

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT CA2206-CS-N

Port of Sacramento, California

Introduction

NOAA Coastal Mapping Program (CMP) Project CA2206-CS-N provides highly accurate digital shoreline data for key areas of change within the port of Sacramento, 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 design of Project CA2206-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 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 digital imagery in order to ascertain the need for more current shoreline data. A Chart Evaluation File (CEF) was forwarded to the Applications Branch (AB) of RSD once the change analysis was complete. Refer to the CSCAP Memorandum for Project CA2206-CS-N for details of the chart comparison process.

Field Operations

The field operations consisted of the collection of kinematic Global Positioning System (GPS) and Inertial Measurement Unit (IMU) data and the acquisition of aerial imagery. Three strips of 4-band images (RGB+NIR) were acquired for this project with a NOAA King Air aircraft (N68RF) in August 2022 using an Applanix Digital Sensor System (DSS) camera at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.23 meters. Although imagery was not acquired in strict coordination with local tides, the goal was to collect all imagery below Mean High Water (MHW).

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. The kinematic GPS data was processed in September 2022 using Applanix POSPac MMS (ver. 8.7) software, utilizing the IN-Fusion PP-RTX processing mode, which is an implementation of Trimble's *CenterPoint RTX* GNSS correction service. For further information refer to the Airborne Positioning and Orientation Report (APOR) that is on file with other project data within the RSD Electronic Data Library.

The processed GPS/IMU data were used to derive precise exterior orientation (EO) values of the digital aerial imagery 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 Exterior Orientation Total Propagated Uncertainty (EO-TPU) tool developed by NGS. Using the EO-TPU tool, the predicted horizontal uncertainty at the 95% confidence level was calculated to be 0.59 meters.

Compilation

Data compilation for this project was accomplished by a member of Applications Branch (AB) of RSD in March 2023. Digital feature data was compiled from orthoimagery generated from the project imagery, using Esri's ArcGIS (ver. 10.8.1) desktop GIS software. Feature identification and attribution within the GC was based on image analysis of project imagery and information extracted from the appropriate NOAA nautical charts. 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 CA2206-CS-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.2 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points is derived by doubling the imagery accuracy computed from the EO-TPU tool.

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

Date	Time (UTC)	Flight Line / Image #s	Tide Level
8-3-2022	21:41 – 21:44	61-003 / 52465 – 52484	0.4 m
8-3-2022	21:49 – 21:53	61-002 / 52485 – 52504	0.4 m
8-3-2022	21:58 – 22:01	61-001 / 52505 – 52524	0.4 m

* Tide levels are given in meters above MLLW and are based on verified observations recorded by the NOS reference station at Port Chicago with offsets applied to the Sacramento substation. The elevation of MHW at Sacramento is 0.315 meters above MLLW.

Quality Control / Final Review

The final review of the project was completed by senior CMP personnel in September 2024, and included analysis of 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 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:

Remote Sensing Division Electronic Data Library

- CSCAP evaluation memorandum
- Airborne Positioning and Orientation Report (APOR)

- Project Completion Report (PCR)
- GC11917 in shapefile format
- CEF in shapefile format

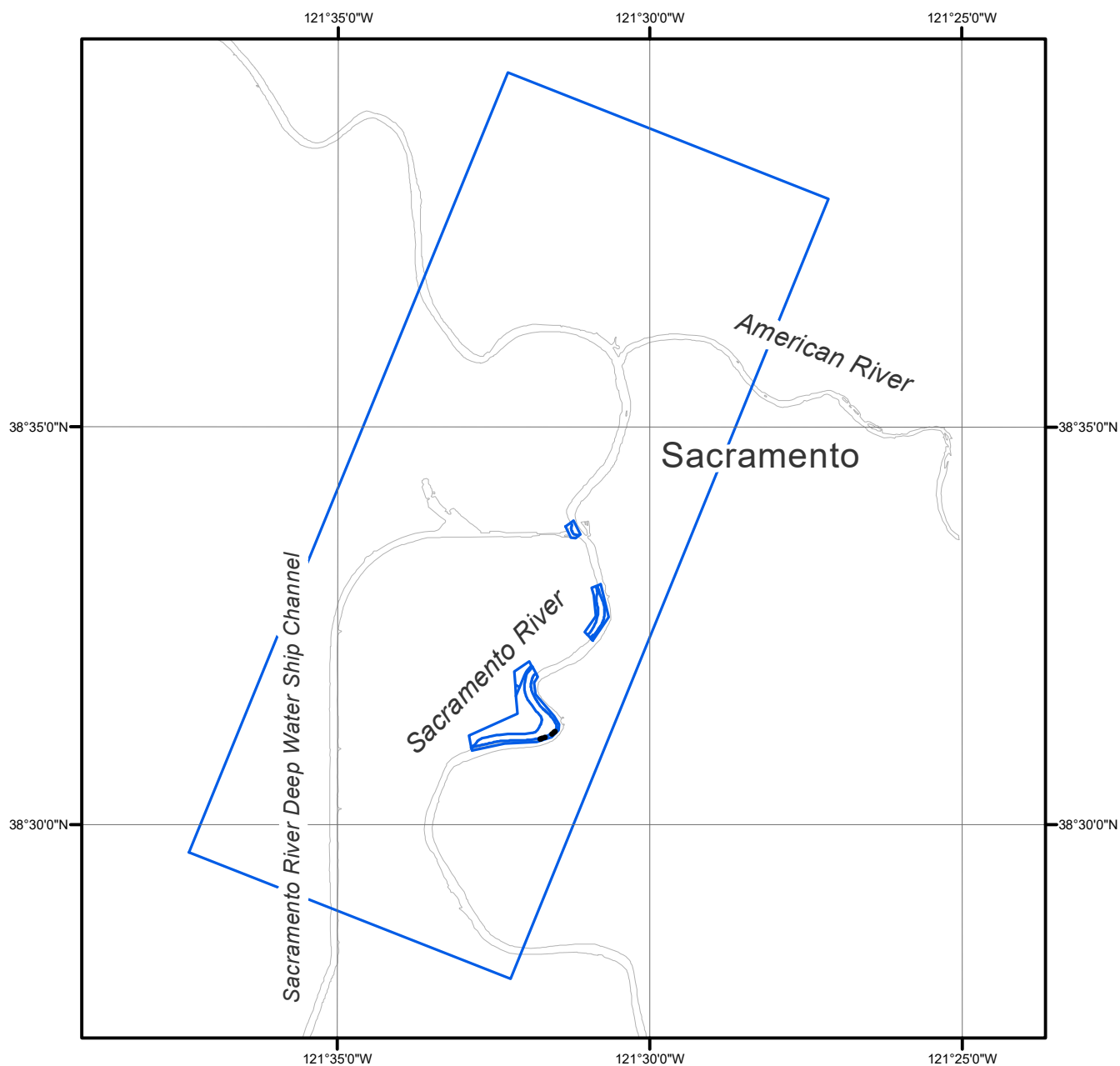
NOAA Shoreline Data Explorer

- GC11917 in shapefile format
- Metadata file for GC11917
- PCR in Adobe PDF format

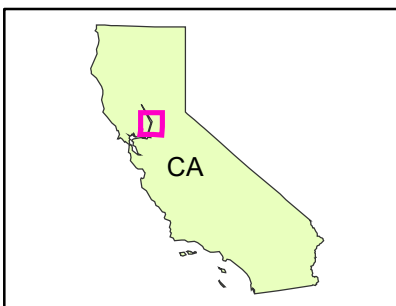
End of Report

PORT OF SACRAMENTO

CALIFORNIA



Overview



CA2206-CS-N

GC11917