

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT CA0702A

Sacramento River Deep Water Ship Channel, California

Introduction

NOAA Coastal Mapping Program (CMP) Project CA0702A provides highly accurate digital shoreline data for the Sacramento River Deep Water Ship Channel, California, and vicinity. The project extends from the Three Mile Slough entrance to the Port of Sacramento on the Sacramento River. Project CA0702A is a sub-project of the larger project, CA0702, which also includes the head of Suisun Slough, 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 personnel 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 static and kinematic GPS data and the acquisition of aerial photographs. The photographic mission operation was conducted on June 13, 2007 using an Applanix POS/AV510 GPS/IMU System in the NOAA Cessna Citation II (N52RF) aircraft. Four strips of natural color photographs were acquired using a Wild RC-30 camera with the NOS "A" lens cone at the nominal scale of 1:30,000. No Black and White Infrared photographs were collected for this project.

A base station was established at the Sacramento Mather (MHR) airport using static GPS. Airborne kinematic GPS data was collected to determine precise camera positions in order to establish a control network necessary for aerotriangulation. GPS data collection operations were conducted in accordance with the GPS Controlled Photogrammetry Field Operations Manual.

GPS Data Reduction

Global Positioning System (GPS) data was processed to provide accurate positions of camera centers for application as photogrammetric control in the aerotriangulation phase of the project.

The static GPS bas station data was processed in June 2007 using the NGS Online Processing User Service (OPUS) software to compute fixed baseline solutions from CORS stations. The final NAD83 position reported by OPUS was the average of these three baseline solutions. The airborne kinematic data was processed in September 2007 using Applanix's POSPAC version 4.31GPS/IMU processing software. The GPS data were integrated with the IMU data to produce the Smoothed Best Estimate Trajectory (SBET) file. Please refer to the 07MHR164 Airborne Positioning and Orientation Report in the RSD Applications Branch (AB) Project Archive for additional information regarding the GPS/IMU processing techniques.

Aerotriangulation

Routine softcopy aerotriangulation methods were applied to establish the 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 initiated by RSD personnel in October 2007 utilizing a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components and other associated peripheral devices. The color photographs were measured and adjusted as one block using BAE's SOCET SET® (version 5.3.0) photogrammetric software in conjunction with the Multi-Sensor Triangulation (MST) aerotriangulation module. Upon successful completion of the aerotriangulation process, the RMS of the standard deviations of the residuals for each aerotriangulated ground point was calculated using a full covariance solve strategy within the MST aerotriangulation module. These values were used to compute a predicted horizontal circular error of 0.8 meters for the 1:30,000 scale color photographs based on a 95% confidence level. Please refer to the CA0702 Aerotriangulation Report on file with other project data within the RSD Applications Branch (AB) Project Archive for additional information on the aerotriangulation process.

The project database consists of project parameters and options, camera calibration data, interior orientation parameters, ground control parameters, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is referenced to the North American Datum of 1983 (NAD 83).

Compilation

The data compilation phase of this project was initiated by RSD in December 2007. Digital mapping was performed using a DPW in conjunction with the SOCET SET Feature Extraction software module. Feature identification and attribution within the Geographic Cell (GC) were based on image analysis of 1:30,000 scale photographs and information extracted from the appropriate NOAA nautical charts, US Coast Guard Light List 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 CA0702A were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.6 meters at the 95% confidence level. The predicted accuracy of compiled, well defined points is derived by doubling the circular error derived from aerotriangulation statistics.

The following table provides information on aerial photographs used in the project completion:

Date	Time (UTC)	Roll Number	Photo Numbers	Scale (nominal)	Tide Level*
06-13-07	20:28-20:30	07ACN10	1486-1491	1:30,000	0.0 m
06-13-07	20:30-21:03	07ACN10	1492-1526	1:30,000	0.7 m
06-13-07	21:04-21:06	07ACN10	1527-1532	1:30,000	-0.1 m

* Tide levels are given in meters above MLLW and are based on actual observations at the Port Chicago reference station, and at various substations throughout the project area with corrections applied from the Port Chicago, CA station. The approximate tide range in the project area varied between 0.8 m and 1.1 m.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of AB. The final QC review was completed in September 2008. The review process 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 ESRI's ArcGIS 9.1 software. All project data was evaluated for compliance to CMP requirements.

