

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT AL0905-CM-N

Mississippi Sound, Bayou La Batre to Mon Louis Island, Alabama

Introduction

NOAA Coastal Mapping Program (CMP) Project AL0905-CM-N provides a highly accurate database of new digital shoreline data for the Mississippi Sound from Bayou La Batre to Mon Louis Island, Alabama. 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

Project AL0905-CM-N was designed by the Requirements Branch (RB) of the Remote Sensing Division (RSD). RB formulated photographic mission instructions following the guidelines of the 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 Global Positioning System (GPS) data and Inertial Measurement Unit (IMU) data and the acquisition of digital aerial imagery. A local GPS base station was established for use as a reference station for kinematic GPS processing operations. The photographic mission operations were conducted on November 13, 2012 with the NOAA King Air (N68RF) aircraft. Six strips of color (RGB) and near-infrared (NIR) digital images were acquired concurrently using an Applanix Digital Sensor System (DSS-439) aerial camera at a nominal altitude of 10,000 feet, resulting in an approximate ground sample distance (GSD) of 1.13 feet (0.35 meter). All project imagery was acquired in coordination with local tides at the Mean Lower-Low Water (MLLW) tide stage. Additionally, two lines of color imagery acquired on October 7, 2012 for CMP project AL0904-CM-N with the same camera and same acquisition parameters were used for this project to cover a small portion of the easternmost edge of project AL0905-CM-N.

Direct Georeferencing Data Processing

The GPS/IMU data were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of the imagery. The position of the GPS 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 POSPac MMS 5.4.4 GPS/IMU software in December 2012. For further information refer to the

Airborne Positioning and Orientation Report (APOR) 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 Excel spreadsheet based 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 1.4 meters for the AL0905-CM-N imagery, and 1.6 meters for the two lines of AL0904-CM-N imagery used.

Several third order geodetic control points were used to verify the horizontal integrity of the DG results. All stereo models were examined and found to have acceptable levels of parallax for mapping purposes.

Compilation

The data compilation phase of this project was accomplished by RSD Applications Branch personnel in October 2015. Digital mapping was performed using the Feature Extraction software module within SOCET SET (ver. 5.6). Feature identification and attribution within the GC were based on image analysis of the aerial imagery and information extracted from the largest scale NOAA nautical charts 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 AL0905-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 2.9 meters for the majority of the project area, and 3.2 meters for features at the eastern edge of the project, covered by the AL0904-CM-N imagery. This predicted accuracy of well-defined points measured during the compilation phase was derived by doubling the imagery accuracy computed 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	Images	Roll	Images	
10-07-2012	19:41 – 19:43	12NC80	28763 – 28777	12NR63	15544 – 15558	0.1 m
10-07-2012	21:00 – 21:01	12NC80	29088 – 29097	12NR63	15869 – 15878	0.1 m
11-13-2012	16:00 – 16:03	12NC84	29862 – 29884	12NR50	11878 – 11900	-0.1 m
11-13-2012	16:08 – 16:11	12NC84	29885 – 29906	12NR50	11901 – 11922	-0.1 m
11-13-2012	16:20 – 16:22	12NC84	29929 – 29946	12NR50	11945 – 11962	-0.1 m
11-13-2012	16:30 – 16:33	12NC84	29947 – 29971	12NR50	11963 – 11987	-0.1 to 0.0
11-13-2012	17:36 – 17:39	12NC84	30173 – 30198	12NR50	12189 – 12214	-0.1 to 0.1
11-13-2012	17:46 – 17:49	12NC84	30211 – 30233	12NR50	12227 – 12249	0.2 to -0.1

*Tide levels are given in meters above MLLW and were calculated using the Pydro software tool with a TCARI grid referenced to verified water level observations at the time of photography from various NOS gauges in the vicinity of the project. The elevation of the MHW tidal datum in the project area varies between 0.38 – 0.47 meters above MLLW.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a member of the Applications Branch. The final QC review was completed in November 2015. 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 10.2.2 software. All project data was evaluated for compliance to CMP requirements.

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

- 11374, Dauphin Island to Dog Keys Pass, 1:40,000 scale, 38th Ed., May 2015
- 11376, Mobile Bay, 1:80,000 scale, 57th Ed., Jan. 2014
- 11377, Mobile Bay Approaches and Lower Half, 1:40,000 scale, 10th Ed., Jan. 2013

End Products and Deliverables

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

Remote Sensing Division Electronic Data Library

- Project database
- Airborne Positioning and Orientation Reports (APOR)
- GC11169 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

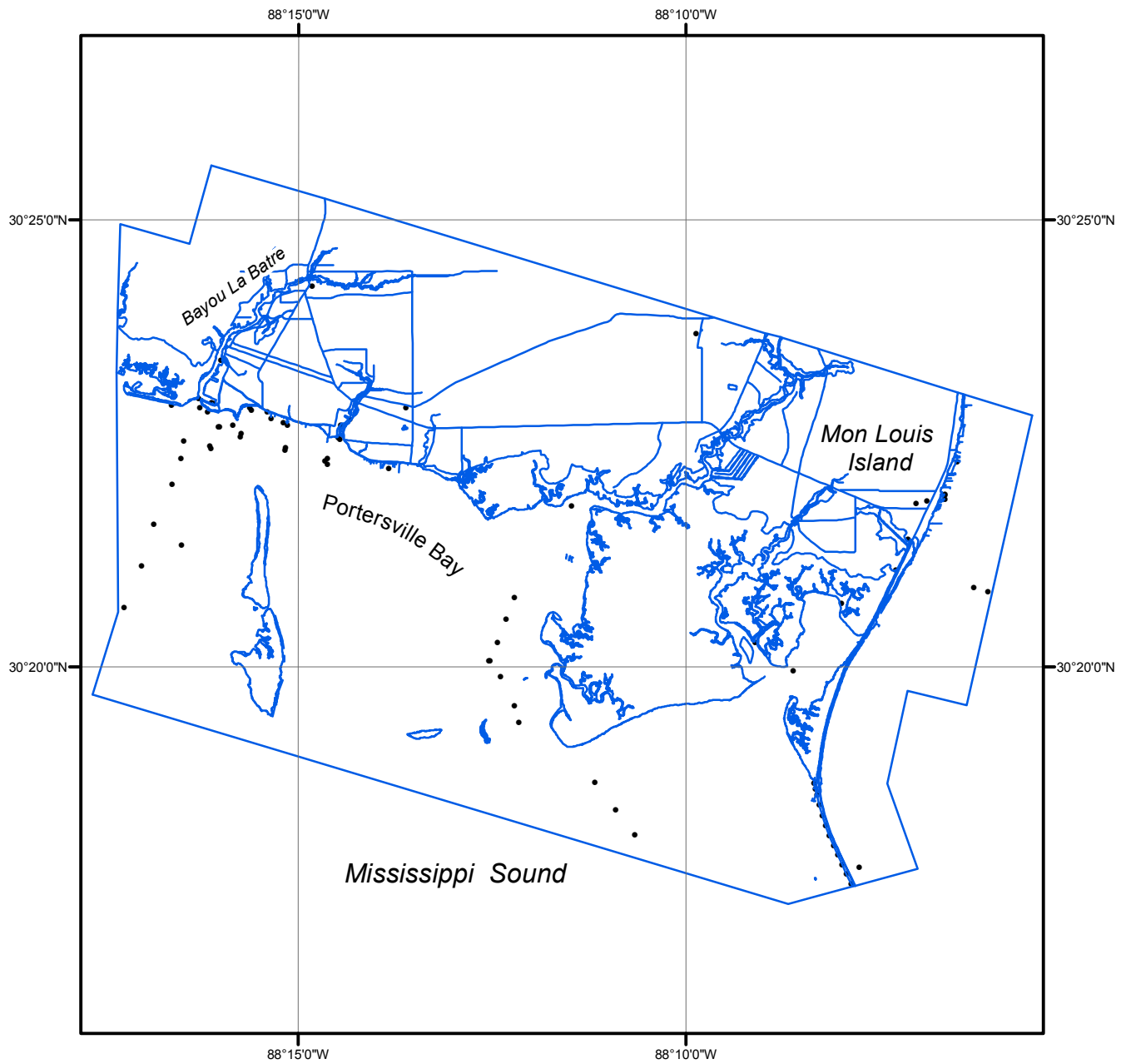
NOAA Shoreline Data Explorer

- GC11169 in shapefile format
- Metadata file for GC11169
- Digital copy of the PCR

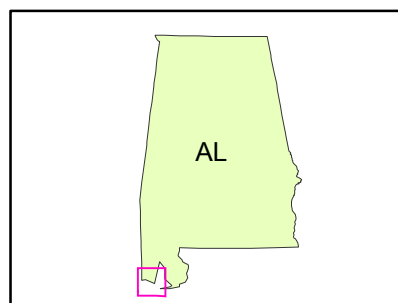
End of Report

MISSISSIPPI SOUND, BAYOU LA BATRE TO MON LOUIS ISLAND

ALABAMA



Overview



AL0905-CM-N

GC11169