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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

Data Acquisition & Processing Report

Type of Survey	**Outside Source Data**
Project No.	**OSD-AHB-13**
Registry No.	**W00271**
Time Frame	**10 June 2013 - 19 June 2013**

LOCALITY

State	**Mississippi**
General Locality	**Gulf of Mexico**

2013

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DATE

Pascagoula Harbor and Bayou Casotte

13USM01 Data Acquisition and Processing Report

Date: 26 July 2013

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Short Details

Title	Pascagoula Harbor and Bayou Casotte
Registry Number	13USM01
Team Members	Geoffrey Lawes (HIC) Ahmed Azab Laura Casey Kandice Gunning Nicolas Waters
Locality	United States - Gulf Coast - Mississippi
Chart No. and Scale	NOAA Chart 11375, Scale 1:20,000
Product Scale	1:5000
Positional Accuracy	IHO Special Order NOAA 1m Object Detection Survey
Horizontal Datum	NAD83 (print charts), WGS84 (ENC)
Vertical Datum	MLLW (NTDE 1983-2001)
Charts Affected	NOAA Charts 11006, 1115A, 11363, 11373 11374, 11375, 11379, 411
ENC Affected	US4MS12M, US5MS21M, US5MS22M
Prior Surveys	H11384 (2005) F00516 (2005) H08645 (1962) H08649 (1962) H04021 (1917) H00365 (1853) Rowe Surveying Job 33407 (2009) Rowe Surveying Job 33409 (2009)

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Acronyms and Abbreviations

CORS Continuously Operating Reference Station

CSAR Caris Spatial ARchive

CUBE Combined Uncertainty and Bathymetry Estimator

ENC Electronic Navigation Chart

FST Fleet Survey Team

GCGC Gulf Coast Geospatial Consortium

GNSS Global Navigation Satellite System

GSF Generic Sensor Format

HIC Hydrographer-In-Charge

HIPS Hydrographic Information Processing System

HSD Hydrographic Survey Division

IHO International Hydrographic Organization

IMU Inertial Motion Unit

JSF JStar Sidescan Format

MBES Multi-Beam Echo-Sounder

MLLW Mean Lower Low Water

NAD83 North American Datum of 1983

NMEA National Marine Electronics Association

NOAA National Oceanic and Atmospheric Administration

NTDE National Tidal Datum Epoch

PPK Post Processed Kinematic

PPS Pulse Per-Second

POSMV Position and Orientation System for Marine Vehicles

QC Quality Control

SBET Smoothed Best Estimate of Trajectory

SEP Ellipsoid to Tidal Vertical Datum Separation

SSC John C. Stennis Space Center

SSS Side-Scan Sonar

SVP Sound Velocity Profiler

TPU Total Propagated Uncertainty

USACE United States Army Corps of Engineers

USM University of Southern Mississippi

UTC Coordinated Universal Time

WAAS Wide Area Augmentation System

WGS84 World Geodetic System of 1984

XTF eXtensible Triton Format

Introduction

The purpose of the survey was to provide National Oceanic and Atmospheric Administration (NOAA) Hydrographic Survey Division (HSD) and the Jackson County Port Authority with a high resolution Multi-Beam Echo-Sounder (MBES) data set for checking existing chart information and historical data.

The survey area was divided into three sub-areas denoted A, B and C. Area A is within the harbor limits of the Port of Pascagoula and is principally concerned with the United States Army Corps of Engineers (USACE) maintained channel. Area B is also within the Port of Pascagoula limits and lies between the Ingalls Shipyard south wharves and Singing River Island. Area C is within the harbor limits of Bayou Casotte and again is principally concerned with the maintained channel.

MBES coverage for both areas A and B are shown in figure 1. Side-Scan Sonar (SSS) coverage for areas A and B is shown in figure 2. MBES coverage for Area C is shown separately, in figure 3 and SSS coverage for Area C is shown in figure 4. The final survey areas vary slightly from the areas shown in the specification in order to alleviate the need for the survey vessel to venture into inadequately charted areas with depths below 4m.

The survey was conducted to the NOAA 1m object detection survey and International Hydrographic Organization (IHO) Special Order standards.

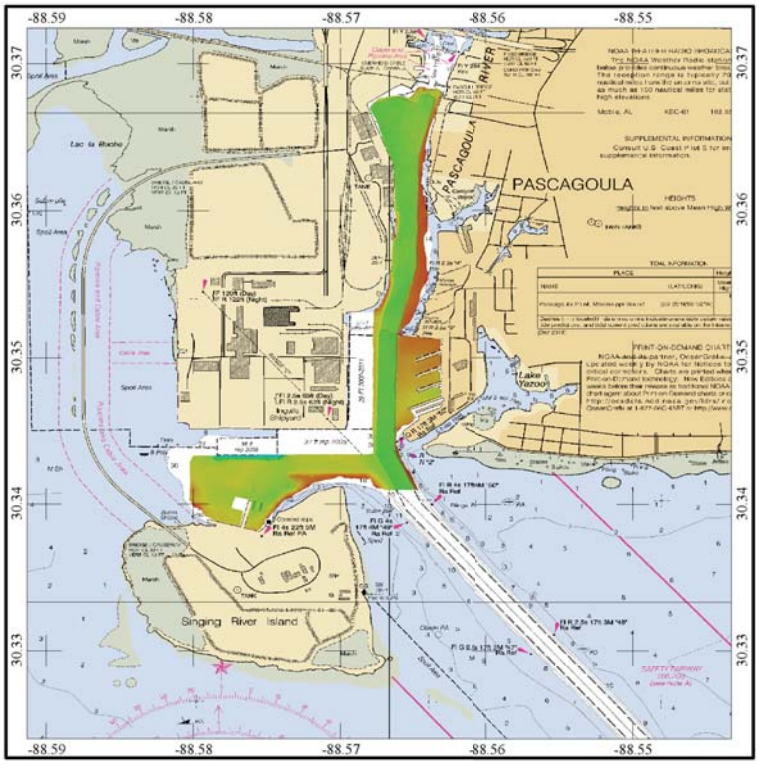


Figure 1: Combined MBES coverage - areas A and B overlaid on chart 11375

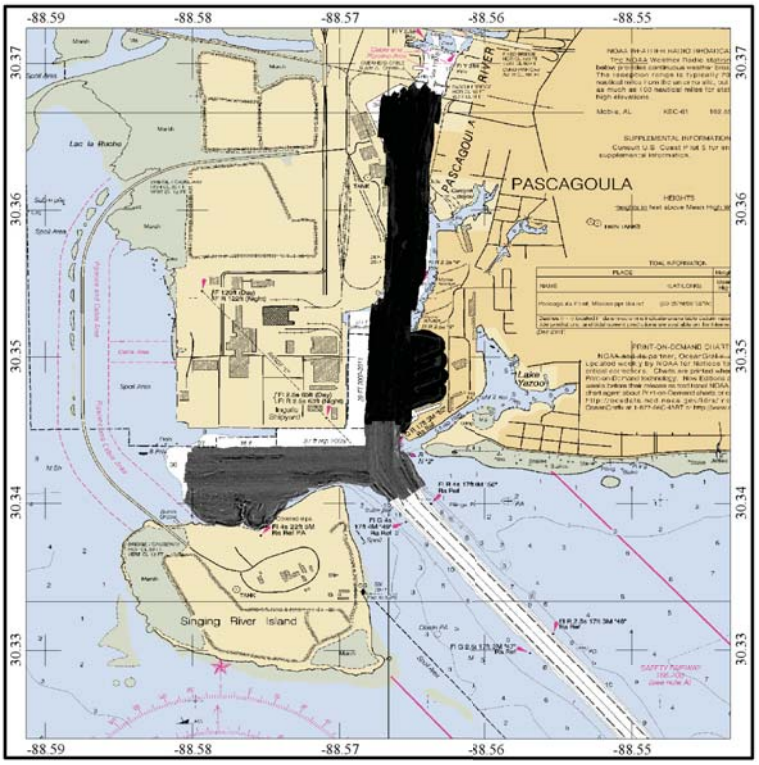


Figure 2: Combined SSS coverage - areas A and B overlaid on chart 11375

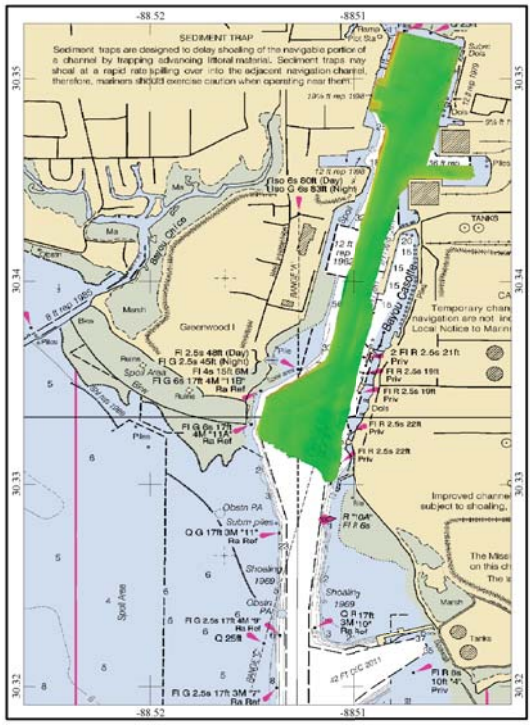


Figure 3: MBES coverage - area C overlaid on chart 11375

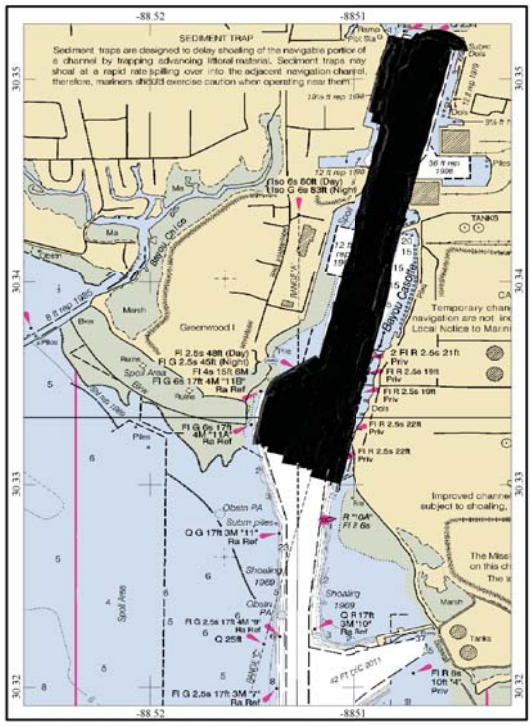


Figure 4: SSS coverage - area C overlaid on chart 11375

A Equipment

A.1 Major Operational Systems

The two major systems used for the survey were the Reson 7125-400 MBES and the Edgetech 4125-D towed SSS. Detailed descriptions of the equipment and systems, both hardware and software, used for data collection and processing of sonar, Position and Orientation System for Marine Vehicles (POSMV) attitude and Global Navigation Satellite System (GNSS) position data follow in the succeeding sections. The major equipment details and serial numbers are shown in table A.1.

Table A.1: *R/V GCGC* equipment

Item	Description	Serial Numbers
MBES	Reson 7125 - 400 kHz (over-the-side pole mounted)	4010148
SSS	EdgeTech 4125-D 900kHz (towed)	Towfish: 6230681322 Topside: 6230680806 Controller: 623068605
Attitude Reference and Navigation	Applanix POSMV Wavemaster v5 fitted with two Trimble Zephyr 2 GNSS antennas	POSMV: 0214808 Antennas: 1441038502 1441043318
Secondary Navigation	TopCon GR3 Geodetic GNSS (PPK)	433-0511, 433-0510
Sound Velocity Profiler (SVP)	Odom Digibar Pro	98571, 003947

A.2 Survey Vessel

The platform used for data collection was the University of Southern Mississippi (USM) research vessel *GCGC*. The *R/V GCGC* has a medium-V planing hull constructed of aluminum. It is 10m in length, has a beam of 3m and a draft of 1m. The vessel is shown in figure A.1.

The *R/V GCGC* was temporarily mobilized with an over-the-side pole mount for the MBES on 29 May 2013. The vessel remained mobilized throughout the survey period. A steel mount was also constructed to safely offset the SSS to the port side of the vessel.

Vessel laybacks and associated measurement uncertainties of the *R/V GCGC* were determined from a vessel configuration survey conducted at the USM John C. Stennis Space Center (SSC) campus on 20 April 2013. The survey was conducted with multiple rounds of observations to each point of interest, from a set of benchmarks, using a Leica TotalStation TPS300. The benchmarks network was also reobserved using the TotalStation. The results of the configuration survey are included in appendix I.

Where an item could not be completely positioned using the TotalStation, a reference mark was positioned instead, to which further laybacks could be measured using a tape measure. The MBES acoustic center and the SSS tow point were positioned in this manner and errors were propagated through the geometry as required. For further information on the use of these figures in *Caris Hydrographic Information Processing System (HIPS)*, see section C.1. Vessel configuration values were validated prior to deployment with a calibration survey conducted on 06 June 2013. For further information on the calibration surveys conducted, see section C.1.2.

Figure A.1: *R/V GCGC* during configuration survey

A.3 Multibeam Echosounder

Bathymetric data was collected using a Reson SeaBat 7125-400 MBES with an integrated SVP, mounted onto a steel maneuverable pole. The pole was then fitted into a mount located on the starboard side of the vessel. The pole was held in place using steel brackets with a nylon bolt weak-point to allow retraction of the pole in case of collision or grounding of the sensor. Figure A.2 shows the pole mounted system in the deployed position.

Figure A.2: *R/V GCGC* MBES pole mount

The Reson 7125-400 MBES operates at 400 kHz, producing up to a 140° swath of 512 beams per ping. It has a beam width of 0.5° x 1.0° in equiangular mode. The MBES was operated at different range scales throughout the survey to obtain the best coverage in varying depths of water. Gain and power adjustments were also made during acquisition as dictated by changes in the depth and data quality. All MBES bathymetry was acquired using equiangular beam spacing with a 120° swath. The maximum ping rate was set to 30 pings per second but the rate achieved varied based on water

depth. The actual ping rate achieved was generally 12-20 pings per second.

While trailering the vessel on 12 June 2013 the MBES housing collided with a pylon. This caused the housing to tilt, requiring realignment and invalidating the initial calibration. The damage caused to the housing by this incident is shown in figure A.3. After realignment of the housing, a second calibration survey was conducted in the Pascagoula River on 13 June 13. For further information on the calibration surveys conducted, see section C.1.2.

Figure A.3: *R/V GCGC* MBES housing damage

A.4 Side Scan Sonar

The Edgetech 4125-D towed SSS (shown in figure A.4) was used for feature detection during the survey. The SSS operates at frequencies of 400/900 kHz. However, due to the relatively low range requirement (75m) for this survey, only 900 kHz data was collected. The horizontal beam width is 0.28° at 900 kHz.

The SSS towfish cable was run through a tow point mounted on the port side of the vessel. The tow point was a pulley, fixed to an extended arm. The cable was marked in 1m increments and the amount of cable-out was manually monitored and controlled by one of the survey vessel crew at all times. The cable-out values were logged in the Edgetech *Discover* JStar Sidescan Format (JSF) output files and also manually in the survey logbook.

The SSS towfish was towed with cable-out of 10 to 15 meters. For further control of the towfish height, the vessel speed was altered as required. Due to the lack of a depressor, the nature of the survey area, vessel traffic density and manoeuvering requirements around piers, barges and berthed ships, speeds of 3-4 knots were used to maintain the desired altitude. The towfish was operated at a range scale of 75 meters. The altitude was maintained between 7.5m and 11m.

Figure A.4: SSS towfish

A.5 Position, Heading and Motion Reference

Real-time positioning for data collection was sourced from the POSMV real-time GNSS data with Wide Area Augmentation System (WAAS) enabled. Prior to processing bathymetry, the raw data sourced from the POSMV and an additional TopCon GR3 GNSS were post-processed to generate a Post Processed Kinematic (PPK) solution. For full details on the postion accuracy obtained during the survey, see chapter B.

A.5.1 POSMV

The *R/V GCGC* was outfitted with an Applanix POSMV Wavemaster V5, fed by two Trimble Zephyr 2 GNSS Antennas with WAAS enabled for real-time positioning. The POSMV incorporates an Inertial Motion Unit (IMU) used to measure attitude, heave and heading of the survey vessel. The POSMV also provided time synchronization for the sonar and acquisition systems using a combination of National Marine Electronics Association (NMEA) "ZDA" timing messages and an analoge Pulse Per-Second (PPS) signal. The POSMV unit was configured to log all raw Ethernet *POSPac* packet data at 50Hz. This included all attitude, heave and position records. The POSMV antenna and IMU mounts are shown in figure A.5.

Figure A.5: POSMV GNSS antenna and IMU unit mounting

A.5.2 TopCon GR3

A standalone TopCon GR3 geodetic GNSS receiver was fastened to the starboard-aft GNSS mounting bolt. The TopCon was configured to log dual frequency raw data at 1 Hz. The TopCon GR3 mounting arrangement is shown in figure A.6

Figure A.6: TopCon GR3 mount

A.6 Sound Velocity Measurement Systems

A.6.1 Odom Digibar Pro

Two Odom Digibar Pro SVPs were used to collect manual casts at intervals between 1-2.5 hours. Intervals were selected on the basis of variability detected in previous casts and comparisons with the hull sound velocity sensor in the multibeam sonar housing. Surface values from each cast were frequently compared with the value shown by the hull sound velocity sensor. Using this comparison approach, sudden unexpected performance degredation was detected in the Odom Digibar with serial number 98571 on 12 June 2013. Multibeam sounding operations were suspended until a second Odom Digibar Pro was sourced through the US Navy Fleet Survey Team (FST). The Digibar Pro system is shown in figure A.7.

Figure A.7: Odom Digibar Pro sound velocity probe

A.6.2 Reson SVP

The SVP built in to the MBES head was used to constantly track the sound velocity at the transducer face. This real-time sound velocity was used as the source for beam firing angle calculation and is stored within the raw eXtensible Triton Format (XTF) and processed Generic Sensor Format (GSF) data.

A.7 Geodetic and Tidal Equipment

Benchmark leveling, geodetic observations and tidal observations were conducted using the equipment detailed in table A.2.

Prior to each use, the Leica NA2002 level was checked for collimation error by multiple observations over 100m/10m baselines. The largest collimation error observed was 0.002m/100m.

The LevelTroll 700 tide gauge was user calibrated on 29 May 13 in a 1.5m test tank against a graduated staff. The results of the calibration confirmed that the gauge measurement accuracy was within the 0.001m requirement stipulated in NOAA Specifications and Deliverables [NOAA, 2013, §4.2.2, p. 15].

For further information geodetic/tidal equipment, calibration and associated data processing, refer to the *Vertical and Horizontal Control Report*.

Table A.2: Geodetic and tidal equipment

Item	Description	Serial Numbers
Tide Gauge	In-Situ LevelTroll 700	134960
Optical Level	Leica NA2002	283627
Geodetic GNSS	TopCon GR3	433-0511
		433-0510

A.8 Seabed Sampler

A Wildco Petite Ponar Grab was used to collect and analyze seabed samples throughout the survey. The grab sampler has a self-releasing pinch-pin which allows samples to be collected upon impact with the seabed. The sampler was deployed through the SSS mount pully. GNSS time and position were noted at the impact of the sampler. Samples were assessed real-time and discarded. The sampler is shown in figure A.8.

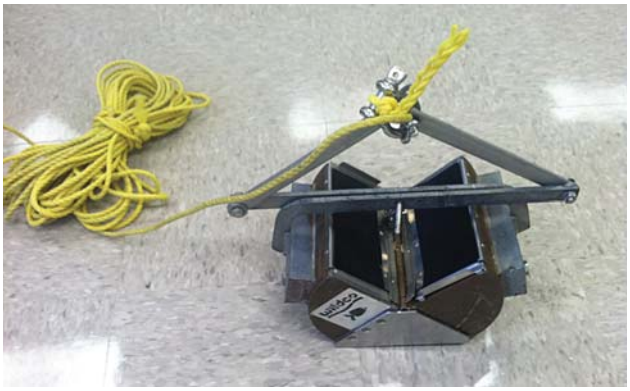


Figure A.8: Wildo Petite Ponar Grab

A.9 Acquisition and Processing Systems

Data processing software versions utilized throughout the survey are shown in table A.3.

Table A.3: Data processing software versions

Software	Usage	Version
Applanix POSView	Real-time monitoring and configuration of POS/MV	6.05
Applanix POSPac MMS	Post-processing attitude and GNSS data from POS/MV	6.2
EdgeTech Discover	Real-time collection of side-scan sonar data	7.15
QPS QINSy	Line planning and real-time recording and coverage monitoring	8
NovAtel GrafNav	Post-processing of TopCon GR3 GNSS data	8.30.2105
Chesapeake SonarWiz	Side scan sonar processing, target classification and mosaicing	5.05.0023
Caris HIPS & SIPS	Bathymetric data processing	7.1.2 SP 2
In-Situ WinSitu	Tide gauge data collection	5.6.21.0
Leica GeoOffice	Vessel configuration survey adjustment	8.3.0.0
NAVOTAS	Tidal analysis	3.0.0
Geospatial Data Abstraction Library	Contouring	1.10.0-1
Tide Analyst	3.1.8	

A.9.1 QINSy

QPS *QINSy* was used to plan and control line spacing and coverage during bathymetric and side-scan sonar sounding. *QINSy* was used to record all bathymetric data and real-time position and attitude data. Data was written to *QINSy* database files for full replay and reconstruction if required. XTF data was also recorded for direct import into *Caris HIPS*.

During MBES sounding, the *QINSy* console was monitored constantly for coverage gaps. This was achieved using a sounding grid. Data spikes were monitored using waterfall sonar displays. The displays were also populated with official NOAA Electronic Navigation Charts (ENCs) and a cross-track distance monitor to aid the helmsman in safely maintaining the planned survey lines. Sensor inputs for attitude, GNSS, timing and sonar were also monitored through the use of visual time-out alarms. This ensured that all sensors could be monitored for correct and consistent output during sounding. The *QINSY* console setup is shown in figure A.9.

Figure A.9: *QINSy* console monitoring during MBES data acquisition in area B

A.9.2 Edgetech Discover

Edgetech *Discover* was used for acquisition of SSS data. It was configured to log 900 kHz data in both Edgetech's native JSF and also XTF format. SSS tow point laybacks and cable-out values were applied in real-time using the hypotenuse calculation method:

$$Layback = \sqrt{Cable\ Out^2 - (Depth + Height)^2} + Offset$$

The *Discover* acquisition software was running on a separate laptop computer with position and timing information fed via the POSMV unit with WAAS enabled.

During SSS acquisition, the *QINSy* and *Discover* displays were monitored simultaneously. Line planning and helmsman functions were provided by *QINSy*, whilst the data recording, towfish control and coverage mapping functions were provided by *Discover*.

A.9.3 Caris HIPS

Bathymetric survey data was processed using *CARIS HIPS*. Processing methodology followed the *CARIS HIPS* workflow for ellipsoid referenced surveys as outlined in the NOAA Field Procedures Manual [NOAA, 2012]. The workflow is detailed in appendix II.1. Processing methodology and results are described in more detail in chapter B.

A.9.4 Chesapeake SonarWiz

Chesapeake *SonarWiz* was used for all SSS data processing. The JSF files recorded by *Discover* were imported and converted to *SonarWiz* native format for gain adjustment, navigation analysis, layback checks, slant range correction, feature classification and mosaicing. Further information on side scan data processing conducted with *SonarWiz* is included in section B.2.

B Quality Control

B.1 Multibeam Echosounder

B.1.1 Data Acquisition

Incremental adjustments to the MBES settings, including changes in power and gain, were made as required during data acquisition. Changes were made in real-time to ensure that the best data quality was obtained by optimizing the number of echo sounder returns passing both collinearity and brightness tests. Value ranges for key settings used throughout data acquisition are shown in table B.1.

The timing synchronization for the MBES was sourced from the NMEA "ZDA" message and PPS signals from the POSMV unit. Additionally, real-time attitude data was supplied from the POSMV unit for roll stabilization.

Table B.1: MBES controller value ranges

Property	**Minimum**	**Maximum**
Transmit Power	180 dB	220 dB
Receiver Gain	15 dB	50 dB
Pulse Length	30 μ s	50 μ s
Horizontal Steering	0 °	0 °
Coverage Angle	100 °	130 °
Range	20 m	50 m
Maximum Rate	30 p/s	50 p/s
Achieved Rate	12 p/s	30 p/s
Absolute Depth Gates	2 m	30 m

During MBES data acquisition, vessel speed was maintained at or below 6 knots to ensure the required along-track and across-track coverage was obtained with high signal to noise ratio. Along-track and across-track coverage gap size working is shown in appendix III. Line spacings for main scheme lines were set to ensure 200% MBES coverage (nadir-to-nadir) in all navigable channels and minimum 150% coverage in all other waters surveyed. Line spacing based coverage data is shown in table B.2.

Table B.2: MBES mainscheme coverage

Area	Planned spacing	200% coverage depths	150% coverage depths
A	16 m	> 9m	> 4.6 m
B	12 m	> 6.8 m	> 3.4 m
C	19 m	> 10.8 m	> 5.4 m

B.1.2 Data Consistency

The internal consistency of data was generally good. However, the MBES experienced low signal-to-noise ratio in waters deeper than 12m. The impact of this was mitigated with IHO special order 0.5m Combined Uncertainty and Bathymetry Estimator (CUBE) surface generation, 100% subset checking in *Caris HIPS* and filtering of soundings to 2 standard deviations from the CUBE surface. The resulting cleaned dataset is highly consistent and shows typical CUBE node densities of around 50 soundings. In addition, beams from 1-37 were removed from the data set due to noise in area B and beams from 470-512 were removed from the area C data set for the same reason. See the section B.1.3 for further details.

B.1.3 Data Processing

Caris HIPS Vessel File

One *Caris HIPS* vessel file was created to capture all vessel configurations used during the survey. Each configuration change is represented in a new section within the file referred by change of Julian day.

