W00611

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service

DESCRIPTIVE REPORT

Type of Survey:	Basic Hydrographic Survey
Registry Number:	W00611

LOCALITY

State(s):	Alabama
General Locality:	Northern Gulf of Mexico
Sub-locality:	Grand Bay & Point Aux Chenes

2021

CHIEF OF PARTY
Chelsea Stalk

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

W00611

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**Alabama**
General Locality:	**Northern Gulf of Mexico**
Sub-Locality:	**Grand Bay & Point Aux Chenes**
Scale:	**40000**
Dates of Survey:	**03/03/2021 to 03/06/2021**
Instructions Dated:	**N/A**
Project Number:	**ESD-PHB-22**
Field Unit:	**US Geological Survey**
Chief of Party:	**Chelsea Stalk**
Soundings by:	**Teledyne Odom Hydrographic Echotrac CV100** (**SBES**)
Imagery by:	**N/A**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/. Products created during office processing were generated in NAD83(2011) UTM 16N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

DESCRIPTIVE REPORT MEMO

June 02, 2022

MEMORANDUM FOR: Pacific Hydrographic Branch

FROM: Report prepared by PHB on behalf of field unit
Chelsea A. Stalk
Electronics Technician, U.S. Geological Survey - St. Petersburg Coastal and Marine Science Center

SUBJECT: Submission of Survey W00611

Scientists from the U.S. Geological Survey St. Petersburg Coastal and Marine Science Center (USGS SPCMSC) in St. Petersburg, Florida, conducted a bathymetric survey of Point Aux Chenes Bay and a small portion of Grand Bay, Mississippi/Alabama, from March 3-6, 2021. Efforts were supported by the Estuarine and MaRsh Geology project (EMRG), and the data described will provide baseline bathymetric information for future research investigating wetland/marsh evolution, sediment transport, and recent and long-term geomorphic change. The data will also support modeling of future changes in response to restoration efforts and storm impacts. During this study, bathymetry data were collected aboard two personal watercrafts (PWC) outfitted with single-beam echosounders.

Archival surfaces were created during the review at the Pacific Hydrographic Branch.

All soundings were reduced to Mean Lower Low Water using VDatum. The horizontal datum for this project is North American Datum of 1983 (NAD 83). The projection used for this project is Universal Transverse Mercator (UTM) Zone 16.

Horizontal Positional Accuracy Report:

All static base station sessions were processed through the Online Positioning User Service (OPUS) maintained by the NOAA NGS. The OPUS solutions were entered into a spreadsheet to compute a final, time-weighted position (latitude, longitude, and ellipsoid height) for each base station. The time-weighted positions for all base stations occupying established NPS benchmarks (B166 [PID: D05987] and 189A [PID: D05977]) were compared against the provided NPS coordinates as well as coordinate solutions from previous survey occupations. The time-weighted positions were within 3 standard deviations of the 2015 coordinate positions established during the initial survey (DeWitt and others, 2017), and therefore, to isolate variables when comparing the two datasets, the previous position coordinates were used in subsequent processing steps. The horizontal variability of the base station coordinates at B166 and 189A were determined by calculating the maximum difference

of any individual occupation from the time-weighted average latitude and longitude values B166: 0.00010 seconds (s) latitude (0.26 centimeters [cm]), 0.00008 seconds longitude (0.20 cm); 189A: 0.00003 (0.08 cm) seconds latitude, 0.00007 seconds longitude (0.18 cm).

Vertical Positional Accuracy Report:

All static base station sessions were processed through OPUS, which is maintained by NOAA and the NGS. The OPUS solutions were entered into a spreadsheet to compute a final, time-weighted position (latitude, longitude, and ellipsoid height) for each base station. The time-weighted positions for all base stations occupying established NPS marks (B166 [PID: D05987] and 189A [PID: D05977]) were compared against the provided NPS coordinates as well as coordinate solutions from previous survey occupations. The time-weighted positions were within 3 standard deviations of the 2015 coordinate positions established during the initial survey (DeWitt and others, 2017), and therefore, to isolate variables when comparing the two datasets, the previous position coordinates were used in subsequent processing steps. The vertical variability of the base station coordinates were determined by calculating the maximum difference of any individual occupation from the time-weighted average ellipsoid height values (B166: +/- 0.5 cm; 189A: +/- 2.3 cm). The base station erected on 189A benchmark served as the secondary for the survey, and data acquired did not need to be utilized for further processing. The kinematic (rover) trajectories were processed using GrafNav version 8.7 software by Novatel, Inc. Occurrences where a personal watercraft trackline crosses itself and the other PWC were evaluated to determine vertical uncertainty. The calculated root mean square (RMS) uncertainty for the PWC's are 0.05 meters (m) for both platforms individually, and when crossing each other.

This dataset is derived from a single field survey using identical equipment, set-ups, and staff; therefore, the dataset is internally consistent. Methods are employed to maintain data collection consistency aboard the platforms. During mobilization, each piece of equipment was isolated to obtain internal- and external-offset measurements with respect to the survey platform. All the critical measurements were recorded manually and then digitally entered into their respective programs. Offsets between the single-beam transducers, motion reference units, and the antenna reference point (ARP) were measured and accounted for in post-processing. Differential Global Positioning System (DGPS) coordinates were obtained using post-processing software packages (NGS OPUS, and Waypoint Product Group GrafNav, version 8.7).

GPS Acquisition:

Two Geographic Positioning System (GPS) base stations were established throughout the survey area, both of which were located on NPS established benchmarks. Benchmark 189A (PID: D05977) was located to the north-north west of the survey area near the railroad tracks at the entrance of the Grand Bay National Estuarine Research Reserve (GNDNERR), B166 (PID: D05987) was located northwest of the survey area at the boat launch location used for this survey. The base stations were continually occupied and equipped with a Spectra Precision SP90M (B166) and a Spectra Precision Proflex 800 (189A) GPS receiver recording full-carrier-phase positioning signals (L1/L2) from satellites via Thales Choke-ring antennas, recording at a rate of 0.1 s.

Differentially Corrected Navigation Processing:

The coordinate values of the GPS base stations are the time-weighted average of values obtained from NGS OPUS. The base station coordinates were imported into GrafNav version 8.7 (Waypoint Product Group) and the kinematic GPS data from the survey vessel were post-processed to the concurrent GPS session data at the base stations. During processing, steps were taken to ensure that the trajectories between the base and the rover were free of erroneous solutions and resulted in fixed positions. By analyzing the graphs, trajectory maps, and processing logs that GrafNav produces for each GPS session, GPS data from satellites flagged by the program as having poor health or satellite time segments that had cycle slips could be excluded, or the satellite elevation mask angle could be adjusted to improve the position solutions. The final differentially corrected, precise DGPS positions were computed at 0.1 s and exported in American Standard Code for Information Interchange (ASCII) text format. Concurrent post-processed navigation data to single-beam data points replace the uncorrected rover positions, recorded during acquisition, in subsequent processing steps. The GPS data were processed and exported in the World Geodetic System of 1984 (WGS84) G1762 geodetic datum.

Single-Beam Bathymetry Acquisition:

The single-beam bathymetric data were collected under the USGS Field Activity Number (FAN) 2021-307-FA, which encompass data from two separate survey platforms; the RV Shark (WVR1, 21CCT01), a 12-ft (foot) Yamaha PWC which collected 28.51 line-km (97 lines), and the RV Chum (WVR2, 21CCT02), an additional 12-ft Yamaha PWC which collected 190.28 line-km (91 lines). Boat motion was recorded at 50-millisecond (ms) intervals using a SBG Ellipse A #1 motion sensor aboard each PWC. HYPACK (version 18.1.8.0), a marine surveying, positioning, and navigation software package, managed the planned-transect information and provided real-time navigation, steering, correction, data quality, and instrumentation-status information to the boat operator. Depth soundings were recorded at 50-ms intervals using an Odom echotrac CV100 sounder with a 200-kilohertz (kHz) transducer. Data from the GPS receiver, motion sensor, and fathometer were recorded in real-time aboard all vessels independently and merged into a single raw data file (*.RAW) in HYPACK, with each device string referenced by a device identification code and time stamped to Coordinated Universal Time (UTC).

Sound velocity profile (SVP) measurements were collected using three SonTek Castaway Conductivity, Temperature, and Depth (CTD) instruments. The instruments were periodically cast overboard to observe changes in water column speed of sound (SOS). A total of 74 successful sound velocity casts were taken throughout the survey at an average depth of 0.94 meters, and on average produced a sound velocity of 1492.32 meters per second (m/s).

Processing Description:

All data were processed using CARIS HIPS and SIPS (Hydrographic Information Processing System and Sonar Information Processing System) version 11.3.0. The raw HYPACK data files were imported into CARIS, the differentially corrected navigation files were imported using the generic data parser tool, and any SVP casts were entered and edited using the SVP editor.

The bathymetric data components (position, motion, depth, and SOS) were then merged and geometrically corrected in CARIS to produce processed x,y,z data. Next, the data were edited for outliers and then further reviewed in the Subset Editor utility for crossing status, and questionable data points or areas. The geometrically corrected point data were then exported as an x,y,z ASCII text file referenced to WGS84 (G1762), ellipsoid height in meters.

For the single-beam bathymetry data, the differential positioning was obtained through post-processing the base station data to the rover. This dataset was transformed from the initial World Geodetic System of 1984 (WGS84) G1762 datum to North American Datum of 1983 (NAD83) reference frame and the North American Vertical Datum of 1988 (NAVD88), using the GEOID12A model (National Oceanic and Atmospheric Administration National Geodetic Survey (NOAA NGS) VDatum software version 4.1 - http://vdatum.noaa.gov/).

Quality Control, Quality Assurance (QA/QC) and Uncertainty Analysis:

All single-beam data exported from CARIS and elevation data exported from GrafNav, were imported into Esri ArcMap version 10.6.0 utilizing the create feature class from an XY table function and plotted in 0.25-m color coded intervals utilizing symbology functions. First, all data were visually scanned for any obvious outliers or problems. Next, a trackline shapefile was produced using X-tools Pro (version 21.1.4313) "Make Polylines from Points" function for each survey platform. Utilizing both the x,y,z (point) and trackline (polyline) shapefiles, a Python script evaluated elevation differences at the intersection of crossing tracklines by calculating the elevation difference between points at each intersection using an inverse distance weighting equation with a search radius of 1 m. The RMS error for WVR1 (21CCT01), when crossing a trackline it previously surveyed, was 5.06 cm and when WVR2 (21CCT02) crossed a track line it previously surveyed, the RMS error was 4.60 cm. Once individual platform statistics were obtained, all data were merged, and crossing analysis yielded a 5.32 cm RMS error. These merged files were separated into three survey areas: Point Aux Chenes, Point Aux Chenes Reefs and Middle Bay. These files were then exported from Esri ArcMap as x,y,z text (.txt) files using the X-tools Pro "table to text" function, and made available in the download section of this data release, along with the populated trackline shapefiles.

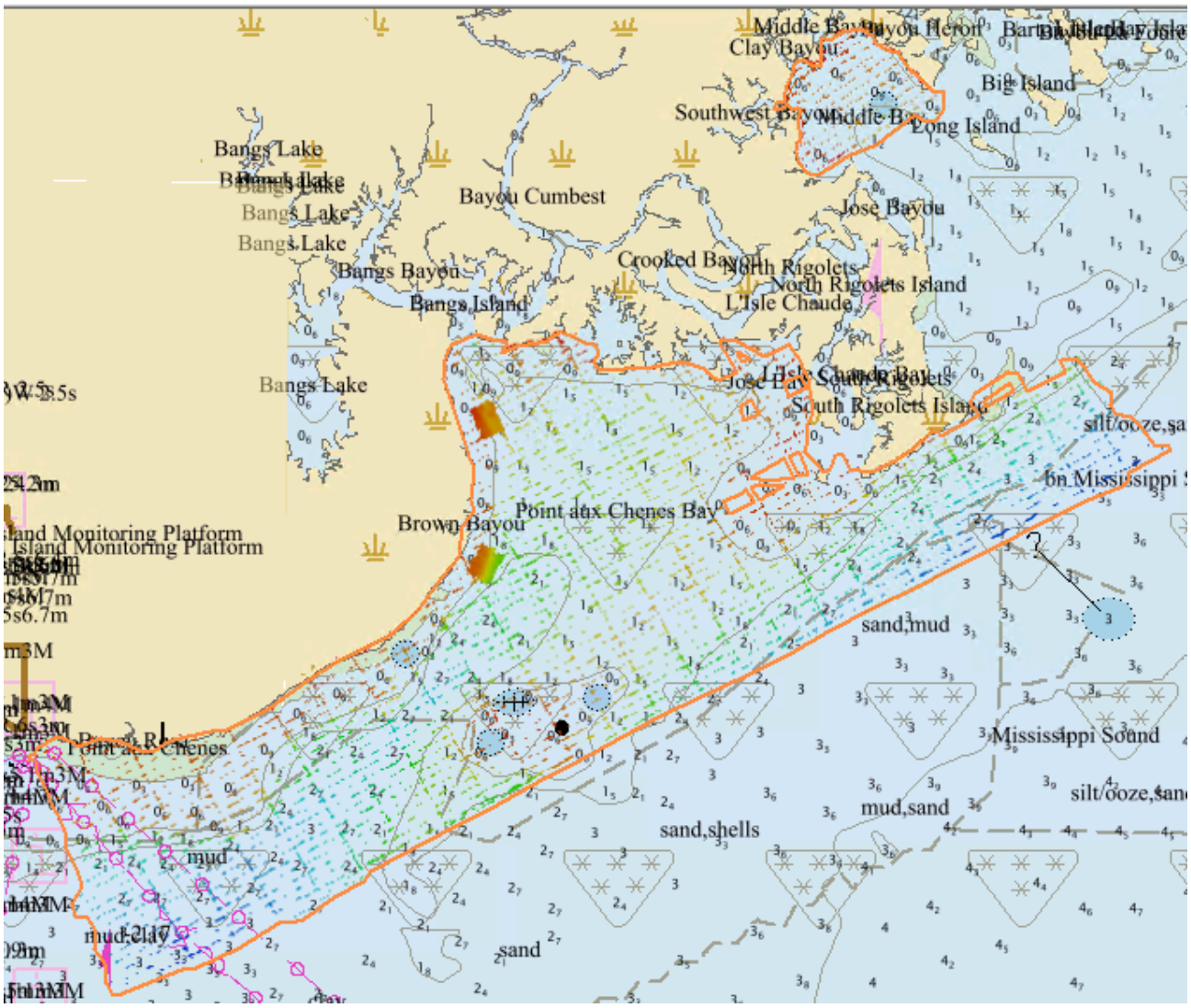
Data Processing and Data Review at the Hydrographic Surveys Division:

Upon data ingestion at the Processing Branch, the NOAA's VDatum v4.4.2 was used to transform the single-beam data points (xyz data) from World Geodetic System of 1984 (WGS84) G1762 datum to North American Datum of 1983 (NAD83) reference frame and MLLW. The xyz file was then gridded into a 4-meter surface using CARIS Base Editor 5.5. Due to the data collection and quality control methods utilized by the field unit, an a-priori uncertainty was calculated using the following formula: 0.5m + 1m * depth.

All data were reviewed for DTONs and none were identified in this survey.

U.S. Geological Survey St. Petersburg Coastal and Marine Science Center acquired the data outlined in this report. Data are available at https://doi.org/10.5066/P93ZM9MK. Additional documentation from the data provider may be attached to this report.

Survey W00611 shows very good agreement with the chart and with junctioning surveys. Survey W00611 is a vertical beam set line spacing survey that does not have feature detection capabilities.



Survey bounds of W00611 shown in orange with the set line spacing vertical beam data overlaid on the ENCs in the area.

The survey is partially adequate to supersede previous data. This survey does not meet feature detection standards, therefore is not adequate to update or disprove charted features.