

Report to Support Request for Supplemental Environmental Impact Statement for the Matagorda Ship Channel Improvement Project

Jessica Dutton, Ph.D.

I. Expert Qualifications

I am an Associate Professor in the Biology Department within the College of Science and Engineering at Texas State University. I have been employed at Texas State University since August 2015. My research focuses on the accumulation of trace elements, particularly mercury and selenium, in marine organisms, specifically bony fishes, sharks, odontocetes (toothed whales and dolphins), and waterbirds. The data I collect is used to determine whether mercury tissue concentrations are above the threshold level for adverse biological effects, if selenium has a protective effect against mercury toxicity, and the risk posed to human health from consuming mercury contaminated seafood. I have published 20 papers to date in peer-reviewed scientific journals and two book chapters. Please refer to the CV attached to this document for further information about my credentials.

II. Overview of Report

This report supports the letter sent by Earthjustice to the U.S. Army Corps of Engineers on October 25, 2021, requesting a Supplemental Environmental Impact Statement (EIS) for the U.S. Army Corps of Engineers' proposed dredging and sediment disposal activities to widen and deepen the Matagorda Bay shipping channel. This project proposes to dredge to -51 ft MLLW (project depth of -47 ft. MLLW plus two feet of allowable over-depth dredging and an additional two feet of advance maintenance dredging) and to create a new 1,200 ft. turning basin in the Alcoa Superfund Site Closed Area. The current concentrations of mercury at the depths of the proposed dredging from the Matagorda Ship Channel Improvement Project (MSCIP) in the closed area of Lavaca Bay are unknown.

The purpose of this report is to provide my expert opinion on new information that has become available since the EIS was published in 2019 (U.S. Army Corps of Engineers, 2019a) regarding the mercury impacts of the proposed dredging project. This new information includes:

- Alcoa's mercury sediment sampling data for a proposed loading dock adjacent to the ship channel (August 2021)
- EPA's Third Five-Year Review Report for Alcoa (Point Comfort)/Lavaca Bay Superfund Site (August 2021)
- Montagna et al, "Evaluation of the proposal for widening and deepening the Matagorda ship channel" (September 2021)
- The U.S. Army Corps of Engineers' Sampling and Analysis Plan for mercury and other contaminants "SAP- Matagorda Ship Channel Improvement Project, Matagorda Peninsula to Point Comfort" (from bids documents dated September 2021)

My opinion is that this new information demonstrates there will very likely be long-term adverse impacts to water quality, biota, fisheries, and human health within Lavaca Bay and Matagorda Bay due to the mobilization of mercury from the proposed Matagorda Bay dredging project. In addition, my opinion is that the U.S. Army Corps of Engineers' post-EIS sediment sampling plan is inadequate to evaluate the levels of mercury in sediment at depths that would be dredged in the Superfund Site Closed Area. Therefore, I recommend that the U.S. Army Corps of Engineers revise its sampling plan and undertake a Supplemental EIS to evaluate the serious risks of this project on the environment and human health.

III. Summary of Expert Opinion on EIS based on New Information and Circumstances

I have read the relevant sections of “Matagorda Ship Channel, Port Lavaca, Texas: Feasibility Report and Environmental Impact Statement, Review of Completed Projects, Calhoun and Matagorda Counties” (“EIS”) and “Appendix B – Environmental Resources. Matagorda Ship Channel, Port Lavaca, Texas” documents published in 2019 by the U.S. Army Corps of Engineers (U.S. Army Corps of Engineers, 2019a,b). I have summarized the sections of the EIS and Appendix B pertaining to mercury below and provided my expert opinion based on new information and circumstances since the EIS.

1. Sediment and Water Quality Impacts

The EIS acknowledges that mercury is an environmental concern within the Alcoa Superfund Site Closed Area (page 22) and “the primary concern with regard to sediment quality within the project area” due to dredging, placement of dredged material, and building access channels for equipment potentially disturbing bay sediments which contain high concentrations of mercury (page 131). The EIS also states that “While the project will not involve dredging in the areas that have the highest mercury concentrations, there will be some amount of resuspension of sediment associated with the construction dredging process, and there is some concentration of mercury in sediments. However, **no significant change in ambient or sediment mercury concentrations are expected**” (Appendix B, page 34).

