H11876

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. M-L906-KR-08

Registry No. H11876

LOCALITY

State CALIFORNIA

General Locality Pacific Ocean - Southern California

Sublocality Vicinity of Pacific Beach

2008

CHIEF OF PARTY

Dean Moyles, Fugro Pelagros

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28
(11-72)

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

HYDROGRAPHIC TITLE SHEET

REGISTER NO.
H11876

NSTRUCTIONS · 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 CALIFORNIA

General Locality Pacific Ocean - Southern California

Sublocality Vicinity of Pacific Beach

Scale N/A

Dates of Survey 05/07/08 – 07/15/08

Instructions Date 7/7/2008

Project No. M-L906-KR-08

Vessel R/V QUICKSILVER (947419), R/V Locator (CF4540NB)

Chief of Party Dean Moyles

Surveyed by ORTHMANN, MOYLES, REYNOLDS, BRIGGS, GILL, MOUNT, FARLEY, POECKERT, ET AL

Soundings taken by echo sounders: RESON SEABAT 7125 ECHOSOUNDER HULL and POLE MOUNTED

Graphic record scaled by Fugro Pelagos, Inc. personnel

Graphic record checked by Fugro Pelagos, Inc. personnel

Evaluation by M. Litrico

Automated plot by HP DESIGN JET 500

Verification by K.Brown

Soundings in Fathoms and Feet at MLLW

REMARKS: Time in UTC. UTM Projection Zone 11

Revisions and annotations appearing as endnotes were generated during office processing.

As a result, page numbering may be interrupted or non-sequential

All separates are filed with the hydrographic data.

A. AREA SURVEYED

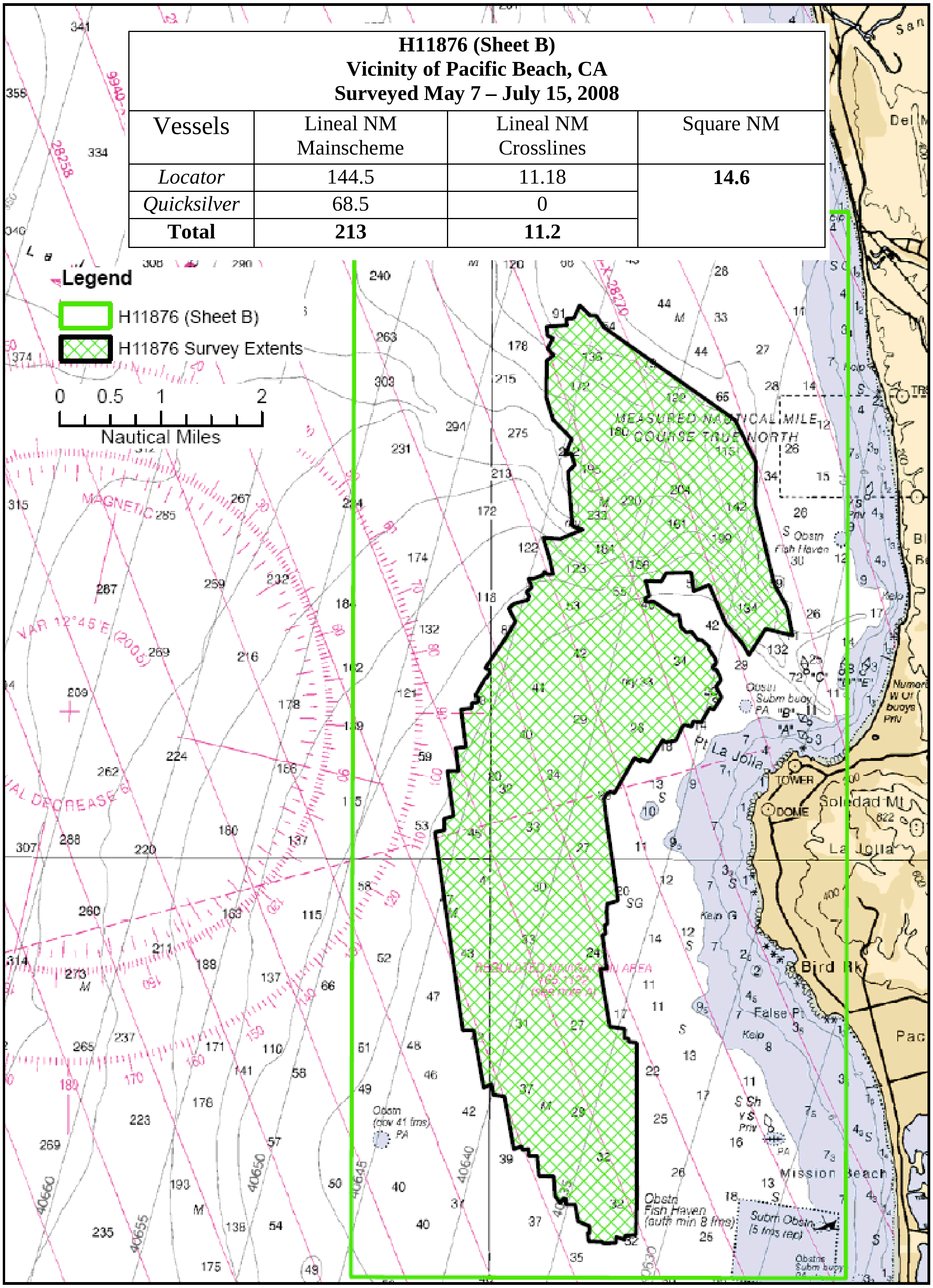
H11876 (Sheet B) is in the vicinity of Pacific Beach, California. It is bound by the coordinates listed in Table 1.[1]

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 May 7, 2008 and ended on July 15, 2008.

Table 1 – Sheet Bounds

Point	Latitude (North)	Longitude (West)
1	32-56-26	117-21-38
2	32-56-26	117-15-48
3	32-45-52	117-15-48
4	32-45-52	117-21-38
5	32-56-26	117-21-38



H11876 (Sheet B) Vicinity of Pacific Beach, CA Surveyed May 7 – July 15, 2008			
Vessels	Lineal NM Mainscheme	Lineal NM Crosslines	Square NM
Locator	144.5	11.18	**14.6**
Quicksilver	68.5	0	
Total	**213**	**11.2**	

Figure 1 H11876 Area Surveyed

B. DATA ACQUISITION AND PROCESSING

Refer to the M-L906-KR-08 Data Acquisition and Processing Report[2]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/V's Locator and Quicksilver acquired all sounding data for H11876.

The Locator, which is 25 feet in length with a draft of 1.5 feet, was equipped with a Reson Seabat 7125 for multibeam data acquisition. The system also operated briefly in a dual head configuration with both sonar heads tilted outwards at a 15° angle. 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 (POSMV 320 V4) with S7K files logged in Winfrog Multibeam v 3.08.23.

The Quicksilver, which is 32 feet in length with a draft of 3 feet, was similarly equipped except a Brooks Ocean Moving Vessel Profiler (MVP) was also installed.

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

Quality control crosslines were planned so that most main scheme lines would intersect with at least one crossline, were well distributed geographically, and that total crossline nautical miles ran would total 5% of the main scheme nautical miles.

Total crossline length surveyed was 11.2 nautical miles or 5.3 percent of the total main scheme nautical miles. All crosslines were compared to the mainline CUBE surface, using the CARIS HIPS QC report routine. The reports were created separately based on vessel and sonar.

All 7125 beams passed at 95 percent confidence level or better[3].

Only some 8111 beams passed at 95 percent confidence level or better. Most did not pass with results as low as 55 percent, esp. in outer beams. However, these failures were on the extreme canyon slopes in deep water, with a very low density of soundings to compare. Matchup was very good between adjacent 8111 lines as well as with overlapping 7125 data therefore these

failures do not indicate a problem with the 8111 data. Results are located in Separate IV[4].
Note: The QC reports were generated based on the given accuracy specification of:

+/- $\sqrt{(a^2 + (b * d)^2)}$ where a = 0.2, b = 0.01, and d = 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 H11876 had uncertainty values of 0.30 m to 0.90 m, which met project specifications. Higher uncertainties are seen in the canyon due to deeper water.

As seen in the uncertainly 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.

Rarely the surface uncertainty exceeded error specifications in rough or rapidly changing areas, especially in areas of low data density on the outer beams. However, despite high uncertainty in these areas, data matchup is good and the data acceptable for nautical charting purposes[5].

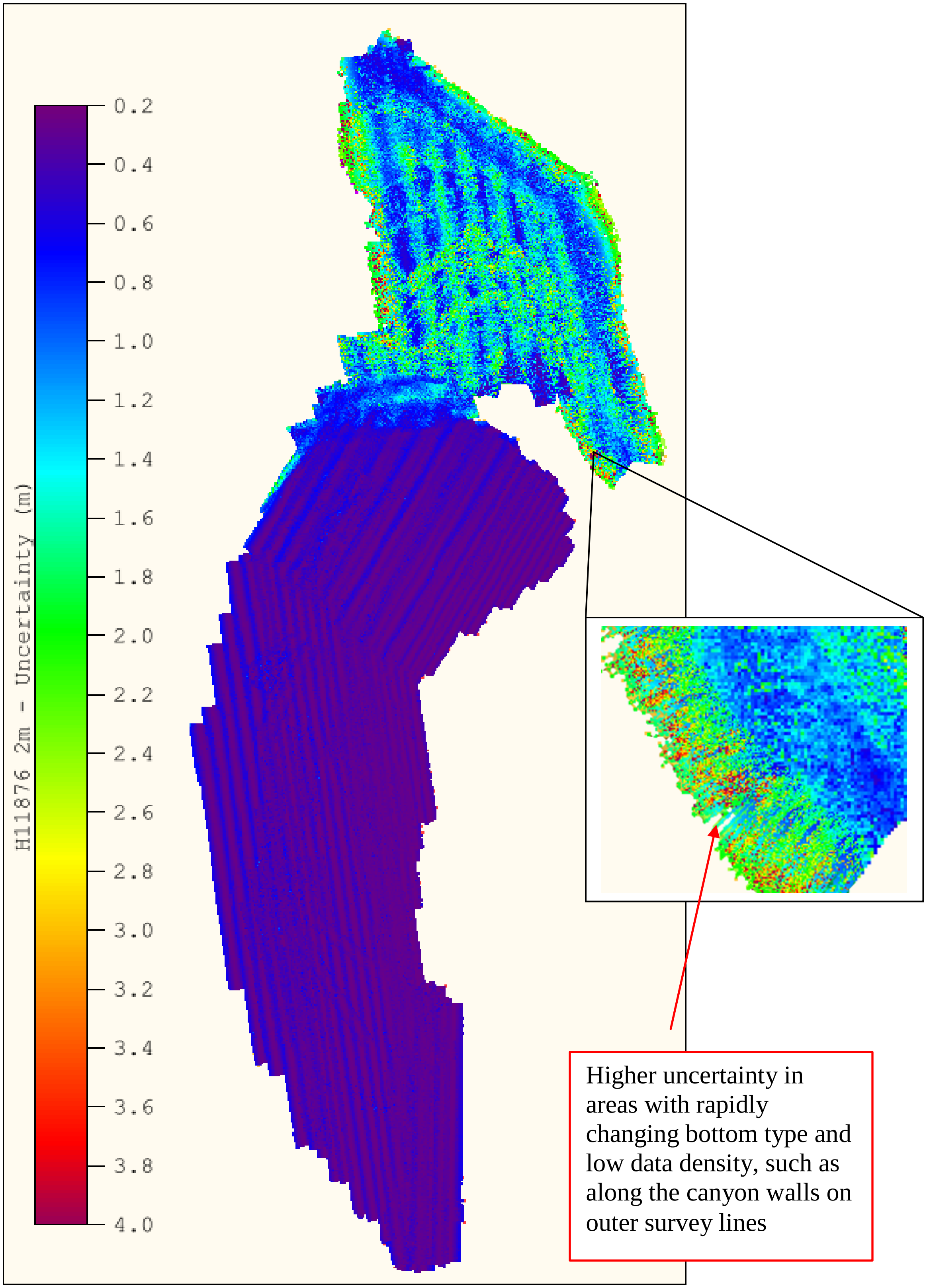


Figure 2 Uncertainty DTM

Survey Junctions

H11876 (Sheet B) junctions with:

Registry #	Date	Junction Side
H11875	2008	South

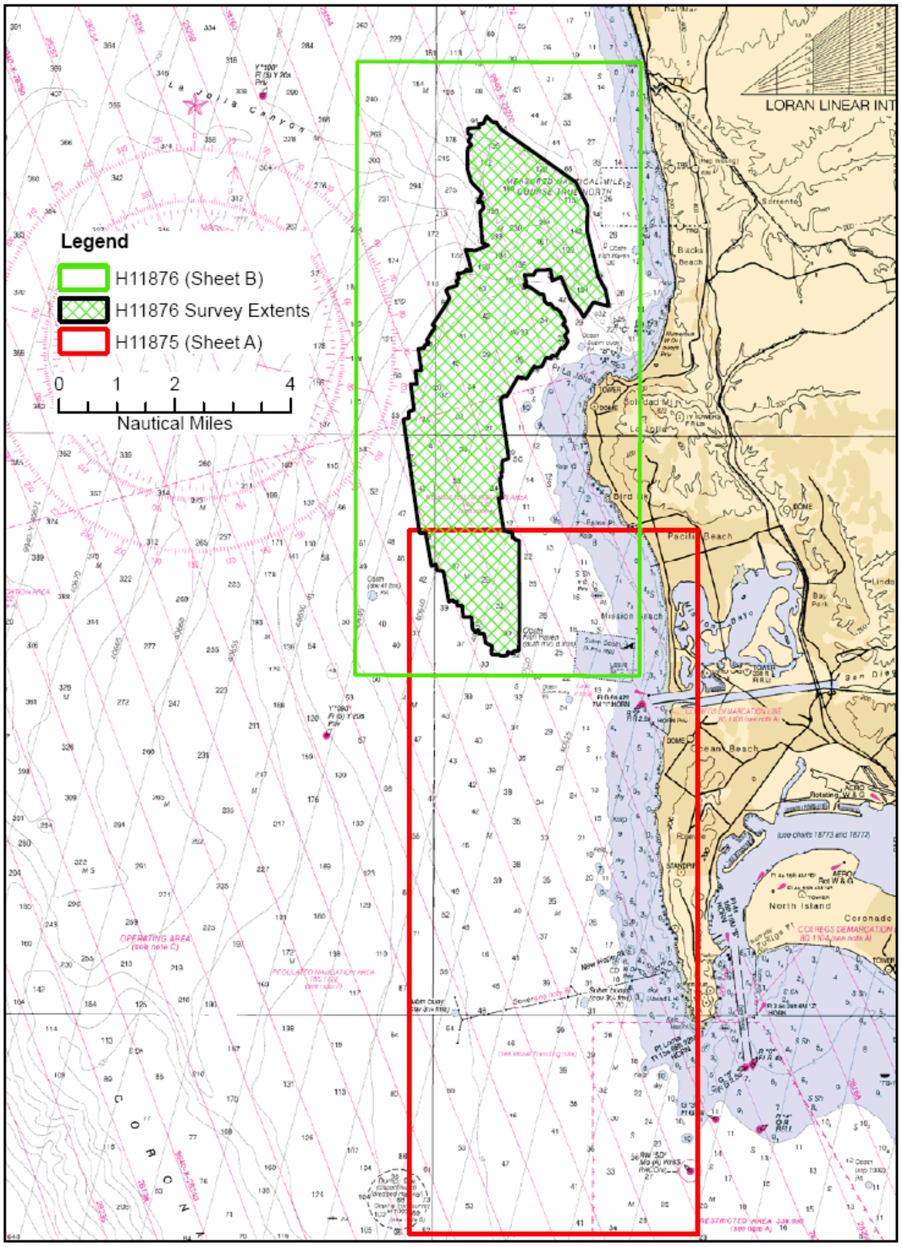


Figure 3 H11876 Survey Junctions

The surveys are in agreement along their common borders. 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.[6]

Quality Control Checks

Positioning system confidence checks were conducted on a daily basis using the POSMV 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.

Comparison of PPK-GPSTide and Zoned Verified Tides

Tidal corrections for this survey were done using PPK-GPS derived altitudes which were reduced to MLLW using VDatum grids and the CARIS HIPS GPSTide function. Since conventional tidal data and zones were available, gross error and reality check comparisons were done between data corrected using both methods. The following tests were performed:

1. For a snapshot of general agreement throughout the survey area, a copy of the crossline data was corrected using zoned, verified smoothed tides, and dynamic draft correctors applied. QC reports were then generated in HIPS for these “tidal” crosslines versus the BASE surfaces (GPSTide method) in the same manner described in the crossline comparison section above.

   Results: All “tidal” beams passed at 95 % or better as compared to the BASE surfaces for the 7125 data.

   Many 8111 beams failed, but so did the same crossline corrected using GPSTides, for the reasons outlined in the crosslines section above.

   Results are available in Separate IV.

2. In order to identify and quantify any static offsets between the two processing methods, a difference surface was created in IVS Fledermaus using a CUBE surface created from the crosslines and a CUBE surface created from the same crosslines corrected using zoned, verified smooth tides. (Difference surface = tidal surface minus GPSTide surface, both 5m resolution).

   Results: Average difference was -0.036 m, median difference was -0.025 m, with a standard deviation of 0.082 m. Therefore, the GPSTide surface was about 4 cm shoaler on average. There was a slight trend apparent, with the difference grading from approximately -0.12 m in the south to zero difference in the north.

