SCIENCE REVIEW OF THE LABRADOR-ISLAND TRANSMISSION LINK PROJECT ENVIRONMENTAL IMPACT STATEMENT (EIS)

Context

The Labrador-Island Transmission Link project involves the development of a high voltage direct current (HVdc) transmission system extending from the lower Churchill River in central Labrador to Soldiers Pond on the Island of Newfoundland. The proposed project will extend over a distance of approximately 1100 km and will include alternating current (AC) to direct current (DC) converter stations at Muskrat Falls, Labrador and Soldiers Pond, Newfoundland; overhead transmission lines; a submarine cable crossing the Strait of Belle Isle; and shore electrodes in the Strait of Belle Isle and Conception Bay.

The Proponent was advised by the Minister of Environment and Conservation that an Environmental Impact Statement (EIS) is required for the Project under the Newfoundland and Labrador *Environmental Protection Act (EPA)*. The Project is also subject to the *Canadian Environmental Assessment Act (CEAA)*. The purpose of the EIS is to identify alternatives to the Project, alternatives methods for carrying it out, the environment that will be affected, the important environmental effects associated with the Project, measures that are required to mitigate any adverse effects and the significance of residual environmental effects. The EIS shall contain a review and assessment of all available information pertinent to the conduct of this environmental assessment as well as such additional new information or data as provided by the Proponent or requested by Canada or Newfoundland and Labrador. Component Studies shall address baseline data requirements to support the evaluation of environmental effects and/or the development of mitigation measures as well as monitoring and follow up programs.

Development of the Project will alter the aquatic environment, which could result in impacts on fish and fish habitat. Since the project is likely to cause a harmful alteration, disruption or destruction of fish habitat, this would require issuance of a *Fisheries Act* Authorization, thereby making Fisheries and Oceans Canada (DFO) a responsible authority under CEAA. On April 13, 2012, the Habitat Protection Division of the Ecosystems Management Branch in the Newfoundland and Labrador Region requested that DFO Science undertake a review of specific sections of the Labrador-Island Transmission Link Project EIS with a deadline of May 18, 2012. An extension on this deadline was subsequently requested by Science and the new deadline for the provision of science advice was determined to be May 29.

Science Branch (NL and Quebec Regions) undertook a Science Special Response Process (SSRP) for this review. The information from this scientific review was provided to Ecosystems Management to help form part of the Department's response to the overall adequacy of the EIS as assessed against the Scoping Document which have been agreed upon by the Government of Canada and the Government of Newfoundland and Labrador. This SSRP focused on the review of the specifically identified sections within the EIS (Appendix 1) and the relevant Component Studies (Appendix 2) that provide baseline information on the current aquatic environment.

The objective of this review was to evaluate:

- The completeness of the EIS in describing the existing environment and environmental effects of the project;
- The accuracy of the information provided within the EIS; and
- The extent to which the EIS addresses requirements outlined within the project's Scoping Document.

The information required for this review can be found in a number of sections throughout the EIS and associated Component Studies. A complete listing of these reports and relevant sections of the EIS are available at the NL's Department of Environment and Conservation website for download.

This Science Response report is from the Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Zonal Science Special Response Process (SSRP) of May 17, 2012 on the Science Review of the Labrador-Island Transmission Link Project Environmental Impact Statement (EIS).

Background

A formal Science review of the Labrador-Island Transmission Link, Marine Environment and Effects Modelling Component Study has already been competed (DFO, 2012). Some of the issues raised in this document but not dealt with by the proponents are repeated here.

Analysis and Response

Review of the Environmental Impact Statement (EIS) for the Labrador-Island Transmission Link

Environmental Impact Statement (General Comments)

- In some sections, the EIS is well-documented using a combination of *in situ* sampling, extensive literature reviews, and modeling to describe the aquatic environment around the project and to predict the potential effects of the project (e.g. freshwater, benthic habitat, marine water quality). Unfortunately, other areas have significant gaps (e.g. the potential impacts of electromagnetic fields, marine mammals) or questionable data (e.g. acoustic characteristics and sound propagation for project activities). In those sections that are well described, the information provides adequate baseline studies which will be useful in order to gauge the impacts of the construction, installation, and operational phases on the marine ecosystem if this project proceeds. In the other areas, however, there are still serious concerns about the validity of the conclusions.
- The proponent demonstrates a tendency to make general conclusions which are not based on evidence. For example, the proponents describe the various Valued Ecosystem Components (VECs) as 'healthy and resilient'. Given the very real and important differences between the various species, there is no basis for such sweeping statements
- It is important that the criteria used to evaluate risk are clearly identified. Without clear criteria, it is impossible to evaluate if the conclusions in the EIS of no significant impact are reasonable. The proponents state that "A relative probability of occurrence is assigned to each scenario, based on Nalcor's experience, historical records of occurrence, and the judgment of the assessors." (p. 5-3, line 25). The relative

probability of occurrence is an important component towards the Risk Evaluation of potential incidents of accidents and malfunctions. However, it is also important to identify the basis for any "judgment of the assessors". Purely subjective assessments are not appropriate and evaluations should be based upon a quantitative assessment or information that can be clearly explained. If the latter, it should be noted in various sections and tables of the EIS where the assessment of the risk (low, moderate, high) is an assumed risk.

- The specific timing of project activities will have a significant impact on the potential of adverse effects on the environment. However, information on timing of project activities and their duration was not provided in the EIS. As a result, a thorough review of Nalcor conclusions about the lack of significant impacts on marine VECs and environment cannot be done at this time. The seasonal timing of construction should be adjusted to reduce any adverse impacts should they be predicted.
- The main environmental impacts related to construction and installation of submarine cables in general include seabed disturbance, habitat damage and/or disturbance to marine organisms, re-suspension and/or displacement of sediments, potential release of contaminants including emissions and wastes, and increased noise levels. The operational phase of the proposed transmission link will include introduction of artificial substrates, production of EMFs, and release of thermal radiation to the marine environment.
- Gaps in our knowledge regarding the operational hazards of submarine power cables limit our ability to make informed decisions regarding the potential impacts to aquatic organisms and the marine ecosystem. Few studies have measured electromagnetic fields, including induced fields, emitted by subsea power cables. In order to predict the consequences of EMF on marine life, we need to better understand specific sensitivities of these organisms to the generated EM fields. In addition, the release of thermal heat as a by-product of the transfer of electric power along subsea power cables requires monitoring to determine the respective changes to the physical environment that may lead to further changes in marine chemical and biological processes.

Volume 1: Project Planning and Description

Section 3.5.3.2 Submarine Cable and Electrodes (Page 3-75)

- Referring to the *in situ* temperatures for hydrolysis product behavior, the models should be re-run using temperatures that are relevant to the operating environment. This was suggested previously (DFO, 2012), but does not appear to have been done.

Section 4.1.6 Bathymetry (Page 4-8)

- No specific comments were received.

Section 4.1.7 Currents and Tides (Page 4-9)

- No specific comments were received.

Section 4.1.8 Waves (Page 4.10)

- No specific comments were received.

Section 4.1.9 Sea Ice and Icebergs (Page 4.11)

- The report fails to adequately consider the way in which the ice drifts through the study area, and into the Strait and northern Gulf, and the potential impact on the proposed project.

- The assessment does not consider the effect that ice accumulation may have on the operation of the electrode ponds. The following issues should be addressed:

  (i) Whether winter ice cover in the ponds would result in an accumulation of hydrolysis products and the potential for a larger effect on the outside of the berm;

  (ii) The possibility that the buildup of ice in/on the berm may reduce its porosity and effectiveness as a ground; and

  (iii) The potential for the formation of anchor ice in and around the electrodes and the effect on their operation.

Section 4.1.11 Climate Change (Page 4-13)

- Sea level is predicted to rise by 80 to 100 cm in the areas of the shore electrodes over the next 90 years. There is no discussion in the EIS of whether this anticipated change in sea level will require the height of the berms to be raised. This requirement should be considered in the siting and design of the ponds.

Section 5.1.3 Risk Evaluation (Page 5-3)

- See General comments

Section 9.0 Environmental Assessment Approach and Methodology

- No specific comments were received.

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Section 10.4 Freshwater Environment (Page 10-210)

- In Table 10.4.5.1 (p. 10-228) **Rainbow Trout** are listed as being confined to the Avalon Peninsula. They are most likely more widespread than represented in this table. There are known populations in eastern Newfoundland in both Shoal Harbour River and Little Shoal Harbour River in the Clarenville area. Rainbow Trout are also known to frequent rivers on the Northern Peninsula being reported in the River of Ponds system and Trout River system.
- In Section 10.4.6 (p. 10-235) **American Eels** are noted to be absent from the Avalon Peninsula. In fact, eels are quite common in rivers on the Avalon. It may be that eels have not been reported from the rivers to be crossed. If this is the case, it should be stated that way in the text.

Section 10.5 Marine Environment (Excluding Section 10.5.10 Seabirds) (Page 10-236)

10.5.6 Marine Ambient Noise (Page 10-259)

- The noise recordings collected can provide information on the local noise, at the depths where the instruments were deployed, for significant periods of time. However, proper extraction of actual ocean noise levels is difficult because the data as presented are heavily contaminated by vibrations from the mooring (c.f. 10.5.6.2 below). This acoustic contamination over a significant frequency band must be first filtered out by adequate signal processing methods. This does not appear to have been done and therefore the ocean noise levels presented are of little use for the purpose of defining noise levels.
- There also appears to be some problems with the assessment of the noise levels, with the presented data being much lower in magnitude than the published soundscape levels for other environments in the northwest Atlantic, as well as with the systematic wiggles propagating on all percentiles of spectral densities in JASCO (2011a), which is unlikely to be real and more likely a measurement artefact (c.f. 10.5.6.2 below).

