

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

## ***PROJECT CA1212A***

### ***Hammond Island Floodgates, Montezuma Slough, California***

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project CA1212A provides a highly accurate dataset of shoreline feature data including the Hammond Island floodgates on Montezuma Slough near Suisun Bay. Project CA1212A is a subproject of a larger project CA1212, which covers the western and northern portions of the San Francisco Bay from the Golden Gate to the Sacramento and San Joaquin 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**

Project CA1212A was designed in response to a request from the Marine Chart Division (MCD) of the Office of Coast Survey, NOAA. Photographic mission instructions for CA1212 were formulated by the Requirements Branch (RB) of the Remote Sensing Division (RSD) following the guidelines of RSD's Photo Mission Standard Operating Procedures. The instructions discussed the project's purpose, geographic 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 created a Project Layout Diagram, flight maps and input files for the aircraft flight management system.

#### **Field Operations**

Field operations for CA1212 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 April 18, 2013 through April 17, 2014 with the NOAA King Air aircraft (N68RF). All project imagery was acquired with an Applanix DSS-439 dual head digital camera system (two 60 mm lenses) in coordination with both MLLW and MHW tide levels. Fifty-four (54) flight lines of natural color and near-infrared (NIR) imagery were acquired concurrently for CA1212, although only four (4) individual color images were used in the completion of subproject CA1212A. All imagery was acquired at a nominal altitude of 10,000 feet, resulting in an approximate ground sample distance (GSD) of 0.35 meters.

#### **Direct Georeferencing Data Processing**

The GPS/IMU data for Project CA1212 were processed by RSD personnel to yield precise camera positions and orientations. GPS base stations were established for use as reference stations for kinematic GPS processing operations. The positions of the base stations were determined using the NGS Online Processing User Service (OPUS), which computed fixed baseline solutions from nearby CORS stations. The airborne kinematic data was processed using POSPac MMS 6.1 GPS/IMU software in May 2013 for the photographs used for CA1212A. For

further information refer to the Airborne Positioning and Orientation Report (APOR) for GPS day 1092013 on file with other project data within the RSD Applications Branch (AB) Project Archive.

For Project CA1212A, no aerial triangulation processing was conducted. Upon completion of the processing of GPS/IMU data, the processed data were used to derive precise exterior orientation (EO) values of the camera centers required for digital feature extraction. A predicted horizontal accuracy of the imagery was determined by propagating sensor EO and image measurement uncertainties through the photogrammetric collinearity equations using an Excel spreadsheet based 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 2.2 meters for the imagery subset used to compile data for CA1212A. Stereo-models were examined for parallax and found to be acceptable.

## Compilation

The data compilation phase of this project was accomplished by AB personnel in May 2014. Digital mapping was performed using the Feature Extraction software module within SOCET SET (ver. 5.6). 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 CA1212A were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 4.4 meters. This predicted accuracy of well-defined points measured during the compilation phase was derived by doubling the imagery accuracy computed from the EO-TPU tool.

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

Date	Time (UTC)	Roll #	Flight Line / Photo #s	Tide Level*
4/19/2013	21:53	13NC15	50-044 / 3424 – 3427 † (C10978823, C10978831, C10978839, C10978847)	0.0 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 1.2 m. above MLLW.

† Original DSS image IDs. Imagery not renamed to strip/frame designation at time of project execution.

## Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of RSD. The final QC review was completed in May 2014. 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 9.3.1 software. All project data was evaluated for compliance to CMP requirements.

A Chart Evaluation File (CEF) resulted from the comparison of source imagery and compiled project data with the largest scale NOAA nautical chart covering the project area:

18652, San Francisco Bay to Antioch (Small Craft), 1:40,000, 36<sup>th</sup> Ed., Feb./11  
18656, Suisun Bay, 1:40,000, 56<sup>th</sup> Ed., Aug./10

## **End Products and Deliverables**

The following specifies the location and identification of the products generated during the completion of this project:

### **RSD Applications Branch Archive**

- Hardcopy of the Data Acquisition Summary for CA1212
- Hardcopy of the APOR for data used in CA1212A
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC11088 file contents, attached to PCR

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

- Project database
- GC11088 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