The single 8111 crossline ran was not used in the comparison since its inclusion skewed the overall results significantly due to the steep slopes of La Jolla Canyon.

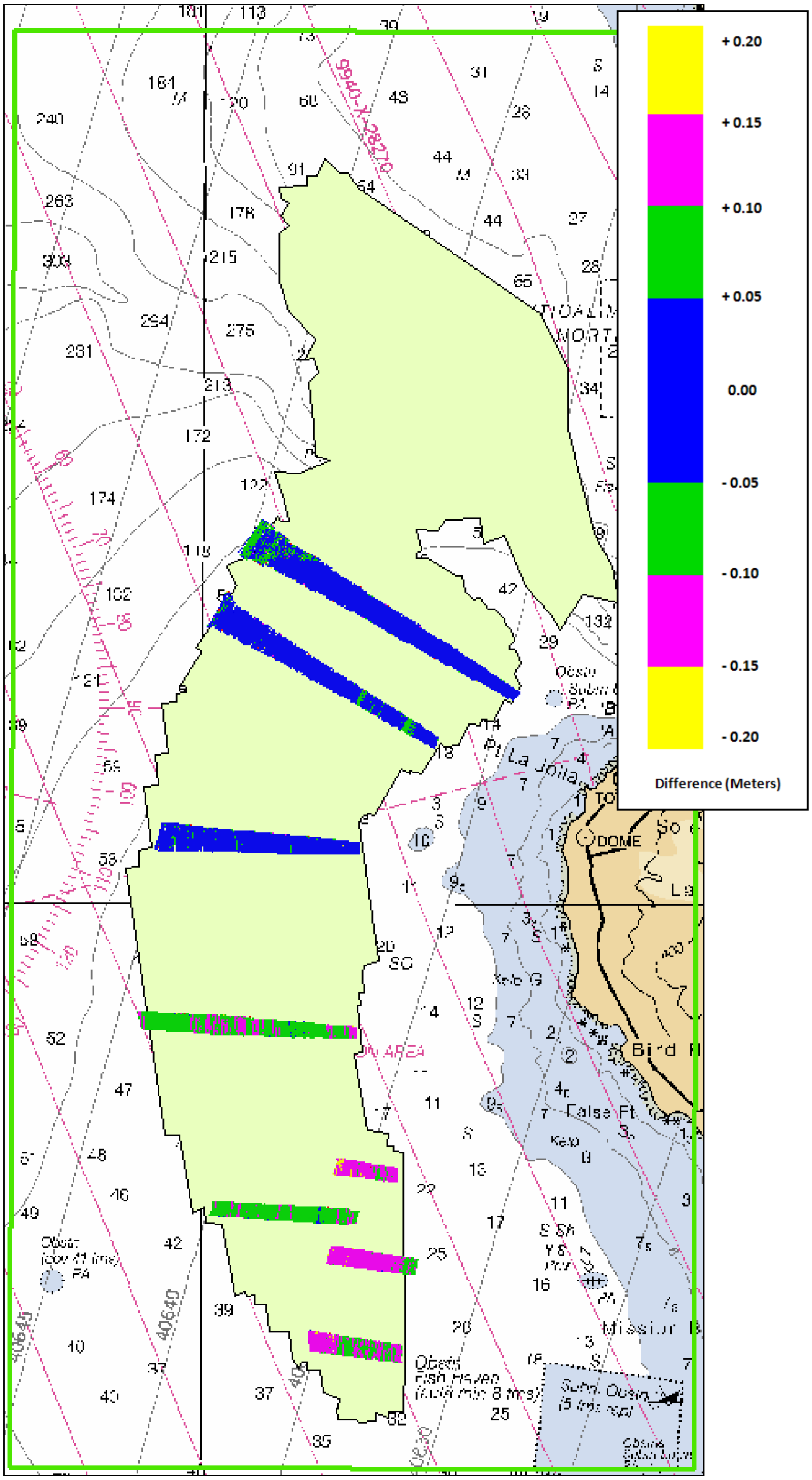


Figure 4 H11876 Difference Surface – Tidal minus GPSTide

In conclusion, absolute correctness of one source of tidal correction over the other cannot be determined by direct comparisons between the two data sets. However, data corrected using both methods statistically compares very well to each other, and qualitatively the matchup between adjacent lines is good using both methods. Therefore, for this survey, the GPSTide method of tidal correction meets specification and is an acceptable alternative to the standard tidal method[7].

Data Quality

In general, the multibeam data quality for H11876 was good. One notable problem follows:

1. Some small holidays exist in the data in the area of La Jolla Canyon. The holidays are small, in relatively deep water, and no shoaling is evident along their edges.[8]

Sound velocity profiles were collected every two to three 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.

Object detection requirements were met 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 fieldsheet for H11876 is called "H11876" and it contains three BASE surfaces. The following parameters were used:

0-45 meters: 1.5 m resolution, name "H11876_1_5m"
40-84 meters: 2 m resolution, name "H11876_2m"
80-100 meters: 4 m resolution, name "H11876_4m"

90-250 meters: 5m resolution, name “H11876_5m”
230-max depth: 10m resolution, name “H11876_10m”

Note: Minimum depth in this survey was approximately 28 m, while max depth was approximately 458 m, therefore resolutions finer then 1_5 m and courser then 10 m were not computed.

The final S57 file for this project is called “H11876_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[9] 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 tuned to the Pt. Loma USCG DGPS site was used. The unit output differentially corrected positions at 1 Hz to the POSMV 320 V4 where it was integrated with inertial data and a position for the top-center of the IMU was generated. This position was then logged concurrently with the bathymetry by 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 MLLW using predicted tidal data from the La Jolla tide station. Predicted tides were used only for preliminary data cleaning.

Final tidal corrections were generated using PPK processing methods in conjunction with

NOAA's VDATUM model and the CARIS GPSTide routine. Applanix POSPac software produced a smoothed best estimate of trajectory (SBET) file that, among other data, contained GPS altitudes based on the NAD83 ellipsoid. The SBET altitudes were loaded in to every line in CARIS HIPS, and HIPS' GPSTide routine then run to compute a GPS-based tide. The GPSTide routine used a VDatum NAD83 to MLLW offset grid to produce MLLW tide correctors. This grid is an XYZ text file and is included with the CARIS data under the tide directory.

See M-L906-KR-08 Horizontal and Vertical Control Report for a more detailed description of the GPSTide methods.

D. RESULTS AND RECOMMENDATIONS

D.1 Chart Comparison

H11876 survey was compared with the charts shown on Table 2.

Table 2 – Chart Comparisons

Chart Number	Type	Cell Name	Scale	Edition	Edition Date
18765	Raster	n / a	1:100,000	16th	January 2005
18744	Raster	n / a	1:100,000	37th	August 2007
18740	Raster	n / a	1:234,270	42nd	March 2007
18740	ENC	US3CA70M	n / a	11th	September 2008

Comparison of Soundings

A comparison of soundings was accomplished by generating shoal-biased soundings and contours in the CARIS Fieldsheet Editor and overlaying them on the latest edition NOAA charts. The general agreement between charted soundings and H11876 soundings was noted. A more detailed comparison was undertaken for any charted shoals or other dangerous features.

General 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 are as follows.

1. 20 fathom sounding at 32-50-49.09 N, 117-19-56.65 W on charts 18765, 18744, and 18740 was not found during this survey. The area received full multibeam coverage, and the shoalest depth found was 31 fathoms at 32-50-39.90 N, 117-19-59.62 W. Recommend removal.[10]
2. Most soundings on the La Jolla Canyon walls as well as in the canyon itself on all charts

often differ significantly from this survey, most likely due to less accurate positioning methods in use on prior surveys. Recommend soundings from this survey supersede those of all affected charts, esp. in and around La Jolla Canyon.[11]

Automated Wreck and Observation Information System

There were no AWOIS items assigned to H11876.[12]

Charted Features

There were no charted features labeled ED, PD, or PA within the limits of H11876.

Dangers to Navigation

No dangers to navigation were found during this survey.[13]

D.2 Additional Results

None to note.

Bottom Samples

None were assigned for this sheet.[14]

Aids to Navigation

No charted aids to navigation existed in the survey area.[15]

No uncharted aids to navigation were found in the survey area. [16]

E. APPROVAL SHEET

Approval Sheet

For

H11876

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 (2008-NOAAAcquisitionProcedures);
Fugro Pelagos, Inc. Processing Procedures (2008-NOAAProcessingProcedures);

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

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

Invalid signature

X 

Dean Moyles
ACSM Certified

[1] Concur
[2] Filed with project records
[3] Concur
[4] Filed with hydrographic records.
[5] Concur. Data are adequate to supersede charted data in the common area.
[6] Concur
[7] Concur
[8] Concur
[9] Filed with project records.
[10] Concur
[11] Concur
[12] Concur
[13] Concur
[14] Concur
[15] Concur
[16] Concur

H11876 HCell Report

Kurt Brown, Physical Scientist
Pacific Hydrographic Branch

Introduction

The primary purpose of the HCell is to directly update NOAA ENCs with new survey information in International Hydrographic Organization (IHO) format S-57. HCell compilation of survey H11876 utilized Office of Coast Survey H-Cell Specifications Version 3.0, May 2008 and Hcell User Guide Version 1.1, June 2008. HCell H11876 will be used to update charts 18740, 1:234,270 (42nd Ed.; March 2007, NM 03/31/2007), 18765, 1:100,000 (16th Ed.; January 2005, NM 01/01/2005) 18774, 1:100,000 (11th Ed.; July 2005, NM 02/14/2009), and US3CA70M.

1. Compilation Scale

The density of soundings in the HCell are compiled as appropriate to emulate those soundings of Chart 18765, 1:100,000 and 18774, 1:100,000. Position and density of non-bathymetric features included in the HCell have not been generalized from the scale of the hydrographic survey H11876.

2. Soundings

2.1 Source Data

One 10-meter resolution Combined BASE surface, **H11876_Combined_Office_10m** was used as the basis for HCell production following Branch certification.

A survey-scale sounding (SOUNDG) feature object source layer was built from the **H11876_Combined_Office_10m** surface in CARIS BASE Editor. A shoal-biased selection was made at 1:20,000 survey scale using a radius of 5mm for all depths.

2.2 Sounding Feature Objects

In CARIS BASE Editor soundings were manually selected from the high density sounding layer from H11876 and imported into a new layer created to accommodate chart density depths. Manual selection was used to accomplish a density and distribution that more closely represents the seafloor morphology and that emulates density and distribution of soundings on charts 18765 and 18772 than is possible using automated methods. See section 10.1, Data Processing Notes, for details about the use of manual sounding selection for H11876. The sounding feature object source layer was imported into the **H11876 _HCell_Features.hob** file, which was used as a template to create the S-57 Composer product **H11876_CS.prd**.

3. Depth Areas

3.1 Source Data

Using the combined BASE surface **H11876_Combined_Office_10m** one depth area were generated. Additional depth contours at the intervals on the largest scale chart were delivered per latest guidance from the 2009 Field Procedures Workshop. The depth contours are included in the US311876_SS.000 file.

3.2 Depth Area Feature Objects

One depth range, 27.432 meters to 459.029 meters, was used for the depth area object. Upon conversion to NOAA charting units, this depth range is 15 fathoms to 251 fathoms.

4. Meta Areas

The following Meta object areas are included in HCell 11882:

M_QUAL
M_COVR

Meta area objects were constructed on the basis of perimeter lines delineating the surveyed limits and extents of data gaps inside the survey area. These perimeters were first used to create the Skin of The Earth (SOTE) layer, then were duplicated to the Meta object layers and attributed per the H-Cell Specifications, ver. 3.0 and HCell User Guide ver. 1.1.

5. Survey Features

A features file **H11876_S57_Features.000** was delivered. The file contained twelve rocky seabed areas. The twelve rocky seabed areas were generalized to four rocky seabed areas included in the HCell as delivered. Two other rocky seabed areas were delineated and are also included in the HCell.

Bottom sample features were imported from ENC US3CA70M.

6. Shoreline / Tide Delineation

Depth areas (DEPARE) were created for all SOTE features.

7. Attribution

All S-57 Feature Objects have been attributed as fully as possible based on information provided by the Hydrographer and in accordance with OCS HCell Specifications, ver. 3.0 and Hcell User Guide ver. 1.1.

8. Layout

8.1 CARIS S-57 Composer Scheme

SOUNDG	Chart scale soundings
DEPCNT	Chart scale contours
DEPARE	Group 1 objects (Skin of the Earth)
SBDARE	Bottom samples from chart and rocky seabed areas
M_COVR	Data coverage meta object
M_QUAL	Data quality meta object
$CSYMB	Blue notes

8.2 Blue Notes

Notes regarding data sources are in S-57 Composer as a $CSYMB feature with the blue note located in the INFORM field and the survey registry number, chart number, chart edition and edition date located in the NINFOM field. The blue notes are included in the HCell when it is exported to .000. The blue notes are also included as a separate ASCII file **H11876_Bluenotes.txt**.

9. Spatial Framework

9.1 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.

9.2 Horizontal and Vertical Units

During creation of sounding sets in CARIS BASE Editor, and creation of the HCell in CARIS S-57 Composer, units are maintained as metric with millimeter resolution. NOAA rounding is applied at the same time that conversion to chart units is made to the metric HCell base cell file, at the end of the HCell compilation process.

A CARIS environment variable, uslXsounding_round, controls the depth at which rounding occurs. Setting this variable to NOAA fathoms and feet displays all soundings equal to or greater than 11 fathoms as whole units. Depths shoaler than 11 fathoms are shown in fathoms and feet.

In an ENC viewer fathoms and feet display in the format X**.**YZZZ, where X is fathoms, Y is feet, and ZZZ is decimals of the foot. For fathoms and feet between 0 and 10 fathoms 4.5 feet (10.75 fms), soundings round to the deeper foot if the decimals of the foot are X**.**Y75000 or greater. For fathoms and feet deeper or equal to 11 fathoms, soundings round to the deeper fathom if feet and decimals of the foot are X**.**45000 (X**.**Y75000) or greater. Drying heights are in feet and are rounded using arithmetic methods. In an ENC viewer, heights greater than 6 feet will register in fathoms and feet using the above stated rules.

<u>S-57 Composer Units</u>
Sounding Units: Meters rounded to the nearest millimeter
Spot Height Units: Meters rounded to the nearest meter

<u>Chart Unit Base Cell Units</u>
Depth Units (DUNI): Fathoms and feet
Height Units (HUNI): Feet (or fathoms and feet above 6 feet)
Positional Units (PUNI): Meters

10. QA/QC

10.1 Data Processing Notes

Manual chart scale sounding selections were made for this survey. Experience has shown that in areas where bathymetry is varied, as in the case of varied topography on the sea floor, automated sounding selection is impractical. None of the default sounding suppression options offered in CARIS BASE Editor or S-57 Composer yields an acceptable density and distribution of depths, generally bunching soundings nearshore with too sparse coverage seaward. While the customized options are more practical for this type of terrain, an inordinate amount of time must be spent in experimentation with variations on the algebraic terms in order to devise the most suitable formula, and manual adjustments are still required to the resulting sounding set.

10.2 ENC Validation Checks

H11876 was subjected to QA and Validation checks in S-57 Composer prior to exporting to the HCell base cell (000) file. Full millimeter precision was retained in the export of the metric S-57 base cell data set. This data set was converted to a chart unit 000 file. dKart Inspector 5.1 was then used to further check the data set for conformity using the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and errors investigated and corrected where necessary.

11. Products

11.1 HSD, MCD and CGTP Deliverables

- H11876 Base Cell File, Chart Units, Soundings compiled to 1:100,000.
- H11876 Base Cell File, Chart Units, Soundings compiled to 1:20,000.
- H11876 Descriptive Report including end notes compiled during office processing and certification
- H11876 HCell Supplemental Report
- Blue Notes ASCII file

11.2 File Naming Conventions

S-57 Composer Product prefix: *H11876_CS.prd and H11876_SS.prd*

MCD Chart units base cell file: *US311876_CS.000*

MCD Chart units base cell file, survey scale soundings: *US311876_SS.000*

11.3 Software

HIPS 6.1:	Management and inspection of Combined BASE surfaces
BASE Editor 2.1:	Combination of Product Surfaces and initial creation of the S-57 bathymetry-derived features
CARIS Notebook 3.0:	Management and inspection of shoreline files
S-57 Composer 2.0:	Assembly of the HCell, S-57 products export, QA
HOM 3.3:	Assembly of the HCell, S-57 products unit conversion and sounding rounding
GIS 4.4a:	Setting the sounding rounding variable
dKart Inspector 5.1:	Validation of the base cell file

12. Contacts

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

Kurt Brown, Physical Scientist, PHB, Seattle, WA; 206-526-6839; kurt.brown@noaa.gov.

APPROVAL SHEET
H11876

Initial Approvals:

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

Digitally signed by
Kurt Brown
Date: 2009.03.11
14:32:18 -07'00'

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.

Digitally signed by Charles R.
Davies
DN: cn=Charles R. Davies, c=US,
o=Pacific Hydrographic Branch,
ou=NOAA,NOS,OCS, email=Russ.
Davies@NOAA.GOV
Date: 2009.03.11 14:32:53 -07'00'

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.

Gary C. Nelson
2009.03.11 15:06:09
-07'00'

Digitally signed by David Scharff
DN: cn=David Scharff, o=OCS, ou=NOAA,
email=david.scharff@noaa.gov, c=US
Reason: AWOIS and Surf Check complete
Date: 2009.03.17 10:31:32 -04'00'