

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT TX0501A

Port of Galveston, Texas

Introduction

NOAA Coastal Mapping Program (CMP) Project TX0501A provides a highly accurate database of new digital shoreline data for Galveston Bay, Texas, and surrounding coastal areas. The project extends from Bolivar Roads westward to West Bay, Texas, and includes Galveston Channel. The digital cartographic feature file (DCFF) 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 photographic mission requirements for this project were formulated as part of NOAA's emergency response program, specifically in response to Hurricane Rita, which made landfall near the Texas-Louisiana border on September 24, 2005. These requirements coincided with requirements for the Coast and Shoreline Change Analysis Program (CSCAP) response to the need for timely updates to NOAA Electronic Navigational Chart (ENC) series, and therefore digital imagery products acquired for emergency response were assessed and deemed adequate to support nautical chart evaluation and correction for the project area.

Field Operations

The field operations consisted of the collection of static and kinematic Global Positioning System (GPS) data and the acquisition of digital aerial imagery. The photographic mission operations were conducted on September 25 and September 30, 2005, with the NOAA Cessna Citation II aircraft. Twelve strips of natural color digital images were acquired, with an approximate ground sample distance of 39 cm, through the use of an Applanix Digital Sensor System (DSS) digital camera. Of the twelve strips acquired, four were used for this project.

A base station was established at Ellington Field, Houston, using static GPS. Airborne kinematic GPS data was collected in conjunction with an Inertial Measurement Unit (IMU) to determine precise camera positions and orientations.

GPS Data Reduction

GPS and IMU data was collected and processed by Remote Sensing Division (RSD) personnel to yield precise positions and orientations of camera centers as a means of rendering accurately georeferenced digital images. The static GPS base station data was processed in September 2005 using the NGS Online Processing User Service (OPUS) software to compute fixed baseline solutions from three CORS stations. The final NAD83 position reported by OPUS was the average of these three baseline solutions. The airborne kinematic data was processed using Applanix POSGPS (ver. 4.2) software in September 2005.

Georeferencing

As a result of the successful collection and processing of GPS and IMU data, no additional georeferencing of images was necessary. Photo-identifiable ground control points were used to assess the horizontal accuracy of the georeferenced imagery, and a predicted horizontal circular error of 2.0 meters was computed for all four strips of the digital imagery based on a 95% confidence level. The accuracy assessment is on file with other project data within the Applications Branch (AB) Project Archive. Positional data is based on the UTM Coordinate System (Zone 15 North) and is referenced to the North American Datum of 1983.

Compilation

The data compilation phase of the project was initiated by RSD personnel in November 2005. The work was accomplished using a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components and other associated peripheral devices. The Feature Extraction software module was used within BAE Systems' SOCET SET (version 5.2) photogrammetric software. 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. Cartographic feature attribution was assigned in compliance with the Coastal Cartographic Object Attribute Source Table (C-COAST). Selected cartographic features were further modified with additional descriptive information to refine general classification.

Spatial data accuracies for Project TX0501A were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were tested to have a horizontal accuracy of 3.9 meters at the 95% confidence level. This predicted accuracy of well-defined points is based on a minimum of twenty (20) check points that were compared to an independent source of higher accuracy.

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

Date	Time (UTC)	Roll Number	Photo Numbers	GSD (nominal)	* Tidal Level (MLLW)
9-25-05	22:07:06-22:08:34	051C31	26938507-26938604	0.39 m	0.27 m (GC)
9-25-05	22:08:39-22:09:06	051C31	26938609-26938637	0.39 m	0.27 m (PB)
9-25-05	22:27:10-22:27:24	051C31	26939720-26939735	0.39 m	0.17 m (PB)
9-25-05	22:27:24-22:27:53	051C31	26939740-26939764	0.39 m	0.25 m (GC)
9-30-05	19:04:06-19:06:10	051C34	27427521-27427645	0.39 m	0.58 m (GC)
9-30-05	19:17:43-19:19:25	051C34	27428338-27428441	0.39 m	0.59 m (PB)
9-30-05	19:19:25-19:20:48	051C34	27428441-27428452	0.39 m	0.59 (GC)

* Tide levels are given in meters above MLLW and are based on actual observations recorded by the NOS gauge at Galveston Channel Pier 21 (GC) at the time of photography, with offsets applied to the Port Bolivar (PB) substation in the project area. The elevation of MHW at Port Bolivar is equal to 0.4 meters above MLLW.