The vessel file contains all laybacks and Total Propagated Uncertainty (TPU) factors for the survey vessel and its systems. Sensor layback values were calculated from the vessel configuration survey. Biases were calculated through calibration surveys. TPU values were sourced from measurement error standard deviations, system manufacturer specifications, and peak-to-peak observed error values where standard deviations were not available. The vessel file configuration report is included in appendix I. For full details of the vessel file values used in echo sounding corrections, see section C.1.1.

Sound Velocity

Sound velocity casts were conducted at intervals between 1-2.5 hours depending on the variability observed. In some areas, particularly in the south-western section of area B, the surface sound velocity was highly variable. This was captured by the hull sound velocity probe built-in to the MBES. Even with highly variable sound velocity in the upper 1m of water, the sound speed profiles deeper than 1m were typically consistent with predictable variation. A complete georeferenced *Caris HIPS* SVP file is included with the survey data. All sound velocity profiles collected are included in appendix IV.

Navigation and Attitude

Some changes in GNSS constellation geometry and solution quality near large ships, oil rigs and onshore structures resulted in some short term vertical reference shifts. These shifts were readily identified in the CUBE surface. In most cases, the shifts were rectified by switching between navigation sources or rejecting the erroneous data. Due to the presence of several vertical shifts in the POSMV Smoothed Best Estimate of Trajectory (SBET) data for area A, all navigation data in area A was sourced from the TopCon GR3 GNSS receiver 1Hz data, post-processed (PPK) in *GrafNav* and augmented with 50Hz SBET attitude-only data processed with *POSPac*.

The TopCon GNSS and POSMV GNSS data were processed against the Gulf Coast Geospatial Consortium (GCGC) Gautier Continuously Operating Reference Station (CORS) station 10 (designation "MSGA") [GCGC, 2013]. This is a 1Hz reference station. PPK navigation data were consistently resolved to fixed integer ambiguity (quality 1) with rare short periods of floating ambiguity solutions (quality 2). All standard deviations remained at or below 0.11m. All navigation coordinates were generated using the North American Datum of 1983 (NAD83) (2011/PA11/MA11) epoch 2010.0 datum. Data was exported from *GrafNav* into a text file and imported to replace the real-time navigation in *Caris HIPS* using the *Generic Data Parser* tool. Data was exported from *POSPac* in SBET format and imported using the *Load Attitude/Navigation* tool.

Position accuracy details are shown in table B.3. Attitude accuracy details are shown in table B.4.

Table B.3: Highest observed position standard deviations during MBES sounding

Date	Source	North σ (m)	East σ(m)	Up σ (m)
10 June 13	TopCon GR3 PPK	0.063	0.063	0.091
11 June 13	POSMV PPK SBET	0.033	0.027	0.064
12 June 13	POSMV PPK SBET	0.095	0.113	0.093
13 June 13	POSMV PPK SBET	0.033	0.034	0.067
14 June 13	POSMV PPK SBET	0.039	0.025	0.057
17 June 13	POSMV PPK SBET	0.044	0.029	0.101

Table B.4: Highest observed attitude standard deviations during MBES sounding

Date	Source	Pitch σ (°)	Roll σ(°)	Heading σ (°)
10 June 13	POSMV PPK SBET	0.030	0.030	0.053
11 June 13	POSMV PPK SBET	0.026	0.026	0.065
12 June 13	POSMV PPK SBET	0.028	0.027	0.120
13 June 13	POSMV PPK SBET	0.023	0.023	0.046
14 June 13	POSMV PPK SBET	0.029	0.029	0.054
17 June 13	POSMV PPK SBET	0.029	0.029	0.050

Caris Data Processing

Multibeam data processing followed the standard *Caris HIPS* workflow, adjusted to allow for ellipsoid referenced data. The normal workflow applied to all data was as follows:

- Import XTF bathymetry against Julian day and *R/V GCGC* vessel file configured for post processed navigation
- Load post-processed navigation solution using the generic data parser (area A only)
- Load post-processed navigation (area B and C) and attitude (all areas) from SBET data
- Load GNSS tide using single Ellipsoid to Tidal Vertical Datum Separation (SEP) model
- Convert daily sound velocity casts to Caris format in a single SVP cast file
- Raytrace the data using the "nearest in time" method
- Compute TPU using SEP uncertainty as "Tide Zoning" uncertainty
- Inspect and correct navigation data
- Inspect and correct attitude data
- Inspect line data and filter as required
- Merge data
- Create fieldsheet
- Generate 0.5m CUBE surface using NOAA *CubeParams.xml* file
- Generate 40m subset tiles
- Inspect and edit surface with subset editor, designate shoal soundings, mark subset tiles as partially complete when inspected/edited
- Re-compute CUBE surface
- Hydrographer-In-Charge (HIC) inspects surface using subset editor, marking subset tiles complete when inspected
- Filter MBES data to 2σ of the CUBE surface - keeping designated soundings
- Re-compute and check CUBE surface for consistency
- Finalize CUBE surface with minimum uncertainty and apply designated soundings
- Manually edit crosscheck lines to remove outlier data, run cross check analysis
- Unload all edited data to GSF format

Three preliminary CUBE surfaces were generated from the corrected soundings. One surface was generated for each of the three survey areas. All CUBE surfaces were generated at 0.5m resolution, using IHO special order conditions and CUBE parameters embedded in the NOAA Field Procedures Manual [NOAA, 2012].

All preliminary CUBE surfaces were 100% inspected using the *Caris HIPS* subset editor. 40m subset tiles were used to track inspection status. All significant bathymetric features identified were inspected to determine the shoalest sounding over the feature. Shoal soundings were flagged as designated to prevent filtering and to ensure inclusion in the finalized surface.

After the CUBE surface had been 100% inspected and all identified features had been flagged, the entire sounding set was filtered to remove unflagged soundings with distances greater than 2σ from the CUBE surface. This filtering was performed to remove water column noise from the sounding set. CUBE surfaces were then recalculated to ensure that the filtering had not adversely affected any part of the surface.

Crossline Comparisons

Crosslines were run perpendicular to main scheme survey lines with a spacing of 15 times the main line spacing (as recommended by the IHO [IHO, 2008]). Crossline comparisons were conducted using the *Caris HIPS* Quality Control (QC) Report tool. Each finalized CUBE surface was assessed independently. The crossline sounding data was grouped by beam number (1-512 in increments of 1). Any beams showing performance below the IHO special order 95% confidence interval were excluded from the CUBE surface using a beam reject filter. The surface was then rebuilt and the coverage reassessed.

For area B, beams from 1-37 were excluded from the surface. For area C, beams from 470-512 were exluded from the surface. Subsequently, all crossline comparisons meet the requirements of Special Order. IHO Order 1a was met without any requirement for beam rejection. For a summary of results see table B.5. Results are also shown graphically for area A (figure B.1), area B (figure B.2) and area C (figure B.3) separately.

Table B.5: Crossline comparison results

Area	No. Beams Order 1a	No. Beams Special Order	Order 1a Met?	Special Order Met?	Highest Mean Difference (m) (Included beams only)
A	512 (100%)	512 (100%)	Yes	Yes	0.128
B	512 (100%)	475 (93%)	Yes	Yes (after filtering)	0.033
C	512 (100%)	469 (92%)	Yes	Yes (after filtering)	0.012

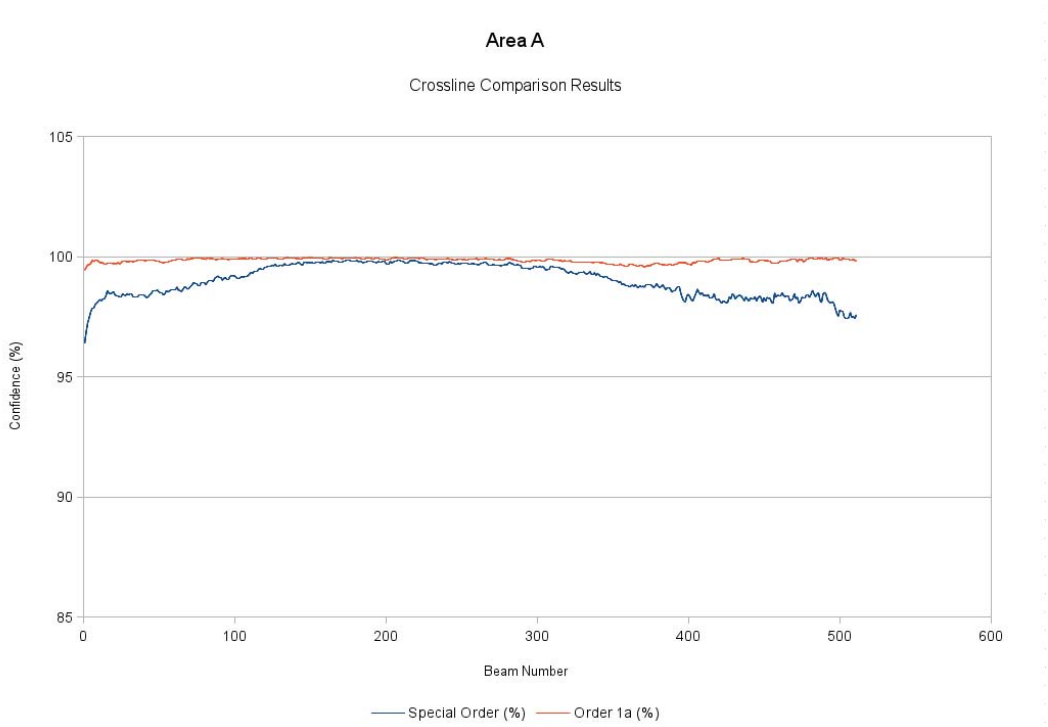


Figure B.1: Crossline comparison results - area A

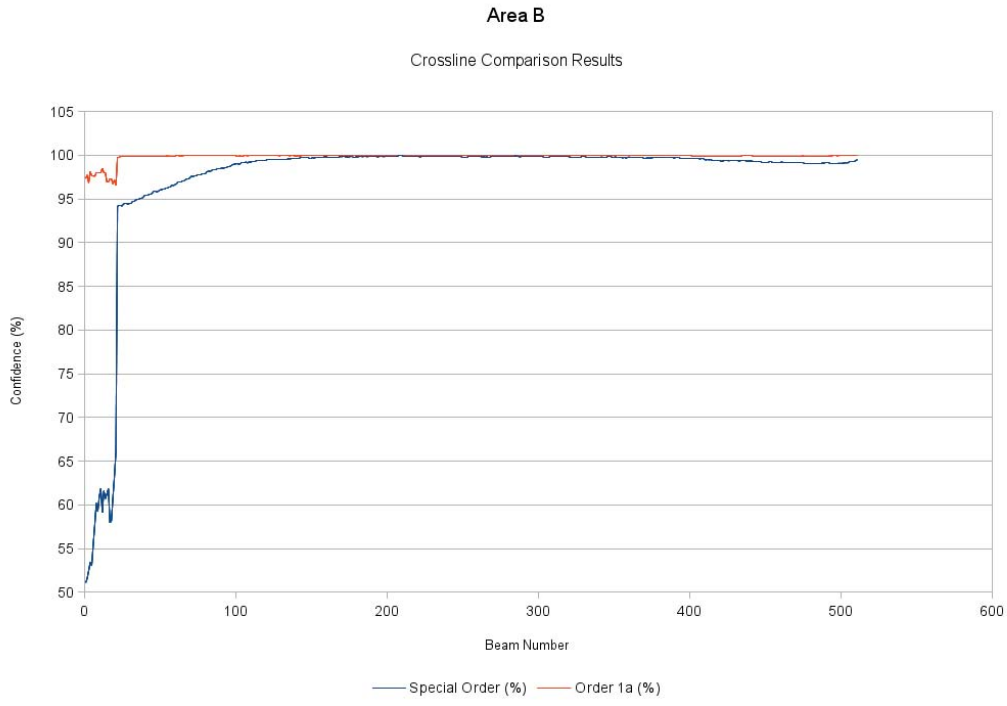


Figure B.2: Crossline comparison results - area B

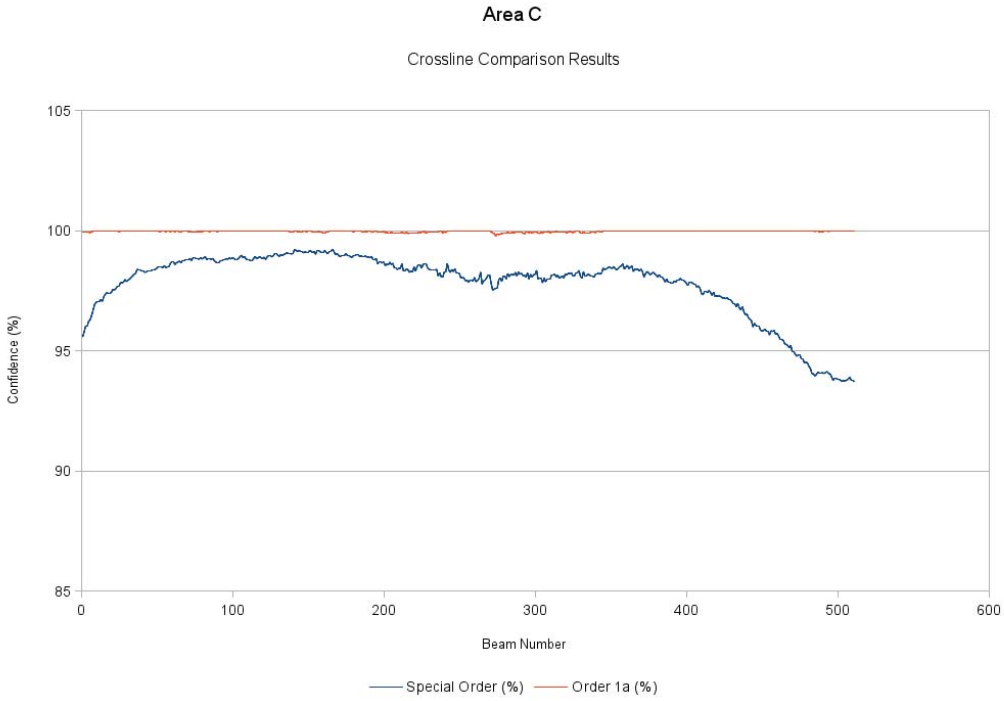


Figure B.3: Crossline comparison results - area C

CUBE surface finalization

Due to the high density of soundings at each CUBE node and the high spatial variation of surface sound velocity, a minimum uncertainty value was entered when generating the finalized CUBE surface for each area. This minimum value was used to prevent unrealistically low uncertainty values propagating to the finalized surface. The minimum value was calculated in accordance with the model by Hare [Hare, 1995], supplemented with values for ellipsoid referenced datum separation. Calculations for the minimum values are shown in table B.6.

Table B.6: Minimum vertical uncertainty values

Factor		$1\times\sigma$ value (meters)		
		Area A	**Area B**	**Area C**
Sounding Uncertainty	σ_1 Vessel GNSS	0.007	0.007	0.007
	σ_2 Vessel Configuration	0.011	0.011	0.011
	σ_3 Sounder Measurement	0.005	0.005	0.005
	σ_4 Refraction	0.060	0.060	0.060
SEP Uncertainty	σ_5 Leveling Misclosure	0.001	0.001	0.000
	σ_6 Benchmark GNSS Uncertainty	0.008	0.008	0.010
	σ_7 Simultaneous Tide Observations	0.004	0.004	0.004
	σ_8 Single SEP Zone Uncertainty	0.010	0.010	0.010
Minimum Vertical Uncertainty (95% Confidence) $1.96\times\sqrt{\sum_{n=1}^{8}\sigma_n^2}$		0.124	0.124	0.158

B.1.4 Coverage and Junctions

All CUBE nodes in the finalized surfaces (except those with designated soundings) exhibit uncertainty values equal to those shown in table B.6. This suggests that the TPU values calculated by *Caris HIPS* for each node in the preliminary CUBE surfaces were unrealistically low. Therefore, the values shown in table B.6 were accepted and retained in the finalized surfaces. They are also supported by the crossline comparison results in section B.1.3.

Although the initial survey requirement was for IHO order 1a, the uncertainty values for all three surfaces meet the requirements for IHO Special Order [IHO, 2008]. The *Caris HIPS* surface QC reports also support this conclusion and are detailed in table B.7.

Table B.7: *Caris HIPS* surface QC results

Surface	Area_A_Main_50cm_SO_Final.csar	Area_B_Main_50cm_Final.csar	Area_C_Main_50cm_Final.csar
Holiday search radius	1	1	1
Holiday minimum nodes	7	7	7
Holiday layer created	Yes	Yes	Yes
Error values from	Uncertainty	Uncertainty	Uncertainty
Number of Nodes Processed	2851339	2014717	9092679
Number of Nodes Populated	2851194 (99.99%)	2014533 (99.9%)	9092545 (100.0%)
Number of Holidays Detected	17	24	3
Nodes within IHO Special Order	100%	100%	100.0%
Residual Mean (m)	-0.138	-0.139	-0.111

The *Caris HIPS* surface QC results in table B.7 indicate the existence of some holidays greater than two nodes in CUBE surfaces of all three areas. 17 holiday nodes exist in area A, 24 in area B and 3 in area C. These holiday areas are stored as holiday layers in the Caris Spatial ARchive (CSAR) files submitted with this survey.

Despite the small holidays in the MBES data, Over 280% SSS coverage was also achieved throughout all survey areas. All features identified in SSS data have been fully investigated using MBES to establish the least depth. No SSS holidays exist within the bathymetry area and no MBES holidays exist over the tops of significant features. Consequently, the NOAA object detection standard has been met for the area surveyed.

One junction exists within the survey area. This is the junction between areas A and B. In this area, the two finalized CUBE surfaces are in agreement. The mean vertical difference between the two finalized CUBE surfaces is 0m with a standard deviation of 0.07m. Horizontal positioning differences are within one node (less than 0.5m). As areas A and B were processed with different navigation sources from different days, this junction area serves to validate the navigation solutions against one another and also to validate the GNSS tide approach.

B.1.5 SEP/GNSS Tide Validation

In order to formally validate the use of GNSS tide data, the crosslines for each area were reprocessed with verified traditional tide data from the NOAA tide stations at the NOAA Lab, Pascagoula and Dock E, Bayou Casotte. 0.5m CUBE surfaces were then calculated from the

traditional tide crosslines and differenced with the finalized CUBE surfaces for each area. Separations between the traditional tide and GNSS tide surfaces are shown in table B.8. The values are within the 95% confidence interval for each surface. This suggests that the final SEP values used were valid and that survey data has been appropriately reduced to the tidal datum, Mean Lower Low Water (MLLW) National Tidal Datum Epoch (NTDE) 1983-2001, using ellipsoid referenced positioning.

Table B.8: SEP/GNSS tide validation

Area	NOAA Station	NOAA tide vs GNSS tide mean surface difference (m)	σ (m)
Area A	NOAA Lab (8741533)	0.04	0.11
Area B	NOAA Lab (8741533)	0.11	0.06
Area C	Dock E (8741041)	-0.02	0.08

B.2 Side Scan Sonar

B.2.1 Data Acquisition and Confidence Checks

SSS data acquisition occured after each area had been assessed with MBES. The SSS was towed with fixed cable out of 10 to 15 meters depending on area. Further control of the SSS towfish height was obtained by altering vessel speed as required. The range scale used for all SSS data collection was 75 meters. The towfish altitude was maintained between 7 to 11 meters above the sea floor. The line spacing was 40 meters, which resulted in a survey coverage of 288% coverage, with 187% overlap.

One major deviation from the specifications was made during the course of the survey. This was the selection of the 75m range scale, instead of the planned 50m range scale. Due to the lack of a depressor wing on the towfish, minimum achievable altitudes were higher than planned - approximately 7.5m - 10m. Consequently, the range scale was adjusted to 75m. Line spacing was kept to 40m and the vessel speed was reduced to approximately 3-4kt. Confidence checks confirmed the theoretical 1m object detection capability at the adjusted range scale:

$$Max\ Speed(ms^{-1}) = \frac{Target\ Size(m) \times PRF(s^{-1})}{3} = \frac{1m \times \left(\frac{1502ms^{-1}}{75m \times 2}\right)}{3} = 3.34ms^{-1} \approx 6.5knots$$

The towed side scan sonar performance was checked on an opportunity basis on multiple occasions throughout each period of use. Checks were conducted using man-made objects including tyres and pylons with less than 0.5m diameter, at or near the full 75m range scale used. All confidence checks demonstrated that the sonar was capable of resolving objects smaller than the 1m requirement at the edge of the range scale. Significantly better resoluton than the 1m requirement was obtained at ranges exceeding 40m (200% coverage envelope). This enabled detection and also classification of features well below the required size. An example is shown in figure B.4

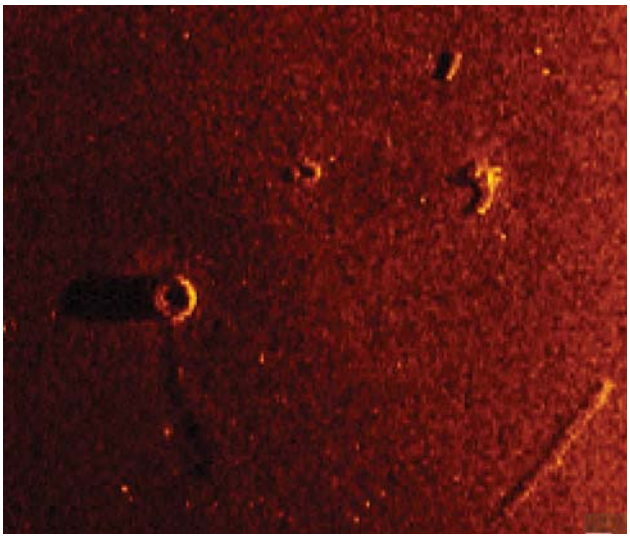


Figure B.4: A car tire and a truck tire at 40m range - high resolution of SSS enables small object (<1m) classification rather than just detection within the 200% coverage envelope

B.2.2 Imaging Processing

The SSS data was reviewed constantly during collection. Significant features, water column disturbances and surface effects were manually logged and recorded in the JSF data.

The JSF lines were imported to *SonarWiz* using time variable gain set to 60 dB in the JSF specific options. 80% of cable-out layback was applied based on feature position matching on reciprocal lines. Altitude tracking was checked prior to slant range correction. User gain control was adjusted for all survey lines in order to generate three consistent mosaics, one for each of the three different survey areas. All lines were 100% examined using the *SonarWiz* digitizer tool. Feature identification and capture was performed on each line. As the survey areas consisted of approach routes and channels, detected features less than 1m in any dimension were also indentified as significant. Features were classified and reports were generated using the *SonarWiz* automated reporting tools. All feature reports are included in appendix V

B.2.3 Review Process and Proof of Coverage

The clarity and intensity of the SSS data were reviewed throughout the collection period and towfish paramaters were adjusted as required. Coverage was monitored in real-time using the *Discover* coverage mapping tool to ensure that no data gaps occurred. The line data and mosaics were independently processed and checked by different team members to ensure that features were adequately classified and that coverage gaps did not occur.

B.2.4 Feature Selection

The intended feature detection size limit was 1m in any dimension. However, the side scan sonar often produced higher resolution data, enabling smaller contacts to be classified. Any contact

showing a significant shadow or reflection at or below 1m in any dimension was digitized and included in the feature report. Feature selection complied with the requirements stipulated in the NOAA Specifications and Deliverables [NOAA, 2013, §6.1.3.2].

All features, were digitized with at least an image, a position and a shadow length measurement in order to obtain an estimate of the feature height. Horizontal dimensions were also captured and where possible, features were type classified.

B.2.5 Seabed Samples

Seabed sampling was completed on 19 June 2013. The Petite Ponar Grab was used to sample the top 5-10cm of seabed sediment in several locations distributed throughout each area. The locations sampled were selected by assessing possible texture boundaries from return intensity variation observed in the gain corrected SSS mosaics. The full list of samples is shown in table B.9. Figure B.5 shows a typical sample of the sediment common throughout the area.

Table B.9: Seabed samples collected 19 June 2013 with S-57 encoding values

Time (UTC)	Latitude	Longitude	NATSUR	NATQUA	COLOUR
1546	30° 19’58.135"N	88° 30’41.491"W	Clay (2)	Stiff (7)	Grey (7)
1555	30° 19 56.592"N	88° 30’42.198"W	Clay, Silt (2,3)	Sticky, Fine (5,1)	Grey, Grey (7,7)
1603	30° 20 01.759"N	88° 30’45.022"W	Silt (3)	Fine (1)	Grey (7)
1611	30° 20’16.015"N	88° 30’36.409"W	Silt (3)	Fine (1)	Grey (7)
1621	30° 20 58.481"N	88° 30’27.109"W	Silt (3)	Fine (1)	Grey (7)
1654	30° 20’22.511"N	88° 34’42.107"W	Silt (3)	Fine (1)	Grey (7)
1701	30° 20’23.870"N	88° 34’32.278"W	Silt (3)	Fine (1)	Grey (7)
1707	30° 20’34.408"N	88° 34’22.150"W	Silt (3)	Fine (1)	Grey (7)
1715	30° 20’35.752"N	88° 34’00.576"W	Silt (3)	Fine (1)	Grey (7)
1721	30° 20’54.328"N	88° 33’55.827"W	Silt (3)	Fine (1)	Grey (7)
1728	30° 21’29.543"N	88° 33’52.965"W	Silt (3)	Fine (1)	Grey (7)
1733	30° 21’53.892"N	88° 33’54.499"W	Silt (3)	Fine (1)	Grey (7)

Figure B.5: Typical sediment

B.2.6 Seabed Texture

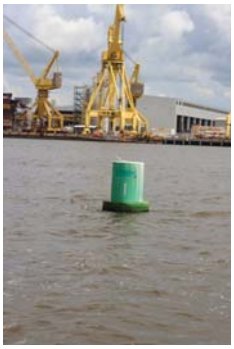
Beam averaged backscatter data was generated from the MBES XTF packets. However, this data was low quality due to significant water column noise. Consequently, processed SSS mosaics were used in place of MBES backscatter to infer seabed texture distribution. The general intensity variation across all mosaics was minimal, suggesting little variation in seabed texture across the survey area. The only observed variation occured at the southern end of area C where a naturally deeper part of the maintained channel contained sticky clay sediment in addition to the fine silt found elsewhere. Seabed sample data is recorded in the S57 Final Feature File submitted with this dataset.

B.3 Aids to Navigation

While many aids to navigation existed in the vicinity of the survey area, only those accessible by boat could be investigated due to security requirements and construction at the shore sites. Two ranges were investigated for their bearing accuracy. These were Bayou Casotte Range "C" and Pascagoula River Range "C" and both were correct. Five floating navigational aids were also positioned using PPK GNSS data sourced from the TopCon GR3 (see table B.10). As all survey activities were conducted during daylight hours, light characteristics were not assessed. Several

floating navigation aids were found to be off station and one floating aid had not yet been charted. However, none of the off station navigation aids were displaced to the degree that they could not serve their purpose.

Table B.10: Floating aids to navigation positioned on 17 June 2013

Timestamp and Imagery	Area	Name	Feature No.	Verified Position	Charted Position	Distance off station (m)	Bearing from station (°)
1557.32 	B	Pascagoula Navy Channel Buoy No. 1	8230	30° 20’ 31.30434"N 88° 34 25.42717"W	30° 20’ 31.574"N 88° 34’ 25.252"W	7	146
1604.38 	B	Lighted Buoy No. 51	8215	30° 20’ 31.38903"N 88° 34’ 05.23274"W	30° 20’ 31.684"N 88° 34’ 25.546"W	7	164
1610.43 	A	*Uncharted* Red can buoy	-	30° 20’ 53.99064"N 88° 33’ 53.10713"W	-	-	-
1615.25 	A	Spoil Bank Day Bn No. 2	8165	30° 21’ 05.56792"N 88° 33’ 57.90609"W	30° 21’ 05.976"N 88° 33’ 58.248"W	12	149
1621.09 	A	Spoil Bank Day Bn No. 4	8150	30° 21’ 19.40770"N 88° 33’ 52.94808"W	30° 21’ 19.728"N 88° 33’ 51.660"W	37	263

C Corrections to Echo Soundings

C.1 Caris HIPS Vessel File

A single *Caris HIPS* vessel file was generated for use over the entire survey period. This file contained separate date-stamped sections to account for changes to navigation source and calibration parameters. The source data for the vessel laybacks was a vessel configuration survey described in section C.1.1. Calibration parameters were generated from calibration surveys as described in section C.1.2. TPU parameters were sourced from manufacturer specifications, and propagation of observed measurement uncertainties.

C.1.1 Vessel Offsets

Vessel Configuration Parameters and Laybacks

On 20 April 2013, a vessel configuration survey for the *R/V GCGC* was conducted using a Leica TPS300 TotalStation, standard Leica prisms and Leica reflective tapes. The 2013 USM Hydrographic Class used a pre-installed set of benchmarks at the USM Center for Marine Science. The *R/V GCGC* was oriented in the network of benchmarks to maximize the visibility of a number of prisms installed on the vessel equipment mounting points. Using the TotalStation, the horizontal distance, horizontal angles and vertical angles between each benchmark, and each prism were measured. The GNSS and IMU sensor positions were all observed from multiple stations. Additional reference marks were also observed to aid in positioning other devices. All benchmarks were also observed from each other to aid in network adjustment. The set up is shown in figure C.1.

The measurements were least-squares adjusted in 3-dimensions using Lieca *GeoOffice*. The coordinate system was then rotated and translated from the survey local reference frame to the vessel reference frame. Uncertainty values calculated during adjustment were retained for use in calculating the *Caris HIPS* vessel configuration file TPU entries.

The position of the SSS tow point and MBES acoustic center were measured with a tape measure, relative to marks positioned with the TotalStation. The uncertanty associated with the TotalStation measurement was propagated through the geometry along with the increased uncertainty associated with tape-measurement. For this reason, uncertainty values for these sensor positions were an order of magnitude higher than that of the marks positioned by TotalStation alone.
Full results of the calibration survey are included in appendix I.2.

Figure C.1: *R/V GCGC* set up for the configuration survey

Principle Systems

The principle system positions and associated uncertainties derived from the vessel configuration file are shown in table C.1.

Table C.1: Vessel configuration (X=bow+, Y=starboard+, Z=down+)

Sensor	X (m)	Y (m)	Z (m)	σ_X (m)	σ_Y (m)	σ_Z (m)
POSMV IMU	0.6152	0.7014	-0.1623	0.0028	0.0013	0.0021
POSMV GNSS 1	-0.2823	-0.9265	-2.0712	0.0037	0.0017	0.0028
POSMV GNSS 2	-0.2947	0.9099	-2.0889	0.0028	0.0013	0.0021
TopCon GR3 GNSS	-1.6647	0.9079	-2.0872	0.0030	0.0013	0.0022
MBES	-1.6673	1.6343	0.8893	0.0278	0.0137	0.0111
SSS Towpoint	-2.01	-1.430	-1.580	0.0300	0.0300	0.0300

The layback values were entered into the POSMV unit so as to ensure real-time translation of heave, pitch, roll and azimuth data to the vessel center of rotation. Laybacks were also entered into *QINSy* to ensure accurate display of vessel position during real-time collection, and to ensure inclusion of layback values in the output XTF data. Finally, the laybacks were combined with the

manufacturer uncertainty and empirical uncertainty values and entered into the *Caris HIPS* vessel file. The vessel report is included in appendix I.

C.1.2 Multibeam Calibration

Initial Calibration

An initial calibration survey (patch test) was conducted 6 June 13 in the Pearl River under benign conditions. The Pearl River calibration area was an ideal location due to its flat seabed with a regular pattern of deep pockmarks that are easily identifed in bathymetry.

Calibration values were obtained via the *Caris HIPS* calibration tool in the order prescribed by NOAA [NOAA, 2013, §5.2.4.1]. Initial calibration values are applied to the *Caris HIPS* vessel file SVP data section for data collected on 6-12 June 13 (Julian days 157-163). Calibration values are shown in table C.2.

An image of the calibration lines and the post-calibration CUBE surface is shown in figure C.2.

Figure C.2: *R/V GCGC* Pearl River calibration lines and post-calibration 0.5m CUBE surface

Additional Calibration

While slipping the vessel on 12 June 13 the MBES housing collided with a pylon. This caused the housing to tilt, requiring realignment and invalidating the initial calibration. After realignment of the housing, a second calibration survey was conducted in the Pascagoula River on 13 June 13.

Values obtained during the second calibration were applied to all data collected from 13 June 13 until survey completion. Adjusted calibration values are also shown in table C.2.

The Pascagoula River calibration lines and post-calibration 0.5m CUBE surface are shown in figure C.3. The feature used for calibration was an outcropping edge of a dredged channel area.

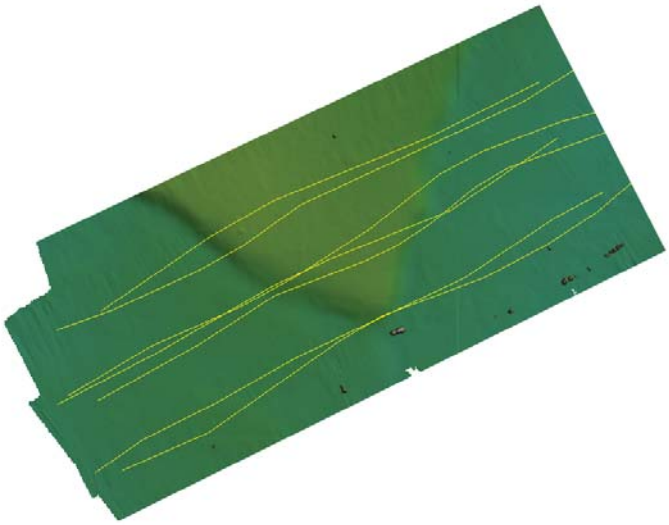


Figure C.3: *R/V GCGC* Pascagoula River calibration lines and post-calibration 0.5m CUBE surface

Table C.2: Vessel calibration values

Date	**Roll (°)**	**Pitch (°)**	**Azimuth (°)**	**Timing (s)**
6-12 June 13	1.00	-2.50	1.40	0.00
13-21 June 13	1.66	-2.50	2.60	0.00

C.2 Attitude and Position Data

The POSMV ethernet packet data was logged at 50 Hz. This data included raw dual frequency positioning data from both GNSS antennae, full attitude data and heave data. The position data was post-processed using the GCGC "MSGA" reference station using *POSPac* and augmented with attitude data to form SBET. The final position rate was 10 Hz, with attitude and heave data at 50 Hz. This data was applied in full to all lines in areas B and C using the *Caris HIPS Load Attitude/Navigation* tool.

In area A, only the attitude portion of the SBET was applied to the lines, with position data obtained from the TopCon GR3 1Hz PPK solution.

C.3 Tide and Water Level Corrections

Tidal correction of soundings was achieved by using a zoned single SEP model with two discrete zones. In each zone, the SEP between the NAD83 (CORS 2011/MA11/PA11) epoch 2010.0 ellipsoid and the MLLW (NTDE 1983-2001) datum reference, at each controlling NOAA tide station location, was established. This was achieved through geodetic GNSS observations, leveling of benchmarks and simultaneous tide gauge-staff observations.

A zoned single SEP value approach was chosen as tidal analysis in *NAVOTAS* indicated less than 1cm range difference and less than 10 minutes phase difference across each zone - significantly below than the normal NOAA single tide zone limit. For further details, see the Vertical and Horizontal Control Report.

SEP values and uncertainties used are shown in table C.3.

Table C.3: SEP values and uncertainty at 95% confidence

Area	SEP (m)	Uncertainty (95%) (m)
A and B	-28.1819	0.0268
C	-28.1543	0.0294

These SEP values were entered when using the *Caris HIPS Compute GNSS Tide* tool as the vertical separation value to reduce soundings to the tidal datum. GNSS tide was then applied during the *Merge* process.

C.4 Sound Velocity Correction

Sound velocity casts conducted during sounding operations were compiled into a single *Caris HIPS* SVP file. Each cast was accompanied by its collection time, date and position. Every sounding was raytraced through same SVP dataset, using the *nearest in time* technique. This method was chosen due to the small survey area sizes and limited geographic distribution of casts.

C.5 TPU Calculation

Manufacturer quoted accuracy values were input into the *Caris HIPS* Vessel File at $1\times\sigma$, in conjunction with measurement uncertainty values derived from the vessel configuration survey also at 1σ. Uncertainty values 1σ derived from GNSS tide values (see table C.3) was included in the *Caris HIPS* TPU calculation tool as "Zoning" uncertainty. This is in accordance with the method stipulated in the NOAA Field Procedures Manual [NOAA, 2012, §4.2.3.8]. TPU values used in the *Caris HIPS* vessel file are shown in table C.4. These values reflect the change in TPU values due to switching navigation source from the TopCon GR3 PPK to the POSMV PPK/SBET data.

Table C.4: *Caris HIPS* vessel file TPU entries

Entry		Julian Day	
		JD 157/13	**JD 163/13**
Offsets	MRU to Transducer X (m)	0.933	0.933
	MRU to Transducer Y (m)	-2.283	-2.283
	MRU to Transducer Z (m)	1.052	1.052
	Nav to Transducer X (m)	0.726	1.634
	Nav to Transducer Y (m)	0.026	-1.667
	Nav to Transducer Z (m)	2.978	0.889
	Transducer Roll (°)	0.000	0.000
Standard Deviations	Motion Gyro (°)	0.030	0.030
	Heave % Amplitude	5.000	5.000
	Heave (m)	0.050	0.050
	Roll (°)	0.030	0.030
	Pitch (°)	0.030	0.030
	Position Navigation (m)	0.100	0.100
	Timing Transducer (s)	0.010	0.010
	Navigation Timing (s)	0.010	0.010
	Gyro Timing (s)	0.010	0.010
	Heave Timing (s)	0.001	0.001
	Pitch Timing (s)	0.001	0.001
	Roll Timing (s)	0.001	0.001
	Offset X (m)	0.014	0.014
	Offset Y (m)	0.028	0.028
	Offset Z (m)	0.011	0.011
	Vessel Speed (m/s)	0.010	0.010
	Loading (m)	0.000 (N/A for ERS Survey)	
	Draft (m)	0.000 (N/A for ERS Survey)	
	Delta Draft (m)	0.000 (N/A for ERS Survey)	
	MRU Gyro Alignment	0.030	0.030
	MRU Roll/Pitch Alignment	0.030	0.030

D Approval Sheet

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Appendices

I Vessel Reports

I.1 *Caris HIPS* Vessel Report

```
Vessel Name: GCGC_Reson_Stbd.hvf
Vessel created: June 21, 2013

Depth Sensor:

Sensor Class:  Swath
Time Stamp:  2013-157 00:00

Comments:
Time Correction(s) 0.000

Transduer #1:
-------------
Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 1.634
DeltaY: -1.667
DeltaZ: 0.889

Manufacturer:  Reson SeaBat 7125 (400kHz 512 Beams)
Model:  sb7125d
Serial Number:

Depth Sensor:

Sensor Class:  Swath
Time Stamp:  2013-163 00:00

Comments:
Time Correction(s) 0.000

Transduer #1:
-------------
Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 1.634
DeltaY: -1.667
DeltaZ: 0.889

Manufacturer:  Reson SeaBat 7125 (400kHz 512 Beams)
Model:  sb7125d
Serial Number:

Depth Sensor:

Sensor Class:  Swath
```

```
Time Stamp:  2013-164 00:00

Comments: Reson Remount
Time Correction(s) 0.000

Transduer #1:
-------------
Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 1.634
DeltaY: -1.667
DeltaZ: 0.889

Manufacturer:  Reson SeaBat 7125 (400kHz 512 Beams)
Model:  sb7125d
Serial Number:


------------------------------------------------------------
Navigation Sensor:

Time Stamp:  2013-157 00:00

Comments: TopCon GNSS
Time Correction(s) 0.000
DeltaX: 0.908
DeltaY: -1.665
DeltaZ: -2.087

Manufacturer:  TopCon
Model:  GR3
Serial Number:  (null)


Time Stamp:  2013-163 00:00

Comments: POSMV SBET
Time Correction(s) 0.000
DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Manufacturer:  POSMV
Model:  v5 Wavemaster
Serial Number:

------------------------------------------------------------
Gyro Sensor:

Time Stamp:  2013-157 00:00

Comments: (null)
Time Correction(s) 0.000
```

```
------------------------------------------------------
Heave Sensor:

Time Stamp:  2013-157 00:00

Comments: (null)
Apply No
Time Correction(s) 0.000
DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000
Offset: 0.000

Manufacturer:  (null)
Model:  (null)
Serial Number:  (null)

------------------------------------------------------
Pitch Sensor:

Time Stamp:  2013-157 00:00

Comments: (null)
Apply No
Time Correction(s) 0.000
Pitch offset: 0.000

Manufacturer:  (null)
Model:  (null)
Serial Number:  (null)

------------------------------------------------------
Roll Sensor:

Time Stamp:  2013-157 00:00

Comments: (null)
Apply Yes
Time Correction(s) 0.000
Roll offset: 0.000

Manufacturer:  (null)
Model:  (null)
Serial Number:  (null)

------------------------------------------------------
TPU

Time Stamp:  2013-157 00:00

Comments:
Offsets
```

```
Motion sensing unit to the transducer 1
X Head 1 0.933
Y Head 1 -2.283
Z Head 1 1.052
Motion sensing unit to the transducer 2
X Head 2 0.000
Y Head 2 0.000
Z Head 2 0.000
Navigation antenna to the transducer 1
X Head 1 0.726
Y Head 1 0.026
Z Head 1 2.978
Navigation antenna to the transducer 2
X Head 2 0.000
Y Head 2 0.000
Z Head 2 0.000

Roll offset of transducer number 1 0.000
Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000'' of heave amplitude.
Measurement errors: 0.014
Motion sensing unit alignment errors
Gyro:0.030 Pitch:0.030 Roll:0.030
Gyro measurement error: 0.030
Roll measurement error: 0.030
Pitch measurement error: 0.030
Navigation measurement error: 0.100
Transducer timing error: 0.010
Navigation timing error: 0.010
Gyro timing error: 0.010
Heave timing error: 0.001
PitchTimingStdDev: 0.001
Roll timing error: 0.001
Sound Velocity speed measurement error: 0.000
Surface sound speed measurement error: 0.000
Tide measurement error: 0.000
Tide zoning error: 0.000
Speed over ground measurement error: 0.010
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000
Delta draft measurement error: 0.000
StDev Comment: (null)

Time Stamp:  2013-163 00:00

Comments:
Offsets

Motion sensing unit to the transducer 1
X Head 1 0.933
Y Head 1 -2.283
Z Head 1 1.052
Motion sensing unit to the transducer 2
```

```
X Head 2 0.000
Y Head 2 0.000
Z Head 2 0.000
Navigation antenna to the transducer 1
X Head 1 1.634
Y Head 1 -1.667
Z Head 1 0.889
Navigation antenna to the transducer 2
X Head 2 0.000
Y Head 2 0.000
Z Head 2 0.000

Roll offset of transducer number 1 0.000
Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000'' of heave amplitude.
Measurement errors: 0.014
Motion sensing unit alignment errors
Gyro:0.030 Pitch:0.030 Roll:0.030
Gyro measurement error: 0.030
Roll measurement error: 0.030
Pitch measurement error: 0.030
Navigation measurement error: 0.100
Transducer timing error: 0.010
Navigation timing error: 0.010
Gyro timing error: 0.010
Heave timing error: 0.001
PitchTimingStdDev: 0.001
Roll timing error: 0.001
Sound Velocity speed measurement error: 0.000
Surface sound speed measurement error: 0.000
Tide measurement error: 0.000
Tide zoning error: 0.000
Speed over ground measurement error: 0.010
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000
Delta draft measurement error: 0.000
StDev Comment: (null)
-----------------------------------------------------------
Svp Sensor:

Time Stamp:  2013-157 00:00

Comments: TopCon GNSS
Time Correction(s) 0.000

Svp #1:
-------------
Pitch Offset: -2.500
Roll Offset: 1.000
Azimuth Offset: 2.600

DeltaX: 1.634
DeltaY: -1.667
```

```
DeltaZ: 0.889

SVP #2:
-------------
Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000


Time Stamp:  2013-163 00:00

Comments: Change to POSMV
Time Correction(s) 0.000

Svp #1:
-------------
Pitch Offset: -2.500
Roll Offset: 1.000
Azimuth Offset: 2.600

DeltaX: 1.634
DeltaY: -1.667
DeltaZ: 0.889

SVP #2:
-------------
Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000


Time Stamp:  2013-164 00:00

Comments: Reson Remount
Time Correction(s) 0.000

Svp #1:
-------------
Pitch Offset: -2.500
Roll Offset: 1.660
Azimuth Offset: 1.400

DeltaX: 1.634
DeltaY: -1.667
DeltaZ: 0.889
```

```
SVP #2:
-------------
Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

------------------------------------------------------------
```

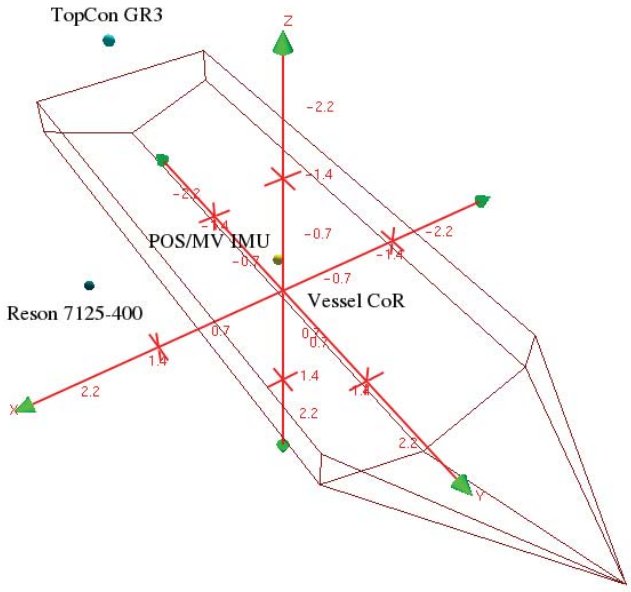


Figure I.1: *Caris HIPS* vessel configuration

I.2 Vessel Configuration Survey Data

The benchmark positions, relative to benchmark A, used in the vessel configuration survey are shown in table I.1

Table I.1: Relative benchmark positions

Point	X (m)	Y (m)	Z (m)
A	0.000	0.000	0.000
B	10.356	-2.607	-0.376
C	22.210	-2.920	-0.289
D	27.407	6.397	-0.274
E	20.596	17.525	-0.298
F	15.703	23.538	-0.340
G	-0.004	26.679	0.109
H	-5.642	13.919	0.067

Positions for relevant sensors and reference points obtained through adjustment in *Leica GeoOffice* are shown in table I.2. An image of the adjusted points and baselines is shown in figure I.2 (NOTE: All distances are in meters and defined in the vessel coordinate system: Y is the centerline and positive forward, X is athwart ships and positive to starboard, Z is the yaw axis and positive upwards.)

Table I.2: Sensor/reference positions relative to center of rotation (RM)

Point ID	X (m)	Y (m)	Z (m)	σ_X (m)	σ_Y (m)	σ_Z (m)
RM	0.0000	0.0000	0.0000	0.000000	0.000000	0.000000
BP	-0.4367	4.7189	1.0137	0.001820	0.003678	0.002800
BS	0.4305	4.7280	1.0230	0.001248	0.002928	0.002100
CLA	0.0000	0.0000	1.9150	0.002835	0.006091	0.004600
CLF	0.0000	2.4917	1.7792	0.001633	0.003607	0.002600
IMU	0.7014	0.6152	0.1623	0.001283	0.002834	0.002100
PAGPS	-0.9087	-1.6591	2.0711	0.001458	0.003221	0.002400
PFGPS	-0.9265	-0.2823	2.0712	0.001691	0.003736	0.002800
PMB	-1.2530	-1.6775	0.7781	0.003137	0.007273	0.005400
PMT	-1.2530	-1.6663	1.6892	0.003137	0.007273	0.005500
SAGPS	0.9079	-1.6647	2.0872	0.001341	0.002963	0.002200
SFGPS	0.9099	-0.2947	2.0889	0.001283	0.002834	0.002100
SMB	1.2719	-1.6743	0.7962	0.002612	0.006114	0.004600
SMT	1.2647	-1.6602	1.7102	0.002612	0.006114	0.004600
SP	-1.1857	-3.7572	0.3929	0.003137	0.007273	0.005500
SS	1.2055	-3.7709	0.4118	0.002694	0.006465	0.004800
PT	-1.4590	-1.6719	-0.7488	0.007245	0.024875	0.014106
ST	1.6343	-1.6673	-0.8893	0.013671	0.027819	0.011095

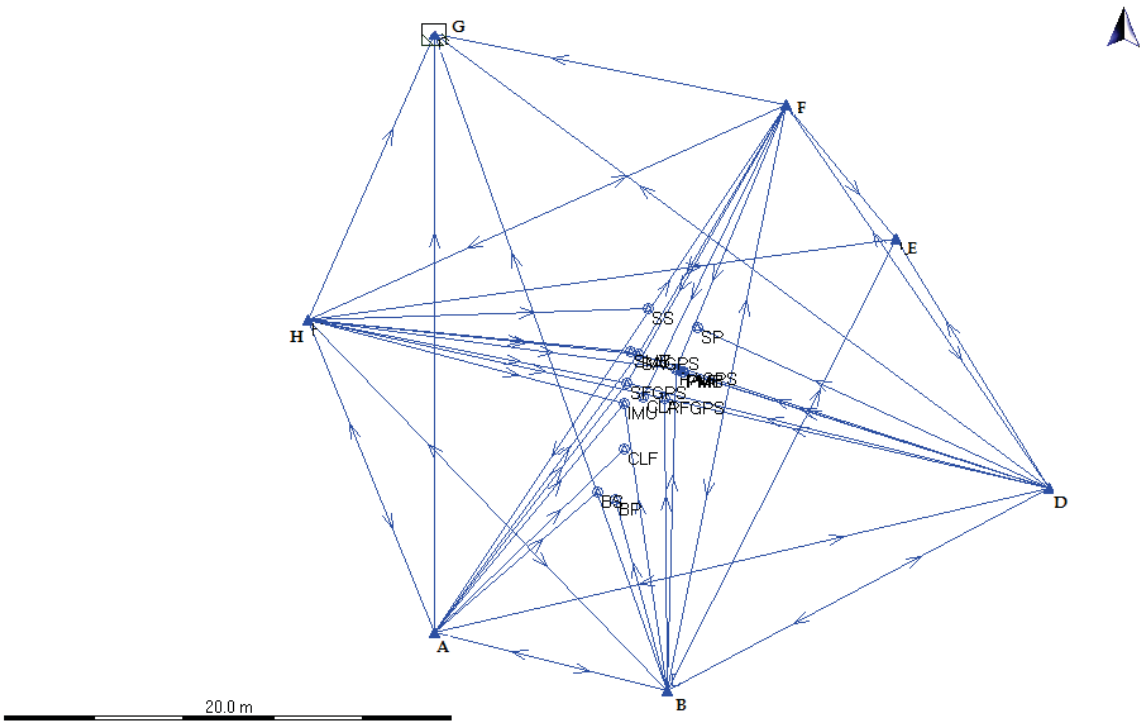
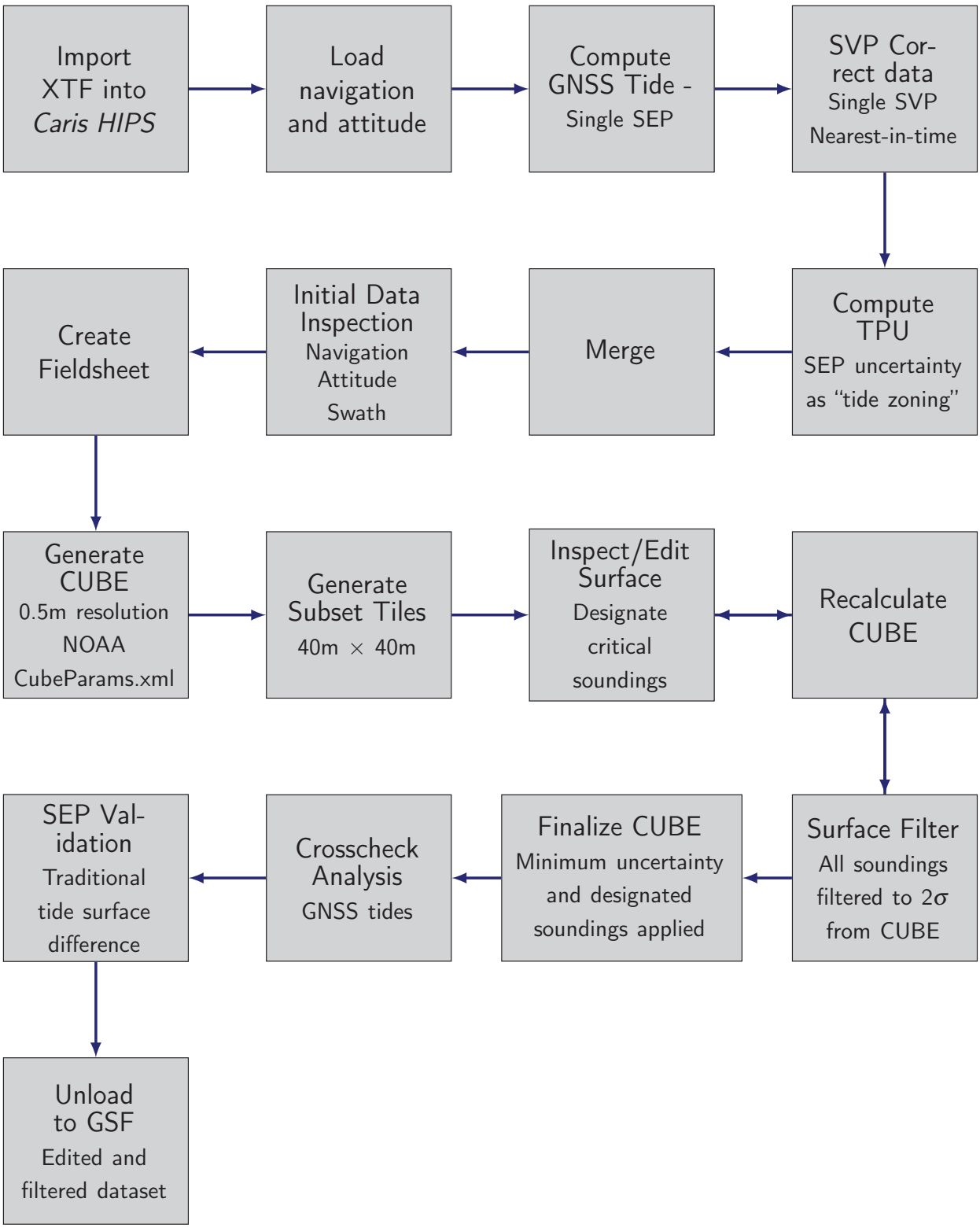


