

**PROGRESS REPORT**

**FEBRUARY 28, 2026**

**Project title: Assessment of groundwater quality and  
dynamics near Formosa plant and Alcoa Superfund Site,  
Lavaca Bay**

**Submitted to:**

Matagorda Bay Mitigation Trust

**Performing Laboratory:**

Texas A&M University at Galveston

**Authors:**

Dr. Dini Adyasari

Dr. David Hala

Dr. Karl Kaiser

## **Assessment of groundwater quality and dynamics near Formosa plant and Alcoa Superfund Site, Lavaca Bay**

### **Personnel**

#### **Principal Investigators:**

Drs. Dini Adyasari, David Hala, Karl Kaiser

#### **Consulting MBMT Project Coordinator:**

Mr. Steven J. Raabe

#### **Location(s):**

Texas A&M University at Galveston

#### **Project Duration:**

01 September 2025 – 31 August 2028

#### **Objectives:**

Objectives 1: Assess the extent of hydrologic connectivity between aquifers and surface water in Lavaca Bay.

Objectives 2: Quantify the contaminant concentration in groundwater and identify the sources of pollutants.

Objectives 3: Conduct public education outreach to well owners and stakeholders regarding groundwater pollutants and their wells' susceptibility to contamination.

## 1. INTRODUCTION

### 1.1 Background

This project investigates groundwater quality and subsurface contaminant transport near the Formosa Plastic Corporation and Alcoa Superfund Site in Lavaca Bay, where groundwater quality has not been previously tested. This project addresses the funding priority of Environmental Research by examining groundwater recharge-discharge processes and contaminant transport in a heavily industrialized area, as well as the associated public health risks. The knowledge gained will inform coastal management and water resource strategies, and aid state organizations in establishing regular monitoring protocols and offering well protection measures to local communities.

In this second progress report (December 1<sup>st</sup>, 2025 – February 28<sup>th</sup>, 2026) we provide a list of key accomplishments as per the second quarter of Year 1 of the project.

## 2. KEY UPDATES

Objectives 1: Assess the extent of hydrologic connectivity between aquifers and surface water in Lavaca Bay.

- Field activities for this objective are scheduled for Summer 2026.

Objectives 2: Quantify the contaminant concentration in groundwater and identify the sources of pollutants.

- We collected approximately 26 groundwater samples between October-December 2025 in Lavaca and Matagorda Bay area (Table 1). Laboratory analyses were conducted to measure parameters included in EPA Drinking Water Standards, including pH, nitrate, heavy metals, total coliform and *E.coli*, Total Dissolved Solids (TDS), and major ions (fluoride, chloride, sulfate).

*Table 1. Sampling Sites and Collection Dates*

| <b>Sample ID</b> | <b>Date</b> | <b>Time</b> | <b>Longitude</b> | <b>Latitude</b> |
|------------------|-------------|-------------|------------------|-----------------|
| CH-1             | 12/6/2025   | 11:05       | -96.4526         | 28.68357        |
| CH-11            | 12/17/2025  | 12:20       | -96.7017         | 28.40934        |
| CH-12            | 12/17/2025  | 13:08       | -96.6146         | 28.40953        |
| CH-13            | 12/6/2025   | 10:18       | -96.4783         | 28.68672        |
| CH-14            | 12/17/2025  | 14:22       | -96.7621         | 28.56986        |
| CH-2             | 12/6/2025   | 12:08       | -96.4224         | 28.67543        |
| CH-3             | 12/6/2025   | 12:58       | -96.4172         | 28.67212        |
| CH-4             | 12/17/2025  | 13:13       | -96.6646         | 28.69108        |
| CH-5             | 12/17/2025  | 14:10       | -96.6837         | 28.68209        |
| CH-6             | 12/17/2025  | 14:52       | -96.6908         | 28.67669        |

