W00121

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. W00121

LOCALITY

State Alaska

General Locality Western Gulf of Alaska SE of Kodiak Island

Sublocality Vicinity of Albatross Bank

2003

CHIEF OF PARTY
Dean Moyles

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72)

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

REGISTER NO.

HYDROGRAPHIC TITLE SHEET

W00121

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.

State: Alaska

General Locality: Western Gulf of Alaska SE of Kodiak Island

Sublocality: Vicinity of Albatross Bank

Scale:

Date of Survey: 8/1/2003 -8/ 6/2003

Instructions Dated:

Project No.:

Vessel: R.V. Davidson

Chief of Party: Dean Moyles

Surveyed by: Thales Geosolutions

Soundings taken by echo sounder, hand lead, pole: Reson 8111

Graphic record scaled by: Thales Geosolutions

Graphic record checked by: Thales Geosolutions

Evaluation by: John J. Lomnicky

Automated plot by: HP Designjet1050c

Verification by: Physical Scientist: J. Lomnicky, Cartographer: B. Taylor

Soundings in: Meters at MLLW

REMARKS: Revisions and annotations appearing as endnotes were generated by the cartographer during office processing.

All depths listed in this report are referenced to mean lower low water unless otherwise noted.

UTM Zone 05

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF COAST SURVEY
Pacific Hydrographic Branch
Seattle, Washington 98115-6349

January 22, 2009

MEMORANDUM TO: Captain John E. Lowell, NOAA
Chief, Marine Chart Division

THROUGH: Jeffrey Ferguson
Chief, Hydrographic Surveys Division

FROM: Captain David O. Neander, NOAA
Chief, Pacific Hydrographic Branch

David Neander
2009.01.23
08:04:09 -08'00'

SUBJECT: Approval Memorandum for W00121
Western Gulf of Alaska, SE of Kodiak Island
Vicinity of Albatross Bank

The Pacific Hydrographic Branch has completed evaluation and chart application of Outside Source Data survey W00121. This survey was conducted for NOAA Fisheries by Thales Geosolutions in 2003. I have reviewed the data, reports and compilation to the chart. Data are suitable for nautical charting except where specifically recommended in the Evaluation and Quality Assurance Memorandum and Chart Application Memorandum.

Within the 2008 NOAA Hydrographic Survey Priorities (NHSP), the area southeast of Kodiak Island is listed as “Priority 1”. Due to the small areal extent of this survey, it is recommended that the areas encompassing survey W00121 remain classified as “Priority 1”.

cc: Chief, HSD Operations Branch N/CS31

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF COAST SURVEY
Pacific Hydrographic Branch
Seattle, Washington 98115-6349

June 28, 2007

MEMORANDUM TO: Commander Donald W. Haines, NOAA
Chief, Pacific Hydrographic Branch

Digitally signed by Kurt Brown
Date: 2009.01.22 12:54:26
-08'00'

FROM: LT(jg) John J. Lomnicky, NOAA
Benthic Mapping Specialist

SUBJECT: Review of Outside Source Data Survey W00121
Thales / National Marine Fisheries Service
Mulitbeam Echosounder Survey in the Vicinity of Albatross Bank

I have reviewed outside source hydrographic survey W00121 with regard to data integrity and completeness of the data submission package, survey field procedures, data processing and quality assurance methods, and overall data accuracy and data quality. Survey W00121 complies with specifications and requirements set forth in the NOS Hydrographic Surveys Specifications and Deliverables Manual (HSSDM), with the following exceptions:

- Data were supplied to PHB in gridded ASCII .xyz format only, which cannot be opened in Caris HIPS and SIPS. Data was reviewed in Caris Base Editor. Full resolution data, as defined in HSSDM 8.5.3, were not supplied[1]
- Tidal, sound velocity, metadata and vessel configuration files were not submitted in accordance with HSSDM 8.5.5[2]
- Because data were only provided in gridded ASCII .xyz format, a crossline comparison cannot be completed[3]

Special attention should be given to the following:

- Refer to the Hydrographic Survey Outside Source Data Quality Assurance Checklist for specific charting recommendations.[4]

Final Recommendations:

- The data should be used to chart soundings and depth curves representing general bathymetric trends, and update shoals that are not adequately depicted on NOAA chart 16580.[5]
- Although some significant discrepancies exist between chart 16580 and W00121, further investigation may not be necessary, due to depth of water and location.[6]

- Although SWMB data in this survey may meet higher requirements, the survey area should be classified as Category of Zone of Confidence (CATZOC) “B” if used to update ENC survey area classification.[7]

Reviewed and approved: 

PS Kurt Brown, NOAA
Acting Hydrographic Team Leader, PHB

Revisions compiled during office processing by the cartographer

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[1] Concur.
[2] Concur.
[3] Concur.
[4] Attached to this report. See Chart Comparison in Hydrographic Survey Outside Source Data Quality Assurance Checklist for specific charting recommendations.
[5] Concur with clarification. Data are considered adequate to supplement or supersede charted information within the common areas except as noted in this report. As described in the hydrographer's report of survey, TGP-100904-RPT-01-00W--121.pdf, attached to this report, the purpose of the survey was to resolve short wavelength targets for fish habitat assessment, not to determine least depths over shoals. Therefore the data should not be used to supersede charted shoal soundings and contours. Retain charted shoal soundings and contours as shown on the Hdrawings in green. Retain bottom samples as charted.
[6] Concur.
[7] Concur. See endnote 5 above.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE OFFICE OF COAST SURVEY
Pacific Hydrographic Branch Seattle, Washington
98115-6349

January 12, 2009

MEMORANDUM TO: Captain David O. Neander
Chief, Pacific Hydrographic Branch

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
Reason: for Beth Taylor
Date: 2009.01.22 13:39:50 -08'00'

FROM: Beth Taylor
Cartographer, Pacific Hydrographic Branch

SUBJECT: Application of Outside Source Data Survey W00121
Thales / National Marine Fisheries Service
Mulitbeam Echosounder Survey in the Vicinity of
Albatross Bank

I concur with all recommendations by the reviewer Jay Lomnicky except where noted in this report.

Summary of compilation:

-soundings, curves and features applied
-no rocks, shoals were superseded
-shoreline was retained as charted
-bottom characteristics were retained
-no aids to navigation in survey area.
-no additional Dangers to Navigation were found during compilation.

It is recommended that OSD survey W00121 selectively supersede charted information within the common area and that it be applied to chart 16580.

Record of Application to Charts is attached.

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
Reason: for Gary Nelson
Date: 2009.01.22 13:40:39 -08'00'

Review and Approved_____

Gary Nelson, Cartographer Team Leader
Pacific Hydrographic Branch

NATIONAL MARINE FISHERIES SERVICE

MULTIBEAM ECHOSOUNDER SURVEY IN THE VICINITY OF ALBATROSS BANK

FINAL REPORT – ALBATROSS BANK

Thales Document No: TGP-100904-RPT-01-00

Applicable to:	**Thales GeoSolutions (Pacific), Inc.**
Controlled by:	**Data Center Supervisor** **Thales GeoSolutions (Pacific), Inc.** **3738 Ruffin Road** **San Diego, CA 92123**
Telephone:	**(858) 292-8922**
Facsimile:	**(858) 292-5308**

REPORT CERTIFICATION
FOR

NATIONAL MARINE FISHERIES SERVICE

MULTIBEAM ECHOSOUNDER SURVEY IN THE VICINITY OF ALBATROSS BANK

TGP-100904-RPT-01-00

This issue of the report has been approved by:

1. Project Manager Robert Pawlowski
2. Data Center Supervisor Carol Lockhart

This report has been distributed to:

1. John Heifetz, National Marine Fisheries Service (NMSF) 4 Copies
2. Edward J VanDenAmeele, NOAA 1 Copy

The following versions of this report have been issued:

0	12/05/03	Final Report	DM	BLD	RP
REV	DATE	DESCRIPTION	APPROVED		

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

Thales GeoSolutions (Pacific), Inc. was contracted by The National Marine Fisheries Service (NMFS), to perform a detailed multibeam echosounder survey on selected sites in the vicinity of Albatross Bank in central Gulf of Alaska. The purpose of the survey is to resolve short wavelength targets for fish habitat assessment rather than determine minimum depths on shoals for hydrographic purposes. The survey required digital, high-resolution multibeam bathymetry along with calibrated backscatter in all survey areas.

1.1 AREA SURVEYED

The survey consisted of four areas, which were located in the vicinity of Albatross Bank in central Gulf of Alaska. Data were collected at each area to sufficiently characterize the continental shelf and upper slope.

Area 1A survey included a total area of 253.42 square kilometers (751.49 line kilometers) in water depths of 60 to 810 meters. Area 1B survey included a total area of 56.59 square kilometers (260.27 line kilometers) in water depths of 75 to 125 meters. Area 2 survey included a total area of 16.87 square kilometers (50.31line kilometers) in water depths of 20 to 716 meters. Area 3 survey included a total area of 31.54 square kilometers (91.15 line kilometers) in water depths of 80 to 800 meters. Hydrographic survey operations began on 1 August 2003 collecting data at Area 1A and ended at Area 3 on 6 August 2003, as noted in Appendix A, Daily Log.

Table 1-1 Albatross Bank Survey Areas

POINT	LATITUDE	LONGITUDE
Area 1A		
1	56º 02’ 04.23” N	153º 21’ 34.72” W
2	55º 50’ 37.80” N	153º 41’ 38.64” W
3	56º 02’ 05.49” N	153º 41’ 36.44” W
Area 1B		
1	56º 02’ 05.49” N	153º 44’ 50.10” W
2	55º 57’ 36.31” N	153º 44’ 52.16” W
3	55º 57’ 36.31” N	153º 52’ 56.93” W
4	56º 02’ 0422” N	153º 52’ 54.42” W
Area 2		
1	56º 18’ 07.30” N	152º 55’ 36.00” W
2	56º 18’ 07.30” N	152º 52’ 56.48” W
3	56º 13’ 19.72” N	152º 52’ 56.48” W
4	56º 13’ 19.72” N	152º 55’ 36.00” W
Area 3		
1	56º 23’ 46.90” N	152º 27’ 07.58” W
2	56º 23’ 46.90” N	152º 24’ 28.27” W
3	56º 17’ 46.91” N	152º 24’ 28.27” W
4	56º 17’ 46.91” N	152º 27’ 07.58” W

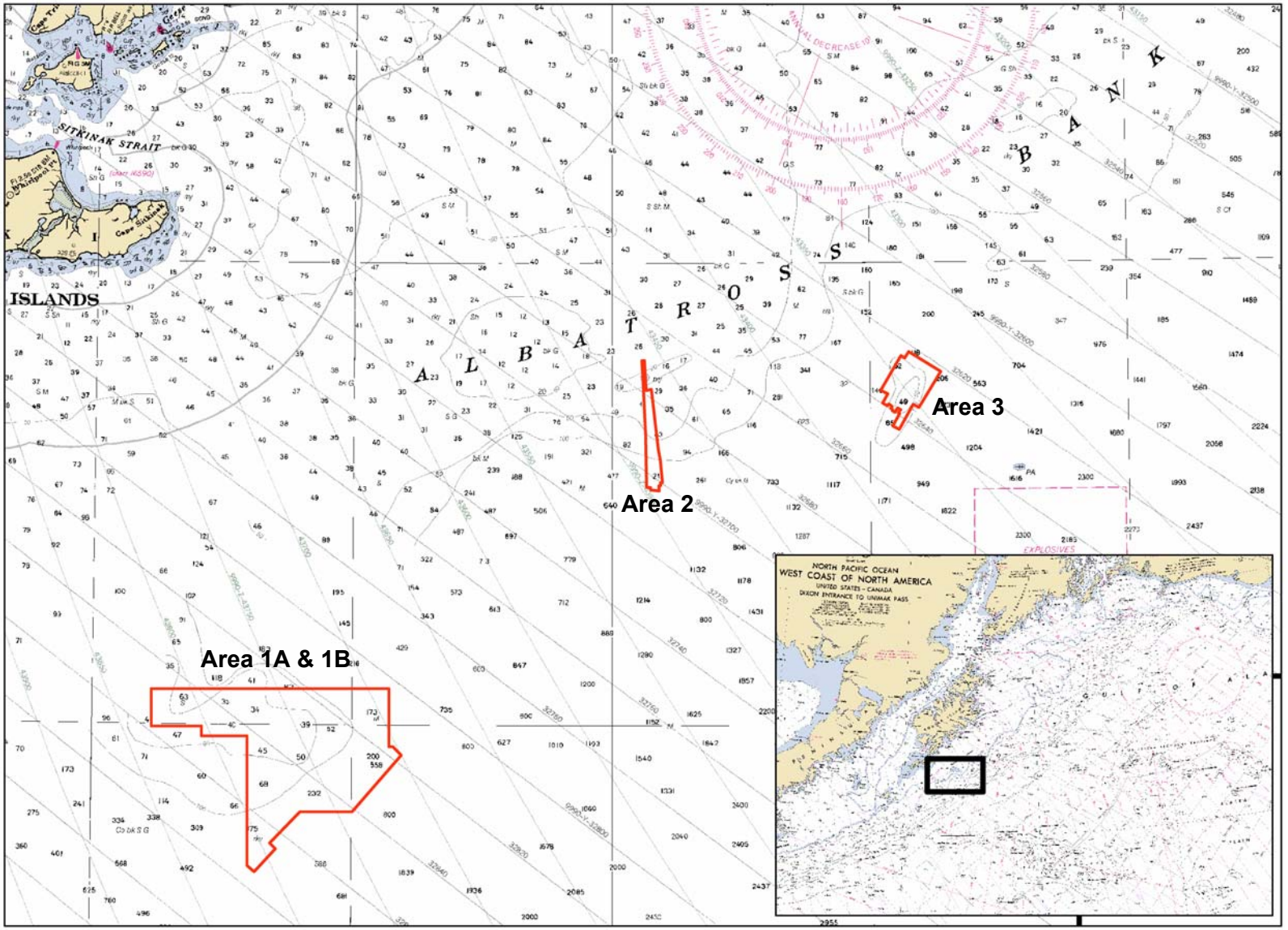


Figure 1-1 Location of the Albatross Bank Survey Areas

2 DATA ACQUISITION

This report describes the hardware and software configurations of the equipment used to perform the multibeam echosounder surveys at Albatross Bank. The R/V Davidson acquired all multibeam sounding data and sound velocity profile data at all survey sites. Vessel specifications and an equipment list are included in Appendix B and C, respectively.

2.1 VESSEL

The R/V Davidson, a 47-meter survey vessel (Appendix B), provided the survey platform for the deployed Thales survey team and NMFS representative. The vessel was equipped with the following primary equipment for execution of the survey:

- Reson SeaBat 8111 Multibeam Echosounder (MBES), hull mounted
- Applanix Position and Orientation System for Marine Vessels 320 (POS/MV 320)
- Sea-Bird Electronics (SBE) SBE 19 Seacat and AML Sound Velocity & Pressure Smart Sensor, for Sound Velocity Profile (SVP) correction
- Sippican XBT and XSV expendable probes, for Sound Velocity Profile (SVP) correction
- Thales GeoSolutions' WinFrog navigation software
- Triton Elics International (TEI) Isis Sonar, DelphMap, and BathyPro Software Suite
- CARIS HIPS

2.2 EQUIPMENT AND PROCEDURES

Detailed equipment specifications are available in Appendix C.

2.2.1 POSITIONING

Vessel positions were determined using a DGPS (Differential Global Positioning System) as available from the USCG DGPS network.

2.2.1.1 Vessel Positioning

Primary positioning data was provided by the POS/MV GPS and a RTCM Receiver. The primary GPS antenna was mounted on the mast above the vessel bridge, over the MBES transducer.

Raw GPS observations were corrected using RTCM (Radio Technical Commission for Maritime Services) corrections transmitted from Kodiak using an MBX-3 differential receiver, that utilizes the U.S. Coast Guard (USCG) network of differential beacons (Table 2-1, below). The RTCM corrections were acquired at one-second intervals using a MBX-3 differential receiver. WinFrog was used to manage the RTCM corrections and then pass a single correction to the POS/ MV, which was used to calculate a position from the raw GPS information and RTCM corrections. This DGPS corrected position was then output as a reasonable estimate of vessel position to the acquisition systems, Isis Sonar, and WinFrog.

Table 2-1 U.S. Coast Guard Base Station

DGPS Base Station	Latitude (N)	Longitude (W)	Station ID
Kodiak, AK	57-37-06 N	152-11-36 W	294

WinFrog navigation software, running on a Windows 2000 based PC, was used to manage RTCM corrections and provide vessel navigation throughout the survey. WinFrog presented vessel position data in graphical and tabular format for QC purposes. The following display windows were used:

- **Graphics** – the Graphics window showed navigation information in plan view. This included vessel position and orientation, survey lines, background plots, charts, and waypoints.

- **Vehicle** – the Vehicle window was configured to show tabular navigation information. Typically this window was set to display position, time and date, line name, distance to start and end of line, distance off line, heading, course over ground, and speed as well as data logging and event status.

- **Calculations** – the Calculation window was used to look at specific data items in tabular or graphical format.

2.2.1.2 Project Datum

Position information supplied by the DGPS was in a geodetic projection and the WGS84 datum (Table 2-2). For mapping purposes, data sets were transformed and projected during processing to the WGS84 datum and Universal Transverse Mercator Zone 5 North meters
(

Table 2-3). The vertical datum for the project was Mean Lower Low Water (MLLW).

Table 2-2 Acquisition Datum

Datum	International Terrestrial Reference Frame (ITRF)
Spheroid	WGS84
Semi-major axis	6378137.000
Semi-minor axis	6356752.314
Inverse flattening (1/f)	298.2572236
Eccentricity squared (e^2)	0.006694380

Table 2-3 Survey Projection

Areas 1, 2, and 3	
Projection	UTM
Zone	5
Central Meridian (C.M.)	156°W
Scale Factor at CM	0.9996
False Easting	500000m
False Northing	0 m

2.2.2 VESSEL ATTITUDE AND MOTION

An Applanix POS/MV 320 position and orientation system measured vessel heading and dynamic motion (heave, pitch and roll). The system consists of a POS/MV processor, an Inertial Measuring Unit (IMU), POS MV Controller software and two GPS antennae.

The IMU uses a series of linear accelerometers and angular rate sensors that work in tandem to determine vessel attitude solutions.

The GPS antennae were mounted on the mast above the vessel's bridge in a bow/stern configuration approximately 2m apart. The POS/MV Processor uses the GPS data, along with data supplied by gyros in the IMU, to compute a dynamic heading alignment. This heading solution is further refined using a GPS Azimuth Measurement Subsystem (GAMS), wherein a vector is computed between the two GPS antennas using carrier phase ambiguity resolution subroutines. The operational accuracy of the system as documented by the manufacturer is given in Table 2-4.

Table 2-4 POS MV 220 Accuracy Specifications

ITEM	ACCURACY
Heading	0.05˚ (Multipath and PDOP dependent)
Heave	5 cm or 5% (Whichever is greater)
Pitch / Roll	0.035˚

The POS/MV controller software displayed real time accuracies of heave, pitch, roll, position and velocity for QC purposes. The software was configured to alert the operator if the actual accuracies were outside the user-defined tolerance limits.

Motion, heading and position data were sent to Isis Sonar for data logging purposes during MBES acquisition.

2.2.3 SOUND VELOCITY PROFILES

Sound velocity profile (SVP), pressure, temperature, conductivity, salinity, and density data was acquired using Sea-Bird Electronics (SBE) SBE 19 Seacat. In addition, two AML Sound Velocity & Pressure (SV&P) Smart Sensors were deployed with the SBE 19. The SV&P Smart Sensors are direct sound velocity reading sensors. For each cast, the probes were held at the surface for three minutes to reach temperature equilibrium. The probes were then lowered at the rate of about 1m/s and then raised to the surface at the same rate.

SVP data was additionally acquired with Sippican XBT expendable probes. The Sippican XBT probes measure the water temperature as the probes descend, at a calibrated rate, to the seafloor. The sound velocity was calculated using measured water salinity. Data from the probes were logged on a dedicated PC using Sippican software.

Sound velocity casts were conducted so that MBES data could be corrected for sound velocity refraction. Details are given in Table 2-5 and an example SVP cast from the project area is shown in Figure 2-1.

