***Exxon Valdez* Oil Spill Trustee Council**

Long-Term Research and Monitoring, Mariculture, Education and Outreach

Annual Project Reporting Form

Project Number: 22200114-P

Project Title: Long-term Monitoring of Lingering Oil in Prince William Sound

Principal Investigator(s): Dan Esler, US Geological Survey, Alaska Science Center, and Mandy Lindeberg, National Oceanic and Atmospheric Administration

Reporting Period: February 1, 2022 – January 31, 2023

Submission Date (Due March 1 immediately following the reporting period): March 1, 2023

Project Website: https://gulfwatchalaska.org/

Please check all the boxes that apply to the current reporting period.

☒ **Project progress is on schedule.**

☐ **Project progress is delayed.**

☐ **Budget reallocation request.**

☐ **Personnel changes.**

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1. Summary of Work Performed:

No work was performed for this project during fiscal year 2022. Field sampling for lingering oil and analysis of sampling is scheduled for 2025.

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2. Products:

Reports:

Lindeberg, M., and R. Heintz. 2023. Long-term monitoring of lingering oil in Prince William Sound. *Exxon Valdez* Oil Spill Restoration Project Draft Final Report (Restoration Project: 21200114-P), *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

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3. Coordination and Collaboration:

Because no work was performed for this project, there was no coordination and collaboration to report with the Alaska SeaLife Center, Prince William Sound Science Center, *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) Mariculture projects, EVOSTC Education and Outreach projects, individual EVOSTC projects, Trustee or management agencies, or Native and local communities. This project is part of the EVOSTC Long-Term Research and Monitoring program Gulf Watch Alaska.

4. Response to EVOSTC Review, Recommendations and Comments:

May 2021 EVOSTC Science Panel Comment: This is a continuing project to follow the weathering and presence of lingering oil in regions where previous documentation has occurred. The PIs propose to sample oil collected during lingering oil surveys and will verify that the oil is Exxon Valdez and will evaluate its weathering state, based on composition of polycyclic aromatic hydrocarbons (PAHs). Chemical markers (not truly biomarkers) of weathering will be determined in order to assess weathering over time. The project has 3 primary objectives: 1) regular surveillance of lingering oil; 2) conduct PAH composition analysis of lingering oil; and 3) document contamination levels in mussels.

We are concerned about the lab analysis. The project states that oiled samples will be sent to a TBD analytical lab to determine PAHs and weathering state. Since the cost per sample is currently unknown by the PIs, they will determine the number of samples they will be able to analyze once costs are known. The PIs state that, if necessary, "they will secure additional funds". The lack of information regarding the lab analyses does not provide any assurance that the analyses will be completed. These are not novel analyses and the costs should be established before the project is funded. We expect to see this information in detail in the revised proposal.

PI Response: While drafting this proposal in March 2021 we were unable to secure analyses due to the 10-year schedule of the Trustee's Invitation. Laboratories were reluctant to commit to analyses that would not arrive until FY2025. However, now we are pleased to provide a commitment from Dr. Apeti with NOAA through the National Ocean Service, National Centers for Coastal and Ocean Science, Monitoring & Assessment Branch, Stressor Detection & Impacts Division. Dr. Apeti is a senior chemist leading the NOAA Mussel Watch Program and has collaborated with the Nearshore Component to analyze and report on contaminants in mussel samples throughout the Gulf of Alaska over the last 10 years. We are pleased that the sediment samples from the lingering oil project will be analyzed from the same laboratory applying the same protocols and quality control standards. We have revised the proposal to reflect this along with estimated costs from Dr. Apeti's lab to process mussel and oiled sediment samples.

Securing additional funds with other partners for extra analyses is a continued endeavor by investigators but not necessary here. This statement has been removed. Section 4, Project Design, B. Procedural and Scientific Methods, has been revised on page 6 to reflect this update.

May 2021 EVOSTC Science Panel Comment: Additionally, we have questions regarding objective 3, will mussels immediately adjacent to pits be the focus? The proximity to the buried oil is not described. Why are analyses focusing on total PAHs (or breakdown products) instead of far more sensitive P450 or CYP1A analyses? Metabolites of PAHs in mussel tissue may not be detected (or even analyzed for), where the biomarkers will provide the answer for exposure. The PIs need to address these questions/concerns.

