NOAA FORM 76-35A

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

DATA ACQUISITION AND PROCESSSING REPORT

NOAA Ship FAIRWEATHER

For Project **OPR-O119-FA-05 Fall**

LOCALITY

State **Alaska**

General Locality **Ernest Sound and Eastern Passage**

CHIEF OF PARTY

CAPT John E. Lowell, Jr.

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DATE

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A. INTRODUCTION

This hydrographic project was completed as specified by Hydrographic Survey Letter Instructions OPR-O119-FA, signed January 4th, 2005. This Data Acquisition and Processing Report applies to sheet E – H11507, sheet F – H11508, and sheet G – H11509. All sheets have the general locality of Ernest Sound and Eastern Passage in the state of Alaska. The additional H-numbers supplied by the Hydrographic Surveys Division for the fall project are included in project correspondence and with the letter instructions.

In accordance with the System Certification memorandum dated February 14, 2005, FAIRWEATHER personnel conducted system certification procedures and produced the *NOAA Ship FAIRWEATHER Hydrographic Systems Certification Report 2005* (*SCR*) submitted April 18, 2005. The System Certification Recommendation memorandum, *FA_SCR_2005_Rev1*, was received on May 23, 2005 and is included in Appendix 1. A System Certification Recommendation Approval memorandum from the Chief of Hydrographic Surveys Division Operations Branch, *FA_SCR_Approval*, was received on August 24, 2005 and is included in Appendix 1.

The information contained within the SCR verifies that the hydrographic systems used for surveying meet or exceed requirements as defined in the *NOS Hydrographic Surveys Specifications and Deliverables (NHSSD)* dated March 2003. The Data Acquisition and Processing Report (DAPR) describes the procedures used to acquire and process data.

Survey specific details will be listed in Descriptive Reports as needed. Unless otherwise noted, the acquisition and processing procedures used and deliverables produced are in accordance with the *Standing Instructions* (July 19th, 2005), the *NHSSD*, and the *Field Procedures Manual v1.1* (March 2005). Hydrographic Surveys Technical Directives 2004-1 through 4 and 2005-1 were followed during the course of this project.

B. EQUIPMENT

Detailed descriptions of the equipment and systems used for bathymetric data acquisition, horizontal and vertical control operations, and shoreline acquisition are included in the *NOAA Ship FAIRWEATHER Hydrographic Systems Certification Report 2005* (*SCR*) submitted under separate cover. The *SCR* also contains the determination of correctors, dates and documentation of calibration and testing information. The hardware and software used for data acquisition and processing are listed in the SCR.

I. Updates, Additions, and Deviations from the SCR

a. System Tracking

The updated system tracking documents, *Survey Software* which includes software versions and dates of installation; *Personnel Inventory; and FA Hardware*, are included in Appendix 1.

b. Addendums to Vessel Reports

The NOAA Ship FAIRWEATHER (S220) RESON 8111ER Vessel Report 2005 submitted with the SCR did not contain the results of the Dynamic Draft Settlement and Squat (DDSSM) testing that was conducted on April 14, 2005. The report, included in Appendix 1, is being resubmitted with the addition of Addendum 1 which lists and explains the DDSSM results.

The NOAA Ship FAIRWEATHER (S220) configurations were upgraded since documentation was submitted in the SCR. Junction boxes were added to the S220_8111 and S220_8160 system setups, to allow for simultaneous acquisition and recording of data by both systems. The addition of the junction boxes did not affect the latency values used in the HIPS Vessel File. In addition, NEMA data was output from ISIS in order to facilitate the auto deploy feature in the Moving Vessel Profiler. These updates are depicted in the updated vessel diagram which is included in Appendix 1.

On May 12th, after 1600 GMT, and August 6th, from 1726 through 2359 GMT, an error occurred with the dropdown transducer mount for Launch 1018 while acquiring data on surveys H11469 from OPR-O167-FA and H11474 from OPR-P183-FA respectively. Debris was trapped between the transducer arm and the stop. This changed the Roll Bias, which remained steady, for the remainder of each day only. Refer to the *NOAA Hydrographic Survey Launch 1018 Vessel Report – 2005 Addendum 2* for further information.

The transducer on Launch 1018 was sheered off the vessel. The mount was reconstructed, the arm was outfitted with grease zirks. Patch testing and a POS M/V GAMS Calibration was conducted once the new transducer was reinstalled, testing occurred on October 21, 2005 (DN 294) and October 26, 2005 (DN 299), values for this testing were entered under DN 293 to cover all data acquired with the new transducer. Refer to the *NOAA Hydrographic Survey Launch 1018 Vessel Report – 2005 Addendum 3* for further information.

On August 27th (DN 239), an error occurred with the dropdown transducer mount for Launch 1010 while acquiring data on survey H11498 from OPR-OP158-FA. Debris was trapped between the transducer arm and the stop. This changed the Roll Bias, which remained steady, for the remainder of the day only. Refer to the *NOAA Hydrographic Survey Launch 1010 Vessel Report – 2005 Addendum 2* for further information.

The transducer on Launch 1010 was removed in order to strengthen welds on the mount. Additional patch testing was conducted once the transducer was reinstalled on October 4th and 5th, 2005 (DNs 277 & 278). Refer to the *NOAA Hydrographic Survey Launch 1010 Vessel Report – 2005 Addendum 3* for further information.

On October 24, 2005 (DN 297), during multibeam acquisition on project OPR-O119-FA-05, survey H11507, the key way on the transducer arm, which connects the swing arm to the transducer mount, gave way. This failure caused severe roll bias in the data, and resulted in the transducer not being able to be raised. Manual examination of the data in CARIS subset mode allowed the exact time of the key way failure to be determined. The data on DN 297 following the failure was rejected and recollected. The key way was repaired on board the FAIRWEATHER. Although Launch 1010 was patch tested on October 26, 2005 (DN 299), it was determined that no additional data would be collected until a permanent stable repair of the keyway was attained. Refer to the *NOAA Hydrographic Survey Launch 1010 Vessel Report – 2005 Addendum 4* for further information.

c. Noise Analysis

The FAIRWEATHER sonar systems RESON 8111ER underwent noise analysis testing on October 11, 2004. The results are utilized during acquisition to enhance data quality and are included Appendix 1. The Standard Operating Procedure for Survey Speeds to be run while acquiring data with the RESON 8111ER is included in Appendix 3.

d. Moving Vessel Profiler (MVP)

The MVP system consists of a winch, cable, fish (the towed unit with the sound velocity sensor), support assembly, and controlling hardware and software. During ship acquisition, the fish was deployed using the on-deck controller and towed with enough cable out to keep the fish 3-5 m below the water surface. A “messenger” (a short cable-thickening sleeve) was set on the cable to allow the system to keep the appropriate amount of cable out and reset as needed when the ship acquisition speed was altered.

During SVP acquisition, the controlling computer application, Brooke Ocean Technology MVP version 2.24, was used to control the MVP system and to acquire SVP data. MVP allows for three acquisition modes: 1) automatic continuous multiple cast freefall casting while at speed, 2) single cast freefall casting while at speed, and 3) single cast winch speed casting while stationary. The user limits the depth to which the fish will fall by setting 1) the depth-off-bottom and 2) the maximum depth. Either single, individually initiated casts can be performed, at the discretion of the Hydrographer or auto deploy can be enabled and set with varying frequency (every 2 minutes for example) for deployment.

e. Maintenance and Periodic Testing

The maintenance and periodic testing that was conducted on the CTD equipment by the FAIRWEATHER personnel is documented in *CTD_Maintenance and Periodic Testing*

and included in Appendix 2. Also included with the spreadsheet of maintenance and testing is a report conducted and written in October, outlining additional testing conducted between the Moving Vessel Profiler (MVP) 200 and the Seabird SBe19+. This testing was conducted to investigate whether the MVP was the source of the sound velocity error affecting various surveys with ship data throughout the season. Although the results were not entirely conclusive, the casts generated by each instrument for three different cast sites were in good agreement and sound velocity error is not readily apparent in the MBES data.

II. Data Acquisition

a. Multibeam Echosounder Acquisition and Monitoring Procedures

Methods of acquisition took into consideration system performance limitations, the bottom topography, water depth, and the ability of the vessel to safely navigate the area.

All multibeam data were acquired in Triton Elic's extended transfer format (XTF) and monitored in real-time using the 2-D and 3-D data display windows and the on-screen displays for the RESON SeaBat 8101ER, and 8111ER sonar processors. Adjustable parameters that were used to control the RESON from the ISIS software include range scale, power, gain, and pulse width. These parameters were adjusted as necessary to ensure best data quality. Additionally, vessel speed was adjusted as necessary to ensure the required along-track coverage for object detection in accordance with the *NOS Specifications and Deliverables and Standing Project Instructions*. The *RESON 81XX SOP* (standard operating procedure) and the *TEI Real Time Bathy SOP* detail the settings and procedures utilized during acquisition of data on the Reson systems and in Isis aboard the FAIRWEATHER. Both are included in Appendix 3.

Mainscheme multibeam sounding lines using the RESON Seabat 8101ER and 8111ER were generally run parallel to the contours at a line spacing approximately three to four times the water depth. For discrete item developments, line spacing was reduced to 2 times water depth to ensure least-depth determination by multibeam near-nadir beams. Triton Elic's DelphMap Real Time Bathy was utilized in lieu of planned line files. The Real Time Bathy displayed the acquired multibeam swath during acquisition and was monitored to ensure overlap and full bottom coverage. If coverage was not adequate, additional lines were run while still in the area.

b. Shoreline Verification

FAIRWEATHER personnel conducted field shoreline verification at times near predicted low water, in accordance with the Standing Project Instructions and the Field Procedures Manual v1.1 (March 2005), section 2.4. Pertinent standard operating procedures such as *Shoreline_Presurvey, Importing Shapefiles in Notebook, Trimble_Pathfinder_Setup,* and *Shoreline_Acquisition_SOP* are included in Appendix 3.

Mapinfo was used to consolidate and review shoreline sources. Remote Sensing Division source shoreline (CFF) was opened and viewed by line and feature type in Mapinfo.

Charted shoreline, when needed for reference purposes or when source data were not available or adequate, was digitized into separate Mapinfo tables classified by S-57 object type. AWOIS and CEF investigation items were also opened in Mapinfo. Boat sheets were produced and geo-referenced images (tif/tfw) were created for use in Trimble TerraSync during shoreline verification.

Detached positions (DPs) and generic positions (GPs) acquired during shoreline verification indicate revisions to features, or features not found in the field. They were recorded in the shoreline acquisition software TerraSync using a Trimble Backpack and on DP forms, and then processed through GPS Pathfinder. Scanned copies of the DP forms are included in the digital Separates folder and hard copies are submitted with the Separates to be included with Survey Data. In addition, annotations describing shoreline were recorded on hard copy plots of the digital shoreline, referred to as boat sheets which are also submitted with the individual survey as Separates.

Terminology used during shoreline verification is as follows. The term "Noted" indicates that the feature is correctly located within the scale of the chart or source, as confirmed from a distance. The term "Verified" is used when the existence of the feature is confirmed in close proximity and the feature is correctly located within the scale of the survey.

c. Bottom Sample Acquisition

Bottom samples were conducted according to section 7.1 of the *NOS Hydrographic Surveys Specifications and Deliverables* (March, 2003).

d. Horizontal Control

A complete description of horizontal control for the project can be found in the *OPR-O119-FA-05 Fall Horizontal and Vertical Control Report (HVCR),* submitted under separate cover.

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential GPS (DGPS) was the sole method of positioning. Differential corrections from the U.S. Coast Guard beacon at Gustavus (288 kHz) and Level Island (295 kHz).

System Checks were not performed during this project. Based on correspondence between personnel from the Hydrographic Systems and Technology Program and FAIRWEATHER, system checks were deemed unnecessary at this time. Refer to correspondence included in Appendix 1.

C. QUALITY CONTROL

I. Data Processing

The FAIRWEATHER has numerous standard operating procedures (SOPs) that are followed by personnel throughout the survey to ensure consistent high quality data and products. A detailed data processing flowchart and several key SOPs, that differ from the *Field Procedures Manual v1.1* (March 2005) and/or are specific only to the FAIRWEATHER, are included for reference in Appendix 3.

a. Multibeam Echosounder Data Processing

Raw XTF multibeam data were converted to HDCS format in Caris HIPS & SIPS 5.4. After conversion, TrueHeave™ was loaded prior to sound velocity correction in HIPS. Tide corrections, dynamic draft correctors, sensor lever arm information, bias information and timing errors, and attitude correctors were applied to the data during "Merge". Once lines are merged, the Total Propagated Error (TPE) was computed in HIPS to determine the quality of the multibeam data.

The TPE takes into account uncertainties in the measurements coming from each sensor (Heave, Pitch, Roll, Position, Heading, Sound Velocity, and Tide) and uncertainties in static measurements (Draft and Latency) to calculate the total uncertainty associated with each sounding. Caris HIPS & SIPS 5.4 uses the vertical uncertainty from TPE to produce a Bathymetry Associated with Statistical Error (BASE) surface. These BASE surfaces and child layers (Depth,Uncertainty, Density, Standard Deviation, Mean, Shoal, Deep) were used for directed data editing, to demonstrate coverage, and to check for systematic errors such as tide, sound velocity, or attitude and timing errors.

Vessel heading, attitude, and navigation data were only reviewed and/or edited in navigation editor and attitude editor as deemed necessary by the Hydrographer. When necessary, fliers or gaps in heading, attitude, or navigation data were manually rejected or interpolated for small periods of time. The data were reviewed and edited in swath editor as needed. All multibeam data were edited and reviewed in HIPS subset mode.

The BASE surfaces, produced as deliverables, have resolutions and depth ranges that are at or below 8 percent of the depth. Overlap is adjusted as necessary for the survey topography. A table listing the resolution and depth ranges used will be provided in the descriptive reports for each survey. Correspondence outlining the FAIRWEATHER use of the above BASE surface resolution guidelines is included in Appendix 1.

In areas of navigational significance where the BASE surface did not depict the desired depth for the given area, a designated sounding was selected. Designated soundings were selected based on the difference between the BASE surface and reliable shoaler sounding(s) being more than half to two thirds of the allowable IHO error budget in depths less than 20m.

1. Data Standards and Processing Guidelines

Bathymetry processing followed section 4.2 of the *Field Procedures Manual v1.1* (March 2005) unless otherwise noted. BASE surface processing was in accordance with *Hydrographic Surveys Technical Directive 2004-3*.

Initial processing (conversion, tide application, sound velocity correction, merge and compute TPE) of the data was conducted in CARIS 6.0. This was to facilitate the testing of CARIS 6.0 for major issues in those processes prior to the end of the 2005 field season. All other processing of was conducted in CARIS 5.4 unless otherwise noted in the Descriptive Report of specific surveys.

The bathymetric data acquired during this project has been examined and it meets or exceeds the specifications defined in the *NOS Hydrographic Surveys Specifications and Deliverables* (NHSSD), dated March 2003. In accordance with the NHSSD the vertical accuracy standards are S-44 IHO Order 1 for water 100 meters or less in depth and IHO Order 2 for depths greater than 100 meters. Data quality issues, specific to individual surveys, are noted in the descriptive reports.

2. System Certification Report Clarifications

Hips Vessel File:

The HVFs for each vessel used for this project and the Devicemodel.xml utilized during data processing in CARIS HIPS are located in the Separates to be included with this report.

Initial entry dates in each vessel HVF do not correspond with the dates noted in each vessel report. The dates entered precede the dates of the patch tests to accommodate other testing and preliminary data collected. As no project data was collected before the initial patch tests by any of the FAIRWEATHER's vessels data quality is not affected.

The sensor latency value noted in the vessel reports can either be entered into each sensor (Navigation, Gyro, Heave, Pitch and Roll) Time Error field or the inverse value can be entered once into the Swath Time Error field. The Swath Time Error value for all vessels is entered as the inverse value of the Navigation Time Error reported in the vessel reports. See correspondence between the Pacific Hydrographic Branch and FAIRWEATHER (*PHB and FA Correspondence*) included in Appendix 1.

Error estimates (TPE values) were entered into the HVF file for each vessel. In the HVFs for 1010_8101, 1018_8101 and S220_8111, the "MRU Align StdDev Gyro" and "MRU Align StdDev Roll/Pitch" values were unknown, and these fields were initially defined as 0.000. The meaning of the values and how to calculate them were

unknown at the time of testing and, moreover, undocumented in Caris' Vessel Editor Help Manual.

The question of the meaning of these values was posed to Dr. Brian Calder from UNH, who was aboard the FAIRWEATHER. Dr. Calder is the creator of the total propagated error concept which was implemented by CARIS. He explained that these error values are defined as the standard deviation of the error estimates for the "gyro" and "roll/ pitch" patch test values, as calculated from the compilation of these values from all of the individuals evaluating the patch test data. These standard deviations were documented when processing the patch tests used for this project. Documentation and reporting of the standard deviation of the error estimates for the "gyro" and "roll/ pitch" patch test values were included in the HVFs for launches 1010_8101 and 1018_8101. The ship system S220_8101 was not re-patched prior to this project and therefore standard deviations were not available. See correspondence between the Pacific Hydrographic Branch and FAIRWEATHER (*PHB and FA Correspondence*) included in Appendix 1.

Dropdown Transducer Securing Mechanism:

In the *SCR* problems with the transducer securing mechanism were noted. It was stated in the *SCR* that a permanent solution would be installed during the April 29th through May 2nd import in Ketchikan. This was not done since the short term solutions which stabilized the mount proved to be adequate.

b. Shoreline Data Processing

During shoreline verification, detached (DP) and generic (GP) positions were acquired with TerraSync 2.4.1. Data were reviewed, edited and exported as ESRI shape files(shp) in GPS Pathfinder 3.00. The exported shape files include the S-57 field attributed positions and are organized by object type.

Pydro and CARIS Notebook 2.2 are used exclusively in the shoreline processing pipeline from the field to the processing branch.

The source shoreline shape files were imported into CARIS Notebook 2.2 into the .hob file format and called H#####_Edited_CFF_Shoreline.hob using the Object Import Utility (OIU). The charted shoreline Mapinfo tables produced for shoreline verification, were imported into Notebook using the OIU and attributed according to S-57 into the H#####_Charted_Shoreline.hob file. These files are annotated with Hydrographer remarks and submitted with the field products as deliverables. An unedited O119_CFF_Shoreline.hob file is also included with the Separates to be included with this report for reference purposes.

Positions acquired during shoreline verification operations are in shape file format from GPS Pathfinder. The Generic GPs/DPs Import tool in Pydro is utilized to retain the S-57 attribution during import into Pydro. The DPs and GPs indicate revisions to features, or

features not found during shoreline verification. Once the features are in Pydro, short descriptive comments along with investigation or survey methods are listed under the Remarks tab in Pydro. Features are flagged as Primary, unless there are multiple detached (DPs) or generic (GPs) positions taken on the same feature. In that case, the most important DP is marked Primary and the associated DPs/GPs were flagged Secondary. A Carto Action of Add, Modify, Delete, or None is assigned to each item in Pydro, and all features are S57 attributed. Items for particular surveys, that were associated with a DP or GP that needed further discussion, are flagged Report in Pydro. Along with the investigation methods provided in the Remarks tab, the hydrographer included recommendations to the cartographer in the Recommendations tab when warranted. All features were flagged according to Pydro Processing Flow Diagram section 4.4.2.4 of the Preliminary Field Procedures Manual dated March 2005.

Photos labeled and associated with a DP/GP number are included in the Pydro PSS session and stored in with the PSS. Photos not associated with a DP/GP are given a descriptive label, are included in the PICREP S-57 attribution column of the associated feature, and stored with the Field Product Notebook files.

The HDCS_DATA lines associated with DPs require further processing in CARIS HIPS & SIPS to correct for tide and sound velocity when necessary. GPs do not have heights associated with them and require no additional processing.

All primary and accepted DPs and GPs are imported from Pydro as an .xml to CARIS Notebook 2.2. Three separate stand alone .hob files are based on the Carto Action assigned in Pydro. The separated files are named H#####_Add_Pydro.hob, H#####_Modify_Pydro.hob, H#####_Delete_Pydro.hob and H#####_None_Pydro.hob. UserID, remarks and recommendations from Pydro are imported to the userID", "remrks" and "recomd" fields associated with each feature in CARIS Notebook.

New HW/MLLW features and any changes to the source shoreline, such as ledges or reefs, were digitized with S57 attribution to the H#####_Add_Ntbk.hob or H#####_Modify_Ntbk.hob files. Any comments or annotations made on the boat sheets from observations made in the field, including field notes made by the Hydrographer regarding verification of features, were added directly to the "remrks" field of the feature in the .hob file. Marker text is used to add comments to features when necessary for display purposes, such as when the "remrks" field does not display correctly or to highlight an item that was not verified. Source items from the Cartographic Feature File (CFF) or charted items that were disproved have been moved to the H#####_Delete_Ntbk.hob. Due to CARIS Notebook 2.2 limitations, the similar tables (ie H#####_Add_Pydro.hob and H#####_Add_Ntbk.hob) cannot be combined in the field. The H#####_Edited_CFF_Shoreline.hob and H#####_Charted_Shoreline.hob files only contain features with no modifications and include Hydrographer remarks.

The CARIS Notebook session along with CARIS HIPS BASE surface(s) were viewed to compare soundings and features simultaneously. For detailed descriptions of procedures,

see the standard operating procedures included in Appendix 3, *Pydro Shoreline Processing, CartoAction Flagging,* and *Notebook Shoreline Processing.*

b. Reference Surface

Due to mechanical issues and time constraints a reference surface was not completed in the OPR-O119-FA-05 Fall project area. Initial lines were run by the NOAA Ship FAIRWEATHER (S220) RESON 8111ER, lines were unable to be completed by NOAA Hydrographic Survey Launch 1010 or NOAA Hydrographic Survey Launch 1018.

II. Data Review

Specific procedures were used on the FAIRWEATHER to ensure quality control of data throughout acquisition, processing, and submission. These procedures are outlined in the *FA QC Checksheets, FA_Data_Query,* and the *Survey Management SOP* located in Appendix 3. As detailed in *FA QC Checksheets*, the QC Check is preformed by the survey manager. The QC Review is conducted by qualified survey personnel other than the survey manager, as an outside review of the survey data and deliverables. The Data Submission and Analog Submission checklists are used to ensure that all data and deliverables are complete and included upon submission. These documents are completed for every survey but are not submitted with the data.

D. CORRECTIONS TO ECHO SOUNDINGS

I. POS/MV Correctors

a. Position Computation

On all FAIRWEATHER vessels the POS/MV is used for positioning multibeam data. The POS/MV controller software was used to monitor position accuracy and quality during data acquisition. This ensured that positioning accuracy requirements were met, as outlined in the NOS Hydrographic Surveys Specifications and Deliverables. The POS/MV controller software provides clear visual indications whenever accuracy thresholds are exceeded.

The CSI Wireless MBX-3S DGPS Receivers are used in conjunction with TSS POS/MV to provide vessel positioning during data acquisition. The DGPS receivers are configured in manual mode to allow reception of only one U.S. Coast Guard (USCG) differential GPS beacon station.

b. Heading Computation

On all vessels, the heading computed by the POS/MV, was used as a corrector for multibeam data.

c. Pitch and Roll Computation

On all vessels, the POS/MV was used for pitch and roll values.

d. Heave Computation

The POS/MV's on FAIRWEATHER and her launches are equipped with the TrueHeave™ option. Stored TrueHeave™ data contains time stamps with attitude, position, acceleration, and rotation information. TrueHeave™ data were acquired in accordance with section 6.0 of the *POS/MV Version 3 Installation and Operation Manual,* dated October 2003. These data were loaded, in CARIS HIPS & SIPS 5.4, into the simultaneously collected multibeam data to determine the vessel heave correctors.

In cases where TrueHeave™ could not be applied, real time heave correctors were used. Real time heave data were recorded in Triton Elic's Isis software, stored in the .XTF format and applied as the heave corrector for multibeam data.

Data, that does not have TrueHeave™ applied, will be listed in the individual Descriptive Report for the survey.

II. Sound Velocity

Within CARIS HIPS there are four different algorithms used to automatically apply sound velocity information to a profile using information stored in the concatenated sound velocity file. They are: Previous in time, Nearest in time, Nearest in distance and Nearest in distance within time. The method used for applying sound velocity information to a line is included in the processing logs that are submitted with the data.

a. SBE 19*plus* SEACAT Profiler

Sound Velocity Profile (SVP) casts from the SBE 19*plus* were processed with Velocwin and the correctors were applied to echosounder data in CARIS HIPS during post processing.

b. Moving Vessel Profiler (MVP)

Sound velocity correction data were acquired using the Brooke Ocean Technology Moving Vessel Profiler 200 (MVP) sound velocity profile (SVP) acquisition system and subsequently converted to .svp format using Velocwin for application to multibeam data in CARIS HIPS during post processing.

MVP records cast data into files of type .001, .001c, .001d, and .001e (collectively called BOT files) where the number increments by one with each subsequent cast. The .001c file for each cast was opened with Velocwin and converted into CARIS .svp file format. The individually taken casts were compiled into a daily .svp file which were in turn

concatenated to the ship .svp file for the project and applied to multibeam data in CARIS HIPS during data processing. No individual .svp files exist for each cast taken by the MVP due to the large number of casts acquired.

III. Water Level

Predicted and unverified observed water level correctors were downloaded from the CO-OPS website when internet was available. When internet was unavailable, the ship enabled the automated Tidebot program, which would send daily observed water level correctors for selected tide stations to the ship via email. The daily water level correctors arrived in .dat file format. The files for the relevant days were collated into a tide station master file which was converted to .tid file format in Mapinfo using HydroMI. The .tid files were applied to data along with the zone definition file (.zdf) in CARIS HIPS & SIPS. The Pacific Hydrographic Branch will apply final approved (smooth) tides to the survey data during final processing.

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary tide station at Ketchikan, AK (945-0460) served as control for datum determination and as the primary source for water level reducers for this project.

FAIRWEATHER personnel installed one Sutron 8210 "bubbler" tide gauges at the tertiary station listed below. Gauge #12 (S/N 023512) was the gauge used. The gauge was installed in order to provide information to Center for Operational Oceanographic Products and Services (CO-OPS N/OPS1) for the determination of time and height correctors, in accordance with the Project Instructions.

Station Name	Station Number	Type of Gauge	Date of Installation	Date of Removal
Bradfield Canal, AK	945-1012	Tertiary 30 Day	October 8, 2005	November 7, 2005

CO-OPS does not provide calibration or quality assurance documentation to the FAIRWEATHER. FAIRWEATHER personnel are responsible for installation and removal of the water level gauges. Although not required in the Letter Instructions, CO-OPS delivered final approved vertical correctors to the FAIRWEATHER for application to the hydrographic data set on December 22, 2005. See the Descriptive Report of specific surveys for tide application details. It will not be necessary for the Pacific Hydrographic Branch to apply the verified water level data (smooth tides) to the survey data during final processing for the fall surveys for project OPR-O119-FA-05 - H11507, H11508, and H11509.

A complete description of vertical control for the project can be found in the *OPR-O119-FA-05 Fall Horizontal and Vertical Control Report (HVCR)*, submitted under separate cover.

Software Systems

Acquisition	Processing	Miscellaneous
ISIS Sonar v6.9	CARIS HIPS & SIPS v5.4	Microsoft Office
Delph Map v2.13	CARIS HIPS & SIPS v6.0	Adobe Acrobat
Delph Nav	CARIS Notebook v2.2	Dreamweaver
BathyPro v1.9	CARIS EASY-ENC	Corel Word Perfect Office 2002
Applanix POS/MV	CARIS GIS v4.4a	iPAQ Navigation System
Controller 2.1	PYDRO v5.9.1	Internet Explorer

LICENSES

Caris License #	On	GIS	HIPS	Notebook	Expires	Type	Comments
~~CW9604043~~	~~FADC2~~	~~5~~	~~5~~	~~5~~	~~10/31/05~~	~~Red USB~~	returned 10/31/05
~~CW9604041~~	~~roving~~	~~1~~	~~1~~		~~12/31/05~~	~~Purple USB~~	corrupt:returned 10/31/05
CW9604403	roving	1	1			Purple USB	replaces CW9604041
CW9604042	roving			1	12/31/05	Purple USB	
~~CW9603454~~		~~1~~	~~1~~			~~White Serial~~	returned 10/31/05
~~CW9603120~~		~~1~~	~~1~~			~~White Serial~~	returned 10/31/05
CW9604366	FADC2	7	7	5	10/31/06	Red USB	new key inst. 10/31/05

ISIS Dongle #	On Processor	Isis	DelphMap	DelphNav	BathyPro	RT Bathy	81XX Server	Mission Monitor	
TEI 03-1525	1010_ACQ	1					1		
TEI 03-15250	1010_ACQ	1	1	1	1	1		1	
TEI 03-1526	220_ACQ	1					1		
TEI 03-15260	220_ACQ	1	1	1	1	1			
TEI 03-1527	1018_ACQ	1					1		
TEI 03-15270	1018_ACQ	1	1	1	1	1			

Processor	Physical #	Pydro License #	Expires
FA_Process_1	00-0B-DB-5A-62-2B	ddbd88e5e2add37c62	01/31/06
FA_Process_2	00-11-11-0F-84-44	17ff4798a45f2e18e0	01/31/06
FA_Process_3	00-11-11-06-9D-42	17ff4798a43184cb81	01/31/06
FA_Process_4	00-01-02-69-5A-45	04730c79144aa2e73d	01/31/06
FA_Process_5	00-0A-5E-42-0B-34	58cd056e835465e329	01/31/06
FA_Process_6	00-0B-DB-56-68-2B	ddbd88e5e2a5818feb	01/31/06
FA_Process_7	00-01-02-69-56-43	04730c79142d3c99d4	01/31/06
FA_Process_8	00-11-11-06-A1-B5	17ff4798ab42d6b8e8	01/31/06
FA_Process_8B	00-0B-DB-C5-F5-ED	ddfeb19d3ec82f7b90	01/31/06
FA_Process_9	00-0B-DB-56-68-30	ddbd88e5e31a2eb007	01/31/06
FA_Process_10	00-0B-DB-5A-D1-21	ddfeb19d320a9b8aa7	01/31/06
FA_CST	00-11-11-06-A4-68	17ff4798a69248559b	01/31/06
FA_FOO	00-0B-DB-56-68-8C	ddbd88e5e8d45ef885	01/31/06

Fledermaus FLEXid	License #	Processor	Comments
~~9-45953CB6~~	~~2518891E2E69~~	~~FA_Process_8~~	Key was destroyed
9-65012FEB	B18BA0DE2D3F	FA_Process_3	local
9-6153BBA5	21DE819F1F03	FADC1	network

Processor	MapInfo v7.5	7.8 Upgrade	MapInfo v8.0 & U	MapBasic v8.0	Comments
FA_Process_3	MUIWEU0750026833	MIUWEU0780026833	MIUWEU0800038720	MBUWEU0800012230	
FA_Process_7	MIUWEU0750026834	MIUWEU0780026834	MIUWEU0800038723		
FA_CST	MIUWEU0750025574	MIUWEU0750025574	MIUWEU0800038722		
FA_FOO		MIUWEU0780034111	MIUWEU0800038721		
FA_Process_8			MIUWEU0800038726		
FA_Process_6			MIUWEU0800038724		
FA_Process_2			MIUWEU0800038725		

GPS Pathfinder S/N
011746-00300-04309-3BAD03D2
024156-00300-05068-0E94DA58

TerraSync Pro S/N
498295-00110-04309-7073A4A7
498295-00110-05068-EBD4EA8B

Processors
FA_Process_7 added & configured 5/6/05
FA_Process_10 added & configured 8/28/05
FA_Process_8 down for maint. 10/8/05-10/27/05
FA_Process_5 added & configured 10/11/05
FA_Process_8b configured 10/12/05, temp replacement
FA_Process_8 back in service 10/27/05, 8b taken out

ISIS SONAR						
	1010_ACQ	**1018_ACQ**	**220_ACQ**	**FA_Process_4**	**FA_Process_5**	**Comments**
v.6.5.0	d.u	d.u	d.u	d.u		
v6.5.1	d.u	d.u	d.u	d.u		
v6.6.0	d.u	d.u	d.u	d.u		
v6.7.0	10/01/04	10/01/04	09/20/04	10/01/04		ISIS removed 2/14/05
v6.7.193.0						
v6.8	02/10/05	02/28/05	02/14/05	N/A		FA_Process_4 No longer back-up computer
v6.9	09/10/05	09/10/05	08/05/05	N/A	10/07/05	
v7.0			01/11/06	N/A		

d.u.=date unknown; exact intall date not documented

ISIS DELPHNAV-DELPHMAP					
	1010_NAV	**1018_NAV**	**220_NAV**	**FA_Process_5**	**Comments**
v2.10	d.u	d.u	d.u		
v2.11	d.u	d.u	09/20/04		
v2.00.193.0					
	1010_ACQ	**1018_ACQ**	**220_ACQ**		
v2.12	02/10/05	02/28/05	02/14/05		
v2.13	09/10/05	09/10/05	08/05/05	10/07/05	

d.u.=date unknown; exact intall date not documented

TerraSync						
	ToughBook1	**ToughTab1**	**TSCe**	**FA-Mobile1**	**ToughBook2**	**Comments**
v2.40		d.u	d.u	d.u		
v2.41	10/5/2004	10/5/2004	10/5/2004	10/6/2004	10/13/2004	

d.u.=date unknown; exact intall date not documented

Pathfinder							
	ToughBook1	**ToughTab1**	**FA-Mobile1**	**ToughBook2**	**Olab**	**Process1**	**Comments**
v3.00	9/30/2004	10/4/2004	d.u	10/13/2004	d.u.	3/22/2005	

d.u.=date unknown; exact intall date not documented

CARIS HIPS & SIPS v5.4

	FA_Process_1	FA_Process_2	FA_Process_3	FA_Process_4	FA_Process_5	FA_Process_6	FA_Process_7	FA_Process_8	FA_Process_8b	FA_Process_9	FA_Process_10	FA_CST	FA_FOO		Comments
v5.4 full	05/05/04	08/02/04	08/02/04	08/02/04	10/11/05	09/11/04	05/06/05	08/02/04	10/12/05	08/02/04	08/28/05	08/04/04	08/11/04		
v5.4 HF1	06/14/04														
v5.4 HF2	06/14/04														
v5.4 HF3	06/14/04														
v5.4 HF4	06/14/04														
v5.4 HF5	06/14/04														
v5.4 HF6	06/14/04														
v5.4 HF7	06/14/04														
v5.4 HF8	06/14/04														
v5.4 HF9	06/14/04														
v5.4 HF10	06/14/04														
v5.4 HF11	06/14/04														
v5.4 HF12	06/14/04														
v5.4 HF13	06/17/04														
v5.4 HF14	06/18/04														
v5.4 HF15															
v5.4 SP1	07/27/04	08/02/04	08/03/04	08/02/04	10/11/05	09/11/04	05/06/05	08/02/04	10/12/05	08/02/04	08/28/05	08/04/04	08/26/04		
v5.4 SP1+HF1	07/27/04	08/02/04	08/03/04	08/02/04	10/11/05	09/11/04	05/06/05	08/02/04	10/12/05	08/02/04	08/28/05	08/04/04	08/26/04		
v5.4 SP1+HF2	08/03/04	08/02/04	08/03/04	08/02/04	10/11/05	09/11/04	05/06/05	08/02/04	10/12/05	08/02/04	08/28/05	08/04/04	08/26/04		
v5.4 SP1+HF3	08/04/04	08/04/04	08/05/04	08/04/04	10/11/05	09/11/04	05/06/05	08/04/04	10/12/05	08/06/04	08/28/05	08/04/04	08/26/04		
v5.4 SP1+HF4	08/26/04	08/26/04	08/26/04	08/26/04	10/11/05	09/11/04	05/06/05	08/26/04	10/12/05	08/26/04	08/28/05	08/26/04	08/26/04		
v5.4 SP1+HF5	08/26/04	08/26/04	08/26/04	08/26/04	10/11/05	09/11/04	05/06/05	08/26/04	10/12/05	08/26/04	08/28/05	08/26/04	08/26/04		
v5.4 SP1+HF6	08/26/04	08/26/04	08/26/04	08/26/04	10/11/05	09/11/04	05/06/05	08/26/04	10/12/05	08/26/04	08/28/05	08/26/04	08/26/04		
v5.4 SP1+HF7	08/26/04	08/26/04	08/26/04	08/26/04	10/11/05	09/11/04	05/06/05	08/26/04	10/12/05	08/26/04	08/28/05	08/26/04	08/26/04		
v5.4 SP1+HF8	10/06/04	10/07/04	09/26/04	10/08/04	10/11/05	09/23/04	05/06/05	09/22/04	10/12/05	09/23/04	08/28/05	10/07/04	10/07/04		
v5.4 SP1+HF9	10/06/04	10/07/04	09/26/04	10/08/04	10/11/05	09/23/04	05/06/05	09/22/04	10/12/05	09/23/04	08/28/05	10/07/04	10/07/04		
v5.4 SP1+HF10	10/06/04	10/07/04	10/07/04	10/08/04	10/11/05	10/07/04	05/06/05	10/05/04	10/12/05	10/07/04	08/28/05	10/07/04	10/07/04		
v5.4 SP1+HF11	10/06/04	10/07/04	10/07/04	10/08/04	10/11/05	10/07/04	05/06/05	10/05/04	10/12/05	10/07/04	08/28/05	10/07/04	10/07/04		
v5.4 SP1+HF12	10/06/04	10/07/04	10/07/04	10/08/04	10/11/05	10/07/04	05/06/05	10/05/04	10/12/05	10/07/04	08/28/05	10/07/04	10/07/04		
v5.4 SP1+HF14	11/05/04	11/05/04	11/04/04	11/06/04	10/11/05	11/06/04	05/06/05	11/06/04	10/12/05	11/06/04	08/28/05	11/06/04	11/06/04		
v5.4 SP1+HF15	01/10/05	01/10/05	01/13/05	01/12/04	10/11/05	01/12/04	05/06/05	01/04/05	10/12/05	01/06/05	08/28/05	01/14/05	01/12/05		
v5.4 SP1+HF16	01/10/05	01/10/05	01/13/05	01/12/04	10/11/05	01/12/04	05/06/05	01/04/05	10/12/05	01/06/05	08/28/05	01/14/05	01/12/05		
v5.4 SP1+HF17	01/10/05	01/10/05	01/13/05	01/12/04	10/11/05	01/12/04	05/06/05	01/04/05	10/12/05	01/06/05	08/28/05	01/14/05	01/12/05		
v5.4 SP1+HF18	01/10/05	01/10/05	01/13/05	01/12/04	10/11/05	01/12/04	05/06/05	01/04/05	10/12/05	01/06/05	08/28/05	01/14/05	01/12/05		
v5.4 SP1+HF19	01/10/05	01/10/05	01/13/05	01/12/04	10/11/05	01/12/04	05/06/05	01/04/05	10/12/05	01/06/05	08/28/05	01/14/05	01/12/05		
v5.4 SP1+HF20	01/10/05	01/10/05	01/13/05	01/12/04	10/11/05	01/12/04	05/06/05	01/04/05	10/12/05	01/06/05	08/28/05	01/14/05	01/12/05		
v5.4 SP1+HF21	01/16/05	01/16/05	01/16/05	01/16/05	10/11/05	01/16/05	05/06/05	01/16/05	10/12/05	01/16/05	08/28/05	01/16/05	01/16/05		
v5.4 SP1+HF22	03/16/05	02/14/05	02/15/05	02/14/05	10/11/05	02/15/05	05/06/05	02/11/05	10/12/05	02/14/05	08/28/05	02/14/05	02/15/05		
v5.4 SP1+HF23	03/16/05	03/12/05	03/16/05	03/16/05	10/11/05	03/23/05	05/06/05	03/12/05	10/12/05	03/12/05	08/28/05	03/29/05	03/29/05		
v5.4 SP1+HF24	05/24/05	05/18/05	04/25/05	04/25/05	10/11/05	05/24/05	05/06/05	05/23/05	10/12/05	05/23/05	08/28/05	05/24/05	05/24/05		
v5.4 SP1+HF25	05/24/05	05/18/05	05/06/05	05/24/05	10/11/05	05/24/05	05/06/05	05/23/05	10/12/05	05/23/05	08/28/05	05/24/05	05/24/05		
v5.4 SP1+HF26	05/24/05	05/18/05	05/06/05	05/24/05	10/11/05	05/24/05	05/06/05	05/23/05	10/12/05	05/23/05	08/28/05	05/24/05	05/24/05		
v5.4 SP1+HF27								06/29/05	10/12/05						causes problems, don't install
v5.4 SP1+HF28	09/02/05	09/02/05	09/02/05	09/02/05	10/11/05	09/02/05	09/02/05	08/10/05	10/12/05	08/02/05	08/28/05	09/06/05	09/06/05		
v5.4 SP1+HF29					10/11/05			10/06/05	10/12/05						

CARIS HIPS & SIPS v6.0

	FA_Process_1	FA_Process_2	FA_Process_3	FA_Process_4	FA_Process_5	FA_Process_6	FA_Process_7	FA_Process_8	FA_Process_8b	FA_Process_9	FA_Process_10	FA_CST	FA_FOO	FA_Mobile1	Comments
v6.0 full			10/04/05	10/04/05										1/17/2006	
v6.0 HF1			10/04/05	10/04/05											
v6.0 HF2			10/04/05	10/04/05											
v6.0 SP1			12/14/05											01/17/06	
SP1 HF1			12/14/05											01/17/06	
SP1 HF2			12/14/05											01/17/06	
SP1 HF3			12/14/05											01/17/06	
SP1 HF4			12/14/05											01/17/06	
SP1 HF5			01/11/06											01/17/06	
SP1 HF6			01/11/06											01/17/06	
SP1 HF7			01/17/06											01/17/06	

CARIS Utililties					
	LUv2.1.0	**CPCR v2.0**	**EasyENCv3.0**	**ConvUtilityv2.0.0.2**	**Comments**
FA_Process_1	05/05/04	06/14/04	11/05/04	2/9/2005	
FA_Process_2	08/02/04	08/02/04	10/07/04	2/14/2005	
FA_Process_3	05/05/04	08/02/04	10/07/04	2/9/2005	
FA_Process_4	08/02/04	08/02/04	10/08/04	2/9/2005	
FA_Process_5	10/11/05	10/11/05	10/11/05	10/11/05	
FA_Process_6	09/11/04	09/11/04	09/23/04	2/10/2005	
FA_Process_7	05/06/05	05/06/05	05/06/05	05/06/05	
FA_Process_8	08/02/04	08/02/04	10/08/04	2/9/2005	
FA_Process_8b	10/12/05	10/12/05	10/12/05	10/12/05	
FA_Process_9	08/02/04	08/02/04	09/23/04	2/9/2005	
FA_Process_10	08/28/05	08/28/05	08/28/05	08/28/05	
FA_CST	08/04/04	08/04/04	10/07/04	2/14/2005	
FA_FOO	08/13/04	08/11/04	10/07/04	2/15/2005	

CARIS GIS														
	FA_Process_1	FA_Process_2	FA_Process_3	FA_Process_4	FA_Process_5	FA_Process_6	FA_Process_7	FA_Process_8	FA_Process_8b	FA_Process_9	FA_Process_10	FA_CST	FA_FOO	Comments
v4.4a	05/05/04	08/02/04	05/05/04	08/02/04	10/11/05	09/11/04	05/06/05	08/02/04	10/12/05	08/02/04	08/28/05	08/04/04	08/13/04	
SP4	05/05/04	08/02/04	05/05/04	08/02/04		09/11/04	05/06/05	08/02/04		08/02/04		08/04/04	08/13/04	
SP4+HF1	06/14/04	08/02/04	05/05/04	08/02/04		09/11/04	05/06/05	08/02/04		08/02/04		08/04/04	08/13/04	
SP4+HF2	06/14/04	08/02/04	05/05/04	08/02/04		09/11/04	05/06/05	08/02/04		08/02/04		08/04/04	08/13/04	
SP4+HF3	06/14/04	08/02/04	05/05/04	08/02/04		09/11/04	05/06/05	08/02/04		08/02/04		08/04/04	08/13/04	
SP4+HF4	06/17/04	08/02/04	05/05/04	08/02/04		09/11/04	05/06/05	08/02/04		08/02/04		08/04/04	08/13/04	
SP4+HF5	06/17/04	08/02/04	08/03/04	08/02/04		09/11/04	05/06/05	08/02/04		08/02/04		08/04/04	08/13/04	
SP4+HF6	08/03/04	08/02/04	08/03/04	08/02/04		09/11/04	05/06/05	08/02/04		08/02/04		08/04/04	08/13/04	
SP4+HF7	08/03/04	08/02/04	08/03/04	08/02/04		09/11/04	05/06/05	08/02/04		08/02/04		08/04/04	08/13/04	
SP4+HF8	08/03/04	08/02/04	08/03/04	08/02/04		09/11/04	05/06/05	08/02/04		08/02/04		08/04/04	08/13/04	
SP4+HF9	08/26/04	08/26/04	08/26/04	08/26/04		09/11/04	05/06/05	08/26/04		08/26/04		08/26/04	08/26/04	
SP4+HF10	08/31/04	08/31/04	08/31/04	08/31/04		09/11/04	05/06/05	08/31/04		09/01/04		08/31/04	09/01/04	
SP4+HF11	11/05/04	11/05/04	11/04/04	11/06/04		11/06/04	05/06/05	11/06/04		11/06/04		11/06/04	11/06/04	
SP4+HF12	11/05/04	11/05/04	11/04/04	11/06/04		11/06/04	05/06/05	11/06/04		11/06/04		11/06/04	11/06/04	
SP4+HF13	11/05/04	11/05/04	11/04/04	11/06/04		11/06/04	05/06/05	11/06/04		11/06/04		11/06/04	11/06/04	
SP4+HF14	11/05/04	11/05/04	11/04/04	11/06/04		11/06/04	05/06/05	11/06/04		11/06/04		11/06/04	11/06/04	
SP4+HF15	11/05/04	11/05/04	11/04/04	11/06/04		11/06/04	05/06/05	11/06/04		11/06/04		11/06/04	11/06/04	
SP4+HF16	01/10/05	01/10/05	01/13/05	01/12/05		01/12/05	05/06/05	01/04/05		01/06/05		01/14/05	01/12/05	
SP4+HF17	01/10/05	01/10/05	01/13/05	01/12/05		01/12/05	05/06/05	01/04/05		01/06/05		01/14/05	01/12/05	
SP4+HF18	01/10/05	01/10/05	01/13/05	01/12/05		01/12/05	05/06/05	01/04/05		01/06/05		01/14/05	01/12/05	
SP4+HF19	01/10/05	01/10/05	01/13/05	01/12/05		01/12/05	05/06/05	01/04/05		01/06/05		01/14/05	01/12/05	
SP4+HF20	01/10/05	01/10/05	01/13/05	01/12/05		01/12/05	05/06/05	01/04/05		01/06/05		01/14/05	01/12/05	
SP4+HF21	01/10/05	01/10/05	01/13/05	01/12/05		01/12/05	05/06/05	01/04/05		01/06/05		01/14/05	01/12/05	
SP4+HF22	2/9/2005	2/14/2005	02/09/05	02/09/05		2/9/2005	05/06/05	02/09/05		02/09/05		02/01/05	02/15/05	
SP4+HF23	2/9/2005	2/14/2005	02/09/05	02/09/05		2/9/2005	05/06/05	02/09/05		02/09/05		02/01/05	02/15/05	
SP4+HF24	2/9/2005	2/14/2005	02/09/05	02/09/05		2/9/2005	05/06/05	02/09/05		02/09/05		02/01/05	02/15/05	
SP4+HF25	2/9/2005	2/14/2005	02/09/05	02/09/05		2/9/2005	05/06/05	02/09/05		02/09/05		2/14/2005	02/15/05	
SP4+HF26	2/9/2005	2/14/2005	02/09/05	02/09/05		2/9/2005	05/06/05	02/09/05		02/09/05		2/14/2005	02/15/05	
SP4+HF27	2/9/2005	2/14/2005	02/09/05	02/09/05		2/9/2005	05/06/05	02/09/05		02/09/05		2/14/2005	02/15/05	
SP4+HF28	2/9/2005	2/14/2005	02/09/05	02/09/05		2/9/2005	05/06/05	02/09/05		02/09/05		2/14/2005	02/15/05	
SP4+HF29	2/9/2005	2/14/2005	02/09/05	02/09/05		2/9/2005	05/06/05	02/10/05		02/09/05		2/14/2005	02/15/05	
SP4+HF30	03/16/05	05/18/05	03/16/05	03/16/05		03/23/05	05/06/05	03/16/05		03/16/05		03/29/05	03/29/05	
SP4+HF31	05/24/05	05/18/05	04/25/05	04/25/05		05/24/05	05/06/05	05/23/05		05/23/05		05/24/05	05/24/05	
SP4+HF32	05/24/05	05/18/05	04/25/05	04/25/05		05/24/05	05/06/05	05/23/05		05/23/05		05/24/05	05/24/05	
SP4+HF33	05/24/05	05/18/05	05/06/05	05/24/05		05/24/05	05/06/05	05/23/05		05/23/05		05/24/05	05/24/05	
SP5					10/11/05				10/12/05	08/02/05	08/28/05			
SP5+HF1					10/11/05				10/12/05	08/02/05	08/28/05			
SP5+HF2					10/11/05				10/12/05	08/02/05	08/28/05			
SP5+HF3					10/11/05				10/12/05	08/02/05	08/28/05			

CARIS NOTEBOOK															
	FA_Process_1	FA_Process_2	FA_Process_3	FA_Process_4	FA_Process_5	FA_Process_6	FA_Process_7	FA_Process_8	FA_Process_8b	FA_Process_9	FA_Process_10	FA_CST	FA_FOO	FA_Mobile1	Comments
v2.1	05/14/04	08/06/04	08/09/04	08/06/04		09/11/04	05/06/05	08/02/04		08/06/04		08/06/04	08/13/04		
SP1	06/23/04	08/06/04	08/09/04	08/06/04		09/11/04	05/06/05	08/02/04		08/06/04		08/06/04	08/13/04		
SP1+HF1	08/06/04	08/06/04	08/09/04	08/06/04		09/11/04	05/06/05	08/06/04		08/06/04		08/06/04	08/13/04		
v2.2BETA	2/9/2005	02/14/05	2/9/2005	2/14/2005		01/31/05	05/06/05	2/9/2005		2/9/2005		02/01/05	02/15/05		
v2.2BETA2	03/25/05											03/25/05			
v2.2	07/11/05	07/12/05	07/12/05	07/12/05	10/11/05	07/11/05	07/12/05	07/12/05	10/12/05	07/12/05	08/28/05	07/11/05	07/12/05	01/17/06	
v2.2+HF1	09/02/05	09/02/05	09/02/05	09/02/05	10/11/05	09/02/05	09/02/05	09/02/05	10/12/05	09/02/05	08/28/05	08/01/05	09/06/05		
SP1	01/18/06	01/20/06	01/18/06	01/20/06	01/18/06	01/20/06		01/20/06		01/20/06	01/18/06		01/20/06	01/17/06	
SP1+HF1	01/18/06	01/20/06	01/18/06	01/20/06	01/18/06	01/20/06		01/20/06		01/20/06	01/18/06		01/20/06	01/17/06	

PYDRO

	FA_Process_1	FA_Process_2	FA_Process_3	FA_Process_4	FA_Process_5	FA_Process_6	FA_Process_7	FA_Process_8	FA_Process_9
MAC	**00-0B-DB-5A-62-2B**	**00-11-11-0F-84-44**	**00-11-11-06-9D-42**	**00-01-02-69-5A-45**	**00-0A-5E-42-0B-34**	**00-0B-DB-56-68-2B**		**00-11-11-06-A1-B5**	**00-0B-DB-56-68-30**
v4.5.1	06/14/04								
v4.6.1	08/03/04	08/05/04	08/05/04	08/05/04				08/05/04	08/05/04
v4.6.1patches	08/03/04	08/05/04	08/05/04	08/05/04				08/05/04	08/05/04
v4.7.1	08/05/04	08/05/04	08/05/04	08/05/04				08/05/04	08/05/04
v4.8.2	08/26/04	08/26/04	08/25/04	08/26/04				08/26/04	08/26/04
v4.8.3	08/31/04	08/31/04	08/31/04	08/31/04				08/31/04	09/01/04
v4.9.0	09/12/04	09/12/04	09/12/04	09/12/04		09/12/04		09/12/04	n/a
v4.9.1	09/30/04	10/04/04	10/04/04	10/08/04		10/07/04		10/5/2004	10/07/04
v4.9.1a	10/04/04	10/04/04	10/04/04	10/08/04		10/07/04		10/05/04	10/07/04
v4.9.3	11/27/04	11/27/04	11/19/04	11/27/04		11/27/04		11/27/04	11/27/04
v5.2.0	02/24/05	n/a	02/24/05	02/24/05		02/24/05		n/a	02/24/05
v5.2.1	n/a	n/a	n/a	n/a		02/28/05		02/28/05	n/a
v5.3.0	03/12/05	03/12/05	03/12/05	03/12/05		03/11/05		03/12/05	03/12/05
v5.3.1	3/16/2005	3/16/2005	3/16/2005	3/16/2005		03/29/05		03/16/05	03/16/05
v5.3.2	05/24/05	05/18/05	05/06/05	05/06/05		05/06/05	05/18/05	05/06/05	03/23/05
v5.3.3rc3	06/29/05	06/29/05	07/10/05	06/29/05		06/15/05	06/29/05	06/29/05	06/29/05
v5.3.3rc3HF1	07/21/05	07/21/05	07/21/05	07/21/05		07/22/05	07/22/05	07/21/05	07/21/05
v5.8.0	10/06/05	10/04/05	10/05/05	10/04/05	10/13/05	10/03/05	10/06/05	10/03/05	10/03/05
v5.9.1	10/06/05	10/04/05	10/05/05	10/04/05	10/13/05	10/03/05	10/06/05	10/03/05	10/03/05

	FA_Process_10	FA_CST	FA_FOO	Comments
MAC	**00-0B-DB-5A-D1-21**	**00-11-11-06-A4-68**	**00-0B-DB-56-68-8C**	
v4.5.1				
v4.6.1		08/06/04	08/13/04	
v4.6.1patches		08/06/04	08/13/04	
v4.7.1		08/06/04	08/13/04	
v4.8.2		08/26/04	08/26/04	
v4.8.3		08/31/04	09/01/04	
v4.9.0		09/12/04		
v4.9.1		10/07/04	10/07/04	
v4.9.1a		10/07/04	10/07/04	You can import GP's w/ this version
v4.9.3		11/27/04	11/27/04	
v5.2.0		02/24/05	02/24/05	
v5.2.1		02/28/05	n/a	
v5.3.0		03/12/05	03/12/05	
v5.3.1		03/29/05	03/29/05	
v5.3.2		05/24/05	05/06/05	
v5.3.3rc3	08/30/05	06/15/05	06/29/05	
v5.3.3rc3HF1	08/30/05	07/22/05	07/28/05	Fixes Windows permissions issue
v5.8.0	10/12/05		10/03/05	
v5.9.1	10/12/05		10/05/05	patch update

Velocwin					
	OLAB	**1010_NAV**	**1018_NAV**	**Fa-Process 1**	**Comments**
v8.5.2	07/31/04	8/10/2004	8/12/2004		
v8.6.0	n/a	n/a	n/a		doesn't really apply directly to us
		1010_ACQ	**1010_ACQ**		
v8.7.2	2/9/2005	2/11/2005	2/28/2005		
v8.7.3					
v8.7.5				4/5/2005	
v8.7.6				5/6/2005	For mvp .bot file processing
v8.7.7				10/6/2005	

Fledermaus														
	FA_Process_1	FA_Process_2	FA_Process_3	FA_Process_4	FA_Process_5	FA_Process_6	FA_Process_7	FA_Process_8	FA_Process_8b	FA_Process_9	FA_Process_10	FA_FOO	FA_CST	Comments
v6.1.0			07/28/04					07/28/04						
V6.1.1			08/03/04					08/03/04				08/13/04		
v6.1.2c			10/05/04					10/07/04				10/07/04		
v6.1.3			01/10/05					01/04/05				01/12/05		2 roving keys
v6.1.3i			03/07/05									03/29/05		What does this do? We don't know.
v6.1.4a			04/18/05											
v6.1.4d	8/15/2005	08/13/05	08/13/05	08/15/05		08/13/05	08/13/05	08/13/05		08/13/05				1 local key on Proc 3 and 1 Network key on FADC1
v6.1.5			d.u.		10/11/05				10/12/05					

MapInfo										
	FA_Process_1	**FA_Process_2**	**FA_CST**	**FA_Process_3**	**FA_FOO**	**FA_Process_6**	**FA_Process_7**	**FA_Process_8**	**FA_Process_8b**	**Comments**
v7.5 (4)	06/15/04		08/04/04	07/30/04	09/01/04	10/07/04				Removed from FA_Process_1, FA_Process_6
v7.8			05/24/05	05/06/05	05/24/05		05/18/05			Upgrade
v8.0		10/12/05	10/20/05	10/05/05	10/05/05	10/11/05	10/06/05	10/4/2005	10/12/2005	New (3) and Upgrade (4)

S220 Hardware						
Unit	**S/N**	**Software/Firmware Version**	**Date of Installation**	**Service**	**Calibration**	**Comment**
POS/MV PCS	846	2.16	Apr-04			
POS/MV IMU	292	N/A	Apr-04			
POS/MV Port Ant.	SGN 98490013	N/A	Apr-04			
POS/MV Stbd Ant.	CGN 96200099	N/A	Apr-04			
DGPS Receiver	0426-16627-0001	N/A	7/2004			
DGPS Ant.		N/A	Apr-04			
Reson 81-P Processor (8111)	35652	N/A	May-04			
Reson 81-P Processor (8160)	35385	N/A	May-04			
Reson 8111 Transducer		Dry:8111-E209-6114 Wet: 8111-E101-AFAA	Apr-04			
Reson 8160 Transducer		Dry:8160-2.09-7C6D Wet:8160-1.00-E9E1	Apr-04			

1010 Hardware Serial Numbers						
Unit	**S/N**	**Software/Firmware Version**	**Date of Installation**	**Service**	**Calibration**	**Comment**
POS/MV PCS	788	2.16	Jul-04			
POS/MV IMU	294	N/A	Jul-04			
POS/MV Port Ant.	SGN 00160051	N/A	Jul-04			
POS/MV Stbd Ant.	SGN 00120116	N/A	Jul-04			
DGPS Receiver	0331-12579-0008	N/A	Jul-04			
DGPS Ant.		N/A	Jul-04			
Reson 81-P Processor	34497	N/A	Jul-04			
Reson 8101 Transducer	2701011	Dry: Wet:	Jul-04			removed 10/6/04 for repair, removed 10/1/05 for welding

1018 Hardware Serial Numbers						
Unit	**S/N**	**Software/Firmware Version**	**Date of Installation**	**Service**	**Calibration**	**Comment**
POS/MV PCS	786	2.16	Jul-04			
POS/MV IMU	323	N/A	Jul-04			
POS/MV Port Ant.	SGN 99330009	N/A	Jul-04			
POS/MV Stbd Ant.	SGN 98370085	N/A	Jul-04			
DGPS Receiver	0328-12352-0001	N/A	Jul-04			
DGPS Ant.		N/A	Jul-04			
Reson 81-P Processor	35737	N/A	Jul-04			
Reson 8101 Transducer	3102026	Dry: Wet:	Jul-04			

Trimble Backpack 1 Hardware Serial Numbers						
Unit	S/N	Software/Firmware Version	Date of Installation	Service	Calibration	Comment
Pro XRS	0224078543					
Antenna	0220341062					

Trimble Backpack 2 Hardware Serial Numbers						
Unit	S/N	Software/Firmware Version	Date of Installation	Service	Calibration	Comment
Pro XRS	0224090101					
Antenna	0220321059					

TSCe handheld data collector	P/N45268-50					Field Laptop/Tougbooks can be used instead of the TSCe handheld data collector

Addl Parts	P/N
Antenna cable	22628
Camcorder Batteries	17466
NMEA/RTCM cable	30232-00
data/power cable	30231-00
dual battery cable	24333
GPS Pathfinder field device cable	45052

Levels						
Unit	**S/N**	**Software/Firmware Version**	**Date of Installation**	**Service**	**Calibration**	**Comment**
Carl Zeiss NI2 333	100056		calibrated 03/2004			
Carl Zeiss NI2 333	103567					
Leica NA2 100	5332739					
Leica NA2 100	5332747					

HORIZONTAL CONTROL						
Unit	**S/N**	**Software/Firmware Version**	**Date of Installation**	**Service**	**Calibration**	**Comment**
Ashtech Z-Xtreme Receiver	ZE1200339016	ZE00			3/7/2005	
Ashtech Geodetic 4 GPS Antenna	8365				3/7/2005	
Pacfic Crest Position Data Link High Powered Base Unit					3/7/2005	
Pacfic Crest Position Data Link Rover					3/7/2005	
Marine Deep Cycle Battery					3/7/2005	
Solar Panel					3/7/2005	

SEACATs						
Unit	**S/N**	**Software/Firmware Version**	**Date of Installation**	**Service**	**Calibration**	**Comment**
SBE 19plus SEACAT Profiler	19P36026-4585	on S220		n/a		based on use, not returned for cal in '05
SBE 19plus SEACAT Profiler	19P36026-4617			n/a		based on use, not returned for cal in '05
SBE 19plus SEACAT Profiler	19P36026-4616			n/a		based on use, not returned for cal in '05

SBE 45 Micro Thermosalinograph (TSG)						

OFFICERS							
Name	**CDR John E. Lowell**	**LDCR Van Den Ameele**	**LT(jg) Abigail Higgins**	**ENS Mike Gonsalves**	**ENS Jon French**	**ENS Wendy Lewis**	**ENS Allison Martin**
Rate	CO	XO	FOO	NAV	ENS	ENS	ENS
Sevice on Fairweather	1 years 9 months		1 years 6 months	1 years 0 months	1 years 0 months	0 years 5 months	0 years 5 months
Hydrographic Experience	21 years 8 months		1 years 11 months	1 years 0 months	1 years 0 months	0 years 5 months	0 years 5 months
Fast Rescue Boat	July 2004		July 2004	Nov 2004	Nov 2004	May 2005	May 2005
Basic Hydro			2004	2005	2005		
Hydro presenter							
SWMB Course			2005				
CARIS HIPS							
RESON Training			Oct 2004				
COOPS Tide							
Launch PIC Qualified							
Survey PIC Qualified							
Launch Cox'n Qualified							
OOD Qualified							
Other Education, Training, and Qualifications						STCW Advanced Fire	STCW Advanced Fire

	Authorized	**Actual**	**Percentage**
Mission	6	5	83%
Support	2	2	100%

ENGINEERING						
Name	**William Ness**	**Kim Parker**	**Marcus Humphreys**	**Vincent Nguyen**	**Gregory Bryant**	**Dale Graham**
Rate	CME	1AE	2AE	3AE	W	Junior Engineer
Service on Fairweather	1 years 9 months	0 years 4 months	0 years 3 months	0 years 2 months	0 years 7 months	0 years 3 months
Engineering Experience	11 years 6 months	35 years 10 months	5 years 10 months	2 years 4 months	0 years 7 months	23 years 1 months
Fast Rescue Boat						
Basic Hydro						
Launch Cox'n Qual.						
Other Education, Training, and Qualifications		Chief Engineer-Diesel License	Third Engineer License			Air condition /refrigeration universal (EPA) Navy Training

SURVEY						
Name	**Lynnette Morgan**	**Jessica Abrams**	**Grant Froelich**	**Jennifer Keene**	**Verena Kellner**	**Michael Castle**
Rate	CST	SST	SST	ST	ST	AST
Sevice on Fairweather	1 years 8 months	1 years 5 months	1 years 5 months	1 years 1 months	1 years 3 months	1 years 2 months
Hydrographic Experience	5 years 10 months	3 years 9 months	3 years 3 months	1 years 8 months	1 years 3 months	1 years 2 months
Fast Rescue Boat	July 2004	July 2004	July 2004	Jan 2005		Jan 2005
Basic Hydro	2000 & 2001	2002	2003	2004	2005	2005
Hydro presenter	2003-present					
SWMB Course	Dec 2001	2004	Jan 2005	Jan 2005		
CARIS HIPS	2001-2005	Jan 2005	Jan 2005	Jan 2005	March 2005	Jan 2005
RESON Training	Oct 2004	Oct 2004	Oct 2004	Oct 2004	Oct 2004	Oct 2004
COOPS Tide	2001	March 2005	December 2003	March 2005	March 2005	March 2005
Launch PIC Qualified	2001	2004	2004	2004	2005	2005
Survey PIC Qualified	2001	2004	2004	2005	2005	2005
Launch Cox'n Qualified						
Other Education, Training, and Qualifications						

	Authorized	**Actual**	**Percentage**
Mission	6	6	100%
Support			

DECK							
Name	**Garry Guice**	**Eric Heiner**	**Ronald Walker**	**John Lawless**	**Leroy Jordan**	**David Grayeagle**	**Jim Klapchuck**
Rate	CB	BGL	DU	AB	BGL	GVA	GVA
Sevice on Fairweather	1 years 7 months	1 years 8 months	1 years 5 months	1 years 2 months		1 years 9 months	0 years 8 months
Deck Experience	23 years 7 months	12 years 7 months	21 years 5 months	20 years 10 months		1 years 9 months	0 years 8 months
Fast Rescue Boat	July 2004	July 2004	July 2004			Jan 2005	
Basic Hydro		2001					
Launch Cox'n Qual.		2000	2005	2005		2005	
Other Education, Training, and Qualifications		Inland masters license- AB unlimited	STCW 95, Survival Craft, AB Unlimited				

	Authorized	**Actual**	**Percentage**
Mission	4	3	75%
Support	6	4	67%

STEWARDS			
Name	**Kathy Brandts**	**Joe**	**Edgar**
Rate	CS	CC	2C
Sevice on Fairweather	1 years 6 months	0 years 4 months	0 years 4 months
Stewards Experience	9 years 7 months	6 years 10 months	2 years 10 months
Fast Rescue Boat			
Basic Hydro			
Launch Cox'n Qual.			
Other Education, Training, and Qualifications			

	Authorized	**Actual**	**Percentage**
Mission			
Support	3	3	100%

ETs		
Name	**Jim Lynn**	**Richard Conway**
Rate	LET	ET
Sevice on Fairweather	1 years 5 months	1 years 5 months
ET Experience	19 years 5 months	1 years 8 months
Fast Rescue Boat		
Basic Hydro		
Launch Cox'n Qual.		
Other Education, Training,		

	Authorized	**Actual**	**Percentage**
Mission			
Support	1	1	100%

NOAA DIVERs								
Name	**John E. Lowell**	**E.J. Van Den Ameele**	**Eric Heiner**	**William Ness**	**Grant Froelich**	**Lynnette Morgan**	**Jon French**	**Allison Martin**
Rate	CO	XO	BGL	CME	SST	CST	ENS	ENS
Type	Master Diver	Dive Master	Dive Master, DMT	Working Diver	Dive Master, DMT	Working Diver	Working Diver	Working Diver
Total Diving Experience	30 years 10 months		6 years 10 months	10 years 6 months	14 years 2 months	4 years 2 months	10 years 3 months	10 years 8 months
Years as NOAA diver	21 years 8 months		6 years 10 months	10 years 6 months	2 years 10 months	4 years 2 months	0 years 2 months	0 years 2 months

NOAA SHIP FAIRWEATHER (S220)
RESON 8111ER VESSEL REPORT 2005

Background

NOAA Ship FAIRWEATHER, Hull Registration Number S220, is a 231 foot hydrographic survey vessel built by Aerojet-General Shipyards in Jacksonville Florida. In 2004, the ship underwent a reactivation and modernization program including hull, mechanical, electrical and mission upgrades. The ship underwent conversion to meet American Bureau of Shipping (ABS) Subchapter L classification. Included in this upgrade, an integrated Reson 8111ER multibeam echo sounder (MBES) installed 39.5" starboard of centerline at approximately frame 29. The installation was designed by Seaworthy Systems Inc.

Tests were performed to determine the residual biases of the sensors and sonar system alignment. Data were assessed in CARIS HIPS & SIPS v5.4 (SP 1, Hot Fixes 1-23) calibration mode and applied to the HIPS Vessel File (HVF), S220_8111.HVF.

Patch Test

Patch tests were performed with NOAA Ship FAIRWEATHER in Eastern Passage, AK on April 7 and 8, 2005 (DN 097 and 103). The patch test data were collected by SST Froelich (DN 097) and AST Kellner and ECO Rheinheimer (DN 103).

Raw ISIS XTF data was converted to CARIS HDCS format. True heave, sound velocity, and predicted tides were applied upon conversion and the lines were "lightly" cleaned in CARIS swath mode to remove major data fliers. The patch test data were then reviewed in CARIS calibration mode independently by SST Froelich, CST Morgan, LT Wetzler and ECO Rheinheimer and other survey personnel to determine the biases.

