H10876

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic / Side Scan Sonar / MultiBeam

Field No. X

Registry No. H10876

LOCALITY

State Texas

General Locality Gulf of Mexico

Locality 27 NM ESE of Galveston

1999 - 2000

CHIEF OF PARTY
Walter S. Simmons

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DATE JUL 16 2001

NOAA FORM 77-28
(11-72)

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

REGISTRY NO. **H10876**

HYDROGRAPHIC TITLE SHEET

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

FIELD NO. **X**

State TEXAS

General locality GULF OF MEXICO

Locality 27 MILES ESE OF GALVESTON

Scale 1:20,000

Date of survey 30 July 1999 – 20 August 1999
16 Jan 2000, 29 Jan 2000 - 30 Jan 2000, 05 Feb 2000

Instructions dated 23 October 1997 as amended

Project No. OPR-K171-KR

Vessel R/V Neptune

Chief of party WALTER S. SIMMONS

Surveyed by W. Simmons, G. Ghiorse, D. Walker, R. Nadeau, L. Gates, A. Quintal, J. Infantino, L. McAuliffe, E. Tobey, S. Lemke, B. Ramaswamy, M. Estaphan, J. Miller, P. Donaldson, G. Paquette

Soundings taken by **echo sounder,** hand lead, pole MULTIBEAM RESON SEABAT 8101

Graphic record scaled by survey personnel

Graphic record checked by survey personnel

Protracted by

Automated plot by HP1055CM (FIELD)

Verification by ATLANTIC HYDROGRAPHIC BRANCH PERSONNEL

Soundings in fathoms **feet,** meters at MLW, **MLLW**

REMARKS: Contract # 50-DGNC-8-90025/SAIC
Contractor Name: Science Applications International Corp.
221 Third Street; Newport, RI 02840
HANDWRITTEN NOTE IN THE DESCRIPTIVE REPORT WERE MADE DURING OFFICE PROCESSING

AWOIS ✓ & SURF ✓ by MBH on 3/13/01

NOAA FORM 77-28 SUPERSEDES FORM C&GS-537.

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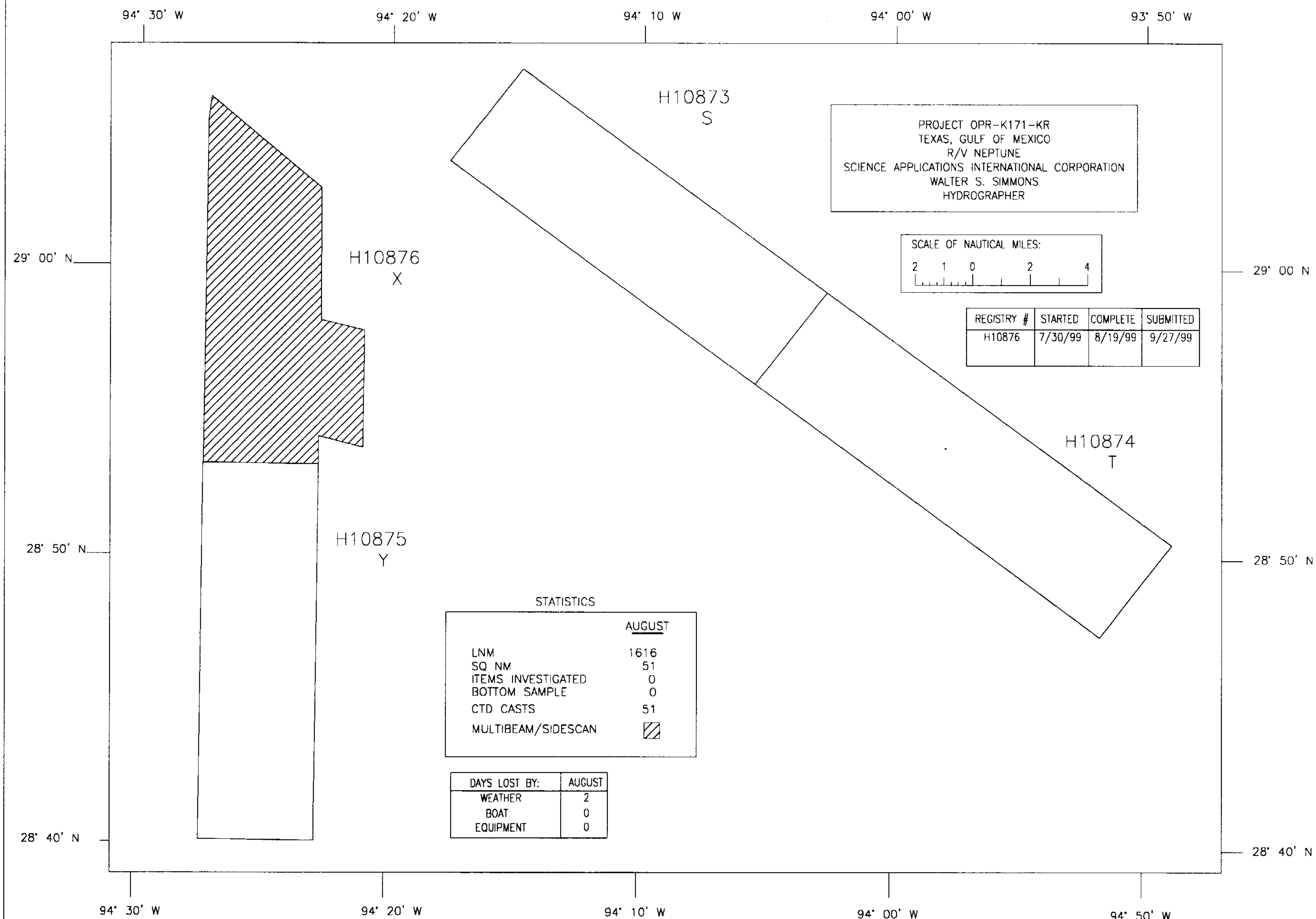
The Progress Sketch on the following page indicates:

1. Survey Outlines
2. Field Survey Letters and Survey Registry Numbers
3. Work Accomplished by Month

PROGRESS SKETCH
H10876
MULTIBEAM SONAR – SIDESCAN SONAR



Science Applications International Corporation (SAIC) warrants only that the survey data acquired by SAIC and delivered to NOAA under Contract 50-DGNC-8-90025/SAIC reflects the state of the sea floor in existence on the day and at the time the survey was conducted.

* FILED WITH ORIGINAL FIELD DATA.

* FILED WITH THE ORIGINAL FIELD DATA

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Descriptive Report to Accompany
Hydrographic Survey H10876
Scale 1:20,000 Surveyed 1999, 2000
R/V NEPTUNE
Science Applications International Corporation (SAIC)
Walter S. Simmons, Hydrographer

A. PROJECT

Project Number: OPR-K171-KR

Dates of Instructions:

23 October 1997	**Original:** 50-DGNC-8-90025/SAIC
5 January 1998	Modification #1:56-DGNC-8-24001/SAIC
7 August 1998	Modification #2:56-DGNC-8-24002/SAIC
9 November 1998	Modification #3:56-DGNC-9-24003/SAIC
9 April 1999	Modification #4:56-DGNC-9-24004/SAIC
12 July 1999	Modification #5:56-DGNC-9-24005/SAIC
14 October 1999	Modification #6:56-DGNC-0-24006/SAIC
04 January 2000	Modification #7:56-DGNC-0-24007/SAIC

Dates of Supplemental Instructions: 4 August 1998, 25 May 1999
Sheet Letter: X
Registry Number: H10876
Purpose: To provide NOAA with modern, accurate hydrographic survey data acquired using shallow water multibeam and side scan sonar technology with which to update the nautical charts of the assigned area.

B. AREA SURVEYED

Description:

The area surveyed was primarily the Shipping Safety Fairway at the Approach to Galveston, Texas. The following coordinates bound the survey approximately:

29.094641 N	094.454006 W
29.042817 N	094.380011 W
28.966963 N	094.379220 W
28.961238 N	094.350568 W
28.893770 N	094.350688 W
28.900071 N	094.380077 W
28.883879 N	094.380008 W
28.883968 N	094.456425 W
29.081597 N	094.455940 W
29.094641 N	094.454006 W

Dates of multibeam data acquisition (UTC):

07/31/99 – 08/10/99	JD 212 – 222
08/15/99	JD 227
08/18/99	JD 230
08/20/99	JD 232
01/16/00	JD 016

01/29/00 – 01/30/00 JD -29 – 030
02/05/00 JD 036

Dates of side scan data acquisition (UTC):
07/31/99 – 08/10/99 JD 212 – 222
08/15/99 JD 227
08/17/99 – 08/18/99 JD 229 – 230
08/20/99 JD 232

C. SURVEY VESSEL

The R/V Neptune was the platform for multibeam sonar, side scan sonar, and sound velocity data collection. Two CONEX containers were welded in place on the aft deck of the R/V Neptune. One container was used for multibeam and side scan data collection, the other for data processing. The POS/MV IMU was mounted on the vessel centerline just forward and above the RESON 8101 transducer, below the main deck. The multibeam sounder transducer was mounted on the keel. The side scan sonar tow position was located at the "A" frame aft center. A double-armored co-ax conductor cable on a SeaMac winch was used for towing the side scan. Table C-1 is a list of vessel characteristics for the R/V Neptune.

Table C-1. Survey Vessel Characteristics

Vessel Name	LOA (Ft)	Beam (Ft)	Draft (Ft)	Gross Tonnage	Power (Hp)	Registration Number
R/V Neptune	106.9	26	8	90	1200	D595478

The R/V Neptune sensor configuration is depicted in Figure C-1 and the vessel offsets are shown in Table C-2. Figure C-2 shows the R/V Neptune's draft calculations. All measurements are in meters. The Reference Point for the entire multibeam system is located at the top centerline of the POS/MV IMU. The transducer depth was recorded as 3.42 meters below the boat's main deck. The distance below the boat deck to the water surface was measured and subtracted from the transducer hull depth to determine the draft of the electronic center of the transducer. Lead line comparisons to the corresponding beam confirmed the 3.42 meters as the correct transducer depth below deck. Measurements were made on each side of the vessel before departure from port and upon return to port in order to prorate the daily draft for fuel and water consumption.

Figure C-1. Configuration of R/V Neptune during Survey Operations, measurements in meters

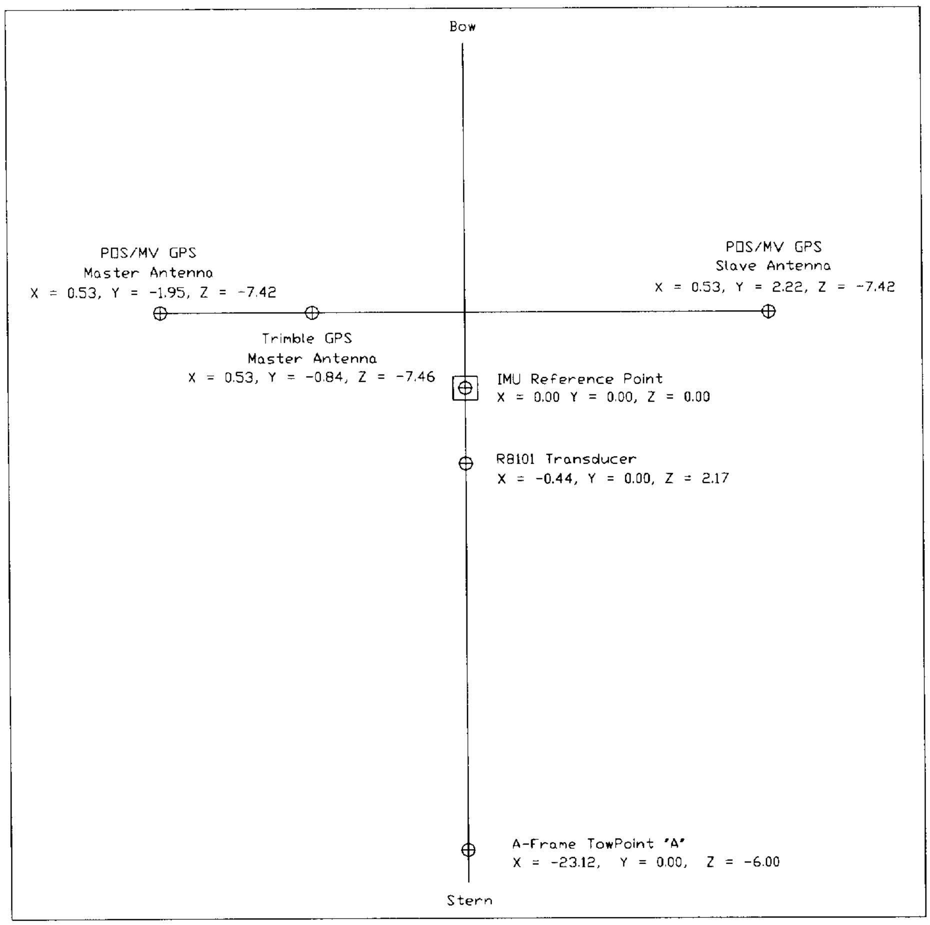
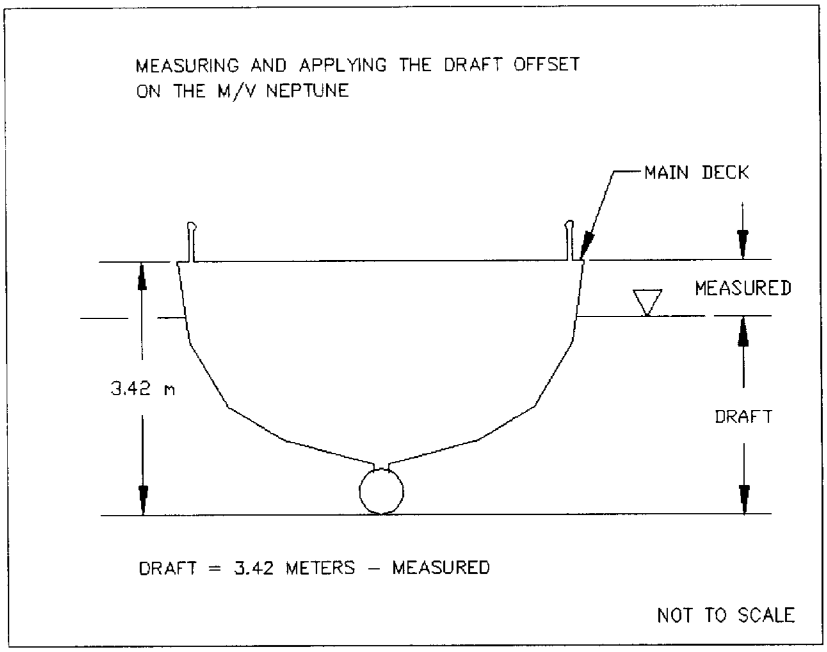


Table C-2. R/V Neptune Antenna and Transducer Locations Relative To the POS/MV IMU Vessel Reference Point, measurements in meters

Sensor	Offset in ISS2000		POS/MV IMU	
Multibeam Reson 8101 Transducer	X		X	-0.44
	Y		Y	0
	Z		Z	2.17
Trimble 7400 Antenna	X	0.53		
	Y	-0.84		
	Z	-7.46		
POS/MV GPS Master Antenna			X	0.53
			Y	-1.95
			Z	-7.42
Side Scan Tow Point "A" frame aft	X	-23.12		
	Y	0		
	Z	-6.00		

Figure C-2. R/V Neptune Draft Determination



The SAIC Integrated Survey System (**iss2000**) and the RESON 8101 multibeam system utilize different coordinate systems, and care must be taken when inputting correctors to the system. The **iss2000** considers "z" to be positive down, while both the RESON and POS/MV consider "z" positive up. Both the **iss2000** and POS/MV consider "x" positive forward, the RESON considers "x" as positive athwart ships to starboard. The SAIC **iss2000** considers "y" positive athwart ships to starboard, the POS/MV considers "y" positive athwart ships to port and the RESON considers "y" as positive forward.

D. <u>AUTOMATED DATA ACQUISITION AND PROCESSING</u> SEE ALSO THE EVALUATION REPORT.

Data acquisition was carried out using the SAIC **iss2000** system. Survey planning, real-time navigation, and data logging were controlled by the **iss2000** on a HP UNIX machine, with navigation and data time tagging running on an OS/2 machine. The **iss2000** also provided navigation data to the Klein 5500 sonar system for merging with the side scan sonar data.

Navigation was recorded from both the POS/MV system and the Trimble 7400. Data from the POS/MV was used as the primary navigation merged with both multibeam and side scan data. Positioning confidence checks were performed alongside survey control stations in port. Daily positioning confidence checks for the R/V Neptune were done by comparing data recorded from the POS/MV to data recorded from the Trimble DGPS.

The RESON 8101 range scale was set to 50 meters. The data acquisition rate for the R8101 was set at 8 pings per second. This means that the specified on average 3.2 pings per 3 meters could be obtained at up to 14.5 knots with the 8 pings per second data rate. At an average speed of 8.5 knots and 8 per pings second, the average alongtrack coverage was 4.37 pings per 3 meters. In all instances, the specified average of 3.2 pings per 3 meters was met.

The side scan sonar equipment used throughout the H10876 survey was the Klein 5500 System. The Transceiver/Processor Unit (TPU) was networked to a personal computer that logged data to hard disk. On a watch-by-watch basis, these raw Klein formatted data were transferred to a side scan sonar-processing computer where they were archived to 4mm tape. Both channels were set at a range scale of 75-meters throughout the survey. Vessel speed averaged 8 to 9 knots and never exceeded 10 knots. This ensured three or more side scan sonar pings per meter along track.

Once collected and archived to tape, the side scan data were converted to eXtended Triton Format (XTF). A side scan processor then reviewed the side scan data using Triton ISIS software. The processor would note data gaps due to weather, system problems, the fish altitude out of range, data masking, or any other events that would cause the data to be rejected. With the assistance of the hydrographer, the processor would locate and verify contacts and create a contact list using ISIS. This contact list was later imported into the **iss2000** system for side scan contact to multibeam feature correlation.

Cleaning of the R8101 multibeam data began with an evaluation of the navigation track line. An automated filter was then applied for minimum and maximum depths of 4 and 30 meters. Interactive editing was then performed to remove noise, fish, etc. The editing process used the geoswath geo-referenced editor which allows for both plan and profile views with each beam in its true geographic position and depth. Tidal correctors were not applied in real-time. Observed tides were down loaded from the NOAA/CO-OPS web page. Preliminary and verified data from the Sabine Offshore Station (877-1081) were applied to the multibeam data using the zoning provided August 4, 1998. NOAA memorandum, "Final Water Level Data for Application to Hydrographic Survey OPR-K171-KR-1998", which is in Appendix F.* All H10876 multibeam data were reprocessed using verified tide data from the Sabine Pass Offshore (877-1081) station as downloaded from the NOAA/CO-OPS web page. THE APPROVED TIDE HAVE BEEN APPLIED TO THE SURVEY DATA

Depth data were then gridded to 1-meter cells for quality evaluation and for comparing to side scan sonar contacts. When anomalies were seen in the 1-meter grids, the edited multibeam files were re-examined and re-edited as needed. When all multibeam files were determined to be satisfactory, the data were binned to a 10-meter cell size, populating the bin with the shoalest sounding in the bin and maintaining its true position and depth with tracking to the gsf data file.

Soundings were selected from the 10-meter binned layer using the **sel_sound** sounding selection software. This routine starts with the shoalest sounding in the survey, flags out soundings that would overlap it on the plot, proceeds to the shoalest remaining sounding and repeats the above process until all soundings in the 10-meter bin layer have been evaluated. The **set_sound** program was run to flag all selected soundings in the gsf multibeam file. The selected sounding file, the platform and navigation aids file, and the feature file were combined to produce the smooth sheet in **AutoCAD**.

Throughout this descriptive report wherever software is mentioned, it is inferred that the most current version of the software available was used. A complete list of all software versions and dates is provided in Appendix K. *

Processing of side scan sonar data is discussed in Section E.

The real time multibeam acquisition system used for the H10876 survey included:

One UNIX workstation – Used for system control, survey operations, real-time quality control.
One personal computer – Used for running POS M/V and Trimble software and for downloading and conversion of sound velocity data from CTD's.

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One personal computer – Used for navigation and time syncing on the O/S-2 operating system.
A custom computer from RESON was used to operate the 8101 system.
A custom computer from RESON was used to operate the R6042 system.

Uninterrupted power supplies (UPS) protected the entire system.

Multibeam Data Processing

Multibeam data processing was performed in two stages. Initial data cleaning and validation was done shortly after the data were collected, usually by the same watchstander who had collected the data. To maintain a high degree of continuity between data collection and data processing it was convenient to split a watchstander's work into two phases, one to collect data and the next to process that same data.

On a watch by watch basis, tracklines were created, verified, and corrected to ensure data coverage and to also check for navigation errors. Next, outer beams of the multibeam data, exceeding the accuracy standards calculated by the Hydrographer, were flagged as invalid using the **iss2000** software. Multibeam data were manually edited and the preliminary multibeam coverage grid was then updated. Each watchstander would perform a backup of all data on the processing system at the end of each processing watch. After the watchstander had completed the initial data cleaning, a different watchstander, a data manager, or the hydrographer verified the data. Any questionable possible obstructions were noted and later evaluated by the hydrographer. A data manager on the survey vessel would later correct the data for draft and tides, make updated coverage grids, tracklines, sounding grids, selected sounding plots and preliminary data products. The data manager's duties also included routine system backups on all computers and quality control on all data.

In the processing lab in Newport, RI, further quality assurance reviews were done, and corrections were made to all data. Contact analysis was performed correlating side scan contacts with multibeam features. Multibeam coverage and sounding grids were updated following changes found during the contact analysis. The **iss2000** system used proprietary algorithms to create the grids and selected soundings. Final plots were produced exporting data to a dxf format using the **iss2000** software. These data were then imported into **AutoCAD** for final map production.

E. SIDE SCAN SONAR

The following side scan sonar equipment was used for the H10876 survey:

Klein 5500 Side scan Sonar System towfish
- Serial Number 250
- Vertical beam width 40°, 0° depression, 455kHz.
- K-Wing Depressor, serial number 435

Transceiver/Processing Unit (TPU), serial number 109
Display/Control/Data logging computer

1. Side Scan Sonar Data Acquisition Procedure

The watchstander would always have the assistance of the previous watchstander who was located close by processing data. This assistance was necessary for conducting CTD casts as well as towfish deployment and retrieval. A minimum of four people were used during towfish deployment and retrieval.

Side scan operations were conducted in water depths ranging from 42 to 79 feet. The side scan towfish altitude off the bottom was maintained between six and fifteen meters. The MacArtney Sheave was equipped with a cable counter with a read out in meters. The cable out data was broadcast from the cable counter to the **iss2000** system where layback and fish position were calculated. The cable length was manually adjusted to maintain the proper fish altitude using a remote controller for the SeaMac winch. The watchstander appended to a side scan annotation file when changes were made to the cable out length. These annotation files were later merged with the XTF data using proprietary software.

Maintaining towfish height above the bottom was relatively easy using the remote controller for the winch. A proprietary software program, which graphically displays the towfish and water depths, aids in monitoring the towfish altitude.

The use of a hydrodynamic depressor allowed the amount of cable out to be kept less than the water depth. Thus permitting turns to be tighter and faster than surveys previously conducted without the use of a depressor. This also removed all concern about the towfish hitting the seafloor while conducting CTD casts. In addition, the depressor kept the towfish below the propwash even at higher survey speeds of 9 knots.

Survey line spacing was 65-meters. Survey lines were run at an azimuth of 001° and 181°. Navigation and side scan file names were manually changed after each survey line was completed. Because the high data rates of the Klein 5500 side scan, the Klein data logging software automatically changes the file name every ten minutes. The range scale was set to 75-meters.

Daily confidence checks were conducted using trawl marks, anchor scours, and any other geologic features (sand waves) that ran through both channels while on line.

2. Problems Encountered During Side Scan Sonar Survey Acquisition

Sargasso weed floating on the water surface was a continual challenge to the acquisition of high quality side scan data. The Klein 5500 locks on to the strongest signal. In water depths less than 60 feet, this often meant the water surface if Sargasso or wind waves were present.

Weather also had a negative impact on the quality of the side scan data. When operating in 3 to 4 foot seas, it was frequently impossible to avoid surface wave noise and the subsequent large number of data gaps.

3. Side Scan Sonar Processing

After being archived to 4mm tape, digital side scan data from the Klein 5500 system were converted from the Klein proprietary format to eXtended Triton Format (XTF) using a SAIC proprietary program called xtf_io. These XTF files were copied to 4mm tape in tar format and are the deliverables to be used with CARIS SIPS. The XTF data also allowed data review and target analysis in Triton Isis.

A side scan processor looked at each record using Triton ISIS to review the data. A spreadsheet was used to log times where data gaps were caused by seaweed interference, biota in the water column, or other reasons. The time, survey line, corresponding multibeam file, start/end of line, side scan file name, watch id number, line azimuth, and data gaps information were all logged in the spreadsheet.

This information was used to set the bad data off line so that they were ignored in processing and in coverage analysis.

On June 16, 1999 a slave IRIG-B card was installed in the TPU to provide accurate time stamping of the ping data in synchronization with the **iss2000** and UTC from the GPS signal. After the IRIG-B card was installed, numerous erroneous dates, times and positions were found in the raw Klein data. The duration of the problem was typically 2 to 3 seconds and could be as large as 6 seconds. The xtf_io program was customized to do an interpolation over these gaps to resolve the problem.

Annotation files logged in real-time by the watchstanders were later corrected for errors and additional annotations were added. Additional annotations include contacts, confidence checks, and comments on the records. The corrected annotations were merged into the XTF data using the xtf_io program. Trackline data were extracted from the XTF files for each Julian day.

A time window file, which lists the times of all valid data, was created for each 100% of coverage in order to create both trackline and coverage plots in the **iss2000** system. By viewing the coverage plots in the **iss2000** survey-planning tool, a user can easily plan survey lines to fill in any data gaps.

Side Scan Contact Analysis

ISIS and Contact Post Processing Software (Triton/Elics Inc.) were used to select and process contact information from the XTF sonar files. Contact information includes the following:

1. Year and Julian Day contact was acquired.
2. Time contact was acquired.
3. Contact position - Latitude and Longitude.
4. Contact identifier (i.e. OBST for Obstruction).
5. Slant range to contact (Note: Negative number if contact was detected on port side).
6. Fish altitude when contact was acquired.
7. Contact height, based on length of shadow and geometric calculation using steps 5 & 6.

Contact information was stored in .CON files that were converted into a .CTV file using a SAIC proprietary program called isis2ctv. During the conversion, a postscript image file was made of each contact. This .CTV file can be directly loaded into **iss2000** as a separate data layer. Once in the **iss2000** system, contacts were correlated by position and height with the one-meter grid of the multibeam data displayed with side scan contacts overlaid. Bathymetric features in the multibeam data were then compared with the side scan contact data.

F. SOUNDING EQUIPMENT

The following components were used for acquisition of multibeam sounding data using the RESON SeaBat 8101 multibeam system:

- Transducer, Serial Number 099707
- 8101 Processor, Serial Number 13819
- R6042 Controller and Processing Unit, Serial Number 590 P0 794-387

A lead line made of Kevlar line with an 8 pound mushroom anchor as a weight was used for checking the multibeam echo sounder. The line was marked in feet and was calibrated against a steel tape.

Lead line comparisons are summarized in Appendix G. Daily comparisons of R8101 nadir soundings to ODOM EchoTrak 200 kHz vertical echo sounder are also summarized in Appendix G. *

G. CORRECTIONS TO SOUNDINGS

1. Speed of Sound

The following systems were used to determine sound velocity profiles for corrections to multibeam sonar soundings.

- "A" - Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 193607-0565,
  Calibration Dates: 23 February 1999, 13 September 1999.
- "B" - Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 2710,
  Calibration Dates: 15 October 1998, 16 September 1999.

02 September 1998.

The primary unit was SBE19 #0565. Daily confidence checks were obtained using simultaneous casts with the primary CTD and one of the other two CTD's. After downloading CTD casts, both were converted to the proper format and compared to each other and to the previously applied cast. All profiles were computed using **SBE Term19** and converted using the **SBE DatCnv** software. Computed profiles were copied to the **iss2000** for comparison on the screen. A selected profile was applied to the system, recorded, and sent to the RESON 6042, where a refraction lookup table was computed for application of speed of sound and ray tracing correctors to the multibeam sounding data. If sounding depths exceeded the cast depth, the RESON 6042 used the bottom of the table to extend correctors below the table.

Factors considered in determining how often a CTD cast was needed included: shape and proximity of the coastline, sources and proximity of freshwater, seasonal changes, wind, sea state, cloud cover, and changes from the previous profile. A cast was taken at least once during each 6-hour watch. Normally there were two casts per 6 hour watch during daylight, and one cast per 6 hour watch during darkness.

Quality control tools, including real-time displays and a multibeam swath editor, were used to monitor how the sound velocity was affecting the multibeam data. Severe effects due to improper sound velocity could easily be seen by viewing multibeam data in an along track direction.

A table including all CTD casts, dates of each cast, the location of the cast, and the maximum depth of each cast is located in Appendix J. *

2. Instrument Corrections

No instrument corrections were necessary after the initial installation and calibration was complete.

3. Corrections Determined from Vertical Casts

Lead line comparisons to multibeam soundings were made at least every two weeks to verify the transducer draft and echo sounder instrument correctors. For each comparison, a CTD cast was taken and the sound velocity profile loaded into the **iss2000** and the RESON 6042. Twenty lead line readings, ten from the port side and ten from starboard, were recorded along with the UTC time of

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observation while the **iss2000** recorded the multibeam readings. **Exammb** was used to determine the appropriate port and starboard beam depth readings for the time and position of each lead line reading.

The results of these readings were entered into a spreadsheet along with the draft readings and any squat correctors that may have been entered into the **iss2000**. The spreadsheet applied a calibration corrector to the lead line readings and converted the readings from feet to meters. It also applied correctors for any settlement and squat inadvertently left in the **iss2000** to the port and starboard multibeam readings.

Each corrected lead line cast depth was compared to the simultaneous multibeam. The ten comparisons were averaged and the standard deviations were computed. The lead line cumulative results are included in Appendix G.*

4. Static draft

Depth of the transducer below the deck was determined from measurements made while the boat was on the marine railway in 1998, and was verified by lead line comparisons. The static draft was observed by measuring from the main deck to the waterline before getting underway from Galveston and subtracting that measurement from the transducer distance below the deck. If the static draft value changed from the previously noted value, the new value was entered into the RESON system. The static draft was again determined upon return to port and the change in draft was prorated on a daily basis. The measured and prorated draft results are reported in Appendix G*, Table App. G-5.

5. Settlement and Squat

Measurements of settlement were conducted near 29 11.7N 094 28.8W on day 138, May 19, 1999, in fifteen meters of water. The following procedures were used to determine the settlement correctors:

- Selected an area of flat bottom at a depth similar to the survey area.
- Planned a survey line across the flat bottom.
  1. Considered the current and wind in planning the line.
  2. Used Sabine Offshore (877-1081) station for the water level during the test.
  3. Calibrated the echo sounder, and applied sound velocity profile for the test area. (Timing latency and pitch, roll and heading biases had been determined and applied.)
  4. Approached the line at a slow to moderate speed, brought the RPM's to zero and drifted down the line while recording soundings over the flat bottom.
  5. Ran the line at each of the predetermined RPM settings while recording soundings over the flat bottom.
  6. Applied water level correctors to the soundings.
  7. Subtracted the depth determined from each of the RPM passes from the depth determined on the drifting, zero RPM pass. These differences are the settlement and squat correctors to be applied when operating at the corresponding RPM.
  8. Constructed a lookup table of RPM and settlement and squat correctors in the configuration file so that the computer could interpolate a corrector based upon the RPM entered into the system

Geoswath was used to measure the depth for each pass. The results were compiled into a lookup table of vessel's engine RPM vs. settlement and squat. When on survey line, the engine's RPM was entered into the **iss2000** system by the real-time system operator. The computer applied settlement and squat correctors interpolated from the lookup table, and recorded them in the "Depth Corrector" field of the GSF data file for each ping.

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All results are reported in Appendix G,* Table App. G-6.

6. Roll, Pitch and Heading Biases

The following sensor was used for acquisition of Heave, Roll, Pitch and Heading data:

- TSS POS/MV Inertial Navigation System, Serial Number 024

The POS/MV was used for heave, roll, and pitch. The accuracy of the sensor was five percent of one meter or five centimeter for heave, ± 0.10° dynamic accuracy for roll and pitch, and ± 0.05° static accuracy for roll and pitch. The POS/MV was used for heading. The dynamic heading accuracy of the unit is better than 0.05°.

Heading, roll, and pitch biases were determined in a series of tests performed in the survey area prior to the start of the survey. Prior to conducting any of the tests, a CTD cast was taken to determine the sound velocity profile and entered into the RESON system. Initially, the roll, pitch, and heading biases were set to 0° in the RESON system.

The roll bias test was run first in an area with relatively flat bottom. The range scale of the RESON was set to 50-meters. Three lines were run spaced 40-meters apart and each line was run in both directions. The data from parallel lines in the same direction were used for roll bias calculations so that the depths from the center beams from one line were compared against the depths of the mid-swath beams. Tidal corrections were applied to all data before roll corrections were calculated using routines in the **Survey Analysis** software. Roll bias results are shown in Appendix G,* Table App. G-4a, G-4b.

After the roll biases were calculated and entered into the RESON system, a pitch bias test was conducted. The pitch test was conducted by surveying multiple reciprocal lines perpendicular to an anchor scour. During the pitch test, ship speed was maintained at as constant a rate as possible. Tidal corrections were applied to all data before the pitch bias was calculated. Pitch biases were computed by comparing runs in opposite directions. There was no discernable pitch bias as a result of these tests, and a bias of 0.0° was kept in the system for the survey. Pitch bias results are shown in Appendix G,* Table App. G-3.

Following the roll and pitch bias tests, a heading bias test was conducted. For the heading bias test, five parallel lines were run in opposing directions so that the inner beams from the transducer overlay the intermediate or outer beams of adjacent swaths. The heading bias was then determined by measuring the distance between equal depths and calculating the angle subtended by that distance. Tidal corrections were applied to all data before heading corrections were calculated using routines in the **Survey Analysis** software. After repeated inconclusive test results, it was deemed that the heading bias was zero. It is believed that the shallow water depths of the survey area combined with the accuracy of the navigation makes it extremely difficult to measure small degrees of heading bias. Further proof of a heading bias of zero lies in trawl marks crossing through numerous swaths with perfect alignment.

Table App. G-7* contains the results of the Accuracy test conducted on JD 197. The Accuracy Test for data collected after the transducer change was derived from two lines run along the northwest sheet limit and compared to the north ends of the mainscheme lines run in the common area.

Roll, pitch, and heading biases applied in H10876 are shown in Table G-1.*

*FILED WITH THE ORIGINAL FIELD RECORDS

Table G-1. Roll, Pitch, and Heading Bias for the R/V Neptune

Julian Days	139-209
Roll	0.40
Pitch	0.00
Heading	0.00

Julian Days	296 - 039
Roll	0.13
Pitch	0.00
Heading	0.00

H. CONTROL STATIONS SEE ALSO THE EVALUATION REPORT.

The horizontal datum used for the survey was the North American Datum (NAD) 1983.

Horizontal control stations CG-20 1974 and CG-21 1974 were used for independent checks of the positioning system on the survey vessel. Data for these stations were downloaded from the NOAA/NGS web page.

I. HYDROGRAPHIC POSITION CONTROL

The following equipment was used for positioning on the R/V Neptune:

- TSS POS/MV, Serial Number 024
- Trimble 7400 GPS Receiver, Serial Number 3713A18839
- Trimble Probeacon Differential Beacon Receiver, Serial Number 0220159406
- 41R Differential Beacon Receiver, Serial Number 3508-102-18550

The primary hydrographic positioning equipment was the POS/MV, which used correctors from the USCG differential station at Galveston, TX. The **iss2000** monitored HDOP, number of satellites, elevation of satellites, and age of correctors to ensure the resulting hydrographic positioning errors did not exceed ten meters at the 95% confidence level.

When in port, the R/V Neptune tied up to Pier 15 where measurements were made to calculate the offset between the hydrographic navigation position and horizontal control station CG-20, 1974, or CG-21, 1974. While measurements were being made, navigation data were being logged. Comparison of the navigation center position computed from the control station and the average position based on navigation resulted in confidence checks that were well within specifications, with no more than 3 meters inverse distance from the check position. A summary of these results is shown in table App H-2. FILED WITH ORIGINAL FIELD DATA

Daily position confidence checks were established using a Trimble DGPS with correctors from the U.S. Coast Guard station at Port Aransas, TX. A real-time monitor raised an alarm when the two DGPS positions differed by more than 10 meters horizontally. Positioning confidence checks were well within the allowable inverse distance of less than 15 meters.

The USCG Galveston DGPS station was used as the primary positioning corrector source. The USCG Port Aransas, TX DGPS station was used for daily positioning confidence checks. The primary DGPS receiver automatically locks onto the strongest DGPS signal; therefore, when the USCG Galveston DGPS station was off the air for upgrades, primary navigation used the USCG Port Aransas, TX DGPS station. When the USCG Galveston DGPS station came back online, primary navigation switched back to it.

All antenna, transducer, towpoint, and towfish offsets were measured relative to the POS/MV's IMU. Two separate teams of two people measured and calculated all offsets using a measuring tape. The final offsets from both teams were compared and were found to agree.

The **iss2000** software calculates the towfish position using an automatic cable out value and the towpoint configuration or offsets previously measured.

J. SHORELINE

Not applicable.

K. CROSSLINES

There were 76 linear nautical miles of crosslines surveyed and 1474 linear nautical miles of mainscheme lines surveyed resulting in 5.1 percent coverage by crosslines.

Comparisons of all crossing data show that more than 97 percent of comparisons are within 20 centimeters and 99.86 percent of comparisons are within 30 centimeters. All comparisons were within 50 centimeters. All comparisons show a bias toward a positive count revealing that the mainscheme data tend to be slightly shoaler than those of the crosslines.

Table K-1. Junction Analysis Main Scheme vs. Cross Lines

Depth Difference Range			All Difference		Positive Difference		Negative Difference		Zero Difference
From		To	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count
00.0cm	->	10.0cm	5,009,986	83.53	1,257,780	56.02	79	87.78	3,752,127
10.0cm	->	20.0cm	808,373	97.01	808,362	92.02	11	100	
20.0cm	->	30.0cm	170,844	99.86	170,844	99.63	0	100	
30.0cm	->	40.0cm	8,118	100	8,118	99.99	0	100	
40.0cm	->	50.0cm	162	100	162	100	0	100	
50.0cm	->	60.0cm	0	100	0	100	0	100	
60.0cm	->	70.0cm	0	100	6	100	0	100	
70.0cm	->	80.0cm	0	100	0	100	0	100	
sub-totals ->			5,997,483		2,245,266		90		3,752,127
			100.00%		37.44%		0.00%		62.56%
H10876 Cross Line Sounding Minus Main Scheme Sounding.									