My Opinion:

The current knowledge of sediment mercury concentrations at depth in the Closed Area does not support the conclusion of the EIS that “no significant change in ambient or sediment mercury concentrations are expected.” Instead, dredging and sediment disposal in the Closed Area will resuspend buried mercury contaminated sediments, which is likely to increase ambient mercury concentrations in the surface sediment and water column. During previous dredging activity, mercury was resuspended into the water column in the Alcoa Closed Area (Bloom and Lasorsa, 1999).

The proposed widening and deepening of the existing channel and new turning basin will require the removal of approximately 2.5 million cubic yards (mcy) of sediment in the Closed Area at depths of 37 ft in the new turning basin (Environmental Integrity Project, 2021, page 2; U.S.

Army Corps of Engineers, 2019a, page 79). However, long-term monitoring studies have only measured mercury concentrations in **surface** sediment (0-5 cm depth) (U.S. EPA, 2021, 2016, 2011; Alcoa, 2003), and it is not currently known at what sediment depths elevated concentrations of mercury may be found. While the mercury concentrations in **surface** sediment in the Closed Area are on a downward trend and many of the sampling locations from the monitoring of the Superfund site now have sediment mercury concentrations below U.S. EPA's remediation action objective (0.5 mg/kg), little information is available about what depth the mercury-rich sediment layer is at, how thick the layer is, and what the mercury concentrations are within that layer.

The last publicly available studies that included a sediment mercury depth profile to determine the depth in the sediment where the highest concentrations of mercury are found and report the mercury concentrations within that layer occurred in the late 1990s (Alcoa, 1999; Bloom et al., 1999), and there has been over 20 years of sedimentation since then. Also, neither of the 1999 studies included sediment samples from the proposed work area. As a result, the depth of the mercury-rich sediment layer and the mercury concentrations within that layer in sediment where the shipping channel will be widened and the turning basin created is not known. Bloom et al. (1999) reported that the highest measured sediment mercury concentrations were between 10 and 30 cm depth. Based on the known annual sedimentation rate of 0.3 to 2.0 cm/yr (U.S. EPA, 2001; Santschi et al., 1999), the mercury levels may now be greatest between 17.5 and 80 cm depth in sediment that has not been disturbed by natural (e.g., storms) or human activities (e.g., dredging) in the past 22 years. A depth study published by Alcoa (1999) reported mercury concentrations at 29 sites within and near the Closed Area. The two closest sampling stations to the proposed work area, ST00261 and LVB0930, had a peak mercury concentration at approximately 38 cm and 17 cm depth, respectively. These depths are comparable to the Bloom et al. (1999) study; however, the mercury-rich layer at ST00261 may now be between 46 and 88 cm depth based on the annual sedimentation rate.

In 2021, Alcoa collected 54 sediment samples at various depths adjacent to the proposed dredge area within the Closed Area and measured the mercury concentration (but as discussed in Section IV, this study did not take depth profiles). Ten of those samples had a sediment concentration greater than the U.S. EPA's remedial action objective of 0.5 mg/kg, which is the level that the U.S. EPA deemed to be an "unacceptable risk" to the health of biota and humans (U.S. EPA, 2001; Section 8-1, page 82-84). These 10 elevated mercury concentrations were found at depths between 52 and 183 cm (Alcoa, 2021; see Section IV for further information).

Further studies building on the recent Alcoa sampling data at depth are needed to determine how much mercury is stored in the sediment that is proposed to be dredged and could be remobilized in order to comprehensively evaluate the risks to water quality, biota, and human health. The risk of mercury entering the food web is not only a concern in the Closed Area but also in other parts of the bay system if the contaminated sediment is undetected and is placed in project placement areas outside of the Closed Area.