Navigation Time Error

A Navigation Time Error test has not yet been performed.

A Time Error of -0.01 was inserted into the S220_8111.HVF under Swath 1. This value is justified since the Navigation Time Error is physically the time difference between the time stamps that the POS/MV and the Reson 81-P Sonar Processor place with their data. Given that the configuration of the POS/MV and the Reson 81-P Sonar Processor have not changed since last year, the Navigation Time Error should not have changed. Secondly, the Navigation Time Error for both launches, using an identical configuration, are both 0.01.

As a data quality analysis check a time latency test will be conducted at the earliest possible opportunity.

Heading and Pitch

The heading and pitch bias patch tests were conducted in Eastern Passage over a pinnacle with a radius of 45 m, in an area with an average depth of 90 m and a least depth of 76 m. The rock is located at 56°26'00"N, 132°12'45"W (See *Figure 1*). On DN 097 one set of heading and pitch lines oriented East-West was run. On DN 103 two sets of heading and pitch lines were run, one oriented East-West and the other North-South, as shown in *Figure 1*.

Heading

The heading bias was determined by acquiring data on one or two sets of parallel lines run in opposite directions. On DN 097, the pair of lines were offset from the rock 175 m and 185 m, respectively. Vessel speed was 5 knots. On DN 103 the East-West heading lines were offset 180 m on either side of the rock. The east and west North-South lines on DN 103 were offset 170 m and 150 m, respectively, from the rock.

Pitch

The procedure used to determine the pitch bias was to run one or two pair of coincident lines over the rock at the same speed in different directions. The lines were run at approximately 6 knots. The only difference between DN 097 and 103 was the addition of pitch lines run in the North-South direction.

Roll

The procedures for acquiring roll biases included running one pair of coincident lines over a locally flat area with an approximate depth of 110 m at approximately 6 knots (see *Figure 1*). Data was acquired for four lines on each of DN 097 and 103.

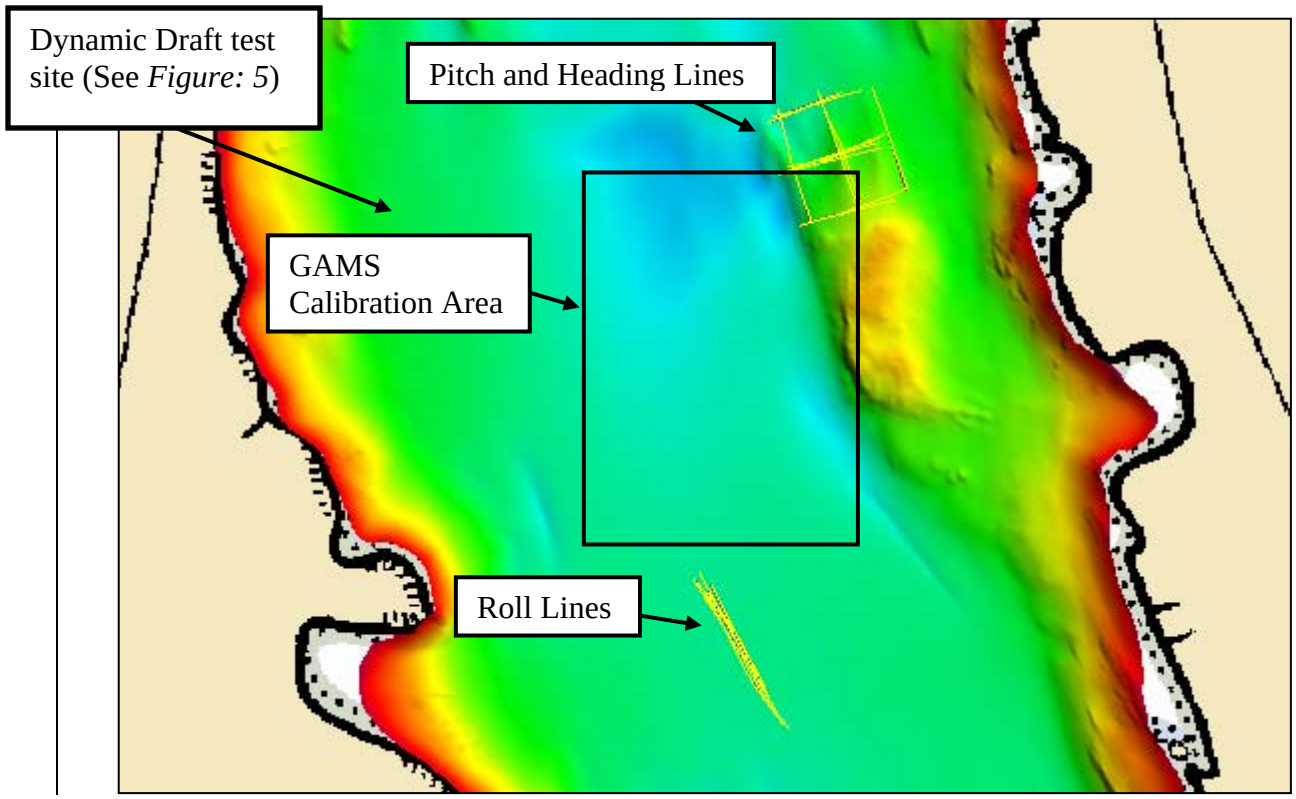


Figure 1. Location of Pitch, Heading, and Roll Lines and GAMS Calibration.

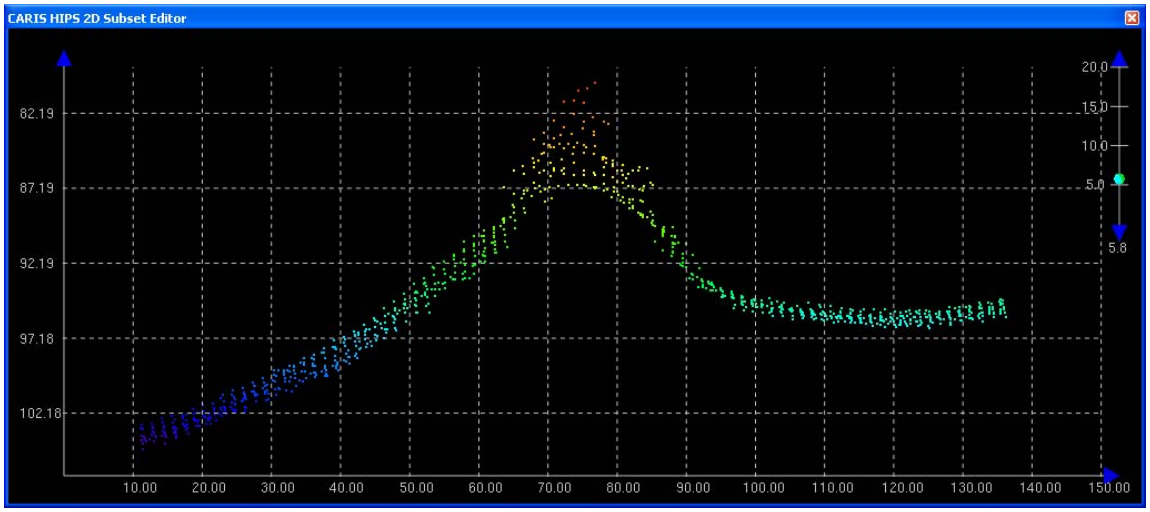


Figure 2. Pinnacle used for Pitch and Heading Patch Tests.

Patch Test Results

The results of the patch tests for each of DN 097 and 103 are given in *Table 1*, below.

Patch Bias	DN 097 Biases	DN 103 Biases	HVF Bias Values
Time Error	N/A	N/A	-0.01
Pitch	-0.35°	-0.1	-0.1
Roll	0.0°	0.01	0.01
Heading	-0.25°	-0.37	-0.35

Table 1: S220 Patch Test Bias Values

Dynamic Draft Settlement and Squat Method (DDSSM)

The DDSSM test was conducted April 14, 2005 (DN 104) in Zimovia Strait near Wrangell, AK. Lines were run at location 56°25'54"N, 132°25'40"W in approximately 25 m of water (see *Figure 3*). The dynamic draft data were collected by AST Kellner and ECO Rheinheimer.

One line was run ten (10) times in the same direction at speeds ranging from 3.5 to 13.3 knots. At three points along the line, data were collected with the engine in idle (dead in water or DIW, see *Figure 3*).

SVP and predicted tides (single station) were applied in CARIS HIPS and lines were "lightly" cleaned in CARIS swath mode to remove major data fliers and filtered to 40° from nadir to remove outer beams. The data were then processed by LT Wetzler using DDSSM as documented in the Draft Field Procedures Manual (January 2005). DDSSM results were saved to S220_DDSSM Settlement and Squat.xls located in Appendix III-S220-4.

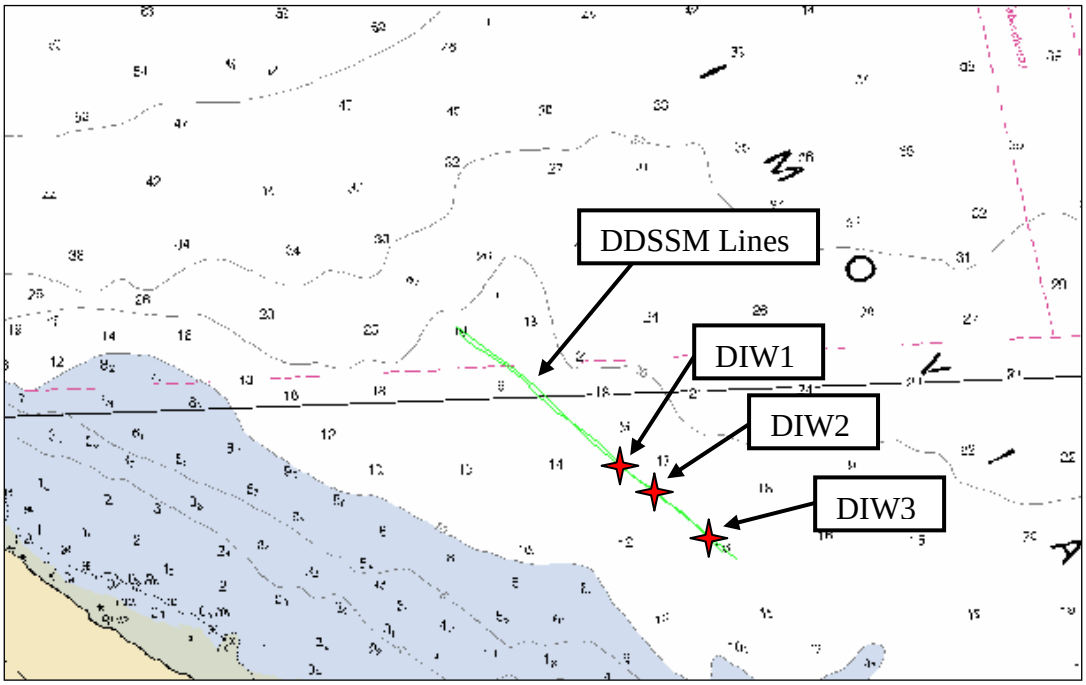


Figure 3. Dynamic Draft test site for S220.

Results of the DDSSM test have not been calculated at this time. FAIRWEATHER personnel are waiting to process the test until observed tides and possibly a zone definition file can be downloaded.

POS/MV GAMS Calibration

POS/MV GPS Azimuth Measurement Subsystem (GAMS) calibration occurred on April 7 (DN 097) near Eastern Passage (see *Figure 1*). GAMS calibration was performed by SST Froelich.

The GAMS heading calibration threshold was initially set to 0.300°. FAIRWEATHER was maneuvered in figure-eights to lower the heading accuracy as much as possible. The best heading accuracy value achieved during this process was 0.721°. The vessel steadied up on a constant heading and GAMS calibration was requested. When the calibration was complete, the POS/MV settings were saved to the file S220_040705_posmv.nvm and are listed below in *Table 2*.

The detailed POS/MV Calibration Report, S220_POS_Calibration_Dn087.xls, is located in Appendix III.

Component	DN 097 Value
Number of Satellites	9
PDOP	2.024
Baseline Vector X	-0.031 m
Baseline Vector Y	4.067 m
Baseline Vector Z	0.026 m
Two Antenna Separation	4.067 m
Heading Correction	0.000 °

Table 2: POS/MV GAMS Calibration Results

Recommendations

The patch test calibration results are based on averages from DN 097 and DN 103. The HVF values listed in table 1 should be used until such a time or event warrants a new calibration.

The POS/MV GAMS calibration results from April 7 (DN 097) should be used until such a time or event warrants a new calibration.

Dynamic Draft Settlement and Squat results will be calculated and utilized at the earliest opportunity.

ADDENDUM 1
NOAA SHIP FAIRWEATHER (S220)
RESON 8111ER VESSEL REPORT 2005

Background

The Dynamic Draft and Settlement and Squat Method DDSSM test was conducted April 14, 2005 (DN 104) in Zimovia Strait near Wrangell, AK. However, the test was not processed immediately, pending availability of Verified Tides.

This Addendum 1 of the NOAA Ship FAIRWEATHER Reson 8111ER Vessel Report 2005 documents the results of the DDSSM test and provides a recommendation regarding their use.

Dynamic Draft Settlement and Squat Method (DDSSM)

One line was run ten (10) times in the same direction at speeds ranging from 3.5 to 13.3 knots. At three points along the line, data were collected with the engine in idle (dead in water or DIW, see *Figure 3* in the initial report).

Sound velocity information and verified tides from the primary National Water Level NLOWN tide gauge 945-0460 were applied in CARIS HIPS and lines were “lightly” cleaned in CARIS swath mode to remove major data fliers and filtered to 40° from nadir to remove outer beams. The data were then processed by LT Wetzler using DDSSM as documented in the Draft Field Procedures Manual (January 2005), with the exception of the idle positions. DDSSM results were saved to the spreadsheet S220_DDSSM_Results.xls and are attached.

Upon processing the data it was determined that the idle positions were unusable. Due to a strong set the nadir beams of the idle positions were 10’s of meters off from the nadir beams of the speed lines. The settlement and squat value of the 0 knot run was extrapolated, and found to be 4.7 cm, by using the slope of the 3.5 knot and 5.5 knot runs. The settlement and squat value for the 0 knot run was then set to 0 cm and the remaining settlement and squat values were reduced by 4.7 cm.

Since the 3 idle positions were not usable six locations in the last 500 m of the line were examined. The use of more locations allowed a better determination of the standard deviation within the results. An average standard deviation of 0.043 m was determined. From the RESON 8111ER documentation the range resolution of the system is 0.037 m. These values show good agreement.

The average change in depth from dead in water for each speed is shown below in *Table 3*.

Speed (kts)	Average Delta Draft (m)
0	0
3.5	-0.047
5.5	-0.074
7.5	-0.074
8.1	-0.026
9.5	-0.015
11.3	0.021
13.2	0.162

Table 3: DDSSM Test Results

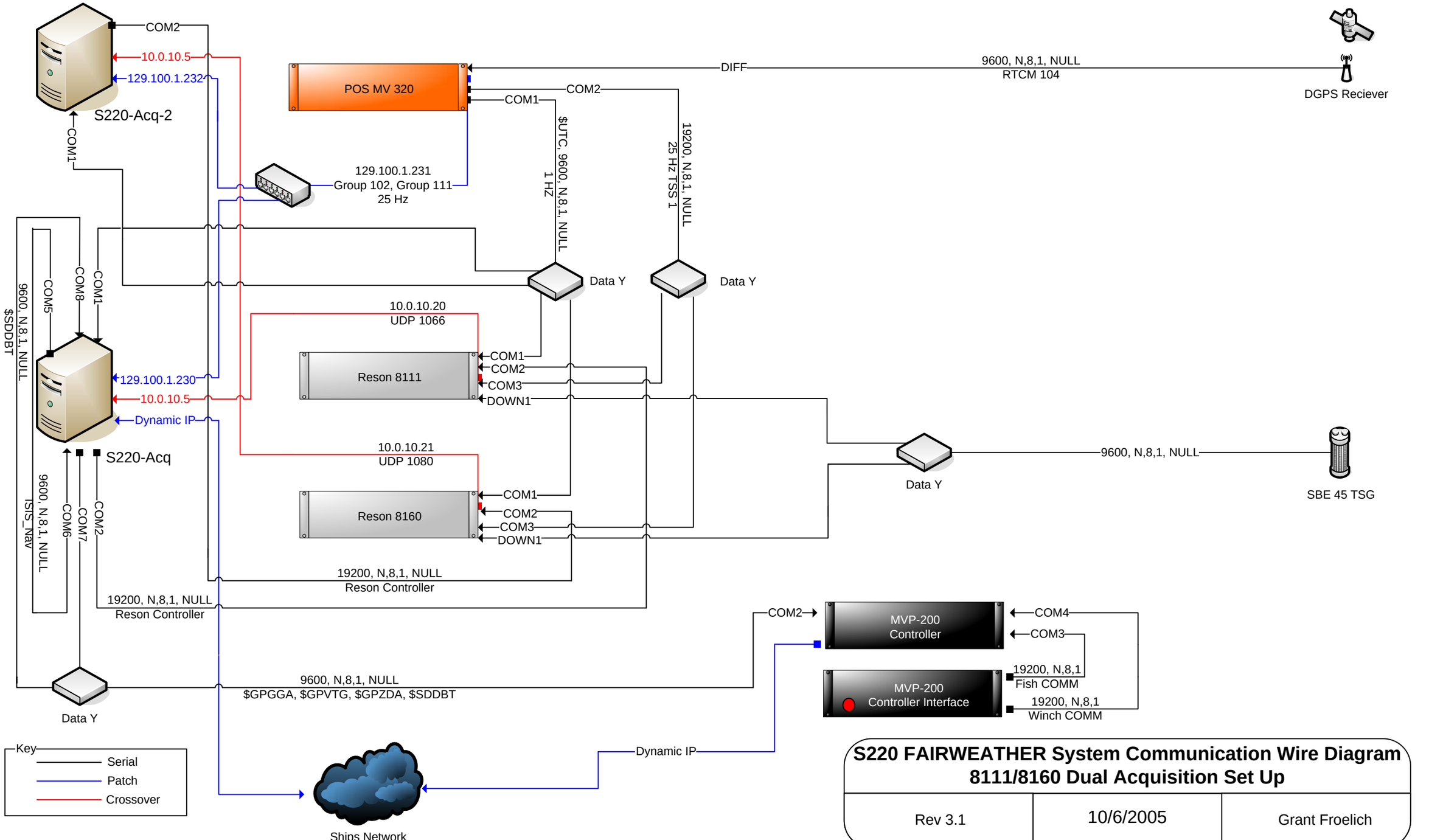
Recommendations

The DDSSM results obtained from April 14 (DN 104) and included in Table 3 should be used until such a time or event warrants a new calibration. These values can be used for both the RESON 8111ER and the RESON 8160.

The patch test calibration results are based on averages from DN 097 and DN 103. The HVF values listed in table 1 should be used until such a time or event warrants a new calibration.

The POS/MV GAMS calibration results from April 7 (DN 097) should be used until such a time or event warrants a new calibration.

A Navigation Time Error latency test should be conducted at the earliest opportunity.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COM2
10.0.10.5
129.100.1.232
COM1
POS MV 320
DIFF
9600, N,8,1, NULL
RTCM 104
DGPS Reciever
COM2
COM1
$UTC, 9600, N,8,1, NULL
1 HZ
19200, N,8,1, NULL
25 Hz TSS 1
129.100.1.231
Group 102, Group 111
25 Hz
Data Y
Data Y
9600, N,8,1, NULL
$SDDBT
COM5
COM8
COM1
10.0.10.20
UDP 1066
Reson 8111
COM1
COM2
COM3
DOWN1
129.100.1.230
10.0.10.5
Dynamic IP
S220-Acq
10.0.10.21
UDP 1080
Data Y
9600, N,8,1, NULL
SBE 45 TSG
Reson 8160
COM1
COM2
COM3
DOWN1
9600, N,8,1, NULL
ISIS_Nav
COM6
COM7
COM2
19200, N,8,1, NULL
Reson Controller
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Reson Controller
COM2
MVP-200
Controller
COM4
COM3
19200, N,8,1
Fish COMM
MVP-200
Controller Interface
19200, N,8,1
Winch COMM
9600, N,8,1, NULL
$GPGGA, $GPVTG, $GPZDA, $SDDBT
Data Y
Key
Serial
Patch
Crossover
Ships Network
Dynamic IP
S220 FAIRWEATHER System Communication Wire Diagram
8111/8160 Dual Acquisition Set Up
Rev 3.1
10/6/2005
Grant Froelich

NOAA POS/MV Calibration Report

Ship: Fairweather **Vessel:** 1018

Date: 10/21/2005 **Dn:** 294

Personnel: Abrams, Martin, Walker

PCS Serial # 786 **IMU Serial #** 323

IP Address: 129.100.1.231

POS controller Version (Use Menu Help > About) 2.1

POS Version (Use Menu View > Statistics) 2.16

GPS Receivers

Primary Receiver: OEM-2 3151R SGN99330009 HW 1 SW 3.36/1.02 Mar 18/99

Secondary Receiver: OEM-2 3151R SGN98370085 HW 1 SW 3.36/1.02 Mar 18/99

Calibration area

Location: Duck Point, Bradfield Canal, AK

Approximate Position:

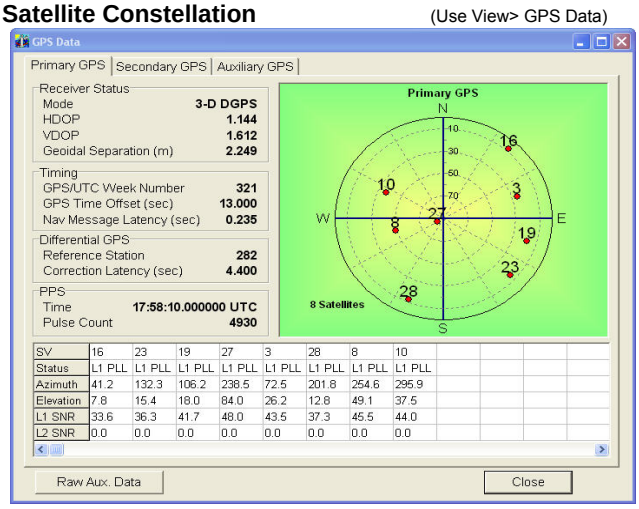
Lat	56	11	30.84
Lon	131	34	39.25

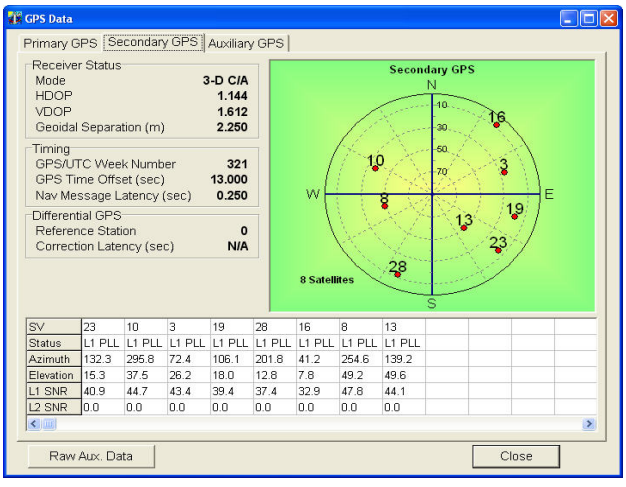
DGPS Beacon Station: Gustavus, AK

Frequency: 288 kHz

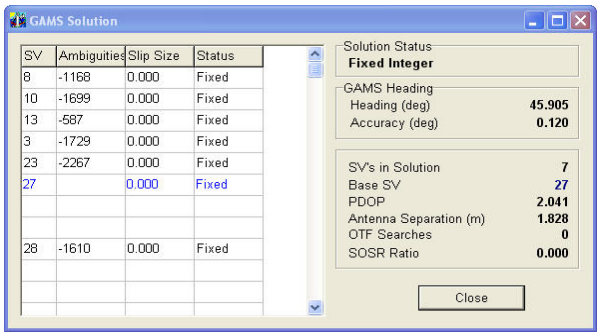
Satellite Constellation

(Use View> GPS Data)



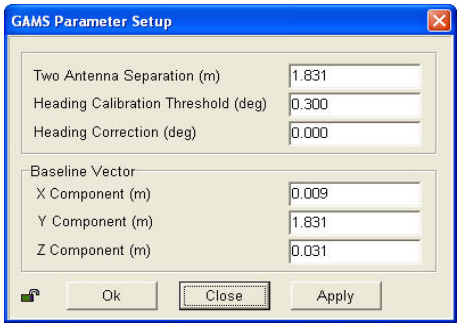


GAMS Solution (Use View> GAMS Solution)



POS/MV Configuration

Settings



Configuration Notes: _____

_____

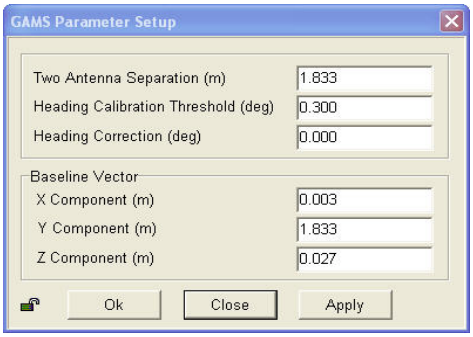
_____

POS/MV Calibration

Calibration Procedure: (Refer to POS MV V3 Installation and Operation Guide, 4-25)

Start time: 17:56
End time: 17:58
Heading accuracy achieved for calibration: 0.028

Calibration Results:



GAMS Status Online **X**
Save Settings **X**

Calibration Notes: _____

_____

_____

Save POS Settings on PC (Use File > Store POS Settings on PC)
File Name: 1018_294_POSMV.nvm

General Notes:

The POS/MV uses a Right-Hand Orthogonal Reference System

The right-hand orthogonal system defines the following:

- The x-axis is in the fore-aft direction in the appropriate reference frame.
- The y-axis is perpendicular to the x-axis and points towards the right (starboard) side in the appropriate reference frame.
- The z-axis points downwards in the appropriate reference frame.

The POS/MV uses a Tate-Bryant Rotation Sequence

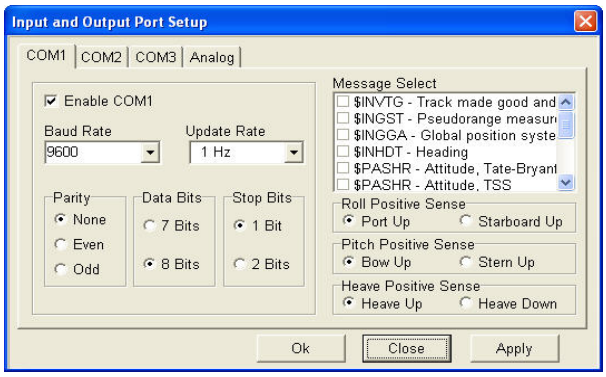
Apply the rotation in the following order to bring the two frames of reference into complete alignment:

a) Heading rotation - apply a right-hand screw rotation θz about the z-axis to align one frame with the other.

b) Pitch rotation - apply a right-hand screw rotation θy about the once-rotated y-axis to align one frame with the other.

c) Roll rotation - apply a right-hand screw rotation θx about the twice-rotated x-axis to align one frame with the other.

SETTINGS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COM3
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9600
Update Rate
1 Hz
Parity
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Even
Odd
Data Bits
7 Bits
8 Bits
Stop Bits
1 Bit
2 Bits
Message Select
$INVTG - Track made good and
$INGST - Pseudorange measur
$INGGA - Global position syste
$INHDT - Heading
$PASHR - Attitude, Tate-Bryant
$PASHR - Attitude, TSS
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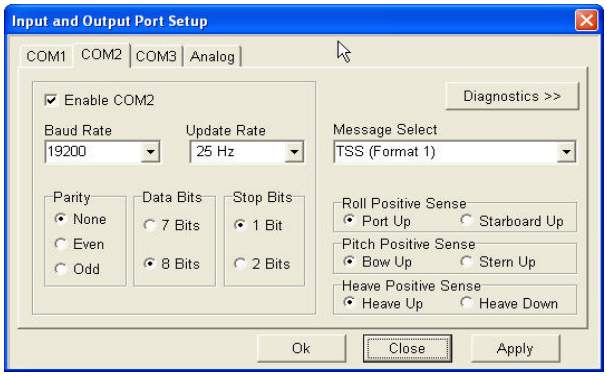
Port Up
Starboard Up
Pitch Positive Sense
Bow Up
Stern Up
Heave Positive Sense
Heave Up
Heave Down
Ok
Close
Apply


Input and Output Port Setup
COM1
COM2
COM3
Analog
Enable COM2
Diagnostics >>
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19200
Update Rate
25 Hz
Message Select
TSS (Format 1)
Parity
None
Even
Odd
Data Bits
7 Bits
8 Bits
Stop Bits
1 Bit
2 Bits
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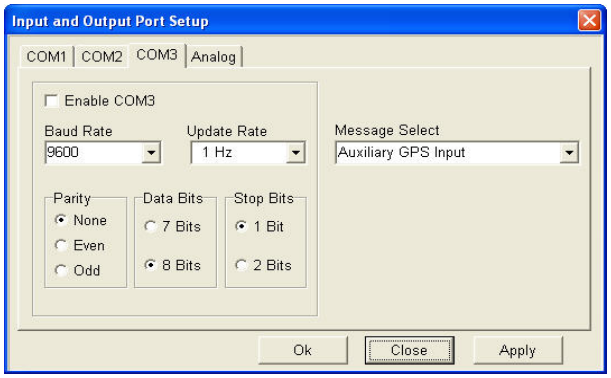
Starboard Up
Pitch Positive Sense
Bow Up
Stern Up
Heave Positive Sense
Heave Up
Heave Down
Ok
Close
Apply


Input and Output Port Setup
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COM3
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Baud Rate
9600
Update Rate
1 Hz
Message Select
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Odd
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7 Bits
8 Bits
Stop Bits
1 Bit
2 Bits
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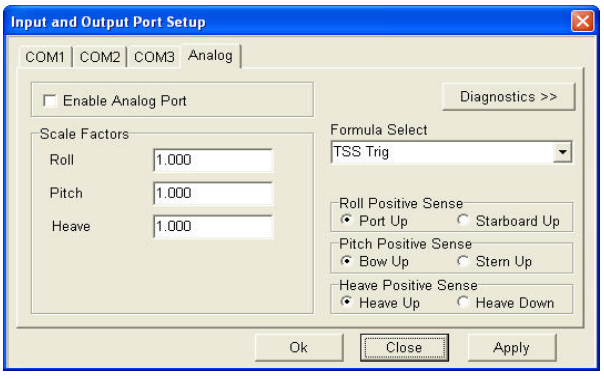
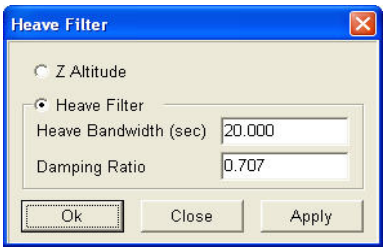
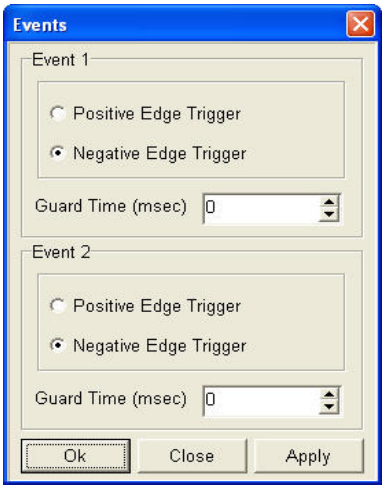
Close
Apply


Input and Output Port Setup
COM1
COM2
COM3
Analog
Enable Analog Port
Diagnostics >>
Scale Factors
Roll
1.000
Pitch
1.000
Heave
1.000
Formula Select
TSS Trig
Roll Positive Sense
Port Up
Starboard Up
Pitch Positive Sense
Bow Up
Stern Up
Heave Positive Sense
Heave Up
Heave Down
Ok
Close
Apply

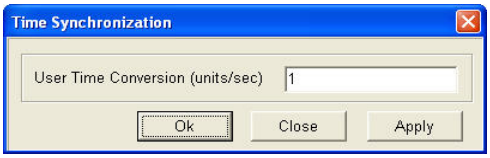
SETTINGS Continued



Events Use Settings > Events)

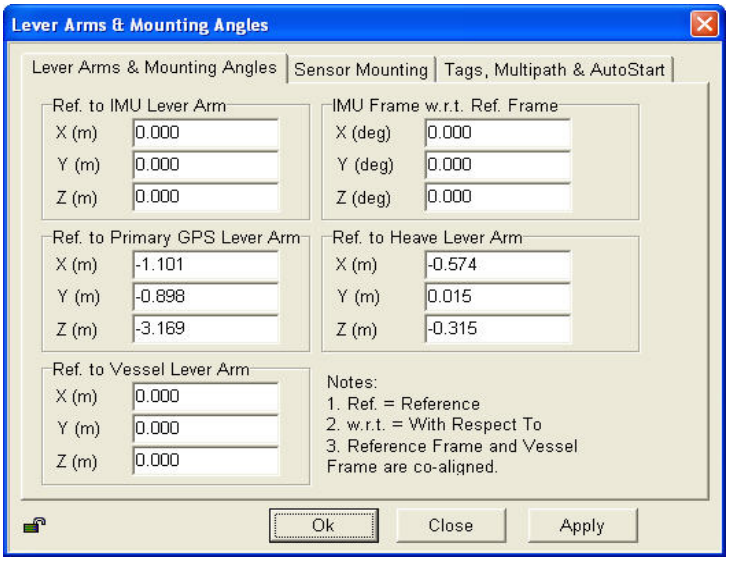


Time Sync (Use Settings > Time Sync)

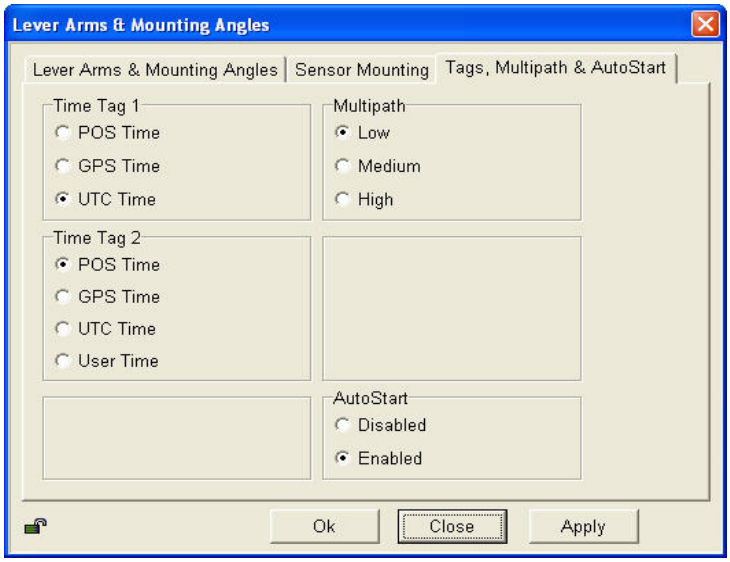


INSTALLATION (Use Settings > Installation)

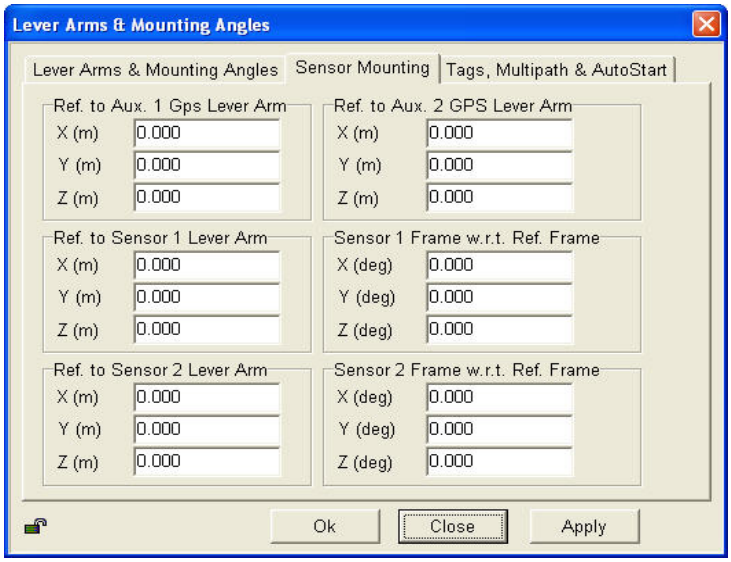
Lever Arms and Mounting Angles (Use Settings > Installation > Lever Arms and Offsets)



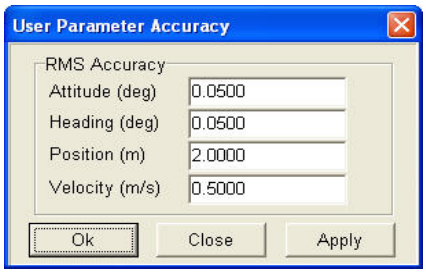
Tags, Multipath and Auto Start (Use Settings > Installation > Tags, Multipath and Auto Start)



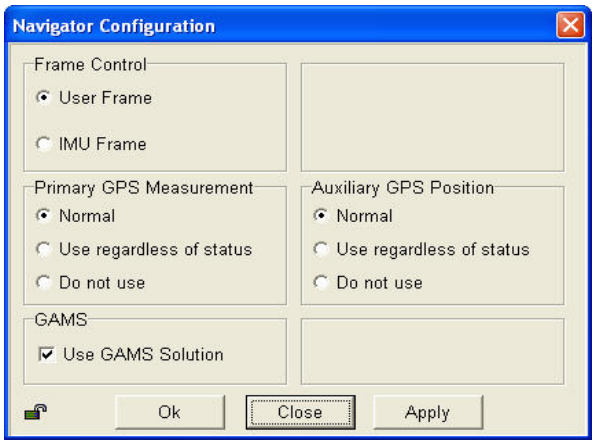
Sensor Mounting (Use Settings > Installation > Sensor Mounting)



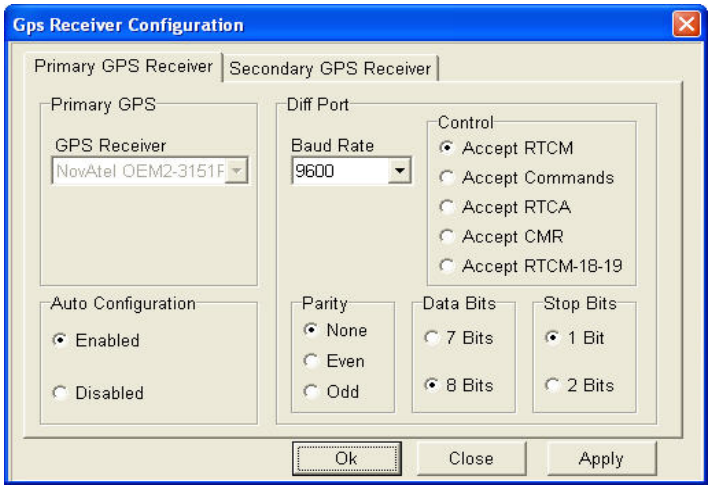
User Parameter Accuracy (Use Settings > Installation > User Accuracy)



Frame Control (Use Tools > Config)

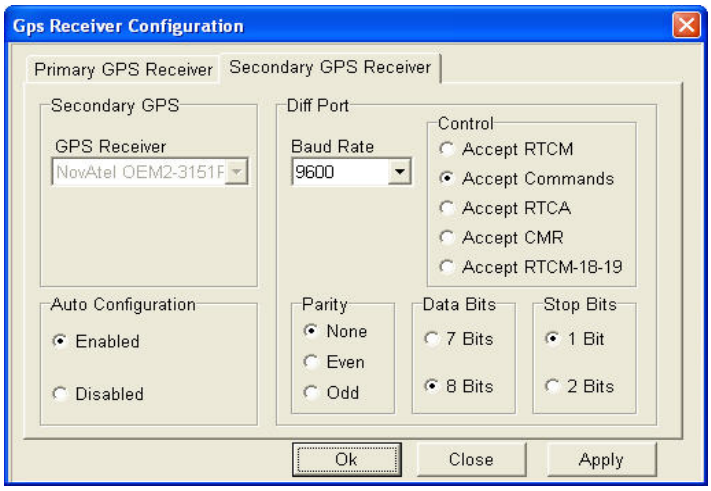


GPS Receiver Configuration (Use Settings> Installation> GPS Receiver Configuration)



1

Secondary GPS Receiver



NOAA HYDROGRAPHIC SURVEY LAUNCH 1018
VESSEL REPORT 2005

Background

NOAA Hydrographic Survey Launch 1018 (Hull Registration Number 1018) is a 28 foot 10 inch aluminum survey launch designed by B. F. Jensen & Associates in 1973. Various vendors built a series of "Jensen" launches for NOAA in the mid 1970's to this general design and 1018 was the 18th in the series. It is considered a Qualified Class II Motorboat within the NOAA classification system and is operated within the parameters required for a vessel of this type.

In 2004, the hull, mechanical, electrical and mission systems underwent a modernization program that increased the performance and utility of the vessel. These upgrades include hull strengthening, increased scantlings to accommodate a larger engine and propeller, hard top, new electrical systems including a 6kW hydraulic generator, a flush deck, hydraulic A frame and dive platform. Also added at this time was a new swing arm transducer mount for the Reson 8101ER multibeam echo sounder (MBES), designed by The Glosten Associates, Inc. All modifications were conducted within the constraints as defined by the NAO 217-103, Management of Small Boats, Section 6.03, Significant Alterations.

The opening portion of this report discusses problems identified during initial testing of launch 1018.

Review of initial Patch Testing

Patch tests were performed with NOAA Launch 1018 in the vicinity of Ketchikan, AK on March 12 & 13 (DN 071 and DN 072). Data from both days were compared for system consistency by acquiring data on the same lines and comparing the results in CARIS HIPS Calibration. The patch test data were collected by SST Froelich, ST Kellner, AST Castle, ENS French, and ECO Rheinheimer.

Raw ISIS XTF data was converted to CARIS HDCS format. Sound velocity and observed tides were applied upon conversion and the lines were "lightly" cleaned in CARIS swath mode to remove major data fliers. The patch test data were then reviewed in CARIS calibration mode independently by CST Morgan, ST Keene, LT Wetzler, and PS Palmer to determine the biases. During this process, problems were identified as described below.

Roll

The procedure for determining roll biases included running one pair of coincident lines over a locally flat area at approximately 8 knots. Patch test bias results were consistent among reviewers. The biases were applied to the HVF and the data was reviewed in CARIS Subset mode. DN 071 results had approximately a 0.4 meter vertical offset between lines that were collected within 10 minutes of each other (see *Figure 1*). When comparing roll lines from DN 071 to DN 072 there was approximately a 4.7 meter vertical offset (see *Figure 2*), which is likely attributable to tidal variations, as preliminary tides were used.

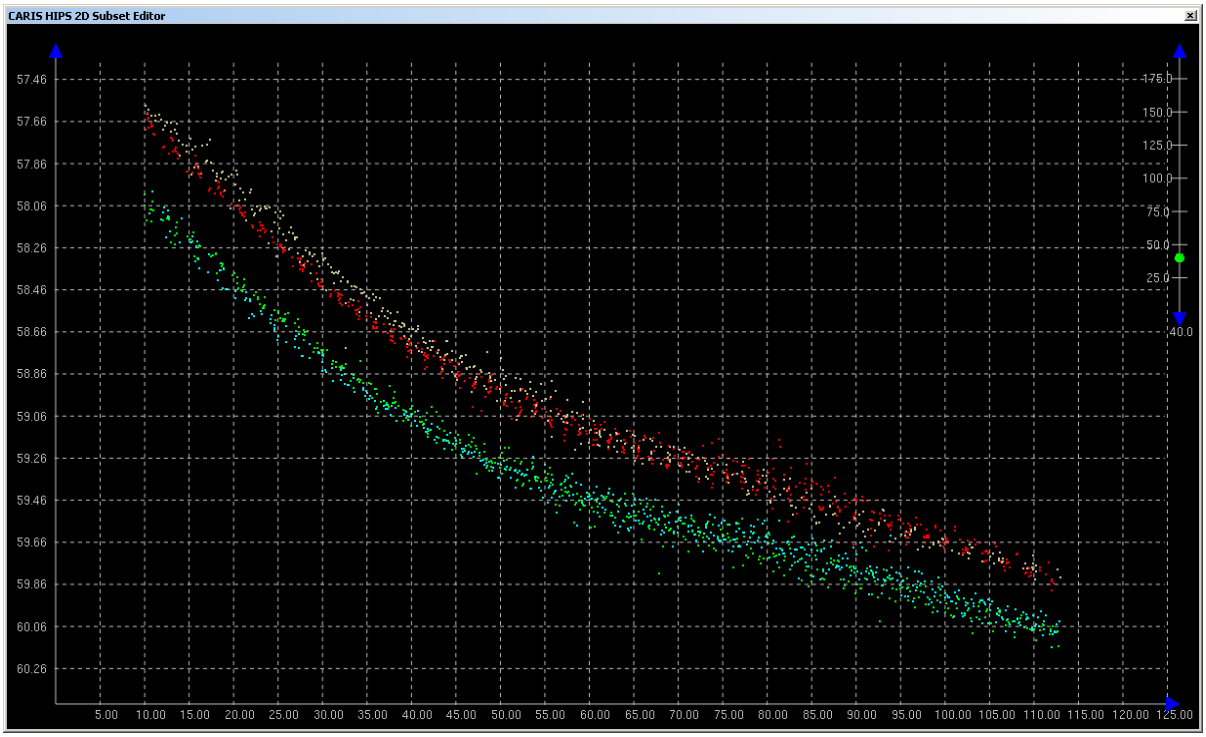


Figure 1: Across-track view of Roll patch lines from DN 071, with a vertical offset of approximately 0.4 m

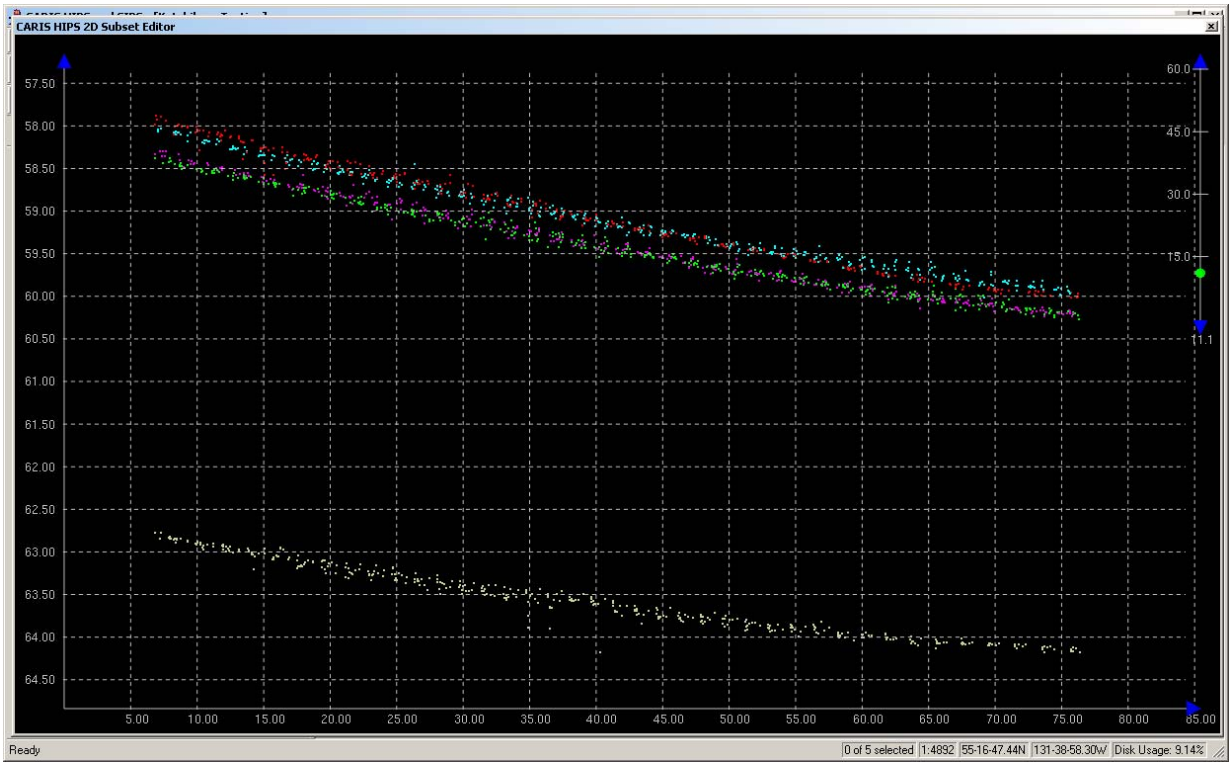


Figure 2: Across-track view of Roll patch lines from DN 071 and DN 072, with a vertical offset of approximately 4.7 m between days

Patch Test Results

Table 1, below, shows the bias values for the patch tests performed on each of DN 071 and 072. Note the difference between the roll bias on the respective days.

Patch Bias	DN 071 Bias value	DN 072 Bias value
Navigation Time Error	0.01 sec	0.01 sec
Pitch	0.00°	-0.2°
Roll	2.13°	2.61°
Heading	0.4°	-0.1°

Table 1: Patch Test Bias Results

Initial Review of Dynamic Draft Settlement and Squat Method (DDSSM) Test

The DDSSM test consisted of acquiring data for multiple coincident lines in the same direction but at different speeds. The swing arm mount was also tested, by raising and lowering the transducer at the end of each line. In addition, three crosslines were acquired to check for data consistency.

The resulting DDSSM data were reviewed in CARIS Subset mode. There was approximately a 0.4 m maximum vertical offset among lines on DN 071 (see *Figure 3*). There was approximately a 1.5 meter maximum vertical offset among lines on DN 072 (see *Figure 4*). There were very large vertical offsets of approximately 4 m between lines collected on DN 071 and lines collected on DN 072 (see *Figure 5*). DN 072 data appears to be vertically offset 2 meters deeper than that of DN 071. It should be noted that preliminary tide data was used to process the DDSSM test lines, accounting for at least some of the noted day-to-day (and possibly intraday) offset.

The DDSSM data collected on DN 071 and DN 072 is not usable.

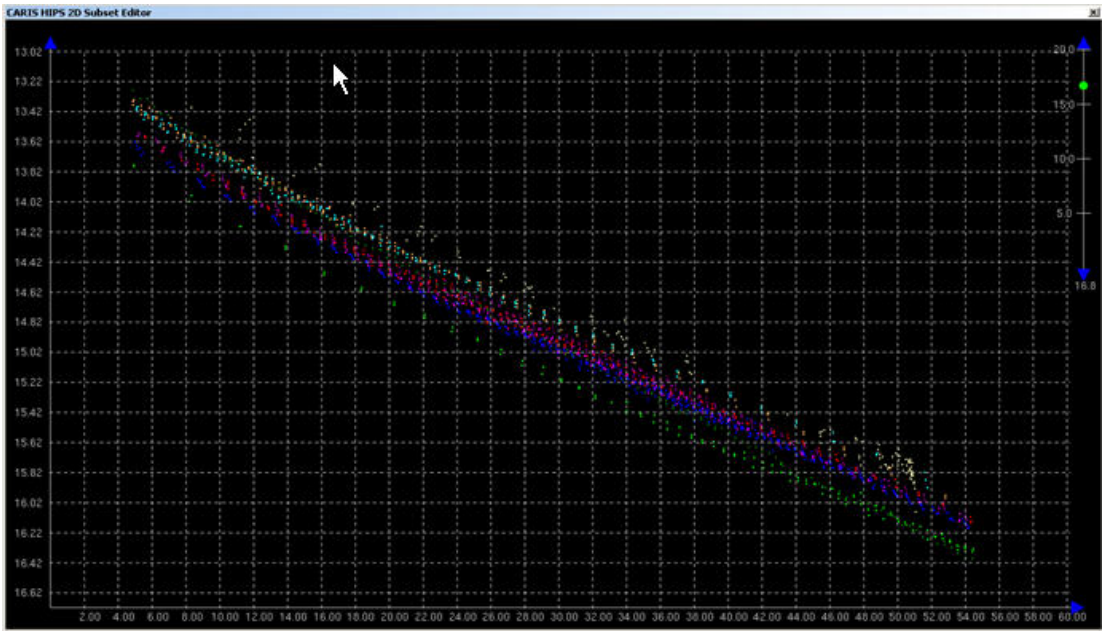


Figure 3: Across-track view of DDSSM patch test lines from DN 071, with a maximum vertical offset of approximately 0.4 m

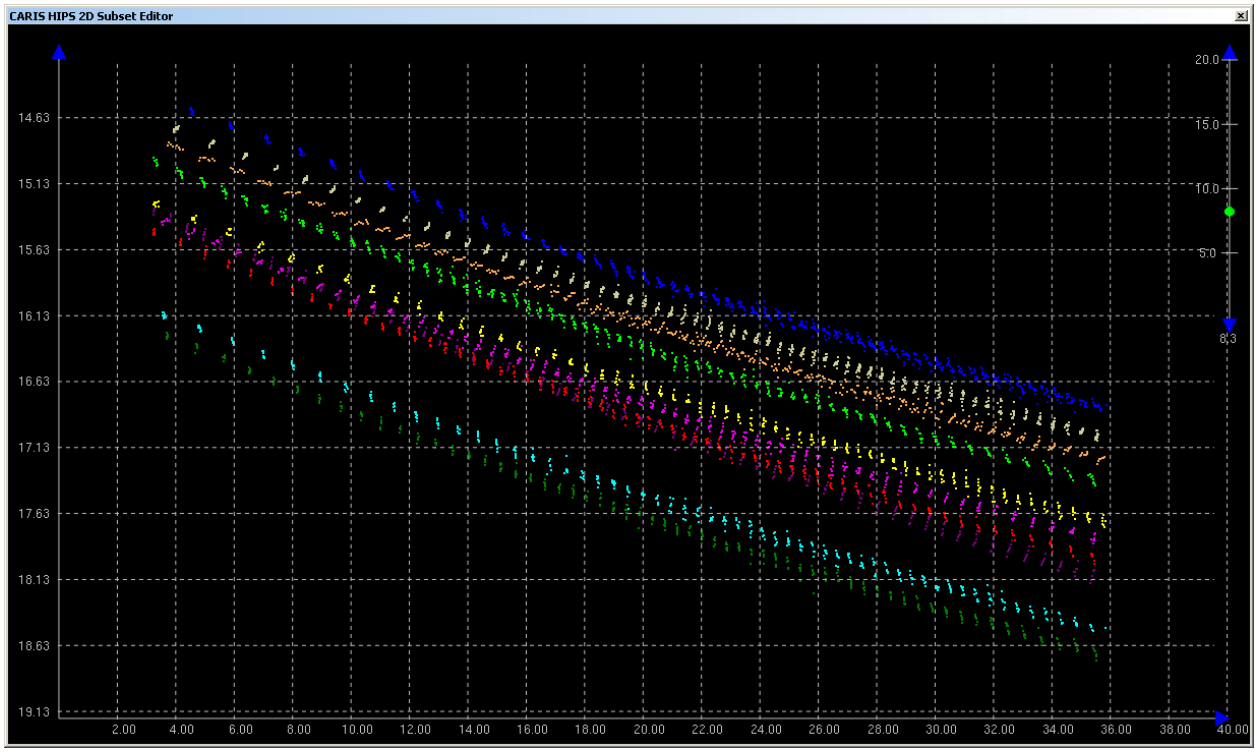


Figure 4: Across-track view of DDSSM patch test lines from DN 072, with a maximum vertical offset of approximately 1.5 m

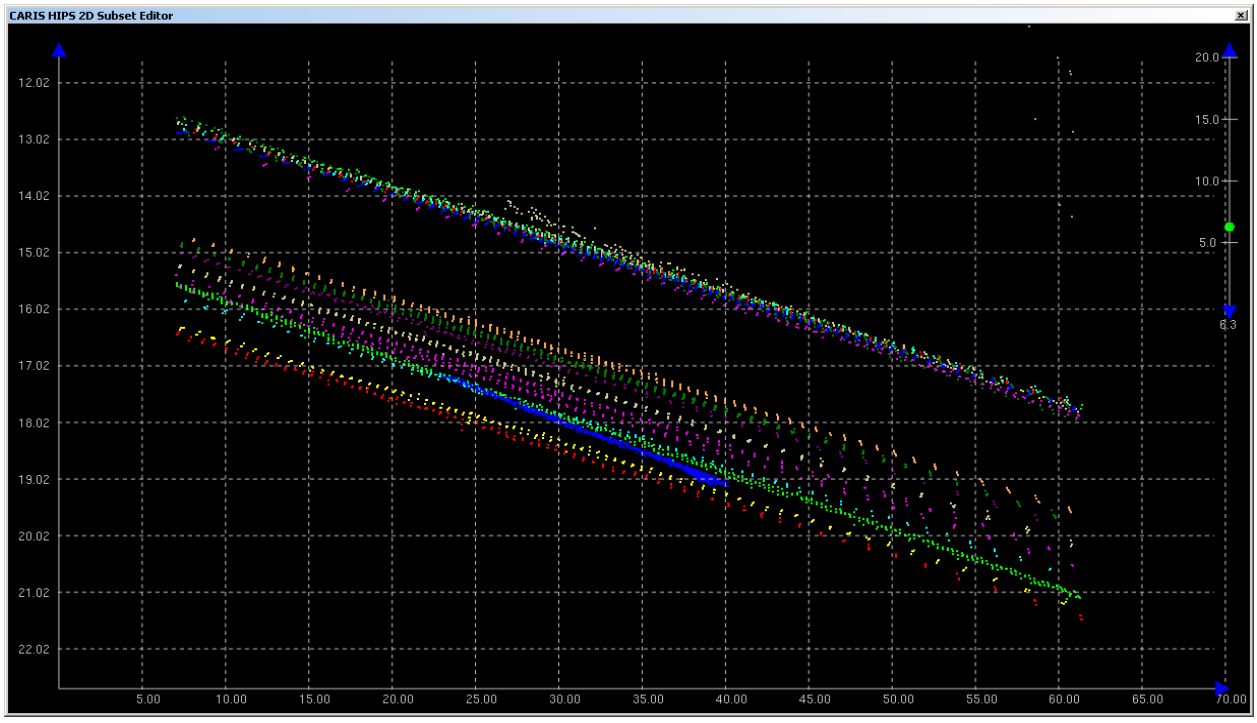


Figure 5: Across-track view of DDSSM patch test lines from DN 071 and DN 072, with a vertical offset of approximately 4 m

Transducer mount issues

We believe the roll inconsistencies are a result of instability in the swing mount arm. The mount was designed to be held in place against the under hull stop, but due to

fabrication and assembly issues, this did not happen. The arm was locked into position inside the cabin by a stainless steel pin sliding through two aluminum brackets (see *Figures 6, 7, and 8*). One of the holes in the brackets has worn away because of the stainless steal pin against a softer aluminum leaving approximately 3 mm of freeplay in the lever arm. Several field modifications were made over a two week period at the start of the 2005 field season that solved this problem (see addendum 1).

Figure 6: Overview of Launch 1018 swing arm inside of cabin

Figure 7: Aluminum bracket for locking position transducer down

Figure 8: Stainless steel pin locked in to with transducer up

ADDENDUM 1
NOAA HYDROGRAPHIC SURVEY LAUNCH 1018
VESSEL REPORT 2005

Background:

During testing of Launch 1018 it was noticed that the mount was not stable from day to day. Testing originally occurred on DN 071 and then DN 072 in order to determine if the mechanical corrections to the swing arm mount were functional. The HVF values for DN 071 and DN 072 did not match. Specifically, there were significant differences in the roll bias and the inconsistencies with the DDSSM data. A third patch test was performed on March 28 (DN 087) in Madan Bay to see which of the earlier days were correct. The HVF values for DN 087 closely matched DN 071, but were different from DN 072.

Those three patch tests showed that the multibeam mount was unstable. Because of the drift in the HVF values over such a short period of time, the mechanics of the swing arm mount were inspected. It was found that the aluminum mounting bracket that held the deployment lever arm in place was worn. Further, when pinned in it was noticed that the deployed position the swing arm mount did not rest on its under hull stop. The worn mounting bracket allowed the transducer to move over time.

Another method of locking the deployment lever arm was proposed in order to keep the transducer in place against the under hull stop. On DN 088, a ratcheting tie-down strap was used to hold the deployment lever arm mount in position. *Figure 9* shows the deployment lever arm and the set pin with the temporary fix of the ratcheting tie-down strap.

Figure 9: The deployment lever arm, set pin and ratcheting tie–down strap. The pin was eventually removed to allow the arm to reach the under hull stop.

The HVF values for DN 088 were calculated and showed intraday stability. In order to determine if the locking ratchet strap provided the needed consistency two patch tests were run on DN 089. One test was run in the morning prior to acquisition and the other in the evening after acquisition. There was again intraday consistency from the start of DN 089 through to the end of DN 089, but the interday roll and heading values between DN 088 and DN 089 were not close enough for the acquired data to meet IHO S-44 Order 1 specifications. That is to say, if the HVF for DN 088 were used on DN 089 data, the resulting processed data would not meet IHO S-44 Order 1 specifications.

During this process the swing arm transducer mount was repeatedly examined. It was found that with the set pin in place the mount did not touch the transducer mount stop on the bottom of the boat. There was a gap of approximately 2 mm.

On DN 095 another set of patch tests were run, this time without the set pin, and removing any obstructions to the arm. The ratcheting tie down strap was the sole device to hold the mount in place. This allowed the transducer mount to rest on the under hull stop and eliminate any instability issues.

The roll bias values on DN 095, due to the change in the angular positioning of the system from removing the set pin, do not match DN 089. This is to be expected.

The procedure was to conduct a patch test before survey operations, collect data, and then patch test in the evening. After processing the patch tests for the morning and evening, the HVF was then updated if necessary. Sounding data was merged using the updated HVF and then examined for internal consistency. Using this procedure, data meets IHO S-44 Order 1 specifications.

Tests were performed to determine the residual biases of the sensors and sonar system alignment and settlement and squat. Data were assessed in CARIS HIPS & SIPS v5.4 (SP 1, Hot Fixes 1-23) calibration and subset modes and applied to the HIPS Vessel File (HVF), 1018_8101.HVF.

Patch Test

Patch tests were performed with Launch 1018 in the vicinity of Wrangell Island, AK (see Figure 10) on March 28 (DN 087). The patch test data were collected by ST Keene, AST Castle, and ECO Rheinheimer.

Raw ISIS XTF data were converted to CARIS HDCS format. Sound velocity and predicted tides were applied upon conversion and the lines were “lightly” cleaned in CARIS swath mode to remove major data fliers. The patch test data were then reviewed in CARIS calibration mode independently by CST Morgan, ST Keene, LT Wetzler, and PS Palmer to determine the biases.

Subsequent to using a the ratcheting tie-down strap, as described above, additional patch tests were conducted by FAIRWEATHER personnel on DN 088, DN 089 (AM & PM), and DN 095 (AM & PM) utilizing the method as describe for DN 087.

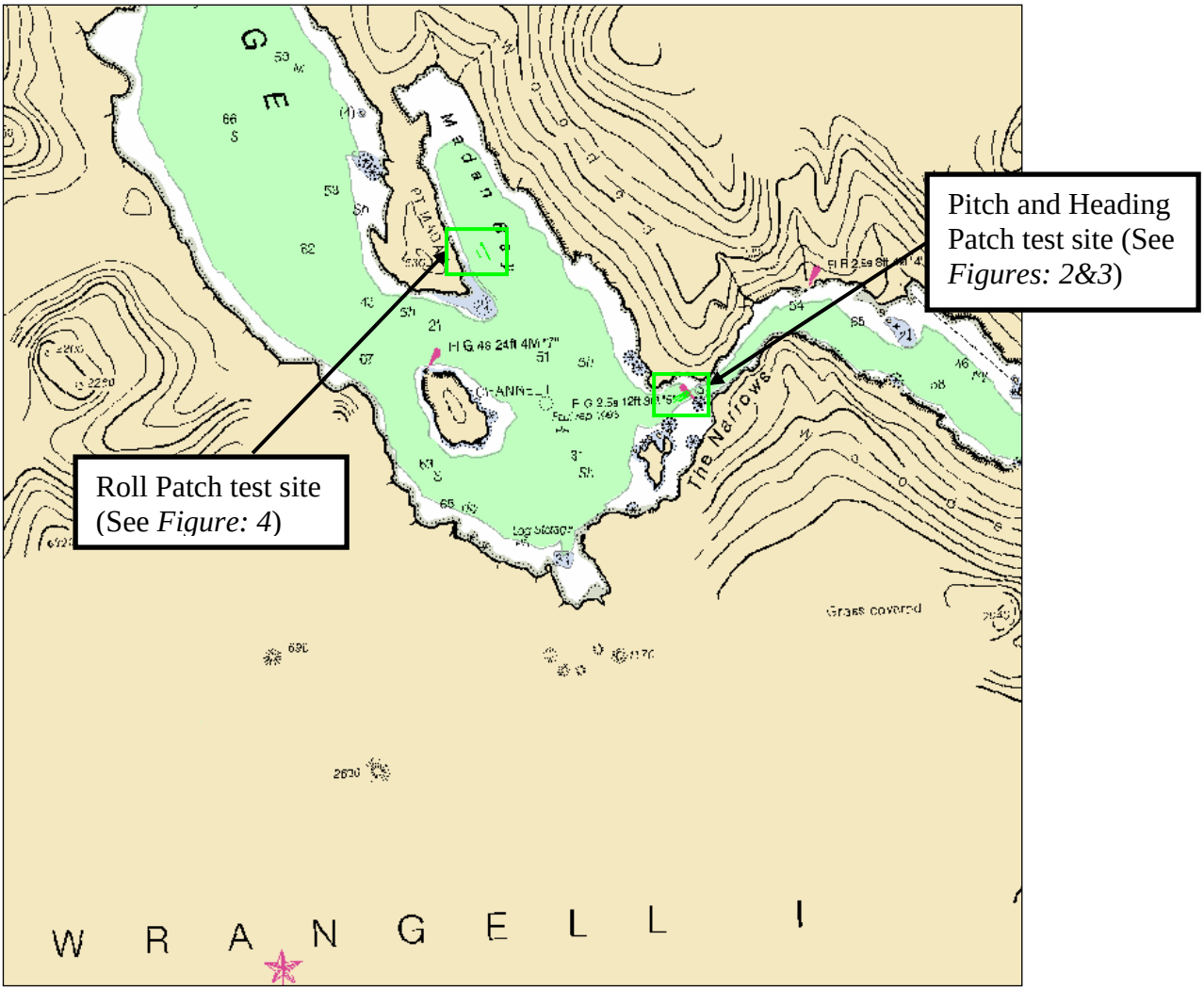


Figure 10: Test Sites for Launch 1018

Heading and Pitch

The heading and pitch bias patch tests were conducted in The Narrows over a rock with a radius of 35 m, in an area with an average depth of 40 m and a least depth of 25 m. The rock is located at 56°21'52"N, 132°06'53"W (see *Figures 11 & 12*).

Heading

The heading bias was determined by acquiring data on two sets of parallel lines run in opposite directions. The pairs of lines were offset from the rock 25 m and 35 m, respectively. Vessel speed was 6-7 knots.

Pitch

The procedure used to determine the pitch bias was to run two pair of coincident lines over the rock in approximately 40 m of water at the same speed in different directions. The lines were run between 6-7 knots.