Table 2-5 SVP Cast Details

Date	Time (UTC)	Probe	Latitude	Longitude
1 August 2003	18:50	SV&P	56º 02’ 06” N	153º 41’ 28” W
1 August 2003	23:15	SV&P	55º 58’ 05” N	153º 40’ 22” W
2 August 2003	02:15	SV&P	56º 02’ 24” N	153º 39’ 21” W
2 August 2003	05:45	SV&P	55º 58’ 07” N	153º 38’ 10” W
2 August 2003	09:00	SV&P	56º 02’ 25” N	153º 37’ 17” W
2 August 2003	12:10	SV&P	55º 57’ 59” N	153º 36’ 21” W
2 August 2003	15:25	SV&P	56º 02’ 20” N	153º 35’ 17” W
2 August 2003	18:40	SV&P	55º 58’ 01” N	153º 33’ 59” W
2 August 2003	21:55	SV&P	56º 02’ 17” N	153º 32’ 56” W
3 August 2003	01:05	SV&P	55º 58’ 04” N	153º 31’ 29” W
3 August 2003	04:30	SV&P	56º 02’ 23” N	153º 28’ 55” W
3 August 2003	08:20	SV&P	55º 53’ 38” N	153º 26’ 38” W
3 August 2003	12:45	SV&P	55º 54’ 16” N	153º 31’ 08” W
3 August 2003	17:35	SV&P	55º 58’ 27” N	153º 28’ 34” W
3 August 2003	22:00	SV&P	55º 54’ 15” N	153º 38’ 02” W
4 August 2003	02:10	SV&P	55º 56’ 46” N	153º 37’ 24” W
4 August 2003	05:40	SV&P	55º 51’ 38” N	153º 41’ 57” W
4 August 2003	11:00	SV&P	55º 56’ 21” N	153º 38’ 17” W
4 August 2003	14:45	SV&P	55º 58’ 35” N	153º 37’ 34” W
4 August 2003	17:57	SV&P	55º 57’ 54” N	153º 42’ 04” W
4 August 2003	20:25	SV&P	56º 00’ 17” N	153º 41’ 00” W
4 August 2003	23:15	SV&P	56º 00’ 48” N	153º 47’ 36” W
5 August 2003	01:55	SV&P	56º 01’ 29” N	153º 40’ 57” W
5 August 2003	04:40	SV&P	56º 01’ 52” N	153º 47’ 30” W
5 August 2003	07:48	SV&P	56º 01’ 29” N	153º 53’ 24” W

Date	Time (UTC)	Probe	Latitude	Longitude
5 August 2003	11:48	SV&P	56º 00' 44" N	153º 46' 39" W
5 August 2003	15:18	SV&P	55º 59' 53" N	153º 46' 43" W
5 August 2003	18:05	SV&P	55º 59' 27" N	153º 41' 18" W
5 August 2003	19:20	SV&P	56º 00' 10" N	152º 27' 50" W
5 August 2003	22:35	SV&P	56º 15' 01" N	152º 55' 18" W
6 August 2003	06:05	SV&P	56º 20' 20" N	152º 26' 56" W
6 August 2003	10:25	SV&P	56º 24' 09" N	152º 24' 22" W
6 August 2003	12:55	SV&P	56º 24' 13" N	152º 25' 58" W

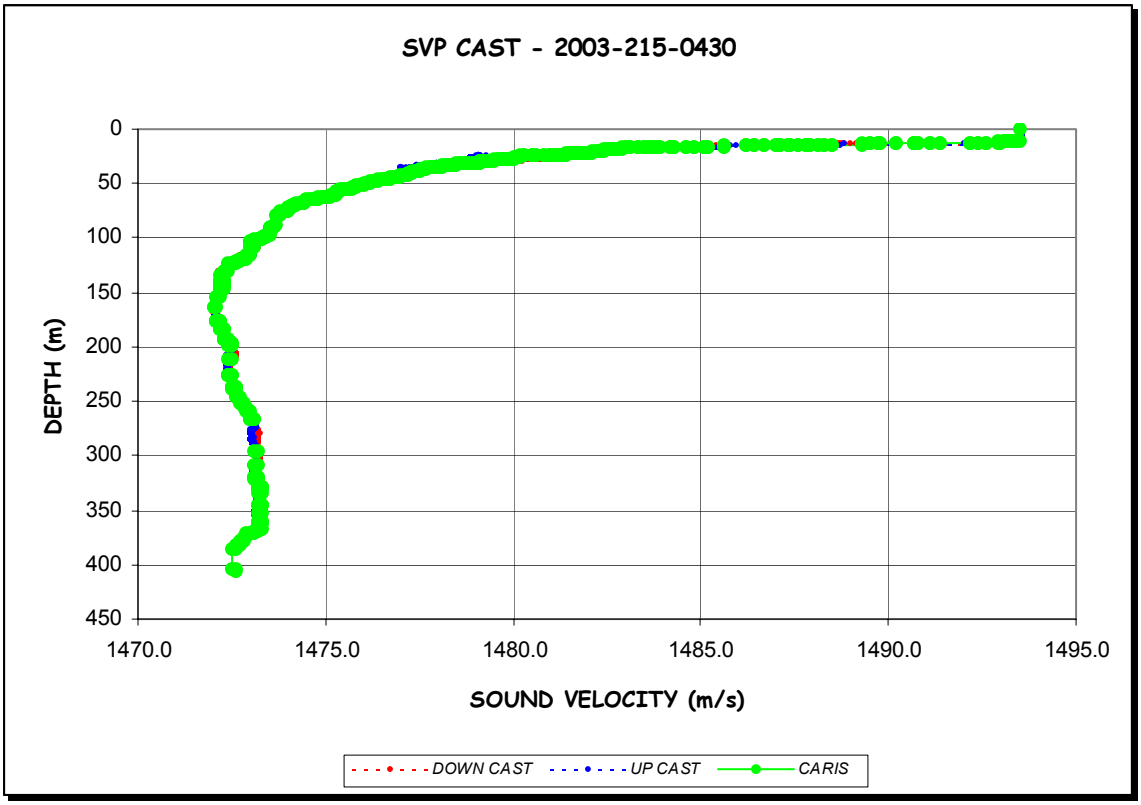


Figure 2-1 Sample SVP Cast

2.2.4 MULTIBEAM ECHOSOUNDER

The R/V Davidson was equipped with the hull mounted Reson SeaBat 8111 with option 033 (multibeam sidescan imagery). The Reson 8111 systems operate at a frequency of 100 kHz, with 101 horizontal beams centered 1.5º apart (150º across-track beam width) and 1.5º along-track beam width. It transmits and receives a sonar signal to measure the relative water depth over the 150º swath. The system was used in water depths ranging from 20 to 800 meters.

Data received by the SeaBat sonar-processing units were sent to Isis Sonar, where backscatter and bathymetry data quality were continually monitored during acquisition operations. Various windows displayed backscatter imagery, a 3D bathymetry profile, and swath coverage so that adjustments to sonar settings or vessel speed could be made, if appropriate, to improve data quality. A parameter window also displayed position, speed, attitude and heading data received from the POS MV, as well as data logging status.

Isis Sonar was used to start and stop data logging in XTF file format, and name lines. Power, gain and range settings were controlled directly through the Reson user interface monitor and varied according to water depth and data quality. Settings were noted on the multibeam line logs, an example of which is given in Appendix D.

The vessel survey speeds varied from 6.0 to 8.0 knots. Survey lines were orientated roughly parallel to the contours in the area. Line spacing varied from site to site, were dependent on the water depth, data quality and provided 100% bottom coverage.

Backscatter data was collected on all survey sites with the Reson 8111 Multibeam system and was used to create the imagery deliverables. The Reson 8111 multibeam sonar produced backscatter records along with range and angle packets used for bathymetry. The sonar's can generate backscatter in one of two distinct modes. For this survey, backscatter data was collected on a beam-by-beam basis. The backscatter from an individual beam is referred to as a snippet.

While a standard sidescan image is produced using one large beam on each side of the sonar, snippets are produced individually from each beam in the multibeam sonar. Snippets can be laced together, end to end, to produce a sidescan type image. The advantage in snippets stems form a large improvement in signal to noise ratio in the image, the result of using a focused beam rather than a broad beam to sample the backscatter.

Snippet data were logged in two formats during survey operations: raw snippets and combined snippets. Both data types are contained within the XTF files. Snippets are combined within the Reson 8111 processor to produce a sidescan like image of superior quality. The Reson 8111 combined snippets were used to produce the backscatter deliverables for this project. Processing software for the raw snippets is still under development.

2.3 CALIBRATIONS AND QUALITY CONTROL

In addition to the online QC tools and displays available in Isis, DelphSeismic and WinFrog, as described in previous sections, the following calibrations and checks were also conducted.

2.3.1 VESSEL OFFSETS

Dimensions of the vessel were taken after all equipment was mobilized, and offsets between the various sonar systems and sensors were measured. Results are given in Appendix B.

2.3.2 MBES PATCH TEST CALIBRATION

A MBES patch test calibration was carried out to derive the mounting offsets between the sonar head and motion reference unit. Procedures for acquiring patch test data can be found in Appendix F.

Patch test lines were acquired prior to survey and patch test values are applied in processing. Processing method and patch test results can be found in 3.1.1.5.

3 DATA PROCESSING

Data were processed on board to assure data coverage.

3.1 BATHYMETRY

All soundings were processed using CARIS's Hydrographic Information Processing System (HIPS) on Windows 2000 workstations. CARIS was used to clean data, produce Digital Terrain models (DTM's) and generate contours for chart production.

3.1.1 CORRECTIONS TO BATHYMETRY DATA

Within CARIS HIPS, Reson 8111 soundings were corrected for calibrated patch test results, vessel offsets, vessel motion, draft, sound velocity and tide.

3.1.1.1 Vessel Offsets

Offsets established prior to survey (Section 2.3.1), were used to correct bathymetry to compensate for differences between the transducer head and GPS antenna position. Offsets are detailed in Appendix B. Offsets were entered in to the Vessel Configuration File in CARIS HIPS, so that CARIS could correct the bathymetry during processing.

3.1.1.2 Sound Velocity Profiles

Processed sound velocity profiles (SVP) were used to correct bathymetry for sound refraction, or ray bending. SVP's were applied within CARIS. Thales' SVP 1.2 Processing Software was used to process the SVP data set, removing duplicated points and noise, to generate a smooth interpolation curve that depicted the original profile at the finest resolution available in CARIS.

3.1.1.3 Static Draft

Static draft observations were measured from both sides of the R/V Davidson. The two measurements were averaged to obtain the static draft correction and the correction was then applied to bring soundings from the transducer level to the water level.

The static draft value (–2.40m) was entered in to the Vessel Configuration file within CARIS. It should be noted that draft is actually distance from the common reference point (CRP) to the water level; CARIS takes into account the distance from the CRP to the transducer head in its calculations as well.

3.1.1.4 Tides

All sounding data were reduced to Mean Lower Low Water (MLLW) by CARIS using NOAA Preliminary Observed tides from Gauge 9457292, Kokiak Island, AK. Summarized tidal data is located in Appendix E.

3.1.1.5 Patch Test

A patch test was completed using seafloor topology to bring multibeam swaths run at varying speeds, headings, and overlaps into coincidence. Patch tests are employed so that data can be corrected for timing latency, pitch, azimuth and roll offsets, which may exist between the MBES transducer and the MRU.

Patch Test values were obtained in CARIS HIPS calibration mode. Calculated values were then entered in to the Vessel Configuration file so that data could be corrected during the processing procedure. Correction values used are given in Table 3-1.

Table 3-1 8111 Patch Test Results

Test	Correction
Latency	-0.03 sec
Pitch Offset	-0.70º
Azimuth Offset	-0.30º
Roll Offset	0.77º

A full patch test report is supplied in Appendix G.

3.1.2 CLEANING

The XTF files were converted to CARIS HIPS format for bathymetry processing. Prior to each survey line being converted from XTF to CARIS's HIPS format, the vessel offsets, patch test calibration values and static draft measurements were entered into the vessel configuration file. Once converted, the SVP file was loaded into each line and the line corrected for sound refraction. During SVP correction the bathymetry was also corrected for dynamic vessel heave, pitch and roll. The attitude, heading, navigation, and bathymetry data were examined for noise and gaps. Nadir beam filters were used to reject data from the outer reaches of the swaths. It should be noted that rejection does not mean deletion from the data set; soundings were simply flagged as 'rejected', and could be re-accepted if necessary.

After each individual line was examined and cleaned in CARIS's Swath Editor (Figure 3-1), the tide file was loaded and the lines merged. During merging, tide and draft corrections were applied. Subsets were then created in CARIS's Subset Edit mode (Figure 3-2) and adjacent overlapping lines of corrected bathymetry data examined to identify any tidal busts, sound velocity errors, motion errors, and data gaps. Any residual noise in the data set was also rejected at this time.

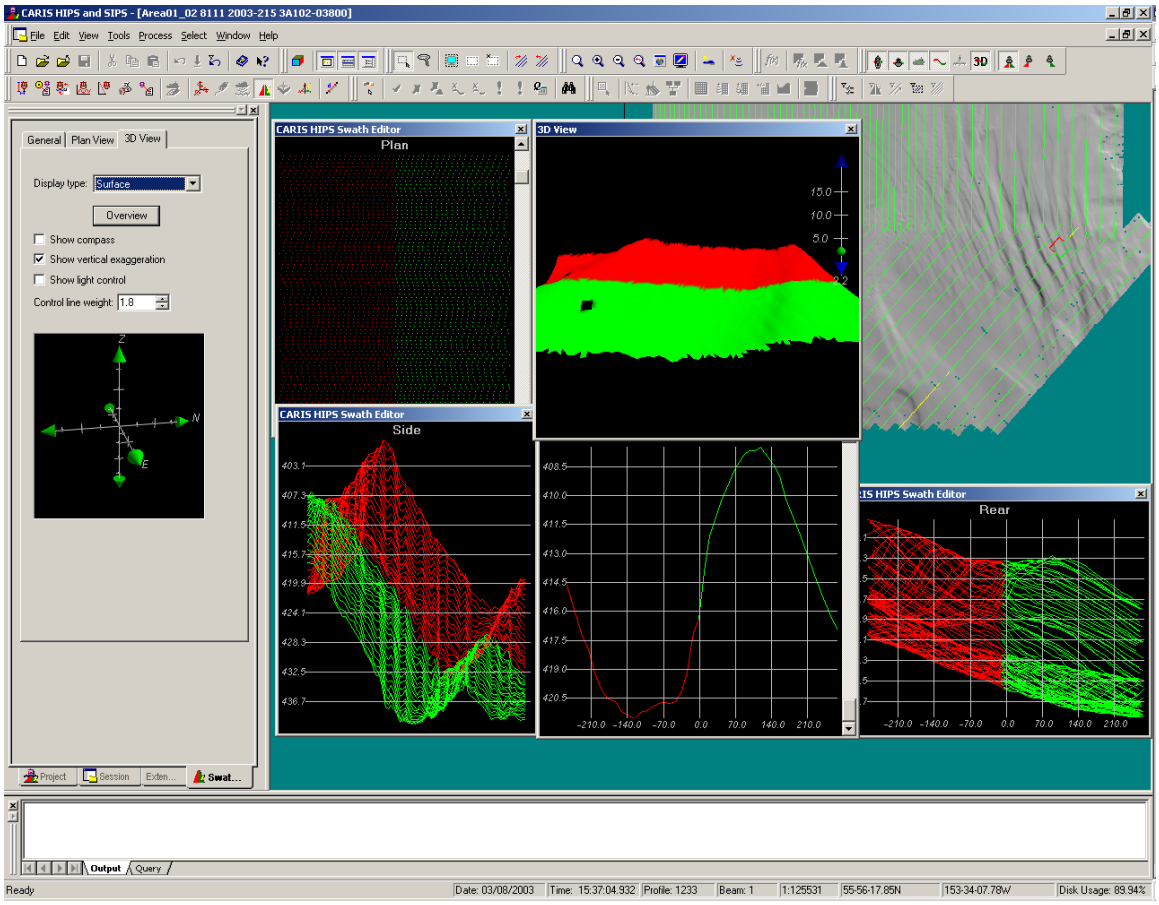


Figure 3-1 CARIS Swath Editor

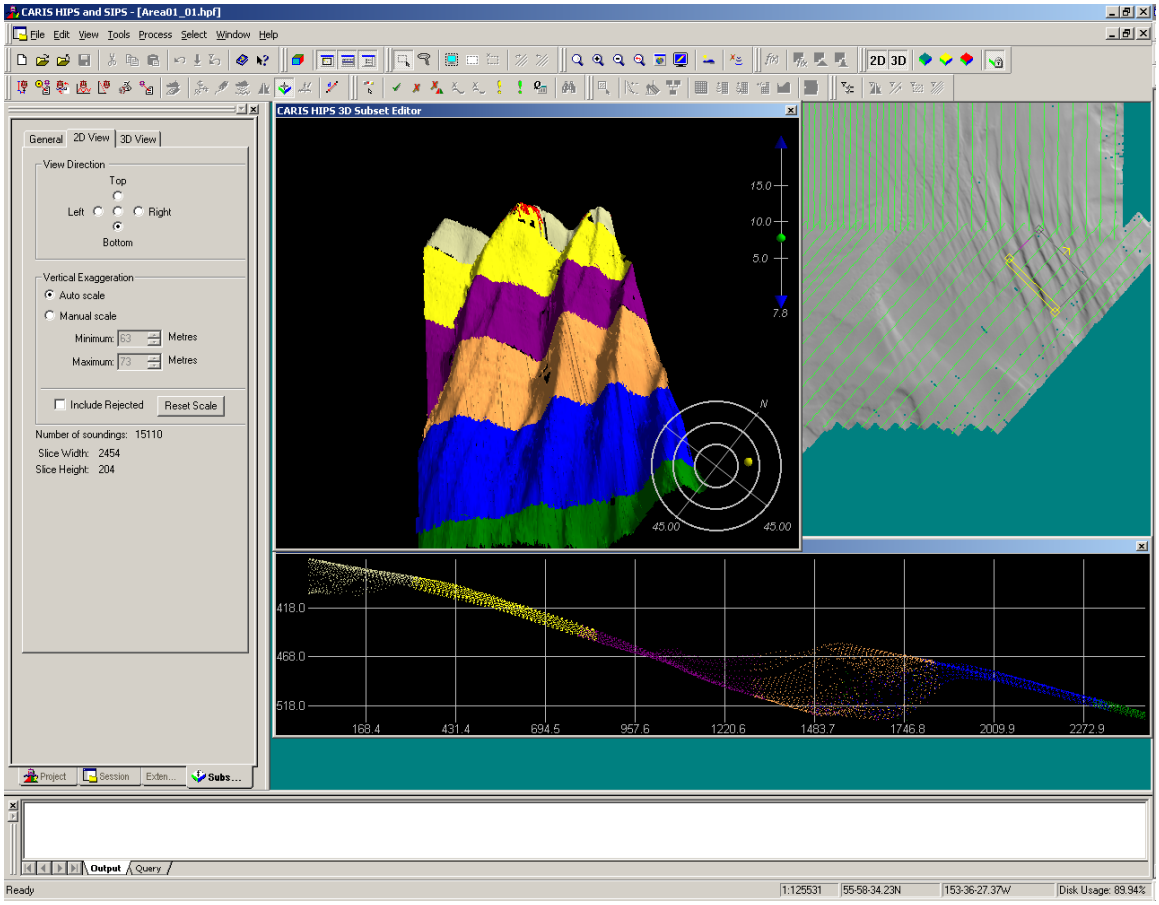


Figure 3-2 CARIS Subset Editor

3.1.3 DTM GENERATION

After data were cleaned in both Swath Editor and Subset Mode, DTM grids were created at various resolutions, depending on water depth.

The grids created within CARIS were mean weighted grids, thus depicting a mean seafloor. Two weighting methods were used in grid creation, range weighting and grazing angle weighting.

Range weighting is based on a sounding's distance from a grid node, where soundings located closer to the node have a greater weight than soundings further away. The number of grid nodes that each sounding influences is determined by the size of the beam footprint. The beam footprint is calculated using water depth; MBES beam width, and grazing angle. Therefore, MBES type is taken in to account during DTM creation.

Grazing angle weighting is based on a beam's intersection angle with the seafloor, whereby a higher weight is given to beams from the inner part of a swath than to outer beams from adjacent track lines. This weighting value is important in areas with adjacent or overlapping track lines.

Sun-illuminated images of the DTMs were created within CARIS using the image manager. These images were then exported in Geotiff format.

3.1.4 CONTOUR PRODUCTION

Once the DTM was generated, it was utilized to create contours at 10m intervals using the CARIS Fieldsheet Contour Wizard. Contours were exported from CARIS in DXF format and imported into Chart-X for labeling. Once labeled, contours were exported to AutoCAD Map 5 for final chart production. Unlabeled versions of the contours were also converted to ArcView Shape format.

3.1.5 ASCII FILES

Two ASCII files were exported from CARIS HIPS; one with XYZ for all DTM grid nodes, and another with XYZ containing all the soundings for later slope analysis.

3.1.6 MBES TIE LINE CHECK

Two tie line checks across Area 1A were conducted to establish whether the Reson 8111 MBES data met IHO depth accuracy standards for hydrographic survey, laid out in SP44, Ed.4.
The makehist function within CARIS HIPS, was used to produce QC Reports, based on the depth accuracy specification given in SP44:

$$\pm\sqrt{a^2 + (b * d)^2}$$

where d is water depth, and values for a and b vary according to the order of the survey. For Order 2 surveys, identified as water depths less than 200m, values for a and b are 1.0 and 0.023 respectively.

A regular, mean weighted average DTM was created from the main scheme survey lines and compared with soundings from each of the tie lines using the makehist function.

Results found in Appendix H, show that the MBES data meets IHO Order 2 Specifications.

3.2 BACKSCATTER

Backscatter data were processed and mosaicked using Isis Sonar and DelphMap.

3.2.1 CORRECTIONS TO BACKSCATTER DATA

Multibeam echo sounder and backscatter data were processed onboard the acquisition vessel and the onboard client representative reviewed the preliminary data.

Prior to processing of final backscatter mosaics, an adjustment to the position within the XTF files was made to reflect the offset between the GPS antenna and the Reson 8111. A position for the Reson 8111 head was calculated using offsets from the antenna to the 8111, taking into account vessel attitude (pitch, roll, and heading). The sonar head position was written into the XTF files, replacing the antenna position.

Time Varied Gain curves (TVG) were set to compensate for signal strength variations. The resulting compensated data more accurately indicate the true variations in seabed reflectivity across the area surveyed.

Data from the outer edges of the swath were clipped where there was sufficient overlap, leaving only higher quality, near range data. Bottom tracking settings were adjusted to ensure correct tracking of the seabed. Once the bottom tracking was correctly set, the water column was removed from the data set by applying a slant-range correction.

Backscatter data were terrain-corrected in Isis Sonar. ASCII XYZ files of generated DTM grid nodes were exported from CARIS. These files were imported into BathyPro and DTMs generated that could be recognized by TEI's software suite. The DTMs were then used by Isis Sonar and DelphMap when mosaicking the backscatter data.

Terrain correction takes account of the variation in seabed elevation in order to determine the true cross-line distance of a reflected pulse signal. Slant-range corrections made without using terrain correction assume a horizontal seabed and if the seabed is not horizontal then reflections will be assigned to incorrect positions, which are at the wrong distance from the survey track line.

3.2.2 MOSAIC CREATION

Three mosaics of the backscatter data were created using Isis Sonar (Figure 3-3) and DelphMap. DelphMap allows lines to be layered in any order; therefore, lines were mosaicked individually then put in the most desirable order before merging into one final mosaic. Once the mosaic was finalized within DelphMap, it was exported in GeoTiff format.