Finally, in my opinion, the new information does not support the EIS's conclusion that the proposed dredging and sediment disposal activities will not significantly impact water quality. A

previous study using Lavaca Bay sediment demonstrated that 5% of sediment bound methylmercury (MeHg; the most toxic form of mercury to biota and humans) is released into the water column when sediment is resuspended (Bloom and Lasorsa, 1999). This MeHg can then enter the planktonic food web, bioaccumulate in organisms, and biomagnify up the food web. If the concentrations of mercury at depth in the proposed dredging area are higher than the U.S. EPA's remediation standard, like the levels found in the 2021 Alcoa study, this could lead to "unacceptable risks" from a significant amount of mercury being released into the water column when sediment is resuspended from dredging.

The EIS also acknowledges there will be an expected increase in the salinity of the bay system (page 144). The expected salinity increase within the bay system can influence the accumulation of mercury from the dissolved phase (water) into biota, potentially increasing the mercury body burden (see Section VI for further explanation).

2. Risks to Biota and Human Health

The EIS acknowledges that mercury is an environmental concern within the proposed dredging and sediment disposal areas but does not address the potential resulting impacts on biota within and near the Alcoa Superfund Closed Area and the risk to human health from consuming mercury contaminated seafood.

My Opinion:

The proposed dredging can remobilize mercury buried at depth into surface sediment and the water column in three ways: 1) resuspension during dredging to widen the shipping channel and create the turning basin; 2) sediment disposal (both inside and outside of the Closed Area); and 3) while creating channels for the movement of equipment. Once resuspended, mercury can desorb from sediment and enter the planktonic food web or mercury-bound sediment can settle out of the water column and accumulate in surface sediments, therefore entering the benthic food web. Mercury can then accumulate in biota residing in the Closed Area and potentially be transferred to the open area as fish, crabs etc move between the two regions. In addition, resuspended mercury may be transferred out of the Closed Area to the open area via water currents or via placement of dredged sediment in bay placement areas. Ultimately, this will likely impact the health of biota inside and outside of the Closed Area and human health through the consumption of mercury contaminated seafood.

*The effects of mercury on biota are well-known. Previous studies have determined that exposure to mercury has resulted in genotoxicity and stress in eastern oysters (*Crassostrea virginica*) in the Closed Area (Bissett et al., 2009a,b) and greater mercury concentrations in Forster's tern (*Sterna forsteri*) and black skimmer (*Rynchops niger*) eggs collected from the western side of Lavaca Bay compared to San Antonio Bay (King et al., 1991). Adverse biological effects, particularly reproductive effects, can occur in fish when the muscle mercury concentration exceeds 0.5 µg/g wet weight (Scheuhammer et al., 2015). Mercury exposure has been shown to result in several deleterious health effects in fish, including, but not limited to, reduced gill and*

liver function, altered behavior, neurotoxic effects, cardiovascular effects, reduced fecundity and hatching success, pericardial edema, reduced heart rate, physical deformities, and increased mortality during early development (Scheuhammer et al., 2015, Wang et al., 2015, Adams et al., 2010; Crump and Trudeau, 2009; Devlin, 2006; Drevnick and Sandheinrich, 2003; Webber and Haines, 2003; Latif et al., 2001; Ribeiro et al., 2000; Samson and Shenker, 2000; Weis et al., 1981; Weis and Weis, 1977). Health effects at the individual level can ultimately impact population numbers for a given species if the mortality rate increases and/or the reproductive success decreases because of mercury exposure.

The U.S. Army Corps of Engineers' proposed sampling and analysis plan does not include lab and field-based studies to investigate whether mercury that could be remobilized during the proposed work poses a threat to the health of biota within the Closed Area and in the bays. The EIS does also not address this issue. A Supplemental EIS is needed to evaluate this risk and incorporate the results of additional sampling and studies by the U.S. Army Corps of Engineers.

