

Letter of Authorization Application

BOEM Control Number: L22-015

Requested Period of Effectiveness:

Start Date: August 10, 2023

End Date: January 2, 2024

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-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)

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):

Survey Area and Operational Plan:

Question:	Response
<p style="text-align: center;">Location: (Lease Block(s), Facility or Prospect Name, Lat/Lon, etc.)</p>	<p>Lease Blocks: Centered on Lease Blocks Walker Ridge 758, 759, and 802</p> <p>Facility: Jack</p> <p>Lat: 26° 10' 60.6748" N Lon: 91° 26' 0.1405" W</p>
<p>Overall Duration of the Activity (days):</p>	<p>90 days</p>
<p style="text-align: center;">Areal extent of the survey area: (in OCS lease blocks or km²) (Attach GIS file(s) of survey lines and/or survey area perimeter)</p>	<p>Lease Blocks: All or portions of 90 Lease Blocks centered on WR-758.</p> <p>~1,728 km²</p>
<p style="text-align: center;">G&G ITR/PEIS Modeling Zone(s) in which the activity will occur (1-7):</p>	<p>7</p>
<p>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.)</p>	<p>75 days total</p> <p>Seasonal distribution of days used in the Take Estimates shown in Section D: Winter: 25 days Summer: 50 days</p>

Sound Sources:

- List the same sound sources provided in response to question #3 in “Section D Proprietary Information Attachment” to the BOEM G&G Permit Application and indicate their duration of use.

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 option 2	Bolt	1900LLXT	5380 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	75 days of shooting

Source Description:

The seismic source for the proposed geophysical survey will be comprised of 42 active airguns with a total operating volume of 5380 in³ (88.16 litres). The 42 airguns will be distributed in three sub-arrays comprised of 14 airguns each (Figure below). Individual airgun sizes range from 70 in³ to 230 in³. Airguns will be operated at 2000 psi. The sub-arrays will be towed at a water depth of ~12 m. The sources vessels will tow two source arrays and activate them alternately in the standard flip-flop pattern every 20 m along the survey line, resulting in approximately 80 source discharges per mile.

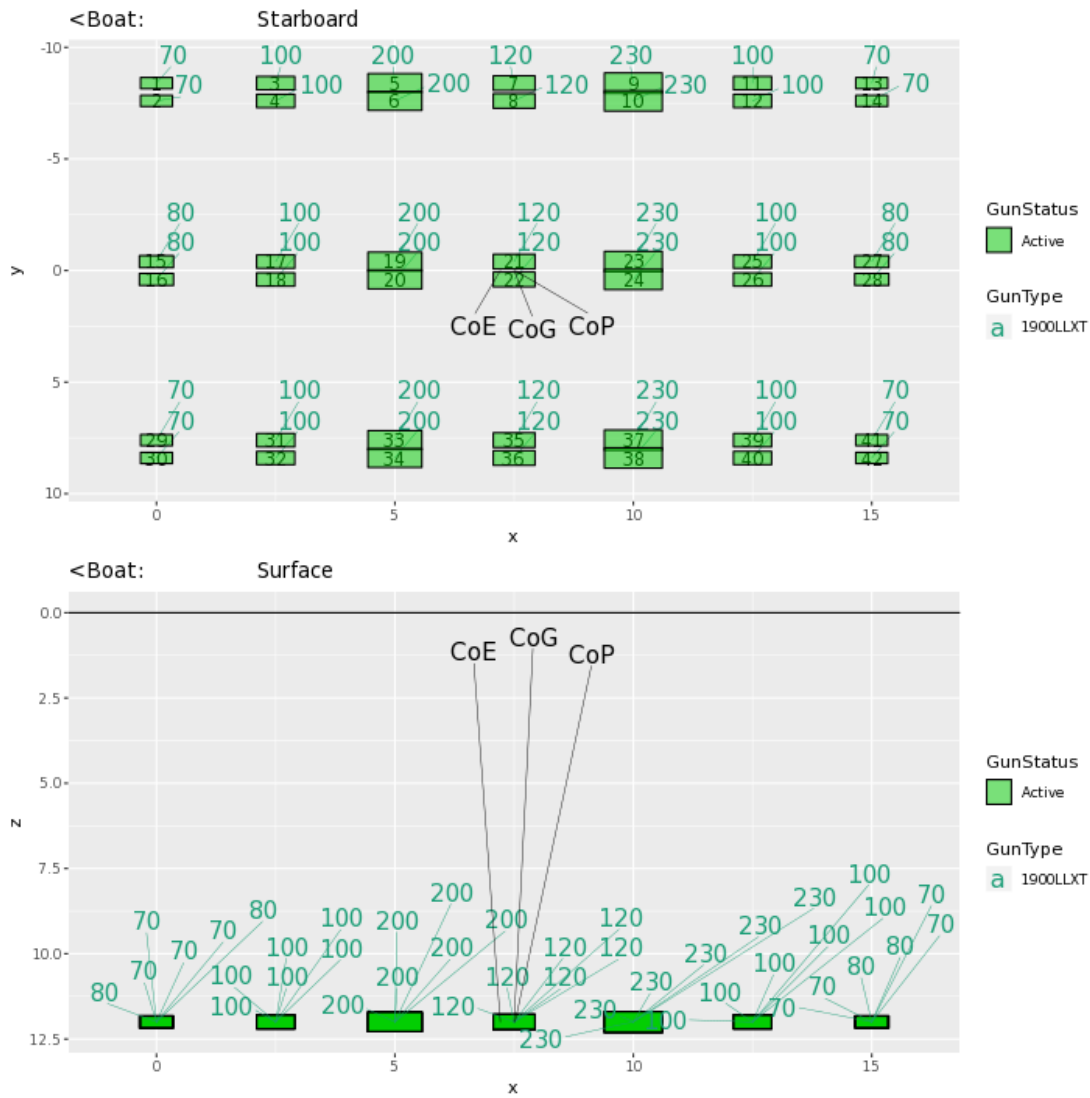


Figure 1. Layout of airguns in each source array.

Table 1. Volume and location of airgun array elements.

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	70.00	1900LLXT	0.000	-8.400	12.000	0.0000	1	2.5	0.3
2	2000.00	70.00	1900LLXT	0.000	-7.600	12.000	0.0000	1	2.5	0.3
3	2000.00	100.00	1900LLXT	2.500	-8.400	12.000	0.0000	1	2.5	0.3
4	2000.00	100.00	1900LLXT	2.500	-7.600	12.000	0.0000	1	2.5	0.3
5	2000.00	200.00	1900LLXT	5.000	-8.400	12.000	0.0000	1	2.2	0.4
6	2000.00	200.00	1900LLXT	5.000	-7.600	12.000	0.0000	1	2.2	0.4
7	2000.00	120.00	1900LLXT	7.500	-8.400	12.000	0.0000	1	2.4	0.3
8	2000.00	120.00	1900LLXT	7.500	-7.600	12.000	0.0000	1	2.4	0.3
9	2000.00	230.00	1900LLXT	10.000	-8.400	12.000	0.0000	1	2.1	0.5
10	2000.00	230.00	1900LLXT	10.000	-7.600	12.000	0.0000	1	2.1	0.5
11	2000.00	100.00	1900LLXT	12.500	-8.400	12.000	0.0000	1	2.5	0.3
12	2000.00	100.00	1900LLXT	12.500	-7.600	12.000	0.0000	1	2.5	0.3
13	2000.00	70.00	1900LLXT	15.000	-8.400	12.000	0.0000	1	2.5	0.3
14	2000.00	70.00	1900LLXT	15.000	-7.600	12.000	0.0000	1	2.5	0.3
15	2000.00	80.00	1900LLXT	0.000	-0.400	12.000	0.0000	2	2.5	0.3
16	2000.00	80.00	1900LLXT	0.000	0.400	12.000	0.0000	2	2.5	0.3
17	2000.00	100.00	1900LLXT	2.500	-0.400	12.000	0.0000	2	2.4	0.3
18	2000.00	100.00	1900LLXT	2.500	0.400	12.000	0.0000	2	2.4	0.3
19	2000.00	200.00	1900LLXT	5.000	-0.400	12.000	0.0000	2	2.2	0.4
20	2000.00	200.00	1900LLXT	5.000	0.400	12.000	0.0000	2	2.2	0.4
21	2000.00	120.00	1900LLXT	7.500	-0.400	12.000	0.0000	2	2.3	0.3
22	2000.00	120.00	1900LLXT	7.500	0.400	12.000	0.0000	2	2.3	0.3
23	2000.00	230.00	1900LLXT	10.000	-0.400	12.000	0.0000	2	2.1	0.5
24	2000.00	230.00	1900LLXT	10.000	0.400	12.000	0.0000	2	2.1	0.5
25	2000.00	100.00	1900LLXT	12.500	-0.400	12.000	0.0000	2	2.4	0.3
26	2000.00	100.00	1900LLXT	12.500	0.400	12.000	0.0000	2	2.4	0.3
27	2000.00	80.00	1900LLXT	15.000	-0.400	12.000	0.0000	2	2.5	0.3
28	2000.00	80.00	1900LLXT	15.000	0.400	12.000	0.0000	2	2.5	0.3
29	2000.00	70.00	1900LLXT	0.000	7.600	12.000	0.0000	3	2.5	0.3
30	2000.00	70.00	1900LLXT	0.000	8.400	12.000	0.0000	3	2.5	0.3
31	2000.00	100.00	1900LLXT	2.500	7.600	12.000	0.0000	3	2.5	0.3
32	2000.00	100.00	1900LLXT	2.500	8.400	12.000	0.0000	3	2.5	0.3
33	2000.00	200.00	1900LLXT	5.000	7.600	12.000	0.0000	3	2.2	0.4
34	2000.00	200.00	1900LLXT	5.000	8.400	12.000	0.0000	3	2.2	0.4
35	2000.00	120.00	1900LLXT	7.500	7.600	12.000	0.0000	3	2.4	0.3
36	2000.00	120.00	1900LLXT	7.500	8.400	12.000	0.0000	3	2.4	0.3
37	2000.00	230.00	1900LLXT	10.000	7.600	12.000	0.0000	3	2.1	0.5
38	2000.00	230.00	1900LLXT	10.000	8.400	12.000	0.0000	3	2.1	0.5
39	2000.00	100.00	1900LLXT	12.500	7.600	12.000	0.0000	3	2.5	0.3
40	2000.00	100.00	1900LLXT	12.500	8.400	12.000	0.0000	3	2.5	0.3
41	2000.00	70.00	1900LLXT	15.000	7.600	12.000	0.0000	3	2.5	0.3
42	2000.00	70.00	1900LLXT	15.000	8.400	12.000	0.0000	3	2.5	0.3

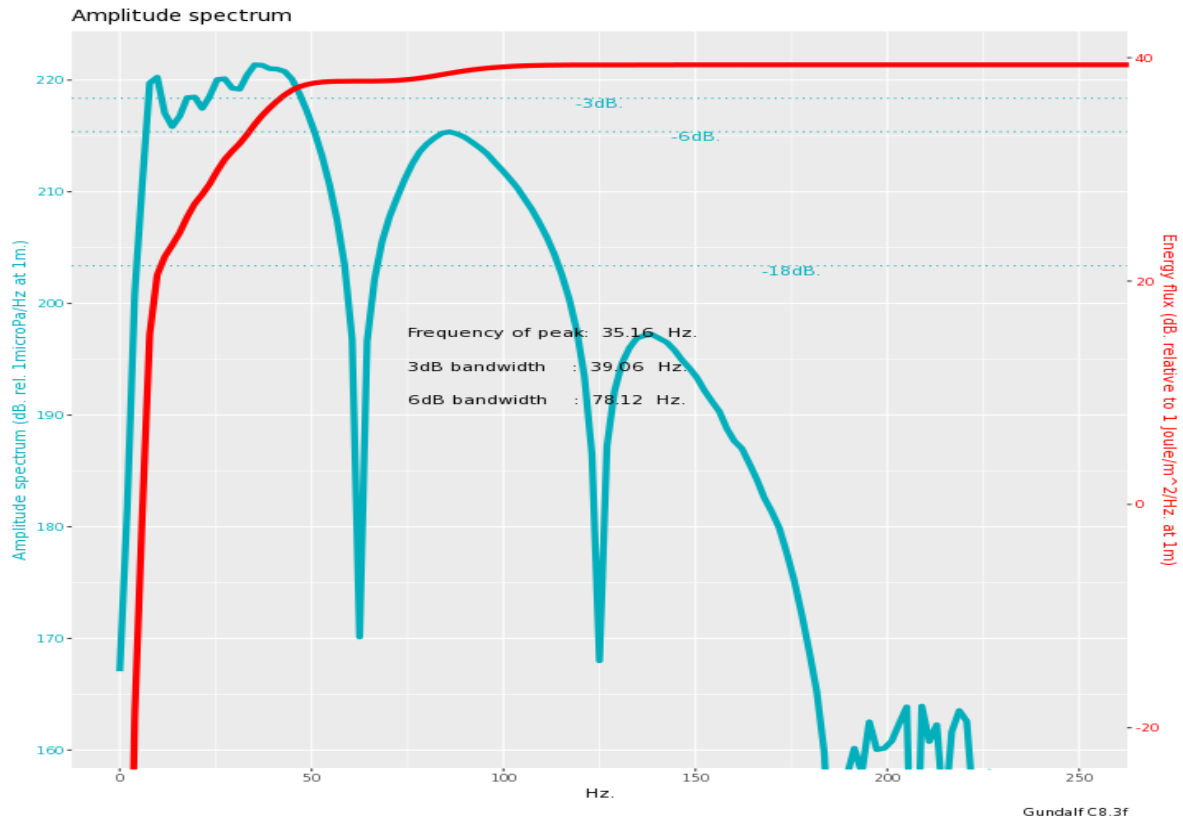


Figure 2. Source Array Vertical Farfield Signature and Frequency Spectrum in dB 1 μ Pa per Hz at 1 m.