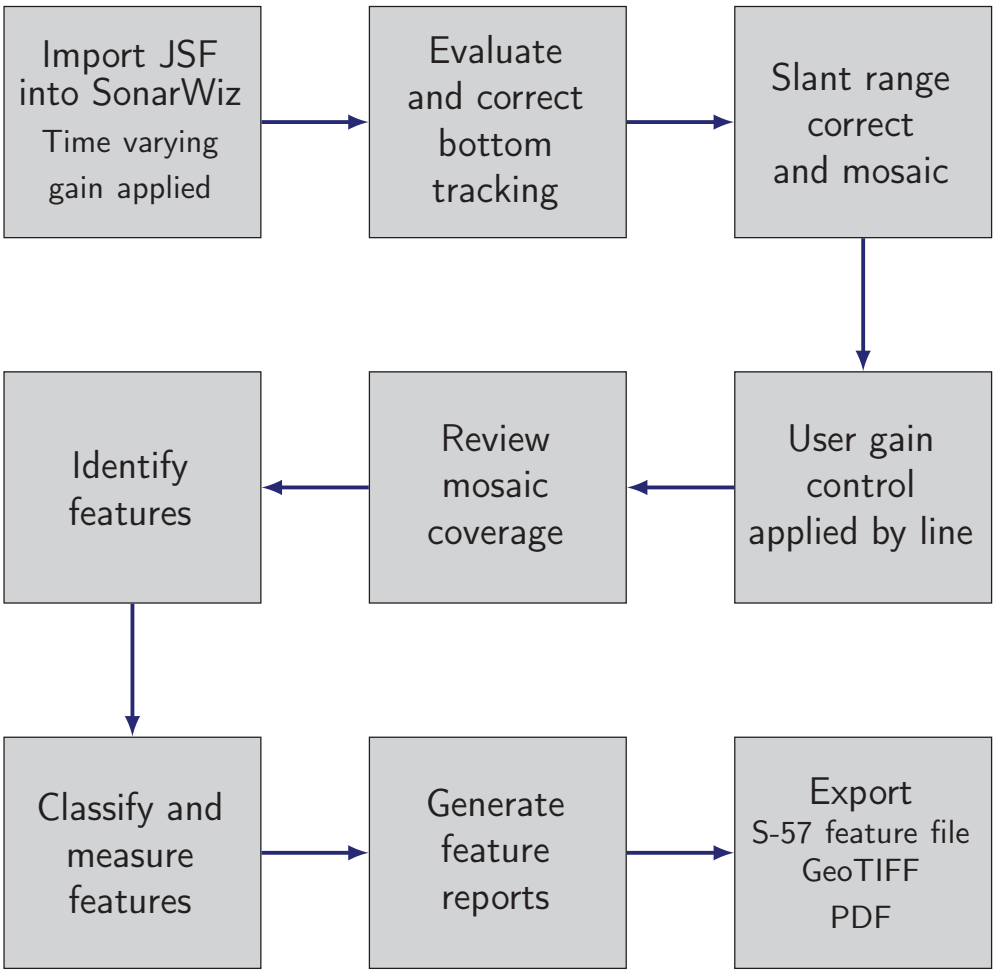
Figure I.2: *Leica GeoOffice* vessel configuration adjustment baselines

II Data Processing Workflow Diagrams

II.1 Caris HIPS Workflow



II.2 SonarWiz Workflow



III Systems and Sensors

III.1 Equipment Wiring

Wiring Diagram

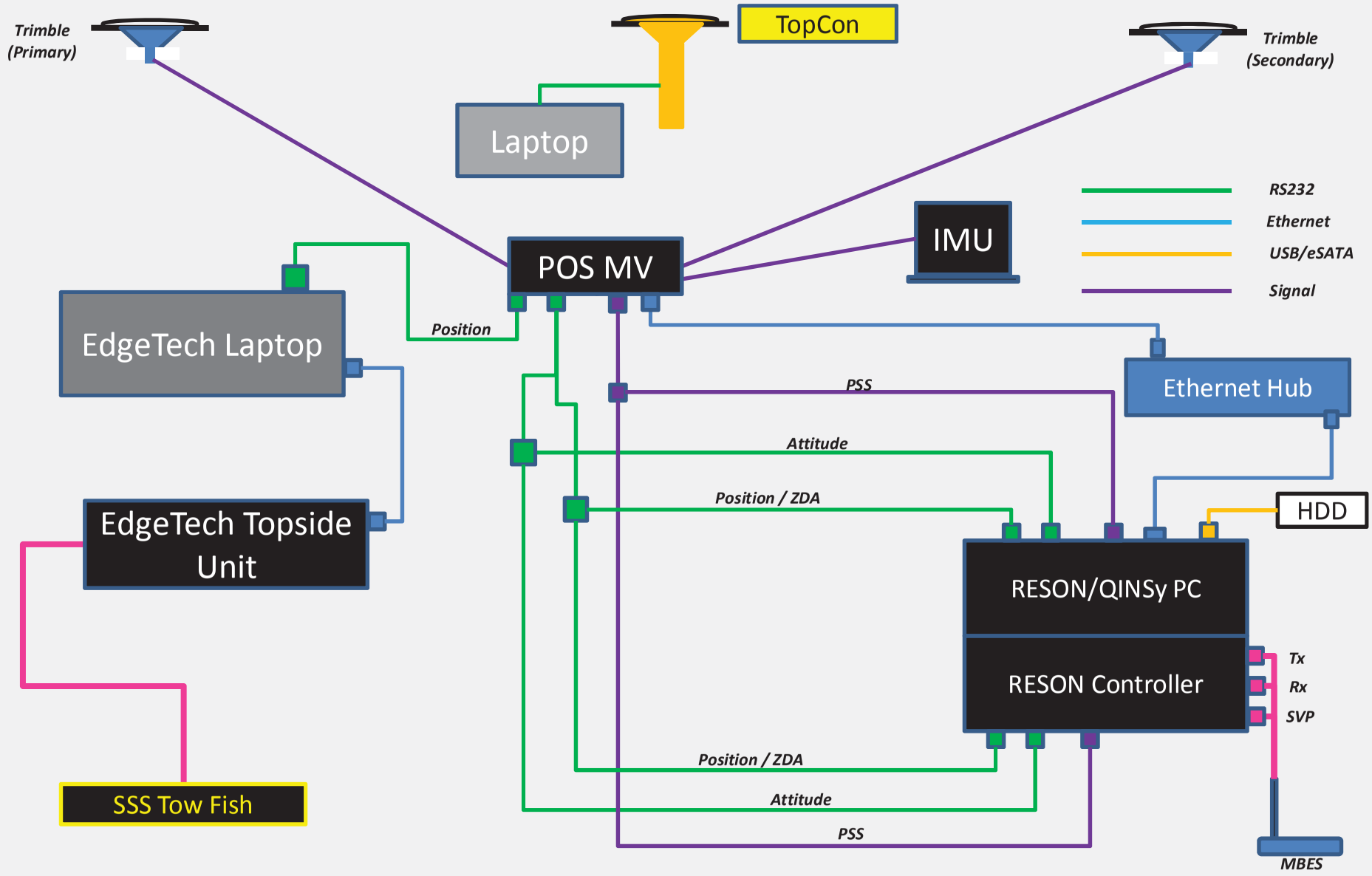


Diagram adapted from original sourced from: *Barbor, K. & Dodd, D. (2011), "The Hydrographic Science Research Center's New Survey Suite and Operational Capabilities", Powerpoint Presentation, University of Southern Mississippi, Slide 15*

III.2 MBES Coverage Calculation

MBES Coverage Calculator

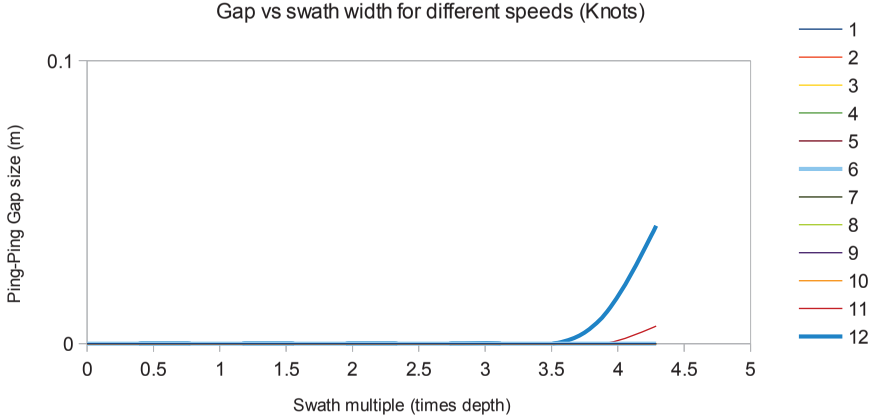
By Geoffrey Lawes 2013

Parameters Sonar: **Reson 7125 – 400kHz**

Fore-aft beam width	1.000	Degrees
Side-side beam width (nominal)	0.500	Degrees
Maximum Ping Rate	30	Hz
Number of Beams	512	Beams
Maximum Depth	22	m
Average SV	1510	m/s
Min Swath Angle	0	Degrees
Max Swath Angle	130	Degrees

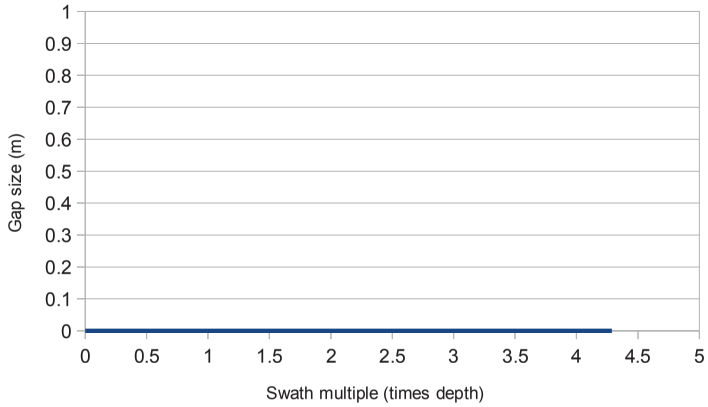
Along track coverage

Gap vs swath width for different speeds (Knots)



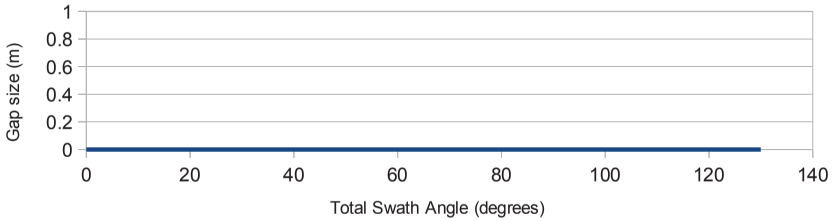
Across track coverage

Gap versus swath width multiple - EQUIDISTANT spacing



Across Track Coverage

Gap size vs Swath Width - EQUI-ANGULAR spacing



Working sheet – Along track

Depth	22
Min Fore-Aft Footprint	0.38397
Fore-aft beamwidth (r)	0.01745
Side-side beamwidth (r)	0.00873
Number of Beams	512
Max Ping Rate	30
SV	1510

	Ping Rate vs ½ Swath Width											
½ Swath Width	**0**	**0.194955**	**0.38991**	**0.584866**	**0.779821**	**0.974776**	**1.169731**	**1.364686**	**1.559641**	**1.754597**	**1.949552**	**2.144507**
Rate (Hz)	30	30	30	29.62355	27.06232	24.57458	22.30019	20.28437	18.52338	16.99293	15.66281	14.50349

Min Angl 0 **Max Angl** 2.268928

		Along-track Gap vs Total Swath Width											
Speed (kt)	**(m/s)**	**0**	**0.38991**	**0.779821**	**1.169731**	**1.559641**	**1.949552**	**2.339462**	**2.729372**	**3.119283**	**3.509193**	**3.899103**	**4.289014**
1	0.5144	0	0	0	0	0	0	0	0	0	0	0	0
2	1.0289	0	0	0	0	0	0	0	0	0	0	0	0
3	1.5433	0	0	0	0	0	0	0	0	0	0	0	0
4	2.0578	0	0	0	0	0	0	0	0	0	0	0	0
5	2.5722	0	0	0	0	0	0	0	0	0	0	0	0
6	3.0867	0	0	0	0	0	0	0	0	0	0	0	0
7	3.6011	0	0	0	0	0	0	0	0	0	0	0	0
8	4.1156	0	0	0	0	0	0	0	0	0	0	0	0
9	4.6300	0	0	0	0	0	0	0	0	0	0	0	0
10	5.1444	0	0	0	0	0	0	0	0	0	0	0	0
11	5.6589	0	0	0	0	0	0	0	0	0	0	0	0.006202
12	6.1733	0	0	0	0	0	0	0	0	0	0	0.010167	0.041672
13	6.6878	0	0	0	0	0	0	0	0	0	0.00959	0.043012	0.077143
14	7.2022	0	0	0	0	0	0	0	0	0.004846	0.039864	0.075857	0.112613
15	7.7167	0	0	0	0	0	0	0	0	0.032618	0.070138	0.108702	0.148083
16	8.2311	0	0	0	0	0	0	0	0.021813	0.060391	0.100412	0.141547	0.183554
17	8.7456	0	0	0	0	0	0	0.008202	0.047175	0.088164	0.130686	0.174392	0.219024
18	9.2600	0	0	0	0	0	0	0.031271	0.072537	0.115936	0.16096	0.207237	0.254495
19	9.7744	0	0	0	0	0	0.013774	0.05434	0.097898	0.143709	0.191234	0.240082	0.289965
20	10.2889	0	0	0	0	0	0.034708	0.077409	0.12326	0.171482	0.221508	0.272927	0.325435
21	10.8033	0	0	0	0	0.01523	0.055642	0.100478	0.148622	0.199255	0.251782	0.305772	0.360906
22	11.3178	0	0	0	0	0.034239	0.076576	0.123547	0.173983	0.227027	0.282056	0.338617	0.396376
23	11.8322	0.010434972	0.010435	0.010435	0.015447	0.053249	0.09751	0.146616	0.199345	0.2548	0.31233	0.371462	0.431847
24	12.3467	0.0275831201	0.027583	0.027583	0.032813	0.072258	0.118444	0.169685	0.224706	0.282573	0.342604	0.404307	0.467317
25	12.8611	0.0447312683	0.044731	0.044731	0.050179	0.091268	0.139378	0.192754	0.250068	0.310345	0.372878	0.437152	0.502787
26	13.3756	0.0618794164	0.061879	0.061879	0.067545	0.110278	0.160312	0.215823	0.27543	0.338118	0.403152	0.469997	0.538258
27	13.8900	0.0790275646	0.079028	0.079028	0.084911	0.129287	0.181246	0.238892	0.300791	0.365891	0.433426	0.502842	0.573728
28	14.4044	0.0961757127	0.096176	0.096176	0.102277	0.148297	0.20218	0.261961	0.326153	0.393664	0.4637	0.535687	0.609198
29	14.9189	0.1133238609	0.113324	0.113324	0.119643	0.167307	0.223114	0.28503	0.351515	0.421436	0.493974	0.568532	0.644669
30	15.4333	0.130472009	0.130472	0.130472	0.13701	0.186316	0.244048	0.308099	0.376876	0.449209	0.524249	0.601377	0.680139

Working Sheet – Across Track

Depth	22
Fore-aft beamwidth (r)	0.01745
Side-side beamwidth (r)	0.00873
Number of Beams	512
Max Ping Rate	30
SV	1510
Min Angle (r)	0
Max Angle (r)	2.26893

	Equidistant Beam spacing vs ½ Swath Width											
½ Swath Multi	**0**	**0.19496**	**0.38991**	**0.58487**	**0.77982**	**0.97478**	**1.16973**	**1.36469**	**1.55964**	**1.7546**	**1.94955**	**2.14451**
Spacing (m)	0	0.01675	0.03351	0.05026	0.06702	0.08377	0.10052	0.11728	0.13403	0.15079	0.16754	0.18429

	Equidistant Beam width vs ½ Swath Width											
½ Swath Multi	**0**	**0.19496**	**0.38991**	**0.58487**	**0.77982**	**0.97478**	**1.16973**	**1.36469**	**1.55964**	**1.7546**	**1.94955**	**2.14451**
Min Footprint (m)	0.19199	0.19199	0.19199	0.19199	0.19199	0.19199	0.19199	0.19199	0.19199	0.19199	0.19199	0.19199
GAP	0	0	0	0	0	0	0	0	0	0	0	0

	Equiangular spacing vs full Swath Angle											
½ Swath Multi	**0**	**0.20627**	**0.41253**	**0.6188**	**0.82506**	**1.03133**	**1.2376**	**1.44386**	**1.65013**	**1.8564**	**2.06266**	**2.26893**
Footprint	0	0.00076	0.00152	0.00228	0.00305	0.00381	0.00457	0.00533	0.00609	0.00685	0.00762	0.00838
GAP	0	0	0	0	0	0	0	0	0	0	0	0
Full sweep (degrees)	0	11.8182	23.6364	35.4545	47.2727	59.0909	70.9091	82.7273	94.5455	106.364	118.182	130

Total Swath Multi	**0**	**0.38991**	**0.77982**	**1.16973**	**1.55964**	**1.94955**	**2.33946**	**2.72937**	**3.11928**	**3.50919**	**3.8991**	**4.28901**

