

# **NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT**

## ***PROJECT FL1301-CM-N***

### ***Santa Rosa Sound, Navarre to Fort Walton Beach, Florida***

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project FL1301-CM-N provides highly accurate digital shoreline data for Santa Rosa Sound, including Santa Rosa Island, from Navarre to Fort Walton Beach, Florida. 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 design of Project FL1301-CM-N was accomplished 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 GPS data and Inertial Measurement Unit (IMU) data and the acquisition of digital aerial imagery. The photographic mission operations were conducted on December 18-19, 2013 with the NOAA King Air (N68RF) aircraft. Two (2) 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 0.35 meters. All project imagery was acquired in coordination with local the Mean Lower Low Water (MLLW) tide stage.

#### **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 base station's geodetic position was derived using the NGS Online Processing User Service (OPUS), which computed fixed baseline solutions from nearby CORS stations. The airborne kinematic GPS data was processed using Applanix POSPac MMS 6.1 GPS/IMU software in December 2013. For further information refer to the Airborne Positioning and Orientation Report (APOR) on file with other project data within the Applications Branch (AB) Project Archive.

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 the 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 1.6 meters. NGS third order geodetic control points 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 accomplished by RSD AB personnel in June 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 FL1301-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 3.2 meters. 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)	Roll #	Strip / Photo #s	Tide Level*
12/18/2013	19:29 – 19:33	13NC88	50-001 / 27428 – 27458	0.0 to -0.1 m
12/18/2013	19:29 – 19:33	13NR71	50-001 / 15115 – 15145	0.0 to -0.1 m
12/19/2013	17:44 – 17:48	13NC89	50-002 / 27745 – 27775	0.0 to -0.1 m
12/19/2013	17:44 – 17:48	13NR72	50-002 / 15432 – 15462	0.0 to -0.1 m

\* 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 0.2 – 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 July 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:

- 11382, Pensacola Bay and Approaches, 1:80,000 scale, 42<sup>nd</sup> Ed., Oct. /12
- 11385, West Bay to Santa Rosa Sound, 1:40,000 scale, 28<sup>th</sup> Ed., May /14
- 11388, Choctawhatchee Bay, 1:80,000 scale, 18<sup>th</sup> Ed., Jun. /12

## **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 FL1301-CM-N Data Acquisition Summary
- Hardcopy of the Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC11157 file contents, attached to PCR

### **Remote Sensing Division Electronic Data Library**

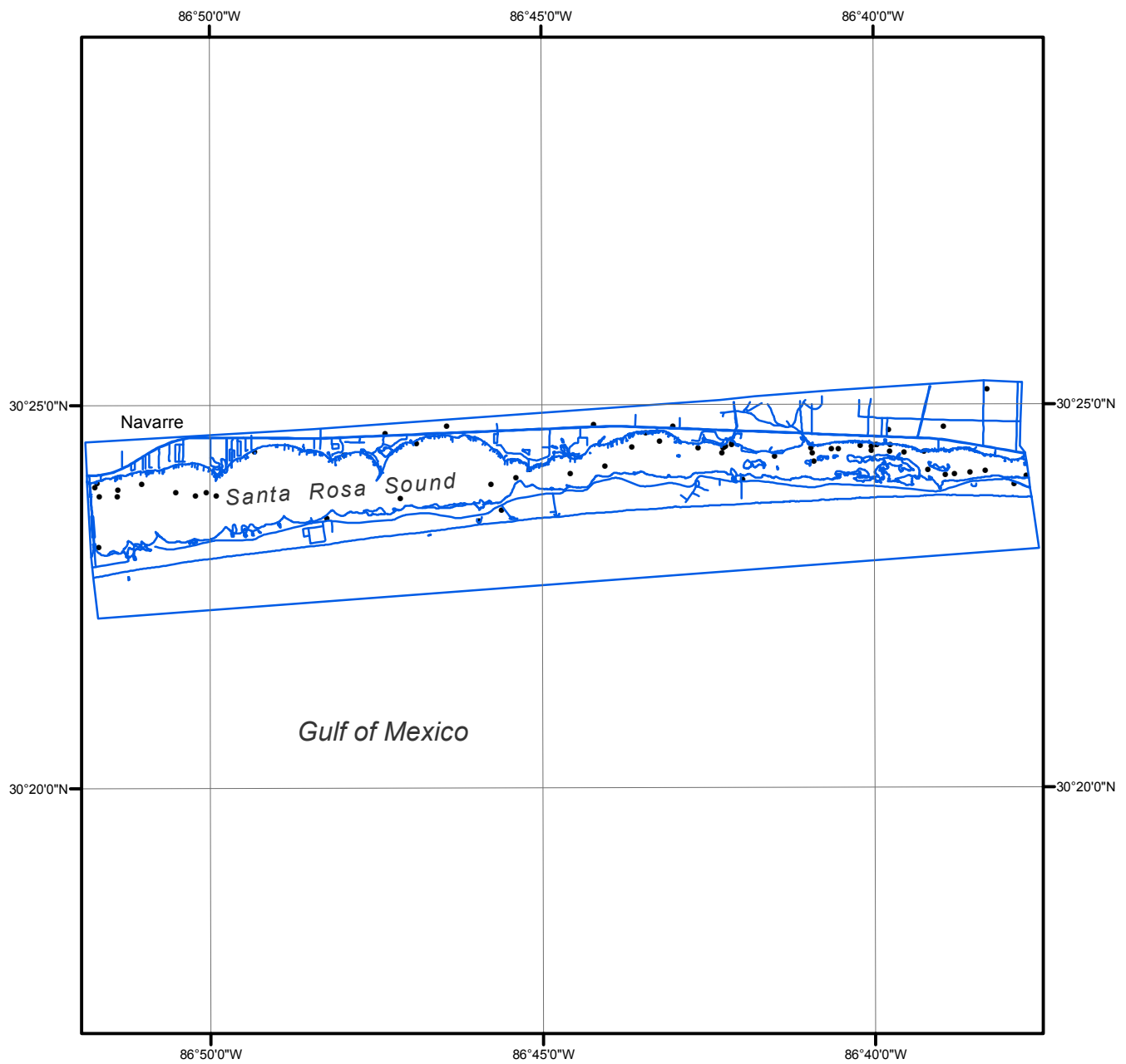
- Project database
- GC11157 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

### **NOAA Shoreline Data Explorer**

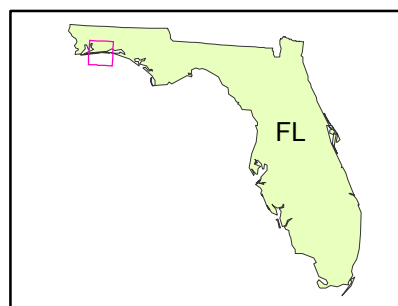
- GC11157 in shapefile format
- Metadata file for GC11157
- Digital copy of the PCR in Adobe PDF format

## **End of Report**

# SANTA ROSA SOUND, NAVARRE TO FORT WALTON BEACH FLORIDA



Overview



FL1301-CM-N

GC11157