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BOEM OCS PERMIT L22-015
CHEVRON JACK OBN 2023 SURVEY
PROTECTED SPECIES OBSERVER REPORT

Final

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22 April 2024

rpsgroup.com

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Acronyms and Abbreviations

ADC	Analog Digital Converter
BO	Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico
BOEM	Bureau for Ocean Energy Management
BZ	Buffer Zone
CPA	Closest Point of Approach
DAQ	Data Acquisition Unit
dB	Decibel
dB re 1 µPa (rms)	Decibel related to 1 micropascal (root mean square)
DSLR	Digital Single Lens Reflex
EOW	End of Watch
EPU	Electronic Processing Unit
ESA	Endangered Species Act
EZ	Exclusion Zone
FFT	Engine Noise Fast Fourier Transform
GOM	Gulf of Mexico
GPS	Global Positioning System
HF	High Frequency
Hz	hertz
kHz	Kilohertz
km	Kilometer
km²	Square kilometers
kts	Knot/s
LA	Louisiana
LF	Low Frequency
LOA	Letter of Authorization
m	Meters
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
OPR	Office of Protected Resources
PAM	Passive Acoustic Monitoring
PSMMRP	Protected Species Monitoring, Mitigation and Reporting Plan
PSO	Protected Species Observer
R/V	Research vessel
SOW	Start of Watch
TOAD	Time-of-Arrival-Distance
TX	Texas
USB	Universal Serial Base
USFWS	United States Fish and Wildlife Service
UTC	Coordinated Universal Time

1 EXECUTIVE SUMMARY

The Chevron Jack ocean bottom node (OBN) 2023 survey was conducted by Magseis Fairfield (TGS) in United States (US) federal waters of the Gulf of Mexico (GOM) off the coast of Texas (TX) and Louisiana (LA). The survey comprised the Walker Ridge protraction area, operating under a survey permit. This report is the Final Protected Species Report for the survey, conducted under Bureau for Ocean Energy Management (BOEM) Permit L22-015 and covers the protected species monitoring and mitigation efforts on the one research vessel (R/V) *Fulmar Explorer* utilized by Chevron and TGS for this survey.

The source vessel, *R/V Fulmar Explorer,* towed two airgun arrays and conducted operations under Permit L22-015, from 27 September 2023 to 03 February 2024.

Protected Species Observers (PSOs) and Passive Acoustic Monitoring (PAM) Operators, provided through RPS, were assigned to the source vessel conducting 24-hour source operations to undertake visual and acoustic observations and implement mitigation protocols, in accordance with the BOEM Permit, the National Marine Fisheries Service (NMFS) Letter of Authorization (LOA), and NMFS Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico (BO). Mitigation protocols for this survey included establishment of buffer zones (BZs) and exclusion zones (EZs) for marine mammals and other protected species including sea turtles, visual and acoustic monitoring, and strike avoidance mitigation measures. The *R/V Fulmar Explorer* had three PSOs and four PAM operators onboard the vessel.

For the survey conducted under Permit L22-015, the *R/V Fulmar Explorer* seismic source was active for a total of 1723 hours and 36 minutes, of which 1573 hours and 36 minutes were at full volume. PSOs conducted visual observations for a total of 1506 hours and 21 minutes, and PAM Operators monitored for a total of 2165 hours and 48 minutes.

A total of 66 detection events of protected species occurred during the survey, 60 of which were marine mammal detections and six sea turtle detections.

Marine mammal detections consisted of 33 visual only detections, 18 acoustic only detections, and 9 correlated visual and acoustic detections. Visual detections of cetaceans consisted of one whale species: sperm whale (*Physeter macrocephalus*) and six identified delphinid species: bottlenose dolphin (*Tursiops truncatus)*, melon-headed whale *(Peponocephala electra)*, pantropical spotted dolphin (*Stenella attenuata),* rough-toothed dolphin (*Steno bredanensis),* and spinner dolphin *(Stenella longirostris).* Additionally, there were visual only detections of unidentified delphinids. Acoustic only detections consisted of sperm whales and unidentified delphinid species. Correlated visual and acoustic detections consisted of melon-headed whale, pantropical spotted dolphin, rough-toothed dolphin, sperm whale, and unidentified dolphin.

Sea turtle detections consisted of three sightings of two identified species: green sea turtle (*Chelonia mydas)*, and loggerhead sea turtle (*Caretta caretta*). Additionally, there were three sightings of unidentified shelled sea turtles.

There were no observations of dead/injured protected species during the survey.

In accordance with stipulations set forth under Permit L22-015, LOA, and the BO, a total of 16 mitigation actions were implemented for the sound source, including two shutdowns of the active source, 13 delays to activation of the source, and one voluntary turtle pause. There were 25 strike avoidance maneuvers for protected species necessary during the survey.

2 INTRODUCTION

The Chevron Jack OBN 2023 survey was conducted by TGS in US federal waters of the GOM off the coast of TX and LA. The survey area comprised the Walker Ridge protraction area, operating under survey permits. This report is the Final Protected Species Report for the survey, conducted under BOEM Permit L22-015 and covers the protected species monitoring and mitigation efforts on the source vessel utilized by Chevron and TGS for this survey.

NMFS and BOEM have advised that sound-producing survey equipment operating in the hearing range of marine species has the potential to cause acoustic harassment, particularly to marine mammals. Protected species monitoring for the survey was conducted in accordance with BOEM and NMFS standards outlined in the BO.

The survey company was responsible for contracting PSOs through a provider to conduct monitoring and mitigation for protected species, including marine mammals, sea turtles, and Endangered Species Act (ESA-listed) fish species such as Gulf sturgeon, oceanic whitetip shark, and giant manta rays during their activities. Monitoring and mitigation procedures that were implemented during this survey are described in Section 4 of this report.

2.1 BOEM and NMFS Reporting Requirements

This report summarizes the information required by the BOEM Permit L22-015, the BO, and LOA, identified in Table 1. A copy of these documents are provided in Appendix A and a Protected Species Monitoring, Mitigation and Reporting Plan (PSMMRP) in Appendix B, which documents reporting requirements from each of those documents.

Table 1: BOEM and NMFS Reporting Requirements

Required Content	Source Reference	Location Addressed in Technical Report
PSOs must use a standardized data collection form, whether hard copy or electronic. PSOs shall record detailed information about any implementation of mitigation requirements, including the distance of animals to the acoustic source and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up of the acoustic source. If required mitigation was not implemented, PSOs should record a description of the circumstances.	NMFS BO Appendix A	Appendix I: Excel Data Sheets of Monitoring Effort, Source Operations and Detections of Protected Species During the Survey
The Marine Mammal Protection Act (MMPA) authorization (as applicable) and BOEM Permit/Plan holder shall submit a draft comprehensive report to BOEM/BSEE (protectedspecies@boem.gov and protectedspecies@bsee.gov) and NMFS (nmfs.psoreview@noaa.gov) on all activities and monitoring results within 90 days of the completion of the survey or expiration of the MMPA authorization (as applicable) or BOEM Permit/Plan, whichever comes sooner, or if an issued MMPA authorization is valid for greater than one year, the summary report must be submitted on an annual basis,. The report must describe all activities conducted and sightings of protected species near the activities, must provide full documentation of methods, results, and interpretation pertaining to all monitoring, and must summarize the dates and locations of survey operations and all protected species sightings (dates, times, locations, activities, associated survey activities, and information regarding locations where the acoustic source was used). A final report must be submitted within 30 days following resolution of any comments on the draft report.	NMFS BO Appendix A	This Technical Report
The MMPA authorization (as applicable) and BOEM Permit/Plan holder must report sightings of any injured or dead aquatic protected species immediately, regardless of the cause of injury or death. For injured or dead non-marine mammal aquatic protected species, report incidents to the hotlines listed at https://www.fisheries.noaa.gov/report (phone numbers vary by state).	NMFS BO Appendix A	7.3 Protected Species Incident Reporting

Required Content	Source Reference	Location Addressed in Technical Report
For reporting dead or injured marine mammals, refer to the reporting requirements specified in the MMPA authorization (as applicable), associated with the activity being conducted.		
SEISMIC SURVEY OPERATION, MONITORING, AND REPORTING GUIDELINES: The applicant will follow the guidance provided under Appendix A. Seismic Survey Mitigation and PSO Protocols found in the BO issued by NMFS on March 13, 2020. The guidance can be accessed on NOAA Fisheries internet website at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federallyregulated-oil-and-gas-survey-gulf-mexico.	BOEM Survey Permit L22-015	This Technical Report
VESSEL-STRIKE AVOIDANCE/REPORTING: The applicant will follow the guidance provided under Appendix C. GOM Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols found in the BO issued by NMFS on March 13, 2020. The Appendix can be accessed on the NOAA Fisheries internet site at https://www.fisheries.noaa.gov/resource/document/appendicesbiological-opinion-federally-regulated-oil-and-gas-survey-gulf-mexico	BOEM Survey Permit L22-015	7.3 Protected Species Incident Reporting 7.4.2 Mitigation for Strike Avoidance
NMFS and BSEE must be notified via email (nmfs.psoreview@noaa.gov and protectedspecies@bsee.gov, respectively) as soon as practicable with the time and location off any operations conducted without an active PAM system exceeding 30 minutes. The notification will include the vessel name, the time and location (GIS position) in which the PAM system ceased function where seismic operations continued.	NMFS BO Appendix A	4.6.2 Non-functioning PAM System During Source Activity
PSOs must use standardized electronic data forms. PSOs must record detailed information about any implementation of mitigation requirements, including the distance of marine mammals to the acoustic source and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up or activation of the acoustic source. If required mitigation was not implemented, PSOs must record a description of the circumstances.	NMFS LOA, Section 5 (c)	Appendix I:Excel Data Sheets of Monitoring Effort, Source Operations and Detections of Protected Species During the Survey

Required Content	Source Reference	Location Addressed in Technical Report
The Holder must submit a summary report to NMFS on all activities and monitoring results within 90 days of the completion of the survey or expiration of the LOA, whichever comes sooner, and must include all information described above under section 5(c) of this LOA. If an issued LOA is valid for greater than one year, the summary report must be submitted on an annual basis. The report must describe activities conducted and sightings of marine mammals, must provide full documentation of methods, results, and interpretation pertaining to all monitoring, and must summarize the dates and locations of survey operations and all marine mammal sightings (dates, times, locations, activities, associated survey activities, and information regarding locations where the acoustic source was used). In addition to the report, all raw observational data must be made available to NMFS.	NMFS LOA, Section 6 (a) i-ii	This technical report
The Holder must provide geo-referenced time-stamped vessel track lines for all time periods in which airguns (full array or single) were operating. Track lines must include points recording any change in airgun status (e.g., when the airguns began operating, when they were turned off). GIS files must be provided in ESRI shapefile format and include the Coordinated Universal Time (UTC) date and time, latitude in decimal degrees, and longitude in decimal degrees. All coordinates must be referenced to the WGS84 geographic coordinate system.	NMFS LOA, Section 6 (a) iv	GIS files are provided as a separate shapefile
The draft report must be accompanied by a certification from the lead PSO as to the accuracy of the report, and the lead PSO may submit directly to NMFS a statement concerning implementation and effectiveness of the required mitigation and monitoring	NMFS LOA, Section 6 (a) v	Appendix J: Letter of Data Certification
In the event that personnel involved in the survey activities discover an injured or dead marine mammal, the Holder must report the incident to the Office of Protected Resources (OPR), NMFS and to the Southeast Regional Stranding Network as soon as feasible.	NMFS LOA, Section 6 (c) i	7.3 Protected Species Incident Reporting

3 PROJECT OVERVIEW

The objectives of this survey were to collect data to support: site characterization, development of a ground model, ensure the seabed is clear of obstructions, and identification of buried archaeological features in compliance with BOEM regulations and guidelines.

The survey area is located 345.64 kilometers (km) (186.63 nautical miles) southwest of Port Fourchon, LA, and 476.70 km (257.40 nautical miles) southeast of Port Galveston, TX, in the Walker Ridge protraction area in US GOM (Appendix C). Water depths in this portion of the survey area ranged from 2000.00 to 3078.00 meters (m). The working prospect covers approximately 1478.40 square kilometers (km^2), with the node polygon covering 513.00 km^2 with 2347 nodes in the center of the survey area (Table 2).

Table 2: General survey parameters

Area Parameters	
General Location	GOM, Walker Ridge
Prospect Size (km^2)	1478.40
Water depth (m)	2000.00 to 3078.00
Port location	Galveston, TX; Port Fourchon, LA
Source Vessel	*R/V Fulmar Explorer*
Other Vessels Involved	*Harvey Intervention* (Node Vessel), *Marianne-G* (Support Vessel)

Table 3 outlines the dates the source vessel was in the portion of the survey area covered in this permit and Table 4 outlines the key survey events dates.

Table 3: Summary of dates in areas of operations

Vessel Name	**Dates on Project**		**Area of Operation**
R/V Fulmar Explorer	27 September 2023	03 February 2024	Walker Ridge

Table 4: Summary of key survey events

Event	*R/V Fulmar Explorer*
PSO team mobilizes	21 September 2023
Kick-off meetings	22 September 2023
Vessel departs dock - PSO effort begins	26 September 2023
Array testing begins	27 September 2023
Data acquisition commences	02 October 2023
Extended breaks in acquisition	14:24 UTC on 07 October 2023 to 17:00 UTC on 08 October 2023
	00:07 UTC on 25 October 2023 to 08:20 UTC on 27 October 2023
	15:54 UTC on 30 October 2023 to 20:10 UTC on 03 November 2023
	06:46 UTC on 14 November 2023 to 13:49 UTC on 18 November 2023
	16:01 UTC on 21 November 2023 to 02:31 UTC on 23 November 2023
	04:04 UTC on 10 December 2023 to 03:17 UTC on 12 December 2023
	14:15 UTC on 12 December 2023 to 15:49 UTC on 18 December 2023
	15:15 UTC on 23 December 2023 to 16:52 UTC on December 25 2023
	23:38 UTC on 02 January 2024 to 14:20 UTC on 06 January 2024
	21:56 UTC on 07 January 2024 to 23:37 UTC on 10 January 2024
	04:23 UTC on 12 January 2024 to 17:10 UTC on 14 January 2024
	21:53 UTC on 19 January 2024 to 02:37 UTC on 25 January 2024
Data acquisition complete	03 February 2024
Vessel reaches dock - PSO effort complete	05 February 2024

3.1 Vessel Summary

The survey was undertaken by the source vessel, *R/V Fulmar Explorer,* towing two airgun arrays.

The *R/V Fulmar Explorer* conducted data acquisition for the survey area from 02 October 2023 to 03 February 2024. The source vessel mobilized and demobilized out of Port Galveston, TX, with port calls at Port Fourchon, LA for the duration of this survey.

Specifications for each vessel is provided in Table 5 and photos of each vessel are included in Appendix D.

Table 5: Summary of project vessel specifications

Vessel Name	Vessel Operator	Length (m)	Width (m)	Production Speed Knots (kts)	Max Speed (kts)
R/V Fulmar Explorer (Source Vessel)	SeaBird Exploration Vessels LTD	80.35	19.20	4.60	15.00
Harvey Intervention (Node Vessel)	Harvey Gulf International Marine, LLC	91.50	19.50	--	11.50
Marianne-G (Support Vessel)	Rederij Groen	57.40	13.80	--	12.00

3.2 Summary of Survey Equipment Used

The *R/V Fulmar Explorer* towed airguns comprised of two source arrays; the configuration is described in Table 6. Each array was activated in succession with the total operating source volume of 5380.00 cubic inches (cu in). The design while in acquisition was a “flip flop flap” pattern for a double source, with the shot point interval per vessel every 8.00 seconds at survey speeds of no more than 4.60 knots (kts).

Table 6: Survey equipment operated.

Energy Source	Frequency/Energy Specifications
Bolt 1900 LLX Airguns Two towed arrays Three strings per array 14 guns per string	Volume: 5380.00 cu in Frequency: 6-70 Hz Intensity: ~203 dB re 1µPa at 10 m in water (peak to peak)

4 MONITORING AND MITIGATION MEASURES

This section describes the protected species monitoring and mitigation measures established to meet the requirements of BOEM permit, NMFS LOA, and NMFS BO. Survey mitigation measures were designed to minimize potential impacts of the survey activities on marine mammals, sea turtles, and other protected species of interest.

The following monitoring protocols were implemented to meet these objectives, and each are described in detail in a sub-section below:

R/V Fulmar Explorer

- Visual observations were required to be conducted from port to port during daytime hours, to provide real-time sighting data, allowing for the implementation of mitigation procedures as necessary.
- A PAM system with a spare PAM system onboard was deployed in place for continuous acoustic monitoring, day and night, during source activity or when source activity was anticipated, to augment visual observations, implement mitigation measures, and provide additional marine mammal detection data.
  - In recognition of brief periods of PAM malfunction/downtime, the NMFS BO allowed for the sound source to remain active for 30 minutes without acoustic monitoring, both day and night. It also allowed for an additional 2 hours of no acoustic monitoring during the day if visual observations were continuous, sea state was at B4 or below, and there had been no acoustic detections in the past 2 hours.
  - Outages over 30 minutes were reported to NMFS directly, describing the date, time, duration, location, source activity, reason for outage, resolution and follow up.
- Protected species BZs and EZs were established around the regulated sound source, with delays to initiation and shutdowns of the active source, as well as voluntary turtle pauses, implemented when protected species were detected within these zones.

4.1 Monitoring: PSOs and PAM Operators

Trained and experienced PSOs and PAM Operators, were assigned to the vessel during survey activities to conduct the monitoring for protected species, record and report detections, and request mitigation actions in accordance with the established regulatory requirements and monitoring plan.

RPS was responsible for ensuring that each PSO and PAM met the minimum requirements set forth by BOEM in Permit Area stipulations and by NMFS. BOEM and NMFS PSO requirements include training in protected species identification and behavior, in addition to field experience in protected species observation in the Atlantic Ocean or the Gulf of Mexico.

RPS was responsible for the provision of training certifications and resumes to be reviewed and approved by BOEM prior to deployment on the vessel.

RPS was responsible for providing the PSOs and PAM Operators with vessel-specific and survey contractor-specific training and Environmental Project Inductions were provided by RPS and Chevron during project kick-off meetings, conducted prior to the start of survey operations and prior to scheduled crew changes.

All certified PSOs and PAM Operators who were deployed during the survey operations are listed in Appendix E.

4.2 Visual Monitoring: Protocols and Methods

A team of PSOs were deployed on *R/V Fulmar Explorer* in sufficient numbers to meet the monitoring requirements of that vessel, as outlined in Table 7. PSOs monitored while the vessel was in transit and prior to and during all sound source operations conducted by the vessel. Visual monitoring was also conducted during all periods between sound source activities to collect additional protected species data. Two PSOs monitored at a time and rotated monitoring shifts as needed to maximize concentration and to meet the watch requirements of the permit area (watch periods not to exceed 2 hours without a minimum 1-hour break, and a maximum duration or 12 hours in a 24-hour period).

Visual monitoring locations on each vessel were selected in consideration of the following factors:

1. To afford PSOs a 360-degree viewpoint around the vessel and acoustic source, such that the EZ around the sound source and the strike avoidance separation distances could be simultaneously monitored,
2. Provide the highest vantage point possible to allow for monitoring out to the greatest distances ahead of, and around, the vessel,
3. Provide shelter from inclement weather, as needed,
4. Provide real-time communication with vessel, equipment operators, and PAM operator.

PSOs conducted their visual monitoring by actively scanning with the naked eye out to the furthest observation points visible, methodically sweeping areas closer to the vessel and focusing on the EZs and ahead of the vessel. PSOs conducted regular sweeps of the surrounding areas using magnification devices as described below in

Table 7. PSOs monitored for cues that might indicate the presence of protected species including but not limited to splashing, footprints, blows, and presence of other marine species (diving seabirds, fish feeding activity, etc.).

Table 7: Visual monitoring methodology

	R/V Fulmar Explorer
Total Number of PSOs	3
Number of PSOs on Watch – Day	1 to 2
Visual monitoring equipment- Day	Hand-held reticle binoculars 7x50 Big Eyes binoculars Digital Single Lens Reflex (DSLR) cameras with 300-mm zoom
Visual monitoring conducted at night	No
Visual monitoring equipment (Night)	--
Range Estimation	Reticle binoculars, by relating to object at known distance
Primary Monitoring Location	Bridge. bridge wings, bridge deck and bow

Displays inside the bridge showed current information about the vessel (e.g., position, speed, heading, etc.), sea conditions (e.g., water depth, sea temperature, etc.), and weather (e.g., wind speed and direction, air temperature, etc.). Environmental conditions, along with vessel and acoustic source activity,

were recorded at least once an hour, or every time there was a change of one or more of the variables (for example, visibility, sea state, etc.).

4.2.1 Daylight Visual

The PSOs on board were equipped with hand-held reticle binoculars (e.g., 7 x 50), Big Eyes binoculars (e.g., 25 x 150; 2.7 view angle; individual ocular focus; height control), and DSLR cameras with zoom lens of 300-mm to aid in visual watches conducted during the day. PSO teams used field notebooks to record data while on watch and laptops were used to enter data.

Range estimates were made by comparison to object of known distance, as well as with reticle binoculars. Reticle binoculars were calibrated whenever possible to ensure accuracy of distance data. These reticle calibration tables are provided in Appendix F.

4.3 Monitoring: PAM Protocols and Methods

4.3.1 Onboard PAM

Acoustic monitoring was used to augment visual monitoring efforts in the detection, identification and locating of marine mammals. Acoustic monitoring was required to be conducted continuously, day and night, during all source operations and on any day that production was expected.

Acoustic monitoring was undertaken by trained and experienced PAM Operators, each of whom had completed a BOEM-accepted PSO training course and an RPS in-house PAM training course, which includes use of the PAM systems on board a vessel. PAM monitoring shifts were no longer than 4 hours in duration followed by 2 hours break.

The PAM systems were installed on each vessel in a location which provided space for the system, allowed for quick communication with the navigation team and source operators. Information about the vessel (including position, heading, and speed), water depth, source activity, and PAM system status (including cable deployments/retrievals, changes to the system) were recorded at least once every shift or whenever any of the parameters changed.

Acoustic monitoring for marine mammals was conducted aurally and visually, utilizing PAMGuard software installed on the PAM system. Low to mid-frequency delphinid whistles, clicks, and burst pulses, as well as sperm whale clicks and baleen whale vocalizations, could be visualized in PAMGuard's spectrogram modules. Odontocete clicks could also be visualized in low frequency (LF) and high frequency (HF) click detector modules. Settings adjustments to amplitude range, amplitude triggers, and spectral content filters, among others, could be made in PAMGuard's spectrogram. Click detector modules were utilized to maximize the distinction between cetacean vocalizations and ambient signal. The map module within PAMGuard could be utilized to attempt localizing the position and range of vocalizing marine mammals. Sound recordings could be made using the HF and LF sound recording modules when potential marine mammal vocalizations were detected, or when the operator noted unknown or unusual sound source.

4.3.2 PAM Parameters

Passive acoustic monitoring systems, designed to detect most species of marine mammals, were installed on the source vessel. The systems were developed by Seiche Measurements Limited and consisted of the following main components: a tow cable with hydrophone array attachment, a deck cable, sounds cards, a computer, and a suite of analysis software. Spare systems were also present on board each vessel, in the event the main system components became damaged or inoperable. The diagram in Figure 1 is a simplified depiction of the PAM system installed on each source vessel. Further PAM system specifications can be found in Appendix G.

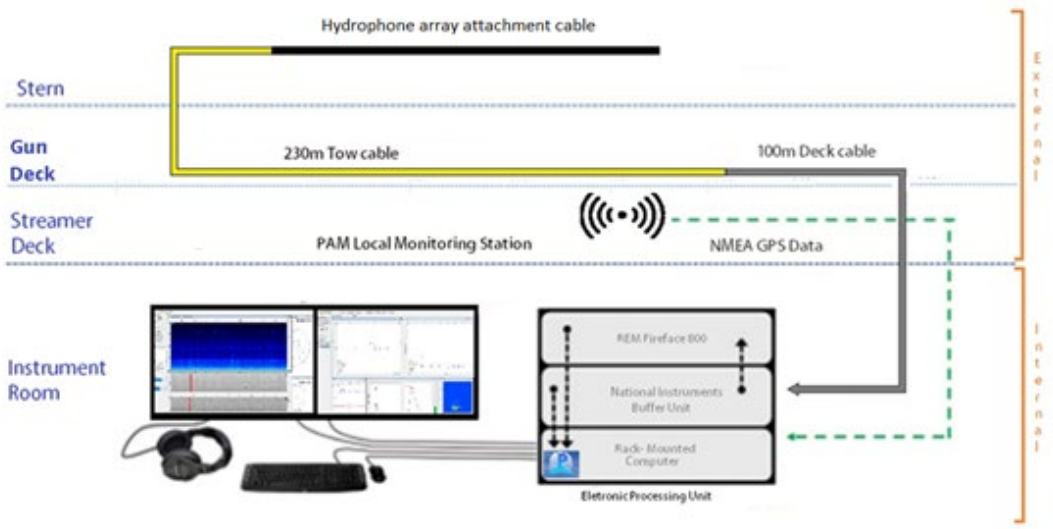


Figure 1: Simplified pathway of data through the PAM system onboard the *R/V Fulmar Explorer*

The linear hydrophone array attachment cable on the *R/V Fulmar Explorer* contained six individual hydrophone elements and a depth transducer, with spacing as shown in Figure 2. The forward hydrophone pair (H1, H2) was used to analyze and record LF sound (10 through 24,000 Hz); the middle hydrophone pair (H3, H4) was used to analyze and record middle frequencies (200 through 200,000 Hz), and the trailing hydrophone pair (H5, H6) was used to analyze and record HF sound (2,000 through 200,000 Hz).

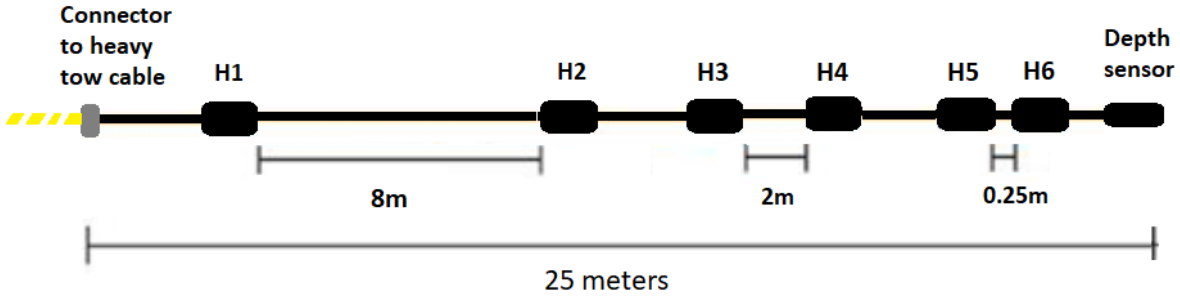


Figure 2: Diagram of 6-hydrophone element separation of the 25m hydrophone array cable

The hydrophone array section was attached to a 230-meter heavy duty tow cable installed on the back deck of each vessel. The deck cable interfaced between the tow cable, and the Electronic Processing Unit (EPU) located at the monitoring station. The EPU contained a buffer unit with Universal Serial Base (USB) output, an RME Fireface 800 Analog Digital Converter (ADC) unit with firewire output, and a rack-mounted computer. A Global Positioning System (GPS) feed was supplied by each vessel's navigation system and connected to the PAM system using a USB port. Data from the hydrophone cable's depth transducer was routed through the buffer unit to the computer, via USB connection. The acoustic monitoring software PAMGuard was utilized for monitoring during the survey.

Raw feed from the two designated HF hydrophone elements was digitized in the buffer unit using an analogue-digital National Instruments data acquisition (DAQ) soundcard at a sampling rate of 500 kHz. The output was filtered for HF content and visualized using the PAMGuard software. PAM Operators configured settings for digital pre-filter and trigger filters to optimize the detection capabilities of their vessels' system. PAMGuard used the difference between the time that a signal arrived at each of the two hydrophones to calculate and display the bearing to the source of the signal. A scrolling bearing/time

module displayed the filtered data in real time, allowing for the detection and directional mapping of click trains. Additional components of the HF click detector system in PAMGuard were an amplitude/time display that registered click intensity data in real time, as well as click waveform, click spectrum, and Wigner plot displays, providing the PAM Operator immediate review of individual click characteristics in the identification process.

Raw feed from the designated LF hydrophone elements was routed from the buffer unit to the RME Fireface 800 unit, where it was digitized at a sampling rate of 48 kHz. The relatively LF output was further processed within PAMGuard by applying Engine Noise Fast Fourier Transform (FFT) filters, including click suppression and spectral noise removal filters (e.g., median filter, average subtraction, Gaussian kernel smoothing and thresholding). Filtered LF content was visualized in two spectrograms, one displaying two channel feeds at frequency ranges of three to 24 kHz, and another displaying one channel feed at a frequency range of 0 to 3 kHz. LF click detector modules allowed for review of individual click characteristics as well as the detection and tracking of click trains.

A map module on the LF system interfaced with GPS data provided by the vessel to display the vessel location and could be used to determine range and bearing estimates based on clicks tracked in the click detector module. PAMGuard contains a function for calculating the range to vocalizing marine mammals based upon the least squares fit test. This method is most effective with animals that are relatively stationary in comparison to the moving vessel, such as humpback whales. The mathematical function estimates the range to vocalizing marine mammals by calculating the most likely crossing of a series of bearing lines generated from tracked clicks or whistles and plotted on a map display. Additionally, the bearings of detected whistles and moans were calculated using a Time-of-Arrival-Distance (TOAD) method (the signal time delay between the arrival of a signal on each hydrophone is compared), and presented on a radar display, along with amplitude information for the detected signal as a proxy for range.

4.3.3 Hydrophone Deployment

On the *R/V Fulmar Explorer*, the hydrophone cable was deployed from a winch on the gun deck down the center of the source arrays. When fully deployed the trailing end of the PAM cable was 110 meters astern of the vessel, the trailing pair of hydrophones were approximately 112 meters from the starboard source and 90 meters from the port source, and tow depths between 15 to 20 meters.

A more detailed description of the hydrophone deployment methods can be found in Appendix H.

4.4 Monitoring: Data Collection

During or immediately after each detection event, the PSOs and PAM Operators recorded the detection details in a standardized datasheet provided to them by RPS. Excel data forms included tabs for project data, monitoring effort data, source operations data, and protected species detection data. RPS supplied a set of standardized variables for specific data fields that were on the data form provided to their PSOs.

Each detection event was linked to an entry on an effort datasheet where specific environmental conditions and vessel activity were logged.

Species identifications were made for visual detections whenever the distance of the animal(s), length of the sighting, and visual observation conditions allowed. Whenever possible during detections, photographs were taken with DSLR cameras that had telephoto lenses. Marine mammal identification manuals were consulted, and photos were examined during observation breaks to confirm identifications.

While acoustic monitoring does not allow assessment of group size with the same level of precision as by visual observation, the LF and HF click detector modules in PAMGuard allow PAM Operators to identify when multiple animals are vocalizing simultaneously or in very close succession. Click detectors present cetacean click trains on computer displays, spatially differentiated by relative bearings to the hydrophone array, so when multiple click trains occur simultaneously or in close succession, and the click trains come

from different bearings, the PAM Operator knows the click trains originate from different animals. While this does not allow the PAM Operator to estimate a total group size, it does provide the PAM Operator an estimate for the minimum group size.

4.4.1 Data Collection Requirements & Methods

Data was collected to meet the requirements of BOEM and NMFS as summarized in Table 1 of this report.

PSOs and PAM Operators collected data in notebooks during watches. During watch breaks and at the end of daylight hours, data was compiled in proprietary data forms on laptop computers and backed up on portable hard drives.

4.5 Mitigation Measures

The following mitigation actions were required for visual and acoustic detections of marine mammals and sea turtles, including Chevron voluntary enhanced mitigation measures, on the survey:

- Establishment of BZ around acoustic array
  - 1500-meter BZ for all true whales (Rice's whale, Sperm whale, Kogia species and all beaked whales)
  - 1000-meter BZ for all other marine mammals and sea turtles
- Establishment of EZ around energy sources with operating frequencies below 200 kHz for operations
  - 1500-meter EZ for all true whales (Rice's whale, Sperm whale, Kogia species and all beaked whales)
  - 500-meter EZ for all other marine mammals and sea turtles
- Chevron voluntary enhanced mitigation measure for the survey included a 10-shot turtle pause implemented for any turtles within 100 meters of the source, such that the turtle is greater than 200m from the array upon resumption of source activity.
- Search periods of 30 minutes, conducted visually and acoustically (daytime) or acoustically (all periods of reduced visibility, including night) prior to the initiation of the acoustic array from silence.
- If marine mammals or sea turtles were detected inside their respective BZ during the search period prior to the initiation of the source, delays to the initiation of the sound source were implemented until all animals had been observed exiting the BZ, or when the animals were not observed exiting, 15 minutes for small odontocetes and 30 minutes for all other marine mammals and sea turtles were implemented. All delays for acoustic-only detections were for 30 minutes.
- Shutdown of the active source upon detection of marine mammals inside their respective EZ. Shutdown was not required for dolphins of the genera *Steno, Tursiops, Stenella,* and *Lagenodelphis*. In the event of an acoustic detection of dolphins inside the EZ, unless a visual observer or PAM Operator could confirm that the animals detected were not of one of the four shutdown-exempted genera listed above, the detection was assumed to have been of one of those genera, and no shutdown was required.
- Once the sound source had been shut down for a protected species detection, operations would resume with ramp-up following at least either all animals were observed exiting the exclusion zone, or when they were not observed exiting, 30 minutes had passed.

4.5.1 Strike Avoidance and Vessel Separation Distances

The following strike avoidance procedures were implemented for detections of protected species in the survey area.

- Vessel operators must maintain a vigilant watch for all aquatic protected species. Vessels must slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any protected species, including marine mammals, sea turtles, and ESA-listed fish species.
- When protected species are sighted while a vessel is underway, the vessel should take act avoid violating the relevant minimum separation distances listed below. If protected species are sighted within their relevant separation distance, the vessel should reduce speed and/or shift the engine to neutral, not engaging the engines until animals are clear of the area. Vessels were not required to shift into neutral for animals that voluntarily approach. For vessels limited in maneuverability, maintaining separation distances were not required if doing so would put the safety of crew or vessel at risk. The minimum separation distances are:
  - 500 meters: All baleen whales including the Rice's whale (formerly known as the Bryde's whale)
  - 100 meters: Sperm whales
  - 50 meters: All other marine mammals (including manatees), and sea turtles, and the ESA-listed fish species.
- Vessel speeds must be reduced to 10 knots or less when mother/calf pairs, pods, or large assemblages of any marine mammal are observed near a vessel.

4.6 Reporting

Reporting requirements of the BOEM Permit Area, NMFS LOA, and BO are outlined in Table 1. Both BOEM and NMFS require that monthly interim reports and a final survey report be prepared, detailing source operations, PSO/PAM effort, detection of protected species and any mitigation measures taken.

4.6.1 Injured or Dead Protected Species

Any injured or dead marine mammal or sea turtle observed either by a PSO on watch or by a crew member was required be reported to BOEM and NMFS as described in Table 1.

Reporting requirements included a phone notification to the NMFS Regional Stranding hotline as soon as practicably possible, made by either the Lead PSO or shore based PSO Provider, as communications permitted from the vessel.

In the event of an injured or dead protected species detection, the Lead PSO would also prepare a written report in accordance with NMFS standard reporting guidelines, using the template provided by BOEM in the permit, which would be submitted to the agencies.

4.6.2 Non-functioning PAM System During Source Activity

There were no PAM outage events during source activity that meet the BO reporting requirements outlined in Table 1 of this report.

4.6.3 Monthly Interim Reports

RPS has prepared monthly interim reports to meet the BOEM Permit, NMFS LOA, and BO report requirements outlined in Table 1 of this report. Interim reports for the *R/V Fulmar Explorer* were submitted

on 02 October 2023, 01 November 2023, 01 December 2023, 02 January 2024, 01 February 2024, and 01 March 2024.

4.6.4 Final Report

RPS has prepared this technical report to meet the BOEM Permit, NMFS LOA, and BO final report requirements outlined in Table 1 of this report. Each of the elements of the required final PSO report is provided in Table 1, referencing the section in this technical report where the element is addressed.

5 DATA RECORDS AND ANALYSIS METHODS

5.1 Operation Activity

PSOs and PAM Operators collected the operational status of regulated equipment each day that the equipment was deployed on the *R/V Fulmar Explorer*.

The *R/V Fulmar Explorer* recorded the start of line times and the end of line times for the equipment during acquisition. The vessel also recorded the status of the equipment while acquisition occurred by noting full power or shutdowns due to mitigation actions.

5.2 Monitoring Effort

PSOs and PAM Operators recorded monitoring effort by entering start of watch (SOW) and end of watch (EOW) times into data sheets where the vessel position and environmental data was also documented for that duration.

Total monitoring effort was calculated by summing the durations of each watch period. Where the monitoring effort entry did not also indicate the source status for that monitoring period, source data was cross referenced during analysis to calculate the duration of monitoring conducted while regulated source was on and off.

Acoustic monitoring while the acoustic source was silent included monitoring during transit between survey sites and other recorded silent periods in which the PAM cable could remain deployed without interfering with operations.

Visual monitoring while the acoustic source was silent included monitoring conducted during transit to/from survey sites and any other recorded silent periods (extended line changes, brief sequence changes, mitigation action, equipment downtime, or weather standby time).

5.2.1 Summary of Environmental Conditions

Each PSO monitoring effort data form included environmental conditions present during that watch period. Environmental variables were recorded every 60 minutes, or when conditions changed. Beaufort Sea State was recorded for each monitoring period using the accepted scale (Table 8).

Table 8: Beaufort Sea State scale

Beaufort Number	Description	Wave Height	Sea Conditions
0	Calm	0 m	Sea like a mirror
1	Light air	0–0.3 m	Ripples with appearance of scales are formed, without foam crests
2	Light breeze	0.3–0.6 m	Small wavelets still short but more pronounced; crests have a glassy appearance but do not break
3	Gentle breeze	0.6–1.2 m	Large wavelets; crests begin to break; foam of glassy appearance; perhaps scattered white horses
4	Moderate breeze	1–2 m	Small waves becoming longer; fairly frequent white horses
5	Fresh breeze	2–3 m	Moderate waves taking a more pronounced long form; many white horses are formed; chance of some spray
6	Strong breeze	3–4 m	Large waves begin to form; the white foam crests are more extensive everywhere; probably some spray

7	High wind	4–5.5 m	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind; spindrift begins to be seen
8	Gale	5.5–7.5 m	Moderately high waves of greater length; edges of crests break into spindrift; foam is blown in well-marked streaks along the direction of the wind
9	Severe gale	7–10 m	High waves; dense streaks of foam along the direction of the wind; sea begins to roll; spray affects visibility
10	Storm	9–12.5 m	Very high waves with long overhanging crests; resulting foam in great patches is blown in dense white streaks along the direction of the wind; on the whole the surface of the sea takes on a white appearance; rolling of the sea becomes heavy; visibility affected
11	Violent storm	11.5–16 m	Exceptionally high waves; small- and medium-sized ships might be for a long time lost to view behind the waves; sea is covered with long white patches of foam; everywhere the edges of the wave crests are blown into foam; visibility affected
12	Hurricane force	>14 m	The air is filled with foam and spray; sea is completely white with driving spray; visibility very seriously affected

Sea swell heights observed during visual monitoring were gauged by PSOs in meters, assigned to one of three swell height categories (<2, 2-4, >4) and recorded for the *R/V Fulmar Explorer*. PSOs also recorded visibility during monitoring effort, in kilometers, where recorded values were selected from categories (>5, 2-5, 1-2, 0.5-1, 0.3-0.5, 0.1-0.3, 0.05-0.1, <0.05). Wind speed, wind direction, percentage of cloud cover, glare intensity and presence of/type of precipitation were other environmental conditions recorded during visual monitoring effort.

5.3 Visual Sightings of Protected Species

PSOs used standardized reporting forms provided by RPS to record all detections of marine mammals and sea turtles made during survey operations. These records were completed any time a sighting was made, regardless of distance, not just for detections where mitigation was implemented.

Sighting identification or detection event numbers were assigned chronologically for all protected species observed on the *R/V Fulmar Explorer* throughout the vessel's survey activity. A new detection number was assigned for a new species sighting or when enough time had passed between observations of animals of the same species such that PSOs could not be certain that they were observing the same animals previously documented. A standard duration of time was to be applied between observations: 15 minutes for delphinid and pinniped detections and 30 minutes for large whales and sea turtles. If there were multiple species in a single detection, each species was recorded with a different detection number.

Protected species movement relative to the vessel and pace, as well as initial and subsequent behavior states, were recorded for each protected species sighting where standardized categories for each were provided as controlled fields in the provided data form.

5.3.1 Closest Point of Approach

All PSOs recorded closest point of approach (CPA) and the source status at the CPA.

5.3.2 Detection Rate

Detection rate was calculated using the number of protected species events per hour of monitoring effort, both visual and acoustic for all vessels. On the *R/V Fulmar Explorer*, when more than one PSO was on watch simultaneously, effort was not duplicated: one hour of monitoring effort by two PSOs consisted of one hour of effort for the purpose of detection rate calculations.

5.3.3 Behavior and Behavior Change

The PSO protected species detection template included an initial behavior and initial pace field for the detection. It included the direction of travel relative to the vessel at initial detection, pace, and direction of travel at final detection and other behaviors documented throughout the event. Where these data points were not included as specific entries in the data form, the information was sometimes available in a detection summary.

Protected species detection events were reviewed and categorized as having exhibited a change in behavior state or no observed change in behavior state.

The variables utilized to analyze change in behavior state are provided in Table 9.

Table 9: Change in behavior state analysis variables

Data Field	Variables	Analysis Method
Change in Behavior	Yes	• A detection narrative was provided that described a change • Initial and final pace were provided and were different • Initial and final direction of travel relative to vessel were provided and were different
	No	• If of the above criteria for an observed behavior change were satisfied, 'No change' was selected and detection data was then evaluated to determine whether no change was in fact observed or whether there was insufficient data provided to indicate whether a behavior change had been observed
Behavior change description	Insufficient data	• Initial and final pace data fields were empty • Initial and final direction of travel relative fields were empty • No detection narrative was provided • No subsequent behaviors after initial behavior state were provided • Detection duration (difference between initial and final detection time) suggested that observations may have occurred that were not documented in the data form
	Other direction change	• Any direction change that could not classified as moving away or approaching
	Pace change	• Any change in pace

5.4 Monitoring Tools Efficacy and Comparisons Assessment

Visual monitoring was mostly conducted by unaided eye, where handheld reticle binoculars, big eye binoculars and DSLR cameras with zoom lenses were also used to confirm a sighting or assist in making a species identification. The comparison of the monitoring tools efficacy will be limited to the vessel that conducted monitoring of the sound source utilized during the survey.

5.5 Mitigation Measures Implemented

Mitigation measures were implemented on the *R/V Fulmar Explorer* as previously described. The onboard PSO team communicated requested mitigation in real time to survey operators that controlled the operation of the regulated sound source or to the vessel crew operating the vessel, depending on the type of action required. Communications were conducted over handheld radios or in person.

Implemented mitigation actions were recorded on PSO data sheets in the detection data form and in the operations activity logs.

For each mitigation action, the mitigation downtime associated with that action was calculated. Mitigation downtime was the duration of the break in regulated source operations as required by the regulatory protocols: the duration of time that an animal was observed inside an EZ and any additional clearance time required before regulated source could be activated. Mitigation downtime did not include any additional downtime that a survey operator needed to resume acquisition: additional vessel maneuvering time, time to deploy or calibrate equipment etc. Some detections included this additional downtime as a different field, production loss, but this variable was not recorded for every mitigation action taken.

5.6 Data Quality Control

The RPS data analysts reviewed all the PSO data sets received from the *R/V Fulmar Explorer* and conducted quality control as described in Table 10.

Table 10: Quality control editing performed by RPS on PSO datasets by data field

Data Type	Data Field	Corrections Made
Monitoring effort	SOW / EOW	• Times were corrected or added where error was evident, typically by inconsistency with adjacent times
	Day time vs. Nighttime	• Failures to adjust time to UTC were corrected. • Times were corrected when end of effort overlapped with start of subsequent effort
Source operations	Testing	• Testing status was not used as a separate category. Based on the survey days and monitoring effort times, testing was either added to the “on” status or not added to operations totals at all.
Protected species detections	Position	• Positions that plotted out of place were corrected using effort positions of corresponding times, where available • When positions could not be corrected and position was on land, detection was removed from detection plots

6 RESULTS

This section of the report details sound source operations as well as protected species monitoring efforts, environmental conditions during monitoring efforts, detection data, and distribution inside and outside the Permit Area during source operation and source silence.

The monitoring effort, source operations and protected species detections for the *R/V Fulmar Explorer* are also provided in excel datasets in Appendix I and letters of data certifications are provided in Appendix J.

6.1 Operation Activity

The survey operations began when the vessel conducted source calibrations in the survey area before proceeding to acquisition, according to the survey plan. Survey operations were briefly suspended when necessary for weather, equipment maintenance, vessel to vessel transfer operations, or port calls for provisions and crew change.

The dates of operation, total days of regulated source activity and hours of regulated source operations (shown in decimal hours [hh.hh]) by the *R/V Fulmar Explorer* are provided in Table 11.

Table 11: Summary of regulated sound source operations on the *R/V Fulmar Explorer*

Vessel	Dates of Operation	Total Days of Regulated Source Activity (dd)	Total Hours of Regulated Source Operations (hh.hh)
R/V Fulmar Explorer	27 September 2023 – 03 February 2024	104	1723.60

The breakdown of source operations (shown in decimal hours [hh.hh]) by source status are provided in Table 12.

Table 12: Summary of seismic source operations broken down by source status on the source vessel

	R/V Fulmar Explorer
Source Status	**Duration (hh.hh)**
Testing at Reduced Source Volume	10.38
Ramp-up	139.33
Full Volume while not Acquiring Production Data	88.28
Full Volume while Acquiring Production Data	1485.32
Reduced Volume Operations*	00.29
Total Source Activity	**1723.60**

*This duration represented an auto-firing event on 19 October 2023 at 19:15 UTC during PAM retrieval

6.2 Monitoring Effort

Visual and acoustic monitoring effort for the *R/V Fulmar Explorer* during the survey is summarized in Table 13, shown by activity of the seismic source and by the type of source utilized.

Table 13: Summary of monitoring effort, visual and acoustic, and by source activity status

Vessel and Type of Source Utilized	Source Equipment Active		Source Equipment Inactive	
	Duration (hh.hh)		Duration (hh.hh)	
	Visual	PAM	Visual	PAM
R/V Fulmar Explorer Bolt 1900 LLX Airguns	849.08	1723.60	657.27	442.20

The combined total breakdown for visual only monitoring effort and concurrent visual and acoustic monitoring effort undertaken during day and night, according to source activity status, is provided for the *R/V Fulmar Explorer* in Table 14.

Table 14: Total monitoring effort, visual and acoustic, during day and night by airgun source activity status on the *R/V Fulmar Explorer*

Monitoring Effort	Day (hh.hh)			Night (hh.hh)		
	Total	Source Active	Source Inactive	Total	Source Active	Source Inactive
Visual Monitoring Only	**412.60**	00.00	412.60	**00.00**	00.00	00.00
Visual and Acoustic Monitoring	**1093.75**	849.08	244.67	**00.00**	00.00	00.00
Acoustic Monitoring Only	**00.00**	00.00	00.00	**1072.05**	874.52	197.53
Total	**1506.35**	**849.08**	**657.27**	**1072.05**	**874.52**	**197.53**

6.3 Environmental Conditions

Environmental conditions can have an impact on the probability of detecting protected species in a survey area. The environmental conditions present during visual observations undertaken for the survey were favorable to moderate.

Visibility was indicated in kilometers and recorded in one of eight categories (>5, 2-5, 1-2, 0.5-1, 0.3-0.5, 0.1-0.3, 0.05 to 0.1, and <0.05). The majority of monitoring effort, 76% was conducted in conditions where visibility extended to greater than 5 kilometers, 21% of monitoring effort occurred while visibility was between 0.5 and 5 kilometers, and only 3% of monitoring effort was conducted while visibility extended to less than 0.5 kilometers. The duration of monitoring conducted at each visibility classification is provided in Table 15.

Table 15: Summary of visibility during visual monitoring effort on the *R/V Fulmar Explorer*

Visibility	***R/V Fulmar Explorer***	***Percent of Total Project***
	Duration (hh.hh)	**%**
>5 km	1151.03	76
2 to 5 km	219.82	15
1 to 2 km	53.52	4
0.5 to 1 km	34.93	2
0.3 to 0.5 km	09.37	1
0.1 to 0.3 km	08.80	<1
0.05 to 0.1 km	12.73	1
>.05 km	16.15	1
Total	**1506.35**	**100**

Monitoring effort for the *R/V Fulmar Explorer* was conducted in Beaufort Sea states ranging from Level 1 to Level 8, however, 41% of the monitoring effort accumulated in sea states at or below Level 3, which is considered favorable conditions for most protected species monitoring (Table 16). Visual observations at Level 4 Beaufort Sea states or higher accounted for 59% of the total visual monitoring effort.

Table 16. Summary of Beaufort Sea State during visual monitoring during the survey

Beaufort Sea State	*R/V Fulmar Explorer*	Percent of Total Project
	Duration (hh.hh)	%
B1	22.78	2
B2	210.72	14
B3	382.88	25
B3 or Less	**616.38**	**41**
B4	420.37	28
B5	270.47	18
B6	135.95	9
Greater than B6	63.18	4
Total	**1506.35**	**100**

Monitoring effort was conducted in swell heights up to 6.00 meters. However, most of the effort was conducted at swell heights below 2.00 meters, which accounted for 71% of the total monitoring effort (Table 17).

Table 17. Summary of swell height during visual monitoring during the survey

Swell Height	*R/V Fulmar Explorer*	Percent of Total Project
	Duration (hh.hh)	%
< 2 m	1066.38	71
2 – 4 m	407.97	27
> 4 m	32.00	2
Total	**1506.35**	**100**

Precipitation may also obscure visibility and sea surface. However, light rain, heavy rain, thin fog, heavy fog, and haze only attributed to 13% of the total visual effort (Table 18). These conditions did not affect visibility to a point where operations had to be suspended.

Table 18. Summary of precipitation during visual monitoring during the survey

Precipitation	*R/V Fulmar Explorer*	Percent of Total Project
	Duration (hh.hh)	%
Clear	1310.67	87
Light Rain	52.32	3
Heavy Rain	09.90	1
Thin Fog	49.03	3
Heavy Fog	12.25	1
Haze	72.18	5
Total	**1506.35**	**100**

Glare may also obscure visibility and sea surface. During 39% of the survey, visibility was affected by severe glare (Table 19). These conditions did not affect visibility to a point where operations had to be suspended.

Table 19. Summary of glare during visual monitoring during the survey

Glare	*R/V Fulmar Explorer*	Percent of Total Project
	Duration (hh.hh)	%
None	534.75	35
Mild	184.87	12
Moderate	204.48	14
Severe	582.25	39
Total	**1506.35**	**100**

7 PROTECTED SPECIES OBSERVATION RESULTS

7.1 Visual Sightings

This section of the report summarizes visual sightings of protected species made during the Chevron Jack area. There were 48 protected species detections, both inside and outside the permit area, (37 delphinid detections, six sea turtle detections and five whale detections). Detections consisted of six species of marine mammal species, two species of sea turtle, as well as unidentified dolphins and sea turtles.

Of the 48 visual detections, (81%) (39 detection events) were identified to the species level while the remaining nine detection events (19%) were identified to family level or a higher taxonomic level (classified as unidentified delphinids or unidentified sea turtles).

A table of all protected species sightings is provided as part of an excel datasheet attachment in Appendix I. Photographs of the identified protected species visually detected during the survey are provided in Appendix K. The distribution of protected species detections both inside and outside the permit area is provided in Appendix L.

Table 20 shows the total number of detection records and the number of individuals detected for each protected species during the survey. The locations of these detections, by group, can be found in Appendix L.

Table 20: Detection records collected for each protected species visually detected during the survey

Species	Total Number of Visual Detection Records	Total Number of Animals
Sperm Whale	5	12
Total Whales	**5**	**12**
Bottlenose Dolphin	15	83
Melon-headed Whales	2	100
Pantropical Spotted Dolphin	8	109
Rough-toothed Dolphin	5	36
Spinner Dolphin	1	1
Unidentified Dolphin	6	37
Total Dolphins	**37**	**366**
Green Sea Turtle	2	2
Loggerhead Sea Turtle	1	1
Unidentified Shelled Sea Turtle	3	3
Total Sea Turtles	**6**	**6**
Total Protected Species	**48**	**384**

7.1.1 Detection and Distance Summaries

The most commonly detected species was the bottlenose dolphin (15 detections of 83 estimated individuals), followed by pantropical spotted dolphins (eight detections of 109 estimated individuals). The number of detection events, approximate number of animals observed, mean group sizes, mean distances from vessel at first detection, and detection rate for each protected species detected over the course of the survey are provided for dolphins in Table 21, for whales in Table 22, and for sea turtles in

Table 23. Melon-headed whales accounted for the largest mean group size of 50.00 (Table 21).

Table 21: Detection summary of dolphins observed during the survey

Dolphins	Bottlenose Dolphin	Melon-headed Whales	Pantropical Spotted Dolphin	Rough-toothed Dolphin	Spinner Dolphin	Unidentified Dolphin
# of Detection Records	15	2	8	5	1	6
Estimated # of Individuals Detected	83	100	109	36	1	37
Mean Group Size	5.53	50.00	13.63	7.20	1.00	6.17
Mean Distance (m) at First Detection	125.67	3111.00	82.63	33.40	50.00	202.50
Detection Rate	0.00996	0.00133	0.00531	0.00332	0.00066	0.00398

There were five visual sightings of sperm whales which was the only whale species detected during the survey. The mean observed group size was 2.40 as shown in Table 22.

Table 22: Detection summary of whales observed during the survey

Whales	Sperm Whale
# of Detection Records	5
Estimated # of Individuals Detected	12
Mean Group Size	2.40
Mean Distance (m) at First Detection	2680.00
Detection Rate	0.00332

There were two species of shelled sea turtles detected, as well as detections of unidentified shelled sea turtles. Of the sea turtle detections, unidentified sea turtles were detected the most frequently (three detections of an estimated three individuals). The mean observed shelled sea turtle group size was 1.00 as shown in Table 23.

Table 23: Detection summary of sea turtles observed during the survey

Sea Turtles	Green Sea Turtle	Loggerhead Sea Turtle	Unidentified Shelled Sea Turtle
# of Detection Records	2	1	3
Estimated # of Individuals Detected	2	1	3
Mean Group Size	1.00	1.00	1.00
Mean Distance (m) at First Detection	115.00	50.00	40.00
Detection Rate	0.00133	0.00066	0.00199

The difference between the closest observed approach of marine mammals to active source, versus inactive source were generally small, with distances generally closer for detections when the source was inactive Table 24.

Table 24: Average CPA of protected species to seismic source or vessel, while active and inactive

Species Detected	Source Deployed – Active		Source Deployed – Inactive		Source Not Deployed	
	Number of Detections	Mean Closest Observed Approach to Source (m)	Number of Detections	Mean Closest Observed Approach to Source (m)	Number of Detections	Mean Closest Observed Approach to Vessel (m)
Sperm Whale	1	7250.00	2	495.00	2	1714.00
Total Whales	**1**	**7250.00**	**2**	**495.00**	**2**	**1714.00**
Bottlenose Dolphin	--	--	--	--	15	35.07
Melon-headed Whale	1	650.00	2	300.00	--	--
Pantropical Spotted Dolphin	1	222.00	2	230.00	5	6.40
Rough-toothed Dolphin	--	--	3	225.00	2	7.50
Spinner Dolphin	--	--	--	--	1	50.00
Unidentified Dolphin	--	--	2	225.00	4	7.75
Total Dolphins	**2**	**436.00**	**9**	**242.78**	**27**	**24.22**
Green Sea Turtle	1	370.00	1	230.00	--	--
Loggerhead Sea Turtle	--	--	--	--	1	5.00
Unidentified Sea Turtle	1	250.00	--	--	2	50.00
Total Sea Turtles	**2**	**310.00**	**1**	**230.00**	**3**	**35.00**
Total Protected Species	**5**	**1748.4**	**12**	**283.75**	**32**	**130.84**

7.2 Acoustic Detection Summary

There were 27 acoustic detections of marine mammals associated with the survey. Acoustic detections consisted of sperm whales, pantropical spotted dolphins, melon-headed whales, rough-toothed dolphins, and unidentified dolphins. There were nine correlated visual and acoustic detections.

Screenshots of acoustically detected protected species during the survey are provided in Appendix M.

Of the 27 acoustic detections for the survey, seven occurred when the source was active and 20 occurred while the source was inactive (Table 25). All acoustic detections were made on the *R/V Fulmar Explorer*.

Table 25: Acoustic detections and source activity during the survey

	R/V Fulmar Explorer
# of Detection Records	27
Number of Detections while Source was Active	7
Number of Detections while Source was Inactive	20
Detection Rate	0.01247

7.3 Protected Species Incident Reporting

There were no observations of dead or injured protected species during the survey.

7.4 Summary of Mitigation Measures Implemented

7.4.1 Mitigation for Sound Exposure from Survey Equipment

Requisite mitigation actions for protected species detected during the survey were requested by PSOs/PAM Operators and implemented by source operators. For the *R/V Fulmar Explorer*, there were 13 delays to source activity for protected species detections, there was one voluntary turtle pause implemented, and there were two shutdowns as seen in Table 26. Mitigation actions were from both visual and acoustic detections.

Table 26: Summary of mitigation actions implemented on the *R/V Fulmar Explorer*

Mitigation Action	Whales		Dolphins		Sea Turtles		All Species	
	No.	Mitigation Downtime (hh:hh)	No.	Mitigation Downtime (hh:hh)	No.	Mitigation Downtime (hh:hh)	No.	Mitigation Downtime (hh:hh)
Delay to Initiation of Source	7	06.50	6	07.42	--	--	**13**	**13.92**
Voluntary Turtle Pause	--	--	--	--	1	00.03	**1**	**00.03**
Shutdown of Active Source	1	02.43	1	00.15	--	--	**2**	**02.58**
All Mitigation Actions	**8**	**08.93**	**7**	**07.57**	**1**	**00.03**	**16**	**16.53**

7.4.2 Mitigation for Strike Avoidance

There were 25 strike avoidance mitigations for vessel or towed equipment interactions with protected species required during this survey. The mitigation actions are summarized in Table 27.

Table 27: Summary of protected species detections occurring inside the species/species group specific separation distances.

Date	Visual Detection Number	Species	Number of Animals	CPA to Vessel (m)	Strike Avoidance Maneuver
26 September 2023	1	Bottlenose dolphin	4	30.00	Maintained speed
26 September 2023	3	Unidentified shelled sea turtle	1	40.00	Kept course, maintained speed
27 September 2023	4	Pantropical spotted dolphin	15	5.00	Maintained speed
27 September 2023	5	Rough-toothed dolphin	16	5.00	Maintained speed
28 September 2023	6	Unidentified dolphin	5	20.00	Maintained speed
28 September 2023	7	Pantropical spotted dolphin	50	10.00	Maintained speed
29 September 2023	9	Green sea turtle	1	30.00	Maintained speed, kept course
01 October 2023	10	Rough-toothed dolphin	5	5.00	Maintained speed
23 October 2023	15	Unidentified shelled sea turtle	1	20.00	Maintained speed, kept course
26 October 2023	16	Pantropical spotted dolphin	10	1.00	Maintained speed, kept course

Date	Visual Detection Number	Species	Number of Animals	CPA to Vessel (m)	Strike Avoidance Maneuver
01 November 2023	20	Unidentified dolphin	4	15.00	Maintained speed
16 November 2023	21	Unidentified dolphin	4	5.00	Maintained speed
22 November 2023	24	Pantropical spotted dolphin	7	10.00	Kept course
11 December 2023	25	Pantropical spotted dolphin	4	1.00	Kept course, maintained speed
17 December 2023	26	Bottlenose dolphin	3	30.00	Maintained speed
24 December 2023	27	Pantropical spotted dolphin	10	10.00	Kept course, maintained speed
25 December 2023	28	Rough-toothed dolphins	5	5.00	Maintained speed, kept course
27 December 2023	29	Pantropical spotted dolphin	12	10.00	Maintained speed, kept course
20 January 2024	37	Rough-toothed dolphin	7	10.00	Maintained speed, kept course
20 January 2024	38	Bottlenose dolphin	15	1.00	Maintained speed, kept course
21 January 2024	40	Bottlenose dolphin	7	10.00	Maintained speed, kept course
21 January 2024	41	Loggerhead sea turtle	1	5.00	Maintained speed, kept course
21 January 2024	42	Bottlenose dolphin	5	40.00	Maintained speed, kept course
21 January 2024	45	Bottlenose dolphin	10	20.00	Maintained speed, kept course
22 January 2024	46	Bottlenose dolphin	4	40.00	Maintained speed, kept course

8 SUMMARY

8.1 Interpretation of the Results

Most of the marine mammal and sea turtle species that were detected during the survey were species that occur commonly in the Gulf of Mexico and that are regularly observed by PSOs and PAM Operators during survey activities. Each species detected was observed within its predicted range with no species encounters occurring outside of that species normal range.

For the marine mammal species groups (all except pantropical spotted dolphins), the distance at initial detection and at closest approach was greater when the regulated sound source was on, but the sample size was still too small to be statistically significant. No behaviors were documented that suggested adverse impacts had occurred to any protected species encountered because of the survey activities undertaken.

8.2 Monitoring Efficacy and Comparison Assessment

During the survey, two different monitoring methods were used to detect protected species. Each method is discussed in Section 4.

1. Daytime unaided eye where PSOs made regular and frequent sweeps of the surrounding area with reticle binoculars and/or big-eye reticle binoculars.
2. PAM, which was used both day and night.

Table 28 breaks down monitoring effort by protected species detections and the detection rate for each monitoring method on the *R/V Fulmar Explorer* in 24-hour operations.

Table 28: Monitoring effort, protected species detections and detection rate for each monitoring method

	Visual Monitoring	PAM
Monitoring effort (hh.hh)	1506.35	2165.80
Number of marine mammal detections	42	27
Detection rate	0.02788	0.01247
Number of sea turtle detections	6	--
Detection rate	0.00398	--

8.2.1 Effectiveness of PAM

PAM had lower detection rate compared to visual monitoring, which is not usual for PAM systems deployed on industry vessels where many factors can limit the efficacy of the system.

