Report of the Independent Observer on the
2018 Sakhalin Energy’s Piltun-Astokh 4-D
Seismic Survey

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**LIST OF TERMS AND ACRONYMS**

AIS  | vessel Automatic Identification System
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AG  | Advisory Group
Big-eyes | binoculars with high magnification for distant detection and identification of marine mammals
CC  | Central Commander
CMS  | Camera Monitoring System
Company  | Sakhalin Energy Investment Company Ltd.
GSM  | Global System for Mobile communications
IUCN  | International Union for Conservation of Nature
IO  | IUCN Independent Observer
MMP  | Monitoring and Mitigation Plan
NTF  | Noise Task Force
nt  | northern shore observation team
Photo-ID  | photo identification
PML  | perimeter monitoring line
SCF  | Sovcomflot company
SEE  | Russian Federation State Environmental Expertise
ST  | southern shore observation team
Mysticetus  | software for whales behavioural and distribution data visualization, management and preliminary analyses
sMMO  | shore based marine mammal observers
vMMO  | vessel based marine mammals observers
VHF  | very high frequency
WGWAP  | Western Gray Whale Advisory Panel
BACKGROUND

Sakhalin Energy Investment Company Ltd. (hereafter Sakhalin Energy or the Company) conducted a 4-D seismic survey of its Piltun-Astokh lease area during the summer of 2018.

The Company had developed an integrated monitoring and mitigation plan (MMP, see Annex) to minimise the effects of the 2018 seismic survey on gray whales, in collaboration with the Western Gray Whale Advisory Panel (WGWAP) via its Noise Task Force (NTF). An essential component of the MMP was to maximise data collection, in order to facilitate planning of similar programmes for future seismic surveys.

The MMP was developed building upon similar Plans developed for the 2010 and 2015 Sakhalin Energy’s seismic surveys (also developed in collaboration with WGWAP). Putting the MMP into practice required complex decision making in real time, driven by many rapidly changing factors (e.g. operational requirements, weather, whale behaviour and distribution) An Advisory Group comprising six WGWAP members from the NTF was established to provide relatively rapid advice on MMP implementation when requested.

In order to evaluate the effectiveness of the MMP, and also to provide a degree of transparency and public confidence, it was agreed that an independent observer (IO) appointed by IUCN should be present on-site, to report on the implementation of the MMP and provide any recommendations for improvements. The qualifications and duties of the independent observer (IO) were laid out in Terms of Reference (see Annex), which stated that the IO should:

“... present the full final report to IUCN on the implementation of the MMP and document any exceptions or changes to the MMP should they occur. The documentation should be of sufficient detail to allow for a full analysis and review of the seismic survey programme, including an overall conclusion on the success of the implementation of the MMP during the Field Mission and recommendations for improvements for future surveys, if appropriate. An outline of the nature of the final report will be developed by the WGWAP. The final report will be authored by the IO and made public by IUCN after acceptance by the Panel. The draft final report will be subject to review by Sakhalin Energy to ensure factual accuracy, following a procedure similar to that used for WGWAP reports and for the IO report on the previous Sakhalin Energy’s Astokh 4-D seismic survey (2015).”

INDEPENDENT OBSERVER’S PREFACE TO THE REPORT

In 2018 I was given the challenging role of IUCN’s Independent Observer (IO) – to observe and report on an extensive 4-D seismic survey by Sakhalin Energy. This was the third time within less than ten years that the Company planned to conduct a seismic survey in a manner that would prevent or at least minimize impacts on gray whales while achieving the Company’s business objectives. The significant experience gained during the seismic surveys in 2010 and 2015 provided lessons that were incorporated into the development of the Monitoring and Mitigation Plan (MMP) for the 2018 survey. This planning had started in November 2015, immediately after completion of the company’s survey that year. Very extensive thought, effort and resources were put into the planning process by the Company and by other involved stakeholders (for details see reports of NTF-9 to NTF-141 and WGWAP-16 to WGWAP-18).

The original MMP for the 2018 4-D survey (i.e. prior to the refusal of the Russian Government to allow the acoustic component – and see Item 3) was, to my knowledge, the most sophisticated and resource-

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1 All NTF reports are available at https://www.iucn.org/western-gray-whale-advisory-panel/panel/task-forces/glance-meetings-and-reports
2 All WGWAP meeting reports are available at https://www.iucn.org/western-gray-whale-advisory-panel/panel/meetings/glance-meeting-reports
intensive plan of its kind, a result of extensive consultation among technical industry personnel, independent scientists and IUCN. The 2018 MMP was meant to be the guiding document for the Company while conducting the survey and my “reference point” when developing my report on actual implementation.

Unfortunately for all concerned, despite the careful planning, MMP implementation in 2018 was impacted by many unforeseen factors, mainly the exceptionally unfavorable environmental conditions which would have made it impossible to complete the survey if all specifications in the MMP had been strictly followed. As a result, some key planned mitigation measures were not fully implemented.

The IO Terms of Reference required me to assess actual implementation in relation to what was specified in the MMP. Though formally speaking, some conclusions of this report indicate that the Company’s activities did not fully adhere to the MMP, I wish to stress that Company employees and contractors put a lot of effort and resources into trying, in good faith, to adhere to the MMP as much as possible, provided very challenging environmental conditions and given the requirement to complete the seismic survey in a single season.

1. OVERVIEW OF ACTIVITIES OF THE INDEPENDENT OBSERVER

The MMP had two components: offshore and onshore. The offshore component involved vessel-based marine mammal observers (vMMOs) on the seismic source vessel and the scout (or chase) vessel. The onshore component included shore-based visual observation teams (sMMOs), the Command Center team, and shore-based photo-identification teams (Fig. 1).

![Fig. 1. General onshore area of Sakhalin Energy 2018 MMP. Red circle indicates command centre at Chaivo IFM camp.](image)

The IO was based on shore, mainly at the Command Centre, and he could visit the shore teams at their observation posts whenever doing so was deemed useful. The importance of having the IO based
primarily at the Command Centre (where data integration would occur and decisions would be taken) had been recognized by the NTF and it was an arrangement that had proved practical during the 2010 and 2015 surveys.

Relevant sections of this report that refer to the offshore component are based on the IO’s indirect observations of team operations through communications with the Central Commander (CC) and the lead offshore MMO.

1.1 Period of observation

The IO’s field mission lasted from 30 May 2018 through 30 July 2018, 62 days total. Of those, 4 days were spent travelling (mobilising/demobilizing to/from Sakhalin and from Yuzhno-Sakhalinsk to/from MMP site), 2 days in Yuzhno-Sakhalinsk and 56 days on-site observing MMP implementation.

Throughout the observation period, environmental conditions (i.e. presence of sea ice, fog, precipitation, strong winds or a combination of these factors) were extremely poor and therefore challenging to MMP implementation. In fact, during the 56 days in which the IO was present on-site, the weather conditions could be considered “good” throughout the whole day on only 4 days.

Due to unexpected delays throughout the survey, caused mainly by unfavorable environmental conditions, its duration had to be extended significantly, exceeding the period originally planned for the IO mission.

In conclusion, this report covers the MMP implementation during the pre-seismic phase and most but not all of the seismic phase: the full period of the streamer component and part of the OBN component.

1.2 Layout of Command Centre and observation posts

Fig. 1 (above) shows the geographic locations of the onshore observation stations and the Command Centre.

The Chaivo IFM Camp is an accommodation camp for employees working on various oil & gas industry projects. The camp was selected by Sakhalin Energy as a location for the Command Centre and as a basecamp for the southern Piltun spit observation teams. It could be reached easily by the well-maintained dirt access road branching east from the main north-south Sakhalin road.

The camp, secured by the fenced and guarded perimeter, provided the base for two southern MMO teams, a photo-id team (which became known later in the survey as the southern photo-id team), the Command Centre team and MMP support personnel.

The Command Centre was located in a dedicated “office” (Fig.2) in the Chaivo IFM camp and it was provided with all necessary equipment to ensure 24/7 access to all relevant data sources and communications for the Command Centre team (the central commander, the JASCO team, and the IO). The Command Centre (and/or its team) was equipped with cell phone(s) and a satellite Iridium phone. It had internet access via a dedicated ‘central’ GSM modem, while individual GSM USB modems could be used when the main source of internet access was inactive. The Centre had enough space to accommodate the Command Centre team and its equipment (i.e. computers, monitoring screens etc.) and to hold meetings, if necessary. Data from the Automatic Identification System (AIS), the acoustic footprint model, and the observation teams were projected on the main screen using Mysticetus – the

\[\text{3 The camp also served as a base for other non-MMP personnel.}\]
software used during 2018 MMP implementation for data visualization, management and preliminary analyses. The visualized data guided CC decisions.

All field teams were equipped with GSM phones and modems (as primary communication) as well as satellite phones, VHF radios and satellite data transmission systems for transferring data (as backup) serving as the primary and backup means of communication allowing data to be transmitted to the Command Centre in near to real time.

The IO was based mainly in the IFM camp and had 24/7 access to the Command Centre.

The acoustic post was not set up given that no real-time acoustic monitoring was conducted during the 2018 seismic survey (for details see Item 3 of this report). Effectively, some of the acoustic post functions were carried out by the JASCO team at the Command Centre.

Observation posts for the collection of data on distribution and behaviour, with a specific focus on mother-calf pairs (MCs), were located along the southern and northern spits of Piltun Lagoon at the same locations as were used in 2015 (see Fig. 1). Two posts were located on each spit. The northern spit teams (NT1 and NT2) were based in and operated out of Pioneer camp, while the southern spit teams (ST1 and ST2) were based in and operated out of Chaivo IFM camp. Travel time from Chaivo IFM camp to ST1 was 1 hour 25 minutes and to ST2 1 hour 45 minutes. From Pioneer camp to NT1 and NT2, travel time was 1 hour 15 minutes and 1 hour 20 minutes respectively.

Each observation team consisted of one theodolite operator, one computer operator/note taker, and two MMOs (for scanning with hand-held binoculars). Each team was accompanied by a driver, who was required to remain with the team for the day.

For the ST2 team, a new tower was built a few hundred meters south of the old (2015) tower due to coastline erosion that made the latter no longer safe to use.

In 2018, an observation tower (Fig. 3) was built at each observation post to provide the teams with the elevation needed to accomplish their tasks. The towers had slightly different designs, though all
followed the main principle of a central column providing necessary stability for the theodolite and the ‘outer’ tower structure allowing team members to move around without compromising theodolite balance.

Teams travelled to posts closest to camps via Toyota Landcruiser and had a small cabin for sheltering during poor weather (Fig. 3, right); teams that had to travel to posts farthest from basecamps commuted via big Kamaz tracks and used their passenger cabins as shelter when needed.

![Fig. 3. Design of sMMO observation towers. Left: tower at NT1 post (station 7.5). Right: tower at ST1 post (station 10)](image)

Onshore teams transmitted data to the Command Centre using internet and cloud storage. Primary communication between team leads and the CC was via GSM phone calls and regular text messaging. Additionally, team members could communicate with the CC via instant messaging using ‘WhatsApp’. This proved effective for weather and visibility updates. Other (backup) means of communication were available to all teams at all times.

1.3 Overview of activities and IO observations

Besides being based mainly at the Command Centre, the IO also visited the southern and northern onshore sMMO observers’ teams/stations. The IO was able to ‘observe’ activities of the offshore MMP component via information shared by the CC and through direct phone conversations with the senior vMMO.

The IO spent 49 days at Command Centre (this included time spent visiting southern observation teams at their posts), undertook 14 visits (7 trips) to southern observation posts and 6 visits (2 trips; total 7 days) to northern observation posts.

Due to the travel time required to visit Pioneer camp and the northern observation teams/posts, on the one hand, and recognising that observation of MMP implementation was most effective at the Command Centre, on the other hand, the IO made only 2 trips to Pioneer camp. This was deemed sufficient to accomplish tasks as per ToR. Sakhalin Energy assured that a vehicle was available for use of the IO whenever required.

1.4 Conclusions and recommendations for the future

The planned timing of the IO field mission was adequate to accomplish the tasks set out in the TOR (see Annex) and to observe all stages of the seismic survey and implementation of the MMP. The maximum
anticipated time in the field (roughly two month) seemed ample and the IO made sure that he was available for the entire period, however neither the Company nor IUCN nor the IO expected the significant delays in survey completion caused by ice and poor weather. Should it be in future that the IO must be present on-site for the duration of the survey, a worst-case scenario (e.g. delays in survey completion) should be considered, and Sakhalin Energy, IUCN and the IO should try to build more flexibility into their arrangements.

Several visits to the field stations in good "working" weather should be sufficient for the IO to make observations on sMMO operations as well as their level of qualification and professionalism. Such observations can be compared later (at the Command Centre) against the data delivered by each team. Though it should not discourage the IO from visiting field stations whenever needed, the primary IO observation platform should continue to be the Command Centre, where the bigger picture of MMP implementation can be observed. This key task should not be compromised.

Similarly to 2015, in 2018 the Command Centre was recognized as the main IO observation location.

1.4.1 Conclusions on the timing of the IO visit and coverage of operations

1. The planned timing (and duration) was adequate to allow detailed and complete observations on MMP implementation. However, unexpected and unprecedented delays due to poor weather, which extended the survey by roughly three weeks, prevented the IO from observing MMP implementation from beginning to end.

2. The IO was provided with necessary technical and logistical support and had access to all necessary information.

3. The IO was able to observe (mainly in-person) all components of MMP implementation.

1.4.2 Recommendations on timing of the IO visit and coverage of operations

1. Relevant recommendations provided in item 1.4.2 of the 2015 IO report were implemented in 2018. Those recommendations remain relevant and should be considered during the planning of future IO missions.

2. Should Sakhalin Energy and IUCN decide in future that the IO needs to be present on-site for the duration of the seismic survey, a worst-case scenario, similar to what was experienced in 2018, should be considered and taken into account so that all parties involved are able to plan accordingly and are prepared to accommodate changes in the survey schedule.

2. REVIEW OF COMMAND CENTRE AND COMMUNICATIONS (MMP ITEM 2.1)

2.1 Personnel and chain of command

The Command Centre team consisted of the central commander (CC), the two-member JASCO team and the Sakhalin Energy's coordinator. The IO was also based at the Command Centre.

The JASCO team was responsible for the continuous and smooth running of data collection and visualization of the data from the AIS system, observation teams, and acoustic footprint model. Once received in near real time at the Command Centre, these data were immediately visualized to help guide

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the CC in making decisions on MMP implementation. The JASCO team remained on ‘stand by’ to run the acoustic footprint model whenever necessary and verify the modeled footprint as required.

This was a vital part of the MMP and the decision-making process since the CC was obliged to implement multilayered mitigation measures while at the same time minimizing duration of the survey. For this reason, a precise understanding of geographic features of the acoustic footprint was essential.

The JASCO team provided the CC with near-real-time visualization of whale distribution and the moving acoustic footprint of the seismic survey (Fig. 4)

Fig. 4. Screenshots from the key Command Centre monitors showing data received: (upper) coastline, station locations, PML, key vessel locations, cumulative modeled footprint for the given survey line, modeled acoustic footprint for the moment; (lower) data visualized in Mysticetus for coastline, whale locations, key vessel locations, combined and immediate modeled acoustic footprints.
Unfortunately, as the Sakhalin Energy’s subcontractors responsible for real-time acoustic monitoring were not granted permission by Russian authorities and acoustic monitoring could not occur, the originally planned communication protocol had to be revised (Fig. 5).

2.2 Communication systems and backup

To ensure that measures consistent with the MMP could be implemented, the CC was provided with all necessary means of communicating with all the onshore teams, the lead vMMO, and the Sakhalin Energy’s representative aboard the seismic vessel.

To communicate orally with the onshore teams, the CC relied mainly on local a GSM cellular phone system, although both the CC and each team were equipped with satellite phones for backup. For offshore, the CC communicated with the Lead vMMO and Sakhalin Energy’s representatives via cell phone (GSM), instant messaging or satellite phone if required as a backup. The acquisition plans were provided to the CC via the onboard SCF Geophysicist team (Reservoir Imaging) via email on a daily basis. The acquisition plans could change regularly and the SCF geophysical team ensured that plans were updated and distributed accordingly.

The CC was usually in direct and regular communication with the chase vessel MMOs via text messaging. This proved to be the most reliable approach for agreeing scouting plan requirements and receiving live
visibility updates. The sighting information was plotted by the Command Centre team using the program Mysticetus. The CC therefore took responsibility for managing the chase vessel scouting operations as he believed that was more effective than the approach included in the MMP and MMO manual that assigned this to the Lead vMMO.

All onshore teams transmitted observation data to the Command Centre via the Mysticetus internet uplink through ‘cloud’ storage using individual GSM modems. For backup, both northern and southern pairs of shore teams could transmit data between the pair using radio channel and each pair was provided with a powerful satellite data transmission station (placed on Toyota Landcruiser). Both stations could then transmit data via satellite to the Command Centre. In practice this was not necessary throughout the period of the IO’s mission, so the system was tested and remained on standby. A dedicated technician remained in the field to service this backup system as needed.

Data from the AIS system were received at the Command Centre directly using an AIS receiver. As a backup, one of the onshore observation teams also had a receiver, and, additionally, these data could be sent to the Command Centre from JASCO’s office in Canada.

2.3 Incidents or difficulties

Overall, communication was reliable and effective. All teams remained in touch at all times and no gaps in data transmission were observed during the IO’s mission. No difficulties were associated with communication and the information flow was almost seamless.

According to the lead vMMO, all of the shutdowns were initiated due to observations of gray whales and other marine mammals in the exclusion (safely) zone were executed “immediately,” requiring only quick notification of the navigation officers.

In many cases only partial lines were acquired due to environmental conditions (mainly visibility, lack of ‘pre dusk scan’ etc.) worsening to such an extent that termination of acquisition for mitigation was necessary. These were not classified as shutdowns, however they required seamless communication between all MMP components allowing the CC to assess all available information and coordinate accordingly in real time. In such instances, the CC was acting cautiously and proactively, so that information on when and where along the acquisition line the survey effort would need to be terminated (unless conditions improved) was communicated to the seismic vessel via the lead vMMO well in advance.

2.4 Overall impression of effectiveness of the Command Centre and communication strategy, including IO access to information

Overall, the Command Centre was effective and well prepared to carry on even in challenging circumstances. The primary and backup means of communication were provided to all MMP components, allowing for successful coordination and implementation. The communication strategy and chain of communication were adequate.

2.5 Suggestions for improvements, if any

None.
3 ACOUSTIC MONITORING (MMP SECTION2.2)

As described in the final Sakhalin Energy's MMP (09 June 2018):

“The agreed MMP was developed in conjunction with Sakhalin Energy within the Noise Task Forces 12 & 13, approved by WGWAP-18 in Moscow November 2017 and further refined in NTF-14 in Gland March 2018.

Following the unprecedented receipt of the RF Denial of Permit for the contracted scientists to undertake underwater acoustic monitoring, Sakhalin Energy informed the Panel and IUCN of the situation. No explanation for the denial of permit was offered by the Russian authorities and it was interpreted by the Company as final: not subject to negotiation or appeal. After some discussions and a presentation by the Company’s acoustics advisor of a proposed way forward based on modelling alone, the Panel issued a statement to the Company... stressing the importance of acoustic monitoring to the MMP and recommended that Sakhalin Energy and IUCN seek a solution to allow for even some underwater acoustic monitoring to take place during the 2018 seismic survey.

The Company agreed with the importance of underwater acoustic monitoring but informed the Panel that neither it nor its Contractors had, at that time, any formal lines of communication for attempting to achieve the recommendation.”

Unfortunately, though the acoustic monitoring component was agreed to be an integral part of the MMP, it could not be implemented due to permits not being issued by Russian authorities. Thus, for the duration of the 2018 Sakhalin Energy’s 4-D seismic survey no acoustic data were received or recorded for monitoring and mitigation purposes.

According to Sakhalin Energy:

"The Company’s acoustical consulting services provider, JASCO, has completed high quality modeling work to bound as much as possible the uncertainty in the modeling estimates and determine conservative, precautionary adjustments to be applied during operations, so that the 2018 seismic survey can be undertaken with justifiable confidence in the adequacy of the mitigation measures. In effect, the adjusted MMP applies a precautionary safety margin which has been increased following the presentation to the WGWAP, to better account for variability and to further mitigate risk to whales.”

Effectively, the only part of the mitigation component related to acoustics and available for implementation during the 2018 seismic survey was the acoustic footprint modeling developed by JASCO based on information on acoustic features of key sound sources used by the operator during the survey.

Having been notified of the permit denial, WGWAP expressed a number of concerns in its statement, including that

“...the lack of even limited acoustic monitoring precludes evaluation of the JASCO modeling either during or after the survey”.

In this regard, a finding made by the JASCO team in the middle of the survey is significant. On 8 July the team discovered, while conducting a task requested by the acquisition team aboard the seismic vessel, that the source parameters used for JASCO’s acoustic footprint modeling did not correspond with those of the source actually being used for the current survey. Though the airguns were of smaller volume than one used for initial modelling, the combined source features resulted in greater side propagation of the energy, including towards the shore, than had been assumed in the modelling to that point.

5 For more details see documents at https://www.iucn.org/western-gray-whale-advisory-panel/panel/statements-and-letters
Once the discrepancy was discovered, the acoustic footprint for each line was re-modeled using the actual source parameters. These calculations showed that the updated modelled 156 dB contour remained within the boundary of the previously modelled footprint (that footprint had incorporated an additional +2dB precautionary offset), and thus did not extend outside of the western border of the A-zone that had been used for mitigation advice until that point in the survey.

However, adding the additional precautionary 2 dB to the new footprint resulted in an increased size, depending on bathymetry, of between 600m and 2,500m. When this was taken into account, four more lines were classified as A-lines. A retrospective review of observed locations of mother-calf pair sightings showed that none were inside the newly modeled A-zone.

Following this finding by JASCO, Sakhalin Energy’s Chief Geophysicist provided the following clarification:

“... on the identified discrepancy between actual Sovcomflot (SCF) gun array and the one used for acoustic modeling:

JASCO identified a difference between the SCF gun array and the one used for modeling as follows: The SCF Party Chief needed to test a single gun from the array and, after communicating with JASCO in the Command Center, provided the volume of the specific gun (230 cu.in), which volume was not in the JASCO gun specification list.

JASCO and Sakhalin Energy then directly checked the gun arrays in detail, and the array being used was indeed not identical to the 2015 one, even though total volume was nearly identical (2018 volume slightly lower).

JASCO (in the CC) assessed the effect of the new array configuration on the modelled directional source levels, which was validated within hours by independent JASCO modeling in the Victoria office. The propagation modelling of the new levels led to an increase of the A-zone footprint in the feeding area and consequent extension of the length of A-segments.

Updated A-segments were provided to Sakhalin Energy, who communicated the updates to the vessel at the earliest opportunity on the same day (6 July, late evening Sakhalin time). The vessel then promptly incorporated the changes in the acquisition line planning.

Concurrently to action 4., JASCO started inputting updated A-zone contours to the Mysticetus maps at the CC so that the correct boundaries were being used in any mitigation decisions.

JASCO validated by 9 July that no M-C pairs had been observed within the extended A-zone areas during the period when the original modelling results were being used. No incorrect mitigation decisions thus appear to have been made because of the erroneous initial assumption about the source.

Sakhalin Energy and JASCO will do a look-back if this could have been prevented, but the underlying causes seem to have been:

JASCO, on the basis of Sakhalin Energy information, assumed the airgun array configuration used in modeling would be identical to the one used in the field.

Sakhalin Energy assumed that the airgun array used by SCF was identical to the previous one for all practical purposes, including its lateral sound distribution....”

The IO was uncertain whether, after adjusting the modelling, Sakhalin Energy had asked JASCO to re-evaluate the exclusion zone as well. This said, the exclusion zone had been prescribed by the State Environmental Expertise (SEE) and in any case could not be less than what was authorized by SEE.

Although the +2dB safeguards built into the JASCO acoustic footprint model after acoustic monitoring permit denial appeared to account for the discrepancies between the real and initially modeled seismic source, this was rather by good luck than judgement (the possibility of incorrect sound source information had not been the initial rationale for the precautionary approach and indeed the same level of precaution was added after the mistake was corrected). In fact, the actual mismatch would probably have been identified from the very start of the survey if real-time acoustic monitoring had been in place.
In addition, real-time acoustic monitoring would perhaps have helped to refine the exclusion zone and not only make mitigation more effective, but also result in fewer shutdowns thus making the survey duration shorter, the key mitigation measure.

