

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

## ***PROJECT CA1401-CS-N***

### ***Port of Humboldt/Eureka, California***

#### **Introduction**

Coastal Mapping Program (CMP) Project CA1401-CS-N provides highly accurate digital shoreline data for key areas of change in the port of Humboldt/Eureka, California. CA1401-CS-N 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 CA1401-CS-N was accomplished by the Requirements Branch (RB) of the Remote Sensing Division (RSD) in response to the need for updates to the NOAA Electronic Navigational Chart (ENC) series. 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 1, 2014 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. The photographic mission operation was conducted on June 13, 2014 with the NOAA King Air (N68RF) aircraft. Five strips of RGB (color) digital images were acquired with an Applanix Digital Sensor System (DSS-439) aerial camera at a nominal altitude of 10,000 feet, resulting in an approximate ground sample distance (GSD) of 0.35 meters. Although imagery was not acquired in strict coordination with local tides, the goal was to collect all imagery below Mean High Water (MHW).

#### **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 6.2 GPS/ IMU software on July 29, 2014. For further information refer to the Airborne Positioning and Orientation Reports (APOR) on file with other project data within the AB Project Archive.

## Aerotriangulation

Routine softcopy aerotriangulation methods were applied to establish a network of precise camera positions and orientations, and other model parameters required for digital compilation. This work was performed by RSD personnel in September 2014 utilizing a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components, and other associated peripheral devices. The digital images were measured and adjusted as a single block using the triangulation software module of BAE Systems SOCET GXP (v4.1.0) software. 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 0.3 meters based on a 95% confidence level. An Aerotriangulation Report was written and is on file with other project data within the RSD Project Archive. 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 RSD in October 2014. Digital feature data was compiled using SOCET SET (v5.6.0) software. 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 CA1401-CS-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 0.6 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points is derived by doubling the circular error calculated from the aerotriangulation statistics.

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

Date	Time (UTC)	Roll Number	Photo Numbers	GSD (nominal)	Tide Level*
13-JUN-2014	22:29 – 22:33	14NC54	11347 – 11379	0.35 m	1.4
13-JUN-2014	22:40 – 22:42	14NC54	11380 – 11393	0.35 m	1.7
13-JUN-2014	22:47 – 22:49	14NC54	11394 – 11406	0.35 m	1.6
13-JUN-2014	22:57 – 23:01	14NC54	11416 – 11439	0.35 m	1.3 – 1.7
13-JUN-2014	23:06 – 23:11	14NC54	11440 – 11472	0.35 m	1.6 – 1.3
13-JUN-2014	23:26 – 23:28	14NC54	11473 – 11482	0.35 m	1.2

\* Tide levels are given in meters above MLLW and are based on verified observations at the North Spit, CA reference gauge (Station ID: 9418767) at the time of photography, with time and height corrections applied to various sub-stations in the project area. The elevation of the MHW tidal datum in the project area varies between 1.8 – 2.1 meters above MLLW.

## **Quality Control / Final Review**

The final review of the project was completed by a senior member of RSD in October 2014 and included analysis of aerotriangulation 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 10.2.2 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:

### **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 GC11107 file contents, attached to PCR

### **Remote Sensing Division Electronic Data Library**

- Project database
- GC11107 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

