WESTERN GRAY WHALE ADVISORY PANEL **NTF-6**

NOISE TASK FORCE

REPORT OF THE NOISE TASK FORCE AT ITS 6TH MEETING

3-4 APRIL 2014

AMSTERDAM, THE NETHERLANDS

CONVENED BY THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE

Report of the 6th Meeting of the Noise Task Force

PARK INN BY RADISSON AMSTERDAM AIRPORT SCHIPHOL HOTEL, THE NETHERLADS
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CONTENTS

ACRONYMS

AUAR	Automated Underwater Acoustic Recorder
Company	Sakhalin Energy Investment Company
DTAGs	Digital Acoustic Recording Tag
EIA	Environmental Impact Assessment
ENL	Exxon Neftegas Limited
IBM	Institute of Marine Biology
IUCN	International Union for Conservation of Nature
IWG	Interdepartmental Working Group on Western Gray Whale Conservation of the Russian Federation
JIP	Joint Industry Program
LFC	Low-frequency Cetaceans
MMO	Marine Mammal Observer
MMP	Monitoring and Mitigation Programme
MNR	Ministry Of Natural Resources and Ecology of the Russian Federation
MVA	Multivariate Analysis
NOAA	National Oceanic and Atmospheric Administration (US)
NTF	Noise Task Force
Photo-ID	Photo Identification
PML	Perimeter Monitoring Line
PTS	Permanent Threshold Shift
RMS	Root-Mean-Square
SEL	Sound Exposure Level
SL	Source Level
SoW	Scope of Work
SPL	Sound Pressure Level
SSTF	Seismic Survey Task Force
SSV	Sound Source Verification
VNIRO	Russian Federal Research Institute of Fishery and Oceanography
WGWAP	Western Gray Whale Advisory Panel

1 INTRODUCTORY ITEMS

1.1 Chairman's opening remarks

The 6th meeting of the Noise Task Force (hereafter NTF) was held at the Park Inn by Radisson Amsterdam Airport Schiphol Hotel, the Netherlands, from 3 to 4 April 2014 under the chairmanship of Greg Donovan. The list of participants is given as Annex A.

Donovan noted that the last meeting was in October 2013 and that there were only two days available at this meeting to discuss the 2015-16 seismic survey. Therefore the group would need to work long and hard to complete its work, as well as to focus on the future work and resources required to meet deadlines associated with the planning, as discussed later in this report.

1.2 Adoption of agenda

The adopted agenda is given as Annex B.

1.3 Available documents/materials

The list of available documents and presentations is given in Annex C.

2 UPDATE ON COMPANY PROGRESS FOR THE 2015 SEISMIC SURVEY

2.1 Status of tender including technical parameters and update of project plan

Sakhalin Energy (the Company) provided a presentation on the status of the tender and the project plan for the proposed 2015 seismic survey. The Company's brief summary of the more detailed presentation is provided here.

In terms of Scope of Work (SoW), no changes were reported since the October 2013 NTF-5 meeting. The only addition to the SoW was the Company's requirement for night-time vision cameras on board the main seismic survey vessel. Such devices are increasingly common in the marine environment and their potential use in the seismic industry has been recognised by manufacturers. The use of night-time vision cameras should help to shorten overall survey duration by expanding monitoring capability of the source exclusion zone during periods of poor visibility, night time and fog.

Detailed preliminary design for the 2015 Piltun-Astokh 4D seismic survey has taken place and noise footprints have been modelled for a number of source points along selected lines. Those results are reported separately.

The invitation to tender was issued in March 2014 with bids due April 2014. Bid evaluation will take a few months and a recommendation to the Sakhalin Energy Tender Board is expected mid-year. The Company expects to formally award the contract by year end 2014. A letter of intent issued mid-year should allow the designated successful bidder to start the permitting and approvals process in time for a June 2015 start of the survey.

Current market forces were discussed. Many medium-specification vessels are leaving the Asia Pacific region, to be replaced by high-capacity vessels (i.e. 12+ streamers). This poses a commercial threat to the Company, in that high-capacity vessels cannot be deployed efficiently at Piltun-Astokh due to constraints set by water depth and the 1997/2010 baseline surveys, which were recorded with 6-streamer vessels. The impact on planned operations is that the Company will add flexibility to its schedule so that better use can be made of medium-capacity 'vessels of opportunity'.

In terms of impact assessment methods and mitigation measures for the proposed survey, the 2010 survey remains the reference. The Company's additional requirement for night-time vision cameras may allow for some minor relaxation of the protocols during poor visibility, since 'poor visibility' will have a different meaning if night-time vision equipment is functioning aboard the main vessel.

Further discussion of these issues occurs below under the relevant agenda items.

2.2 Update on deadlines for NTF input (internal and Environmental Impact Assessment - EIA)

The Company confirmed that the key dates identified at NTF-5 remain unchanged, i.e. to ensure that the final details are ready by December, the draft of the Monitoring and Mitigation Programme (MMP) is aimed for completion by the beginning of October 2014, with the final details to be ready as soon as possible after that, taking into account the Russian Federation's regulatory approvals process. The implications of this for the workplan are dealt with under Item 6.

During discussion, the Company gave assurances that 'equipment' problems, such as those that delayed start of the 2010 Astokh 4D survey described in the 6th report of the Seismic Survey Task Force (SSTF),[1] will not arise again as use of the correct cold water equipment would be part of the contract requirements. The Company also gave assurances that its planning for the 2015 survey was taking account of future developments, to the extent that these can be foreseen, in terms of sizes of available vessels and arrays.