- The deployment configuration of a towed hydrophone cable is limited by vessel specific features such as the presence of thrusters and propeller because the PAM Operator must identify a safe location for deployment of the cable where entanglement risk for the cable is low.

- Vessel noise from the propellers occurs in the low-frequency range and at high decibel levels and has the potential to mask marine mammal vocalizations, especially those of large mysticete whales that produce calls that overlap in frequency with this vessel noise. Additional masking may occur from the vessel itself, especially for animals like dolphins that will frequently approach the front of the vessel and ride at the surface, where their highly directional vocalizations can be blocked by the hull.

Additionally, PAM detections are limited to vocalizing marine mammals where many species exhibit highly variable vocalizing behavior that changes depending on behavior state, social structure factors, age, and gender. Environmental conditions can also limit the efficacy of PAM where increased background noise could result in masking of vocalizations that overlap in frequency with the noise.

Despite the limitations that exist with PAM systems, there were four daytime acoustic detection made during the survey that was not accompanied by a visual sighting of the marine mammals, so this monitoring method enabled the detection of marine mammals that would otherwise not have been detected visually.

8.3 Effectiveness of Monitoring and Mitigation

To minimize the potential impacts to marine mammals and sea turtles, PSOs and PAM Operators were prepared to implement mitigation measures whenever protected species were detected approaching, entering, or within the designated exclusion/buffer zones. Mitigation actions for airgun source were implemented successfully during 16 detection events. PSOs and PAM Operators searched the exclusion zones prior to activation of the sound source and survey crew confirmed that exclusion zones were clear prior to initiating operations. Airgun source was initiated gradually, in ramp-up format whenever multiple airguns would be active simultaneously.

There were no sightings of injured or dead protected at any point during the survey.

Visual and acoustic observations yielded a total 66 protected species detections and included marine mammals and sea turtles. PSOs and PAM Operators likely did not detect all animals present; however, it is highly unlikely that protected species were not detected inside the exclusion and buffer zones while the source was active, especially since zones were relatively small and PSOs were equipped with multiple tools to augment visual monitoring. The environmental conditions present during monitoring were generally good for detecting protected species, especially inside the exclusion and buffer zones.

The monitoring and mitigation measures required by the GOM BO, LOA, and the survey permit appear to have been an effective means to protecting the marine species encountered during survey operations.

9 LITERATURE CITED

Bureau of Ocean Energy Management (BOEM) Permit

United States Fish and Wildlife Service (USFWS). 2019. Marine Mammal Protection Act (MMPA). 16 U.S.C.

National Marine Fisheries Service (NMFS) Endangered Species Act Section 7 Biological Opinion. Biological Opinion of the Federally Regulated Oil and Gas Survey Activities in the Gulf of Mexico. 2020. Appendix A & C.

Appendix A: BOEM Permit, LOA, NMFS Biological Opinion

United States Department of the Interior
BUREAU OF OCEAN ENERGY MANAGEMENT
Gulf of Mexico Regional Office
1201 Elmwood Park Blvd
New Orleans, Louisiana 70123-2394

ELECTRONIC MAIL – RETURN RECEIPT REQUESTED

7/20/23

Chevron USA Inc.
Attention: Joe T. Gordon
1500 Louisiana Street
Houston, TX 77002

Dear Mr. Gordon:

Your application received June 6, 2022, requests a Federal permit to conduct geophysical operations in the area shown on the map accompanying the application. Magseis Fairfield will conduct exclusive operations for Chevron USA Inc. The proposed program is a 4D OBN seismic survey.

A permit designated OCS Permit L22-015 is hereby granted to conduct geophysical operations on the OCS in the area and manner described in the application subject to the enclosed Permit for Geophysical Exploration for Mineral Resources on the OCS and Attachment A that follow. Furthermore, any conditions stated in the applicable Letter of Authorization issued by the National Marine Fisheries Service must also be followed. **Before starting acquisition, you are required to notify BOEM of your survey start date. BOEM must also be advised of the end date immediately upon survey completion.**

Our National Environmental Policy Act (NEPA) review of the subject action is complete and results in a Finding of No Significant Impact (FONSI). This FONSI is conditioned on adherence to the conditions of approval that ensure environmental protection, consistent environmental policy, and safety as required by NEPA, as amended, and is valid only insofar as the conditions are met in Attachment A.

If you have any questions, please call Goh Sakulpitakphon at (504) 736-5731 (tanaporn.sakulpitakphon@boem.gov) or the Office of Resource Evaluation, Data Acquisition and Special Projects Unit at (504) 736-3231 (GGPermitsGOMR@boem.gov).

Sincerely,

MATTHEW WILSON
Digitally signed by MATTHEW WILSON
Date: 2023.07.20 15:16:22 -05'00'

Matthew G. Wilson
Regional Supervisor
Gulf of Mexico Office
Office of Resource Evaluation

ATTACHMENT A

Our National Environmental Policy Act (NEPA) review of the subject action is complete and results in a Finding of No Significant Impact (FONSI). This FONSI is conditioned on adherence to the following mitigation and monitoring measures that ensure environmental protection, consistent environmental policy, and safety as required by NEPA, as amended, and is valid only insofar as the following conditions are met:

Conditions of Approval

1. **Compliance with Biological Opinion Terms and Conditions and Reasonable and Prudent Measures:** This approval is conditioned upon compliance with the Reasonable and Prudent Measures and implementing Terms and Conditions of the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020, and the amendment issued on April 26, 2021. This includes mitigation, particularly any appendices to Terms and Conditions applicable to the plan, as well as record-keeping and reporting sufficient to allow BOEM and BSEE to comply with reporting and monitoring requirements under the BiOp; and any additional reporting required by BOEM or BSEE developed as a result of BiOp implementation. The NMFS Biological Opinion may be found here: (https://www.fisheries.noaa.gov/resource/document/biological-opinion-federally-regulated-oil-and-gas-program-activities-gulf-mexico). The Appendices and protocols may be found here: (https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico). The amendment provided updates to Appendices A, C and I which may be found here: https://repository.library.noaa.gov/view/noaa/29355.

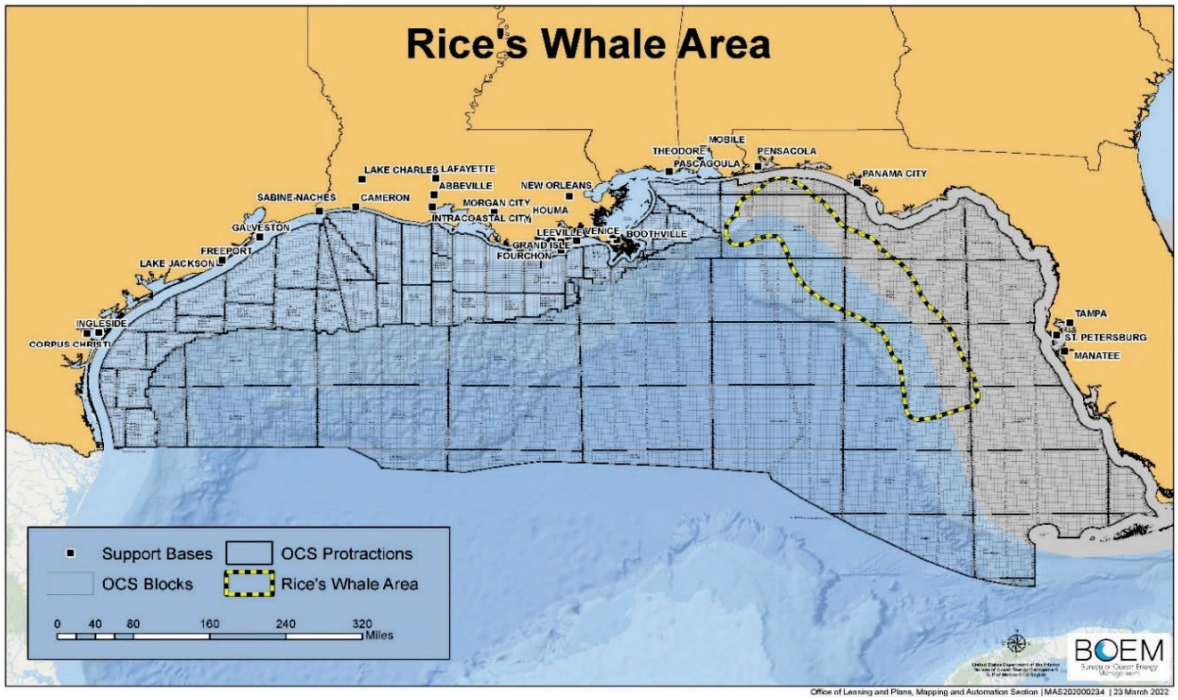
2. **Notification of Intention to Transit Rice's Whale Area Condition of Approval (COA):** Operators or their recognized representative must notify the Bureau of Ocean Energy Management (BOEM) or Bureau of Safety and Environmental Enforcement (BSEE) as appropriate of their intention to transit through the Rice's (formerly Bryde's in 2020 Biological Opinion and subsequent amendment) whale area (from 100- to 400- meter isobaths from 87.5° W to 27.5° N as described in the species' status review plus an additional 10 km around that area) (see figure below) when this transit is associated with either an initial plan/application or as part of a change to an existing plan/application when either vessel route and/or support base changes. If proposing to transit through any portion of the Rice's whale area, the BOEM Permit/Plan holder shall submit their notification to transit and concurrence to fulfil the reporting requirements as stated below to BOEM/BSEE (protectedspecies@boem.gov and protectedspecies@bsee.gov). In the case of a post-approval change in vessel route or change in a support base, your intention to transit through the Rice's whale area should be made by contacting the BOEM or BSEE Point of Contact for the most recent applicable permit or application. Please be advised that changes to the use of a support base may trigger a revised plan (e.g., 30 CFR § 550.283), revised application, or modified permit (for geological and geophysical [G&G] activities). You will be required to follow the requirements defined below as originally outlined (as Bryde's whale) in the 2020 Biological Opinion and April 2021 Amendment to the Incidental Take Statement and Revised Appendices issued by the National Marine Fisheries Service (NMFS). Note these conditions of approval refer to the species as the Rice's whale (*Balaenoptera ricei*). Until 2021, the species was known as Bryde's whale (*Balaenoptera edeni*).

    1. Vessel operators and crews must maintain a vigilant watch for Rice's whales and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any Rice's whale. Visual observers monitoring the 500 m vessel strike avoidance zone for Rice's whales can be either third-party observers or crew members (e.g., captain), but crew members responsible for these duties must be provided sufficient training to distinguish aquatic protected species to broad taxonomic groups, as well as those specific

species detailed further below. If the species is indistinguishable, then operators should assume it is a Rice's whale and act accordingly (see below).

2. If transiting within the Rice's whale area (figure below), operators must notify BOEM and/or BSEE of their plans prior to transit and include what port is used for mobilization and demobilization and explain why the transit is necessary. If an unavoidable emergency transit through this area occurs (i.e., safety of the vessel or crew is in doubt or the safety of life at sea is in question), it must be reported immediately after the emergency is over and must include all required information referenced herein. After completing transit through the Rice's whale area, you must prepare a report of transit describing the time the vessel entered and departed the Rice's whale area, any Rice's whale sightings or interactions (e.g., vessel avoidance) that occurred during transit, and any other marine mammal sightings or interactions. Minimum reporting information is described below:
    i. The plan, permit or other BOEM or BSEE number used to identify the activity;
    ii. Automatic Identification System (AIS), if available;
    iii. Time and date vessel entered and exited the Rice's whale area;
    iv. Time, date, water depth, and location (latitude/longitude) of the first sighting of the animal;
    v. Name, type, and call sign of the vessel in which the sighting occurred;
    vi. Species identification (if known) or description of the animal involved;
    vii. Approximate size of animal (if known);
    viii. Condition of the animal during the event and any observed injury / behavior (if known);
    ix. Photographs or video footage of the animal, if available;
    x. General narrative and timeline describing the events that took place;
    xi. Time and date vessel departed Rice's whale area;
    xii. Trackline (e.g., time, location, and speed) of vessel while within Rice's whale area; and
    xiii. Environmental conditions, including Beaufort Sea State (BSS) and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon.
3. Upon conclusion of transit, operators must submit reports to protectedspecies@boem.gov and protectedspecies@bsee.gov within 24 hours of transit through the Rice's whale area. The title of the email should include "Transit through Rice's Whale Area."
4. All vessels, regardless of size, must observe a 10-knot, year-round speed restriction in the Rice's whale area during daylight hours. The only exception to the 10-knot vessel speed restriction would be when observing the speed restriction would cause the safety of the vessel or crew to be in doubt or the safety of life at sea to be in question.

5. All vessels must maintain a minimum separation distance of 500 m from Rice's whales. If a whale is observed but cannot be confirmed as a species other than a Rice's whale, the vessel operator must assume that it is a Rice's whale and take appropriate action.
6. All vessels 65 feet or greater associated with oil and gas activity (e.g., source vessels, chase vessels, supply vessels) must have a functioning Automatic Identification System (AIS) onboard and operating at all times as required by the U.S. Coast Guard. If the U.S. Coast Guard does not require AIS for the vessel, it is strongly encouraged. At minimum, the reporting (as specified within this COA) must be followed and include trackline (e.g., time, location, and speed) data.
7. No transit is permissible at nighttime or during low visibility conditions (e.g., BSS 4 or greater) except for emergencies (i.e., when the safety of the vessel or crew would otherwise be in doubt or the safety of life at sea is in question).
8. If an operator while operating within the Rice's whale area
    i. Exceeds the 10-knot vessel speed,
    ii. Does not maintain a 500 m minimum separation distance from a Rice's whale, and/or
    iii. Conducts transit during nighttime or during low visibility conditions (e.g., BSS 4 or greater), the operator must notify BSEE and BOEM by emailing protectedspecies@bsee.gov and protectedspecies@boem.gov within 24 hours. The notification must be reported as a separate and distinct notification to the transit report with the title "Transit Deviation" in the subject line. The notification must provide a detailed explanation as to why the Transit Deviation occurred.
9. This COA does not remove or alter the need to comply with any other applicable regulatory or legal requirements with respect to vessel operations, including as outlined in the amended Appendix C - Gulf of Mexico Vessel Strike Avoidance and lnjured/Dead Aquatic Protected Species Reporting Protocols.



3. **SEISMIC SURVEY OPERATION, MONITORING, AND REPORTING GUIDELINES**: The applicant will follow the guidance provided under Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols found in the Biological Opinion amendment issued by the National Marine Fisheries Service on April 26, 2021. The guidance can be accessed on NOAA Fisheries internet website at https://repository.library.noaa.gov/view/noaa/29355.

4. **MARINE TRASH AND DEBRIS AWARENESS AND ELIMINATION**: The applicant will follow the guidance provided under Appendix B. Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on NOAA Fisheries internet website at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico.

5. **VESSEL-STRIKE AVOIDANCE/REPORTING**: The applicant will follow the protocols provided under Appendix C. Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols found in the Biological Opinion amendment issued by the National Marine Fisheries Service on April 26, 2021. The guidance can be accessed on the NOAA Fisheries internet site at https://repository.library.noaa.gov/view/noaa/29355.

6. **SEA TURTLE RESUSCITATION GUIDELINES**: The applicant will follow the guidance provided under Appendix J. Sea Turtle Handling and Resuscitation Guidelines found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on the NOAA Fisheries internet site at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico.

7. **SLACK-LINE PRECAUTIONS CONDITION OF APPROVAL:** If operations require the use of flexible, small diameter (< 2 inch) lines to support operations (with or without divers), operators/contractors must reduce the slack in the lines, except for human safety considerations, to prevent accidental entanglement of protected species (i.e. species protected under the Endangered Species Act [ESA] and/or Marine Mammal Protection Act [MMPA]). This requirement includes tether lines attached to remotely operated equipment. The requirements below must be followed for any activities entailing use of flexible, small diameter lines that will not remain continuously taut, except when complying with these requirements would put the safety of divers, crew, or the vessel at risk:

    - Operators must utilize tensioning tools and/or other appropriate procedures to reduce unnecessary looseness in the lines and/or potential looping;
    - The lines must remain taut, as long as additional safety risks are not created by this action;
    - A line tender must be present at all times during dive operations and must monitor the line(s) the entire time a diver is in the water; and
    - Should the line tender and/or diver become aware of an entanglement of an individual protected species, the reporting requirements described in the *Reporting Requirements* COA must be followed as soon as safety permits.

8. **REPORTING REQUIREMENTS CONDITION OF APPROVAL:** Review of your proposed activities identified use of equipment that has the potential for entanglement and/or entrapment of protected species (i.e. species protected under the Endangered Species Act [ESA] and/or Marine Mammal Protection Act [MMPA]) that could be present during operations. In case of entrapment, procedures and measures for reporting are dependent upon the situation at hand. **These requirements replace those specific to dead and injured species reporting in respective sections of Appendix A (insofar as they relate to geophysical surveys) and Appendix C of the 2020 Biological Opinion on the Bureau of Ocean Energy Management's Oil and Gas Program Activities in the Gulf of Mexico**.

    *Incidents Requiring **Immediate** Reporting*

    Certain scenarios or incidents require immediate reporting to Federal agencies; these are described below:

Should any of the following occur at any time, **immediate reporting** of the incident is required after personnel and/or diver safety is ensured:

- Entanglement or entrapment of a protected species (i.e., an animal is entangled in a line or cannot or does not leave a moon pool of its own volition).
- Injury of a protected species (e.g., the animal appears injured or lethargic). Interaction, or contact with equipment by a protected species.
- Any observation of a leatherback sea turtle within a moon pool (regardless of whether it appears injured, or an interaction with equipment or entanglement/entrapment is observed).

1. As soon as personnel and/or diver safety is ensured, report the incident to National Marine Fisheries Service (NMFS) by contacting the appropriate expert for 24-hr response. If you do not receive an immediate response, you must keep trying until contact is made. Any failed attempts should be documented. Contact information for reporting is as follows:
    a. **Marine mammals**: contact **Southeast Region's Marine Mammal Stranding Hotline at 1-877-433-8299.**
    b. **Sea turtles**: contact **Brian Stacy, Veterinary Medical Officer at 352-283-3370**. If unable to reach Brian Stacy, contact Lyndsey Howell at 301-310-3061. This includes the immediate reporting of **any observation of a leatherback sea turtle within a moon pool.**
    c. Other protected species (e.g., giant manta ray, oceanic whitetip shark, or Gulf sturgeon): contact the **ESA Section 7 biologist at 301-427-8413 (nmfs.psoreview@noaa.gov)** and report all incidents to takereport.nmfs@noaa.gov.
    d. Minimum reporting information is described below:
        i. Time, date, water depth, and location (latitude/longitude) of the first discovery of the animal;
        ii. Name, type, and call sign of the vessel in which the event occurred;
        iii. Equipment being utilized at time of observation;
        iv. Species identification (if known) or description of the animal involved;
        v. Approximate size of animal;
        vi. Condition of the animal during the event and any observed injury / behavior;
        vii. Photographs or video footage of the animal, only if able; and
        viii. General narrative and timeline describing the events that took place.
2. After the appropriate contact(s) have been made for guidance/assistance as described in 1 above, you may call BSEE at 985-722-7902 (24 hours/day) for questions or additional guidance on recovery assistance needs (if still required) and continued monitoring requirements. You may also contact this number if you do not receive a timely response from the appropriate contact(s) listed in 1. above.
    a) Minimum post-incident reporting includes all information described above (under 1.d.i-viii) in addition to the following:

i. NMFS liaison or stranding hotline that was contacted for assistance;

ii. For moon pool observations or interactions:

- Size and location of moon pool within vessel (e.g., hull door or no hull door);
- Whether activities in the moon pool were halted or changed upon observation of the animal; and
- Whether the animal remains in the pool at the time of the report, or if not, the time/date the animal was last observed.

Reporting of Observations of Protected Species within an Enclosed Moon Pool

If a protected species is observed within an enclosed moon pool and does not demonstrate any signs of distress or injury or an inability to leave the moon pool of its own volition, measures described in this section must be followed (only in cases where they do not jeopardize human safety). Although this particular situation may not require immediate assistance and reporting as described under *Incidents Requiring Immediate Reporting* (see above), a protected species could potentially become disoriented with their surroundings and may not be able to leave the enclosed moon pool of their own volition. In order for operations requiring use of a moon pool to continue, the following reporting measures must be followed:

Within 24 hours of any observation, and daily after that for as long as an individual protected species remains within a moon pool (i.e., in cases where an ESA listed species has entered a moon pool but entrapment or injury has not been observed), the following information must be reported to BSEE (protectedspecies@bsee.gov) and BOEM (protectedspecies@boem.gov):

1. For an initial report, all information described under 1.d.i-viii above should be included.
2. For subsequent daily reports:
   a. Describe the animal's status to include external body condition (e.g., note any injuries or noticeable features), behaviors (e.g., floating at surface, chasing fish, diving, lethargic, etc.), and movement (e.g., has the animal left the moon pool and returned on multiple occasions?);
   b. Description of current moon pool activities, if the animal is in the moon pool (e.g., drilling, preparation for demobilization, etc.);
   c. Description of planned activities in the immediate future related to vessel movement or deployment of equipment;
   d. Any additional photographs or video footage of the animal, if possible;
   e. Guidance received and followed from NMFS liaison or stranding hotline that was contacted for assistance;
   f. Whether activities in the moon pool were halted or changed upon observation of the animal; and
   g. Whether the animal remains in the pool at the time of the report, or if not, the time/date the animal was last observed.

9. **Moon Pool Monitoring Condition of Approval:** A moon pool has been identified during review of your plan submittal. The requirements below must be followed for any

activities entailing use of the moon pool, except under circumstances when complying with these requirements would put the safety of the vessel or crew at risk. If any protected species (i.e. species protected under the Endangered Species Act [ESA] and/or Marine Mammal Protection Act [MMPA]) is detected in the moon pool, you are required to follow the appropriate procedures described in the Reporting Requirements condition of approval (COA) in your plan approval.

Application of these measures includes, but is not limited to, dive support vessels, service vessels, pipelaying vessels, drillships, floating platforms (e.g., SPAR), mobile offshore drilling units, and other facilities with enclosed moon pools (e.g., well in the hull of a vessel, with or without a door).

General Requirements

- Where the moon pools have hull doors, the operator(s) should keep the doors closed as much as reasonably practicable when no activity is occurring within the moon pool, unless the safety of crew or vessel require otherwise. This will prevent protected species from entering the confined area during periods of non-activity.
- Use of a moon pool requires regular monitoring while open to the water column and if a vessel is not underway. Regular monitoring means 24-hour video monitoring with hourly recurring checks for at least five minutes of the video feed, or hourly recurring visual checks of the moon pool for at least five minutes by a dedicated crew observer with no other tasks during that short visual check.
- If water conditions are such that observers are unable to see within a meter of the surface, operations requiring the lowering or retrieval of equipment through the moon pool must be conducted at a rate that will minimize potential harm to protected species.

Closure of the Hull Door

- Should the moon pool have a hull door that can be closed, then prior to and following closure, the moon pool must be monitored continuously by a dedicated crew observer with no other tasks to ensure that no individual protected species is present in the moon pool area. If visibility is not clear to the hull door from above (e.g., turbidity or low light), 30 minutes of monitoring is required prior to hull door closure.
- If a protected species is observed in the moon pool prior to closure of the hull door, the hull door must not be closed, except for human safety considerations. Once the observed animal leaves the moon pool, the operator may commence closure. If the observed animal remains in the moon pool after closure, contact NMFS or BSEE prior to the closure of the hull doors according to reporting requirements (*see Reporting Requirements COA under Reporting of Observations of Protected Species within an Enclosed Moon Pool)*.

Movement of the Vessel (no hull door) and Equipment Deployment/Retrieval

- Prior to movement of the vessel and/or deployment/retrieval of equipment, the moon pool must be monitored continuously for a minimum of 30 minutes, by a dedicated crew observer with no other tasks, to ensure no individual protected species is present in the moon pool area.
- If a protected species is observed in the moon pool prior to movement of the vessel, the vessel must not be moved and equipment must not be deployed or retrieved, except for human safety considerations. If the observed animal leaves the moon pool, the operator may commence activities. If the observed animal remains in the moon pool contact

BSEE prior to planned movement of the vessel according to reporting requirements (see *Reporting Requirements* COA under *Reporting of Observations of Protected Species within an Enclosed Moon Pool*.

- Should a protected species be observed in a moon pool prior to activity commencement (including lowering or retrieval of equipment), recovery of the animal or other actions specific to the scenario may be required to prevent interaction with the animal. If protected species are observed during activity, only reporting is required (see *Reporting Requirements* COA). Operators must not take such action except at the direction of, and after contact with, NMFS (see *Reporting Requirements* COA).

10. **NON-RECURRING MITIGATION BENTHIC COMMUNITIES:** BOEM review of geophysical activities proposed in L20-015 Amendment identified confirmed and potential sensitive sessile benthic resources within the proposed node area. According to NTL 2009-G40, the minimum separation distance for bottom disturbing activities is 76 m (250 ft.) from any sensitive sessile benthic community (e.g., deepwater coral, chemosynthetic tube worms). Based on the methods described in the application, BOEM authorizes the applicant to deploy nodes with less than 76 m (250 ft) avoidance of high-density deepwater benthic communities contingent upon the applicant adhering to the mitigations described below:

    1. All seafloor disturbances, including nodes, cables, and ROV, must remain a minimum of 5 m (16 ft) from all sensitive sessile benthic communities.
    2. The contractor must photograph the seabed within a 10 m (33 ft) radius of any node placed within 76 m (250 ft.) of a BOEM anomaly (June 2019 dataset, see link below). Photographs of each such location shall be taken: Pre-node deployment, post-node deployment, and post-node retrieval. The photos shall clearly show the geographic location of each node.
    3. If any sessile benthic communities are present at a proposed node location, a new site that allows compliance with the above requirements shall be selected.
    4. The contractor must provide an as-placed GIS shapefile of actual OBN locations to demonstrate compliance. Submit the required photographs and shapefile to the BOEM Regional Supervisor, Office of Resource Evaluation, Data Acquisition and Special Projects Unit, within 90 calendar days after you complete the G&G activity.

    Refer to the following BOEM site for GIS data layers of known 3D seismic water bottom anomalies: https://www.boem.gov/Seismic-Water-Bottom-Anomalies-Map-Gallery/

    The following feature classes have a high probability of supporting sensitive sessile benthic organisms and shall be avoided unless visual inspection and photographic data confirm an absence of high-density deepwater benthic communities:

    1. Anomaly_patchreefs (Shallow Water)
    2. Anomaly_confirmed_patchreefs (Shallow Water)
    3. Seep_anomaly_positives
    4. Seep_anomaly_positives_possible_oil
    5. Seep_anomaly_positives_confirmed_oil
    6. Seep_anomaly_positives_confirmed_gas
    7. Seep_anomaly_confirmed_corals
    8. Seep_anomaly_confirmed_organisms

9. Seep_anomaly_confirmed_hydrate
10. Seep_anomaly_confirmed_carbonate
11. Anomaly_Cretaceous
12. Anomaly_Cretaceous_talus

If you have any question regarding this mitigation, please contact Dr. Alicia Caporaso – Benthic Ecology Lead (Alicia.Caporaso@BOEM.gov) or Dr. Kate Segarra – Biological Sciences Unit Supervisor (Katherine.Segarra@BOEM.gov).

11. **Non-Recurring Mitigation For The Protection of Potential Archaeological Resources:** This review indicates that at least two potential archaeological targets exist in the area of proposed Ocean Bottom Node (OBN) and PIES deployment within the Federal waters of the Outer Continental Shelf (OCS). The target locations will require avoidance mitigation as listed in Table 1 below; no OBNs or other bottom disturbance activities may be placed within the avoidance boundary listed in the table. Your accuracy margin-of-error for placement locations should be added to the listed avoidance boundary, in order to ensure that the area is avoided. **There are 2 node locations that are currently proposed within these avoidance boundaries. These locations must either be relocated outside of the avoidance boundaries or removed from the survey design.** Alternatively, if you are able to visually confirm that the target is not a potential archaeological site, then further avoidance will not be necessary. Guidance for conducting a visual survey is provided below.

    There are significant portions of the project area within the OCS that have received either limited or no previous archaeological survey, and these areas are likely to contain additional archaeological materials that may be impacted by the proposed operations. If the applicant discovers man-made debris that appears to indicate the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of man-made objects such as bottles or ceramics, piles of ballast rock, aircraft wreckage or remains) within or adjacent to the proposed action area during the proposed survey operations, they will be required to immediately halt operations, take steps to ensure that the site is not disturbed in any way, and contact the BOEM Regional Supervisor for Environment within 48-hours of its discovery. They must cease all operations within 1,000 feet (305 meters) of the site until the Regional Director instructs you on what steps you must take to assess the site's potential historic significance and what steps you must take to protect it. If an OBN impacts any submerged object, then the applicant must also submit a report detailing each instance of this activity. This report should include the coordinates of the impact (to DGPS accuracy), a description of the submerged object, any damage that may have resulted from the OBN placement or retrieval operations, and any photographic or video imagery that is collected. The applicant must submit a copy of any data collected as a result of these investigations.

    Following completion of fieldwork, the applicant must submit as-placed plats, at a scale of 1-inch = 1,000 ft, of all OBNs relative to the listed target and the avoidance boundary. If remote-sensing survey data is collected for any reason during the course of this project (i.e., side-scan sonar, sector-scan sonar, multi-beam bathymetry, or magnetometer) then the applicant must submit copies of this data to BOEM.

Table 1: Target Location Requiring Avoidance

Lease Block	LATITUDE (NAD 27)	LONGITUDE (NAD 27)	Minimum Avoidance Distance (ft)*
Walker Ridge 802	26.164164675	-91.455047737	200
Walker Ridge 803	26.17765215	-91.41465863	500

*Operator's expected accuracy margin-of-error based on water depth and positioning accuracy should be added to these distances.

Guidance for conducting an ROV investigation for target clearance:

If you choose to investigate the target(s) with your ROV, collect enough video data to determine if it is a potential shipwreck. If the target appears to be a shipwreck as described above (e.g., visible man-made objects including an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of bottles or ceramics, piles of ballast rock, engine machinery, etc.), document as best as possible the horizontal and vertical extents of the wreck and any associated debris fields. Do not physically impact the site in any way or remove any artifacts. If the target appears to be a shipwreck or potential shipwreck then you must continue to avoid it but may reduce the avoidance radius to a minimum of 100 ft from the primary wreck site and any visible debris. If the target is conclusively not a shipwreck, no further avoidance is necessary. All ROV video collected at the target must be submitted to BOEM at the conclusion of fieldwork.

Please direct any questions or correspondence pertaining to these requirements to Mr. Scott Sorset (504) 736-2999.

Additional Conditions of Approval:

1. Man-made structure(s) such as pipeline(s) or other potential hazard(s) may be located in the permitted work area; therefore, prior to performing operations that involve seafloor disturbance (e.g., coring), take precautions in accordance with Notice to Lessees and Operators No. 2008-G05, Section VI.B, Shallow Hazards Program (see the BOEM website at: http://www.boem.gov/Regulations/Notices-To-Lessees/2008/08-g05.aspx).

2. If you conduct activities that could disturb the seafloor in an Ordnance Dumping Area (see the BOEM website at: https://www.boem.gov/Ordnance-Dumping- Areas/ for a map), exercise caution, since this area might contain old ordnance, including unexploded shells and depth charges, dumped before 1970. In addition, the U.S. Air Force has released an undeterminable amount of unexploded ordnance in Water Test Areas 1 through 5 (most of the Eastern Planning Area of the GOM).

3. If you discover any site, structure, or object of potential archaeological significance (i.e., cannot be definitively identified as modern debris or refuse) while conducting operations, the provisions of 30 CFR 250.194(c) and NTL 2005-G07, (Archaeological Resource Surveys and Reports) require you to immediately halt operations within 1,000 feet of the

area of discovery and report this discovery to the Regional Supervisor (RS) of the Office of Environment (OE) within 48 hours. Every reasonable effort must be taken to preserve the archaeological resource from damage until the RS of OE has told you how to protect it.

4. Comply with the provisions of NTL 2009-G39, Biologically-Sensitive Underwater Features and Areas, effective January 27, 2010, (see the BOEM website at: https://www.boem.gov/Regulations/Notices-To-Lessees/2009/09-G39.aspx). If you conduct activities near an identified biologically sensitive topographic features (see the specific list at https://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Gulf-of-Mexico-Region/topoblocks-pdf.aspx), in the Live Bottom "Pinnacle Trend" Area, or Live Bottom "Low Relief" Area (see the BOEM website at https://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Gulf-of-Mexico-Region/topomap-pdf.aspx for a map of all three features), the following measures apply:
    a. Ensure you do not anchor or otherwise disturb the seafloor within 152 meters (500 feet) of a designated "No Activity Zone." Information on the activities that disturbed the seafloor within 305 meters (1,000 feet) of the "No Activity Zone" of a biologically sensitive topographic feature shall be submitted to BOEM (see "d" below.)
    b. Do not anchor or otherwise disturb the seafloor within 30 meters (100 feet) of any identified pinnacles or other hard bottoms that have a vertical relief of eight feet or more. Information on the activities that disturbed the seafloor within 61 meters (200 feet) of pinnacles in the "Pinnacle Trend" Area shall be submitted to BOEM (see "d" below.)
    c. Do not anchor or otherwise disturb the seafloor near any identified live bottom low relief features. Information on the activities that disturbed the seafloor within 30 meters (100 feet) of live bottom low relief features in the Live Bottom "Low Relief" Area shall be submitted to BOEM (see "d" below.)
    d. Within 90 calendar days of completing activities, submit information regarding seafloor disturbances to BOEM New Orleans Office Data Acquisition and Special Project Unit (see page 5 of these "Protective Measures" for the address) a PDF map and the appropriate shape files to reproduce the map, showing the location of the seafloor disturbance relative to these features.

5. If you conduct activities in water depths 300 meters (984 feet) or greater, make sure that you do not anchor, use anchor chains, wire, ropes, or cables, or otherwise disturb the seafloor within 76 meters (250 feet) of any features or areas that could support deep water sessile benthic communities. Refer to NTL No. 2009-G40, Deepwater Chemosynthetic Communities, effective January 27, 2010 (see the BOEM website at: http://www.boem.gov/Regulations/Notices-To-Lessees/2009/09-G40.aspx). Also, refer to the BOEM website for GIS data layers of known 3D seismic water bottom anomalies at https://www.boem.gov/Seismic-Water-Bottom-Anomalies-Map-Gallery/.

   The following feature classes have a high probability of supporting sensitive sessile benthic organisms and shall be avoided unless visual inspection and photographic data confirm an absence of high-density deepwater benthic communities:

13. Anomaly_patchreefs (Shallow Water)
14. Anomaly_confirmed_patchreefs (Shallow Water)
15. Seep_anomaly_positives
16. Seep_anomaly_positives_possible_oil
17. Seep_anomaly_positives_confirmed_oil
18. Seep_anomaly_positives_confirmed_gas
19. Seep_anomaly_confirmed_corals
20. Seep_anomaly_confirmed_organisms
21. Seep_anomaly_confirmed_hydrate
22. Seep_anomaly_confirmed_carbonate
23. Anomaly_Cretaceous
24. Anomaly_Cretaceous_talus

Within 90 calendar days after completing activities that disturbed the seafloor within 152 meters (500 feet) of features or areas that could support high-density chemosynthetic communities, submit to the BOEM New Orleans Office Data Acquisition and Special Project Unit (see page 5 of these "Protective Measures" for the address) a PDF map and the appropriate shape files to reproduce the map, showing the location of the seafloor disturbance relative to these features

6. Comply with the provisions of NTL 2009-G39, Biologically-Sensitive Underwater Features and Areas of the Gulf of Mexico, effective January 27, 2010, (see the BOEM website at: http://www.boem.gov/Regulations/Notices-To-Lessees/2009/09- G39.aspx). If you discover any high-relief topographic feature with a relief greater than eight (8) feet while conducting activities, report the discovery to the BOEM New Orleans Office Regional Director. Make sure you do not anchor on or otherwise disturb such a feature. Within 90 calendar days after completing an activity that disturbed the seafloor within 30 meters (100 feet) of such a feature, submit to the BOEM New Orleans Office Data Acquisition and Special Project Unit (see page 5 of these "Protective Measures" for the address) a map at a scale of 1 inch = 1,000 feet with DGPS accuracy, showing the location of the seafloor disturbance relative to the feature.

7. Before you conduct activities that could disturb the seafloor within 254 meters (1,000 feet) of a Texas artificial reef site or artificial reef permit area, within152 meters (500 feet) of a Louisiana artificial reef site or artificial reef permit area, or could disturb the seafloor within a General Permit Area established by the States of Texas, Alabama or Florida for the placement of artificial reef material, contact the appropriate State reef management agency. See the BOEM websites at: http://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Gulf-of- Mexico-Region/artreefmap.aspx for a map and http://www.boem.gov/Environmental- Stewardship/Environmental-Studies/Gulf-of-Mexico-Region/artreefcontacts-pdf.aspx for State contacts.

8. If you conduct activities within the boundaries of the Flower Gardens National Marine Sanctuary (Flower Gardens Banks and Stetson Bank), exercise caution to ensure that such activities do not endanger any other users of the Sanctuary. See the BOEM website at:

http://www.boem.gov/Environmental-Stewardship/Environmental- Studies/Gulf-of-Mexico-Region/FGNMSmap-pdf.aspx for map. Additionally, activities involve moving the marker buoys at the Sanctuary, contact Mr. G. P. Schmahl, the current Sanctuary Manager, for instructions. See the BOEM website at: http://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Gulf-of- Mexico-Region/FGNMScontacts-pdf.aspx for Mr. Schmahl's contact information. See the BOEM website at: http://www.boem.gov/Environmental-Stewardship/Environmental- Studies/Gulf-of-Mexico-Region/FGNMSbuoys-pdf.aspx for the locations of the Flower Gardens' marker buoys.

9. If your proposed activities will involve using boats from a port located south of the Suwannee River mouth in Florida, make sure that you adhere to the following manatee protection plan:

   a. Advise your personnel of the possibility of the presence of manatees in the inland and coastal waters of Florida in the Eastern Gulf of Mexico.
   b. Advise your personnel that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Endangered Species Act, the Marine Mammal Protection Act, and the Florida Manatee Sanctuary Act of 1978.
   c. Advise your vessel operators to (1) use the deeper ship channels to the maximum extent possible; (2) avoid collisions with manatees and to stay within the existing channels; and (3) obey all speed restrictions and travel at "no wake/idle" speeds at all times while operating in shallow water or in channels where the draft of the vessel provides less than four (4) feet of clearance. (Areas of manatee concentrations have been identified and speed limit signs have been erected in accordance with Federal, State, and local regulations.)
   d. While vessels are berthed in port, advise your vessel operators to use fenders between the dock and the vessel and/or between adjacent vessels berthed side-by-side. Make sure that the fenders have a minimum clearance of three feet when compressed between the dock and the vessel
   e. Ensure that your vessel operators keep logs detailing any sighting of, collision with, damage to, or death of manatees that occur while you conduct an ancillary activity. If a mishap involving a manatee should occur, make sure that the vessel operator immediately calls the "Manatee Hotline" ((888) 404-3922), and the U.S. Fish and Wildlife Service, Jacksonville Field Office ((904) 232-2580) for north Florida or the U.S. Fish and Wildlife Service, Vero Beach Ecosystem Office ((772) 562-3909) for South Florida.
   f. Within 60 calendar days after completing the activity, submit a report summarizing all manatee incidents and sightings to the Florida Marine Research Institute, Florida Fish and Wildlife Conservation Commission, 100 Eighth Avenue SE, St. Petersburg, FL 33701-5095; and to the U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Suite 310, Jacksonville, FL 32216-0958, for north Florida, or to the U.S. Fish and Wildlife Service, 1339 20th Street, Vero Beach, Florida 32960-3559, for south Florida.

10. The Magnuson-Stevens Fisheries Conservation and Management Act (see 50 CFR 600.725) prohibits the use of explosives to take reef fish in the Exclusive Economic Zone. Therefore, if your activities involve the use of explosives, and the explosions result in stunned or killed

fish, do not take such fish on board your vessels. If you do, you could be charged by the National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries Service) with a violation of the aforementioned Act. If you have any questions, contact NOAA Fisheries Service, Office for Law Enforcement, Southeast Division, at (727) 824-5344.

11. When operations extend south of approximately 26 degrees north latitude in the Western Gulf of Mexico or 24 degrees to 25 degrees north latitude in the Eastern Gulf of Mexico (the 200-nautical mile provisional maritime also called the Exclusive Economic Zone Conservation Zone Limit), notify the Department of State: Ms. Roberta Barnes, Room 2665, OES/OPA, Department of State, Director, Office of Ocean and Polar Affairs, Washington, D.C., 20520, at (202) 647-0240 or barnesrm@state.gov.

12. As part of the requirements of 30 CFR 551.6(a), if any operation under this Permit and Agreement is to be conducted in a leased area, the Permittee shall take all necessary precautions to avoid interference with operations on the lease and damage of existing structures and facilities. The lessee (or operator) of the leased area will be notified, in writing, before the Permittee enters the leased area, or commences operations, and a copy of the notification will be sent to the Regional Supervisor executing this Permit Agreement.

13. (a) Solid or liquid explosives shall not be used, except pursuant to written authorization from the Regional Supervisor. Requests of the use of such explosives must be in writing, giving the size of charges to be used, the depth at which they are to be detonated, and the specific precautionary methods proposed for the protection of fish, oysters, shrimp, and other natural resources. The use of explosives represents a may affect situation under Section 7 of the Endangered Species Act of 1973, as amended.

    (b) The following provisions are made applicable when geophysical exploration on the Outer Continental Shelf using explosives is approved:

    i. Each explosive charge will be permanently identified by markings so that unexploded charges may be positively traced to the Permittee and to the specific field party of the Permittee responsible for the explosive charge
    ii. The placing of explosive charges on the seafloor is prohibited. No explosive charges shall be detonated nearer to the seafloor than five (5) feet (1.52 meters).
    iii. No explosive shall be discharged within 1,000 feet (304.8 meters) of any boat not involved in the survey.

14. Any serious accident, personal injury, or loss of property shall be immediately reported to the Regional Supervisor of Resource Evaluation.

15. All pipes, buoys, and other markers used in connection with seismic work shall be properly flagged and lighted according to the navigation rules of the U.S. Corps of Engineers and the U.S. Coast Guard.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OCEAN ENERGY MANAGEMENT

Gulf of Mexico OCS Region

(Insert Appropriate Regional Office)

APPLICATION FOR PERMIT TO CONDUCT GEOLOGICAL OR GEOPHYSICAL EXPLORATION FOR MINERAL RESOURCES OR SCIENTIFIC RESEARCH ON THE OUTER CONTINENTAL SHELF

(Section 11, Outer Continental Shelf Lands Act of August 7, 1953, as amended on September 18, 1978, by Public Law 95-372, 92 Statute 629, 43 U.S.C. 1340; and 30 CFR Parts 551 and 251)

Chevron U.S.A Inc.
Name of Applicant

1500 Louisiana St.
Number and Street

Houston, TX, 77002
City, State, and Zip Code

Application is made for the following activity: (check one)

- ☐ Geological exploration for mineral resources
- ☐ Geological scientific research
- ☒ Geophysical exploration for mineral resources
- ☐ Geophysical scientific research

Submit: Original plus three copies, totaling four copies, which include one copy of the original, one digital copy, and one public copy (all with original signatures).

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To be completed by BOEM

Permit Number: L22-015 **Date:** 06-June-2022

A. General Information

1. The activity will be conducted by:

magseis fairfield Service Company Name	For Chevron U.S.A Inc. Purchaser(s) of the Data
9811 Katy Fwy Suite 1200 Address	1500 Louisiana St. Address
Houston, TX, 77024 City, State, Zip	Houston, TX, 77002 City, State, Zip
(281) 468 2340 Telephone/FAX Numbers	832 854 4982 Telephone/FAX Numbers
laurie.stewart@magseisfairfield.com E-Mail Address	apeinado@chevron.com E-Mail Address

2. The purpose of the activity is: ☒ Mineral exploration

☐ Scientific research

3. Describe your proposed survey activities (i.e., vessel use, benthic impacts, acoustic sources, etc.) and describe the environmental effects of the proposed activity, including potential adverse effects on marine life. Describe what steps are planned to minimize these adverse effects (mitigation measures). For example: 1) Potential Effect: Excessive sound level Mitigation; Soft Start, Protected Species Observers (PSO's), mammal exclusion zone or 2) Potential Effect: Bottom disturbance; Mitigation: ROV deployment/retrieval of bottom nodes) (use continuation sheets as necessary or provide a separate attachment. Label as **BOEM-0327 Section A General Information**.):

Air gun sources impact will be avoided by following NTL 2016-BOEM-G01.

See BOEM-0327 3 - SECTION A GENERAL INFORMATION Attachment 2.pdf

4. The expected commencement date is: April 20, 2023

The expected completion date is: November 20, 2023

5. The name of the individual(s) in charge of the field operation is:
Fabricio Mora, Operations Manager

May be contacted at:
9811 Katy Fwy Suite 1100, Houston, TX, 77024

Telephone (Local) (281) 468 2340 (Marine) (281) 468 2340

Email Address: fabricio.mora@magseisfairfield.com

6. The vessel(s) to be used in the operation is (are):

Vessel Name (s)	Vessel Model	Registry Number(s)	Radio Call Sign(s)	Registered Owner(s)
REM Saltire (node)	ST-327-L	9377016	5BYV4	E. Forland AS
Sanco Star (source)	Vaagland Båtbyggeri	9410313	ZDIT 8	Sanco Shipping AS
Artemis Arctic (source	DNV 1A1 HELDK TM9207510		LJZK3	Artemis Shipping AS

7. The port from which the vessel(s) will operate is: Port Fourchon, LA

8. Briefly describe the navigation system (vessel navigation only):

DGPS on all vessels

Radars, Direction finders, DGPS+LoranC, Gyro, Autopilot, Echo-sounder, etc, etc.

B. Complete for Geological Exploration for Mineral Resources or Geological Scientific Research

1. The type of operation(s) to be employed is: (check one)

   a. ☐ Deep stratigraphic test, or

   b. ☐ Shallow stratigraphic test with proposed total depth of _____, or

   c. ☐ Other _____

2. Attach a page-size plat showing: 1) The generalized proposed location for each test, where appropriate, a polygon enclosing the test sites may be used; 2) BOEM protraction areas, coastline, point of reference, OCS boundary/3-mile limit; 3) Distance and direction from a point of reference to area of Activity; and 4) Label as "**Public Information**".

C. Complete for Geophysical Exploration for Mineral Resources or Geophysical Scientific Research

1. The proposed operation: Jack OBN 2023

   a. Acquisition method (OBN, OBC, Streamer): OBN

   b. Type of acquisition: (High Resolution Seismic, 2D Seismic, 3D Seismic, gravity, magnetic, CSEM, etc.)
   3D seismic using Ocean Bottom Nodes and Airgun Sources

2. Attach a page-size plat showing:
   a. The generalized proposed location of the activity with a representative polygon;
   b. BOEM protraction areas, coastline, point of reference, OCS boundary/3- mile limit;
   c. Distance and direction from a point of reference to area of activity;
   d. Label as "**Public Information**"; and
   e. Submit relevant shape files needed to recreate the map as part of the required digital copy.

3. List all energy source types to be used in the operation(s): (Air gun, air gun array(s), sub-bottom profiler, sparker, towed dipole, side scan sonar, etc.).

Airgun Arrays

4. Explosive charges will [ ] will not [X] be used. If applicable, indicate the type of Explosive and maximum charge size (in pounds) to be used: _____

Type _____ Pounds _____ Equivalent Pounds of TNT _____

D. Proprietary Information Attachments

Use the appropriate form on page 9 for a "geological" permit application or the form on page 11 for a "geophysical" permit application. You must submit a separate Form BOEM-0327 to apply for each geological or geophysical permit.

E. Certification

I hereby certify that foregoing and attached information are true and correct.

Print Name: Adrian Peinado

SIGNED Adrian Peinado **DATE** 06/02/2022

TITLE Geophysicist

COMPANY NAME: Chevron U.S.A.

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TO BE COMPLETED BY BOEM

Permit No. L22-015 **Assigned by** Tanaporn Sakulpitakphon **Date** 06-June-2022
of BOEM

This application is hereby:

a. X Accepted

b. _____ Returned for reasons in the attached

SIGNED MATTHEW WILSON Digitally signed by MATTHEW WILSON Date: 2022.06.21 12:57:19 -05'00' **TITLE** Regional Supervisor **DATE** 6/21/22

Section D Proprietary Information Attachment
Required for an Application for Geophysical Permit

Please provide the information in an attached document labeled **BOEM-0327 Section D Proprietary Information Attachment**.

1. Attach detailed narrative and description of the energy source(s) and receiving array.

2. Attach a map view diagram/schematic that illustrates vessel(s) source and receiver(s) configuration. Label each vessel indicating its function and include the dimensions of streamer(s), tow fish, etc. Indicate the number of chase and alternate vessels to be used.

For items 1,2 and 3 please refer to attached file BOEM-0327 5 - SECTION D PROPRIETARY Attachment 4.pdf

For item 12 refer to BOEM-0327 6 - Jack OBN - PROPRIETARY INFORMATION MAP Attachment-5.pdf, BOEM-0327 8 - Jack OBN PROPRIETARY_INFORMATION MAP Attachment-7.zip and BOEM-0327 7 - LoA Application Shape Files Attachment-

3. List each energy source to be used (e.g., airgun, airgun array(s), sparker, towed dipole, side scan sonar, sub bottom profiler, etc.). Indicate the source's manufacturer, model, Source Level (SL) in dB re 1µPa @1m in water (RMS) and if applicable, Source Level (SL) in dB re 1µPa @1m in water (Peak to Peak) and ping rate. If the manufacturer does not provide a peak to peak level (many side scan sonars, etc.), please enter N/A. Additionally, provide the operational frequency ranges.

Energy Source	Manufacturer	Model	Array or Airgun Size (cu. in.)	Source Level (SL) in dB re 1µPa@1m in water (RMS)	Source Level (SL) in dB re 1µPa@1m in water (Peak to Peak)	Frequency (Hz, kHz range)	Ping Duration/ Cycle	Ping Rate
Airgun	Bolt	1900 LLX	5220	241	267	2-70 Hz	0.2 sec	Every 40 m

For air guns/air gun arrays (excludes multibeam bathymetry, high frequency subbottom profilers, and side scan sonar systems), provide the maximum distance from the sound source to the 190, 180, and 160 dB in RMS dB levels: (Required for Alaska region, GOM region only requires this information for surveys in the GOM that will use simsource during acquisition; Not required for Atlantic permits).

dB level	Maximum Distance from Source
190 dB	
180 dB	
160 dB	

4. State the shot frequency of the source array(s) as shots per minute or shots per linear mile (statute): 40.23 per mile (40 m shot interval) or 80 shots per source line mile (flip-flop)

5. List the towing depth (ft/m) of the source array(s):
12 meters

6. If applicable, list the towing depth (ft/m) of the receiver(s):
Receivers will be OBNs - stationary at the seabed

7. CSEM, OBN, Magnetotelluric, and OBC surveys: Describe the receiver deployment and retrieval procedures. Indicate the number and spacing of anyocean bottom receivers, cables, and anchors. If anchors will not be retrieved, provide theirphysical composition and rate of decomposition.

Deployment/retrieval via ROV. OBN station spacing 346m x 346m,~2,283 OBN stati

8. List the navigation/positioning system or method used to position shotpoint locations and/or ocean bottom receivers:

Shot locations are from rGPS measurements at the floats on the source arrays (2 per float, 3 floats)

Receiver locations are determined by a combination of inertial positioning and USBL on the ROV

9. Proposed areal extent (in OCS blocks) for 3D surveys or total number of line miles for 2D surveys:
Area of operations is ~100 OCS blocks, source deployment area ~ 66.5 OCS Blocks

10. Provide the company identification name of the proposed survey (e.g., Deep Six Survey) and list all proposed initial and final processed data sets that will result from survey acquisition..

Jack OBN 2023

Fast track and full processing 3D Migrations using Reverse Time Migration

11. State the estimated date (month and year) on which initial and final processing will be available for all proposed processed data sets:

Fast Track March 2024, Full Processing Dec 2024

12. Attach map(s), plat(s), and chart(s) (preferably at a scale of 1:250,000) and an electronic version of same showing latitude and longitude, scale, specific protraction areas, OCS boundary/3-mile limit, block numbers. The map, plat or chart should be submitted at a sufficient size and scale to make out all details of the activities shown. The map should be labeled "**Proprietary**." For 2D data acquisition provide specific track lines with line identifications with the total number of line miles proposed or a representative polygon and total number of blocks for 3D surveys. Along with the hardcopy map, submit on CD or flashdrive (subject to security screening), the necessary ArcGIS shape files to reproduce the map for 2D track lines including individual line names in the attribute table. For 3D surveys provide a representative polygon as an ArcGIS shape file. You must provide a shapefile data set of the latitude/longitude location for all track lines, shot lines, and node placements. This can be submitted at a later time but must be received before activities can take place.

BOEM-0327 ATTACHMENT 2

BOEM-0327 SECTION A GENERAL INFORMATION

Chevron U.S.A., Inc

Jack OBN 2023

Describe your proposed survey activities (i.e., vessel use, benthic impacts, acoustic sources, etc.) and describe the environmental effects of the proposed activity, including potential adverse effects on marine life. Describe what steps are planned to minimize these adverse effects (mitigation measures). For example: 1) Potential Effect: Excessive sound level Mitigation; Soft Start, Protected Species Observers (PSO's), mammal exclusion zone or 2) Potential Effect: Bottom disturbance; Mitigation: ROV deployment/retrieval of bottom nodes) (use continuation sheets as necessary or provide a separate attachment. Label as BOEM-0327 Section A General Information.):

CHEVRON RESPONSE:

The proposed survey activity will acquire 3D OBN seismic data using air gun sources within Walker Ridge Area: Blocks 490-496, 533-542, 576-587, 620-632, 664-676, 708-720, 752-764, 796-808, 840-852, 883-896, 930-939, 974-982 and Amery Terrace Area: Blocks 8-13. The source points will be acquired using 2 source vessels, each with 2 source arrays for a total of 4 source arrays. A total of 2,283 OBN units (seismic receivers) will be deployed on the ocean floor. All OBN units will be carefully deployed and retrieved by ROV aboard a single OBN handling vessel.

To mitigate potential environmental effects, including potential adverse effects on marine life, Chevron will comply with:

- Any permit conditions of approval,
- 2020 NMFS Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico and the following appendices:
    - Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols

  - Appendix B: Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols
  - Appendix C: Gulf of Mexico Vessel Strike Avoidance and lnjured/Dead Aquatic Protected Species Reporting Protocols
  - Appendix J: Sea Turtle Handling and Resuscitation Guidelines
- 2021 NMFS Incidental Take Regulations (ITR [86 FR 5322]) and the general, mitigation, monitoring, and reporting requirements included in the Letter of Authorization.
- Applicable NTLs, including but not limited to:
  - BOEM NTL 2016-G01: Vessel Strike Avoidance and Injured/Dead Protected Species Reporting
  - BOEM NTL 2016-G02: Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program
  - BSEE NTL 2015-G03: Marine Trash and Debris Awareness and Elimination
  - Joint NTL 2011-G01: Revisions to the List of OCS Lease Blocks Requiring Archaeological Resource Surveys and Reports
  - NTL 2009-G40: Deepwater Benthic Communities
  - NTL 2009-G39: Biologically-Sensitive Underwater Features
  - NTL 2008-G05: Shallow Hazards Program
  - NTL 2005-G07: Archaeological Resource Reports and Surveys

Details on potential effects and specific mitigations are below.

1. Potential Effect: Excessive sound level

Significant adverse effects on marine life from the sound sources are not anticipated to occur. Potential adverse effects related to the use of air gun sources will be mitigated by implementing NTL 2016-BOEM-G02, Biological Opinion Appendix A, and the Incidental Take Regulations.

All aspects of the NTL and Biological Opinion Appendix A will be implemented including these key topics, summarized:

- Ramp-up Procedures to warn marine mammals and sea turtles of impending seismic operations and to allow sufficient time for those animals to leave the immediate vicinity.
- Protected Species Visual Observers who have completed a protected species observer training program will be implemented on all source vessels in accordance with the NTL requirements.

- Reporting of the results of the mitigation measures as detailed in the NTL including daily Observer Effort Reports, Daily Survey Reports, Sighting Reports to be submitted on the 1st and 15th of every month.
- Passive Acoustic Monitoring for Protected Species.

In addition to mitigation measures required by BOEM NTL 2016-G02 and Biological Opinion Appendix A, the mitigation measures required for Deep Penetration Surveys in Subpart S, Sections 217.184 and 217.185 of the Incidental Take Regulations (ITR [86 FR 5322]) issued by the National Marine Fisheries Service to allow for the authorization, through LOAs, of take of marine mammals incidental to the conduct of geophysical surveys for oil and gas activities in Federal waters of the U.S. Gulf of Mexico will be implemented. The ITR mitigations are aligned with those in BOEM NTL 2016-G02 but include additional requirements for deep water, deep penetrating surveys including:

- Mitigation Requirements for PSO Dolphin Observations: The ITR requires seismic airgun survey shutdowns for large dolphins identified within the 500-meter exclusion zone for deep penetration surveys.
- Additional Mitigation Requirements for PSO Whale Observations: The ITR requires deep penetration seismic airgun survey shutdowns due to PSO sightings of baleen whales, sperm whales, beaked whales, and Kogia species outside of the 500-meter exclusion zone and within a 1,500-meter extended distance shutdown zone.
- PAM Implementation Requirements and Associated Mitigation for Whale Detections: The ITR implementation of PAM 24 hours/day for deep penetration airgun surveys in water depths greater than 100 meters. PAM detections of baleen whales, sperm whales, beaked whales, and Kogia species require shutdown of deep penetration seismic airgun surveys.
- PSO Equipment Requirements: The ITR requires deep penetration survey vessels to provide pedestal-mounted “bigeye” binoculars for PSOs.
- PSO Training and Experience Requirements: The ITR requires that all PSOs: a) must have appropriate training and must be third-party (i.e., not crew members); b) at least one visual PSO must have a minimum 90 days relevant experience, completed not less than 18 months prior; and c) at least two acoustic PSOs must have a minimum 90 days relevant experience, completed not less than 18 months prior.
- Reporting Requirements: The Final Rule specifies that all surveys must submit reports within 90 days of the conclusion of the survey concerning the activity conducted, observations of marine mammals, and details of mitigation implementation, as applicable.

2. Potential Effect: Bottom Disturbance

The proposed activity includes the placement of ocean bottom nodes on the sea floor. Bottom disturbance resulting from node placement will be temporary and limited to the physical footprint of the node. To reduce the potential effects to the sea floor the following measures will be implemented:

- Nodes will be deployed to predetermined locations and retrieved using ROVs launched from a dedicated vessel
- ROVs will be fitted with cameras to aid in the placement of the nodes
- Location of all nodes will be recorded for recovery at the end of the survey activity

3. Potential Effect: Vessel Strike

To reduce potential effects to protected species resulting from vessel strikes, mitigation measures described in BOEM NTL 2016-G01 and the 2020 Biological Opinion, Appendix C will be implemented. These include:

- Vessel operators and crews will maintain vigilant watch for all marine protected species
- Vessel speeds will be reduced to 10 knots or less when mother/calf pairs or large assemblages (greater than three individuals) are observed near the vessel
- Vessels will maintain a 100-m minimum separation distance sperm whales and 500 m from any baleen whale
- Vessels will maintain a 50-m minimum separation distance from other aquatic protected species

4. Potential Effect: Entanglement or Entrapment of Protected Species

Entrapment in Moon Pool

A vessel containing a moon pool will be utilized to deploy the ROV for ocean bottom node placement and retrieval. To reduce the likelihood of entrapment of a protected species in the moon pool, the following mitigation measures will be implemented:

- When no activity is occurring within the moon pool, attempt to keep hull doors (if present) closed unless the safety of crew or vessel require otherwise.
- Moon pool will be regularly monitored when open to water column and vessel is not underway
- Moon pool will additionally be monitored prior to closure of hull door, movement of vessel, and during ROV deployment.

Entanglement in Slack Lines (e.g. flexible lines or rope)

If operations require the use of flexible, small diameter (< 2 inch) lines to support operations (with or without divers), the slack in the lines will be reduced to the extent practicable to prevent accidental entanglement of entanglement of protected species.

- Tensioning tools and/or other appropriate procedures will be used to reduce unnecessary looseness in the lines and/or potential looping.
- The lines must remain taut, as long as additional safety risks are not created by this action.

5. Potential Effect: Transit across Bryde's whale area

No vessel transit is planned across the Bryde's whale area while conducting the proposed seismic acquisition survey. Should this change, BOEM/BSEE will be notified at least 15-days prior to any vessel route changes that require transit of the Bryde's Whale area. The transit will not occur without prior approval from BOEM/BSEE

6. Potential Effect: Marine Trash and Debris effects to protected species

To mitigate any potential effects resulting from marine trash and debris, the protocols described in Appendix B of the 2020 Biological Opinion and in BSEE NTL 2015-G03 will be implemented. These protocols include:

- Posting marine trash and debris placards on survey vessels
- Providing crew members with marine trash and debris awareness training.

BOEM-0327 ATTACHMENT 4

SECTION D PROPRIETARY INFORMATION ATTACHMENT

Chevron U.S.A., Inc

Jack OBN 2023

1. **Attach detailed narrative and description of the energy sources and receiving array**

Receivers

The 3D seismic data will be acquired using Ocean Bottom Node receivers from MagSeis Fairfield. The ZXPLR unit dimensions (length x width x height) are 386mm diameter by 152 mm. The units weigh 23.5 kg in air, and 11.8 kg in water. The ZXPLR units record 4 component seismic data including a hydrophone and 3 geophones.

All OBN units will be carefully deployed and retrieved by ROV aboard a single OBN handling vessel, mitigating any potential disturbance of the sea bottom. No equipment is dropped from the surface. The positions of the OBN units will be determined at the time of deployment/retrieval using a combination of inertial location on the ROV and USBL acoustic positioning to achieve high accuracy.

There are planned to be 2283 OBN units placed on the seabed within a central OBN station area at 346m x 346m spacing. The full-density OBN station area is approximately 10 OCS blocks. An additional 276 sparse OBN stations will be deployed outside the full-density area over an additional radial extent round the full-density OBN station area, at a spacing of 1,072 x 914 m, for a total of 2,283 total OBN stations.

No ballasts or anchors will be left behind at the seabed after retrieval of the OBN units.

Sources

The 3D OBN seismic data will be acquired using air gun sources. The source points will be acquired using 2 source vessels, each vessel with 2 source arrays for a total of 4 source arrays. The arrays on each vessel likely be actuated in an alternating “flip-flop” sequence between port and starboard arrays. The two vessels will operate independently with the largest separation possible within the operational constraints will be always maintained between the source vessels.

