CITY OF CORPUS CHRISTI
PROFESSIONAL MONITORING CONTRACT
PACKERY CHANNEL MONITORING 2012-2013
Amendment No. 7

The City of Corpus Christi, Texas, hereinafter called "CITY", and Texas A&M University-Corpus Christi hereinafter called "TAMU-CC", hereby agree to amendment of the Contract as approved by City Council Motion 2008-052 on February 26, 2008, administratively amended on March 3, 2008, by Motion 2009-007 on January 13, 2009, by Motion 2009-091 on April 14, 2009, by Motion 2010-095 on April 27, 2010, administratively on September 21, 2010, by Motion 2011-212 on September 27, 2011 as follows:

I. SERVICES TO BE PERFORMED

TAMU-CC hereby agrees to perform all consulting services necessary to monitor, perform, complete, and report the results of a comprehensive study of morphology and changes and current velocity at Packery Channel.

II. SCOPE OF SERVICES

TAMU-CC's services will be those necessary to provide the monitoring required to deliver an annual written report and presentation of the observations and results of the monitoring program that takes place during the term of this contract.

The monitoring program will include the collection of bathymetric data in Packery Channel and the surrounding nearshore, measurement of elevation along the adjacent beach and inland channel segment (shoreline position), and elevation measurements across the Mollie Beattie Coastal Habitat Community. TAMU-CC will conduct the comprehensive study of change in channel depth, shoaling, scour, shoreline position and beach volume at Packery Channel. TAMU-CC will complete the tasks set forth by Section II.A as set forth in the research proposal attached as Exhibit "A".

A. TASKS

Specific tasks to be undertaken are set out as follows:

Task 1. Project Management and Aerial Photography

1-1. Project Management

Project management includes historic analysis, reporting, survey organization and scheduling as well as presentations and generation of materials requested by the City of Corpus Christi. Additional support includes coordination with surveyors, engineers and other environmental professionals to assist the City of Corpus Christi with related projects including potential dredge operations and/or FEMA reimbursement for storm damage.

1-2. Aerial Photography

Description: Acquisition of an annual set of rectified aerial photographs of the Packery Channel region including the entire channel from the GIWW to the Gulf of Mexico (GOM); including North Padre and Mustang Islands from the south end of the seawall to Newport Pass. Photographs are applied in ArcGIS environment for comparative analysis of change relative to key features and as a reference for overlay of data and terrain models. Bids received during 2011 show that the cost of aerial photography has increased reportedly due to increases in fuel costs.
Purpose: For interpretation of large-scale changes in vegetation, dune line, and inter-tidal regions adjacent to the inland segment of the channel as well as along Padre and Mustang Islands. In addition, the aerials are appropriate for visuals and explanation aids to residents and laypersons.
Schedule: (1) annual set conducted Aug/Oct 2012 (pending weather conditions).

Task 2. Measurement of Morphologic change in Packery Channel and along Mustang and Padre Island.

2-1. Beach Profile Survey

Description: The beach profile survey provides information on changes occurring at 18 specified locations from the Nueces Kleberg County Line to north of Fish Pass. There are historic data for these locations since 1995. Elevation measurements are collected along transects that initiate landward of the dune or other landward limiting feature (seawall or pavement) and extend offshore up to one mile into the Gulf of Mexico.

Purpose: To document changes in features such as the dune toe (seaward limit of dunes) berm crest (most landward point of active sediment transport on the beach), and sand bars. The data are applied to calculate volumetric change along historically surveyed areas of the beach and applied to calculate sand volume which is required for sand placement and documentation for FEMA funding. Data is also applied to verify shoreline position data and to determine the maximum region of sheltering (Zone of Influence) by the jetties.

Schedule: (1) annual survey conducted during peak summer condition (Sep/Oct 2012).

2-2. Shoreline Position surveys

Description: Elevation data are collected by RTK GPS across the beach from close to the dune toe to the water line along a zigzag path. The beach is surveyed from south of the Nueces Kleberg County Line to north of Fish Pass.

Purpose: These surveys are an efficient and low-cost way to measure changes in the width of the dry beach over the broad study area. Within days, a large section of the beach can be measured to determine changes in shoreline position from which regions of beach erosion and accretion can be determined and potential “hot spots” can be identified. Monitoring the seasonal position of the shoreline assists in management of beach vehicular access south of the inlet and addresses persistent regions of shoreline recession that have been identified fronting the North Padre Island Seawall and Whitecap Blvd as well as regions of receding shoreline north of the inlet near Newport Pass.

Schedule: (2) Surveys. Tentative survey schedule: Sep/Oct 2012, Jan/Feb 2013.

2-3. Surveys of channel and nearshore depth and morphology (bottom features)

Description: These bathymetric surveys combine single-beam and multi-beam sonar coverage to provide high resolution of morphology (shoals, scour and bars). Seasonal series of data is applied to interpretation of pathways of sediment transport.

Purpose: Data is applied to define features such as shoals (areas of deposition) and scour (areas of erosion) in the channel, nearshore and around structures. This data is applied to determine pathways of sediment transport and to calculate volumetric change for application to the estimation of the sand volume available for dredging. The data are applied to interpret trends in sediment transport as well as to calculate volumetric change, the calculation of sand loss or gain, for nourishment projects, and to identify potential regions of shoaling which could limit navigation. A primary application of this data is to assist with determining potential scheduling of dredging.

Schedule: (3) Surveys. Tentative survey schedule: Sep/Oct 2012, Jan/Feb 2013 and June 2013. Additional surveys may be required if data indicate that depth-limited navigation is imminent.

2-4. Inland Channel Segment and Mollie Beattie Coastal Habitat Community (MBCHC)

Description: The inland channel segment bordering MBCHC continues to modify as the region adjusts to changes in water flow in the channel and over the wetland. These changes are best captured seasonally through a network of cross-sections that document changes in wetland extent, channel boundaries and shoreline change. Elevation is measured along transects (survey lines) roughly perpendicular to channel orientation starting at the location of mean higher high water (MHHW) shoreline position along the south shore and then extending across the channel to the location of MHHW shoreline position or until a limiting feature (such as coverage of a raised

placement area) is defined. Measure the MHHW shoreline position along the south shore of Packery Channel from the HWY 361 Bridge to the Relief Channel west of the channel dog leg.
Purpose: These surveys define change in the inland segment of the channel that borders the MBCHC and changes in the elevation of the wetland. Analysis of these data sets provide quantification of change in primary (-5 ft) and upper bank (MSL) width along MBCHC. In addition the MHHW position of the west side of the inland channel segment (residential) is surveyed and compared to previous surveys to determine historic change in position.
Schedule: (2) Survey Sets (Transects and MHHW). Tentative survey schedule: Sep/Oct 2012, Jan/Feb 2013. Additional surveys may be required if data indicate that the rate of change has increased during the study period.

2-5. Event/Transitional Survey and/or Dredge Support
Description: In a continued effort to respond to reported City of Corpus Christi budgetary constraints, the monitoring program continues at a modified schedule to include (2) seasonal surveys (Sept/Oct 2012 and Jan/Feb 2013) and (1) transitional survey (June 2013). To accommodate monitoring concerns beyond these seasonal surveys this task provides for event survey or other survey requirements as needed. Such support outside of seasonal surveys could include but is not limited to dredge support, engineering support, environmental assessment (wetland), and sand placement activities outside the seasonal survey scope. The primary purpose of the event surveys is to facilitate timely pre- or post- storm surveys. Surveys may be needed beyond the seasonal designation, such as after storms, and to assist with the investigation of sensitive environmental habitat or anthropogenic influences on the coastal environment that are identified during the course of the three seasonal surveys. The cost is based upon the following survey suite but may be utilized as needed:

a. Shoreline position survey (1) Task 2-2
b. MBCHC (1) Task 2-2 OR Full Beach Profile Survey (1) Task 2-1
c. Bathymetric channel and nearshore survey (1) as described in Task 2-3
d. Modified beach profile survey of seawall nourishment area south of Packery Channel (Includes profiles at 400-ft to 1100-ft spacing to accommodate more accurate beach volume calculation for FEMA).

Purpose: To define morphology immediately before or after a storm event or related to sensitive habitat such as the MBCHC without time restrictions associated with the amendment process.
Schedule: To be determined

Deliverables:
ASCII data sets (x,y,z) NAVD88 State Plane south Zone FIPS 4205
Email status report (monthly or as updates are available)
Status Reports (post-survey quarterly reports)

Note: all surveys may be rescheduled based upon study findings or weather and sea conditions. Additional surveys may be recommended upon seasonal findings or evidence of change based upon observations in the field.

The proposal for Year 2012-2013 is attached as Exhibit “A”.

III. FEES AUTHORIZED
The City will pay TAMU-CC a fixed fee not to exceed $1,548,028.00 for providing all services during the contract term (12 months). The fee consists of an original contract fee of $241,487.00, a fee for Amendment No. 1 of $11,020.00, a fee for Amendment No. 2 of $61,715.00, a fee for Amendment No. 3 of $299,900.00, a fee for Amendment No. 4 of $325,517.00, a fee for Amendment No. 5 of $600.00, a fee for Amendment No. 6 of $293,400, and a fee for Amendment No. 7 of $314,389.00. This fee will be full and total compensation for all services provided and expenses incurred in performing the tasks specified in Section II.A. Invoices will be submitted to the Director of

Engineering Services. Invoices will be submitted no more frequently than once per month for services rendered. All invoices shall be accompanied by a cover letter summarizing project status and the tasks undertaken during the time period covered by the invoice. Invoices will be based on the Task Fee as set out by this contract. Invoices will be sequentially numbered for each project, state the project name (Packery Channel Monitoring 2012-2013) and City project number (E12082). The letter shall state the number of the current invoice, the total authorized fee, the amount previously invoiced, and the current amount due. Statements will be based upon percent of project completed. However, a final payment of $3,500 will be retained until delivery of the final report.

It is mutually acknowledged that fees authorized by this original contract not invoiced may be used to defray the costs and expenses of Amendment No. 7 for such additional tasks as may be directed by the City Manager or his designee. However, any task or additional service that requires additional funding beyond that authorized will be evidenced in writing as an amendment to this contract.

Contract	Fee
Original Contract	$241,487.00
Amendment No. 1	$11,020.00
Amendment No. 2	$61,715.00
Amendment No. 3	$299,900.00
Amendment No. 4	$325,517.00
Amendment No. 5	$600.00
Amendment No. 6	$293,400.00
Amendment No. 7	$314,389.00
Total	$1,548,028.00

The fee for each Task of Amendment No. 7 is estimated as:

	Tasks	Fee
1.1	Project Management	$43,466
1.2	Aerial Photography	$16,210
2.1	Beach Profile Survey	$38,628
2.2	Shoreline Position Survey	$14,209
2.3	Surveys of channel and nearshore depth and morphology	$102,322
2.4	Inland Channel Segment and Mollie Beattie Coastal Habitat Community	$32,419
2.5	Event/Transitional Survey and/or Dredge Support	$67,135
	Total	$314,389

IV. TERMINATION OF CONTRACT

The City may, at any time, with or without cause, terminate this contract upon thirty days written notice to TAMU-CC at the address of record. In this event, TAMU-CC will be compensated for its services on all stages authorized based upon TAMU-CC and City's estimate of the proportion of the total services actually completed at the time of termination.

V. LOCAL PARTICIPATION

The City Council's stated policy is that City expenditures on contracts for professional services be of maximum benefit to the local economy. TAMU-CC agrees that at least 75% of the work described herein will be performed by a labor force residing within the Corpus Christi Metropolitan Statistical Area (MSA). Additionally, no more than 25% of the work described herein will be performed by a labor force residing outside the Corpus Christi Metropolitan Statistical Area (MSA.)

VI. ASSIGNABILITY

TAMU-CC will not assign, transfer or delegate any of its obligations or duties in this contract to any other person without the prior written consent of the City, except for routine duties delegated to personnel of TAMU-CC staff. If TAMU-CC is a partnership, then in the event of the termination of the partnership, this contract will inure to the individual benefit of such partner or partners as the City may designate. No part of the fee may be assigned in advance of receipt by TAMU-CC without written consent of the City.

The City will not pay the fees of expert or technical assistance and consultants unless such employment, including the rate of compensation, has been approved in writing by the City.

VII. DISCLOSURE OF INTERST

TAMU-CC further agrees, in compliance with City of Corpus Christi Ordinance No. 17112, to complete, as part of this contract, the *Disclosure of Interests* form attached hereto as Exhibit "B".

All other terms and conditions of the February 26, 2008 contract, as amended, between the City and Consultant shall remain in effect.

CITY OF CORPUS CHRISTI

Oscar R. Martinez, Date
Assistant City Manager

RECOMMENDED

8/13/12
Daniel Biles, P. E., Date
Director of Engineering Services

Michael Morris 8/13/12
Operating Department Date

APPROVED AS TO FORM

Office of Management Date
and Budget

Legal Department Date

ATTEST

Armando Chapa, City Secretary

TEXAS A&M UNIVERISTY–CORPUS CHRISTI

8-9-2012
Deidre D. Williams Date
Principal Investigator

8.9.12
Date

Dr. Luis Cifuentes
[redacted] Vice President
Division of Research,
Commercialization and Outreach

Exhibit "A"
Packery Channel Monitoring Program
Proposed Amendment for 2012/13

Project Tasks and Cost Estimate

July 11, 2012

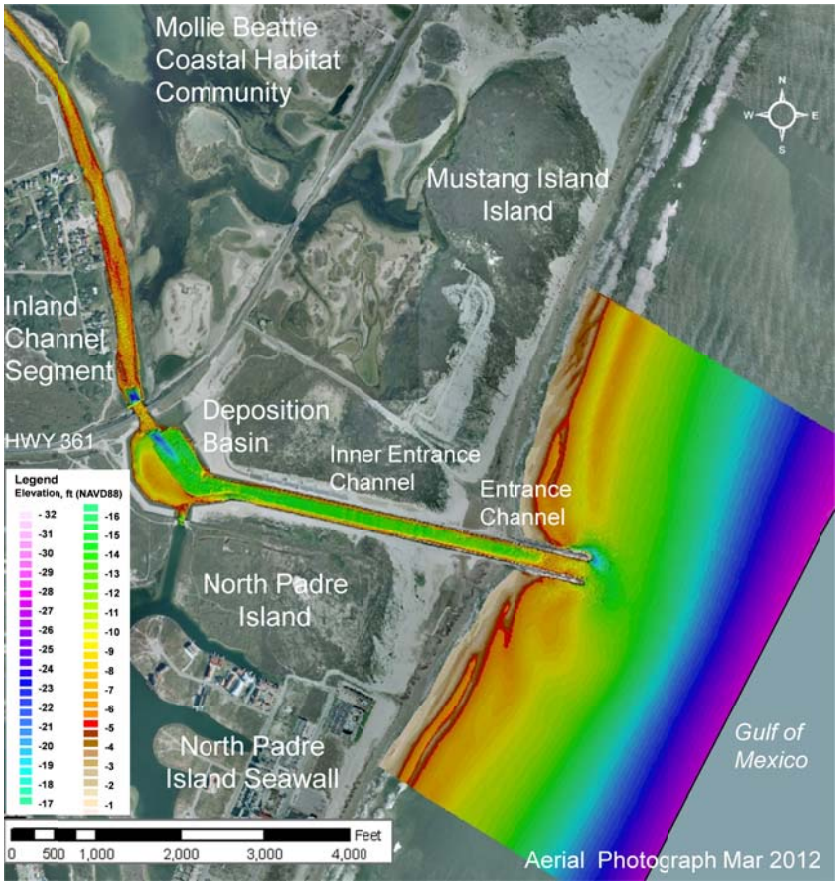

Figure 1. Post-dredge channel and nearshore morphology at Packery Channel (23 March 2012).

Submitted to:
The City of Corpus Christi

Submitted by:
Deidre D. Williams
The Conrad Blucher Institute for Surveying and Science
Texas A&M University-Corpus Christi

Introduction

The Packery Channel Monitoring Program began prior to construction in 2003 under sponsorship of the U.S. Army Corps of Engineers, Galveston District and has continued under the sponsorship of the City of Corpus Christi from 2008 to present (spring 2012). The Conrad Blucher Institute for Surveying and Science (CBI), Texas A&M University-Corpus Christi (TAMUCC) leads these investigations. The monitoring program includes the collection of bathymetric data in Packery Channel and the surrounding nearshore, measurement of elevation along the adjacent beach and inland channel segment (shoreline position), and elevation measurements across the Mollie Beattie Coastal Habitat Community (MBCHC). The monitoring program also includes measurement of current velocity in the inland channel segment, previously sponsored by the USACE, Coastal Hydraulics Laboratory, and the Coastal Inlets Research Program (2007-2011) and presently as an added contribution by TAMUCC. The analysis and interpretation of this data supports the City of Corpus Christi in the research-based management of Packery Channel as well as the adjacent wetland and Gulf beaches.

The Packery Channel inlet system is dynamic; responding to storms, anthropogenic change such as dredging, as well as typical seasonal coastal forcing (wind, current, water level, waves). Of primary importance for the 2012/2013 monitoring year is the investigation of changes in Entrance Channel shoaling. Dredging of the last 500 feet of the Entrance Channel was not completed by March 2012 when the contractor began demobilization in anticipation of Spring Break (Fig. 1). Surveys planned during 2012/13 will document the channel extent and volume associated with this shoal. The analysis of the seasonal data sets during the first post-dredge year are instrumental to describing early trends in shoaling and scour throughout the channel system. The adjacent beaches are a critical component of this system and therefore beach profile surveys and shoreline position surveys will document changes in beach volume and width along the recently nourished section of North Padre Island along the seawall. The information and guidance provided by the Packery Channel Monitoring Program will support the City of Corpus Christi in the decision of whether to re-initiate dredge operations during Fall 2012. This decision will be based, in part, upon changes in the extent and volume of the Entrance Channel Shoal and evaluation of the performance of the beach nourishment effort.

Application of New Datum

Starting with the March 2012 survey, all data will be reported as elevation (ft) relative to North American Vertical Datum 1988 (NAVD88), based on GPS static observations using GEOID09. This change was made in order to agree with pre- and post-dredging engineering and construction specifications and in an effort to reduce the opportunity for confusion between user groups. Elevations below NAVD88 = 0 will be reported as negative (-ft) and referred to as *depth*. Previous documentation reported data relative to Mean Sea Level (MSL) calculated for Bob Hall Pier. Surveys conducted during 2011 showed that MSL measured at Bob Hall Pier was located 0.40 ft *above* NAVD88. In addition, the bathymetric color ramp representing elevation in the channel and nearshore has been revised to better describe the shallow regions in the nearshore

fronting the adjacent beaches and some variation in color ramp will exist between 2012 reporting and previous documents.

Purpose

There are two primary goals for the 2012/13 monitoring year; 1) document post-dredge shoaling and scour in Packery Channel to support City dredge and navigation management and 2) measure and document changes in volume and width of the nourished beach along the North Padre Island Seawall (including Michael J. Ellis Seawall) relative to adjacent regions. In addition, the comprehensive program will continue to monitor changes in the Mollie Beattie Coastal Habitat Community that borders the inland channel segment and the Event Task (Task 2-5) will allow for post-storm and focus surveys as they are needed. The continuation of the monitoring program will allow the City to track changes in system dynamic due to the increase in overall channel depth, now deeper than post-construction, and onset of the summer season, a period associated with peak shoaling.

The Monitoring Program will describe the channel system as it begins to modify, relative to the change in water depth, from the basin to the Entrance Channel. The channel will likely undergo a period of rapid change over the summer months. Summer is the most dynamic season for sediment transport by wind from the adjacent beach and dunes which are the primary sources of sand contributing to shoal development in the Entrance Channel. Continued monitoring will assist the city in research-based management of the channel, adjacent beaches, and wetland habitat and to identify and allow adequate time to prepare for maintenance tasks including the possibility of continued dredging during Fall 2012.

Concerns and Benefits Addressed by Monitoring Program:

1. Expansion of the remaining shoal at mouth due to:
   a. Reduction in ebb current velocity (Increase in channel depth and lack of reinforcement by fronts during summer).
   b. Introduction of sand from nearshore (Weaker ebb flow to deter entry).
   c. Introduction of sand from nearshore (Sand bar development at mouth).
2. Expansion of remaining shoal in Deposition Basin.
3. Beach advance at jetties (Sand entry around jetties when critical threshold is reached).
4. Pre-storm condition of nourished beach along seawall (FEMA reimbursement).
5. Longevity of beach nourished during 2011/12 (Future nourishment strategies).
6. Early identification of trends in sediment transport (Future dredge planning)
7. Assistance/support related to other City projects in the vicinity.

Post-Dredge and Nourishment Status Summary

Packery Channel

Dredging conducted from Dec 2011 to March 2012 increased channel depth in the northern section of the Deposition Basin and across the entire Inner Entrance Channel. The overall primary channel depth in this region is greater than post-construction due to

the series of interruptions by tropical storms during 2005 which introduced sand into the channel directly from the beach and from the contribution of the sand plug at channel mouth. Dredging of the last 500-ft of the channel near the channel mouth was not completed (Fig. 2). The mean depth along centerline during the 23 March 2012 survey was -12.82 ft (Fig. 2). Depth across the remaining shoal in the Entrance Channel was variable (- 6 to -10 ft) with across-channel position and along the length of the shoal. The shoal terminated abruptly on the west-end (T1) with post-dredge centerline depths between -12 and -14 ft (Fig. 4). Transect T2 is located at the western transition region of the Entrance Channel shoal. An increase in shoaling at T2 location indicates that the shoal migrated westward after dredging was completed between the 05 Mar 2012 and 23 Mar 2012 surveys. Across the remaining shoal depth was relatively uniform across the channel width ranging from -5.5 to -7 ft during both the pre- and post-dredge surveys (Fig 5). Westward shoal migration occurred during a period of onshore forcing by late-season frontal systems. Interestingly, depth across the width of the channel just west of the mouth increased by approximately 3 ft between 25 Sep 2011 and 05 Mar 2012 unrelated to the dredge activity but rather to winter onshore forcing. Based on pre- and post-storm data analysis the total volume of sand removed from the channel was on the order of 188,000 cu yd, with on the order of 4,000 cu yd contributed from the inland channel segment. These calculations derived from the detailed 23 Mar 2012 survey data agree with the pay volume reported by the contractor (190,757 cu yd). The volume of sand associated with the remaining shoal was approximately 24,000 cu yd (-14 ft dredge depth) during the 23 Mar 2012 survey. Change in volume was negligible since the 05 Mar 2012 contractor survey, although the volume of sand in this region did decrease some 10,000 cu yd since the preceding Sep 2012 survey.

An additional region of interest is at the intersection of the Deposition Basin and the Inner Entrance Channel. The 23 Mar 2012 survey showed that a portion of the Basin Shoal remained after dredging was conducted (Fig 6). The transect survey of the basin conducted under direction of the contractor did not completely define this remaining shallow feature. The shoal is located approximately 170 ft from the centerline and is approximately 23-ft wide and 160-ft long. Before dredging, this feature formed the northern border of the deepest section of the channel that was confined along the revetment to the south. The shoal is located northwest of the large-scale revetment repair conducted prior to dredging. Depth at this feature ranges from - 4.5 to - 5.5 ft. Future surveys will determine if the shoal presents a navigation hazard warranting removal or placement of an aid to navigation.

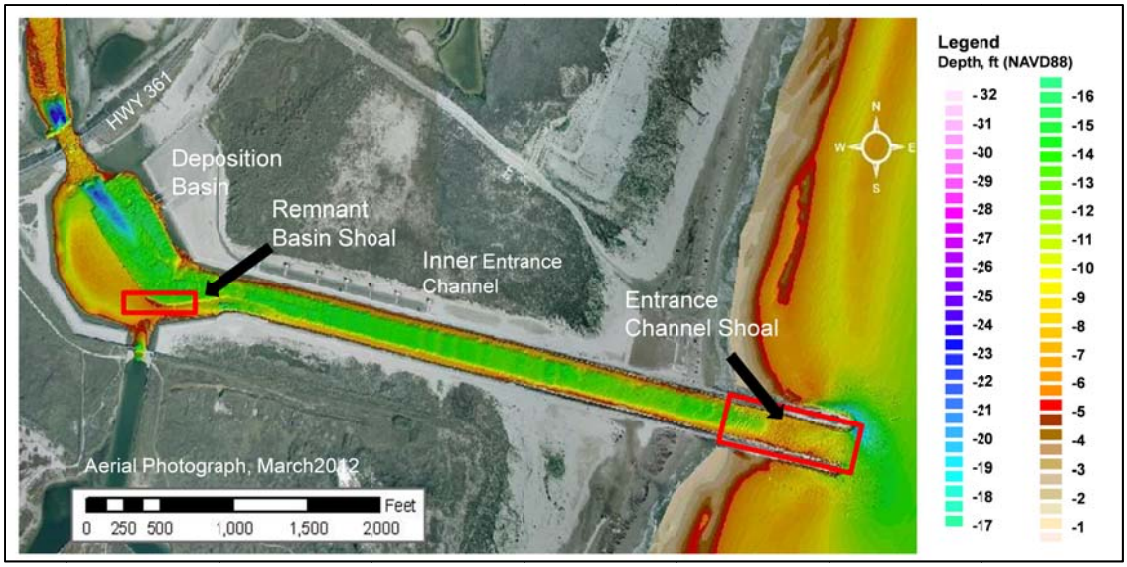

Figure 2. Post-dredge channel depth and location of shoaling (23 Mar 2012).

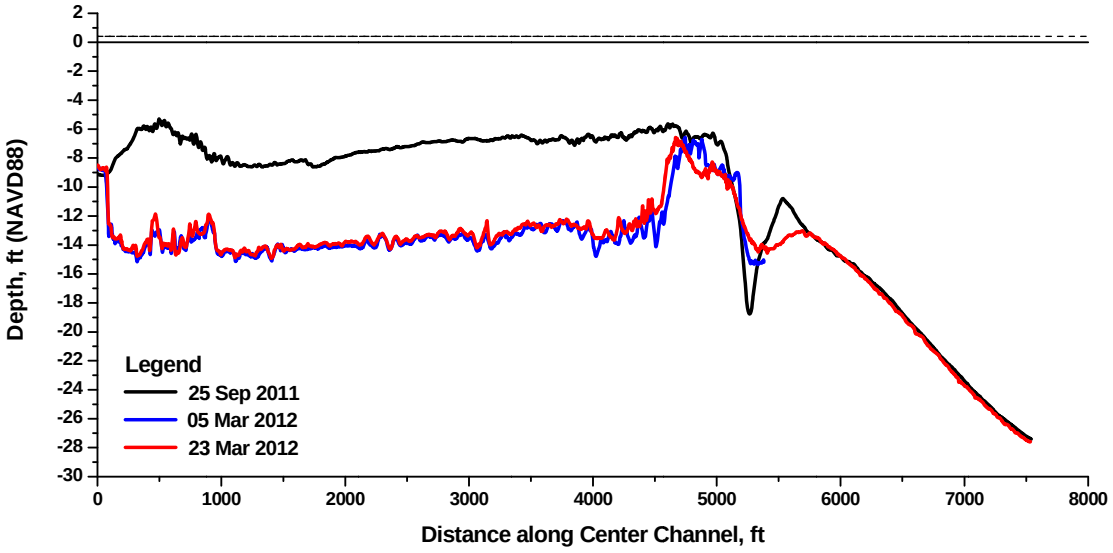

Figure 3. Depth along centerline from the basin shoal to the Gulf of Mexico (23 Mar 2012).

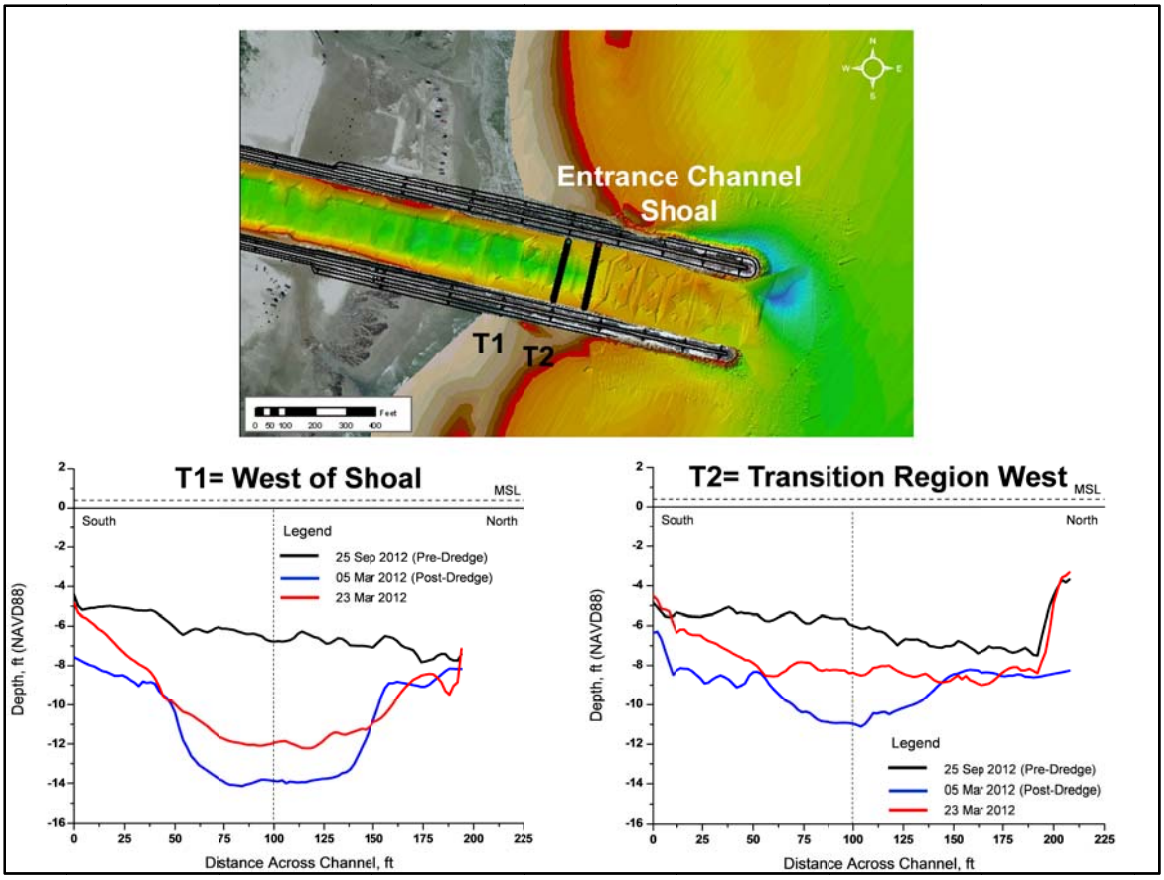

Figure 4. Change in channel cross-section west of remaining Entrance Channel Shoal.

Future surveys will focus on monitoring change in the height, extent and direction of expansion of the shoal located near the mouth of the Entrance Channel. Summer months provide the greatest opportunity for shoal growth by wind-blown sand transport. The Monitoring Program has established that the dry and typically windy summer season supports wind-blown transport of sand from the wide beach adjacent to the channel. During a typical year, on the order of 20,000 to 30,000 cu yd of sand transported by wind enters the channel from the adjacent beaches. In addition, ebb flow is not reinforced by frontal passage during the summer; therefore the ebb current is often too weak to transport a sufficient quantity of sand out of the channel mouth resulting in shoal development. Historically, this reduction in reinforced flow has resulted in the impoundment of sand at the west end of the pre-existing shoal, allowing for a gradual increase in shoal volume and extent. Thus, even a small shoal that remains post dredge has the potential to function as the seed for shoal development over the summer months. The Monitoring Program will measure the rate of shoal development so that the City can determine if dredging should continue during Fall 2012 and anticipate future dredge scheduling.

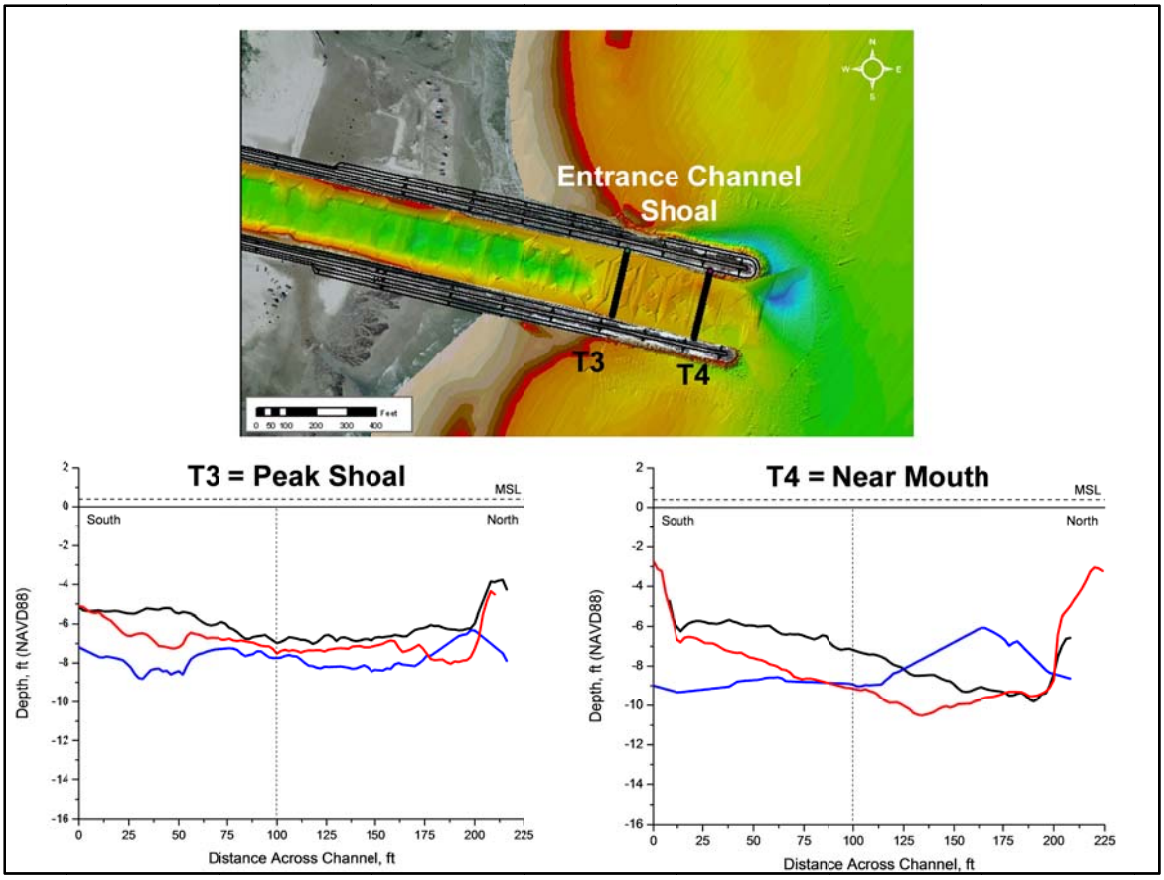

Figure 5. Change in channel cross-section west of remaining Entrance Channel Shoal.

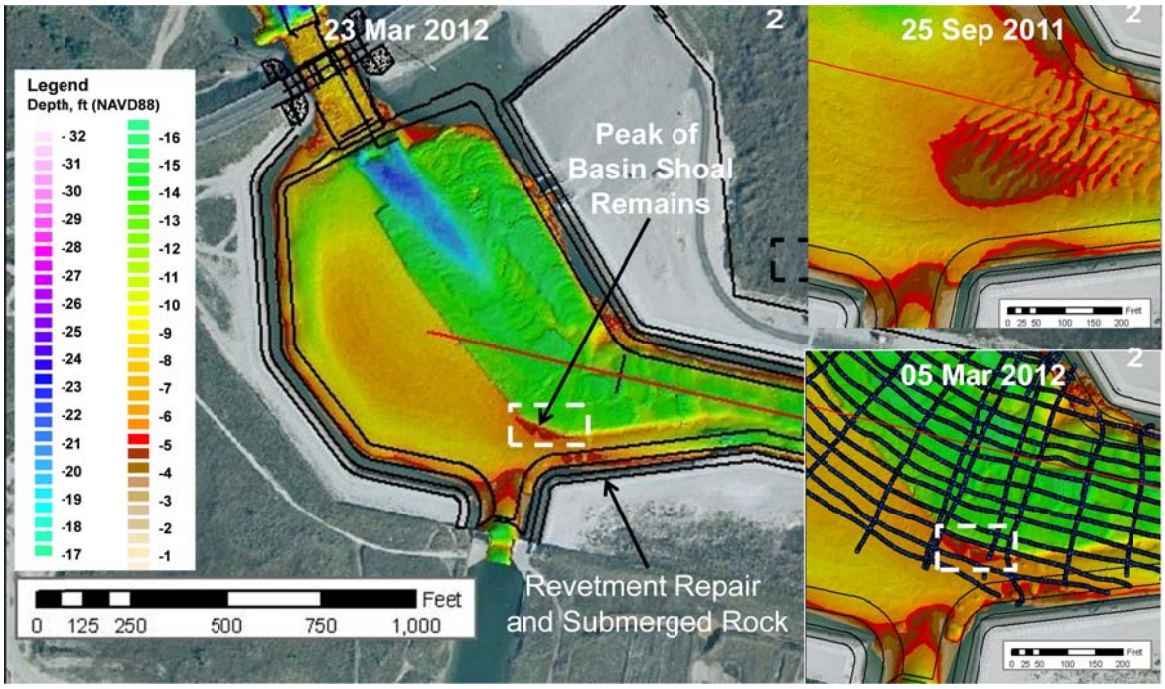

Figure 6. Narrow region of Basin Shoal remains after 2011/12 dredge effort.

North Padre Island Seawall Beach Nourishment

Approximately 190,000 cu yd of sand dredged from Packery Channel was placed along the North Padre Island Seawall from December 2011 to March 2012. The seawall is approximately 4,300-ft long. The nourishment area stretched along nearly half of the seawall, some 2,000 ft, from the approximate mid-point (just south of the Holiday Inn) to the south end of the seawall at Whitecap Blvd. (Fig. 7). The purpose of the nourishment effort was to widen the historically (prior to construction of Packery Channel) narrow beach along the seawall. The width of a beach is determined relative to a designated shoreline datum, in this case, the berm crest (the highest position seaward before the slope to water's edge). The application of berm crest as a shoreline position locator provides a conservative estimate of the width of the beach for planning purposes. The region landward of the shoreline position does not typically experience rapid change during daily forcing but is more representative of the beach width during a particular season or large scale event.

The primary goal of the nourishment effort was to increase the width of the beach along the retreating section of beach fronting the south end of the seawall. Prior to the 2011/12 nourishment, beach width at the south-end of the seawall had been highly variable and overall, very narrow (20 to 50-ft wide). The greatest increase in post-nourishment beach width was observed in this region where beach advance was on the order of 80 to 100 ft from the Nov 2012 position which was equivalent to the pre-construction baseline position. Benefits of sand placement were found to gradually decrease moving northward along the seawall with only a 20 to 30 ft increase measured at the northern terminus of the nourishment area, located just south of the Holiday Inn. The post-nourishment shoreline position survey was postponed until May 2012 due to high water levels that limited unrestricted vehicular access. The post-nourishment shoreline position was in agreement with, or within 50-ft landward of that measured after the first nourishment (2005-2006) during the construction of Packery Channel (Fig. 8). Benefits from the 2011/12 nourishment extend over 1,200 ft to the south, beyond the active placement region. Future surveys will track sediment transport in this region and assist in determining placement options to maximize longevity of the beach nourishment for future efforts.

Shoreline Position Adjacent Packery Channel

The shoreline position at the inlet remains nearly symmetric indicating nearly balanced sediment transport from the north and from the south since the inlet was constructed (Fig. 9). The shoreline adjacent to the inlet in the zone of influence is stable at approximately the same position as during Sep 2011. The position of the shoreline is the greatest distance from the baseline since construction, thus the beach is the widest observed to date. The shoreline initially advanced to near this position during 2007 but receded during Hurricane Ike (Sep 2008). Recovery began within months of the storm. The shoreline continues to be sheltered by the jetties in the zone of influence. Stability in this region extends 2,200 ft to the north and 4,000 ft to the south of the inlet although the widest section of the beach remains near the jetties. The shoreline beyond this sheltered region is highly variable in position relative to seasonal and storm forcing.

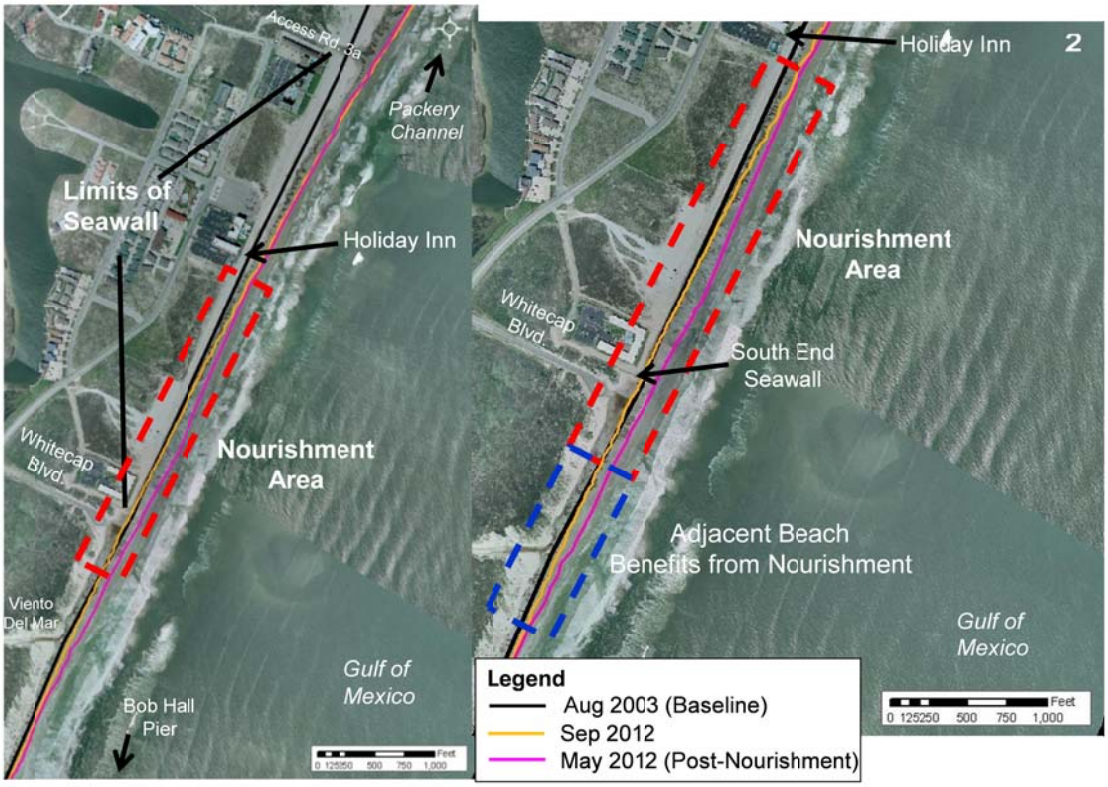

Figure 7. Post-nourishment shoreline position (May 2012) relative to pre-construction baseline (2003) and pre-nourishment (Sep 2011).

Shoreline advance adjacent to the inlet is beneficial but does present the potential for complications related to future channel management. If the shoreline position advances too close to the inlet mouth sand may be transported directly into the channel from this rich source. In addition, the wide beach provides a source of sand available for transport by wind directly into the channel over the low elevation (≈ 4.8 ft) jetties. Seasonal monitoring of the channel system including the channel and nearshore bathymetry and beach topography provides research-based guidance in managing these interdependent resources.

Importance of Beach Profile Surveys and Shoreline Position Surveys

These topographic surveys provide a view of large scale change across the beach face. From this data a conservative estimate of beach width, the most narrow the beach would be on a given day. Regions of persistent shoreline recession (landward shift) are identified and "hot spots" of erosion and shoreline loss can be quantified. Beach profile survey data is applied to determine the volume of sand associated with the beach for FEMA reimbursement as well as determining sand placement regions for beach nourishment. Task 2-5 provides for a post-storm beach profile survey to maximize FEMA reimbursement after the nourishment conducted during 2011/12.

