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Progress report on outstanding oil spill-related issues
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Review of OSR Plans for Lun-A, PA-B and Prigorodnoye Terminal and the associated OSR Handbooks and Review of Report on Vityaz Crude Oil Characterisation by AEAT/Leeder

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1. BACKGROUND

A review of SEIC's OSR Plans (OSRPs) for Lun-A, PA-B and the Prigorodnoye Terminal was conducted in mid-2007 and then revised following a site visit to Sakhalin Island in August 2007 to inspect the company's spill response resources and how they matched up with the OSR Plans. Subsequent to that review, the GWAP made a number of recommendations for changes to the OSRPs with the aim of minimising potential impacts of clean-up operations on western gray whales.

Because of the size and complexity of the OSR Plans (which ran to more than 1,000 pages for each site, including Appendices) the company had decided to prepare more user-friendly and concise handbooks which set out the main strategies and clean-up techniques, but in the 2007 review it was noted that there were many discrepancies between the handbooks and the plans that needed to be resolved.

At GWAP-4 in spring 2008 the Panel assigned me to check through the revised OSRPs and determine whether the changes suggested by the Panel had been incorporated, and whether the handbooks matched up with the main plans. However, the revised OSRPs were not made available for Panel review until GWAP-5 in December 2008. Consequently the review covered by this document has been conducted in the first three months of 2009.

Following GWAP-5, SEIC also provided IUCN and the Panel with additional details of Vityaz crude oil properties and a copy of the summary of a review of the revised OSRPs conducted by PCCI on behalf of the lenders for the Sakhalin II project. The additional oil characterisation data are included here, as is my consideration of the PCCI review and how it compares with the Panel's findings.

It is intended that a site visit will be carried out during the summer of 2009 to check the status of the on-site resources and any further revisions that have been made to the plans.

2. APPROACH

The revised OSRPs, which total more than 3,000 pages, have not been read through in great detail. Rather, the relevant sections where the Panel had recommended changes or where discrepancies had been found in the earlier review were inspected to judge whether suitable amendments had been made. Fortunately, the formulaic nature of the plans (which follow a combination of Russian regulatory requirements and the normal international OSRP practices adopted by the major oil companies) meant that many of the sections and appendices were virtually identical between plans, which assisted the review process.

The relevant handbook was compared with the corresponding OSRP to assess whether it contained the same response approaches and guidance. This exercise proved to be not particularly straightforward, however, because the layout of the handbooks does not follow the layout of the OSRPs. This is not a technical criticism as the handbooks are intended for guidance rather than detailed planning, and their layout is a matter of choice by the company.

The detailed review of SEIC reports on oil property analyses conducted by AEA Technology and the Leeder group has been given particular consideration in relation to concerns expressed in the earlier WGWAP review regarding: the amenability of the crude to natural dispersion, the formation of water-in-oil emulsions, the amenability of the crude to the application of dispersant chemicals, and content of aromatic compounds. In addition, the reports contain sections on laboratory tests of in-situ burning and biodegradability of the crude, which are reviewed here. It has been accepted for the purposes of this review that the two companies conducting the analyses are reputable in these analytical fields and the reports have been accepted at face value.

3. OSRP REVIEW

Because the OSRPs are so similar in content and layout overall, with only site-specific variations between them, it has proved possible to summarise the review findings for all three OSRPs together. The main points are as follows:

3.1. **Complexity of the OSRPs.** All three OSRPs are still very complex and contain lots of repeated details of techniques, so they read more like response manuals than OSR plans, but this is a typical approach by major oil companies, and in this case also reflects Russian regulatory requirements. **There is no merit in following this generic criticism further as it will be of no benefit to the whales.** Similarly, the regulatory requirement that the company must 'control a spill in 4 hours' will be unfeasible in some circumstances. The criticism that the company agree to this requirement

is still valid, although it is recognised that it will depend on how the regulators view this issue post-spill. **There is nothing to be gained from pursuing this issue.**

3.2. **Response policy.** The basic policy of the plans is now focussed primarily on mechanical and manual containment and recovery of spilled oil (using booms, skimmers and other manual and mechanical equipment), assisted by in-situ burning of oil trapped in winter ice (where feasible). **The emphasis on dispersant use appears to have been reduced significantly compared with the earlier versions of the plans.** Although their potential use is included, relatively small quantities of dispersant and application equipment are available on site and they receive little consideration in the plans other than as a minor 'backup' technique. This is partly based on the very light and non-persistent nature of the Vityaz crude oil (see section 7 below). **I have no problem with this as the Panel has recommended that dispersant use be avoided in or near gray whale feeding grounds.**

