The Role of Phyto Remediation in Plume Management

Maritime Science Center
Mobile, Alabama

Jymalyn Redmond
Environmental Manager
GMC

FIRM OVERVIEW

GMC

Since 1947

350+ employees

16 offices across Southeast US

- Architecture
- Engineering
- Environmental
- Geotechnical
- Landscape Design
- Surveying
- Transportation
- Interior Design
- Planning

GMC | Case Study

PROJECT OVERVIEW

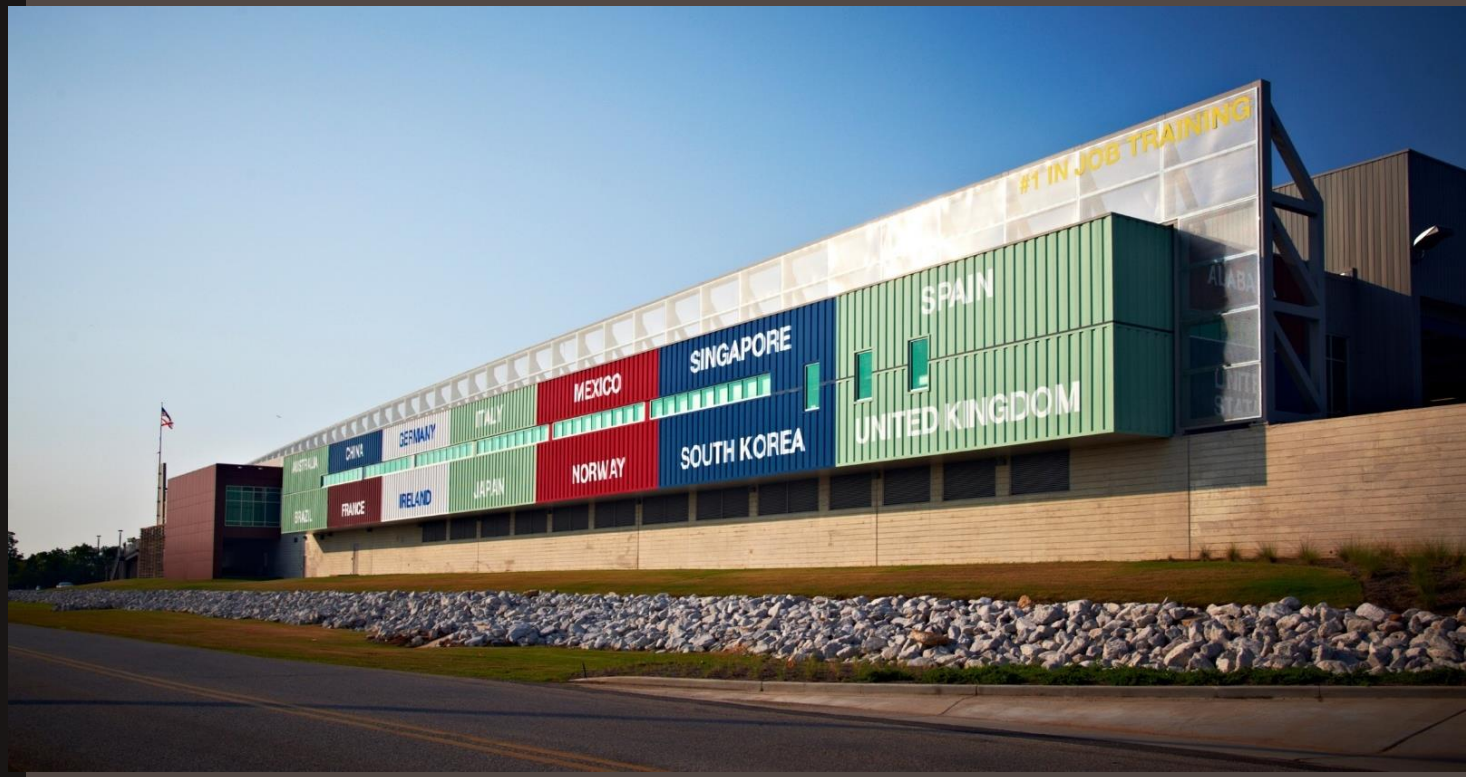
10-Acre Facility

Operated
30 Years

Waste deposited in the water table

Metals and petroleum products

Redeveloped for Training Center



MARITIME SCIENCE CENTER

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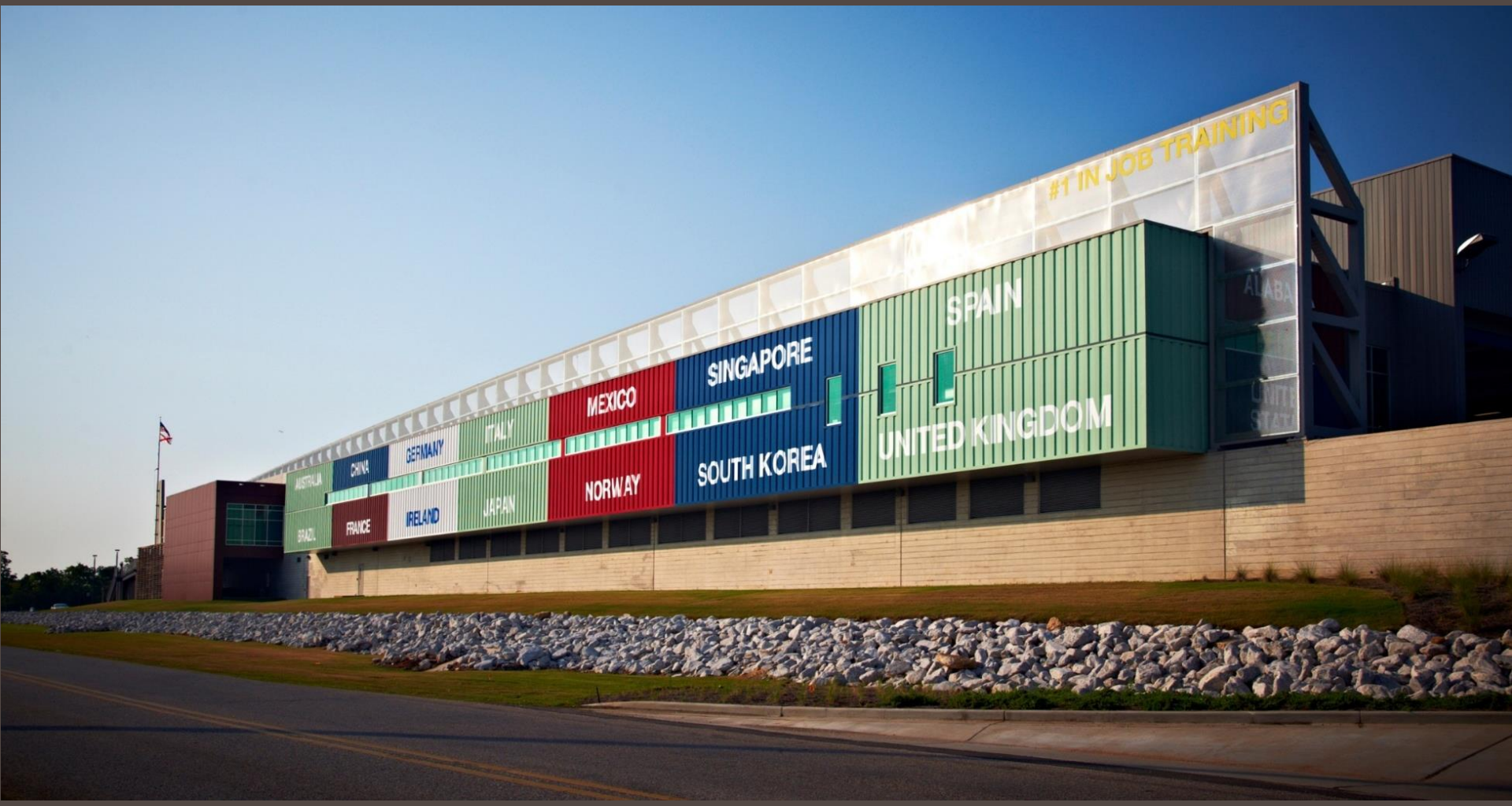
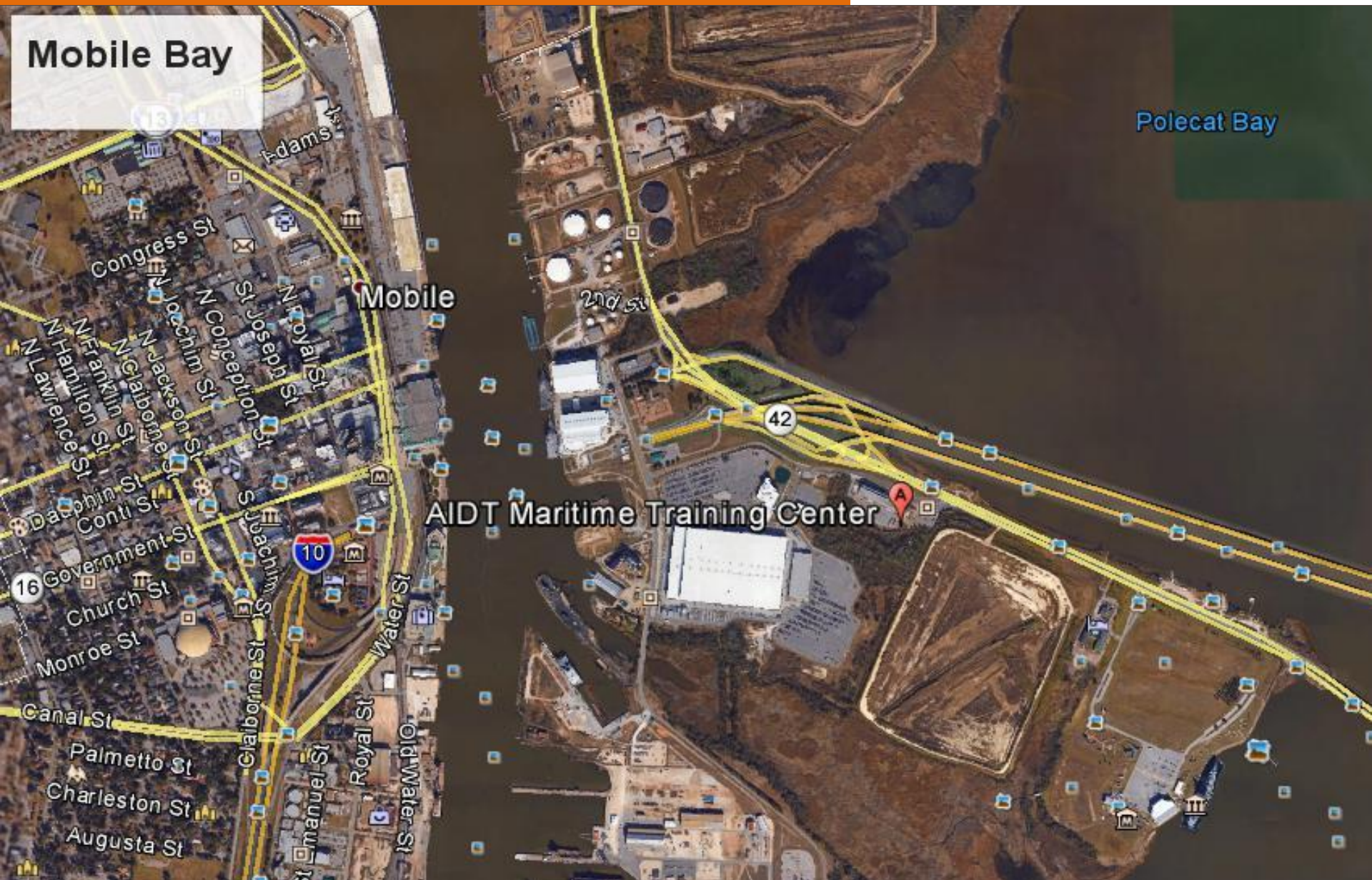
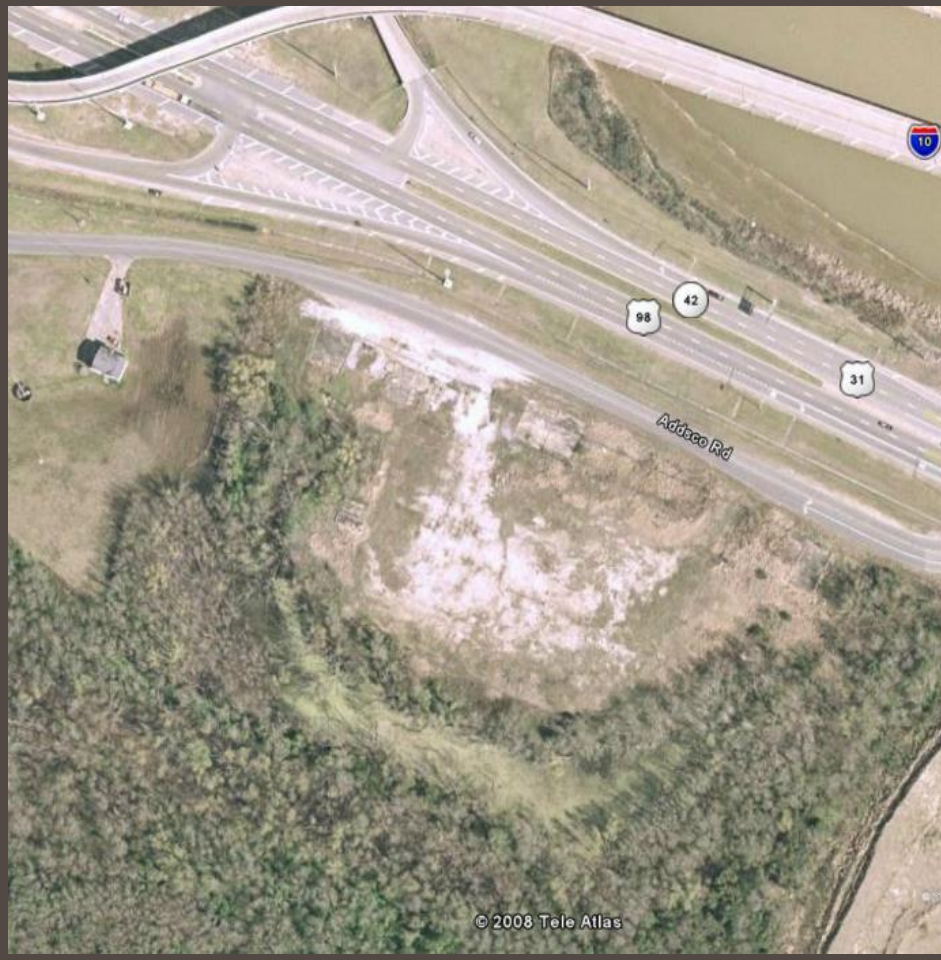