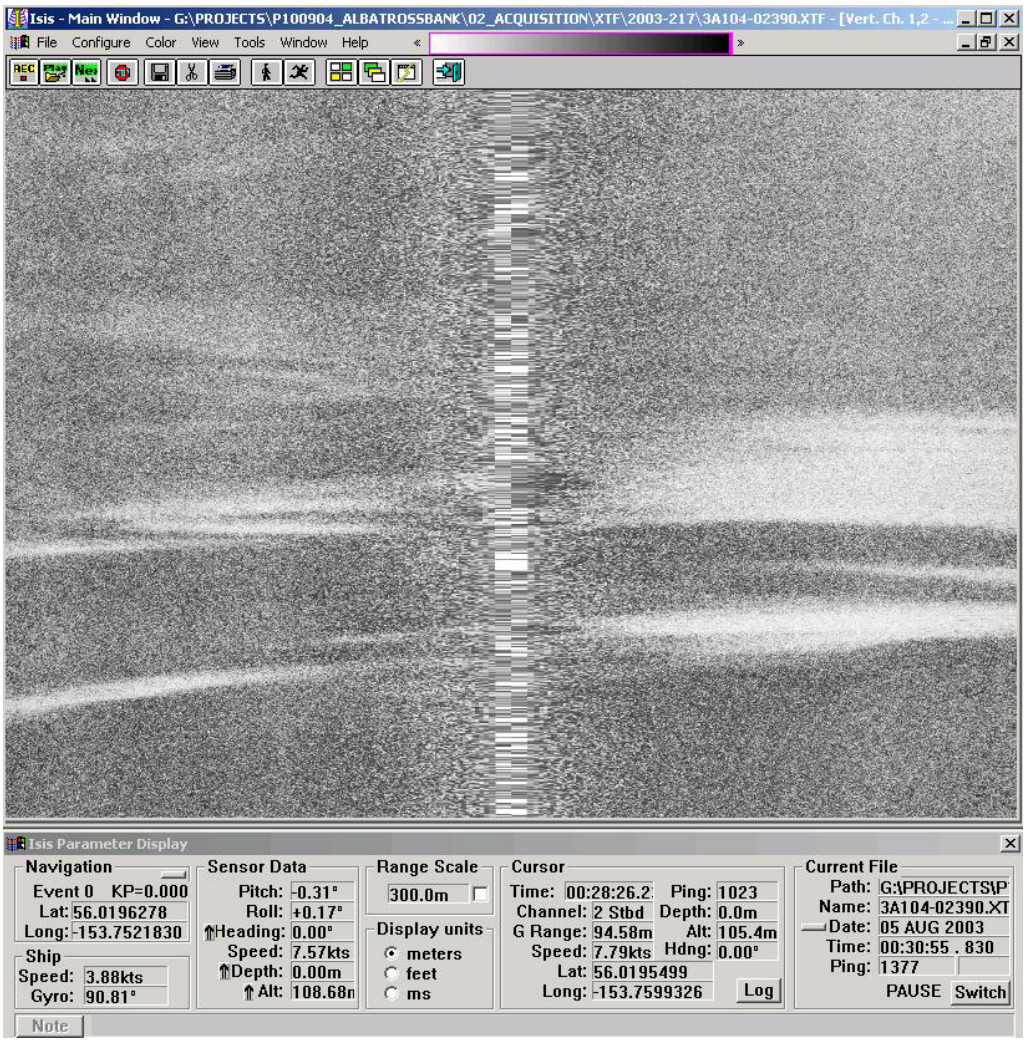


Figure 3-3 Data Playback in Isis Sonar

4 CHARTING AND DATA PRODUCTS

4.1 FINAL PRODUCTS

After all processing was completed at, the following deliverables for the survey were provided:

- Final Report
- All Raw XTF files for Multibeam and Backscatter data
- All Processed CARIS HDCS data
- Gridded ASCII XYZ data at appropriate grid intervals
- Grey-scale and Color GeoTiffs of sun-illuminated bathymetry
- Soundings for slope analysis in ASCII
- Bathymetric contours in ArcView SHP format
- GeoTiffs of Backscatter at best resolution
- GeoTiffs of Backscatter at best resolution draped over bathymetry
- Map Products
    - 1:25,000 Charts for all Sites (Paper, DWG and PDF format on CD)
        - 10 X Sun-Illuminated Bathymetry
        - 10 X Color Coded Sun-Illuminated Bathymetry
        - 5 X Multibeam Backscatter
        - 5 X Multibeam Backscatter draped over Bathymetry

APPENDIX A : DAILY LOG

THALES

Date: 07/31/03 Julian Days: 212/213 Project Survey Day#: 1

Summary of Day's Activities*: @ 1900 (AST) Davidson depart Kodiak for Albatross Bank. Start of operations for NMFS (Phase 2).*

2. Vessel Operations:
Survey Vessel ops #s

Survey Vessels	Survey Operations	Downtime Weather	Survey Equip	Vessel
Davidson (24)				
Today	5			
Project	5			
Project %	100%			

Mother vessel status: *Fully operational, no problems to note.*

Vessel Concerns: *None to note.*

3. Outstanding Technical, Personnel or Equipment Issues:
None To Note.

4. Personnel and Logistics:
A. Personnel

Thales Geosolutions (Pacific)	8
LCMF	1
McClane	0
Total Survey Staff:	9

B. Logistics
Next Rotation Date: 08/07/03
Personnel Off: None
Personnel On: *N/A*

C. Safety Incidents to Report: None to Note.
5. Weather
A. NOAA Short Term Weather Forecast:

N/A

B. NOAA Extended Forecast

N/A

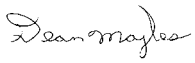
6. Position and General Location

57-05.8º N 152-21.3º *W, transit to Albatross Bank*.

7. Survey Plan
A. Survey Plan/weather impact expected for next 24 hours
During the transit to Area 01 we will deviate and conduct a single line that runs from the 8-fathom sounding located to the North of Area 02. The line will be orientated due south and will run to approximately to 600 meters of water. We will then continue our transit to Area 01 and commence survey.

B. General Plan/Priorities for the next week
Commence survey of specified Areas and transit to Prince William Sound.

Signed



Dean Moyles
Lead Hydrographer

THALES

Date: 08/01/03 Julian Days: 213/214 Project Survey Day#: 2

Summary of Day's Activities*: @ 0918 (AST) Davidson arrives on site, commence survey of Block 01_ 01.*

2. Vessel Operations:
Survey Vessel ops #s

Survey Vessels	Survey Operations	Downtime Weather	Survey Equip	Vessel
Davidson (24)				
Today	24			
Project	29			
Project %	100%			

Mother vessel status: *Fully operational, no problems to note.*

Vessel Concerns: *None to note.*

3. Outstanding Technical, Personnel or Equipment Issues:
Client informed us that we would not be using the Sub Bottom Profiler on this project.

4. Personnel and Logistics:
A. Personnel

Thales Geosolutions (Pacific)	8
LCMF	1
McClane	0
Total Survey Staff:	9

B. Logistics
Next Rotation Date: 08/07/03
Personnel Off: None
Personnel On: *N/A*

C. Safety Incidents to Report: None to Note.

5. Weather
A. NOAA Short Term Weather Forecast:

$$
AREA 3. KODIAK ISLAND WATERS.
PKZ310-020000-
PKZ320-020000-
AREA 3B. SHUYAK ISLAND TO SITKINAK.
SMALL CRAFT ADVISORY
NORTHWEST WINDS 25 KT. SEAS 8 FT. OUTLOOK NORTHWEST WINDS 20 KT. SEAS 6 FT.

$$

PKZ510-021200-
AREA 5A. COASTAL WATERS SOUTH OF THE ALASKA PENINSULA FROM SITKINAK TO CASTLE CAPE.
NORTHWEST WIND 20 KTS WITH HIGHER GUSTS. SEAS 6 FT. RAIN BEGINNING FRI NIGHT. OUTLOOK WEST WIND 10 KTS. SEAS 3 FT.

B. NOAA Extended Forecast

PKZ590-021200-
EXTENDED FORECAST FOR BRISTOL BAY AND THE ALASKA PENINSULA WATERS
VALID SUN NIGHT AUG 3 THROUGH WED AUG 6.

.SUN NIGHT AND MON...VARIABLE WIND 15 KTS.
.TUE AND WED...SOUTH WIND 30 KTS OR LESS.

THE NEXT SCHEDULED FORECAST WILL BE ISSUED AT 4 AM ADT SAT.

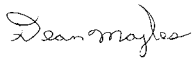
6. Position and General Location

56-00.2º N 153-35.3º *W, Area 01, Block 01*.

7. Survey Plan
A. Survey Plan/weather impact expected for next 24 hours
For survey operations, Area 01 as been divided into 4 blocks, we are currently surveying Block A01_01.

B. General Plan/Priorities for the next week
Commence survey of specified Areas and transit to Prince William Sound.

Signed



Dean Moyles
Lead Hydrographer

THALES

Date: 08/02/03 Julian Days: 214/215 Project Survey Day#: 3

Summary of Day's Activities*: Davidson continues with survey of Block A01_ 01.*

2. Vessel Operations:
Survey Vessel ops #s

Survey Vessels	Survey Operations	Downtime Weather	Survey Equip	Vessel
Davidson (24)				
Today	24			
Project	53			
Project %	100%			

Mother vessel status: *Fully operational, no problems to note.*

Vessel Concerns: *None to note.*

3. Outstanding Technical, Personnel or Equipment Issues:
None to Note.

4. Personnel and Logistics:
A. Personnel

Thales Geosolutions (Pacific)	8
LCMF	1
McClane	0
Total Survey Staff:	9

B. Logistics
Next Rotation Date: 08/07/03
Personnel Off: None
Personnel On: *N/A*

C. Safety Incidents to Report: Conducted abandon ship and fire drills.

5. Weather
A. NOAA Short Term Weather Forecast:

$$
AREA 3. KODIAK ISLAND WATERS.

PKZ320-031200-
AREA 3B. SHUYAK ISLAND TO SITKINAK.
NORTHWEST WINDS 20 KTS. SEAS 5 FT. OUTLOOK NORTHWEST WINDS 20 KTS. SEAS 5 FT.

$$
PKZ510-031200-

AREA 5A. COASTAL WATERS SOUTH OF THE ALASKA PENINSULA FROM SITKINAK TO CASTLE CAPE.
NORTHWEST WIND 15 KTS WITH HIGHER GUSTS. SEAS 4 FT. OUTLOOK VARIABLE WIND 10 KTS. SEAS 3 FT.

B. NOAA Extended Forecast

PKZ590-031200-
EXTENDED FORECAST FOR BRISTOL BAY AND THE ALASKA PENINSULA WATERS
VALID MON NIGHT AUG 4 THROUGH THU AUG 7.

.MON NIGHT...VARIABLE WIND 15 KTS.
.TUE AND WED...SOUTH WIND 25 KTS OR LESS.
.THU...SOUTH GALES.

THE NEXT SCHEDULED FORECAST WILL BE ISSUED AT 4 AM ADT SUN.

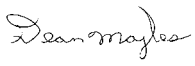
6. Position and General Location

55-58.0º N 153-26.5*º W, Area 01, Block 01*.

7. Survey Plan
A. Survey Plan/weather impact expected for next 24 hours
Complete survey of Block A01_01 and start Block A01_02.

B. General Plan/Priorities for the next week
Conduct survey of specified Areas and transit to Prince William Sound.

Signed



Dean Moyles
Lead Hydrographer

THALES

Date: 08/03/03 Julian Days: 215/216 Project Survey Day#: 4

Summary of Day's Activities*: Deep section of Block A01_02 was completed @ 1849 AST, transit and commence Block A01_03 @ 1855 AST.*

2. Vessel Operations:
Survey Vessel ops #s

Survey Vessels	Survey Operations	Downtime Weather	Survey Equip	Vessel
Davidson (24)				
Today	24			
Project	77			
Project %	100%			

Mother vessel status: *Fully operational, no problems to note.*

Vessel Concerns: *None to note.*

3. Outstanding Technical, Personnel or Equipment Issues:
None to Note.

4. Personnel and Logistics:
A. Personnel

Thales Geosolutions (Pacific)	8
LCMF	1
McClane	0
Total Survey Staff:	9

B. Logistics
Next Rotation Date: 08/07/03
Personnel Off: None
Personnel On: *N/A*

C. Safety Incidents to Report: *None to Note.*

5. Weather
A. NOAA Short Term Weather Forecast:

$$
AREA 3. KODIAK ISLAND WATERS.
PKZ310-040000-
AREA 3A. BARREN ISLANDS AND KAMISHAK BAY WATERS.
NORTHWEST WINDS 15 KT. SEAS 5 FT. OUTLOOK NORTHWEST WINDS 15 KT. SEAS 5 FT.

$$
PKZ320-040000-
AREA 3B. SHUYAK ISLAND TO SITKINAK.
WEST WINDS 15 KT. SEAS 5 FT. OUTLOOK WEST WINDS 15 KT. SEAS 5 FT.

$$
PKZ510-040000-
AREA 5A. COASTAL WATERS SOUTH OF THE ALASKA PENINSULA FROM SITKINAK TO CASTLE CAPE.
NORTHWEST WIND 15 KTS WITH HIGHER GUSTS DIMINISHING TO VARIABLE 10 KTS OR LESS SUN NIGHT. SEAS 5 FT.
OUTLOOK VARIABLE WINDS 10 KTS. SEAS 3 FT.

B. NOAA Extended Forecast

PKZ590-040000-
EXTENDED FORECAST BRISTOL BAY AND THE ALASKA PENINSULA WATERS
VALID TUE AUG 05 THROUGH THU AUG 7.

.TUE...VARIABLE WINDS 20 KTS.
.WED AND THU...SOUTH WIND 30 KTS.

THE NEXT SCHEDULED FORECAST WILL BE ISSUED AT 4 PM ADT SUN.

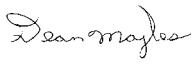
6. Position and General Location

55-51.5º N 153-39.8º *W, Area 01, Block 03*.

7. Survey Plan
A. Survey Plan/weather impact expected for next 24 hours
For Blocks A01_02 and A01_03, we will survey the deep-water section first and then the shallow section.

B. General Plan/Priorities for the next week
Conduct survey of specified Areas and transit to Prince William Sound.

Signed



Dean Moyles
Lead Hydrographer

THALES

Date: 08/04/03 Julian Days: 216/217 Project Survey Day#: 5

Summary of Day's Activities*: Completed Block A01_02@ 0955 AST and started Block A1_04 @ 1010 AST.*

2. Vessel Operations:
Survey Vessel ops #s

Survey Vessels	Survey Operations	Downtime Weather	Survey Equip	Vessel
Davidson (24)				
Today	24			
Project	101			
Project %	100%			

Mother vessel status: *Fully operational, no problems to note.*

Vessel Concerns: *None to note.*

3. Outstanding Technical, Personnel or Equipment Issues:
None to Note.

4. Personnel and Logistics:
A. Personnel

Thales Geosolutions (Pacific)	8
LCMF	1
McClane	0
Total Survey Staff:	9

B. Logistics
Next Rotation Date: 08/07/03
Personnel Off: None
Personnel On: *N/A*

C. Safety Incidents to Report: *None to Note.*

5. Weather
A. NOAA Short Term Weather Forecast:

$$
PKZ510-050000-
AREA 5A. COASTAL WATERS SOUTH OF THE ALASKA PENINSULA FROM SITKINAK TO CASTLE CAPE.
VARIABLE MAINLY SOUTHWEST WIND 15 KTS. SEAS 5 FT. RAIN.
OUTLOOK VARIABLE WINDS 15 KTS. SEAS 5 FT.

B. NOAA Extended Forecast

```
$$
PKZ590-050000-
EXTENDED FORECAST BRISTOL BAY AND THE ALASKA PENINSULA WATERS
VALID WED AUG 06 THROUGH FRI AUG 8.

.WED...VARIABLE WINDS 20 KTS
.THU...SOUTH WIND 30 KTS.
.FRI...VARIABLE WINDS 20 KTS.

THE NEXT SCHEDULED FORECAST WILL BE ISSUED AT 4 PM ADT MON.
```

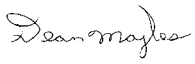
6. Position and General Location

56-01.5º N 153-55.28º *W, Area 01, Block 04*.

7. Survey Plan
A. Survey Plan/weather impact expected for next 24 hours
Complete Block A01_04 and run 5 lines in Block A01_05, we will then run one tieline across A01_01 and transit to Area 02. Once we arrive at this site we will run one or two lines, depending on the time, and head to Area 03 to use the remaining time before transiting to Prince William Sound.

B. General Plan/Priorities for the next week
Conduct survey of specified Areas and transit to Prince William Sound.

Signed



Dean Moyles
Lead Hydrographer

THALES

Date: 08/05/03 Julian Days: 217/218 Project Survey Day#: 6

Summary of Day's Activities*: Completed Block A01_05 @ 0715 AST, Block A1_07 was started @ 0724 AST and completed @ 1000 AST. Before transiting to Area 02 one tieline was conducted in Block A1_01. The Davidson arrived at Area 02 @ 1500 AST, completed Block A02_01 @ 1742 AST and transit to Area 03. Arrived at Area 03 @ 1924 AST.*

2. Vessel Operations:
Survey Vessel ops #s

Survey Vessels	Survey Operations	Downtime Weather	Survey Equip	Vessel
Davidson (24)				
Today	24			
Project	125			
Project %	100%			

Mother vessel status: *Fully operational, no problems to note.*

Vessel Concerns: *None to note.*

3. Outstanding Technical, Personnel or Equipment Issues:
None to Note.

4. Personnel and Logistics:
A. Personnel

Thales Geosolutions (Pacific)	8
LCMF	1
McClane	0
Total Survey Staff:	9

B. Logistics
Next Rotation Date: 08/07/03
Personnel Off: None
Personnel On: *N/A*

C. Safety Incidents to Report: *None to Note.*

5. Weather
A. NOAA Short Term Weather Forecast:

PKZ320-060000-
AREA 3B. SHUYAK ISLAND TO SITKINAK.
VARIABLE WINDS INCREASING TO SOUTHWEST 15 KT TUE AFTERNOON. SEAS BUILDING TO 5 FT TUE AFTERNOON. OUTLOOK WEST WINDS 15 KT. SEAS 5 FT.

$$
PKZ510-061200-
AREA 5A. COASTAL WATERS SOUTH OF THE ALASKA PENINSULA FROM

SITKINAK TO CASTLE CAPE.
VARIABLE WIND 15 KTS BECOMING SOUTHWEST WIND 15 KTS WED MORNING.
SEAS 5 FT. AREAS OF RAIN AND FOG. OUTLOOK WEST WIND 15 KTS. SEAS
5 FT.

B. NOAA Extended Forecast

```
$$
PKZ590-061200-
EXTENDED FORECAST FOR BRISTOL BAY AND THE ALASKA PENINSULA WATERS
VALID THU NIGHT AUG 7 THROUGH SUN AUG 10.

.THU NIGHT...SOUTH WIND 20 KTS.
.FRI...VARIABLE WIND 15 KTS.
.SAT...SOUTHEAST WIND 25 KTS.
.SUN...VARIABLE WIND 15 KTS.

THE NEXT SCHEDULED FORECAST WILL BE ISSUED AT 4 AM ADT WED.
```

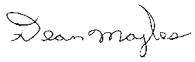
6. Position and General Location

56-20.2º N 152-26.9º *W, Area 03*.

7. Survey Plan
A. Survey Plan/weather impact expected for next 24 hours
Work on Area 03 and depart @ 0600 AST for Prince William Sound.

B. General Plan/Priorities for the next week
Conduct survey of specified Areas and transit to Prince William Sound.

Signed



Dean Moyles
Lead Hydrographer

THALES

Date: 08/06/03 Julian Days: 218/219 Project Survey Day#: 7

Summary of Day's Activities*: Continue with Area 03, at 0500 AST start transit to Prince William Sound.*

2. Vessel Operations:
Survey Vessel ops #s

Survey Vessels	Survey Operations	Downtime Weather	Survey Equip	Vessel
Davidson (24)				
Today	14.2			
Project	139.2			
Project %	100%			

Mother vessel status: *Fully operational, no problems to note.*

Vessel Concerns: *None to note.*

3. Outstanding Technical, Personnel or Equipment Issues:
None to Note.

4. Personnel and Logistics:
A. Personnel

Thales Geosolutions (Pacific)	8
LCMF	1
McClane	0
Total Survey Staff:	9

B. Logistics
Next Rotation Date: 08/07/03
Personnel Off: None
Personnel On: *N/A*

C. Safety Incidents to Report: *None to Note.*

5. Weather
A. NOAA Short Term Weather Forecast:

$$
PKZ320-070000-
AREA 3B. SHUYAK ISLAND TO SITKINAK.
SOUTHWEST WINDS 15 KT BECOMING NORTHWEST 15 KT WED NIGHT. SEAS 5 FT.
LATE NIGHT AND MORNING FOG. OUTLOOK NORTHWEST WINDS 15 KT. SEAS 4 FT.

$$
PKZ510-070000-
AREA 5A. COASTAL WATERS SOUTH OF THE ALASKA PENINSULA FROM

SITKINAK TO CASTLE CAPE.
VARIABLE MAINLY WEST WINDS 15 KTS. SEAS 5 FT. AREAS OF FOG. OUTLOOK
WEST WINDS 15 KTS. SEAS 5 FT.

B. NOAA Extended Forecast

$$
PKZ590-070000-
EXTENDED FORECAST BRISTOL BAY AND THE ALASKA PENINSULA WATERS
VALID FRI AUG 8 THROUGH SUN AUG 10.

.FRI...VARIABLE WIND 15 KTS.
.SAT...SOUTHEAST WIND 25 KTS.
.SUN...VARIABLE WIND 15 KTS.

THE NEXT SCHEDULED FORECAST WILL BE ISSUED AT 4 PM ADT WED.

6. Position and General Location

Transit to Prince William Sound.

7. Survey Plan
A. Survey Plan/weather impact expected for next 24 hours
Transit to Prince William Sound.

B. General Plan/Priorities for the next week
Prince William Sound survey.

Signed

Dean Moyles
Lead Hydrographer

APPENDIX B : VESSEL SPECIFICATIONS AND OFFSETS

R/V Davidson

The R/V Davidson is a 47 meter (153 foot) 833 GRT survey vessel capable of extended duration offshore survey operations (see Figure B-1). The R/V Davidson accommodates a vessel and survey crew, acquisition hardware, and processing center for reducing acquired data to field quality products. Additional information about the R/V Davidson can be seen in the table below:

Figure B-1 R/V Davidson

Table B-1 R/V Davidson Specifications

SURVEY VESSEL	R/V DAVIDSON
Official Number	D1066485
Owner	Venture Pacific Marine Inc.
Year Built	01/02/67
Length	153 ft
Beam	38 ft
Draft	17.75 ft
Gross Ton	250
Net Ton	833
Power	1800 hp

Three NovAtel antennas were mounted on the ship's mast for positioning and heading. The central antenna was used for vessel position. The two POS/MV antennas were offset 2.0 meters, fore and aft, of one another. The forward antenna functioned as the POS/MV master

antenna while the aft antenna functioned as the POS/MV secondary (see Figure B-4-1). A spare NovAtel GPS antenna was mounted between two differential antennas behind the ship's mast (see Figure B-4-2).

Figure B-4-1 Primary GPS and POS MV Antennas

Figure B-4-2 Spare GPS and Differential Antennas

Offsets are used in WinFrog for display purposes only. Offset values were applied to the data in CARIS HIPS as specified in the vessel configuration file. The vessel offsets used are shown in the following table:

Table B-2 R/V Davidson Vessel Offsets

FROM	TO	X	Y	Z
CRP	8111 Transducer	0.00	0.00	2.04
CRP	Primary Navigation GPS Antenna	0.01	3.82	-23.45
CRP	Backup Navigation GPS Antenna	0.05	-5.95	-14.36
CRP	POS/MV Master Antenna (1)	0.15	5.07	-23.45
CRP	POS/MV Slave Antenna(2)	0.15	3.07	-23.45
CRP	POS/MV (IMU)	0.00	0.00	0.00
CRP	Draft Measuring Point, Port	-5.79	0.00	-5.26
CRP	Draft Measuring Point, Starboard	5.79	0.00	-5.28

Note: All units are meters.
Axis used: X positive toward starboard
Y positive toward bow
Z positive into the water

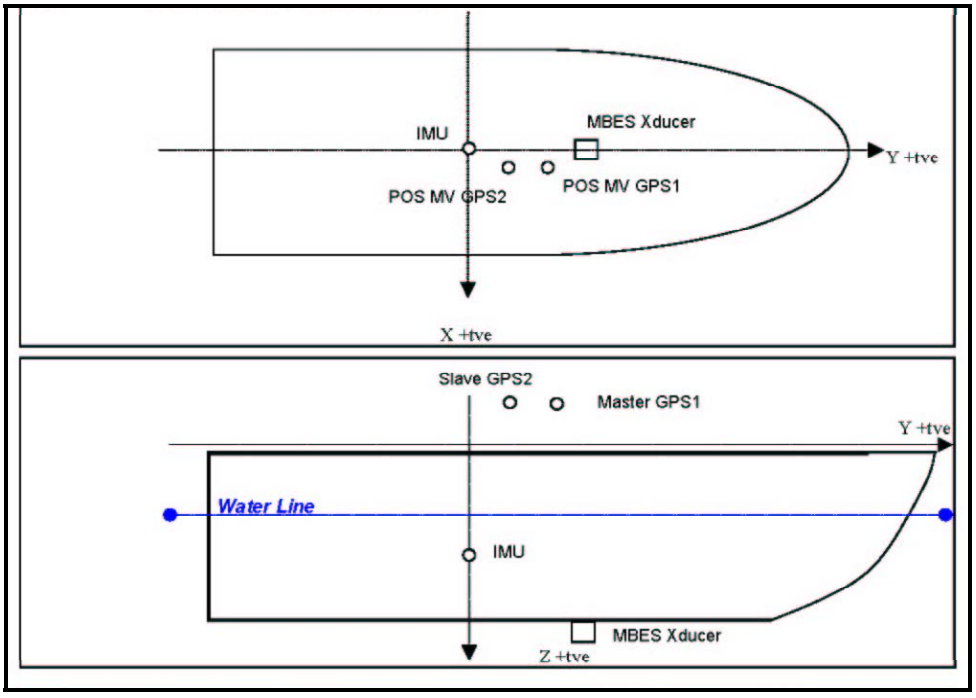


Figure B-5 R/V Davidson Equipment Layout

APPENDIX C : EQUIPMENT SPECIFICATIONS

THALES

MBX-3

2 Channel Automatic Differential Beacon Receiver

Standalone Radiobeacon Receiver

FEATURES

- Dual independent channels for superior automatic beacon tracking
- State-of-the-art digital architecture enhances beacon reception
- Fast acquisition times ensure you are up and running quickly
- 2-line by 16-character LCD display provides more information simultaneously
- Global beacon table listing gives you quick access to beacons by name
- Low power consumption gives extended battery life for portable applications
- Automatic and manual tune modes provide operational versatility
- Optional internal splitter and GPS signal output port for use with combination GPS/beacon antennas
- Firmware upgrades are easily loaded into the receiver through the serial port
- Wide selection of antennas available

Advanced Beacon Receiver Technology

The CSI MBX-3 beacon receiver employs CSI's third generation of digital receiver technology to receive free DGPS signals broadcast by the networks of 300 kHz radiobeacons deployed worldwide.

