

## **Letter of Authorization Application**

**BOEM Control Number:** # L22-022

**Requested Period of Effectiveness:**

**Start Date:** April 20, 2023

**End Date:** Nov 30, 2023

**A. Type of Survey:**

Please indicate which type of survey will be used in the proposed activity

**X Deep Penetration Seismic (greater than 1,500 in<sup>3</sup> total airgun array volume)**

- 2D Seismic-towed Streamer
- 2D Seismic-Sea-floor Cable or Nodes
- 3D Seismic-towed Streamer
- 3D Seismic-Sea-floor Cable or Nodes
- NAZ
- WAZ
- 4D (Time Lapse)
- Vertical Cable
- Borehole Seismic (VSP)
- 3D Borehole Seismic (VSP)

**Shallow Penetration Seismic (less than 1,500 in<sup>3</sup> total airgun array volume)**

- Surface Vessel
- Surface Vessel and AUV/ROV
- Borehole Seismic (VSP)

**HRG Surveys (no airguns used)**

- Surface vessel
- AUV/ROV
- Both

**Other**

Describe (if Other):

**B. Survey Area and Operational Plan:**

<b>Question:</b>	<b>Response</b>
<b>Location:</b> (Lease Block(s), Facility or Prospect Name, Lat/Lon, etc.)	Centered around Lease Block G16942 (Big Foot)
<b>Overall Duration of the Activity (days):</b>	~4 weeks between April 20, 2023-November 30, 2023
<b>Areal extent of the survey area:</b> (in OCS lease blocks or km <sup>2</sup> ) (Attach GIS file(s) of survey lines and/or survey area perimeter)	Source activation Area: ~442 km <sup>2</sup> Portions of ~30 OCS lease blocks
<b>G&amp;G ITR/PEIS Modeling Zone(s) in which the activity will occur (1-7):</b>	Zones 5 and 7
<b>Number of days during the overall activity period on which the sound source(s) listed in Section C will operate:</b> (If the activity will occur in more than one Modeling Zone, provide the number of operating days within each modeling zone.)	~23 days  Zone 5: 11 days  Zone 7: 12 days

### C. Sound Sources:

- List all survey-related instruments that emit acoustic energy into the water column, including but not limited to airgun or airgun arrays, sub-bottom profilers, bubble pulsers, sparkers, side scan sonars, multi-beam sonars, single-beam echosounders, ultra-short baseline (USBL) position systems, pressure inverted echosounder (PIES), etc.

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, milliseconds)	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)
Airgun array	Sercel	G-Source II	5040 cu in 32 elements	233	264	5-200 Hz	0.1 sec.	Every 50 m or ~24 sec. at 4 knots	12 m	N/A	100%

**Source Description:**

The seismic source for the proposed geophysical survey will be comprised of 32 active airguns with a total operating volume of 5040 in<sup>3</sup> (82.6 litres). The 32 airguns will be distributed in sub-arrays with individual airgun sizes range from 90 in<sup>3</sup> to 250 in<sup>3</sup>. Airguns will be operated at 2000 psi. The sub-arrays will be at a water depth of ~ 12 m. The source vessel will tow two identical arrays and discharge them in an alternating “flip-flop” pattern. An airgun array will be discharged approximately 32 times per mile (50 m shot interval).

## D. Take Estimate:

Since Level B takes are based on the number of individuals exposed above  $SPL_{rms}$  thresholds (see Wood et al. 2012; NMFS 2018) over a 24-hour period, regardless of the duration of an exposure, the area covered (in square kilometers) by a source vessel (or source vessels) within 24-hrs is directly related to the number of Level B takes that may occur. Thus, comparing the area covered over a 24-hour period by the source vessel(s) in the different Survey Types simulated in the exposure modelling (Zeddies et al. 2015) to the area expected to be covered during a planned survey provides a means to select the Survey Type most appropriate for the planned survey.

In the exposure modelling conducted by Zeddies et al. (2015; pg. D-157), the Coil survey type assumed four source vessels sailing at 4.9 knots (2.5 m/s) along a series of overlapping circles 12.5 km in diameter. This circular pattern concentrated survey activities in a smaller area relative to the patterns used to simulate 2D, 3D NAZ, and 3D WAZ Survey Types. The survey area in which the Coil survey pattern was simulated was 58 km x 58 km, or 3,364 km<sup>2</sup>. Over the course of the 7-day simulation, 30% of the area was covered (1,009 km<sup>2</sup>) or 144 km<sup>2</sup> per day.

