

LETTER OF AUTHORIZATION APPLICATION

BOEM CONTROL NUMBER: L22-018

REQUESTED PERIOD OF EFFECTIVENESS:

START DATE: April 19, 2023

END DATE: December 31, 2023

A. TYPE OF SURVEY:

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

Deep Penetration Seismic (greater than 1,500 in³ total airgun array volume)

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

Shallow Penetration Seismic (less than 1,500 in³ 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:

Question:	Response
Location: (Lease Block(s), Facility or Prospect Name, Lat/Lon, etc.)	Mississippi Canyon 657 and surrounding 44 blocks
Overall Duration of the Activity (days):	~80 days
Areal extent of the survey area: (in OCS lease blocks or km ²) (Attach GIS file(s) of survey lines and/or survey area perimeter)	~890 km ²
Water Depth Range:	1,600 – 3,000 m
G&G ITR/PEIS Modeling Zone(s) in which the activity will occur (1-7):	Modeling Zone 7
Number of days during the overall activity period on which the sound source(s) listed in Section C will operate: (If the activity will occur in more than one Modeling Zone, provide the number of operating days within each modeling zone.)	60 days Seasonal and Zonal distribution of days used in Take Estimates shown in Section D (except where noted for sperm whales): Summer Zone 7 = 29 days Winter Zone 7 = 31 days

C. SOUND SOURCES:

List the same sound sources provided in response to question #3 in "Section D Proprietary Information Attachment" to the G&G Permit Application and indicate their Duration of Use.

The seismic source will be a conventional airgun array smaller than or equivalent to the 32-element 5,110 in³ array described below.

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)
Airgun Array	Teledyne	Bolt LLX	5110 in ³ 32 elements	~242 dB	~267 dB	0-200 Hz	0.1 s	31.25 meters Or ~13.5 seconds @ 4.5 knots	8-10 m	9 m	60
PIES (Pressure Inverted Echo Sounder)	Sonardyne	8302-3116	N/A	190-202 dB	80-120 dB	14-19 kHz	N/A	1 pulse every 30 seconds	Placed on seabed	Placed on seabed	80

D. TAKE ESTIMATE:

Since Level B takes are based on the number of individuals exposed above the 160 dB SPL_{rms} threshold 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 km². Over the course of the 7-day simulation, 30% of the area was covered (1,009 km²) or 144 km² 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 km² in 7 days or 795 km² per day;
- 3D NAZ – 1,392 km² in 7 days or 199 km² per day;
- 3D WAZ – 5,916 km² in 7 days or 845 km² per day.

The planned 4D towed streamer survey will involve one primary source vessel sailing along closely spaced survey lines that are 100 m apart and approximately 30 km in length. A second source vessel may be used to re-shoot certain segments of survey line, if necessary. The “racetrack” path taken by the source vessels and the large turn radius required when towing long hydrophone streamers (12 streamers, each 4.5-5 km in length) will mean that the distance between consecutive survey lines sailed may be rather large. We reviewed the survey type descriptions in Zeddies et al. (2015) and we believe the 3D NAZ survey type best represents the planned towed streamer survey so it was selected to calculate the estimated takes in the following section.

Zone 7 Estimated Take:

Parameters	
Survey Type	3D NAZ
Zone Number	7

Schedule	
Season	# days
Summer	29
Winter	31

Exposures by Metric			
	Summer	Winter	Total
Level A			
Low-Frequency Hearing Group			
Bryde's whale	< 0.01	< 0.01	< 0.01
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	5.11	5.46	10.57
Level B			
Low-Frequency Hearing Group			
Bryde's whale	< 0.01	< 0.01	< 0.01
Mid-Frequency Functional Hearing Group			
Beaked whales (Cuvier/Blainville/Gervais)	2,162.08	2,446.96	4,609.04
Bottlenose dolphin	8.69	11.02	19.70
Short-finned pilot whale	49.03	59.42	108.46
Sperm whale	212.23	249.60	461.83
Atlantic spotted dolphin	< 0.01	< 0.01	< 0.01
Clymene dolphin	834.43	1,062.23	1,896.66
False killer whale	257.10	317.97	575.07
Fraser's dolphin	156.83	190.06	346.89
Killer whale	29.04	37.58	66.62
Melon-headed whale	618.64	749.74	1,368.38
Pantropical spotted dolphin	8,284.23	10,545.79	18,830.02
Pygmy killer whale	227.19	280.98	508.17
Risso's dolphin	136.47	174.25	310.72
Rough-toothed dolphin	274.51	339.50	614.02
Spinner dolphin	194.39	247.46	441.85
Striped dolphin	433.47	551.80	985.27
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	122.22	146.46	268.68

Level A Color Legend:	
	Level A SEL
	Level A Peak

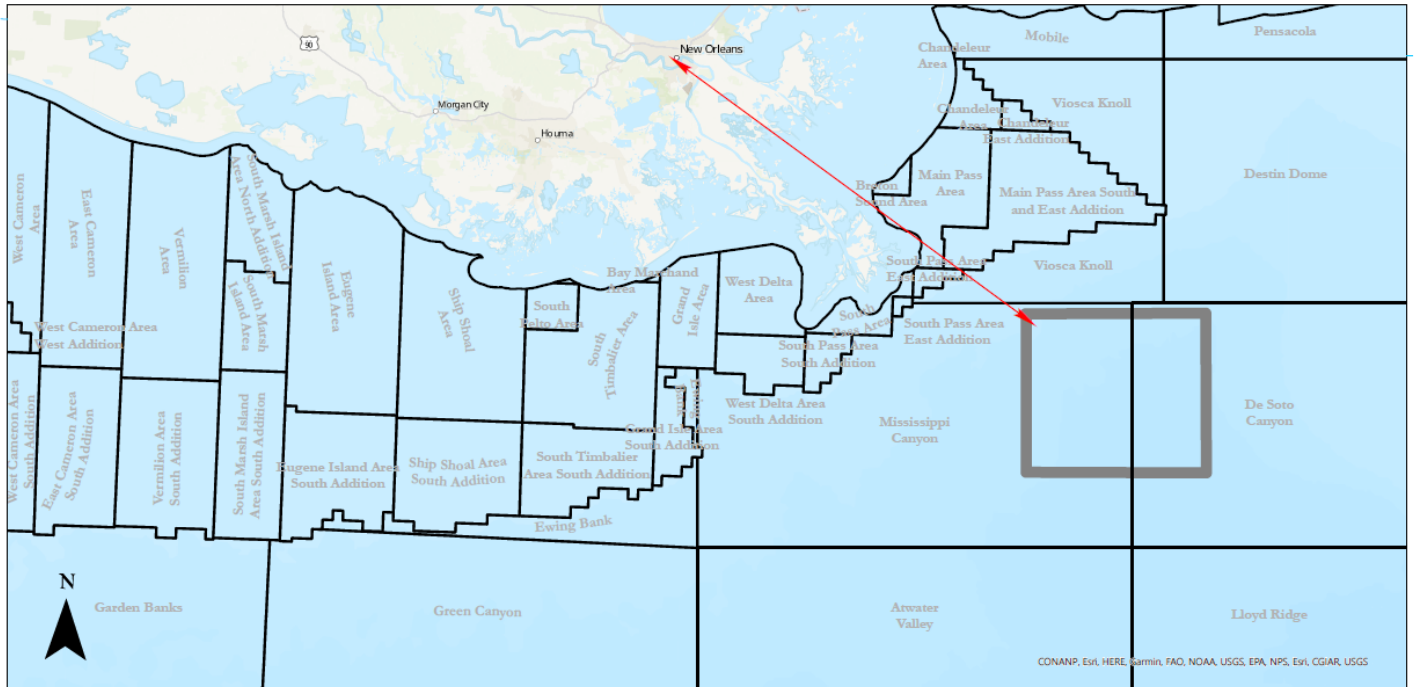
*If no color highlight, both level A peak and SEL are <0.01

Total take, including Level B Scaling (where appropriate)		
Summer	Winter	Total
< 0.01	< 0.01	< 0.01
218.37	247.14	465.51
2.49	3.16	5.65
14.46	17.53	32.00
89.77	105.58	195.35
< 0.01	< 0.01	< 0.01
239.48	304.86	544.34
75.84	93.80	169.65
45.01	54.55	99.56
8.57	11.09	19.65
182.50	221.17	403.67
2377.57	3026.64	5404.22
67.02	82.89	149.91
40.26	51.40	91.66
78.79	97.44	176.22
55.79	71.02	126.81
124.41	158.37	282.77
44.34	52.47	96.82

E. MITIGATION AND MONITORING EFFORTS:

Question:	Response:
Please indicate which set of monitoring and mitigation measures from the ITR apply to the planned activity:	All monitoring and mitigation measures in the ITRs applicable to Airgun Surveys with a total volume >1,500 in ³ (Deep Penetration) will be followed.
Confirm that you will apply this set of monitoring and mitigation measures during the activity:	Yes

F. MAP OF SURVEY AREA AND TRANSIT ROUTE:



INDEX MAP	MAP INFORMATION	COORDINATE PARAMETERS	MAP SCALE	<p>Europa Survey PUBLIC INFORMATION</p> <p>128 Miles South West of New Orleans LA</p> <p>Author: Bradley Nolan Date: 02 Oct 2021</p>
<p> <input type="checkbox"/> Protraction Areas <input checked="" type="checkbox"/> Manuever Area </p>	<p>Horizontal Coordinate Reference System CRS Name: EPSG:11407 BSV 10N RUS CRS Code: EPSG:11407 Projection: Transverse Mercator Coordinate System: North American 1927 Horizontal Units: Feet_US Vertical Coordinate Reference System Vertical Datum: Mean Sea Level Vertical Units: Feet Elevation/Depth: Elevation</p> <p>NOTES</p> <p>This map has been prepared by SHELL from a series of reports, logs, charts and other party information. SHELL, OGP and/or FPSO may not be liable for errors or omissions. Information from third party sources are not to be considered as guaranteed by SHELL. The responsibility for this document is placed on SHELL. © 2021. All rights reserved.</p>	<p>Scale: 1:1,579,245</p> <p>300 1 Feet</p> <p>Print Size: 11"x17"</p>		