IV Sound Velocity Profiles

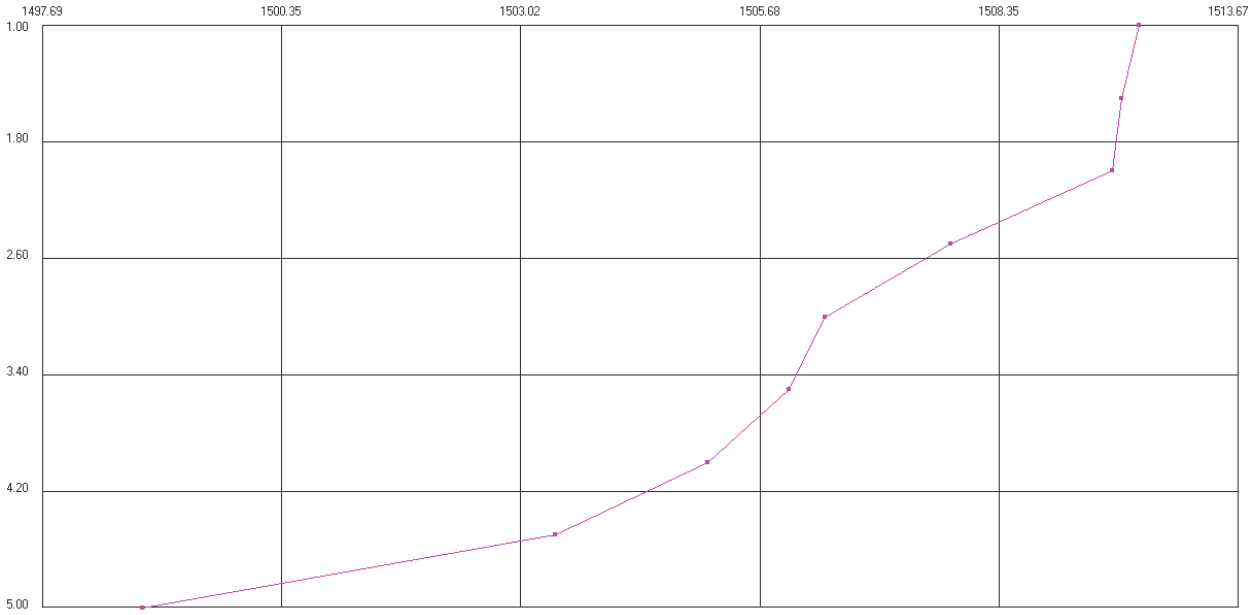


Figure IV.1: SVP Cast 2013-157 13:47:00 30°21’09"N 089°37’47"W

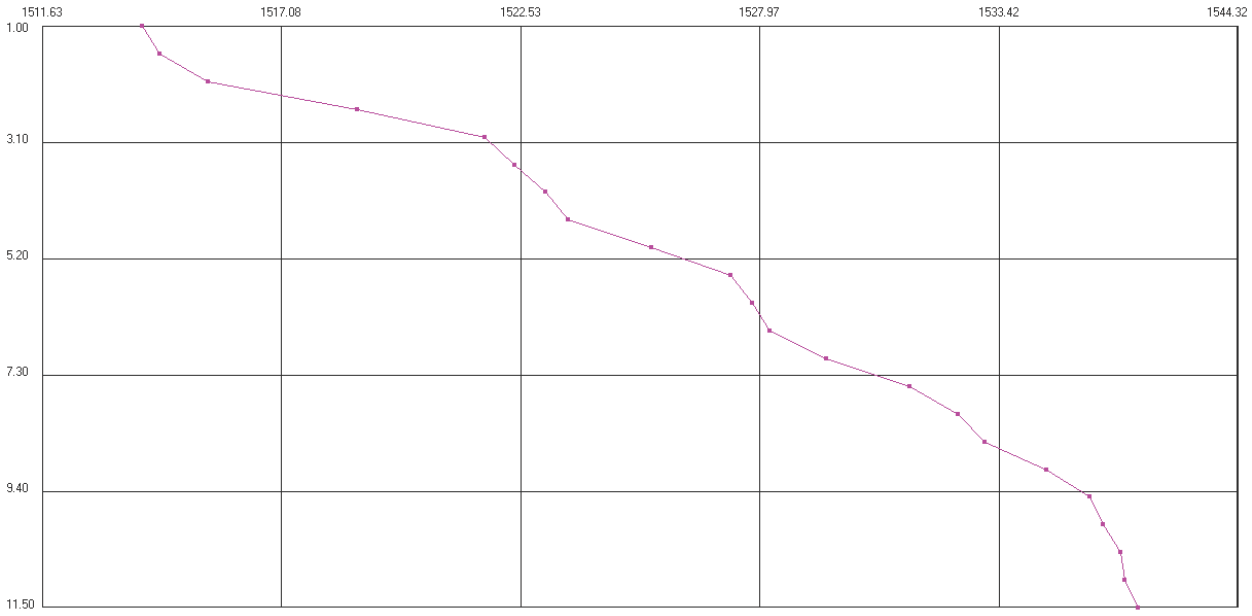


Figure IV.2: SVP Cast 2013-161 14:36:00 30°22’03"N 088°33’50"W

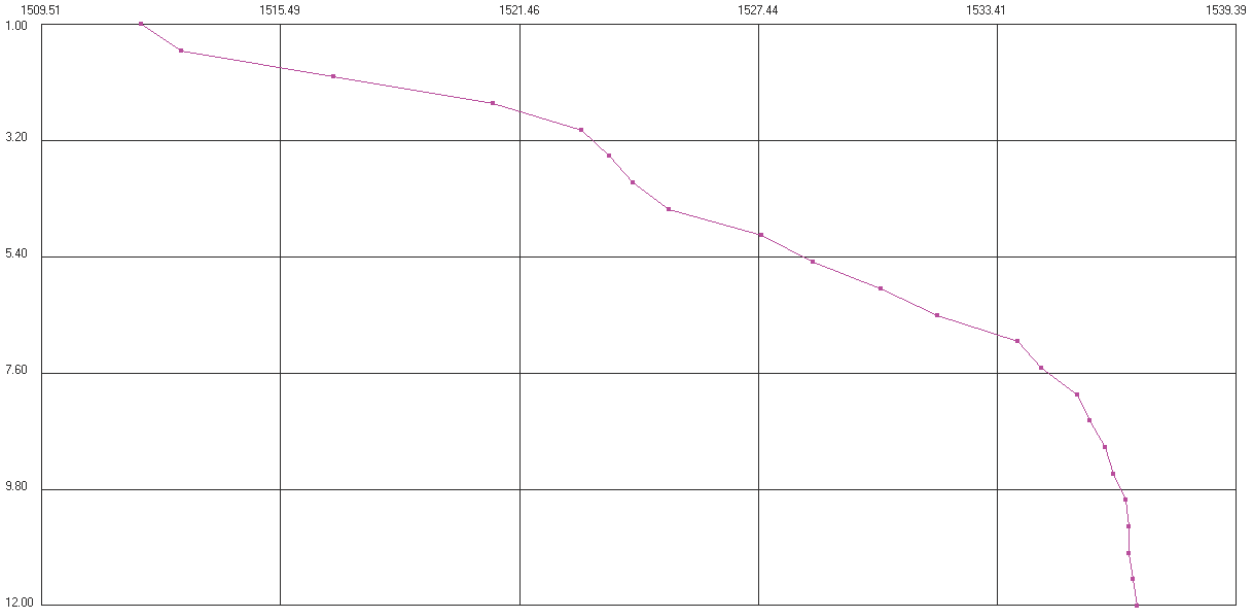


Figure IV.3: SVP Cast 2013-161 16:03:00 30°22’01"N 088°33’51"W

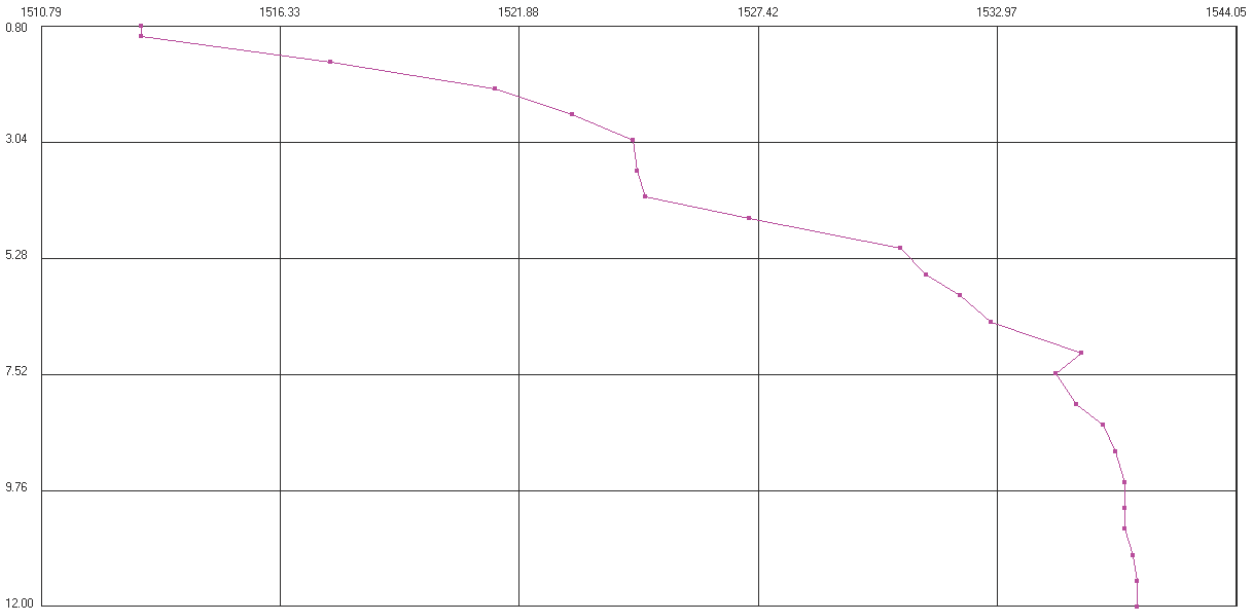


Figure IV.4: SVP Cast 2013-161 17:29:00 30°20’36"N 088°34’07"W

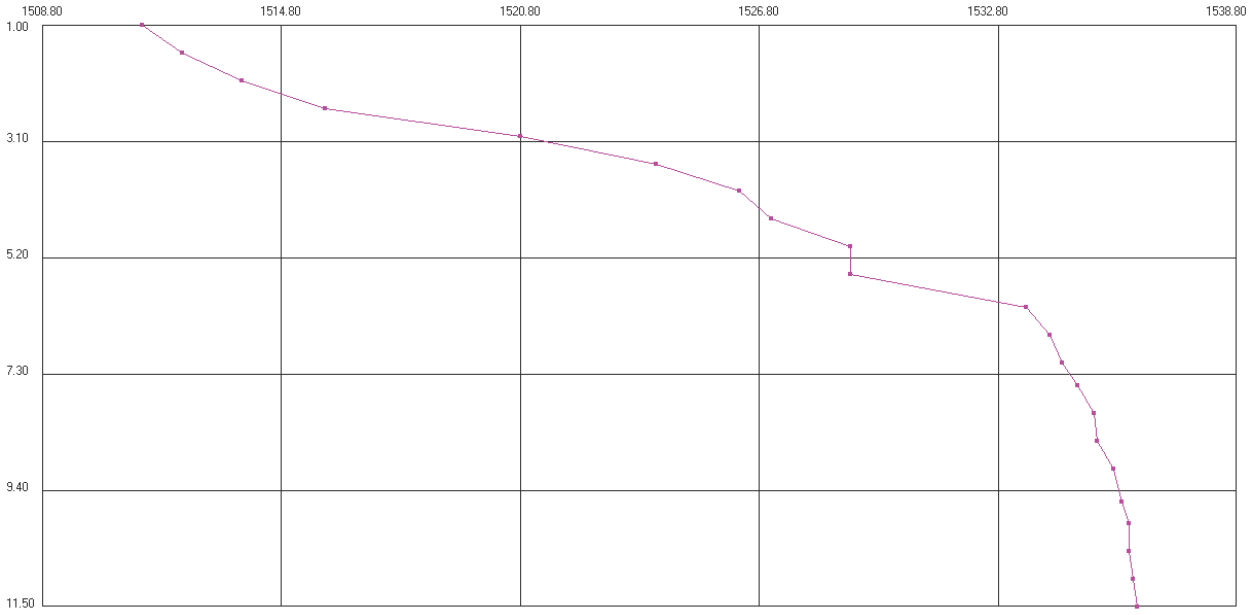


Figure IV.5: SVP Cast 2013-161 18:55:00 30°21’58"N 088°33’55"W

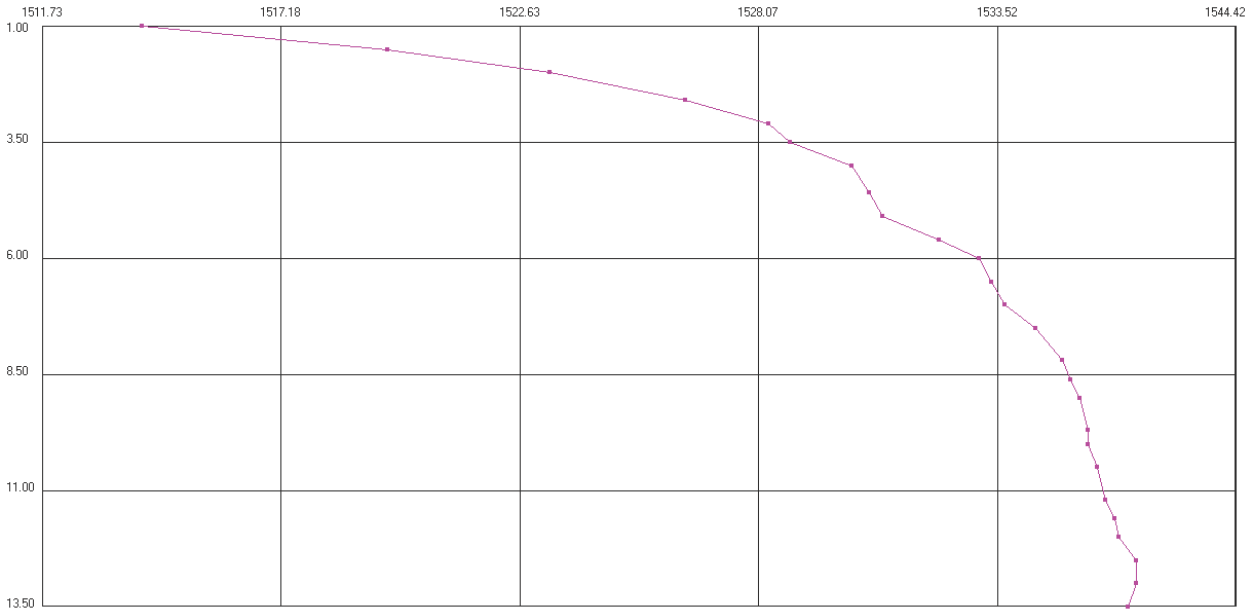


Figure IV.6: SVP Cast 2013-162 13:09:00 30°22’01"N 088°33’58"W

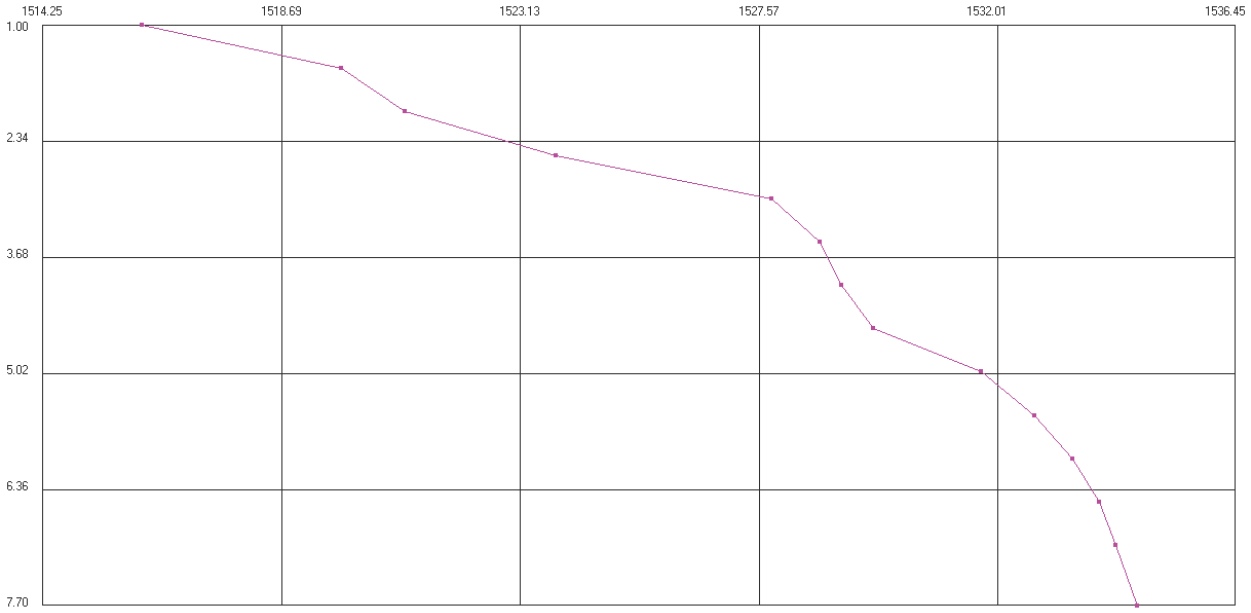


Figure IV.7: SVP Cast 2013-162 16:33:00 30°21’58"N 088°33’34"W

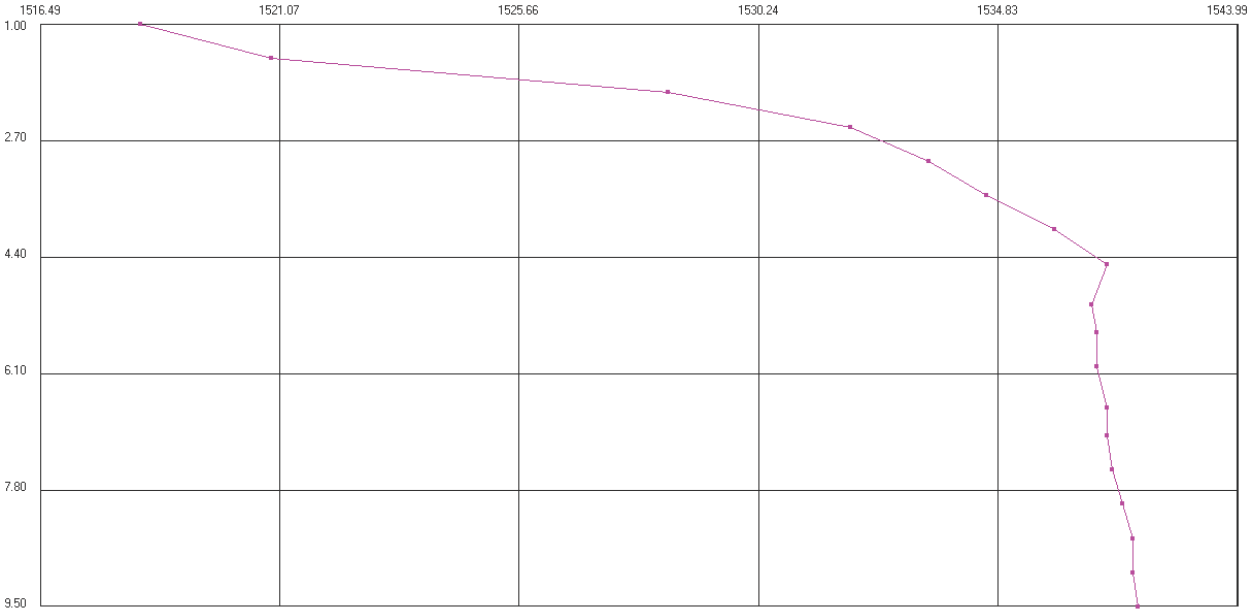


Figure IV.8: SVP Cast 2013-164 18:02:00 30°21’59"N 088°33’53"W

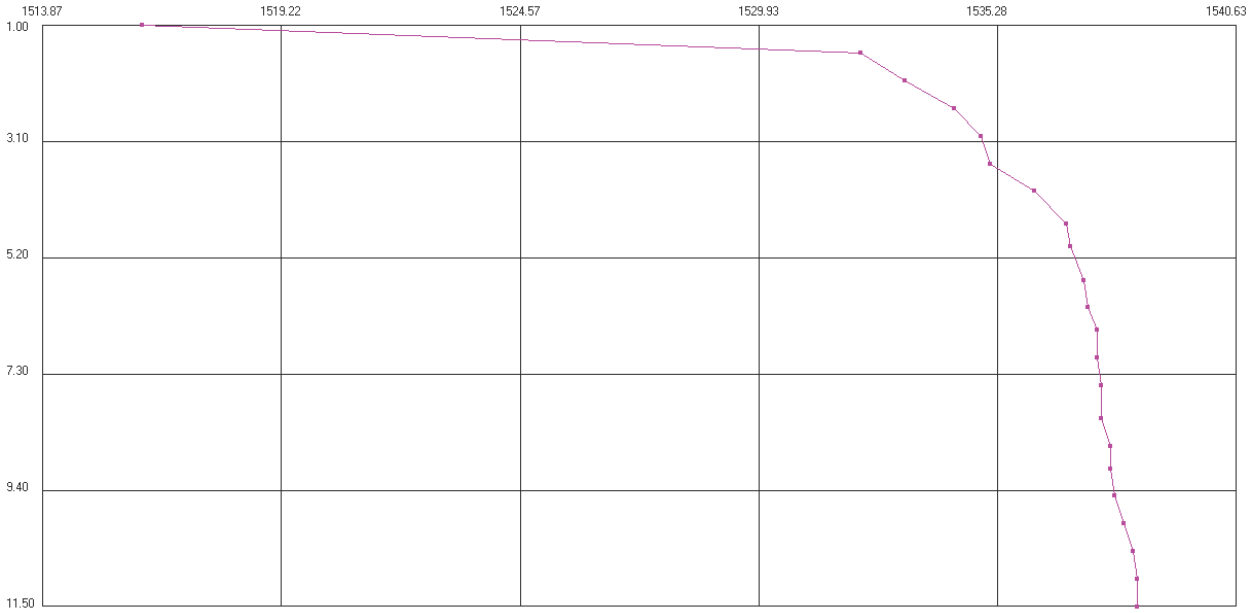


Figure IV.9: SVP Cast 2013-165 12:54:00 30°20’05"N 088°34’05"W

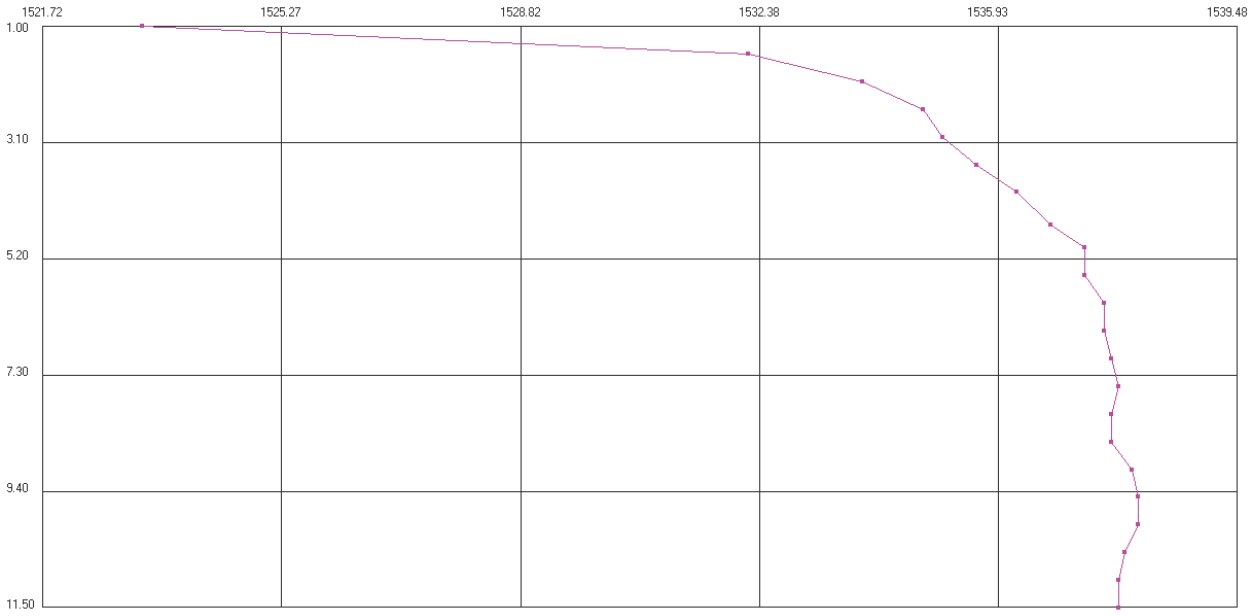


Figure IV.10: SVP Cast 2013-165 15:40:00 30°20’34"N 088°34’19"W

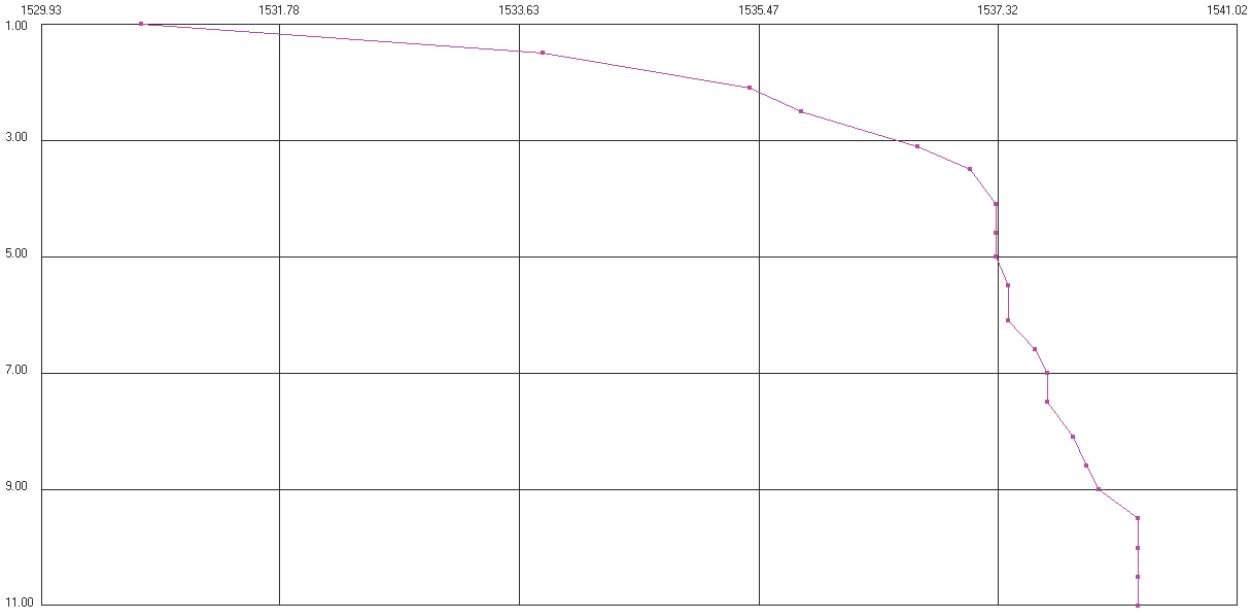


Figure IV.11: SVP Cast 2013-165 18:02:00 30°20’33"N 088°34’23"W

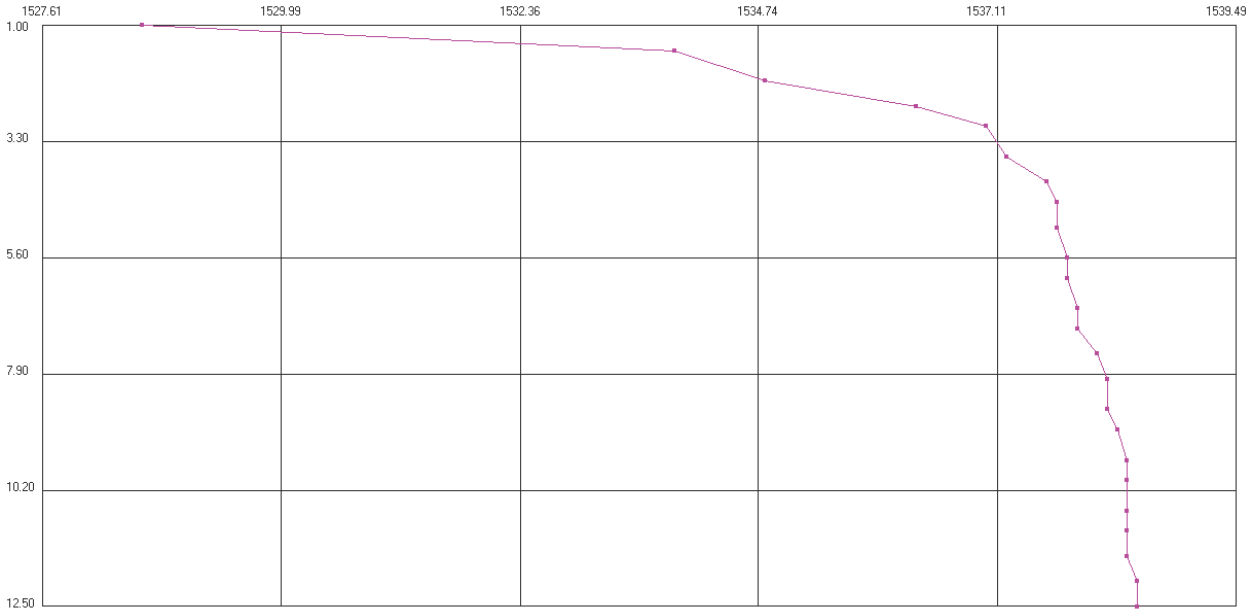


Figure IV.12: SVP Cast 2013-165 19:01:00 30°20’28"N 088°34’02"W

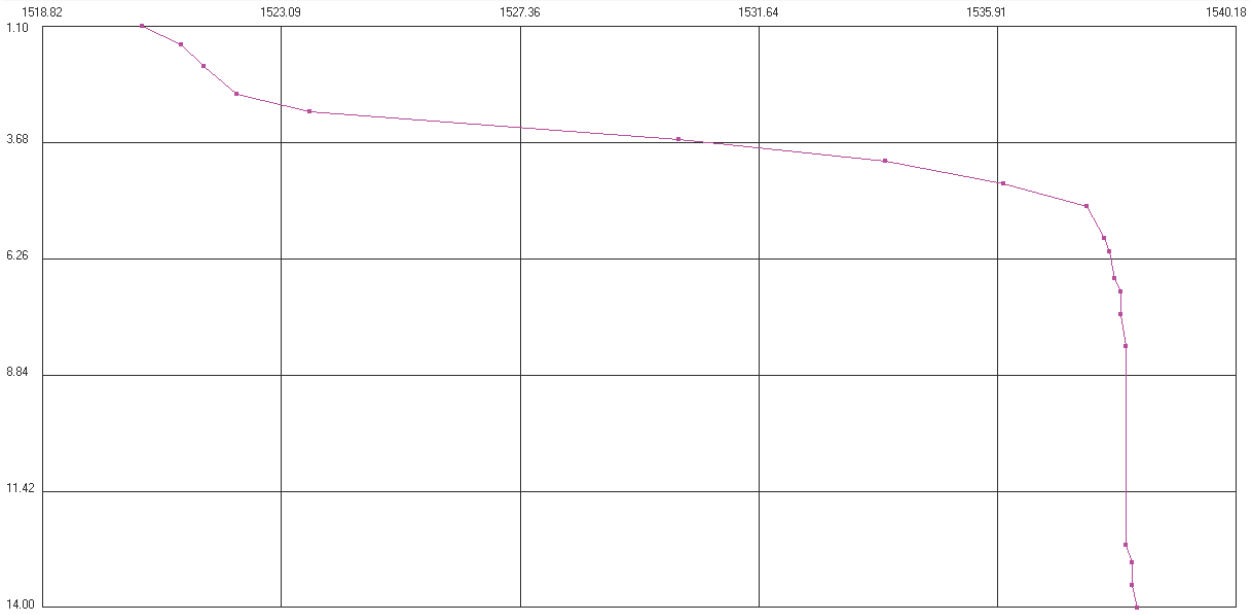


Figure IV.13: SVP Cast 2013-169 12:59:00 30°20’54"N 088°30’24"W

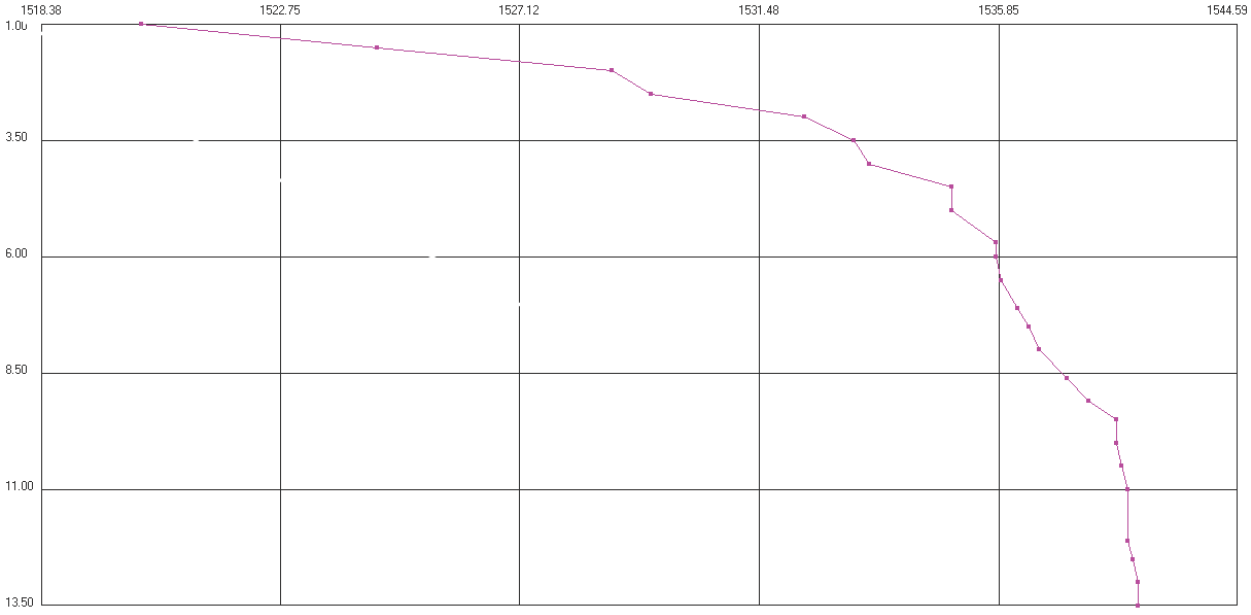


Figure IV.14: SVP Cast 2013-169 14:27:00 30°21’00"N 088°30’00"W

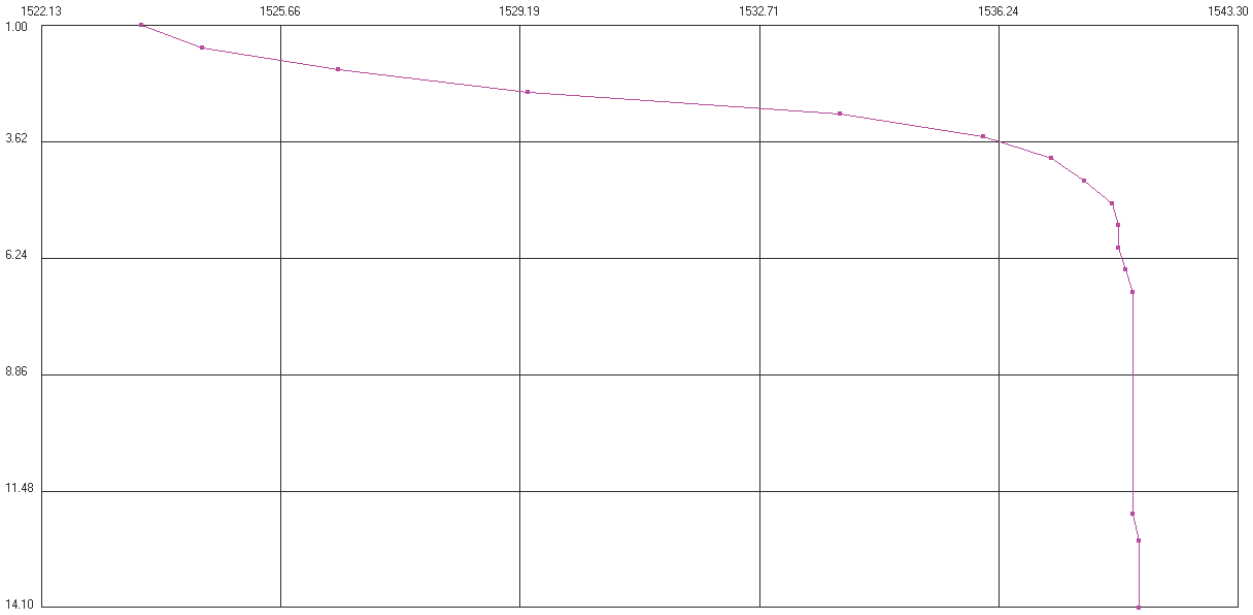


Figure IV.15: SVP Cast 2013-169 16:17:00 30°21’01"N 088°30’22"W

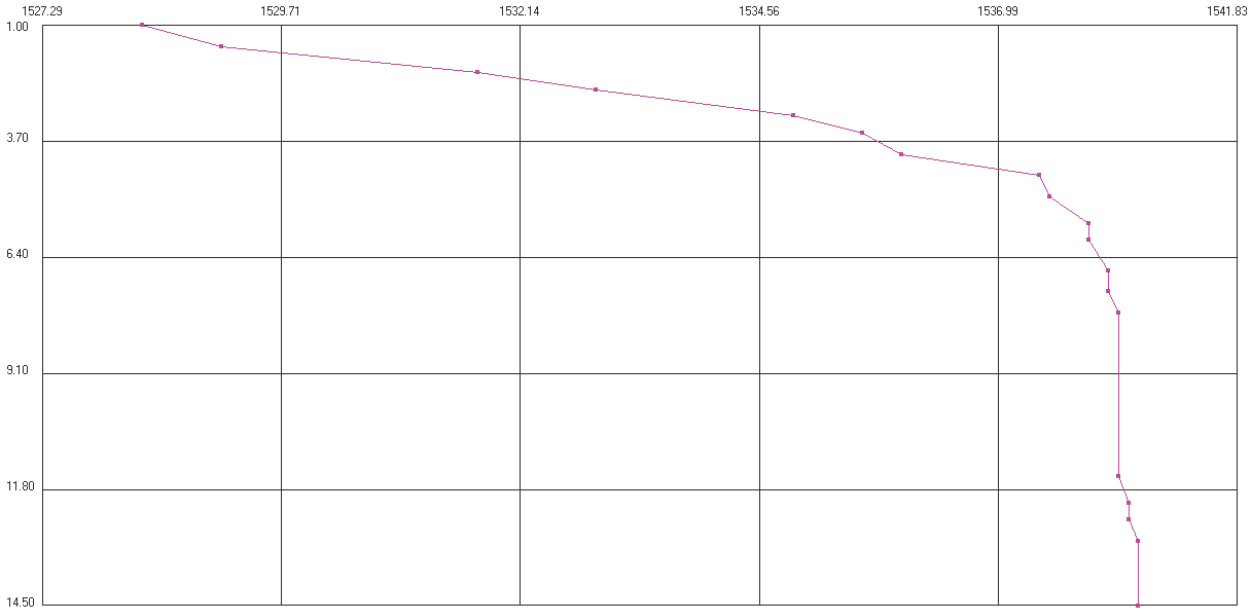


Figure IV.16: SVP Cast 2013-169 17:35:00 30°20’36"N 088°30’34"W

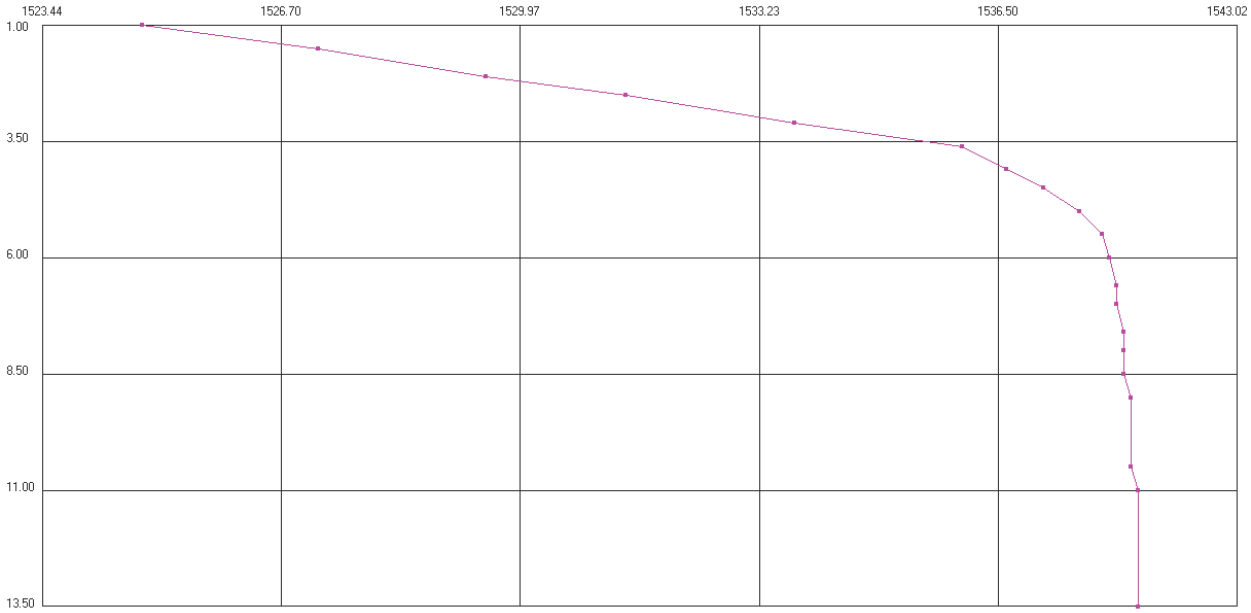
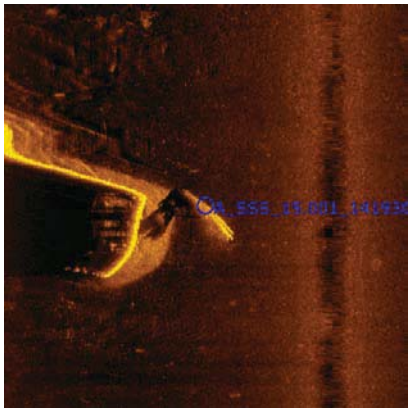
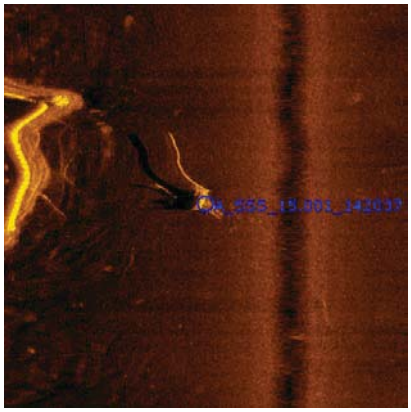
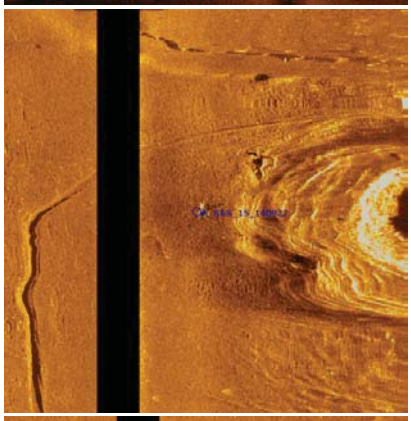
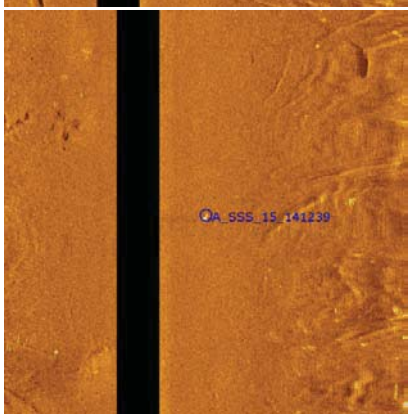


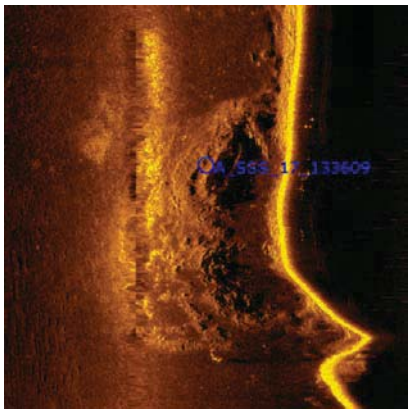
Figure IV.17: SVP Cast 2013-169 17:35:00 30°20’36"N 088°30’34"W

V SSS Contact Reports

Report 13USM01_Area_A_Targets

Generated on: 07/22/2013 03:38:17 PM by SonarWiz.MAP targetReportGen2 V3.15.15

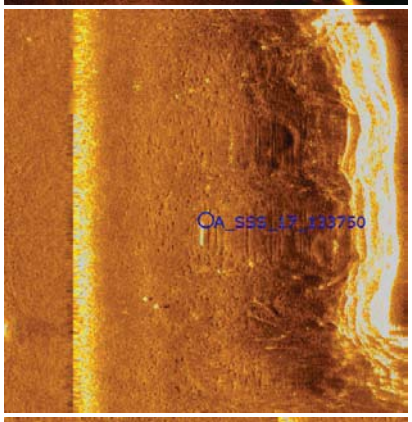
Contact Image	Contact Info	User Entered Info
	**A_SSS_15.001_141930** • Sonar Time at Target: 06/12/2013 14:19:27 • Map Proj: UTM84-16N • Acoustic Source File: A_SSS_15.001.jsf • Ping Number: 48713 • Range to Target: 23.53 Meters • Fish Height: 6.58 Meters • Heading: 178.690 degrees • Event Number: 0 • Water Depth: 2.64 • Line Name: A_SSS_15.001	**Dimensions** Target Height: = 1 Meters Target Length: 14 Meters Target Shadow: 7 Meters Target Width: 3 Meters Mag Anomaly: Avoidance Area: Classification 1: debris Classification 2: Area: Block: Description:
	**A_SSS_15.001_142037** • Sonar Time at Target: 06/12/2013 14:20:37 • Map Proj: UTM84-16N • Acoustic Source File: A_SSS_15.001.jsf • Ping Number: 49381 • Range to Target: 15.87 Meters • Fish Height: 7.17 Meters • Heading: 161.500 degrees • Event Number: 0 • Water Depth: 2.76 • Line Name: A_SSS_15.001	**Dimensions** Target Height: = 2 Meters Target Length: 18 Meters Target Shadow: 5 Meters Target Width: 2 Meters Mag Anomaly: Avoidance Area: Classification 1: debris Classification 2: Area: Block: Description:
	**A_SSS_15_140927** • Sonar Time at Target: 06/12/2013 14:09:29 • Map Proj: UTM84-16N • Acoustic Source File: A_SSS_15.jsf • Ping Number: 42949 • Range to Target: 14.59 Meters • Fish Height: 5.27 Meters • Heading: 57.000 degrees • Event Number: 0 • Water Depth: 3.69 • Line Name: A_SSS_15	**Dimensions** Target Height: = 1 Meters Target Length: 2 Meters Target Shadow: 4 Meters Target Width: 2 Meters Mag Anomaly: Avoidance Area: Classification 1: debris Classification 2: Area: Block: Description:
	**A_SSS_15_141239** • Sonar Time at Target: 06/12/2013 14:12:38 • Map Proj: UTM84-16N • Acoustic Source File: A_SSS_15.jsf • Ping Number: 44776 • Range to Target: 12.65 Meters • Fish Height: 6.44 Meters • Heading: 0.600 degrees • Event Number: 0 • Water Depth: 3.06 • Line Name: A_SSS_15	**Dimensions** Target Height: = 1 Meters Target Length: 2 Meters Target Shadow: 1 Meters Target Width: 2 Meters Mag Anomaly: Avoidance Area: Classification 1: rock Classification 2: Area: Block: Description:



A_SSS_17_133609

- Sonar Time at Target: 06/12/2013 13:36:10
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_17.jsf
- Ping Number: 23710
- Range to Target: 13.08 Meters
- Fish Height: 5.12 Meters
- Heading: 74.190 degrees
- Event Number: 0
