

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT AS0901

Rose Atoll, American Samoa, South Pacific

Introduction

Coastal Mapping Program (CMP) Project AS0901 provides coastal zone mapping data of Rose Atoll which is the easternmost land of the Samoan Islands archipelago. The atoll is the southernmost point in United States controlled territory and is uninhabited. Rose Atoll is located between 14°31'48" and 14°33'50" south latitude and 168°10'20" and 168°08'20" west longitude. The geographic cell (GC) may be used in support of the NOAA Nautical Charting Program (NCP) and coastal zone management activities.

Project Design

This project was designed per a request to update the geospatial reference datum for Chart 83484, South Pacific Ocean, Samoa Islands, Rose Atoll, US, 1:80,000 scale, from the 1939 Astronomical based datum to the North American Datum (1983). Available source data deemed adequate for successful completion of this project included both natural color aerial photography acquired with airborne kinematic Global Positioning System (GPS) positioning in June 1994 and black and white infrared photography acquired in tandem with the natural color imagery but without GPS positioning.

One QuickBird standard satellite image acquired by Digital Globe, Inc. on August 1st, 2006 was also compared to the aerial photography for the purpose of determining any changes between the 1994 aerial imagery and the more recent 2006 satellite imagery.

Field Operations

Field operations for this project consisted of the collection of static and kinematic GPS data and the acquisition of aerial photographs. The photographic mission operations were conducted on June 22, 1994, with the NOAA Cessna Citation II (N52RF) aircraft. Two strips of natural color photographs were acquired using a Wild RC-30 camera with the NOS "A" lens cone and two strips of black and white infrared photographs were acquired using a Wild RC-10 camera with the NOS "Z" lens cone. The color and IR photographs were collected in tandem at the nominal scale of 1:24,000.

A base station was established at the Pago Pago International 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 Reduction

GPS data was processed by RSD personnel to provide precise positions of camera centers for application as photogrammetric control in the aerotriangulation phase of project

completion. The static base station was positioned atop PPG ARP, an “A” order NGS monument, at the Pago Pago International Airport. The airborne kinematic data was processed using Applanix POSPAC (ver. 4.4) GPS processing software in February 2009. Refer to the AS9401APOR for further information on GPS data processing.

Aerotriangulation

Routine softcopy aerotriangulation methods were applied to establish a 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 Applications Branch (AB) personnel in December 2009 using a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components and other associated peripheral devices. The natural color and infrared strips were measured and adjusted as two separate blocks. The natural color photographs were aerotriangulated first and, once an acceptable solution was achieved, control points were measured from the color photographs in order to control the infrared photographs. The Multi-Sensor Triangulation (MST) module within the BAE Systems SOCET SET® (version 5.4.1) suite of digital photogrammetric software was used to perform the aerotriangulation and evaluate the accuracy of the adjustments.

The standard deviation 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 predicted horizontal circular errors of 1.1 meters for the natural color photographs and 1.6 meters for the infrared photographs at the 95% confidence level. An Aerotriangulation Report was written and is on file with other project data within the RSD Project Archive.

Compilation

Digital feature data compilation for this project was accomplished by a member of the Applications Branch (AB) of RSD in December 2009. Digital mapping was performed using a Digital Photogrammetric Workstation (DPW) in conjunction with the SOCET SET Feature Extraction software module. Feature identification and attribution within the GC were based on image analysis of color and B&W infrared aerial photographs from 1994, the satellite image from 2006, and information extracted from the appropriate NOAA nautical chart. 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.

No changes were observed between the 1994 aerial photographs and the 2006 satellite image; therefore the higher resolution aerotriangulated aerial photographs were used as the reported source for all compiled features.

Spatial data accuracies for AS0901 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features visible in the natural color photography were compiled to meet a horizontal accuracy of 2.2 meters and

features compiled from the B&W infrared were compiled to meet a horizontal accuracy of 3.2 meters at the 95% confidence level. This predicted accuracy of compiled, well defined points is calculated by doubling the circular error derived from aerotriangulation statistics. The tide stage for this project could not be precisely determined but is believed to be near low water.

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

Date	Time (UTC)	Roll Number	Photo Numbers	Scale (nominal)	Tide Stage
06-22-94	22:05 – 22:06	94ACN13	3566-3569	1:24,000	Near Low
06-22-94	22:16 – 22:18	94ACN13	3570-3574	1:24,000	Near Low
06-22-94	22:05 – 22:07	94ZR06	1053-1060	1:24,000	Near Low
06-22-94	22:27 – 22:29	94ZR06	1068-1074	1:24,000	Near Low

The following table provides information on the satellite image used in the project completion:

Image Source	Source ID	Acquisition Date/Time
QuickBird	06AUG01215538-M1BS-052154933030_01_P001	2006-08-01 21:55:38 GMT

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of AB. Final QC review was completed in December 2009, including 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 ArcGIS 9.3 software. All project data was evaluated for compliance to CMP requirements.

