H10706

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey ... Hydrographic

Field No. ... BO-10-2-96

Registry No. ... H-10706

LOCALITY

State ... California

General Locality ... Santa Barbara Channel

Sublocality ... Approaches to Gaviota

1996

CHIEF OF PARTY
Mark W. Brooks

NOAA FORM 77-28 (11-72)

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

HYDROGRAPHIC TITLE SHEET

REGISTER NO.: H-10706

FIELD NO.: BO-10-2-96

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

State: California

General locality: Santa Barbara Channel

Locality: Approaches to Gaviota

Scale: 1:10,000 Date of survey: June 28 - Oct. 11, 1996

Instructions dated: 9/19/96 Project No.: OPR-L308-KR

Vessel: M/V Bonnie Marietta; NOAA 60 (helicopter)

Chief of party: Mark W. Brooks, J.E.C.A.

Surveyed by: John E. Chance & Associates, Inc.

Soundings taken by ~~echo sounder, hand lead, pole~~ SWMB, LIDAR

Graphic record scaled by: Mark W. Brooks, Eddie Culpepper

Graphic record checked by: Mark W. Brooks, Eddie Culpepper

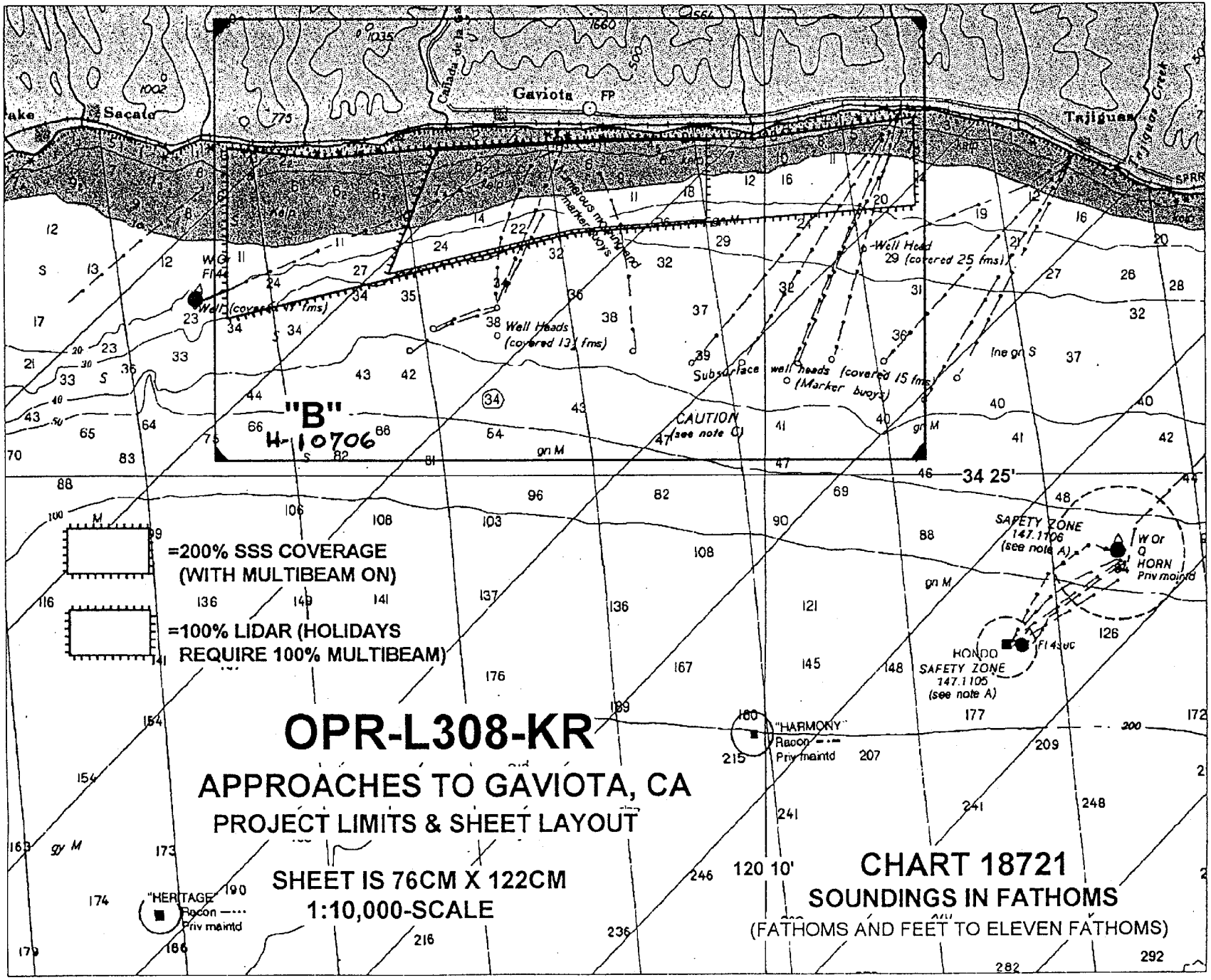
Evaluation by ~~Protracted by~~: C.J. Barry Automated plot by: HP Design Jet 650C

Verification by: C.J. Barry

Soundings in fathoms ~~feet~~ at ~~MLW~~ MLLW and tenths

REMARKS: Time in UTC. Revisions and marginal notes in black were generated during office processing. All separates are filed with the hydrographic data. As a result, page numbering may be interrupted or non-sequential. All depths listed in this report are referenced to mean lower low water unless otherwise noted.

U.S. GOVERNMENT PRINTING OFFICE: 1986 - 652-007/41215


"B"
H-10706
=200% SSS COVERAGE
(WITH MULTIBEAM ON)
=100% LIDAR (HOLIDAYS
REQUIRE 100% MULTIBEAM)
OPR-L308-KR
APPROACHES TO GAVIOTA, CA
PROJECT LIMITS & SHEET LAYOUT
SHEET IS 76CM X 122CM
1:10,000-SCALE
CHART 18721
SOUNDINGS IN FATHOMS
(FATHOMS AND FEET TO ELEVEN FATHOMS)
Gaviota
Tajiguas
Well Heads
(covered 13 fms)
Well Heads
29 (covered 25 fms)
Subsurface well heads (covered 15 fms)
(Marker buoys)
CAUTION
(see note C)
SAFETY ZONE
147.1106
(see note A)
HONDO
SAFETY ZONE
147.1105
(see note A)
"HARMONY"
Racon
Priv maintd
"HERITAGE"
Racon
Priv maintd
34 25'
120 10'

A. PROJECT ✓

A.1 This survey was conducted in accordance with Hydrographic Project Instructions OPR-L308-KR, Port San Luis, Approaches to Gaviota, California, and Approaches to Ellwood, California.

A.2 Project OPR-L308-KR provides NOAA with modern, accurate hydrographic survey data acquired using lidar technology augmented with shallow water multibeam sonar and side scan sonar technology.

A.3 This portion of Project OPR-L308-KR, Approaches to Gaviota, California, has been designated as sheet B.

A.3 No information has been presented to the contractor concerning the origin or possible requests for Project OPR-L308-KR.

B. AREA SURVEYED ✓ SEE EVAL.REPT., SECTION B

The survey encompasses an area along the coast of California near Gaviota. The survey ranges from about 4 miles east of Gaviota to a point about 4 miles west of Gaviota and out from the beach approximately 1 mile.

Both commercial vessels and pleasure craft are frequent in this area. No critical depth is defined for this area and deep draft vessels are not typically expected to transit these waters. Commercial fishing vessels, mostly crab fishing, are the most common vessels in this area.

Side scan sonar data acquisition began on July 3, 1996 and concluded on July 8, ~~1997~~ 1996. No multibeam data were collected during this period because of problems with the data collection system. Multibeam data collection began on October 4, 1996. On October 11, 1996 multibeam data collection was completed for the Gaviota portion of Project OPR-L308-KR.

LIDAR data collection days included June 28-29, July 1, July 4 and August 14, 1996.

C. SURVEY VESSELS ✓

C.1 The following survey vessels was used during this project:

VESSEL	REGISTRATION NUMBER	PRIMARY FUNCTION
M/V BONNIE MARIETTA	633694	Hydrography/ Side Scan Operations (S W MULTIBEAM)
NOAA 60 HELO (AIRBORNE PLATFORM)	N60RF	Hydrography (LIDAR)

C.2 No unusual vessel configurations or problems were encountered. SEE SUBSEQUENT COMMENTS, SECTIONS D, E, F AND R, REGARDING QUALITY ISSUES.

D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓ SEE EVAL. REPT., SEC. D

D.1 Multibeam survey data acquisition and processing were accomplished using the SEABAT 6042 Data Collection software version 4.2D by Reson, Inc., Goleta, California. This software was used for the entire data collection period and for processing all of the raw data. TERRAMODEL version 4.11 was used to edit and QC the multibeam data.

D.2 a) During multibeam data collection, navigation was provided using LINE_RUN version 5.3. LINE_RUN is a PC-based, navigation package written by John E. Chance & Associates, Inc.

b) During Side scan sonar data collection, navigation was provided using HYPACK. HYPACK is a PC-based software program from Coastal Oceanographics, Inc.

c) All LIDAR data were collected using the SHOALS Airborne Data Collection System, version 951105. This software is manufactured by OPTECH, Inc., North York, Ontario, Canada.

D.3 LIDAR data were processed using the SHOALS Data Processing System, version 1.73. This software is manufactured by OPTECH, Inc., North York, Ontario, Canada.

D.4 No non-standard automated acquisition or processing methods were used.

D.5 During the processing of the multi-beam data, some lines were discovered to contain heave, pitch, roll anomalies. These anomalies appeared to only roll the scan, but because of the interdependencies between the HRP measurements, all the values were corrupted. These anomalies only occurred at the beginning of lines and every precaution has been

taken to remove them from the data. No reasons could be found for the HRP mismeasurements. The following lines contained these anomalies:

1015	2022	3026	5099
2004	2030	5048	
2006	2032	5089	
2020	2033	5097	

HRP ANOMOLIES ALSO OCCURED THROUGOUT LINES. THESE WERE REMOVED DURING RE-PROCESSING OF RAW MULTIBEAM DATA AT PHB. NO GAPS IN DATA RESULTED FROM REMOVAL OF THIS ANOMALOUS DATA. SEE EVAL. REPT, SECTION D

D.6 The original intent of the survey party was to use the PC-based software program, HYPACK, from Coastal Oceanographics, Inc., to collect and process the SEABAT 9001 data. The software has been tested and accepted by several government and private industries. While trying to calibrate the SEABAT 9001 for roll, pitch and heading offsets, problems occurred that forced the crew of the BONNIE MARIETTA to take an extensive period of time troubleshooting. The vessel was demobed and a suspension in data collection was taken until all problems could be resolved.

Communications and investigations between Coastal Oceanographics, Reson and John E. Chance & Associates personnel identified three (3) problems with the HYPACK software:

ALL HYPACK DATA WAS REPROCESSED AND RE-RUN USING RESON 6042 SOFTWARE.

1) The software was basing times on a wavering clock. This PC-based clock had a waver of approximately ±45 milliseconds. This waver would cause mismatches between HRP measurements and range measurements as the vessel proceeded down line. These mismatches were presented as errors in the final depth and positions calculated by the software.

2) The software was time-tagging the SEABAT 9001 data string at the end of the string. According to Coastal Oceanographics, all other data were tagged at the time of entrance to the computer. This presented the time of ping later than actual and caused a mismatch with HRP measurements.

3) The software was using values of HRP at the time of SEABAT ping when matching measurements. There is a difference of opinion about when these measurements should be matched. According to RESON personnel, the pitch angle should be applied at the time of ping. The heave measurement used should be from the time the ping hits bottom. The roll angle used should be from the time the ping is received. This is how the RESON 6042 software matches measurements.

The HYPACK software has always worked with these problems. Since these problems have been found, Coastal Oceanographics has provided upgrades to the HYPACK software for more accurate and better quality data. These upgrades have not been tested by the survey crew. At the time of re-mobilization, however, it was felt by John E.

Chance & Associates' personnel that the RESON 6042 data collection and processing system would be a much better and more accurate way to collect multibeam data.

HTPACK SOFTWARE PROGRAM WAS NOT USED FOR DATA COLLECTION AND PROCESSING.

E. SONAR EQUIPMENT ✓

E.1 The side scan sonar operations were conducted using an EG&G Model 260 image corrected side scan sonar recorder and a model 272 tow fish. Also, a Klein model 595 side scan sonar and tow fish was used. All side scan operations were conducted from the BONNIE MARIETTA. The following list shows equipment serial numbers and the corresponding dates used:

EQUIPMENT TYPE	SERIAL NUMBER	DATES USED
EG&G Recorder	12316	185-190
EG&G Towfish	12996	185-190

E.2 The side scan towfish were configured with a 20° beam depression, which is the normal setting and which yields the best beam correction.

E.3 Both the 100 KHz and 500 KHz frequencies were used during this survey. The Klein side scan sonar records both frequencies simultaneously.

E.4 Both the 100 meter and 75 meter range scale was used during this survey. On lines where the 75 meter range scale were used, the line spacing was 60 meters. Lines that were ran using the 100 meter range scale were spaced 80 meters. Two hundred percent side scan sonar coverage was completed for the specified areas in this survey. * DO NOT CONCUR. AREAS OF MISSED COVERAGE, SEE EVAL. REPT. SECTION P.

Confidence checks were obtained daily by noting recognizable bottom characteristics at the edges of the range scale in use. Features such as piers, sand waves, trawl scours and pipelines were commonly used for this purpose.

Overall, the side scan data were clear with excellent returns. There were occasions upon which the side scan towfish became entangled in crab pod floats. On these occasions, the tow fish was brought on board and inspected. Twice during the survey operations had to be halted so that a retermination of the towfish cable could be performed. These reterminations were completed once the crew returned to land.

F. SOUNDING EQUIPMENT ✓

F.1 All hydrographic soundings were acquired using a Reson SEABAT 9001 multibeam survey system or the US Army Corps of Engineers SHOALS Lidar Bathymetry System. The following list contains information for the separate components of the system:

COMPONENT	SERIAL NUMBER	DATES USED
SEABAT Processor	8514	278-285
SEABAT Transducer Head	447003	278-285
SHOALS	1	180-181, 183, 186, 227

F.2 The SEABAT 9001 and the SHOALS system were the only sounding equipment used during this survey for the purpose of charting. A dual-frequency Echotrac was used during the survey for the purpose of checking the multibeam data. This check was done on-line and the checks were favorable. No diver investigations were conducted for this survey, eliminating the need for a pneumatic depth gauge.

F.3 There were no faults in the SEABAT 9001 equipment that affected the accuracy of the data. When the system arrived on the vessel, the SEABAT 9001 was set up as a SEABAT 9002. This means that the system was only collecting one-half of the data that was possible. This was corrected during the survey and had no effect on the accuracy of the sounding data. However, the SEABAT 6042 processing software appears to skew this data with respect to azimuth and the data is produced with an incorrect Latitude and Longitude. None of these skewed data were plotted. SKEWED DATA WERE REJECTED.

F.4 Only 455 KHz data were collected when using the SEABAT 9001.

F.5 The SHOALS Lidar Bathymetry System uses a laser that is a 200 Hz Nd:YAG operating at a wave length of 1064 nm (infrared) and frequency doubled to 532 nm (green). The system operates at a power level of about 5 milli-joules. The receiver includes a Cassegrain design telescope. Five detectors are in the system, a gated photomultiplier tube (PMT), two avalanche photo diodes (APD) to detect 1064 nm radiation (IR1 and IR2), an APD to detect 532 nm radiation (green), and an APD to detect Raman radiation at 645 nm. There were no faults in the SHOALS system that affected the accuracy of the data. CONCUR. HOWEVER, NOT ABLE TO VERIFY. THE LIDAR DATA SUBMITTED WAS COMPRISED OF ASCII DATA SETS OF BOTH THE FULL RESOLUTION AND THE FINAL GRIDDED DATA. THE RAW LIDAR WAVE FORM DATA AND ANOMALY PLOTS REQUIRED TO ANALYZE THE DATA IN DEPTH WERE NOT PROVIDED. SEE EVAL. REPT., SECTION G.