Currently, the Texas Department of State Health Services (TDSHS) prohibits the taking of fish and shellfish for human consumption from the Lavaca Bay Closed Area due to elevated mercury concentrations in fish and shellfish. However, people could still consume contaminated seafood as a result of the dredging project even if the area remains closed due to currents redistributing contaminated sediment to the open area, mercury being remobilized from sediment that is placed in the open area, or species moving from the Closed Area to the open area where they are caught. The EIS does not evaluate the risk to human health from the consumption of mercury contaminated seafood. The predominant way humans are exposed to mercury is through seafood consumption (Silbernagel et al., 2011). This can ultimately impact human health (e.g., negatively impact the central nervous system, cardiovascular system, digestive system, renal system, reproductive system, and immune system, and be maternally transferred from mother to child via the placenta and breastmilk; Rice et al., 2014) if contaminated seafood is consumed and have an economic impact on commercial and recreational fisheries within the bay. A Supplemental EIS is needed to evaluate whether mercury in the dredged material could potentially impact human health and the impact this could have on fisheries within Lavaca Bay.

3. Impacts on Fisheries

The EIS states that “none of the proposed future projects is expected to impact commercial or recreational fisheries in the study area” (page 142).

My Opinion:

*In my opinion, there is no evidence to support this conclusion based on new information since the EIS. Mercury concentrations in red drum (*Sciaenops ocellatus*) and juvenile blue crab (*Callinectes sapidus*) are on a downward trend in the Closed Area (U.S. EPA, 2021), but the resuspension of mercury because of dredging and sediment disposal activities could cause tissue mercury concentrations to increase again. While the area is currently closed to the taking of fish and shellfish (although catch and release is allowed), the plan is to reopen the area in the future when mercury concentrations are comparable to the open area. Furthermore, species that are*

currently caught in the open area may move between the open and Closed Area; as a result, mercury maybe accumulated by species in the Closed Area and then transported to the open area where they are fished for commercially or recreationally.

Outside the Closed Area, the U.S. Army Corps of Engineers plans to place dredged sediment in placement areas in Lavaca Bay and Matagorda Bay, which means that any mercury in the sediment would be resuspended and transported to new areas, which could cause higher levels of mercury in fish and shellfish throughout Lavaca and Matagorda Bays. For example, a recent study found that the new sediment placement areas along the western side of the Matagorda Ship Channel would cover over 800 acres of oyster reefs (Montagna et al., 2021). The U.S. Army Corps of Engineers' statement that no contaminated sediment would be placed in the placement areas can only be true if the location and extent of mercury contamination in the dredged sediments is known. However, as discussed briefly in Section III.4. and more extensively in Section VII, the U.S. Army Corps of Engineers' current sampling plan will not provide this needed information about mercury levels at depth in the sediment. Therefore, it is very likely that mercury contaminated sediments will be placed in new placement areas as part of the dredging project. Based on several of the reported sediment mercury concentrations adjacent to the ship channel in the 2021 Alcoa study being greater than EPA's remedial action objective of 0.5 mg/kg, it is very likely that the sediment in the ship channel is also contaminated above these levels and could cause harm to commercial and recreational fisheries.

4. Additional Sediment, Water, and Biota Testing Needed

The EIS states that sediment testing to determine the concentration of a suite of contaminants, including mercury, will be undertaken by the U.S. Army Corps of Engineers during the pre-construction, engineering, and design phase (page 132 and Appendix B page 35). The measured sediment concentrations will be used to determine whether mercury concentrations are high enough to be toxic to biota (page 132).

My Opinion:

The U.S. Army Corps of Engineers' current sampling and analysis plan (U.S. Army Corps of Engineers, 2021a), which was released after the EIS, will not provide the information needed to determine the concentration of mercury in sediment that will be dredged and the impact of mercury exposure on water quality and the health of biota within and near the Closed Area (see Section VII for further information).

The U.S. Army Corps of Engineers sampling plan will only sample surface sediment, however, as discussed above, the greatest mercury concentrations are found at depth. In addition, the proposed sampling and analysis plan will only collect three sediment samples within the entire Closed Area and there are no plans to carry out lab-based toxicity tests on biota (see Section VII for further information).

The U.S. Army Corps of Engineers' sampling and analysis plan needs to be updated and the results should be incorporated into a Supplemental EIS to evaluate potential risk to water quality, biota, and human health from the resuspension of mercury.

IV. New information since the EIS: Alcoa 2021 Sediment Sample Results and Dredge Plan in Support of the Calhoun Port Authority (CPA) Liquid Docks Project.