LOCATION - MOBILE BAY CAUSEWAY

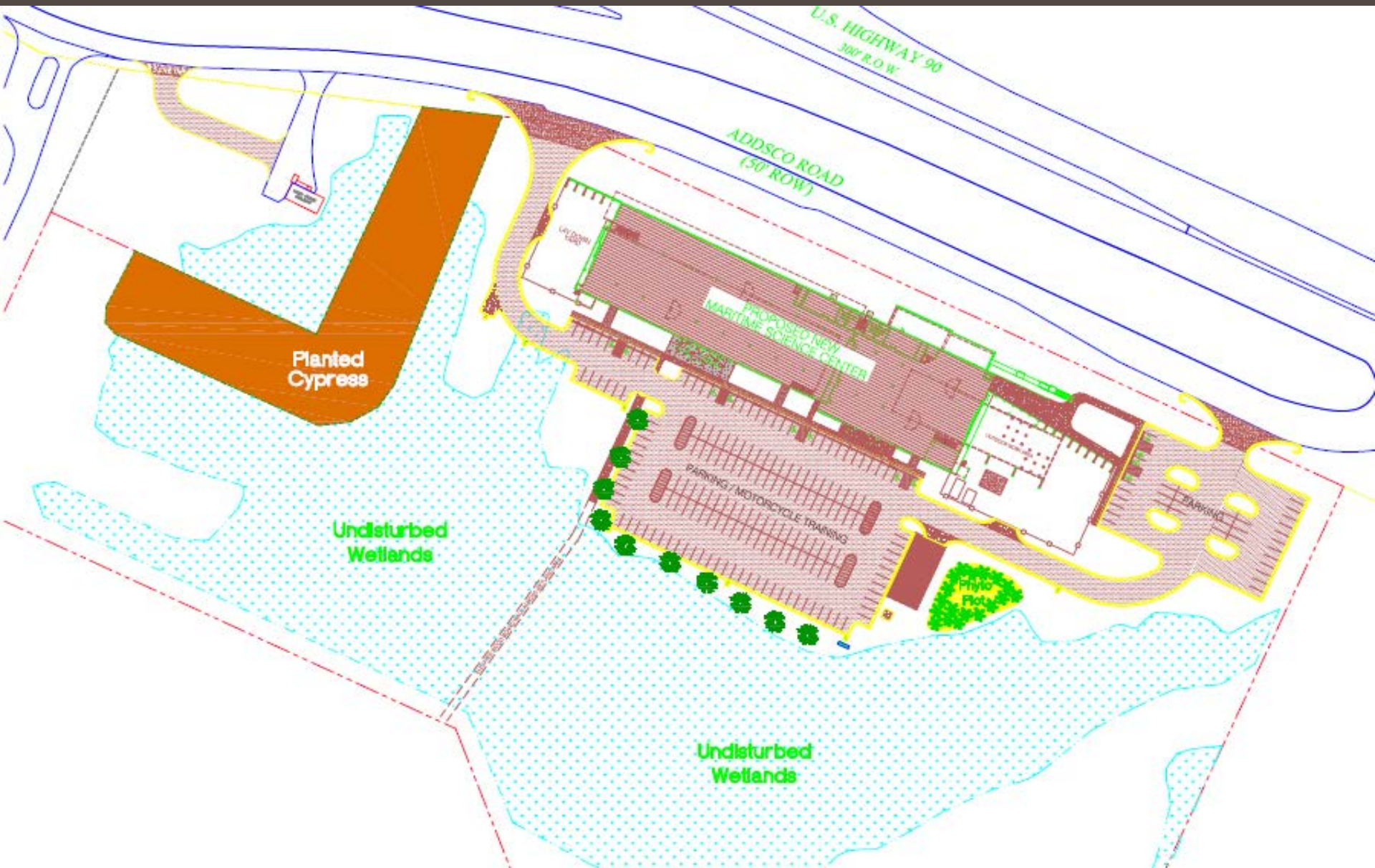


DISCOVERED CONTAMINATION

The site was ideally located just off Mobile Bay adjacent to a major ship builder. While the site was a long-idled strip of cracked concrete and asphalt, the available property was just large enough to meet the needs for the training facility and provided great access to the interstate system and ship building industry. Everything appeared to be optimal until contaminated fill-material was discovered at facility. After quickly characterizing the site, a plan was developed to meet the unique aspects of the environment. Delay would seriously impact the construction schedule. Significant cost overruns due to serious environmental issues could kill the project. Rather than lose hope for the project, environmental specialists began to work with the architects and engineers that had a vision for the site.



