best practices for seismic operations as outlined in the Statement of Canadian Practice (SOCP) will be followed.						
S88. **§6.4.6.1 Noise, pg. 190 (and 211, 219, 220)** - "*The Project*	Text amended as follows: Section 6.6.3.2 "The biological significance of such						

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Area offers no unique habitat or feeding areas for marine mammals or sea turtles" and related statements. This conclusion is not supported by any existing data, and our knowledge of the life processes of marine mammals and leatherback turtles in this area have limitations with which to assess this. Leatherbacks can be attracted and feed wherever aggregations of jellyfish or other prey invertebrates might occur, including the project area.	a change in behavior is considered slight since there are no known critical habitats identified within the Affected Area and there are alternate feeding and migratory routes." Section 6.6.3.2 "There are no known unique feeding areas for sea turtles within the Affected Area" Section 6.6.6.2. "The implications of temporary avoidance are few as the Affected Area offers no known unique habitat or feeding areas for marine mammal species at risk." Section 6.6.6.3. " Avoidance is not expected to affect them biologically however, as the Affected Area is not considered a known feeding ground for sea turtles, although their primary prey, the jellyfish, may occur there."						
S89. **§6.4.7 Follow-up, pg. 193 & §6.5.7 Follow-up, pg. 202** – The ESRF study, undertaken by CWS, is scheduled to complete by the end of 2009. In addition, such a program may not exist throughout the 2036 timeframe. Has HMDC considered other options regarding seabird monitoring, such as those implemented at White Rose and Terra Nova? If not, why are	HMDC will support continuation of the ESRF study and provide opportunities to continue the ESRF surveys. The study is viewed as the best approach for pelagic seabird data collection. Also, an environmental observer will be considered during the drilling program.						

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such programs not considered for this Project.							
S90. **§6.4.8 Summary of Potential and Residual Environmental Effects, pg. 194, Table 6.5 (and Table 6.8)** - Care should be taken when making assumptions regarding the propagation characteristics of an area without actual acoustic measurements. A number of studies have shown that propagation modeling does not always produce results reflective of the actual sound field. For very loud or prolonged activity, especially in areas where marine mammals of high concern or potential sensitivity are likely to be encountered, sound measurement studies should be considered as a monitoring and mitigation tool.	See response to Comment G6.						
S91. **§6.5 Marine Birds, pg. 195** - Hydrobaridae is spelled wrong. The correct spelling is Hydrobatidae. Also, the italics on Phalaropodinae need to be checked.	Text amended						
S92. **§6.5.3.2 Lights and Flares, pg. 198** - This	Text amended to remove “September” and replace with						

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section states that the greatest period of risk of attraction to offshore lights is in September. However, this is unfounded speculation with no data for support. Survey maps show large numbers of seabirds in summer on the Grand Banks that are potentially attracted as well. It should also be noted that while some Procellariids including Storm-Petrels sometimes forage at night, they are not limited to this mode as this section suggests.	"late summer and fall".						
S93. In several places the hyphen is missing in Storm-Petrel.	Text amended						
S94. **§6.5.3.4 Noise, pg. 199** - On page 200, the word measurable should be replaced with significant.	Given the context of "significant" within an environmental assessment, the word "measureable" is replaced with "considerable"						
S95. **§6.5.3.5 Vessel and Aircraft Traffic, pg. 200** - The statements that marine birds on the Grand Banks are habituated to vessel activity and energy expended during these events (following vessels for extended periods) would be minimal and have no physiological effect on the birds are unfounded unreferenced	Text amended. The statement is removed.						

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speculation and should be rewritten.							
S96. **§6.5.6.5 Vessel and Air Traffic, pg. 202** - Although birds are mobile, the important point is that birds are attracted to vessels and may subsequently come into contact with oil or grease from machinery.	Agreed.						
S97. **Table 6.6 Summary of EA for Marine Birds, pg. 204** - The geographic extent of presence of structures and lights is listed as <1km, but birds can likely see and be attracted to lights from a much greater distance. This number should be increased.	Text amended. Geographic extent has been changed to <10 km.						
S98. **§6.6 Species at Risk, pg. 205** – The listing of species under Section 6.6 is not consistent with the listing of species 'likely to occur' as provided in Table 4.10. This section must include all species under consideration by COSEWIC and SAR likely to occur in the study area. Failure to include COSEWIC species would potentially result in additional environmental effects assessment requirements later in	Text amended. The listing of species under Section 6.6 is now consistent with the listing of species 'likely to occur' as provided in Table 4.10. The following text has been added to Section 6.6.6.1: "The porbeagle shark is especially vulnerable to overexploitation due to its late maturity and low fecundity (COSEWIC 2004a). The capture of this species as bycatch is the only source of human-induced mortality There is no evidence that other factors have contributed to porbeagle declines (COSEWIC 2004)".						

