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OIL SPILL PREVENTION, PREPAREDNESS AND RESPONSE

Final report of the Oil Spill Task Force

Submitted by the Oil Spill Task Force

WESTERN GRAY WHALE ADVISORY PANEL **WGWAP:**

Oil Spill Task Force

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REPORT OF THE TASK FORCE

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1 INTRODUCTION

Over the past several years, Sakhalin Energy Investment Company Ltd (SEIC) has been preparing to manage the risk of accidental release of oil (e.g., spills, leaks, accidental discharges) through a variety of processes including risk-averse planning, quantitative risk analysis, and development of prevention measures and spill response capabilities. From the initial IUCN independent review of Sakhalin II, Phase 2 to the present, various panels have been engaged in reviewing such preparations to evaluate the risks to the western gray whale (WGW) population and recommend measures to avoid or minimize them.

At its first meeting in November 2006, the WGW Advisory Panel (WGWAP) agreed to engage in a more extensive evaluation of the oil issue than had been possible to that time. Such an evaluation would necessarily review the adequacy of previous recommendations by WGW panels, assess SEIC's responses to those recommendations, and determine whether or what further action would be required to protect WGWs and their habitat.

At its April 2007 meeting the WGWAP established terms of reference for the oil spill task force.[1] The work plan of the task force consisted of three main elements, as follows:

(1) WGWAP members of the task force conducted a detailed review of a series of documents provided by SEIC. This included the Corporate Oil Spill Response Plan; the Lunskoye Oil Spill Response Plan; the Piltun–Astokh Oil Spill Response Plan; the Prigorodnoye Offshore Oil Spill Response Plan; a report on Sakhalin II oil properties; an analysis of the fates of spilled oil, including weathering, emulsification, and dispersibility (SINTEF report); reports providing environmental sensitivity maps (e.g., Piltun feeding area and lagoon) pertaining to WGWs and associated biota or habitats (notably benthic communities); and a report describing ice conditions and ice movement.

(2) Three task force members (Dicks, Reeves, and Tsidulko), accompanied by Roberts of IUCN, carried out a site visit to Sakhalin Island in early August 2007 to inspect equipment, observe field sites, and meet with individuals directly involved with oil spill response planning and implementation for Sakhalin II Phase 2.

(3) A task force workshop was held in Lausanne, Switzerland, for three days (6-8 November 2007) immediately preceding the third meeting of the WGWAP.

The remainder of this present report follows the agenda of the Lausanne workshop (Annex 1) and constitutes the final report of the task force, incorporating results from all three elements of the aforementioned work plan.

2 OVERVIEW OF ISSUES PREVIOUSLY CONSIDERED

In preparation for the task force workshop, Reeves prepared a summary of considerations given to oil spill preparedness and response issues by previous WGW panels (Annex 2).

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[1] WGWAP 2/3, *Report of the western WGW advisory panel at its second meeting*, p. 22. (http://www.iucn.org/themes/marine/sakhalin/meeting_april07/WGWAP%202%20-%20FINAL%20Report%20-%2010%20May%2007%20(2).pdf).

The summary describes findings and recommendations, as well as responses by SEIC, contained in four reports in addition to the first two WGWAP reports. These are the report of IUCN's Independent Scientific Review Panel (ISRP) from April 2005,[2] the report of a workshop at IUCN headquarters in Gland in May 2005[3] to provide feedback to SEIC on their response to the ISRP report and contribute to the potential international Lenders' understanding of remaining issues relevant to WGWs, the report of the Lenders' Workshop in Vancouver in September 2005[4] primarily to provide the potential international Lenders with further clarification of outstanding issues with regard to Sakhalin II Phase 2 and WGWs, and the report of the Interim Independent Scientists' Group (IISG)[5] workshop held in Vancouver in April 2006 (the IISG was a precursor to the WGWAP). The review document was presented and discussed briefly at the Lausanne workshop.

3 OIL PROPERTIES – IMPLICATIONS FOR OIL SPILL RESPONSE

3.1 Crude oil, condensate, heavy fuel oil, diesel fuel

The main products from Sakhalin II oil and gas operations are crude oil, gas, and liquid condensate. Once on shore, the gas and condensate from Lunskoye are separated and the condensate is blended with the crude oil, for delivery of both products to the Aniva Bay terminal through pipelines. To ensure the task force was using the most up to date information, SEIC provided a summary of the main properties of the Vityaz crude oil as follows. Vityaz crude oil:

- is classed as light (specific gravity = 0.852); 97% of the oil distils at 370ºC or less;
- has a low pour point (<-30ºC);
- is volatile (loses approx 50% of its volume in 3-6 hours depending on wind and temperature);
- spreads rapidly (surface tension = 30dynes/cm at 0ºC). Spreading rate of fresh oil on water is similar to that of jet fuel (33dynes/cm);
- has low viscosity (kinematic viscosity = 5.689cSt at 0ºC);
- forms unstable emulsions when fresh. Emulsion stability increases with weathering;
- is a "non sticky" oil, that is, has low adhesiveness to surfaces (0.0024g/cm compared to 0.34 for lubricating oil);
- has a low asphaltene content (0.1%w/w); and
- has a low wax content (<0.1%w/w).

[2] http://www.iucn.org/themes/marine/sakhalin/isrp/ISRP_Report_with_covers_low_res.pdf

[3] http://www.iucn.org/themes/marine/sakhalin/ISRP_Followup/ISRP_Followup_workshop%20Report_Final_6June05.pdf

[4] http://www.iucn.org/themes/marine/sakhalin/ISRP_Followup/lenders_wkshop.htm

[5] http://www.iucn.org/themes/marine/sakhalin/ISRP_Followup/IISG%20April%2006.htm

Laboratory analyses, undertaken on behalf of SEIC, suggest that the oil has been partly biologically degraded within ground formations (i.e., prior to extraction). Such biodegradation is likely to have increased the miscibility of the oil with seawater. Laboratory tests have confirmed that Vityaz crude oil is relatively miscible with water but will separate and re-surface in calm conditions over time.

Vityaz crude oil is a “non-persistent” oil, which is defined by the International Oil Pollution Compensation Fund as:

> oil which, at the time of shipment, consists of hydrocarbon fractions, (a) at least 50% of which, by volume, distils at a temperature of 340°C (645°F) *and* (b) at least 95% of which, by volume, distils at a temperature of 370°C (700°F); when tested by the ASTM Method D86/78 or any subsequent revision thereof.[6]

In empirical terms this means that a small proportion of the constituents (those boiling above 370ºC) may persist in the environment despite the “non-persistent” categorization.

Vityaz crude oil will be produced from the Piltun-Astokh field. The crude oil produced from the Lunskoye field is expected to be similar. In both cases, blending of the much lighter condensate with the crude oil prior to its transport to Prigorodnoye will make the oil lighter and less persistent (although the degree of alteration will depend on the ratio of the two components in the mixture. Tankers leaving the Aniva Bay terminal will carry the blended oil.

Tanker spills of Vityaz crude oil will not be covered by current international compensation conventions, which do not cover vessels carrying “non-persistent” oil. SEIC representatives assured the task force that the company would have adequate insurance to cover all compensation claims for spill-related damages from tankers and other sources, and costs of all responses and cleanup necessary to protect western gray whales and their feeding habitat.

Diesel fuel and heavy fuel oil (HFO) also may be spilled. Diesel is used to power supply vessels, generators, and ancillary equipment on platforms and vessels. HFO is used as a bunker fuel by tankers and passing cargo vessels. Diesel fuel generally is held in small quantities (a few to several hundred tonnes) and also is classed as a light, non-persistent oil. Its persistence is slightly higher than that of Vityaz crude oil. If spilled, diesel would likely behave in a manner similar to Vityaz crude oil.

In the Sakhalin II project area, tankers moored at the Okha storage terminal near the Molikpaq platform use HFO as fuel. The Okha terminal may be decommissioned during 2008 and HFO will no longer be used by Sakhalin II platforms and vessels operating in the area. Subsequent risks of HFO spills in the WGW feeding areas most likely will be from non-SEIC sources such as passing vessels. The main risk of an HFO spill is in Aniva Bay from visiting tankers (which may carry 2,000 tonnes or more of HFO), other vessels operating in the port, and bunker re-fueling operations at the terminal and in the port. HFO has quite different properties from diesel fuel and Vityaz crude oil. It is viscous, highly persistent, shows little or no tendency to evaporate or naturally disperse, is resistant to

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[6] Refer to the IOPC Fund website http://www.iopcfund.org.

treatment by chemical dispersants, and may form stable and persistent water-in-oil emulsions.

3.2 Weathering and fate

Laboratory studies have investigated the physical and chemical properties of Vityaz crude oil, its reactions to dispersants (when fresh or weathered), and its tendency to form water-in-oil emulsions. Future research will continue to focus on emulsions, and will investigate the oil's response to burning (including the nature of burn residues) and its propensity for biodegradation.

Laboratory studies cannot fully replicate field conditions because of variation associated with physical scaling factors. Although open ocean studies of Vityaz crude oil properties would be useful to understand its behavior when spilled, such tests are unlikely due to regulatory restrictions.

Based on laboratory data and previous observations of spilled light oils, slicks of spilled Vityaz crude oil in open water can be expected to spread and break up quickly due to evaporation and physical dispersion. Conditions favouring formation of water-in-oil emulsions will slow this process. Low temperatures are expected to increase oil viscosity and slow natural dissipation. Moderate or strong winds and wave action will increase evaporation and natural dispersion rates. However, in windy conditions spilled oil may form narrow windrows rather than spreading rapidly, and such windrows may reach shore as liquid or emulsified oil. Windrow formation may facilitate recovery at sea if working conditions for response crews and equipment are within tolerable limits.

Vityaz crude oil may be amenable to the use of chemical dispersants in certain circumstances. However, the rapid evaporation and spread of spilled oil and resultant thinness of the surface film is expected to reduce the effectiveness of dispersants in the open sea. The available time window for dispersant use is likely to be limited to perhaps only a few hours after a spill.

Laboratory studies indicate that the specific gravity of spilled Vityaz crude oil likely will not rise to greater than 1.0 during the weathering process. Thus, neither the freshly spilled oil nor any weathered residues are expected to sink. However, oil can be incorporated into the upper water column through wave action and, as noted, through the action of chemical dispersants. These mechanisms may transfer oil to shallow-water benthic communities. The Task Force recognized concerns regarding use of dispersants near WGW feeding areas, where oil dispersed into the water column could adversely affect benthic invertebrate populations that are prey for whales (see also sections 6.2-6.4 and 7.4.3).

Spilled crude oil generally is more persistent at sea if water-in-oil emulsions are formed. These emulsions form more easily and are more stable once the oil has weathered and lost the most volatile fractions. Laboratory studies with Vityaz crude oil suggest that water-in-oil emulsions will separate back to oil and water components in calm conditions. However, the time required for separation is not precisely known and requires further investigation. In the presence of sea ice, persistence of oil or emulsions can be expected to increase in open-water leads because of greater oil viscosity in lower temperatures and reduced wave exposure secondary to the buffering effects of the ice.

Overall, the high volatility of Vityaz crude means that large volumes of persistent residues are unlikely. Traces of oil remaining after natural or chemical dispersion and cleanup are expected to biodegrade, although rates of biodegradation cannot be predicted. SEIC representatives reported that SEIC will conduct further studies on this topic.

As noted above, weathering and persistence of spilled diesel fuel are expected to be similar to those of Vityaz crude oil. Here, too, cold temperature and ice will slow these processes. Also as noted above, spilled HFO is likely to behave differently and usually requires an extensive cleanup effort to minimize exposure of sensitive areas and resources. Its high persistence means that HFO has the potential to travel considerable distances if it is not recovered.

3.3 Toxicity

Toxic effects of Vityaz crude on marine organisms are not well known. Light and non-persistent oils often exhibit greater toxicity than more persistent oils, usually because lighter components are much more biologically active and can disrupt metabolic systems when they penetrate tissues. However, the likelihood of impacts is reduced by the short time they are present in quantity due to evaporation, natural dispersion, and dilution. By contrast, heavy oils like HFO generally have low toxicity and exhibit their worst biological impacts through direct contact, ingestion or smothering.

Toxicity also depends on the proportion of aromatic compounds in the oil. Many crude oils have relatively low proportions of aromatics. During the Task Force workshop SEIC staff did not have ready access to data on proportions of aromatic fractions in Vityaz crude oil, but **they agreed** to provide what was known about aromatic constituents to the Task Force.

The main mechanisms for potential impacts on WGWs are through inhalation of volatiles in the air, contact with oil spread as a slick on the water surface (eyes, skin, and baleen), and ingestion of oil with a food source (oil dispersed as droplets in the water column or incorporated in the benthos). As pointed out in the original ISRP report, the significance of such impacts on WGWs through these mechanisms is unknown (see also section 6.3). In many circumstances small spills are expected to evaporate, disperse, and become diluted before reaching WGW feeding areas. This may not be the case for larger spills or where windrows or emulsions form. In such cases, oil could reach either the near-shore (shallow-water) or offshore (deep-water) feeding areas in significant quantities. In deep waters, dilution might reduce the potential for impacts on WGWs although contact with and inhalation of volatiles at the surface may still be possible. The **task force agreed** that the potential for WGWs to contact spilled oil would be greater in shallow-water feeding areas.

The task force discussed whether cleanup of oil should be attempted if it is present in recoverable or chemically dispersible quantities in or near the shallow-water Piltun feeding area. **The general consensus within the task force was** that recovery might be beneficial, but would only be feasible in waters deeper than 10m because of vessel operational constraints. The task force also noted that severe weather conditions may well place recovery of spilled oil beyond reasonable human control or intervention. Such conditions could be expected to cause considerable natural dispersion of oil, including in nearshore locations such as the Piltun feeding area.

4 OIL SPILL RISK

4.1 Pipelines and leak detection/monitoring

Oil may be spilled as a result of an accident at a platform, on a pipeline, or involving a vessel carrying crude oil, liquid natural gas, or fuel. Although many types of spills may be readily detected, a considerable amount of oil could be spilled from a pipeline without immediate detection. Operating at full capacity, the pipelines will transport 70,000 barrels of oil per day (bbl/d). The leak detection systems used with the pipelines are capable of detecting leaks of 1% or greater. Hypothetically, a leak approaching 700bbl/d could go undetected by the leak detection system.

Concerns about detection of pipeline leakage have been noted and discussed by preceding panels and SEIC. Based on the Lenders' Workshop (Vancouver I, September 2005, Status of Issues Table, item 12.2), the scientists' panel summarized its understanding of SEIC efforts to detect such leaks to include "opportunistic daily crew-change flights, dedicated weekly flights of the whole pipeline, annual assessment using a subsurface remotely operated vehicle (ROV), ROV assessment after major storm or other events, monthly cleaning pigging, and 5-year intelligent pigging of the pipeline." Based on that understanding, the panel considered this issue to be closed for its purposes and deferred any future consideration to the anticipated independent review body (WGWAP). The issue was revisited and monitoring measures reaffirmed at the April 2006 IISG meeting (Vancouver II).

The issue was raised yet again at the oil spill task force workshop to ensure that new SEIC staff were aware of and planning to carry out the pipeline surveillance program as outlined above. **SEIC staff acknowledged** previous commitments and stated that to their knowledge the program as outlined was being incorporated into a master maintenance schedule to ensure implementation.

4.2 Natural hazards

The pipelines associated with Sakhalin II are exposed to several types of natural hazards, including earthquakes, typhoons, and ice gouging. **The task force reiterated** the importance of additional pipeline monitoring whenever a seismic event or typhoon occurs close enough and with sufficient force to potentially affect the pipeline. As noted above, **SEIC concurred** that supplemental surveillance is necessary after such events to confirm the integrity of the pipeline.

The task force discussed the potential for ice gouging of the pipeline. Previously, the ISRP reported that: "Ice scouring of the seabed occurs in water shallower than 30m and the pipeline must be buried to depths between 2m (in water 25m deep) and 7m (at shore) to protect it from the ice." This is deeper than existing records of scour depth and deeper than originally proposed to protect the pipeline from both scouring and shifting of the seabed, as noted in the 2005 Comparative Environmental Assessment completed by SEIC. Based on the increased depth of burial, **the task force concurred** that the risk of ice gouging of the pipeline appears to be negligible.

To ensure the integrity of other infrastructure, SEIC conducts annual ROV surveys of scour protection around the platforms, the legs of the platforms, and the ice abrasion plates on the hull of the Molikpaq platform as well as its cathodic protection anodes. These inspections are part of the company's planned annual maintenance schedule.

The "Topsides Induced Acceleration Monitoring System" detects earthquake-induced accelerations of platform "topsides" (i.e. superstructure) of between 0.1 and 1.0g. This system initiates an emergency shutdown when acceleration exceeds 0.5g. SEIC indicated that, when such an event occurs, an inspection as described in the preceding paragraph would be carried out.

4.3 Vessels

Pipeline transfer of oil from the PA-A (Molikpaq), PA-B, and Lunskoye platforms will reduce substantially the risk of an oil spill compared to the system initially in use at the PA-A platform. There, the oil has been, and still is being, transferred by a short pipeline (1 km) to the Okha floating storage facility (a large, anchored vessel), then transferred again to another vessel (tanker) for transport to the market place. The new pipelines will eliminate the risk of spills associated with this floating storage facility and transfer process. The pipelines will transfer the oil ashore and down the length of Sakhalin Island to Prigorodnoye and Aniva Bay, where it will be loaded onto tankers at the newly constructed tanker loading facility.

Three issues were raised regarding possible interactions between spills in the Aniva Bay area and WGWs or their habitat. The first issue pertained to the potential for spills in the Aniva Bay area to reach or affect WGWs or their feeding areas off the northeastern coast of Sakhalin. **SEIC described** their efforts to model oil spills in Aniva Bay and, based on the results, suggested that spilled oil would not likely reach the feeding areas given potential spill locations and seasonal weather patterns. **SEIC agreed** to look again at their modelling to confirm this conclusion and better quantify whether vessels approaching from the east to Aniva Bay posed any different risk (see below).

The second issue pertained to the potential overlap of WGW migratory routes and spill trajectories in and near Aniva Bay and toward La Perouse Strait. The possibility that whales will encounter spilled oil during this phase of their migration depends on the location of the spill (whether from a tanker or at the tanker loading facility), its geographical spreading and persistence, and the season in which the spill occurs (i.e., WGWs occur near the southern end of Sakhalin Island primarily during their spring and fall migrations). A spill in this area poses a potential risk to WGWs. The response would depend on a number of factors, including numbers and anticipated movements of whales at immediate risk; volume, type, and anticipated trajectory of spilled oil; and safety factors for response teams.

The third issue involved potential future changes to shipping patterns. Shipping traffic may increase in the North Pacific due to changes in global climate patterns. Russian authorities may ask SEIC to respond to third-party spills from passing cargo vessels and tankers. SEIC advised that they have no plans to supply crude oil to American ports, but they are anticipating the shipment of liquid natural gas (LNG) to Mexico. If such shipments occur, vessels inbound and outbound from the eastern approaches to Aniva Bay present the additional risk of HFO spills. Should such changes in vessel traffic occur, **the task force agreed** that it would be prudent to model the potential increase in risk from an oil spill and implement precautionary measures according to the results.

Despite the shift in location of tanker loading to Aniva Bay, vessels that are used to support oil and gas operations (e.g., standby vessels at the platforms, crew change vessels, and vessels used for moving equipment and supplies) still pose some level of risk to the feeding grounds. These vessels may be accidentally disabled and the oil or fuel that they carry may be spilled. The risk of a spill from a disabled vessel may be reduced if other vessels in the area are able to lend assistance. This issue was discussed briefly for the purpose of ascertaining the number of vessels operating or on standby in the area and the likelihood of assistance for a disabled vessel. Standby vessels will be present at each of the platforms, and the platforms will be visited regularly by other support vessels. The capacity of standby and crew change vessels to respond and assist a disabled vessel will undoubtedly vary depending on conditions and may be limited to rescue of personnel. This is an area where **further consideration is needed** to determine if more can be done to prepare vessels associated with Sakhalin II, Phase 2 to provide assistance under such circumstances.

5 CONTINGENCY PLANNING & EXERCISING

5.1 Issues raised in Panel review

The company's oil spill response (OSR) plans for Piltun-Astokh, Lunskoye, and Prigorodnoye and the corporate plan were initially reviewed in mid-2007, after which WGWAP members on the oil spill task force determined that a site visit was needed to ensure that the final review would be comprehensive. Reeves, Dicks, Tsidulko, and Roberts visited Sakhalin Island in July/August. SEIC facilitated visits to equipment stockpiles, arranged meetings with response and Health, Safety, and Environment (HSE) staff, and provided opportunities to visit key locations such as the beaches adjacent to the near-shore WGW feeding area and Piltun Lagoon.

Observations during the site visit indicated that the company has made good progress in developing its response resources, that it has stored considerable quantities of high quality response equipment, and that it has plans to add more resources. The combination of quality equipment, trained personnel, and equipment storage facilities suggests that SEIC has an appropriate spill response capability for the types of oil that could be spilled. The findings of the site visit addressed many of the issues raised in the preliminary review of the OSR plans. However, a number of outstanding issues and concerns remained and were itemized for discussion at the task force workshop. After the site visit, SEIC has continued its development of the OSR plans and revisions that address identified concerns are noted below.

Lender representatives at the task force workshop briefly outlined their review process, which in many ways paralleled that of the WGWAP review, identified many of the same issues and concerns, and resulted in similar findings. Although the WGWAP review focused on potential effects on WGWs, the lenders’ review evaluated the plans using international and oil industry standards for resources, training, and environmental considerations. The lenders’ review also considered whether SEIC plans would meet Russian regulatory requirements. Overall the lenders’ review concluded that the plans are of a quality that meet or exceed many international and industry criteria and that they comply with regulatory requirements. The review concluded that the plans therefore are not an impediment to provision of a loan.

The task force was reassured by the similarity in findings of the two reviews, which increases confidence that the review process has been comprehensive and that important outstanding issues and potential problems with the plans and spill response capabilities have been identified for corrective action. The most important concerns pertained to worst-case scenarios, limitations to effective spill response imposed by adverse weather and winter ice, equipment maintenance and training schedules, some specific response techniques such as dispersant use and *in situ* burning, and the use of net environmental benefit analysis (NEBA). WGWAP has been particularly concerned about best- and worst-case response capabilities given the remote and difficult working environment along the northeast coast of Sakhalin. These issues are all discussed in greater detail in Sections 5.2, 6 and 7 (below). SEIC representatives suggested that they had already addressed many of the issues raised by the subject reviews and had adopted a number of prudent best practices to suit local conditions on Sakhalin Island, rather than just complying with international/industry best practices.

SEIC representatives outlined recent regulatory changes and stated that they have developed a practical working relationship with the regulators. Nevertheless, it also was clear that the authorities could step in and take control of an incident if they deemed it necessary, which could mean that response activities would not necessarily be under SEIC's control (see also section 7.1).

SEIC continues to revise the plans in response to developing Russian regulations and review comments. In the Health, Safety, Environment, and Social Action Plan (HSESAP), SEIC stated that, with two possible exceptions, it would have in place approved Oil Spill Response Plans at least six months prior to first oil. The two possible exceptions involve the onshore pipeline and Prigorodnoye onshore LNG plant. **SEIC representatives emphasised** that no oil will be introduced to any asset until it is covered by an approved plan for which all the equipment is in place and the relevant personnel have received the necessary training.

SEIC representatives were asked about a date for first production-scale extraction of crude oil ("first oil"), which earlier had been estimated to be December 2007. SEIC representatives indicated that the estimated date of first oil was being revised, but was not yet available for public release.

5.2 Exercising under realistic conditions

Previous panels strongly emphasized the importance of preventing oil spills. Once a spill occurs, options for responding are complicated by the fundamental difficulty of recovering oil in the marine environment. The difficulty is exacerbated by the remote locations of platforms and pipelines, the harsh environmental conditions under which recovery may have to occur (e.g., winter ice conditions), and the multiple lines of authority and communication that must be coordinated to promote efficient and effective response and to ensure the safety of responders.

To ensure that responders are as well prepared as possible, previous panels recommended that responders take part in frequent training and practice exercises to enhance response capacity. The oil spill task force discussed the need for exercises under conditions that might be expected in the Piltun area, including winter conditions. Such exercises are necessary to ensure that responders are trained under various spill scenarios. Safety of personnel is a primary consideration in both practice and real spill scenarios, and training and practice are essential to maximize both response effectiveness and safety. Repetition of such activities is necessary to ensure that members of the workforce, which will change over time, are fully up-to-date with their training and that the overall effectiveness of response capabilities does not erode over time.

SEIC staff described annual emergency exercises that are planned at different levels and with different objectives. The purposes are to prepare for a variety of emergencies including, but not limited to, oil spills. Exercises include mobilization of the Emergency Control Centre and the Crisis Management Teams. In addition, subunits within SEIC hold their own exercise drills. For example, the pipeline team will conduct a river exercise in March 2008.

SEIC also is planning annual exercises with oil spill equipment to give response teams an opportunity to practice. The nature and timing of the exercises are varied to emphasize different skills and needs. Two offshore exercises are planned in the near future, one in pancake ice conditions in mid December 2007 and the other in flowing mature ice conditions at the end of March or in early April 2008.

SEIC oil spill response training will involve both theoretical (desktop) and practical exercises. Desktop exercises are held annually, tactical field exercises are held twice each year, and large-scale combined exercises (desktop and field) are held for two days every three years. Exercises may simulate Tier I, II, or III spills. Training includes descriptions of oil spill hazards to health, wildlife, and the environment; fire prevention; first aid; rescue and repair; waste management; and general response rules. Contractors involved in oil spill responses also must demonstrate their preparedness.

5.3 Effectiveness of exercises

The task force discussed various measures of training effectiveness. Potential measures include the speed, accuracy, and completeness with which responders carry out their respective tasks; the operability of equipment and the availability of supplies; the level of coordination among responders; the level of effective communication among authorities and decision-makers; and the safety with which all field measures are undertaken. Realistic exercises will require responding to scenarios that are not excessively scripted in advance. Results of exercises should be evaluated and used to modify planning activities in a timely manner and as appropriate.

5.4 Completion of practical planning documents

Reviews by both the panel and the lenders found the plans to be overly complex. Such complexity might encumber the selection and implementation of the most appropriate response options for WGWs. SEIC stated that the documents had been prepared in a format required by regulations and that the company was developing site-specific, simplified OSR handbooks; several have already been placed on SEIC’s web site with more to follow. SEIC also suggested that the regulators, although firm in their approach, were open to adaptation of the plans to ensure the use of best practices and to meet environmental concerns. In addition, SEIC stated that as OSR plans are revised in relation to technical concerns or regulatory changes, the company adjusts the handbooks so that they are consistent with plan requirements. The task force examined one handbook and discrepancies between it and the OSR plan were noted. **SEIC representatives indicated** that the discrepancies would be resolved.

6 OIL SPILL IMPACTS

6.1 Sensitive areas/sites

The task force agreed that the Piltun (nearshore) and offshore feeding areas warrant priority protection because of their potential sensitivity to spilled oil and the significance of such impacts for WGWs. **The task force also agreed** that, for a number of reasons, protection of Piltun Lagoon from oil spill impacts is a priority.

The task force agreed that WGW migratory corridors were of less significance as sensitive areas and do not warrant the same level of consideration (see also section 4.3). In addition, the corridors are not well known or described for this whale population. In any event, response to oil spills in areas used by migrating whales would depend on the source, condition, and location of spilled oil, the number of whales present and their risk of contact with the oil, safety considerations for response personnel, and overall assessment of potential environmental benefits and costs of a response effort.

The task force briefly discussed changes in the priority of sensitive areas in different seasons. Members recognized that other species and resources also warrant consideration in response planning, and that their vulnerability to spilled oil varies by season as is the case with WGWs. For example, economically significant salmon populations would warrant high priority concern during seasons when salmon are present. Similarly, shorebird populations and various seal species may be vulnerable to oil in the water and on the beaches, and the risk to such species must be factored into response operations.

6.2 Net Environmental Benefits Analysis (NEBA)

Once oil has been spilled, decisions need to be made urgently about the options available for cleanup, so that environmental and socioeconomic impacts are kept to a minimum. Getting the correct balance is always a difficult process and conflicts inevitably arise. The advantages and disadvantages of different response options need to be compared with each other and with the advantages and disadvantages of natural cleanup, a process sometimes known as Net Environmental Benefit Analysis (NEBA).

NEBA requires taking into account the circumstances of the spill, the practicalities of cleanup response, scientific understanding of the relative impacts of oil and cleanup options, and judgement regarding the relative importance of social, economic and environmental factors. The decision-making process is greatly facilitated if contingency planning has included reviews of environmental and socioeconomic information, appropriate consultation, and advance agreement by all relevant organisations. The NEBA concept has evolved over the past several decades in response to management challenges posed by oil spills and other forms of anthropogenic environmental damage, and to date has lacked clearly defined procedures and protocols. There is some recognition of the need to improve this situation. For example, the National Petroleum Office of the U.S. Department of Energy has funded the Oak Ridge National Laboratory to develop a procedural framework for NEBA implementation, with particular attention to applications for oil spill responses (see http://www.ornl.gov/info/reports/2003/3445605367625.pdf).

The task force discussed the use of NEBA to assist with selection and implementation of oil spill response actions (see also section 5.1). Such use can be straightforward where only one sensitive resource is at risk and response techniques can be chosen to keep impacts to a minimum. The situation is more difficult when several resources are at risk, as options that favour protection of one resource may harm others. For example, dispersants may introduce and stabilize large quantities of floating oil into the water column where they are less likely to harm seabirds but more likely to harm fish. NEBA processes are intended to help resolve such conflicts.

NEBA also may be used to determine when response efforts should be stopped. Not all situations involving oil spills will be improved by active response. NEBA may reveal that circumstances favour a restrained rather than an aggressive response. Excessive response can jeopardize the safety of response personnel and further damage the species or resources for which protection is desired. Many such cases are documented in the literature on oil spill response.

Such matters are best resolved during the planning process, rather than in the heat of spill response when emotions run high and striking a sensible balance between alternatives may prove difficult. SEIC representatives stated that they were expecting in the near future to start NEBA discussions with the regulators as a continuation of the process of developing their plans.

Most workshop participants were comfortable with the concept of NEBA and its use in decision-making. However, some participants expressed reservations about NEBA because of the absence of explicit definitions and protocols.

6.3 Impact on whales – oil and response activities

The potential direct impacts of spilled oil on WGWs would likely involve contact of liquid residues with skin, eyes, or baleen, or inhalation of evaporated residues (see also section 3.3). The task force acknowledged that consequences to the health of WGWs from such contact are uncertain. The group discussed known effects of contact with spilled oil in other marine mammal taxa. Sea otters and pinnipeds are known to experience physiological damage from contact, inhalation, or ingestion of spilled oil or the evaporated fumes thereof. Killer whales in Prince William Sound, Alaska, experienced increased mortality following the Exxon Valdez spill in 1989, although the mechanisms causing that mortality are not known. **Task force members agreed** that existing information on other taxa does not necessarily provide a reliable basis for predicting effects on WGWs.

The task force also discussed the likelihood that WGWs would avoid physical contact with spilled oil. Sparse information from the Platform A event (Santa Barbara Channel, California, 1969) suggests that gray whales either cannot or do not avoid contact with floating oil. Anecdotal information also suggests that gray whales will swim through surface slicks produced by natural oil seeps. Nonetheless, **the task force agreed** that the available evidence is not sufficient to confidently characterize the likelihood of contact avoidance by gray whales.

Spill response activities may introduce additional risk factors including vessel and aircraft noise, ship strikes, toxicity from dispersants, and entanglement in floating booms. SEIC representatives stated that oil dispersants would not be applied in or near WGW feeding areas. **The task force acknowledged** this position, but it also recognized the potential benefits from using this technique in or near the offshore feeding area in exceptional circumstances, where targeted and limited use of dispersants may lead to a better environmental outcome (see section 7.4.2).

The task force expressed concern about potential negative effects of noise and elevated risks of ship strikes associated with response vessels near whales. At the same time it acknowledged the vessel noise may be useful for hazing whales to move them away from floating oil (see also section 7.4.3). Further discussion of the subject of vessel noise impacts on WGWs was expected at the WGWAP meeting immediately after the task force workshop.

The task force discussed the potential for WGW entanglement in oil containment and deflection booms deployed as part of spill response activities. **Participants agreed** that boom design and configuration are such that entanglement risks are low. In addition, deployed booms typically are tended by response personnel, allowing movement of booms away from approaching whales if circumstances warrant.

6.4 Impacts on feeding grounds

Potential impacts of spilled oil on WGW feeding grounds have been the focus of substantial discussion at all panel meetings since formation of the ISRP by IUCN in 2004. The task force also discussed this issue at length. In particular, it discussed the properties of Vityaz crude oil as they pertain to the probability of an oil spill reaching the WGW feeding grounds and causing damage to benthic prey populations (see also section 3.1). The discussion focused on the consequences of several interrelated aspects of the oil: viscosity, specific gravity, proportional composition of volatile components, and behavior of spilled oil under conditions that might facilitate formation of water-in-oil emulsions. Crude oil with a high proportion of volatile components is likely to change rapidly after spillage at sea, but has higher relative toxicity as compared to crude oil with smaller proportions of volatile components. The propensity of crude oil to form water-in-oil emulsions when spilled is also a critical element in response planning. The formation of stable emulsions slows natural evaporation and other processes that dissipate the oil. Thus, emulsified spilled oil can be expected to persist longer and travel farther from the spill site.

The task force considered what conditions might result in oil entering the WGW feeding grounds and affecting the whales' food resources. Given its chemical and physical properties, Vityaz crude oil spilled at sea is likely to evaporate rapidly and travel minimal distances, as compared to heavier crude oils. This behavior would reduce potential impacts on the marine environment. In contrast, the oil's natural dispersion before evaporation and tendency to form emulsions increase the oil's persistence and the likelihood of oil reaching shallow waters and shorelines. In deep water, natural dilution reduces the likelihood of significant impacts from a spill. Natural dispersion of Vityaz crude oil in shallow waters or remobilization of oil on beaches into shallow near-shore waters by wave action presents the greatest chance for interactions between spilled oil and the benthic organisms that form the food resources for WGWs.

Oil spills near feeding areas also could involve diesel fuel or HFO (see also sections 3.1, 3.2, and 3.3). Industry service vessels that will be operating routinely near Sakhalin II platforms and pipelines typically use diesel for fuel, and they could produce spills with a risk of impacts on WGW feeding areas or Piltun Lagoon. Diesel fuel also is stored on platforms and vessels to power electrical generators and other equipment. However, diesel fuel shares many of the properties of Vityaz crude oil and may behave in similar ways following a spill. Rapid evaporation and weathering and minimal dispersal distances are typical of diesel fuel spills at sea. In addition, stores of diesel fuel on vessels and platforms typically are small, such that a large diesel fuel spill near the whale feeding areas is unlikely under patterns of activity currently anticipated by SEIC.

Spills of heavy fuel oils near the whale feeding areas are not expected to occur in association with vessels, platforms, or pipelines operated by SEIC once year-round production begins (i.e., Phase 2 of the Sakhalin II project). During the 2007 season, tankers were transporting oil products from the Okha storage terminal near the Molikpaq platform, presenting a risk of heavy fuel oil spills until the normal seasonal closure of the Okha terminal, and this risk is expected to continue through 2008, or until the Piltun-Astokh pipeline is activated, which will eliminate the need for the Okha terminal. However, vessels not associated with the Sakhalin II project and not under the control of SEIC may present a risk of heavy fuel oil spills in the vicinity of WGW feeding areas over the long term. To date, companies responsible for other oil and gas operations off northeastern Sakhalin Island have not participated in the WGWAP process.

As described above, heavy fuel oils spilled at sea are expected to behave quite differently from Vityaz crude oil or diesel fuel due to their higher viscosities and specific gravities, lower proportional contents of volatile components, and higher probabilities of persistence once spilled, among other differing properties. Although **the task force** perceived a minimal risk of a HFO spill near sensitive areas for WGWs after 2008, it **recognized** that such a spill is plausible and would require a different response strategy as compared to responses for spilled Vityaz crude oil or diesel fuel. The natural dispersibility of HFO is very low and this type of oil would not be amenable to chemical dispersion, so the likelihood of HFO reaching benthic communities in the WGW feeding areas is probably lower than for Vityaz crude oil, given the occurrence of a spill near the feeding areas.

The task force discussed at length a document entitled “Screening Assessment of Potential Oil Spill Impacts on the Food Resources of WGWs Feeding near Sakhalin Island, Russia” (Shell Global Solutions, Inc., September 2005). The report begins by summarizing results of a previous study on probabilities that spilled oil from SEIC platforms or pipelines might reach WGW feeding areas. Contact probabilities ranged, among seasons (spring, summer, autumn), from 6 to 22% for the Piltun area and 25 to 49% for the offshore area. The document then describes a study intended to estimate the proportion of WGW feeding areas that might be rendered toxic to prey of WGWs as a result of spillage, movement, weathering patterns, incorporation to sediments, and residual toxicity. The study was based on a sequence of interrelated models, and used substantial information on oil spill behaviour, toxicity estimations, and whale foraging collected through reviews of literature for studies carried out in locations other than the Sakhalin II project area, to inform model development and parameterisation. Model outputs were developed for three hypothetical oil spill sizes (50, 500, and 5,000 m^3), and three spill locations (Molikpaq and PA-B platforms, and the southern segment of the submerged pipeline that will deliver crude oil from the platforms to the onshore pipeline at Chaivo Lagoon). Model runs with spills from Molikpaq used assumed wind and current directions that would move spilled oil directly from the platform to the offshore feeding area (minimum travel distance ~25nm). Runs with spills from PA-B and the pipeline assumed wind and current directions that would move spilled oil from the respective sources to the Piltun feeding area (minimum travel distances ~4 and ~8nm for PA-B and the pipeline, respectively). The assumptions for wind and current direction and strength were intended to simulate worst-case conditions for rate of movement of spilled oil. The models incorporated a series of assumptions about evaporation rates and other weathering processes, by chemical component of Vityaz crude oil, to estimate likely compositions of spilled oil residues on contact with feeding areas. The models also included procedures for estimating rates of incorporation of spill residues, again by chemical component, into the sediments of the feeding areas, and consequent toxicity rates for benthic species that are known prey of WGWs. Finally, a model run was completed for a case in which typical sandy substrata in the feeding areas were replaced with a hypothetical muddy substratum. The substitution was meant to approximate a worst-case scenario, based on the predicted higher rate of adherence of spilled oil residues to muddy substrata as compared to sandy substrata.

Model outputs projected no toxic impact of any spill scenario from the Molikpaq platform on the offshore feeding area, or from the pipeline on the Piltun feeding area. Outputs estimated short-term toxic effects on benthic prey of WGWs, due primarily to dispersed or dissolved oil residues in the water column, for ~0.3% of the bottom area in the Piltun feeding area for spills from the PA-B platform. The results also predicted that spill residues would not be incorporated into sandy substrata. For the muddy substratum substitution, toxic levels of polycyclic aromatic hydrocarbons were predicted to occur in ~0.1% of the Piltun feeding area. The overall risk assessment indicated probabilities of impact on Piltun area sediments at 0.002-0.07% of the bottom area.

The task force discussed at length potential sources of uncertainty in the model results, including the toxic properties of Vityaz crude oil. Absent such information, the modeling exercise was forced to rely on data from other locations and oil types that may or may not have properties similar to Vityaz crude oil. Other concerns about model application centered on the validity of using laboratory studies to estimate weathering and emulsification properties of Vityaz crude oil. Laboratory studies of spill characteristics are constrained by scaling issues and some known behaviours of spilled oil at sea, such as formation of windrows in strong winds, are not apparent from laboratory data. In addition, the maximum spill size ($5{,}000m^3$) used in the modeling study may be substantially less than the spill volume in a worst-case occurrence such as a platform blowout. At the end of the discussion, **task force members reached differing conclusions** regarding the utility of the modeling exercise for predicting spill behavior and guiding spill response.

The task force did agree, however, that *available* information favours the view that oil spills associated with SEIC platforms and submerged pipelines do not pose a significant risk to the prey species of WGWs in the two known feeding areas. Nevertheless, **the task force agreed that**, should a spill occur, monitoring would be essential to evaluate potential contamination and compare findings with pre-spill data (see below).

The task force had a lengthy discussion about options for SEIC oil spill response protocols for feeding areas, given available information and model outputs. Members were informed that regulatory authorities for the Sakhalin II project area are likely to ask SEIC to muster an active response to spills that could pose a threat to feeding areas even if model predictions suggest only minimal impacts. A directive for active response would be particularly likely if observed or projected impacts of spilled oil were localized in space. **The task force agreed** that spilled oil containment and recovery efforts should be implemented on the shortest possible timeline, and should be deployed as close as possible to the source of any spill.

The task force also discussed possible response protocols for cases in which containment near the spill source had failed, spilled oil had become dispersed, and projections indicated movement of oil toward the Piltun feeding area. **The task force agreed** that response options involving disturbance of floating spilled oil or shallow sediments near the shoreline should be avoided because of the risk that such disturbance would increase the amount of contact of spilled oil with sediments that provide habitat for whale prey populations. Also**,** in some cases serious consideration should be given to allowing the oil to strand on beaches, where manual cleanup could be pursued without the risk of incorporating spilled oil into subtidal sediments where whale prey reside.

The task force discussed the advisability of an *a priori* decision to allow spatially dispersed spills of light oils in small quantities to strand on beaches without recovery or containment efforts on the water. Shoreline circumstances, however, may require alternative approaches. For example, an effort might be made to prevent oil from reaching a beach that is occupied by large numbers of resting seabirds. Such alternatives may be particularly important for protecting vulnerable wildlife such as shorebird species (e.g. dunlin, greenshank, Steller's sea eagle) and haul-out sites used by pinnipeds (e.g. largha, ringed, and bearded seals). Response options will need to address such potentially conflicting objectives. **The task force agreed**, however, that the critically endangered status of the WGW population should be taken into account when such decisions are made.

The task force agreed that oil spill response plans should include efforts to document effects of an oil spill on benthic communities in the whale feeding areas, and that such efforts should be carefully coordinated and integrated with pre-spill monitoring programmes (see section 6.5 below). **It also agreed** that the primary elements of the existing benthic monitoring programme led by Dr. V.I. Fadeev should be maintained through and following any oil spill event that may have affected either of the WGW feeding areas. **The task force further agreed** that the existing monitoring effort should be enhanced in the event of a spill, drawing on the best available protocols for sampling based on the technical literature on oil spill response, adding additional sampling stations as appropriate in the vicinity of the spill impact area, and decreasing the sampling interval during the period immediately following the spill to document impacts with greater resolution. The details of a post-spill monitoring response may vary depending on the timing of the event. Benthic monitoring typically occurs during mid-summer when weather and sea conditions tend to be most favourable. Should a spill occur in summer, the monitoring effort could proceed as normally scheduled in the pre-spill situation, incorporating some changes in sample distribution and temporal frequency as noted above. A monitoring response during a winter spill likely would be unsafe for participating personnel, and winter conditions likely would make any monitoring programme either infeasible or unrealistic. Should a spill occur in spring or autumn, monitoring efforts should be separated from the normal mid-summer sampling work for the purpose of assessing the earliest phases of ecosystem disturbance and recovery. Generally, monitoring should continue, with increased sampling density in and near affected areas, until data indicate that community recovery has occurred (see section 8.3 below).

6.5 Pre-spill monitoring

The task force discussed the value of current efforts by SEIC to monitor benthic communities and benthic habitat characteristics in the two WGW feeding areas. This matter has been the subject of frequent discussions over the life of WGWAP and preceding panels.

The report from the Lenders' Workshop (Vancouver I, September 2005) recommended that monitoring of WGW feeding areas should include a permanent array of sites for sampling benthic biota and physical and chemical variables over time. In response to the recommendation, SEIC representatives indicated that they saw “no significant value” to “prey and physical studies of this nature.” Nevertheless, company representatives stated that they were in the process of commissioning “background hydrocarbon monitoring,” that this monitoring would continue “through operations phase and post-spill,” and that they were “currently developing spill and post-spill monitoring plans and procedures.”

Several months later (Vancouver II, April 2006), the report of the IISG recommended that SEIC should “commit to and undertake a long-term environmental monitoring program to determine if undetected leaks and spills are contaminating the environment around or downstream of the platforms and pipelines.” The report also provided detailed advice on how such a programme should be structured and carried out.

At the two previous WGWAP meetings, Dr. Fadeev presented detailed information on sampling activities and benthic communities in the two feeding areas, based on SEIC-supported field work carried out during summer months over the last several years. Samples also had been taken for measurement of physical and chemical properties of sediments in the feeding areas, in the interest of characterising habitat properties on which whale prey and other benthic species depend, and for documentation of “background” levels of hydrocarbon and heavy metal residues in sediments.

The benthic monitoring programme has two primary benefits. The first is to establish current patterns in resident benthic biological communities and in the properties of associated sediments. Comparing these data with those collected following an oil spill will permit quantitative determinations of the spatial and temporal extent and intensity of ecological damage associated with the spill. The second benefit is the ability to determine the extent to which benthic communities might already be experiencing damage as a result of anthropogenic disturbances of lesser intensity or visibility than a major oil spill. Such disturbances might include residual effects of outdated “legacy” petroleum development sites onshore, which may be causing unrecognised damage to the marine environment through seepage of oil, or unrecognized effects of SEIC operations. **The task force agreed** that the absence of high quality “pre-spill” data could result in inappropriate assignment of responsibility to SEIC for damage caused by another party.

Although the studies led by Dr. Fadeev may differ in some details from protocols recommended by WGWAP and predecessor groups, **the task force agreed** that the studies as currently established capture the spirit of prior recommendations, and represent a constructive and comprehensive approach to monitoring of WGW feeding habitats and prey assemblages. **The task force also agreed** that SEIC and collaborating companies should continue to support the survey work by Dr. Fadeev’s team. **The task force further agreed** that sampling of benthic biota should continue to be augmented by sampling of organic and heavy metal residues at as many stations as necessary to provide a statistically defensible basis for comparison with post-spill conditions in the benthic environments of the feeding areas, should a spill occur and reach these areas. Finally, **the task force agreed that** analysis of sediments for hydrocarbon residues should be done using gas chromatographic and mass spectrometric methods to the maximum extent possible, allowing detailed identification and quantification of component hydrocarbons. Such methods permit “fingerprinting” of hydrocarbon residues, thereby allowing identification of origins of the residues.

7 OIL SPILL RESPONSE ISSUES

7.1 Command and control

The OSR plans are based on the concept of tiered response, which allows for escalation of response from company control (Tier 1) to control by local/regional authorities using additional industry or local resources (Tier 2) and finally to control by national authorities using the full range of national resources, often with international assistance or participation (Tier 3). Approximate spill volumes corresponding to these three tiers are inconsistent in planning documents, which has the potential to cause confusion.

For clarification, SEIC representatives presented the following brief summary of their approach to the tiered system. They defined Tier 1 spills to be up to 500 tonnes, Tier 2 spills to be between 500 and 5,000 tonnes, and Tier 3 spills as greater than 5,000 tonnes. In practice, these quantities are guidelines rather than specific cut-off points, recognizing that other factors, such as season, prevailing weather and sea conditions, or resources available for response may also influence the assignment of Tier status to a given spill event.

Spill control is managed under a system called the Unified Command (UC) which involves both company and regulator participation (at the local level the primary regulatory agency is likely to be the Ministry of the Russian Federation for Civil Defence, Emergencies, and Elimination of the Consequences of Natural Disasters [Emercom], also known as the Ministry for Extraordinary Situations [MChS]). If SEIC demonstrates that it is comfortably handling a spill, then it likely would remain in overall control and the spill would remain classified as Tier 1. In such a case, the representative of the local authority in the UC would be expected to monitor response activities and leave the task of cleanup to SEIC, which would be expected to follow the procedures set out in the response plans and handbooks.

Escalation to Tier 2 is likely to be decided by Emercom. Should SEIC resources not be sufficient to cope with the spill (regardless of whether it is larger or smaller than 500 tonnes) or should the response be deemed inadequate or ineffective by the authorities, the spill classification would then be escalated to Tier 2 and Emercom likely would assume command. Local resources (for example, military or local government resources and personnel) would be mobilized to assist with the cleanup and deployed under Emercom direction. This would be most likely if shorelines were oiled as Emercom has shoreline cleanup resources but none for at-sea response. In the event that a spill at sea was deemed sufficiently important, it could be upgraded by Emercom from Tier 1 to Tier 2. However, according to SEIC, in such circumstances Emercom would likely leave SEIC in command as Emercom has no at-sea resources to deploy.

SEIC also reported that, should the combined resources of industry and local/regional authorities prove inadequate, the spill would be escalated to Tier 3, with overall control assumed by federal authorities (probably Emercom or the Ministry of Transport). A Tier 3 response would be expected for a spill of thousands of tonnes and would likely result in deployment of additional federal resources and perhaps a call to neighbouring countries or the industry response cooperatives for additional support. Authorities might also escalate a smaller spill to Tier 3 if the spilled oil crossed an international border.

In all the above scenarios, SEIC understands that it would likely retain control over the company’s own resources and be in a position to deploy them according to the plans. However, **SEIC representatives also made it clear** that the authorities have the right at any time to assume command of the response and to deploy or re-direct resources as they see fit. This essentially "nationalises" SEIC's resources and raises the possibility that the authorities would implement response options that reflect a relatively low priority given to WGWs and their habitat.

Noting the above, SEIC representatives suggested that they have a sound working relationship with the authorities, and particularly with Emercom locally, and that environmental considerations included in the plans likely would be respected, although this could not be guaranteed. In support of this position, SEIC described a recent example of a non-SEIC spill in which the authorities asked SEIC to respond. A dredger, the *Cristoforo Colombo*, had spilled an estimated 50 tonnes of fuel oil. A unified command was established and, according to SEIC, worked well. The process was described by SEIC as improving the working relationship between SEIC and local authorities. In addition, SEIC and authorities have conducted regular command and control exercises, both desktop and in the field, including a 2006 trans-boundary exercise in Aniva Bay.

Another comparatively minor issue discussed by the task force was the turnover of response personnel in SEIC and in relevant local and regional bodies. This has not been regarded as a problem to date and it was the company's view that the effects of turnover could be managed in the future by adhering to the schedule of regular training and practice.

7.2 Personnel

The preliminary review of the plans and the site visit had revealed that SEIC employs some 50 individuals specifically trained in response operations and a further 140 who are less highly trained but familiar with equipment deployment and safety issues. Emercom also has personnel trained in spill response.

SEIC confirmed that this is basically correct, but that numbers of highly trained personnel are to be increased. SEIC provided the following details concerning trained personnel.

OSR/Emergency Response (ER) Teams Available from SEIC Facilities

	Facility /Location		**OSR/ER Team**	**Auxiliary Personnel**
Offshore	Piltun Astokh	MSV 1	Crew (12)	N/A
		OSRV	Crew (12)	N/A
	Lunskoye (MSV)		Crew (12)	N/A
	Prigorodnoye (OSRV)		Crew (12)	N/A
Onshore*	Nogliki		12	40
	OPF		6	
	BS2		16	12
	Sovetskoye		14	12
	Yasnoye		10	12
	Prigorodnoye		8	40
	Kholmsk		8	8

** Currently under negotiation.*

SEIC representatives explained that the company has two classes of trained personnel. The first, classified as "professionals" under the regulatory training requirements, are primarily the offshore vessel crews. They are employed fulltime for spill response, meet regulatory training requirements, and are able to assume command and control of response resources and personnel in the field. Members of the OSR/ER team listed in the table include both SEIC and contractor personnel. Some of these are already classified as professionals under regulatory requirements (mainly contractor personnel maintaining the equipment stockpiles), but these requirements are currently in flux. New regulations, due soon, will identify precise numbers of professionals which the company must have in place, and additional personnel will be trained accordingly. This is expected to result in increased numbers of professionals.

The second group of trained personnel is classified as "auxiliary" and numbers about 200 at present. As noted above, these personnel are said to be familiar with the basics of spill response and company safety policy, and most have some training for operating equipment in the field.

Although these numbers may be sufficient to respond to a Tier I spill under company control, additional personnel from Emercom, the military, and regional, national, or international sources would be needed to respond to Tier 2 and 3 spills**.**

7.3 Logistics

The task force discussed various environmental conditions that will limit SEIC's ability to respond to a spill, such as winter weather, limited daylight in winter months, and poor road access to spill sites. **Task force members were particularly concerned** about the fragility of coastal tracks running along beaches and across or along sand spits and sand dunes.

SEIC reported that access roads are surveyed periodically, particularly at river crossings. Company representatives recognized the difficulties of road access and maintenance in the context of oil spill response, and indicated that the company has placed priority on maintaining roads in usable status at least to the main coastal access points. SEIC representatives concurred that many tracks along the coast are fragile and they assured the task force that where access was difficult or the risk of damage to roads was unacceptable, personnel and equipment would be transported to work sites by helicopter. SEIC representatives also suggested that in certain circumstances it may be feasible, with Emercom and military assistance, to support teams for prolonged periods at advance field bases rather than transporting them to and from work sites every day, depending on weather conditions and considerations of personnel safety. In some places the company might be able to construct additional access roads. Finally, continuing development of the northern part of the island will result in some improvements to the roads, thereby improving access. SEIC representatives reported that considerable attention has been devoted to access difficulties, and that planning is underway to identify solutions, e.g. requesting assistance from Emercom and military resources.

7.4 Response options

7.4.1 Impact of adverse conditions – ice

The presence of ice off the northeastern shore of Sakhalin for approximately six months each year will have a strong influence on the movement of spilled oil and the options available for responding and recovering that oil. Oil spill recovery under ice conditions has been discussed at a number of previous meetings of WGWAP and predecessor panels and highlighted at the Lenders' Workshop in Vancouver in September 2005. Opinions on recovery potential varied considerably. Some participants in those meetings argued that ice presents severe constraints on the likelihood of effective spill cleanup because both the ice and low temperatures make access to oil difficult and create hazardous operational and safety conditions for spill responders. Others suggested that recovery of oil under ice would not be as difficult as anticipated because the ice tends to form barriers on the water surface that help contain oil and inhibit its dispersion.

To address the difficulties of oil spill response in ice, the industry has been studying detection and recovery options. The task force reviewed current knowledge and state-of-the-art technologies, and compared them to what is contained in SEIC's Offshore Oil Spill Response Plans. In particular, the summary findings from the recent *Oil and Ice Workshop* held in Anchorage, Alaska, on 10-11 October 2007 were reviewed and discussed. The following key points were noted by the task force:

1. *Oil Detection and Tracking*: Advancements with Ground Penetrating Radar, together with "thin bed analysis," have led to multiple successes in the laboratory and in the field to detect oil on, in, and under ice. Such applications are being developed for varying thicknesses of oil and of ice, ice salinity, and ambient temperatures.

   Aerial remote sensing and satellite technologies are currently available, can be used in open-water and broken-ice conditions, and have been applied to oil spill surveillance and tracking. Side-looking airborne radar (SLAR) can detect spilled oil over long distances, and an extended near-range sensor system consisting of an IR/UV scanner, microwave radiometer, and laser fluorosensor (Forward Looking Infra Red Radar) can be used to determine oil spill coverage, thickness, volume, and even type in adverse weather and light conditions.

   SEIC agreed to maintain familiarity with emerging technologies with potential for application to offshore response planning.

2. *Oil Properties*: The task force recognized that existing knowledge is limited regarding oil weathering processes for crude oil in Arctic/ice conditions. Low temperatures and ice can strongly influence oil weathering properties, decreasing spreading and evaporation and increasing viscosity. Also, high ice concentrations reduce wave action, leading to less emulsification of the oil. These modified properties extend the period of time that various recovery techniques may be used effectively. Conversely, the same modified properties increase the time available for spilled oil to damage sensitive organisms and habitat.

3. *Mechanical Spill Response Technologies*: Considerable evidence indicates that the effectiveness of oil spill booming and skimming operations drop off considerably where surface coverage by ice exceeds approximately 30 percent. Recent testing has confirmed that brush and brush/drum skimmers have the best potential for recovery of oil in ice conditions, assuming that the skimmers have ice-processing capabilities and that they can be deployed effectively into significant accumulations of oil.

Recent improvements in icebreaking hull design and technology provide additional capabilities to recover oil mechanically in heavy ice or solid ice conditions. In particular, azimuthing thrusters in ice-capable vessels enhance the vessel's ability to free and reach small quantities of oil trapped beneath ice. **The task force recognized** the limitations of mechanical recovery operations in such a scenario **and also agreed** that the safety of response personnel must be assured where such techniques are considered.

4. *Non-Mechanical Spill Response Techniques*: The task force discussed developments in the use of oil spill "herding" (chemical) agents to concentrate oil mixed with sea ice to a thickness that could sustain *in situ* burning. Due to the unfavourable view of Russian authorities towards the use of such chemical agents, together with a lack of data on the toxic composition and behaviour of burn residues, **the task force agreed** that first priorities should focus on better characterization of Vityaz crude oil, including burn residues, to inform decisions regarding *in situ* burning.

The task force noted that none of the techniques noted above have been proven effective in the Sakhalin II project area, although some of the emerging methods appear promising.

Acknowledging the difficulty of recovering oil in ice conditions, SEIC has stated its intention to position ice-breaking response vessels at each of the platforms. In the event of a spill, those vessels would be used to create channels in the ice where recovery equipment can be deployed. *In situ* burning may used to manage the spilled oil (see section 7.4.3). Although spill cleanup in ice is unlikely to be entirely successful, the measures being put in place by SEIC represent best available technology. Therefore, at least at this time, the addition of further resources will not improve the situation.

7.4.2 Impact of adverse conditions – weather

Constraints on oil spill cleanup that are imposed by severe weather and fog are well documented and have been discussed in previous meetings. Much of SEIC's at-sea response equipment is designed for ocean-going use and is understood to be sufficiently robust to withstand poor sea conditions. Nevertheless, SEIC representatives recognised that strong winds and heavy seas may preclude spill response for periods of days or even weeks, and that cleanup may be prolonged by the necessity of fitting response efforts around periods of bad weather. In addition, more severe conditions would be expected to dissipate a spill "naturally" and therefore make the argument for mounting a response less compelling. Fog also may interfere with safe response at times and thus cause cleanup to be delayed. These constraints apply to spill response worldwide and are not specific to Sakhalin. Adding further equipment resources, vessels, or personnel would not be expected to alter this situation.

Some specific items in the OSR plans that would be particularly affected by poor weather conditions were discussed. For example, the task force considered whether defensive booming of the lagoon mouths might be used as described in the oil spill response plans. The site visit and discussions with response personnel had indicated that the boom deployments specified in the plans are likely to be only partially effective, at best, in good weather conditions because of tidal currents. The specified deployments are not likely to be feasible in strong winds or wave action. **SEIC agreed with these observations and also agreed** to modify the plans to take account of these likely constraints.

It also was noted that the response plans took little account of the likely need to clean up oiled wetlands should strong winds or heavy wave action cause oil to penetrate the Piltun Lagoon. The lagoon contains extensive areas of salt and freshwater marsh. **The task force** also discussed the high vulnerability of wetlands to disturbance and aggressive cleanup, and **agreed** that these sensitivities should be taken into account in the plans. SEIC explained that procedures for dealing with oiled wetlands were included in the pipeline plans as the highest risk of spillage affecting such areas was from a pipeline spill. **The company agreed** that appropriate procedures for cleanup should be included in the OSR plans and it stated its commitment to take action to ensure such inclusion.

7.4.3 Impacts of response methods (dispersants, surf washing, prop-washing, *in situ* burning)

Use of dispersants: Previous reviews of the OSR plans had raised concerns about the use of dispersants in or adjacent to WGW feeding areas. As noted elsewhere in this document (sections 3.2, 6.2, 6.3), SEIC responded to an earlier WGWAP recommendation by adopting a policy to not use dispersants in or adjacent to WGW feeding grounds. **The WGWAP and SEIC continue to agree** that dispersants should not be used in or near the Piltun feeding area, where dispersants could increase the amount of oil in shallow water sediments. This restriction is consistent with Russian regulations that prohibit dispersant application in waters shallower than 20m. However, the task force also noted the need to discuss with the panel the question of dispersant use near the offshore feeding ground, where water depth is such that dispersed oil will be diluted rapidly and significant amounts of dispersed oil are not likely to reach depths where the oil could contaminant the benthos.

Surf washing: Surf washing is a shoreline cleanup procedure in which oiled sediment is moved mechanically from the upper to the lower shore, with the expectation that exposing the sediment to a greater degree of wave action will promote natural removal of the associated oil through dispersion and biodegradation. The potential use of surf washing on or near beaches adjacent to the Piltun feeding area was raised as a matter of concern during the review of the OSR plans because this activity would increase the possibility of oil transfer to benthic sediments and WGW food resources. SEIC representatives said that surf washing was included in the plans as a technique to be used only in areas where the shoreline substrate consists mainly of pebbles and cobbles. As no such areas are present adjacent to the Piltun feeding area (where beaches are composed primarily of sand), **SEIC gave assurance** that surf washing would not be used near the Piltun feeding area. **The task force concurred with this position**.

Prop-washing: Previous review of the OSR plans also had raised concern regarding the potential use and effectiveness of prop-washing. Following discussion, **the task force agreed** that prop-washing was inappropriate as a response technique for a variety of reasons and should be removed from the plans.

***In-situ* burning**: SEIC representatives stated that the company’s intention was to use *in situ* burning only for oil concentrated in channels or openings in ice in winter conditions and that its use would be approached with considerable caution. SEIC representatives also acknowledged that a number of issues needed to be resolved concerning the effectiveness of this technique with Vityaz crude oil. It is not yet clear that this light crude oil will burn, whether a burn could be sustained, and whether unburned residues might introduce a new set of environmental problems. To confirm that burning would be a feasible and desirable response option with Vityaz crude oil, **SEIC representatives stated** that further studies are to be conducted before the decision to use this technique is finalized. Studies will include ignition properties of the oil and the nature of any residues following a burn, and will include field trials (with participation of the authorities). **The task force concurred** with this approach.

Oil recovery in the Piltun feeding area: The task force discussed whether attempts should be made to recover floating oil using booms and skimmers in the Piltun feeding area (see sections 3.3 and 6.3) because of potential disturbance to the whales. Whether and to what extent oil recovery efforts should be undertaken would depend on the amount of spilled oil, its pattern of spreading, environmental conditions, the presence of whales, the expected effectiveness of available response equipment and measures, and whether response activities could be conducted safely in the shallow waters of the feeding area. At-sea recovery efforts will be limited to waters deeper than 10m because of operational restrictions on response vessels in shallow waters. **The task force could not be prescriptive** about conditions under which recovery should or would be attempted in the feeding area, **and deferred the issue** to the WGWAP for further discussion and consideration.

7.4.4 Keeping whales away from oil

The proximity of the oil platforms and pipelines to the whale feeding areas increases the possibility of direct contact of the whales with oil or fuel if a spill occurs. Responders may be faced with situations where they might consider actions to alter the distribution or movement of whales to prevent them from coming into contact with oil. Possible mechanisms include the use of vessels and noise sources that would cause one or more whales to leave an area or prevent them from entering an area. After some discussion, task force members remained sceptical that use of a vessel (e.g., a small watercraft) could elicit a predictable response from a whale or be used reliably to haze whales away from oil. Sound-generating devices have been used purposefully in a number of instances to affect the distribution of marine mammals, and the potential for unintended effects of sound (e.g., seismic testing) has been a matter of concern for marine mammals generally and WGWs specifically. **The task force concluded** that the use of a noise-generating device for this purpose warranted consideration by the WGWAP in its upcoming meeting, but it also noted that such use could result in unintended detrimental effects and would require study with other whale populations before use with WGWs.

8 POST-SPILL ISSUES

8.1 Termination criteria

The task force discussed a range of possible termination criteria and the risk of misinterpreting information in the response plans regarding termination of response activities. **SEIC representatives agreed** that the wording in the latest versions of the plans should be checked and, where necessary, revised to minimize the probability of misinterpretation. **The task force accepted** this as an appropriate means of resolving its concerns.

SEIC representatives confirmed that information in response plans is intended as guidance. Their approach is based upon net environmental benefit analysis (see section 6.2), which aims to evaluate whether continued efforts to clean a contaminated area might do more harm than good. However, the review process indicated that the authorities might require the company to continue cleanup to such an extent that unnecessary additional damage would be caused to marine resources. SEIC representatives also indicated that termination criteria are not stipulated in regulations, and that the authorities had full control over this aspect of spill response. The end result could be a shift in response priorities, with potentially negative consequences for WGWs and their habitat.

8.2 Response evaluation

The report from the Lenders' Workshop recommended that, "In the event of a spill, every effort should be made to assess direct acute and chronic effects of the spill on the whales and their habitat." Further, the IISG recommended that, "should a spill occur, an assessment team be convened to determine the extent and nature of damage caused by the spill." Moreover, the IISG stated that the assessment team "should be independent of the response effort."

The oil spill task force discussed the potential value of such an assessment. SEIC staff raised a number of important questions that required further consideration by the panel. Those questions were:

(1) Who decides when such an assessment is necessary?

(2) Under what conditions would such an assessment be useful?

(3) Who should conduct the assessment?

(4) What should the assessment evaluate?

Since the assessment may focus on both the whales and their habitat, **SEIC staff also requested** additional discussion and input regarding whale monitoring activities. This task was deferred to the WGWAP.

8.3 Monitoring of environmental recovery

The task force agreed that monitoring ecosystems affected by oil spills is, in principle, a high priority and necessary for documenting recovery. **The task force also agreed** that "recovery" should be defined as:

> … convergence of data on biological community structure and associated habitat properties from impacted areas with comparable data from non-oiled areas that are collected on the same time schedule.

This definition allows for the possibility that ecosystems in the project area would change over time in response to factors other than oil spills. In this context, collection of data from "control" areas (i.e., locations not affected by spilled oil) is essential, both as a standard for evaluating recovery and as a basis for recognizing change driven by factors other than spilled oil.

The task force discussed the types of ecosystems within the Sakhalin II project area that should be monitored. The discussion identified three types based on likelihood of contamination with spilled oil, or sensitivity to the effects of spilled oil: WGW feeding areas, Piltun Lagoon and possibly other lagoon and wetland habitats, and beaches along the shores of the feeding areas. In each case, monitoring of recovery requires a basis for comparison, in the form of data for relevant biological and habitat variables, collected over representative temporal and spatial scales prior to the occurrence of oil spills.

In the case of the WGW feeding areas, **the task force agreed** that continued collection of biological and habitat data from a broad range of benthic stations, including those not affected by spilled oil, would be essential in evaluating recovery in affected locations. The **task force also agreed** that the ongoing program led by Dr. Fadeev (see section 6.5) meets the need quite well. SEIC is currently monitoring potentially vulnerable populations of shorebirds and Steller sea eagles in the Sakhalin II project area. SEIC also is conducting biological monitoring in wetland habitats near project facilities. Continuation of these monitoring activities will facilitate assessment of the effects of a future oil spill, should one occur.

The task force noted that the ecosystems of shoreline beaches and dunes in the project area are not being monitored. Although the task force did not make a recommendation in this regard, mobilization of logistic support for oil spill response activities might damage shoreline habitats by heavy nearshore road use and associated erosion. **It may be prudent, therefore, for SEIC to consider** the possibility of biological and habitat impacts along shoreline beaches and dunes in the project area, and to establish a monitoring program for the same purposes and benefits outlined above.

8.4 Restoration

The task force agreed that options for active restoration of damaged ecosystems following oil spills in the Sakhalin II project area will be limited. It was not able to identify any reasonable or practical options for restoration of benthic habitats used for feeding by WGWs. Restoration work may be feasible for wetland habitats. For example, reseeding or replanting wetland vegetation can physically stabilize damaged habitats and restore biogenic structure, detrital production, and food for herbivorous species. A number of sediment stabilization approaches may be used to reduce rates of erosion in damaged wetlands. **The task force encouraged SEIC to consider** such restoration strategies in the event of wetland damage from oil spills.

As noted in section 8.3, activities associated with oil spill response have the potential for damage to shoreline beaches and dunes. The task force was particularly concerned about the possibility of erosion resulting from heavy road use by vehicles for logistic support during response operations. **SEIC representatives stated** that regulations require the reinstatement of working sites, including beaches, dunes, and roads. This would include repair and restabilization of existing roads, removal of roads created specifically for response logistics, replacement of displaced vegetation as appropriate to the locations involved, stabilization of eroding sands and other sediments, and restoration of shoreline profiles to pre-spill conditions.

8.5 Waste disposal

In many previous oil spills elsewhere in the world, the disposal of post-spill wastes has been a challenge. Considerable volumes of waste (oily sand and recovered oily debris) can be generated, often amounting to as much as or more than ten times the quantity of oil spilled. The panel’s review of the OSR plans raised concern as to whether SEIC is aware of these considerations and has adequate capacity on Sakhalin Island to deal with likely waste volumes.

The task force also discussed the potential for reducing the volume of recovered waste by employing biodegradation-enhancement techniques for final traces of oil on beaches, including addition of nutrients. SEIC is currently studying such options. Company representatives assured the task force that oiled debris such as stranded driftwood and timber, which is common on some shorelines, would be recovered if the degree of oiling justified it.

SEIC representatives confirmed that at least one waste-storage and disposal site has been identified at Smirnykh and that authorities have agreed on the use of this site. Although waste-disposal options have not yet been finalised with the authorities, SEIC's preference is for bioremediation of oily wastes to take place at identified sites such as the one at Smirnykh. SEIC representatives expressed confidence that the company will have the capacity to deal with anticipated volumes of waste.

The task force noted that the actual volume of recovered waste is difficult to predict and the adequacy of the proposed disposal site(s) is also difficult to assess. Most task force members had not visited the Smirnykh site. Based on the available information, however, **the task force agreed** that the overall approach for waste disposal appeared to be reasonable in concept. However, **panel members on the task force also agreed** that this issue requires followup to verify that the planned capacity for handling wastes is adequate.

ANNEX 1

WGW ADVISORY PANEL — **WGWAP/OSTF**

Oil Spill Task Force Workshop — **6-8 November 2007**

Lausanne, Switzerland

FINAL AGENDA

6 November 2007

(1)	**09:00 – 09:30**	**Opening** Introductions and logistics Adoption of agenda Discussion of report drafting and reporting procedures
(2)	**09:30 – 10:00**	**Overview of issues previously considered (Resolved or outstanding?)** ISRP Meeting Lenders' Meeting IISG Meeting
(3)	**10:00 -10:45**	**Oil properties – Implications for oil spill response** Crude, condensate, HFO, diesel Weathering & fate Toxicity
	10:45 – 11:00	**Break**
(4)	**11:00-12:30**	**Oil spill risk** Pipelines and leak detection / monitoring Natural hazards Vessels
	12:30-13:30	**Lunch**
(5)	**13:30 –**	**Contingency planning & exercising**

	15:00	Issues raised in Panel review Exercising under realistic conditions Effectiveness of exercises Completion of practical planning documents
	15:00 – 15:15	**Break**
(6)	**15:15 – 17:15**	**Oil spill impacts** Sensitive areas/sites NEBA Impact on whales – oil and response activities Impacts on feeding grounds Pre-spill monitoring
	17:15	**Adjourn for the day**

<u>7 November 2007</u>

	09:00-10:00	**Outstanding issues from Day 1**
(7)	**10:00-10:30**	**Oil spill response issues** Command and control Personnel Logistics Response options Impact of adverse conditions (weather, ice) Use of adverse response methods (dispersants, surf washing, prop-washing, in-situ burning) Keeping whales away from oil
	10:30 – 10:45	**Break**
	10:45-12:00	**Oil spill response issues contd.**
	12:00-13:00	**Lunch**

(8)	**13:00 – 16:00**	**Post spill issues**
		Termination criteria Response evaluation Monitoring of environmental recovery Restoration Waste disposal
	16:00	**Ends**

<u>8 November 2007</u>

09:00-12:30	**Report writing**
12:30-13:30	**Lunch**
12:30-15:30	**Report writing continued**
15:30	**Adjourn for the day**

Final Workshop Participants

WGWAP
Brian Dicks
Tim Ragen (Co-chair of the Workshop)
Randall Reeves (Co-chair of the Workshop)
Grisha Tsidulko
Glenn VanBlaricom

SEIC
Doug Bell
Tatiana Sapozhkova
John Wardrop
Glenn Gailey

IUCN
Julian Roberts

Independent Consultants
Chris Halliwell (AEA)
Frank Marcinkowski (PCCI)

ANNEX 2

Review of Oil Spill-related Issues to Date

Randall Reeves

9 November 2007

This working paper provides the Oil Spill Task Force of the Western Gray Whale Advisory Panel (WGWAP) with an overview and summary of oil-spill related conclusions, advice, and recommendations from previous western gray whale (WGW) panels/workshops. To prepare it, I extracted information from the following six documents:

- Report of IUCN's Independent Scientific Review Panel (ISRP) [http://www.iucn.org/themes/marine/Sakhalin/isrp/index.htm];

- Report from the May 2005Workshop held at IUCN headquarters in Gland to provide feedback to Sakhalin Energy on their response to the ISRP report and contribute to the potential international lenders' understanding [http://www.iucn.org/themes/marine/Sakhalin/ISRP_Followup/ISRP_Followup_Workshop%20Report_Final_6June05.pdf];

- Report of the Lenders' Workshop held in Vancouver in September 2005 primarily to provide the potential international lenders with further clarification of outstanding issues with regard to Sakhalin II Phase 2 and WGWs.

- Report of the Interim Independent Scientists' Group (IISG) workshop in April 2006, the IISG having been a precursor to the WGWAP [http://www.iucn.org/themes/marine/Sakhalin/isrp_Followup/IISG%20April%2006.htm];

- First meeting of the WGWAP [http://www.iucn.org/themes/marine/pdf/wgwap/WGWAP%201_3%2021%2011%2006.pdf]; and

- Second meeting of the WGWAP [http://www.iucn.org/themes/marine/sakhalin/meeting_april07/WGWAP%202%20-%20FINAL%20Report%20-%2010%20May%2007%20(2).pdf].

ISRP Report (Feb. 2005)

General Concerns

The 2005 ISRP report included an extensive review of concerns related to oil (and gas) exposure of WGWs, direct and indirect (i.e. mediated via prey). These were summarized as follows:

"The potential effects …, either through direct exposure or through damage to prey, are poorly known. Observations of the direct effects of oil on other marine mammals and the well-documented effects of oil on benthic invertebrates indicate that there is reason for serious concern. The consequences for gray whales of oil spills in the Sakhalin marine environment could vary from minor to catastrophic depending on the location, timing and size of the spill, the prevailing conditions and the ability of the benthos to recover. All available information indicates that western gray whales are almost completely dependent on benthic communities for feeding."

The ISRP review of oil spill prevention and response was extensive but current only through January 2005. It was recognised that the risk of a major spill from Sakhalin II should be reduced considerably by the transition from Phase 1 to Phase 2. However, the Panel noted that non-negligible risks of a platform blowout and/or a major pipeline spill would remain. Citing the ongoing spill risks (based on modelling), the ecological importance of Piltun Lagoon and the adjacent WGW feeding area, and the formidable environmental, logistical, and other types of challenges to spill response, the ISRP emphasized the transcendent importance of spill prevention. It also noted that the relatively high risk of a major spill from the current operation (involving a Floating Storage and Offloading tanker and shuttle tankers to transport oil from the PA-A platform) would remain until it is replaced by the pipeline link to Prigorodnoye, and it now (2007) appears that that risk will continue at least into 2008.

The Panel made a number of general suggestions and comments on how spill risks could be further reduced – e.g., with respect to low-level leakage detection, rules for contractors, the oil spill response plan, the locations of platforms and pipelines, the use of double-hulled tankers, and the suspension of oil production at the PA-A platform until the pipeline was in place. Some of these have been addressed since February 2005 or have otherwise been rendered moot by the passage of time. Other items remain open for consideration.

The ISRP also identified types of research and monitoring needed to ensure a high probability of detecting changes in WGW population demography that might be linked to oil exposure. These included the following:

- Continued, uninterrupted annual monitoring of important population parameters including abundance, trends, survival rates, reproductive rates and age (size)/sex structure;
- Annual monitoring of gray whale foraging and habitat use patterns to provide a time series of data that could be used, for example, in analysing potential effects of acute or chronic oil spillage;
- Investigation of ocean dynamics (currents, tides, winds) in the vicinity of Sakhalin II, the Piltun (nearshore) and offshore feeding habitats, and the Piltun Lagoon;
- Investigation of the ecology of Piltun Lagoon and the nearshore foraging area, and the links between them;
- Investigation of the biomass, distribution, and ecology of gray whale prey populations and the effects of oil on them;
- If one or more spills occur, investigation of (1) any direct, acute effects of oil on whales and (2) the effects of chronic exposure should spilled oil remain present for a prolonged period;
- Periodic monitoring of contaminant levels in the habitats exposed to potential (and actual, should they occur) leaks and spills.

The ISRP concluded that monitoring would be most effective if based on an array of permanent stations in the whales' foraging habitat and that such stations should be stratified by habitat characteristics (e.g., depth, exposure to waves, exposure to ice scour, sediment characteristics, and proximity to project infrastructure) and distributed randomly within strata. The Panel specified the physical, chemical, and biological variables that should be measured over time.

<u>Direct Effects</u>

The ISRP reviewed the literature on "direct effects" of oil on gray whales due to exposure from skin contact (including contamination of baleen), inhalation, or ingestion. Although carcass surveys and sampling after major spills in California (*Union Oil* in 1969) and Alaska (*Exxon Valdez* in 1989) provided no conclusive evidence of effect or non-effect, the Panel concluded that it was prudent and reasonable to infer direct effects from studies of exposure in other mammals. There is no evidence to support the idea that gray whales will actively avoid oil and therefore, again, it is prudent and reasonable to assume that they are unlikely to leave an area of plentiful prey, or for that matter to route themselves around a slick when relocating or migrating. The Panel concluded that if gray whales do not avoid oil slicks, they will be vulnerable to inhalation and ingestion of oil, as well as fouling of the baleen, eyes, and skin.

<u>Indirect Effects</u>

Spilled oil, in any of its forms (surface slick, vapours just above the sea surface, dissolved hydrocarbons or suspended globules or adsorbed to small particles of suspended sediments in the water column, layers or patches on the sea bottom, interstitial concentrations within benthic sediments or among biogenic benthic structures such as amphipod tube mats) can kill or injure marine invertebrates on which WGWs depend for food. The Panel noted that a high proportion of WGW prey species rely heavily on ecological processes on the sediment surface and within 1-2 cm of the surface for nutrition, shelter from predators, and habitat. Most of them are herbivorous or detritivorous and have vertical distributions linked to the location of their benthic food base. The key sources of primary production for the benthic communities are microalgae attached to the sediment surface, phytoplankton in the epibenthic water column, phytodetritus accumulating on the sediment surface from the water column, and detritus and associated microbiota advected from other locations (e.g., Piltun Lagoon) to sediment surfaces in the feeding areas. An important concept to bear in mind is that structural integration of oil (e.g., incorporation interstitially into bottom sediments or biogenic structures such as amphipod tube mats) may shelter the oil from physical weathering and result is greater temporal persistence and increased risk of chronic damage to prey.

The Panel listed the following factors that would influence the probability of oil exposure for WGW prey:

(a) The probability that oil will reach important aggregations of prey, which will vary by spill volume, season, and location;

(b) The condition of the oil at the time it reaches prey aggregations;

(c) The prey aggregations (benthic, midwater or sea surface) that are of greatest importance to the whales at the time;

(d) The vulnerability of prey to the oil (e.g., fouling of feeding apparatus, acute mortality, reproductive impairment); and

(e) The effects of dispersant, if applied, on the above considerations.

Resolution of key questions regarding oil spill effects on prey would require modelling of spilled oil behaviour, collection of data on prey populations in the area, and empirical study of the effects of spilled oil of various kinds on those populations.

Predictions of Oil Dispersion and Persistence

In the absence of estimates by Sakhalin Energy, the ISRP made its own qualitative estimates of the proportions of the gray whale feeding areas included within oil spill excursion envelopes as depicted in the Comparative Environmental Assessment (CEA) (Table 2 on p. 46 of the ISRP report). The Panel expressed dissatisfaction with the relative superficiality of the oil spill trajectory analyses contained in the CEA.

The Panel reached the following conclusions, inter alia, concerning SEIC's spill trajectory modelling, based on results reported in the CEA and in published literature:

- Oil spills of the size modelled are reasonably likely to affect both the near-shore and offshore foraging areas and may do so within a matter of hours to a few days.

- Physical processes, including currents, winds, and tides, would influence the movements and fate of spilled oil. It was not clear that the complex current patterns known to exist in the region were incorporated into the modeling exercises.

- The nutritional base for known or potential WGW prey populations in the area is linked strongly to production processes in a thin layer that includes the sediment surface and the top few centimetres of the sediment column. This creates vulnerability to any event causing contamination of the sediment surface, and any potential incursion of spilled oil onto the feeding areas, as indicated by trajectory probability analyses, is likely to have major indirect effects on the western gray whale population.
- Although it is likely true that the potential indirect effects of spilled oil decrease with increasing ocean depth, both the near-shore (<20m) and offshore (<50m) feeding areas for WGWs off NE Sakhalin are relatively shallow and therefore vulnerable.
- There was concern about the reliability and precision of the pipeline leak detection system and that if, for example, a leak of 1% or more of the volume transported (i.e., up to 700-900 barrels per day) were to go undetected for several days, it could exceed the maximum credible amounts modeled.

- In the event of spills below the leak detection threshold or failure of the leak detection system, visual observation (affected by, for example, sea state, presence of ice, amount of daylight) would not constitute a reliable backup system or a suitable primary system.

- The CEA did not model the worst-case scenario, i.e., a platform blowout, but such modelling is essential for a thorough and unbiased assessment of risk. The risks associated with such a low-probability event could exceed considerably those from the spills that were modelled.

- The CEA did not model spills occurring during winter months when weather conditions may be more severe than those modelled (10-year averages for spring, summer and autumn) and when the sea may be covered with ice. Again, such modelling is essential for a thorough and unbiased assessment of risk. Even though spills during the winter may not have immediate direct consequences for gray whales, they could well have significant consequences for gray whale habitat and prey.

- Seismic activity in the Sakhalin region poses an unknown but potentially significant risk to the platforms and pipelines. SEIC maps indicated that the location of the PA-B platform is directly over a system of shallow faults, and that pipelines either cross or run in close proximity to these faults. The proximity of the faults to the platform and pipelines raises serious concerns regarding seismic risk, particularly from large destructive earthquakes.

<u>Characteristics of the Crude Oil</u>

Vityaz crude oil was characterised as relatively light and likely to weather more quickly than heavier crude oils. However, as the Panel noted, lighter oils are generally more toxic to marine life due to their volatile components. Also, again, the Panel was dissatisfied with the selectivity and superficiality of the analyses of "persistence" presented in the CEA. For example, year-round temperature and wind speed data were not presented or considered, and the Panel concluded that the information provided was "not sufficient to determine persistence patterns or rule out persistence times that are sufficiently long to expose the feeding areas, whales and prey populations to oil and at least some portion of its more toxic components." There was concern that failure to consider the potential effects of emulsification processes on persistence time could have led to underestimation of the persistence of oil spills at sea off Sakhalin and in turn downward bias in the sizes of excursion envelopes presented in the CEA.

<u>Chemical Dispersants</u>

Regarding the issue of chemical dispersants, the ISRP noted that "their use certainly reduces the visibility of spilled oil and may give the impression that environmental risks have been lessened." Further, "oil droplets dispersed into the water column are more likely to reach benthic habitats and bind to sediment particles or to the tubes or other biogenic structures of benthic organisms, as compared to untreated oil slicks on the sea surface. Thus, they may actually increase the likelihood of damage to benthic communities, with consequent negative effects from both the oil and the dispersant itself."

<u>Information Gaps</u>

The report identified gaps in information needed to fully understand and evaluate the risks of oil to WGWs. Many of these gaps have not been addressed, and some of them cannot be addressed in practical terms at this time. The report offered a number of speculations and posed questions, concluding that in the absence of critical information it would not be possible to make reliable quantitative predictions of oil spill risks to WGW prey.

<u>Quantitative Risk Assessment</u>

Considerable effort was invested by the ISRP in reviewing SEIC's quantitative risk assessments (QRA), which were presented in comparative terms, i.e. FSO/shuttle tanker (Phase 1) vs the three different pipeline options being considered at the time for Phase 2. Not surprisingly, the estimated overall risk that at least one spill or blowout would occur over the ca 40-year project lifespan was greatly reduced by the transition from Phase 1 to Phase 2.

The Panel stated a number of cautions regarding the QRA methods and results, including the following:

- To the extent that various input values were based on past performance in the oil industry, they could be biased high or low, depending on the extent to which measures of past performance pertained to situations or conditions similar to those prevailing off northeastern Sakhalin, and on whether they included consideration of spills/accidents related to gas production and transportation;

- The probability of an event's occurrence does not give the whole story – consequences will depend on what happens to the spilled oil after the event itself has occurred.

- A major shortcoming was the failure to incorporate risks from the construction and operation of the Prigorodnoye export terminal and associated LNG and oil tankers. Although gray whales may not feed off southern Sakhalin and northern Hokkaido, they do migrate through the region in both spring and fall, placing them at risk of oil exposure in the event of a spill.

<u>Process</u>

Given the importance of focusing on prevention (as opposed to response), the Panel emphasised the need for "specificity with regard to standards" – e.g., it is not always clear what is meant by "best practice" and "internationally accepted standards." Also, the Panel stated that "forthrightness and transparency are required to identify and appreciate the nature and extent of risk involved," and that "other parties, including the public-at-large, have expertise that will contribute to overall mitigation efforts." It urged that one or more mechanisms be found to involve the public as a way of enhancing prevention and response.

<u>Oil Spill Response (OSR) Planning and Preparation</u>

The ISRP's expressed view on OSR reads as though it could have been drafted yesterday:

> To the extent that an effective response to a major spill can be mounted, it will require adequately trained personnel in the right locations; sufficient equipment and resources in the right locations; ongoing assessment of spill characteristics; an adequate communication system; and an effective planning and decision-making system. The response system must be able to cope with the temporal and spatial characteristics of the spill or accident under the potentially severe conditions (e.g. winter storm) that can occur in the Sakhalin region. The trajectory modelling results indicate that to be effective, spill responses – particularly for large spills – must be employed within hours in regions that are not readily accessible. Developing a robust response system that will be effective for all plausible Phase 2 spill scenarios will be both difficult and expensive. The resources to respond must be in place, funded, staffed and known to be operational prior to the occurrence of a spill, and the state of readiness must be maintained on a continuing basis for the life of the project.

As to the details of the ISRP critique of the OSR plan as it existed in 2004-05, these are probably largely superfluous at this point and therefore not necessary to recount, given the much more detailed and up-to-date critique led by Brian Dicks of the WGWAP. Several items, however, are worth flagging (again), as follows:

- Response to Tier 2 and 3 spills, in particular, will require considerable planning, communication, and organisation because of the number of persons, agencies, organisations and (potentially) nations involved.

- For Tier 2 response, the plan anticipated an elaborate organisational system with multiple lines of authority, multiple parties with similar goals but potentially competing objectives or methods for achieving them, extensive lines of communication, and long lists of equipment and supplies that could be used. However the plan is less clear as to how efficiently these additional resources can be mobilised, transported to the spill site and used in a coordinated, effective manner to prevent exposure of western gray whales and their habitat to the spilled oil.

- For Tier 3 response, the plan did not specify how international efforts would be coordinated (including consideration of what to do if a major spill were to threaten the coast of Japan) and did not discuss the implications for gray whales in the event of an international response.

- There are no known effective strategies or tools for protecting individual gray whales in the event of a spill or for treating individuals that have been exposed to oil. Several methods to deter them from areas where they may contact oil might be attempted, including harassing the whales and using nets or other obstructions. However, these methods may be ineffective, or worse, pose additional risks to the animals.

- Although dispersants or other chemicals may facilitate effective responses in some circumstances, they also may have significant adverse effects (e.g., toxic effects on whales or their food resources). Therefore, they should be dispensed only under clear and informed guidance.

- Response activities could themselves pose threats to gray whales and their habitat. For example, vessels, aircraft, and equipment could disturb whales to the point where they abandon near-shore foraging habitat or, in the case of nursing mothers, abandon or lose contact with their calves.

Gland Workshop Report (May 2005)

Relatively little time was spent at the Gland workshop discussing oil spill issues, and most of what was discussed either was covered in detail in the ISRP report or was to be covered in greater detail in subsequent WGW workshops and meetings (summarized below). Among the main points made in Gland were the following:

- A “gap” in the company’s OSR strategy was “the need for plans for rapid response in cases where a dangerous situation for WGWs has developed (such as a tanker run adrift) but oil is not yet in the water.”

- The lack of consideration of risks from spills by tankers leaving Prigorodnoye, especially during the autumn and spring WGW migrations, was deemed a "major deficiency" in the SEIC risk evaluation and mitigation plan.

- SEIC committed to the use of double-hulled tankers to help minimize the risks associated with tanker-based transport.

Lenders' Workshop Report (Sept 2005)

At the Lenders' Workshop in September 2005, two main oil spill-related items were considered:

- The need for a long-term, standardized monitoring program, with emphasis on obtaining "baseline data … for comparisons in the case of a catastrophic oil spill or other toxic event, as well as for evaluations of chronic environmental degradation as a result of oil and gas activities in the region";

- The status of oil spill risk assessment and response plans.

Regarding the first of these, the independent scientists were assured that SEIC's ongoing benthic sampling program, hydrological measurements and chemical analyses would "follow very close[ly] the recommended 'template' set" as set forth in the ISRP report. SEIC confirmed its view that Piltun Lagoon is "of high ecological importance" (e.g. it is "an important source of nutrients) and the company stated its intention to "treat[s] it as such" in its OSRP, noting that protection of the lagoon mouth in the event of a spill was "a key component of the current Phase 1 Vityaz oil spill response plan." Nonetheless, the workshop report noted, "There is ongoing disagreement between the independent scientists and SEIC regarding the ecology and vulnerability of Piltun Lagoon and the lagoon's significance to the maintenance of gray whale prey resources on the Sakhalin Shelf."

Regarding the independent scientists' call for a permanent array of monitoring sites for assessing the benthos as well as physical and chemical changes over time, the company questioned the need for such sites – "SEIC does not believe prey and physical studies of this nature will have significant value." The company nevertheless indicated that it was commissioning "background hydrocarbon monitoring" and that this would "continue through operations phase and post spill."

In response to the scientists' concern that a post-spill monitoring program be established that is independent from clean-up operations, SEIC stated that it was developing such a program linked to the overall operations-phase monitoring program. The company stated that this was to ensure consistency of approach and enable post-spill monitoring to be incorporated into the longer-term monitoring program beyond the response phase "if required."

Regarding the status of the company's oil spill risk assessment and response plans, SEIC confirmed that additional risk assessments for the onshore pipeline and for tanker operations were underway and that "further risk studies" would be commissioned "as needed throughout the year [2006]." Importantly, the company asserted that its OSRP "assumes damage/harm on impact and does not require detailed toxicological or other work designed to quantify potential damage." Moreover, SEIC maintained that "spill frequencies and volumes stand up well against what could be expected industry-wide (although comparisons are difficult as there are far fewer oil spill QRAs than ones for personnel risk)." Specifically with regard to blowout risk, the company claimed its analyses had shown that "protection against spills has been built in to an ALARP level - increasing protection … could only be done with significant detriment to risk to life (e.g. by enclosed wellbays which would increase the explosion risk)." Reference was made to a SEIC-commissioned study by D. Bonsall of Risktec "to provide a comprehensive review of engineering design that will fully demonstrate the minimization of spill risk."

To minimize the risks of oil spills under ice, SEIC stated that it was planning:

a) Further assessment of actual ice conditions,

b) Assessment of the effect of ice on spill tracking and monitoring,

c) Further excursion envelopes for the winter season for Piltun area, and

d) Involvement in joint industry projects studying oil spill response in ice, including field trials in various conditions.

In response to requests by the scientists, SEIC agreed to provide additional excursion curves, including winter season trajectory maps for the Piltun area.

An independent technical evaluation of blowout risk (by AEAT) was underway, and the company's risk assessment for the tanker loading unit was undergoing review and amendment by Noble Denton. This latter was expected to assess and summarise existing QRA work related to shipping risk associated with the Sakhalin 2 Project, and in particular (but not exclusively) shipping risk in and around Aniva Bay.

Regarding the use of dispersants, the agreed position following the workshop was summarized as follows: "… dispersants will not be used in the gray whale feeding areas or in any location where it might affect the feeding areas." Use of dispersants "in areas where they would not affect gray whales or their prey" remained a live option, and SEIC indicated that a study was underway to review that option.

The issue of pipeline leak-detection systems and procedures that had been flagged in the ISRP report and at the Gland workshop was considered further at the Lenders' Workshop. The company provided a detailed description of the ATMOS leak detection system and an independent review of the system and its efficacy. The independent scientists concluded that given the limits of detection by the ATMOS system, it would be possible for a considerable amount of oil (i.e., on the order of 0.6 to 1.0%) to leak from the pipeline without detection and therefore "additional monitoring systems are needed." In response, the company stated a series of measures to be taken to supplement the automated system, as follows: opportunistic daily crew-change flights, dedicated weekly flights of the whole pipeline, annual assessment using a subsurface remotely operated vehicle (ROV), ROV assessment after major storm or other events, monthly cleaning pigging, and 5-year intelligent pigging of the pipeline. It was agreed that as long as the stated inspection regime was followed and it met the highest industry standards according to independent review, and as long as environmental monitoring was conducted, this issue was closed.

This workshop also included an exchange of views between Sakhalin Energy and the independent scientists concerning interpretation and application of (a) a precautionary approach and (b) the concept of ALARP, i.e., reducing risk to "as low as reasonably practicable." The position of the independent scientists is summarized as follows: "Some of the concerns expressed in the ISRP report remain regarding the implementation of standards such as the precautionary approach and ALARP, as well as, for example, mechanisms for contractor compliance, implementation or enforcement of mitigation measures, and the need for independent monitoring of pertinent operations. The approach taken to date has not always been suitably or consistently precautionary, nor has the ALARP concept always been implemented in a manner that provides the least practicable risk to the whales." The company, in response, noted that its "operations and installations identified as critical will have a documented demonstration … that risks are ALARP" and that "the corporate standard requires that during concept selection, front end engineering and design and detail design stages, the design should be verified as providing risk levels that are tolerable (in relation to the SEIC risk tolerability criteria) and ALARP." Both parties agreed that these issues would remain in play for the WGWAP. With regard to the concerns about contractor compliance, the company summarized its auditing procedures and its automated (satellite-linked) vessel-tracking system.

Interim Independent Scientists' Group (IISG) Report (April 2006)

After publication of the IISG report, Sakhalin Energy extracted and tabulated the recommendations and provided written responses to each of them. Those recommendations that related to oil spill prevention and response are encapsulated in Table 1, below.

Table 1. Summary of oil spill-related issues considered by the IISG.

Essence of recommendation	Sakhalin Energy's response	Target completion date	Status at July 2006
Piltun Lagoon monitoring	Non-SEIC-funded "academic study" (IBM) of linkage between lagoon and feeding area being conducted in 2005 and 2006. SEIC does not consider long-term monitoring of the lagoon a priority "because offshore activities conducted by SEIC are not expected to influence Piltun Lagoon ecosystem" (except possibly in relation to OSRP – see later).	Not applicable/ongoing (through 2006?)	Pending for WGWAP
A principal question underlying long-term monitoring of Piltun Lagoon and WGW feeding areas is: How will pollution events such as oil spills affect the structure and dynamics of marine benthic communities of significance to WGWs, and how will those effects be distinguished from natural variation?	Agrees on importance of the questions as basis for long-term monitoring. Considers ongoing benthic studies adequate to provide "good baseline data on natural variation" which "could be used to verify any impacts on benthic communities in the event of an oil spill…." "Research will be confined to the Piltun feeding area."	Ongoing	Pending for WGWAP
A series of specifications for assessment and monitoring of relevant biological communities, including those in Piltun Lagoon	Above-mentioned IBM study "carried out [and would continue in 2006] sampling specifically to identify the influence of detritus from the Piltun lagoon on the benthic communities of the Piltun feeding area…." Otherwise, commitment only to continue to review progress and consider needs for "follow-up studies."	End 2006	Pending for WGWAP

Actions to investigate oiling of seabirds in late 2005 off Hokkaido	Both IUCN and SEIC would make some effort.	As soon as possible	Ongoing [but no longer active, November 2007]
Studies of ways to deal with oil in sea ice need to continue.	Agreed.	Ongoing	Ongoing
Ensure OSR strategies are in place for Tiers, I, II, and III before first oil, and conduct appropriate training and drills.	Agreed to have Russian Federation-approved OSR strategies in place by first oil. Plans being reviewed by RF authorities and by "an independent international oil spill response consultancy." The latter would assess "the adequacy of the plans against a number of recognised, robust international standards."	First oil (company's target)	Ongoing
Confirmation needed that biweekly helicopter flights will be conducted to detect pipeline leaks once the pipeline is carrying oil.	"SEIC confirms that helicopter flights are planned on a weekly basis to detect any irregularity along the pipelines."	First oil	Closed
More modelling to predict trajectories of oil in Sakhalin sea ice.	Agreed – programme "is and will be continuing."	Ongoing(?)	Presumably ongoing (although report indicated "complete")
OSR efforts to "include protection of Piltun Lagoon and the Piltun feeding area."	Agreed. "Protection of Piltun and other lagoons, and the Piltun whale feeding area, is a primary objective of the OSRPs covering those areas."	Complete	Closed
"Dispersants should not be used in areas where they may affect WGWs and, particularly, their habitat."	Agreed. "SEIC will not use dispersants in or near WGW feeding areas or in areas where WGWs are observed."	Complete	Closed
In the event of a spill, an independent assessment team should be convened "to determine the nature and extent of damage caused by the spill." It was emphasized that this team needed to be "independent of the response effort."	Agreed. This component was said to be incorporated into the response and long-term monitoring plans. With regard to the monitoring aspect, the company noted the need to consider logistics of participation by "non-Russian whale experts," assuming such participation was implicit in the recommendation.	First oil	SEIC was "working on contracting procedures to have this work conducted."
Need confirmation of SEIC's commitment to "long-term environmental monitoring program to determine if undetected leaks and spills are	SEIC noted that in addition to the weekly helicopter flights for visual detection of leaks and spills (see above), Remotely Operated Vehicle	First oil	Although it is interesting to know about the ROV surveys, the company

contaminating the environment around or downstream of the platforms and pipelines."	surveys "are planned annually." These surveys would take about a month to cover all offshore pipelines. [ROV surveys should be conducted more frequently in the first year, starting immediately after the pipelines have begun to carry oil.]		seems to have missed the point of this recommendation.

In addition to the recommendations in Table 1, a series of recommendations were made concerning the need for dedicated efforts to detect, investigate, and sample gray whale carcasses, either stranded along the Sakhalin shoreline or found floating off the coast. This work, although in some ways independent of OSR, is complementary and essential to it.

Report of First Meeting of the WGWAP (November 2006, Prangins)

The first meeting of the WGWAP gave sparse attention to the oil spill issue, on the understanding that little had changed since the IISG meeting some six months earlier. The Panel affirmed its interest (following that expressed by the IISG) in knowing more about the spill that caused the large-scale seabird die-off in northern Hokkaido from December 2005 through March 2006. It requested updates from both SEIC and IUCN at the next meeting.

In its report of the Prangins meeting, the Panel stated its intention to carry out a "comprehensive evaluation" of the oil spill issue though a task force led by Ragen and VanBlaricom working with IUCN. At the time, it was hoped that the evaluation (i.e., the task force's work) would be carried out "immediately prior to and in conjunction with" the second WGWAP meeting in April 2007. That target date has slipped by approximately six months. The evaluation was expected to consider not only whether the oil spill prevention and response measures meet general international industry standards, but also whether they are sufficient to protect WGWs and their habitat – "with this higher standard being necessary because of the whale population's vulnerability and endangered status."

Also, the Panel (mainly VanBlaricom) elaborated on earlier recommendations (starting with the ISRP report) concerning long-term monitoring of benthic communities and re-emphasized the need for improved understanding of linkages between Piltun Lagoon and the near-shore WGW feeding area.

Report of Second Meeting of the WGWAP (April 2007, St. Petersburg)

The second meeting followed the pattern of the first, addressing two main oil-related topics – the 2005-06 Hokkaido seabird die-off and the planning of a comprehensive OSRP evaluation. It was confirmed that the oil involved in the seabird die-off was heavy fuel oil ("bunker C") of undetermined source, location, etc. Although there was no evidence that this spill had affected WGWs or conditions in their migration routes, the Panel expressed continued interest in the event because of what might be learned from it. For example, "the actions taken subsequent to the discovery of the oiled birds in this instance may be indicative of response capabilities with regard to future spills of undetermined origin and significance in the region. Intergovernmental cooperation between Russia and Japan will be an important aspect of effective response to such spills." The Panel recommended that IUCN:

(1) determine whether oil on dead birds in 2005 and the winter of 2006/07 can be fingerprinted to establish if it came from the same source;

(2) consider whether archived satellite photographs are likely to provide additional evidence of the source and movement of spilled oil; and

(3) consider preparing a summary report on the spill, after consultation with authorities at the UNESCO World Heritage Site on the Shiretoko Peninsula.

The terms of reference for the oil task force of the WGWAP were set out in the meeting report, as follows:

(4) The task force will consist of several panelists (VanBlaricom, Dicks, Tsidulko, Ragen), designated Sakhalin Energy representatives, selected experts contracted by international Lenders, and an independent consultant under contract to IUCN.

(5) The independent consultant to IUCN will complete a review entitled "Oil spill planning and response evaluation criteria" that will be used to guide the task force's evaluation.

(6) Sakhalin Energy will provide the documents needed for the review to IUCN by 1 June 2007. The documents will be distributed to the Task Force. The required documentation (listed in part in WGWAP 2/INF 22; additional documents may be identified and requested by Task Force members) consists of the following:

- Corporate Oil Spill Response Plan,
- Lunskoye Oil Spill Response Plan,
- Piltun – Astokh Oil Spill Response Plan,
- Prigorodnoye Offshore Oil Spill Response Plan,
- A report on Sakhalin II oil characteristics,
- An analysis of the fates of spilled oil, including weathering, emulsification, and dispersibility (SINTEF report),
- A report or reports providing environmental sensitivity maps (e.g., Piltun feeding area and lagoon) pertaining to western gray whales and associated biota or habitats (notably benthic communities), and
- A report describing ice conditions and ice movement.

Task Force members will review the documents independently and then meet for additional review and discussion in October 2007 in Washington, D.C. [This turned out to be in November 2007 in Lausanne, Switzerland, instead.] The Task Force will complete and distribute a report to WGWAP prior to its November 2007 meeting (WGWAP 3).