

# **NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT**

## ***PROJECT LA1002A-CM-N***

### ***Mississippi River, Southwest Pass, Louisiana***

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project LA1002A-CM-N provides a highly accurate database of new shoreline data for the Southwest Pass of the Mississippi River from its mouth at the Gulf of Mexico to Head of Passes. Project LA1002A-CM-N is a subproject of a larger project, LA1002-CM-N, consisting of shoreline of the Mississippi River from the Gulf of Mexico upriver to Baton Rouge.

Successful completion of the project resulted in a densification of the National Spatial Reference System (NSRS), a set of controlled metric-quality aerial photographs and digital feature data of the coastal zone which complements the Nautical Charting Program (NCP) as well as geographic information systems (GIS) for a variety of coastal zone management applications.

The project database consists of information measured and extracted from aerial imagery and metadata related to photogrammetric compilation. Base mapping was conducted in a digital environment using stereo softcopy photogrammetry and associated cartographic practices.

#### **Project Design**

The Requirements Branch (RB) of the Remote Sensing Division (RSD) formulated the Project Instructions for this project following the guidelines of the “Scope of Work, Shoreline Mapping for the Coastal Mapping Program” (SOW), Version 13B, dated January 2008. The instructions discussed the project’s purpose, geographic area of coverage, scope and priority; data acquisition, processing, accuracy, and compilation requirements; product delivery and reporting instructions; and contact and communication information.

#### **Field Operations**

All project digital imagery was acquired by NOAA between March 13th and 14th, 2010 using a dual mounted Applanix DSS 439 digital camera aboard NOAA’s King Air aircraft (N68RF) at an altitude of 10,000 feet giving a Ground Sample Distance (GSD) of 1.13 feet (0.35 m). NOAA provided 310 Applanix DSS frames of color (RGB) imagery, and processed airborne GPS and IMU data in order to support photogrammetric processing and feature compilation. Tide coordination was not required for this project. NOAA also provided shapefiles depicting the shoreline to be mapped, the boundaries of the project compilation areas, and flight lines, frame footprints, and exposure centers of the imagery to be used for compilation.

The collection of static GPS data was performed by AeroMetric. Eight (8) ground checkpoints were required and multiple sessions were observed and submitted to the NGS Online Processing User Service (OPUS), which computed fixed baseline solutions from nearby CORS stations. A

mean of the values was used to determine the checkpoint coordinates. For more information please refer to the Ground Control Report.

## **GPS Data Reduction**

GPS and IMU data was collected and processed by RSD personnel to yield precise positions and orientations of camera centers for application as photogrammetric control in the aerotriangulation phase of project completion. 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 OPUS. The airborne kinematic data was originally processed in May and June 2010 using POSPAC 4.4.0, and then reprocessed in May 2013 using POSPAC 6.1.0 to achieve a tightly coupled solution. For further information refer to the Airborne Positioning and Orientation Report (APOR) that is on file with other project data within the RSD Applications Branch (AB) Project Archive.

## **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 completed by Aerometric in March 2011 utilizing a Z/I Imaging workstation running Image Station Automatic Triangulation (ISAT) photogrammetric software. The point matching and bundle adjustment were completed as a single block for the color imagery.

Eight ground check points were surveyed by AeroMetric. Due to restricted access and the lack of precisely photo identifiable points in the project area, all of these points were used as vertical only points. Horizontal check points were selected and measured on aerotriangulated imagery that was flown at a scale of 1:25,000 with a Digital Mapping Camera (AME project number 1-101002). Four of the ground points were used as check points and four were used as control in the aerotriangulation of the DMC images. Of the twenty eight horizontal control points selected from the DMC images, four were used as check points and twenty-four were used as control in the aerotriangulation of the NOAA DSS images. Upon successful completion of the aerotriangulation process, the ISAT software provided the RMS of the standard deviations for each aerotriangulated ground point which were used to compute a predicted horizontal circular error of 0.44 meters based on a 95% confidence level. An Aerotriangulation Report was written to provide detailed information on this phase of project completion, and is on file with other project data within the RSD AB Project Archive.