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

- 18661, Sacramento and San Joaquin Rivers, CA, 1:40,000 scale, 29th Ed.
- 18662, Sacramento R., Andrus Island to Sacramento, CA, 1:40,000 scale, 21st 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 Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC10686 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC10686 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

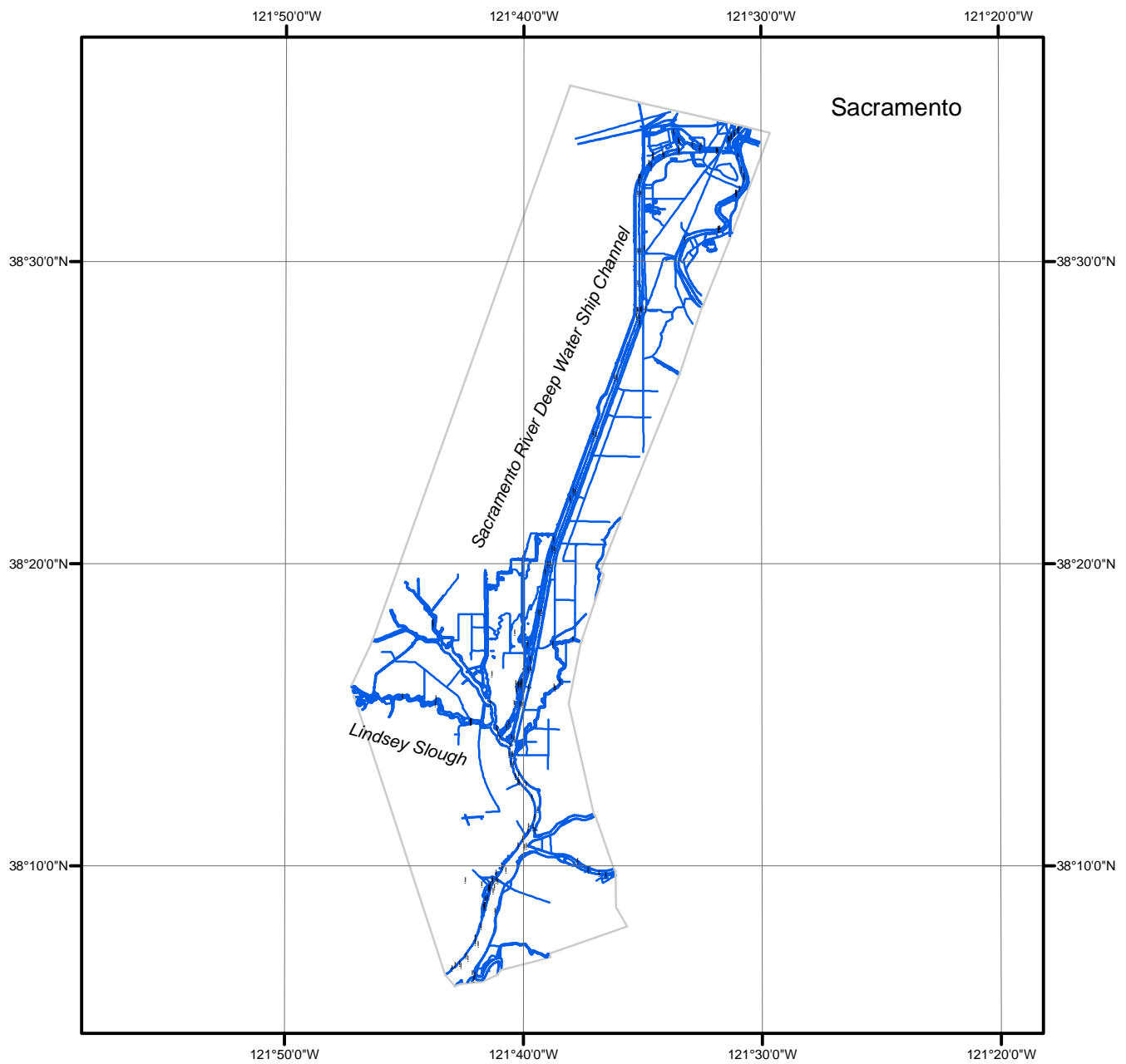
NOAA Shoreline Data Explorer

- GC10686 in shapefile format
- Metadata file for GC10686
- Digital copy of the PCR in Adobe PDF format

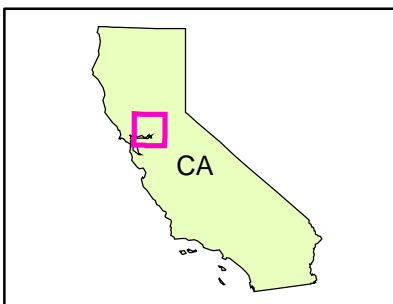
End of Report

SACRAMENTO RIVER DEEP WATER SHIP CHANNEL

CALIFORNIA



Overview



CA0702A

GC10686