NOAA COASTAL MAPPING PROGRAM
PROJECT COMPLETION REPORT

PROJECT MI1802-CS-N

Port of Escanaba, Michigan

Introduction

NOAA Coastal Mapping Program (CMP) Project MI1802-CS-N provides highly accurate digital shoreline data for key areas of change within the Port of Escanaba, Michigan. 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 MI1802-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 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 digital imagery in order to ascertain the need for more current shoreline data. 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 August 16, 2018 for details of the chart comparison process.

Field Operations

The 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. Project imagery consisted of two strips of color digital images, acquired with the NOAA King Air aircraft on May 13, 2018 using an Applanix Digital Sensor System (DSS) aerial camera at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.33 meters. Near-infrared (NIR) images were also acquired concurrently with the color images but were not used for this project.

GPS Data Processing

The GPS/IMU data were processed by RSD personnel to yield precise camera positions in order to provide a control network necessary for aerotriangulation (AT). The base station's geodetic position was derived using the NGS Online Processing User Service (OPUS), which computed fixed baseline solutions from nearby CORS stations. The kinematic GPS data was processed using Applanix POSPac MMS (ver. 8.2) software in August 2018. For further information refer to the Airborne Positioning and Orientation Report (APOR) on file with other project data within the RSD Electronic Data Library.

Aerotriangulation

The AT phase of project completion was performed by a member of RSD in August 2018. Routine softcopy 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. The digital images were measured and adjusted as a single block using the Multi-Sensor Triangulation module of BAE Systems SOCET SET (ver. 5.6) software on a Windows based photogrammetric workstation. Upon successful completion of this process, the triangulation software provided the standard deviations for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.56 meters based on a 95% confidence level. An AT 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 (NAD83).

Compilation

The data compilation phase of this project was accomplished by a member of AB in August 2018. Digital feature data was compiled using SOCET SET software. 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 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 MI1802-CS-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.1 meter at the 95% confidence level. This predicted accuracy of compiled well-defined points is derived by doubling the circular error calculated from the AT statistics.

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

Date	Time (UTC)	Roll #	Strip/Photo #s	Lake Level*
05-13-2018	14:00 – 14:03	18VC34	5664-001/8485 - 8499	177.0 m
05-13-2018	14:08 – 14:11	18VC34	5664-002/8503 - 8517	177.0 m

* Lake water levels are given in meters above IGLD 1985 and are based on verified observations at the Menominee station in Michigan. The Low Water Datum (LWD) for Lake Michigan is 176.0 meters above IGLD 1985.

Quality Control / Final Review

The final review of the project was completed by a senior member of RSD in August 2018, 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 (ver. 10.5) software. All project data 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)
- Project database
- Aerotriangulation Report
- Project Completion Report (PCR)
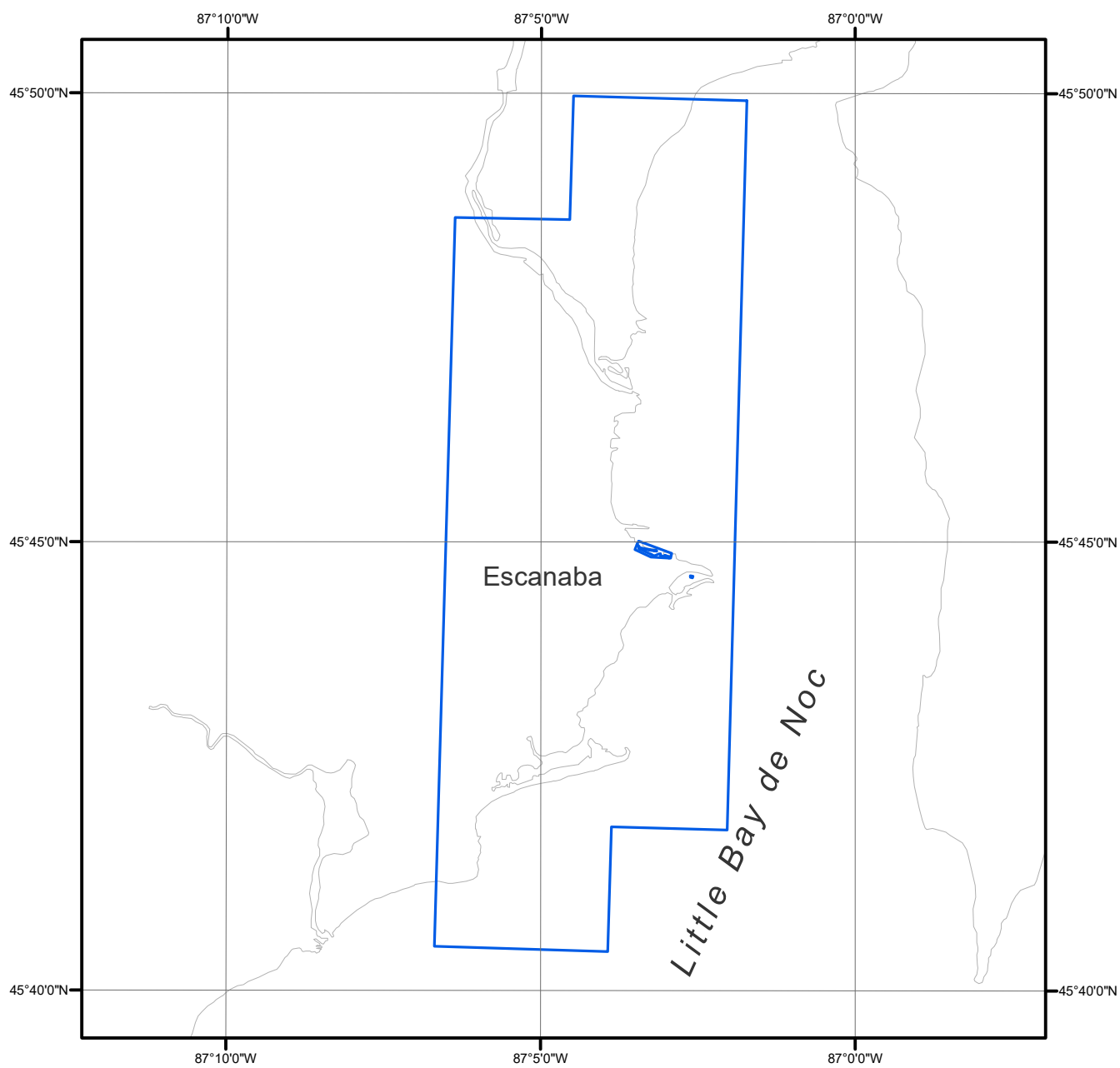- GC11439 in shapefile format
- CEF in shapefile format

NOAA Shoreline Data Explorer

- GC11439 in shapefile format
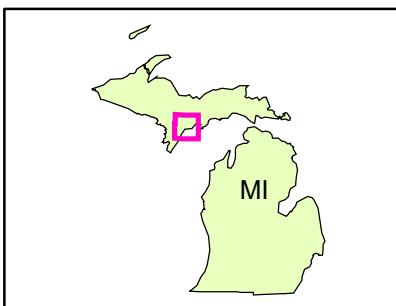- Metadata file for GC11439
- PCR in Adobe PDF format

End of Report

PORT OF ESCANABA

MICHIGAN

87°10'0"W 87°5'0"W 87°0'0"W

45°50'0"N

45°45'0"N

Escanaba

Little Bay de Noc

45°40'0"N

Overview

MI1802-CS-N

MI

GC11439