

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

## ***PROJECT NY1007***

### ***East Long Island, Peconic Bays to Montauk***

#### **Introduction**

Coastal Mapping Program (CMP) Project NY1007 provides highly accurate digital shoreline data for the eastern portion of Long Island, New York, from the Peconic Bays to Montauk, including East Hampton, Gardiner Island, Sag Harbor and Shinnecock Canal. The Geographic Cell (GC) may be used in support of the NOAA Nautical Charting Program (NCP) as well as geographic information systems (GIS) for 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. The instructions discussed the project's purpose, geographic area of coverage, scope and priority, image 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.

After field operations were completed, a gap was discovered in the planning of photo coverage south of Gardiners Island (at approximately 41° 02' N, 72° 06' W). To fill this gap, satellite imagery from a commercial vendor (DigitalGlobe, Inc.) was downloaded from National Geospatial-Intelligence Agency's (NGA) Web-based Access and Retrieval Portal (WARP). One panchromatic WorldView-1 image with a ground sample distance (GSD) of 0.50 meters, acquired on 8/14/2010, was obtained. The vendor's stated accuracy of this imagery is 5.0 meters circular error at the 90% confidence level (CE90).

#### **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 aerial imagery. A local GPS base station was established for use as a reference station in kinematic GPS processing operations. Aerial survey operations were conducted on three (3) separate days (6/15/11, 9/19/11 and 10/5/11), with the NOAA King Air aircraft, and consist of 518 natural color images within eleven flight lines. The data were acquired using an Applanix Digital Sensor System (DSS-439, Dual Cam) camera at a flying height of 10,000 feet for an approximate GSD of 0.35 meters. Acquisition of this data was not coordinated with local tides. An Acquisition Summary Report was written and is on file within the RSD Project Archive.

## **GPS Data Reduction**

GPS and IMU data were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing of the imagery, and to provide a control network necessary for aerotriangulation. The position of the GPS base station was determined using the NGS Online Processing User Service (OPUS) software, which computed fixed baseline solutions from nearby CORS stations. The airborne kinematic data was originally processed using Applanix POSPAC (ver. 5.4) software between July and November 2011, but during the aerotriangulation process an offset was discovered, and the data was reprocessed in April 2012. An Airborne Positioning and Orientation Report was written for each mission day, and is on file 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 initiated by RSD personnel in February 2012, utilizing a Digital Photogrammetric Workstation (DPW). The digital images were measured and adjusted as a single block using BAE Systems SOCET SET (version 5.5) photogrammetric suite in conjunction with the Multi-Sensor Triangulation (MST) AT module. Upon successful completion of the AT process, the MST software provided the standard deviations for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.57 meters based on a 95% confidence level. An AT 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, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is referenced to the North American Datum of 1983 (NAD83).

## **Compilation**

The digital compilation phase of this project was initiated by RSD in May 2012. Digital mapping was performed using a DPW in conjunction with the SOCET SET Feature Extraction software module. Feature identification and attribution within the GC were based on image analysis of the aerial 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 NY1007 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features extracted from aerial imagery were compiled to meet a horizontal accuracy of 1.1 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points is derived by doubling the circular error calculated from AT statistics. Cartographic features extracted from the WorldView-1 imagery were compiled to meet a horizontal accuracy of 5.7

meters at the 95% confidence level. This predicted accuracy of compiled data is derived by statistically converting the vendor's reported CE90 to a CE95 figure.

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

Date	Time (UTC)	Roll #	Line #	Photo #s	GSD	Tide Level*
6/15/2011	21:04 – 21:12	11NC37	50-011	06898 – 06957	0.35 m	0.5 – 1.0
6/15/2011	21:17 – 21:26	11NC37	50-010	06958 – 07019	0.35 m	1.0-0.4-0.8
6/15/2011	21:30 – 21:35	11NC37	50-008	07020 – 07055	0.35 m	0.7 – 0.4
6/15/2011	21:40 – 21:45	11NC37	50-009	07056 – 07092	0.35 m	0.5 – 0.9
6/15/2011	21:52 – 21:57	11NC37	50-007	07093 – 07125	0.35 m	0.5
9/19/2011	13:29 – 13:34	11NC64	50-006	21493 – 21530	0.35 m	0.4
10/5/2011	14:52 – 15:00	11NC68	50-001	21758 – 21809	0.35 m	0.4 – 0.6
10/5/2011	15:05 – 15:13	11NC68	50-002	21810 – 21869	0.35 m	0.6 – 0.4
10/5/2011	15:32 – 15:38	11NC68	50-004	21923 – 21966	0.35 m	0.5 – 0.4
10/5/2011	15:43 – 15:50	11NC68	50-005	21967 – 22009	0.35 m	0.4 – 0.5
10/5/2011	15:55 – 16:03	11NC68	50-003	22010 – 22062	0.35 m	0.5 – 0.4
8/14/2010	15:54	10aug14155416-p1bs-052618948010			0.50 m	0.8

\* Tide levels given in meters above MLLW. For most of the photos the tides were calculated using the Pydro software tool with a TCARI grid referenced to verified water level observations at NOS gauges. For those photos that were not covered by the grid the tide levels were calculated from verified observations at the Sandy Hook and New London reference stations, with offsets applied to several substations in the project area. The height of the MHW tidal datum in the project area varies between 0.66 - 1.0 meters above MLLW.

