

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT NC1001B

Intracoastal Waterway, Myrtle Grove Sound to Oak Island, North Carolina

Introduction

Coastal Mapping Program (CMP) Project NC1001B provides highly accurate digital shoreline data for a portion of the Intracoastal Waterway, from Myrtle Grove Sound to Oak Island, North Carolina, and includes the mouth of the Cape Fear River. NC1001B is a subproject of a larger project, NC1001, which covers the Intracoastal Waterway from Rich Inlet to Oak Island and the Cape Fear River from its mouth 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 NC1001B 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 ten flights over the course of three years, from October 2011 through May 2013, with the NOAA King Air (N68RF) aircraft. Fourteen (14) 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. All images in this sub-project were collected in coordination with both MHW and MLLW tide stages. 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 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 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 – 1.5 meters for the imagery used to compile data for NC1001B.

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 NC1001B 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 #	Photo #s	~GSD	Tide Level*
10-21-2011	18:29 - 18:31	11NR45	14469 - 14481	0.35 m	1.3 m
10-21-2011	18:37 - 18:39	11NR45	14482 - 14494	0.35 m	1.3 m
10-21-2011	18:44 - 18:45	11NR45	14495 - 14501	0.35 m	1.3 m
10-21-2011	18:50 - 18:52	11NR45	14502 - 14515	0.35 m	1.4 m
10-21-2011	19:00 - 19:02	11NR45	14516 - 14530	0.35 m	1.3 m
10-21-2011	19:08 - 19:10	11NR45	14531 - 14545	0.35 m	1.3 m
10-21-2011	19:15 - 19:17	11NR45	14546 - 14556	0.35 m	1.2 m
01-25-2012	15:16 - 15:21	12NR03	00386 - 00422	0.35 m	1.4 m
01-25-2012	15:25 - 15:30	12NR03	00423 - 00456	0.35 m	1.3 m

02-18-2012	16:25 - 16:27	12NC17	04520 - 04534	0.35 m	0.4 m
02-18-2012	16:25 - 16:27	12NR38	08760 - 08774	0.35 m	0.1 m
06-09-2012	15:29 - 15:36	12NR23	05312 - 05360	0.35 m	1.4 m
06-09-2012	15:41 - 15:47	12NR23	05365 - 05405	0.35 m	1.4 m
06-09-2012	17:19 - 17:22	12NR23	05406 - 05420	0.35 m	1.4 m
06-09-2012	17:38 - 17:40	12NR23	05490 - 05505	0.35 m	1.3 m
09-25-2012	14:35 - 14:37	12NR61	15260 - 15273	0.35 m	0.1 m
09-25-2012	14:35 - 14:37	12NC78	28493 - 28506	0.35 m	0.3 m
09-26-2012	14:59 - 15:00	12NR62	15342 - 15352	0.35 m	0.1 m
09-26-2012	14:59 - 15:00	12NC79	28561 - 28571	0.35 m	0.2 m
09-26-2012	15:05 - 15:07	12NR62	15353 - 15367	0.35 m	0.1 m
09-26-2012	15:05 - 15:07	12NC79	28572 - 28586	0.35 m	0.2 m
09-26-2012	15:11 - 15:13	12NR62	15368 - 15381	0.35 m	0.0 m
09-26-2012	15:11 - 15:13	12NC79	28587 - 28600	0.35 m	0.1 m
09-26-2012	15:18 - 15:19	12NR62	15382 - 15388	0.35 m	0.0 m
09-26-2012	15:18 - 15:19	12NC79	28601 - 28607	0.35 m	0.0 m
09-26-2012	15:26 - 15:27	12NR62	15389 - 15393	0.35 m	0.0 m
09-26-2012	15:26 - 15:27	12NC79	28608 - 28612	0.35 m	0.0 m
09-26-2012	15:33 - 15:35	12NR62	15394 - 15406	0.35 m	0.0 m
09-26-2012	15:33 - 15:35	12NC79	28613 - 28625	0.35 m	0.1 m
09-26-2012	15:40 - 15:42	12NR62	15407 - 15419	0.35 m	0.0 m
09-26-2012	15:40 - 15:42	12NC79	28626 - 28638	0.35 m	0.1 m
09-26-2012	15:46 - 15:54	12NR62	15420 - 15468	0.35 m	0.0 m
09-26-2012	15:46 - 15:54	12NC79	28639 - 28687	0.35 m	0.1 m
03-01-2013	14:41 - 14:45	13NR03	00151 - 00180	0.35 m	1.5 m
03-13-2013	19:14 - 19:21	13NR03	00300 - 00340	0.35 m	0.1 m
03-13-2013	19:14 - 19:21	13NC03	00300 - 00340	0.35 m	0.3 m
03-14-2013	19:42 - 19:46	13NR04	00369 - 00398	0.35 m	0.1 m
03-14-2013	19:42 - 19:46	13NC04	00369 - 00398	0.35 m	0.2 m
03-14-2013	19:52 - 19:57	13NR04	00399 - 00435	0.35 m	0.0 m
03-14-2013	19:52 - 19:57	13NC04	00399 - 00435	0.35 m	0.1 m

03-14-2013	20:03 - 20:08	13NR04	00436 - 00469	0.35 m	0.0 m
03-14-2013	20:03 - 20:08	13NC04	00436 - 00469	0.35 m	0.1 m
05-10-2013	19:06 - 19:08	13NR25	04939 - 04954	0.35 m	0.1 m
05-10-2013	19:06 - 19:08	13NC30	05784 - 05799	0.35 m	0.2 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 the time of photography from NOS reference tide gages in the vicinity. The elevation of the MHW tidal datum in the project area varies between 1.2 - 1.5 meters above MLLW.

Quality Control / Final Review

The final review of the project was completed by a senior member of RSD in January 2015, and included analysis of the 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 the 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/Cape Fear R. to Casino Cr., 1:40,000 scale, 38th Ed. Sep./13
11537, Cape Fear River, NC, 1:40,000 scale, 39th Ed. Apr./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 Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Project Completion Report (PCR)
- Page size graphic plot of GC11113 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC11113 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

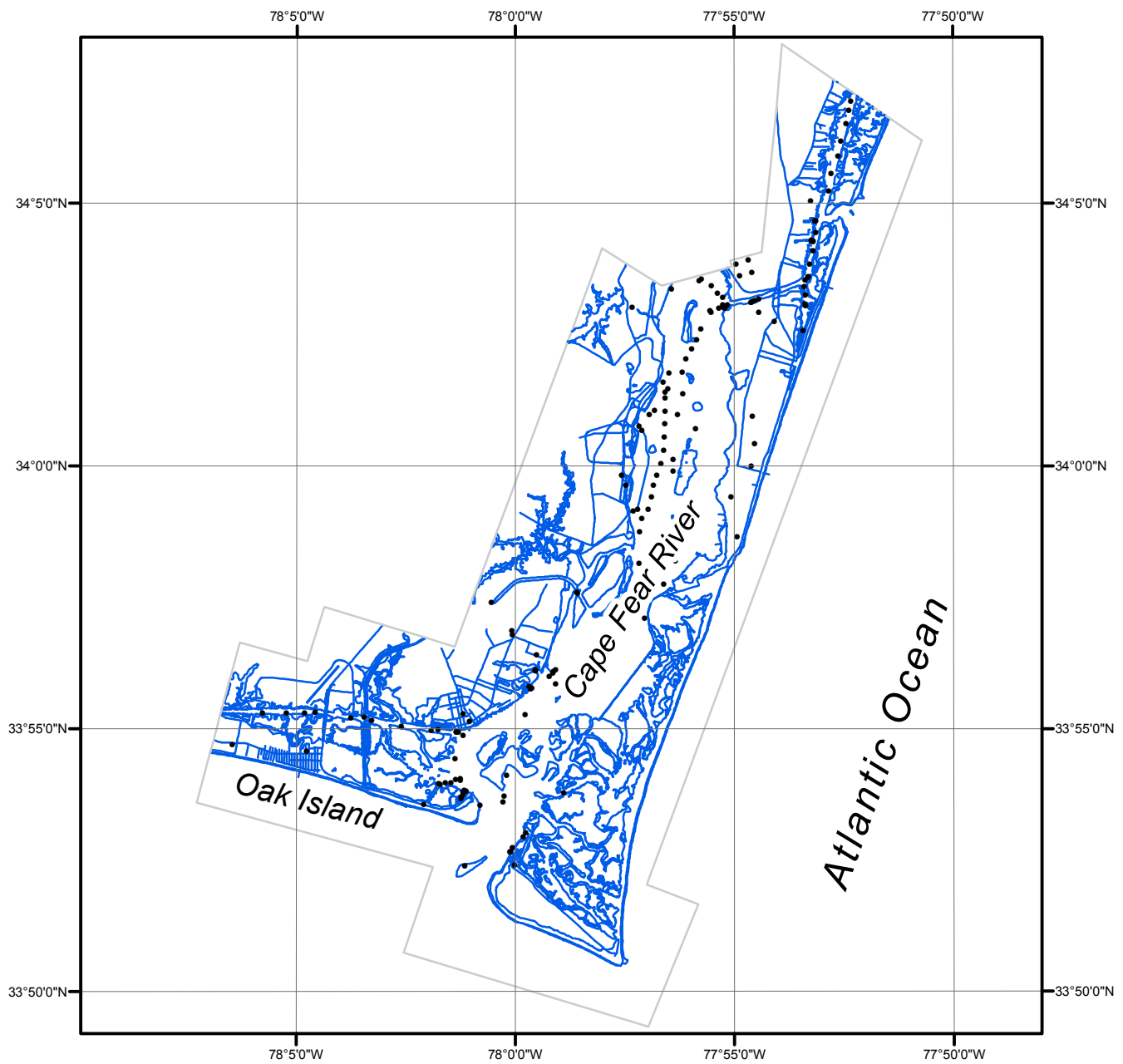
NOAA Shoreline Data Explorer

- GC11113 in shapefile format
- Metadata file for GC11113
- Digital copy of the PCR in Adobe PDF format

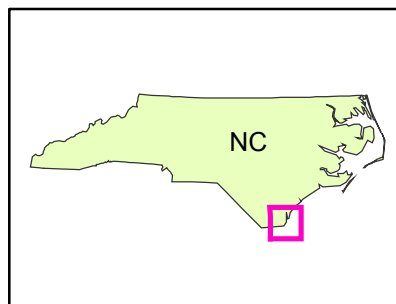
End of Report

ICW, MYRTLE GROVE SOUND TO OAK ISLAND

NORTH CAROLINA



Overview



NC1001B

GC11113