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

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

Annual Project Reporting Form

Project Number: 24200114-P

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

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

Reporting Period: February 1, 2024 – January 31, 2025

Submission Date: March 1, 2025

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:

During FY24, an amended proposal was submitted for this project, which was approved in July 2024. Although overall objectives remained the same, the emphasis on different parts of the proposed work changed, as did the timing. As a result, field sampling was conducted in September 2024 instead of the originally proposed schedule of summer 2025.

As background, it is well understood that a small proportion of spilled *Exxon Valdez* oil remains sequestered in intertidal sediments at a few locations in Prince William Sound with certain physiographic characteristics. Lingering oil monitoring has demonstrated that occurrence and weathering state has not changed markedly through time (e.g., Michel et al. 2016, Lindeberg et al. 2018). This conclusion was confirmed most recently by Heintz et al. (2023), based on sampling in 2021.

The *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) has had a long history of lingering oil studies focusing on quantifying distribution, quantity, loss rate, weathering state, and bioavailability of *Exxon Valdez* oil through field studies and by developing empirical models. These findings are summarized in periodic reports on the status of lingering oil and effects on biota (Michel and Esler 2010, EVOSTC 2016, Michel et al. 2016), which are intended to inform sponsoring EVOSTC agencies, decision makers, and the public. This project is designed to continue this line of inquiry.

Objectives of this study include the following:

1. Conduct intermittent surveillance for presence of lingering oil.
2. Conduct polycyclic aromatic hydrocarbon (PAH) composition analysis of any excavated lingering oil.
3. Document contaminant levels of mussels, both at Nearshore Component rocky intertidal sites throughout the spill-affected area, as well as at specific Lingering Oil sampling sites known to retain oil.

Following the recommendations of Heintz et al. (2023), we modified sampling activities in the July 2024 amendment of the proposal for this project, with the intent of minimizing sediment excavation associated with Objectives 1 and 2 and focusing on use of mussels as biological samplers of contaminants (Objective 3).

At each of 5 sites known to retain lingering oil (Fig. 1), we conducted the following activities in September 2024:

1. Dig 3 to 4 pits in the lower intertidal zone to evaluate presence of lingering oil, detected through evidence of sheening and odor (Fig. 2).
2. When oil is encountered, collect contaminated sediment for archiving and subsequent PAH analysis to determine weathering state (Fig. 3).
3. Collect mussels for inclusion in the National Oceanic and Atmospheric Administration's (NOAAs) Mussel Watch analyses of contaminants (Fig. 4).

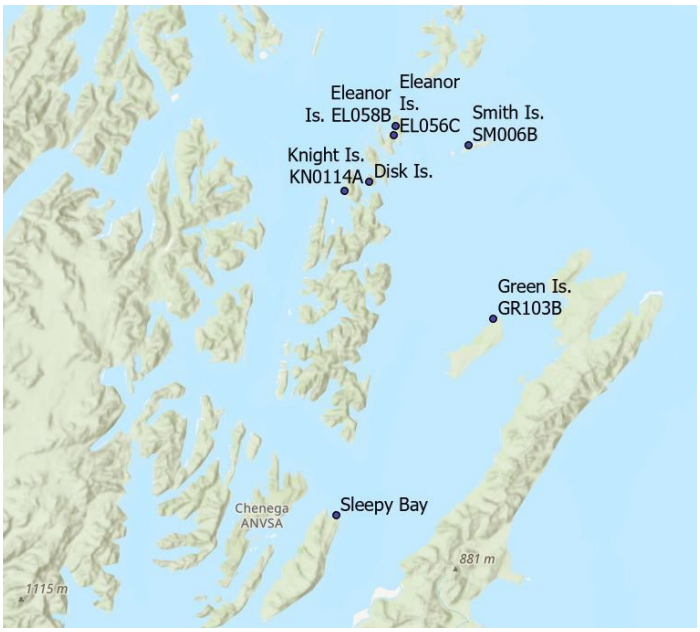

Figure 1. Sites in Prince William Sound known to have sequestered lingering Exxon Valdez oil as recently as 2021, which were sampled as part of this project in September 2024. Sites without numbers, Disk Island and Sleepy Bay, were sampled for mussels but not excavated for oiled sediment.

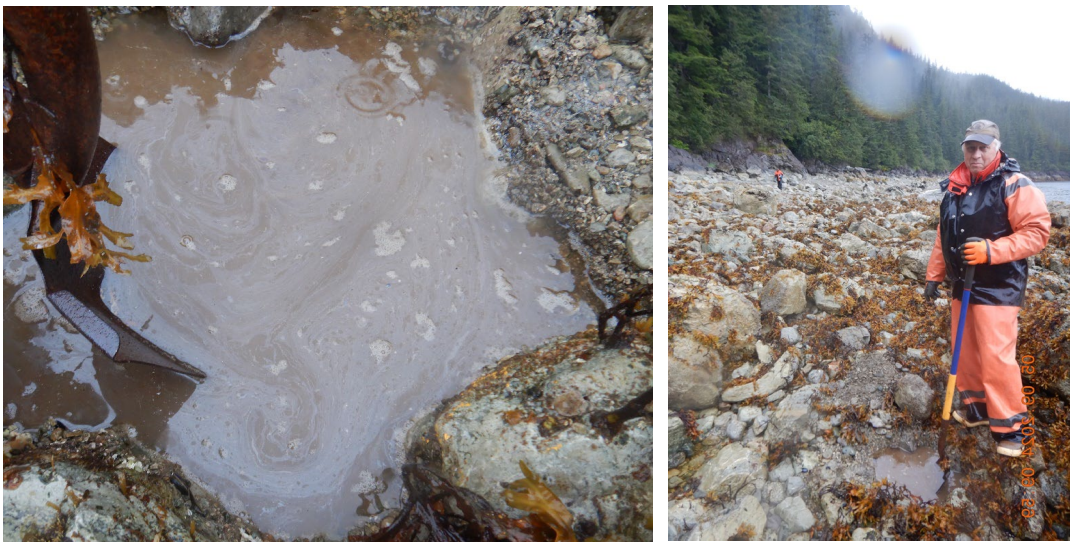

Figure 2. Dr. Dan Monson digging a pit in search of lingering Exxon Valdez oil in Prince William Sound, September 2024 (right). The left panel is a photo of a pit on Eleanor Island showing sheening resulting from excavation of oiled sediment.

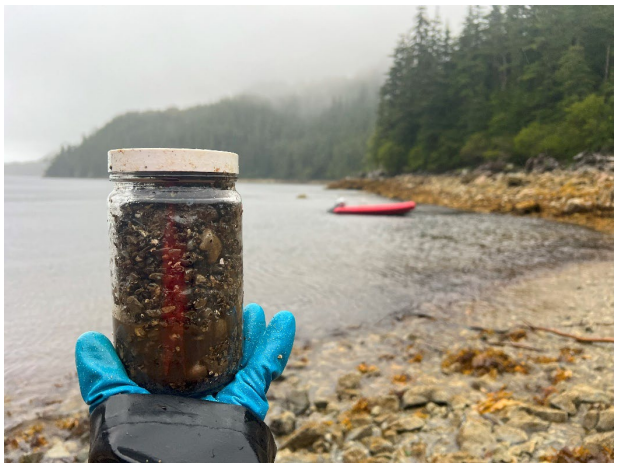

Figure 3. A jar of oiled sediment collected from the intertidal zone of Eleanor Island in Prince William Sound, September 2024.

Figure 4. Dan Monson and Jade Couturier collecting mussels (Mytilus trossulus) at a lingering oil site in Prince William Sound for inclusion in Mussel Watch analyses of contaminants.

Field work was conducted according to the plan described in the revised Lingering Oil proposal approved July 2024. We successfully dug pits and collected mussels from all 5 sites in September 2024. With minimal excavation (no more than 4 pits per site), we detected oil at both sites on Eleanor Island. From each site, we collected oiled sediment for subsequent chemical analysis of weathering state; those samples are currently archived at the U.S. Geological Survey

(USGS). The mussels collected at Lingering Oil sites, as well as those collected at Nearshore Component intertidal monitoring sites across the northern Gulf of Alaska, have been shipped to the lab for inclusion in Mussel Watch analyses.

Oiled sediment samples will be shipped to a lab during FY25 for PAH analysis. Results of Mussel Watch and PAH analysis will be included in the final report.

Literature Cited:

EVOSTC. 2016. An Evaluation of Remedial Options for Lingering Oil from the *Exxon Valdez* Oil Spill. Prepared by the Alaska Department of Environmental Conservation Division of Spill Prevention and Response for the *Exxon Valdez* Oil Spill Trustee Council.

Heintz, R. A., M. Lindeberg, and A. McCarrel. 2023. Extending the timeline for lingering oil in Prince William Sound. *Exxon Valdez* Oil Spill Long-Term Monitoring Program (Gulf Watch Alaska) Final Report (*Exxon Valdez* Oil Spill Trustee Council Project 21120014-P). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Lindeberg, M. R., J. Maselko, R. A. Heintz, C. J. Fugate, and L. Holland. 2018. Conditions of persistent oil on beaches in Prince William Sound 26 years after the *Exxon Valdez* spill. Deep-Sea Research Part II 147:9-19.

Michel, J., and D. Esler. 2010. Summary of lingering oil studies funded by the *Exxon Valdez* Oil Spill Trustee Council. *Exxon Valdez* Oil Spill Trustee Council.

Michel, J., D. Esler, and Z. Nixon. 2016. Studies on *Exxon Valdez* Lingering Oil: Review and Update on Recent Findings – February 2016. Prepared for the *Exxon Valdez* Oil Spill Trustee Council.

2. Products:

No publications, reports, presentations, or public outreach were produced in FY24.

3. Coordination and Collaboration:

This project is part of the EVOSTC Long-Term Research and Monitoring program Gulf Watch Alaska-Long Term Ecosystem Monitoring (GWA-LTRM), which is administered, in part, by the Prince William Sound Science Center. The Lingering Oil project is inextricably linked with the Nearshore Component of GWA-LTRM. In FY24, as prescribed by an update to the Lingering Oil proposal, mussels were collected from all Nearshore Component sampling sites across the spill affected region for inclusion in NOAA's Mussel Watch program. Mussel Watch analyzes a large number of contaminants in mussels, including PAHs, which are of most relevance as a contribution to this Lingering Oil project. The Lingering Oil field team was led by Nearshore Component principal investigators (Esler and Monson). Gear, personnel, and vessels are shared between Nearshore and Lingering Oil Components.

Otherwise, there was no coordination and collaboration to report with the Alaska SeaLife Center, Prince William Sound Science Center, EVOSTC Mariculture projects, EVOSTC Education and Outreach projects, individual EVOSTC projects, Trustee or management agencies (aside from USGS and NOAA), or Native and local communities.

4. Response to EVOSTC Review, Recommendations and Comments:

September 2024 EVOSTC Science Panel Comment:

This project proposes a low-cost presence/absence approach to intermittent monitoring, along with chemical analyses in FY25, that can be combined with previous EVOSTC-funded modeling efforts to provide managers with contemporary data on the status of lingering oil. Sampling is scheduled for every 5 years. No work was performed for this project during FY22 and FY23. Field sampling for lingering oil and analysis of sampling was scheduled for FY25. As communicated to us by the ED, the PIs submitted a proposal amendment request to decrease the number of samples associated with collecting sediments and conducting PAH composition analysis of lingering oil and increase mussel collections to reduce disturbance and release of oil, considering recent recommendations made by Heintz et al. (2023). Sampling has been changed from FY25 to FY24 to coordinate with the NOAA Mussel Watch Program and the next 5-year sampling will occur in FY29 (instead of FY30). We had two questions: are there less invasive ways to sample for oil with minimal disturbance? Using mussels to evaluate contaminants is a

useful tool but limited in scope. If oil is detected, how will it be determined if it is EVO or a different source of oil?