3.3. **Response in ice, including in-situ burning of oil.** I remain of the general opinion that response during winter ice cover is likely to be considerably more difficult than the OSRPs convey, and that there is still very likely to be a significant gap between what is in the plans and what is actually achievable. Response in ice stands out as one of the scenarios in which effective action is likely to be extremely limited by the harsh conditions. I also remain of the opinion that a significant spill in winter will only be finally dealt with after ice melt. Having said all that, the OSRPs now appear to have changed in their emphasis, with more caveats related to human safety in a potentially extremely difficult environment, and greater recognition of limitations imposed by winter conditions. They also include a commitment to continually review available techniques for response in ice and in particular to keep up with and implement international developments in this field. There is also a clear training emphasis on winter response. **These are significant improvements to the OSRPs.** The proposed 2009 site visit will present the opportunity to check this training initiative with response personnel on site and evaluate their awareness of the real constraints associated with a winter spill.

The oil characterisation report by AEAT/Leeder contains additional information on the effects of in-situ burning on Vityaz crude (see section 5.2 below). The OSRPs continue to identify this technique as an option for response in ice, although there is considerably more emphasis on obtaining necessary approvals from the Russian authorities for use of the technique, and a more cautious approach to conditions under which the technique might be employed. **Given the doubts expressed about use of in-situ burning in the WGWAP OSRP review in 2007, this is a welcome change of emphasis.** The AEAT/Leeder report confirms that unburned residues of higher viscosity and density remain after laboratory burns, and this is an important factor when trying to decide whether a burn should take place. I recall from discussions with SEIC that the company was

planning joint trials of in-situ burning with the Russian authorities (to confirm acceptability of the method as a winter response option in ice), but we have no further information on whether the trials have been conducted. **SEIC will need to clarify this.**

3.4. **Emergency contacts.** The plans contain only limited and not particularly easily accessible telephone contacts for emergency response. However, I believe from discussions with company response personnel that the members of the company's emergency response team all have round-the-clock immediate access (through their internal computer and communications networks) to all the necessary emergency response and notification contacts, as do all the response contractors. **Again, SEIC will need to confirm this or clarify as necessary.**

3.5. **Use of booms to protect coastal lagoons.** Considerable revision has been made to the defensive and deflection booming strategies for the coastal lagoons, which now appear to be more realistic than in the earlier OSRP versions. The proposed booming layouts now reflect different weather conditions and the difficulties likely to be presented by waves, currents and poor weather. **These sections are greatly improved** and it is planned to check the implementation of these strategies during the proposed 2009 site visit.

3.6. **Implementation of Panel recommendations for changes to response techniques.** **The main Panel recommendations for changes to response techniques to reflect gray whale considerations all appear to have been incorporated into the plans.** Overall, the approach to offshore response and shoreline cleaning is more thoroughly covered than in the earlier versions of the OSRPs and the response techniques which are to be employed appear technically sound. However, there is an important concern that needs to be addressed. Some shoreline cleaning techniques have the potential to transfer contaminated sediments into shallow nearshore waters. These are high- and low-pressure sediment flushing, and in particular a response technique called 'sediment reworking', and all of these techniques are included in all the OSRPs. Flushing simply washes oil and some sediment down the beach, with the intention of collection and recovery, whilst 'sediment reworking' involves mechanical relocation of relatively lightly oiled sediments which remain on the upper shore (after heavier oil contamination has been removed) into the middle and lower shores to promote the final stages of oil removal by natural processes such as wave action. The problem with all three methods is that they provide a potential mechanism for the transfer of oil-contaminated sediments into shallow gray whale feeding areas. **Although the OSRPs note this possibility of oil transfer and also note that the use of these strategies should be avoided where there is the potential for impacts on environmentally and commercially sensitive species, there is no clear statement that these techniques should be avoided on shores adjacent to gray whale feeding areas.**

