

H10532

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. .. RA-10-2-94 .....

Registry No. .. H-10532 .....

### LOCALITY

State ..... California .....

General Locality .. Estero Bay .....

Sublocality .. Approaches to Morro Bay .....

19 94

### CHIEF OF PARTY

..... R. C. Arnold, CAPT, NOAA .....

### LIBRARY & ARCHIVES

DATE ..... MAR 6 1995 .....

**PROGRESS SKETCH**

121 00' 00"      OPR-L111-RA      120 50' 00"

HYDROGRAPHIC SURVEY  
ESTERO BAY, CALIFORNIA

MAR 25 - APR 18, 1994

**NOAA SHIP RAINIER**

R. C. ARNOLD, CAPT., NOAA  
COMMANDING

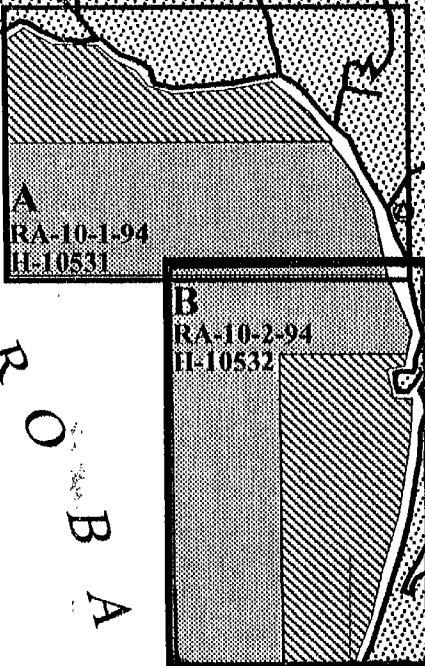
SCALE OF CHART 18700 = 1:216,116

035 20' 00"

PACIFIC

OCEAN

ESTERO BAY



035 20' 00"

MAR    APR

20	19	SQ. NM SOUNDINGS
539	957	LNM SOUNDINGS
203	44	LNM SIDE SCAN SOUNDINGS
0	162	BOTTOM SAMPLES (GRAB)
2	2	ELECTRONIC CONTROL STATIONS
1	1	TEMP., DEPTH, SOUND VEL. CAST
1	1	TIDE GAGES
6	4	GEO. CONT. STATIONS EST./REC.
0	14	AWOIS ITEMS INVESTIGATED
		AREA SURVEYED

121 00' 00"

120 50' 00"

## HYDROGRAPHIC TITLE SHEET

H-10532

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.

RA-10-2-94

State CaliforniaGeneral locality Estero BayLocality Approaches to Morro BayScale 1:10,000 Date of survey March 25-April 18, 1994Instructions dated February 23, 1994 Project No. OPR-L111-RAVessel NOAA Ship RAINIER (2120), (2123), (2124), (2125), (2126)Chief of party CAPT Russell C. Arnold, NOAASurveyed by CAPT R. Arnold, LT D. Neander, LT D. Haines, LTJG D. Lemke, ENS G. Glover, ENS J. Graham, ENS S. Shaulis, ENS K. Pavelle, ENS S. Maenner, ENS S. SmithSoundings taken by echo sounder, ~~hand lead, etc.~~ DSF-6000N, pneumatic depth gaugeGraphic record scaled by RAINIER PersonnelGraphic record checked by RAINIER PersonnelEvaluation by: R. Davies Automated plot by PHS Xynetics PlotterVerification by R. DaviesSoundings in ~~feet~~ ~~XXXX~~ meters at MEW MLLW and decimeters

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.

*AWOIS and Surf - 4/95 RW*

# Descriptive Report to Accompany Hydrographic Survey H-10532

Field Number RA-10-2-94

Scale 1:10,000

March-April 1994

NOAA Ship RAINIER  
Chief of Party: Captain Russell C. Arnold

## A. PROJECT ✓

This basic hydrographic survey, under the navigable area concept, was completed in Estero Bay, California, as specified by Project Instructions OPR-L111-RA dated February 23, 1994 and Change Number 1, dated *May 24, 1994*.

Survey H-10532 corresponds to "Sheet B" as defined in the Project Instructions.

This project responds to a U.S. Coast Guard request to survey the approaches, offshore oil tanker moorings, and loading facilities at Estero Bay. Estero Bay, which is an environmentally sensitive area, is host to heavy tanker traffic passing close inshore. This project provides data in support of existing charts and a planned large scale inset of the area.

## B. AREA SURVEYED *See Evaluation Rpt, Section 1*

This survey area is centered in Estero Bay. The survey's western limit is longitude  $120^{\circ}57'06''$  W, the northern limit is latitude  $35^{\circ}24'05''$  N and the southern limit is latitude  $35^{\circ}17'51''$  N. The eastern limit is the 5-meter depth curve and the breakwater at Morro Bay.

Data acquisition was conducted from March 25, 1994, Day Number (DN) 84, through April 18, 1994, DN 108.

## C. SURVEY VESSELS ✓

Data were acquired by the NOAA SHIP RAINIER and four survey launches as noted below:

<u>Vessel</u>	<u>EDP #</u>	<u>Operation</u>
RAINIER	2120	Sound Velocity Casts Bottom Samples
RA-3	2123	Side Scan Sonar
RA-4	2124	Hydrography
RA-5	2125	Side Scan Sonar Hydrography Bottom Samples Detached Positions
RA-6	2126	Hydrography Dives

**D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓**

Data acquisition and processing were accomplished with the following HDAPS programs:

<u>Program Name</u>	<u>Version</u>	<u>Date Installed</u>
BACKUP	2.00	3/7/94
BASELINE	1.14	3/7/94
BIGABST	2.07	3/7/94
BIGAUTOST	3.01	3/7/94
BLKEDIT	2.02	3/7/94
CARTO	2.11	3/7/94
CLASSIFY	1.05	3/7/94
CONVERT	3.54	3/7/94
CONTACT	2.32	3/7/94
CONVERT	3.62	3/7/94
DAS_SURV	6.62	3/7/94
DIAGNOSE	3.03	3/7/94
DISC-UTIL	1.00	3/7/94
DP	2.14	3/7/94
EXCESS	4.21	3/7/94
FILESYS	3.21	3/7/94
GRAFEDIT	1.06	3/7/94
HIPSTICK	1.01	3/7/94
HPRAZ	1.26	3/7/94
INVERSE	2.01	3/7/94
LISTDATA	1.02	3/7/94
LOADNEW	2.10	3/7/94
LSTAWOIS	3.06	3/7/94
MAINMENU	1.20	3/7/94
MAN_DATA	2.01	3/7/94
NEWPOST	6.01	3/7/94
PLOTALL	2.25	3/7/94
POINT	2.10	3/7/94
PREDICT	2.01	3/7/94
PRESURV	7.07	3/7/94
PRINTOUT	4.03	3/7/94
QUICK	2.04	3/7/94
RAMSAVER	1.02	3/7/94
REAPPLY	2.10	3/7/94
RECOMP	1.02	3/7/94
SCANNER	1.00	3/7/94
SELPRINT	2.04	3/7/94
SYMBOLS		3/7/94
VERSIONS	1.00	3/7/94
ZOOMEDIT	2.22	3/7/94

Velocity corrections were determined using:

<u>Program Name</u>	<u>Version</u>	<u>Date Installed</u>
VELOCITY	2.10	3/15/94

## E. SONAR EQUIPMENT

Side scan sonar (SSS) operations were conducted using an EG&G Model 260 image-corrected SSS recorder and a Model 272-T single frequency towfish. RA-5 was equipped with a thermal recorder, and RA-3 was equipped with an older multi-stylus recorder. SSS was run with RA-5 on DN 84-91 and with RA-3 on DN 93 and 95. Serial numbers of the equipment used are located on the raw master printouts.\*

The SSS towfish was configured with a 20° beam depression, the normal setting, which yields the best beam correction. The 100 kHz frequency was used throughout this survey. The 100 m range scale (RS) was used primarily for this survey. The 75 m and the 50 m RS were used in the shallower waters (usually less than 10 m water depth). The towfish was deployed exclusively from the stern of the launch.

Standard line spacing used was 150 m for 100 m RS, 100 m for 75 m RS and 70 m for 50 m RS (Side Scan Sonar Manual, Section 2.1.3.2). Two hundred percent SSS was achieved as required by conducting two separate 100 percent coverages wherein the vessel track lines during the second coverage split the distance between the track lines of the first coverage (Side Scan Sonar Manual Section 1.2.2). Track lines were run parallel to the depth contours. Overlap of SSS coverage was checked on-line using the real-time plot and the edited swath plot was employed to identify holidays.

Daily confidence checks were performed by towing the fish over bottom texture features. Confidence checks were also possible during SSS operations due to numerous rocks, obstructions and bottom features.

The SSS traces were scanned for data quality and contacts. Contacts were selected if an object had a connecting shadow and the shadow indicated a significant height above the bottom. Any contact appearing significant was entered into contact tables. In areas of numerous contacts, the number of contacts recorded was limited to one per selected sounding per channel. Contacts in less than 20 m of water which had a height less than 1 m and contacts in water greater than 20 m with heights less than 10% of the total depth labeled insignificant. The significant contacts were grouped into developments and were investigated by intensive echosounder investigation. In addition, dives were conducted to investigate the most significant features as determined by echosounder development. Tables for contact/development correlation are located in "Separates to be included with Survey Data, Section V".\*

### Problems

When satellites were at or near an elevation mask of 8° or during other times of high HDOP, minor discontinuities in position were noted. While conducting SSS, these discontinuities led to apparent holidays in the coverage. The problem was exacerbated by the new HDAPS algorithm for computing SSS swath coverage, based on course made good (CMG). The swath width is centered on and perpendicular to each course made good CMG segment. During times of DGPS discontinuities, the swath coverage can become twisted, occasionally creating small holidays which eventually were rerun.

Due to a significant sea and swell action area near the 5-meter curve, the towfish at times, had problems keeping track of the bottom. Some areas appeared to have reduced coverage and were easily recognized because the on-line swath plot would leave holidays. These areas of reduced coverage were eventually rerun. All SSS coverage was ultimately checked with a smooth plot to ensure proper overlap between consecutive lines.

On DN 85 the transmitter on the starboard channel of the towfish failed. The towfish was repaired and back on-line on DN 87.

\* Filed with the hydrographic data

## F. SOUNDING EQUIPMENT ✓

The Raytheon DSF-6000N is a dual frequency (100 kHz, 24 kHz), paper trace echo sounder. Serial numbers are included on the headers of the daily Raw Master Printouts.\* No problems which affect survey data were encountered. All soundings were acquired using the High + Low, High frequency digitized setting.

A pneumatic depth gauge (S/N 8503358) was used for dive investigations on DN 97, 107-108. It was calibrated by Pacific Operations Section (N/OES214) on March 17, 1994.

## Problems

For the most part echo sounder developments were used successfully to resolve contacts; however, there were several anomalous soundings of considerable apparent height which after further echo sounder development were found to be erroneous. The exact reason was never determined, although the presence of kelp, fish, or even whales (all of which were numerous) could explain the phenomenon.

## G. CORRECTIONS TO ECHO SOUNDINGS ✓

Correctors for the velocity of sound through water were determined from the casts listed below:

<u>Velocity</u> <u>Table #</u>	<u>Cast</u> <u>#</u>	<u>DN</u>	<u>Cast **</u> <u>Position</u>	<u>Deepest</u> <u>Depth (m)</u>	<u>Applicable</u> <u>DN</u>
1	1	089	35°24'14" N 121°00'32" W	116.3	84-97
2	2	104	35°23'48" N 120°59'38" W	115.4	103-108

\*\* Both casts fall outside the survey limits.

The sound velocity casts were acquired with SBE SEACAT Profiler (S/N 811), calibrated 12/17/93. Velocity correctors were computed using the PC program VELOCITY in accordance with Hydrographic Survey Guideline (HSG) No. 69. A printout of the Sound Velocity Corrector Tables used in the HDAPS Post Survey program is included in the "Separates to be Included with Survey Data, IV:\* Sounding Equipment Calibrations and Corrections".

## Static Draft ✓

A transducer depth was determined using FPM Fig 2.2 for launches 2123, 2124, 2125 and 2126 in the spring of 1994 and was entered into the offset tables for each launch.

## Settlement and Squat ✓

Correctors were computed in accordance with Hydrographic Manual Section 4.9.4.2., using FPM Fig. 2.3, and are included with project data for OPR-L111-RA. The data used was collected in Shilshole Bay, Washington in March of 1994.

\* Filed with the hydrographic data

### Offset Tables ✓

Offset tables contain offset and laybacks for the GPS antenna and the SSS towpoint, as well as the static draft, settlement and squat data. Offset tables 3-6 correspond to the number of the launch. The offset tables were compiled with new measurements in the spring of 1994 and are contained in the "Separates to be Included with Survey Data".\*

### Heave ✓

The launches are not equipped with heave, pitch and roll sensors; consequently, irregular profiles caused by significant sea action were taken along a line representing the mean depth, not from tops of peaks (HSG No. 31). Periods of significant sea action were annotated on the fathograms and raw master printouts.\*

### Bar Check and Lead Lines ✓

Bar check and lead lines were calibrated by RAINIER personnel during the winter 1993-1994 inport. Calibration forms are included with the project data for OPR-L111-RA. Bar checks were performed on a weekly basis and served as a functional check of the DSF 6000N .

### Tide Correctors ✓

The tidal reference and control station used for this survey was Port San Luis, California (941-2110). Tidal information was used from this station with 0.00 time correction and 0.00 height correction as provided in the project instructions.

HDAPS listings of the data used in generating tide corrector tables are included in Appendix V<sup>\*</sup> of this report.

The tide gage at Port San Luis is maintained by Pacific Operations Section (N/OES214). The tide gage was checked daily on weekdays for data output by POS via computer modem. Opening levels were performed by RAINIER personnel on March 21 and 23, 1994. Closing levels were performed on April 15, 1994.

The station description, field tide records, and Field Tide Note (Appendix V)<sup>\*</sup> were forwarded to N/OES212 in accordance with HSG 50 and FPM 4.3. A request for approved tides was forwarded to N/OES2. Tide Note dated July 6, 1994 is attached.

### H. CONTROL STATIONS ✓ See Evaluation Report, Section 2.

A listing of the geodetic stations used to control this survey is included in ~~Appendix III~~ of this report.

Two DGPS base stations were established using static GPS methods. California High Precision Stations, HPGN 05 07 and TIDAL 14 were used as control stations. Station TOWER was established atop the Morro Bay Coast Guard building and station CHEVRON was established on Chevron Oil Company property approximately two miles north of Morro Bay. Horizontal datum for this project is NAD 83. All existing stations were recovered in accordance with methods stated in Section 5.2.4 of the FPM. Further information can be found in the "Spring 1994 Horizontal Control Report for OPR-L111-RA" and Appendix III<sup>\*</sup> of this report.

\* Filed with the hydrographic data



## I. HYDROGRAPHIC POSITION CONTROL ✓

### Method of Position Control ✓

All soundings and features were positioned using differential GPS. Serial numbers for Ashtech GPS equipment are annotated on the data printouts.\*

The estimated system error (ESE) for the DGPS "fly away system" has been recently reduced from 4 m to 2.5 m (Project Instructions Change Number 1). For a 1:10,000 hydrographic survey, the HDOP limit becomes 6.0 (FPM Section 3.4.2).

### Calibrations & Systems Check Methods ✓

System checks were performed by launch to launch comparisons of position. Three observations of position were made by each launch using correctors from two independent DGPS base stations. System checks were performed once a week and the results were transferred to forms which are included in the project data for OPR-L111. An abstract of the system checks is included in the "Separates to be Included with Survey Data, III. Horizontal Position Control and Corrections to Position Data".\*

### Problems ✓

Using the new ESE of 2.5 m, the maximum allowable inverse distance between two DGPS system check positions becomes  $\text{HDOP (observed)} \times 2.5$  (FPM Section 3.4.4.1). During periods of low HDOP, the maximum allowable error is reduced to levels unachievable using three observations. On several such occasions, during the low HDOP, the launches would take as many as ten positions each to meet performance check specifications.

### Ashtech GPS ✓

VHF differential shore stations were established at stations CHEVRON and TOWER. The difference between the computed location and the station's published position was recorded by the MONITOR program on an PC. Data from a 24-hour period were recorded and examined for signs of multi-path signal reflection, which was not evident at either station.

### Problems ✓

Except as noted below, the differential GPS stations on TOWER and CHEVRON ran without problems for sheet B.

During the first 10 days of the project, one satellite (SV7), critical to our constellation, was unhealthy. This resulted in a period of high HDOP which lasted for one to two hours in the early afternoon. Examination of this data revealed no significant problems.

### Offset ✓

The launch GPS antenna offsets are stored in the HDAPS Offset Tables as listed in Section G. Copies of the Offset Tables are included in the "Separates to be Included with Survey Data".\*

\* Filed with the hydrographic data

**J. SHORELINE** *See EVAE Report, section 2*

There was no photogrammetric source data for OPR-L111. Shoreline for field sheets was drawn from an enlargement of NOS chart 18703, 22nd Edition, November 6, 1993, 1:40,000 (NAD 83), shown in brown, and used for orientation purposes only.

Verification of the shoreline shoreward of the 5 m depth curve was not required for this project.

**K. CROSSLINES** ✓

Crosslines are in good agreement with mainscheme hydrography. Crosslines totaled 50.4 nautical miles, representing 14.2 % of the total mainscheme hydrography.

**L. JUNCTIONS** *See EVAE Report, section 5.*

The survey joins H-10531 to the north. There were no discrepancies in soundings or depth curves found along the junction. Agreement between overlapping soundings appears acceptable. Detailed comparisons will be made by N/CG245.

**M. COMPARISON WITH PRIOR SURVEYS** *See EVAE Report, section 6*

Preliminary comparisons with prior surveys were conducted by RAINIER during survey operations. Final prior survey comparison will be accomplished by N/CG245.

**N. ITEM INVESTIGATIONS**

Eight AWOIS items were assigned to survey H-10532.

**AWOIS ITEM 52024** ✓

**1. Area of Investigation**

State: California  
Locality: Estero Bay  
Reported Latitude: 35°23'27.5"N  
Reported Longitude: 120°52'02.5"W  
Datum: NAD 83  
Depth: 3/4 FM (1.3 m)  
Feature: Submerged Rock

**2. Description of Source Item**

COE reported a submerged rock 4.9 FT at MLLW (BP56973/58). Position scaled from chart.

**3. Survey Requirements**

Verify or disprove, determine least depth or elevation and position. Techniques to be used are echo sounder, bottom drag or diver investigation with a search radius of 100 m.

#### 4. Method of Investigation

A visual inspection was conducted by walking along the beach at low water using a hand-held GPS receiver for positioning.

#### 5. Results of Investigation

The inspection was conducted on DN 105 and the rock was not located. Search time was 15 minutes. A launch was unable to investigate this item due to its location in the surf zone.

#### 6. Comparison with Prior Surveys

The item did not originate with a prior survey.

#### 7. Comparison with the Chart and Charting Recommendations

The item was compared to NOS chart 18703, 22nd Edition, November 6, 1993, 1:40,000 (NAD 83).

#### Recommendation

Since a sufficient search could not be made, it is recommended that the rock be retained at its charted location. *COYKUN*

#### AWOIS ITEM 52025 ✓

#### 1. Area of Investigation

State: California  
Locality: Estero Bay  
Reported Latitude: 35°23'35.9"N  
Reported Longitude: 120°52'35.6"W  
Datum: NAD 83  
Depth: 6 1/4 FM (11.3 m)  
Feature: Artificial Reef established over seaward ends of two abandoned fuel pipelines.

#### 2. Description of Source Item

COE reports an artificial reef established over seaward ends of two abandoned fuel pipelines owned by Texaco. Reef consists of 3500 tons of quarry rock and tribar, and rises 9.5 FT off the bottom. At the seaward end, the depth over the reef would be no less than 38 FT. The pipeline is approximately 3100 FT long and is buried 11.5 FT inshore, 6.5 FT offshore. Mooring buoys, anchors, chain, and other debris were removed in 1977. The pipeline was then abandoned in place. The overall limits of the reef are approximately 90 x 320 FT (CL1254/85--(BP127841)).

#### 3. Survey Requirements

Verify or disprove, determine least depth and position. Techniques to be used are 200 % side scan coverage, echo sounder, bottom drag or diver investigation. Search an area 200 m about the stated position and zig-zag across the axis of the pipeline inshore to the limit of safe navigation, to ensure that scouring has not occurred.

#### 4. Method of Investigation

The area was developed with an echo sounder using 10 m splits (Expansion 51A). Divers investigated the region with 2-3 m of visibility using a 25 m search radius for 17 minutes. A least depth was taken with a pneumatic depth gage.

#### 5. Results of Investigation

Date:	DN 97
Time (UT):	19 16 20
Average Measured Depth:	12.8 m
Pneumo Depth Corrector:	+0.3
Predicted tide corrector:	-0.6
Corrected Least Depth:	12.5 m (6 3/4 FM)
Position Number	9889
Latitude	35°23'33.0"N
Longitude	120°52'33.9"W
Datum:	NAD 83

#### 6. Comparison with Prior Surveys

The item did not originate with a prior survey.

#### 7. Comparison with the Chart and Charting Recommendations

The item was compared to NOS chart 18703, 22nd Edition, November 6, 1993, 1:40,000 (NAD 83). This item was not submitted as a Danger to Navigation.

#### Recommendation

Delete fish haven <sup>and 6 3/4 rep</sup> at latitude 35°23'35.9"N, longitude 120°52'35.6"W.

Chart fish haven <sub>(obstr)</sub> covering 6 3/4 FM at revised position 35°23'33.0"N, 120°52'33.9"W. <sup>(12.6m)</sup> <sub>com cur</sub>

See Eval. Report, para 7.9.

AWOIS ITEM 52026 ✓

#### 1. Area of Investigation

State:	California
Locality:	Estero Bay
Reported Latitude:	35°19'32.0"N
Reported Longitude:	120°52'35.0"W
Datum:	NAD 83
Depth:	4 FM (7.2 m)
Feature:	Submerged Rock

#### 2. Description of Source Item

COE reports a submerged rock (BP56972/58). Position scaled from chart.

### 3. Survey Requirements

Verify or disprove, determine least depth or elevation and position. Techniques to be used are 200 % side scan coverage, echo sounder, bottom drag or diver investigation with a search radius of 100 m.

### 4. Method of Investigation

The region was investigated (development 55A, position numbers 3100-3149) with an echo sounder using 10 m line spacing.

### 5. Results of Investigation

The investigation was conducted on DN 096. There was no indication of a submerged rock at the charted location.

### 6. Comparison with Prior Surveys

The item did not originate with a prior survey.

### 7. Comparison with the Chart and Charting Recommendations

The item was compared to NOS chart 18703, 22nd Edition, November 6, 1993, 1:40,000 (NAD 83).

### Recommendation

Delete submerged rock charted at latitude 35°19'32.0"N, longitude 120°52'35.0"W. ~~SCALE~~  
*Investigation inconclusive, retain as charted.*  
AWOIS ITEM 52027 ✓

### 1. Area of Investigation

State: California  
Locality: Estero Bay  
Reported Latitude: 35°22'33.0"N  
Reported Longitude: 120°52'03.0"W  
Datum: NAD 83  
Depth: 1 1/2 FM (2.7 m)  
Feature: Single Pile or Row of Pilings

### 2. Description of Source Item

COE reports a row of pilings (offshore end in 12 FT of water) (BP56975/58). REV (classIII) reports single pile at latitude 35°22'3"N, longitude 120°51'5"W (NAD27) at the inshore end (TP00707/76). Position scaled from chart.

### 3. Survey Requirements

Verify or disprove, determine least depth or elevation and position. Techniques to be used are visual search, echo sounder, diver investigation. The area to be searched is to be 50 m wide from the stated position to the inshore end of the charted feature.

#### 4. Method of Investigation

A visual inspection was conducted by walking along the beach at low water using a hand-held GPS receiver for positioning.

#### 5. Results of Investigation

The investigation was conducted on DN 105 and no evidence of piles was found. An area of 300 m around the reported position was searched for 15 minutes.

#### 6. Comparison with Prior Surveys

The item did not originate with a prior survey.

#### 7. Comparison with the Chart and Charting Recommendations

The item was compared to NOS chart 18703, 22nd Edition, November 6, 1993, 1:40,000 (NAD 83).

#### Recommendation

Delete row of pilings charted at latitude 35°22'33.0"N, longitude 120°52'03.0"W *Do not concur*  
*Since a sufficient search at the offshore end could not be made, it is recommended that the row of piles*  
**AWOIS ITEM 52028** *be retained at its charted position but be revised to submerged piles.*

#### 1. Area of Investigation

State: California  
Locality: Estero Bay  
Reported Latitude: 35°22'42.0"N  
Reported Longitude: 120°51'57.0"W  
Datum: NAD 83  
Depth: 3/4 FM (1.3 m)  
Feature: Sewer Outfall

#### 2. Description of Source Item

COE reports a sewer outfall (16" cast iron pipe) extends 970 FT from the HWL seaward, bearing 81-12°T. Outfall is laid on the bed of the ocean and would terminate in an outlet structure having a minimum top elevation of 4.5 FT below MLLW (CL249/55).

#### 3. Survey Requirements

To verify or disprove, to determine least depth and determine position, to ensure that scouring has not occurred. Techniques to be used are 200 % side scan coverage echo sounder. Ensure the scouring has not occurred, zig-zag 100 m wide across the axis inshore to the limit if safe navigation.

#### 4. Method of Investigation

A visual inspection was made by walking along the beach at low water using a hand-held GPS receiver for positioning. A launch was unable to investigate the offshore end of this item due to its location in the surf zone.

## 5. Results of Investigation

The investigation was conducted on DN 105 and no indication of sewer outfall was found. An area of 300 m in the vicinity of the reported position was searched for 15 minutes.

## 6. Comparison with Prior Surveys

The item did not originate with a prior survey.

## 7. Comparison with the Chart and Charting Recommendations

The item was compared to NOS chart 18703, 22nd Edition, November 6, 1993, 1:40,000 (NAD 83).

## Recommendation

Since a sufficient search at the offshore end could not be made, it is recommended that the sewer outfall be retained as charted. *Recommend the chart compiler research the source of this feature. There is a possibility that the sewer is part of AWOIS item 52084. Unlikely* *CONCUR*  
AWOIS ITEM 52029 ✓

## 1. Area of Investigation

State: California  
Locality: Estero Bay  
Reported Latitude: 35°22'56.0"N  
Reported Longitude: 120°52'33.0"W  
Datum: NAD 83  
Depth: 10 FM (18.1 m)  
Feature: 24 inch pipeline

## 2. Description of Source Item

COE reported that a 24" oil pipeline would be laid on the bed of the ocean and would extend seaward, bearing 302-42°T, to a depth of about 60 FT approximately 4300 FT long (CL239/55). Position scaled from chart.

## 3. Survey Requirements

To ensure that scouring has not occurred, zig-zag 100 m wide across the axis inshore, to the limit of safe navigation. Techniques to be used are 200 % side scan coverage and echo sounder.

## 4. Method of Investigation

A dive investigation was conducted by swimming inshore along the pipeline. A position was not taken.

## 5. Results of Investigation

The investigation was conducted on DN 107. It was found that the seaward ends of pipeline are exposed, and the two outlets form a "T" then run underground. No evidence of scouring was found.

**6. Comparison with Prior Surveys**

The item did not originate with a prior survey.

**7. Comparison with the Chart and Charting Recommendations**

The item was compared to NOS chart 18703, 22nd Edition, November 6, 1993, 1:40,000 (NAD 83). This item was not submitted as a Danger to Navigation.

**Recommendation**

Retain pipeline at charted position and depth.

*Callout*

**AWOIS ITEM 52030 ✓**

**1. Area of Investigation**

State:	California
Locality:	Estero Bay
Reported Latitude:	35°21'15.0"N
Reported Longitude:	120°51'47.5"W
Datum:	NAD 83
Depth:	1/2 FM (0.9 m)
Feature:	Rock

**2. Description of Source Item**

COE reports a rock (BP56974/58). Position scaled from chart.

**3. Survey Requirements**

Verify or disprove, determine least depth or elevation and position. Technique to be used is visual inspection with 100 m search radius.

**4. Method of Investigation**

A visual inspection was conducted from a skiff at low water using a hand-held GPS receiver for positioning.

**5. Results of Investigation**

The investigation was conducted on DN 105 and no indication of the submerged rock was found. Due to the location of the rock in the surf zone, it was not feasible to maneuver the boat over the exact position of the rock.

**6. Comparison with Prior Surveys**

The item did not originate with a prior survey.

**7. Comparison with the Chart and Charting Recommendations**

The item was compared to NOS chart 18703, 22nd Edition, November 6, 1993, 1:40,000 (NAD 83).



## Recommendation

Since a sufficient search could not be made, it is recommended that the rock be retained as charted.

*COMPL*

## AWOIS ITEM 52034 ✓

### 1. Area of Investigation

State: California  
Locality: Estero Bay  
Reported Latitude: 35°23'10.8"N  
Reported Longitude: 120°52'30.4"W  
Datum: NAD 83  
Depth: 7 3/4 FM (14.0 m)  
Feature: Sewer Outfall

### 2. Description of Source Item

The city of Morro Bay reports that the sewer outfall terminates 4400 FT from shore in 50 FT of water (CL1600/93). The 12<sup>th</sup> Coast Guard District reports that Morro Creek Outfall Buoys A & B mark the position of the completed sewer outfall.

### 3. Survey Requirements

To verify or disprove, to determine least depth and position, to ensure that scouring has not occurred, zig-zag 100 m wide across the axis inshore, to limit of safe navigation. Techniques to be used are 200 % side scan coverage, echo sounder, or diver investigation.

### 4. Method of Investigation

A diver investigation was conducted using a 20 m search radius in water with 6 m of visibility. A least depth was taken with a pneumatic depth gage.

### 5. Results of Investigation

Date: DN 108  
Time (UT): 15 02 01  
Average Measured Depth: 15.9 m  
Pneumo Depth Corrector: -0.4  
Predicted tide corrector: +0.4  
Corrected Least Depth: 8 3/4 FM (15.9 m)  
Position Number 9892  
Latitude 35°23'12.1"N  
Longitude 120°52'31.0"W  
Datum: NAD 83

There is no indication of scouring.

## 6. Comparison with Prior Surveys

The item did not originate with a prior survey.

## 7. Comparison with the Chart and Charting Recommendations

The item was compared to NOS chart 18703, 22nd Edition, November 6, 1993, 1:40,000 (NAD 83). This item was not submitted as a Danger to Navigation.

### Recommendation

Chart a sewer outfall covering 8 3/4 FM at latitude 35°23'12.1"N, longitude 120°52'31.0"W. *CONCUR*

## O. COMPARISON WITH THE CHART *See EMAC Report, section 7*

This survey was compared to NOS chart 18703, 22nd Edition, November 6, 1993, 1:40,000 (NAD 83).

A cable area is charted on the southern portion of the sheet extending from the shore to the seaward limit of the sheet. No indication of this cable was found during the survey. Recommend the cable area remains as charted. *CONCUR*

### Changes ✓

The fish haven noted in Section N (AWOIS Item 52025) is depicted in red on the final field plot.

The charted soundings were found to be in general agreement with the survey. Final comparisons will be made by N/CG245.

### Dangers to Navigation ✓

One danger to navigation within the limits of this survey was reported to the Eleventh Coast Guard District by letter dated April 21, 1994. Copies of the correspondence can be found in ~~Appendix I~~ of this report. *No other dangers were found during office processing.*

## P. ADEQUACY OF SURVEY *See EMAC Report, sections 6 and 7*

With the exceptions of items noted in Section N, and prior to final approval, survey H-10532 is complete and adequate to supersede charted depths and features in their common areas.

## Q. AIDS TO NAVIGATION

There are five Light List Aids to Navigation within the survey boundaries. All were found within close proximity to their charted positions. Detailed information is available in ~~Appendix V~~ in this report.

Detached positions were obtained on seven mooring buoys and one spar buoy associated with the PG&E terminal. Detailed information is summarized in ~~Appendix V~~ in this report.

Five landmarks\* in the vicinity of Morro Bay were positioned to third-order accuracy by intersection methods. One landmark was positioned to less than third-order accuracy. Unadjusted field positions were forwarded to the U.S Coast Guard by letter dated May 4, 1994. A copy of the letter is included in ~~Appendix VI~~ of this report. Further information can be found in the "Spring 1994 Horizontal Control Report". *Chart landmarks*

\* One landmark (Power Pole) plots within the survey limits. Refer to letter dated May 4, 1994 for positional information.

**R. STATISTICS** ✓

<u>Vessel:</u>	<u>2120</u>	<u>2123</u>	<u>2124</u>	<u>2125</u>	<u>2126</u>	<u>Total</u>
Number of Positions	92	321	629	1615	2168	4825
NM Hydrography	0	0	9.67	44.67	301.68	356.02
NM SSS	0	3.9	0	90.63	0	94.53
Velocity Casts	2					
Detached Position	13					
Bottom Samples	83					
Dives	8					
Tide Stations	1					
NM <sup>2</sup> Hydrography	24.26					

**S. MISCELLANEOUS** ✓

Bottom samples were obtained in accordance with Sections 1.6.3 and 4.7.1 of the Hydrographic Manual. Bottom samples were stored and shipped in accordance with section 4.7.1 of the Hydrographic Manual and Hydrographic Survey Guideline No. 36. Bottom samples were sent to the Smithsonian Institution in accordance with the Project Instructions.

The Coast Pilot comparisons were made in accordance with Project Instructions. See Section U for report information.

**T. RECOMMENDATIONS** ✓

As noted in Section I, during times of low HDOP, it was difficult to demonstrate a successful critical systems check. The problem was partly the result of lower maximum allowable Estimated Position Error (EPE) due to the low HDOP and reduced Estimated System Error (ESE), and partly due to the result of sea action and antenna separation. To compensate for the latter of the two problems, we recommend a minimum EPE<sub>max</sub> of 5 m be established for the purpose of launch to launch system checks.

*This recommendation was forward to HSB.*

**U. REFERRAL TO REPORTS** ✓

The following supplemental reports contain additional information relevant to this survey:

<u>Title</u>	<u>Date Sent</u>	<u>Office</u>
Spring 1994 Horizontal Control Report for OPR-L111-RA	May 1994	N/CG245
Spring 1994 Coast Pilot Report for OPR-L111-RA	May 1994	N/CG245
Project related data for OPR-L111-RA	May 1994	N/CG245

Respectfully Submitted,

*Stacy M. Maenner*  
Stacy M. Maenner  
Ensign, NOAA

Approved and Forwarded,

*Russell C. Arnold*  
Russell C. Arnold  
Captain, NOAA  
Commanding Officer



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
Office of NOAA Corps Operations  
Pacific Marine Center  
1801 Fairview Avenue East  
Seattle, Washington 98102-3767

NOAA Ship RAINIER

April 21, 1994

**ADVANCE  
INFORMATION**

Commander  
Eleventh Coast Guard District  
Federal Building  
501 W. Ocean Boulevard  
Long Beach, CA 90822

Dear Sir:

NOAA Ship RAINIER has located one danger to navigation in Estero Bay, California (Project OPR-L111-RA) within the limits of hydrographic survey H-10532. The attached information is provided for publication in the Local Notice to Mariners for the Eleventh Coast Guard District. A copy of the chartlet is also included.

This is advance information subject to office review. Questions concerning this letter should be directed to the Chief, Pacific Hydrographic Section at (206) 526-6835.

Sincerely,

Russell C. Arnold  
Captain, NOAA  
Commanding Officer

Attachments

cc: DMAHTC  
N/CG221  
PMC



Hydrographic Survey Registry Number: H-10532

Survey Title:           State:           California  
                          Locality:       Estero Bay  
                          Sublocality:   Approaches to Morro Bay

Project Number:    OPR-L111-RA

Survey Date:       March - April 1994

**ADVANCE  
INFORMATION**

Features are reduced to mean lower low water using predicted tides.

Affected Nautical Charts:

<u>Chart</u>	<u>Edition/Date</u>	<u>Scale</u>	<u>Datum</u>
18703	22nd, 11/6/93	1:40,000	NAD83
18700	16th, 12/14/91	1:216,116	NAD83

	<u>Danger to Navigation</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
A.	Shoal, 7 1/2 fathom	35/23/37.6	120/52/40.0

Questions concerning this report should be directed to the Chief, Pacific Hydrographic Section at (206) 526-6835.



CONTROL STATIONS as of 2 May 1994 ✓

No	Type	Latitude	Longitude	H	Cart	Freq	Vel Code	MM/DD/YY	Station Name
100	F	035:22:16.583	120:51:29.092	23	250	0.0	0.0	03/24/94	TOWER(DGPS STATION)
101	F	035:24:42.744	120:52:16.536	25	250	0.0	0.0	03/25/94	CHEVRON(DGPS STATION)



**Section Q Insert**  
**Oil Terminal Buoy Summary ✓**

All terminals buoys are maintained by Chevron USA.

Light List buoys are listed separately.

Mooring Buoys are white cylindrical buoys with a blue horizontal stripe around the horizontal axis, 5 ft in diameter and 10 ft long.

<b>NAME</b>	<b>Fix #</b>	<b>LATITUDE</b>	<b>LONGITUDE</b>	<b>CHARACTERISTICS</b>
#1	6844	35 22 50.00	120 52 36.90	Mooring Buoy
#2	6845	35 22 48.77	120 52 31.90	Mooring Buoy
#3	6846	35 22 52.33	120 52 27.47	Mooring Buoy
#4	6847	35 22 56.58	120 52 27.49	Mooring Buoy
#5	6848	35 22 59.17	120 52 32.14	Mooring Buoy
#6	6849	35 23 02.55	120 52 35.62	Mooring Buoy
#7	6853	35 22 49.77	120 52 41.12	Mooring Buoy
Y Spar	6850	35 22 54.90	120 52 33.57	Y Spar with blue horizontal stripes

Section Q  
Descriptive Report Insert

Name of Aid: PG&E Heading Buoy (Y N #1) ✓

Light List #: 3925

Pos. # 6841 Method of Positioning: 3rd Order Hydro

Positioning Info

Latitude N Longitude W

Charted Pos. 35°23'00" 120°59'54"

Survey Pos. 35°23'02.60" 120°52'57.51" ✓

Easting Northing

Charted Pos. 18180.1 24038.3

Survey Pos. 18091.4 24118.5

Difference Between Survey/Charted Position 119.6 m 312.1 deg T

Characteristics

Do Characteristics Match Light List? (y/n) Yes

If NO, what are the characteristics?

New/Uncharted Aids (if info is known or easily obtained)

Date Established:

Maintained By: Private (y/n)

Frequency of Maintenance:

Purpose:

Name of Aid: Gong Buoy 10 E ✓

Light List #: 3930

Pos. # 6842 Method of Positioning: 3rd Order Hydro

Positioning Info

Latitude N Longitude W

Charted Pos. 35°23'08" 120°53'12"

Survey Pos. 35°23'02.96" 120°53'14.17" ✓

Easting Northing

Charted Pos. 17725.7 24223.1

Survey Pos. 17671.1 24129.4

Difference Between Survey/Charted Position 108.4 m 210.2 deg T

Characteristics

Do Characteristics Match Light List? (y/n) Yes

If NO, what are the characteristics?

New/Uncharted Aids (if info is known or easily obtained)

Date Established:

Maintained By: Private (y/n)

Frequency of Maintenance:

Purpose:

Section Q  
Descriptive Report Insert

Name of Aid: RW Morro Bay Approach "MB" ✓

Light List #: 3840

Pos. # 6843 Method of Positioning: 3rd Order Hydro

Positioning Info

	Latitude N	Longitude W
Charted Pos.	35°21'42"	120°52'30"

Survey Pos.	35°21'38.46"	120°52'31.87" ✓
	Easting	Northing

Charted Pos.	18786.8	21634.7
--------------	---------	---------

Survey Pos.	18739.7	21525.6
-------------	---------	---------

Difference Between Survey/Charted Position 118.8 m 203.4 deg T

Characteristics

Do Characteristics Match Light List? (y/n) Yes

If NO, what are the characteristics? \_\_\_\_\_

New/Uncharted Aids (if info is known or easily obtained)

Date Established: \_\_\_\_\_

Maintained By: \_\_\_\_\_ Private (y/n)

Frequency of Maintenance: \_\_\_\_\_

Purpose: \_\_\_\_\_

Name of Aid: <sup>"S"</sup>Outfall Spar (Morro Creek) ✓

Light List #: 3920

Pos. # 6851 Method of Positioning: 3rd Order Hydro

Positioning Info

	Latitude N	Longitude W
Charted Pos.	35°23'12"	120°52'30"

Survey Pos.	35°23'10.22"	120°52'28.20" ✓
	Easting	Northing

Charted Pos.	18785.6	24408.4
--------------	---------	---------

Survey Pos.	18831.1	24353.5
-------------	---------	---------

Difference Between Survey/Charted Position 71.3 m 140.3 deg T

Characteristics

Do Characteristics Match Light List? (y/n) No

If NO, what are the characteristics? White with one blue-gray band  
and traces of a deteriorated orange stripe

New/Uncharted Aids (if info is known or easily obtained)

Date Established: \_\_\_\_\_

Maintained By: \_\_\_\_\_ Private (y/n)

Frequency of Maintenance: \_\_\_\_\_

Purpose: \_\_\_\_\_

Section Q  
Descriptive Report Insert

Name of Aid: <sup>"A"</sup> Outfall Spar (Morro Creek) ✓  
Light List #: 3920  
Pos. # 6852 Method of Positioning: 3rd Order **Hydro**

Positioning Info

	Latitude N	Longitude W
Charted Pos.	35°23'12"	120°52'30 "
Survey Pos.	35°23'12.17"	120°52'31.07" ✓
	Easting	Northing
Charted Pos.	18785.6	24408.4
Survey Pos.	18758.7	24413.7

Difference Between Survey/Charted Position 27.4 m 281.1 deg T

Characteristics

Do Characteristics Match Light List? (y/n) No  
If NO, what are the characteristics? White with one blue-gray band  
and traces of a deteriorated orange stripe

New/Uncharted Aids (if info is known or easily obtained)

Date Established: \_\_\_\_\_  
Maintained By: \_\_\_\_\_ Private (y/n)   
Frequency of Maintenance: \_\_\_\_\_  
Purpose: \_\_\_\_\_



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
Office of NOAA Corps Operations  
Pacific Marine Center  
1801 Fairview Avenue East  
Seattle, Washington 98102-3767

NOAA Ship RAINIER

May 4, 1994

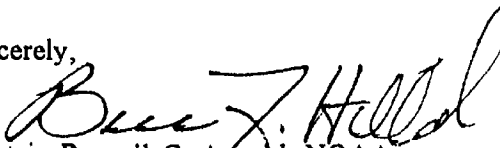
Commander D. J. Ihnat  
U.S. Coast Guard  
Chief, Signal Management Branch  
2100 Second Street S.W.  
Washington, DC 20593-0001

Dear Sir:

In response to your letter dated January 2, 1994 to the Chief, Hydrographic Surveys Branch, NOAA Ship RAINIER positioned five of the six requested landmarks while conducting hydrographic survey operations in the vicinity of Estero Bay, California. One additional navigational aid, Morro Bay Breakwater Light, was also positioned.

Descriptions, NAD83 positions, and positional accuracies are included on the attached form.

Sincerely,

  
for Captain Russell C. Arnold, NOAA  
Commanding Officer  
NOAA Ship RAINIER

Attachments



**OPR-L111-RA  
ESTERO BAY, CALIFORNIA**

**LANDMARKS IN THE VICINITY OF MORRO BAY**

**FIELD POSITIONS**

CG Request Number	Landmark Name	Latitude (N)	Longitude (W)	Surveyed Accuracy
1	Power Pole	35/22/04.58191	120/51/56.57706	1:13,000
2	So. Most Tank of Five*	35/22/27.31163	120/51/33.55998	1:18,000
3	CG#3 Trans Twr*	35/22/34.06135	120/50/19.81650	1:12,000
4	PG&E Center Stack*	35/22/18.43716	120/51/25.02454	1:10,000
5	CG#5 Trans Twr*	35/22/15.20364	120/50/02.91532	1:23,000
6	CG#6 Trans Twr*	N/A	N/A	N/A
Additional	Morro Bay Bkwtr LT	35/21/46.37020	120/52/11.25732	1:50,000

*\* Does not plot on smooth sheet*

**NOTE: Third -Order, Class I Accuracy = 1:10,000**

APPROVAL SHEET

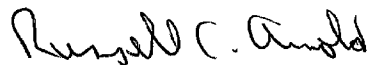
for

H-10532

RA-10-2-94

Standard procedures were followed in accordance with the Hydrographic Manual, Fourth Edition; the Hydrographic Survey Guidelines; and the Field Procedures Manual in producing this survey. The data were examined daily during data acquisition and processing.

The field sheet and accompanying records have been examined by me, are considered complete and adequate for charting purposes, and are approved.



Russell C. Arnold  
Captain, NOAA  
Commanding Officer



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

ORIGINAL

**TIDE NOTE FOR HYDROGRAPHIC SURVEY**

**DATE:** July 6, 1994

**MARINE CENTER:** Pacific

**HYDROGRAPHIC PROJECT:** OPR-L111-RA

**HYDROGRAPHIC SHEET:** H-10532

**LOCALITY:** California, Approaches to Morro Bay, Estero Bay

**TIME PERIOD:** March 25 - April 18, 1994

**TIDE STATION USED:** 941-2110 Port San Luis, Ca.  
Lat.  $38^{\circ} 10.1'N$  Lon.  $120^{\circ} 45.2'W$

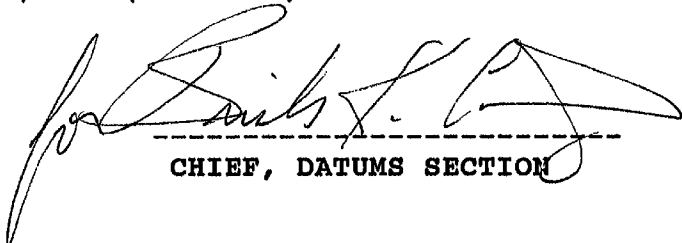
**PLANE OF REFERENCE (MEAN LOWER LOW WATER):** 4.13 ft.

**HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:** 4.7 ft.

**REMARKS:** RECOMMENDED ZONING

Times and heights are direct on Port San Luis, Ca. (941-2110).

- Note:**
1. Times are tabulated in Greenwich Mean Time.
  2. Data for Port San Luis, Ca. (941-2110) is stored in file #741-2110.

  
CHIEF, DATUMS SECTION





GEOGRAPHIC NAMES

Name on Survey	A ON CHART No. 18703 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 GRAND McNALLY ATLAS H U.S. LIGHT LIST K											
	CALIFORNIA (TITLE)	X										
ESTERO BAY	X											2
MORRO BAY (locale)	X											3
MORRO BEACH (locale)	X											4
MORRO CREEK	X											5
MORRO ROCK	X											6
PILLAR ROCK	X											7
												8
												9
												10
												11
												12
												13
												14
												15
												16
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												18
												19
												20
												21
												22
												23
												24
												25

Approved:

*Charles E. Huntington*  
Chief Geographer - N/CG2/XB

MAY 23 1994

**HYDROGRAPHIC SURVEY STATISTICS**

H-10532

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

RECORD DESCRIPTION		AMOUNT	RECORD DESCRIPTION		AMOUNT
SMOOTH SHEET		1	SMOOTH OVERLAYS: POS., ARC, EXCESS		1
DESCRIPTIVE REPORT		1	FIELD SHEETS AND OTHER OVERLAYS		
DESCRIPTION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/SOURCE DOCUMENTS
ACCORDION FILES	3				
ENVELOPES					
VOLUMES					
CAHIERS					
BOXES				2	

**SHORELINE DATA**

SHORELINE MAPS (List):  
 PHOTOBATHYMETRIC MAPS (List):  
 NOTES TO THE HYDROGRAPHER (List):

SPECIAL REPORTS (List):  
 NAUTICAL CHARTS (List):

**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			4825	
POSITIONS REVISED				
SOUNDINGS REVISED				
CONTROL STATIONS REVISED				
	TIME-HOURS			
	VERIFICATION	EVALUATION	TOTALS	
PRE-PROCESSING EXAMINATION				
VERIFICATION OF CONTROL				
VERIFICATION OF POSITIONS	24		24	
VERIFICATION OF SOUNDINGS	31		31	
VERIFICATION OF JUNCTIONS				
APPLICATION OF PHOTOBATHYMETRY				
SHORELINE APPLICATION/VERIFICATION				
COMPILATION OF SMOOTH SHEET	11		11	
COMPARISON WITH PRIOR SURVEYS AND CHARTS		16	16	
EVALUATION OF SIDE SCAN SONAR RECORDS				
EVALUATION OF WIRE DRAGS AND SWEEPS				
EVALUATION REPORT		14	14	
GEOGRAPHIC NAMES				
OTHER*				
*USE OTHER SIDE OF FORM FOR REMARKS	<b>TOTALS</b>	66	30	96

Pre-processing Examination by <b>LT M. Larsen</b>	Beginning Date 5/4/94	Ending Date 5/11/94
Verification of Field Data by <b>R. Davies</b>	Time (Hours) 66	Ending Date 1/5/95
Verification Check by	Time (Hours)	Ending Date
Evaluation and Analysis by <b>R. Davies</b>	Time (Hours) 30	Ending Date 1/9/95
Inspection by <b>B. Olmstead</b>	Time (Hours) 25.5	Ending Date 1/9/95

**EVALUATION REPORT  
H-10532**

**1. INTRODUCTION**

Survey H-10532 is a basic hydrographic survey under the navigable area concept, accomplished by the NOAA Ship *Rainier* under the following Project Instructions.

OPR-L111-RA, dated February 23, 1994  
CHANGE NO. 1, dated May 24, 1994

This survey was conducted in Estero Bay, California and covers the approaches to Morro Bay. The surveyed area extends from latitude 35/17/37N to latitude 35/23/45N, and from longitude 120/52/06W to longitude 120/57/06W. The bottom consists of sand, mud and shells. Depths range from 3.0 meters along the shoreline to 85 meters offshore.

Side scan sonar was used on this survey to search the area between regular sounding lines for indications of possible dangers and bottom irregularities. The sonar search was conducted for the approaches to the offshore oil tanker moorings and loading facilities at Estero Bay with 200% swath coverage of the bottom within the area specified in the project instructions. Significant side scan sonar contacts identified in the field were adequately investigated by echo sounder developments. This project will provide data in support of existing charts and for a planned large scale inset of the area.

Depth curves depicted on the smooth sheet were selected from those authorized through HSG 69. However, instead of drafting all authorized curves only those curves considered necessary for the reasonable portrayal of the bottom were drafted. The selected curves are the 5, 10, and 20 meter. A note was added to the smooth sheet to identify these values. A few supplemental depth curves have been added to the smooth sheet in brown where warranted. Bottom characteristics are annotated on a separate overlay.

Predicted tides for Port San Luis, California were used for the reduction of soundings during field processing. Approved hourly heights zoned from Port San Luis, California, gage 941-2110, were used during office processing.

The field sheet parameters have been revised to center the hydrography on the smooth sheet and to change the projection to polyconic. NAD 83 is used as the horizontal datum for plotting and position computation. The offset values and sound velocity correctors are adequate. An accompanying computer printout contains the parameters and the correctors.

A digital file has been generated for this survey that includes categories of information required to comply with Hydrographic Survey Guidelines No. 52, Standard Digital Data Exchange Format, April 15, 1986. Certain descriptive information, however, may not be in the digital record due to the restrictions of the presently available cartographic codes. The

user should refer to the smooth sheet for complete information.

## **2. CONTROL AND SHORELINE**

Sections H and I of the hydrographer's report and the Spring 1994 Horizontal Control Report for OPR-L111-RA, contain adequate discussions of horizontal control and hydrographic positioning.

Differential GPS (DGPS) was used to control this survey. A horizontal dilution of precision (HDOP) not to exceed 6.0 was computed for survey operations. The quality of 182 positions exceeded the limit in terms of HDOP. The majority of these positions occur during the evening hours for the first ten days of the project, see section I of the hydrographer's report. A review of the data, however, indicates that none of these fixes are used to position dangers to navigation. The features or soundings located by these fixes are consistent with the surrounding information. These fixes are considered acceptable.

Positions of horizontal control stations used during hydrography are 1994 field values based on NAD 83.

The smooth sheet and accompanying overlays are annotated with NAD 27 adjustment ticks based on values determined with 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: -0.092 seconds (-2.822 meters)  
Longitude: 3.655 seconds (92.284 meters)

The year of establishment of control stations shown on the smooth sheet originates with the horizontal control records for this survey.

The shoreline for survey H-10532 was drawn in brown ink and originates with chart 18703, 22nd edition, and should be used for orientation purposes only.

## **3. HYDROGRAPHY**

Except as noted below and elsewhere in this report, hydrography 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;
- c. show the survey was properly controlled and soundings are correctly plotted.

The 5-meter depth curve along longitude 120/52/07W and between latitude 35/20/00N and latitude 35/21/45N, could not be defined due to hazardous surf conditions.

#### 4. CONDITION OF SURVEY

The hydrographic records and reports received for processing are adequate and conform to the requirements of the Hydrographic Manual, 4th Edition, revised through Change No. 3, the Hydrographic Survey Guidelines, and the Field Procedures Manual, March 1993 edition, except for the following.

Several charted features identified as specific AWOIS items were inadequately investigated. Hazardous surf conditions prevented the hydrographer from conducting an adequate search and complying with section 1.8 of the project instructions. See section 7 of this report for the identification of these features.

The development of the 5-meter depth curve was incomplete. Although heavy surf conditions exist along the nearshore areas, the hydrographer failed to document this condition.

A complete list of all prior surveys which the hydrographer used for comparison should be listed in section M of the hydrographers report.

One charted landmark, a radio beacon, was not investigated. All landmarks are required to be examined, located and described within the project area, section 4.2.2 of the project instructions.

#### 5. JUNCTIONS

Survey H-10532 junctions with the following survey.

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Area</u>
H-10531	1994	1:10,000	North

The junction with survey H-10531 is complete.

There are no contemporary surveys to the west and south. A comparison with charted depths reveals good agreement with the present survey.

#### 6. COMPARISON WITH PRIOR SURVEYS

H-5566(1933) 1:40,000  
H-5692(1934) 1:10,000  
H-5750(1934) 1:10,000

H-5774(1934) 1:40,000

Surveys H-5566, H-5692, H-5750 and H-5774 cover the entire area common to the present survey except for the area north of latitude 35/22/15N. There is an average difference in depths of between one to two meters with extreme cases of up to five meters. Shoreline has generally remained stable throughout the survey area over the past sixty years. However, cultural changes are readily evident around Morro Rock and at the entrance to Morro Bay since 1933-34. The present survey is deeper. These differences are largely attributed to the relative accuracy of the data acquisition techniques between these surveys and dynamic natural processes.

Except for soundings inside the 5-meter depth curve, survey H-10532 is adequate to supersede the above prior survey within the common area.

H-9737(1978) 1:5,000

Survey H-9737 covers a small area at the entrance to Morro Bay. There is excellent agreement between the two surveys. In most cases, the present survey is shoaler by 0.5 to 1.0 meters. What differences there are can be explained by the relative accuracy of the data acquisition techniques between the two surveys, dynamic natural processes, and accretion and erosion attributed to cultural changes during the past sixteen years.

Except for soundings inside the 5-meter depth curve, survey H-10532 is adequate to supersede the above prior surveys soundings within the common area.

H-5692WD(1935) 1:10,000

H-5984WD(1935) 1:10,000

H-5985WD(1935) 1:10,000

Wire drag surveys H-5692, H-5984 and H-5985 cover the entire area common to the present survey. There were no hang depths or soundings on survey H-5985 and H-5692 in the common area. There are two hang depths, a 6 4/6 fm (12.2 m) and 5 1/6 fm (9.4 m) on survey H-5984 at latitude 35/22/41N, longitude 120/52/39W and latitude 35/23/03N, longitude 120/53/07W. These soundings are superseded by diver determined least depths of 12.8 (7.0 fm) and 9.9 meter (5 1/4 fm) on the present survey at latitude 35/22/40.34N, longitude 120/52/38.04W and latitude 35/23/02.74N, longitude 120/53/08.66W. There are no other conflicts between the prior surveys and survey H-10532.

Except for soundings inside the 5-meter depth curve, survey H-10532 is adequate to supersede the above prior surveys within the common area.

TP-00706(1976) 1:20,000

TP-00707(1976) 1:5,000

TP-00709(1976) 1:5,000

Section 6.10 of the project instructions lists these shoreline map as prior surveys. In addition the hydrographer was not required to perform shoreline verification. A comparison with the chart and the above shoreline maps reveal no significant differences. It appears that these shoreline maps are the source for the charted shoreline.

There are no AWOIS items which originate with the above mentioned prior surveys.

## 7. COMPARISON WITH CHART

Chart 18703 22nd Edition, November 6, 1993; scale 1:40,000

### a. Hydrography

Charted hydrography originates with the prior surveys mentioned in section 6 and miscellaneous sources and requires no further discussion, except as follows.

The following features could not be adequately investigated because of surf conditions in the nearshore area. These features should be retained at their presently charted position and depicted as shown below.

<u>Feature</u>	<u>Latitude(N)</u>	<u>Longitude(W)</u>	
sewer outfall	35/22/42.0	120/51/57.0	(AWOIS 52028)
3/4 fm Rk	35/23/27.5	120/52/02.5	(AWOIS 52024)
pipeline	35/22/56.0	120/52/33.0	(AWOIS 52029)
rock	35/21/15.0	120/51/47.5	(AWOIS 52030)
subm piles	35/22/33.0	120/52/03.0	(AWOIS 52027)
4 fm RK	35/19/32.0	120/52/35.0	(AWOIS 52026)

Except for the charted features listed above, survey H-10532 is adequate to supersede charted hydrography within the common area.

The pipelines (abandoned) and fish haven (AWOIS 52025) located at latitude 35/23/35.9N longitude 120/52/35.64W, are shown on BP 150987 approximately 80 meters SE of the present charted position. The original source for the pipeline was BP31107/1937. With additional information provided by N/CG241, it was discovered that the pipelines were positioned incorrectly and should have been placed on the chart with a PA note. It is recommended that these features be revised on the next chart edition as an obstruction (fish haven) with a least depth of 12.6 meters (6 3/4 fm) and pipelines (abandoned) as shown on BP150987. Additional information can be found on page 9 of the hydrographers report.

### b. AWOIS

All AWOIS items originate with miscellaneous sources. Refer to the hydrographer's report

and above for discussion and disposition of these features.

**c. Controlling Depths**

There are no channels with controlling depths found within the survey area.

**d. Aids to Navigation**

There is one fixed aid and five floating aids which exist within the survey area. In addition, there are eight terminal buoys maintained by Chevron USA. These aids were located and serve their intended purpose.

There was one landmark located and identified for charting within the common area of this survey. An additional landmark, a radio beacon, charted at latitude 35/22/03N, longitude 120/52/06W, was not addressed during survey operations and should be retained.

**e. Geographic Names**

Names appearing on the smooth sheet and in the survey title have been approved by the Chief Geographer.

**f. Dangers to Navigation**


The hydrographer reported one danger to navigation to the Eleventh Coast Guard District. No dangers to navigation reports were generated during office processing.

**8. COMPLIANCE WITH INSTRUCTIONS**

Survey H-10532 adequately complies with the project instructions, except where noted in this report.

**9. ADDITIONAL FIELD WORK**

This is an adequate hydrographic survey. Additional field work is recommended to investigate the features noted in section 7 of this report.

  
C.R. Davies  
Cartographer



APPROVAL SHEET  
H-10532

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 digital data have been completed and all revisions and processing have been entered in the magnetic tape record for this survey. Final control, position, and sounding printouts have been made and are included with the survey records. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

*Bruce A. Oenstad*  
for Dennis J. Hill \_\_\_\_\_ Date: 1/10/95  
Chief, Hydrographic Processing Unit  
Pacific Hydrographic Section

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*  
Commander Kathy Timmons, NOAA \_\_\_\_\_ Date: 1/25/95  
Chief, Pacific Hydrographic Section

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Final Approval

Approved:

*J. Austin Yeager*  
for J. Austin Yeager \_\_\_\_\_ Date: 2/8/95  
Rear Admiral, NOAA  
Director, Coast and Geodetic Survey

