Quarterly Progress Report

December 2025

Project Title

Trace Element Concentrations in Sediment from the Alcoa (Point Comfort)/Lavaca Bay Superfund Site

Contract # 094

Submitted to

Matagorda Bay Mitigation Trust

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Project Summary

Bauxite contains elevated concentrations of trace elements that are toxic to biota. Through alumina production, bauxite has contaminated bay sediment within the Alcoa Superfund site. The proposed Matagorda ship channel improvement project could remobilize trace elements stored in sediment back into the bay. This study will investigate how sediment trace element concentrations vary with depth throughout the Superfund site, if concentrations exceed sediment quality guidelines for the protection of aquatic life, and calculate biota sediment accumulation factors for benthic organisms. Agencies can use the data to make decisions about how to handle contaminated sediment to minimize its environmental impact.

Project Goals and Objectives

The goal of the proposed project is to a) investigate the concentration of trace elements in sediment in the Alcoa Superfund site with a focus on elements found at elevated concentration in bauxite and red mud, and b) determine if concentrations of individual trace elements are great enough that they could pose a risk to the health of organisms found in the Superfund site.

Objective 1: Investigate how the concentration of each trace element changes with sediment depth to determine a) at what depth the greatest concentrations are found, b) how thick the layer of each element is, and c) how it varies spatially throughout the Superfund site.

Objective 2: Investigate how the concentration of each trace element varies spatially in the surface sediment throughout the Superfund site.

Objective 3: Evaluate whether trace element concentrations exceed known sediment quality guidelines/threshold levels for protection of aquatic life.

Objective 4: Calculate biota sediment accumulation factors (BSAFs) for mollusks, shrimp, crabs, and fishes to determine if they are more enriched in each trace element compared to the sediment.

Project Update

Objective 1

Sediment cores collected in 2023 and 2024 under MBMT contract #041 were used to investigate how the concentration of a suite of trace elements changes with sediment depth and how these concentrations vary spatially throughout the Superfund site. The goal is to analyze at least 20 cores (each core has been sectioned into 1 or 2 cm depth intervals). The investigated trace elements are aluminum (Al), antimony (Sb), arsenic (As), beryllium (Be), bismuth (Bi), cadmium (Cd), cesium (Cs), chromium (Cr), cobalt (Co), copper (Cu), gallium (Ga), iron (Fe), lead (Pb), lithium (Li), manganese (Mn), molybdenum (Mo), nickel (Ni), radium (Ra), selenium

(Se), silver (Ag), thorium (Th), tin (Sn), uranium (U), vanadium (V), and zinc (Zn). The mercury (Hg) concentration in each core was measured under MBMT contract 041.

To date, 27 cores have been selected (Fig. 1). Twenty-four cores have been analyzed and a concentration vs sediment depth profile is being made for each element and core. The remaining three cores have been analyzed and the data is going through quality control.