MASTER PLAN


U.S. HIGHWAY 90
300' R.O.W.
ADDSCO ROAD
(50' ROW)
PROPOSED NEW
MARITIME SCIENCE CENTER
PARKING / MOTORCYCLE TRAINING
PARKING
Planted
Cypress
Undisturbed
Wetlands
Undisturbed
Wetlands

THE REMEDIAL PLAN

Developed a strategic plan to:

- Established sentry phyto plots to slow the migration of groundwater to help contain and treat contaminants on-site.
- Removed surface waste and debris.
- Utilized the parking and existing building as cap for the wastes that could not be removed due to their presence in the shallow water table.
- Construction was not abandoned.

CONCERNS AFFECTING REMEDIAL PLANNING

- The depth to groundwater in site monitoring wells was 1-3 feet below ground surface.
- The groundwater was anticipated to be moving at a rate of 1 to 3 feet per day.
- There was no confining unit to inhibit contaminant migration.
- There was an almost limitless supply of water to recharge the groundwater table.
- Contaminants included lead concentrations as great as 4,000 ppm. Naphthalene and anthracene were present above screening levels.

THE PETROLEUM

- Bunked C was used locally as a marine fuel. A large tank failed years earlier, releasing fuel to low lying areas across the Maritime complexes. Inadequate cleanup left contaminants to infiltrate deep into sandy soils at the site.

CONTAMINATED CORE

REMEDIATION

- Phytoremediation plan treated large volumes of soil and groundwater in-place.
- Phyto was coupled with a cap that protected most areas of the site. This also allowed construction of the training facility.
- Cleanup and monitoring continued as the most effective approach to remediation
- A vapor extraction system is in operation to ensure air quality inside training rooms. There is ongoing training for welding and other various industrial activities at the center.

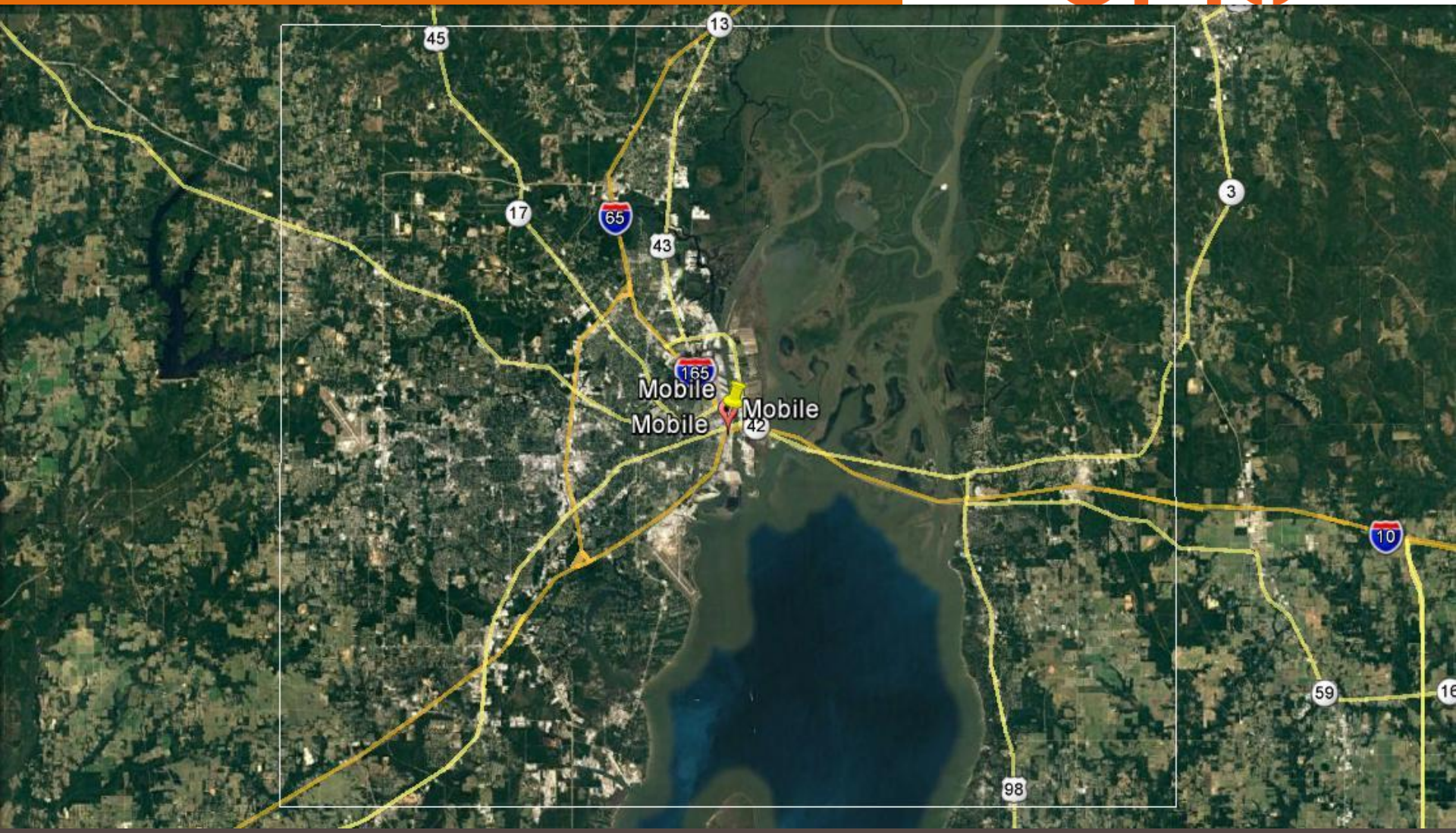
REMEDIATION

FIRST YEAR OF PLANTING

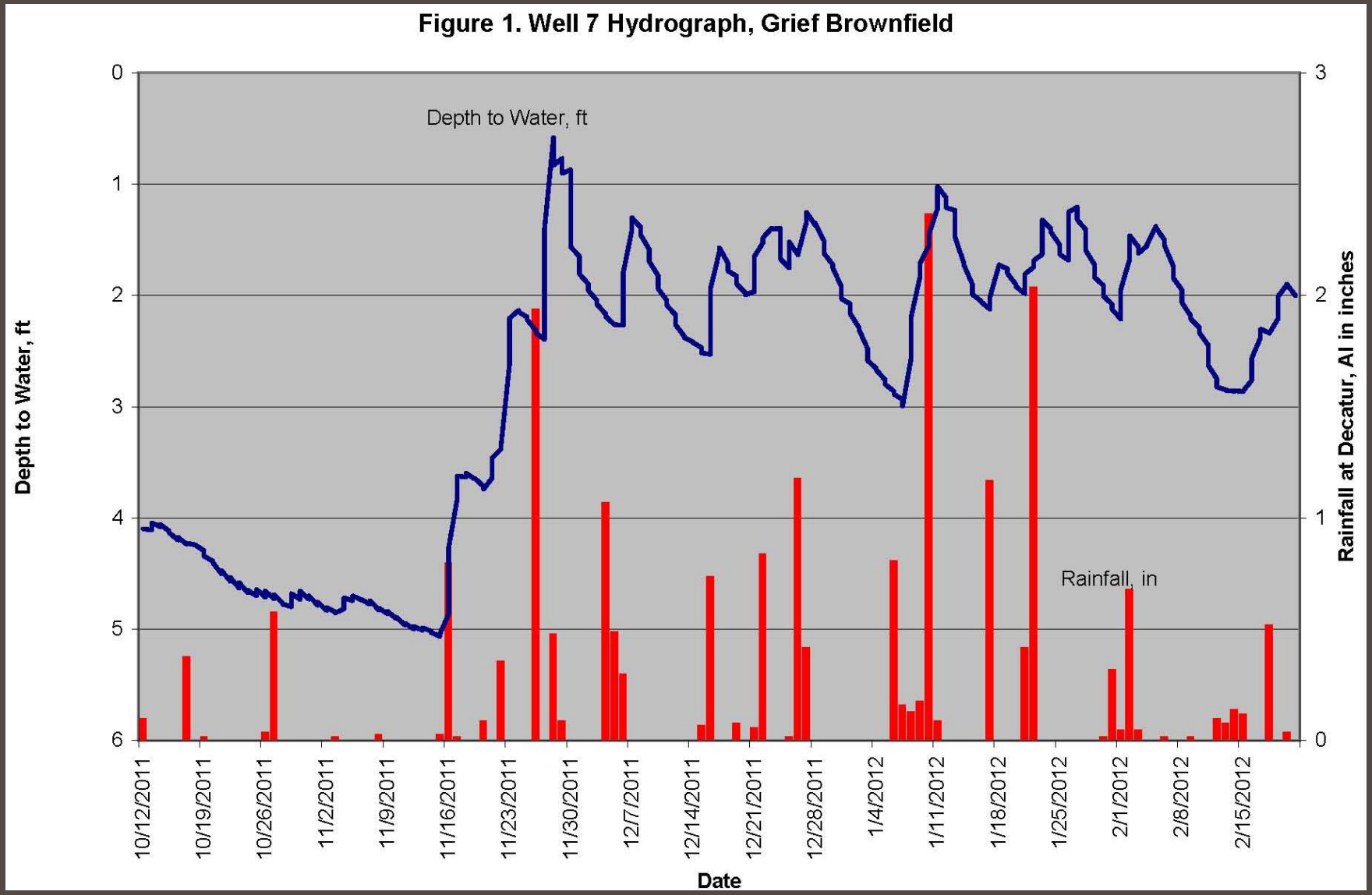
The Maritime remedy utilizes a technique known as phyto-pumping to provide hydraulic control of groundwater. Each tree utilizes approximately 10 gallons of water per day. As the trees grow, evapotranspiration will increase and more water will be consumed. Each tree acts like a micro well pumping and cleaning the groundwater it utilizes. At Maritime the trees are closely spaced to ensure that groundwater is under the influence of the phyto-pumping. By planting a dense band of trees down gradient of the area of contamination, the potential for the migration of any contaminants beyond the band is greatly reduced. At Maritime, no poly cyclic aromatic hydrocarbons were detected in the monitoring wells two years after the trees were first planted.

Providing an environmentally-friendly approach to redevelopment

PHYTOREMEDIATION PLOTS


45
13
17
65
43
3
165
Mobile
Mobile
Mobile
42
10
59
98

HYDRAULIC CONTROL



HYDRAULIC CONTROL CONTRIBUTIONS

- Initially 120 trees in the sentry planting were consuming 1,200 gallons of water per day. In a month, they were consuming 36,000 gallons of water per month.

- After 8 years, the mature trees consume about 50 gallons per tree per day. This results in treating 6,000 gallons per day and 180,000 gallons per month.

BENEFITS

- Eliminate the opportunity for contaminants to impact:
    1. Sensitive Eco-systems
    2. Endangered Species
    3. Students and Employees On-site
- Preserve and protect the valuable natural habitat at the site

CONCLUSIONS

- By 2017, the anticipated total of water consumer per growing season is expected to be 1.9 million gallons of water in the 9 month growing season
- This planting is a significant contributor to controlling the former plume and has aided in reducing groundwater contaminants to a level that meets state regulatory guidelines for contaminated sites. The No Further Action letter was issued in 2016.

THANK YOU !

GMC