

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT TX1403A-CM-N

Brownsville Ship Channel and Brazos Island, Texas

Introduction

NOAA Coastal Mapping Program (CMP) Project TX1403A-CM-N provides highly accurate digital shoreline data for key areas of change for the Brownsville Ship Channel and Brazos Island, in Texas. TX1403A-CM-N is a subproject of a larger acquisition project, TX1403-CU-N, which extends from the Rio Grande River to Port Mansfield, 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 TX1403-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. Additionally, comparison of the project imagery and the latest edition NOAA nautical chart coverage revealed few differences. Therefore the determination was made to compile targeted updates rather than a full GC.

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 conducted on October 15th, 2014 and February 25th, 2015 with the NOAA King Air (N68RF) aircraft. Color and near infrared (NIR) digital images were acquired concurrently with an Applanix Digital Sensor System (DSS) 439 aerial camera system, except on February 25th, 2015 when only color imagery was acquired. Eight flight lines were acquired at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.37 meter.

GPS Data Processing

GPS/IMU data was collected and processed by RSD personnel to yield precise positions and orientations of camera centers for application as photogrammetric control in the aerotriangulation (AT) phase of project completion. 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 POSPac (ver. 7.1) in March 2015. For further information refer to the Airborne Positioning and Orientation Reports (APOR) on file with other project data in the RSD Electronic Data Library.

Aerotriangulation

Routine softcopy AT methods were applied to establish the network of precise camera positions and other control for mapping, and to provide model parameters and orientation elements required for digital compilation. This work was completed by RSD personnel in August 2018 utilizing a softcopy photogrammetric workstation. The color and IR images were measured and adjusted as a single block using BAE Systems' SOCET SET (ver. 5.6) photogrammetric software in conjunction with the Multi-Sensor Triangulation (MST) module. Upon successful completion of the AT process, the software provided the RMS of the standard deviations of the residuals for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.59 meters based on a 95% confidence level. An AT Report was completed and is on file with other project data within the RSD Electronic Data Library.

The project database consists of project parameters and options, camera calibration data, interior orientation parameters, ground control parameters, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is referenced to the North American Datum of 1983 (NAD 83).

Compilation

The data compilation phase of this project was completed in September 2018. The Feature Extraction module of BAE Systems' SOCET SET (ver. 5.6) photogrammetric software was used to extract 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 TX1403A-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.2 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points measured during the compilation phase was derived by doubling the circular error calculated from the aerotriangulation statistics.

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	
15-OCT-2014	20:34 – 20:39	14NC92	53-035 / 20756-20791	14NR82	53-035 / 17286-17321	n/a
15-OCT-2014	20:44 – 20:48	14NC92	53-034 / 20792-20815	14NR82	53-034 / 17322-17345	n/a

15-OCT-2014	20:52 – 20:56	14NC92	53-036 / 20816-20841	14NR82	53-036 / 17346-17371	0.1 m
15-OCT-2014	21:01 – 21:02	14NC92	53-037 / 20842-20849	14NR82	53-037 / 17372-17379	n/a
25-FEB-2015	19:19 – 19:22	15NC22	50-003 / 3780 – 3791	n/a	n/a	0.4 m
25-FEB-2015	19:28 – 19:29	15NC22	53-004 / 3792 – 3800	n/a	n/a	0.4 – 0.3
25-FEB-2015	19:53 – 19:54	15NC22	53-016 / 3834 – 3837	n/a	n/a	0.3 m
25-FEB-2015	20:05 – 20:07	15NC22	53-002 / 3867 – 3878	n/a	n/a	0.5 m

* In the northeast portion of the project area tidal zoning information was available. For those photos that cover the zoned area, tide levels are given in meters above MLLW and were calculated based on verified observations at the Port Isabel (#8779770) and Bob Hall Pier, Corpus Christi (#8775870) reference tide gauges, with time and height offsets applied to the several tide zones. In general, tide levels could not be determined for images located south and west of Port Isabel Channel. The height of the MHW tidal datum in the project area varies between 0.26 – 0.45 meters above MLLW.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of RSD. The final QC review was completed in September 2018. The review process included analysis of AT 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. 10.5.1) software. All project data was evaluated for compliance to CMP requirements.