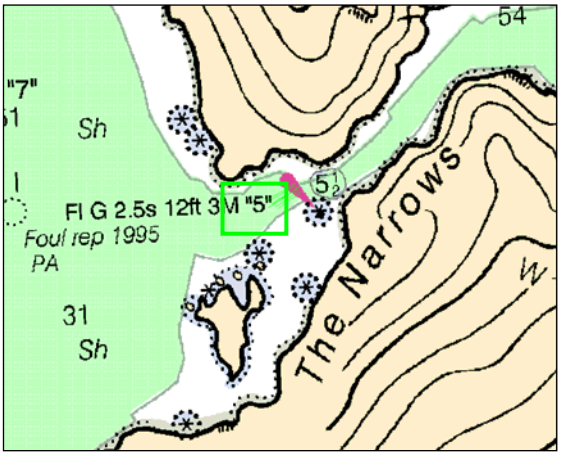


Figure 11: Heading and Pitch patch test site for launch 1018

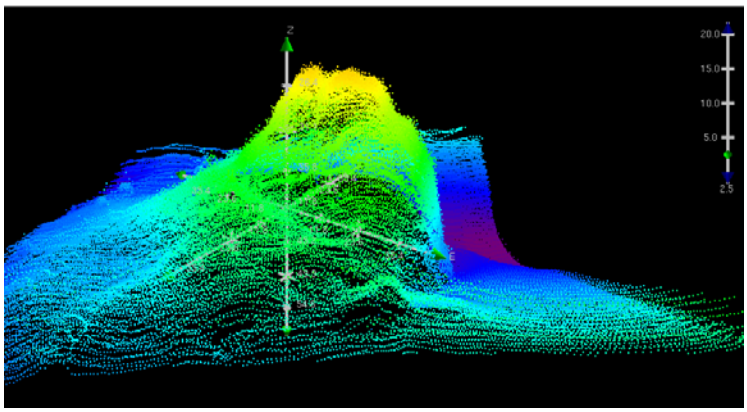


Figure 12: Rock used for Heading and Pitch patch test for launch 1018

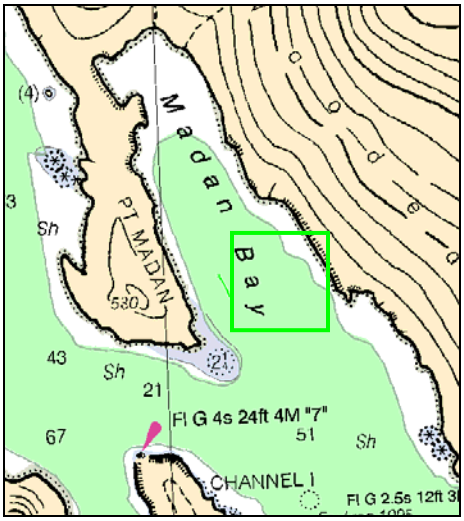


Figure 13: Roll patch test site for Launch 1018.

Roll

The roll bias patch was conducted in Madan Bay over a flat area in approximately 90 m of water at location 56°23'00"N, 132°09'21"W (see *Figure 13*). Roll bias was determined by running three pair of coincident lines over the area at 7-8 knots in different directions.

Navigation Time Error

There was no Navigation Time Error test performed on March 28 (DN 087). Final values entered into 1018_8101.HVF were based on previous test results.

Vertical offsets were not noticed in the roll lines from DN 087. However, pitch and heading data shows there is an approximate 0.4° offset from lines collected on the same day. There is approximately a 0.5-1.0m vertical offset from lines run within 15 minutes of each other (see *Figure 6*).

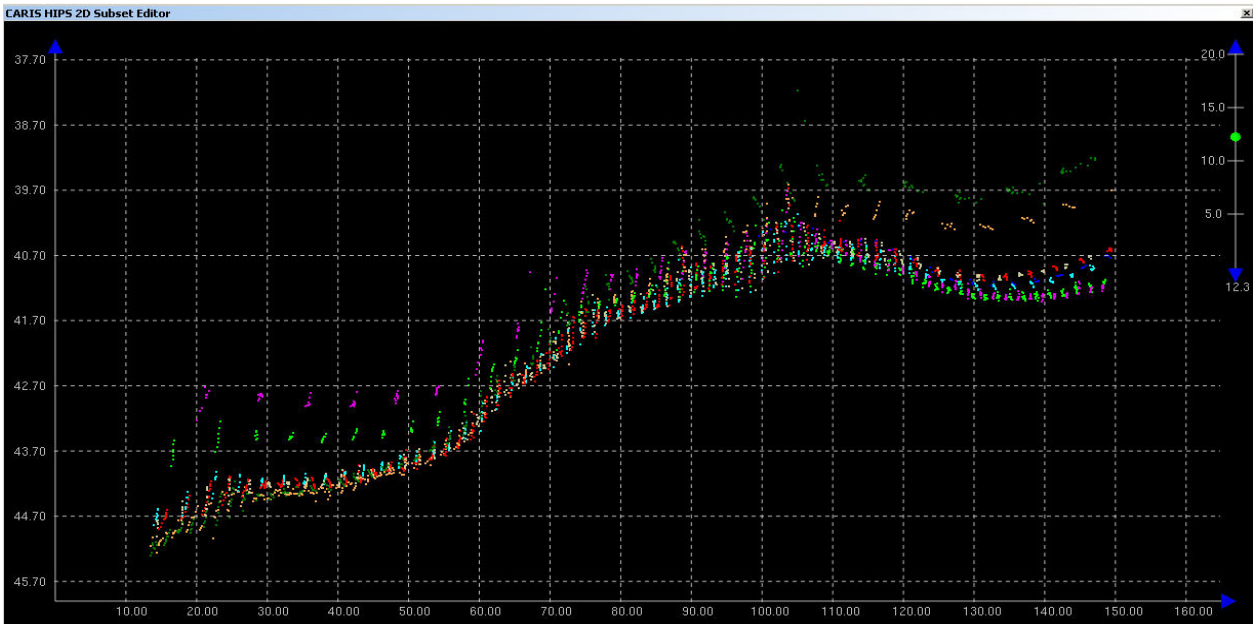


Figure 14: Pitch & heading patch test lines from DN 087 with approximately a 0.5-1.0 meter vertical offset

Patch Test Results

The bias results from these second set of patch tests are shown in *Table 2*, below. The bias values applied during processing in the HVF are given for DN 089 and 095 in *Table 3*.

Patch Bias	DN 087 Bias	DN 088 Bias	DN 089 AM Bias	DN 089 PM Bias	DN 095 AM Bias	DN 095 PM Bias
Nav Time Error	0.01 sec	0.20°	0.0°	0.10°	0.0°	0.0°
Pitch	0.04°	2.50°	2.68°	2.68°	2.96°	3.03°
Roll	2.64°	-0.95°	0.35°	0.45°	0.1°	0.3°
Heading	0.25°					

Table 2: Patch Test Bias Results

HVF Patch Bias	DN 089 HVF Bias values	DN 095 HVF Bias values
Time Error	-0.01 sec	-0.01 sec
Pitch	0.05°	0.0°
Roll	2.68°	3.00°
Heading	0.4°	0.2°

Table 3: Patch Test HVF Bias Values

Modifications and Additional Patch Testing

Data was continued to be acquired on project OPR-O119-FA and was used because the system was proving to be consistent over the course of a day. Further modifications continued to remedy the day to day fluctuations in biases. Launch 1018 modifications consisted of the pin no longer being used as a stop for the arm, a portion of the wood decking being removed, and the arm being ground down to eliminate any possibility of the arm resting anywhere but the under hull stop (see *Figure 15* for under hull stop).

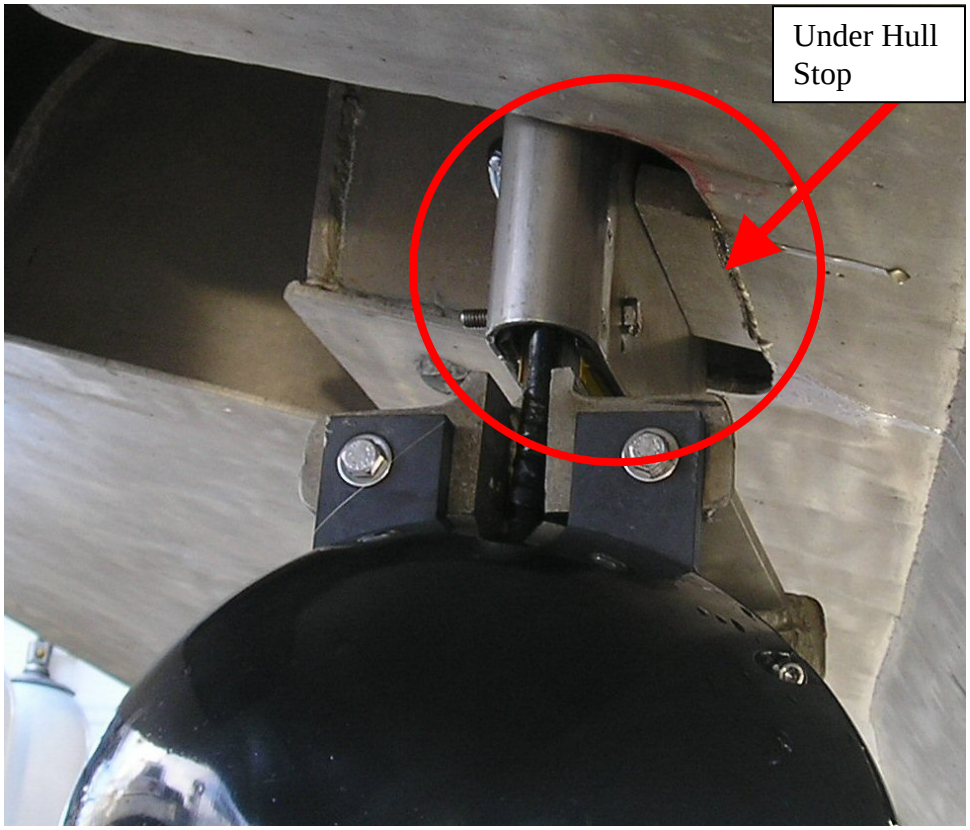


Figure 6: Launch 1010 swing arm mount against hull stop.

Patch testing on DN 097 was conducted as described and in the same locations as discussed on DN 087. The patch test data were collected by SST Abrams and AST Castle. Additional roll lines were conducted along with a tension test to examine whether variations in ratcheting of the strap would show up in the data. The patch test data were reviewed in CARIS calibration mode independently by CST Morgan, SST Froelich, ECO Rheinheimer, and ENS Higgins to determine biases. No data was collected on DN 097, due to additional testing being done after modifications.

A new mount with a drilled hole for the tie-down strap to anchor to was bolted to the frame of Launch 1010 on DN 101.

Patch testing on DN 098, DN 099, and DN 101 through DN 102, was conducted in the morning and evening as described and in the same locations as discussed on DN 087. The patch test data were collected and reviewed in CARIS calibration mode to determine biases by FAIRWEATHER personnel.

Patch Test Results

The results of five days of morning and evening patch testing are reported in *Table 5*, below.

Patch Bias	DN 097 First Bias	DN 097 Roll2 Bias	DN 097 Roll3 Bias	DN 097 Roll4 Bias	DN 097 Final Bias
Pitch	-0.4°				-0.4°
Roll	3.01°	3.01°	3.02°	3.02°	3.01°
Heading	0.0°				0.0°

Patch Bias	DN 098 AM Bias	DN 098 PM Bias	DN 099 AM Bias	DN 099 AM2Bias	DN 099 PM Bias
Pitch	-0.42°	-0.4°	0.2°		0.2°
Roll	3.06°	3.04°	3.03°	3.05°	3.03°
Heading	0.1°	N/A	0.1°		-0.15°

Patch Bias	DN 101 AM Bias	DN 101 PM1Bias	DN 101 PM2Bias	DN 102 AM Bias	DN 102 PM Bias
Pitch	-0.10°	-0.10°	-0.15°	0.2°	0.0°
Roll	3.03°	2.99°	3.01°	3.06°	3.05°
Heading	0.0°	-0.15°	N/A	0.0°	-0.1°

Table 4: Patch Test Bias Results

Patch Test Biases used for data processing

The bias values in the HVF file, used for daily data processing on lines run on and after Dn 098, are shown in *Table 5*. The DN 098 values are based on averages of values from DN 097 through DN 101.

HVF Patch Bias	DN 098 - HVF Bias values
Time Error	-0.01 sec
Pitch	-0.17°
Roll	3.02°
Heading	0.0°

Table 5: Patch Test HVF Bias Values

Patch test acquisition and processing logs are located in Appendix III-1018-3.

Optical Settlement and Squat

Settlement and Squat were performed on March 13th (DN 072) in Blank Inlet at location 55°14’45.80”N, 131°40’58.58”W in approximately 40m of water (see *Figure: 5*). Data were collected by CST Morgan, SST Froelich, AST Castle, ENS French and PS Palmer.

Optical levels were used to determine settlement and squat biases. The procedure included setting up on shore a Leica NA2 352036 stadia level and placing a graduated metric staff on top of launch 1018's port side gas cap (see *Figures 16 & 17*). The settlement and squat data were acquired at seven different speeds: 5,6,7,8,9,10, and 11 knots. Readings were taken for all seven speeds: four "at rest" before and after each direction, ten readings as the launch is moving away "at speed", and ten as the launch is moving toward the shore team "at speed". This procedure was repeated for all seven speeds.

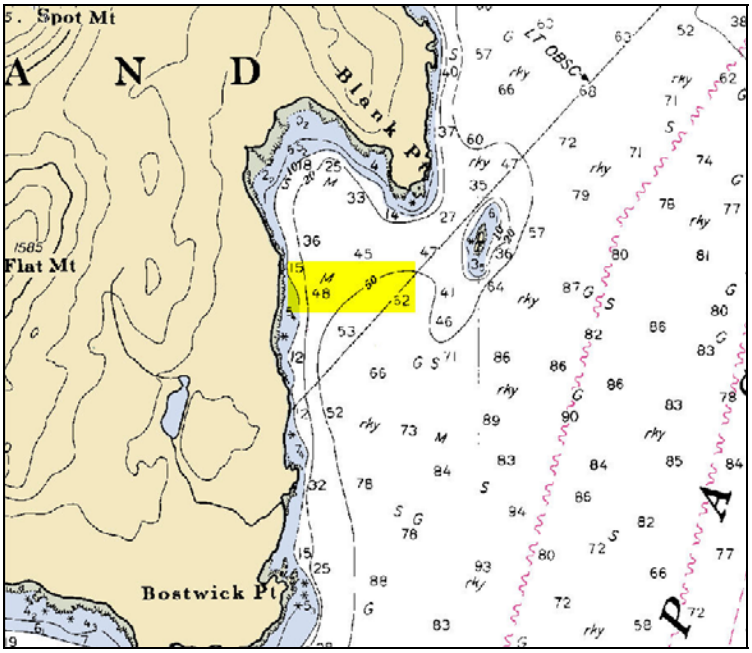


Figure 15: Settlement and Squat test site for Launch 1018.

The computations and table of results are included in *1018_DDSSM Settlement and Squat* located in Appendix III-1018-4. The results are summarized in the table below:

Average Speed (knots)	Delta Draft (m)
0.0	0.000
5.2	0.0255
6.2	0.027
7.15	0.03795
7.95	0.0545
8.95	1.0025
9.9	0.052
11.05	0.0425

Table 6: Settlement and Squat Results

Figure 16: Settlement and Squat shore team using optical level.

Figure17: Graduated metric staff on port side gas cap.

Dynamic Draft Settlement & Squat Method (DDSSM)

Due to the swing arm mount problem, the DDSSM lines run on DN 071 & 072 could not be utilized. The DDSSM was not re-run. After analysis of Launch 1010 DDSSM and Optical Settlement and Squat values, FAIRWEATHER personnel decided the Optical values were adequate to be utilized as the Delta Draft correctors.

POS MV GAMS Calibration

POS MV GPS Azimuth Measurement Subsystem (GAMS) calibration occurred on March 28th (DN 087) near Madan Bay (see *Figure 8*). GAMS calibration was performed by ST Keene, AST Castle and ECO Rheinheimer.

The GAMS heading calibration threshold was initially set to 0.300°. 1018 was maneuvered in "figure 8's" to lower the heading accuracy as much as possible. The best heading accuracy value achieved during this process was 0.05°. The vessel steadied up on a constant heading and GAMS calibration was requested. When the calibration was complete, the POS MV settings were saved to the file 1010_085_posmv.nvm (see *Table 3*). The file name has the wrong vessel number and the wrong day number, due to confusion in the field.

The detailed POS/MV Calibration Report, 1018_POS_Calibration_Dn087.xls, is located in Appendix III-1018-5.

Component	DN 087 Value
Number of Satellites	8
PDOP	1.789
Baseline Vector X	0.009 m
Baseline Vector Y	1.831 m
Baseline Vector Z	0.031 m
Two Antenna Separation	1.831 m
Heading Correction	0.000 °

Table 7: POS MV GAMS Calibration Results

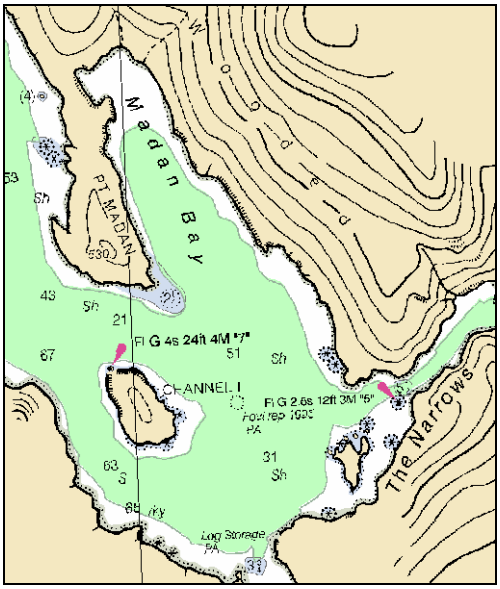


Figure 18: POS/MV GAMS Calibration test area.

Recommendations:

The patch test calibration results, HVF Bias values for March 30th (DN 089) & April 5th (DN 095) in table 3 above, should be used for processing data for those respective days.

The patch test calibration results listed in table 5 for DN 098 should be used for launch 1018 until such a time or event warrants a new calibration.

The Optical Settlement and Squat delta draft values from March 13th, 2005 (DN 072) should be used until such a time or event warrants a new test.

The POS MV GAMS calibration results from March 28th (DN 087) should be used until such a time or event warrants a new calibration.

Future Modifications Planned:

At the present time, installation of a dog-type latching mechanism is planned for launch 1018. The latch will be installed to permanently replace the ratcheting tie down strap and ensure the swing arm mount is stable and firmly up against the under hull stop.

ADDENDUM 2
NOAA HYDROGRAPHIC SURVEY LAUNCH 1018
VESSEL REPORT 2005

Background:

Launch 1018's swing arm mount was stabilized by utilizing a ratcheting tie down strap to ensure that the swing arm was stable and firmly up against the under hull stop. From testing discussed in Addendum 1 of this report and examination of data through August 15, 2005 (DN 225) it is apparent that this solution works.

A drawback of the swing arm mount occurs when the mount is lowered and debris can be caught between the swing arm and the under hull stop. This changes the roll bias for the system and it is apparent in the data.

Roll:

On two occasions the roll value for Launch 1018 was affected by debris trapped between the swing arm and the under hull stop. During evening processing the data was found to exhibit a roll which was not consistent with the current HVF value.

On May 12th (DN 132), from 1600 through 2220 GMT, and August 6th (DN 218), from 1726 though 2359 GMT roll bias issues were detected. In each case data were examined by the Field Operations Officer and a roll bias was determined utilizing the acquired data in the CARIS HIPS/SIPS 5.4 Calibration routine. The calculated roll biases were then entered into the .HVF for launch 1018. Roll biases were then returned to the base value of 3.020 following the time of data acquisition. Figure 1 shows the values in the HVF for Swath 1 on Launch 1018.

	Date	Time	Time E	X	Y	Z	Pitch	Roll	Yaw	Manuf	Model	Comments
7	2005-132	16:00	-0.010	0.302	-0.164	0.550	-0.170	1.020	0.000	Reson	Reson SeaBat 8101	Object wedged in Ducer Mount for sheet H11469.
8	2005-132	22:20	-0.010	0.302	-0.164	0.550	-0.170	3.020	0.000	Reson	Reson SeaBat 8101	Object cleared from Ducer Mount
9	2005-218	17:26	-0.010	0.302	-0.164	0.550	-0.170	0.640	0.000	Reson	Reson SeaBat 8101	Object wedged in Ducer Mount
10	2005-219	00:00	-0.010	0.302	-0.164	0.550	-0.170	3.020	0.000	Reson	Reson SeaBat 8101	Object cleared from Ducer Mount

Figure 1: Screen grab of HVF Swath 1 settings on Launch 1018

Data from May 12th and August 6th were remerged using the updated .HVF and were examined by the Field Operations Officer. Data were found to meet or exceed the requirements in *NOS Hydrographic Surveys Specifications and Deliverables*, as updated for March, 2003.

Recommendations:

Roll bias results for May 12th and August 6th should be used for processing data on those respective days only.

The patch test calibration results, HVF Bias values for March 30th (DN 089) & April 5th (DN 095) in table 3 of Addendum 1, should be used for processing data for those respective days only.

The patch test calibration results listed in table 5 of Addendum 1 for DN 098 should be used for launch 1018 until such a time or event warrants a new calibration.

The Optical Settlement and Squat delta draft values from March 13th, 2005 (DN 072) should be used until such a time or event warrants a new test.

The POS MV GAMS calibration results from March 28th (DN 087) should be used until such a time or event warrants a new calibration.

ADDENDUM 3
NOAA HYDROGRAPHIC SURVEY LAUNCH 1018
VESSEL REPORT 2005

Background:

On September 22, 2005, Launch 1018 ran aground while conducting shallow water multibeam. The welds connecting the transducer to the swing arm sheared, and the transducer was lost.

The launch was taken to Alaska Shipping and Drydock for repair work to the swing arm. Because the repair work involved welding, the IMU was also removed from Launch 1018.

The IMU and a new Reson 8101 transducer were reinstalled on the launch. The offsets on the launch were measured, and a GAMS calibration and patch test were performed.

Offsets:

Launch 1018 was initially leveled and a full survey was conducted by NOAA personnel in 2004. The full survey included several benchmarks welded to the launch, the GPS antennas, the phase center of the transducer, and the IMU. Coordinates for all of these items were determined and recorded in the 1018 Offsets and Measurements Spreadsheets as an appendix in the *NOAA Ship FAIRWEATHER Hydrographic Systems Certification Report 2005.* The grounding was not sufficient in nature to warp the frame of the boat, so the coordinates of the benchmarks welded to the launch did not change.

In order to determine if the positions of the IMU and transducer had changed when the equipment was removed and reinstalled, the distances from the IMU and the phase center of the transducer to the nearest benchmark were measured in three dimensions. From these measurements, the xyz coordinates of the IMU and phase center were calculated.

The measurements were taken with a steel tape to the nearest millimeter while Launch 1018 was secured in its davit. Though the Launch does not sit level in the davit cradle, the distance between the equipment and the benchmarks is sufficiently small that a slight incline of the vessel will not cause a significant error in the measurement.

Additionally, the Applanix POS M/V, version 3, on the vessel only requires offsets to be measured within 3 cm. Our measurements, as shown below in Table 1 and Table 2, indicate the equipment was measured within millimeters, and differed at most 1.8 cm, from its original position.

Table 1: Calculating measured coordinates of the IMU

	BM J Coordinates	Measured Distance from J to IMU (m)	IMU Measured Coordinates (2005)	IMU 2004 Survey Coordinates	Difference (m)
x	3.290	0.255	3.545	3.546	**-0.001**
y	0.004	-0.016	-0.012	-0.015	**0.003**
z	-0.810	-0.043	-0.853	-0.859	**0.006**

Table 2: Calculating measured coordinates of the phase center of the transducer

	BM H Coordinates	Measured Distance from H to Phase Center (m)	Phase Center Measured Coordinates (2005)	Phase Center 2004 Survey Coordinates	Difference (m)
x	3.302	0.098	3.400	3.382	**0.018**
y	0.431	-0.161	0.270	0.287	**-0.017**
z	-1.048	-0.357	-1.405	-1.409	**0.004**

The “Benchmark Coordinates” column is the surveyed position of the benchmarks closest to the IMU and the phase center of the transducer. The “Measured Distance” column is the distances measured with steel tape between the benchmarks and the equipment. The “Measured Coordinates” column describes the coordinates of the equipment as determined by the measurements from the positioned benchmarks. The “2004 Survey Coordinates” were the originally surveyed coordinates, based on the complete survey conducted in 2004. Finally, the “Difference” column is the difference in coordinates between the 2004 surveyed coordinates, and the 2005 measured coordinates.

The coordinates are in the theodolite coordinate system, as described in the 1018 2005 Offsets and Measurements Document.

Because the differences in the 2004 surveyed position and the 2005 measured position were smaller than the required 3 cm position and the differences were likely due to the launch not being level, the 2004 surveyed positions were retained as the best positions in the CARIS Hips Vessel File for Launch 1018.

Patch Test:

Following the reinstallation of the transducer and the IMU, a patch test was conducted for Launch 1018. The first patch test was conducted on October 21, 2005 (DN 294), in the vicinity of Bradfield Canal, AK. The patch test data were collected by SST Abrams and ENS Martin, following the patch test procedures outlined in the main body of the 2005 1018 Vessel Report.

Raw ISIS XTF data was converted to CARIS HDCS format. Sound velocity and observed tides were applied upon conversion and the lines were “lightly” cleaned in CARIS swath mode to remove major data fliers. The patch test data were then reviewed in CARIS calibration mode independently by LT(jg) Higgins, SST Abrams, SST Froelich, and ST Keene to determine the biases.

During the processing, it became apparent that the patch test target was insufficient to determine pitch and heading biases. Only the roll bias could be determined from the patch test. The average of the roll values was retained as the best roll bias value.

In order to resolve the pitch and heading biases, another patch test was conducted on Launch 1018 on October 26, 2005 (DN 299) in the vicinity of Madan Bay in Eastern Passage, AK. The data were collected by ENS Gonsalves and SST Abrams.

The patch test data were processed in the same manner as on DN 294. ST Keene, SST Abrams, LT(jg) Higgins, and CST Morgan independently reviewed the data and determined pitch and heading biases. The average of the pitch values and the average of the heading values were used as the best bias values available.

Navigation timing latency was not tested, as the system configuration had not changed. Values from previous testing were retained. Table 3 indicates the values applied to the CARIS Hips Vessel File and their sources.

Table 3: Bias values

	Timing	Roll	Pitch	Heading
Value	-0.01	3.39	-0.16	0.36
Source	previous tests	DN 294 Test	DN 299 Test	DN 299 Test

The CARIS Hips Vessel File was updated with the values from Table 3 and dated to DN 293. The HVF was back dated because project data had been collected in the interim before the bias values were determined with finality.

POS MV GAMS Calibration:

POS MV GPS Azimuth Measurement Subsystem (GAMS) calibration occurred on October 21, 2005 (DN 294) In Bradfield Canal, AK. GAMS calibration was performed by SST Abrams and ENS Martin.

The GAMS heading calibration threshold was set to 0.300°. Launch 1018 was maneuvered in “figure 8’s” to lower the heading accuracy as much as possible. The best heading accuracy value achieved during this process was 0.028°. The vessel steadied up on a constant heading and GAMS calibration was requested. When the calibration was complete, the POS MV settings were saved to the file 1018_294_POSMV.nvm.

The detailed POS/MV Calibration Report, POS_cal_report_1018_294.xls, is located in Appendix III-1018-5.

Table 4 shows a summary of the calibration results.

Component	DN 294 Value
Number of Satellites	7
PDOP	2.041
Baseline Vector X	0.009 m
Baseline Vector Y	1.831 m
Baseline Vector Z	0.031 m
Two Antenna Separation	1.831 m
Heading Correction	0.000 °

Table 4: POS MV GAMS Calibration Results

Recommendations:

The patch test calibration results listed in table 3 of Addendum 3 dated on DN 293 should be used for launch 1018 until such a time or event warrants a new calibration.

The Optical Settlement and Squat delta draft values from March 13th, 2005 (DN 072) should be used until such a time or event warrants a new test.

The POS MV GAMS calibration results from October 21, 2005 (DN 294) should be used until such a time or event warrants a new calibration.

NOAA HYDROGRAPHIC SURVEY LAUNCH 1010
VESSEL REPORT 2005

Background

NOAA Hydrographic Survey Launch 1010 (Hull Registration Number 1010) is a 28 foot 10 inch aluminum survey launch designed by B. F. Jensen & Associates in 1973. Various vendors built a series of "Jensen" launches for NOAA in the mid 1970's to this general design and 1010 was the 10th in the series. It is considered a Qualified Class II Motorboat within the NOAA classification system and is operated within the parameters required for a vessel of this type.

In 2004, the hull, mechanical, electrical and mission systems underwent a modernization program that increased the performance and utility of the vessel. These upgrades include hull strengthening, increased scantlings to accommodate a larger engine and propeller, hard top, new electrical systems including a 6kW hydraulic generator and dive platform. Also added at this time was a new swing arm transducer mount for the Reson 8101ER multibeam echo sounder (MBES), designed by The Glosten Associates, Inc. All modifications were conducted within the constraints as defined by the NAO 217-103, Management of Small Boats, Section 6.03, Significant Alterations.

Tests were performed to determine the residual biases of the sensors and sonar system alignment and settlement and squat. Data were assessed in CARIS HIPS & SIPS v5.4 (SP 1, Hot Fixes 1-23) calibration and subset modes and applied to the HIPS Vessel File (HVF), 1010_8101.HVF.

Patch Test

Patch tests were performed with NOAA Launch 1010 in the vicinity of Ketchikan, AK (See *Figure 1*) on March 12 & 13 (DN 071 and DN 072). Data from both days were compared for system consistency by acquiring data on the same lines and comparing the results in CARIS HIPS Calibration. The patch test data was collected by ST Keene, ST Kellner, ENS French, PS Palmer, and ECO Rheinheimer.

Raw ISIS XTF data was converted to CARIS HDCS format. Sound velocity and observed tides were applied upon conversion and the lines were "lightly" cleaned in CARIS swath mode to remove major data fliers. The patch test data were then reviewed in CARIS calibration mode independently by CST Morgan, ST Keene, LT Wetzler, and PS Palmer to determine the biases.

The patch test acquisition and processing logs are located in Appendix III-1010-3.

Heading and Pitch

The heading and pitch bias patch tests were conducted in Tongass Narrows over a 50 meter by 10 meter wreck lying in an average depth of 42m and a least depth of 24m. The wreck is located at 55°19'56.21"N, 131°37'52.09"W (see *Figures 2 & 3*).

Heading

The heading bias was determined by acquiring data on two sets of parallel lines run in opposite directions. The pairs of lines were offset from the wreck 120m and 85m, respectively. Vessel speeds was 4-6 knots. Final values entered into the HVF were based on an average value between those involved.

Pitch

The procedure used to determine the pitch bias was to run one pair of coincident lines over the wreck in approximately 42m of water at the same speed in opposite directions. The lines were run between 4-6 knots. Final values entered into the HVF were based on a consensus value between those involved.

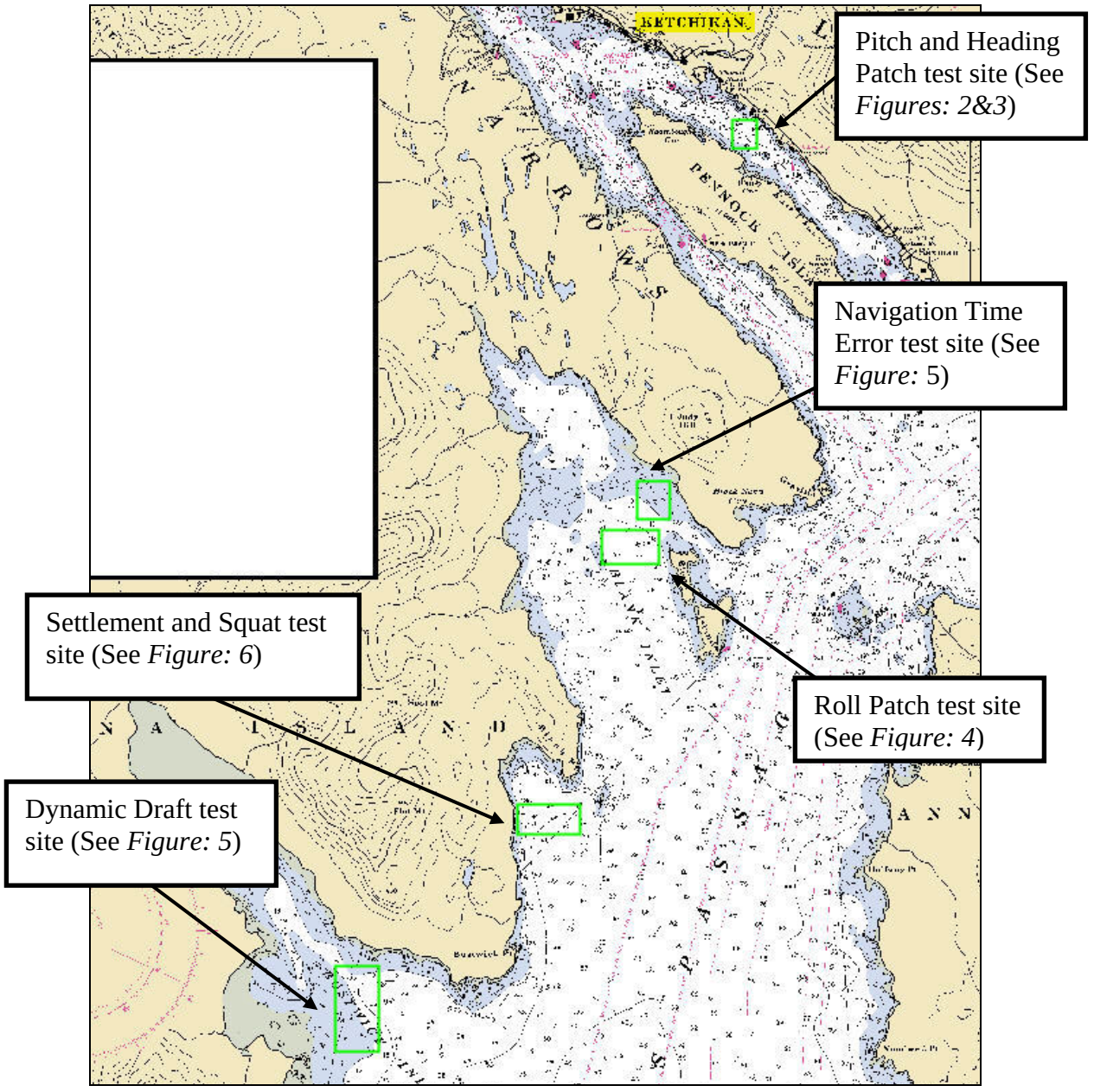


Figure 1: Test sites for Launch 1010.

Roll

The roll bias patch was conducted in Blank Inlet over a locally flat area in approximately 60m of water at location 55°16'45.46"N, 131°39'37.03"W (see *Figure 4*). Roll bias was determined by running one pair of coincident lines over the area at 6 knots in opposite directions. Final values entered into the HVF were based on a consensus value between those involved.

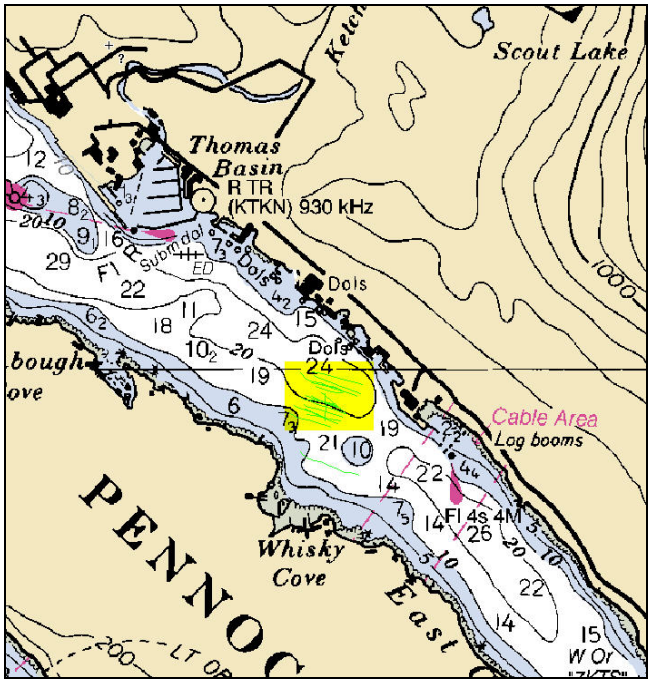


Figure 2: Heading and Pitch patch test site for Launch 1010.

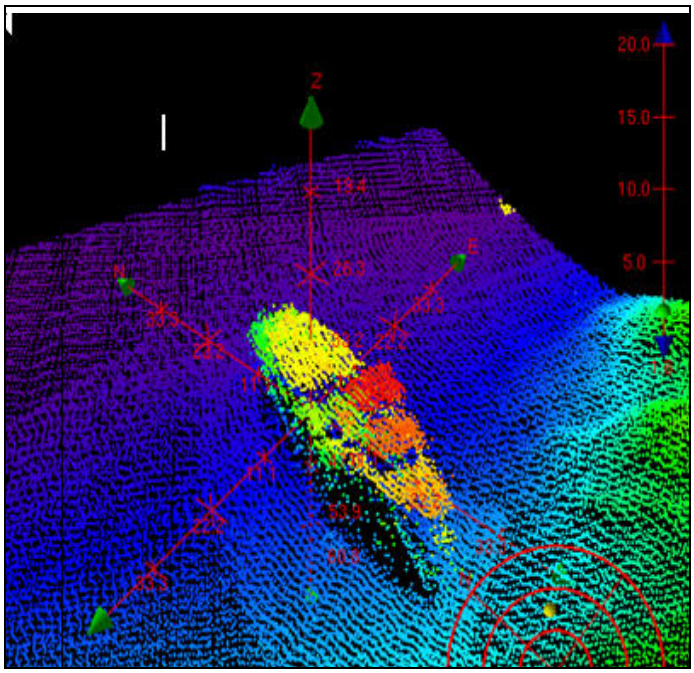


Figure 3: Wreck used for Heading and Pitch patch test site for Launch 1010.

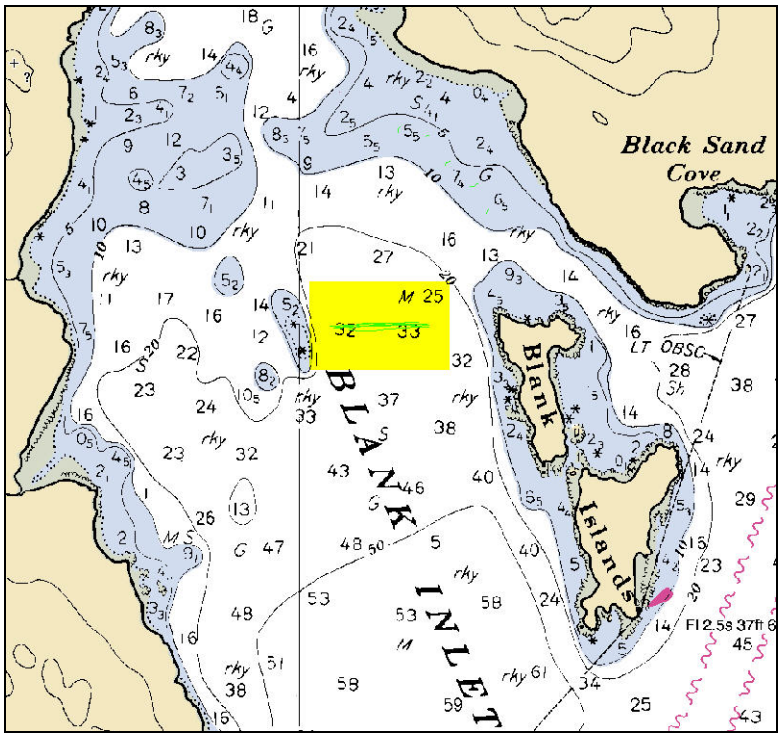


Figure 4: Roll patch test site for Launch 1010.

Navigation Time Error

The Navigation Time Error test was conducted on March 12, 2005 (DN 072) in Blank Inlet over a locally flat area at 55°17’11.72”N, 131°39’17.84”W (see *Figure 5*) in approximately 15 meters of water. The data were acquired using a different form of the Roll patch test method. Launch 1010 traveled at a constant speed and then quickly reduced speed and turned parallel to its own wake, thus forcing a roll. Final values entered into the HVF were based on a consensus value between those involved.

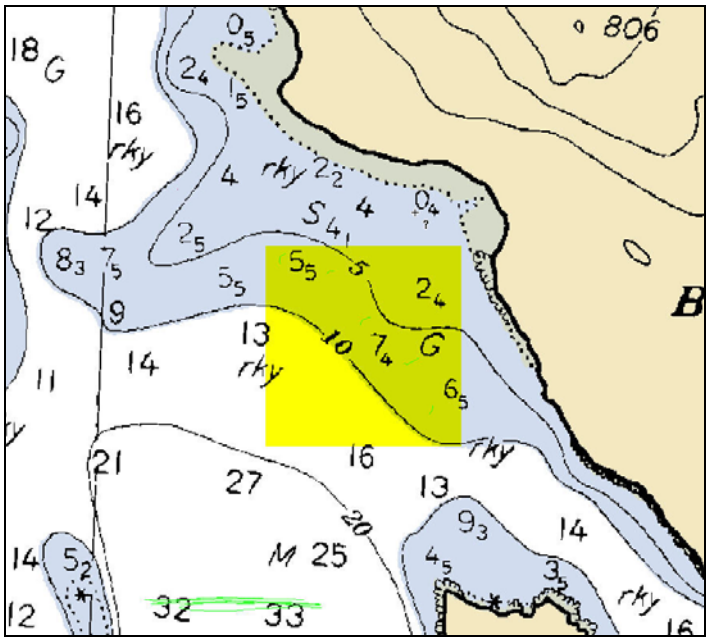


Figure 5: Navigation Time Error test site.

Patch Test Results

The results of the patch test for Launch 1010 are summarized in *Table 1*, below.

Patch Bias	Bias value
Navigation Time Error	0.01 sec
Pitch	0.00°
Roll	0.60°
Heading	0.40°

Table 1: Patch Test Bias Result

Optical Settlement and Squat Test

The Settlement and Squat test using the optical method was performed on March 13 (DN 072) in Blank Inlet at location 55°14’45.80”N, 131°40’58.58”W in approximately 40 m of water (see *Figure 6*). Data were collected by CST Morgan, ST Keene, AST Kellner, PS Palmer, and ECO Rheinheimer.

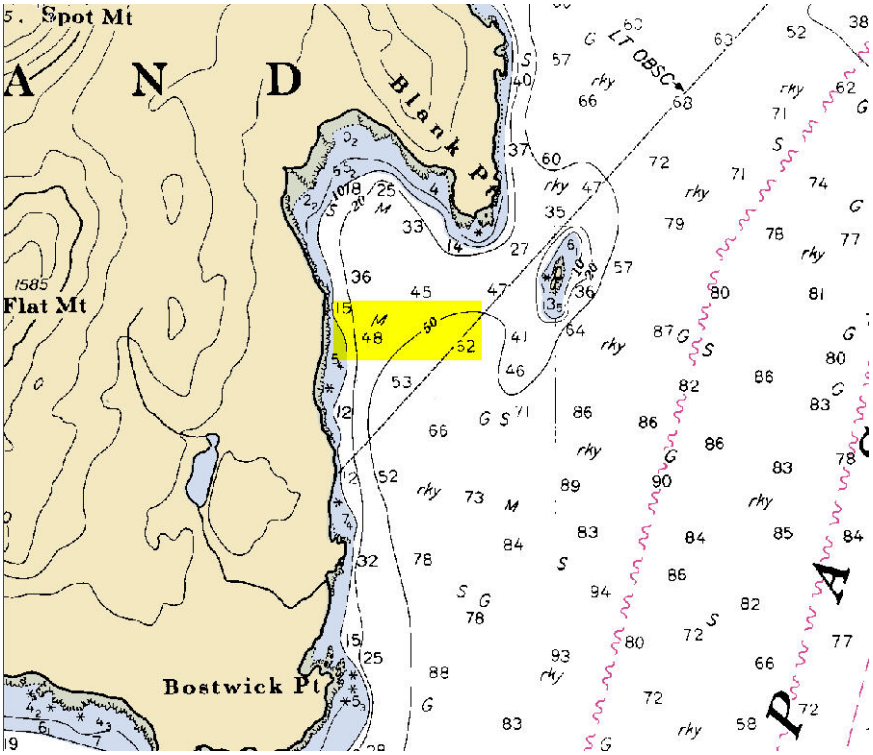


Figure 6: Settlement and Squat test site for Launch 1010.

Optical levels were used to determine settlement and squat biases. The procedure included setting up on shore a Zeiss NI2 333 stadia level and placing a graduated metric staff on top of Launch 1010's port side gas cap (see *Figures 7 & 8*). The settlement and squat data were acquired at seven different speeds: 5, 6, 7, 8, 9, 10, and 11 knots. Three different readings were taken for each of the seven speeds: one "at rest", one as the launch was moving away "at speed", and one as the launch was moving toward the shore team "at speed".

The computations and table of results are included in *1010_DDSSM Settlement and Squat* located in Appendix III-1010-4. The results are summarized in *Table 2*, below:

Average Speed (knots)	Delta Draft (m)
0.0	0.000
5.35	-0.01075
6.25	0.021
7.3	0.047
8.2	0.064
9.35	0.074
10.4	0.045
11.65	0.027

Table 2: Settlement and Squat Results

Figure 7: Settlement and Squat shore team using optical level.

Figure 8: Graduated metric staff on port side gas cap.

Dynamic Draft Settlement and Squat Method (DDSSM)

Due to an engine malfunction, the dynamic draft test was only partially collected on March 12 (DN 071). This data was not utilized for calibration. The full dynamic draft test was run on March 13 (DN 072). Lines were collected at location 55°13'11.17"N, 131°43'21.24"W in approximately 25m of water (see *Figure 9*). The dynamic draft data was collected by ST Keene, ST Kellner, ENS French, PS Palmer, and ECO Rheinheimer.

The procedure used to acquire data consisted of running one line four times in the same direction but at different speeds ranging from 5-11 knots. At three points along the line, data were collected with the engine in idle (referred to as dead in the water, DIW, in the dynamic draft acquisition and processing spreadsheet). However, line DIW1 was not used in processing because it was too far from the "at speed" lines to make a good comparison.

SVP and observed tides were applied in CARIS HIPS and lines were "lightly" cleaned in CARIS swath mode to remove major data fliers. The data were then processed by LT Wetzler, CST Morgan, ST Keene, and PS Palmer using the Dynamic Draft Settlement and Squat Method (DDSSM) as documented in the Draft Field Procedures Manual (January 2005).

Diversions from the FPM included also reviewing the lines in CARIS BASE Surface. These data were then processed in the same manner as the CARIS Subsets and compared to the Optical Settlement and Squat results by creating a scatter line chart in Microsoft Excel. Results were inconclusive because of too much variability and therefore the final delta draft values from the optical method were used. DDSSM results were saved to 1010_DDSSM Settlement and Squat.xls located in Appendix III-1010-4.

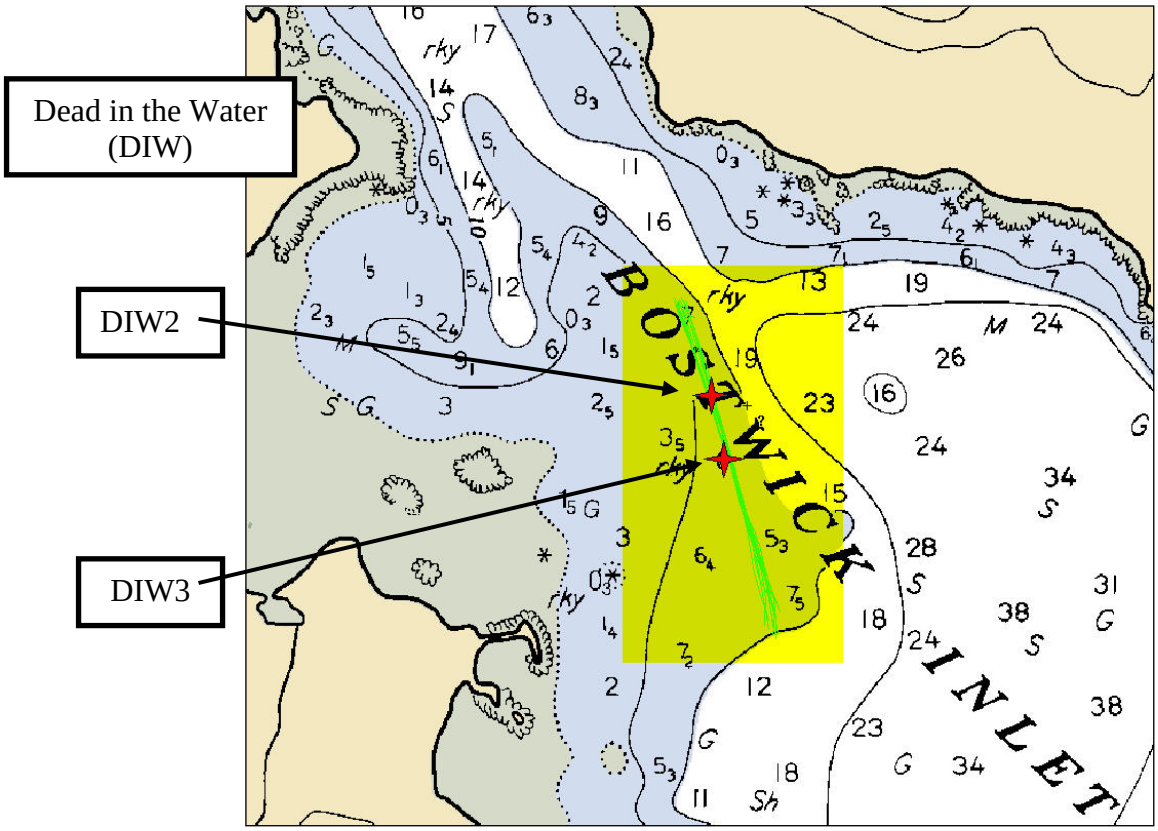


Figure 9: Dynamic Draft test site for Launch 1010.

POS/MV GAMS Calibration

POS/MV GPS Azimuth Measurement Subsystem (GAMS) calibration was performed on March 11 (DN 070) in Tongass Narrows (see *Figure 1*) by SST Froelich, ST Keene, and PS Palmer.

The GAMS heading calibration threshold was initially set to 0.300°. 1010 was maneuvered in figure eights to lower the heading accuracy as much as possible. The lowest heading accuracy value achieved during this process was 0.293°. The vessel steadied up on a constant heading and GAMS calibration was requested. The vessel failed to calibrate the first time for unknown reasons so a “forced calibration” was performed while the vessel was still steadied up. This worked and the calibration completed successfully. The POS/MV settings were then saved to the file 1010_070_posmv.nvm (see *Table 3*).

A second calibration was performed on March 27 (DN 086) in Madan Bay (see *Figure10*) after re-calculation of physical measurements and after replacing the POS/MV antennas and a connecting wire that had malfunctioned for unknown reasons. The GAMS calibration was performed by SST Abrams and ENS Gonsalves. The POS/MV settings were then saved to the file 1010_086_posmv.nvm (see *Table 3*).

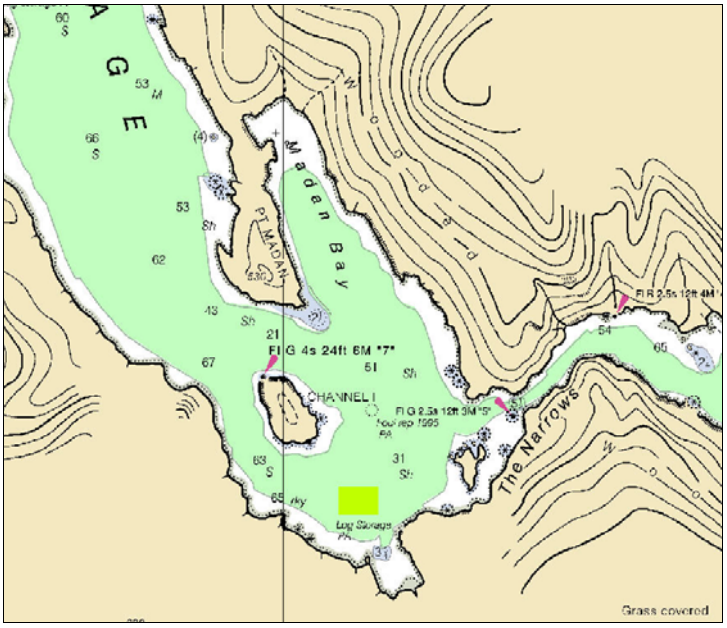


Figure 10: POS/MV GAMS Calibration test site DN 086

The detailed POS/MV Calibration Reports, *1010_070_POS_Calibration.xls* and *1010_086_POS_Calibration.xls*, are located in Appendix III-1010-5.

Component	DN 070 Value	DN 086 Value
Number of Satellites	8	9
PDOP	2.430	Unknown
Baseline Vector X	0.002 m	0.002
Baseline Vector Y	1.833 m	1.833
Baseline Vector Z	0.034 m	0.034
Two Antenna Separation	1.833 m	1.839
Heading Correction	0.000 °	0.000

Table 4: POS MV GAMS Calibration Results

Recommendations:

The patch test calibration results from March 12 & 13, 2005 (DN 071 & 072) should supersede prior bias determination values and should be used until such a time or event warrants a new calibration.

The Optical Settlement and Squat delta draft values from March 13, 2005 (DN 072) should be used until such a time or event warrants a new test.

The POS/MV GAMS calibration results from March 27, 2005 (DN 086) should be used until such a time or event warrants a new calibration.

ADDENDUM 1
NOAA HYDROGRAPHIC SURVEY LAUNCH 1010
VESSEL REPORT 2005

Background

Within a week of commencing acquisition, data from launch 1010 started to display signs of roll error. It is believed that, similar to launch 1018, the swing arm mount is not stable from day to day. Additional patch testing was conducted with NOAA launch 1010 in the vicinity of Wrangell Island, AK (see *Figure 11*) on numerous days by FAIRWEATHER personnel in the morning and evening.

The procedure was to conduct a patch test before survey operations, collect data, and then patch test in the evening. After processing the patch tests for the morning and evening, the HVF was then updated if necessary. Sounding data was merged using the updated HVF and then examined for internal consistency. Using this procedure, data meets IHO S-44 Order 1 specifications.

Tests were performed and data assessed as previously described, with differences noted below.

Additional Patch Test

Heading and Pitch

The heading and pitch bias patch tests were conducted in The Narrows (Eastern Passage) over a rock with a radius of 35 m, in an area with an average depth of 40 m, with a least depth of 25 m. The rock is located at 56°21’52”N, 132°06’53”W (as in *Figures 1 & 2*).

Heading

The heading bias was determined by acquiring data on two sets of parallel lines run in opposite directions.

Pitch

Pitch bias was determined by acquiring data on two pair of coincident lines directly over the rock at the same speed but in opposite directions.

Roll

The roll bias test was conducted in Madan Bay over a flat area in approximately 90 m of water at location 56°23’00”N, 132°09’21”W (see *Figure 4*). Roll bias was determined by running pairs of coincident lines over the area in opposite directions. On some testing days, the roll lines were not acquired and the pitch lines were extended to include a flat area and used to determine the roll biases.

Navigation Time Error

No additional Navigation Time Error testing was performed. Final values entered into the HVF are based on previous test results.

For all tests raw Reson XTF data were converted to CARIS HDCS format. Sound velocity and predicted tides were applied upon conversion and the lines were not cleaned or only “lightly” cleaned in CARIS swath mode to remove major data fliers.

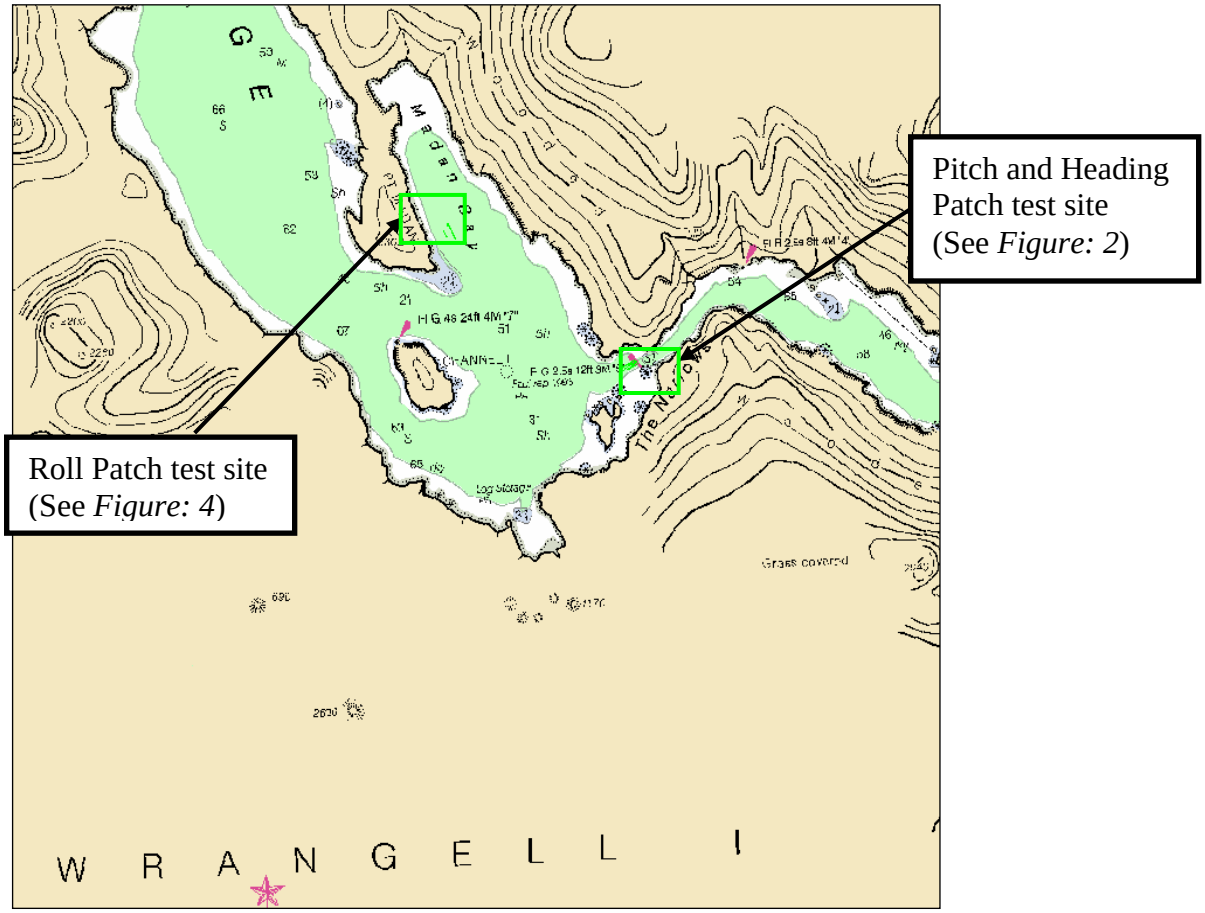


Figure 11: Test Sites for launch 1010.

Patch Test Results

The results of three days of morning and evening patch testing are reported in *Table 5*, below.

Patch Bias	DN 096 AM Bias	DN 096 PM Bias	DN 097 AM Bias	DN 097 PM Bias	DN 098 AM Bias	DN 098 PM1Bias	DN 098 PM2Bias
Pitch	-0.76°	-0.72°	-0.17°	-0.76°	-0.34°		
Roll	0.54°	0.71°	0.74°	0.76°	0.72°	0.74°	0.78°
Heading	0.42°	0.40°	0.51°	0.6°	0.45°		

Table 5: Patch Test Bias Results

Patch Test Bias values used for data processing

The bias values used in the HVF file for daily data processing during the three days of testing (corresponding with the days included in Table 5) are shown in *Table 6*.

HVF Patch Bias Values	DN 096 HVF Bias	DN 097 HVF Bias	DN 098 – DN099 AM HVF Bias
Time Error	-0.01 sec	-0.01 sec	-0.01 sec
Pitch	-0.7°	-0.17°	-0.34°
Roll	0.7°	0.75°	0.74°
Heading	0.4°	0.56°	0.45°

Table 6: Bias Values Used in HVF for Data Processing

Modifications and Additional Testing

Modifications continued, in order to remedy the day to day fluctuations in biases. On DN 098, launch 1010 modifications consisted of the pin no longer being used as the locking mechanism for the arm, the arm being ground down, and a ratcheting tie down strap employed to hold the deployment lever arm in position. These modifications were made to ensure that the swing arm mount would rest on the stop under the hull when fully deployed (see Figure 12).

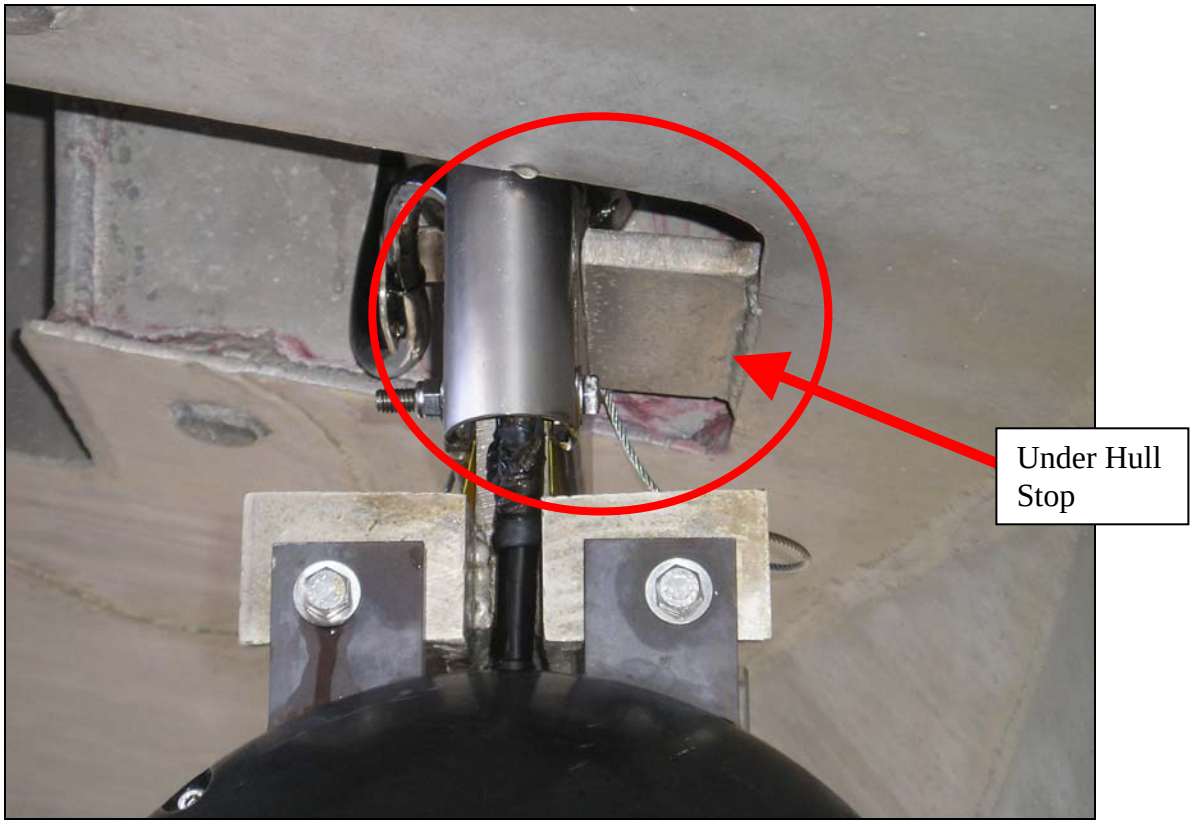


Figure 12: Launch 1010 swing arm mount against hull stop.

A new drill hole, for the tie down strap to anchor to, was bolted to the frame of launch 1010 on DN 101 (See Figure 13 & 14).

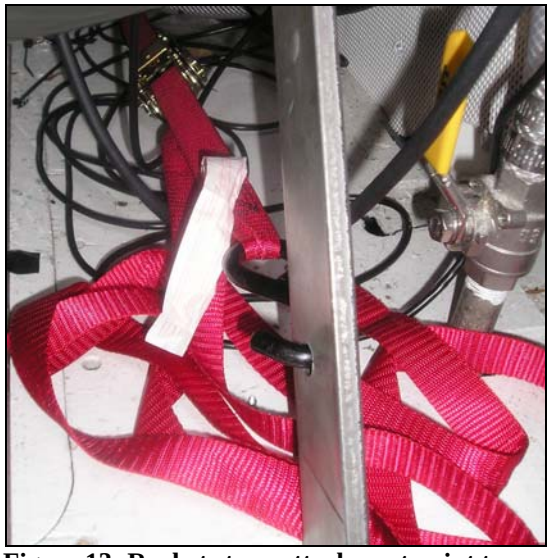


Figure 13: Rachet strap attachment point to arm.

Figure 14: Rachet strap attachment point to hull.

Patch Test Results

The results of four days of morning and evening patch testing are reported in *Table 7*, below.

Patch Bias	DN 099 AM Bias	DN 099 PM Bias	DN 100 AM1 Bias	DN 100 AM2 Bias	DN 101 AM Bias	DN 101 PM Bias	DN 102 AM Bias	DN 102 PM Bias
Pitch	0.0°	-0.30°	-0.40°	-0.35°	-0.35°	-0.35°	-0.33°	-0.2°
Roll	0.74°	1.06°	1.06°	1.05°	1.09°	1.11°	1.06°	1.08°
Heading	0.45°	0.45°	0.55°	0.48°	0.35°	0.35°	0.30°	0.30°

Table 7: Patch Test Bias Results

Patch Test Bias values used for data processing

The bias values in the HVF file, used for daily data processing afternoon lines run on Dn 099 and the values used for data on and after DN 100, are shown in *Table 6*.

HVF Patch Bias Values	DN 099 PM HVF Biases	DN 100 - HVF Biases
Time Error	-0.01 sec	-0.01 sec
Pitch	-0.30°	-0.35°
Roll	1.06°	1.09°
Heading	0.45°	0.4°

Table 8: Patch Test HVF Bias Values

Patch test processing logs are located in Appendix III-1018-3.

Recommendations:

The patch test calibration results, which should be used for processing the data on various days prior to DN 100, are listed in tables 6 and 8.

The patch test calibration results listed in table 8 for DN 100 should be used for launch 1010 until such a time or event warrants a new calibration.

The Optical Settlement and Squat delta draft values from March 13th, 2005 (DN 072) should be used until such a time or event warrants a new test.

The POS MV GAMS calibration results from March 27th (DN 086) should be used until such a time or event warrants a new calibration.

Future Modifications Planned:

At the present time, installation of a dog-type latching mechanism is planned for launch 1010. The latch will be installed to permanently replace the ratcheting tie down strap and ensure the swing arm mount is stable and firmly up against the under hull stop.

ADDENDUM 2
NOAA HYDROGRAPHIC SURVEY LAUNCH 1010
VESSEL REPORT 2005

Background:

Launch 1010's swing arm mount was stabilized by utilizing a ratcheting tie down strap to ensure that the swing arm was stable and firmly up against the under hull stop. From testing discussed in Addendum 1 of this report and examination of data through October 4, 2005 (DN 277) it is apparent that this solution works in most instances. Future modifications of a swing arm placement indicator are under development.

A drawback of the swing arm mount occurs when the mount is lowered and debris can be caught between the swing arm and the under hull stop. This changes the roll bias for the system and it is apparent in the data.

Roll:

The roll value for Launch 1010 was affected by debris trapped between the swing arm and the under hull stop. During final processing the data was found to exhibit a roll which was not consistent with the current HVF value.

On August 27th (DN 239) roll bias issues were detected and affected all lines for the day. The data were examined by the Chief Survey Technician and a roll bias was determined utilizing the acquired data in the CARIS HIPS/SIPS 5.4 Calibration routine. The calculated roll biases were then entered into the .HVF for launch 1010. Roll biases were then returned to the base value of 1.090 from DN100 in a DN 240 entry. Figure 1 shows the values in the HVF for Swath 1 on Launch 1010.

11	2005-100	00:00	-0.010	0.263	-0.150	0.546	-0.350	1.090	0.400	Reson	Reson SeaBat 8101		Avg of Dn 100 & 101 Patch tests
12	2005-239	15:00	-0.010	0.263	-0.150	0.546	-0.350	0.260	0.400	Reson	Reson SeaBat 8101		Roll error adjustment for H11498
13	2005-240	02:00	-0.010	0.263	-0.150	0.546	-0.350	1.090	0.400	Reson	Reson SeaBat 8101		Back to Dn 100 Patch test values

Figure 1: Screen grab of HVF Swath 1 settings on Launch 1010

Data from August 27th were remerged using the updated .HVF and were examined by the Survey manager and Chief Survey Technician. Data were found to meet or exceed the requirements in *NOS Hydrographic Surveys Specifications and Deliverables*, as updated for March, 2003.

Recommendations:

Roll bias results for August 27th DN 239 should be used for processing data on that respective day only. Only sheet H11498 is affected by this issue.

The patch test calibration results listed in table 8 for DN 100 should be used for launch 1010 from DN 240 on, until such a time or event warrants a new calibration.

The Optical Settlement and Squat delta draft values from March 13th, 2005 (DN 072) should be used until such a time or event warrants a new test.

The POS MV GAMS calibration results from March 27th (DN 086) should be used until such a time or event warrants a new calibration.

ADDENDUM 3
NOAA HYDROGRAPHIC SURVEY LAUNCH 1010
VESSEL REPORT 2005

Background

After completion of project OPR-P158-FA in Orca Bay, AK, the hull mounted Reson 8101 was removed from Launch 1010 in order to strengthen the welds to the mount. Once the transducer was reinstalled, a patch test was performed near Ketchikan, AK on October 4, 2005 (DN 277), with additional heading lines acquired on October 5, 2005 (DN 278). Refer to *Figures 1* through *4* in the main report for patch testing sites.

