

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT ME1502C-CM-N

Sheepscot and Damariscotta Rivers, Maine

Introduction

NOAA Coastal Mapping Program (CMP) Project ME1502C-CM-N provides a highly accurate database of new digital shoreline data for the Sheepscot and Damariscotta Rivers, in Maine. Project ME1502C-CM-N is a subproject of a larger project ME1502-CM-N, which includes coverage of the Androscoggin, New Meadows, Kennebec, Sheepscot and Damariscotta Rivers. 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 instructions for the aerial photographic mission for this project following the guidelines of the Photo Mission Standard Operating Procedure. The instructions discussed the project's purpose, geographic area of coverage, scope and priority; photographic requirements; 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 Inertial Measurement Unit (IMU) data, and the acquisition of digital aerial imagery. The photographic mission operations were conducted in July 2015 with the NOAA King Air (N68RF) aircraft. Project imagery included natural color (RGB) and near-infrared (NIR) imagery acquired concurrently using an Applanix DSS-580/560 dual head digital camera system in coordination with both MLLW and MHW tide levels.

Seventeen flight lines, consisting of 1,540 images, were acquired for ME1502-CM-N, with imagery from a subset of six flight lines used in the completion of subproject ME1502C-CM-N. All imagery was acquired at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.33 meters for the color imagery and 0.35 meters for NIR.

Direct Georeferencing Data Processing

GPS/IMU data for project ME1502-CM-N was processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of the imagery. 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 a nearby CORS station at Brunswick Executive Airport, in Brunswick, Maine. The airborne kinematic data was processed in July 2015 using POSpac MMS (ver. 7.1) software. For further information refer to the Airborne Positioning and Orientation Reports (APOR) on file with other project data within the RSD Electronic Data Library.

The processed GPS/IMU data were used to derive precise exterior orientation (EO) values of the camera centers required for digital feature extraction. The predicted horizontal accuracy of the imagery was determined by propagating sensor EO and image measurement uncertainties through the photogrammetric collinearity equations using the Exterior Orientation Total Propagated Uncertainty (EO-TPU) tool developed by NGS. Using this tool, the predicted horizontal uncertainty at the 95% confidence level was calculated to be 0.9 to 1.0 meters for all imagery used in the completion of ME1502C-CM-N.

NGS third order geodetic control points were used to test the horizontal integrity of the DG data. All stereo-models were examined and found to have acceptable levels of parallax for mapping purposes.

Compilation

The data compilation phase of this project was completed by a member of the RSD Applications Branch in October of 2019. Digital mapping was performed using the Feature Extraction software module within BAE's SOCET SET (ver. 5.6) photogrammetric software. Feature identification and attribution within the GC were based on image analysis of the aerial imagery and information extracted from the largest scale NOAA nautical chart 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 ME1502C-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.8 to 2.0 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points measured during the compilation phase was derived by doubling the horizontal uncertainty calculated from the EO-TPU tool.

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

Date	Time (UTC)	Strip	Color Imagery		NIR Imagery		Tide Level*
			Roll	Images	Roll	Images	
07/06/2015	11:58 – 12:02	64-014	15VC02	00112 – 00131	15VR02	00113 – 00132	-0.1 – 0.0
07/06/2015	12:09 – 12:14	64-015	15VC02	00136 – 00162	15VR02	00137 – 00163	-0.1
07/06/2015	12:20 – 12:23	64-012	15VC02	00163 – 00178	15VR02	00164 – 00179	-0.2
07/06/2015	12:31 – 12:35	64-017	15VC02	00191 – 00210	15VR02	00192 – 00211	-0.2
07/06/2015	14:21 – 14:25	64-016	15VC03	00227 – 00247	15VR03	00228 – 00248	0.0 – -0.1

07/06/2015	20:12 – 20:16	64-017	15VC04	00299 – 00318	15VR04	00300 – 00319	3.0 – 3.1
07/06/2015	20:20 – 20:24	64-014	15VC04	00319 – 00338	15VR04	00320 – 00339	3.1 – 2.9
07/06/2015	20:28 – 20:32	64-016	15VC04	00341 – 00361	15VR04	00342 – 00362	2.8 – 3.1
07/06/2015	20:37 – 20:38	64-013	15VC04	00367 – 00373	15VR04	00368 – 00374	2.9
07/06/2015	20:44 – 20:49	64-015	15VC04	00380 – 00406	15VR04	00381 – 00407	2.7 – 3.0
07/06/2015	20:54 – 20:57	64-012	15VC04	00407 – 00422	15VR04	00408 – 00423	2.9 – 2.8

* Tide levels are given in meters above MLLW and were calculated using Pydro software with a TCARI grid referenced to verified water level observations at the time of photography from NOS gauges in the vicinity of the project. The elevation of the MHW tidal datum in the project area ranges between 2.77 – 3.00 m. above MLLW.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a member of the Applications Branch. The final QC review was completed in December 2019. The review process included analysis of the DG 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. 10.8.1) desktop GIS 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:

- 13293, Damariscotta, Sheepscot and Kennebec Rivers, 36th Ed., Mar. 2016
- 13296, Boothbay Harbor to Bath - Kennebec River, 26th Ed., Jan. 2012

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

- Airborne Positioning and Orientation Reports (APORs)
- Project database
- GC11452 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

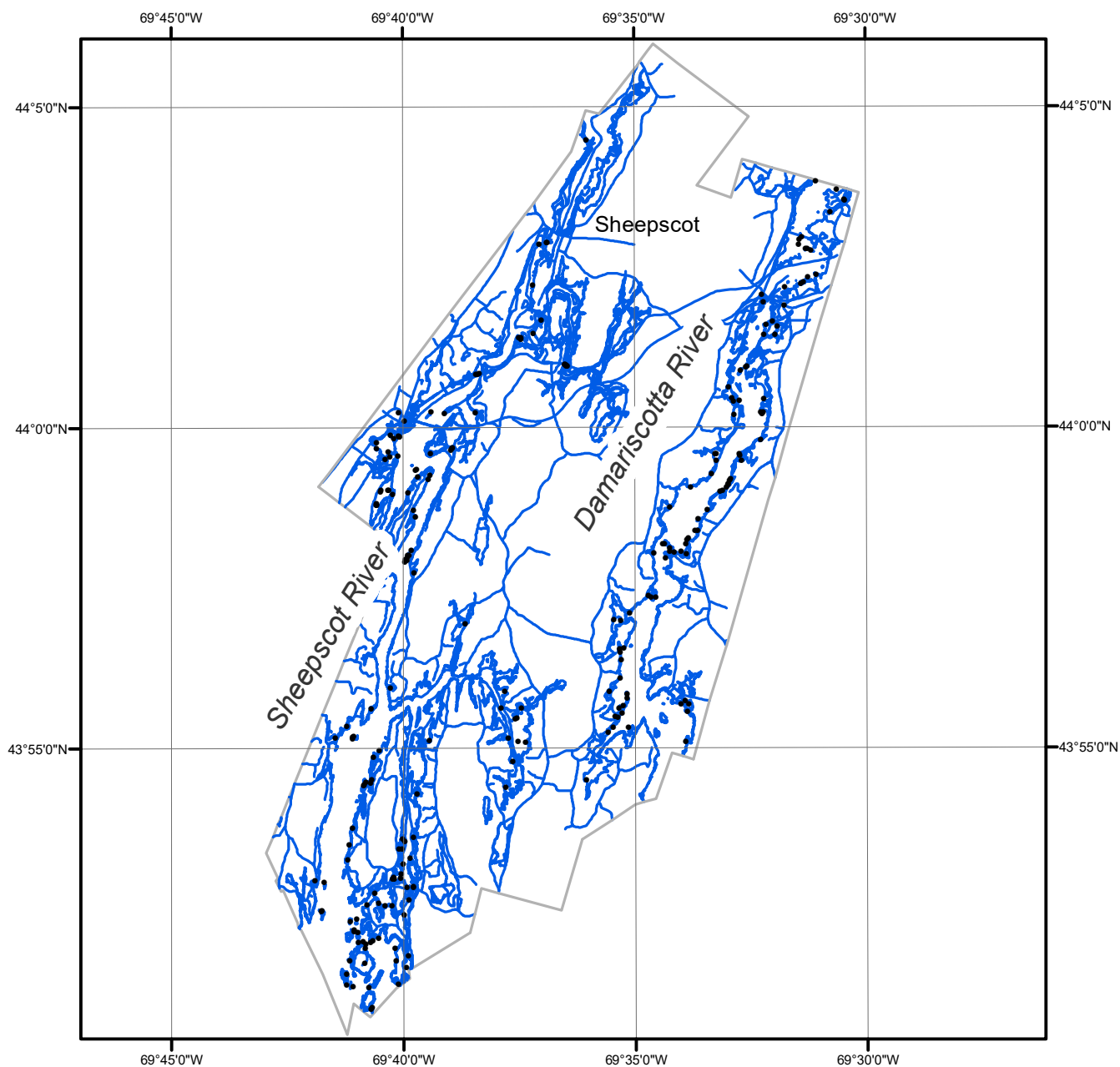
NOAA Shoreline Data Explorer

- GC11452 in shapefile format
- Metadata file for GC11452
- PCR in Adobe PDF format

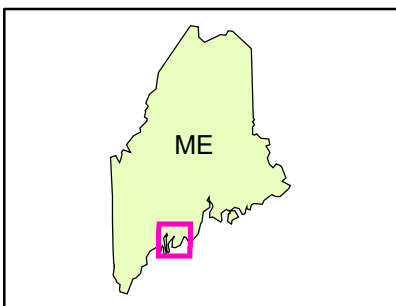
End of Report

SHEEPSCOT AND DAMARISCOTTA RIVERS

MAINE



Overview



ME1502C-CM-N

GC11452