PI Response: These are good questions; we have modified the proposal text to make collection and analysis plans clearer. Objective #3 constitutes a continuation of mussel contaminants sampling typically done under the Nearshore Component of Gulf Watch Alaska. For continuity and comparability, we will collect mussels at the Nearshore Component sampling sites across the northern Gulf of Alaska rather than in relation to the more restricted set of sites assessed for lingering oil. This will allow a broad regional perspective on contaminants, including PAHs, relative to levels in Prince William Sound where lingering oil will be sampled. This sampling design allows continuation of an existing data stream at the same spatial scale as previous collections, while also providing specific insights into differential PAH biocontamination in study blocks with a history of lingering oil.

In terms of analyses, we recognize that there are many potential approaches, including direct measurement of PAHs (which we have chosen), cytochrome P4501A (CYP1A) response, gene transcription, etc. We have chosen the metric that is consistent with the approach taken with mussels during previous Gulf Watch Alaska analyses, as well as many others dating back to the time of the Exxon Valdez oil spill, allowing the perspective and context provided by those previous samples. Also, the analyses are consistent with those used by the NOAA Mussel Watch program at a continental scale, allowing larger spatial comparisons. Finally, with the agreement of Dr. Apeti to conduct both sediment and mussel analyses, we eliminate any concern about laboratory or methodological differences that might inhibit comparisons of sediment and mussel PAH concentrations.

September 2021 EVOSTC Science Panel Comment: Since the lab identified will be committed to analyses of both sediments and mussel tissues, and does this routinely for NOAA Mussel Watch, we feel more comfortable with the proposed approach and budget. There is no text pointing out that if PAHs are detected in mussels or sediment, that these will be fingerprinted as an EVO source rather than a different source (diesel or fuel spills for example). It seems this should be able to be included as only using PAH levels does not link to lingering oil unless the ratios of different PAH components can be tied to EVO fingerprint. We would like to see this included in

a final proposal. Please change the term "biomarkers" in describing the chemistry of oil to "chemical markers" as we requested in the first review. What is described are not biological markers.

The PIs should provide more fine-scale detail on the collection of mussels, the number of animals, the proximity to pits with oil, etc. This was requested in the first review of the proposal. The map with locations of sampling is at such a large scale, details cannot be ascertained. No protocols or extraction methods for mussel tissue are presented. Even though this will be routine as for Mussel Watch animals, a very brief description with references should be included, not just a broad Mussel Watch document.

Lastly, the long-established extraction of mussel tissue proposed here is fine as it is aligned with Mussel Watch. However, 10 years from now it is hard to imagine high throughput approaches using molecular techniques will not be used for tissues. These would be to determine CYP1A (P4501A) approaches. It was hoped that some subset of tissues would be analyzed in this way to advance the approach that is the future of monitoring programs. Even if the PIs will not include preliminary screening, some text acknowledging that this is the future of tissue monitoring for oil would be appreciated.

PI Response: The PIs appreciate these comments and will evaluate these suggestions in preparation for the 2025 field season. More formal responses will be included in later annual reports.

5. Budget:

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROGRAM BUDGET PROPOSAL AND REPORTING FORM

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5-YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$0	$0	$0	$16,800	$0	$16,800	$0
Travel	$0	$0	$0	$5,000	$0	$5,000	$0
Contractual	$0	$0	$0	$75,000	$0	$75,000	$0
Commodities	$0	$0	$0	$17,000	$0	$17,000	$0
Equipment	$0	$0	$0	$0	$0	$0	$0
Indirect Costs (varies by proposer)	$0	$0	$0	$0	$0	$0	$0
SUBTOTAL	$0	$0	$0	$113,800	$0	$113,800	$0
General Administration (9% of subtotal)	$0	$0	$0	$10,242	$0	$10,242	N/A
PROGRAM TOTAL	**$0**	**$0**	**$0**	**$124,042**	**$0**	**$124,042**	
Other Resources (In-Kind Funds)	**$0**	**$0**	**$25,500**	**$38,000**	**$0**	**$63,500**	

COMMENTS:
This is the combined budget for Esler at USGS and Lindeberg at NOAA. Please see attached budgets for details. No spending was proposed for this project for FY22.

FY22-26	**Project Number: 22220114-P** **Project Title: Lingering Oil** **PI(s): Esler (USGS) & Lindeberg (NOAA)**	SUMMARY TABLE

No spending was proposed for this project for FY22.