

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

## ***PROJECT FL1603A-CM-N***

### ***Convoy Point, Biscayne Bay, Florida***

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project FL1603A-CM-N provides a highly accurate database of new digital shoreline data for a Convoy Point, Florida. FL1603A-CM-N is a subproject of a larger acquisition project, FL1603-CM-N, which covers Biscayne Bay, 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**

Project FL1603-CM-N was designed by the Requirements Branch (RB) of the Remote Sensing Division (RSD) 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. Subproject FL1603A-CM-N was subsequently designed to fulfill a request for shoreline data received from the Marine Chart Division (MCD) of NOAA's Office of Coast Survey.

#### **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. Aerial survey operations were conducted on March 19, 2017 with the NOAA King Air aircraft (N68RF). Eleven lines of natural color and near-infrared (NIR) imagery were acquired concurrently using an Applanix DSS-580/560 dual camera system. All lines were originally planned to be acquired in coordination with both the MHW and MLLW tide stages, however the acquisition phase was terminated after only the MHW-coordinated imagery was obtained for nine of the eleven lines. Project imagery for subproject FL1603A-CM-N included color imagery from one flight line. All imagery was acquired at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.32 meters.

#### **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 airborne kinematic data was processed using Applanix POSPAC (ver. 7.1) software in April 2017. 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 uncertainty at the 95% confidence level was calculated to be 0.94 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 Applications Branch (AB) personnel in July 2019. 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 chart 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 FL1603A-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.9 meters at the 95% confidence level. 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 #	Line / Photo #s	Tide Level*
3/19/2017	18:24 – 18:25	17VC21	64-003 / 03834 – 03839	0.4

\* 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 NOS gauges in the project area. The elevation of the MHW tidal datum in the project area is approximately 0.53 m. 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 July 2019. 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 (ver. 10.6.1) desktop GIS software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical chart 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:

11463, Intracoastal Waterway, Sands Key to Blackwater Sound, 20th Ed., Jan. 2017

## **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**

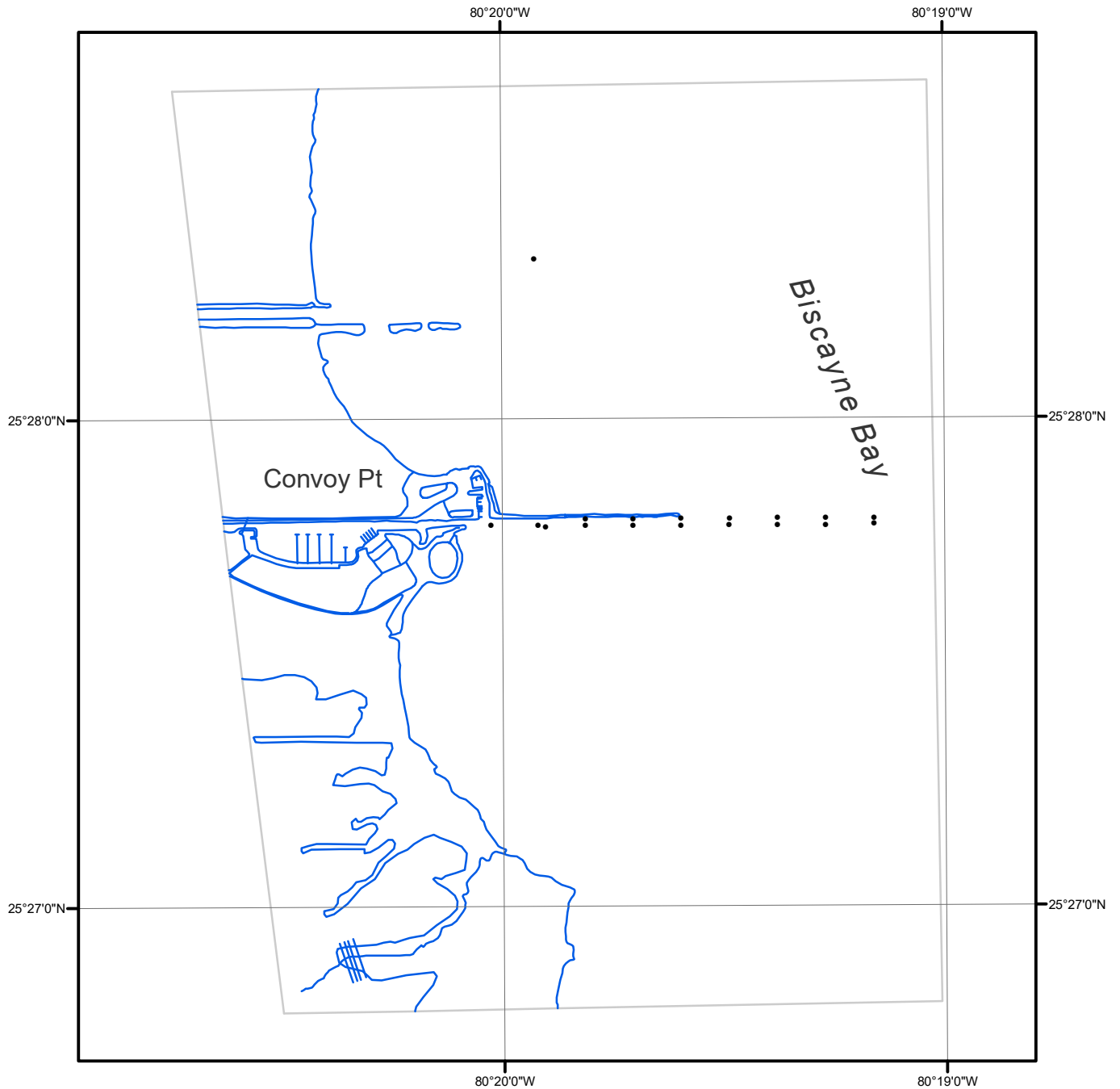
- Airborne Positioning and Orientation Report (APOR)
- Project Completion Report (PCR)
- Project database
- GC11552 in shapefile format
- Chart Evaluation File in shapefile format

### **NOAA Shoreline Data Explorer**

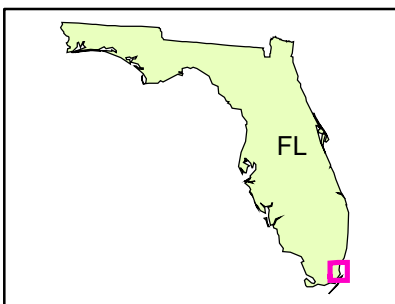
- GC11552 in shapefile format
- Metadata file for GC11552
- Digital copy of the PCR

## **End of Report**

# CONVOY POINT, BISCAYNE BAY FLORIDA



Overview



FL1603A-CM-N

GC11552