NOAA COASTAL MAPPING PROGRAM
PROJECT COMPLETION REPORT

PROJECT MD0703B

Herrington Harbor North, Maryland

Introduction

Coastal Mapping Program (CMP) Project MD0703B provides highly accurate digital shoreline data of northern Herring Bay, from Fairhaven to Deale, Maryland, including Herrington Harbor North. Project MD0703B is a sub-project of a larger project, MD0703, which also includes shoreline data in the vicinity of Cambridge, MD.

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 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 (7/1/93). 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

Field operations consisted of the collection of static and kinematic Global Positioning System (GPS) data and acquisition of aerial imagery. The photographic mission operations were conducted on February 9, 2007, with the NOAA Cessna Citation II aircraft. Two strips of natural color digital photographs were acquired, with an approximate ground sample distance (GSD) of 0.36 meters, through use of an Applanix Digital Sensor System (DSS) 322 digital camera.

A base station was established at Salisbury Airfield (KSBY), MD, using static GPS. Airborne kinematic GPS data was collected in conjunction with Inertial Measurement Unit (IMU) data to determine precise camera positions and orientations.

GPS Data Reduction

GPS and IMU data was collected and processed by RSD personnel to provide precise positions of camera centers for application as photogrammetric control in the aerotriangulation phase of project completion. The static GPS base station data was processed in February 2007 using the NGS Online Processing User Service (OPUS)

software to compute fixed baseline solutions from three CORS stations. The final
NAD83 position reported by OPUS was the average of these three baseline solutions.
The airborne kinematic data was processed using Applanix POSPac (ver. 4.4) software in
December 2007. Refer to the Airborne Positioning and Orientation Report (APOR) for
further information on GPS data processing and CORS Stations used.

Aerotriangulation

Routine softcopy aerotriangulation 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 initiated by
RSD personnel in January 2008 utilizing a Digital Photogrammetric Workstation (DPW),
which is a configuration of computer hardware, modular software components and other
associated peripheral devices. The color photographs were measured and adjusted as a
single block using BAE Systems SOCET SET (version 5.3) photogrammetric software in
conjunction with the Multi-Sensor Triangulation (MST) module of aerotriangulation
software. Upon successful completion of the aerotriangulation process, the MST
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 0.6 meters based on a 95% confidence level. An Aerotriangulation
Report was written and is on file with other project data within the RSD Project Archive.

The project database 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 RSD personnel in January
2008. 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 the digital 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 MD0703B were determined according to standard
Federal Geographic Data Committee (FGDC) practices. Cartographic features were
compiled to meet a horizontal accuracy of 1.2 meters at the 95% confidence level. This
predicted accuracy of compiled, well defined points is calculated by doubling the circular
error derived from aerotriangulation statistics.

The following table provides information on imagery used in project completion:

Date	Time (UTC)	Roll ID	Photo Numbers	GSD	Tide Level*
02-09-07	1701-1710	07QC01	1-36	0.36 m	-0.1 m

*Tide levels are given in meters above MLLW and are based on actual observations at the NOS gauge in Baltimore, MD, with offsets applied to the Fairhaven substation in Herring Bay. The elevation of the MHW tidal datum at Fairhaven is equal to 0.3 meters above MLLW.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of the RSD Applications Branch (AB). The final QC review was completed in February 2008. The review process included analysis of the 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 9.1 software. The entire suite of project products was evaluated for compliance to CMP requirements.

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

> 12266, Chesapeake Bay, Choptank River & Herring Bay, MD, 1:40,000, 29th ed.
> 12270, Eastern Bay and South River, MD, 1:40,000, 34th ed.

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 Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page size graphic plot of GC10692 file contents, attached to PCR

Remote Sensing Division Electronic Data Library
- Project database
- GC10692 in shapefile format
- Digital copy of the PCR in Adobe PDF format
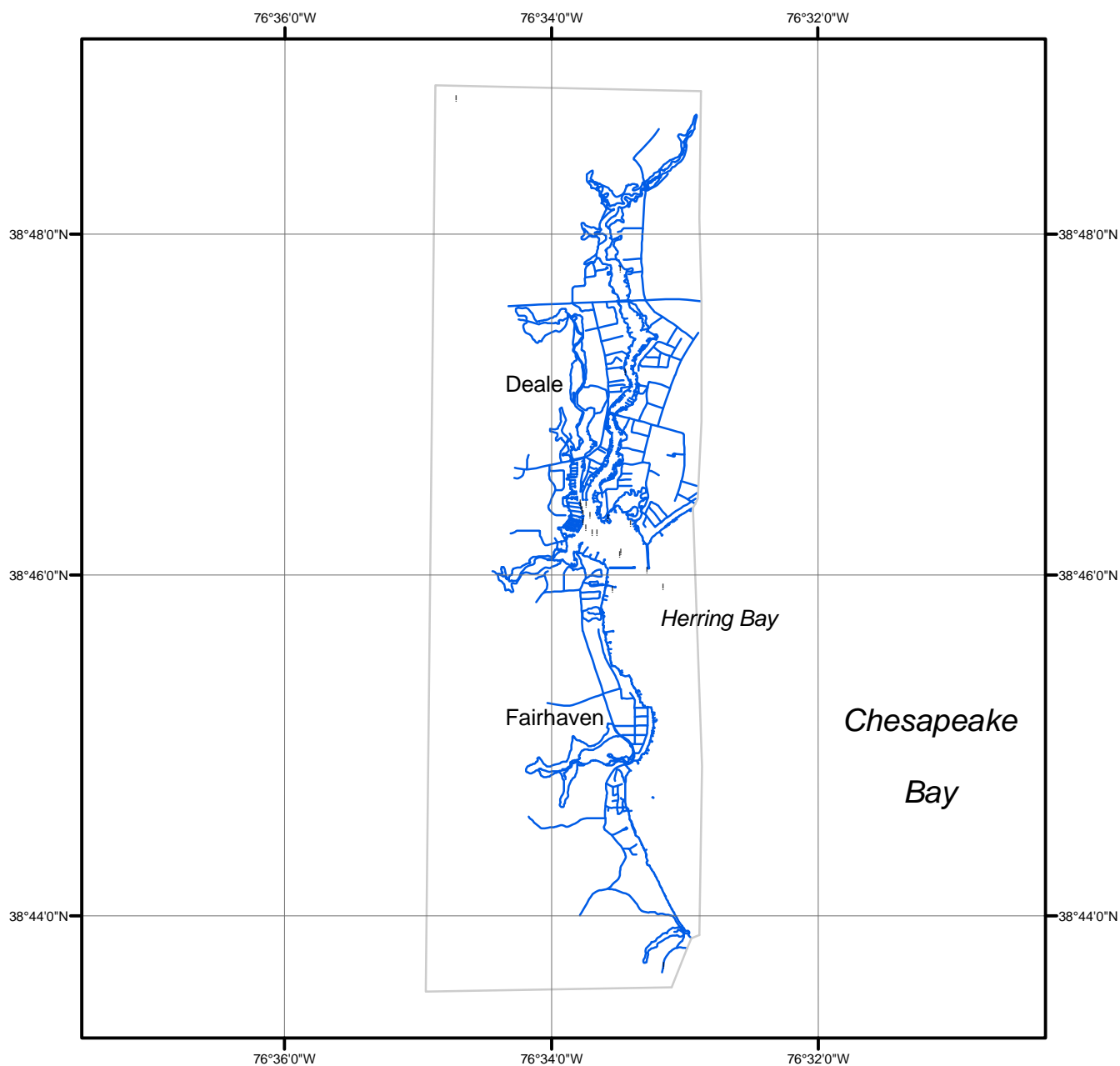- CEF in shapefile format

NOAA Shoreline Data Explore
- GC10692 in shapefile format
- Metadata file for GC10692
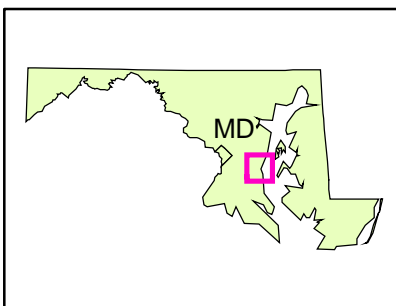- Digital copy of the PCR in Adobe PDF format

End of Report

HERRINGTON HARBOR NORTH

MARYLAND

76°36'0"W 76°34'0"W 76°32'0"W

38°48'0"N

38°46'0"N

Deale

Herring Bay

Fairhaven

Chesapeake

Bay

38°44'0"N

76°36'0"W 76°34'0"W 76°32'0"W

38°48'0"N

38°46'0"N

38°44'0"N

Overview

MD

MD0703B

GC10692