A Chart Evaluation File (CEF) was not created for this project due to a lack of discrepancies between any charted features and the project imagery.

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 GC10791 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project Data Base
- GC10791 in ESRI shapefile format
- Digital copy of the PCR in Adobe PDF format

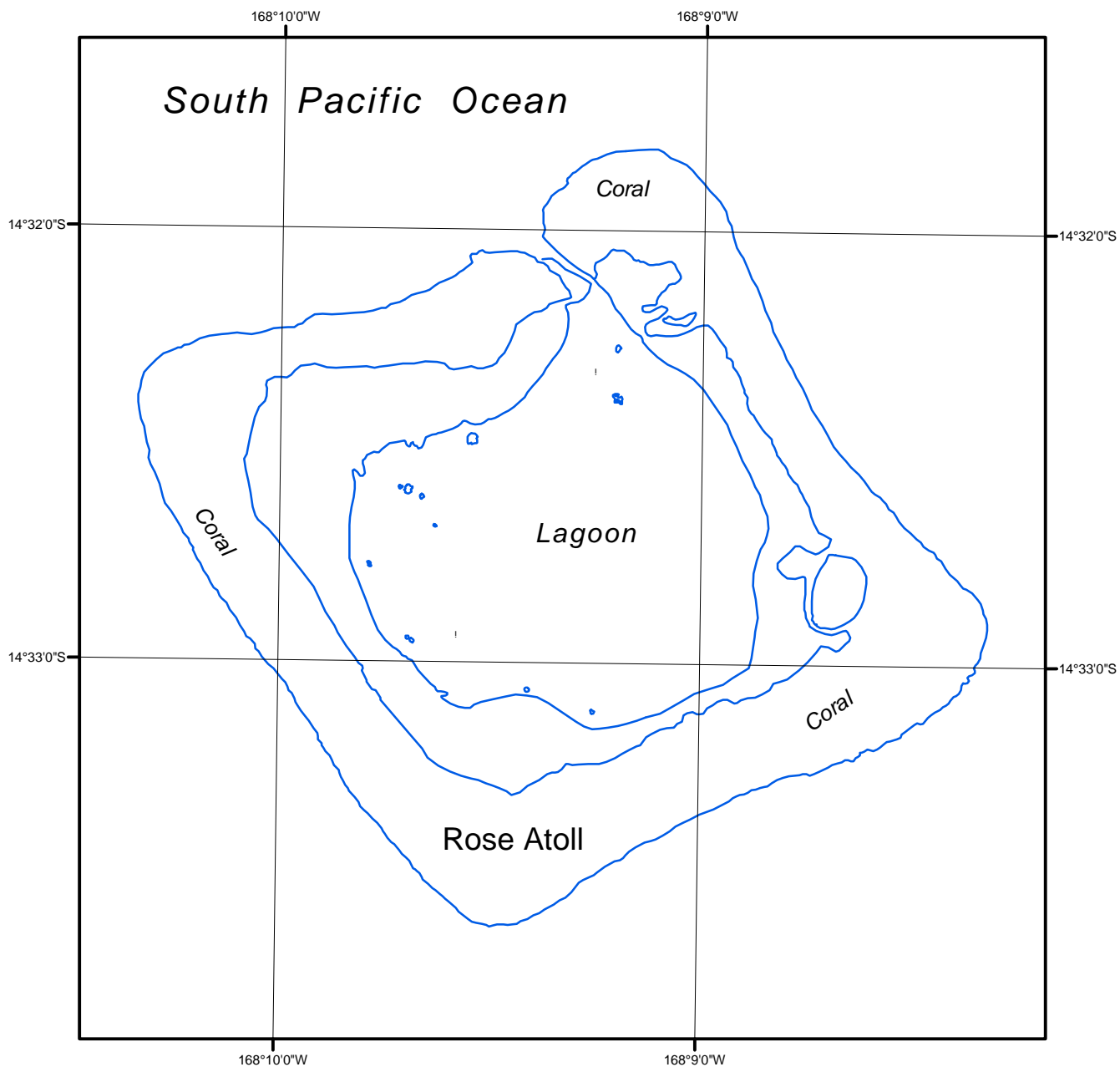
NOAA Shoreline Data Explorer

- GC10791 in ESRI shapefile format
- Metadata file for GC10791
- Digital copy of the PCR in Adobe PDF format

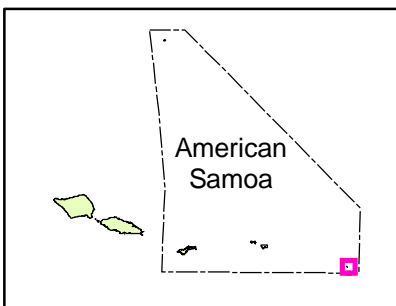
End of Report

ROSE ATOLL

AMERICAN SAMOA, SOUTH PACIFIC



Overview



AS0901

GC10791