

# Ferguson Comments on SAExploration's Revised 4MP for the Proposed Colville 3D Seismic Survey Operations in 2014

27 May 2014

1. SAExploration did not revise any of their proposed monitoring methods for vessel-based PSOs; therefore, all concerns that the peer review panel noted in their final report still exist. The most important point relates to the panel's response to Question II for Objective 1 of the visual vessel-based monitoring, which is that the PSOs will not be able to monitor the entire 180 dB zone and, therefore, cannot determine whether Level A takes occur.
2. The SSV section states that the buoys will be "allowed to drift with the tidal flow into the vicinity of the active source." Will the SSV exercise be limited to a time period when winds and sea state are below certain maximum values?
3. The data analysis section for PAM states that "PAM recordings will be processed at the end of the season using marine mammal detection and classification software capable of detecting vocalizations from bowhead, walrus, beluga, ringed seals, bearded seals, ribbon seals, fin whale, humpbacks, killer whales, gray whales, and minke whales." NMFS should require SAExploration provide proof that the software is capable of meeting these claims. To my knowledge, automatic detectors do not exist for all of these species.
4. In the section on spotted seal haulout monitoring, SAE states, "If sites of suspected high use are found, SAE will contact NMFS and the North Slope Borough Department of Wildlife to identify mitigation measures to minimizing impacts to these sites." NMFS should require that SAE consult with NMFS and NSB-DWM prior to issuing the IHA so that protocols are in place before operations occur. This will ensure that the relevant personnel are available and have sufficient time to help develop mitigation measures.

**Open Water Peer Review Panel  
Monitoring Plan Recommendations Report  
for  
SAExploration's Colville 3D Seismic Survey Operations**

**2 April 2014**

The Open Water Peer Review Panel (hereinafter referred to as the panel) has reviewed SAExploration's marine mammal monitoring plan (4MP) for its proposed 3D seismic survey in the Alaskan Beaufort Sea during the summer of 2014. The activities proposed in SAExploration's application for an Incidental Harassment Authorization (IHA) were similar to those proposed (but not conducted) in 2013. The 2014 panel noted that SAExploration proposed to implement two monitoring methodologies that the 2013 panel recommended, namely, aerial surveys and passive acoustic monitoring. The 2014 panel welcomed these additions to SAExploration's 4MP. The panel answered questions provided by the National Marine Fisheries Service's Office of Protected Resources (OPR) and provided the following recommendations. The panel's answers and recommendations based on the specific questions were developed using the general monitoring requirements outlined in the implementing regulations of the Marine Mammal Protection Act (MMPA) and from guidance provided by OPR (Appendix). Additional points that a revised 4MP should address are also discussed.

### **Summary of Activities**

SAExploration plans to conduct 3D nodal or ocean-bottom node (OBN) seismic surveys in nearshore state and federal waters adjacent to the Colville River delta, in the central Alaskan Beaufort Sea, in the 2014 open water season. The maximum area proposed to be surveyed covers 1,882 km<sup>2</sup> (727 mi<sup>2</sup>). The depth distribution of the study area is as follows: 19% within 0-1.5 m; 14% within 1.5-5 m; 39% within 5-15 m, and 28% greater than 15 m deep. At the time of the 2014 panel meetings, SAExploration could not provide specific information on the timing of their proposed seismic activities, although they mentioned that the operations would likely occur later in the season (i.e., late August through October). Specific information on the timing of the operations is necessary to design an effective 4MP because the presence, density, and behavior of marine mammal species vary spatially and temporally over the course of the open water season within the study area shown in Figure 1-1 of the IHA application. In addition, subsistence hunting activities vary temporally as animal densities and distributions in the area change with the seasons.