Using these signals, the MBX-3 beacon receiver outputs differential correction data in the industry standard RTCM SC-104 format accepted by differential-ready GPS receivers.

The advanced digital signal processing techniques of the MBX-3 allow for reliable extraction of DGPS data from the beacon broadcasts, even in noisy environments.

Ease of Operation

The MBX-3 incorporates a large 2-line by 16-character display and 3-switch keypad. The intuitive menu system provides access to receiver status information and operating parameters.

You may configure the MBX-3 beacon receiver for either automatic or manual tune operation using the convenient menu system.

A new global beacon table within the receiver menu system allows selection of beacons by name.

Automatic Operation

In automatic mode, the two channels of the beacon receiver cooperatively construct and maintain a table of radiobeacons available in your area. The receiver's primary channel automatically locks to the station providing the highest quality signal. This ensures that the MBX-3 is always locked to the best beacon in the area.

Antennas

The MBX-3 receiver may use any of a variety of antennas offered by CSI. Options include an E-field Whip antenna, two varieties of H-field beacon Loop antennas, and a combination GPS/beacon antenna.

All CSI antennas incorporate band-pass filtering and integral preamplifiers. The MBX-3 receiver provides power to these active antennas.

H-field beacon Loop antennas do not require a counterpoise ground connection and are ideal for portable applications. They are also less susceptible than a conventional whip antenna to predominate E-field noise, including precipitation static.

Hassle-Free Upgrading

The MBX-3 supports firmware upgrades as improvements to firmware or changes to the global beacon table are made. These upgrades are easily loaded into the receiver through the serial port using a PC computer.

Configuration Software

CSI offers custom Windows 95® software for beacon receiver configuration, monitoring receiver performance, and decoding RTCM data. A terminal interface and data logging capability are also included.

Warranty

CSI is committed to supporting its products and offers a one-year warranty on parts and labor.

Contact us to discover why the MBX-3 is the right choice for your application.

MBX-3 – *2 Channel Automatic Differential Beacon Receiver*

Receiver Specifications

Channels:	2 independent channels
Frequency Range:	283.5 to 325.0 kHz
Channel Spacing:	500 Hz
MSK Bit Rates:	50, 100, and 200 bps
Cold Start Time:	< 1 minute
Warm Start Time:	< 2 seconds
Demodulation:	Minimum shift keying
Sensitivity:	2.5 µV/m for 10 dB SNR
Dynamic Range:	100 dB
Frequency Offset:	± 5 Hz
Adjacent Channel Rejection:	60 dB
Correction Output Protocol:	RTCM SC-104
Input/Status Protocol:	NMEA 0183

Communications

Interface Level:	RS-232C or RS-422
Baud Rates:	2400, 4800, 9600

Environmental Specifications

Operating Temperature:	-30°C to +70°C
Storage Temperature:	-40°C to +80°C
Humidity:	95% non-condensing
EMC:	EN 60945 EN 50081-1 EN 50082-1 FCC: Part 15, sub-part J, class A digital device

Power Specifications

Input Voltage:	9 - 40 VDC
Nominal Power:	2.5 W
Nominal Current:	210 mA
Antenna Voltage Output:	10 VDC (5 VDC optional)

Mechanical Specifications

Dimensions:	150 mm L x 125 mm W x 51 mm H (5.9" L x 4.9" W x 2.0" H)
Weight:	0.64 kg (1.4 lb)
Display:	2-line by 16-character LCD
Keypad:	3-key switch membrane
Power Connector:	2-pin circular locking
Data Connector:	DB9-S
Antenna Connector:	BNC-S
Optional GPS Output Port:	TNC-S

Operating Modes

MBX-3 Mode (Default):	RTCM SC-104 correction and NMEA status message output (Default Mode)
MBX-E Mode:	RTCM SC-104 correction and NMEA status message output and GPS NMEA message input for position and satellite status display.

NMEA 0183 I/O

- Receiver Automatic and Manual tune command
- Frequency and data rate query
- Receiver performance and operating status queries
- Automatic search almanac queries (proprietary)
- Baud rate selection command (proprietary)
- Receiver tune command
- Force cold start command (proprietary)
- Software upgrade command (proprietary)
- Configuration up-load command (proprietary)

Accessories

Antenna:	Various
Power Cables:	Various
Antenna Cables:	Various
Data Cables:	Various
CSI Beacon Command Center:	MS Windows 95® beacon control software

Pin-Out, RS-232C

DB9 Pin #	Description
2	TXD, RTCM SC-104 / status output
3	RXD, configuration input
5	Signal return

Pin-Out, RS-422

DB9 Pin #	Description
1	TXD +, RTCM SC-104 / status output
2	TXD -, RTCM SC-104 / status output
4	RXD -, configuration input
5	Signal return
7	RXD +, configuration input

CSI Authorized Dealer

Communication Systems International, Inc.
1200 – 58th Avenue S.E., Calgary, AB, Canada, T2H 2C9
Phone: (403) 259-3311 Fax: (403) 259-8866
Web: www.csi-dgps.com e-mail: info@csi-dgps.com

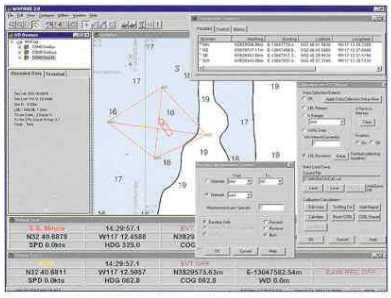
THALES

WinFrog Integrated Navigation System

Thales GeoSolutions (Pacific), Inc. (TGPI), a member of the Thales GeoSolutions family, specializes in providing services and software for the marine survey and positioning industry. We employ the most experienced professionals in the industry, and as a company have more than 20 years of success worldwide. We specialize in integrating systems to provide advanced solutions to handle all of your survey and positioning needs.

We take pride in our ability to give customers the personalized attention of a small company while providing them with the resources and infrastructure of a large, global organization. Our customers benefit from the fact that we develop and test our own solutions, on our own projects, before releasing them commercially. Our clients know they are receiving a system that has been proven in the field.

At TGPI, we understand our customers' needs because we work alongside them. Our project managers and their teams maintain full control of a project from beginning to end to ensure a project's technological and commercial success.
Whether in the field or at the drawing board, our customers are confident that they are receiving a product that meets their needs.



TGPI provides you with the latest innovations in integrated navigation and data management system software.

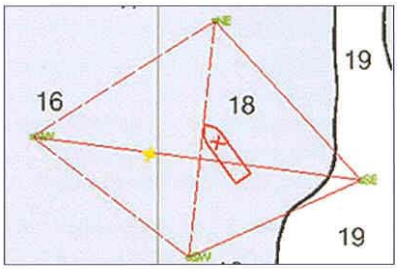
THALES

WinFrog is a complete Integrated Navigation System that combines surface navigation and underwater positioning into one cost-effective package. Its modular design allows customization to meet users' various needs.

The core program provides you with real-time position and navigation information, and can simultaneously collect data from up to 25 types of devices, including other GPSs and sounders. WinFrog currently supports over 300 different devices through either serial or Ethernet communications. It also allows you to define multiple vehicles, each having its own devices, names, offsets, tracks and shapes. In addition, data can be output through industry standard NMEA or customized formats.

WinFrog also supports multiple file formats for graphical display, including C-MAP, ARCS and BSB electronic charts, as well as DXF, DWG, DGN and other file formats.

With over 500 licenses in operation for customers in fields ranging from marine survey to underwater construction, WinFrog is today's integrated navigation and data management system solution. Our success in many industries stems from our commitment to delivering complete solutions based on customers' needs and tailoring our systems to ensure complete satisfaction.



THALES

POS/MV 220

POSITION AND ORIENTATION SYSTEM

- Roll and pitch accuracy to 0.05° in all dynamics
- True heading accuracy to 0.05° independent of latitude and dynamics
- DGPS or RTK position accuracy
- No motion artefacts, even in severe conditions
- Robust high MTBF military grade inertial sensors <10°/hour IMU
- No gyro spin-up time
- Proven technology
- Digital, analogue and Ethernet interfaces
- Self-calibrating for rapid deployment
- Industry standard

Complete navigation and attitude solution for marine vessels

POS/MV is a GPS aided Inertial Navigation System (INS) that delivers full six-degrees of freedom (position and orientation) solutions for marine vessels. POS/MV has the functionality of a gyro-compass, GPS receiver and a motion sensor in a single self-calibrating package.

Modern sonar/acoustic systems can be limited in their performance by the use of conventional motion sensors. The limiting factor is that the accuracy of conventional sensors degrades with increasing dynamics. This results in shorter operational windows and reduced survey accuracy.

POS/MV has been developed to meet the exacting requirements of today's multibeam sonar systems. Using significantly higher performance inertial sensors than conventional systems, and a sophisticated aided inertial navigation algorithm, POS/MV provides high accuracy attitude data regardless of platform dynamics. In addition, POS/MV provides smooth position data at high update rates, continuity of data during GPS outages and high accuracy true heading regardless of latitude.

The inertial heading solution is aided by a carrier phase GPS sub-system (GAMS). Hence POS/MV computes accurate true heading independent of latitude and dynamics (unlike traditional gyro-compasses). This is maintained even where GPS reception is poor, given that the heading drift is only 0.08° per minute during GAMS outage.

The key benefit of POS/MV is the accuracy and stability of the position and attitude data. Hence, with POS/MV, survey operations can continue through deteriorating sea conditions and in areas where GPS/DGPS reception is problematic.

Over 100 POS/MV users are already benefiting by making full use of outer beams, from an increased window of operability, through continuous data collection during turns and by maintaining data during short GPS outages.

POS/MV enables survey operators to make the most of their investment in multibeam sonar.

TSS TECHNOLOGY IN MOTION

POS/MV 220

TSS

POS/MV 220

Technical Specifications		
PERFORMANCE	RTK	DGPS
Position (m CEP)	0.02 - 0.10	0.5 - 2.0
Velocity (m/s)	0.01	0.03
Roll and pitch	<0.05°	0.05°
True heading	4m baseline: 0.05°, 2m baseline: 0.1°	
Heading drift rate during GAMS (GPS) outage	0.08°/minute	
Heave	5% of heave amplitude or 5cm	
PHYSICAL SPECIFICATIONS		
Size	IMU PCS Antenna Choke ring	204 x 204 x 168mm 441 x 111 x 346mm 2.5U, 19" rack mount 178 x 77mm (2 off) 370 x 61mm (2 off)
Weight	IMU PCS	3.5Kg 7 Kg
Power	120/220 VAC, 60/50 Hz, 60W	
Temperature	IMU & Antennas PCS	-40° to +60°C 0° to +60°C
Humidity	IMU & Antennas PCS	0 to 100% 5 to 95% RH non-condensing
Cables	IMU Antennas	8m standard 15m (2 off standard)
INTERFACES		
Ethernet Interface (10base-T)	Function Data UDP Ports IP Port	Operate POS/MV & record data Position, attitude, heading, velocity, track and speed, acceleration, status and performance, raw data. All data has time and distance tags Display port - low rate (1Hz) data Data port - high rate (1-200Hz) data Control port - used by POS controller
RS232 Interface (DB9 males)	NMEA Port High rate attitude data port	GGA, HDT, VTG, GST, ZDA, PASHR, PRDID (1-50Hz) Roll, pitch, true heading and heave in all multibeam proprietary formats (1-200 Hz)
Options	Internal RTK GPS receiver; analogue interface (roll, pitch & heave); field support kit	

Represented by:

TSS (UK) Ltd:
New Mill, New Mill Lane, Witney, Oxfordshire OX29 9SN UK
Tel +44 (0)1993 777700 Fax +44 (0)1993 777701 E-mail: tssmail@tssuk.co.uk

Aberdeen:
Tel +44 (0)1224 707081 Fax +44 (0)1224 707085 E-mail: tssmail@tssuk.co.uk

America:
Tel +1 713 461 3030 Fax +1 713 461 3099 E-mail: tssusa@tssusa.com

S G Brown Division:
Tel +44 (0) 1923 470800 Fax +44 (0) 1923 470842 Email: sgbmail@tssuk.co.uk

24 HR CUSTOMER SUPPORT +44 (0) 7899 665603

Due to continuous development of our products, specifications may vary from those listed above.

DP180022DE

A VOSPER THORNYCROFT Company

www.tss-realworld.com

SEACAT Profiler

SBE 19*plus*

The SBE 19*plus* is the next generation *Personal CTD*, bringing numerous improvements in accuracy, resolution (in fresh as well as salt water), reliability, and ease-of-use to the wide range of research, monitoring, and engineering applications pioneered by its legendary SEACAT predecessor. The 19*plus* samples faster (4 Hz vs 2), is more accurate (0.005 vs 0.01 in T, 0.0005 vs 0.001 in C, and 0.1% vs 0.25% — with *seven* times the resolution — in D), and has more memory (8 Mbyte vs 1). There is more power for auxiliary sensors (500 ma vs 50), and they are acquired at higher resolution (14 bit vs 12). Cabling is simpler and more reliable because there are four differential auxiliary inputs on two separate connectors, and a dedicated connector for the pump. All exposed metal parts are titanium, instead of aluminum, for long life and minimum maintenance.

The 19*plus* can be operated without a computer from even the smallest boat, with data recorded in non-volatile FLASH memory and processed later on your PC. Simultaneous with recording, real-time data can be transmitted over single-core, armored cable directly to your PC's serial port (maximum transmission distance dependent on number of auxiliary sensors, baud rate, and cable properties). The 19*plus'* faster sampling and pump-controlled TC-ducted flow configuration significantly reduces salinity spiking caused by ship heave, and allows slower descent rates for improved resolution of water column features. Auxiliary sensors for dissolved oxygen, pH, turbidity, fluorescense, PAR, and ORP can be added, and for moored deployments the 19*plus* can be set to *time-series* mode using software commands. External power and two-way real-time communication over 10,000 meters of cable can be provided with the SBE 36 CTD Deck Unit and Power and Data Interface Module (PDIM).

The 19*plus* uses the same temperature and conductivity sensors proven in 5000 SEACAT and MicroCAT instruments, and a superior new micro-machined silicon strain gauge pressure sensor developed by Druck, Inc. Improvements in design, materials, and signal acquisition techniques yield a low-cost instrument with superior performance that is also easy to use. Calibration coefficients, obtained in our computer-controlled high-accuracy calibration baths, are stored in EEPROM memory. They permit data output in ASCII engineering units (degrees C, Siemens/m, decibars, Salinity [PSU], sound velocity [m/sec], etc.). The 19*plus* can be factory-configured to emulate the .hex output format and 2 Hz data rate of old SEACATs for compatibility with existing software or instrument fleets.

Accuracy, convenience, portability, software, and support; compelling reasons why the 19*plus* is today's best low-cost CTD.

CONFIGURATION AND OPTIONS

A standard SBE 19*plus* is supplied with:
- Plastic housing for depths to 600 meters
- Strain-gauge pressure sensor
- 8 Mbyte FLASH RAM memory
- 9 D-size alkaline batteries
- Impulse glass-reinforced epoxy bulkhead connectors: 4-pin I/O, 2-pin pump, and two 6-pin (two differential auxiliary A/D inputs each)
- SBE 5M miniature pump and T-C Duct

Options include:
- Titanium housing for depths to 7000 meters
- Sensors for oxygen, pH, fluorescence, light (PAR), light transmission, and turbidity
- SBE 5T pump in place of SBE 5M for use with dissolved oxygen and/or other pumped sensors
- Stainless steel cage
- MCBH *Micro* connectors
- Ni-Cad batteries and charger


Shown with optional cage, SBE 5T pump, & SBE 43 DO sensor

SOFTWARE

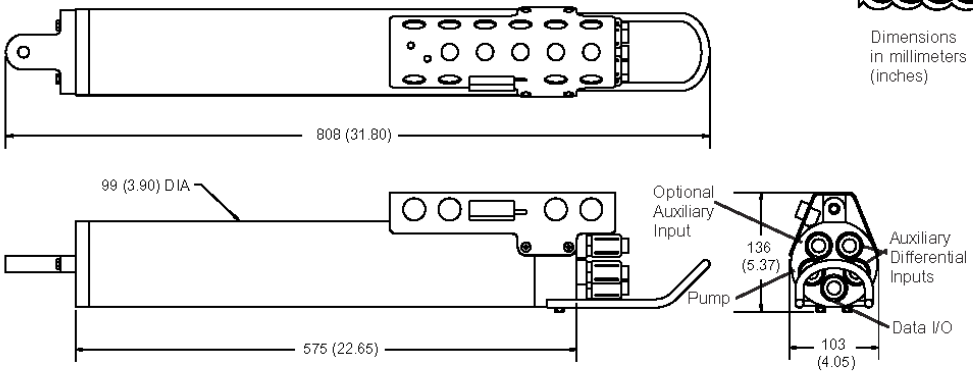
SEASOFT®-Win32, our complete Windows 95/98/NT/2000/XP software package, is included at no extra charge. Its modular programs include:
- SEATERM® — communication and data retrieval
- SEASAVE® — real-time data acquisition and display
- SBE Data Processing® — filtering, aligning, averaging, and plotting of CTD and auxiliary sensor data and derived variables

Sea-Bird Electronics, Inc.
1808 136th Place NE, Bellevue, Washington 98005 USA
Website: http://www.seabird.com
Email: seabird@seabird.com
Telephone: (425) 643-9866
Fax: (425) 643-9954

SEACAT Profiler

SBE 19*plus*

Dimensions in millimeters (inches)

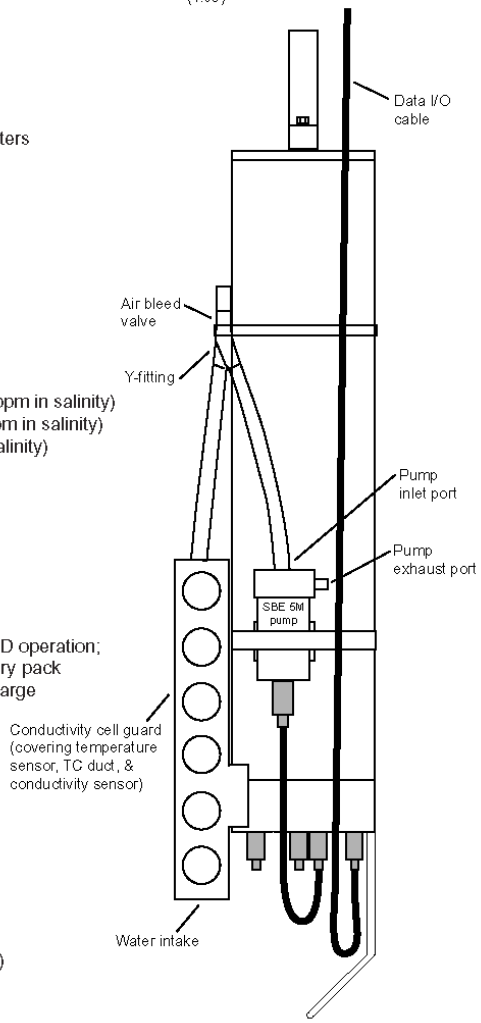


SPECIFICATIONS

Measurement Range		
Temperature	-5 to +35 °C	
Conductivity	0 to 9 S/m	
Pressure	0 to 20 / 100 / 350 / 1000 / 2000 / 3500 / 7000 meters	
Initial Accuracy		
Temperature	0.005 °C	
Conductivity	0.0005 S/m	
Pressure	0.1% of full scale range	
Typical Stability (*per month*)		
Temperature	0.0002 °C	
Conductivity	0.0003 S/m	
Pressure	0.004% of full scale range	
Resolution		
Temperature	0.0001 °C	
Conductivity	0.00005 S/m (most oceanic waters; resolves 0.4 ppm in salinity) 0.00007 S/m (high salinity waters; resolves 0.4 ppm in salinity) 0.00001 S/m (fresh waters; resolves 0.1 ppm in salinity)	
Pressure	0.002% of full scale range	
Memory	8 Mbyte non-volatile FLASH memory	
Data Storage	Recorded Parameter	Bytes/Sample
	T + C	6
	pressure	5
	each external voltage	2
Real-Time Clock	32,768 Hz TCXO accurate to ±1 minute/year	
Internal Batteries	9 alkaline D-cells provide 60 hours continuous CTD operation; optional 9-cell rechargeable nickel-cadmium battery pack provides approximately 24 hours operation per charge	
External Power Supply	9 - 28 VDC	
Power Requirements		
Sampling	65 mA	
SBE 5M pump	95 mA	
Quiescent	30 µA	
Auxiliary Voltage Sensors		
Auxiliary power out	up to 500 mA at 10.5 - 11 VDC	
A/D resolution	14 bits	
Input range	0 - 5 VDC	

Housing Materials — Depth Rating — Weight

Acetal Copolymer *Plastic* housing — 600 meter (1950 feet) — 7.3 kg (16 lbs)
3AL-2.5V *Titanium* housing — 7000 meter (22,900 feet) — 13.7 kg (30 lbs)



Sea-Bird Electronics, Inc.
1808 136th Place NE, Bellevue, Washington 98005 USA
Website: http://www.seabird.com
Email: seabird@seabird.com
Telephone: (425) 643-9866
Fax: (425) 643-9954

THALES

*The **ONLY CHOICE** for reliable measurements of sound velocity and pressure.*

Sound Velocity & Pressure Smart Sensor

The SV&P Smart Sensor is a low cost instrument designed to measure sound velocity and pressure in water. This highly adaptive sensor is ideal for integration into existing data collection platforms or OEM equipment. Connect it directly to a PC or combine it with an AML Smart View hand-held display and hand hauled profiles can be conducted in real-time. Its small size, extremely fast response time and high sampling rate make the sensor ideal for fast profiles or tow speeds.

