W00451

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	W00451

LOCALITY

State(s):	Maine
General Locality:	Maine Coastline
Sub-locality:	Kennebec River

2017

CHIEF OF PARTY
Kerby Dobbs, Project Hydrographer

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**W00451**

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**Maine**
General Locality:	**Maine Coastline**
Sub-Locality:	**Kennebec River**
Scale:	**10000**
Dates of Survey:	**05/01/2017 to 06/02/2017**
Instructions Dated:	**N/A**
Project Number:	**ESD-AHB-18**
Field Unit:	**Maine Coastal Mapping Initiative**
Chief of Party:	**Kerby Dobbs, Project Hydrographer**
Soundings by:	**Kongsberg Maritime EM 2040C (MBES)**
Imagery by:	**Kongsberg Maritime EM 2040C (MBES Backscatter)**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

The purpose of this survey is to provide contemporary data to update National Oceanic and Atmospheric Administration (NOAA) nautical charts. Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/.

Products created during office processing were generated in NAD83 UTM 19N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

DESCRIPTIVE REPORT MEMO

October 24, 2018

MEMORANDUM FOR: Atlantic Hydrographic Branch

FROM: Report prepared by AHB on behalf of field unit
Kerby Dobbs
Project Hydrographer, Maine Coastal Mapping Initiative

SUBJECT: Submission of Survey W00451

The purpose of this survey was to obtain bathymetric and backscatter data to meet the needs of habitat classification, bathymetric mapping, and sediment resource objectives set forth by BOEM, MCMI, and NOAA. The survey was conducted in part to support the Federal Bureau of Ocean and Energy Management's (BOEM) efforts to enhance coastal resiliency through identification and characterization of potential sand and gravel resources on the outer continental shelf that may be used for beach replenishment.

Products were generated by the hydrographic branch for chart update and archival.

All soundings were reduced to Mean Lower Low Water using Discrete Zoning. The horizontal datum for this project is North American Datum of 1983 (NAD 83). The projection used for this project is Universal Transverse Mercator (UTM) Zone 19.

Survey data were collected in World Geodetic System 1984 (WGS84) with a UTM 19N projection. The project projection was changed at the branch to North American Datum 1983 (NAD83) with a UTM 19N projection. All products were created using NAD83.

A DAPR does not exist for this survey.

All data were reviewed for DTONs and none were identified in this survey.

Maine Coastal Mapping Initiative acquired the data outlined in this report.

This survey was acquired using QPS QINSy and post-processed in Qimera by the data provider. At AHB, Generic Sensor Format (gsf) files of the processed data were exported from Qimera and a Caris HIPS project was created. From this project, single resolution CUBE surfaces were generated. A sounding set and contours were visually compared with the charted contours from the largest scale Electronic Navigational Charts; where most differences were less than two meters.

The report below was submitted by the field unit detailing their acquisition and processing steps.

This survey does meet charting specifications and is adequate to supersede prior data.

Prepared in cooperation with the Maine Submerged Lands Program and National Oceanic and Atmospheric Administration

2017 Descriptive Report of Seafloor Mapping: Lower Kennebec River – Bath to Fort Popham

Chief of Party - Kerby Dobbs, Project Hydrographer, Contractor to the Maine Coastal Program

Maine Coastal Mapping Initiative, October 2017

Disclaimer

These data and information published herein are accurate to the best of our knowledge. Data synthesis, summaries and related conclusions may be subject to change as additional data are collected and evaluated. While the Maine Coastal Program makes every effort to provide useful and accurate information, investigations are site-specific and (where relevant) results and/or conclusions do not necessarily apply to other regions. The Maine Coastal program does not endorse conclusions based on subsequent use of the data by individuals not under their employment. The Maine Coastal Program disclaims any liability, incurred as a consequence, directly or indirectly, resulting from the use and application of any of the data and reports produced by staff. Any use of trade names is for descriptive purposes only and does not imply endorsement by The State of Maine.

For an overview of the Maine Coastal Mapping Initiative (MCMI) information products, including maps, data, imagery, and reports visit http://www.maine.gov/dacf/mcp/planning/mcmi/index.htm.

Acknowledgements

The Maine Coastal Mapping Initiative would like to acknowledge the efforts of Hodgdon Vessel Services and Maine Geological Survey staff for contributing to the success of the 2017 survey season. The individual contributions made by many were an integral part of sampling, analysis, and synthesis of data collected for this project. Funding for this study was provided by provided by the Maine Submerged Lands Program.

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Suggested citation:
Dobbs, K.M., 2017. 2017 Descriptive report of seafloor mapping: Kennebec River – Bath to Fort Popham, Maine. Maine Coastal Mapping Initiative, Maine Coastal Program, Augusta, ME. 68 p.

ABSTRACT

During May of 2017 the Maine Coastal Mapping Initiative (MCMI) conducted hydrographic surveying using a multibeam echosounder (MBES) in the estuarine portion of the lower Kennebec River from Bath to Fort Popham in midcoast Maine. Follow-up surveys were conducted on June 2, 2017 in three select areas because they represent zones where sediment is highly mobile and the comparison between surveys on two separate occasions is a valuable tool for estimating sediment transport dynamics in the Kennebec River estuary; especially where the deposition of sediment may impede safe navigation. The surveying was conducted at the request of the Maine Submerged Lands Program to help accomplish a variety of objectives, including but not limited to: identification and delineation of submerged cables in charted cable areas, locate and delineate submerged debris, evaluate sediment transport and potential sand and gravel resources for beach nourishment, provide up to date navigational data for NOAA's Office of the Coast Survey, establish baseline habitat coverage, and to possibly open previously restricted areas to commercial fishing, aquaculture, and overnight recreational boating.

1.0 Area Surveyed

The survey area was located mainly within the federal navigation channel of the Kennebec River between Bath and Fort Popham in midcoast Maine (Figure 1); a portion of the survey extended seaward from the Kennebec rivermouth at Fort Popham to Seguin Ledges (north of Seguin Island). The southern-most portion of the survey area adjoins the areas mapped by MCMI in 2016 (Figure 2). These surveys took place on 9 separate days between May 1-24, 2017. Follow-up surveys (Figure 1; discussed in next section) of the following select areas were conducted on June 2, 2017: immediate vicinity of recurring dredging area adjacent to Doubling Point, a 1.2 kilometer stretch of channel including an in-river sediment disposal area (shown on chart 13296) between Fiddler Reach and Bluff Head, and a 0.5 kilometer stretch spanning the channel between Phippsburg and Squirrel Point. These data were not collected in direct accordance with the *NOS Hydrographic Surveys Specifications and Deliverables* and the *Field Procedures Manual* requirements; however, both documents were referenced during acquisition for guidance.

Overall survey limits are listed in Table 1. Specific dates of data acquisition for the survey are listed in Appendix A.

Table 1 – 2017 Kennebec River survey limits

Northwest Limit	Southeast Limit
43° 54.278” N	43° 43.422” N
69° 48.752” W	69° 44.969” W

1.1 Survey Purpose

The surveying was conducted at the request of the Maine Submerged Lands Program to help accomplish a variety of objectives, including but not limited to: identification and delineation of submerged cables in charted cable areas, locate and delineate submerged debris, evaluate sediment transport and potential sand and gravel resources for beach nourishment, aid in dredging activities, provide up to date navigational data for NOAA’s Office of the Coast Survey, establish baseline habitat coverage, and to possibly open previously restricted areas to commercial fishing, aquaculture, and overnight recreational boating. Follow-up surveys were conducted in three select areas because they represent zones where sediment is highly mobile and the comparison between surveys on two separate occasions is a valuable tool for estimating sediment transport dynamics in the Kennebec River estuary; especially where the deposition of sediment may impede safe navigation. Preliminary results and generalized interpretations of follow-up survey data are presented in Appendix B.

These data were acquired and processed to meet Office of Coast Survey bathymetry standards as best as possible, and were shared with the UNH-NOAA Join Hydrographic Center / Center for Coastal and Ocean Mapping for review.

1.2 Survey Quality

The entire survey should be adequate to supersede previous data.

1.3 Survey Coverage

Occasional mall holidays (gaps in MBES coverage) exist within the surveyed area, and normally occurred as sonic shadows in areas of locally high relief and/or highly irregular bathymetry. Analyses of bathymetric data show that the least depths were achieved over all features, and that holidays have not compromised data integrity.

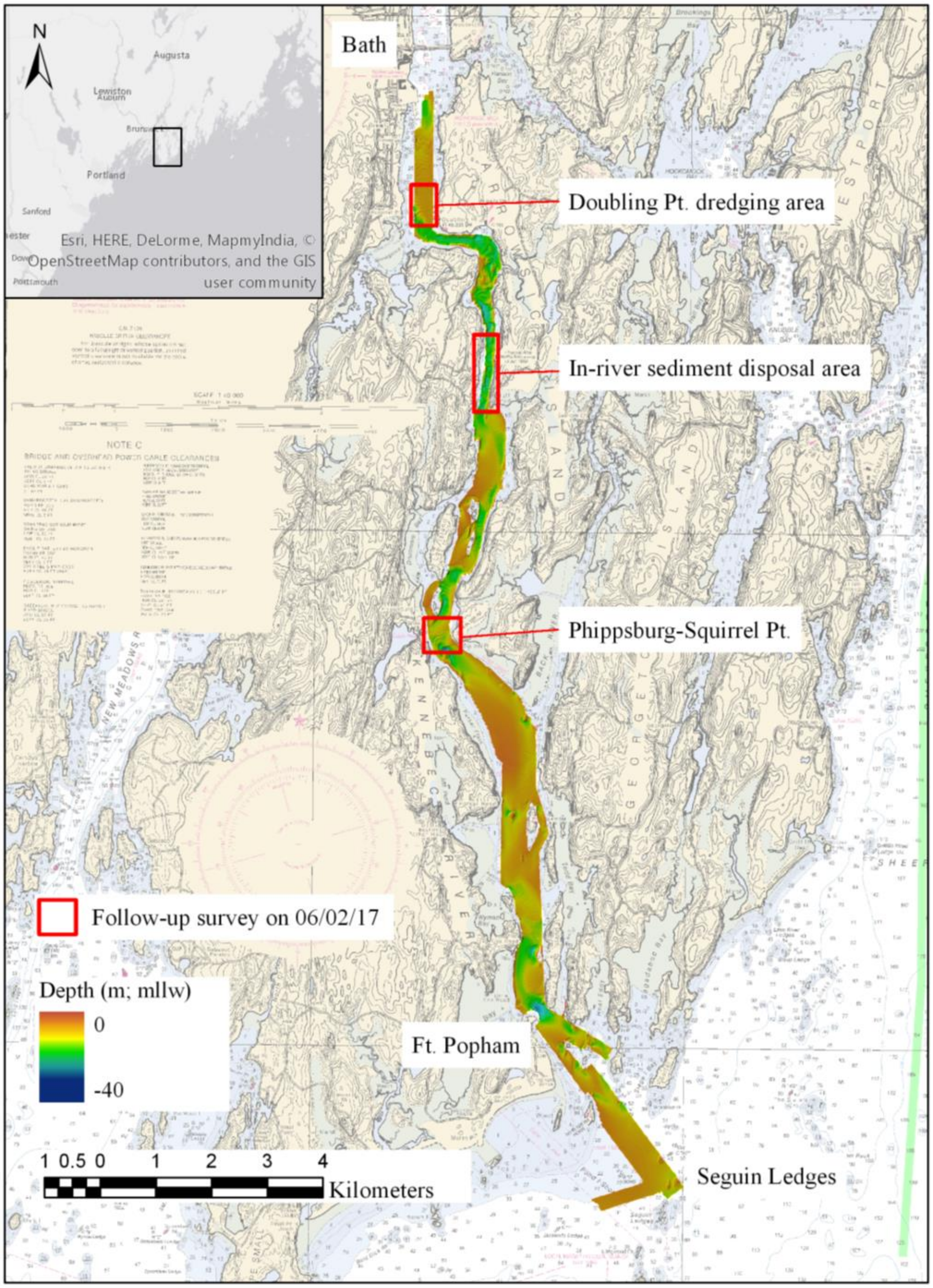


Figure 1 – General locality of 2017 Kennebec River survey coverage; plotted over RNC 13293

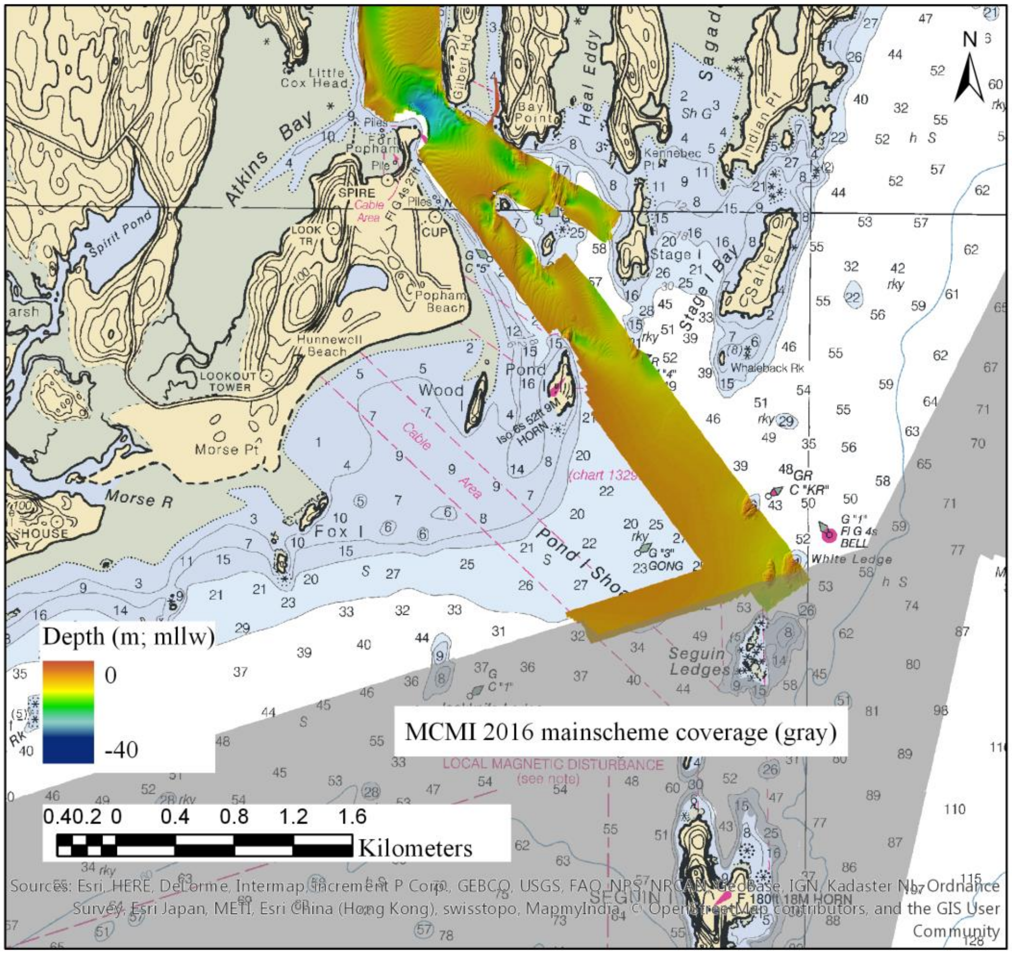


Figure 2 – 2017 Kennebec River survey relative to 2016 mainscheme survey (greyed area); plotted over RNC 13293

2.0 Data Acquisition

The following sub-sections contain a summary of the systems, software, and general operations used for acquisition and preliminary processing of survey data.

2.1 Survey Vessel

All data were collected aboard the Research Vessel (R/V) Amy Gale (length = 10.7 m, width = 3.81 m, draft = 0.93 m) (Figure 3), a former lobster boat converted to a survey vessel and contracted to the MCMI. The vessel was captained by Caleb Hodgdon of Hodgdon Vessel Services based out of Boothbay Harbor, Maine. The EM2040C transducer, motion reference unit (MRU), AML MicroX surface sound speed probe, and dual GNSS antennas were pole-mounted to the bow; pole raised (for transit) and lowered (for survey) via a pivot point at the edge of the bow. The main cabin of the vessel served as the data collection center and was outfitted with four display monitors for real time visualization of data during acquisition.

Figure 3 – R/V Amy Gale shown with pole-mounted dual GPS antennas, Kongsberg EM2040c multibeam sonar, MRU (not visible), and surface sound speed probe (not visible) in acquisition mode

2.2 Acquisition Systems

The real-time acquisition systems used aboard the R/V Amy Gale during the 2017 survey are outlined in Table 2. Data acquisition was performed using the Quality Positioning Services (QPS) QINSy (Quality Integrated Navigation System; v.8.16) acquisition software. The modules within QINSy integrated all systems and were used for real-time navigation, survey line planning, data time tagging, data logging, and visualization.

Table 2 – Major systems used aboard R/V Amy Gale

Sub-system	Components
Multibeam Sonar	Kongsberg EM2040C and processing unit
Position, Attitude, and Heading Sensor	Seapath 330 processing unit, HMI unit, dual GPS/GLONASS antennas, MRU 5 motion reference unit (subsea bottle)
Acquisition Software and Workstation	QINSy software v.8.16 and 64-bit Windows 7 PC console
Surface Sound Velocity (SV) Probe	AML Micro X with SV Xchange
Sound Velocity Profiler (SVP)	Teledyne Odom Digibar S sound speed profiler
Ground-truthing/Sediment Sampling Platform	Ponar grab sampler, GoPro Hero video camera, dive light, dive lasers, YSI Exo I sonde

2.3 Vessel Configuration Parameters

Prior to the 2017 survey season, the MCMI contracted Doucet Survey, Inc. to perform high-definition (precision ±5mm) 3D laser scanning of the Amy Gale and all external MBES system components (e.g. MRU, GPS antennas, and EM2040C) (Figure 4). The purpose of the laser scan survey was to refine and or verify the precision of hand-made vessel reference frame measurements. All points were referenced to the center point of the base of the MRU (mounted inside the pole and directly atop the EM2040C transducer) (Figure 5), which served as the origin (e.g. 0,0,0), where 'x' was positive forward, 'y' was positive starboard, and 'z' was positive down. The laser scan survey results only differed from hand-made measurements by ≤ 3mm for all nodes of interest. Reference measurements for each component were entered into the Seapath 330 Navigation Engine (Table 3) and converted so all outgoing datagrams would be relative to the location of the EM2040C transducer (e.g. EM2040C was used as the monitoring point for all outgoing datagrams being received by QINSy during acquisition). Additional configuration and interfacing of all systems were established during the creation of a template database in the QINSy console. See appendices for specific settings as entered in the Seapath 330 Navigation Engine (Appendix C) and for the template database (Appendix D) used during data acquisition while online in QINSy. Configuration settings of the EM2040c were assigned in the EM Controller module of QINSy (Appendix E).

Table 3 – 2017 equipment reference frame measurements for Seapath 330

	x (m)	**y (m)**	**z (m)**
MRU	0.000	0.000	0.00
Antenna 1 (port)	0.158	-1.245	-3.000
Antenna 2 (starboard)	0.158	1.252	-3.035
EM2040C	0.036	0.000	0.133

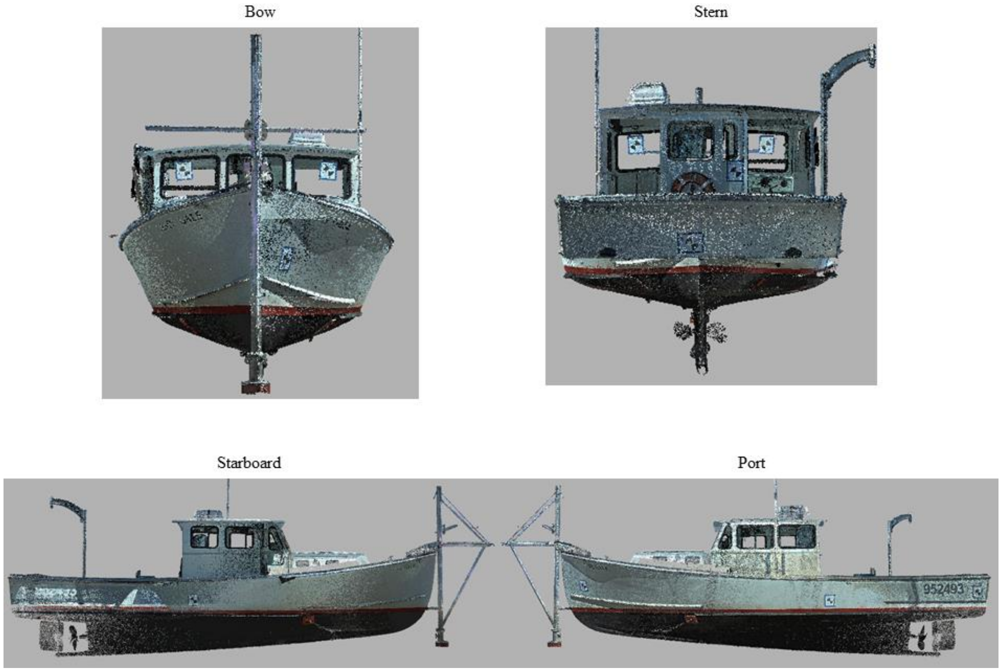


Figure 4 – Amy Gale RGB color images generated from 3D laser scan survey (GPS antennas and external cabling not included in survey) data (.pts file converted to .las for visualization)

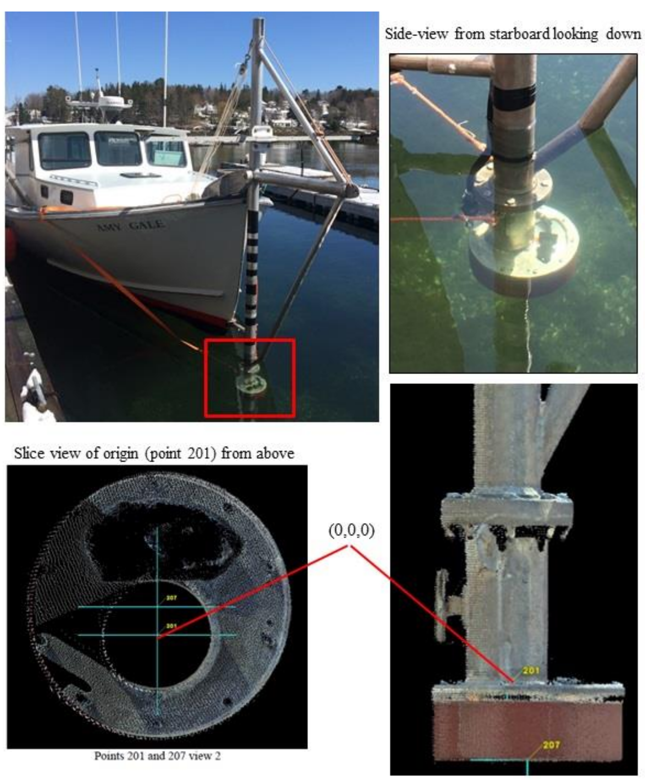


Figure 5 – Amy Gale origin (point 201 in RGB images) for vessel reference frame(s); origin is center point within the base of the pole (center point of base within internally-mounted motion reference unit (MRU) point 201 in images above)

2.4 Survey Operations

The following is a general summary of daily survey operations. Once the survey destination was reached, the sonar pole mount was lowered into survey position and its bracing rods were fastened securely to the hull of the ship via heavy-duty ratchet straps. Electric power to all systems was provided by a 2000 watt Honda *eu2000i* generator. Immediately following power-up, all interfacing instruments were given time to stabilize (e.g. approximately 30-45 minutes for Seapath to acquire time tag for GPS). Next, the desired QINSy project (e.g. Kennebec River) was selected for data acquisition. All files (e.g. raw sonar files, sound speed profiles, grid files, etc.) were recorded and stored within their respective project subfolders on a local drive. Prior to surveying, a sound speed cast was taken and imported into the 'imports' folder of the current project. After confirming a close match between the upcast and downcast data, the profile was applied to the sonar (EM2040C) in the QINSy Controller module. Data were gridded at 50 centimeters for real-time visualization. All data was acquired at approximately 5 - 6 knots, although some areas required slower speeds to ensure safe operation of the vessel around obstructions (e.g. fishing gear, docks, ledges, etc.). Raw sonar files were logged in the QINSy Controller module in .db format and saved directly onto the hydrographic workstation computer. All data were backed up daily on an external hard drive. At the end of each day's survey, sonar and navigation systems were powered down and the pole mount was raised and fastened for transit back to port. Upon arriving at the dock, all external instruments/hardware were visually inspected and rinsed with freshwater to prevent corrosion.

2.5 Survey Planning

Line planning and coverage requirements were designed to meet the specifications set forth in the NOAA Field Procedures Manual (2014). Parallel lines were mostly planned in real time and run approximately parallel to charted contours. Lines were spaced at regular intervals to obtain a minimum of 10% overlap between full swaths. Soundings from beam angles outside of ±60 degrees from the nadir were blocked from visualization during acquisition, thus increasing the true minimum full-swath overlap. This online blocking filter was recommended by Quality Positioning Services field engineers with the intent of eliminating noisy outer beams from the final product, thereby increasing the overall contribution of higher quality soundings.

2.6 Calibrations

One patch test was conducted aboard the R/V Amy Gale at the beginning of the 2017 survey season to correct for alignment offsets. During the test, a series of lines were run to determine the latency, pitch, roll, and heading offset. The patch test data were processed using the Qimera (v.1.3.3) patch test tool. After calibration was complete, offsets (Table 4) were entered in to the template database in QINSy. Overall, roll and pitch offsets calculated for this patch test were comparable to calibrations from previous seasons. Full built-in self-tests (BIST) were performed at semi-regular intervals throughout the season to determine if any significant deviations in background noise were present at the chosen survey frequency of 300KHz.

Table 4 – 2017 patch test calibration offsets for EM2040C

	4/11/2017
Latency (seconds)	0.00
Roll (degrees)	0.24
Pitch (degrees)	0.64
Heading (degrees)	-0.81

3.0 Quality Control

3.1 Crosslines
No crosslines were run for this survey.

3.2 Junctions
The junctions shown in Table 5 were made with this survey. The southern extent of this survey overlaps with areas of the mainscheme area mapped by the MCMI in 2016. A 2-meter (resolution) surface of the Kennebec River survey data was created to match the resolution of the 2016 surface, and the areas of overlap between these data were evaluated for sounding agreement by performing a surface difference test in Fledermaus (v.7.7.7, 64-bit), where the junctioning (2016) surface was subtracted from the new 2017 surface. A summary of surface difference test results is shown in Table 6. The extent of overlap between these surfaces and surface difference results are illustrated in Figure 6. Overall agreement between the two surfaces was excellent, with a mean difference of -0.01 meters. The resulting standard deviation of 0.24 meters was likely due to disagreement in areas with a steep, rocky seabed. The distribution of differences in the resulting surface also suggests some disagreement occurred over relatively flat areas possibly due to sediment mobilization and deposition, which is well documented in the area immediately seaward of the rivermouth. The surfaces used for these tests are submitted with the data in these surveys.