G. CORRECTIONS TO SOUNDINGS ✓

G.1 a) The velocity of sound through water was determined using a Applied Microsystems SEABIRD velocity profiler (S/N 3038). A check of the velocity probe was done using a Digibar Sound Velocity Probe, model DB1100 (S/N 262). The data from the Digibar was recorded in the field notes for the survey.* Velocity casts were conducted at least daily and the cast for that day was used as corrections for that entire day's data. Some days more than one cast was taken for QC. * FILED WITH THE HYDROGRAPHIC DATA

Velocity corrections were entered into the SEABAT 6042 program and were used in both initial and final processing of the SEABAT data.

b) The SHOALS system requires no velocity correction, but does require an index of refraction based upon the water salinity. This number is used for the calculation of the refraction angle when the light enters the water. No major fresh water streams are in the area of the project, therefore a value of 1.3423, which is typical of salty water, was used.

c) No instrument correctors were applied to either the SEABAT 9001 or the SHOALS system. CONCUR.

d) The draft of the BONNIE MARIETTA was measured prior to survey operations. The vessel was tied securely to the dock with the transducer pole in the survey position. The draft of the SEABAT head was then measured. Every precaution was taken to insure that the instrument was in a non-mobile position during survey operations. The transducer's static draft was measured to be 1.594 meters. This draft was applied in the SEABAT 6042 software. CONCUR.

Operating characteristics of the SHOALS system requires no draft corrections to collected data.

e) No settlement and squat correctors were applied to the SEABAT data. Precautions were taken by the captain of the vessel to insure that the power applied to and the speed of the vessel was held constant so that squat was held to a minimum. However, due to the currents in the area, more power to the vessel was required to keep survey speeds.

Operating characteristics of the SHOALS system requires no draft corrections to collected data.

f) On the BONNIE MARIETTA heave, pitch and roll data were measured by a TSS DMS-05.* These corrections were collected and applied to the sounding data by the SEABAT 6042 software. All records of this data are in the original raw data files. * HRP APPLIED IN CARIS
RAW DATA FILES PRESENTLY ARCHIVED AT PHB.

A Litton LTN-90 Inertial Reference System measures roll, pitch and vertical acceleration of the helicopter for the SHOALS system. These values are stored on the raw data tapes and are applied in the SHOALS processor.

G.2 There were no unusual or unique methods or instruments used for correcting the SEABAT 9001 or the SHOALS data. CONCUR

G.3 Pneumatic depth gauges were not required for this phase of survey H-10706. CONCUR

G.4 The SHOALS data processor incorporates a wave correction algorithm. This algorithm is capable of producing corrections for both long- and short-period waves. A corrector value is produced for every sounding and is automatically applied to each sounding. The value for each pulse can be found in the database of each flight the SHOALS system attempted. Application of the wave corrector to raw measurements appeared to accurately represent true depths. CONCUR

G.5 The SHOALS system uses a ~~an~~ apriori_k value that is used to calculate surface biases in real time for the alignment of the waveforms in the digital record, and for the recalculation of the biases in the post-processing. The value should be based on the water clarity of the area being surveyed. A value of 0.15 m^{-1} was used for ~~project~~ SURVEY H-10706. VALUES APPROPRIATE PER NAUTICAL CHARTING DEVELOPMENT LAB.

G.6 a) The tidal datum for this project is Mean Lower Low Water. The operating tide station at Santa Barbara, California (941-1340) served as direct control for the datum determination. No predicted tides were provided or used during this project.

b) Zoning for this project is consistent with the project instructions.

A request for smooth tides was faxed on January 21, 1997.

H. CONTROL STATIONS ✓SEE EVAL. REPT., SECTION H.

H.1 The horizontal datum for this project is the North American Datum of 1983 (NAD 83).

H.2 This survey was conducted exclusively using Differential GPS (DGPS) positioning, which precluded the need for shore-based horizontal control stations. STARFIX II and OMNISTAR were the systems used for this survey.

H.3 No horizontal control stations were used or established for this survey.

H.4 Verification of horizontal control was not necessary since no land-based horizontal control stations were used.

H.5 There are no photogrammetric problems, positioning problems or unconventional survey methods pertinent to this survey.

I. HYDROGRAPHIC POSITION CONTROL ✓SEE EVAL. REPT., SECTION I

I.1 This survey was conducted exclusively using Differential GPS (DGPS) positioning.

I.2 Accuracy requirements as specified by the Hydrographic Manual and Field procedures Manual (FPM) were not precisely followed during this survey. During data collection operations aboard the BONNIE MARIETTA, the Position Dilution of Precision (PDOP) was monitored. When the PDOP exceeded a value of 6.0, survey operations were suspended until DGPS performance improved. Data were never collected when this value was exceeded, so no smoothing or rejecting of unsatisfactory data was performed. Data collected aboard NOAA 60 were not collected when the Horizontal Dilution of Precision (HDOP) exceeded 4.0. The GPS was monitored differently on the two platforms because of the operational characteristics of the two platforms.

Both vessel's DGPS receiver's were configured such that only satellites ten degrees or greater above the horizon were used in the position computation. The age of pseudo-range correctors used in the position computation was set not to exceed 30 seconds. A minimum of four satellites was used to compute positions. No Dead Reckoning (DR) was ever performed. CONCUR

I.3 Control Equipment:

BONNIE MARIETTA DGPS

John E. Chance & Associates, Inc.
Trimble receiver board S/N 3344A04446
John E. Chance & Associates, Inc. STARFIX® II

Correctors were computed using the West Coast network of OMNISTAR® sites. These sites include ~~Everitt~~ EVERETT, Washington, San Diego, California, Redding, California and Houston, Texas. The correctors were computed using CHANCE's Wide Area Differential (WADS) software, version 2.1.

NOAA 60 DGPS
Ashtech GPS Sensor
S/N 70070D1281
John E. Chance & Associates, Inc. OMNISTAR®

Correctors were computed using the entire United States OMNISTAR® network. The DGPS system requires no calibration from outside sources. However, to check the position accuracy of the DGPS system, a daily performance check was conducted. This

check was done only on the BONNIE MARIETTA. No checks were done for data collected on NOAA 60.

The performance check on the BONNIE MARIETTA was completed at the dock at the beginning or ending of every day's survey. While tied to the dock, the position of vessel was calculated using the West Coast OMNISTAR® sites. The network was switched to the remaining US sites and the position was recalculated. The two positions generally checked within five meters.

I.4 No calibration data were required to be applied to the raw positioning data because DGPS was the primary positioning system.

I.5 a) There were no unusual methods used to calibrate or operate the electronic positioning equipment.

b) The STARFIX® II aboard the BONNIE MARIETTA did experience interference during survey operations. It is still unknown what the cause of this interference was. The STARFIX® II system is known to have interference problems in the area of the survey. During these periods, survey operations were suspended until the system was operating satisfactorily.

The OMNISTAR® used for the positioning of NOAA 60 experienced no such problems. This is presumably because of the short time periods that the SHOALS system takes to do a survey.

c) At no time was weather a problem or concern for the DGPS system on either vessel. STARFIX® II AND OMNISTAR® ARE DGPS SYSTEMS.

d) No systematic errors were detected that required adjustments to the DGPS system.

e) Aboard the BONNIE MARIETTA, antenna positions were corrected for offset and layback, and referenced to the position of the SEABAT 9001 transducer. These correctors were located in SEABAT 6042 offset table. These offsets are applied when post-processing the data. Equipment on the vessel was installed so that offsets were minimal as possible.

Aboard NOAA 60, antenna positions were corrected for offset and referenced to the position of the SHOALS scanning mirror. These correctors were located on the flight planning tape and are applied in the post-processing of the data.

f) Offset and layback distances for the tow point of the side scan sonar aboard the BONNIE MARIETTA were located in the field notes for the survey. These offsets, along with cable length were used to position the towfish.

I.6 During multibeam data collection a Robertson Gyro (S/N 786) was used for azimuth determination. Heading biases were determined during the calibration of the multibeam system.

During side scan sonar data collection John E. Chance's GPS Azimuth software, version 2.0, was used in determining the heading of the vessel.

J. SHORELINE ✓ SEE EVAL. REPT., SECTION J

Not Applicable. No shoreline is contained within the boundaries of this survey.

