REVIEW OF THE "TERRA NOVA 2008 ENVIRONMENTAL EFFECTS MONITORING PROGRAM YEAR 6"

Context

DFO Science, Newfoundland and Labrador Region, was asked by Oceans, Habitat and Species at Risk (OHSAR) Branch, NL Region, to review the report of the "Terra Nova 2008 Environmental Effects Monitoring Program Year 6". Specifically, the request was for scientific advice on any inconsistencies, inaccuracies and/or gaps in the analysis of the information provided by the report. It was determined that, given the short timeline and previous experience providing these types of reviews, a Science Special Response Process would be appropriate to address the needs of this request. This report formulates the review developed during this process.

Background

The Terra Nova oil field is one of several offshore oil development projects located on the Grand Banks, approximately 350 km east southeast of St. John's and 35 km southeast of the Hibernia oil field. Suncor Energy operates the development on behalf of the owners (Suncor Energy, Mobil Oil Canada Properties, Husky Energy Inc., StatoilHydro ASA, Murphy Oil Company Ltd., Mosbacher Operating Limited and Chevron Canada Resources).

The Terra Nova Environmental Effects Monitoring (EEM) program was established to fulfill commitments made in the Terra Nova Environmental Impact Statement (EIS) (Petro-Canada 1996) and addendum document (Petro-Canada 1997). The design of the EEM program was based on the Terra Nova Baseline Characterization Program (Petro-Canada 1998a), dispersion model results for drill cuttings and produced water (Seaconsult 1998) and input from experts and the public. The main goals of the program have been to assess effects predictions made in the EIS and determine the zone of influence of project contaminants.

Terra Nova EEM programs one through five were conducted in 2000, 2001, 2002, 2004 and 2006. The Report entitled "Terra Nova 2008 Environmental Effects Monitoring Program Year 6" represents the sixth EEM monitoring program report for the Terra Nova project. The sixth EEM program was conducted in the summer of 2008 and the resulting report relates the findings from 2008 to those of the baseline study and previous EEM findings.

Analysis and responses

The EEM program covers a variety of components as agreed upon by a number of stakeholders during program formulation. The program is generally more comprehensive than those carried out in many other jurisdictions worldwide. This observation is in respect to the number of environmental components being studied as well as the frequency of field surveys.

In general, the report is well prepared, the information provided is useful, and the analysis is thorough and careful. Analysis of the results for the 2008 EEM program indicate that the Terra Nova project results in contaminated sediments and scallops, and that changes to benthic community structure are well within the predicted zone of influence for the project. In addition the results for 2008 provide evidence for a decrease in the magnitude and areal extent of these effects that may be related to a decrease in drilling activity during the period from 2006 to 2008. This indicates that the EEM program design is sensitive and capable of detecting the effects of interest and possible concern.

Regarding project related effects, there would appear to be little cause for concern to date from an environmental or fisheries perspective. However, the project is identifying some differences, which may be natural and/or potentially project related, indicating the importance of ongoing EEM. Differences appear to be of minor significance, but exist for toxicity, benthic community structure, primary productivity and fish health. Furthermore, the onset of increases in produced water gives further cause for ongoing EEM.

Minor comments and suggestions for improvement

Table 4-5 Was the value for September included in the calculation of the average discharge? In this context, average discharge is not a very useful number since it includes months where no discharges took place.

Section 4.4 It was not clear if the proponent is or is not reporting that bilge water and deck drainage effluent streams exceeded regulatory limits? If so, how often, how long, and to what extent did this occur?

Table 5-3 This table should specify if dry or wet weights were used for these calculations.

P 51 & 163 Observations less than the Reportable Detection Limit (RDL) are not treated correctly in the statistical analyses. The recommendations of Helsel (2005) should be followed.

Figure 5-13 One redox measure in this figure seems very high. Is this a transcription error?

P113 There is reference to "…correlations were weak $0.01 < p < 0.05$)". It is important to state clearly that these relationships are in fact significant, not just "weak". Given the shear number of statistical tests in this area of the report, it is appropriate to indicate that the results of some tests were more significant than others, but not to lose sight of the fact that they are significant in the first place.

Section 5.4.4.1 The relationship between the Microtox results and barium should also be explored and included in this section.

Section 6 Analysis of the water column profiles in relation to the possible influence of produced water assumes that produced water will spread equally in all directions once it is released. This assumption should be addressed or a more appropriate model for produced water should be used. A map of observed chlorophyll levels could be used to provide a preliminary evaluation of direction effects.

P215 Mercury levels in fish are usually highly correlated with size. This should be tested for the American plaice used in the study and the analysis of mercury in plaice tissue should be weighted for size.

P242 3 Water column suspended sediment levels are not usually relevant for benthic suspension feeders. Fines and flocculants, including drilling wastes, have been shown to accumulate in the benthic boundary layer in which most of these organisms feed.

P245 The rationale for examining the relationship between chlorophyll a and distance should be presented in this section. Without this rationale the discussion of this finding is weak and not as clearly presented as other topics in the report.

Since aliphatic hydrocarbons and barite/bentonite have generally been shown to have little or no direct toxicity in laboratory studies (and are often classified as negligible), the differences in sediment meiofauna could simply be indirect and related to surficial fines and slight anaerobiosis (e.g. from hydrogen sulfide). Very low concentrations of hydrogen sulfide are highly toxic and would not be accounted for in analysis of « total sulfides ». Alternatively, slight changes in particle size may be influencing invertebrate "recruitment" for some species.

However, on balance, it is recognized that any slight movement and deposition of fines, whether caused by development activities in the offshore, trawling, or natural "everyday" oceanographic phenomena occurring over widespread geographic areas, could cause similar changes in sediment meiofauna. It should be noted that information already exists in this area.

The source of traces of PAH in a few water samples may be combustion (e.g. boat traffic derived) since they were parental and not alkylated compounds as one might expect if the source were produced water.

The coloration of scallop meats, i.e., orange-brown color, is commonly associated with feeding in different areas.

Section 8.6 In general these recommendations are appropriate for the ongoing EEM program and should be followed.

The report states that CTD casts were to be abandoned after 2010, but that as a result of the 2008 finding of a distance relationship between chlorophyll and production activities, it is now being recommended that this component of the monitoring program be continued for year 7. This exemplifies the reason why changes to future EEM procedures (usually expressed as recommendations to “reduce sampling effort”) should be viewed and evaluate with extreme caution in individual EEM programs.

Conclusions

Overall, the quality of this report is impressive, especially in the thoroughness with which the proponent has analyzed the data. It was noted during the review that report was likely one of the best EEM reports presented for review within the past decade. The statistical analysis and tests for project related effects are very well done and carefully reported in clear and understandable prose. It was also noted that the proponent takes into consideration the difficulties of working with natural variation and the vagaries of field work without making them an excuse for not analyzing the resulting data. This prudent approach should serve as a model for analysis of other offshore oil EEM programs.

It is useful to recognize that changes to EEM programs may statistically compromise the ability of the proponent to identify an effect of the development in a future year. One of the purposes of the EEM pre-design phase is to lay out an effective sampling effort and protocol design, given the knowledge at the time. Although reduced effort later may seem prudent at the time such a request is made, such changes carry with them a real risk of modifying the program to such an extent as to make future results scientifically indefensible. This is especially true in instances where many small changes in the design accumulate over subsequent iterations of the program – producing a large change when taken together. Clearly, there will be instances where changes at a future time may become necessary. However, any changes in the design should be considered with extreme caution.

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