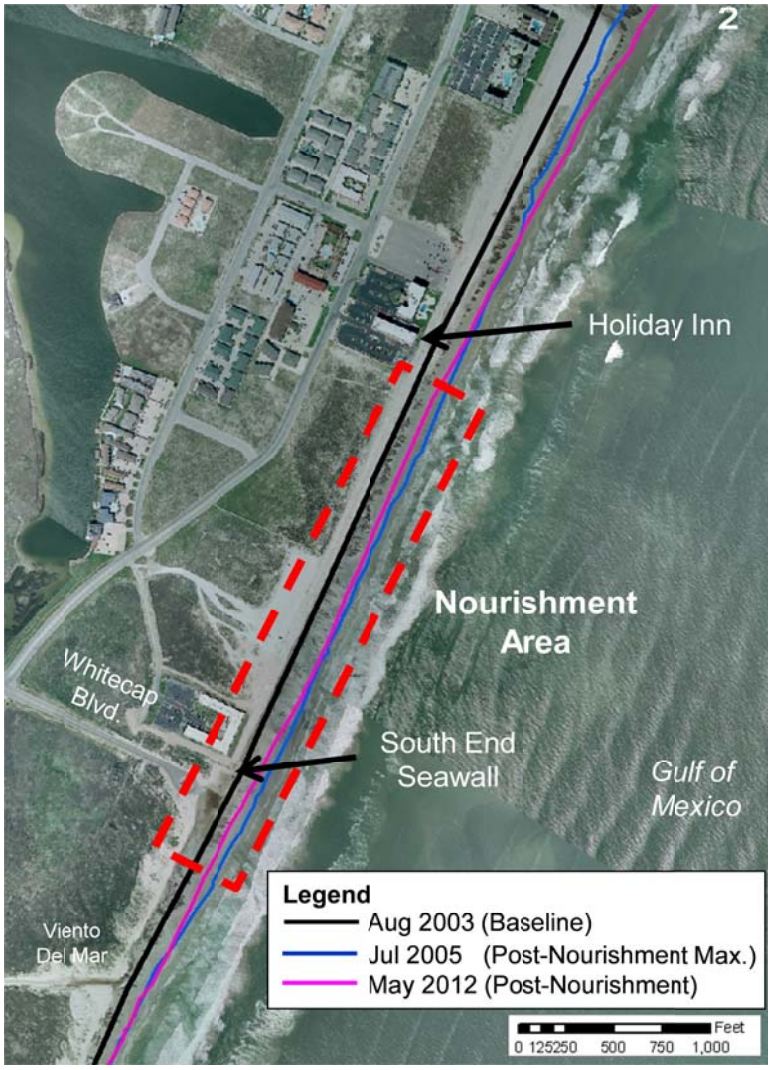

Figure 8. Comparison of 2012 and 2005 post-nourishment shoreline positions.

Benefit of Packery Channel Monitoring Program to the City of Corpus Christi

Seasonal surveys provide information to support proactive channel management which includes the initiation of; 1) permitting and placement of aids to navigation when depth limited navigation in a segment of the channel is imminent, 2) rapid public alert when potential for depth-limited navigation is imminent, 3) permitting and scheduling of dredge activities when the channel reaches a critical sand threshold and can no longer self-maintain. 4) Assessment of dredge effort. 5) Documentation of a consistent "monitoring program" and pre-storm data for FEMA reimbursement. In addition, the monitoring program tracks changes in channel width and tracks change in morphology and water depth along the inland channel segment adjacent to the MBCHC. These proactive measures are possible due to timely information provided through seasonal monitoring and analysis. Unscheduled gaps in the seasonal survey schedule result in gaps in understanding of the system and quantification of change.

Figure 9. Shoreline position in the region sheltered by the jetties.

Seasonal Monitoring and Long-term Channel Management

The key to successful management of an inlet system is knowledge of the processes that force sand into and out of the system; and to identify developing trends in sediment transport, particularly after major changes such as channel dredging or in the case of storm damage. Seasonal monitoring at Packery Channel provides tracking of changes which allows both 1) identification of trends in sediment transport and 2) deviation from those trends that could indicate a change in system dynamic and need for management action. The monitoring program has documented both a seasonality and event driven component to sediment transport in this system with shoaling most prevalent during the summer and after storms. Future monitoring will determine if the change in channel depth due to dredging will alter the magnitude and rate of such seasonal change.

Monitoring Program Tasks

This proposal describes the 2012/2013 amendment to the existing contract for the Packery Channel Monitoring Program. The five Tasks are outlined as a guide following the successful program implemented in 2008. The goal of the 2012/13 year is to measure and document changes in channel morphology as shoaling resumes post-dredge. This information will assist the City of Corpus Christi in determining whether additional dredging during 2012 is required to maintain navigation at the channel mouth. In addition the program will continue to assist the City in the anticipation of the next dredge event

and document pre-storm beach width and volume for FEMA reimbursement should the area sustain damage during hurricane season.

These tasks may be conducted simultaneously or independently and in the order that best supports the monitoring program goals.

Task 1. Project Management and Aerial Photography

1-1. Project Management

Project management includes historic analysis, reporting, survey organization and scheduling as well as presentations and generation of materials requested by the City of Corpus Christi. Additional support includes coordination with surveyors, engineers and other environmental professionals to assist the City of Corpus Christi with related projects including potential dredge operations and/or FEMA reimbursement for storm damage.

Estimated Cost: $43,466

1-2. Aerial Photography

Description: Acquisition of an annual set of rectified aerial photographs of the Packery Channel region including the entire channel from the GIWW to the Gulf of Mexico (GOM); including North Padre and Mustang Islands from the south end of the seawall to Newport Pass. Photographs are applied in ArcGIS environment for comparative analysis of change relative to key features and as a reference for overlay of data and terrain models. Bids received during 2011 show that the cost of aerial photography has increased reportedly due to increases in fuel costs.

Purpose: For interpretation of large-scale changes in vegetation, dune line, and inter-tidal regions adjacent to the inland segment of the channel as well as along Padre and Mustang Islands. In addition, the aerials are appropriate for visuals and explanation aids to residents and laypersons.

Schedule: (1) annual set conducted Aug/Oct 2012 (pending weather conditions).

Estimated Cost: $16,210

Task 2. Measurement of Morphologic change in Packery Channel and along Mustang and Padre Island.

2-1. Beach Profile Survey

Description: The beach profile survey provides information on changes occurring at 18 specified locations from the Nueces Kleberg County Line to north of Fish Pass. There are historic data for these locations since 1995. Elevation measurements are collected along transects that initiate landward of the dune or other landward limiting feature (seawall or pavement) and extend offshore up to one mile into the Gulf of Mexico.

Purpose: To document changes in features such as the dune toe (seaward limit of dunes) berm crest (most landward point of active sediment transport on the beach), and sand bars. The data are applied to calculate volumetric change along historically surveyed areas of the beach and applied to calculate sand volume which is required for sand placement and documentation for FEMA funding. Data is also applied to verify shoreline position data and to determine the maximum region of sheltering (Zone of Influence) by the jetties.

Schedule: (1) annual survey conducted during peak summer condition (Sep/Oct 2012).
Estimated Cost: $ 38,628

2-2. Shoreline Position surveys
Description: Elevation data are collected by RTK GPS across the beach from close to the dune toe to the water line along a zigzag path. The beach is surveyed from south of the Nueces Kleberg County Line to north of Fish Pass.
Purpose: These surveys are an efficient and low-cost way to measure changes in the width of the dry beach over the broad study area. Within days, a large section of the beach can be measured to determine changes in shoreline position from which regions of beach erosion and accretion can be determined and potential "hot spots" can be identified. Monitoring the seasonal position of the shoreline assists in management of beach vehicular access south of the inlet and addresses persistent regions of shoreline recession that have been identified fronting the North Padre Island Seawall and Whitecap Blvd as well as regions of receding shoreline north of the inlet near Newport Pass.
Schedule: (2) Surveys. Tentative survey schedule: Sep/Oct 2012, Jan/Feb 2013.
Estimated Cost: $14,209

2-3. Surveys of channel and nearshore depth and morphology (bottom features)
Description: These bathymetric surveys combine single-beam and multi-beam sonar coverage to provide high resolution of morphology (shoals, scour and bars). Seasonal series of data is applied to interpretation of pathways of sediment transport.
Purpose: Data is applied to define features such as shoals (areas of deposition) and scour (areas of erosion) in the channel, nearshore and around structures. This data is applied to determine pathways of sediment transport and to calculate volumetric change for application to the estimation of the sand volume available for dredging. The data are applied to interpret trends in sediment transport as well as to calculate volumetric change, the calculation of sand loss or gain, for nourishment projects, and to identify potential regions of shoaling which could limit navigation. A primary application of this data is to assist with determining potential scheduling of dredging.
Schedule: (3) Surveys. Tentative survey schedule: Sep/Oct 2012, Jan/Feb 2013 and June 2013. Additional surveys may be required if data indicate that depth-limited navigation is imminent.
Estimated Cost: $ 102,322