- Water Depth: 2.52
- Line Name: A_SSS_17

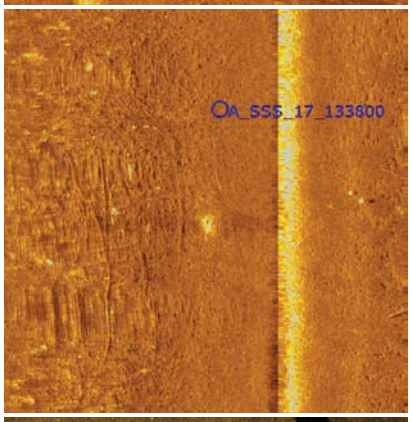
Dimensions
Target Height: = 2 Meters
Target Length: 22 Meters
Target Shadow: 8 Meters
Target Width: 16 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: mound
Classification 2:
Area:
Block:
Description:



A_SSS_17_133750

- Sonar Time at Target: 06/12/2013 13:37:49
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_17.jsf
- Ping Number: 24662
- Range to Target: 24.71 Meters
- Fish Height: 4.76 Meters
- Heading: 277.700 degrees
- Event Number: 0
- Water Depth: 2.85
- Line Name: A_SSS_17

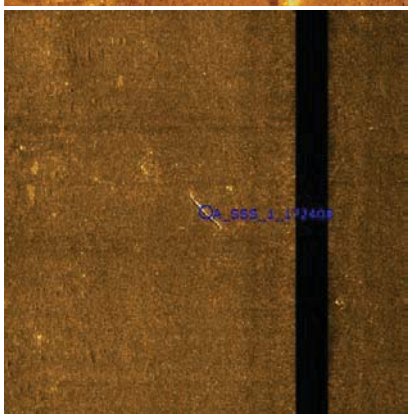
Dimensions
Target Height: = 0 Meters
Target Length: 5 Meters
Target Shadow: 0 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_17_133800

- Sonar Time at Target: 06/12/2013 13:38:00
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_17.jsf
- Ping Number: 24659
- Range to Target: 10.81 Meters
- Fish Height: 4.76 Meters
- Heading: 276.200 degrees
- Event Number: 0
- Water Depth: 2.83
- Line Name: A_SSS_17

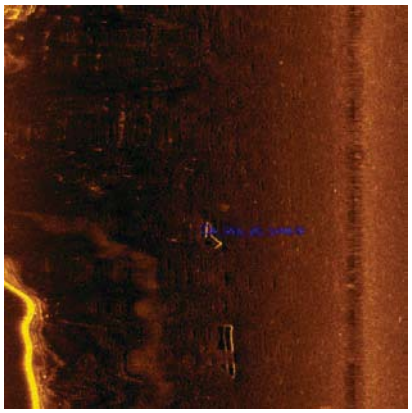
Dimensions
Target Height: = 0 Meters
Target Length: 3 Meters
Target Shadow: 0 Meters
Target Width: 4 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_1_172408

- Sonar Time at Target: 06/11/2013 17:24:09
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_1.jsf
- Ping Number: 20911
- Range to Target: 12.79 Meters
- Fish Height: 7.59 Meters
- Heading: 185.690 degrees
- Event Number: 0
- Water Depth: 5.69
- Line Name: A_SSS_1

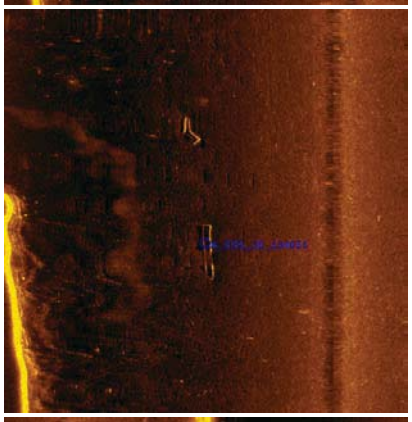
Dimensions
Target Height: = 0 Meters
Target Length: 5 Meters
Target Shadow: 0 Meters
Target Width: 0 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_20_134838

- Sonar Time at Target: 06/12/2013 13:48:37
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_20.jsf
- Ping Number: 30906
- Range to Target: 27.61 Meters
- Fish Height: 4.32 Meters
- Heading: 305.200 degrees
- Event Number: 0
- Water Depth: 3.78
- Line Name: A_SSS_20

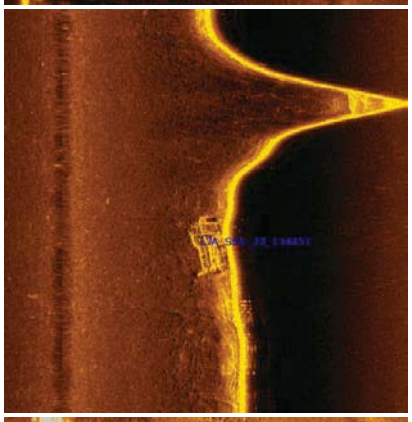
Dimensions
Target Height: = 0 Meters
Target Length: 5 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_20_134855

- Sonar Time at Target: 06/12/2013 13:48:56
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_20.jsf
- Ping Number: 31084
- Range to Target: 23.70 Meters
- Fish Height: 4.61 Meters
- Heading: 251.690 degrees
- Event Number: 0
- Water Depth: 3.60
- Line Name: A_SSS_20

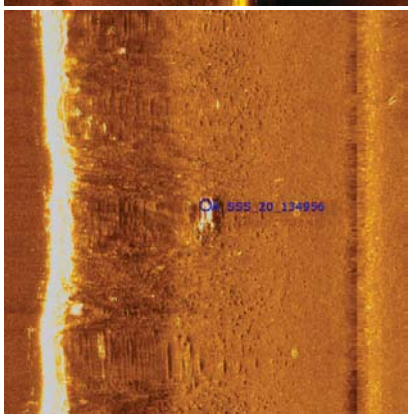
Dimensions
Target Height: = 0 Meters
Target Length: 10 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: beam
Classification 2:
Area:
Block:
Description:



A_SSS_20_134857

- Sonar Time at Target: 06/12/2013 13:48:58
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_20.jsf
- Ping Number: 31104
- Range to Target: 26.65 Meters
- Fish Height: 4.76 Meters
- Heading: 244.600 degrees
- Event Number: 0
- Water Depth: 3.52
- Line Name: A_SSS_20

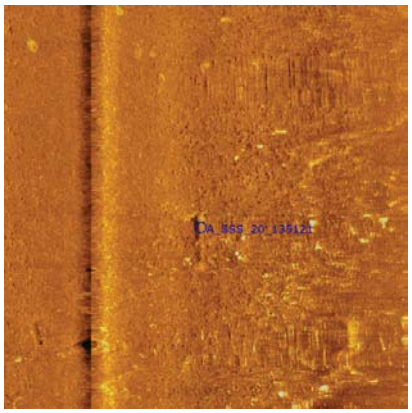
Dimensions
Target Height: = 0 Meters
Target Length: 11 Meters
Target Shadow: 0 Meters
Target Width: 6 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_20_134956

- Sonar Time at Target: 06/12/2013 13:49:55
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_20.jsf
- Ping Number: 31656
- Range to Target: 28.07 Meters
- Fish Height: 5.12 Meters
- Heading: 252.100 degrees
- Event Number: 0
- Water Depth: 3.34
- Line Name: A_SSS_20

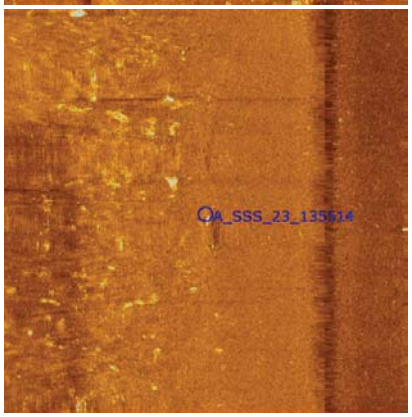
Dimensions
Target Height: = 0 Meters
Target Length: 7 Meters
Target Shadow: 2 Meters
Target Width: 3 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_20_135121

- Sonar Time at Target: 06/12/2013 13:51:22
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_20.jsf
- Ping Number: 32484
- Range to Target: 20.35 Meters
- Fish Height: 5.19 Meters
- Heading: 250.000 degrees
- Event Number: 0
- Water Depth: 3.44
- Line Name: A_SSS_20

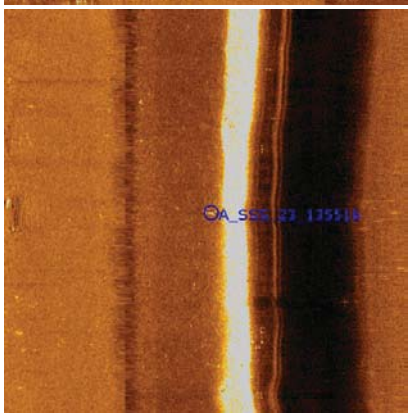
Dimensions
Target Height: = 0 Meters
Target Length: 5 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: snag
Classification 2:
Area:
Block:
Description:



A_SSS_23_135514

- Sonar Time at Target: 06/12/2013 13:55:14
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_23.jsf
- Ping Number: 34725
- Range to Target: 22.03 Meters
- Fish Height: 6.51 Meters
- Heading: 72.000 degrees
- Event Number: 0
- Water Depth: 2.94
- Line Name: A_SSS_23

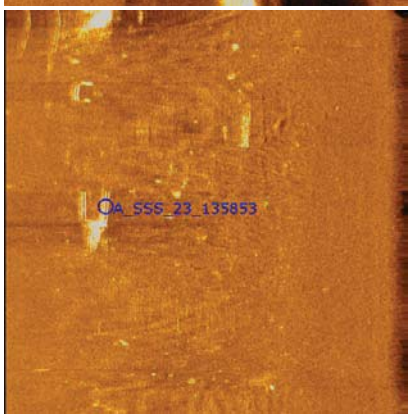
Dimensions
Target Height: = 0 Meters
Target Length: 2 Meters
Target Shadow: 1 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_23_135516

