

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT FL1809D-CM-N

Intracoastal Waterway, Port Everglades to Golden Beach

Introduction

NOAA Coastal Mapping Program (CMP) Project FL1809D-CM-N provides a highly accurate database of new digital shoreline for a portion of the Intracoastal Waterway (ICW) from Port Everglades to Golden Beach in Florida. This is a subproject of a larger imagery acquisition project, FL1809-CM-N, which was designed to provide coverage of the ICW and various other navigable canals in Florida from Boynton Beach to Little Lake Canal. 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 FL1809-CM-N were formulated by the Requirements Branch (RB) of the Remote Sensing Division (RSD) following the guidelines of the Photo Mission Standard Operating Procedures. The instructions detailed 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 for FL1809-CM-N consisted of the collection of static and kinematic GPS data and Inertial Measurement Unit (IMU) data, and the acquisition of non-tidally coordinated digital aerial imagery. Aerial imagery was acquired using Applanix Digital Sensor System (DSS) 580/560 and DSS 6150/6100 dual cameras with the NOAA King Air aircraft (N68RF) from April 2019 to September 2021. A total of eight flight lines of natural color (RGB) and near-infrared (NIR) imagery was acquired concurrently at a nominal altitude of 10,500 feet. Lines 62-007 and 62-008 were collected in April 2019 using the DSS 580/560 with ground sample distances (GSD) of 0.32 meters for RGB imagery and 0.38 meters for NIR, and lines 62-001 through 62-006 were collected in September 2021 using the DSS 6150/6100 with GSDs of 0.23 meters for RGB and 0.29 meters for NIR. A subset of four lines of imagery was used for FL1809D-CM-N.

GPS Data Processing

The GPS/IMU data were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of the imagery. The Airborne kinematic data for project FL1809D-CM-N was processed in November 2021 using Applanix POSPac MMS (ver. 8.7) software, utilizing the IN-Fusion PP-RTX processing mode, which is an implementation of Trimble's *CenterPoint RTX* GNSS correction service. For further information refer to the

Airborne Positioning and Orientation Reports (APOR) on file with other project data within the RSD Electronic Data Library.

Aerotriangulation

Routine softcopy aerotriangulation (AT) methods were applied to establish a network of precise camera positions and other control for mapping, and to provide model parameters and orientation elements required for digital compilation. This work was performed by personnel of the Applications Branch (AB) of RSD in December 2021 utilizing BAE's SOCET GXP (ver. 4.5) software on a Windows-based photogrammetric workstation. The imagery was measured and adjusted as 2 separate blocks (RGB and NIR) using the Multi-Sensor Triangulation (MST) module of SOCET GXP. Upon successful completion MST provided the standard deviations for each AT ground point, which were used to compute a predicted horizontal circular error of 0.35 meters for the RGB data and 0.42 meters for the NIR, based on a 95% confidence level. An AT report was written and is on file with other project data within the RSD Electronic Data Library. Positional data is referenced to the North American Datum of 1983 (NAD83).

Compilation

The data compilation phase of this project was completed by AB personnel in May 2022. Digital mapping was performed using Esri's ArcGIS Pro stereo extraction software (ver. 2.93). 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 FL1809D-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled from the RGB images only, and were compiled to meet a horizontal accuracy of 0.7 meters, a predicted accuracy of well-defined points measured during the compilation phase, derived by doubling the imagery accuracy computed in the AT phase above. The table below provides detailed information on the image sources used:

Date	Time (UTC)	RGB Imagery		NIR Imagery		Tide Level*
		Roll	Strip / Images	Roll	Strip / Images	
19-Sep-2021	13:46 – 13:49	21VC02	62-004 / 29 – 45	21VR02	62-004 / 29 – 45	0.8 m
19-Sep-2021	13:58 – 13:59	21VC02	62-006 / 55 – 60	21VR02	62-006 / 55 – 60	0.8 m
19-Sep-2021	14:03 – 14:04	21VC02	62-005 / 61 – 65	21VR02	62-005 / 61 – 65	0.7 m
19-Sep-2021	14:13 – 14:15	21VC02	62-003 / 77 – 90	21VR02	62-003 / 77 – 90	0.7 m

* 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 NOS gauges. The height of the MHW tidal datum in the project area is 0.65 meters above MLLW.

