

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

## ***PROJECT FL1501F-CM-N***

### ***Intracoastal Waterway, Mosquito Lagoon and Indian River to Black Point, Florida***

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project FL1501F-CM-N provides highly accurate digital shoreline data for a portion of the Intracoastal Waterway (ICW) within Mosquito Lagoon and Indian River to Black Point, in Florida. Project FL1501F-CM-N is a subproject of a larger acquisition project, FL1501-CM-N, designed to provide coverage of the ICW from Jacksonville Beach, Florida, southward to Mosquito Lagoon and Indian River. 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**

Photographic mission instructions for FL1501-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, 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**

Field operations for FL1501-CM-N 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, conducted October 22-25, 2014 and October 30, 2015 with the NOAA King Air aircraft (N68RF), consisted of the acquisition of twenty five flight lines of natural color and near-infrared (NIR) imagery using an Applanix DSS-439 dual head digital camera system. All imagery was acquired at a nominal altitude of 10,500 feet, resulting in approximate ground sample distances (GSD) of 0.36 meters (DSS-439) and 0.33 meters (DSS-580). For subproject FL1501F-CM-N, only color imagery from ten flight lines (257 images) collected with the DSS-439 camera were used. Imagery was not acquired in strict coordination with local tides, though the goal was to collect all imagery below the Mean High Water (MHW) tide stage.

#### **Direct Georeferencing Data Processing**

The GPS/IMU data were processed by RSD personnel to yield precise camera positions and orientations for direct geo-referencing (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. Airborne kinematic data

was processed using Applanix POSPac software on November 3, 2014 (ver. 6.2). For further information refer to the Airborne Positioning and Orientation Reports (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 the Exterior Orientation Total Propagated Uncertainty (EO-TPU) tool developed by NGS. Using this tool, the predicted horizontal uncertainty at the 95% confidence level for all project imagery was calculated to be 1.5 meters. NGS third order geodetic control points were used to verify the horizontal integrity of the directly georeferenced (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 January 2017. 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 FL1501F-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 3.0 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points is derived by doubling the horizontal uncertainty calculated from the EO-TPU tool.

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

Date	Time (UTC)	Roll	Strip / Images	Tide Level *
10/22/2014	15:39 – 15:44	14NC98	53-025 / 22183 – 22209	0.4 – 0.6 m
10/22/2014	15:48 – 15:50	14NC98	53-016 / 22210 – 22223	0.6 m
10/22/2014	15:54 – 15:58	14NC98	53-017 / 22224 – 22246	0.6 m
10/22/2014	16:08 – 16:12	14NC98	53-018 / 22247 – 22270	0.6 m
10/22/2014	16:16 – 16:20	14NC98	53-019 / 22271 – 22295	0.6 – 0.5 m
10/22/2014	16:25 – 16:30	14NC98	53-020 / 22296 – 22320	0.5 m
10/22/2014	16:34 – 16:38	14NC98	53-021 / 22321 – 22345	0.4 – 0.5 m
10/22/2014	16:42 – 16:48	14NC98	53-022 / 22346 – 22377	0.4 m

10/22/2014	16:56 – 17:01	14NC98	53-023 / 22406 – 22437	0.4 m
10/22/2014	17:05 – 17:11	14NC98	53-024 / 22438 – 22468	0.3 m

\* Tide levels in the table above are given in meters above MLLW based on verified water level observations at the time of photography from various NOS gauges in the vicinity of the project. These water levels were calculated using the Pydro software tool, with discrete tidal zoning for the outer coast area (line 53-024), and with a TCARI grid for the back-bay areas. The elevation of the MHW tidal datum in the project area varies between 1.18 – 1.25 meters above MLLW for the outer coast, and 0.19 – 0.58 meters above MLLW for the back-bays.

## Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of RSD. The final QC review was completed in February 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 ArcGIS 10.3.1 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:

- 11484, Ponce de Leon Inlet to Cape Canaveral, 1:80,000, 24<sup>th</sup> Ed., Jul. 2011
- 11485, ICW – Tolomato River to Palm Shores, 1:40,000, 38<sup>th</sup> 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