The operation will require a total of eight vessels, including two source vessels (source levels 165.7 - 179.0 dB), two node equipment deployment and retrieval vessels (source level 165.7 dB), one mitigation/housing vessel (source level 200.1 dB), one crew transport vessel (source level 191.8 dB), and two bow pickers (source level 171.8 dB). For surveying the deeper waters of the study area, 880 and 1760 cubic inch sleeve airgun arrays will be used; a 440 cubic inch array will be used in the very shallow (<1.5 m deep) waters. The source levels for the seismic arrays are 221.1 dB re 1  $\mu$ Pa rms for the 440 cubic inch array; 226.86 dB re 1  $\mu$ Pa rms for the 880 cubic inch array; and 236.55 dB re 1  $\mu$ Pa for the 1760 cubic inch array. The safety radii for the 440 cubic inch array are estimated to be 126 m to the 190 dB

isopleth and 325 m to the 180 dB isopleth; the 160 dB isopleth for this array is estimated to be 1.33 km (i.e., the harassment radius). The safety and harassment radii for the 880 cubic inch array are estimated to be 167 m to the 190 dB isopleth, 494 m to the 180 dB isopleth, and 1.5 km to the 160 dB isopleth. Corresponding safety radii for the 1760 cubic inch array are 321 m (190 dB) and 842 m (180 dB); the 160 dB isopleth for this array is estimated at approximately 3 km from the source. SAExploration plans to hire an acoustical firm to conduct sound source verification testing of the airgun arrays for the project as soon as the first seismic survey begins, and results will be used to establish new safety (180/190 dB) and harassment (160 dB) zones. An acoustical positioning (pinger) system, comprised of transceivers and transponders, will be used to position and interpolate the location of nodes. The transceiver has a transmission source level of 197 dB re 1  $\mu$ Pa @ 1 m and operates at frequencies between 35 and 55 kilohertz. The transponder produces short pulses of 184 to 187 dB re 1  $\mu$ Pa @ 1 m at frequencies also between 35 and 55 kilohertz. Due to the low acoustical output of the pingers, the associated harassment radius is estimated to be approximately 100 m.

SAExploration provided detailed methods about their proposed visual vessel-based monitoring plan, which included protected species observers (PSOs) stationed aboard the source vessels, with one PSO on duty on each ship during all daylight seismic operations. SAExploration could not provide specific details on the survey designs and protocols for the aerial and passive acoustic monitoring components of their proposed 4MP because the contracting firms responsible for the monitoring projects had not been selected. There was concern among panelists that the lingering uncertainty in the 4MP would prevent the panel from having an opportunity to make recommendations on SAExploration's final 4MP and that the necessary resources (e.g., trained personnel, planning, aircraft, acoustic recording devices) for monitoring might not be available on short notice once operations commenced.

The IHA application should contain an attainable, defensible, and detailed 4MP for the panel to review. Therefore, the panel considered the 2014 application from SAExploration to be incomplete, lacking information needed to adequately review the proposed activity and associated aerial survey and passive acoustic monitoring components of the 4MP. The panel considered the details presented on the proposed visual vessel-based monitoring to be sufficient to answer the questions below set forth by OPR.

## Questions

### **I. Will the applicant's stated objectives effectively further the understanding of the impacts of their activities on marine mammals and otherwise accomplish the goals stated below? If not, how should the objectives be modified to better accomplish the goals below?**

#### A. Visual Vessel-based Monitoring

SAExploration listed the following objectives for their visual vessel-based monitoring program.

1. Ensure that disturbance to marine mammals is minimized and all permit stipulations are followed;
2. Document the effects of the proposed seismic activities on marine mammals; and
3. Collect data on the occurrence and distribution of marine mammals in the proposed area.

The panel thought that all three objectives would effectively further the understanding of the impacts of the SAExploration's proposed activities on marine mammals.

## B. Aerial Surveys

SAExploration listed the following objectives for their aerial survey program.

1. Conduct a before, during, and after survey of pinniped use in the seismic area (in conjunction with boat-based survey);
2. Detect migrating bowhead whales "upstream" of the active seismic area and alert the vessel-based PSOs of the whale's approach (but only after the Cross Island-based bowhead whale hunt is over); and
3. Monitor the spotted seal haul out sites at the Colville River delta.

The panel noted the following.

Objective 1: Collecting data to understand pinniped use in the seismic area before, during, and after seismic activities is a useful objective; however, as explained below, aerial surveys are not an effective means to achieve this.

Objective 2: This objective is limited in its ability to effectively further the understanding of the seismic activities' impacts on bowhead whales because it incorrectly assumes that bowhead whales will be undertaking a unidirectional course of travel through the study area. It will not be effective in determining the impacts of the activities on bowhead whales that approach the area from the west or north, or on whales that may be feeding and relatively stationary in the area.

Objective 3: This objective is useful in furthering the understanding of current use of the Colville River delta by spotted seals as a haulout and the seismic activities' impacts on spotted seals in the study area.

## C. Passive Acoustic Monitoring (PAM)

SAExploration listed one objective for their PAM program: to record seismic noise levels and marine mammal vocalizations before, during, and after the seismic survey. The panel thought this objective would effectively further the understanding of the impacts of the seismic activities on marine mammals.

**II. Can the applicant achieve the stated objectives based on the methods described in the plan? (Note: in the past, applicants have sometimes submitted a strong monitoring plan that would accomplish a good objective that supports NMFS' goals, but the stated objective has been oddly disassociated from the planned work or badly worded. As you answer questions I & II – keep in mind if the objective might just needed to be re-worded to better fit the planned work).**

The panel discussed and commented on each of the methods proposed by SAExploration.

A. Visual Vessel-based Monitoring

Objective 1: The applicant cannot ensure that the disturbance to marine mammals is minimized and all permit stipulations are followed using the methods described in the plan. Based on sightability curves presented for vessel-based PSOs during other seismic operations in the Alaskan Arctic, it is evident that sighting probabilities drop off dramatically within a short distance from vessels. For example, Cate et al. (2014) presented sightability curves (probability of detection as a function of perpendicular distance from the ship) for cetacean and pinniped sightings collected aboard a monitoring vessel associated with a 2D seismic survey in the Chukchi Sea in 2013. Cate et al. (2014) found that, during dual-PSO effort from an observation height of 6.5 m, using unaided eye, Fujinon 7 x 50 reticle binoculars, or 25 x 150 Fujinon “Big-eyes,” the detection probability dropped by 50% within 150 m of the ship.

For comparison, SAExploration estimated the distance to the 160 dB isopleth for the 1760 cubic inch array to be 3 km, and the distances to the 180 dB and 190 dB isopleths to be 321 m and 842 m, respectively. SAExploration states that a single PSO would be on watch at a time on each source vessel, and their observation height (if viewing from the bridge) would be approximately 6 m. Similar to the protocols reported by Cate et al. (2014), the PSOs would have access to 7 x 50 and 16-40 x 80 reticle binoculars. Assuming that the vessel-based PSOs monitoring SAExploration's activities have sighting abilities similar to those reported by Cate et al. (2014), SAExploration's PSOs would not even be able to direct the vessels to power-down or stop activities as an animal approaches or enters the safety zone to avoid a Level A take. Furthermore, PSOs would not be able to effectively count or estimate the number of potential Level A takes that occurred within the safety zones.

Objective 2: Given the limitations to effective observation range of vessel-based PSOs presented above for Objective 1, the panel thought that SAExploration could provide some information to help document the effects of the proposed seismic activities only for animals that surface very close to the source vessels. SAExploration's proposed vessel-based visual monitoring plan cannot document the effects of the proposed seismic activities on marine mammals located farther than a couple hundred meters from the source vessels because the plan lacks far-field monitoring techniques.

Objective 3: SAExploration will be able to obtain occurrence and distribution data only for animals that surface within a couple hundred meters of the source vessels. Therefore, this

objective could only be partially met. Furthermore, the 2013 panel<sup>1</sup> described the limitations to sighting data collected by vessel-based PSOs as follows:

Data collected by vessel-based PSOs are not equivalent to data from rigorous scientific surveys. Vessel-based PSO data should not be considered baseline data on marine mammal distribution, density, movement, or behavior; they should not be considered reliable for estimating marine mammal takes because they likely underestimate the number of animals in the project area; and they do not provide sufficient information to evaluate individual or cumulative impacts of human activities on marine mammals or subsistence activities.

For these data to be even marginally valuable, detailed activity logs and acoustic data with information about the associated industrial sounds would need to be recorded and made publicly available not only for SAExploration's activities but also for any other activities occurring in the area that have the potential to impact marine mammals. In addition, SAExploration's PSOs would need to collect the complete suite of marine mammal sighting data while maintaining constant sighting effort during times when the airguns are on and off.

