

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT CA1901-CM-N

Newport Beach, California

Introduction

NOAA Coastal Mapping Program (CMP) Project CA1901-CM-N provides highly accurate digital shoreline data for Newport Beach, California, from Santa Ana River southeastwards to Corona del Mar, including Newport Bay. 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 CA1901-CM-N was designed by the Requirements Branch (RB) of the Remote Sensing Division (RSD). Mission instructions followed the guidelines of the Photo Mission Standard Operating Procedures. The instructions discussed the project's purpose, geographic area of coverage, scope and priority, image requirements, flight line priority, Global Positioning System (GPS) data collection procedures and guidelines, instructions for data recording and handling, and contact and communication information. RB created a Project Layout Diagram, flight maps and input files for the aircraft flight management system.

Field Operations

The field operations consisted of collection of kinematic Global Positioning System (GPS) and Inertial Measurement Unit (IMU) data, and the acquisition of aerial imagery. Two strips of natural color (RGB) and near-infrared (NIR) digital imagery were acquired concurrently with a NOAA King Air (N68RF) aircraft in coordination with Mean High Water (MHW) and Mean Lower Low Water (MLLW) tide levels. Flight missions were conducted in July 2019 using an Applanix Digital Sensor System (DSS) 580/560 aerial camera and October 2022 using a DSS 6150/6100 camera. All imagery was flown at a nominal altitude of 10,500 feet.

Direct Georeferencing Data Processing

The GPS/IMU data were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of the imagery. Airborne kinematic data for project CA1901-CM-N was processed in August 2019 and October 2022 using Applanix POSPac MMS software (ver. 8.3 and 8.8) 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 Reports (APOR) on file with other project data within the RSD Electronic Data Library.

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 calculated using the Exterior Orientation Total Propagated Uncertainty (EO-TPU) tool developed by NGS. Using this tool, the predicted

horizontal uncertainties at the 95% confidence level were calculated to be 0.86 meters for MHW RGB, 0.89 meters for MHW NIR, and 0.58 meters for MLLW (RGB+NIR bandstacked) images.

Stereo models were examined in order to verify the quality of the DG data and ensure acceptable levels of parallax for mapping purposes. Additionally, at least four independent, 3rd order NGS control points were measured and verified in the acquired imagery.

Compilation

Data compilation was accomplished by a member of AB in May 2023. Digital feature data was compiled from imagery using stereo extraction capabilities of Esri's ArcGIS Pro software (ver. 3.1). Feature identification and attribution within the GC were based on image analysis of the aerial imagery and information extracted from the largest scale NOAA Electronic Navigational Charts (ENC) 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 CA1901-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet horizontal accuracies of 1.7 meters for features extracted from MHW RGB imagery, 1.8 meters for features from MHW NIR, and 1.2 meters for features from MLLW (RGB+NIR) imagery, all calculated at the 95% confidence level. These predicted accuracies of compiled well-defined points are derived by doubling the imagery accuracies computed from the EO-TPU tool. The table below provides further information on the images used in project completion:

Date	Time (UTC)	RGB Imagery (GSD=0.32 meters)		NIR Imagery (GSD=0.38 meters)		Tide Level*
		Roll	Images	Roll	Images	
29-JUL-2019	23:41 – 23:43	19VC36	7429 – 7440	19VR33	5365 – 5376	1.3 – 1.4 m
29-JUL-2019	23:50 – 23:52	19VC36	7441 – 7452	19VR33	5377 – 5388	1.4 m
Date	Time (UTC)	RGB+NIR (4-band) Imagery (GSD=0.23 meters)				Tide Level*
		Rolls		Images		
9-OCT-2022	22:22 – 22:24	22VC56, 22VR54		60555 – 60566		0.1 m
9-OCT-2022	22:30 – 22:32	22VC56, 22VR54		60567 – 60578		0.1 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 from various NOS gauges in the vicinity of the project. The elevation of the MHW tidal datum in the project area ranges between 1.41 – 1.43 meters above MLLW.