Source point spacing is variable in 2 distinct zones. The full-density source spacing is 40m x 50m. In the sparse source area, only every 4rd sail line will be acquired, resulting in an approximate source spacing of 40m x 200m.

The total area of the source points is approximately 66.52 OCS blocks. The volume of each source array will be 5,220 cubic inches. Each source array will be composed of 3 sub-arrays. All the mitigation measures required by BOEM NTL 2016-G02 and BOEM NTL JOINT 2012-G02, will be followed.

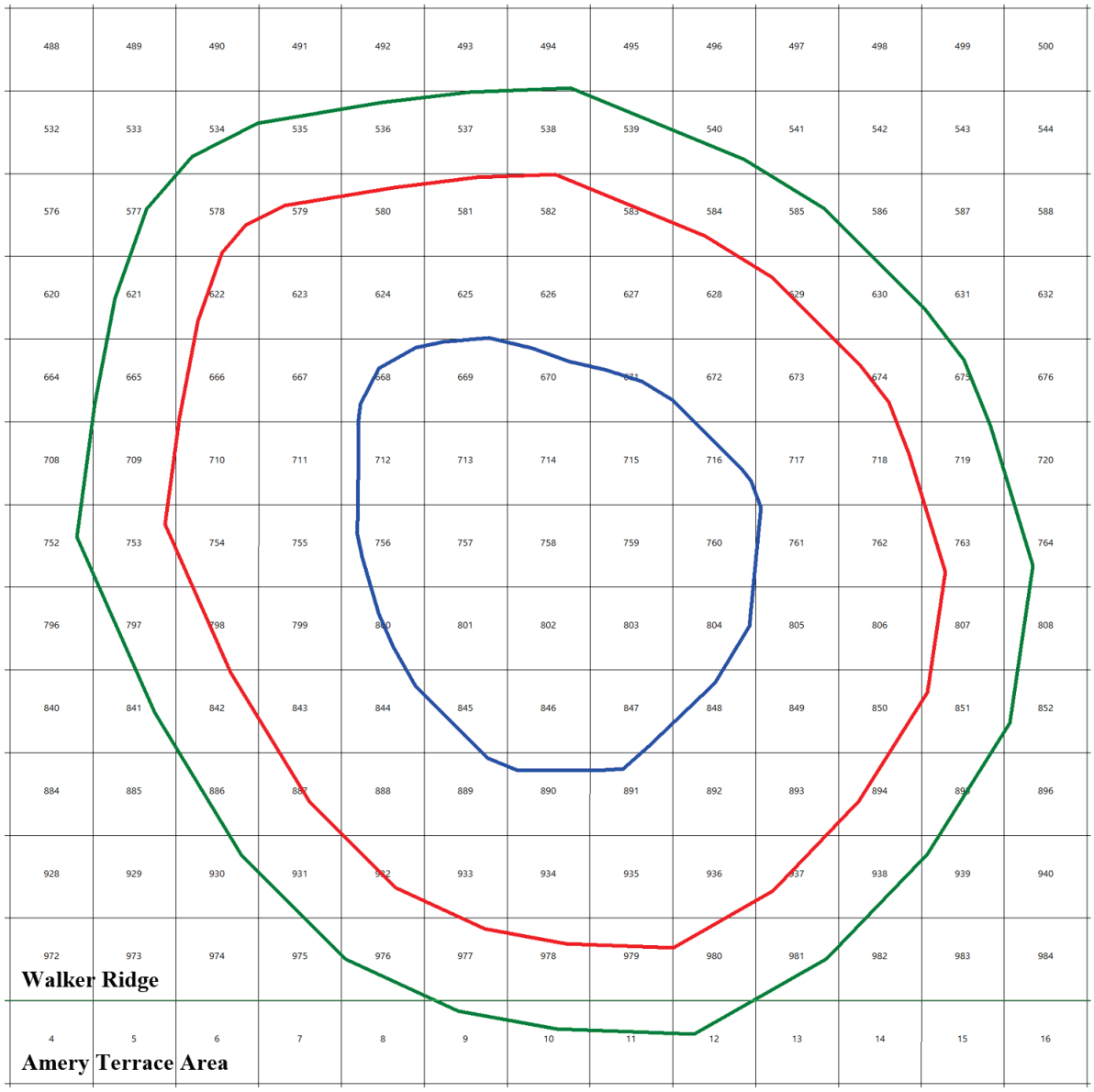
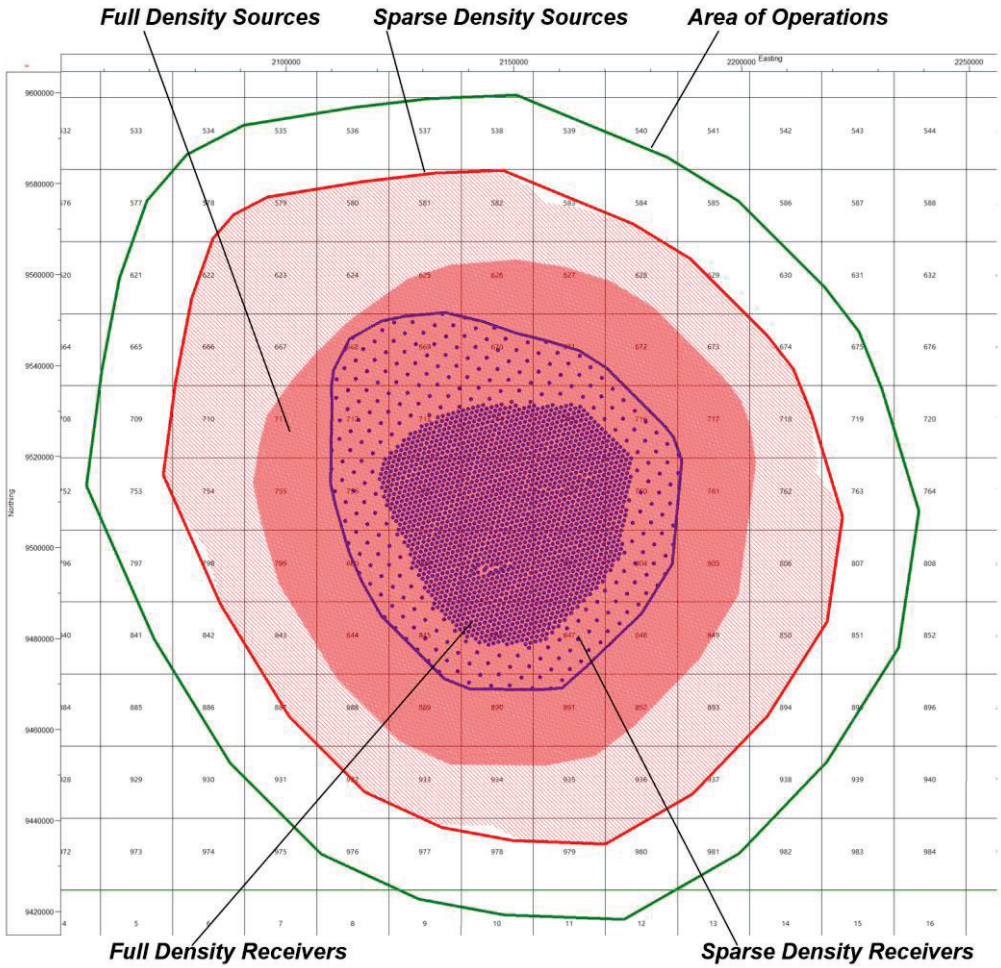


Figure Above: Blue polygon is the receiver area. Red polygon is source area. Green polygon is Area of Operations for maneuverability. The survey area is within Walker Ridge and the operational area slightly goes over the Amery Terrace area.



Source and receiver extent diagram – illustrating the sparse and full-density shot areas.

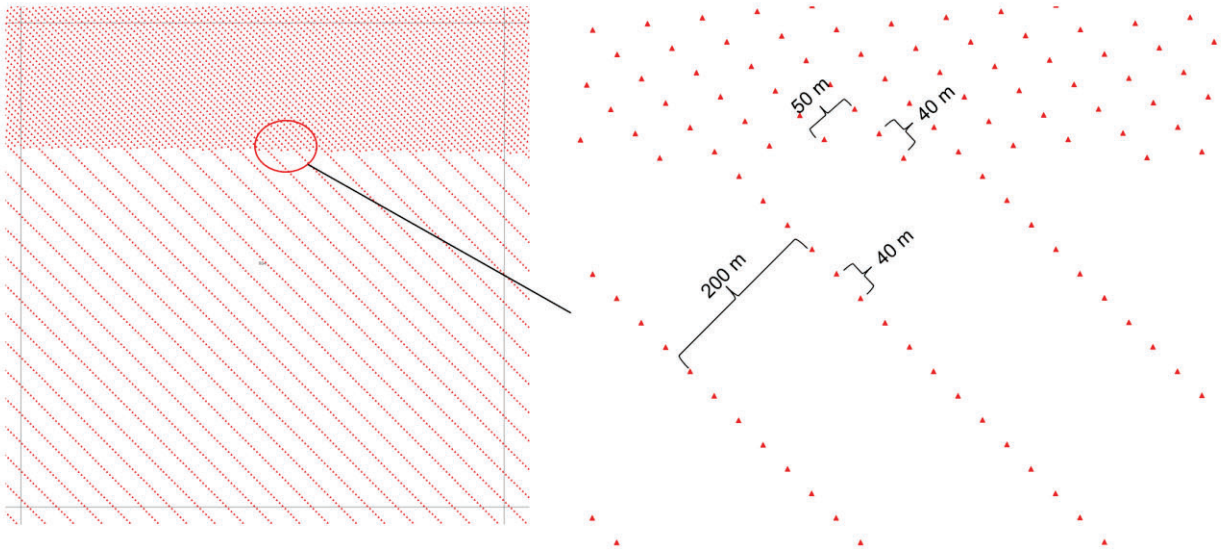
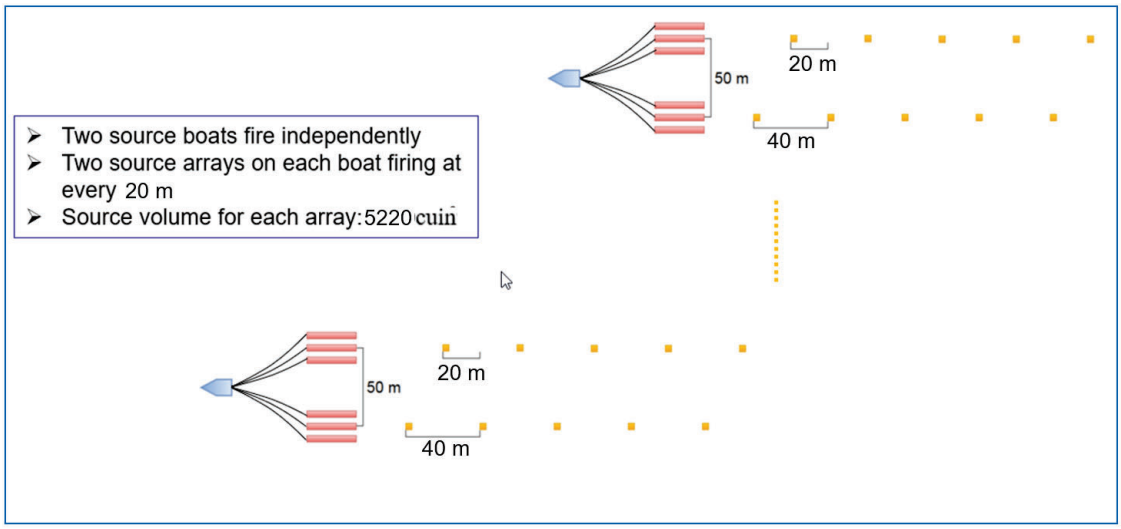
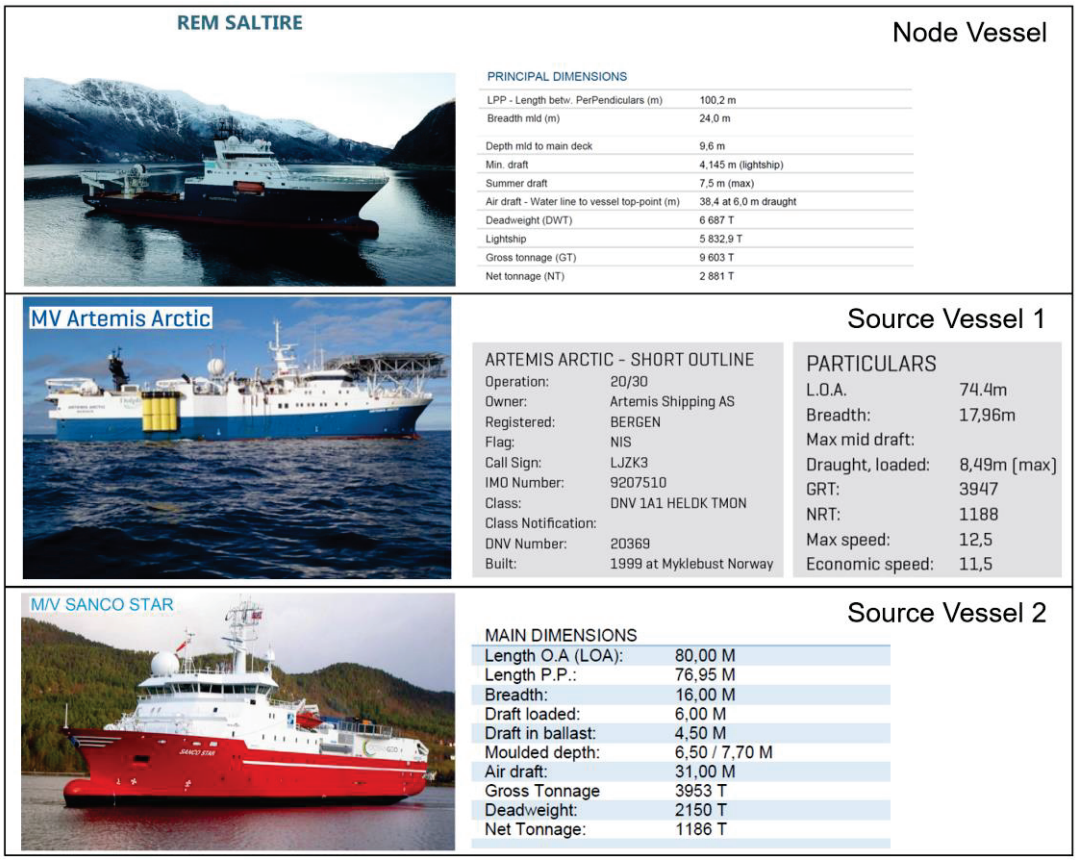


Figure Above: Zoom in of representative source locations, 40 m x 50 m grid and the sparse 40m x 200 m.

2. **Attach a map view diagram/schematic that illustrates vessel(s) source and receiver(s)configuration. Label each vessel indicating its function and include the dimensions of streamer(s), tow fish, etc. Indicate the number of chase and alternate vessels to be used.**



Current assessment of OBN and source Vessels are shown below.



3. **List each energy source to be used (e.g., airgun, airgun array(s), sparker, towed dipole, side scan sonar, sub bottom profiler, etc.).**

    a. **Indicate the source's manufacturer, model, Source Level (SL) in dB re 1µPa @1m in water (RMS) and if applicable, Source Level (SL) in dB re 1µPa @1m in water (Peak to Peak) and ping rate. If the manufacturer does not provide a peak to peak level (many side scan sonars, etc.), please enter N/A. Additionally, provide the operational frequency ranges.**

Energy Source	**Manufacturer**	**Model**	**Total Array Volume & Number of Elements** (cubic inches or Liters.)	**Source Level (SL) in dB re 1µPa@1m in water** (RMS)	**Source Level (SL) in dB re 1µPa@1m in water** (Peak to Peak)	**Operating Frequency** (Hz, kHz, range)	**Pulse Duration** (seconds, milli-seconds)	**Pulse Rate (or Cycle)** (Pulses per second or minute)	**Towing Depth of the Source** (ft or m)	**Towing Depth of the Receiver(s)** (ft or m)	**Duration of Use** (Number of Days or Percent of Active Sound Source Days)
*Air Gun array previously used by CVX	Bolt	1900LLXT	5220 cu in 42 elements	241	267	6-70Hz	200 ms	10.8 pulses/sec for 4.5 knot Vessel speed	12 m	Not applicable to OBN	60 150 days of shooting

Table above: Detailed source information.

ZXPLR™

Typical Node Specifications

Seismic Data Channels: 4

ADC Resolution: 24 bits

Sample Interval: 0.5, 1, 2, 4 ms

Preamplifier Gain

0 dB to 36 dB in 6 dB steps

Anti-Alias Filter

206.5 Hz (82.6% of Nyquist) @ 2 ms, Linear Phase

DC Blocking Filter

1 Hz to 60 Hz, 6 dB/Octave, or OUT

Operating Temperature Range

-10˚C to +60˚C

Operating Life (100% Charge)

100 days (2400hours) @ 2 ms acquisition

Acquisition Channel

(2 ms sample interval, 25°C, 31.25 Hz, internal test, unless otherwise indicated)

Total Harmonic Distortion
0.0003% @ 12 dB gain, -3 dB Full Scale

Equivalent Input Noise
1.0 µVrms @ 0 dB
0.4 µVrms @ 12 dB
0.3 µVrms @ 24 dB
0.3 µVrms @ 36 dB

Full Scale Input Signal
2500 mV peak @ 0 dB
625 mV peak @ 12 dB
156 mV peak @ 24 dB
39 mV peak @ 36 dB

Gain Accuracy: 0.50%*

Dynamic Range
120 dB @ 0 dB Preamplifier Gain

Crossfeed
<-100 dB Geophone Channels
<-80 dB Hydrophone Channel**

Common Mode Rejection Ratio
>+90 dB Geophone Channels
>+40 dB Hydrophone Channel**

DC Offset
<10% of Input Noise with DC Blocking Filter IN

Timing Accuracy
<±1 ms – corrected post-acquisition

Self Test Features

Internal Noise (preamp input terminated)
Internal THD
Internal Gain Accuracy
Internal CMRR
Internal Crossfeed
Internal Impulse
Sensor Impedance
Sensor Impulse
TBD

Sensors

Geophone
3 orthogonal, omni directional,
15 Hz @ -3 dB, 70% damped
1.76 V/in/s (69.3 V/m/s)

Hydrophone
3.4 Hz @ -3 dB, 8.9 V/Bar

Orientation
±1.5° tilt indication
±5° azimuth (at latitudes within ±50° of the Equator)

Pressure: TBD

Physical

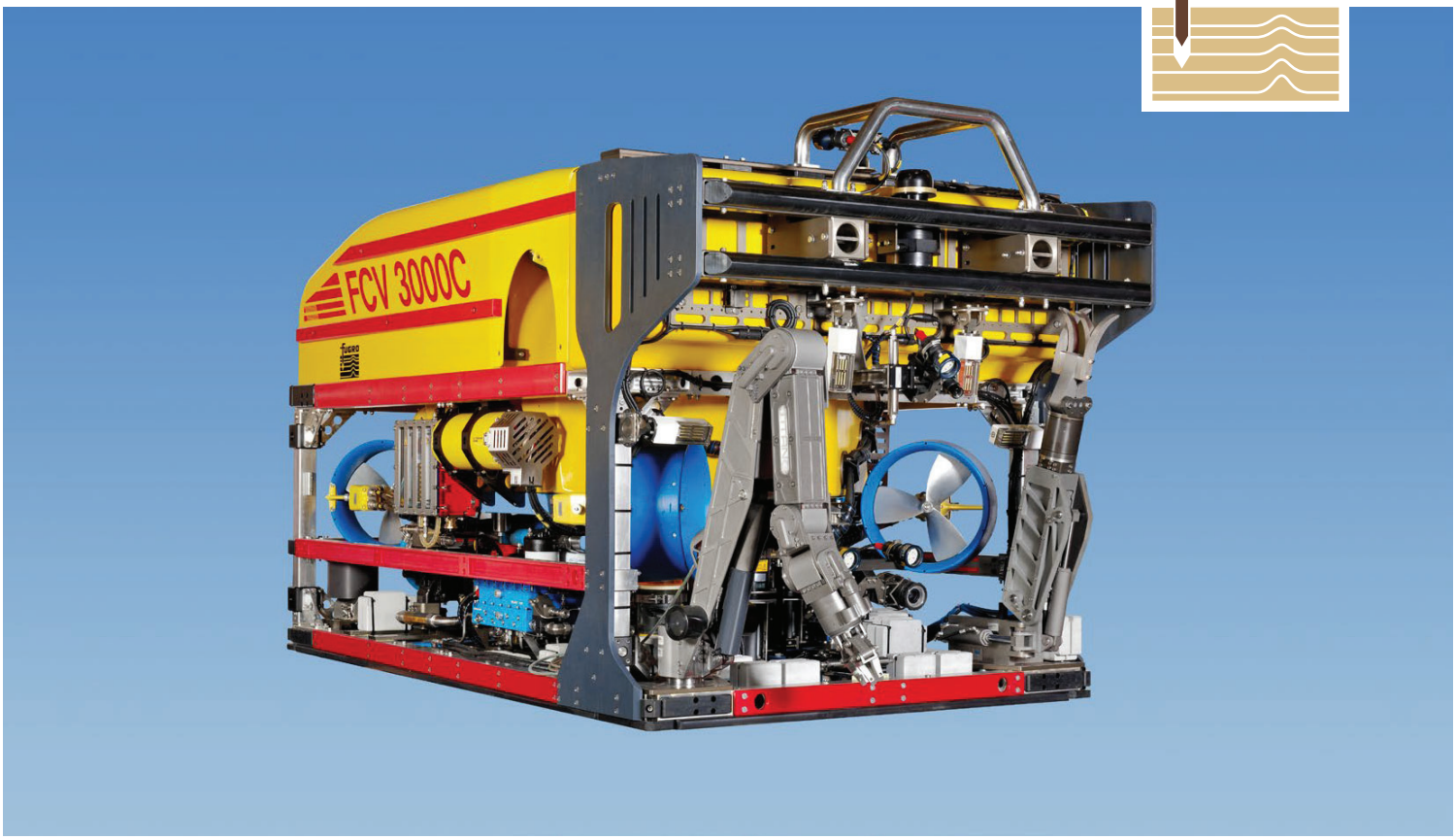
Weight: 48 lb (21.8 kg) in air,
24 lb (10.9 kg) in water

Dimensions: 15.1 in (38.35 cm) diameter by 5.9 in (14.99 cm) high

Operating Depth: 4000 m

* Does not include high-impedance low-cut filter for directly coupled hydrophone interface
** Channel includes high-impedance low-cut filter for directly coupled hydrophone interface
All specifications relate to Node Part Number 221.8600.0001 only. Fairfield Geotechnologies reserves the right to change specifications without notice to provide the best possible product.

Drawing Number 601.6021.0001 Rev. – ZXPLR Remote Unit Specifications Sheet July 2017



FUGRO
FCV® 3000 (150HP)

The FCV 3000 is designed and built in-house by Fugro and offers the next generation of performance and capability to our world-wide customer base. The FCV 3000 reflects the Fugro commitment to Remote Technology Solutions and incorporates a range of internally developed expertise to help us deliver information from collected data, faster, better and with enhanced accuracy.

Over the years Fugro has developed a wide range of innovative technology and solutions to better address our customers' needs, so it is logical that when we turn our attention to the objectives of our ROV Business Line, we build the new generation of capability on a stable platform of field proven components and include our own particular brand of innovation.

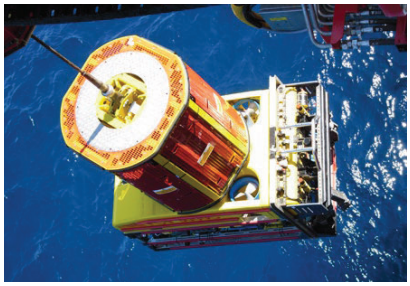
Key capabilities that are incorporated into the FCV 3000 is designed to improve the efficiency of the operations and address the need to provide greater spatial awareness to the Operations Team.

Together with its console installed Simulator the FCV 3000 offers:

- Real time visualisation of the local subsea environment – helicopter view
- Mission rehearsal tools – Simulation and Planning
- Semi autonomous functionality
- 3 Dimensional Dynamic Positioning
- Pilot Training whilst ROV is on deck

In addition to its ability to carry a full instrumentation package, the FCV 3000 has class leading mechanical / hydraulic tooling interfaces that include:

- Mechanical Interface: Fugro proprietary 4-point
- Through Frame Lift: 3,000 Kg at 3 g
- Tooling: up to 217 LPM @ 210 bar
- IHPU: 70 LPM @ 225 bar
- Bi-directional Solenoid: 15 Solenoid Valves
- Servo Valves: 8, being 7 Thruster + 1 spare
- Remote Control IVP : (Optional)
- High Flow IVP: (Optional)
- Skid Contol IVP: 10 x NG3 + 1 x NG6



FCV 3000 (150HP) being launched.

Like its in-house built predecessors, the FCV 3000 is part of an evolving system design that provides the customers with all of the essential demands of the deep water ROV System such as a 3.2 knot forward speed delivery by its 150 Hp hydraulic power system and high power vectored thrust design. This base level of standard capability, combined with the industry leading Sonar, Camera and Manipulator Systems of the 3,000 msw rated FCV 3000 will immediately allow the unit to be recognised as a market leading solution to the rigours of deep water intervention and support.

At the heart of the FCV 3000 is Fugro's proven control & communications system based on single-mode fibre-optic technology including Fugro's own design / build SMFO multiplexer, giving an exceptionally high data throughout and features switching in the event of failure of a fibre. The high end multiplexer handles up to 3 HD cameras and 12 conventional cameras (8 simultaneously) and provides a wide range of data communications protocols facilitating efficient integration of add-on tools and sensors.
The data highway of the FCV 3000 can cater for up to 20GB, which is sufficient to run the ROV, the TMS, 3 x HD cameras, full survey data suite including dual MBES (such as Reson 7125) and still have sufficient headroom to allow a range of other specialist sensors to be operated simultaneously.

FCV® 3000 (150HP)

Technical Specifications

Dimensions

Length	3.3 m
Height	1.7 m (excl TMS)
Width	1.7 m (excl TMS)
Weight	4.1 Te (incl 400 Kg payload)

Power

Motor	1 x 2850 VAC @ 112 kW (150 Hp)
Hydraulic Pump Flow	217 LPM +70 LPM @ 60 Hz
Hydraulic Pump Pressure	225 bar (main)
Single Phase Electric Supply	10 KVA , 24 VDC & 115 VAC
Tooling	up to 217 LPM @ 60 Hz

Speed

Forward / Aft	3.2 knots
Lateral	2.4 knots
Vertical up / down	2.4 knots

Thrusters

4 x 15" vectored Horizontal	Fwd/Lateral: 806 Kgf
3 x 15" vectored	Vertical: 826 Kgf

Sensors

Heading	FOG / OCTANS
Pitch and Roll	FOG / OCTANS
Depth	Digiquartz 8CB4000-I
Altimeter	Simrad 1007 Digital Altimeter
Sonar	Simrad MS1071 6000 m digital
Cameras	12 x SD Cameras, 8 at any one time
	3 x HD Cameras (Optional)
Data	RS232, RS485 TTL Ethernet and Gb Ethernet
Lighting	8 x 110 VAC 600W Dimmable lights
	2 x 24 VDC Dimmable LED lights

Manipulators

Manipulator 1	Schilling TITAN 4
Manipulator 2	Schilling RigMaster

Control System

Vehicle Control	Fugro Proprietary ERA-004
FO Multiplexer	Fugro Proprietary SM 20GBit Bandwidth
Survey Module	Fugro Proprietary StarPort

Tooling

Mechanical Interface	Fugro Proprietary – 4 point
Through Frame Lift	3,000 Kg
Tooling IHPU	70 LPM @ 210 bar
Bi-Directional Solenoid	15 x Solenoid Valves
Servo Valves	8, being 7 Thruster + 1 spare
Mini IVP	Optional
High Flow IVP	Optional
Skid Control IVP	10 x NG3 + 1NG6 (proportional)

Power Requirements

System (typical)	350 KVA, 380-500 VAC 3-ph supply 50/60 Hz. 60 Hz for optimum performance

Main Lifting Umbilical

37 mm Ø double armoured
Optimised design with single mode fibres in robust steel tube

TMS

Type	Top Hat , PSSL Type 4, 11 Te SWL
Tether	600 m of 30 mm diameter tether
Dimensions	1.8 m (Dia) x 2.0 m (H)
Weight: In Air/Water	2.5 Te / 1.5 Te (inc 600 m tether) / Submerged

Full array report with directivity

Technical Overview

The following report was compiled using the Gundalf source array modelling program.

Gundalf has been calibrated for all modern airgun types including the latest environmental e300 and e500 sources, long-life guns, G guns, and sleeve guns both singly and in clusters. Gundalf users can access calibration information directly within the product in a variety of environments. Gundalf calibration is revisited periodically whenever new data becomes available. The current calibration epoch is given in the header of this report. For more information

From 2022 it can optionally model a growing number of alternative types, including some sparkers, boomers and marine vibrators.

Array Summary

The following table includes error bounds for the primary characteristics of the source signature where relevant: peak to peak, primary to bubble and bubble period. Error bounds for airguns are derived during calibration where possible, a time-consuming process involving optimally matching the model to many near- and far-field measurements of different quality, bandwidth and provenance, for both single and clustered airguns. Error bounds are not normally available for other source types modelled by Gundalf. For more on this, see the Modelling Notes at the end of this report and also the online help for calibration in Gundalf itself.

Note that it is important to state the conditions under which the RMS is computed since it depends directly on the length of the window used. Here an energy criterion determines the length when less than the full window must be used, specified as a precentage of the energy in the full window as is the case with drop-out computations. The energy window used is indicated in the table.

Note also that some of these parameters, most obviously the peak measurements will depend on the maximum model bandwidth, which is shown for reference. In addition some parameters for example those associated with bubbles are difficult to define for some source types

Where given, the error bounds shown in the table represent 95% confidence intervals for the Gundalf model against its calibration data.

Number of guns	42 (5220.00 cu.in., 85.54 litres)
Peak to peak in bar-m.	132.8 +/- 1.6 (13.28 +/- 0.2 MPa, 262 dB re 1muPa. at 1m.)
Zero to peak in bar-m.	59.5 (5.95 MPa, 255 dB re 1muPa. at 1m.)
RMS pressure in bar-m. (full window)	9.65 (0.965 MPa, 240 dB re 1muPa. at 1m.)
Primary to bubble (calculated zero to peak)	5.5 +/- 5.4
Bubble period (s.)	0.048 +/- 0.022
Maximum spectral ripple (dB)	51 (6 - 70 Hz.)
Maximum spectral value (dB)	221 (6 - 70 Hz.)
Average spectral value (dB)	214 (6 - 70 Hz.)
Total acoustic energy (Joules)	813746.5
Total acoustic efficiency (%)	68.9
Maximum model bandwidth (Hz)	0-1024

Array geometry

The following table lists all the guns modelled in the array along with their characteristics. Please note the following:-

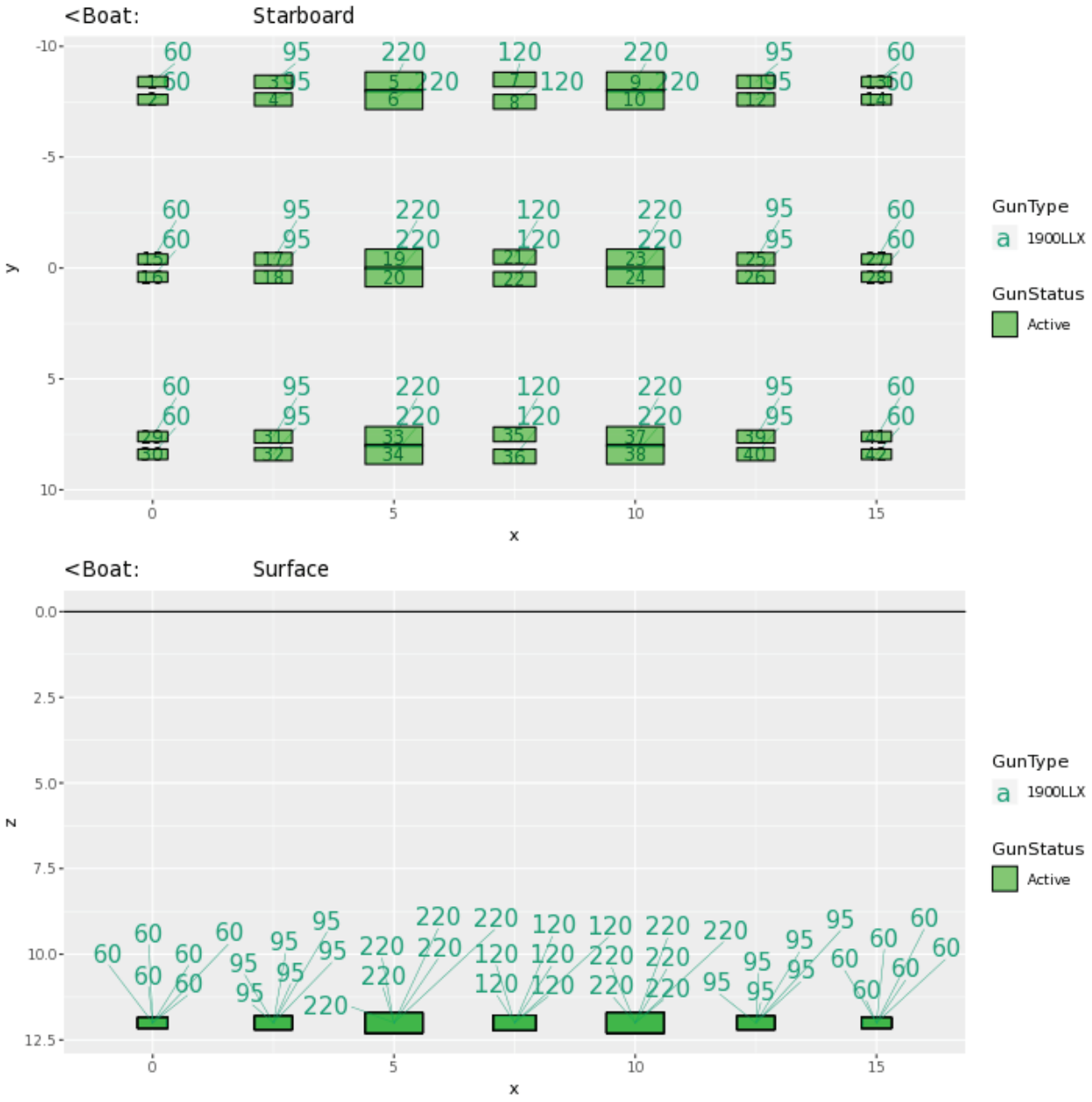
- The peak to peak varies only as the cube root of the volume for the same gun type so that even small guns contribute significantly. This is particularly relevant to drop-out analysis.
- The peak to peak can also be depressed due to clustering effects as reported long ago by Strandenes and Vaage (1992), "Signatures from clustered airguns", First Break, 10(8).

Gun number	Press. (psi)	Volume (cu.in)	Gun Type	x (m.)	y (m.)	z (m.)	Delay (s.)	Sub-array number	Peak to peak contrib. (percent)	Max. bub. rad (m.)
1	2000.00	60.00	1900LLX	0.000	-8.400	12.000	0.0000	1	2.3	0.3
2	2000.00	60.00	1900LLX	0.000	-7.600	12.000	0.0000	1	2.2	0.3
3	2000.00	95.00	1900LLX	2.500	-8.400	12.000	0.0000	1	2.3	0.3
4	2000.00	95.00	1900LLX	2.500	-7.600	12.000	0.0000	1	2.3	0.3
5	2000.00	220.00	1900LLX	5.000	-8.400	12.000	0.0000	1	2.8	0.4
6	2000.00	220.00	1900LLX	5.000	-7.600	12.000	0.0000	1	2.7	0.4
7	2000.00	120.00	1900LLX	7.500	-8.500	12.000	0.0000	1	2.4	0.3
8	2000.00	120.00	1900LLX	7.500	-7.500	12.000	0.0000	1	2.4	0.3
9	2000.00	220.00	1900LLX	10.000	-8.400	12.000	0.0000	1	2.8	0.4
10	2000.00	220.00	1900LLX	10.000	-7.600	12.000	0.0000	1	2.7	0.4
11	2000.00	95.00	1900LLX	12.500	-8.400	12.000	0.0000	1	2.3	0.3
12	2000.00	95.00	1900LLX	12.500	-7.600	12.000	0.0000	1	2.3	0.3
13	2000.00	60.00	1900LLX	15.000	-8.400	12.000	0.0000	1	2.3	0.3
14	2000.00	60.00	1900LLX	15.000	-7.600	12.000	0.0000	1	2.2	0.3
15	2000.00	60.00	1900LLX	0.000	-0.400	12.000	0.0000	2	2.2	0.3
16	2000.00	60.00	1900LLX	0.000	0.400	12.000	0.0000	2	2.2	0.3
17	2000.00	95.00	1900LLX	2.500	-0.400	12.000	0.0000	2	2.2	0.3
18	2000.00	95.00	1900LLX	2.500	0.400	12.000	0.0000	2	2.2	0.3
19	2000.00	220.00	1900LLX	5.000	-0.400	12.000	0.0000	2	2.6	0.4
20	2000.00	220.00	1900LLX	5.000	0.400	12.000	0.0000	2	2.6	0.4
21	2000.00	120.00	1900LLX	7.500	-0.500	12.000	0.0000	2	2.3	0.3
22	2000.00	120.00	1900LLX	7.500	0.500	12.000	0.0000	2	2.3	0.3
23	2000.00	220.00	1900LLX	10.000	-0.400	12.000	0.0000	2	2.6	0.4
24	2000.00	220.00	1900LLX	10.000	0.400	12.000	0.0000	2	2.6	0.4
25	2000.00	95.00	1900LLX	12.500	-0.400	12.000	0.0000	2	2.2	0.3
26	2000.00	95.00	1900LLX	12.500	0.400	12.000	0.0000	2	2.2	0.3
27	2000.00	60.00	1900LLX	15.000	-0.400	12.000	0.0000	2	2.2	0.3
28	2000.00	60.00	1900LLX	15.000	0.400	12.000	0.0000	2	2.2	0.3
29	2000.00	60.00	1900LLX	0.000	7.600	12.000	0.0000	3	2.2	0.3
30	2000.00	60.00	1900LLX	0.000	8.400	12.000	0.0000	3	2.3	0.3
31	2000.00	95.00	1900LLX	2.500	7.600	12.000	0.0000	3	2.2	0.3
32	2000.00	95.00	1900LLX	2.500	8.400	12.000	0.0000	3	2.3	0.3
33	2000.00	220.00	1900LLX	5.000	7.600	12.000	0.0000	3	2.7	0.4
34	2000.00	220.00	1900LLX	5.000	8.400	12.000	0.0000	3	2.8	0.4
35	2000.00	120.00	1900LLX	7.500	7.500	12.000	0.0000	3	2.4	0.3
36	2000.00	120.00	1900LLX	7.500	8.500	12.000	0.0000	3	2.4	0.3
37	2000.00	220.00	1900LLX	10.000	7.600	12.000	0.0000	3	2.7	0.4
38	2000.00	220.00	1900LLX	10.000	8.400	12.000	0.0000	3	2.8	0.4

Gun number	Press. (psi)	Volume (cu.in)	Gun Type	x (m.)	y (m.)	z (m.)	Delay (s.)	Sub-array number	Peak to peak contrib. (percent)	Max. bub. rad (m.)
39	2000.00	95.00	1900LLX	12.500	7.600	12.000	0.0000	3	2.2	0.3
40	2000.00	95.00	1900LLX	12.500	8.400	12.000	0.0000	3	2.3	0.3
41	2000.00	60.00	1900LLX	15.000	7.600	12.000	0.0000	3	2.2	0.3
42	2000.00	60.00	1900LLX	15.000	8.400	12.000	0.0000	3	2.3	0.3

Array plan and side views

The plan and side views appear below. These are annotated for gun type (colour of floating text indicating volume in cuin. for airguns), gun active status (fill colour) and also gun number, matching the table above. The side view is a view from the port side towards the starboard side and shares the same x-axis as the plan view. This is annotated identically to the plan view.



Array centres

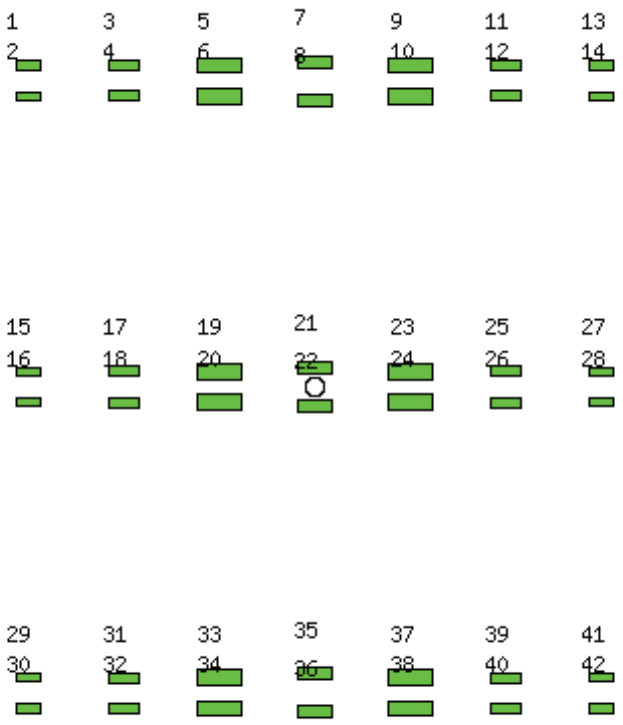
The following diagram shows the array geometric centre, the centre of pressure and the centre of energy defined as follows:-

- The array geometric centre is defined to be the arithmetic mean of the x,y,z positions for each gun (non-active guns are ignored). This is shown as a blue circle.
- The centre of pressure is defined to be the array centre when each active gun position is weighted by its contribution to the overall peak to peak pressure value. This is shown as a red circle.
- The centre of energy is computed by weighting the coordinates by the self-energy of the active gun at that position. In an interacting array this may be a long way from the centre of pressure as some guns may absorb energy giving a negative self-energy. This is shown as a black circle.

Depending on how first breaks are calculated, these can be used for first break analysis.

Dropped out guns are shown as orange rectangles whilst live guns are shown as green rectangles.

Note that Gundalf by default uses the deepest gun to define time zero for the vertical far-field and it uses the nearest gun to the observation point to define time zero if an observation point is specified. This means that if one gun is accidentally run deep, this will cause the bulk of the signature to appear to be delayed. It is still a matter of debate how an airgun array should be timed. There are several candidates as defined above but it is not currently clear which if any is appropriate in complex scenarios such as Ocean Bottom Deployment. Positions are shown as (x,y,z) colour-coded accordingly.

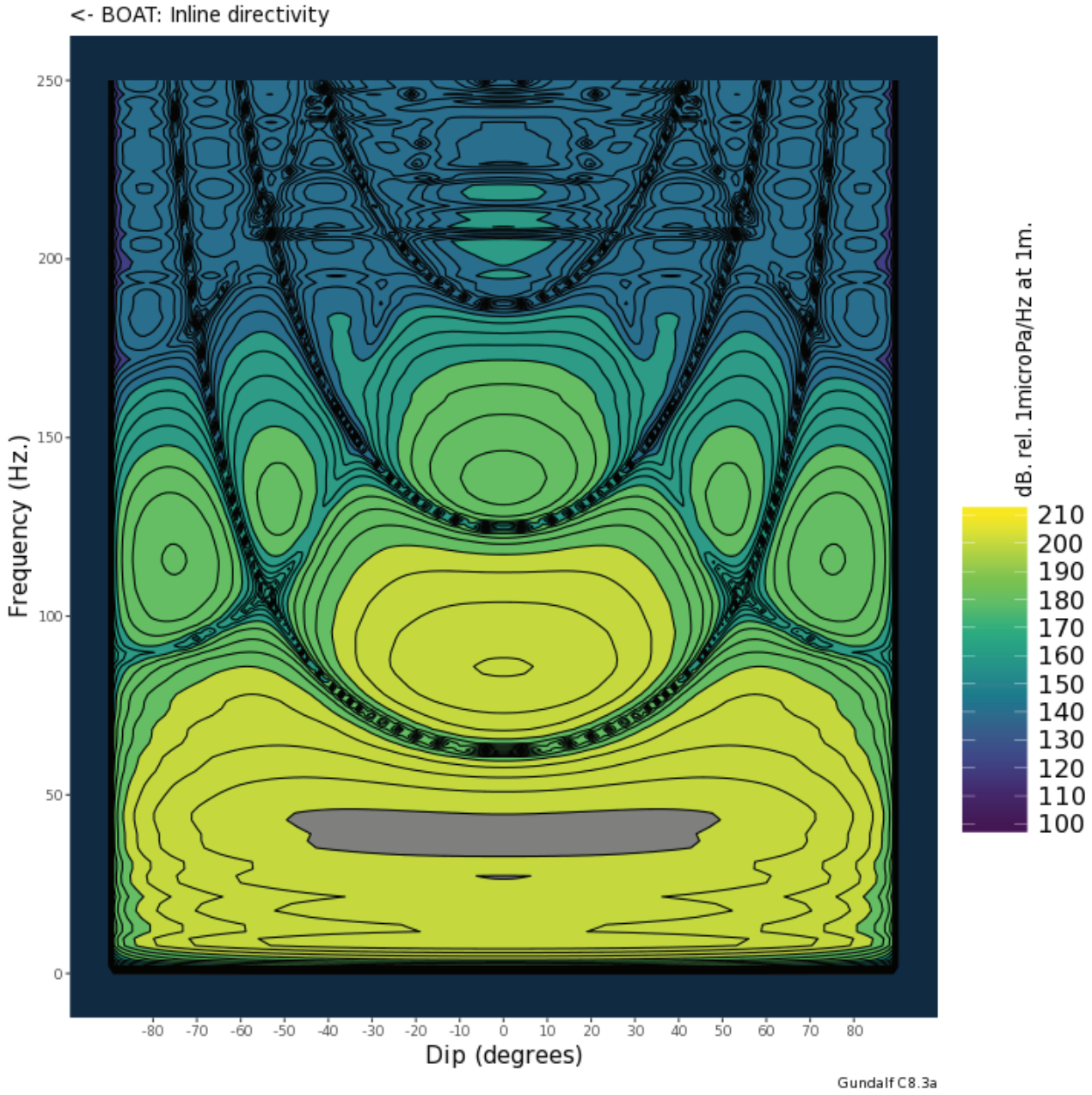


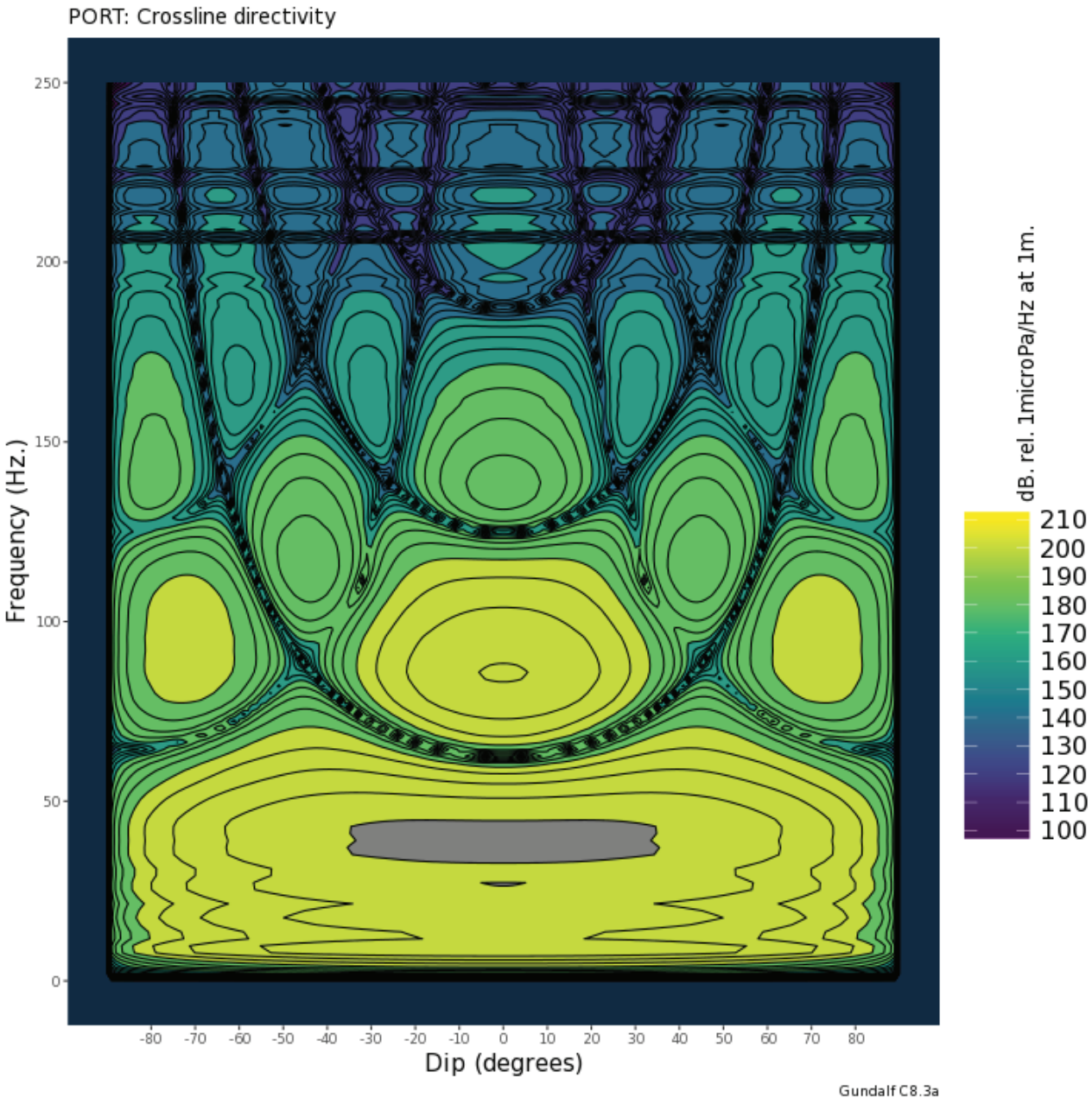
Geometric centre (m.)	Centre of pressure (m.)	Centre of energy (m.)
(7.50, 0.00, 12.00)	(7.50, 0.00, 12.00)	(7.50, 0.00, 12.00)

Array directivity

The following tables show the inline and crossline directivity of the array. These are scaled as db. relative to 1 microPa. per Hz. at 1m.The inline directivity is annotated to indicate the boat direction and the crossline directivity is annotated with 'Port' to show the correct crossline orientation.

Angle-frequency form

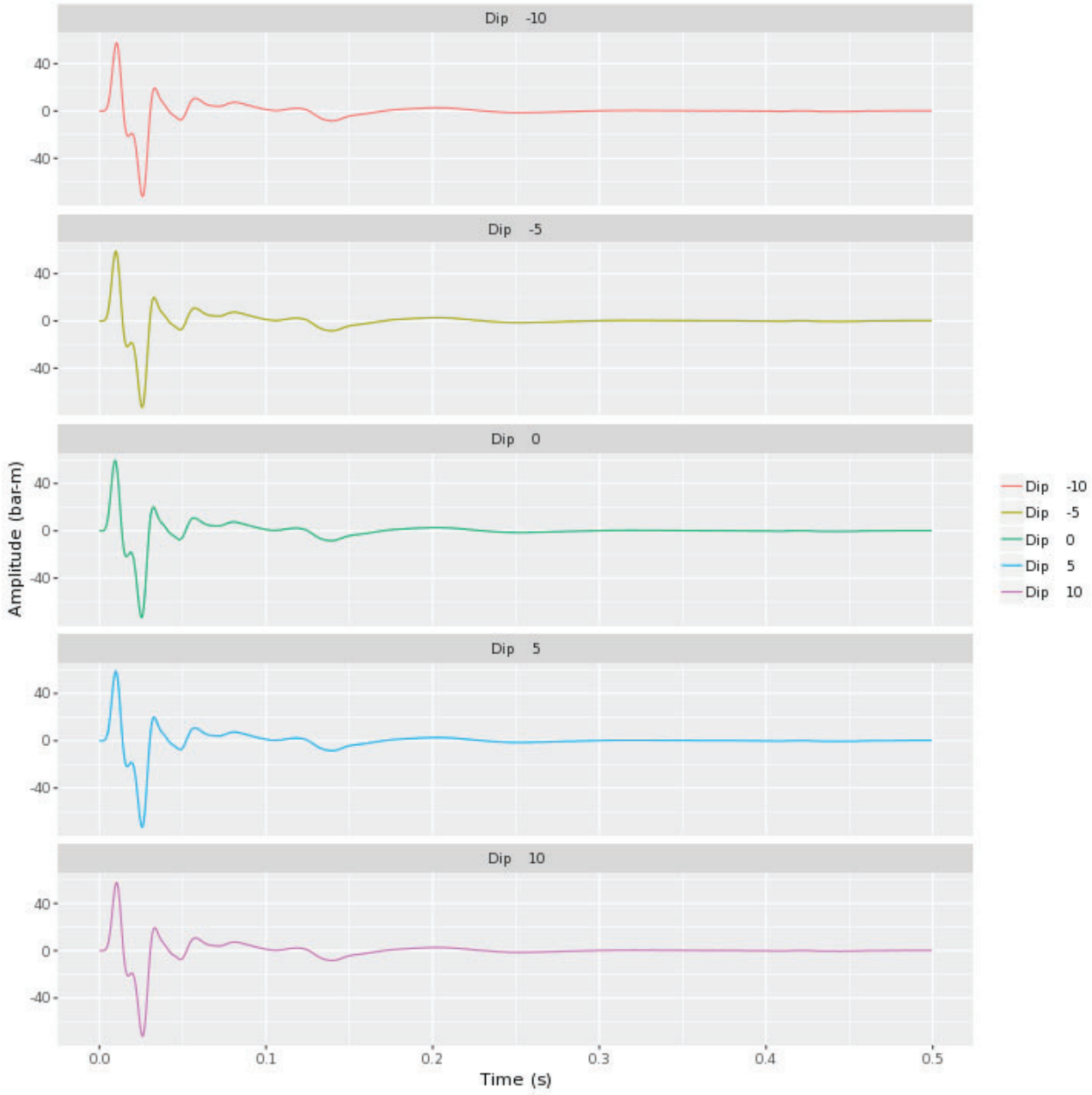




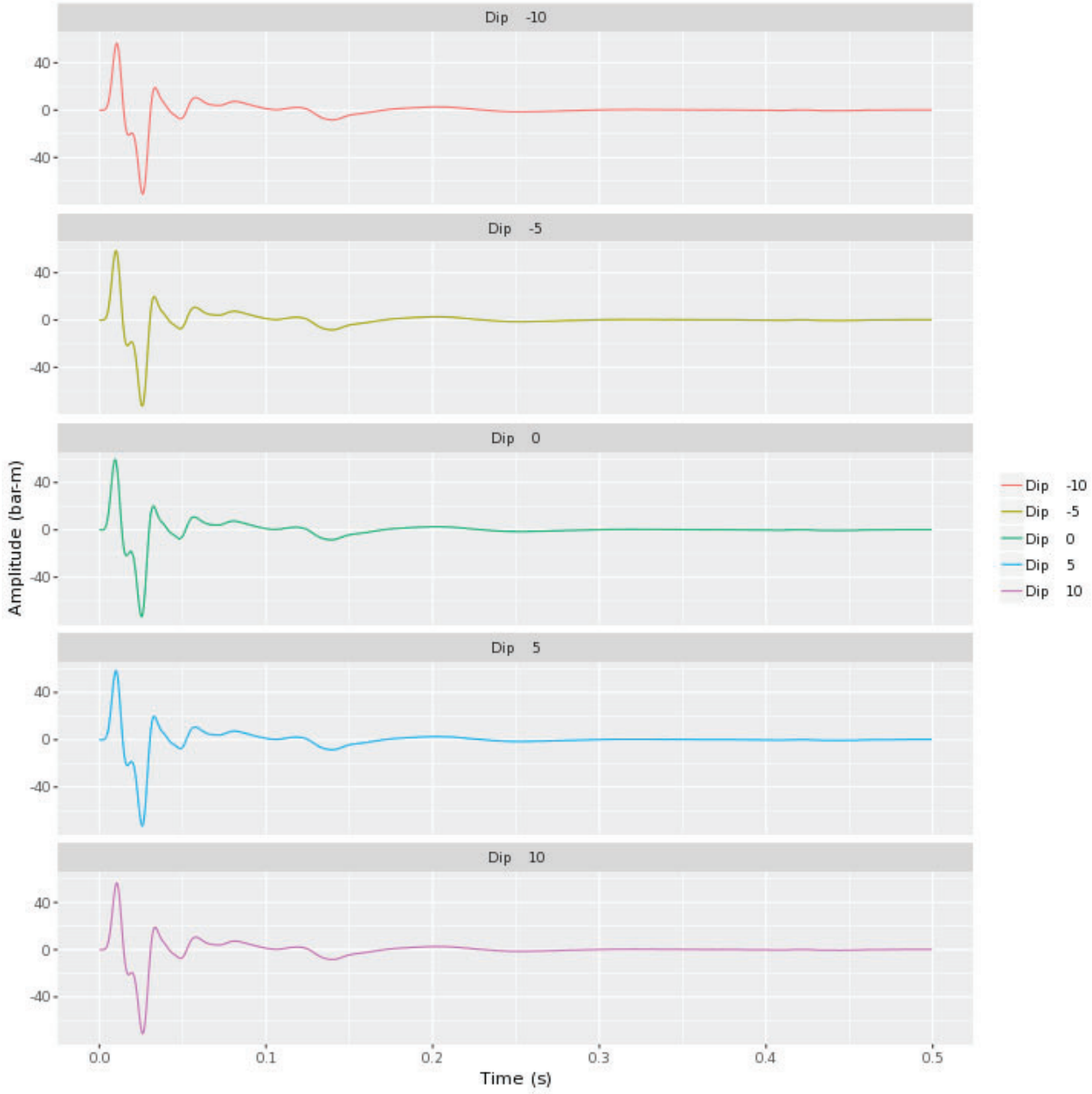
Angle-amplitude form

The following tables show the inline and crossline directivity of the array in (dip angle, amplitude) form. The computed signature (or under option the amplitude spectrum) for each angle is shown in colour varying form for each angle computed with a legend to indicate which is which. The vertical scale indicates the type of plot, time or frequency. Both types of plot are individually scaled and plotted with the same units as the corresponding plots in the Signature Characteristics section.

Inline directivity



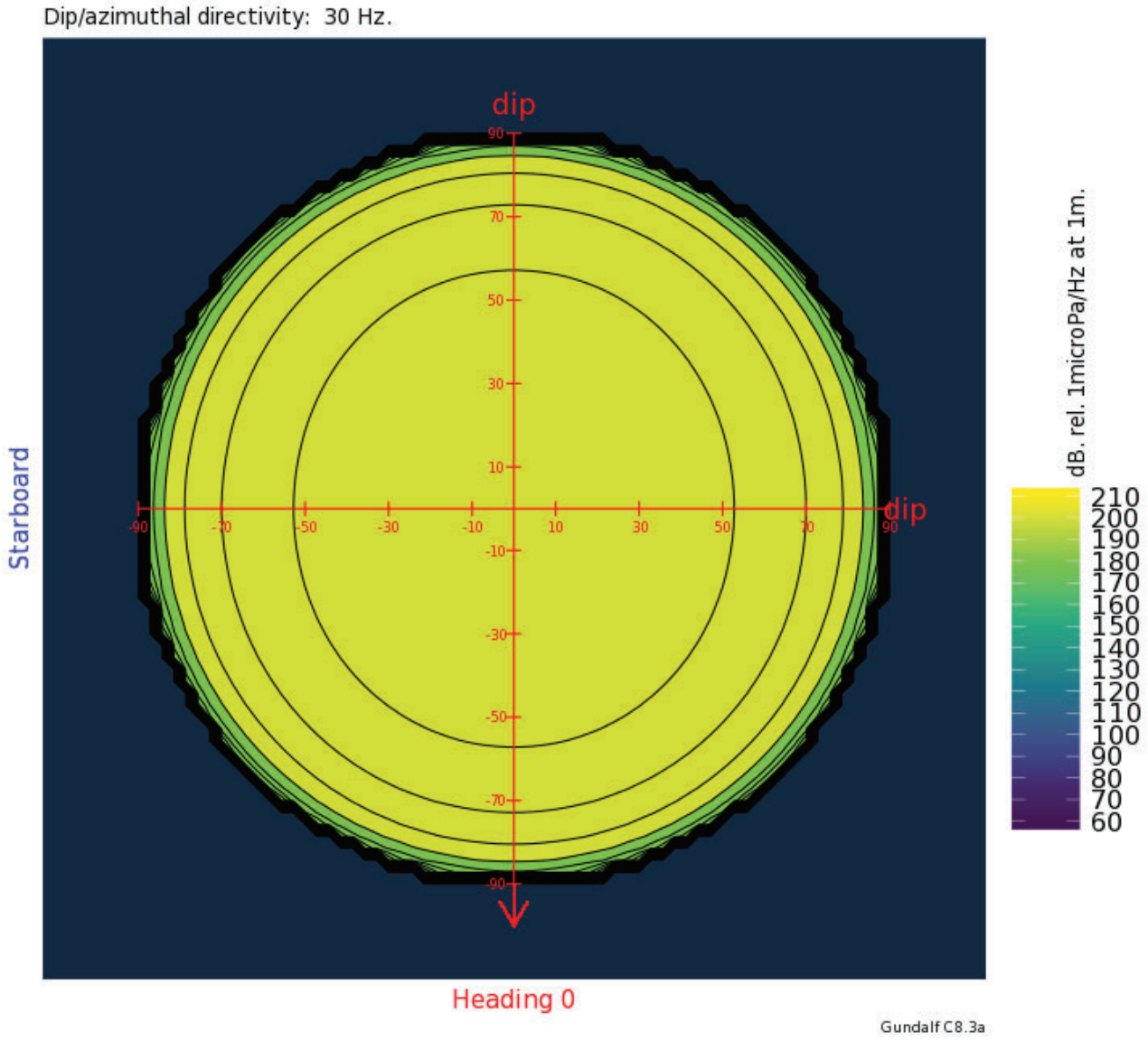
Crossline directivity



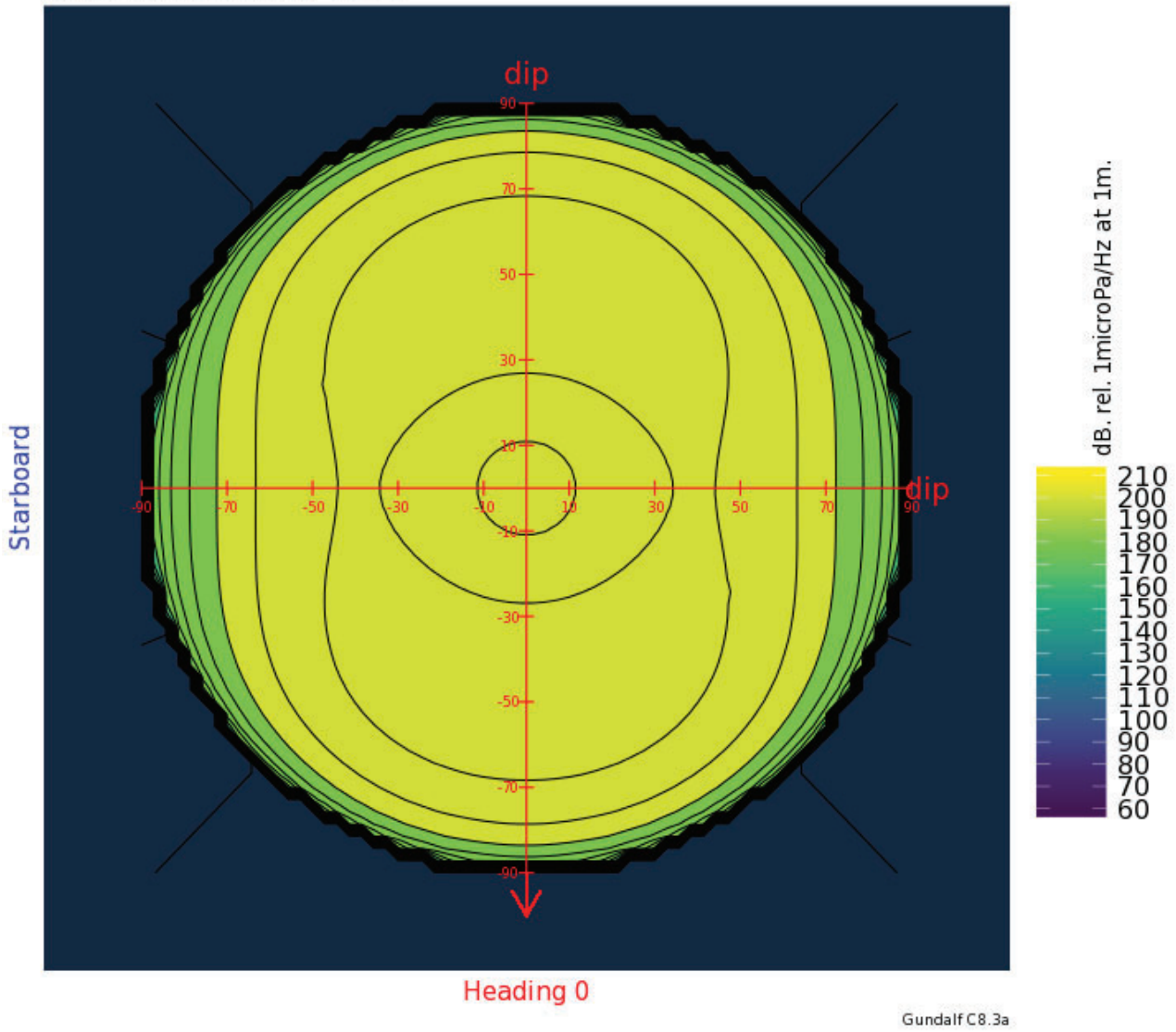
Array directivity

The following tables show the azimuthal directivity (i.e. plan view) theta-phi plots, at four user-specified frequencies. The dip, theta is the angle to the vertical so a value of zero corresponds to vertically down, (the centre of the plot). The azimuthal angle phi is measured relative to the positive x axis so the boat direction corresponds to a value of phi of 180 degrees as shown by the red arrow. The plots are scaled as dB. relative to 1 muPa. per Hz. at 1m.