Besides the questions above, the Science Panel does not have any concerns at this time and looks forward to the next progress update.

PI Response:

The Science Panel had two questions:

Are there less invasive ways to sample for oil with minimal disturbance?

The main impetus for revision of the Lingering Oil proposal was to minimize sediment disturbance and any associated release of oil, following the recommendations of Heintz et al. (2023). However, it was determined that there was still value in getting oil samples for PAH analysis to (1) confirm its origin and (2) continue the timeline tracking weathering state. Therefore, we proposed a much-reduced design for excavating sediments. That plan was instituted in September 2024, and it resulted in many fewer pits dug relative to the original plan, while also providing samples for PAH analysis. Unfortunately, there are no practical field methods for collecting oil samples other than excavating pits. We feel that our revised strategy optimized the balance between minimized disturbance and the value of collecting samples of lingering oil.

Using mussels to evaluate contaminants is a useful tool but limited in scope. If oil is detected, how will it be determined if it is EVO or a different source of oil?

Mussels are a widely used biosampler for contaminants, which is the premise of NOAA's Mussel Watch program. Evidence of PAH contamination in mussel tissue would not indicate the source, as the Science Panel notes. However, inference about the source of PAHs would be drawn in two ways: (1) we will contrast PAH levels between mussels sampled across the northern Gulf of Alaska at Nearshore Component sites against those collected at Lingering Oil sites. If the Lingering Oil sites had elevated PAHs, we would infer that lingering *Exxon Valdez* oil was the likely source. There is a considerable body of literature addressing sources of hydrocarbons in Prince William Sound that would support that inference. (2) For those sites where we found oiled sediment, PAH analyses will indicate whether that oil is from the *Exxon Valdez*. Elevated PAHs from those sites, or other Lingering Oil sites, are likely to have originated from the oil source in those contaminated sediments.

2024 EVOSTC Executive Director Comments

I concur with the Science Panel. Staff do not have any concerns at this time.

2024 EVOSTC PAC Comments

Stekoll asked about oil sampling. Esler stated they collect jars of oily sediment that are archived for weathering analysis as needed. They did not question the oil was from EVOS, so there was no fingerprinting. Stekoll suggested that is an assumption, and there should be funding to analyze it. Mandy Lindeberg, NOAA, noted the Council did not fund oil testing, which was part of the project proposal. Esler stated they are also analyzing mussels for PAHs and other contaminants.

Whissel asked if they plan to continue the study indefinitely. Esler stated the Council funded the project, and hopefully there is funding in 2030. Mussel Watch is separate and will carry on, and they may want to prolong lingering oil monitoring.

Cunningham introduced a motion to move forward with no concerns. Whissel seconded, and there was no opposition. The motion carried unanimously.

5. Budget:

In the original proposal, no spending was proposed for this project for FY24. The approved amended proposal shifted some spending from FY25 to FY24 (see below). However, because the revised proposal and budget were approved late in the year (July 2024), transfer of funds did not occur in time to support field research in September 2024 (i.e., cumulative spending to date is nil). Other funds were used and will be re-balanced with the designated funding that will arrive in FY25.

***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	$12,600	$4,200	$0	$16,800	$0
Travel	$0	$0	$5,000	$0	$0	$5,000	$0
Contractual	$0	$0	$0	$75,000	$0	$75,000	$0
Commodities	$0	$0	$17,000	$0	$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	$34,600	$79,200	$0	$113,800	$0
General Administration (9% of subtotal)	$0	$0	$3,114	$7,128	$0	$10,242	N/A
PROGRAM TOTAL	**$0**	**$0**	**$37,714**	**$86,328**	**$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.

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FY22-26	Project Number: 24220114-P Project Title: Lingering Oil PI(s): Esler (USGS) & Lindeberg (NOAA)	SUMMARY TABLE