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the project life, should new species be added to SARA. Also, the listing of SAR should be by their respective list (Threatened, Special Concern, etc). Which species are on schedule 1, which ones are under consideration by COSEWIC?							
S99. **§6.6.3.1 Discharge of Drill Muds and Cuttings, pg. 210, Para.3** - Leatherback turtles are known to dive to great depths to feed on various gelatinous prey as well, and recent satellite tagging data showed that one turtle spent most of its time foraging near the seafloor of the Grand Banks for the weeks it spent off the Avalon Peninsula.	Acknowledged. However, it is generally accepted that jellyfish are the primary food source of the leatherback turtle. Text amended to remove “in the upper water column.” The sentence now reads “As with the mammal species at risk, the leatherback will not likely be affected by the discharge of drilling mud and cuttings due to avoidance of the immediate area and because they feed primarily on jellyfish.						
S100. **§6.6.3.2 Noise, pg. 210** - It is important to note that in some cases the old NMFS sound exposure criteria are no longer considered conservative, but rather NMFS has proposed that sound energy exposure-based criteria be adopted for each mammal hearing type and human activity (*see*: Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J.,	Noted. HMDC will be aware of any changes in the applicable guidelines and regulations.						

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Gentry, R.L., Greene, C.R.J., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A., and P.L. Tyack 2007. Marine mammal noise exposure criteria: initial scientific recommendations. Aquat. Mamm. **33(4):** 1-521). As these criteria are being considered for use in the United States, it is quite possible that Canada and other countries may adopt them as well.							
S101. **§6.6.6.4 Effects Assessment for Marine Birds Species at Risk, pg. 221** - CWS is concerned with the interaction between drilling waste and any run-off from drill rigs or associated vessels and the Ivory Gull. Toxin accumulation in Ivory Gulls is a possible factor in their dramatic decline over the past 20 years. It is not clear from this brief write-up what sort of toxins may be introduced into the surrounding environment (especially what may be brought up from the ocean floor), and therefore it is difficult to assess the	The following text has been added to Section 6.6.6.4. "Numerous studies have demonstrated that mercury impurities associated with drilling mud barite are not capable of being taken up by marine organisms that might come in contact with discharged drilling fluid solids (Neff et al. 1988). The source of contamination for the Ivory Gull is in large part due to their diet at the top of the food web (COSEWIC 2006). Operational discharges from oil and gas projects are not known or expected to be a factor in the decline of Ivory Gulls. Given the relative abundance of other bird species in the Project Area compared to the Ivory Gull and the low risk of contamination of other						

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possible impacts. This factor in the decline of Ivory Gulls should be discussed in this section.	species from Project activities (see Section 6.5.6), the risk to the Ivory Gull from the Project operations is considered negligible."						
S102. **§7.0 Cumulative Effects, pg. 223** - The cumulative effect of subsequent glory hole excavations and spoil disposals should be considered along with the use of either one or several disposal sites.	See response to Comment S106.						
S103. The cumulative effects of discharges, beyond those captured in the Hibernia EIS, and in consideration of other projects, must be addressed.	The cumulative effects of discharges are included in Section 7.2.1. The cumulative effects of produced water associated with production at the Hibernia platform were assessed as a part of the *Hibernia Development Project Increased Production and Produced Water Environmental Assessment Report* (HMDC 2006).						
S104. **§7.2.1 Marine Fish Habitat, pg. 228, Para.3** - This section addresses chemical change and the measurement of chemical signals, but does not address the physical habitat changes that may occur. How long will the cuttings piles last? Do they disperse? Is there a permanent alteration of habitat characteristics? If so, then the potential area of effect and	The paragraph includes an assessment of physical habitat alteration in the statement: "Fish habitat, as measured by changes in benthic community structure around single exploration wells, returned to baseline conditions within one year after cessation of drilling (Hurley and Ellis 2004)." The duration of cuttings piles post drilling will vary with the physical and chemical conditions of the area, but the cumulative effect assessment assumes the disturbance is permanent from all projects and estimates that						