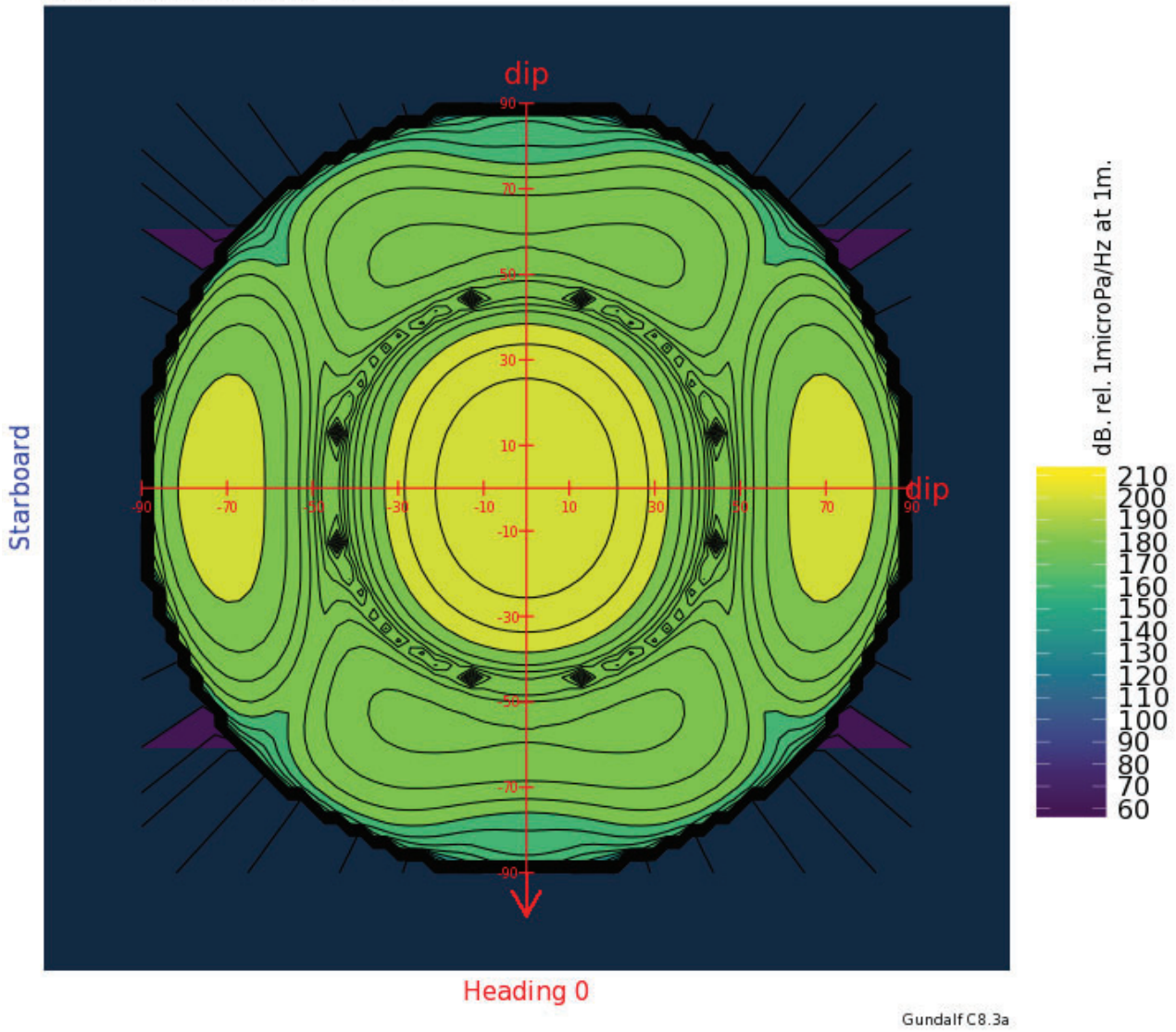
Dip-azimuthal form



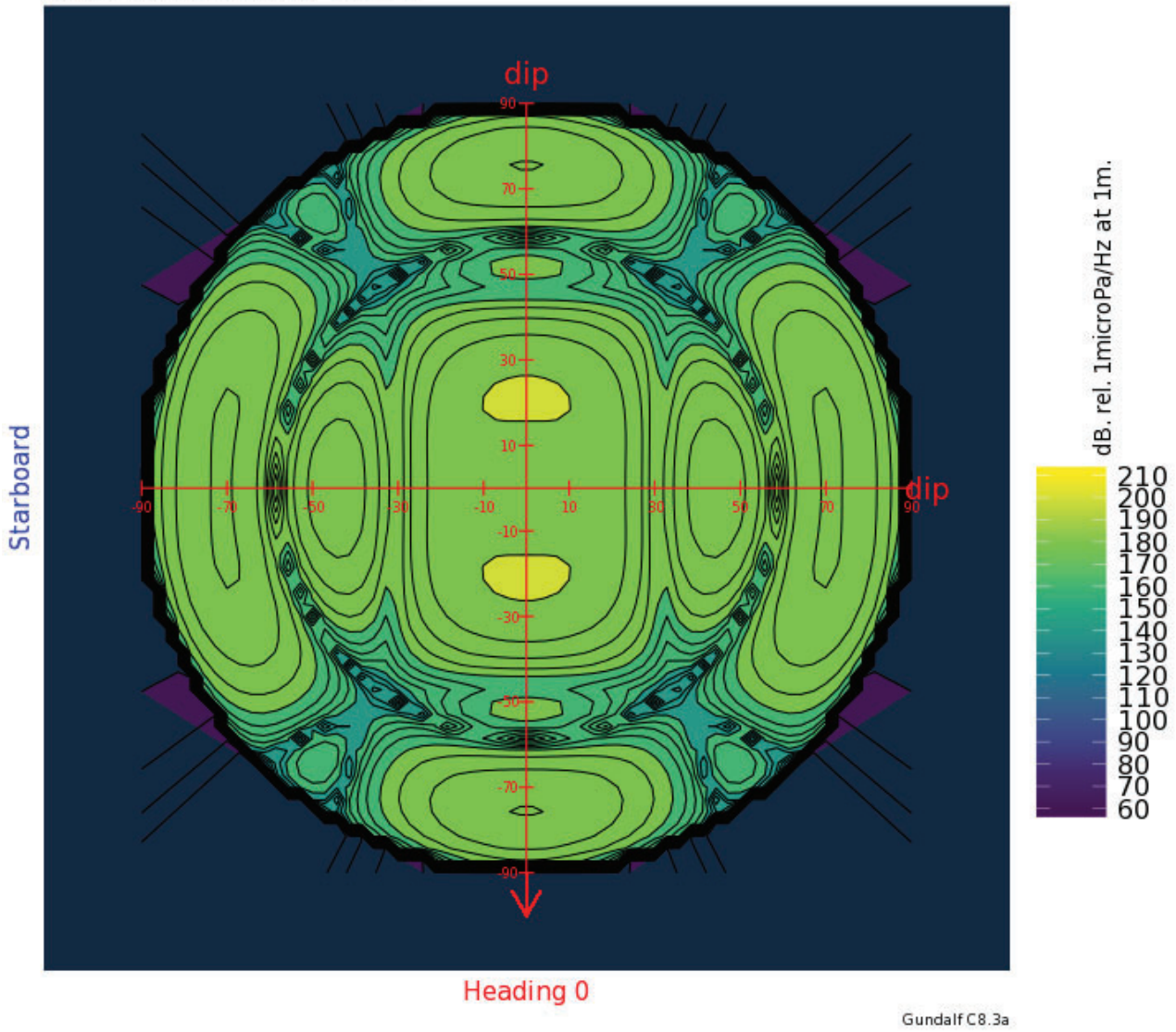
Dip/azimuthal directivity: 60 Hz.



Dip/azimuthal directivity: 90 Hz.



Dip/azimuthal directivity: 120 Hz.



Acoustic energy characteristics

The following table lists the individual gun contributions to the acoustic energy field in joules. A negative value means the gun is actually absorbing energy. This is very common in interacting arrays. It does not however mean that the gun is damaging the array performance. Rather it is acting as a catalyst to allow the other guns to perform more efficiently. The total acoustic energy gives the true performance of the array as a whole. See Laws, Parkes and Hatton (1988) Energy-interaction: The long-range interaction of seismic sources, Geophysical Prospecting (36), p333-348 and 38(1) 1990 p.104 for more details. Note that internal energy is not included in the data below. The true acoustic efficiency of airgun arrays was typically less than 5 percent of the total initial energy until gun clustering became common and the efficiency is now often above 25 percent.

Overall acoustic energy contribution

Total acoustic energy output (j.)	Acoustic energy output due to energy-interaction (j.)	Total potential energy available in array(j.)	Percentage of total potential energy appearing as acoustic energy
813746.5	39373.1	1180663.8	68.9

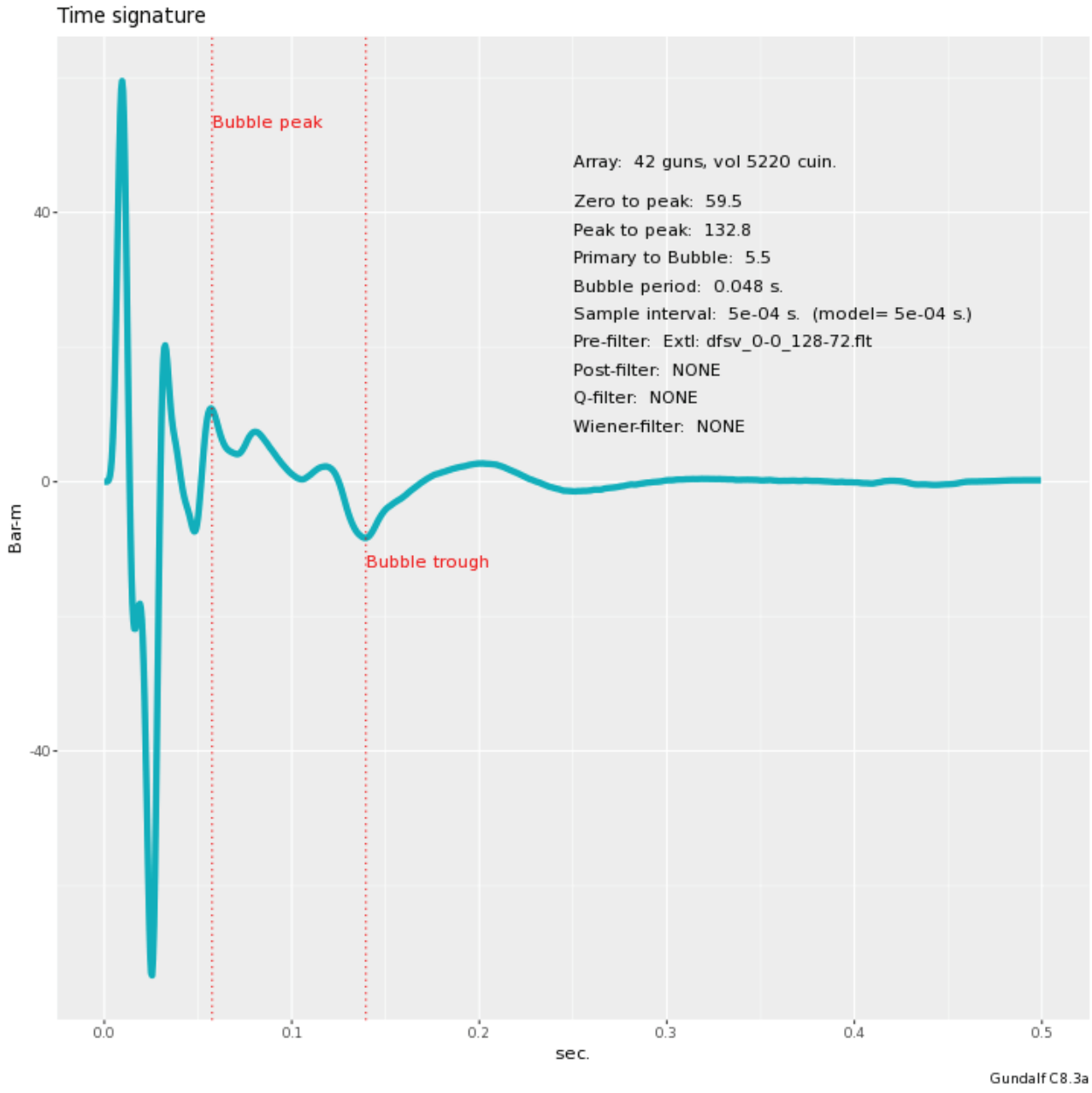
Individual acoustic energy contributions

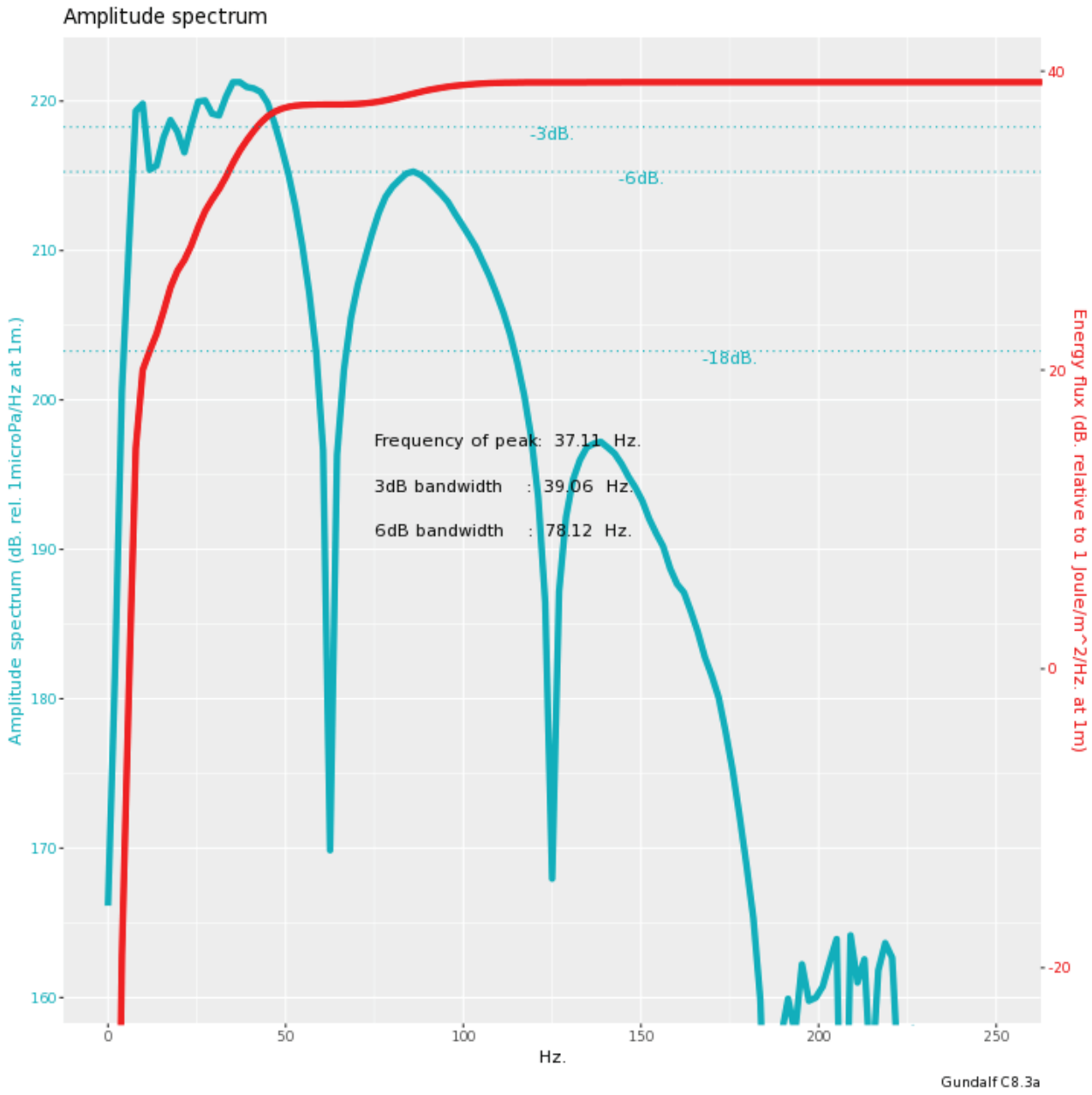
Volume (cuin)	x (m.)	y (m.)	z (m.)	Acoustic energy contribution (j.)
60.0	0.00	-8.40	12.00	22541.2
60.0	0.00	-7.60	12.00	23030.4
95.0	2.50	-8.40	12.00	24475.3
95.0	2.50	-7.60	12.00	24921.9
220.0	5.00	-8.40	12.00	4320.7
220.0	5.00	-7.60	12.00	2619.0
120.0	7.50	-8.50	12.00	30091.4
120.0	7.50	-7.50	12.00	30580.2
220.0	10.00	-8.40	12.00	4326.1
220.0	10.00	-7.60	12.00	2624.1
95.0	12.50	-8.40	12.00	24477.0
95.0	12.50	-7.60	12.00	24922.9
60.0	15.00	-8.40	12.00	22542.7
60.0	15.00	-7.60	12.00	23033.5
60.0	0.00	-0.40	12.00	25599.9
60.0	0.00	0.40	12.00	25627.3
95.0	2.50	-0.40	12.00	27747.0
95.0	2.50	0.40	12.00	27812.9
220.0	5.00	-0.40	12.00	1257.1
220.0	5.00	0.40	12.00	1422.0
120.0	7.50	-0.50	12.00	32847.3
120.0	7.50	0.50	12.00	32890.5
220.0	10.00	-0.40	12.00	1261.7
220.0	10.00	0.40	12.00	1428.2
95.0	12.50	-0.40	12.00	27747.0
95.0	12.50	0.40	12.00	27815.5
60.0	15.00	-0.40	12.00	25604.1
60.0	15.00	0.40	12.00	25629.1
60.0	0.00	7.60	12.00	23002.0
60.0	0.00	8.40	12.00	22571.0
95.0	2.50	7.60	12.00	24854.5
95.0	2.50	8.40	12.00	24546.8

Volume (cuin)	x (m.)	y (m.)	z (m.)	Acoustic energy contribution (j.)
220.0	5.00	7.60	12.00	2450.2
220.0	5.00	8.40	12.00	4500.6
120.0	7.50	7.50	12.00	30541.8
120.0	7.50	8.50	12.00	30141.6
220.0	10.00	7.60	12.00	2454.4
220.0	10.00	8.40	12.00	4505.8
95.0	12.50	7.60	12.00	24856.7
95.0	12.50	8.40	12.00	24547.7
60.0	15.00	7.60	12.00	23004.2
60.0	15.00	8.40	12.00	22573.0

Signature

This section shows the time signature and the amplitude spectrum of the modelled array. The bubble period was determined automatically. The bubble start time was input as 0s. The computed positions of the bubble peak and bubble trough are shown for QC purposes. If these do not match your visual estimate of the bubble, for example, if the filter you are using delays the peak somewhat, try again specifying your own bubble search start time, relative to time zero. The amplitude spectrum plot comprises two separate displays. One curve shows the amplitude spectrum itself in units of dB. relative to 1 microPa. per Hz. at 1m. The other curve (in red) follows the SEG guidelines and shows the energy flux in dB. relative to 1 Joule/m^2/Hz. at 1m.





Modelling Summary

The following table lists the modelling parameters for the array quoted in various commonly used units for convenience.

General parameters ...	
Sample interval (s.)	0.0005
Modelling sample interval (s.)	0.0005
Number of samples in signature	1000
Duration of signature (s.)	0.500
Observation point	Infinite far-field
Gun controller variation (s.)	0
Pre-filter parameters ...	
Anti-alias/instrument filtering	Standard filter: dfsv_0-0_128-72.flt
Post-modelling parameters ...	
Band-pass filtering	No band pass filter applied
Q filtering	No Q filtering applied
Wiener filtering	No Wiener filtering applied

Filter Amplitude Spectrum

No post-processing filtering was applied.

Signature filtering policy

For marine environmental noise reports, Gundalf performs no signature filtering other than anti-alias filtering in the modelling engine itself, along with any requested marine animal weighting functions.

For all other kinds of reports, Gundalf performs filtering in this order:-

- If a pre-conditioning filter is chosen, for example, an instrument response, it is applied at the modelling sample interval.
- If the output sample interval is larger than the modelling sample interval, Gundalf applies appropriate anti-alias filtering. (This can be turned off in the event that anti-alias filtering is included in the pre-conditioning filter, in which case Gundalf will issue a warning.)
- Finally, Gundalf applies the chosen set of post-filters, Q, Wiener and band-pass filtering as specified, at the output sample interval. If none are specified, (often known as unfiltered), only the above anti-alias and/or pre-conditioning are applied.

In reports, when filters are applied, they are applied to the notional sources first so that signatures, directivity plots and spectra are all filtered consistently. The abbreviation muPa is used for microPascal throughout.

Finally note that modelled signatures always begin at time zero for reasons of causality.

Physical parameters

The following table gives the values of the physical parameters used where relevant. The sea temperature, velocity of sound in sea water, wavelet dominant frequency and average wave height were input parameters.

The surface reflection coefficient was entered directly.

The physical parameters used were:-

Sea temperature (deg.C)	Velocity of sound in water (m.sec-1)	Wavelet dominant frequency (Hz.)	Average wave height (m.)	Surface reflection coeff.
10	1496	20	0	-1

Some notes on the modelling algorithm

The Gundalf airgun modelling engine is the end-product of 20 years of state of the art research. It takes full account of all air-gun interactions including interactions between sub-arrays. No assumptions of linear superposition are made. This means that if you move sub-arrays closer together, the far-field signature will change. The effect is noticeable even when sub-arrays are separated by as much as 10m. The engine is capable of modelling airgun clusters right down to the 'super-foam' region where the bubbles themselves collide and distort.

Calibration notes

Airgun modelling programs like Gundalf must be calibrated against real data and no computational model is any better than the quality of that calibration. Calibration datasets however are themselves subject to experimental error so Gundalf is calibrated to best fit the various datasets which are used across the extensive range of volumes, pressures and depths available.

In practice, such experimental errors arise for a variety of reasons including

- Depth inaccuracies. These are usually around 3-5% even in the best facilities particularly if there is sea surface movement.
- How frequently the gun is being cycled during measurement. This is rarely recorded but a warmed up gun might be 50deg C warmer than the sea, changing its normal peak-to-peak and other parameters by 5-10% compared with when it is first fired.
- Filtering differences. Filtering is recorded but filtering errors are still more frequent than we would like and analog filter v. digital filter differences are also sometimes a factor.

As a guideline, typical individual errors across different measurement datasets for the best-calibrated guns are of the order of 5% for peak to peak, 15% for primary to bubble and 2% for bubble periods.

Individual gun errors are calculated from the data shown in Help -> Calibration (which themselves accumulate gun data from different sources) and the resulting array error bounds are calculated by accumulating these errors for each gun in the array. The error bounds are calculated as 95% error bounds and for simplicity assume that errors are non-correlated although in practice some are systematic. The total error bound is always greater than any of the individual error bounds and is strongly influenced by the largest gun contributions.

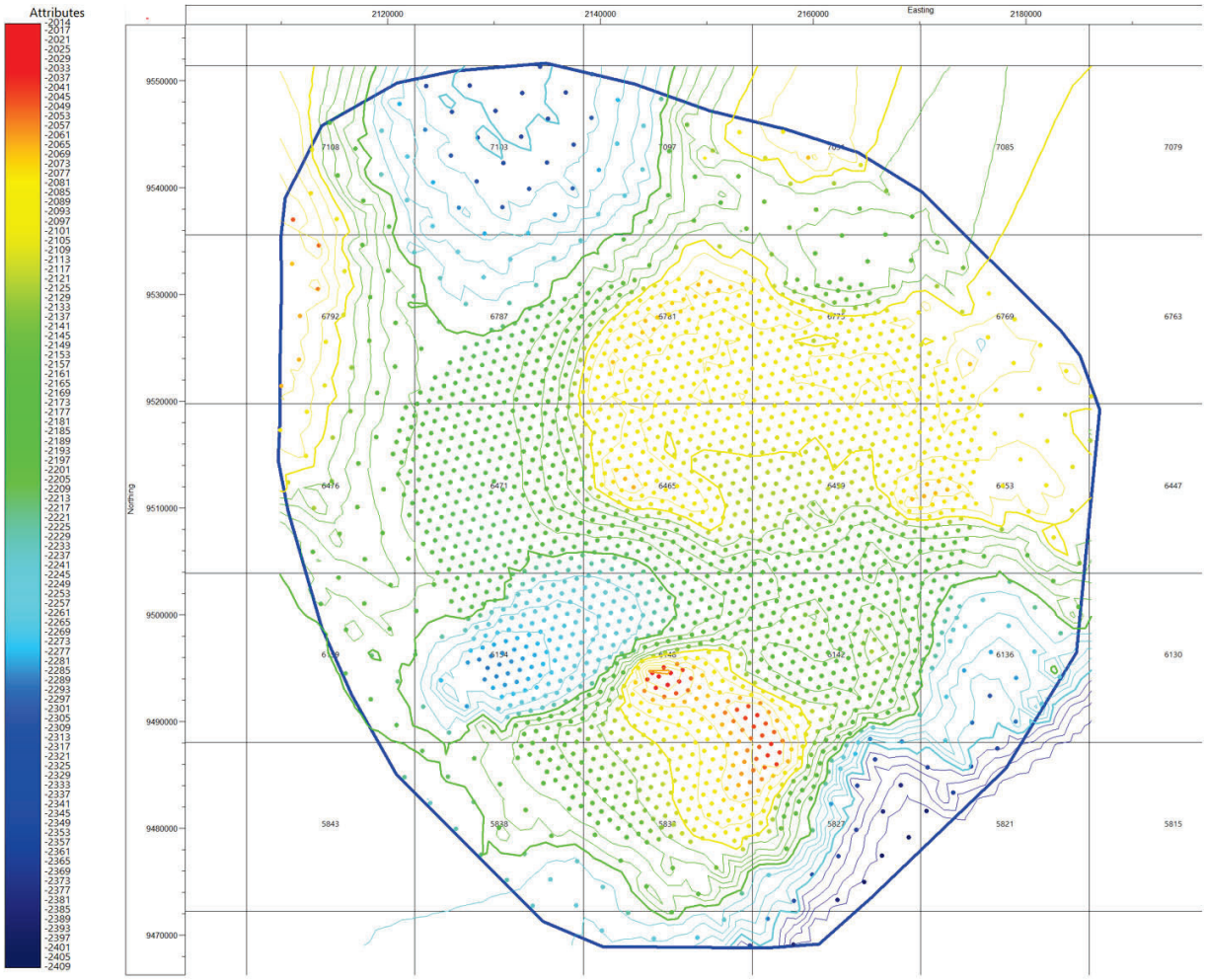
The error bounds simply mean that *it is very likely that the true values for these primary characteristics will be within the ranges shown, but it is not possible to be more precise.* If other comparison data or models indicate values outside this range, this means that those data or models are very likely to be *incompatible* with Gundalf's calibration data. This may be due to several causes as described above. For more on calibration see Gundalf's calibration Help pages.

G&G Permits Request for Information

The following information is requested to ensure BOEM has the details necessary to evaluate your proposed action and ensure it will protect the ESA-listed species covered by the 2020 Biological Opinion. If your activity includes any of the following, please provide additional details on the equipment / technology, procedures for ensuring ESA-listed species are not impacted, and/or results of modeling and analysis of sound associated with pile-driving or air guns.

This information must be included as part of your application.

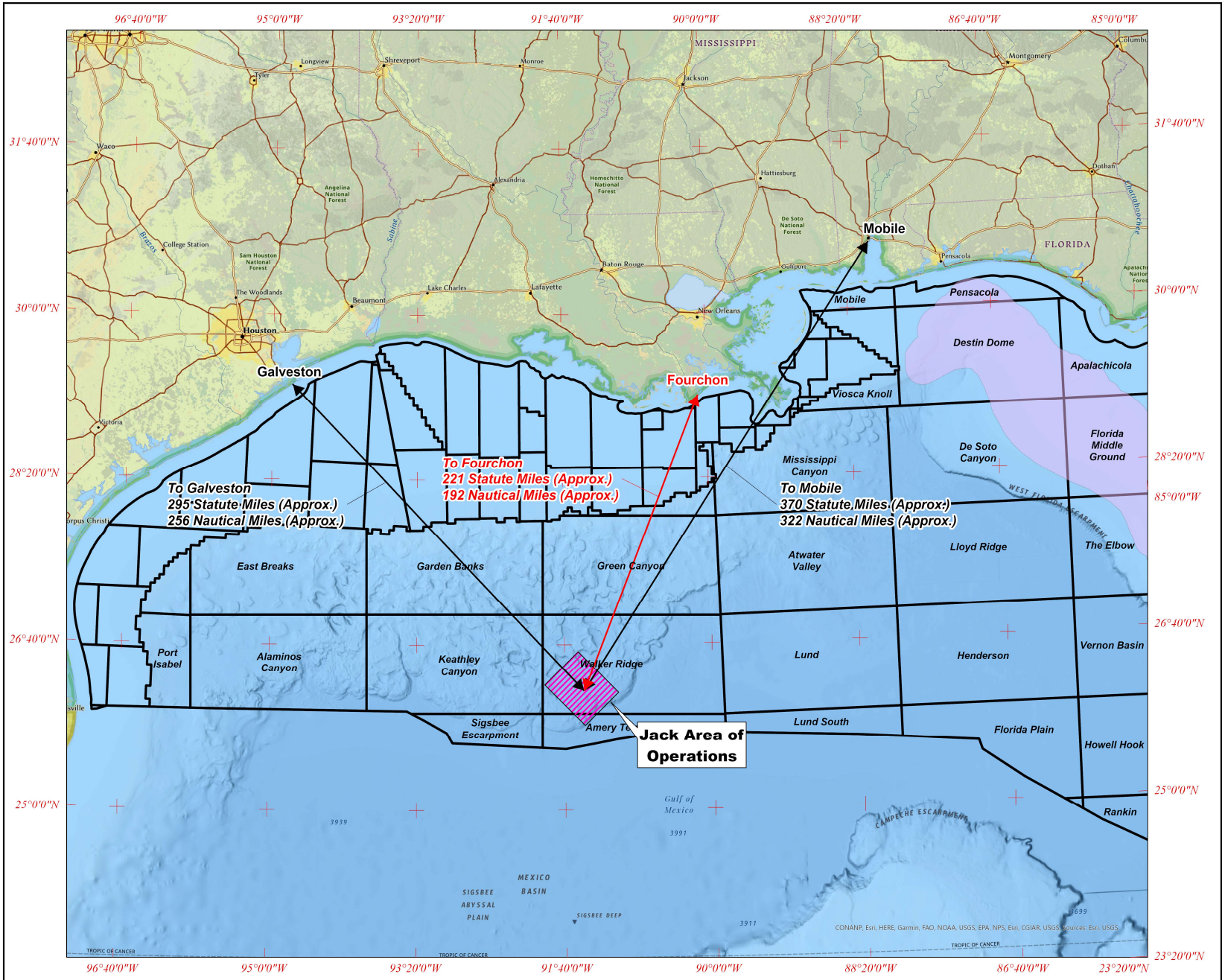
1. Use of New or Unusual Technology (NUT).
   We will not be deploying any New technology for this survey and certainly none that can qualify as Unusual. PIES, USBL Source arrays and other acoustic tools are all conventional now by industry standards. The only elements that may change between now and the time of the survey is the nodes as newer technology than the MSFF ZXPLR may be deployed in a year (MSFF MASS III) and these are upgraded versions of the nodes but the technology is not new and definitively no unusual. Use of MSFF MASS III nodes in place of MSFF ZXPLR is not anticipated to result in any change to the environmental effects of node placement and use already assessed in the Biological Opinion.
2. Use of a vessel with a moon pool.
   Addressed in Attachment 2, pdf file. The pdf file is BOEM-0327 3 - SECTION A GENERAL INFORMATION Attachment 2.docx
3. Equipment with an entanglement or entrapment risk (e.g., flexible lines/ropes).
   Equipment with an entanglement or entrapment risk: We included the mitigation measures for slack lines in BOEM-0327 3 - SECTION A GENERAL INFORMATION Attachment 2.docx. Our operation will include the use of small diameter lines, including the ROV tether and the air gun umbilicals and these and the air guns are suspended using short chains and ropes with a low practical chance of entanglement or entrapment from their deployment. The SVP for water velocity measurements is deployed using a rope but the rope is tensed during the entire deployment which is concurrent with the shooting so again low risk of entanglement or entrapment..
4. Please indicate on a Vicinity Map all associated support bases / ports used and verify that no vessels, including supply and crew vessels, cross or enter the Bryde's whale area. If vessels will enter the Bryde's whale area, you must clearly state this, as additional restrictions will apply.
   Already Addressed.
5. Provide the total number of days you project to have an active seismic source.
   The LOA application says a maximum of **150 days**. The LOA application was included with attachment 4 and as separate pdf file in the original package of documents.
6. Speed (knots) the acoustic sources will be towed.
   Sources will be towed at 4.0 – 4.5 Knots in general.
7. Maximum and minimum water depth of your operation
   -2010 m to -2410 m of water depth.



8. Review and update your application to verify the threatened or endangered species, critical habitat, and marine mammal information reflects the requirements found in the 2020 Biological Opinion.

The 2020 Biological Opinion may be found here: https://www.fisheries.noaa.gov/resource/document/biological-opinion-federally-regulated-oil-and-gas-program-activities-gulf-mexico.

The Appendices may be found here: (https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico).



0 50 100 200 300 400 Kilometers

0 25 50 100 150 200 Miles

N

Map Projection
System : USA NAD27 TM BLM15 CM 93W USFT
Datum : North American 1927
Spheroid : Clarke 1866
Projection : Transverse Mercator
Units : Foot US
Central Meridian : 93° 00' 00.00" W
Scale Factor : 0.9996
False Northing : 0.0
False Easting : 1,640,416.67

Chevron

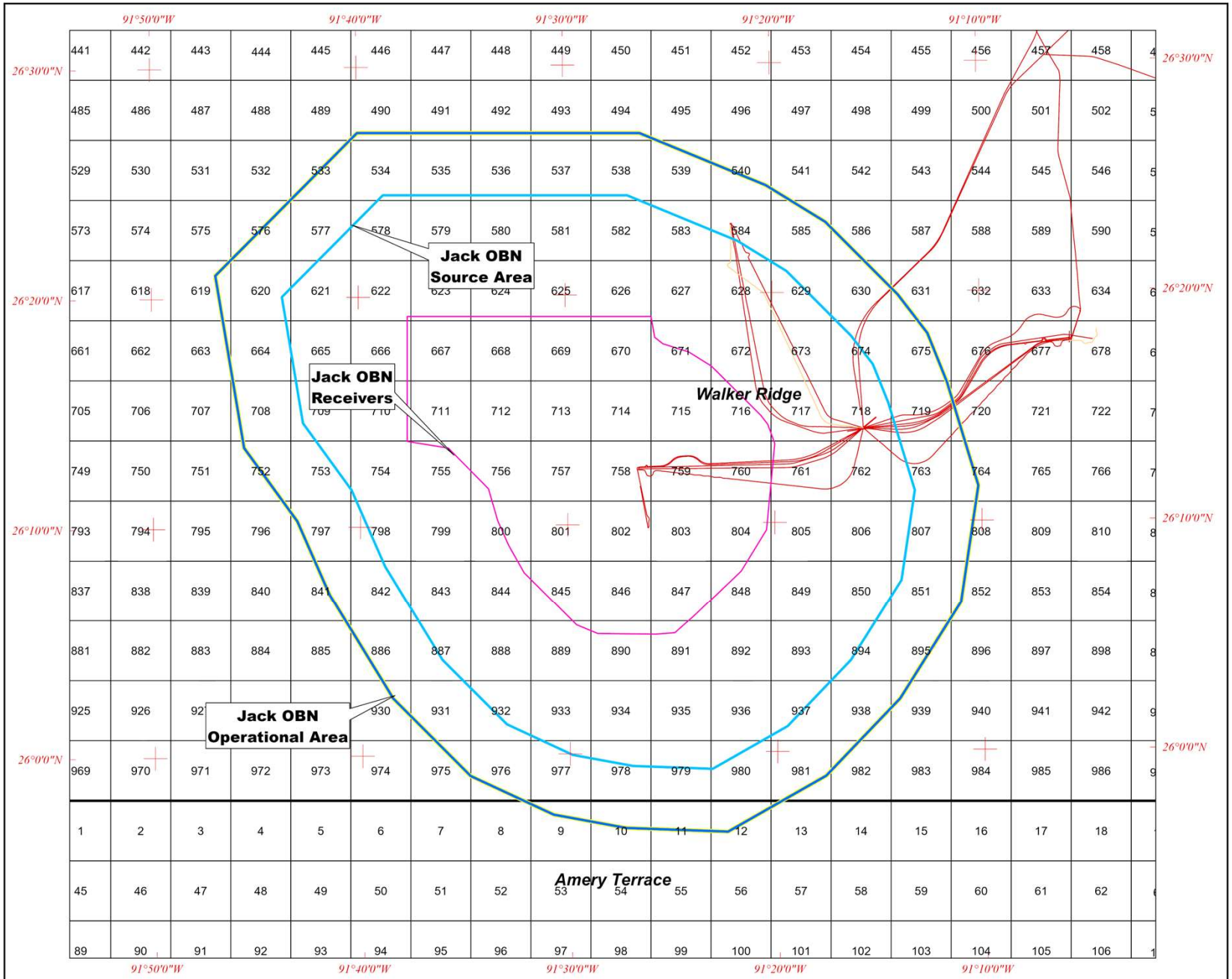
Jack OBN

NA Upstream AD - GOM

PUBLIC INFORMATION

VICINITY MAP

Scale:	Drawn By:	Approver:	
1:2,641,793	M.Garcia	G.Hennenfent	
File: 2023 Jack OBN Public Map.mxd		Date: 4/5/2023	Rev:



0 3.75 7.5 15 22.5 30 Kilometers

0 1.75 3.5 7 10.5 14 Miles

N

Map Projection
System : USA NAD27 TM BLM15 CM 93W USFT
Datum : North American 1927
Spheroid : Clarke 1866
Projection : Transverse Mercator
Units : Foot US
Central Meridian : 93° 00' 00.00" W
Scale Factor : 0.9996
False Northing : 0.0
False Easting : 1,640,416.67

Chevron

Jack OBN

NA Upstream AD - GOM

PROPRIETARY INFORMATION

OPERATIONS AREA MAP

Scale:	Drawn By:	Approver:	
1:189,977	M.Garcia	G.Hennenfent	
File: 2023 Jack OBN Proprietary Map.mxd		Date: 4/5/2023	Rev:

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OCEAN ENERGY MANAGEMENT

Gulf of Mexico OCS Region

(Insert Appropriate Regional Office)

PERMIT FOR GEOPHYSICAL EXPLORATION FOR MINERAL RESOURCES OR SCIENTIFIC RESEARCH ON THE OUTER CONTINENTAL SHELF

In consideration of the terms and conditions contained herein and the authorization granted hereby, this permit is entered into by and between the United States of America (the Government), acting through the Bureau of Ocean Energy Management (BOEM) of the Department of the Interior, and

Chevron U.S.A Inc.

(Name of Permittee)

1500 Louisina St

(Number and Street)

Houston TX 77002

(City, State, and Zip Code)

PERMIT NUMBER: L22-015 **DATE:** 18-July-2023

This permit is issued pursuant to the authority of the Outer Continental Shelf Lands Act, as amended (43 U.S.C. 1331 *et seq.*), hereinafter called the "Act," and Title 30 Code of Federal Regulations Parts 551 (Geological and Geophysical (G&G) Explorations of the Outer Continental Shelf). The permittee must conduct all activities in compliance with the terms and conditions of this permit, including the "Stipulations," "Environmental Protective Provisions," and the approved "Application for Permit," which are attached to and incorporated into this permit. The permittee must conduct all geophysical exploration or scientific research activities in compliance with the Act, the regulations in 30 CFR Parts 551 and 251, and other applicable statutes and regulations whether such statutes and regulations are enacted, promulgated, issued, or amended before or after this permit is issued. Some of the provisions of 30 CFR Parts 551 and 251 are restated in this permit for emphasis. However, all of the provisions of 30 CFR Parts 551 and 251 apply to this permit. The permittee should note particularly that G&G activities may cause incidental "taking" of animals under the Marine Mammal Protection Act (16 U.S.C. 1361 et seq.) or the Endangered Species Act (16 U.S.C. § 1531 et seq.). Any such incidental taking is not authorized by this permit, and it may only be authorized by the National Marine Fisheries Service or the U.S. Fish and Wildlife Service. The permittee should contact these two agencies to address any questions about these laws or requirements.

Paperwork Reduction Act of 1995 (PRA) Statement: This permit refers to information collection requirements contained in 30 CFR Parts 551 and 251 regulations. The Office of Management and Budget (OMB) has approved those reporting requirements under OMB Control Number 1010-0048.

Section I. Authorization

The Government authorizes the permittee to conduct:

X Geophysical exploration for mineral resources as defined in 30 CFR 551.1.

_____ Geophysical scientific research as defined in 30 CFR 551.1. A permit is required for any geophysical investigation that involves the use of solid or liquid explosives or developing data and information for proprietary use or sale.

This permit authorizes the permittee to conduct the above geophysical activity during the period from 20-July-2023 to 20-July-2024 in the following area(s):
see attached map

The permittee shall not conduct any geophysical operation (i.e., active sound source(s)) outside of the permitted area specified herein even if no data is collected or obtained from such operations. Geophysical operations shall not be conducted "in-transit" to the permitted area and may only proceed once the survey vessel enters the permitted area. (This restriction does not apply to Alaska.)

Extensions of the time period specified above must be requested in writing. A permit plus extensions for activities will be limited to a period of not more than 1 year from the original issuance date of the permit. Inspection and reporting of geophysical exploration activities, suspension and cancellation of authority to conduct exploration or scientific research activities under permit, and penalties and appeals will be carried out in accordance with 30 CFR 551.8, 551.9, and 551.10.

The authority of the Regional Director may be delegated to the Regional Supervisor for Resource Evaluation for the purposes of this permit.

Section II. Type(s) of Operations and Technique(s)

The permittee will employ the following type(s) of operations:
Acquisition of an Ocean Bottom Node (OBN) seismic survey
; and

will utilize the following instruments and/or technique(s) in such operations:
Remote Operated Vehicle deployment and retrieval of deep water seismic nodes and
Seismic sources composed of airguns arranged in arrays .

Section III. Reports on Operations

A. Status Reports

1. In the Gulf of Mexico and Atlantic OCS Regions:

The permittee must submit status reports every **two months** in a manner approved or prescribed by

the Regional Supervisor, Resource Evaluation (here after referred to as Supervisor). The report must include a map of appropriate scale showing traverse lines, protraction areas, blocks, and block numbers (if map scale permits). The map should be a cumulative update for each status report and clearly illustrate the planned traverse lines (one color) and the portion of those traverse lines in which data acquisition has been completed to date (a second color). Please indicate the cumulative total line miles (2D) or blocks (3D) of data acquired. The map should be submitted in digital format preferably as a GeoPDF.

2. In the Alaska and Pacific OCS Regions:

The permittee must submit status reports **weekly** in a manner approved or prescribed by the Regional Supervisor, Resource Evaluation (here after referred to as Supervisor). The report must include a map of appropriate scale showing the location and extent of acquired lines of 2D data or traverse lines for 3D data and the 3-mile limit when data collection is adjacent to the OCS boundary or other important boundaries as specified by BOEM. The map should be a cumulative update for each status report and clearly illustrate the planned lines (one color) and the portion of those lines in which data acquisition has been completed to date (a second color). The report must show the activity of the source vessel (i.e., no seismic activity, time and location when a mitigation gun is on, ramp-up, and full acquisition mode). Protected Species Observer (PSO) reports must also be included. Please indicate the cumulative total line miles (2D) or square miles (3D) of data acquired. The map should be submitted in digital format as a PDF and ESRI file – gdb-feature class(s) or shape files.

B. The permittee must submit to the Supervisor a Final Report within 30 days after the completion of operations. The final report must contain the following:

1. In the Gulf of Mexico and Atlantic OCS Regions:

i. The total number of 2D line miles or OCS blocks of geophysical data acquired as well as the "typical" or average sail miles per block for the survey;

ii. A *brief* daily log of operations. A suggested format for the daily log of operations would include, but is not limited to, a table that provides the name of the survey, a date column, a column for number of line miles or blocks collected each day, and an operations column. Preferably, the date column would commence on the date in which the vessel begins to transit to the permitted area and end on the date in which the vessel either transits away from the permitted area or when operations pertinent to the permitted activity are completed. The corresponding operations column would contain a *brief* description of the operations for each day listed in the date column noting activities such as the major work stoppages, no data acquired, and other pertinent activities. This may be submitted as a digital Word document or as an Excel spreadsheet;

iii. A PDF or, preferably, a GeoPDF or shape file indicating the areal extent of the data *actually acquired*;

iv. The start and finish dates on which the actual geophysical exploration or scientific research activities were performed;

v. A narrative summary of any: (a) hydrocarbon slicks or environmental hazards observed and (b) adverse effects of the geophysical exploration or scientific research activities on the environment, aquatic life, archaeological resources, or other uses of the area in which the activities were conducted;

vi. The estimated date on which the processed or interpreted data or information will be available for inspection by BOEM;

vii. A CD or DVD containing a *single*, final edited navigational data file. Shot point locations should be provided in both latitude/longitude degrees and in x, y coordinates. The single navigational file should be in either SEG-P1 or UKOOA P190 format for either two-dimensional or three-dimensional geophysical data. Two-dimensional data should be decimated to the first, last, and every tenth shot point. Three-dimensional data should be decimated at every line and first and last CDP. A single ESRI shape file containing navigational data and one shape file with post-plot locations of any geophysical equipment on the seafloor (i.e., ocean bottom nodes, CSEM, etc.) should also be submitted if applicable;

viii. Identification of geocentric ellipsoid (NAD 27 or NAD 83) used as a reference for the data or sample locations; and

ix. Such other descriptions of the activities conducted as may be specified by the Supervisor.

2. In the Alaska and Pacific OCS Regions:

i. The total number of 2D line miles or square miles for 3D surveys and the number of OCS blocks of geophysical data acquired, as well as total number of traverse miles for the survey;

ii. A *weekly report*.

iii. Chart(s), map(s), or plat(s) depicting the areas in which any exploration or scientific research activities were conducted. These graphics must clearly indicate the location of the activities so that the data produced from the activities can be accurately located and identified;

iv. The start and finish dates on which the actual geophysical exploration or scientific research activities were performed;

v. A narrative summary of any: (a) hydrocarbon slicks or environmental hazards observed, (b) adverse effects of the geophysical exploration or scientific research activities on the environment, aquatic life, archaeological resources, or other uses of the area in which the activities were conducted, and (c) safety incidents;

vi. The estimated date on which the processed or interpreted data or information will be available for inspection by BOEM;

vii. A final edited navigation file on suitable storage medium of all data or sample locations in latitude/longitude degrees including datum used. The navigation for 2D lines should include line name and location for the first, last, and every tenth SP. For 3D surveys, please submit a

navigation file for the acquired track lines that includes the location of the first and last SP and/or the corner locations for the area acquired. Contact the G&G permitting office for the specific navigation required for this permitted activity. The digital file is to be formatted in standard SEG-P1, UKOOA P1-90 or other current, standard industry format, coded in ASCII. A printed data listing and a format statement are to be included;

viii. Identification of geocentric ellipsoid (NAD 83) used as a reference for the data or sample locations; and

ix. Such other descriptions of the activities conducted as may be specified by the Supervisor.

C. The Final Report is a stand-alone document containing all the pertinent information regarding the permit.

Section IV. Submission, Inspection, and Selection of Geophysical Data and Information

A. The permittee must notify the Supervisor, in writing, when the permittee has completed the initial processing and interpretation of any geophysical data and information collected under an exploration permit or a scientific research permit that involves developing data and information for proprietary use or sale. If the Supervisor asks if the permittee has further processed or interpreted any geophysical data and information collected under a permit, the permittee must respond within 30 days. If further processing of the data and information is conducted, it is the responsibility of the permittee to keep the most current resulting products available in the event the Supervisor requests the current status of data processing. At any time within 10 years after receiving notification of the completion of the acquisition activities conducted under the permit, the Supervisor may request that the permittee submit for inspection and possible retention all or part of the geophysical data, processed geophysical information, and interpreted geophysical information.

After a period of 10 years from the issuance of the permit, the permittee must notify the Supervisor in writing if their intention is to no longer maintain all or part of the geophysical data, processed geophysical information, and interpreted geophysical information, and provide the Supervisor 30 days to request that the permittee submit for inspection and possible retention all or part of the geophysical data, processed geophysical information, and interpreted geophysical information.

B. The Supervisor will have the right to inspect and select the geophysical data, processed geophysical information, or interpreted geophysical information. This inspection will be performed on the permittee's premises unless the Supervisor requests that the permittee submit the data or information to the Supervisor for inspection. Such submission must be within 30 days following the receipt of the Supervisor's request unless the Supervisor authorizes a later delivery date. If the inspection is done on the permittee's premises, the permittee must submit the geophysical data or information selected within 30 days following receipt of the Supervisor's request, unless the Supervisor authorizes a longer period of time for delivery. The data or information requested for inspection or selected by the Supervisor must be submitted regardless of whether the permittee and the Government have or have not concluded an agreement for reimbursement. If the Supervisor decides to retain all or a portion of the geophysical data or information, the Supervisor will notify the permittee, in writing, of this decision.

C. In the event that a third party obtains geophysical data, processed geophysical information, or interpreted geophysical information from a permittee, or from another third party, by sale, trade, license agreement, or other means:

1. The third party recipient of the data and information assumes the obligations under this section except for notification of initial processing and interpretation of the data and information and is subject to the penalty provisions of 30 CFR Part 550, Subpart N; and

2. A permittee or third party that sells, trades, licenses, or otherwise provides the data and information to a third party must advise the recipient, in writing, that accepting these obligations is a condition precedent of the sale, trade, license, or other agreement; and

3. Except for license agreements, a permittee or third party that sells, trades, or otherwise provides data and information to a third party must advise the Supervisor in writing within 30 days of the sale, trade, or other agreement, including the identity of the recipient of the data and information; or

4. With regard to license agreements, a permittee or third party that licenses data and information to a third party, within 30 days of a request by the Supervisor, must advise the Supervisor, in writing, of the license agreement, including the identity of the recipient of the data and information.

D. Each submission of geophysical data, processed geophysical information, and interpreted geophysical information must contain, unless otherwise specified by the Supervisor, the following:

1. An accurate and complete record of each geophysical survey conducted under the permit, including digital navigational data and final location maps of all surveys;

2. All seismic data developed under a permit presented in a format and of a quality suitable for processing;

3. Processed geophysical information derived from seismic data with extraneous signals and interference removed, presented in a format and of a quality suitable for interpretive evaluation, reflecting state-of-the-art processing techniques; and

4. Other geophysical data, processed geophysical information, and interpreted geophysical information obtained from, but not limited to, shallow and deep subbottom profiles, bathymetry, side-scan sonar, gravity, magnetic, and electrical surveys, and special studies such as refraction, shear wave, and velocity surveys.

Section V. Reimbursement to Permittees

A. After the delivery of geophysical data, processed geophysical information, and interpreted geophysical information requested by the Supervisor in accordance with subsection IV of this permit, and upon receipt of a request for reimbursement and a determination by BOEM that the requested reimbursement is proper, BOEM will reimburse the permittee or third party for the reasonable costs of reproducing the submitted data and information at the permittee's or third party's lowest rate or at the lowest commercial rate established in the area, whichever is less.

B. If the processing was in a form and manner other than that used in the normal conduct of the permittee's business at BOEM's request, BOEM will reimburse the permittee or third party for the reasonable costs of processing or reprocessing such data. Requests for reimbursement must identify processing costs separate from acquisition costs.

C. The permittee or third party will not be reimbursed for the costs of acquiring or interpreting geophysical information.

D. Data and information required under section IV.D.1. of this permit are not considered to be geophysical data or processed geophysical information and must be provided by the permittee at no cost to the Government.

Section VI. Disclosure of Data and Information to the Public

A. BOEM will make data and information submitted by a permittee available in accordance with the requirements and subject to the limitations of the Freedom of Information Act (5 U.S.C. 552) and the implementing regulations (43 CFR Part 2), the requirements of the Act, and the regulations contained in 30 CFR Parts 550 and 250 (Oil and Gas and Sulphur Operations in the Outer Continental Shelf), 30 CFR Parts 551 and 251, and 30 CFR Parts 552 and 252 (Outer Continental Shelf (OCS) Oil and Gas Information Program).

B. Except as specified in this section, or Section VIII, or in 30 CFR Parts 550, 552, 250, and 252, no data or information determined by BOEM or the Bureau of Safety and Environmental Enforcement to be exempt from public disclosure under subsection A of this section will be provided to any affected State or be made available to the executive of any affected local government or to the public, unless the permittee or third party and all persons to whom such permittee has sold, traded, or licensed the data or information under promise of confidentiality agree to such an action.

C. Geophysical data and processed or interpreted geophysical information submitted under a permit, and retained by BOEM, will be disclosed as follows:

1. Except for deep stratigraphic tests, BOEM will make available to the public geophysical data 50 years after the date of issuance of the permit under which the data were collected (see 30 CFR 551.14).

2. Except for deep stratigraphic tests, BOEM will make available to the public processed geophysical information and interpreted geophysical information 25 years after the date of issuance of the permit under which the original data were collected (see 30 CFR 551.14).

3. BOEM will make available to the public all geophysical data and information and geophysical interpretations related to a deep stratigraphic test, at the earlier of the following times: (a) 25 years after the completion of the test, or (b) for a lease sale held after the test well is completed, 60 calendar days after the Department of the Interior executes the first lease for a block, any part of which is within 50 geographic miles (92.6 kilometers) of the site of the completed test.

D. All line-specific preplot or postplot plat(s), and navigation tapes, including but not limited to seismic survey traverses and shotpoint locations, submitted as a requirement of 30 CFR 551.7, 551.l2, or 251.7, will be considered as "PROPRIETARY INFORMATION." Such information will not be made available to the public without the consent of the permittee for a period of 25 years from the date of issuance of the permit, unless the Director, BOEM, determines that earlier release is necessary for the proper development of the area permitted.

E. All other information submitted as a requirement of 30 CFR 551.8 and determined by BOEM to be exempt from public disclosure will be considered as "PROPRIETARY." Such data and information will not be made available to the public without the consent of the permittee for a period of up to 25 years from the date of issuance of the permit as addressed in 30 CFR 551.14, unless the Director, BOEM, determines that earlier release is necessary for the proper development of the area permitted. The executed permit will be considered as "PROPRIETARY" except the public information copy, which will be available to the public upon request and on BOEM's website.

F. The identities of third party recipients of data and information collected under a permit will be kept confidential. The identities will not be released unless the permittee and the third parties agree to the disclosure.

Section VII. Disclosure to Independent Contractors

BOEM reserves the right to disclose any data or information acquired from a permittee to an independent contractor or agent for the purpose of reproducing, processing, reprocessing, or interpreting such data or information. When practicable, BOEM will advise the permittee who provided the data or information of intent to disclose the data or information to an independent contractor or agent. BOEM's notice of intent will afford the permittee a period of not less than 5 working days within which to comment on the intended action. When BOEM so advises a permittee of the intent to disclose data or information to an independent contractor or agent, all other owners of such data or information will be deemed to have been notified of BOEM's intent. Prior to any such disclosure, the contractor or agent will be required to execute a written commitment not to sell, trade, license, or disclose any data or information to anyone without the express consent of BOEM.

Section VIII. Sharing of Information with Affected States

A. At the time of soliciting nominations for the leasing of lands within 3 geographic miles of the seaward boundary of any coastal State, BOEM, pursuant to the provisions of 30 CFR Parts 552.7 252.7 and subsections 8(g) and 26(e) (43 U.S.C. 1337(g) and 1352(e)) of the Act, will provide the Governor of the State (or the Governor's designated representative) the following information that has been acquired by BOEM on such lands proposed to be offered for leasing:

1. All information on the geographical, geological, and ecological characteristics of the areas and regions proposed to be offered for leasing;

2. An estimate of the oil and gas reserves in the area proposed for leasing; and

3. An identification of any field, geological structure, or trap located within 3 miles of the seaward boundary of the State.

B. After the time of receipt of nominations for any area of the OCS within 3 geographic miles of the seaward boundary of any coastal State and Area Identification in accordance with the provisions of Subparts D and E of 30 CFR Part 556, BOEM, in consultation with the Governor of the State (or the Governor's designated representative), will determine whether any tracts being given further consideration for leasing may contain one or more oil or gas reservoirs underlying both the OCS and lands subject to the jurisdiction of the State.

C. At any time prior to a sale, information acquired by BOEM that pertains to the identification of potential and/or proven common hydrocarbon-bearing areas within 3 geographic miles of the seaward boundary of any such State will be shared, upon request by the Governor and pursuant to the provisions of 30 CFR Parts 552.7 and 252.7 and subsections 8(g) and 26(e) of the Act, with the Governor of such State (or the Governor's designated representative).

D. Knowledge obtained by a State official who receives information under subsections A, B, and C of this section will be subject to the requirements and limitations of the Act and the regulations contained in 30 CFR Parts 550, 551, 552, 250, 251, and 252.

Section IX. Permit Modifications

The Department will have the right at any time to modify or amend any provisions of this permit, except that the Department will not have such right with respect to the provisions of Sections VI, VII, and VIII hereof, unless required by an Act of Congress.

IN WITNESS WHEREOF the parties have executed this permit and it will be effective as of the date of signature by the Supervisor.