10.5.6.1 Information Sources and Data Collection (Page 10-259)

- The term: “ambient noise” has a special meaning in underwater acoustics and is incorrectly used in this Section (and elsewhere in Chapter 10) to discuss “ocean noise” (NRC 2003).
- Table 10.5.6.1 (p. 10-259) should indicate the realized (and not the planned) start and end dates, and the average depths of the recordings at the three stations from JASCO 2011a. The depth of the recordings is not indicated in JASCO (2011a).

Section 10.5.6.2 Description of Marine Ambient Noise (Page 10-260)

- Concerning questionable noise levels, JASCO (2011a, June and November) refer to large acoustic contamination of the low frequency band by noise due to the vibrations of their mooring, in response to strong M2 and Msf tidal currents, that they called “pseudonoise”. Spectrograms presented show that this contamination extends above 100 Hz, even up to 1000 Hz during peak periods (e.g., November addendum, Figure 7). The noise estimates provided in the reports for the high-energy low-frequency (<1 kHz) band is therefore not representative of the actual noise in Strait of Belle Isle; these data are therefore not useful as a means to provide levels for this band, if the contaminated data are not filtered out first. The text states “Below 100 Hz real and pseudo-noise from tidal flow dominates the measured noise.” Also, JASCO (2011a) spectral levels appear too low compared to similar measurements in other environments (e.g., Deharnais and Collison, 2001; Gervaise *et al.,* 2012; Hatch *et al.,* 2008; Parks *et al.,* 2009; Simard *et al.,* 2010). No explanation was provided for this surprising result. Such low spectral noise levels would define the Strait of Belle Isle as an unusually quiet underwater environment which would be surprising given the strong currents, close proximity of shorelines with breaking waves, winds, and anthropogenic activities.
- In the same section of JASCO (2011a), the spectral percentiles plots often show curious humps at all percentiles at some frequency bands. This raises questions about the use of correct receiving sensitivity (RS) versus frequency curves used to compute the noise levels. Discussion is required in the text to explain the type of source that could cause such a constant signal excess above the ambient at these frequencies, for all noise level conditions (i.e., either during silent or very noisy periods).
- The statement (p.10-260, line 18) “sound levels are well within the limits of prevailing noise for oceans” is uninformative given that these limits provide the full range of possible average ocean noise levels. It would be more informative to provide a comparison with other areas where such soundscape descriptions were made. For example, are sound levels in the Strait relatively high, average, or lower than in other areas of the northwest Atlantic where similar measurements were made?

10.5.8.3 Description of Marine Fish and Fish Habitat (Page 10-309)

- The Strait of Belle Isle is an important migratory corridor for a large number of marine species (e.g. Harp and Hooded Seals, many cetacean species, Leatherback Turtles, Atlantic Salmon, Atlantic Sturgeons, Eels, Mackerel, Capelin, etc). The important seasonal use of this area to these species has not been considered, particularly in light of the uncertain timing of construction activities.
- There is no discussion in the EIS regarding fish avoidance of underwater cameras and/or survey platforms. This potential source of error should be explained in the EIS, as it is likely that species, notably Cod, as well Capelin and other pelagic fish tend to show high avoidance behavior towards ROVs, drop cameras, and survey platforms. This source of uncertainty is important within the context of this study, as drop camera

surveys seem to be the main source of information for fish species occurring in the study areas.

- Scientific names should be provided for all species. There are several ***Buccinum*** species along the Canadian coast and some are quite variable in morphology and similar in appearance, making identification difficult. While *B. undatum* may be the most common species in the infralittoral and accounts for most of commercial landings, other species may be represented in surveys and catches.
- There is no species specific information presented on **Greenland Shark**. This is a deficiency and species profile information should be added to describe the occurrence of Greenland Shark in the northern Gulf of St. Lawrence.
- It is surprising that the **Green Sea Urchin** (*Strongylocentrotus droebachiensis*) was not reported in the subtidal and drop video surveys in the study area. This species is targeted by fisheries that are currently expanding along the north shore of the Gulf of St. Lawrence and some fishing also occurs in other parts of Newfoundland.
- Of the eight fishery-targeted species profiled on pages 10-325 to 10-329, seven have previously been harvested in the area of interest. However, the "species profiles" are inconsistent in their reporting of where (by geography and bathymetry) fishing occurs/occurred in relation to the crossing corridor and how important it currently is or historically was (number of fishers, landings, etc). For Lobster, some information can be found on page 10-324, whereas for Scallop and Snow Crab some is found in the species profile section. No information was found for the other four species. This omission may be, in part, due to the lack of references from Quebec sources.
- **Icelandic Scallops** have been commercially fished in the Strait of Belle Isle since, at least, 1969. Examination of the fishing patterns since 1995 indicated that the proposed transmission line routes fall within an area that is currently, as well as historically, fished. Figure 1 below shows where the proposed sub-sea transmission lines are in relation to the commercial effort for **Iceland Scallops** (p. 10-325) in the most recent year. In the DFO Strait of Belle Isle research vessel surveys, the source of recruitment has not been located due mainly to the inefficiency of sampling gear on the substrate in this area. Therefore the implications of habitat destruction on the resource are unknown. There will certainly be an economic impact on those who currently prosecute the fishery in this area if the proposed operation impacts recruitment or the scallop harvest stock. There are currently approximately 10 active fishers of Iceland Scallops in this area who landed 430 t of product with an estimated landed value of approximately $479,000 in 2011.

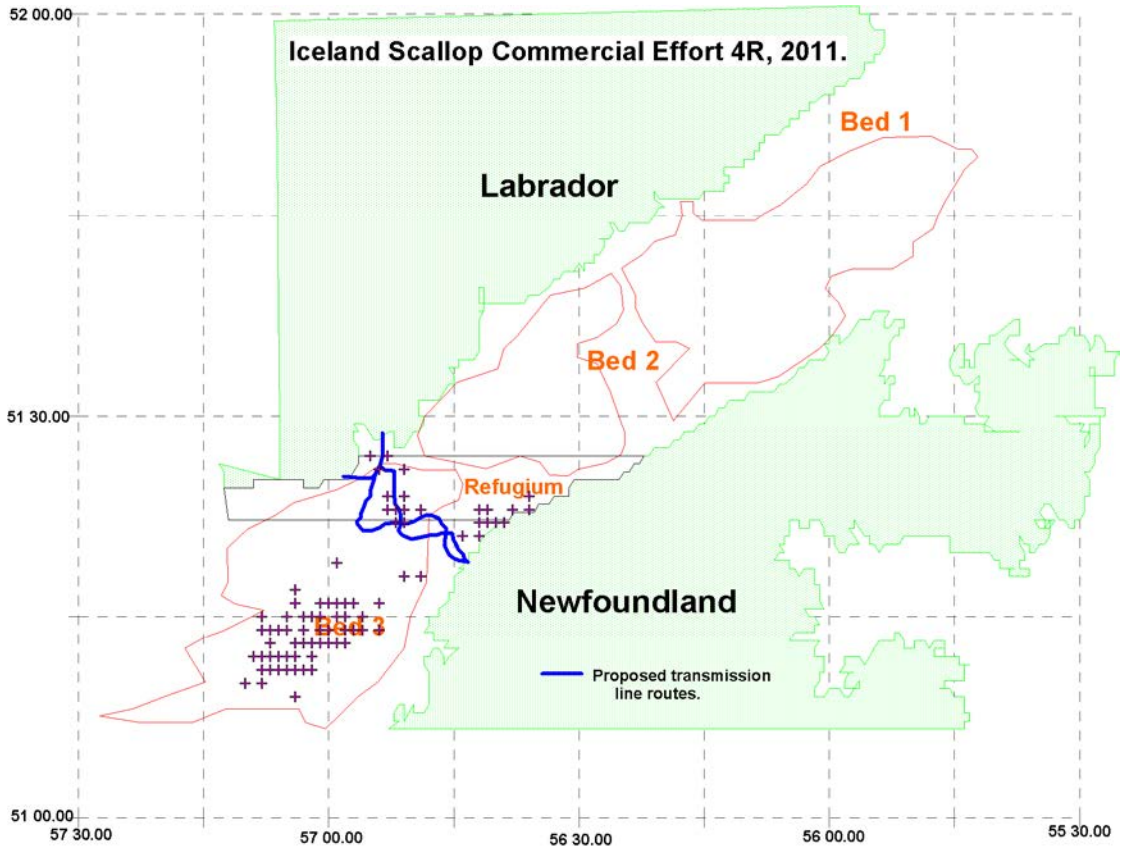

Figure 1: The location of proposed sub-sea transmission lines in relation to the 2011 commercial effort for Iceland Scallops. The proposed transmission line is represented in blue, while the purple symbols illustrate the areas of the 2011 commercial effort.

- The project location is not in close proximity to the **Northern Shrimp** (p. 10-327) resource that is off the north eastern coast of Newfoundland and Labrador. There are no commercial concentrations of northern shrimp in the northern gulf component of the study area (too shallow, too cold), there has never been any fishing either. This should be stated explicitly. In the Gulf of St. Lawrence, commercial concentrations and most adults of northern shrimp are found at temperatures above 4°C.
- Pelagic species (p. 10-333) **Atlantic Mackerel** do not spawn in the Strait of Belle Isle (they move there after the spawning season). The Strait of Belle Isle is an important migration corridor for pelagic fish (Capelin, Mackerel and perhaps Herring). It is quite possible that this corridor be taken at times that do not coincide with research surveys. The importance of this corridor also varies from year to year. For example, when temperatures are cold, mackerel could not cross to the east coast of Newfoundland.
- The presence of pelagic fish was determined, in part, using methods more appropriate for groundfish. One should always be cautious in interpreting data on pelagic fish distribution from such surveys as they do not adequately survey the species.
- No specific comments were received pertaining to **Snow Crab**. However, it was noted that the proposed transmission link runs through Fisheries Management Area 13.
- Note that Murray *et al.* (2008) provides a history of **Atlantic Cod** (p. 10-332) tagging in the study area. Also refer to Templeman (1979) for more information on cod tagging on

the Centre Bank. The information contained in these references should be added to the Atlantic Cod species profile.

