

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT TX1404A-CM-N

Padre Island, Cuba Island to Mile Marker 44, Texas

Introduction

NOAA Coastal Mapping Program (CMP) Project TX1404A-CM-N provides highly accurate digital shoreline data for a portion of the coast of Padre Island, Texas from Cuba Island to Mile Marker 44. TX1404A-CM-N is a subproject of a larger acquisition project, TX1404-CU-N, which extends from Port Mansfield to Rocky Slough, Texas. The Geographic Cell (GC) may be used in support of the NOAA Nautical Charting Program (NCP) as well as geographic information systems (GIS) for a variety of coastal zone management applications.

Project Design

The Requirements Branch (RB) of the Remote Sensing Division (RSD) designed Project TX1404-CU-N to support the Continually Updated Shoreline Product (CUSP), a seamless shoreline database. Photographic mission instructions were formulated following the guidelines of RSD's Photo Mission Standard Operating Procedures. The instructions discussed the project's purpose, geographic area of coverage, scope and priority, image requirements, Global Positioning System (GPS) data collection procedures and guidelines, instructions for data recording and handling, and mission communication protocols. RB created a Project Layout Diagram, flight maps and input files for the aircraft flight management system.

Field Operations

The field operations consisted of the collection of static and kinematic GPS data, Inertial Measurement Unit (IMU) data, and the acquisition of aerial imagery. The photographic mission operations were completed during October 2014 and February 2015 with the NOAA King Air aircraft. Natural color (RGB) and near-infrared (NIR) digital images were acquired concurrently with an Applanix Digital Sensor System (DSS) 439 aerial camera system, though for the February 2015 mission NIR imagery was not collected since only the RGB camera was available. All images were acquired at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.37 meters. Acquisition of the back-bay (Laguna Madre) imagery was coordinated within +/- 0.3 ft of the Mean Sea Level (MSL) tidal datum, and the outer coast imagery was coordinated with the Mean High Water (MHW) tidal datum.

Direct Georeferencing Data Processing

GPS/IMU data were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of the imagery. A local GPS base station was established for use as a reference station for kinematic GPS processing operations. The position of the base station was determined using the NGS Online Processing User Service (OPUS), which computed fixed baseline solutions from nearby CORS stations. The airborne kinematic data was processed using Applanix POSPac (ver. 6.2) software in November 2014 and March 2015. For further information refer to the Airborne Positioning and Orientation Report (APOR) that is on file with other project data within the RSD Electronic Data Library.

The processed GPS/IMU data were used to derive precise exterior orientation (EO) values of the camera centers required for digital feature extraction. The predicted horizontal accuracy of the imagery was determined by propagating sensor EO and image measurement uncertainties through the photogrammetric collinearity equations using an Exterior Orientation Total Propagated Uncertainty (EO-TPU) tool developed by NGS. Using this tool, the predicted horizontal uncertainty at the 95% confidence level was calculated to be 1.5 meters.

NGS third order control was used to verify the horizontal integrity of the DG data. All stereo models were examined and found to have acceptable levels of parallax for mapping purposes. Positional data is referenced to the North American Datum of 1983 (NAD 83).

Compilation

The data compilation phase of this project was completed in April 2019. The Feature Extraction module of BAE Systems' SOCET SET (ver. 5.6) photogrammetric software was used to compile feature data from imagery. Feature identification and the assignment of cartographic codes were based on image analysis of the project digital images and information extracted from the appropriate NOAA Nautical Charts, U.S. Coast Guard Light List and other ancillary sources. Feature attribution was assigned in compliance with the Coastal Cartographic Object Attribute Source Table (C-COAST), which provides the definition and attribution scheme for the full range of cartographic features pertinent to the CMP. Selected features were further modified with additional descriptive information to refine general classification.

Spatial data accuracies for Project TX1404A-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 3.0 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points measured during the compilation phase was derived by doubling the horizontal uncertainty calculated from the EO-TPU tool.

The following table provides information on the imagery used to complete this project:

Date	Time (UTC)	Color Imagery		Infrared Imagery		Tide Level
		Roll	Strip/Images	Roll	Strip/Images	
14-OCT-2014	21:03 – 21:05	14NC90	53-018 / 19908-19920	14NR80	53-018 / 16438-16450	0.0 m **
14-OCT-2014	21:09 – 21:11	14NC90	53-019 / 19921-19929	14NR80	53-019 / 16451-16459	0.0 m **
15-OCT-2014	15:06 – 15:12	14NC91	53-003 / 20183-20221	14NR81	53-003 / 16713-16751	0.1 m **
25-FEB-2015	21:31 – 21:34	15NC22	53-002 / 4050 – 4064	n/a		0.5 m *
25-FEB-2015	21:41 – 21:47	15NC22	53-001 / 4065 – 4104	n/a		0.5 m *

* The outer Gulf coast portion of the project area is tidal, and water levels for the images covering this portion of the project area are given in meters above MLLW based on verified observations recorded at the NOS station at Corpus Christi (8775870). The height of the MHW tidal datum in this tidal portion of the project area is approximately 0.47 meters above MLLW.

** Most of the back-bay (Laguna Madre) portion of the project area is considered to be non-tidal, and water levels for the images covering these areas are given in meters above MSL based on verified observations recorded at the TCOON stations at Baffin Bay (8776604) and Rincon Del San Jose (8777812).

