

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT AL0903B-CM-N

Upper Mobile and Tensaw Rivers, Alabama

Introduction

Coastal Mapping Program (CMP) Project AL0903B-CM-N provides highly accurate digital shoreline data for the Upper Mobile and Tensaw Rivers, including Chuckfee Bay. Project AL0903B-CM-N is a subproject of a larger acquisition project of AL0903-CM-N, designed to provide coverage of the northern portion of Mobile Bay, Alabama. The Geographic Cell (GC) maybe 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

Photographic mission instructions for AL0903-CM-N were formulated by the Requirements Branch (RB) of the Remote Sensing Division (RSD) 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; photographic requirements; flight line priority; Global Positioning System (GPS) and Inertial Measurement Unit (IMU) data collection procedures and guidelines for both kinematic and static surveys; data recording and handling instructions; and contact and communication information. RB created a Project Layout Diagram, flight maps and input files for the aircraft's flight management system.

Field Operations

The field operations consisted of the collection of static and kinematic GPS/IMU data and the acquisition of digital aerial imagery. Aerial survey operations were conducted on October 16, 2012 and January 4, 2014 with the NOAA King Air aircraft (N68RF), consisting of the acquisition of sixteen strips of natural color and near-infrared (NIR) imagery acquired concurrently using an Applanix DSS-439 dual camera system. All imagery was acquired at a nominal altitude of 10,000 feet for an approximate ground sample distance (GSD) of 0.35 meters. For subproject AL0903B-CM-N, imagery from seven flight lines (273 images) was used. All imagery acquisition was coordinated to coincide with the local Mean Lower Low Water (MLLW) tide level.

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 October 2012 airborne kinematic data was processed using Applanix POSPAC (ver. 5.4) software in November 2012 and the January 2014 data was processed using Applanix POSPAC (ver. 6.2) software in

January 2014. 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 uncertainties at the 95% confidence level for both collection dates were calculated to be 1.4 meters

Two NGS third order geodetic control points (“BG4144” and “BH1980”) were 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.

Compilation

The data compilation phase of this project was initiated by personnel of RSD’s Applications Branch (AB) in February 2017. Digital feature data was compiled using the Feature Extraction module of BAE’s SOCET SET (ver. 5.6) photogrammetric software. Feature attribution within the GC 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 AL0903B-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 2.8 meters at the 95% confidence level. This value was derived by doubling the imagery accuracy computed from the EO-TPU tool in order to conservatively predict the accuracy of compiled well defined points.

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

Date	Time (UTC)	Strip No.	Color Imagery		Infrared Imagery		Tide Level*
			Roll	Images	Roll	Images	
10-16-2012	15:51 – 15:52	50-010	12NC82	29427 – 29434	12NR65	16208 – 16215	0.1 m
10-16-2012	16:11 – 16:14	50-014	12NC82	29492 – 29514	12NR65	16273 – 16295	0.1 m
01-04-2014	17:37 – 17:39	50-011	14NC01	0032 – 0044	14NR01	0032 – 0045	-0.1 m
01-04-2014	17:46 – 17:49	50-012	14NC01	0059 – 0080	14NR01	0059 – 0080	-0.1 m
01-04-2014	17:54 – 17:57	50-013	14NC01	0081 – 0102	14NR01	0081 – 0102	-0.1 m
01-04-2014	18:02 – 18:06	50-015	14NC01	0105 – 0128	14NR01	0105 – 0128	-0.1 m
01-04-2014	18:11 – 18:15	50-016	14NC01	0129 – 0152	14NR01	0129 – 0152	-0.1 m

* Tide levels in the table above 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 NOS gauges. The height of the MHW tidal datum in the project area varies between 0.45 – 0.49 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 August 2017. 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 ESRI's ArcGIS software (ver. 9.4.1). The entire suite of project products 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 chart was used in the comparison process:

- 11376, Mobile Bay, 1:80,000, 58th Ed., Nov. 2015

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

- Airborne Positioning and Orientation Report (APOR)
- Project Completion Report (PCR)
- Project database
- GC11298 in shapefile format
- CEF in shapefile format

