H10873

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey MULTIBEAM/SIDE SCAN SONAR

Field No. S

Registry No. H10873

LOCALITY

State TEXAS

General Locality GULF OF MEXICO

Locality 37 MILES ESE OF GALVESTON

1999-2000

CHIEF OF PARTY
WALTER S. SIMMONS

NOAA FORM 77-28 (11-72) U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NO.
HYDROGRAPHIC TITLE SHEET	**H10873**
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. **S**

State TEXAS

General locality GULF OF MEXICO

Locality 37 MILES ESE OF GALVESTON

Scale 1:20,000 Date of survey 19 May 1999 – 28 July 1999
03 Feb 2000 –08 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, B. Andrews, E. Tobey, S. Lemke, R. DeKeyzer

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~~ HP DESIGNJET 2500CP

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

HAND WRITTEN NOTES IN THE DESCRIPTIVE REPORT WERE MADE DURING OFFICE PROCESSING
AHB/OIS/SURFV 11/8/00, SJV

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

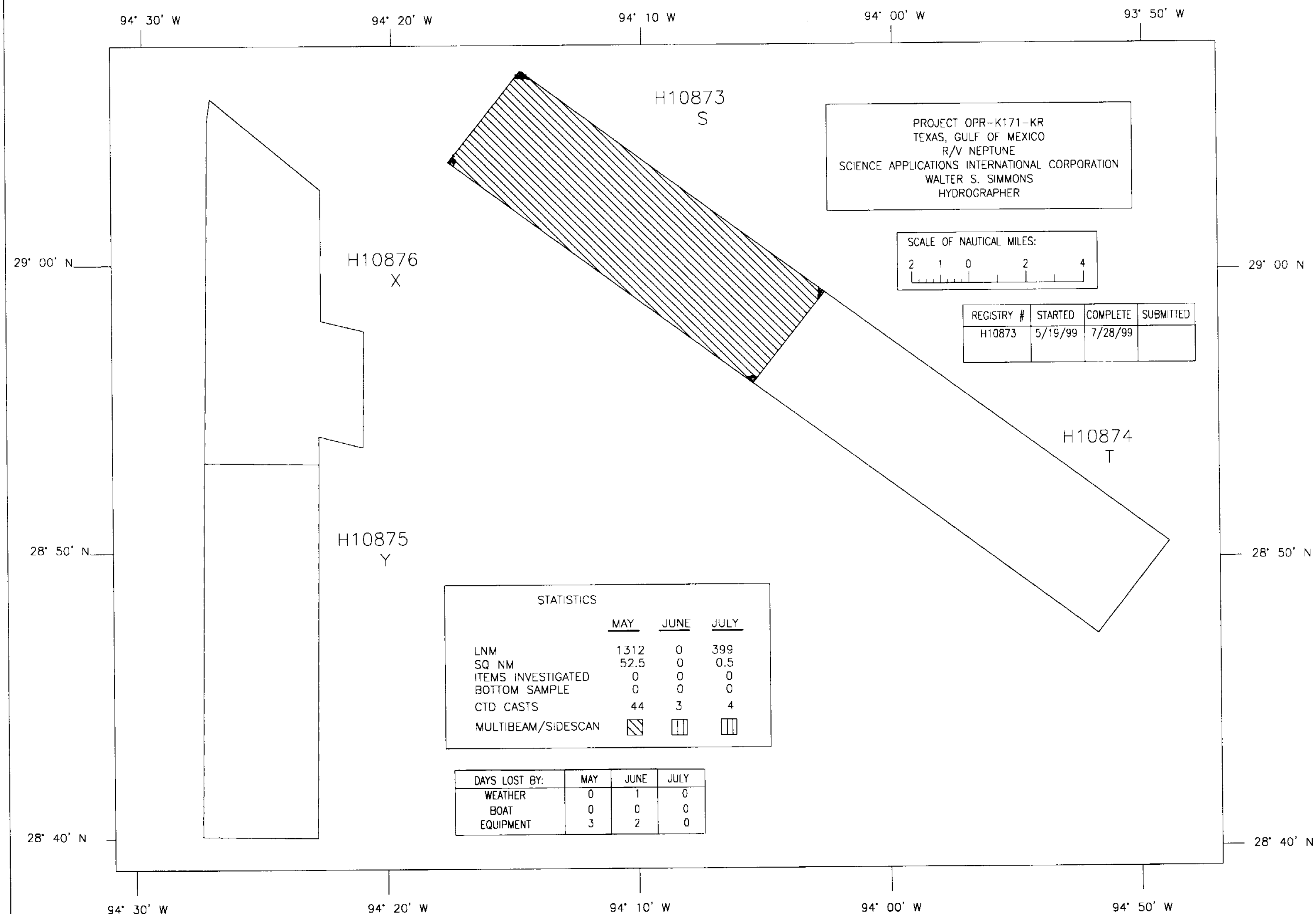
☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—665-661/1222 REGION NO. 6

INDEX OF SHEETS

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
H10873
MULTIBEAM SONAR – SIDESCAN SONAR



PROJECT OPR-K171-KR
TEXAS, GULF OF MEXICO
R/V NEPTUNE
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
WALTER S. SIMMONS
HYDROGRAPHER

REGISTRY #	STARTED	COMPLETE	SUBMITTED
H10873	5/19/99	7/28/99	

STATISTICS

	MAY	JUNE	JULY
LNM	1312	0	399
SQ NM	52.5	0	0.5
ITEMS INVESTIGATED	0	0	0
BOTTOM SAMPLE	0	0	0
CTD CASTS	44	3	4
MULTIBEAM/SIDESCAN			

DAYS LOST BY:	MAY	JUNE	JULY
WEATHER	0	1	0
BOAT	0	0	0
EQUIPMENT	3	2	0

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.

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List of Figures

List of Tables

Descriptive Report to Accompany
Hydrographic Survey H10873
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
	04 January 2000	Modification #6:56-DGNC-0-24007/SAIC

Dates of Supplemental Instructions: 4 August 1998, 25 May 1999
Sheet Letter: S
Registry Number: H10873
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:

29.059374 N	094.294823 W
29.112429 N	094.247297 W
28.985523 N	094.044740 W
28.932596 N	094.091899 W
29.059374 N	094.294823 W

Dates of multibeam data acquisition (UTC):

05/19/99 – 05/22/99	JD 139 – 142
05/24/99 – 05/31/99	JD 144 – 151
06/05/99	JD 156
06/11/99	JD 192
01/30/00 – 01/31/00	JD 030 – 031
02/03/00 – 02/06/00	JD 034 – 037
02/08/00	JD 039

Dates of side scan data acquisition (UTC):

05/19/99 – 05/22/99	JD 139 – 142
05/24/99 – 06/05/99	JD 144 – 156

06/08/99 – 06/09/99	JD 159 – 160
07/08/99 – 07/12/99	JD 189 – 193
07/24/99 – 07/28/99	JD 205 – 209
02/04/00 – 02/06/00	JD 035 – 037