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of AB. The final QC review was completed in April 2019. The review process included analysis of the DG results and assessment of the identification and attribution of digital feature data within the GC according to image analysis and criteria defined in C-COAST. The quality control process concluded with an inspection of topological connectivity within the GC using ArcGIS (ver. 10.6.1) software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical charts with natural color images and compiled project data resulted in creation of the Chart Evaluation File (CEF). The following nautical chart was used in the comparison process:

- 11306, IWW, Laguna Madre, Middle Ground to Chubby Island, 22nd Ed., Oct. 2012

End Products and Deliverables

The following specifies the location and identification of end products generated during the completion of this project:

Remote Sensing Division Electronic Data Library

- Project database
- Airborne Positioning and Orientation Report (APOR)
- GC11447 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

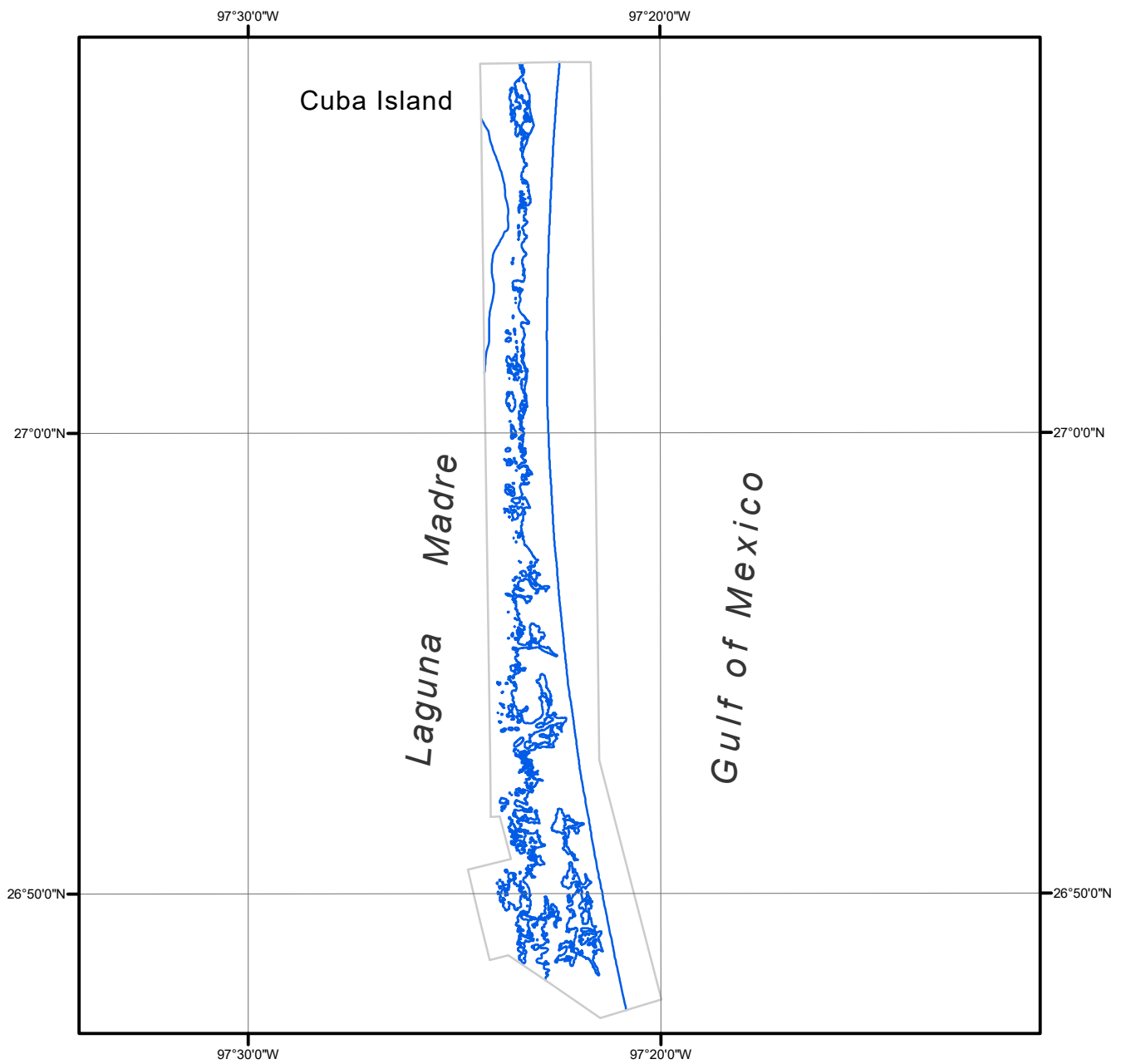
NOAA Shoreline Data Explorer

- GC11447 in shapefile format
- Metadata file for GC11447
- PCR in Adobe PDF format

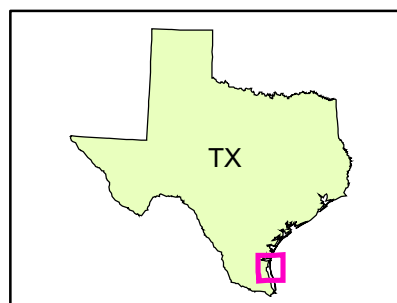
End of Report

PADRE ISLAND, CUBA ISLAND TO MILE MARKER 44

TEXAS



Overview



TX1404A-CM-N

GC11447