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cumulative effect may be much larger. As the proponent correctly states, sediment grain size is a determinant of benthic community structure. What is the long term effect of all these projects on sediment grain size in this part of the Grand Banks? A lot of data has already been collected and there are numerous existing wells drilled that can provide information regarding the duration of cuttings piles in the NL offshore. It may be timely to consider a research study (e.g. ESRF-funded) to investigate the fate and effects of cuttings piles in this area.	approximately 0.07% of the Project Area is affected.						
S105. The drill centres and disposal sites for White Rose and Terra Nova and the footprint of the flowlines, need to be considered as part of the cumulative effects assessment.	The information requested is not available in the environmental assessment reports for the Terra Nova project. From the *Husky White Rose Development Project: New Drill Centre Construction and Operations Program EA Addendum* (Husky Energy 2007) we determine that 279,200 m^2 is affected by glory hole construction and dredge spoils disposal.						
S106. **§7.2.1 Marine Fish Habitat, pg. 229, Para.1** - As a result of this project and other current or proposed	Following text has been added to Section 7.2.1 If six drill centres are developed, HMDC is						

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projects, it appears that more than 50 km^2 of benthic habitat will be affected. While this may be small in the context of the entire Grand Banks it still represents significant habitat alteration.	considering designating two dredge spoil disposal areas, each approximately 1 square kilometer. However it is possible more than two dredge spoil disposal areas may be required. DFO has determined that the glory hole(s) dredging and dredge spoils disposal will result in a HADD. The total area of the HADD has yet to be determined, but HMDC will comply with the DFO policy of no net loss of the productive capacity of fish habitat from this Project. The spatial and temporal scales of potential effects from dredging, compared to the amount of existing similar habitat on the Grand Banks, the high potential for reversibility and the commitment for habitat compensation means the cumulative environmental effects from dredging and disposal are considered non-significant.						
S107. **§7.2.1 Marine Fish Habitat, pg. 229, Para.2** - According to the proponent, cumulative effects only occur if the zones of influence (ZOI) overlap, which is not the case for habitat alteration. Actually, the cumulative loss of habitat will occur and be greater if the ZOI do not overlap.	The intention was to assess the worst case scenario of no overlap, recognizing that the area of habitat altered would decrease with any overlap. The fourth paragraph on page 229 states “Assuming that all six drill centers are developed using a maximum of eleven wells each and using the conservative assumption that there is no overlap of deposition piles for wells within each glory hole, the total benthic area that could be affected would be 8.8						

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	km^2."						
S108. **§7.2.1 Marine Fish Habitat, pg. 229, Para.5** - The rate of discharge may affect the ability of the environment to accommodate some wastes, thus avoiding acute effects. However, it is the total amount of waste that determines cumulative effects. Even discharges that are within waste treatment/disposal guidelines may result in significant cumulative effects. Both drill cuttings and produced water disposal should be assessed from this perspective.	Project-specific environmental effects were assessed based on the total amount of waste discharged in light of all other projects in the area. It was determined that adverse environmental effects would not likely result to Marine Fish Habitat, as per the definition of "significant effect". A significant effect is defined as one that affects marine fish habitat in such a way as to cause a decline or change in abundance and/or distribution of the population over one or more generations and natural recruitment (reproduction and in-migration from unaffected areas) may not re-establish the population to its original (i.e. pre-Project) level within several generations or avoidance of the area becomes permanent. The cumulative effects of produced water associated with production at the Hibernia platform were assessed as a part of the *Hibernia Development Project Increased Production and Produced Water Environmental Assessment Report* (HMDC 2006).						
S109. **§7.2.3 Commercial Fisheries, pg. 230** – Cumulative effects associated with the safety zones for three production operations, as well as the potential to add 5 more drill centres,	Following text has been added to Section 7.2.3. Safety zones associated with the White Rose project (93 km^2), the proposed new drill centres (17.2 km^2), Husky exploration (25.7 km^2), the StatoilHydro drill centres (14						

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must be considered.	km^2), the Terra Nova exclusion zone (14 km^2) and safety zone (255 km^2) and Hibernia safety zone (6 km^2) together total approximately 419 km^2 . The Hibernia South Project will require a maximum of 8.2 km^2 per drill centre, plus a 500 m safety zone along the flowline route, theoretically requiring approximately 53.2 km^2, plus a safety zone for each future flowline. If all the potential safety zones for all projects were in effect at the same time, the total area could be approximately 472 km^2. This absolute worst case scenario amounts to approximately 2.2% of the NAFO division 3Lt, where all these projects lie. Given the relative area that fishing is actually restricted at any one time, compared to the available fishing area and the relatively little fishing activity that occurs near these projects, the safety areas, both within and between project cumulative effects of safety zones are considered non-significant.						
S110. **§7.2.5 Marine Birds - Cumulative Effects, pg. 231** - The sentence listing potential effects should also include interaction with harmful substances after stranding on a vessel.	Text amended- interaction added.						
S111. The statements that	Text amended – sentence						

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the project is located far enough from other offshore structures to avoid cumulative effects with respect to attraction to lighting are unsubstantiated. CWS offshore bird observers report that they can see Hibernia's flares from other offshore projects, and birds may be able to do so as well. The cumulative effect of attraction of lighting should be discussed further.	removed.						
S112. **§7.2.6 Species at Risk, pg. 232, Para.6** - For the statement "…*all operators are required to comply with* ***both***…" only one document (Statement of Canadian Practice) is listed. Please list the other document as well.	Text amended "the C-NLOPB Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2008a)" has been added.						
S113. **§*8*.0 Accidental Events, pg. 234** - Contrary to the scoping document the discussion of accidents and malfunctions is limited to Hibernia crude and to a limited extend diesel. There is no reference to drilling fluids, drilling muds, and chemicals and does not consider the effects of these materials on all VECs.	The following text has be added to Section 8.5.4: 8.5.4 Synthetic and Water Based Mud and Fluid Spills "SBMs are drilling muds that consist of a synthetic base fluid chemical that is in continuous phase with water as the dispersed phase (Denney 2005). As such, SBMs are largely immiscible in water (Hart et al. 2007). When accidently released into seawater, SBM breaks into individual droplets. Due to the presence of barite in						

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	emulsion, SBMs are denser than seawater and will sink when released. Dispersal, size and fall velocity of droplets depend on the conditions of release and mixing during descent through the water column (Hart et al. 2007). The contrasting physical/chemical properties of WBM versus SBM emulsions leads to different responses to dilution in seawater and subsequently different behaviours in the marine environment. These differences are fundamental and are possibly best described in terms of a comparison of the general behaviour of WBM and SBM releases in seawater. In the case of WBM, seawater dilutes an emulsion that is already water-based (JW 2004). As a result, individual particles in the emulsion are separated by larger and larger distances such that they can be eventually treated as independent particles falling under the force of gravity. After sufficient dilution these particles simply 'rain' down toward the seabed. The particles may coalesce (flocculate) and their behaviour in the benthic boundary layer (overlying water column and uppermost centimetres of sediment) may be complex, but, in any case, the original properties of the emulsion are lost. In the case of WBM, the effect of dilution is invariably to break the emulsion."						

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	The following text has been added to Tables 8.10. 8.11, 8.12, 8.13, 8.14, and 8.15 under “Interactions”: “Smothering and contamination from drilling mud and fluid spills.” The following text has been added to the sections as indicated: 8.7.1.1 Marine Fish Habitat “There are few studies that have studied the fate and affects of an accidental release of drilling muds and fluids (MMS 2004b; CNSOPB 2005). Drilling fluids and muds are known for their degradation under certain environmental conditions. The rate of biodegradation is dictated by temperature, hydrostatic pressure and oxygen levels. Smothering may occur due to the weight of the barite where the SBM collects in a layer of 1 cm or more (Bakke et al. 1989), in particular in areas where sediment unevenness may permit pooling of the SBM. The SBM will likely be confined to the sediment-water interface and is not likely to be incorporated into the sediment as would be the case with cuttings. Animals dependant on this interface for food or that are non-tolerant to the SBM would be most affected. Another potential effect is reduced recruitment caused by habitat						