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 March 2006. The review process included analysis of aerotriangulation results and assessment of the identification and attribution of cartographic features within the DCFF according to image analysis and criteria defined in C-COAST. The quality control process concluded with an inspection of topological connectivity within the DCFF using ArcGIS 9.1 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:

11324, Galveston and Texas City Harbors, TX, 1:25,000 scale, 34th edition

End Products and Deliverables

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

RSD Applications Branch Archive

- Hardcopy of the Accuracy Assessment
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC10590 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

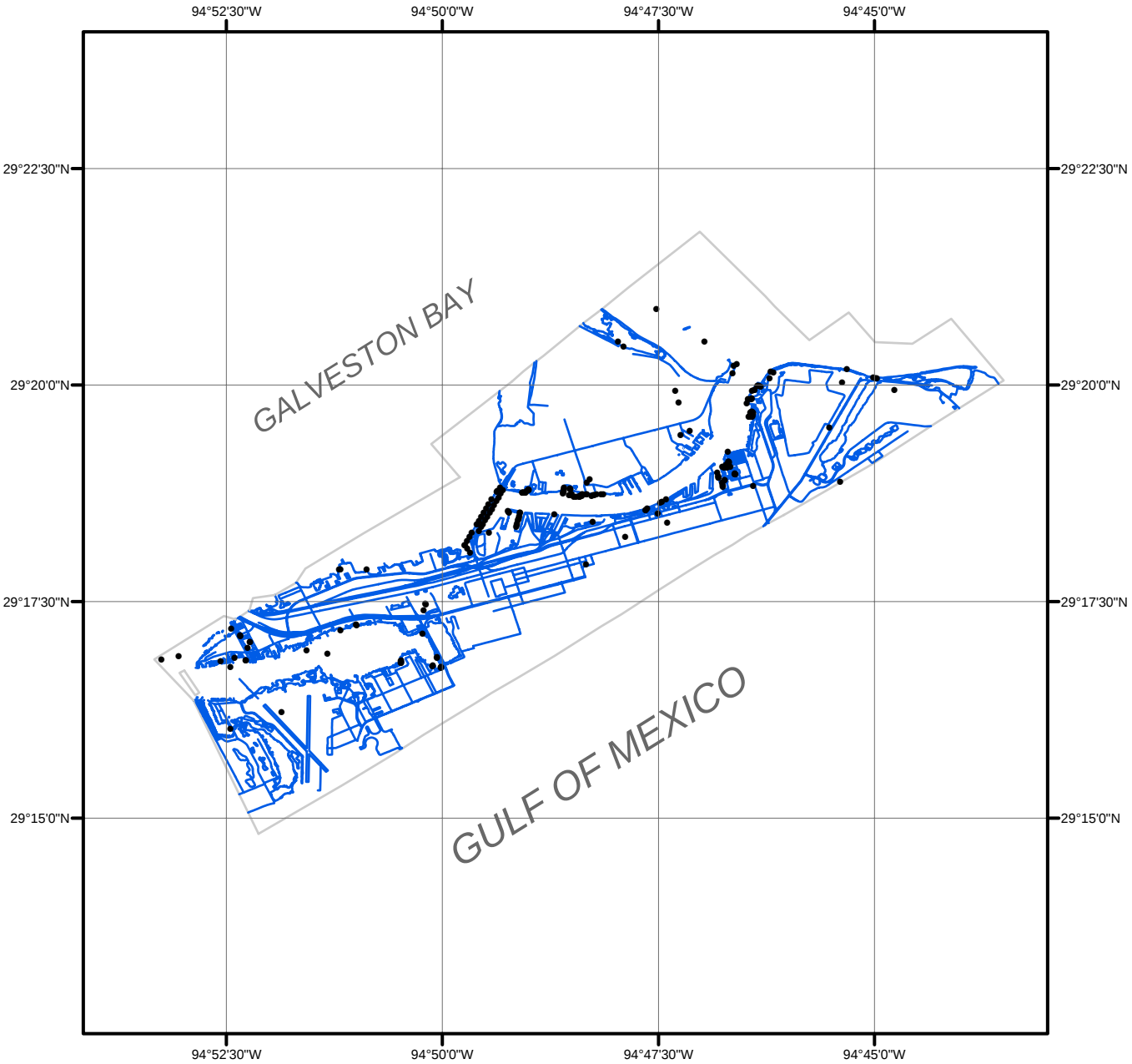
- Project Database
- Digital copy of DCFF GC10590 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- Chart Evaluation File in shapefile format

NOAA Shoreline Data Explorer

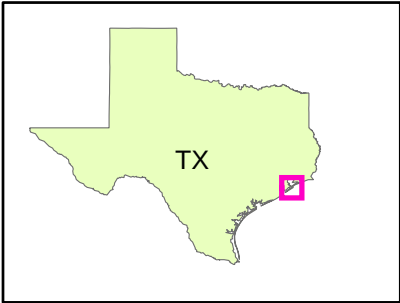
- DCFF for GC10590
- Metadata file for GC10590
- Digital copy of the PCR in Adobe PDF format

End of Report

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Overview



TX0501A

GC10590