I believe from Panel discussions and from discussions on site that the company is aware of and has agreed to this caveat and therefore that it does not intend to use such techniques next to whale feeding areas. The omission from the plans of any reference to a caveat of this kind may be due to the fact that it was agreed between the Panel and SEIC after the plans had already been formally submitted to the regulators, and therefore there was no opportunity to include such a caveat in the plans. **This is a point that needs to be discussed with SEIC at WGWP-6.**

3.7. Spill volume and response resources. 1,500 tonnes remains the Russian planning regulation standard for a 'worst case' spill, but **the OSRPs now recognise the possibility and spell out the likely sizes of more serious 'worst cases'**. The quantities of stockpiled response equipment clearly continue to reflect planning for a possibly far larger spill than the regulations require. It was noted following the 2007 site visit that the response equipment and resources listed in the OSRPs were of excellent quality and well maintained and in excess of regulatory needs. The quantities of response equipment were largely present as set out in the plans, with more equipment being added. **Overall, I remain of the general opinion that the available response equipment and storage facilities are exceptional in quality and quantity and further expansion of response resources is unlikely to be necessary.**

In the OSRPs the quantities of resources remain based on theoretical evaluations of holding and recovery capacities under optimal conditions. **Whilst it is easy to contest the validity of this approach, it is based upon Russian regulatory requirements and in the plans the theoretical capacities far exceed worst-case volumes. There seems little to be gained from further contesting this approach.** The proposed 2009 site visit will allow a check that the final stockpiles are as set out in the OSRPs and that the storage, maintenance and training of staff in use of the equipment remains adequate.

3.8. Handover of command to Russian authorities for larger spills and transboundary issues. **The OSRPs set out procedures for handover of control of the response should the seriousness of the spill require it. The plans also set out details of a Memorandum of Understanding with Japanese authorities for spills that enter Japanese waters.** **[IS THIS A LITTLE OVER THE TOP? I.E. DOES IT REALLY NEED HIGHLIGHTING?]**

3.9. Risk of spills from Aniva Bay reaching gray whale feeding grounds and migration routes. SEIC agreed to conduct additional trajectory modelling to re-assess these risks, but so far further details have not been provided. **SEIC will need to respond.**

3.10. **Environmental and whale monitoring after a spill.** Both the OSRPs and their Appendices spell out basic procedures for operational response and impact monitoring designed to feed back into modification/improvement of the clean-up response. This guidance strays into fisheries and wildlife impacts, which is understandable given the difficulties of drawing a clear line between information needed to enhance response versus judging longer-term impacts. This approach doesn't really cause any problems, just a slight lack of clarity. The survey methods to be used are specified in a separate handbook, the "SEIC Handbook for OSR Monitoring and Assessment" (Document Number 0000-S-90-04-P 0177-00) and a second document, "SEIC Environmental Monitoring Plan" which provides detailed procedures for the design of sampling plans. These are reportedly summarized in Table 14.2, but the table is a bit vague in its content and says nothing about sampling design, sample size or numbers etc. I have not had sight of the two documents, and the Panel needs to consider whether these should be obtained and reviewed for best practice. On a related topic, Appendix 20.7 provides guidelines for response in or near gray whale feeding areas. The approach spelled out seems sound, but I think it would be helpful for whale specialists on the Panel to review this document.

3.11. **Bioremediation as a response technique.** Bioremediation was included as a response technique in the earlier versions of the OSRPs, but the new versions greatly reduce the emphasis on this technique. It is made clear that this is an approach to be used only in certain circumstances and after an environmental benefit analysis has been performed, so that potential unwanted side effects are identified and avoided. This is an acceptable outcome.

It was understood from SEIC that environmental trials of bioremediation were to be undertaken with the Russian authorities. Have they taken place and if so with what outcome? SEIC will need to respond.

3.12. **Termination of response and NEBA.** The OSRP sections dealing with these issues are comprehensive and address the relatively minor concerns raised in the earlier WGAP review.

4. HANDBOOK REVIEW

The OSR Handbooks have a different layout to the OSRPs. In 80 pages or so they summarise the contents of about 1,000 pages of OSRP and appended material. They contain mainly practical information for responders, including a summary of oil properties, organisation for response and responsibilities, checklists for responders and summaries of available response resources. No major discrepancies were found between the handbooks and the OSRPs.

