

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

## ***PROJECT AK1610-CS-N***

### ***Port of Nikiski/Kenai, Alaska***

#### **Introduction**

Coastal Mapping Program (CMP) Project AK1610-CS-N provides highly accurate digital shoreline data for key areas of change within the Port of Nikiski/Kenai, 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 design of Project AK1610-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 imagery to ascertain the need for more current shoreline data. A Chart Evaluation File (CEF) was created and forwarded to the Applications Branch (AB) of RSD once a change analysis was completed. Refer to the RB CSCAP memorandum of August 22, 2016 for details of the chart comparison process.

#### **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. Aerial survey operations were conducted on May 22, 2016 with the NOAA King Air aircraft (N68RF). Project imagery included three (3) flight lines of natural color and near-infrared (NIR) imagery acquired concurrently using an Applanix DSS 580/560 dual lens camera. All imagery was acquired at a nominal altitude of 9,500 feet, resulting in an approximate ground sample distance (GSD) of 0.79 feet (0.24 meters). The NIR imagery was not used for this project. Although imagery was not acquired in strict coordination with local tides, the goal was to collect all imagery below Mean High Water (BMHW).

#### **GPS Data Reduction**

The GPS/IMU data were processed by RSD personnel to yield precise camera positions in order to provide a control network necessary for aerotriangulation. 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. 7.1) in July 2016. For further information refer to the Airborne Positioning and Orientation Reports (APOR) on file with other project data within the RSD Electronic Data Library.

## Aerotriangulation

Routine softcopy aerotriangulation 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 initially performed by RSD AB personnel in November 2016, but had to be redone in January 2017 after resolving a camera calibration issue. Aerotriangulation was accomplished utilizing a photogrammetric workstation with the SOCET SET (version 5.6) suite of photogrammetric software. The digital images were measured and adjusted as a single block using the Multi-Sensor Triangulation (MST) module of SOCET SET. Upon successful completion of this process, the triangulation software provided the standard deviations for each aerotriangulated ground point, which were used to compute predicted horizontal circular errors of 0.2 meters based on a 95% confidence level. An Aerotriangulation 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 initiated by RSD AB personnel in November 2016 utilizing the first aerotriangulation adjustment. After a camera calibration issue was discovered and resolved, and a second AT adjustment was performed, the compiled features were shifted and edited to match the new adjusted positions of the imagery.

Digital mapping was performed using the Feature Extraction software module of SOCET SET. 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.

Spatial data accuracies for project AK1610-CS-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet horizontal accuracies of 0.4 meters at the 95% confidence level. These predicted accuracies of well-defined points measured during the compilation phase were derived by doubling the circular error calculated from the final aerotriangulation statistics.

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

Date	Time (UTC)	Roll #	Strip / Photo #s	Tide Level*
5-22-2016	19:23 – 19:29	16VC62	45-002 / 14583 – 14620	+0.1 to -0.5 m
5-22-2016	19:33 – 19:38	16VC62	45-003 / 14621 – 14653	-0.5 to -0.2 m
5-22-2016	19:43 – 19:45	16VC62	45-001 / 14654 – 14672	-0.5 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 is 5.9 – 6.1 m. above MLLW.

## **Quality Control / Final Review**

The final review of the project was completed by a senior member of RSD in January 2017, and 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 10.3.1 software. All project data was evaluated for compliance to CMP requirements.

## **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**

- CSCAP evaluation memorandum
- Project database
- Project Completion Report (PCR)
- GC11285 in shapefile format
- Chart Evaluation File in shapefile format

