

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

## ***PROJECT SC1502B-CS-N***

### ***Port of Charleston, South Carolina***

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project SC1502B-CS-N provides highly accurate shoreline data for the Port of Charleston, South 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 SC1502B-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 Electronic Navigational Chart (ENC) series. 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 RB CSCAP memorandum of December 23, 2015 for details of the chart comparison process.

#### **Field Operations**

The field operations consisted of the collection of static and kinematic GPS data and Inertial Measurement Unit (IMU) data and the acquisition of digital aerial imagery. The photographic mission operations were conducted on October 23, 2015 with the NOAA King Air (N68RF) aircraft. Seven flight lines of natural color (RGB) and near-infrared (NIR) imagery were acquired concurrently using an Applanix DSS 580/560 dual-head digital camera system. All imagery was acquired at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.32 meters for the RGB images. The NIR images were not used for this project. Although imagery was not acquired in strict coordination with local tides, the goal was to collect all imagery below the Mean High Water (MHW) tide stage.

#### **GPS Data Reduction**

The GPS/IMU data were processed by RSD personnel to yield precise camera positions in order to provide a control network necessary for aerotriangulation. 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 November 5, 2015 using POSPac MMS 7.1 GPS/IMU software. For further information refer to the Airborne Positioning and Orientation Report (APOR) on file with other project data within the RSD Project Archive.

## Aerotriangulation

Routine softcopy aerotriangulation (AT) 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 performed by RSD personnel in February 2016 utilizing SOCET GXP (version 4.1.0) software on a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components, and other associated peripheral devices. The color images were measured and adjusted as a single block using the Triangulation module of SOCET GXP. Upon successful completion of this process the Triangulation module provided the standard deviations for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.3 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. Positional data is referenced to the North American Datum of 1983 (NAD83).

## Compilation

The data compilation phase of this project was accomplished by a member of the Applications Branch (AB) of RSD in June 2016. Digital mapping was performed using the Feature Extraction software module within SOCET SET (ver. 5.6). Feature identification and attribution within the GC were based on analysis of the aerial imagery and information extracted from the largest scale NOAA nautical chart. 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 SC1502B-CS-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 0.6 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points is derived by doubling the circular error calculated from the aerotriangulation statistics. The following table provides information on the imagery used to complete this project:

Date	Time (UTC)	Roll #	Photo #s	Tide Level*
10/23/2015	13:42 – 13:45	15VC17	02481 – 02500	0.3 m
10/23/2015	13:50 – 13:53	15VC17	02501 – 02526	0.3 m
10/23/2015	13:58 – 14:03	15VC17	02527 – 02558	0.3 m
10/23/2015	14:08 – 14:13	15VC17	02559 – 02595	0.3 – 0.2 m
10/23/2015	14:19 – 14:25	15VC17	02596 – 02635	0.2 – 0.3 m
10/23/2015	14:29 – 14:35	15VC17	02636 – 02675	0.3 – 0.2 m

\* Tide levels are given in meters above MLLW based on verified water levels at the Charleston reference station. The height of the MHW tidal datum in the project area varies between 1.61 – 1.64 meters above MLLW.

## **Quality Control / Final Review**

The final review of the project was completed by a senior member of RSD in July 2016, and included analysis of AT results and assessment of the identification and attribution of digital feature data within the Geographic Cell (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 10.3.1 software. All project data was evaluated for compliance to CMP requirements.

## **End Products and Deliverables**

The following specifies the location and identification of the 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
- GC11198 in shapefile format
- Project Completion Report (PCR)
- Chart Evaluation File (CEF) in shapefile format

