

Technical Summary

Study Title	Characteristics and Contributions of Noise Generated by Mechanical Cutting During Conductor-removal Operations
Report Title	Characteristics and Contributions of Noise Generated by Mechanical Cutting During Conductor Removal Operations Volume 1: Final Report Volume 2: Appendix A Volume 3: Appendices B – F
Report Number(s) (OCS Study)	BOEM 2022-029
Completion Date of Report	June 2022
Number of Pages	Volume 1: 105 pages Volume 2: 44 pages Volume 3: 252 pages
Award Number(s)	140M0120C0011
Sponsoring OCS Region or Office	Pacific
Applicable Planning Area(s)	Southern California
Fiscal Year(s) of Study Funding	FY 2020: \$499,700.00; FY 2021: \$59,686.00
Costs by Fiscal Year	FY 2020: \$24,985.00; FY 2021: \$209,596.00; FY 2022: \$324,805.00
Cumulative Project Cost	\$559,386.00
Project Manager(s)	Ann Zoidis
Affiliation of Project Manager(s)	Tetra Tech, Inc.
Address of Project Manager(s)	10 Post Office Square, Suite 1100, Boston, MA 02109
Principal Investigator(s)	Kevin Fowler, Tricia Pellerin, Ann Zoidis, Elizabeth Ferguson
Keywords	oil and gas platform, Pacific Outer Continental Shelf, passive acoustics, particle motion, marine mammal, field measurements, conductor removal

ABSTRACT: Oil and gas production platforms in federal waters offshore southern California have been identified for decommissioning and the removal of the platform conductors will be accomplished using mechanical cutting. In particular, this study focuses on mechanical cutting activities at Platform Hermosa, which is one of the Point Arguello Unit Platforms. This study was conducted to analyze the sound pressure and particle motion levels associated with those mechanical cutting activities as well as evaluate the presence and contribution of marine mammals to the soundscape. A field program was conducted in support of this study and results showed that mechanical cutting noise contributed to the underwater acoustic environment, but below applicable marine mammal acoustic threshold criteria. A semi-automated review of the data from one recorder was conducted to document periods of vocalizing marine

mammals. Optimization of the detection of marine mammal calls was explored using soundscape metrics and a deep neural network was also investigated.

BACKGROUND: The Bureau of Ocean Energy Management (BOEM) has identified 23 oil platforms planned for decommissioning within federal waters offshore of southern California. Freeport-McMoRan Oil & Gas LLC (Freeport) submitted Applications for Permits to Modify (30 Code of Federal Regulations Part 250.1704) to remove well conductors and casings on three Point Arguello Unit Platforms (Hidalgo, Harvest, and Hermosa). The scope of this Study was to collect empirical data documenting the characteristics of sound pressure level (SPL) and particle motion generated by the high-pressure abrasive conductor cutting at one of the three Point Arguello Unit Platforms; however, abrasive cutting was not conducted as anticipated due to challenges Freeport encountered in the field. Mechanical cutting was used instead to facilitate conductor removal. This report provides analyses from the mechanical conductor cutting activities.

OBJECTIVES: Quantify sound pressure levels and particle motion characteristics associated with mechanical cutting during conductor removal, including directionality. Evaluate sound propagation characteristics of mechanical cutting, and review quantification of the ambient soundscape. Determine whether mechanical cutting contributes to the ambient soundscape, and, if so, provide a quantification of that contribution.

METHODS: The field program focused on mechanical activities conducted by Freeport at Platform Hermosa. A total of six passive acoustic monitors, a particle motion monitor, and a thermistor chain were deployed for a period of 21 days. Particle motion data could not be recovered, but processing of acoustic data included application of analysis tools to determine broadband and octave band sound levels as well as other relevant acoustic metrics. Sound propagation of mechanical cutting activities was also modeled using the dBSea acoustic modeling program incorporating site-specific characteristics including sound speed profile information collected during the field survey. Marine mammal vocalizations were documented, and novel methods of detection were explored using a set of acoustic indices and deep neural network development.

RESULTS: Data were collected for a total of 25 conductors incorporating a total of 40 identified mechanical cutting events. The cut depth ranged from 6 to 8 m (20 to 25 ft) below the mudline and the cutter revolutions per minute ranged from 60 to 72 RPM. The duration of the cuts was dependent on the number of casing strings that needed to be cut. Wellbores containing more casing strings took much longer to cut compared to the conductors that were empty. In total, 9 wellbores and 16 empty conductors were cut during the monitoring period. Sound pressure levels (SPLs) generated by cutting were fairly comparable for cutting of wellbore and empty conductors, generally increasing ambient sound levels by 14 to 33 dB SPL on a broadband basis with variable increases on a spectral basis. During the field survey ambient sound levels were typically found to be in the 110 to 120 dB SPL range on a broadband basis. Significant sound contribution was also identified from humpback whales and from delphinid species. The calls from both humpback whales and delphinids occur within the same frequency bands as the conductor cutting noise and were determined to contribute to the ambient sound pressure levels observed. After comprehensive annotation of the data for the occurrence of marine mammal sounds, deep neural networks were created for humpback whale and delphinid calls from the dataset, which can be modified and scaled for future field endeavors.

CONCLUSIONS: Mechanical cutting activities associated with oil and gas platform conductor removal produces underwater sound pressure levels that contribute to the existing underwater ambient acoustic environment; however, sound pressure levels are generally below the thresholds for marine mammal temporary and permanent threshold shift onset. In addition, while the distance to vocalizing marine mammal groups was not possible to determine given equipment configuration of the Project scope,

presence of marine mammals was detected, and their calls also contributed to the underwater ambient acoustic environment.

STUDY PRODUCTS:

1. BOEM Study Report (three volumes):

Fowler K, Pellerin T, Zoidis A (Tetra Tech, Inc., Boston, MA). 2022. Characteristics and contributions of noise generated by mechanical cutting during conductor removal operations; Volume 1: Final report. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 105 p. Report No.: OCS Study BOEM 2022-029. Contract No.: 140M0120C0011.

Fowler K, Pellerin T, Zoidis A (Tetra Tech, Inc., Boston, MA). 2022. Characteristics and contributions of noise generated by mechanical cutting during conductor removal operations; Volume 2: Appendix A. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 44 p. Report No.: OCS Study BOEM 2022-029. Contract No.: 140M0120C0011.

Fowler K, Pellerin T, Zoidis A (Tetra Tech, Inc., Boston, MA). 2022. Characteristics and contributions of noise generated by mechanical cutting during conductor removal operations; Volume 3: Appendices B – F. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 252 p. Report No.: OCS Study BOEM 2022-029. Contract No.: 140M0120C0011.

- 2. Marine Mammal Data Library:** Processed PAMGuard dataset, files summarizing acoustic detections, output from acoustic indices analysis, deep neural network and test files, and instruction deep neural network video. Library file inventory included.
- 3. EndNote PDF Reference Library:** Final Report citation reference PDF library.

MAP OF STUDY AREA: Location of and bathymetry in the Project study area: a 500-m-radius area around Platform Hermosa. Figure 4 of report OCS Study BOEM 2022-029; Volume 1: Final Report.