In August 2021, Alcoa sent a letter to the U.S. EPA and Texas Commission on Environmental Quality (TCEQ) with the results of a small study that investigated mercury concentrations in sediment collected at depth from 54 locations adjacent to the proposed dredge area within the Closed Area (Alcoa, 2021). Ten of those sites had a sediment mercury concentration that exceeded the U.S. EPA's 0.5 mg/kg target sediment clean-up goal (highest measured mercury concentration was 3.28 mg/kg at 91 cm depth). These 10 elevated mercury concentrations were found at a depth between 52 and 183 cm.

My Opinion:

The findings of this study confirm that elevated concentrations of mercury are found at depth and that this mercury could be resuspended into the water column through the dredging and sediment disposal activities.

Samples were collected at various depths throughout the study area, ranging from < 6 cm (< 0.2 ft) to 183 cm (6 ft) beneath the sediment surface. The reported sediment mercury concentrations reflected this inconsistency in depth sampling with shallower samples having a mercury concentration < 0.5 mg/kg and deeper samples having a higher mercury concentration (> 0.5 mg/kg). At sampled sediment depths \geq 52 cm (1.7 ft), 10 sites had a mercury concentration > 0.5 mg/kg, with reported mercury concentrations ranging between 0.730 mg/kg at 52 cm depth and 3.28 mg/kg at 91 cm (3 ft) depth. This study should have included a depth profile at each site to determine how the mercury concentration changed with increasing depth below the sediment surface and identify the depth and thickness of the mercury-rich sediment layer. It is not surprising that mercury concentrations are lower in shallower sediment samples due to sedimentation over the past two decades. I expect that if a depth profile was done at all sites, then mercury concentrations exceeding the U.S. EPA's 0.5 mg/kg target sediment clean-up goal would be found at most sites. Furthermore, at sites where mercury concentrations exceeded 0.5 mg/kg, I expect the mercury concentration is even higher than reported because a random depth was sampled and it's unlikely it corresponded to the depth where the peak mercury concentration would be found.

I did not have this document in November 2021 when I wrote my opinion about the U.S. Army Corps of Engineers' "Matagorda Ship Channel Improvement Project, Matagorda Peninsula to Point Comfort (USACE) Sampling and Analysis Plan." The results of this small study only strengthens the need for the U.S. Army Corps of Engineers to update their sampling and analysis plan and the findings incorporated into a Supplemental EIS. The U.S. EPA has determined that exposure to a sediment mercury concentration > 0.5 mg/kg poses an "unacceptable risk" to the health of biota and humans (U.S. EPA, 2001; Section 8-1, page 82-84); therefore, extensive sediment sampling and mercury analysis should be carried out to understand and minimize this risk.

V. New information since the EIS: U.S. EPA's Third Five-Year Superfund Report

The U.S. EPA published its third five-year review report for the Alcoa/Lavaca Bay Superfund Site in August 2021 (U.S. EPA, 2021). I have read the report and written a summary and my opinion of sections of the report that provide new information since the 2019 EIS was published below.

There is ongoing monitoring of mercury concentrations in sediment, red drum, and blue crab in the Closed Area to determine whether mercury concentrations are decreasing over time and reaching concentrations that are comparable to adjacent open water mercury concentrations in Lavaca Bay. The 2021 U.S. EPA report states that “mercury concentrations in the juvenile blue crabs in the closed area are decreasing and approaching levels found in juvenile blue crabs in the adjacent open area” and “the mean concentration of mercury measured in the closed area red drum in 2020 represents the lowest mean concentration measured in the fish/shellfish monitoring program. The 2020 data represent a continuation in the downward trend observed in average concentrations in the closed area red drum” (page 23). However, the mercury concentration in red drum is, on average, still 1.62-times higher in the closed area than in the adjacent open area (0.42 mg/kg and 0.26 mg/kg, respectively; page 23).