## Final Review

The final review of the project was completed by a senior member of RSD in May 2012, and included analysis of the AT 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 source imagery and compiled project data resulted in creation of the Chart Evaluation File (CEF). The following nautical charts were used in the comparison process:

- 12354 - Long Island Sound Eastern part, 1:80,000 scale, 43<sup>rd</sup> Ed., Sep./10
- 12358 - Long Island, Shelter I. Sound & Peconic Bays, 1:40,000 scale, 21<sup>st</sup> Ed., Jul./11
- 13209 - Block Island Sound & Gardiners Bay, 1:40,000 scale, 26<sup>th</sup> Ed., Aug./11
- 13212 - Approaches to New London Harbor, 1:20,000 scale, 39<sup>th</sup> Ed., Jun./10

## **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 Acquisition Summary
- Hardcopy of the Airborne Positioning and Orientation Reports (APOR)
- Hardcopy of the Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC10939 file contents, attached to PCR

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

- Project database
- GC10939 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

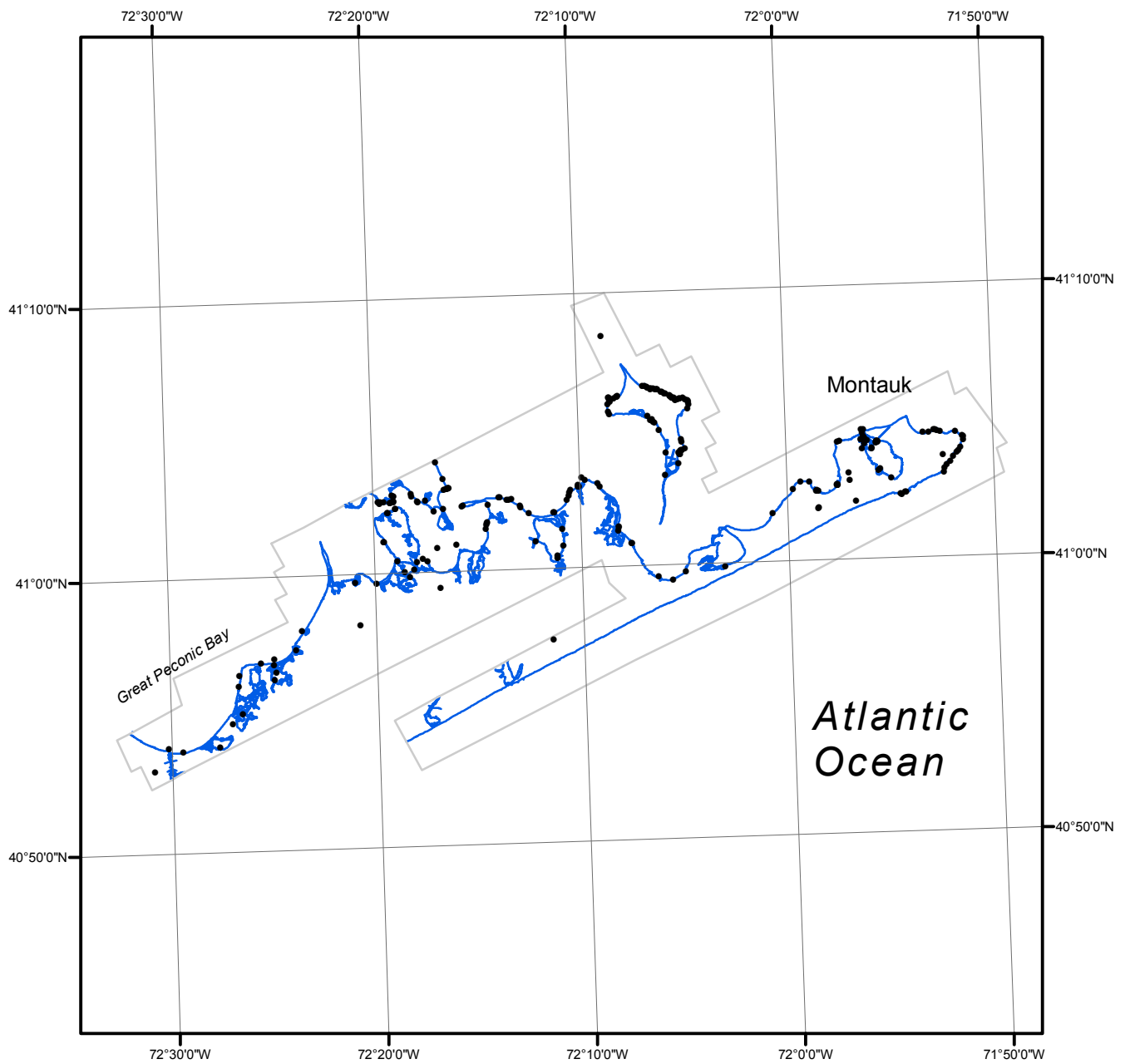
### **NOAA Shoreline Data Explorer**

- GC10939 in shapefile format
- Metadata file for GC10939
- Digital copy of the PCR in Adobe PDF format

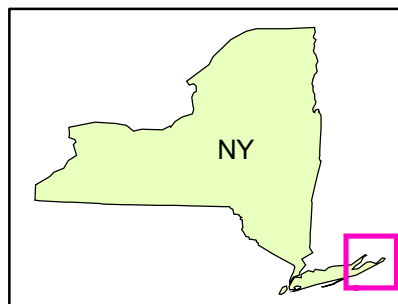
## **End of Report**

# EAST LONG ISLAND, PECONIC BAYS TO MONTAUK

## NEW YORK



Overview



NY1007

GC10939