The other Survey Types were simulated in a different sized survey area (145 km x 48 km) using 2 to 4 survey vessels sailing at 4.5 or 4.9 kts along various patterns resulting in the following estimated areas covered:

- 2D – 5,568 km<sup>2</sup> in 7 days or 795 km<sup>2</sup> per day;
- 3D NAZ – 1,392 km<sup>2</sup> in 7 days or 199 km<sup>2</sup> per day;
- 3D WAZ – 5,916 km<sup>2</sup> in 7 days or 845 km<sup>2</sup> per day.

The planned 3D DAS-VSP survey will involve one source vessel sailing along closely spaced survey lines that are approximately 100 m apart and approximately ~23 km in length. The source vessel will optimize line turns using a “racetrack” or “teardrop” pattern to sail on adjacent or nearby lines 100–1,000 m apart. With this relatively tight line spacing and at a survey speed of 4.0–4.5 knots (7.3–8.3 km/hr), the area covered by this single source vessel will be about 134.4 km<sup>2</sup> per week, or 19.2 km<sup>2</sup> per day. Therefore, the “Coil” Survey Type was selected in the take calculator because the area covered during that simulated survey most closely matches that of the area to be covered by the single source vessel operating during the planned survey.

**Take Estimate Summary for Zones 5 and 7 Combined** (not including scalar reduction for survey duration over 20 days):

Hearing Group / Species	Summer		
	Zone 5	Zone 7	Total
Low-Frequency Hearing Group			
Bryde's whale	5	< 0.01	5
Mid-Frequency Functional Hearing Group			
Beaked whales (Cuvier/Blainville/Gervais)	1240	521	1761
Bottlenose dolphin	978	2	980
Short-finned pilot whale	116	12	128
Sperm whale*	289	57	347
Atlantic spotted dolphin	403	< 0.01	403
Clymene dolphin	587	230	817
False killer whale	147	84	231
Fraser's dolphin	68	39	108
Killer whale	4	8	12
Melon-headed whale	400	155	555
Pantropical spotted dolphin	2662	2,285	4948
Pygmy killer whale	93	74	167
Risso's dolphin	172	38	210
Rough-toothed dolphin	213	89	302
Spinner dolphin	713	54	767
Striped dolphin	229	120	349
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	104	31	136

**Zone 5 Estimated Take Calculations** (not including scalar reduction for survey duration over 20 days):

Parameters	
Survey Type	COIL
Zone Number	5

Schedule	
Season	# days
Summer	11
Winter	0

Exposures by Metric			
	Summer	Winter	Total
<b>Level A</b>			
<b>Low-Frequency Hearing Group</b>			
Bryde's whale	0.10	< 0.01	0.10
<b>High-Frequency Hearing Group</b>			
Kogia (dwarf, pygmy sperm whale)	5.79	< 0.01	5.79
<b>Level B</b>			
<b>Low-Frequency Hearing Group</b>			
Bryde's whale	4.74	< 0.01	4.74
<b>Mid-Frequency Functional Hearing Group</b>			
Beaked whales (Cuvier/Blainville/Gervais)	1,240.27	< 0.01	1,240.27
Bottlenose dolphin	978.00	< 0.01	978.00
Short-finned pilot whale	115.73	< 0.01	115.73
Sperm whale	289.33	< 0.01	289.33
Atlantic spotted dolphin	402.61	< 0.01	402.61
Clymene dolphin	586.67	< 0.01	586.67
False killer whale	147.43	< 0.01	147.43
Fraser's dolphin	68.39	< 0.01	68.39
Killer whale	3.93	< 0.01	3.93
Melon-headed whale	400.11	< 0.01	400.11
Pantropical spotted dolphin	2,662.24	< 0.01	2,662.24
Pygmy killer whale	92.67	< 0.01	92.67
Risso's dolphin	172.12	< 0.01	172.12
Rough-toothed dolphin	212.99	< 0.01	212.99
Spinner dolphin	713.36	< 0.01	713.36
Striped dolphin	229.14	< 0.01	229.14
<b>High-Frequency Hearing Group</b>			
Kogia (dwarf, pygmy sperm whale)	98.61	< 0.01	98.61