The 2021 U.S. EPA report also expresses concern about the proposed dredging and sediment disposal activities in the Closed Area – “It is likely that shipping channel projects could affect ongoing remedial actions in the Closed Area” and “EPA recognizes the potential for negative impacts to the Site by the MSCIP and will engage with the Corps to evaluate any effects to the remedy and ensure proper disposal of material” (page 24). This concern is also listed under the issues/recommendations at the front of the report: Issue “Ongoing and pending improvements to the Matagorda Ship Channel from 2020 to 2024 may need to be monitored to assess how ship channel dredging could affect the remedy”. Recommendation: “Assess the planned ship channel improvements (e.g., the new turning basin and port in the bay area immediately next to the Site) to determine if these dredging activities will affect ongoing remedial actions”.

My Opinion:

Previous field and laboratory-based studies have shown that eastern oyster, brown shrimp (Penaeus aztecus), blue crab, flounder (Paralichthys sp.), black drum (Pogonias cromis), and red drum in the Closed Area can accumulate mercury primarily from their diet, resulting in a mercury body burden that is elevated compared to individuals of the same species outside of the closed area (U.S. EPA, 2021, 2016, 2011; Sagar, 2002; Evans et al., 2000; Palmer Locarnini and Presley, 1996; Palmer and Presley, 1993, Palmer et al., 1993). The U.S. EPA has been monitoring the concentration of mercury in sediment, red drum, and blue crab since 1997. For most sediment sampling locations in the Closed Area, the mercury concentration is now close to the mercury concentration in sediment in the open area, however, this is based only on surface sampling and does not include sediment at the depths of the dredging project. The concentration of mercury in blue crab and red drum is on a downward trend, although red drum are not decreasing at as fast a rate as expected.

The proposed dredging work could resuspend mercury into the Closed Area and if it accumulates in blue crab and red drum will reverse the overall downward trend in mercury concentrations that have been observed over the past 24 years. The Lavaca Bay Closed Area is an excellent case study on how long it takes for species to reduce their mercury body burdens to a concentration comparable to opens waters and what their body burdens would have been prior to the discharge of mercury into the Bay. The resuspension of mercury could ultimately reverse the good work that has been done to date and prolong the time it will take for the Closed Area to be reopened to fishing.

I agree with the concerns that the U.S. EPA included in their report regarding the effect of dredging activities on ongoing remedial actions. The U.S. Army Corps of Engineers' sampling and analysis plan will not determine whether the resuspension of mercury could cause an increase in tissue mercury concentrations in blue crab and red drum, nor does the EIS evaluate this. Extensive research is needed by the U.S. Army Corps of Engineers prior to starting work to understand the possible impacts of mercury exposure on biota (see Section VII for further information) and the results incorporated into a Supplemental EIS.

VI. New information since the EIS: Montagna et al. Study

Paul Montagna et al. at Texas A&M University – Corpus Christi published a report funded by the Matagorda Bay Mitigation Trust in September 2021 evaluating the proposal for widening and deepening the Matagorda Ship Channel (Montagna et al. 2021). I have read the report and written a summary and my opinion of sections of the report that pertain to mercury below.

The surficial sediments in Lavaca Bay are predominantly fine-grained mud (page 23) that have favorable conditions for the methylation of mercury. The location of the fine grain sediments in the Closed Area corresponds with the location where the highest sediment mercury concentrations were reported (page 37). The authors concluded that the main area of concern with regards to the remobilization of mercury was at the end of the channel in the Closed Area where the turning basin will be located and the highest sediment mercury concentrations are found (page 36). The report also stresses that mercury may not only be remobilized by the dredging process but could also stay at a slightly elevated concentration in the water column due to continual resuspension by ship wakes (page 38).

The report states that the salinity in Lavaca Bay could increase by 2 ppt (from 20 ppt to 22 ppt), altering water quality and decreasing the secondary production of mollusks and crustaceans (page 15). This could influence the bioavailability, and therefore uptake, of mercury into biota from the dissolved phase.

The report also addresses the issue of the bioaccumulation and biomagnification of mercury in biota (page 38-39). It supports the U.S. EPA's Third Five-Year Review Report (Section V) regarding concerns about the resuspension of mercury halting or reversing the current downward trend of mercury concentrations in red drum.