Each sensor has internal calibration coefficients and outputs real-time data to allow a "plug and play" environment. The optional addressable features provide for daisy chaining with other sensors allowing the user to create their own system.

Sensors

SOUND VELOCITY

- Proprietary "Time of Flight" technology
- 1400 to 1550 m/s standard measuring range
- ±0.050 meters per second accuracy
- 0.015 meters per second resolution
- 145 µs response time
- Temperature compensated

PRESSURE

- Semiconductor strain gauge (temperature compensated)
- Available ranges: 0-10, 20, 50, 100, 200, 500 dbars (higher ranges available)
- ±0.05% full scale accuracy
- 0.01 dbar resolution
- 10 ms response time

Electrical

- 10 samples per second maximum
- RS-232 ASCII communications
- Optional: RS-485 or TTL
- Autobaud rates from 2,400 to 38,400 baud

Power

- 40 mA sampling current
- External 8 – 16 Vdc (12 Vdc nominal)
- Optional power configurations available upon request

Mechanical

- Weight: 575 grams in air
  180 grams in water
- Dimensions: 45.7 mm (1.80″) Ø x 368 mm (14.5″)
- Construction: Type 316 stainless sensor & plate, INVAR rods, acetal housing rated to 500 meters.
  Optional: Type 316 stainless steel housing rated to 4,500 meters.
  Optional: Titanium housing rated to 10,000 meters
- Connector: IMPULSE Miniature Wet Pluggable™ Series
- Environment: Operating: -20° to 50°C
  Storage: -40° to 60°C

Instrumentation THROUGH *Innovation*

APPLIED MICROSYSTEMS LTD

THALES

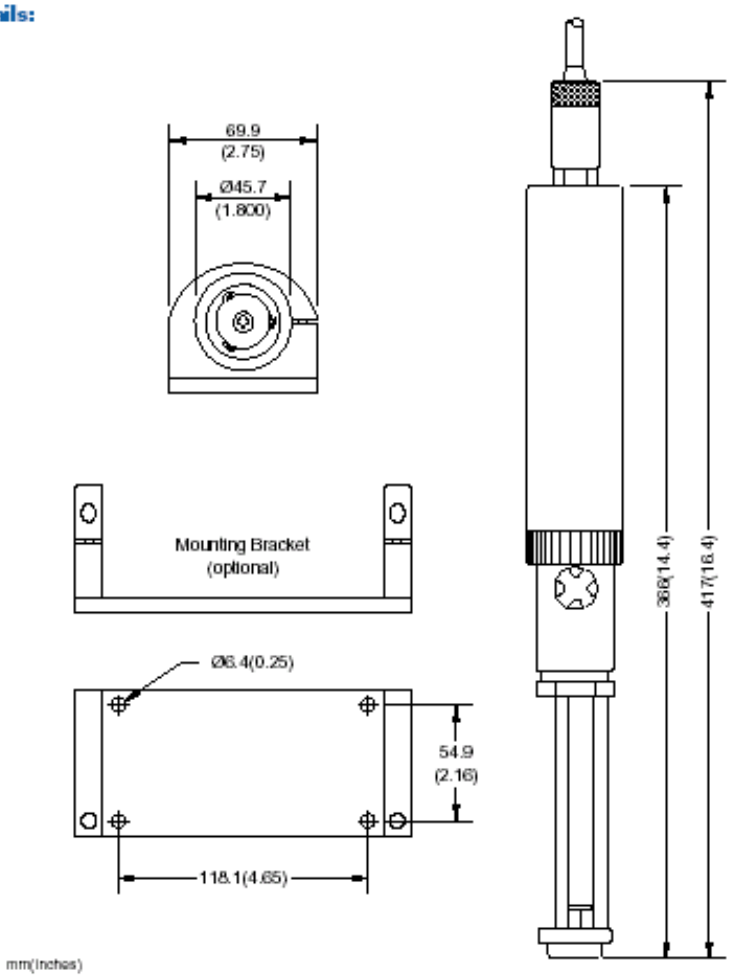
Sound Velocity & Pressure Smart Sensor

Accessories and Software

See Accessories Data Sheet for available options and software.

Smart Talk Data Logging Software is included at no charge with every sensor.

Mechanical Details:



mm(inches)

Instrumentation Through Innovation

APPLIED MICROSYSTEMS LTD

Head Office
2071 Malaview Avenue
Sidney, B.C. Canada V8L 5X6
Phone: 250 656 0771
Fax: 250 655 3655
1 800 663 8721 (Canada & USA)
info@AppliedMicrosystems.com

XBT / XSV

EXPENDABLE BATHYTHERMOGRAPH / EXPENDABLE SOUND VELOCIMETER

sippican, inc.

EXPENDABLE PROFILING SYSTEMS

Sippican expendable profiling systems offer antisubmarine warfare (ASW) specialists and oceanographers a fast, accurate, cost effective means of collecting environmental data without restricting ship operation.

GENERAL SYSTEM DESCRIPTION

A standard XBT/XSV system consists of an expendable probe, a data processing/recording system, and a launcher. An electrical connection between the probe and the processor/recorder is made when the canister containing the probe is placed within the launcher and the launcher breech door is closed. Following launch, wire dereels from the probe as it descends vertically through the water. Simultaneously, wire dereels from a spool within the probe canister, compensating for any movement of the ship and allowing the probe to freefall from the sea surface unaffected by ship motion or sea state.

The XBT/XSV system uses a sea water ground. As soon as an electrode within the nose of the expendable probe makes contact with the water, the circuit is complete and temperature or sound velocity data can be telemetered to the ship-board data processing equipment. Data are recorded and displayed in real time as the probe falls.

The nose of each expendable probe is precision-weighted and the unit spin-stabilized to assure a predictable rate of descent. From this rate of descent, probe depth is determined to an accuracy of ±2%. When the probe reaches its rated depth (a function of ship speed and the quantity of wire contained within the shipboard spool) the profile is completed and the system is ready for another launch.

EXPENDABLE BATHYTHERMOGRAPH (XBT)

Temperature profiles and computed sound velocity data obtained by the Expendable Bathythermograph (XBT) are used by ASW operators to identify the impact of temperature on sonar propagation and acoustic range prediction. The XBT also provides a quick and inexpensive means of collecting temperature data for oceanographic and geophysical studies.

The XBT contains a precision thermistor located in the nose of the probe. Changes in water temperature are recorded by changes in the resistance of the thermistor as the XBT falls through the water. The XBT is capable of temperature accuracies of ±0.1°C.

The XBT has proved to be reliable in over 30 years of use. During this time, Sippican has developed several variations of the standard probe to meet the requirements of a wide range of applications.

EXPENDABLE SOUND VELOCIMETER (XSV)

Sippican also offers an Expendable Sound Velocimeter (XSV) for the direct measurement of sound velocity. The XSV obtains accurate sound velocity profiles for the support of ASW operations, mine counter-measure operations and oceanographic research.

The XSV measures the speed of sound in water using a sing around sound velocity sensor. The XSV obtains real time sound velocity data accurate to ±0.25 meters/second at depths up to 2000 meters.

The XSV can significantly increase the accuracy of sonar propagation and acoustic range predictions, improve the accuracy of acoustic positioning systems and provide data for the study of acoustic propagation in the world's oceans. The XSV is most useful in such areas as Arctic, Mediterranean and coastal waters where high salinity variability may cause computed sound velocity data, based upon temperature profiles and assumed salinity data, to be inaccurate.

Both the XBT and XSV are available in air-launched and sub-launched configurations.

EXPENDABLE BATHYTHERMOGRAPH (XBT)

	APPLICATIONS	MAXIMUM DEPTH	RATED SHIP SPEED*	VERTICAL RESOLUTION
T-4	Standard probe used by the US Navy for ASW operations	460 m 1500 ft	30 knots	65 cm
T-5	Deep ocean scientific and military applications	1830 m 6000 ft	6 knots	65 cm
Fast Deep™	Provides maximum depth capabilities at the highest possible ship speed of any XBT	1000 m 3280 ft	20 knots	65 cm
T-6	Oceanographic applications	460 m 1500 ft	15 knots	65 cm
T-7	Increased depth for improved sonar prediction in ASW and other military applications	760 m 2500 ft	15 knots	65 cm
Deep Blue	Increased launch speed for oceanographic and naval applications	760 m 2500 ft	20 knots	65 cm
T-10	Commercial fisheries applications	200 m 660 ft	10 knots	65 cm
T-11 (Fine Structure)	High resolution for US Navy mine countermeasures and physical oceanographic applications	460 m 1500 ft	6 knots	18 cm

EXPENDABLE SOUND VELOCIMETER (XSV)

	APPLICATIONS	MAXIMUM DEPTH	RATED SHIP SPEED*	VERTICAL RESOLUTION
XSV-01	ASW application where salinity varies; Naval and civilian oceanographic and acoustic applications	850 m 2790 ft	15 knots	32 cm
XSV-02	Increased depth for improved ASW operation where salinity varies; Naval and civilian oceanographic and acoustic applications	2000 m 6560 ft	8 knots	32 cm
XSV-03	High resolution data for improved mine counter-measures and ASW operations in shallow water; geophysical survey work; commercial oil industry support	850 m 2790 ft	5 knots	10 cm

System depth accuracy: 4.6 meters or 2% of depth; whichever is larger (for XSV).
*All probes may be used at speeds above rated maximum, however there will be a proportional reduction in depth capability.
All probes are shipped 12 to a case which is constructed of weather-resistant biodegradable material. Shipping weight varies from 25 lbs. to 43 lbs. depending on probe type. Dimensions of the case vary from 17" X 14" X 16" (2.3 cu. ft.) to 17" X 14" X 19" (2.6 cu. ft.).

LAUNCHERS

Sippican launchers are available in three models. Each is compatible with all XBTs, XSVs and shipboard data processing systems.

LM-2A DECK-MOUNTED
The LM-2A is easily installed on the deck of any vessel.

LM-3A HAND-HELD
Provides portability, allows more flexibility in selecting launcher position and reduces interference with other equipment.

LM-4A THRU-HULL
The standard launcher for all military vessels. Employs the same basic assembly as the LM-2A, however, the LM-4A is installed below deck for improved safety and increased convenience under heavy weather conditions.

sippican, inc.

SEA-AIR SYSTEMS DIVISION
7 Barnabas Road, Marion, MA 02738 TEL (508) 748-1160 FAX (508) 748-3626 EMAIL sea_air@sippican.com www.sippican.com

17199 10 02

THALES

SeaBat 8111
PRODUCT SPECIFICATION
MULTIBEAM ECHOSOUNDER

- **Phase and amplitude bottom detection**
- **100 kHz frequency**
- **150° swath coverage**
- **Real-time quality control**
- **Sidescan upgradeable**
- **Modular and portable**
- **Pitch stabilization**

The SeaBat 8111 is a modular multibeam echosounder system operating at 100 kHz. When installed on a vessel, it produces high-density, high-accuracy soundings on the seafloor over a 150° swath. Major system components include a transducer array, a transceiver unit, and a processor unit.

The SeaBat 8111 transducer array is comprised of a cylindrical receive array and a linear transmitter array, mounted together on a support cradle that provides mounting points to the vessel. Lightweight and portable, the array can be installed temporarily over the side of a vessel of opportunity—a first for a system in this frequency range.

The SeaBat 8111 transceiver features plug-in cards for easy maintenance and is controlled from the sonar processor.

The Seabat 8111 processor is compatible with other SeaBat sonar heads, can be updated in minutes to accommodate future requirements, and features a user-friendly point-and-click interface.

RESON
www.reson.com

RESON A/S
Denmark
Ph: + 45 47 38 00 22
Fax: + 45 47 38 00 66
email: reson@reson.dk

RESON Inc.
USA
Ph: + 1 805 964 6260
Fax: + 1 805 964 7537
email: sales@reson.com

RESON Offshore Ltd.
UK
Ph: + 44 1224 709 900
Fax: + 44 1224 709 910
email: sales@reson.co.uk

RESON GmbH
Germany
Ph: + 49 431 720 7180
Fax: +49 431 720 7181
email: reson@reson-gmbh.de

RESON SA (PTY) LTD
South Africa
Ph: + 27 21 786 3420
Fax: +27 21 786 3462
email: reson@reson.co.za

RESON-Telenav
Singapore
Ph: + 65 6 872 0863
Fax: +65 6 872 1334
email: telenav@mbox2.singnet.com.sg

THALES

SeaBat 8111 SYSTEM SPECIFICATIONS

SYSTEM PERFORMANCE

Frequency:	100 kHz
Range Resolution:	3.7 cm
Swath Coverage:	150º
Range:	3m to 1200m (with Option 040)
Number of Beams:	101
Along-Track Beamwidth:	1.5º 3.0º 4.5º 6.0º*
Across-Track Beamwidth:	1.5º
Stabilization:	Pitch stabilization within +/-15º
Projector Beam Control:	External motion sensor required
Accuracy:	IHO Compliant
Operational Speed:	Up to 20 knots
Max. Update Rate:	35 Hz
Transducer Pressure Rating:	100m

*operator selectable

INTERFACE

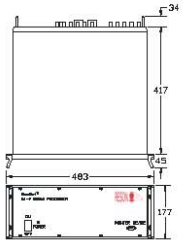
System Supply:	90 to 260VAC, 50/60 Hz, 200W max.
Video Display:	SVGA, 800 x 600, 72 Hz
System Control:	Trackball or from Ethernet
Data Output:	10 MB Ethernet or serial RS232C
Data Uplink:	High-speed digital coax with fiber-optic option
Temperature:	Operating: 0° to +40° C Storage: -30° to +55° C

RELATED PRODUCTS

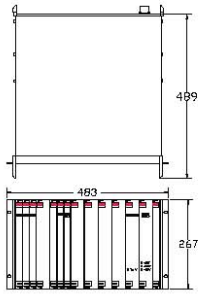
- Option 040 Extended range capabilities
- Option 033 Sidescan upgrade
- Option 051 24DC power supply for SeaBat 81-P Processor

MECHANICAL INTERFACE

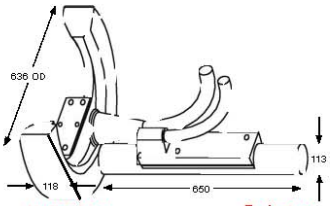
Dimensions (in mm):	
Transducer Array:	
Hydrophone:	636 x 118 (Dia./Length)
Projector:	113 x 650 (Dia./Length)
Processor:	177 x 483 x 417
Transceiver:	267 x 483 x 489
Weight:	
Transducer Array:	72 kg (dry) / 59 kg (wet) with cables
Processor:	20 kg
Transceiver:	13.6 kg
Cable Length:	15m



Processor



Transceiver



Transducer Array

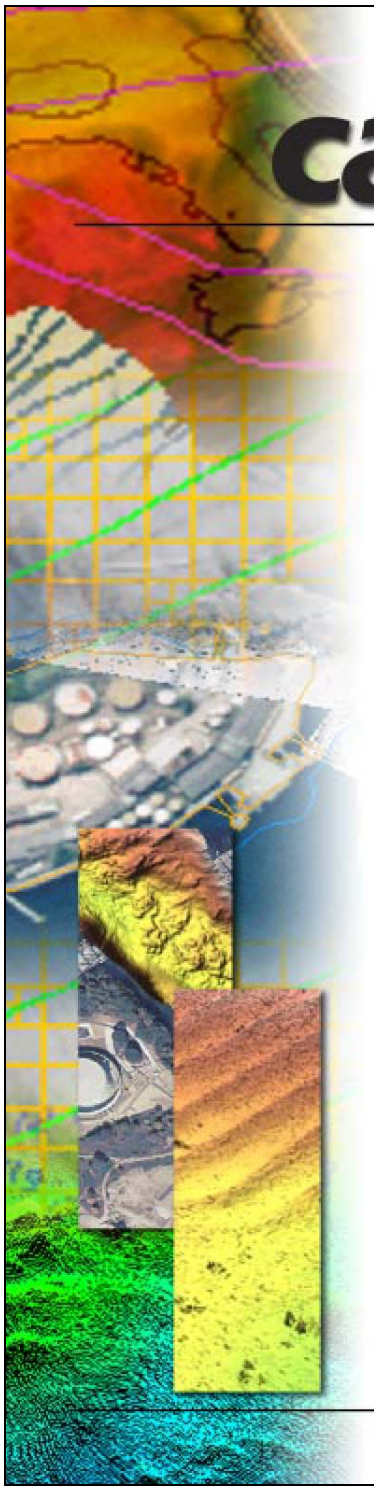
SEAFLOOR COVERAGE

(with Extended Range option)

Bottom Depth (meters)	Swath Width (meters)
5 to 150	Up to 1110 (7.4 x water depth)
300	960 (3.2 x water depth)
450	810 (1.8 x water depth)
600	600 (1.0 x water depth)
750	450 (0.6 x water depth)
900	360 (0.4 x water depth)

RESON

Version: B006 030205



caris®

Bathymetric and Sonar Data Processing and Production

CARIS HIPS & CARIS SIPS

Hydrography. Cable and Pipeline Routing. Minecountermeasures. Side Scan search and recovery. Geophysical Exploration. Management of Fisheries. No matter what the application, the reliability and usability of your cleaned bathymetric and side scan sonar survey data is critical.

Based on its reputation for rigorous and proven algorithms, CARIS HIPS, for processing large bathymetric datasets, and CARIS SIPS, for processing side scan sonar imagery and multibeam backscatter data, have been selected number one among marine and hydrographic specialists for over 10 years.

PURPOSE-BUILT PROCESSING

Area and line based cleaning, 3D visualization, integrated sensor cleaning tools. These are but a few of the features that clearly suggest one thing: CARIS HIPS and CARIS SIPS are purpose-built processing and production systems.

INFORMATION YOU CAN USE

Tiling, contours, depth areas, shoal-biased sounding selection and an interactive dynamic profile are among the multitude of outputs that can be generated from your clean bathymetry and sonar data. Bottom line, CARIS software turns your survey data into information you can use.

ENGINEERED TO WORK TOGETHER

CARIS software systems are engineered to work together. CARIS HIPS and CARIS SIPS are standalone systems but are also capable of operating in unison offering the functionality and format support allowing you to take your clean data further.

BUILT TO GROW ON

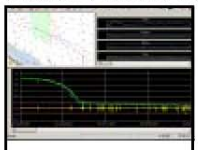
Open an S-57 ENC file and display the data with other data types such as BSB, HCRF, and GeoTIFF as well as vector CARIS map data. Regardless of your current workflow, CARIS HIPS and CARIS SIPS are built to grow on.

CARIS HIPS and CARIS SIPS are backed by training from subject matter experts, assistance in data production flowline implementation, and by knowledgeable and responsive support personnel.

Review the suite of CARIS HIPS and CARIS SIPS products described on the reverse side and contact CARIS today about a solution that is right for you.

turning data into information

CARIS HIPS & CARIS SIPS Product Suite

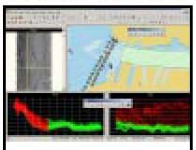


HIPS Singlebeam

Supported Formats:
- Hypack, Winfrog
- Generic ASCII Data

Data Cleaning:
- Interactive singlebeam depth cleaning
- Automatic singlebeam spike filters

Data Processing:
- Apply tides / zoning
- Apply SV corrections

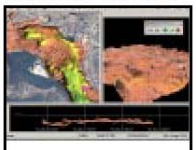


HIPS Multibeam Lite

Supported Formats:
- *HIPS Singlebeam, PLUS*
- Atlas, Furuno, GSF, LADS, Seabeam / Elac, SeaFalcon, Simrad, UNB, XTF

Data Cleaning:
- *HIPS Singlebeam, PLUS*
- Interactive swath cleaning
- Automatic swath filters
- Refraction repair
- Integrated side scan display

Data Processing:
- Apply tides / zoning
- Apply SV corrections

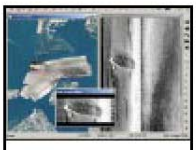


HIPS Multibeam Professional

Supported Formats:
- *same as HIPS Multibeam Lite*

Data Cleaning:
- *HIPS Multibeam Lite, PLUS*
- 3D subset area cleaning
- Statistical surface cleaning

Data Processing:
- *HIPS Multibeam Lite, PLUS*
- Weighted gridding

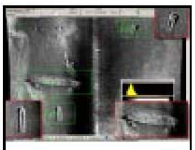


SIPS Lite

Supported Formats:
- Cmax, Coda, EdgeTech, GSF, MarineSonics, Qmips, Segy, XTF
- Generic ASCII Data

Data Cleaning:
- Side Scan viewing and cleaning
- Digitize towfish altitude

Data Processing:
- Re-compute towfish navigation
- Slant range correction
- Mosaic



SIPS Professional

Supported Formats:
- *same as SIPS Lite*

Data Cleaning:
- *same as SIPS Lite*

Data Processing:
- *SIPS Lite, PLUS*
- Generate side scan contacts database

HIPS & SIPS Common

Data Tools:
- Vessel configuration
- Tide / Svp preparation
- Attitude / Navigation cleaning
- GPS RTK Tide
- Background displays (CARIS, S-57, BSB, HCRF, TIF...)

Mapping Tools:
- Variable depth tiling
- Sounding selection
- Contouring
- Plotting

For more information on CARIS HIPS and CARIS SIPS contact:

CARIS
264 Rookwood Avenue
Fredericton, New Brunswick
E3B 2M2 Canada
Tel +1.506.458.8533
Fax +1.506.459.3849
info@caris.com
www.caris.com

CARIS BV
Mgr. van Oorschotstraat 13
PO Box 47 5473 ZG
Heeswijk The Netherlands
Tel +31.413.296010
Fax +31.413.296012
sales@caris.nl
www.caris.nl

CARIS USA
11750 Frederick Road
Ellicott City, MD
21042 USA
Tel +1.410.531.5129
Fax +1.410.531.5759
info@caris.com
www.caris.com

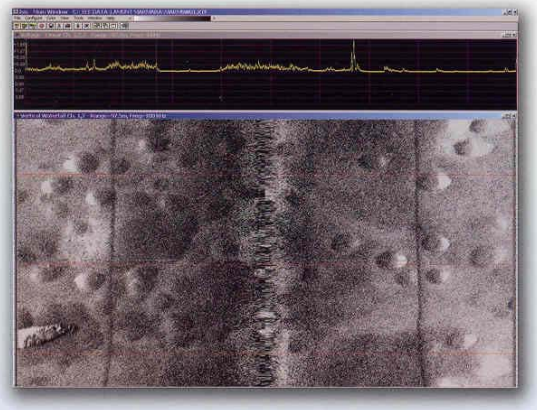
caris® marine
www.caris.com

THALES

Isis Sonar

Sidescan Sonar Aquisition and Processing

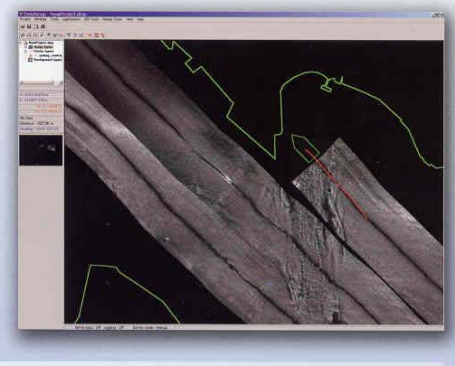
Integration | Acquisition | Processing | Mapping & Analysis



TEI Isis® Sonar continues to be the most advanced sidescan sonar acquisition system available today. Isis Sonar is the tool of choice for a variety of applications including: mine-hunting, hydrography, archeology, environmental studies, oilfield engineering, civil engineering, oceanography, and law enforcement.

Quality Control

Isis Sonar typically displays a waterfall display of the sonar data, a signal window, and a survey parameter screen. Isis Sonar produces a real-time mosaic which greatly increases survey productivity. The mosaic is created in TEI Delph® Map as the survey proceeds, allowing the operator to alter the survey plan to ensure full coverage or gather more data on a feature of interest. Surveying is made easier with the possibility of setting different types of alarms.



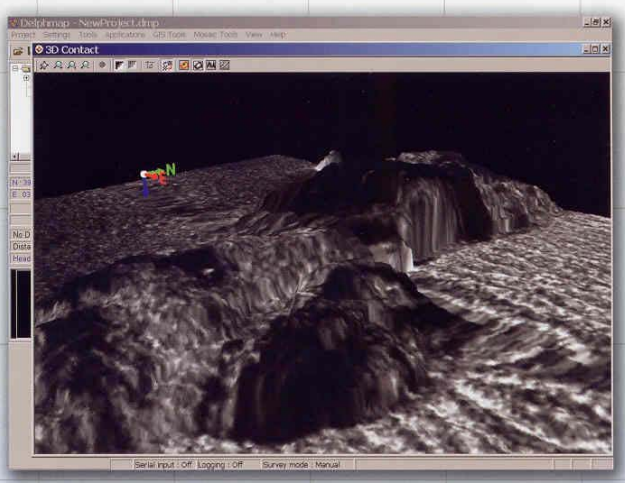
Wide Compatibility

Isis Sonar can be smoothly integrated to any sidescan sonar available today. It performs accurate data logging for both analog and digital sonars from: Edgetech, Klein, Benthos, and many others. Isis Sonar can be delivered with a special rugged workstation designed to withstand the rigors of offshore work.

Accurate Data Acquisition

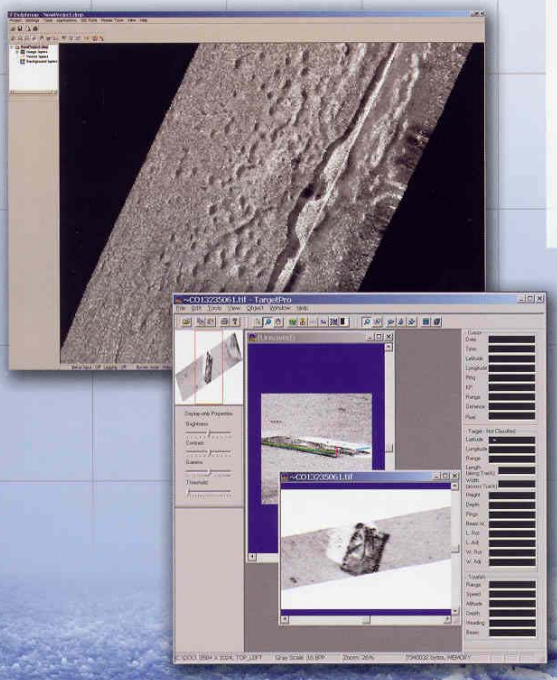
The quality of the sonar imagery is ensured by TEI's experience in system integration. Isis Sonar is delivered with a custom interface to each sonar model. Isis Sonar can also simultaneously acquire data from additional sensors including magnetometers, sub-bottom profilers, and gravity meters. Isis Sonar's mosaic processing options are the most extensive available with an emphasis on rigorous data geo-referencing.

Isis Sonar



Rich Features

Isis Sonar rigorously integrates external sensors including GPS & gyros, and correctly logs & geo-references sonar imagery. Isis Sonar stores sonar data in TEI's open XTF (eXtended Triton Format), an industry standard. Isis Sonar may also be used in conjunction with a short baseline acoustic positioning system to more accurately determine the exact position of the towfish. The ability to take into account the towfish layback is a standard feature. It is possible to view 3D sidescan draped over bathymetry in Delph Map.



Continuous R & D

Isis Sonar is also the result of a long-term effort conducted in cooperation with TEI customers, the most advanced sidescan sonar users in the world. It incorporates innumerable improvements based on their expert feedback and exacting requirements. As a result, Isis Sonar offers a depth of features unmatched by any other sidescan acquisition and processing system.

Object Database

Isis Sonar can be augmented with TEI Target Pro which creates a database of images of submerged objects, and allows measurement of each object directly on the sonar image.

Isis Sonar is the standard search and recovery system of the US Navy, NOAA, and many other US government agencies. A demonstration version can be downloaded from www.tritonelics.com.

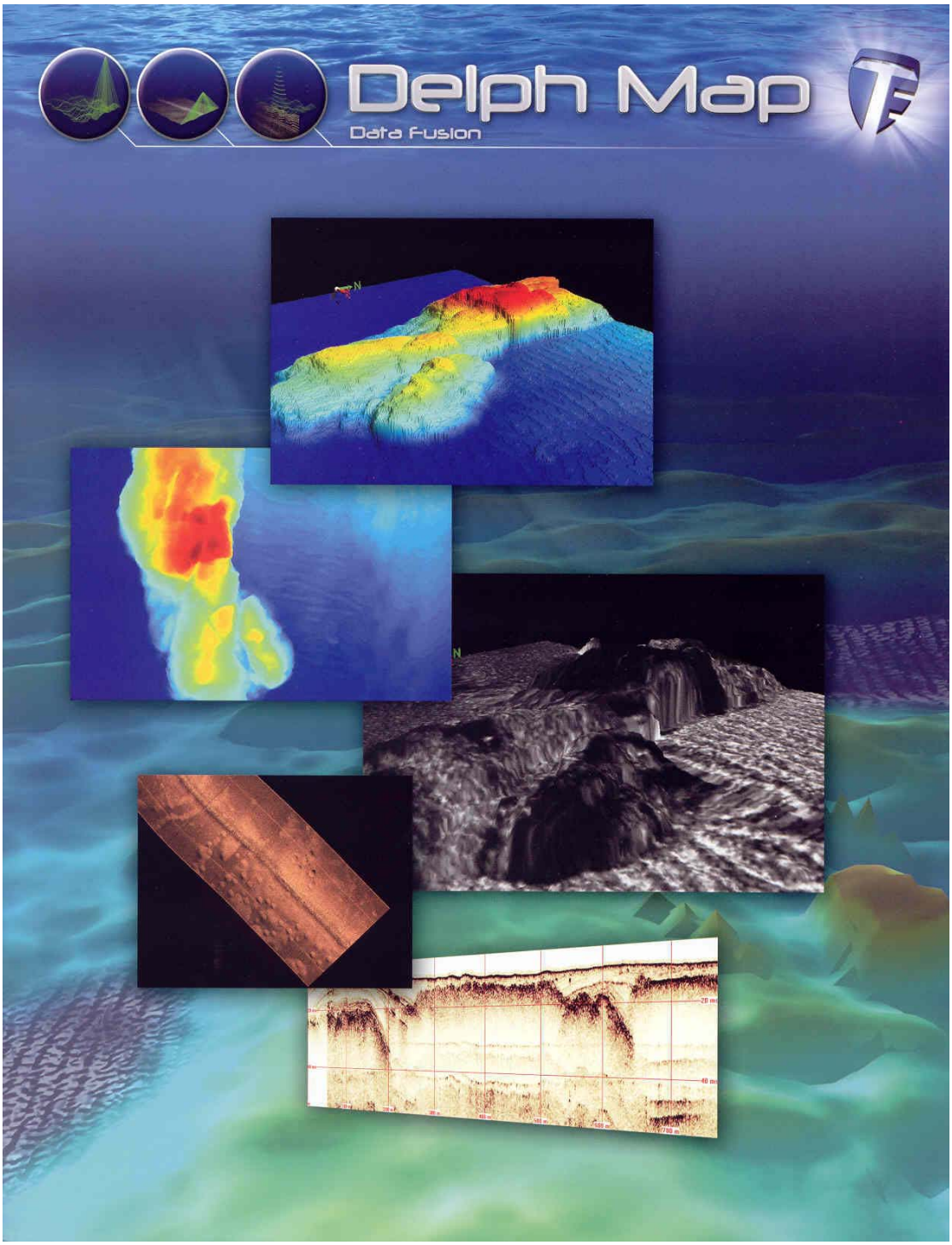
Triton Elics International

TEI Headquarters
125 Westridge Drive
Watsonville, California 95076 USA
Tel. ++(1) 831 722-7373
Fax ++(1) 831 722-1405
www.tritonelics.com

TEI USA East Coast
1064 Gardner Road, Suite 101
Charleston, South Carolina 29407 USA
Tel. ++(1) 843 571-5956
Fax ++(1) 843 571-6992

TEI Europe
112, Rue Brancion
75015 Paris, France
Tel. ++(33) 1 44 19 65 80
Fax ++(33) 1 44 19 65 89

THALES



Data Fusion

All data acquired and processed by TEI acquisition and processing modules can be displayed in Delph® Map; this includes sidescan data from Isis® Sonar, multibeam data from Isis® Bathy and Bathy Pro™, and sub-bottom and shallow seismic data from Delph® Seismic+Plus. Delph Map displays and allows manipulation of the following types of raster data sets: bathymetry DTMs, sidescan sonar mosaics, sub-bottom profiles, seismic sections, GPR profiles, and gridded surfaces from magnetometers and gravity meters. Various display modes and definable color palettes are available to maximize the usefulness of raster imagery. Computing the difference between two maps produced at a time interval is possible for bathymetry DTMs with the Volume Computation tool and forsidescan sonar mosaics with the A-B tool. Delph Map imports raster images as background information, such as GeoTIFF files (e.g., satellite imagery, scanned navigation charts) and C-MAP electronic navigation charts.

Vector Objects

Vector information can be imported into Delph Map in a variety of formats including DXF, SHP, and CLA. Contacts saved during playback and analysis of raw sonar data may also be imported and displayed as vector objects (symbols) laid-over raster imagery. Other vector objects that may be displayed include iso-contours, boundaries of seabed types (e.g., as identified by TEI's SeaClass™ bottom classification module), depth soundings, and navigation hazards.

Delph Map offers full digitizing capabilities. Operators may draw directly on the screen to highlight areas and objects of interest. All on-screen interpretations are stored as vector objects exportable to other software packages in DXF format. Profiles may be extracted across a given region of the survey area, with all layers (surface and subsurface) associated with that region displayed in the profile window. Position and depth information associated with the profile may be exported as an ASCII file for reporting and analysis purposes.

Specialized Tools

A number of tools in Delph Map are designed to minimize interpretation time for a data set. The tools include: automated pipeline tracking and span detection, automated object detection, automated digitization, and automated object measurement. Databases are created with each of these tools, which may be exported as ASCII files for reports or manipulated to modify the results of the automated interpretations.

Data Analysis

Delph Map allows 3D analysis of data layers in two different ways. The first involves creation of a full resolution 3D model through selection of a point on the mosaic or DTM. The second involves selecting an area to analyze and then viewing all data files composing that area in a 3D perspective window. Both methods allow free rotation of the data for better viewing and interpretation. An example is draping a mosaic over a DTM to analyze texture information relative to relief.

Survey Planning & Operations Monitoring

Delph Map offers full survey planning and control through its Delph® Nav option. Survey lines may be imported into or created within Delph Map, and vessel position relative to these lines may be monitored in real-time. An option exists for ROV monitoring and simulation against a geo-referenced background layer (e.g., mosaic or DTM) with the ROV Flight module. The same function is available for tracking the position of a dredge's cutting head in TEI Nessie Dredge.

Printing

Any Windows-supported printer or plotter can be used to create hard copies of imagery and maps displayed in Delph Map, with the direction of printing controlled by the operator.

All images displayed in Delph Map can be exported as TIFF, GeoTIFF or DXF (AutoCad) files.

Triton Elics International

TEI Headquarters
125 Westridge Drive
Watsonville, California 95076 USA
Tel. ++(1) 831 722-7373
Fax ++(1) 831 722-1405
www.tritonelics.com

TEI USA East Coast
1064 Gardner Road, Suite 101
Charleston, South Carolina 29407 USA
Tel. ++(1) 843 571-5956
Fax ++(1) 843 571-6992

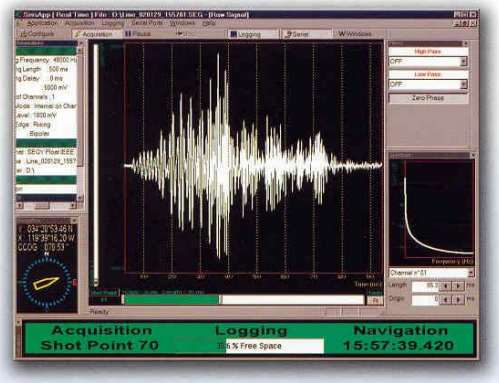
TEI Europe
112, Rue Brancion
75015 Paris, France
Tel. ++(33) 1 44 19 65 80
Fax ++(33) 1 44 19 65 89

THALES

Delph Seismic+Plus

Next Generation Logging and Processing

Integration | Acquisition | Processing | Mapping & Analysis

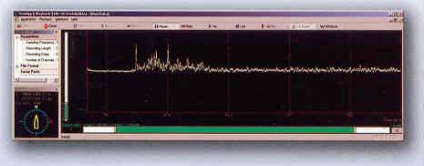


TEI's new data acquisition and processing system is the result of 12 years of experience in accurately logging data from shallow seismic systems and sub-bottom profilers.

The acquisition and the processing functions are increasingly performed by different teams aboard survey vessels. Delph® Seismic+Plus reflects this structure by providing a data logger that creates a SEG-Y file, -and- a full-featured processing module that may run on the same computer or on a remote computer connected to a network.

Top Priority: Online Quality Control

Recording prime quality data can be a challenge, especially when simultaneously supervising several pieces of equipment. Delph Seismic+Plus' data logger features an easy-to-read display with warning messages, color-coded (Green, Yellow or Red background) to indicate the nature and severity of the warning.



Data Input Status

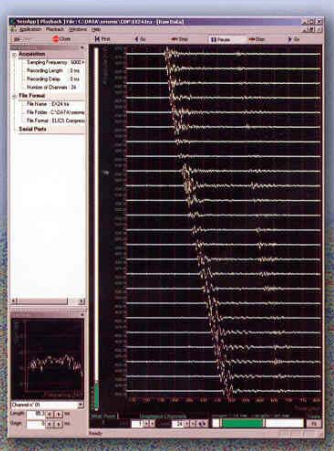
- Status indicating either the system is acquiring data (or not)
- Automatic detection and warning display of data clipping
- Automatic detection of low level signal

Navigation/Ancillary Sensors Status

- Status indicating that the input is active (or not)
- User-defined time-out warning

Logging Status

- Logging proceeding (or not)
- File size display
- Available space remaining
- Automatic line switching based on file size, number of shots
- Data logging in SEG-Y format, 32-bit floating point, when 24-bit data are acquired.



Process and Workflow

Different users with different tasks may access the same file from different locations. A typical scenario consists of a client's representative performing quality control and processing on selected portions of a data set while a geophysicist processes and interprets the data.

THALES

Delph Seismic+Plus

High Quality Acquisition for Analog Systems

The use of a 24 bits A/D converter simplifies data acquisition when using sparkers, boomers, and air guns, and maintains an extremely high dynamic range for digitized data. This sigma/delta converter also performs anti-aliasing, which improves data quality.

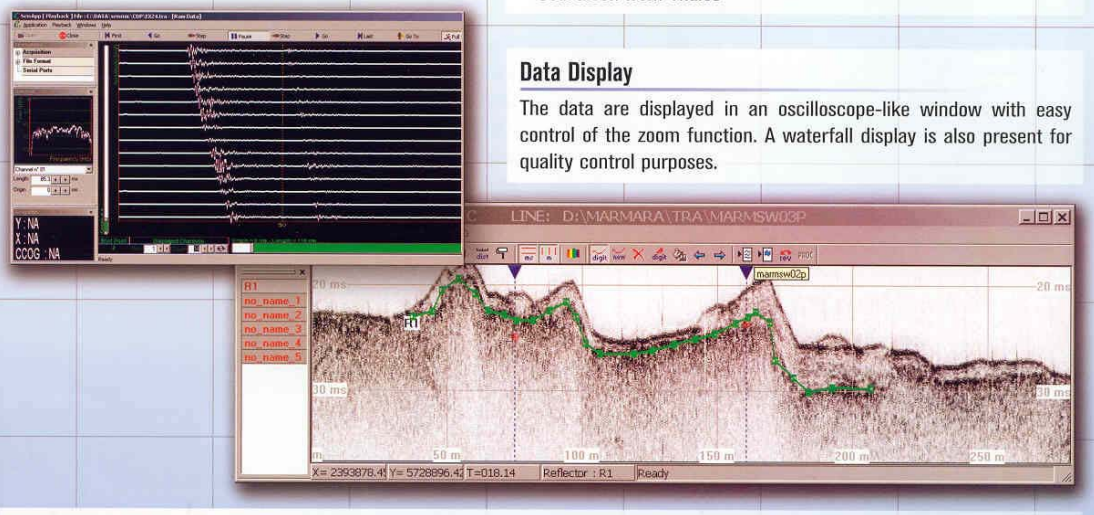
Dedicated Interface

The logging system connects with existing devices through a dedicated purpose-built interface; a single interface will not require any selection. The set-up parameters are specific to each device. Interfaces available for sub-bottom profilers include:

- Chirp II from Benthos
- FSSB from Edgetech
- SeaFalcon from Thales

Data Display

The data are displayed in an oscilloscope-like window with easy control of the zoom function. A waterfall display is also present for quality control purposes.



Advanced Processing

Delph Seismic+Plus reads the file being recorded and performs digital signal processing such as band pass filters, adaptive gain control, and bottom detection and finally geo-references the data.

The geo-referencing occurs in near real-time. After a maximum delay of 10 pings, the data are displayed in profile view with a user-defined zoom on the vertical and horizontal axes. In this geo-referenced form, true slope measurements are possible. The profile is corrected for depth in the case of a deep-tow system.

A one-dimension migration algorithm is included. This algorithm can be applied on the grid data to remove edge artifacts and to convert the data from a time series to a depth series.

The fully processed data can be displayed in two ways: at a fixed scale with the data slowly scrolling in the window or- at a dynamic scale where the full recorded line is displayed.

Triton Elics International

TEI Headquarters
125 Westridge Drive
Watsonville, California 95076 USA
Tel. ++(1) 831 722-7373
Fax ++(1) 831 722-1405
www.tritonelics.com

TEI USA East Coast
1064 Gardner Road, Suite 101
Charleston, South Carolina 29407 USA
Tel. ++(1) 843 571-5956
Fax ++(1) 843 571-6992

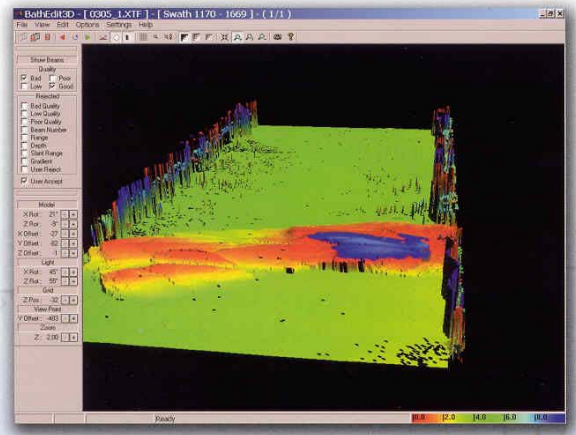
TEI Europe
112, Rue Brancion
75015 Paris, France
Tel. ++(33) 1 44 19 65 80
Fax ++(33) 1 44 19 65 89

THALES

Bathy Pro

Advanced Bathymetry Processing

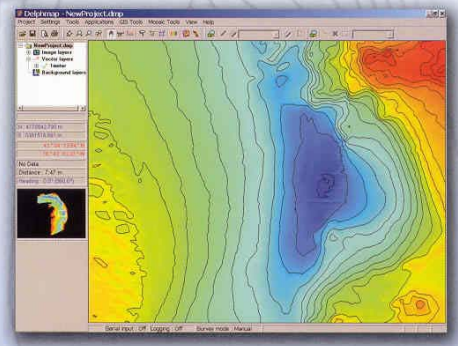
Integration | Acquisition | **Processing** | Mapping & Analysis

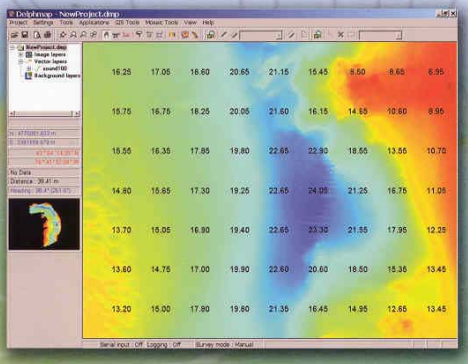


TEI Bathy Pro™ is a powerful solution designed for the challenges of modern bathymetry data processing. Bathy Pro offers the flexibility of producing grid, contour and sounding files to any user defined specification while keeping the processing-to-collection ratio to a minimum. It is the result of years cooperation with hydrographers and surveyors working in a variety of operations.

Automatic Processing

In automatic mode, the operator chooses processing parameters to be used to edit the data, and tags unacceptable data points. The resulting data set, the grid, sounding or contour file, use only the soundings that meet a minimum quality level. Bathy Pro's automatic processing is very fast: 1 million soundings can be processed in a matter of minutes. A typical eight hour survey day can be processed in under one hour.



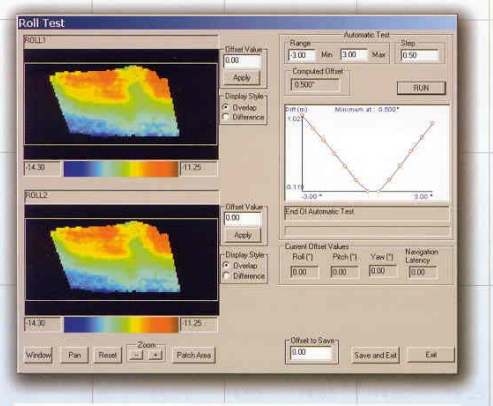


Interactive Bathymetry Processing

Bathy Pro gives the operator control over processing. Bathymetry data can be processed interactively or automatically: processed in batch modes for multiple line files, or for a specific selection of a line's segment. In interactive mode, the operator can review each sounding point and data from vessel motion for data anomalies. This process allows for each swath to be viewed, compared and analyzed. Filters can be set to flag data points that do not fit user-defined criteria.