2-4. Inland Channel Segment and Mollie Beattie Coastal Habitat Community (MBCHC)
Description: The inland channel segment bordering MBCHC continues to modify as the region adjusts to changes in water flow in the channel and over the wetland. These changes are best captured seasonally through a network of cross-sections that document changes in wetland extent, channel boundaries and shoreline change. Elevation is measured along transects (survey lines) roughly perpendicular to channel orientation starting at the location of mean higher high water (MHHW) shoreline position along the south shore and then extending across the channel to the location of MHHW shoreline position or until a limiting feature (such as coverage of a raised placement area) is

defined. Measure the MHHW shoreline position along the south shore of Packery Channel from the HWY 361 Bridge to the Relief Channel west of the channel dog leg.
Purpose: These surveys define change in the inland segment of the channel that borders the MBCHC and changes in the elevation of the wetland. Analysis of these data sets provide quantification of change in primary (-5 ft) and upper bank (MSL) width along MBCHC. In addition the MHHW position of the west side of the inland channel segment (residential) is surveyed and compared to previous surveys to determine historic change in position.
Schedule: (2) Survey Sets (Transects and MHHW). Tentative survey schedule: Sep/Oct 2012, Jan/Feb 2013. Additional surveys may be required if data indicate that the rate of change has increased during the study period.
Estimated Cost: $ 32,419

2-5. Event/Transitional Survey and/or Dredge Support
Description: In a continued effort to respond to reported City of Corpus Christi budgetary constraints, the monitoring program continues at a modified schedule to include (2) seasonal surveys (Sept/Oct 2012 and Jan/Feb 2013) and (1) transitional survey (June 2013). To accommodate monitoring concerns beyond these seasonal surveys this task provides for event survey or other survey requirements as needed. Such support outside of seasonal surveys could include but is not limited to dredge support, engineering support, environmental assessment (wetland), and sand placement activities outside the seasonal survey scope. The primary purpose of the event surveys is to facilitate timely pre- or post- storm surveys. Surveys may be needed beyond the seasonal designation, such as after storms, and to assist with the investigation of sensitive environmental habitat or anthropogenic influences on the coastal environment that are identified during the course of the three seasonal surveys. The cost is based upon the following survey suite but may be utilized as needed:

a. Shoreline position survey (1) Task 2-2
b. MBCHC (1) Task 2-2 OR Full Beach Profile Survey (1) Task 2-1
c. Bathymetric channel and nearshore survey (1) as described in Task 2-3
d. Modified beach profile survey of seawall nourishment area south of Packery Channel (Includes profiles at 400-ft to 1100-ft spacing to accommodate more accurate beach volume calculation for FEMA).

Purpose: To define morphology immediately before or after a storm event or related to sensitive habitat such as the MBCHC without time restrictions associated with the amendment process.
Schedule:
Estimated Cost: up to $67,135

Total Estimated Cost to City of CC: $ 314,389

Deliverables:
ASCII data sets (x,y,z) NAVD88 State Plane south Zone FIPS 4205
Email status report (monthly or as updates are available)
Status Reports (post-survey quarterly reports)

Note: all surveys may be rescheduled based upon study findings or weather and sea conditions. Additional surveys may be recommended upon seasonal findings or evidence of change based upon observations in the field.

Budget Next Page

Estimated Budget
June 2012 to June 2013

Personnel	
Principal Investigator	$ 54,836
Database Management/support and technical staff	$ 13,035#
Subtotal Personnel	$ 67,871
Benefits	$ 17,850
Total Personnel	$ 85,721
Travel (Transportation to Surveys)	
Truck/fuel	$ 1,000
Total Transportation	$ 1,000
Other Project Costs	
Materials and Computer (software upgrades Repair Allowance, Backup/Archive)	$ 1,500
Surveying/post processing (Contractual)	$ 180,200
Aerial Photography (Contractual)	$ 10,000
Total Transportation and Other Project Costs	$ 2,500
Subtotal contractual	$ 190,200
Subtotal salary and wages	$ 67,871
F/A (53% salary and wages)	$ 35,972
Project Total	$ 314,389

SUPPLIER NUMBER _____
TO BE ASSIGNED BY CITY
PURCHASING DIVISION

City of Corpus Christi

CITY OF CORPUS CHRISTI
DISCLOSURE OF INTEREST

City of Corpus Christi Ordinance 17112, as amended, requires all persons or firms seeking to do business with the City to provide the following information. Every question must be answered. If the question is not applicable, answer with "NA". See reverse side for Filing Requirements, Certifications and definitions.

COMPANY NAME: **Texas A&M University-Corpus Christi**

P. O. BOX: _____

STREET ADDRESS: **6300 Ocean Drive** **CITY:** **Corpus Christi** **ZIP:** **78412**

FIRM IS: 1. Corporation ☐ 2. Partnership ☐ 3. Sole Owner ☐
4. Association ☐ 5. Other ☐ _____

DISCLOSURE QUESTIONS

If additional space is necessary, please use the reverse side of this page or attach separate sheet.

1. State the names of each "employee" of the City of Corpus Christi having an "ownership interest" constituting 3% or more of the ownership in the above named "firm."

Name	Job Title and City Department (if known)
N.A.	

2. State the names of each "official" of the City of Corpus Christi having an "ownership interest" constituting 3% or more of the ownership in the above named "firm."

Name	Title
N.A.	

3. State the names of each "board member" of the City of Corpus Christi having an "ownership interest" constituting 3% or more of the ownership in the above named "firm."

Name	Board, Commission or Committee
N.A.	

4. State the names of each employee or officer of a "consultant" for the City of Corpus Christi who worked on any matter related to the subject of this contract and has an "ownership interest" constituting 3% or more of the ownership in the above named "firm."

Name	Consultant
N.A.	

FILING REQUIREMENTS

If a person who requests official action on a matter knows that the requested action will confer an economic benefit on any City official or employee that is distinguishable from the effect that the action will have on members of the public in general or a substantial segment thereof, you shall disclose that fact in a signed writing to the City official, employee or body that has been requested to act in the matter, unless the interest of the City official or employee in the matter is apparent. The disclosure shall also be made in a signed writing filed with the City Secretary. [Ethics Ordinance Section 2-349 (d)]

CERTIFICATION

I certify that all information provided is true and correct as of the date of this statement, that I have not knowingly withheld disclosure of any information requested; and that supplemental statements will be promptly submitted to the City of Corpus Christi, Texas as changes occur.

Certifying Person: _____ **Title:** Dr. Luis Cifuentes [redacted] Vice President Division of Research, Commercialization and Outreach

(Type or Print)

Signature of Certifying Person: _____ **Date:** 8.5.12

DEFINITIONS

a. "Board member." A member of any board, commission, or committee appointed by the City Council of the City of Corpus Christi, Texas.

b. "Economic benefit". An action that is likely to affect an economic interest if it is likely to have an effect on that interest that is distinguishable from its effect on members of the public in general or a substantial segment thereof.

c. "Employee." Any person employed by the City of Corpus Christi, Texas either on a full or part-time basis, but not as an independent contractor.

d. "Firm." Any entity operated for economic gain, whether professional, industrial or commercial, and whether established to produce or deal with a product or service, including but not limited to, entities operated in the form of sole proprietorship, as self-employed person, partnership, corporation, joint stock company, joint venture, receivership or trust, and entities which for purposes of taxation are treated as non-profit organizations.

e. "Official." The Mayor, members of the City Council, City Manager, Deputy City Manager, Assistant City Managers, Department and Division Heads, and Municipal Court Judges of the City of Corpus Christi, Texas.

f. "Ownership Interest." Legal or equitable interest, whether actually or constructively held, in a firm, including when such interest is held through an agent, trust, estate, or holding entity. "Constructively held" refers to holdings or control established through voting trusts, proxies, or special terms of venture or partnership agreements."

g. "Consultant." Any person or firm, such as engineers and architects, hired by the City of Corpus Christi for the purpose of professional consultation and recommendation.