3 UPDATE ON WORK/ANALYSES FOR 2015 SEISMIC SURVEY

3.1 Update on 2012 2-D Seismic Analysis

3.1.1 Presentation

Racca gave a presentation on the estimation of acoustic levels (per-pulse Sound Pressure Level, or SEL) from the 2012 High Resolution 2D seismic survey at locations of whales tracked from a single coastal theodolite station over the period of the seismic survey (Kriukova and Vladimirov, 2013). The received pulse levels were computed through numerical modelling of airgun array source levels (SL) and sound propagation, adjusted by referencing to measured pulse levels. Acoustic measurements were made during the seismic survey at two Automated Underwater Acoustic Recorder (AUAR) monitoring stations deployed at the 20m and 10m bathymetry lines shoreward of the notional centre of the seismic survey area (Rutenko et al, 2012). The modelling was based on the specifications of the source array (total volume 180 cubic inches in three identical airguns) and a default set of acoustic propagation conditions found to give realistic estimates in previous studies including the modelling of the 2010 4D seismic survey. The estimation was performed at individual whale sighting times over periods when the airgun array was active, running the model from the seismic source location to two receiver sites: the tracked whale position and the AUAR at 20m water depth. An adjustment offset was computed as the difference between the measured pulse level at the AUAR (taking the average of 5 pulses centred at sighting time to reduce pulse jitter) and the model estimate at that location and bottom depth (the reference levels at the 10m water depth AUAR were also compared to model estimates and found to yield generally a larger reduction). The model estimate at the whale location was corrected by the above offset, yielding a measurement-compensated result based on the assumption that model error would be similar at different receiver locations.

Of the tracked whale time histories reported in the theodolite study (only tracks lasting more than 10 minutes were considered), 11 contained periods when seismic data acquisition was active. The whales were classified as exhibiting feeding behaviour in 8 of those tracks and moving behaviour in 3. In producing maps of the tracked paths, the full time history was shown including periods when the seismic source was not operating. Each observation point was colour-coded to represent dB levels, leaving points without source exposure as blank outlines. Racca presented all 11 tracked whale time histories in maps which also showed the corresponding track of the seismic source and its status (active or inactive). One such map is shown in F below, for a whale classified as feeding. Racca singled out this case in the presentation because the whale tracking spanned the shutdown of the source array for a line turn and its subsequent reactivation about 30 minutes later, showing a trajectory apparently unaffected by the abrupt changes in exposure to sound pulses.

Responding to a question about whether the analysis could be extended to consider cumulative exposure levels instead of per-pulse SEL only, Racca pointed out that this would be impossible for individual whales because their known exposure history is limited to the tracking period and there is no continuous record of the spatial relation of the animal to the source for any prior interval.

[1] http://cmsdata.iucn.org/downloads/sstf_6_report_final.pdf

3.1.2 Discussion and conclusion

The NTF thanked Racca for his analyses and presentation. After some discussion regarding the obvious importance of these observations and the caveats and limitations that were clearly given in the presentation, it **agrees** that the results from the 2012 analyses do not suggest any specific changes to the 'behavioural' sound thresholds for the 2015 seismic survey (see Item 3.3). The NTF **encourages** the Company to develop a short paper for publication, including a comparison of measured and modelled sound levels. The Company indicated its desire to see the results of such work published.

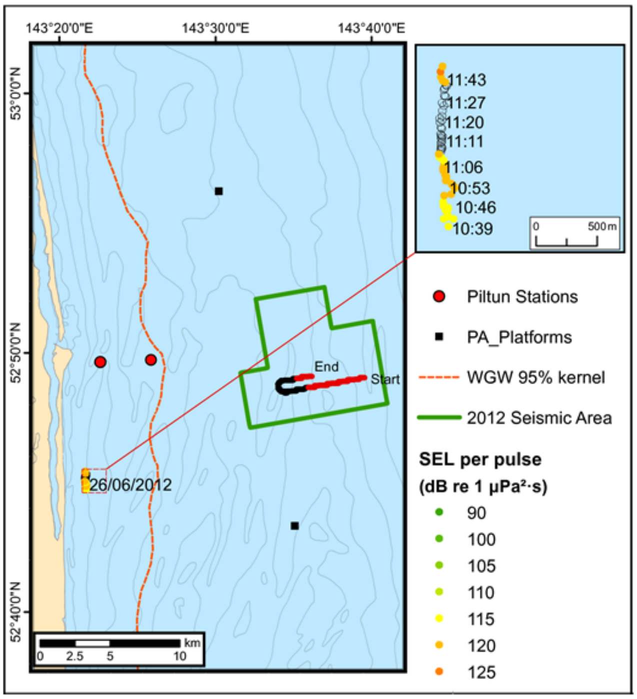

Figure 1. Example of a tracked whale time history also showing the corresponding track of the seismic source and its status (active or inactive, red and black, respectively). For details see text.

3.2 Progress on acoustic modelling including work completed for Piltun-Astokh survey

3.2.1 Presentation

Racca gave a presentation on the initial acoustic modelling performed to estimate the extent of ensonification at potentially behaviour-affecting sound levels that could be expected from the planned 2015 Piltun-Astokh 4D survey (based on the per-pulse SEL criterion of 156 dB re 1 µPa^2-s established for the 2010 Astokh 4D survey). He began by summarizing the modelling approach, which retained essentially the same conditions and assumptions as were used in 2010 including the same source array with a volume of 2620 cubic inches (the source for 2015 could be smaller). Based on the field record of that survey, the model results for the default modelling parameters ("base case") had been shown to underestimate the measured levels by 1 dB on average for most of the survey, but up to 3 dB in the few early days when sound propagation conditions were more favourable. The model estimates and ensonification maps in the initial assessment for the 2015 survey had therefore been computed in two versions to bracket the range of expected variation: one version representing the base case plus 1 dB, and the other the base case plus 3 dB. Before presenting the model results, Racca commented on the spatial extent of the survey acquisition footprint, showing a map that demonstrated how the 2015 survey area essentially matches the one for 2010 in the south portion but extends farther to the north for a total of about 2.5 times the surface of the earlier operation, coming into closer proximity of the coastline and the boundary of the near-shore feeding area than in the southern part. The model results were shown first as a succession of single-pulse SEL footprints for selected acquisition points along the inshore perimeter of the 2015 survey area; this gave a sense of the evolution of sound levels as the seismic vessel advanced into different regions. The individual footprints were then merged to show the estimated composite shoreward front of sound propagation to areas with levels predicted to exceed the 156 dB re 1 µPa^2-s behavioural threshold for the inshore perimeter of the 2015 survey area under presumed typical and higher-limit propagation conditions. On the basis of further modelling of pulses along seismic survey lines farther offshore, it was estimated that about 2/3 of the survey lines would result in some exposure of the coastal feeding area to levels above the behavioural threshold (the figure below shows a single pulse footprint at the point of closest approach of the survey line to the feeding area boundary).

In the final part of his presentation Racca discussed the estimation of the safety shut-down radius that Marine Mammal Observers (MMOs) would have to enforce around the seismic survey vessel to ensure whales would not be exposed to injury levels. Based on the regulatory practice adopted for the 2010 4D survey, which presupposes an injury threshold rms Sound Pressure Level (SPL) of 180 dB re 1 µPa, the safety radius under typical propagation conditions was estimated to be 2.0 km.

3.2.2 Discussion and conclusions

The NTF thanked Racca for these preliminary analyses. A number of suggestions for improved analyses and graphical presentations were made. The NTF **reiterates** the agreement at NTF-5 that ideally the modelling work should be completed and submitted to the NTF for review using the final equipment specifications. However, it was clear even from the preliminary analyses that some areas in the northern part of the survey area frequented by at least some gray whales for most of the season (see Figure 2) will be ensonified at levels above the behavioural disturbance threshold. The implications of this are discussed further under Item 6.

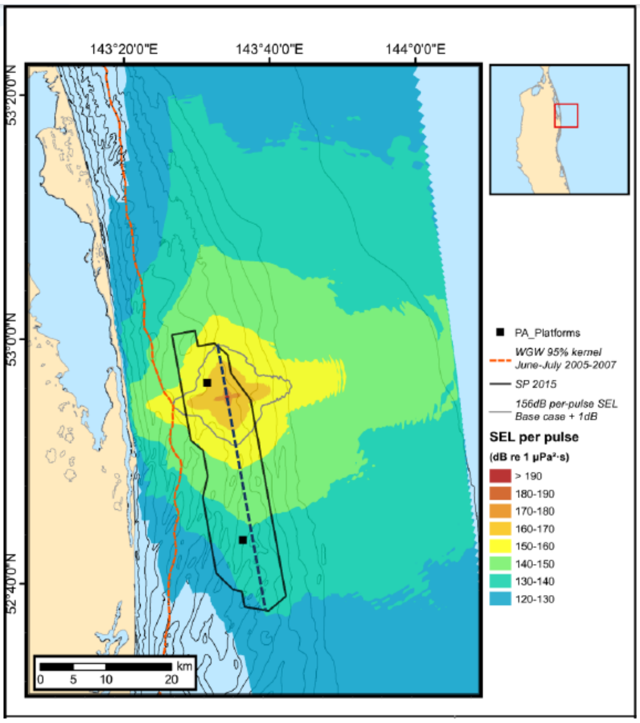

Figure 2. Preliminary map showing predicted ensonification (see text).

3.3 Progress on consideration of appropriate sound levels with regard to mitigation in light of analyses since 2010 and case studies (and see Item 5.6.2).

3.3.1 Presentation

As the discussion had broached the subject of the recently proposed (draft) injury (Permanent Threshold Shift, or PTS) criteria published by the US National Oceanic and Atmospheric Administration (NOAA) in 2013 for consultation and comment (see NTF-6/INF.1, NTF-6/INF.2, NTF-6/INF.3), Racca showed some additional slides about the initial acoustic modelling for the planned 2015 4D survey, illustrating the process and outcome of using cumulative SEL to estimate the safety radius as per the new draft criteria. He showed a diagram of how the cumulative received level at any point some distance off a seismic survey line would be computed by modelling the airgun array pulse propagation from each acquisition point along the line to the sample point, effectively creating a fan of some 2,200 propagation paths for all the pulses on a typical 2015 4D survey line. He then discussed briefly the frequency weighting function proposed by NOAA to calibrate the effective received levels to the auditory sensitivity of gray whales (i.e. low-frequency cetaceans, or LFC); this function differs from the ones suggested in earlier scientific work and has not been broadly accepted as representative for the acoustic levels at which injury can occur. He pointed out that the LFC weighted cumulative SEL injury threshold of 187 dB re 1 μPa^2-s would occur at a relatively short distance (no more than a few km) from a seismic survey line and that the relevant accumulation would accrue only from pulses a few km on either side of the closest point of approach. This meant that even though the NOAA guidelines called for a 24 hour accumulation period, the effective safety range for a given acquisition line in the 2015 4D survey would be computed from the pulses on that line alone (assuming that the next line would not be in close proximity). With this preamble, Racca then presented a contour map of the computed cumulative SEL from a single 2015 4D line, showing the 187 dB re 1 μPa^2-s injury threshold to be a narrow corridor straddling the line. The width of this corridor on either side of the line did not exceed 2.2 km, thus giving an estimate of the safety range based on the draft NOAA criteria that was similar in size to that based on the rms SPL criterion mentioned earlier.

Racca reiterated that this estimation was based on guidelines still in a state of evolution and that various aspects of the modelling (especially the use of maximum level over depth for every received pulse in the accumulation) caused the result to be likely over-precautionary. The arbitrary accumulation period of 24-h rather than some period relating to exposures that would be likely to be integrated by a receiving animal is also a limitation and likely an overly-precautionary aspect of the draft NOAA guidelines. He concluded that realistic modelling of a cumulative SEL-based safety range would have to take into account the target animal's diving profile, if not its statistical motion pattern relative to the seismic source.

After considering the results of the 2010 analyses, case studies presented earlier to the NTF, the results of the 2012 analyses and case studies and the above discussion of the NOAA draft guidelines, and the lack of any new scientific findings, the NTF **agrees** that there is no reason at this point to change the thresholds for injury or behavioural disturbance for the 2015 survey. It **agrees**, however, that this matter should be kept under review by the NTF if and when new data or guidelines become available.

