

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT FL1303A-CM-N

Marco Island, Florida

Introduction

NOAA Coastal Mapping Program (CMP) Project FL1303A-CM-N provides a highly accurate database of new digital shoreline data for a portion of the coastline in the vicinity of Marco Island, Florida. FL1303A-CM-N is a subproject of a larger project, FL1303-CU-M, which extends from Marco Island southward to Florida Bay. 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 Requirements Branch (RB) of the Remote Sensing Division (RSD) designed Project FL1303-CU-M to support the Continually Updated Shoreline Product (CUSP), a seamless database of the best available high-resolution shoreline data. Subproject FL1303A-CM-N was subsequently designed to satisfy a request for updated shoreline data received from the Office of Coast Survey's Marine Chart Division (MCD). Shoreline data was then extracted from CUSP to undergo further processing and formatting to produce a GC.

Field Operations

Field operations for FL1303-CU-M consisted of the collection of static and kinematic GPS data and Inertial Measurement Unit (IMU) data, and acquisition of digital aerial imagery. The aerial survey was conducted from October 25, 2013 through January 16, 2014 with the NOAA King Air (N68RF) aircraft, during which fourteen flight lines of color (RGB) and infrared (IR) imagery were acquired in tandem using an Applanix DSS-439 dual camera system. For subproject FL1303A-CM-N only three partial lines of RGB imagery (48 images) were used. All imagery was acquired at a nominal altitude of 10,000 feet, resulting in an approximate ground sample distance (GSD) of 0.35 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 MMS 6.1.0 GPS/IMU software in January 2014. For further information refer to the Airborne Positioning and Orientation Reports (APOR) on file with other project data within the RSD 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 an Excel spreadsheet based 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 1.4 meters.

Compilation

The data compilation phase of this project was accomplished by RSD AB personnel in April 2015. Shoreline features previously compiled from monoscopic orthoimagery for the CUSP program were extracted from the CUSP database, reformatted to create a GC, and revised as needed. Additional feature data of significance to nautical charting was compiled in the GC from stereoscopic imagery using the Feature Extraction software module within SOCET SET (ver. 5.6). Feature identification and attribution within the GC was 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 FL1303A-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. 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 #	Photo #s	~ GSD	Tide Level*
10/25/2013	18:36 – 18:38	13NC79	26089 – 26104	0.35 m	0.3 m
10/25/2013	18:45 – 18:47	13NC79	26113 – 26128	0.35 m	0.3 m
10/25/2013	18:52 – 18:54	13NC79	26129 – 26144	0.35 m	0.3 m

* Tide levels are given in meters above MLLW and are based on actual observations at the Naples reference station with time/height offsets applied to substations within the project area. The elevation of MHW in the project area is approximately 0.72 – 0.89 meters above MLLW.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a member of AB. The final QC review was completed in April 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 chart was used in the comparison process:

11430, Lostmans River to Wiggins Pass, FL, 1:40,000, 27th Ed., Mar./09

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 FL1303-CU-M Data Acquisition Summary
- Hardcopy of the Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC11141 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC11141 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

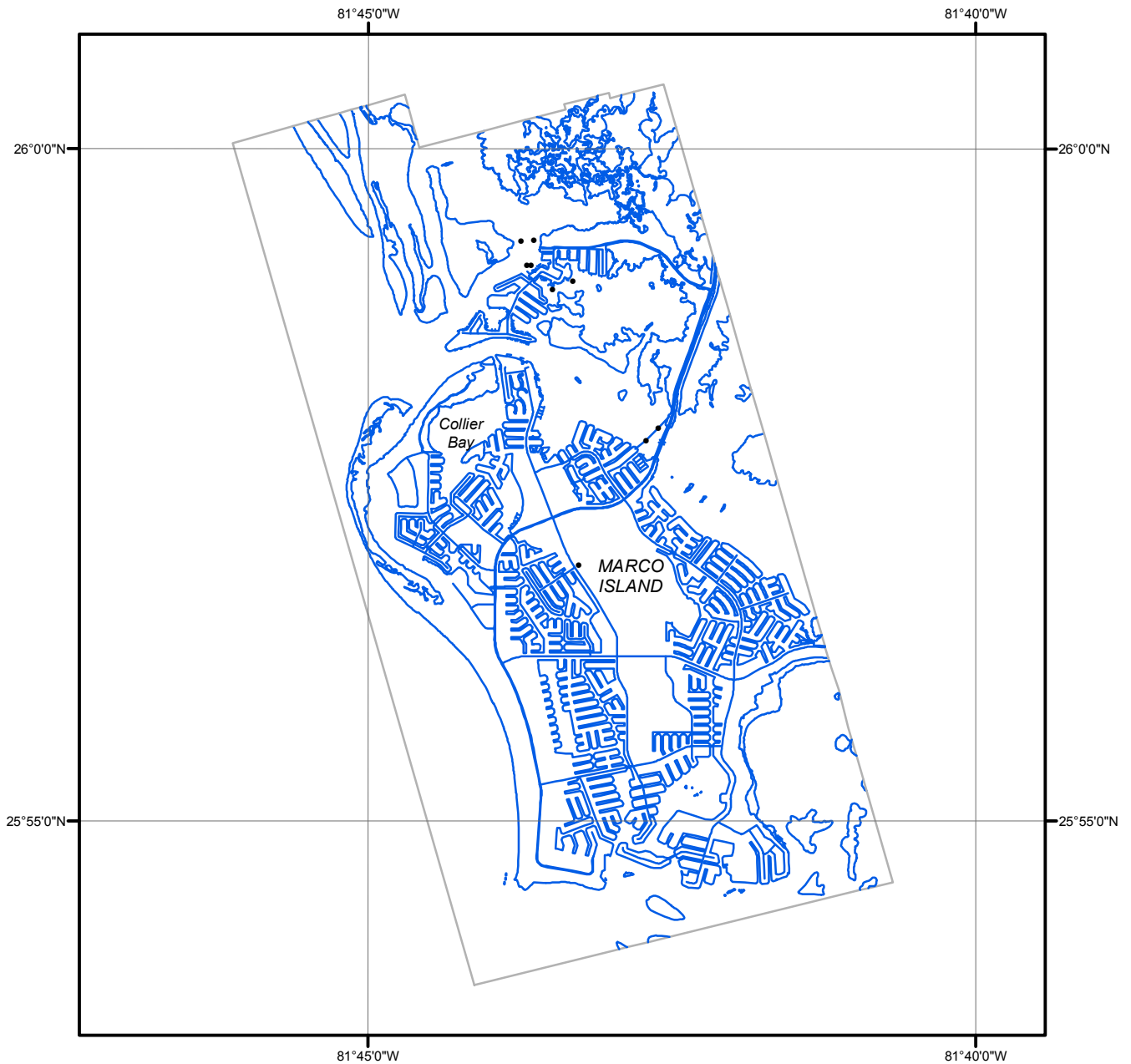
NOAA Shoreline Data Explorer

- GC11141 in shapefile format
- Metadata file for GC11141
- Digital copy of the PCR in Adobe PDF format

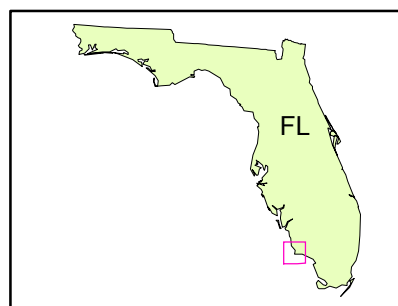
End of Report

MARCO ISLAND

FLORIDA



Overview



FL1303A-CM-N

GC11141