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

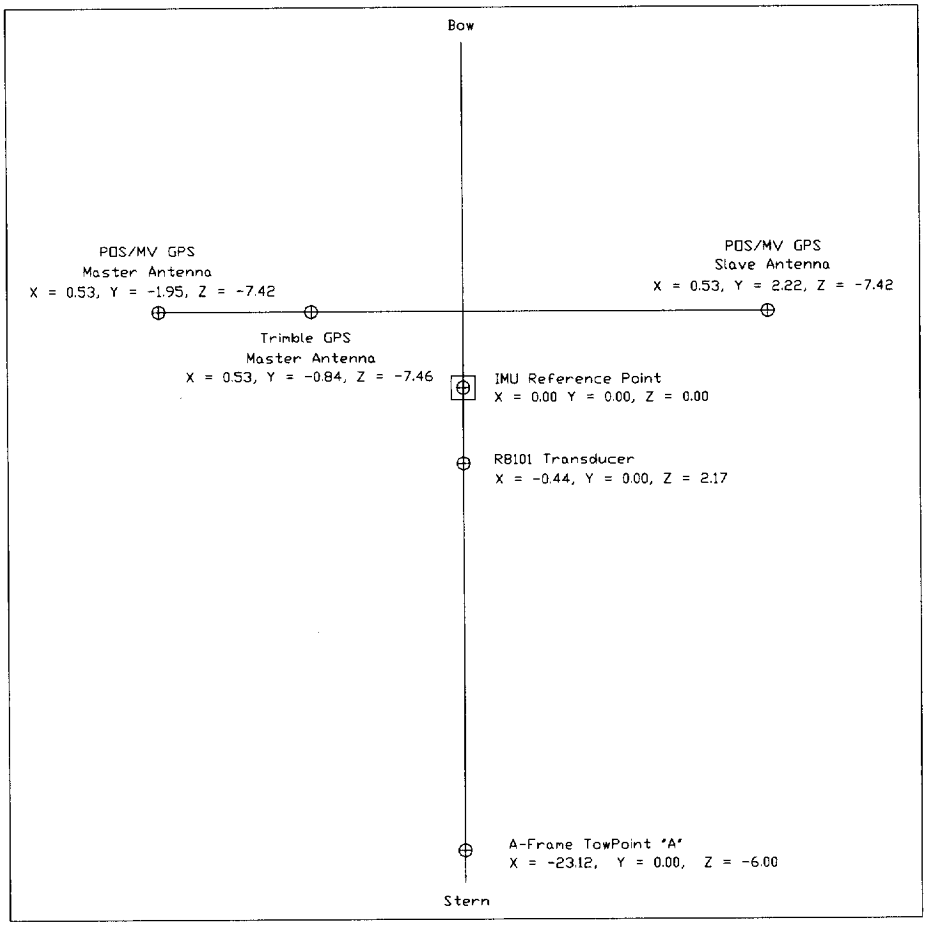
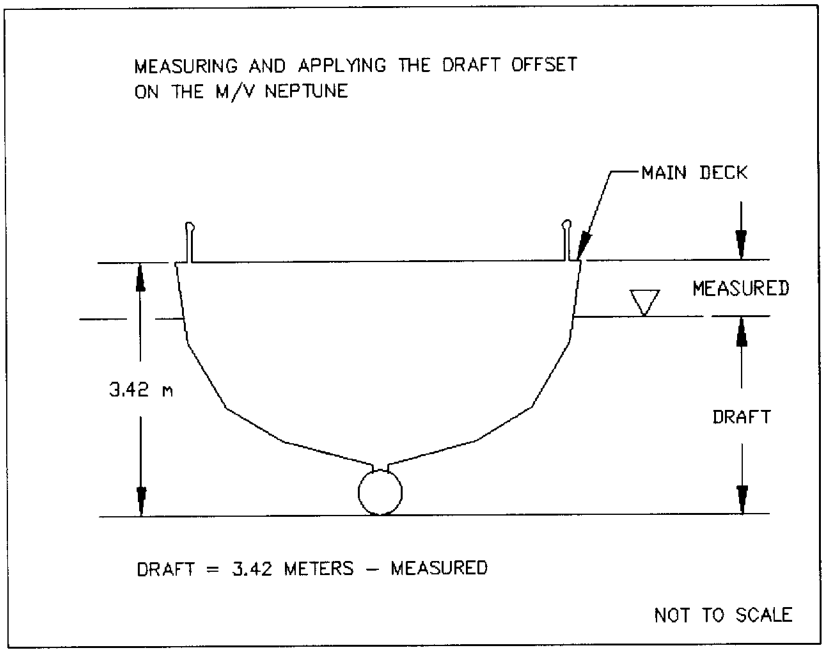


Table C-2. R/V Neptune Antenna and Transducer Locations Relative To the POS/MV IMU Vessel Reference Point, measurements in meters

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 have different coordinate systems, and therefore 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. AUTOMATED DATA ACQUISITION AND PROCESSING SEE ALSO THE EVALUATION REPORT

Data acquisition was through 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** 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 35 meters in the area of Heald Bank and the shoaler area in the southeast portion of the survey area. Range scale was set to 50 meters for the remainder of the sheet. 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 H10873 survey was the Klein 5500 System. This 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 100-meters throughout the survey, except for some gap fills where the hydrographer decided to set the range scale to 75-meters each side to reduce the occurrence of additional gaps caused by surface wave interference. 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 find 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. Then the interactive editing was performed to remove noise, fish, etc. The editing process used the geoswath geo-referenced editor which allowed 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 H10873 multibeam data were reprocessed with verified tide data from the Sabine Pass Offshore (877-1081) station as downloaded from the NOAA/CO-OPS web page. VERIFIED TIDES FROM NOS/CO-OPS WEBSITE 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.

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The real time multibeam acquisition system used for the H10873 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.
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 done 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 made, verified, and corrected to ensure data coverage and also check for navigation errors. Next, outer beams of the multibeam data, exceeding 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 written down 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 H10873 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 38 to 68 feet. The side scan towfish altitude off the bottom was maintained between eight and fifteen meters. The MacArtney Sheave used had 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 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 due to the remote controller for the winch. Adjustments to the length of cable deployed were required several times during each survey line. These primarily occurred in the Heald Bank area and an area of shallower water in the southern portion of the sheet. A proprietary software program, which displays the towfish and water depths, made monitoring the towfish altitude easy.

The depressor allowed the amount of cable out to be less than the water depth. This permitted turns to be tighter and thus faster than surveys previously conducted without the use of a depressor. There was also no need to worry 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 80-meters. Survey lines were run at an azimuth of 126° and 306°. Navigation and side scan file names were manually changed after each survey line was completed. Due to 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 100-meters except for some gap fill lines where the range scale was set to 75-meters and the line spacing was proportionally reduced.

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

2. Problems Encountered During Side Scan Sonar Survey Acquisition

Cable failures – Initially we were using a 0.40 inch diameter armored co-ax cable to tow the Klein 5500 sonar. After experiencing three cable breaks, we changed to a 0.68 inch diameter armored co-ax cable. Both cables would strum in the water. The first and third cable breaks appeared to be caused by the cable flexing against the termination bottle lip as the cable strummed. There were no signs of tensile failure in the wire strands. The second cable break was caused by hitting something soft but very heavy in the water column. The cable was stretched and stripped from the termination bottle, and the mounting brackets for the Klein K-wing-2 depressor were bent and the bolt holes stretched out. Duct tape faring was used to reduce the strumming, but it did not prevent the third cable break.

In the beginning, there were numerous and frequent Klein TPU crashes. After we discovered a shorted 200 volt wire in the TPU and replaced it, the crashes were in-frequent.

Sargasso weed floating on the water surface was a continual detriment to acquisition of good side scan data. The Klein 5500 locks on to the strongest signal. In water depths less than 60 feet, this usually means the water surface if Sargasso or wind waves are 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. After having difficulty collecting acceptable quality data because of surface wave interference, the hydrographer decided to collect side scan gap fill data using a range scale of 75-meters. The decrease in range of 25 meters per channel dramatically improved the quality of the image. Where the 75-meter range scale was used, two lines were needed to fill each of these data gaps to ensure adequate coverage.

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.

After data collection began, we discovered that the ping time was time-stamped from the Klein TPU clock that drifts at an excessive rate. This resulted in the wrong position being recorded for each ping. Fortunately, the 1-PPS fix time and position were correctly recorded in the Klein 5kd data files. SAIC's xtf_io software was used to adjust the ping times to the correct time, which was determined from the fix times. SAIC's navup (navigation update) software was used to correct the ping positions in all XTF data through June 16, 1999. 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, and features were selected for the smooth sheet.

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.

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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, 14 September 1999.
- "B" - Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 2710, Calibration Dates: 15 October 1998, 14 September 1999.
- "C" - Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 1915869-2389, Calibration Dates: 02 September 1998.

The primary unit was SBE19 #0565. Daily confidence checks were obtained from 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 center beam 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 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

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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' 42"N,094° 28' 48"W 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.

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

* FILED WITH ORIGINAL FIELD RECORDS

sound velocity profile and entered into the RESON system. Initially, the roll, pitch, and heading bias's 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. 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 H10873 are shown in Table G-1.

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

* FILED WITH ORIGINAL FIELD RECORDS

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. 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 below 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 82 linear nautical miles of crosslines surveyed and 1236 linear nautical miles of mainscheme lines surveyed resulting in 6.6 percent coverage by crosslines.

Comparisons of all crossing data show that more than 96 percent of comparisons are within 30 centimeters and 99.99 percent of comparisons are within 50 centimeters. All comparisons show a bias toward a positive count revealing that the mainscheme data tend to be slightly deeper than that 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	1,651,624	46.82	893,482	35.7	642,489	70.66	115,653
10.0cm	->	20.0cm	1,180,677	80.29	964,917	74.26	215,760	94.39	
20.0cm	->	30.0cm	585,046	96.88	536,128	95.68	48,918	99.77	
30.0cm	->	40.0cm	96,602	99.62	94,573	99.46	2,029	100	
40.0cm	->	50.0cm	13,203	99.99	13,167	99.99	36	100	
50.0cm	->	60.0cm	357	100	357	100	0	100	
60.0cm	->	70.0cm	6	100	6	100	0	100	
70.0cm	->	80.0cm	0	100	0	100	0	100	
80.0cm	->	90.0cm	0	100	0	100	0	100	
90.0cm	->	100.0cm	0	100	0	100	0	100	
100.0cm	->	110.0cm	0	100	0	100	0	100	
sub-totals ->			3,527,515		2,502,630		909,232		115,653
			100.00%		70.95%		25.78%		3.28%
H10873 Main Scheme Sounding minus Cross Line Sounding.									

L. JUNCTIONS SEE ALSO THE EVALUATION REPORT

This survey junctions with H10850 on the north, and with H10874 on the south. See Table L-1 for the listing of the Junction Analysis, H10873, Sheet S to H10850, Sheet R, and Table L-2 for the listing of the Junction Analysis, H10873, Sheet S to H10874, Sheet T. Of the 201,027 comparisons with H10850, 91.26% were within 30 centimeters, and more than 99.99% were within 50 centimeters. No differences exceeded 60 centimeters.

Table L-1. Junction Analysis H10873, Sheet S 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	63,516	31.60	44,154	24.88	16,712	79.91	2,650
10.0cm	->	20.0cm	73,604	68.21	69,723	64.17	3,881	98.47	
20.0cm	->	30.0cm	46,331	91.26	46,011	90.10	320	100	
30.0cm	->	40.0cm	15,325	98.88	15,325	98.73	0	100	
40.0cm	->	50.0cm	2,244	100	2,244	100	0	100	
50.0cm	->	60.0cm	7	100	7	100	0	100	
60.0cm	->	70.0cm	0	100	0	100	0	100	
sub-totals ->			201,027		177,464		20,913		2,650
			100.0%		88.28%		10.40%		1.32%
H10873 Sounding Minus H10850 Sounding Junction Analysis									

Of the 455,374 comparisons with H10874, 98.15% were within 30 centimeters, and more than 99.99% were within 50 centimeters. No differences exceeded 60 centimeters.

Table L-2. Junction Analysis H10873, Sheet S vs. H10874, Sheet T

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	203,589	44.71	131,259	50.29	57,225	31.92	15,105
10.0cm	->	20.0cm	169,380	81.90	103,622	90.00	65,758	68.60	
20.0cm	->	30.0cm	73,981	98.15	21,946	98.41	52,035	97.62	
30.0cm	->	40.0cm	7,356	99.77	3,103	99.60	4,253	99.99	
40.0cm	->	50.0cm	1,060	100	1,043	100	17	100	
50.0cm	->	60.0cm	8	100	8	100	0	100	
60.0cm	->	70.0cm	0	100	0	100	0	100	
sub-totals ->			455,374		260,981		179,288		15,105
			100.0%		57.31%		39.37%		3.32%
H10873 Sounding Minus H10874 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

H10873 was compared to Chart 11323, 57th edition, 27 March 1999 at scale 1:80,000 in lieu of the specified 55th edition.

In some areas, charted soundings agree closely with this survey; however, in sand wave areas there are differences where this survey is up to 7 feet shoaler, and up to 10 feet deeper than the chart. The density of charted soundings is inadequate to depict the shape of the bottom. In the deeper areas, this survey is in general one to two feet deeper than the chart. Recommend replacement of the charted soundings with a more dense selection of soundings from this survey. CONCUR

Charted platform HI-A20-A was found at position 29° 03' 41.46"N 094° 16' 08.16"W. This is a lighted platform with RACON(---).

Charted platform HI-A23-02 was found at position 29° 00' 46.56"N 094° 12' 03.96"W. This is a lighted platform.

There are no charted pipelines within this survey, and no new pipelines were detected. U.S. Coast Guard buoy, R "2", was found on station as charted.

Charted submerged dangerous obstruction PA 29° 00' 45"N 094° 12' 03"W was not seen at that location in either the 200% side scan or the multibeam coverage. Feature #1, 57 Obstr, is the nearest to the charted position. No other obstructions found within a 2000-meter radius. Recommend removal of the charted dangerous obstruction, CONCUR and charting a 57 foot Obstruction at 29° 00' 51.17"N 094° 11' 58.37"W. DO NOT CONCUR. INSIGNIFICANT DELETE OBSTN PA

Report of a danger to navigation was filed on June 05, 1999. This report is Appendix A along with the section of chart 11323 indicating the position of danger. On July 22, 1999 NOAA forwarded a message from LT Jeffrey M. Smith, USCG Group Galveston reporting removal of the sunken buoy and dropping of the old sinker because of a fouled chain. A gap fill multibeam line, file hbmba99192.d06, revealed that there are no features at the reported Danger to Navigation positions, but there is a new obstruction (#3 in the features list, covered 46 feet) that matches the height of a USCG buoy sinker. Recommend charting 46 foot obstruction at 29° 05' 01.54"N 094° 13' 44.58"W. CONCUR ADD 46 OBSTN

Item and Area Investigation were conducted in accordance with instructions as follows:

Item 1:

I-1 originates in SAIC's table S-1 and is the correlation of side scan contacts #10, #13 and #14 (heights 1.51m, 1.37m, 0.42). These contacts were not covered within the multibeam swath, and are recommended by SAIC for an additional investigation. Contact #10 is located at 29° 04' 58.1"N, 094° 13' 35.9"W, contact #13 is located at 29° 04' 58.4"N, 094° 13' 36.4"W and contact #14 is located at 29° 04' 58.4"N, 094° 13' 35.6"W. Contacts #10, 13 appear to be a sunken buoy lying on its side, while contact #14 appears to be its sinker. Upon inspection of the side scan images, NOAA has determined that these contacts justify additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contacts near nadir.

Method of investigation: Orthogonal multibeam lines with the features near nadir.

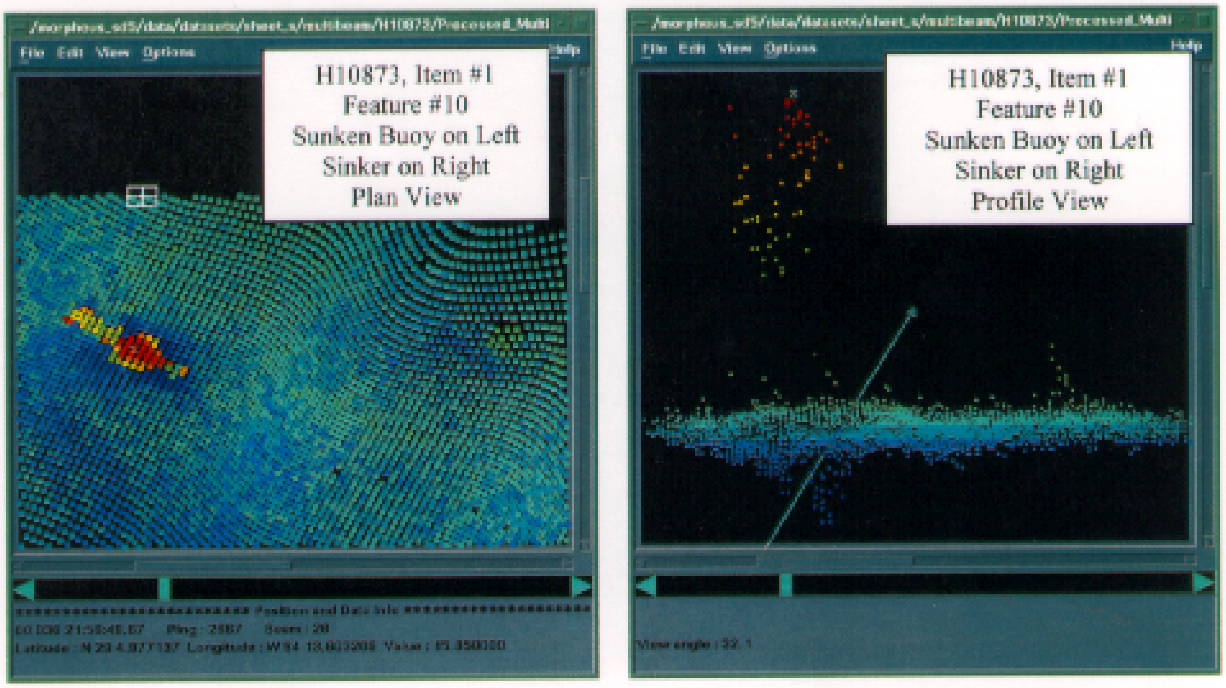
Results of investigation: The apparent sunken buoy found and designated as feature #10. The apparent buoy sinker was also found, but was not designated as a feature or plotted on the smooth sheet. The two are too near each other for plotting both (about 50 meters). Figure N-1 shows the plan and profile views of the multibeam coverage over these objects.

Recommendation: Recommend charting a 47 foot obstruction as follows:

CONCUR
ADD (47) OBSTN

Least depth:	47 feet
Latitude:	29° 04' 58.33"N
Longitude:	094° 13' 36.22"W
File:	hbmba00030.d36
Time:	21:56:50

Figure N-1. Plan and Profile Views of Feature #10, Item #1



Item 2:

I-2 originates in SAIC's table S-1 and was detected just outside the original survey area. Contact #22 is covered by 100% side scan (height 0.72), located at 28° 05' 20.5"N, 094° 12' 33.4"W. This contact is not covered within the multibeam swath and is recommended by SAIC for an additional investigation. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir.

Method of investigation: Orthogonal multibeam lines with the feature near nadir.

Results of investigation: The multibeam investigation revealed an obstruction, designated as Feature #7.

Recommendation: Recommend charting a 48 foot obstruction as follows: DO NOT CONCUR INSIGNIFICANT

Least depth:	48 feet
Latitude:	29° 05' 20.42"N
Longitude:	094° 12' 33.37"W
File:	hbmba00030.d37
Time:	22:24:23

Item 3:

I-3 originates in SAIC's table S-1 and is the correlation of side scan contacts #27 and #30 (heights 1.22m, 1.25m). These contacts were not covered within the multibeam swath, and are recommended by SAIC for an additional investigation. Contact #27 is located at 29° 03' 43.4" N, 094° 16' 07.2"W, and contact #30 is located at 29° 03' 43.1"N, 094° 16' 06.4"W. Upon inspection of the side scan images, NOAA has determined that these contacts justify additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir.

Method of investigation: Orthogonal multibeam lines with the feature near nadir.

Results of investigation: The multibeam investigation revealed an obstruction, designated as Feature #9. This obstruction is too near Platform HI-A20-A to be plotted on the smooth sheet without over lay; therefore, it was not plotted.

Recommendation: Recommend charting a 55 foot obstruction as follows: DO NOT CONCUR INSIGNIFICANT

Least depth:	55 feet
Latitude:	29° 03' 43.38"N
Longitude:	094° 16' 06.96"W
File:	hbmba00030.d38
Time:	23:06:56

Item 4 (AWOIS #312):

I-4 is a charted dangerous wreck (50 ft Rep) located at 29° 00' 01.2"N, 094° 12' 00.0"W, at the west edge of the survey limits. This feature was not detected in the 200% side scan sonar or in the multibeam. The search radius for this feature extends beyond the original survey limits. NOAA has determined that this item justifies additional work by SAIC. Additional investigation shall be conducted using side scan sonar. Side scan coverage shall be 200% encompassing a 2000 meter search radius around the charted position, extending into the area beyond the original survey limits. If the item in question is detected with side scan, multibeam data shall be acquired, specifically two orthogonal lines crossing the contact near nadir.

Method of investigation: 200 % side scan coverage of the portion of a 2000 meter radius circle around the charted position not covered by the initial survey. Orthogonal multibeam lines over a side scan contact with the feature near nadir.

Results of investigation: Three side scan contacts on the same object revealed a rectangular shape with little vertical relief. Multibeam investigation revealed a similar shape with less than one foot height, designated as Feature #8. Charted dangerous wreck (50 ft Rep) was not seen at charted location in either the 200% side scan or the multibeam coverage. The only feature that may be the wreck was Feature #8.

Recommendation: Recommend removing charted dangerous wreck (50 ft Rep), located at 29°00'01.2"N, 094°12'00.0"W, and charting of the 59 foot wreck as follows: CONCUR

DO NOT CONCUR

Least depth:	59 feet
Latitude:	29° 00' 17.89"N
Longitude:	094° 13' 0.23"W
File:	hbmba00039.d11
Time:	07:28:26

DELETE (50 ft. rep)

Item 5:

I-5 is a charted dangerous obstruction PA at 29° 02' 31.0"N, 094° 08' 01.2"W, at the east edge of the survey limits. This feature was not detected in the 200% side scan sonar or in the multibeam. The search radius for this feature extends beyond the original survey limits. NOAA has determined that this item justifies additional work by SAIC. Additional investigation shall be conducted using side scan sonar. Side scan coverage shall be 200% encompassing a 2000 meter search radius around the charted position, extending into the area beyond the original survey limits. If the item in question is detected with side scan, multibeam data shall be acquired, specifically two orthogonal lines crossing the contact near nadir.

Method of investigation: 200% side scan coverage encompassing the sector of a 2000 meter search radius around the charted position, extending into the area beyond the original survey limits

Results of investigation: Charted submerged dangerous obstruction PA, at 29° 02' 31.0"N, 094° 08' 01.2"W, was not seen at that location in either the 200% side scan or the multibeam coverage. No obstruction found within the 2000-meter radius of the charted position.

Recommendation: Recommend removing charted submerged dangerous obstruction PA. CONCUR

DELETE OBSTN PA

Additional Multibeam Coverage:

Attached are descriptions and diagrams of 9 regions which cover significant least depths over shoal areas. Additional multibeam shall be acquired within these regions, filling in the original multibeam to ensure 100% multibeam coverage within these areas.

Figure N-2. Regions 1-8

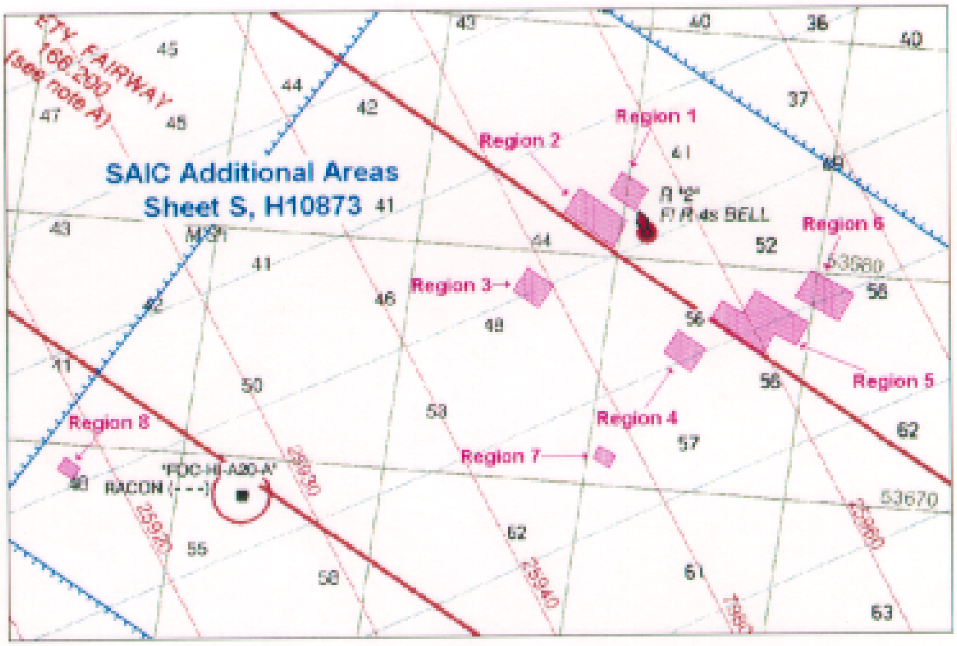
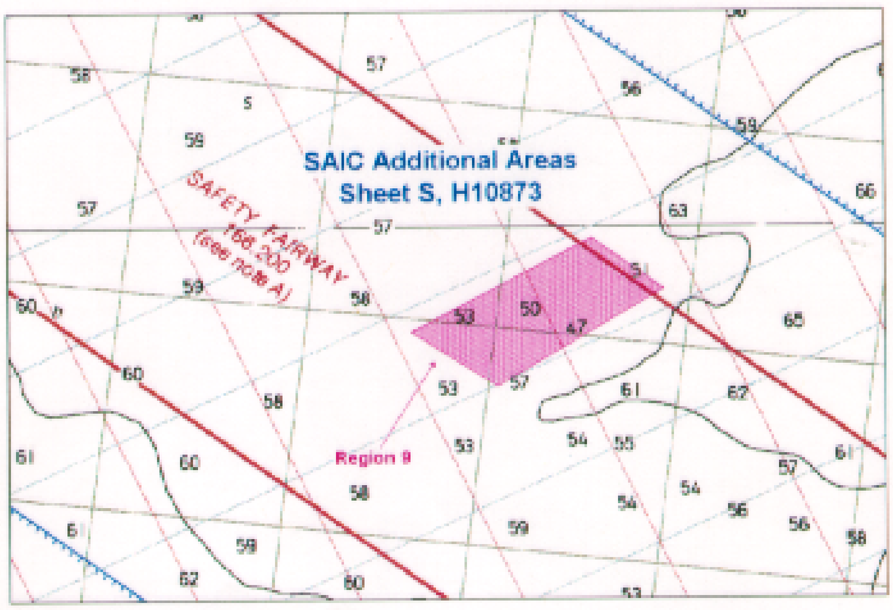


Figure N-3. Region 9



100 % multibeam coverage in Regions 1, 2, and 3 revealed sand wave formations on the edge of Heald Bank. These Regions are within an area of sand waves depicted on the smooth sheet. Least depths were:

Regions 1: 40 feet between charted 41 feet and charted 44 feet.
Regions 2: 41 feet between charted 41 feet and charted 44 feet.
Regions 3: 44 feet between charted 44 feet and charted 48 feet.

100 % multibeam coverage in Regions 4, 5, 6 and 7 revealed sand wave formations south of and generally parallel to Heald Bank. These Regions are within an area of sand waves depicted on the smooth sheet. Least depths were:

Region 4: 50 feet in charted 56 feet.
Region 5: 50 feet between charted 52 feet and charted 56 feet.
Region 6: 51 feet between charted 52 feet and charted 56 feet.
Region 7: 54 feet between charted 52 feet, charted 57 feet, and charted 62 feet.

100 % multibeam coverage in Region 8 revealed sand wave formations. . This Region is within an area of sand waves depicted on the smooth sheet. Least depth was 47 feet in charted 48 feet.

100 % multibeam coverage in Region 9 revealed sand wave formations. This Region is within an area of sand waves depicted on the smooth sheet. Comparison to the chart indicates the waves have migrated to the northwest. Least depths were:

49 feet between charted 41 feet and charted 50 feet.
50 feet in charted 51 feet.
51 feet between charted 50 feet and charted 53 feet.

O. ADEQUACY OF SURVEY SEE ALSO THE EVALUATION REPORT

Not Used by Contractor.

P. AIDS TO NAVIGATION

There are no charted pipelines within this survey, and no new pipelines were detected. U.S. Coast Guard buoy was found on station as listed in Table P-1. This buoy adequately serves its apparent purpose.

Table P-1. U.S. Coast Guard Buoys

Latitude	Longitude	Buoy Descriptor
29° 05' 00.96"N	094° 13' 42.36"W	R "2" Fl R 4s BELL

Oil Platforms were found at the positions listed in Table P-2. The platforms are near their charted positions.

Table P-2. Oil Platforms, Lighted

Latitude	Longitude	Platform Descriptor
29° 03' 41.46"N	094° 16' 08.16"W	HI-A20-A RACON(---)
29° 00' 46.56"N	094° 12' 03.96"W	HI-A23-02

Q. STATISTICS

Survey statistics are as follows:

1711 nm Linear nautical miles of sounding lines (multibeam and side scan)

53.0 nm^2	Square nautical miles of multibeam and side scan
51	Number of sound velocity casts
14	Number of items investigated

R. MISCELLANEOUS SEE ALSO THE EVALUATION REPORT

Figure R-1 shows the distribution by beam number of the 35,437 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

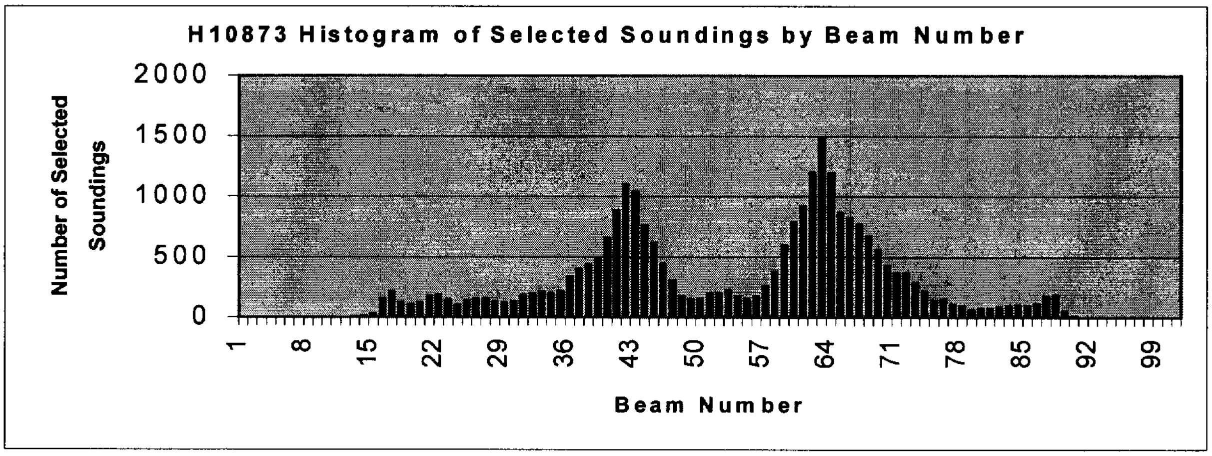
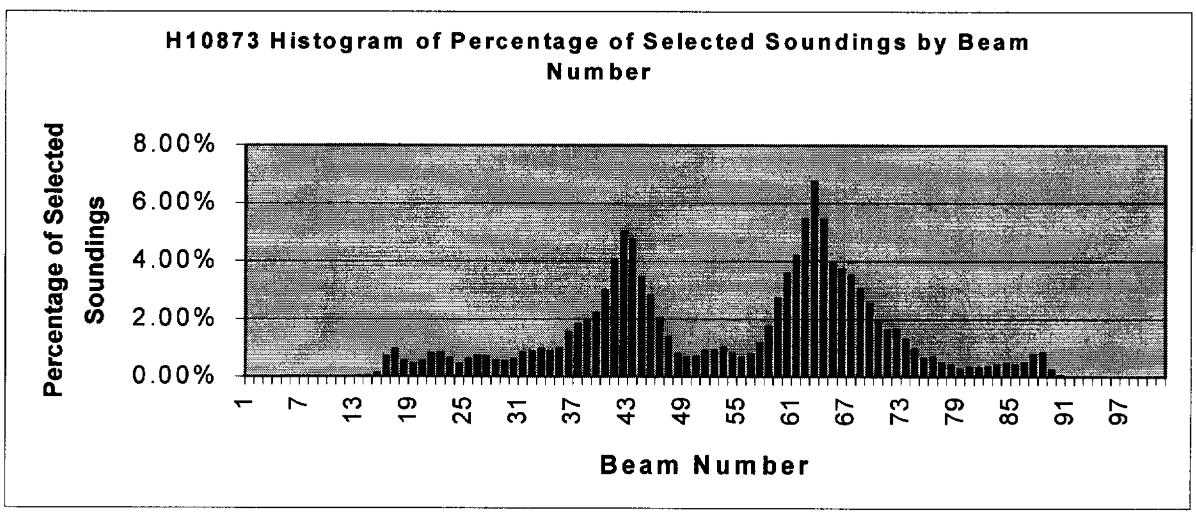


Figure R-2. Histogram of Percentage of Selected Soundings by Beam Number



S. RECOMMENDATIONS

Recommend the entire common area of charts 11323, and 11330 be reconstructed with a more dense selection of soundings from this survey. See Section N for additional recommendations.

There are no recommendations for additional investigation.

T. REFERRAL TO REPORTS

None.

APPENDIX A: DANGER TO NAVIGATION REPORT

Report of a danger to navigation was filed on June 05, 1999. This report is enclosed along with the section of chart 11323 indicating the position of danger. On July 22, 1999 NOAA forwarded a message from LT Jeffrey M. Smith, USCG Group Galveston reporting removal of the sunken buoy and dropping of the old sinker because of a fouled chain. A gap fill multibeam line, file hbmba99192.d06, revealed that there are no features at the reported Danger to Navigation positions, but there is a new obstruction (#3 in the features list, covered 46 feet) that matches the height of a USCG buoy sinker.

From: Walter Simmons <wsimmons@mtg.saic.com>
To: Andrew L. Beaver <Andrew.L.Beaver@noaa.gov>; Dave Neander <dave.neander@noaa.gov>
Cc: Rod Evans <revans@mtg.saic.com>
Subject: DANGER TO NAVIGATION
Date: Saturday, June 05, 1999 2:28 AM

The attached report describes an apparent sunken buoy sitting upright, and its associated chain and sinker.

Walter S. Simmons
Science Applications International Corporation
Hydrographic Field Party in the R/V NEPTUNE
offshore 713-652-8364, inshore 409-770-4362
Newport RI office 401-847-4210

REPORT OF DANGER TO NAVIGATION

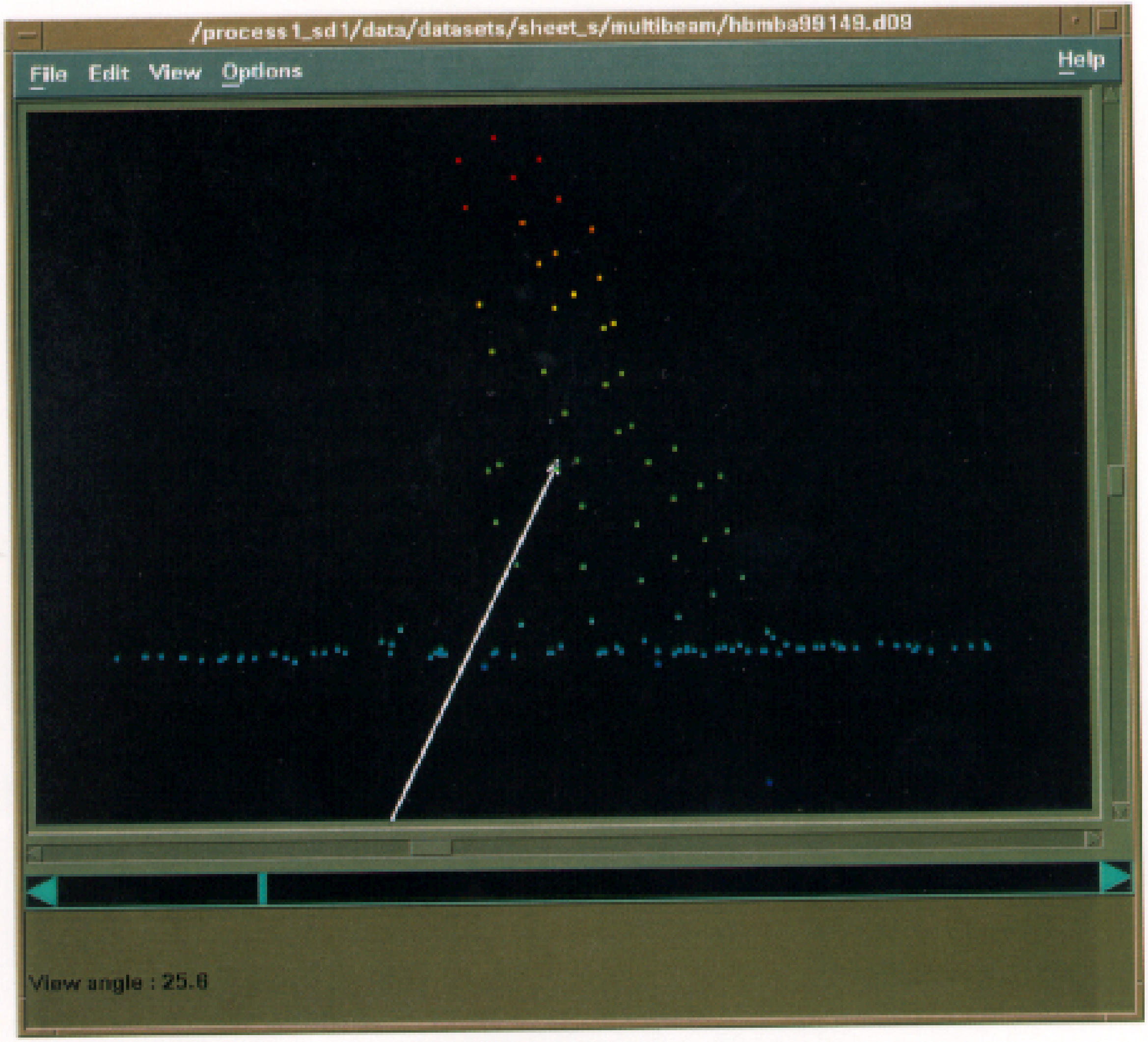
Hydrographic Survey Registry Number: H10873