Quality Control / Final Review

Quality control (QC) tasks were conducted by a senior member of the RSD. The final QC review

was completed in July 2022. The review process consisted of an assessment of the identification and attribution of cartographic features 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 (ver. 10.8.1). 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 ENC's were used in the comparison process:

- US5FL33M, 50th Ed., Nov. 2021
- US5FL32M, 44th Ed., Dec. 2021

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

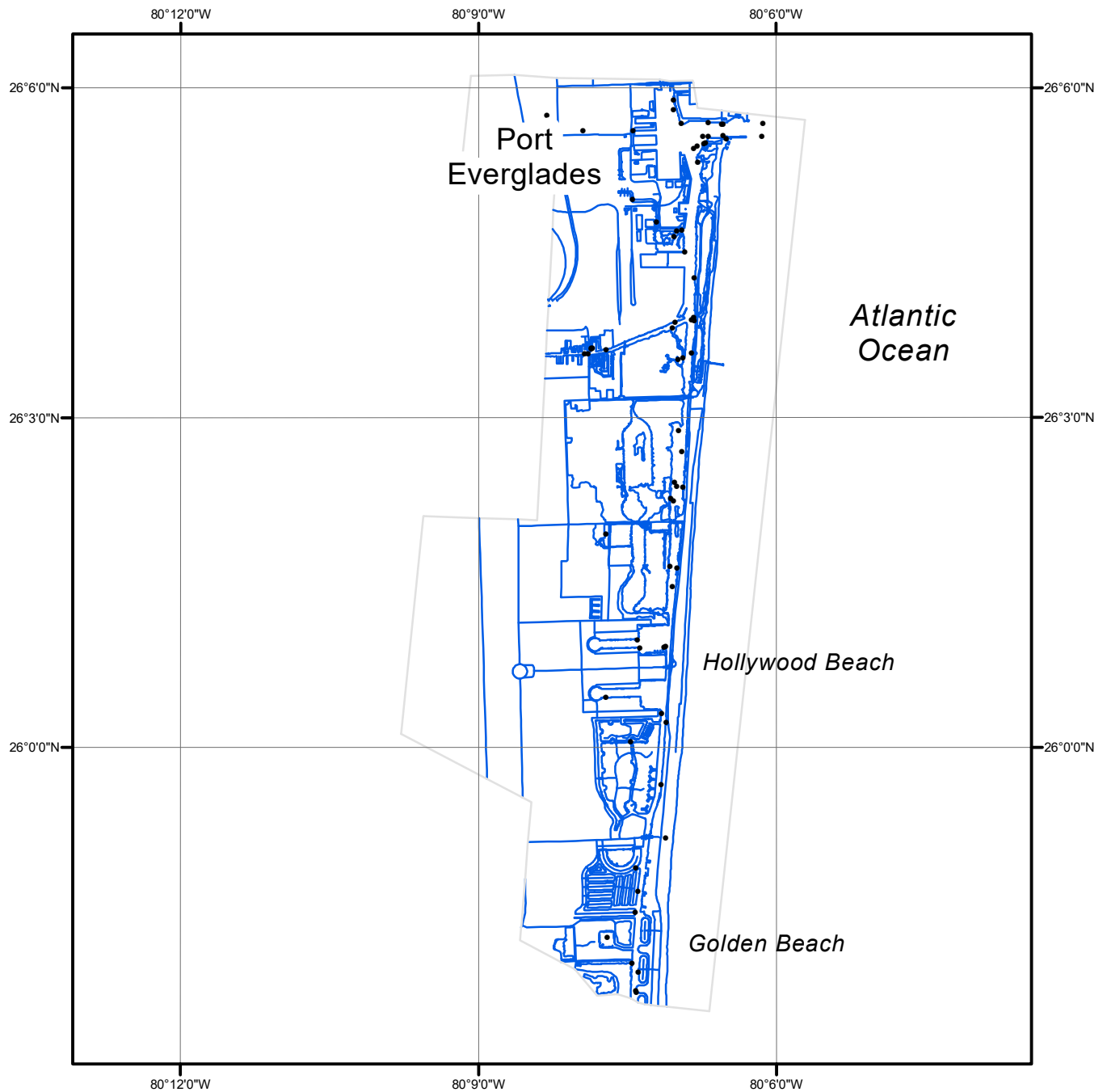
- Project database
- Airborne Positioning and Orientation Reports
- Aerotriangulation Report
- GC11759 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

NOAA Shoreline Data Explorer

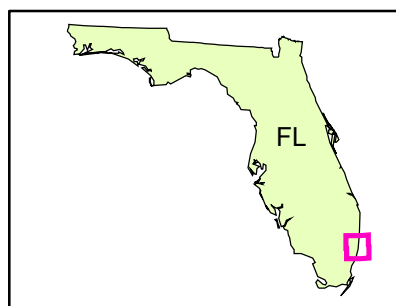
- GC11759 in shapefile format
- Metadata file for GC11759
- PCR in Adobe PDF format

End of Report

ICW, PORT EVERGLADES TO GOLDEN BEACH FLORIDA



Overview



FL1809D-CM-N

GC11759