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

- 11302, Intracoastal Waterway, Stover Point to Port Brownsville, 34th Ed., Jan. 2014

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 Reports (APOR)
- AT Report
- GC11434 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

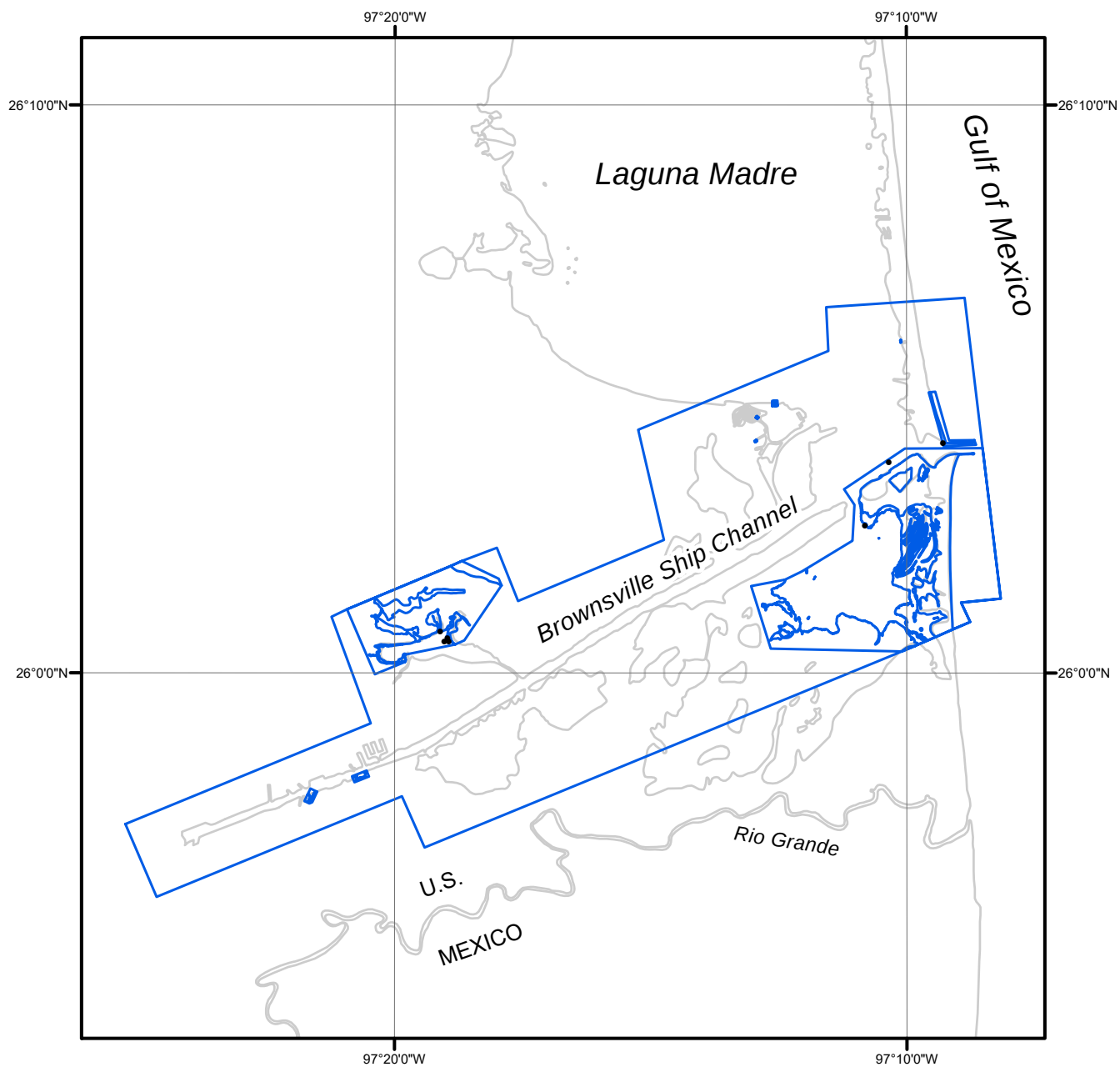
NOAA Shoreline Data Explorer

- GC11434 in shapefile format
- Metadata file for GC11434
- PCR in Adobe PDF format

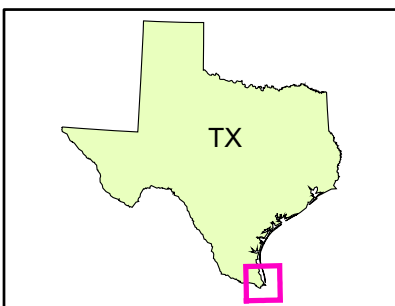
End of Report

BROWNSVILLE SHIP CHANNEL AND BRAZOS ISLAND

TEXAS



Overview



TX1403A-CM-N

GC11434