

MEMORANDUM

To: Nicole Dobroski, Chief of the Environmental Planning & Management Division, California State Lands Commission

From: Monica LeFlore, Science Officer, California Ocean Science Trust

CC: Eric Gillies, Assistant Chief of the Marine Environmental Protection Division, California State Lands Commission
Liz Whiteman, Executive Director, California Ocean Science Trust
Anthony Rogers, Director of Programs, California Ocean Science Trust
Kiya Bibby, Senior Science Officer, California Ocean Science Trust

Date: January 10, 2023

Re: California Ocean Science Trust scientific and technical review of the information and conclusions presented in the “Review of Lease Obligations and Assessment of Impacts to Public Trust Resources and Values: State Oil and Gas Leases PRC 1824 and PRC 3150 Terminations and 4H Shell Mounds Disposition” on behalf of the California State Lands Commission

REVIEW REQUEST AND SCOPE

In order to ensure state decisions are grounded in sound scientific conclusions, California State Lands Commission (CSLC) has requested California Ocean Science Trust (OST), a non-profit organization dedicated to convening science expertise to accelerate process toward a resilient coast and ocean, coordinate a peer review to evaluate the scientific and technical merits of the white paper “Review of Lease Obligations and Assessment of Impacts to Public Trust Resources and Values: State Oil and Gas Lease PRC 1824 and PRC 3150 Terminations and 4H Shell Mounds Disposition”, which includes an assessment of effects to public trust resources and values associated with the presence of the 4H shell mounds on the seafloor.

The review panel conducted an assessment of whether:

- 1) the scientific information presented within the report is sound and reasonable,
- 2) the relevant science included in the report is comprehensive and representative of existing knowledge in this field of research; and,
- 3) interpretations and conclusions drawn in the report are appropriate given the available scientific information.

REVIEW PROCESS OVERVIEW

OST facilitated the review process between October and December 2022. Steps included:

1. **Scoping the review.** OST worked closely with CSLC to develop and formalize the review scope and process, identify reviewer expertise needs, and develop review instructions and guiding questions for reviewers. The co-produced scope and process document can be found on the OST [website](#)¹.
2. **Reviewer selection.** OST recruited four external scientific experts to complete reviews, accepting recommendations from the California State University Council on Ocean Affairs, Science and Technology (CSU COAST), and OST's own professional network. Reviewers were selected based on relevant expertise and were required to sign a form to declare any conflicts of interest prior to the review. Reviewers were informed of the client and authorship of the report. Reviewer names were kept anonymous to CSLC and the public during the review, and their comments were submitted anonymously without attribution to any single reviewer. With the release of this document, the reviewers are made public:
 - Dr. Eunha Hoh, Professor of Environmental Health, School of Public Health at San Diego State University
 - Dr. Milton Love, Research Biologist, Marine Science Institute at University of California Santa Barbara
 - Dr. Samuel Y Johnson, Emeritus Research Geologist & Independent Consultant, United States Geological Survey
 - Dr. Tom Connolly, Physical Oceanographer, Moss Landing Marine Laboratories at San Jose State University
3. **Facilitating the review process.** OST provided the reviewers with a set of instructions and review questions to guide their evaluation of the document's scientific merits. Reviewers were asked to respond in writing to the questions in the instructions and were able to provide anonymous annotated comments directly to the report.
4. **Providing deliverables.** This memo was produced as a public summary of the review and will remain available on the OST [website](#)¹. OST also provided CSLC with comprehensive anonymized reviewer feedback, which included individual responses to the review questions and in-text comments. The comprehensive review documents are for internal use only.

OST valued this opportunity to collaborate with CSLC to provide scientific support to the State of California. CSLC's commitment to ensuring decisions are founded in sound scientific reasoning and conclusions is commendable. We appreciated their constructive engagement and dedication to upholding scientific values throughout the review process. OST would also like to thank the four reviewers who dedicated their time to provide thoughtful comments and expertise.

¹ Project page url: <https://www.oceansciencetrust.org/projects/seafloormounds/>

REVIEW BACKGROUND

CSLC administers leases related to oil and gas operations located in and adjacent to the state's waterways, beaches, and coastline. Although CSLC issued a moratorium on new oil and gas leases in 1969, the Commission still oversees the management, revenue, and regulation of leases issued prior to that time. Four relic leases associated with oil and gas production from Platforms Hilda, Hazel, Hope and Heidi (collectively the '4H' Platforms), were installed in State waters offshore Santa Barbara County between 1958 and 1965. The lease holders for the 4H Platforms include Chevron Corporation, ExxonMobil and BP p.l.c.

After approval by CSLC in 1994, Chevron removed the 4H Platforms in 1996, leaving behind four subsea shell mounds that had accumulated at the base of each platform. The shell mounds are composed of empty mussel shells, sediment, and debris covering an inner layer of drill muds and cuttings. The 4H Platform Removal Project that CSLC approved did not specify removal of the shell mounds. Chevron maintains that it has met the lease obligations and has submitted a petition to quitclaim its leases, which includes a proposal to keep the 4H shell mounds in place in their current configuration, unless otherwise specified by CSLC.