THALES

Bathy Pro

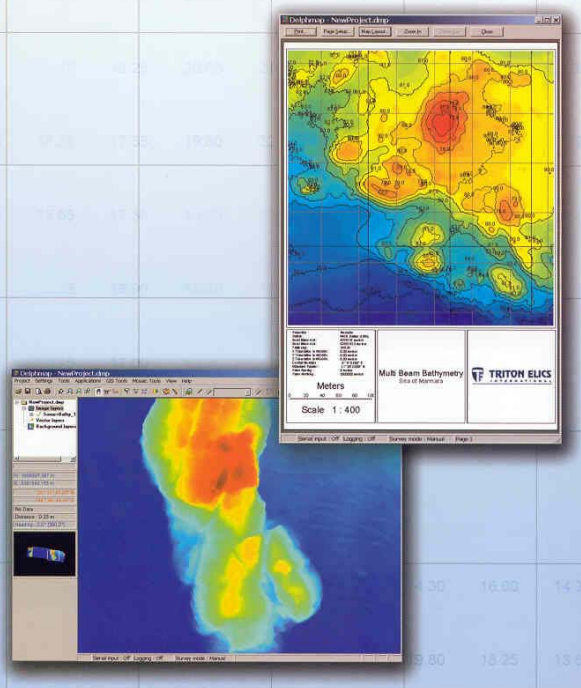


Manual Processing on a 3D Map

Bathy Pro now delivers ultimate control in manual editing with editing on a 3D representation of the raw data. With the ability to rotate the data and illuminate the model, subtle artifacts become visible. Any dubious points can be flagged in this view. The operator may select single points or entire areas with the mouse, query the data for information, and eliminate points from the final data set. Automated processing will re-compute surrounding areas, and rebuild the contours, sounding charts, and grid files.

Calibration & Patch Test

Bathy Pro includes an advanced tool for determining offsets to compensate for biases and latencies present in an integrated multibeam system. The patch test will automatically compute optimal offset values from a set of overlapping survey lines using either bathymetry or (for greater accuracy) sidescan data, if available.



Processing Options

When processing data, the raw file remains unmodified throughout, allowing for re-processing with different parameters. A database is built for those selected points that have been flagged during the processing routine, allowing for quick access for re-evaluating those suspected points. The many filters that can be implemented include the following:

- Beam Quality
- Angle from vertical
- Beam number
- Depth Range
- Gradient
- Slant range

Special Maps

After building a DTM, Bathy Pro can compute iso-contours or produce a traditional soundings chart. Volume computations are also available. The operator has full control over the parameters to produce any type of map.

Triton Elics International

TEI Headquarters
125 Westridge Drive
Watsonville, California 95076 USA
Tel. ++(1) 831 722-7373
Fax ++(1) 831 722-1405
www.tritonelics.com

TEI USA East Coast
1064 Gardner Road, Suite 101
Charleston, South Carolina 29407 USA
Tel. ++(1) 843 571-5956
Fax ++(1) 843 571-6992

TEI Europe
112, Rue Brancion
75015 Paris, France
Tel. ++(33) 1 44 19 65 80
Fax ++(33) 1 44 19 65 89

APPENDIX D : MULTIBEAM LINE LOG EXAMPLE

THALES

TGPI Project # : 100904 — Multibeam Log : 3A201-00000

PROJECT INFORMATION

Client :	*NMFS*		
Project :	*Hydrographic Survey*	Location :	*Albatross Bank, Alaska*

GEODETICS

Horizontal Datum :	*WGS84*	Projection :	*UTM*
Vertical Datum :	*MLLW*	Zone / Units :	*5N / Meters*

EQUIPMENT

Vessel :	*R/V Davidson*	Positioning :	*POS/MV with USCG DGPS Station*
Sounder :	*RESON 8111*	Timing Source :	*POS/MV*
Motion Reference :	*POS/MV*	Multibeam Acquisition System :	*Triton ISIS (ver6.24)*

SURVEY DATA — Survey Crew : *DA, DL* — Vessel Crew : — Logged By : *DA*

Line Name :	*3A201-00000*
XTF File Name :	*3A201-00000*
POS/MV File Name :	*2003-213-0000*
WFrog RAW File Name :	
Weather / SeaState :	*Clear/Night / 1-2m Seas*
Depressors :	*N/A*

Date :	*1-Aug-03*
Julian Day :	*2003-213*
Heading :	*176.0°*
Length of Line :	*~10.00 Km*
DGPS Station ID :	*KODIAK*
Max Ping Rate / Sec :	*10.0*

TIME	RPM	SPEED	HDOP	POWER	RANGE	GAIN	PULSE	COMMENT
13:15:05	0	8.3	1.7	14	175	8	60	SOL
13:24:12	0	8.3	1.7	14	150	8	60	
14:24:43	0	7.6	1.7	14	1250	8	60	EOL

Comments :

LINE QUALITY ☑ GOOD ☐ BAD

PROCESSING

Project :	*100904*		
Date :	*2003-213*	ISIS TIMING	☐
Convert :	AM	POS/MV TIMING	☑

Draft File :		☐ LOADED
SVP File :	3A101.1SVP	☑ LOADED
Tide File :	ABank.tid	☐ LOADED

LINE EDIT:

GHPR :	AM	☑ Delayed Heave	Comments :
Nav :	AM	Comments :	
Draft :		Comments :	
Bathy :	AM	Settings File :	

Comments:

Additional Filters

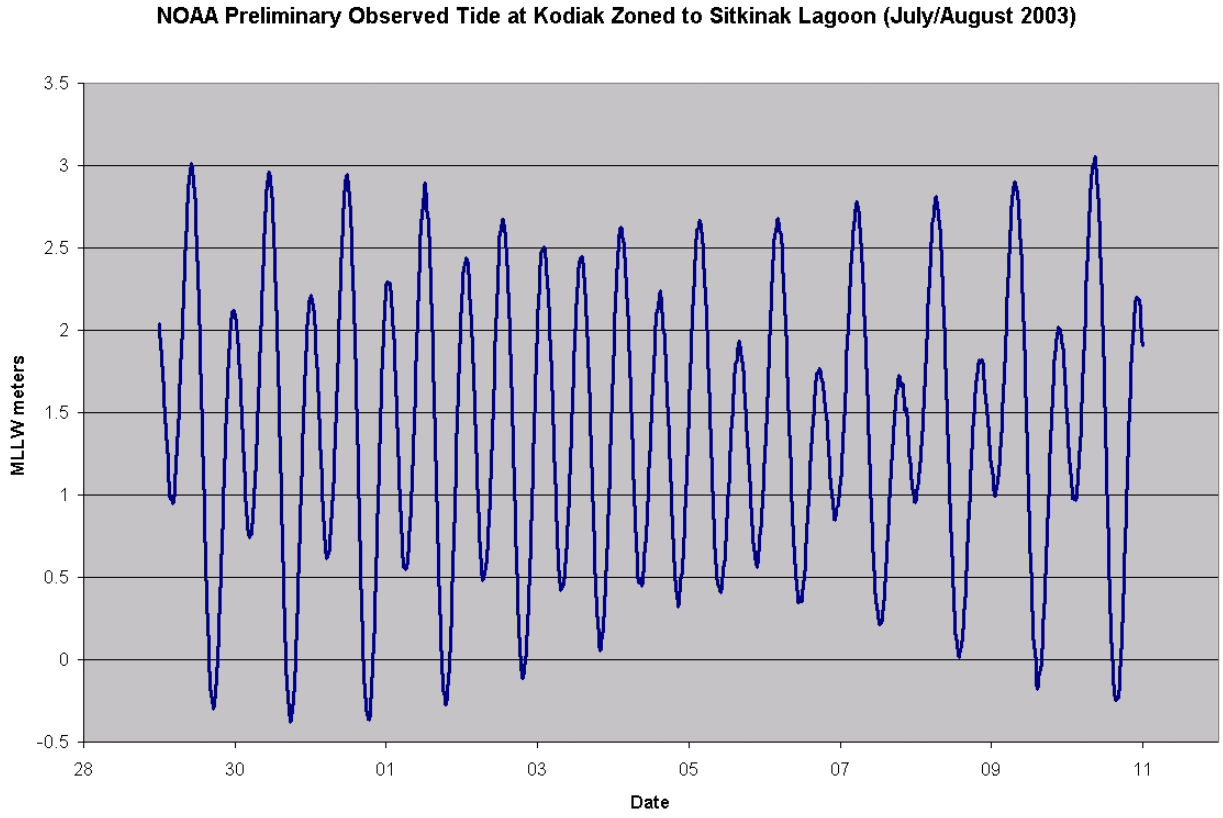
Depth	Beams :	
	Min :	
	Max :	
Nadir	Port :	65
	Stbd :	65
	RF :	0,1,2

Merge : ASK

LINE QUALITY ☑ GOOD ☐ BAD

THALES

APPENDIX E : TIDAL DATA SUMMARY


NOAA Preliminary Observed Tide at Kodiak Zoned to Sitkinak Lagoon (July/August 2003)
MLLW meters
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
28
30
01
03
05
07
09
11
Date

APPENDIX F : PATCH TEST ACQUISITION PROCEDURES

THALES

PATCH TEST PROCEDURES

RECOMMENDED METHOD: *Using A Point Target*

A patch test over a point target can be completed by running as few as 5 lines.

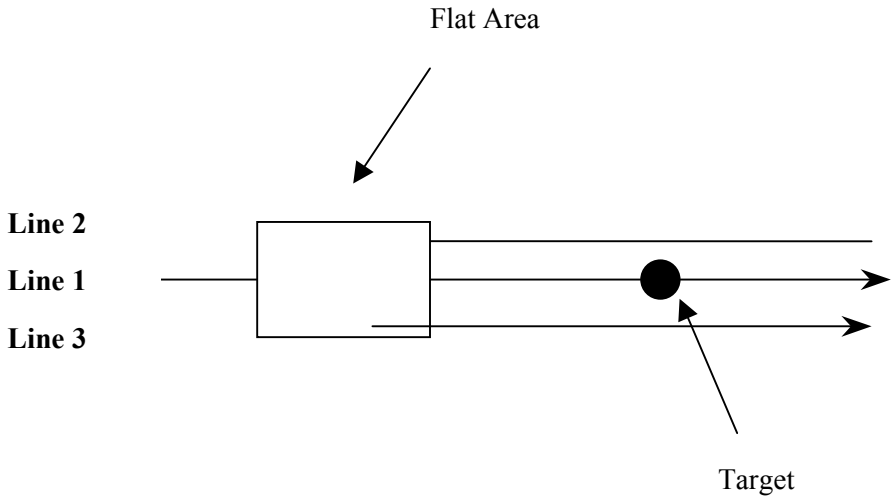
Four of these lines should be run at a slow survey speed to increase sounding density and reduce noise. They need to be run only fast enough to maintain good steerage.

The fifth line, (listed below as Run 3), should be run as fast as practical while still maintaining good data quality. This line is used to calibrate the Navigation (time) latency and will be compared with one of the slower lines. The greater the difference in velocity between the two lines, the more accurate the calibration.

All lines should be run along the same azimuth. Perpendicular lines are not required or desirable.

There are three lines, the center line is run three times, directly over the target. The lines should be run as follows:

Run	Line	Direction	RPM
1	1	Right	Low
2	1	Left	Low
3	1	Right	High
4	2	Left	Low
5	3	Right	Low



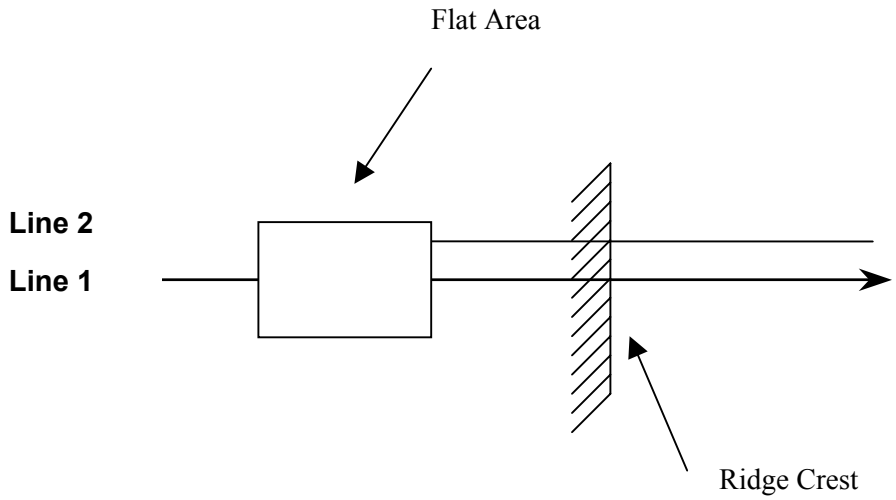
The distance between lines, should be equal to the water depth. If the survey vessel is crabbing, the line spacing must be adjusted to ensure the swaths from Runs 4 & 5 overlap at 45 degrees from nadir.

The runs will be processed as follows.

Calibration	Runs	
Navigation	1	3
Pitch	1	2
Azimuth	4	5
Roll	1	2

ALTERNATIVE METHOD 1: *Using A Ridge As A Target*

A linear target such as a small ridge, dredge cut, or sand ripples can be used in place of a point target. In this case, only 4 lines need to be run. They are all run perpendicular to the ridge or ripple crests.



There are two lines, Line 1 is run three times. The lines should be run as follows:

Run	Line	Direction	RPM
1	1	Right	Low
2	1	Left	Low
3	1	Right	High
4	2	Left	Low

The distance between Lines 1 and 2 should be equal to twice the water depth. If the survey vessel is crabbing, the line spacing must be adjusted to ensure the swaths from Runs 1 and 4 overlap at 45 degrees from nadir.

The runs will be processed as follows.

Calibration	Runs	
Navigation	1	3
Pitch	1	2
Azimuth	1	4
Roll	1	2

ALTERNATIVE METHOD 2: *Individual Line Pairs*

Most documents pertaining to multibeam patch tests suggest that a pair of lines be run for each of the four calibrations. This is generally unnecessary for data quality, takes additional boat time, and takes longer to process than the above techniques. Individual line pairs should be used only if mandated in the contract, or required by local conditions.

Line patterns for each of the four calibrations follow.

NAVIGATION

Line 1

Target

PITCH

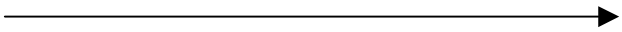
Line 2

Target

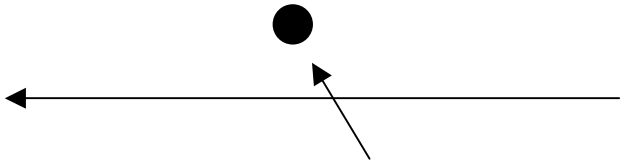
AZIMUTH (YAW)

- *Point Target*.
  The distance from the line to the target should be equal to the water depth. The Distance between lines should be twice the water depth.

Line 3

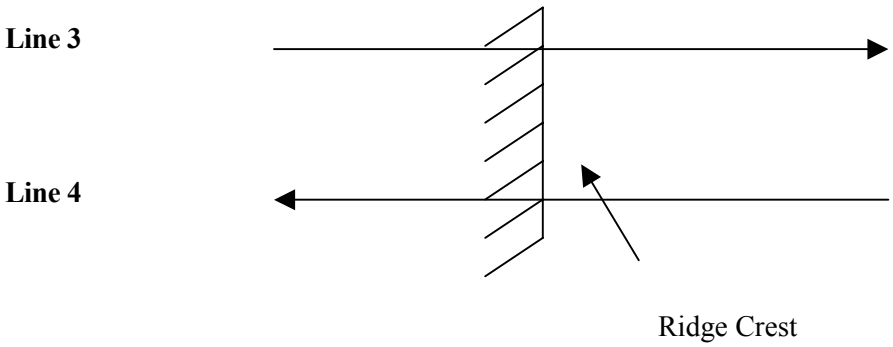


Line 4

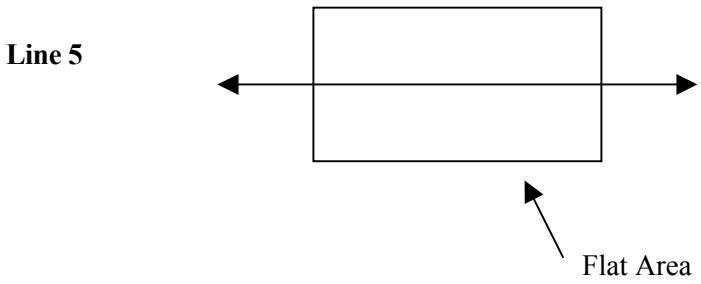


Target

- *Linear Target*.
  The distance between lines should be equal to twice the water depth.



ROLL



Run	Line	Direction	RPM
1	1	Right	Low
2	1	Right	High
3	2	Left	Low
4	2	Right	Low
5	3	Right	Low
6	4	Left	Low
7	5	Right	Low
8	5	Left	Low

Calibration	Runs	
Navigation	1	2
Pitch	3	4
Azimuth	5	6
Roll	7	8

THALES

APPENDIX G : PATCH TEST PROCESSING REPORT

THALES

PATCH TEST REPORT

A patch test was completed using seafloor topology to bring multibeam swaths run at varying speeds, headings, and overlaps into coincidence. Patch tests are employed so that data can be corrected for timing latency, pitch, azimuth and roll offsets, which may exist between the MBES transducer and the MRU.

The physical offsets were determined in the following order: Latency (Timing), Pitch, Yaw and Roll. Results used were:

Reson 8111

Offset	Latency	Pitch	Yaw	Roll
Correction	-0.03 sec	0.70°	-0.30°	0.77°

Latency

TGPI has implemented a new timing protocol for multibeam data acquisition. In this new scheme, UTC time tags generated within the POSMV are applied to all position, heading and attitude data. The POSMV UTC string is also sent to the SeaBat, where the ping data are tagged. The architecture of the POSMV ensures that there is zero latency between the position, heading and attitude strings. The only latency possible is in the ping time. In addition, the navigation-to-ping latency will be identical to the attitude-to-ping and heading-to-ping latencies.

Navigation latency is generally difficult to measure using standard timing and patch testing techniques. However, using TGPI's timing protocol, the navigation latency will be the same as the roll latency. Fortunately, roll latencies are very easy to identify. Data with a roll timing latency will have a rippled appearance along the edge of the swath. During patch test analysis, the roll latency is adjusted until the ripple is gone. This latency value is then applied to the ping time, synchronizing it with the position, attitude and heading data.

This rippled appearance was evident in this case, hence, a latency of –0.03 seconds was applied.

Pitch

The Pitch error adjustment was performed on sets of two coincident lines, run at the same velocity, over a conspicuous topographic feature, in opposite directions. The latency error was already identified. The nadir beams from each line were compared and brought in to alignment, by adjusting the pitch error value.

Yaw

The azimuth error adjustment was performed on sets of two lines, run over a conspicuous topographic feature. Lines were run in opposite directions, at the same velocity with the same outer beams crossing the feature. The latency error and pitch

error were already identified. Data from the same outer beams for each line were compared and brought in to alignment, by adjusting the azimuth error value.

Roll

The roll error adjustment was performed on sets of two coincident lines, run at the same velocity, in the opposite direction. The latency error, pitch error and azimuth error were already identified. Data across a swath was compared for each line and brought in to agreement, by adjusting the roll error value.

Patch test data were then corrected using the identified values, and the process repeated to check their validity.

APPENDIX H : BATHYMETRY QUALITY CONTROL

Quality Control Report for file :
G:\P100904_AlbatrossBank\CARIS\Fieldsheets\A1_Tielines\Tie1A-Soundings\tie1a-soundings

Elevation Range is : -87.299(m) -82.733(m)

Total number of 3D points used: 35895

Starting Time: 5-AUG-2003 18:26:36.34
Ending Time: 5-AUG-2003 18:29:13.09

IHO statistics a/b are : 1.000 0.023

User#	Total	# fail	% fail	# pass	% pass
1	3	0	0.00	3	100.00
2	14	0	0.00	14	100.00
3	92	3	3.26	89	96.74
4	209	1	0.48	208	99.52
5	337	2	0.59	335	99.41
6	370	0	0.00	370	100.00
7	373	0	0.00	373	100.00
8	374	0	0.00	374	100.00
9	374	0	0.00	374	100.00
10	374	0	0.00	374	100.00
11	374	0	0.00	374	100.00
12	374	0	0.00	374	100.00
13	374	0	0.00	374	100.00
14	374	0	0.00	374	100.00
15	374	0	0.00	374	100.00
16	374	0	0.00	374	100.00
17	374	0	0.00	374	100.00
18	374	0	0.00	374	100.00
19	374	0	0.00	374	100.00
20	374	0	0.00	374	100.00
21	375	0	0.00	375	100.00
22	375	0	0.00	375	100.00
23	375	0	0.00	375	100.00
24	375	0	0.00	375	100.00
25	375	0	0.00	375	100.00
26	375	0	0.00	375	100.00
27	375	0	0.00	375	100.00
28	375	0	0.00	375	100.00
29	375	0	0.00	375	100.00
30	375	0	0.00	375	100.00
31	375	0	0.00	375	100.00
32	375	0	0.00	375	100.00
33	374	0	0.00	374	100.00
34	375	0	0.00	375	100.00
35	375	0	0.00	375	100.00
36	375	0	0.00	375	100.00
37	375	0	0.00	375	100.00
38	375	0	0.00	375	100.00
39	375	0	0.00	375	100.00
40	375	0	0.00	375	100.00
41	375	0	0.00	375	100.00
42	374	0	0.00	374	100.00
43	374	0	0.00	374	100.00
44	373	0	0.00	373	100.00
45	369	0	0.00	369	100.00
46	371	0	0.00	371	100.00
47	366	0	0.00	366	100.00

48	369	0	0.00	369	100.00
49	367	0	0.00	367	100.00
50	365	0	0.00	365	100.00
51	363	0	0.00	363	100.00
52	368	0	0.00	368	100.00
53	370	0	0.00	370	100.00
54	367	0	0.00	367	100.00
55	373	0	0.00	373	100.00
56	373	0	0.00	373	100.00
57	374	0	0.00	374	100.00
58	374	0	0.00	374	100.00
59	375	0	0.00	375	100.00
60	375	0	0.00	375	100.00
61	375	0	0.00	375	100.00
62	375	0	0.00	375	100.00
63	375	0	0.00	375	100.00
64	375	0	0.00	375	100.00
65	375	0	0.00	375	100.00
66	375	0	0.00	375	100.00
67	375	0	0.00	375	100.00
68	375	0	0.00	375	100.00
69	375	0	0.00	375	100.00
70	375	0	0.00	375	100.00
71	375	0	0.00	375	100.00
72	375	0	0.00	375	100.00
73	375	0	0.00	375	100.00
74	375	0	0.00	375	100.00
75	375	0	0.00	375	100.00
76	375	0	0.00	375	100.00
77	375	0	0.00	375	100.00
78	375	0	0.00	375	100.00
79	375	0	0.00	375	100.00
80	375	0	0.00	375	100.00
81	376	0	0.00	376	100.00
82	376	0	0.00	376	100.00
83	376	0	0.00	376	100.00
84	376	0	0.00	376	100.00
85	376	0	0.00	376	100.00
86	376	0	0.00	376	100.00
87	376	0	0.00	376	100.00
88	376	0	0.00	376	100.00
89	376	0	0.00	376	100.00
90	376	0	0.00	376	100.00
91	376	0	0.00	376	100.00
92	376	0	0.00	376	100.00
93	376	0	0.00	376	100.00
94	376	0	0.00	376	100.00
95	376	0	0.00	376	100.00
96	376	0	0.00	376	100.00
97	371	0	0.00	371	100.00
98	357	0	0.00	357	100.00
99	274	0	0.00	274	100.00
100	161	0	0.00	161	100.00
101	42	0	0.00	42	100.00