Quality Control / Final Review

The final review of the project was completed by senior CMP personnel in June 2023, 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 Esri's ArcGIS software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical chart products with source imagery and compiled project data resulted in creation of the Chart Evaluation File (CEF). The following ENC's were used in the comparison process:

- US4CA60M, 37th Ed., Aug. 2022
- US5CA83M, 15th Ed., Oct. 2021

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

- Airborne Positioning and Orientation Report (APOR)
- Project database
- Project Completion Report (PCR)
- GC11920 in shapefile format
- CEF in shapefile format

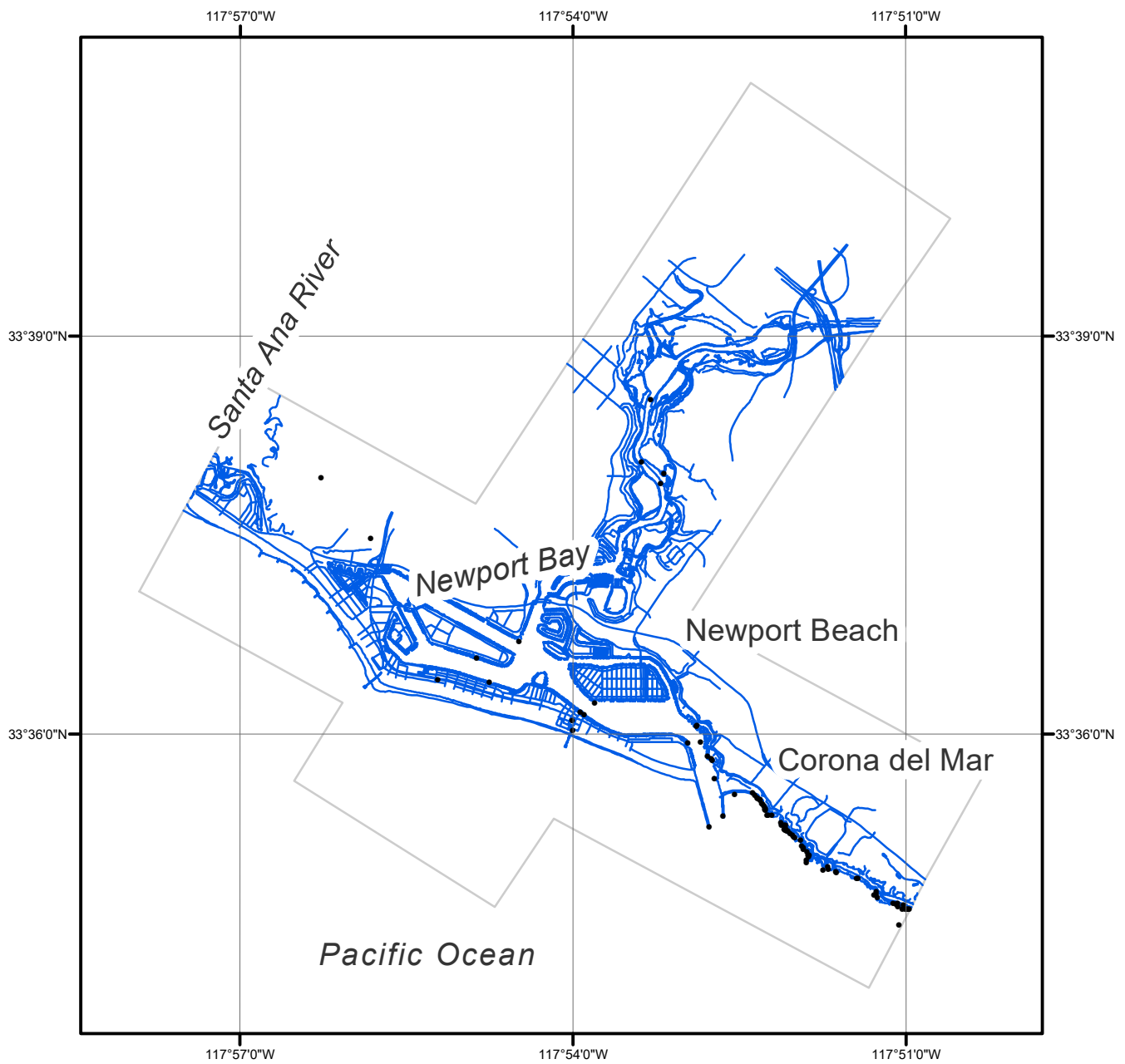
NOAA Shoreline Data Explorer

- GC11920 in shapefile format
- Metadata file for GC11920
- PCR in Adobe PDF format

End of Report

NEWPORT BEACH

CALIFORNIA



Overview



CA1901-CM-N

GC11920