Raw Reson XTF data were converted to CARIS HDCS format. Sound velocity correctors and zero tides were applied upon conversion and the lines were only "lightly" cleaned in CARIS swath mode to remove major data fliers.

Additionally, because the transducer was removed and reinstalled, it was necessary to measure the offsets to the transducer to ensure its position hadn't changed.

Additional Patch Test

Heading and Pitch

The heading and pitch bias patch tests were conducted in Tongass Narrows over a 50 meter by 10 meter wreck lying in an average depth of 42m and a least depth of 24m. The wreck is located at 55°19'56.21"N, 131°37'52.09"W (see *Figures 2 & 3*).

Heading

The heading bias was determined by acquiring data in two sets of parallel lines run in opposite directions. One set of lines was acquired on DN 277, with an additional pair run on DN 278. The pairs of lines were offset from the wreck 115m and 80m, respectively. Vessel speed was approximately 7.0 knots. Final values entered into the HVF were based on an average value between those involved, with the exception of SST Froelich, who was unable to determine a heading offset value in CARIS Calibration Editor.

Pitch

The procedure used to determine the pitch bias was to run one pair of coincident lines over the wreck in approximately 42m of water at the same speed in opposite directions. The lines were run at approximately 7.5 knots. Final values entered into the HVF were based on an average value between those involved.

Roll

The roll bias patch was conducted in Blank Inlet over a locally flat area in approximately 60m of water at location 55°16'45.46"N, 131°39'37.03"W (see *Figure 4*). Roll bias was determined by running one pair of coincident lines over the area at 7.2 knots in opposite directions. Final values entered into the HVF were based on an average value between those involved.

Navigation Time Error

No additional Navigation Time Error testing was performed. Final values entered into the HVF are based on previous test results.

Standard Deviations

In the Launch 1010 .hvf, the “MRU Align StdDev Gyro” and “MRU Align StdDev Roll/Pitch” were previously defined as 0.000, because these values were unknown and undocumented in the CARIS Vessel Editor Help Manual. According to Brian Calder of UNH, these error values are defined as the standard deviation of the bias values from all individuals evaluating the patch test data.

The value entered in the .hvf for the “MRU Align StdDev Gyro” field was calculated from the standard deviation of all Heading bias estimates.

The standard deviation of the roll bias estimates was averaged with the standard deviation of the pitch bias estimates to obtain a single value to be entered in the .hvf “MRU Align StdDev Roll/Pitch” field.

Patch Test Results

The results of the patch test for Launch 1010 are summarized in *Table 1*, below.

Patch Bias	Bias value
Pitch	-0.80°
Roll	0.91°
Heading	0.65°
MRU Align StdDev Gyro	0.11
MRU Align StdDev Roll/Pitch	0.11

Table 1: Patch Test Bias Results

Offsets:

Launch 1010 was initially leveled and a full survey was conducted by NOAA personnel in 2004. The full survey included several benchmarks welded to the launch, the GPS antennas, the phase center of the transducer, and the IMU. Coordinates for all of these items were determined and recorded in the 1010 Offsets and Measurements Spreadsheets as an appendix in the *NOAA Ship FAIRWEATHER Hydrographic Systems Certification Report 2005.*

The distances in three dimensions from the phase center of the transducer to the nearest benchmark, benchmark H, were measured. From these measurements, the coordinates of the phase center were calculated to determine if the coordinates had changed when the transducer was removed and reinstalled.

The measurements were taken with a steel tape to the nearest millimeter while Launch 1010 was secured in its davit. The Launch does not sit level in the davit; however, the distance between the phase center of the transducer and the benchmarks is sufficiently small, that a small incline of the vessel will not cause a significant error in the measurement.

Table 2 displays the measured values and calculations of the coordinates.

Table 2: Calculating measured coordinates of the phase center of the transducer

	BM H Coordinates	Measured Distance from H to Phase Center (m)	Phase Center Measured Coordinates (2005)	Phase Center 2004 Survey Coordinates	Difference (m)
x	3.271	0.113	3.384	3.365	**0.019**
y	0.426	-0.160	0.266	0.273	**-0.007**
z	-1.377	-0.349	-1.726	-1.729	**0.003**

The “BM H Coordinates” column is the surveyed position of the benchmarks closest to the phase center of the transducer. The “Measured Distance” column is the distance measured with steel tape between the benchmark and the phase center of the transducer. The “Measured Coordinates” column describes the coordinates of the transducer as determined by the measurements taken. The “2004 Survey Coordinates” were the originally surveyed in coordinates based on the complete survey conducted in 2004. Finally, the “Difference” column is the difference in coordinates between the 2004 surveyed coordinates, and the 2005 measured coordinates.

The coordinates are in the theodolite coordinate system, as described in the 1010 2005 Offsets and Measurements Document.

Offsets to equipment are required to be known within 3 cm for the functionality of the Applanix POS M/V, version 3, installed on Launch 1010.

Because the differences in the 2004 surveyed position and the 2005 measured position were smaller than the required 3 cm position and the differences were likely due to the launch not being level, the 2004 surveyed positions are the best positions for use in the CARIS Hips Vessel File for Launch 1010.

Recommendations:

The patch test calibration results from October 4 & 5, 2005 (DN 277 & 278) should supersede prior bias determination values and should be used until such a time or event warrants a new calibration. Values are entered under Dn 277 in the 1010_8101.hvf.

TPE values – StdDev row three should supersede prior TPE standard deviation values, so that the new “MRU Align StdDev Gyro” and “MRU Align StdDev Roll/Pitch” values are included. All other TPE values should remain the same.

The offset values from the 2004 survey should be retained as the most accurate position, as there is no indication the equipment has moved, and the measured values contain a known slight error from the launch not being level when the measurements were taken.

ADDENDUM 4
NOAA HYDROGRAPHIC SURVEY LAUNCH 1010
VESSEL REPORT 2005

Background

On October 24, 2005 (DN 297), Launch 1010 was conducting multibeam acquisition on project OPR-O119-FA-05, survey H11507. During the course of the day, the key way on the transducer arm, which connects the swing arm to the transducer mount, gave way. This failure caused severe roll bias in the data, and resulted in the transducer not being able to be raised.

Manual examination of the data in CARIS subset mode allowed the exact time of the key way failure to be determined (it occurred when the transducer was raised, the vessel transited, and the transducer was lowered again). The data on DN 297 following the failure was rejected and recollected.

The key way was repaired on board the FAIRWEATHER, and Launch 1010 was patch tested on October 26, 2005 (DN 299).

Additional Patch Test

The patch test data was collected in the vicinity of Madan Bay in Eastern Passage, AK by ST Kellner and PS Herzog. The procedure as outlined in Addendum 2 was followed.

The patch test was independently analyzed in CARIS Hips Calibration mode by SST Froelich, SST Abrams, LT(jg) Higgins, and ST Keene.

Patch Test Results

The results of the patch test for Launch 1010 on October 26 are summarized in *Table 1*, below.

Patch Bias	Bias value
Pitch	-0.69°
Roll	3.08°
Heading	0.42°
MRU Align StdDev Gyro	0.26
MRU Align StdDev Roll/Pitch	0.09

Table 1: Patch Test Bias Results

All of the bias values are based on averages of the evaluators. Navigation time latency was not calculated because the system configuration did not change.

Roll Issues:

Data was collected on DN 299 and DN 300 and an HVF based on the above patch test results were applied. However, further examination of the transducer swing arm revealed that although the transducer rested against the hull stop, there was some play in the transducer swing arm. After this was determined, data collection with Launch 1010 was discontinued for the remaining few days of the 2005 field season.

Recommendations:

The patch test calibration results from October 26, 2005 (DN 299) should supersede prior bias determination values and should be used for data collected after that date.

The data collected on and following DN 299 has been examined and meets NOS specifications. However, because there was still some doubt regarding the stability of the transducer arm, Launch 1010 was removed from surveying status until the keyway issue can be resolved during the winter import repair period.

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

23 May 2005

MEMORANDUM FOR: W. Michael Gibson
Chief, Hydrographic Surveys Division

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

FROM: For Megan Palmer
Physical Scientist

Shyla Allen
Physical Scientist

Lieutenant Mark Van Waes, NOAA
HSTP Field Support Liaison, Pacific

SUBJECT: System Certification Recommendation - Revised
NOAA Ship FAIRWEATHER (S220)

The purpose of this memorandum is to make recommendations for the certification of hydrographic survey systems aboard NOAA Ship FAIRWEATHER and her survey launches. These recommendations are based on review of the *2005 FAIRWEATHER System Certification Report*, *2005 FAIRWEATHER Systems Certification Memorandum,* and supplemental correspondence[i]. This memorandum has been revised following a conference call with FAIRWEATHER, Pacific Hydrographic Branch, and HSTP personnel on 13 May, 2005.

Certification status summary (as of 19 April 2005):

The following systems are **recommended** for certification:

FAIRWEATHER (S220) – Reson 8111

The following systems are **recommended (with qualification)** for certification:

Launch 1010 – Reson 8101ER
Launch 1018 – Reson 8101ER

The following system is **not recommended** for certification:

FAIRWEATHER (S220) – Reson 8160

Discussion and Qualifications

FAIRWEATHER's hull-mounted Reson 8111 has been properly configured and tested. FAIRWEATHER personnel have demonstrated that the system is capable of meeting Office of Coast Survey requirements for acquiring hydrographic survey data. Subsequent to the submission of the System Certification Report, the ship's Dynamic Draft Settlement and Squat data has been processed. It will be documented in 2005 Data Acquisition and Processing Reports.

The Reson 8101ER systems aboard launches 1010 and 1018 are recommended for certification with qualification. Earlier stability issues with the transducer mounts on Launches 1010 and 1018 were documented in the System Certification Report. Temporary corrective action has stabilized the transducer arm (see Attachment 1 of this memorandum). Per this email correspondence from FAIRWEATHER, more frequent patch testing is planned to confirm the stability of the mount. PHB requests all patch test data be submitted with Data Acquisition and Processing Reports throughout the 2005 field season.

A patch test for FAIRWEATHER's Reson 8160 sonar system has not been conducted. Until such time as a patch test can be conducted and the biases verified, it should not be used to acquire survey data.

The following issues *do not warrant denial of certification for any system*, but may impact the ship's ability to meet programmatic requirements. They are highlighted here to bring them to the attention of OCS management for discussion with NMAO.

- **Davits.** Two of FAIRWEATHER's four survey launch davits are not functional, and the remaining two davits are only partially operational (in manual mode). Until all davits reliably operate per manufacturer specifications, there exists potential for negative impact on survey operations.

- **Survey Launches.** Though not specifically mentioned in the System Certification Report, FAIRWEATHER is currently sailing at half of its survey launch capacity. The addition of two survey launches will increase production capabilities.

- **Horizontal Control Equipment.** Equipment lost during the 2004 field season should be replaced prior to commencement of OPR-P183 on the Alaska Peninsula, scheduled for early June, as local DGPS correctors will be required for this project. Replacement gear is required for a complete DGPS "fly-away" station, as well as for replacement of static survey equipment.

- **Moving Vessel Profiler.** The MVP requires additional hardware in order to enable the bottom-detect functionality and operate in fully automatic mode. Currently it is only able to operate in a maximum-depth limit mode. As is, the system is meeting current operational requirements, and has proven to be a boon to efficiency. Once the

additional hardware is installed, the full capabilities of the MVP system will be available.

- **Engineering Department Staffing.** Survey operations have already been impacted this season due to staffing issues. Action is required at the appropriate levels to minimize the impact on operations due to staffing shortfalls.

Documentation

Modifications or changes that affect the certification status of the sonar systems aboard FAIRWEATHER will be documented in 2005 Data Acquisition and Processing Reports; the full system certification report does not need to be resubmitted this year.

Attachments

cc: Chief HSD Operations Branch N/CS31
Chief HSTP N/CS11
Commanding Officer, NOAA Ship FAIRWEATHER MOC-P/FA

[i] Lowell, J., *MBES Deployment Arm*, email to Stephen Curry, 24 April, 2005 (See Attachment 1).
Wetzler, M., *System cert and other questions,* email to Mark Van Waes, 28 April 2005 (See Attachment 2)

Attachment 1

Subject: Re: MBES Deployment Arm
Date: Sun, 24 Apr 2005 11:48:23 -0700
From:co fairweather <co.fairweather@noaa.gov>
To: Stephen P Currie <Stephen.P.Currie@noaa.gov>

Not sure is everyone was notified, but after weeks of testing and twice a day patch tests, the arm is stable. Pls see our system certification report for photos and additional details.

The Glostin design needs to rest against the under hull stop.
Unfortunately, during the fabrication, installation, redesign etc., this key component was overlooked. The transducer must be hard against the under hull stop. No other resting position is acceptable. Do not secure the arm in the down position with a pin or topside hard
point. Cut away any obstructions to the interior arm and use pressure to hold the arm against the under hull stop. We cut wood decking and ground down the interior arm where it impacted the curved housing. It took us several attempts to get all the interference points identified and eliminated, they may not be obvious. Once all interference has been eliminated, simply secure it in place.

You can dbl. ck the hard rest by placing paper between the transducer arm and the stop. Shove hard and see if the paper can be removed.

We are using a ratchet strap to hold the arm down. Pressure variation
testing was done by conducting three patch tests, one at the normal
"secure" pressure, and two more, each with an additional cranking on the strap. No change to the orientation. The bottom line is once it is in place, it is in place. Getting it there turned to be more trouble that thought.

The permanent solution will be crafted shortly for our vessels, until
then, we are ratcheting. The TJ units look like they will have a dog
installed, this should work fine, but dbl., no, triple check the
fabrication and "as built" configuration. Hydraulic ram would be neat.

Our plan is to conduct more frequent patch tests, interval TBD. Just in case.

later, johnl

Attachment 2

-------- Original Message --------
Subject: Re: System cert and other questions
Date: Thu, 28 Apr 2005 10:58:37 -0800
From:foo fairweather <foo.fairweather@noaa.gov>

To: Mark VanWaes <Mark.Vanwaes@noaa.gov>

Mark,
The best number to get us on is the Iridum number of 011 8816 7631 0054. Things are running fair, but there are our share of issues also. We have installed a tide gauge at CD, but it is transmitting intermittently.
Replies:
System Cert.
TH was applied to all vessels for patch testing.
The 3 mm was reported by the POS, not measured.
The sever vertical offset of 4.7m was an error. I think that Megan misspoke in the 1018 vessel report. The problem with DN 72 is that the tide is not applied when she produced the vessel report. Tides were applied (I looked at the data and it was fine) but then the tides were lost or zero tides were reapplied at some point. Ignore that issue.
CeeDucer
The Ceeducer system electronics corroded. The Ceeducer came with Doug Baird from the Nav Manager position. If we could get another Ceeducer system that would be beneficial for shoreline work.
GPS Gear
Would like to look at purchasing new systems. For compatibility reasons I would like the Ashtech Z-Xtremes. The report of the loss of the base station is sent in a separate Email. Please keep it internal.
It would also be nice to have the pacific crest base station and receivers for the possibility of setting up more flyaways.
I will also send another Email listing the lost gear.
Mark

Mark VanWaes wrote:
Mark,
I tried calling but wasn't able to get through on any of your lines. I see from your SEAS reporting that you're tucked away up above Lemon Pt. Hope the weather is agreeing with you. Have you tried to install another tide guage at CD yet?
I have a bunch of questions for you. They cover several topics, so I've broken them down. Here goes:
System Certification
- In the vessel reports you specifically stated that TrueHeave was applied for patching S220, but not 1010 or 1018. Was TH applied for those and just not specifically noted?
- On 1010, in the GAMS calibration section, after replacing the antennas the antenna separation changed by 3mm. a) why was this, and b) was this difference measured, or reported by the POS?
- Also on 1010, what happened to the antennas that caused them to be replaced?
- On 1018, you documented a severe vertical offset. Some amount of that can certainly be attributed to predicted/preliminary tides, but 4.7m? Any further thoughts as to the cause of this?
Ceeducer
- A while ago Lynn asked me to look into a replacement for your Ceeducer system. I asked her for some supporting information, but received no response. I'd like to know what happened to the system, how it happened, whether repair has been considered, and what the requirements are of a replacement system. If there is an inherent flaw with the Ceeducers, we need to know so that the issue can be addressed. There are two identical systems to yours here, one is PHB's and one is HSTP's. I may be able to get you one of them if that would suffice.
DGPS/HORCON

- The news that the DGPS fly-away station was destroyed was a surprise to Gerd at FPW. He would like more details on what happened than I've been able go give. Was there a report written about the incident? I seem to recall Grant working on something. If so, to whom was it sent, and could you send me a copy?

- What are the specifics of the fly-away setup? Do you have complete specs, system diagrams, etc. to facilitate a replacement? Who put that together in the first place (I'm assuming it wasn't completely off-the-shelf)? Could you send me any documentation you have on it?

- As I understand it, you are down to one complete Ashtech Z-Xtreme setup for static survey. That being the case you need at least one (preferably two) units to replace the two that were lost in the landslide, correct? Why was it that there were two of the receivers at the fly-away station again? I was there to help set up, but I didn't get into how the system was configured.

That's it for now. You should be hearing from Shyla and myself regarding the system cert soon. We're working on the memo now. Hope things are going well.

Mark

--

LT Mark Van Waes, NOAA
NOAA Coast Survey Development Lab, HSTP-West
c/o Pacific Hydrographic Branch
7600 Sand Point Way NE, Building 3
Seattle, WA 98115
206-526-6891 (voice)
206-526-4514 (fax)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Coast Survey
Silver Spring, Maryland 20910-3282

24 August 2005

MEMORANDUM FOR: Commander John Lowell, NOAA
Commanding Officer, NOAA Ship FAIRWEATHER

FROM: W. Michael Gibson
Chief, Hydrographic Surveys Division

THROUGH: Captain Roger L. Parsons, NOAA
Director

SUBJECT: Systems Certification Recommendation Approval

Following extensive review of your System Certification Report and accompanying documentation I approve your recommendation for readiness. Data acquisition should continue as normal at the discretion of the Lead Hydrographer.

The fact that this approval comes at this late date should not be interpreted to mean that the System Certification process is unimportant or that your extensive effort in this process is unappreciated. Review of a field unit's systems and personnel readiness is vital for ensuring that we are able to collect the highest quality data possible while operating safely and efficiently. The diligent effort of your crew and program representatives to fully and accurately evaluate your platform's state of readiness was highly evident in your System Certification Report and accompanying documentation.

The pre-season systems review was never intended to be as burdensome on the fleet as it was at the beginning of the 2005 field season. In future years the Systems Certification concept will evolve into a simplified Systems Readiness Review, which, with adequate preparation, will be completed in a matter of days with minimized reporting requirements. The new report will likely be composed of a systems readiness checklist with descriptions of specific deficiencies. This will reduce the workload of the Survey Department and facilitate a rapid review and response from Chief, HSD.

A detailed explanation of the revised System Readiness reporting process will be provided in Chapter 1 of the upcoming version of the Field Procedures Manual which will be made available prior to the January 2006 Field Procedures Workshop. Comments and recommendations regarding the System Readiness Review process should be directed to your Field Procedures Manual liaison, Physical Scientist Peter Holmberg, at the Pacific Hydrographic Branch.

cc: Chief, Operations Branch
Chief, HSTP
Chief, Pacific Hydrographic Branch
PS Shyla Allen
PS Megan Palmer
LT Ben Evans
LTJG Mark VanWaes
FOO, FAIRWEATHER

SeaBat 8111 Noise Analysis

1.0 Overview

For mid and deep water sonar systems, noise emanating from the vessel on which the sonar is mounted is a major determinant in the performance of the sonar. In addition to sources such as echosounders and other acoustic devices, such as doppler logs, mechanical noise from the engines and drive trains, and flow noise will also affect performance, with the magnitude of the noise varying with vessel speed.

This document describes the noise analysis test done on the RESON SeaBat 8111 installed on the NOAA S/V Fairweather, on 11 October 2004.

2.0 Test Conduct

The following is a description of the system setup and test protocol used to test the SeaBat 8111 multibeam sonar.

2.1 Sonar Setup

To determine the amount of in-band noise seen by the sonar, the system was configured as follows:

Setting	Value
Power	Off
Gain	Manual Fixed 20
Range	100 meters

Data collection was done using a RESON engineering utility, which collects the full amplitude and phase time series data from the sonar. Figure 1 shows a sample screen capture, in this case one of the data sets taken at six knots, with a shaft speed of 140 RPM. At least ten (10) collections were done for each test case, and the results for first 10 measurements each test case were averaged for the report.

2.2 Vessel Operation

Normal survey speed for the vessel is approximately 10 knots. To bracket this range, and to check at possible lower survey speeds, the test protocol was defined to cover the range of 2 to 12 knots, in 2 knot steps. The tests were conducted at shaft speeds of 120 to 170 RPM, in 10 RPM steps, with the speed adjusted by changing the pitch on the propellers. For each RPM value, the speeds that could be achieved at that shaft speed were tested. A log of data collections for the tests is provided in Appendix A.

All the underway data collections were done in water depths of 120 to 160 fathoms. The zero speed data collections, with the engines on, were done at anchor in about 30 meters of water, and out in the bay, at water depths of about 130 fathoms.

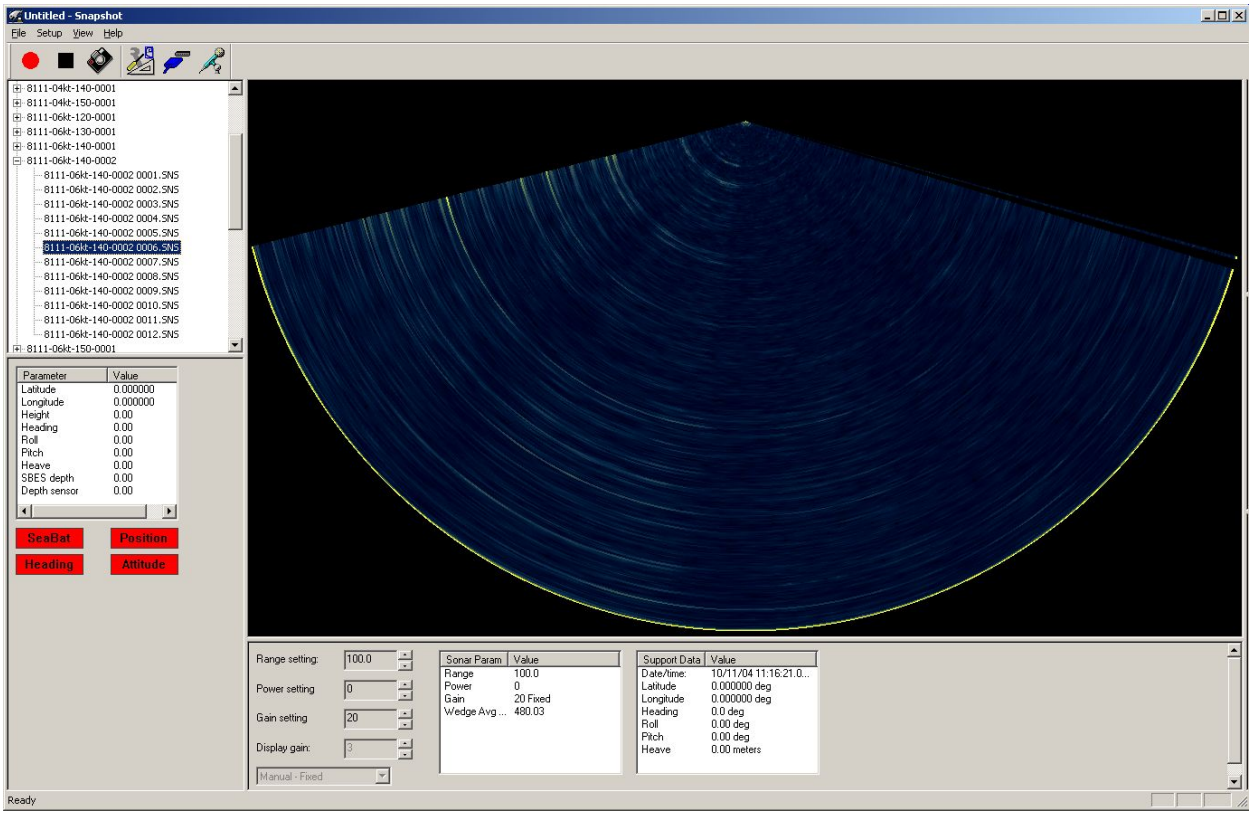


Figure 1 - Snapshot Utility Screen Capture

2.3 Data Analysis

The data from each of the test cases were collated in an Excel spreadsheet, shown in Appendix B. A graph of the measured noise levels, as a function of vessel speed and shaft RPM is shown in Figure 2. The noise level is a unitless value that represents the average of all the amplitude samples, from all the beams for the sampled sonar ping. This value represents a combination of the electrical noise in the sonar, and the response to all acoustic energy, within the bandwidth of the sonar, impinging on the receive array.

For each the tests, the plot shows the noise level as a function of vessel speed. Again, the tests were run at the speeds that could be achieved at the selected shaft RPM.

In an effort to resolve the cause of the high noise levels at anchor seen in the 8160 tests, noise tests with the engines at idle (110 shaft RPM, 0 pitch) in both shallow and deep water. In deeper

water, much lower noise levels were observed, apparently due to the greater attenuation of the noise from the various acoustic sources on the ship over the greater range.

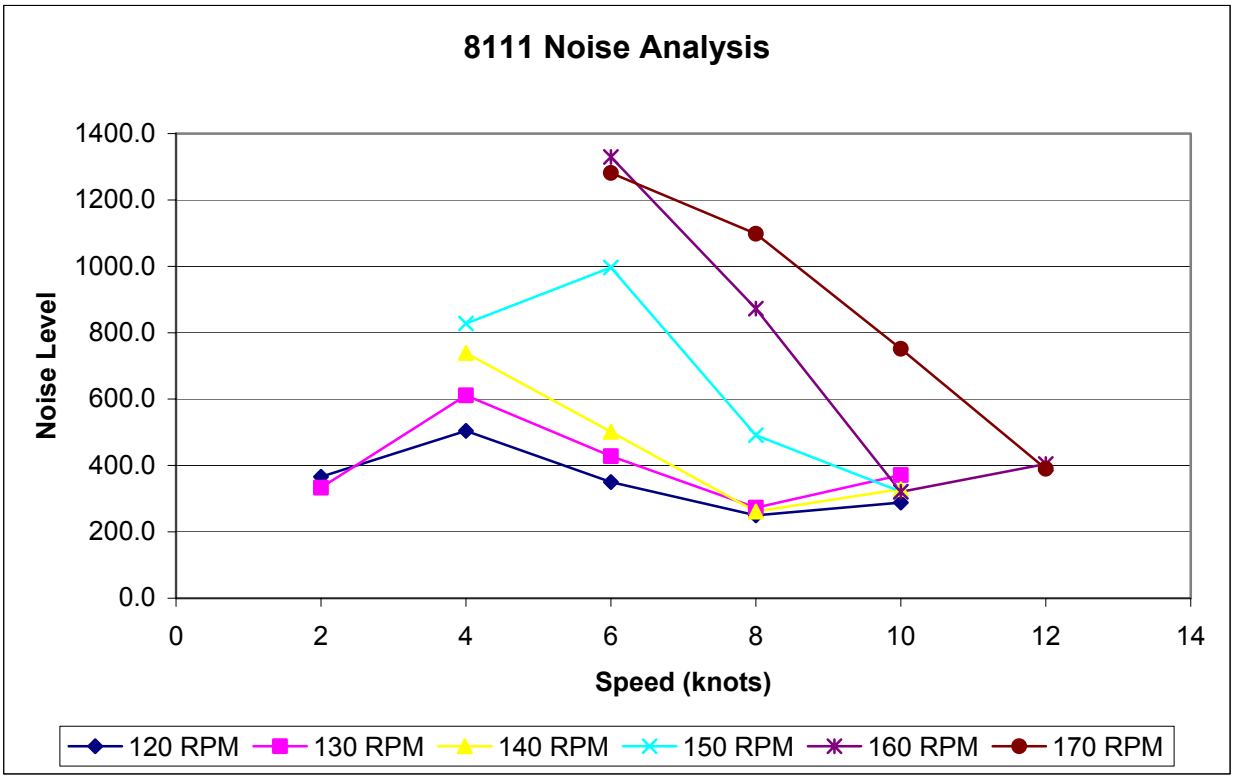


Figure 2 - Noise Plot

3.0 Conclusions

a. It appears that the best survey speed for the 8111, from a noise perspective, is in the range of 8 to 10 knots. Both lower and higher speeds correlate with higher noise levels.
b. It would be desirable to use shaft speeds of 140 RPM, or lower, to minimize the noise level seen by the sonar.
c. Significantly increased levels of reverberation from acoustic sources on the vessel are seen in shallower water. If this causes any degradation in the quality of the soundings in the 8111, increased power levels, higher than those recommended in the sonar settings guide, should be used to compensate.

Appendix A – Test Logs

Survey Log - 8111 Noise Test.xls

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	RESON Inc.												
2	Date:	10/11/2004				Survey Area:		Rudyerd Bay, AK			Page / Pages:		1 of 2
3	Survey Name:		8111 Noise Test			Surveyors:		B Bridge			TimeZone:		-9
4	Survey Vessel:		NOAA Fairweather			Client:		NOAA					
5	Offset Information												
6			X	Y	Z	Latency	Roll	Pitch	Yaw		SVP File:		
7	*Sounder*										Tide File		
8	*DGPS*												
9	*Motion Sensor*											Total Pole	
10	*Other*					Date of Patch Test						minus Dry Pole	
11												Draft (Z)	

12	Start	Stop	Line	Dir.	Speed	COMMENTS
13			8111-00kt-EngOn-0001		0	Gain MF20, Power 0, Range 100, at anchor, 110 RPM
14			8111-00kt-0001		0	110 RPM 0 Pitch
15			8111-02kt-120-0001		2	120 RPM 1.0 Pitch 0.4 Doppler
16			8111-04kt-120-0001		4	120 RPM 3.0 Pitch 2.8 Doppler
17			8111-06kt-120-0001		6	120 RPM 6.0 Pitch 4.6 Doppler
18			8111-08kt-120-0001		8	120 RPM 8.5 Pitch 6.7 Doppler
19			8111-10kt-120-0001		9	120 RPM 10.0 Pitch 7.2 Doppler
20			8111-10kt-130-0001		10	130 RPM 10.0 Pitch 8.2 Doppler
21			8111-08kt-130-0001		8	130 RPM 7.0 Pitch 6.2 Doppler
22			8111-06kt-130-0001		6	130 RPM 5.0 Pitch 4.5 Doppler
23			8111-04kt-130-0001		4	130 RPM 3.0 Pitch 2.2 Doppler
24			8111-02kt-130-0001		2	130 RPM 1.5 Pitch 0.5 Doppler
25			8111-04kt-140-0001		4	140 RPM 2.5 Pitch 2.5 Doppler
26			8111-06kt-140-0001		6	140 RPM 4.75 Pitch 4.3 Doppler Too Shallow
27			8111-06kt-140-0002		6	140 RPM 5.3 Pitch 5.2 Doppler
28			8111-08kt-140-0001		8	140 RPM 7.4 Pitch 6.5 Doppler
29			8111-10kt-140-0001		10	140 RPM 9.0 Pitch 8.5 Doppler
30						
31						
32	Survey Manager:				Client Representative:	
33	Signature:				Signature:	
34						
35						

Sheet1 Sheet2 Sheet3

Survey Log - 8111 Noise Test Pg2.xls

1	RESON Inc.											
2	**Date:**	10/11/2004			**Survey Area:**		Rudyerd Bay, AK			**Page / Pages:**	2 of 2	
3	**Survey Name:**	8111 Noise Test			**Surveyors:**		B Bridge			**TimeZone:**	-9	
4	**Survey Vessel:**	NOAA Fairweather			**Client:**		NOAA					
5	**Offset Information**											
6		**X**	**Y**	**Z**	**Latency**	**Roll**	**Pitch**	Yaw		**SVP File:**		
7	***Sounder***									**Tide File**		
8	***DGPS***											
9	***Motion Sensor***									Total Pole		
10	***Other***				**Date of Patch Test**					minus Dry Pole		
11										**Draft (Z)**		
12	**Start**	**Stop**	**Line**			**Dir.**	**Speed**	**COMMENTS**				
13			8111-10kt-150-0001				10	Gain MF20, Power 0, Range 100, 150, 8.2, 7.4				
14			8111-08kt-150-0002				8	150 RPM 6.1 Pitch 6.3 Doppler				
15			8111-06kt-150-0001				6	150 RPM 4.3 Pitch 4.4 Doppler				
16			8111-04kt-150-0001				4	150 RPM 3.0 Pitch 2.8 Doppler				
17			8111-06kt-160-0001				6	160 RPM 4.0 Pitch 5.2 Doppler				
18			8111-08kt-160-0001				8	160 RPM 6.1 Pitch 6.5 Doppler				
19			8111-10kt-160-0001				10	160 RPM 8.2 Pitch 8.8 Doppler				
20			8111-12kt-160-0001				11.7	160 RPM 10. Pitch 9.9 Doppler				
21			8111-12kt-170-0001				12	170 RPM 9.0 Pitch 10.4 Doppler				
22			8111-06kt-170-0001				6	170 RPM 4.0 Pitch 4.8 Doppler				
23			8111-08kt-170-0001				8	170 RPM 5.9 Pitch 6.8 Doppler				
24			8111-10kt-170-0001				10	170 RPM 7.0 Pitch 8.3 Doppler				
25												
26												
27												
28												
29												
30												
31												
32	Survey Manager:					Client Representative:						
33	Signature:					Signature:						
34												

Sheet1 Sheet2 Sheet3

Appendix B – Noise Analysis Spreadsheet

8111 Noise Test Results

Test Condition	Speed	Pitch (ft)	Test Case										Average
			1	2	3	4	5	6	7	8	9	10	
Eng On Shallow	0	0	707.5	740.2	754.1	711.4	728.1	710.6	691.5	747.9	813.7	722.1	732.7
Eng On Deep	0	0	209.0	208.4	208.6	207.2	205.6	211.2	206.3	208.8	210.9	210.0	208.6
120 RPM	2.0	1.0	382.8	363.0	363.6	330.6	447.5	315.2	389.0	322.1	371.9	371.1	365.7
	4.0	3.0	552.7	431.0	555.9	480.0	517.9	448.0	472.8	500.7	583.6	499.2	504.2
	6.0	6.0	325.5	332.9	302.5	322.9	324.8	364.2	325.8	384.3	409.1	407.4	349.9
	8.0	8.5	253.8	244.0	250.3	253.0	248.4	241.0	241.7	252.4	253.5	259.1	249.7
	9.0	10.0	298.8	296.8	277.4	306.1	284.1	274.0	274.1	290.1	287.5	291.9	288.1
130 RPM	2.0	1.5	316.9	363.0	366.1	429.6	317.1	313.9	303.7	315.5	315.5	289.4	333.1
	4.0	3.0	671.0	657.4	700.4	632.7	602.6	631.0	552.5	605.8	537.9	523.7	611.5
	6.0	5.0	488.2	471.1	410.9	497.2	387.7	390.9	431.0	448.9	361.3	393.5	428.1
	8.0	7.0	285.2	279.1	276.7	266.2	287.8	268.3	271.0	262.5	283.4	249.9	273.0
	10.0	10.0	362.8	396.1	378.8	378.2	370.2	391.7	354.6	369.9	334.3	374.0	371.1
RPM140	4	2.5	763.9	725.6	669.0	723.3	759.5	751.5	773.5	750.6	689.0	785.7	739.2
	6	5.3	487.1	551.5	605.3	596.4	444.3	480.0	416.2	500.0	452.6	478.9	501.2
	8	7.4	261.5	257.6	260.7	273.1	259.8	274.8	255.0	252.1	248.7	270.6	261.4
	10	9.0	301.5	365.3	328.4	360.1	359.9	328.4	326.2	315.0	302.7	300.4	328.8
RPM150	4	3.0	775.2	766.3	916.9	809.7	815.4	860.6	710.5	801.1	892.1	928.6	827.6
	6	4.3	1058.7	926.7	737.5	1015.6	1028.1	1086.3	1048.8	1133.8	997.3	931.8	996.5
	8	6.1	507.8	567.2	535.4	486.4	507.3	443.4	460.9	537.6	461.0	406.4	491.3
	10	8.2	299.2	294.1	315.8	306.5	308.4	323.2	348.8	336.8	332.8	344.5	321.0
160 RPM	6	4.0	1488.4	1551.6	1328.3	1454.8	1456.9	1518.9	1256.4	1146.3	1089.5	1005.8	1329.7
	8	6.1	740.7	777.4	926.5	904.7	851.6	817.7	886.5	801.0	1005.7	1015.9	872.8
	10	8.2	339.9	330.9	335.0	329.4	300.6	326.7	316.9	311.6	313.7	300.9	320.6
	12	10.0	581.4	396.6	351.5	360.6	344.6	410.5	466.2	357.1	389.6	386.4	404.5
170 RPM	6	4.0	1240.1	1173.3	1016.2	1346.1	1301.8	1391.5	1520.2	1327.6	1320.2	1176.3	1281.3
	8	5.9	961.9	1096.9	1229.4	1017.2	1041.2	1168.9	1176.6	1060.5	1117.9	1112.2	1098.3
	10	7.0	756.2	751.3	747.9	640.1	769.5	844.8	714.6	795.6	787.4	709.4	751.7
	12	9.0	396.2	360.1	552.7	339.9	348.5	339.3	352.6	356.5	502.1	351.7	390.0

PHB and FA Discussions of H11334 Survey Review

Meeting Notes

The Survey Certification Memo for H11334 was used as a guideline for discussion points. The following Notes reference the relevant portions of that memo. The double-starred items (**) indicate actions to be taken and/ or requests for feedback.

1. Exceptions to NOAA's standards:
   "The areas addressed in the Descriptive Report referring to data that does not meet IHO Order 1 standards should be qualified as IHO Order 2, which for depths less than 100 meters does not meet NOS HSSDM requirements."

   This point and the notes from the Survey Review Checklist were discussed and it was agreed upon that the BASE Surface should not be regarded as higher quality than the data itself, particularly in areas where the coverage contributing to computation of the BASE Surface is comprised primarily of outer beam data.

2. PHB's requests from FA:
   a. HDCS data that was removed from the submitted data set due to positioning problems should be submitted, with edits (if available).
      - FA deleted the edited HDCS data with positioning problems. The XTF data still exists, unprocessed, but will have to be re-converted.
      - CST Morgan has agreed to submit the converted HDCS data. She did, however, express considerable concern that the data be separated from the rest of the project data and used only to verify that no navigationally significant features exist in the areas lacking coverage, as stated in the DR.
      - **Further input is requested from PHB with regards to whether or not the HDCS data should be edited, prior to submission.
      - ** The HDCS data will be copied to a CD and I will submit it, upon returning from the FA to the office.
   b. The following remarks are in response to the detailed summary of discrepancies between the .hvf and the DAPR in the Survey Review Checklist, Comment 2.
      - The following Checklist comments relate to differences between Day Numbers, in the DAPR vs. .hvf's:
        - 101_8101, comments a & d;
        - 1018_8101, comments a & b;
        - S220, comment a;

        In each of these cases, the .hvf Day Numbers were earlier than the patch test acquisition dates listed in the DAPR. Both the CST and FOO confirmed that the acquired patch test values were used in .hvf's that were defined with earlier dates so that the patch values could be applied to data that was acquired prior to the patch test data (other-wise known as "back-timing").

- The following Checklist comments relate to differences between the Time Error as documented in the DAPR and the corresponding Swath 1 values in the .hvf's:
    - 1010_8101, comment b;
    - 1018_8101, comment c;
    - S220, comment b;

  Both the CST and FOO explained that the Time Error can either be entered in the Swath 1 Time Error or the Time Error data fields in the Navigation, Gyro, Heave, Pitch and Roll categories, but does not need to be entered into all of those fields. This explanation of the FA's application of the latency correctors is consistent with H11334's submitted .hvf's.
  **It was agreed that this explanation of the application of their latency correctors should be documented in the DAPR.

c. In the .hvf's for 1010_8101, 1018_8101 and S220, the DAPR indicates that the "MRU Align StdDev Gyro" and "MRU Align StdDev Roll/Pitch" values are unknown, but these fields are defined as 0.000 in the .hvf's. After discussing this amongst CO, FOO, CST and myself it was decided that the values are indeed unknown and, moreover, undocumented in Caris' Vessel Editor Help Manual.

   The question of the meaning of these values was posed to Brian Calder from UNH, who is currently aboard the FA. He explained that these error values are defined as the standard deviation of the error estimates for the "gyro" and "roll/ pitch" patch test values, as calculated from the compilation of these values from all of the individuals evaluating the patch test data.

   **I will email Caris to inform them of their lacking documentation with respect to the definition of these values in the Vessel Editor Help Manual.
   **The FA will calculate and enter these values into the .hvf's, for future patch tests.

3. The Survey Certification Memo contains an error that will be confusing to anyone reviewing it for future work. In the section introduced with "Special attention should be given to…", the first bullet contains the following statement:
   "The H11334_Office field sheet should be used by the Cartographers (instead of H11334_Final) to generate contours and soundings, since it does contain coverage for areas omitted due to positioning error (section B.2 of the DR)."
   Not only is this a double negative (as pointed out by the CO), but it implies the exact opposite action that the statement is intended to propose.

   **I will replace the statement with the following:
   "The H11334_Office field sheet should be used by the Cartographers (instead of H11334_Final) to generate contours and soundings, since the BASE surfaces in

the office generated field sheet only contain coverage from data with acceptable positioning."

4. The second bullet point in the "Special Attention" section of the memo (and comment 5 in the Checklist) pertains to the version of the chart that was used for the Chart Comparison.

   This comment brought up concerns about the availability of charts that are updated mid-field season, and whether arrangements can be made for HSD to provide these to the field units throughout the field season. Currently, the field uses the most updated charts that are available, as provided by HSD at the beginning of the field season. The following suggestions were made, to remedy the problem of chart comparisons with outdated charts:

   - Could HSD make a formal request to receive the most up-to-date charts from MCD, and then send those updates out to the field, as they become available?
   - Should the field units consider going outside HSD to find an alternative chart updating service?
   - Should the question of which chart was used for the Chart Comparison continue to be addressed in the Survey Review process, if the ship does not have access to the most recent chart updates, but continues to adhere to the policy of using the most updated chart that is available?

   **Additional suggestions/ recommendations from PHB would be appreciated.

The rest of the comments made in the Survey Certification Memo and the Checklist were noted and generally agreed upon.

Subject: [Fwd: [Fwd: DGPS: P-checks & Nav DQA]]
Date: Mon, 12 Sep 2005 18:22:20 -0800
From: "foo fairweather" <foo.fairweather@noaa.gov>
To: chiefst.fairweather@noaa.gov

Subject: [Fwd: DGPS: P-checks & Nav DQA]
Resent-Date: Mon, 12 Sep 2005 20:17:27 GMT
Resent-From: FOO.Fairweather@noaa.gov
Date: Mon, 12 Sep 2005 20:29:01 +0100
From: "FOO Rainier" <foo.rainier@noaa.gov>
To: _NMAO MOP FOO Fairweather <FOO.Fairweather@noaa.gov>,
abigail higgins <abigail.higgins@noaa.gov>

Abigail,

I assume you're checking FOO-FA now, so sorry if you get this twice. Anyway, here's the email from Gerd from the spring about P-checks. Looks like it was a question from Lynn which prompted it in the first place.

Ben

-------- Original Message --------
Subject: DGPS: P-checks & Nav DQA
Date: Wed, 25 May 2005 17:01:38 -0400
From: Gerd Glang <Gerd.Glang@noaa.gov>
Organization: NOAA Hydro Systems & Technology Programs (301-713-2653, x152)
To: holly.dehart.atsea@noaa.gov
CC: Jack Riley <Jack.Riley@noaa.gov>, "Lynnette V. Morgan" <Lynnette.V.Morgan@noaa.gov>, "Holly A. Dehart" <Holly.A.Dehart@noaa.gov>, Benjamin K Evans <Benjamin.K.Evans@noaa.gov>, Guy Noll <Guy.Noll@noaa.gov>
References: <793c68e7.68e7793c@fairweather.nmao.noaa.gov>

Hi Holly (I hear my train leaving),

Your "atsea" e-mail keeps getting bounced back...so I'm copying Lynn on this.

Short answer - No.

USCG Beacons are subject to their own rigorous integrity monitoring. If the beacon signal is being received w/ good signal strength, it should be valid for correcting your position (simple answer). The Specs and Deliverables requirements assume this.

What we need to do is check that our receivers are working properly and no bogus antenna offsets were entered. Probably adequate to do this once per season as part of the system cert, or when you suspect a problem. Our MB data (and side scan data) are spatially dense enough that any problems would be apparent in the data right away. Also, the several GPS failures we've experienced this year have all been pretty catastrophic, i.e., there was no doubt the POS GPS had failed. Bottom line, it's not in the current draft FPM, its not in the Specs and Deliverables. Should be a reqt for the System Cert process.

So the two things I would require:

1) During data acquisition, conscientious monitoring of all sensor data (POS controller window, POS CPU lights, USCG Beacon Receiver display/lights, Isis display, etc).
2) During daily post-processing, a systematic and careful review of the data - treat as a directed editing problem.

Of course, we often fiddle with acquisition system configurations, both hardware and software, for one reason or another (or some gremlin gets into the system). It would be prudent to have a system cert-like checklist to run thru on Monday mornings after a long inport to prompt the briefly-befuddled or newly-trained OIC and chase Mr. Murphy away. Sort of like a pre-flight checklist. You may recall, we once had a case on the WH where an entire launch day (+4 hrs OT) of data was hosed because the Isis config was messed up the night before, and the JO's (who shall remain nameless but were nevertheless well qualified) didn't pay attention to #1.

(The complacent hydrographer will soon go aground - GFG).

BTW - RA has SonarPro for SSS (haven't used it much lately). NRTs use SonarPro.

G2

Holly DeHart atsea wrote:

> Hi Gerd,
>
> Lynn was asking me about comparing differential beacons, where you
> take coincident positions w/ two systems on different beacons. Sounds
> like WH's old p-check system. Do we still need to do these? If so at
> what frequency? They've been doing it weekly all season w/ no errors,
> is this still necessary?
>
> Holly
>
>

--
LT Ben Evans, NOAA
Field Operations Officer
NOAA Ship RAINIER (s221)
NOAA Marine Operations Center, Pacific
1801 Fairview Ave. E
Seattle, WA 98102

Fairweather CTD Maintenance

1-Apr-05	cleaned 4616 and 4617 w/ Triton X-100
9-Apr-05	cleaned 4616 and 4617 w/ Triton X-100
10-Apr-05	performed DQA 4987 (MVP 200) and 4585
15-Apr-05	cleaned 4616 and 4617 w/ Triton X-100
1-May-05	cleaned 4616 and 4617 w/ bleach and Triton X-100
10-May-05	performed DQA 4585 and 4616 w/in specs.
13-May-05	cleaned 4616 and 4617 w/ Triton X-100
14-May-05	performed DQA 4585 and 4617 w/ in specs. cleaned 4585 w/ Triton X-100
24-May-05	cleaned 4616 and 4617 w/ Triton X-100
31-May-05	cleaned 4616 and 4617 w/ Triton X-100, performed DQA 4616 and 4987 w/ in specs
13-Jun-05	performed DQA 4585 and 4987 w/ in specs
16-Jun-05	cleaned 4616 and 4617 w/ Triton X-100, performed DQA 4616 and 4617 w/ in specs
26-Jun-05	cleaned 4616 and 4617 w/ Triton X-100
28-Jun-05	performed DQA 4987 and 4585 w/ in specs
18-29-July-0	FOCI project nothing conducted
5-Aug-05	cleaned 4585 w/ Triton X-100 and bleach, performed DQA 4616 and 4617 w/ in specs
13-Aug-05	cleaned 4616 and 4617 w/ Triton X-100
14-Aug-05	performed DQA 4616 and 4617 w/ in specs, performed DQA 4585 and 4987 w/ in specs
14-Sep-05	cleaned 4585 w/ Triton X-100
16-Sep-05	cleaned 4616 & 4617 Triton X-100; note Launch 1018 was down for two weeks, CTDs were swapped out of Launch 1010, performed DQA 4616 and 4617 w/ in specs
23-Sep-05	cleaned 4616 and 4617 w/ Triton X-100
10-Oct-05	performed DQA 4585 and 4987 w/ in specs
11-Oct-05	cleaned 4617 w/ Triton X-100
27-Oct-05	cleaned 4616 and 4617 w/ Triton X-100, performed DQA 4616 and 4617 w/ in specs
5-Oct	SV Measurement Comparison between Brooks Ocean Technology MVP 200 and Seabird SBE19+, see Oct-05 Report
5-Nov-05	cleaned 4617 w/ Triton X-100 (1018 is the only active launch)
6-Nov-05	performed DQA 4616 and 4617 w/ in specs

Sound Velocity Measurement Comparison

Brooke Ocean Technology MVP 200 vs. Seabird SBE19+

ST Jennifer Keene, October, 2005

Purpose:
While in the Shumagin Islands project area during the summer of 2005, sound velocity error was noted in data acquired by the NOAA Ship FAIRWEATHER. The water column in the area was extremely dynamic, so casts were taken at regular intervals using the Brooke Ocean Technology Moving Vessel Profiler 200. Cast data were applied to the multibeam data using the method of Nearest in Distance within Time. Despite the number of casts applied, sound velocity error of up to 1.5m, in 60 to 90 meters of water, was still apparent in the outer beams of the data, as shown in Figure 1. The vertical exaggeration is aproximately 251 times normal.

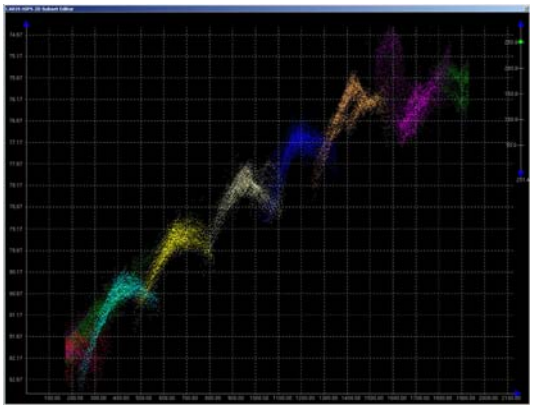


Figure 1: Sound velocity error in ship's data from Shumagin Islands project area.

The source of the sound velocity error was believed to be inaccurate measurements made by the MVP 200. To test this hypothesis, an experiment was designed to compare sound velocity measurements made with the MPV 200 and a Seabird SBE19+.

Equipment:

- Brooke Ocean Technology MVP 200 with AML Smart SV+P Sensor
- Seabird SBE19+ CTD Probe
- Velocwin Processing Software
- Reson 8111ER Multibeam Echosounder
- CARIS HIPS & SIPS v.5.4

Procedure:
While in Bradfield Canal in October, 2005, the FAIRWEATHER acquired a line of multibeam data with a Reson 8111ER at the normal survey speed of ten knots. Three casts were taken with the MVP 200 without ceasing survey operations. Positions of the casts were noted by bridge personnel. At the end of the survey line, the ship turned around and went back to the MVP cast sites, acquiring data during the transit. The ship was stopped at each cast site and a stationary cast was done with the SBE19+, as well as a simultaneous cast with the MVP 200 for comparison. Track lines and cast sites are shown in Figure 2.

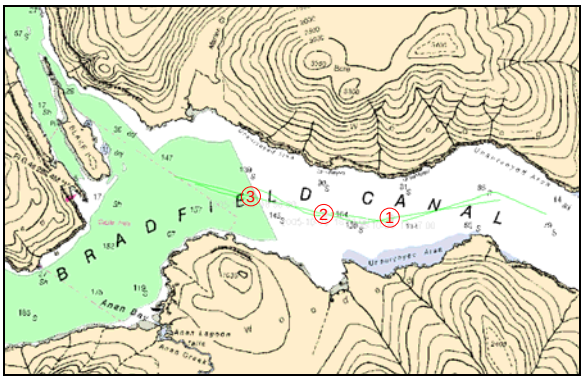


Figure 2: Ship track lines and sound velocity cast sites.

Sound velocity data were processed with NOAA's Velocwin software. Three separate concatenated .svp files were created for the data sets; one for the MPV 200 casts taken while the ship was moving at 10 knots, another file for the stationary MVP 200 casts and a third file for the SBE19+ stationary casts.

Multibeam echosounder (MBES) data were processed in CARIS HIPS & SIPS v.5.4. The concatenated .svp file for the moving MVP casts was applied to the first line of MBES data, using the method of Nearest in Distance within Time. A copy of this line was created, and sound velocity correctors from the SBE19+ casts were applied by the same method. This allowed different sound velocity correctors to be applied to identical MBES data, eliminating other factors affecting data quality. For further comparison, the concatenated file from the stationary MVP casts was applied to the MBES data acquired while the ship transited in the reverse direction, going back to the cast sites.

Results:
The MBES data sets are shown in Figure 3, where the tan data points have sound velocity correctors from the moving MVP casts applied, the green data points use the SBE19+ correctors and the stationary MVP casts were applied to the blue data points.

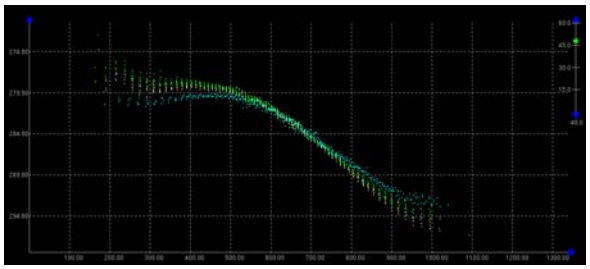


Figure 3: Multibeam data with various sound velocity correctors applied.

There is some roll error evident in the data set, but it is also apparent that the data in the green and tan lines, which should be identical, do not match up in the outer beams. There is a difference of approximately one meter in 280 meters of water.

Cast data were imported to Excel, where comparison graphs were created. Sound velocity profiles were created at the three cast sites for each insturement. For comparisons shown in Figures 4 through 6, the blue line is data from the MVP 200 at 10 knots, the pink line is data from the stationary MVP 200 cast and the yellow line represents the SBE19+ data.

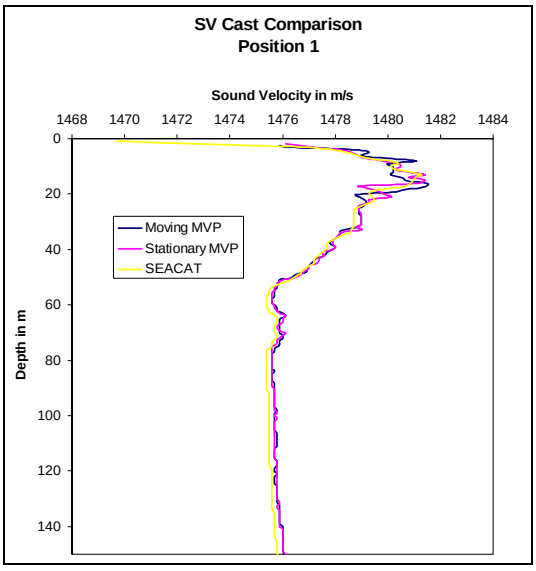


Figure 4: Sound velocity profiles from Position 1.

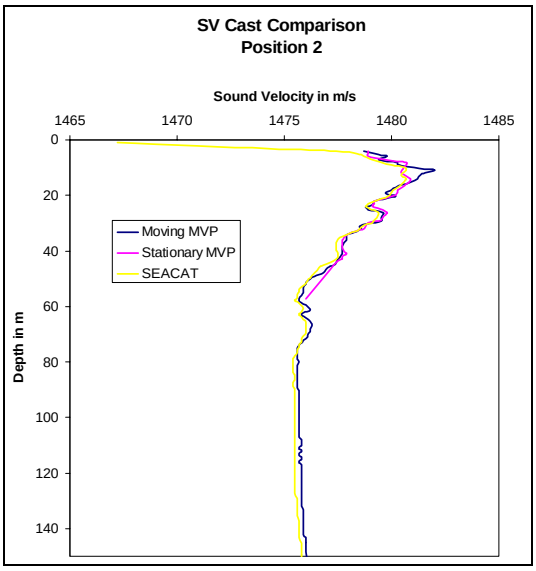


Figure 5: Sound velocity profiles from Position 2.

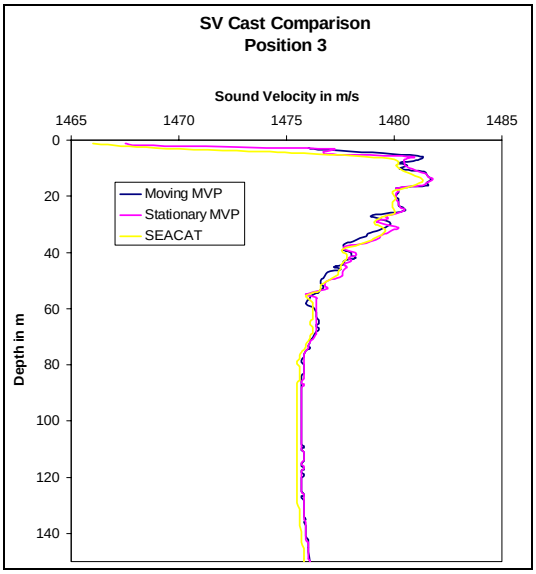


Figure 6: Sound velocity profiles from Position 3.

The SBE19+ and stationary MVP 200 casts were performed simultaneously and were separated in time from the moving MVP 200 casts by no more than two hours. The profiles were not identical, but agreement appeared to be good.

Further comparison was made between the MVP 200 and the Seabird SBE19+. The sound velocity measured by the SBE19+ was subtracted from the values measured by the MVP 200 at 10 knots over a depth range of

three to 100 meters. The comparison results for each cast site are shown in Figure 7.

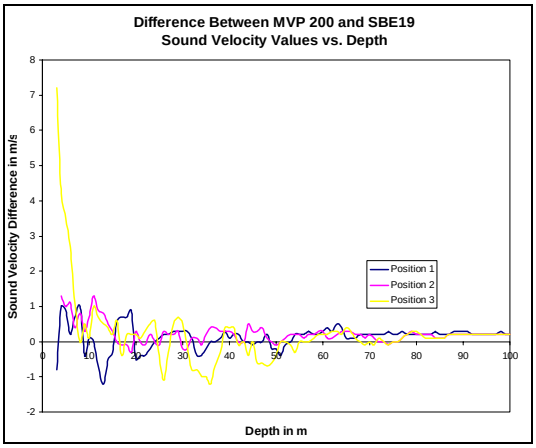


Figure 7: Difference between sound velocities measured by MVP 200 at 10 knots and stationary SBE19+.

The greatest differences between the profiles occur near the water's surface. During normal survey operations, the MVP 200 is generally operated from a depth of three to four meters below the surface. The SBE19 is capable of acquiring measurements much nearer the surface.

Conclusions:

During this experiment, sound velocity measurements made by the MVP 200 at 10 knots were compared to data acquired with a SBE19+. The sound velocity profiles generated by each instrument for three different cast sites were in good agreement. Sound velocity error is not readily apparent in MBES data.

The sound velocity error noted in the Shumagin Islands project area may have been exaggerated by the dynamic water column and flat bottom topography. Automatic vertical exaggeration in CARIS subset editor may have caused the error to appear more substantial. However, there was error present in the data and it is believed that the high density of sound velocity casts should have minimized this error.

It is possible that there is some surface effect causing problems in the data, due to the fact that the MVP 200 is not configured to get sound velocity data above three to four meters depth while the ship is moving at survey speed. However, the ship's draft puts the transducer at a depth of approximately four meters. Data should not be affected by missing sound velocity measurements above this depth.

SST Grant Froelich believes that there may be a calibration problem with the MVP 200, due to rust on the calibrated spacers. Figure 8 shows the current state of the MVP 200 sensor, compared to the new sensor shown in Figure 9. It should also be noted that sound velocity problems were not seen in ship's MBES data until after the sensor struck the hull. Unseen damage or misalignment may have occurred.

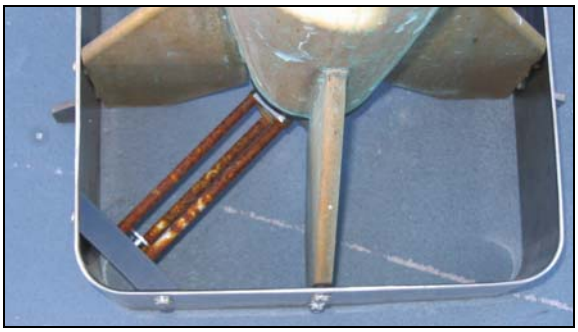


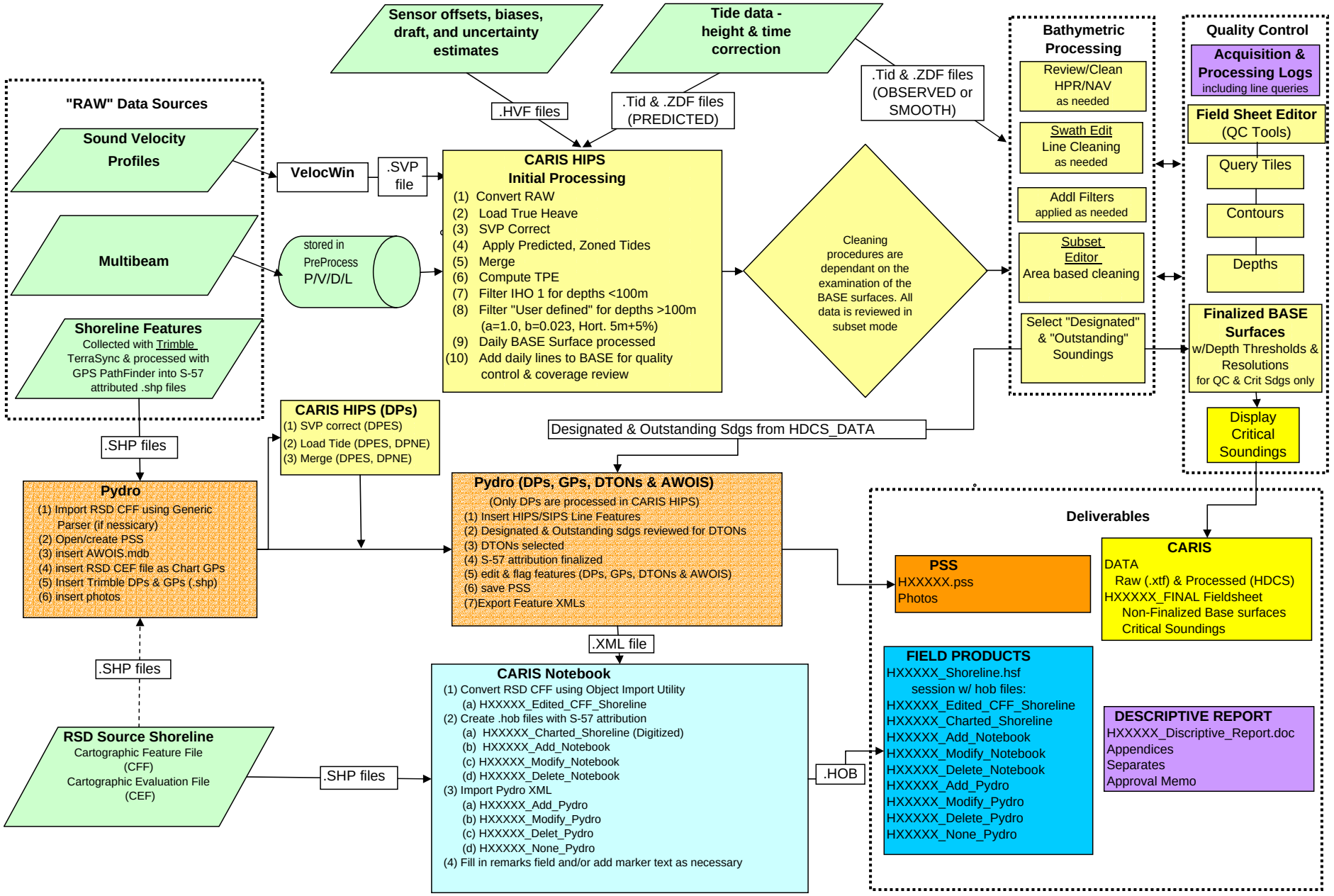
Figure 8: Rusted MVP 200 sensor.

Figure 9: New MVP 200 sensor.

Results of this experiment are inconclusive. The area where this experiment was performed was not ideal, due to the extreme bottom topography. Further testing should be done in an area with a flat bottom during system certification for the 2006 field season.

It is recommended that the MVP 200 AML SV+P sensor be cleaned and calibrated during the winter inport. Also, a CTD sensor should be purchased for the MVP 200 when funds allow, as CTD sensors have been shown to provide more accurate sound velocity measurements than direct sound velocity probes.

FAIRWEATHER Data Processing 2005



Survey Management

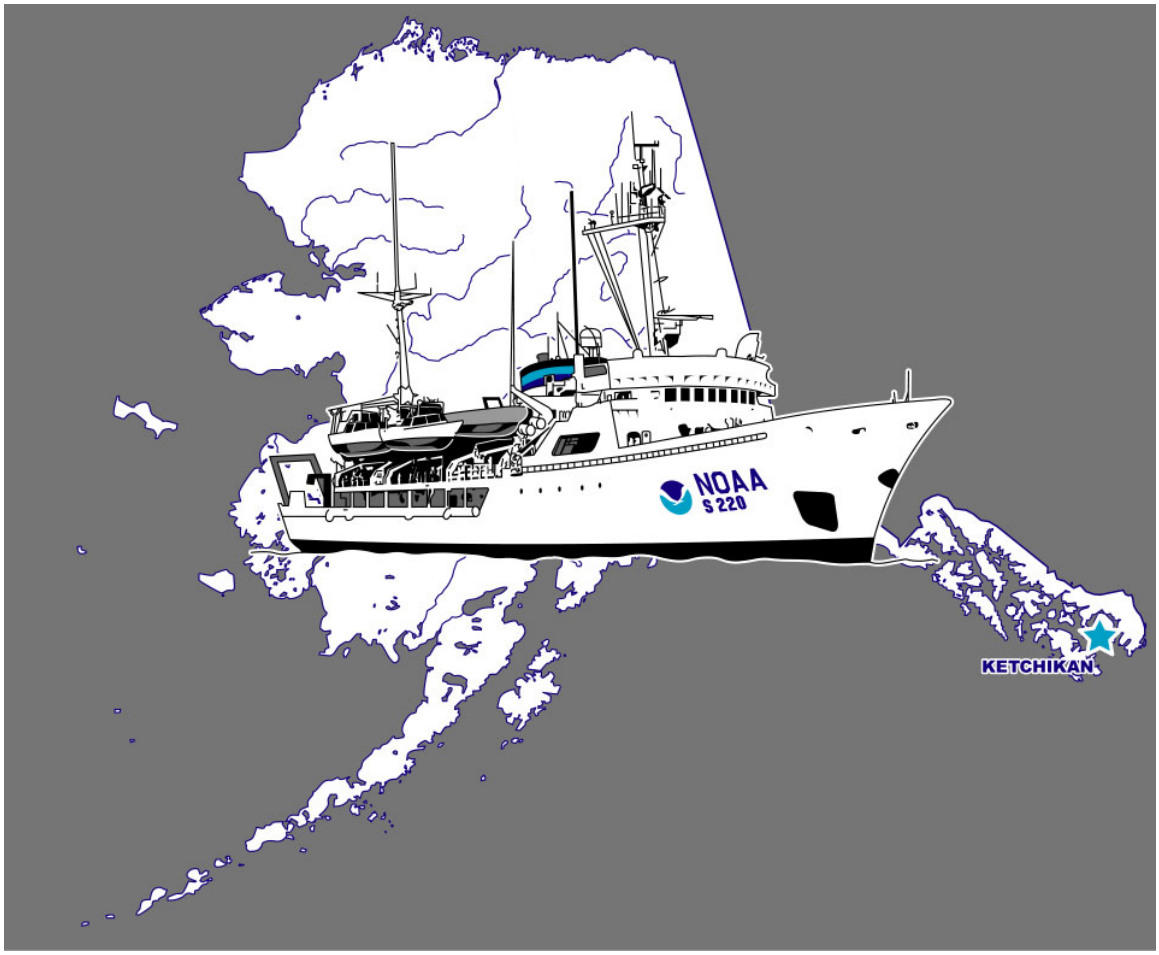


Table of Contents

Survey Management

0.0 Document Scope

This document is meant to be used as a guideline for survey managers to insure that surveys are completed properly. There is a general order to this list. Some things have to be done in order, while others, like the Coast Pilot, DR and Final Fieldsheet prep can be started in advance. This document can be used in conjunction with the R:\Utilities\II_Forms_Lists_and_Templates\4_Quality_Control\QC Checksheet. Copy and rename to H#####_QC_Checksheet and put it into your Survey_Files\Quality_Control folder. This document and the QC_Checksheet should match fairly closely, beginning with the Post Acquisition section.

1.0 Survey Planning

Survey planning begins before arriving at the survey area and continues throughout the project.

1.1 Letter Instructions

Read and understand the project letter instructions, located here: *H:\OPR-XXXX-FA-Project\Project_Reports\I Letter_Instructions.*

1.2 Manager Responsibilities

The survey manager is responsible for creating polygon files, a shoreline workspace, boat sheets, setting up projects on the launches (including suitcase shoreline and ship if necessary for your survey). In addition, the Survey Manager is responsible for directing the daily work schedule (polygon plans and chartlets) of launches assigned to acquire data on the survey. See:
R:\Utilities\FA_SOP\0_Management\File Management\Survey File Management
R:\Utilities\I_FA_SOP\1_Presurvey\Shoreline\Shoreline_Presurvey.doc
R:\Utilities\FA_SOP\1_Presurvey\AWOIS_Presurvey\ AWOIS_Setup.doc
R:\Utilities\FA_SOP\1_Presurvey\Creating_DelphMap_Projects_SOP.doc
R:\Utilities\FA_SOP\2_Acquisition\Shoreline\Shoreline_Guidelines

2.0 Acquistion

2.1 Planning Multibeam Polygons

To convert Notebook polygons to shape files for DelphMap, see:
R:\Utilities\FA_SOP\1_Presurvey\Notebook Polygons to DelphMap.doc

The purpose of drawing polygons is to guide the launch crew acquiring multibeam data. Try to set them up in such a way that turns are minimized and lines are manageable length for processing. Be aware of any possible sources of fresh water, or other factors

that will affect the water column and make smaller polygons in these areas. Ask the launch crew to do more CTD casts in these areas.

Remember to update your near shore polygons using the shoreline buffer, shoreline updates and new features to determine the inshore limit of hydro. Review polygons with shoreline data so you don't accidentally send a SWMB boat over a new rock, or into an area that is too shoal. Also, use the Buffer Lines that were collected to edit your near shore polygons.

DO NOT send multibeam boats inshore of the eight meter curve until shoreline verification has been run in that area. Once shoreline has been run, export your new features from Pydro to be brought into DelphMap for use by the multibeam boats during near shore acquisition.

2.2 Data Cleaning

Any time multibeam data is acquired on your sheet, check in with the evening processors at the end of the day. Ask if they noticed any problems in the data, such as sound velocity or excess noise. Use this information when planning the polygons for the next day. It's also a good idea to keep on top of the data cleaning. This will make assessment of coverage more accurate.

2.3 Cross Lines

Cross lines are necessary for quality control checks of data. Looking at nadir beams from cross lines with outer beams of mainscheme lines, errors in the data such as sound velocity problems become much more apparent. Plan to get enough linear nautical miles of cross lines to equal 10% of the total linear nautical miles acquired on the sheet. This will insure that the specified 5% is met.

2.4 Shoreline

Keep on top of it!!! When you get back from an early morning out in the cold rain, all you want to do is take a hot shower and a nap. Don't give in to the temptation. Bring the DPs into Pydro and transfer remarks from the boat sheets to Notebook layers as soon as possible. Otherwise, you will forget what you meant in those cryptic notes and cartoon drawings. This will also help insure that everything gets addressed. Stay on top of it. Don't put it off!

Insure that shoreline verification is conducted in accordance with the Letter Instructions and that adequate annotations are made in the field to allow for complete description of the shoreline environment.

2.5 Survey Log

Keep a survey log in addition to the daily acquisition and processing logs to note any problems during the survey, or deviations from the DAPR. This will be useful when writing the DR. H######_Survey_Log.doc should be in the Survey_Files\Quality_Control folder. Update the log on a daily basis when data is being acquired on the sheet, whether it be multibeam or shoreline. It is also a helpful place to put processing notes and screen grabs of problem data for possible use in the DR.

3.0 Post Acquisition

These steps are intended to be followed both during acquisition and immediately after data acquisition has been completed for the survey. The order should be generally the same as that of the QC Checksheet, offering more detail for following those steps.

3.1 Quality Control and Assessment of Soundings

During acquisition of data, the Sheet Manager is responsible for analyzing the quality of the soundings and insuring coverage and sounding density. Before leaving the survey area, the Sheet Manager must review the BASE child layers, using subset mode to check for sound velocity and tide problems, as well as checking for ample coverage, especially over navigationally significant areas. Unverified observed tides are usually available within a day or two and can then be applied to the data.

It may be beneficial to create a subset tile layer in CARIS to keep track of areas that have been reviewed. This review is not cleaning in subset. It's just a quick look in subset mode for lines that may not have been cleaned properly, holidays, SV, tide and other problems with the data. Have the BASE surfaces open in CARIS and use different sun illumination angles. Problem areas will look suspect.

3.2 Check for Immediate DTON's

Look for any items in the bathymetry which are extremely navigationally significant. These items should be brought to the attention of the FOO and the CO immediately, so they can be added to the relevant charts as soon as possible. Otherwise, the regular DTON review occurs at the end of post processing.

3.3 Document Deviations from DAPR

Be familiar with the System Certification Report for the year and DAPR for the project. Any deviations from the aforementioned reports should be recorded in the survey log, or the acquisition and processing logs for possible inclusion into the DR if necessary. Changes to the HVF, or other unusual steps taken during data acquisition or processing should be noted and explained in the DR.

3.4 Shoreline Data Review

Review Pydro and Notebook sessions, photos and DP forms for completeness prior to leaving the survey area. Pydro PSS features should be completely addressed, with the Chart, Significant, Primary and Report flags checked where applicable. See:
R:\Utilities\I_FA_SOP\3_Processing\Shoreline\Pydro_Shoreline_Processing.doc
R:\Utilities\I_FA_SOP\3_Processing\Shoreline\Notebook_Shoreline_Processing.doc
R:\Utilities\FA_SOP\3_Processing\Pydro\Pydro Logic_SOP.doc & *Pydro Editor Notebook_SOP.doc*

3.5 AWOIS Items

Insure that all AWOIS items listed for the survey are either verified or disproved through methods listed in the AWOIS database technique section, provided from the AWOIS database. Refer to the AWOIS section of the Field Procedures Manual v1.1 for further

information. Update the AWOIS database using Pydro. If there are questions about which method is best for a particular item, consult the FOO, CST or an SST.

3.6 Coast Pilot Updates

The Coast Pilot should be updated while still in the survey area. Don't put it off! If a Coast Pilot exists for the survey area, the Coast Pilot officer will place a copy of the relevant section in *H:\OPR-XXXX-FA\Surveys\HXXXXX\Survey_Files\Coast_Pilot*. Read through the section and verify the existing text. Reference depths, bottom samples and shoreline information as needed to update relevant paragraphs. See:
R:\Utilities\FA_SOP\4_Deliverables\Coast_Pilot\Coast Pilot Survey PIC Instructions.doc

The *HXXXXX _CP_Update.doc* should be saved in:*H:\OPR-XXXX-FA-Project \Project_Reports\IV Coast_Pilot*

3.7 Smooth Tide Request

Request for Smooth Tides letters should be drafted and submitted as soon as all survey acquisition is completed. These requests do not need to wait until all data processing is complete or the DR has been written. See:
R:\Utilities\FA_SOP\4_Deliverables\SmoothTides\Smooth Tides Request.doc

All of the files should be saved in: *H:\OPR-XXXX-FA-Project\Surveys\HXXXXX\ Descriptive_Report\Appendices\III Smooth_Tide_Request*

3.8 Create Survey Outlines

For step by step instructions on creating the survey outline and appropriate MapInfo tables, see:
R:\Utilities\I_FA_SOP\4_Deliverables\Survey_Outline\Creating_Survey_Outlines_in_CARIS.doc

All of the outline files should be saved in: *H:\OPR-XXXX-FA-Project\Surveys\HXXXXX\ Descriptive_Report\Appendices\II Survey_Outline*

3.9 Apply Observed or Verified Tides to HIPS Data

Using CARIS HIPS, open the file in Tide Editor to insure that it looks OK. Look for fliers and for problems with the data, such as a shift up or down in one section of the data, or any discontinuities. Make sure that all acquisition days are included in the tide file. Be sure that there is a buffer of one extra day at the end of the file, or before any gaps in acquisition days. This will cover any data collected after midnight GMT. Alert the tides people if you see a problem, so it can be corrected. If you can't find, or don't know which tide file to use, check with the tides people.

At the end of acquisition, load the observed or verified tides with the zone file to all lines and DPs, then remerge the data.

3.10 Review Sound Velocity Files

1) Check all SVPs, using CARIS Sound Velocity Editor to look for any fliers or other problems with the cast.

2) Display SVP Positions in CARIS with the MBES data open to look for any gross positioning errors.
3) From the HDCS_Data folder, select the folder for one line from each boat day. Use a text editor to compare the SVP file listed to the cast that the acquisition log query lists as being applied.
4) Make sure that all casts listed in the acquisition logs have been copied to the appropriate folders to be applied to the data.
5) Insure that the master concatenated file contains all SV files for that vessel.
6) If discrepancies are found, assess whether SV should be re-applied.

3.11 Query All Lines and Features

The data query is a mechanism to check all your HDCS lines for SV casts, tide file application, vessel speeds, etc., as well as # of Raw files compared to # of HDCS folders. Getting them to match is the tricky bit. In addition there is a format for checking Pydro files to raw files and ensuring the number of features match in Pydro and Notebook.

Check the CARIS H#####_QC session to make sure that it contains all MBES lines. There should not be any DP files in the subset cleaning session. Query all HDCS lines and save the results in the H#####_Data_Query.xls, which can be found in the *Survey_Files\Quality_Control* folder. If it's not there, the blank data query form to use is located in:
R:\Utilities\II_Forms_Lists_and_Templates\4_Quality_Control\HXXXXX_Data_Query.xls.
The (QCCheck) MBES QC Ssn Date and (QCCheck) DP-GP-BS Date tabs are to be completed by the Survey PIC as part of the QC Check.

Use Notebook shoreline session and Pydro PSS to complete the DP-GP-BS query tab.

Check that the appropriate tide file has been applied and that the SV profile makes sense as far as time and position. Compare this query with the original queries recorded in the acquisition and processing logs and investigate any discrepancies.

3.12 Review Acquisition and Processing Logs

Go back through all the daily acquisition logs. Look for notes from the acquisition crew and night processors regarding any possible problems with the data. Check the affected lines or areas in CARIS HIPS. Be familiar with your data set and know what's going on. Discuss any problems, such as not meeting IHO spec, in the DR.

4.0 Post Survey

These steps outline the process for final review of data before submission, continuing to follow the QC Checksheet.

4.1 Quality Control and Data Review

The Survey Manager must review the entire survey area in subset mode, using the H#####_QC session in CARIS HIPS. Refer to:
R:\Utilities\\FA_SOP\3_Processing\CARIS HIPS\Bathy_Processing_SOP.doc

It may be helpful to create a subset tile layer for the entire survey to keep track of which areas have been checked. This requires a surface that is up to date and contains all

MBES lines. The CARIS session should not include any DPs or BSs. The recommended tile size for a 1:10,000 scale survey is 20m. Bigger than that causes overlap between subsets to be too large and smaller is not necessary.

4.2 Designate Soundings

Use CARIS Subset Editor to review the data with a BASE surface in the background. Designate soundings in areas where the surface doesn't match the highest point of the data. Refer to: *R:\Utilities\\FA_SOP\3_Processing\CARIS HIPS\Bathy_Processing_SOP.doc*

Depth Threshold BASE Surfaces must be finalized in H#####_QC session for designated soundings to take effect and become critical soundings that will be submitted with data.

If you make a mistake in designating soundings or remove/add critical soundings after you have displayed the critical soundings in CARIS, you must delete the .hcsidx file that resides in your HDCS_DATA folder and then redisplay critical soundings to get them to display in CARIS.

4.3 Depth Checking for Flyers

Using CARIS Fieldsheet Editor, create contours and soundings in the H#####_QC session. Review the entire survey area and check areas with bulls eye contours or questionable depths using subset or line mode. Also use the BASE surface child layers to look for problems in the Shoal, Deep or Standard Deviation layers.

4.4 Chart Comparisons

New Method: From Fieldsheet Editor in HIPS, export soundings (contours can be helpful too) from BASE surface (2m or 5m resolution) to S-57. In Notebook, open the .000 file with the applicable charts. To have the soundings display in fathoms, go to Tools/Options/Units, click Depth Units as US Survey Fathoms and Sounding Display Units as Fathoms. Compare the surveyed depths to the charted values. Note any areas of discrepancy in the DR. Otherwise, give a general degree of agreement between the survey and charts.

Old Method: Make sure the BASE surface has been recomputed in CARIS HIPS. In Pydro, select appropriate units (FATHOM), insert BASE/weighted grid, select appropriate surface (2m or 5m), and review depths (PVDL, BASE/WGRID needs to be BASE/WGRID) with the appropriate chart in the background.

Write up results in the DR. Also, check the latest Local Notice to Mariners for the most recent updates to the chart. The .kap file header will tell you the NTM that has been applied to it if you open it in Wordpad.

4.5 DTONs

For information on selecting DTONs, refer to:
R:\Utilities\FA_SOP\4_Deliverables\DTONs\Selecting DTONs.doc

Select any possible DTONs in CARIS and mark soundings as outstanding or designated. Insert the item as a HIPS/SIPS Line Feature in Pydro and check the DTON flag. Also,

new DPs/GPs can be possible DTONs, so review the new features and check the DTON flag if applicable. E-mail the FOO to review the possible DTONs in the PSS.

Once the DTONs have been approved by the FOO, continue with the instructions given in: *R:Utilities\FA_SOP\4_Deliverables\DTONs\DTONS_Procedure_XML.ppt*

In Pydro, make sure all Remarks and Recommendations tabs have been filled in and then export an .xml of the DTONs. This is easily done through Pydro, from the *Reports* menu, choose *Danger to Navigation*. Have the FOO review the .xml and e-mail it to MCD, CC-ing the Sheet Manager. A digital copy of the e-mail should be kept in the PSS folder. This PSS folder should also include the H#####_DTON.xml and the H#####_DTON_Report.

4.6 Field Products

A CARIS Notebook session should be created for the survey, which includes all shoreline and bottom sample data. For the proper procedures, refer to:
R:\Utilities\FA_SOP\3_Processing\Notebook_Shoreline_Processing.doc
R:\Utilities\FA_SOP\3_Processing\Pydro_Shoreline_Processing.doc
R:\Utilities\FA_SOP\3_Processing\CartoAction_Flagging.doc

4.7 Create Depth Threshold BASE Surfaces

The *H#####_QC* session should contain all SWMB lines, but none of the DP or BS files. The fieldsheet can contain any BASE surfaces used during processing, but should also contain finalized BASE surfaces, with the appropriate depth thresholds. It could also contain soundings and contours to be used for review. Refer to the Digital Submission Checksheet for required depth ranges and resolutions of BASE surfaces.

The *H#####* session should contain a field sheet with non-finalized BASE surfaces. These surfaces should be named to reflect the resolution and depth ranges used for the finalized surfaces in the QC session.

4.8 Preliminary Smooth Sheet (PSS session in Pydro)

Open the PSS in Pydro. Use the Data Stats function to make sure that the data is not stale or outdated. Check the shoreline and bottom sample DPs to insure that the appropriate flags are checked, the Remarks and Recommendations tabs are filled in as necessary and that correctors have been properly applied. Everything should be Resolved. If you didn't complete the data query above, do it now. Check to make sure everything matches in Pydro and Notebook. Scan the DP forms and save them to the DP log folder. Finally, generate a Features report as described in:
R:\Utilities\I_FA_SOP\4_Deliverables\Shoreline Report\Generating a Shoreline Report.doc

4.9 Descriptive Report

In the DR, the Survey Manager describes what, where, why, when, how and with whom the survey was conducted. The DR is a legal document and can be brought up in court to prove (or disprove) the accuracy of the survey. Go to the template:
H:\OPR-XXXX-FA-Projects\Surveys

Save a copy to the survey folder:

H:\OPR-XXXX-FA-Project\Surveys\HXXXXX\Descriptive_Report
and name it H#####_Descriptive_Report. Use the survey log and acquisition and processing logs to write about any issues encountered, or deviations from standard procedures.

4.9.1 Cross Line Analysis

Review crossline areas in subset mode. Discrepancies need to be investigated and written about in the DR if necessary.

With all MBES lines inserted into Pydro by type (Mainscheme or Checkline), use the built in function in Pydro to determine the mileage, or the Data Query mileage from CARIS could be utilized. Calculate the percentage of cross lines to mainscheme and report it in the DR. If requirements were not met, be sure to include an explanation.

4.9.2 Junction and Prior Survey Comparisons

Examine Junctions and Prior surveys in CARIS subset mode or Fledermaus (if possible). Measure the distance for a general difference range and note if agreement was good or not. Major discrepancies should be investigated and addressed in DR.

4.9.3 Discussion of Issues and Deviations from Standards

It is important to discuss any problems with the data, or processes that were done differently than those described in the DAPR.

4.9.4 Shoreline

Disprovals and anything ambiguous, about which further information would be helpful to the cartographer, should be flagged for Report in Pydro. Most shoreline discussion items will be in Pydro, if something was not positioned or could not be brought in as a GP, it will need a paragraph in the DR to address the item. A general write-up on how shoreline was conducted, what programs and processes were used, and any deviations from shoreline procedures outlined in the DAPR should be included in the shoreline section of the DR.

4.9.5 Cover & Title Pages / Approval memo

Copy the Excel/Word templates from the Project survey folder into the DR folder for the survey. Fill in all fields with information from the project letter instructions and acquisition and processing logs.

4.9.6 Digital Images

Limits of Hydrography.jpg and Junctions.jpg are created in MapInfo with the survey limit displayed. These images should be saved to the survey Misc folder, NOT in the Descriptive Report folder. Insert the images directly into the DR. The digital images do not get submitted separately.

4.10 DR Appendices

4.10.1 Shoreline and AWOIS Item(s) Report

From Pydro, generate a Survey Feature Report, as described in: *R:\Utilities\I_FA_SOP\4_Deliverables\Shoreline Report\Generating a Shoreline Report.doc* Save the report to Appendix I.

4.10.2 Survey Outline

Refer to the Survey Outline section (2.8) above.

4.10.3 Smooth Tide Request

Refer to the Smoot Tide Request section (2.7) above.

4.10.4 Supplemental Correspondence

This appendix should contain copies of any additional correspondence, such as e-mails, relating to the survey.

4.10.5 Geographic Names

The Geographic Names form 76-155 will only need to be filled out if there are new geographic names in the survey area. Copy the form from: *R:\Utilities\II_Forms_Lists_and_Templates\3_Deliverables\Appendices\Geographic names form 76-155.xlt*

Name the file H#####_Geographic_Names and save it to the Appendix V - Geographic Names.

The names will also need to be added as marker text in a new edit layer in CARIS Notebook, named H#####_GeoNames.hob. This will go into the Final Fieldsheets\Notebook Files folder.

Make a note in the DR referring to the Geographic Names form in the Appendix. Also note that the names were included in the CARIS Notebook session.

4.11 DR Separates

4.11.1 Logs

Templates are located in
OPR_XXXX_FA\Surveys\HXXXXX\Descriptive_Report\Separates\I Logs

4.11.1.1 Acquisition and Processing Logs

The digital folder should contain only the master logs for each vessel. Any daily logs should be removed from the submission folder. You can keep them in the Survey Files\Misc folder if you don't want to delete them entirely.

Clean up the binder with the hard copies. It should contain only official paperwork, boat sheets, and DP forms. Remove any personal items and unnecessary paperwork, such as polygon plans, PODs, etc.

4.11.1.2 Detached Positions

Check that all DP forms are in the binder, completely filled out, match the Pydro session entries and are properly labeled. Scan the DP forms and combine them into a single .pdf called HXXXXX_DP_Forms. Save the file to the folder:
H######\Descriptive_Report\Separates\I_Logs\Detached_Positions

4.11.2 Side Scan Contacts

Not applicable at this time.

5.0 Submission

5.1 Check Coverage and Accuracy Requirements

The coverage requirements for the survey are specified in the project letter instructions. Check the data to make sure the requirements were met. The BASE surface depth ranges and resolutions are helpful for this task. If requirements were not met, be sure to make a note in the DR about what kind of coverage was achieved and why letter instructions could not be followed.

The accuracy standards are as stated in the Specifications and Deliverables, unless otherwise noted in the project letter instructions. Be sure the data meets standards and discuss any problems in the DR.

5.2 File Management

Please remove/delete all extraneous files from the I: drive. This includes temp files, delete_me files, etc, which were used during processing but are no longer needed once the survey is approved. Once the necessary files are copied into the Field Products folder, the survey files folder and its contents can be deleted. Delete any non-official field sheets, surfaces and sessions from the CARIS folders. It should contain two sessions: H#####_QC and H##### for each survey. The H##### session should contain an H##### fieldsheet, and include the official non-finalized depth threshold & resolution BASE surfaces. The H#####_QC session & fieldsheet can contain any surfaces, fieldsheets, contours, depths, etc. that were used during the processing & QC of the survey, please have soundings, contours and finalized surfaces available for the QC Review. All other sessions & FS should be deleted. Please note that the H & I drives will be cleaned up after data has been submitted.

5.3 Quality Control Review

Once all of the above processes have been completed, a reviewer (FOO, CST, SST) will be assigned to go through the QC Review portion of the checksheet

The (QCReview) MBES Final Ssn Date will be **completed by a reviewer**, who will compare this to the QC Ssn query. The two should match. If not, the Survey PIC should

be notified of any discrepancies. The reviewer also checks the (QCCheck) DP-GP-BS Date. Boxes of the same color should have the same number, DPES DP files need to have SV, tide and merge, DPNE only need tide and merge. CARIS lines should not be outdated. Notify the Survey PIC of discrepancies.

5.4 Submit to FOO

Submit the survey to the FOO for review and approval.

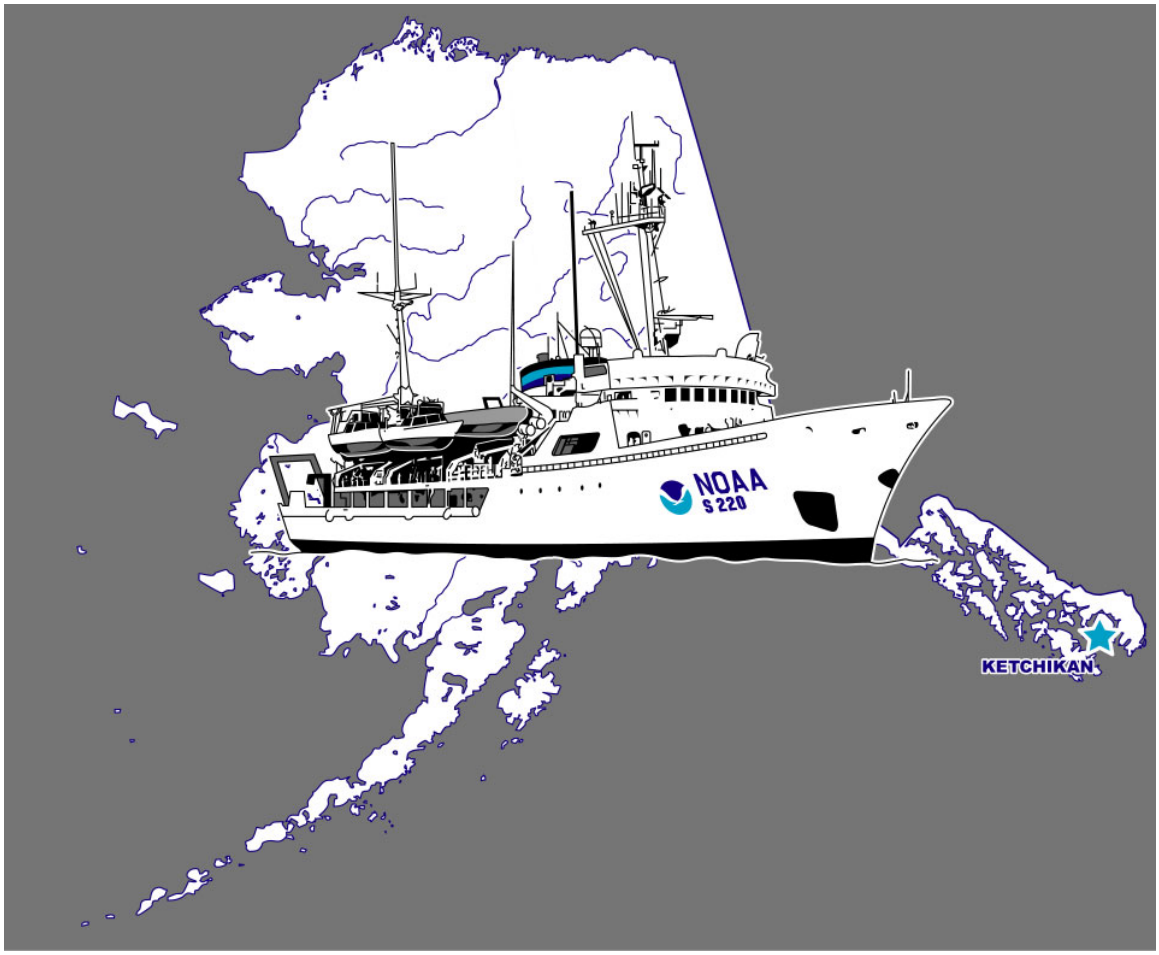
5.5 Paper Separates compiled

Use a brown or blue folder to compile your paper separates. These should include DP forms, boat sheets and paper acquisition logs if produced for this survey.

The folder should be labeled, using the Smart Labeler, with Project, Sheet, and Separates to be Included with DR, as shown below.

OPR-XXXX-FA-0X
HXXXXX
SEPARATES TO BE INCLUDED WITH
THE DESCRIPTIVE REPORT

SHORELINE PRE-SURVEY DUTIES



Shoreline Pre-Survey Duties

Table of Contents

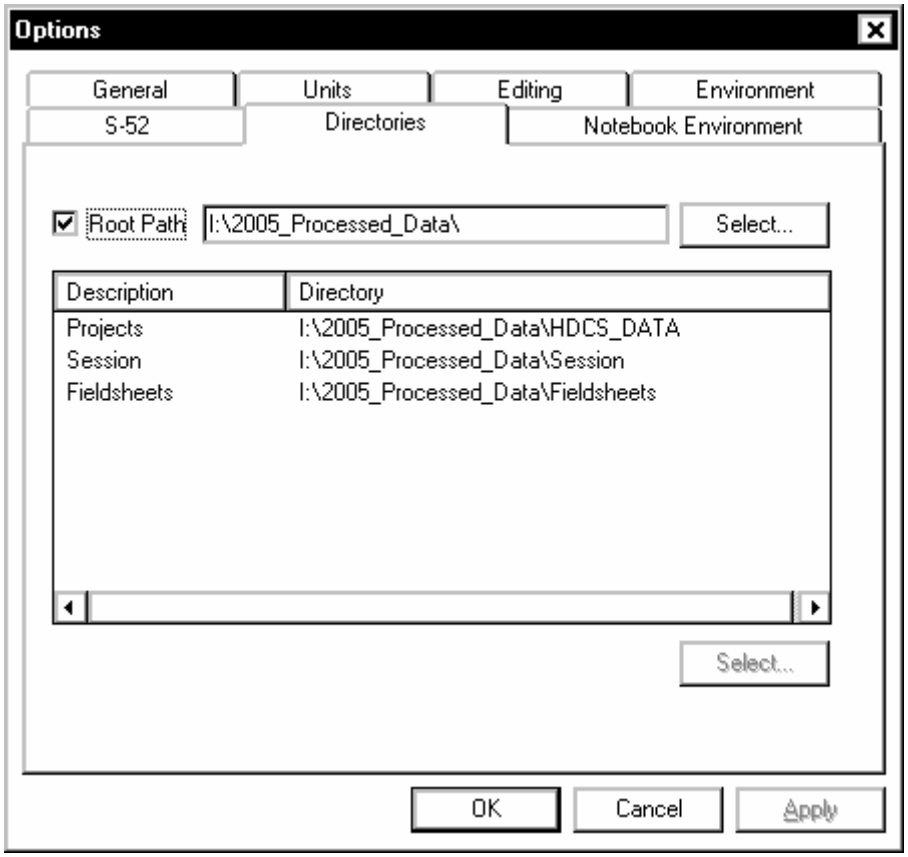
0.0 Document Scope

Before sending boats out in the field, it is important to know where to send them and what needs to be verified. This document is intended to guide sheet managers through setting up a shoreline project in CARIS Notebook. Other SOP's will be referenced for further guidance.

1.0 Setting the Directories

In order for CARIS Notebook to communicate properly with CARIS HIPS, the directories have to be properly set. This only has to be done once.

1. From the *Tools* menu, select *Options*.
2. Click on the *Directories* tab in the pop-up window.



3. Set the Root Path to:
   I:\200#_Processed_Data
4. The *Projects* directory should point to the *CARIS HDCS* folder.
5. The *Session* directory should point to the *CARIS Session* folder. This will allow HIPS sessions to be opened into Notebook for reviewing shoreline data with a BASE surface in the background.
6. The *Fieldsheets* directory should point to the *CARIS Fieldsheets* folder. Individual fieldsheets can be opened in Notebook for review.
7. Once all directories have been properly set, click *Apply* and then *OK*.

2.0 Editing Files

2.1 Source Shoreline Files

Source shoreline files will be provided to the sheet manager in Notebook's .hob format with S57 attribution. Any additional items from the chart that should be addressed during verification will need to be digitized in Notebook.

Mapinfo Setup

Copy your Mapinfo survey limit from H:\OPR_XXXX_FA\Project_Files\FA_Layout\MapInfo into H:\OPR_XXXX_FA_Cordova\Surveys\H11XXX\Survey_Files\Shoreline\MapInfo.

Copy the Mapinfo XXXX_CFF_Shoreline.TAB and legend from H:\OPR_XXXX_FA_Cordova\Project Files\FA_Shoreline\Mapinfo, rename
with H# and put in H:\OPR_XXXX_FA_Cordova\Surveys\H11XXX\Survey_Files\Shoreline\MapInfo.

You can but don't have to edit your copy of the CFF shoreline in mapinfo to fit your survey, remember these files are only for Pre-Survey and
are not a deliverable. IF you don't edit it, just deal with what is in your survey limit.

Digitize charted features in Mapinfo as necessary into separate tables sorted by S-57 object type, i.e. Chd_UWTROC for rocks,
Chd_DEPCNT_0 for LW, Chd_OBSTRN for foul, Chd_SBDARE for ledge and reef, and Chd_COALNE for HW. These files should also
be in your Survey_Files\Shoreline\MapInfo folder. (This will make the importation into Notebook easier and also make sure tables all have the
same projection of LLNAD83.)

In Mapinfo, have all of your newly copied and renamed tables open and then save workspace called HXXXXX_Shoreline in your Survey_Files\Shoreline\MapInfo
folder. This session is only used for pre-survey shoreline setup.

Adjust CFF/chd parts of your copy of the legend as necessary. CFF items should be bright green (blue/black features distinguished for
reference only), Charted items should be red.

Print atleast 2 sets of boat sheets and save digital files for Terra Sync as before.

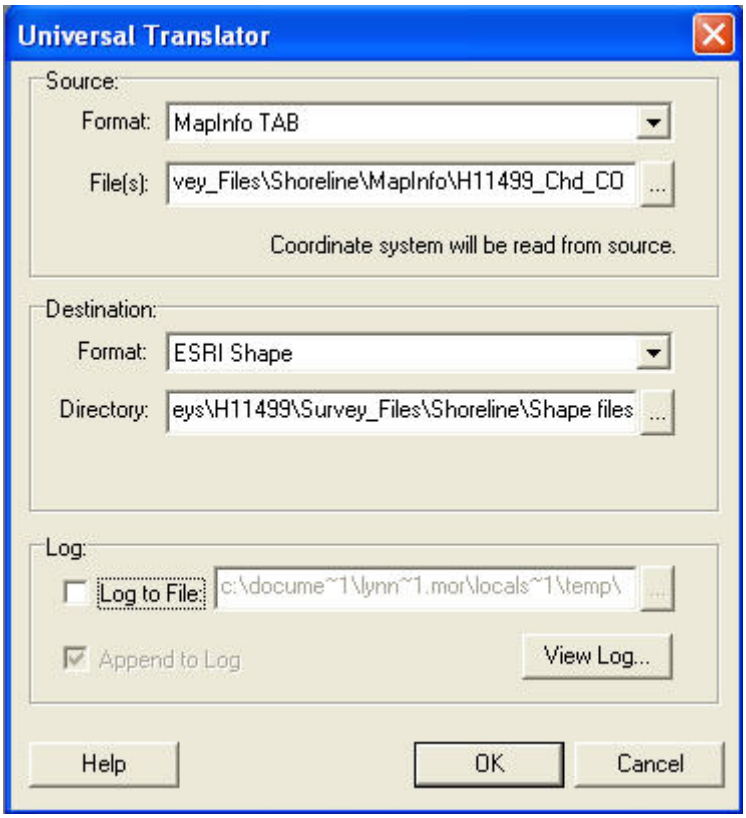
Notebook Setup

CFF_Shoreline and survey limit hobs are provided as before. (Copy O119_CFF shoreline.hob from H:\OPR_XXXX_FA\Project Files\FA_Shoreline and rename.
Copy HXXXXX_survey_limits.hob from H:\OPR_XXXX_FA\Project Files\FA_Layout\hobs.

The Chd Mapinfo files will be used and imported into Ntbk with the Object Import Utility. Templates have been created for you to use to import the charted shoreline tables.

In an Explorer window create a new folder in H:\OPR_O119_FA \Surveys\HXXXXX\Survey_Files\Shoreline called Shape Files.

Open Mapinfo, go to Tools/Universal Translator. Translate only your Charted Mapinfo TABs to ESRI Shape. Put the new shape files in your new folder.



That's it for Mapinfo, now open back to Notebook.

Check out R:\Utilities\I_FA_SOP\3_Processing\Shoreline\Importing Shapefiles in Notebook.doc.

Open atleast your HXXXXX_survey_limits.hob, make a new editable layer covering your whole survey area called HXXXXX_Charted_Shoreline.hob

Go to Tools/Object Import Utility/ don't worry if you get an error message, if you do in OIU go to Tools/Options and
Browse to R:\Utilities\VI_CARIS\Notebook Import Scripts\Charted Shoreline. From here click on pertinent object type (ie Chd_UWTROC), then clck on Modify, Shape File
should be checked. ****IMPORTANT - Browse to your charted shape file. In the next windows, check to make sure the correct Object Class is selected and the Caris Key,
Lat and Lon are mapped correctly then click Finish. Then Highlight the template you just modified and clck Execute. Check for errors in the log and close OIU.

In Notebook select all from the new OIU Import Layer and Tools/Import Selection into the Chd Shoreline hob. Continue untill allcharted features imported. If you have a
object type that does not have a template and need help let me know.

New helpful Notebook functionality -
Mass attributing:
To change one common attribute for a large number of objects from the same

object class (for example, UWTROC), the procedure to follow is the following:
a) Select all in the Edit layer (HOB file) in which you want to change the attribute for a given object class.
b) In the Worksheet window's query box, click on the Acronym column header to sort by Acronym. (double clicking will toggle between alphabetical and reverse alphabetical)
c) Select all the relevant Acronyms in the list (for example, all UWTROC): highlight using CNTRL or SHIFT key to add to the highlighted selection
d) right click to get the right-click pop-up menu
e)Select the right-click menu option : Remove Others from Selection
f) Once you have isolated the target Object class Acronym in the query, the next step will be to use the Edit tool to change the common attribute for all objects selected
g) Click on the menu item: Edit > Change All
h) The Change All dialog box appears. It works only for common Attributes.
i) left click inside the white box under the Acronym column header, a drop down menu will appear with all the valid attribute acronyms
h) Select the Attribute to change from the list and enter its common replacement value.

If you need assistance with the mass attributing, please see Gonsalves.

Attribution for charted features should be as listed below. Use the mass attribution functionality when possible. Also you can use mass attribution for adding info to remarks like Chd (16709) rk.

COALNE has no necessary attribution

For UWTROC
VALSOU = -8888.88
QUASOU = depth unknown
WATLEV = covers/uncovers or submerged, etc

For DEPCNT_0 (LW)
VALDCO = 0
VERDAT = Mean Lower Low Water

For OBSTRN (Foul)
CATOBS = foul area

For SBDARE (ldg/reef)
NATSUR = rock

2.2 Creating New Edit Layers

Editable layers are used for digitizing charted items or adding new shoreline features.

1. From the *File* menu, select *New Edit Layer*, or click on the *New* button in the toolbar.
2. Browse to the *Notebook_Files* folder and create a new .hob file, named *H#####_CHD_Shoreline.hob*
3. Digitize any items from the chart to the *CHD_Shoreline* layer, such as rocks or AtoNs that need to be addressed in the field and are not represented in the source shoreline files.

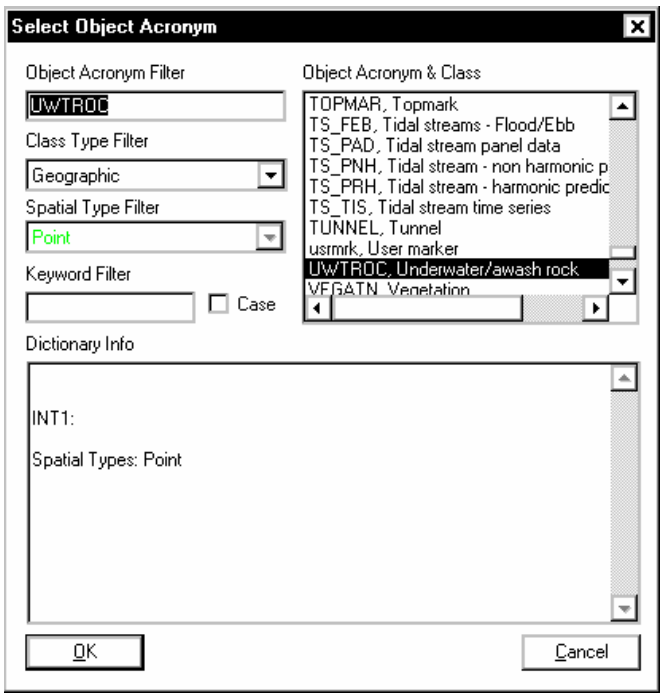
If the chart scale is 1:40,000; do not digitize the rock that is within 40 meters of a CFF rk.

4. After acquiring shoreline data, addrtional layers named *H#####_Add_Notebook, H#####_Modify_Notebook,and H#####_Delete_Notebook* will need to be created.

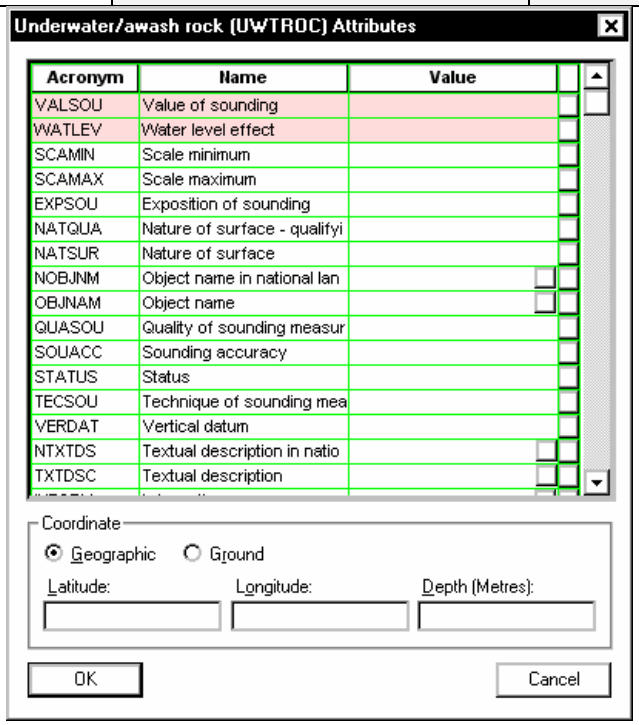
2.3 Digitizing Features

1. In the *Layers* tab, select the layer to be edited, right click and *Set As Active Digitize Layer*, or do this from the *Edit* menu. When digitizing to a layer, that layer must be selected in the *Layers* tab.
2. Select the appropriate digitizing tool from the toolbar (point, line or area).

3. When a digitizing tool is selected, a *Select Object Acronym* window will appear. Choose the appropriate acronym from the list (UWTROC, $CSYMB, WEDKLP, etc), then click *OK*.
   Attribute a ledge or reef as SBDARE with NATSUR as 9:rock
   Attribute foul areas as OBSTRN with CATOBS as 6:foul area



4. An *Attributes* window will appear. Fill in any required fields, which will appear red, and any desired optional fields, then click *OK*. If a depth or VALSOU is required for something digitized off the chart enter -8888.88 with the WATLEV as 4:covers and uncovers.

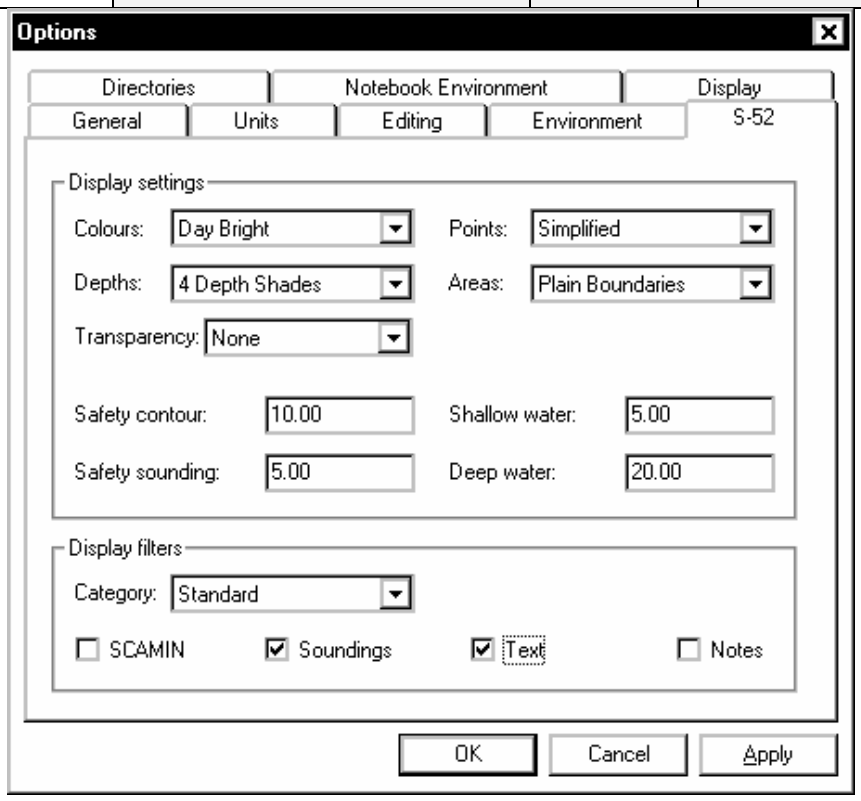


5. The cursor symbol will change. Click on the desired position for the digitized object, line or area.
6. To end a digitized line or area, right click on the last point dropped and select *End Line,* or *Close Line*.
7. Digitized features can be moved or edited using the *Edit Feature* tool in the toolbar, but be sure to save often!

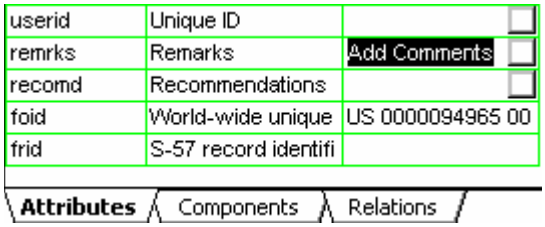
2.4 Turning on Text Display

Some text from Object ID, Inform and Remarks fields can be displayed with the digital data.

1. Go to the *Tools* menu and select *Options.*
2. Select the *S52* tab.
3. There are several check boxes at the bottom of the window. Turn on the *Text* option, then click *OK*. The *Notes* check box refers to Marker Text, which is discussed below.



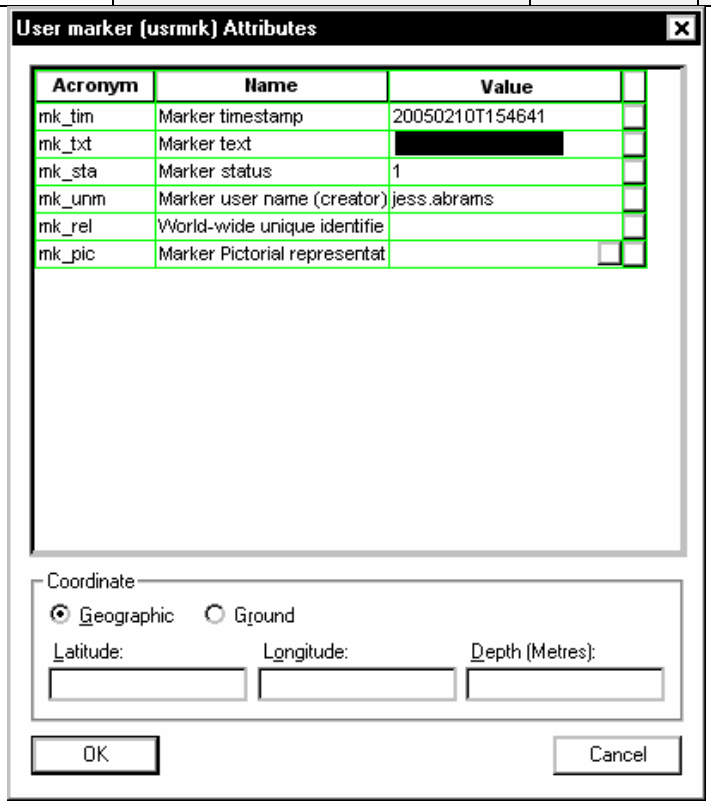
4. Text can be added to a feature by selecting it, then adding the desired comment to the *remrks* field.



2.5 Marker Layers

Marker layers are not stand alone layers. They must be attached as a child layer to an Edit layer.

1. Highlight the parent layer to which a marker layer will be added (e.g. CFF or Lidar).
2. From the *File* menu, select *New Marker Layer*, or simply click the *M* icon in the tool bar.
3. A new Marker layer will appear in the *Layers* tab, with the same name as the parent layer. Select the Marker layer and *Set As Active Edit Layer*. It must be highlighted before digitzing.
4. Right click on the associated parent layer and *Set as Snap/Grab Target.*
5. Choose the appropriate digitizing tool (usually point). Even when digitizing a Marker for a line feature, a point Marker is generally used for simplicity.
6. An *Attributes* window will open and comments can be entered in the *Marker text* field.



ATTRIBUTES OF THE MARKER:
mk_tim: Marker timestamp Displays the date and time captured automatically from the computer
mk_txt: Marker text User text, description, recommendation, comment, etc., populated during entry
mk_sta: Marker Status Value is a number: 1. Active, 2. Dismissed, 3. Closed, 4. Unknown
mk_unm: Marker User Name Capture of the user account id. Can be changed later
mk_rel: *Related feature ids* Capture of the FOIDs when objects on the parent layer are selected
mk_pic: Marker picture file A multi-media file can be attached to the marker

7. Once the text has been entered and other fields set as desired, click *OK* and the digitizing tool will appear.
8. Position the mouse over the desired location, hold down the "s" key, then left click and release. This will snap the marker to the object being marked.
9. To display the text of the markers in the *Display* window, follow the steps for Turning on Text Display above, but check the *Notes* box in the *S52* window.

2.6 Capturing a FOID

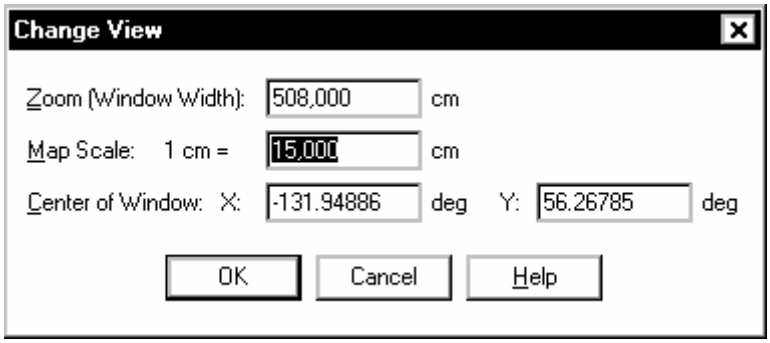
If a marker layer is attached to a parent layer that contains S-57 objects, it is possible to capture the Feature Object Identification (FOID), which is the S-57 worldwide unique ID, and snap to the source object. A reference FOID can only be captured on the parent layer of a marker. This is not a necessary procedure, but if you need to do it, here's how.

1. From the *Edit* menu, select *New Feature.*

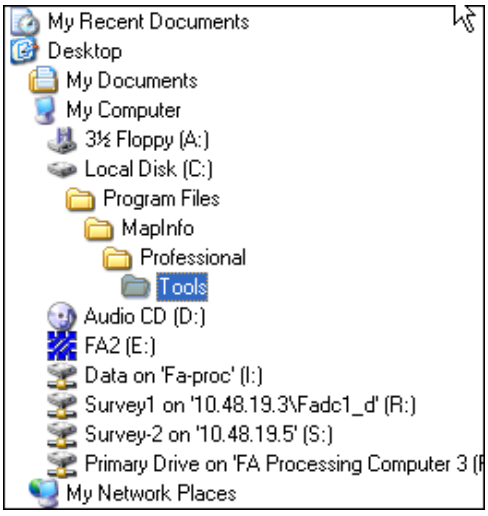
2. Choose *Create Marker Reference from Superselection* when using just a single object highlighted in the worksheet window, or *Create Marker Reference from Selection* for several objects, or the entire parent layer.
3. Follow Steps 1-4 above, to create a new Marker layer for the desired S-57 layer.
4. Highlight the parent layer in the *Layers* window, then select the desired object (superselection) or objects (selection) from which to capture the FOID.
5. Follow Steps 5-8 above to complete the marker.

3.0 Generating GeoReferenced TIFFs

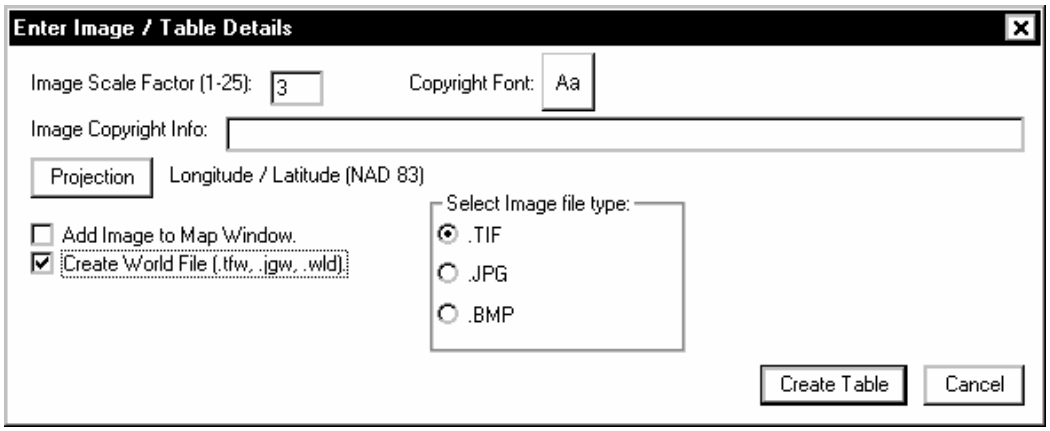
1. In the MapInfo display window, zoom in on the newly colored shoreline layers.
2. Right click in the window and choose *Change View*.
3. Set the *Map Scale* to between 1:10,000 and 1:15,000. (It may be necessary to change the distance units of the display from the *Map, Options* menu.)



4. Start at one end of the sheet and center the shoreline data in the display window.
5. From the *WorldReg* menu, select *Save Window as TAB.*
   If the *WorldReg* menu is not visible, it can be added from the *Tools* menu, by selecting *Tool Manager > Add Tool.* On the local drive, navigate to the WorldReg tool.



6. In the WorldReg pop-up window, make sure the projection is correct and check the *Create World File* checkbox.



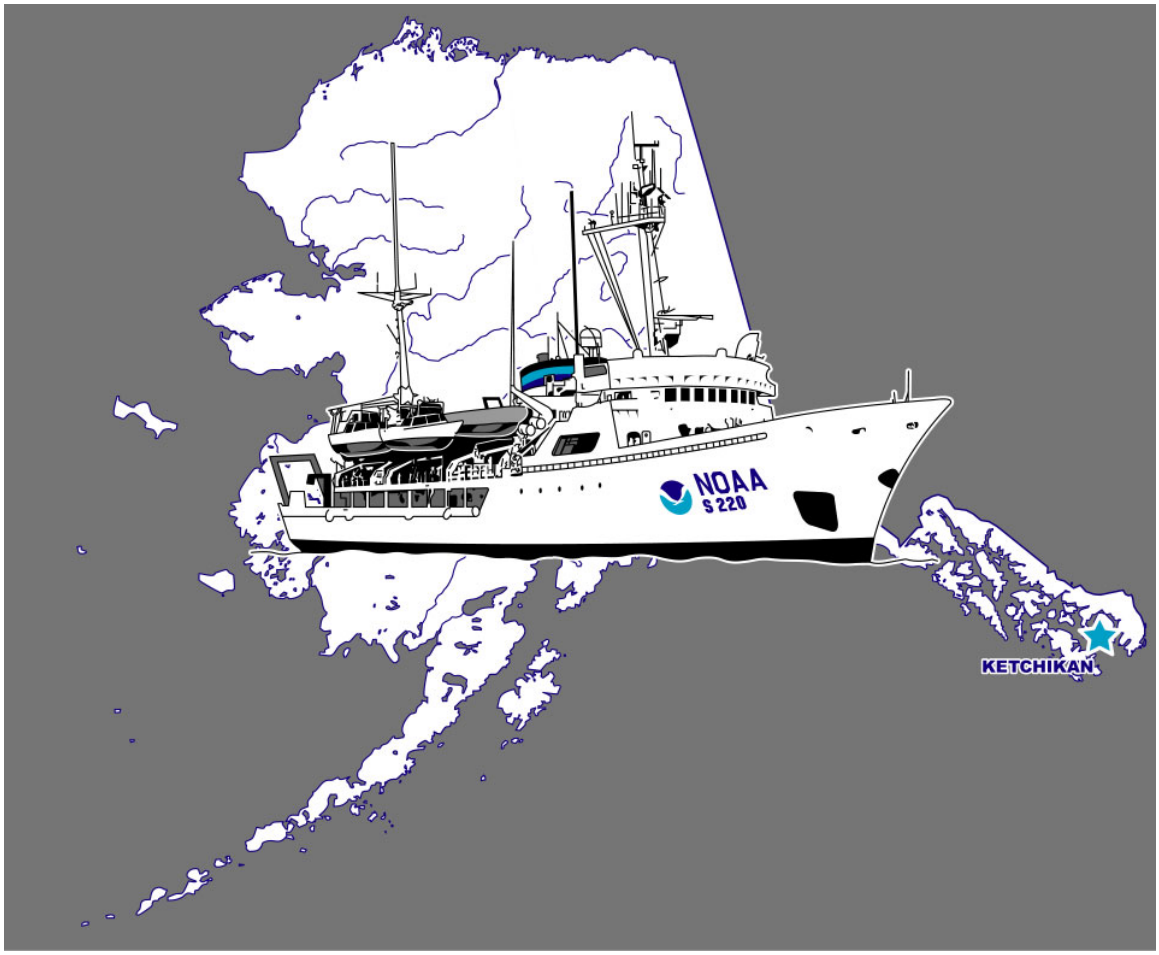
7. Click the *Create Table* button and save the files to the *Misc* folder. Naming convention is H#####_1, etc.
8. Repeat this process as many times as necessary to get images of the entire shoreline area. It is a good idea to have some overlap between the edges of the images.
9. It may be helpful to draw a rough delineation on the legend of where each background image ends.

3.0 Printing Boat Sheets

Boat sheets will be used to make notes in the field regarding shoreline features.

1. Print a color copy of the Shoreline Legend for each shoreline boat on 8 ½ " x 11" paper.
2. Print color copies of each of the TIFFs on 8 ½ " x 11" rite in the rain paper.
3. Make sure all paper copies are clearly labeled with project and sheet information.

Importing ESRI Shapefiles in Notebook



Standard Operating Procedure

Importing ESRI Shape Files in Notebook

Table of Contents

0. Document Scope

This document describes the process that the CARIS Notebook user should follow in order to successfully import ESRI Shapefiles into Notebook using Notebook's built-in Object Import Utility. The objective is to convert Shapefiles containing feature and attribute information into an editable S-57 compliant format in Notebook. It is intended to supplement existing Notebook Standard Operating Procedures so it is therefore assumed that the user of this document has a working knowledge of Notebook.

General notes, advanced tips, and troubleshooting are discussed at the end.

Specific notes for current buffer line import are highlighted in blue.

At time of writing this only works on CARIS Ntbk 2.2beta2 that is on FA_CST & FA_Process1.

1. Shape File Import

Importing ESRI Shapefiles in Notebook was previously a lengthy and cumbersome process as the Object Import Utility (OIU) did not support the direct importing of Shapefiles. In order for this procedure to work, you must be using a version of Notebook with the Shapefile import feature available in the OIU.

The overall procedure to import the Shapefiles is as follows.

1. Create/open an edit layer into which you will import the Shapefile features.
2. Create the OIU scripts that will convert the Shapefiles.
3. Execute the import scripts.
4. Import the temporary import layer into the edit layer.

1.1 Create/Open an Edit Layer

Create a new edit layer or open an existing one into which you would like to import your Shapefile.

To create a new edit layer, use the extents of the Shapefile you will be importing as the extents of the edit layer.

1. Open the Shapefile you will be importing. (File → Open)
2. Zoom to the extents of the Shapefile.
3. Create a new edit layer and use the current display or window selection tool when defining your extents. NOTE: Remember to use Geographic when defining the edit layer.

For buffer lines the file should be located in H:\OPR-XXXX-FA\Surveys \HXXXXX\Survey_Files\Survey_Planning and be called HXXXXX_Buffer_Lines.hob.

Alternatively, you can open an existing .hob file into which you would like to import your Shapefile, but be certain that the extents of the edit layer includes the geographic extents of the Shapefile features.

1.2 Use the Object Import Utility to Create Import Scripts

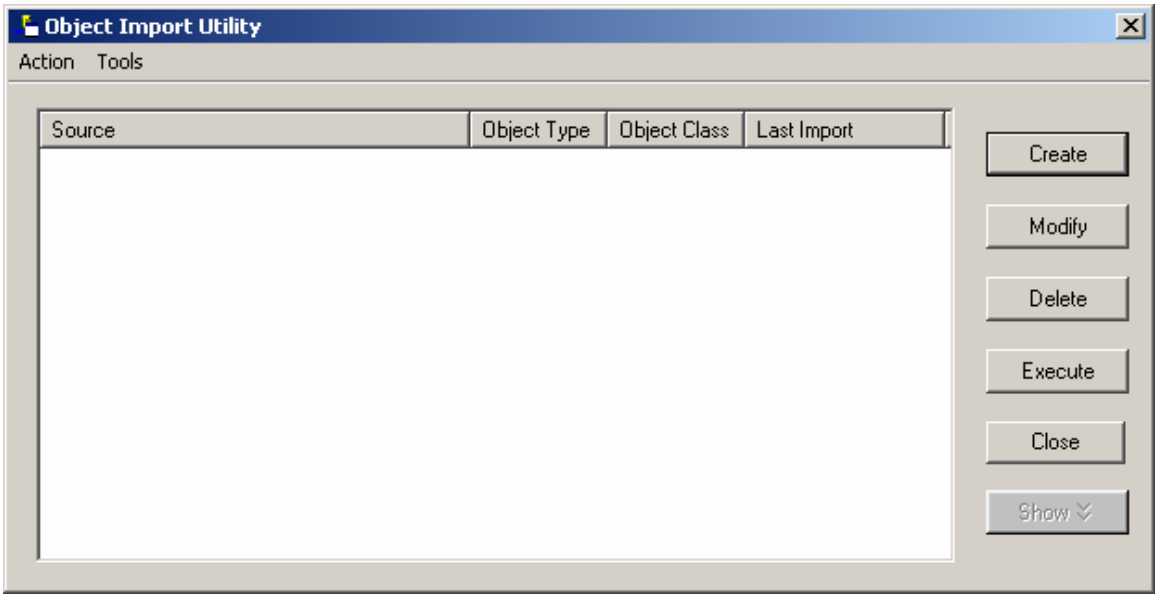
Creating the OIU conversion scripts is the most important part of the import process. First the OIU environment must be setup. Then the scripts can be created.

1.2.1 Object Import Utility Setup

First you need to open the OIU and set up the scripts directory.

1. Highlight the edit layer you just created or opened and select the Object Import Utility from the Tools menu (Tools → Object Import Utility…) or click the OIU button . The Object Import Utility window should appear.

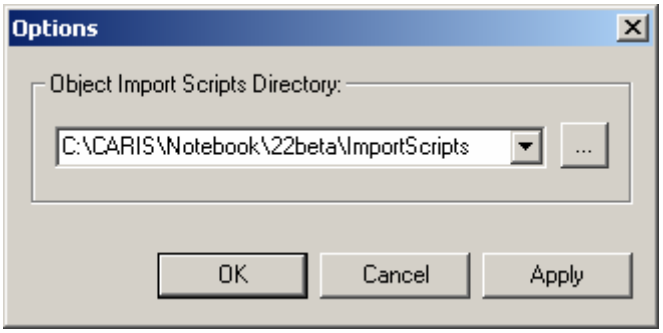
   NOTE: The first time you do this an error message will pop up. Click OK.



2. When the OIU window appears, select Tools → Options. Set the Object Import Scripts Directory (R:\Utilities\VI_CARIS\Notebook Import Scripts) then click OK.

   For Buffer lines use Line_Generic Buffer Line and skip to 1.2.2 #3

   You are now ready to create your script(s).

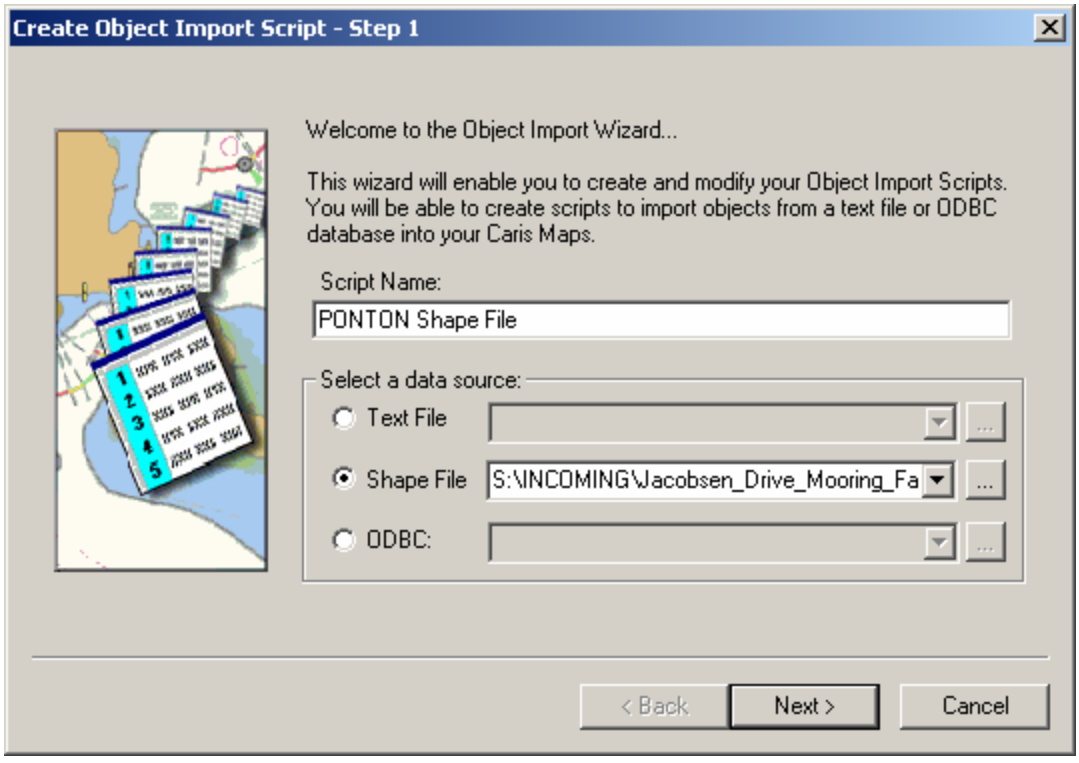


1.2.2 Import Scripts

You must create one script for every different S-57 Object that you will be importing. For example, if you are importing one Shapefile with pontoon information and another with shoreline construction information, you will need to create two different scripts. Similarly, you will need to create different scripts if you intend to import different S-57 Objects from one Shapefile.

1. Click the Create button in the OIU main window (or Action → Create).
2. Enter a script name. Choose a script name that is reflective of the feature type you are importing and optionally the kind of data. For example, “PONTON” or “Pontoon Shape File”.
3. Select the source Shapefile
   For buffer lines it should be in H:\OPR-O167-FA Cape Decision 2005\Surveys \H11469\CARIS\Preprocess\Trimble\Export\Buffer Lines\TRX_XXX_Line_gen.shp.

   NOTE: If the OIU does not give you a Shape File data source option to select, as shown below, your version of CARIS Notebook does not support this procedure and you cannot go on. You must be using a version of Notebook that includes this option.

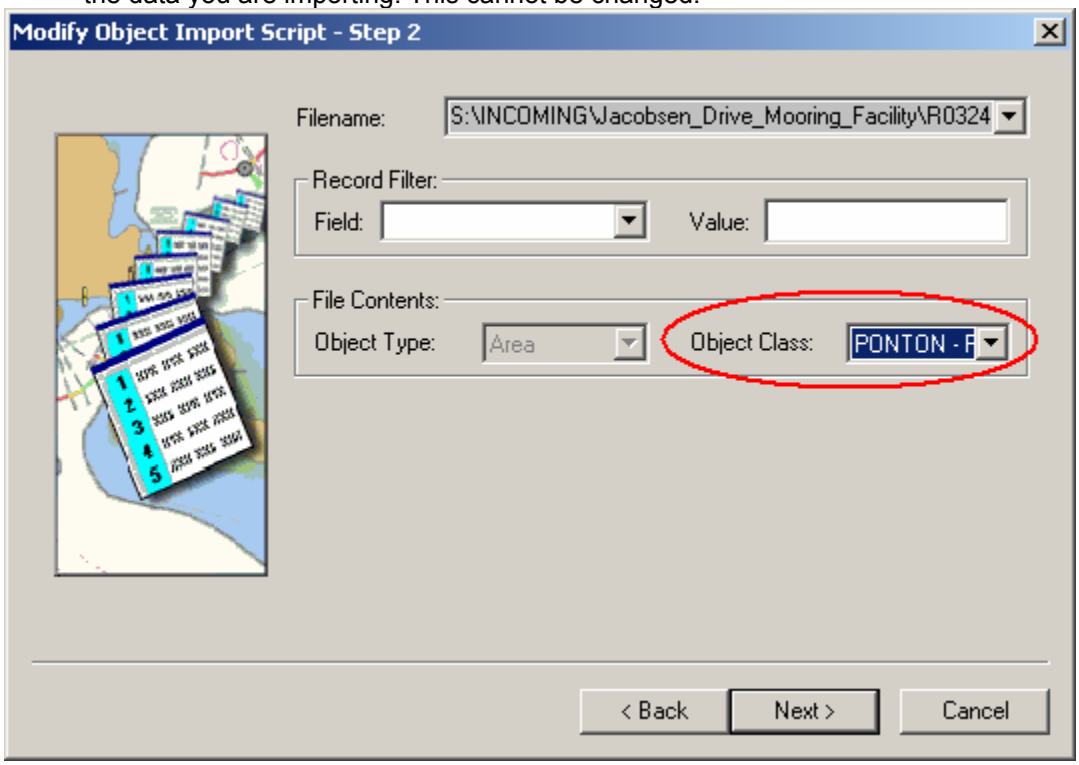


4. Click Next.
5. **(OPTIONAL)** Apply a data filter to the import. Choose a field (from the .dbf file) from the drop-down menu. Enter the field value that you would like to import. The filter will import only those features that match the attribute/value you select. Therefore, to ensure that the import filter value is entered correctly, open the .dbf file (with, say, Microsoft Excel) and verify the value. The filter is very useful for extracting a single feature type from a Shapefile containing many different features.