Table 5 – 2017 Kennebec River survey junctions

Survey ID	Scale	Year	Field Unit	Relative Location(s)
Mainscheme_2016	1:10,000	2016	Amy Gale	S

Table 6 – Summary of surface difference test results for overlapping (junction) surveys

Junction Surface ID	New Surface ID	Median (m)	Mean (m)	Std. Dev. (m)
MCMI_mainscheme_2016_2m_mllw	KennebecRiverMay2017_2m_mllw	0.01	-0.01	0.24

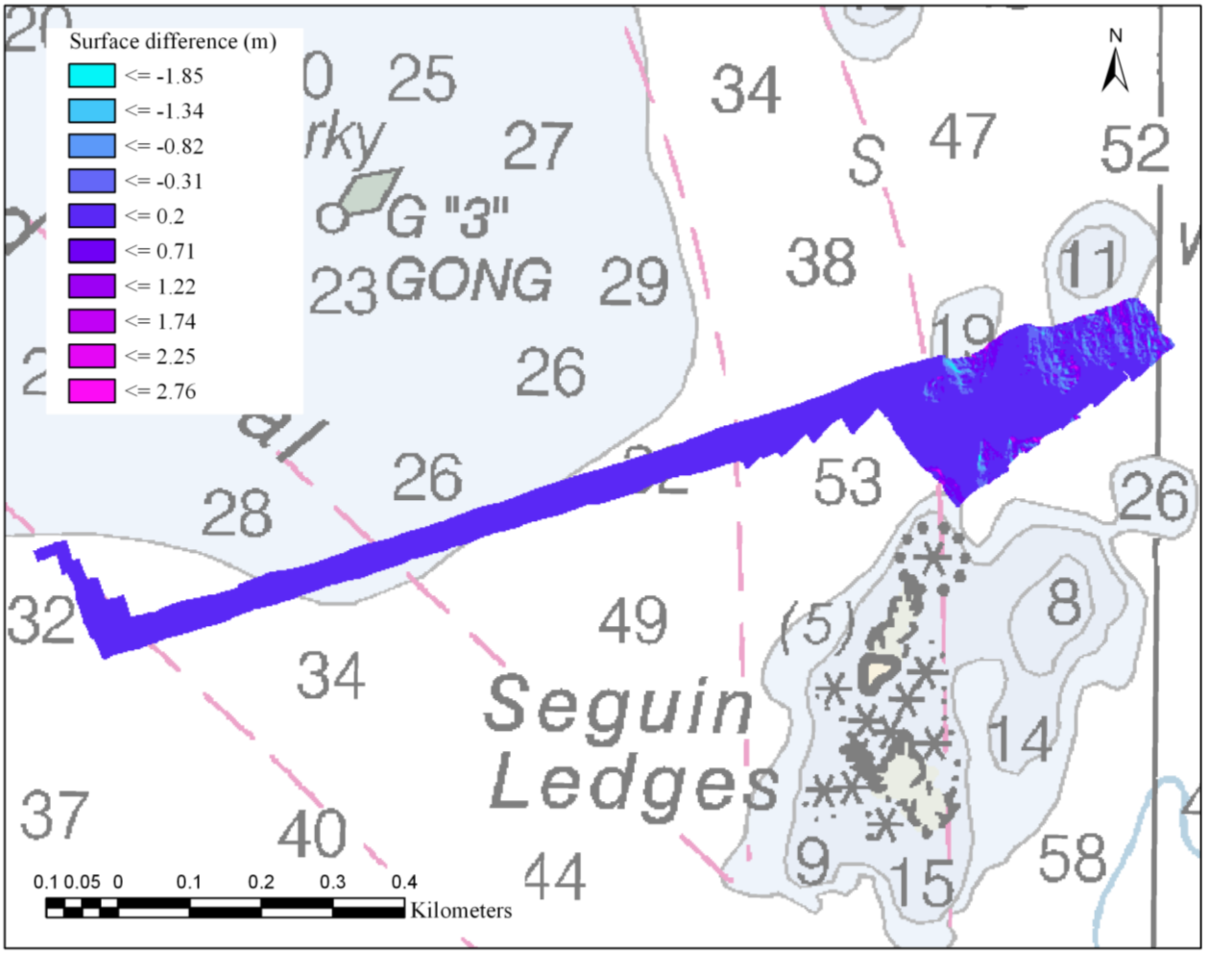


Figure 6 – Surface difference results (2-meter) between junctioning areas between southern extent of 2017 Kennebec River and 2016 mainscheme survey

3.3 Equipment Effectiveness

<u>Sonar</u>

Sonar data were acquired with a Kongsberg EM2040C set to a survey frequency of 300 kHz, high-density beam forming, with 400 beams per ping. Although the EM2040C allowed full swath widths at this frequency, lines from previous year's survey run at comparable depths contained considerable noise in outer beams (> ±60 degrees from the nadir; as identified by QPS engineers). As a result (and as per QPS recommendation), soundings greater than ±60 degrees from the nadir were not included in final bathymetric surfaces.

3.4 Sound Speed Methods

Sound speed cast frequency: A total of 26 sound speed casts were taken within the boundaries of the 2017 survey. All sound speed cast measurements were collected using the Teledyne Odom Digibar S profiler. Sound speed casts were taken as needed throughout the survey, which was generally when the observed surface sound speed (monitored and visualized in real-time using the AML MicroX SV sensor) differed from the surface sound speed in the active profile by more than 2 meters per second. In certain instances, supplemental casts were taken when there was reason to suspect significant changes in the water column (e.g. change in tide, abrupt changes in seafloor relief, etc.). During the collection of sound speed casts, logging was stopped to download and apply the new cast and was resumed when the boat circled around and came back on the survey line. Throughout the duration of the survey, the surface sound speed was observed in real-time (by the AML Micro X SV probe). Although sound speed data were recorded in raw sonar files, the raw sound velocity profiles (.csv) were also submitted with the survey data.

A quality comparison between the AML Micro X SV sensor and the Teledyne Odom Digibar S profiler was not performed. However, real-time comparisons between surface sound speed observed by the AML Micro X SV and the surface sound speed entry in the Digibar S profile suggested these instruments were in agreement.

4.0 Data Post-processing

The following is a summary of the procedures used for post-processing and analysis of survey data using Qimera (v.1.5.4, 64-bit edition) and Fledermaus (v.7.7.7, 64-bit edition) software.

4.1 Horizontal Datum

The horizontal datum for these data is WGS 84 projected in UTM zone 19N (meters).

4.2 Vertical Datum and Water Level Corrections

The vertical datum for these data is mean lower-low water (MLLW) level in meters. Water level corrections referenced to MLLW were applied to two zones (Figure 7). The first zone included all data collected seaward of the river mouth at Fort Popham. These data fell within zone NA149 of a discrete tidal zoning file (.zdf) provided by NOAA CO-OPS, which was used to apply verified tide data with time and range corrections referenced to Portland station 8418150. The second zone included all data collected upstream of Fort Popham. Since no time and/or range corrections for a known reference station currently exist for this zone, predicted tide data (6-minute intervals) spanning the range of survey dates (May 1, 2016 – May 24, 2016; and June 2, 2016) were applied for this zone with a linear co-tidal interpolation strategy using the following two stations: Bath, ME (8417227) and Fort Popham, Hunniwell Point, ME (8417177). Time corrections, tide height offsets, and tide scale (range) for each zone are listed in Table 8.

Table 8 – Tide zones, reference stations, and corrections

Zone ID	Time Correction (mins.)	Tide Offset (m)	Tide Scale	Reference Station(s)
NA149	-6	0	0.96	Portland (8418150)
Co-tidal	Linear co-tidal interpolation			Bath (8417227) and Fort Popham (8417177)

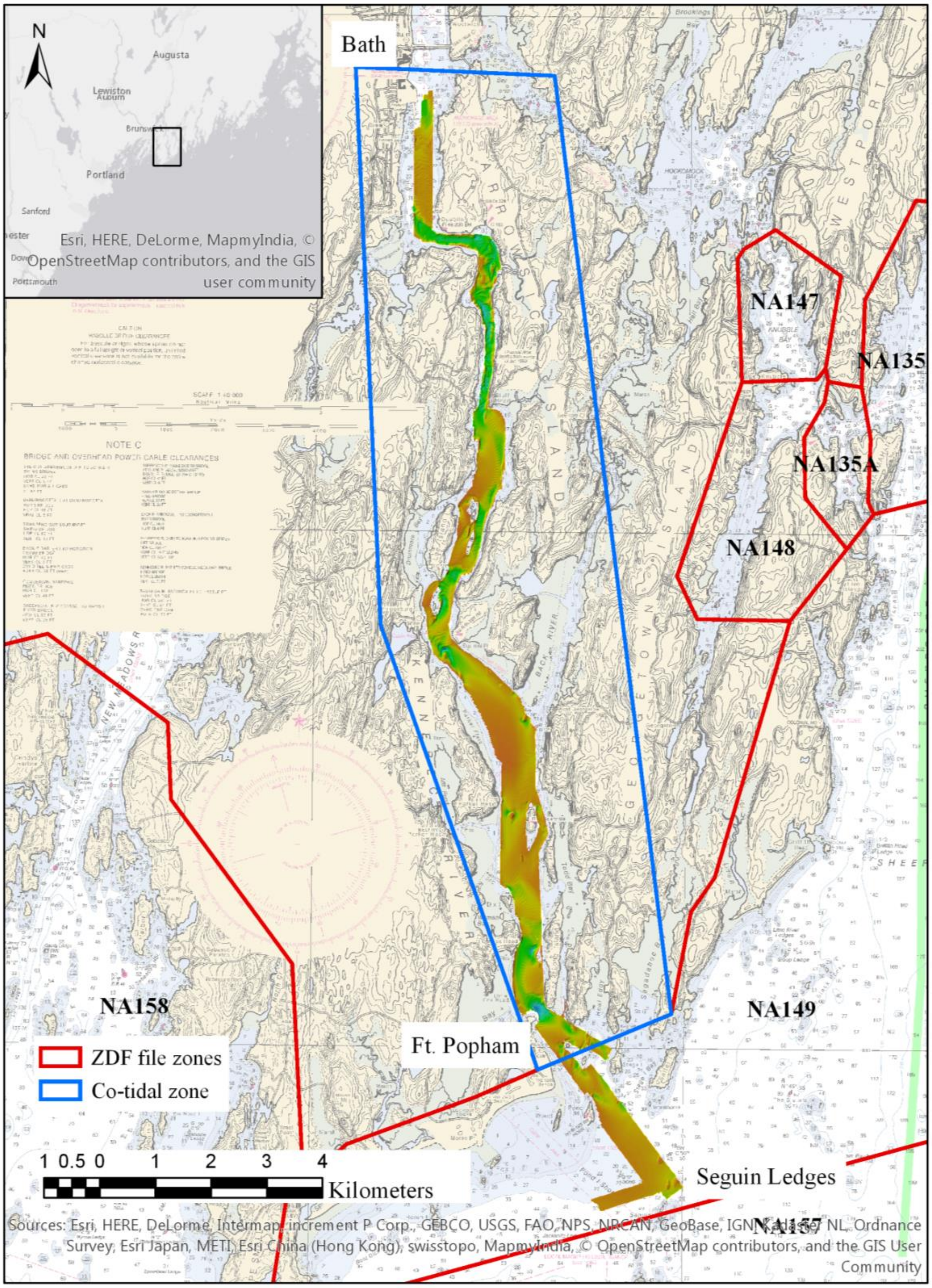


Figure 7 – Tide zones relative to survey extent; ZDF file zone NA149 and co-tidal zone (blue outline) were used to correct for tidal offsets and reference to vertical datum (mllw)

4.3 Processing Workflow

The general post-processing work flow in Qimera was as follows:

1. Create project
2. Add raw sonar files (e.g. metadata extracted and processed bathymetry data converted to. qpd, including vessel configuration and sound velocity)
3. Add tide data, tide zoning file (.zdf), and co-tidal tide strategy; integrate into raw files
4. Create dynamic surface
5. Review and edit soundings/clean surface with 3D editor tool
6. Export final surface to .BAG file
7. Export processed data in .GSF format for backscatter processing

4.4 Final Surfaces

The surfaces (.BAG file format) listed in Table 9 were submitted with the survey data.

Table 9 – Surfaces submitted with 2017 survey data

Surface Name	Resolution (m)	Depth Range (m)	Surface Parameter
KennebecRiver_co-tidal_May2017_2m_mllw	2	0 – 39	N/A
KennebecRiver_co-tidal_May2017_1m_mllw	1	0 – 39	N/A
KennebecRiver_co-tidal_May2017_50cm_mllw	0.5	0 – 39	N/A
DoublingPoint_060217_1m_mllw	1	7 – 27	N/A
DoublingPoint_060217_50cm_mllw	0.5	7 – 27	N/A
In-river_disposal_area_060217_1m_mllw	1	4 – 32	N/A
In-river_disposal_area_50cm_mllw	0.5	4 – 32	N/A
Phippsburg-SquirrelPt_060217_1m_mllw	1	11 – 39	N/A
Phippsburg-SquirrelPt_50cm_mllw	0.5	11 – 39	N/A

4.5 Backscatter

Backscatter was logged in the raw .db files. The .db files also hold the navigation record and bottom detections for all lines of surveys. Processed files containing multibeam backscatter data (snippets and beam-average) were exported from Qimera v.1.5.4. in .GSF format. QPS Fledermaus Geocoder Toolbox (FMGT; v.7.7.7, 64-bit edition) was used to import, process, and mosaic time-series backscatter data. An adaptive angle varied gain (AVG) filter with a window of 100 pings and otherwise default backscatter processing settings were used to create the mosaics. The GSF files containing the extracted were submitted with the data in this survey. Processed mosaics (Table 10) were saved in geoTIFF (grayscale and floating point geoTIFF) format and submitted.

Table 10 – Backscatter mosaics submitted with survey data

Mosaic Name	Pixel Size (m)
KennebecRiver_backscatter_May2017_2m	2
KennebecRiver_backscatter_May2017_1m	1
KennebecRiver_backscatter_May2017_50cm	0.5

5.0 Results and Recommendations

Overall, the co-tidal strategy appeared to work well with these data, with the resulting surfaces nearly seamless and free of tidal offset artifacts in areas of overlapping swaths. The most distinct tidal offset artifacts were observed on the eastern side of the channel between Bald Head and Fort Popham. The abundance of artifacts observed in these are were thought to occur for the following reasons: (1) many days elapsed between overlapping surveys in this portion of the river, (2) the sequence of survey lines was not consistent (e.g. successive lines were not run from east to west or vice versa), and (3) the tide strategy and/or predicted tide data were imperfect for this highly dynamic survey area.

It is recommended that any future surveys conducted in highly dynamic survey environments (such as the Kennebec River) are thoughtfully planned, thereby reducing tidal offset artifacts and uncertainty associated with the overlapping survey areas. The following survey planning recommendations may decrease the likelihood of tidal offset artifacts:

(1) individual days' surveys should extend from bank-to-bank within a pre-planned segment of the river (e.g. only plan segments that can be completed bank-to-bank in one day)
(2) ensure that areas of overlap between individual daily surveys are located either on the upstream or downstream end of the previously surveyed segment of river; this method will eliminate along-swath overlap in areas where considerable sediment transport/migration of bedforms may have occurred
(3) each successive daily survey should build on the previous days' survey in the same direction (e.g. upstream) for the duration of the entire project survey has been completed

Generalized interpretations of preliminary data collected in the follow-up survey areas are presented in Appendix B.

These new data were collected within the extent of the large scale navigational charts listed in Table 11.

Table 11 – Largest scale raster charts in survey area

Chart	Scale	Source Edition	Source Date	NTM Edition	NTM Date
13295	1:15,000	12	5/1/2013	27	2/28/2015
13296	1:15,000	26	1/1/2012	50	2/28/2015
13298	1:15,000	11	6/1/2013	24	2/28/2015

6.0 Summary

During May of 2017 the Maine Coastal Mapping Initiative (MCMI) conducted hydrographic surveying using a multibeam echosounder (MBES) in the estuarine portion of the lower Kennebec River from Bath to Fort Popham in midcoast Maine. Follow-up surveys were conducted on June 2, 2017 in three select areas because they represent zones where sediment is highly mobile and the comparison between surveys on two separate occasions is a valuable tool for estimating sediment transport dynamics in the Kennebec River estuary; especially where the deposition of sediment may impede safe navigation. The surveying was conducted at the request of the Maine Submerged Lands Program to help accomplish a variety of objectives, including but not limited to: identification and delineation of submerged cables in charted cable areas, locate and delineate submerged debris, evaluate sediment transport and potential sand and gravel resources for beach nourishment, provide up to date navigational data for NOAA's Office of the Coast Survey, establish baseline habitat coverage, and to possibly open previously restricted areas to commercial fishing, aquaculture, and overnight recreational boating.

Surface difference tests between these survey data and the junctioning area surveyed by the MCMI in 2016 reveal excellent agreement between data collected and processed by the MCMI. Overall, these data have a variety of applications and are an invaluable resource to public and private agencies who wish to more effectively manage and understand coastal and marine resources.

These data were acquired and processed to meet Office of Coast Survey bathymetry standards as best as possible, and were shared with the UNH-NOAA Join Hydrographic Center / Center for Coastal and Ocean Mapping for review.

Please contact the Maine Coastal Mapping Initiative for additional information or data requests.

References

NOAA, 2014. NOS hydrographic surveys specifications and deliverables: U.S Department of Commerce National Oceanic and Atmospheric Administration. Page 89.

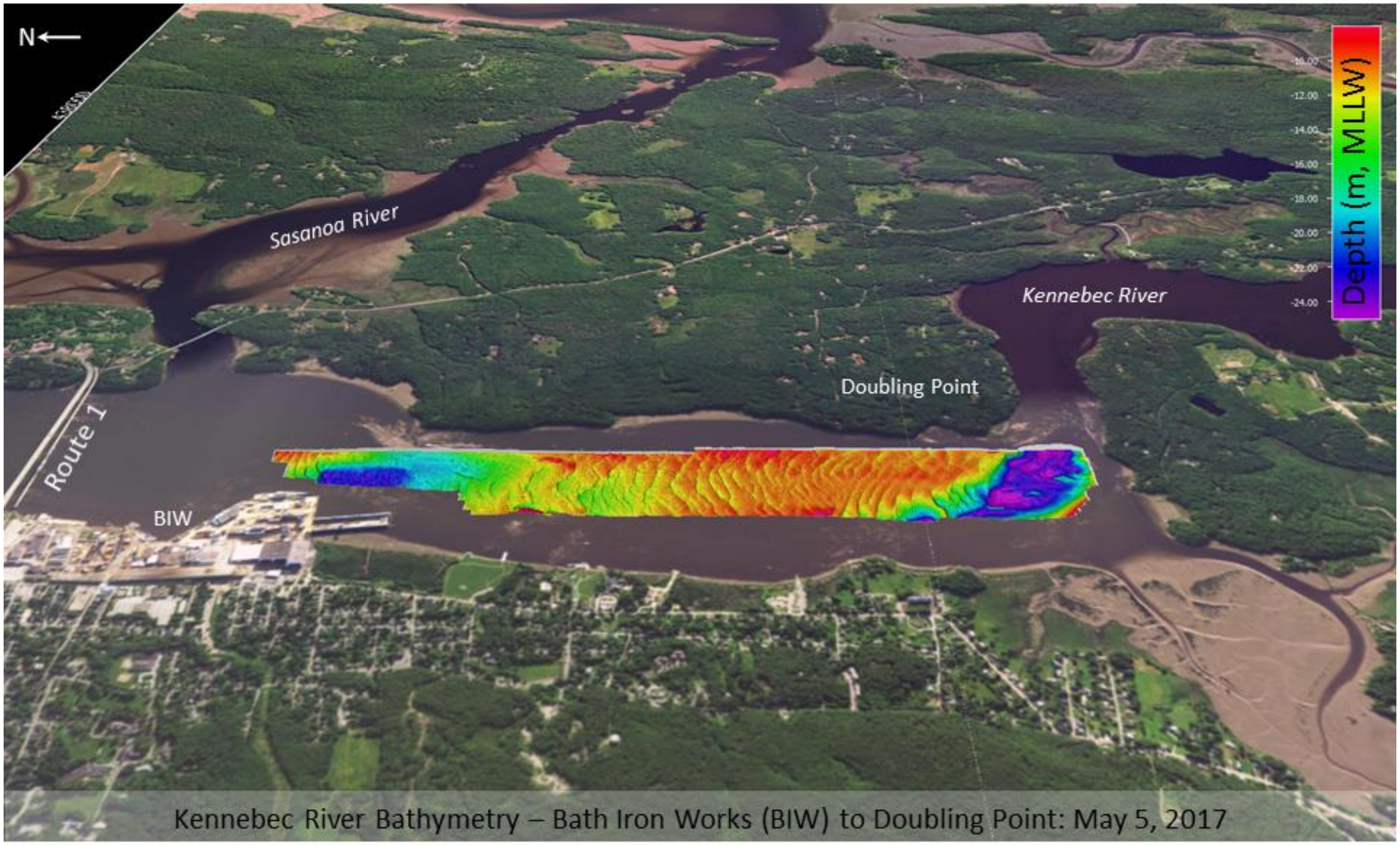
Appendix A – Specific dates of data acquisition

Survey Dates
5/1/17
5/5/17
5/8/17
5/9/17
5/10/17
5/19/17
5/22/17
5/23/17
5/24/17
6/2/17 (follow-up surveys)

Appendix B - Preliminary results and generalized interpretations of the follow-up survey data

Note: Preliminary analyses and results were generated from surfaces that used tide corrections that differed from those used for final surfaces (e.g. predicted tide data for Bath (8417227) for preliminary vs. co-tidal strategy for final surfaces). Thus, all results presented in this appendix represent relative changes in bathymetry between subsequent surveys; regardless, all interpretations and general concepts remain valid.

Preliminary results summary for MBES surveys in vicinity of Doubling Point dredging area and in-river placement area: Kennebec River



Kennebec River Bathymetry – Bath Iron Works (BIW) to Doubling Point: May 5, 2017

MCMI MBES surveys in vicinity of Doubling Point dredge area

- During May 2017, the MCMI completed MBES surveying within the navigable waters of the Kennebec River from Bath to Popham Beach, ME

- Select areas were chosen for re-surveying on 06-02-17 to evaluate sediment transport and deposition in vicinity of dredging and disposal areas; this preliminary results summary only presents data and surface difference test results for these areas

- Surfaces corrected using predicted tide data for Bath, ME (station 8417227)

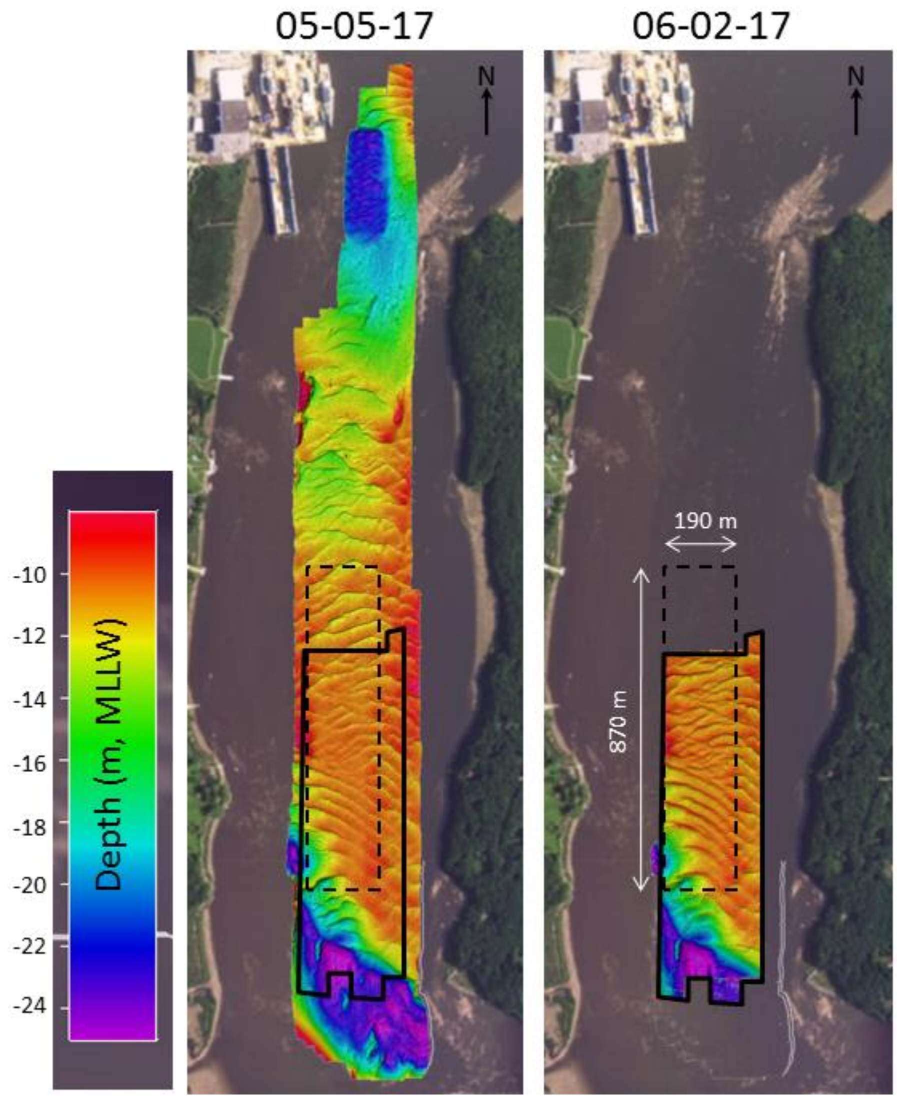
- Mean vertical uncertainty for all MBES surfaces = 0.08 m; rock outcrops used as vertical control points

- All surface difference tests use 05-05-17 data as bathymetric reference surface; reference surface data were subtracted from newer 06-02-17 surface

- Analyses not conducted with respect to recent dredge depth reported by USACE (-27 ft MLLW)

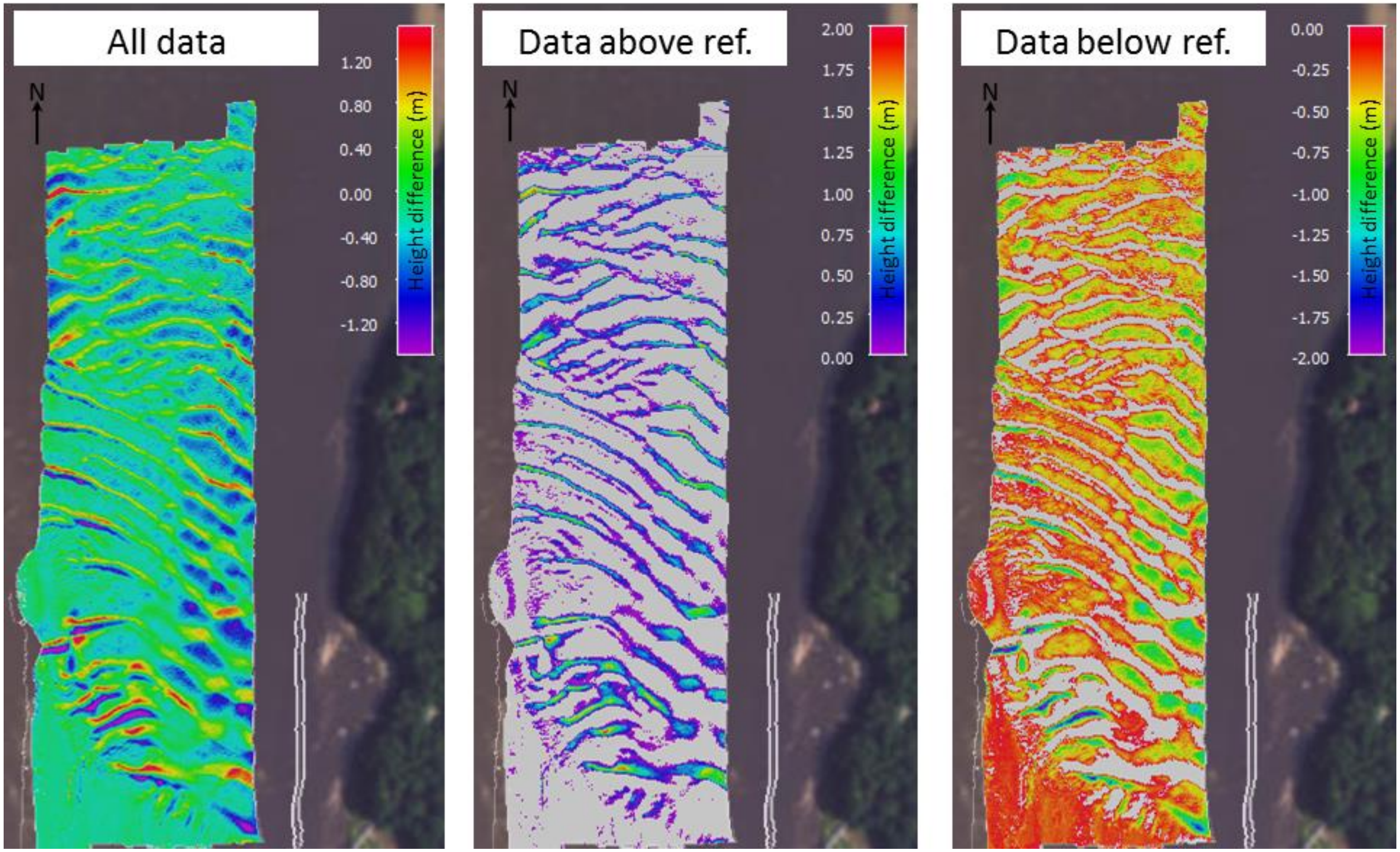
Approx. extent of April 2017 dredging (dashed outline)

Extent of 06-02-17 MBES re-survey (solid outline)



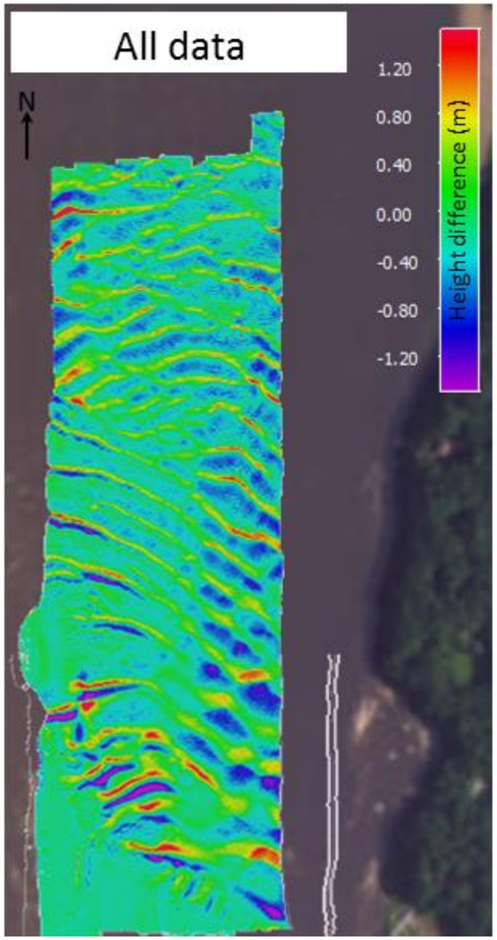
Doubling Point surface difference test results (060217_50cm_surface – 050517_50cm_surface)

+ values indicate areas that were shoaler on 06-02-17 (shallower than 05-05-17 reference surface)
- values indicates areas that were deeper on 06-02-17 (deeper than 05-05-17 reference surface)



Doubling Point surface difference test results: all height difference data

+ values indicate areas that were shoaler on 06-02-17 (shallower than 05-05-17 reference surface)
- Values indicates areas that were deeper on 06-02-17 (deeper than 05-05-17 reference surface)



Surface Characteristics Information
Name: QR0_DoublingPoint_dredgearea_060217_50cm_mllw_DoublingPoint_050517_50cm_mllw
Dimensions: 2080 rows x 672 columns
Cell Size: 0.500000 m
Bounds:
X Range (m): 434750 to 435086
Y Range (m): 4859044 to 4860083
Z Range (m): -4.05 to 4.10
Horizontal Coordinate System:
FP_WGS_84_UTM_zone_19N

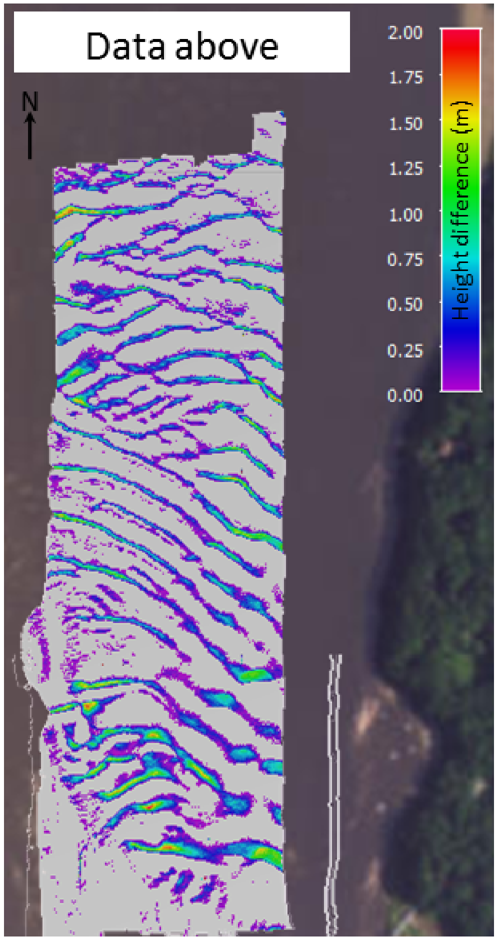
Surface Statistics Information
Name: QR0_DoublingPoint_dredgearea_060217_50cm_mllw_DoublingPoint_050517_50cm_mllw
Median: -0.16 m
Mean: -0.14 m
Std Dev: 0.43 m
Height Range: [-4.051, 4.099]
Total 2D Surface Area: 245412.00 m^2
Positive 2D Surface Area: 71336.50 m^2
Negative 2D Surface Area:174075.75 m^2
Total Volume: -33568.27 m^3
Positive Volume: 25649.62 m^3
Negative Volume: 59217.89 m^3

Summary:

- riverbed in area resurveyed on 06-02-17 had a mean depth 14 cm deeper than on 05-05-17
- areas with negative height difference (e.g. where deepening occurred) were predominantly in sand wave troughs
- areas with positive height difference (e.g. areas that became shallower) were predominantly along sand wave crests
- Where is fate of volume imbalance? Upstream?