The Company put significant effort and resources into planning and preparation for acoustic monitoring. It is recognized that in 2018 it was beyond Sakhalin Energy’s control to conduct real-time acoustic monitoring as part of its MMP due to the permit refusal and the short time to try to see if approval could be obtained if adjustments to the equipment or approach had been made.

3.1 Suggestions for improvements

(1) Real-time acoustic monitoring is widely regarded as a standard responsible practice to be used in efforts to mitigate the impacts of seismic operations on marine mammals. Every effort should be made to ensure that such monitoring is integral to future MMPs.

(2) Many recommendations with regard to acoustic monitoring from previous IO reports were taken into account while developing the 2018 MMP. These recommendations remain relevant for future surveys and MMPs.

4. VISUAL MONITORING - BEHAVIOUR AND DISTRIBUTION

Visual monitoring was conducted throughout the area shoreward of the PML and also around the seismic ship. The onshore behaviour and distribution monitoring teams (sMMOs) arrived on-site on 3 June, roughly 9 days before anticipated start of the seismic survey, and they remained in place throughout the entire IO observation period.

Vessel-based observation teams (vMMOs) consisted of two groups: one on the seismic vessel and one on the scout vessel. The team on the seismic vessel included the CMS (camera monitoring system) technologist who was responsible for operating the CMS equipment and night-time monitoring.

The systematic monitoring efforts were supplemented by non-systematic observations by the shore-based photo-ID teams (the second of which arrived on-site on 30 June and operated continuously along the northern Piltun spit thereafter).

4.1 Establishment of platforms and timing of deployment

Behaviour and distribution monitoring was conducted from fixed onshore platforms located along the coastline facing the seismic survey area. Under good viewing conditions, the entire area that may have been affected by seismic noise shoreward of the PML could be covered visually from those platforms. Four dedicated platforms were built (Fig.3) to facilitate observations, accounting for landscape elevation features at each station and allowing for required coverage (also see section 1.2 of this report). Several platforms had survived from previous years and only needed reinforcement, but at one station (ST2), the shore had eroded to such an extent that the platform could not be used safely. A new platform was built therefore, about 200m south of the 2015 location. All towers were ready and usable before the observation teams arrived.

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Upon their first visit to stations on 4 June, the sMMOs observed a wide strip of open water (~15-20km) near shore with a significant amount of ice present farther offshore (Fig. 6).

Single gray whales were present in the area. On 6-7 June, the ice observed at a distance offshore was pushed inshore. The pre-seismic observation period was anticipated to last for roughly 8-9 days (03-12 June), but environmental conditions (mainly ice coverage of 80-100%) precluded the seismic survey from starting on time (Fig. 7). Due to challenges and risks associated with surveying in ice conditions, the seismic survey line acquisition could only begin on 24 June at the eastern edge of the survey area. This resulted in 21 days of pre-seismic time, but unfortunately during most of this time sea ice, often coupled with fog, prevented observation and the collection of pre-seismic survey data.

The primary mitigation measure was to conduct the survey as early in the season as possible when it was expected that fewer whales would be present in the area. Weather prevented this but the shore-based observer teams had been effectively mobilized so that they could collect pre-survey (pre-seismic) data that could be used for future analyses.

**Fig. 6.** Southern teams at observation post at Piltun lagoon mouth, first day in the field, 4 June. The nearshore area is ice-free, but some ice is still present (arrow).

**Fig. 7.** Ice coverage near shore 6 June 2018.
4.2 Operations of land-based observation teams, including personnel, equipment, understanding and following of protocols, and communication with the Command Centre

Visual monitoring was conducted by four teams, each comprising four members. Each team had a theodolite operator, a computer operator, and two observers using reticle binoculars. All team members had experience relevant to their roles. All four teams were multinational with English being the primary communication language. No problems were observed in team operations in the field, in communication between teams or in communication with the Command Centre.

None of the teams had worked together before as a unit, although some individuals had worked together previously. All sMMOs had experience in industry-related monitoring projects and some had experience at Sakhalin. The high skill level and previous experience of the teams allowed them to move quickly into smooth, efficient operation. All team leaders had relevant experience in collecting behavioural observations using theodolites and were able to lead their teams with confidence.

Taking into account the long hours in the field, long commuting time across challenging terrain (for some teams up to 4 hours a day) and overall duration of the survey, Sakhalin Energy had decided before the survey to employ ‘extra’ sMMOs to allow rotation and breaks. Every visual team member was given a day off from field effort roughly once a week. This day would not be a holiday, but rather an ‘easy day’ when the person could remain in the camp and complete some tasks related to reporting, data QA/QC etc.

All theodolite operators in all teams were experienced in tracking marine mammals. In some teams more than one member had such experience, so rotation throughout the day was possible.

Field protocol information was provided to all team members in either English or Russian well in advance and before mobilization to Sakhalin. Upon arrival to Yuzhno-Sakhalinsk, all onshore teams jointly went through induction and safety training. In addition, all theodolite operators and operators went through training with the Mysticetus program. Although some individuals had previous experience with a variety of data collection software, this was a very useful exercise allowing ‘synchronization’ of terminology, data collection procedures, descriptions etc. across all four teams. Mysticetus, even though it is an off-the-shelf commercial product, allows some degree of customization, and this was done for the project by a JASCO team member who had previously received special training at Mysticetus HQ. The Mysticetus workshop in Yuzhno-Sakhalinsk allowed fine-tuning of the Mysticetus set-up across all teams before they departed to the field (Fig. 8).
All of the electronic equipment (theodolites, laptops, software) was provided for the monitoring as a package by the developers of Mysticetus, and therefore it had been tested for compatibility and the software had been pre-installed and tested. This ensured that each shore team was using a standard set of equipment effectively identical to the others. Mysticetus developers also provided advice and remote technical support addressing minor challenges related to the use of the program. Altogether, this helped to avoid any major technical issues with data collection.

By default, all data were to be synchronized to the cloud storage, but also saved on a memory stick and stored separately on a hard drive. A JASCO team member was in charge of data backup and final QA/QC in the field, and this individual provided the teams with technical support regarding data collection and software use.

The data collection protocols for conducting distribution scans, focal follows, whale respiration monitoring etc. were well understood by all team members and appeared to have been followed consistently.

Once collected at the observation posts, data on whale distribution were immediately available to the Command Centre via cloud storage. If for any reason the storage could not be reached by either the field teams or Command Centre teams, data could be sent directly from posts to Command Centre using backup cellular or satellite lines. The Command Centre thus had near-real-time information on whale distribution and specifically on the locations of mother-calf pairs. With all other data incorporated, the picture of whale distribution relative to the moving noise footprint was available to the Central Commander in near real time.

Using the primary or backup means of communication described above, the observation teams could communicate with each other, the photo-ID team(s), and the Command Centre to exchange information, upload data or coordinate their activities as needed.
4.3 Operations of photo-ID teams, including occasional distribution monitoring, equipment, understanding and following of protocols, and communication with the Command Centre

Early in the season, during pre-seismic and at the beginning of the seismic period, only one photo-ID team operated in the field in the field. This team was based mainly in the Chaivo IFM camp and operated predominantly along southern Piltun lagoon spit. The team leader was in contact with the northern observation teams and had all relevant information to determine whether any photo-ID effort needed to be conducted along northern spit (e.g. due to presence of mothers and calves). Whenever necessary, this team could relocate to Pioneer camp to carry out photo-ID effort at the northern section of the area. The team was fully equipped for such effort in terms of equipment and associated logistics and resources.

Later (30 June) a second photo-ID team arrived that was permanently based at Pioneer camp. After its arrival, the two shore-based photo-ID teams conducted photo-ID effort along both the northern and southern spits of Piltun lagoon.

The shore-based photo-ID teams consisted of a drone pilot, photographer, data recorder and driver. Weather permitting, the photo-ID team(s) travelled along the coastline in search of whales near shore and photographed them from shore (Fig. 9). The operating range of the photo-id teams included the visual range of sMMOs but extended further north and south. They remained in communication with the Command Centre and sMMOs, informing them of whale sightings, specifically of mother-calf pairs as required.

![Shore-based photo-ID team at work](image)

Fig. 9. Shore-based photo-ID team at work

4.4 Operations of vessel-based MMOs, including equipment, understanding and following of protocols, and communication with Command Centre

Six vMMOs (including the senior (lead) MMO), plus the CMS technologist, arrived in the survey area aboard the seismic vessel. Soon after, two of the MMOs were relocated to the scout vessel.
The primary role of the ship-based MMOs was, as per the MMP, to monitor the exclusion zone near the seismic vessel and whenever needed and feasible, to search for whales near or shoreward of the PML. The vMMOs were equipped with hand-held binoculars for close-range observations. In addition, a pair of Big-eye binoculars and a camera monitoring system (CMS; Dual Thermal Imaging/High Definition system) allowing 360° coverage had been installed on the seismic ship to be used for detecting and observing whales at greater distances, at and near the PML (Big-eyes), and at night (CMS) around the seismic ship, specifically to prevent whales from entering the exclusion zone.

Two attachment points for the ‘Big-eyes’ binoculars were mounted on the foredeck of the RV Vyacheslav Tikhonov, allowing them to be used from either side of the vessel. By default, they were mounted on the port side so that the MMOs could use them during acquisition of northbound lines closest to shore. If needed, they could be dismantled and mounted on the starboard side, but the IO was not made aware in the field that this was ever needed. During the drafting of this report, the CC clarified that the option of relocating the Big-eyes from port to starboard was in fact exercised and this presented no difficulties. The Big-eyes were used only occasionally by the MMOs. For most of the time there was either no need to use them or it was not feasible to use them given the conditions.

The dedicated technologist managed the CMS system and conducted monitoring during the hours of darkness, with assistance from the MMOs whenever they were available. The lead MMO reported that the CMS system provided some positive whale detections at night time. After the IO had departed from the field, he was informed by the Central Commander that one shutdown was initiated at night due to the detection of a gray whale by the CMS at 400 m. At the time of this detection, visibility was estimated as ~3 km.

Even though the CMS system was viewed as having considerable potential, it was not recognised by the NTF as a primary mitigation tool for the 2018 survey as the system’s effectiveness had not yet been carefully evaluated. The IO understood that a report on CMS use and its effectiveness, providing a level of detail allowing further in-depth evaluation of the practicality of using the same or similar method and equipment for mitigation during future surveys, was being prepared by Sakhalin Energy’s subcontractor.

The two vMMOs on the scout vessel played a critical role in enabling the survey to proceed as quickly as possible. In 2018, visibility from shore and from offshore vessels was often severely limited, and in many instances the ability of the scout vessel’s MMOs to monitor for whales close to the PML, which could not be well observed from either shore or the seismic vessel, made it possible to continue acquisition.

The four vMMOs aboard the seismic vessel and the two vMMOs aboard the scout vessel carried out observations in accordance with MMP protocols. As a result of these observations, several mitigation shutdowns were initiated due to gray whales or other marine mammals entering the exclusion zone.

Throughout the IO’s time in the field, information from the lead vMMO was communicated to the Command Centre via different channels: phone, e-mail and text messaging and as noted earlier, no communication issues arose. The CC was in direct contact on a daily basis with the chase vessel MMOs, predominately via text messaging and GSM calls. The CC provided pre-dusk planning information and course corrections for the chase vessel as it sailed along the PML. Additionally, the chase vessel MMOs provided regular updates on visibility conditions, which the CC updated on the AIS monitor. Also, GW sightings were texted to the Command Centre where they were entered into Mysticetus by the CC and JASCO teams. If the chase vessel was outside of GSM range, the scout vessel MMOs could always
communicate with the lead vMMO or with the Command Centre via the lead MMO using marine VHF radio as needed.

A minor matter in protocols that required clarification was the definition of visibility, as the term ‘visibility’ can be interpreted differently depending on the ‘target’. For example, in a light fog or haze it may possible to see the shoreline at a distance of 20 km, but clearly not a whale blow. This issue was addressed and quickly resolved in the field. The ‘visibility’ for the implications of the MMP was agreed to mean the distance at which MMOs could confidently detect whales from a given platform. This is something that might be more clearly specified in future MMPs and field protocols.

The main challenge to vMMOs was the continual ‘erosion’ of the mitigation measures towards the end of the seismic survey when all components of the MMP were seriously undermined by the extremely poor weather (for details see section 5 of this report).

4.5 Overview of land-based visual and photo-ID monitoring

The onshore monitoring teams had relevant skills and experience and were dedicated and hard-working despite the challenging conditions. All teams were provided with necessary equipment, transportation and logistics support, including primary and backup means of communication. The teams were familiar with protocols and had undertaken additional training to ensure standard data collection across all teams.

The shore-based photo-ID monitoring efforts, although referred to in the MMP, were only supplementary to the key components. The photo-ID teams fully understood and followed the protocols. Sightings of individually recognized whales are extremely useful, especially for long-term population monitoring. However, this component did not contribute much to mitigation or whale distribution monitoring during the IO observation period. Photo-ID teams operated largely over the same area as was covered by shore-based observation teams. With regards specifically to the mitigation and monitoring related to the seismic survey, the photo-ID teams’ efforts may have been more valuable if they had covered feeding ground areas outside the visual range of the shore-based observation teams. Identification of individuals is valuable in that it can provide, for example, information on movements and residency within the seismic period – and this can be examined in conjunction with data from the survey.

4.6 Overview of vessel-based MMO operations

Vessel-based MMO operations appeared to be conducted in accordance with the MMP and protocols. These operations allowed mitigation measures to be put in place and implemented when needed.

Some mitigation measures originally specified in the MMP were modified throughout the survey due to the extended periods of poor weather (for details see section 5 of this report). Vessel-based MMOs had to adapt to those changes.

Scans with the Big-eye binoculars of the portion of the feeding area near the PML were not always possible (or needed), but pre-dusk scans by the vMMOs on the chase vessel as it sailed along or near the PML, when feasible, provided a useful supplement.
4.7 Suggestions for improvements, if any

Lessons learned during the implementation of the 2010 and 2015 MMPs, as well as suggestions made in previous IO reports with regards to visual monitoring and mitigation, had been incorporated into the planning of the 2018 MMP. These lessons and suggestions were also taken into account and implemented in the field to the extent considered possible by the Central Commander and Company.

I suggest that the following points are considered in the development of any future MMP:

(1) Although relocation of the Big-eyes from port to starboard was optional in 2018, the IO reiterates his previously raised point that for future surveys, choosing a single location for the Big-eyes that would provide an unobstructed view shoreward on both northbound and southbound lines should be considered.

(2) The formal incorporation of CMS into the monitoring and mitigation program should be re-evaluated carefully in the light of experience and data obtained during this and other surveys.

(3) Terminology in protocols should be reviewed to avoid ambiguity (e.g. ‘visibility’ is the distance at which a whale can be reliably detected by an observer).

(4) While the Chaivo IFM camp provided a number of benefits, the long-distance daily commute had its effects on personnel (time-consuming, fatigue etc.). Having ‘south cluster’ camp at its 2015 location or similar would allow for more efficient and effective use of the southern observer teams.

5. MITIGATION MEASURES

When reading all sections of this report (and particularly this one), it is important to bear in mind the extreme environmental conditions in 2018, starting with exceptionally late departure of the sea ice from the survey area, followed by extended periods of bad weather with poor visibility. The teams in the field, while fully adhering to the MMP mitigation measures in the early stages of the survey, found it increasingly difficult to do so given the significant delays.

There were two interacting factors for the Company to consider as a result of the delays and weather: (1) the financial cost of such delays and the risk of not completing the survey in 2018 if fully adhering to the MMP; and (2) recognition that the primary mitigation measure was to complete the survey as rapidly as possible.

Under such pressure, which grew towards early-mid July (by which time it had been expected that the survey would be finished), the Company and Central Commander decided to relax some of the measures specified in the MMP. Operationally, the decision to relax these measures under pressing circumstances was taken by the Central Commander (after seeking the Company’s general concurrence) on a case by case basis after consideration of operational requirements, available data on whale distribution and other factors such as current and forecast environmental conditions and the imperative to complete the survey as early in the season as possible. This approach was relevant to MMP Section 3.2.3. item (1):

"... If a choice is to be made between postponement (e.g., by two weeks needed to get a feather match between the line to be acquired and the baseline survey) and acquiring the line or segment at night or in poor visibility conditions as

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9https://www.iucn.org/sites/dev/files/wgwap_9_doc_20_independent_observer_report.pdf and
defined in Annex D, then that choice is made by the Central Commander on the day, after considering all available information."

5.1 Updating A and B zones in real time

In the absence of real-time acoustic monitoring, all A and B lines were defined based on modelling conducted by JASCO, initially before the survey. The modelling incorporated a precautionary offset (+2 dB) to account for uncertainty arising from the inability to adjust estimates with the benefit of real-time data as had been done in the 2010 and 2015 seismic surveys.

The discrepancy in the seismic source specifications discussed in Section 3 was discovered fortuitously and in spite of the absence of real-time acoustic monitoring. Once it had been discovered, the Company and its subcontractors reacted in a responsive and transparent manner. This turn of events provided another illustration of the importance of real-time acoustic monitoring and the need for source verification at the start of each seismic survey.

Screens at the Command Centre always showed predicted ‘combined footprint’ for each line and the footprint at the exact moment of the acquisition. The latter, as the survey proceeded, was modelled using real-time AIS data providing the exact position of the seismic vessel. The actual/immediate footprint occasionally extended slightly shoreward or retracted westward of the pre-modelled ‘combined A-zone’ as the seismic vessel deviated from its planned geo-seismic profile (line) due to currents, drag or a combination of factors (Fig. 10, left). This occasionally affected the extent of the predicted A-zone but in most cases the shoreward extent of the ‘immediate footprint’ corresponded with that predicted by the model (Fig. 10, right).
The A-zone is defined as a moving zone of overlap between the acoustic footprint at a given moment in time with the area shoreward of the PML. One of the screens at the Command Centre showed whale locations (specifically mother-calf pairs) when visibility permitted observations and the ‘actual’ footprint, ensuring that the Central Commander was always fully aware of the situation in order to assess the need for mitigation.

On eight occasions, when a geo-seismic profile was formally classified as an A-line, but in practice only a small portion of the line (few hundred meters) was in the A-zone and the predicted footprint was just ‘touching’ the PML, the Central Commander took an operational decision to reclassify the line as a B-line. These case-by-case decisions took into account the available information and the primary mitigation measure of completing the survey as early in the season as possible.\(^\text{10}\)

### 5.2 Use of ramp-up and low-level (mitigation) gun operations during line changes (MMP Section 3.2.2, Items 1&5)

Ramp-up (soft start) was specified in the MMP as follows:

> "After more than 20 minutes of inactive source, ramp-up procedures will be followed such that the individual air guns will be activated in a progressively larger combination over a period of several minutes (6 dB increments every five minutes over 20 minutes). Ramp-up to full operational power should be achieved as close to the start of the line as possible."

The MMP also specified that ramp-up be preceded by a 30-minute scan around the seismic vessel to ensure that no gray whales were in the exclusion zone. This rule was not fully followed on several occasions (e.g. when poor visibility meant that scanning was only possible for ~20 minutes) or ramp-up was conducted at a faster rate. These occasions arose during the last days of the streamer survey when only a few segments of A-lines had not been acquired and weather conditions dictated conducting operations at a faster pace.

In the absence of line changes of more than four hours, the ‘mitigation gun’ was not used.

### 5.3 Exclusion zone shutdowns, including precautionary shutdowns (MMP Section 3.2.2, Items 2 &3)

Nine exclusion zone shutdowns occurred in 2018 (during IO mission) due to sightings of gray whales or other marine mammals. There was a single case of a precautionary shutdown when whale was judged to be about to enter the exclusion zone.

Unfortunately, due to extremely poor weather conditions, the exclusion zone was not adequately monitored at all times. I was informed by the Central Commander, that after discussions with the lead vMMO, he allowed acquisition to continue with partial or no coverage of the exclusion zone if the zone had been adequately covered during ramp-up. Starting 15 July this has become a new “operational procedure” for acquisition in poor visibility conditions.

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\(^{10}\) Clarification (15 November 2018): These eight lines included six A-lines which either had only some small area of overlap or slightly touched the PML, and some actually missed it completely. The other two lines were remaining partial lines which were B-segments at the ends of classified A-lines, so did not require A-zone scanning.
5.4 Shutdowns for A-zone due to presence of mother-calf pairs up to 31 July, and any animals after 1 August (MMP Section 1.3 and Section 3.2.2, item 2)

The MMP required a shutdown if a mother-calf pair was observed either heading towards or inside the moving A-zone. Up to two six\(^{11}\) individual pairs of mother-calf pairs were observed throughout IO presence in the field but these were always close to shore and outside the A-zone. Some whales were observed in the A-zone throughout the survey, but the MMP did not require shutdown for those.

In summary, no shutdowns occurred due to mother-calf pairs in the A-zone whilst the IO was present at Sakhalin.

Prior to the IO’s leaving on 29 July, discussions were held to decide whether different mitigation rules would apply starting 1 August, i.e. during what has been assumed to be the whales’ ‘peak abundance’ period. Sakhalin Energy’s Chief Geophysicist indicated at the time that, given the significant delays and in aiming to achieve the primary mitigation goal of finishing acquisition as early as possible, the Company would likely continue to follow the non-peak season rules (i.e. shutdown only if mother-calf pairs were in the A-zone) and also with 2018 “operational relaxations” in cases of limited visibility (see 5.2 and 5.3 and 5.5).

5.5 Decision to acquire A-lines in poor visibility (MMP Section 3.2.3, Item 1)

The priority during the survey was to acquire A-lines as quickly as possible; this was both the Company’s operational goal and one of the key mitigation measures specified in the MMP. The IO was present in the field to observe acquisition of the entire streamer survey and a portion of the OBN survey (3 days).

On 16 occasions the CC suggested changes in line planning to the seismic crew (more frequently early in the survey), notably that they refrain from commencing acquisition of an A-line because of poor visibility. These instances were not shutdowns per se, i.e. stopping acquisition that is already under way. Instead, after seriously considering all of the data and information coming from the teams, the CC advised the acquisition team and the company representative aboard the seismic ship, in consultation with the lead MMO, that certain A-lines could not be acquired under current conditions.

The use of ‘pre-dusk scans’ (to ensure that no mother-calf pairs were present or likely to enter the A-zone) allowed the Company to acquire A-lines in poor visibility. Use of the scout vessel to conduct pre-dusk scans was quite intensive. Given that poor-visibility conditions dominated throughout the survey period, pre-dusk scanning was used during daylight hours on most days. Whenever available, the scout vessel continuously scouted along the PML so that if the visibility were to decrease below ‘optimal’, A-line acquisition could still be conducted by applying the ‘pre-dusk scan philosophy’. When visibility at the PML was less than the estimated A-zone shoreward extent, the chase vessel was directed to move west of the PML to maximize A-zone coverage (Fig. 11). The CC could monitor the progress of the chase vessel sail down the A-zone in real time using the AIS data.

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\(^{11}\)This is preliminary number reported by MMOs and photo-ID teams; the exact number to be confirmed after appropriate analysis.
This was a somewhat questionable decision as the scout vessel introduced additional noise into the environment when sailing inside the primary feeding ground (i.e. west of the PML); doing so in limited visibility also presumably increased the risk of the vessel striking a whale. Such an approach should be evaluated carefully before considering it acceptable for implementation during future surveys. This said, the approach did facilitate completion of the survey as early in the season as possible and was effective for clearing the A-zone when it could not have been done from shore or from the seismic vessel.

Early in the survey, with a lack of information on gray whale distribution, there were at least two occasions when partial lines were acquired as the CC had requested shutdowns at certain shot points until conditions for monitoring improved.

As the survey progressed, some A-lines and A-line segments were acquired in poor visibility, including at night. In most cases a pre-dusk scan was undertaken to ‘clearing’ the A-zone. In some instances, however, towards the end of streamer survey and later, the chase vessel was not available and visibility was zero at or near the PML, yet some A-line segments were acquired regardless. These decisions were made by the Central Commander based on general knowledge of MC distribution and the pressing need to complete the survey before peak whale abundance. Every effort was made to acquire A-lines in good visibility and with all mitigation measures in place, but if this was not possible, a decision to acquire in poor visibility was preceded by a careful, case-specific evaluation by Central Commander.