6. Select the S-57 Object Class that the feature will be converted to. **IMPORTANT**: It is critical that you choose the correct Object during this step, as this cannot be changed later.

   As an example for buffer lines Object Class should be *$LINES – Cartographic line*.

   NOTE: The File Contents: Object Type shows the geometric type (point, line, or area) of the data you are importing. This cannot be changed.



7. Click Next.
8. Now you must map the Shapefile fields to the appropriate S-57 Class Attributes in the resulting window, as explained in the following subsections.
9. Click Finish when mapping is complete.
10. Repeat the preceding steps as necessary for the various S-57 Object Classes for which you have Shapefiles.

    NOTE: To modify an existing script, select the script to be modified and click Modify. Nothing in the script will change unless you change it.

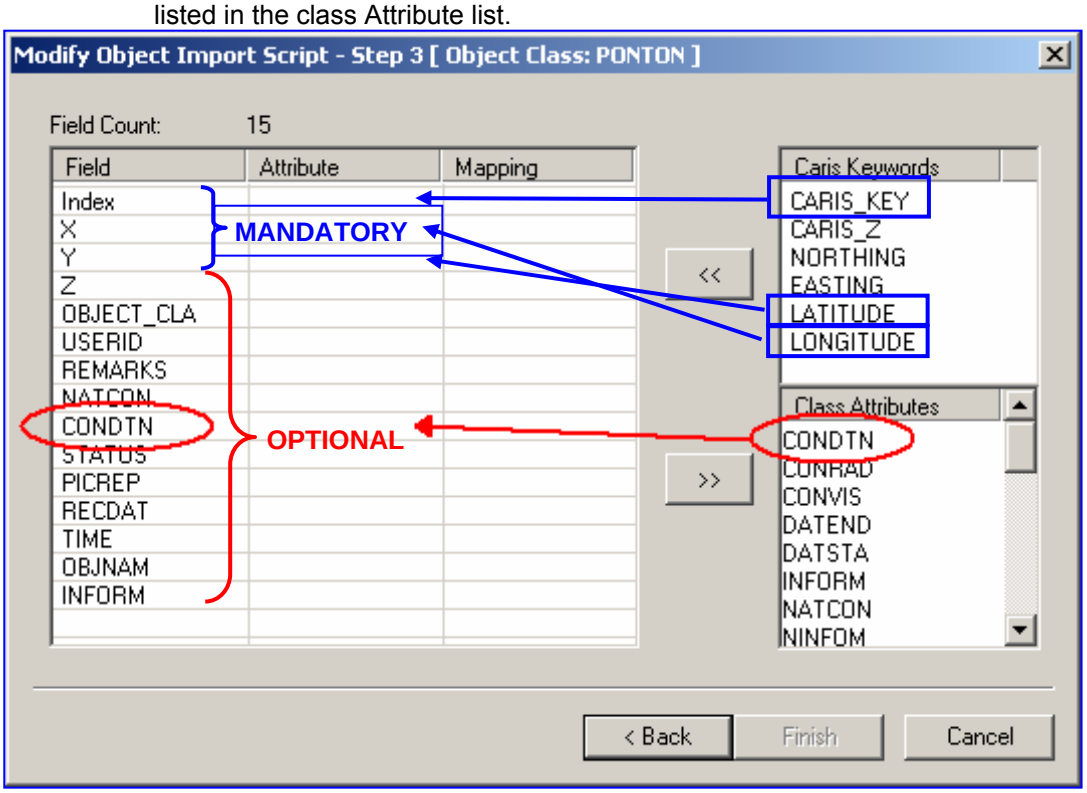
1.2.2.1 Map Shapefile Fields to S-57 Class Attributes

The Shapefile fields are listed on the left. Map either a Caris Keyword or a Class Attribute to a Field as follows:

1. Select the Shapefile field to be mapped.
2. Double-click the Keyword or Attribute to be mapped. Alternatively, select (single-click) the Field and Keyword/Attribute in any order and click the double-left arrow button (<<).

IMPORTANT: At a minimum, the following must be mapped: CARIS_KEY (to "Index"), LATITUDE or NORTHING (to "Y"), and LONGITUDE or EASTING (to "X"). (See figure below.) Then skip to steps 1.3 through 1.4.2.

NOTE: Only those Class Attributes relevant to the Object Class selected earlier are listed in the class Attribute list.



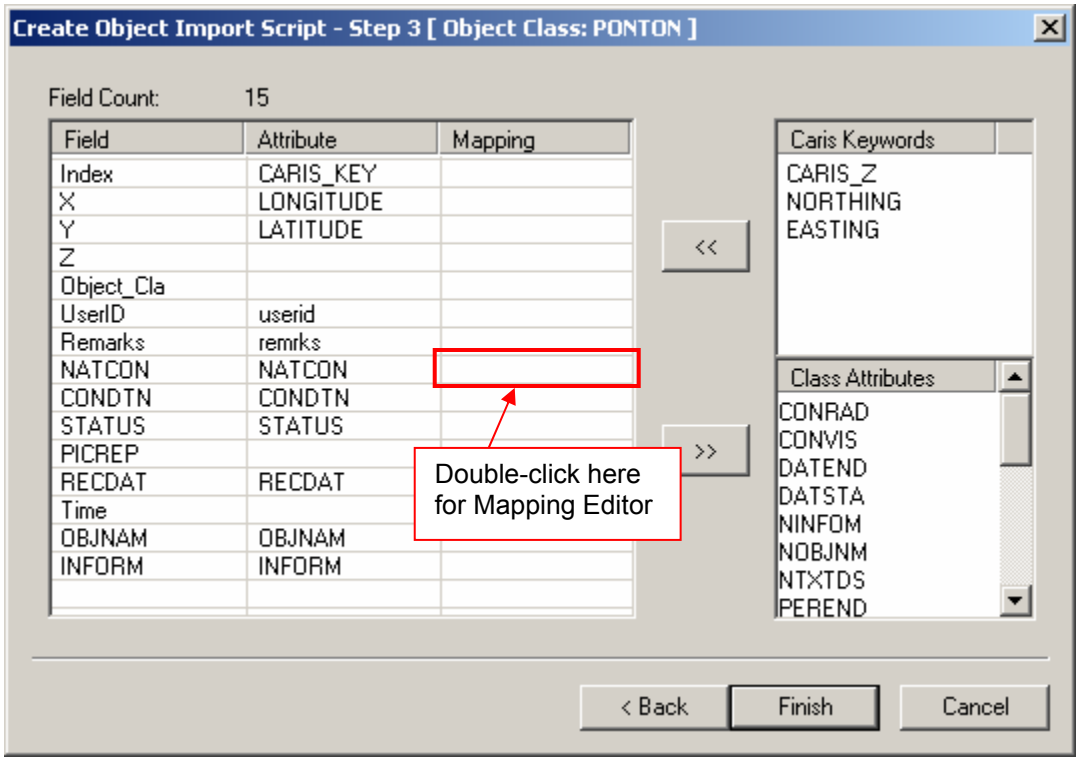
3. **For list type field values only**: Map the Field values to the Attribute values (see next subsection). **IMPORTANT**: If the Shapefile fields contain the code values instead of text (e.g. "6" instead of "yellow"), then this step can be skipped.
4. **(OPTIONAL)** To remove a mapping, double click the Attribute you wish to remove.
5. Click "Finish" when mapping is complete.

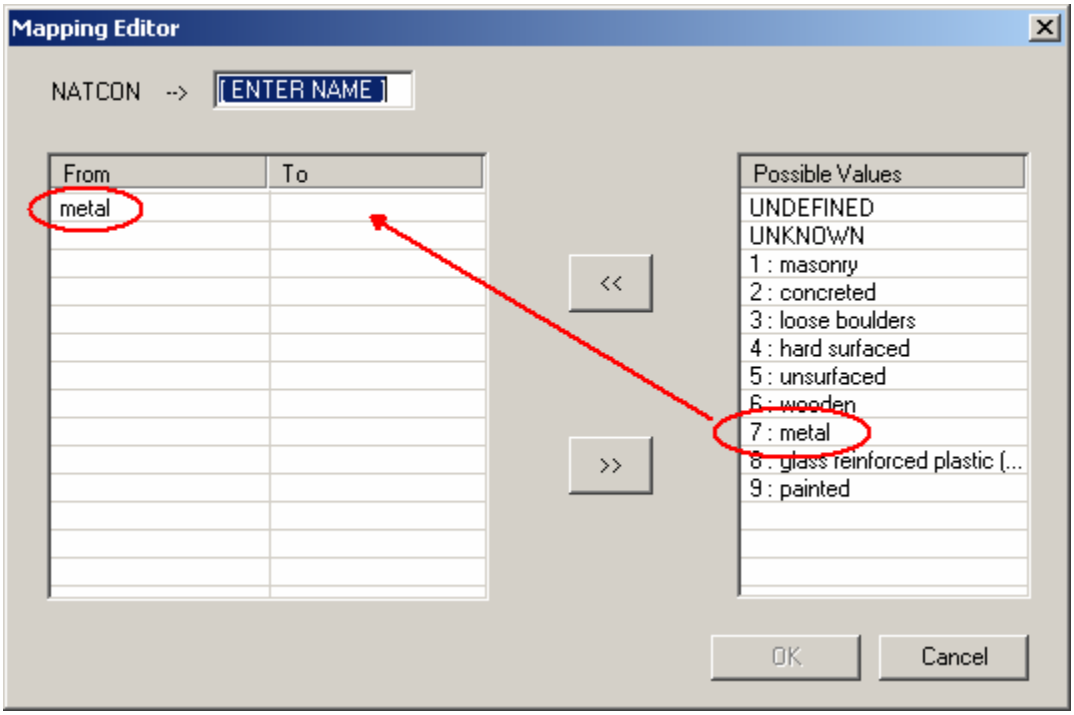
1.2.2.1.1 Map Shapefile Field Values to S-57 Class Attribute Values

If the Class Attribute contains fixed value choices (e.g. COLOUR: 1: white; 2: black; 3: red; etc.) then the Shapefile field values must be mapped to the S-57 Class Attribute values.

As mentioned above, if the field values include the associated S-57 code values instead of the actual text values (e.g. "6" instead of "yellow"), then this process is not needed. Otherwise, it must be done manually, as follows:

1. Double-click the empty box in the Mapping column in the row containing the field whose values will be mapped. The Mapping Editor will appear, as shown below.
2. Give the mapping scheme a name.
3. Map the values as appropriate.
4. Click "OK" when finished.


Create Object Import Script - Step 3 [Object Class: PONTON]
Field Count: 15
Field
Attribute
Mapping
Index
X
Y
Z
Object_Cla
UserID
Remarks
NATCON
CONDTN
STATUS
PICREP
RECDAT
Time
OBJNAM
INFORM
CARIS_KEY
LONGITUDE
LATITUDE
userid
remrks
NATCON
CONDTN
STATUS
RECDAT
OBJNAM
INFORM
Double-click here for Mapping Editor
<<
>>
Caris Keywords
CARIS_Z
NORTHING
EASTING
Class Attributes
CONRAD
CONVIS
DATEND
DATSTA
NINFOM
NOBJNM
NTXTDS
PEREND
< Back
Finish
Cancel


Mapping Editor
NATCON -->
[ENTER NAME]
From
To
metal
<<
>>
Possible Values
UNDEFINED
UNKNOWN
1 : masonry
2 : concreted
3 : loose boulders
4 : hard surfaced
5 : unsurfaced
6 : wooden
7 : metal
8 : glass reinforced plastic (...
9 : painted
OK
Cancel

1.3 Execute the Import Scripts

Once the scripts have been created or modified, they can now be executed.

1. Select the script(s) to be executed (use Ctrl to select more than one)
2. Click Execute.
3. Review the log that appears at the bottom of the window.
4. If there are no errors, click Close. If there are some errors, it is likely that your script was not set up correctly. See below for some explanations of and solutions to common problems and errors.

1.4 Import Temporary Layer into Edit Layer

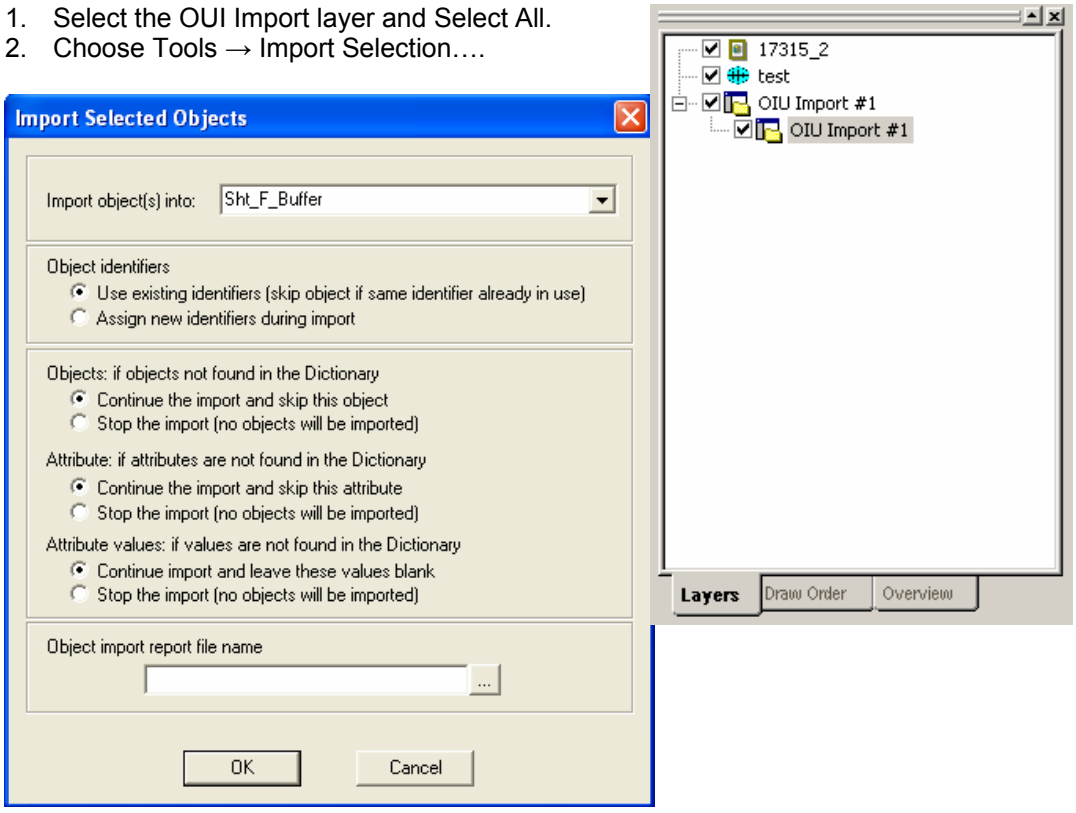
The Shapefiles have now been imported to Notebook. However, they have been imported into a temporary non-editable layer called OUI.Import #1 (or #2, etc.). This allows you to review your imported data to make sure everything in the data looks good before finalizing the import into your Notebook Edit Layer.

1.4.1 Review Temporary OIU Import

To review the data, select the OIU Import layer and Select All. The imported features and their attribute fields/values should appear in the Worksheet Window.

1.4.2 Finalize the Import

1. Select the OUI Import layer and Select All.
2. Choose Tools → Import Selection….



3. Select the Edit layer into which you would like to import your data.
4. Choose other options as desired.
5. Click OK.
6. Your Shapefile has now been successfully imported to an editable S-57 layer in Notebook. Click OK again.
7. Close the temporary OIU Import layer.

2. General Notes, Advanced Tips, and Troubleshooting

2.1 General notes

File naming

Every time you execute the script you are creating, you will need to ensure that the data source filename is set correctly. To save time in the future, you might maintain a consistent file naming scheme so that the files associated with the respective import scripts are the same as the previous import and in the same folder. The scripts, once created, would then not need to be modified, only executed, thus saving time.

Field naming

The field names, strictly speaking, do not need to be identical to the built-in S-57 Class Attributes in Notebook. However, as a practice it is a good idea to name the fields identical or very similar to their S-57 counterparts. They must be the same if they are to be imported into Pydro at any time. For shoreline collection these fields names are defined in the Data Dictionary Editor via GPS Pathfinder.

2.2 Advanced Tips

Mapping multiple-object, single position Shapefiles

Because a Shapefile can have many user-defined fields and because these fields are manually mapped in the OIU in multiple parallel scripts, several objects can be imported from one single feature (i.e. one single position) from one single file.

This is useful if you have, for example, a lateral beacon, a light, and a topmark (multiple objects) that share the exact same position. You can record attribution information during field data collection for each of these objects as attributes/fields of the same feature (this would need to be planned and set up before data collection, e.g. in the Data Dictionary Editor if using TerraSync/GPS Pathfinder).

The resulting Shapefile/feature would then have: 1) BCNLAT attribution fields/values, 2) LIGHTS attribution fields/values, and 3) TOPMAR attribution fields/values, this file can be imported into three separate objects (BCNLAT, LIGHTS, TOPMAR) using the OIU by creating three separate scripts as follows:

1. In the first script, you would set the Object Class to BCNLAT and map the lateral beacon fields in the Shapefile accordingly; you would simply ignore the light and topmark fields.

2. In the second script you would select the exact same Shapefile, set the Object Class to LIGHTS, and map only the light fields.
3. In the third script you would set the Object Class to TOPMAR, and map only the topmark fields.

Upon execution of all three of these scripts (each drawing information the same data source, just mapped differently), you will have three different objects in Notebook that share the exact same position.

The figures below show basic mapping schemes from the same file/feature: the one on the left has fields mapped to a S-57 BCNLAT while that on the right shows the mapping for a S-57 LIGHTS.

Field	Attribute
Index	CARIS_KEY
X	LONGITUDE
Y	LATITUDE
Z	
OBJECT_CLA	
USERID	
REMARKS	
BCNSHP	BCNSHP
CATLAM	CATLAM
COLOUR	COLOUR
COLPAT	
CATLIT_L	
COLOUR_L	
LITCHR_L	

Field	Attribute
Index	CARIS_KEY
X	LONGITUDE
Y	LATITUDE
Z	
OBJECT_CLA	
USERID	
REMARKS	
BCNSHP	
CATLAM	
COLOUR	
COLPAT	
CATLIT_L	CATLIT
COLOUR_L	COLOUR
LITCHR_L	LITCHR

It is important to note, however, that you should be certain that a feature actually exists before executing the script for that feature using this method. In other words, if you execute a topmark script using this approach (with lateral beacon position information in the Shapefile) then a topmark object will be created whether or not you collected data on it (there may have only been a light on that beacon).

NOTE: In this multiple-object import method, there may have been more than one field with the same name in the original Data Dictionary used when gathering the data. If so, duplicate fields have been renamed during the GPS Pathfinder export process by appending sequential numbers to the fields (e.g. COLOUR, COLOUR2, COLOUR3).

2.3 Troubleshooting

Object Import Utility Message Log Errors

The OIU Message Log appears upon execution of a script. Listed below are some error messages you may encounter.

119025: Failed to create feature object. The attribute data does not match the type specified in the object catalog. Record 0 will be skipped.

For each S-57 attribute the OIU expects a certain attribute value type such as text, numeric, or one of a predefined list of integers that correspond to menu values. This message will most likely occur if the OIU is expecting one of several integer values but

does not encounter it. Specifically, if attribute list values are identified by their text value instead of their numeric value, this message may occur. For example, if the COLOUR attribute values are “white” or “green” instead of their integer counterparts “2” or “6”, respectively, then this error would appear.

Solution:

First, you can manually map the values using the procedure described herein.

Second, you can re-export the source data to ensure that the numeric code value is exported instead of the text value. This assumes that numeric codes are associated with the list values in during the data collection process, which must be set up in the Data Dictionary, for example, if using TerraSync/GPS Pathfinder.

Trimble PathFinder Setup

Table of Contents

0. Document Scope

This document outlines the standard operating procedures for creating a data dictionary and creating and configuring a project in TerraSync with the necessary settings for efficient and S-57 compliant shoreline data acquisition.

1. Data dictionary

The data dictionary is a customized list of features that allows the user to assign feature attribution directly in the field that can later be readily converted to a S-57 data format during processing back on the ship or in the office. The data dictionary itself does not contain positions or feature-specific information, but rather structures data collection in the field and prompts the user to enter relevant information. NOTE: Check your data logger under C:\MyDocuments\TerraSync for an existing data dictionary and verify it is the approved version (Fairweather_DD.ddf). If the data dictionary is created and up-to-date you can skip ahead to section 2: TerraSync Configuration.

1.1. Pathfinder Office

You will use GPS Pathfinder Office throughout the suitcase shoreline process, for everything from creating a data dictionary to processing GPS data and exporting shapefiles to Pydro. Upon opening GPS Pathfinder Office, a dialog box will prompt you to select a project. Later in the process you will create a new project; for now select Default.

1.2. Data dictionary creation to S57 standards

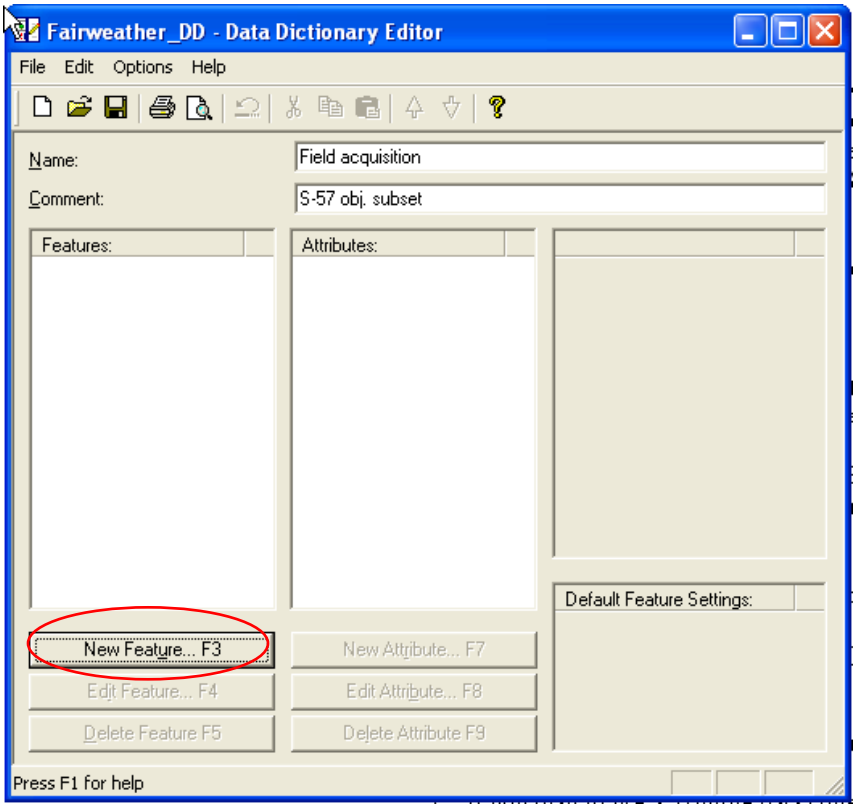
To create a new data dictionary, choose Data Dictionary Editor from the Utilities menu in Pathfinder Office. When the Data Dictionary Editor opens, select File → New. Fill out the Name and Comment fields. Give data dictionary a descriptive name and save (File → Save) to the ship's designated network folder (2005 Fairweather data dictionary: R:\Utilities\Shoreline_S57\Trimble\Data Dictionary\Fairweather_DD.ddf). Alternatively, select File → Open to modify an existing Data Dictionary. Eventually, the final data dictionary will be transferred to the TerraSync folder of the acquisition laptop or handheld data collector.

1.2.1. Add new features

Now that the dictionary has been created, it must be populated with the potential features (S-57 objects) and attributes you will want to record in the field. Consult the CARIS S-57 ENC Catalogue (C:\Program Files\Python23\Pydro\S57\S57cat\frames\S57catalog.htm) for a list of S-57 objects, attributes, and coding information. The NOAA point features file (C:\Program Files\Python23\Pydro\forms\NOAAHydroS57PointObjects.xls) is a good resource to help determine which features and attributes are necessary to include. The Data Dictionary Record, an Excel spreadsheet

(R:\Utilities\IV_Trimble\Data Dictionary\Data_Dictionary_Record.xls), has been created and should be used to keep track of the Data Dictionary features and attributes and their relation to S-57 requirements.

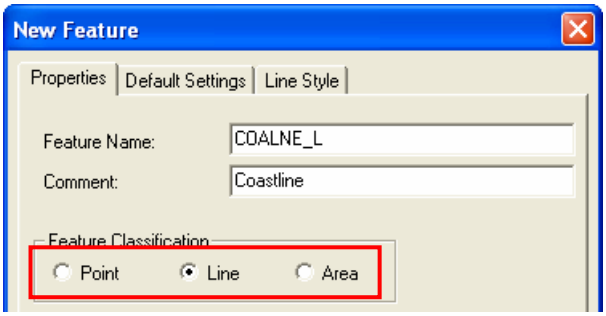
To add a new feature, click the New Feature button at the bottom of the left-hand (Feature) column.



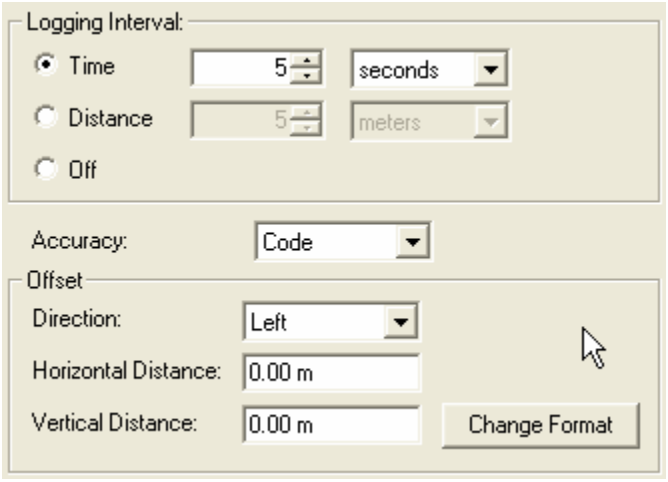
Click on the Properties tab and fill in the Name and Comments fields for your new feature: name the feature after the S57 feature object acronym, and use the comment field to describe what the code represents. It is recommended that you add a letter to the name to identify whether the feature is a point, area, or line. For example, OBSTRN_L for a line obstruction. This will maintain future filename uniqueness and avoid confusion.

NOTE: Non-S-57 Fields may be used for the Feature Name if the feature is only for field/office use. For example, UserID is used to give the feature a unique identifier, but is not a S-57 object.

Under Feature Classification, select either Point, Line, or Area.



In the Default settings tab, set GPS logging preferences:



Set the time interval to one (1) second for point features and five (5) seconds for line and area features. Leave Minimum Positions set at 1 (for point feature). Leave the default Offset settings as is.

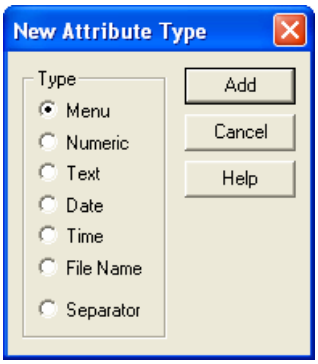
NOTE: Carrier phase logging can be collected, but requires a minimum lock of 10 minutes which is generally impractical and unnecessary for shoreline acquisition.

For a point feature, change the symbol style by clicking on the Symbol tab; these can be edited later as well. For line and area features, the line style can also be changed via the Line Style tab.

NOTE: To edit an existing feature, highlight the desired feature and click Edit Feature. Likewise, a feature is easily deleted by selecting the feature to be deleted and clicking Delete Feature.

1.2.2. Add new attributes

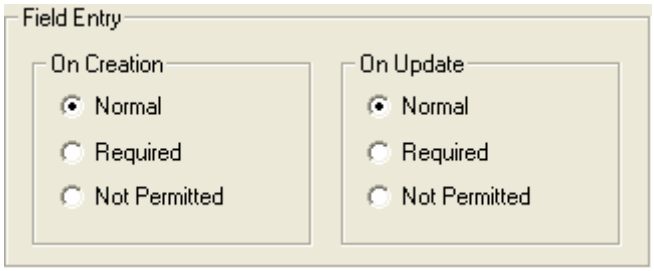
Each feature must have certain pieces of descriptive information, or attributes, attached to it in order to be useful. Highlight the feature you wish to add an attribute to, then click New Attribute in the right-hand (Attribute) column. Select attribute type, as shown. Most of your attributes will be Menu, Numeric, and Text types, but for each detached position (DP) you will also need Date and Time attributes. Refer to the Pathfinder Office help menu for more information on the different specific attribute types.



Each attribute allows for Attribute Name, Comment, attribute-specific values, Field Entry permissions and requirements, and an auto-increment option (numeric and text only).

For each attribute, fill in Attribute Name with the corresponding S-57 attribute name (e.g. “COLOUR”) and the Comment field.

You must decide whether you want this feature to be required for entry in the field. If you do not want this attribute to be required, leave the On Creation: Normal option selected in the Field Entry section at the bottom, otherwise choose Required. For On Update, select Normal.



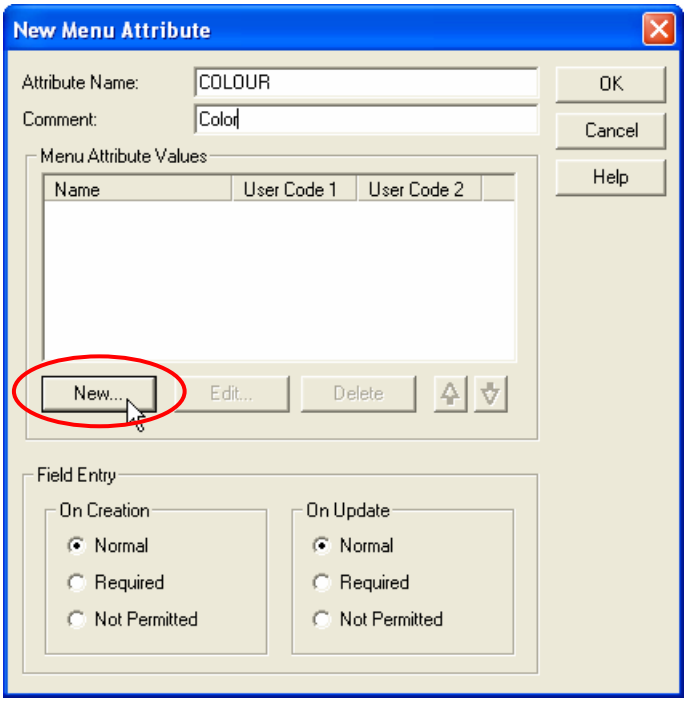
Note the distinction between a *mandatory* S-57 attribute and a *required* data dictionary attribute. In general, mandatory S-57 attributes should be required in the data dictionary, but sometimes the mandatory S-57 attributes can be assigned during office processing. The Data Dictionary Record spreadsheet should be used to keep track of what is mandatory per S-57 versus what is required in the Data Dictionary.

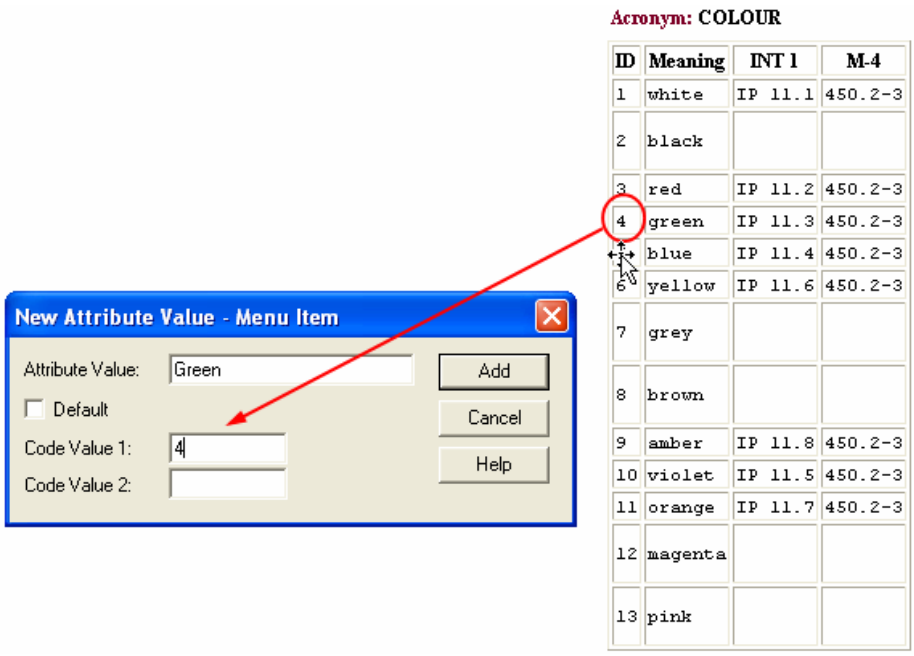
1.2.2.1. Add "menu" type attributes

After filling in the standard fields, click New.

Fill in Attribute Value (e.g. "Green") and check the Default box if you want to set this value as the default for the attribute, otherwise leave it unchecked. In order for Pydro to recognize the S-57 assignment, each menu-type attribute value must also have a code attached. Consult the attribute's entry in the S-57 catalog and fill this into the Code Value 1 field, as depicted below.

After you click Add, the New Attribute Value window will stay open for you to insert remaining attribute values. Close the window after all values have been added.



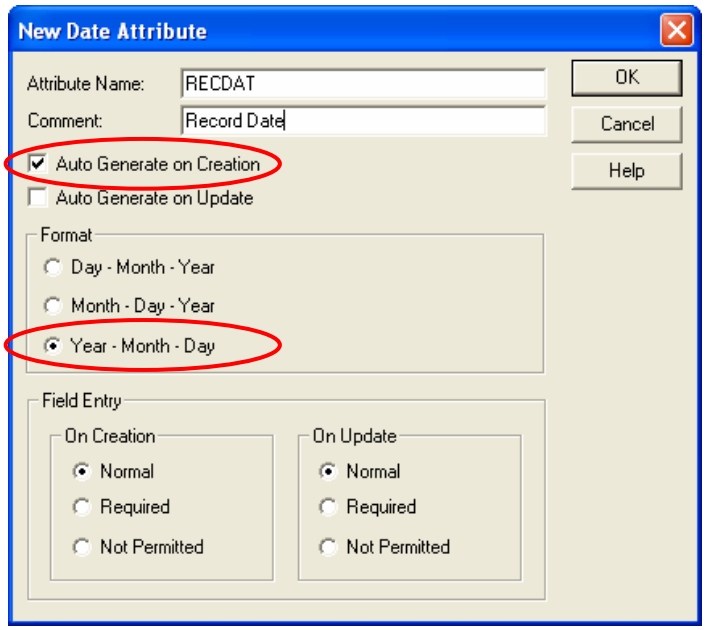


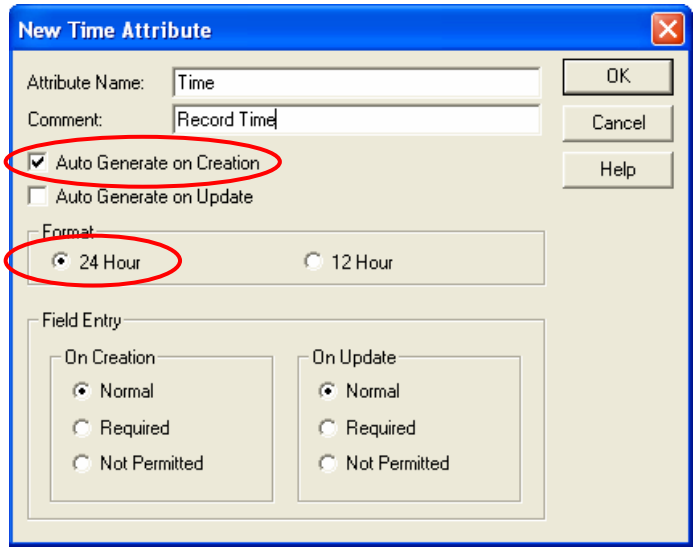
1.2.2.2. Add numeric, text, time, and date attributes

For numeric attributes (e.g., LENGTH), enter the number of decimal places allowed or required, the minimum and maximum values (the range), and the default value, using the S-57 catalog and experience as guidance.

For text attributes (e.g., INFORM), enter the maximum string length and the default value, if any.

For both date and time attributes (e.g. RECDAT and Time), Auto Generate on Creation should be checked. The date format should be Year – Month – Day and the time format should be 24 Hour. Refer to the screen shots below.

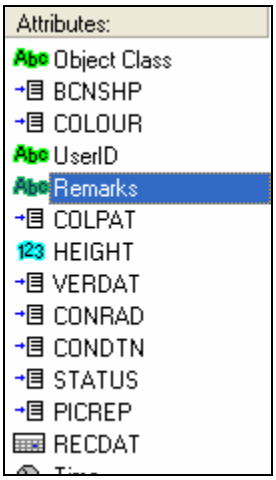




1.2.3. Organize features and attributes

Arrange features and attributes in a convenient order for field acquisition. The more efficient you are when collecting positions, the more data you will be able to gather. Using the up and down arrows on the toolbar at the top of the Data Dictionary Editor, arrange features so that the most commonly used ones are at the top of the list. In the attributes column, move required attributes to the top of the list for each feature. You may want to consider consistently putting a common attribute (e.g. Remarks) as the last required field so that, at a glance, you can tell which attributes are required and which are discretional (see below).

Recall, however, that the data gathering program (TerraSync) will prompt you for required fields.



2. TerraSync Configuration

TerraSync, the GPS logging interface you will be using during feature collection, has five modes: Map, Data, Navigation, Status, and Setup. The mode you're in is determined by which of these options is selected in the uppermost left-hand menu. When you switch modes, the display windows and menu options will automatically change.

There are two ways to change TerraSync GPS Settings. The first method will work in a pinch; the second is recommended.

2.1. Change GPS settings in TerraSync

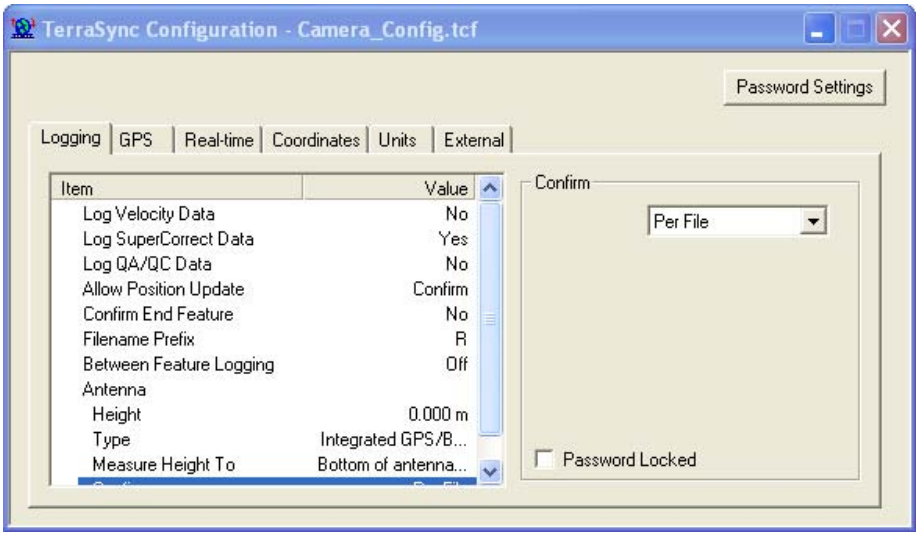
In Setup mode, click on each of the different buttons (Logging, GPS, Real-time, Coordinates, Units, and External) and set your preferences.

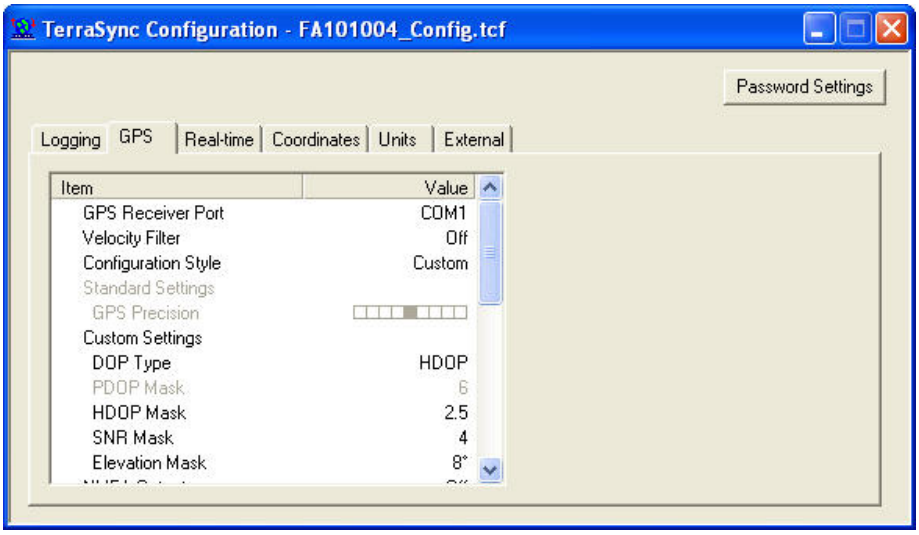
2.2. Change GPS settings by creating a Configuration File

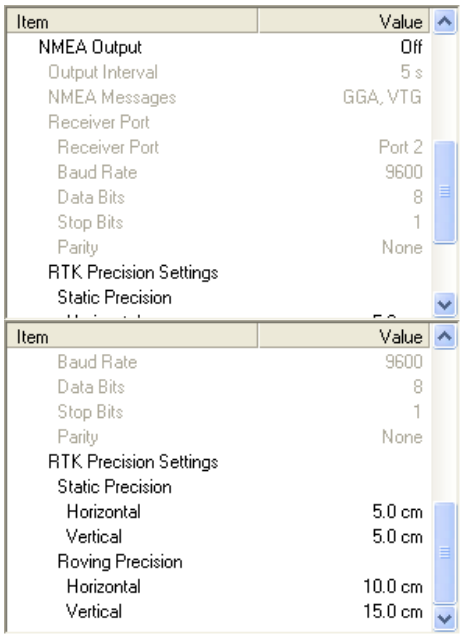
You can save your desired settings by creating a configuration file in Pathfinder Office Configuration Manager (located in Pathfinder Office folder from Windows Start menu, or Utilities→ Other→ Configuration Manager, if Pathfinder Office is already open). Through File→ New, choose TerraSync Configuration in the next window, and say OK. If multiple data collectors may be used, it is a good idea to save the configuration file in an accessible location (*R:\Utilities\Shoreline_S57\Trimble\Configuration Files*) rather than just the C:\\ drive of one computer or datalogger. This file can be referenced or updated easily for future projects.

NOTE: Creating a new configuration file for each project is recommended since the DGPS beacon frequency will change for each area. Each file should be well labeled with the project name and/or date. The project configuration file may have already been created so it is a good idea to check for an existing configuration file on the data logger under C:\MyDocuments\TerraSync\Configuration and verify if it is correct.

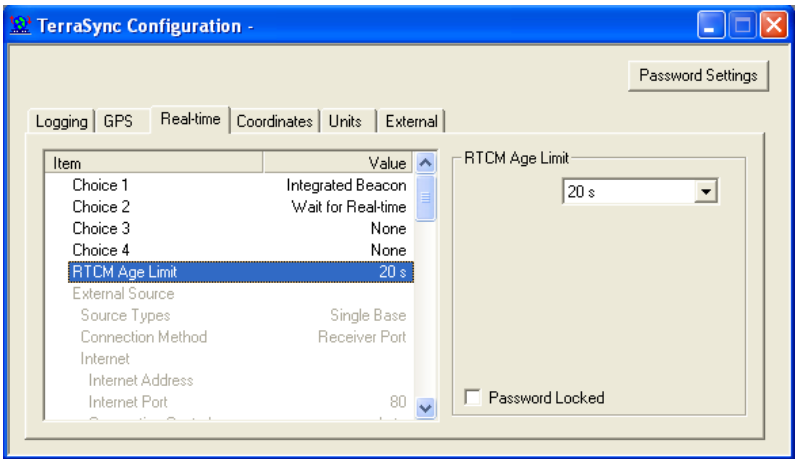
To create a new configuration file, click on each tab and set according to your preferences, or follow the examples:

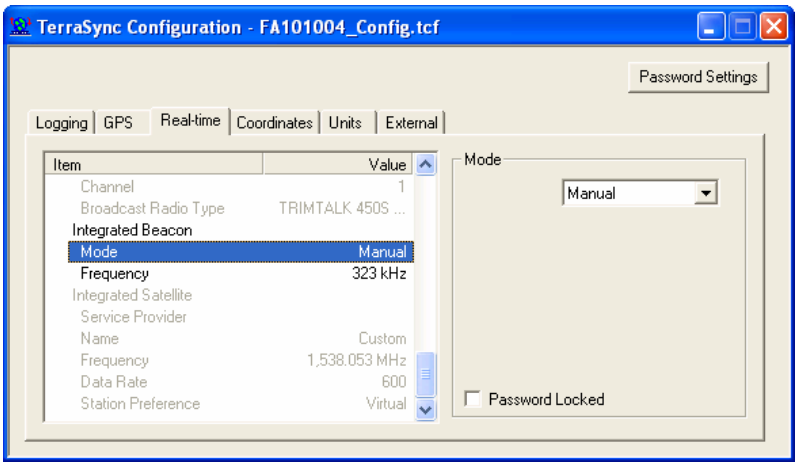


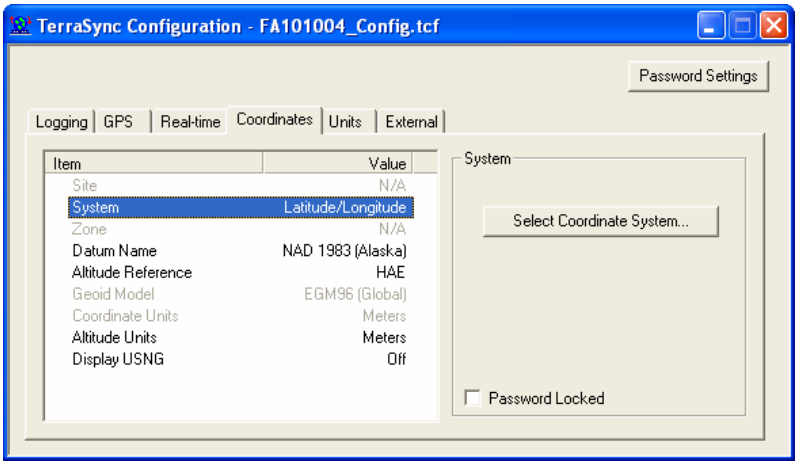


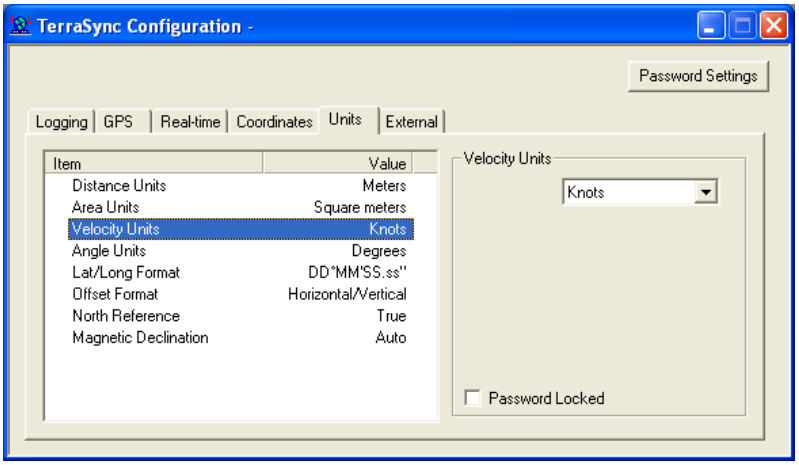


NOTE: In the Real-time tab, Frequency must be determined prior to configuration and entered manually. The frequency you will enter depends on which U.S. Coast Guard DGPS base station in the area is being utilized, which will vary by project and location.

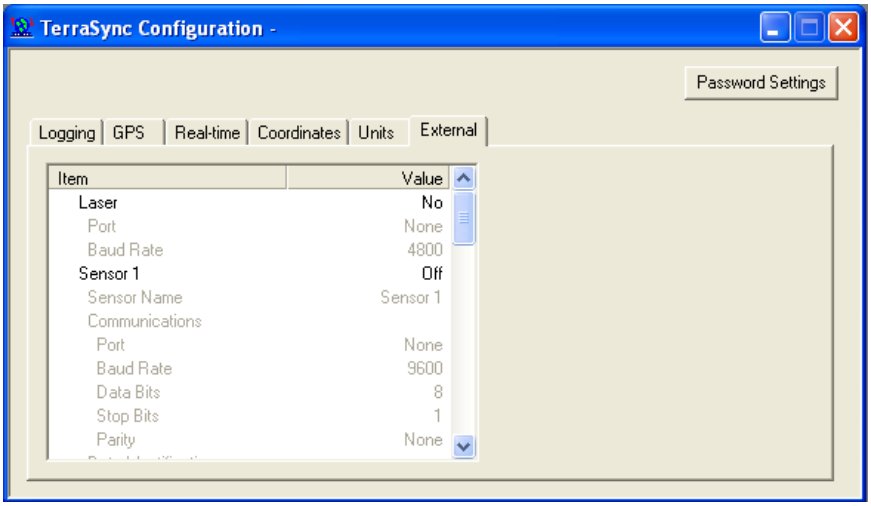


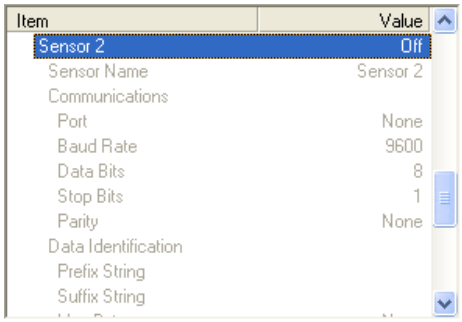

TerraSync Configuration - FA101004_Config.tcf
Password Settings
Logging
GPS
Real-time
Coordinates
Units
External
Item
Value
Channel
1
Broadcast Radio Type
TRIMTALK 450S ...
Integrated Beacon
Mode
Manual
Frequency
323 kHz
Integrated Satellite
Service Provider
Name
Custom
Frequency
1,538.053 MHz
Data Rate
600
Station Preference
Virtual
Mode
Manual
Password Locked


TerraSync Configuration - FA101004_Config.tcf
Password Settings
Logging
GPS
Real-time
Coordinates
Units
External
Item
Value
Site
N/A
System
Latitude/Longitude
Zone
N/A
Datum Name
NAD 1983 (Alaska)
Altitude Reference
HAE
Geoid Model
EGM96 (Global)
Coordinate Units
Meters
Altitude Units
Meters
Display USNG
Off
System
Select Coordinate System...
Password Locked


TerraSync Configuration -
Password Settings
Logging
GPS
Real-time
Coordinates
Units
External
Item
Value
Distance Units
Meters
Area Units
Square meters
Velocity Units
Knots
Angle Units
Degrees
Lat/Long Format
DD°MM'SS.ss"
Offset Format
Horizontal/Vertical
North Reference
True
Magnetic Declination
Auto
Velocity Units
Knots
Password Locked

NOTE: While it is possible to configure a laser range-finder or other external sensor to feed directly into the GPS log, this capability is not part of the Fairweather's procedure as of 2004. Thus far, the laser has not been accurate or consistent enough to warrant automatic association with GPS positions without first passing through a human filter. A digital camera with the proper functionality can also be connected to a laptop or data collector and set up as a sensor.





When all properties are set as desired, choose a descriptive name and File→ Save the configuration file to the data logger in the folder *C:\My documents\TerraSync\Configuration*.

3. Project and data file setup

3.1. Transfer data dictionary to datalogger

In order to use the data dictionary to collect and attribute positions in the field, you will need to transfer the data dictionary into TerraSync on a GPS data collector or field PC. If using a computer as the data logger, files can be transferred directly by connecting to the network.

NOTE: If your datalogger is a separate device from your processing computer, you will need to utilize some type of data transfer software. If no such program is included with your datalogger, download Microsoft ActiveSync to your processing computer: www.microsoft.com/windowsmobile/resources/downloads/default.mspx. Connect handheld unit and processing computer via serial port, USB, or infrared port (refer to device's User's Guide for details).

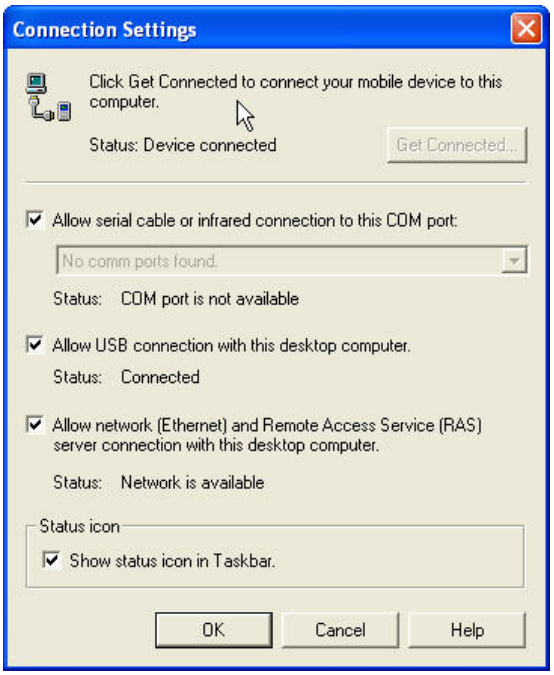
Under the Utilities menu in Pathfinder Office on your processing computer, select Data Transfer. If using the handheld unit, it will be necessary to connect the device to your processing computer using appropriate serial and/or USB cables. Choose a device from the pull-down menu, or add a new one by clicking the Devices button; then press New.

If you plan to use a Trimble data collector as your field device, choose GIS Datalogger on Windows CE.

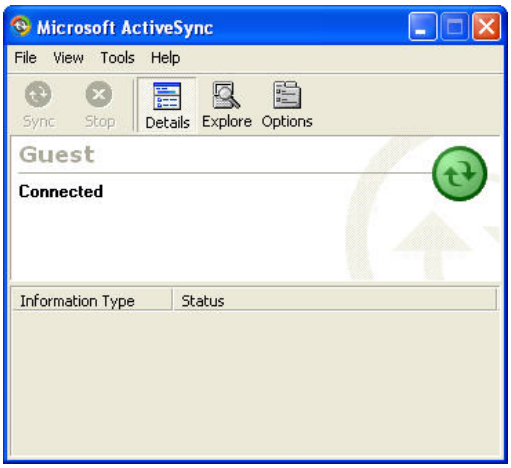
The follow-up screens will vary depending on the type of device you select. Fill in the location of your datalogger, enter the correct port when prompted if using an outside device, type in a name and click Finish. Minimize Pathfinder Office.

Turn datalogger on, and open Microsoft ActiveSync. In the Partnership window that pops up, just say No and set up a guest partnership.

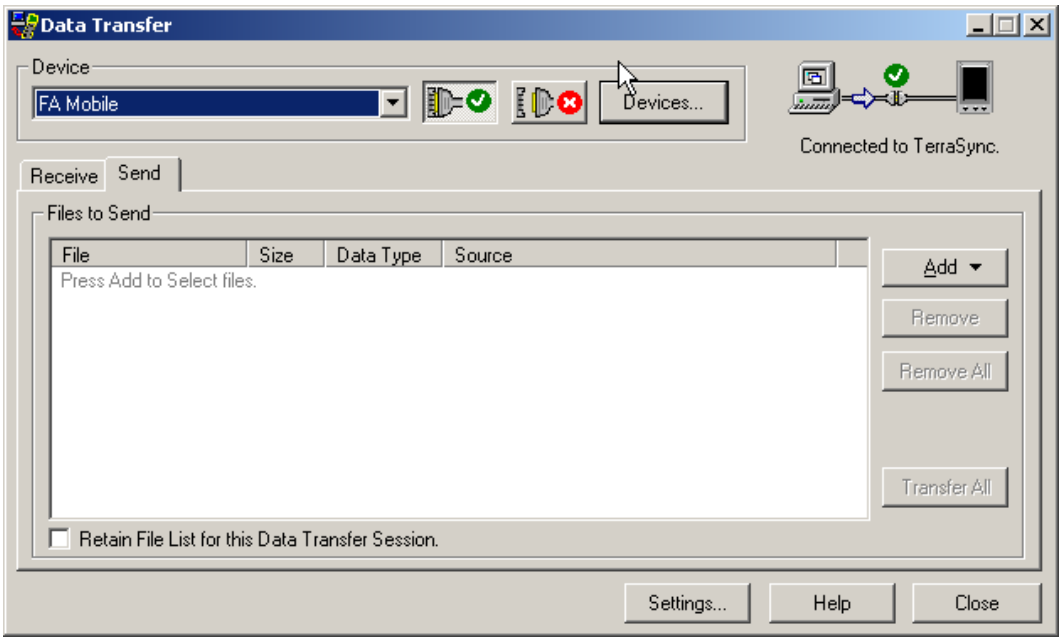
In ActiveSync, check to make sure the correct port for your device is allowed, through File→ Connection Settings, and say OK.



If ActiveSync does not automatically detect your device after this window closes, navigate to File→ Get Connected. After your device is found, ActiveSync should indicate that the status is connected:



Minimize ActiveSync and reopen Pathfinder Office. The icon in the upper right corner of the Data Transfer window (Utilities menu) indicates the status of your computer's connection with the field device. If "Not connected" is displayed, click the button with the green checkmark to connect to the device (the button with the red arrow disconnects).



Click the Send tab and then press Add; select Data dictionary from the pull-down menu. Navigate to your data dictionary and Open.

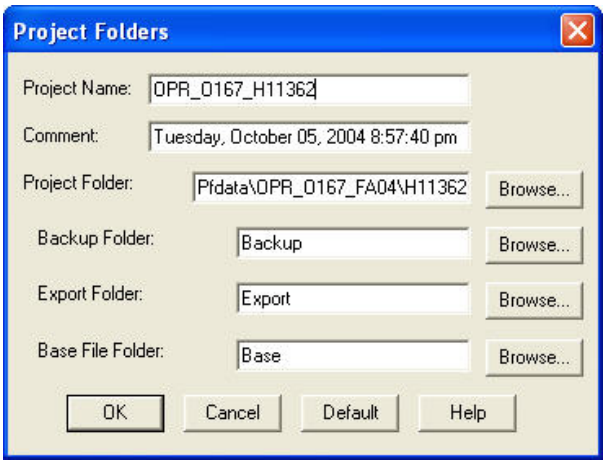
In the Data transfer window select Transfer All. Once the transfer is complete, press Close.

3.2. Create a new project

If creating a new project, it is best to first use an explorer window to manually create new folders with the desired Pathfinder project name (OPR_OXXX_FA_04\HXXXXX) in the Pathfinder local drive (C:\Pfdata\).

In Pathfinder Office, select File→ Projects. Choose a project from the drop-down menu or click New.

Type in desired project name and click Browse to find the folder you just created. Accept default settings for Backup, Base and Export folders.



Click OK in the Project Folders window, and again in the Select Project window. Exit Pathfinder Office.

NOTE: You are now ready to acquire shoreline data! Before actually venturing out in the field, you may want to set up a TerraSync data file and load it with the correct configuration settings so that you don't have to waste any time during your shoreline window. To create TerraSync data and configuration files, proceed on to Shoreline Acquisition SOP.

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Shoreline Acquisition

Standard Operating Procedure

Table of Contents

0. Document Scope

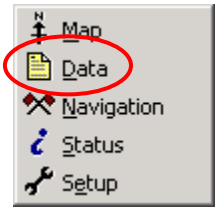
This document outlines the standard operating procedures for acquiring shoreline data and logging detached positions to meet S57 standards, as well as transferring that data back to the ship for processing. Effectively, this SOP outlines everything that needs to be done immediately before collecting data, in the field and immediately after collecting data.

1. Set up TerraSync for GPS logging

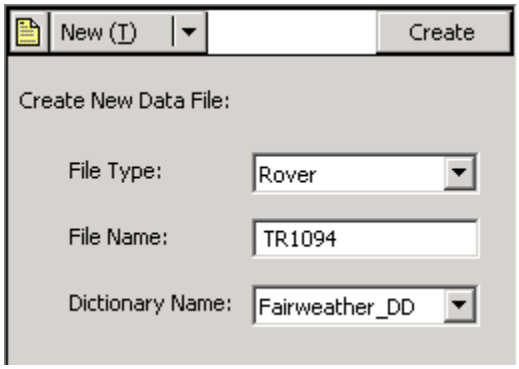
Everything in this section should be done in preparation for a specific survey, but should be set up before actually going out in the field.

NOTE: The setup procedures for a field PC and the handheld datalogger vary slightly. The primary difference is the screen size on the different platforms; there is no space on the handheld for multiple windows. Operational differences are noted where applicable.

1.1. Create a new TerraSync data file



1. In TerraSync, enter Data mode (select "Data" in the upper left-hand menu).
2. In the menu directly below it, choose New File (If you are resuming work from an old file, choose Existing File). All the data you acquire in a given session will be stored in the file you are now creating.
3. Name the file after the Trimble unit number and the day number in the form of TRXDn. For example, enter "TR1258" for data from Trimble unit 1 on day 258.
4. Select the data dictionary called Fairweather_DD from the pull-down menu (the data dictionary must be located in C:\My Documents\TerraSync).
5. Click Create.
6. In the following screen, leave Antenna Height and Measure To fields as default; these are not necessary as they apply only to vertical GPS positions.



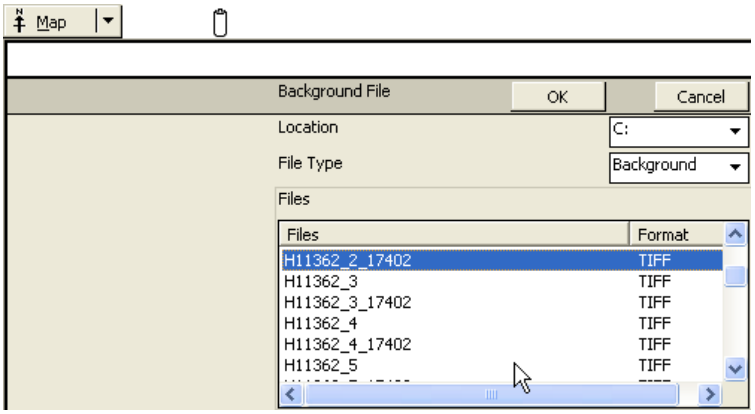
NOTE: When the user creates a new TerraSync file, TerraSync creates an associated set of files (DD, GIC, GIP, GIS, GIW, GIX, OBS, OBX). All these must be located directly in the TerraSync local drive (*C:\My Documents\TerraSync*) in order for the TerraSync file to be opened in the future.

1.2. Load background files into TerraSync

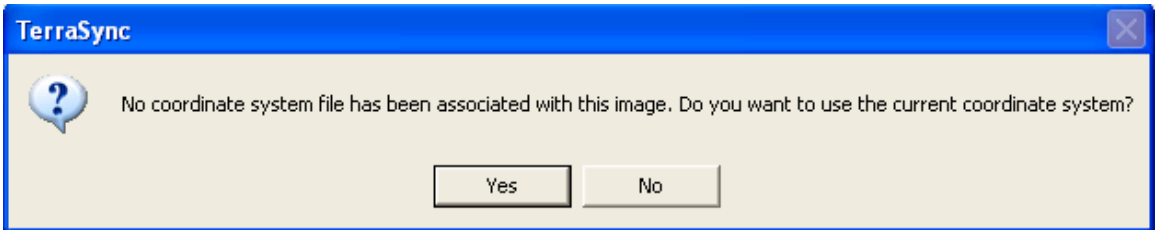
All final background files (TIF, TFW, CS) must be saved into the data logger's TerraSync folder (C:\My documents\TerraSync) to be accessible. If the datalogger is the same machine that background files are currently saved on, simply copy all TIF's and associated files to C:\My documents\TerraSync.

HANDHELD ONLY: If background files are located on a separate machine, these will need to be transferred in ActiveSync. Open ActiveSync and connect to datalogger and transfer the files with the procedure outlined above in Section 3.2 of the Trimble_Pathfinder_Setup SOP, substituting file type "Background" for "Data Dictionary."

Open TerraSync on your datalogger and select Map mode. From Layers→ Background File, navigate to your file. Select File Type→ Background, find the desired image, and click OK.



The first time you load a background image you will get this message (select yes):



If the image does not immediately appear in the map window, try pressing the Zoom Extents button (equal sign with a circle around it in the lower left-hand corner of the map window).

NOTE: Upon transfer of the georeferenced TIF file to TerraSync, a CS (coordinate system) file will be created, among others. If the coordinate system of the image is changed and then reloaded into TerraSync, the original CS file must be deleted before TerraSync will acknowledge the new coordinate system.

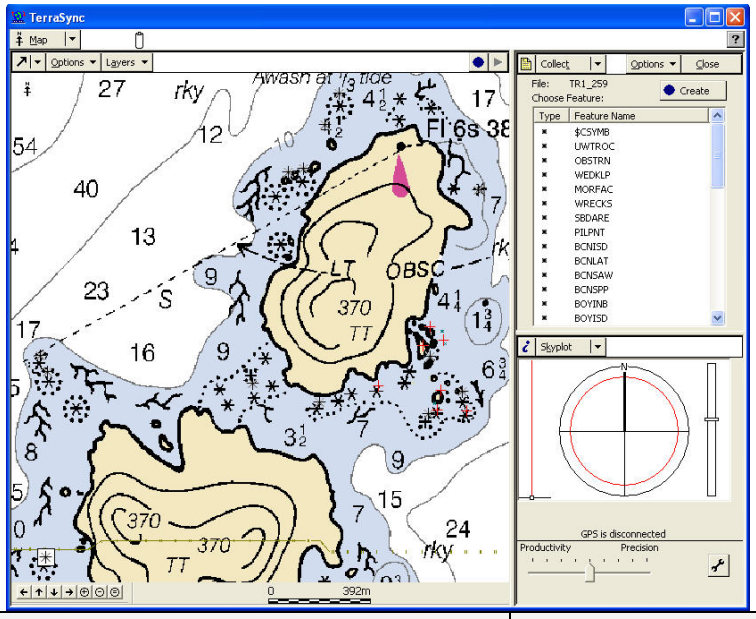
1.3. Load configuration file into TerraSync

Even if the correct configuration file is already listed, you may need to reload it if the GPS is not connecting: from Setup mode, press the Change button, and then Load. As long as it was saved directly into your datalogger's local TerraSync folder (C:\My documents\TerraSync\Configuration), the configuration file you created for the current project should be listed as an option. Select the file and then press Load.

1.4. Customize TerraSync Display

Immediately before going out to survey, open TerraSync and the project you created. If it is not already open, choose Existing File from the second menu in the Data window and select the file you created. If prompted for antenna height, leave as default; antenna height does not matter unless you are using GPS for vertical heights.

FIELD PC ONLY: There are three different windows that can simultaneously display different sections, or modes (i.e. Map, Data, and Status); set them up the way you want them to be when you start collecting points. Note that there is only space for one window on the handheld datalogger.

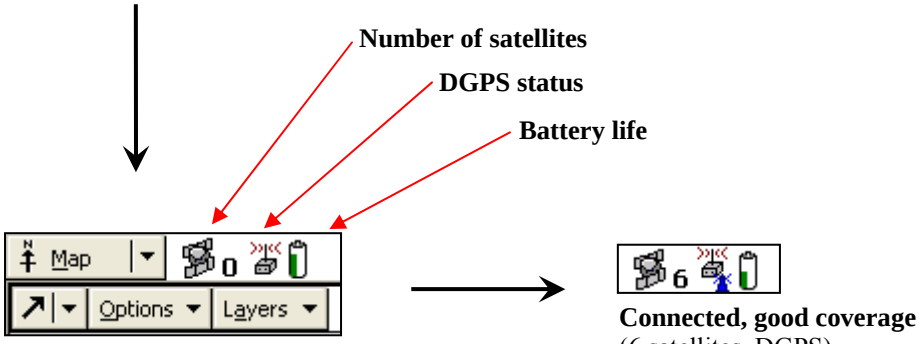


2. Collect GPS positions

2.1. Connect to GPS in TerraSync

Make sure your GPS receiver is connected to the data logger through the appropriate COM port (specified under GPS Settings in Setup mode). From Setup mode, Click on the Options button and choose Connect to GPS, or simply click the "GPS" button in the upper right-hand corner of the window. Icons on left-hand side of the upper toolbar display current status, as shown below; clicking on each icon provides additional details.

Connecting to receiver



Connected, no coverage
(no satellites, no DGPS)

Connected, good coverage
(6 satellites, DGPS)

In Data mode, choose Collect Features from the second pull-down menu, then Log Later from the Options menu. This setting is recommended for logging precise positions from a launch because the time required for S-57 attribution is most likely longer than the boat can stay still. Choosing Log Later allows you to enter feature attributions at a leisurely pace, and to acquire a GPS signal only when you are ready. Select Collect Features from the Data menu to prepare for acquisition.