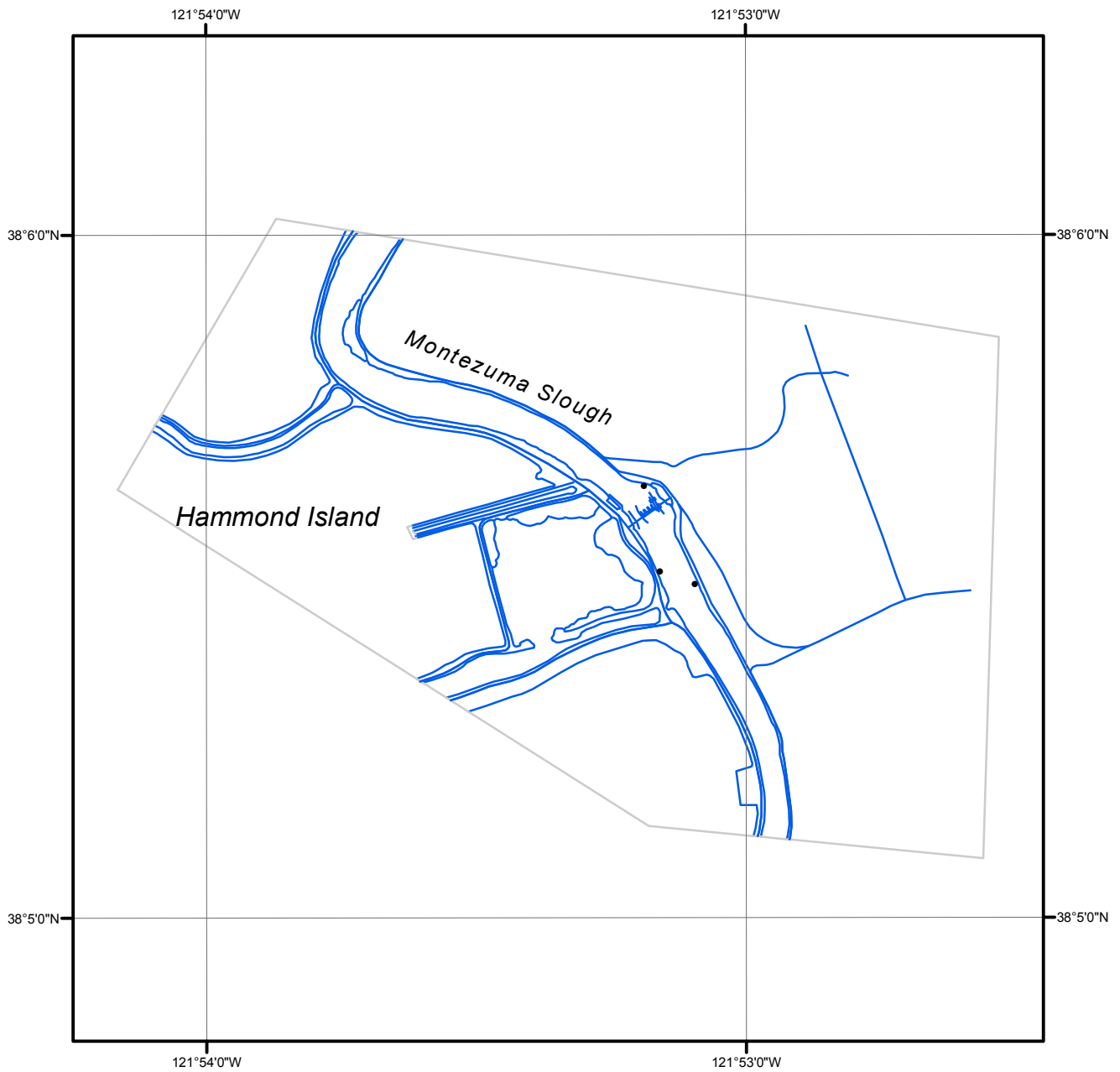
### **NOAA Shoreline Data Explorer**

- GC11088 in shapefile format
- Metadata file for GC11088
- Digital copy of the PCR in Adobe PDF format

## **End of Report**

# HAMMOND ISLAND FLOODGATES, MONTEZUMA SLOUGH

## CALIFORNIA



Overview



CA1212A

GC11088