5. REVIEW OF THE AEAT/LEEDER REPORT ON CHARACTERISATION OF VITYAZ CRUDE OIL.

The detailed report concerning oil property analyses conducted by AEA Technology and the Leeder group has been given particular consideration in relation to concerns expressed by the Panel, as noted in the introductory comments, and these are considered individually below. In addition, the report contains sections on laboratory tests of in-situ burning and biodegradability of the crude, which are also considered here.

5.1. Oil properties and oil behaviour once spilled into the sea. Four areas of concern were noted in the 2007 review of the OSRPs: two have implications for the use of various response techniques (the formation of water-in-oil emulsions and amenability of the crude oil to the application of dispersant chemicals); one is relevant to the transfer of oil to shallow-water sediments and therefore to gray whale feeding areas (amenability of the crude to natural dispersion); the fourth relates to potential toxicity of the crude (content of aromatic compounds in particular). The AEA Technology/Leeder report provides additional information in these areas, as follows:

Formation of water-in-oil emulsions: The data presented show that fresh Vityaz crude does not generally form stable emulsions with long-term persistence. Both the OSRPs and Handbooks state this as a general premise. However, the data presented in the AEAT/Leeder report show that as the oil weathers (by evaporative loss) the tendency for emulsion formation increases, and the proportion of water taken up increases with degree of weathering. In addition, the tendency to emulsify increases as temperature drops, so the likelihood of emulsion formation is higher in winter than summer. AEAT's laboratory results show that emulsions formed are highly unstable and readily and quickly separate back to water and oil. The Leeder analyses used slightly different techniques that subjected the oil to slightly more vigorous physical procedures. Whilst their findings are similar to AEAT's, they reveal that more stable emulsions can be formed from weathered oil where thick layers of weathered oil are subject to wave action at low temperatures such as those experienced in Sakhalin's winter. The potential longevity of the emulsions was not tested. Such stable emulsions have the potential to be much more persistent than the oil from which they have formed. Both groups conclude that under most circumstances the low viscosity of the fresh crude will promote spreading and evaporation rather than emulsification. Overall, their interpretation of the results seems accurate, particularly in summer conditions, when gray whales are present.

However, the low risk of stable emulsion formation is not mentioned in the OSRPs and neither are the particular circumstances in which they can form. Set against this criticism is the fact that on-site

response resources include equipment which is capable of dealing with viscous oils and emulsions, even though the risk posed by them is not specifically identified in the plans. **Whilst the plans should probably be modified for completeness, it is not possible or necessary to make practical recommendations for changes to response equipment that would reflect this.**

Chemical dispersability: The data show the Vityaz crude to be highly amenable to chemical dispersion. However, as noted above, the OSRPs now give dispersant use a much lower profile than previously, mainly on the basis of the very low persistence of the crude and risks to responders from trying to apply dispersant to fresh crude. **Consequently, this seems no longer to be an issue.**

Natural dispersability of the crude oil: The report shows this crude to be relatively easily dispersible into the water phase by wave action, but also that the oil/water phase rapidly separates once conditions calm down. The implication of this is that the risk of contact between naturally dispersed oil and shallow-water sediments is probably greater than initially thought, but it should be remembered that this is a natural process determined by weather conditions at the time of the spill, and is beyond human control. **These results are not surprising and have no practical consequences for recommending changes to response strategies or equipment.**

Aromatic content: The report contains a short section which summarises the aromatic compounds found in Vityaz crude oil. The report does not identify the analytical technique that was used or its detection limits, and some inconsistencies were noted in the interpretation of the data presented. **These are being clarified with SEIC and for the moment it is not possible to present a summary or compare the Vityaz crude with other oils. It is proposed to follow this up at WGWAP 6 and during the site visit planned for this summer.**

5.2. In-situ burning. Laboratory studies show that Vityaz crude is amenable to in-situ burning, provided it can be contained in relatively thick layers of 1mm or more for fresh crude. A greater thickness is required for sustained combustion as the oil weathers. It should be noted that SEIC holds no boom suitable for containing and burning thick layers, and that use of the technique is only envisaged where sufficiently thick layers of oil become trapped in openings or leads in ice, which acts as a natural booming system.

