

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT FL0703B

Escambia River to Blackwater River, Florida

Introduction

NOAA Coastal Mapping Program (CMP) Project FL0703B provides a highly accurate database of new digital shoreline data from Escambia River to Blackwater River, Florida, including the Escambia and Blackwater Bays. Project FL0703B is a subproject of a larger project, FL0703, which extends to the entrance of Pensacola Bay.

Successful completion of this project resulted in controlled metric-quality aerial photographs; color digital orthophotos, and digital feature data of the coastal zone which complements the Nautical Charting Program (NCP) as well as geographic information systems (GIS) for a variety of coastal zone management applications.

The project database consists of information measured and extracted from aerial photographs and metadata related to photogrammetric compilation. Base mapping was conducted in a digital environment using stereo softcopy photogrammetry and associated cartographic practices.

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 Procedure Version II. 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.

NOAA provided Shoreline Mapping contractor Photo Science, Inc. with the imagery and associated acquisition data to be used for the aerotriangulation and compilation phases of the project.

Field Operations

The field operations consisted of the collection of static and kinematic GPS data and the acquisition of aerial imagery. Project imagery consisted of three sets of aerial photographs: Eight strips of B&W IR photos coordinated with Mean High Water (MHW) tide levels, eleven strips of B&W IR coordinated with Mean Lower Low Water (MLLW) tide levels, and four strips of natural color photos generally taken at any tide stage below MHW.

All film was captured using the NOAA Cessna Citation II (N52RF) aircraft, and a WILD RC-30 camera with the NOS "A" lens cone, at a nominal scale of 1:30,000. The color imagery was captured on 2/6/2007 and 2/7/2007. The MLLW IR imagery was captured on 3/2/2008, 3/6/2008 and 3/10/2008. The MHW IR imagery was captured on 3/2/2008 and 3/10/2008.

A GPS base station was positioned atop a PKNAIL at Pensacola Regional Airport and static base station data were collected using an Ashtech UZ-12, ZE21 dual frequency GPS receiver. Airborne kinematic GPS/IMU data was collected using an APPLANIX Position and Orientation System (POS) POS/AV510 GPS/IMU System with an embedded Trimble Dual frequency receiver and a Novatel-512 antenna.

Photo Science, Inc. was contracted to locate a total of fifteen (15) new photo control points for FL0703. The control points were photo-identifiable features and were taken from well-defined discrete locations. An additional 4 photo-identifiable features that were used as check points for the aerotriangulation were also surveyed. Please see the final ground control report for a listing of final coordinates, elevations, and descriptions.

GPS Data Reduction

GPS and IMU data was collected and processed by RSD personnel to provide precise positions and orientations of camera centers for application as photogrammetric control in the aerotriangulation phase of project completion. The static GPS base station data was processed using the NGS Online Processing User Service (OPUS), which computed fixed baseline solutions from nearby CORS stations. The airborne kinematic data was processed by RSD personnel in July 2009 using POSPAC 4.4 GPS/IMU processing software. For further information refer to the Airborne Positioning and Orientation Reports (APOR) for each mission date, which are on file with other project data within the RSD Applications Branch (AB) Project Archive.

The GPS/IMU data was provided to Photo Science by NOAA in August 2009. The data was formatted with fields for ID, X, Y, Z, omega, phi, kappa, time. The XYZ units were in UTM zone 16N (NAD 83) coordinates, and the orientation angles were in decimal degrees. Photo Science reformatted the data to be compatible with the BINGO frame import used in BAE Systems SOCET SET[®] photogrammetric software.

Aerotriangulation

Aerotriangulation for this project was performed by Photo Science using a softcopy (digital) stereo photogrammetric system to establish the network of control required for the compilation phase. The project photography was bridged as two separate blocks and then merged together to form a single block of adjusted imagery. The first block included all of the 1:30,000 color photographs; and the second block included all of the 1:30,000 MHW and MLLW IR imagery. The softcopy system hardware consisted of a high-end Dell Precision[™] Workstation with the Windows[®] XP Professional operating system, and stereo viewing capability. BAE Systems SOCET SET[®] v. 5.4.1 softcopy photogrammetry suite was used for both project setup and aerotriangulation, using its MultiSensor Triangulation (MST) module.

The Airborne GPS/IMU data provided by NOAA was used in the BINGO frame import module to orient the photography.

Upon successful completion of the aerotriangulation process, the BINGO software provided the RMS of the standard deviations of the residuals for each aerotriangulated ground point which were used to compute a predicted horizontal circular error of 0.74 meters for the aerotriangulation block of the three (3) photo missions based on a 95% confidence level. An Aerotriangulation Report was completed and is on file with other project data within the RSD Applications Branch (AB) Project Archive.

The project database was submitted and consists of project parameters and options, camera calibration data, interior orientation parameters, ground control parameters, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is referenced to the North American Datum of 1983 (NAD 83).

Compilation

The data compilation phase of this project was initiated by Photo Science in February 2010. Digital mapping was performed using a DPW in conjunction with the SOCET SET Feature Extraction software module. Feature identification and attribution within the Geographic Cell (GC) were based on image analysis of 1:30,000 scale photographs and information extracted from the appropriate NOAA nautical charts, 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 FL0703B were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.5 meters at the 95% confidence level. The predicted accuracy of compiled, well defined points is derived by doubling the circular error derived from aerotriangulation statistics.

The following table provides information on aerial images used in the project completion:

Date	Time (UTC)	Roll Number	Photo Numbers	Scale (nominal)	Tide Level*
02-06-07	20:35-20:41	07ACN03	0306-0324	1:30,000	-0.1
02-06-07	20:46-20:51	07ACN03	0325-0337	1:30,000	-0.1
02-06-07	20:56-20:59	07ACN03	0338-0350	1:30,000	-0.1
02-07-07	16:19-16:23	07ACN03	0377-0389	1:30,000	0
02-07-07	16:35-16:39	07ACN03	0390-0402	1:30,000	0
03-02-08	16:02-16:05	08AR01	0055-0061	1:30,000	-0.1
03-02-08	16:11-16:13	08AR01	0062-0069	1:30,000	-0.1
03-02-08	16:38-16:41	08AR01	0095-0103	1:30,000	-0.1 – 0
03-02-08	16:46-16:49	08AR01	0104-0113	1:30,000	-0.1 – 0

03-02-08	16:57-17:02	08AR01	0121-0133	1:30,000	-0.1 – 0
03-02-08	17:07-17:10	08AR01	0134-0143	1:30,000	-0.1 – 0
03-10-08	15:41-15:42	08AR02	0312-0314	1:30,000	0.2
03-10-08	15:52-15:56	08AR02	0327-0336	1:30,000	0.2
03-10-08	16:03-16:05	08AR02	0337-0345	1:30,000	0.2 – 0.3
03-10-08	16:14-16:17	08AR02	0357-0364	1:30,000	0.2 – 0.3
03-10-08	16:31-16:36	08AR02	0382-0394	1:30,000	0.2 – 0.3
03-10-08	16:43-16:46	08AR02	0395-0402	1:30,000	0.2 – 0.3
03-10-08	16:55-16:57	08AR02	0410-0416	1:30,000	0.2 – 0.3
03-10-08	17:22-17:26	08AR02	0435-0444	1:30,000	0.3

* Tide levels are given in meters above MLLW and are based on actual observations at various substations throughout the project area with corrections applied from the Pensacola, FL reference station. The mean tide range at the reference station is 0.4 meters.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of Photo Science. The Photo Science Project Manager worked closely with NOAA staff assigned to the project to relay any questions or concerns relating to the compilation process. The final QC review was completed in September 2010. The review process included analysis of aerotriangulation 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 9.3 software. All project data was evaluated for compliance to CMP requirements.

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

11378, Intracoastal Waterway, Santa Rosa Sound to Dauphin I., 1:40,000, 36th Ed. Jul/09
 11382, Pensacola Bay and Approaches, 1:80,000, 41st Ed. May/10
 11383, Pensacola Bay, 1:30,000, 51st Ed. Jan/06
 11385, Intracoastal Waterway, West Bay to Santa Rosa Sound, 1:40,000, 27th Ed. Feb/07

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 Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC10825 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC10825 in shapefile format

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

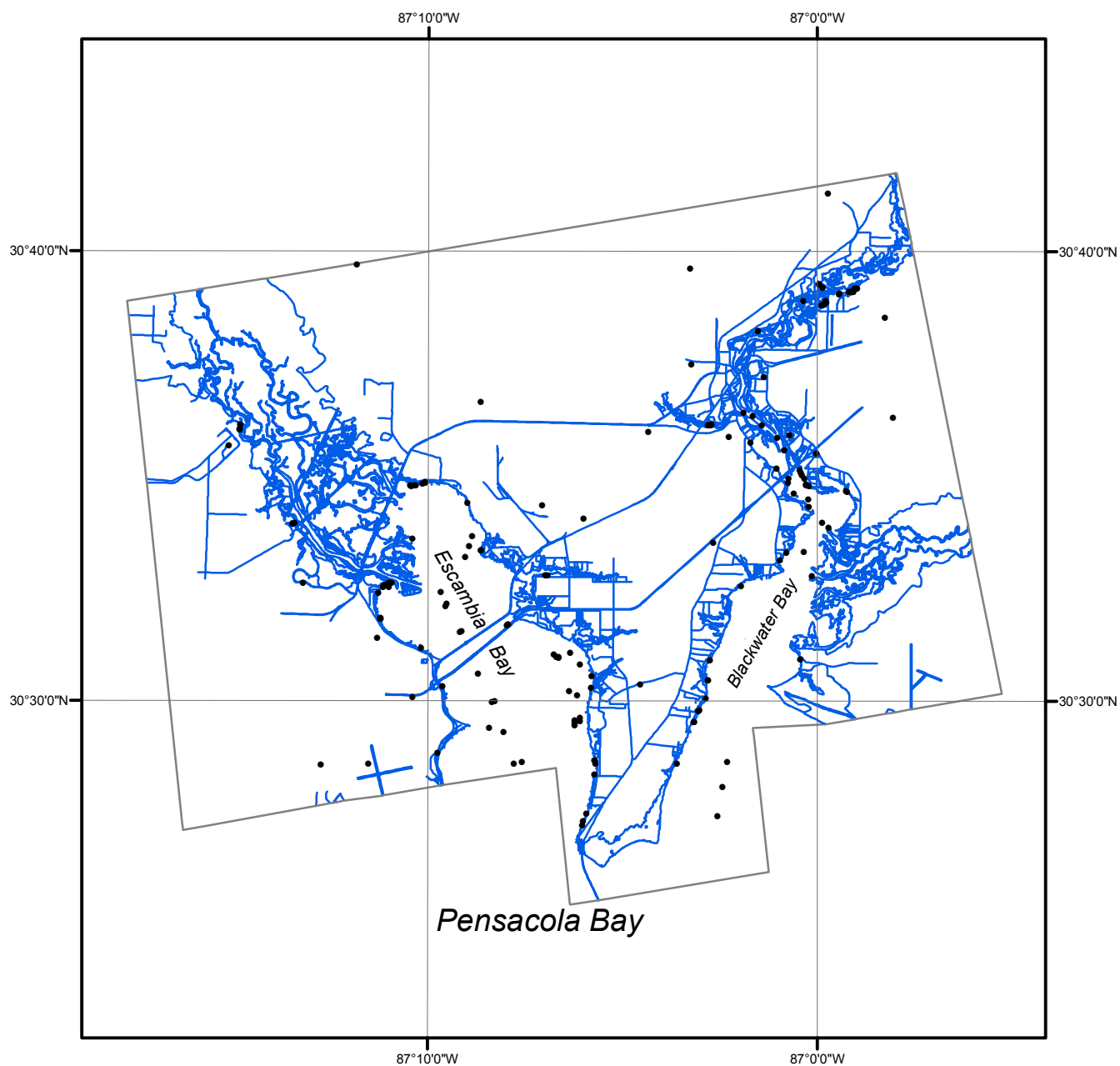
NOAA Shoreline Data Explorer

- GC10825 in shapefile format
- Metadata file for GC10825
- Digital copy of the PCR in Adobe PDF format

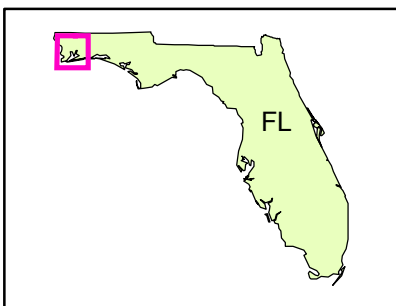
End of Report

ESCAMBIA RIVER TO BLACKWATER RIVER

FLORIDA



Overview



FL0703B

GC10825