State: Texas
General Locality: Gulf of Mexico
Sublocality: 37 Miles ESE of Galveston
Project Number: OPR-K171-KR
The following objects were found during hydrographic survey operations:

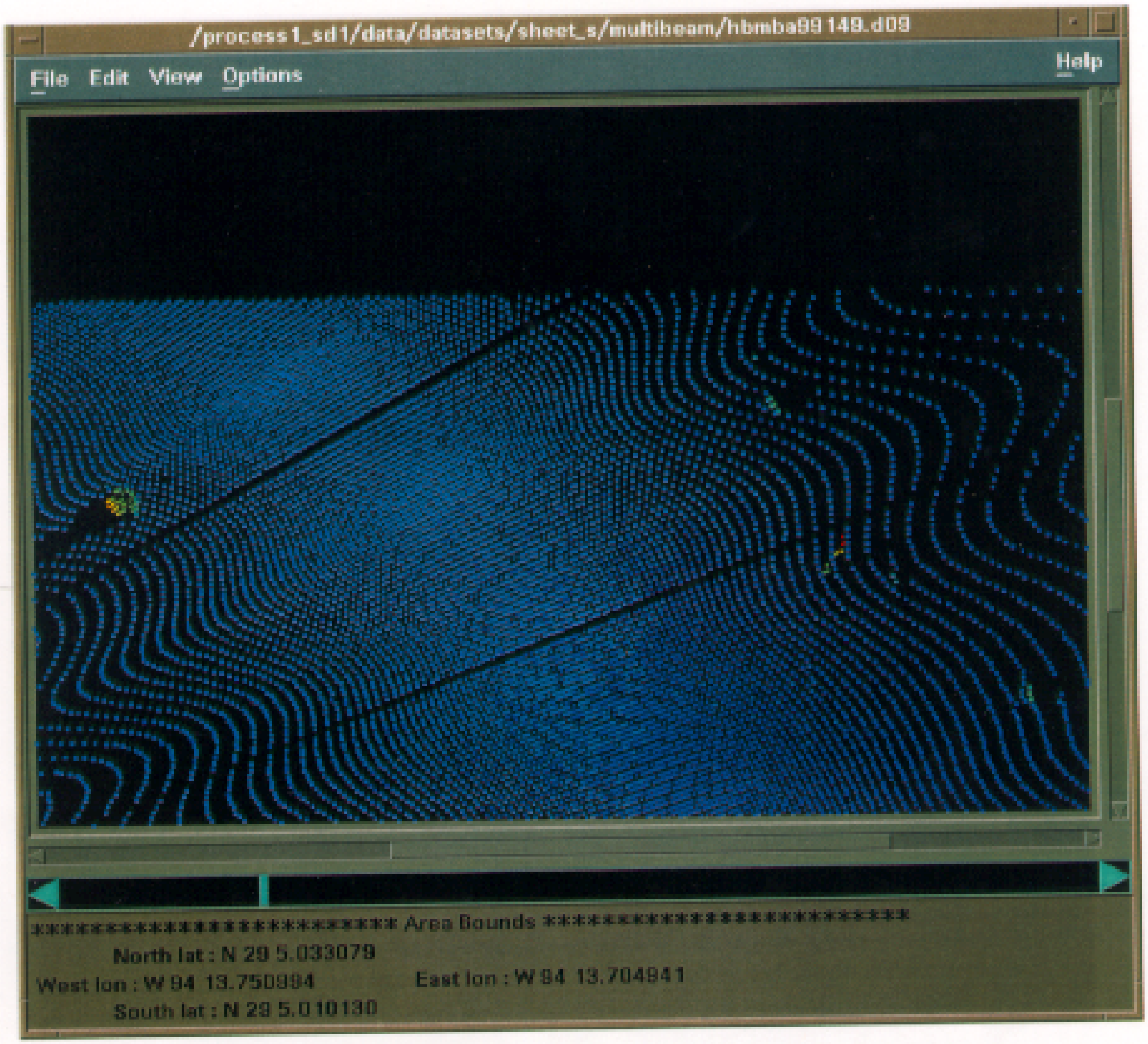
Affected nautical charts:

Chart Number	Edition		Class	Reported Depth MLLW	Charted Horizontal Datum	Geographic Position	
	No	Date		Observed		Latitude	Longitude
11323	56	03/28/98	OBSTN	32 ft	NAD 83	29° 05' 01.5" N	094° 13' 44.9" W
11323	56	03/28/98	OBSTN	46 ft	NAD 83	29° 05' 01.7" N	094° 13' 43.1" W

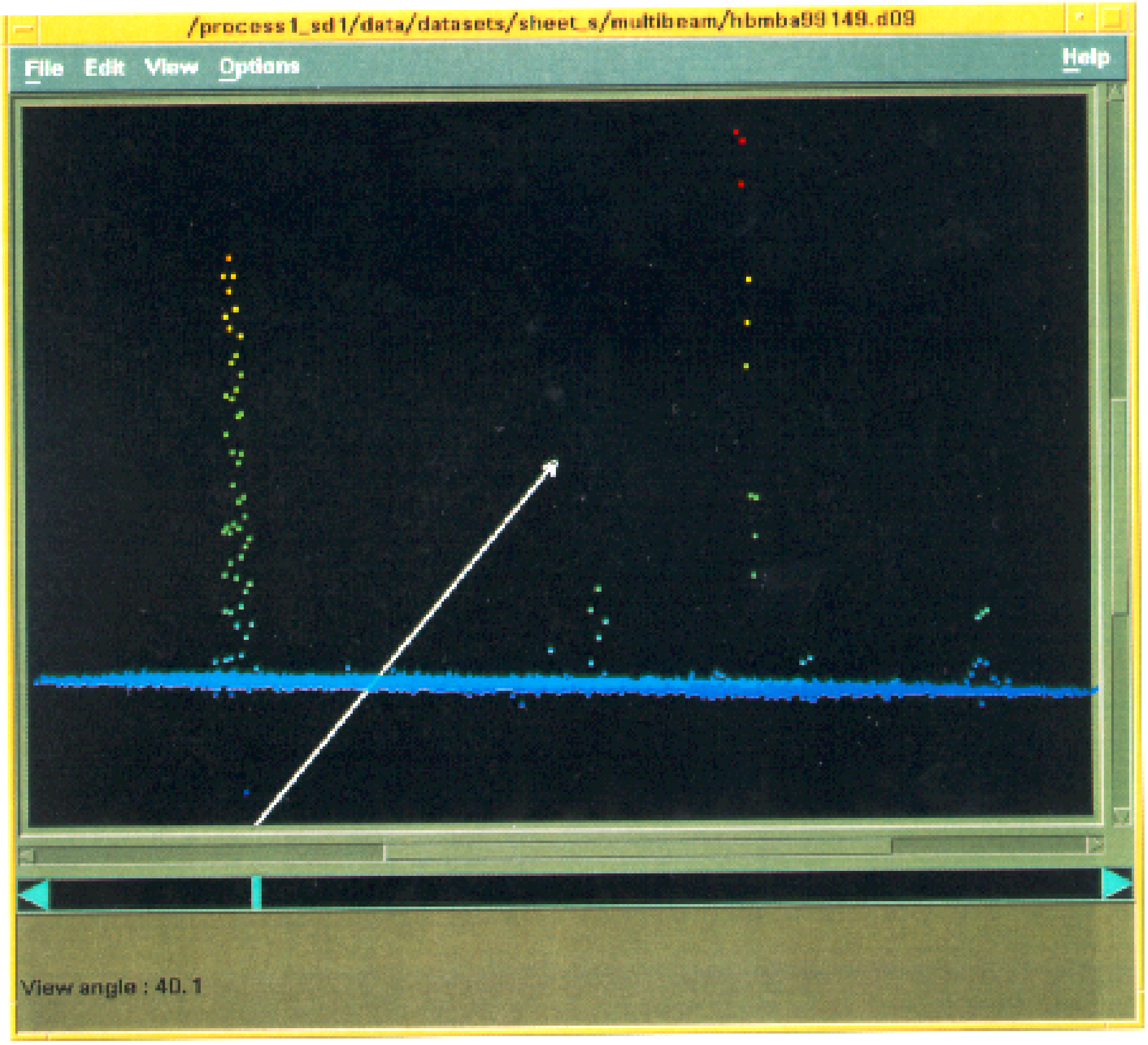
The first obstruction (32 feet) appears to be a sunken buoy sitting upright, and connected by a chain stretched straight to the second obstruction (46 feet), an apparent buoy sinker. These obstructions are near the current R "2" buoy and its associated sinker.



Profile view of sunken buoy R "2" Heald Bank looking toward azimuth 025.



Plan view of buoy R "2" Heald Bank showing sunken buoy on left, old sinker upper right (chain stretched between these two), chain to floating buoy center right, and sinker for floating buoy lower right (chain loops from sinker to chain in water column).



Profile view of buoy R "2" Heald Bank showing left to right: sunken buoy, sinker for sunken buoy, chain in water column to floating buoy, sinker for floating buoy.

From: Dave Neander <dave.neander@noaa.gov>
To: Walter Simmons <wsimmons@mtg.saic.com>
Cc: Eric Sipos <Eric.Sipos@noaa.gov>
Subject: Fw: Buoy recovery
Date: Thursday, July 22, 1999 8:40 AM

Walt,

FYI - Buoy R"2" information from USCG.

-----Original Message-----
From: JMSmith@grugalveston.uscg.mil <JMSmith@grugalveston.uscg.mil>
To: 'Dave.Neander@NOAA.Gov' <Dave.Neander@NOAA.Gov>
Date: Wednesday, July 21, 1999 4:25 PM
Subject: Buoy recovery

>Dave,
>I confirmed with the CGC PAPAW that the Buoy (#2) off Heald Bank was
>recovered, the chain was fouled so it was cut which means the sinker is
>still out there. If you need anything else let me know, sorry for the delay
>in getting that info to you. Have a good day!
>R/
>
>LT Jeffrey M. Smith
>USCG Group Galveston
>Operations Officer
>(409)766-5603
>STUIII X5607

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: H10873

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	11323									1
Heald Bank	11323									2
Texas	11323									3
Galveston	11323									4

April 4, 2000

LETTER OF APPROVAL

REGISTRY NUMBER H10873

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of survey H108~~35~~73 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
April 4, 2000

NOAA FORM 61-29
(12-71)

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

REFERENCE NO.
N/CS 33-73 -00

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 6815
1315 East-West Hwy.
Silver Spring, MD 20910-3282

DATE FORWARDED 11/01/2000

NUMBER OF PACKAGES 1

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.

H10873

Texas
Gulf of Mexico, ESE of Galveston

1 Descriptive Report / Evaluation Report
1 Drawing History form 76-71 for NOS chart 11323

1 Mylar final AHB Smooth Sheet
2 Paper Composite plots for Nos chart 11323
1 Mylar H-Drawing for NOS chart 11323

2 Smooth Sheets (Contractor)
11 Miscellaneous Plots (Contractor)

FROM: (Signature) Maxine Fetterly

RECEIVED THE ABOVE
(Name, Division, Date)

Return receipted copy to:

Maxine Fetterly
Atlantic Hydrographic Branch
439 W. York St.
Norfolk, VA 23510

NOAA FORM 61-29 SUPERCEDES FORM C AND GS 413 WHICH MAY BE USED.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1988 - 554-006- 61309

11/01/2000

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NUMBER: H10873

NUMBER OF CONTROL STATIONS	2
NUMBER OF POSITIONS	22044
NUMBER OF SOUNDINGS	22044

	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	44.0	07/18/2000
VERIFICATION OF FIELD DATA	59.5	09/05/2000
QUALITY CONTROL CHECKS	27.0	
EVALUATION AND ANALYSIS	34.5	
FINAL INSPECTION	9.5	09/07/2000
COMPILATION	38.5	10/31/2000
TOTAL TIME	213.0	

ATLANTIC HYDROGRAPHIC BRANCH APPROVAL	09/15/2000

NOAA FORM 76-155
(11-72)

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

GEOGRAPHIC NAMES

SURVEY NUMBER

H-10873

Name on Survey	A ON CHART NO. 11323, 11300, 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
HEALD BANK	X		X							3
TEXAS (title)	X		X							4
										5
										6
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										25

Dennis J. Romesburg

AUG 15 2000

NOAA FORM 76-155 SUPERSEDES C&GS 197

ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR H10873 (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 (HPS)
MicroStation 95, version 5.05
SiteWorks, version 2.01
NADCON, version 2.10
I/RAS B, version 5.01
Caris HIPS/SIPS
AutoCAD, Release 14

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). 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 datum, move the projection lines 0.878 seconds (27.02 meters or 1.35 mm at the scale of the survey) north in latitude and 0.638 seconds (17.25 meters or 0.86 mm at the scale of the survey) west in longitude.

L. JUNCTIONS

H10850 (1998-1999) to the northwest
H10874 (1999-2000) to the southeast

Standard junctions were effected between the present survey and survey H10850 (1998-1999) and survey H10874 (1999-2000). There are no junctional surveys to the northeast or southwest. Present survey depths are in harmony with the charted hydrography.

M. COMPARISON WITH PRIOR SURVEYS

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

N. COMPARISON WITH CHARTS 11323 (57th Edition, Mar. 27/99)
11300 (36th Edition, Jul. 31/99)
11330 (12th Edition, Aug. 08/98)
11340 (65th Edition, Feb. 05/00)

Hydrography

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

1. An uncharted obstruction with a depth of 57 feet (17.4 m), in Latitude 28°59'59.50"N, Longitude 94°07'54.50"W, was located by the hydrographer. This item is considered insignificant. It is recommended that the feature not be charted and representative depths be charted as shown on the present survey.

2. It is recommended that a 60 foot depth curve be added to the chart within the vicinity of the following co-ordinates:

Latitude 29°03'00"N, Longitude 94°05'00"W
Latitude 29°07'00"N, Longitude 94°08'00"W
Latitude 29°00'30"N, Longitude 94°16'30"W

Dangers to Navigation

One Danger to Navigation report was submitted to Commander (oan), Eighth Coast Guard District, New Orleans, Louisiana for inclusion in the Local Notice to Mariners. The report is appended to the Descriptive Report.

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

O. ADEQUACY OF SURVEY

This is an adequate hydrographic survey and should supersede all prior surveys within the common area with the exception of those items noted above.

R. MISCELLANEOUS

Chart compilation using the present survey data was done by Atlantic Hydrographic Branch personnel in Norfolk, Virginia. Compiled data will be forwarded to Hydrographic Survey Division, Silver Spring, Maryland.

The following NOS charts were used for compilation of the present survey:

11323 57th Edition, Mar. 27/99

H10873

Marilyn Schlüter

Marilyn L. Schlüter
Cartographic Technician
Verification of Field Data
Evaluation and Analysis

APPROVAL SHEET
H10873

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 disapproval 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: 9-8-00

Maxine Fetterly
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: 9/15/00

Andrew L. Beaver
Lieutenant Commander, NOAA
Chief, Atlantic Hydrographic Branch

****

Final Approval:

Approved: Date: January 31, 2001

Samuel P. DeBow, 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. H10873

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	9/18/00	Maxine Fetterly	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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