L. JUNCTIONS *SEE ALSO THE EVALUATION REPORT.*

This survey junctions with H10850 on the north, and with H10875 on the south. See Table L-1 for the listing of the Junction Analysis, H10876, Sheet X to H10850, Sheet R, and Table L-2 for the listing of the Junction Analysis, H10876, Sheet X to H10875, Sheet Y. Of the 429,720 comparisons with H10850, 94.07% were within 30 centimeters, and more than 99.99% were within 50 centimeters. No differences exceeded 60 centimeters.

Table L-1. Junction Analysis H10876, Sheet X vs. H10850, Sheet R

Depth Difference Range			All Difference		Positive Difference		Negative Difference		Zero Difference
From		To	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count
00.0cm	->	10.0cm	179,446	41.76	101,978	30.45	63,379	78.52	14,089
10.0cm	->	20.0cm	128,536	71.67	115,692	64.99	12,844	94.44	
20.0cm	->	30.0cm	96,242	94.07	92,297	92.55	3,945	99.33	
30.0cm	->	40.0cm	21,300	99.02	20,759	98.75	541	100	
40.0cm	->	50.0cm	4,032	100	4,029	99.95	3	100	
50.0cm	->	60.0cm	164	100	164	100	0	100	
60.0cm	->	70.0cm	0	100	0	100	0	100	
sub-totals ->			429,720		334,919		80,712		14,089
			100.00%		77.94%		18.78%		3.28%
H10850 Sounding Minus H10876 Sounding Junction Analysis									

Of the 459,901 comparisons with H10875, 97.52% were within 30 centimeters, and more than 99.99% were within 50 centimeters. Only one difference exceeded 60 centimeters.

Table L-2. Junction Analysis H10876, Sheet X vs. H10875, Sheet Y

Depth Difference Range			All Difference		Positive Difference		Negative Difference		Zero Difference
From		To	Count	Cumulative Percent	Count	Cumulative Percent	Count	Cumulative Percent	Count
00.0cm	->	10.0cm	197,589	42.96	61,320	69.68	126,492	34.93	9,777
10.0cm	->	20.0cm	156,423	76.98	20,244	92.69	136,179	72.54	
20.0cm	->	30.0cm	78,074	93.95	6,003	99.51	72,071	92.44	
30.0cm	->	40.0cm	16,425	97.52	431	100	15,994	96.85	
40.0cm	->	50.0cm	10,305	99.76	1	100	10,304	99.70	
50.0cm	->	60.0cm	1,084	100	0	100	1,084	100	
60.0cm	->	70.0cm	1	100	0	100	1	100	
sub-totals ->			459,901		87,999		362,125		9,777
			100.00%		19.13%		78.74%		2.13%
H10875 Sounding Minus H10876 Sounding Junction Analysis									

M. COMPARISON WITH PRIOR SURVEYS SEE ALSO THE EVALUATION REPORT

Comparison with prior surveys was not required under this contract. See Section N for comparison to the nautical chart.

N. COMPARISON WITH THE CHART SEE ALSO THE EVALUATION REPORT

H10876 was compared to Chart 11323, 57th edition, 27 March 1999 at scale 1:80,000 instead of the specified 55th edition, and to chart 11330, 12th edition, 08 August 1998, at a scale 1:250,000.

Soundings on this survey are generally within one foot of the charted soundings. In the vicinity of 29° 02' 19"N, 094° 22' 49"W, this survey is 3 feet shallower than the chart (11323). An area of sand waves runs from approximately 28° 57 12'"N, 094° 21' 00"W to 28° 54' 09"N, 094° 27' 03"W. The extents of the sand wave areas are depicted on the smooth sheet, and are further discussed in the three area investigations below. These three areas appear to be branches of the same sand wave field.

Charted platform HI-A577-A at 29° 00' 50"N 094° 26' 16"W was listed for deletion by Notice to Mariners before the start of this survey. No traces of the platform were found in any of the survey data. NOT SHOWN ON CHART 11330. DELETE PLATFORM ACH-HI-A577-A FROM CHART 11323.

Charted platform HI-235-1 was found as charted on chart 11323 at 29° 01' 31"N 094° 27' 26"W, just outside this survey, but was not positioned by this survey. This is a lighted platform. This platform was not on chart 11330. Recommend charting of this platform. CONCUR UNLESS OTHER INFORMATION INDICATES OTHERWISE

Charted platform HI-261-A was found at position 28° 59' 39"N 094° 26' 20"W. Platform was positioned at the center of the platform from multibeam data. This is a lighted platform. This platform was not on chart 11330. Recommend charting of this platform. CONCUR, UNLESS OTHER INFORMATION INDICATES OTHERWISE. SHOWN ON CHART 11323

Charted pipelines within this survey appeared only as faint traces in the survey data. Most visible of the buried pipes was to the east from platform HI-261-A. No new pipelines were detected.

An area of shoaling at 28° 53' 07"N 094° 25' 52"W has a least depth of 63 feet. CONCUR

The shallowest in a series of small shoals was found at 28° 54' 09"N 094° 25' 02"W and has a least depth of 54 feet. The shoals extend northwesterly from this point. CONCUR.

Region 1:

Region 1 covers significant least depths over a shoal area. Additional multibeam shall be acquired within this region, filling in the original multibeam to ensure 100% multibeam coverage within this area. Region 1 is defined as follows:

28.960833N, 94.371664W
28.960833N, 94.368330W
28.954985N, 94.368330W
28.954985N, 94.371664W
28.960833N, 94.371664W

Results of Investigation: The 100% multibeam coverage revealed a large sand wave oriented north northeast to south southwest with a least depth of 42 feet, and a smaller wave with least depth of 44 feet just to the west. Surrounding depths are 47 to 50 feet. Chart 11323 shows a 43-foot sounding just east of the surveyed 42-foot sounding. Recommend removing charted 43 feet at 28° 57' 30"N 094° 22' 04"W, and replacing by a 42 foot sounding at 28° 57' 30"N 094° 22' 06"W. CONCUR

Region 2:

Region 2 covers significant least depths over a shoal area. Additional multibeam shall be acquired within this region, filling in the original multibeam to ensure 100% multibeam coverage within this area. Region 2 is defined as follows:

28.944946N, 94.370093W
28.955797N, 94.355811W
28.955797N, 94.350057W
28.946620N, 94.349975W
28.936569N, 94.370134W
28.944946N, 94.370093W

Results of Investigation: The 100% multibeam coverage revealed large sand waves oriented northwest to southeast in an area extending across the survey to the southwest. At the north east end of the area are several least depth 42-foot soundings. Depths in the troughs of the waves are 49 to 50 feet. Least depths of the sand waves become gradually deeper toward the southwest. In this sand wave area, soundings are both deeper and shallower than the charted soundings. This is likely because of migration of the sand waves. Recommend that least depths from this survey be charted to replace the presently charted soundings. Charted 43 feet at 28° 57' 09"N 094° 21' 00"W should be replaced by a 42 foot sounding. The charted 45 feet at 28° 56' 45"N 094° 21' 48"W should be replaced by a 43 foot sounding at 28° 56' 33"N 094° 21' 54"W. CONCUR. CHART PRESENT SURVEY SOUNDINGS.

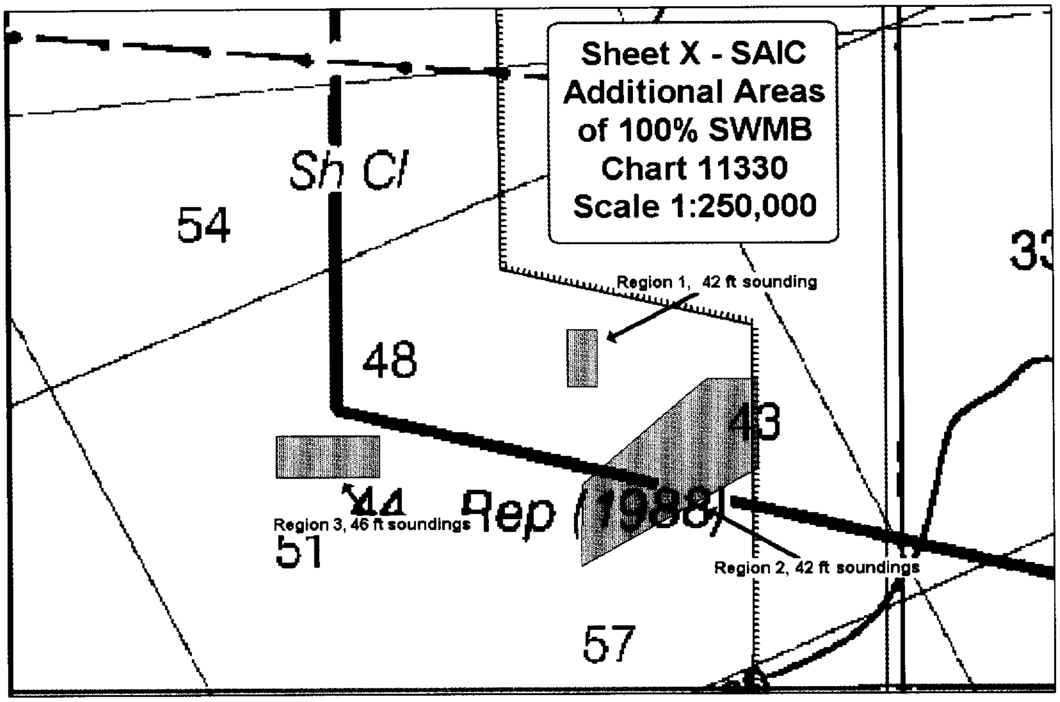
Region 3:

Region 3 covers significant least depths over a shoal area. Additional multibeam shall be acquired within this region, filling in the original multibeam to ensure 100% multibeam coverage within this area. Region 3 is defined as follows:

28.94583N, 94.405055W
28.95000N, 94.405055W
28.95000N, 94.393279W
28.94583N, 94.393279W
28.94583N, 94.405055W

Results of Investigation: The 100% multibeam coverage revealed sand waves oriented north to south in an area generally east - west. This area contains several least depth 46-foot soundings. The charted 44 Rep (1988) is now in 50 foot depths at the southeast corner of this investigation. Perhaps the reported position was wrong, or the sand waves may have migrated. Recommend charting the 46-foot soundings from this survey, and removing the charted 44 Rep (1988). CONCUR. DELETE 44 REP (1998). CHART PRESENT SURVEY SOUNDINGS

Figure N-1. Additional Areas of 100% SWMB



O. ADEQUACY OF SURVEY SEE ALSO THE EVALUATION REPORT.

Not used by Contractor.

P. AIDS TO NAVIGATION

Charted pipelines within this survey are buried pipelines whose traces are barely visible in the data. These pipes are not useful for aids to navigation. No new pipelines were detected. There are no aids to navigation in this survey.

Q. STATISTICS

Survey statistics are as follows:

1616 nm	Linear nautical miles of sounding lines (multibeam and side scan)
51.0 nm^2	Square nautical miles of multibeam and side scan
57	Number of sound velocity casts
3	Number of items investigated

R. MISCELLANEOUS SEE ALSO THE EVALUATION REPORT

Figure R-1 shows the distribution by beam number of the 36,525 soundings selected for the smooth sheet. The majority of soundings appear to be in the area where the bottom detection algorithm changes from phase to amplitude. All of the soundings selected meet the position and depth accuracy specifications (position error not to exceed 10 meters at 95% confidence, depth error not to exceed 0.3 meter at 90% confidence).

Figure R-1. Histogram of Selected Soundings by Beam Number

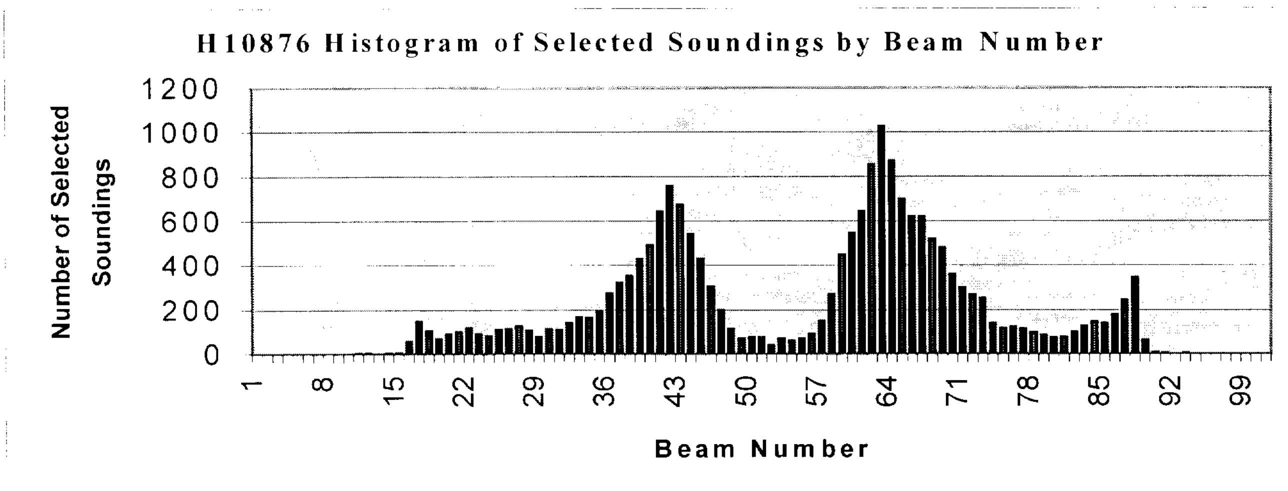
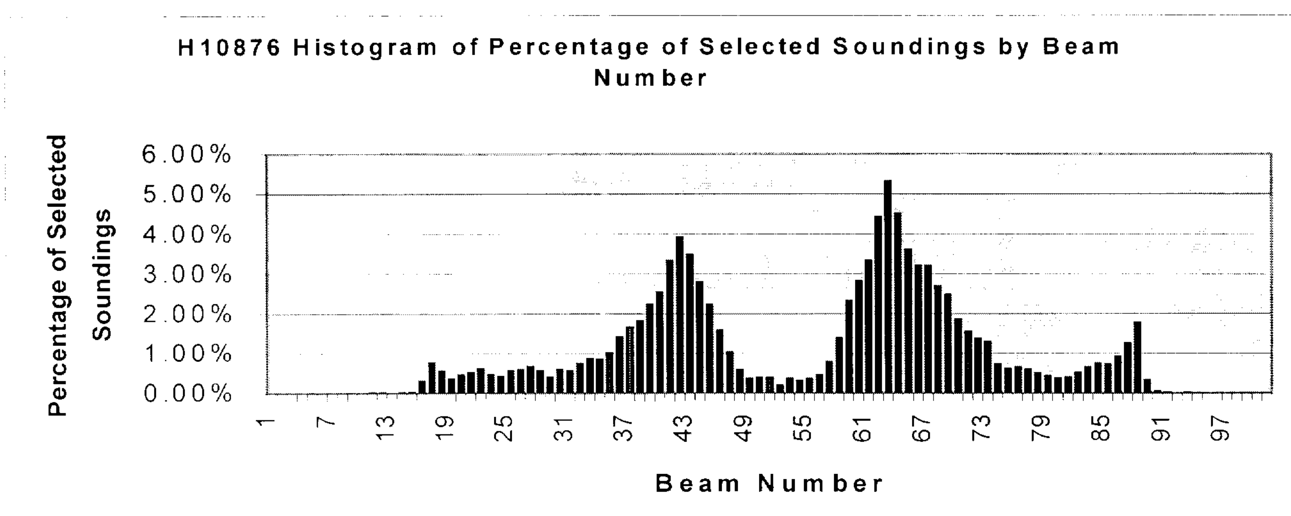


Figure R-2. Histogram of Percentage of Selected Soundings by Beam Number



S. RECOMMENDATIONS

Recommend the entire common area of charts 11323, and 11330 be reconstructed with data from this survey. There are no recommendations for further investigation.

T. REFERRAL TO REPORTS

None.

March 31, 2000

LETTER OF APPROVAL

REGISTRY NUMBER H10876

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of survey H10876 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and smooth sheet have been closely reviewed and are considered complete and adequate as per the Statement of Work.

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Walter S. Simmons
Hydrographer
March 31, 2000

APPENDIX A: DANGER TO NAVIGATION REPORT

None.

APPENDIX B: LANDMARKS AND NON-FLOATING AIDS TO NAVIGATION LISTS

None.

APPENDIX C: LIST OF HORIZONTAL CONTROL STATIONS

Pier 15:
Latitude: 29 18 49.0409 N
Longitude: 094 47 10.5748 W
Elevation: 9.0 feet
Geodetic station name: CG 20
Year established: 1974
Source of position: Published in National Geodetic Survey database.

Pier 15:
Latitude: 29 18 42.29418 N
Longitude: 094 47 22.07144 W
Elevation: 9.0 feet
Geodetic station name: CG 21
Year established: 1974
Source of position: Published in National Geodetic Survey database.

APPENDIX D: LIST OF GEOGRAPHIC NAMES

NOAA FORM 76-155 (11-72)

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

GEOGRAPHIC NAMES

SURVEY NUMBER H10876

Name on Survey	A ON CHART NO.	B ON PREVIOUS SURVEY NO.	C ON U.S. QUADRANGLE MAPS	D FROM LOCAL INFORMATION	E ON LOCAL MAPS	F P.O. GUIDE OR MAP	G RAND MCNALLY ATLAS	H U.S. LIGHT LIST	K	
Gulf of Mexico	11330									1
Sabine Pass	11330									2
Texas	11330									3

NOAA FORM 76-155
(11-72)

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

GEOGRAPHIC NAMES

SURVEY NUMBER

H-10876

Name on Survey	A ON CHART NO. 11323, 11330	B ON PREVIOUS SURVEY NO.	C ON U.S. QUADRANGLE MAPS	D FROM LOCAL INFORMATION	E ON LOCAL MAPS	F P.O. GUIDE OR MAP	G RAND MCNALLY ATLAS	H U.S. LIGHT LIST	K	
GALVESTON (title)	X		X							1
GULF OF MEXICO	X		X							2
TEXAS (title)	X		X							3
										4
										5
										6
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										24
										25

Approved:

Chief Geographer AUG 31 2000

NOAA FORM 76-155 SUPERSEDES C&GS 197

NOAA FORM 61-29
(12-71)

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

REFERENCE NO.
N/CS 33-09-01

LETTER TRANSMITTING DATA

DATA AS LISTED BELOW WERE FORWARDED TO YOU BY (Check)

- [ ] ORDINARY MAIL
- [ ] AIR MAIL
- [ ] REGISTERED MAIL
- [x] EXPRESS
- [ ] GBL (Give number)

TO:

NOAA/National Ocean Service
Chief, Data Control Group, N/CS 3x1
SSMC3, Station 6826
1315 East-West Highway
Silver Spring, MD 20910-3832

DATE FORWARDED

NUMBER OF PACKAGES 2

NOTE: A separate transmittal letter is to be used for each type of data, as tidal data, seismology, geomagnetism, etc. State the number of packages and include an executed copy of the transmittal letter in each package. In addition the original and one copy of the letter should be sent under separate cover. The copy will be returned as a receipt. This form should not be used for correspondence or transmitting accounting documents.

H10876
Texas, Gulf of Mexico, 27 NM ESE of Galveston

1 Box Containing:
  1 Original Descriptive Report

1 Tube Containing:
  1 Original smooth sheet for H10876
  1 paper composit plot for H10876 for chart 11323
  1 paper composit plot for H10876 for chart 11330
  1 mylar H-Drawing for H10876 for chart 11323
  1 mylar H-Drawing for H10876 for chart 11330
  10 Contractor (SAIC) field sheets

FROM: (Signature) R. H. Whitfield

RECEIVED THE ABOVE
(Name, Division, Date)

Return receipted copy to:

Richard H. Whitfield
NOAA, NOS, Atlantic Hydrographic Branch, N/CS33
439 West York St.
Norfolk, VA 23510

02/15/2001

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NUMBER: H10876

NUMBER OF CONTROL STATIONS	2
NUMBER OF POSITIONS	19327
NUMBER OF SOUNDINGS	19327

	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	18.0	04/20/2000
VERIFICATION OF FIELD DATA	49.0	08/18/2000
QUALITY CONTROL CHECKS	0.0	
EVALUATION AND ANALYSIS	2.0	
FINAL INSPECTION	50.0	01/29/2001
COMPILATION	38.0	02/06/2001
TOTAL TIME	157.0	

ATLANTIC HYDROGRAPHIC BRANCH APPROVAL 02/15/2001

ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR H10876 (1999-2000)

This Evaluation Report has been written to supplement and/or clarify the original Descriptive Report. Sections in this report refer to the corresponding sections of the Descriptive Report.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

The following software was used to process data at the Atlantic Hydrographic Branch:

Hydrographic Processing System
NADCON, version 2.10
AutoCad, Release 12
MicroStation 95, version 5.05
I/RAS B, version 5.01
CARIS HIPS/SIPS

The smooth sheet was plotted using a Hewlett Packard DesignJet 2500CP plotter.

H. CONTROL STATIONS

Horizontal control used for this survey during data acquisition is based upon the North American Datum of 1983 (NAD 83). Office processing of this survey is based on these values. The smooth sheet has been annotated with ticks showing the computed mean shift between the NAD 83 and the North American Datum of 1927 (NAD 27).

To place this survey on the NAD 27, move the projection lines 0.883 seconds (27.187 meters or 1.36 mm at the scale of the survey) north in latitude, and 0.664 seconds (17.988 meters or 0.90 mm at the scale of the survey) west in longitude.

L. JUNCTIONS

H10850 (1999) to the north
H10875 (1999) to the south
H10943 (1999) to the southeast

A standard junction was effected between the present survey and surveys H10850, H10875, and H10943. There are no junctional surveys to the northeast and west. Present survey depths are in harmony with the charted hydrography to the northeast and west.

M. COMPARISON WITH PRIOR SURVEYS

A comparison with prior surveys was not done during office processing in accordance with section 4. of the memorandum titled *Changes to Hydrographic Survey Processing*, dated May 24, 1995.

N. COMPARISON WITH CHARTS 11323 (58th ED., JUN 24/00) 11330 (12th ED., AUG 08/98)

The charted hydrography originates with the prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in section N. of the Descriptive Report.

The present survey is adequate to supersede the charted hydrography within the common area.

O. ADEQUACY OF SURVEY

This is an adequate hydrographic/side scan sonar/multi-beam survey. No additional work is recommended.

R. MISCELLANEOUS

Chart compilation was done by Atlantic Hydrographic Branch personnel, in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver Spring, Maryland. The following NOS Charts were used for compilation of the present survey: 11323 (58th ED., JUN 24/00)
11330 (12th ED., AUG 08/98)

H10876

Robert Snow

Robert Snow
Cartographic Technician
Verification of Field Data
Evaluation and Analysis

APPROVAL SHEET
H10876 (1999-2000)

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of depth curves, development of critical depths, cartographic symbolization, and verification or disproval of charted data. The digital data have been completed and all revisions and additions made to the smooth sheet during survey processing have been entered in the digital data for this survey. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Date: 2-15-01

Richard H. Whitfield
Cartographer
Atlantic Hydrographic Branch

I have reviewed the smooth sheet, accompanying data, and reports. This survey and accompanying digital data meet or exceed NOS requirements and standards for products in support of nautical charting except where noted in the Evaluation Report.

Date: 2/15/1

Andrew L. Beaver, LCDR, NOAA
Chief, Atlantic Hydrographic Branch

****

Final Approval:

Approved: Date: 7-16-01

Samuel P. De Bow, Jr.
Captain, NOAA
Chief, Hydrographic Surveys Division

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H10876

INSTRUCTIONS

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.

1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS
11323	1/31/01	[signature]	Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No.
11330	2/2/01	[signature]	Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
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			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.