

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT AK1702A-CM-N

Beaufort Sea, Thetis Island to Pingok Island, Alaska

Introduction

NOAA Coastal Mapping Program (CMP) Project AK1702A-CM-N provides accurate shoreline data for several islands off the north coast of Alaska, including Thetis Island, Spy Islands, and Pingok Island. AK1702A-CM-N is a subproject of a larger project, AK1702-CU-N, extending from Barrow to Demarcation Point, in Alaska. 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) originally designed Project AK1702-CU-N to support the Continually Updated Shoreline Product (CUSP), a seamless database of high resolution shoreline data. Subproject AK1702A-CM-N was later designed in response to a request for shoreline data to update NOAA's nautical chart suite.

During the planning stage of AK1702-CU-N, RB formulated photographic mission instructions, following the guidelines of the Photo Mission Standard Operating Procedures, which discussed the project's purpose, area of coverage, scope and priority, image requirements, Global Positioning System (GPS) data collection procedures and guidelines, instructions for data recording and handling, and mission communication protocols. RB also created flight maps and input files for the aircraft flight management system.

Field Operations

The field operations consisted of the collection of kinematic Global Positioning System (GPS) data and Inertial Measurement Unit (IMU) data and the acquisition of imagery. Project imagery for subproject AK1702A-CM-N included three flight lines of natural color imagery acquired with the NOAA King Air aircraft on July 19, 2017 using an Applanix Digital Sensor System (DSS) dual camera at a nominal altitude of 7,500 feet, resulting in an approximate ground sample distance (GSD) of 0.25 meters. Near-infrared (NIR) imagery was also acquired concurrently with the color imagery but was not used for this project. All imagery for AK1702-CU-N was acquired with no tide-coordination.

Direct Georeferencing Data Processing

The GPS/IMU data were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of the imagery. The kinematic GPS data was processed in October 2017 using Applanix POSPac MMS (ver. 8.0) software, utilizing the IN-Fusion PP-RTX processing mode, which is an implementation of Trimble's CenterPoint RTX GNSS correction service. For further information refer to the Airborne Positioning and

Orientation Report (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 for imagery used in this subproject was calculated to be 0.3 meters. Stereo models were examined and to ensure acceptable levels of parallax for mapping purposes. Positional data is referenced to the North American Datum of 1983 (NAD 83).

Compilation

The data compilation phase of this project was accomplished by a member of RSD in March 2018. Digital feature data was compiled using the Feature Extraction module of SOCET SET (ver. 5.6) photogrammetric 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.

A small island within the requested area was discovered to fall outside of the extent of aerial imagery coverage. Therefore delineation of this island was extracted from CUSP to undergo further processing and formatting for inclusion in the GC. The island was originally compiled in CUSP using WorldView-3 commercial satellite imagery from DigitalGlobe, Inc.

Spatial data accuracies for Project AK1702A-CM-N 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 0.6 meters at the 95% confidence level, a predicted accuracy derived by doubling the horizontal uncertainty calculated from the EO-TPU tool. Features extracted from satellite imagery were compiled to meet an accuracy of 18 meters at the 95% confidence level.

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

Aerial Imagery				
Date	Time (UTC)	Roll #	Strip / Photo #s	Tide Level*
07-19-2017	23:15 – 23:17	17VC36	45-041 / 08828 – 08840	0.4 m
07-19-2017	23:21 – 23:24	17VC36	45-040 / 08841 – 08858	0.4 m
07-19-2017	23:31 – 23:33	17VC36	45-039 / 08859 – 08879	0.4 m
Satellite Imagery				
Date	Time (GMT)	Image Catalog ID		Tide Level
06-02-2017	07:28	104001002D1CA900		0.2 m

* Tide levels are given in meters above MLLW and were calculated using the Pydro software tool with a TCARI grid referenced to verified water level observations at the time of photography from various NOS gauges in the vicinity of the project. The elevation of the MHW tidal datum in the project area varies between 0.17 – 0.18 meters above MLLW.

Quality Control / Final Review

The final review of the project was completed by a senior member of RSD in March 2018, and included analysis of the georeferencing results and assessment of the identification and attribution of 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. 10.5) 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 charts were used in the comparison process:

- 16062, Jones Islands and Approaches, 1:50,000 scale, 8th Ed., Jan. 2015
- 16063, Harrison Bay to Eastern Part, 1:50,000 scale, 8th Ed., Jan. 2015

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

- Airborne Positioning and Orientation Report (APOR)
- Project Completion Report (PCR)
- Project database
- GC11416 in shapefile format
- CEF in shapefile format

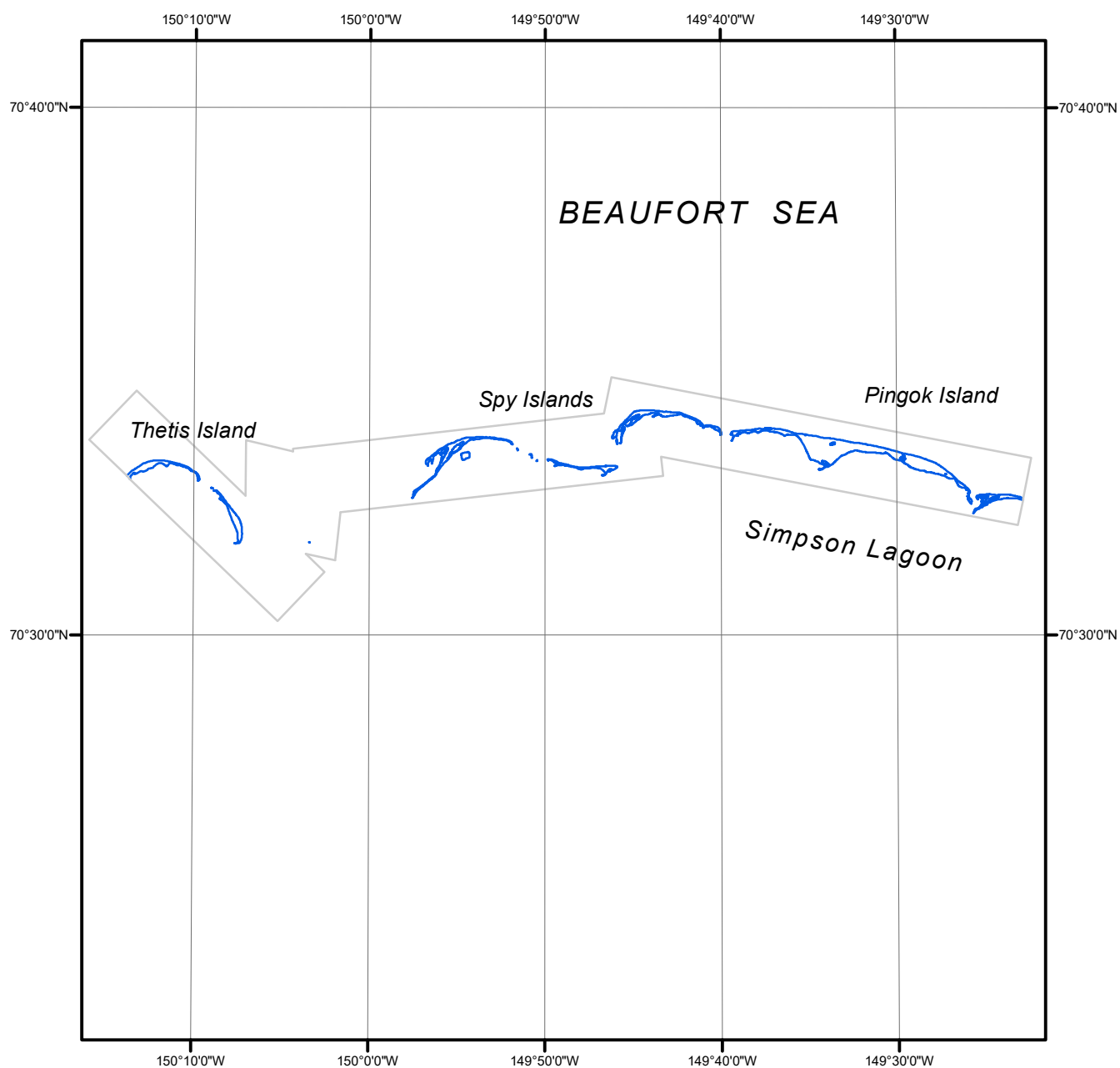
NOAA Shoreline Data Explorer

- GC11416 in shapefile format
- Metadata file for GC11416
- PCR in Adobe PDF format

End of Report

BEAUFORT SEA, THETIS ISLAND TO PINGOK ISLAND

ALASKA



Overview



AK1702A-CM-N

GC11416