## B. Aerial Surveys

Objective 1: The panel thinks that SAExploration will not be able to further understanding of pinnipeds' use of the study area by conducting aerial surveys, with the possible exception of spotted seal use of land haulouts. It is nearly impossible to use aerial surveys to make inferences into ice seal density or abundance during the open water season when seals are likely to be in the water because such surveys have extremely high availability bias that cannot be reliably estimated. The ability to identify ice seals to species from aerial surveys is also extremely limited due to the low contrast of their dark heads against the background of dark water. Finally, the residents of Nuiqsut, located near the Colville River delta, have expressed considerable concerns about the frequency of aerial overflights in the area. The cultural impacts of excessive aerial surveys in this region largely outweigh the value of the ice seal data that could be collected using this methodology.

Objective 2: The objective of detecting migrating bowhead whales "upstream" (i.e., to the east) of the active seismic area is unlikely to be achieved because it is based on the inaccurate assumption that all bowhead whales in the vicinity of the proposed activities will be undertaking a unidirectional migration westward across the study area. To detect bowhead whales that could be impacted by SAExploration's activities, it would be necessary to search for animals that may enter the area from the west, north, or east. Furthermore, the panel would need additional details on the survey protocols to evaluate whether they would be able to effectively detect bowhead whales in the vicinity.

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<sup>1</sup> 2013 Expert Panel Review of Monitoring Protocols in Applications for Incidental Harassment Authorizations Related to Oil and Gas Exploration and Development in the Chukchi and Beaufort Seas.

Objective 3: It is unknown whether SAExploration could successfully monitor the spotted seal haulout sites located at the Colville River delta using aerial surveys because the 4MP lacked details about specific survey protocols and survey design.

#### C. Passive Acoustic Monitoring (PAM)

There was insufficient information presented in the 4MP for the panel to evaluate the likely success of the passive acoustic monitoring plan.

### **III. Are there technical modifications to the proposed monitoring techniques and methodologies proposed by the applicant that should be considered to better accomplish the objectives?**

The panel provided the following comments and recommendations.

#### A. Vessel-based Monitoring

SAExploration proposed that a single PSO would be on watch on each vessel “during all ongoing operations and air-gun ramp ups.” The panel recommends that SAExploration require a minimum of two PSOs be on watch throughout all daylight hours, regardless of whether airguns are firing.

The effective sighting distance for two observers is larger than for one observer. For example, in the Joint Monitoring Program’s activities in the Chukchi and Beaufort seas in 2006-2008, Funk et al. (2010) estimated effective strip widths (ESWs) for mysticete whale sightings from vessel-based PSOs during periods when only one PSO was on watch and when two PSOs were on watch. Funk et al. (2010) found that ESWs increased by 15% to nearly 100%, depending on Beaufort Sea State and vessel type, when two PSOs were on watch. The likelihood of missing sightings is understandably higher when a single PSO is responsible for observing the entire activity area, recording data, and communicating with the ship to discuss mitigation activities.

In order to document and determine the effects of seismic activities on marine mammals, it is necessary to document marine mammal occurrence, density, and behavior during times when airguns are not operating. Without information about marine mammals during the “control” period when airguns are inactive, there is no standard against which to compare marine mammal density and behavior when airguns are firing.

#### B. Aerial Surveys

There was insufficient information presented in the 4MP for the panel to determine whether technical modifications should be investigated for their aerial survey monitoring plan.

#### C. Passive Acoustic Monitoring

There was insufficient information presented in the 4MP for the panel to determine whether technical modifications should be investigated for their passive acoustic monitoring plan.

**IV. Are there techniques not proposed by the applicant (i.e., additional monitoring techniques or methodologies) that should be considered for inclusion in the applicant’s monitoring program to better accomplish the objectives?**

Due to the concerns expressed by residents of Nuiqsut about excessive manned aircraft overflights, the panel recommends that SAExploration conduct surveys of the spotted seal coastal haulouts from unmanned aerial systems, which are considerably quieter than manned aircraft.