| Sample ID | Date       | Time  | Longitude | Latitude |
|-----------|------------|-------|-----------|----------|
| CH-7      | 12/17/2025 | 10:46 | -96.576   | 28.58289 |
| CH-8      | 12/17/2025 | 12:00 | -96.5477  | 28.55605 |
| CH-9      | 12/17/2025 | 11:14 | -96.7952  | 28.52945 |
| MG-1      | 11/22/2025 | 12:25 | -95.6935  | 28.9503  |
| MG-10     | 12/6/2025  | 12:15 | -96.2087  | 28.74743 |
| MG-11     | 12/6/2025  | 13:13 | -96.1677  | 28.7266  |
| MG-13     | 12/6/2025  | 10:20 | -96.3551  | 28.6454  |
| MG-15     | 11/22/2025 | 11:31 | -95.9576  | 28.94693 |
| MG-15p    | 11/22/2025 | 11:25 | -95.9576  | 28.94693 |
| MG-16     | 11/22/2025 | 12:37 | -95.7907  | 29.04188 |
| MG-16b    | 11/22/2025 | 13:08 | -95.7907  | 29.04188 |
| MG-2      | 11/22/2025 | 13:30 | -95.7239  | 28.95147 |
| MG-3      | 11/22/2025 | 11:50 | -95.6731  | 28.85911 |
| MG-4      | 11/22/2025 | 10:45 | -95.8705  | 28.96448 |
| MG-5      | 11/22/2025 | 10:00 | -95.875   | 29.02683 |
| MG-8      | 11/22/2025 | 10:00 | -95.9497  | 28.99796 |

- Among the parameters measured, several exceeded EPA Drinking Water Standards limits (Table 2). Although 18 out of 26 samples showed detectable total coliform (>0), *E. coli* was not detected. This finding suggests that the coliform bacteria most likely originate from soil or environmental sources rather than sewage contamination. Most exceedances were associated with secondary standards and therefore do not pose a health concern. Elevated TDS and chloride exceedances, with minimal sulfate exceedance, likely reflects natural coastal mineralization. Other parameters, such as nitrate and heavy metals, were within standard limits.

Table 2. Parameters Exceeding EPA Drinking Water Standards (n = 26)

| Parameter              | EPA Drinking Water Standard | Number of samples exceeding standard limits |
|------------------------|-----------------------------|---|
| Total coliform         | Primary                     | 18  |
| Chloride               | Secondary                   | 12  |
| Sulfate                | Secondary                   | 1   |
| Total Dissolved Solids | Secondary                   | 20  |

- Groundwater samples have been processed for microplastic analysis and are expected to be ready for quantification in the next project quarter.

- We are currently developing an expansive PAHs and PCBs method to quantify these persistent pollutants in the water samples. A full list of the analytes is listed in Table 3 below.

*Table 3. List of PAHs and PCBs that will be monitored in water samples. The list shows the analyte names, their abbreviations, chromatographic retention times (mins), major quantifying ion (Quant Ion), and adjacent qualifying ions that will be used to confirm the presence of each analyte (Qual Ion 1 and Qual Ion 2).*

| Name                       | Abbreviation | RT (mins) | Quant Ion | Qual Ion 1 | Qual Ion 2 |
|----------------------------|--------------|-----------|-----------|------------|------------|
| Naphthalene                | Nap          | 7.41      | 128.1     | 127.1      | 126.1      |
| Acenaphthylene             | Acy          | 10.81     | 152.1     | 151.1      | 150.1      |
| Acenaphthene               | Ace          | 11.23     | 153.1     | 154.1      | 152.1      |
| Fluorene                   | Flu          | 13.25     | 166.1     | 165.1      | 163.1      |
| Phenanthrene               | Phe          | 19.87     | 178.1     | 176.1      | 179.1      |
| Anthracene                 | Ant          | 20.17     | 178.1     | 176.1      | 179.1      |
| Fluoranthene               | Fla          | 31.07     | 202.1     | 200.1      | 203.1      |
| Pyrene                     | Pyr          | 34.02     | 202.1     | 200.1      | 203.1      |
| Benzo[a]anthracene         | B(a)Ant      | 47.73     | 228.1     | 226.1      | 229.1      |
| Chrysene                   | Chr          | 48.65     | 228.1     | 226.1      | 229.1      |
| Benzo[b]fluoranthene       | B(b)Fla      | 60.37     | 252.1     | 250.1      | 253.1      |
| Benzo[k]fluoranthene       | B(k)Fla      | 60.62     | 252.1     | 250.1      | 253.1      |
| Benzo[a]pyrene             | B(a)Pyr      | 64.68     | 252.1     | 250.1      | 253.1      |
| Dibenzo[a,h]anthracene     | D(a,h)Ant    | 78.42     | 278.1     | 279.1      | 280.1      |
| Indeno[1,2,3-cd]pyrene     | I(c,d)Pyr    | 78.39     | 276.1     | 272.1      | 273.1      |
| Benzo[ghi]perylene         | B(g,h,i)Per  | 83.22     | 276.1     | 138.0      | 277.1      |
| Perylene                   | Per          | 66.02     | 252.1     | 250.1      | 235.1      |
| Benzo[e]pyrene             | B(e)Pyr      | 64.12     | 252.1     | 250.1      | 253.1      |
| Benzo[c]phenanthrene       | B(c)Phe      | 45.38     | 228.1     | 227.1      | 226.1      |
| Cyclopenta[cd]pyrene       | C(c,d)Pyr    | 48.36     | 226.1     | 224.1      | 113.0      |
| Benzo[j]fluoranthene       | B(j)Fla      | 60.84     | 252.1     | 250.1      | 253.1      |
| Dibenzo[a,c]anthracene     | D(a,c)Ant    | 77.90     | 278.1     | 276.1      | 279.1      |
| Picene                     | Pic          | 81.28     | 278.1     | 276.1      | 279.1      |
| Anthanthrene               | Ann          | 85.59     | 276.1     | 138.0      | 227.1      |
| Dibenzo[a,e]fluoranthene   | D(a,e)Fla    | 101.27    | 302.1     | 300.1      | 150.0      |
| Dibenzo[a,l]pyrene         | D(a,l)Pyr    | 102.64    | 302.1     | 300.1      | 150.1      |
| Dibenzo[a,e]pyrene         | D(a,e)Pyr    | 110.40    | 302.1     | 150.0      | 300.1      |
| Dibenzo[a,i]pyrene         | D(a,i)Pyr    | 114.98    | 302.1     | 303.1      | 151.1      |
| Dibenzo[a,h]pyrene         | D(a,h)Pyr    | 117.51    | 302.1     | 303.1      | 151.1      |
| 1-Methylnaphthalene        | 1-M,Nap      | 8.51      | 142.1     | 141.1      | 139.1      |
| 1,3-Dimethylnaphthalene    | 1,3-D,Nap    | 9.62      | 156.1     | 141.1      | 115.1      |
| 1,6,7-Trimethylnaphthalene | 1,6,7-T,Nap  | 11.83     | 170.1     | 155.1      | 153.1      |

|                                 |                |       |       |       |       |
|---------------------------------|----------------|-------|-------|-------|-------|
| 1,4,6,7-Tetramethylnaphthalene  | 1,4,6,7-       | 14.23 | 184.1 | 169.1 | 153.1 |
| 2-Methylphenanthrene            | 2-M,Phe        | 23.56 | 192.1 | 191.1 | 189.1 |
| 3,6-Dimethylphenanthrene        | 3,6-D,Phe      | 26.54 | 206.1 | 191.1 | 189.1 |
| 2-Methylanthracene              | 2-M,Ant        | 23.80 | 192.1 | 191.1 | 189.1 |
| 9,10-Dimethylanthracene         | 9,10-D,Ant     | 33.63 | 206.1 | 191.1 | 205.1 |
| 2-Methylfluoranthene            | 2-M,Fla        | 35.16 | 216.1 | 215.1 | 213.1 |
| 1-Methylpyrene                  | 1-M,Pyr        | 39.88 | 216.1 | 215.1 | 213.1 |
| 1-Methylbenzo[a]anthracene      | 1-M,B(a)Ant    | 51.95 | 242.1 | 241.1 | 239.1 |
| 7,12-Dimethylbenzo[a]anthracene | 7,12-D,B(a)Ant | 60.38 | 256.1 | 241.1 | 239.1 |
| 6-Methylchrysene                | 6-M,Chr        | 53.27 | 242.1 | 239.1 | 241.1 |
| Indole                          | Ino            | 8.77  | 117.1 | 90.1  | 89.1  |
| Quinoline                       | Qun            | 8.12  | 129.1 | 102.1 | 128.1 |
| Isoquinoline                    | Iqn            | 8.36  | 129.1 | 102.1 | 128.1 |
| Benzo[h]quinoline               | 7,8-Bqn        | 20.81 | 179.1 | 178.1 | 180.1 |
| Carbazole                       | Car            | 23.23 | 167.1 | 166.1 | 168.1 |
| Dibenzo[c,g]carbazole           | D(c,g)Car      | 86.10 | 267.1 | 265.1 | 266.1 |
| Acridine                        | Acr            | 21.27 | 179.1 | 178.1 | 180.1 |
| Dibenz[a,h]acridine             | D(a,h)Acr      | 75.46 | 279.1 | 278.1 | 280.1 |
| Dibenz[a,j]acridine             | D(a,j)Acr      | 75.99 | 279.1 | 280.1 | 277.1 |
| Benzothiophene                  | BTh            | 7.59  | 134.0 | 89.1  | 135.0 |
| Dibenzothiophene                | DTh            | 18.86 | 184.0 | 139.1 | 185.0 |
| Benzofuran                      | Bfu            | 6.23  | 118.1 | 89.1  | 90.1  |
| Dibenzofuran                    | DBf            | 11.76 | 168.1 | 139.1 | 169.1 |
| PCB 77                          | N/A            | 33.67 | 291.9 | 289.9 | 220.0 |
| PCB 81                          | N/A            | 32.56 | 291.9 | 289.9 | 220.0 |
| PCB 126                         | N/A            | 40.47 | 325.9 | 323.9 | 327.9 |
| PCB 169                         | N/A            | 46.82 | 359.9 | 361.9 | 357.9 |
| PCB 114                         | N/A            | 36.14 | 325.9 | 327.9 | 323.9 |
| PCB 123                         | N/A            | 34.32 | 325.9 | 327.9 | 323.9 |
| PCB 156                         | N/A            | 43.74 | 359.9 | 361.9 | 289.9 |
| PCB 167                         | N/A            | 40.93 | 359.9 | 361.9 | 289.9 |
| PCB 189                         | N/A            | 49.61 | 393.8 | 395.8 | 323.9 |
| PCB 1                           | N/A            | 10.90 | 188.1 | 152.1 | 190.0 |
| PCB 18                          | N/A            | 17.67 | 186.0 | 256.0 | 258.0 |
| PCB 33                          | N/A            | 21.43 | 256.0 | 258.0 | 186.0 |
| PCB 52                          | N/A            | 22.70 | 291.9 | 220.0 | 289.9 |
| PCB 95                          | N/A            | 27.91 | 325.9 | 253.9 | 255.9 |
| PCB 101                         | N/A            | 28.94 | 325.9 | 254.0 | 255.9 |
| PCB 128                         | N/A            | 42.44 | 359.9 | 289.9 | 361.9 |
| PCB 138                         | N/A            | 38.99 | 359.9 | 361.9 | 289.9 |

|         |     |       |       |       |       |
|---------|-----|-------|-------|-------|-------|
| PCB 149 | N/A | 34.16 | 359.9 | 289.9 | 361.9 |
| PCB 153 | N/A | 35.68 | 359.9 | 361.9 | 289.9 |
| PCB 157 | N/A | 44.34 | 359.9 | 361.9 | 289.9 |
| PCB 170 | N/A | 47.63 | 393.8 | 395.8 | 323.9 |
| PCB 171 | N/A | 43.38 | 393.8 | 395.8 | 323.9 |
| PCB 177 | N/A | 42.86 | 393.8 | 395.8 | 323.9 |
| PCB 180 | N/A | 43.99 | 393.8 | 395.8 | 323.9 |
| PCB 183 | N/A | 39.74 | 393.8 | 395.8 | 323.9 |
| PCB 187 | N/A | 39.23 | 393.8 | 395.8 | 323.9 |

Objectives 3: Conduct public education outreach to well owners and stakeholders regarding groundwater pollutants and their wells' susceptibility to contamination.

- We collected survey data from well owners regarding well water perception, maintenance practices, and vulnerability to hurricanes and drought. These data will serve as the basis for the outreach activities planned for the end of the project.

### 3. FURTHER WORK

Planned activities for the next reporting period (March – May 2026) include:

- Prepare the logistics for hydrologic field sampling (Objective 1) that will be conducted in June/July 2026.
- Continue analysis of chemical parameters from groundwater samples, including for PAHs, PCBs, PFAS, and microplastics (Objective 2).
- Conduct statistical analyses for well owner survey results (Objective 3).

### 4. REFERENCES

None reported for this progress report.

Contract# 0089  
Matagorda Bay Mitigation Trust

Texas A&M University at Galveston  
200 Seawolf Parkway, Galveston, TX 77554

Reviewed by:

*Dini Adyasari*

---

Dr. Dini Adyasari, TAMUG, PI

Date: 2/28/2026