NOAA COASTAL MAPPING PROGRAM
PROJECT COMPLETION REPORT

PROJECT MA0802

Madaket Harbor, Massachusetts

Introduction

NOAA Coastal Mapping Program (CMP) Project MA0802 provides a highly accurate database of new digital shoreline data for the western tip of Nantucket Island, including Madaket Harbor and Tuckernuck Island, Massachusetts. 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. 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

The field operations consisted of the collection of static and kinematic GPS data and the acquisition of digital aerial imagery. Aerial survey operations were conducted with the NOAA Cessna Citation II (N52RF) aircraft on May 11 and August 22, 2008. The two planned flight lines were each flown twice in coordination with both Mean High Water (MHW) and Mean Lower Low Water (MLLW) tide stages. In each flight both natural color and black & white infrared imagery were collected concurrently using an Applanix DSS-439 dual-head camera system, resulting in eight strips of imagery (116 images). All imagery was acquired at a nominal altitude of 10,000 feet, resulting in an approximate ground sample distance (GSD) of 0.35 meters. Of the eight strips acquired, six were used for this project. The two strips of color images collected at MHW were not used.

GPS Data Reduction

GPS/IMU data was collected and processed by RSD personnel to yield precise positions and orientations of camera centers for application as photogrammetric control in the aerotriangulation phase of project completion. 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 in February 2011 using POSPAC ver. 5.3. For further

information refer to the Airborne Positioning and Orientation Reports (APOR) that are on file with other project data within the RSD Applications Branch (AB) Project Archive.

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 completed by RSD personnel in April 2012 utilizing a softcopy photogrammetric workstation. The color and IR images were measured and adjusted as a single block using BAE Systems' SOCET SET (ver. 5.6) photogrammetric software in conjunction with the Multi-Sensor Triangulation (MST) module and BINGO (ver. 5.6). Upon successful completion of the aerotriangulation process, the BINGO 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 0.4 meters based on a 95% confidence level. An Aerotriangulation Report was written to provide detailed information on this phase of project completion, and is on file with other project data within the AB 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 the project was initiated by RSD personnel in April 2012. The work was accomplished using a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components and other associated peripheral devices. The Feature Extraction module was used within BAE Systems' SOCET SET (version 5.6) photogrammetric software. Feature identification and the assignment of cartographic codes were based on image analysis of the project digital images 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). Selected features were further modified with additional descriptive information to refine general classification.

Spatial data accuracies for Project MA0802 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 0.8 meters at the 95% confidence level. This predicted accuracy of well-defined points is based on a doubling of the circular error derived from aerotriangulation statistics.

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

Date	Time (UTC)	Roll #	Photo #s	GSD	Tide Level*
5-11-08	19:12 - 19:14	08NR33	15143 - 15157	0.35 m	0.7 - 0.8
5-11-08	19:17 - 19:20	08NR33	15158 - 15171	0.35 m	0.8
8-22-08	13:33 - 13:35	08NC38	7906 - 7920	0.35 m	0.1
8-22-08	13:33 - 13:35	08NR13	2883 - 2897	0.35 m	0.1
8-22-08	13:41 - 13:43	08NC38	7921 - 7934	0.35 m	0.1
8-22-08	13:41 - 13:43	08NR13	2898 - 2911	0.35 m	0.1

* Tide levels given in meters above MLLW and were calculated using the Pydro software tool with a TCARI grid referenced to verified water level observations at NOS gauges. The height of the MHW tidal datum in the project area varies between 0.68 - 0.86 meters above MLLW.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of AB. The final QC review was completed in April 2012. The review process included analysis of 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 9.3.1 software. All project data was evaluated for compliance to CMP requirements.

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

13241, Nantucket Island, MA, 1:40,000 scale, 16th edition

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 GC10869 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC10869 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- Chart Evaluation File in shapefile format

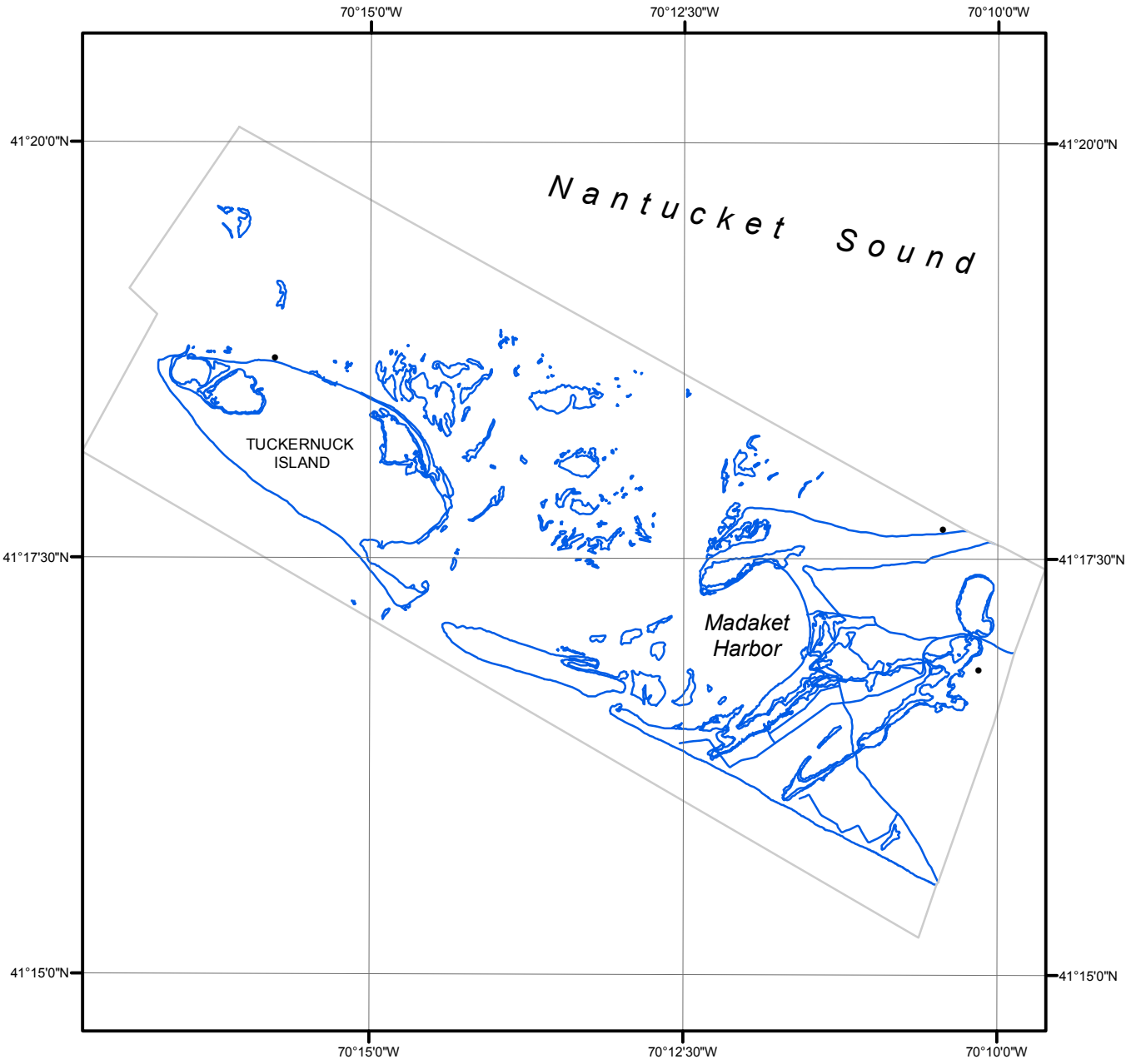
NOAA Shoreline Data Explorer

- GC10869 in shapefile format
- Metadata file for GC10869
- Digital copy of the PCR in Adobe PDF format

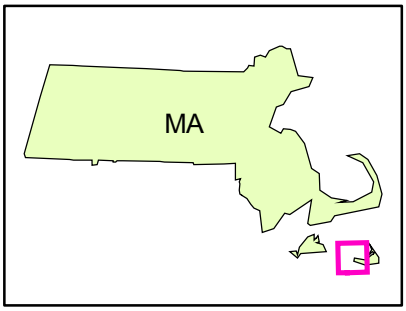
End of Report

MADAKET HARBOR

MASSACHUSSETTS



Overview



MA0802

GC10869