NOAA COASTAL MAPPING PROGRAM
PROJECT COMPLETION REPORT

PROJECT FL1416-CM-N

Intracoastal Waterway, Cabbage Creek to St. Johns River, Florida

Introduction

NOAA Coastal Mapping Program (CMP) Project FL1416-CM-N provides a highly accurate database of new digital shoreline data for a portion of the Intracoastal Waterway (ICW) from Cabbage Creek to St. Johns River, in 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

Photographic mission instructions for FL1416-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 FL1416-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 were conducted October 8, 2014 with the NOAA King Air aircraft (N68RF). Project imagery included two flight lines of natural color and near-infrared (NIR) images acquired concurrently using an Applanix DSS-439 dual head digital camera system (two 60 mm lenses), in coordination with both MLLW and MHW tide levels. Due to the characteristics of the tide zoning in this project area and, of the observed water levels, approximately two hours separated the times of peak tide from one end of the pair of lines to the opposite end. Thus, the lines were flown in short segments, following the tide as it progressed along the waterway. All imagery was acquired at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.37 meters.

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 (ver. 6.2) software on November 3, 2014. 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 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 1.3 meters. One NGS third-order geodetic control point was 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 October 2016. 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 FL1416-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 2.6 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)	Color Imagery		NIR Imagery		Tide Level*
		Roll	Images	Roll	Images	
10/08/2014	15:39 – 15:40	14NC85	19111 – 19115	14NR75	15641 - 15645	1.2 m
10/08/2014	15:45 – 15:45	14NC85	19116 – 19118	14NR75	15646 - 15648	1.1 m
10/08/2014	16:07 – 16:08	14NC85	19122 – 19125	14NR75	15652 - 15655	1.1 m
10/08/2014	16:13 – 16:13	14NC85	19126 – 19128	14NR75	15656 - 15658	1.1 m
10/08/2014	16:25 – 16:26	14NC85	19133 – 19134	14NR75	15663 - 15664	1.1 m
10/08/2014	16:37 – 16:38	14NC85	19139 – 19142	14NR75	15669 - 15672	1.1 m
10/08/2014	16:49 – 16:49	14NC85	19146 – 19148	14NR75	15676 - 15678	1.0 m
10/08/2014	16:54 – 16:55	14NC85	19149 – 19151	14NR75	15679 - 15681	1.2 m
10/08/2014	17:06 – 17:06	14NC85	19155 – 19157	14NR75	15685 - 15687	1.0 m
10/08/2014	17:18 – 17:19	14NC85	19172 – 19179	14NR75	15702 - 15709	1.1 m

10/08/2014	17:23 – 17:24	14NC85	19180 – 19186	14NR75	15710 - 15716	1.0 m
10/08/2014	17:29 – 17:30	14NC85	19191 – 19193	14NR75	15721 - 15723	1.0 m
10/08/2014	17:34 – 17:35	14NC85	19194 – 19197	14NR75	15724 - 15727	0.9 m
10/08/2014	19:38 – 19:38	14NC86	19203 – 19205	14NR76	15733 - 15735	0.0 m
10/08/2014	19:43 – 19:43	14NC86	19206 – 19210	14NR76	15736 - 15740	0.0 m
10/08/2014	19:50 – 19:50	14NC86	19211 – 19213	14NR76	15741 - 15743	0.0 m
10/08/2014	19:55 – 19:56	14NC86	19214 – 19217	14NR76	15744 - 15747	0.0 m
10/08/2014	20:20 – 20:22	14NC86	19218 – 19235	14NR76	15748 - 15765	0.0 m
10/08/2014	20:28 – 20:30	14NC86	19236 – 19254	14NR76	15766 - 15784	0.0 m

* Tide levels are given in meters above MLLW, and were calculated using the Pydro software tool with tide zoning referenced to verified water level observations from the NOS reference station at Mayport, FL (872-0218). The elevation of the MHW tidal datum in the project area varies between 1.17 – 1.35 meters above MLLW.