**V. What is the best way for an applicant to present their data and results (formatting, metrics, graphics, etc.) in the required reports that are to be submitted to NMFS (i.e., 90-day report and comprehensive report)?**

The panel thinks it is important that the required reports are useful summaries and interpretations of the results of the various elements of the monitoring plan, as opposed to merely recitations of the raw results. The reports should represent an initial level of summary or interpretation of the efficacy, measurements, and observations rather than raw data or fully processed analyses. A clear summary timeline and spatial representation (map, with latitude and longitude clearly shown) or summary of operations and important observations should be given. A complete characterization of the acoustic footprint resulting from various activity states should be provided. Any and all mitigation measures (e.g., operational shutdowns if they occur) should be summarized. Additionally, an assessment of the efficacy of the monitoring methods should be provided. Finally, SAExploration should collaborate with other industrial operators in the area to integrate and synthesize monitoring results as much as possible. At a minimum, SAExploration should submit “sightings” data (detected species i.d., latitude, longitude, and group size, if known) from their vessel-based, passive acoustic, and aerial monitoring projects to an online data archive, such as OBIS-SEAMAP, and they should archive and make the complete databases available upon request. This last recommendation will be essential for making progress on assessing cumulative impacts from all activities.

**Additional Considerations**

SAExploration should include the most recent data in their IHA application, which spanned the summer and fall time periods (July through October). Specifically, the 2012 and 2013 data from the Aerial Surveys of Arctic Marine Mammals (ASAMM) project are relevant to understanding the summer (July and August) distribution of marine mammals, particularly bowhead whales, in the western Beaufort Sea. The ASAMM historical database for survey years 1979-2012 is publicly available in its entirety online (<http://www.afsc.noaa.gov/nmml/cetacean/bwasp/index.php>). Daily reports for every ASAMM flight are posted to the same website within 24-72 hours of the end of each flight; archives for the 2013 daily reports are available at [http://www.afsc.noaa.gov/nmml/cetacean/bwasp/flights\\_2013.php](http://www.afsc.noaa.gov/nmml/cetacean/bwasp/flights_2013.php).

## Literature Cited

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- Funk., D.W., D.S. Ireland, R. Rodrigues, and W.R. Koski (eds.). 2010. Joint Monitoring Program in the Chukchi and Beaufort seas, open water seasons, 2006–2008. LGL Alaska Report P1050-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., and JASCO Research , Ltd., for Shell Offshore, Inc. and Other Industry Contributors, and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 506 p. plus Appendices.

## Appendix

### Monitoring Plan Requirements

The MMPA implementing regulations generally indicate that each Incidental Harassment Authorization (IHA) applicant's monitoring program should be designed to accomplish one or more of the following: document the effects of the activity (including acoustic) on marine mammals; document or estimate the actual level of take as a result of the activity (in this case, seismic surveys or exploratory drilling programs); increase the knowledge of the affected species; or increase knowledge of the anticipated impacts on marine mammal populations. As additional specific guidance beyond that provided in the MMPA regulations, NMFS further recommends that monitoring measures prescribed in MMPA authorizations should be designed to *accomplish or contribute to one or more of the following top-level goals*:

(a) An increase in our understanding of the likely occurrence of marine mammal species in the vicinity of the action, i.e., presence, abundance, distribution, and/or density of species.

(b) An increase in our understanding of the nature, scope, or context of the likely exposure of marine mammal species to any of the potential stressor(s) associated with the action (e.g., sound, explosive detonation, or expended materials), through better understanding of one or more of the following: 1) the action itself and its environment (e.g., sound source characterization, propagation, and ambient noise levels); 2) the affected species (e.g., life history or dive patterns); 3) the likely co-occurrence of marine mammal species with the action (in whole or part) associated with specific adverse effects, and/or; 4) the likely biological or behavioral context of exposure to the stressor for the marine mammal (e.g., age class of exposed animals or known pupping, calving or feeding areas).

(c) An increase in our understanding of how individual marine mammals respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level).

(d) An increase in our understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: 1) the long-term fitness and survival of an individual; or 2) the population, species, or stock (e.g., through effects on annual rates of recruitment or survival).

(e) An increase in our understanding of the effectiveness of mitigation and monitoring measures.

(f) A better understanding and record of the manner in which the authorized entity complies with the incidental take authorization and incidental take statement.

(g) An increase in the probability of detecting marine mammals (through improved technology or methodology), both specifically within the exclusion zone (thus allowing for more effective implementation of the mitigation) and in general, to better achieve the above goals.