Quality Control Report for file :
G:\P100904_AlbatrossBank\CARIS\Fieldsheets\A1_Tielines\Tie1B-Soundings\tie1b-soundings

Elevation Range is : -424.058(m) -353.536(m)

Total number of 3D points used: 35102

Starting Time: 3-AUG-2003 04:08:21.92
Ending Time: 3-AUG-2003 06:31:14.99

Classification report 2 of 2

IHO statistics a/b are : 1.000 0.023

User#	Total	# fail	% fail	# pass	% pass
12	1	0	0.00	1	100.00
26	3	0	0.00	3	100.00
27	35	0	0.00	35	100.00
28	177	0	0.00	177	100.00
29	414	0	0.00	414	100.00
30	511	0	0.00	511	100.00
31	519	0	0.00	519	100.00
32	518	0	0.00	518	100.00
33	522	0	0.00	522	100.00
34	520	0	0.00	520	100.00
35	520	0	0.00	520	100.00
36	532	0	0.00	532	100.00
37	632	0	0.00	632	100.00
38	761	0	0.00	761	100.00
39	845	0	0.00	845	100.00
40	856	0	0.00	856	100.00
41	855	0	0.00	855	100.00
42	854	0	0.00	854	100.00
43	856	0	0.00	856	100.00
44	857	0	0.00	857	100.00
45	857	0	0.00	857	100.00
46	859	0	0.00	859	100.00
47	856	0	0.00	856	100.00
48	853	0	0.00	853	100.00
49	838	0	0.00	838	100.00
50	825	0	0.00	825	100.00
51	818	0	0.00	818	100.00
52	832	0	0.00	832	100.00
53	842	0	0.00	842	100.00
54	854	0	0.00	854	100.00
55	854	0	0.00	854	100.00
56	854	0	0.00	854	100.00
57	855	0	0.00	855	100.00
58	854	0	0.00	854	100.00
59	853	0	0.00	853	100.00
60	857	0	0.00	857	100.00
61	857	0	0.00	857	100.00
62	856	2	0.23	854	99.77
63	857	6	0.70	851	99.30
64	857	26	3.03	831	96.97
65	856	51	5.96	805	94.04
66	856	76	8.88	780	91.12
67	835	86	10.30	749	89.70
68	723	35	4.84	688	95.16
69	626	7	1.12	619	98.88

70	599	1	0.17	598	99.83
71	596	0	0.00	596	100.00
72	594	0	0.00	594	100.00
73	591	0	0.00	591	100.00
74	524	0	0.00	524	100.00
75	365	0	0.00	365	100.00
76	109	4	3.67	105	96.33

APPENDIX I : PERSONNEL

Thales GeoSolutions – Offshore Personnel	
Party Chief	Dean Moyles
Surveyor	Dale Reynolds
Surveyor	Andy Orthmann
Engineer	Len Roe
Data Analyst	Amy Mount
Data Analyst	Lynn Collier
Geologist	Anne Garcia
Thales GeoSolutions – Onshore Personnel	
Project Manager	Robert Pawlowski
Data Center Supervisor	Carol Lockhart
Senior Data Analyst	Brian Davidson
Geologist	Anne Garcia
Reports Secretary	Vera Morrow

Registry No: W00121

State: Alaska

General Locality: Western Gulf of Alaska, SE of Kodiak Island

Sub Locality: Vicinity of Albatross Bank

Dates of Survey: August 1, 2003 through August 6, 2003

OSD Supplier: Thales

OSD Project No:

Reviewer: LT(jg) Jay Lomnicky, NOAA **Review Date:** 10JAN2007

I. DATA INVENTORY

A. Reports

Report Type	Format	Document Title	Date
Descriptive Report or equivalent	.pdf	Multibeam Echosounder Survey in the Vicinity of Albatross Bank (Thales Doc. # TGP-100904-RPT-01-00)	05DEC2003
Data Acquisition and Processing Report or equivalent	.pdf	Multibeam Echosounder Survey in the Vicinity of Albatross Bank (Thales Doc. # TGP-100904-RPT-01-00)	05DEC2003
Horizontal and Vertical Control Report or equivalent	.pdf	Multibeam Echosounder Survey in the Vicinity of Albatross Bank (Thales Doc. # TGP-100904-RPT-01-00)	05DEC2003
System Certification Report or Equivalent	none		
Other			

B. Data

Data Type	Format	Description (Raw, Processed)
Smooth Sheet Sounding Plots	none	
XYZ ASCII Files	.xyz	3 processed .xyz files in easting, northing, depth format (no time stamp)
Multibeam	none	
Side Scan Sonar	none	
LIDAR	none	
Single Beam	none	n/a

Data Type	Format	Description (Raw, Processed)
Detached Position Point Feature	none	
Kinematic / Static GPS	none	
Sound Velocity	none	
Water Levels	none	
AWOIS	none	
DtoN	none	
Shoreline	none	
Bottom Sample	none	

yes(1) All data open correctly and without error (MBES lines, SSS lines, VBES, Crosslines, Fieldsheets, Smooth Sheets, Sessions, DTM's, BASE grids, Mosaics, and DP's).

C. Sensors

List all sensor(s) that were used to acquire data.

Sensor	Manufacturer	System	Model	Vessel / Platform
SWMB	Reson		8111	R/V DAVIDSON
vessel motion	Applanix	POS/MV	320	R/V DAVIDSON
position	Applanix	POS/MV	320	R/V DAVIDSON
SV	Sea-bird Electronics		SBE 19 Seacat	R/V DAVIDSON
SV	Applied Microsystems	SV&P	Smart Sensor	R/V DAVIDSON
SV	Sippican		XBT & XSV	R/V DAVIDSON
		8111		

yes Are all sensors listed above capable of meeting NOAA HSSDM accuracy and object detection requirements? Provide information in the comments section.

II. DATA ACQUISITION AND PROCESSING

A. System Calibrations and/or Certifications

yes A sensor offset and alignment survey was conducted to NOAA HSSDM requirements

yes Offset values provided

yes Patch tests were conducted for shallow-water multibeam systems

yes Alignment bias and latency values provided

yes Draft measurements were conducted

✔ Static Draft ___ Dynamic Draft ___ Loading

yes Draft values were provided

yes Sensors were calibrated in accordance with manufacturer requirements and NOAA specifications

no Calibration reports were provided.

B. Sound Velocity Corrections

yes Sound velocity sampling regimen is in accordance with NOAA HSSDM requirements

no Sound velocity profiles were supplied

n/a All profiles appear valid

C. Water Levels

yes Water level measuring equipment and methods are consistent with NOAA equipment and methods and are capable of meeting specifications

Equipment / method used: see comment #2

no Tide corrector files were supplied

n/a All tide correctors appear valid

yes Water level correctors applied to sounding data

___ Verified ✔ Observed ___ Predicted ___ NOAA Zoning ___ Other zoning

no Water level error estimate provided by CO-OPS

Water level / zoning error estimate: n/a

E. Survey Methodology

yes The surveyor has conducted adequate quality control of horizontal positioning data

yes DTM, BASE surface, and/or mosaics indicate that seafloor coverage requirements (per NOAA HSSDM) were met and no significant coverage holidays exist.

no (3) All least depths over shoals, wrecks, rocks, obstructions, and other features have been determined

no The Hydrographer has conducted the required quantity of cross lines, or acquired sufficient redundant data, in accordance with the HSSDM, to assess internal data consistency.

F. Data Processing and Quality Control

yes An adequate description of data processing and quality control methods is provided in documentation.

Processing software used: Caris HIPS/SIPS

yes Data processing methodology is robust enough and adequate to provide a dataset suitable for charting.

yes Data have been reviewed and are cleaned appropriately with no noise, fliers, or systematic errors noted.

n/a Crossline agreement or redundant data overlap has been visually inspected by the hydrographer

n/a Disagreements have been noted

no (4) A Chart comparison was conducted by the hydrographer

no Disagreements have been noted.

III. DATA QUALITY AND RESULTS

A. Internal Data Consistency

no — Full resolution data was provided in order to gauge the adequacy of cleaning and/or processing of the data.

n/a — A review of the data reveals no positioning errors exceeding NOAA specifications

n/a — Crossline agreement or redundant data overlap shows no disagreements exceeding NOAA HSSDM tolerances.

no — **A**nomalous data (fliers, noise, etc) were apparent in the BASE surface, DTM, and/or selected sounding set.

n/a — Are there any tide errors exceeding NOAA HSSDM requirements observable in the data

no — Are there any observable SV errors exceeding NOAA HSSDM accuracy standards.

yes — All shoals are valid (no fliers) and the proper least depth has been retained.

n/a — Where multiple systems, platforms, and/or sensors were used, junctioning or overlapping data agree within NOAA HSSDM tolerance between platforms.

yes — Any statistical assessment of the data (e.g. BASE standard deviation, QC reports, etc) indicate that data agree within NOAA HSSDM tolerances.

B. Error Budget Analysis

no — An error budget analysis was provided by the surveyor

n/a — The error budget analysis indicates that data are capable of meeting NOAA HSSDM standards

n/a — The evaluator concurs with the provided error budget analysis

no — The evaluator has conducted an error budget analysis

n/a — The error budget analysis indicates that data are capable of meeting NOAA HSSDM standards

D. Automated Wreck and Obstruction Information System (AWOIS) Items

no — AWOIS Items are located within the limits of the survey.

n/a — AWOIS Items can be sufficiently confirmed or disproved using data from this survey (Attach AWOIS pages to the certification memorandum.).

E. Dangers to Navigation

no Dangers to Navigation (DTONs) were selected and submitted by the surveyor / data provider

n/a DTONs have been verified by the office evaluator.

no Additional DTONs were noted during office evaluation and submitted

F. Aids to Navigation

no Aids to Navigation (ATONs) were positioned during this survey

no New ATONS were positioned during this survey

n/a Survey positions match charted positions

no The surveyor / data provider issued DTONs or notified the USCG for any ATON discrepancies

no ATON discrepancies were noted during office evaluation and submitted as DTONs.

G. Shoreline and Bottom Samples

no The shoreline (MHW and/or MLLW lines) were included as part of this survey

n/a Surveyed shoreline matches charted shoreline

n/a Surveyed shoreline compares with NGS/RSD source data

n/a Surveyed shoreline should be used to revise nautical charts

no Shoreline features were positioned during this survey

n/a Surveyed features match charted shoreline

n/a Surveyed features compares with NGS/RSD source data

n/a Surveyed features should be used to revise nautical charts

no Bottom samples were acquired during this survey

n/a Bottom sample spacing was in accordance with NOAA HSSDM requirements

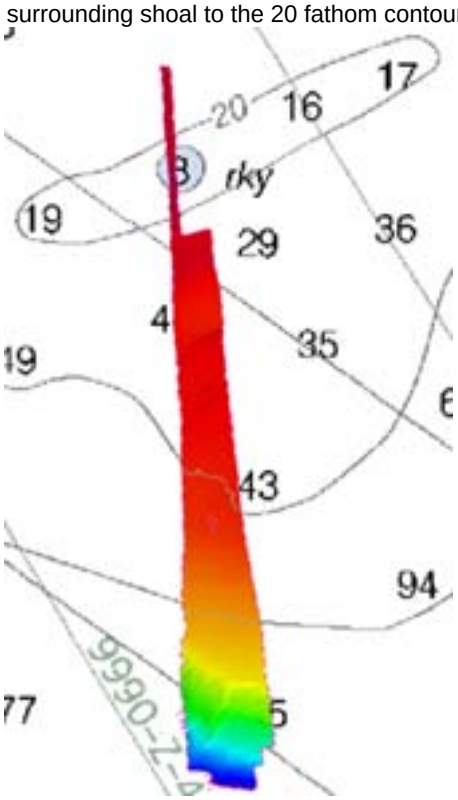
n/a Bottom samples should be used to update NOAA charts

IV. COMMENTS

1. Data were opened/reviewed in Caris Base Editor 1.0. Caris HIPS/SIPS cannot open .xyz data that does not contain a time stamp. Data were also cursorily reviewed using Fledermaus 6.1.5 as well as MapInfo 8.5.

2. Data were reduced prior to submission in Caris HIPS/SIPS to MLLW using preliminary observed tides from gauge 9457292, Kodiak Island, AK

3. Shoaling may exist immediately adjacent to surveyed areas. Most notably, there is a significant lack of data over a charted 8 fathom sounding, and the surrounding shoal to the 20 fathom contour, in Site 2.



V. CHART COMPARISON

Affected charts

Chart	Scale	Edition	Date
16580	1:350,000	13th Ed, Jan 2005	

Smooth Sheet Soundings

Reported Obstructions

none

Charted Features

See additional comments on attached pages.

New Features

none

A chart comparison with chart 16580 (13th Ed., Jan 05) was conducted at PHB using Caris Base Editor 1.0 and MapInfo 8.5. Significant finding and discrepancies are described below:

Site 1

Overall, the charted soundings are shoaler than W00121 by approximately 15-20 fathoms[1]. A depth of approximately 41 fathoms exists in the area over a charted 63 fathom sounding at approximately 56º 01' 39"N / 153º 49' 19"W.[2] A charted sounding of 558 fathoms at position 55º 57' 21"N / 153º 27' 08"W lies immediately below, and unusually close to, a charted sounding of 200 fathoms. There is no evidence of a 558 fathom depth at the charted position (Fig. 2).[3]

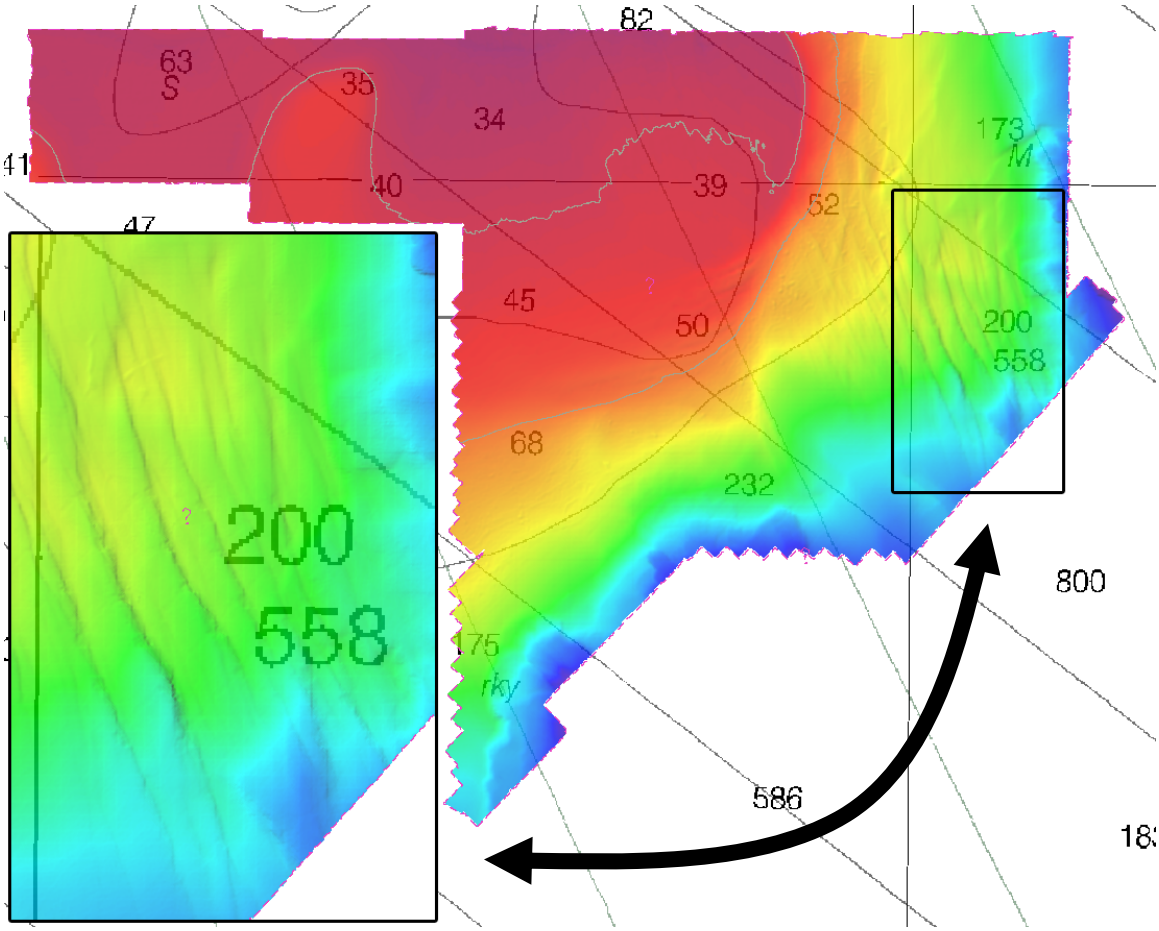


Fig. 2 – Site 1 with inset, Caris contours in gray

Site 2

No charted sounding are completely covered by data from W00121. The data over partially covered soundings, and created contours, suggest agreement with the chart over this steeply sloping area. Full coverage was not obtained over the 8 fathom shoal, nor the the shoal encompassed by the 20 fathom contour (Fig. 3).[4]

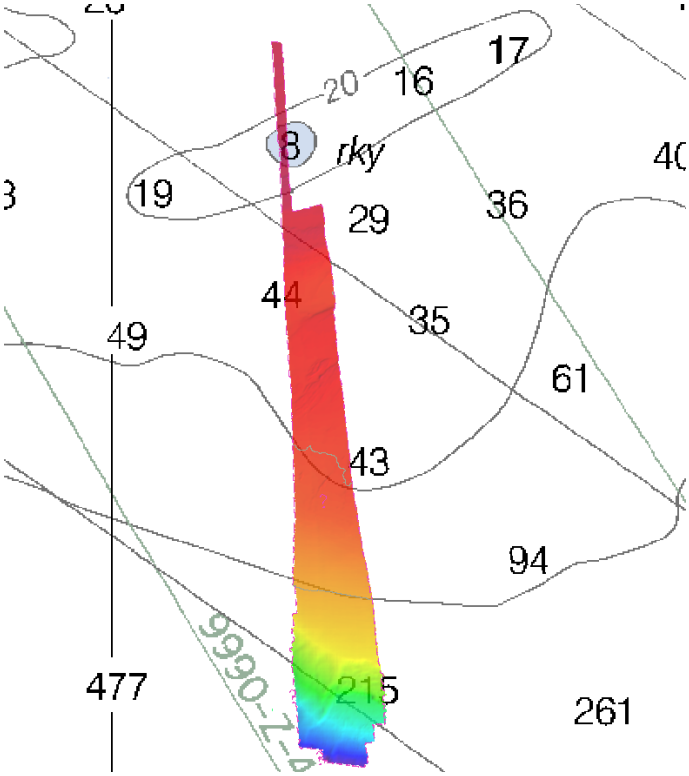


Fig. 3 – Site 2, Caris contours in gray

Site 3

The area within the charted 100 fathom contour was not entirely surveyed. W00121 found depths shoaler than 50 fathoms outside of the charted 100 fathom curve (Fig. 4).[5]

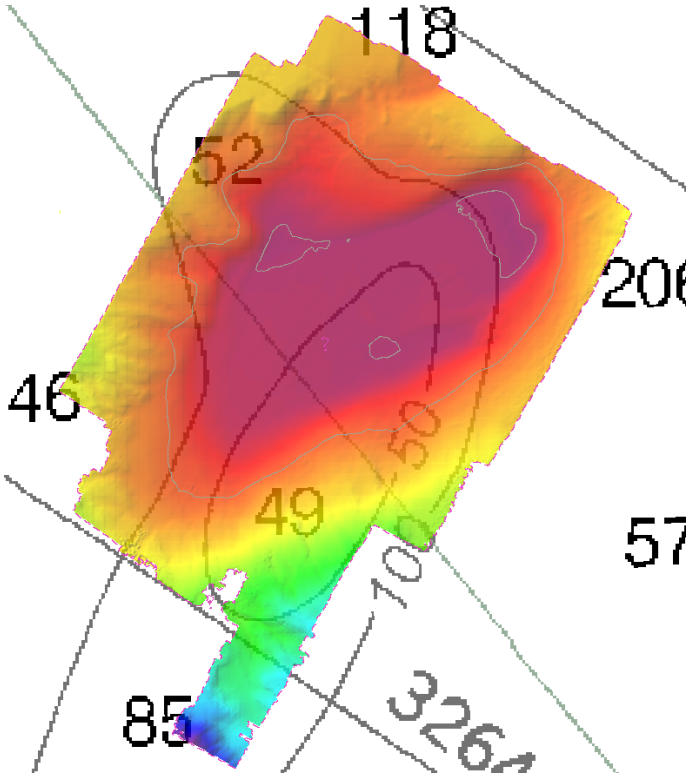


Fig.4 – Site 3, Caris contours in gray

Revisions compiled during office processing by the cartographer

[1] Concur with clarification. In PHB processing, W00121 was also compared with Chart 16580, 14th Edition, continuous maintenance raster dated12/05/08. Survey depths from 12 fathoms to approximately 60 fathoms deeper than charted soundings were found in areas deeper than 100 fathoms. Do not supersede charted shoal soundings and contours. Chart as shown on the Hdrawing.

[2] Concur.

[3] Concur. It is recommended that the charted 558 fathom sounding at approximately 55º 57' 21"N / 153º 27' 08"W be removed the chart. Chart vicinity as shown on the Hdrawing.

[4] Concur. Chart survey area as shown on the Hdrawing.

[5] Concur with clarification. The survey suggests northeasterly movement of the shoal area. Chart as shown on the Hdrawing.

APPROVAL SHEET
W00121

Evaluated by:

Digitally signed by Kurt Brown
Date: 2009.01.22 12:55:25 -08'00'

LT (jg) Jay Lomnicky, NOAA
Pacific Hydrographic Branch

Review by:

Digitally signed by Kurt Brown
Date: 2009.01.22 12:55:51 -08'00'

Kurt Brown
Hydrographic Team Leader
Pacific Hydrographic Branch

Cartography

The evaluated survey has been inspected with regard to delineation of the depth curves, development of critical depths, cartographic symbolization, and verification or disproval of charted data

Compiled by:

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
Reason: for Beth Taylor
Date: 2009.01.22 13:41:32 -08'00'

Beth Taylor
Cartographer
Pacific Hydrographic Branch

Reviewed by:

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: 2009.01.22 13:41:49 -08'00'

Russ Davies
Cartographer
Pacific Hydrographic Branch

Approval

I have reviewed the data, and reports. Data are suitable for nautical charting except where specifically recommended in this report.

David Neander
2009.01.23 08:01:07 -08'00'

David O. Neander
Captain, NOAA
Chief, Pacific Hydrographic Branch

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: 2009.02.05 09:16:56 -05'00'

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. W00121

INSTRUCTIONS

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.

1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS
16580	12/04/08	B. TAYLOR	~~Full~~ Part ~~Before~~ After Marine Center Approval Signed Via PARTIAL APPLICATION
			~~Drawing No.~~ OF SOUNDINGS, FEATURES AND CURVES
			FROM SMOOTH SHEET.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
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			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED