

H11984

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.* .....

*Registry No.* ..... H11984 .....

### LOCALITY

*State* ..... California .....

*General Locality* ..... Pacific Ocean--Northern California .....

*Sublocality* ..... Vicinity of Saint George Reef .....

**2008**

### CHIEF OF PARTY

..... Dean Moyles .....

### LIBRARY & ARCHIVES

DATE .....

NOAA FORM 77-28 (11-72) <div style="text-align: center; margin-top: 20px;"> <b>U.S. DEPARTMENT OF COMMERCE</b>  <b>NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION</b> </div> <div style="text-align: center; margin-top: 20px;"> <b>HYDROGRAPHIC TITLE SHEET</b> </div>	REGISTRY No  <div style="text-align: center; font-size: 1.5em; font-weight: bold;">H11984</div>
<b>INSTRUCTIONS</b> — 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
State <u>California</u>	
General Locality <u>Pacific Ocean--Northern California</u>	
Sub-Locality <u>Vicinity of Saint George Reef</u>	
Scale <u>N/A</u> Date of Survey <u>September 9 to November 13, 2008</u>	
Instructions dated <u>7/7/2008</u> Project No. <u>OPR-M-L906-KR-08</u>	
Vessel <u>F/V PACIFIC STAR (556510), R/V R2 (623241), R/V D2 (647782)</u>	
Chief of party <u>DEAN MOYLES</u>	
Surveyed by <u>ORTHMANN, MOYLES, REYNOLDS, BARROW, ZURITA, TODD, TIDEY, CAMERON, MOUNT, et al.</u>	
Soundings by echo sounder, hand lead, pole <u>Reson SEABAT 7125 &amp; 8125 ECHOSOUNDERS HULL MOUNTED</u>	
Graphic record scaled by <u>FUGRO PELAGOS, INC. Personnel</u>	
Graphic record checked by <u>N/A</u> Automated Plot <u>N/A</u>	
Verification by <u>K. Toepfer</u> Evaluation by <u>K. Toepfer</u>	
Soundings in <u>Feet</u> at <u>MLLW</u>	
REMARKS: <u>All times are UTC. UTM Projection Zone 10</u>	
<u>The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS)</u>	
<u>nautical charts. All separates are filed with the hydrographic data. Revisions and end notes in red were</u>	
<u>generated during office processing. Page numbering may be interrupted or non sequential.</u>	



## A. AREA SURVEYED

H11984 (Sheet BN) is in the vicinity of Saint George Reef, California. It is bound by the coordinates listed in Table 1.

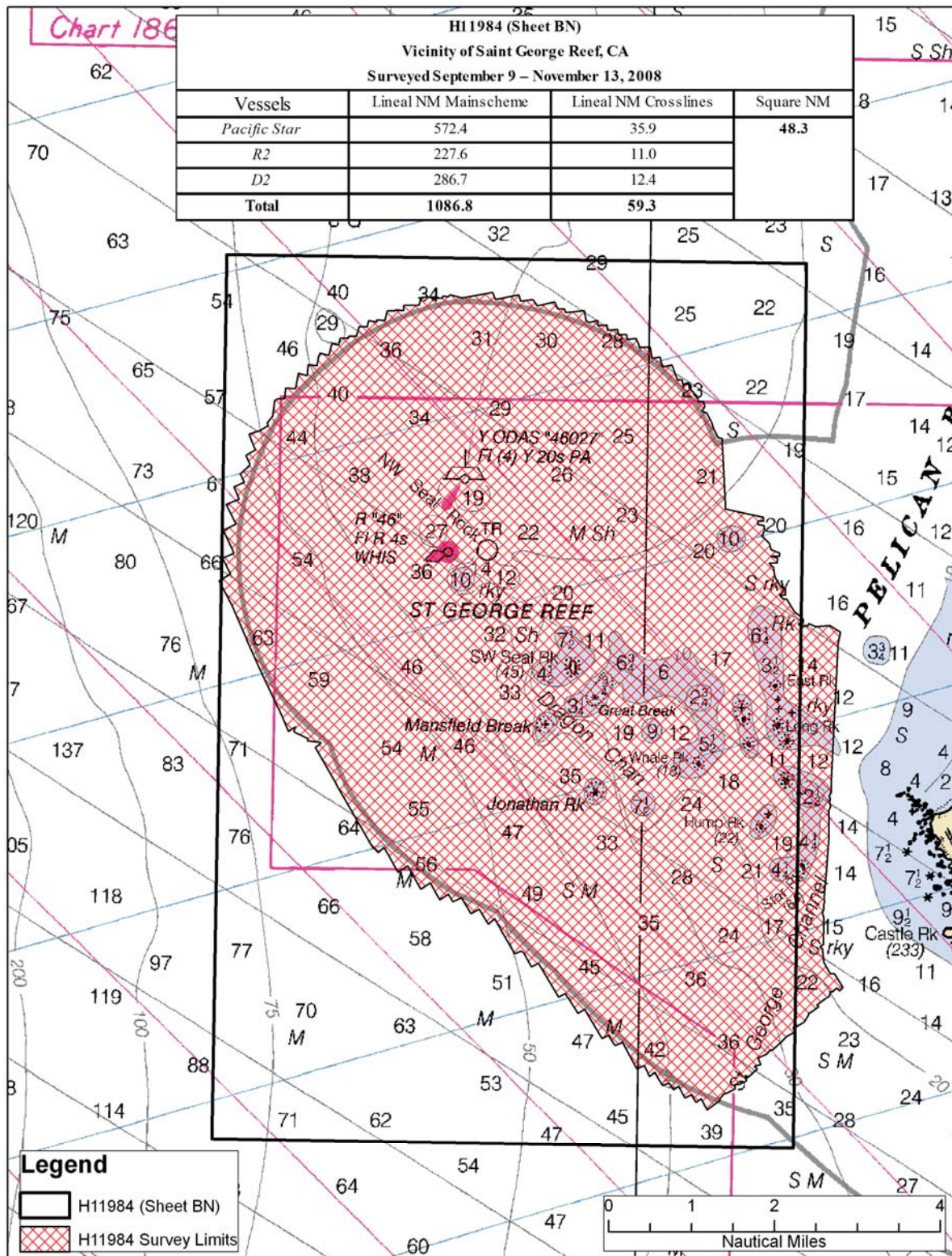
This data was collected by Fugro Pelagos, Inc. for NOAA and the State of California's Coastal Conservancy. While the State of California's interest in this data is primarily for fisheries habitat mapping, the necessary steps to meet NOAA specifications and make the data suitable to OCS for nautical charting purposes have been taken, as detailed in the 2008 Specifications and Deliverables and described in this and accompanying reports.

Hydrographic data collection began on September 9, 2008 and ended on November 13, 2008<sup>1</sup>.

**Table 1 – Sheet Bounds**

<b>Point</b>	<b>Latitude (North)</b>	<b>Longitude (West)</b>
1	41-53-46	124-26-51
2	41-53-46	124-17-28
3	41-43-34	124-17-28
4	41-43-34	124-26-51
5	41-53-46	124-26-51

Note: The eastern bounds were modified slightly (shifted further east) from originally planned to include additional survey area.



**Figure 1 H11984 Area Surveyed**

## **B. DATA ACQUISITION AND PROCESSING**

Refer to the M-L906-KR-08 Data Acquisition and Processing Report<sup>2</sup> for a detailed description of all equipment, survey vessels, processing procedures and quality control features. Items specific to this survey and any deviations from the Data Acquisition and Processing Report are discussed in the following sections.

### B.1 Equipment & Vessels

The R/Vs R2, D2, and F/V Pacific Star acquired all sounding data for H11984.

The Pacific Star, which is 162 feet in length with a draft of 16 feet, was equipped with a Reson Seabat 7125 (400/200 kHz dual frequency) and a Reson Seabat 8111 for multibeam data acquisition. The vessel was also equipped with two AML sound velocity and pressure sensors (SV&P) and a Brooks Ocean Moving Vessel Profiler (MVP) for sound velocity profiles. Vessel attitude and position were measured using an Applanix Position and Orientation System for Marine Vessel (POS MV 320 V4) with S7K files logged in Winfrog Multibeam v 3.08.23.

Vessel D2, a Pacific Star launch, at 29 feet in length with a draft of 3 feet, was equipped with a Reson Seabat 8125 (455 kHz). The vessel was also equipped with two AML sound velocity and pressure sensors (SV&P) for sound velocity profiles. Vessel attitude and position were measured using an Applanix Position and Orientation System for Marine Vessel (POS MV 320 V4) with XTF files logged in Winfrog Multibeam v 3.08.23.

Vessel R2, with the same specifications as D2, was similarly equipped, except the 7125 system was single frequency (400 kHz only) and S7K files were logged instead of XTF.

Refer to M-L906-KR-08 Data Acquisition and Processing Report for a complete listing of equipment and vessel descriptions.

### B.2 Quality Control

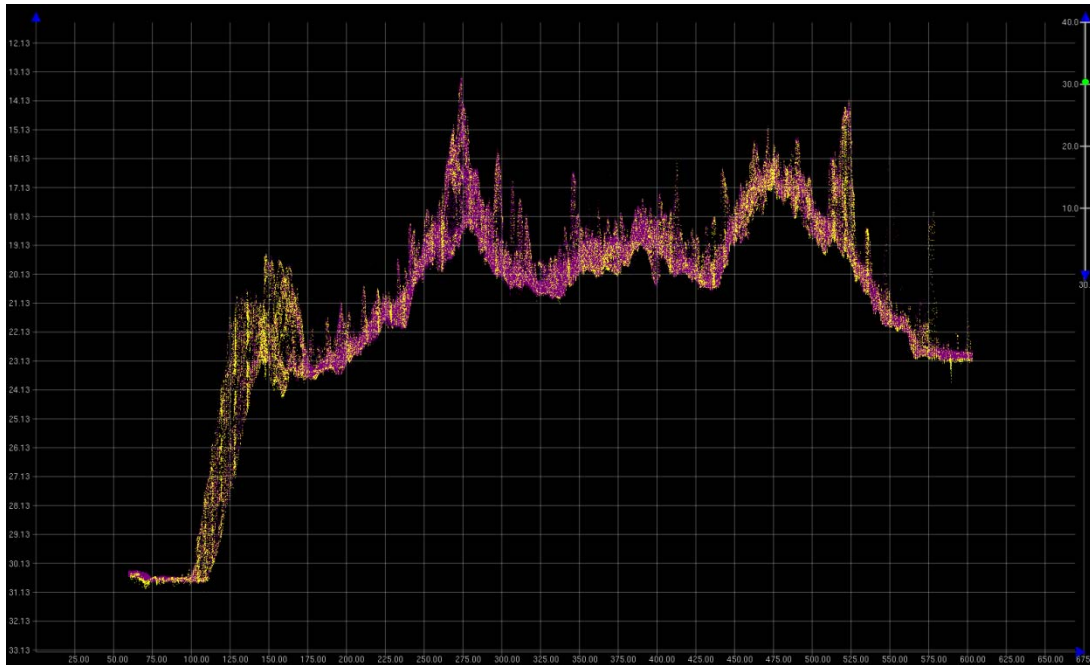
#### Crosslines

Crosslines were planned and well distributed throughout the survey to ensure adequate quality control<sup>3</sup>. Total crossline length surveyed was 59.3 nautical miles or 5.5 percent of the total main scheme line length, exceeding the 5 percent planned. Each crossline was compared to the entire main scheme line plan and CUBE surface it intersected, using the CARIS HIPS QC report routine.

The majority of QC Reports fall well within the required accuracy specifications<sup>4</sup>. However, beams that fall below the 95 percent confidence level in the QC report are associated with areas

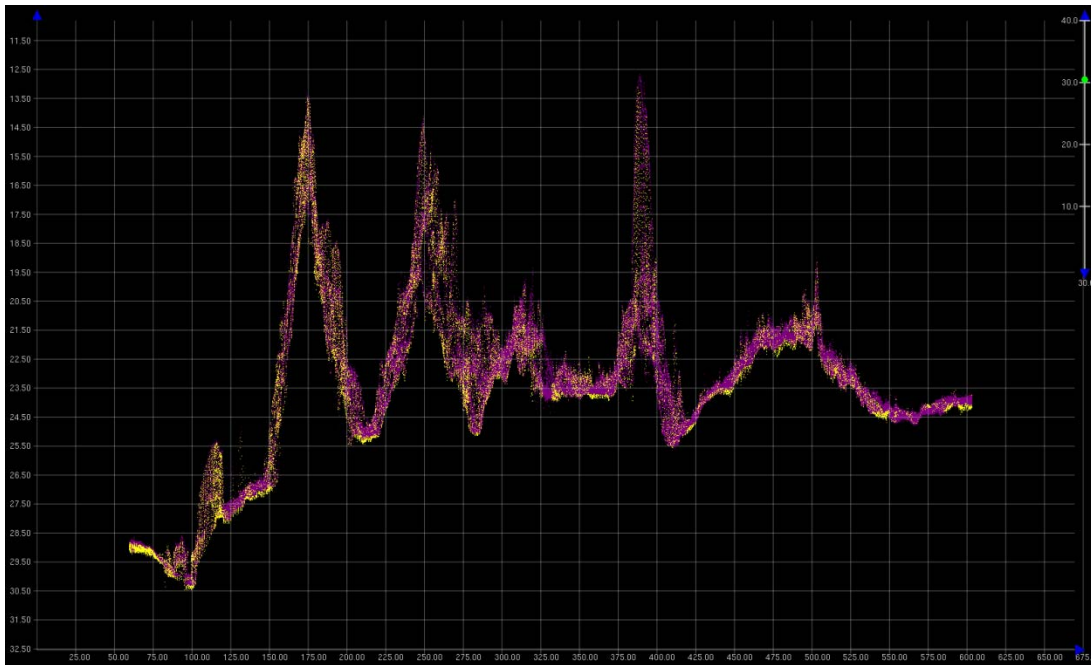
and conditions illustrated below. It should be noted that these locations are in agreement with the surrounding adjacent lines and are considered well within the required specifications<sup>5</sup>. Results are located in Separate IV.

The majority of beams that fall below the 95 percent confidence level are located in areas having extremely steep slopes and/or rocks<sup>6</sup>. Figures 2 and 3 below provide examples, note main scheme lines are shown in purple and the crossline in yellow.



**Figure 2 Profile of 5BN02-TIE02**





**Figure 3 Profile of 5BN02-TIE03**

Note: The QC reports were generated based on the given accuracy specification of:

$\pm \sqrt{(a^2 + (b * d)^2)}$  where  $a = 0.2$ ,  $b = 0.01$ , and  $d = \text{depth}$ .

However, since a variance of a difference, rather than a variance from a mean is being used, the  $a$  and  $b$  values were defined in the user defined option within the CARIS HIPS QC Report routine as follows:

$$a = 0.2 * \sqrt{2} = 0.283$$

$$b = 0.01 * \sqrt{2} = 0.014$$

### Uncertainty Values

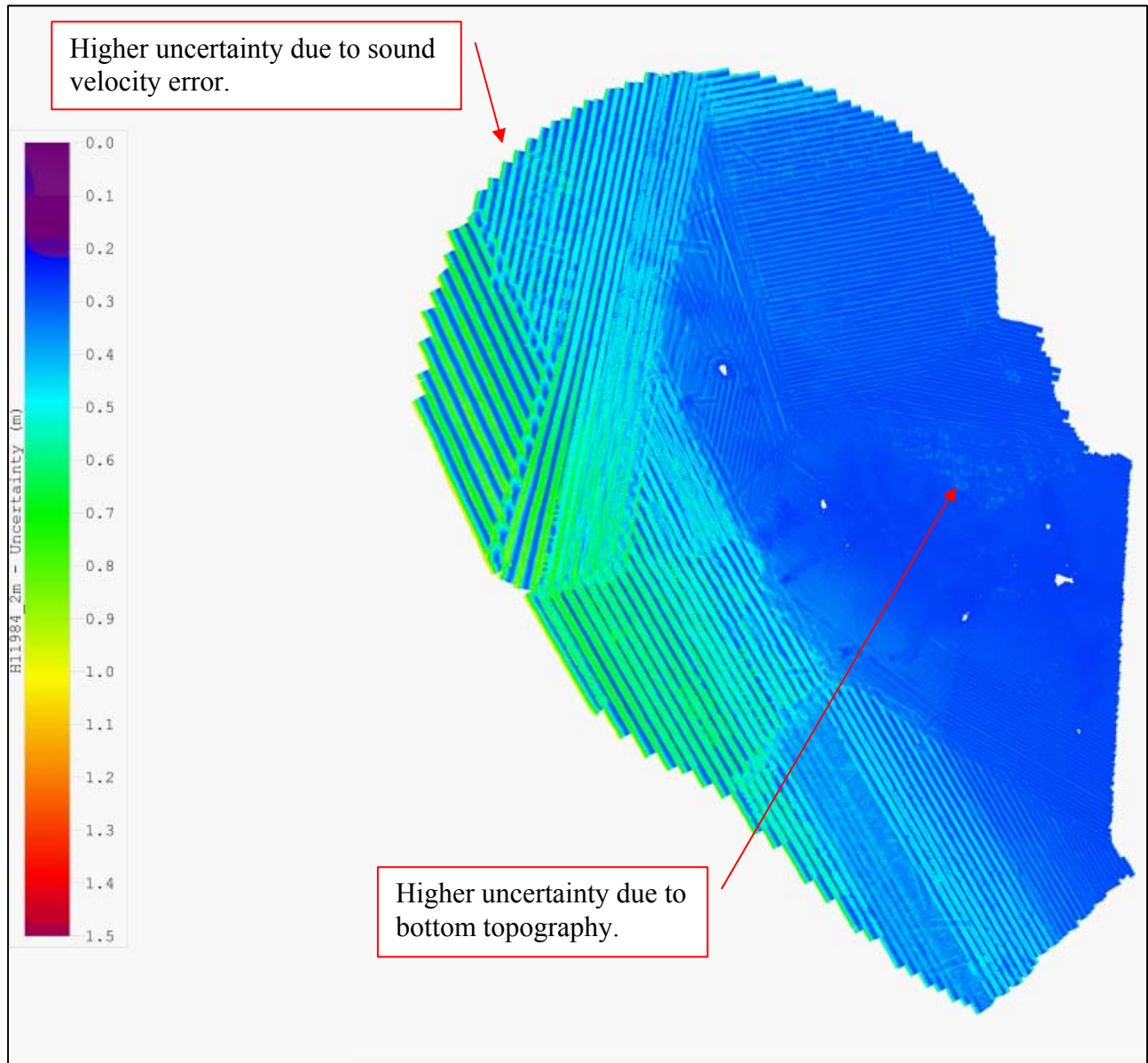
The majority of H11984 had uncertainty values of 0.25 m to 0.8 m, which met project specifications<sup>7</sup>.

As seen in the uncertainty surface, uncertainty is generally lowest near the sonar nadir beams and increases toward the outside of each swath. This is expected and primarily a result of sound velocity error uncertainty.

Oscillations from port to starboard along lines in the uncertainty surface are due to higher uncertainty computed due to vessel roll, again prevalent mostly in the outer beams.

Higher uncertainties are seen in areas of steep or rapidly changing bottom topography and areas

where outer beams were left to contribute to the surface. However, despite high uncertainty in these areas, data matchup is good and the data acceptable for nautical charting purposes<sup>8</sup>.



**Figure 4 Uncertainty DTM**



## Survey Junctions

H11984 (Sheet BN) junctions with:

Registry #	Date	Junction Side
H11985	2008	Northeast
H11983	2008	East

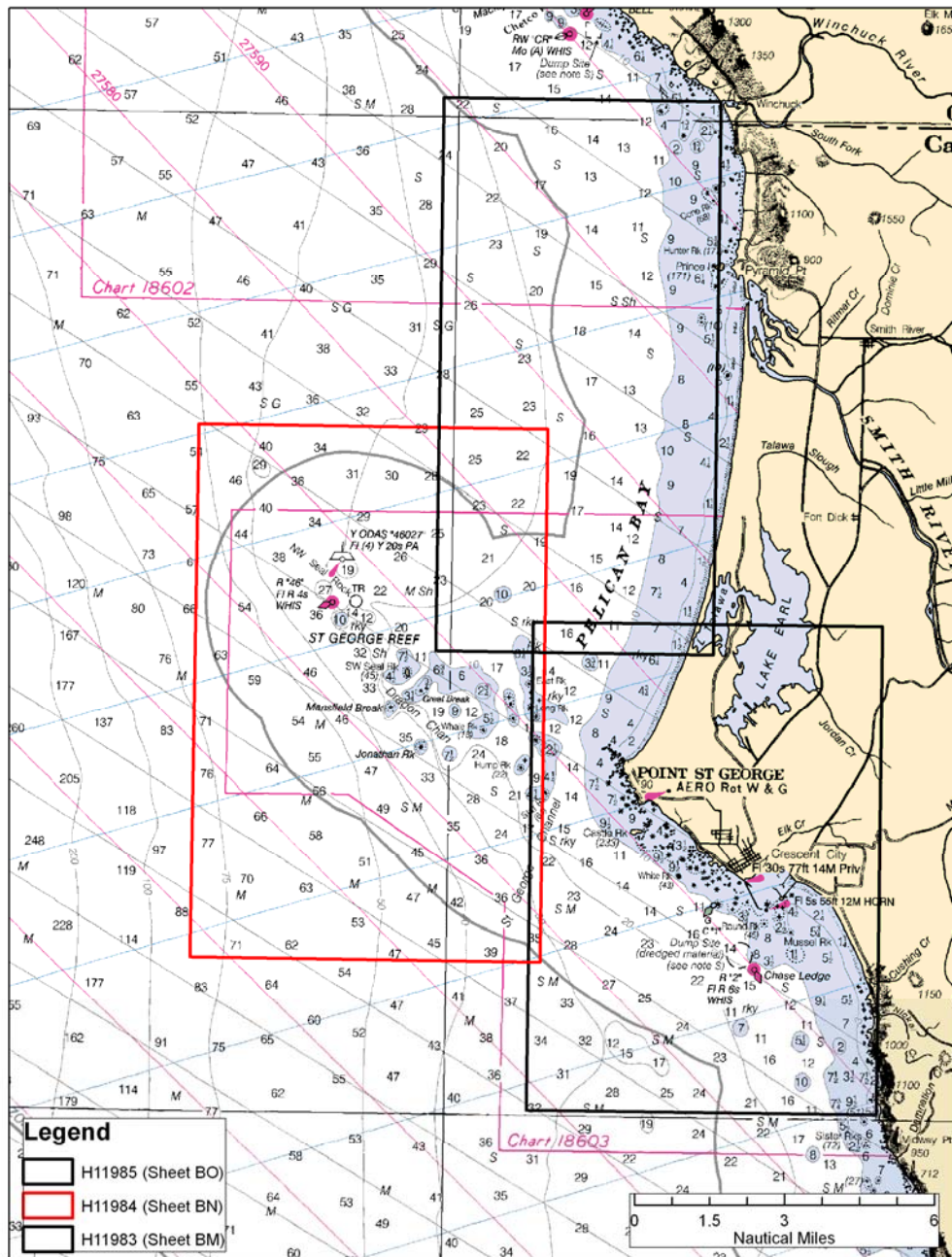


Figure 5 H11984 Survey Junctions

The surveys are in agreement along their common borders<sup>9</sup>. The agreement was noted in the field using the CUBE surfaces during subset cleaning. The conformity is also apparent in the Final Combined BASE Surfaces.

### Quality Control Checks

Positioning system confidence checks were conducted on a daily basis using the POS MV controller software. The controller software had numerous real-time displays that were monitored throughout the survey to ensure the positional accuracies specified in the NOS Hydrographic Surveys Specifications and Deliverables were achieved. These include, but are not limited to the following: GPS Status, Position Accuracy, Receiver Status (which included HDOP), and Satellite Status. During periods of high HDOP and/or low number of available satellites, survey operations were stopped.

### Data Quality

In general, the multibeam data quality for H11984 was good. One notable problem follows:

1. A general downward and/or upward cupping is noticeable in the across track sounding profiles for certain areas. This is possibly due to a high volume of thermal layering and strong undercurrents in the water column. This problem was addressed by conducting SVP casts more frequently and reducing the line spacing interval. Even though this SVP error is noticeable in the data, it is within required specifications<sup>10</sup>.

The R2 and D2 launches collected sound velocity profiles every two hours to compensate for velocity changes over time. Profiles were collected on alternate ends of lines, or often in the middle of lines, to minimize the spatial aspect of sound velocity changes.

The MVP system on the Pacific Star was also used at an interval of every two hours, except that the system was used to collect as many as five profiles along the course of a single line. Two hours later, another set of profiles would be collected, with the net result being the creation of a grid of sound velocity profiles that kept differences in time and distance minimal between the survey data and the in-use sound velocity profile.

Object detection requirements were met<sup>11</sup> by minimizing vessel speed when necessary, using sonar range scales appropriate to the water depth to maximize ping rates, and maximizing swath overlap. These variables were adjusted in real-time by the online acquisition crew based on the Winfrog QC and coverage displays. The office-based processing crew provided feedback after preliminary processing and coverage creation in CARIS HIPS, and reported re-runs or in-fills as necessary to the acquisition crew.

Refer to the M-L906-KR-08 Data Acquisition and Processing Report for a detailed description of the survey equipment and methodology used over the course of this survey.

### B.3 Corrections to Echo Soundings

Refer to the M-L906-KR-08 Data Acquisition and Processing Report for a detailed description of all corrections to echo soundings. No deviations from the report occurred.

### B.4 Data Processing

Refer to the M-L906-KR-08 Data Acquisition and Processing Report for a detailed description of the processing flow.

The final fieldsheets for H11984 were divided into separate resolutions (due to the volume of data) and are called:

- “H11984\_0\_5m” and it contains five BASE surfaces.
- “H11984\_1m” and it contains six BASE surfaces.
- “H11984\_1\_5m” and it contains seven BASE surfaces.
- “H11984\_2m” and it contains six BASE surfaces.
- “H11984\_4m” and it contains three BASE surfaces.
- “H11984\_5m” and it contains two BASE surfaces.

The following parameters were used:

0-22 meters: 0.5 m resolution, name “H11984\_0\_5m”  
20-33 meters: 1 m resolution, name “H11984\_1m”  
30-45 meters: 1.5 m resolution, name “H11984\_1\_5m”  
40-84 meters: 2 m resolution, name “H11984\_2m”  
80-100 meters: 4 m resolution, name “H11984\_4m”  
90-250 meters: 5 m resolution, name “H11984\_5m”

Note: Maximum depth was approximately 120 m, therefore resolutions coarser<sup>12</sup> than 5 m were not computed.

The final S57 file for this project is called “H11984\_S57\_Features.000”. This file contains the object and metadata S57 objects as required in the Specifications and Deliverables.

## **C. VERTICAL AND HORIZONTAL CONTROL**

Refer to the M-L906-KR-08 Horizontal and Vertical Control Report<sup>13</sup> for a detailed description of the horizontal and vertical control used on this survey. No deviations from the report occurred. A summary of the project’s horizontal and vertical control follows.

### Horizontal Control

The horizontal control datum for this survey was the North American Datum of 1983 (NAD83).

For real-time DGPS corrections, a CSI MBX-3 unit was tuned to the Cape Mendocino, CA. USCG DGPS site. The unit output differentially corrected positions at 1 Hz to the POS MV 320 V4 where it was integrated with inertial data and a position for the top-center of the IMU was generated. This position was logged concurrently with the bathymetry from Winfrog and logged to the POS file by Winfrog POS logger. It was later corrected for offsets to the MBES sonar by CARIS HIPS in processing.

Final positioning, however, was done using post-processed kinematic (PPK) methods. Applanix POSPac software was used in conjunction with the POS files and local base station data to generate a higher accuracy position which was applied in processing, replacing the real-time position records.

See M-L906-KR-08 Horizontal and Vertical Control Report for a more detailed description of PPK positioning methods used.

### Vertical Control

All sounding data were initially reduced to mean lower low water (MLLW) using predicted tidal data. It should be noted that predicted tides were used in the field for preliminary processing only.

**Table 2 – Tide Gauges**

Gauge	Location	Latitude	Longitude
9419750	Crescent City, CA	41° 44.7' N	124° 10.9' W
9418767	North Spit, CA	40° 46.0' N	124° 13.0' W

### Tides

All sounding data were initially reduced to mean lower low water (MLLW) using predicted tidal data. Predicted tidal data for a month long period, UTC (Pacific Standard Time to UTC was +7 hours), was assembled (for gauges 9418767 & 9419750) from the National Water Level Observation Program accessed through the NOAA tides and currents website (<http://tidesandcurrents.noaa.gov/>). A cumulative file for the gauges was updated monthly by appending the new data. It should be noted that predicted tides were used in the field for preliminary processing only. Refer to the Horizontal and Vertical Control Report for any additional tidal information.

On March 1, 2009, verified tide data was acquired from the National Water Level Observation

Program accessed through the NOAA tides and currents website (<http://tidesandcurrents.noaa.gov/>). Tidal zoning file was developed and provided by NOAA. From March 1, 2009 to March 2, 2009, all sounding data were re-merged using CARIS HIPS and SIPS tide routine. Verified tidal data from the Crescent City, CA. (9419750) and the North Spit, CA. (9418767) tidal stations were used for the final Navigation Base Surfaces and S-57 Feature files. Tidal Stations were owned and operated by the NOAA's National Ocean Service through the National Water Level Observation Program.

Final tidal corrections for this portion of the project were traditional tides and zoning and not GPS-derived, because to date, no VDatum model exists for conversion from NAD83 to MLLW.

## D. RESULTS AND RECOMMENDATIONS

### D.1 Chart Comparison

H11984 survey was compared with the charts shown on Table 3.

**Table 3 – Chart Comparisons**

Chart Number	Type	Cell Name	Scale	Edition	Edition Date
18600	Raster	n/a	1:196,948	14 <sup>th</sup>	January 2002
18603	Raster	n/a	1:40,000	16 <sup>th</sup>	December 2002
18600	ENC	US3OR03M	n/a	6 <sup>th</sup>	October 2008
18007	ENC	US2WC12M	n/a	4 <sup>th</sup>	August 2008

### Comparison of Soundings

A comparison of soundings was accomplished by overlaying the latest edition of NOAA charts and ENCs on the final BASE surfaces in CARIS HIPS & SIPS. The general agreement between charted soundings and H11984 soundings was noted. A more detailed comparison was undertaken for any charted shoals or other dangerous features.

Agreement between soundings on this survey and all charts is good (Raster and ENC), with BASE surface depths comparing to charted soundings generally within +/- 1 fathom. Exceptions follow:

1. Some discrepancy exists at the exact position of charted soundings on steep slopes, likely due to the charted soundings being slightly out of position, making a large difference in depths apparent. Recommend soundings as charted be superseded by this survey.



### Automated Wreck and Observation Information System

There were no AWOIS items assigned to H11984.<sup>14</sup>

### Charted Features

There were no charted features labeled ED, PD, or PA within the limits of H11984.<sup>15</sup>

### Dangers to Navigation

Twenty-one dangers to navigation were found and reported for this survey.<sup>16</sup> See Appendix I for the DtoN reports.

### D.2 Additional Results

None to note.

### Bottom Samples

None were assigned for this sheet.

### Aids to Navigation

The following aids to navigation were examined during this survey:

1. Weather Buoy Y ODAS "46027" Fl (4) Y 20s PA at 41-51-05 N, 124-22-56 W (chart 18603) found to exist and to be serving its intended purpose.
2. Buoy R "46" Fl R 4s WHIS at 41-50-14 N, 124-23-11 W (chart 18603) found to exist and to be serving its intended purpose.
3. TOWER on NW Seal Rk at 41-50-14 N, 124-22-31 W (chart 18603) found to exist and to be serving its intended purpose.

No uncharted aids to navigation were found in the survey area.

### **E. APPROVAL SHEET**



## Approval Sheet

For

**H11984**

Standard field surveying and processing procedures were followed in producing this survey in accordance with the following documents:

M-L906-KR-08 Statement of Work

NOS Hydrographic Surveys Specifications and Deliverables, April 2008 Edition

Fugro Pelagos, Inc. Acquisition Procedures (2009-MBES\_Acquisition\_Procedures\_R0);

Fugro Pelagos, Inc. Processing Procedures (2009-MBES\_Processing\_Procedures\_R0)

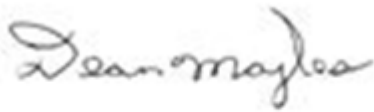
The data were reviewed daily during acquisition and processing, and the survey is complete and adequate for its intended purpose.<sup>17</sup>

This report has been reviewed and approved. All records are forwarded for final review and processing to the Chief, Pacific Hydrographic Branch.

Approved and forwarded,

Dean Moyles,  
Lead Hydrographer  
Fugro Pelagos, Inc. Survey Party

X



---

Dean Moyles  
ACSM Certified

## **Revisions Compiled During Office Processing and Certification**

---

<sup>1</sup> Day numbers 253 through 318, inclusive.

<sup>2</sup> Filed with the project records.

<sup>3</sup> Concur.

<sup>4</sup> Concur.

<sup>5</sup> Concur.

<sup>6</sup> Concur.

<sup>7</sup> Concur.

<sup>8</sup> Concur.

<sup>9</sup> Concur.

<sup>10</sup> Concur.

<sup>11</sup> Concur.

<sup>12</sup> Should read “coarser.”

<sup>13</sup> Filed with the project records.

<sup>14</sup> Concur.

<sup>15</sup> Concur.

<sup>16</sup> Concur.

<sup>17</sup> Concur.



## **APPENDIX I -- DANGER TO NAVIGATION REPORTS**

Twenty-one dangers to navigation were found and reported for during H11984.

[Appendix I \(Danger to Navigation Reports\)\H11984DTON\\_1.pdf](#)

## REPORT OF DANGERS TO NAVIGATION

**Hydrographic Survey Registry Number:** H11984

**Survey Title:**  
**State:** California  
**Locality:** Pacific Ocean  
**Sub-locality:** Vicinity of Saint George Reef

**Project Number:** M-L906-KR-08

**Survey Dates:** September 2008

**Survey Danger Acquisition Date and Time:** See feature.

Features are reduced to Mean Lower Low Water using preliminary tide data from 9419750 (Crescent City).

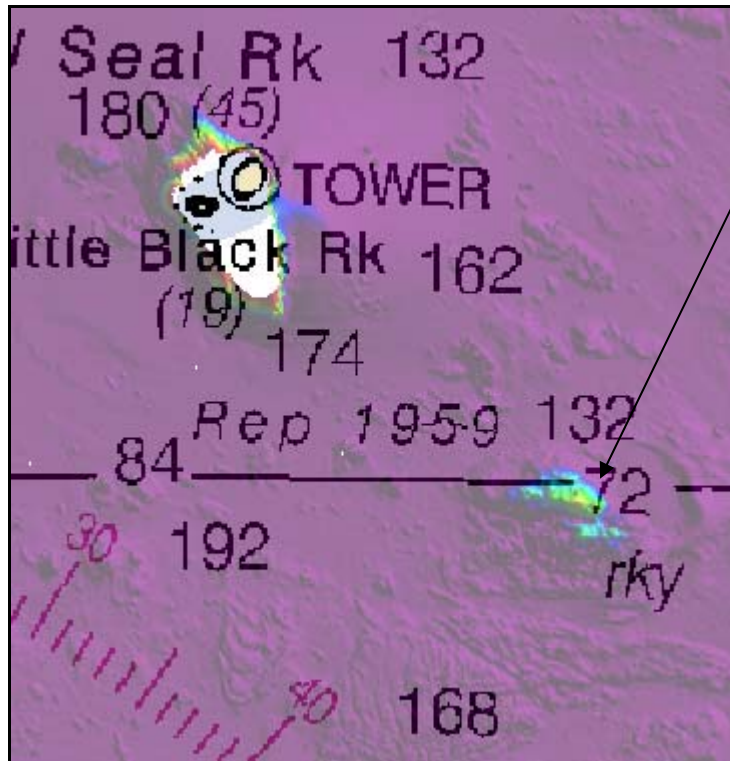
### CHARTS AFFECTED:

Chart	Type	Scale	Edition	Edition Date
18603	Raster	1:40,000	16 <sup>th</sup>	December, 2002
18600	Raster	1:96,948	14 <sup>th</sup>	January, 2002
US3OR03M	ENC		5 <sup>th</sup>	July, 2007

### DANGER:

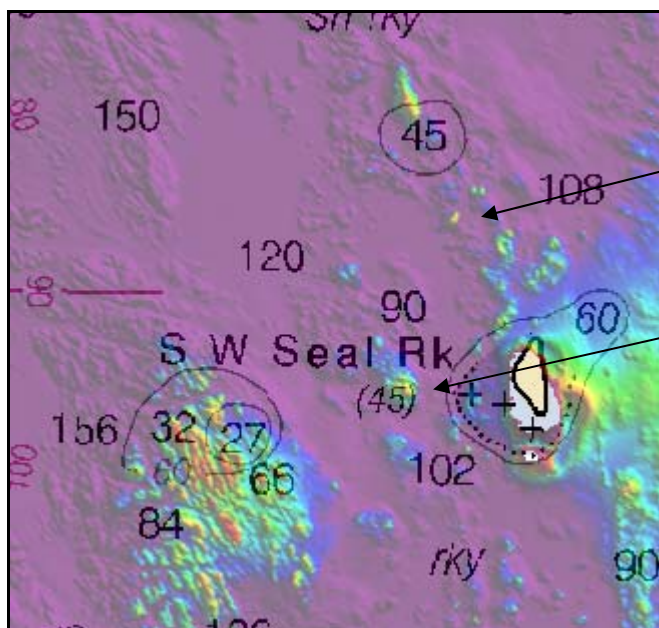
Feature	Depth	Latitude	Longitude	Time (UTC)
1. Sounding	54'	41-49-59.39N	124-22-10.03W	2008-09-15 @ 21:48:21
2. Sounding	47'	41-49-01.27N	124-21-13.82W	2008-09-16 @ 16:32:34
3. Sounding	43'	41-48-49.06N	124-21-17.99W	2008-09-16 @ 23:01:42
4. Sounding	36'	41-48-28.79N	124-21-07.83W	2008-09-17 @ 20:05:11
5. Sounding	49'	41-48-16.86N	124-21-11.52W	2008-09-18 @ 01:03:18
6. Sounding	31'	41-48-59.35N	124-20-17.63W	2008-09-15 @ 16:42:14
7. Rock	12'	41-47-35.62N	124-17-47.61W	2008-09-19 @ 21:56:12
8. Sounding	22'	41-47-22.79N	124-17-41.32W	2008-09-20 @ 17:41:34
9. Sounding	35'	41-47-14.07N	124-17-56.38W	2008-09-23 @ 23:29:24
10. Sounding	17'	41-47-10.91N	124-17-50.61W	2008-09-20 @ 20:47:26
11. Sounding	22'	41-46-56.25N	124-17-22.78W	2008-09-23 @ 16:59:37
12. Sounding	53'	41-46-58.16N	124-17-52.43W	2008-09-20 @ 22:46:16
13 Rock	6'	41-46-49.05N	124-17-23.66W	2008-09-20 @ 22:35:08

14 Rock	13'	41-47-51.71N	124-17-49.34W	2008-09-19 @ 19:11:12
15 Rock	21'	41-47-43.59N	124-17-54.14W	2008-09-19 @ 21:03:07
16 Rock	20'	41-48-27.84N	124-18-29.17W	2008-09-18 @ 22:40:12
17 Rock	6'	41-48-30.26N	124-17-51.48W	2008-09-16 @ 19:20:01
18 Rock	6'	41-48-19.94N	124-18-00.13W	2008-09-18 @ 22:21:31
19 Rock	18'	41-48-13.88N	124-18-16.34W	2008-09-20 @ 14:57:24
20 Rock	14'	41-48-07.33N	124-18-21.98W	2008-09-20 @ 15:14:33
21 Sounding	56'	41-49-23.11N	124-18-10.66W	2008-09-27 @ 01:26:49



DTON item 1: A 9 fathom sounding acquired in the vicinity of 72 foot sounding (chart 18603)

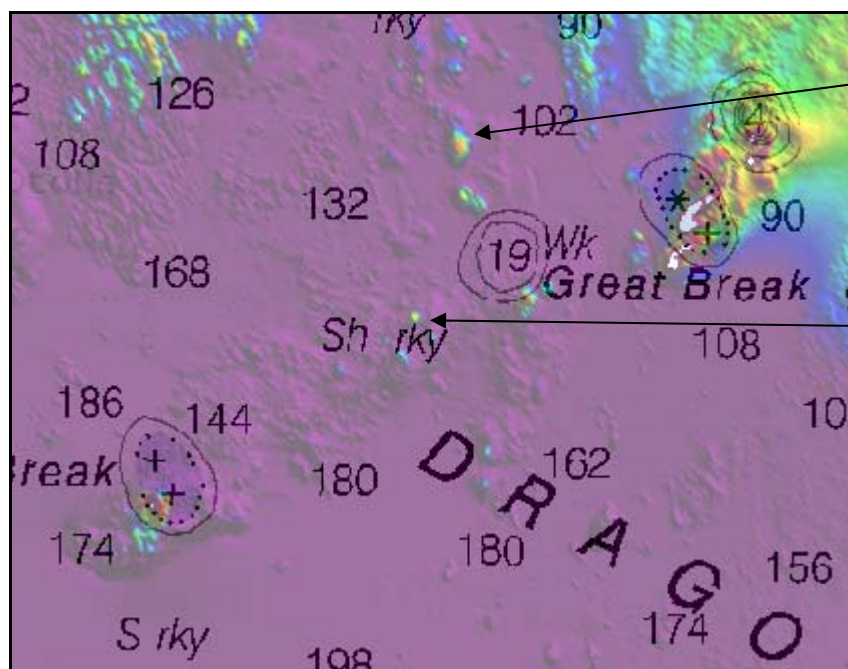
**DTON item 1**



DTON item 2: A 7 fathom 5 foot sounding acquired in the vicinity of 108 foot sounding (chart 18603)

DTON item 3: A 7 fathom 1 foot sounding acquired in the vicinity of 90 foot sounding (chart 18603)

**DTON items 2 & 3**

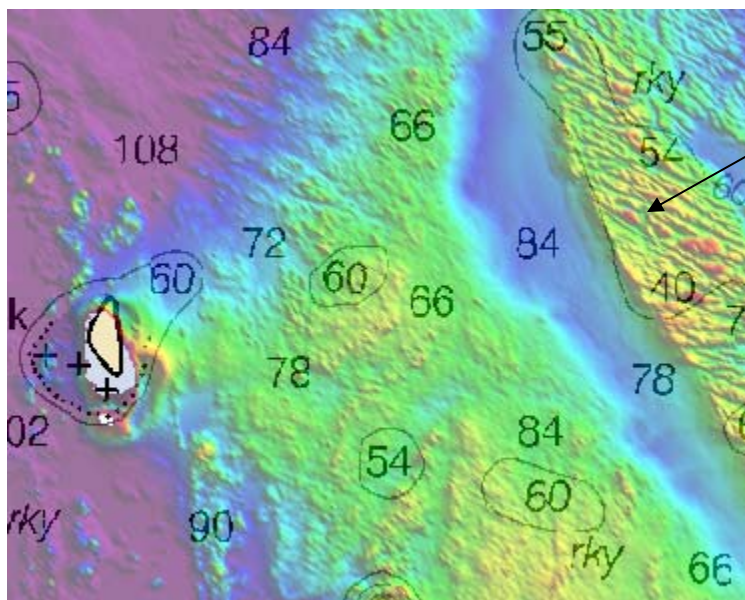


DTON item 4: A 6 fathom sounding acquired in the vicinity of 120 foot sounding (chart 18603)

DTON item 5: A 8 fathom 1 foot sounding.

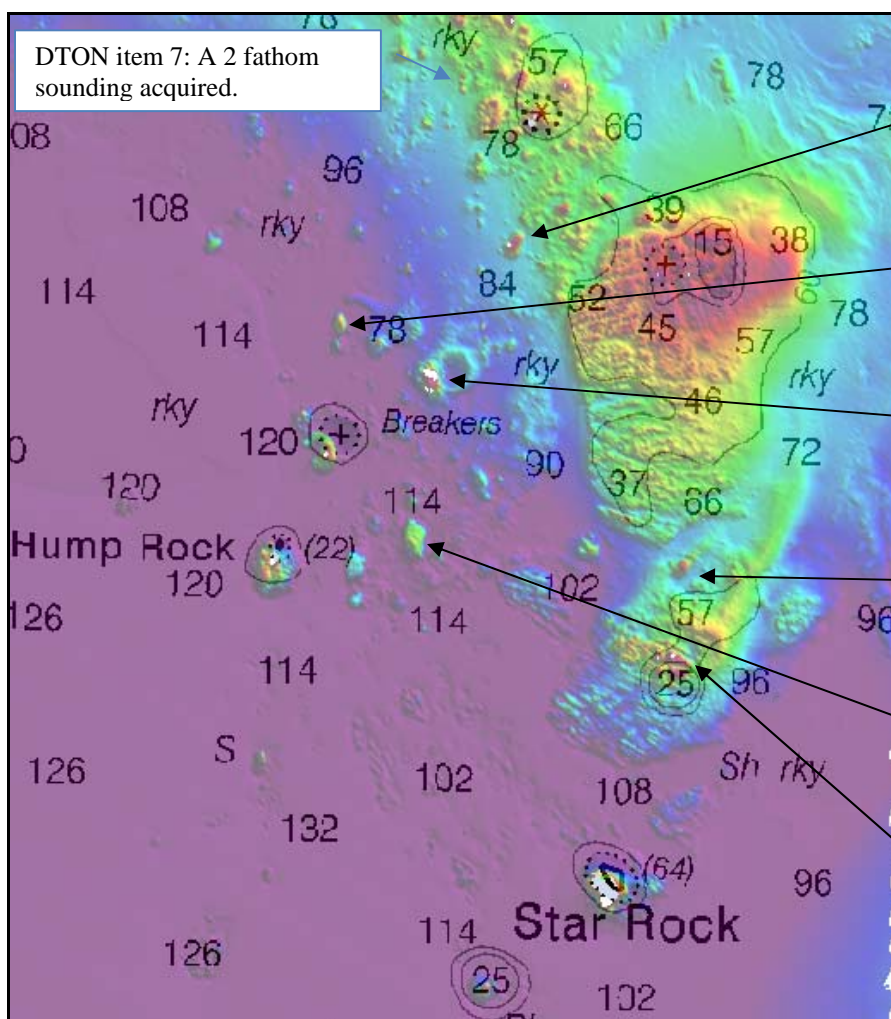
**DTON items 4 & 5**





DTON item 6: A 5 fathom 1 foot sounding acquired in the vicinity of 40 foot sounding (chart 18603)

**DTON item 6**



DTON item 7: A 2 fathom sounding acquired.

DTON item 8: A 3 fathom 4 foot sounding acquired in the vicinity of 84 foot sounding (chart 18603)

DTON item 9: A 5 fathom 5 foot sounding acquired in the vicinity of 78 foot sounding (chart 18603)

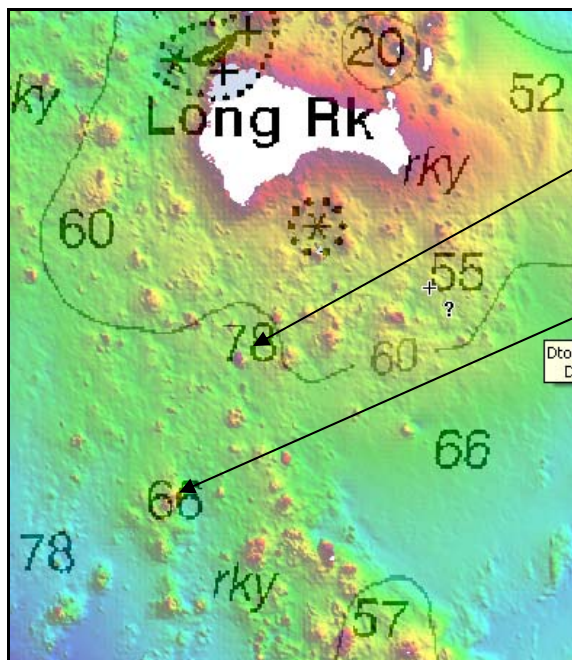
DTON item 10: A 2 fathom 5 foot sounding acquired in the vicinity of 78 foot sounding (chart 18603)

DTON item 11: A 3 fathom 4 foot sounding acquired in the vicinity of 57 foot sounding (chart 18603)

DTON item 12: A 8 fathom 5 foot sounding acquired in the vicinity of 114 foot sounding (chart 18603)

DTON item 13: A 1 fathom sounding acquired in the vicinity of 25 foot sounding (chart 18603)

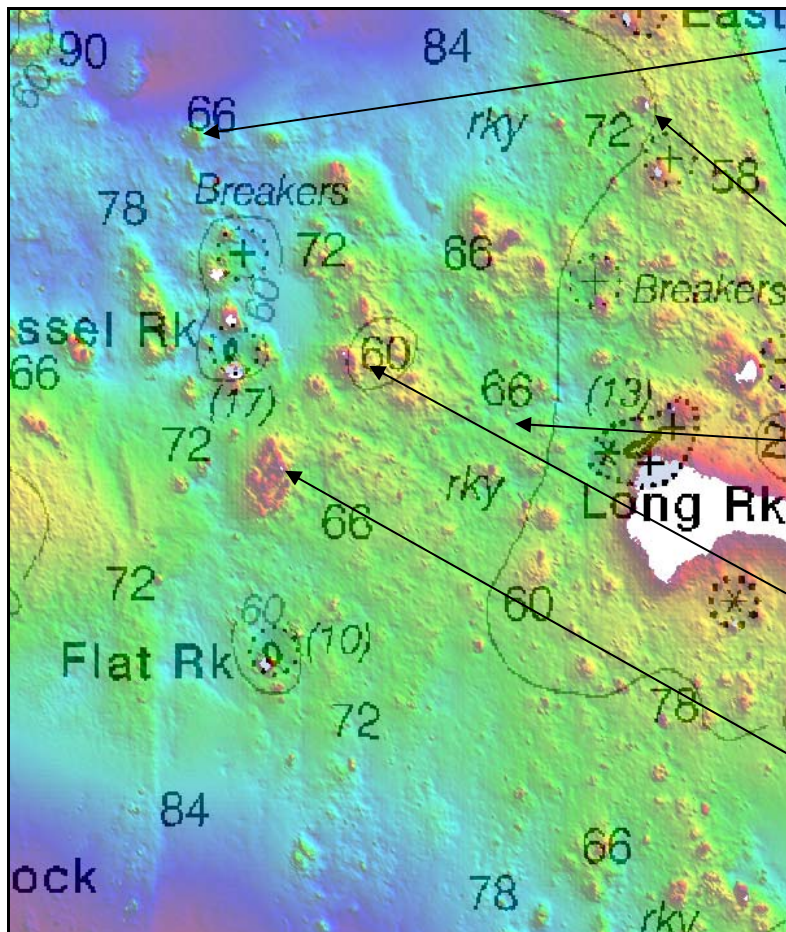
**DTON items 7, 8, 9, 10, 11, 12 & 13**



DTON item 14: A 2 fathom 1 foot sounding acquired in the vicinity of 78 foot sounding (chart 18603)

DTON item 15: A 3 fathom 3 foot sounding acquired in the vicinity of 66 foot sounding (chart 18603)

DTON items 14 & 15



DTON item 16: A 3 fathom 2 foot sounding acquired in the vicinity of 66 foot sounding (chart 18603)

DTON item 17: A 1 fathom sounding acquired in the vicinity of 72 foot sounding (chart 18603)

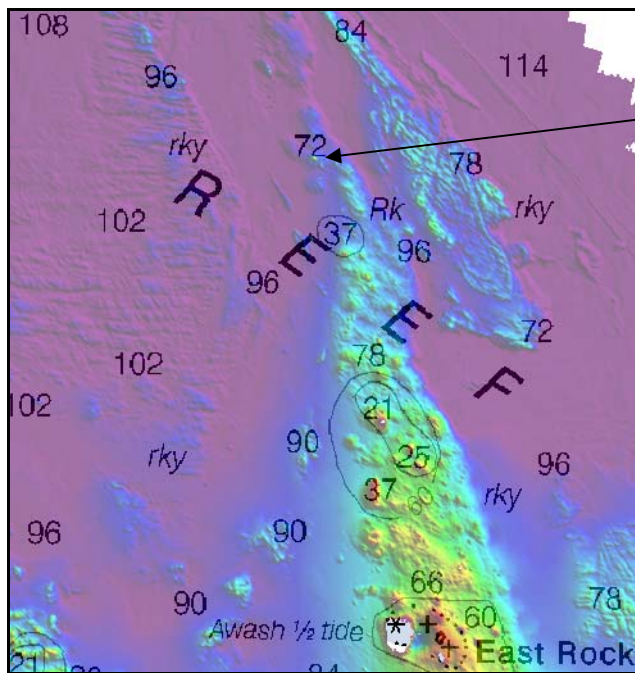
DTON item 18: A 1 fathom sounding acquired in the vicinity of 66 foot sounding (chart 18603)

DTON item 19: A 3 fathom sounding acquired in the vicinity of 60 foot sounding (chart 18603)

DTON item 20: A 2 fathom 2 foot sounding acquired in the vicinity of 66 foot sounding (chart 18603)

DTON items 16, 17, 18, 19 & 20





DTON item 21: A 9 fathom 2 foot sounding acquired in the vicinity of 72 foot sounding (chart 18603)

#### DTON items 21

#### COMMENTS:

Submitted by Fugro-Pelagos, Reviewed by PHB. Note: Soundings in text boxes are shown as fathoms and feet rather than as charted (feet).

Questions concerning this report should be directed to the Chief, Pacific Hydrographic Branch (N/CS34), at (206) 526-6836.



## **APPENDIX II – SURVEY FEATURE REPORT**

No AWOIS items were assigned for H11984.



### **APPENDIX III – FINAL PROGRESS SKETCH AND SURVEY OUTLINE**

Included in Descriptive Report directory:

[AppendixIII \(Progress\\_Sketch\)\ M-L906-KR-08\\_N\\_California\\_Progress-December.pdf](#)

## PROGRESS SKETCH

M-L906-KR-08  
Northern California  
Fugro Pelagos, Inc.

Start Date: 9/8/08  
End Date: n/a  
Submitted Date: n/a

Chart 18010



Emily Todd  
Lead Hydrographer



0 5 10 20  
Nautical Miles

December - Pacific Star	October - Pacific Star
December - R2	October - R2
December - D2	October - D2
November - Pacific Star	September - Pacific Star
November - R2	September - R2
November - D2	September - D2

September Progress										
Sheet	Total LNM	Ship LNM	Launch LNM	Square NM	SVP Casts	Bottom Samples	AWOIS	Weather Down	Equipment Down	Days In Field
BG	53	0	53	1.1	3	n/a	n/a	2.2 days	3.0 days	23 days
BH	85	0	85	1.4	10					
BK	50	50	0	1.8	25					
BL	830	806	24	28.6	322					
BM	811	343	468	21.7	137					
BN	1085	571	514	56.3	210					
BO	650	550	100	21.4	212					
<b>Total</b>	<b>3564</b>	<b>2320</b>	<b>1244</b>	<b>132.2</b>	<b>919</b>					

October Progress										
Sheet	Total LNM	Ship LNM	Launch LNM	Square NM	SVP Casts	Bottom Samples	AWOIS	Weather Down	Equipment Down	Days In Field
BG	578	266	312	17.6	203	n/a	n/a	8.9 days	3.1 days	31 days
BH	1003	655	348	30.6	435					
BI	1192	700	492	35.2	335					
BJ	356	356	0	20.0	107					
BK	301	301	0	9.4	68					
BM	100	60	40	1.8	21					
BO	825	482	343	12.0	207					
<b>Total</b>	<b>4354</b>	<b>2820</b>	<b>1534</b>	<b>126.7</b>	<b>1376</b>					

November Progress										
Sheet	Total LNM	Ship LNM	Launch LNM	Square NM	SVP Casts	Bottom Samples	AWOIS	Weather Down	Equipment Down	Days In Field
BB	9	0	9	0.3	6	n/a	n/a	8.3 days	1.1 days	30 days
BC	439	266	173	31.9	138					
BD	22	22	0	7.1	15					
BE	45	0	45	0.7	5					
BF	157	113	44	7.0	54					
BG	138	121	18	4.3	26					
BI	134	18	115	1.8	35					
BJ	579	530	48	11	145					
BK	1017	932	84	36.2	393					
BL	550	194	356	12.4	153					
BM	193	67	126	4.1	49					
BO	200	72	127	3.3	98					
<b>Total</b>	<b>3484</b>	<b>2337</b>	<b>1147</b>	<b>120.4</b>	<b>1117</b>					

December Progress										
Sheet	Total LNM	Ship LNM	Launch LNM	Square NM	SVP Casts	Bottom Samples	AWOIS	Weather Down	Equipment Down	Days In Field
BA	51	51	0	2.4	4	n/a	n/a	7.6 days	0.4 days	21 days
BB	787	480	307	30.0	114					
BC	187	66	121	3.1	35					
BD	362	280	82	19.1	51					
BE	602	406	197	25.1	70					
BF	453	343	110	14.8	51					
BG	53	16	38	1.5	6					
<b>Total</b>	<b>2496</b>	<b>1642</b>	<b>854</b>	<b>96.0</b>	<b>331</b>					

Notes:

1. Sheet AU (H11965), Farallon Islands, is not shown.
2. Sheets not listed under each month were not surveyed that month
3. Weather and equipment down based on the sum of all vessel's downtime divided by 42 (expected daily production in hours)

H11984 (Sheet BN)  
Vicinity of Saint George Reef

H11985 (Sheet BO)  
Pelican Bay

H11983 (Sheet BM)  
Point St George

H11982 (Sheet BL)  
Midway Point to Split Rock

H11981 (Sheet BK)  
Johnson Creek to Mussel Point

H11980 (Sheet BJ)  
Conical Rock to Rocky Point

H11979 (Sheet BI)  
Vicinity of Trinidad

H11978 (Sheet BH)  
West of Arcata Bay

H11977 (Sheet BG)  
Vicinity of Humboldt

H11976 (Sheet BF)  
Eel River to Mussel Rock

H11975 (Sheet BE)  
Vicinity of Cape Mendocino

H11974 (Sheet BD)  
Mussel Rocks to Punta Gorda

H11973 (Sheet BC)  
Vicinity of Spanish Canyon

H11972 (Sheet BB)  
Vicinity of Point Delgada

H11971 (Sheet BA)  
Vicinity of Bear Landing

H11970 (Sheet AZ)  
Big White Rock to Abalone Point

H11969 (Sheet AY)  
De Haven to Laguna Point

H11968 (Sheet AX)  
Fort Bragg to Little River

H11967 (Sheet AW)  
Still Well Point to Greenwood Cove

H11966 (Sheet AV)  
Vicinity of Point Arena Light





## APPENDIX IV – TIDES AND WATER LEVELS

Abstract of Times of Hydrography for Smooth Tides

Project Number: M-L906-KR-08     Registry Number: H11984

Contractor Name: Fugro Pelagos Inc.     Date: May 11, 2009

Sheet Letter: BN

Inclusive Dates: September 9, 2008 and ended on November 13, 2008.

Fieldwork is complete and verified tides were applied for the production of the final combined BASE surfaces and S-57 feature file.

**Table 1 - Abstract of Times of Hydrography for R/V R2**

YEAR	DAY	START TIME (UTC)	END TIME (UTC)	COMMENTS
2008	259	16:00:16	23:59:59	
2008	260	0:00:00	1:04:23	
2008	260	15:04:57	21:03:38	
2008	260	22:08:04	23:59:59	
2008	261	0:00:00	1:25:00	
2008	261	17:41:45	23:59:59	
2008	262	0:00:00	1:22:49	
2008	262	14:43:27	23:59:59	
2008	263	0:00:00	0:19:44	
2008	263	15:07:23	23:59:59	
2008	264	0:00:00	1:23:13	
2008	264	15:06:27	23:59:59	
2008	265	0:00:00	1:13:51	
2008	272	15:19:33	16:43:15	



**Table 2 - Abstract of Times of Hydrography for R/V D2**

YEAR	DAY	START TIME (UTC)	END TIME (UTC)	COMMENTS
2008	259	16:16:09	23:59:59	
2008	260	0:00:00	1:02:43	
2008	260	15:15:56	23:59:59	
2008	261	0:00:00	1:04:19	
2008	261	15:30:12	23:59:59	
2008	262	0:00:00	0:50:30	
2008	262	15:17:41	23:09:52	
2008	263	16:31:32	23:59:59	
2008	264	0:00:00	0:57:22	
2008	264	14:42:25	23:59:59	
2008	265	0:00:00	0:54:39	
2008	265	15:12:53	23:59:59	
2008	266	0:00:00	1:03:21	
2008	266	14:39:30	17:41:30	
2008	267	15:04:28	23:31:28	
2008	318	20:19:49	21:09:54	

**Table 3 - Abstract of Times of Hydrography for F/V Pacific Star**

YEAR	DAY	START TIME (UTC)	END TIME (UTC)	COMMENTS
2008	253	19:11:28	20:22:59	
2008	255	2:55:38	23:59:59	
2008	256	0:00:00	0:14:49	
2008	256	1:28:17	23:59:59	
2008	257	0:00:00	17:50:18	
2008	259	13:04:29	13:41:36	
2008	259	16:25:11	20:53:41	
2008	259	21:54:14	23:59:59	
2008	260	0:00:00	1:05:35	
2008	260	2:27:08	13:54:33	
2008	260	14:54:48	17:37:15	
2008	263	15:30:30	17:24:22	
2008	265	20:39:46	23:59:59	
2008	266	0:00:00	0:47:50	
2008	266	15:31:22	17:52:14	



---

YEAR	DAY	START TIME (UTC)	END TIME (UTC)	COMMENTS
2008	266	21:26:12	22:06:18	
2008	267	19:00:05	23:59:59	
2008	268	0:00:00	0:05:22	
2008	268	18:54:02	0:06:18	
2008	269	0:18:13	1:06:59	
2008	269	14:55:52	23:59:59	
2008	270	0:00:00	0:49:58	
2008	270	14:55:47	14:52:49	
2008	270	15:57:33	19:03:29	
2008	270	20:27:31	19:51:28	
2008	271	0:53:17	2:01:48	



## **APPENDIX V – SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE**

The following emails are included since they are recommendations or directives from NOAA that affected the survey.



**Andy Orthmann**

---

**From:** Crescent Moegling [Crescent.Moegling@noaa.gov]  
**Sent:** Tuesday, July 08, 2008 9:10 AM  
**To:** Ed Saade  
**Cc:** Andy Orthmann; Bob Richards; Jeffrey Ferguson  
**Subject:** Re: data transfer

Ed,

To further clarify, Fugro will only send raw data to NGDC, no other products or data types such as processed data, BAGs, etc.

Crescent

Ed Saade wrote:  
Andy;

Just a note to confirm that when I met with NOAA in late June, Jeff indicated we plan to only send the master copy of the NOAA portion of the California data set directly to NGDC. You will not need to duplicate this data to your regular channels at Sand Point.

Regards;

Ed

--  
Crescent Moegling  
NOAA Hydrographic Surveys Division  
Branch Chief - Data Acquisition Control  
301.713.2700 x111



## Andy Orthmann

---

**From:** David Scharff [David.Scharff@noaa.gov]  
**Sent:** Tuesday, November 04, 2008 12:06 PM  
**To:** Andy Orthmann  
**Subject:** Re: svp calibrations f/ California  
**Attachments:** David\_Scharff.vcf

Andy,

I would recommend simply treating it as a single survey. You could always run a final calibration check towards the end of the project as a check, but you are correct this is technically one continuous survey.

Dave

Andy Orthmann wrote:

>  
> Dave,  
>  
> We haven't had a continuous project quite as long as this one so the  
> subject of sound velocity profiler calibrations has come up.  
>  
> The specs and deliverables say that all profilers shall be calibrated  
> within six months prior to the start of survey operations, and  
> re-calibrated at an interval no greater than 12 months until survey  
> completion.  
>  
> For purposes of SVP calibration, will California be considered three  
> separate surveys, or one single survey? We would argue that since ops  
> have been continuous since survey operations began that it is  
> effectively the same survey despite it being broken up for  
> administrative purposes into three separate ops.  
>  
> Thanks a lot,  
>  
> Andy Orthmann  
>  
> Fugro Pelagos, Inc.  
>



**H11984 HCell Report**  
Keith Toepfer, Cartographer  
Pacific Hydrographic Branch

## **Introduction**

The primary purpose of the HCell is to provide new survey information in International Hydrographic Organization (IHO) format S-57 to update the largest scale ENC's and RNC's in the region: NOAA RNC's, 18603 (1:40,000), 18600 (1:196,948), and corresponding NOAA ENC US3OR30M. (See section 4. Meta Areas.)

HCell compilation of survey H11984 utilized Office of Coast Survey HCell Specifications Version 3.1, with approved modifications to better align with PHB's HCell process and to meet MCD needs.

## **1. Compilation Scale**

Depths and features for HCell H11984 were compiled to the largest scale chart in the region, 18603, 1:40,000, with additional scales compiled using the M\_CSCL meta area object. (See section 4. Meta Areas.)

## **2. Soundings**

A survey-scale sounding (SOUNDG) feature object layer was built from the 12-meter Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at 1:10,000 survey scale using a Radius Table file with values shown in the table, below. The resultant sounding layer contains 51,305 depths ranging from 1.524 to 121.615 meters.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
0	10	3
10	20	4
20	50	4.5
50	500	5

In CARIS BASE Editor soundings were manually selected from the high density sounding layers and imported into a new layer created to accommodate chart density depths. Manual selection was used to accomplish a density and distribution that closely represents the seafloor morphology.

## **3. Depth Areas and Depth Contours**

### **3.1 Depth Areas**

The extents of the highest resolution BASE Surface together with the extents of the soundings layer were used to digitize the hydrographic extents, which were then used to create the single, all encompassing depth area (DEPARE). This extent was then modified as needed to accommodate nearshore area features.

### 3.2 Depth Contours

Depth contours at the intervals on the largest scale chart are included in the \*\_SS HCell for MCD raster charting division to use for guidance in creating chart contours. The metric and fathom equivalent contour values are shown in the table below.

Chart Contour Intervals in Feet from Chart 18603	Metric Equivalent to Chart Feet, Arithmetically Rounded	Metric Equivalent of Chart Feet, with NOAA Rounding Applied	Feet with NOAA Rounding Applied	Feet with NOAA Rounding Removed for Display on H11984_SS.000
6	2.057	1.829	6.750	6
12	3.886	3.658	12.750	12
18	5.715	5.486	18.750	18
30	9.373	9.144	30.750	30
60	18.517	18.288	60.750	60

There was no GC shoreline for H11984 and the area is entirely offshore. As a consequence, there are no conflicts between hydrography and shoreline.

### 4. Meta Areas

The following Meta object areas are included in HCell H11984:

M\_QUAL  
M\_CSCL

Meta area objects were constructed on the basis of the limits of the hydrography adjusted for .  
(See 3.1 *Depth Areas*.)

### 5. Features

#### 5.1 Generalization of Features to Chart Scale

The only Features delivered by Fugro were the 27 rocky seabed areas. All new obstruction areas and underwater rocks were digitized from the BASE surface and added during compilation. These feature, as well as features to be retained from the chart and so annotated in the NINFOM field, are included in the HCell. The geometry of these features is modified to emulate chart scale.

Feature generalization to emulate chart scale is accomplished primarily through reduction in the number of features included in the HCell, and in some cases generalizing groupings of features such as rocks to area objects. Some instances of reduction of area features to point objects is entrusted to the RNC division, for example rocky seabed areas that will display as point features on the RNC. Where line and area objects are included in the HCell, complexity of the lines and edges comprising the features have been smoothed to be commensurate with chart scale.

#### 5.2 Compilation of Features to the HCell

Features for H11984 were delivered from the field in one hob file defining new features. These were deconflicted against the chart and hydrography during office processing.

During office processing, numerous submerged rocks and several obstruction areas were digitized from the high resolution BASE Surfaces.

The source of all features included in the H11984 HCell can be determined by the SORIND field.

## **5.2 Mean High Water Used for HCells**

For the purposes of determining the height at which a rock becomes an islet, the “*Tidal Information*”, “*Height referred to Datum of Soundings (MLLW)*”, “*Mean High*” from chart 18603 was used. No exposed rocks and islets were delivered by Fugro. Charted rocks and islets in conflict with the hydrography so noted in the NINFOM field and will need to be deconflicted by MCD using the latest aerial imagery available.

No intertidal depth areas were submitted by Fugro. The MHW value from chart 19603 was used for H11984.

## **6. S-57 Objects and Attributes**

The \*\_CS HCell contains the following Objects:

\$CSYMB	Blue Notes
DEPARE	The all-encompassing depth area
M_CSCL	Compilation scale meta area to define areas of H11984 lying outside the limits of chart 18603
M_QUAL	Data quality Meta object
OBSTRN	Obstruction area objects
SBDARE	Rocky seabed areas
SOUNDG	Soundings at the chart scale density
UWTROC	Rock features

The \*\_SS HCell contains the following Objects:

DEPCNT	Ungeneralized contours at chart scale intervals
SOUNDG	Soundings at the survey scale density

All S-57 Feature Objects in the \*\_CS HCell have been attributed as fully as possible based on information provided by the Hydrographer and in accordance with current guidance and the OCS HCell Specifications.

## **7. Blue Notes**

Notes to the RNC and ENC chart compilers are included in the HCell as \$CSYMB features with the Blue Note information located in the INFORM field. By agreement with MCD, the NINFOM field is populated with an abbreviated version of the Blue Note (30 characters or less), describing the chart disposition, to be used by MCD in generating their Chart History spreadsheet.

## **8. Spatial Framework**

### **8.1 Coordinate System**

All spatial map and base cell file deliverables are in an LLDG geographic coordinate system, with WGS84 horizontal, MHW vertical, and MLLW (1983-2001 NTDE) sounding datums.

### **8.2 Horizontal and Vertical Units**

DUNI, HUNI and PUNI are used to define units for depth, height and horizontal position in the chart units HCell, as shown below.

Chart Unit Base Cell Units:

Depth Units (DUNI):	Feet
Height Units (HUNI):	Feet
Positional Units (PUNI):	Meters

During creation of the HCell in CARIS BASE Editor and CARIS S-57 Composer, all soundings and features are maintained in metric units with as high precision as possible. Depth units for soundings measured with sonar maintain millimeter precision. Depths on rocks above MLLW and heights on islets above MHW are typically measured with range finder, so precision is less. Units and precision are shown below.

BASE Editor and S-57 Composer Units:

Sounding Units:	Meters rounded to the nearest millimeter
Spot Height Units:	Meters rounded to the nearest decimeter

Conversion to charting units and application of NOAA rounding is completed in the same step, at the end of the HCell compilation process.

Conversion to feet charting units with NOAA rounding ensures that:

- All depth units display as whole feet.
- All height units display as whole feet.

## **9. Data Processing Notes**

### **9.1 Junctions with H11983 and H11985**

H11984 junctions with H11985, submitted in May 2009. A common junction was not made between the two surveys during the earlier compilation. Based on a comparison of depths in the common area, the eastern edge of H11984 was relocated to match the western edge of H11985 in the common area. The sole exception is a 114 usft sounding from H11984 that should replace a 115 usft sounding from H11985, both of which are annotated by Blue Note in the HCell. With the exception of that one sounding there is no common area with H11985 submitted in the HCell.

H11984 also junctions with H11983, submitted in May 2009. A common junction was not made between the two surveys during the earlier compilation. Based on a comparison of depths in the common area, the eastern edge of H11984 was predominantly relocated to match the western

edge of H11983. One very slight adjustment was made in the boundary of H11984 in the common area to create a clean juncture of a rocky depth area common to the two surveys. Seven soundings from H11983 are annotated via Blue Note to be deleted from the common area: six being replaced by shoaler soundings from H11984, and one to achieve a more even distribution of soundings on the completed chart.

## **9.2 Conflicts between Shoreline and Hydrography**

There were no instances of conflict between GC shoreline and hydrography, because there was no GC shoreline associated with the survey, and, with the exception of a few rocks, islets and islands displayed on the chart, the limits of the hydrography did not approach the shoreline any closer than depths of 1.5 meters. The conflicts between charted islets/islands and hydrography will require adjustment at MCD using the latest aerial imagery.

## **10. QA/QC and ENC Validation Checks**

H11984 was subjected to QA checks in S-57 Composer prior to exporting to the metric HCell base cell (000) file. The millimeter precision metric S-57 HCell was converted to chart units and NOAA rounding applied. dKart Inspector was then used to further check the data set for conformity with the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and warnings and errors investigated and corrected unless they are MCD approved as inherent to and acceptable for HCells.

## **11. Products**

### **11.1 HSD, MCD and CGTP Deliverables**

H11984_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:40,000
H11984_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:10,000
H11984_DR.doc	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H11984_outline.gml	Survey outline to populate SURDEX

### **11.3 Software**

CARIS HIPS Ver. 6.1	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 2.3	Creation of soundings and bathy-derived features, creation of the depth area, meta area objects, and Blue Notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer Ver. 2.0	Final compilation of the HCell, correct geometry and build topology, apply final attributes, export the HCell, and QA.
CARIS GIS 4.4a	Setting the sounding rounding variable for conversion of the metric HCell to NOAA charting units with NOAA rounding.
CARIS HOM Ver. 3.3	Perform conversion of the metric HCell to NOAA charting units with NOAA rounding.
HydroService AS, dKart Inspector Ver. 5.1	Validation of the base cell file.

Newport Systems, Inc., Fugawi View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.
---	--

## **12. Contacts**

Inquiries regarding this HCell content or construction should be directed to:

Keith Toepfer  
Physical Scientist  
Pacific Hydrographic Branch  
Seattle, WA  
206-526-6877  
[Keith.Toepfer@noaa.gov](mailto:Keith.Toepfer@noaa.gov).

APPROVAL SHEET  
H11984

The survey evaluation and verification has been conducted according to branch processing procedures and the HCell compiled per the latest OCS HCell Specifications.

The survey and associated records have been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, S-57 classification and attribution of soundings and features, cartographic characterization, and verification or disproval of charted data within the survey limits. The survey records and digital data comply with OCS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area.

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