

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT CA0901-CM-N

Sacramento River, Sacramento to Colusa, California

Introduction

NOAA Coastal Mapping Program (CMP) Project CA0901-CM-N provides highly accurate digital shoreline data for the Sacramento River from Sacramento to Colusa, California. 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 photographic mission instructions for this project following the guidelines of the Photo Mission Standard Operating Procedure Version II. The instructions discussed the project's purpose, geographic area of coverage, scope and priority; photographic requirements; flight line priority; 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 kinematic Global Positioning System (GPS) data, Inertial Measurement Unit (IMU) data, and the acquisition of aerial imagery. Photographic mission operations were conducted on February 2, 2012 with NOAA's King Air aircraft (N68RF). Ten strips (50-001 through 50-010) of natural color digital images were acquired with an Applanix Digital Sensor System (DSS 439) digital camera at a nominal altitude of 10,000 feet, resulting in an approximate Ground Sample Distance (GSD) of 0.35 meters.

Direct Georeferencing Data Processing

GPS/IMU data were 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 nearby CORS stations. The airborne kinematic data was processed using Applanix POSPAC (ver. 5.4) software in March 2012. For further information refer to the Airborne Positioning and Orientation Report (APOR) on file with other project data within the RSD Applications Branch (AB) Project Archive.

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 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 1.7 meters.

Four NGS third order geodetic control points were used to verify 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 accomplished by RSD AB personnel in March 2014. Digital mapping was performed using SOCET GXP (ver. 4.1). 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. Selected features were further modified with additional descriptive information to refine general classification.

Spatial data accuracies for Project CA0901 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 3.4 meters at the 95% confidence level. 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 #	Photo #s	GSD	Tide Level
2-2-2012	19:04 – 19:11	12NC08	1856 – 1898	0.35 m	N/A
2-2-2012	19:16 – 19:23	12NC08	1899 – 1953	0.35 m	N/A
2-2-2012	19:29 – 19:37	12NC08	1954 – 1999	0.35 m	N/A
2-2-2012	19:44 – 19:56	12NC08	2000 – 2081	0.35 m	N/A
2-2-2012	20:01 – 20:09	12NC08	2082 – 2134	0.35 m	N/A
2-2-2012	20:13 – 20:16	12NC08	2135 – 2152	0.35 m	N/A
2-2-2012	20:28 – 20:30	12NC08	2153 – 2168	0.35 m	N/A
2-2-2012	20:35 – 20:45	12NC08	2169 – 2240	0.35 m	N/A
2-2-2012	20:51 – 21:02	12NC08	2241 – 2312	0.35 m	N/A
2-2-2012	21:07 – 21:17	12NC08	2313 – 2384	0.35 m	N/A

Quality Control / Final Review

The final review of the project was completed by a senior member of RSD in April 2014, and 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 9.3.1 software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical chart with natural color digital images and compiled project data resulted in the creation of the Chart Evaluation File (CEF). The following nautical charts were used in the comparison process:

- 18662, Sacramento River, Andrus Island to Sacramento, 1:40,000 scale, 22nd Ed.
- 18664, Sacramento River, Sacramento to Fourmile Bend, 1:20,000 scale, 12th Ed.
- 18667, Sacramento River, Fourmile Bend to Colusa, 1:20,000 scale, 12th Ed.

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 Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC11035 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC11035 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

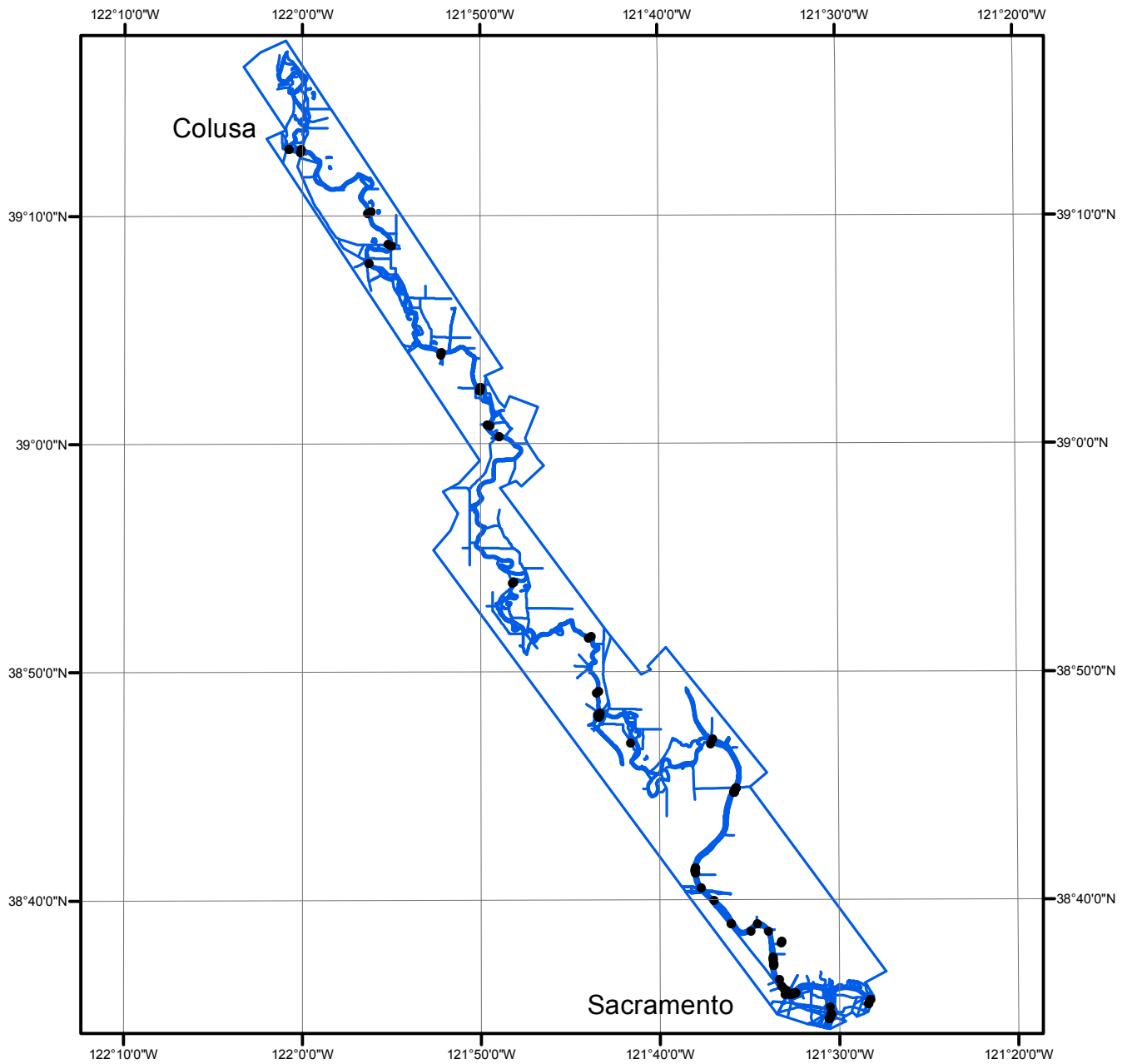
NOAA Shoreline Data Explorer

- GC11035 in shapefile format
- Metadata file for GC11035
- Digital copy of the PCR in Adobe PDF format

End of Report

SACRAMENTO RIVER, SACRAMENTO TO COLUSA

CALIFORNIA



Overview



CA0901-CM-N

GC11035