PERMITTEE:

Joe T. Gordon

(Signature of Permittee)

Joe T. Gordon

(Type or Print Name of Permittee)

GOM Regulatory Affairs Team Lead

(Title)

July 18, 2023

(Date)

THE UNITED STATES OF AMERICA:

MATTHEW WILSON Digitally signed by MATTHEW WILSON Date: 2023.07.20 15:10:21 -05'00'

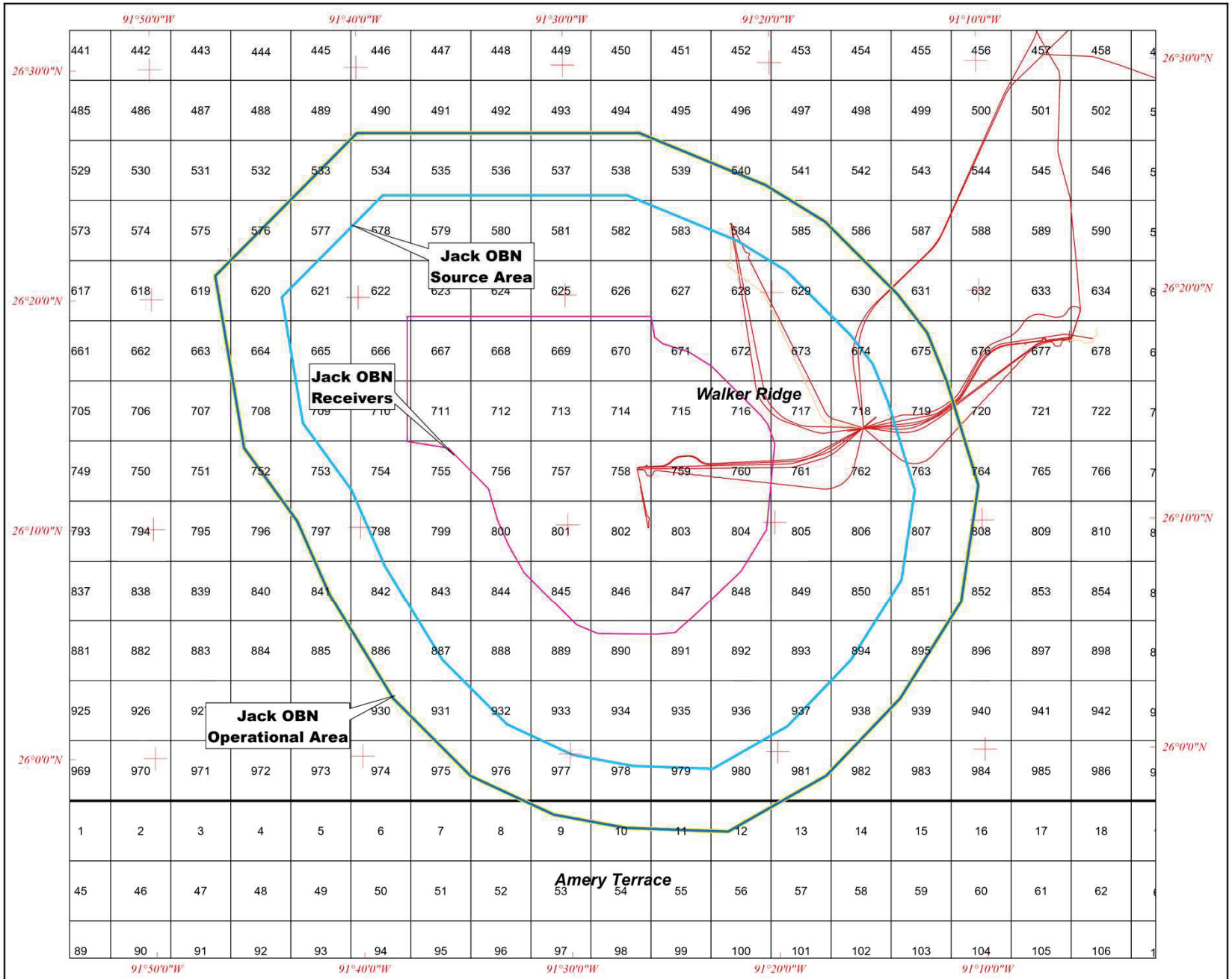
(Signature of Regional Supervisor)

Matthew G. Wilson

(Type or Print Name of Regional Supervisor)

July 20, 2023

(Date)



0 3.75 7.5 15 22.5 30 Kilometers

0 1.75 3.5 7 10.5 14 Miles

N

Map Projection
System : USA NAD27 TM BLM15 CM 93W USFT
Datum : North American 1927
Spheroid : Clarke 1866
Projection : Transverse Mercator
Units : Foot US
Central Meridian : 93° 00' 00.00" W
Scale Factor : 0.9996
False Northing : 0.0
False Easting : 1,640,416.67

Chevron

Jack OBN

NA Upstream AD - GOM

PROPRIETARY INFORMATION

OPERATIONS AREA MAP

Scale:	Drawn By:	Approver:	
1:189,977	M.Garcia	G.Hennenfent	
File: 2023 Jack OBN Proprietary Map.mxd		Date: 4/5/2023	Rev:

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

LETTER OF AUTHORIZATION

Chevron U.S.A. Inc. and its designees are hereby authorized under section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1371(a)(5)(A)) to take marine mammals incidental to geophysical survey activities in the Gulf of Mexico, subject to the provisions of the MMPA and the Regulations Governing Taking Marine Mammals Incidental to Geophysical Survey Activities in the Gulf of Mexico (50 CFR Part 217, Subpart S) (Regulations).

1. This Letter of Authorization (LOA) is valid from August 10, 2023, through January 2, 2024.

2. This LOA authorizes take incidental to the specified geophysical survey activities (3D OBN survey of Walker Ridge 758, 759, 802 and surrounding lease blocks) described in the LOA request.

3. General Conditions

   (a) A copy of this LOA must be in the possession of the Holder of the Authorization (Holder), vessel operator, other relevant personnel, the lead protected species observer (PSO), and any other relevant designees operating under the authority of the LOA.

   (b) The species and/or stocks authorized for taking are listed in Table 1. Authorized take, by Level A and Level B harassment only, is limited to the species and numbers listed in Table 1.

   (c) The taking by serious injury or death of any of the species listed in Table 1 or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA. Any taking exceeding the authorized amounts listed in Table 1 is prohibited and may result in the modification, suspension, or revocation of this IHA.

   (d) The Holder must instruct relevant vessel personnel with regard to the authority of the protected species monitoring team (PSO team), and must ensure that relevant vessel personnel and PSO team participate in a joint onboard briefing, led by the vessel operator and lead PSO, prior to beginning work to ensure that responsibilities, communication procedures, protected species monitoring protocols, operational procedures, and LOA requirements are clearly understood. This briefing must be repeated when relevant new personnel join the survey operations before work involving those personnel commences.

   (e) The acoustic source must be deactivated when not acquiring data or preparing to acquire data, except as necessary for testing. Unnecessary use of the acoustic source must be avoided. Notified operational capacity (i.e., total array volume)

(not including redundant backup airguns) must not be exceeded during the survey, except where unavoidable for source testing and calibration purposes. All occasions where activated source volume exceeds notified operational capacity must be communicated to the PSO(s) on duty and fully documented. The lead PSO must be granted access to relevant instrumentation documenting acoustic source power and/or operational volume.

(f) PSO requirements:

i. LOA-holders must use independent, dedicated, qualified PSOs, meaning that the PSOs must be employed by a third-party observer provider, must have no tasks other than to conduct observational effort, collect data, and communicate with and instruct relevant vessel crew with regard to the presence of protected species and mitigation requirements (including brief alerts regarding maritime hazards), and must be qualified pursuant to section 5(a) of this LOA. Acoustic PSOs are required to complete specialized training for operating passive acoustic monitoring (PAM) systems and are encouraged to have familiarity with the vessel on which they will be working. PSOs may act as both acoustic and visual observers (but not simultaneously), so long as they demonstrate that their training and experience are sufficient to perform each task.

ii. The Holder must submit PSO resumes for NMFS review and approval prior to commencement of the survey (submit to nmfs.psoreview@noaa.gov). Resumes should include dates of training and any prior NMFS approval, as well as dates and description of last experience, and must be accompanied by information documenting successful completion of an acceptable training course. NMFS is allowed one week to approve PSOs from the time that the necessary information is received by NMFS, after which PSOs meeting the minimum requirements will automatically be considered approved.

iii. At least one visual PSO and two acoustic PSOs aboard each acoustic source vessel must have a minimum of 90 days at-sea experience working in those roles, respectively, with no more than eighteen months elapsed since the conclusion of the at-sea experience. One visual PSO with such experience must be designated as the lead for the entire PSO team. The lead must coordinate duty schedules and roles for the PSO team and serve as the primary point of contact for the vessel operator. (Note that the responsibility of coordinating duty schedules and roles may instead be assigned to a shore-based, third-party monitoring coordinator.) To the maximum extent practicable, the lead PSO must devise the duty schedule such that experienced PSOs are on duty with those PSOs with appropriate training but who have not yet gained relevant experience.

4. Mitigation Requirements

(a) Visual monitoring requirements:

i. During survey operations (i.e., any day on which use of the acoustic source is planned to occur, and whenever the acoustic source is in the water, whether activated or not), a minimum of two PSOs must be on duty and conducting visual observations at all times during daylight hours (i.e., from 30 minutes prior to sunrise through 30 minutes following sunset).

ii. Visual monitoring must begin not less than 30 minutes prior to ramp-up and must continue until one hour after use of the acoustic source ceases or until 30 minutes past sunset.

iii. Visual PSOs must coordinate to ensure 360° visual coverage around the vessel from the most appropriate observation posts, and must conduct visual observations using binoculars and the naked eye while free from distractions and in a consistent, systematic, and diligent manner.

iv. Visual PSOs must immediately communicate all observations of marine mammals to the on-duty acoustic PSO, including any determination by the PSO regarding species identification, distance, and bearing and the degree of confidence in the determination.

v. Any observations of marine mammals by crew members aboard any vessel associated with the survey must be relayed to the PSO team.

vi. During good conditions (e.g., daylight hours; Beaufort sea state (BSS) 3 or less), visual PSOs must conduct observations when the acoustic source is not operating for comparison of sighting rates and behavior with and without use of the acoustic source and between acquisition periods, to the maximum extent practicable.

vii. Visual PSOs may be on watch for a maximum of two consecutive hours followed by a break of at least one hour between watches and may conduct a maximum of 12 hours of observation per 24-hour period. NMFS may grant an exception for LOA applicants that demonstrate such a “two hours on/one hour off” duty cycle is not practicable, in which case visual PSOs will be subject to a maximum of four consecutive hours on watch followed by a break of at least two hours between watches. Combined observational duties (visual and acoustic but not at the same time) must not exceed 12 hours per 24-hour period for any individual PSO.

(b) Acoustic monitoring requirements:

i. All source vessels must use a towed PAM system at all times when operating in waters deeper than 100 m, which must be monitored by a

minimum of one acoustic PSO beginning at least 30 minutes prior to ramp-up, at all times during use of the acoustic source, and until one hour after use of the acoustic source ceases. "PAM system" refers to calibrated hydrophone arrays with full system redundancy to detect, identify, and estimate distance and bearing to vocalizing cetaceans, coupled with appropriate software to aid monitoring and listening by a PAM operator skilled in bioacoustics analysis and computer system specifications capable of running appropriate software. The PAM system must have at least one calibrated hydrophone (per each deployed hydrophone type and/or set) sufficient for determining whether background noise levels on the towed PAM system are sufficiently low to meet performance expectations. Applicants must provide a PAM plan including description of the hardware and software proposed for use prior to proceeding with any survey where PAM is required.

ii. Acoustic PSOs must immediately communicate all detections of marine mammals to visual PSOs (when visual PSOs are on duty), including any determination by the PSO regarding species identification, distance, and bearing, and the degree of confidence in the determination.

iii. Acoustic PSOs may be on watch for a maximum of four consecutive hours followed by a break of at least two hours between watches, and may conduct a maximum of 12 hours of observation per 24-hour period. Combined observational duties (visual and acoustic but not at the same time) must not exceed 12 hours per 24-hour period for any individual PSO.

iv. Survey activity may continue for 30 minutes when the PAM system malfunctions or is damaged, while the PAM operator diagnoses the issue. If the diagnosis indicates that the PAM system must be repaired to solve the problem, operations may continue for an additional two hours without acoustic monitoring during daylight hours only under the following conditions:

(A) Sea state is less than or equal to BSS 4;

(B) No marine mammals (excluding delphinids) detected solely by PAM in the applicable exclusion zone in the previous two hours;

(C) NMFS is notified via email as soon as practicable with the time and location in which operations began occurring without an active PAM system; and

(D) Operations with an active acoustic source, but without an operating PAM system, do not exceed a cumulative total of four hours in any 24-hour period.

(c) PSOs must establish and monitor applicable exclusion and buffer zones. These zones must be based upon the radial distance from the edges of the airgun array (rather than being based on the center of the array or around the vessel itself). During use of the acoustic source (i.e., anytime the acoustic source is active, including ramp-up), occurrence of marine mammals within the relevant buffer zone (but outside the exclusion zone) should be communicated to the operator to prepare for the potential shutdown of the acoustic source.

i. Two exclusion zones are defined, depending on the species and context. A standard exclusion zone encompassing the area at and below the sea surface out to a radius of 500 meters from the edges of the airgun array (0-500 m) is defined. For special circumstances (defined at 4(e)(v) of this LOA), the exclusion zone encompasses an extended distance of 1,500 meters (0-1,500 m).

ii. During pre-start clearance monitoring (i.e., before ramp-up begins), the buffer zone acts as an extension of the exclusion zone in that observations of marine mammals within the buffer zone would also preclude airgun operations from beginning (i.e., ramp-up). For all marine mammals (except where superseded by the extended 1,500-m exclusion zone), the buffer zone encompasses the area at and below the sea surface from the edge of the 0-500 meter exclusion zone out to a radius of 1,000 meters from the edges of the airgun array (500-1,000 m). The buffer zone is not applicable when the exclusion zone is greater than 500 meters, i.e., the observational focal zone is not increased beyond 1,500 meters.

(d) A ramp-up procedure, involving a step-wise increase in the number of airguns firing and total active array volume until all operational airguns are activated and the full volume is achieved, is required at all times as part of the activation of the acoustic source. A 30-minute pre-start clearance observation period must occur prior to the start of ramp-up. The Holder must adhere to the following pre-start clearance and ramp-up requirements:

i. The operator must notify a designated PSO of the planned start of ramp-up as agreed upon with the lead PSO; the notification time should not be less than 60 minutes prior to the planned ramp-up.

ii. Ramp-ups must be scheduled so as to minimize the time spent with source activated prior to reaching the designated run-in.

iii. A designated PSO must be notified again immediately prior to initiating ramp-up procedures and the operator must receive confirmation from the PSO to proceed.

iv. Ramp-up must not be initiated if any marine mammal is within the

applicable exclusion or buffer zone. If a marine mammal is observed within the exclusion zone or the buffer zone during the 30-minute pre-start clearance period, ramp-up must not begin until the animal(s) has been observed exiting the zones or until an additional time period has elapsed with no further sightings (15 minutes for small delphinids and 30 minutes for all other species).

v. Ramp-up must begin by activating a single airgun of the smallest volume in the array and shall continue in stages by doubling the number of active elements at the commencement of each stage, with each stage of approximately the same duration. Total duration must not be less than 20 minutes. The operator must provide information to the PSO documenting that appropriate procedures were followed.

vi. Ramp-up must cease and the source shut down upon observation of marine mammals within the applicable exclusion zone. Once ramp-up has begun, observations of marine mammals within the buffer zone do not require shutdown.

vii. Ramp-up may occur at times of poor visibility, including nighttime, if appropriate acoustic monitoring has occurred with no detections of a marine mammal other than delphinids in the 30 minutes prior to beginning ramp-up. Acoustic source activation may only occur at night where operational planning cannot reasonably avoid such circumstances.

viii. If the acoustic source is shut down for brief periods (i.e., less than 30 minutes) for reasons other than implementation of prescribed mitigation (e.g., mechanical difficulty), it may be activated again without ramp-up if PSOs have maintained constant visual and/or acoustic observation and no visual or acoustic detections of any marine mammal have occurred within the applicable exclusion zone. For any longer shutdown, pre-start clearance observation and ramp-up are required. For any shutdown at night or in periods of poor visibility (e.g., BSS 4 or greater), ramp-up is required, but if the shutdown period was brief and constant observation maintained, pre-start clearance watch is not required.

ix. Testing of the acoustic source involving all elements requires ramp-up. Testing limited to individual source elements or strings does not require ramp-up but does require the pre-start clearance observation period.

(e) Shutdown requirements:

i. Any PSO on duty has the authority to delay the start of survey operations or to call for shutdown of the acoustic source pursuant to these requirements.

ii. The operator must establish and maintain clear lines of communication directly between PSOs on duty and crew controlling the acoustic source to ensure that shutdown commands are conveyed swiftly while allowing PSOs to maintain watch.

iii. When both visual and acoustic PSOs are on duty, all detections must be immediately communicated to the remainder of the on-duty PSO team for potential verification of visual observations by the acoustic PSO or of acoustic detections by visual PSOs.

iv. When the airgun array is active (i.e., anytime one or more airguns is active, including during ramp-up) and (1) a marine mammal appears within or enters the applicable exclusion zone and/or (2) a marine mammal (excluding delphinids) is detected acoustically and localized within the applicable exclusion zone, the acoustic source must be shut down. When shutdown is called for by a PSO, the acoustic source must be immediately deactivated and any dispute resolved only following deactivation.

v. The extended 1,500-m exclusion zone must be applied upon detection (visual or acoustic) of a baleen whale, sperm whale, beaked whale, or *Kogia* spp. within the zone.

vi. Shutdown requirements are waived for dolphins of the following genera: *Tursiops*, *Stenella*, *Steno*, and *Lagenodelphis*. If a delphinid is visually detected within the exclusion zone, no shutdown is required unless the PSO confirms the individual to be of a genus other than those listed above, in which case a shutdown is required. Acoustic detection of delphinids does not require shutdown.

vii. If there is uncertainty regarding identification or localization, PSOs may use best professional judgment in making the decision to call for a shutdown.

viii. Upon implementation of shutdown, the source may be reactivated after the marine mammal(s) has been observed exiting the applicable exclusion zone or following a 30-minute clearance period with no further detection of the marine mammal(s).

(f) *Entanglement avoidance*. To avoid the risk of entanglement, if conducting surveys using ocean-bottom nodes or similar gear the Holder must:

i. Use negatively buoyant coated wire-core tether cable;

ii. Retrieve all lines immediately following completion of the survey; and

iii. Attach acoustic pingers directly to the coated tether cable; acoustic releases should not be used.

(g) *Vessel strike avoidance*. The Holder must adhere to the following requirements:

i. Vessel operators and crews must maintain a vigilant watch for all marine mammals and must slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any marine mammal. A visual observer aboard the vessel must monitor a vessel strike avoidance zone around the vessel, which shall be defined according to the parameters stated in this subsection. Visual observers monitoring the vessel strike avoidance zone may be third-party observers (i.e., PSOs) or crew members, but crew members responsible for these duties must be provided sufficient training to distinguish marine mammals from other phenomena and broadly to identify a marine mammal as a baleen whale, sperm whale, or other marine mammal;

ii. Vessel speeds must be reduced to 10 kn or less when mother/calf pairs, pods, or large assemblages of marine mammals are observed near a vessel;

iii. All vessels must maintain a minimum separation distance of 500 m from baleen whales;

iv. All vessels must maintain a minimum separation distance of 100 m from sperm whales;

v. All vessels must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 m from all other marine mammals, with an exception made for those animals that approach the vessel; and

vi. When marine mammals are sighted while a vessel is underway, the vessel must take action as necessary to avoid violating the relevant separation distance, e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area. If marine mammals are sighted within the relevant separation distance, the vessel must reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear or any vessel that is navigationally constrained.

vii. These requirements do not apply in any case where compliance would create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of the restriction, cannot comply.

5. <u>Monitoring Requirements</u>

(a) PSO qualifications:

i. PSOs must successfully complete relevant, acceptable training, including completion of all required coursework and passing (80 percent or greater) a written and/or oral examination developed for the training program.

ii. PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or equivalent in the biological sciences, and at least one undergraduate course in math or statistics. The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver must be submitted to NMFS and shall include written justification. Requests will be granted or denied (with justification) by NMFS within one week of receipt of submitted information. Alternate experience that may be considered includes, but is not limited to:

(A) secondary education and/or experience comparable to PSO duties;

(B) previous work experience conducting academic, commercial, or government-sponsored marine mammal surveys; or

(C) previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties.

(b) *Equipment*. The Holder is required to:

i. Provide PSOs with bigeye binoculars (e.g., 25 x 150; 2.7 view angle; individual ocular focus; height control) of appropriate quality solely for PSO use. These must be pedestal-mounted on the deck at the most appropriate vantage point that provides for optimal sea surface observation, PSO safety, and safe operation of the vessel.

ii. For each vessel required to use a PAM system, provide a PAM system that has been verified and tested by an experienced acoustic PSO who will be using it during the trip for which monitoring is required;

iii. Work with the selected third-party observer provider to ensure PSOs have all equipment (including backup equipment) needed to adequately perform necessary tasks, including accurate determination of distance and bearing to observed marine mammals. (Equipment specified in A. through G. below may be provided by an individual PSO, the third-party observer provider, or the LOA-holder, but the LOA-holder is responsible for ensuring PSOs have the proper equipment required to perform the duties specified herein.) Such equipment, at a minimum, must include:

(A) Reticle binoculars (e.g., 7 x 50) of appropriate quality (at least one per PSO, plus backups);

(B) Global Positioning Unit (GPS) (plus backup);

(C) Digital camera with a telephoto lens (the camera or lens should also have an image stabilization system) that is at least 300 mm or equivalent on a full-frame single lens reflex (SLR) (plus backup);

(D) Compass (plus backup);

(E) Radios for communication among vessel crew and PSOs (at least one per PSO, plus backups); and

(F) Any other tools necessary to adequately perform necessary PSO tasks.

(c) *Data collection*. PSOs must use standardized electronic data forms. PSOs must record detailed information about any implementation of mitigation requirements, including the distance of marine mammals to the acoustic source and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up or activation of the acoustic source. If required mitigation was not implemented, PSOs must record a description of the circumstances. At a minimum, the following information should be recorded:

i. Vessel names (source vessel and other vessels associated with survey), vessel size and type, maximum speed capability of vessel, port of origin, and call signs;

ii. PSO names and affiliations;

iii. Dates of departures and returns to port with port name;

iv. Dates of and participants in PSO briefings;

v. Dates and times (Greenwich Mean Time) of survey effort and times corresponding with PSO effort;

vi. Vessel location (latitude/longitude) when survey effort began and ended and vessel location at beginning and end of visual PSO duty shifts;

vii. Vessel location at 30-second intervals (if software capability allows) or 5-minute intervals (if location must be manually recorded);

viii. Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any line change;

ix. Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions changed significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon;

x. Vessel location when environmental conditions change significantly;

xi. Factors that may have contributed to impaired observations during each PSO shift change or as needed as environmental conditions change (e.g., vessel traffic, equipment malfunctions);

xii. Survey activity information, such as acoustic source power output while in operation, number and volume of airguns operating in an array, tow depth of an acoustic source, and any other notes of significance (i.e., pre-start clearance, ramp-up, shutdown, testing, shooting, ramp-up completion, end of operations, streamers, etc.); and

xiii. Upon visual observation of a marine mammal, the following information:

(A) Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);

(B) PSO who sighted the animal and PSO location (including height above water) at time of sighting;

(C) Time of sighting;

(D) Vessel coordinates at time of sighting;

(E) Water depth;

(F) Direction of vessel's travel (compass direction);

(G) Speed of the vessel(s) from which the observation was made;

(H) Direction of animal's travel relative to the vessel;

(I) Pace of the animal;

(J) Estimated distance to the animal (and method of estimating distance) and its heading relative to vessel at initial sighting;

(K) Identification of the animal (e.g., genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;

(L) Estimated number of animals (high/low/best);

(M) Estimated number of animals by cohort (adults, juveniles, group composition, etc.);

(N) Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);

(O) Detailed behavior observations (e.g., number of blows/breaths, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior), including an assessment of behavioral responses to survey activity;

(P) Animal's closest point of approach (CPA) and/or closest distance from any element of the acoustic source;

(Q) Platform activity at time of sighting (e.g., deploying, recovering, testing, shooting, data acquisition, other); and

(R) Description of any actions implemented in response to the sighting (e.g., delays, shutdown, ramp-up) and time and location of the action.

xiv. Upon acoustic detection of a marine mammal using a PAM system, the following information:

(A) An acoustic encounter identification number, and whether the detection was linked with a visual sighting;

(B) Date and time when first and last heard;

(C) Types and nature of sounds heard (e.g., clicks, whistles, creaks, burst pulses, continuous, sporadic, strength of signal); and

(D) Any additional information recorded such as water depth of the hydrophone array, bearing of the animal to the vessel (if determinable), species or taxonomic group (if determinable), spectrogram screenshot, and any other notable information.

6. Reporting Requirements

(a) Annual reporting:

i. The Holder must submit a summary report to NMFS on all activities and monitoring results within 90 days of the completion of the survey or expiration of the LOA, whichever comes sooner, and must include all information described above under section 5(c) of this LOA. If an issued LOA is valid for greater than one year, the summary report must be submitted on an annual basis.

ii. The report must describe activities conducted and sightings of marine mammals, must provide full documentation of methods, results, and interpretation pertaining to all monitoring, and must summarize the dates and locations of survey operations and all marine mammal sightings (dates, times, locations, activities, associated survey activities, and information regarding locations where the acoustic source was used). In addition to the report, all raw observational data must be made available to NMFS.

iii. For operations requiring the use of PAM, the report must include a validation document concerning the use of PAM, which should include necessary noise validation diagrams and demonstrate whether background noise levels on the PAM deployment limited achievement of the planned detection goals. Copies of any vessel self-noise assessment reports must be included with the report.

iv. The Holder must provide geo-referenced time-stamped vessel tracklines for all time periods in which airguns (full array or single) were operating. Tracklines must include points recording any change in airgun status (e.g., when the airguns began operating, when they were turned off). GIS files must be provided in ESRI shapefile format and include the UTC date and time, latitude in decimal degrees, and longitude in decimal degrees. All coordinates must be referenced to the WGS84 geographic coordinate system.

v. The draft report must be accompanied by a certification from the lead PSO as to the accuracy of the report, and the lead PSO may submit directly to NMFS a statement concerning implementation and effectiveness of the required mitigation and monitoring.

vi. A final report must be submitted within 30 days following resolution of any comments on the draft report.

(b) *Comprehensive reporting*. The Holder must contribute to the compilation and analysis of data for inclusion in an annual synthesis report addressing all data

collected and reported through annual reporting in each calendar year. The synthesis period shall include all annual reports deemed to be final by NMFS in a given one-year reporting period. The report must be submitted to NMFS within 90 days following the end of a given one-year reporting period.

(c) Reporting of injured or dead marine mammals:

i. In the event that personnel involved in the survey activities discover an injured or dead marine mammal, the Holder must report the incident to the Office of Protected Resources (OPR), NMFS and to the Southeast Regional Stranding Network as soon as feasible. The report must include the following information:

(A) Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);

(B) Species identification (if known) or description of the animal(s) involved;

(C) Condition of the animal(s) (including carcass condition if the animal is dead);

(D) Observed behaviors of the animal(s), if alive;

(E) If available, photographs or video footage of the animal(s); and

(F) General circumstances under which the animal was discovered.

ii. In the event of a ship strike of a marine mammal by any vessel involved in the survey activities, the LOA-holder must report the incident to OPR, NMFS and to the Southeast Regional Stranding Network as soon as feasible. The report must include the following information:

(A) Time, date, and location (latitude/longitude) of the incident;

(B) Species identification (if known) or description of the animal(s) involved;

(C) Vessel's speed during and leading up to the incident;

(D) Vessel's course/heading and what operations were being conducted (if applicable);

(E) Status of all sound sources in use;

(F) Description of avoidance measures/requirements that were in place

at the time of the strike and what additional measures were taken, if any, to avoid strike;

(G) Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike;

(H) Estimated size and length of animal that was struck;

(I) Description of the behavior of the marine mammal immediately preceding and following the strike;

(J) If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;

(K) Estimated fate of the animal (e.g., dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and

(L) To the extent practicable, photographs or video footage of the animal(s).

7. Actions to Minimize Additional Harm to Live-Stranded (or Milling) Marine Mammals

(a) In the event of a live stranding (or near-shore atypical milling) event within 50 km of the survey operations, where the NMFS stranding network is engaged in herding or other interventions to return animals to the water, the Director of OPR, NMFS (or designee) will advise the Holder of the need to implement shutdown procedures for all active acoustic sources operating within 50 km of the stranding. Shutdown procedures for live stranding or milling marine mammals include the following:

i. If at any time, the marine mammal(s) die or are euthanized, or if herding/intervention efforts are stopped, the Director of OPR, NMFS (or designee) will advise the LOA-holder that the shutdown around the animals' location is no longer needed.

ii. Otherwise, shutdown procedures will remain in effect until the Director of OPR, NMFS (or designee) determines and advises the LOA-holder that all live animals involved have left the area (either of their own volition or following an intervention).

iii. If further observations of the marine mammals indicate the potential for re-stranding, additional coordination with the LOA-holder will be required to determine what measures are necessary to minimize that likelihood (e.g., extending the shutdown or moving operations farther away) and to implement those measures as appropriate.

(b) If NMFS determines that the circumstances of any marine mammal stranding found in the vicinity of the activity suggest investigation of the association with survey activities is warranted, and an investigation into the stranding is being pursued, NMFS will submit a written request to the LOA-holder indicating that the following initial available information must be provided as soon as possible, but no later than 7 business days after the request for information. In the event that the investigation is still inconclusive, the investigation of the association of the survey activities is still warranted, and the investigation is still being pursued, NMFS may provide additional information requests, in writing, regarding the nature and location of survey operations prior to the time period above.

i. Status of all sound source use in the 48 hours preceding the estimated time of stranding and within 50 km of the discovery/notification of the stranding by NMFS; and

ii. If available, description of the behavior of any marine mammal(s) observed preceding (i.e., within 48 hours and 50 km) and immediately after the discovery of the stranding.

8. This Authorization may be modified, suspended or revoked if the Holder fails to abide by the conditions prescribed herein (including, but not limited to, failure to comply with monitoring or reporting requirements), or if NMFS determines: (1) the authorized taking is likely to have or is having more than a negligible impact on the species or stocks of affected marine mammals, or (2) the prescribed measures are likely not or are not effecting the least practicable adverse impact on the affected species or stocks and their habitat.

_____

Kimberly Damon-Randall
Director,
Office of Protected Resources,
National Marine Fisheries Service.

Table 1. Authorized Incidental Take.

Common name	Scientific name	Level A harassment	Level B harassment
Sperm whale	*Physeter macrocephalus*	0	371
Pygmy/Dwarf sperm whale	*Kogia* spp.	19	187
Beaked whales	*Ziphius cavirostris*/ *Mesoplodon* spp.	0	3,338
Rough-toothed dolphin	*Steno bredanensis*	0	590
Bottlenose dolphin	*Tursiops truncatus*	0	21
Clymene dolphin	*Stenella clymene*	0	1,533
Pantropical spotted dolphin	*Stenella attenuata*	0	15,216
Spinner dolphin	*Stenella longirostris*	0	357
Striped dolphin	*Stenella coeruleoalba*	0	796
Fraser's dolphin	*Lagenodelphis hosei*	0	257
Risso's dolphin	*Grampus griseus*	0	252
Melon-headed whale	*Peponocephala electra*	0	1,014
Pygmy killer whale	*Feresa attenuata*	0	488
False killer whale	*Pseudorca crassidens*	0	553
Killer whale	*Orcinus orca*	0	7
Short-finned pilot whale	*Globicephala macrorhynchus*	0	80

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

LETTER OF AUTHORIZATION

Chevron U.S.A. Inc. and its designees are hereby authorized under section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1371(a)(5)(A)) to take marine mammals incidental to geophysical survey activities in the Gulf of Mexico, subject to the provisions of the MMPA and the Regulations Governing Taking Marine Mammals Incidental to Geophysical Survey Activities in the Gulf of Mexico (50 CFR Part 217, Subpart S) (Regulations).

1. This Letter of Authorization (LOA) is valid for 45 days from date of issuance.

2. This LOA authorizes take incidental to the specified geophysical survey activities (3D OBN survey of Walker Ridge 758, 759, 802 and surrounding lease blocks) described in the LOA request.

3. General Conditions

   (a) A copy of this LOA must be in the possession of the Holder of the Authorization (Holder), vessel operator, other relevant personnel, the lead protected species observer (PSO), and any other relevant designees operating under the authority of the LOA.

   (b) The species and/or stocks authorized for taking are listed in Table 1. Authorized take, by Level A and Level B harassment only, is limited to the species and numbers listed in Table 1.

   (c) The taking by serious injury or death of any of the species listed in Table 1 or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA. Any taking exceeding the authorized amounts listed in Table 1 is prohibited and may result in the modification, suspension, or revocation of this IHA.

   (d) The Holder must instruct relevant vessel personnel with regard to the authority of the protected species monitoring team (PSO team), and must ensure that relevant vessel personnel and PSO team participate in a joint onboard briefing, led by the vessel operator and lead PSO, prior to beginning work to ensure that responsibilities, communication procedures, protected species monitoring protocols, operational procedures, and LOA requirements are clearly understood. This briefing must be repeated when relevant new personnel join the survey operations before work involving those personnel commences.

   (e) The acoustic source must be deactivated when not acquiring data or preparing to acquire data, except as necessary for testing. Unnecessary use of the acoustic source must be avoided. Notified operational capacity (i.e., total array volume) (not including redundant backup airguns) must not be exceeded during the survey,

except where unavoidable for source testing and calibration purposes. All occasions where activated source volume exceeds notified operational capacity must be communicated to the PSO(s) on duty and fully documented. The lead PSO must be granted access to relevant instrumentation documenting acoustic source power and/or operational volume.

(f) PSO requirements:

i. LOA-holders must use independent, dedicated, qualified PSOs, meaning that the PSOs must be employed by a third-party observer provider, must have no tasks other than to conduct observational effort, collect data, and communicate with and instruct relevant vessel crew with regard to the presence of protected species and mitigation requirements (including brief alerts regarding maritime hazards), and must be qualified pursuant to section 5(a) of this LOA. Acoustic PSOs are required to complete specialized training for operating passive acoustic monitoring (PAM) systems and are encouraged to have familiarity with the vessel on which they will be working. PSOs may act as both acoustic and visual observers (but not simultaneously), so long as they demonstrate that their training and experience are sufficient to perform each task.

ii. The Holder must submit PSO resumes for NMFS review and approval prior to commencement of the survey (submit to nmfs.psoreview@noaa.gov). Resumes should include dates of training and any prior NMFS approval, as well as dates and description of last experience, and must be accompanied by information documenting successful completion of an acceptable training course. NMFS is allowed one week to approve PSOs from the time that the necessary information is received by NMFS, after which PSOs meeting the minimum requirements will automatically be considered approved.

iii. At least one visual PSO and two acoustic PSOs aboard each acoustic source vessel must have a minimum of 90 days at-sea experience working in those roles, respectively, with no more than eighteen months elapsed since the conclusion of the at-sea experience. One visual PSO with such experience must be designated as the lead for the entire PSO team. The lead must coordinate duty schedules and roles for the PSO team and serve as the primary point of contact for the vessel operator. (Note that the responsibility of coordinating duty schedules and roles may instead be assigned to a shore-based, third-party monitoring coordinator.) To the maximum extent practicable, the lead PSO must devise the duty schedule such that experienced PSOs are on duty with those PSOs with appropriate training but who have not yet gained relevant experience.

4. Mitigation Requirements

(a) Visual monitoring requirements:

i. During survey operations (i.e., any day on which use of the acoustic source is planned to occur, and whenever the acoustic source is in the water, whether activated or not), a minimum of two PSOs must be on duty and conducting visual observations at all times during daylight hours (i.e., from 30 minutes prior to sunrise through 30 minutes following sunset).

ii. Visual monitoring must begin not less than 30 minutes prior to ramp-up and must continue until one hour after use of the acoustic source ceases or until 30 minutes past sunset.

iii. Visual PSOs must coordinate to ensure 360° visual coverage around the vessel from the most appropriate observation posts, and must conduct visual observations using binoculars and the naked eye while free from distractions and in a consistent, systematic, and diligent manner.

iv. Visual PSOs must immediately communicate all observations of marine mammals to the on-duty acoustic PSO, including any determination by the PSO regarding species identification, distance, and bearing and the degree of confidence in the determination.

v. Any observations of marine mammals by crew members aboard any vessel associated with the survey must be relayed to the PSO team.

vi. During good conditions (e.g., daylight hours; Beaufort sea state (BSS) 3 or less), visual PSOs must conduct observations when the acoustic source is not operating for comparison of sighting rates and behavior with and without use of the acoustic source and between acquisition periods, to the maximum extent practicable.

vii. Visual PSOs may be on watch for a maximum of two consecutive hours followed by a break of at least one hour between watches and may conduct a maximum of 12 hours of observation per 24-hour period. NMFS may grant an exception for LOA applicants that demonstrate such a "two hours on/one hour off" duty cycle is not practicable, in which case visual PSOs will be subject to a maximum of four consecutive hours on watch followed by a break of at least two hours between watches. Combined observational duties (visual and acoustic but not at the same time) must not exceed 12 hours per 24-hour period for any individual PSO.

(b) Acoustic monitoring requirements:

i. All source vessels must use a towed PAM system at all times when operating in waters deeper than 100 m, which must be monitored by a minimum of one acoustic PSO beginning at least 30 minutes prior to

ramp-up, at all times during use of the acoustic source, and until one hour after use of the acoustic source ceases. "PAM system" refers to calibrated hydrophone arrays with full system redundancy to detect, identify, and estimate distance and bearing to vocalizing cetaceans, coupled with appropriate software to aid monitoring and listening by a PAM operator skilled in bioacoustics analysis and computer system specifications capable of running appropriate software. The PAM system must have at least one calibrated hydrophone (per each deployed hydrophone type and/or set) sufficient for determining whether background noise levels on the towed PAM system are sufficiently low to meet performance expectations. Applicants must provide a PAM plan including description of the hardware and software proposed for use prior to proceeding with any survey where PAM is required.

ii. Acoustic PSOs must immediately communicate all detections of marine mammals to visual PSOs (when visual PSOs are on duty), including any determination by the PSO regarding species identification, distance, and bearing, and the degree of confidence in the determination.

iii. Acoustic PSOs may be on watch for a maximum of four consecutive hours followed by a break of at least two hours between watches, and may conduct a maximum of 12 hours of observation per 24-hour period. Combined observational duties (visual and acoustic but not at the same time) must not exceed 12 hours per 24-hour period for any individual PSO.

iv. Survey activity may continue for 30 minutes when the PAM system malfunctions or is damaged, while the PAM operator diagnoses the issue. If the diagnosis indicates that the PAM system must be repaired to solve the problem, operations may continue for an additional two hours without acoustic monitoring during daylight hours only under the following conditions:

(A) Sea state is less than or equal to BSS 4;

(B) No marine mammals (excluding delphinids) detected solely by PAM in the applicable exclusion zone in the previous two hours;

(C) NMFS is notified via email as soon as practicable with the time and location in which operations began occurring without an active PAM system; and

(D) Operations with an active acoustic source, but without an operating PAM system, do not exceed a cumulative total of four hours in any 24-hour period.

(c) PSOs must establish and monitor applicable exclusion and buffer zones. These zones must be based upon the radial distance from the edges of the airgun array (rather than being based on the center of the array or around the vessel itself). During use of the acoustic source (i.e., anytime the acoustic source is active, including ramp-up), occurrence of marine mammals within the relevant buffer zone (but outside the exclusion zone) should be communicated to the operator to prepare for the potential shutdown of the acoustic source.

i. Two exclusion zones are defined, depending on the species and context. A standard exclusion zone encompassing the area at and below the sea surface out to a radius of 500 meters from the edges of the airgun array (0-500 m) is defined. For special circumstances (defined at 4(e)(v) of this LOA), the exclusion zone encompasses an extended distance of 1,500 meters (0-1,500 m).

ii. During pre-start clearance monitoring (i.e., before ramp-up begins), the buffer zone acts as an extension of the exclusion zone in that observations of marine mammals within the buffer zone would also preclude airgun operations from beginning (i.e., ramp-up). For all marine mammals (except where superseded by the extended 1,500-m exclusion zone), the buffer zone encompasses the area at and below the sea surface from the edge of the 0-500 meter exclusion zone out to a radius of 1,000 meters from the edges of the airgun array (500-1,000 m). The buffer zone is not applicable when the exclusion zone is greater than 500 meters, i.e., the observational focal zone is not increased beyond 1,500 meters.

(d) A ramp-up procedure, involving a step-wise increase in the number of airguns firing and total active array volume until all operational airguns are activated and the full volume is achieved, is required at all times as part of the activation of the acoustic source. A 30-minute pre-start clearance observation period must occur prior to the start of ramp-up. The Holder must adhere to the following pre-start clearance and ramp-up requirements:

i. The operator must notify a designated PSO of the planned start of ramp-up as agreed upon with the lead PSO; the notification time should not be less than 60 minutes prior to the planned ramp-up.

ii. Ramp-ups must be scheduled so as to minimize the time spent with source activated prior to reaching the designated run-in.

iii. A designated PSO must be notified again immediately prior to initiating ramp-up procedures and the operator must receive confirmation from the PSO to proceed.

iv. Ramp-up must not be initiated if any marine mammal is within the applicable exclusion or buffer zone. If a marine mammal is observed

within the exclusion zone or the buffer zone during the 30-minute pre-start clearance period, ramp-up must not begin until the animal(s) has been observed exiting the zones or until an additional time period has elapsed with no further sightings (15 minutes for small delphinids and 30 minutes for all other species).

v. Ramp-up must begin by activating a single airgun of the smallest volume in the array and shall continue in stages by doubling the number of active elements at the commencement of each stage, with each stage of approximately the same duration. Total duration must not be less than 20 minutes. The operator must provide information to the PSO documenting that appropriate procedures were followed.

vi. Ramp-up must cease and the source shut down upon observation of marine mammals within the applicable exclusion zone. Once ramp-up has begun, observations of marine mammals within the buffer zone do not require shutdown.

vii. Ramp-up may occur at times of poor visibility, including nighttime, if appropriate acoustic monitoring has occurred with no detections of a marine mammal other than delphinids in the 30 minutes prior to beginning ramp-up. Acoustic source activation may only occur at night where operational planning cannot reasonably avoid such circumstances.

viii. If the acoustic source is shut down for brief periods (i.e., less than 30 minutes) for reasons other than implementation of prescribed mitigation (e.g., mechanical difficulty), it may be activated again without ramp-up if PSOs have maintained constant visual and/or acoustic observation and no visual or acoustic detections of any marine mammal have occurred within the applicable exclusion zone. For any longer shutdown, pre-start clearance observation and ramp-up are required. For any shutdown at night or in periods of poor visibility (e.g., BSS 4 or greater), ramp-up is required, but if the shutdown period was brief and constant observation maintained, pre-start clearance watch is not required.

ix. Testing of the acoustic source involving all elements requires ramp-up. Testing limited to individual source elements or strings does not require ramp-up but does require the pre-start clearance observation period.

(e) Shutdown requirements:

i. Any PSO on duty has the authority to delay the start of survey operations or to call for shutdown of the acoustic source pursuant to these requirements.

ii. The operator must establish and maintain clear lines of communication

directly between PSOs on duty and crew controlling the acoustic source to ensure that shutdown commands are conveyed swiftly while allowing PSOs to maintain watch.

iii. When both visual and acoustic PSOs are on duty, all detections must be immediately communicated to the remainder of the on-duty PSO team for potential verification of visual observations by the acoustic PSO or of acoustic detections by visual PSOs.

iv. When the airgun array is active (i.e., anytime one or more airguns is active, including during ramp-up) and (1) a marine mammal appears within or enters the applicable exclusion zone and/or (2) a marine mammal (excluding delphinids) is detected acoustically and localized within the applicable exclusion zone, the acoustic source must be shut down. When shutdown is called for by a PSO, the acoustic source must be immediately deactivated and any dispute resolved only following deactivation.

v. The extended 1,500-m exclusion zone must be applied upon detection (visual or acoustic) of a baleen whale, sperm whale, beaked whale, or *Kogia* spp. within the zone.

vi. Shutdown requirements are waived for dolphins of the following genera: *Tursiops*, *Stenella*, *Steno*, and *Lagenodelphis*. If a delphinid is visually detected within the exclusion zone, no shutdown is required unless the PSO confirms the individual to be of a genus other than those listed above, in which case a shutdown is required. Acoustic detection of delphinids does not require shutdown.

vii. If there is uncertainty regarding identification or localization, PSOs may use best professional judgment in making the decision to call for a shutdown.

viii. Upon implementation of shutdown, the source may be reactivated after the marine mammal(s) has been observed exiting the applicable exclusion zone or following a 30-minute clearance period with no further detection of the marine mammal(s).

(f) *Entanglement avoidance*. To avoid the risk of entanglement, if conducting surveys using ocean-bottom nodes or similar gear the Holder must:

i. Use negatively buoyant coated wire-core tether cable;

ii. Retrieve all lines immediately following completion of the survey; and

iii. Attach acoustic pingers directly to the coated tether cable; acoustic

releases should not be used.

(g) *Vessel strike avoidance*. The Holder must adhere to the following requirements:

i. Vessel operators and crews must maintain a vigilant watch for all marine mammals and must slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any marine mammal. A visual observer aboard the vessel must monitor a vessel strike avoidance zone around the vessel, which shall be defined according to the parameters stated in this subsection. Visual observers monitoring the vessel strike avoidance zone may be third-party observers (i.e., PSOs) or crew members, but crew members responsible for these duties must be provided sufficient training to distinguish marine mammals from other phenomena and broadly to identify a marine mammal as a baleen whale, sperm whale, or other marine mammal;

ii. Vessel speeds must be reduced to 10 kn or less when mother/calf pairs, pods, or large assemblages of marine mammals are observed near a vessel;

iii. All vessels must maintain a minimum separation distance of 500 m from baleen whales;

iv. All vessels must maintain a minimum separation distance of 100 m from sperm whales;

v. All vessels must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 m from all other marine mammals, with an exception made for those animals that approach the vessel; and

vi. When marine mammals are sighted while a vessel is underway, the vessel must take action as necessary to avoid violating the relevant separation distance, e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area. If marine mammals are sighted within the relevant separation distance, the vessel must reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear or any vessel that is navigationally constrained.

vii. These requirements do not apply in any case where compliance would create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of the restriction, cannot comply.

5. Monitoring Requirements

(a) PSO qualifications:

i. PSOs must successfully complete relevant, acceptable training, including completion of all required coursework and passing (80 percent or greater) a written and/or oral examination developed for the training program.

ii. PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or equivalent in the biological sciences, and at least one undergraduate course in math or statistics. The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver must be submitted to NMFS and shall include written justification. Requests will be granted or denied (with justification) by NMFS within one week of receipt of submitted information. Alternate experience that may be considered includes, but is not limited to:

(A) secondary education and/or experience comparable to PSO duties;

(B) previous work experience conducting academic, commercial, or government-sponsored marine mammal surveys; or

(C) previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties.

(b) *Equipment*. The Holder is required to:

i. Provide PSOs with bigeye binoculars (e.g., 25 x 150; 2.7 view angle; individual ocular focus; height control) of appropriate quality solely for PSO use. These must be pedestal-mounted on the deck at the most appropriate vantage point that provides for optimal sea surface observation, PSO safety, and safe operation of the vessel.

ii. For each vessel required to use a PAM system, provide a PAM system that has been verified and tested by an experienced acoustic PSO who will be using it during the trip for which monitoring is required;

iii. Work with the selected third-party observer provider to ensure PSOs have all equipment (including backup equipment) needed to adequately perform necessary tasks, including accurate determination of distance and bearing to observed marine mammals. (Equipment specified in A. through G. below may be provided by an individual PSO, the third-party observer provider, or the LOA-holder, but the LOA-holder is responsible for ensuring PSOs have the proper equipment required to perform the duties specified herein.) Such equipment, at a minimum, must include:

(A) Reticle binoculars (e.g., 7 x 50) of appropriate quality (at least one per PSO, plus backups);

(B) Global Positioning Unit (GPS) (plus backup);

(C) Digital camera with a telephoto lens (the camera or lens should also have an image stabilization system) that is at least 300 mm or equivalent on a full-frame single lens reflex (SLR) (plus backup);

(D) Compass (plus backup);

(E) Radios for communication among vessel crew and PSOs (at least one per PSO, plus backups); and

(F) Any other tools necessary to adequately perform necessary PSO tasks.

(c) *Data collection*. PSOs must use standardized electronic data forms. PSOs must record detailed information about any implementation of mitigation requirements, including the distance of marine mammals to the acoustic source and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up or activation of the acoustic source. If required mitigation was not implemented, PSOs must record a description of the circumstances. At a minimum, the following information should be recorded:

i. Vessel names (source vessel and other vessels associated with survey), vessel size and type, maximum speed capability of vessel, port of origin, and call signs;

ii. PSO names and affiliations;

iii. Dates of departures and returns to port with port name;

iv. Dates of and participants in PSO briefings;

v. Dates and times (Greenwich Mean Time) of survey effort and times corresponding with PSO effort;

vi. Vessel location (latitude/longitude) when survey effort began and ended and vessel location at beginning and end of visual PSO duty shifts;

vii. Vessel location at 30-second intervals (if software capability allows) or 5-minute intervals (if location must be manually recorded);

viii. Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any line change;

ix. Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions changed significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon;

x. Vessel location when environmental conditions change significantly;

xi. Factors that may have contributed to impaired observations during each PSO shift change or as needed as environmental conditions change (e.g., vessel traffic, equipment malfunctions);

xii. Survey activity information, such as acoustic source power output while in operation, number and volume of airguns operating in an array, tow depth of an acoustic source, and any other notes of significance (i.e., pre-start clearance, ramp-up, shutdown, testing, shooting, ramp-up completion, end of operations, streamers, etc.); and

xiii. Upon visual observation of a marine mammal, the following information:

(A) Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);

(B) PSO who sighted the animal and PSO location (including height above water) at time of sighting;

(C) Time of sighting;

(D) Vessel coordinates at time of sighting;

(E) Water depth;

(F) Direction of vessel's travel (compass direction);

(G) Speed of the vessel(s) from which the observation was made;

(H) Direction of animal's travel relative to the vessel;

(I) Pace of the animal;

(J) Estimated distance to the animal (and method of estimating distance) and its heading relative to vessel at initial sighting;

(K) Identification of the animal (e.g., genus/species, lowest possible

taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;

(L) Estimated number of animals (high/low/best);

(M) Estimated number of animals by cohort (adults, juveniles, group composition, etc.);

(N) Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);

(O) Detailed behavior observations (e.g., number of blows/breaths, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior), including an assessment of behavioral responses to survey activity;

(P) Animal's closest point of approach (CPA) and/or closest distance from any element of the acoustic source;

(Q) Platform activity at time of sighting (e.g., deploying, recovering, testing, shooting, data acquisition, other); and

(R) Description of any actions implemented in response to the sighting (e.g., delays, shutdown, ramp-up) and time and location of the action.

xiv. Upon acoustic detection of a marine mammal using a PAM system, the following information:

(A) An acoustic encounter identification number, and whether the detection was linked with a visual sighting;

(B) Date and time when first and last heard;

(C) Types and nature of sounds heard (e.g., clicks, whistles, creaks, burst pulses, continuous, sporadic, strength of signal); and

(D) Any additional information recorded such as water depth of the hydrophone array, bearing of the animal to the vessel (if determinable), species or taxonomic group (if determinable), spectrogram screenshot, and any other notable information.

6. Reporting Requirements

(a) Annual reporting:

i. The Holder must submit a summary report to NMFS on all activities and monitoring results within 90 days of the completion of the survey or expiration of the LOA, whichever comes sooner, and must include all information described above under section 5(c) of this LOA. If an issued LOA is valid for greater than one year, the summary report must be submitted on an annual basis.

ii. The report must describe activities conducted and sightings of marine mammals, must provide full documentation of methods, results, and interpretation pertaining to all monitoring, and must summarize the dates and locations of survey operations and all marine mammal sightings (dates, times, locations, activities, associated survey activities, and information regarding locations where the acoustic source was used). In addition to the report, all raw observational data must be made available to NMFS.

iii. For operations requiring the use of PAM, the report must include a validation document concerning the use of PAM, which should include necessary noise validation diagrams and demonstrate whether background noise levels on the PAM deployment limited achievement of the planned detection goals. Copies of any vessel self-noise assessment reports must be included with the report.

iv. The Holder must provide geo-referenced time-stamped vessel tracklines for all time periods in which airguns (full array or single) were operating. Tracklines must include points recording any change in airgun status (e.g., when the airguns began operating, when they were turned off). GIS files must be provided in ESRI shapefile format and include the UTC date and time, latitude in decimal degrees, and longitude in decimal degrees. All coordinates must be referenced to the WGS84 geographic coordinate system.

v. The draft report must be accompanied by a certification from the lead PSO as to the accuracy of the report, and the lead PSO may submit directly to NMFS a statement concerning implementation and effectiveness of the required mitigation and monitoring.

vi. A final report must be submitted within 30 days following resolution of any comments on the draft report.

(b) *Comprehensive reporting*. The Holder must contribute to the compilation and analysis of data for inclusion in an annual synthesis report addressing all data collected and reported through annual reporting in each calendar year. The

synthesis period shall include all annual reports deemed to be final by NMFS in a given one-year reporting period. The report must be submitted to NMFS within 90 days following the end of a given one-year reporting period.

(c) Reporting of injured or dead marine mammals:

i. In the event that personnel involved in the survey activities discover an injured or dead marine mammal, the Holder must report the incident to the Office of Protected Resources (OPR), NMFS and to the Southeast Regional Stranding Network as soon as feasible. The report must include the following information:

(A) Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);

(B) Species identification (if known) or description of the animal(s) involved;

(C) Condition of the animal(s) (including carcass condition if the animal is dead);

(D) Observed behaviors of the animal(s), if alive;

(E) If available, photographs or video footage of the animal(s); and

(F) General circumstances under which the animal was discovered.

ii. In the event of a ship strike of a marine mammal by any vessel involved in the survey activities, the LOA-holder must report the incident to OPR, NMFS and to the Southeast Regional Stranding Network as soon as feasible. The report must include the following information:

(A) Time, date, and location (latitude/longitude) of the incident;

(B) Species identification (if known) or description of the animal(s) involved;

(C) Vessel's speed during and leading up to the incident;

(D) Vessel's course/heading and what operations were being conducted (if applicable);

(E) Status of all sound sources in use;

(F) Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken,

if any, to avoid strike;

(G) Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike;

(H) Estimated size and length of animal that was struck;

(I) Description of the behavior of the marine mammal immediately preceding and following the strike;

(J) If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;

(K) Estimated fate of the animal (e.g., dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and

(L) To the extent practicable, photographs or video footage of the animal(s).

7. Actions to Minimize Additional Harm to Live-Stranded (or Milling) Marine Mammals

(a) In the event of a live stranding (or near-shore atypical milling) event within 50 km of the survey operations, where the NMFS stranding network is engaged in herding or other interventions to return animals to the water, the Director of OPR, NMFS (or designee) will advise the Holder of the need to implement shutdown procedures for all active acoustic sources operating within 50 km of the stranding. Shutdown procedures for live stranding or milling marine mammals include the following:

i. If at any time, the marine mammal(s) die or are euthanized, or if herding/intervention efforts are stopped, the Director of OPR, NMFS (or designee) will advise the LOA-holder that the shutdown around the animals' location is no longer needed.

ii. Otherwise, shutdown procedures will remain in effect until the Director of OPR, NMFS (or designee) determines and advises the LOA-holder that all live animals involved have left the area (either of their own volition or following an intervention).

iii. If further observations of the marine mammals indicate the potential for re-stranding, additional coordination with the LOA-holder will be required to determine what measures are necessary to minimize that likelihood (e.g., extending the shutdown or moving operations farther away) and to implement those measures as appropriate.

(b) If NMFS determines that the circumstances of any marine mammal stranding found in the vicinity of the activity suggest investigation of the association with survey activities is warranted, and an investigation into the stranding is being pursued, NMFS will submit a written request to the LOA-holder indicating that the following initial available information must be provided as soon as possible, but no later than 7 business days after the request for information. In the event that the investigation is still inconclusive, the investigation of the association of the survey activities is still warranted, and the investigation is still being pursued, NMFS may provide additional information requests, in writing, regarding the nature and location of survey operations prior to the time period above.

i. Status of all sound source use in the 48 hours preceding the estimated time of stranding and within 50 km of the discovery/notification of the stranding by NMFS; and

ii. If available, description of the behavior of any marine mammal(s) observed preceding (i.e., within 48 hours and 50 km) and immediately after the discovery of the stranding.

8. This Authorization may be modified, suspended or revoked if the Holder fails to abide by the conditions prescribed herein (including, but not limited to, failure to comply with monitoring or reporting requirements), or if NMFS determines: (1) the authorized taking is likely to have or is having more than a negligible impact on the species or stocks of affected marine mammals, or (2) the prescribed measures are likely not or are not effecting the least practicable adverse impact on the affected species or stocks and their habitat.

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Kimberly Damon-Randall
Director,
Office of Protected Resources,
National Marine Fisheries Service.

Table 1. Authorized Incidental Take.

Common name	Scientific name	Level A harassment	Level B harassment
Sperm whale	*Physeter macrocephalus*	0	138
Pygmy/Dwarf sperm whale	*Kogia* spp.	6	71
Beaked whales	*Ziphius cavirostris*/ *Mesoplodon* spp.	0	1,216
Rough-toothed dolphin	*Steno bredanensis*	0	226
Bottlenose dolphin	*Tursiops truncatus*	0	21
Clymene dolphin	*Stenella clymene*	0	596
Pantropical spotted dolphin	*Stenella attenuata*	0	5,921
Spinner dolphin	*Stenella longirostris*	0	139
Striped dolphin	*Stenella coeruleoalba*	0	310
Fraser's dolphin	*Lagenodelphis hosei*	0	97
Risso's dolphin	*Grampus griseus*	0	96
Melon-headed whale	*Peponocephala electra*	0	384
Pygmy killer whale	*Feresa attenuata*	0	187
False killer whale	*Pseudorca crassidens*	0	212
Killer whale	*Orcinus orca*	0	7
Short-finned pilot whale	*Globicephala macrorhynchus*	0	30

Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols

This Appendix has been revised as of April 26, 2021, and replaces the original Appendix C (dated March 13, 2020). These protocols will be implemented by the Bureau of Ocean Energy Management (BOEM), the Bureau of Safety and Environmental Enforcement (BSEE), and provide guidelines to operators in complying with the Endangered Species Act (ESA; 16 U.S.C. §§ 1531-1544) and Marine Mammal Protection Act (MMPA; 16 U.S.C. §§1361-1423h). The measures contained herein apply to all seismic surveys approved by BOEM and associated with the federally regulated oil and gas program in the Gulf of Mexico.

Background

Geophysical surveys, including the use of airguns and airgun arrays may have an impact on marine wildlife. Many marine species are protected under the Endangered Species Act (ESA) and all marine mammals (including manatees) are protected under the Marine Mammal Protection Act (MMPA). The following Gulf of Mexico species are listed under the ESA:

ESA-listed Species common to the Gulf of Mexico
Gulf of Mexico Bryde's Whale (*Balaenoptera edeni*)
Sperm Whale (*Physeter macrocephalus*)
Green Turtle (*Chelonia mydas*) – North Atlantic DPS and South Atlantic DPS
Hawksbill Turtle (*Eretmochelys imbricata)*
Kemp's Ridley Turtle (*Lepidochelys kempii*)
Leatherback Turtle (*Dermochelys coriacea*) - Northwest Atlantic DPS
Loggerhead Turtle (*Caretta caretta*) – Northwest Atlantic Ocean DPS
Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)
Oceanic Whitetip Shark (*Carcharhinus longimanus*)
Giant Manta Ray (*Manta birostris*)
West Indian Manatee (*Trichechus manatus*)*

**Managed by the US Fish and Wildlife Service*

Note that this list can change as other species are listed/delisted, and this protocol shall be applied to any ESA-listed protected species (and all marine mammals) that occur in the Gulf of Mexico, including rare and extralimital species.

BSEE and BOEM consult jointly with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) under Section 7 of the ESA to ensure that BOEM- or BSEE-authorized activities do not jeopardize the continued existence of ESA-listed species nor result in destruction or adverse modification of designated critical habitat. Incidental take of ESA-listed species is prohibited except as authorized pursuant to an Incidental Take Statement in the attached Biological Opinion. Incidental take of ESA-listed marine mammals cannot be exempted under the ESA unless also authorized under the MMPA. In this case, NMFS is

developing an incidental take regulation (ITR) to facilitate subsequent issuance of MMPA authorization (as applicable) to operators to authorize take incidental to seismic surveys. The proposed regulations would establish a framework for authorization of incidental take by Level A and Level B harassment through MMPA authorization (as applicable). Once an ITR and subsequent LOA is complete, the Biological Opinion and associated Incidental Take Statement may be amended to exempt take for Gulf of Mexico Bryde's whale and sperm whale, which are listed under the ESA. Following development of the ITRs, implementation could occur via issuance of MMPA authorization (as applicable and as Letters of Authorization [LOAs]) upon request from individual industry applicants planning specific seismic survey activities.

These protocols are the result of coordination between BOEM, BSEE, and NMFS and are based on: past and present mitigation measures; terms and conditions and reasonable and prudent measures identified in the attached Biological Opinion issued to the Bureaus; conditions, mitigation, monitoring, and reporting requirements identified in the MMPA ITR (50 CFR part 217 Subpart S); and NMFS' technical memorandum on standards for a protected species observer and data management program (Baker et al. 2013). BSEE is tasked as the lead agency for compiling lessee or operator reporting data required under current Biological Opinions applicable to both Bureaus. Therefore, while BOEM is issuing these protocols, all observer reports described herein must be submitted to BSEE as well as to NMFS where specified.

In order to protect ESA-listed species and marine mammals during seismic operations, seismic operators will be required to use protected species observers (PSOs) and follow specific seismic survey protocols when operating. These measures contained herein apply to all on-lease ancillary activity surveys conducted under 30 CFR Part 550 and all off-lease surveys conducted under 30 CFR Part 551, regardless of water depth. Operators must demonstrate your compliance with these requirements by submitting to BSEE and NMFS reports asdetailed below.

Definitions

Terms used in these protocols have the following meanings:

1. Protected species means any species listed under the ESA and/or protected by the MMPA. The requirements discussed herein focus on marine mammals and sea turtles since these species are the most likely to be observed during seismic surveys. However, other ESA-listed species (e.g., giant manta rays) are also protected and observations of them should be reported as detailed below.
2. Airgun means a device that releases compressed air into the water column, creating an acoustical energy pulse with the purpose of penetrating the seafloor.
3. Deep penetration surveys are defined as surveys using airgun arrays with total volume greater than 1,500 in^3.These surveys may in some cases collect return signals using sensors incorporated into ocean-bottom cables (OBC) or autonomous

ocean-bottom nodes (OBN) placed on the seafloor. These surveys are also referred to as high energy surveys.

4. Shallow penetration surveys are defined as surveys using airgun arrays with total volume equal to or less than 1,500 in^3, single airguns, boomers, or equivalent sources. These surveys are also referred to as low energy surveys.
5. Ramp-up (sometimes referred to as "soft start") means the gradual and systematic increase of emitted sound levels from an airgun array. Ramp-up begins by first activating a single airgun of the smallest volume, followed by doubling the number of active elements in stages until the full complement of an array's airguns are active. Each stage should be approximately the same duration, and the total duration should not be less than approximately 20 minutes for deep penetration surveys.
6. Shutdown of an airgun array means the immediate de-activation of all individual airgun elements of the array.
7. Exclusion zone means the area to be monitored for possible shutdown in order to reduce or eliminate the potential for injury of protected species. Two exclusion zonesare defined, depending on the species and context.
8. Buffer zone means an area beyond the exclusion zone to be monitored for the presence of protected species that may enter the exclusion zone. During pre-clearance monitoring (i.e., before ramp-up begins), the buffer zone also acts as an extension of the exclusion zone in that observations of marine mammals and sea turtles within the buffer zone would also prevent airgun operations from beginning (i.e. ramp-up). The buffer zone is not applicable for contexts that require an exclusion zone beyond 500 meters. The buffer zone encompasses the area at and below the sea surface from the edge of the 0– 500 meter exclusion zone, out to a radius of 1000 meters from the edges of the airgun array (500–1,000 meters) The buffer zone is not applicable when the exclusion zone is greater than 500 meters, *i.e.*, the observational focal zone is not increased beyond 1,500 meters.
9. Visual monitoring means the use of trained protected species observers (herein referred to as visual PSOs) to scan the ocean surface visually for the presence of protected species. These observers must have successfully completed a visual observer training program as described below. The area to be scanned visually includes primarily the exclusion zone, but also the buffer zone. Visual monitoring of the exclusion zones and adjacent waters is intended to establish and, when visual conditions allow, maintain zones around the sound source that are clear of marine mammals and sea turtles, thereby reducing or eliminating the potential for injury. Visual monitoring of the buffer zone is intended to (1) provide additional protection to marine mammals and sea turtles and awareness and potential protection of other visual protected species that may be in the area during pre-clearance, and (2) during airgun use, aid in establishing and maintaining the exclusion zone by alerting the visual observer and crew of marine mammals and sea turtles that are outside of, but may approach and enter, the exclusion zone.
10. Acoustic monitoring means the use of trained personnel (sometimes referred to as

passive acoustic monitoring (PAM) operators, herein referred to as acoustic PSOs) to operate PAM equipment to acoustically detect the presence of marine mammals. These observers must have successfully completed a passive acoustic observer training program as described below. Acoustic monitoring is intended to further support visual monitoring in maintaining an exclusion zone around the sound source that is clear of marine mammals, in part for the purpose of reducing or eliminating the potential for injury. In cases where visual monitoring is not effective (e.g., due to weather, nighttime), acoustic monitoring may be used to allow certain activities to occur, as further detailed below.

General Requirements

1. A copy of a MMPA incidental take authorization (as applicable) and BOEM-approved Permit/Plan must be in the possession of the vessel operator, other relevant personnel, the lead PSO (see description below), and any other relevant designees operating under the authority of the MMPA authorization (as applicable) and BOEM Permit/Plan.
2. The MMPA authorization holder (as applicable) and BOEM-approved Permit/Plan holder shall instruct relevant vessel personnel with regard to the authority of the protected species monitoring team (PSO team), and shall ensure that relevant vessel personnel and the PSO team participate in a joint onboard briefing (hereafter PSO briefing) led by the vessel operator and lead PSO to ensure that responsibilities, communication procedures, protected species monitoring protocols, operational procedures, and MMPA authorization (as applicable) and BOEM Permit/Plan requirements are clearly understood. This PSO briefing must be repeated when relevant new personnel join the survey operations before work commences.
3. The acoustic source must be deactivated when not acquiring data or preparing to acquire data, except as necessary for testing. Unnecessary use of the acoustic source must be avoided. For surveys using airgun arrays as the acoustic source notified operational capacity (not including redundant backup airguns) must not be exceeded during the survey, except where unavoidable for source testing and calibration purposes. All occasions where activated source volume exceeds notified operational capacity must be communicated to the PSO(s) on duty and fully documented. The lead PSO must be granted access to relevant instrumentation documenting acoustic source power and/or operational volume.

Protected Species Observers (PSOs, Visual and Acoustic)

Qualifications

1. The MMPA authorization (as applicable) and BOEM-approved Permit/Plan holder must use independent, dedicated, trained visual and acoustic PSOs, meaning that the PSOs must be employed by a third-party observer provider, may have no tasks other than to conduct observational effort (visual or acoustic), collect data, and communicate

with and instruct relevant vessel crew with regard to the presence of protected species and mitigation requirements (including brief alerts regarding maritime hazards), and must have successfully completed an approved PSO training course appropriate for their designated task (visual or acoustic). Acoustic PSOs are required to complete specialized training for operating PAM systems and are encouraged to have familiarity with the vessel with which they will be working. PSOs can act as acoustic or visual observers (but not at the same time) as long as they demonstrate to NMFS (nmfs.psoreview@noaa.gov) that their training and experience are sufficient to perform necessary tasks. NMFS must review and approve PSO resumes accompanied by a relevant training course information packet that includes the name and qualifications (i.e., experience, training completed, or educational background) of the instructor(s), the course outline or syllabus, and course reference material as well as a document stating successful completion of the course. NMFS shall have one week to approve PSOs from the time that the necessary information is submitted by the BOEM-approved Permit/Plan holder, after which PSOs meeting the minimum requirements shall automatically be considered approved.

2. At least one visual and two acoustic PSOs (when required) aboard the vessel must have a minimum of 90 days at-sea experience working in those roles, respectively, with no more than 18 months elapsed since the conclusion of the at-sea experience. One visual PSO with such experience shall be designated as the lead for the entire protected species observation team. The lead shall coordinate duty schedules and roles for the PSO team and serve as primary point of contact for the vessel operator (the responsibility of coordinating duty schedules and roles may instead be assigned to a shore-based, third-party monitoring coordinator). To the maximum extent practicable, the lead PSO shall devise the duty schedule such that experienced PSOs are on duty with those PSOs with appropriate training but who have not yet gained relevant experience.
    a. PSOs must successfully complete relevant training, including completion of all required coursework and passing (80 percent or greater) a written and/or oral examination developed for the training program. PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or

equivalent in the biological sciences, and at least one undergraduate course in math or statistics. The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver shall be submitted by the BOEM-approved Permit/Plan holder to NMFS (nmfs.psoreview@noaa.gov) and must include written justification. Requests shall be granted or denied (with justification) by NMFS within one week of receipt of submitted information. Alternate experience that may be considered includes, but is not limited to: (1) secondary education and/or experience comparable to PSO duties; (2) previous work experience conducting academic, commercial, or government-sponsored protected species surveys; or (3) previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties.

Equipment

The MMPA incidental take authorization (as applicable) and BOEM-approved Permit/Plan holder is required to:

1. Provide PSOs with bigeye binoculars (e.g., 25 x 150; 2.7 view angle; individual ocular focus; height control) of appropriate quality solely for PSO use. These shall be pedestal-mounted on the deck at the most appropriate vantage point that provides for optimal sea surface observation, PSO safety, and safe operation of the vessel.
2. Work with the selected third-party observer provider to ensure PSOs have all equipment (including backup equipment) needed to adequately perform necessary tasks, including accurate determination of distance and bearing to observed protected species. Such equipment, at a minimum, shall include:
    a. Each vessel requiring PAM will include a passive acoustic monitoring system that has been verified and tested by an experienced acoustic PSO that will be using it during the trip for which monitoring is required.
    b. Reticle binoculars (e.g., 7 x 50) of appropriate quality (at least one per PSO, plus backups)
    c. Global Positioning Units (GPS) (plus backup)
    d. Digital camera with a telephoto lens (the camera or lens should also have an image stabilization system) that is at least 300 mm or equivalent on a full-frame single lens reflex (SLR) (plus backup)
    e. Radios for communication among vessel crewand PSOs (at least one per PSO, plus backups)
    f. Any other tools necessary to adequately perform necessary PSO tasks.

    Equipment specified in (a) through (g) above may be provided by an individual PSO, the third-party observer provider, or the MMPA authorization (as applicable) and BOEM-approved Permit/Plan holder but the latter is responsible for ensuring PSOs have the proper equipment required to perform the duties specified within these protocols.

Data Collection

PSOs must use standardized data collection forms. PSOsshall record detailed information about any implementation of mitigation requirements, including the distance of animals to the acoustic source and description of specific actions thatensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up of the acoustic source. If required mitigation was not implemented, PSOs should record a description of the circumstances. At a minimum, the following information must be recorded:

1. BOEM Permit/Plan number;
2. Vessel names (source vessel and other vessels associated with survey), vessel size and type, maximum speed capability of vessel, port of origin, and call signs;
3. PSO names and affiliations;
4. Dates of departures and returns to port with port name;
5. Date and participants of PSO briefings (as discussed in General Requirements. 2);
6. Dates and times (Greenwich Mean Time) of survey effort and times corresponding with PSO effort;
7. Vessel location (latitude/longitude) when survey effort began and ended and vessel location at beginning and end of visual PSO duty shifts;
8. Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any line change;
9. Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions changed significantly), including BSS and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon;
10. Factors that may have contributed to impaired observations during each PSO shift change or as needed as environmental conditions changed (e.g., vessel traffic, equipment malfunctions);
11. Survey activity information, such as acoustic source power output while in operation, number and volume of airguns operating in the array, tow depth of the array, and any other notes of significance (i.e., pre-clearance, ramp-up, shutdown, testing, shooting, ramp-up completion, end of operations, streamers, etc.); and
12. Upon visual observation of any protected species, the following information:
    a. Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);
    b. PSO who sighted the animal;
    c. Time of sighting;
    d. Vessel location (coordinates) at time of sighting;
    e. Water depth;
    f. Direction of vessel's travel (compass direction);
    g. Direction of animal's travel relative to the vessel;
    h. Pace of the animal;

i. Estimated distance to the animal and its heading relative to vessel at initial sighting;

j. Identification of the animal (e.g., genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix ofspecies;

k. Estimated number of animals (high/low/best);

l. Estimated number of animals by cohort (adults, juveniles, group composition, etc.);

m. Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);

n. Detailed behavior observations (e.g., number of blows/breaths, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior), including an assessment of behavioral responses to survey activity;

o. Animal's closest point of approach (CPA) and/or closest distance from any element of the acoustic source;

p. Platform activity at time of sighting (e.g., deploying, recovering, testing, shooting, data acquisition, other); and

q. Description of any actions implemented in response to the sighting (e.g., delays, shutdown, ramp-up) and time and location of the action.

13. If a marine mammal is detected while using the PAM system, the following information should be recorded:
    a. An acoustic encounter identification number, and whether the detection was linked with a visual sighting;
    b. Date and time when first and last heard;
    c. Types and nature of sounds heard (e.g., clicks, whistles, creaks, burst pulses, continuous, sporadic, strength of signal);
    d. Any additional information recorded such as water depth of the hydrophone array, bearing of the animal to the vessel (if determinable), species or taxonomic group (if determinable), spectrogram screenshot, and any other notable information.

Deep Penetration Seismic Survey Protocols

Visual Monitoring

1. During survey operations (e.g., any day on which use of the acoustic source is planned to occur, and whenever the acoustic source is in the water, whether activated or not), a minimum of two visual PSOs must be on duty and conducting visual observations at all times during daylight hours (i.e., from 30 minutes prior to sunrise through 30 minutes following sunset).
2. Visual monitoring must begin no less than 30 minutes prior to ramp-up and must

continue until one hour after use of the acousticsource ceases or until 30 minutes past sunset.

3. Visual PSOs shall coordinate to ensure 360° visual coverage around the vessel from the most appropriate observation posts, and shall conduct visual observations using binoculars and the naked eye while free from distractions and in a consistent, systematic, and diligent manner.
4. PSOs shall establish and monitor applicable exclusion and buffer zones. These zones shall be based upon the radial distance from the edges of the airgun array (rather than being based on the center of the array or around the vessel itself). During use of the acoustic source (i.e., anytime the acoustic source is active, including ramp-up), occurrences of protected species within the buffer zone (but outside the exclusion zone) should be communicated to the operator to prepare for the potential shutdown for marine mammals (or voluntary pause for other non-marine mammal protected species [e.g., sea turtles] if being employed) of the acoustic source.
5. Visual PSOs shall immediately communicate all observations to the on duty acoustic PSO(s), including any determination by the PSO regarding species identification, distance, and bearing and the degree of confidence in the determination.
6. Any observations of protected species by crew members aboard any vessel associated with the survey shall be relayed to the PSO team.
7. During good conditions (e.g., daylight hours; Beaufort sea state (BSS) 3 or less), visual PSOs shall conduct observations when the acoustic source is not operating for comparison of sighting rates and behavior with and without use of the acoustic source and between acquisition periods, to the maximum extent practicable.
8. Visual PSOs may be on watch for a maximum of two consecutive hours followed by a break of at least one hour between watches and may conduct a maximum of 12 hours of observation per 24-hour period. Combined observational duties (visual and acoustic but not at same time) may not exceed 12 hours per 24-hour period for any individual PSO. NMFS may grant an exception for LOA applications that demonstrate such a "two hours on/one hour off" duty cycle is not practicable, in which case visual PSOs will be subject to a maximum of four consecutive hours on watch followed by a break of at least two hours between watches. Combined observational duties (visual and acousticbut not at the same time) must not exceed 12 hours per 24-hour period for any individual PSO

Acoustic Monitoring

1. Applicants must provide a PAM plan to NMFS according to the MMPA authorization including description of the hardware and software proposed for use prior to proceeding with any survey where PAM is required. The source vessel must use a towed PAM system at all times when operating in waters deeper than 100 m, which

must be monitored by at a minimum one on duty acoustic PSO beginning at least 30 minutes prior to ramp-up, at all times during use of the acoustic source, and until one hour after use of the acoustic source ceases. "PAM system" refers to calibrated hydrophone arrays with full system redundancy to detect,identify, and estimate distance and bearing to vocalizing cetaceans, coupled with appropriate software to aid monitoring and listening by a PAM operator skilled in bioacoustics analysis and computer system specifications capable of running appropriate software. The PAM system must have at least one calibrated hydrophone (per each deployed hydrophone type and/or set) sufficient for determining whether background noise levels on the towed PAM system are sufficiently low to meet performance expectations).

2. Acoustic PSOs shall immediately communicate all detections to visual PSOs, when visual PSOs are on duty, including any determination by the PSO regarding species identification, distance, and bearing and the degree of confidence in the determination.
3. Acoustic PSOs may be on watch for a maximum of four consecutive hours followed by a break of at least two hours between watches and may conduct a maximum of 12 hours of observation per 24-hour period. Combined observational duties (acoustic and visual but not at same time) may not exceed 12 hours per 24-hour period for any individual PSO.
4. Survey activity may continue for 30 minutes when the PAM system malfunctions or is damaged, while the PAM operator diagnoses the issue. If the diagnosis indicates that the PAM system must be repaired to solve the problem, operations may continue for an additional two hours without acoustic monitoring during daylight hours only under the following conditions:
    a. Sea state is less than or equal to BSS 4;
    b. No marine mammals (excluding delphinids) detected solely by PAM in the applicable exclusion zone in the previous two hours;
    c. NMFS and BSEE are notified via email (nmfs.psoreview@noaa.gov and protectedspecies@bsee.gov, respectively) as soon as practicable with the time and location in which operations began occurring without an active PAM system; and
    d. Operations with an active acoustic source, but without an operating PAM system, do not exceed a cumulative total of four hours in any 24-hour period.

Pre-clearance and Ramp-up

The intent of pre-clearance observation (30 minutes) is to ensure no protected species are observed within the exclusion zones, and buffer zone if applicable (i.e., only when the exclusion zone is equal to 500 meters, see Definitions section for details on when the buffer

zone is not applicable), prior to the beginning of ramp-up. During pre-clearance is the only time observations of protected species in the buffer zone would prevent operations (i.e., the beginning of ramp-up). The intent of ramp-up is to warn protected species of pending seismic operations and to allow sufficient time for those animals to leave the immediate vicinity. A ramp-up procedure, involving a step-wise increase in the number of airguns firing and total array volume until all operational airguns are activated and the full volume is achieved, is required at all times as part of the activation of the acoustic source. All operators must adhere to the following pre-clearance and ramp-up requirements, which are applicable to both marine mammals and sea turtles:

1. The operator must notify a designated PSO of the planned start of ramp-up as agreed upon with the lead PSO; the notification time should not be less than 60 minutes prior to the planned ramp-up.
2. Ramp-ups shall be scheduled so as to minimize the time spent with the source activated prior to reaching the designated run-in.
3. A designated PSO must be notified againimmediately prior to initiating ramp-up procedures and the operator must receive confirmation from the PSO to proceed.
4. Ramp-up may not be initiated if any marine mammal or sea turtle is within the applicable exclusion or buffer zone. If a marine mammal or sea turtle is observed within the applicable exclusion zone or the buffer zone during the 30 minute pre-clearance period, ramp-up may not begin until the animal(s) has been observed exiting the zones or until an additional time period has elapsed with no further sightings (15 minutes for small odontocetes and 30 minutes for all other species including sea turtles).
5. Ramp-up shall begin by activating a single airgun of the smallest volume in the array and shall continue in stages by doubling the number of active elements at the commencement of each stage, with each stage of approximately the same duration. Duration shall not be less than 20 minutes. The operator must provide information to the PSO documenting that appropriate procedures were followed.
6. PSOs must monitor the exclusion and buffer zones during ramp-up, and ramp-up must cease and the source must be shut down upon observation of a marine mammal or sea turtle within the applicable exclusion zone. Once ramp-up has begun, observations of marine mammals and sea turtles within the buffer zone do not require shutdown, or voluntarily pause for other non-marine mammal protected species (e.g., sea turtles) if being employed, but such observation shall be communicated to the operator to prepare for the potential shutdown, or voluntarily pause if being employed.
7. Ramp-up may occur at times of poor visibility, including nighttime, if appropriate acoustic monitoring has occurred with no detections in the 30 minutes prior to beginning ramp-up. Acoustic source activation may only occur at times of poor

visibility where operational planning cannot reasonably avoid such circumstances.

8. If the acoustic source is shut down for brief periods (i.e., less than 30 minutes) for reasons other than implementation of prescribed mitigation (*e.g.*, mechanical difficulty), it may be activated again without ramp-up if PSOs have maintained constant visual and/or acoustic observation and no visual detections of marine mammals or sea turtleshave occurred within the applicable exclusion zone and no acoustic detections of marine mammals have occurred. For any longer shutdown, pre-clearance observation and ramp-up are required. For any shutdown at night or in periods of poor visibility (e.g., BSS 4 or greater), ramp-up is required, but if the shutdown period was brief andconstant observation was maintained, pre-clearance watch of 30 min is not required.
9. Testing of the acoustic source involving all elements requires ramp-up. Testing limited to individual source elements or strings does not require ramp-up but does require pre-clearance observation period.

Shutdown

For non-marine mammal protected species (e.g., sea turtles), shutdowns are not required. However, the BOEM Permit or authorized Plan and MMPA authorization (as applicable) holder may employ a voluntary pause during which the visual PSO would request that the operator voluntarily pause the airgun array for six shots if a non-marine mammal protected species is observed within the exclusion zone (within 500 meters) during active airgun use, to let the animal float past the array while it is inactive. For marine mammals, all operators must adhere to the following shutdown requirements:

1. Any PSO on duty has the authority to delay the start of survey operations or to call for shutdown of the acoustic source if a marine mammal is detected within the applicable exclusion zone.
2. The operator must establish and maintain clear lines of communication directly between PSOs on duty and crew controlling the acoustic source to ensure that shutdown, and voluntary pause commands (optional for other protected species) are conveyed swiftly while allowing PSOs to maintain watch.
3. When both visual and acoustic PSOs are on duty, all detections must be immediately communicated to the remainder of the on-duty PSO team for potential verification of visual observations by the acoustic PSO or of acoustic detections by visual PSOs.
4. Two exclusion zones are defined, depending on the species and context. A standard exclusion zone encompassing the area at and below the sea surface out to a radius of 500 meters from the edges of the airgun array (0-500 m) is defined. An extended 1,500-m exclusion zone must be applied upon detection (visual or acoustic) of a baleen whale, sperm whale, beaked whale or *Kogia* spp. within the zone.
5. When the airgun array is active (i.e., any time one or more airguns is active, including during ramp-up) and (1) a marine mammal appears within or enters the applicable exclusion zone and/or (2) a marine mammal (excluding delphinids) is detected acoustically and localized within the applicable exclusion zone, the acoustic source must be shut down. When shutdown is called for by a PSO, the acoustic source must be

immediately deactivated and any dispute resolved only following deactivation.

6. The shutdown requirement is waived for dolphins of the following genera: *Steno*, *Tursiops*, *Stenella*, and *Lagenodelphis*.
    a. If a small delphinid (individual of the Family Delphinidae, which includes the aforementioned dolphin genera), is acoustically detected and localized within the exclusion zone, no shutdown is required unless the acoustic PSO or a visual PSO confirms the individual to be of a genera other than those listed above, in which case a shutdown is required.
7. If there is uncertainty regarding identification (i.e., whether the observed marine mammal(s) belongs to one of the delphinid genera for which shutdown is waived or one of the species with a larger exclusion zone), visual PSOs may use best professional judgment in making the decision to call for a shutdown.
8. Upon implementation of shutdown, the source may be reactivated after the marine mammal(s) has been observed exiting the applicable exclusion zone (i.e., animal is not required to fully exit the buffer zone where applicable) or following a 30-minute clearance period with no further observation of the marine mammal(s).

Time-area closure

From January 1 through May 31, no use of airguns may occur shoreward of the 20-m isobaths and between 90-84º W

Shallow penetration protocols

1. The requirements defined for deep penetration surveys shall be followed, with the following exceptions:
    a. PAM is not required for shallow penetration surveys.
    b. Ramp-up for small airgun arrays must follow the procedure described above for large airgun arrays, but may occur over an abbreviated period of time. Ramp-up is not required for surveys using only a single airgun. For sub-bottom profilers, power should be increased as feasible to effect a ramp-up.
    c. Two exclusion zones are defined, depending on the species and context. A standard exclusion zone encompassing the area at and below the sea surface out to a radius of 100 meters from the edges of the airgun array (if used) or from the acoustic source (0-100 m) is defined. An extended 500-m exclusion zone must be applied upon detection (visual or acoustic) of a baleen whale, sperm whale, beaked whale or *Kogia* spp. within the zone.
    d. The buffer zone encompasses the area at and below the sea surface from the edge of the 0-100 meter exclusion zone out to a radius of 200 meters from the edges of the airgun array (if used) or from the acoustic source (100-200 meters). The buffer zone is not applicable when the exclusion zone is greater than 100 meters.

Non-Airgun High-Resolution Geophysical (HRG) Protocol

Non-airgun HRG surveys are conducted in leases and along pipeline routes to evaluate the potential for geohazards, archaeological resources, and certain types of benthic communities. Non-airgun HRG sources include but are not limited to side-scan sonars, boomers, sparkers (in limited situations) and compressed high-intensity radiated pulse (CHIRP) sub bottom profilers (in limited situations), and single-beam or multibeam depth sounders.

Non-Airgun HRG Surveys with Frequencies ≥180 kHz

Acoustic sources do not require detailed analyses because the frequency is outside the general hearing range of marine mammals.

Non-Airgun HRG Surveys with Frequencies <180 kHz

For all non-airgun HRG surveys in which one or more active acoustic sound sources are operating at <180 kHz, the requirements defined for shallow penetration surveys shall be followed, with the following exceptions:

1. Pre-clearance watch is required for a period of 30 minutes and over a 200-m radius from the acoustic source.
2. When operating in waters deeper than 100-m, during survey operations (*e.g.*, any day on which use of the acoustic source is planned to occur, and whenever the acoustic source is in the water, whether activated or not), a minimum of one trained and experienced independent PSO must be on duty and conducting visual observations at all times during daylight hours (*i.e.*, from 30 minutes prior to sunrise through 30 minutes following sunset).
3. When operating in waters shallower than 100-m, a minimum of one trained visual PSO, which may be a crew member, must be employed. PSOs employed during shallow-water HRG surveys are only required during the pre-clearance period.
4. PSOs are not required during survey operations in which the active acousticsource(s) are deployed on an autonomous underwater vehicle.
5. PAM is not required for HRG surveys. Shutdowns are not required for HRG surveys.

Entanglement and Entrainment Risk Reduction

Nodal Survey Requirements

To avoid the risk of entanglement, lessees and operators conducting surveys using ocean-bottom nodes or similar gear must:

1. Use negatively buoyant coated wire-core tether cable;
2. Ensure any cables/lines are designed to be rigid;

3. Retrieve all lines immediately following completion of the survey; and
4. Attach acoustic pingers directly to the coated tether cable; acoustic releases should not be used.

Reporting

1. The BOEM Permit/Plan holder shall submit interim reports (see Data Collection section for details) on the 1st of each month to BSEE (protectedspecies@bsee.gov) detailing all protected species observations with closest approach distance. The MMPA authorization (as applicable) and BOEM Permit/Plan holder shall submit a draft comprehensive report to BOEM/BSEE (protectedspecies@boem.gov and protectedspecies@bsee.gov) and NMFS (nmfs.psoreview@noaa.gov) on all activities and monitoring results within 90 days of the completion of the survey or expiration of the MMPA authorization (as applicable) or BOEM Permit/Plan, whichever comes sooner, or if an issued MMPA authorization is valid for greater than one year, the summary report must be submitted on an annual basis. The report must describe all activities conducted and sightings of protected species near the activities, must provide full documentation of methods, results, and interpretation pertaining to all monitoring, and must summarize the dates and locations of survey operations and all protected species sightings (dates, times, locations, activities, associated survey activities, and information regarding locations where the acoustic source was used). For operations requiring the use of PAM, the report must include a validation document concerning the use of PAM, which should include necessary noise validation diagramsand demonstrate whether background noise levels on the PAM deployment limited achievement. The draft report shall also include geo-referenced time-stamped vessel track lines for all time periods during which airguns were operating. Track lines should include points recording any change in airgun status (e.g., when the airguns began operating, when they were turned off, or when they changed from full array to single gun or vice versa). GIS files shall beprovided in ESRI shapefile format and include the UTC date and time, latitude in decimal degrees, and longitude in decimal degrees. All coordinates shall be referenced to the WGS84 geographic coordinate system. In addition to the report, all raw observational data shall be made available to BOEM/BSEE and NMFS. The report must summarize the information submitted in interim monthly reports as well as additional data collected as described above in *Data Collection* and the MMPA authorization (as applicable). The draft report must be accompanied by a certification from the lead PSO as to the accuracy of the report, and the lead PSO may submit directly to BOEM/BSEE and NMFS a statement concerning implementation and effectiveness of the required mitigation and monitoring. A final report must be submitted within 30 days following resolution of any comments on the draft report.
2. Reporting injured or dead protected species:
   The MMPA authorization (as applicable) and BOEM Permit/Plan holder must report

sightings of any injured or dead aquatic protected species immediately, regardless of the cause of injury or death. For reporting dead or injured marine mammals, refer to the reporting requirements specified in the MMPA authorization (as applicable), associated with the activity being conducted, and Appendix C

References

Baker, K., D. Epperson, G. Gitschlag, H. Goldstein, J. Lewandowski, K. Skrupky, B. Smith, and T. Turk. 2013. National standards for a protected species observer and data management program: A model using geological and geophysical surveys. Technical Memorandum NMFS-OPR-49, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration; Bureau of Ocean Energy Management, U.S. Department of the Interior; Bureau of Safety and Environmental Enforcement, U.S. Department of the Interior, Silver Spring, Maryland.

Appendix C. Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols

This Appendix has been revised as of April 26, 2021 and replaces the original Appendix C (dated March 13, 2020). These protocols will be implemented by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) through non-discretionary conditions of approval (COA) applied programmatically to BOEM/BSEE permitted activities (see Attachment 1 to the amended Incidental Take Statement), and provide guidelines to operators in complying with the Endangered Species Act (ESA; 16 U.S.C. §§ 1531-1544) and Marine Mammal Protection Act (MMPA; 16 U.S.C. §§1361- 1423h). The measures contained herein apply to all seismic surveys approved by BOEM and associated with the federally regulated oil and gas program in the Gulf of Mexico.

Aquatic Protected Species Identification

Crew and supply vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark; hereafter collectively termed "other aquatic protected species") that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS). Vessel operators must comply with the below measures except under extraordinary circumstances when the **safety of the vessel or crew is in doubt or the safety of life at sea is in question**.

Vessel Strike Avoidance

1. Vessel operators and crews must maintain a vigilant watch for all aquatic protected species and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any protected species. A single aquatic protected species at the surface may indicate the presence of submerged animals in the vicinity of the vessel; therefore, precautionary measures should always be exercised. A visual observer aboard the vessel must monitor a vessel strike avoidance zone (species-specific distances detailed below) around the vessel according to the parameters stated below, to ensure the potential for strike is minimized. Visual observers monitoring the vessel strike avoidance zone can be either third-party observers or crew members (e.g., captain), but crew members responsible for these duties must be provided sufficient training to distinguish aquatic protected species to broad taxonomic groups, as well as those specific species detailed further below.
2. Vessel speeds must also be reduced to 10 knots or less when mother/calf pairs, pods, or large assemblages (greater than three) of any marine mammal are observed near a vessel.

3. All vessels must maintain a minimum separation distance of 100 meters (m) from sperm whales, and 500 m from any baleen whale to specifically protect the Gulf of Mexico Bryde's whale.
4. All vessels must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 meters from all "other aquatic protected species" including sea turtles, with an exception made for those animals that approach the vessel.
5. When aquatic protected species are sighted while a vessel is underway, the vessel should take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If aquatic protected species are sighted within the relevant separation distance, the vessel should reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear (e.g., source towed array and site clearance trawling).
6. Any BOEM/BSEE-authorized or -permitted activity occurring within the Eastern Planning Area will be subject to a step-down review with NMFS under the attached 2020 biological opinion on BOEM Oil and Gas Program Activities in the Gulf of Mexico.

The above requirements do not apply in any case where compliance would create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of that restriction, is unable to comply.

Injured/Dead Protected Species Reporting

The measures below have been revised from the original measures (contained in the Appendices to the biological opinion dated March 13, 2020) in accordance with the revised proposed action (see Attachments 1 and 2 to the amended ITS).

At all times, vessel operators must report sightings of any injured or dead aquatic protected species immediately, regardless of whether the injury or death was caused by the operator's vessel. If the injury or death was caused by a collision with the operator's vessel, the operator must immediately report the incident to NMFS by email at nmfs.psoreview@noaa.gov and must also immediately report the incident to the appropriate NMFS contact below for 24 hour response. The operator must further notify BOEM and BSEE within 24 hours of the strike by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. The report must include the following information:

1. Time, date, and location (latitude/longitude) of the incident;
2. Species identification (if known) or description of the animal(s) involved;
3. Vessel's speed during and leading up to the incident;
4. Vessel's course/heading and what operations were being conducted (if applicable);
5. Status of all sound sources in use;

6. Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike;
7. Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike;
8. Estimated size and length of animal that was struck;
9. Description of the behavior of the marine mammal immediately preceding and following the strike;
10. If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;
11. Estimated fate of the animal (*e.g.*, dead, injured but alive, injured and moving, bloodor tissue observed in the water, status unknown, disappeared); and
12. To the extent practicable, photographs or video footage of the animal(s).

In the event that any of the following occur at any time, immediate reporting of the incident is required, after personnel and/or diver safety is ensured:

- Entanglement or entrapment of a protected species (i.e., an animal is entangled in a line or cannot or does not leave a moon pool of its own volition).
- Injury of a protected species (e.g., the animal appears injured or lethargic).
- Interaction or contact with equipment by a protected species.
- Any observation of a leatherback sea turtle within a moon pool (regardless of whether it appears injured, or an interaction with equipment or entanglement/entrapment is observed).

As soon as personnel and/or diver safety is ensured, any of the incidents listed above must be reported to NMFS by contacting the appropriate expert for 24-hr response. If an immediate response is not received, the operator must keep trying until contact is made. Any failed attempts should be documented. Contact information for reporting is as follows:

- Marine mammals: contact Southeast Region's Marine Mammal Stranding Hotline at 1-877-433-8299.
- Sea turtles: contact NMFS Veterinary Medical Officer at 352-283-3370. If no answer, contact (301) 301-3061. This includes the immediate reporting of any observation of a leatherback sea turtle within a moon pool.
- Other protected species (e.g., giant manta ray, oceanic whitetip shark, or Gulf sturgeon): contact the ESA Section 7 biologist at 301-427-8413.

The report must include the following information:

1. Time, date, water depth and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
2. Name, type, and call sign of the vessel in which the event occurred;
3. Equipment being utilized at time of observation;
4. Species identification (if known) or description of the animal(s) involved;
5. Approximate size of animal;
6. Condition of the animal(s) during the event and any observed injury / behavior;
7. photographs or video footage of the animal(s), if able; and
8. General narrative and timeline describing events that took place.

After the appropriate contact(s) have been made for guidance/assistance as described above, the operator may call BSEE at 985-722-7902 (24 hours/day) for questions or additional guidance on recovery assistance needs (if still required) and continued monitoring requirements. The operator may also contact this number if a timely response from the appropriate contact(s) listed above were not received.

Appendix B: Protected Species Monitoring, Mitigation and Reporting Plan

A TETRA TECH COMPANY

CHEVRON JACK 3D OBN SURVEY – PERMIT L22-015

Protected Species Monitoring, Mitigation and Reporting Plan

05 September 2023

CHEVRON JACK 3D OBN SURVEY – PERMIT L22-015

Protected Species Monitoring, Mitigation and Reporting Plan

With reference to the Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico issued by the National Marine Fisheries Service on 13 March 2020 & the Bureau of Ocean Energy Management Permit L22-015.

Revision		
Date	**Version**	**Revision made**
22 August 2023	1	Update to survey name, client
05 September 2023	2	Updated permit number and date (Section 1.1), contractor (Section 1), survey equipment used (Table 1), added voluntary turtle pause information (Section 8.5.3)
	3	
	3	
	4	

Approval for issue				
Name	Stephanie Milne	Signature	DocuSigned by: Stephanie Milne 6312C0728E234BC...	Sep 6, 2023

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List of Acronyms

3D – 3-Dimensional

BOEM – Bureau of Ocean Energy Management

BO – Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico

BSEE – Bureau of Safety and Environmental Enforcement

BSS – Beaufort Sea State

BZ – Buffer Zone

Chevron – Chevron U.S.A. Inc.

CV – Curriculum Vitae

PSMMRP – Protected Species Monitoring, Mitigation and Reporting Plan

EZ – Exclusion zone

ESA – Endangered Species Act

GIS – Geographic Information System

GOM – Gulf of Mexico

Hz – Hertz

HUET – Helicopter Underwater Egress Training

JSA – Job Safety Analysis

kHz– Kilohertz

km – Kilometer

LOA – Letter of Authorization

MMPA – Marine Mammal Protection Act

m – Meter

NMFS – National Marine Fisheries Service

OBN – Ocean Bottom Node

PAM – Passive Acoustic Monitoring

PIES – Pressure Inverted Echo-Sounder

PM – Project Manager

PPE – Personal Protective Equipment

PSO – Protected Species Observer

RPS – RPS Group Company Name

USBL – Ultra-short Baseline

VSA – Vessel Strike Avoidance

1 INTRODUCTION

Chevron U.S.A. Inc. (Chevron) has contracted Magseis Fairfield to conduct a 3-Dimensional (3D) Ocean Bottom Node (OBN) survey within the Gulf of Mexico (GOM). The details of the survey activities are provided in the survey plan application.

In an effort to minimize the potential impacts of seismic operations on certain protected species, including marine mammals and sea turtles, the Bureau of Ocean Energy Management (BOEM), the National Marine Fisheries Service (NMFS), and the Bureau of Safety and Environmental Enforcement (BSEE), have outlined monitoring, mitigation, and reporting procedures that survey operators and permit holders are expected to implement during their seismic survey operations.

1.1 Applicable Regulatory Documents and Permits

Protected species monitoring, mitigation and reporting procedures that are applicable to the 3D OBN survey are contained in the following regulatory documents:

1. The Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico (BO) issued by the NMFS on 13 March 2020, where Protected Species Observer (PSO) procedures are outlined in detail in Appendix A and the amendment issued on 26 April 2021

2. The survey permit issued by BOEM, permit L22-015, on 20 July 2023

3. The Letter of Authorization (LOA) issued by NMFS on 14 June 2023, effective from 10 August 2023 to 02 January 2024

This document, the Protected Species Monitoring, Mitigation and Reporting Plan (PSMMRP), prepared by RPS on behalf of Chevron, describes how monitoring, mitigation, and reporting measures for protected species will be executed during the 3D OBN survey to maintain compliance with the regulatory requirements in the 2020 Gulf of Mexico Biological Opinion and its appendices and the BOEM survey permit L22-015.

2 MARINE PROTECTED SPECIES

Marine protected species or protected species refers to any marine species for which dedicated monitoring and mitigation procedures will be implemented, including:

- All marine mammals
- All sea turtles
- Gulf sturgeon, oceanic whitetip shark, giant manta ray*

*Note that strike avoidance procedures apply to these Endangered Species Act (ESA)-listed species, but monitoring and sound source mitigation procedures do not need to be implemented.

3 PROTECTED SPECIES OBSERVERS AND PASSIVE ACOUSTIC MONITORING OPERATORS

3.1 Staffing Plan

A team of three Protected Species Observers (PSOs), supplied by RPS, will be onboard each source vessel to undertake day-time visual watches, implement mitigations, conduct data collection and reporting in accordance with the BO and the survey permit.

A team of four Passive Acoustic Monitoring (PAM) Operators will conduct 24-hour PAM monitoring, implement mitigations, and conduct data collection and reporting in accordance with the BO and the survey permit.

3.2 Roles and Responsibilities

Lead PAM Operator

- Maintain copies of the regulatory documents including the LOA and the BOEM survey permit as well as the most up-to-date version of the PSMMRP
- Install and operate PAM as required, including permit to work and task-based risk assessment
- Communicate with seismic operator to delay or shutdown operations
- Acoustically detect and identify protected species in accordance with regulatory requirements
- Organize and maintain appropriate monitoring schedules
- Monitor seismic operations for compliance to the regulatory requirements
- Prepare required reports (with lead PSO)
- Support visual watches when possible
- Participate in daily operation meeting with crew when appropriate

Lead PSO

- Coordinate and oversee PAM and PSO Operations and ensure compliance with monitoring requirements
- Visually monitor, detect, and identify protected species, as well as determine distance from source.
- Record and report protected species sightings, survey activities, and environmental conditions, per regulations
- Monitor and advise on sound source and vessel operations for compliance with the environmental requirements for the survey
- Communicate with the crew to implement mitigation actions as required by environmental protocols
- Participate in daily operation meeting with crew when appropriate

PSO

- Visually monitor, detect, and identify protected species
- Record and report according to survey plan
- Monitor and advise on sound source and vessel operations for compliance with the environmental requirements for the survey plan
- Communicate with the crew to implement mitigation actions as required by environmental protocols
- Participate in daily operation meeting with crew when appropriate

PAM Operators

- Acoustically monitor, detect, and identify marine mammals and determine distance to source
- Record and report marine mammal sightings, survey activities and environmental conditions, per regulations
- Monitor and advise on sound source and vessel operations for compliance with the environmental requirements for the survey
- Assist in maintaining and troubleshooting the PAM system hardware and software
- Communicate with the crew to implement mitigation actions as required by environmental protocols, including delays to initiation of survey equipment
- Participate in daily meetings and drills with crew when appropriate

3.3 PSO and PAM Operator Requirements

- All Protected Species Observers (PSOs) and PAM Operators will have completed a protected species observer training program as described in the BO.
- PAM Operators will have completed a PAM training course as described in the BO.
- PSOs' and PAM Operators' Curriculum Vitae (CV) will be submitted to NMFS for approval prior to deployment on the project.

- PSOs will have completed Helicopter Underwater Egress Training (HUET) / Sea Survival training.
- PSOs and PAM Operators will be equipped with Personal Protective Equipment (PPE), including hard hat, steel-toe boots, fire-retardant coveralls, work gloves, and safety glasses.

4 MONITORING EQUIPMENT

4.1 Visual Monitoring Equipment

The PSOs on duty will monitor for marine protected species using the naked eye, hand-held reticle binoculars, and big-eye binoculars as described in BO, its appendices, and the LOA.

Digital single-lens reflex camera equipment, including zoom lens, will be used to record sightings and verify species identification.

4.2 Acoustic Monitoring Equipment

4.2.1 Passive Acoustic Monitoring (PAM) System

The PAM system is designed to provide a flexible approach to the monitoring for marine mammals using a towed hydrophone system. The system uses PAMGuard software modules such that the optimum system can be configured for the application, vessel, and deployment method. PAM software modules will be configured for the application, vessel, and deployment method.

The source vessel will have two acoustic monitoring systems installed, a primary system and a secondary system available as back-up should any issues be encountered with the main system.

The PAM system has been designed to monitor for most cetacean species found in the Gulf of Mexico, covering a broad range of frequencies up to 200 kilohertz (kHz). Some propeller and engine noise will dominate the lowest frequencies, but the species of concern should all be detectable and vocalize above the range that engine noise dominates.

Mid and high frequency marine mammal vocalizations are processed by the laptop internal sound card. Mid frequency vocalizations include sperm whale click trains and codas and delphinid whistles in the frequency range of approximately 2 kHz to 24 kHz. Kogia species, beaked whales, and delphinid echolocation clicks that are emitted at very high frequencies in excess of 80 kHz are processed by a specialized sound card in the buffer unit, an external National Instruments sound card, capable of sampling audio at 500 kHz. PAM equipment specifications are provided in Appendix A.

4.2.2 PAM JSA and PAM deployment and retrieval procedure

A job safety analysis (JSA) will be completed prior to hydrophone deployment. The Lead PSO/PAM Operator will develop, in cooperation with the vessel crew, a vessel-specific deployment and retrieval procedure that considers both the minimization of entanglement risks with other towed equipment while maximizing the acoustic range of the system.

4.2.3 Distance estimation of acoustic detections

There are a variety of methods that can be used to estimate the distance to vocalizing marine mammals using the acoustic detection software, PAMGuard. When the distance to a vocalizing animal cannot be determined by PAMGuard, the experienced PAM Operator can make a distance estimation assisted by the noise or detection score system developed by Gannier et al. (2002). Gannier et al. monitored sperm whales in the Mediterranean both visually and acoustically. A scale was developed based upon the strength or intensity of the sperm whale clicks at various distances that were then measured when the sperm whales surfaced and were visually observed. Although the scale is subjective, and sounds produced in marine environments will vary according to local conditions, the scale provides a measure for approximating distances when using a single, linear hydrophone array.

5 VISUAL AND ACOUSTIC MONITORING PROCEDURES

5.1 Visual Monitoring Watches

There will be **at least two PSOs on visual watch** during:

- All seismic source activity in daylight hours, including testing
- During search periods prior to activating the seismic source
- **For the duration of any day when there is planned acoustic source activity, regardless of whether the source is deployed**

While the Biological Opinion allows for one person watches, **only under the listed conditions below, no one person watches can occur without this project's RPS Project Manager (PM) approval.**

- Acoustic source is not operating and no plans of operating during the day

AND

- Monitoring condition is "poor" (poor conditions are defined in the BO as Beaufort Sea State (BSS) of 4 or more).

Visual monitoring will begin 30 minutes before sunrise and continue until 30 minutes after sunset.

The following guidelines will apply to these watch periods:

- No additional duties may be assigned to the PSO during his/her visual observation watch
- No PSO will be allowed more than **two consecutive hours on watch** before being allocated a one-hour break from visual monitoring
- No PSO will be assigned a combined watch schedule of more than 12 hours in a 24-hour period

The PSOs will stand watch in a suitable, outdoor location that will not interfere with the navigation or operation of the vessel and affords an optimal view of the sea surface. PSOs will maintain 360° coverage surrounding the vessel and the seismic source.

If a protected species is observed, the PSO should first take care of any necessary mitigation actions, or if no mitigation actions are required, they will note and monitor the position (including latitude/longitude of the vessel and relative bearing and estimated range to the animal) until the animal dives or moves out of visual range of the observer.

Visual monitoring must be consistent, diligent, and free of distractions for the duration of the watch.

5.2 Passive Acoustic Monitoring Watches

Passive acoustic monitoring will be conducted, day and night, during all uses of the seismic sources AND during the search periods prior to activation of the seismic sources.

During acoustic monitoring watches, the following guidelines shall be followed:

- No additional duties may be assigned to the PAM Operator during their acoustic monitoring watch
- No PAM Operator will be allowed more than **four consecutive hours of acoustic monitoring** before they will be allocated a break of two hours
- No person on watch as a PSO or PAM Operator will be assigned a combined watch schedule of more than 12 hours in a 24-hour period

Acoustic monitoring must be consistent, diligent, and free of distractions for the duration of the watch.

5.2.1 Procedures for PAM System Malfunction

In the event that a PAM system is not functional for the purposes of mitigation monitoring, whether because of malfunction with the cables, electronics, monitoring software or another issue, the PAM Operator is permitted **30 minutes to diagnose the issue** without the need to shut down the source array.

During daylight when PSOs are also on watch, an additional 2 hours is permitted to conduct repairs, where seismic operations can continue during that time **if all the following conditions are met:**

1. The sea state at the time of the malfunction is BSS 4 or less.

   AND

2. There were no acoustic-ONLY detections of marine mammals other than delphinids inside the applicable EZ in the 2 hours preceding the malfunction.

Operations conducted without ongoing acoustic monitoring **may not exceed a total of 4 hours in a 24-hour period**.

NMFS and BSEE must be notified as soon as is practicable of any PAM system malfunctions exceeding 30 minutes in duration that occur while acoustic source operations are ongoing. Reporting procedures are outlined in the Reporting section of this PSMMRP.

6 PROJECT BRIEFING

The vessel crew and PSO team should participate in a project briefing that includes communication procedures, monitoring requirements and operating protocols.

The briefing should be repeated every time relevant new personnel join the vessel before operations begins.

7 MITIGATION PROCEDURES: STRIKE AVOIDANCE

7.1 Strike Avoidance Monitoring and Vessel Maneuvering

Vessel operators must maintain a vigilant watch for all aquatic protected species.

Vessel must slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any protected species:

- All marine mammals
- All sea turtles
- Gulf sturgeon, oceanic whitetip shark, giant manta ray

These procedures apply to physical interactions involving vessel and the towed equipment.

7.2 Vessel Speed Restrictions

Vessel speeds must be reduced to 10 knots or less **when mother/calf pairs, pods, or large assemblages (greater than three) of any marine mammal** are observed near a vessel.

7.3 Separation Distances

When protected species are sighted while a vessel is underway, the vessel should take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area).

If marine protected species are sighted within the relevant separation distance, the vessel should reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area.

While Appendix C of the BO states that this does not apply to any vessel that is towing gear, an effort should still be made by the vessel, as is operationally feasible to maintain a separation distance. PSOs should always provide the suggestion for vessel strike avoidance (VSA) and allow the vessel crew to make determination on whether that procedure can be executed without risk to the safety of the vessel and crew.

NOTE: Vessels are not required to shift into neutral for animals that approach the vessel voluntarily.

- **500 m**: All baleen whales including the Rice's whale (formerly known as the Bryde's whale)
- **100 m**: Sperm whales
- **50 m**: All other marine mammals (including manatees), and sea turtles, and the ESA-listed fish species referenced in Section 7.1.

NOTE: Any large whale for which species can't be identified should be mitigated for as a baleen whale.

7.4 Rice's Whale Area

In accordance with the new language in the BOEM permit, operators or their recognized representatives must notify BOEM or BSEE as appropriate of their intention to transit through the Rice's Whale Area (from 100- to 400- meter isobaths from 87.5° W to 27.5° N as described in the species' status review plus an additional 10 km around that area) Figure 1 below.

For this survey the Rice's Whale Area should not be a consideration as the survey area and transit path in and out of the survey area does not approach the Rice's Whale Area.

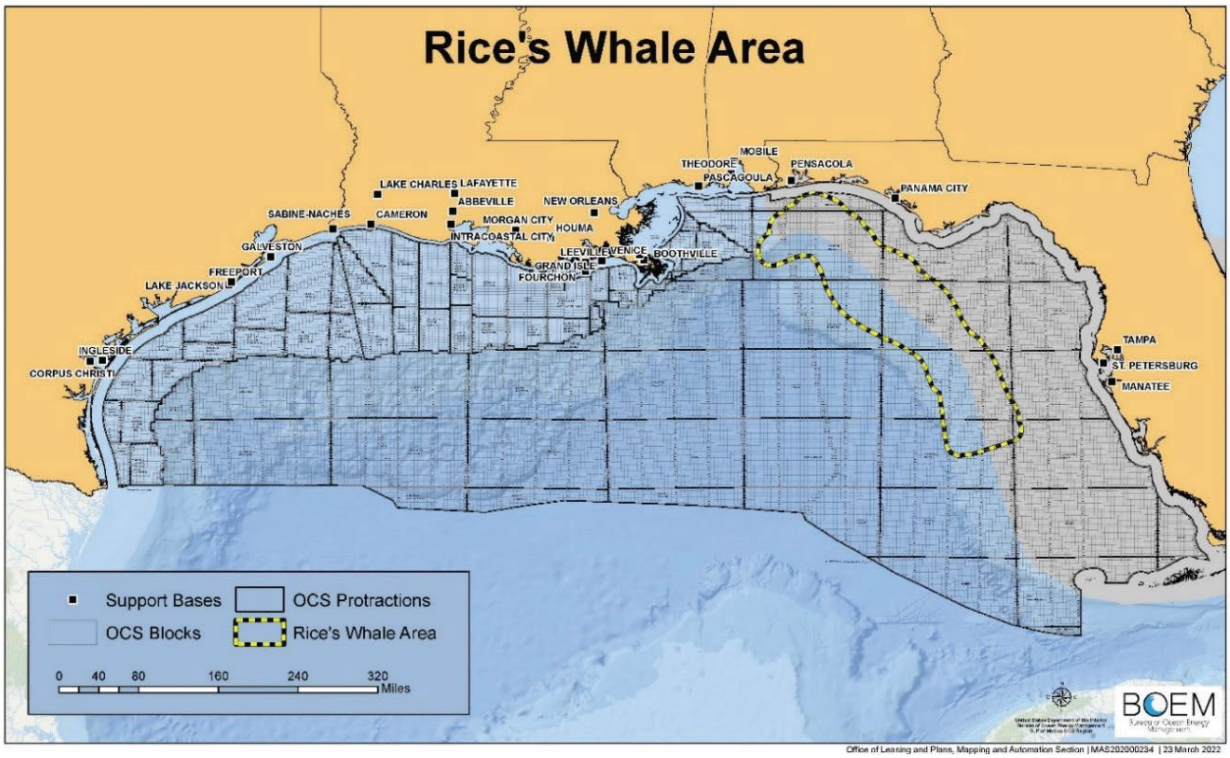

Figure 1: Rice's Whale Area as described in BOEM Permit.

8 MITIGATION PROCEDURES: SOUND SOURCES

8.1 Survey Equipment Subject to Monitoring and Mitigation Procedures

All of the survey equipment (Table 1) that produces sound below 200 kHz is subject to the following monitoring and mitigation protocols with the exception of equipment that has been determined by NMFS to be “diminutive” and therefore not subject to monitoring and mitigation requirements (for example the use of ultra-short baselines (USBLs)).

Table 1: Equipment used for this survey.

Equipment	Array or Airgun Size (cu. In.)	Frequency (Hz)	Subject to Monitoring and Mitigation Requirements
Bolt 1900 LLX Airgun Array(s)	5220	2-70	Yes
Pressure Inverted Echo-Sounder (PIES)	--	--	No
Ocean Bottom Nodes	--	--	No

8.2 Sound Source Exclusion Zones and Buffer Zones

Two types of zones will be established around the seismic sources, both radii that extend from the outer edge of the airgun array.

Buffer Zones (BZ): Applicable during the pre-clearance search periods conducted prior to initiating the sound source from silence, where detections of a protected species inside it’s applicable BZ during the search will result in a delay to activating the source.

- **1500 meters:** All true whale species (Rice’s whale, sperm whales, Kogia species and all beaked whales)
- **1000 meters**: All other marine mammals and sea turtles

Exclusion Zones (EZ): Applicable once the source has been activated, where detections of a protected species inside it’s applicable EZ will result in a shutdown of the sound source.

- **1500 meters:** All true whale species (sperm whales, Kogia species and all beaked whales)
- **500 meters**: All other marine mammals and sea turtles

8.3 Visual and Acoustic Pre-clearance Search Periods

To activate the sound source, a minimum of a 30-minute search period must be conducted.

During the daytime, the search will be conducted visually by the PSOs and acoustically by the PAM Operator.

During nighttime, the search will be conducted acoustically by the PAM Operator.

PSO and PAM on watch should be notified of the intent to turn on the source from silence, either to conduct a ramp-up or for testing, at least 60 minutes prior to the planned start.

8.3.1 Delays to Initiation of the Seismic Source

If any marine mammal or sea turtle was detected inside its respective BZ during the 30-minute search period, initiation of the seismic source must be delayed until:

- When all marine protected species that were observed inside the relevant BZ have been confirmed by the visual observer to have exited the relevant BZ.
- 15 minutes from last detection for small odontocetes if not observed exiting the BZ
- 30 minutes from last detection for all other protected species, including sea turtles, if not observed exiting the BZ
- 30 minutes from last detection for acoustic-only detections

NOTE: Both the 30-minute pre-clearance search period and the mandatory delay for animals not seen exiting the BZ must be completed before source initiation, but the pre-clearance search and delays can be implemented concurrently (they overlap). For a delay period that ends BEFORE the clearance search period is completed, the BZ will be cleared when the clearance search is completed. For a delay period that ends AFTER the standard clearance search period is completed, the source can be turned on when the delay period is completed.

8.4 Ramp-up Procedure and Testing

The intent of ramp-up is to warn marine mammals and sea turtles of pending seismic operations and to allow sufficient time for those animals to leave the immediate vicinity.

For all acoustic source activity, including source testing involving more than one airgun element, ramp-up procedures must be conducted to allow marine mammals and sea turtles to depart the exclusion zone before surveying begins.

- The vessel can test a single gun or cluster without ramp-up regardless of volume, if going beyond a single cluster- ramp-up is required from smallest volume to gun size needed for testing.
- Ramp-up should be planned in an effort to minimize time that the source is active on the run in to the start of the survey line.
- Acoustic source activation may only occur at times of poor visibility (including night) where operational planning cannot reasonably avoid such circumstances.

Ramp-up procedures are as follows:

- Visually and acoustically (day) or acoustically (night) monitor the BZ and adjacent waters for the absence of marine mammals and sea turtles for at least 30 minutes before initiating ramp-up procedures.
- If no protected species are visually or acoustically detected inside their respective BZs, ramp-up procedures may begin. If animals are detected, refer to Procedures to clear the BZs prior to start of source operations.
- Seismic personnel confirm with PSOs on watch (day) and/or PAM Operator (day and night) that the BZs are clear of protected species.
- Ramp-up begins by activating a single airgun of the smallest volume in the array.
- Continue ramp-up in stages by doubling the number of active elements at the commencement of each stage, with each stage of approximately the same duration.
- Total duration of the ramp-up should not be less than 20 minutes.

NOTE: Please review Section 8.5.1 below for shutdown requirements for protected species detected inside the EZ during a ramp-up.

8.5 Protected Species Shutdown Procedures

8.5.1 Shutdown During Ramp-up

If **any marine mammal or sea turtle** is visually or acoustically detected within its EZ, an immediate shutdown of the seismic source in ramp-up is required. This shutdown also applies for the four “non-shutdown” species listed in Section 8.5.2 below.

1. No shutdown of the ramp-up is required for marine mammals or sea turtles detected inside the BZ during ramp-up, however, notification should be made that a shutdown could be called for if those animals move into the EZ.

2. No shutdown of the ramp-up is required for acoustic only detections (day or night) unless those acoustic only detections can be localized inside the appropriate EZ. Notification should still be made that a shutdown could be called for if animals are able to be localized.

8.5.2 Shutdown During Full-Volume Operations

If any **marine mammal** is detected visually or acoustically within its EZ, an immediate shutdown of the seismic source is required.

The shutdown requirement is waived under the following circumstances:

1. Shutdown is not required for dolphins of the following genera: *Steno, Tursiops, Stenella,* and *Lagenodelphis* (this does not apply during ramp-up).
2. Shutdown is not required for acoustic detections of delphinids inside the EZ unless the PSO or PAM Operator can confirm that the dolphin(s) present are from a different genus than those listed above.

If there is uncertainty regarding identification (i.e., whether the observed marine mammal(s) belongs to one of the delphinid genera for which shutdown is waived or one of the species with a larger exclusion zone), visual PSOs should use best professional judgment in making the decision to call for a shutdown.

The vessel operator must comply immediately with any shutdown request made by a PSO or PAM Operator. Any discussion can occur only after the shutdown has been implemented.

Subsequent restart of seismic source may only occur following clearance of the EZ of all marine protected species under the following conditions:

- When all other marine mammals have been confirmed by the visual observer to have been seen exiting the relevant EZ (not BZ)
  OR
- When a marine mammal was not observed exiting the EZ, an additional 30 minutes has elapsed following the last detection inside the EZ.

NOTE: All resumptions of source activity following a protected species shutdown must begin with a ramp-up

8.5.3 Voluntary Turtle Pause

For any turtle detected within 100 m of the source vessel, a pause of 10 shots shall be implemented, such that the turtle is greater than 200 m from array upon resumption of source activity.

8.6 Short Breaks in Source Operations

8.6.1 Daylight

In recognition of occasional short periods of silence for a variety of reasons other than for mitigation, during daylight operations, the seismic source may be silenced for periods of time not exceeding **30 minutes in duration** and may be restarted at the same volume for operations without a ramp-up if:

1. Visual and acoustic monitoring (daytime) is continued diligently through the silent period

   AND

2. No marine protected species are visually observed in their respective EZ during the silent period, and no acoustic detections made **at any distance.**

NOTE: Procedures for returning to full volume without ramp-up after silent periods also apply to returning to full volume from reduced volume.

However, if the source were operating at that reduced volume for more than 30 minutes, **a ramp-up would be required to return to full volume.**

8.6.2 Nighttime and Daylight Poor Visibility

In recognition of occasional short periods of silence for a variety of reasons other than for mitigation, the seismic source may be silenced for periods of time not exceeding **10 minutes in duration** and may be restarted at the same volume for operations without a ramp-up if:

1. Acoustic monitoring (nighttime and daylight poor visibility (e.g., BSS 4 or greater)) is continued diligently through the silent period,

   AND

2. No acoustic detections have been made **at any distance.**

NOTE: Procedures for returning to full volume without ramp-up after silent periods also apply to returning to full volume from reduced volume.

For example, if two of three strings were silenced from full volume for the purpose of testing single strings, and testing was completed in less than 10 minutes, the array could return to full volume without a ramp-up provided that the conditions described above were met.

However, if the source were operating at that reduced volume for more than 10 minutes, **a ramp-up would be required to return to full volume.**

8.7 Non-acquisition and Non-Testing Source Activity

The acoustic source should be deactivated when not acquiring data or preparing to acquire data, except as necessary for testing. Unnecessary use of the acoustic source shall be avoided.

9 REPORTING

9.1 Incident Reporting

9.1.1 Potential Non-Compliance Incidents

The Lead PSO or Lead PAM Operator verbally informs Party Manager and on-board Client Representative of any potential compliance related issues immediately. The Lead PSO/PAM Operator also informs the RPS Project Manager immediately of all potential non-compliance events.

If the issue can be resolved between the Lead PSO/PAM Operator, Client Representative and Party Manager, the lead PSO/PAM Operator will document in writing the compliance issue and the agreed-upon practices for minimizing future non-compliance incidents of the same nature. The party manager and QC Representative review and approve, and the statement is submitted to the following distribution list:

Name: Scott Baker, Email: SBAKER@chevron.com

The representatives listed above will distribute any pertinent information resulting from the incident to their respective crews as deemed necessary and appropriate.

If the issue cannot be resolved at the vessel level, Chevron and RPS will discuss and determine the appropriate future actions to be taken. When a common position is reached, notification of the agreed procedures will be distributed by Chevron to vessel crew and by RPS to the PSOs and PAM Operators.

If an agreement cannot be reached at the office level, a Chevron representative will contact BOEM/NMFS/BSEE for clarification. Results from the clarification will be distributed by Chevron.

9.1.2 Reporting A Non-functioning PAM System During Seismic Operations

The PAM Operator on duty will notify the RPS Project Manager as soon as possible. The RPS PM will email NMFS (nmfs.psoreview@noaa.gov) and BSEE (protectedspecies@bsee.gov) as soon as is practicable of any PAM system malfunctions exceeding 30 minutes in duration that occur while acoustic source operations are ongoing.

The notification will include the vessel name, the time and location (Geographic Information System (GIS) position) in which the PAM system ceased function where seismic operations continued. The template for this email will be provided by the RPS PM.

The PAM Operator will also notify by email:

- The vessel Party Chief
- The Client Representative
- The RPS PM should also be copied on this

9.1.3 Injured or Dead Protected Species Reporting

1. The PSO on watch will report the sightings of a dead and/or injured marine species to the Lead PSO, the RPS project manager, on board client representative and vessel Party Chief as soon as possible after the sighting.
2. The RPS PM will report the sighting to the NMFS stranding hotline. This will occur as soon as practicably possible but no more than 24 hours of the detection.
3. A written report will be prepared including any photos taken of the animal and sent to RPS as soon as possible.
4. The RPS office will submit the written report to the following distribution list within 12 hours of the detection for review:

   On-board:
   - Onboard Party Chief
   - Chevron Representative

   On-shore:
   - Chevron Project Manager

RPS will provide the written report, once the draft has been reviewed and approved per above, to NOAA, NMFS, and BOEM with Chevron included in copy.

NOTE: Unless otherwise directed by BOEM, NOAA Fisheries, or NOAA, the dead or injured marine mammal or sea turtle SHOULD NOT be touched! Dead and injured marine mammals and sea turtles are still protected by the ESA and the Marine Mammal Protection Act (MMPA) and touching the animals in any manner is considered harassment and is punishable by law.

9.2 Daily Progress, Interim and Final Reporting

9.2.1 Daily Progress Reports

A daily report will be completed and submitted to the Party chief, onboard client representative and RPS project manager.

The template will be provided by RPS and Chevron will be provided opportunity to review and provide comments.

9.2.2 Interim Reports

RPS will submit interim reports in the format of an excel spreadsheet for the vessel containing the required information listed in the BO.

RPS will submit interim reports (a dataset in a format approved by NMFS and BSEE) on the 1st of each month to BSEE (protectedspecies@bsee.gov).

9.2.3 Final Report

RPS will develop a final report summarizing the survey activities and all PAM / PSO observations. The report will contain all the data required to meet the requirements of the BO.

