

# **NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT**

## ***PROJECT MD0703A***

### ***Cambridge Harbor, Maryland***

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project MD0703A provides a highly accurate database of new digital shoreline data for a portion of the Choptank River extending from Great Marsh Point eastward towards Hurst Creek, and includes the area of Cambridge Harbor, MD. Project MD0703A is a sub-project of the larger project, MD0703, which also includes shoreline data in the area of northern Herring Bay and Herrington Harbor North. 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 January 2008. 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 March 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 the Multi-Sensor Triangulation (MST) module within BAE Systems SOCET SET (version 5.3) photogrammetric 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 March 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 MD0703A 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 the aerotriangulation statistics.

The following table provides information on the imagery used to complete this project:

Date	Time (UTC)	Roll ID	Photo Numbers	GSD	Tide Level*
02-09-07	17:22-17:30	07QC01	42-61	0.36 m	0.0 m

\* Tide levels are given in meters above MLLW and are based on actual observations recorded by the NOS reference station at Cambridge, MD at the time of photography. The elevation of the MHW tidal datum at Cambridge is equal to 0.5 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 June 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 with 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, 1:40,000, 29<sup>th</sup> ed.

12268, Choptank River, Cambridge to Greensboro, 1:40,000, 11<sup>th</sup> ed.

### **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 GC10699 file contents, attached to PCR

#### **Remote Sensing Division Electronic Data Library**

- Project database
- GC10699 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- Chart Evaluation File in shapefile format

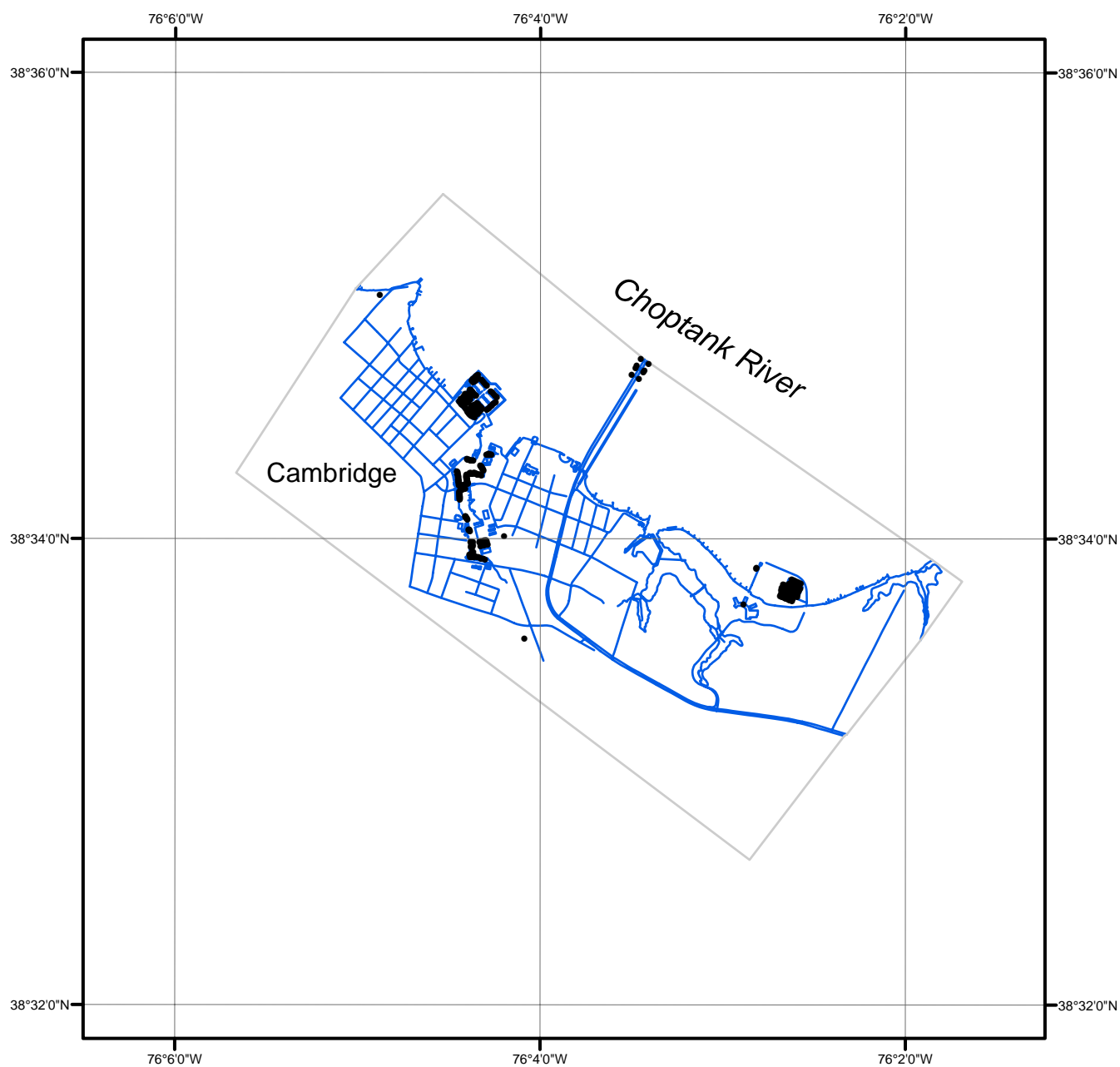
#### **NOAA Shoreline Data Explorer**

- GC10699 in shapefile format
- Metadata file for GC10699
- Digital copy of the PCR in Adobe PDF format

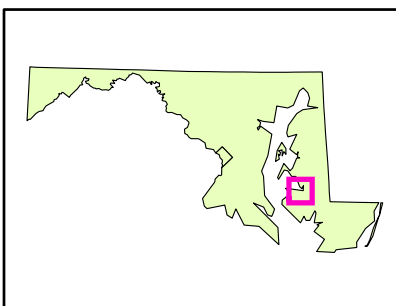
### **End of Report**

# CAMBRIDGE HARBOR

## MARYLAND



Overview



MD0703A

GC10699