- Sonar Time at Target: 06/12/2013 13:55:16
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_23.jsf
- Ping Number: 34741
- Range to Target: 15.99 Meters
- Fish Height: 6.66 Meters
- Heading: 75.400 degrees
- Event Number: 0
- Water Depth: 2.88
- Line Name: A_SSS_23

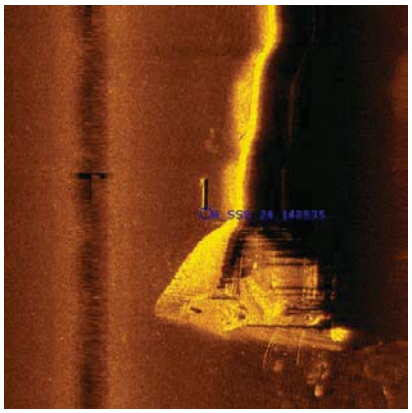
Dimensions
Target Height: = 1 Meters
Target Length: 4 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_23_135853

- Sonar Time at Target: 06/12/2013 13:58:50
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_23.jsf
- Ping Number: 36802
- Range to Target: 55.98 Meters
- Fish Height: 6.33 Meters
- Heading: 231.500 degrees
- Event Number: 0
- Water Depth: 2.85
- Line Name: A_SSS_23

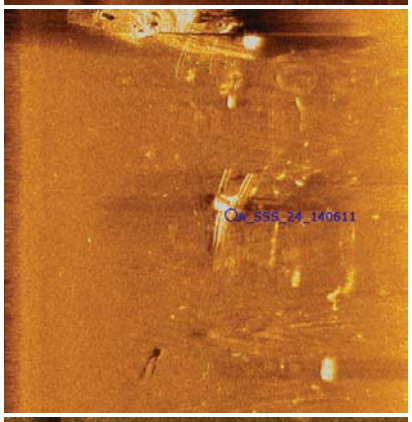
Dimensions
Target Height: = 0 Meters
Target Length: 10 Meters
Target Shadow: 3 Meters
Target Width: 5 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_24_140535

- Sonar Time at Target: 06/12/2013 14:05:35
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_24.jsf
- Ping Number: 40700
- Range to Target: 21.18 Meters
- Fish Height: 7.24 Meters
- Heading: 263.100 degrees
- Event Number: 0
- Water Depth: 3.43
- Line Name: A_SSS_24

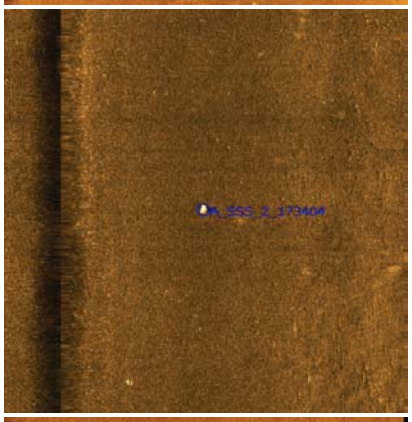
Dimensions
Target Height: = 0 Meters
Target Length: 6 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: beam
Classification 2:
Area:
Block:
Description:



A_SSS_24_140611

- Sonar Time at Target: 06/12/2013 14:06:13
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_24.jsf
- Ping Number: 41071
- Range to Target: 42.11 Meters
- Fish Height: 7.24 Meters
- Heading: 248.690 degrees
- Event Number: 0
- Water Depth: 3.19
- Line Name: A_SSS_24

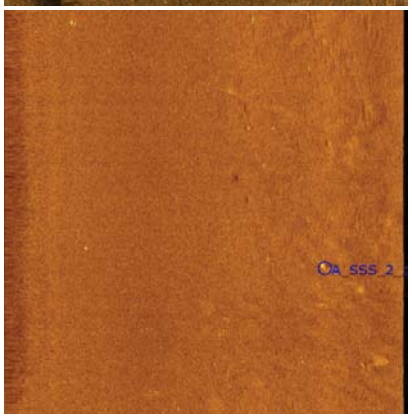
Dimensions
Target Height: = 2 Meters
Target Length: 16 Meters
Target Shadow: 12 Meters
Target Width: 5 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_2_173404

- Sonar Time at Target: 06/11/2013 17:34:05
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_2.jsf
- Ping Number: 29472
- Range to Target: 17.26 Meters
- Fish Height: 7.16 Meters
- Heading: 355.600 degrees
- Event Number: 0
- Water Depth: 5.89
- Line Name: A_SSS_2

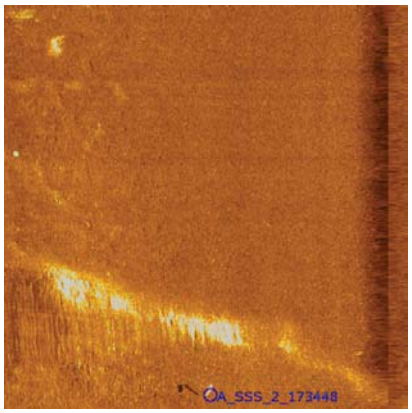
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_2_173438

- Sonar Time at Target: 06/11/2013 17:34:38
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_2.jsf
- Ping Number: 29957
- Range to Target: 38.82 Meters
- Fish Height: 7.45 Meters
- Heading: 26.100 degrees
- Event Number: 0
- Water Depth: 5.75
- Line Name: A_SSS_2

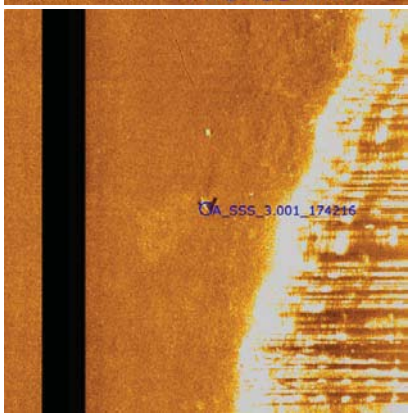
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_2_173448

- Sonar Time at Target: 06/11/2013 17:34:48
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_2.jsf
- Ping Number: 30105
- Range to Target: 21.52 Meters
- Fish Height: 7.45 Meters
- Heading: 6.400 degrees
- Event Number: 0
- Water Depth: 5.64
- Line Name: A_SSS_2

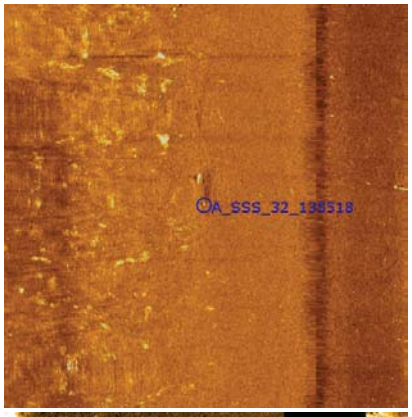
Dimensions
Target Height: = 1 Meters
Target Length: 2 Meters
Target Shadow: 3 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_3.001_174216

- Sonar Time at Target: 06/11/2013 17:42:17
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_3.001.jsf
- Ping Number: 36286
- Range to Target: 25.88 Meters
- Fish Height: 7.03 Meters
- Heading: 187.600 degrees
- Event Number: 0
- Water Depth: 6.09
- Line Name: A_SSS_3.001

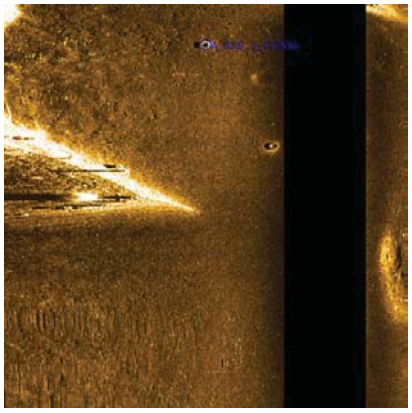
Dimensions
Target Height: = 1 Meters
Target Length: 4 Meters
Target Shadow: 3 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_32_135518

- Sonar Time at Target: 06/12/2013 13:55:18
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_23.jsf
- Ping Number: 34759
- Range to Target: 20.77 Meters
- Fish Height: 6.73 Meters
- Heading: 67.590 degrees
- Event Number: 0
- Water Depth: 2.79
- Line Name: A_SSS_23

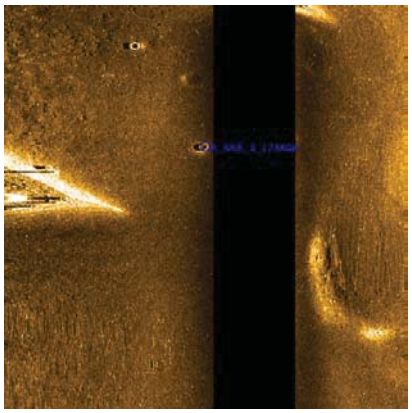
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_3_173556

- Sonar Time at Target: 06/11/2013 17:35:56
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_3.jsf
- Ping Number: 31077
- Range to Target: 14.42 Meters
- Fish Height: 3.58 Meters
- Heading: 138.390 degrees
- Event Number: 0
- Water Depth: 6.71
- Line Name: A_SSS_3

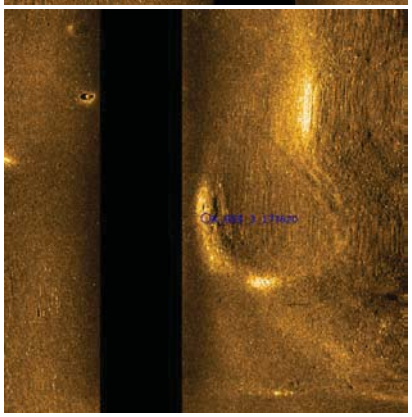
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: tire
Classification 2:
Area:
Block:
Description:



A_SSS_3_173608

- Sonar Time at Target: 06/11/2013 17:36:07
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_3.jsf
- Ping Number: 31236
- Range to Target: 5.92 Meters
- Fish Height: 3.91 Meters
- Heading: 164.300 degrees
- Event Number: 0
- Water Depth: 6.54
- Line Name: A_SSS_3

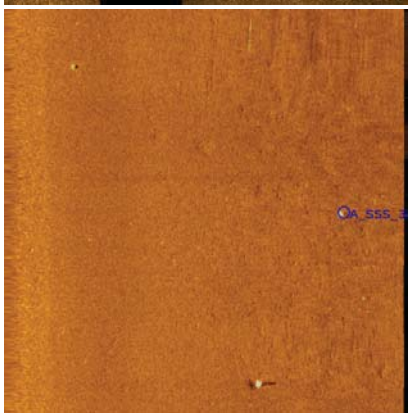
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: tire
Classification 2:
Area:
Block:
Description:



A_SSS_3_173620

- Sonar Time at Target: 06/11/2013 17:36:21
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_3.jsf
- Ping Number: 31428
- Range to Target: 7.83 Meters
- Fish Height: 3.53 Meters
- Heading: 223.600 degrees
- Event Number: 0
- Water Depth: 7.54
- Line Name: A_SSS_3

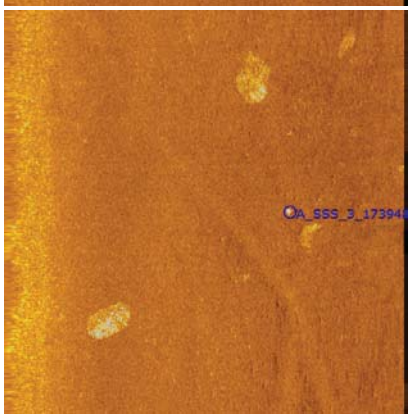
Dimensions
Target Height: = 0 Meters
Target Length: 11 Meters
Target Shadow: 1 Meters
Target Width: 3 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: mound
Classification 2:
Area:
Block:
Description:



A_SSS_3_173720

- Sonar Time at Target: 06/11/2013 17:37:20
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_3.jsf
- Ping Number: 32280
- Range to Target: 41.13 Meters
- Fish Height: 6.99 Meters
- Heading: 167.300 degrees
- Event Number: 0
- Water Depth: 6.32
- Line Name: A_SSS_3

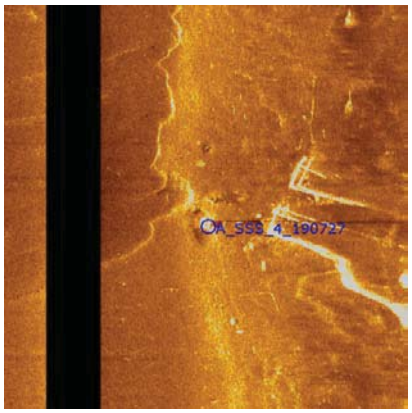
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_3_173948

- Sonar Time at Target: 06/11/2013 17:39:48
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_3.jsf
- Ping Number: 34406
- Range to Target: 34.56 Meters
- Fish Height: 6.35 Meters
- Heading: 173.890 degrees
- Event Number: 0
- Water Depth: 6.11
- Line Name: A_SSS_3

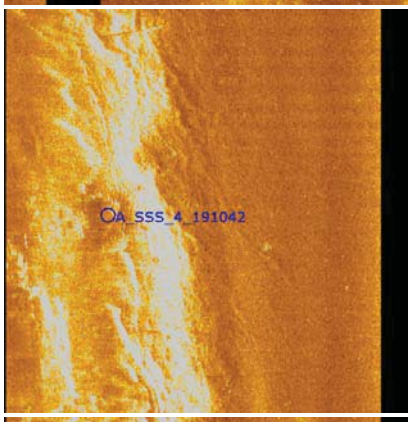
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_4_190727

- Sonar Time at Target: 06/11/2013 19:07:28
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_4.jsf
- Ping Number: 7806
- Range to Target: 24.52 Meters
- Fish Height: 6.38 Meters
- Heading: 346.890 degrees
- Event Number: 0
- Water Depth: 7.21
- Line Name: A_SSS_4

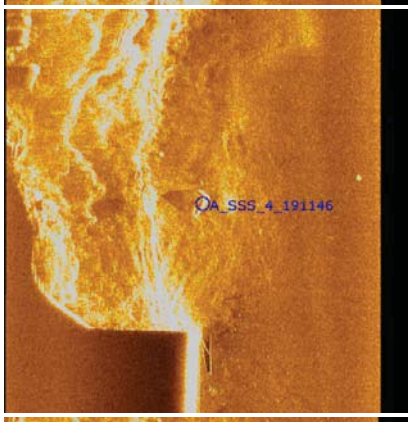
Dimensions
Target Height: = 0 Meters
Target Length: 3 Meters
Target Shadow: 0 Meters
Target Width: 3 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: buoy anchor
Classification 2:
Area:
Block:
Description:



A_SSS_4_191042

- Sonar Time at Target: 06/11/2013 19:10:41
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_4.jsf
- Ping Number: 9675
- Range to Target: 54.50 Meters
- Fish Height: 6.81 Meters
- Heading: 7.500 degrees
- Event Number: 0
- Water Depth: 5.89
- Line Name: A_SSS_4

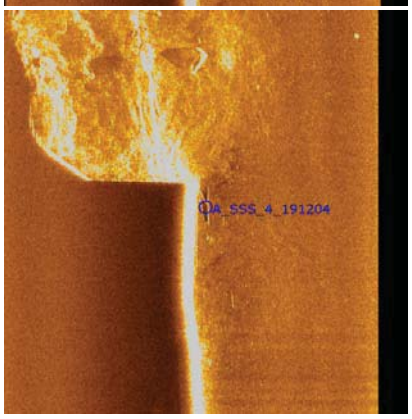
Dimensions
Target Height: = 0 Meters
Target Length: 11 Meters
Target Shadow: 4 Meters
Target Width: 8 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: mound
Classification 2:
Area:
Block:
Description:



A_SSS_4_191146

- Sonar Time at Target: 06/11/2013 19:11:46
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_4.jsf
- Ping Number: 10298
- Range to Target: 37.27 Meters
- Fish Height: 6.67 Meters
- Heading: 20.790 degrees
- Event Number: 0
- Water Depth: 6.11
- Line Name: A_SSS_4

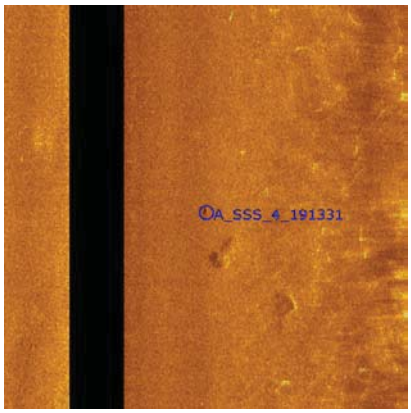
Dimensions
Target Height: = 1 Meters
Target Length: 5 Meters
Target Shadow: 8 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_4_191204

- Sonar Time at Target: 06/11/2013 19:12:04
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_4.jsf
- Ping Number: 10468
- Range to Target: 36.32 Meters
- Fish Height: 6.24 Meters
- Heading: 11.100 degrees
- Event Number: 0
- Water Depth: 6.44
- Line Name: A_SSS_4

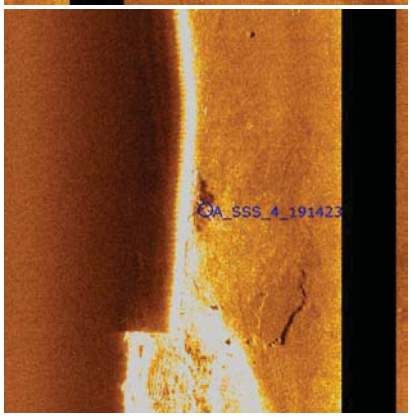
Dimensions
Target Height: = 0 Meters
Target Length: 7 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_4_191331

- Sonar Time at Target: 06/11/2013 19:13:31
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_4.jsf
- Ping Number: 11312
- Range to Target: 19.95 Meters
- Fish Height: 6.45 Meters
- Heading: 13.390 degrees
- Event Number: 0
- Water Depth: 5.73
- Line Name: A_SSS_4

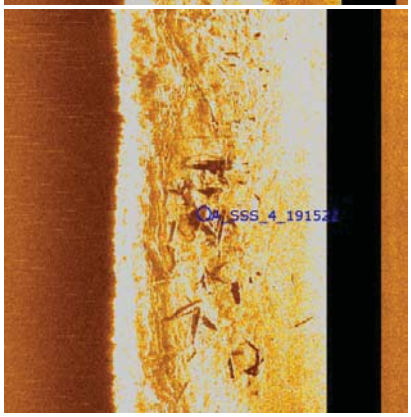
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 0 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: depression
Classification 2:
Area:
Block:
Description:



A_SSS_4_191423

- Sonar Time at Target: 06/11/2013 19:14:24
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_4.jsf
- Ping Number: 11814
- Range to Target: 29.64 Meters
- Fish Height: 6.74 Meters
- Heading: 13.390 degrees
- Event Number: 0
- Water Depth: 5.75
- Line Name: A_SSS_4

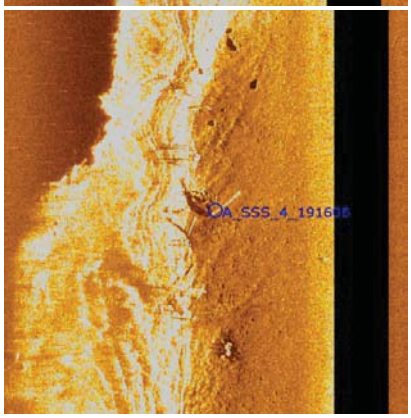
Dimensions
Target Height: = 0 Meters
Target Length: 4 Meters
Target Shadow: 2 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_4_191522

- Sonar Time at Target: 06/11/2013 19:15:23
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_4.jsf
- Ping Number: 12378
- Range to Target: 27.23 Meters
- Fish Height: 6.52 Meters
- Heading: 12.890 degrees
- Event Number: 0
- Water Depth: 6.03
- Line Name: A_SSS_4

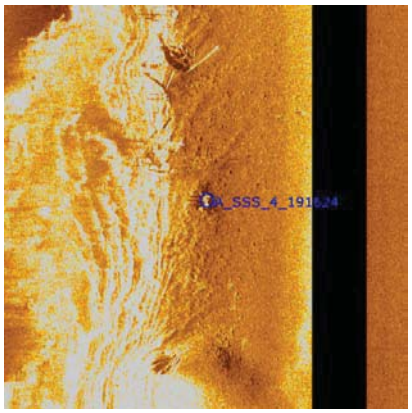
Dimensions
Target Height: = 1 Meters
Target Length: 4 Meters
Target Shadow: 2 Meters
Target Width: 4 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_4_191608

- Sonar Time at Target: 06/11/2013 19:16:08
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_4.jsf
- Ping Number: 12822
- Range to Target: 26.55 Meters
- Fish Height: 6.24 Meters
- Heading: 5.900 degrees
- Event Number: 0
- Water Depth: 5.65
- Line Name: A_SSS_4

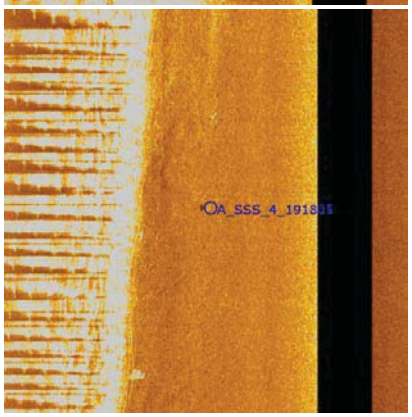
Dimensions
Target Height: = 1 Meters
Target Length: 8 Meters
Target Shadow: 3 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_4_191624

- Sonar Time at Target: 06/11/2013 19:16:24
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_4.jsf
- Ping Number: 12970
- Range to Target: 24.07 Meters
- Fish Height: 6.38 Meters
- Heading: 3.090 degrees
- Event Number: 0
- Water Depth: 5.92
- Line Name: A_SSS_4

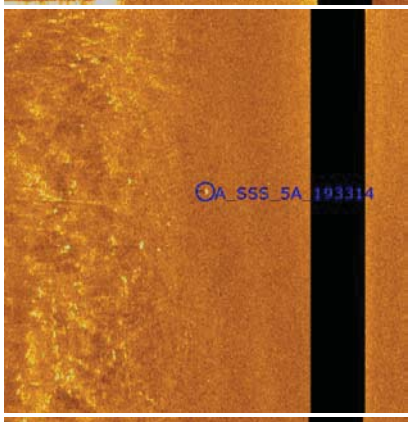
Dimensions
Target Height: = 1 Meters
Target Length: 3 Meters
Target Shadow: 2 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_4_191805

- Sonar Time at Target: 06/11/2013 19:18:06
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_4.jsf
- Ping Number: 13946
- Range to Target: 24.39 Meters
- Fish Height: 6.38 Meters
- Heading: 14.190 degrees
- Event Number: 0
- Water Depth: 6.37
- Line Name: A_SSS_4

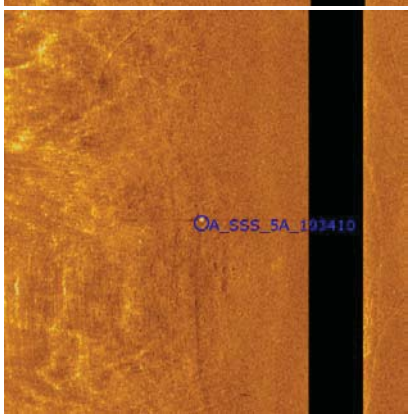
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_5A_193314

- Sonar Time at Target: 06/11/2013 19:33:14
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_5A.jsf
- Ping Number: 22696
- Range to Target: 23.98 Meters
- Fish Height: 6.88 Meters
- Heading: 179.800 degrees
- Event Number: 0
- Water Depth: 5.18
- Line Name: A_SSS_5A

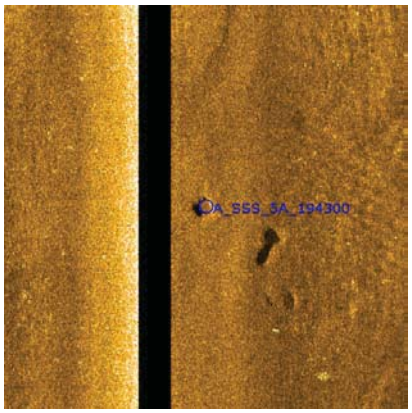
Dimensions
Target Height: = 1 Meters
Target Length: 2 Meters
Target Shadow: 2 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_5A_193410

- Sonar Time at Target: 06/11/2013 19:34:10
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_5A.jsf
- Ping Number: 23234
- Range to Target: 24.40 Meters
- Fish Height: 3.94 Meters
- Heading: 186.600 degrees
- Event Number: 0
- Water Depth: 7.88
- Line Name: A_SSS_5A

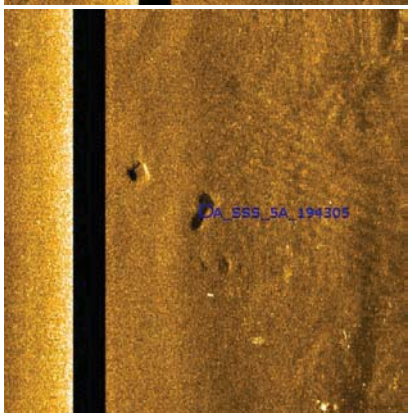
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 3 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_5A_194300

- Sonar Time at Target: 06/11/2013 19:43:00
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_5A.jsf
- Ping Number: 28336
- Range to Target: 9.32 Meters
- Fish Height: 4.45 Meters
- Heading: 169.500 degrees
- Event Number: 0
- Water Depth: 7.85
- Line Name: A_SSS_5A

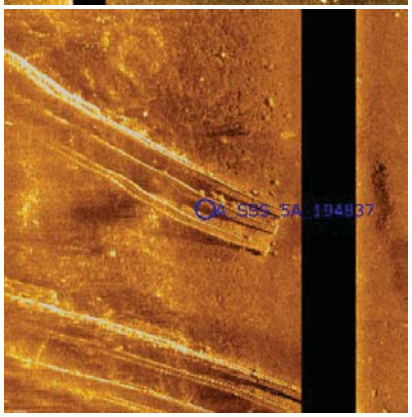
Dimensions
Target Height: = 1 Meters
Target Length: 3 Meters
Target Shadow: 2 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:debris
Classification 2:
Area:
Block:
Description:



A_SSS_5A_194305

- Sonar Time at Target: 06/11/2013 19:43:05
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_5A.jsf
- Ping Number: 28379
- Range to Target: 21.22 Meters
- Fish Height: 4.45 Meters
- Heading: 185.000 degrees
- Event Number: 0
- Water Depth: 7.80
- Line Name: A_SSS_5A

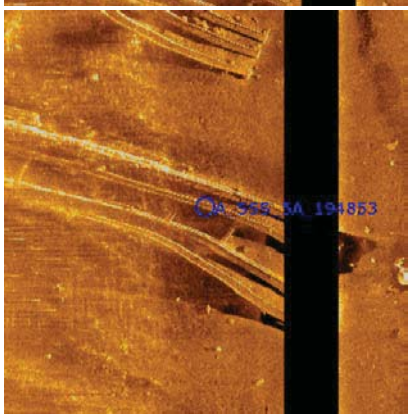
Dimensions
Target Height: = 0 Meters
Target Length: 7 Meters
Target Shadow: 2 Meters
Target Width: 3 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: mound
Classification 2:
Area:
Block:
Description:



A_SSS_5A_194837

- Sonar Time at Target: 06/11/2013 19:48:39
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_5A.jsf
- Ping Number: 31595
- Range to Target: 22.35 Meters
- Fish Height: 3.73 Meters
- Heading: 175.690 degrees
- Event Number: 0
- Water Depth: 4.19
- Line Name: A_SSS_5A

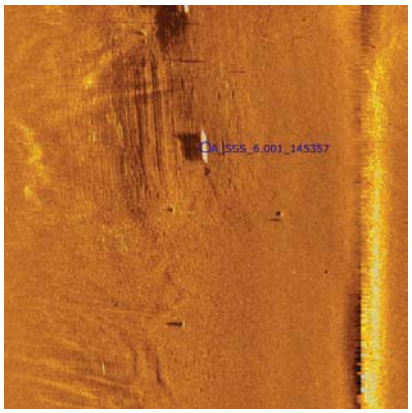
Dimensions
Target Height: = 1 Meters
Target Length: 54 Meters
Target Shadow: 5 Meters
Target Width: 11 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: train-tracks
Classification 2:
Area:
Block:
Description:



A_SSS_5A_194853

- Sonar Time at Target: 06/11/2013 19:48:53
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_5A.jsf
- Ping Number: 31733
- Range to Target: 19.21 Meters
- Fish Height: 3.37 Meters
- Heading: 175.100 degrees
- Event Number: 0
- Water Depth: 4.30
- Line Name: A_SSS_5A

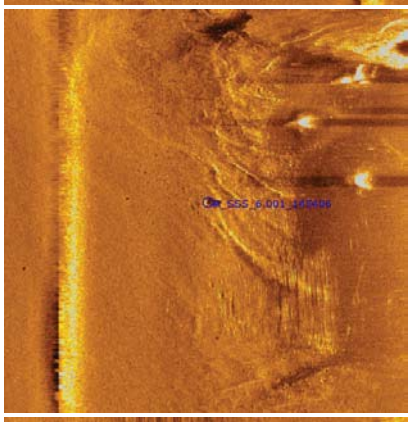
Dimensions
Target Height: = 1 Meters
Target Length: 53 Meters
Target Shadow: 6 Meters
Target Width: 15 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: train-tracks
Classification 2:
Area:
Block:
Description:



A_SSS_6.001_145357

- Sonar Time at Target: 06/12/2013 14:53:57
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_6.001.jsf
- Ping Number: 66095
- Range to Target: 28.79 Meters
- Fish Height: 5.27 Meters
- Heading: 176.390 degrees
- Event Number: 0
- Water Depth: 6.04
- Line Name: A_SSS_6.001

Dimensions
Target Height: = 1 Meters
Target Length: 7 Meters
Target Shadow: 4 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_6.001_145406

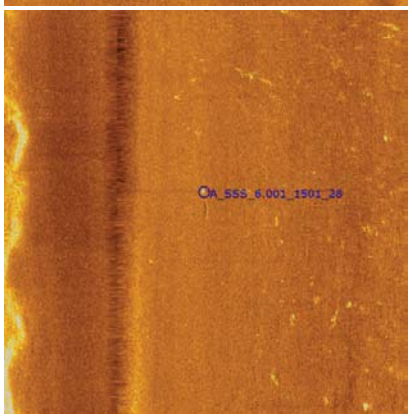
- Sonar Time at Target: 06/12/2013 14:54:06
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_6.001.jsf
- Ping Number: 66178
- Range to Target: 27.67 Meters
- Fish Height: 5.05 Meters
- Heading: 193.000 degrees
- Event Number: 0
- Water Depth: 6.30
- Line Name: A_SSS_6.001

Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 3 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:

A_SSS_6.001_145424

- Sonar Time at Target: 06/12/2013 14:54:23
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_6.001.jsf
- Ping Number: 66355
- Range to Target: 33.11 Meters
- Fish Height: 4.98 Meters
- Heading: 192.890 degrees
- Event Number: 0
- Water Depth: 6.55
- Line Name: A_SSS_6.001

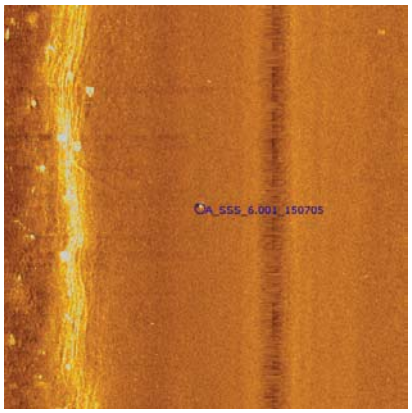
Dimensions
Target Height: = 0 Meters
Target Length: 2 Meters
Target Shadow: 3 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_6.001_1501_28

- Sonar Time at Target: 06/12/2013 15:01:28
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_6.001.jsf
- Ping Number: 70437
- Range to Target: 16.05 Meters
- Fish Height: 6.95 Meters
- Heading: 182.600 degrees
- Event Number: 0
- Water Depth: 5.29
- Line Name: A_SSS_6.001

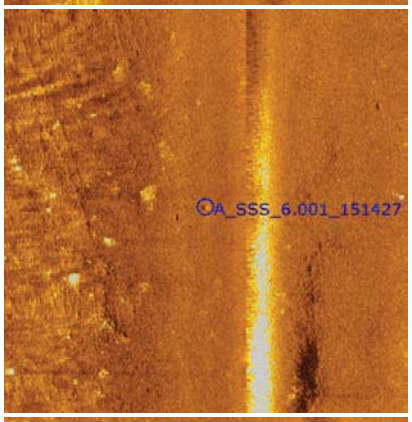
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_6.001_150705

- Sonar Time at Target: 06/12/2013 15:07:06
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_6.001.jsf
- Ping Number: 73689
- Range to Target: 13.38 Meters
- Fish Height: 6.73 Meters
- Heading: 184.600 degrees
- Event Number: 0
- Water Depth: 5.88
- Line Name: A_SSS_6.001

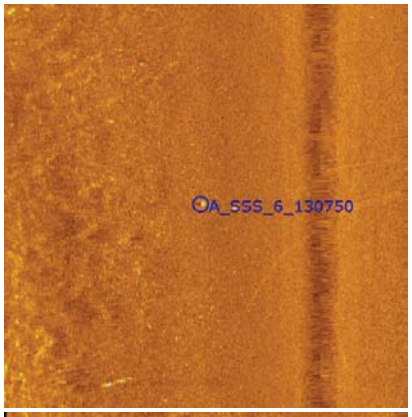
Dimensions
Target Height: = 0 Meters
Target Length: 2 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_6.001_151427

- Sonar Time at Target: 06/12/2013 15:14:27
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_6.001.jsf
- Ping Number: 77932
- Range to Target: 7.48 Meters
- Fish Height: 4.32 Meters
- Heading: 181.100 degrees
- Event Number: 0
- Water Depth: 3.93
- Line Name: A_SSS_6.001

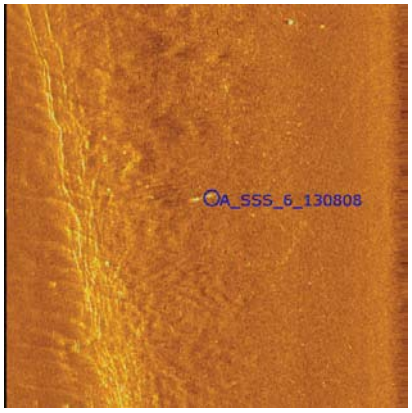
Dimensions
Target Height: = 1 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_6_130750

- Sonar Time at Target: 06/12/2013 13:07:51
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_6.jsf
- Ping Number: 7354
- Range to Target: 22.20 Meters
- Fish Height: 7.83 Meters
- Heading: 173.300 degrees
- Event Number: 0
- Water Depth: 4.12
- Line Name: A_SSS_6

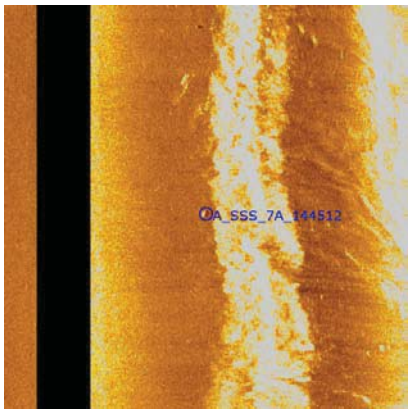
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_6_130808

- Sonar Time at Target: 06/12/2013 13:08:09
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_6.jsf
- Ping Number: 7523
- Range to Target: 36.40 Meters
- Fish Height: 7.39 Meters
- Heading: 192.690 degrees
- Event Number: 0
- Water Depth: 4.49
- Line Name: A_SSS_6

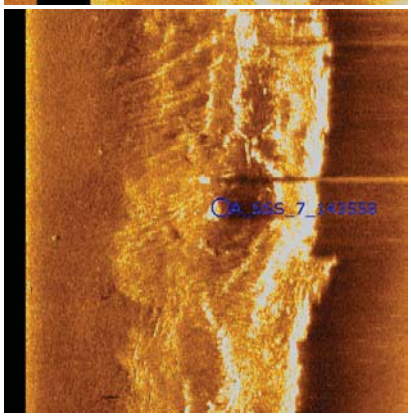
Dimensions
Target Height: = 0 Meters
Target Length: 6 Meters
Target Shadow: 0 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



A_SSS_7A_144512

- Sonar Time at Target: 06/12/2013 14:45:12
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_7A.jsf
- Ping Number: 61040
- Range to Target: 26.47 Meters
- Fish Height: 6.95 Meters
- Heading: 6.800 degrees
- Event Number: 0
- Water Depth: 5.93
- Line Name: A_SSS_7A

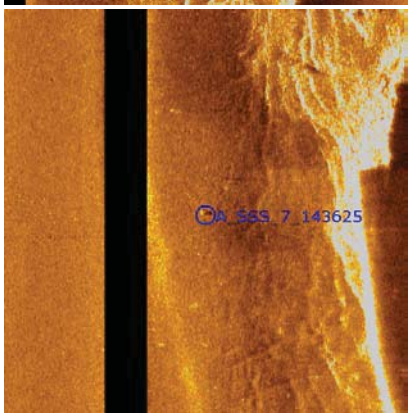
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description:



A_SSS_7_143558

- Sonar Time at Target: 06/12/2013 14:35:58
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_7.jsf
- Ping Number: 55705
- Range to Target: 40.17 Meters
- Fish Height: 4.98 Meters
- Heading: 18.600 degrees
- Event Number: 0
- Water Depth: 2.71
- Line Name: A_SSS_7

Dimensions
Target Height: = 1 Meters
Target Length: 5 Meters
Target Shadow: 14 Meters
Target Width: 6 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: mound
Classification 2:
Area:
Block:
Description:



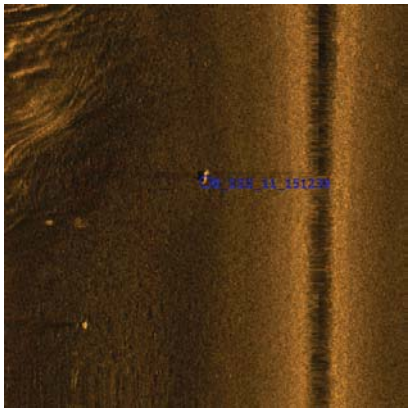
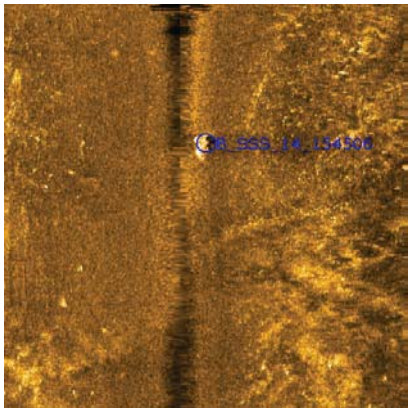
A_SSS_7_143625

- Sonar Time at Target: 06/12/2013 14:36:25
- Map Proj: UTM84-16N
- Acoustic Source File: A_SSS_7.jsf
- Ping Number: 55971
- Range to Target: 14.82 Meters
- Fish Height: 8.27 Meters
- Heading: 4.190 degrees
- Event Number: 0
- Water Depth: 2.67
- Line Name: A_SSS_7

Dimensions
Target Height: = 1 Meters
Target Length: 1 Meters
Target Shadow: 2 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: large rock
Classification 2:
Area:
Block:
Description:

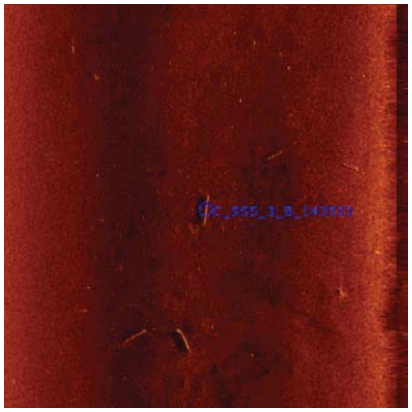
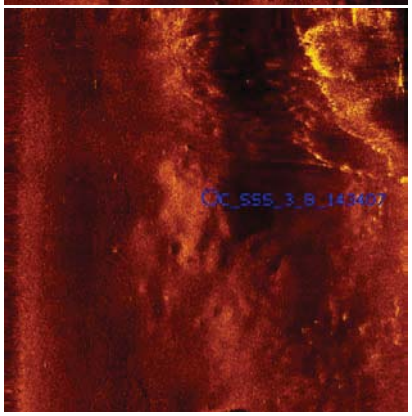
Report 13USM01_Area_B_Targets

Generated on: 07/22/2013 01:18:40 PM by SonarWiz.MAP targetReportGen2 V3.15.15

Contact Image	Contact Info	User Entered Info
	**B_SSS_11_151239** • Sonar Time at Target: 06/17/2013 15:12:26 • Map Proj: UTM84-16N • Acoustic Source File: B_SSS_11.jsf • Ping Number: 62803 • Range to Target: 20.92 Meters • Fish Height: 5.93 Meters • Heading: 269.390 degrees • Event Number: 0 • Water Depth: 6.01 • Line Name: B_SSS_11	**Dimensions** Target Height: = 0 Meters Target Length: 2 Meters Target Shadow: 1 Meters Target Width: 1 Meters Mag Anomaly: Avoidance Area: Classification 1: rock Classification 2: Area: Block: Description:
	**B_SSS_14_154506** • Sonar Time at Target: 06/17/2013 15:45:06 • Map Proj: UTM84-16N • Acoustic Source File: B_SSS_14.jsf • Ping Number: 81677 • Range to Target: 4.83 Meters • Fish Height: 6.80 Meters • Heading: 127.400 degrees • Event Number: 0 • Water Depth: 2.90 • Line Name: B_SSS_14	**Dimensions** Target Height: = 1 Meters Target Length: 5 Meters Target Shadow: 2 Meters Target Width: 4 Meters Mag Anomaly: Avoidance Area: Classification 1: rock Classification 2: Area: Block: Description:

Report 13USM01_Area_C_Targets

Generated on: 07/22/2013 01:15:17 PM by SonarWiz.MAP targetReportGen2 V3.15.15

Contact Image	Contact Info	User Entered Info
	**C_SSS_3_B_143703** • Sonar Time at Target: 06/19/2013 14:37:04 • Map Proj: UTM84-16N • Acoustic Source File: C_SSS_3_B.jsf • Ping Number: 45617 • Range to Target: 32.73 Meters • Fish Height: 5.63 Meters • Heading: 182.100 degrees • Event Number: 0 • Water Depth: 7.67 • Line Name: C_SSS_3_B	**Dimensions** Target Height: = 2 Meters Target Length: 55 Meters Target Shadow: 14 Meters Target Width: 48 Meters Mag Anomaly: Avoidance Area: Classification 1: mound Classification 2: Area: Block: Description:
	**C_SSS_3_B_143533** • Sonar Time at Target: 06/19/2013 14:35:34 • Map Proj: UTM84-16N • Acoustic Source File: C_SSS_3_B.jsf • Ping Number: 44749 • Range to Target: 35.37 Meters • Fish Height: 5.85 Meters • Heading: 192.890 degrees • Event Number: 0 • Water Depth: 7.40 • Line Name: C_SSS_3_B	**Dimensions** Target Height: = 0 Meters Target Length: 5 Meters Target Shadow: 2 Meters Target Width: 1 Meters Mag Anomaly: Avoidance Area: Classification 1: debris Classification 2: Area: Block: Description:
	**C_SSS_3_B_143540** • Sonar Time at Target: 06/19/2013 14:35:40 • Map Proj: UTM84-16N • Acoustic Source File: C_SSS_3_B.jsf • Ping Number: 44806 • Range to Target: 18.00 Meters • Fish Height: 6.15 Meters • Heading: 194.500 degrees • Event Number: 0 • Water Depth: 7.02 • Line Name: C_SSS_3_B	**Dimensions** Target Height: = 0 Meters Target Length: 6 Meters Target Shadow: 0 Meters Target Width: 0 Meters Mag Anomaly: Avoidance Area: Classification 1: debris Classification 2: Area: Block: Description:
	**C_SSS_3_B_143407** • Sonar Time at Target: 06/19/2013 14:34:08 • Map Proj: UTM84-16N • Acoustic Source File: C_SSS_3_B.jsf • Ping Number: 43920 • Range to Target: 38.20 Meters • Fish Height: 7.46 Meters • Heading: 184.390 degrees • Event Number: 0 • Water Depth: 5.39 • Line Name: C_SSS_3_B	**Dimensions** Target Height: = 1 Meters Target Length: 20 Meters Target Shadow: 9 Meters Target Width: 11 Meters Mag Anomaly: Avoidance Area: Classification 1: mound Classification 2: Area: Block: Description:

C_SSS_3_B_143535

- Sonar Time at Target: 06/19/2013 14:35:35
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_3_B.jsf
- Ping Number: 44820
- Range to Target: 37.43 Meters
- Fish Height: 6.07 Meters
- Heading: 188.190 degrees
- Event Number: 0
- Water Depth: 7.07
- Line Name: C_SSS_3_B

Dimensions
Target Height: = 1 Meters
Target Length: 25 Meters
Target Shadow: 7 Meters
Target Width: 9 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: mound
Classification 2:
Area:
Block:
Description:

C_SSS_3_B_143434

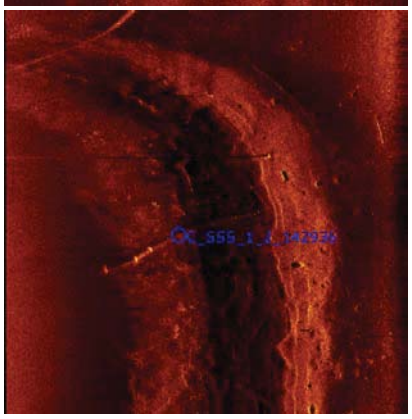
- Sonar Time at Target: 06/19/2013 14:34:34
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_3_B.jsf
- Ping Number: 44176
- Range to Target: 23.77 Meters
- Fish Height: 6.80 Meters
- Heading: 186.500 degrees
- Event Number: 0
- Water Depth: 6.39
- Line Name: C_SSS_3_B

Dimensions
Target Height: = 1 Meters
Target Length: 2 Meters
Target Shadow: 3 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: tires
Classification 2:
Area:
Block:
Description:

C_SSS_3_B_143431

- Sonar Time at Target: 06/19/2013 14:34:32
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_3_B.jsf
- Ping Number: 44156
- Range to Target: 12.81 Meters
- Fish Height: 6.44 Meters
- Heading: 192.800 degrees
- Event Number: 0
- Water Depth: 6.74
- Line Name: C_SSS_3_B

Dimensions
Target Height: = 0 Meters
Target Length: 2 Meters
Target Shadow: 1 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



C_SSS_1_2_142936

- Sonar Time at Target: 06/19/2013 14:29:37
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_1_2.jsf
- Ping Number: 41312
- Range to Target: 42.45 Meters
- Fish Height: 6.95 Meters
- Heading: 98.400 degrees
- Event Number: 0
- Water Depth: 6.44
- Line Name: C_SSS_1_2

Dimensions
Target Height: = 0 Meters
Target Length: 35 Meters
Target Shadow: 0 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: pipeline
Classification 2:
Area:
Block:
Description:

C_SSS_1_2_141623

- Sonar Time at Target: 06/19/2013 14:16:23
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_1_2.jsf
- Ping Number: 33675
- Range to Target: 31.67 Meters
- Fish Height: 9.00 Meters
- Heading: 11.890 degrees
- Event Number: 0
- Water Depth: 6.03
- Line Name: C_SSS_1_2

Dimensions
Target Height: = 1 Meters
Target Length: 15 Meters
Target Shadow: 2 Meters
Target Width: 6 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:

C_SSS_2_1_3_145848

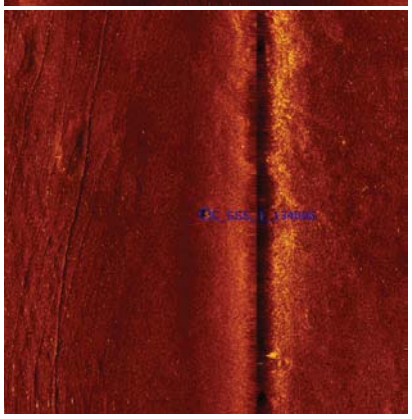
- Sonar Time at Target: 06/19/2013 14:58:48
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_2_1_3.jsf
- Ping Number: 58172
- Range to Target: 9.38 Meters
- Fish Height: 7.71 Meters
- Heading: 180.300 degrees
- Event Number: 0
- Water Depth: 6.67
- Line Name: C_SSS_2_1_3

Dimensions
Target Height: = 1 Meters
Target Length: 7 Meters
Target Shadow: 2 Meters
Target Width: 3 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:

C_SSS_5_152723

- Sonar Time at Target: 06/19/2013 15:27:24
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_5.jsf
- Ping Number: 74676
- Range to Target: 43.67 Meters
- Fish Height: 5.78 Meters
- Heading: 180.300 degrees
- Event Number: 0
- Water Depth: 7.71
- Line Name: C_SSS_5

Dimensions
Target Height: = 2 Meters
Target Length: 3 Meters
Target Shadow: 17 Meters
Target Width: 4 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: large rock
Classification 2:
Area:
Block:
Description:



C_SSS_1_134806

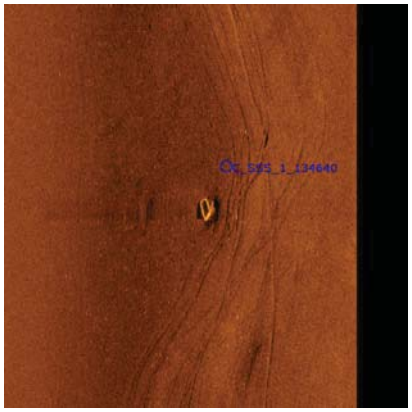
- Sonar Time at Target: 06/19/2013 13:48:06
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_1.jsf
- Ping Number: 17338
- Range to Target: 9.49 Meters
- Fish Height: 6.07 Meters
- Heading: 198.300 degrees
- Event Number: 0
- Water Depth: 8.17
- Line Name: C_SSS_1

Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: tires
Classification 2:
Area:
Block:
Description:

C_SSS_1_2_142928

- Sonar Time at Target: 06/19/2013 14:29:28
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_1_2.jsf
- Ping Number: 41231
- Range to Target: 26.35 Meters
- Fish Height: 6.80 Meters
- Heading: 88.400 degrees
- Event Number: 0
- Water Depth: 6.60
- Line Name: C_SSS_1_2

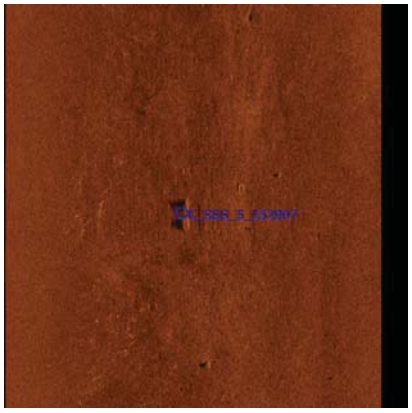
Dimensions
Target Height: = 4 Meters
Target Length: 2 Meters
Target Shadow: 40 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: buoy anchor
Classification 2:
Area:
Block:
Description:



C_SSS_1_134640

- Sonar Time at Target: 06/19/2013 13:46:42
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_1.jsf
- Ping Number: 16473
- Range to Target: 29.21 Meters
- Fish Height: 6.15 Meters
- Heading: 208.800 degrees
- Event Number: 0
- Water Depth: 8.20
- Line Name: C_SSS_1

Dimensions
Target Height: = 0 Meters
Target Length: 4 Meters
Target Shadow: 0 Meters
Target Width: 3 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: debris
Classification 2:
Area:
Block:
Description:



C_SSS_5_152907

- Sonar Time at Target: 06/19/2013 15:29:07
- Map Proj: UTM84-16N
- Acoustic Source File: C_SSS_5.jsf
- Ping Number: 75682
- Range to Target: 42.01 Meters
- Fish Height: 6.00 Meters
- Heading: 190.600 degrees
- Event Number: 0
- Water Depth: 7.85
- Line Name: C_SSS_5

Dimensions
Target Height: = 0 Meters
Target Length: 6 Meters
Target Shadow: 2 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1: rock
Classification 2:
Area:
Block:
Description: