

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

## ***PROJECT MD1802-CS-N***

### ***Port of Annapolis, Maryland***

#### **Introduction**

Coastal Mapping Program (CMP) Project MD1802-CS-N provides highly accurate digital shoreline data for key areas of change in the port of Annapolis, 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 design of Project MD1802-CS-N was accomplished by the Requirements Branch (RB) of the Remote Sensing Division (RSD) in response to the need for timely updates to the NOAA chart suite within key U.S. ports. Project requirements were initially formulated as a result of analysis conducted within the Coast and Shoreline Change Analysis Program (CSCAP), in which NOAA nautical chart products are compared to contemporary high resolution imagery in order to ascertain the need for more current shoreline data. Aerial photography was utilized for the CSCAP analysis. A Chart Evaluation File (CEF) was forwarded to the Applications Branch (AB) of RSD once the change analysis was complete. Refer to the CSCAP memorandum of February 22, 2019 for details of the chart comparison process.

#### **Field Operations**

Field operations 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. Aerial survey operations were conducted on November 11, 2018 with the NOAA King Air aircraft. Two strips of digital RGB (color) images were acquired with an Applanix DSS-580 medium format digital camera at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.32 m. Near-infrared (NIR) images were also acquired concurrently but were not used. Although imagery was not acquired in strict coordination with local tides, the goal was to collect all imagery below Mean High Water (MHW).

#### **GPS Data Reduction**

GPS and IMU data was collected and processed to yield precise positions and orientations of camera centers for use in the aerotriangulation phase. The airborne kinematic data were collected using an Applanix POS/AV510 GPS/IMU System. This data was processed in November 2018 using POSpac (ver. 8.2) software. For further information refer to the Airborne Positioning and Orientation Report (APOR) that is on file with other project data within the RSD Electronic Data Library.

#### **Aerotriangulation**

Routine softcopy aerotriangulation methods were applied to establish the 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 AB personnel in March 2019. The aerial images were measured and adjusted as one block using BAE Systems' Multi-Sensor Triangulation (MST) module within SOCET SET (ver. 5.6) 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 0.64 meters for the block based on a 95% confidence level. An Aerotriangulation Report was written and is on file with other project data within the RSD Electronic Data Library. Positional data is referenced to the North American Datum of 1983 (NAD 83).

## Compilation

The data compilation phase of this project was accomplished by AB personnel in April 2019. Digital mapping was performed using the SOCET SET Feature Extraction software module. Feature identification and attribution within the GC were based on image analysis of the digital photographs and information extracted from the appropriate NOAA nautical charts, U.S. 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 MD1802-CS-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.3 meters at the 95% confidence level. This predicted accuracy of compiled, well-defined points is derived by doubling the circular error value computed from the aerotriangulation statistics.

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

Date	Time (UTC)	Roll Number	Strip / Photo Numbers	Tide Level*
11/11/2018	16:15 – 16:17	18VC77	64-001 / 21175 – 21181	0.0 m
11/11/2018	16:22 – 16:24	18VC77	64-002 / 21182 - 21192	0.0 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 various NOS gauges in the vicinity of the project. The elevation of the MHW tidal datum in the project area is 0.36 meters above MLLW.

## Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of RSD. The final QC review was completed in May 2019. The review process included analysis of the 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 (ver. 10.6.1) software. The entire suite of project products was evaluated for compliance to CMP requirements.

## **End Products and Deliverables**

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

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

- CSCAP Evaluation Memorandum
- Airborne Positioning and Orientation Report (APOR)
- Aerotriangulation Report
- Project database
- Project Completion Report (PCR)
- GC11478 in shapefile format
- CEF in shapefile format

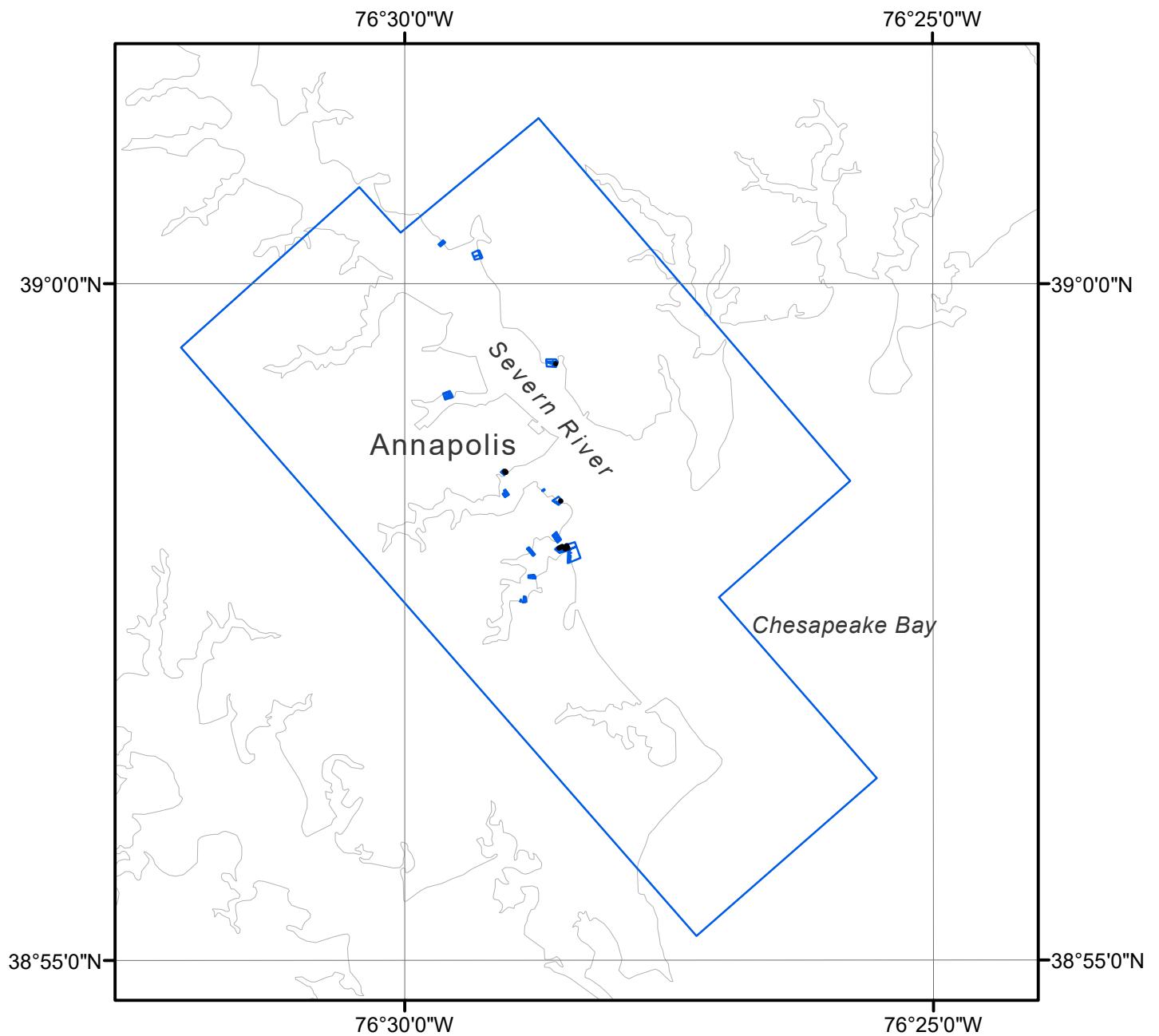
### **NOAA Shoreline Data Explorer**

- GC11478 in shapefile format
- Metadata file for GC11478
- PCR in Adobe (PDF) format

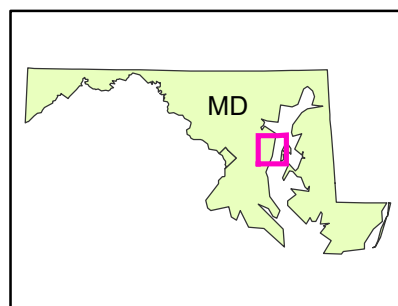
## **End of Report**

# PORT OF ANNAPOLIS

## MARYLAND



Overview



MD1802-CS-N

GC11478