3.4 Progress on updated analyses of distribution data[2]

Donovan recalled that at its last meeting (NTF-5) the task force had agreed that work on determining the Perimeter Monitoring Line (PML) needed to be given high priority and it had identified a 5-step process for such work. The Company did not present documentation as it had indicated before the meeting that no new data were available to warrant changing the PML from 2010.

The NTF **welcomes** the news that additional analyses for the PML have been undertaken by the Company and **looks forward** to receipt of written documentation of these analyses. In this context the NTF **agrees** that the following work, as agreed at NTF-5, is relevant:

1) List the available datasets (systematic and opportunistic sightings; distance bias; possibly also existing telemetry data from the tags whilst whales were in the Sakhalin area), and ensure that they are updated to include all years up to the most recently available. Note any provisos associated with the data (e.g. 2005 was excluded last time because of 'anomalous' distribution).
2) Provide updated density maps (1km x 1km square) by year and by using the existing methods, initial split as last time, i.e. 1 June – 31 July; 1 August – 30 September. To aid in assessment of the significance of any changes, the map data should also be provided in tabular form, with the number of sightings alongside the estimated density for each square by period by year.
3) Make final choice of appropriate combination of datasets.
4) Decide on the method of calculating the PML: review last time's approach (95% of whale distribution for June and July, excluding 2005), and if necessary make modifications.

The NTF **recommends** that these factors are considered in the document and that it is presented to the NTF at least one month in advance of its next meeting.

The NTF also noted that for the more distant future (i.e. post 2015) surveys it will be important to have some additional data from early June-mid July in order to re-examine the question of baselines, recognising that these may change for a number of reasons including climate change and disturbance from human activities on the Sakhalin shelf. This matter will be kept on the agenda of the NTF.

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[2] In the absence of new information or after a review of the available new information, one option is to keep the same assumptions about whale distribution and the same nominal feeding ground boundary as were made for the 2010 survey.

3.5 Progress on review of 2012 behavioural work

The NTF noted that some aspects of the work agreed at NTF-5 with respect to the 2010 and 2012 behaviour studies remain to be addressed (and see Item 6). Some members of the NTF thought there would be value in having Gailey and/or Sychenko review the 2012 experience to see if there were any useful lessons that could be applied to planning for the 2015 seismic survey, as was recommended previously (recommendation WGWAP 12/019[3]). The NTF reiterated that the 2010 behaviour criteria and data collection protocols should be provided to the NTF by the Company and reviewed and re-evaluated in the context of the length and configuration of the PML for the 2015 survey, the number of observation teams on the spit, etc. One example is the issue of how to manage the trade-off between scans and focal follows – focal follows may last several hours, precluding scans at regular time intervals. This could be addressed by enlarging the teams so that both long focal follows and regular scans can be conducted, or alternatively by establishing explicit priorities to guide the allocation of time and personnel in regard to the two types of tasks.

The NTF **looks forward** to receiving written documentation on this at its next meeting (see Item 6).

In addition, the NTF **notes** that behavioural monitoring during seismic surveys is of general interest to oil companies and other stakeholders, since the coordinated analysis of behavioural and acoustic monitoring data has been to date a fundamental approach to the estimation of possible impact of seismic surveys on whales. There would be considerable value in having generally agreed protocols, recommended software and perhaps a central pool of identified observers. This would improve greatly the ability to combine datasets around the world and increase sample sizes for analyses examining potential effects. This is beyond the scope of the NTF or WGWAP *per se*, but the NTF **encourages** IUCN to contact other industry stakeholders and bodies such as the Joint Industry Program (JIP)[4] to see if this can be taken further in the longer term.

3.6 Progress on possible use of DTAGS

The NTF and WGWAP have noted on several occasions the great potential value of using Digital Acoustic Recording Tags (DTAGs).

The NTF **reiterates** its view of the potential for DTAGs or similar technology for studying whale behaviour in relation to received sound levels. It thanked Tsidulko for looking into the question of import licenses and recognised that the requirements meant that it would not be possible to trial the use of DTAGs in the 2014 season. It **agrees** that a small group comprising Nowacek, Southall and Racca[5] should develop a fully costed proposal based on initial thoughts made available informally during the meeting, identifying specific tags, field requirements, deadlines (e.g., permitting) and data analysis for consideration at the next NTF meeting. In agreeing to this, the NTF **stresses** that this was not intended to imply that the Company was committed to supporting such work for the 2015 survey but rather that having such a proposal on the table would enable a more focussed discussion of this item, which has been on the NTF's and Panel's agendas for several years.

3.7 Other

The NTF previously discussed the potential value of examining within-season sightings of individual whales to understand better the periods of time over which individuals remain in the Sakhalin area as well as to provide some information on movements. Such understanding and information may be useful when examining and estimating exposure to problematic levels of noise.

The NTF **agrees** that there is potential value, during the planning for the 2015 survey, in investigating within-season resightings of known individuals. It **recognises** that the value of such an exercise would be optimised if the undertaking involved looking not only at resightings within the two catalogues individually but also at resightings within the combined catalogues; it also **recognises** the practical and data availability difficulties that this will involve. The NTF therefore established a small working group (Vladimirov, Cooke **(convenor)**, Tsidulko and Weller) to examine the possibility of obtaining and presenting within-season resighting data:

1) for the Institute of Marine Biology (IBM) team;

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[3] https://portals.iucn.org/wgwap/

[4] http://www.soundandmarinelife.org/Site/index.html

[5] After the meeting it was clarified by the Company that this is not part of Racca's remit from the Company and appearance of his name as a working group contributor does not constitute agreement by the Company to support this work in any way.

2) for the Russia-US team; and
3) the combined datasets.

The NTF recalled the work of the Photo identification (Photo-ID) Task Force and the co-operative use of the data availability agreement in this regard.