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 October 2016. 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:

11488, Amelia Island to St. Augustine, 1:80,000, 28th Ed., Sep. 2012
11489, ICW - St. Simons Sound to Tolmato River, 1:40,000, 40th Ed., Feb. 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

- Project database
- Airborne Positioning and Orientation Report (APOR)
- GC11278 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

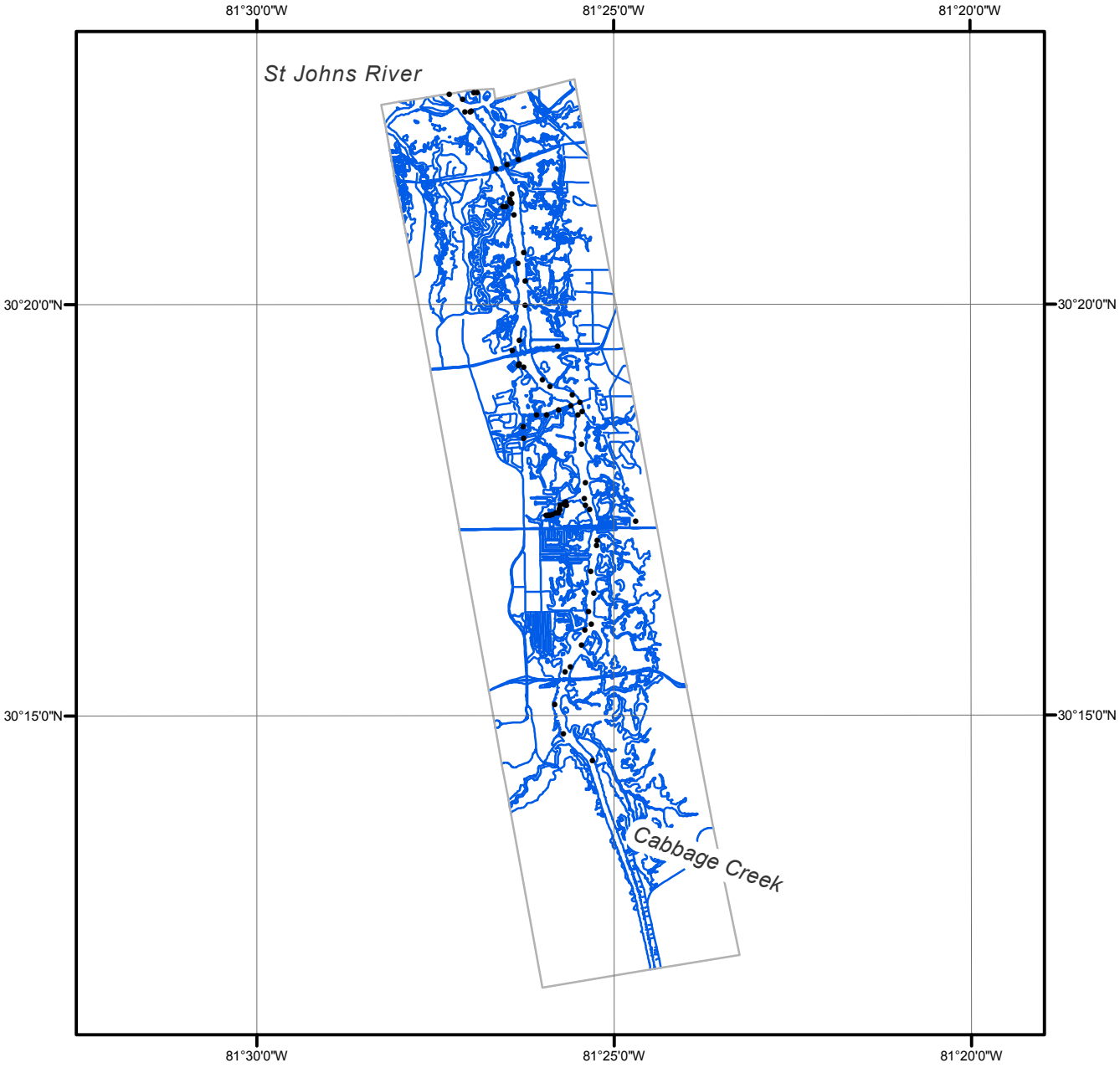
NOAA Shoreline Data Explorer

- GC11278 in shapefile format
- Metadata file for GC11278
- Digital copy of the PCR in Adobe PDF format

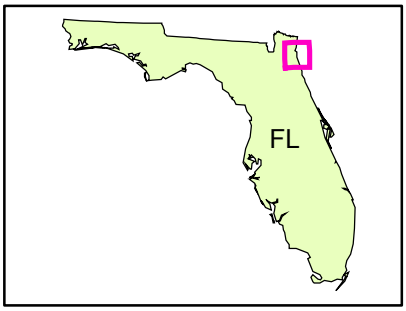
End of Report

ICW, CABBAGE CREEK TO ST JOHNS RIVER

FLORIDA



Overview



FL1416-CM-N

GC11278