It was also discussed that ‘validity’ of pre-dusk scan should be better specified in future MMPs (i.e. what is the time interval for which ‘pre-dusk’ scan ‘clears’ the A-zone).
5.6 Overview of ability to implement mitigation measures, including communications

Mitigation measures were well described in the MMP, and procedures were in place for implementation of both the onshore and offshore components. Shore-based teams had all the tools necessary for observation for mitigation purposes, including primary and backup equipment for communication and relevant protocols. Both sMMOs and vMMOs were well qualified to document, inform and/or advise the Central Commander and/or the lead vMMO when any mitigation measures were warranted.

Both onshore and offshore MMOs were integral to the mitigation process, and they seemed to be effective, dedicated and able and willing to accommodate challenging field conditions and operational requirements.

The placement of two MMOs on the scout (or chase) vessel for close-range scans along the PML or of at least the anticipated A-zone seemed practical, although the associated risks (additional noise and vessel strikes) require further evaluation.

The communication protocols and systems, including backup, allowed mitigation measures to be implemented when needed without delay.

Under normal circumstances, implementation of mitigation measures per the MMP should have allowed Sakhalin Energy to achieve the mitigation goals during the survey. Unfortunately, the extremely unfavourable environmental conditions for extended periods during the summer of 2018 caused significant delays in survey completion. Had the Company fully adhered to the letter of the MMP, it would have faced the risk of not completing the survey in 2018. Under these circumstances, the Company appeared to remain committed to applying the agreed mitigation measures whenever possible – however it prioritized the primary mitigation measure of completing the survey as early as possible. In order to achieve this priority goal and to ensure that the survey was completed in 2018, the Company, after extensive thought and discussion, decided to dismiss some of the mitigation measures, outlined in MMP, in poor visibility conditions.

5.7 Suggestions for improvements in mitigation implementation, if any

The 2018 MMP contained a comprehensive set of mitigation measures. Unfortunately, however, the plan did not account for the worst-case scenario (in terms of environmental conditions). This experience should be kept in mind during the development of future MMPs.

One practical suggestion would be to investigate and perhaps employ passive acoustic monitoring technology during future surveys so that when visual means of whale detection are not effective (i.e. in fog or at night), surveying (seismic acquisition) can proceed with at least some of the mitigation measures in place.

6. OVERALL OBSERVATIONS AND CONCLUSIONS

6.1 Logistical arrangements for IO, ability to observe various components of the MMP, and suggestions for improvements, if any

Significant effort was undertaken by Sakhalin Energy to accommodate the IO throughout the observation period and to facilitate observation. Lessons learned and suggestions provided by the IO

12 The author is aware that gray whales do not vocalize much on the Sakhalin feeding grounds.
after the 2015 seismic survey were fully taken into account. The IO was provided with all necessary logistics arrangements and given access to the information needed to achieve the tasks specified in the TOR

6.2 Integrated overview of the monitoring components, including suggestions for improvements, if any

A detailed review of implementation of these components is provided above in sections 3, 4 and 5. Real-time acoustic monitoring, is highly desired and necessary in accordance with widely accepted responsible practices for monitoring of effects of seismic surveys on marine mammals. Such monitoring was not allowed in 2018 due to the denial of a permit by Russian authorities. This situation was beyond the control of Sakhalin Energy, especially given the late notice of the denial. Every effort must be made to obtain permission for any future surveys.

The 2018 monitoring and mitigation campaign should be considered as a one-off and not viewed as a precedent for future seismic surveys. Real-time acoustic monitoring remains an integral element of effective, reliable monitoring and mitigation during seismic surveys.

6.3 Integrated overview of the mitigation components, including suggestions for improvements, if any

A detailed review of implementation of the mitigation components is provided above in section 5 of this report.

Overall, the planned mitigation component was comprehensive and sufficient, but under the pressures of unprecedented and unforeseen circumstances, Sakhalin Energy and its subcontractors were not able to adhere fully to the prescribed and agreed procedures.

Each survey is different, and any MMP needs to be tailored to the specific features of the planned survey whilst honouring common principles and striving to meet the highest standards of responsible environmental stewardship (e.g. see Nowacek et al., 2013[13]), and capitalize on experience.

ACKNOWLEDGEMENTS

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I thank Peter van der Wolf for allowing me to join his shore-based photo-ID missions occasionally.

Finally, I wish to recognize and highlight the outstanding work of the Chaivo IFM camp and Pioneer camp staff: it was only with their constant, hard, round-the-clock work that the shore-based MMP teams could perform their tasks at a high level. This being said, acknowledgement should also go to all the drivers, who on a daily basis ensured the safe transportation of personnel across some challenging terrain.
ANNEX - MONITORING AND MITIGATION PLAN FOR THE 2018 SAKHALIN ENERGY’S PILTUN-ASTOKH 4-D SEISMIC SURVEY
# UPDATED MONITORING AND MITIGATION PLAN FOR THE 2018 PILTUN-ASTOKH 4D SEISMIC SURVEY

09 JUNE 2018

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Annex A - Independent Observer Terms of Reference


Annex C - Offshore Marine Mammal Observer Monitoring and Mitigation Manual

Annex D – WGWAP Advisory Group Communications Protocol
1 INTRODUCTION

As in planning the 2010 Astokh and 2015 Piltun-Astokh 4D seismic surveys, planning the 2018 Piltun-Astokh survey involved a major time investment by the Western Gray Whale Advisory Panel (WGWAP), Sakhalin Energy and the WGWAP Noise Task Force (NTF). Detailed documentation regarding these efforts can be found in the full series of WGWAP, NTF and Seismic Survey Task Force (SSTF) reports which are available on the International Union for Conservation of Nature (IUCN) website¹.

1.1 FUNDAMENTAL PRINCIPLES OF A MONITORING AND MITIGATION PLAN²

The 2010 Monitoring and Mitigation Plan (MMP) was one of the most rigorous whale-focused MMPs developed for a seismic survey anywhere in the world. The 2015 MMP was based on the 2010 MMP, and this 2018 one further builds on 2010 and 2015 experiences. The fundamental mitigation principles in 2010 were and still are to:

(1) design ahead of the survey
   
   (a) minimise the area surveyed;
   
   (b) minimise the sound levels reaching the areas of highest expected whale density based on previous experience (i.e. within the perimeter monitoring line – PML).

(2) take measures during the survey

   (a) carry out the survey as early in the season as possible, i.e., when fewest whales are expected to be present;

   (b) stop the survey when necessary to protect the whales that are present.

Development of the 2010 MMP highlighted that little information was available on the effects of noise on gray whales, especially feeding whales. Furthermore, much of what was considered ‘best practice’ mitigation had rarely, if ever, been properly evaluated. Monitoring was recognised to be an essential component of planning a survey, both to evaluate the effectiveness of the mitigation component of the MMP and to ensure that future MMPs could be based on increasingly strong scientific information.

1.2 SCOPE AND TIMING OF THE 2018 SEISMIC SURVEY

The 2018 Sakhalin Energy seismic survey will be conducted offshore of Sakhalin and cover an area of some 350km² around the Piltun and Astokh platforms. It is planned to begin in early June 2018 (see Item 3.1). The survey will consist of a streamer acquisition phase resembling the 2015 survey, plus an Ocean Bottom Node (OBN) phase to cover data-gap patches of some 25km² each around the Piltun and Astokh platforms. The survey is predicted to last approximately 42 days (±7), including uncertainty in

¹ http://www.iucn.org/wgwap/
² This MMP focuses on western gray whales, but protection of all relevant marine mammals encountered in the Sakhalin area will follow all Russian Federation procedures; see footnote 12 for details.
timing and duration due to weather, fog, mitigation and other oil field activities that may be ongoing in
the area.

1.3  FUNDAMENTAL ASPECTS OF THE 2018 MMP

The 2015 MMP used by the Company was adapted from the successful 2010 programme, with
modifications based on advances in both knowledge and technology in the intervening years, and on
the need to tailor the MMP to specific circumstances (e.g. simultaneous operations by other operators).
Similarly, this document incorporates changes to the 2015 MMP that are applicable to the planned 2018
seismic survey.

The mitigation components of the 2018 MMP again focus on survey design and measures to be
implemented during the survey (see Item 1.1) with the primary mitigating principle remaining to start
and finish as early as possible in the season to minimize whale exposure to noise whilst also ensuring
other protective measures.

The present document updates the 2018 MMP, as developed through NTF-12 and NTF-13 [and
confirmed at WGWAP-18] and further refined in NTF-14, in response to the notification of Permit
Denial by the Russian authorities in respect to underwater noise monitoring by Sakhalin Energy's
contractors, the National Scientific Centre of Marine Biology and Pacific Oceanological Institute, of the
seismic survey (Appendix i). The key sections updated to acknowledge and compensate for the Denial
of Permit are Items 2.2 and 3.2.1 below. Further details on MMP changes and development over time
can be found in reports available on the IUCN website. Key changes to the 2010 MMP that were
reflected in the 2015 MMP related to (i) aspects of the distribution and behaviour monitoring, (ii)
addition of information on the command centre, (iii) refinement of the concept of A- and B-zones and
(iv) limiting the protection of whales potentially exposed to noise levels above the behavioural
threshold prior to 1-Aug 2015 to only mother-calf pairs rather than protecting all whales in this way (see
NTF-8 report, Item 5).

This 2018 MMP also incorporates changes related to (i)-(iv). It continues to give priority to what is
considered the most effective mitigation measure, which is to start and complete the survey as early as
possible to minimize overall whale exposure to noise, but also emphasizes the following:

(1) the importance of Marine Mammal Observer (MMO) training requirements, giving high priority
to selecting experienced lead MMOs several months in advance and ensuring field simulation
exercises to test the hardware and software before the actual survey begins;
(2) having appropriately trained and experienced shore-based MMOs monitoring one week before
and after the seismic operations to establish proper pre- and post-survey baselines;
(3) minimizing acquisition, especially of A- lines, during periods of poor visibility (including at night).
2  MONITORING (WHALE NUMBERS, DISTRIBUTION, BEHAVIOUR)

The monitoring measures specified here are integrally related to the mitigation measures and are essential for implementation of those mitigation measures in the 2018 seismic survey.

The monitoring measures fall into two categories:

1. real-time (or near real-time) monitoring required to trigger appropriate action where sound levels approach or exceed defined thresholds at locations where whales are observed (i.e. information essential for mitigation);
2. additional monitoring to obtain data (that do not require real-time analysis) on the effects of the seismic survey on whales, especially gray whales, to add to the existing knowledge base, and to contribute to the design of mitigation strategies for future seismic surveys.

2.1  SHORE-BASED COMMAND CENTRE

It is essential for the efficient and successful implementation of the 2018 MMP that the key information from all sources is assembled in one place in near real time to allow informed, timely management decision-making. In line with the 2015 MMP, a key component of the 2018 MMP is therefore a Command Centre that fulfils this consolidation role.

1. The Command Centre will be established on shore to coordinate implementation of the MMP and ensure efficient communications among all teams at the various observation platforms and outposts;
2. The Command Centre will be equipped to enable it to receive all real-time data and other appropriate information that is considered essential for overseeing MMP implementation;
3. The Company will appoint a qualified Central Commander with primary responsibility for implementation of the MMP. The Central Commander will be based at the Command Centre and able to maintain 24-hour contact with the seismic vessel and all monitoring teams that are on duty as part of the MMP;
4. An Independent Observer (IO) will be appointed and contracted by IUCN prior to the seismic survey and will be deployed in the field and report on the implementation of the MMP. The IO will be housed at, and will also operate from, the Command Centre and will be granted full access to information (e.g. be able to communicate with all observation platforms) in accordance with the IO terms of reference.

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3 Chain-of-command protocols for the Command Centre and vessels are included in the MMO Manuals, Annexes B (6.1) and C (6).
4 Annex A contains the terms of reference for the Independent Observer.
2.2 DENIAL OF PERMIT FOR ACOUSTIC MONITORING

The agreed MMP was developed in conjunction with Sakhalin Energy within the Noise Task Forces 12 & 13, approved by WGWAP-18 in Moscow November 2017 and further refined in NTF-14 in Gland March 2018.

Following the unprecedented receipt of the RF Denial of Permit for the contracted scientists to undertake underwater acoustic monitoring, Sakhalin Energy informed the Panel and IUCN of the situation. No explanation for the denial of permit was offered by the Russian authorities and it was interpreted by the Company as final: not subject to negotiation or appeal. After some discussions and a presentation by the Company’s acoustics advisor of a proposed way forward based on modelling alone, the Panel issued a statement to the Company (Appendix ii) stressing the importance of acoustic monitoring to the MMP and recommended that Sakhalin Energy and IUCN seek a solution to allow for at least some underwater acoustic monitoring to take place during the 2018 seismic survey.

The Company agreed with the importance of underwater acoustic monitoring but informed the Panel that neither it nor its Contractors had, at that time, any formal lines of communication for attempting to implement the recommendation. The Company released a response (Appendix iii) to the Panel’s statement confirming that it would not be able to implement the planned underwater acoustic monitoring and proposing an approach by its acoustical consulting services provider, JASCO, to compensate for lack of field corroboration through adjustments to the modelling based on newly available data and a detailed analysis of the error bounds. That approach, which is now incorporated into this updated MMP, bounds as much as possible the uncertainty in the modelling estimates and applies a precautionary adjustment to minimize the risk of exposure for the whales.

The Panel Co-chairs issued an immediate reply (Appendix iv), providing their own interpretation of the circumstances plus their views on how the situation should be handled thenceforth. They were sympathetic to the position in which the Company was placed and recognised the good faith in which each party involved had attempted to resolve the situation. They acknowledged that the Denial of Permit would not be overturned and that underwater acoustic monitoring would not be carried out by the Company in 2018. Although they welcomed the precautionary adjustments made by JASCO and the Company to the modelled estimates, they noted that the effectiveness of the approach could not be confirmed without measurements in the field. The Co-chairs pointed out that for the 2018 seismic survey to go ahead without underwater acoustic monitoring all other elements of the agreed MMP should be implemented in full and that the situation should not set a precedent for future seismic surveys.

Sakhalin Energy appreciates and accepts the points made by the Panel’s Co-chairs. The Company agrees that the absence of underwater acoustic monitoring in the 2018 seismic survey does not set a precedent for successive ones, and learning from this unprecedented experience it will work in future cases with the contracted scientists to jointly engage with the permitting authorities as early as possible to avoid any possibility of repeat.
2.3 GENERAL VISUAL MONITORING (SHORE-BASED AND VESSEL-BASED)

Monitoring of whale distribution and behaviour will be conducted in the entire area inshore of the seismic survey area, supplemented by at least weekly observations to the north and south\(^5\). Monitoring will commence (if at all possible given the weather conditions) at least one week before the start of the seismic survey and will continue during the survey and for at least one week after its completion. This is important for analysing and interpreting the data with respect to effects of seismic surveys on the whales, and for maintaining the long-term monitoring data series that is expected to serve as a valuable resource when future seismic survey operations occur. Drones will be used opportunistically to supplement but not replace the work of the monitoring teams.

2.3.1 ON THE COASTAL SIDE OF THE PERIMETER MONITORING LINE (SHORE-BASED)

(1) Monitoring by four experienced\(^6\) teams will be conducted from the shore-based platforms located along the coastline facing the seismic survey area. The entire potentially affected (i.e. ensonified) area shoreward of the PML must be covered. The distribution of whales in the areas to the north and to the south of the seismic survey region will be monitored occasionally in accordance with the agreed field protocol (Annex B).

(2) Onshore photo-ID efforts will be made to collect information about individual whales. The coastal area is divided into two spits by the mouth of Piltun Lagoon. Two vehicle-based photo-ID teams will be mobilised and these teams will also carry out the occasional distribution monitoring described under (1) above (for details see Annex B).

(3) All onshore teams must report to the Command Centre at least daily, and immediately whenever they have information to report of potential relevance to real-time mitigation.

2.3.2 ON THE COASTAL SIDE OF THE PERIMETER MONITORING LINE (VESSEL-BASED)

(1) Gray whale distribution will also be monitored, at times, from the seismic vessel following the protocol outlined in Annex C. A minimum of four MMOs are responsible for monitoring the exclusion zone (see item 3.2.2) close to the seismic vessel and also, when required, engage in shoreward distant distribution monitoring of the PML. To ensure adequate coverage of the area shoreward of the PML, a pair of Big-Eye binoculars (one unit) will be mounted on the deck of the seismic vessel for use by MMOs trained in their use.\(^7\) The Big-Eye binoculars will be mounted so they have an unobstructed view of the area near and shoreward of the PML.

\(^5\) Annexes B and C contain the protocols for visual monitoring (shore-based and vessel-based)

\(^6\) In this context, each team will be led by a researcher with at least one year’s relevant experience with cetaceans and contain a theodolite operator with similar relevant experience and have the necessary language skills (for full discussion see NTF-13 report). All members of the team must at least undertake a thorough pre-survey training exercise and be familiar with the computer programs, reticle binoculars and field protocols.

\(^7\) By default, and as in 2015 MMP, two dedicated MMOs were required to be based onboard seismic vessel specifically for the task of ‘distant’ distribution monitoring (i.e. to detect whales near or shoreward of the PML). However, for the 2018 survey, the Company stated that only five additional persons (four MMOs and one technologist) could be accommodated on the seismic vessel. The [NTF/Panel] agreed that for this survey, this should be sufficient to accomplish this task as well as their primary role of securing the exclusion zone. This agreement assumes that the ‘distant’ distribution monitoring from offshore will be required in only a limited number of instances when poor visibility precludes appropriate coverage of PML from shore.
(2) Additionally, an experienced CMS (Camera Monitoring System) technologist will be based onboard the seismic vessel to assist in monitoring the exclusion zone, especially at night and if feasible in poor visibility conditions as defined in Annex B.

(3) Additional gray whale monitoring will be undertaken onboard the chase vessel by two MMOs or a CMS remotely linked to the seismic vessel for the task of A-zone monitoring for a planned A-line when shore-based monitoring is ineffective.

(4) Vessel-based MMOs must report to the Command Centre at least daily, and immediately whenever they have information to report that is of potential relevance to the effective implementation of the MMP.

(5) Experienced MMOs will be stationed on the seismic vessel for the duration of the survey.
   a. MMOs will be limited to a maximum 2-hour continuous shift with a minimum of 1 hour as a break between shifts;
   b. Single-point authority for operational shutdown related to marine mammal protection will lie with the on-shift Senior MMO on the seismic vessel as described in Annex es B and C;
   c. The MMOs will be located on the bridge or at the highest elevation available on the seismic vessel with the maximum viewable range from the bow to 90° port/starboard of the vessel;
   d. A 30-minute visual search will be conducted prior to start-up of the seismic source;
   e. A minimum of two MMOs will be on watch on the seismic vessel from 30 minutes before start of ramp-up onwards and throughout line acquisition;
   f. Occurrence and behaviour of whales will be documented in accordance with existing Marine Mammal Protection Plan (MMPP) and MMO procedures.

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8 Under exceptional operational circumstances and with the agreement of the Lead MMO this may occasionally be extended to 3 hours
9 Insert link as to where these documents can be found
3 MITIGATION MEASURES

3.1 TIMING OF SURVEY

(1) The seismic survey will commence and be completed as early in the season as technically and logistically possible. Logistics include ensuring that all mitigation and monitoring procedures are in place and implemented. The actual start date is dependent on ice/weather and for 2011-2017, the ice-retreat dates fell in the 6-15 June window. Therefore, it is likely that the earliest date the onshore teams would need to be in place would be 1 June 2018.

(2) A-line segments (see item 3.2.1) should be acquired at the earliest possible opportunity given visibility, mitigation and monitoring requirements.

3.2 GENERAL DESIGN AND CONDUCT OF SURVEY

The most stringent mitigation measures in relation to whales (other than those observed in the exclusion zone near the seismic vessel) should be applied in the A-zone (see item 3.2.1).

3.2.1 DEFINITION AND ESTIMATION OF A-ZONES

(1) The area for which the additional mitigation measures are in effect (A-zone) is defined by the overlap of the region inshore of the PML and the area bounded by the 156 dB per-pulse SEL isopleth for the current acquisition point.

(2) The 156 dB per-pulse SEL isopleth will be estimated through numerical modelling of the airgun array acoustic output and the propagation of underwater sound. The numerical models for source levels and propagation have been validated over several previous years of operations and most recently during the monitoring of the 2015 seismic survey, for which many comparison data points are available between pulse levels measured along the PML and their model estimated values. For the 2018 season, improvements have been made to the modelling software and/or its parametrization that intrinsically yield more realistically accurate estimates:

- The bathymetry dataset has been improved from the one used in 2015 pre-field and earlier modelling: additional depth logs from Pacific Oceanological Institute were standardized and incorporated into the earlier bathymetry to improve resolution.
- A more advanced version of the AASM airgun array source model, calibrated against a newly available collection of airgun measurement results, was introduced; this produces slightly increased source levels compared to the estimates for the same source used in 2015 and earlier.

(3) In the absence of acoustic monitoring data at the PML that would allow an adaptive offset to be applied to the model output to reduce the discrepancy between estimates and measurement, a fixed precautionary adjustment of the model output will be applied to ensure that the statistical distribution of the error (expressed as the difference between actual levels and estimated levels) bounds the occurrence of positive values, i.e. underestimation of true levels by the model, to an adequately small percentile. An error analysis based on the comparison of the estimates from the improved modelling for 2018 and the pulse levels measured at the PML during the entire 2015 seismic survey, for all pulses having measured levels above 154 dB per-pulse SEL to focus the analysis on a behaviourally relevant subset, showed the model results to be predominantly conservative (overestimating the
measurements), with a residual incidence of 4% of the pulse levels being underestimated by 3dB or more. By adding a fixed precautionary adjustment of +2dB to the model results, the incidence is reduced to 1% of the pulse levels at the PML being underestimated by 2dB or more. This was considered an adequate bound in balancing the opposite risk of excessive overestimation resulting in unnecessary prolonging of the seismic survey.

(4) The precautionarily adjusted model will be used to generate the estimated 156 dB per-pulse SEL isopleth at each acquisition point as well as its envelope for the complete line. Based on the model predictions, shot line segments for which an overlap is predicted between the 156 dB per-pulse SEL contour and the PML will be classified as A-segments, for which the additional mitigation measures specified below apply.

3.2.2 MEASURES NEAR THE SEISMIC VESSEL – ENTIRE SURVEY

(1) After more than 20 minutes of inactive source, ramp-up procedures will be followed such that the individual air guns will be activated in a progressively larger combination over a period of 20 minutes (6 dB increments every 5 minutes). Ramp-up to full operational power should be achieved as close to the start of the line as possible.

(2) The Senior MMO will initiate source shutdown if a gray whale is observed within the exclusion zone of the source calculated to be 1km (NTF-13 report)\(^{10}\).

(3) The Senior MMO will initiate a precautionary shutdown if a gray whale is observed to be on a course that will result in its entering the exclusion zone.

(4) Various types of field-tested remote-sensing (non-acoustic) equipment may be installed onboard the seismic vessel to assist in detecting marine mammals at night and/or during periods of poor visibility, recognising that there is no technology that works in fog or heavy rain. The use of such equipment will not be regarded as fully compensatory for the lack of visual monitoring, but instead as uncontrolled field experimentation. This caveat remains until such time as the technology has been proven to be at least as efficient at detecting whales as visual monitoring by experienced MMOs.

3.2.3 ADDITIONAL CONSIDERATIONS FOR THE A-ZONE

A considered trade-off is required between preventing the disturbance of a smaller number of animals expected to be present early in the season and preventing the disturbance of a larger number of whales expected to be present later in the season if operations are still ongoing due to temporary stoppages early in the season. The following conditions will apply in 2018\(^{11}\).

(1) For the streamer part of the survey, all reasonable attempts will be made to acquire the A-line segments positioned closest to shore repeating the 2015 acquisition direction during daylight hours in ‘good visibility’, i.e., the PML must be within the effective sighting range of a shore station or a vessel-based ‘distant’ monitoring team. If a choice is to be made between postponement (e.g., by two weeks needed to get a feather match between the line to be

\(^{10}\) NB This document focuses on western gray whales. It is noted that exclusion zone criteria will also be applied for other species (1000 m for bowhead whale, North Pacific right whale, fin whale, Cuvier’s beaked whale; and 350 m for Steller sea lion).

