GENERAL COMMENTS

Project Description

G1. The project description and environmental assessment is focussed 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.

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.

G3. The project description does not include the required description of dredge spoils disposal.

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 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.

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 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.

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?

G8. The proponent suggests that since there will be no increase in the overall rate of produced water 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.

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 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.

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.

S2. **Pg. vi** - Abandonment could be a greater source of disturbance and injury for mammals and leatherbacks than vessel operations if explosive well severance methods are used.

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.

S4. **Figure 1.1, pg. 3** – The figure should also show the Study area for the project.

S5. **Figure 1.2, pg. 4** – Where is the location of the drill centre and the location of the dump zone?

S6. **§1.4, Regulatory Context, pg. 5** – A development plan amendment, pursuant to the Accord Acts is also required.

S7. **§2.1.1 Glory Hole Construction, pg. 8** - Is it likely that boulders could be encountered that are too large for the suction dredge to handle? If so, there should be a contingency plan and possible inclusion in the disposal at sea permit.

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.

S9. **Figure 2.4, pg. 15** – The scale and direction should be included in figure.

S10. **§2.6 Discharge and Emissions, pg. 22** – The discussion in this section is focussed 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 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.

S12. **§2.6.2, Produced 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.

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?

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 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.

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 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.

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.

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.

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 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 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 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 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-hour mean to a 10 minute mean). This discrepancy is large enough to indicate the importance of using measurements to supplement modelled winds, where sufficient measurements exist.

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.

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

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.

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 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.

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.

S28. **§3.1.8 Climate Variability, pg. 55** - The analysis of the North Atlantic 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.

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.

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.

S31. **§3.3 Sea Ice and Icebergs, pg. 67, Para.1** - The word "*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 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 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 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.

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 season was **July 15**, 2008 and CIS iceberg charts indicate extensive iceberg sightings in the area until ~July 12, 2008).

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 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 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 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.

S41. **§4.1 Fish and Fish Habitat, pg. 76** – The numbering of the sections referenced in the first paragraph are not correct.

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.

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 Grand Banks, including the SE Shoal where many fish and marine mammals feed in the summer and apparently overwinter.

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.

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. 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.

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.

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.

S49. **Table 4.7 Foraging Strategy and Prey of Seabirds in the Study Area, pg. 108** - 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 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.

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.).

S53. **Pg. 116** – It is stated that concentrations of Alcids are contracted to the northern Grand 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.

S54. **Pg. 118, 2nd para.** - In the last sentence of the second paragraph, Witless Bay Island should be replaced with Witless Bay Islands.

S55. **Pg. 118, last para.** – It is stated that the project area is well beyond the foraging range of breeding 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.

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.)

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.

S58. **Table 5.1 Potential Issues Identified in the Scoping Document, pg. 133 –** Under "Marine Resources", Sections 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.

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 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, 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.

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.

S63. **§6.1.3 Potential Interactions and Existing Knowledge, pg. 151, Para.3** - The proponent confuses 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.

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.

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?

S67. **Pg. 152, Para.3** - Other risks to the benthic habitat that should be discussed include increased depth of the pile; cladding and permanent change of substrate characteristics; organic enrichment of the sediments; and shift in community composition.

S68. **Pg. 153, top of pg.** – Is there a reference 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.

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 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.

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.

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.

S73. **§6.1.4 Mitigations, pg. 158, Para.3** - How long does the WBM remain in the benthic boundary layer (BBL)? What 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?

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.

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.

S76. **§6.1.8 Summary of Potential and Residual Environmental Effects, pg. 161, Table. 6.1** - 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.

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.

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.

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.

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?

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.

S83. **§6.4.3 Potential Interactions and Existing Knowledge, pg. 185** - The international NAFO candidate vulnerable marine ecosystems (VMEs) identified on 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 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.

S86. **§6.4.4 Mitigations, pg. 189** - Note previous comment regarding vessel watches and notification procedures for large whales.

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.

S88. **§6.4.6.1 Noise, pg. 190 (and 211, 219, 220)** - "*The Project 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 has 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.

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 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.

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.

S92. **§6.5.3.2 Lights and Flares, pg. 198** - This 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.

S93. In several places the hyphen is missing in Storm-Petrel.

S94. **§6.5.3.4 Noise, pg. 199** - On page 200, the word measurable should be replaced with significant.

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 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.

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.

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 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.

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., 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 possible impacts. This factor in the decline of Ivory Gulls should be discussed in this section.

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.

S103. The cumulative effects of discharges, beyond those captured in the Hibernia EIS, and in consideration of other projects, must be addressed.

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 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.

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.

S106. **§7.2.1 Marine Fish Habitat, pg. 229, Para.1** - As a result of this project and other current or proposed 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.

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.

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.

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, must be considered.

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.

S111. The statements that 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.

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.

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.

S114. The assessment of accidental effects should include the effect of the unintentional disposal of dredge material on route to the intended disposal site.

S115. Define what is meant by extremely large, 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.

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.

S118. Table 8.8, in determining spill probabilities, NL data should also be used.

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.

S120. **§8.7.3.1 Potential 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.

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.

S122. **§10.2 Summary of Mitigation and Follow-Up, pg. 267, Table 10.2** - 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 be revised to ensure that the SOCP is only referenced in discussion of seismic (VSP and/or well site surveys) programs.

Appendix A

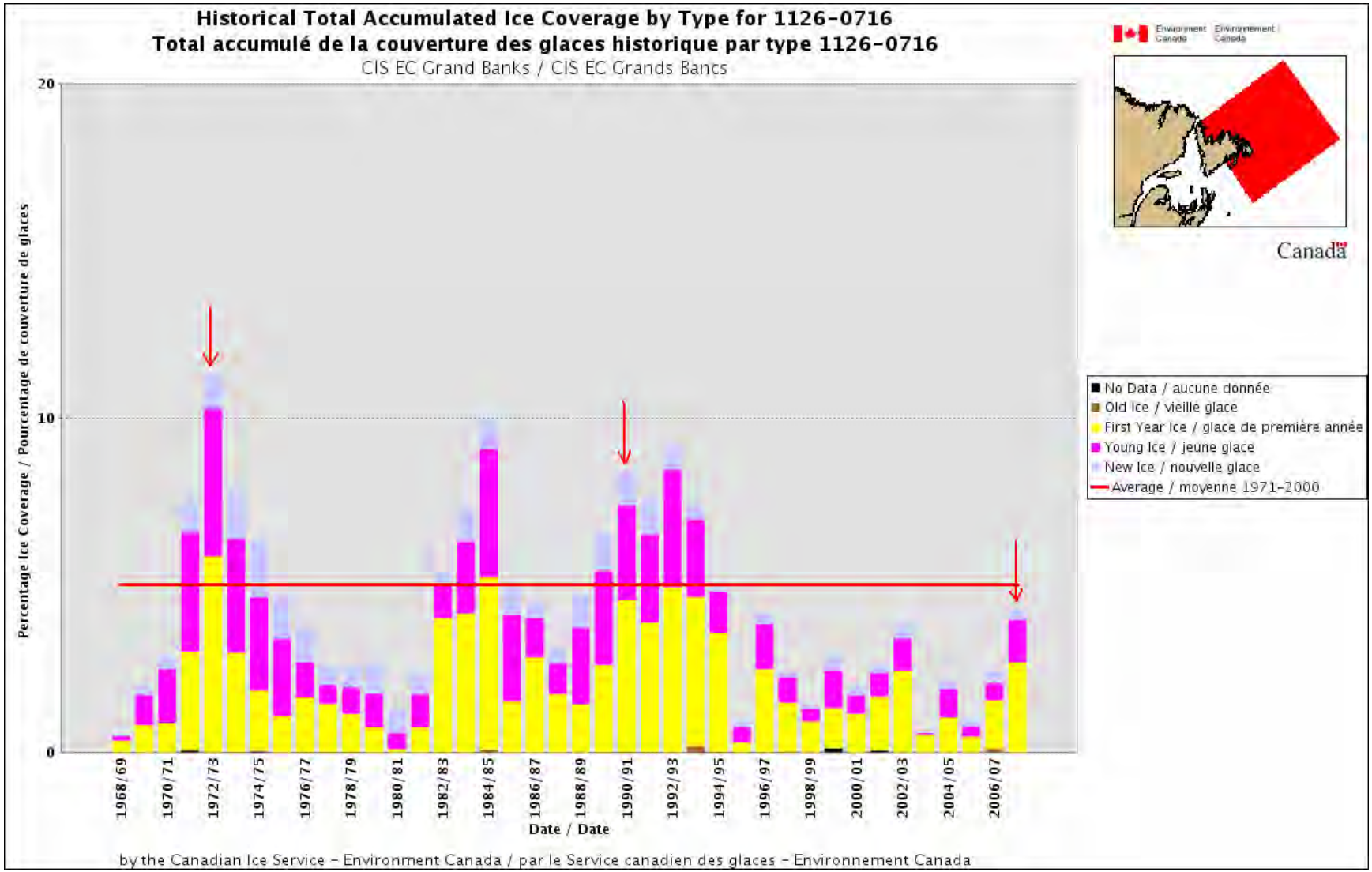


Figure 1. Years with large ice incursions into the study area are shown with arrows.

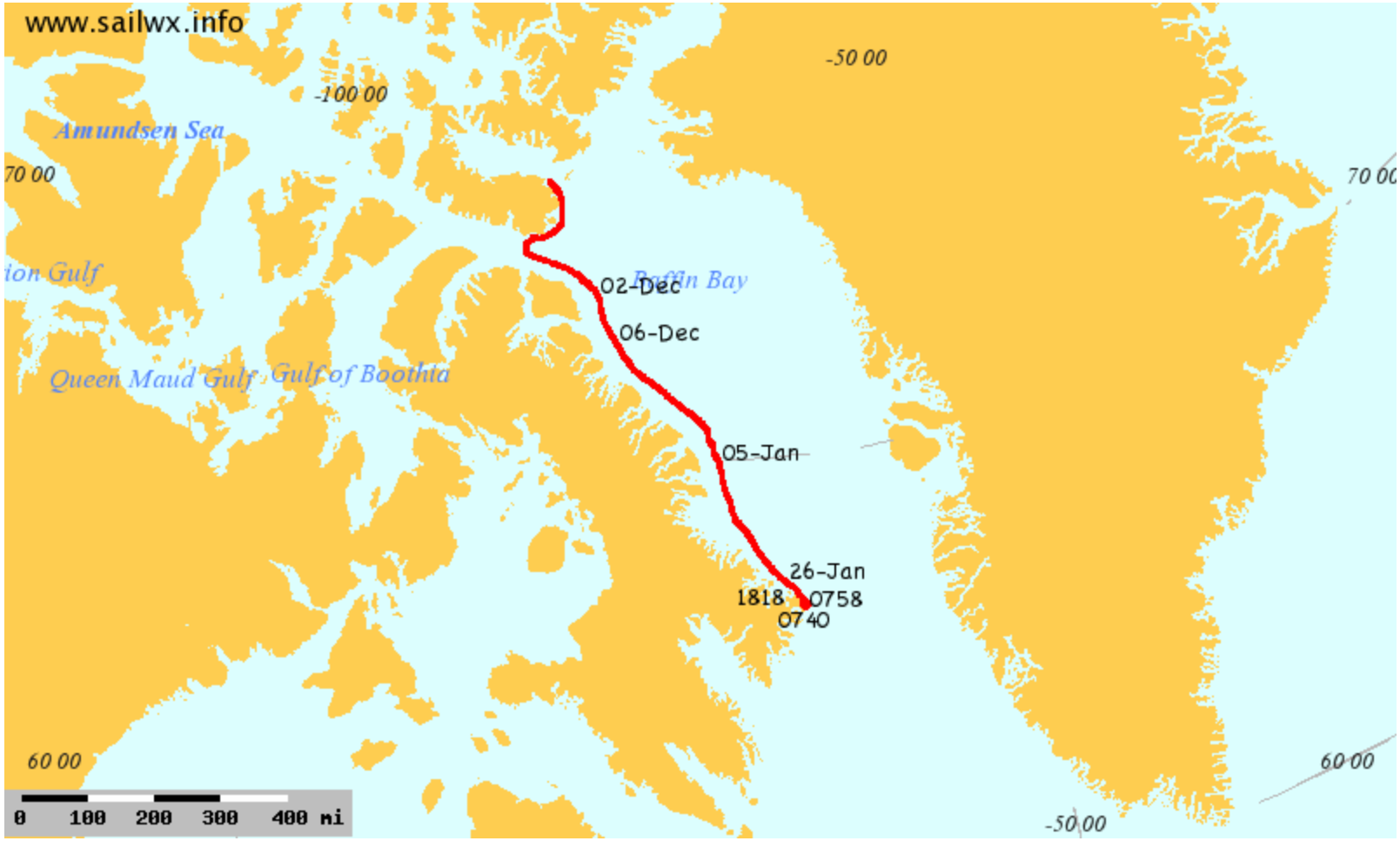
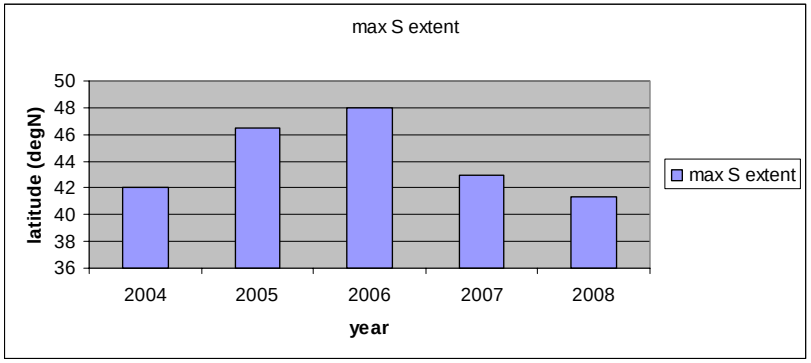


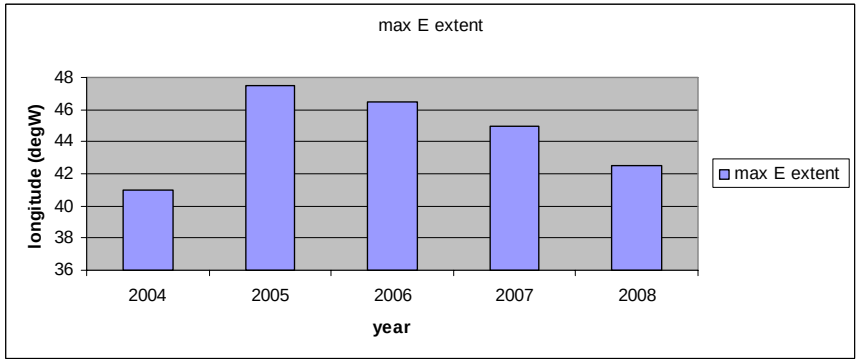
Figure 2. The Petermann ice island can be tracked using the sailwx.info ship tracker. The beacon # is 47557.

5-year Iceberg Statistics

based on daily CIS Iceberg charts 2004-2008

year	date icebergs first crossed S of 49N	max S extent latitude (degN)	max S extent date	max E extent longitude (degW)	max E extent date	date iceberg limit perm. retreated N of 49N
2004	Mar-18	42	various times Jun 25 - Jul 26	41	jun 30 - Jul 03	Aug-12
2005	Feb-15	46.5	Apr 24-25	47.5	Mar30-Apr07, May 2-14	Jun-03
2006	Mar 29, Aug 5	48	May 30, Aug 9-12	46.5	aug 8-10	May 31, Aug 13
2007	Mar-02	43	Jul 8-13	45	Jun27-Jul17	Sep-04
2008	Feb-09	41.3	May 29 - Jun 13	42.5	May 16-17	Aug-12





**Note that the higher bars mean less-far-south and less-far-east, while the lowest bars represent the most extreme-south and most-extreme east extents.