The white paper entitled "Review of Lease Obligations and Assessment of Impacts to Public Trust Resources and Values: State Oil and Gas Leases PRC 1824 and PRC 3150 Terminations and 4H Shell Mounds Disposition", presents an assessment of the effects to public trust resources and values associated with the presence of the 4H shell mounds on the seafloor. The document includes information on a) Chevron's renewed proposal to quitclaim its leases related to the 4H Platforms; b) Commission staff's evaluation of historic records related to the leases; and c) an assessment of effects to public trust resources and values associated with the continued presence of the 4H shell mounds on the seafloor, if they are not removed.

REVIEW SUMMARY

Scientific Rigor

- One reviewer recommended a comprehensive assessment of sediment samples from the shell mounds to provide additional information on contaminant levels. The reviewer recommended that sediment contaminant levels be compared temporally, spatially and per individual in-depth core sample. They also recommended an assessment of contaminant bioaccumulation in surrounding biota.
- One reviewer suggested that potential dispersal of contaminants should be further investigated. They expressed the need for estimates of spatial and time scales for contaminant dispersal because such estimates are important for assessing impacts on commercial fisheries, recreation at nearby beaches, and on public safety in the event of seismic activity or shell mound removal.
- One reviewer recommended that a series of biological surveys be conducted at each shell mound, at least quarterly, for at least two years. The reviewer pointed out that the biological

surveys that were conducted were either short term or one of a kind, which does not account for potential seasonal or interannual changes to fish assemblages. The reviewer also recommended that future surveys investigate assemblages of smaller organisms in addition to the fishes and large invertebrates included in completed surveys.

Comprehensiveness of Cited Literature

Reviewers were overall satisfied with the literature review conducted and reflected in the report. Several specific additional works cited were recommended, but reviewers also acknowledged that there is limited existing knowledge that specifically addresses impacts from shell mounds produced by offshore drilling operations. Reviewers therefore expressed that the report authors included a majority of the limited relevant studies.

- One reviewer recommended conducting additional literature reviews for what other chemical contaminants are associated with oil drilling activities and ensuing samples to determine presence and level of those contaminants within the shell mounds' sediments.
- One reviewer pointed out that a 2019 publication assessing ecological resources on shell mounds surrounding platform decommissioning sites in the Santa Barbara Channel found that shell mounds support higher fish and invertebrate diversity than surrounding soft-bottom reference areas, indicating that removal of the mounds may be detrimental to biodiversity.

Science-Based Conclusions to Support Decision-Making

Reviewers did not raise major concerns about a lack of drawing on existing available scientific information. However, reviewers across the board did recommend further assessment of the various ways in which leaving the shell mounds intact or removing them could threaten public trust resources. The reviewers' feedback was primarily focused on recommendations for additional studies, such as collecting and analyzing time-series data about biodiversity supported by the shell mounds, rather than on recommendations for inclusion of additional readily-available scientific information.

Reviewers recommended additional analyses of the following:

- Sediment contaminant levels
- Habitat value of the shell mounds
- Earthquake hazards
- Effects of decreasing ocean pH conditions on the shell mounds
- Quantification of ocean currents in the vicinity of the mounds

Regarding triggers for post-earthquake monitoring response, one reviewer suggested a more conservative approach to setting the trigger for post-earthquake surveys. The reviewer agreed with the report's proposed response protocol that within one week of a qualifying trigger event, Chevron should be required to complete high-resolution bathymetric surveys of the shell mounds to assess the extent of damage. The more conservative earthquake events that the reviewer recommended trigger this response include:

- An event of magnitude 6-6.5 within 20 km of the 4H shell mounds;

- An event of magnitude 6.6 to 7.0 within 50 km of the shell mounds; or
- An event of magnitude greater than 7.0 within 80 km of the shell mounds.

Additional Comments

- One reviewer highlighted the need for identification of data gaps since there are significant additional analyses that could be conducted to more thoroughly assess the potential public trust impacts of leaving the shell mounds intact.
 - One reviewer recommended that the predicted carbon footprint of, and pollution created by, shell mound removal should be investigated and made public, so as to account for the ramifications of the various potential scenarios dealing with the shell mounds.
 - One reviewer suggested that the report more directly discuss ways in which earthquake strong ground motions could lead to exposure of potentially toxic drilling muds to the open sea. The two scenarios that the reviewer considered possible are:
 - Slope failure on the steep margins of the shell mounds, with drilling muds exposed in slide scars; or,
 - Cracks, fissures or liquefaction-associated sediment boils on the upper surface and slopes of the shell mounds, causing exposure of drilling muds on the flanks and rims of the mounds.
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