LETTER OF AUTHORIZATION APPLICATION

BOEM CONTROL NUMBER: L22-001

REQUESTED PERIOD OF EFFECTIVENESS:
START DATE: June 1, 2022
END DATE: December 31, 2022

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^3 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 in^3 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.)	Lease Block WR 508; Stones development area.
Overall Duration of the Activity (days):	~70 days (Mobilization to Demobilization)
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)	WR 508 and surrounding ~110 lease blocks. Shape files attached separately.
Water Depth Range:	1825 - 3050 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.)	55 days Seasonal distribution of days used in Take Estimates shown in Section D: Winter = 31 days Summer = 24 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.

Energy Source	**Manu-facturer**	**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	~239 dB	~264 dB	0-200 Hz	0.1 s	10.5 s	8-10 m	OBN receivers on seabed	55
PIES (Pressure Inverted Echo Sounder)	Sonardyne	8306	N/A	188-200 dB	190-200 dB	14-19 kHz	N/A	1 pulse every 30 seconds	Placed on seabed	Placed on seabed	65

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 kilometres) 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^2. Over the course of the 7-day simulation, 30% of the area was covered (1,009 km^2) or 144 km^2 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^2 in 7 days or 795 km^2 per day;
3D NAZ – 1,392 km^2 in 7 days or 199 km^2 per day;
3D WAZ – 5,916 km^2 in 7 days or 845 km^2 per day.

The planned 3D OBN survey will involve a single source vessel sailing along closely spaced survey lines that are 100 m apart and approximately 30 km in length. The source vessel will optimise line turns using the "teardrop" method to sail on the next adjacent lines 100 m apart. With this relatively tight line spacing and at a survey speed of 4.5 knots (2.31 m/sec), the area covered by this single source vessel will be about ~105 km^2 per week, or 15 km^2 per day. Therefore, the Coil Survey Type was selected in the take calculator because the area covered during that simulated survey closely matches that of the area to be covered by the single source vessel operating during the planned 3D OBN survey.

Zeddies, D., S. Denes, C. Pyc. 2017. Gulf of Mexico Acoustic Exposure Model Variable Analysis. Prepared by JASCO Applied Sciences (USA) Inc. for International Association of Geophysical Contractors and American Petroleum Institute. 171 pp.

Parameters	
Survey Type	*COIL*
Zone Number	*7*

Schedule	
Season	# days
Summer	24
Winter	31

Level A Color Legend:	
	Level A SEL
	Level A Peak

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

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)	5.98	7.73	13.71
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)	1,041.29	1,449.69	2,490.98
Bottlenose dolphin	4.72	7.15	11.87
Short-finned pilot whale	24.53	36.33	60.86
Sperm whale	114.44	164.18	278.62
Atlantic spotted dolphin	< 0.01	< 0.01	< 0.01
Clymene dolphin	460.38	711.14	1,171.52
False killer whale	167.53	252.34	419.86
Fraser's dolphin	78.47	116.18	194.65
Killer whale	16.84	25.47	42.30
Melon-headed whale	309.54	458.30	767.85
Pantropical spotted dolphin	4,570.61	7,060.18	11,630.79
Pygmy killer whale	148.04	222.98	371.02
Risso's dolphin	76.47	114.65	191.12
Rough-toothed dolphin	178.87	269.42	448.30
Spinner dolphin	107.25	165.67	272.92
Striped dolphin	239.15	369.42	608.57
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	56.93	84.67	141.61

Total take, including Level B Scaling (where appropriate)

Summer	Winter	Total
< 0.01	< 0.01	< 0.01
105.17	146.42	251.59
1.36	2.05	3.41
7.24	10.72	17.95
48.41	69.45	117.86
< 0.01	< 0.01	< 0.01
132.13	204.10	336.23
49.42	74.44	123.86
22.52	33.34	55.87
4.97	7.51	12.48
91.32	135.20	226.52
1311.76	2026.27	3338.04
43.67	65.78	109.45
22.56	33.82	56.38
51.34	77.32	128.66
30.78	47.55	78.33
68.64	106.02	174.66
24.26	34.91	59.17

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: