

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT FL1414-CM-N

Venice Inlet, Blackburn Bay to Alligator Creek, Florida

Introduction

Coastal Mapping Program (CMP) Project FL1414-CM-N provides highly accurate digital shoreline data for a portion of the Gulf of Mexico coastline and Intracoastal Waterway in the vicinity of Venice Inlet, Florida, extending from Blackburn Bay to Alligator Creek. The Geographic Cell (GC) may be used in support of the NOAA Nautical Charting Program (NCP) as well as geographic information systems (GIS) for coastal zone management applications.

Project Design

The Requirements Branch (RB) of the Remote Sensing Division (RSD) formulated the photographic mission instructions for this project 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. Aerial survey operations were conducted on May 21, 2014 and February 12, 2016 with the NOAA King Air aircraft (N68RF). Project imagery included three flight lines (196 individual exposures) of natural color and near-infrared (NIR) imagery acquired concurrently using an Applanix Digital Sensor System (DSS) dual-head camera in coordination with both Mean High Water (MHW) and Mean Lower Low Water (MLLW) tide levels. The MHW NIR imagery was not used for compilation. All imagery was acquired at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) from 0.33 – 0.38 meters.

Direct Georeferencing Data

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 July 21, 2014 (ver. 6.2) and March 11, 2016 (ver. 7.1). 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 at most 1.4 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 personnel in March 2016. Digital mapping was performed using the Feature Extraction software module within SOCET SET (ver. 5.6). Feature identification and attribution within the Geographic Cell (GC) were based on image analysis of the aerial imagery and information extracted from the largest scale NOAA nautical charts, the US Coast Guard Light List, 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 FL1414-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 2.7 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 #	Photo #s	~GSD	Tide Level*
05/21/2014	21:09 – 21:12	14NC48	10902 – 10922	0.36	0.4 – 0.6 m
05/21/2014	21:17 – 21:20	14NC48	10923 – 10939	0.36	0.4 – 0.5 m
05/21/2014	21:24 – 21:26	14NC48	10940 – 10950	0.36	0.4 – 0.5 m
02/12/2016	14:18 – 14:21	16VC14	03952 – 03972	0.33	0.0 – 0.2 m
02/12/2016	14:18 – 14:21	16VR14	03951 – 03971	0.38	0.0 – 0.2 m
02/12/2016	14:25 – 14:28	16VC14	03973 – 03989	0.33	0.1 m
02/12/2016	14:25 – 14:28	16VR14	03972 – 03988	0.38	0.1 m
02/12/2016	14:33 – 14:34	16VC14	03990 – 04000	0.33	0.1 m
02/12/2016	14:33 – 14:34	16VR14	03989 – 03999	0.38	0.1 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 station at Naples, FL (ID: 8725110). The elevation of the MHW tidal datum in the project area varies between 0.4 – 0.6 meters above MLLW.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by Applications Branch personnel. The final QC review was completed in March 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 Esri's 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:

- 11424, Lemon Bay to Passage Key Inlet, 1:80,000 scale, 20th Ed., Apr. 2012
- 11425, Tampa Bay to Blackburn Bay, 1:40,000 scale, 39th Ed., May. 2013
Including 1:20,000 scale inset of Venice Inlet

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)
- GC11205 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

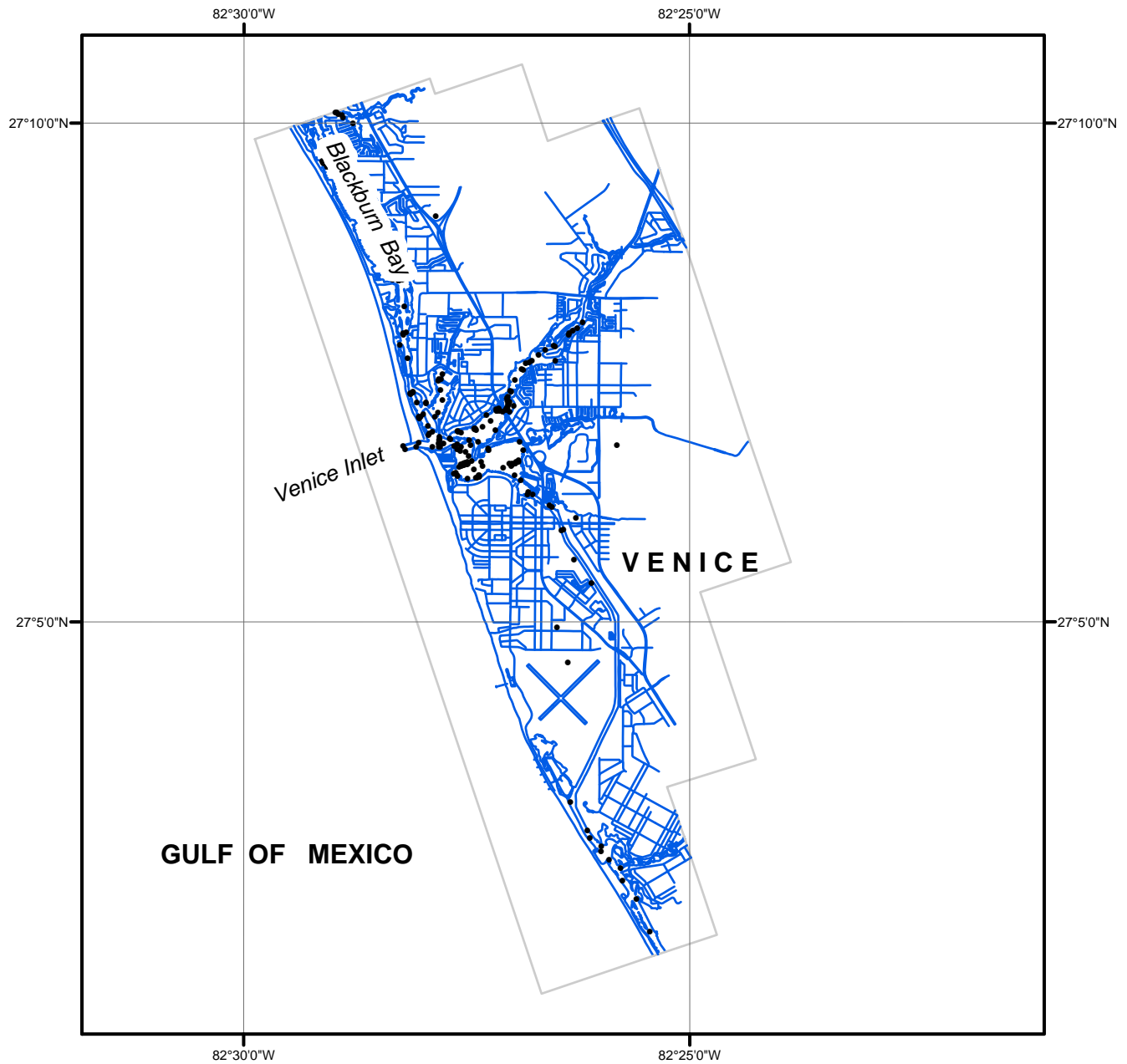
NOAA Shoreline Data Explorer

- GC11205 in shapefile format
- Metadata file for GC11205
- PCR in Adobe PDF format

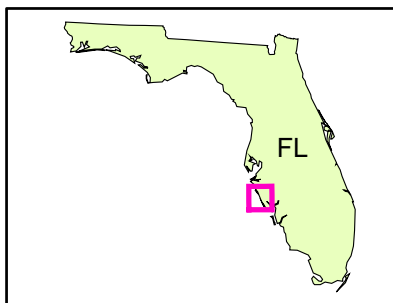
End of Report

Venice Inlet, Blackburn Bay to Alligator Creek

FLORIDA



Overview



FL1414-CM-N

GC11205