\(^{11}\) While the decision has been made to suspend operations only if mother–calf pairs are sighted in the A-zone for this 2018 MMP, this condition is not necessarily to be assumed for future MMPs (or to exclude potential measures to protect other critical segments of the population e.g. pregnant females).
acquired and the baseline survey) and acquiring the line or segment at night or in poor visibility conditions as defined in Annex B, then that choice is made by the Central Commander on the day, after considering all available information. If acquisition is planned to take place at night, then a pre-dusk scan must take place and confirm that no mother-calf pairs are present in the A-zone.

a. No acquisition will occur if mother-calf pairs are observed (with a 100m radius buffer around geo-referenced positions) in the A-zone. When a mother-calf pair is observed in the A-zone, ongoing acquisition (if any) will be suspended. No acquisition will commence or resume until either (a) the mother-calf pair are outside the A-zone, or (b) at least 3 hours have passed since the pair were last sighted.

(2) For the OBN part of the survey, A-line segments will only be acquired during good visibility (as defined in Annex B), unless the Central Commander, after consultation with the Company and the WGWAP Advisory Group, decides that complications would lead to prolonged duration of the survey. Paragraph 3.2.3.1a above with respect to mother-calf pairs also applies for the OBN segment.

3.2.4 MEASURES FOR THE DEPLOYMENT OF OCEAN BOTTOM NODES
The node deployment vessel will operate under the same operational safety envelopes as platform-servicing vessels.

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12 If such complications would be identified during planning and prior to execution of the OBN survey, then relaxation of this restriction will be discussed and agreed with the Advisory Group. If such complications would arise during execution itself, caused by near-platform or simultaneous operations, then a potential relaxation would be decided by the Central Commander, after considering all available information.
Appendix i

Denial of Permit

Ministry of Education and Science

Department of Science and Technology

Ref. # 14-515 of 02.03.2018

To: National Scientific Centre of Marine Biology,

Far East Academy of Science

Re: Denial of Permit

Pursuant to Article 20 of the Rules of marine scientific surveys in Russian internal waters and shelf, Department of Science and Technology informs that Request from National Scientific Centre of Marine Biology for expedition of Stepan Makarov and other vessels during the period from 20.05.2018 to 10.10.2018 was declined without reasons during approvals process with relevant federal authorities and was removed from the 2018 Plan of Marine Surveys.

Deputy Director

I.A. Mosicheva
Appendix ii

Panel Statement related to acoustic monitoring during Sakhalin Energy's 2018 seismic survey

17 May 2018

WGWAP private meeting – 30 April 2018, 10 pm to midnight CEST.

WGWAP Members on the call: Randall Reeves, Greg Donovan, Alexander Vedenev, Grigoriy Tsidulko, Dave Weller, Alexander Burdin, Justin Cooke, Brandon Southall, Corinne Pomerleau, Doug Nowacek

IUCN Staff: Giulia Carbone, Jerome Duramy

Others: Roberto Racca (JASCO) for the first hour; Stephanie Lock (Sakhalin Energy) for 5 minutes during the private Panel portion of the call.

Background

A teleconference meeting of the Panel was urgently convened on 30 April 2018 to receive information and discuss options for conclusions and recommendations following the denial by Russian authorities (Ministry of Education and Science, Department of Science and Technology) of National Scientific Marine Biology Centre’s request for permits to allow deployment of acoustic sensors (both real-time and archival) in 2018 as part of Sakhalin Energy’s seismic survey Monitoring and Mitigation Plan (MMP). The denial was characterized as final and not subject to negotiation or appeal. Stephanie Lock of Sakhalin Energy was called during the meeting to answer a question from the Panel regarding the possibility of installing at least one monitoring buoy, with the data recorded to be under strict control of Russian security authorities. She stated that Sakhalin Energy did not have the necessary lines of communication to make this type of request within the available timeframe.

Essential role of acoustic monitoring to the MMP

Real-time and archival monitoring is fundamental to the philosophy and success of the mitigation and monitoring plan (MMP) for the 2018 seismic survey, as it was for the 2010 and 2015 surveys. The 2018 MMP was developed with a major investment of time, effort and resources by the NTF (Panel members, Company members and IUCN). The Panel deeply regrets that Sakhalin Energy may not be able to deploy acoustic sensors in the vicinity of the near-shore (Piltun) gray whale feeding area in 2018. Since the Panel was informed of this in late March, Panel members had made several suggestions to the Company for possible remedies, but the Company was not able to implement any of these remedies within the timeframe available.

The Panel reiterates that the acoustic monitoring component plays a critical role in supporting
systematic real-time mitigation of the potential impacts of the 2018 seismic survey and ensuring that whales (especially mother-calf pairs) are not subjected to unacceptably high levels of noise during the survey. It also plays an essential role, post-survey, in evaluating the success of the mitigation efforts and, in combination with the visual components, contributes to understanding the effects of noise on the animals in this important feeding ground.

Consideration of back-up plans

In the absence of real-time monitoring, the MMP would be based entirely on the predicted noise levels from the JASCO model. Comparisons of model-predicted and recorded noise levels during the 2015 survey were presented to the 9th meeting of the Noise Task Force in November 2016. Also, immediately before the April 2018 call, the Panel received from Roberto Racca an update of these comparisons based on the latest version of the JASCO model, showing similar results. Racca joined the call briefly to explain possible ways in which model output might be adjusted to partially compensate for the lack of acoustic monitoring in 2018. The Panel welcomed this effort by Racca and the Company and acknowledged once again that the modeling was of a very high quality.

Panel discussion and conclusions

In discussing the implications of not having acoustic monitoring as part of MMP implementation, the following considerations were deemed pertinent:

(1) ENL is understood to be planning another seismic survey in 2019 such that postponement of the Sakhalin Energy surveys to that year would result in the same problems that occurred and caused great concern in 2015 (furthermore, according to Sakhalin Energy, due to the duration of its own survey it would probably be technically infeasible to implement both surveys – Sakhalin Energy’s and ENL’s – during the same year);

(2) Sakhalin Energy is planning to carry out other activities (rig repairs and/or construction) in 2020 that might preclude carrying out a seismic survey that year;

(3) real-time acoustic monitoring is an integral pillar of the MMP since (a) without real-time acoustic monitoring, the mitigation component of the MMP cannot be implemented fully and (b) without real-time and archival acoustic monitoring, the monitoring component of the MMP will be greatly compromised;

(4) while the predictive methods outlined by Racca appear fundamentally sound, they have not been, and cannot be, fully evaluated and validated given the limited time available and the potentially different environmental conditions during the 2018 survey compared to those in the past seasons used for validation by JASCO;

(5) the lack of even limited acoustic monitoring precludes evaluation of the JASCO modelling either during or after the survey;

(6) a lack of acoustic monitoring will make it impossible to ascertain and attempt to account for any other noise-generating activities that may occur in the area and add to the cumulative noise exposure experienced by the whales.

Finally, the Panel is greatly concerned that if it is seen to consider a decision by the
Company to carry out the survey without acoustic monitoring as being acceptable, there is a significant risk that this would be falsely understood as a precedent.

The Panel acknowledges that there is no simple solution to the present scenario. If the survey were conducted as early in 2018 as ice conditions allow, then the total exposure of the whale population to noise from the seismic survey would be less than if the Company rescheduled its survey for 2019 when a situation similar to that in 2015, when multiple surveys took place sequentially, is likely to arise, thus lengthening substantially the overall duration of the whales’ seismic noise exposure and extending this exposure into the period of peak whale presence in the Piltun feeding area. However, as noted in Panel and NTF reports since 2015, the scientific evidence is equivocal regarding the question of whether an occasional single ‘extreme’ season like 2015 (with prolonged and relatively intensive noise-generating activity) is better or worse for the whales than two or more years with less extreme but still noisy seasons.

The Panel recommends that the Company and IUCN make every effort, as a matter of urgency, to ensure that acoustic monitoring takes place at the required level or at least at a minimal level to allow some degree of model verification during the survey. If the Company decided to proceed with its survey in 2018, use of the model predictions described by Racca as the sole ‘measures’ of sound levels would mean that the MMP, as developed and agreed by the Noise Task Force, was not fully implemented.
Appendix iii

Sakhalin Energy Response 24 May 2018

Sakhalin Energy is committed to conducting safe operations and to protecting the environment. For many years, the Company has sought advice from the Western Gray Whale Advisory Panel when planning for seismic surveys in its oil and gas fields off the north-eastern coast of Sakhalin.

The Company thanks the Panel for their contributions in development of the Monitoring and Mitigation Plan (MMP) for the 2018 Seismic Survey. Much effort was made to develop the MMP, and the Company was ready for its full implementation. However, the service providers (National Scientific Marine Biology Centre and Pacific Oceanological Institute) are not permitted to deploy environmental acoustic monitoring this season as it had been permitted to do for many previous seasons, and there are no other permitting options available to the Company at this time. Hence Sakhalin Energy will not be able to implement the planned environmental acoustic monitoring.

Previous monitoring programmes have not identified any measurable impact on gray whales as a result of seismic surveys conducted by the Company in 2010-2015. Spatial distribution and Seasonal dynamic of abundance didn’t change significantly, and the whales successfully restored their body condition during the feeding season. Monitoring indicates that Sakhalin gray whales are a feeding aggregation with potential status of sub-population of the larger Eastern population. On whole, the number of gray whales visiting Sakhalin has continued to grow at approximately 3.5-4.0% per year.

The Company’s acoustical consulting services provider, JASCO, has completed high quality modeling work to bound as much as possible the uncertainty in the modeling estimates and determine conservative, precautionary adjustments to be applied during operations, so that the 2018 seismic survey can be undertaken with justifiable confidence in the adequacy of the mitigation measures. In effect, the adjusted MMP applies a precautionary safety margin which has been increased following the presentation to the WGWAP, to better account for variability and to further mitigate risk to whales.

The Company is committed to implementing all other activities as agreed in the MMP for the seismic survey. Sakhalin Energy will take learnings from this survey into preparations for any future seismic surveys.

If you have further questions, please feel free to contact Sakhalin Energy by e-mail: ask@sakhalinenergy.ru or by phone +7(4242) 662000
Appendix iv

Panel Co-chairs’ Response

The Panel’s statement on the matter of acoustic monitoring during the planned 2018 seismic survey was shared with both Sakhalin Energy and IUCN on 14-15 May. During a teleconference of the WGWAP “coordination group” on 15 May, Company representatives explained that they had exhausted the options and did not foresee having any opportunity to implement even a minimal level of acoustic monitoring in the 2018 season. The Company’s formal response was received on 24 May. Given the shortage of time, we as Panel Co-chairs decided to respond immediately, without consulting with the full Panel. The following comments reflect our own interpretation of the circumstances and our own views on how the situation should be handled from this point forward.

We have carefully considered the explanations given by the Company and its formal response. It has become clear to us that despite the good-faith efforts made by all parties to find a way of obtaining acoustic data in the coming season, this will not be possible. It is also clear that Sakhalin Energy intends to proceed with its seismic survey and to implement as many elements of the agreed Monitoring and Mitigation Plan (MMP) as feasible given the major overarching constraint of no ability to verify the JASCO model. During the survey, the Company will rely solely upon modelling to define the acoustic footprint of the seismic pulses and thereby determine the size and configuration of the A-zone. We acknowledge and welcome, under the circumstances, that precautionary modifications will be made to the modelling and A-zone protocols, with the intention of reducing the risk that noise levels near the whales will be under-estimated – although at the same time we note, as before, that the effectiveness of this approach cannot be confirmed without measurements in the field.

Even though the Panel’s conclusion that the MMP, as developed and agreed by the Noise Task Force at its 14th meeting, cannot be fully implemented in the absence of an acoustic monitoring program remains valid, we still consider it important for IUCN and the Panel to remain engaged in the following two ways –

(i) the Independent Observer under contract to IUCN should proceed to monitor and report on MMP implementation to the best of his ability and (ii) the WGWAP Advisory Group should function as anticipated in the MMP. Moreover, we emphasize in the strongest possible terms that this continued engagement should in no way be interpreted to mean the Panel concedes that sound source verification and acoustic monitoring are optional elements of any monitoring and mitigation programme to protect whales from the potential impacts of a seismic survey. This turn of events must be regarded as an unfortunate one-off occurrence and as something not to be repeated in the future.

Randall Reeves and Greg Donovan, Panel Co-chairs
24 May 2018
Independent Observer for 2018 SEIC Piltun-Astokh 4-D Seismic Survey

TERMS OF REFERENCE (TOR)

V15.02.2018

Sakhalin Energy Investment Company Ltd. (“SEIC” or the “Company”) is planning to conduct a 4-D seismic survey of its Piltun-Astokh lease area in the Russian Far East during the summer of 2018. The survey start date will be at the earliest 6 June 2018 or latest 15 June 2018 (depending on ice-free conditions, weather, etc), with expected date of completion of all the survey “A-lines” by 15 July 2018 and the conclusion of the survey by 1 August 2018 (the “Survey”).

Sakhalin Energy and WGWAP, primarily via the Noise Task Force (the “NTF”), worked together to develop a Monitoring and Mitigation Plan (MMP) to minimise the effects of the survey on gray whales and to maximise data collection to assist in the planning of similar programs for future seismic surveys. The final MMP as adopted by the Company for its 2018 Piltun-Astokh 4-D Seismic Survey is attached to this Contract as Annex VI [with an explanatory footnote indicating changes from the MMP recommended by the WGWAP]. Inevitably, these programs are complex and require decisions to be taken in the field in real time based on the guidance provided in the MMP. Implementation of the MMP will require prompt integration of information of a number of types (e.g. acoustic, visual sightings, observed whale behaviour) from a number of sources (buoys, vessels, shore stations).

In order to assist the Panel and the Company in evaluating the effectiveness of the MMP, and also to provide a degree of transparency and public confidence, it was agreed that an independent observer (the “IO”) should be present to develop a first-hand report on the MMP’s implementation and provide recommendations for improvements (if any).

The qualifications and duties of the IO are given below.

1. Qualifications

The Independent Observer:

(1) Is able to speak English and to communicate, if needed, with relevant Sakhalin Energy personnel and others, as appropriate1;

(2) Has completed the Sakhalin Energy basic safety training program for shore-based personnel or an approved equivalent2;

(3) Is in possession of any Russian documentation3 needed to undertake the duties outlined in these Terms of Reference;

(4) Has experience in cetacean fieldwork;

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1 There are regularly scheduled telephone conference calls to/with shore and vessel based teams, in which it is possible for the IO to participate.

2 As communicated by Sakhalin Energy to IUCN, the basic safety induction to the IO will be provided by Sakhalin Energy on the morning of 31 May 2018 during a briefing meeting to be held in Yuzhno-Sakhalinsk (the “Safety Training”), before the mobilisation to the onshore camp, scheduled for the evening of the same day.

3 The IO should have at minimum higher (university) education in marine biology and a valid medical certificate allowing him/her to take part in shore-based activities in the Russian Far East. In addition, the Company will inform IUCN well in advance of the IO recruitment and mission of all necessary permits and certifications needed to fulfill the role, including those needed for travel between all field locations, as appropriate.
(5) Has a good understanding of the issues surrounding seismic surveys and whales, including knowledge of seismic operations and procedures;

(6) Is familiar with the MMP and the reports that led to its development;

(7) Has a good understanding of all the data (acoustic, behaviour, distribution) expected to be received and an ability to interpret such data in the light of the MMP;

(8) Is able to understand the related concepts and software to monitor the progress of the seismic vessel in the light of A- and B-lines as specified in the MMP.

2. Duties and collaboration

(1) Behave courteously and responsibly at all times and conduct duties in a manner that is factual and impartial;

(2) Arrive on Sakhalin Island in time to complete the Safety Training and then mobilize to the field camp to be able to observe pre-seismic monitoring, and post-seismic monitoring efforts, if feasible. Contractor shall remain on site for at least that portion of the seismic Survey that involves the acquisition of A-lines. This is likely to mean that the IO will need to be present for approximately six weeks (extendable), starting from 31 May 2018 (the “Field Mission”). The IO “mobilization date” to Sakhalin is expected to be no later than 30 May 2018; As communicated by Sakhalin Energy to IUCN, the date of “mobilization” from Yuzhno-Sakhalinsk in the south of Sakhalin Island, Russian Far East to the shore-based camp in the north-east of Sakhalin Island is the evening of 31 May 2018. All onshore team members and the IO will depart in the evening of 31 May 2018 by train from Yuzhno-Sakhalinsk in the south of Sakhalin Island to Nogliki, in the north-east of Sakhalin Island and then by truck from there to the South Piltun onshore camp on the following day. The team, together with the IO, will arrive at the onshore camp on 1 June 2018. The shore-based monitoring will commence on 2 June 2018. The IO should therefore arrive in Yuzhno-Sakhalinsk during the preceding week, at the latest.

(3) Receive (request if needed) from the Company, and review, in near real time or as regularly as practically achievable, visual and acoustic data relevant to implementation of the MMP (IO will be permitted access to all relevant documentation including any field protocols, log books, journals or other forms of documentation on the Survey that are relevant to the assignment) and thus enable the Panel and the Company to evaluate compliance with the MMP and/or any difficulties in its implementation. IO will Comply with Company IT policy if granted access to company IT infrastructure;

(4) The IO will be based at seismic survey command centre and will be able to view and access the acoustic data coming from the real time monitoring buoys (however such access may be granted retrospectively, not in real time, if the latter interferes with ongoing operations), as well as observe all operations of the teams involved in the MMP via multiple visits to field stations, posts etc. IO shall adhere to Company’s Life Saving Rules while on Company premises (including the shore based camp) which will be explained during the project briefing, and any violations will have the same consequences as for Company personnel5. IO will act as an observer at all times and not hinder the ongoing monitoring and operations in any way. IO will cooperate with Company HSE inspections if so requested;

(5) Co-operate and communicate with Sakhalin Energy’s designated Central Commander of overall seismic operations and provide advice where appropriate on the implementation of the MMP, whilst recognising the existing decision-making structure (the IO has no authority to start or stop any operations). It is understood that the Central Commander should allow the IO to request information from the senior MMO via the Central Commander;

(6) Submit weekly activity updates to IUCN (that IUCN will share with the WGWAP Co-chairs and the Company) and present the full final report to IUCN on the implementation of the MMP and document any exceptions or changes to the MMP should they occur. The documentation should be of sufficient detail to allow for a full analysis and review of the seismic survey programme, including an overall conclusion on the success of the implementation of the MMP during the Field Mission and recommendations for improvements for future surveys, if appropriate. An outline of the nature of the final report will be developed by the WGWAP. The final report will be authored by the IO and

4 As communicated by Sakhalin Energy to IUCN, the date of “mobilization” from Yuzhno-Sakhalinsk in the south of Sakhalin Island, Russian Far East to the shore-based camp in the north-east of Sakhalin Island is the evening of 31 May 2018. All onshore team members and the IO will depart in the evening of 31 May 2018 by train from Yuzhno-Sakhalinsk in the south of Sakhalin Island to Nogliki, in the north-east of Sakhalin Island and then by truck from there to the South Piltun onshore camp on the following day. The team, together with the IO, will arrive at the onshore camp on 1 June 2018. The shore-based monitoring will commence on 2 June 2018. The IO should therefore arrive in Yuzhno-Sakhalinsk during the preceding week, at the latest.

5 Violation of Life Saving Rules results in immediate removal from the project for alcohol violation, and three strikes approach for other violations such as failure to wear seatbelt.
made public by IUCN after acceptance by the Panel. The draft final report will be subject to review by Sakhalin Energy to ensure factual accuracy, following a procedure similar to that used for WGWAP reports and for the IO report on the previous SEIC Astokh 4-D seismic survey (2015). Any and all information, data and documents gathered and/or prepared by the IO during the Field Mission shall only be shared as necessary and relevant with the Panel, IUCN and/or the Company and, by no means shall be made public until the final report is publicly released by IUCN.

3. IO communication chain and protocols

(1) Giulia Carbone, Deputy Director, Business and Biodiversity Programme, will be the IO focal person to communicate with the IO for the duration of the Contract;

(2) An “advisory group” consisting of the Panel Co-chairs and the four Panel acoustics experts (Nowacek, Southall, Vedenev and Weller) will be available for consultation should the need arise during the Field Mission;

(3) For any communication with/access to the offshore Marine Mammal Observers (MMOs) and crew, the first point of contact shall always be the Senior MMO, in line with article 2 (5) of this TOR;

(4) In the case of a significant deviation from the MMP or an outright rejection of any aspect of it, the IO shall immediately inform Sakhalin Energy’s designated Central Commander as well as IUCN’s focal person and at least one of the Panel Co-chairs (Reeves and/or Donovan) (by phone or radio and always followed by written communication by e-mail as soon as feasible);

(5) For issues related to the IO presence in the camp, Contractor shall contact Stephanie Lock (SEIC HSE General Manager) (by phone or radio and always followed by written communication by e-mail as soon as feasible);

(6) If necessary, the IO may liaise with Company’s overall head of the survey operations (including geophysical acquisition, monitoring and mitigation components, based in Yuzhno-Sakhalinsk: Bastian Blonk, SEIC Chief Geophysicist).

4. Duty stations during the Field Mission

(1) SEIC onshore camp in the north-east of Sakhalin Island, Russian Federation (and/or other accommodation additionally provided by the Company allowing the IO to fulfil the objectives);

(2) SEIC monitoring team’s camps, stations, posts etc.

5. Submission of written reports to IUCN

Contractor shall submit the following written reports to IUCN:

(1) Weekly activity updates starting from the first day of the Field Mission;

(2) Preliminary field report – promptly upon completion of the Field Mission by IO;

(3) Draft report – within forty days following the completion of the Field Mission for fact check by Sakhalin Energy.

(4) Final report 10 days after Sakhalin Energy submits its final comments and/or clarifications (if any).

6. Other arrangements

(1) All contractual, travel and financial arrangements will be made by IUCN, unless otherwise specified;

(2) Company will ensure IO has necessary access to observe all aspects of implementation of the MMP and is able to communicate with appropriate Company personnel as necessary and feasible, given the priority of completion of their immediate tasks ensuring successful Survey, and access to command centre communication equipment and/or facilities necessary to allow communication with the MMP components, Central Commander, IUCN and the Panel “advisory group”;

(3) IO will be provided with the opportunity to have regular meetings with the offshore MMOs via phone (radio), throughout the course of the survey;
(4) Company will inform IUCN well in advance of the IO mission of all necessary permits and certifications needed to fulfil the role, including those needed for travel between all field locations;

(5) The IO should have direct access to all key personnel, either via personal visits or through means of communication (e.g. some sort of direct interview with offshore MMOs), recognizing that such access must not be allowed to interfere with the duties of these personnel;

(6) Company will make arrangements for the IO mobilisation from Yuzhno-Sakhalinsk to its onshore camp and back;

(7) Company will provide for all IO needs (e.g., lodging, meals, ground transport) during the Field Mission.
MARINE MAMMAL OBSERVER ONSHORE MONITORING & MITIGATION MANUAL FOR THE 2018 PILTUN-ASTOKH 4D SEISMIC SURVEY

Rev.03
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Revised by: Neil Niru Dorrian (SEIC), Heloise Frouin-Mouy (JASCO) 25/03/2018
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1 INTRODUCTION

The purpose of this document is:

To provide guidance and reference information to Marine Mammal Observers (MMO) who will participate during shore based gray whale monitoring activities for the “Sakhalin Energy Investment Company Ltd.” (SEIC) 2018 Piltun-Astokh 4D Seismic Survey.

This guide is a working document that will be adjusted as necessary. Changes should be included in accordance with the current types of work, as well as based on the comments and proposals received from MMOs with regard to the effectiveness of measures to reduce the impact, as well as on the basis of comments and suggestions from all interested parties.

1.1 GRAY WHALE MONITORING & MITIGATION

Monitoring of gray whale distribution and behaviour takes place before; during, and after planned 4D seismic surveys performed by SEIC in order to investigate whether operations have affected whales feeding activities. Behaviour and distribution of whales are observed from four permanent stations (Figure 1). Distribution of gray whales before and after seismic survey is assessed northward and southward of Piltun Bay mouth using protocol forms similar to those applied in previous years. This document does not cover such analysis of gray whale distribution.

Four onshore teams are engaged in monitoring behaviour and distribution of gray whales during the seismic survey: two teams are positioned at two northern observation stations (stations 7.5 & 8), and the other two teams, are positioned at two southern observation stations (stations 9 & 10). The locations were logically selected as needed to control the entire coastal part of the feeding area during the seismic survey, since the density of gray whales in this area is the highest.

This document establishes the work procedure for the teams at the observation stations, defines the protocols for sea surface scanning, and contains the description of MMO (Marine Mammals Observer) tables and specifications.

In order to ensure efficient and prompt measures for mitigating the gray whales impact near the seismic survey zone, behavioural monitoring shall be conducted.