The project database consists of camera calibration data, interior orientation parameters, airborne GPS antenna position and offset data, adjusted exterior orientation parameters, positional listing of all measured points, the control file and refined image coordinates as listed in the Project Database section of the Aerotriangulation Report. Positional data is referenced to the North American Datum of 1983 (NAD 83).

## **Compilation**

The data compilation phase of the project was initiated by AeroMetric, Inc. in March 2011. Digital feature extraction was completed in a softcopy stereo environment using DAT/EM Systems International Summit Evolution software (ver. 6.2), and Bentley Systems MicroStation

V8. All coding and classification of features occurred within the MicroStation environment as features were collected, and was based on interpretation of the project imagery, and on 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 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 0.9 meters at the 95% confidence level. This predicted accuracy of compiled, well-defined points is derived by doubling the circular error derived from aerotriangulation statistics.

The following table provides information on the imagery used in this project:

<b>Date</b>	<b>Time (UTC)</b>	<b>Roll Number</b>	<b>Photo Numbers</b>	<b>GSD (nominal)</b>	<b>Tide Level*</b>
3/13/2010	20:16 – 20:17	10NC04	0589 – 0599	0.35 m	0.2 m
3/13/2010	20:28 – 20:31	10NC04	0640 – 0656	0.35 m	0.2 m
3/13/2010	20:38 – 20:41	10NC04	0670 – 0688	0.35 m	0.2 m
3/13/2010	20:48 – 20:51	10NC04	0689 – 0710	0.35 m	0.2 m
3/13/2010	20:58 – 21:00	10NC04	0719 – 0735	0.35 m	0.2 m
3/13/2010	21:14 – 21:16	10NC04	0772 – 0786	0.35 m	0.2 m
3/13/2010	21:25 – 21:27	10NC04	0801 – 0817	0.35 m	0.2 m
3/13/2010	21:35 – 21:39	10NC04	0837 – 0856	0.35 m	0.2 m
3/13/2010	21:50 – 21:56	10NC04	0859 – 0903	0.35 m	0.2 m
3/13/2010	22:05 – 22:12	10NC04	0911 – 0958	0.35 m	0.2 m
3/14/2010	15:34 – 15:40	10NC10	2805 – 2846	0.35 m	0.1 m
3/14/2010	15:46 – 15:47	10NC10	2847 – 2854	0.35 m	0.1 m
3/14/2010	18:31 – 18:33	10NC10	3607 – 3617	0.35 m	0.1 m
3/14/2010	18:44 – 18:46	10NC10	3665 – 3677	0.35 m	0.1 m

\* Tide levels are given in meters relative to MLLW and are based on verified observations at the Pilots Station East, SW Pass station (876-0922). The elevation of MHW in the project area varies from 0.3 – 0.4 m. above MLLW.

## **Quality Control / Final Review**

Quality control tasks were conducted during all phases of project completion. The final QC review was completed in November 2011. 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 MicroStation 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:

- 11361, Mississippi River Delta, LA, 1:80,000 scale, 77<sup>th</sup> edition, May /13
- Head of Passes (Inset), 1:40,000 scale
- Southwest Pass (Inset), 1:40,000 scale

## **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 GC10877 file contents, attached to PCR

### **Remote Sensing Division Electronic Data Library**

- Project database
- GC10877 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

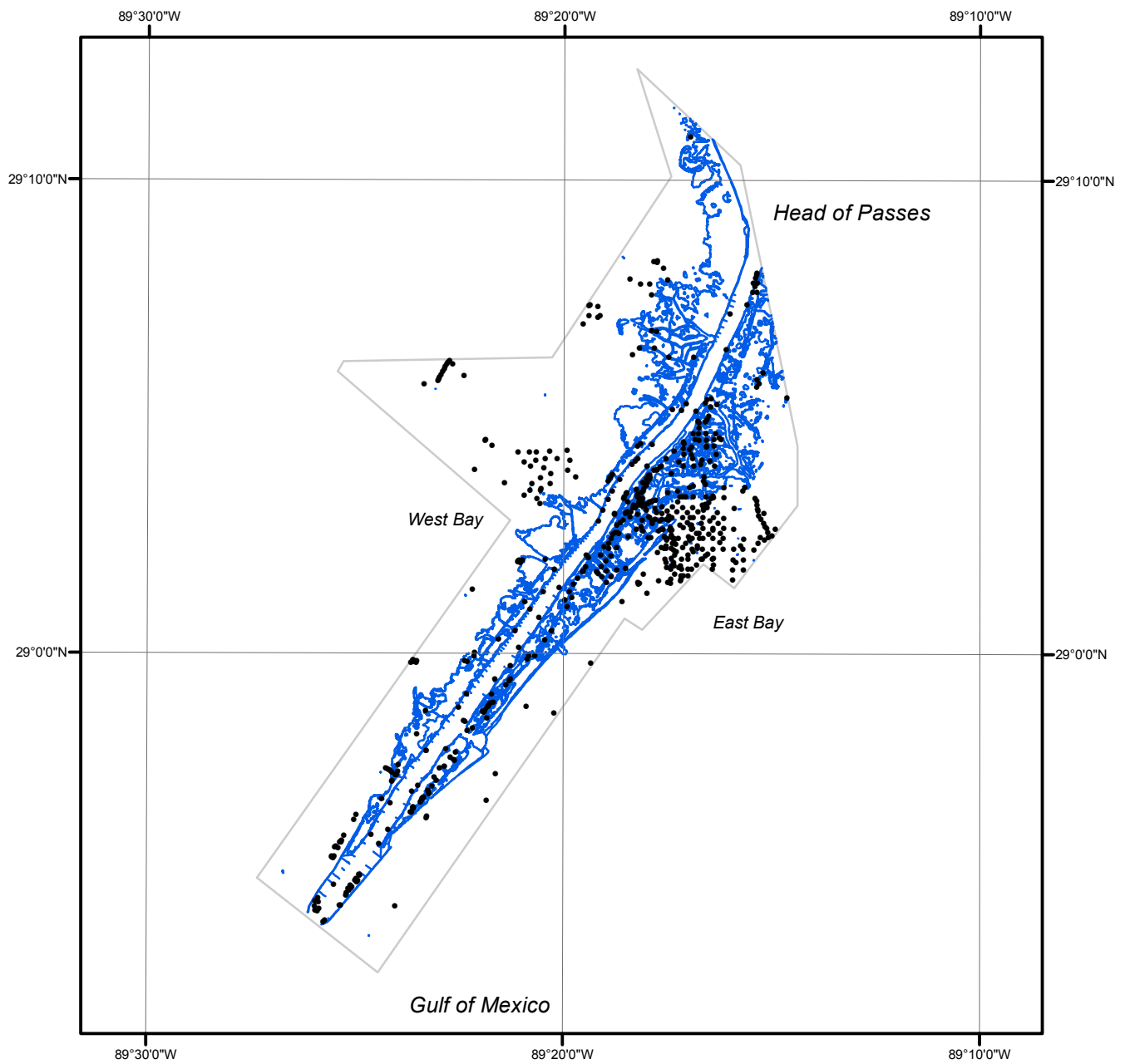
### **NOAA Shoreline Data Explorer**

- GC10877 in shapefile format
- Metadata file for GC10877
- Digital copy of the PCR in Adobe PDF format

## **End of Report**

# MISSISSIPPI RIVER, SOUTHWEST PASS

## LOUISIANA



Overview



LA1002A-CM-N

GC10877