Finally, the report addresses an emerging area of concern – the interaction between mercury and plastic. The Closed Area of Lavaca Bay has been negatively impacted by both contaminants and future research needs to focus on whether plastic could serve as a vector for the transfer of mercury into biota, with a particular focus on commercial and recreational fisheries. (page 40-42)

My Opinion:

I agree with the findings of this report. The sediment within the Closed Area of Lavaca Bay has the conditions required to promote the methylation of mercury. The only difference of opinion is the study referred to the depth of the mercury layer being between 10 and 30 cm (page 36). This is the depth the layer was at in 1996 when the sediment was collected. However, as discussed in Sections III and IV, it is not known at what depth the highest concentration of mercury is currently at, but I expect it to be at a deeper depth than 10-30 cm because there has been over 20 years of sedimentation since the Bloom et al. (1999) study they referenced. In addition, the Alcoa 2021 study, which was only available after the Montagna et al. report was written, reports the highest mercury concentration around 90 cm depth, but that study did not include depth profiles. The lack of knowledge on the depth at which the highest sediment Hg concentrations are found supports the need for further sediment sampling to be done.

*Salinity is known to influence the uptake of mercury from the dissolved phase (water). I published a study investigating the influence of salinity on the uptake of mercury (inorganic and MeHg) from the dissolved phase in the mummichog (*Fundulus heteroclitus*) in 2011 (Dutton and Fisher, 2011). The study determined that as salinity increased, mercury became more bioavailable and mummichogs accumulated a greater concentration from the dissolved phase [due to uptake at the gills and across the gastrointestinal tract (marine fish drink seawater to osmoregulate)]. Therefore, an increase in salinity of 2 ppt may not only decrease secondary production, but also increase the body burden of mercury. However, it should be noted that this may not impact the overall accumulation of MeHg because >99% of the body burden of MeHg in mummichogs comes from the diet, however, it could influence the accumulation of inorganic mercury because between 57 and 93% is accumulated from the dissolved phase based on biokinetic modelling (Dutton and Fisher, 2014).*

The issue of the interaction between mercury and plastic is an important one to address and should be included in a Supplemental EIS. Lavaca Bay is contaminated with between 185 and 1,850 tons of pre-production plastic pellets and plastic powder that has been released into the bay by Formosa Plastics. In 2019, Formosa Plastics was found in violation of the Clean Water Act (CWA) and agreed to pay \$50 million to settle a lawsuit, the largest settlement of a lawsuit filed by private individuals under the CWA (Venables, 2019). Since the lawsuit, Formosa Plastics has incurred \$3,525,000 in fines for continuing to discharge plastic into Lavaca Bay (Diane Wilson, personal communication). I am currently a Co-Principal Investigator on a three-year study investigating whether mercury binds to plastic, the factors that influence this, and whether plastic could serve as a vector for the transfer of mercury to commercially and recreationally important fish and shellfish. Our findings to date show that mercury does bind to

plastics. If mercury is released into the water column during the dredging and sediment disposal process, it could bind to the plastic and be ingested by wildlife in the bay.

VII. New information since the EIS: U.S. Army Corps of Engineers' Sampling Plan for Mercury and Other Contaminants

The Calhoun Port Authority released the U.S. Army Corps of Engineers' sampling and analysis plan in a September 2021 Request for Proposals (U.S. Army Corps of Engineers, 2021a). I have read the "Matagorda Ship Channel Improvement Project, Matagorda Peninsula to Point Comfort (USACE) Sampling and Analysis Plan" and a summary of my opinions is below. I have already written a report on my concerns about the sampling analysis plan which was submitted to the U.S. Army Corps of Engineers and U.S. EPA on November 23, 2021 (Dutton, 2021). That report supported a letter that was sent to the U.S. Army Corps of Engineers and U.S. EPA by the Environmental Integrity Project on November 12, 2021. A copy of that more detailed report is attached to this report.

