Kemah Living Shoreline Habitat Protection and Restoration

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A PROGRAM OF TCEQ

Galveston Bay Estuary Program
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Final Report

A Natural Partnership

CCA's National Habitat Program

Habitat Today for Fish Tomorrow

I. EXECUTIVE SUMMARY

The Kemah Living Shoreline project aimed to protect the shoreline of the Galveston Bay Foundation's headquarters property from erosion and restore intertidal wetland complex. Owned by the Galveston Bay Foundation (GBF), the Kemah tract is a 30-acre conservation and education property located on the west shoreline of Galveston Bay in Galveston County, Texas. Galveston Bay is a high wave energy environment, particularly in the immediate area of the project. The project is located along approximately 900 feet of eroding shoreline. Wind-driven waves resulting in severe shoreline erosion at the project site.

GBF and project partners developed the Kemah Living Shoreline project to reduce wave energy impacting the shoreline, halt erosion of the shoreline, and promote deposition of suspended sediments landward of the structure. After acquiring the necessary permits and competitively bidding the project, GBF oversaw the construction of the 905-foot rip-rap breakwater which protects the adjacent shoreline from erosion. The breakwater layout provides for the restoration of 2.8 acres of intertidal wetland complex restoration. The planting of smooth cordgrass by community volunteers has been delayed due to COVID-19 social distancing guidelines. GBF is hopefully planting efforts can begin with small groups in late 2020 and early 2021.

II. INTRODUCTION

The Kemah Living Shoreline Habitat Protection and Restoration Project aimed to restore estuarine habitats, including estuarine intertidal marshes, while protecting coastal upland habitats on Galveston Bay in the City of Kemah (Kemah), through the installation of rock/rip-rap wave breaks and the transplanting of native marsh vegetation. In partnership with the landowner, the Galveston Bay Foundation (GBF), the City of Kemah conducted a project to restore previously present native estuarine habitats that provide ecosystem functions, such as habitat for fish and wildlife, shoreline stabilization, water quality improvement, and flood protection. The goals and objectives of the project were to:

- Construct up to 900 feet of rock/rip-rap wave breaks off the property's shoreline to reduce wave energy impacts.
- Halt erosion of the shoreline and promote deposition of suspended sediments landward of the structure.
  Transplant native marsh vegetation shoreward of the breakwater to augment the shoreline stabilization process and restore an estimated 3-4 acres of intertidal marsh habitat.
- Directly involve 100 community volunteers in the transplanting of smooth cordgrass at the project site, allowing the public to participate directly in the wetland restoration process.

To complete the project as described, the City of Kemah entered a formal agreement with the Galveston Bay Foundation to carry out the tasks and provide the deliverables that are associated with this contract. GBF provided Kemah with all deliverables outlined in this document for submission to TCEQ.

III. PROJECT SIGNIFICANCE AND BACKGROUND

The project site is located to the south of the city of Kemah, Texas, an historic fishing town that has been transformed to a tourism destination, mostly due to the development of the Kemah Boardwalk recreation area. The project site is the waterfront of a 30+ acre property that was recently purchased by the Galveston Bay Foundation. The shoreline is the property's most prominent feature. It is one of the few unarmored shorelines in the vicinity (adjacent properties have been bulkheaded), and erosion has greatly affected its shape and habitat makeup. The shoreline is distinctly concave and features a high bluff where there once was a gentle gradation from uplands down to high and low marsh and open bay. The shoreline's concave shape is easily distinguishable on Google Earth when viewing the western shoreline of Galveston Bay just south of Clear Lake.

GBF is currently amid a capital campaign to raise funds to construct a Bayfront headquarters for the Foundation on the property. GBF has a vision to have the headquarters completed within the next 5 years. GBF expects to have educational programs on site available to students and families alike. GBF expects to have up to 20,000 visitors to the headquarters in the first year of operation with 5,000 of those being students. At the time of this proposal GBF has received just shy of seven million dollars (~1/3 of goal) in pledges and contributions toward the capital campaign goal. In addition to the habitat enhancements of the property, GBF aims for the headquarters building to qualify for living building challenge certification. As part of the long-term property vision, GBF also expects to showcase a boardwalk over the living shoreline, a pier, educational boat tours, and self or semi-guided trails through the upland habitat enhancements (freshwater wetlands, prairie, etc.)

IV. PROJECT METHODOLOGY

Project activities began in 2017, prior to the execution of this agreement. In late 2017, Galveston Bay Foundation entered a contractional agreement with a consultant to provide basic engineering and design analysis that would guide the final design of the project. The consultant began the analysis work in November 2018 and issued a final Conceptual Design Analysis Document in May 2019. A final project design and layout was determined based on the recommendations from the document.

In late 2018, the Galveston Bay Foundation prepared and submitted regulatory permitting applications to the United States Army Corps of Engineers and Texas General Land Office.