The main objectives of this monitoring programme are: 1) record the distribution of gray whales in the monitoring area, 2) record the behavioural responses of gray whales to the activities of vessels and the levels of noise caused by the survey; 3) to identify obvious deviations from the norm in the behaviour of gray whales (Annex A) and to report the results to the command centre for mitigation measures implementation; and 4) to document the observations of gray whales and to estimate their proximity to the seismic surveys zone for early alert of seismic vessel to avoid close approach to the whales (in particular the sighting of gray whale mother/calf pair within A-Zone).
2 TEAM COMPOSITION

Each of the four teams are located at a permanent station and conducts surveillance during daylight, with due regard for the safe departure and return of the team to the base camp.

Composition of Northern Teams
Two northern teams consisting of 4 personnel: two observers, one theodolite operator, and the team leader.

Composition of Southern Teams
Two southern teams also consisting of 4 personnel: two observers, one theodolite operator, and the team leader.

2.1 MMO STANDARDS OF CONDUCT

STANDARD OF CONDUCT

All MMOs must avoid any behaviour that could adversely affect the confidence of the public in the integrity of the program or of the company. MMOs are thus expected to conduct themselves in a manner that will reflect favourably upon the program by maintaining high standards of honesty, integrity, impartiality, and conduct in all situations. MMOs must report honestly and may not falsify any observer data. MMOs shall not use any data collected under this contract for purposes other than the performance of this contract nor shall MMOs release, reproduce, distribute, or publish any of the data without prior approval from Sakhalin Energy. MMOs must not share project related images or information on social media sites. MMOs are prohibited from conducting personal research or from retaining specimens of any kind for any reason not specified in the Marine Mammal Observer onshore monitoring manual. MMOs must refrain from engaging in any illegal actions or any other activities that would reflect negatively on their image as professional scientists, on other MMOs, or on the MMO Program as a whole. Those would include, but not be limited to:

- Engaging in drinking of alcoholic beverages;
- Engaging in the use or distribution of illegal drugs; and
- Engaging in criminal, dishonest, disrespectful, immoral, or disgraceful conduct.

Behaviour that is contrary to these standards or to the intent of these standards would be grounds for dismissing the MMO. An MMO may be discharged without warning for just cause. Just cause includes, but is not limited to: dishonesty, incompetence, insubordination, negligence with equipment, unexcused absenteeism, unexcused tardiness, disobedience of orders, unsatisfactory performance of duties, loss of data, imposed on the contractor, and failure to live up to the above standards of conduct.
3 WORK PROCEDURE

If the weather permits, continuous observations are carried out from each station during each working day. The daily schedule of observations is established taking into account the seismic survey schedule (line acquisitions). It is required for comparative monitoring of whales distribution during seismic profiling and the periods of seismic noise absence, when the seismic source vessel turns to move from one seismic profile to another.

The SEIC Central Commander (CC) or team leaders will make a decision on whether or not to conduct full-scale observations due to adverse weather or sea heaving (Annex B); however, if during the day the situation improves and partial observations become possible, the team will continue to observe.

The teams shall agree on the time of the sea surface survey commencement.¹ The central commander is in charge of aligning the time agreed; he shall inform the onshore teams daily regarding the traffic of the seismic vessel passing the seismic profiles.

The CC and the team leaders communicate primarily utilising cellular mobile/SAT phones, and by VHF as means of backup.

The onshore sea surface survey shall not be performed or shall be suspended under the following conditions:

- Adverse sea state due to the wind force of 4 points or more on the Beaufort scale;
- Wind speed of 10 m/s or more;
- Intense precipitation (rain, ice hail, snow);
- Fog;
- Other natural phenomena (or their combination) that reduce visibility and impede the detection of whales at a distance over 2 km from the observation station;
- Bear safety related incidents.

¹ ‘Survey’ means observation from the stations provided for a team.
Figure 1. Survey area with the observation stations for each of the four teams.
4.1 THEODOLITE TRACKING

Monitoring of spatial-temporal routes of gray whales is performed using a digital theodolite; with 30x magnification and the countdown accuracy of 5 seconds. The method performs horizontal and vertical angles conversion to geographic coordinates, latitude and longitude, at each recording of readings.

- At first, the gray whales will be detected in the study area visually, by the unaided eye or using binoculars (7x50) (see below).
- If necessary, a photograph related to a sighting can be embedded within the sighting record using Mysticetus.
- Theodolite tracking session will start when it is possible to detect the presence of a single or individually recognised gray whale in a group.
- Individuals will be tracked continuously until the animal travels out of sight, moves beyond the 5 km area from the station, or when the environmental conditions prevent further tracking. If the whale is moving from the shore or is approaching another onshore station of whale behaviour observations, the location of the whale shall be reported to this station so that the observers continue following/monitoring the animal. Unique identifier of the information related to the route for both stations shall be communicated to, and registered at, each station to reference the routes during the subsequent analysis.
- Types of behaviour (travel, feeding, feeding/travel, interaction, etc. see Annex A) shall be registered during each target observation (see below), as well as tracking session, by manually entering data in Mysticetus while in the field.

4.2 TARGET OBSERVATION OF AN ANIMAL

Target observations of behavioural responses and breathing shall be carried out for particular gray whale individuals (Annex A).

- When choosing an observation object, the priority is given to mother/calf pairs detected during scanning. The next priority is given to the whales that are closer to the seismic survey area.
- The sessions of behaviour observation (Altmann, 1974; Martin and Bateson, 1993) of selected individuals shall begin when the team leader decides that monitoring can be carried out continuously and reliably enough so that respiratory and other critical behavioural parameters are not omitted.
- At least one observer shall continue monitoring the individuals using manual binoculars (Fujinon 7x50).
- The observer verbally comments every behavioural act observed (for detailed description of each behavioural act, see Annex A, Table A2); the team lead enters this information into the laptop with Mysticetus software being run. Data entry sheets will be created pre-season and will be identical between stations. Once defined, in the field, entering data will be done by selecting a cell in Mysticetus and typing in the data or using the dropdown.
- Observation sessions are limited to 30 minutes, after which the observer should be changed in order to minimise eye fatigue.
• Sessions of target observation can be conducted simultaneously with theodolite survey, which enables location information tied to each target observation to be gathered.

4.3 SELECTIVE SCANNING (DISTRIBUTION)

To monitor relative abundance and distribution of gray whales within monitoring area, selective scanning method is applied on an hourly basis (Annex D).

• Two observers use manual binoculars (Fujinon FMTRC-SX 7x50 with ocular reticle scale and compass) to monitor a given part of the survey area from north to south.
• The duration of scanning shall be approximately 18-20 minutes at the intensity 10° per minute. Dependant on the observation angle on each station.
• As soon as the whales are detected, the observer shall record the number of whales, the angular distance between the whale and the horizon (based on ocular grids of binoculars), magnetic azimuth, the course of the whale(s), and if necessary, approximate distance from the station.
• During the studies, Mysticetus software developed by Dave Steckler and Paul Donlan will be utilised to 1) provide the form for data entering which is used for the observed issues registration; and 2) calculate the geographical coordinates and provide visual display of the sighted individuals in real time. A comments field is available to add additional context to sightings as necessary.
• Primary scanning shall be conducted before the behaviour observations start. This scanning gives an idea about the number of whales in the area and provides some time for the theodolite operator to adjust the instrument and to find a whale for observation. At the end of the observation day, final scanning shall be performed (e.g., extension of target observation session) to determine the number of whales in the area at the end of the observation day.
• Scan sessions should be conducted by all teams from all observation stations simultaneously. The schedule of scanning sessions must be previously agreed between all teams (for example 9:00, 10:00, etc.).

5 SOFTWARE

Due to the need for data management and real-time processing of the observation data, Mysticetus LLC software (Steckler and Donlan 2018) will be utilised to record the visual data acquired during the target observation sessions. Mysticetus allows for the recording of real time data into field laptops storing all behavioural acts and types of behaviour (Annex A) during the target observation sessions, translating the digital readings of the theodolite in geographic coordinates and correcting for all inputted parameters. A customized data entry template will be created in Mysticetus based on the Sakhalin Energy data requirements. The data entry management will consist of an Effort log, a Sighting Log and a Behaviour Log. Formulas are included to estimate the position of sightings based on the optic used (theodolite, binoculars). Mysticetus software display in real time sighted individuals and the acoustic model output (predicted footprint) allowing informed decisions.
It is important to continuously follow or conduct target observations of selected animals for as long as possible, since this animal will be exposed to various levels of noise, and any changes in its movements and/or breathing may indicate certain levels of exposure. Besides, behaviour observation teams should communicate their findings to other teams that may continue observation of an individual or a group. Continuous communication shall be maintained between the onshore teams when the whales leave the observed zone and travel towards the other observation team. Any deviation from normal behaviour observed by any team shall be first reported to the command centre, as well as to all other teams observing behaviour of the whales.

6.1 CHAIN OF COMMAND

Successful implementation of the monitoring and mitigation plan (MMP) will require effective communication between SEIC management, vessel contractors and field MMOs. Communication protocols have been developed to facilitate efficient deployment and movement of MMO resources and to assure that the SEIC Central Commander is kept fully apprised of the progress and effectiveness of the MMP.

Figure 2: Chain of command communication protocol flowchart.
Chain of command
1. Each shutdown decision triggered by onshore-based observations will be made by the Central Commander, who will pass on this decision to the offshore Lead MMO or Senior MMO ‘Delegate’ (if the Lead not on shift), who will then initiate the shutdown via the seismic vessel’s Party Manager.

2. Each shutdown decision triggered by offshore-based observations will be made by the offshore Lead MMO or Delegate Senior MMO (if the Lead not on shift), who will initiate the shutdown via the seismic vessel’s Party Manager. Directly after this, the Lead MMO or Delegate who made the shutdown decision will inform the Central Commander about all relevant details.

3. The Central Commander (onshore) and Lead MMO or Delegate (offshore) have full shutdown authority for onshore-based or offshore-based shutdown calls, respectively, but have the obligation to consult their staff or each other if there is ambiguity.

4. All onshore and offshore MMOs / field staff are required to inform the Central Commander (onshore) or the Lead MMO / Delegate (offshore), respectively, as soon as a potential shutdown situation arises.

5. The Central Commander needs to know at all times who the decision-making offshore MMO (Lead or Delegate) is.

7 ENVIRONMENTAL DATA REGISTRATION

The onshore teams shall register the environmental data at least once an hour or when the conditions (sea state, visibility, wind direction, etc.) have changed significantly (Annex B). Data on the environmental condition are received from several sources: 1) observations, 2) instruments for meteorological measurements, and 3) mathematical forecasting (i.e. the height of tide). Registered environmental conditions include relative visibility, light intensity, sea state, wind speed, wind direction, cloud cover and the height of waves. For automatic registration of air temperature, barometric pressure, speed and direction of wind, humidity, and other parameters of the environment, portable weather stations (Kestrel) shall be used at each of the observation station with 10-minute intervals throughout every working day. The data on ambient temperature and barometric pressure shall be further used for calculating the refraction correction, which is required for distance approximation calculation (Leaper and Gordon, 2001). At the end of each day, the environmental data shall be uploaded to computer and saved.

If the environmental parameters hinder observations, the monitoring programme shall be suspended until the conditions are acceptable.

For observations with selective scanning, data registration and studies are unacceptable when the visibility conditions exceed the level of 3 (i.e. the shaded horizon) and/or when the wind force on Beaufort scale is > 3.

For target observations and observations using theodolite, shaded horizon (visibility code > 3) does not affect data registration (but affects the monitored area), and the data can be collected under these conditions. Theodolite observation with the known distance between the animal and the observation platform can be continued until the wind force on Beaufort scale exceeds 5 points and the visibility level becomes > 5. Annex B describes the environmental parameters that will be registered during 4D seismic surveys at the Pilton-Astokh field.
8 DATA VERIFICATION AND REPORTING

At the end of each field day, all registered data (observations, GPS data, environmental condition, target observation, theodolite tracking, comments, etc.) shall be inspected for possible logging errors (QA/QC) and edited as appropriate. The team leader at each station shall be in charge of daily evening data inspections aimed at identifying any errors and correct unclear entries. Two types of reports can be automatically generated in *Mysticetus*: On Effort Report and Sightings Summary. All observations and target observation data should be collated and registered. Any abnormal behaviour or event shall be highlighted in the report. All data shall be daily backed up to two external media (external hard drives, USB pen drives, etc.).

9 PROJECT MANAGEMENT

In regard to any project related concerns, please contact:

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A customized data entry template with predefined major field required will be created in *Mysticetus* based on the Sakhalin Energy data requirements for data collection and identification and will be used by all stations.

**Deviations from Normal Behaviour** - Behaviour deviating from the norm is determined as abnormal behaviour, which is different from natural behaviour. For example, assumed natural speed of a gray whale is 2 to 6 km/h (Table A1). If a gray whale moves at a speed of 8 to 10 km/h for an extended duration it is abnormal because such a speed exceeds natural rate. An anxious animal may demonstrate shorter breathing intervals or more frequent cycles of surfacing/breathing/diving. The evidence of behavioural response can be difficult to identify or reliably assessed in real time. The animal's speed and breathing intervals are controlled in real time; with that, they should also be considered in the context of animal’s behavioural activity. Continuously changing direction of travel in response to adjacent activity can be interpreted as a consequence of a neighbouring source impact. Changes in behavioural type may be an evidence of impact as well. For example, if, according to the observations, an animal was permanently feeding in the area, but its behavioural activity has changed when a vessel approached, and the animal started moving, we can assume that the vessel or the vessel's noise made the animal leave the area.

Active behaviour at the surface can also be considered as a response to, or at least irritation by, human activities. For example, multiple tail slapping or quick diving when a vessel is approaching can be considered as a response to an excitant. Highly active behaviour (such as intentional jumping out of water when at least 40% of animal's body is seen) can be caused by a variety of reasons and should be studied within the context. **Please remember that calves and young individuals behave more actively than adult animals.** Adult individuals tend to behave more actively mainly in a social context, when groups are formed or split (Whitehead, 2002). There appeared new assumptions that more active behaviour can be associated with increased wind speed. As for the seismic surveys, multiple jumps out of water combined with rapid movement from the sound source will be considered as deviant behaviour. However, these actions can be caused by natural reasons as well, and they should be studied within the context. If a distance between a female and a small calf exceeds the length of five bodies, being accompanied by uncoordinated movement, this should be considered as a deviation from the norm during the period of seismic surveys (July–August).

**Mitigating Deviations from Normal Behaviour** - In the event that any abnormal (aberrant) gray whale behaviour is observed from any monitoring platform it will be reported by the team lead immediately to the central commander. The CC will continue to evaluate the situation and potential associated risk, with sustained occurrence (increasing duration), high/increasing exposure level, and close/increasing proximity and vessel location and operational status being risk factors increasing the probability of triggering a shut down. A more precautionary risk assessment approach will be taken to trigger a shut down for aberrant behaviour observed in mother-calf pairs at any range, but any aberrant behaviour of any duration observed in mother-calf pairs within 2 km of the seismic vessel will trigger an immediate shut-down.
Table A1. Rate of changes in western gray whales’ direction of travel by three behavioural types

<table>
<thead>
<tr>
<th>Variable</th>
<th>Feed</th>
<th>Feed/Travel</th>
<th>Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (km/h)</td>
<td>0.8 ± 0.47 (35)</td>
<td>1.5 ± 0.86 (36)</td>
<td>3.9 ± 1.78 (83)</td>
</tr>
<tr>
<td>Travel direction change rate (°/min)</td>
<td>33.5 ± 13.82 (35)</td>
<td>21.5 ± 12.53 (36)</td>
<td>9.2 ± 7.01 (83)</td>
</tr>
<tr>
<td>Travel linearity index</td>
<td>0.6 ± 0.23 (35)</td>
<td>0.8 ± 0.16 (36)</td>
<td>1.0 ± 0.05 (83)</td>
</tr>
<tr>
<td>Average vector magnitude</td>
<td>0.5 ± 0.23 (35)</td>
<td>0.8 ± 0.20 (36)</td>
<td>0.9 ± 0.09 (83)</td>
</tr>
<tr>
<td>Range utilisation index (m/min)</td>
<td>10.1 ± 7.00 (35)</td>
<td>22.5 ± 14.54 (36)</td>
<td>62.6 ± 29.51 (83)</td>
</tr>
<tr>
<td>Distance to shore Acceleration (km/h)^2</td>
<td>1.0 ± 0.54 (35)</td>
<td>1.0 ± 0.56 (36)</td>
<td>1.0 ± 0.72 (83)</td>
</tr>
<tr>
<td></td>
<td>0.0 ± 0.12 (35)</td>
<td>-0.1 ± 0.15 (36)</td>
<td>0.0 ± 0.30 (83)</td>
</tr>
<tr>
<td>Breathing interval (min)</td>
<td>0.23 ± 0.056 (15)</td>
<td>0.27 ± 0.060 (18)</td>
<td>0.54 ± 0.193 (43)</td>
</tr>
<tr>
<td>Blows/surfacing</td>
<td>3.89 ± 1.063 (15)</td>
<td>4.38 ± 2.146 (18)</td>
<td>4.55 ± 2.912 (40)</td>
</tr>
<tr>
<td>Time at the surface (min)</td>
<td>0.65 ± 0.226 (15)</td>
<td>0.94 ± 0.757 (18)</td>
<td>1.86 ± 1.772 (40)</td>
</tr>
<tr>
<td>Time under water (min)</td>
<td>2.74 ± 0.842 (15)</td>
<td>2.73 ± 0.863 (18)</td>
<td>1.75 ± 0.511 (40)</td>
</tr>
<tr>
<td>Frequency of blows at the surface</td>
<td>6.40 ± 1.403 (15)</td>
<td>5.28 ± 1.280 (18)</td>
<td>3.21 ± 1.225 (40)</td>
</tr>
<tr>
<td>Frequency of blows within the entire surfacing-diving cycle</td>
<td>1.10 ± 0.225 (15)</td>
<td>1.16 ± 0.297 (18)</td>
<td>1.19 ± 0.302 (40)</td>
</tr>
</tbody>
</table>

**Groups and Group Structure**

During any session, a single individual is usually observed. Gray whales, except for females with small calves, normally live alone; their groups can be observed in the areas favourable for feeding, as co-travellers, during short-time interactions, social activities, etc. Within behaviour studies, a group is determined as one or more interacting individuals, which demonstrate, coordinated actions in their behaviour. In some cases, it is possible to identify one individual in a group as an object for target observations. This individual can be somehow distinguished from other individual(s) (e.g. by a large white spot on the body, the body size, etc.).

It is important to record changes in the group composition. According to the observations, gray whales can form groups for a short time, for example, when one individual feeds alone, and other individuals enter the area and join it. This group may exist for a short period, such as 10 minutes or one hour. Such interactions often hinder the observer from collecting reliable data, since it is unclear which whale has surfaced. However, behaviour observers should register such events and the duration of group existence even if it is impossible to collect data on breathing and other behavioural types of the animal being observed. On the other hand, two individuals observed in a group can differ from each other. It is
essential to register such coalescences and separations, especially if a female with a small calf is observed. Additionally group composition spacing should be noted (tight, or loose aggregations).

**Behavioural Types and Acts**

During the behaviour observations, it is important to distinguish behavioural acts and behavioural types. Behavioural acts are instant and can be either regular or spontaneous, whereas behavioural types are more continuous and specify general activity of animal(s). For example, a whale making abrupt movements (behavioural act) could travel in one direction (behavioural type). Behavioural acts of gray whales, such as time under water, breathing interval, etc., were often associated with their behavioural type (feed, feed/travel, travel, etc.). Therefore, it is important to consistently and reliably identify both behavioural acts and behavioural types of an animal being researched. Identification of behavioural types requires observation background and patience in order to identify the behaviour pattern. Taking into account that “the greatest source of error in the valuation of others’ observations derives from the fact that any two observers watching the same thing do not observe the same thing” (Lorenz, 1935), it is essential to maintain congruence between the behaviour observers. It is necessary to collect data on the reliability of information gathered by different observers (Annex C) in order to assess congruence between the observers.

**Behavioural types.** There are three basic types of behaviour observed in whales’ feeding areas: 1) feeding; 2) feeding/moving; and 3) moving. Mill (aimless moving) has been studied to some extent, being most typical for females with small calves. In Table A2 below, seven behavioural types are defined.
**Table A2. Gray whales’ behavioural types**

<table>
<thead>
<tr>
<th>Behavioural types</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed</td>
<td>F</td>
<td>Individual(s) normally stay(s) in one limited area, moving in any directions and diving with regular duration.</td>
</tr>
<tr>
<td>Feed/travel</td>
<td>FT</td>
<td>Individual(s) travel(s) in one direction at relatively low speed, with regular diving and permanent direction of movement.</td>
</tr>
<tr>
<td>Travel</td>
<td>T</td>
<td>Individual(s) travel(s) in one direction and often stay(s) at the surface, without regular diving.</td>
</tr>
<tr>
<td>Social travel</td>
<td>S</td>
<td>Two or more interacting individuals are active at the surface, follow each other, or play mating games.</td>
</tr>
<tr>
<td>Mill</td>
<td>M</td>
<td>Individual(s) moving in uncertain direction (i.e. moving around, back and forth, playing in the waves, etc.).</td>
</tr>
<tr>
<td>Rest</td>
<td>R</td>
<td>Individual(s) stay(s) relatively motionless at the surface without any periods of diving observed.</td>
</tr>
<tr>
<td>Unknown</td>
<td>U</td>
<td>Any unidentified/unrecognised behaviour.</td>
</tr>
</tbody>
</table>

**Behavioural acts.** Any action observed when the animal is at the surface is registered as an event. Events (acts) can be categorized as breathing, diving, jumping, sticking up tail fins or pectoral fins out of water, social behaviour, anxiety and different kinds of behaviour (Table A3). It should be noted that many of the breathing and diving acts are time-dependent, since the reaction variables such as time under water, time at the surface, breathing intervals, etc., have been derived from them. Data on events are also considered as the time-series data where an event depends on the previous one; therefore, it is critical that breathing and diving facts (as well as jumping/breaching have not been missed and have been recorded accurately. If the observer or recording unit is unable to detect or record events during the observation, the data should be registered as skipped and should not be evaluated retroactively. Other events, such as "sea birds", "mud", "chase", etc. depend on the time to lesser extent. When registering a behavioural act, the priority should be given to breathing and diving, as they are time-dependent.