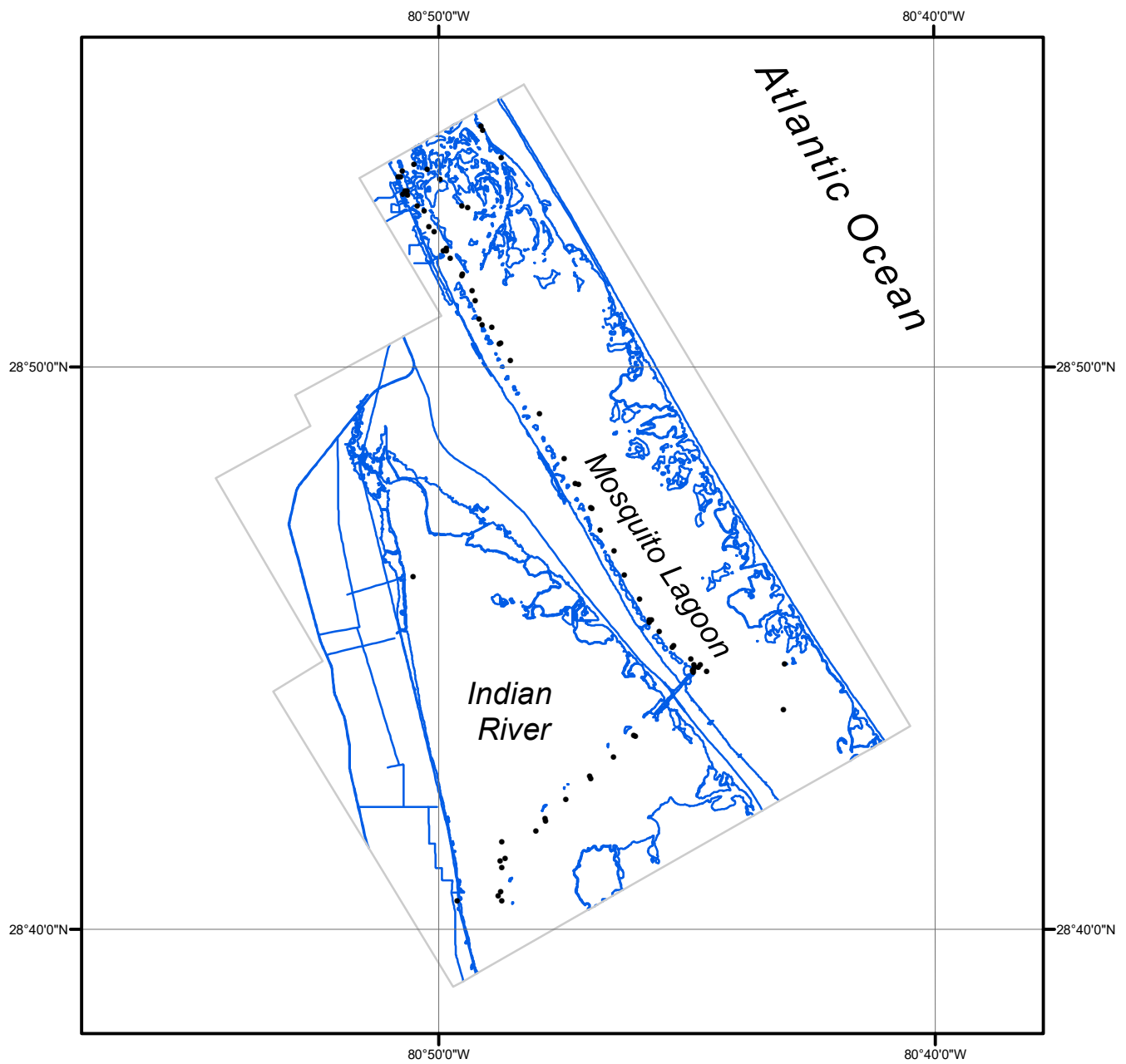
- Project database
- Airborne Positioning and Orientation Report (APOR)
- GC11293 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

### NOAA Shoreline Data Explorer

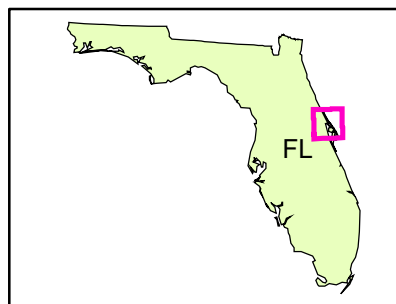
- GC11293 in shapefile format
- Metadata file for GC11293
- Digital copy of the PCR in Adobe PDF format

## End of Report

# ICW, MOSQUITO LAGOON AND INDIAN RIVER TO BLACK PT FLORIDA



Overview



FL1501F-CM-N

GC11293