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	selection in settling invertebrate larvae. Where synthetic drilling products are in the order of magnitude of 10,000 ppm total extractable hydrocarbons (TEH) in the sediments, loss of the benthic community is expected due to toxicity effects (Bakke et al. 1989). Under low current conditions, high hydrocarbon concentrations, and the absence of bioturbation due to smothering, recovery of the benthos is likely over the long term (about 5 years). The seafloor-water interface around the SBM may become anaerobic from bacterial degradation due to smothering effects in this interface. Areas where the sediment hydrocarbon concentration is in the order of magnitude of 1,000 ppm, a reduction in infauna abundance and diversity may be expected, with return to background conditions within one to several years (Bakke et al. 1989). Recovery of the sediment chemistry to background levels at a distance of 250 m (TEH levels at 100s ppm) was observed within two years following cessation of SBM cuttings discharge (Belford and Ross 2003). A more rapid recovery has been observed at Hibernia where in 2001 approximately 50% of SBM cuttings started to be reinjected. In the subsequent						

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	2002 EEM program, hydrocarbons in sediments were noted to have substantially declined to levels observed in the previous 1998 EEM programs. The 50% which remained discharge consisted of fines removed via centrifuges to adjust mud weights, the material reinjected was the coarser cutting removed by the vibrating shaker screens. (HMDC EEM 2002). Muschenheim and Milligan (1996) have noted that a near-seabed velocity in excess of 20 cm/s was sufficient to re-suspend drilling cuttings. The implication of this information and its applicability to the Hibernia site is not necessarily clear cut. Hibernia bottom current speeds are generally between 5 to 14 cm/s, with currents greater than 23 cm/s occurring approximately 8 percent of the time (Seaconsult 1994). Regardless, this indicates that for 8 percent of the time, even heavy particulate matter associated with the drilling discharges can be transported due to bottom current velocities. Furthermore, the bottom current velocities are such that transport of fine particulates may well occur on a regular basis at the Hibernia site. The density of the fluid						

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	causes the mud plume to sink rapidly down to the seafloor and if bottom currents are present dispersion may occur. A partial recovery is expected within weeks or months, likely followed by more or less full recovery within 3 to 5 years. Mobile macroinvertebrates and fish are capable of avoiding the mud." 8.7.2.1 Marine Fish "Adult fish would likely avoid areas that experienced significant deposition of drilling mud. Moreover, contaminant levels would reach background levels within a short distance from spill area and be undetectable beyond 3,000 m from the site, according to some studies of surface discharges (MMS 2000). The PAHs, which are primarily responsible for the toxicity of oil-based drilling fluids, are below detectable levels in SBMs. Numerous studies have demonstrated that mercury impurities associated with drilling mud barite are not capable of being taken up by marine organisms that might come in contact with discharged drilling fluid solids (Neff et al. 1988). Therefore, no significant residual effects are likely to occur." 8.7.3.1 Commercial Fisheries "Given the safety zones around drill centres and the lack of fishing effort within the						

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	Project area, no significant residual effects on commercial fisheries are likely to occur." 8.7.4.1 Marine Birds "Given the density and location of the potential incident, a drilling mud spill is unlikely to interact with marine birds. Therefore, no significant residual effects are likely to occur." 8.7.5.1 Marine Mammals "Given the density and location of the potential incident, a drilling mud spill is unlikely to interact with marine mammals. Therefore, no significant residual effects are likely to occur." 8.7.6.1 Species at Risk "Given the density and location of the potential incident, a drilling mud spill is unlikely to interact with marine species at risk. Therefore, no significant residual effects are likely to occur."						
S114. The assessment of accidental effects should include the effect of the unintentional disposal of dredge material on route to the intended disposal site.	This is not deemed to be a credible scenario. However, given the homogeneity of the habitat within the Project Area, effects of unintentional disposal of dredge material would not differ substantially from that discussed for the selected disposal sites.						
S115. Define what is meant by extremely large,	Spill volume definitions are provided in Section 8.1.						