**Behavioural events of interest.** During any behavioural events of interest that are not listed in table A3 then detailed notes should be recorded regarding distances to the various events, e.g., predators or anthropogenic source. It is essential to record as much detailed information regarding proximity/range of animals observed and the overall context of the scenario for consideration after the fact is really the best way to understand the scenario in post analysis.
Table A3. Gray whales' behavioural acts

<table>
<thead>
<tr>
<th>Behavioral Events</th>
<th>Code</th>
<th>Definition</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Surface</td>
<td>FS</td>
<td>First respiration after an observed dive</td>
<td>Respiration</td>
</tr>
<tr>
<td>Surface No Blow</td>
<td>SNB</td>
<td>Animal observed at the surface with no apparent respiration</td>
<td>Respiration</td>
</tr>
<tr>
<td>Blow</td>
<td>BI</td>
<td>Animal observed breathing</td>
<td>Respiration</td>
</tr>
<tr>
<td>Missed First Surfacing</td>
<td>MFS</td>
<td>Missed initial respiration after an observed dive</td>
<td>Respiration</td>
</tr>
<tr>
<td>Missed Blow</td>
<td>MB</td>
<td>A respiration occurred but observer missed recording the observation</td>
<td>Respiration</td>
</tr>
<tr>
<td>Peduncle Arch</td>
<td>PA</td>
<td>Animal observed arching back portion of body, indicator of diving event</td>
<td>Submergence</td>
</tr>
<tr>
<td>Missed Dive</td>
<td>MD</td>
<td>Animal remains submerged for &gt; 60 seconds without any indication of diving</td>
<td>Submergence</td>
</tr>
<tr>
<td>Fluke Up</td>
<td>FU</td>
<td>Fluke extends out of the water</td>
<td>Submergence</td>
</tr>
<tr>
<td>Fluke</td>
<td>FI</td>
<td>Fluke observed on the surface or slightly above the water</td>
<td>Submergence</td>
</tr>
<tr>
<td>Head-Out</td>
<td>HO</td>
<td>A portion of the animal's head rises out of the water</td>
<td>Leaping</td>
</tr>
<tr>
<td>Head Lunge</td>
<td>HL</td>
<td>An angular movement out of the water with forward movement</td>
<td>Leaping</td>
</tr>
<tr>
<td>Breach</td>
<td>Br</td>
<td>Vertical movement out of the water with a non-forward direction of movement</td>
<td>Leaping</td>
</tr>
<tr>
<td>Unidentified Leap</td>
<td>UL</td>
<td>An individual observed to move a portion of the body out of the water but</td>
<td>Leaping</td>
</tr>
<tr>
<td></td>
<td></td>
<td>unable to recognize the type of leaping behavior</td>
<td></td>
</tr>
<tr>
<td>Fluke Out</td>
<td>FO</td>
<td>A portion of the animal's fluke is observed above the water line (indicator of feeding)</td>
<td>Pectoral &amp; Fluke</td>
</tr>
<tr>
<td>Tail Slap</td>
<td>TS</td>
<td>Animal observed to raise fluke above water line and forcible slash water</td>
<td>Pectoral &amp; Fluke</td>
</tr>
<tr>
<td></td>
<td></td>
<td>below with their fluke</td>
<td></td>
</tr>
<tr>
<td>Pectoral Out</td>
<td>PO</td>
<td>A portion of the animal's pectoral fin is observed above the water line</td>
<td>Pectoral &amp; Fluke</td>
</tr>
<tr>
<td>Rolling</td>
<td>Ro</td>
<td>Alternating portions of the animal's fluke and/or pectoral fins are</td>
<td>Pectoral &amp; Fluke</td>
</tr>
<tr>
<td></td>
<td></td>
<td>observed above the water line</td>
<td></td>
</tr>
<tr>
<td>Sea Birds</td>
<td>SB</td>
<td>Sea bird(s) are observed hovering above or near the focal animal</td>
<td>Other</td>
</tr>
<tr>
<td>Mud</td>
<td>Mu</td>
<td>Observed mud plume observed near the focal animal</td>
<td>Other</td>
</tr>
<tr>
<td>Bubbles</td>
<td>Bu</td>
<td>Air bubbles are observed near the focal animal's position</td>
<td>Other</td>
</tr>
<tr>
<td>Object Play</td>
<td>OP</td>
<td>Animal observed interacting with object at the surface</td>
<td>Other</td>
</tr>
<tr>
<td>---------------</td>
<td>----</td>
<td>-------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Sexual Social</td>
<td>SS</td>
<td>Interacting individual in a social group with an observed penis above the water</td>
<td>Social</td>
</tr>
<tr>
<td>Social Play</td>
<td>SP</td>
<td>Two or more individuals interacting for apparent non-sexual purpose</td>
<td>Social</td>
</tr>
<tr>
<td>Nursing</td>
<td>N</td>
<td>An observed adult interacting with one or more calves in apparent nursing behavior where adult rolls or calf is observed diving under the stationary adult</td>
<td>Social</td>
</tr>
<tr>
<td>Chasing</td>
<td>C</td>
<td>One or more individuals observed to continually follow one or more other individuals with intermittent social activity</td>
<td>Social</td>
</tr>
</tbody>
</table>
ANNEX B: ENVIRONMENTAL PARAMETERS

In this Annex, environmental parameters are summarized, which will be registered during 4D seismic surveys in 2015 (Table B1). Category codes for wind strength on Beaufort scale and for visibility are presented in Table B2 and B3.

Table B1. Environmental parameters registered hourly during behaviour observation

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Units</th>
<th>Description</th>
<th>Assessment</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station</td>
<td>Text</td>
<td>Observation station name</td>
<td>Computer</td>
<td>Station 2</td>
</tr>
<tr>
<td>Date</td>
<td>Date</td>
<td>Date of environmental data registration</td>
<td>Computer</td>
<td>12 Aug 2014</td>
</tr>
<tr>
<td>Time</td>
<td>Time</td>
<td>Time of environmental data registration</td>
<td>Computer</td>
<td>14:23:33</td>
</tr>
<tr>
<td>Heaving points</td>
<td>0-12</td>
<td>Beaufort scale for sea state assessment in points.</td>
<td>Observation</td>
<td>3</td>
</tr>
<tr>
<td>Visibility</td>
<td>1-5</td>
<td>Code for visibility conditions assessment.</td>
<td>Observation</td>
<td>2</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C</td>
<td>Ambient air temperature during environmental data registration.</td>
<td>Instrument for meteorological measurements</td>
<td>12.5</td>
</tr>
<tr>
<td>Pressure</td>
<td>mbar</td>
<td>Atmospheric pressure during environmental data registration.</td>
<td>Instrument for meteorological measurements</td>
<td>1008.5</td>
</tr>
<tr>
<td>Wave height</td>
<td>m</td>
<td>Supposed height of waves during environmental data registration.</td>
<td>Observation</td>
<td>0.8</td>
</tr>
<tr>
<td>Wind speed</td>
<td>km/h</td>
<td>Wind speed during environmental data registration.</td>
<td>Instrument for meteorological measurements</td>
<td>13.6</td>
</tr>
<tr>
<td>Wind direction</td>
<td>Text</td>
<td>Wind direction (N, E, S, W, NE, SSW etc.) during environmental data registration.</td>
<td>Instrument for meteorological measurements</td>
<td>SSE</td>
</tr>
<tr>
<td>Illumination</td>
<td>%</td>
<td>Percentage of observation area well-lit by the sun.</td>
<td>Observation</td>
<td>10</td>
</tr>
<tr>
<td>Light incidence angle</td>
<td>Numeric bearing (0-360)</td>
<td>Beginning of the sun bright light concentration in the northern part towards the southern end of bright light which prevents the observation.</td>
<td>Observation</td>
<td>120-145</td>
</tr>
<tr>
<td>Clouds</td>
<td>%</td>
<td>Percentage of clouds cover in the atmosphere.</td>
<td>Observation</td>
<td>60</td>
</tr>
<tr>
<td>Tide</td>
<td>m</td>
<td>Predicted height of tide during observations. It is not assessed in field conditions.</td>
<td>Forecast</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Table B2. Wind strength on Beaufort scale for environmental data registration

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
<th>Sea state</th>
<th>Onshore conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Calm</td>
<td>Flat</td>
<td>Calm. Smoke rises vertically.</td>
</tr>
<tr>
<td>1</td>
<td>Light air</td>
<td>Ripples without crests.</td>
<td>Smoke drift indicates wind direction.</td>
</tr>
<tr>
<td>2</td>
<td>Light breeze</td>
<td>Small wavelets. Small wavelets, crests of glassy appearance, not breaking.</td>
<td>Wind felt on exposed skin. Leaves rustle.</td>
</tr>
<tr>
<td>3</td>
<td>Gentle breeze</td>
<td>Large wavelets. Crests begin to break; scattered whitecaps.</td>
<td>Leaves and small twigs constantly moving.</td>
</tr>
<tr>
<td>4</td>
<td>Moderate breeze</td>
<td>Small waves with breaking crests. Fairly frequent whitecaps.</td>
<td>Dust and loose paper raised. Small branches begin to move.</td>
</tr>
</tbody>
</table>

Table B3. Visibility category codes for environmental data registration

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excellent</td>
<td>Horizon line is clearly seen.</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
<td>No fog, or slight fog and/or rain with relatively clear horizon line.</td>
</tr>
<tr>
<td>3</td>
<td>Satisfactory</td>
<td>Slight fog and/or rain, but the horizon is still visible for grid evaluation.</td>
</tr>
<tr>
<td>4</td>
<td>Insufficient</td>
<td>Horizon is not seen due to fog and/or rain.</td>
</tr>
<tr>
<td>5</td>
<td>Lack of visibility</td>
<td>Horizon is not seen due to fog and/or rain; visibility distance is less than half distance between the observation point and the horizon.</td>
</tr>
</tbody>
</table>
## ANNEX C: ONSHORE REGISTRATION OF GRAY WHALE DISTRIBUTION

<table>
<thead>
<tr>
<th>Period of observations</th>
<th>Observers</th>
<th>Conditions of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Time</td>
<td>Obs.1</td>
</tr>
<tr>
<td>Day</td>
<td>Month</td>
<td>Year</td>
</tr>
</tbody>
</table>

### Notes:
____________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________

<table>
<thead>
<tr>
<th>Time</th>
<th>Obs.</th>
<th>Species</th>
<th>Qty</th>
<th>Age</th>
<th>Sex</th>
<th>Bearing</th>
<th>Grid below horizon</th>
<th>Met earlier</th>
<th>Travel direction</th>
<th>Speed</th>
<th>Actions</th>
<th>Distance from observation point</th>
<th>Confirmanon</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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ANNEX D: INCIDENTS WITH MARINE MAMMALS

In this Annex, emergency response procedures are summarized. Detailed description of emergency response procedures is fully presented in the document Marine Mammals Protection Plan.

- Upon discovery of a dead, sick, or injured marine mammal, the MMO should immediately notify the Central Commander.
- The MMO is prohibited to undertake any unassisted actions with the marine mammal found.
- The observer is prohibited to act arbitrary with regard to direct contact with a marine mammal.
- The observer should under no circumstances expose themselves or other people to risk associated with approaching an injured or dead marine mammal. Direct contact with a marine mammal is possible only after consultation with the Emergency Coordination Team (ECT).

Any actions related to catching, treatment, transportation, stabilisation of condition, or release of the injured animal shall be performed only with the permission of the relevant state authority, issued to Sakhalin Energy.

In the event of (1) collision with a marine mammal, or (2) a marine mammal entanglement in the equipment used during SEIC operations, or (3) detection or receiving of information on a stranded marine mammal, the MMO shall follow the protocol below.

COLLISION WITH MARINE MAMMALS

In the event of witnessing a vessel collision with a marine mammal, the onshore MMO is obliged to observe the following procedure:

1. Determine how many animals have been injured and identify the animal species.
2. Make a preliminary assessment of the severity of the incident (including the attempt to find out whether the marine animal has entangled in materials not related to the project works (i.e. fishing gear).
3. Immediately inform the Central Commander who will inform the captain of the vessel and Lead MMO onboard and the SEIC MMO programme coordinator.
4. Sakhalin Energy onboard representative / captain of the vessel / the Central Commander / SEIC MMO Programme coordinator will contact the Emergency Coordinator in Yuzhno-Sakhalinsk. The Emergency Coordination Team will coordinate the notification of relevant agencies.
5. Ensure that other MMOs present onboard continue monitoring other whales in the survey area.
6. Continue observing the affected animal to assess its condition and, if possible, take photos or video records.
7. The observer shall provide the information to the Coordination Team but shall not be entitled to take unilateral actions.
8. All external contacts shall be made through the Coordination Team. MMO’s work consists only in providing the information to its representatives.

9. After the incident, hold a meeting with other MMOs to identify the causes of the collision and to develop measures for collisions prevention and forward to SEIC MMO Programme coordinator and Sakhalin Energy representative.


11. Send all necessary documents to the Coordination Team immediately upon completion, within 24 hours after the incident.

**MARINE MAMMAL ENTANGLEMENT**

In the case of marine mammal entanglement, the MMO is obliged to observe the following procedure:

1. Determine how many animals have become entangled and attempt to identify the species.

2. Try to ascertain whether the marine mammal is entangled in materials not related to the project operations, for example, in fishing nets. Assess the possibility and safety of the animal to disentangle itself.

3. Immediately inform the captain of the vessel and Lead MMO onboard/Onshore Command Centre, and the MMO programme coordinator.

4. The Lead MMO immediately informs the Sakhalin Energy onboard representative, the Onshore Central Commander, and the MMO programme coordinator.

5. Sakhalin Energy onboard representative / captain of the vessel / the Central Commander / SEIC MMO programme coordinator will contact the Emergency Coordinator in Yuzhno-Sakhalinsk. The Emergency Coordination Team will coordinate the notification of relevant agencies.

6. Coordinate all actions in accordance with the requirements of the Coordination Team. It is forbidden to take any action before receiving information from the CT.

**MARINE MAMMAL STRANDING**

In the event of a marine mammal stranding event, take the following steps:

1. Determine how many animals have stranded and attempt to identify the species.

2. Immediately inform the onshore Central Commander and the MMO programme coordinator.

3. The Central Commander shall immediately inform the Sakhalin Energy onboard representative and the SEIC MMO programme coordinator.

4. Sakhalin Energy onboard representative / captain of the vessel / the Central Commander / SEIC MMO programme coordinator will contact the Emergency Coordinator in Yuzhno-Sakhalinsk. The Emergency Coordination Team will coordinate the notification of relevant agencies.

5. Coordinate all actions with the Coordination Team. It is forbidden to take any action before receiving information from the CT.
MMOs are not permitted to leave the operations area for examining the stranded animals without instructions from the EMERCOM. The vessels involved in the project should be attended by an experienced MMO at all times.

**OIL SPILL RESPONSE**

In the event of an oil spill detection, the MMO shall immediately notify the captain of the vessel/work supervisor.

In the case an oil spill is observed to have affected marine mammals, the MMOs shall coordinate their actions with the Oil Spill Response Headquarters. All decisions regarding the oil spills, including coordination and reporting, shall be made through contacting with the Oil Spill Response Headquarters.

If necessary, the observer shall be placed under orders of the ECT.

**NON-PROJECT RELATED INJURIES & MORTALITY OF MARINE MAMMALS**

Marine mammals with injuries not related to project activities may be encountered during operations. Such injuries can be caused by other types of human activity (fishing) or have a natural origin (injuries caused by predators, or disease).

Dead animals may also be encountered. The MMO shall report any such cases to the Sakhalin Energy onboard representative and the Central Commander / SEIC MMO programme coordinator and complete all necessary documents (ANNEX E) in accordance with the procedure set for the project-related incidents. If the animal is large or is classified as a protected species, the representative of Sakhalin Energy / captain of the vessel shall immediately contact the Emergency Coordinator in Yuzhno-Sakhalinsk for further coordination.
EMERGENCY RESPONSE – MARINE MAMMAL INJURY & STRANDING FLOW CHART

OFFSHORE Mortality – Injury/Entangled MM

- Vessel Captain, offshore Lead MMO, SEIC Representative
- Central Commander, SEIC Representative on site

ONSHORE Stranding/Entangled MM

- SEIC Representative on site, Central Commander
- offshore Lead MMO

SEIC Representative on site/SEIC MMO Programme Coordinator

SEIC office

EMERGENCY COORDINATION TEAM
### EXAMINER

**DATE OF INITIAL OBSERVATION:** Year: _____ Month: _____ Day: ______

Name: ______________________________________________________

Affiliation: ______________________________________________________

Address: ______________________________________________________

Phone: ______________________________________________________

### SPECIES AND LOCATIONS DETAILS

**Common Name:** ______________________________________________________

**Genus:** ______________________________________________________

**Species:** ______________________________________________________

**Site description:** ______________________________________________________

**GPS Co-ordinates:** ______________________________________________________

**Vessel:** ______________________________________________________

**Sighting conditions:** ______________________________________________________

**Vessel activity:** ______________________________________________________

**Distance to Marine Mammal at first sighting:** _________________________________

Floating? YES NO

Stranded? YES NO

**Body Condition Code:**


13 REFERENCES


MARINE MAMMAL OBSERVER OFFSHORE MONITORING & MITIGATION MANUAL FOR THE 2018 PILTUN-ASTOKH 4D SEISMIC SURVEY

Rev.04
## Document history

<table>
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<th>Sakhalin Energy Investment Company Ltd.</th>
<th>20/05/2015</th>
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<tr>
<td>Revised by</td>
<td>Neil Niru Dorrian (SEIC)</td>
<td>25/03/2018</td>
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<tr>
<td>Approved by</td>
<td>Sergey Vinogradov and Bastian Blonk (SEIC)</td>
<td>30/03/2018</td>
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### Issue

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1 INTRODUCTION

The purpose of this document is:

To provide guidance and reference information to trained Marine Mammal Observers (MMO) who will participate during “Sakhalin Energy Investment Company Ltd” (SEIC) 2018 Piltun-Astokh 4D Seismic Survey.

This guide is a working document that will be adjusted as necessary. Changes should be included in accordance with the current types of work, as well as based on the comments and proposals received from MMOs with regard to the effectiveness of measures to reduce the impact, as well as on the basis of comments and suggestions from all interested parties.

2 MARINE MAMMAL MITIGATION TEAM

Experienced and qualified Marine Mammal Observers (MMO) will receive orientation training on the Monitoring and Mitigation Plan (MMP) requirements prior to project commencement. The majority of MMOs will hold relevant biological science degrees and experience in marine mammal monitoring and mitigation.

The number of MMOs assigned to each vessel depends on the activity of the vessel and other factors. On the seismic source vessel one of the experienced observers will be designated as the Lead MMO and will have overall responsibility with regard to the successful performance of the team and the execution of the mitigation plan.

- Experienced MMOs will be stationed on the seismic vessel for the duration of the survey.
- MMOs will be limited to a maximum 2-hour continuous shift\(^1\) with a minimum of 1 hour as a break between shifts;
- Single-point authority for operational shutdowns related to marine mammal protection will lie with the on-shift Senior MMO on the seismic vessel;
- The MMOs will be located on the bridge or at the highest elevation available on the seismic vessel with the maximum viewable range from the bow to 90° port/starboard of the vessel;
- A 30-minute visual search will be conducted prior to start-up of the seismic source;
- A minimum of two MMOs will be on watch on the seismic vessel from 30 minutes before initiation of soft-start onwards and throughout line acquisition;
- All MMOs on duty should standardise their distance estimations amongst each other with eye and reticle binoculars prior to the start of observations;
- Occurrence and behaviour of whales will be documented in accordance with existing Marine Mammal Protection Plan (MMPP) and MMO procedures;

Specific responsibilities of the Lead MMO and tasks and responsibilities applying to all MMOs are listed below in section 2.1 and 2.2.

\(^1\) Under exceptional operational circumstances and with the agreement of the Lead MMO this may occasionally be extended to 3 hours
2.1 LEAD MARINE MAMMAL OBSERVER

- To act as the principle MMO contact for the program on-board the seismic source vessel (see communication protocol section 6).

- To ensure that adequate equipment and data entry forms are available during the monitoring program, and that all field equipment is shipped back to the appropriate office at the end of the season.

- To ensure that observations are made under all possible circumstances. This includes preparation of a workable time schedule for all MMOs on the vessel, taking into account that each MMO will be on duty for no more than two consecutive hours and will remain on duty until relieved by another MMO. Under exceptional operational circumstances and with the agreement of the Lead MMO this may occasionally be extended to 3 hours.

- To coordinate source vessel and support MMO duties and schedules with the captain and vessel party manager.

- To coordinate with the captain, party manager and chase vessel MMOs for pre dusk scans of the PML when necessary.

- To ensure that upon completion of each two-hour observation period, each MMO will complete all required paperwork and data entry.

- To maintain oversight and tracking of proper debriefing procedures, including the execution of final data review, data editing and data entry.

- To organise open meetings with vessel personnel to provide updates and consider suggestions and concerns with regard to the marine mammal observations and related vessel activities.

- To familiarise MMOs with any special operating procedures and changes to the operational program during MMO crew rotation.

- To prepare and submit daily and weekly reports to Sakhalin Energy Central Commander (see reporting section).

- To prepare a final closeout report (see reporting section 7).

- To carry out direct radio access with the onshore Command centre and Central Commander.

- To be responsible for operational shutdown on the seismic vessel related to marine mammal protection.

  - The Lead/Senior MMO will initiate source shutdown if marine mammals is observed within the exclusion zone of the source;

  - The Lead/Senior MMO will initiate a precautionary shutdown if marine mammals are observed to be on a course that is likely to result in its entering the exclusion zone radius.
2.2 MARINE MAMMAL OBSERVER

- To maintain a diligent, systematic watch for marine mammals around the vessels during daylight hours and all periods of operational activity.
- When marine mammals are sighted the MMO will record such sightings, making use of a standard Marine Mammal Sighting Form (Annex A).
- If any mitigation measures are implemented the MMO will record what action was taken at what time.
- After completion of the operations or survey the MMO will participate in the preparation of a report to summarise the observations, results, and conclusions of the marine mammal-monitoring programme.
- Every day the MMO records data tracking the route of the vessel (GPS track with an interval of 1 minute), regardless of the type of vessel activity and weather conditions.

It is important to remember that all MMOs are part of a team and aid each other when practical in order to complete the monitoring objectives. MMOs are not expected to perform any crew functions, except those assigned for emergency situations (e.g., life vessel drills, fire drills).

2.3 CAMERA MONITORING SYSTEM TECHNOLOGIST

An experienced CMS (Camera Monitoring System) technologist will be based on-board the seismic vessel to assist in monitoring the exclusion zone, specifically at night and if feasible in poor visibility conditions.

2.4 MMO SCHEDULE, SHIFT/CREW CHANGE

- Once aboard the vessel the MMO will be expected to begin work immediately as a full member of the marine mammal observation team.
- If there are scheduled MMO crew changes the MMO being replaced must not leave the vessel until his/her replacement arrives aboard the vessel (i.e. MMOs must “shake hands” before they can leave). This is to ensure that the monitoring requirements regarding the number of MMOs on duty can be met even if the crew change schedule is disrupted.
- Overlap time during a shift change will be used to exchange information and concerns that might be relevant to observational operations.
- As the continuous observation of marine mammals at sea is a demanding job, the maximum observation period during seismic survey will not exceed two hours (Annex G).
- If an MMO needs to leave their station at any time during their shift, they must first notify the bridge. If marine mammals are in the area the MMO may need to wait until a replacement MMO is available before he can leave his post.
- Shift changes between MMOs should be expedited to ensure minimal down time. If an MMO is observing a marine mammal at the time of a scheduled shift change, the MMO on duty will remain on duty until the sighting has been completed or an appropriate opportunity presents to pass the sighting over to the next MMO.
- In the event that large numbers of whales are seen, all MMOs may be called on duty during any two-hour period.
2.5 MMO STANDARDS OF CONDUCT

STANDARD OF CONDUCT

♦ All MMOs must avoid any behaviour that could adversely affect the confidence of the public in the integrity of the program or of the company. MMOs are thus expected to conduct themselves in a manner that will reflect favourably upon the program by maintaining high standards of honesty, integrity, impartiality, and conduct in all situations. If a vessel maintains a stricter policy for its employees, then the MMO must comply with that policy.

♦ MMOs must report honestly and may not falsify any observer data.

♦ MMOs shall not use any data collected under this contract for purposes other than the performance of this contract nor shall MMOs release, reproduce, distribute, or publish any of the data without prior approval from Sakhalin Energy.

♦ MMOs must not share project related images on information on social media sites.

♦ MMOs are prohibited from conducting personal research or from retaining specimens of any kind for any reason not specified in the Marine Mammal Observer offshore monitoring manual.

♦ MMOs must refrain from engaging in any illegal actions or any other activities that would reflect negatively on their image as professional scientists, on other MMOs, or on the MMO Program as a whole. Those would include, but not be limited to:
  ♦ Engaging in drinking of alcoholic beverages;
  ♦ Engaging in the use or distribution of illegal drugs; and
  ♦ Engaging in criminal, dishonest, disrespectful, immoral, or disgraceful conduct.

Behaviour that is contrary to these standards or to the intent of these standards would be grounds for dismissing the MMO. An MMO may be discharged without warning for just cause. Just cause includes, but is not limited to: dishonesty, incompetence, insubordination, negligence with equipment, unexcused absenteeism, unexcused tardiness, disobedience of orders, unsatisfactory performance of duties, loss of data, violation of vessel owner’s rules imposed on the contractor, and failure to live up to the above standards of conduct.
3 MMO EQUIPMENT AND REMOTE SENSING

3.1 MMO EQUIPMENT

The MMOs will have several pairs of reticle binoculars. MMOs will scan the water surface around the vessel, aided by 7x50 (or similar) binoculars as optical instruments. The binoculars include a reticle (a series of small dark bars visible through the eyepiece) to measure depression angle relative to the horizon - an indicator of distance. When looking through the binoculars, the more reticles between the horizon and the mammal, the closer the animal is to the vessel.

Conditions can be cold, windy, and damp during many observation sessions. Responsible body for providing all necessary equipment is outlined in the Table 1 below. Sunglasses (polarized) are recommended, as the sun can be very bright when reflected off the water.

MMOs should keep a list of all equipment they are issued. All equipment provided must be returned at the end of the field season. MMOs are also responsible for making sure that all equipment remains in useable condition. Equipment associated with the MMO positions includes the following. Not all equipment may be on every vessel.

MMOs will be expected to become familiar with all of the safety equipment on board the vessel and to participate in safety drills and if applicable cold water training.

Table 1 Field equipment to be present

<table>
<thead>
<tr>
<th>Equipment</th>
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<tr>
<td>Big-Eye binoculars</td>
<td>SEIC</td>
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<tr>
<td>Reticle binoculars</td>
<td>MMO/Contractor</td>
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<td>Handheld GPS</td>
<td>SSU</td>
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<tr>
<td>PPE</td>
<td>Contractor/SEIC</td>
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<tr>
<td>Notebook computer</td>
<td>MMO/Contractor</td>
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<tr>
<td>Handheld radio/cellular phone</td>
<td>MMO/SEIC</td>
</tr>
<tr>
<td>Flash disk</td>
<td>MMO/SSU</td>
</tr>
<tr>
<td>Photo-camera &amp; accessories</td>
<td>SEIC/MMO</td>
</tr>
<tr>
<td>Field guides</td>
<td>Contractor/SEIC</td>
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<tr>
<td>Deck forms</td>
<td>Contractor/SEIC</td>
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<td>Clipboard</td>
<td>Contractor/MMO</td>
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<tr>
<td>Pencils</td>
<td>Contractor/MMO</td>
</tr>
<tr>
<td>Zip waterproof pouch for field guides</td>
<td>Contractor/MMO</td>
</tr>
<tr>
<td>Appropriate weather clothing/gear</td>
<td>Contractor/MMO</td>
</tr>
</tbody>
</table>
3.2 CAMERA MONITORING SYSTEM

Three Seiche Camera Monitoring System (CMS) units will be installed on-board the source vessel to provide enhanced visual coverage of near up to 360 degrees. The system is designed to operate efficiently both in daylight (HD) or in darkness (IR) in sea-states comparable and often exceeding those favourable for visual (MMO) sighting conditions. The CMS Infrared sensor is less effective in thick fog and this limitation should be noted and acknowledged by the operator. The CMS has the capacity to detect blows, breaches, and other surface movements of whales at night.

3.3 SOURCE VESSEL RADAR SYSTEM

A Radar system installed on the bridge of the source vessel will be easily accessible to the observer team during night-time or foggy conditions. The system setting controls allow for increasing and decreasing the scanning range and frequency. This system may assist monitoring for surfacing marine mammals during calm sea conditions when effective visual monitoring is reduced.

3.4 BIG-EYE BINOCULARS

A pair of Big-Eye binoculars (one unit) will be mounted on a mobile base on-board the source vessel, such that they have an unobstructed view of the area near and shoreward of the PML. They will be used primarily for the task of ‘distant’ distribution monitoring (i.e. to detect whales near or shoreward of the PML) when required. The MMOs will additionally utilise these binoculars to extend the range of observations and assist in identifying marine mammals.
4 MARINE MAMMAL MONITORING AND MITIGATION

4.1 MONITORING DURING TRANSIT

A transit watch is conducted while the vessel is heading to or from the main activity area. During this watch the vessel will be traveling with no other activities generating significant noise and no equipment in the water. Transit watches are conducted during daylight time when the Beaufort Sea state is 5 or less. The Beaufort scale defines a Force 5 as 17-21 knot wind speed, 6-8 foot waves, many white caps, and some spray. Each transit watch is maintained continuously while the vessel is underway.

Protocols during the transit watch are below.

- The MMO should choose a watch position, facing the bow, free of obstructions and as high off the water as possible.
- During a transit watch the MMO should thoroughly scan a 180° area that corresponds to the front half of a circle centred on the MMO (Figure 1). Continuous scanning of the water surface in the designated area is done with the naked eye.
- Once a sighting is made binoculars are used to confirm the sighting, make an identification of the species, determine the number of animals sighted, distance from the vessel, and direction of travel.
- If the whales are within the vessel path the MMO will contact the bridge and make recommendations regarding vessel speed and direction.
- If the vessel is transiting under sea state conditions that preclude observations, the MMO will consult with the captain and remain on the bridge to advise on speed and travel direction.
- In poor weather vessel speed should be significantly reduced.
- Every day MMO records data on the route of the vessel (GPS track with an interval of 1 minute), regardless of the type of vessel activity and weather conditions.

*Figure 1. Area to be scanned during transit watch, star is MMO on the vessel*
4.2 MONITORING DURING SEISMIC ACTIVITY

An activity watch is conducted when the vessel is performing any operational activity that also involves the deployment of equipment or the testing of equipment (including any activity that generates sufficient noise to be of concern). Activity watches provide information on marine mammals in the vicinity of the operations. An activity watch is conducted during all operational activities, regardless of weather conditions.

- During an activity watch the MMOs on board maintain a continuous watch until the activity has been completed.
- The MMO should choose the best possible location from which to conduct the activity watch while remaining out of the way of normal vessel operations.
- The observation post should provide an unobstructed view of the activity and the area around the vessel.
- Continuous scanning of the water surface in the designated area should be done with the naked eye.
- Once a sighting is made binoculars are used to confirm the sighting, make an identification of the species, determine the number of animals sighted, distance from the vessel, and direction of travel.
- Every day MMO records data of the route of the vessel (GPS track with an interval of 1 minute), regardless of the type of vessel activity and weather conditions.

4.3 AVOIDANCE AND MITIGATION OF SHIP STRIKES

The following standard mitigation measures will be used to reduce the likelihood of ship strikes in all phases of SEIC operations during the early, peak and late seasons of Gray whale (GW) presence near Sakhalin.

4.3.1 VESSEL CORRIDORS

Corridors have been established for SEIC vessel traffic along the east coast of Sakhalin Island. Information recorded during marine mammal surveys was used to design vessel traffic routes. All SEIC vessels are required to keep within the designated corridors, unless deviation is essential for safety or else specifically required and authorised (Annex C).

To prevent vessel strikes of whales or disturbance of feeding whales, all vessel traffic shall comply with these route definitions. Deviation from these routes is allowed only for justifiable safety / emergency reasons, or if specifically, authorized. Deviations from the corridors will be recorded as non-compliances and investigated in line with SEIC procedures.
4.3.2 SPEED LIMITS

Speed limits for vessels are established as follows: The established speed limit is mandatory for all vessels involved in offshore activity of Sakhalin Energy, unless emergency or safety situations require otherwise.

<table>
<thead>
<tr>
<th>Speed limits (maximum in knots)</th>
<th>Crew transfer corridor</th>
<th>Within navigational corridors</th>
<th>Westward from corridors(^2), within safety zones and in pipeline inspection corridor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daylight conditions &amp; visibility ≥0.5 n.m.</td>
<td>35 knots</td>
<td>17 knots</td>
<td>10 knots</td>
</tr>
<tr>
<td>Visibility &lt;0.5 n.m. km or at night</td>
<td>21 knots(^3)</td>
<td>17 knots</td>
<td>7 knots</td>
</tr>
</tbody>
</table>

4.3.3 SAFETY DISTANCES

Safety distances for all vessels including seismic vessels in transit (without seismic operation):

- 1 km – safety distances for Gray whale and other endangered whale species (bowhead whale, north pacific right whale, fin whale);
- 0.5 km – safety distances for other whales, dolphins and porpoises;
- No safety distances for pinnipeds but proceed with caution.

If any species of whale is sighted near the path of a vessel the MMO will advise the Sakhalin Energy representative and the captain (or officer on duty) on options for avoiding the whale. This might include:

- Slowly changing heading to divert whales path of movement.
- Slowing to idling speed or stopping vessel as well if that can be done safely.

If a vessel strikes or comes in contact with a marine mammal the MMO will immediately report the incident to the Central Commander (Annex I), and will record the event in the Marine Mammal Mortality-Injury Report (Annex D).

\(^2\) Speed limits westward from the corridors (towards areas where encounters with GW are more likely).
\(^3\) The speed limit within the corridors is the same under all conditions under the assumption that the probability of encountering Gray whales in these offshore routes is very low.
5 MITIGATION OF SEISMIC SURVEY RISKS TO MARINE MAMMALS

5.1 MMO/CMS RESPONSIBILITIES ONBOARD SOURCE VESSEL

- MMOs maintain a systematic watch for marine mammals around the vessel during daylight hours and during all periods of operational activity.
- CMS Technologist will maintain a systematic watch for marine mammals around the vessel during hours of darkness.
- Vessel-based MMOs/CMS must report to the Command Centre immediately if they have information to report that is of potential relevance to real-time mitigation. (See communication protocol).
- Lead/Senior MMO to be given 1-hour notice prior to soft start/source activity to ensure timely start of a dedicated 30-minute pre-watch.
- A concentrated visual search will be conducted 30 minutes prior to start-up of the seismic source.
- There are minimum of two MMOs on watch on the seismic vessel for 30 minutes before initiation of soft-start, at any given time during soft-start, gun tests and throughout line acquisition (Annex G).
- A pair of Big-Eye binoculars (one unit) will be mounted on the deck of the seismic vessel for use by MMOs.
- Every day the MMO records data on the route of the vessel (GPS track with an interval of 1 minute), regardless of the type of vessel activity and weather conditions.

5.2 MMO RESPONSIBILITIES ONBOARD CHASE VESSEL

- Two dedicated MMOs will be based on-board the chase vessel specifically for the task of A-zone monitoring for a planned A-line when shore-based monitoring is ineffective. (to detect whales near or shoreward of the PML).
- Chase vessel-based MMOs maintain a systematic watch for marine mammals around the vessel during daylight hours.
- There are minimum of one MMO on watch on the chase vessel at any given time.
- As the continuous observation of marine mammals at sea is a demanding job the maximum observation period during seismic survey will not exceed two hours.
- To coordinate with the source vessel Lead MMO, vessel Captains, and Party Manager for pre-dusk scans of the PML when necessary.
- Chase vessel-based MMO must report to the source vessel Lead MMO immediately if they have information to report that is of potential relevance to real-time mitigation. (See communication protocol).
- Every day the MMO records data on the route of the vessel (GPS track with an interval of 1 minute), regardless of the type of vessel activity and weather conditions.
- To prepare and submit daily and weekly reports to Sakhalin Energy Central Commander and sends reports to the "Sakhalin Energy" functional mailbox SEIC-MMO-Field-Reports@Sakhalinenergy.ru (see reporting section).
5.3 MARINE MAMMAL EXCLUSION ZONES

Exclusion zone for seismic vessel during survey (Annex H):

- 1 km – exclusion zone for **Gray whale and other endangered whale species** (bowhead whale, North Pacific right whale, Fin whale, Cuvier’s beaked whale);
- 0.5 km – exclusion zone for **other cetaceans** (whales, dolphins and porpoises);
- 350 m exclusion zone for Steller sea lion.

5.4 PRE-SHOOTING SEARCH FLOWCHART

*Figure 2 Pre-shooting searches protocol.*
5.5 OPERATION SHUTDOWNS

- The Lead/Senior MMO will initiate source shutdown if a marine mammal is observed within the established exclusion zone.
- The Lead/Senior MMO will initiate a precautionary shutdown if marine mammals are observed to be on a course that will result in its entering the exclusion zone.
- Soft-start procedure will be conducted no earlier than 30 minutes after the animal(s) leaving exclusion zone.

![Figure 3 Operational shut down protocol flow chart.](image)

5.6 ADDITIONAL MITIGATION

The area for which the additional mitigation measures are in effect (A zone) is defined by the overlap of the region inshore of the perimeter monitoring line (PML) and the maximum shoreward extent of the 156 dB for the current acquisition line.

- When a Gray whale mother-calf pair is observed in the A-zone, ongoing acquisition (if any) will be suspended. No acquisition will commence or resume until either (a) the mother-calf pair are outside the A-zone, or (b) at least 3 hours have passed since the pair were last sighted.
- In the event that the 156 dB per pulse SEL is exceeded at any receiver on the edge of the feeding ground while shooting a B line, the line shall be reclassified as a A line accordingly.
Mitigating Deviations from Normal Behaviour - In the event that any aberrant gray whale behaviour is observed from the seismic vessel it will be recorded and reported by the Lead MMO immediately to the Central Commander.

- Any aberrant behaviour of any duration observed with gray whale mother-calf pairs within 2 km of the seismic vessel will trigger an immediate shut-down.

6 COMMUNICATION PROTOCOL

Successful implementation of the Monitoring and Mitigation Plan (MMP) will require effective communication between SEIC management, vessel contractors, and field MMOs. Communication protocols have been developed to facilitate efficient deployment and movement of MMO resources and to assure that the SEIC Central Commander is kept fully apprised of the progress and effectiveness of the MMP.

Figure 4 Chain of command communication protocol flowchart.
Chain of command
1. Each shutdown decision triggered by onshore-based observations will be made by the Central Commander, who will pass on this decision to the offshore Lead MMO or Senior MMO (if the Lead not on shift), who will then initiate the shutdown via the seismic vessel’s Party Manager.
2. Each shutdown decision triggered by offshore-based observations will be made by the offshore Lead MMO or Delegate Senior MMO (if the Lead is not on shift), who will initiate the shutdown via the seismic vessel’s Party Manager. Directly after this, the Lead MMO or Delegate who made the shutdown decision will inform the Central Commander about all relevant details.
3. The Central Commander (onshore) and Lead MMO or Delegate (offshore) have full shutdown authority for onshore-based or offshore-based shutdown calls, respectively, but have the obligation to consult their staff or each other if there is ambiguity.
4. All onshore and offshore MMOs / field staff are required to inform the Central Commander (onshore) or the Lead MMO / Delegate (offshore), respectively, as soon as a potential shutdown situation arises.
5. The Central Commander needs to know at all times who the decision-making offshore MMO (Lead or Delegate) is.

6.1 CAPTAIN AND PARTY MANAGER (PM)
- The Captain of each vessel and/or the Party Manager (vessel operator) are responsible for ensuring the safety of the vessel and all on board, and for conducting their operations such that they meet the various permit specifications.
- The Captain and/or the Party Manager must ensure that everybody on board is aware of the safety specifications related to the vessels activity.
- In case of violation of the safety rules on board the Captain and/or Party Manager should notify the Lead MMO.

6.2 VESSEL CREW
- The vessel crew fall primarily under the responsibility and orders of the captain and/or party manager.
- All marine mammals sighted by personnel aboard the vessel are brought to the MMOs’ attention immediately.
- The bridge crew on-board may provide marine mammal monitoring coverage of the radar system during the period of darkness/fog to assist the CMS technologist. This has to be approved by the Captain, Party Manager and under no circumstances obstruct any safety procedures.
- In the event of a Gray whale sighting when the MMO is off duty, the MMO is notified and comes to the bridge to assist with data recording.

6.3 LEAD/SENIOR MMO
- The Lead MMO will act as the principle MMO contact for the program on that vessel. This means that any issue related to MMO performance should be addressed to the Lead MMO.
- The Lead MMO should ensure that all MMO duties and schedules are coordinated with the captain or vessel operator.
• The Lead MMO is responsible for organising regular open meetings with the vessel personnel to provide updates and consider suggestions and concerns with regard to the marine mammal observations and related vessel activities.

• The Lead MMO is responsible to familiarise MMOs with any special operating procedures and of any changes in the operational program during MMO crew rotation.

• The Lead MMO should discuss all current measures with the MMOs and during consultations with the vessel Captain and the Party Manager on board.

• At the end of each day the Lead MMO will debrief the other MMOs on board the vessel and discuss any problems or difficulties that may have arisen. The Lead MMO will raise problems associated with the operation of the vessel with the Captain and the Party Manager.

• On-shift Lead MMO on the seismic vessel will have direct communication access to the Central Commander via radio in addition to cellular mobile/SAT phones.

• On-shift Lead MMO on the seismic vessel will have a single-point authority for operational shutdown of the source array.

### 6.4 MMO TEAM

• Constant communication among the MMOs, and among the MMOs and vessel crewmembers, is of the utmost importance to ensure that MMOs work together to effectively implement the monitoring and mitigation program.

• Any apparent violations or adaptations of the mitigation measures should be brought to the attention of the captain / the operation manager and the Central Commander.

• Communications between MMOs on other vessels is essential to report any unusual sightings or logistical problems. When possible, communications will be conducted by VHF radio. A satellite phone link may be available. The vessel operator may have a computer network established such that digital copies of the daily report can be sent among vessels. MMOs will have access to a satellite telephone as well.

• When two MMOs are working as a team, communication must be maintained to clarify which animals have been counted and the path they are traveling. This is important as to avoid double-counts of a whale (by the same or different MMOs) as much as possible.
7 REPORTING PROCEDURES

7.1 DAILY LOG

- The Lead MMO will keep a daily log of each day’s activities in a notebook to be kept in the field box in their cabin, including general weather patterns and the daily vessel activities. The entries need not be long stories, but rather comments on the operations or key events of the day - particularly as they might relate to MMO activity or marine mammals.
- MMOs should complete all of their data sheet forms (Annex A) immediately following each MM sighting or every 30 minutes period during watch and review their data sheets at the end of each shift.
- MMOs should check their own work at the end of each watch to ensure that it is accurate and that written sequences make sense. In addition, MMOs should make sure all columns are filled in.
- Trainee MMOs will have their data sheets reviewed and will be debriefed by the Lead MMO at the end of each shift.

7.2 ELECTRONIC DATABASE

- MMOs must use the Microsoft access SEIC database program to record and collate data from the written record sheets, after each shift or at the end of the day. The data entry program is written in Microsoft Access so MMOs will be able to produce the daily reports automatically (assuming data are entered during the course of each day during MMOs off-shift time) and edit the electronic records more easily.
- In the database program there will be prompts to enable the MMO to enter correct data, in addition to out-of-range error checking.
- In other surveys it has been found that when two MMOs are present on the vessel it is often best if they combine efforts to enter data during periods of vessel inactivity (such as standing by during a storm).
- The database Program must be saved every day. File name should include the following features: MMO name_vessel_day,month,year. The Program is able to export required data volume for further forwarding to SEIC via e-mail each week.
- When working with the database, it is important to use the rule "one vessel - one base" - that is, if observers work on several vessels a new, separate database is set up for each vessel.

7.3 DATA QUALITY CONTROL AUDITING

- After filling out a single datasheet in its entirety the MMO will check entries prior to signing off duty. Common errors to check for are missing or miscoded latitude and longitude notation, missing coding of the presence (if any) of a second MMO on duty, and of course weather and visibility variables.
- If, at the end of a watch, the MMO discovers that he or she has omitted recording data for one of these variables, make a note of this in the “comments” column. All changes to a data sheet must be initialled by the MMO. MMOs should never make a guess and enter data unless they are sure they are correct. Missing data is always preferable to incorrect data.
- If an MMO notes a mistake by an MMO on another shift, it must be brought to their attention as soon as possible in order that they can correct the record. Any corrections made to the data sheets must be initialled by the MMO.
• The data from the electronic database program will be computer-verified as soon as possible after arrival at the office of the HSE Marine Mammal Specialist, with the objective that the data will be error-free and ready for analysis at the end of the field season.

• The Lead MMO on each vessel is responsible for ensuring the integrity of the data set collected. At the end of each day, the Lead MMO will debrief the other MMOs on board the vessel and discuss any problems or difficulties that may have arisen.

• The Lead observer will run weekly distance estimation ranging scenarios with the MMO team. This shall be undertaken to verify the range distance accuracy and quality of collected data.

• Issues associated with the operation of the vessel will be raised with the Party Manager (Sakhalin Energy representative or captain) by the Lead MMO.

• The Lead MMO will submit a daily report according to the template of Annex B, by e-mail to the separate mailbox. File name should include the following features: `year.month.day_MMOdailyReport_Vessel`. Electronic database program, allows automatic generation of a daily report. (see Guidelines on the use of Data base.docx)

• Daily report message subject the same as the file name to the report: `2013.06.16_MMO-DailyReport_PolarBaikal`.

• Every Monday the Lead MMO will submit the part of database, saved by database Program within the space of week, to the separate mailbox. The file name must contain the following information:

  • Date of start observation-date of end of the observation (year, month,day)_MMOweeklyReport_Name of vessel. For example:

    • `2013.06.16-06.21_MMOweeklyReport_Polar_Baikal`.

• The Lead MMO will e-mail a daily screenshot of the movement of the vessel tracks in the corridors to the designated SEIC e-mail address (see Guidelines on the use of program files MapSource.docx).

• The Lead MMO will e-mail weekly the vessel GPS tracks through the corridors to the designated SEIC e-mail address (see Guidelines on the use of program files MapSource.docx). GPS tracks are provided to the company in two formats: dxf, and Garmin data base - gdb

• More comprehensive reports will be prepared after the end of the fieldwork, in a detailed survey closeout report (Annex F). Electronic database program allows automatic generation of a main part of closeout report (see Guidelines on the use of Data base.docx). Sakhalin Energy will use those reports to assess the distribution, numbers, behaviour and impacts, if any, on marine mammals in near shore waters along Sakhalin Island

• At the end of the project the Lead MMO will send to the SEIC office a file with the data of the field observation program - MMO_BOAT_OBS_DATA.mdb, which is in the folder with the database installed and contains all the information entered into it from the moment of creation

Mailbox address: SEIC-MMO-Field-Reports@Sakhalinenergy.ru
## 7.4 DATA BACKUP AND STORAGE

In addition to the original datasheets used to record data, MMOs will be required to take measures to ensure that these data are not lost. Several established methods are listed here and must be followed by every MMO.

- After filling out a single datasheet in its entirety the MMO will check his or her entries prior to going off duty (see also quality control).
- The original datasheets will be placed in waterproof bags as a further precaution against loss or damage.
- MMO returning to base after exchanging should hand-carry originals and copies of the forms, and should not carry them within their luggage during a flight.
- If computers are used, the computer database will be backed up in three places. One copy will be placed on a clearly labelled flash disk.
- Two copies will be written into two folders.
- In the unlikely event of an emergency evacuation of the vessel, at least one copy of the data sheets and disk should be retrieved and taken off the vessel if this can be done safely.