The RPS Project Manager will provide the draft final report to the Chevron Project Manager within 45 days of project completion and then the final submission of the report will be submitted to BOEM, BSEE, NMFS within 90 days of project completion.

Appendix A: Passive Acoustic Monitoring System

1 Passive Acoustic Monitoring (PAM) Equipment

The PAM equipment comprises the following items:

- 250m Hydrophone Array Cable containing 2 Low Frequency hydrophones (10Hz to 24kHz), 2 Ultra Broadband hydrophones (200Hz to 200kHz), and 2 Broadband hydrophones (2kHz to 200kHz)
- 100m deck cable
- Electronic data capture and processing unit including:
  - Headphones RF transmitter
  - Fireface audio interface
  - Rackmount PC
  - Buffer interface unit
- Integral screen and keyboard
- Backup System

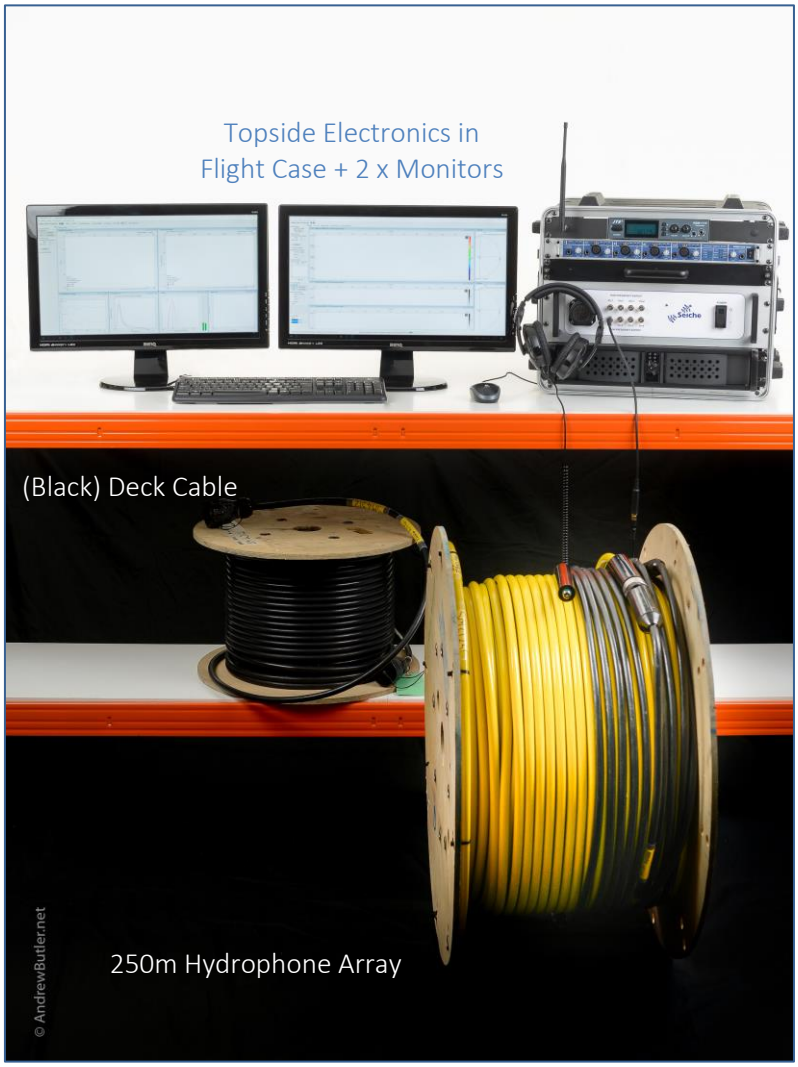

Figure 1 Seiche PAM System

2 6 Hydrophone Array

The array includes six hydrophones arranged in three pairs of identical specification with appropriate physical separation to provide direction-finding (bearings) to marine mammals and localization using Target Motion Analysis (TMA).

- The front pair (H1 and H2, 8m separation) consists of two “Low Frequency” hydrophones with a response of 10Hz to 24kHz;
- The middle pair (H3 and H4, 2.0m separation) consists of two “Broadband” hydrophones with a response of 200Hz to 200kHz;
- The rear pair (H5 and H6, 0.25m separation) consists of two “Standard” hydrophones with a response of 2kHz to 200kHz.

The “Low Frequency” hydrophones are configured to detect very low frequency vocalizations while the “Broadband” and “Standard” hydrophones are configured to detect low-mid frequency and mid-high vocalizations respectively. These three pairs of hydrophones provide the capability to detect the full range of marine mammal vocalizations anticipated to be encountered.

Simulation exercises have been completed using the PAMGuard software to verify that the within-pair separation provides consistently accurate bearings to a range of marine mammal vocalizations. Test signals used in these exercises simulated right whale up-calls, broadband sperm whale clicks, delphinid whistles, and narrow band high frequency harbor porpoise clicks. Anecdotal reports from surveys utilizing Seiche PAM systems with simultaneous visual and acoustic monitoring indicate that the acoustic range estimates have been sufficiently accurate for decision-making on whether vocal animals are within or beyond a 500m mitigation zone.

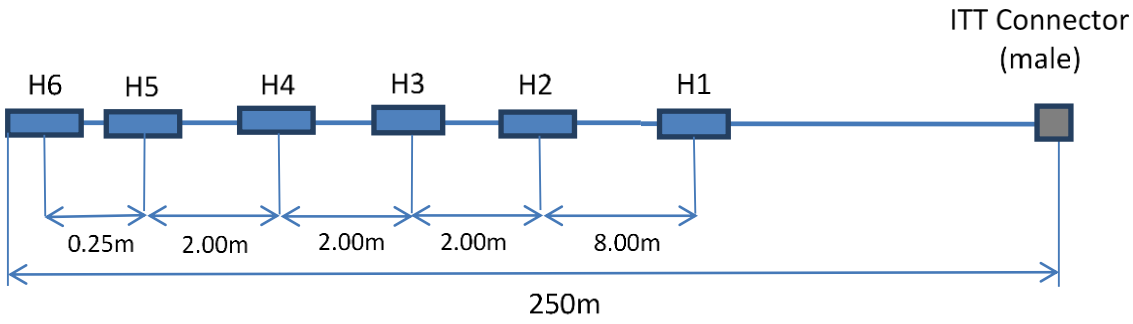

Figure 2 6 Hydrophone Array Configuration

2.1 Frequency Response Curves

Frequency response curves provide a standard for demonstrating hydrophone sensitivity over a range of frequencies. A flat response between the frequencies of interest is desirable, indicating consistent sensitivity across the band of interest. The frequency response curves provided were generated from 10Hz to 24kHz, 200Hz to 200kHz, and 2kHz to 200kHz hydrophone elements (including pre-amps) of a Seiche towed array and are representative of the response curves for the 6 Hydrophone Array. The frequency response curves for each element within the arrays (main system and spare) used on the survey will be generated as part of the calibration process prior to their dispatch.

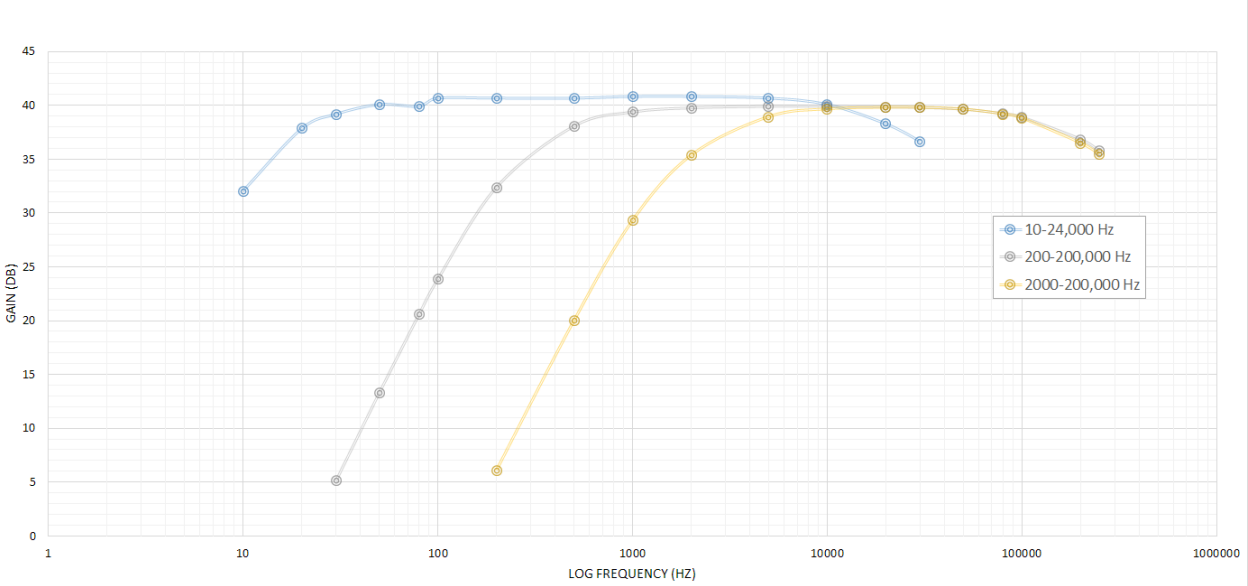

Figure 3 Frequency Response Curve of the Three Types of Hydrophones

Appendix C: Map of Survey Area

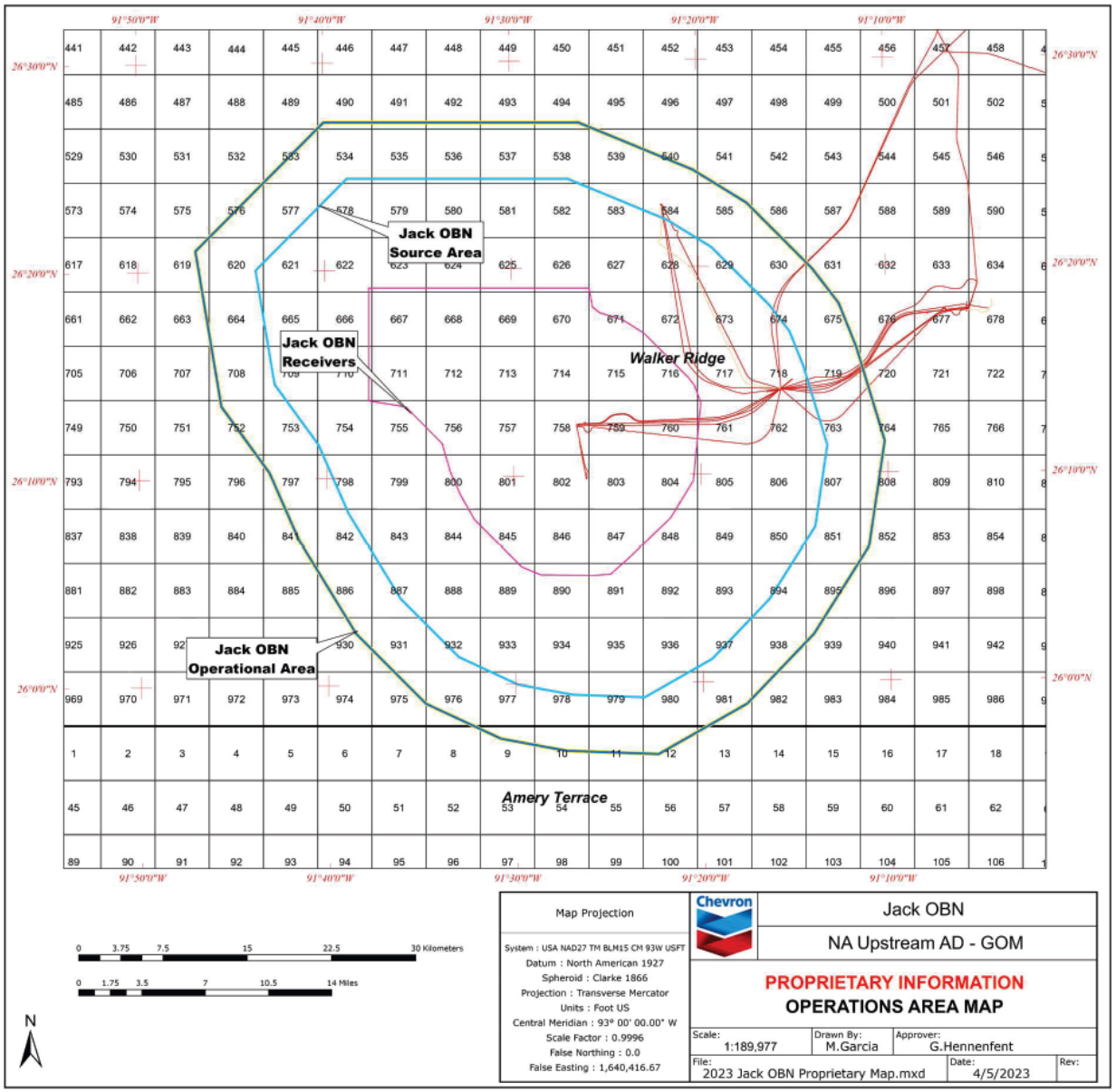

Figure 1. Map of survey area

Appendix D: Survey Vessel Photos

Figure 1. Source vessel – R/V Fulmar Explorer

Figure 2. Node Vessel – Harvey Intervention

Figure 3. Support Vessel – Marianne-G

Appendix E: PSOs and PAM Operators

RPS PSOs and PAM Operators - *R/V Fulmar Explorer*
Miguel Lopez Cuellar
Shauna Mohler
Eli Nass
Erendira Penfield-Espinosa
Sharon Belen Toro Ramirez
Kaylee McRae
Heber Huizar
Bryan Rutherford
Brennan Baringer
Samuel Dorado
Paola Díaz
Leticia Lili
Caleb Sistrunk
Jeri Butcher
McKenna Hanson
Shelby Tobin
Duncan Breeze
Sandra Piña
Delroy Thomas
Nathan Watlington
Jorge Simancas
Laura Vallin
Romeo Alexander De Freitas Jr.
Sara Amozurrutia
Valeria Peña Mendoza
Myka Steinbeisser
Lilia Pérez
Karen Villegas Manriquez

Appendix F: Reticle Binocular Calibration Table

Reticle Binocular Calibration Table

Week #	Date	Observer Name	Reticle Binocular Estimated Distance (m)	True Distance from Radar (m)	Sea State (Beaufort)	Wind Force (knots)	Swell (m)	Comments
1	26 September 2023	Miguel Lopez	1493	1100	3	8	<2	Cargo vessel
1	26 September 2023	Shauna Mohler	3934	3704	3	8	<2	Vessel
1	26 September 2023	Eli Nass	1498	1203	3	6	<2	Rig
2	02 October 2023	Eli Nass	897	804	5	12	2 to 4	Rig
2	02 October 2023	Shauna Mohler	891	804	5	12	2 to 4	Rig
2	03 October 2023	Miguel Lopez	1443	1668	3	4	<2	Rig
3	12 October 2023	Miguel Lopez	248	200	3	10	<2	seismic source
3	12 October 2023	Eli Nass	305	200	3	9	<2	seismic source
3	12 October 2023	Shauna Mohler	343	200	3	6	<2	seismic source
3	15 October 2023	Bryan Rutherford	-	-	6	15	2 to 4	No target/Rough weather
3	15 October 2023	Brennan Baringer	-	-	6	15	2 to 4	No target/Rough weather
4	19 October 2023	Brennan Baringer	2297	2315	3	11	<2	Supply vessel
4	19 October 2023	Bryan Rutherford	2500	2315	3	11	<2	Supply vessel
4	19 October 2023	Eli Nass	2500	2315	3	11	<2	Supply vessel
5	26 October 2023	Brennan Baringer	3246	3334	5	13	2 to 4	oil transport vessel
5	26 October 2023	Eli Nass	3446	2600	5	14	2 to 4	SUPPLY VESSEL
5	26 October 2023	Bryan Rutherford	3446	2600	5	14	2 to 4	SUPPLY VESSEL
6	29 October 2023	Eli Nass	689	645	3	12	<2	OIL RIG, calibrated the last day of week 5 in anticipation of a bad weather week
6	03 November 2023	Brennan Baringer	1723	1852	3	11	<2	BULK CARGO VESSEL
6	N/A	Bryan Rutherford	N/A	N/A	N/A	N/A	N/A	No targets seen during the week
7	07 November 2023	Brennan Baringer	3246	2963	4	11	<2	OIL RIG
7	08 November 2023	Eli Nass	2461	2037	4	14	<2	Passing vessel
7	08 November 2023	Bryan Rutherford	2299	2037	4	14	<2	Passing vessel

Week #	Date	Observer Name	Reticle Binocular Estimated Distance (m)	True Distance from Radar (m)	Sea State (Beaufort)	Wind Force (knots)	Swell (m)	Comments
8	16 November 2023	Eli Nass	1149	1111	6	26	2 to 4	Passing vessel
8	16 November 2023	Bryan Rutherford	1834	1500	6	25	2 to 4	Passing vessel
8	13 November 2023	Brennan Baringer	2963	3246	5	18	<2	CRUISE SHIP
8	19 November 2023	Jeri Butcher	266	275	2	5	<2	Calculated to gun array
8	19 November 2023	Caleb Sistrunk	286	275	2	5	<2	Calculated to gun array
8	19 November 2023	Leticia Lili	265	275	2	3	<2	Calculated to gun array
9	19 November 2023	Leticia Lili	484	580	3	9	<2	Marianne G
9	19 November 2023	Jeri Butcher	680	629	3	9	<2	Marianne G
9	19 November 2023	Caleb Sistrunk	1350	1387	3	10	<2	Marianne G
10	23 November 2023	Leticia Lili	484	580	3	9	<2	Marianne G
10	23 November 2023	Jeri Butcher	680	629	3	9	<2	Marianne G
10	23 November 2023	Caleb Sistrunk	1350	1387	3	10	<2	Marianne G
10	23 November 2023	Caleb Sistrunk	3440	3148	4	17	<2	Marianne G
10	03 December 2023	Jeri Butcher	3390	3622	4	16	<2	Marianne G
10	03 December 2023	Leticia Lili	550	615	3	13	<2	Marianne G
11	12 December 2023	Jeri Butcher	3220	3500	4	22	<2	Cargo vessel
11	12 December 2023	Caleb Sistrunk	4510	4300	5	24	<2	Vessel
11	12 December 2023	Leticia Lili	3440	3500	4	22	<2	Cargo vessel
12	N/A	Leticia Lili	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
12	N/A	Jeri Butcher	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
12	N/A	Caleb Sistrunk	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
12	N/A	Sandra Piña	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
12	N/A	Delroy Thomas	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
12	N/A	Nathan Watlington	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
13	22 December 2023	Sandra Pina	2345	2222	3	10	<2	Tanker Vessel Seapeak Bahrain

Week #	Date	Observer Name	Reticle Binocular Estimated Distance (m)	True Distance from Radar (m)	Sea State (Beaufort)	Wind Force (knots)	Swell (m)	Comments
13	22 December 2023	Delroy Thomas	2394	2222	3	10	<2	Tanker Vessel Seapeak Bahrain
13	22 December 2023	Nathan Watlington	2394	2222	3	10	<2	Tanker Vessel Seapeak Bahrain
14	26 December 2023	Sandra Pina	3699	3704	4	12	<2	Touro Houston Tanker vessel
14	27 December 2023	Delroy Thomas	3771	3148	4	16	<2	Chase vessel Sunrise G
14	27 December 2023	Nathan Watlington	274	285	4	16	<2	Starboard side sound sources
15	N/A	Sandra Piña	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
15	N/A	Delroy Thomas	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
15	N/A	Nathan Watlington	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
16	N/A	Sandra Piña	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
16	N/A	Nathan Watlington	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
16	14 January 2024	Delroy Thomas	276	240	4	14	<2	seismic source
16	14 January 2024	Valeria Peña	2650	2778	2	8	<2	Platform
16	14 January 2024	Myka Steinbeisser	340	370	4	13	<2	seismic source
16	14 January 2024	Delroy Thomas	276	240	4	14	<2	seismic source
16	14 January 2024	Valeria Peña	2650	2778	2	8	<2	Platform
16	14 January 2024	Myka Steinbeisser	340	370	4	13	<2	seismic source
17	17 January 2024	Valeria Peña	210	205	3	9	<2	seismic source
17	18 January 2024	Delroy Thomas	2408	2222	4	17	<2	Marianne G supply vessel
17	18 January 2024	Myka Steinbeisser	2100	2222	4	16	<2	Marianne G supply vessel
17	18 January 2024	Valeria Peña	1990	2037	4	16	<2	Marianne G supply vessel

Week #	Date	Observer Name	Reticle Binocular Estimated Distance (m)	True Distance from Radar (m)	Sea State (Beaufort)	Wind Force (knots)	Swell (m)	Comments
18	N/A	Delroy Thomas	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
18	N/A	Myka Steinbeisser	N/A	N/A	N/A	N/A	N/A	Unable to calibrate, no targets in the area
18	27 January 2024	Valeria Peña	4090	4444	5	22	2 to 4	Tanker vessel
19	29 January 2024	Valeria Peña	2660	2629	4	18	<2	Sea Elephant tanker vessel
19	29 January 2024	Delroy Thomas	2370	2660	4	18	<2	Sea Elephant tanker vessel
19	29 January 2024	Myka Steinbeisser	5800	6112	3	8	<2	Marianne G supply vessel
19	01 February 2024	Delroy Thomas	2293	1666	2	4	<2	Stena Bulk tanker vessel
19	01 February 2024	Valeria Peña	1590	1666	3	10	<2	Stena Surprise tanker vessel
19	02 February 2024	Valeria Peña	3220	3333	3	10	<2	Asterix I tanker vessel
19	01 February 2024	Myka Steinbeisser	2350	2500	3	10	<2	Marianne G supply vessel
19	01 February 2024	Delroy Thomas	3260	3333	3	10	<2	Asterix I tanker vessel

Appendix G: PAM Calibration Certificates

SM.7942 System Frequency Response

This PAM system has been calibrated so that realistic sound level and signal amplitudes values may be displayed in PAM software. The system frequency response of the system when using this hydrophone array is shown below, and calibration settings are provided for use in Pamguard.

Table 2 provides -3 dB and -6 dB points of the system response curves for hydrophones in each group. These points delimit the 'flat' portion of the response curve. Groups H1-H2 and H3-H4 are acquired by the Fireface 800/802 sound card. Group H5-H6 is acquired by the NI USB-6251 DAQ. The frequency response curves are shown in Fig. 14.

Table 2 Frequency points for -3 dB and -6 dB sensitivity, for representative hydrophones of each group.

Hydrophone	Fireface 800, -3 dB	Fireface 800, -6 dB	USB-6251, -3 dB	USB-6251, -6 dB
H1	16-25,000 Hz	10-40,000 Hz	-	-
H3	400-80,000 Hz	250-80,000 Hz	-	-
H5	-	-	2,500-160,000 Hz	1,600-250,000 Hz

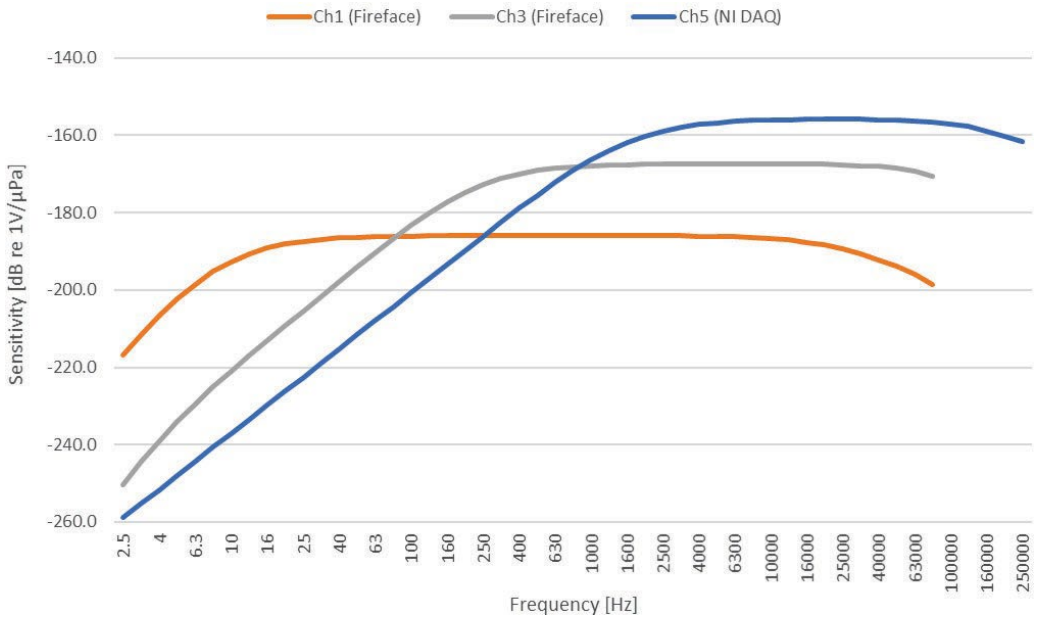

Fig. 14 System frequency response curves showing channel sensitivity for representative hydrophones of the H1-H2, H3-H4 and H5-H6 groups.

Calibration Values for PAM Software

Pamguard Array Manager

H1 (Ch0, 0.01-24 kHz) Sensitivity = -195.7 dB re: 1 V/uPa, Preamplifier Gain = +21.0 dB

H2 (Ch1, 0.01-24 kHz) Sensitivity = -195.3 dB re: 1 V/uPa, Preamplifier Gain = +21.0 dB

H3 (Ch2, 0.2-200 kHz) Sensitivity = -195.5 dB re: 1 V/uPa, Preamplifier Gain = +39.9 dB

H4 (Ch3, 0.2-200 kHz) Sensitivity = -195.5 dB re: 1 V/uPa, Preamplifier Gain = +39.9 dB

H5 (Ch4, 2-200 kHz) Sensitivity = -195.8 dB re: 1 V/uPa, Preamplifier Gain = +39.7 dB

H6 (Ch5, 2-200 kHz) Sensitivity = -195.8 dB re: 1 V/uPa, Preamplifier Gain = +39.7 dB

Pamguard Sound Acquisition

NI USB-6251

Terminal Configuration .....Differential

Input Voltage Range.....4 V (set as +/- 2 V per channel)

Additional System Gain.....0 dB

Channels .....SW Ch0 / HW Ch4, SW Ch1 / HW Ch5

Sample Rate .....up to 500 kHz

Sample Size .....16 bit

RME Fireface 800

Line Level Input..... ..-10 dBV (set in the Fireface Settings utility)

Input Voltage Range (p-p).....2 V (i.e., +/- 1 V)

Additional System Gain.....11.3 dB

Channels .....SW Ch0 / HW Ch0, SW Ch1 / HW Ch1

. .....SW Ch2 / HW Ch2, SW Ch3 / HW Ch3

Sample Rate ....48-192 kHz

Sample Size .....24 bit

Depth Sensor

The array section is terminated with a piezoresistive pressure sensor.

Pressure Sensor Rating .....10 bar

Working Depth Range..... ..0-100 m (overpressure limit = 200 m)

ADC.....Measurement Computing USB-1208 LS

Range ..... to +2.5 V

Hardware Channel 0

Pamguard Calibration.....Depth (m) = 64.8 * Voltage + 67.3 offset

SM.8286 System Frequency Response

This PAM system has been calibrated so that realistic sound level and signal amplitudes values may be displayed in PAM software. The system frequency response of the system when using this hydrophone array is shown below, and calibration settings are provided for use in Pamguard.

Table 2 provides -3 dB and -6 dB points of the system response curves for hydrophones in each group. These points delimit the 'flat' portion of the response curve. Groups H1-H2 and H3-H4 are acquired by the Fireface 800/802 sound card. Group H5-H6 is acquired by the NI USB-6251 DAQ. The frequency response curves are shown in Fig. 14.

Table 2 Frequency points for -3 dB and -6 dB sensitivity, for representative hydrophones of each group.

Hydrophone	Fireface 800, -3 dB	Fireface 800, -6 dB	USB-6251, -3 dB	USB-6251, -6 dB
H1	16-25,000 Hz	10-40,000 Hz	-	-
H3	400-80,000 Hz	250-80,000 Hz	-	-
H5	-	-	2,500-160,000 Hz	1,600-250,000 Hz

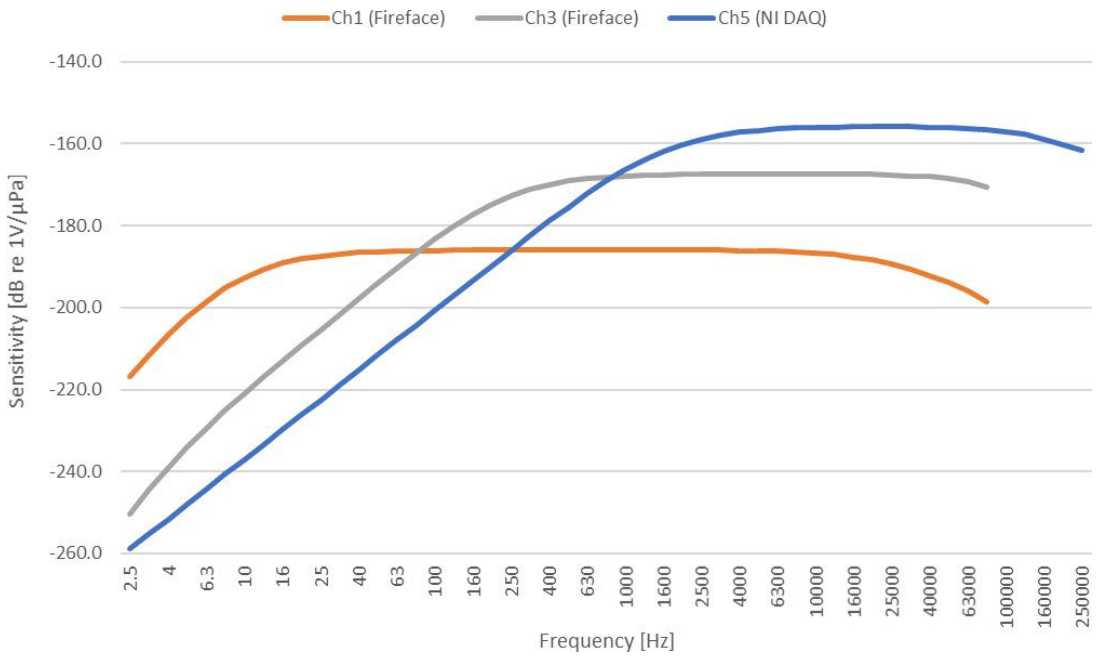

Fig. 14 System frequency response curves showing channel sensitivity for representative hydrophones of the H1-H2, H3-H4 and H5-H6 groups.

Calibration Values for PAM Software

Pamguard Array Manager

H1 (Ch0, 0.01-24 kHz) Sensitivity = -196.5 dB re: 1 V/uPa, Preamplifier Gain = +21.0 dB H2 (Ch1, 0.01-24 kHz) Sensitivity = -196.7 dB re: 1 V/uPa, Preamplifier Gain = +21.0 dB H3 (Ch2, 0.2-200 kHz) Sensitivity = -196.7 dB re: 1 V/uPa, Preamplifier Gain = +39.8 dB H4 (Ch3, 0.2-200 kHz) Sensitivity = -196.9 dB re: 1 V/uPa, Preamplifier Gain = +39.9 dB H5 (Ch4, 2-200 kHz) Sensitivity = -196.6 dB re: 1 V/uPa, Preamplifier Gain = +39.7 dB H6 (Ch5, 2-200 kHz) Sensitivity = -196.8 dB re: 1 V/uPa, Preamplifier Gain = +39.8 dB

Pamguard Sound Acquisition

NI USB-6251

Terminal Configuration ..... Differential

Input Voltage Range ..... 4 V (set as +/- 2 V per channel)

Additional System Gain..... 0 dB

Channels ..... SW Ch0 / HW Ch4, SW Ch1 / HW Ch5

Sample Rate..... up to 500 kHz

Sample Size..... 16 bit

RME Fireface 800

Line Level Input .....-10 dBV (set in the Fireface Settings utility)

Input Voltage Range (p-p)..... 2 V (i.e., +/- 1 V)

Additional System Gain.....11.3 dB

Channels ..... SW Ch0 / HW Ch0, SW Ch1 / HW Ch1

..... SW Ch2 / HW Ch2, SW Ch3 / HW Ch3

Sample Rate.....48-192 kHz

Sample Size..... 24 bit

Depth Sensor

The array section is terminated with a piezoresistive pressure sensor.

Pressure Sensor Rating ..... 10 bar

Working Depth Range.....0-100 m (overpressure limit = 200 m)

ADC..... Measurement Computing USB-1208 LS

Range..... to +2.5 V

Hardware Channel..... 0

Pamguard Calibration ..... Depth (m) = 64.8 * Voltage + 67.3 offset

Appendix H: Vessel Specific PAM Deployment Procedures

R/V Fulmar Explorer PAM Hydrophone Deployment Procedures

The deployment required two PAM operators and one gun mechanic to operate the winch.

Overview

The PAM equipment comprised the following items:

- 230m tow cable
- 25m hydrophone array cable containing 6 hydrophones and a depth gauge.
- 100m deck cable
- Electronic data capture and processing unit including:
    - Headphones RF transmitter
    - Fireface audio interface
    - Rackmount PC
    - Buffer interface unit
    - Integral screen and keyboard
- Backup System

The array included six hydrophones arranged in three pairs of identical specification with appropriate physical separation to provide direction-finding (bearings) to marine mammals and localization using Target Motion Analysis (TMA).

- The front pair (H1 and H2, 8m separation) consisted of two “Low Frequency” hydrophones with a response of 10Hz to 24kHz;
- The middle pair (H3 and H4, 2.0m separation) consisted of two “Broadband_” hydrophones with a response of 200Hz to 200kHz;
- The rear pair (H5 and H6, 0.25m separation) consisted of two “Standard” hydrophones with a response of 2kHz to 200kHz.

The “Low Frequency” hydrophones were configured to detect very low frequency vocalizations while the “Broadband” and “Standard” hydrophones were configured to detect low-mid frequency and mid-high vocalizations respectively. These three pairs of hydrophones provided the capability to detect the full range of marine mammal vocalizations anticipated to be encountered.

Simulation exercises have been completed using the PAMGuard software to verify that the within-pair separation provides consistently accurate bearings to a range of marine mammal vocalizations. Test signals used in these exercises simulated right whale up-calls, broadband sperm whale clicks, delphinid whistles, and narrow band high frequency harbor porpoise clicks. Anecdotal reports from surveys utilizing Seiche PAM systems with simultaneous visual and acoustic monitoring indicate that the acoustic range estimates have been sufficiently accurate for decision-making on whether vocal animals are within or beyond a 500m mitigation zone.

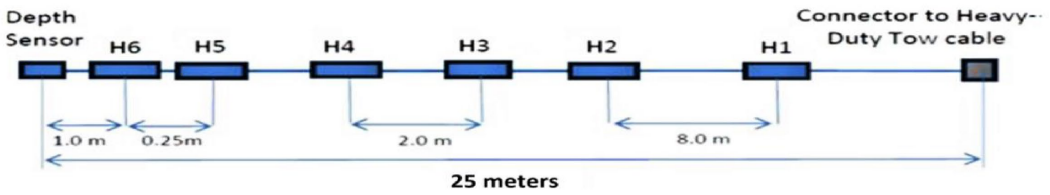

Figure 1: Schematic diagram of the hydrophone array cable indicating the position and separation of individual hydrophone elements and hydrophone pairs.

A 230-meter conventional tow cable, a 25-meter hydrophone array containing six hydrophone elements, and a 100-meter deck cable were supplied for the survey. The 100-meter deck cable was connected to the data processing unit (DPU) located in the instrument room and was connected via a SD-16 connector to the hydrophone tow cable. The 230-meter tow cable was spooled onto a centered gun deck winch, from where it was guided through the gun deck all the way into the water (Figure 2).

Figure 2. Tow cable mounted on winch and connected to the deck cable (bottom right side).

During deployment the operator ensured that the deck cable was disconnected from the tow cable at the winch and the electronics in the instrument room were powered off. The hydraulic/electric winch had to be connected prior deployment for power supply next to the gun shack. The end of the PAM cable was placed through the center of the gun deck stern. A gun mechanic then paid out the winch toward the desired towing length while a PAM operator helped to manually push/pull the PAM cable along the deck (Figure 3).

Figure 3. PAM operators manually feeding tow cable into the gun deck. Left: PAM operator directing the cable. Middle: PAM operator placing the cable on deck. Right: PAM operator manually deploying the first 3-5 meters of the hydrophone cable.

Once the PAM cable reached the towing point of 110 meters, the gun mechanic stopped paying out the winch and the tow cable was then secured with a Chinese finger to the back deck gate. (Figure 4). The winch was then turned off and disconnected; the deck cable was connected to the tow cable on the winch before returning to the instrument room (Figure 5).

Figure 4. Gun mechanic handling the winch and PAM operators handling the PAM cable.

Figure 5. Left: Connection between tow cable and deck cable (located on winch). Right: PAM operator disconnecting the winch.

Once the PAM cable was fully deployed 110 meters astern of the vessel, the hydrophones were approximately 120 meters from the centre of the source arrays, towing at a depth 8 to 12 meters depending on sea current and vessel's speed.

To decrease the likelihood of entanglement with the gun umbilical cables, the tow cable was weighted with a 5-kilogram chain link section to achieve a proper towing depth. The chain link was securely taped to the tow cable at approximately three meters from the tow cable connection point to the hydrophone array (Figure 6).

Figure 6: 5kg weight chain added to the tow cable.

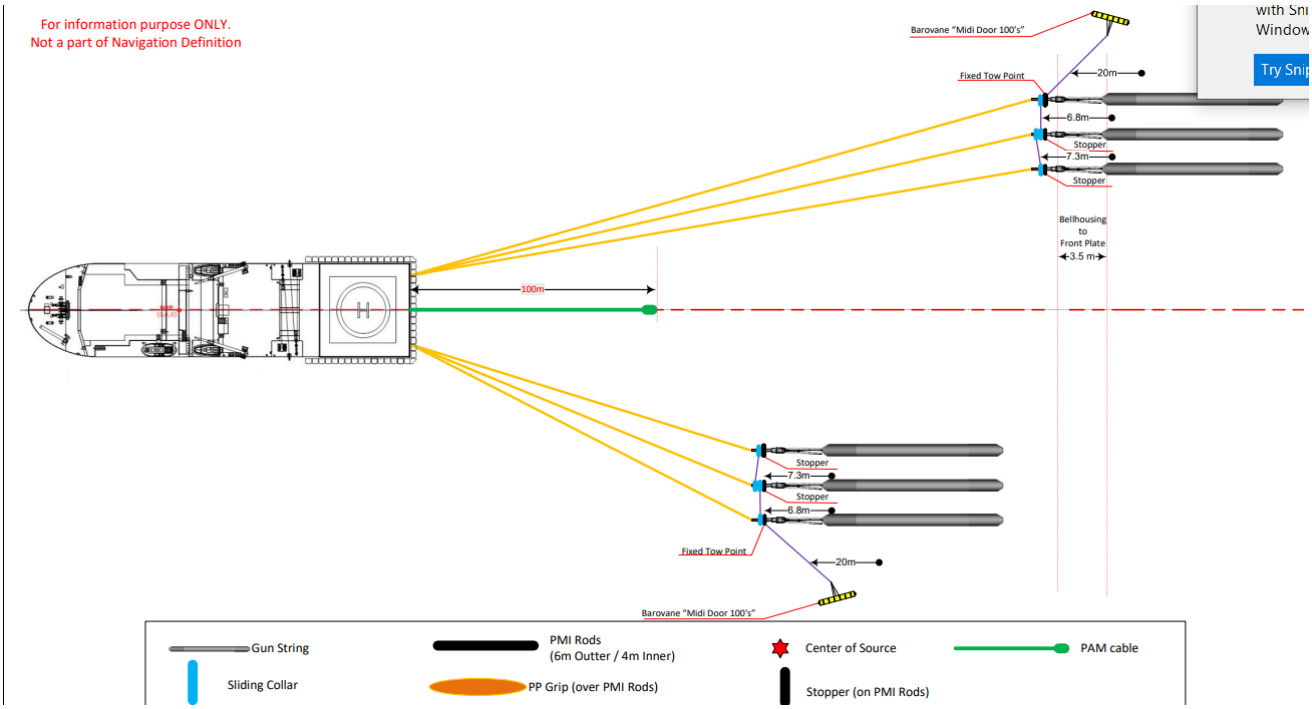

Figure 7: General Offset of PAM cable deployed with the Source deployed on board the *R/V Fulmar Explorer* for the survey.

Figure 8: Passive acoustic monitoring station in instrument room.

Pre-Deployment and Retrieval Tasks

- Ensure the system is tested and calibrated
- Chief mechanic / SL mechanic / PAMs assess environmental conditions (consulting MOPO).

Deployment

- Ensure that the PAM electronics unit is powered down.
- Toolbox meeting alerting instrument room of pending hydrophone deployment.
- Ensure the deck cable is disconnected from the hydrophone tow cable (tape both connectors to prevent corrosion).
- Connect the power supply for the hydraulics/electric winch.
- Manually deploy the first 3 to 5 meters under the back deck gate.
- Pay out the hydrophone cable until a total length of 110m has been deployed.
- Secure the PAM cable with the Chinese finger to the back deck gate.
- Turn off and disconnect the winch.
- Connect the deck cable to the hydrophone cable.

● Power up electronics on PAM station.

Retrieval

● Power down electronics in instrument room.

● Toolbox meeting alerting instrument room of pending hydrophone retrieval.

● Ensure the deck cable is disconnected from the hydrophone cable (tape both connectors to prevent corrosion).

● Connect the power supply for the hydraulics/electric winch.

● Release the tow cable from the back deck gate.

● Retrieve the entire tow cable onto the winch.

● Turn off and disconnect the winch.

● Manually coil the hydrophone array cable and place it on top of the lever control of the winch.

Always ensure the deck cable is disconnected from the tow cable before operating the winch.

HSE

Normal working deck PPE was required (hard hat, boots, gloves, eye protection, and coveralls). The operation carried a relatively low risk. Hazards include working close to the side of the vessel, trip hazards, and pinch points at the winch.

A Job Safety Analysis (JSA) had been completed for this task. A JSA required for review upon any additional modifications.

Appendix I: Excel Data Sheets of Monitoring Effort, Source Operations and Detections of Protected Species During the Survey

Appendix J: Letter of Data Certification

Report Certification Statement

I, Jorge Simancas, am familiar with the protocols outlined in Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols, implemented by the Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE), which provide guidelines to operators in complying with the Endangered Species Act (ESA; 16 U.S.C. §§ 1531-1544) and Marine Mammal Protection Act (MMPA; 16 U.S.C. §§1361- 1423h).

I hereby certify that, to the best of my knowledge, the data collected by the Protected Species Observer (PSOs) offshore and the information that was provided to RPS by the PSO team for our vessel to compile this report is accurate.

Name: Jorge Simancas

Position: Lead PAM Operator

Date: mar. 19, 2024

Signed _____ DocuSigned by: 2FA3131816C142A...

I, Anna Williams, am familiar with the protocols outlined in Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols, implemented by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE), which provide guidelines to operators in complying with the Endangered Species Act (ESA; 16 U.S.C. §§ 1531-1544) and Marine Mammal Protection Act (MMPA; 16 U.S.C. §§1361- 1423h).

I hereby certify that, to the best of my knowledge, the information provided in this report that was compiled by the RPS Project Support Manager is accurate.

Name: Anna Williams

Position: Environmental Project Manager

Date: Mar 19, 2024

Signed _____ DocuSigned by: Anna Williams 3AEB4A1548B54FF...

Appendix K: Photographs of Protected Species Visually Detected During the Survey

PHOTOS OF PROTECTED SPECIES FROM *R/V FULMAR EXPLORER*

Figure 1. Visual detection #01 – Bottlenose dolphin, 26 September 2023

Figure 2. Visual detection #03 – Unidentified shelled sea turtle, 26 September 2023

Figure 3. Visual detection #04 – Pantropical spotted dolphin, 27 September 2023

Figure 4. Visual detection #05 – Rough-toothed dolphin, 27 September 2023

Figure 5. Visual detection #06 – Unidentified dolphin, 28 September 2023

Figure 6. Visual detection #07 – Pantropical spotted dolphin, 28 September 2023

Figure 7. Visual detection #08 – Unidentified dolphin, 28 September 2023

Figure 8. Visual detection #09 – Green sea turtle, 29 September 2023

Figure 9. Visual detection #10 – Rough-toothed dolphin, 01 October 2023

Figure 10. Visual detection #11 – Sperm whale, 01 October 2023

Figure 11. Visual detection #12 – Sperm whale, 17 October 2023

Figure 12. Visual detection #13 – Melon-headed whale, 21 October 2023

Figure 13. Visual detection #14 – Melon-headed whale, 21 October 2023

Figure 14. Visual detection #15 – Unidentified shelled sea turtle, 23 October 2023

Figure 15. Visual detection #16 – Pantropical spotted dolphin, 26 October 2023

Figure 16. Visual detection #17 – Pantropical spotted dolphin, 30 October 2023

Figure 17. Visual detection #18 – Unidentified dolphin, 31 October 2023

Figure 18. Visual detection #19 – Unidentified dolphin, 31 October 2023

Figure 19. Visual detection #20 – Unidentified dolphin, 01 November 2023

Figure 20. Visual detection #21 – Unidentified dolphin, 16 November 2023

Figure 21. Visual detection #24 – Pantropical spotted dolphin, 22 November 2023

Figure 22. Visual detection #25 – Pantropical spotted dolphin, 11 December 2023

Figure 23. Visual detection #28 – Rough-toothed dolphin, 25 December 2023

Figure 24. Visual detection #29 – Pantropical spotted dolphin, 27 December 2023

Figure 25. Visual detection #34 – Bottlenose dolphin, 13 January 2024

Figure 26. Visual detection #35 – Sperm whale, 14 January 2024

Figure 27. Visual detection #36 – Sperm whale, 19 January 2024

Figure 27. Visual detection #38 – Bottlenose dolphin, 20 January 2024

Figure 28. Visual detection #39 – Bottlenose dolphin, 21 January 2024

Figure 29. Visual detection #40 – Bottlenose dolphin, 21 January 2024

Figure 30. Visual detection #41 – Loggerhead Sea turtle, 21 January 2024

Figure 31. Visual detection #42 – Bottlenose dolphin, 21 January 2024

Figure 32. Visual detection #47 – Rough-toothed dolphin

Appendix L: Protected Species Distribution Maps

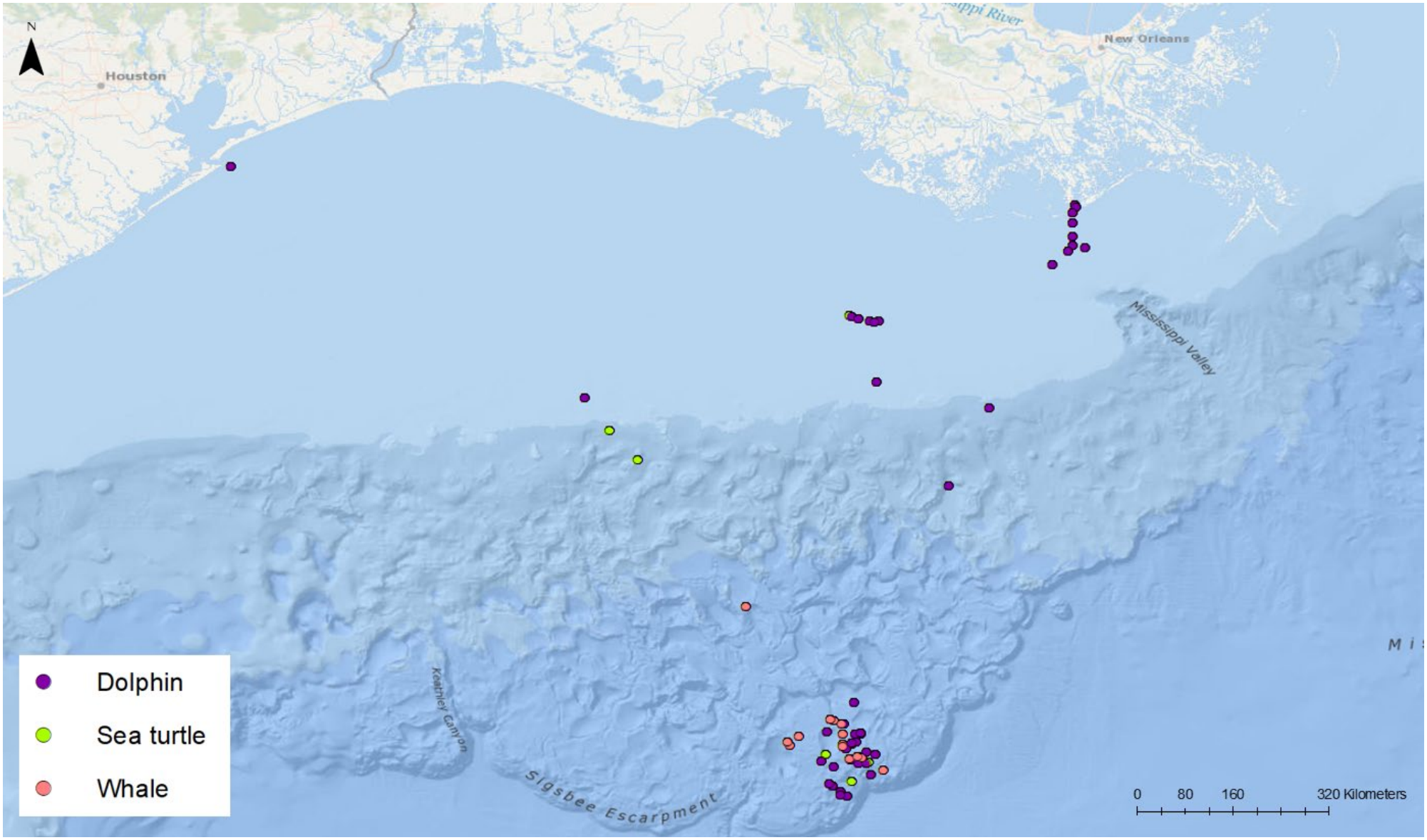

Figure 1. Detection distribution map for all protected species

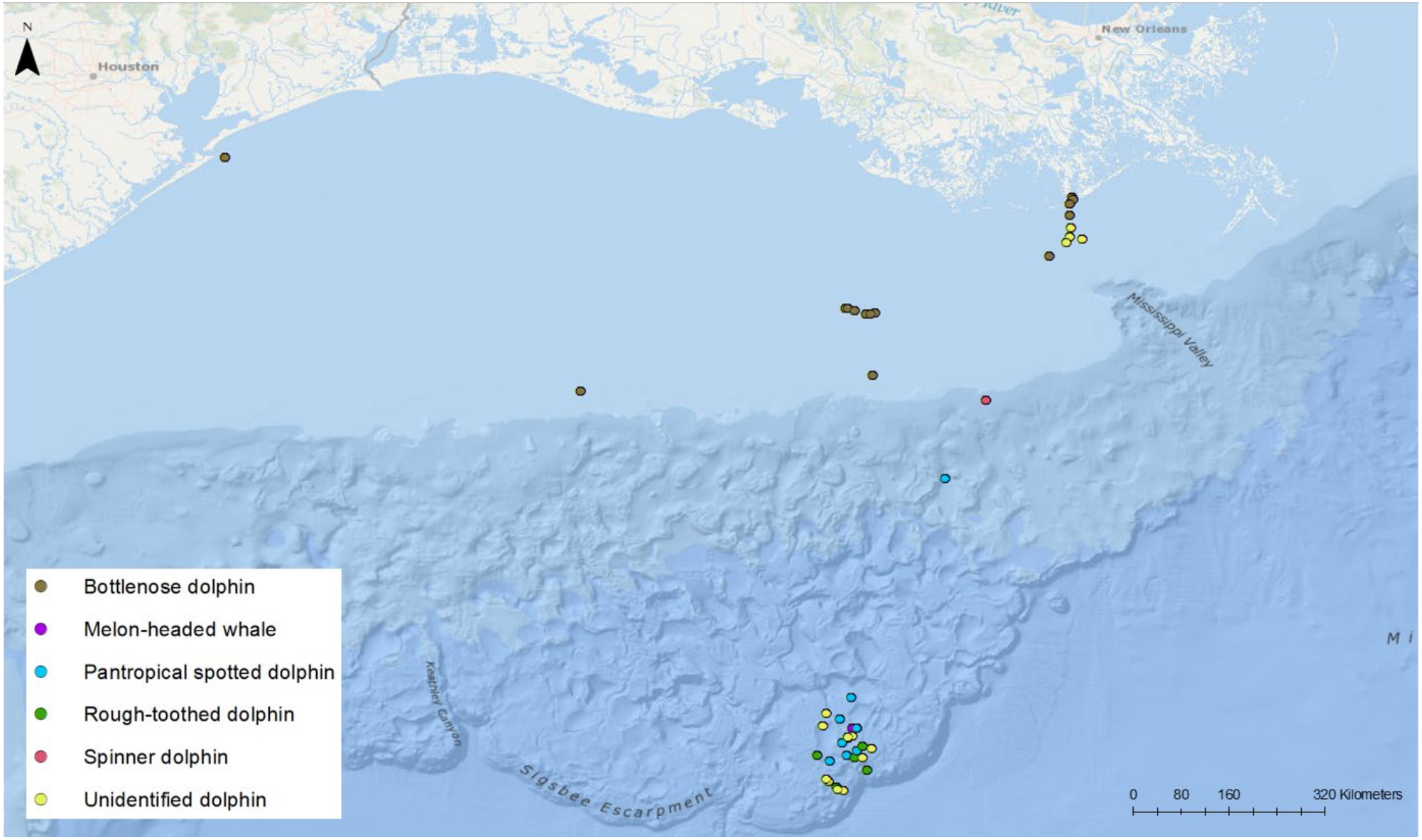

Figure 2. Detection distribution map for dolphins

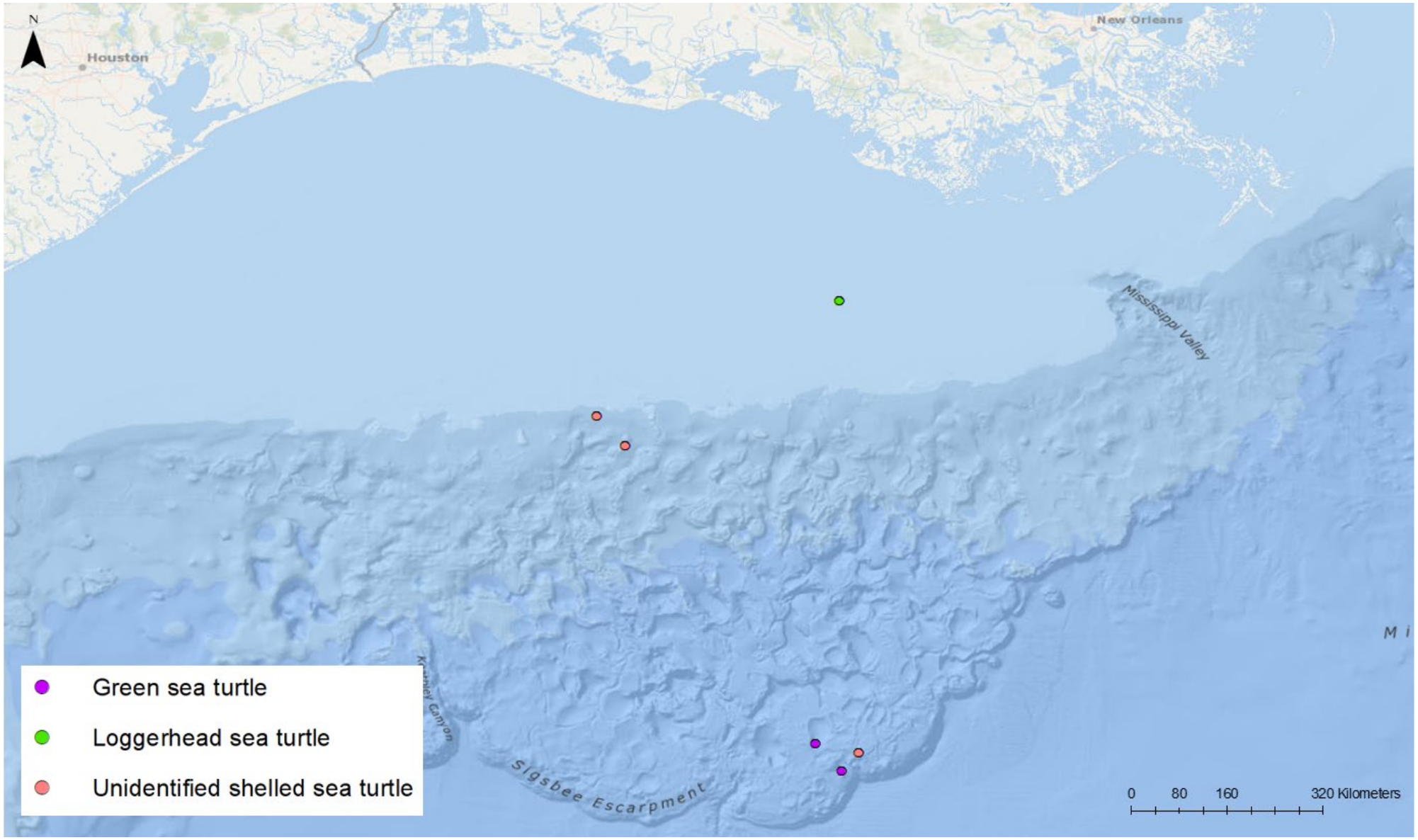

Figure 3. Detection distribution map for sea turtles

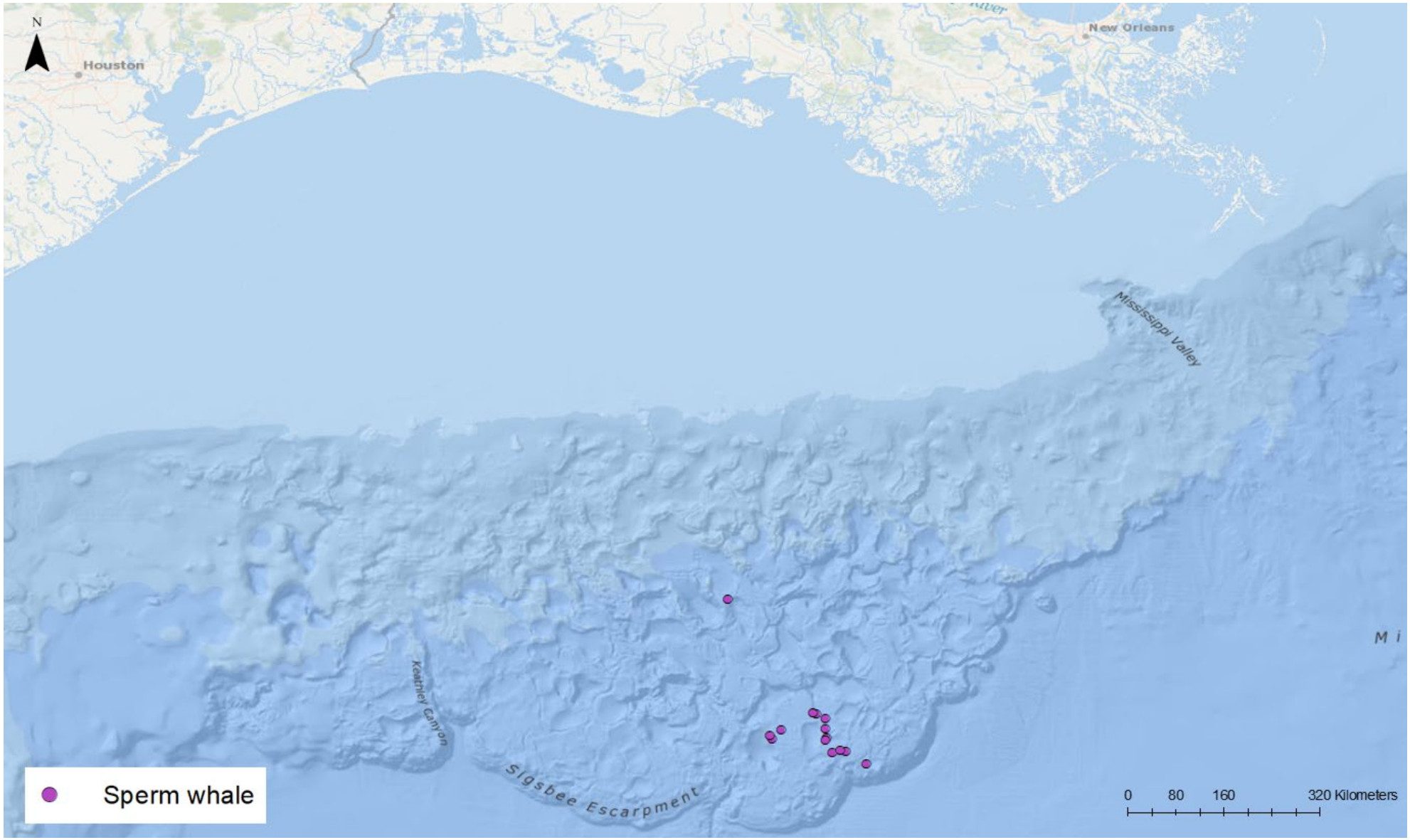

Figure 4. Detection distribution map for whales

Appendix M: Screenshots of Protected Species Acoustically Detected During the Survey