- A "Bonavista cod stock" (line 30) does not exist. The sentence should be rewritten to suggest that the fish tagged in Bonavista do not undertake extensive migrations to the study area.
- P. 10-333 (line 15) suggests that **Capelin feed upon other Capelin (** "…capelin were also the main prey items for redfish and other capelin."). This is likely a misprint but if there is a reference to such an occurrence, it should be provided.
- The most recent Lumpfish assessment (DFO 2011) indicates that the resource is very weak and likely overexploited. The Section on **Lumpfish** (p. 10-333 and associated Component Study by Sikumiut [2010]) requires an update from the referenced 2006 information and publications provided.
- In the report, "Marine Fish and Fish Habitat in the Strait of Belle Isle: Information Review and Compilation" by Sikumiut Environmental Management Ltd. (2010), there was an oversight relating to information regarding **Atlantic Halibut** (distribution, abundance, fishery, historical trends) (p. 10-335). This species was listed as being found in the study area (p. 51 of the Comprehensive Study), but is not among the list of main fish considered (Atlantic Cod, American Plaice, Greenland Halibut, Lumpfish, and Witch Flounder). It should be. The Atlantic Halibut fishery in the Straits has been relatively productive especially in the past few years. Currently, there is not enough information to determine if the project could affect Atlantic Halibut distribution and whether the timing of the project could coincide with the Halibut fishery, or not. A potential interaction between the timing of the project and the fishery is a potential concern from a scientific and fishery management perspective, for which there is not enough information provided to make mitigation decisions. The Atlantic Halibut fishery occurs over a very short time period: a number of hours. This should make mitigation measures straight forward. Up-to-date information on Atlantic Halibut and the fishery, within in the study region should be added.
- Able (1978) found **American Plaice** (p. 10-337) eggs and larvae in the northern Gulf. The information contained in this reference should be added to the American Plaice species profile. The review seems to be short on references for American plaice. The COSEWIC documents appear to be the main documents used for all background information.
- P. 95 in Table 3.19 of the Component Study (Sikumiut, 2010) indicates that the population of American Plaice in the Strait of Belle Isle (Division 4R) is the Maritimes Population, not the Newfoundland and Labrador Population. The COSEWIC designation is still the same.
- Pertaining to the same Component Study above (p. 107) "A large number of groundfish species were captured in DFO scientific and sentinel fisheries surveys from 1999 to 2009: Cod species, Skate, Sculpin, Alligator Fish, Eelpout, Snailfish, Shanny and Wolffish." American Plaice should also be included in this species list.
- For each species of **Wolffish** (p. 10-338 and 339*)*, the text does not include the most up-to-date information. Refer EIS authors to the following papers: Dutil *et al.* (2010); Ouellet *et al*. (2010); Simon *et al.* (2011); and Simpson *et al.* (2011). The document should be revised with the updated information prior to acceptance.

10.5.9.3 Description of Marine Mammals (Page 10-342)

- DFO had strongly encouraged the proponent to consolidate the three related EIS reports into one thorough review of the available information, where would be presented the seasonal occurrence and abundance of the various species, and habitat functions for each, with a highlight on species of special concern, including both species that are COSEWIC-listed and those that are officially listed by the federal or provincial governments. The document "Supplementary Information Review and Compilation" would have been a good starting point. However, DFO's suggestion to reorganize the document was not taken into account, and as a result, not only is it extremely difficult even for experts to make sense of the information provided, but important discrepancies among the three reports on marine mammals and sea turtles remain. For instance, blue whales are presented as a species of special concern in some places, and correctly as endangered in others. Further, while the dates on the reports were changed, DFO reviewers were unable to identify where revisions were made.
- Along the same lines, DFO's previous comment (DFO, 2012) about the need to qualify the data available in the context of sampling bias (very little sighting effort exists for Belle Isle Strait) was also not taken into account (see Appendices 4 and 5). A lack of data does not equate to an absence of animals. For many years researchers and other marine stakeholders have recognized that the Strait is ecologically and biologically significant for marine mammals, given the diversity of species using the area (at least 16 species when including **Beluga Whales** and **Polar Bears**) and main functions fulfilled, i.e., feeding area and migration corridor for most species, but also as a reproduction site for others (Lesage *et al,.* 2007). To biologists, the Strait is known as a marine "choke point" where marine mammal densities are higher during the late summer and fall as whales are constrained by the narrow topography of the Strait, aggregate, and pass northward to follow herring and mackerel to the Newfoundland north coast and southern Labrador. DFO reiterates its recommendation to clearly present this information in the document, including a summary table of the species of special concern using the area, their seasonal densities, and the main functions associated with their presence.
- Page 14-2: The proponent claims to include "all relevant species of special conservation concern, those currently recommended for status, previously considered to be of special conservation concern, and those yet to be re-assessed for formal status (i.e., Schedule 2 and Schedule 3 species, COSEWIC designated, and SSAC designated)". However, and as indicated in DFO's previous review, several species identified as threatened or of special concern by the COSEWIC, but not listed by provincial or federal agencies, are not reviewed in the report. These include **Harbour Porpoises**, **Killer Whales**, **Beluga Whales**, and **Polar Bears**. These species are present in the area (see "supplementary information component study"), but are not considered in the NALCOR report.
- Page 14-131: The mitigation measures proposed by the proponent to reduce potential operational impacts on marine mammals are either unrealistic to enact (e.g., a vessel tasked with dredging a trench or laying a cable will not be able to manoeuvre to avoid concentrations of marine mammals), or do not constitute modifications to the proposed schedule or design to reduce impacts (such as re-scheduling certain operations to avoid interfering with the peak migration periods of listed species). As a result, DFO concludes that there is no effective mitigation measure in place to reduce potential impacts on marine mammal and turtle VECs.

- Page 14-133: The proponent concludes that the project is likely to disturb marine mammals and turtles using the area, but nonetheless these effects are deemed insignificant and thus require no monitoring or mitigation. DFO's understanding of the current project is that it will take 2.5 years to be completed. However, there is currently no detail provided in the EIS documentation on the schedule for the work conducted in the water. There is a need to obtain information on the periods and duration for each of the activity in the water in order to better evaluate impacts on VECs. DFO is unable to conduct a comprehensive analysis of the impacts of this project on marine mammal and **Sea Turtle** VECs (as well as other components of this ecosystem) without this information. Given the importance of the Strait area for marine species (including some of special concern) the proposed duration of the project, and the absence of effective mitigation measures, DFO cannot concur with the proponent's conclusion that there will be no significant impacts on marine mammals and sea turtles.
- In general, the reports (JASCO 2011a, June 4 and the addendum of Nov. 29) bring relevant information on the occupation of the area by marine mammals over the June-August and October-December periods. For some species, the identification using acoustic recordings by signature calls is clear (e.g., **Fin Whales**, **Humpback Whales**, **Blue Whales**). But for other species it is more difficult, especially when confounding calls from other possible species occupy the same frequency band and when the signal is faint or distorted by propagation effects. This may explain why one-third of the detections were not identified by the analysts. An attempt to count the event density by a grouping/identification algorithm was made but this approach shares the same challenges. Therefore it is reasonable to retain some doubt for some of the whale identifications. Nevertheless, clear occupation time-series by marine mammals from a systematic, acoustic method are provided and represents new and useful information.
- **Sperm whales** are listed as being present in Conception Bay during the summer only. However, there are a number of documented sightings and strandings of sperm whales in the area during the winter.
- Table 10.5.9-1 (p. 10-344 and 345), **Bearded Seal** is considered "*extralimital*" in Strait of Belle Isle, and "*not likely to occur*". Bearded seals are regular inhabitants of this area (e.g., Cleater 1996) and recent year-round acoustic recordings in Strait of Belle Isle in 2010 and 2011 (Y. Simard, DFO. IML, pers. comm.) have confirmed the occurrence of this species with a high calling rate during the breeding season in March-April.
- Bearded seals are regularly seen in the Strait of Belle Isle area every year. It is not clear if they are breeding but they definitely use the area for feeding. Ringed seals are also in the area during the winter and spring and this species should be included under the Section detailing Pinnipeds. Both Bearded and **Ringed Seals** should be described in more detail since they are important components of the Strait of Belle Isle ecosystem during the winter and spring.
- The author should consider reviewing the following sentence in the **Blue Whale** (p. 10-354) sub-section: "They are frequently seen in estuaries and shallow coastal zones where the mixing of waters results in the high productivity of krill (SARA 2011, internet site)." and refer to published literature on how krill aggregations are formed", or alternatively explain how local mixing can produce and maintain krill locally for the duration of their 2-year life cycle.
- P. 10-354 "JASCO (2011b) identified sound recordings that they determined to be Blue Whales from the Newfoundland acoustic stations deployed in the Strait of Belle Isle during four days in July. No blue whale vocalizations were identified during the October to December deployment (JASCO 2011b)." Different sampling effort was neglected:

JASCO (2011a) indicates that no instrument was recovered for October-December at the location where Blue Whale calls were detected in July. Therefore the result is not surprising, given the fact that the total recording effort was limited.

- Table 10.5.6-3 (p. 10-260) **Sei Whale** (p. 10-355) and the sentence "A single Sei Whale call was detected during the acoustic programme in the Strait of Belle Isle Area in the summer 2010 on July 4 at the Middle station (JASCO 2011b). It was not detected during the second deployment period of September to December (JASCO 2011b)." (p. 10-356, line 5). The call detected by JASCO (2011a) and attributed to a Sei Whale, could also be from another species, likely a **Minke Whale** (Schevill & Watkins, 1972). Experts on both species' repertoires would be needed to confirm the record as a Sei Whale detection.
- At several places JASCO 2011b is cited instead of JASCO 2011a.
- The statement "**Killer Whales** calls…" (p. 10-360, line 25)) needs more proof: JASCO 2011a attributed several calls with harmonics over a large bandwidth to Killer Whales and referred to Ford (1989). They however provided a spectrogram in their Figure 3.5 that is not convincing compared to Ford (1989). Other odontocetes can produce calls with comparable spectrograms in this bandwidth, including low-frequency components of clicks, another criterion they used to attribute the call to killer whales. Until more proof is provided and they conduct much higher resolution spectrogram matching Ford (1989), it is reasonable to retain some doubt about the correct identification of these calls.
- The comment about "captured **Seals** (p. 10-361) in areas south of where they might have been normally" makes no sense and it is impossible to know to what they are referring. There are no surveys in the Gulf that "captured seals further south". Perhaps, they are referring to reports of Harp and Hooded Seals in New England. There is nothing unusual in what has been seen in the Gulf. This information is not presented correctly. Refer to Sjare *et al.* (2005).
- The report underestimates the importance of the Strait and northern Gulf to whelping Harp and Hooded Seals. This is a critical area for them between February and April.
- Pertaining to **Harp Seals** (p. 10-361) several deficiencies were noted. The population estimates are out of date. Lesage *et al.* (2007) is not an appropriate reference for the population as more recent assessments are available. Harp Seals are in the Gulf from mid November through May, and possibly June.
- **Grey Seals** (p. 10-362) have been reported in the northern Gulf and Strait of Belle Isle in all months of the year, with the possible exception of January (not just May - December). Large numbers (>1000) have been reported during the summer in the Strait. Grey Seals are very sensitive to disturbance and will likely be displaced by the construction activity.
- The authors have suggested "three migratory paths" for **Hooded Seals** (p. 10-362). In reality there are only two paths; one through Cabot Strait and the other through Strait of Belle Isle. The third suggested pathway reported in the EIS to start on the Scotian Shelf does not exist. This misinformation should be corrected.
- The EIS describes the location of **Harbour Seal** (p. 10-362) colonies using Boulva and McLaren (1979). More recent work published by Sjare (2005) and others show the location of colonies in the northern Gulf. This report should be referenced and the information updated accordingly. Also, Harbour Seals are highly susceptible to disruption since they are relatively sedentary. This information should be included.

- See also Appendix 3 for further comments on Marine Mammals.

Volume 2B Existing Biophysical Environment

Section 13 Freshwater Environment: Environmental Effects Assessment

- On p. 13-14 (line 30) the following statement is used with respect to following standard practices and mitigations "where technically and economically possible these techniques and standard practices will be adhered to". After this statement a series of known mitigations are listed. This statement is also used in the fish and fish habitat section of chapter 13. It would have been better if the proponent committed to mitigations in all situations as it is hard to envision a situation where at least some of these mitigations would not be possible. As currently stated, it leaves too much discrepancy for the use of mitigation measures. Without knowing what threshold would be used to declare a set of mitigations 'economically unviable' it would be very difficult to evaluate the cost (in dollars) against the expected adverse environmental effects.
- While the EIS treats all 586 river crossings in an equal manner it should be noted that from a fisheries perspective this is not necessarily the case. For example, given the proposed route the transmission line will cross a number of fairly productive Atlantic Salmon rivers on the Northern Peninsula. The crossings of these rivers should be managed from a timing perspective to both avoid the main fishing season (mid June to August) as well as the spawning season (mid October to mid November). While the adverse effects of sedimentation will no doubt be localized and of a short duration as predicted, if it is evident at the wrong time of year it can have significant effects on fishery values and/or fish production within any given river system.

Section 13.4.6 (Page 19-67)

- Pertaining to the monitoring program, it would be beneficial to select a number of crossings to test for herbicide in the water during the first two applications.

Section 14 Marine Environment: Environmental Effects Assessment

General Comments

- A recent review of the potential effects of **electromagnetic fields** (EMFs) on marine organisms prepared for the U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement (Normandeau *et al*., 2011) concluded that while magnetic and electric senses have been reported for a wide range of marine taxa, and effects of EMFs at levels similar to those generated by both AC and DC marine transmission lines have been observed for some of them, there is a lack of consistent study methodology and the responses of populations have not been addressed. Nevertheless, Normandeau *et al.* were able to make some inferences about potential ecological effects based on the existing information and weight of evidence. These authors conclude that it is premature to require significant mitigations for EMF effects as further research is necessary and monitoring should be required for new installations. Nalcor has committed to monitor EMFs generated by the electrodes and the transmission cables and to refine and optimize mitigation measures if required. Monitoring of behaviour of species of concern (e.g., marine mammals, Sea Turtles, Wolfish) or commercial interest (e.g., Lobster) should be considered as part of the monitoring program.

  Some of the thresholds for sensitivity and effects limits are too high. P. 14-85 states that "*A threshold of effects on marine fauna at a magnetic flux density of 200 nT (2 x* 10^{-7} *T) is a reasonable (and conservative) value to use to define the ZOI of the electrodes*." It is not clear how this threshold was determined when the previous

section cites several references that indicate a sensitivity and negative response to magnetic flux densities of 30-40 nT.

The potential for electrical field induction by a fish swimming over the cable is ignored in the Nalcor assessment. Studies cited in Normandeau *et al.* (2011) indicate that these effects may not be negligible and that fish behaviour may be affected since many species, particularly elasmobranchs, use EMFs for prey, predator, or mate detection. This may be particularly important for species that live and/or feed in close proximity to the bottom and for species with limited ranges such as Wolfish.

"Electrosensitive fish are highly sensitive to DC electric field gradients as low as 5 nV/cm as they swim through them." (Normandeau *et al.*, 2011)

"The sensitivity of elasmobranch fishes to electric and magnetic stimuli described above can be compared to those associated with underwater cable systems as modeled in Section 4.1.3. Several empirical studies show that sharks and rays are sensitive to dipole and uniform fields with gradients as low as 1-5 nV/cm (=1-5 x10-7 V/m). Thus these measurements provide a starting point to predict general behavioral responses" (Normandeau *et al.*, 2011)

Section 14.2.3.2 Key Indicators and Measureable Parameters (Page 14-6)

- Referring to Table 14.2.3-2 (p. 14.7) changes in biodiversity is likely another important measurable parameter for both benthic and fish habitats.

Section 14.2.5.3 Construction Effects: Marine Water Quality (Page 14-19)

- There are several problems with the models used to predict the concentrations of suspended sediment in the water column and the eventual fate of the suspended sediments during this operation. These concerns were identified in an earlier review (DFO, 2012) but no additional information has been provided.
- Installation of the proposed cables and the rock covering will cause some temporary sedimentation particularly, on the Labrador side of the Strait, with 100mg/L for up to 100+ hours (Section 3.2 p. 60) sediment dispersion benthic boundary layer transport, in Labrador-Island Transmission Link. Strait of Belle Isle: Oceanographic Environment and Sediment Modeling final report by AMEC, 2011). The temporal aspect of the project in-water activities could be clarified, or recognized as being an important factor to mitigate against. For example, if sedimentation is high while fish such as Capelin, Lumpfish, and Herring are spawning then there could be unnecessary effects on fish and fish habitat. Similarly, if sedimentation attracts Flounder (e.g., Atlantic Halibut) to a specific location while the commercial fishery is ongoing, the project could (or could be perceived as) affecting the fishery. Therefore the timing of the in-water component of the project needs to be considered, and information should be added such that potential mitigation measures can be developed if necessary. The timing of in-water activities related to rock placement is important and can likely be mitigated if timed correctly.
- On p.14-20 (line 2) listed are the ways elevated total suspended solids (TSS) conditions can affect marine invertebrates and fish, but it does not mention reproductive effects. This assumes that there are some reproductive effects.
- On p.14-21 (line 30), the authors mention particle displacement but do not explain what it is or whether it is important.

Section 14.2.5.4 Construction Effects: Fish (Page 14-22)

- Although briefly mentioned here under changes in heath of macro-Invertebrates and fishes (p. 14-25), the issue of environmental impacts to fish and invertebrates inhabiting

the regions adjacent to the study areas *vis-a-vis* the impacts to population and management units is, in general, not addressed by this report. For example, would potential deleterious effects on fish and invertebrates inhabiting the study areas impact populations? The same logic could apply to alteration and/or destruction of habitats. The likely potential effects will be limited and not a major driver for trends in population abundance. However, the issue should be considered in this study.

- On p.14-25 (line 16) it states: "underwater sound produced during drilling and vessel transit will not likely evoke fish behavioral responses beyond 350 m from the source" but prior to this, on p. 14-24 (line 42), it states that "the lowest fish densities were observed within 9.3 km of the seismic discharge area". These two statements do not appear to be comparable. This should be clarified.

Section 14.2.7.2 Definition and Determination of Significance (Page 14-49)

- In the second paragraph (line 10) “For the purposes of this EIS, significant environmental effects on the Marine Fish and Fish Habitat Valued Environmental Components (VECs) are those that affect more than 10% of the physical and biological components of the VEC occurring within the Regional Study Area (RSA) for a period exceeding one year. The use of the 10% benchmark is fully-justified. The Maximum Sustainable Yield (MSY) value used in fisheries science varies by species but is commonly in the 25% to 35% range.” As it stands, this section does not make any sense and requires clarification. No justification is provided for the use of the 10% benchmark and it is not clear what the 10% refers to. In the US, acceptable harm is below 10% of the surplus production (i.e. after natural and alternate human induced mortality). This report seems to equate this to the MSY which is a totally different concept. Without a clear definition of what is acceptable harm, it is impossible to conclude, as the proponents have done, that the project will not have any detrimental impacts.

Section 14.2.9 Cumulative Environmental Effects (Page 14-49)

- In Table 14.2.9–1 Cumulative Environmental Effects Summary: Marine Fish and Fish Habitat VEC, it is stated: “The current condition of the Marine Fish and Fish Habitat VEC in the Strait of Belle Isle RSA can be described as healthy and resilient.” The basis for this conclusion is not clear. The word “healthy” could not be found in any of the component studies relating to Marine fish. There are various species of conservation concern listed in this document that occur within the Strait of Belle Isle RSA, then a generalization of health and resilient is hardly warranted.
- In Table 14.2.9-1 (p. 14-50), it is difficult to assess the impact of habitat loss and/or disturbance to a particular species without having an idea about the proportion of the population abundance/life stage present in the study areas.