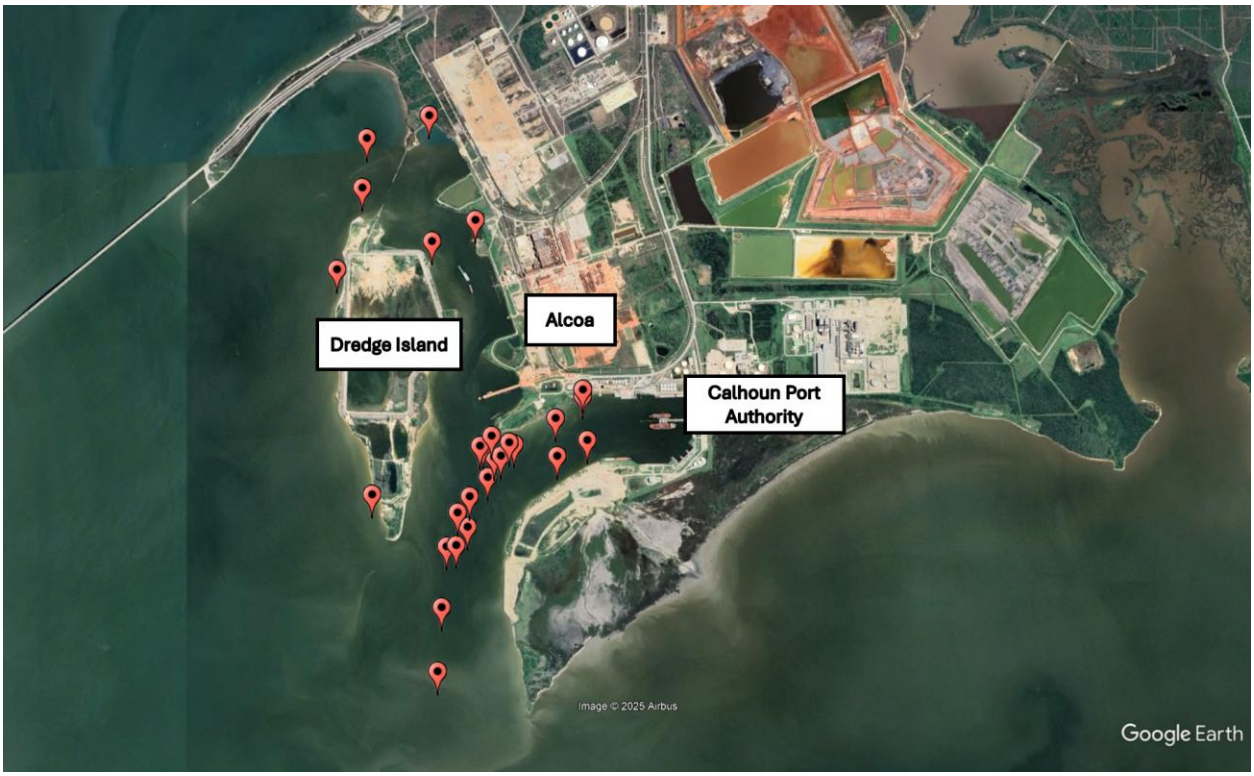

Fig.1. Location of the cores analyzed to date.

Objective 2

The goal was to collect sediment from at least 500 locations (stations) throughout the Superfund site and adjacent areas; however, sediment was collected from 768 stations (Fig. 2). All sediment was collected using a petite ponar grab sampler. At every station, a 0 – 2 cm depth sediment sample was collected and where the grab sampler penetrated deep enough, a 0 – 5 cm depth sample was also collected. Following collection, each sample was stored in a plastic bag (Whirlpak) and once at Texas State University, transferred into a 50 ml trace metal clean centrifuge tube and stored at -20°C.

Each sample is now being freeze dried and powdered, and subsampled for the following analyses: Hg concentration, concentration of other trace elements (same list as objective 1), grain size (coarse vs fine; i.e., sand vs silt/clay), and organic matter content. Progress to date is shown in Table 1.

Fig. 2. Sediment grab sample collection areas.

The sediment collection areas (Fig. 2) and the number of stations sampled in each area are as follows:

A = north of SH-35 (18 stations)

B = Causeway Cove (90 stations)

C = Witco (85 stations)

D = small cove south of Witco (65 stations)

E = front of Alcoa (44 stations)

F = left side of Calhoun Port Authority (90 stations)

G = right side of Calhoun Port Authority (45 stations)

H = east side of Dredge Island (65 stations)

I = west side of Dredge Island (92 stations)

J = Cox Bay (35 stations)

K = Cox Creek (downstream of dam and spillway; 36 stations)

L = Cox Creek (upstream of dam and spillway; 48 stations)

For comparison, 55 stations were also sampled in Port Lavaca (between just north of SH-35 down to Bayfront Peninsula Park).

Table 1. Sample collection locations along with the sample depth (2 or 5 cm) and corresponding number of samples collected (N), and sediment analyses to be completed for the project. MC = samples dried and moisture content determined; Hg = Hg analysis; TE = other trace elements analysis; GS = grain size; OMC = organic matter content. X = analysis completed.

Location	Depth (cm)	N	MC	Hg	TE	GS	OMC
North of Bridge	2	18	X	X		X	
	5	3	X	X		X	
Causeway Cove	2	90					
	5	3	X			X	
Witco North	2	55					
	5	52	X			X	
Witco South	2	30	X				
	5	17	X			X	
South Cove	2	54					
	5	14	X			X	
Entrance to South Cove	2	11					
	5	11					
Front of Alcoa	2	44	X				
	5	16	X			X	
Left Side of Port	2	90					
	5	6					
Right Side of Port	2	45					
	5	3	X			X	
East Side of Dredge Island	2	65					
	5	9					
West Side of Dredge Island	2	92					
	5	7	X			X	
Cox Bay	2	35	X			X	
	5	24	X			X	
Cox Creek	2	36	X			X	
	5	13	X			X	
Cox Reservoir	2	48	X			X	
Port Lavaca	2	55	X			X	
	5	3	X			X	

Goals for the Next Quarter

- Continue measuring trace element concentrations in selected cores and plot the concentration of each element against depth (Objective 1)
- Start freeze drying and subsampling the grab samples for further analysis (trace element concentrations, grain size, organic matter content, moisture content) (Objective 2)