

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT NC1001A

Intracoastal Waterway, Rich Inlet to Myrtle Grove Sound

North Carolina

Introduction

Coastal Mapping Program (CMP) Project NC1001A provides highly accurate digital shoreline data for a portion of the Intracoastal Waterway from Rich Inlet to Myrtle Grove Sound, North Carolina. NC1001A is a subproject of a larger project, NC1001, which extends from Rich Inlet around Cape Fear to Oak Island, as well as extending up the Cape Fear River to Wilmington, North Carolina. 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 design of Project NC1001 was accomplished by the Requirements Branch (RB) of the Remote Sensing Division (RSD). RB formulated the photographic mission instructions for this project following the guidelines of the Photo Mission Standard Operating Procedure. The instructions discussed the project's purpose, geographic area of coverage, scope and priority; photographic requirements; flight line priority; Global Positioning System (GPS) data collection procedures and guidelines for both kinematic and static surveys; data recording and handling instructions; and contact and communication information. RB created a Project Layout Diagram, flight maps and input files for the aircraft's flight management system.

Field Operations

The field operations for Project NC1001 consisted of the collection of static and kinematic Global Positioning System (GPS) data and Inertial Measurement Unit (IMU) data and the acquisition of aerial imagery. The photographic mission operations were conducted during eleven flights over the course of three years, from April 2010 through May 2013, with the NOAA King Air (N68RF) aircraft. Twenty-nine (29) lines of Natural Color (RGB) and Black & White Infrared (B&W IR) digital images were acquired with an Applanix Digital Sensor System (DSS-439) dual-head aerial camera at a nominal altitude of 10,000 feet, resulting in an approximate ground sample distance (GSD) of 0.35 meters. Lines 50-001 through 50-017, 50-022, and 50-026 through 50-029 were collected in coordination with both MHW and MLLW tide stages. Tide-coordination was not required for lines 50-018 through 50-021, and 50-023 through 50-025. For further information refer to the NC1001 Acquisition Summary on file with other project data within the RSD Applications Branch (AB) Project Archive.

Direct Georeferencing Data Processing

GPS/IMU data for project NC1001 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 between November 2011 and May 2013 using various versions of Applanix POSPAC software. 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 (CE95) was calculated to be 1.4 – 1.5 meters for the imagery used to compile data for NC1001A. NGS third order geodetic control points were used to test the horizontal integrity of the 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 a member of AB in December 2014. Digital feature data was compiled using SOCET SET (version 5.6.0) suite of digital photogrammetric software. 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.

Spatial data accuracies for Project NC1001A 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 Number	Photo Numbers	GSD (nominal)	Tide Level*
10-21-2011	17:42 – 17:44	11NR45	14411 – 14426	0.35 m	1.1 m
10-21-2011	18:01 – 18:03	11NR45	14427 – 14437	0.35 m	1.1 m
10-21-2011	18:10 – 18:14	11NR45	14438 – 14468	0.35 m	1.1 m
06-09-2012	15:36 – 15:37	12NR23	05356 – 05364	0.35 m	1.3 m

06-09-2012	17:21 – 17:27	12NR23	05417 – 05454	0.35 m	1.3 – 1.2 m
06-09-2012	17:33 – 17:38	12NR23	05455 – 05492	0.35 m	1.2 – 1.3 m
09-25-2012	13:45 – 13:47	12NC78	28434 – 28449	0.35 m	0.1 m
09-25-2012	13:53 – 13:58	12NC78	28450 – 28480	0.35 m	0.1 m
09-25-2012	14:04 – 14:05	12NC78	28481 – 28491	0.35 m	0.1 m
09-25-2012	14:37 – 14:41	12NC78	28503 – 28531	0.35 m	0.1 m
09-26-2012	15:53 – 15:54	12NC79	28683 – 28691	0.35 m	0.0 m
09-26-2012	15:57 – 15:59	12NC79	28692 – 28701	0.35 m	0.0 m
05-10-2013	19:08 – 19:13	13NC30	05797 – 05834	0.35 m	0.1 m
09-25-2012	13:45 – 13:47	12NR61	15201 – 15216	0.35 m	0.1 m
09-25-2012	13:53 – 13:58	12NR61	15217 – 15247	0.35 m	0.1 m
09-25-2012	14:04 – 14:05	12NR61	15248 – 15258	0.35 m	0.1 m
09-25-2012	14:37 – 14:41	12NR61	15270 – 15298	0.35 m	0.1 m
09-26-2012	15:53 – 15:54	12NR62	15464 – 15472	0.35 m	0.0 m
09-26-2012	15:57 – 15:59	12NR62	15473 – 15482	0.35 m	0.0 m
05-10-2013	19:08 – 19:13	13NR30	04952 – 04989	0.35 m	0.1 m

* Tide levels are given in meters above MLLW & were calculated using the Pydro software tool with a TCARI grid referenced to verified water level observations at the time of photography from the NOS tide gage at Wrightsville Beach, NC (#8658163). The elevation of the MHW tidal datum in the project area are varies between 1.2 – 1.3 meters above MLLW.

Quality Control / Final Review

The final review of the project was completed by a senior member of RSD in December 2014, and included analysis of direct georeferencing 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 10.1 software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical charts with natural color images and compiled project data resulted in creation of the Chart Evaluation File (CEF). The following nautical charts were used in the comparison process:

- 11534, ICW Myrtle Grove Sound and Cape Fear R., 1:40,000 scale, 38th Ed., Sep./13
- 11539, New River Inlet to Cape Fear, 1:80,000 scale, 19th Ed., Sep./10
- 11541, ICW Neuse River to Myrtle Grove Sound, 1:40,000 scale, 40th Ed., Feb./13

End Products and Deliverables

The following specifies the location and identification of end products generated during the completion of this project:

RSD Applications Branch Archive

- Hardcopy of the NC1001 Data Acquisition Summary
- Hardcopy of the Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Project Completion Report (PCR)
- Page size graphic plot of GC11097 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC11097 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

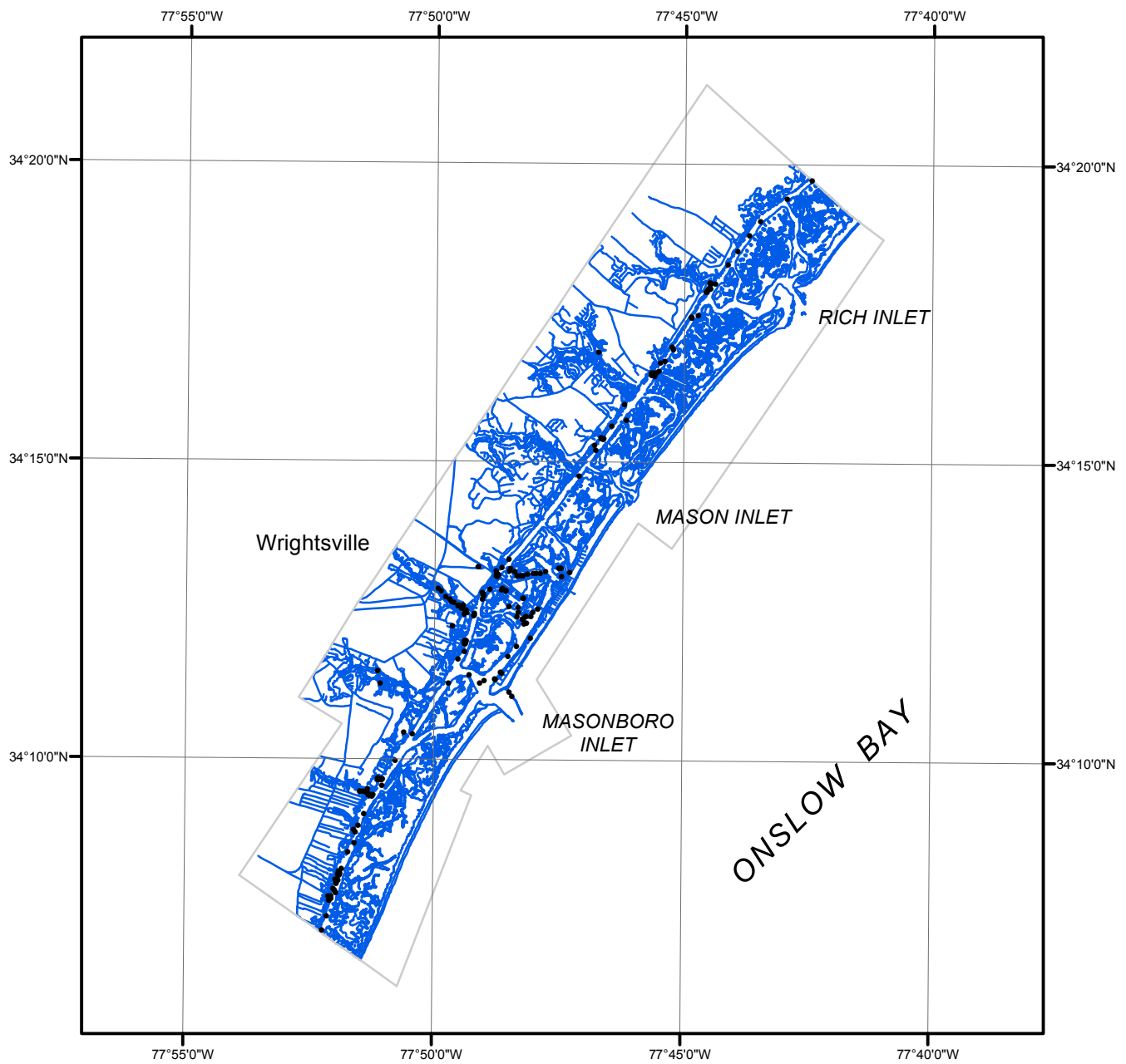
NOAA Shoreline Data Explorer

- GC11097 in shapefile format
- Metadata file for GC11097
- Digital copy of the PCR in Adobe PDF format

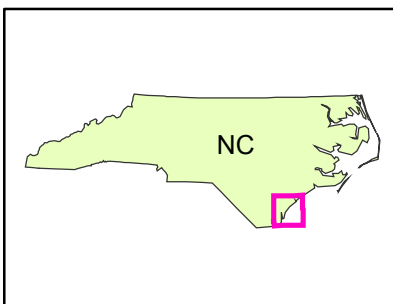
End of Report

ICW, RICH INLET TO MYRTLE GROVE SOUND

NORTH CAROLINA



Overview



NC1001A

GC11097