SCREENSHOTS OF ACOUSTIC DETECTIONS ON *R/V FULMAR EXPLORER*

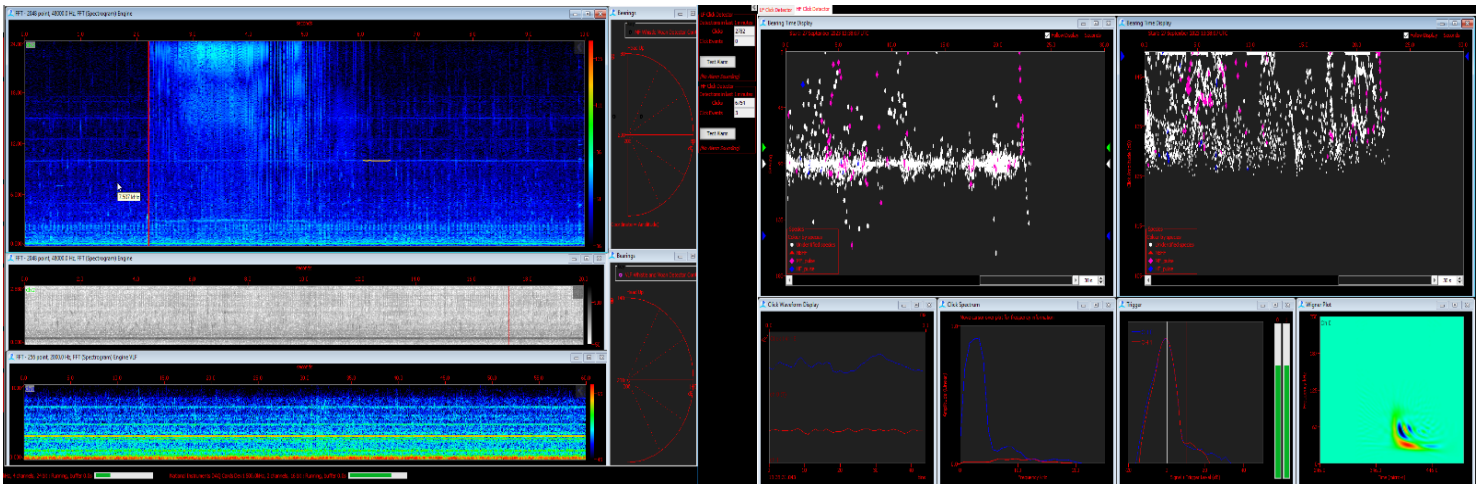

Figure 1. Acoustic detection #01 – Rough-toothed dolphins, 27 September 2023

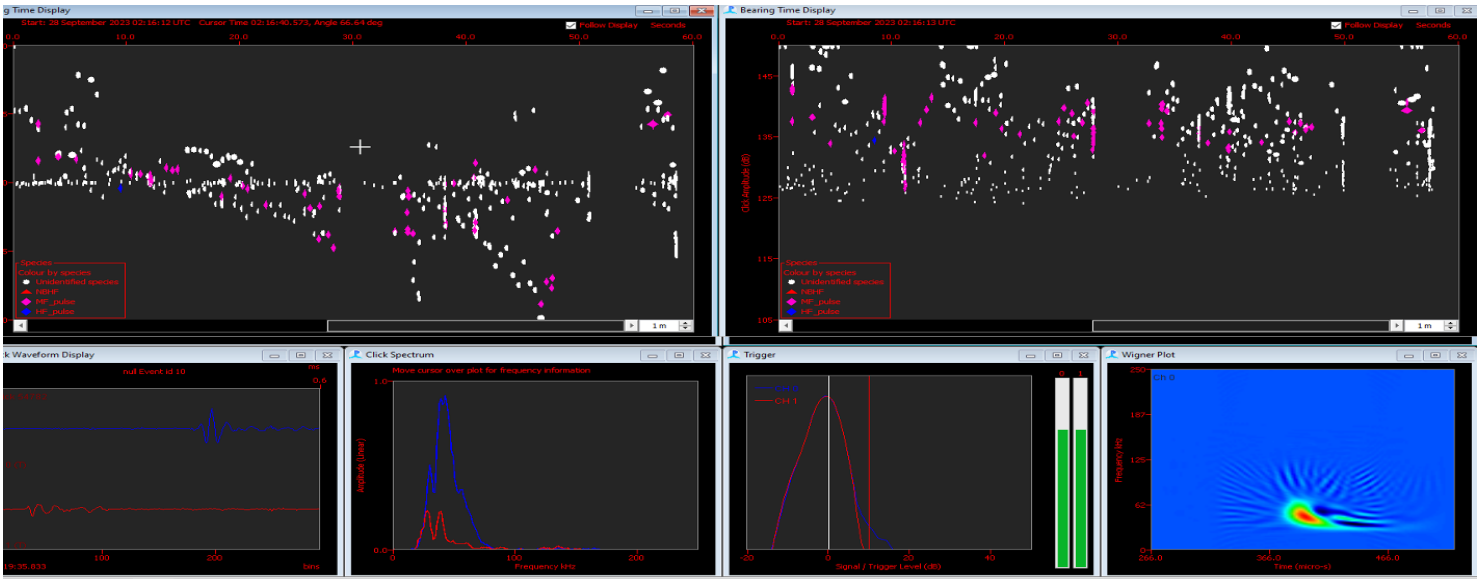

Figure 2. Acoustic detection #02 – Unidentified dolphins, 28 September 2023

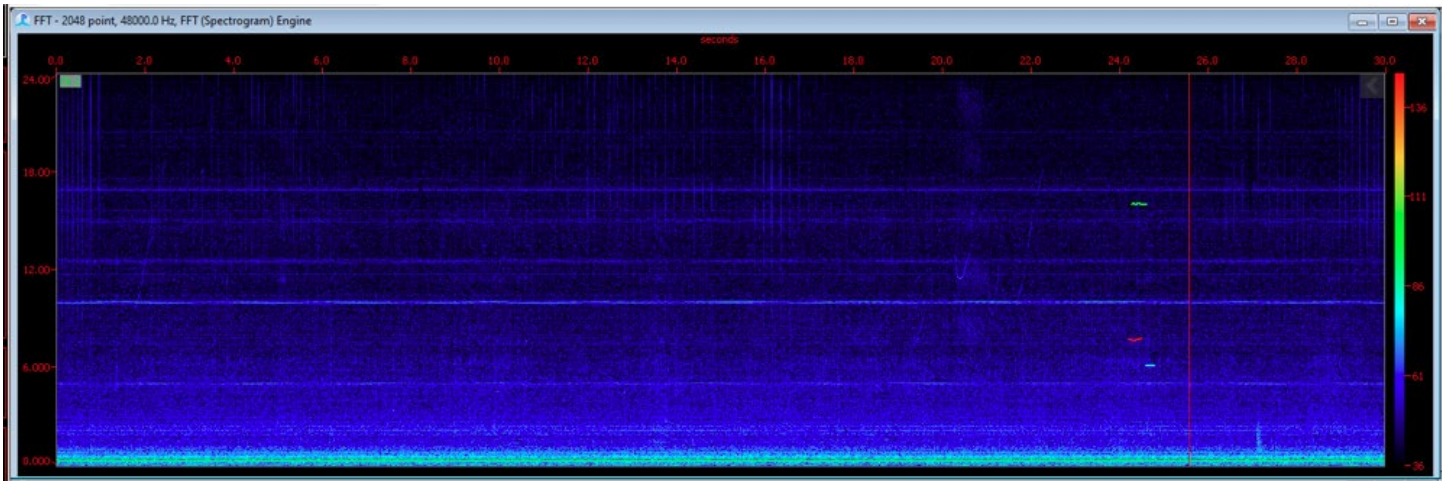

Figure 3. Acoustic detection #03 – Pantropical spotted dolphins, 28 September 2023

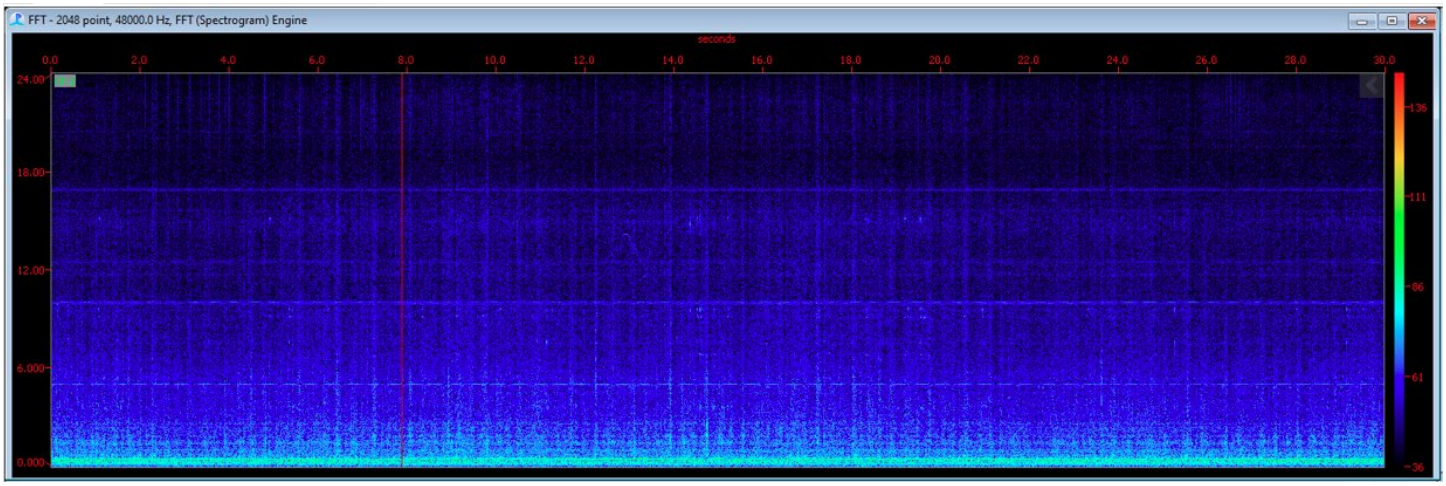

Figure 4. Acoustic detection #04 – Unidentified dolphins, 28 September 2023

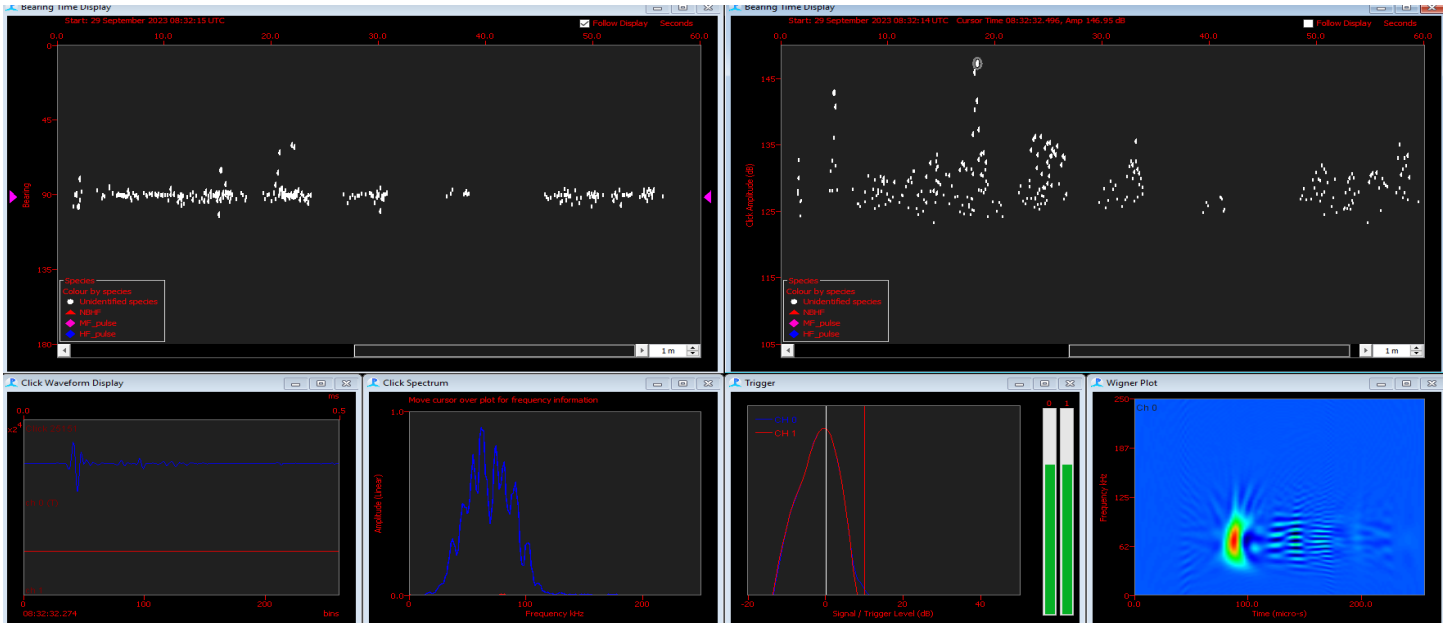

Figure 5. Acoustic detection #05 – Unidentified dolphins, 29 September 2023

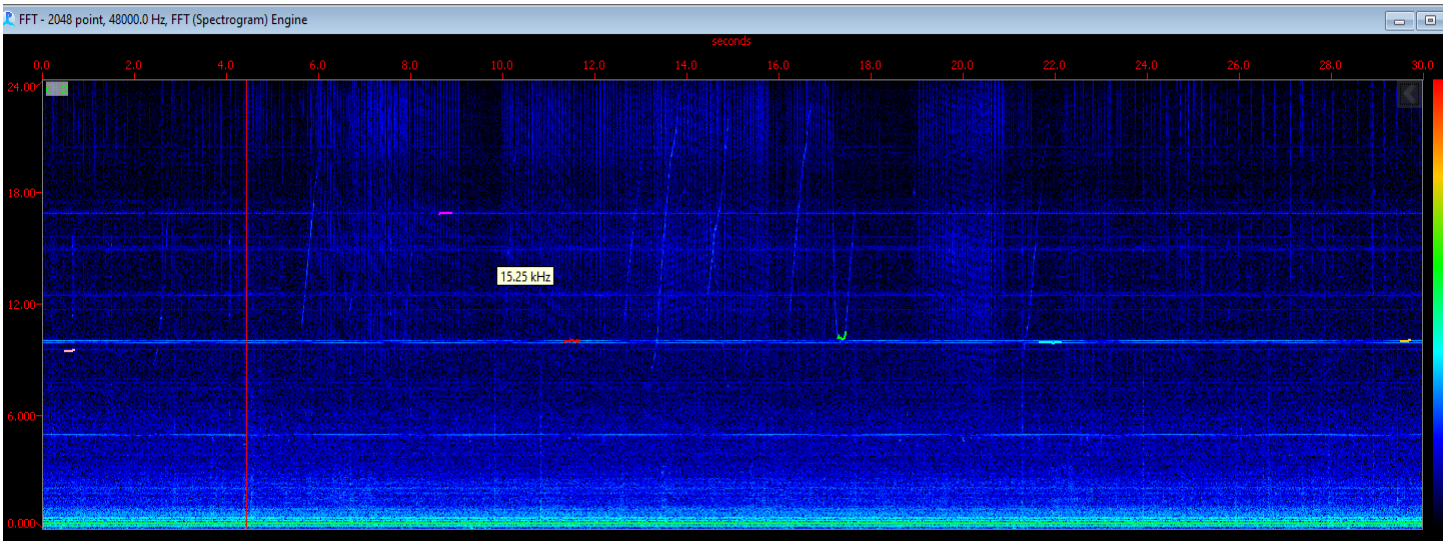

Figure 6. Acoustic detection #05 – Unidentified dolphins, 29 September 2023

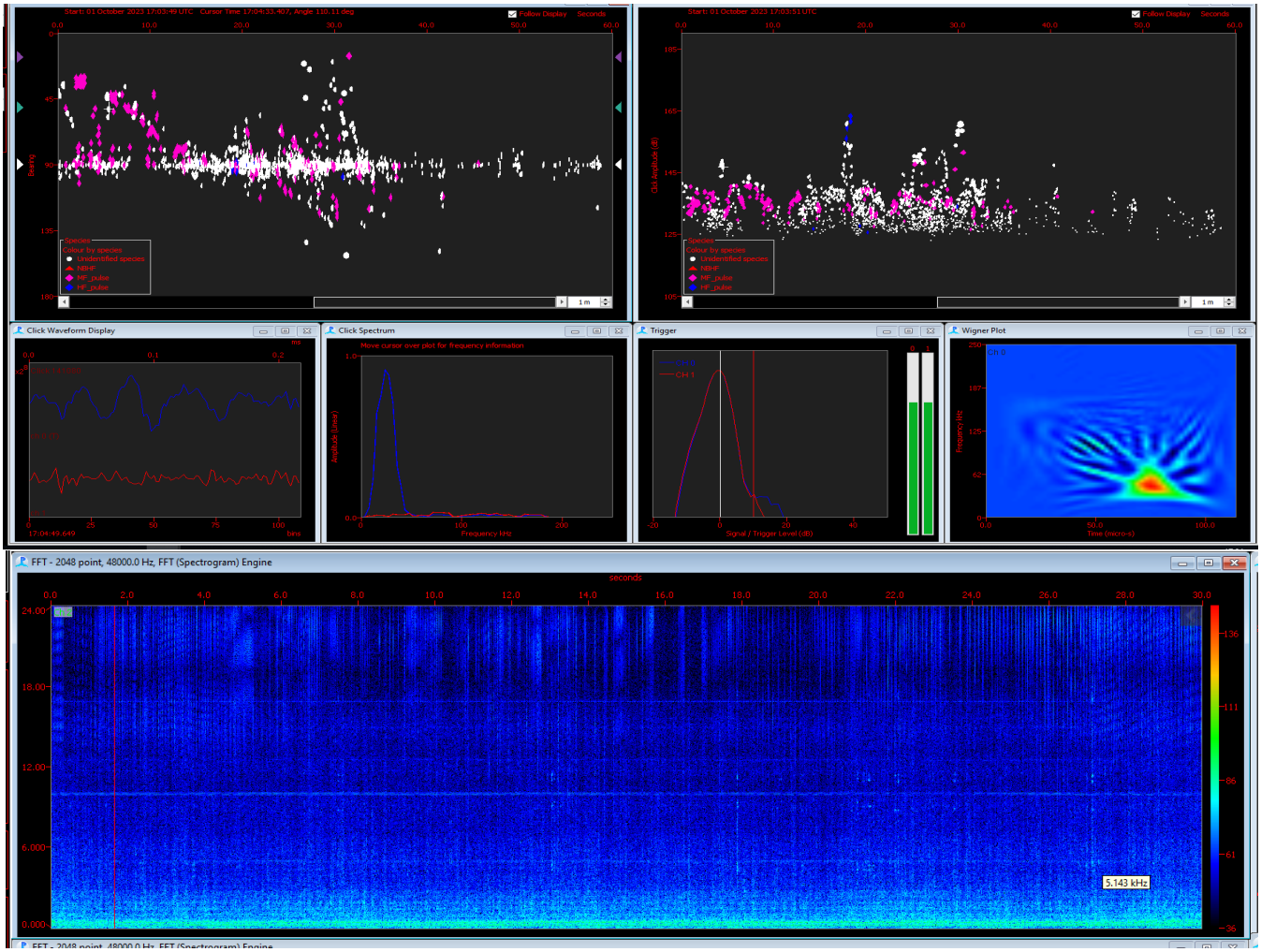

Figure 7. Acoustic detection #06 – Rough-toothed dolphins, 01 October 2023

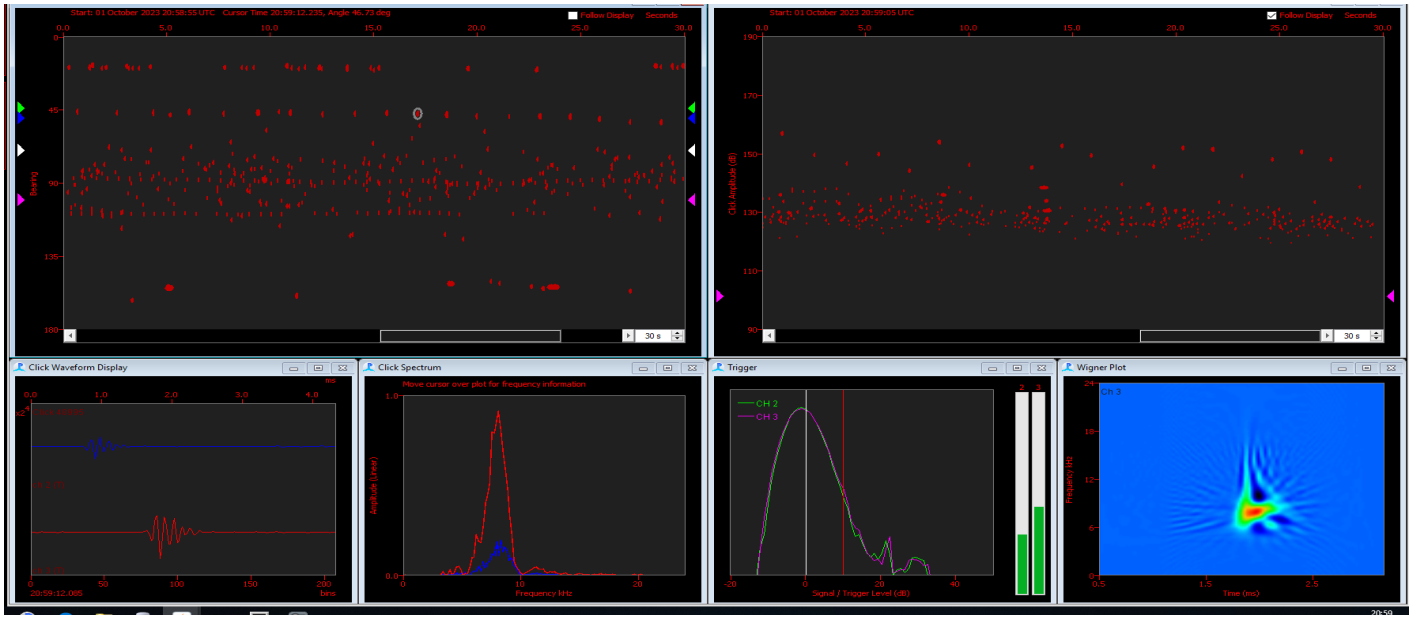

Figure 8. Acoustic detection #07 – Sperm whale, 01 October 2023

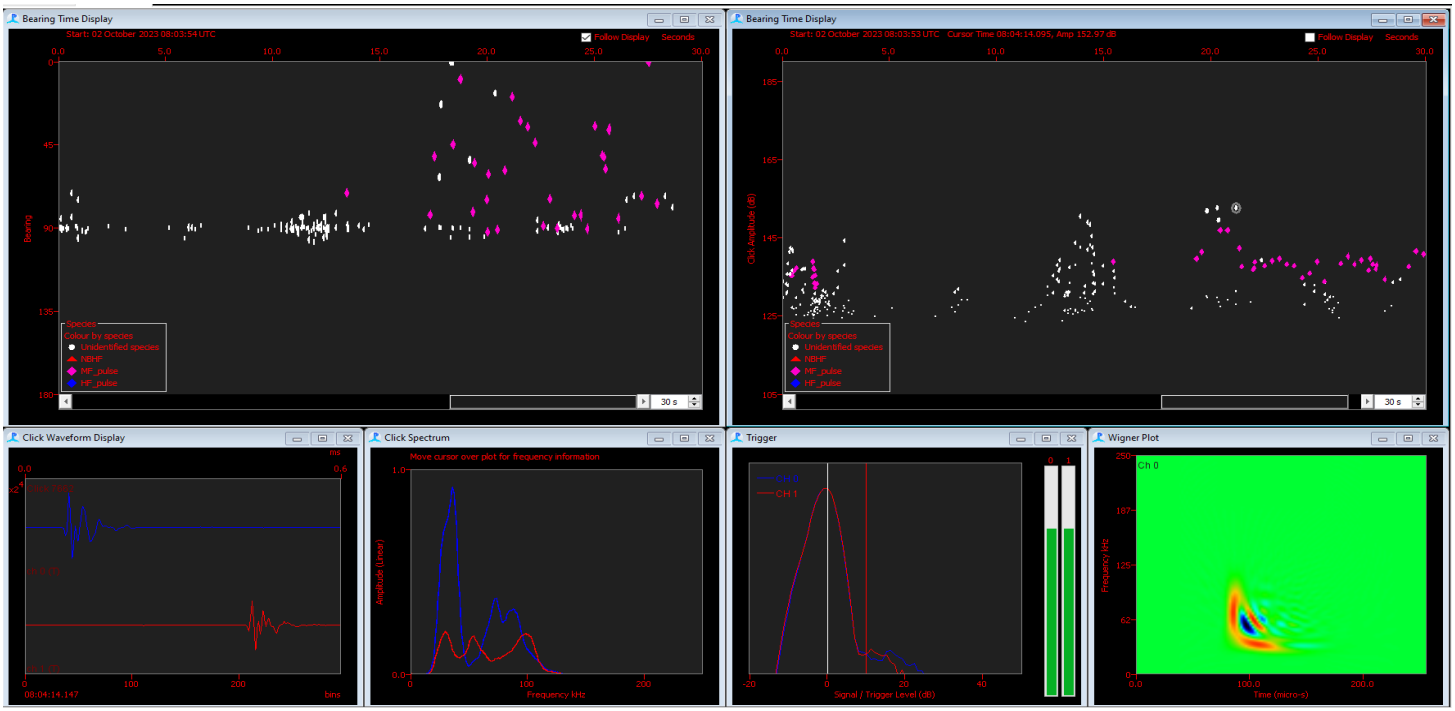

Figure 9. Acoustic detection #08 – Unidentified dolphins, 02 October 2023

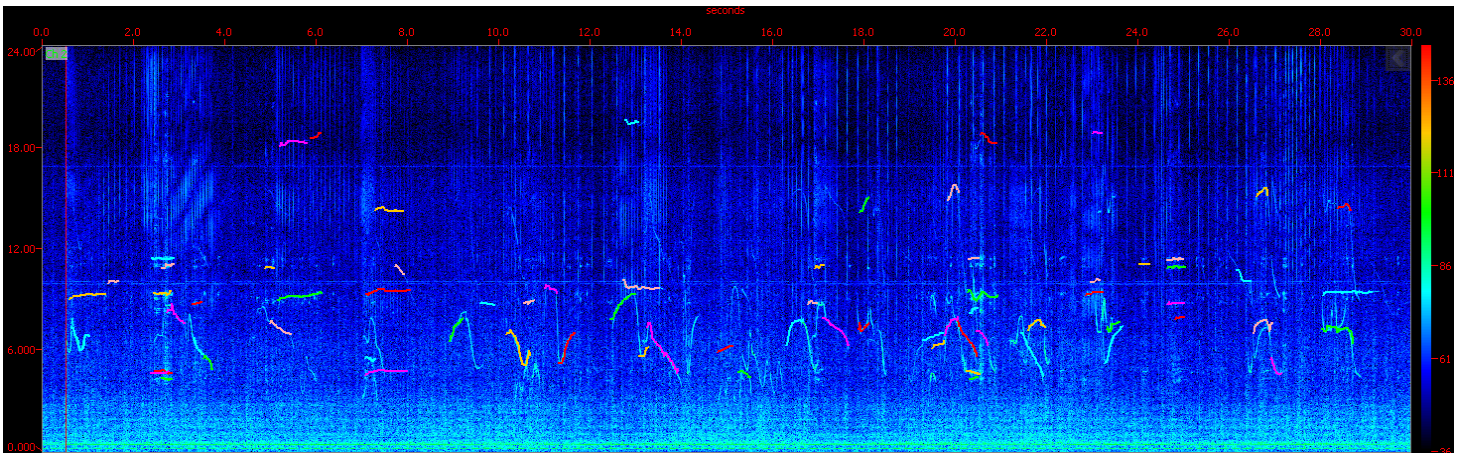

Figure 10. Acoustic detection #09 – Unidentified dolphins, 02 October 2023

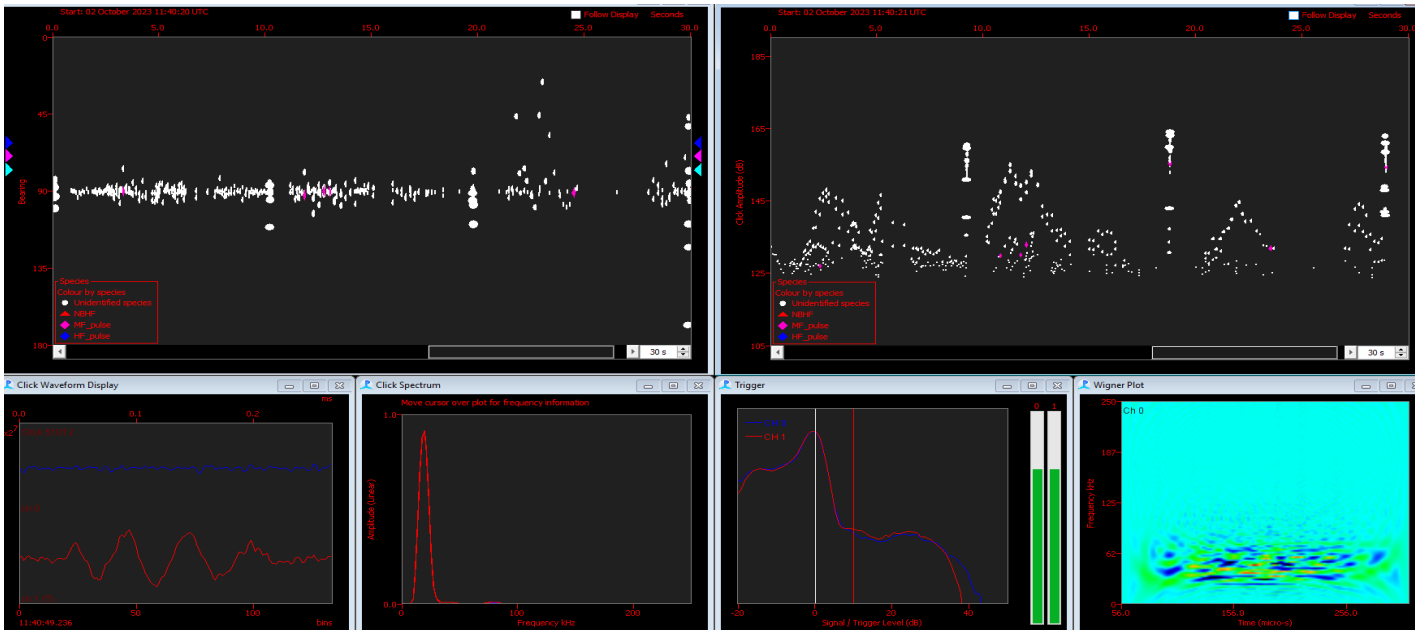

Figure 11. Acoustic detection #10 – Unidentified dolphins, 02 October 2023

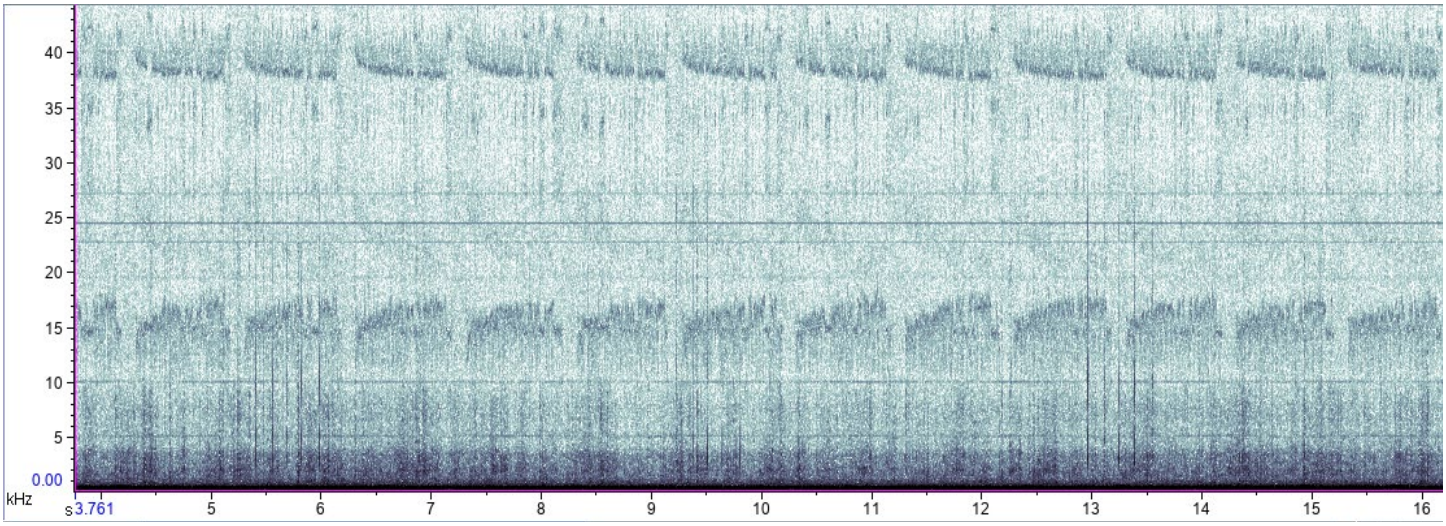

Figure 12. Acoustic detection #16 – Sperm whale, 22 October 2023

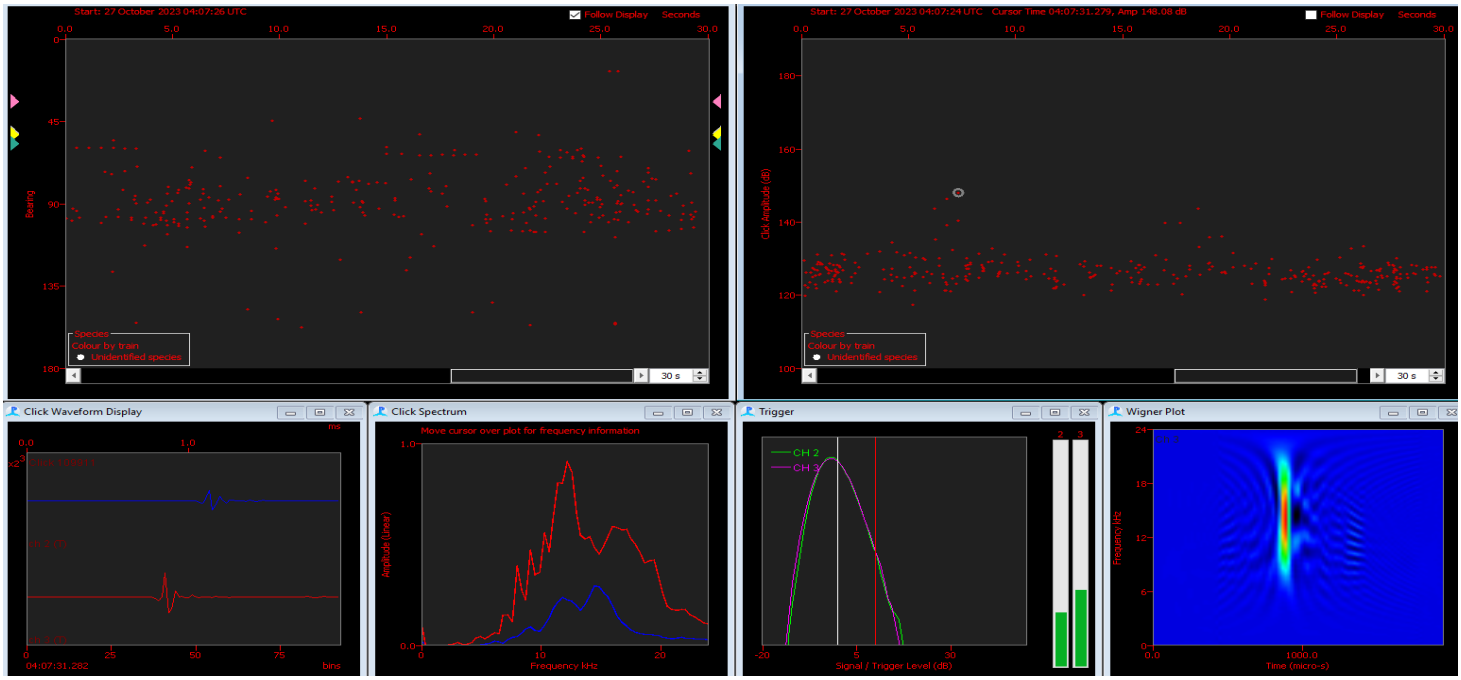

Figure 13. Acoustic detection #17 – Sperm whale, 27 October 2023

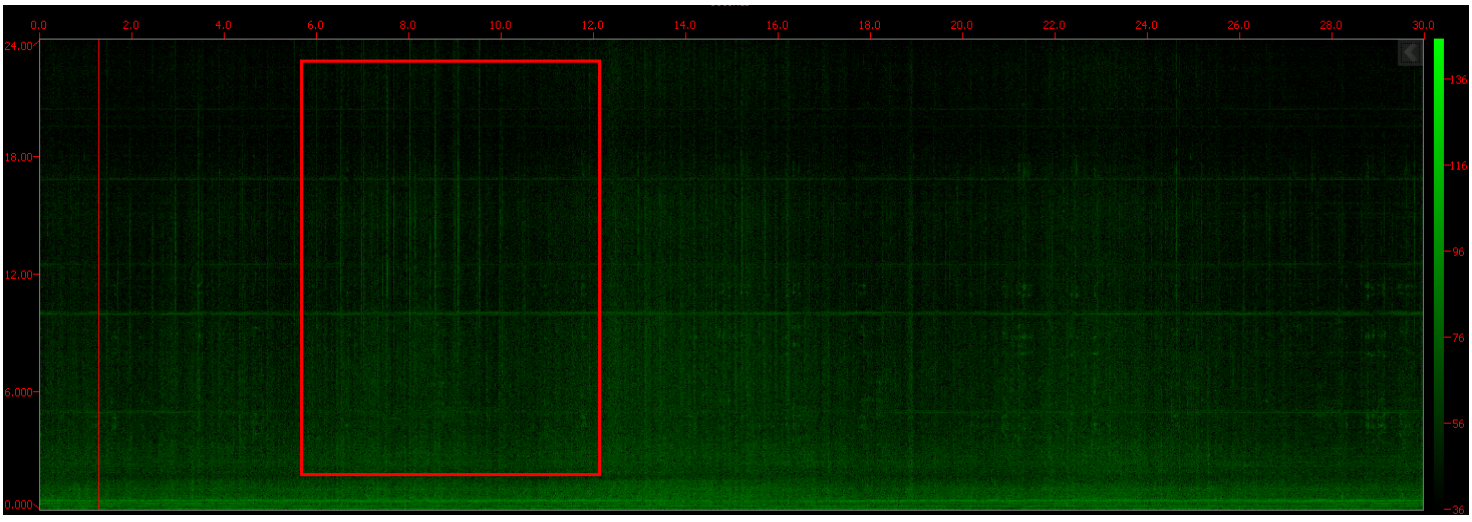

Figure 14. Acoustic detection #18 – Sperm whale, 27 October 2023

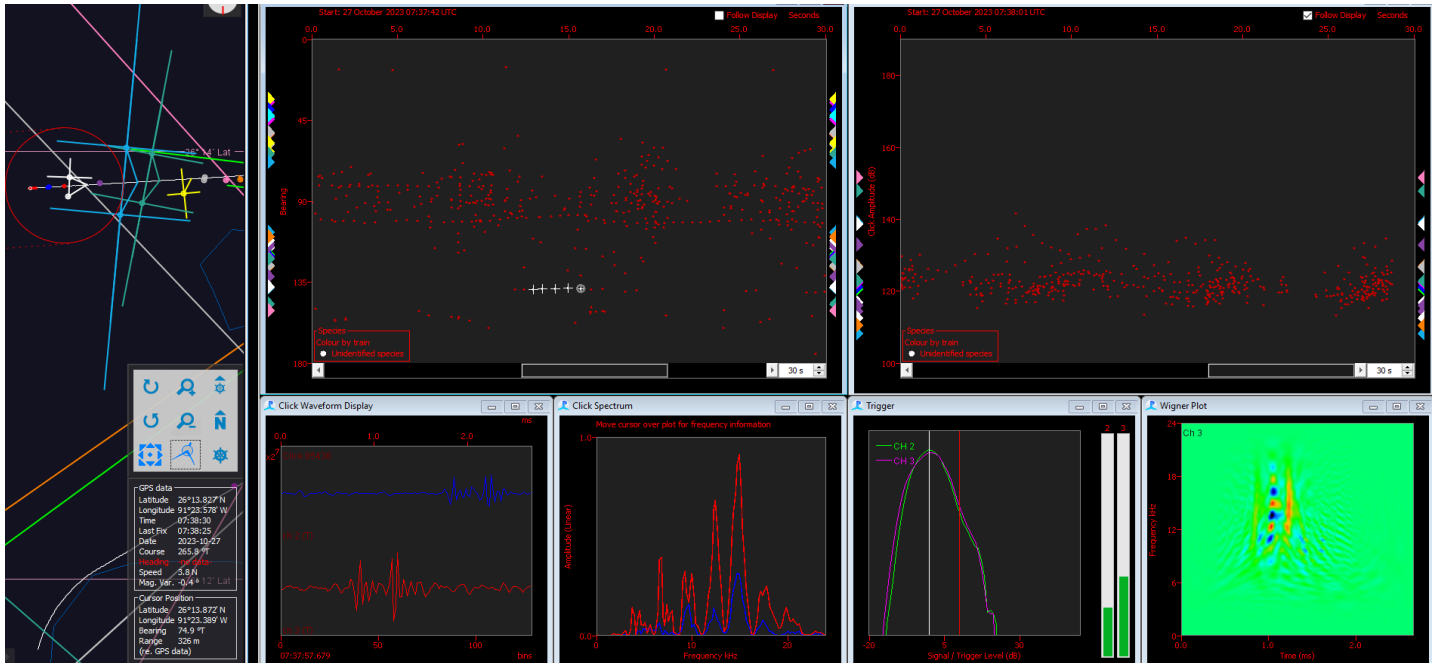

Figure 15. Acoustic detection #19 – Sperm whale, 27 October 2023

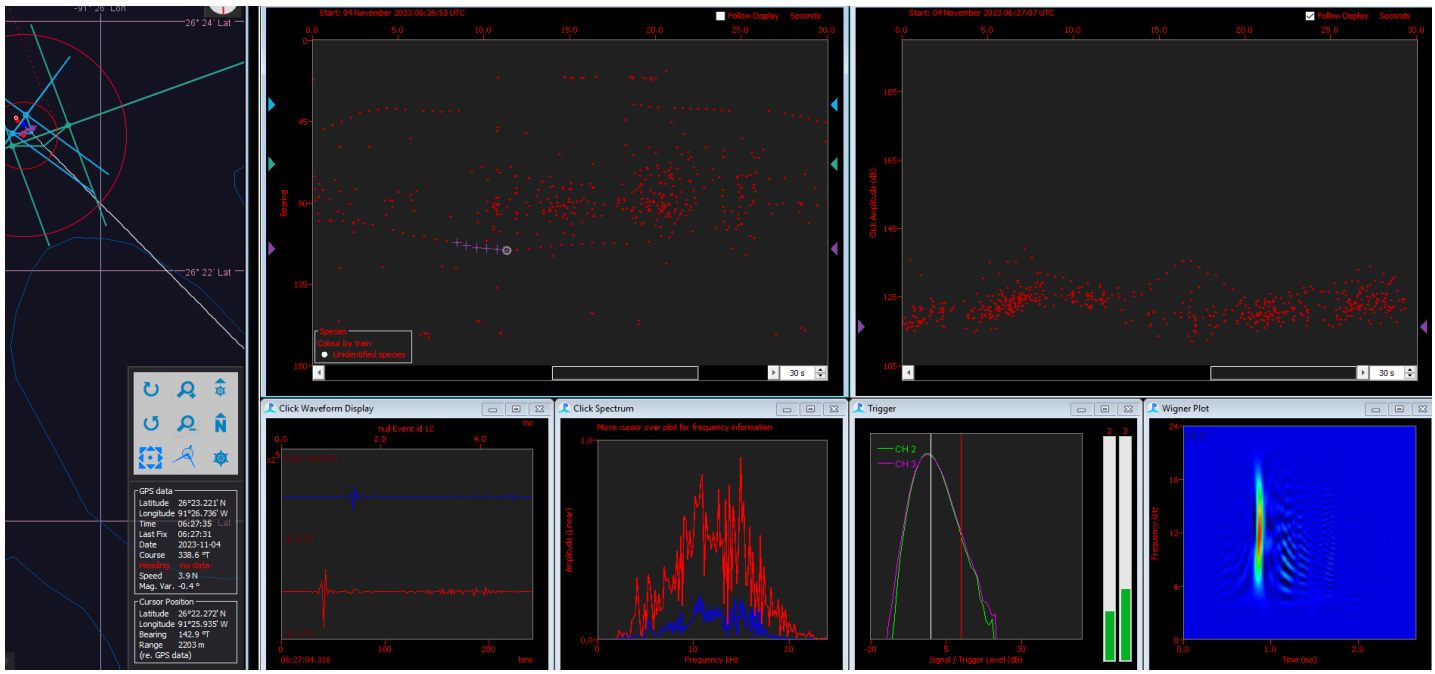

Figure 16. Acoustic detection #20 – Sperm whale, 04 November 2023

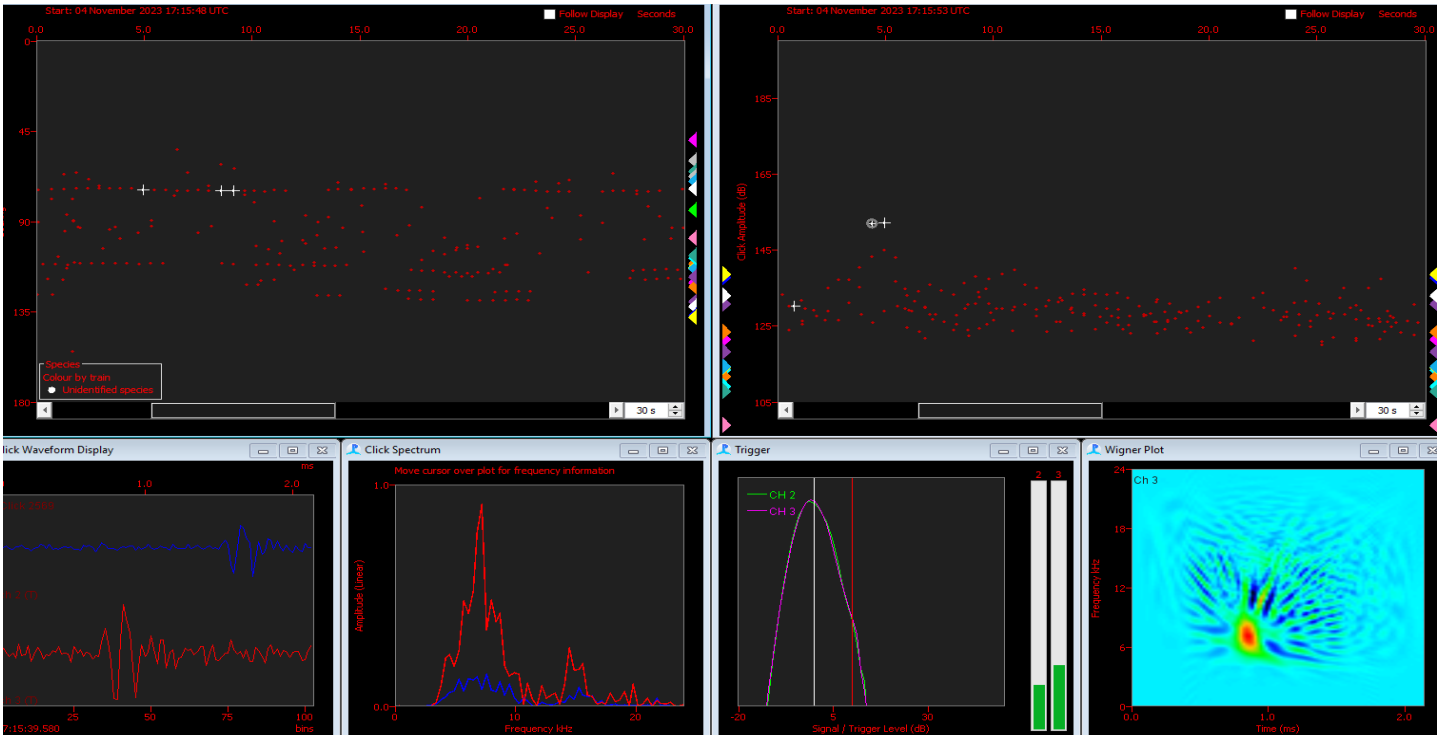

Figure 17. Acoustic detection #21 – Sperm whale, 04 November 2023

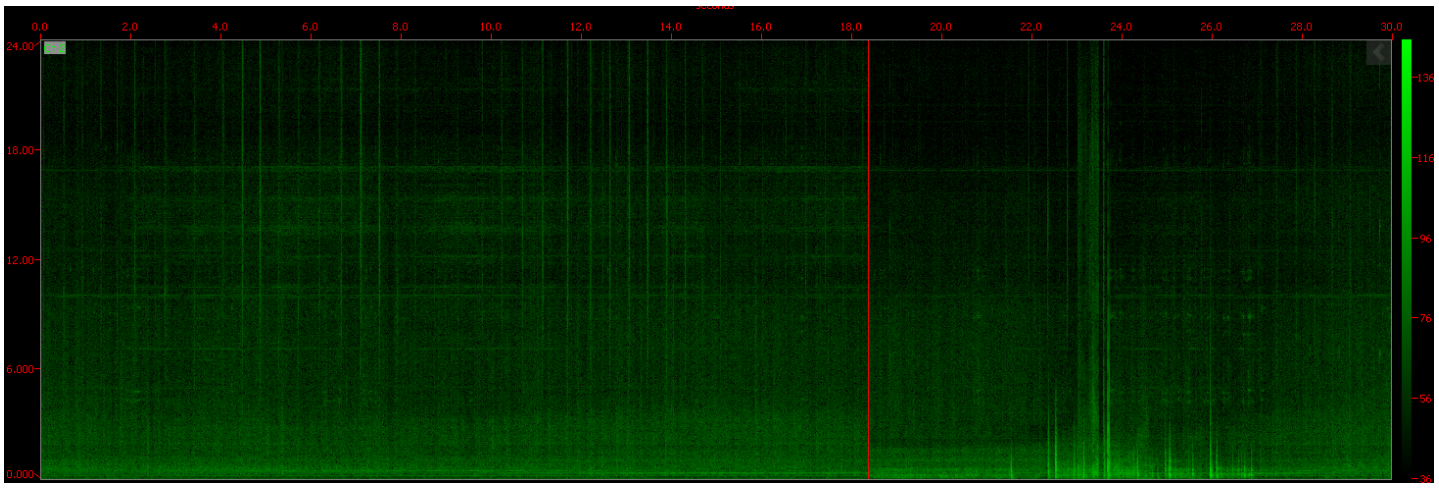

Figure 18. Acoustic detection #22 – Sperm whale, 04 November 2023

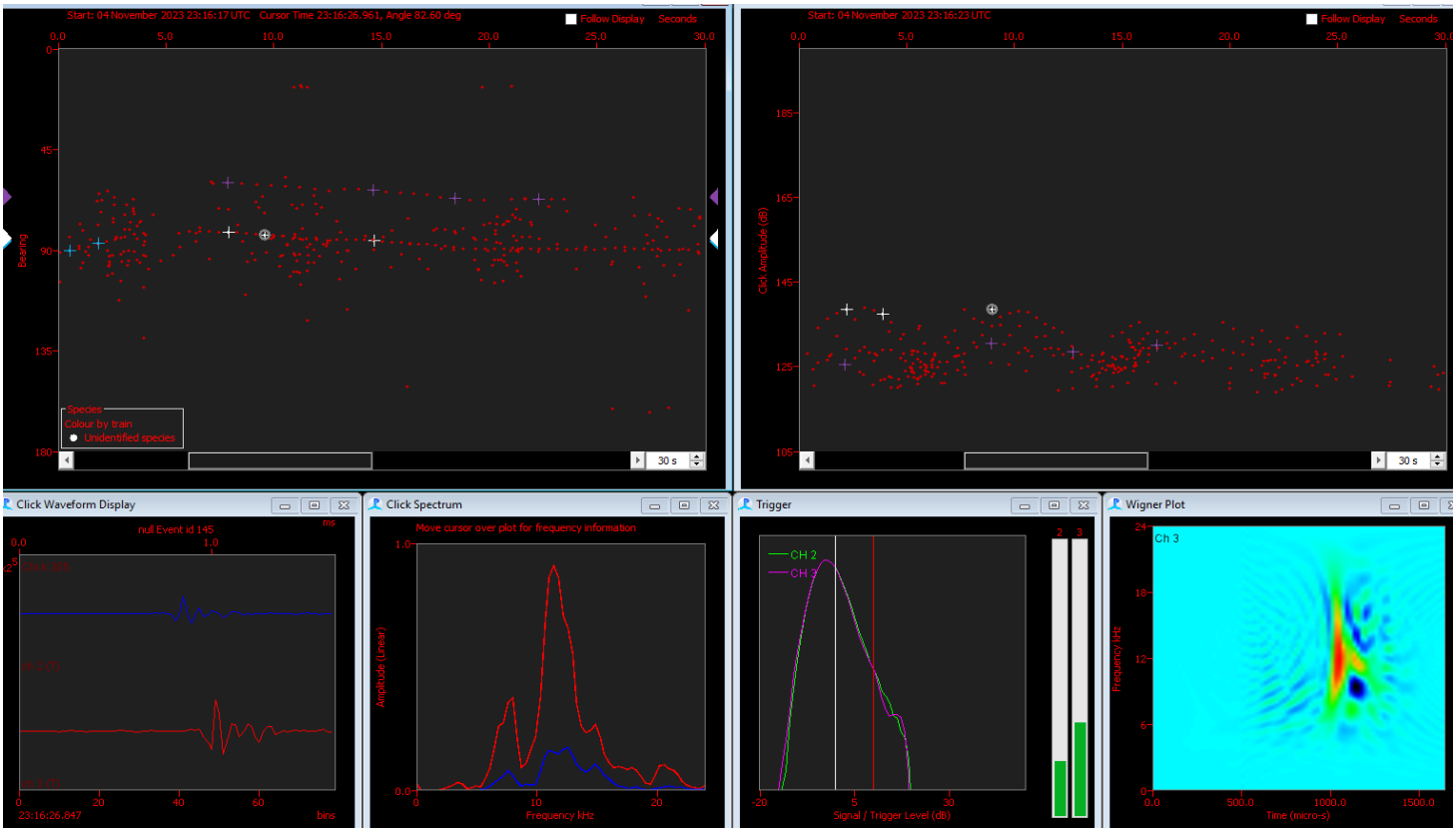

Figure 19. Acoustic detection #22 – Sperm whale, 04 November 2023

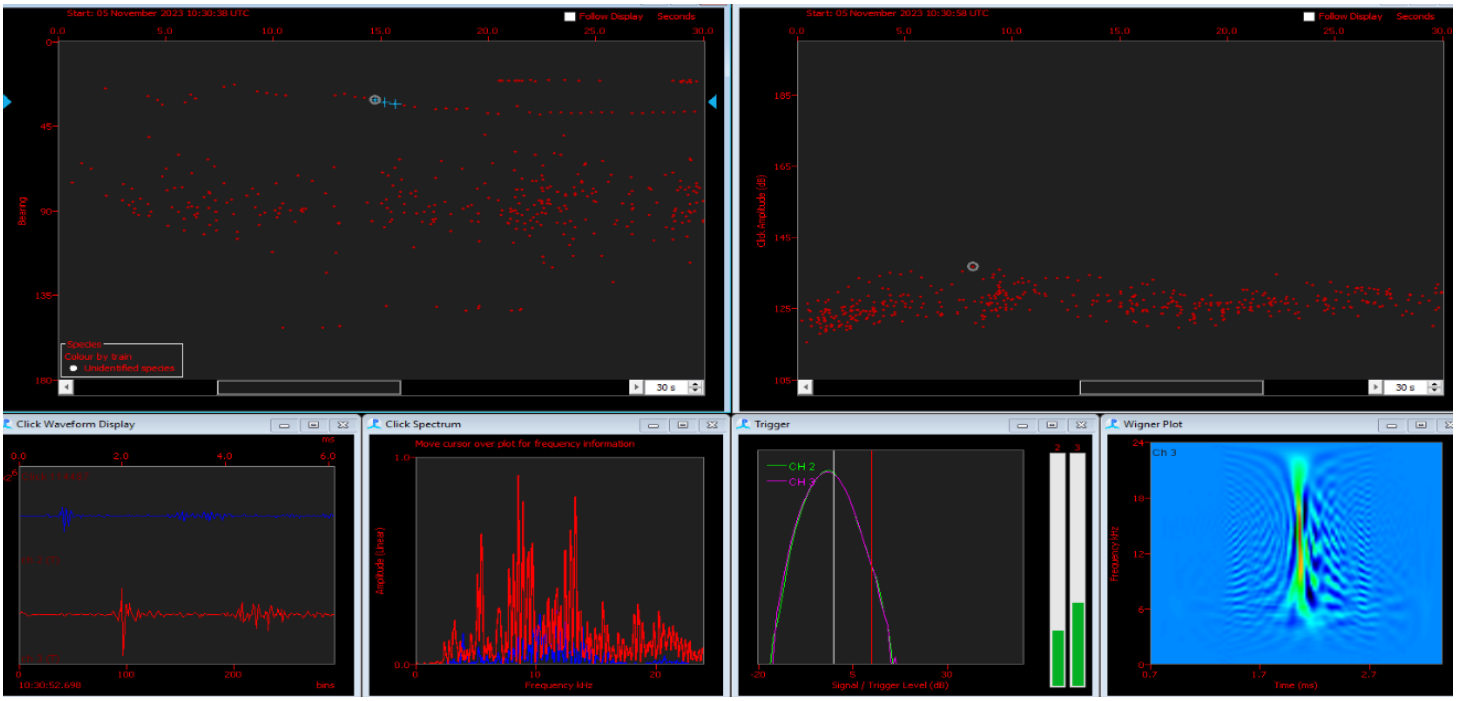

Figure 20. Acoustic detection #23 – Sperm whale, 05 November 2023

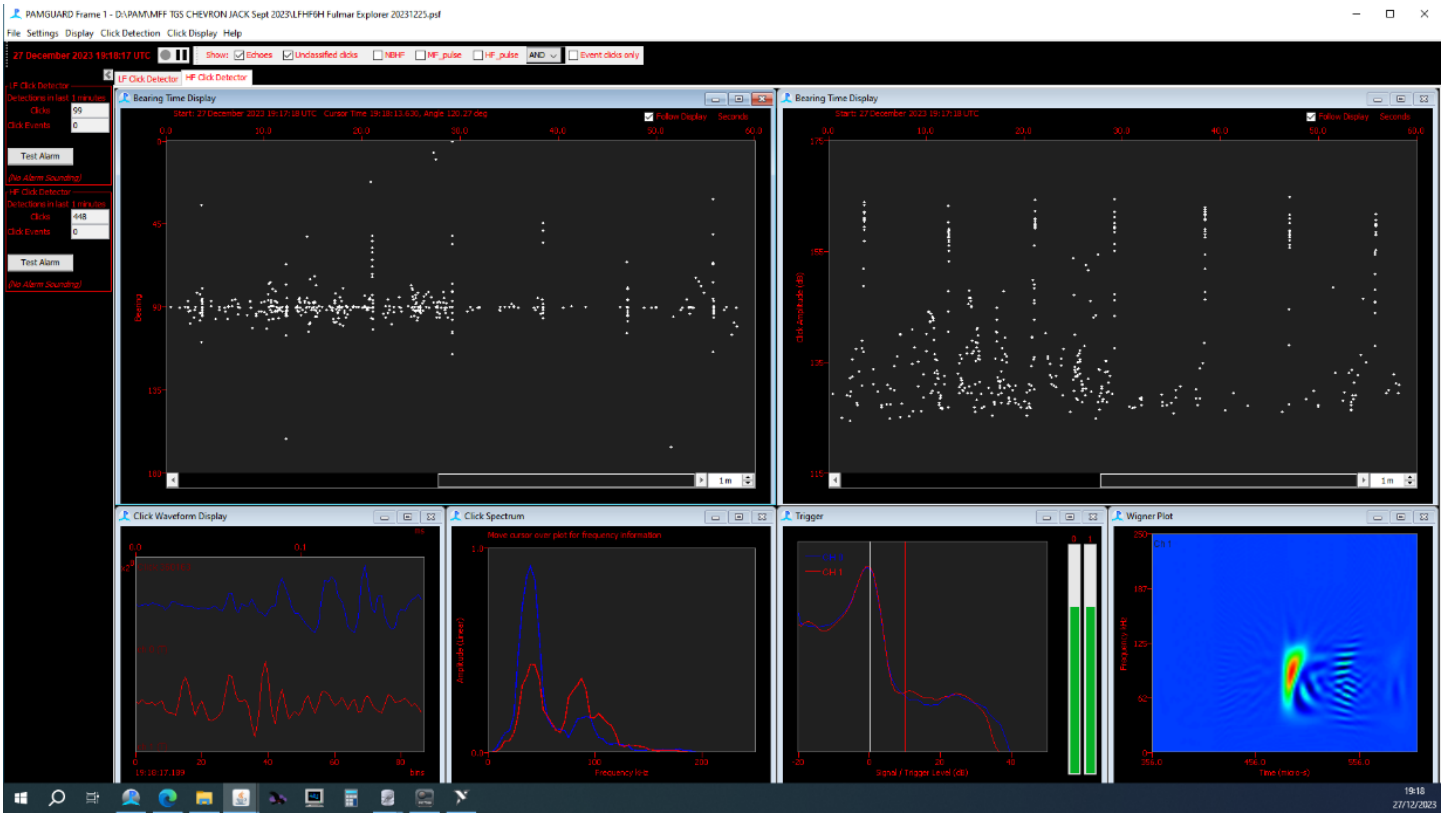

Figure 21. Acoustic detection #24 – Pantropical spotted dolphin, 27 December 2024

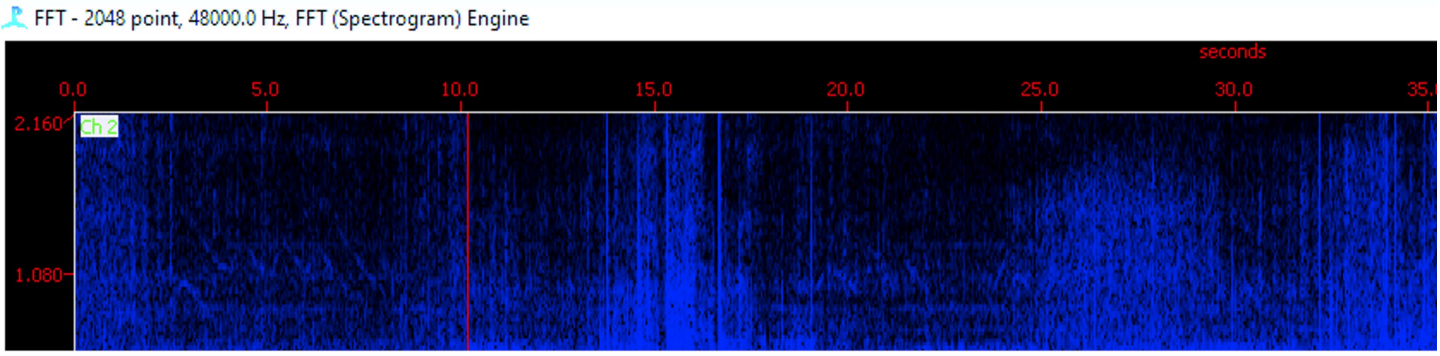

Figure 22. Acoustic detection #27 – Rough-toothed dolphin, 29 January 2024