Regulatory authorization was issued as follows:
United States Army Corp of Engineers permit SWG-2018-00969 issued on January 30, 2019 Texas General Land Office Surface Lease SL20190031 issued on November 25, 2019.

The project site is also covered under GBF's aquatic vegetation transplant permit issued by Texas Parks and Wildlife Department.

The Galveston Bay Foundation prepared construction bidding and contract documents and began a formal competitive procurement process to select a marine construction contractor to construct the projects breakwater. A notice to bidders was advertised in the Galveston Daily News on October 5th and 9th, 2019. An optional pre-bid meeting was held on October 16, 2019. Four potential bidders attended the pre-bid meeting. GBF received three sealed bids on October 24, 2019. After discussions with the apparent low bidder, it was discovered that that bidder planned to construct the project utilizing overland construction techniques (material delivery and placement from GBF's property/access road). However, this technique was stated as prohibited both during the pre-bid meeting and site visit, of which this bidder attended both. The low bid was withdrawn as a result. GBF began discussions with the next lowest bidder and began the process of executing a construction contract. The selected contractor (and the highest bidder) both had schedules that would only allow them to begin construction until later in 2020. GBF issued a Notice of Award and executed the construction contract on December 9, 2019, with Padgett Shoreline Construction.

The construction contractor began site prep work in June 2020. Site preparation consisted mainly of the removal of derelict pier pilings and bulkhead structures within and adjacent to the breakwater construction site. The contractor mobilized a barge and heavy equipment to the site to remove the structures. Structures were pulled from the bay bottom with a track hoe and the resulting debris was loaded onto the barge and hauled away for proper disposal.

The contractor returned to the site to begin construction of the breakwater on August 6, 2020. Construction equipment consisted of a track hoe on a barge that placed rip-rap brought to the project site via additional shallow draft barges. Construction progressed quickly until the threat of tropical weather to the area caused a few minor delays. Due to the uncertain predicted paths of Hurricanes Marco and Laura, the contractor temporarily demobilized his equipment from the project site after completing work on August 21, 2020. Prior to this delay, construction was on path to be completed by the end of August. The contractor returned to the site on August 31st and completed construction on September 4, 2020. Final survey documents were submitted and approved on September 23, 2020 and project construction is considered complete.

The project resulted in the construction of 905 linear foot of breakwater structures, creating an area of 2.8 acres available for intertidal marsh complex restoration.

Due to COVID-19 social distancing recommendations large scale volunteer planting efforts are not possible currently. However, GBF does plan to begin small group plantings at the site in October 2020. Several plantings are planned in October and additional plantings will be held beginning in spring 2021, as CDC recommendations allow.

V. PROJECT RESULTS AND OBSERVATIONS

The project resulted in the construction of 905* linear foot of breakwater structures being constructed to a minimal elevation of +3.0 NAVD88. The final breakwater layout has resulted in 2.8 acres available for intertidal wetland complex to be restored. In

additional to the construction of the breakwater, derelict pier, bulkhead, and concrete rubble debris was cleaned up from the project site.

> **Please note that the project map below shows a breakwater length of 895'. 895 was the length of breakwater surveyed as part of the final as built survey. An additional 10' of breakwater was constructed on the northern end of the project, tying into the neighboring properties bulkhead. The additional non surveyed 10' brings total breakwater length constructed to 905'.*

VI. MOVING FORWARD

Due to CDC social distancing guidelines associated with COVID-19, no volunteer planting efforts have taken place at the project site. Upon completion of this grant agreement, GBF will continue to pursue community volunteer, student, staff, and partner opportunities to plant the area behind the breakwaters with smooth cordgrass (as CDC guidelines allow). Currently small group plantings are being schedule for October 2020.

Since the completion of the breakwater, the project site was impacted by high tide, winds, and wave action from Tropical Storm Beta and Hurricane Delta. The integrity of the breakwaters does not seem to have been impacted by either storm.

VII. PROJECT FUNDING

Partner	Contribution	Contribution Type
GBEP (TCEQ)	$100,000.00	State
Galveston Bay Foundation	$204,028.11	Private
NFWF Gulf Coast Conservation Program-Shell	$132,000.00	Private
USFWS Coastal Program	$50,000.00	Federal
CCA Texas/Building Conservation Trust	$50,000.00	Private
NFWF Conoco Philips via Houston Wilderness	$19,894.38	Private
Supplemental Environmental Projects	$83,183.48	Private
ERM	$8,689.00	Private (in-kind)
TOTAL Project Cost:	**$647,794.97**	
TOTAL Leveraged Funds:	**$547,794.97**	

VIII. LESSONS LEARNED

The engineering and design consultant's conceptual design analysis recommended that the breakwater crest elevation be +2.2 NAVD88 for typical conditions to be effective in reducing wave energies and slowing erosion. Due to GBF staff seeing the trend of higher tides within Galveston Bay and the large fetch at the project site, GBF decided to construct the breakwater to a minimum elevation of +3.0 NAVD88. Initially, it appears that this was a good direction to take. The breakwaters have seen impacts from three tropical systems and multiple cool fronts during and after construction. Anecdotal observations of the structure during these adverse weather conditions have shown positive effects of the increased elevation.