K. CROSSLINES ✓

K.1 Approximately five percent of the total linear miles ran on this survey were crosslines. All of these lines were run at a 90° intersection angle with the mainscheme lines. This was the case for both the lidar lines and the multibeam lines.

K.2 The correlation between the mainscheme lines and crosslines of the multibeam data was very good. Better than 90% of all the crosslines compared to within 30 cm of the mainscheme lines. The average delta between the two was 5 cm. Appendix M shows a comparison of each line-by-line crossline. These comparisons show data that contain obvious wrong data. These data could be caused by aeration or by something floating in the water column.

K.3 The lidar crosslines do not show agreement or disagreement. The speed of the helicopter and the width of the valid mainscheme lines prevents a good comparison from being done. Not enough soundings were collected to enable a proper comparison to be performed.

K.4 The average difference between the lidar depths and the multibeam depths was approximately 5 centimeters. Kelp was significantly present in the areas of overlap between the two sets so a good comparison was difficult to measure. One line from each of the five sections of data was used in the comparison

K.6 The crossline comparison data is presented in Appendix M.* Each sheet shows the number of points being compared, the average difference between the main scheme lines and the crosslines and the standard deviation of differences. Only one line appears to have significant diffences in the comparison. Line 2035 has a noticable decline in accuracy when the depth is greater than 30 meters. No explanation for this could be found.

*APPENDIX M IS FILES WITH THE HYDROGRAPHIC DATA

L. JUNCTIONS ✓ SEE EVAL. REPT., SECTION L

Junctional comparisons with contemporary surveys are not applicable under this contract. See Section N for comparison to the nautical charts.

M. COMPARISON WITH PRIOR SURVEYS ✓ SEE EVAL. REPT., SECTION M

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

N. COMPARISON WITH EXISTING CHARTS ✓ SEE EVAL. REPT., SECTION O

N.1 Charts affected by this survey area:

Chart 18721
10th ed. August 5, 1995
Scale 1:100,000

N.2 No Danger to Navigation reports were submitted in conjunction with survey H-10706.

N.3 The correlation between charted shoal areas and this survey is very good.

O. NOT USED ✓

P. AIDS TO NAVIGATION ✓

P.1 No correspondence with the U.S. Coast Guard regarding floating aids to navigation was conducted.

P.2 No floating aids to navigation exist within the survey area.

P.3 No bridges, overhead cables or overhead pipelines are located within the survey limits.

P.4 Several submerged pipelines exist within the survey area. These pipelines are easily seen on the side scan sonar records and all are charted correctly. These pipelines run from the shoreline to offshore platforms. PIPELINES ARE NOTED ON THE CHART AND SEEN ON SIDE SCAN SONARGRAMS. THE POSITION AND 'LEAST DEPTH' OF ONE PIPE WAS EXTRACTED USING CARIS SOFTWARE AT PHB. PIPELINE LOCATIONS HAVE NOT BEEN VERIFIED AGAINS THE CHART USING SIDE SCAN RECORDS AS SS COVERAGE IS INCOMPLETE IN THIS AREA.

P.5 Several privately maintained mooring buoys are contained within the survey area. The positions of these buoys are shown on the final smooth sheet.

P.6 No ferry terminals are located within the survey area.

Q. STATISTICS ✓

Q.1	**a)** Total number of valid soundings	> 64,000,000
	b) Lineal nautical miles of survey	
	- nautical miles of survey with the use of side scan sonar	75.4
	- nautical miles of survey with the use of SEABAT 9001	303.6
	- nautical miles of survey with the use SHOALS Lidar system	171.10
Q.2	**a)** Square nautical miles of hydrography	
	- SEABAT 9001	4.5
	- SHOALS Lidar	3.7
	b) Hours of data acquisition	90
	c) Hours of survey support	50
	d) Hours of data processing (approx.)	300
	e) Hours of weather and environmental downtime(approx.)	10
	f) Number of velocity casts	
	- AML Seabird	13

R. MISCELLANEOUS ✓

R.1 No evidence of silting was found during this survey.

R.2 No evidence of unusual submarine features was found during this survey.

R.3 No evidence of anomalous tidal conditions was found during this survey.

R.4 No evidence of unusual currents was recorded during this survey.

R.5 The survey area is part of an area where natural oil and gas seepage is prevalent. This seepage produces a sheen of oil on the top of the water surface. This should in no way affect the multibeam data. However, as the oil and/or gas seeped to the top of the surface, invalid returns were produced on both the side scan sonar and the multibeam systems. These invalid returns were noted on the side scan images at the time of survey. CONCUR. INVALID RETURNS WERE NOT USED.

The sheen on top of the water presents a different problem for the SHOALS system. The returns were sometimes affected by sun glint magnified by the sheen. These areas were generally rerun during the course of the survey. A rerun of the line in the opposite direction would solve the problem. However, the calculated surface biases for each channel could be affected by this sheen. Also, the sheen sometimes caused a flattening of the surface returns which caused a lack of good surface returns for the wave corrector. In this case all depths in the area are automatically rejected.

The only condition stated above that could affect the accuracy and quality of the data is the case where the sheen affects the surface biases for the surface channels. Careful procedures were taken by the hydrographer to use the best surface channel when processing the data. DATA WAS ANALYZED DURING OFFICE PROCESSING AND FOUND TO BE CONSISTENT WITH SURROUNDING DEPTH INFORMATION.

R.6 Appendix G* shows multibeam calibration data. This data were obtained by running overlapping lines so that the middle beams of one line were compared with the outer beams of the next. Crosslines were then run so that all beams across a swath could be compared. Six lines were run in all. * FILED WITH FIELD RECORDS

R.7 The velocimeter files are incorrect as dated. The PC that downloaded the files was dated incorrectly. The julian date that is referenced in the name of the file is the correct date.

R.8 Some areas have less than 100% coverage. This was due to kelp in the water or to areas of oil sheen. All precaution have been taken to ensure that all data shown in these

areas are correct. It is felt that more surveys in these areas would not enhance the provided data. CONCUR

S. RECOMMENDATIONS ✓

S.1 The contractor is aware of no construction or dredging that will affect results of this survey.

S.2 No further investigations of the survey area is recommended. CONCUR

T. REFERRAL TO REPORTS ✓

No reports have been published which are not part of this Descriptive Report for survey H-10706.

Omnistar Site Survey 1996

ITRF94/96 Coordinates

Site	Latitude	Longitude	Ellipsoidal Height
Mercedes, TX	N 26° 06' 10.83388"	W 97° 51' 24.48161"	-3.8720m
Houston, TX	N 29° 35' 04.68541"	W 95° 30' 10.75933"	4.3010m
West Glenn, TX	N 29° 43' 30.59525"	W 95° 30' 33.38134"	-2.7070m
Pensacola, FL	N 30° 28' 50.08871"	W 87° 14' 55.37459"	10.4230m
Coco Beach, FL	N 28° 07' 09.09154"	W 80° 34' 42.45647"	-20.3080m
Fayetteville, NC	N 35° 06' 20.24045"	W 78° 55' 19.65223"	32.3280m
Long Island, NY	N 40° 46' 58.27470"	W 72° 45' 51.48090"	-28.0800m
Duluth, MN	N 46° 50' 14.24659"	W 92° 12' 48.62647"	432.4340m
Everett, WA	N 47° 54' 15.02694"	W 122° 16' 29.04485"	167.7410m
Redding, CA	N 40° 33' 53.54173"	W 122° 21' 48.85769"	134.3110m
San Diego, CA	N 32° 54' 47.94791"	W 117° 13' 51.30125"	-19.6990m
Denver, CO	N 39° 34' 49.64003"	W 104° 51' 50.88076"	1743.7880m
Lafayette, LA	N 30° 13' 13.84437"	W 92° 03' 21.29095"	-8.6890m
St Johns, Canada	N 47° 36' 51.56310"	W 52° 43' 23.62332"	134.8370m
Carmen, Mexico	N 18° 38' 38.37706"	W 91° 49' 23.66018"	27.2120m
Carmen Hotel, Mexico	N 18° 39' 41.92219"	W 91° 49' 50.65762"	-1.0790m

filename: omni9496.itr

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Ocean and Earth Sciences
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: January 30, 1997

HYDROGRAPHIC SURVEYS DIVISION: Headquarters

HYDROGRAPHIC PROJECT: OPR-L308-KR

HYDROGRAPHIC SHEET: H-10706

LOCALITY: Approaches to Gaviota, CA

TIME PERIOD: June 28 - October 12, 1996

TIDE STATION USED: 941-1340 Santa Barbara, CA
Lat. 34° 24.5'N Lon. 119° 41.1'W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.414 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: Zone 10.