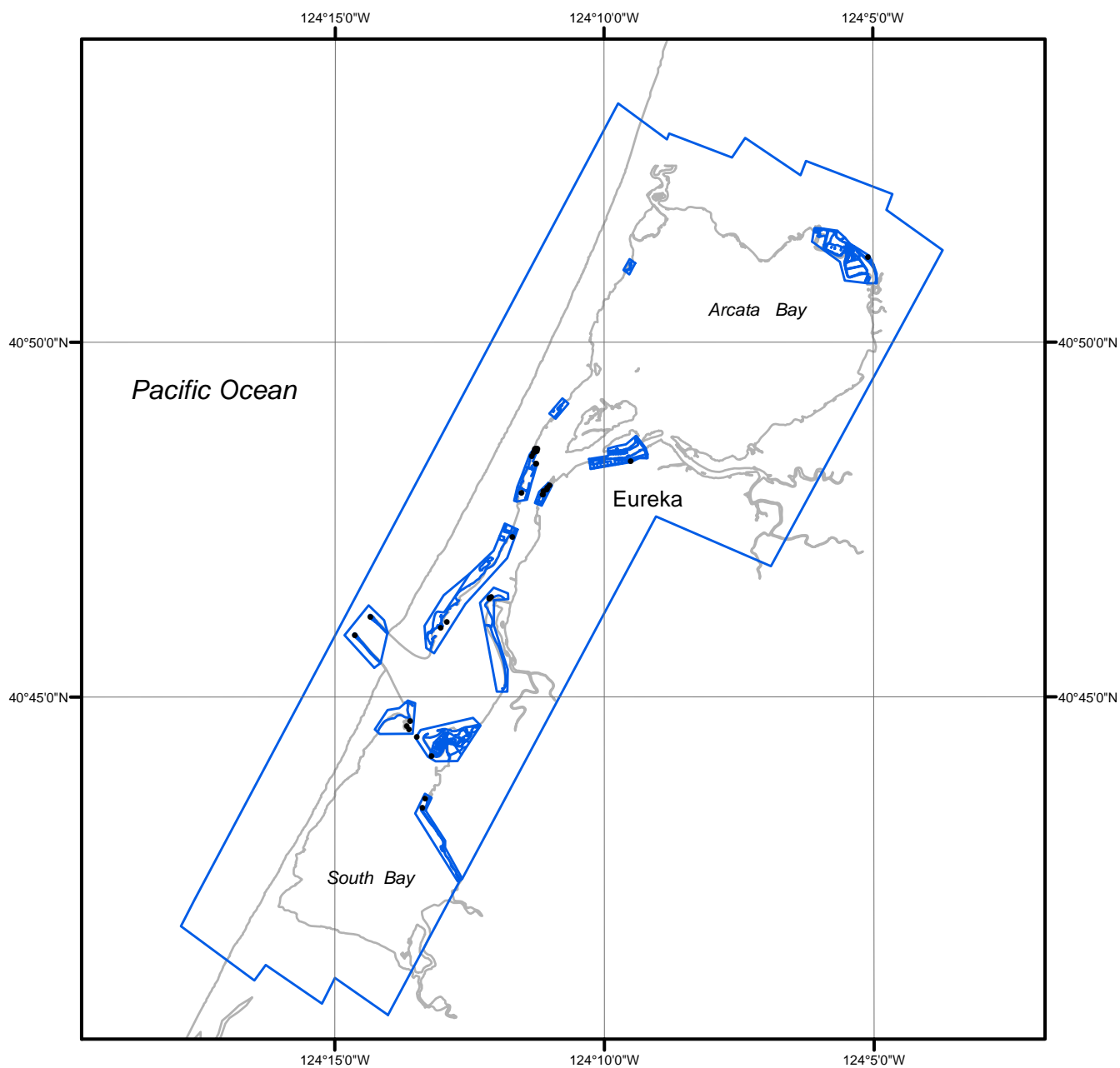
### **NOAA Shoreline Data Explorer**

- GC11107 in shapefile format
- Metadata file for GC11107
- Digital copy of the PCR in Adobe PDF format

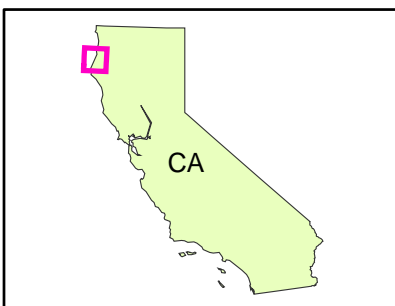
## **End of Report**

# PORT OF HUMBOLDT/EUREKA

## CALIFORNIA



Overview



CA1401-CS-N

GC11107