Under optimal conditions in the laboratory, between 90 and 95% of fresh and partially weathered Vityaz oil burned off. Oil that had been weathered for 24 hours burned off to a lesser degree, 84%. In practice this means that between 5 and 16% of unburned residues will remain; such residues have a higher viscosity and density than unburned crude and are far more persistent. In addition,

the residues contain pyrolysis products which are undesirable contaminants of seafood. Under sub-optimal conditions, less of the crude would burn and viscous residues would be greater in quantity. As noted in the 2007 GWAP review, I continue to have reservations about this technique. As noted in section 3.3 above, the OSRPs place a lower emphasis on its use, and focus more on getting approvals and making a proper benefit analysis beforehand.

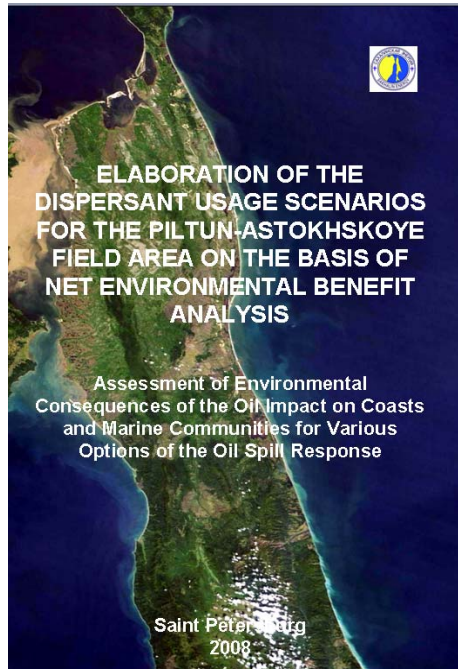
5.3. *Biodegradability of Vityaz crude.*

The AEAT/Leeder report provides laboratory data on degradability of Vityaz crude. Experiments were conducted using sandy soils and various fertiliser treatments, and appear to have been conducted primarily to assess the potential for treating oily waste by land farming. The studies confirm that both fresh and weathered crude are amenable to biodegradation. The data are helpful to waste management but have little application with respect to bioremediation as a response technique.

Brian Dicks, 27th March 2009

Review of SEIC document “Elaboration of the Dispersant Usage Scenarios for the Piltun-Astokhskoye Field Area on the Basis of Net Environmental Benefit Analysis”

Brian Dicks, WGWAP



Approach

The document under review comprises 71 pp. plus references and two appendices. It adopts a net environmental benefit approach (NEBA) in support of obtaining pre-approval for dispersant use from the Russian authorities. For convenience, it is referred to below as the dispersant NEBA report rather than by its full title. The English language version has been translated from Russian and whilst translation anomalies are numerous, these have not posed any difficulties for the present review. My focus has been to summarise for the Panel the contents of the report, its technical merits and main findings. The full text of the document has not been subjected to a detailed review because of time constraints.

In broad terms, it is good international practice to obtain pre-approval for dispersant use because it is a valuable response option under the right conditions. By way of explanation, the importance of obtaining pre-approval for dispersant application is that the ‘window’ for their use is usually very short because they work best only when the oil is relatively fresh. This is especially true for a very light and volatile crude like Vityaz. Set against this is that the normal permitting process takes several days and often involves approval from several agencies. If the permit is applied for at the

time of a spill, the opportunity to use dispersants is often lost before the permit can be granted. Hence the need for pre-approval.

It should also be noted that pre-approval is rarely a *carte blanche* for dispersant use. There are normally quite strict restrictions attached to the pre-approval, usually regulating where, when and in what quantities they can be applied. The restrictions are normally determined as a result of a thorough review of environmental sensitivities (including the presence of rare and endangered species and particularly sensitive habitats), commercial activities like fishing and the presence of fish nursery areas. When conflicts over dispersant use arise, which they often do between different environmental and commercial lobbies, the pre-approval may be subject to review at the time of a spill by a government agency or ombudsman.

Review of the dispersant NEBA report

The dispersant NEBA report is set out in eight sections plus two Appendices. Section 7 presents the conclusions. For brevity, I have only summarised the main approaches below, not the detail.