IX. PROJECT MAP

X. PROJECT PHOTOGRAPHS

Figure 1: Equipment mobilizes onsite to remove derelict pier and bulkhead pilings and debris

Figure 2: Derelict piling removal in process

Figure 3: View post piling cleanup

Figure 4: Day 1 of breakwater construction

Figure 5: Breakwater at approximately 50% completion

Figure 6: Construction along northern property line. Background: Barge bringing additional rip-rap

Figure 7: Aerial view after concrete debris has been removed

Figure 8: Breakwater performance during Hurricane Laura (western LA landfall)

Figure 9: Removal of large concrete debris pile

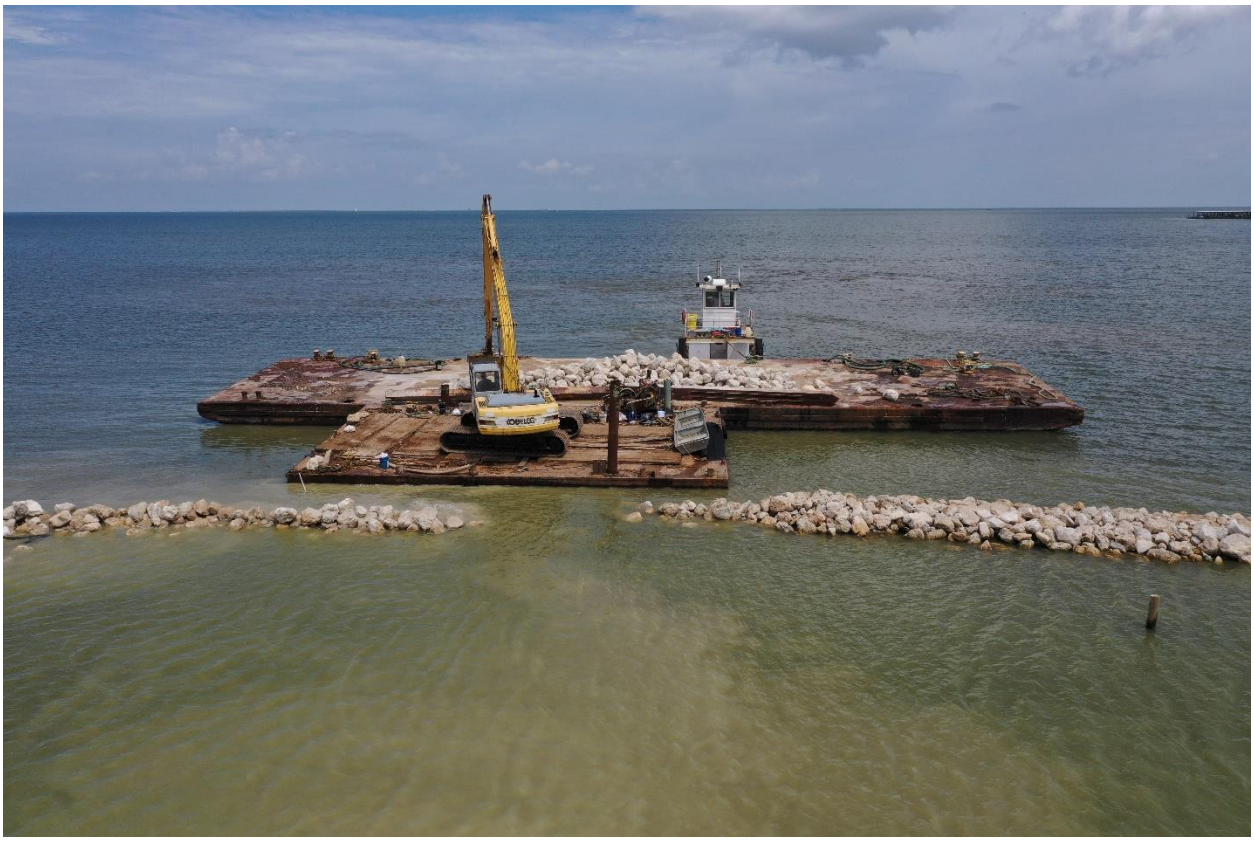

Figure 10: Final stretch of construction

Figure 11: Rough water bayward of breakwater and calm water shoreward of breakwater.

Figure 12: View of completed structure and GBF headquarters property

Figure 13: View looking toward City of Kemah

Figure 14: Fully completed breakwater