Level A Color Legend:	
	Level A SEL
	Level A Peak

\*If no color highlight, both level A peak and SEL are <0.01

Total take, including Level B Scaling (where appropriate)		
Summer	Winter	Total
4.83449	< 0.01	4.83
1240.27	< 0.01	1240.27
978.00	< 0.01	978.00
115.73	< 0.01	115.73
289.33	< 0.01	289.33
402.61	< 0.01	402.61
586.67	< 0.01	586.67
147.43	< 0.01	147.43
68.39	< 0.01	68.39
3.93	< 0.01	3.93
400.11	< 0.01	400.11
2662.24	< 0.01	2662.24
92.67	< 0.01	92.67
172.12	< 0.01	172.12
212.99	< 0.01	212.99
713.36	< 0.01	713.36
229.14	< 0.01	229.14
104.40	< 0.01	104.40

**Zone 7 Estimated Take Calculations** (not including scalar reduction for survey duration over 20 days):

Parameters	
Survey Type	COIL
Zone Number	7

Schedule	
Season	# days
Summer	12
Winter	0

Exposures by Metric			
	Summer	Winter	Total
<b>Level A</b>			
<b>Low-Frequency Hearing Group</b>			
Bryde's whale	< 0.01	< 0.01	< 0.01
<b>High-Frequency Hearing Group</b>			
Kogia (dwarf, pygmy sperm whale)	2.99	< 0.01	2.99
<b>Level B</b>			
<b>Low-Frequency Hearing Group</b>			
Bryde's whale	< 0.01	< 0.01	< 0.01
<b>Mid-Frequency Functional Hearing Group</b>			
Beaked whales (Cuvier/Blainville/Gervais)	520.64	< 0.01	520.64
Bottlenose dolphin	2.36	< 0.01	2.36
Short-finned pilot whale	12.27	< 0.01	12.27
Sperm whale	57.22	< 0.01	57.22
Atlantic spotted dolphin	< 0.01	< 0.01	< 0.01
Clymene dolphin	230.19	< 0.01	230.19
False killer whale	83.76	< 0.01	83.76
Fraser's dolphin	39.24	< 0.01	39.24
Killer whale	8.42	< 0.01	8.42
Melon-headed whale	154.77	< 0.01	154.77
Pantropical spotted dolphin	2,285.30	< 0.01	2,285.30
Pygmy killer whale	74.02	< 0.01	74.02
Risso's dolphin	38.23	< 0.01	38.23
Rough-toothed dolphin	89.44	< 0.01	89.44
Spinner dolphin	53.62	< 0.01	53.62
Striped dolphin	119.58	< 0.01	119.58
<b>High-Frequency Hearing Group</b>			
Kogia (dwarf, pygmy sperm whale)	28.47	< 0.01	28.47

Level A Color Legend:	
	Level A SEL
	Level A Peak
*If no color highlight, both level A peak and SEL are <0.01	

Total take, including Level B Scaling (where appropriate)		
Summer	Winter	Total
< 0.01	< 0.01	< 0.01
520.64	< 0.01	520.64
2.36	< 0.01	2.36
12.27	< 0.01	12.27
57.22	< 0.01	57.22
< 0.01	< 0.01	< 0.01
230.19	< 0.01	230.19
83.76	< 0.01	83.76
39.24	< 0.01	39.24
8.42	< 0.01	8.42
154.77	< 0.01	154.77
2285.30	< 0.01	2285.30
74.02	< 0.01	74.02
38.23	< 0.01	38.23
89.44	< 0.01	89.44
53.62	< 0.01	53.62
119.58	< 0.01	119.58
31.46	< 0.01	31.46



## E. Mitigation and Monitoring Efforts:

Question:	Response:
Please indicate which set of monitoring and mitigation measures from the ITR's apply to the planned activity:	All monitoring and mitigation measures in the ITRs applicable to Deep Penetration Airgun Surveys with a total volume >1,500 in <sup>3</sup> will be followed.
Confirm that you will apply this set of monitoring and mitigation measures during the activity:	Yes, we will apply these measures during the 3D VSP Borehole Seismic survey.

## F. Map of Survey Area and Transit Route