My Opinion:

In my opinion, the U.S. Army Corps of Engineers' September 2021 Sampling and Analysis Plan is inadequate to evaluate the potential for the proposed dredging and sediment disposal to cause adverse impacts to biota within Lavaca Bay and human health from mercury contamination. My main concerns are:

- 1. The widening and deepening of the current shipping channel and entire dredging of the new turning basin in the Alcoa Closed Area will remove an estimated 21 mcy of sediment (Rosenberg, 2021). Only three sediment samples will be collected from the region that will be dredged inside the Alcoa Closed Area removing 2.5 mcy of sediment; based on the findings of the small Alcoa 2021 sediment study (Section IV), this is not enough samples. Three sampling locations is inadequate to characterize the sediment, understand the spatial distribution of mercury within the area that will be dredged, and determine the impact of mercury in the dredged material on biota.*
- 2. The methods proposed for the collection of sediment samples (page 1 of the MSCIP sampling and analysis plan) are inadequate to determine the amount of mercury that is stored in the sediment and the depth where the highest mercury concentrations will be found. Grab samples will only sample the first few centimeters of sediment and will not reach the depth where the highest concentrations of mercury will be found.*
- 3. The methods proposed for the collection of water samples (page 1-2 of the MSCIP sampling and analysis plan) are inadequate to determine the concentration of mercury in water. More detail is required on the number of samples that will be collected and the frequency of sampling. To determine baseline water mercury concentrations in the Closed Area, water samples should be collected weekly over several months. Taking*

water samples only once will provide mercury concentrations as a snapshot in time and the mercury concentrations may vary based on recent weather events, changes in stream flow, and runoff from land.

- 4. The objectives on page 1 of the MSCIP sampling and analysis plan states that “The material will be collected and evaluated to determine whether unacceptable adverse impacts could result from dredging and dredged material placement options”. No biota toxicity/bioaccumulation tests or risk assessment studies have been included in the sampling and analysis plan; therefore, this objective cannot be met. To exclude laboratory and field-based studies to determine the risk of mercury exposure to the health of species within the Closed Area is a major omission in this sampling and analysis plan. In comparison, the MSCIP – New Work ODMDS Sampling and Analysis Plan (U.S. Army Corps of Engineers, 2021b) did include plans for laboratory-based experiments.*

Other concerns and my suggestions on how to improve the sampling and analysis plan are included in the report dated November 23, 2021, that is attached to this report (Dutton, 2021). In my opinion, a revised sampling and analysis plan needs to be published.

A Supplemental EIS is needed to incorporate the results of a revised sampling plan. In particular, the Supplemental EIS should address the risk of mercury exposure on water quality, species health, and human health. Laboratory-based toxicity and bioaccumulation studies and measurements of mercury concentrations in wild-caught fish and shellfish within the Closed Area will more accurately determine the risk of mercury exposure on species health and ultimately human health. In addition, the Supplemental EIS should include an estimation on how much mercury could be remobilized in Lavaca Bay due to the dredging and sediment disposal activities. Since the length and width of the channel that will be dredged is known and the proposed update to the sample collection and analysis plan includes identifying the depth within the sediment where the highest concentrations of mercury are found (including the thickness of this layer and mercury concentrations), the amount of mercury that could be remobilized because of the dredging and sediment disposal process can be estimated. Finally, sediment and water mercury concentrations can be used to model the expected trophic transfer of mercury through the benthic and planktonic food web, respectively.

VIII. Conclusion

In my professional opinion, based on new information and studies that have been published since the EIS was released, there will very likely be long-term adverse impacts to water quality, biota, fisheries, and human health from the resuspension of mercury from the dredging project. This new information undermines the conclusions about potential environmental impacts made by the U.S. Army Corps of Engineers in the 2019 EIS, and therefore a Supplemental EIS needs to be published to evaluate the mercury impacts of this proposed dredging project. The Supplemental EIS needs to include how much mercury could be remobilized into Lavaca Bay (including the mercury concentration in the sediment, how thick the mercury layer is and at what depth) to

evaluate the water quality impacts and risk of deleterious health effects to biota due to mercury exposure. In addition, the EIS needs to evaluate the risk to human health from consuming mercury contaminated seafood and the potential economic impact on commercial and recreational fisheries in the area.

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Signed:

A handwritten signature in black ink, appearing to read 'J. Dutton', written in a cursive style.

Jessica Dutton, Ph.D.

February 10, 2022