Refer to attachment(s) for zoning information.

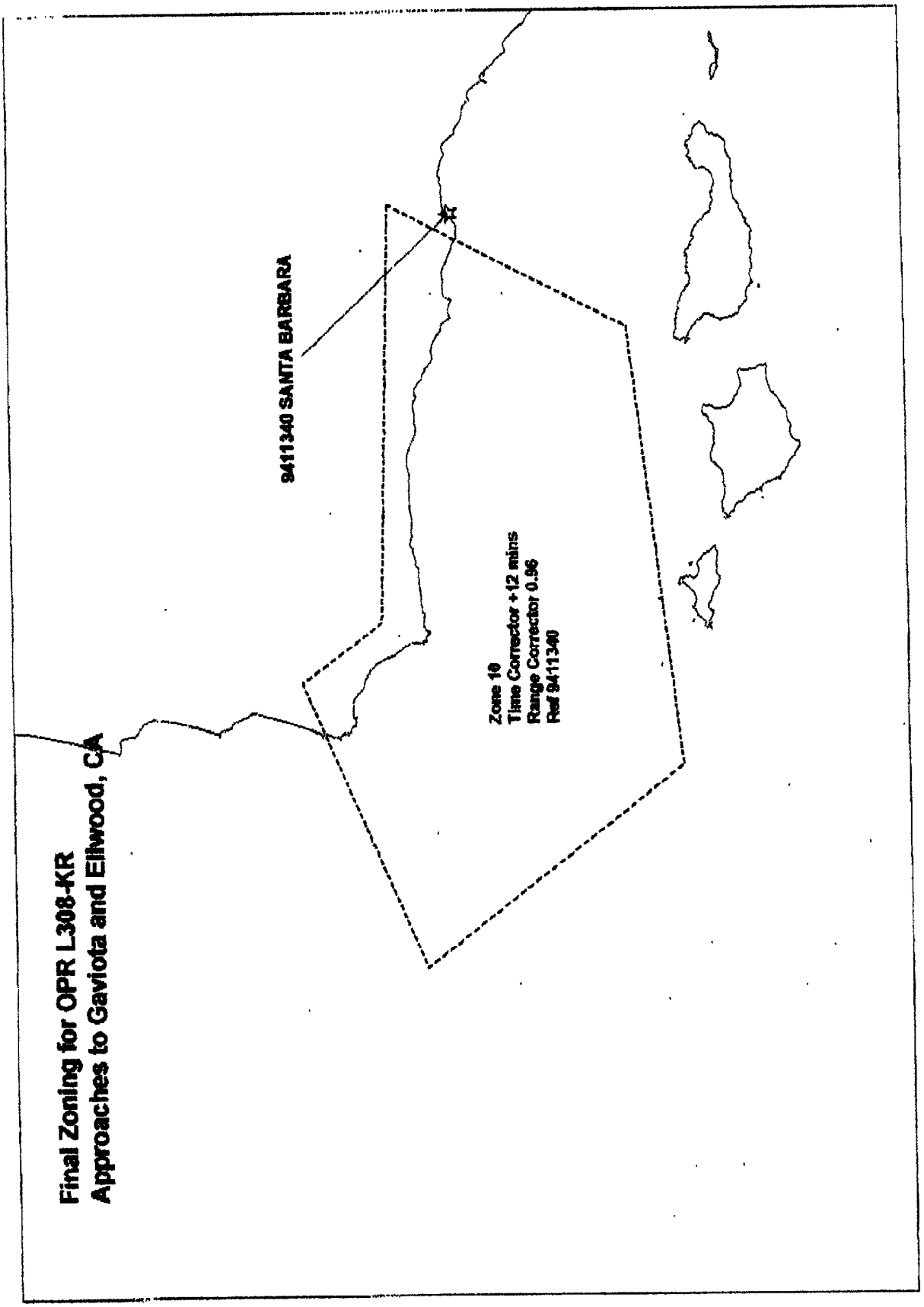
Note: Provided time series data are tabulated in metric units (meters) and on Greenwich Mean Time.

CHIEF, TIDAL ANALYSIS BRANCH

Final tide zone nodal point locations for OPR L308-KR.

Format: Longitude in decimal degrees (negative value denotes Longitude West),
Latitude in decimal degrees
Tide Station (in recommended order of use)
Average Time Correction (in minutes)
Range Correction

	Tide Station Order	AVG Time Correction	Range Correction
Zone 10			
-119.667422 34.497877	9411340	+12	0.96
-119.895577 34.148006			
-120.700444 34.071779			
-121.069773 34.452615			
-120.546491 34.631484			
-120.435877 34.514599			
-119.667422 34.497877			


9411340 SANTA BARBARA
Zone 10
Time Corrector +12 mins
Range Corrector 0.96
Ref 9411340
Final Zoning for OPR L308-KR
Approaches to Gaviota and Elwood, CA

NOAA FORM 76-155
(11-72)

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

SURVEY NUMBER

H-10706

GEOGRAPHIC NAMES

Name on Survey	A ON CHART NO. 18721	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	
CALIFORNIA (title)	X		X							1
GAVIOTA (ppl)	X		X							2
NORTH PACIFIC OCEAN	X		X							3
SANTA BARBARA CHANNEL	X		X							4
										5
										6
										7
										8
					[redacted]					9
										10
					Dennis J. Romberg					11
					Chief Geographer			JUN 8 1998		12
										13
										14
										15
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										24
										25

NOAA FORM 76-155 SUPERSEDES C&GS 197

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Coast Survey
Silver Spring, Maryland 20910-3282

JUN 9 1998

MEMORANDUM FOR: DISTRIBUTION

FROM: Captain Andrew A. Armstrong, III, NOAA
Chief, Hydrographic Surveys Division

SUBJECT: Application of SHOALS Lidar Data to Nautical Charting Documents

The Office of Coast Survey (CS) was involved in the development of the SHOALS lidar bathymetry system and continues to be actively engaged in data quality assurance, system upgrades, and advanced algorithm development. Based on CS participation in the development of processing algorithms and analysis of both demonstration and operational survey results, the Hydrographic Surveys Division (HSD) has sufficient information to establish a policy for incorporation of lidar data into NOAA registered surveys (Smooth Sheets) and NOAA nautical chart compilation documents (H-Drawings).

SHOALS Demonstration Phase data, an HSD-funded test survey in the approaches to Tampa Bay, Florida, and HSD-funded operational surveys in the approaches to Miami and Port Everglades, Florida have all shown that SHOALS general depth data meet NOAA and International Hydrographic Organization Order 1 standards for depth and position accuracy. SHOALS depths, when acquired and processed as part of an HSD-funded survey, are acceptable for superseding prior NOS hydrographic and shoreline surveys except for point features, which will be dealt with on a case-by-case basis.

The same demonstration and operational survey data that established the depth and position accuracy of SHOALS soundings have also shown that specific environmental and operational conditions must be met if SHOALS data alone are to be acceptable for the assured detection or disproval of small point features such as rocks, wrecks, and obstructions. The SHOALS system, while providing very dense sounding coverage, does not always provide complete small-feature detection coverage of the bottom. Mathematical models developed by the Coast Survey Development Laboratory, and supported by survey results, have shown that detection of objects on the bottom is dependent on water depth and clarity and object size. Therefore, only if the project instructions or AWOIS requirements specify water-clarity (or

signal-quality), feature size limits, and sounding density standards for disproval, and those conditions are met by the SHOALS survey, can SHOALS data disprove rocks, coral heads, wrecks, or obstructions originating with prior surveys employing acoustic or lead-line sounding techniques. Disproval of similar charted features is likewise dependent upon feature size, operational survey parameters and type of originating technology.

Experience to date has also shown that, like sonar, lidar returns are often received from reflectors above the bottom. These returns may represent valid obstructions on the bottom, or they may represent fish, off-beam-center reflections from steep slopes, vegetation, or drifting debris in the water column. Evaluation of these returns is based on the characteristics of the lidar waveform and the presence or absence of supporting soundings. As with sonar surveys, when during the course of an HSD-funded survey, these returns cannot confidently be attributed to side reflections or harmless targets in the water column, they should be considered and reported as dangers to navigation and scheduled for follow-up investigation by sonar, lidar, and/or diver.

These policies will be revised and adjusted as warranted by additional information and experience gained in the acquisition and review of lidar sounding data. Background material is attached.

Distribution:

N/CS3x1
N/CS31
N/CS32
N/CS33
N/CS34

cc: N/CS
N/CS11

Attachments

NOAA FORM 77-27(H)
(9-83)

U.S. DEPARTMENT OF COMMERCE

HYDROGRAPHIC SURVEY STATISTICS

REGISTRY NUMBER
H-10706

RECORDS ACCOMPANYING SURVEY: To be completed when survey is processed.

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET		SMOOTH OVERLAYS: POS., ARC, EXCESS	N/A
DESCRIPTIVE REPORT		FIELD SHEETS AND OTHER OVERLAYS	N/A

DESCRIPTION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/ SOURCE DOCUMENTS	
ACCORDION FILES	1					
ENVELOPES						
VOLUMES						
CAHIERS						
BOXES						

SHORELINE DATA

SHORELINE MAPS (List):	N/A
PHOTOBATHYMETRIC MAPS (List):	N/A
NOTES TO THE HYDROGRAPHER (List):	N/A
SPECIAL REPORTS (List):	N/A
NAUTICAL CHARTS (List):	Chart 18721 10th Ed., Aug. 5, 1995

OFFICE PROCESSING ACTIVITIES

The following statistics will be submitted with the cartographer's report on the survey

PROCESSING ACTIVITY	AMOUNTS		
	VERIFICATION	*EVALUATION*	*TOTALS*
POSITIONS ON SHEET			
POSITIONS REVISED			
SOUNDINGS REVISED			
CONTROL STATIONS REVISED			
	TIME-HOURS		
	VERIFICATION	*EVALUATION*	*TOTALS*
PRE-PROCESSING EXAMINATION			
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS			
VERIFICATION OF SOUNDINGS			
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET	328		328
COMPARISON WITH PRIOR SURVEYS AND CHARTS			
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT		43	43
GEOGRAPHIC NAMES			
OTHER*			
*USE OTHER SIDE OF FORM FOR REMARKS — TOTALS	328	43	371

Pre-processing Examination by G. Nelson, M. Bigelow	*Beginning Date* 9/17/97	*Ending Date* 6/2/98
Verification of Field Data by G. Nelson, C. Barry, D. Hill	*Time (Hours)* 328	*Ending Date* 6/23/98
Verification Check by B. Olmstead	*Time (Hours)* 5	*Ending Date* 6/19/98
Evaluation and Analysis by C. Barry	*Time (Hours)* 43	*Ending Date* 7/15/98
Inspection by B. Olmstead	*Time (Hours)* 11	*Ending Date* 7/22/98

EVALUATION REPORT

H-10706

A. PROJECT

Survey H-10706 was conducted under a contract initiated by the U.S. Army Corps of Engineers. NOS issued a Statement of Work specifying the completion of a survey for the purpose of updating nautical charts. The SHOALS lidar survey system was designated as the primary system for acquiring soundings supplemented by shallow water multibeam and side scan sonar as needed to investigate obstructions and determine least depths.

The NOS work was completed as part of Purchase Order No. NA96AANCG0634.

The contractor, hereafter identified as the hydrographer, performing the work was John E. Chance & Associates, Inc. Specific information pertaining to this contractor may be obtained from the Hydrographic Surveys Division (N/CS3).

The hydrographer's report contains a complete discussion of the project information.

B. AREA SURVEYED

The survey area is adequately described in the hydrographer's report. Page-size plots of the charted area depicting the limits of supersession accompany this report as Attachment 1.

Bottom sampling was not required during the survey. Depths range from six to 35 fathoms.

C. SURVEY VESSELS

See the hydrographer's report.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

Shallow water multibeam survey data were acquired and processed by the hydrographer using Reson SEABAT systems. Specifically, SEABAT 9001 hardware was used with SEABAT 6042, version 4.2D, software. Editing and processing of the data done by the hydrographer used TERRAMODEL, version 4.11.

The hydrographer's smooth sheet was constructed by combining sounding information from both multibeam and lidar. In order to separate the two data sets and provide a new smooth sheet with a denser distribution of soundings, multibeam data was reprocessed at PHB using CARIS HIPS, version 4.2.7.

First, the raw multibeam data was converted, then imported into CARIS. The data was then manually cleaned using HDCS. Spikes obviously caused by noise, fish, kelp, water column turbidity, or other factors not associated with a true bottom return were manually rejected. The survey line files were then merged with smooth tide data and analyzed using the CARIS Subset Mode. Any additional 'fliers' discovered in Subset Mode were manually rejected. The final cleaned data was then imported into a CARIS Work File. The soundings in the work file were then suppressed to eliminate over plotting of soundings. The final suppressed soundings were then exported from CARIS and imported into HPS.

Lidar survey data were acquired using the SHOALS Airborne Data Collection System, version 951105. The SHOALS Airborne Data Processing System, version 1.73, was used for data processing. Pacific Hydrographic Branch converted SHOALS data to USL CARIS/HIPS, version 4.2.7, for smoothing. CARIS data were then converted to a format for use in the Hydrographic Processing System (HPS). Subsequently, the processed data were merged with the multibeam data, then exported to MicroStation 95 for compilation of the smooth sheet.

Digital data for this survey exists in the standard HPS format, that is a database format using the .dbf extension. In addition, the smooth sheet drawing is filed in the MicroStation format, i.e., dgn (extension). Copies of these files will be forwarded to the Hydrographic Surveys Division and a backup copy will be retained at PHB. Database records forwarded are in the Internal Data Format (IDF) and are in compliance with specifications in existence at the time of survey processing.

The drawing files necessarily contain information that is not part of the HPS data set, such as geographic names text, line-type data, and minor symbolization. In addition, those soundings deleted from the drawing for clarity purposes remain unrevised in the HPS digital files to preserve the integrity of the original hydrographic data set. Cartographic codes used to describe the digital data are those authorized by Hydrographic Survey Guideline No. 35 and No. 75.

The data are plotted using a Universal Transverse Mercator projection and are depicted on a single sheet.

E. SONAR EQUIPMENT

See the hydrographer's report.

F. SOUNDING EQUIPMENT

See the hydrographer's report.

G. CORRECTIONS TO SOUNDINGS

The verification of sounding data originating with the SHOALS survey system created special problems during office processing. The digital format of this data is incompatible with any software currently in use by the Pacific Hydrographic Branch. Therefore, it was not possible to review the digital field data to ensure that it meets specifications for quality in terms of data reduction. The quality of the data is assumed to be acceptable for charting based on information obtained from the contractor regarding system operation and the field records and reports, which discuss certain operational problems. The plotted data were further compared to other existing reliable information in order to infer its quality. Comparison with the nautical chart (see section O), prior surveys (see section M) and concurrently acquired echo sounder data all indicate that these lidar data are consistent, reasonable and apparently adequate to be considered for use in revising nautical charts.

In addition, the Hydrographic Surveys Division issued a specific policy regarding the use of SHOALS Lidar data and the limitations of the system when used for hydrographic surveying and the compilation of nautical chart revision documents. A copy of the document, titled *Application of SHOALS Lidar Data to Nautical Charting Documents*, dated June 9, 1998, is attached.

The reducers for multibeam sounding data include corrections for actual tide, dynamic draft, and sound velocity. Heave, pitch and roll correctors were applied by SEABAT 6042 software. The reducers for SHOALS lidar data include a light refraction angle value based on salinity. This reducer was verified as being acceptable by verbal consultation with the Nautical Charting

Development Lab, Hydrographic Technology Programs. The SHOALS processing software applied roll, pitch and vertical acceleration, as well as other correctors.

Reduction of soundings for tide was accomplished by the hydrographer in the field. Tide reducers were derived from the Santa Barbara gage, 941-1340, in accordance with the attached Tide Note.

Within the limitations described above the reduction of soundings to Mean Lower Low Water is consistent with NOS specifications.

H. CONTROL STATIONS

Section H of the hydrographer's report contains an adequate discussion of horizontal control.

The positions of horizontal control stations used during hydrographic operations are published values based on NAD 83. The geographic positions of all survey data are based on NAD 83. The smooth sheet is annotated with an NAD 27-adjustment tick based on values determined with the NGS program NADCON. Geographic positions based on NAD 27 may be plotted on the smooth sheet utilizing the NAD 83 projection by applying the following corrections:

Latitude: -0.037 seconds (-1.153 meters)

Longitude: 3.535 seconds (90.244 meters)

I. HYDROGRAPHIC POSITION CONTROL

The hydrographer used OMNISTAR® and STARFIX® II as DGPS systems for positioning survey platforms. Section I of the hydrographer's report contains an adequate description of the hydrographic position systems used during the survey.

The verification of DGPS performance by monitoring PDOP is not an accepted NOS method. However, subsequent consultation with the hydrographer indicates that based on the consistency of the PDOP value throughout the time of the survey and the use of multiple DGPS stations, thereby creating an internal cross-check, the quality of hydrographic positioning is adequate for nautical charting.

The failure to monitor DGPS performance used to position the helicopter (NOAA 60) is an exception to NOS specifications. However, with review of the junction of this sounding data with that acquired by boat found to be in good agreement, positioning is determined to be good and acceptable.

Additional information concerning calibrations and system checks can be found in the hydrographer's report and in the separates related to horizontal position control and corrections to position data.

NAD 83 is used as the horizontal datum for plotting and position computations.

J. SHORELINE

Shoreline shown on the smoothsheet is for orientation purposes only. Shoreline was digitized from raster images of surveys H-10161 (1984) and H-10171 (1985). The digital shoreline and the hydrographic data files were merged during smoothsheet compilation. The line representing the shoreline is shown on the smoothsheet in brown. Cultural features attached to the shoreline are depicted in red if originating from survey H-10161 (1984) and in violet if originating from survey H-10171 (1985).

K. CROSSLINES

Crosslines are discussed in the hydrographer's report.

L. JUNCTIONS

Survey H-10706 does not junction with any contemporary survey.

M. COMPARISON WITH PRIOR SURVEYS

Comparison with prior surveys was not required of the hydrographer.

Comparison with the following prior surveys was conducted as a part of office processing.

Survey	Scale
H-10161 (1984)	1:20,000
H-10171 (1985)	1:20,000

Prior surveys H-10161 (1984) and H-10171 (1985) cover the entire area of the present survey. Sounding agreement is good with present survey depths agreeing within one to three fathoms of the prior surveys. Specifically, inshore areas are now generally more shoal while offshore areas in depths greater than 20 fathoms are deeper. The cause of this minor difference is unknown. However, there is the possibility that the sandy bottom, characteristic of this coastline, experiences typical onshore-offshore migration coincidental to season changes in tidal surge and wave energy.

Pier ruins originating with survey H10161 (1984) at latitude 34°28"13.5N, longitude 120°12"16.5W, were verified by the present survey. However, the depiction of these ruins on chart 18721, 10th Edition is incorrect. The charted symbology is approximately 0.65 NM east of the surveyed location. The charted pier ruins should be deleted and pier ruins should be charted as indicated on the present survey.

The extent of hydrography is not sufficient to adequately address nearshore features originating with prior surveys. Historical information has been carefully evaluated, and where necessary to supplement the present survey, has been carried forward to the smoothsheet. This information specifically includes soundings, rocks, ledges and kelp notations. Elsewhere, bottom characteristics have been carried forward since no bottom sampling was conducted during the present survey.

Information carried forward from survey H-10161 (1984) is depicted in red; information from survey H-10171 (1985) is depicted in violet.

The Hydrographic Surveys Division issued specific policy regarding the supersession of prior survey information by lidar surveys on June 9, 1998. A copy of this document, titled *Application of SHOALS Lidar Data to Nautical Charting Documents*, is attached.

With the addition of prior survey information survey H-10706 is adequate to supersede the prior surveys within the common area.

N. ITEM INVESTIGATIONS

There were no AWOIS items assigned to this survey.

O. COMPARISON WITH CHART

Survey H-10706 was compared with the following chart:

Chart	Edition	Date	Scale	Datum
18721	10th	Aug. 5, 1995	1:100,000	NAD83

a. Hydrography

Charted hydrography originates with the previously discussed prior surveys. The prior surveys have been adequately addressed in section M and require no further discussion.

Survey H-10706 is adequate to supersede charted hydrography within the charted area.

b. Dangers To Navigation

No dangers to navigation were discovered during survey operations or during office processing.

P. ADEQUACY OF SURVEY

With the exception of the following and as noted elsewhere in this report the hydrography acquired during survey H-10706 is adequate to:

a. delineate the bottom configuration, determine least depths, and draw the required depth curves;

b. reveal there are no significant discrepancies or anomalies requiring further investigation; and

c. show the survey was properly controlled and soundings are correctly plotted.

A visible pipe, located on the hydrographer's preliminary smoothsheet at latitude 34°27"31.1"N, longitude 120°12"44.4W, is questionable. The field records, including sonargrams, were carefully reviewed to obtain specific information on this feature. No indication of the pipe can be found in any document other than the sounding plot. The evaluator considers this feature to be discredited. It has not been depicted on the present survey smoothsheet.

Bottom coverage with the side scan sonar system is less than 200% in two areas. These areas are shown in a figure that accompanies this report as Attachment 2. Bottom coverage in areas of SHOALS lidar operations is less than 100 percent. The areas of deficient coverage are identified in a figure showing coverage limits, Attachment 3.

The survey was submitted for government approval without an accompanying Approval Page signed by the hydrographer.

Hydrographic records and reports received for processing conform to the requirements of the Hydrographic Manual, 4th Edition, revised through Change No. 3, the Hydrographic Survey Guidelines, and the Field Procedures Manual, April 1994 Edition.

Q. AIDS TO NAVIGATION

There are no fixed and floating aids to navigation within the survey area.

There were no features of landmark value located within the area of this survey.

R. STATISTICS

Statistics are contained in section Q of the hydrographer's report.

S. MISCELLANEOUS

Miscellaneous information is discussed in section R of the hydrographer's report.

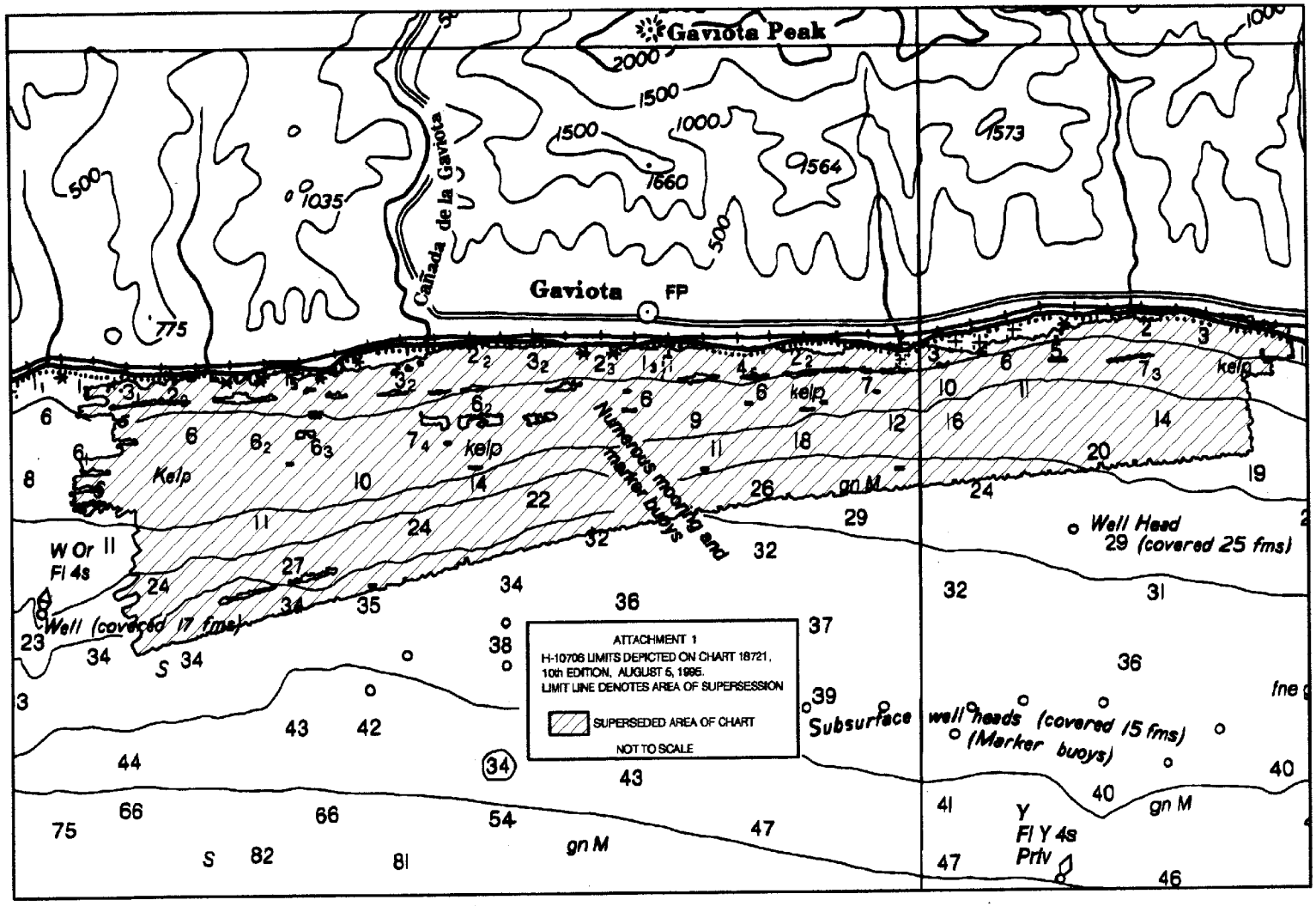
T. RECOMMENDATIONS

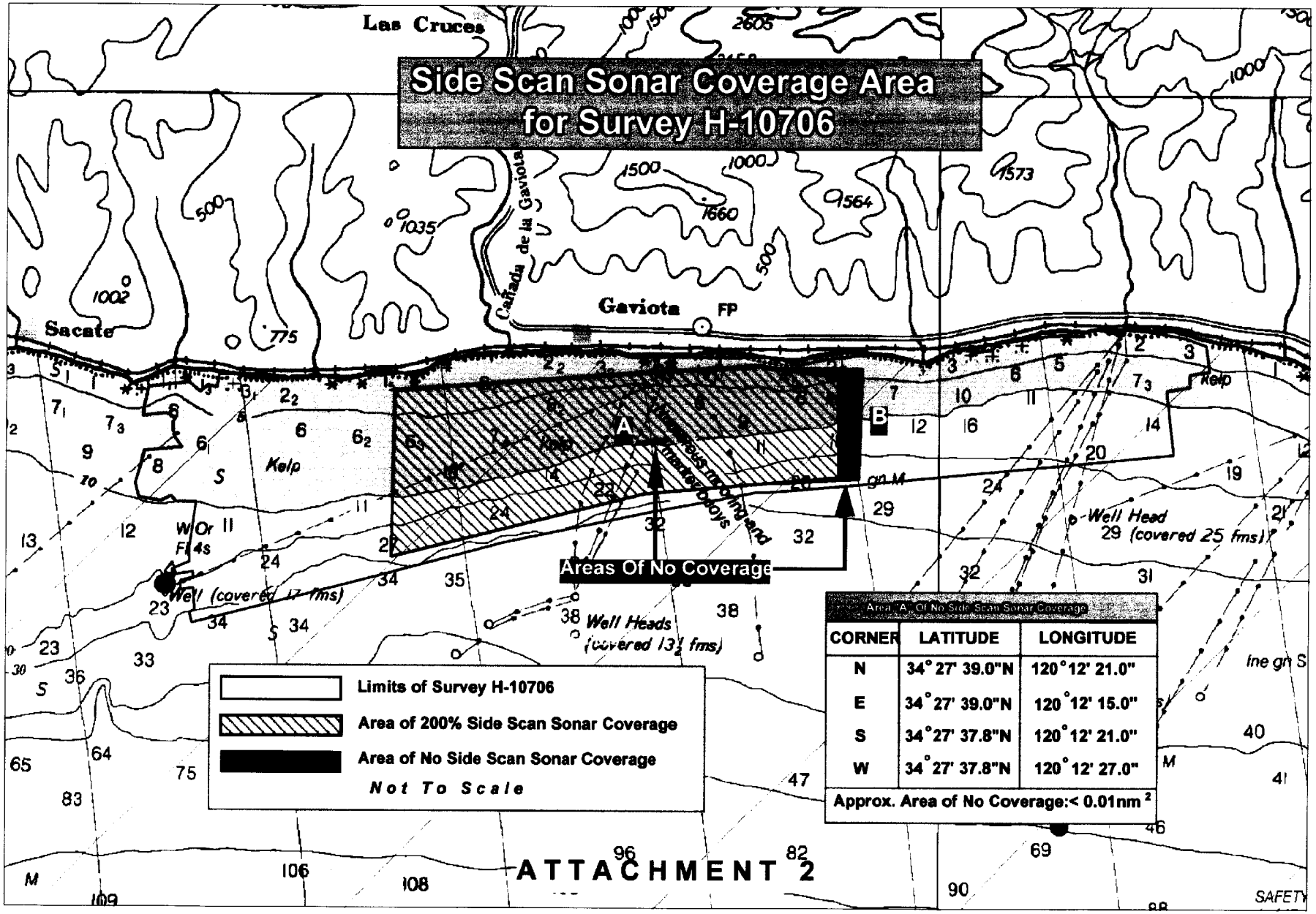
This is an adequate hydrographic survey and no additional work is recommended.

U. REFERRAL TO REPORTS

See section T of the hydrographer's report.

C.J. Barry
Cartographer


Gaviota Peak
2000
1500
1000
500
1573
1564
1660
1035
775
Cañada de la Gaviota
Gaviota FP
Kelp
kelp
Numerous mooring and marker buoys
W Or II
Fl 4s
Well (covered 17 fms)
Well Head
29 (covered 25 fms)
gn M
Subsurface
well heads (covered 15 fms)
(Marker buoys)
Y
Fl Y 4s
Priv
ATTACHMENT 1
H-10706 LIMITS DEPICTED ON CHART 18721,
10th EDITION, AUGUST 5, 1995.
LIMIT LINE DENOTES AREA OF SUPERSESSION
SUPERSEDED AREA OF CHART
NOT TO SCALE


Side Scan Sonar Coverage Area
for Survey H-10706
Las Cruces
Gaviota FP
Sacate
Cañada de la Gaviota
Kelp
Well Head
29 (covered 25 fms)
Well Heads
(covered 13½ fms)
Areas Of No Coverage
A
B
Limits of Survey H-10706
Area of 200% Side Scan Sonar Coverage
Area of No Side Scan Sonar Coverage
Not To Scale
Area "A" Of No Side Scan Sonar Coverage
CORNER | LATITUDE | LONGITUDE
N | 34° 27' 39.0"N | 120° 12' 21.0"
E | 34° 27' 39.0"N | 120° 12' 15.0"
S | 34° 27' 37.8"N | 120° 12' 21.0"
W | 34° 27' 37.8"N | 120° 12' 27.0"
Approx. Area of No Coverage:< 0.01nm²
ATTACHMENT 2

APPROVAL SHEET
H-10706

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, comparison with prior surveys and verification or disproval of charted data. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Bruce A. Olmstead Date: 7/17/98
Bruce A. Olmstead
Senior Cartographer, Cartographic Section
Pacific 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.

Kathy Timmons Date: 7/23/98
Kathy Timmons
Commander, NOAA
Chief, Pacific Hydrographic Branch

****

Final Approval

Approved:

Andrew A. Armstrong III Date: Aug 31, 1998
Andrew A. Armstrong III
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. H-10706

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
18721	6/17/98	C.J. BARRY	Full ~~Part Before~~ After Marine Center Approval Signed Via FULL APPLICATION OF
			Drawing No. SOUNDINGS, CURVES AND FEATURES FROM SMOOTH SHEET
			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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			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.