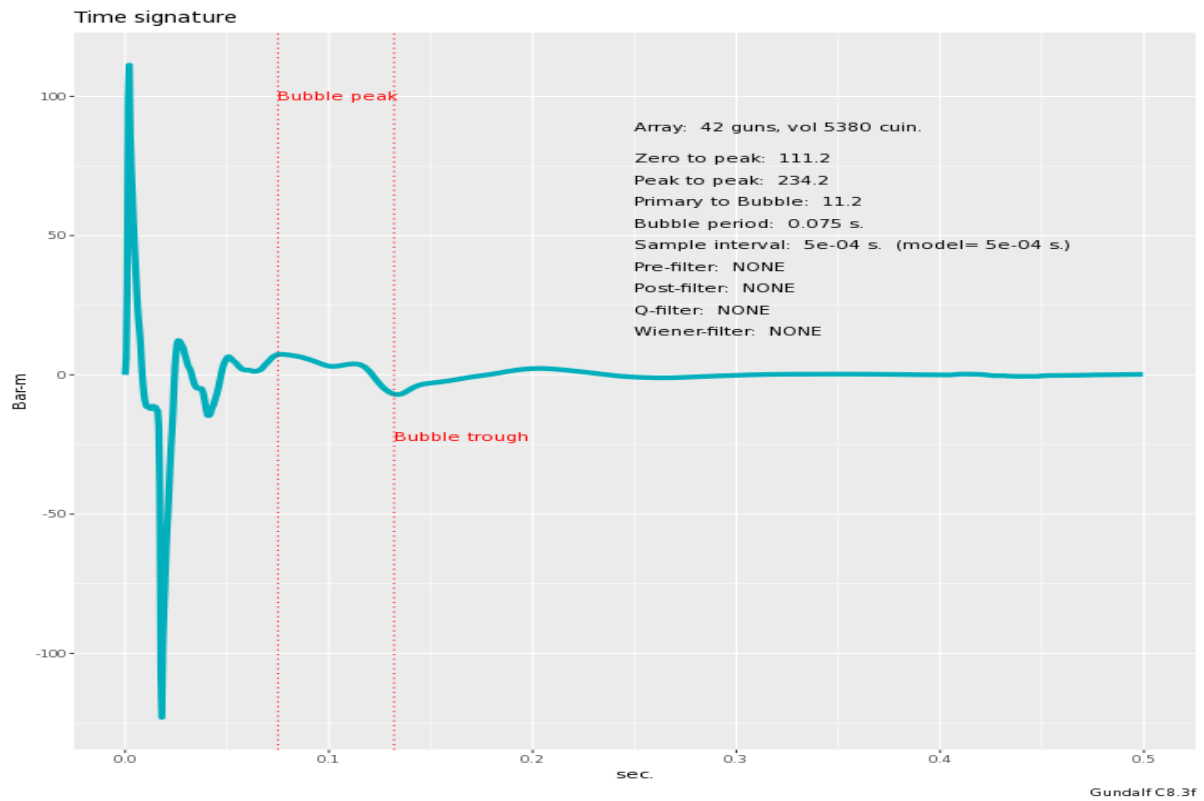


Figure 3. Overpressure signature and power spectrum of the 42 airgun 5380 in3 array.

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 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 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 approximately 100–150 m apart and approximately ~40 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 72.4 km² per week, or 10.3 km² 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 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	50
Winter	25

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)	12.46	6.23	18.70
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)	2,169.35	1,169.10	3,338.45
Bottlenose dolphin	9.84	5.76	15.60
Short-finned pilot whale	51.11	29.29	80.41
Sperm whale	238.42	132.40	370.82
Atlantic spotted dolphin	< 0.01	< 0.01	< 0.01
Clymene dolphin	959.12	573.50	1,532.62
False killer whale	349.01	203.50	552.51
Fraser's dolphin	163.48	93.70	257.18
Killer whale	35.08	20.54	55.61
Melon-headed whale	644.88	369.60	1,014.48
Pantropical spotted dolphin	9,522.10	5,693.69	15,215.80
Pygmy killer whale	308.41	179.82	488.23
Risso's dolphin	159.31	92.46	251.77
Rough-toothed dolphin	372.65	217.28	589.93
Spinner dolphin	223.44	133.60	357.04
Striped dolphin	498.24	297.92	796.16
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	118.61	68.29	186.89

Level A Color Legend:	
	Level A SEL
	Level A Peak

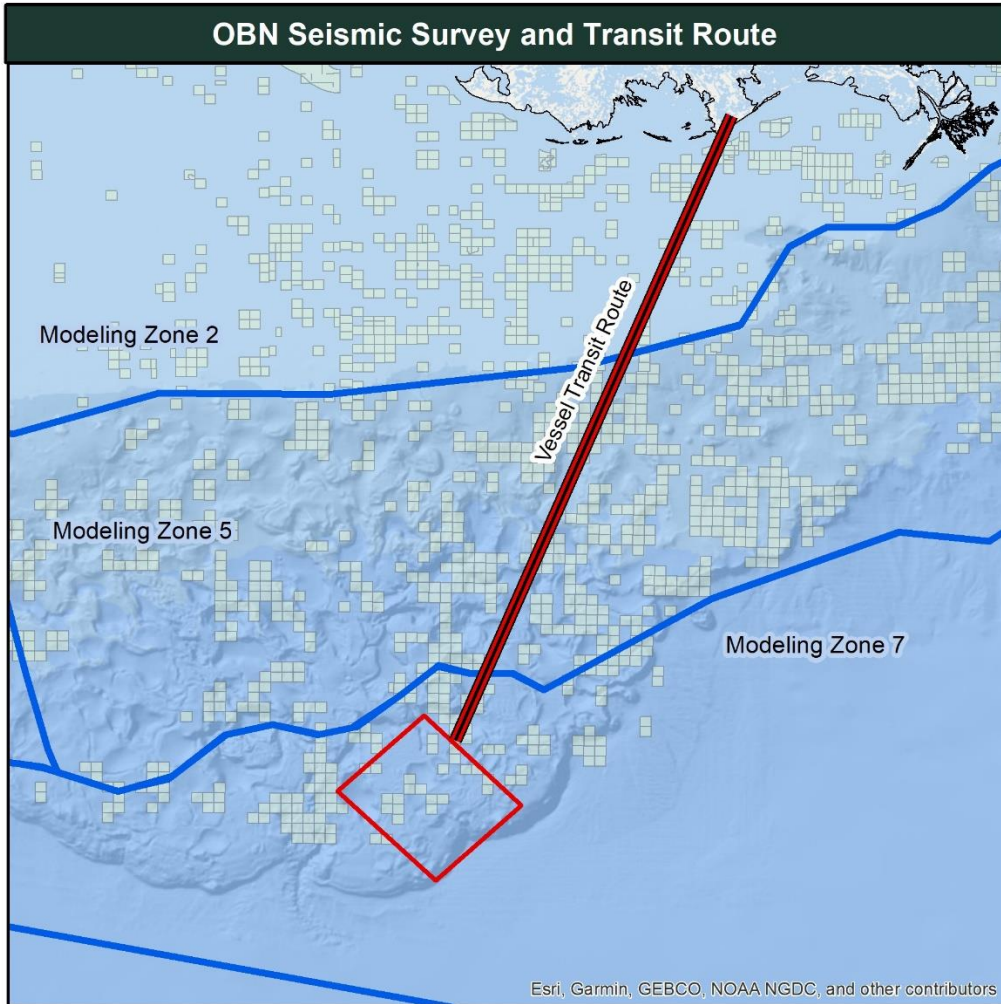
*If no color highlight, both level A peak and SEL are <0.01




Total take, including Level B Scaling (where appropriate)		
Summer	Winter	Total
< 0.01	< 0.01	< 0.01
219.10	118.08	337.18
2.82	1.65	4.48
15.08	8.64	23.72
100.85	56.01	156.86
< 0.01	< 0.01	< 0.01
275.27	164.59	439.86
102.96	60.03	162.99
46.92	26.89	73.81
10.35	6.06	16.41
190.24	109.03	299.27
2732.84	1634.09	4366.93
90.98	53.05	144.03
47.00	27.28	74.27
106.95	62.36	169.31
64.13	38.34	102.47
142.99	85.50	228.50
50.54	28.15	78.69

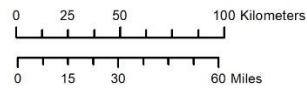
Mitigation and Monitoring Efforts:

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 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

Map of Survey Area and Transit Route



-  Survey Area Perimeter
-  Modeling Zones
-  Active Lease Blocks



Jack OBN Seismic Survey Area
for Letter Of Authorization Application



Ecological Research Associates, Inc.