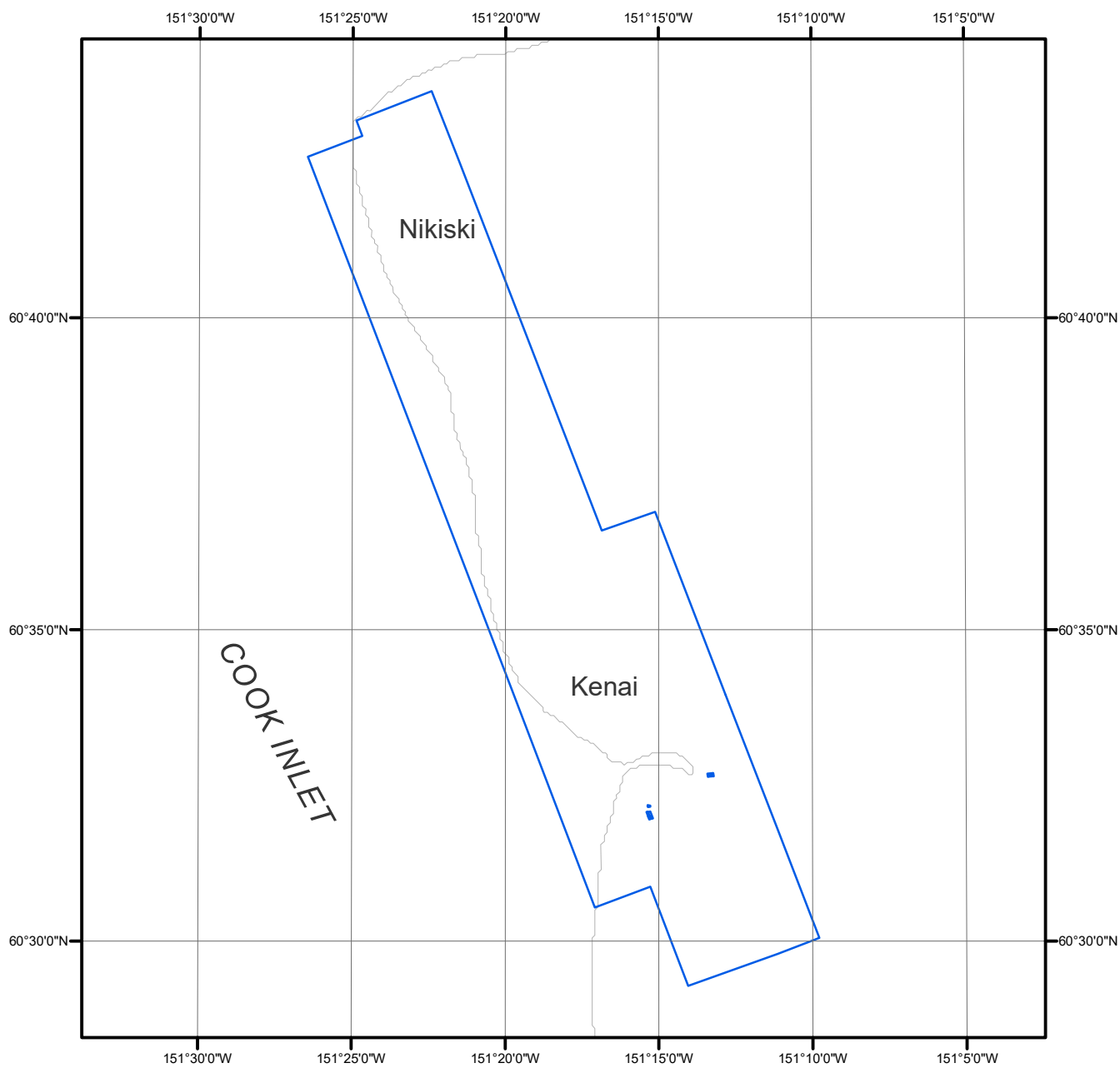
### **NOAA Shoreline Data Explorer**

- GC11285 in shapefile format
- Metadata file for GC11285
- Digital copy of the PCR

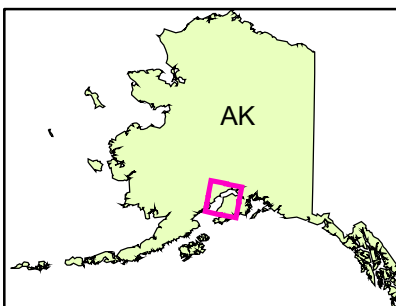
## **End of Report**

# PORT OF NIKISKI/KENAI

## ALASKA



Overview



AK1610-CS-N

GC11285