Doubling Point surface difference test results: data above (e.g. shallower than) reference surface

+ values indicate areas that were shoaler on 06-02-17 (shallower than 05-05-17 reference surface)
- Values indicates areas that were deeper on 06-02-17 (deeper than 05-05-17 reference surface)



Surface Characteristics Information
Name: QR0_DoublingPoint_dredgearea_060217_50cm_mllw_DoublingPoint_050517_50cm_mllw
Dimensions: 2080 rows x 672 columns
Cell Size: 0.500000
Bounds:
X Range: 434750.5 to 435086.0
Y Range: 4859043.5 to 4860083.0
Z Range: 0.00 to 4.10
Horizontal Coordinate System:
FP_WGS_84_UTM_zone_19N

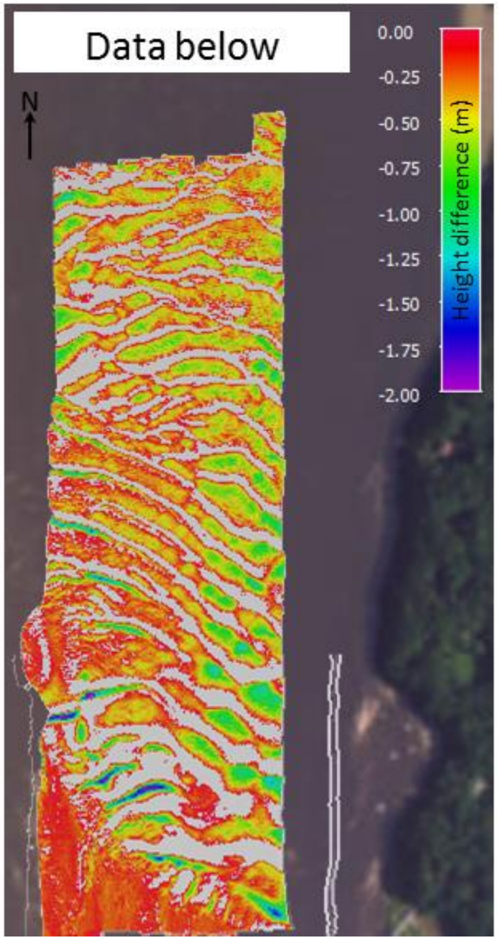
Surface Statistics Information
Name: QR0_DoublingPoint_dredgearea_060217_50cm_mllw_DoublingPoint_050517_50cm_mllw
Median: 0.26
Mean: 0.36
Std Dev: 0.33
Height Range: [0.000, 4.099]
Total 2D Surface Area: 71362.50 m^2
Positive 2D Surface Area: 71362.50 m^2
Negative 2D Surface Area:0.00 m^2
Total Volume: 25651.82 m^3
Positive Volume: 25651.82 m^3
Negative Volume: 0.00 m^3

Summary:

- resulting surface shows deposition is occurring along crests of sand waves
- bathy profiles (see profile slide) indicate transition from ebb-orientated morphology to near-symmetric

Doubling Point surface difference test results: data below (e.g. deeper than) reference surface

+ values indicate areas that were shoaler on 06-02-17 (shallower than 05-05-17 reference surface)
- Values indicates areas that were deeper on 06-02-17 (deeper than 05-05-17 reference surface)

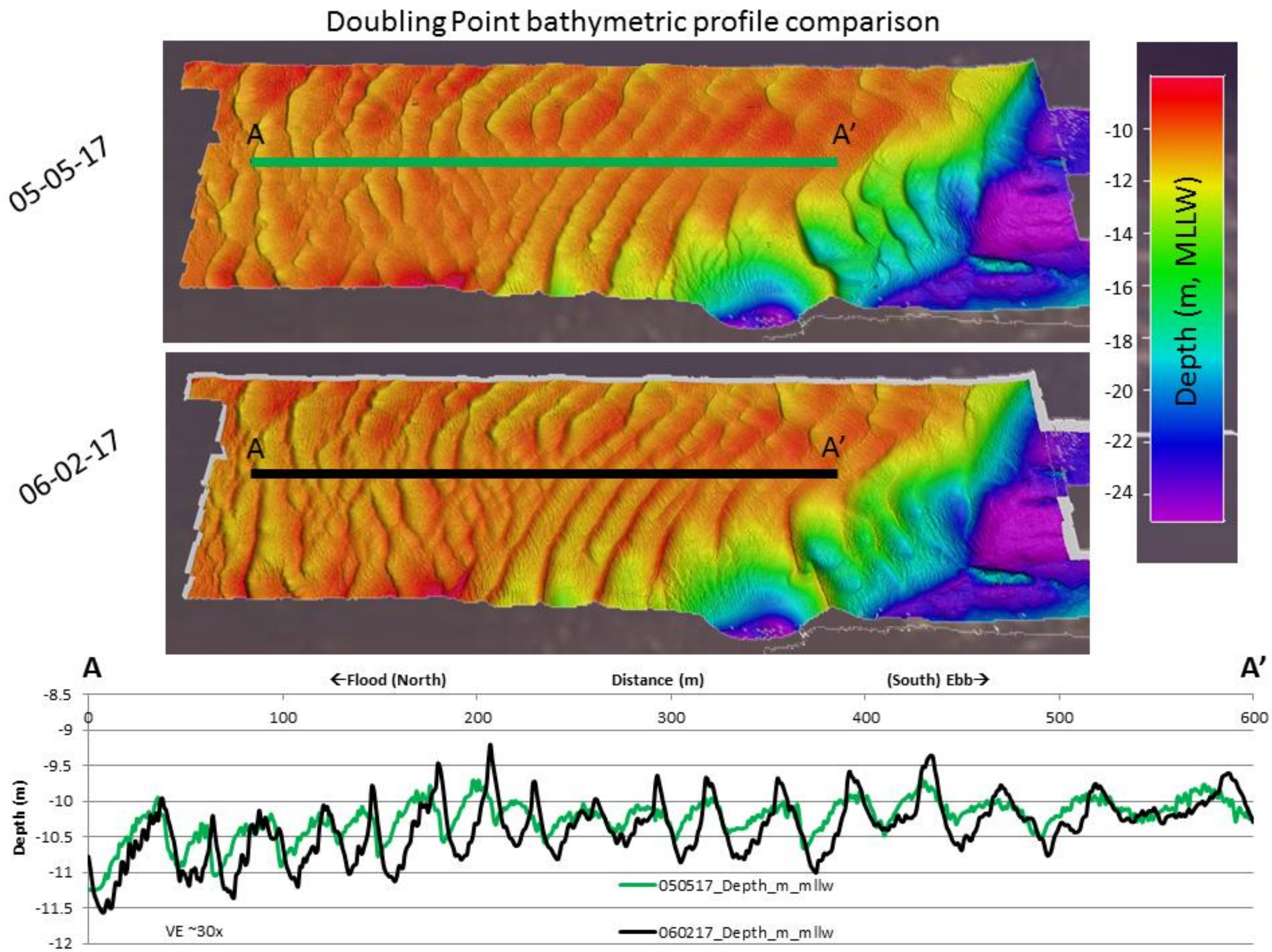


Surface Characteristics Information
Name: QR1_DoublingPoint_dredgearea_060217_50cm_mllw_DoublingPoint_050517_50cm_mllw
Dimensions: 2080 rows x 672 columns
Cell Size: 0.500000
Bounds:
X Range: 434750.5 to 435086.0
Y Range: 4859043.5 to 4860083.0
Z Range: -4.05 to 0.00
Horizontal Coordinate System:
FP_WGS_84_UTM_zone_19N

Surface Statistics Information
Name: QR1_DoublingPoint_dredgearea_060217_50cm_mllw_DoublingPoint_050517_50cm_mllw
Median: -0.28
Mean: -0.34
Std Dev: 0.26
Height Range: [-4.051, 0.000]
Total 2D Surface Area: 174050.00 m^2
Positive 2D Surface Area: 0.25 m^2
Negative 2D Surface Area:174049.75 m^2
Total Volume: -59212.41 m^3
Positive Volume: 0.00 m^3
Negative Volume: 59212.41 m^3

Summary:

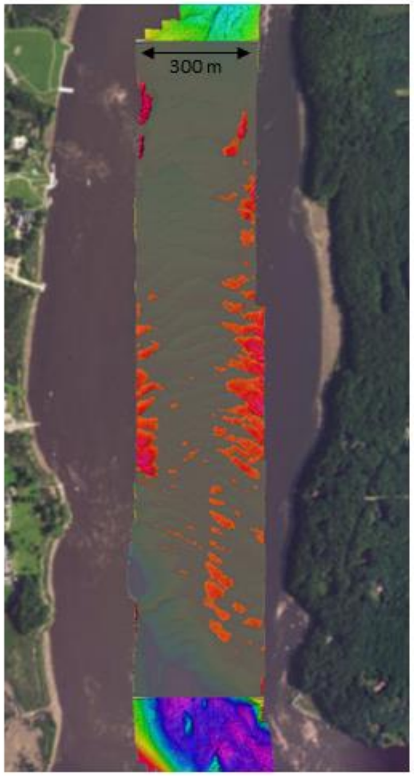
- resulting surface indicates deepening of troughs
- see bathy profile slides for changes in sand wave morphology



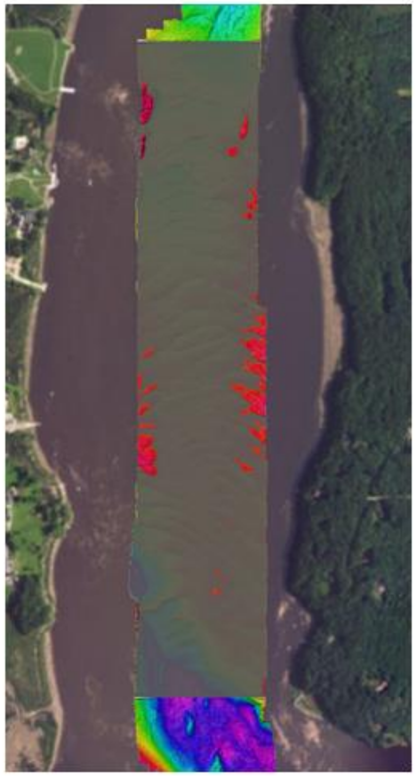
Doubling Point bathymetric profile comparison
05-05-17
06-02-17
A
A'
Depth (m, MLLW)
-10
-12
-14
-16
-18
-20
-22
-24
←Flood (North)
Distance (m)
(South) Ebb→
Depth (m)
050517_Depth_m_mllw
060217_Depth_m_mllw
VE ~30x

Doubling Point 050517 bathymetry relative to depth planes

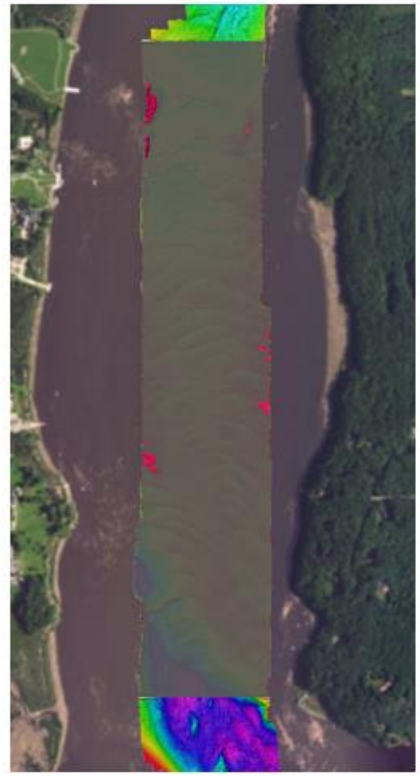
-32’ MLLW



-30’ MLLW

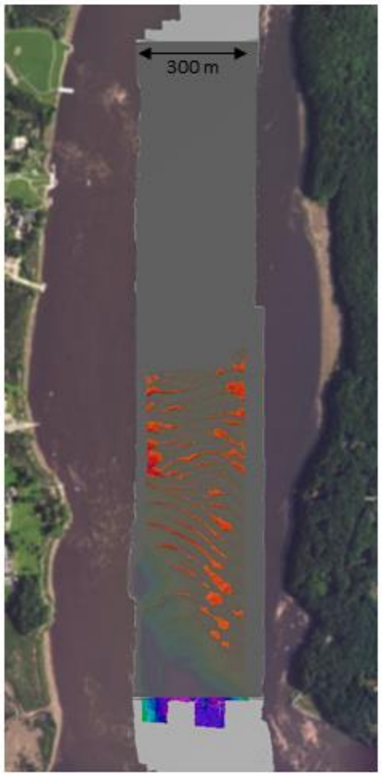


-27’ MLLW

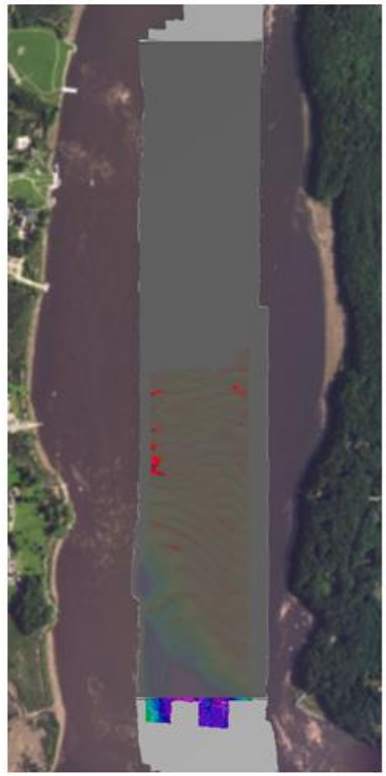


Doubling Point 060217 bathymetry relative to depth planes

-32' MLLW



-30' MLLW



-27' MLLW

MCMI MBES surveys in vicinity of in-river placement area

- During May 2017, the MCMI completed MBES surveying within the navigable waters of the Kennebec River from Bath to Popham Beach, ME

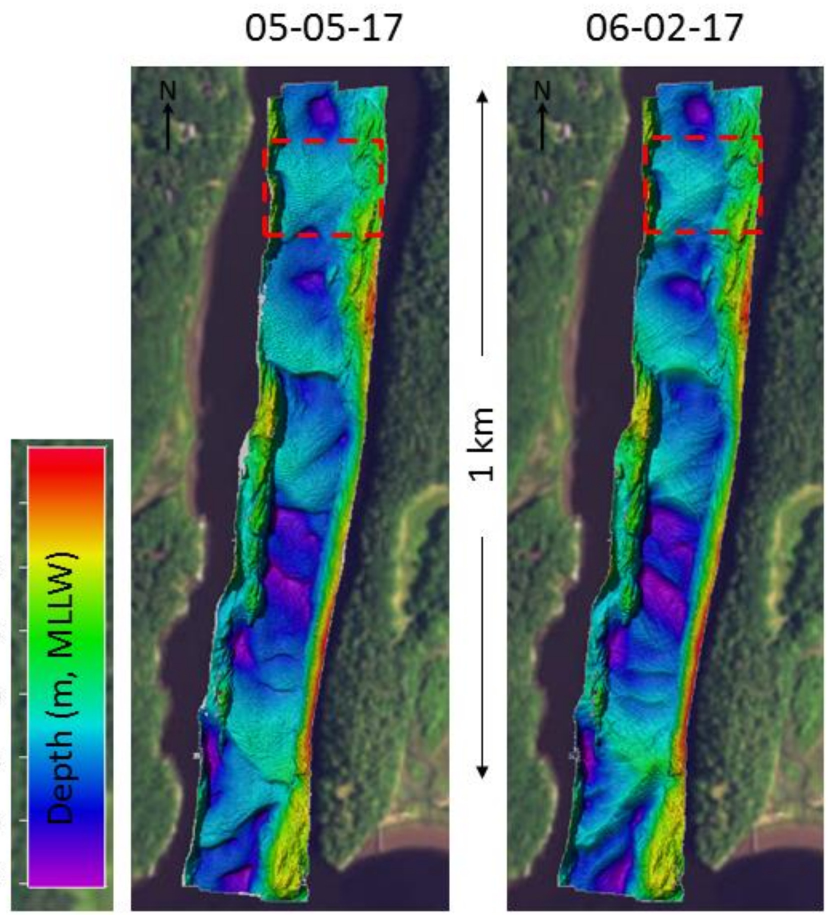
- Select areas were chosen for re-surveying on 06-02-17 to evaluate sediment transport and deposition in vicinity of dredging and disposal areas; this preliminary results summary only presents data and surface difference test results for these areas

- Surfaces corrected using predicted tide data for Bath, ME (station 8417227)

- Mean vertical uncertainty for all MBES surfaces = 0.24 m; rock outcrops used as vertical control points; greater uncertainty exists in these areas (relative to doubling point surfaces) due to several dynamic variables related to the survey environment, inquire with hydrographer for details

- All surface difference tests use 05-05-17 data as bathymetric reference surface; reference surface data were subtracted from newer 06-02-17 surface

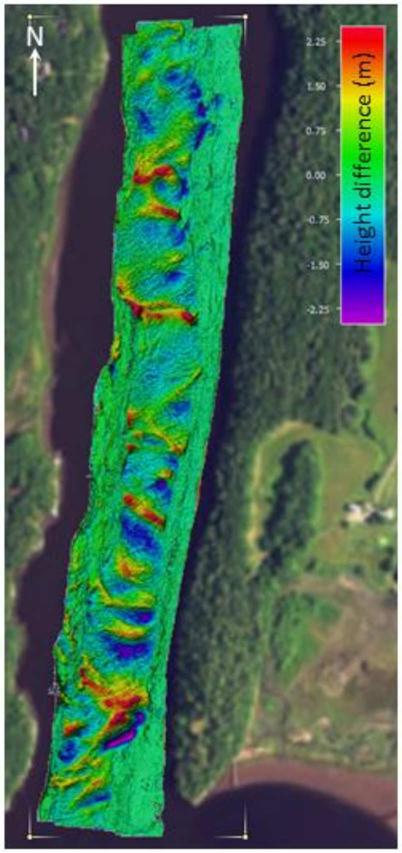
Approx. bounds of in-river placement area



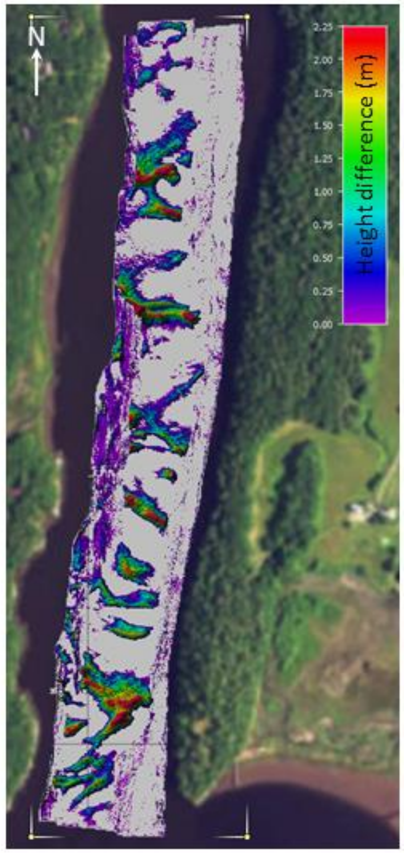
In-river placement area surface difference test results (060217_1m_surface – 050517_1m_surface)

+ values indicate areas that were shoaler on 06-02-17 (shallower than 05-05-17 reference surface)
- values indicates areas that were deeper on 06-02-17 (deeper than 05-05-17 reference surface)

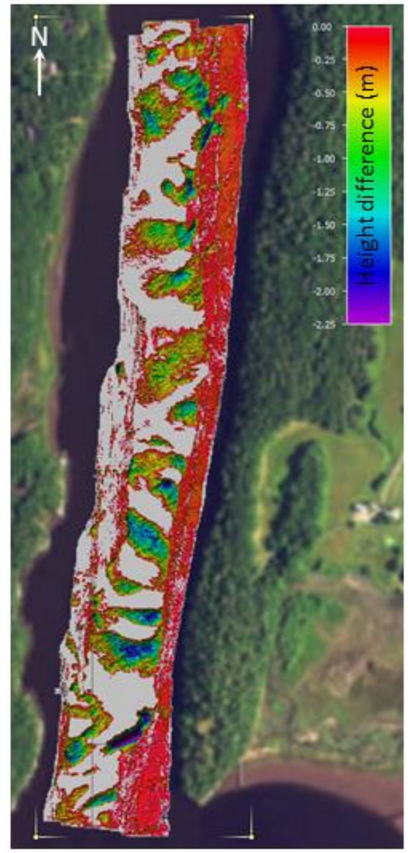
All data



Data above ref.



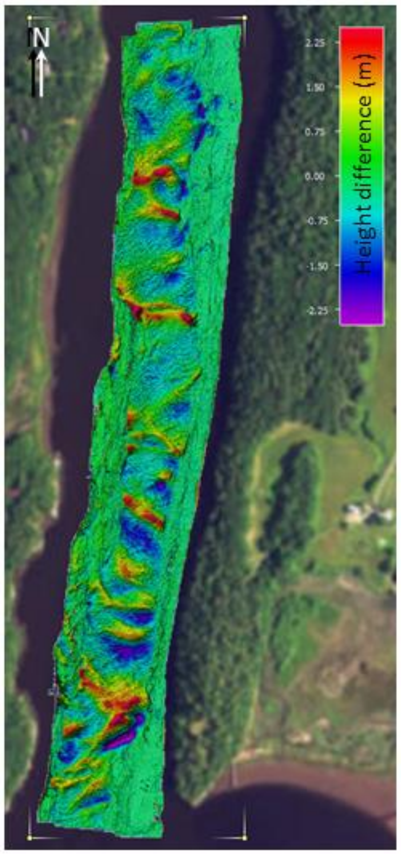
Data below ref.



In-river placement area surface difference test results (060217_1m_surface – 050517_1m_surface)

+ values indicate areas that were shoaler on 06-02-17 (shallower than 05-05-17 reference surface)
- values indicates areas that were deeper on 06-02-17 (deeper than 05-05-17 reference surface)

All data



Surface Characteristics Information
Name: QR0_In-riverDisposalArea_060217_1m_mllw_In-riverDisposalArea_5-5-17_1m_mllw_clipped
Dimensions: 1216 rows x 320 columns
Cell Size: 1.000000
Bounds:
X Range: 435916 to 436236
Y Range: 4855862 to 4857078
Z Range: -10.38 to 8.33
Horizontal Coordinate System:
FP_WGS_84_UTM_zone_19N

Surface Statistics Information
Name: QR0_In-riverDisposalArea_060217_1m_mllw_In-riverDisposalArea_5-5-17_1m_mllw_clipped
Median: -0.08
Mean: -0.04
Std Dev: 0.71
Height Range: [-10.378, 8.329]
Total 2D Surface Area: 200599.00
Positive (above 0.0) 2D Surface Area: 76455.00
Negative (below 0.0) 2D Surface Area:124144.00
Total Volume: -8170.63
Positive (above 0.0) Volume: 42909.11
Negative (below 0.0) Volume: 51079.73

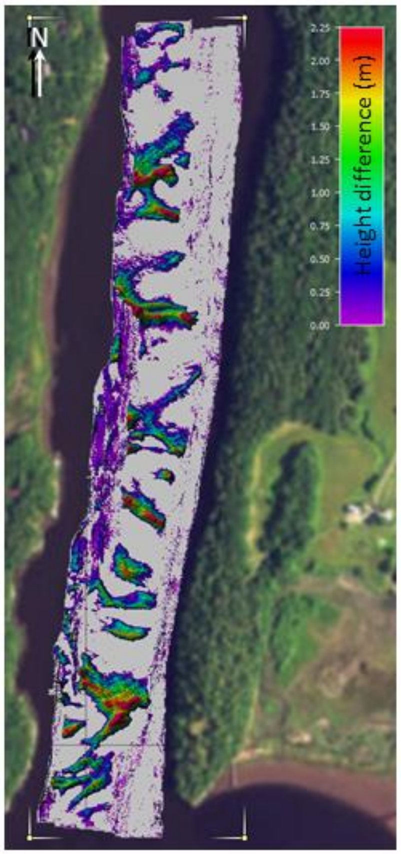
Summary:

- Some downstream (ebbing) migration of large packages of sediment with most deposition along crests of bedforms
- If we assume system is balanced without anthropogenic introduction (e.g. placement of dredged material) of dredged material, then newly disposed material may account for volume imbalance in immediate vicinity of survey (+ or – vertical uncertainty volume, which was not determined in this analysis)

In-river placement area surface difference test results (060217_1m_surface – 050517_1m_surface)

+ values indicate areas that were shoaler on 06-02-17 (shallower than 05-05-17 reference surface)
- values indicates areas that were deeper on 06-02-17 (deeper than 05-05-17 reference surface)

Data above ref.



Surface Characteristics Information
Name: QR1_In-riverDisposalArea_060217_1m_mllw_In-riverDisposalArea_5-5-17_1m_mllw_clipped
Dimensions: 1216 rows x 320 columns
Cell Size: 1.000000
Bounds:
X Range: 435916 to 436236
Y Range: 4855862 to 4857078
Z Range: 0.00 to 8.33
Horizontal Coordinate System:
FP_WGS_84_UTM_zone_19N

Surface Statistics Information
Name: QR1_In-riverDisposalArea_060217_1m_mllw_In-riverDisposalArea_5-5-17_1m_mllw_clipped
Median: 0.32
Mean: 0.56
Std Dev: 0.63
Height Range: [0.000, 8.328]
Total 2D Surface Area: 76458.00
Positive (above 0.0) 2D Surface Area: 76458.00
Negative (below 0.0) 2D Surface Area:0.00
Total Volume: 42915.12
Positive (above 0.0) Volume: 42915.12
Negative (below 0.0) Volume: 0.00

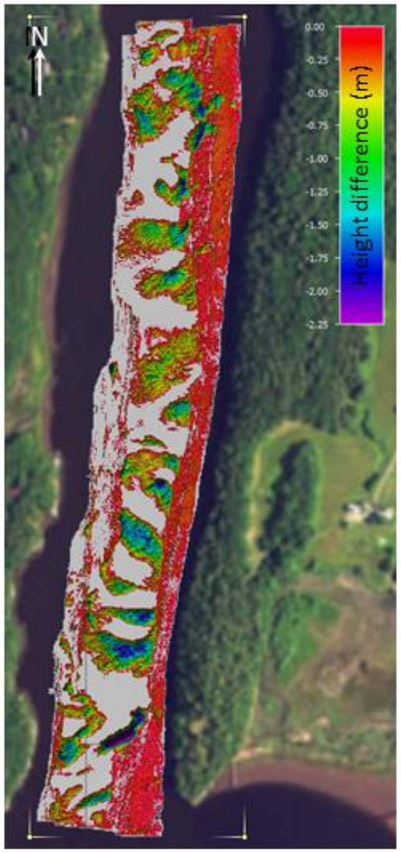
Summary:

- Surface difference data highlight locations of shoaler material in vicinity of bedform crests

In-river placement area surface difference test results (060217_1m_surface – 050517_1m_surface)

+ values indicate areas that were shoaler on 06-02-17 (shallower than 05-05-17 reference surface)
- values indicates areas that were deeper on 06-02-17 (deeper than 05-05-17 reference surface)

Data below ref.



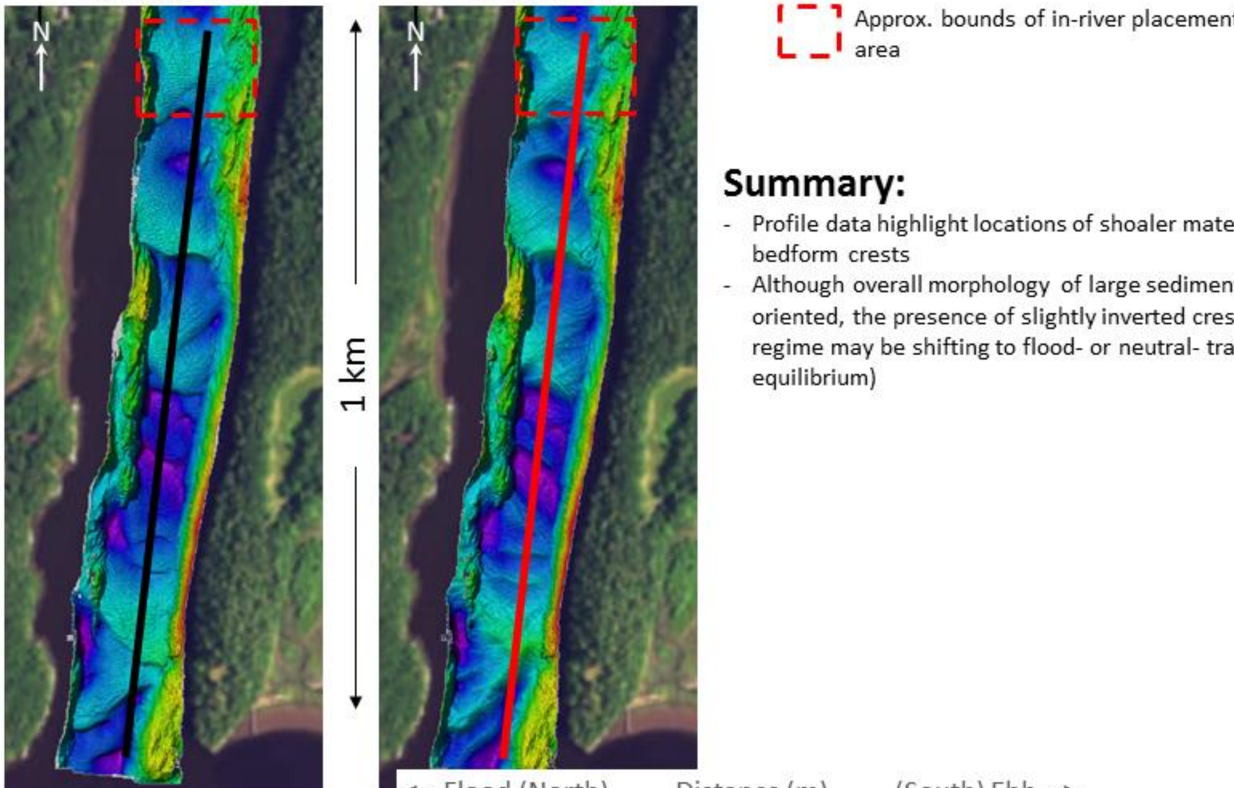
Surface Characteristics Information
Name: QR2_In-riverDisposalArea_060217_1m_mllw_In-riverDisposalArea_5-5-17_1m_mllw_clipped
Dimensions: 1216 rows x 320 columns
Cell Size: 1.000000
Bounds:
X Range: 435916 to 436236
Y Range: 4855862 to 4857078
Z Range: -10.38 to -0.00
Horizontal Coordinate System:
FP_WGS_84_UTM_zone_19N

Surface Statistics Information
Name: QR2_In-riverDisposalArea_060217_1m_mllw_In-riverDisposalArea_5-5-17_1m_mllw_clipped
Median: -0.21
Mean: -0.41
Std Dev: 0.46
Height Range: [-10.378, 0.000]
Total 2D Surface Area: 124141.00
Positive (above 0.0) 2D Surface Area: 0.00
Negative (below 0.0) 2D Surface Area:124141.00
Total Volume: -51071.89
Positive (above 0.0) Volume: 0.00
Negative (below 0.0) Volume: 51071.89

Summary:

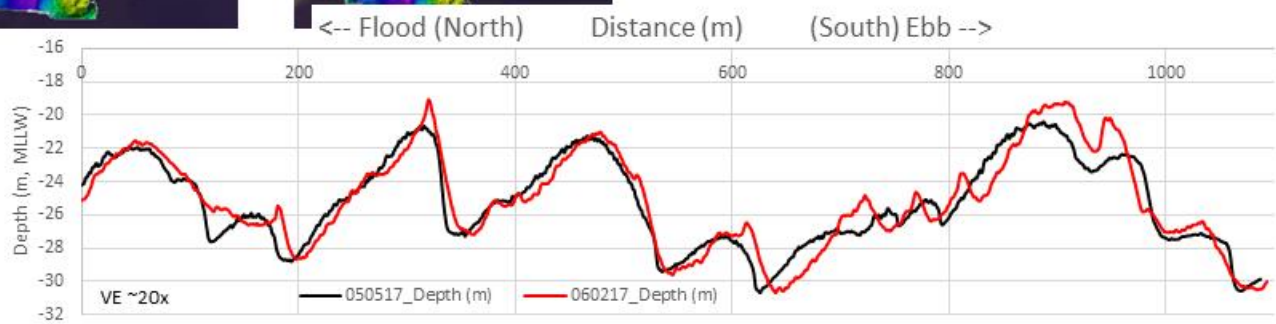
- Surface difference data highlight locations of deepening on upstream (north) side of ebb-oriented bedforms, indicating net ebb transport

05-05-17 06-02-17

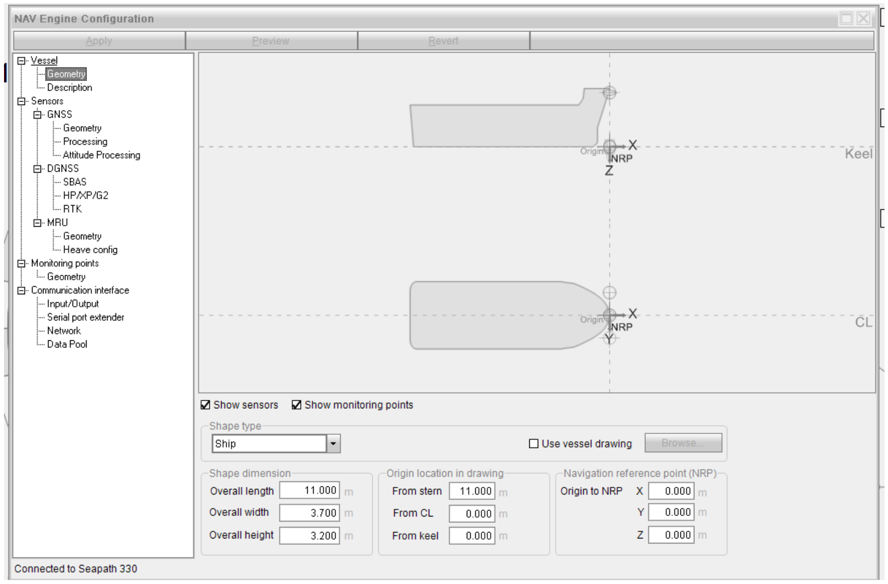


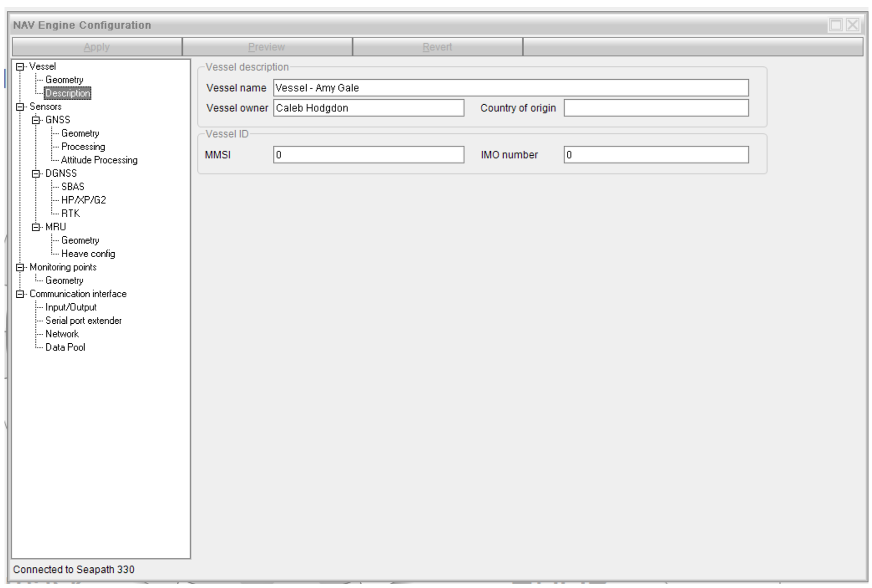
Summary:

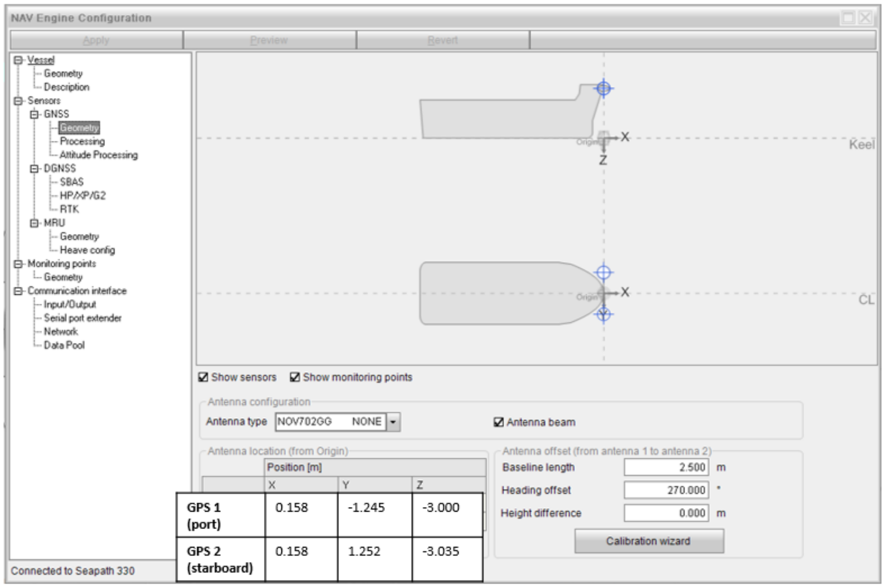
- Profile data highlight locations of shoaler material in vicinity of bedform crests
- Although overall morphology of large sediment package appear ebb-oriented, the presence of slightly inverted crests suggests transport regime may be shifting to flood- or neutral- transport (e.g. closer to equilibrium)



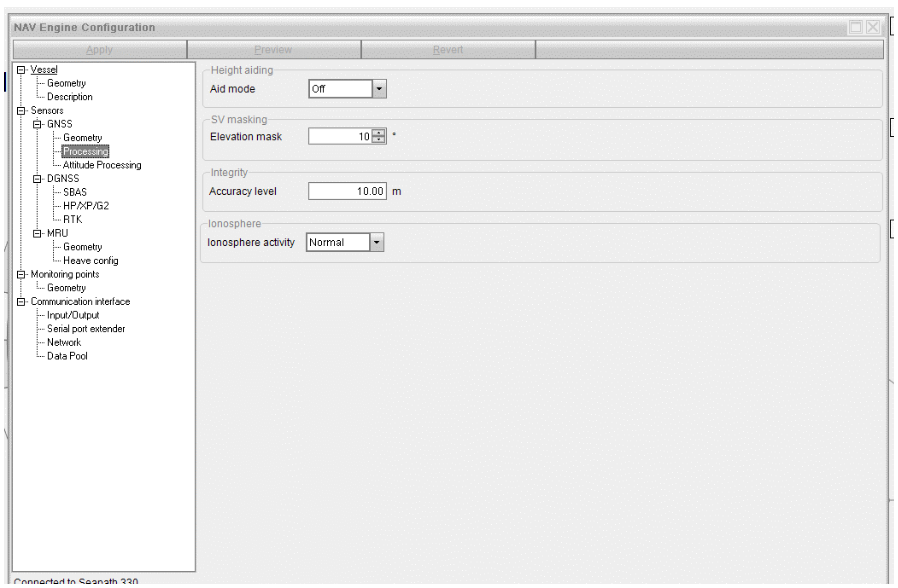
Appendix C – Configuration settings for Seapath 330

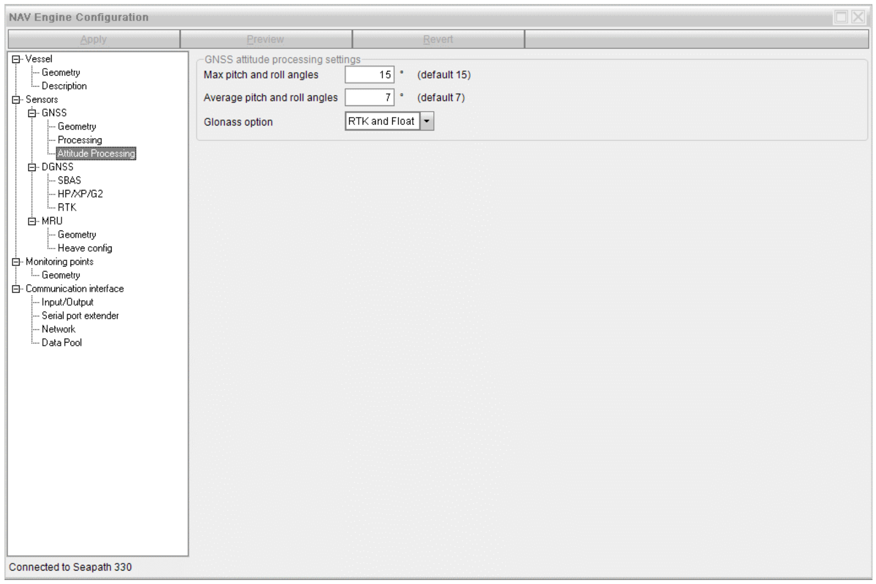


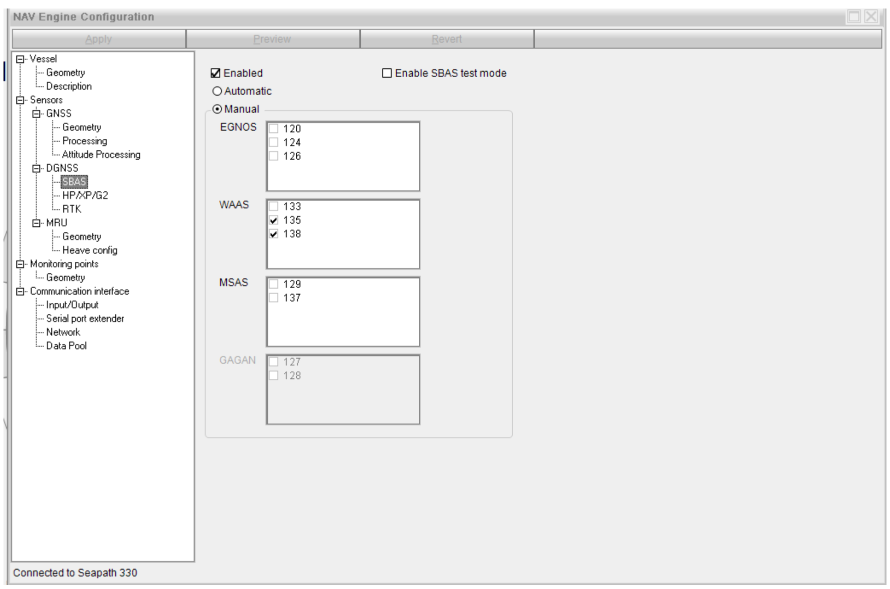


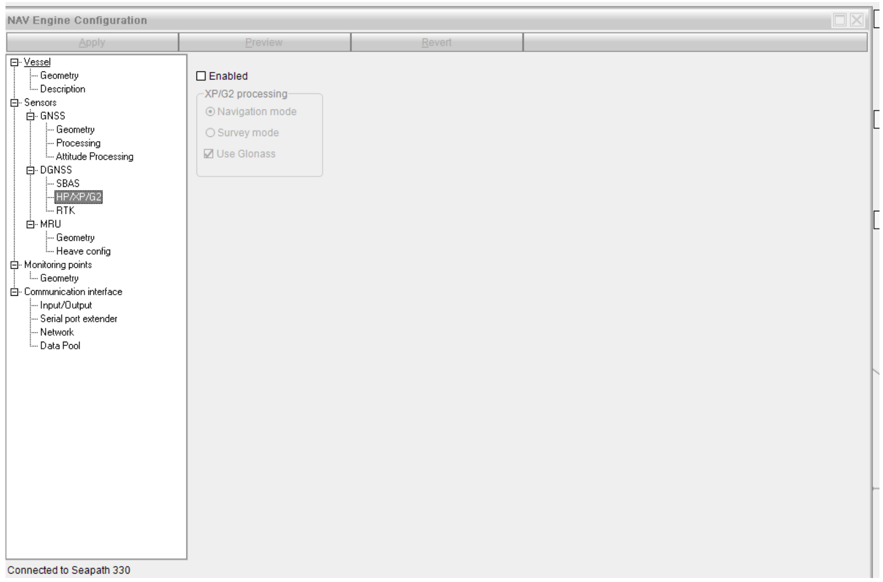


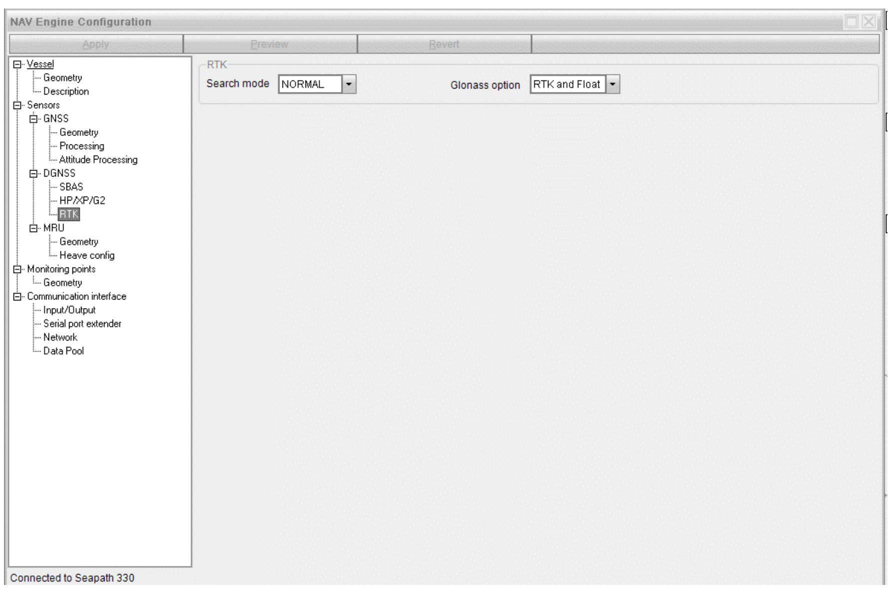
	X	Y	Z
GPS 1 (port)	0.158	-1.245	-3.000
GPS 2 (starboard)	0.158	1.252	-3.035

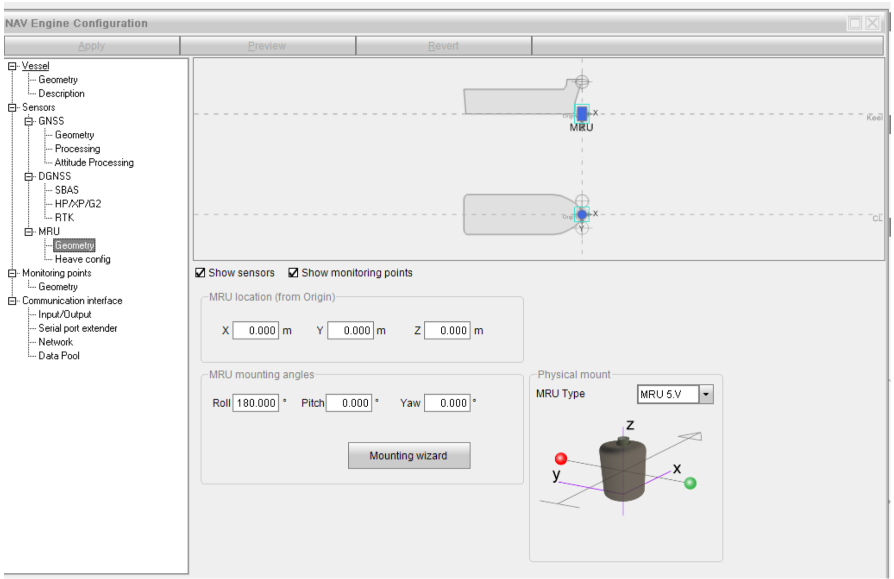


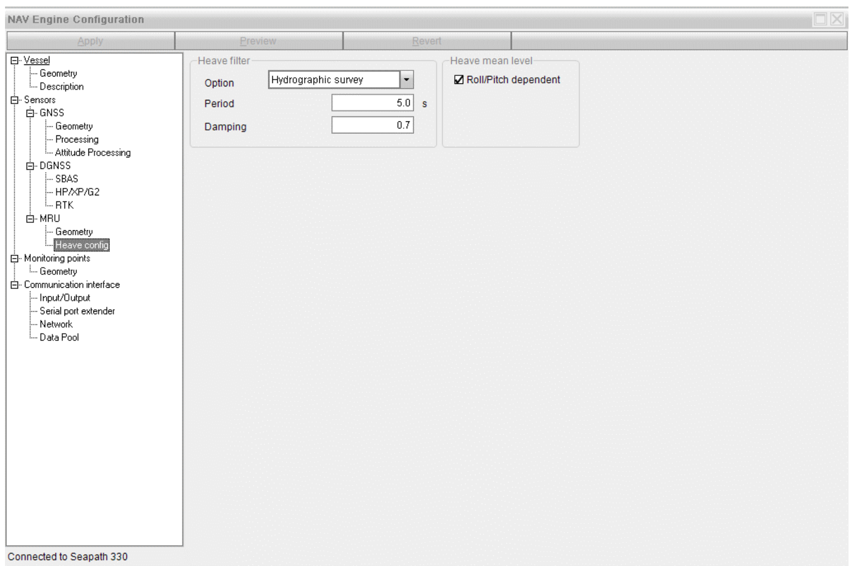

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
GNSS attitude processing settings
Max pitch and roll angles 15 ° (default 15)
Average pitch and roll angles 7 ° (default 7)
Glonass option RTK and Float
Connected to Seapath 330

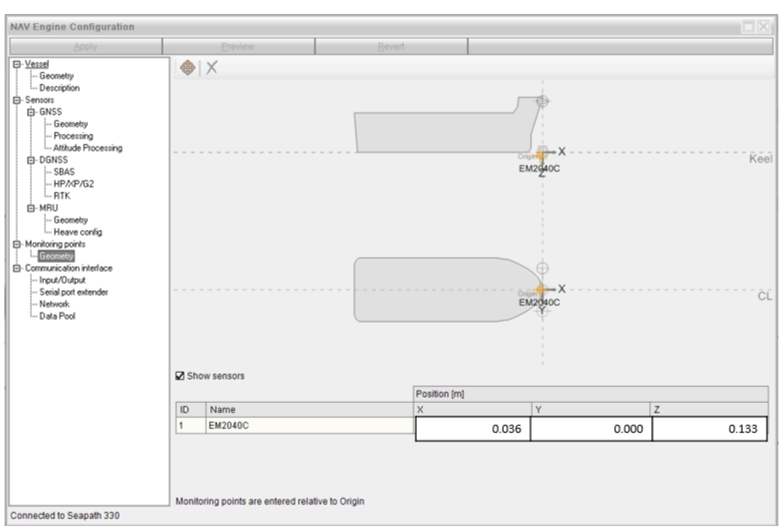

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Enabled
Enable SBAS test mode
Automatic
Manual
EGNOS 120 124 126
WAAS 133 135 138
MSAS 129 137
GAGAN 127 128
Connected to Seapath 330

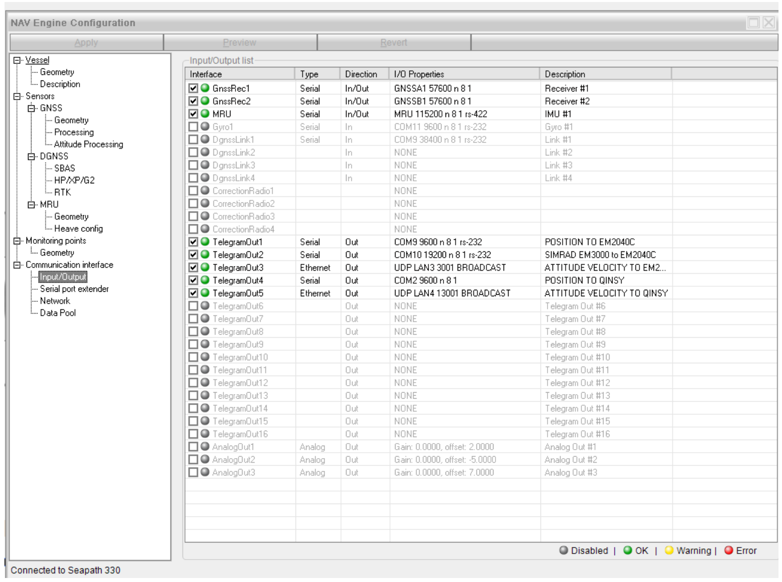

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Enabled
XP/G2 processing
Navigation mode
Survey mode
Use Glonass
Connected to Seapath 330

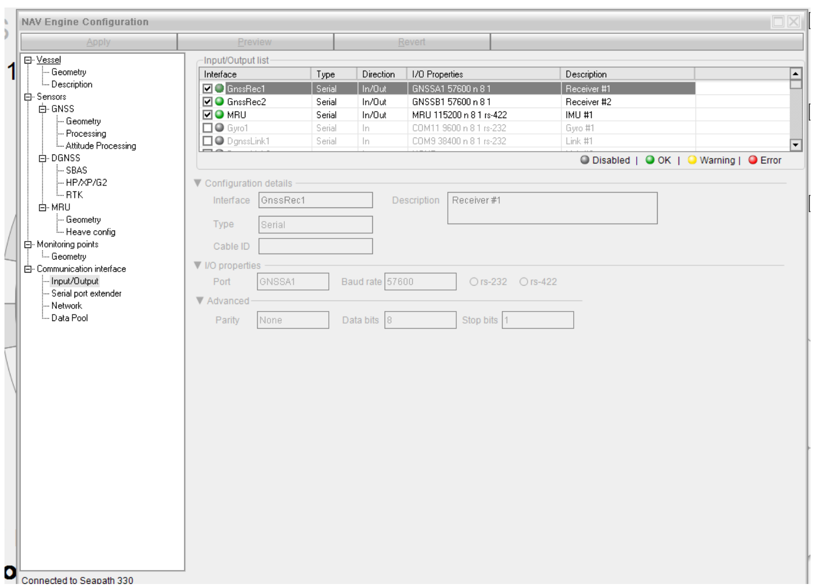

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
RTK
Search mode
NORMAL
Glonass option
RTK and Float
Connected to Seapath 330

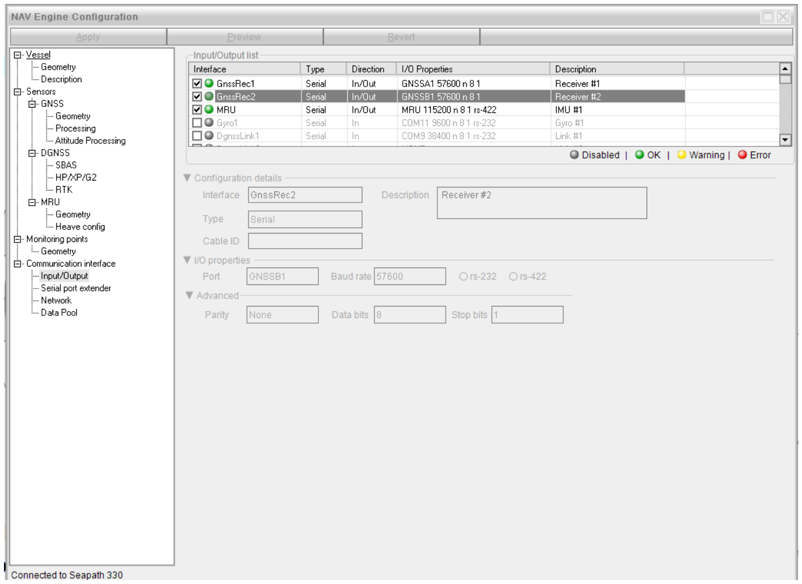

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
MRU
Show sensors
Show monitoring points
MRU location (from Origin)
X 0.000 m
Y 0.000 m
Z 0.000 m
MRU mounting angles
Roll 180.000 °
Pitch 0.000 °
Yaw 0.000 °
Mounting wizard
Physical mount
MRU Type MRU 5.V
z
y
x

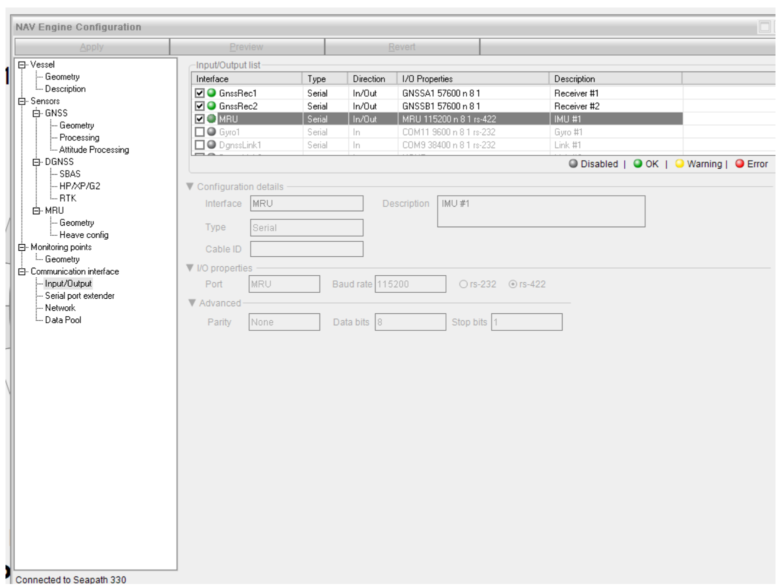

NAV Engine Configuration
Apply
Preview
Revert
Heave filter
Option Hydrographic survey
Period 5.0 s
Damping 0.7
Heave mean level
Roll/Pitch dependent
Connected to Seapath 330

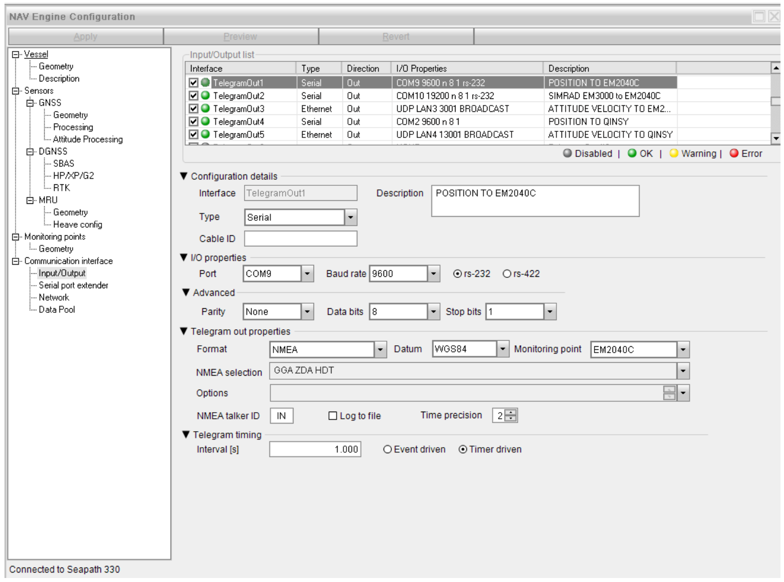

NAV Engine Configuration
Apply
Preview
Revert
EM2040C
Keel
CL
Show sensors
Position [m]
ID
Name
X
Y
Z
1
EM2040C
0.036
0.000
0.133
Monitoring points are entered relative to Origin
Connected to Seapath 330

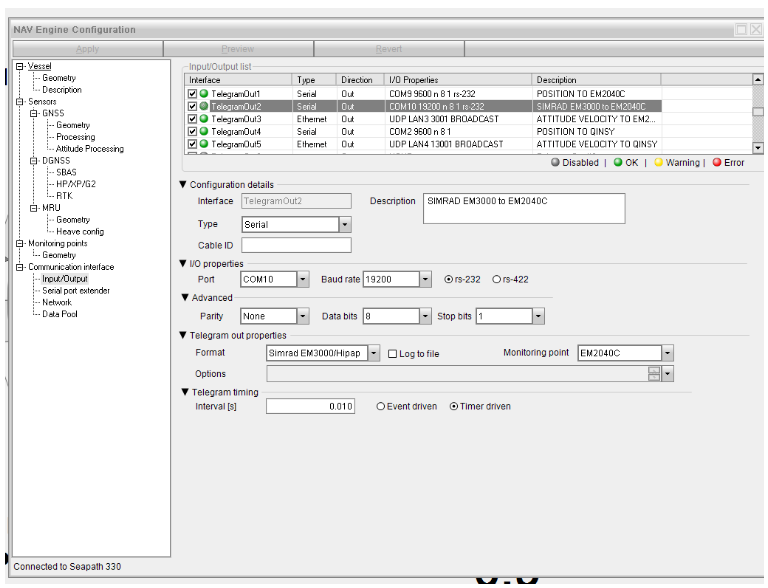

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Heave config
Monitoring points
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
Type
Direction
I/O Properties
Description
GnssRec1 Serial In/Out GNSSA1 57600 n 8 1 Receiver #1
GnssRec2 Serial In/Out GNSSB1 57600 n 8 1 Receiver #2
MRU Serial In/Out MRU 115200 n 8 1 rs-422 IMU #1
TelegramOut1 Serial Out COM9 9600 n 8 1 rs-232 POSITION TO EM2040C
TelegramOut2 Serial Out COM10 19200 n 8 1 rs-232 SIMRAD EM3000 to EM2040C
TelegramOut3 Ethernet Out UDP LAN3 3001 BROADCAST ATTITUDE VELOCITY TO EM2...
TelegramOut4 Serial Out COM2 9600 n 8 1 POSITION TO QINSY
TelegramOut5 Ethernet Out UDP LAN4 13001 BROADCAST ATTITUDE VELOCITY TO QINSY
Disabled | OK | Warning | Error
Connected to Seapath 330

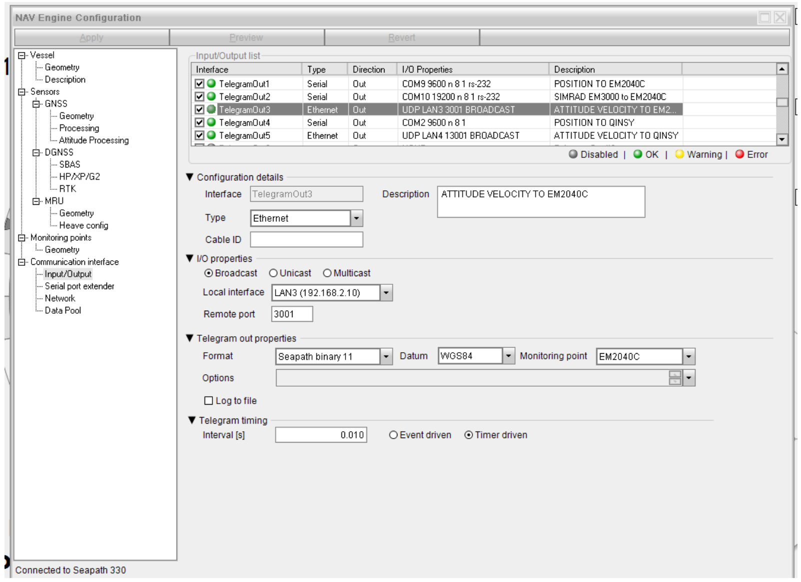

NAV Engine Configuration
Apply
Preview
Revert
Input/Output list
Interface
Type
Direction
I/O Properties
Description
GnssRec1 Serial In/Out GNSSA1 57600 n 8 1 Receiver #1
GnssRec2 Serial In/Out GNSSB1 57600 n 8 1 Receiver #2
MRU Serial In/Out MRU 115200 n 8 1 rs-422 IMU #1
Disabled | OK | Warning | Error
Configuration details
Interface GnssRec1
Description Receiver #1
Type Serial
Cable ID
I/O properties
Port GNSSA1
Baud rate 57600
rs-232
rs-422
Advanced
Parity None
Data bits 8
Stop bits 1
Connected to Seapath 330


NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface Type Direction I/O Properties Description
GnssRec1 Serial In/Out GNSSA1 57600 n 8 1 Receiver #1
GnssRec2 Serial In/Out GNSSB1 57600 n 8 1 Receiver #2
MRU Serial In/Out MRU 115200 n 8 1 rs-422 IMU #1
Gyro1 Serial In COM11 9600 n 8 1 rs-232 Gyro #1
DgnssLink1 Serial In COM9 38400 n 8 1 rs-232 Link #1
Disabled | OK | Warning | Error
Configuration details
Interface GnssRec2
Description Receiver #2
Type Serial
Cable ID
I/O properties
Port GNSSB1
Baud rate 57600
rs-232
rs-422
Advanced
Parity None
Data bits 8
Stop bits 1
Connected to Seapath 330

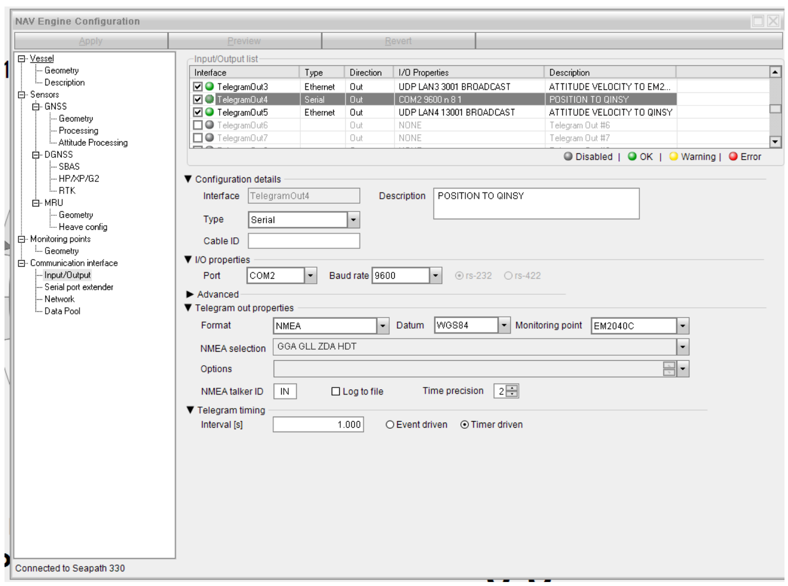

NAV Engine Configuration
Apply
Preview
Revert
Input/Output list
Interface Type Direction I/O Properties Description
GnssRec1 Serial In/Out GNSSA1 57600 n 8 1 Receiver #1
GnssRec2 Serial In/Out GNSSB1 57600 n 8 1 Receiver #2
MRU Serial In/Out MRU 115200 n 8 1 rs-422 IMU #1
Gyro1 Serial In COM11 9600 n 8 1 rs-232 Gyro #1
DgnssLink1 Serial In COM9 38400 n 8 1 rs-232 Link #1
Disabled | OK | Warning | Error
Configuration details
Interface MRU
Description IMU #1
Type Serial
Cable ID
I/O properties
Port MRU
Baud rate 115200
rs-232
rs-422
Advanced
Parity None
Data bits 8
Stop bits 1
Connected to Seapath 330


NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface | Type | Direction | I/O Properties | Description
TelegramOut1 | Serial | Out | COM9 9600 n 8 1 rs-232 | POSITION TO EM2040C
TelegramOut2 | Serial | Out | COM10 19200 n 8 1 rs-232 | SIMRAD EM3000 to EM2040C
TelegramOut3 | Ethernet | Out | UDP LAN3 3001 BROADCAST | ATTITUDE VELOCITY TO EM2...
TelegramOut4 | Serial | Out | COM2 9600 n 8 1 | POSITION TO QINSY
TelegramOut5 | Ethernet | Out | UDP LAN4 13001 BROADCAST | ATTITUDE VELOCITY TO QINSY
Disabled | OK | Warning | Error
Configuration details
Interface TelegramOut1
Description POSITION TO EM2040C
Type Serial
Cable ID
I/O properties
Port COM9
Baud rate 9600
rs-232
rs-422
Advanced
Parity None
Data bits 8
Stop bits 1
Telegram out properties
Format NMEA
Datum WGS84
Monitoring point EM2040C
NMEA selection GGA ZDA HDT
Options
NMEA talker ID IN
Log to file
Time precision 2
Telegram timing
Interval [s] 1.000
Event driven
Timer driven
Connected to Seapath 330

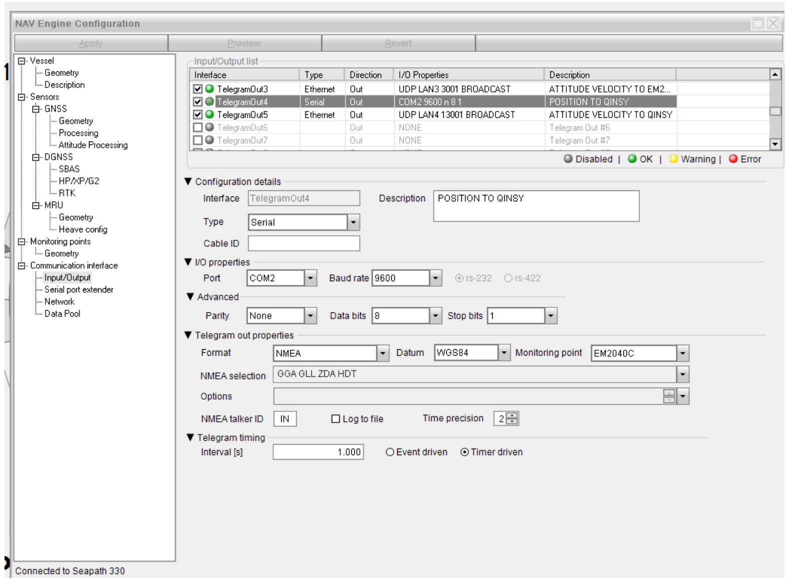

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface | Type | Direction | I/O Properties | Description
TelegramOut1 | Serial | Out | COM9 9600 n 8 1 rs-232 | POSITION TO EM2040C
TelegramOut2 | Serial | Out | COM10 19200 n 8 1 rs-232 | SIMRAD EM3000 to EM2040C
TelegramOut3 | Ethernet | Out | UDP LAN3 3001 BROADCAST | ATTITUDE VELOCITY TO EM2...
TelegramOut4 | Serial | Out | COM2 9600 n 8 1 | POSITION TO QINSY
TelegramOut5 | Ethernet | Out | UDP LAN4 13001 BROADCAST | ATTITUDE VELOCITY TO QINSY
Disabled | OK | Warning | Error
Configuration details
Interface TelegramOut2
Description SIMRAD EM3000 to EM2040C
Type Serial
Cable ID
I/O properties
Port COM10
Baud rate 19200
rs-232
rs-422
Advanced
Parity None
Data bits 8
Stop bits 1
Telegram out properties
Format Simrad EM3000/Hipap
Log to file
Monitoring point EM2040C
Options
Telegram timing
Interval [s] 0.010
Event driven
Timer driven
Connected to Seapath 330

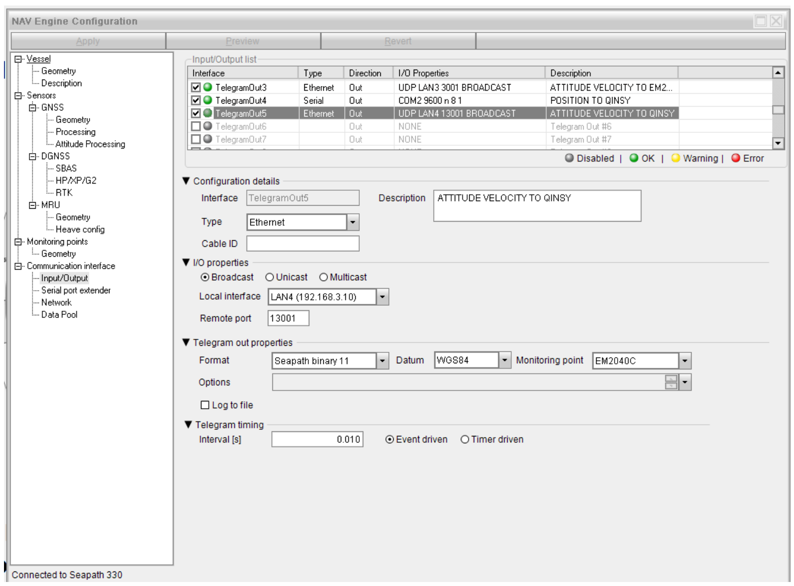


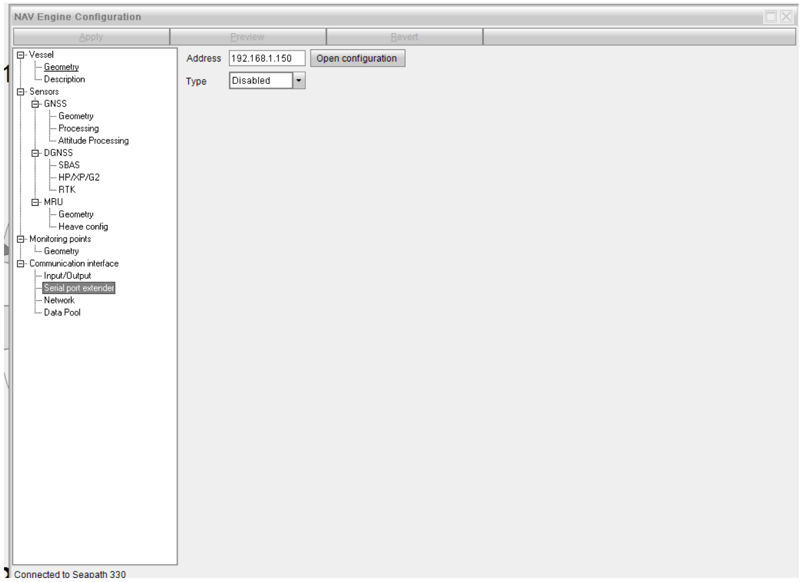
NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface Type Direction I/O Properties Description
TelegramOut1 Serial Out COM9 9600 n 8 1 rs-232 POSITION TO EM2040C
TelegramOut2 Serial Out COM10 19200 n 8 1 rs-232 SIMRAD EM3000 to EM2040C
TelegramOut3 Ethernet Out UDP LAN3 3001 BROADCAST ATTITUDE VELOCITY TO EM2...
TelegramOut4 Serial Out COM2 9600 n 8 1 POSITION TO QINSY
TelegramOut5 Ethernet Out UDP LAN4 13001 BROADCAST ATTITUDE VELOCITY TO QINSY
Disabled | OK | Warning | Error
Configuration details
Interface TelegramOut3
Description ATTITUDE VELOCITY TO EM2040C
Type Ethernet
Cable ID
I/O properties
Broadcast
Unicast
Multicast
Local interface LAN3 (192.168.2.10)
Remote port 3001
Telegram out properties
Format Seapath binary 11
Datum WGS84
Monitoring point EM2040C
Options
Log to file
Telegram timing
Interval [s] 0.010
Event driven
Timer driven
Connected to Seapath 330

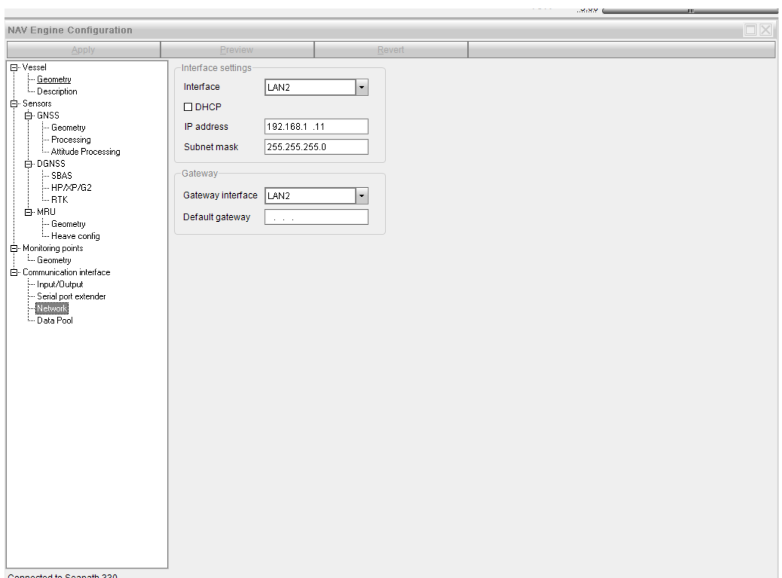


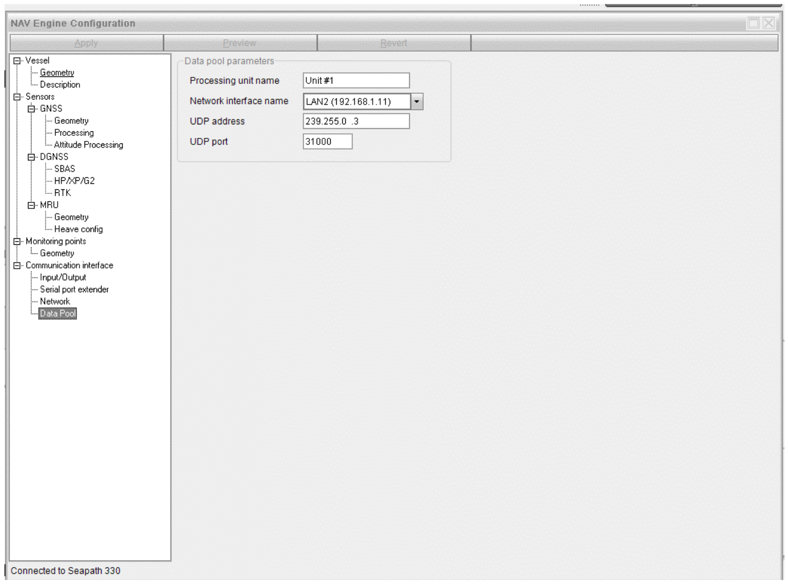
NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface Type Direction I/O Properties Description
TelegramOut3 Ethernet Out UDP LAN3 3001 BROADCAST ATTITUDE VELOCITY TO EM2...
TelegramOut4 Serial Out COM2 9600 n 8 1 POSITION TO QINSY
TelegramOut5 Ethernet Out UDP LAN4 13001 BROADCAST ATTITUDE VELOCITY TO QINSY
TelegramOut6 Out NONE Telegram Out #6
TelegramOut7 Out NONE Telegram Out #7
Disabled | OK | Warning | Error
Configuration details
Interface TelegramOut4
Description POSITION TO QINSY
Type Serial
Cable ID
I/O properties
Port COM2
Baud rate 9600
rs-232
rs-422
Advanced
Telegram out properties
Format NMEA
Datum WGS84
Monitoring point EM2040C
NMEA selection GGA GLL ZDA HDT
Options
NMEA talker ID IN
Log to file
Time precision 2
Telegram timing
Interval [s] 1.000
Event driven
Timer driven
Connected to Seapath 330






NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Address
192.168.1.150
Open configuration
Type
Disabled
Connected to Seapath 330


NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Interface settings
Interface
LAN2
DHCP
IP address
192.168.1 .11
Subnet mask
255.255.255.0
Gateway
Gateway interface
LAN2
Default gateway
Connected to Seapath 330


NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Data pool parameters
Processing unit name
Unit #1
Network interface name
LAN2 (192.168.1.11)
UDP address
239.255.0 .3
UDP port
31000
Connected to Seapath 330

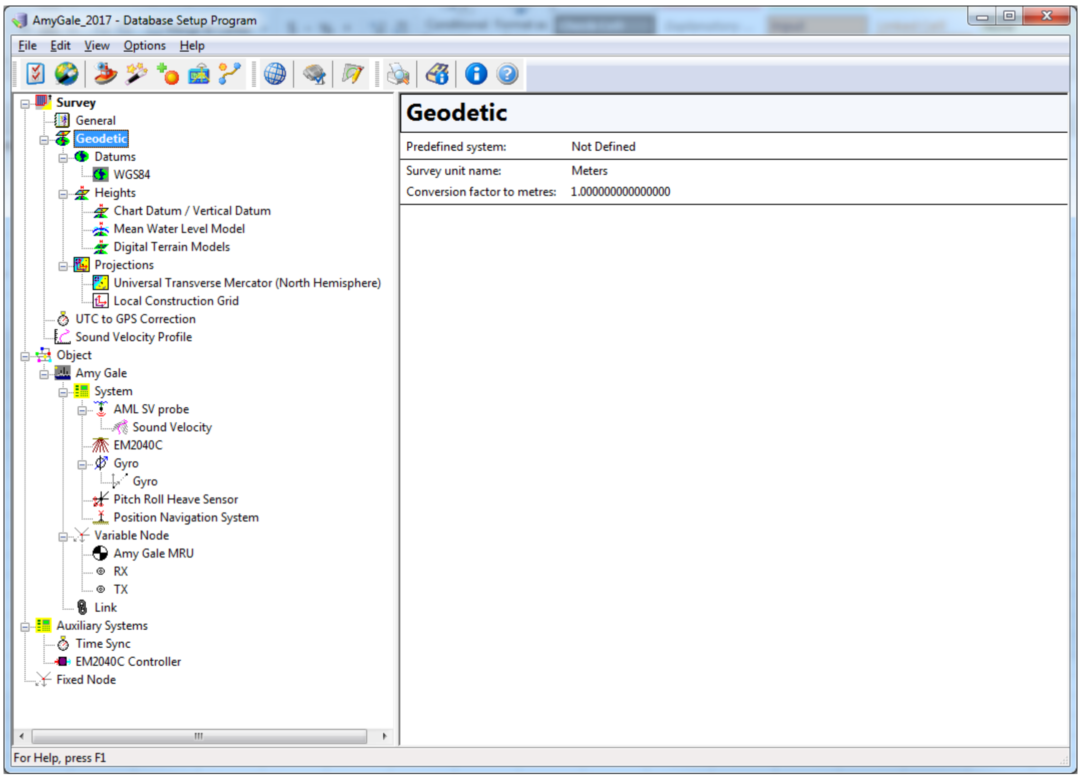
Appendix D – Template database settings in QINSy (for acquisition)

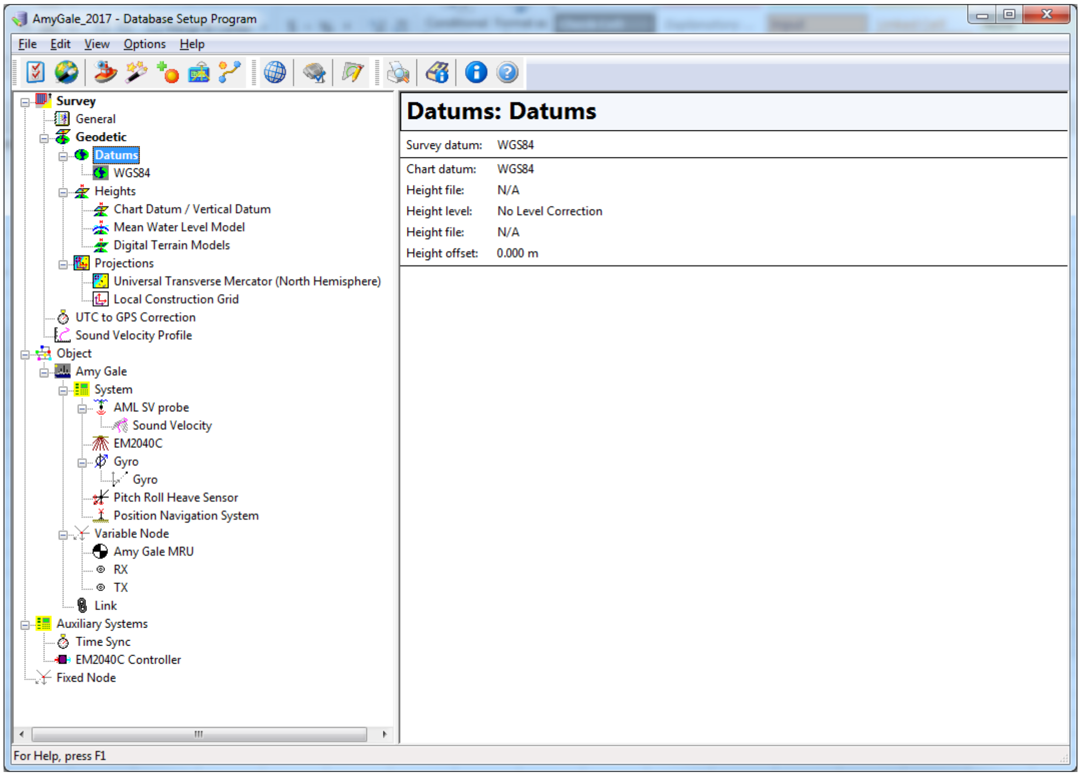
Template database name: AmyGale_2017.db

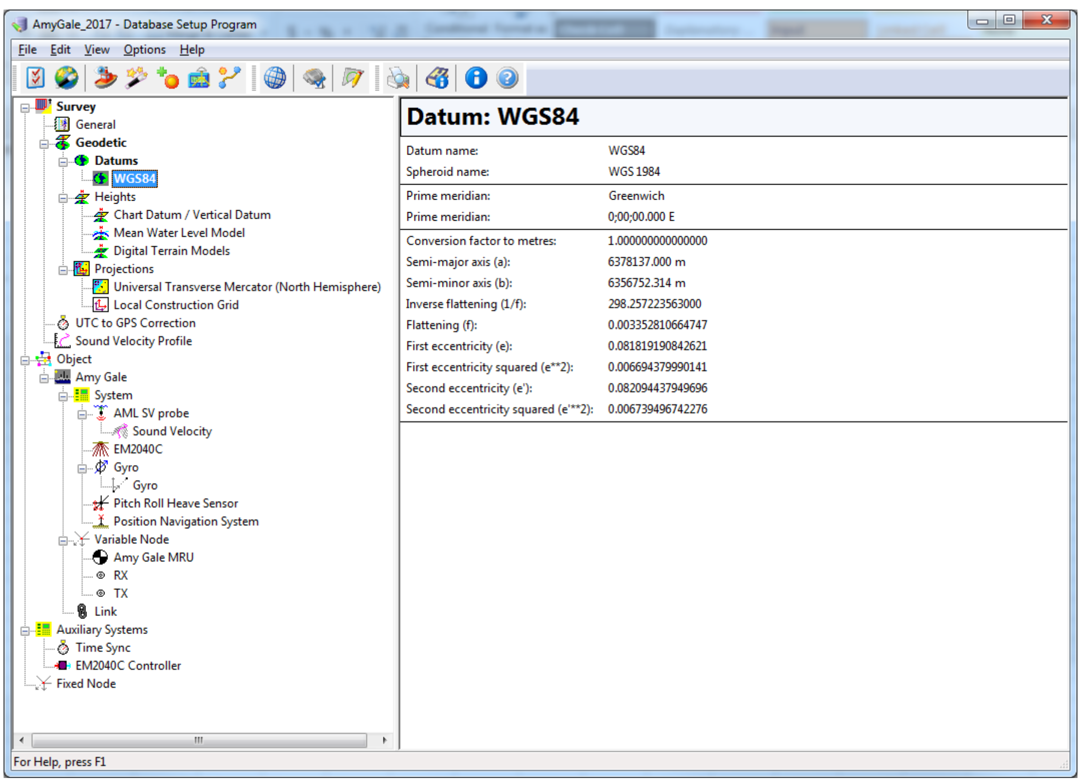
QINSy uses the following reference frame conventions (these differ from those used by Seapath 330):

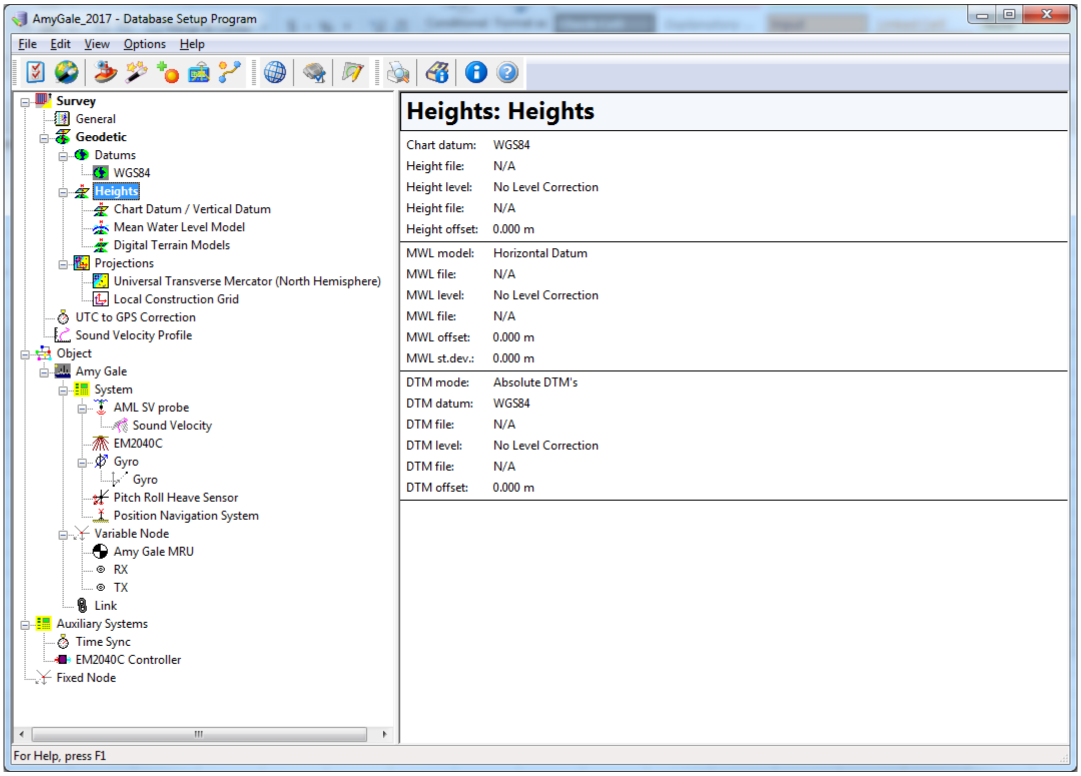
Pitch rotation: + bow up
Roll rotation: + heeling to starboard
Heave: + upwards

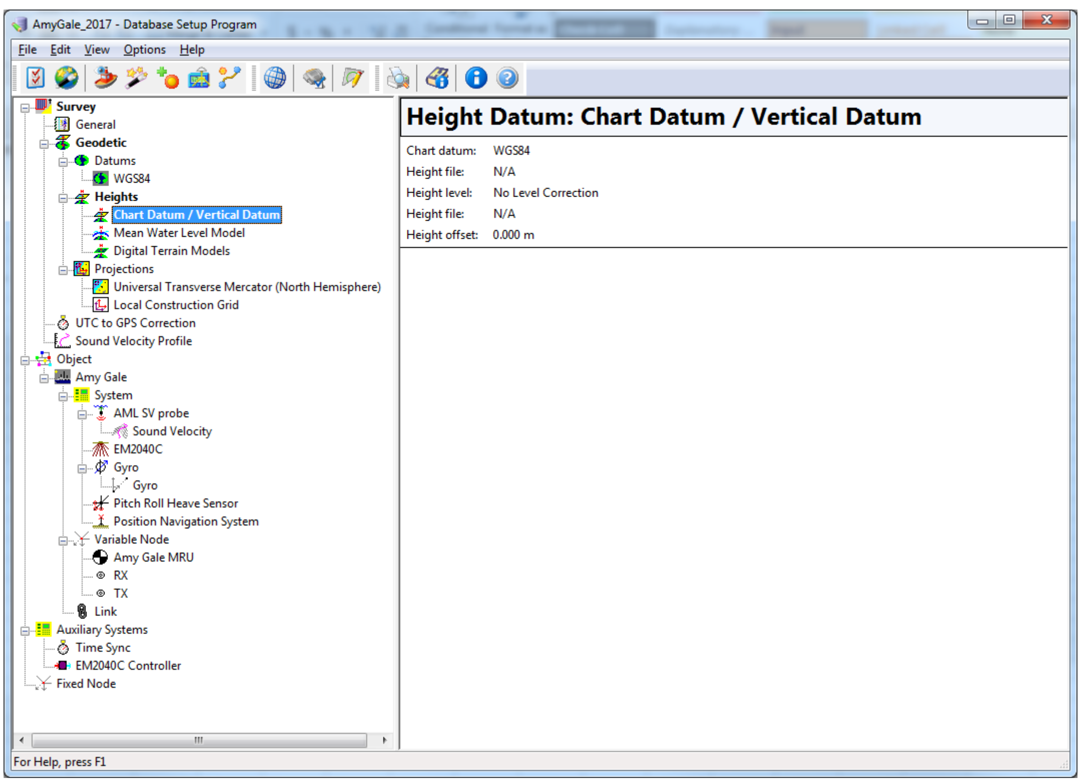
X: + to starboard
Y: + towards bow
Z: + up

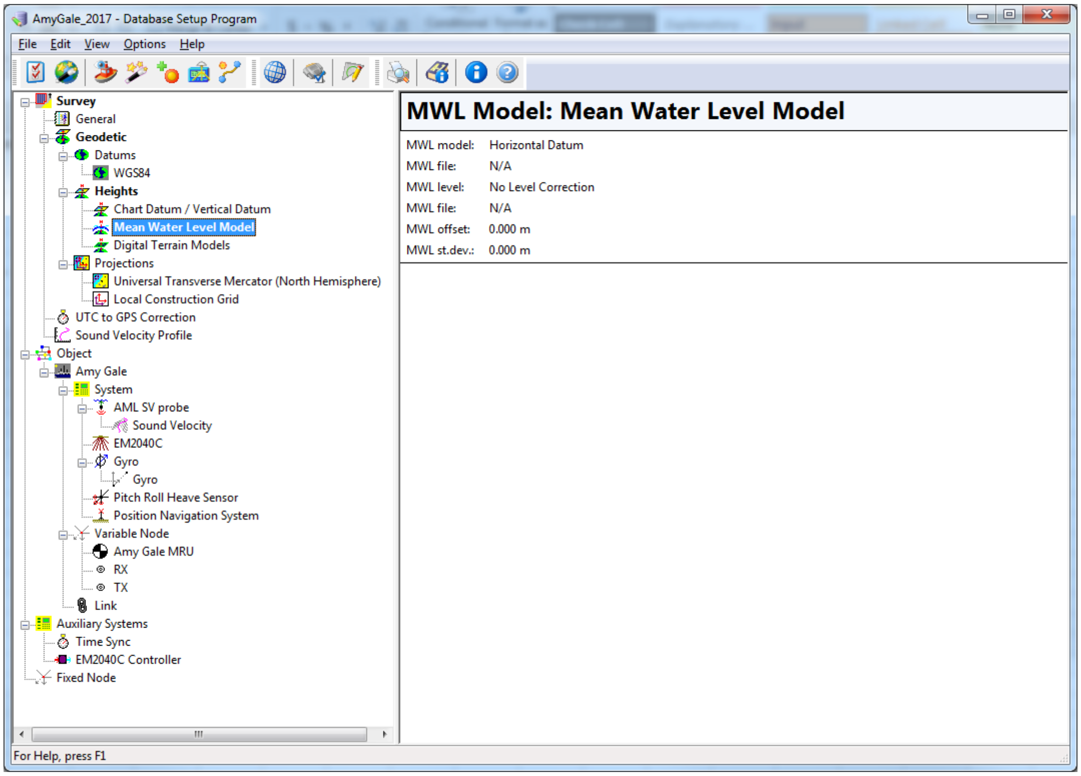


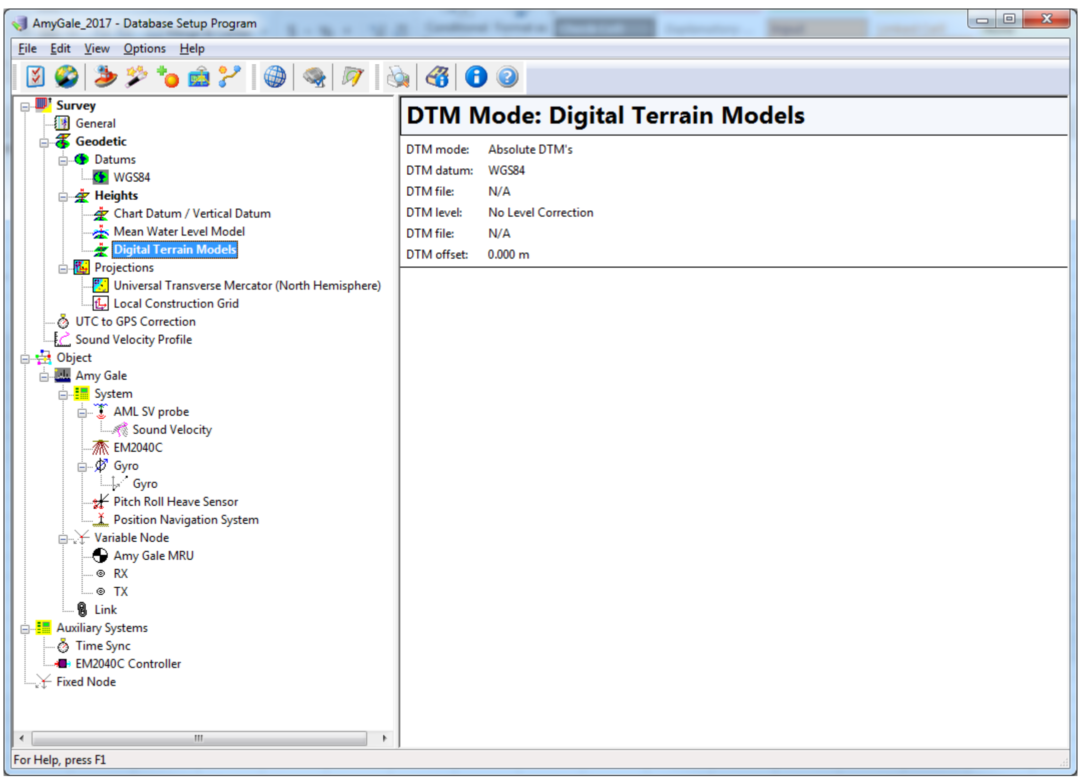

AmyGale_2017 - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Datums: Datums
Survey datum: WGS84
Chart datum: WGS84
Height file: N/A
Height level: No Level Correction
Height file: N/A
Height offset: 0.000 m
For Help, press F1

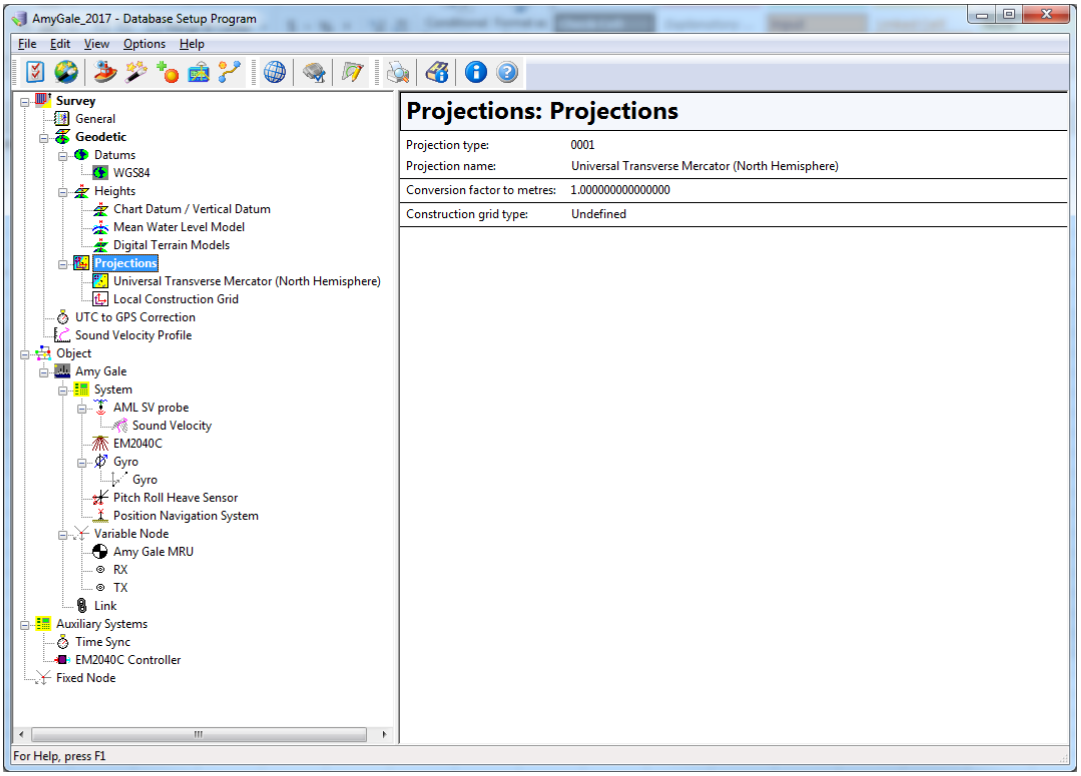

AmyGale_2017 - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Datum: WGS84
Datum name: WGS84
Spheroid name: WGS 1984
Prime meridian: Greenwich
Prime meridian: 0;00;00.000 E
Conversion factor to metres: 1.000000000000000
Semi-major axis (a): 6378137.000 m
Semi-minor axis (b): 6356752.314 m
Inverse flattening (1/f): 298.257223563000
Flattening (f): 0.003352810664747
First eccentricity (e): 0.081819190842621
First eccentricity squared (e**2): 0.006694379990141
Second eccentricity (e'): 0.082094437949696
Second eccentricity squared (e'**2): 0.006739496742276
For Help, press F1

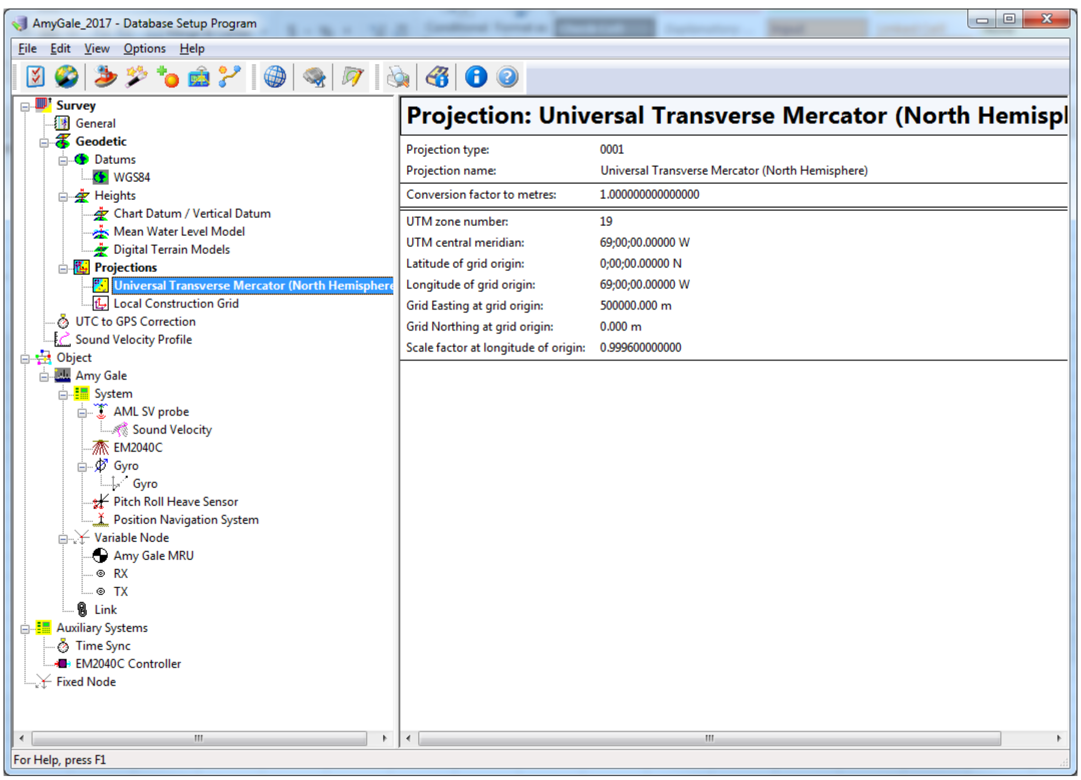

AmyGale_2017 - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Heights: Heights
Chart datum: WGS84
Height file: N/A
Height level: No Level Correction
Height file: N/A
Height offset: 0.000 m
MWL model: Horizontal Datum
MWL file: N/A
MWL level: No Level Correction
MWL file: N/A
MWL offset: 0.000 m
MWL st.dev.: 0.000 m
DTM mode: Absolute DTM's
DTM datum: WGS84
DTM file: N/A
DTM level: No Level Correction
DTM file: N/A
DTM offset: 0.000 m
For Help, press F1

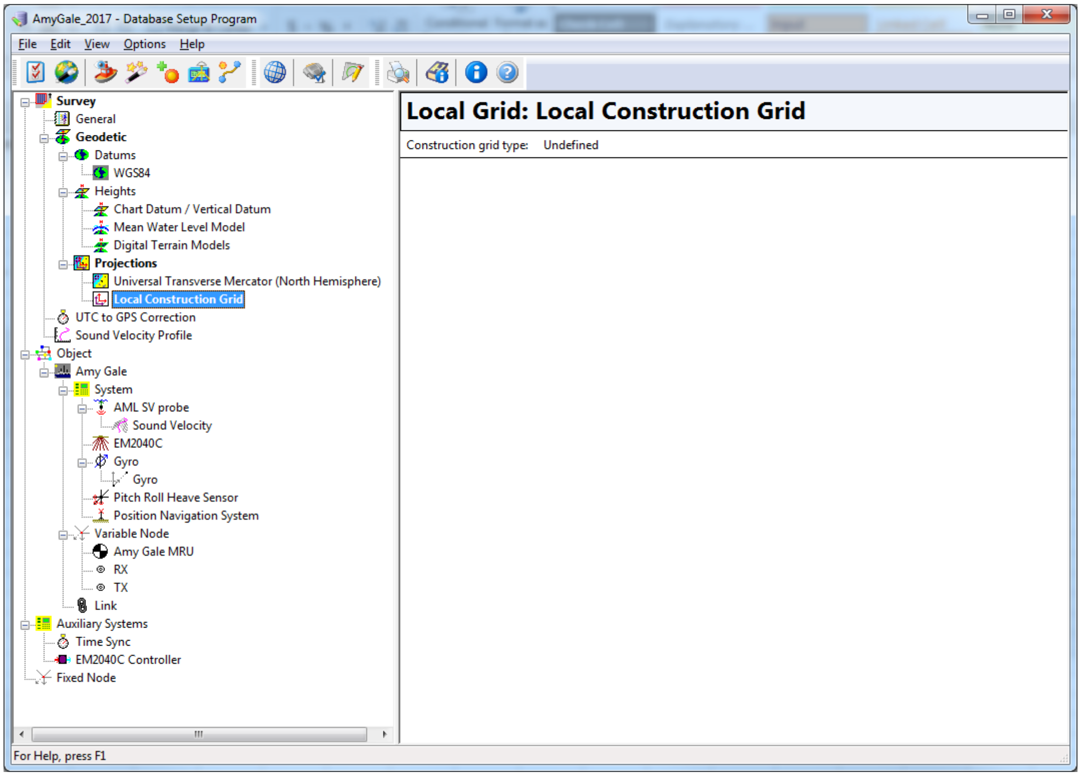

AmyGale_2017 - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Height Datum: Chart Datum / Vertical Datum
Chart datum: WGS84
Height file: N/A
Height level: No Level Correction
Height file: N/A
Height offset: 0.000 m
For Help, press F1


AmyGale_2017 - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
MWL Model: Mean Water Level Model
MWL model: Horizontal Datum
MWL file: N/A
MWL level: No Level Correction
MWL file: N/A
MWL offset: 0.000 m
MWL st.dev.: 0.000 m
For Help, press F1


AmyGale_2017 - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
DTM Mode: Digital Terrain Models
DTM mode: Absolute DTM's
DTM datum: WGS84
DTM file: N/A
DTM level: No Level Correction
DTM file: N/A
DTM offset: 0.000 m
For Help, press F1


AmyGale_2017 - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Projections: Projections
Projection type: 0001
Projection name: Universal Transverse Mercator (North Hemisphere)
Conversion factor to metres: 1.000000000000000
Construction grid type: Undefined
For Help, press F1


AmyGale_2017 - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Projection: Universal Transverse Mercator (North Hemispl
Projection type: 0001
Projection name: Universal Transverse Mercator (North Hemisphere)
Conversion factor to metres: 1.000000000000000
UTM zone number: 19
UTM central meridian: 69;00;00.00000 W
Latitude of grid origin: 0;00;00.00000 N
Longitude of grid origin: 69;00;00.00000 W
Grid Easting at grid origin: 500000.000 m
Grid Northing at grid origin: 0.000 m
Scale factor at longitude of origin: 0.999600000000
For Help, press F1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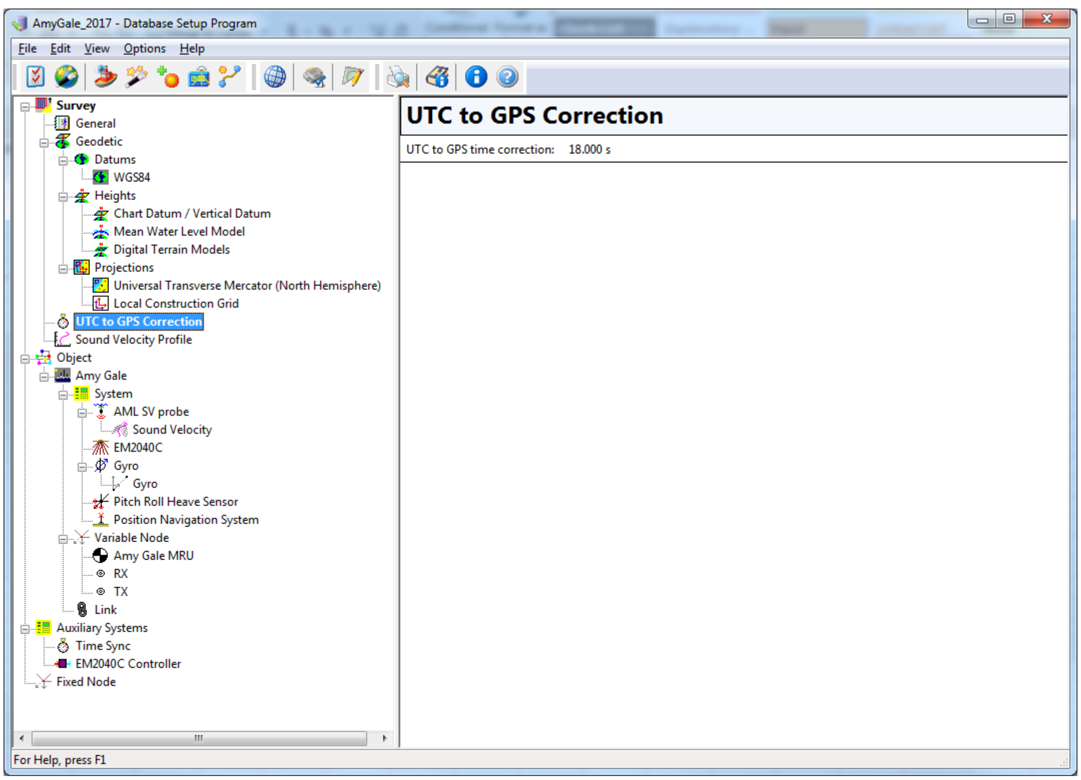
Local Grid: Local Construction Grid
Construction grid type: Undefined
For Help, press F1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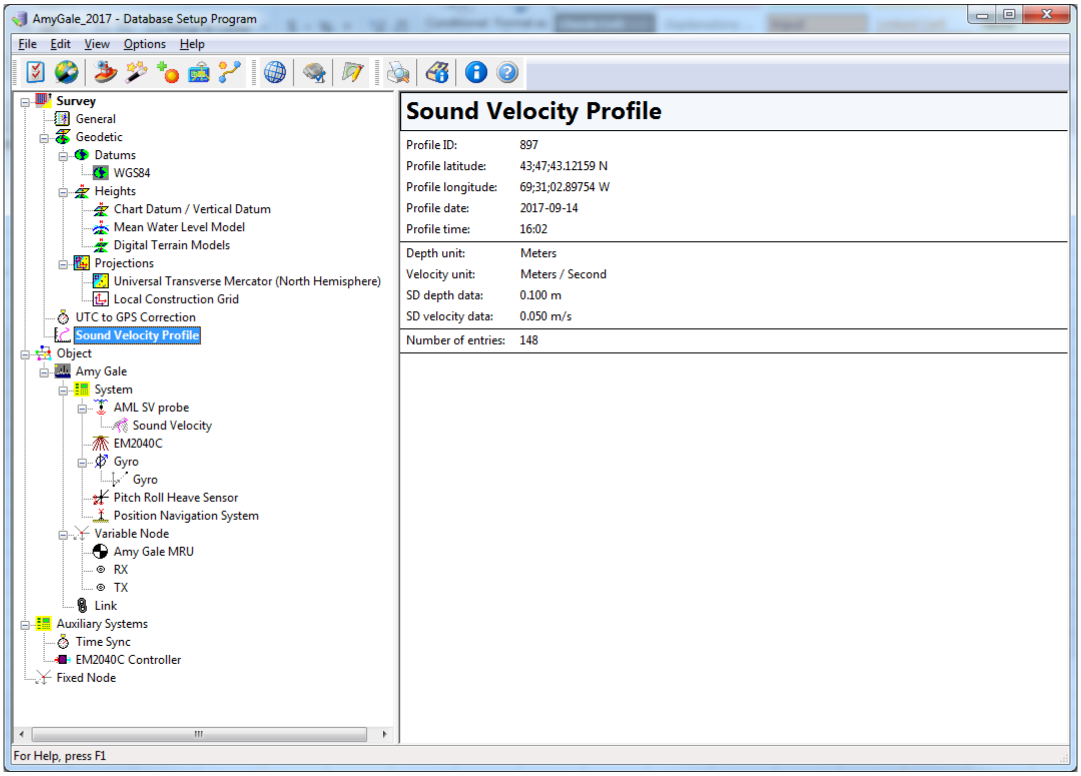
Fixed Node
UTC to GPS Correction
UTC to GPS time correction: 18.000 s
For Help, press F1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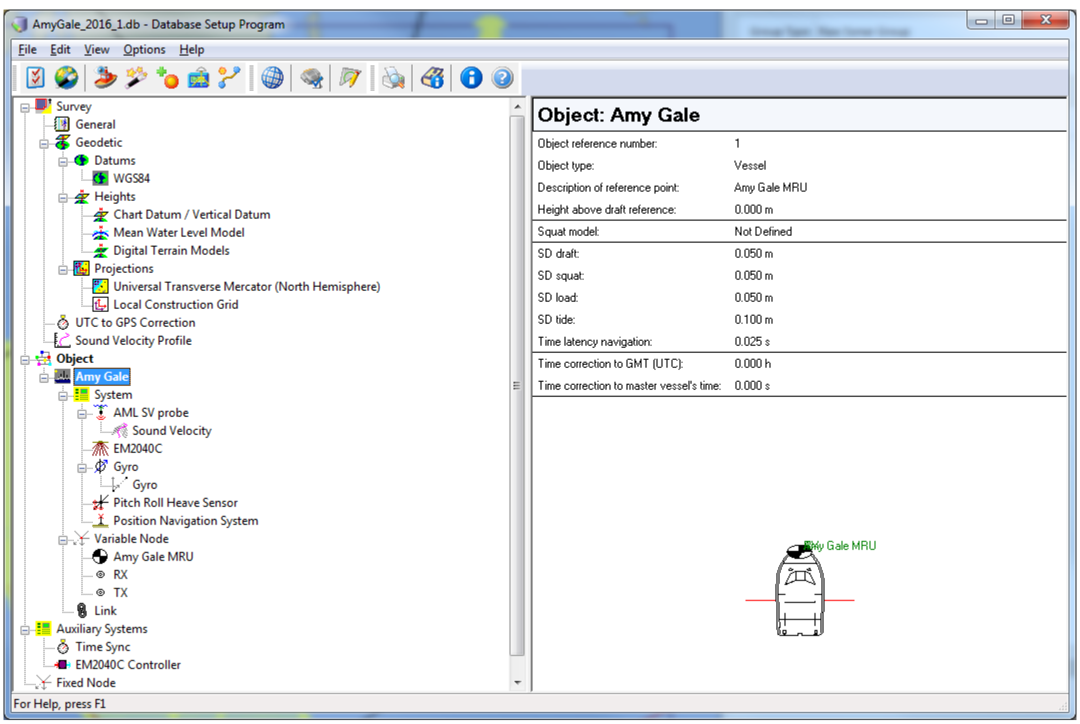
Fixed Node
Sound Velocity Profile
Profile ID: 897
Profile latitude: 43;47;43.12159 N
Profile longitude: 69;31;02.89754 W
Profile date: 2017-09-14
Profile time: 16:02
Depth unit: Meters
Velocity unit: Meters / Second
SD depth data: 0.100 m
SD velocity data: 0.050 m/s
Number of entries: 148
For Help, press F1


AmyGale_2016_1.db - Database Setup Program
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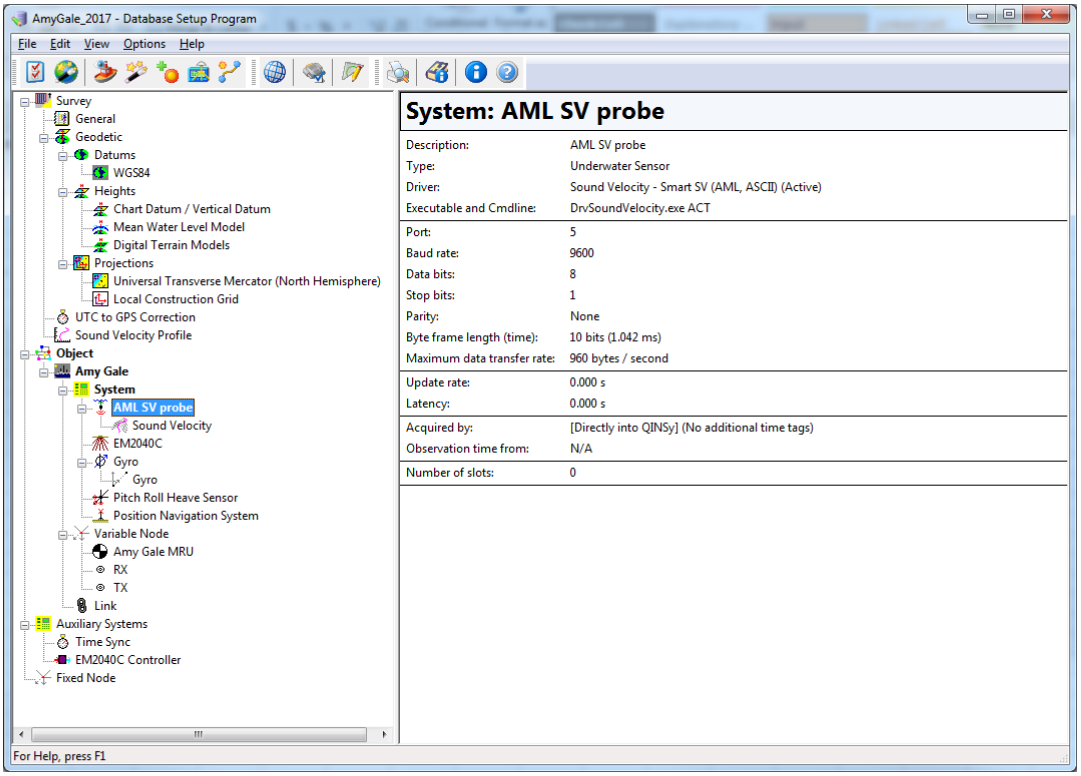
Fixed Node
Object: Amy Gale
Object reference number: 1
Object type: Vessel
Description of reference point: Amy Gale MRU
Height above draft reference: 0.000 m
Squat model: Not Defined
SD draft: 0.050 m
SD squat: 0.050 m
SD load: 0.050 m
SD tide: 0.100 m
Time latency navigation: 0.025 s
Time correction to GMT (UTC): 0.000 h
Time correction to master vessel's time: 0.000 s
Amy Gale MRU
For Help, press F1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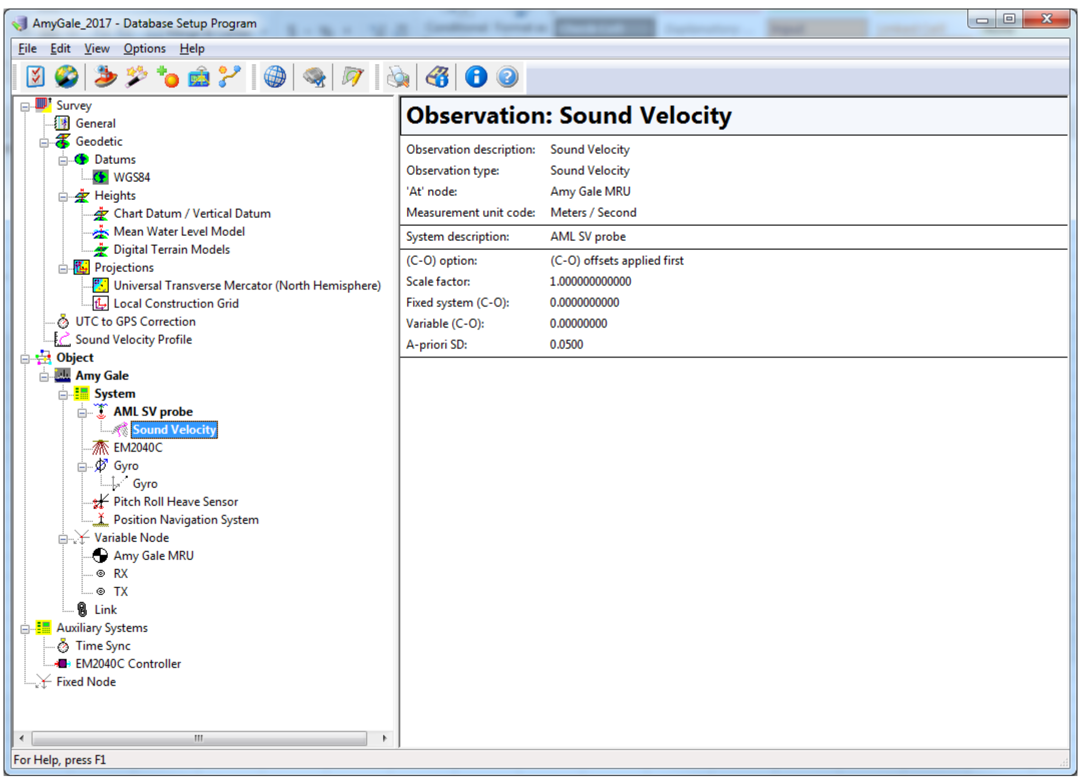
Fixed Node
System: AML SV probe
Description: AML SV probe
Type: Underwater Sensor
Driver: Sound Velocity - Smart SV (AML, ASCII) (Active)
Executable and Cmdline: DrvSoundVelocity.exe ACT
Port: 5
Baud rate: 9600
Data bits: 8
Stop bits: 1
Parity: None
Byte frame length (time): 10 bits (1.042 ms)
Maximum data transfer rate: 960 bytes / second
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation time from: N/A
Number of slots: 0
For Help, press F1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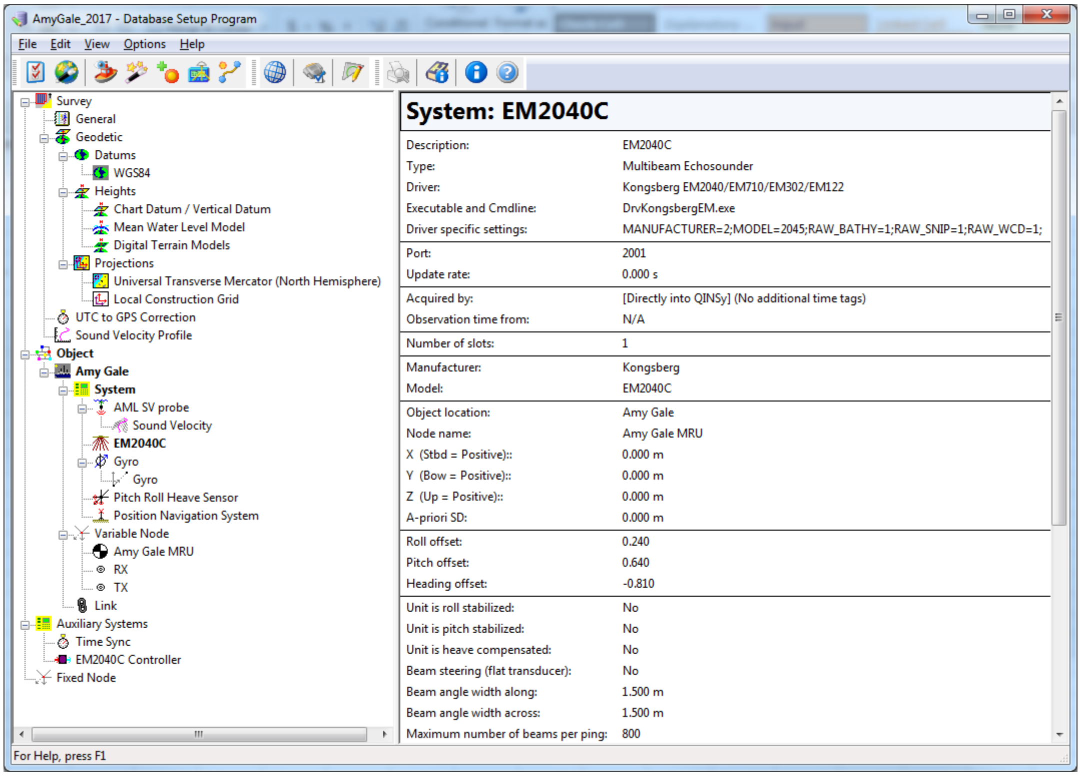
Fixed Node
Observation: Sound Velocity
Observation description: Sound Velocity
Observation type: Sound Velocity
'At' node: Amy Gale MRU
Measurement unit code: Meters / Second
System description: AML SV probe
(C-O) option: (C-O) offsets applied first
Scale factor: 1.000000000000
Fixed system (C-O): 0.0000000000
Variable (C-O): 0.00000000
A-priori SD: 0.0500
For Help, press F1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EM2040C Controller
Fixed Node
System: EM2040C
Description: EM2040C
Type: Multibeam Echosounder
Driver: Kongsberg EM2040/EM710/EM302/EM122
Executable and Cmdline: DrvKongsbergEM.exe
Driver specific settings: MANUFACTURER=2;MODEL=2045;RAW_BATHY=1;RAW_SNIP=1;RAW_WCD=1;
Port: 2001
Update rate: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation time from: N/A
Number of slots: 1
Manufacturer: Kongsberg
Model: EM2040C
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive):: 0.000 m
Y (Bow = Positive):: 0.000 m
Z (Up = Positive):: 0.000 m
A-priori SD: 0.000 m
Roll offset: 0.240
Pitch offset: 0.640
Heading offset: -0.810
Unit is roll stabilized: No
Unit is pitch stabilized: No
Unit is heave compensated: No
Beam steering (flat transducer): No
Beam angle width along: 1.500 m
Beam angle width across: 1.500 m
Maximum number of beams per ping: 800
For Help, press F1

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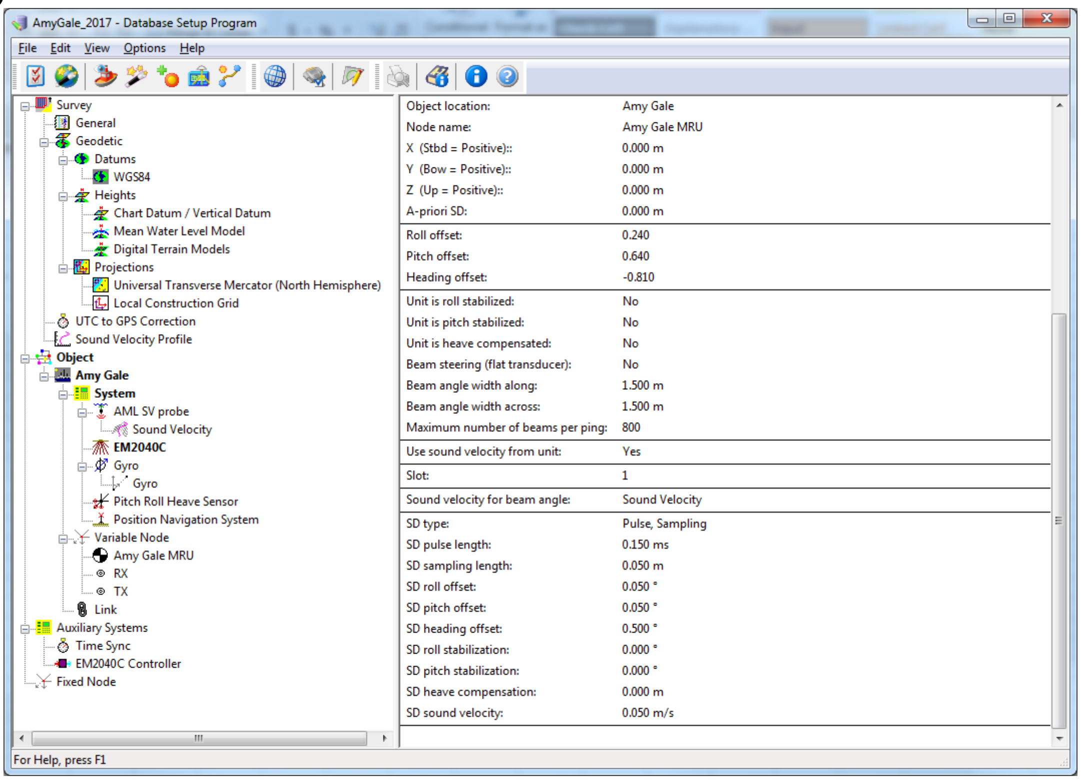
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Fixed Node
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive):: 0.000 m
Y (Bow = Positive):: 0.000 m
Z (Up = Positive):: 0.000 m
A-priori SD: 0.000 m
Roll offset: 0.240
Pitch offset: 0.640
Heading offset: -0.810
Unit is roll stabilized: No
Unit is pitch stabilized: No
Unit is heave compensated: No
Beam steering (flat transducer): No
Beam angle width along: 1.500 m
Beam angle width across: 1.500 m
Maximum number of beams per ping: 800
Use sound velocity from unit: Yes
Slot: 1
Sound velocity for beam angle: Sound Velocity
SD type: Pulse, Sampling
SD pulse length: 0.150 ms
SD sampling length: 0.050 m
SD roll offset: 0.050 °
SD pitch offset: 0.050 °
SD heading offset: 0.500 °
SD roll stabilization: 0.000 °
SD pitch stabilization: 0.000 °
SD heave compensation: 0.000 m
SD sound velocity: 0.050 m/s
For Help, press F1

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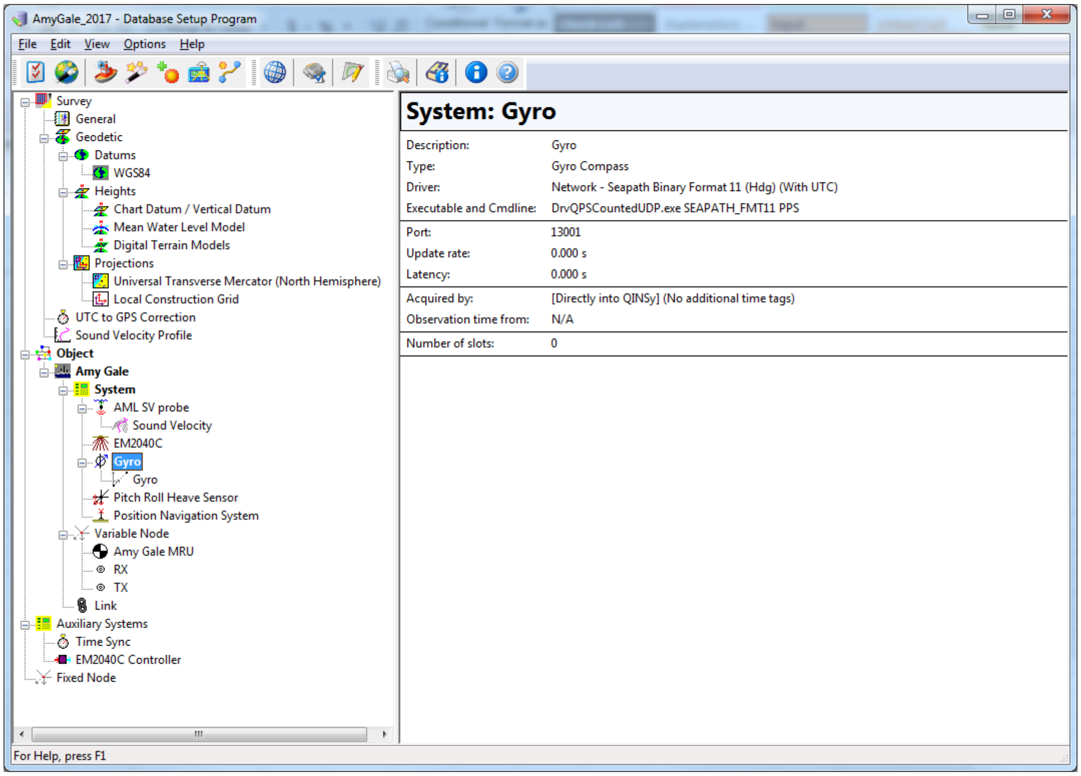
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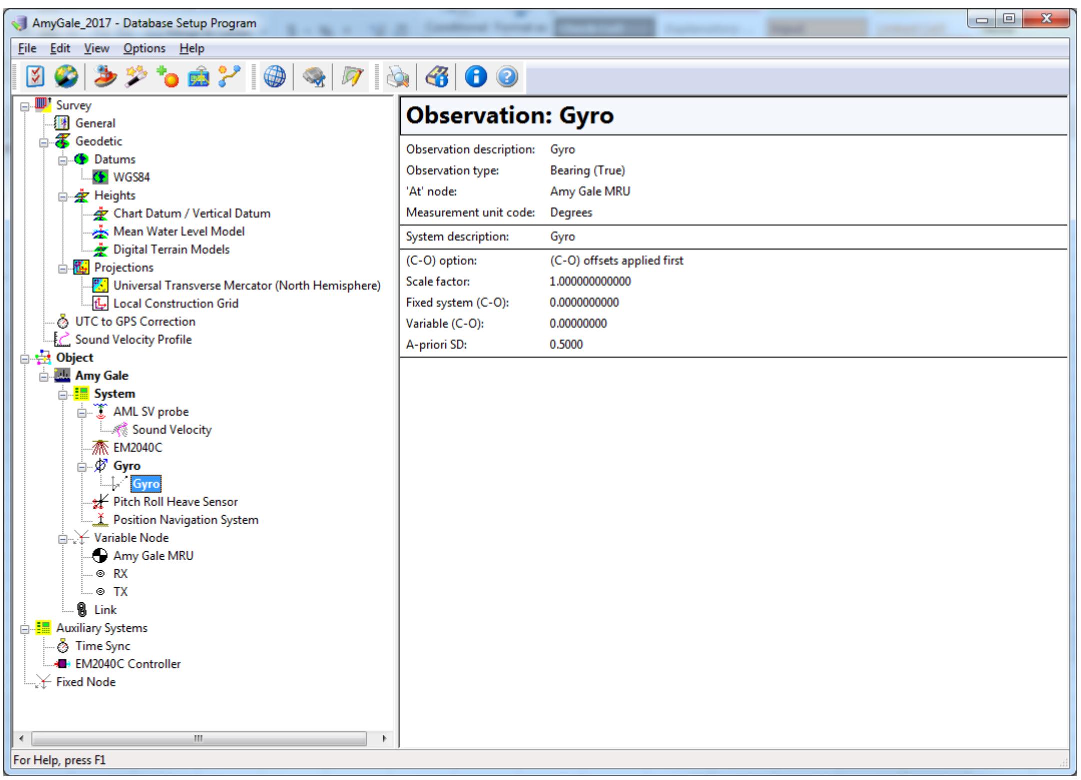
Fixed Node
System: Gyro
Description: Gyro
Type: Gyro Compass
Driver: Network - Seapath Binary Format 11 (Hdg) (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe SEAPATH_FMT11 PPS
Port: 13001
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation time from: N/A
Number of slots: 0
For Help, press F1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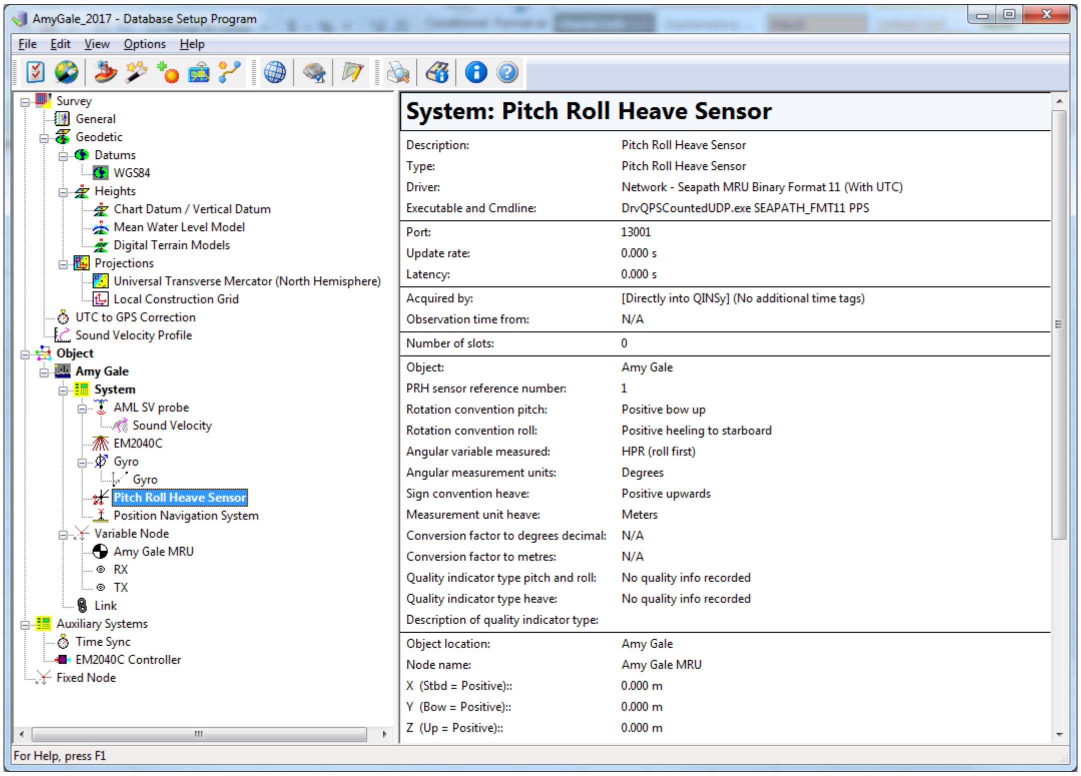
Fixed Node
Observation: Gyro
Observation description: Gyro
Observation type: Bearing (True)
'At' node: Amy Gale MRU
Measurement unit code: Degrees
System description: Gyro
(C-O) option: (C-O) offsets applied first
Scale factor: 1.000000000000
Fixed system (C-O): 0.0000000000
Variable (C-O): 0.00000000
A-priori SD: 0.5000
For Help, press F1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Fixed Node
System: Pitch Roll Heave Sensor
Description: Pitch Roll Heave Sensor
Type: Pitch Roll Heave Sensor
Driver: Network - Seapath MRU Binary Format 11 (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe SEAPATH_FMT11 PPS
Port: 13001
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation time from: N/A
Number of slots: 0
Object: Amy Gale
PRH sensor reference number: 1
Rotation convention pitch: Positive bow up
Rotation convention roll: Positive heeling to starboard
Angular variable measured: HPR (roll first)
Angular measurement units: Degrees
Sign convention heave: Positive upwards
Measurement unit heave: Meters
Conversion factor to degrees decimal: N/A
Conversion factor to metres: N/A
Quality indicator type pitch and roll: No quality info recorded
Quality indicator type heave: No quality info recorded
Description of quality indicator type:
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive):: 0.000 m
Y (Bow = Positive):: 0.000 m
Z (Up = Positive):: 0.000 m
For Help, press F1
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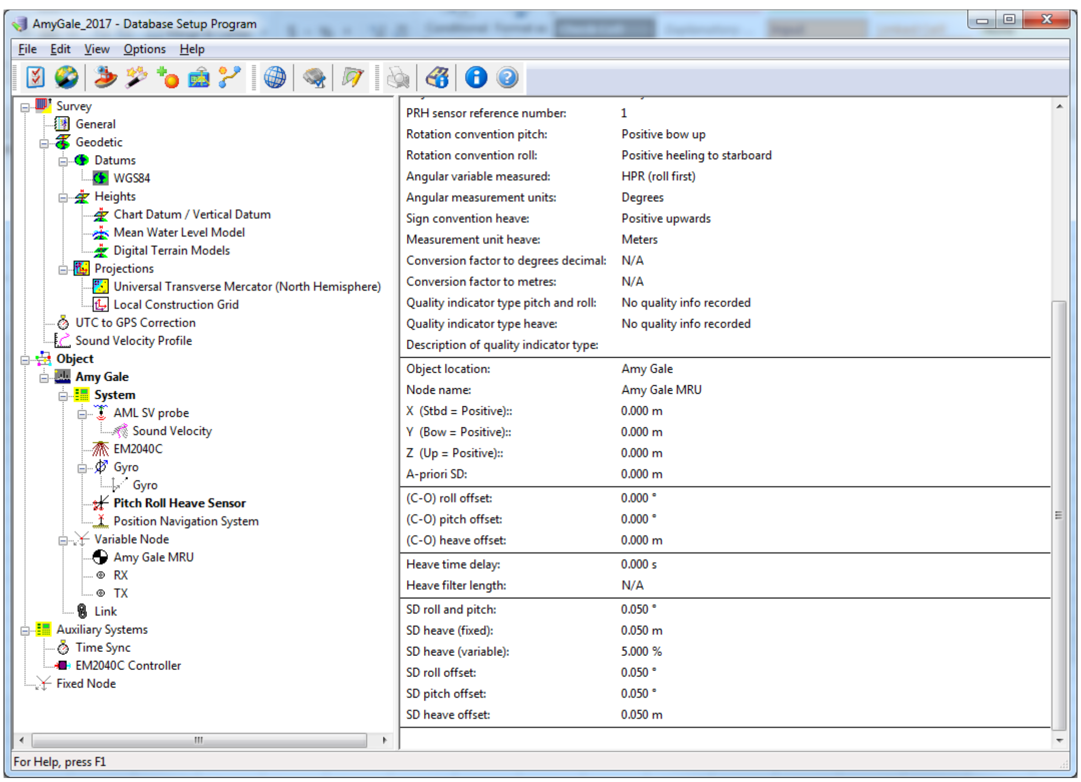
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PRH sensor reference number: 1
Rotation convention pitch: Positive bow up
Rotation convention roll: Positive heeling to starboard
Angular variable measured: HPR (roll first)
Angular measurement units: Degrees
Sign convention heave: Positive upwards
Measurement unit heave: Meters
Conversion factor to degrees decimal: N/A
Conversion factor to metres: N/A
Quality indicator type pitch and roll: No quality info recorded
Quality indicator type heave: No quality info recorded
Description of quality indicator type:
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive):: 0.000 m
Y (Bow = Positive):: 0.000 m
Z (Up = Positive):: 0.000 m
A-priori SD: 0.000 m
(C-O) roll offset: 0.000 °
(C-O) pitch offset: 0.000 °
(C-O) heave offset: 0.000 m
Heave time delay: 0.000 s
Heave filter length: N/A
SD roll and pitch: 0.050 °
SD heave (fixed): 0.050 m
SD heave (variable): 5.000 %
SD roll offset: 0.050 °
SD pitch offset: 0.050 °
SD heave offset: 0.050 m
For Help, press F1
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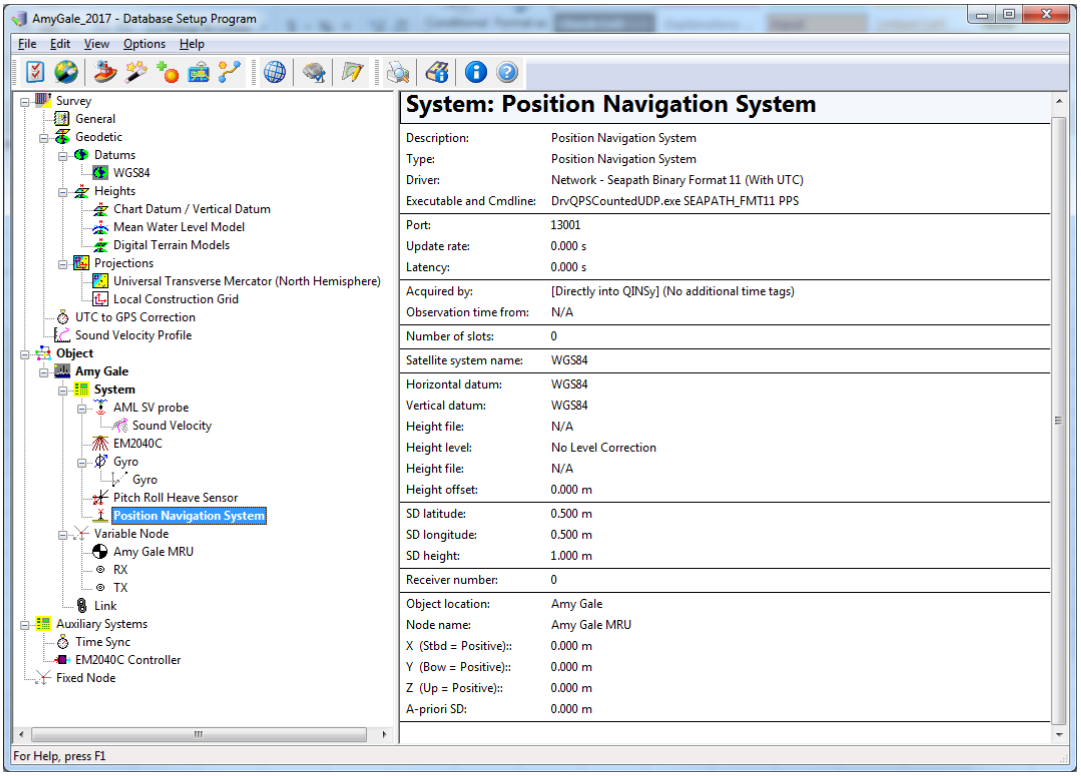
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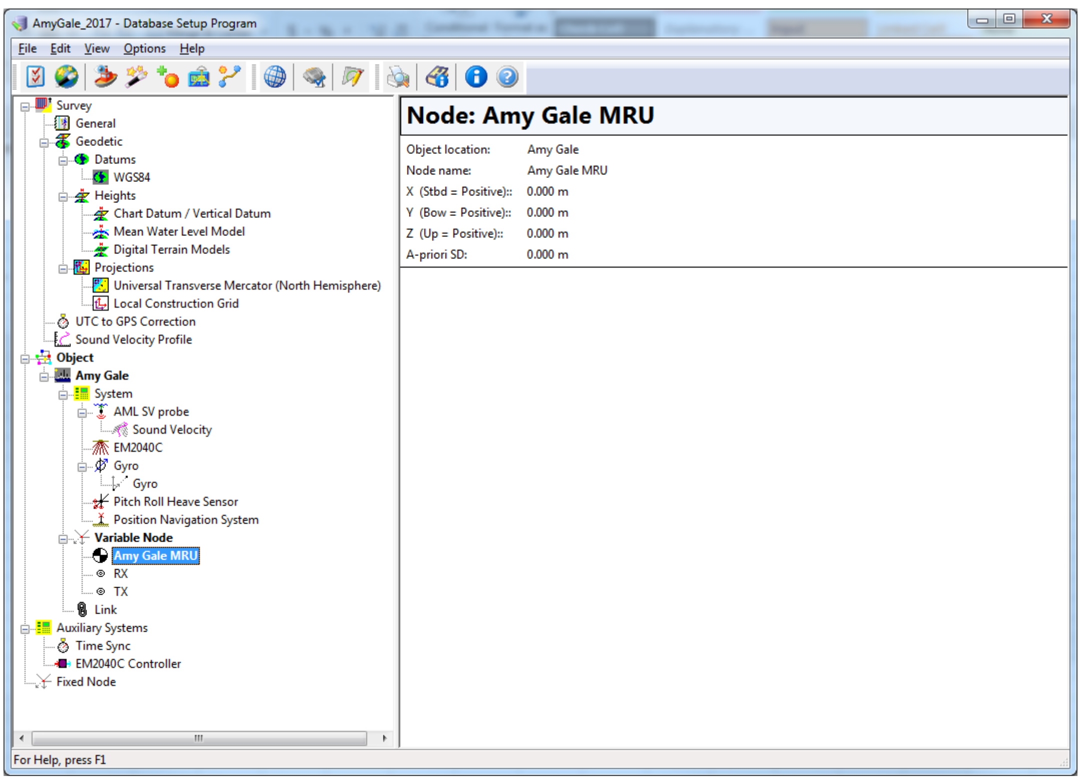
Fixed Node
System: Position Navigation System
Description: Position Navigation System
Type: Position Navigation System
Driver: Network - Seapath Binary Format 11 (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe SEAPATH_FMT11 PPS
Port: 13001
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation time from: N/A
Number of slots: 0
Satellite system name: WGS84
Horizontal datum: WGS84
Vertical datum: WGS84
Height file: N/A
Height level: No Level Correction
Height file: N/A
Height offset: 0.000 m
SD latitude: 0.500 m
SD longitude: 0.500 m
SD height: 1.000 m
Receiver number: 0
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive):: 0.000 m
Y (Bow = Positive):: 0.000 m
Z (Up = Positive):: 0.000 m
A-priori SD: 0.000 m
For Help, press F1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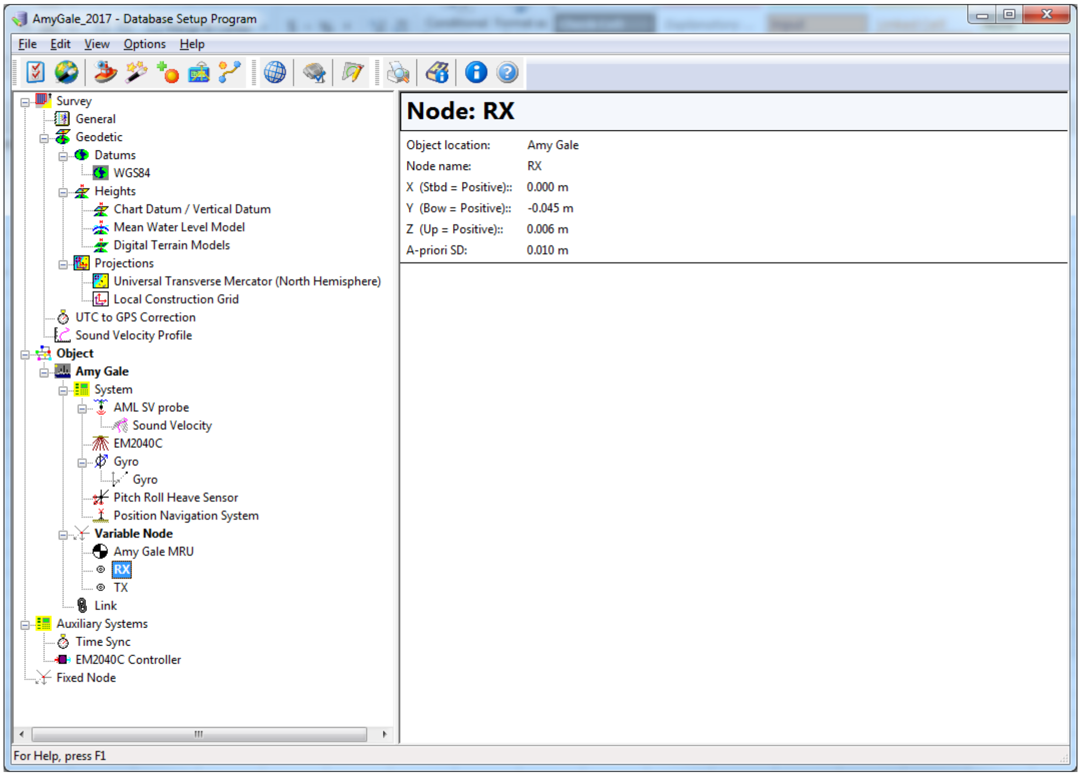
Node: Amy Gale MRU
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive):: 0.000 m
Y (Bow = Positive):: 0.000 m
Z (Up = Positive):: 0.000 m
A-priori SD: 0.000 m
For Help, press F1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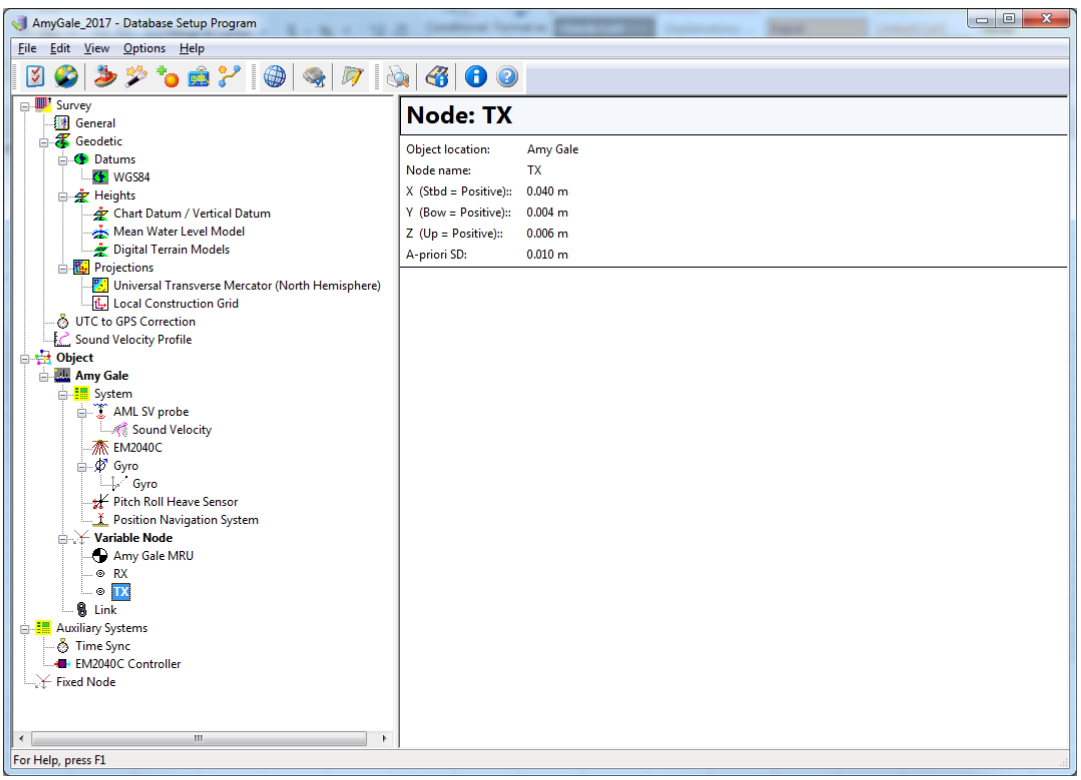
Fixed Node
Node: RX
Object location: Amy Gale
Node name: RX
X (Stbd = Positive):: 0.000 m
Y (Bow = Positive):: -0.045 m
Z (Up = Positive):: 0.006 m
A-priori SD: 0.010 m
For Help, press F1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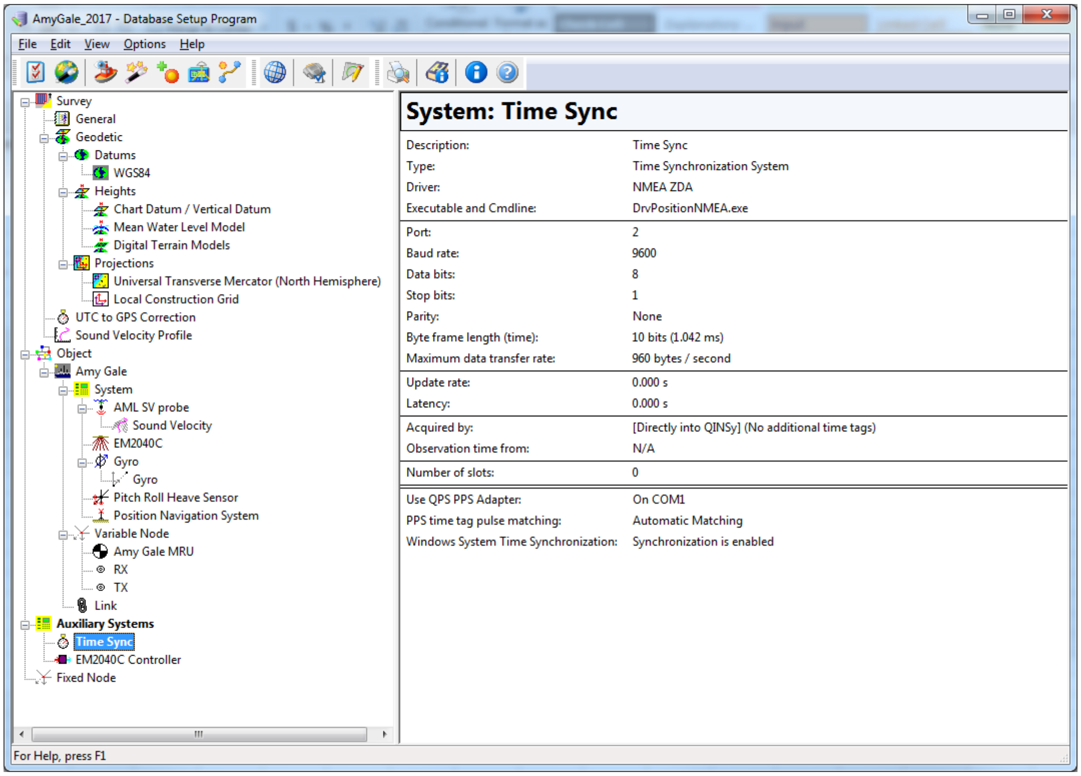
Fixed Node
Node: TX
Object location: Amy Gale
Node name: TX
X (Stbd = Positive):: 0.040 m
Y (Bow = Positive):: 0.004 m
Z (Up = Positive):: 0.006 m
A-priori SD: 0.010 m
For Help, press F1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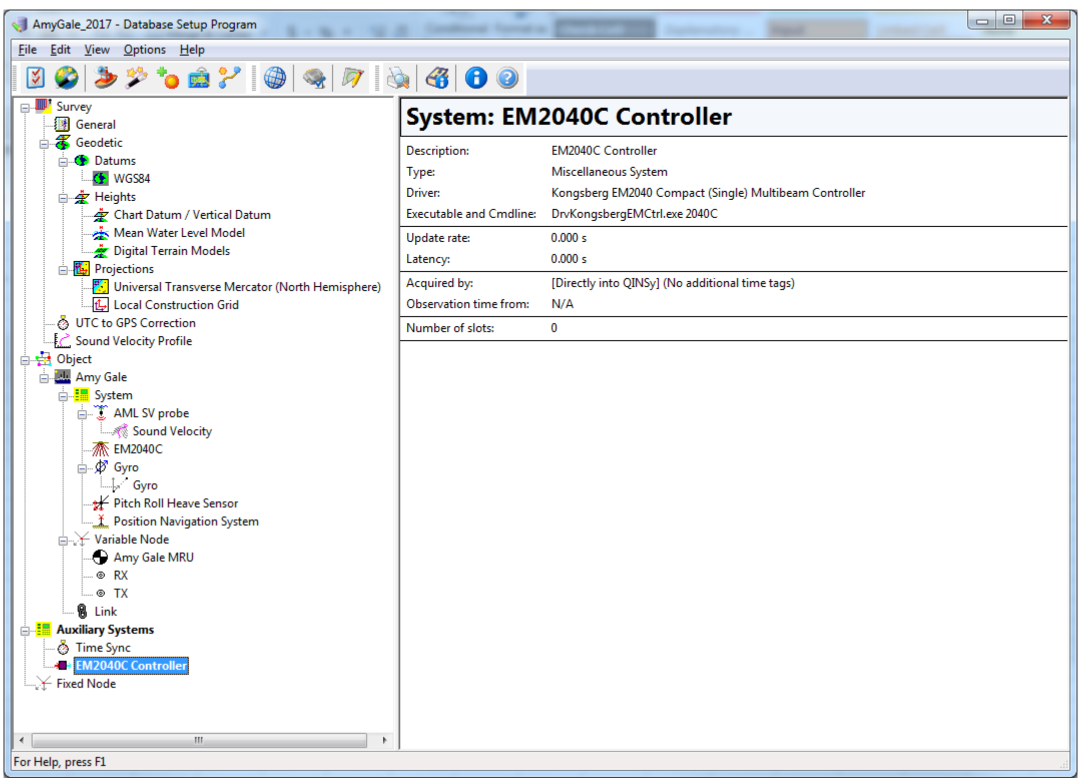
Fixed Node
System: Time Sync
Description: Time Sync
Type: Time Synchronization System
Driver: NMEA ZDA
Executable and Cmdline: DrvPositionNMEA.exe
Port: 2
Baud rate: 9600
Data bits: 8
Stop bits: 1
Parity: None
Byte frame length (time): 10 bits (1.042 ms)
Maximum data transfer rate: 960 bytes / second
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation time from: N/A
Number of slots: 0
Use QPS PPS Adapter: On COM1
PPS time tag pulse matching: Automatic Matching
Windows System Time Synchronization: Synchronization is enabled
For Help, press F1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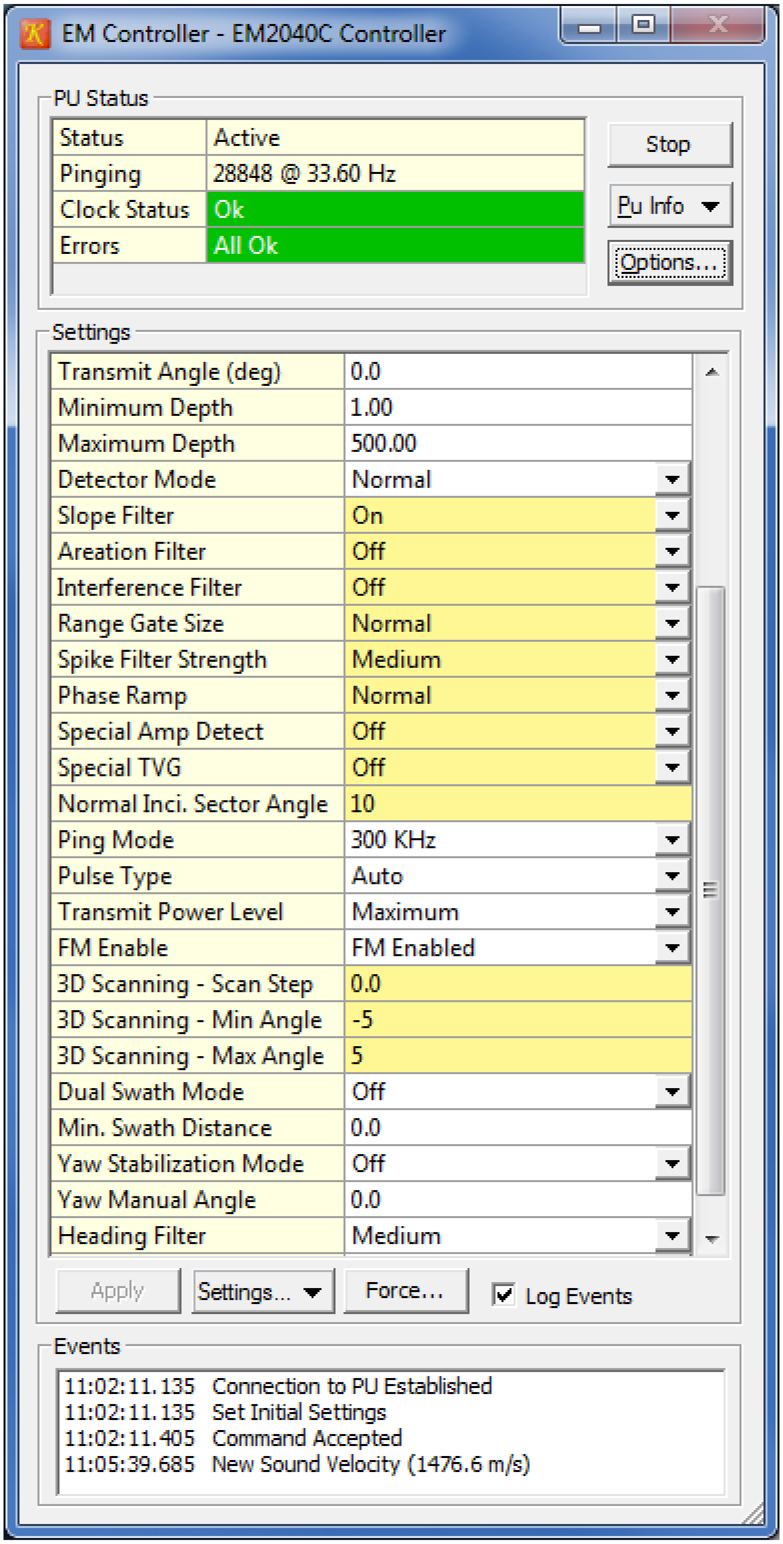
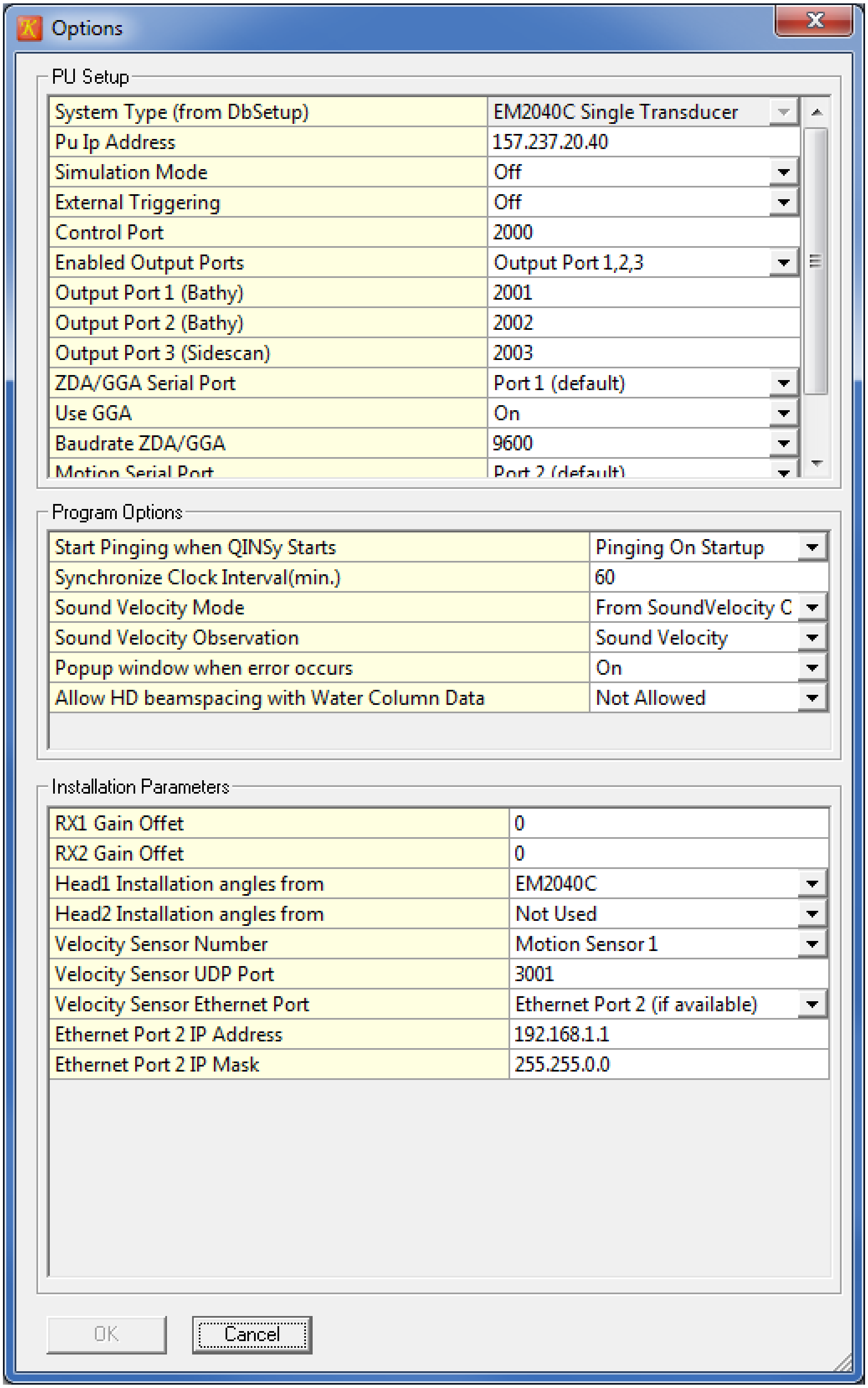
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
System: EM2040C Controller
Description: EM2040C Controller
Type: Miscellaneous System
Driver: Kongsberg EM2040 Compact (Single) Multibeam Controller
Executable and Cmdline: DrvKongsbergEMCtrl.exe 2040C
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation time from: N/A
Number of slots: 0
For Help, press F1

Appendix E – Configuration settings for QINSy EM controller




Options
PU Setup
System Type (from DbSetup)
EM2040C Single Transducer
Pu Ip Address
157.237.20.40
Simulation Mode
Off
External Triggering
Off
Control Port
2000
Enabled Output Ports
Output Port 1,2,3
Output Port 1 (Bathy)
2001
Output Port 2 (Bathy)
2002
Output Port 3 (Sidescan)
2003
ZDA/GGA Serial Port
Port 1 (default)
Use GGA
On
Baudrate ZDA/GGA
9600
Program Options
Start Pinging when QINSy Starts
Pinging On Startup
Synchronize Clock Interval(min.)
60
Sound Velocity Mode
From SoundVelocity C
Sound Velocity Observation
Sound Velocity
Popup window when error occurs
On
Allow HD beamspacing with Water Column Data
Not Allowed
Installation Parameters
RX1 Gain Offet
0
RX2 Gain Offet
0
Head1 Installation angles from
EM2040C
Head2 Installation angles from
Not Used
Velocity Sensor Number
Motion Sensor 1
Velocity Sensor UDP Port
3001
Velocity Sensor Ethernet Port
Ethernet Port 2 (if available)
Ethernet Port 2 IP Address
192.168.1.1
Ethernet Port 2 IP Mask
255.255.0.0
OK
Cancel

APPROVAL PAGE

W00451

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Processed survey data and records
- Geospatial PDF of survey products

The survey evaluation and verification has been conducted according to current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

MCGOVERN.MEGHAN.ELIZABETH.1284020495 Digitally signed by MCGOVERN.MEGHAN.ELIZABETH.1284020495 Date: 2020.01.23 09:19:47 -05'00'

Approved:____________________________________

Commander Meghan McGovern, NOAA
Chief, Atlantic Hydrographic Branch