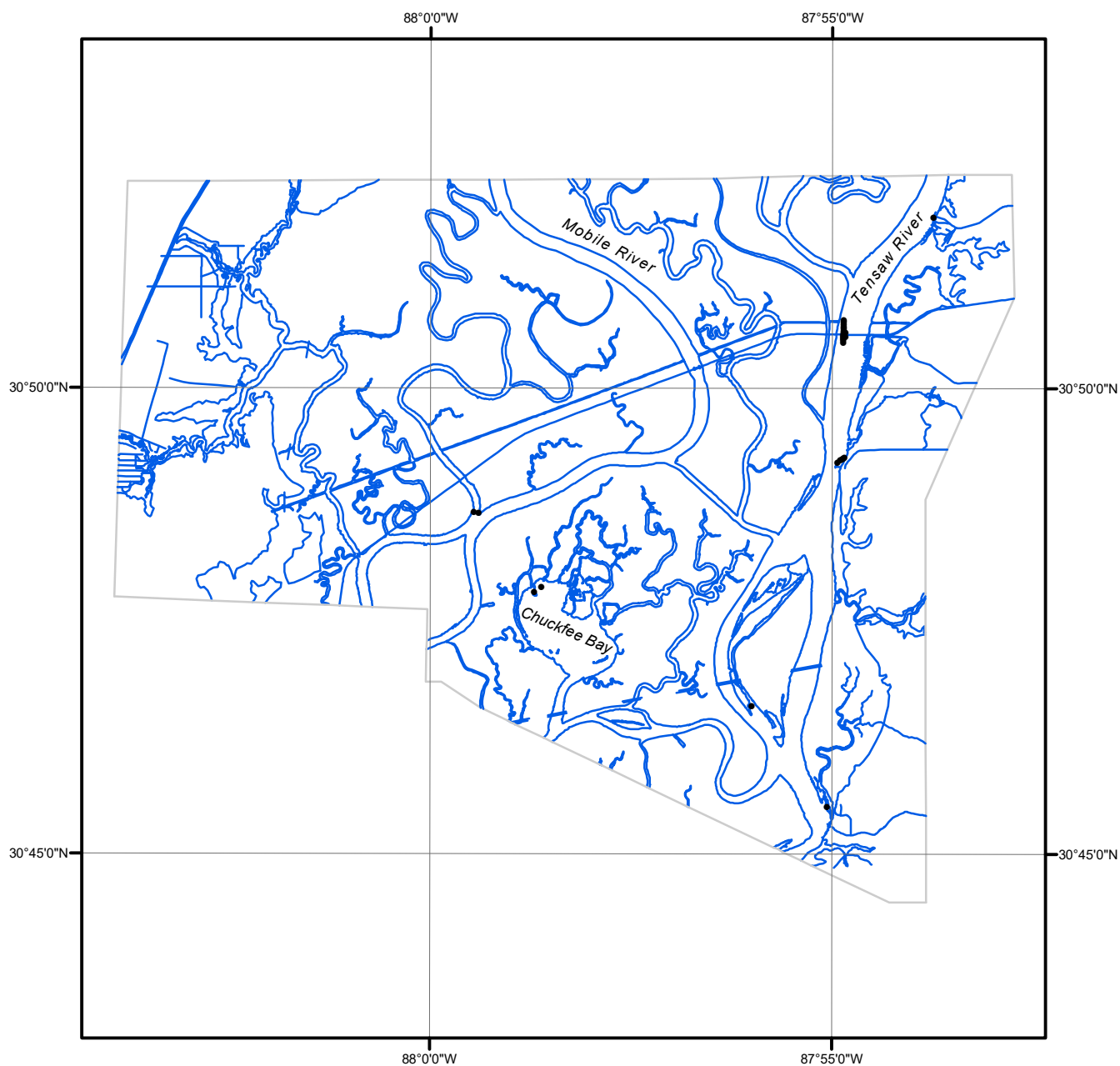
NOAA Shoreline Data Explorer

- GC11298 in shapefile format
- Metadata file for GC11298
- PCR in Adobe PDF format

End of Report

UPPER MOBILE AND TENSAW RIVERS

ALABAMA



Overview



AL0903B-CM-N

GC11298