The text covers the scope of the Skahalin II project, and a fairly detailed consideration of spill response techniques. The company preference for containment and recovery of oil is clearly stated, with dispersants and in-situ burning identified as supplementary techniques for certain conditions. Oddly, the report contains quite a detailed summary of in-situ burning (although potential problems from unburned residues are not mentioned - see OSRP review) but this subject is then not considered again. An important early statement is that the NEBA process is fundamental to determining whether dispersant use could be beneficial, with the only stated constraint being that dispersants should not be used in waters shallower than 10 metres. Oddly, no mention is made of the company's stated position that dispersants would not be used in gray whale feeding grounds and no consideration is given in the report to this subject. The benefits of obtaining pre-approval are set out, and the rest of the report considers the NEBA process.

The environmental sensitivities are well summarised and seem comprehensive. The net conclusion is that Area of Piltun-Astokhskoye field development and adjacent water areas and coasts are exceptionally rich in natural resources and are the habitat for a large number of protected species. It is shown that the most ecologically fragile areas are the coast near the lagoons, the lagoons themselves and adjacent shallow waters up to 5-10 m.

This is followed by consideration of various indices of sensitivity, including those set out in international scientific and technical literature as well as some which have been developed in Russia. The overall consideration of sensitivities and the potential effects of dispersants is sound

and I found nothing major to disagree with. However, the system that is then developed of trying to turn the numerical part of the various sensitivity indices into a pseudo-mathematical ranking model has many weaknesses. There is little point in arguing this, however, as the broad conclusions from the modelling are pretty consistent with common sense deductions which can be made from the original environmental sensitivity data. The coastal lagoons, shorelines and shallow nearshore waters are rated as most sensitive to potential impacts of oil and to dispersant use, but given the 10 metre water depth exclusion on dispersant use, they would not be used in such areas (again, no mention is made of gray whale feeding grounds). The main importance of ascribing these sensitivities is to support dispersant use in deeper water, in order to prevent oil slicks from penetrating into these more sensitive habitats.

Section 6 provides the crucial NEBA, which is based upon a theoretical efficiency comparison of three scenarios - no response to a spill (i.e. leaving the oil to dissipate naturally), containment and recovery, and containment and recovery supplemented with dispersant application. Different spill volumes are fed into these scenarios.

The 'no response' options sets the worst-case baseline, and spill trajectory modelling is used to 'predict' likely length of coast/sensitive areas likely to be oiled by the different spill sizes. Theoretical calculations of how much oil is removed by the response techniques are then used to compute the likely reduction in oil volume and thereby the extent of coastal oiling. The logic here is faulty. Whilst I agree that both containment and recovery and dispersant use will reduce the volume of oil floating on the sea, this would not necessarily reduce the length of shore oiling - less oil could still contaminate the same length of shoreline, but not as heavily. Whilst this can be argued *ad nauseam* (and often is!) I have no problem with the conclusion that containment and recovery plus dispersant use is likely to deal with more oil than containment and recovery alone.

This argument is supplemented by calculations of concentration of oil in water following dispersant application. A completely arbitrary supposed 'hazardous concentration' of oil (I think of around 15ppm) is then combined with calculations of likely oil concentration in the water (derived from published literature and some AEA Technology data). This leads the authors to the conclusion that the 'hazardous concentration' is never likely in waters deeper than 5 metres and that dispersant use is therefore always acceptable as they are only permitted to be used in water deeper than this (again, no mention of gray whale feeding grounds). This really is open to criticism, primarily because of various weaknesses noted above in the modelling and the arbitrary nature of the 'hazardous concentration'.

Whilst I do not disagree that dispersant use may confer some net benefits, and I also agree with the need for pre-approval, the basis of the above conclusions are far too simplistic. A full NEBA would normally be much broader in scope, and to be fair to SEIC, the OSRPs which I have just reviewed set out a much broader approach. It is not clear why that has not been adopted for the dispersant NEBA.

What is missing from the dispersant NEBA report? Absolutely no consideration is given to many important concerns, such as seasonal variation in the presence of whales, birds or commercial fishing, which might require special restrictions for dispersant use at certain times or in certain areas. No mention is made of potential NEBA conflicts which are likely to arise, such as those frequently encountered between environmental lobbies for sea birds, which generally support dispersant use, versus fisheries interests, which often do not. No consideration is given to the potential for non-hazardous concentrations of oil in water causing taint to important commercial seafood organisms, which might lead to identify additional dispersant no-go areas at certain times of year. My main concern is that no recognition of gray whale feeding ground is included in the report, given that a ban on dispersant use in them has been agreed in recent WGWAP meetings.

Brian Dicks, 2nd April 2009