2.2. Collect GPS data with S-57 attribution

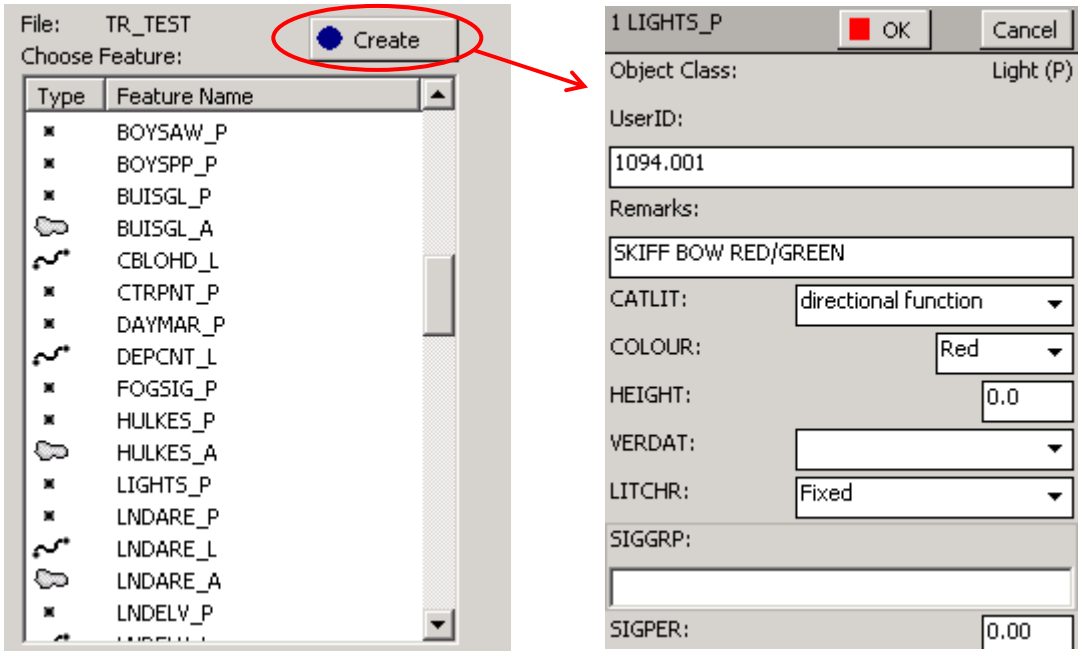
Features in TerraSync can collected as points, lines, or areas. In the feature list, these are represented as follows:

Point:  Line:  Area: 

The Data Dictionary is set up to indicate a point, line, or area in the feature name (e.g. MORFAC_L for a line mooring facility), as shown. The data collection procedure differs for each of point, line, or area, as described below.

When you are ready to begin taking a position, highlight the desired Feature Name (corresponding with the desired Type) from the list in TerraSync's Collect Features mode, and click Create (this will not begin logging).

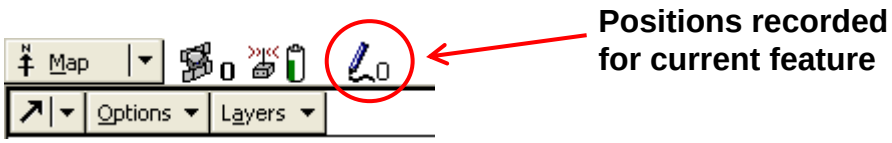
NOTE: It is important to enter the correct *feature* type before beginning to log; as attribute fields are specific to feature type you won't easily be able to change feature type in Pydro. *Attributes* can easily be altered in Pathfinder or Pydro, so it is fine to take more detailed notes by hand and electronically update attribute fields later.



Fill in all required fields (TerraSync will inform you if you are missing any required data) as well as any desired optional fields; click OK. To abandon the feature or switch feature types, click Cancel and start again.

2.2.1. Log Point data

To begin logging, click the Log button in the upper right hand corner of the Data window in Collect mode. The pencil icon on the left-hand side of the upper toolbar indicates that positions are being logged and displays the number of positions recorded for this point feature. The logging interval is predefined in the Data Dictionary, but may be changed by selecting Logging Interval from the Options menu. The default logging interval for point features is one second.



After several positions have been logged (if the boat is drifting it is better to get just a few localized points than many spread-out ones), press Pause to end logging for this feature.

NOTE: It is possible to add more positions to the feature by hitting Resume and then Pause, but this option should be used with discretion and not while drifting.

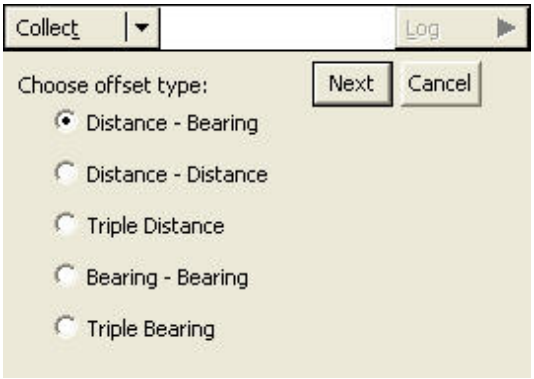
2.2.2. Log Line and Area data

To begin logging a line or an area (polygon), click Log, wait until one position is logged, then click Pause. Repeat this process for each line segment of the segmented line or area. The default logging interval for lines and areas is 5 seconds (as defined in the Data Dictionary) to allow sufficient time to pause between vertices.

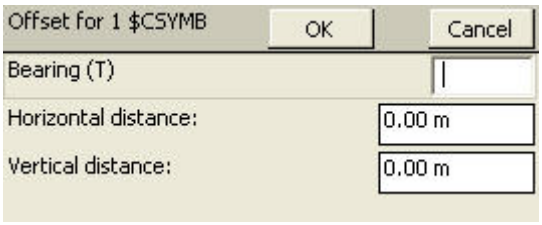
NOTE: Alternatively, TerraSync allows you to collect multiple positions for each line or area vertex. This feature is located in the Options menu by clicking New Vertex.

2.2.3. Account for offsets

Often, a feature will be at some distance and bearing from the actual GPS antenna when a position is logged. Offsets can be accounted for during creation of a new feature: from Data mode, choose Collect, and then click the Create button. From the Options menu select Offset. The simplest way to measure offset from a shoreline vessel is through the Distance - Bearing technique; select this option, then Next.



While logging the position, another person should determine range (visually or with a laser rangefinder) and bearing (with a compass adjusted for true North) from the Trimble antenna to the point of interest of the feature. After logging but before closing the position, follow instructions on the Offset screen to enter Bearing (T) and Horizontal distance in the blank fields. Vertical distance does not need to be entered.



Press OK to return to the feature attributes; press OK when values have been filled in and you are ready to record the position.

NOTE: It is possible to connect external sensors (i.e. a laser rangefinder or camera) to the GPS unit so that data transmitted by the sensor will automatically be recorded and associated with a DP. However, the laser rangefinder has not been consistently accurate enough in moving seas to make this option desirable.

3. Complete Detached Positions (DP's) form

To log a detached position (DP), fill out all information on the DP form: DP Form_FA_05.xls.

A system should be set in place in order to keep track of all the positions that are logged and to ensure that no positions with duplicate names are recorded. For example, use a Unit #, Day #, DP# format, where 12581 represents Trimble Unit 1, Day 258, DP 1, and 225913 represents Trimble Unit 2, Day 259, DP 13. This is the same unique number that is entered as OBJNAM attribute when entering information in the data logger.

For each DP, make sure to record the position number (i.e. 12581), feature type ($CSYMB, UWTROC, BCNLAT), and geometric type (point, line, area) as well as the position of the actual feature in relation to the GPS antenna. It is also important to record how the depth or height was determined. Range may be determined visually or with a laser rangefinder; use the "remarks" field to note any other relevant pieces of information.

3.1. Associate photographs with DP's

If possible and desirable to take photos, keep track of how many photos were taken of each feature or make some sort of notes to indicate which pictures correspond to each DP so they can be correlated back on the ship. It is helpful to mention any other

relevant information as well, such as the direction the picture was taken toward or the water level at the time.

4. Transfer data from field datalogger back to ship

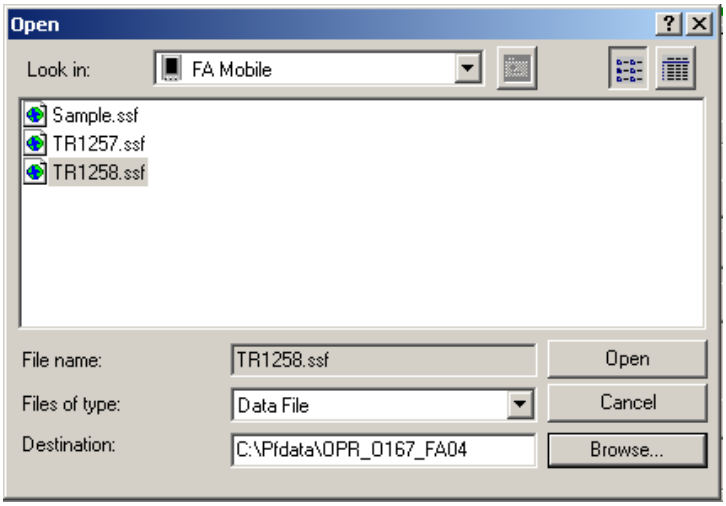
4.1. Boat sheets and DP forms

Boat sheets and DP forms are valuable pieces of data and must be kept track of and submitted as part of the DR. Completed DP forms should be filed in the appropriate sheet binder, and boat sheets should be stowed in a plastic sleeve in the back of the binder.

4.2. Data transfer

In GPS Pathfinder Office, select Data Transfer from the Utilities menu. Select a device from the pull-down menu. The icon in the upper right corner of the window indicates the status of Pathfinder's connection with TerraSync. If "Not connected" is displayed, click the button with the green checkmark to connect to TerraSync; the button with the red arrow disconnects.

Click the Receive tab and then press Add and select Data File from the pull-down menu. Navigate to your data file. Click Browse in order to find your project folder; set this as your destination location. Click Open.



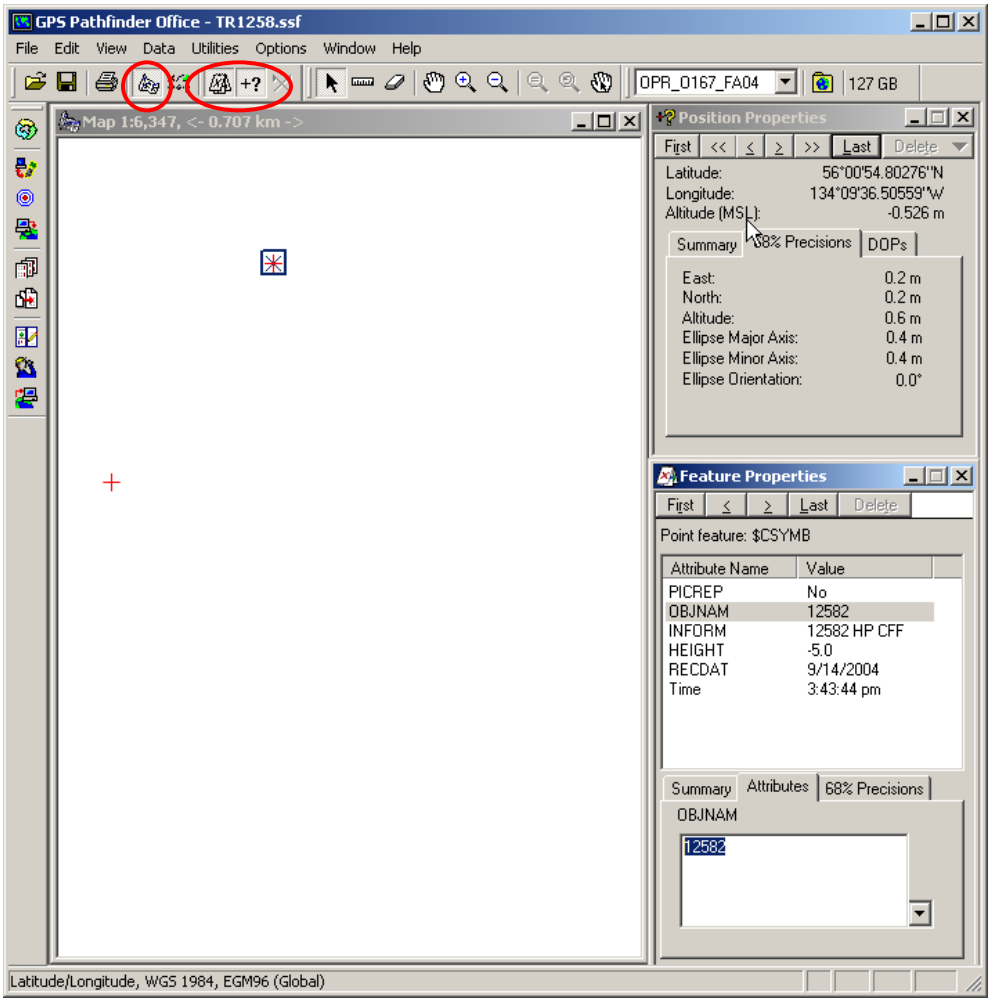
In the Data transfer window select Transfer All. Once the transfer is complete, press Close.

After transferring data into Pathfinder, a duplicate of the additional TerraSync data files (DD, GIC, GIP, GIS, GIW, GIX, OBS, OBX) will be created in the Pathfinder project's Backup folder. Save these files from the Backup folder to the following

network folder: H:\[OPR#]\Surveys\HXXXX\CARIS\Preprocess\Trimble\Backup\TRXDn\. After the files have been successfully reproduced in Pathfinder and copied onto the network, the files can be deleted from TerraSync.

4.3. Open Data

Go to File→ Open. Navigate to your project folder, find your file, and click Open. You can now view and manipulate your data in three different windows: Map, Feature Properties, and Position Properties. If these windows are not open, make sure the buttons encircled in below are selected.



5. Edit attribution information in Pathfinder

Before exporting the Shapefiles for use in Pydro, check to make sure that all information is correct, and that it matches any notes on the DP form. Scroll through all attribute fields for each point, line, and area and make sure all information is correct.

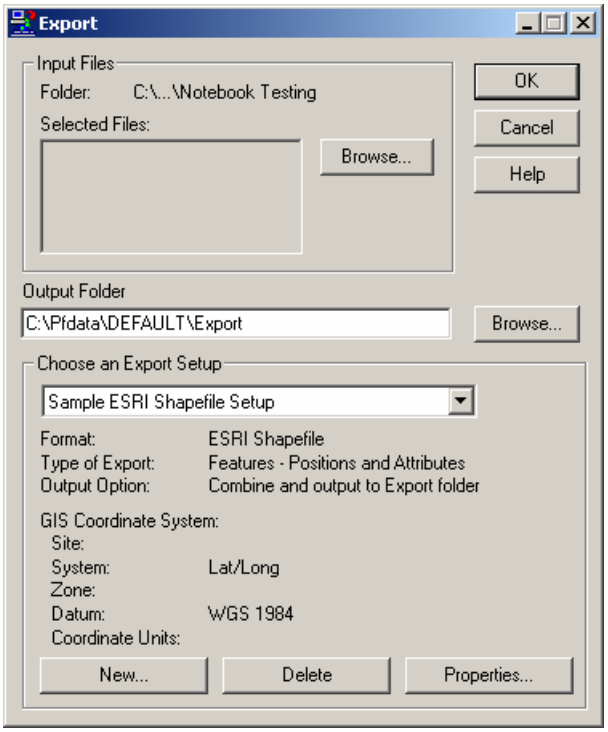
Clicking on a feature in the Map window will automatically select it and bring up its attribution information in the Feature Properties and Position Properties windows. In each of these windows, the forward and back arrows can also be used to scroll between features. Double-clicking an Attribute Name in the Feature Properties window will automatically bring up its Attributes tab and allow you to edit the field. Make sure to save any changes you make.

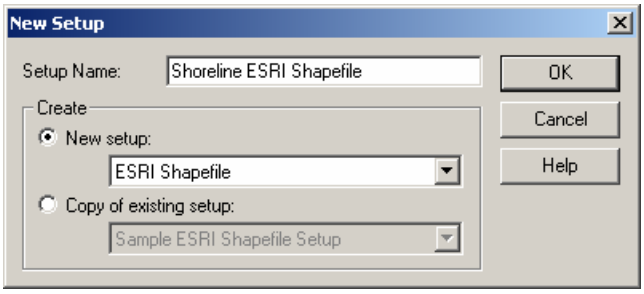
6. Prepare for Pydro

6.1. Export Shapefiles to Pydro

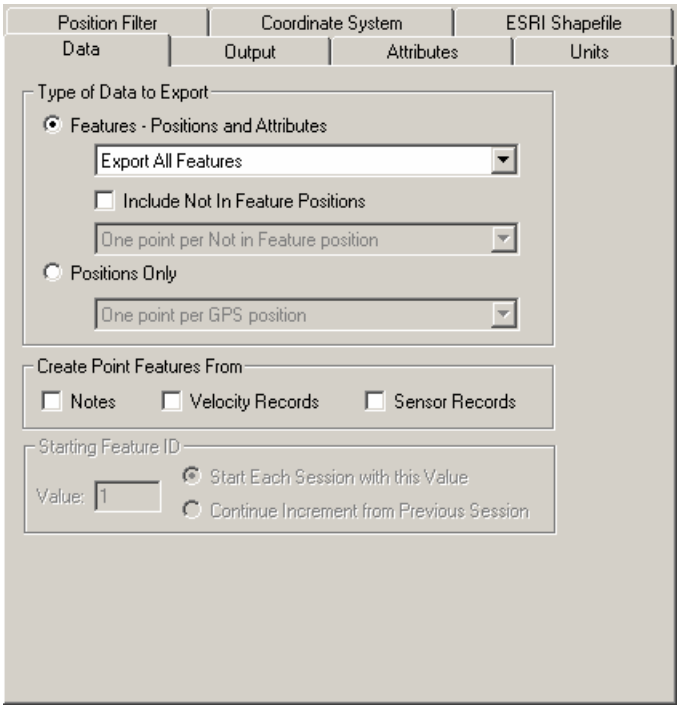
To export Shapefiles to Pydro, choose Export from the Utilities menu in GPS Pathfinder Office. Click Input Files: Browse in order to select the raw SSF Trimble data file(s) you wish to export. The default output folder is defined in the GPS Pathfinder project setup. Click Output Folder: Browse to change the output folder.

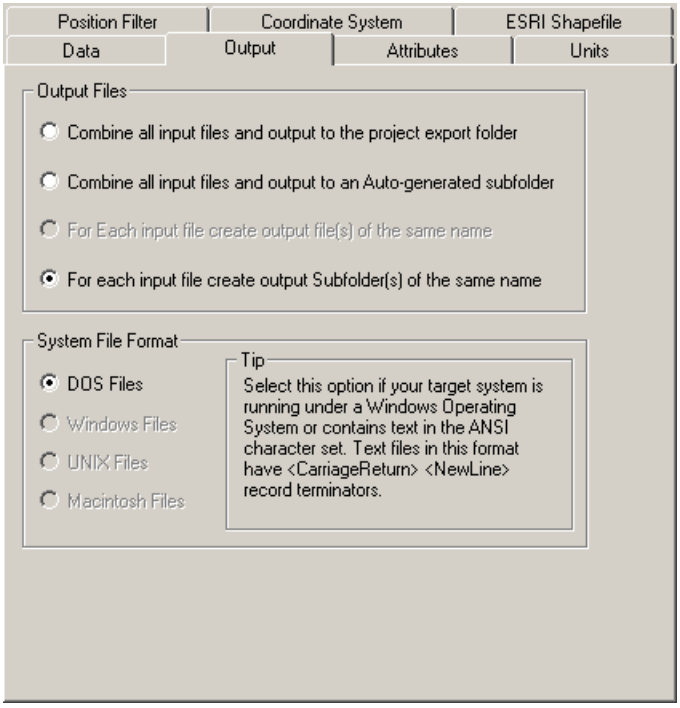
If an export setup has already been created, select it from the pull-down menu. Otherwise, select Sample ESRI Shapefile Setup from the pull-down menu and click New. Give the new setup a name (e.g. “Shoreline ESRI Shapefile”) and click OK.



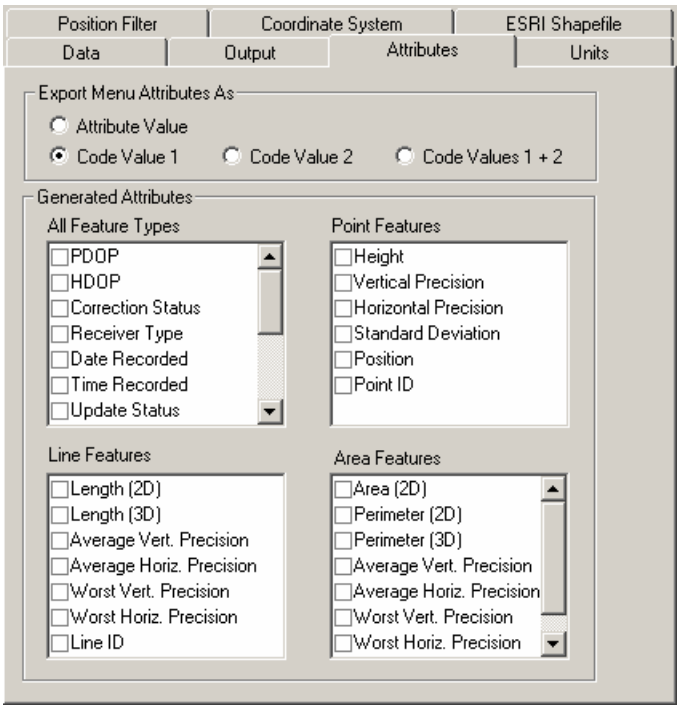


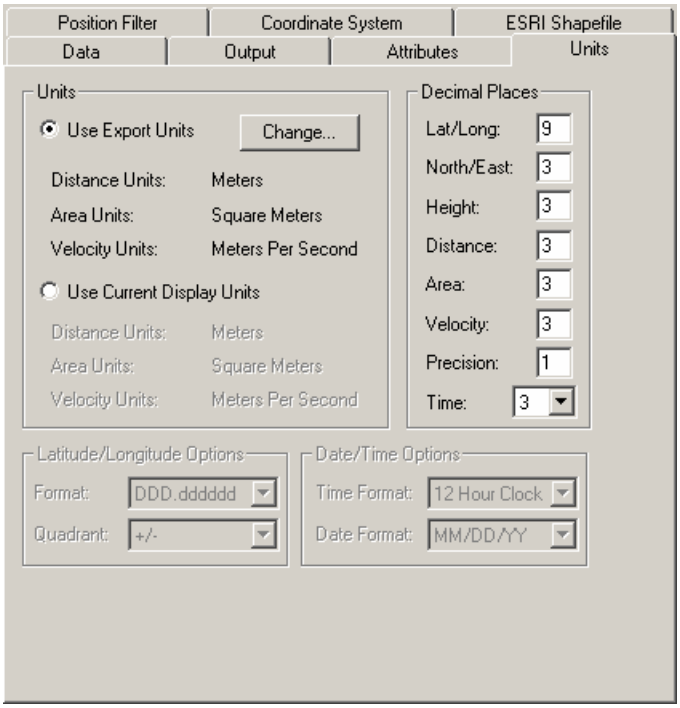
Click Properties and make sure all tabs are set according to the following examples.

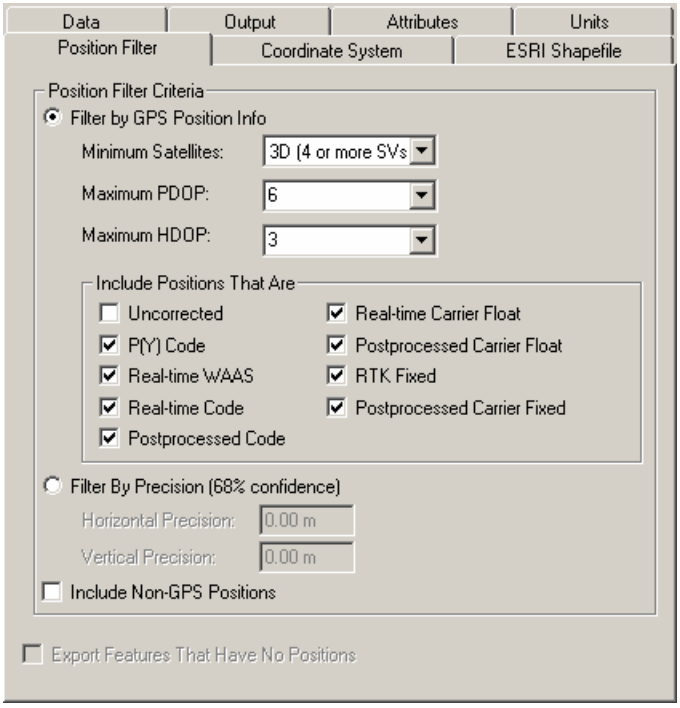

Position Filter
Coordinate System
ESRI Shapefile
Data
Output
Attributes
Units
Type of Data to Export
Features - Positions and Attributes
Export All Features
Include Not In Feature Positions
One point per Not in Feature position
Positions Only
One point per GPS position
Create Point Features From
Notes
Velocity Records
Sensor Records
Starting Feature ID
Value: 1
Start Each Session with this Value
Continue Increment from Previous Session


Position Filter
Coordinate System
ESRI Shapefile
Data
Output
Attributes
Units
Output Files
Combine all input files and output to the project export folder
Combine all input files and output to an Auto-generated subfolder
For Each input file create output file(s) of the same name
For each input file create output Subfolder(s) of the same name
System File Format
DOS Files
Windows Files
UNIX Files
Macintosh Files
Tip
Select this option if your target system is running under a Windows Operating System or contains text in the ANSI character set. Text files in this format have <CarriageReturn> <NewLine> record terminators.

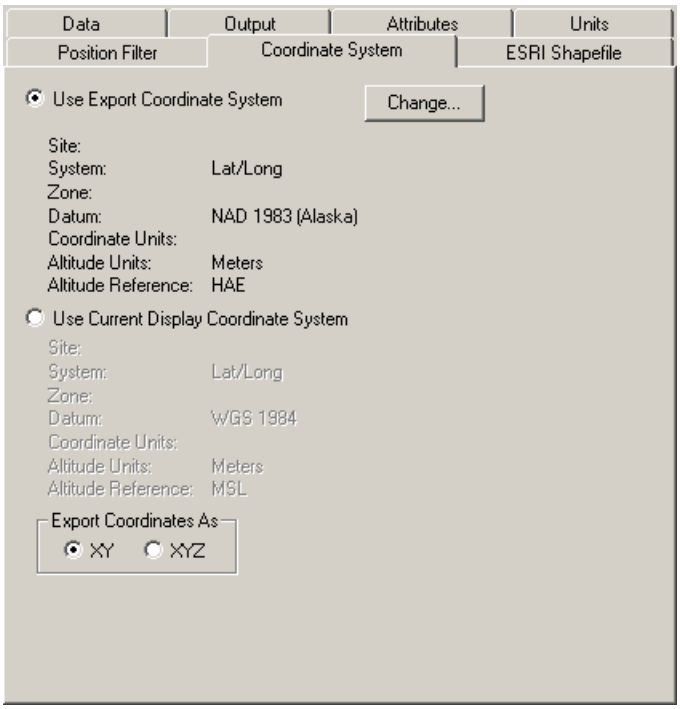
In the Attributes tab, Code Value 1 must be checked in the "Export Menu Attributes as" field so that Pydro (and Notebook if not using Pydro) can correctly interpret their S-57 attribute values.

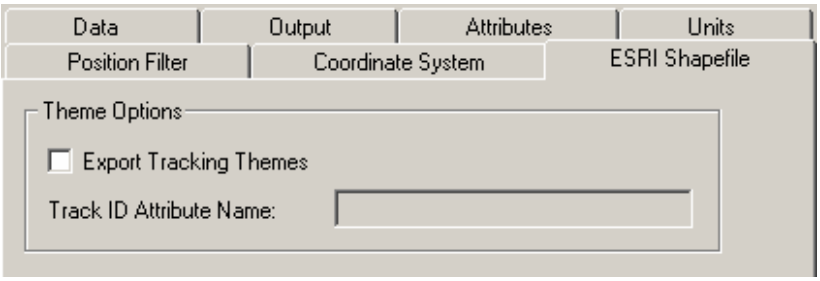






Change the coordinate system by clicking Change and set up the system as shown.





NOTE: If there is more than one feature with the same name the features after the first will be renamed (e.g. MORFAC to MORFAC2). This would occur if both a point and line feature share the same name and can be avoided by the naming scheme suggested in Section 2.2.

NOTE: One set of files (DBF, SHP, SHX) will be created per feature type ($CSYMB, UWTROC, WRECKS, etc.) so each file may contain one or many points/lines/areas, depending on how many DP's were given this feature name in the field.

After exporting, open the export folder in Windows Explorer, and find the files you just created. Rename each file, giving it the Trimble GPS unit and day number (TR1*XXX*_ or TR2*XXX*_) as a prefix. Files must be uniquely identified in this manner before transfer into Pydro, otherwise the next DP of the same feature type will repeat the file name.

Transfer the exported files to H:\[OPR#]\Surveys\HXXXXX\CARIS\Preprocess\Trimble\Export\TRX_Dn.

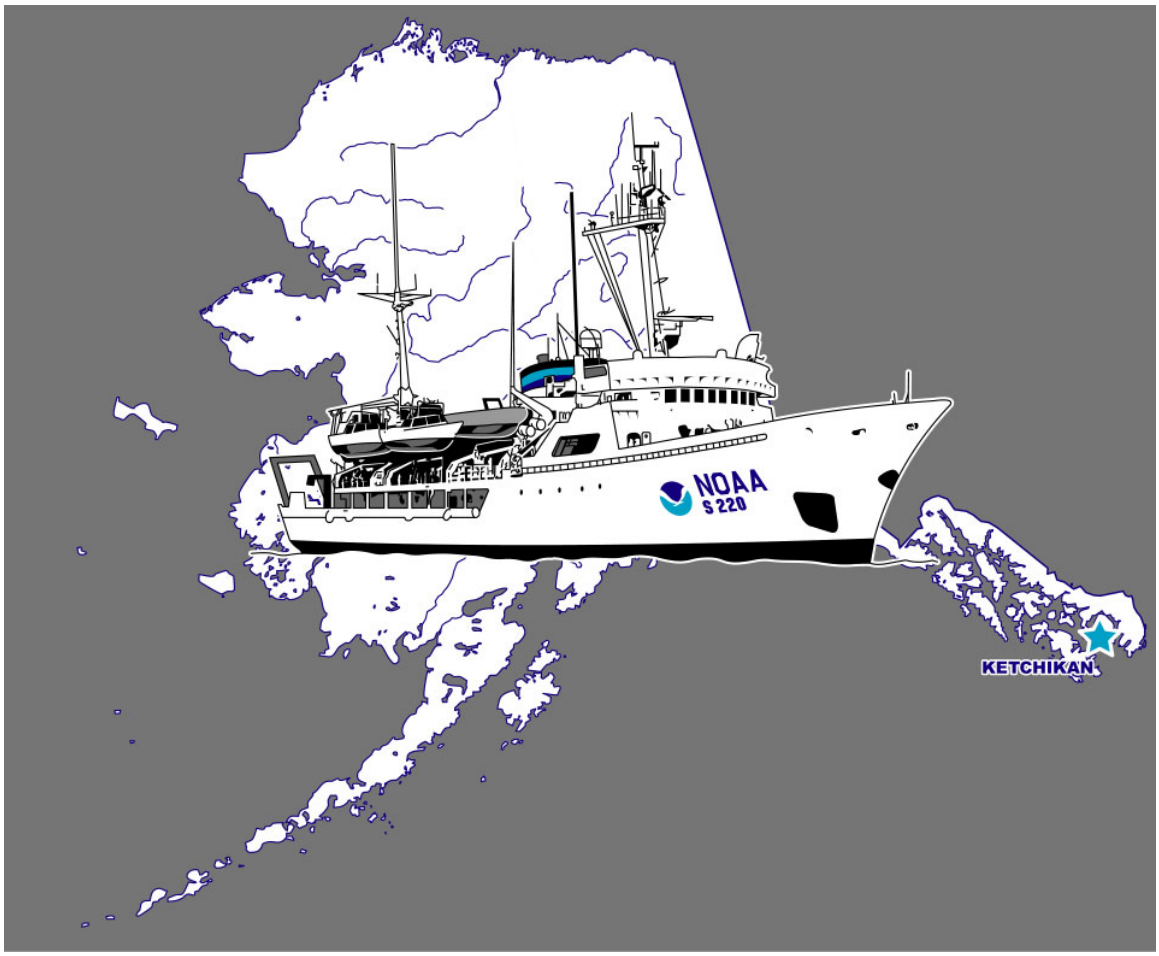
NOTE: Buffer lines will be named "Lin_gen" upon export. These files should also be renamed as per the other files and transferred to H:\...\Export\Buffer_Lines\.

6.2. Transfer Photos for DP's

Upload any photos from the field to H:\[OPR#]\Surveys\HXXXXX\PSS\Photos\ then erase them from the camera to avoid any future confusion. Name photos by their DP numbers and any other notes that will help the sheet manager and cartographers understand what the picture represents (i.e. the cartographer could interpret "12583_hp_toE" to mean that the photo is of the high point of DP 12583, and was taken towards the East).

If the subject of a photo is unclear or if multiple features are represented in the same picture, it may be useful to crop or label the picture with text and arrows in a photo editor. Save final copies of DP photos in a subfolder of the survey's PSS folder. It is fine to have multiple pictures for one feature, but any "fun" pictures from the day should be saved elsewhere.

Pydro Shoreline Processing



Pydro Shoreline Processing

Table of Contents

0.0 Document Scope

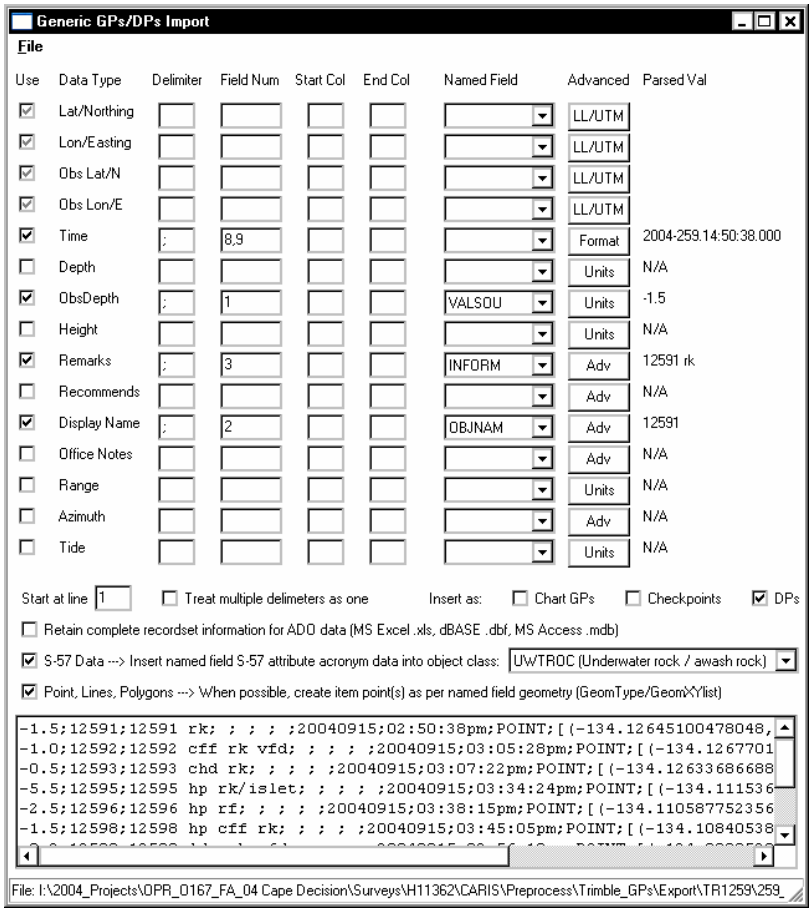
This document is intended to guide sheet managers through shoreline processing in Pydro. It should be followed by Notebook_Shoreline_Processing.doc.

1.0 Import Features

Positions recorded in the field must be imported into Pydro for processing. The boat crew will be responsible for transferring the Trimble files to the appropriate folder, then the sheet manager should bring the features into Pydro. Open the PSS for the survey, or create a new one if one does not exist. Be sure all metadata is entered and correct.

1.1 Insert DPs and GPs

1. From the Pydro *Data* menu, select *Insert > Generic GPs/DPs*.
2. In the pop up window, go to the *File* menu and select *Open template.*
3. Browse to *R:\Utilities\III_Pydro\ Parser Templates* and open the appropriate template file (e.g. $CSYMB or UWTROC). Some fields in the *Import* window will be filled in automatically. (If a template does not exist for the feature to be imported, refer to the procedure for creating a parser template described below.)



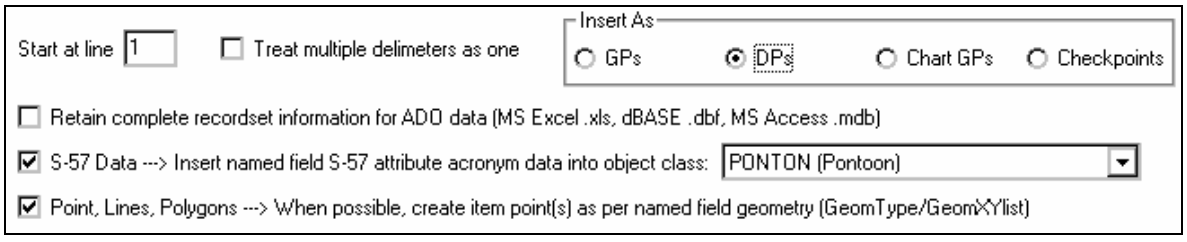
4. From the *File* menu, select *Open data file*.
5. Browse to the folder where the Trimble files were saved. *H:\OPR-XXXX-FA\Surveys\H######\CARIS\Preprocess\Trimble\Export\TRX_DDD*

6. Open the desired .shp file. Check to make sure that the parser template is correct and that fields in the *Import* window are being filled properly. This insures proper processing.
7. From the *File* menu, select *Process file(s)* and open the shape file used in Step 6.
8. When importing DPs, Pydro will ask for an associated CARIS project. Point to the H###### folder within the HDCS Data folder for the project. When the PSS is saved, a new line will be written to the HDCS folder.
9. Repeat Steps 6 & 7 for all new .shp files.
10. Fill in the Pydro Feature Log for each file inserted. The template is located in: *R:\Utilities\II_Forms_Lists_and_Templates\2_Acquisition and Processing\Shoreline.*
11. A copy of the file, named *H######_Pydro_Feature_Log.xls* should be saved in: *H:\OPR-XXXX-FA\Surveys\H######\Descriptive_Report\Separates\I_Logs\Detached_Positions*
12. When all features have been imported, close the *Import* window and save the PSS. The field unit used to acquire the DP's should appear as a vessel in the associated HIPS project HDCS folder.

1.2 Create Parser Templates

If there are feature types to be inserted which to do not have an existing parser template, it is possible to create one. If a template already exists, skip this step.

1. From the Pydro *Data* menu, select *Insert > Generic GPs/DPs*.
2. In the pop up window, go the the *File* menu and select *Open*.
3. Browse to the shape file of the feature to be inserted and click *Open.*
4. On the left side of the *Import* window, check the boxes of all rows to be populated.
5. On the right side of the *Import* window, use the drop down menus to fill in the attribute to be associated with each *Data Type.*
6. Once the attribute is set, the *Field Delimiter* and *Field Num* columns will automatically be filled with the appropriate values.
7. The *Field Num* column can also be filled in manually, which is desireable when two separate data dictionary attributes (e.g. RECDAT and Time) must be used to fill in the Pydro *Data Type* (e.g. Time).
8. Use the window at the bottom of the *Import* window that lists all attributes to find the desired entries.
9. Determine the filed numbers of the desired attributes, counting the blank before the first semicolon as one.
10. Check the *S-57 Data* box at the bottom of the window and choose the appropriate acronym for the features from the drop down menu.
11. Check the *Point, Lines, Polygons* box.
12. Check the appropriate box to *Insert as: GPs, DPs, Chart GPs,* or *Checkpoints*.



13. Most features are classified as DPs. Check with the CST if there is a question.
14. From the *File* menu, select *Save Template*.
15. Give the template a name identifying the type of feature it is to be used for and save it in *R:\Utilities\III_Pydro\Parser Templates.*

2.0 Process Features

2.1 Apply Correctors in CARIS HIPS

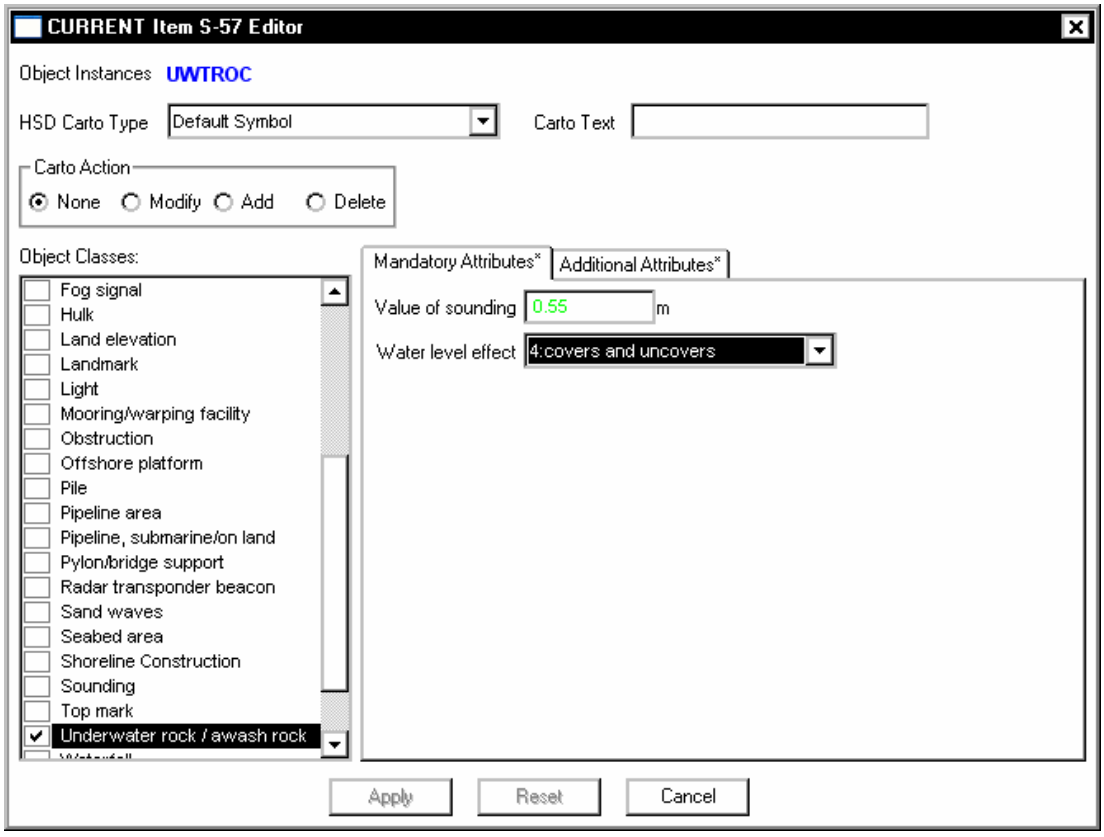
1. Open CARIS HIPS.
2. From *File* > *Open*, browse to the project folder and open the DPs. The vessel name will begin with TRB1 or TRB2 for the Trimble units used during acquisition.
3. Apply observed tides to all items. If the observed tide file is not yet available, predicted tides can be applied. Observed or verified tides must be applied before submission.
4. Skip this step if no echosounder was used for DPs. Apply SVP correctors to any echosounder DPs. If necessary, use a nearby cast taken during hydrography.
5. Merge all data and update the Pydro Feature Log. Depth values will automatically update in Pydro.

2.2 Review Features

1. Compare the items inserted in Pydro with the HXXXXX_Pydro_Feature_Log.xls. The log should be completely filled out and up to date.
2. Check the comments in the Remarks tab for each feature against the DP forms and boat sheet. Edit and clarify if necessary.
3. If depth values show a value followed by a question mark, remerge the features in CARIS HIPS.

2.3 S57 Attribution

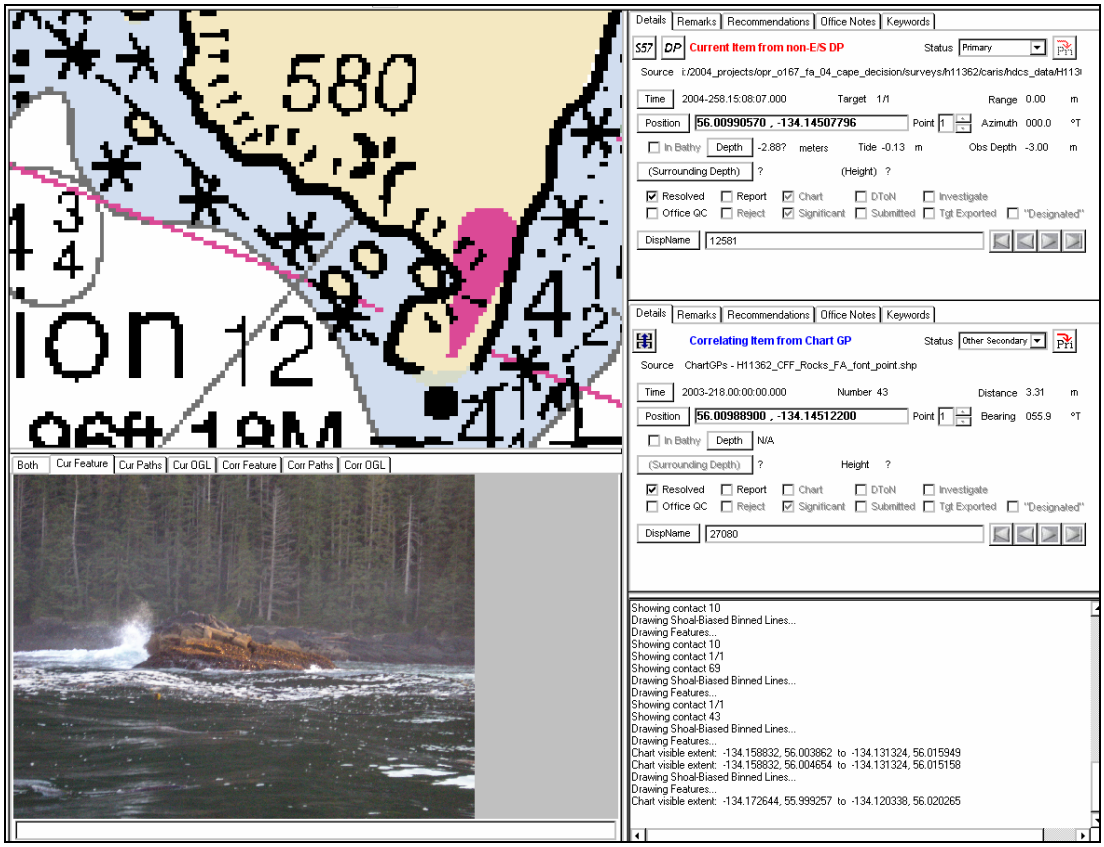
1. Under the *Details* tab for a feature, click the *S57* button to open the *S57 Editor*.
2. A window will open with the information for the selected item.



3. Check that the *Object Instances* displays the correct object type (e.g. UWTROC, $CSYMB, etc).
4. Left click on the appropriate object type in the *Object Classes* box to select it. There should be a check mark in the box next to the object type.
5. Information will appear in the *Mandatory Attributes* tab. Fill in the appropriate information, in *Mandatory* and *Additional Attributes*.
6. Select the appropriate *CartoAction*. Refer to CartoAction_Flagging.doc for guidance.
7. Click *Apply*.
8. Repeat this process for all features in the PSS.

2.4 Add Images

1. Photos taken in the field should be saved in one *Photos* folder, within the survey PSS folder. Do not make separate folder for each day.
2. To associate a photo with a DP, select the feature and click on the *Cur Feature* tab below the chart.
3. Right-click in the blank space and choose *Add Image(s).*
4. Navigate to the *Photos* folder, highlight the appropriate image(s), and select *Open*. Once an image is displayed under the *Cur Feature* tab, the paths of all images can be displayed under the *Cur Path* tab.



5. Alternately, images can be added by having the *Photos* folder open and dragging and dropping the images into the *Cur Feature* window.

6. To toggle between images, right click in the image window with either the *Cur Path* or *Cur Feature* tab activated, and choose *Next Image*.
7. To remove an image, right click and select *Remove Image*.
8. To designate an image as the S-57 PICREP, choose the best photo representation of the feature, right click in the image and choose *Set S57 PICREP*.

3.0 Sheet Manager Review

3.1 Check for Completeness

1. Clarify and update Remarks with notes and survey methods. Add Recommendations as necessary.
2. Add chart numbers anywhere the chart is referenced (e.g. CHD (17424) RK DSP).
3. Add Light List numbers to ATONs
4. Address and update AWOIS items using the Pydro Editor function.
5. Make sure that the appropriate Carto Action, Add, Modify, Delete or None, is selected.
6. Use the Pydro logic tree to edit flags. Flags should be updated to *Chart*, *Significant*. Check the *Report* flag if an item needs to be addressed in the DR. Refer to *R:\FA_SOP\3_Processing\Pydro\Pydro Logic_SOP.doc*
7. Any item flagged as *Report* should have the surveying information in the *Remarks* tab. Necessary recommendations should be entered under the *Recommendations* tab.
   NOTE: Complete disprovals and changes to HW must be marked report and have a recommendation. Other instances are at the Hydrographers discretion. An item CAN be marked report and not have a recommendation. This is useful in instances where additional information would be useful to the cartographer but a recommendation is not warranted.
8. Check the DP Forms in the project binder. Make sure they are completely filled out and match the information entered in Pydro.
   NOTE: The distance and bearing entered in TerraSync as noted on the DP form will not appear in Pydro. The position is automatically updated.
9. Scan the finalized DP forms and save as a single PDF called HXXXXX_DPforms.pdf located in: *H:\OPR_XXXX_FA\Surveys\H######\Descriptive_Report\Separates\1_Logs\Detached_Positions.*
10. Mark a feature as *Resolved* once everything has been checked and finalized.
11. Generate a Shoreline report as described in:
    R:\Utilities\I_FA_SOP\4_Deliverables\Shoreline Report\Generating a Shoreline Report.doc

3.2 Export XML Data

Features will be imported to CARIS Notebook for further processing, so it is necessary to export the .xml data from Pydro.

1. From the *Data* menu, select *Export > XML Feature Data*.
2. Set the filter to export only *Primary* features, as well as *CartoAction*, *Add*.
3. Click *OK* and save the file as *H######_Add_Pydro.xml* in the PSS folder for the sheet.
4. Repeat steps 1-3 for the remaining Carto Actions Modify, Delete and None. Name the .xml files appropriately.
   NOTE: It is not necessary to export an .xml file for a CartoAction for which there are no features. In fact, an empty .xml file will crash Notebook, so know what is being exported.

DRAFT CartoAction Flagging

ADD, MODIFY, DELETE None, Designations

ADD
A new feature was identified during survey operations. The hydrographer recommends adding the feature to the chart.

- New features (hp or ext new reef or ldg, new rk, etc)
- Bottom Samples

MODIFY
The feature was found to be positioned or portrayed (e.g.) incorrectly on the chart.
The hydrographer recommends removing feature A and replacing it with feature B.
(Positions of both old and new features must be indicated.)
Or, The feature was found to be attributed incorrectly or insufficiently. The feature now reflects the additional or corrected attribution.

- DP'd for height
- new pos chd or CFF rk
- chd rk is ldg (reclassification)
- visible wreck is clearly a submerged wreck
- new ldg found, chd rk disproval
  (DP/GP on rk would be delete, the DP/GP on ldg would be modify)
- *CFF rk is Lidar islet (choosing Lidar or chart over CFF is modify)
- *ATON, significant differences in location/attribution from chart or CFF

DELETE
The feature was disproved using approved search methods and guidelines. The hydrographer recommends removing it from the chart.

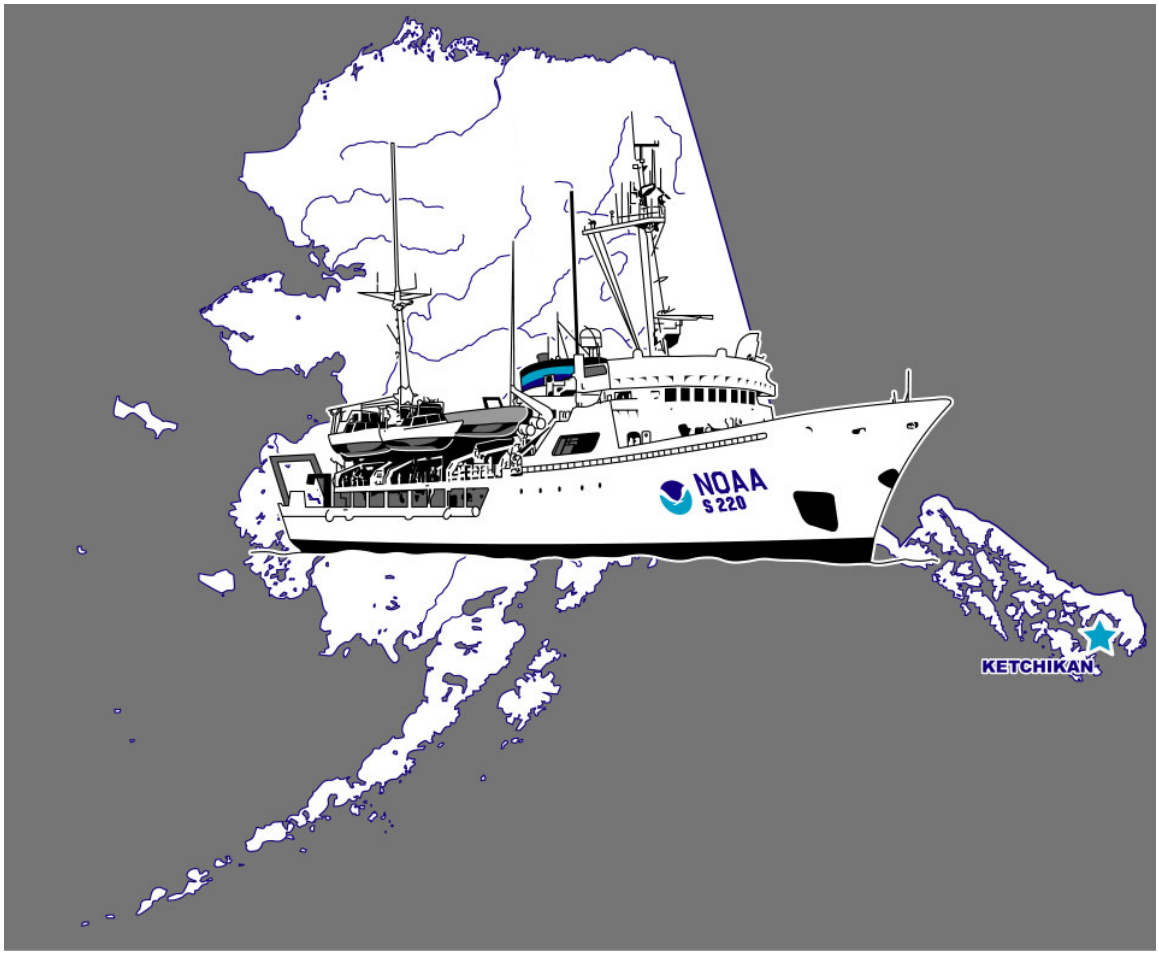
- complete disprovals
- anything that you don't want on there anymore (even if it is associated with a modify item)

NONE (aka Retain)
The feature was found during survey operations to be positioned correctly or was not investigated. The hydrographer recommends retaining the feature as charted.

- verified item without additional attribution, but not DP'd for height
- *Lidar rk verified (still a question if Lidar can be consider a source or it's considered new)
- *ATON that serves it's intended purpose

* These definitions are questionable, need feedback on whether this is the best approach. Additional source, like LIDAR, adds confusion.

Notebook Shoreline Processing



Notebook Shoreline Processing

Table of Contents

0.0 Document Scope

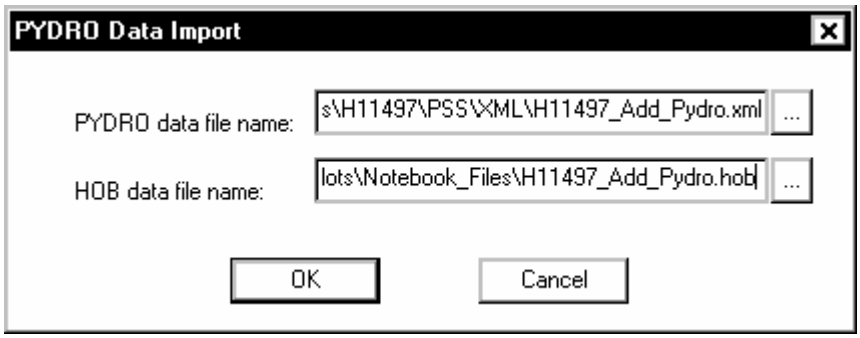
This document is intended to guide sheet managers through shoreline processing in CARIS Notebook. It should be used after the processing in Pydro has been completed. Refer to the Pydro_Shoreline_Processing and Shoreline_Presurvey SOPs for further information.

1.0 Import Pydro Features

CARIS Notebook can read features directly from the Pydro .xml file, exported as described in the Pydro_Shoreline_Processing SOP. If some features do not import, it is possible that they do not have the correct S57 attribution. Check the attribution in Pydro and try re-exporting the .xml.

1.1 Create Add, Modify, Delete, Retain Layers

1. From the *Tools* menu in Notebook, select *PYDRO Data Import*.
2. In the *PYDRO data file name* field of the pop-up window, browse to the location of the exported xml files. There should be separate files for Add, Modify, Delete and possibly Retain.
3. In the *HOB data file name* field, browse to the *Notebook_Files* folder for the sheet and create a new .hob file called *H######_Add_Pydro,* etc.



4. Click *OK*. A new layer should appear in the *Layers* tab and the features should appear in the *Display* window of CARIS Notebook.
   NOTE: Bottom samples will not appear unless the text is set to display.
5. Repeat this process to create layers for all features exported from Pydro.

2.0 Shoreline Updates and Notes

2.1 Adding New Line Features

If there are new line features found during field verification, it will be necessary to create a new edit layer for digitizing the features.

1. Create a new layer named *H######_Add_Notebook.hob* and save it to the *Notebook_Files* folder for the sheet.
2. Digitize any new line features to this layer, such as fouls, ledges, shoaling or new high water lines which are not on the current chart, or in the source files.
3. Use the boat sheet and DP forms for sizes and extents of new line features. Buffer lines may also be helpful. Refer to the Importing Shapefiles in Notebook SOP for buffer lines.
4. Do not add new point features to this layer. These should have DP's associated with them and brought into the *H######_Add_Pydro* layer using the *Pydro Data Import* described above.
5. Use the *remrks* field to add comments to digitize features, such as, "NEW LDG. USE DP 22562 FOR SWM EXT."

2.2 Modifying Source Features

If there are features in any source layers that are identified during field verification that need modification, it will be necessary to create a new edit layer for them. Prior to making any edits to the source layers make sure the you have an unedited version of the source files as a backup. Remember to SAVE OFTEN!

1. Create a new layer named *H######_Modify_Notebook.hob* and save it to the *Notebook_Files* folder for the sheet.
2. Move any source items into this layer that need modification either in position, height, or classification.
3. Highlight the source layer and select the item to be moved.
4. From the *Tools* menu, select *Import Selection* and import the feature into the *H######_Modify_Notebook.hob* layer
5. Check the *Use Existing Identifiers* button, accept all other defaults then click OK.
6. Once the item is in the modify layer, SAVE, then delete it from the source layer.

2.3 Removing Source Features

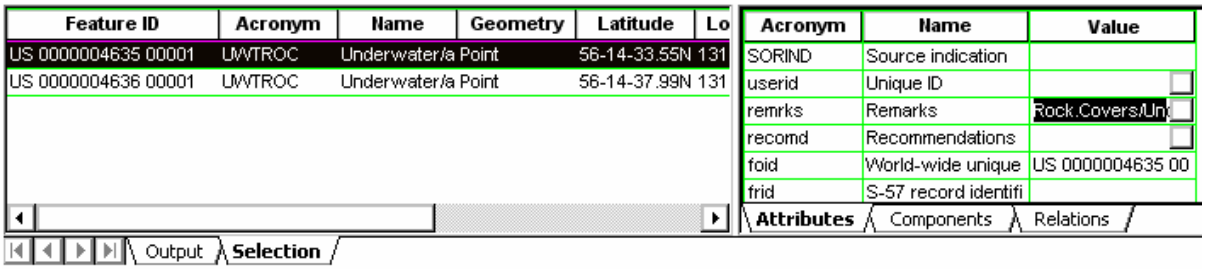
If there are features in any source layers that are identified during field verification to be deleted, it will be necessary to create a new edit layer for them. Once again, prior to making any edits to the source layers make sure the you have an unedited version of the source files as a backup.

1. Create a new layer named *H######_Delete_Notebook.hob* and save it to the *Notebook_Files* folder for the sheet.
2. Move any source items into this layer that are to be deleted, such as rock disprovals.
3. Highlight the source layer and select the item to be moved.
4. From the *Tools* menu, select *Import Selection* and import the feature into the *H######_Delete_Notebook.hob.*
5. Check the *Use Existing Identifiers* button, accept all other defaults then click OK.
6. Once the item is in the delete layer, SAVE, then delete it from the source layer.

2.4 Adding Field Notes

Any notes made on the boat sheet in the field referencing source features will need to be added to the Notebook session. As a reminder, any charted item must have the chart number added in parathesis, i.e. CHD (17324) RK NTD.

1. To add remarks to features, highlight the source layer containing the object.
2. Select the feature to be commented. The feature will appear in the *Selection* tab at the bottom of the screen.
3. Scoll down to the *remrks* field in the *Attributes* tab and add any relevant notes from the boat sheet, such as CFF RK NTD.



4. If a feature cannot be verified in the field, do not just leave the *remrks* field blank. Add a note such as, “Unable to verify due to shoaling.”

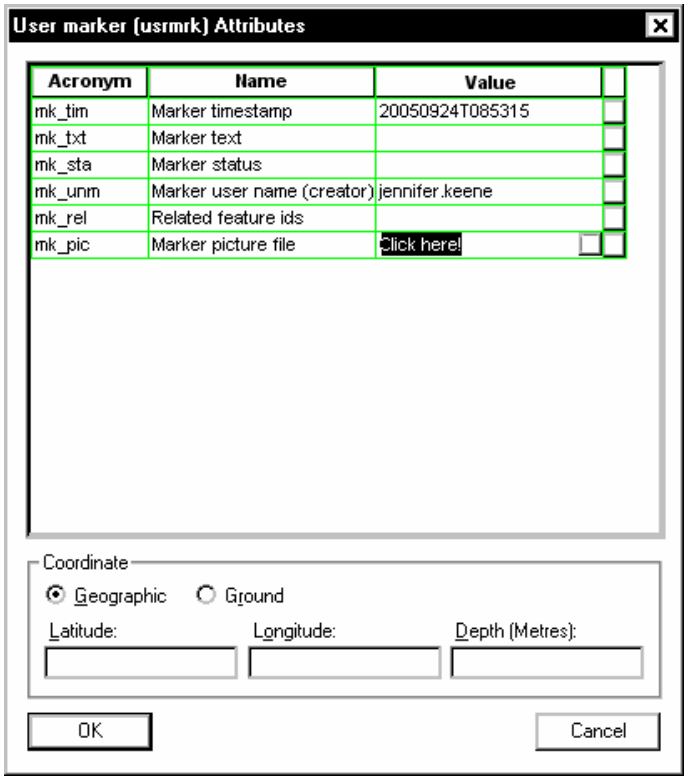
5. Source features that could not be addressed in the field should be flagged with a Marker point for easy review by the cartographer.
6. Everything in the source layers must have a remark for the deliverable product. A good way to check that everything has been addressed is to choose a layer, then click on the "Select All" tool. Every feature in that layer will appear in the *Selection* tab. Scroll through the features to make sure each has something in the *remrks* field.
   NOTE: It is especially important to check line features such as COALNE or DEPCNT, as they may be segmented lines, where one part has a remark, but another section in the same area was skipped. Check everything in every layer.

2.5 Adding Pictures to Features

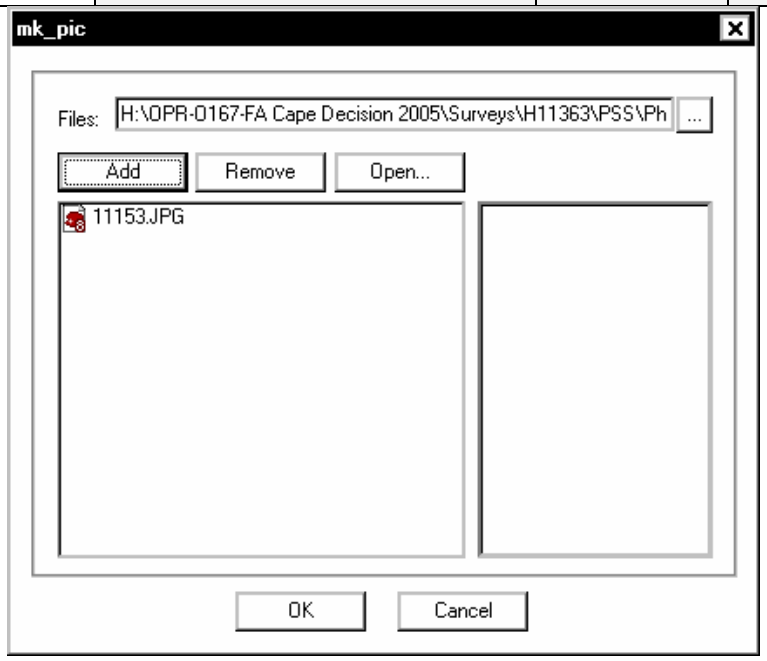
Pictures are currently being added using a Marker point snapped to a feature. This is useful for source features that do not have an associated DP.

IMPORTANT NOTE: In order for pictures to remain associated with features in the deliverable product, it is important that the file path remain the same. Do not move the pictures when cleaning up folders for submission.

1. Create a Marker layer for the desired source layer. The Marker layer should be the active edit layer and the source layer should be the Snap/Grab target.
2. Choose the *New Point Feature* tool and click *OK* in the first pop up window.
3. Click the button in the *Marker picture file* value field.



4. In the next pop up window, use the *Files* bar to browse to the picture to be added and open it. The path should appear in the *Files* bar.
5. Click the *Add* button. The picture name should appear in the window.
   NOTE: Multiple photos can be added to the same Marker point by repeating these steps.

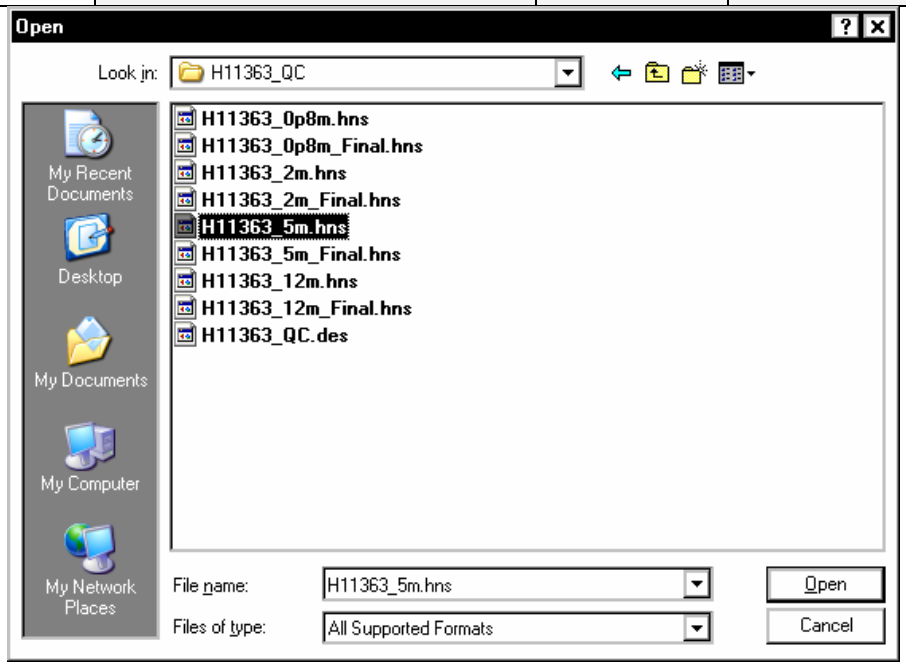


6. When all desired pictures have been added, click *OK* in all the pop up windows.
7. Hover the digitizing tool over the desired feature, hold down the "s" key to enable the snap function, then left click and release. The Marker point with the pictures is now snapped to the feature.