4 UPDATE ON OTHER ACTIVITIES ON THE SAKHALIN SHELF IN 2015 (PRIOR TO, DURING OR AFTER THE SAKHALIN ENERGY SURVEY)

The NTF received information on a number of activities on the Sakhalin shelf by companies other than SEIC that are of concern because of the potential for considerable additional disturbance. These include (information from Vedenev):

a) Construction by Exxon Neftegas Limited (ENL) of a temporary unloading facility on the eastern shore of Piltun Lagoon scheduled to take place from June 2014 to October 2015;
b) A 2D seismic survey of northern Chayvo by Rosneft Shelf Far East (daughter company of Rosneft) planned for the open-water seasons of 2014 and 2015. Provisionally this would involve 500 km of seismic line coverage near Chayvo Lagoon between end of May and middle of November – 250 km in 2014 and 250 km in 2015 – accompanied (in 2015) by electro-prospecting and geochemical probing (round the clock regardless of visibility). The ‘Northern Chayvo’ licence area is on the southern periphery of the Piltun feeding area where up to 25% of the Sakhalin gray whales may be present at times;
c) ENL plans to construct three boreholes for extended reach wells (O-14, O-41, O-42) on Chayvo in 2014 and 2015, working from the Orlan marine platform.

In light of the above, the NTF **agrees** to draw the attention of the Panel to this information. It **requests** that IUCN in consultation with the Panel contact the appropriate Russian authorities (e.g., the Interdepartmental Working Group on Western Gray Whale Conservation of the Ministry Of Natural Resources and Ecology of the Russian Federation, or IWG/MNR) to obtain more precise information (dates and location) on non-Sakhalin Energy activities (including but not restricted to seismic surveys) in the proximity of the Sakhalin feeding areas in 2015 and report back to the Panel and the NTF as soon as possible.

5 MITIGATION AND MONITORING PLAN FOR 2015 SEISMIC SURVEY (& BEYOND)

5.1 Summary of mitigation measures for past surveys

The NTF received a brief overview of the measures adopted for the 2010 and 2012 SEIC seismic surveys, to frame the discussion, noting small differences between the two MMP’s that had been agreed by the Panel and the Company. Both MMP’s were based on a primary mitigation measure, which is to complete the survey as early in the season and as quickly as possible.

5.2 Proposed modifications to mitigation measures & shutdown criteria for the 2015 survey

Sakhalin Energy confirmed that for future seismic surveys it commits to following the same approach for a seismic survey MMP as that developed for the 2010 Astokh 4D survey. As has been noted several times in the past, including at NTF-5, the 2010 seismic survey MMP is the baseline for future MMPs at Sakhalin. The primary mitigation measure is to complete the survey as early in the season and as quickly as possible.

There is inevitably a degree of trade-off in the application of mitigation and monitoring measures for whales that are present early in the season because this may slow down the survey and thus result in greater numbers of whales potentially being affected as increased numbers enter the area. Finding an appropriate balance is one of the most difficult tasks facing the NTF, especially for the present survey, which is considerably greater in scope than previous surveys. The NTF considered a number of proposals suggested by the Company to modify the 2010 protocols appropriately given the 2015 survey design. These resulted in considerable discussion. Recognising the importance of having further documentation and analyses before any decisions are taken, this report focusses upon recommendations for information to be presented to the next NTF meeting rather than attempting to provide a detailed summary of the discussions.

5.2.1 Use of night vision technology

The NTF **welcomes** the potential of night-vision technology for detecting whales during seismic surveys, particularly during periods of poor visibility, as defined for the 2010 MMP. Techniques and technologies that can increase ability to detect animals and thus reduce the potential for harm or harassment are important and will, if successful, improve the chances of meeting the primary mitigation measure of completing the survey as early and quickly as possible. Night-vision technology, both light-gathering and infrared, has improved in recent years, and indeed other agencies reviewing the activities of offshore energy development have recommended that continued testing and assessment of such methods be conducted (NMFS, 2012).

Despite its promise, however, several potential issues were identified during discussions that need to be addressed before this technology can be assumed to provide 'daytime like observations' during periods of poor visibility; these are summarised below.

It should be noted that not all members of the NTF necessarily agreed with each of the points raised:

1) The theoretical detection range of the units described by the Company was impressive, e.g., 4 km in good conditions. However, some noted that it is not just a matter of the maximum range, but of the effective search area (roughly speaking, the product of the area within range and the detection probability within that range). It is possible that because of reduced resolution and contrast, the detection rate may be lower with night vision equipment than in daylight. If and how this is manifest may depend on observer behaviour. For example, one possibility is that some observers may find themselves scanning more slowly to compensate for the lower resolution and contrast (thus missing more cues because they are outside their field of view), while another is that observers may scan at the same rate, but only pick up the stronger cues.
2) Some also suggested that in daylight, even if binoculars are used, there may be additional opportunistic naked-eye sightings, especially at short range, both by MMOs and by other personnel; in terms of whale protection they are potentially the most important sightings because of the proximity of the sighted animal to the sound source. Some noted that with night vision methods, once a whale has passed through the scanned area undetected, it then has a very small chance of being detected by naked eye, even if it surfaces right in front of the vessel.

The NTF was briefly informed (by way of email) of the infra-red method described in Zitterbart *et al.* (2013) and noted that it is promising, but for several reasons its developmental stage is not yet close to the reliability required for real-time use at night. Specifically and most notably, the false-positive rate of detection in the conditions where a validation assessment was conducted is still too high, even when not analysed in real time. For real-time use at night, the false-positive rate would need to be brought down substantially; otherwise the survey would be continually interrupted unnecessarily which would hinder rather than enhance the progress of the survey and thus the Company's ability to complete it as early and quickly as possible.

The NTF **agrees** that for its next meeting, it should receive full documentation of the system(s) proposed to be used, especially sufficient documentation to verify its efficacy under a range of environmental conditions (including field experiments). Without this it will not be possible to evaluate the use of the technology as a basis for relaxing the 2010 conditions for A-lines for the 2015 survey.