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very large, large, and small spills?							
S116. **§8.1.1 Extremely Large, Very Large and Large Oil Spills, pg. 236, Table 8.2** - This table should be updated to incorporate more recent information; the data from 2005 should no longer be considered a forecast.	The table used the data available at the time of writing.						
S117. **§8.3, Well Blow-out Probabilities, pg 238**. Why is the probability of spills less than 1 bbl not included? As stated in Table 8.7, there have been 12 such spills per year in NL offshore area, a greater occurrence than the larger spills.	The probability of spills less than 1 bbl not included since well blow outs are most likely larger than 1 bbl.						
S118. Table 8.8, in determining spill probabilities, NL data should also be used.	Standard methods from previous EAs in the area were used to calculate spill probabilities.						
S119. **§8.4.2 Diesel Fuel, pg. 241, Para.3** - Although the U.S. Coast Guard (2005) reference sounds interesting, the website provided in the reference list is inaccessible. Care should be taken when developing the reference lists to ensure that all internet-based references are still current and available to the reader.	Comment noted. The website was accessed less than one month prior to report submission.						
S120. **§8.7.3.1 Potential**	Text amended - reference is						

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Interactions and Existing Knowledge, pg. 254 - In the second paragraph, reference is made to two fishing gear conflicts per year. This is in relation to seismic activities and is not related to accidental spill events, the focus of this discussion.	removed.						
S121. **§9.0 Effects of the Environment on the Project, pg. 263** - Despite the intent stated in the Scoping Document to describe the effects of the environment on different platform types, this section is very short and general. There were no specifics about typical limiting environmental conditions for each platform type, including dredging and disposal activities or the frequency of occurrence of such thresholds by season.	Limiting environmental conditions are specific to the vessel and platform being used and the installation techniques employed. Wind and waves are the two dominant environmental conditions. All vessels and platforms are designed to operate in certain significant wave height, period and direction thus operational weather windows are in place under approved safety plans. Neither vessels nor platforms have been selected for the project at this time so we are unable to provide specific values. Trained and experienced weather observers generate daily weather observations that are used by marine, aviation, drilling, and production operations when making decisions regarding field activity. Site specific forecasting is also used for planning field operations. Such forecasts are updated more frequently when conditions become challenging.						

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	Unfavorable forecasts could result in operations being stopped and non-essential personnel down-manned. Should unpredicted conditions arise which approach or exceed safe operating limits, all activity can be ceased immediately and the facility made safe. Risk assessments may be conducted at such times to support decisions. Emergency response plans may be utilized as well to address such situations. In general, activities will be planned for those periods when most favorable environmental conditions are experienced on the Grand Banks. Some equipment however is designed to operate year round.						
S122. **§10.2 Summary of Mitigation and Follow-Up, pg. 267, Table 10.2** - Baseline information is required for the follow up monitoring program.	Text amended- Baseline information is required for the follow up monitoring program.						
S123. The Statement of Canadian Practice (SOCP) provides mitigation and best practices for seismic operations. It does not provide mitigations for production and/or drilling operations. The table (and appropriate sections in the report) should	Text amended- The Statement of Canadian Practice is referenced only where appropriate.						

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be revised to ensure that the SOCP is only referenced in discussion of seismic (VSP and/or well site surveys) programs.							
S124. NRCan anticipated that information on seabed scour density, scour severity and scour frequency would have been presented in support of the decision to excavate to 10 m, or to bury/or not bury flowlines, but NRCan did not locate that information within the EIS document. The EIS refers to detailed information in Appendix B, but NRCan did not find any information on seabed scour in Appendix B. Thus, NRCan could not comment on those issues.	Using existing data from repetitive mapping of ice berg scour and pits, HMDC is presently assessing the risk of iceberg scour in relation to flowline trenching and determination of glory hole excavation depth based on probability and depth of iceberg scour.						
S125. It was not clear what geological information was used to quantify the amount of fines that will be excavated from the glory holes. On page 153 (EIS), it states approximately 90 percent of the spoils at the HSE glory hole location consist of fine- to course-grained sand with minor gravel. These sediments are expected to disperse and settle in an asymmetric,	The composition and grain size distribution of soils at the proposed glory hole excavation site has been estimated from geotechnical – geophysical correlations with existing offset borehole information (FJGI 2005). A number of geotechnical investigations have been conducted in the Hibernia region prior and subsequent to installation of the Gravity Base Structure (GBS) production platform and related seabed infrastructure (e.g. Newfoundland Geosciences Ltd., 1988,						

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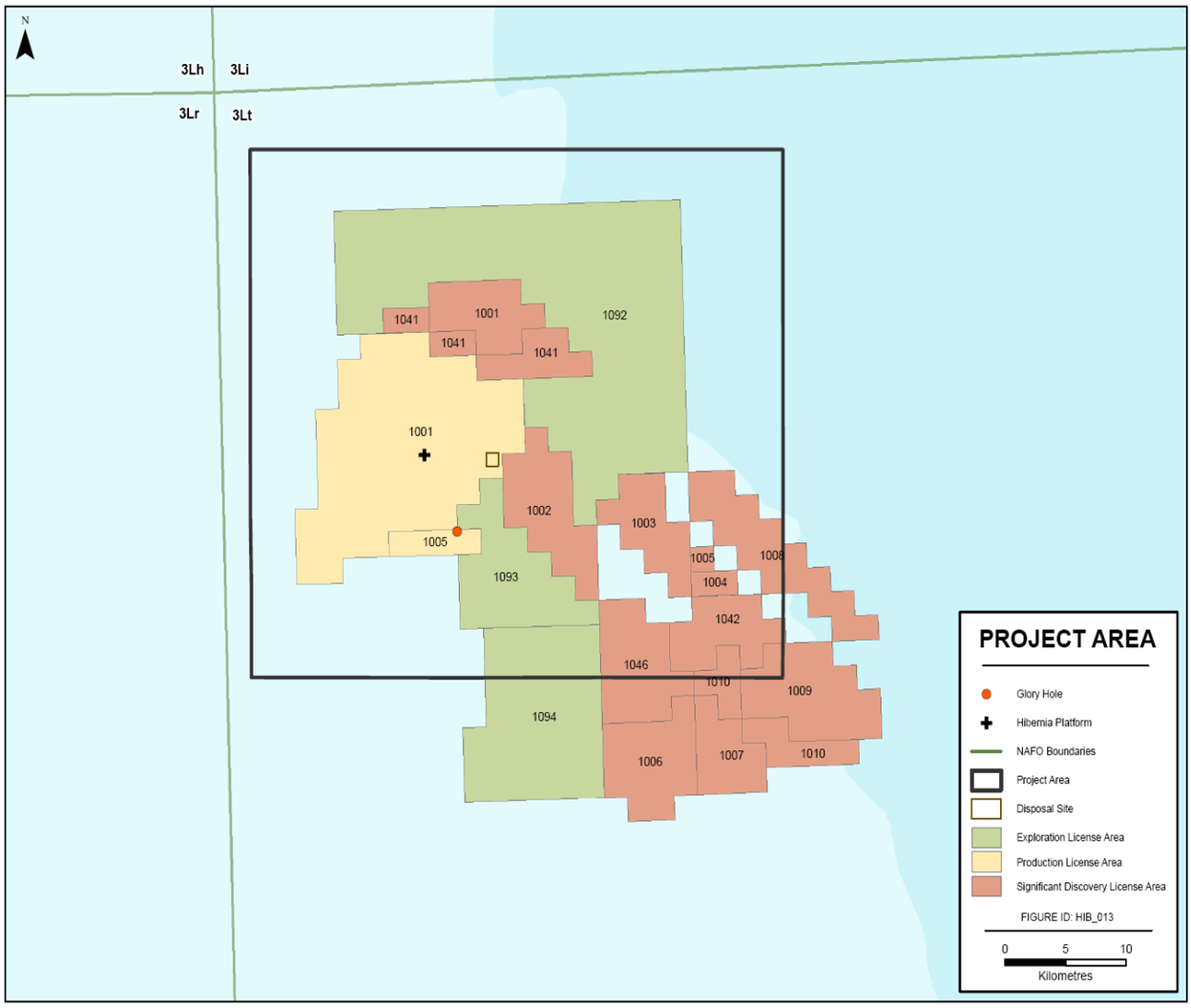
anticipated more slits and clays in the upper 10 m. There are many geotechnical boreholes in the Hibernia area (several Jacques Whitford reports), but it was not clear how that information was used.	1992). The nearest geotechnical borings to the HSE glory hole site are the OLSA and B locations, approximately 4 km to the north-northwest (Figure 2.1; Appendix A). In addition, shallow box cores have been collected in the vicinity of the planned glory hole site (JW 2008) to characterize surficial sediment grain sizes and sediment quality parameters.						

APPENDIX A

REVISED FIGURES

Revised Figure 1.1 Project Area



Revised Figure 2.4. Flowline/Umbilical Routing to Glory Hole

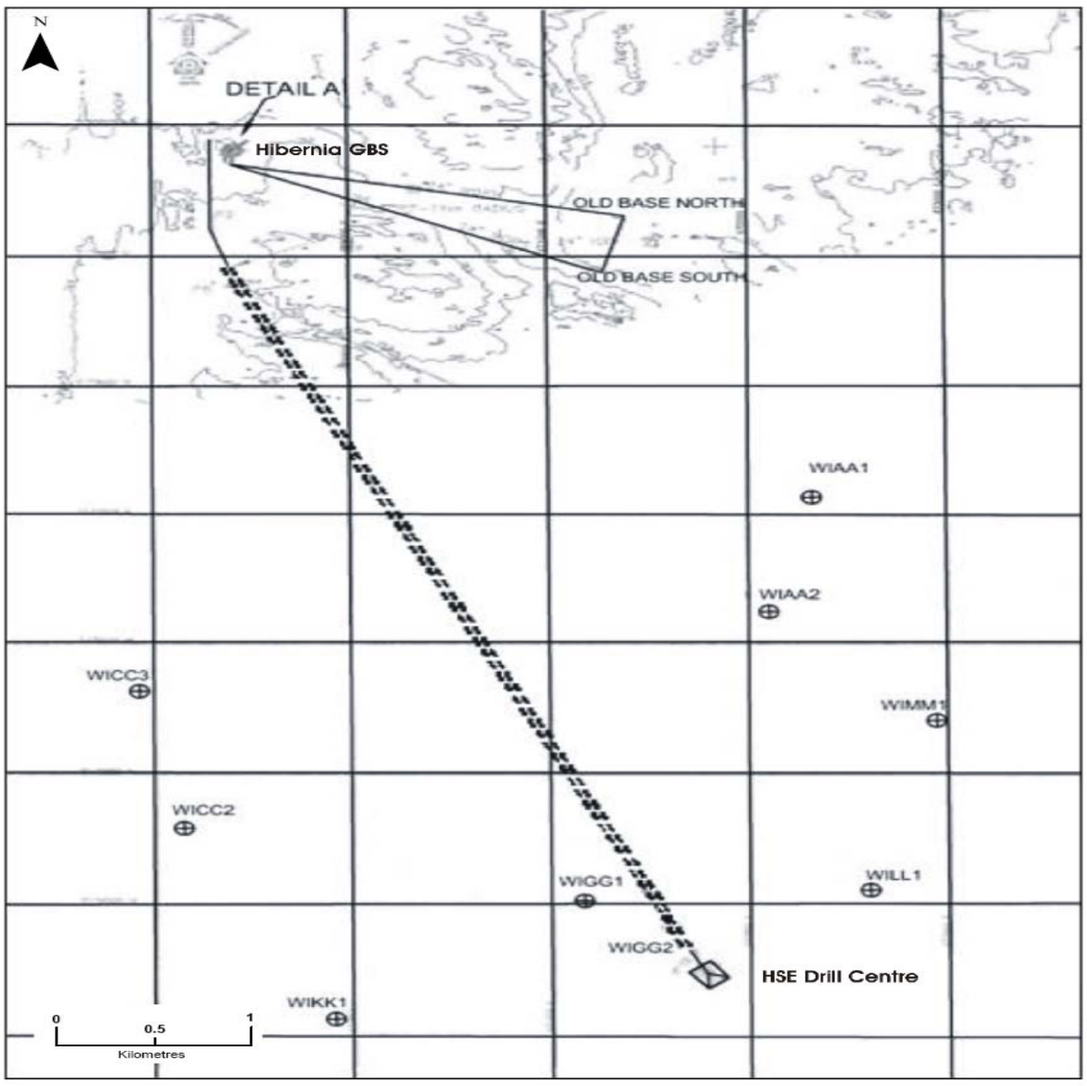


Figure 4.3 Sensitive and Vulnerable Areas on and around the Grand Banks