## 7.5 PHOTOGRAPHY

Digital photographs should be taken of all incidents, if possible, and may also be used to confirm the identity of unknown marine mammals. Photos are an important part of the identification process and can also aid in determining the sex, age, unique markings, and condition of animals taken. **Please keep in mind that photographs may only be taken if this will not negatively influence the actual observations.**

- A Photo Form (Annex E) should be used to record information about what photos were taken during the course of observations. The Photo Form should be completed for each digital image taken.
- Digital photographs of incidents taken will be sent to the SEIC MMO mailbox or stored on flash disk until the first occasion to send via email presents itself.
- If digital images are taken, it is tempting to delete images believed to be irrelevant, and thus save storage space. Images should only be deleted if they are clearly of no use - no whale in the image or completely out of focus. If in doubt, save the image file.
8 PROJECT MANAGEMENT

In regard to any project related concerns, please contact:

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Mobile +7 914 760 0191  
E-mail: Dorrian.Environmental@gmail.com
ANNEX A: MARINE MAMMAL RECORDING FORMS & CODES
<table>
<thead>
<tr>
<th>Vessel activity</th>
<th>Observer</th>
<th>Vessel position</th>
<th>Time</th>
<th>Weather condition</th>
<th>Marine mammals</th>
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</thead>
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<tr>
<th>Observer</th>
<th>Vessel position</th>
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<th>Weather condition</th>
<th>Marine mammals</th>
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## Summary of Data Codes

### Direction FROM
- 1-12: in clock face coordinates
- 99: Unknown

### Direction TO
- 1-12: in clock face coordinates
- 88: Not travelling or "milling"
- 99: Unknown

### Vessel activity
- **SEIS**: Seismic surveys
- **PIPE**: Construction activities related to offshore pipeline installation
- **HLO**: Construction activities related to the heavy load operations at the beach landing facility
- **PLAT**: Platform related activities or surveys
- **ENG**: Engineering surveys
- **SURV**: Other surveys
- **ICE**: Ice scour surveys
- **TRAN**: Transit
- **ANC**: Anchor
- **DRT**: Drift

### Sighting cue
- **BL**: Blow
- **HE**: Head
- **BO**: Body
- **FL**: Fluke
- **FP**: Flipper
- **FI**: Fin
- **SP**: Splash
- **SI**: Sign, Wake or Ripples

### Estimation distance
- 0-14: Number of reticles
- E: Estimate by eye

### With above record?
- Y: Yes

### Pace of movement
- **SE**: Sedate
- **MO**: Moderate
- **VI**: Vigorous
### Sea State

<table>
<thead>
<tr>
<th>Beaufort Scale</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>Sea like a mirror</td>
</tr>
<tr>
<td>1</td>
<td>Ripples with the appearance of scales are formed, but without foam crests.</td>
</tr>
<tr>
<td>2</td>
<td>Small waves, short but more pronounced. Crests have a glazy appearance and don't break.</td>
</tr>
<tr>
<td>3</td>
<td>Large waves. Crests begin to break. Perhaps scattered white caps.</td>
</tr>
<tr>
<td>4</td>
<td>Small waves, becoming longer. Fairly frequent white caps.</td>
</tr>
<tr>
<td>5</td>
<td>Moderate waves, taking a pronounced long form. Many white caps. Chance of spray.</td>
</tr>
<tr>
<td>6</td>
<td>Large waves forming; white foam crests more extensive everywhere. Probably spray.</td>
</tr>
</tbody>
</table>

### Marine Mammal Species

<table>
<thead>
<tr>
<th>Species</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray whale</td>
<td>GW</td>
</tr>
<tr>
<td>Fin whale</td>
<td>FW</td>
</tr>
<tr>
<td>Minke whale</td>
<td>MW</td>
</tr>
<tr>
<td>Bowhead whale</td>
<td>BW</td>
</tr>
<tr>
<td>North Pacific right whale</td>
<td>RW</td>
</tr>
<tr>
<td>Unidentified baleen whale</td>
<td>UB</td>
</tr>
<tr>
<td>Killer whale</td>
<td>KW</td>
</tr>
<tr>
<td>Harbor porpoise</td>
<td>HP</td>
</tr>
<tr>
<td>Dalls's porpoise</td>
<td>DP</td>
</tr>
<tr>
<td>White whale</td>
<td>WW</td>
</tr>
<tr>
<td>Sperm whale</td>
<td>SPW</td>
</tr>
<tr>
<td>Short-finned pilot whale</td>
<td>SF PW</td>
</tr>
<tr>
<td>Baird's beaked whale</td>
<td>BBW</td>
</tr>
<tr>
<td>Cuver's beaked whale</td>
<td>CBW</td>
</tr>
<tr>
<td>Common dolphin</td>
<td>SBCD</td>
</tr>
<tr>
<td>Bottlenose dolphin</td>
<td>BD</td>
</tr>
<tr>
<td>Pacific white-sided dolphin</td>
<td>PWSD</td>
</tr>
<tr>
<td>Northern right whale dolphin</td>
<td>NRWD</td>
</tr>
<tr>
<td>Unidentified odontocete</td>
<td>UO</td>
</tr>
<tr>
<td>Unidentified whale</td>
<td>UW</td>
</tr>
<tr>
<td>Ringed seal</td>
<td>RS</td>
</tr>
<tr>
<td>Bearded seal</td>
<td>BS</td>
</tr>
<tr>
<td>Ribbon seal</td>
<td>IS</td>
</tr>
<tr>
<td>Spotted seal</td>
<td>SS</td>
</tr>
<tr>
<td>Stellar sea lion</td>
<td>SL</td>
</tr>
<tr>
<td>Northern fur seal</td>
<td>NF</td>
</tr>
<tr>
<td>Unidentified seal</td>
<td>US</td>
</tr>
<tr>
<td>Unidentified Marine Mammal</td>
<td>UMM</td>
</tr>
</tbody>
</table>

### Activity MM

<table>
<thead>
<tr>
<th>Activity</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Dive</td>
<td>FD</td>
</tr>
<tr>
<td>Brood</td>
<td>BR</td>
</tr>
<tr>
<td>Thrash</td>
<td>TH</td>
</tr>
<tr>
<td>Feed</td>
<td>FE</td>
</tr>
<tr>
<td>Front Dive</td>
<td>FD</td>
</tr>
<tr>
<td>Breach</td>
<td>BR</td>
</tr>
<tr>
<td>Feed</td>
<td>FE</td>
</tr>
<tr>
<td>Fluking</td>
<td>FL</td>
</tr>
<tr>
<td>Thrash</td>
<td>TH</td>
</tr>
<tr>
<td>Spy Hop</td>
<td>SH</td>
</tr>
<tr>
<td>Look</td>
<td>LO</td>
</tr>
<tr>
<td>Feed</td>
<td>FE</td>
</tr>
<tr>
<td>Brood</td>
<td>BR</td>
</tr>
<tr>
<td>Swim</td>
<td>SW</td>
</tr>
<tr>
<td>Sink</td>
<td>SI</td>
</tr>
<tr>
<td>Thrash</td>
<td>TH</td>
</tr>
<tr>
<td>Rest</td>
<td>RE</td>
</tr>
<tr>
<td>Other (Describe)</td>
<td>OT</td>
</tr>
<tr>
<td>None (sign only seen by MMO)</td>
<td>NO</td>
</tr>
</tbody>
</table>

### Visibility

<table>
<thead>
<tr>
<th>Number</th>
<th>Estimation of visibility, km</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001-10</td>
<td>99</td>
</tr>
</tbody>
</table>

### Light or Dark

<table>
<thead>
<tr>
<th>Light or Dark</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>L</td>
</tr>
<tr>
<td>Dark</td>
<td>D</td>
</tr>
</tbody>
</table>

### Glare Position

<table>
<thead>
<tr>
<th>Sector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-12 in clock face coordinates</td>
<td></td>
</tr>
<tr>
<td>12-3 o'clock</td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>(vessel turning)</td>
</tr>
</tbody>
</table>

### Movement

<table>
<thead>
<tr>
<th>Movement</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swim Toward</td>
<td>ST</td>
</tr>
<tr>
<td>Swim Away</td>
<td>SA</td>
</tr>
<tr>
<td>Swim Parallel</td>
<td>SP</td>
</tr>
<tr>
<td>Swim Parallel</td>
<td>SP</td>
</tr>
<tr>
<td>Mill</td>
<td>MI</td>
</tr>
<tr>
<td>No movement</td>
<td>NO</td>
</tr>
<tr>
<td>Unknown</td>
<td>UN</td>
</tr>
</tbody>
</table>

---

**Summary of Data Codes**

- Marine Mammal Observers Program 2018
- WGWAP-19/7 (corrigendum)
- 14-16 November 2018
- PUBLIC
ANNEX B: MMO DAILY REPORT TEMPLATE

TEMPLATE MMO DAILY REPORT (ОБРАЗЕЦ ЕЖЕДНЕВНОГО ОТЧЕТА)

Name of the vessel (название судна):
Name of the observer (фамилия, имя, отчество наблюдателя):
Date: day, month, year (дата: число, месяц, год):
Area (район работ):
Platforms (платформы):

1. Marine mammals (recorded marine mammals)

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of animals</th>
<th>Time</th>
<th>Vessel speed</th>
<th>Distance to MM, m</th>
<th>Movement with respect to vessel</th>
<th>Behavior</th>
<th>from</th>
<th>to</th>
<th>Dangerous distance</th>
<th>Measure s taken</th>
<th>Explanation</th>
<th>Description of MM sighting</th>
</tr>
</thead>
</table>

- Leaving the navigation, construction, and crew transfer corridors.

<table>
<thead>
<tr>
<th>Time of leaving the corridor</th>
<th>Time of returning into the corridor</th>
<th>Time of being outside the corridor</th>
<th>Reason</th>
<th>Full name of the person who sanctioned this</th>
</tr>
</thead>
</table>

3. Cases of exceeding the speed limit.

4. Duration of observation: (hh:mm)
Environmental Monitoring Data

<table>
<thead>
<tr>
<th>Controlled parameters</th>
<th>Measurement</th>
<th>Parameters</th>
<th>Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic environment</td>
<td>Visual control of the water surface</td>
<td>Presence of oil slicks, patches of increased turbidity, foam, floating waste</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Ornitofauna</td>
<td>Visual control</td>
<td>Unusual behaviour</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Ichthyofauna</td>
<td>Visual control</td>
<td>Unusual behaviour (frequent jumping out of the water, long-term presence near surface of the water, etc.),</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

Example of a graphic image of vessel track of daily report (received through “Map Source” software)
ANNEX C: NAVIGATION CORRIDORS
ANNEX D: MARINE MAMMAL MORTALITY-INJURY REPORT

EXAMINER

DATE OF INITIAL OBSERVATION: Year: _____ Month: _____ Day: _____

Name: ______________________________________________________
Affiliation: ______________________________________________________
Address: ______________________________________________________
Phone: ______________________________________________________

SPECIES AND LOCATIONS DETAILS

Common Name: ______________________________________________________
Genus: ______________________________________________________
Species: ______________________________________________________
Site description: ______________________________________________________

GPS Co-ordinates: ______________________________________________________

Vessel: ______________________________________________________
Sighting conditions: ______________________________________________________
Vessel speed: ______________________________________________________
Vessel activity: ______________________________________________________

Distance to Marine Mammal at first sighting: _________________________________

Floating? YES NO
Stranded? YES NO

Body Condition Code:

ANNEX E: MARINE MAMMAL PHOTO FORM

<table>
<thead>
<tr>
<th>Observer, Vessel</th>
<th>Folder</th>
<th>Quality Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1=Exc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2=Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3=Fair</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4=Poor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Image #</th>
<th>Date</th>
<th>Time</th>
<th>Species/Subject</th>
<th>Description</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
</tbody>
</table>
ANNEX F: MMO CLOSE OUT REPORT TEMPLATE

Title  Marine mammal observations from –Vessel name–

Period  Period of survey

**MMOs qualifications**

<table>
<thead>
<tr>
<th>№</th>
<th>Name</th>
<th>Education</th>
<th>Scientific degree</th>
<th>MMO work experience, seasons</th>
<th>Year of last works MMO</th>
<th>Last training</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. **Offshore activity**

**Short description of vessel activity (can be copied from the weekly report)**

<table>
<thead>
<tr>
<th>The site and type of work</th>
<th>The vessel</th>
<th>The names of the MMO</th>
<th>Date of start</th>
<th>Date of completion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. **Materials and protocols**

What materials were used (binoculars) and what was the protocol of observations (location on the ship, hours of observation, etc.)
Number of hours of observations.

<table>
<thead>
<tr>
<th>Site</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piltun</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunskoye</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aniva</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Weather conditions during survey period. Give number of good days, number of days with poor visibility, etc.

Favourable weather conditions have been accepted (a) the visibility ≥ 1 km, (b) sea state ≤ 3 on the Beaufort scale.

Observation of marine mammals in different weather conditions.

<table>
<thead>
<tr>
<th>Weather conditions</th>
<th>number of records</th>
<th>% Of the total number of records</th>
<th>The number of observations MM</th>
<th>% Of the records with the observation of marine mammals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favorable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unfavorable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Visibility during observations of marine mammals

<table>
<thead>
<tr>
<th>Visibility</th>
<th>number of records</th>
<th>% Of the total number of records</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 1 KM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 KM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bcero</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Results of the observations

Give total hours of observation and total number of sightings for each species. Make more detailed table with number of sightings and dates of sightings for each species.

The total number of observations of marine mammals and the total number of mammals,
<table>
<thead>
<tr>
<th>Common name</th>
<th>Latin name</th>
<th>Code</th>
<th>Number of observations</th>
<th>Number of animals sighted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Gray whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Short summary of the sightings and some characteristics observed during the survey period

Observations of Gray whales from vessels during offshore operations, "Sakhalin Energy"

<table>
<thead>
<tr>
<th>№</th>
<th>Number of animals</th>
<th>Data</th>
<th>Time</th>
<th>Distance (m)</th>
<th>Behaviour</th>
<th>Coordinates</th>
<th>Measures?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Latitude</td>
<td>Longitude</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Minke whale*

*Killer whale, Etc.*

The number of observations and the direction of the cetaceans.

<table>
<thead>
<tr>
<th>Data</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minke whale</td>
</tr>
<tr>
<td>Number of observations</td>
<td></td>
</tr>
<tr>
<td>The number of observations at a distance of ≤ 500 m</td>
<td></td>
</tr>
<tr>
<td>Visibility ≤ 500 m</td>
<td></td>
</tr>
</tbody>
</table>

Movement
<table>
<thead>
<tr>
<th>Action</th>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>Cause</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swim Away</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swim Parallel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swim Toward</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mill</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No movement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. **Mitigation measures taken**
   Have there been mitigation measures implemented during this period. If yes, what measures and why. Was it effective?

5. **Outs of corridors**
   Tabular. Description: The date, time, area, causes, resolution (decision)

6. **Overspeed**
   Tabular. Description: The date, time, area, causes, resolution (decision)

7. **Conclusions**
### ANNEX G: MMO/CMS SCHEDULE

N.B Provisional and may be subject to changes to meet operational requirements

<table>
<thead>
<tr>
<th>Hour</th>
<th>Lead MMO</th>
<th>MMO 1</th>
<th>MMO 2</th>
<th>MMO 3</th>
<th>CMS Technologist</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00 - 01:00</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>ON DUTY</td>
</tr>
<tr>
<td>01:00 - 02:00</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>ON DUTY</td>
</tr>
<tr>
<td>02:00 - 03:00</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>ON DUTY</td>
</tr>
<tr>
<td>03:00 - 04:00</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>ON DUTY</td>
</tr>
<tr>
<td>04:00 - 05:00</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>ON DUTY</td>
</tr>
<tr>
<td>05:00 - 06:00</td>
<td>ON DUTY</td>
<td>ON DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
</tr>
<tr>
<td>06:00 - 07:00</td>
<td>ON DUTY</td>
<td>ON DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
</tr>
<tr>
<td>07:00 - 08:00</td>
<td>OFF DUTY</td>
<td>OFF DUTY</td>
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<td>21:00 - 22:00</td>
<td>CMS*</td>
<td>CMS*</td>
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<td>ON DUTY/BREAK*</td>
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<tr>
<td>22:00 - 23:00</td>
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<td>CMS*</td>
<td>CMS*</td>
<td>ON DUTY/BREAK*</td>
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<td>23:00 - 24:00</td>
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*CMS technologist will train MMOs in alternating hour-long sessions to operate the CMS. This will accommodate for sufficient breaks.*
### ANNEX H: EXCLUSION ZONE FOR PROTECTED SPECIES DURING SEISMIC SURVEY

<table>
<thead>
<tr>
<th>Status IUCN</th>
<th>Status Red Book RF</th>
<th>Species</th>
<th>Distance</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Whales/Китообразные</td>
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<tr>
<td>Critically endangered</td>
<td>1st Category</td>
<td>Gray Whale</td>
<td></td>
</tr>
<tr>
<td>Endangered</td>
<td>1st Category</td>
<td>Bowhead Whale</td>
<td></td>
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<tr>
<td>Endangered</td>
<td>1st Category</td>
<td>Northern Right whale</td>
<td>1000m</td>
</tr>
<tr>
<td>Endangered</td>
<td>2nd Category</td>
<td>Fin Whale</td>
<td></td>
</tr>
<tr>
<td>Vulnerable</td>
<td>3rd Category</td>
<td>Curvier's Beaked whale</td>
<td></td>
</tr>
<tr>
<td>Various</td>
<td>No</td>
<td>Other whales and dolphins</td>
<td>500m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seals/Ластоногие</td>
<td></td>
</tr>
<tr>
<td>Endangered</td>
<td>2nd Category</td>
<td>Sea Lion</td>
<td>350m</td>
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</table>
ANNEX I: INCIDENTS WITH MARINE MAMMALS

In this Annex, emergency response procedures are summarized. Detailed description of emergency response procedures is fully presented in the document Marine Mammals Protection Plan.

- Upon discovery of a dead, sick, or injured marine mammal, the MMO should immediately notify the Central Commander, Captain of the vessel, and the onboard representative of Sakhalin Energy.
- The MMO is prohibited to undertake any unassisted actions with the marine mammal found.
- The observer is prohibited to act arbitrary with regard to direct contact with a marine mammal.
- The observer should under no circumstances expose themselves or other people to risk associated with approaching an injured or dead marine mammal. Direct contact with a marine mammal is possible only after consultation with the Emergency Coordination Team (ECT).

Any actions related to catching, treatment, transportation, stabilisation of condition, or release of the injured animal shall be performed only with the permission of the relevant state authority, issued to Sakhalin Energy.

In the event of (1) collision with a marine mammal, or (2) a marine mammal entanglement in the equipment used during SEIC operations, or (3) detection or receipt of information on a stranded marine mammal, the MMO shall follow the protocol below.

COLLISION WITH MARINE MAMMALS

In the event of a vessel collision with a marine mammal, the MMO onboard is obliged to observe the following procedure:

1. Recommend the captain and/or Sakhalin Energy onboard representative to suspend all operations onboard the vessel. The captain of the vessel has the right to cancel this decision solely in the interests of the vessel safety.

2. Determine how many animals have been injured and identify the animal species.

3. Make a preliminary assessment of the severity of the incident (including the attempt to find out whether the marine animal has entangled in materials not related to the project works, for example, in fishing gear).

4. Immediately inform the captain of the vessel and Lead MMO onboard

5. The lead MMO immediately informs the Sakhalin Energy onboard representative, the onshore central commander and SEIC MMO programme coordinator.

6. Sakhalin Energy onboard representative / captain of the vessel / the central commander / the SEIC MMO programme coordinator will contact the Emergency Coordinator in Yuzhno-Sakhalinsk. The emergency coordination team will coordinate the notification of relevant agencies.
7. Ensure that other MMOs present onboard continue monitoring other whales in the survey area.

8. Continue observing the affected animal to assess its condition and, if possible, take photos or video records.

9. The observer shall provide the information to the Coordination Team but shall not be entitled to take unilateral actions.

10. **All external contacts shall be made through the Coordination Team. MMO’s work consists only in providing the information to its representatives.**

11. After the incident, hold a meeting with other MMOs and the captain of the vessel to identify the causes of the collision and to develop measures for collisions prevention.


13. Send all necessary documents to the Coordination Team immediately upon completion, within 24 hours after the incident.

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**MARINE MAMMAL ENTANGLEMENT**

In the case of marine mammal entanglement, the MMO is obliged to observe the following procedure:

1. Determine how many animals have become entangled and attempt to identify the species.

2. Try to ascertain whether the marine mammal is entangled in materials not related to the project operations, for example, in fishing nets. Assess the possibility and safety of the animal to disentangle itself.

3. Immediately inform the captain of the vessel and Lead MMO onboard/Onshore Command Centre, and the SEIC MMO programme coordinator.

4. The lead MMO immediately informs the Sakhalin Energy onboard representative, and the onshore central commander and the SEIC MMO programme coordinator.

5. Sakhalin Energy onboard representative / captain of the vessel / the central commander/ SEIC MMO programme coordinator will contact the Emergency Coordinator in Yuzhno-Sakhalinsk. The emergency coordination team will coordinate the notification of relevant agencies.

6. Coordinate all actions in accordance with the requirements of the Coordination Team. It is forbidden to take any action before receiving information from the CT.
MARINE MAMMAL STRANDING

In the event of a marine mammal stranding event, take the following steps:

1. If possible determine how many animals have stranded and attempt to identify the species.
2. Immediately inform the captain of the vessel and lead MMO onboard/onshore central Commander and SEIC MMO programme coordinator.
3. The lead MMO immediately informs the Sakhalin Energy onboard representative, and the onshore command center and SEIC MMO programme coordinator.
4. Sakhalin Energy onboard representative / captain of the vessel / the central commander / SEIC MMO programme coordinator will contact the Emergency Coordinator in Yuzhno-Sakhalinsk. The emergency coordination team will coordinate the notification of relevant agencies.
5. Coordinate all actions with the coordination team. It is forbidden to take any action before receiving information from the CT.

MMOs are not permitted to leave the operations area for examining the stranded animals without instructions from the EMERCOM. The vessels involved in the project should be attended by an experienced MMO at all times.

OIL SPILL RESPONSE

In the event of an oil spill detection, the MMO shall immediately notify the captain of the vessel/work supervisor.

In case of an oil spill is observed to have affected marine mammals, the MMOs shall coordinate their actions with the Oil Spill Response Headquarters. All decisions regarding the oil spills, including coordination and reporting, shall be made through contacting with the Oil Spill Response Headquarters.

If necessary, the observer shall be placed under orders of the ECT.

NON-PROJECT RELATED INJURIES AND MORTALITY OF MARINE MAMMALS

Marine mammals with injuries not related to production activities may be encountered during operations. Such injuries can be caused by other types of human activity (fishing) or have a natural origin (injuries caused by predators, or disease).

Dead animals may also be encountered. The MMO shall report any such cases to the Sakhalin Energy onboard representative, Central Commander / SEIC MMO programme coordinator and complete all necessary documents (ANNEX D) in accordance with the procedure set for the project-related incidents. If the animal is large or is classified as a protected species, the representative of Sakhalin Energy / captain of the vessel shall immediately contact the Emergency Coordinator in Yuzhno-Sakhalinsk for further coordination.
ANNEX D

WGWAP ADVISORY GROUP COMMUNICATIONS PROTOCOL
FOR 2018 SEISMIC SURVEY

Version Updated 01 June 2018

Note that this includes requests for advice that may lead to action (items 1 and 2) and items simply concerning
provision of information (items 3 and 4)

(1) ‘Advisory Group’
An Advisory Group of WGWAP Members has been established, as for the 2010 and 2015 surveys, comprising Gregory
Donovan, Randall Reeves, Douglas Nowacek, Brandon Southall, Alexander Vedenev, and David Weller. The primary
purpose of the Group is to be available to provide advice to the Company, if for example circumstances lead the
Company to consider modifying its MMP. The Independent Observer (IO), Grigory Tsidulko, may also seek formal
advice from the Advisory Group should he/she so wish following a similar process to that detailed below for the
Company.

It is recognised that if formal advice is sought on any matters, it is likely that a quick response will be required; it is also
recognised that the availability of individual members of the Advisory Group will vary throughout the seismic survey
period. Hence, it has been decided that two members is considered ‘quorate’ and the following approach should be
followed if the Company decides to seek advice:

(1) an email will be sent by the Central Commander (Dorrian) to all members of the Advisory Group – this
will be cc’d to Blonk, Lock, Carbone, Duramy and Berzina, as well as the IO;

(2) the Advisory Group members will respond immediately to indicate their availability;

(3a) assuming that at least one or both of Reeves and Donovan are able to respond, he/they will arrange for an
‘Advisory Group’ view to be sent to the Company in writing within 1-2 days – this will comprise the views of
those who indicated that they are able to respond within the timeframe and may be the result of a conference
call or written exchange of comments;

(3b) in the unlikely event that neither Reeves nor Donovan is able to respond, then the Advisory Group
members who are available will arrange for a single response to be sent within the 1-2 day timeframe.

(2) Monthly Updates

SEIC (Blonk/Dorrian) will provide monthly e-mail updates to the entire Advisory Group (cc IUCN/Jerome-Giulia)
concerning progress on survey planning etc. If necessary (as judged by any Advisory Group member), a teleconference
will be arranged to discuss, otherwise the e-mail information transfer/exchange will be adequate. Importantly, the
Advisory Group will be notified immediately of any decision by SEIC to diverge or vary from the specifications in the
MMP as agreed by WGWAP, and such notification should take place right away without waiting for the scheduled
monthly update.

This monthly update routine will begin in January 2018 and continue through May 2018, after which the ‘as needed’
approach indicated elsewhere in this ToR will prevail.

(3) Important issue(s)\(^1\) identified by the IO regarding MMP implementation or ability to perform his duties

The IO will immediately inform the Central Commander (Neil Dorrian), Blonk and Lock via available means of
communication (preferably in writing, however in cases this is not possible at the time, this will always be followed up
in writing as soon as feasible thereafter), cc’d to Carbone, Berzina, Duramy, Reeves and Donovan. The Company will
respond in writing within 24 hours and cc this response to the IO, Carbone, Berzina, Duramy, Reeves and Donovan; if
they deem it necessary, IUCN may also organise a conference call.

(4) Weekly summary report from the IO

The weekly report shall be sent to IUCN (Carbone) and cc’d to Lock, Blonk, Central Commander, Donaghy, Berzina,
Duramy, Donovan, Reeves, Hancox and Mate, as well as to the full Advisory Group.

(5) Items for information only from the Company and/or the IO to IUCN and the Panel Co-chairs

Items that are for information only (e.g., events that required fast/immediate decisions in the field without an
opportunity for formal consultation, other important-to-know observations, events or decisions) that IUCN and the
Panel Co-chairs should be aware of, but for which formal advice is not required/possible, shall be sent to IUCN
(Carbone) and cc to Blonk, Lock, Berzina, Duramy, Donovan and Reeves. This will be shared with the full Advisory
Group at the discretion of IUCN and the WGWAP Co-Chairs.

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\(^1\) Small matters that can be fixed promptly will be dealt with in person by the IO with the Central Commander