5.2.2 Modification of the concept of A- and B-lines

The NTF **agrees** that the proposal by Racca first presented at NTF-5 and further enhanced at the present meeting shows particular promise for increasing the efficiency of the survey without compromising mitigation principles. It **recommends** that this be developed into a formal proposal with an associated practical implementation approach for consideration at the next meeting. The proposal should also take into account any issues raised at NTF-5.

Sakhalin Energy refers to its statement included at the end of Section 6.

5.2.3 Development of the final MMP

The NTF **reiterates** that the MMP that was developed by the Company in consultation with WGWAP and tested in the field in 2010 provides the basis for the 2015 seismic survey MMP. As noted before, the primary mitigation measure is to complete the survey as early and quickly as possible to minimise the number of whales that might be affected. Major challenges for the 2015 survey include the fact that the planned survey area is some 2.5 times larger than in 2010 and that part of the northern area inside the PML is likely to be ensonified beyond the behavioural threshold. Satisfactory development of an effective MMP will require intense effort by the NTF to meet the 15 December 2014 deadline.

5.2.4 Use of simulations

The NTF **agrees** that it is important for the Company to simulate possible approaches to the conduct of the survey to achieve the desired objective of minimising gray whale exposure to the appropriate thresholds before a final MMP can be developed. Such simulations should make use of the 2010 and 2012 experiences and consider at least:

a) use of the 2010 MMP rules as a baseline as well as proposed modifications to those rules including the sliding-boundary protection zone concept described by Racca;

b) the possibility of dividing the survey into a northern and a southern block such that the northern block (which is the more problematic) can be completed first;

c) possible options for sequencing of line acquisitions within the single block;

d) various scenarios for down time (e.g. assuming that the night vision approach works without error or with varying degrees of error – including underestimation and overestimation of gray whale presence).

The NTF **requests** that a written report on results of such simulations and assumptions is submitted to the NTF one month in advance of its next meeting. Members of the NTF are available to be consulted about simulation scenarios and assumptions to assist the Company.

5.3 Real-time and acoustic monitoring/mitigation

5.3.1 Equipment and practical process in the field

The NTF **welcomes** the progress reported by the Company with respect to improved acoustic equipment, the use of satellite as well as radio transmission of data for the 2015 survey, and the careful consideration of a number of options by the Company. It noted the importance of real-time information as part of the conduct of the MMP as well as the importance of backup systems. It also took note of Vedenev's experience with the transmission of real-time acoustic data and **recommends** that a small group comprising Racca, Vedenev and Nowacek (convenor) examine all approaches and report back to the next meeting on any conclusions they may reach.

5.3.2 Future possibilities

Vedenev described a possible alternative for Sound Source Verification (SSV), including verification of the injury and behavioral disturbance threshold distances (radii). This approach would involve obtaining data from a set of sensors located regularly along a streamer (hydrophone cable assembly) all the way to the end of it (ca 5-8 km from the airguns). These sensors would measure seismic pulse levels and other characteristics at different distances from the seismic source. The injury radius (Exclusion Zone 180dB) could be determined according to where along the streamer the level of a pulse decreases to 180 dB. Although Vedenev suggested that the behavioral disturbance radius (Exclusion Zone 163 dB) could be determined in the same manner, Racca noted that the range from the source to the 163 dB behavioural threshold can easily exceed the 5-8 km length of the streamers and therefore the proposed method may not allow direct measurement of behavioural threshold ranges towards shore but only in the direction behind the tow. Vedenev expressed his view that by using sensors along all 8 streamers, the geometry would make it possible to measure the sound from the source not only in a backward direction but also up to +- 65 degrees from the direction of the moving ship (the actual value of course would depend on the spread of the streamers and the layback of the measurement point). Racca argued that the lateral spacing between the centreline and the outermost streamer cannot be much more than several hundred metres, so it would not be possible to achieve the cited lateral angle for ranges that are meaningful for the measurement of the 180 dB threshold (some 2 km). In Racca's view, measurement of the 180 dB threshold would be possible only at small lateral angles from the direction of tow. Regardless, this method assumes that the receivers are well below the surface, so streamer depths would need to be known.

Vedenev believed that the use of this method to perform the SSV and estimate the exclusion zones would have no impact on the course of seismic acquisition and it would provide direct measurements without the need for dedicated experiments using bottom buoys or acoustic modeling. If it were to prove feasible, this method would be less costly and less time-consuming than the traditional SSV approach whilst achieving accuracy and simplifying the entire process of establishing exclusion zones.

In conclusion, the NTF did not have time to fully discuss this issue but **recognises** the potential value of this idea. It **agrees** that it needs further discussion and consideration from both the practical and theoretical perspectives. It **requests** that Vedenev and Racca continue their discussions intersessionally and report back to the next NTF meeting.

5.4 Behavioural monitoring/mitigation associated with the 2015 survey

The NTF **welcomes** the information provided by the Company about the progress made in identifying the behavioural team leaders for the 2015 survey. It **strongly encourages**, if at all possible, that the identified expert team members visit Sakhalin for at least some of the 2014 season to familiarise themselves with the situation and with Russian team members as part of the process of finalising details for 2015 (e.g. equipment, software, protocols). Given the timing of NTF meetings, the NTF hopes to receive updates intersessionally (i.e., June/July 2014) on development of the behavioural monitoring/mitigation teams and their training for the 2015 survey.

5.4.1 Status update on Marine Mammal Observers, Behavioural observation teams

The Company informed the NTF that there will be four MMOs on board the seismic vessel, and these MMOs will have obtained training and experience via working on vessels as part of the Joint Program with ENL.

The topic of training the behavioural teams for the 2015 seismic survey was raised in the context of having at least some members of the proposed team (that is from Australia) visit Sakhalin in 2014 to gain experience of the location and to begin communication with the Company. Some members of the NTF were familiar with the proposed team and noted that they are well-qualified. However, the NTF also recognised the value of them experiencing the Sakhalin working environment prior to the 2015 survey. As such, the NTF **recommends** that at least the leadership members of the team be brought to Sakhalin during the 2014 to begin this training and transition.

The Company stated that the MMOs would be certified according to international standards, have prior experience in offshore service, and receive response training on board the vessels.

The Company indicated that based on 2010 experience, it does not intend to use a scout vessel in 2015, which was part of the 2010 protocol. Taking into account the:

1) 2010 4-D Seismic MMO Close-out Report;
2) Independent Observer Reports; and
3) results of the behaviour Multivariate Analysis (MVAs), the Company reported that it found the use of a separate scout vessel inefficient and it considered the vessel a potential cause of additional disturbance to gray whales.

The NTF considers this decision of the Company not to use a scout vessel as a change from the 2010 protocol that requires further discussion. It therefore **requests** additional information about how the supply and seismic vessels will be able to fulfil the at-sea obligations of the 2010 protocol. Until that information is provided, the NTF cannot assess whether deviation from the baseline protocol (2010 survey MMP) will or will not compromise MMP effectiveness.

5.5 Other monitoring (e.g. distribution, photo-identification)

5.5.1 Overview of the 2013/2014 Joint Programme and implications for 2015

Sakhalin Energy indicated that neither results from the 2013 field season nor full plans for the 2014 season would be provided at this meeting due to the agreement with ENL that such information will not be shared until official presentations have been made to Russian authorities. The planned submission date for the 2013 Annual Report was 7 April 2014 and the 11th IWG/MNR meeting was to be held on 24 April 2014. Thus only an overview of the 2013 Field Programme, lessons learnt and the 2014 Plan were presented at this meeting. The Company noted that in 2014 shore-based Photo-ID from small boats will be conducted in addition to normal vessel-based Photo-ID studies plus onshore vehicle-based photo-ID surveys.

The NTF was disappointed that the experiment to measure noise levels produced by the jet boat was not conducted in 2013, and **reiterates** the Panel's earlier recommendation (WGWAP-13/006[6]). It was informed, however, that the Company has decided to purchase a different boat, with 2 outboard engines, rather than the water-jet vessel. The NTF was also informed that there were likely to be boats operated by other research groups working in the field in 2014. The overall vessel plan and operations for 2015, including all information related to the vessels to be used and any information about radiated noise signatures, need to be discussed fully at the next NTF meeting.

5.5.2 Discussion and conclusion

The NTF **notes** that it did not review the overview of the 2013 Joint Programme and the proposed 2014 Joint Programme in any detail (see item 5.5.1). This is the responsibility of the Panel. However, recognising that any early season data are of great value for its consideration of the 2015 survey, the NTF **requests** that the Company liaise with ENL to ensure that such data can be considered by the NTF as soon as possible after the close of the 2014 season so that it can be considered as part of the work to finalise the MMP by 15 December 2014.

5.5.3 Other groups (e.g. Russia-US team)

The NTF did not have any details of the plans for other groups available at the meeting.

5.6 Other (future)

5.6.1 Alternatives to traditional seismic surveys

There were no significant updates on this topic, but this does not diminish its importance. The NTF therefore **agrees** to keep this item on the agenda for future meetings.

5.6.2 Implications of NOAA review on acoustic guidance for assessing the effects of anthropogenic sound on marine mammals

This item was not discussed but see Item 3.3.1.

6 SUMMARY OF CONCLUSIONS AND WORKPLAN (INCL. ALLOCATION OF RESOURCES & REPORTING TO WGWAP)

The NTF **recognises** that it has requested a considerable amount of work and that time is short for final agreement of a plan for 2015. It therefore **agrees** that the Company, two weeks in advance of the next meeting, will present a document showing the protocols for the 2010 survey and, in tracked changes, any proposed differences. NTF **requests** that proposed changes that have not already been agreed by the NTF be accompanied by a short rationale in addition to the documentation on various topics referred to above. Without such a document it may not be possible to reach agreement on the MMP [7] in time to meet the proposed deadlines.

The NTF **agrees** that two additional meetings of the task force are required to prepare for the 15 December 2014 deadline. NTF-7 will be held in conjunction with WGWAP-14 if possible, and a subsequent NTF-8 should be targeted for mid-November. Furthermore, NTF-7 should be 3 days long as the material to be considered is substantial.

At the close of the meeting, Sakhalin Energy stated that it was committed to a MMP which avoids or minimises the impact of its operations on whales, as per the 2010 MMP. It asked that the following statement be included in this report:

"The early start and finish of the operation is the key mitigation measure, as accepted by the WGWAP. Based on initial modelling done to date for the 2015 survey (Racca, 2014, NTF-6/8), the operation cannot avoid exposure of some whales to sound levels that might lead to a behavioural response. The 2010 mitigation protocols did not envisage such a scenario. The consequence of this is that strict application of the

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[6] https://portals.iucn.org/wgwap/

[7] IUCN was requested to circulate the full 2010 MMP to the NTF by 11 April 2014 and this was done.

2010 mitigation measures will extend the survey, thereby exposing increasing numbers of whales to sound levels that might lead to a behavioural response. To this end, the Company will explore modifications to the 2010 protocols that will allow the survey to proceed while achieving the primary mitigation measure of starting and finishing early. The Company will present the results of this study by an intersessional communication."

7 OTHER BUSINESS

7.1 Short progress report on 2013 photo-id boat experiment

See item 5.5.1

7.2 Short progress report on publication of 2010 analyses

Reeves gave a brief report on progress with production of a Theme Section of *Endangered Species Research* which is expected to consist of several articles containing results and analyses of the 2010 Astokh 4D data.

7.3 Short progress report on analyses of noise recordings made in 2013 at the platform

Sakhalin Energy advised the NTF that a full report on the findings from PA-B would be provided at the next meeting.

7.4 Update on publicity for Nowacek *et al.*, 2013

Berzina reported that the media campaign associated with the publication of Nowacek *et al.* (2013) was a great success (NTF-6/INF.5) and she thanked everyone for their contributions, in particular, those who responded to all the numerous media requests, including Nowacek, Reeves, Racca and Donovan, among others.

In the same vein, Donovan noted that it was important for results of the 2012 seismic survey monitoring effort to be published in the peer-reviewed literature even though the data were relatively sparse and the results unlikely to be conclusive. The NTF **recommends** that a serious effort be made to accomplish this.

8 ADOPTION OF REPORT

The Chair thanked the participants for the constructive and intense discussions. It is clear that considerable work remains but he remained optimistic that the work could be completed provided sufficient time and resources were made available. He thanked IUCN for organising the meeting and the interpreters and rapporteur for excellent work. He especially thanked Reeves and Nowacek for final editing assistance. The main conclusions and recommendations were agreed by the NTF prior to the close of the meeting; these were not modified except for editorial clarifications. The full report incorporating comments from participants that did not substantially affect the agreed main conclusions and recommendations was adopted by e-mail on 27 June 2014 apart from some minor clarifications adopted on 21 July 2014.

9 REFERENCES

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Annex A – List of Participants

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Richard Evans (Sakhalin Energy)
Doug Nowacek (WGWAP)
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Mariken Betsema (Rapporteur)

Interpreters

Alexander Danilov
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Annex B – Agenda

1. **INTRODUCTORY ITEMS**
   - 1.1. Introductions and logistics
   - 1.2. Adoption of agenda
   - 1.3. Available documents/materials
   - 1.4. Rapporteur

2. **UPDATE ON COMPANY PROGRESS FOR THE 2015 SEISMIC SURVEY**
   - 2.1. Status of tender including technical parameters
   - 2.2. Update on project plan
   - 2.3. Update on deadlines for NTF input (internal and EIA)

3. **UPDATED ON WORK/ANALYSES FOR 2015 SEISMIC SURVEY**
   - 3.1. Update on 2012 2-D Seismic Analysis
   - 3.2. Progress on acoustic modelling including work completed for Piltun-Astokh survey
   - 3.3. Progress on consideration of appropriate sound levels wrt mitigation in light of analyses since 2010 and case studies
     - 3.3.1. Review novel approach to estimating exclusion zone
   - 3.4. Progress on possible use of DTAGS
   - 3.5. Other

4. **UPDATE ON OTHER ACTIVITIES ON THE SAKHALIN SHELF IN 2015 (prior, during or post- SEIC survey)**

5. **MITIGATION AND MONITORING PLAN FOR 2015 SEISMIC SURVEY (& BEYOND)**
   - 5.1. Summary of mitigation measures for past surveys
   - 5.2. Proposed modifications to mitigation measures & shutdown criteria for future survey
     - 5.2.1. Development of A- and B- line criteria (arises out of 3 above)
     - 5.2.2. Position of PML (arises out of 3 above)
   - 5.3. Real-time and acoustic monitoring/mitigation
     - 5.3.1. Developments on Autonomous Underwater Acoustic Recorders
     - 5.3.2. Practical process in field
   - 5.4. Behavioural monitoring/mitigation
     - 5.4.1. Status update on Marine Mammal Observers, Behavioural observation teams
   - 5.5. Other monitoring (e.g. distribution, photo-identification)
     - 5.5.1. Summary of Joint Programme 2013 and plans for 2014-15
   - 5.6. Other

6. **SUMMARY OF CONCLUSIONS AND WORKPLAN (INCL. ALLOCATION OF RESOURCES)**

7. **OTHER BUSINESS**
   - 7.1. Short progress report on photo-id boat experiment
   - 7.2. Short progress report on publication of 2010 analyses
   - 7.3. Short progress report on analyses of noise recordings made in 2013 at the platform

8. **ADOPTION OF REPORT**

Annex C – List of Documents

DOCUMENT #	TITLE	LANGUAGE	STATUS
NTF-6/1	Provisional agenda	English	Public
NTF-6/2	List of documents distributed in connection with the 6th meeting of the WGWAP Noise Task Force	English	Public
NTF-6/3	Программа мониторинга охотско-корейской популяции серого кита у северо-восточного побережья острова Сахалин в 2014 году (Western (Okhotsk-Korean) Gray Whale Research and Monitoring Programme in 2014, Sakhalin Island, Russia)	Russian	Confidential
NTF-6/4	Western (Okhotsk-Korean) Gray Whale Research and Monitoring Programme in 2014, Sakhalin Island, Russia)	English (unofficial translation)	Confidential
NTF-6/5	Presentation on 3D/4D Seismic Plans, Piltun-Astokh, Sakhalin Energy 2014-2016	English	Confidential
NTF-6/6	Presentation “Summary of mitigation measures for past surveys”	English	Confidential
NTF-6/7	Presentation “Analysis of pulse levels at tracked whales in 2012 South Piltun HR2D seismic survey”	English	For NTF internal use only
NTF-6/8	Presentation “Initial acoustic modelling of planned 2015 Piltun-Astokh 4D seismic survey”	English	For NTF internal use only
NTF-6/9	Presentation “Additional slides – draft NOAA criteria for PTS safety range estimation”	English	For NTF internal use only
NTF-6/INF.1	Peer Review Report: National Oceanic and Atmospheric Administration (NOAA) Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals: Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts, September 2013, available at http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm	English	Public

NTF-6/INF.2	National Oceanic and Atmospheric Administration (NOAA) Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals: Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts, December 2013, available at http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm	English	Public
NTF-6/INF.3	Public Meeting/Webinar Presentation on the National Oceanic and Atmospheric Administration (NOAA) Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals: Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts, January 2014	English	Public
NTF-6/INF.4	Compilation of other operator activities between 2013-2021 – information sheets per project from the mapping exercise and a summary file, v. March 2014, IUCN	English	For NTF internal use only
NTF-6/INF.5	Summary of global media coverage http://bit.ly/1dQexYd on the IUCN's media campaign "Keeping whales safe in sound" http://www.iucn.org/?14297 regarding the Nowacek *et al.* (2013) paper *Responsible Practices for Minimizing and Monitoring Environmental Impacts of Marine Seismic Surveys with an Emphasis on Marine Mammals*, published in the journal *Aquatic Mammals*	English	Public