3.0 Final Review

3.1 Review with BASE Surface

1. CARIS HIPS fieldsheets can be opened directly into Notebook. From the *File* menu, choose *Open* and browse to the folder containing the appropriate fieldsheet.
2. Make sure that the *Files of type:* drop down menu is set for *All Supported Formats.*
3. Select the appropriate BASE surface for review. These are the files with .hns extension. **NOTE:** Notebook tends to choke on the large amount of data in the BASE surface. For faster refresh rates, it is recommended that a mid-range resolution BASE surface, such as the 5m BASE, be opened instead of the highest resolution.



4. Open all Notebook files necessary for review.
5. Review shoreline remarks and features with BASE surfaces to make sure there are no conflicts (i.e. SWMB over CHD (17324) RK NTD).
6. CARIS HIPS sessions, with contours and soundings can also be opened into Notebook following the same procedure. This may be another useful reviewing tool.

3.2 Finalizing

1. Check that the *H######_Add_Notebook.hob, H######_Modify_Notebook.hob* and *H######_Delete_Notebook.hob* files are correctly attributed and complete.
2. Make sure all notes, shoreline additions and edits have been entered from the boat sheet to the appropriate layer.
3. Make sure all deliverable hob files are in the *Notebook_Files* folder and delete any outdated or extra layers.
4. Save a session that includes all relevant files to the *Notebook_Files* folder for the sheet named *H######_Shoreline.* The session should not contain any charts or BASE surfaces.

PYDRO

- CFF rk vrd, DP'd for height, use CFF position (that is the remark in Pydro)
    1. In Notebook, move CFF rk to MODIFY_Ntbk layer, take attribution from UWTROC DP that was acquired in the field and add it to the CFF rk.
    2. In Pydro, change the DP from UWTROC to CSYMB, so that there aren't two rk symbols for the item in Notebook. At this point the DP is only useful for height info and is awaiting smooth tide application. DP's carto action should be MODIFY.

- ATONs

  remark in Pydro should be based on Light list if possible and look something like: AIRPORT RUNWAY ROCK LIGHT, FL W 6s, LL#22687

  if static position taken, remark should refer to it, such as, see DR for HORCON position.

Recommendations (and therefore must be marked report) in Pydro are required for:

- Complete disprovals (NOT rk is ldg)
- Changes to MHW
- Anything the Hydrographer decides may need a recommendation

Report should be checked in Pydro for:

- Anything that requires a recommendation
- Anything that is ambiguous and requires further explanation (these can have but do not require a recommendation)

- DTONs should be flagged designate to ensure they are referenced by the BASE surface after smooth tide application.

- DTONs and other designated soundings should not be exported out to Notebook, filter appropriately using the deliverable treetemplates

- check that all mandatory attributes are entered in Pydro

Notebook

- Ledges/Reefs should be SBDARE to easily distinguish them from DPTCNT 0 for LW. (Ldg -> sbd area rk)

- WEDKLP - eelgrass attributed as CATWED 3 (sea grass) with eelgrass ntd or vrd in remark

- Attribute Foul area OBSTRN w/CATOBS - foul area

- Remarks in Edited CFF Shoreline.hob file or other source file should be

  CFF rk ntd

  rk.awash

where the top remark is Hydrographers and the bottom remark is from the source file and there are two carriage returns between the comments.

- If item is moved to HXXXXX_Delete_Notebook and it is associated with a DP, add see DP# to the HXXXXX_Delete_Notebook item's remark.

- CFF rk vrd, DP'd for height, use CFF position (that is the remark in Pydro)
    1. In Notebook, move CFF rk to MODIFY_Ntbk layer, take attribution from DP that was acquired in field and add it to the CFF rk.
    2. In Pydro, change the DP from UWTROC to CSYMB, so that there aren't two rk symbols for the item in Notebook. At this point the DP is only useful for height info and is awaiting smooth tide application.

- Unable to verify
  In Notebook, items need to have marker text pointing to them with remark such as, unable to verify rk due shoaling.

- Markers should be in marker layer.

- Add picture in Marker not as PICREP

- If the layer is empty, remove or do not create, ie if you don't have any Add Notebook items you don't need an HXXXXX_Add_Notebook.hob

- At this time, do not digitize areas if possible, they do not display correctly, ie OBSTRN areas.

- You should have _Pydro draw on top of _Ntbk

- When digitizing ledges, MLLW, etc. cross over the MHW line (ie overshoot)

1 FAIRWEATHER Operational Survey Speeds

1.0 COMMENT

High quality hydrographic data collection is the reason FAIRWEATHER exists. The following speed guidelines have been determined through a noise analysis conducted onboard the NOAA Ship FAIRWEATHER on October 10-11, 2004. Pls see the reports *SeaBat 8111 Noise Analysis* and *SeaBat 8160 Noise Analysis* for additional details.

From these reports, it is generally desirable to use lower shaft RPM, combined with a higher pitch setting to minimize the noise level seen by the sonar systems. Significantly increased levels of reverberation from acoustic sources on the vessel are seen in shallower water.

In order to reduce emanated noise from the ship, the following RPM/Pitch combinations shall be followed.

1.1 REASON SeaBat 8111ER

Based on the referenced report, it appears that the best survey speed for the 8111ER system, from a noise perspective, is the range of 8 to 10 kts. Both lower and higher speeds correlate with higher noise levels.

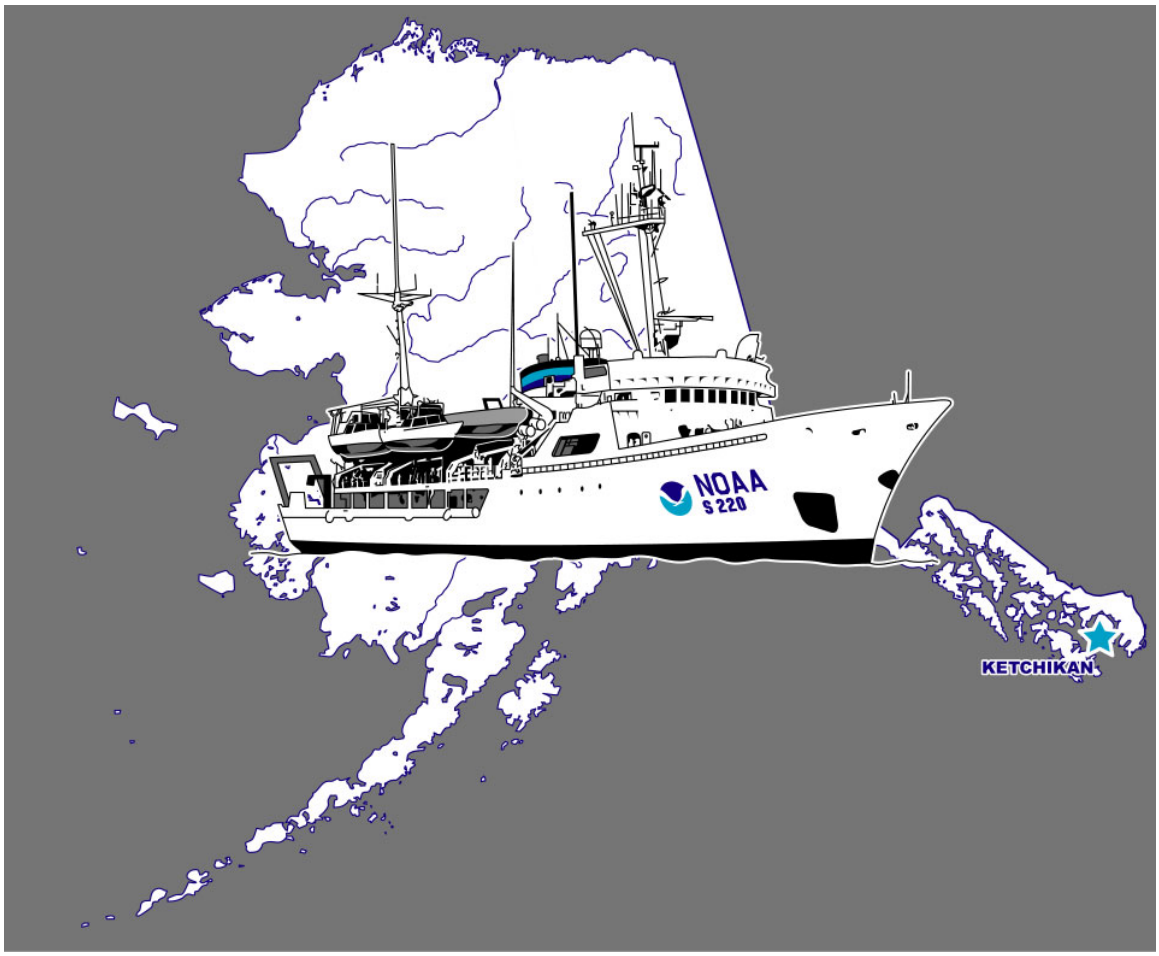
10 kts – Any combination of RPM and Pitch with RPM not to exceed 160 RPM
8 kts – Any combination of RPM and Pitch with RPM not to exceed 140 RPM
6 kts or below – Any combination of RPM and Pitch with RPM not to exceed 130

1.2 RESON SeaBat 8160

Based on the referenced report, it appears that the best survey speed for the 8160 system, from a noise perspective, is at 10 kts. Both lower and higher speeds correlate with higher noise levels.

10 kts – Any combination of RPM and Pitch with RPM not to exceed 160 RPM
8 kts – 130 RPM with required pitch setting
6 kts or below – RPM not to exceed 130 and required pitch

RESON 8101/8111/8160
Data Acquisition



RESON 8101/8111/8160 Data Acquisition

Table of Contents

0.0 Document Scope

This is a step by step guide to 

acquiring RESON data.

1.0 Start-up Procedure

1.1 Turn on ISIS computer.

1.2 Make Day Number Folder on the Isis machine under appropriate project and sheet in Windows Explorer. It is also helpful to have this folder open and visible in Windows Explorer somewhere on screen to make sure that the lines are being recorded and saved correctly.

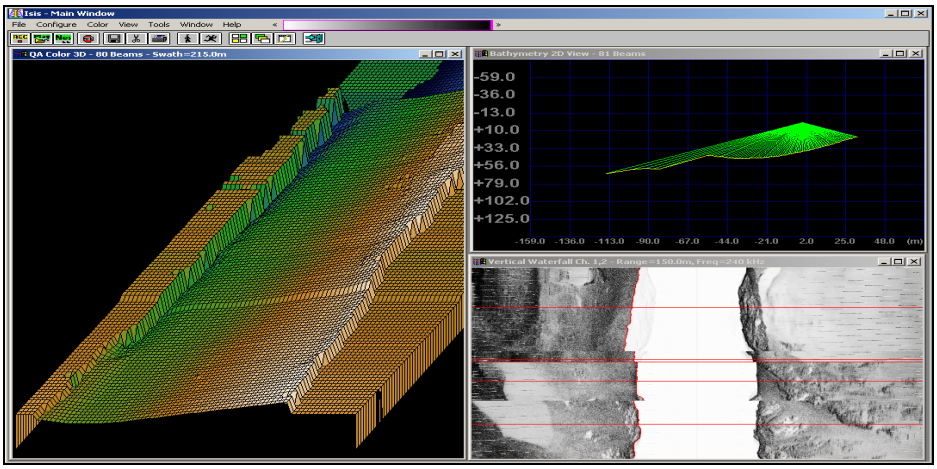
1.3 Launch Isis Sonar from the desktop. An empty shell will come up.

1.4 Turn on RESON machine.

1.5 On the upper left hand corner of the ISIS screen, hit “REC” (RECORD).

1.6 Three important image screens will come up in the Isis Main Window:

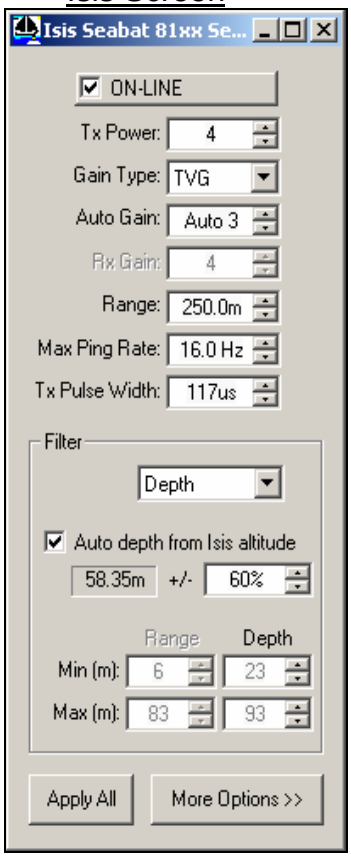
3-D Screen 2-D Screen



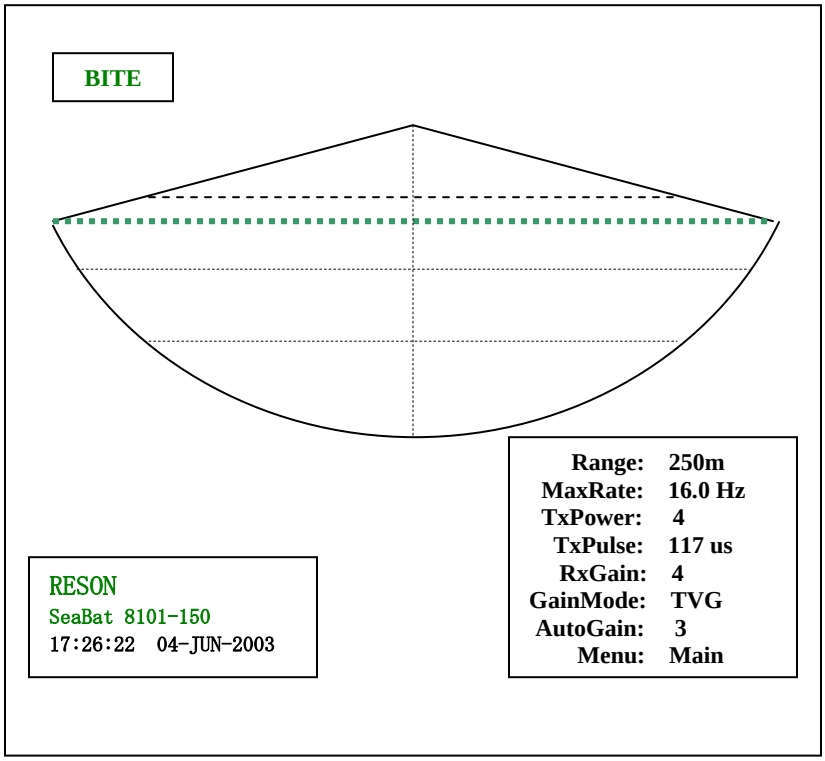
Vertical Waterfall/Sidescan

The Isis Seabat 81xx Server menu will come up that will allow you to change the settings that affect these three ISIS image screens as well as the RESON screen—i.e. general data quality of the sonar itself.

Isis Screen



Reson Screen



2.0 Isis Seabat 81xx Server

2.1 ON-LINE

This box should be checked all the time except to playback lines (See the Acquisition Tools section on page 12 for this procedure).

2.2 Tx Power

This controls how much power is going to the sonar. The power settings for the 8101 ranges from OFF to FULL with 1 to 7 in between. The power setting should be set as low as possible

without getting too many flyers. When the power is set too high, often there will be a glow or a halo around each ping (this can be a result of other settings being too high also), as well as flyers. Do what you can to prevent this from happening.

2.3 Gain Type

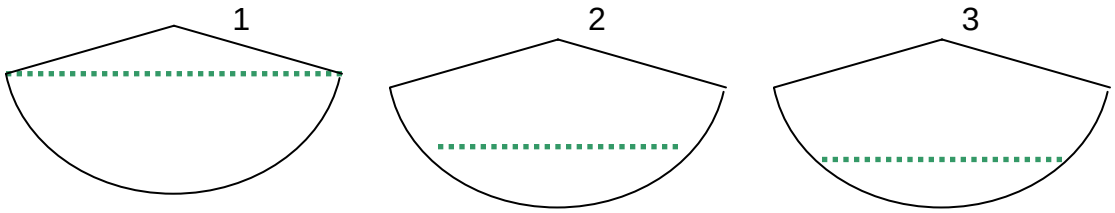
Gain type should always be TVG (Time Varied Gain).

Auto Gain – Auto Gain is an automatic gain function that can be used instead of Rx Gain, which is where the gain can be set manually. The setting for this ranges from Auto 1 to Auto 10. This will analyze the bottom return to increase or decrease the receiver gain. Auto 2 through 4 are the typical settings for acquisition. Again, try and set this as low as possible to prevent possible flyers and the "power glow" that will be seen if any setting is too high. To run the gain manually, hit "Off" on the drop down menu.

Rx Gain – Gain is the "ears" of the sonar. The Gain function controls the amount of receiver gain to be applied to the returned sonar signal. If you are using manual Gain mode, keep the number as low as possible, ranging from about 4 to 12 for best results.

2.4 Range

The Range setting determines ping rate and how far down the sonar will "see". The 8101 minimum range is 0 (though the setting will never be seen so low) and maximum is 400. This will be the setting that will most likely be changed the most because it is so closely linked with water depth. The 8111 minimum range is 5 and maximum is 1400. The 8160 minimum range is 5 and the maximum is 5000. The Range should be kept above or even with the widest part of the wedge on the RESON computer screen, as in the first illustration below.



Good Too Low Bad
Outer Beams are Lost

2.5 Max Ping Rate

This will be already be set 20.0 Hz for the 8101. For the 8111 it is set at 20.0 Hz. For the 8160 it is set to 15.0 Hz. The only reason to change these values is if the vessel is in shallow water and moving very slowly and you wish to reduce superfluous data. These values should never be changed without approval of the FOO.

2.6 Tx Pulse Width

Pulse Widths on the 8101 ranges from 21µs to 225 µs, but keep these numbers within 70µs to 120µs for best results during acquisition. On the 8111 this value ranges from 50 µs to 670 µs, the recommended/minimum value for the 8111 is 225 µs. Donot go below 225 µs, nothing is gained by going lower. On the 8160 this value ranges from 0.2 ms to 10 ms. For the 8160 the pulse width is range dependent. At 750m, the minimum is 150 micro sec, at 1000m the minimum 300 micro sec, and at 1750 the minimum is 1 milli sec (the minimum is listed here, pulse width can be set higher but resolution decreases). The smaller the number, the narrower the pulse width. A narrow pulse width means higher resolution while cutting back on range capabilities; likewise a larger pulse width lowers the resolution while increasing the range (better outer beam response. Therefore, in sloping areas, increasing the pulse width will increase how much slope the Reson can acquire.

2.7 Filter

There are two types of filters that can be used during acquisition: The “Auto Depth Filter from Isis Attitude” and the Filter based on “Depth”, “Range”, or “Both” for depth and range together.

2.7.1 Auto Depth Filter

Percentage ranging from 1% to 100%. This filter is most helpful in sloping areas, i.e. the steeper the slope, the better the sonar will pick it up when the percentage is set high. However, a high percentage on a flat area will create flyers, so keep the percentage low in these cases.

2.7.2 Filter based on Depth or Range

Auto Depth Filter must be unchecked. To select between Depth, Range, or Both, simply click on the drop down menu to highlight your choice. For multibeam, utilize only the Depth option. Under Min (m); and Max (m); set depth values appropriate to the depth of water that you are working in, keeping in mind that any depths outside of this minimum and maximum will not be acquired.

2.7.3 No Filter

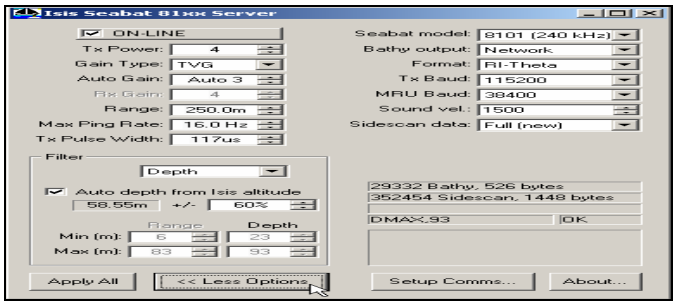
It is also possible to run with no filter by selecting “None” in the drop down menu.

2.8 Apply All

This button is inessential because every change made in the Seabat Server is immediately applied. Another reason it is not recommended to use this is it can cause the system to crash.

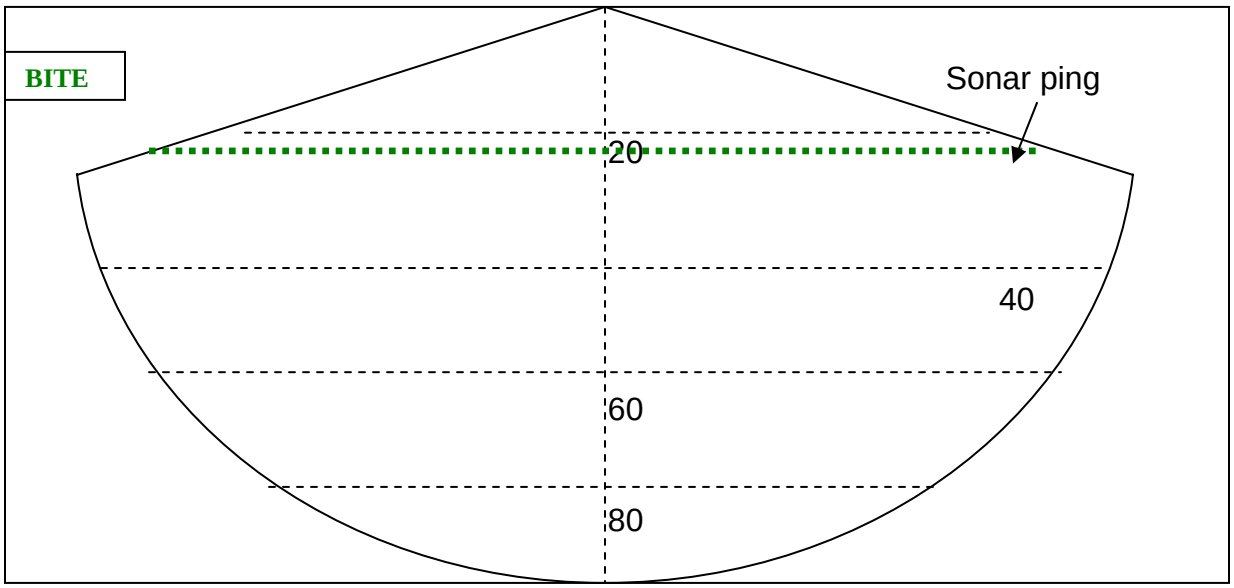
2.9 More Options

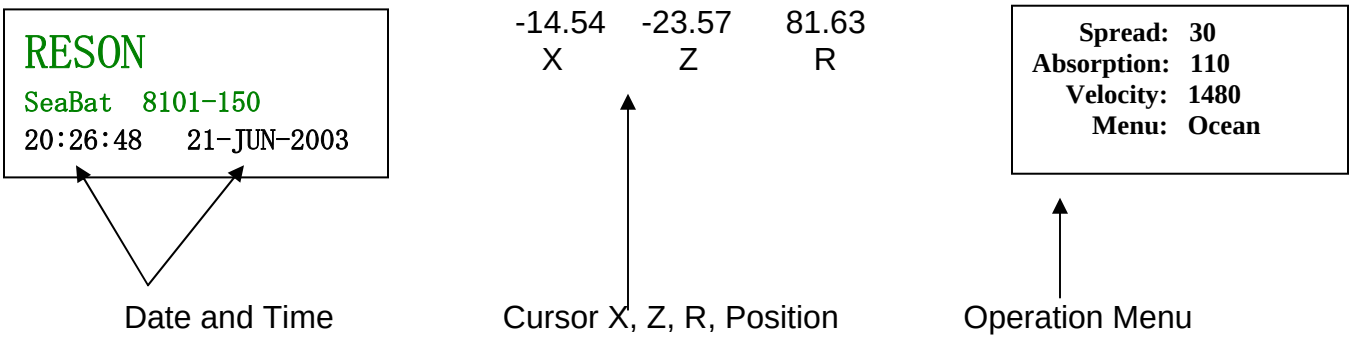
These are mainly configuration options. It is important to know where they are found, however these options should not be changed without FOO or CST approval.



3.0 Reson Display Screens

The Main Sonar Display Screen, which is used for acquisition, is shown below.





3.1 Cursor Position

When the cursor is within the wedge, its position is displayed. X = Across Track, Z = Depth, R = Range.

3.2 Operation Menu

There are four different menus, Main, Ocean, Filters, and Display. There is also the Menu Off option. To change between menus, simply click on Menu to scroll to the menu you need.

3.2.1 Main Menu

The Main Menu shares the same information that is found in the top half of the Isis Seabat Server: Range, Max (Ping) Rate, Tx Power, Tx Pulse (Width), Rx Gain, Gain Mode, and Auto Gain. These numbers should mirror the numbers in the Isis Seabat Server. If for some reason this is not the case, and changing settings in Isis has no effect on the sonar, the settings in the Main Menu can be changed by using the three-button trackball. The three buttons function as so: Left button—down, Right button—up, Middle button—speeds up the direction when held with the right or left button.

3.2.2 Ocean Menu

There are three options: Spread, Absorb, and Velocity. Spread and Absorption are linked together, where the numbers represent the amount of spreading and absorption loss that can be expected. These values will factor into the TVG, which in turn affect the return signal. For the 8101, keep these numbers at 30 and 70 in salt water and 30 and 20 for fresh water for the spread and absorption respectively. For the 8111, keep these numbers at 30 and 30 for salt water and 30 and 5 for fresh water.for the 8160 keep these numbers at 30 and 13 for salt water and 30 and 2 for fresh water. Velocity is the speed of sound for the area. This only applies for the 8160 which receives surface sound velocity via the SBE 45 TSG. This value should roughly correspond to the sound velocity seen during the last CTD cast. If it differs greatly then you should consider taking a new cast.

System	Spread	Absorb (sea)	Absorb (fresh)
8101	30	70	20
8111	30	30	5
8160	30	13	2

3.2.3 Filters Menu

Found in the bottom half of the Seabat Server, namely Filter,

Min Range, Max Range, Min Depth, Max Depth, and Head Tilt. Head Tilt has to do with if the transducer had been mounted with a roll offset, which does not apply to our Reson transducers.

3.2.4 Display Menu

Color, Contrast, Dots, Grid, and Freeze. This menu has to do with how objects on the Reson screen are being displayed. These options do not need to be changed.

3.3 BITE Menu

By clicking on "BITE" in the upper left-hand corner, the Built-In Test Environment (BITE) Screen opens up. This menu is available for viewing diagnostic and configuration information—like some of the information found in More Options of the Isis Seabat Server. The color of the BITE button shows if the Reson system is operational or not:

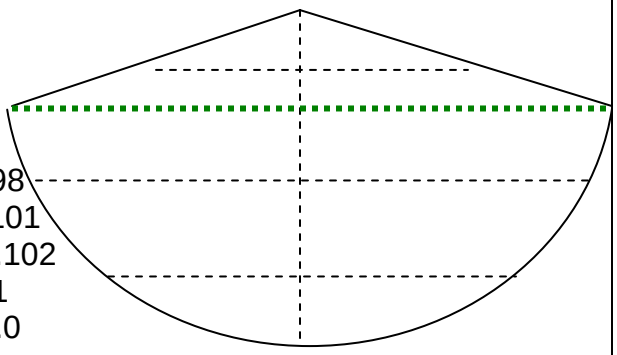
GREEN = System is operational;
YELLOW = System is operational but some areas are not working properly or are out of sync;
RED = System is not operational—there is a malfunction somewhere. Inside the BITE menu, the text will also be in one of three different colors depending on the status of each particular setting. The color code is same as above except that text will also be WHITE to show that the system is operating OK

The BITE Menu Screen looks something like this below:

BITE BUILT- IN TEST **CALIB** **RESET**

Wet-End Status
Leak: +5.0V
HeadTemp: +18.4°C
-5V: -4.8V
+12V: +12.0V
-12V: -12.0V
DipSwitch: 50

Commuication
Uplink: Good
Downlink: Good
Internal: Good
Ethernet: 00E0CB030498
Local: 192.168.195.101
Remote: 192.168.195.102
Gateway: 192.168.1.1
Subnet: 255.255.255.0



Firmware Version
Dry: 8101-2.09-E34D
Wet: 8101-1.08-C215

Sensor Inputs
Pitch:
Roll:
Heave:
Velocity:
UTC Date:
UTC Time:

Uplink:
Format:
Sidescan:
TestPtrn:
Output:
ProfilBd:
TimeBd:

Receiver Gain Offsets:

- 3db

ContrlBd:
MotionBd:
VeloctyBd:
UDP Base:
Oriented:

Receiver Phase Offsets:

- 45°

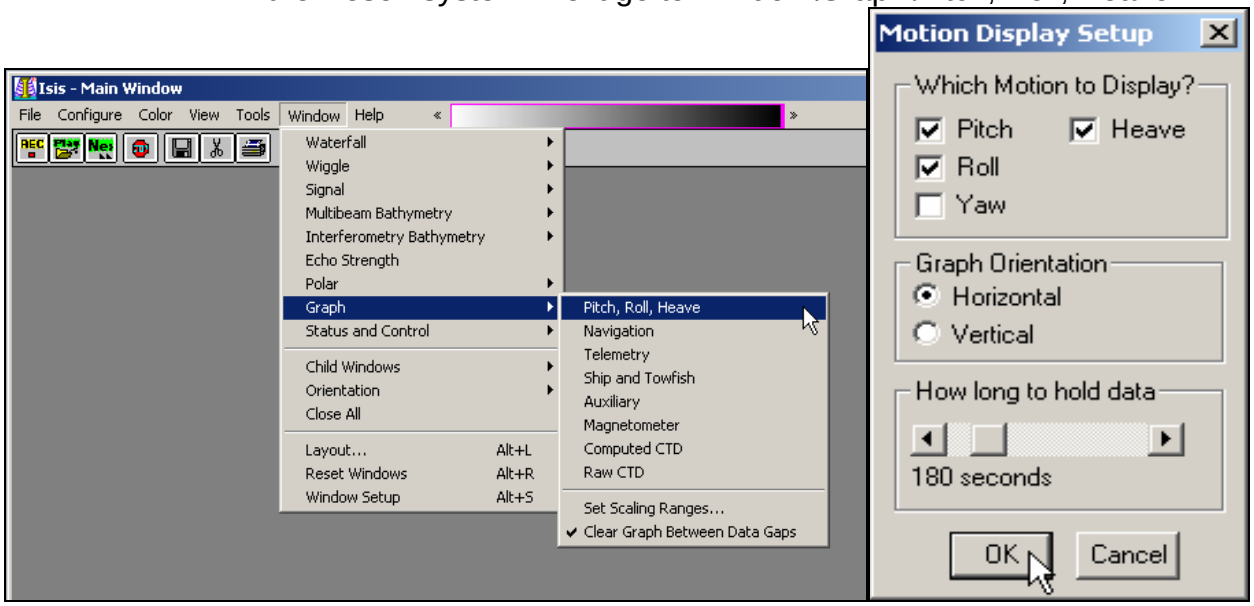
HeadSync:
Projectr:
MENU:

Config

In the upper right hand corner, the BITE menu displays the sonar data wedge, so that it can still be viewed while in this menu.

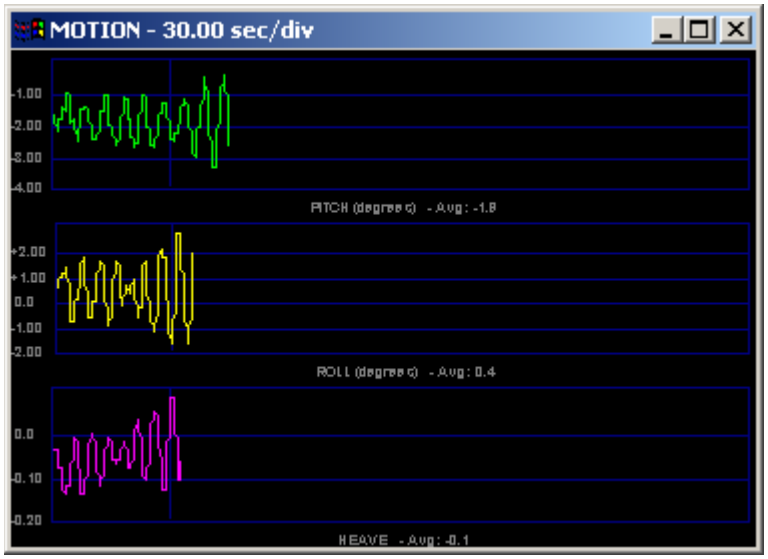
3.4 Sensor Inputs

Here are where the numbers are found for Heave, Pitch, and Roll for the Reson system. Next go to Window\Graph\Pitch, Roll, Heave



The window that pops up will only show Pitch values. In order to view Roll and Heave as well, right click inside the graph box and under “Which Motion to Display?” check each of the boxes for the other sensors.

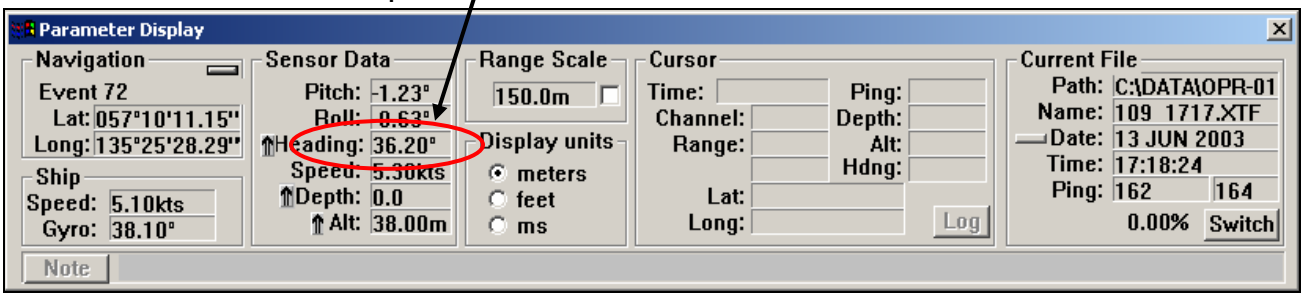
3.4.1 Good motion sensor data will look like this



3.4.2 Parameter Display

Sensor data for heading in the parameter display is not correct (raw navigation packet is usually selected during processing- which comes from the posmv)

.



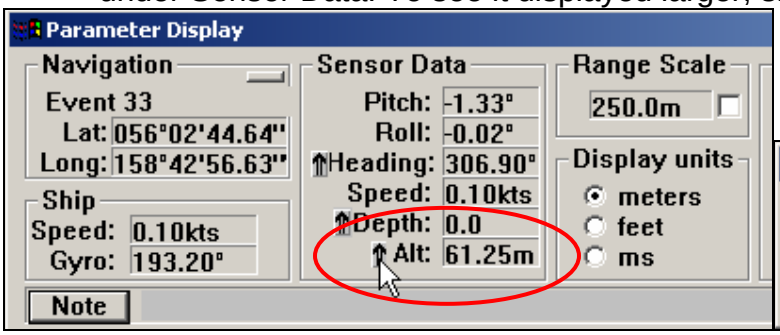
3.4.3 ISIS Shutdown

If any or all of these sensors values are not changing or flat-lining in the Pitch, Roll, and Heave Motion Window, the ISIS computer must be shut down—DO NOT RESTART, SHUT DOWN. After, beginning again with the start-up procedure; make sure that the RESON has been turned off before the Isis is brought up again.

A possible reason for this communication error is if the Isis computer was never shut down. Check to see if the Isis computer is on upon first getting in the launch. If it is, log in and shut down.

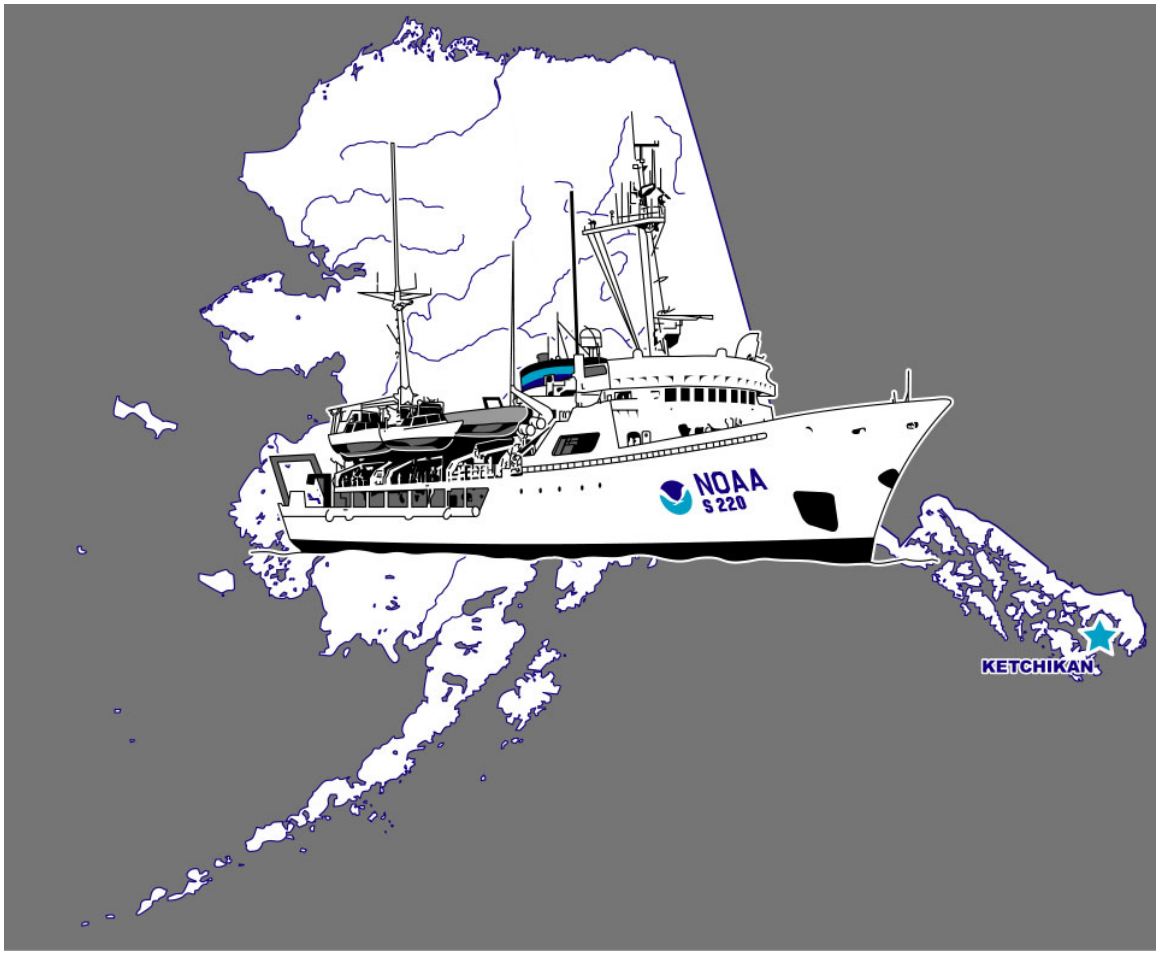
3.4.4 Altitude

Another value to monitor is the Altitude. It is found in the Parameter Display under Sensor Data. To see it displayed larger, simply click left of the Alt button:



This is what will pop up:

TEI Real Time Bathy SOP



TEI Real Time Bathy SOP

Table of Contents

0.0 Document Scope

The scope of this document covers setting up and acquiring multibeam data using TEI Isis and TEI DelphMap/DelphNav/RT Bathy Programs.

1.0 RT Bathy Set Up

Currently you need a very high end computer to record multibeam data and have RT Bathy in operation. On the FA we are using dual 2.8 GHz processors with at least 1 GB of RAM and a Seagate Cheetah Ultra SCSI hard drive. You will also need two high end video cards to display all the information on 3 screens.

2.0 Setup

2.1 Isis Sonar

1. Open Isis
2. Tools→Realtime BathyPro Map→Multibeam Bathymetry

2.2 BathyPro Real Time

1. Open Project (HXXXXX.dmp) in **DelphMap** from C:\Project\OPR-XXXX-FA-XX\HXXXXX\RT_Bathy\. If you do not have DelphMap open, BathyPro will open it for you.
2. Set the **DTM File settings**. Under Encoding Type choose "Average". Save the DTM to the correct folder.
3. Set the **Map Projection and Settings**. *You must uncheck the Set Default Limit Box.*

4. Under Boundaries in the **Map Projection and Settings** menu, enter a bounding box for the area you wish to create the DTM for. Use a reasonable resolution for the DTM size (i.e. don't use 1m resolution for a 10,000m x 10,000m box).
5. Enter the North-West corner of the bounding box for the area you wish to create the DTM for.
6. The input projection is Not Projected (Lat/Long) (using NAD83 as datum)
7. The output projection is UTM with the correct zone (using NAD83 as datum)
8. Click on START
9. The box next to START should switch to "Waiting…"
10. Turn off the "Fill Gaps filter", so holidays will be visible.

2.3 DelphMap

1. Right click on Background
2. Import a Background Image
3. Browse to the folder where the coverage map is located and select it.
4. Click on "Change..." to change the projection of the chart. It should be in UTM with the correct zone number (using NAD83 as the datum).

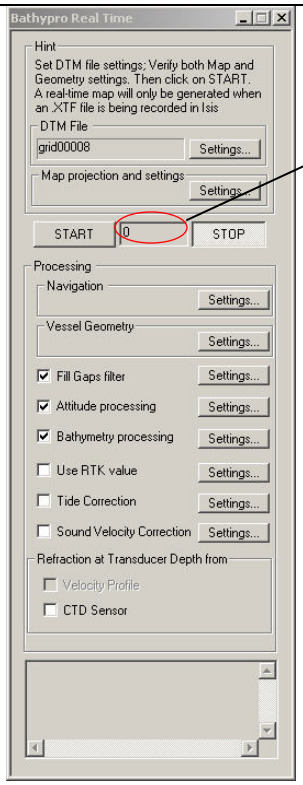


Figure 1. RT Bathy Window

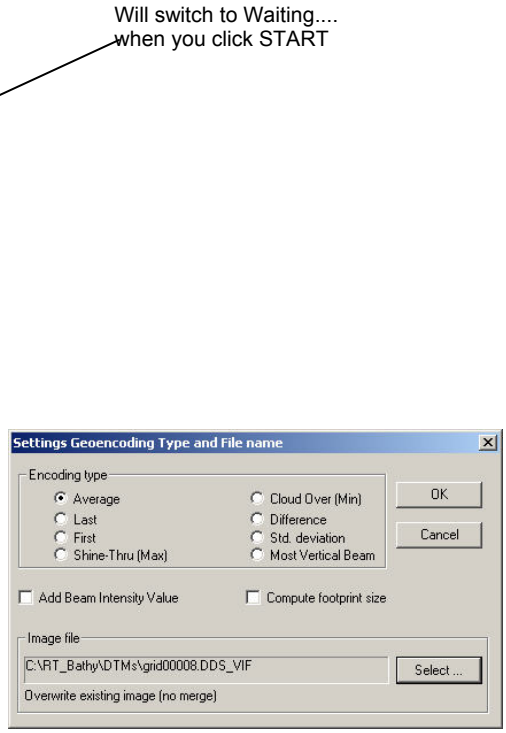


Figure 2. Setting grid type and location

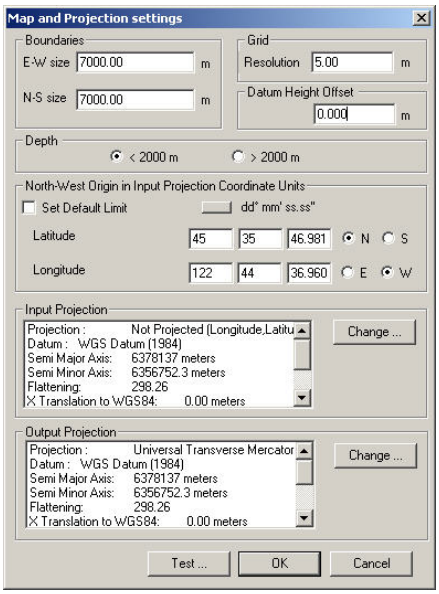


Figure 3. Setting Bounding box and grid projection

3.0 Recording data

1. Click on Switch button
2. Click on Record data to File Name radio button and browse to correct storage location
3. When ready to start recording, click on the Switch Now! button. This will start logging data.
4. When getting close to end of line click on the Display Only radio button
5. When ready to stop logging, click on the Switch Now! button. This will end data logging.

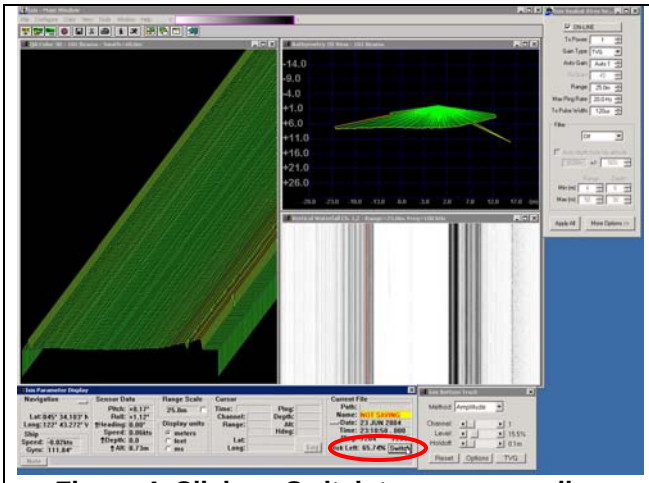


Figure 4. Click on Switch to open recording dialog

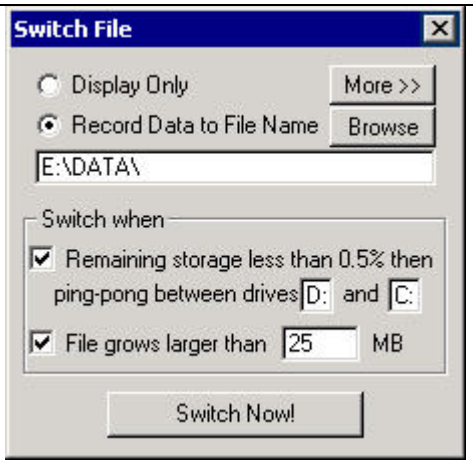


Figure 5. Switch File Dialog

4.0 BathyPro Real Time Display

4.1 Real Time Bathy

1. The box next to START should be counting up. The number should correlate to the ping number in the Isis parameter display. If the box says “Outside”, then Isis thinks your bounding box coordinates are off. Double check to make sure that they are correct.

4.2 DelphMap

1. Click on the center Plug in the upper left hand in the Survey Control Panel Window to display boat navigation.
2. Click on arrows to bring up Left/Right indicator

Boat Shape

1. Click on the far upper left hand plug in the Survey Control Panel Window to bring up the Serial Port data acquisition settings.
2. Select the Com 05 tab (for ship Com 06).
3. Select the Shape tab and then the modify button to change the length and width of the boat display.

5.0 Issues/Things to watch for

1. The Isis parameter display must display Lat/Long in Decimal Degrees (i.e. 34.9827271 -120.12891717) for navigation to display correctly.
2. Telemetry output must be on Form 2. Nicole Stagner (TEI Rep) thinks that Form 1 may not know how to correctly output at 1 Hz. Problems seem to arise.
3. The POS/MV Controller software must be started after you hit the record button in Isis. If this is not done, the POS/MV controller software will take control of the socket and Isis will not receive any navigation data.

Fixing Data with Incorrect Date on Time Stamp

Written by SST Froelich

Problem:

An error can occur due to unknown reasons during acquisition when data is logged through and past midnight. The error places the wrong day in the time stamp for the Raw Nav and Attitude packets. These packets have the correct time, but the date is incorrect. All other packets (Bathymetry, Side Scan, Snippets) have the correct date on the time stamp. Jack Riley was contacted for help and he provided a Pydro macro that creates a copy of the file and then changes the date in the Raw Navigation packet to whatever date is specified by the user.

Procedure:

1) The SetXTFRawNavYMD.py macro sent from Jack Riley is located under python23\Pydro\Macros folder
2) Run Pydro and run SetXTFRawNavYMD.py macro from Misc. menu
3) Entered the correct date for the line(s) (ex. 2005-05-17)
4) Copy lines with adjusted dates which are automatically named DDD-HHMM_dt.xtf (ex. 137-1754_dt.xtf)
5) HDCS data with the bad dates is not retained (XTF was retained)
6) The new lines (DDD-HHMM_dt.xtf) are converted as usual

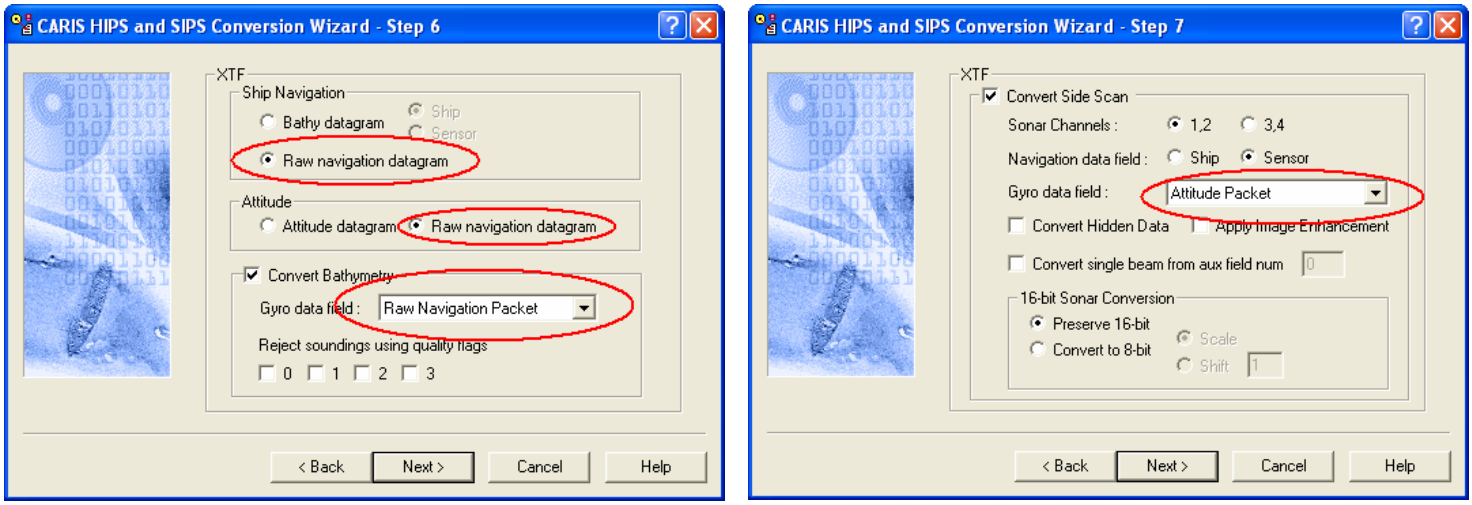


Figure 1. Conversion Settings

Discussion:

The Raw Navigation date was changed to the correct day, but the Attitude date was not changed. This is not a problem because attitude information is converted from the Raw Navigation packet. No change needs to be made to conversion process therefore. Upon conversion, CARIS HIPS reads navigation (speed, CMG and distance), attitude (heave, pitch and roll) and gyro from the Raw Navigation packet (now with the correct date and time) (see figure 1).

Sensor	Packet read from	Correct date in packet?
Speed	Raw Navigation	Yes, after macro applied
CMG	Raw Navigation	Yes, after macro applied
Distance	Raw Navigation	Yes, after macro applied
Heave	Raw Navigation	Yes, after macro applied
Pitch	Raw Navigation	Yes, after macro applied
Roll	Raw Navigation	Yes, after macro applied
Bathy Gyro	Raw Navigation	Yes, after macro applied
Bathy	Bathy	Yes
SSS	SSS	Yes
Snippets	Snippets	Yes
SSS Navigation	SSS Sensor	Yes
SSS Gyro	Attitude	No*

Table 1. Summary of Sensor Data

* Because it appears the Side Scan is getting the date and time stamp from the Side Scan Sensor packet, which has the correct date, and is just taking the gyro field from the attitude packet (with no date value from the attitude packet, just a time value and a gyro value) the Side Scan gyro matches the Bathy gyro for a given time stamp (see figures 2 & 3).

	Time	d-Time	Value	d-Value	Status
✓	2005-05-17 17:54:28.209	0.040	272.779	0.003	Accept
✓	2005-05-17 17:54:28.249	0.040	272.781	0.002	Accept
✓	2005-05-17 17:54:28.289	0.040	272.783	0.002	Accept
✓	2005-05-17 17:54:28.329	0.040	272.786	0.002	Accept
✓	2005-05-17 17:54:28.369	0.040	272.788	0.002	Accept
✓	2005-05-17 17:54:28.409	0.040	272.790	0.002	Accept
✓	2005-05-17 17:54:28.449	0.040	272.792	0.002	Accept

Figure 2. Bathy Date/Time & Gyro

Day	TimeStamp	Period	Altitude	Port	Stbd	Gyro
2005-137	17:54:28.195	533	95.60	2698	2698	272.778°
2005-137	17:54:28.804	533	95.90	2698	2698	272.804°
2005-137	17:54:29.399	533	96.20	2698	2698	272.786°
2005-137	17:54:30.008	533	96.70	2698	2698	272.726°
2005-137	17:54:30.601	533	96.70	2698	2698	272.654°
2005-137	17:54:31.212	533	96.70	2698	2698	272.592°
2005-137	17:54:31.804	533	96.70	2698	2698	272.554°

Figure 3. SSS Date/Time & Gyro

Hydrographic Survey Quality Control Checklist

Survey: HXXXXX Project: OPR-XXX-FA Survey PIC: _____

Bold underlines require a date and initials of when item was completed.
Refer to Survey Management SOP for detailed instructions to complete these steps.

Post Acquisition - review of data

- _____ Quality Control of survey area in subset prior to departure from field (SV, Tide, Holidays, Noise)
  - _____ BASE surfaces reviewed
  - _____ Survey area reviewed in subset mode
  - _____ Review Acquisition and Processing logs for issues/problem data
- _____ Check for immediate DTONs
  - _____ Immediate DTONs submitted
- _____ Document special circumstances/problems and HVF changes/deviations from DAPR as occurred for DR
  - _____ Issues listed in HXXXXX_Survey_Log.doc
  - _____ Issues explained in DR
- _____ Shoreline Data Review
  - _____ Pydro
    - _____ DPs/GPs & Bottom Samples reviewed/flagged/S57 attributed/Add, Modify, Delete Selected
    - _____ Pictures labeled correctly, in one folder, & inserted
    - _____ AWOIS.mdb inserted
    - _____ Tide and SVP correctors applied where necessary
  - _____ CARIS Notebook
    - _____ All Pydro features imported
    - _____ Features reviewed with DP forms and boat sheet
    - _____ All items addressed (all data including CFF, Chart, Lidar, and new items)
    - _____ AWOIS investigations complete
- _____ Coast Pilot review & write up with edits completed
- _____ Smooth Tides Request (*.mif/mid and times of Hydro)
  - _____ Produced, Submitted, Archived [Digital-copy (letter, times, & mif/mid) in Appendix VI Smooth Tide Req fldr]
- _____ Survey Outline
  - _____ Produced, Submitted, & Archived (digital-copy in Appendix I Survey Outline folder)
- _____ Additional (Observed, Verified or Smooth) Tides applied
  - _____ Tide file reviewed & checked for gaps/flyers (txt in Notepad, .tid in Caris Tide Editor)
  - _____ Applied to lines
  - _____ Applied to DPs
  - _____ Data re-merged in CARIS after tides have been re-applied.
- _____ Verify Sound Velocity files
  - _____ SVP files compared in digital acquisition logs vs. I drive – all should match
  - _____ Each cast profile reviewed individually in CARIS
  - _____ SV cast positions displayed in CARIS (check for gross error)
  - _____ SV cast list produced (digital copy in Separates III SV Profile List folder)
  - _____ SV acquisition/processing deviations from the DAPR are noted in the DR.
- _____ Data queried in CARIS (compare to digital acquisition logs)
  - _____ Query all lines in CARIS
    - _____ Save query to H#####_Data_Query log
    - _____ Compare query to SVP file in HDCS line directory (random sample)
    - _____ Tide and SVP files applied are correct and most current (observed or verified)
  - _____ Problems/discrepancies investigated
  - _____ Vessel speeds queried in CARIS and reviewed
    - _____ Vessel speeds meet object detection requirements for relevant depths
- _____ Logs reviewed
  - _____ SV method documented
  - _____ If true heave not able to be applied, noted in logs and discussed in DR

Post Survey - post spatial (subset) review of data

_____ Quality Control of cleaning performed by others and general QC of survey area
- _____ All lines re-inserted into HXXXXX_QC session, for BASE/subset review (not DP lines)
- _____ Complete Subset Review (include looking at rejected and BASE child layers)
  - _____ Subset tiles created for review process
- _____ Review all examined soundings (to designate, mark outstanding, or reaccept)
- _____ Data checked for systematic errors (Std deviation child layer especially useful)
- _____ Data issues discussed in DR if present

_____ Designate soundings in areas where surface does not accurately represent the bottom
- _____ # of Designated Soundings

_____ Depth checking for flyers (CARIS Field Sheet Editor)
- _____ BASE Surfaces reviewed
- _____ Contours & Soundings generated (CARIS Field Sheet Editor)

_____ Chart comparisons completed and documented in DR
- _____ Local Notice to Mariners checked for recent updates
- _____ Chart edition & date corrected through included in DR

_____ DTONs (Dangers to Navigation)
- _____ Select DTONs (marked outstanding in CARIS and inserted as CARIS Line Feature)
- _____ Notify that they are ready for review
- _____ Pydro session updated/.xml produced
- _____ Once actual DTONs chosen they should be marked Designated in Pydro or CARIS
- _____ Submittal email/DTON Report archived (digital copies in PSS folder)

_____ CARIS Fieldsheets & Sessions review and submission ready
- _____ HXXXXX_QC Fieldsheet & Session contains soundings, contours & Finalized surfaces for review
  - _____ Depth Threshold BASE surfaces finalized to produce critical soundings
  - _____ Use Finalized (clipped by depth range) surfaces to assess if coverage requirements were met
- _____ Non-Finalized BASE Surfaces produced (in HXXXXX Fieldsheet & Session)
  - _____ BASE surfaces include Depth Threshold ranges and resolutions

_____ Pydro
- _____ PSS data IS NOT Stale or Outdated
- _____ All features resolved
- _____ DP forms match PSS & scanned into DP Log folder
- _____ Correct Vessels were selected for all data
- _____ Correctors were applied properly
- _____ Remarks/Recommendations completed in Pydro
- _____ AWOIS items finalized
- _____ Features Report produced and archived (digital copy in folder)

_____ Descriptive Report completed
- _____ Cross-line (SWMB) comparisons completed and documented in DR
  - _____ Required quantity of XLs met. If not, addressed in DR.
- _____ Junction comparisons completed and documented in DR
- _____ Prior surveys were reviewed because of special issues _____
  - _____ Did the issues require an explanation in the DR
- _____ Special circumstances/problems/issues/HVF changes/deviations from DAPR documented in DR
  - _____ Does the data meet specifications? Discuss in DR.
- _____ Shoreline Processes described in DR
- _____ Cover & Title sheets produced (digital copy in folder)
- _____ Appropriate Appendices completed and included with digital data
- _____ Separates completed and included with digital data

Submission

_____ Coverage requirements were met.
_____ If not, addressed in DR.

_____ Accuracy requirements were met.
_____ If not, addressed in DR

_____ Digital folders cleaned up
_____ HXXXXX Fieldsheet folder contains only official Non-Finalized BASE Surfaces
_____ Sessions & Fieldsheets open in CARIS and are not outdated
_____ All .hob files are in the Notebook session, named properly, & are in the Field Products/Notebook folder
_____ Extraneous files are removed from the Field Products folder

_____ Content of all submission folders (CARIS, DR, Field Products, & PSS folders) checked for completeness and suitability

_____ Data checks
_____ HVFs match current DAPR
_____ If not, addressed in DR.

The quality and completion of all tasks are the responsibility of the Sheet Manager (OIC) (meaning if someone else completed a task, the OIC has verified the accuracy).

Standard field surveying and processing procedures were followed in conducting the above mentioned survey.

The digital data and supporting records have been fully reviewed and are considered complete and adequate for review and approval.

_____ _____
Sheet PIC Name Date

Reviews

_____ Hydrographic Survey Quality Control Review Checklist completed
List name of reviewer _____
Date completed _____

_____ All data and DR submitted to Final Review for approval

_____ Data and DR are approved
_____ Descriptive Report & Appendices reviewed
_____ Shoreline Report reviewed
_____ Pydro/Notebook Sessions reviewed
_____ Data reviewed in Fledermaus

_____ _____
Final Review Name Date

Hydrographic Survey Quality Control Review Checklist

Survey: _____ Project: _____ Survey Reviewer: _____

Bold underlines require and date and initials when item is completed.

- _____ Logs reviewed
  - _____ Digital Acquisition & Processing Logs
  - _____ Pydro Feature Log
  - _____ Survey Log
- _____ HXXXXX_Data_Query
  - _____ DPES lines are SVP/Tide/Merged, DPNE lines are just Tide/Merged
  - _____ DP GP BS Query reviewed
  - _____ Final Session Query
- _____ Outside Review of Shoreline & Pydro session
  - _____ All features resolved
  - _____ Remarks/Recommendations make sense
  - _____ AWOIS Items resolved sufficiently
  - _____ Files in Notebook folder open in CARIS Notebook
  - _____ Review Notebook shoreline files with Caris Map .des from BASE surface for survey
- _____ Quality and flyer check of depths/surfaces (review in CARIS w/ HXXXXX_QC Session & Fieldsheets)
  - _____ Subset (include looking at rejected) – just need to look at around 10% of area
    - _____ Shoals and Navigationally Significant areas reviewed
  - _____ Contours & Depths checked
  - _____ Designated soundings reviewed
  - _____ Errors discussed in DR if present
- _____ DTONs (Dangers to Navigation)
  - _____ Reviewed/Verified
- _____ Chart comparisons reviewed
  - _____ Ensure chart edition and date corrected through included in DR
- _____ Coverage and accuracy requirements were met
  - _____ If not, addressed in DR.
- _____ Descriptive Report reviewed
  - _____ Special circumstances/problems/issues/HVF changes/deviations from SysCert/DAPR documented in DR
    - _____ Were data requirements met?
- _____ Quality Control Checklist reviewed
- _____ Check that all lines are in HXXXXX_FINAL CARIS session
  - _____ Session & Fieldsheet open correctly
  - _____ HXXXXX_FINAL Fieldsheet folder contains official Depth Threshold BASE surfaces
  - _____ Depth Threshold BASE surfaces open correctly and are not outdated

Digital Data Submission Checklist

OPR-A###-FA-##

HXXXXX Survey X

CARIS

Fieldsheets

_____ HXXXXX (Non-Finalized BASE Surfaces)

Naming convention: HXXXXX_DepthRange_Resolution(m)

List all Non-Finalized BASE Surfaces - the number of surfaces submitted is dependent on the depth range of the data and the finest resolution the data can support.

- _____ HXXXXX__0to35_0p8m
- _____ HXXXXX__25to70_2m
- _____ HXXXXX__60to170_5m
- _____ HXXXXX__150to300_12m
- _____ HXXXXX__280to550_22m
- _____ Critical Soundings

_____ HXXXXX_QC (Working fieldsheet used throughout the survey for coverage and QC.)

(The following are examples of possible files)

- _____ Preliminary Finalized BASE Surfaces
- _____ Subset Tiles
- _____ Depths and Contours

HDCS_Data

_____ HXXXXX (processed CARIS HDCS data)

_____ VesselConfig (only vessels that apply to this survey)

_____ DeviceModel.xml (DeviceModel used for processing this survey)

Preprocess

_____ ISIS (raw XTF data and True Heave from ISIS)

_____ SVP_raw (raw SV data from Velocwin)

_____ Trimble (raw data from TerraSync & exported SHP files from GPS PathFinder)

Session

_____ HXXXXX.hsf (CARIS session)

_____ HXXXXX_QC.hsf (CARIS session)

SVP (processed CARIS SVP data files separated by vessel)

_____ 1010

_____ 1018

_____ S220

Tide

_____ Observed or Verified .tid and .zdf (Tide files applied to the data at the time of submission)

DESCRIPTIVE REPORT

_____ HXXXXX_Descriptive_Report.doc

Appendices

I. Survey Feature Report

_____ HXXXXX_Survey_Feature_Report.pdf (report produced in Pydro)

II. Survey Outline

_____ HXXXXX_Survey_Outline.tab (survey outline of hydrography)

III. Smooth Tide Request

_____ HXXXXX.pdf (Smooth Tides Request & Abstract Times of Hydro)

_____ HXXXXX.mif/mid files

IV. Supplemental Correspondence

_____ HXXXXX_Correspondence.xxx (digital copies of emails, request & correspondence)

V. Geographic Names

_____ HXXXXX_Geographic_Names

Separates

I. Logs

Acquisition & Processing

- _____ HXXXXX_1010_8101_Log.xls
- _____ HXXXXX_1010_8101_Log.xls
- _____ HXXXXX_S220_8111_Log.xls
- _____ HXXXXX_S220_8160_Log.xls

Detached Positions

- _____ HXXXXX_Pydro_Feature_Log.xls
- _____ HXXXXX_DPForms.pdf (Scanned DP forms)

Side Scan Contacts

N/A HXXXXX_Sidescan_Contact_List

FIELD PRODUCTS

Final Fieldsheet

Notebook Files

_____ HXXXXX_Edited_CFF_Shoreline.hob
_____ HXXXXX_Charted_Shoreline.hob
_____ HXXXXX_Add.hob
_____ HXXXXX_Modify.hob
_____ HXXXXX_Delete.hob
_____ HXXXXX_Add_Features.hob (hob file created from xml import)
_____ HXXXXX_Modify_Features.hob (hob file created from xml import)
_____ HXXXXX_Delete_Features.hob (hob file created from xml import)
_____ HXXXXX_None_Features.hob (hob file created from xml import)
_____ HXXXXX.hsf (Notebook session)

PR and Constituent Products

_____ Include all products that were provided to constituents

PSS (Pydro Preliminary Smooth Sheet)

_____ HXXXXX.PSS
_____ Photos (Non-SSS contact images associated with Pydro features, named w/unique identifier)

DTON

_____ HXXXXX_DTON.xml (XML of DTONs exported from Pydro)
_____ HXXXXX_DTON_Report.pdf (report produced in Pydro)
_____ HXXXXX_DTON_email.txt (copy of submission email)

HXXXXX Contents

_____ size
_____ number of files
_____ number of folders

_____ Survey data included in transmittal list text file

Analog Data Submission checklist

HXXXXX Sheet X

_____ Digital Data on Hard Drive (listed on Digital Data tab)

_____ Shoreline boatsheets

_____ DP Forms

_____ Daily acquisition forms

Data Query (QC Review MBES Final Session)

Date: _____ ***Name:*** _____

Total Mileage
0

Total Lines in Session _____ lines in HDCS_DATA folder
0 _____ lines in PreProcess folder

Length	Line	TideLoaded	Project	Vessel	Day	TideFile	SVPCorrecte	SVPFile	Merged	Outdated	TPE Comput	Speed	Heading	SR Correctec	TotalTime

Data Query (Features)

Date: _____ ***Filled out by:*** _____

Date: _____ ***Reviewed by:*** _____

List of Acquired GP Files below

_____ **Total # of Features in Pydro**

_____ **# of Primary in Pydro**

_____ **# of Add Features in Pydro**

_____ **# of Modify Features in Pydro**

_____ **# of Delete Features in Pydro**

_____ **# of None Features in Pydro**

0

_____ **# of Secondary in Pydro***

_____ **# of Rejected in Pydro***

** Not exported to Ntbk*

_____ **# of DP Files in HDCS_DATA folder**

_____ **# of DP Files in PreProcess/Trimble/Export folder**

_____ **# of GP Files in PreProcess/Trimble/Export folder**

_____ **Total # of Files in PreProcess/Trimble/Export folder**

_____ **# of Digitized ChartGP & Bathy Files in Pydro**

0 **Preprocess + Digitized + Bathy**

_____ **# of Position Files in Pydro**

_____ **# of Add Features in Ntbk**

_____ **# of Modify Features in Ntbk**

_____ **# of Delete Features in Ntbk**

_____ **# of None Features in Ntbk**

0 **Total # of Features in Ntbk**

Total Acquired GP Files 0

Total DP Files in CARIS 0

0

CARIS Query

Line	Project	Vessel	Day	SVPCorre	SVPFile	TideLoade	TideFile	Merged	Outdated