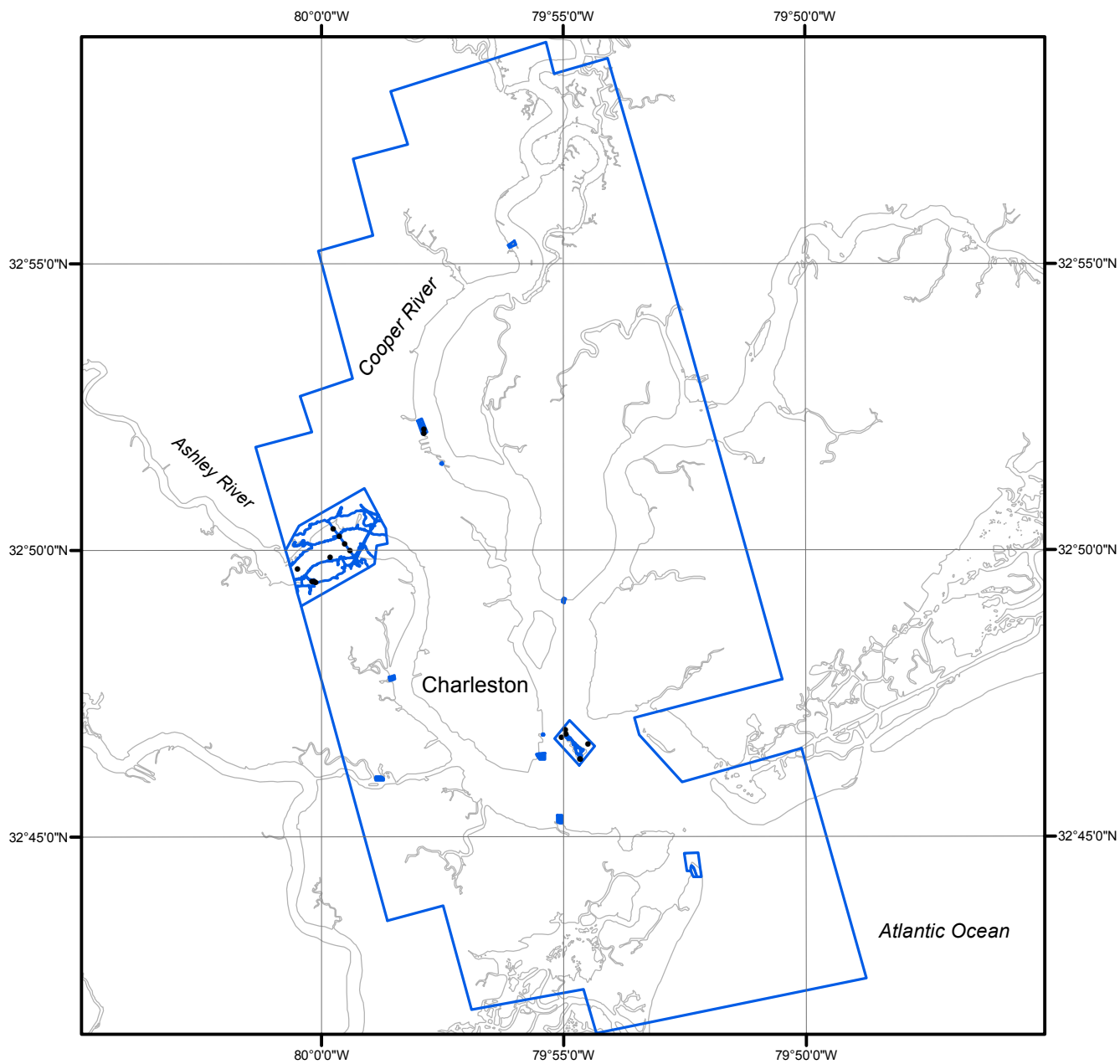
### **NOAA Shoreline Data Explorer**

- GC11198 in shapefile format
- Metadata file for GC11198
- Digital copy of the PCR

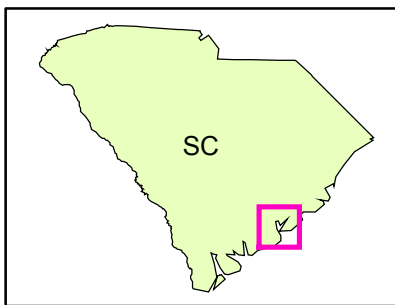
## **End of Report**

# PORT OF CHARLESTON

## SOUTH CAROLINA



Overview



SC1502B-CS-N

GC11198