Section 14.5. Environmental Assessment Summary (Page 14-128)

- The conclusions reached (line 30) in terms of marine fish species, are not supported by any analysis or reviews.

Section 14.5.2 Species of Special Conservation Concern (Page 14-132)

- In reference to Table 14.5.2-1, does the “significance” relate to populations? This significance is also not defined in line 25.
- Referring to Table 14.5.4-1 (p. 14-139), it is unclear how such conclusions and quantitative assessment were obtained. Further clarifications are needed.

Section 14.5.4 Residual Project Effects and Significance (Page 14-138)

- In the last paragraph (p. 14-140, line 5), it is not clear how such conclusions were reached.

Volume 3: Existing Socioeconomic Environment, Socioeconomic Effects Assessment, Commitments, Sustainability and Conclusions

Section 15.6 Marine Fisheries:

Section 15.6.2 Information Sources and Data Collection (Page 15-180)

- In the second paragraph (line 10) it states: "The statistical information and analysis are based on time-series data from DFO, Newfoundland and Labrador Region Statistics Division, Policy and Economics Branch, which capture the quantity, value, month, and location (by fisheries UA) of fish harvesting, as well as the fishing gear and vessels used (DFO 1990-2009). The dataset was acquired from DFO in digital form, for the period 1990 to 2009 and represent all fish landings in the Newfoundland and Labrador Region. Data analysis and consultations with area fisheries interests (described below) confirm that fishing activities in the Strait of Belle Isle are undertaken almost exclusively by fishers based in Newfoundland and Labrador and are thus captured in these data." It appears that the fishing statistics of Quebec fishers are not included in the acquired dataset. While it is stated (above) that fishing activities in the Strait of Belle Isle are almost exclusively by fishers based in NL, based on fisher consultations. However, there is no reason for not including datasets from other regions who may have fished in this area.

Volume 4: Supplementary Environmental Studies

1. Strait of Belle Isle: Ambient Noise and Marine Mammal Survey

- DFO has concerns that vessel transit and operations sound characteristics were modelled at only four locations along the proposed cable crossing corridor, and that given the apparent long-range underwater signal propagation, it would have been preferable if more than one site in the deeper waters of the mid-Strait had been assessed. While Nalcor believes that the sound propagation modelling may produce estimates that approximate reality, DFO nonetheless suggests that Nalcor conduct field measurements to confirm these at deeper water sites, and during multiple construction operations (see discussion in Table 3, Appendix 5).
- Given that the important sound modeling efforts by Nalcor rely on data from a few acoustic recorders, and given JASCO's concerns that autonomous recorders deployed in the Strait might be at risk from fishing operations, DFO encourages the proponent to consider monitoring at mid-Strait deep-water sites (see Table 3, Appendix 5).
- As one of the potentially-louder underwater noise sources, DFO believes that the sound output from dynamically-positioned (DP) vessels should be modeled (and preferably, measured) at their highest operational thrust rating – which would be a more conservative approach – rather than the 25% thrust levels proposed by Nalcor. Additionally, it is the great number of variables that can influence sound propagation, and the frequent inaccuracies of modelled results once measurements are obtained, that lead DFO and other experts to encourage field sound measurements in at least worst-case scenarios (see Table 3, Appendix 5).
- Nalcor's rationale for assuming a low sound output from horizontal drilling operations may be correct, but the large variation in modelled sound propagation presented in the review suggest that the source values need to be better described. This is particularly

important since evidence suggests that baleen whales have good hearing up to 500 Hz. Given the lack of available data on many frequencies output during horizontal drilling, DFO suggests that Nalcor conduct field measurements during this operation to confirm these estimates (see Table 3, Appendix 5).

- Refer to Appendices 4 and 5 for previously submitted reviews and/or comments on this study.

2. 2011 Marine Habitat and Water, Sediment and Benthic Survey: Strait of Belle Isle Cable Corridor Segment – Shoal Cove Option

- The marine water quality assessments as part of baseline studies conducted were sufficient to characterize the marine biological community along with associated chemical and physical characterization of the marine ecosystem. The associated impacts to marine water quality may be limited to the local area and may not pose a significant threat to the existing marine life in the surrounding area. Despite the potential limited local impact due to construction, installation, and operation of the proposed project, appropriate mitigation measures should be applied in order to minimize changes in the marine environment that may pose a significant threat to aquatic resources.

Conclusions

In general, the EIS is extensive and reasonably comprehensive in many areas. However, there are significant, unacknowledged, data gaps in a number of sections.

The most important issue is the lack of explanation of the criteria used to determine when an impact is considered significant. Without clear criteria, it is impossible to evaluate if the conclusions in the EIS of no significant impact are reasonable. Quantitative criteria should be established and used to evaluate proposed activities rather than relying on opinion.

There is no clear description of the timing of construction activities. The exact timing of the construction of each component of the project will have a major impact on the extent and nature of any impacts. Timing of certain components may also serve to mitigate environmental effects relating to seasonal habitat use.

The Strait of Belle Isle is a major migratory pathway for many marine species. The background material and predicted impacts do not take adequate account of these migratory species. The degree of impact will likely depend upon the timing of activities.

The potential impacts of electromagnetic fields are not adequately addressed, particularly as they affect benthic and migratory species, such as elasmobranches.

The acoustic characteristics and sound propagation for project activities, and the potential impacts of these sound, are described poorly or modelled using measured data that are limited in geographic scope. The baseline sound recordings used to derive “ambient” levels may be contaminated by mooring artefacts, and thus of limited use.

Biological and fisheries information for the study area were obtained primarily from Newfoundland. Significant knowledge is available in Quebec and should be included.

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Date: May 29, 2012

Sources of information

This Science Response Report results from the Zonal Science Special Response Process (SSRP) of May 17, 2012 on the Science Review of the Labrador-Island Transmission Link Project Environmental Impact Statement (EIS). Additional publications from this process will be posted as they become available on the Fisheries and Oceans Canada Science Advisory Schedule.

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Appendix 1

Table 1: Summary of Concordance for the Environmental Impact Statement with Guidelines. The column on the left side represents the requested list of specific sections for DFO Science review within the Labrador-Island Transmission Link EIS.

Section of the EIS	Section of the Scoping Document
Section 3.5.3.2 (Potential Emissions) Submarine Cable and Electrodes	4.3.5 Operations and Maintenance
Section 9.0 Environmental Assessment Approach and Methodology	n/a
Section 10.4 (Existing Biophysical Environment) Freshwater Environment	4.4.4.2 Aquatic Environment (Freshwater and Marine)
Section 10.5 (Existing Biophysical Environment) Marine Environment Excluding Section 10.5.10 Seabirds	4.4.4.2 Aquatic Environment (Freshwater and Marine)
Section 13 Freshwater Environment: Environmental Effects Assessment	4.5 Environmental Effects
Section 14 Marine Environment: Environmental Effects Assessment Excluding Section 14.4 Seabirds	4.5 Environmental Effects
Section 4.1.6 Bathymetry Section 4.1.7 Currents and Tides Section 4.1.8 Waves Section 4.1.9 Sea Ice and Icebergs	4.5.5 Effects of the Environment on the Project
Strait of Belle Isle: Ambient Noise and Marine Mammal Survey Supplementary Report (November 2011)	n/a
2011 Marine Habitat and Water, Sediment and Benthic Survey: Strait of Belle Isle Cable Corridor Segment – Shoal Cove Option (September 2011)	n/a

Appendix 2

Applicable Component Studies

Freshwater Environment: Fish and Fish Habitat and Water Resources Component Study (AMEC 2010)

Marine Environment: Fish and Fish Habitat, Water Resources Component Study

1. Marine Fish and Fish Habitat in the Strait of Belle Isle – Information Review and Compilation (Sikumiut 2010)
2. Marine Flora, Fauna and Habitat Survey – Strait of Belle Isle Submarine Cable Crossing Corridors 2008 and 2009 (AMEC 2010)
3. Marine Habitats in the Strait of Belle Isle – 2007 Geophysical (Sonar) Survey for the Cable Crossing Corridors (Fugro Jacques 2010)
4. Strait of Belle Isle Submarine Cable Crossing Corridors Marine Water, Sediment and Benthic Surveys (Sikumiut 2011)
5. Marine Water, Sediment, Benthos and Nearshore Habitat Surveys Potential Electrode Sites (Sikumiut 2011)

Marine Environment: Marine Mammals, Sea Turtles and Seabirds Component Study

1. Marine Mammals, Sea Turtles and Seabirds in the Strait of Belle Isle: Supplementary Information Review and Compilation (Sikumiut 2010)
2. Marine Mammals and Seabirds in the Strait of Belle Isle (Jacques Whitford 2000)
3. Strait of Belle Isle: Ambient Noise and Marine Mammal Survey (JASCO 2011)

Marine Environment and Effects Modelling Component Study

1. Strait of Belle Isle: Oceanographic Environment and Sediment Modelling (AMEC 2011)
2. Sound Modelling: Proposed Strait of Belle Isle Cable Installation Activities (JASCO 2011)
3. Environmental Modelling: Proposed Shore Electrodes (Hatch 2011)

Species of Special Conservation Concern Component Study (Nalcor 2011)

Appendix 3

Previously submitted review of Geophysical Survey Program (Nalcor, 2009)

Review of the "Nalcor Energy 2009 Strait of Belle Isle Geophysical Survey Program. Project Description, July 15, 2009"

By Jack Lawson

August 11, 2009

I have reviewed the (short) document produced in support of this operation. Given the very short time frame I have to review this prior to this operation, there will not be much if any time to modify the planned operations. I note that I was not consulted during the planning of this project so have not had until now to provide advice and caution. Therefore, I am sorry to say that this operation will be conducted at a place and time when it is known that there is a high likelihood of encountering marine mammals - some of which might be SARA-listed (e.g., Blue Whales, Fin Whales)

Currently (as of 10 August), there are reports of many marine mammals (primarily large whales and dolphins) in the Straits area; in fact an unusual number for this time of year. It is likely that this high density of whales will continue as long as there are fish aggregations in this area. Normally this aggregation begins in the early fall as whales move north to undertake foraging on the fall Herring and Mackerel spawning events in this area (and along southern Labrador).

No mention is made of the qualifications of the marine mammal observer, or how the proposed single observer will be able to remain alert and effective when working every day for at least 23 days. I would recommend at least two observers such that each gets a rest period as it has been shown that observer fatigue has an important impact on effectiveness. Also, it is usual for seismic operations in the NL region to be manned by trained and experienced marine mammal observers. This is particularly important for this area where the narrow coastal confines restrict the ability of migrating whales to avoid exposure to the seismic sounds. While I commend the proponents for undertaking soft starts and shut downs, the usual concerns are raised that these mitigation methods work best during times when the observer(s) can have a good chance of sighting marine mammals. In conditions of fog, night, and high sea state it is unlikely that these mitigation methods will be as effective (or in the case of shut downs, not possible).

I cannot help but wonder why the extensive core sampling and bottom characterization studies that were conducted by the province in the summer of 1981 have not been used to assist with this project? Perhaps these would provide enough data such that the extent or duration of these seismic activities could be reduced in scope?

While the maximum capacity of the airgun array is less than many offshore seismic sources, its source level is not much different. And more critically, the sound propagation characteristic of this shallow, enclosed study area may render the sounds reverberant and louder than expected. Sound propagation modeling should have formed part of this impact assessment, and its omission here is a significant weakness.

Overall, the background data in this brief assessment is limited, and more could have been done to assess the efficacy of mitigation, and the extent and characteristics of the operational ensonification. Trained and multiple observers would be a better monitoring and mitigation strategy than a single observer. This year I fear that many feeding and migrating large whales and smaller toothed whales will be exposed to loud sounds during this operation in the restricted confines of the Straits. Delaying the operation into the fall period could do much to reduce the number of whales which might be exposed to these sounds.

Appendix 4

Previously submitted reviews of the marine environmental sound modelling and effects carried out by JASCO 2011a & 2011b.

Review of the "Nalcor Energy 2009 Strait of Belle Isle Geophysical Survey Program. Project Description, July 15, 2009"

By Jack Lawson and Véronique Lesage

June 2011

Overview:

Nalcor Energy is proposing to develop the Labrador – Island Transmission Link (the Project) which will include the installation of submarine cables across the Strait of Belle Isle. The EA includes descriptions and magnitude models for potential sound levels resulting from the proposed construction: (1) horizontal directional drilling, (2) transit of cable-laying vessel, (3) operations of cable-laying vessel in dynamic positioning (DP) mode, (4) transit of rock-placement vessel, and (5) operations of rock-placement vessel in DP mode. Given the modelled received sound levels it is apparent that the proposed operations will produce a significant amount of underwater sound energy, and at levels appreciably higher than ambient noise levels at distances of kilometres for some frequencies and locations.

When M-weighting is applied to the modelled received sound levels, there are reductions in received levels for marine mammal listeners at most ranges. However, M-weighting has little effect on maximum range radii during rock-placement and cable laying operation while the vessels are in DP mode. Broad-band noise levels as high as 50 dB above ambient are expected to be detected as far as 14 km from the source.

Specific Issues:

Vessel transit and operations sound characteristics were modelled at only four locations along the proposed cable-crossing corridor. Given the apparent long-range underwater signal propagation, it would have been preferable if more than one site in the deeper waters of the mid-Strait had been assessed. In addition, while the total sound energy exposure from overlapping sound sources (such as drilling plus rock dumping DP work plus cable laying DP work) may not be much higher than each of the sources alone, their effective noise footprint could ensonify waters across the entire Strait. This will potential result in either displacement of marine mammals, or changes in their migration and feeding behaviour in the Strait.

Figure 1.1 - why was ambient noise monitoring at two of the three sites close to shore where wave action would potentially produce greater values than mid-Strait? Why were not two sites in the mid Strait monitored? And the nearshore sites are up on shallow banks away from the higher-slope drop-offs into the Strait - this might limit sound propagation from elsewhere to the receivers relative to deeper water sites. It is desirable to see summary of the ambient noise measures in terms of location, variation, seasonality, frequency etc. During quiet periods NALCOR's operations might have a much greater effect on marine mammals and leatherbacks than it would during quiet or ice-covered periods.

"The dive support vessel DSV Fu Lai was recorded by JASCO while operating in DP mode, with DP levels of 25%, i.e., at approximately 3,000 HP (MacGillivray and Racca, 2006). The calculated source levels from these recordings were used to estimate the source levels for vessels in DP mode during the proposed construction activities for the SOBI submarine cables." Why did the proponent not model a worst case at 100% power level?

Figure 2.1 - we note that the underwater SL rises again as the frequency approaches 100 Hz. What might the sound levels for drilling be at closer ranges and for higher frequencies such as

up to 500 Hz (which could be detected by marine mammals such as toothed whales and pinnipeds)?

The assumed DP third-octave band source levels of 185.3 dB re 1 µPa @ 1 m up to 10 kHz are very loud, and could induce TTS in some marine mammal species that remain near the operations (recent studies in Europe suggest that harbour seals and young grey seals seem attracted to the sounds of vessel thrusters and either remain nearby for extended periods, or have been killed when sucked into the thruster system.

The modelled received levels, while seemingly unlikely to induce hearing sensitivity changes except at short distances from the source, propagate at levels thought high enough to cause behaviour changes in some cases to several kilometres. For the DP cable operations in the deeper parts of the Strait such sound levels are above ambient across almost the entire Strait (e.g., Tables 3.15, 3.16, and 3.22; Figure 3.24), and such sound output would last for extended periods of time.

P. 50 “The 50 dB above ambient level was selected as the minimal level to display on the figures.” Why 50 dB? Cetaceans have shown responses to underwater anthropogenic sounds at levels far less than 50 dB above ambient, so it would have been useful to see these (no doubt large) received sound distances. Some of the lower RMS values, which could be perceived above ambient levels, are modelled to extend to more than 10 km (Tables 3.1 and 3.2 for example).

What about cumulative impacts of having the NALCOR ops IN ADDITION TO the current passage of many large freighters, ferries, and fishing vessels? Multiple sound sources would likely be more disturbing to migrating marine mammals than a single source in a fixed location.

No matter what the results from the modelling, it is our recommendation that the proponent measure the actual sound levels to ascertain the accuracy of the modelled sound values, since we know in other locales that modelled and actual sound propagation behaviour differed (e.g., Gully study by McQuinn and Carrier 2005). This would be particularly important given the high sound speeds and low sound attenuation values featured by the underlying limestone in the shallow and deeper seabed areas modelled in the project area (Tables 2.4, 2.5, and 2.6). For example, the received levels are higher at greater distances for the undersea drilling operations than for vessel transits which suggests that seabed sound propagation is very important in this area (e.g., Table 3.1 versus Table 3.5).

For noise exposure criteria, I suggest the authors cite and employ Southall et al. (2007) in place of the dated Gentry et al. 2004.

Species of Special Conservation Concern Component Study

This is a very information-weak section, with poor descriptions of project-based sightings, and other data sources. There should be more detailed discussions of seasonal occurrence of listed AND non-listed marine mammals, as they could all be potentially impacted if project activities displace them or modify important life history activities such as migration and feeding. To biologists, the Strait is known as a marine “pinch point” where marine mammal densities are higher during the late summer and fall as whales aggregate and pass northward to follow herring and mackerel to the Newfoundland north coast and southern Labrador.

P. 35 - the gray whale is “extirpated” so extremely unlikely to be sighted in the project area - we are not sure why it is even considered, when beluga and right whales are not.

P. 35 - lone beluga whales, and at least one large groups of 10s of whales, have been sighted in the Strait of Belle Isle and likely have passed through the Project Area. Recently, a beluga group estimated to number in the thousands, passed northward along the coast near St. Anthony. This indicates that larger groups of this species move around the northern peninsula,

and could be encountered in the Strait or use it as a migratory pathway should these be part of the Gulf of St. Lawrence population (which is listed as Endangered). Table 3.7 lists the presence of this species as "rare", but when they are present they might be in large numbers, with mothers and young.

Table 3.7 - why is the leatherback sea turtle and fin whale not included here?

Marine Mammals and Seabirds in the Strait of Belle Isle

Most of the information in this report (dated 2000) is outdated and even at the time of writing was limited in scope and applicability. More recent information used in EAs for other industrial activities proposed off the north coast would be relevant and could have been included - even without citing the most recent DFO large-scale aerial survey of the Canadian eastern seaboard in 2007, or the detailed description of marine mammal distribution and density included in the Gulf EBSA study by Lesage et al. (2007).

Kingsley was the scientific authority for the 1998 survey and thus set an acceptably high standard for data collection and analytical methods of the time; the line transect methods and design with replicates over time was a good approach despite the data caveats resulting from flat aircraft windows and sea state influences. Nonetheless, the described aerial/boat-based surveys conducted by JWEL in 1998 are 13 years old and too outdated to include except as historic background.

As evidenced by the 1998 survey results, the longliner surveys are biased to some extent by the known responses of marine mammal and seabird species (some attracted, some repelled) to vessels. At 5 metres, the observers' eye heights on the boats are also very limited and this is reflected in the small ESWs.

P. 17 - the expression "truncated" is more appropriate for the data outlier selection description than "censoring".

P. 41 - the section on "effects of construction on marine mammals" was limited in scope when it was written, and is very dated now, despite some sections of the report being described as "updated" as late as November 2009. The review in Richardson et al. (1995) is even older than the original JWEL study, but has more numerous and relevant examples, and as such, is much broader and applicable scope to the NALCOR operations proposed.

Marine Mammals, Sea Turtles and Seabirds in the Strait of Belle Isle: Supplementary Information Review and Compilation

This document provides a generally good summary of the most recent (limited) information on marine mammal distribution and abundance in the Strait and nearby marine areas. It is relatively superficial in terms of its discussion of the density and distribution of marine mammals provided in large-scale reports, such as that by Lesage et al. (2007) for the Gulf.

P. 26 and Figure 3.6 - the leatherback turtle has been sighted occasionally up to the mid Labrador coast, and in the western Strait and lower Quebec north shore, so Area "B" in the figure is too small. Also, areas A and B in the figure should be joined, with no gap between the two as leatherbacks move north and south through the Cabot Strait.

Review of the "Labrador-Island Transmission Link Sound Modelling: Proposed Strait of Belle Isle Cable Installation Activities

By Jack Lawson and Véronique Lesage

December 20, 2011

Overview:

As part of the Labrador – Island Transmission Link, there will be installation of submarine cables

across the Strait of Belle Isle. The EA includes descriptions and magnitude models for potential sound levels resulting from the proposed construction: (1) horizontal directional drilling, (2) transit of cable-laying vessel, (3) operations of cable-laying vessel in dynamic positioning (DP) mode, (4) transit of rock-placement vessel, and (5) operations of rock-placement vessel in DP mode. According to the modelled received sound levels, the proposed operations will produce underwater sound energy at levels appreciably higher than ambient noise levels at distances of kilometres for some frequencies and locations.

When M-weighting is applied to the modelled received sound levels, there are reductions in received levels for marine mammal listeners at most ranges. However, M-weighting has little effect on maximum range radii during rock-placement and cable laying operation while the vessels are in DP mode. Broad-band noise levels as high as 50 dB above ambient are expected to be detected as far as 14 km from the source.

Specific Issues:

M-weighting has been promoted as a conservative function to estimate hearing sensitivities in cetaceans (Southall et al., 2007), as it will tend to overestimate perceived levels and thus suggests that more sound is "detected" than C- or A-weighting based on equal-loudness contours. However, this modeling approach most likely does not de-emphasize the auditory frequency response adequately in the non-optimal hearing bands. As a result, its appropriateness for assessing detection levels or potential behavioural responses to the continuous background noise that concerns us here has been recently questioned (see McQuinn et al. 2011; Finneran and Schlundt 2011).

Vessel transit and operations sound characteristics were modelled at only four locations along the proposed cable-crossing corridor. Given the apparent long-range underwater signal propagation, it would have been preferable if more than one site in the deeper waters of the mid-Strait had been assessed. In addition, while the total sound energy exposure from overlapping sound sources (such as drilling plus rock dumping DP work plus cable laying DP work) may not be much higher than each of the sources alone, their effective noise footprint could ensonify waters across the entire Strait. Potential effects on marine mammal use of the Strait, and on their migration patterns and feeding behaviour will need to be evaluated in that perspective (see below).

Ambient noise was monitored at two sites close to shore where wave action would potentially produce greater values than mid-Strait (Figure 1.1). The nearshore sites were also up on shallow banks away from the higher-slope drop-offs into the Strait. This might limit sound propagation from elsewhere to the receivers relative to deeper water sites. Why were not two sites in the mid Strait monitored? It is desirable to see summary of the ambient noise measures in terms of location, variation, seasonality, frequency etc. During quiet periods, NALCOR's operations might have a much greater effect on marine mammals and leatherbacks than it would during noisy or ice-covered periods.

We also question the rationale for using DP levels of 25% and not 100% for estimating source levels for vessel DP mode operations. "The dive support vessel DSV Fu Lai was recorded by JASCO while operating in DP mode, with DP levels of 25%, i.e., at approximately 3000 HP (MacGillivray and Racca, 2006). The calculated source levels from these recordings were used to estimate the source levels for vessels in DP mode during the proposed construction activities for the SOBI submarine cables."

We note that the underwater SL rises again as the frequency approaches 100 Hz (Figure 2.1). Information is lacking on the sound levels for drilling at closer ranges and for higher frequencies such as up to 500 Hz, which could be detected by marine mammals such as toothed whales and pinnipeds.

The assumed DP third-octave band source levels of 185.3 dB re 1 µPa @ 1 m up to 10 kHz are very loud, and could induce TTS in some marine mammal species that remain near the operations (recent studies in Europe suggest that harbour seals and young grey seals seem attracted to the sounds of vessel thrusters and either remain nearby for extended periods, or have been killed when sucked into the thruster system).

The modelled received levels, while seemingly unlikely to induce hearing sensitivity changes except at short distances from the source, propagate at levels thought high enough to cause behaviour changes in some cases to several kilometres. For the DP cable operations in the deeper parts of the Strait, such sound levels are above ambient across almost the entire Strait (e.g., Tables 3.15, 3.16, and 3.22; Figure 3.24), and such sound output would last for extended periods of time.

Cetaceans have shown responses to underwater anthropogenic sounds at levels far less than 50 dB above ambient. Therefore, we question the rationale for selecting 50 dB above ambient level as the minimal level to display on the figures (p. 50). It would be useful to see (no doubt large) received sound distances for levels lower than 50 dB above ambient. Some of the lower RMS values, which could be perceived above ambient levels, are modelled to extend to more than 10 km (Tables 3.1 and 3.2 for example).

Multiple sound sources would likely be more disturbing to migrating marine mammals than a single source in a fixed location. However, cumulative impacts of having the NALCOR ops IN ADDITION TO the current passage of many large freighters, ferries, and fishing vessels are not considered.

No matter what the results are from the modelling, it is our recommendation that the proponent measure the actual sound levels to ascertain the accuracy of the modelled sound values, since we know in other locales that modelled and actual sound propagation behaviour differed (e.g., Gully study). This would be particularly important given the high sound speeds and low sound attenuation values featured by the underlying limestone in the shallow and deeper seabed areas modelled in the project area (Tables 2.4, 2.5, and 2.6). For example, the received levels are higher at greater distances for the undersea drilling operations than for vessel transits, which suggests that seabed sound propagation is very important in this area (e.g., Table 3.1 versus Table 3.5).

For noise exposure criteria, we suggest the authors cite and employ Southall *et al*. (2007). (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 Tyack, P.L. 2007. Marine mammal noise exposure criteria: initial scientific recommendations. Aquat. Mamm. 33(4):1-521) in place of the dated Gentry *et al*. (2004).

Marine Mammals And Seabirds In The Strait Of Belle Isle

Most of the information in this report (dated 2000) is outdated and even at the time of writing, was limited in scope and applicability. More recent information used in EAs for other industrial activities proposed off the north coast would be relevant and could have been included - even without citing the most recent DFO large-scale aerial survey of the Canadian eastern seaboard in 2007, or the detailed description of marine mammal distribution and density included in the Gulf EBSA study by Lesage *et al.* (2007).

Kingsley was the scientific authority for the 1998 survey and thus set an acceptably high standard for data collection and analytical methods of the time; the line transect methods and design with replicates over time was a good approach despite the data caveats resulting from flat aircraft windows and sea state influences.

As evidenced by the 1998 survey results, the longliner surveys are biased to some extent by the known responses of marine mammal and seabird species (some attracted, some repelled) to

vessels. At 5 metres, the observers' eye heights on the boats are also very limited and this is reflected in the small effective strip widths.

P. 17 - The expression "truncated" is more appropriate for the data outlier selection description than "censoring".

P. 41 - The section on "effects of construction on marine mammals" was limited in scope when it was written, and is very dated now, despite some sections of the report being described as "updated" as late as November 2009. The review in Richardson et al. (1995) is even older than the original JWEL study, but has more numerous and relevant examples, and as such, is much broader and applicable in scope to the NALCOR operations proposed.

Marine Mammals, Sea Turtles and Seabirds in the Strait of Belle Isle: Supplementary Information Review and Compilation

This document provides a generally good summary of the most recent (limited) information on marine mammal distribution and abundance in the Strait and nearby marine areas. However, it is relatively superficial in terms of its discussion of the seasonal density and distribution of marine mammals, and specific functions associated with area use by the different species (see for example: Lesage *et al.*, 2007).

There needs to be a distinction between the Estuary and Gulf of St Lawrence for marine mammal sightings. For instance, on p. 20, it is not true to say that 'beluga whales were the second most commonly sighted cetacean in the Gulf and Scotian Shelf strata during the TNASS surveys in the summer 2007', as almost all beluga were sighted in the St Lawrence Estuary, not the Gulf (Lawson and Gosselin 2009).

P. 26 and Figure 3.6 - the leatherback turtle has been sighted occasionally up to the mid Labrador coast, and in the western Strait and lower Quebec north shore, so Area "B" in the figure is too small. Also, areas A and B in the figure should be joined, with no gap between the two as leatherbacks move north and south through the Cabot Strait.

Species of Special Conservation Concern Component Study

Other reports prepared for inclusion in the draft EIS, such as the *Supplementary Information Review and Compilation for Marine Mammals and Seabirds*, provide a relatively complete review of the information available. The current report was likely produced to compensate for the weakness of the outdated report presented initially (see above). However, it seems that the proponent has put together three documents with information on marine mammals and seabirds, but without cross-validating information among reports, or at least cross-referencing it.

This component of the study is extremely relevant to the evaluation of impacts of the Project as it concerns species with special status. However, this report is particularly information-weak, with poor descriptions of project-based sightings, and other data sources, and of information available on seasonal use of the area by each species. We strongly encourage the proponent to consolidate the three reports into one thorough review of the available information, where would be presented the seasonal occurrence and abundance of the various species, and habitat functions for each, with a special highlight on species of special concern, including both the COSEWIC listed and species officially listed by the federal or provincial governments. The document '*Supplementary Information Review and Compilation'* would be a good starting point. However, if the current component is to be maintained as part of the draft EIS, we recommend that this information be provided for each species of special concern, and that ALL of them be considered. The proponent claims to include 'all relevant species of special conservation concern, those currently recommended for status, previously considered to be of special conservation concern, and those yet to be re-assessed for formal status (i.e., Schedule 2 and Schedule 3 species, COSEWIC designated, and SSAC designated)'. However, several species identified as threatened or of special concern by the Committee on the Status of Endangered

Wildlife in Canada, but not on the provincial or SARA listed species, are not reviewed in the report. These include harbour porpoises, killer whales, beluga whales, and polar bears. These species are present in the area (see 'supplementary information component study'), but are not considered here.

The Strait is ecologically and biologically significant for marine mammals, given the diversity of species using the area (at least 16 species when including beluga and polar bears) and main functions fulfilled, i.e., feeding area and migration corridor for most species, but also as a reproduction site for others (Lesage *et al*., 2007). To biologists, the Strait is known as a marine "pinch point" where marine mammal densities are higher during the late summer and fall as whales aggregate and pass northward to follow herring and mackerel to the Newfoundland north coast and southern Labrador. This should be clearly presented in this document if the proponent chooses not to present a consolidated review of the information available for marine mammals, including a summary table of the species of special concern using the area, their seasonal densities, and the main functions associated with their presence.

P. 35 - Since 2007 when the Lesage *et al.* review was put together, there has been repeated observations of lone beluga whales, and at least one large group of 10's of whales, in the Strait of Belle Isle. Recently, a beluga group estimated to number in the thousands, passed northward along the coast near St. Anthony. This indicates that larger groups of this species move around the northern peninsula, and could be encountered in the Strait or use it as a migratory pathway. Whether these animals were from the St Lawrence Estuary or a northern population remains uncertain, but potential populations of origin are all listed as of species concern, threatened or endangered. Table 3.7 lists the presence of this species as "rare", but when they are present they might be in large numbers, with mothers and young.

P. 35 - the gray whale is "extirpated" so extremely unlikely to be sighted in the project area - we are not sure why it is even considered, when beluga and right whales are not.

Table 3.7 - The leatherback sea turtle, fin whale, and St Lawrence beluga should be included in this table. In addition, humpback whales are no longer considered of special concern. They have been declared not at risk in 2003.

Literature Cited

Finneran, J.J., and Schlundt, C.E. 2011. Subjective loudness level measurements and equal loudness contours in a bottlenose dolphin (*Tursiops truncatus*). Journal of the Acoustical Society of America 130(5): 3124-3136.

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Appendix 5

Table 3: Exchange of information between DFO Science (NL and Quebec Regions) and Nalcor on aspects of the underwater sound modeling.

DFO Comment (December 2011)	Nalcor Response (January 2012)	DFO Reply (February 2012)
M-weighting has been promoted as a conservative function to estimate hearing sensitivities in cetaceans (Southall *et al.*, 2007), as it will tend to overestimate perceived levels and thus suggests that more sound is detected than C- or A-weighting based on equal-loudness contours. However, this modeling approach most likely does not de-emphasize the auditory frequency response adequately in the non-optimal hearing bands. As a result, its appropriateness for assessing detection levels or potential behavioural responses to the continuous background noise that concerns us here has been recently questioned (see McQuinn *et al*., 2011; Finneran and Schlundt, 2011).	Finneran and Schlundt (2011) showed that the perceived level of the sound by the mammals may be higher than M-weighting functions suggests. However, the auditory weighting function approximated by Finneran and Schlundt (2011) provides higher perceived level (by 10 dB at 7 kHz and 15 dB at 15 kHz) only for the frequencies above 3 kHz. For lower frequencies it provides lower perceived levels than M-weighting function suggested by Southall et al. In this modeling study there is no source that produces significant acoustic wave energy in the frequency range where the auditory weighting function approximated by Finneran and Schlundt (2011) provides more conservative results than M- weighting curve. The model relies on widely accepted standards and data.	DFO concurs with the proponent's suggestion to employ a more conservati albeit less accurate, modelling approach for estimating perceived sound levels by marine mammals in this study area.

DFO Comment (December 2011)	Nalcor Response (January 2012)	DFO Reply (February 2012)
Vessel transit and operations sound characteristics were modelled at only four locations along the proposed cable crossing corridor. Given the apparent long-range underwater signal propagation, it would have been preferable if more than one site in the deeper waters of the mid-Strait had been assessed. In addition, while the total sound energy exposure from overlapping sound sources (such as drilling plus rock dumping dynamic positioning (DP) work plus cable laying DP work) may not be much higher than each of the sources alone, their effective noise footprint could ensonify waters across the entire Strait. Potential effects on marine mammal use of the Strait, and on their migration patterns and feeding behaviour will need to be evaluated in that perspective (see below).	The number of sites and their location were chosen based on the variation of the propagation conditions in the Strait. The sound field distribution at all other locations along the corridor can be estimated using the modeling results from the modelled sites.	While the sound propagation modelling may produce estimates that approximate reality, DFO suggests that Nalcor conduct field measurements to confirm these at deeper water sites, and during multiple construction operations.
Ambient noise was monitored at two sites close to shore where wave action would potentially produce greater values than mid Strait (Figure 1.1). The nearshore sites were also up on shallow banks away from the higher-slope drop-offs into the Strait. This might limit sound propagation from elsewhere to the receivers relative to deeper water sites. Why were two sites in the mid- Strait not monitored? It is desirable to see a summary of the ambient noise measures in terms of location, variation, seasonality, frequency etc. During quiet periods, the proponent's operations may have a much greater effect on marine mammals and leatherbacks than it would during noisy or ice-covered periods.	The intention was to distribute recorders evenly across the Strait. However, in consultation with the local fishermen assisting with the deployments it was determined that fishing activity proposed a risk of to the deployed gear. Therefore, the northern and southern sites were moved to the closest locations that contained large boulders and hence would not be trawled. Figure 3.16 in the report provides a comparison between the three stations in terms of time, location, and frequency.	While DFO understands Nalcor's concern regarding a possible interaction between fishing operations and acoustic recorders at deeper water sites, the issue of having no deeper-water mid-Strait station to assess sound propagation in this context remains significant, in DFO's opinion. DFO encourages the proponent to consider monitoring at these deep-water sites using short-term or vessel-based acoustic receiver deployments. Nalcor's summary of ambient noise measurements described by location, time, and frequency is useful.

DFO Comment (December 2011)	Nalcor Response (January 2012)	DFO Reply (February 2012)
The rationale for using DP levels of 25% and not 100% for estimating source levels for vessel DP mode operations is questionable. “The dive support vessel DSV Fu Lai was recorded by JASCO while operating in DP mode, with DP levels of 25%, i.e., at approximately 3000 HP (MacGillivray and Racca, 2006). The calculated source levels from these recordings were used to estimate the source levels for vessels in DP mode during the proposed construction activities for the SOBI submarine cables.”	JASCO has spent a significant amount of time determining the source levels for the vessels in transit and in DP mode. Considering the fact that many parameters that influence the source level for a noise source were unknown, an adjustment of 10log(HP/HPref) for the different power outputs of the vessel machinery was considered appropriate for the specific case.	DFO considers modeling of noise levels above ambient using DP levels of 25% - and not 100% - is not conservative as an approach. DFO's concerns remain until actual received sound levels can be obtained. It is the great number of variables that can influence sound propagation, and the frequent inaccuracies of modelled results once measurements are obtained, that lead DFO and other experts to encourage field sound measurements in at least worst-case scenarios.
It is noted that the underwater source level (SL) rises again as the frequency approaches 100 Hz (Figure 2.1). Information is lacking on the sound levels for drilling at closer ranges and for higher frequencies such as up to 500 Hz, which could be detected by marine mammals such as toothed whales and pinnipeds.	The lack of information on higher frequencies related to horizontal drilling is recognized. Unfortunately, that is the only data we were able to obtain on the drilling operation with significant separation of the drilling machinery and the drilling point. Willis et al. (2010) provide an extended measured spectrum for a drill rig installed on the bottom. The measured spectrum show a global maximum (~100 dB) in the frequency range of 10–30 dB, local maximum (~85 dB) at 150 Hz and drop in the received levels of about 15 dB for higher	Nalcor's rationale for assuming a low sound output from horizontal drilling operations may be correct, but the large variation in modelled sound propagation presented in the review suggest that the source values need to be better described. This is particularly important since evidence suggests that baleen whales have good hearing up to 500 Hz. Given the lack of available data on many frequencies output during horizontal drilling, DFO suggests that Nalcor conduct field measurements during this operation to confirm these estimates.

DFO Comment (December 2011)	Nalcor Response (January 2012)	DFO Reply (February 2012)
	frequencies. These observations as well as the fact that slow rotating drilling bit is very unlikely to excite significant acoustic wave energy at frequencies higher than 100 Hz make us believe that the modelled frequency range of 1–100 Hz adequately estimates the noise impact of drilling operation on the marine mammals.	
Cetaceans have shown responses to underwater anthropogenic sounds at levels far less than 50 dB above ambient. Therefore, we question the rationale for selecting 50 dB above ambient level as the minimal level to display on the figures (P. 50). It would be useful to see (no doubt large) received sound distances for levels lower than 50 dB above ambient. Some of the lower root mean square (RMS) values, which could be perceived above ambient levels, are modelled to extend to more than 10 km (Tables 3.1 and 3.2 for example).	Five more maps were created for the sites 1 to 5 and are attached (Attachment 1) and present sound level above ambient noise level. New maps were plotted based on the already available propagation modeling data, which extend 12 km from drilling noise source and at least 30 km from vessel noise source. The minimum sound level contour displayed was 0 dB above Ambient. In all cases the full extension of the 40 dB contour is provided and, with small exceptions, the 30 dB contour as well.	DFO accepts the improved received level data presentation at greater distances from the sources, although DFO suggests that Nalcor conduct field measurements to confirm these.

This Report is Available from the:

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