

SonarWiz Single-beam Reference

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1 Introduction - SonarWiz Single-Beam

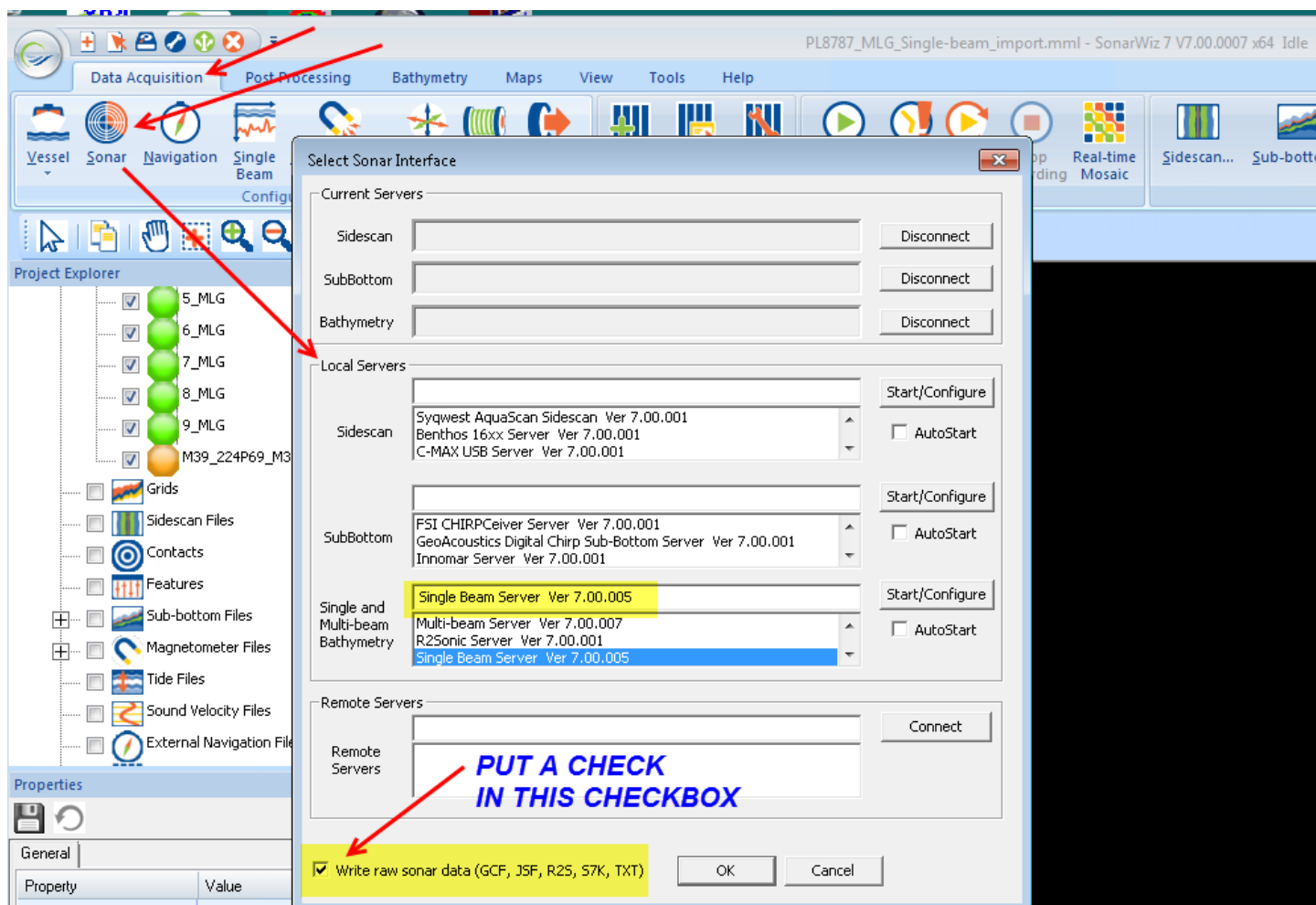
Single-beam recording and post-processing is now supported in early versions of SonarWiz 7. This document explains the basics of single-beam acquisition and import, as implemented in SonarWiz version 7.00.0009.

2 Single-beam Acquisition

Single-beam acquisition function is licensed much like fathometer acquisition was licensed in SonarWiz 6. If you have **any real-time data-acquisition license**, you will have single-beam and magnetometry acquisition capability too.

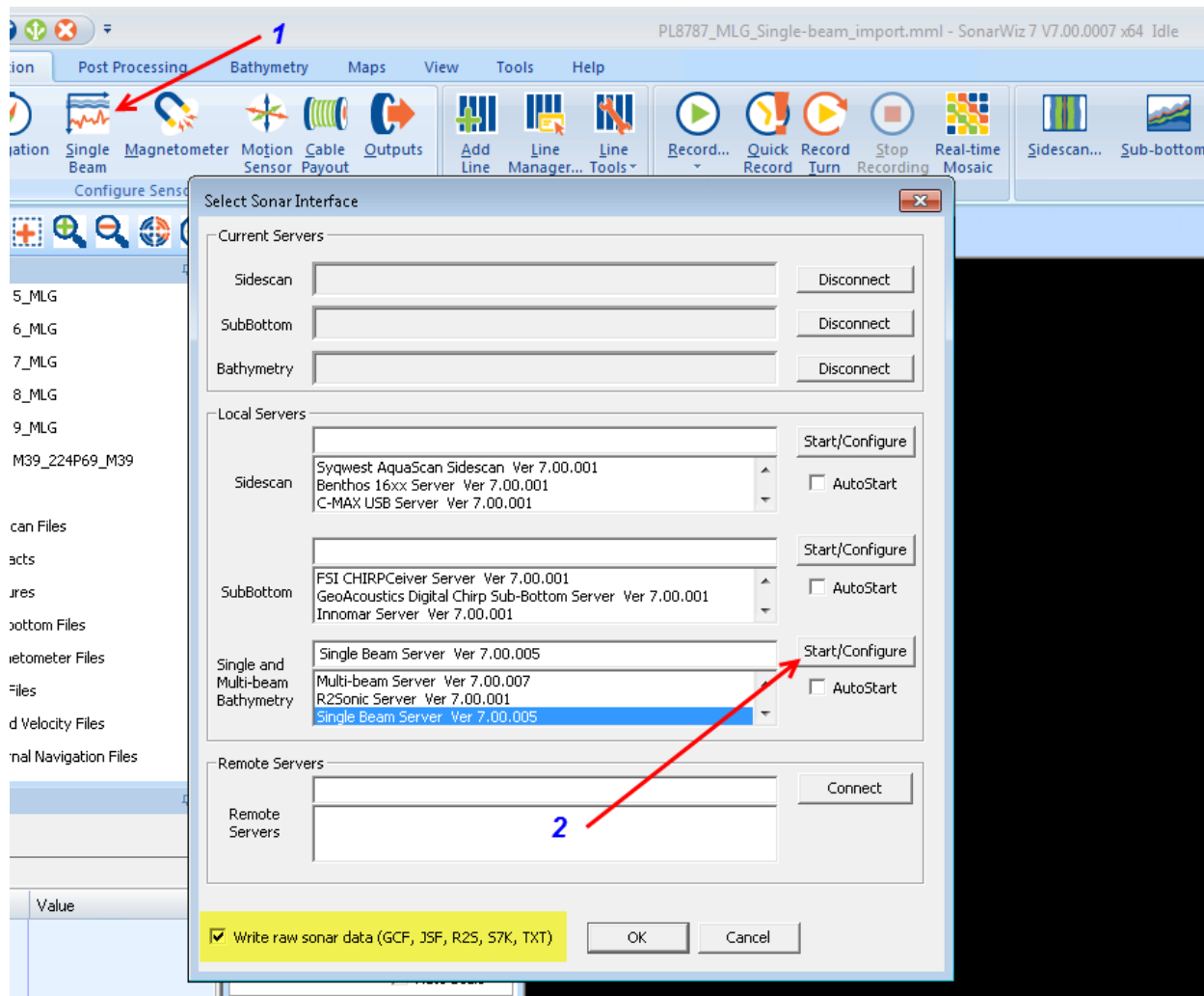
2.1 First Session - select SONAR then enable TXT file recording

For your first single-beam acquisition session, use the Data Acquisition -> Sonar tab to start the single-beam acquisition server, and select to record TXT format files (enable with this checkbox):



Thereafter this enable-TXT-recording checkbox setting will be remembered by SonarWiz in this project, until you install a new version of SonarWiz.

Then to actually start the server, do this:



2.2 Recording Some Data

Then it's good to have navigation enabled and feeding in, then use QUICKRECORD to record a few minutes of data, and verify that it can be imported (see import sections below). The 5 key items you need, to import these types of data and merge the files as bathymetry, are:

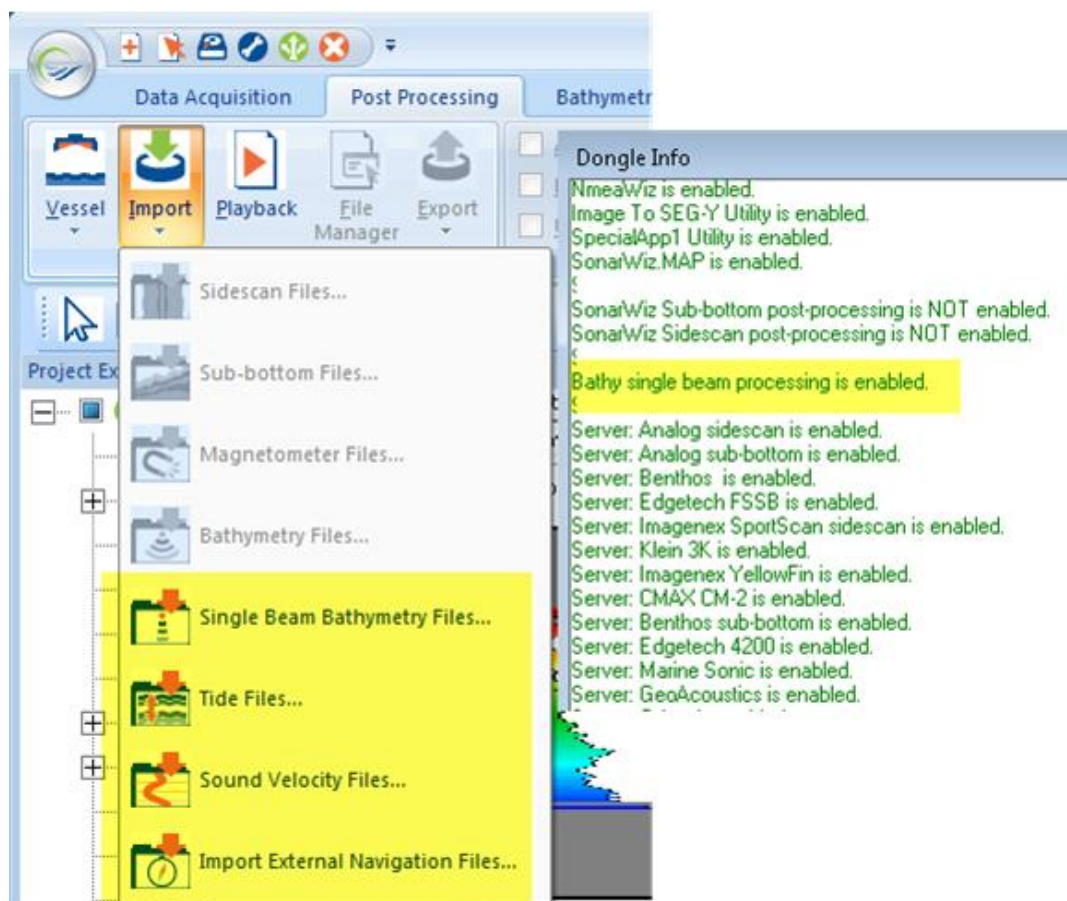
date, time, depth, X position, Y position (or longitude, latitude).

3 Single-beam Post-processing

3.1 Licensing

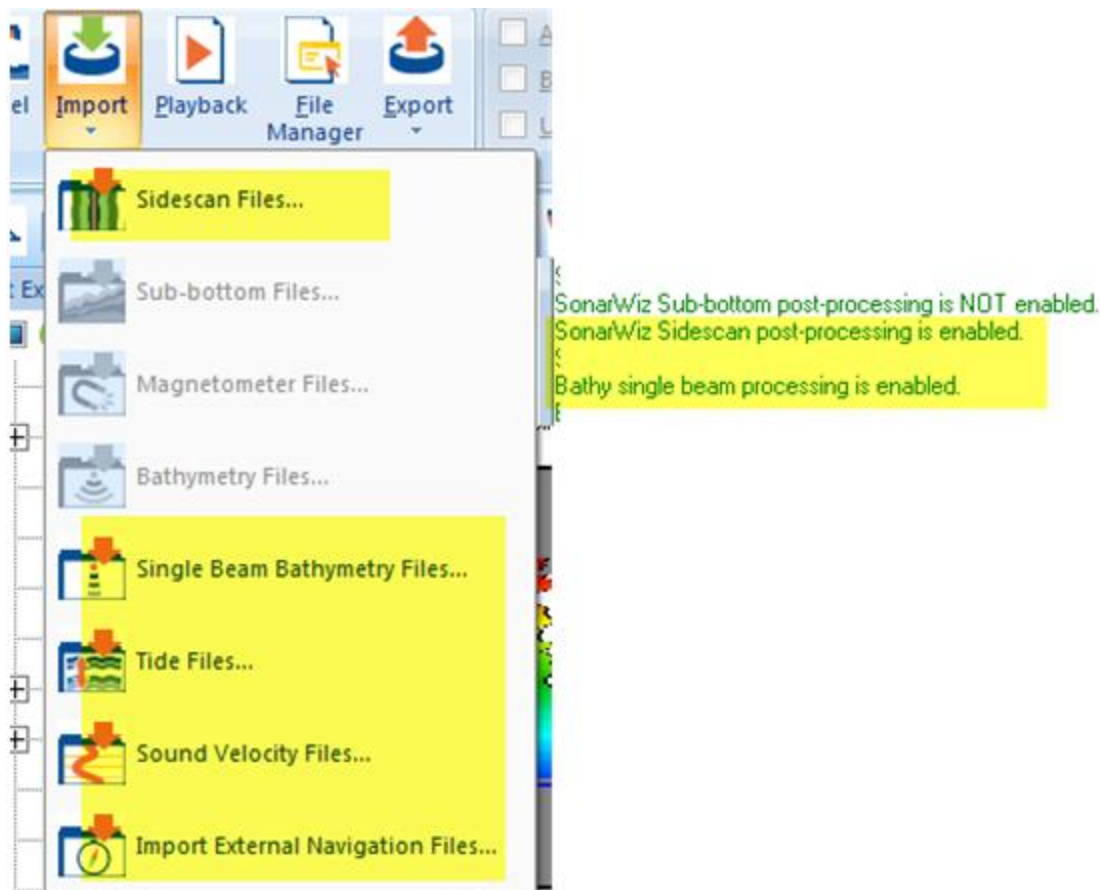
You can purchase SonarWiz with only single-beam post-processing, or add-on single-beam post-processing in addition to any other post-processing or real-time license (e.g. sidescan + single-beam post-processing). Single-beam is incorporated into a bathymetry post-processing license, and no extra charge. You can see if your license key supports it by looking for one of these two indications in your TOOLS -> Dongle Info output text:

Single-beam post-processing direct license shows like this:



On the left, above, you see the post-processing -> import options necessary to import single-beam files: single-beam files, tide and sound-velocity files, and external navigation import. On the right, is shown the Dongle Info when direct single-beam post-processing license has been enabled on your license key.

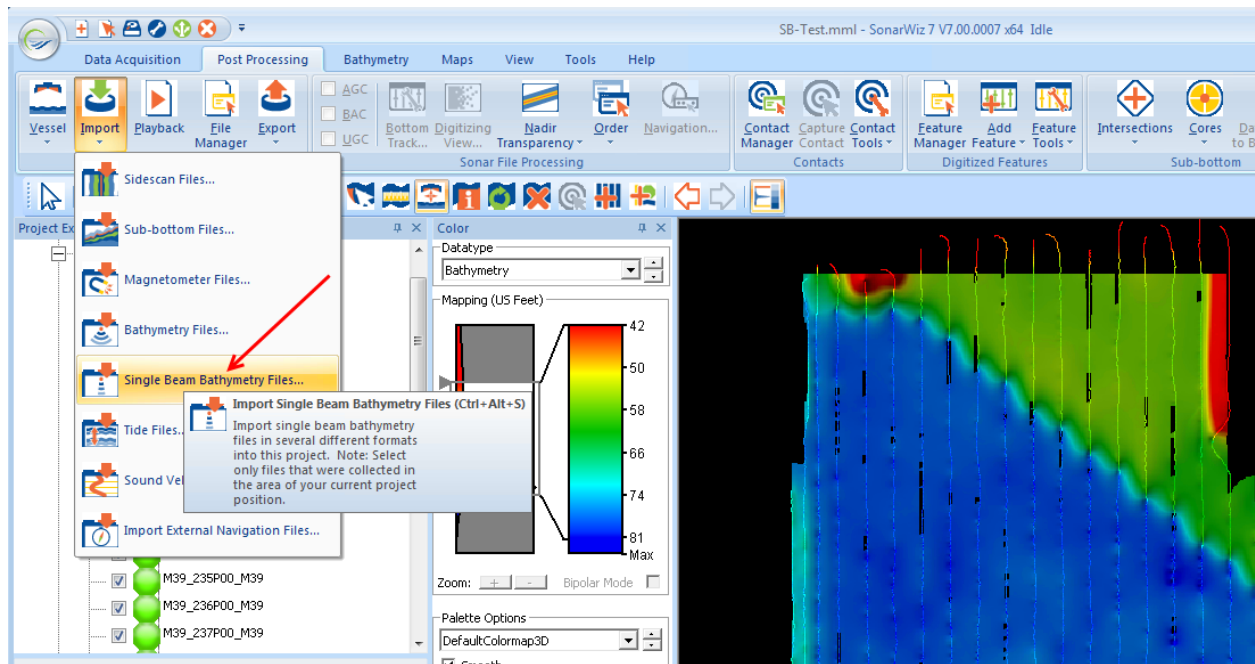
Single-beam post-processing indirect license (supported because bathymetry post-processing is licensed, may show like this:



In this example license, sidescan and bathymetry post-processing are enabled, and the left side shows that single-beam files may be imported too. On the right, you can see that Dongle Info may not call out single-beam post-processing as a supported license, when it is implicit in a bathymetry post-processing license.

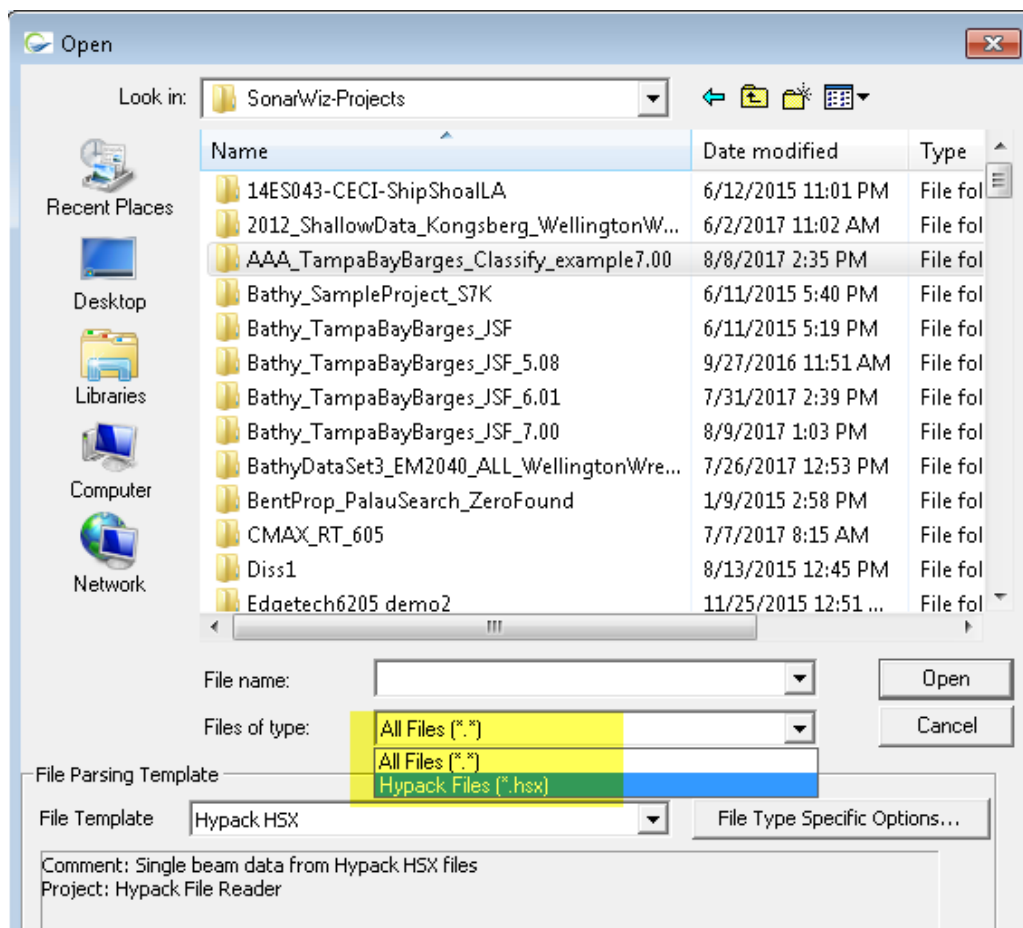
3.2 Single-beam Import Step

Importing single-beam data is currently supported with this post-processing import choice:



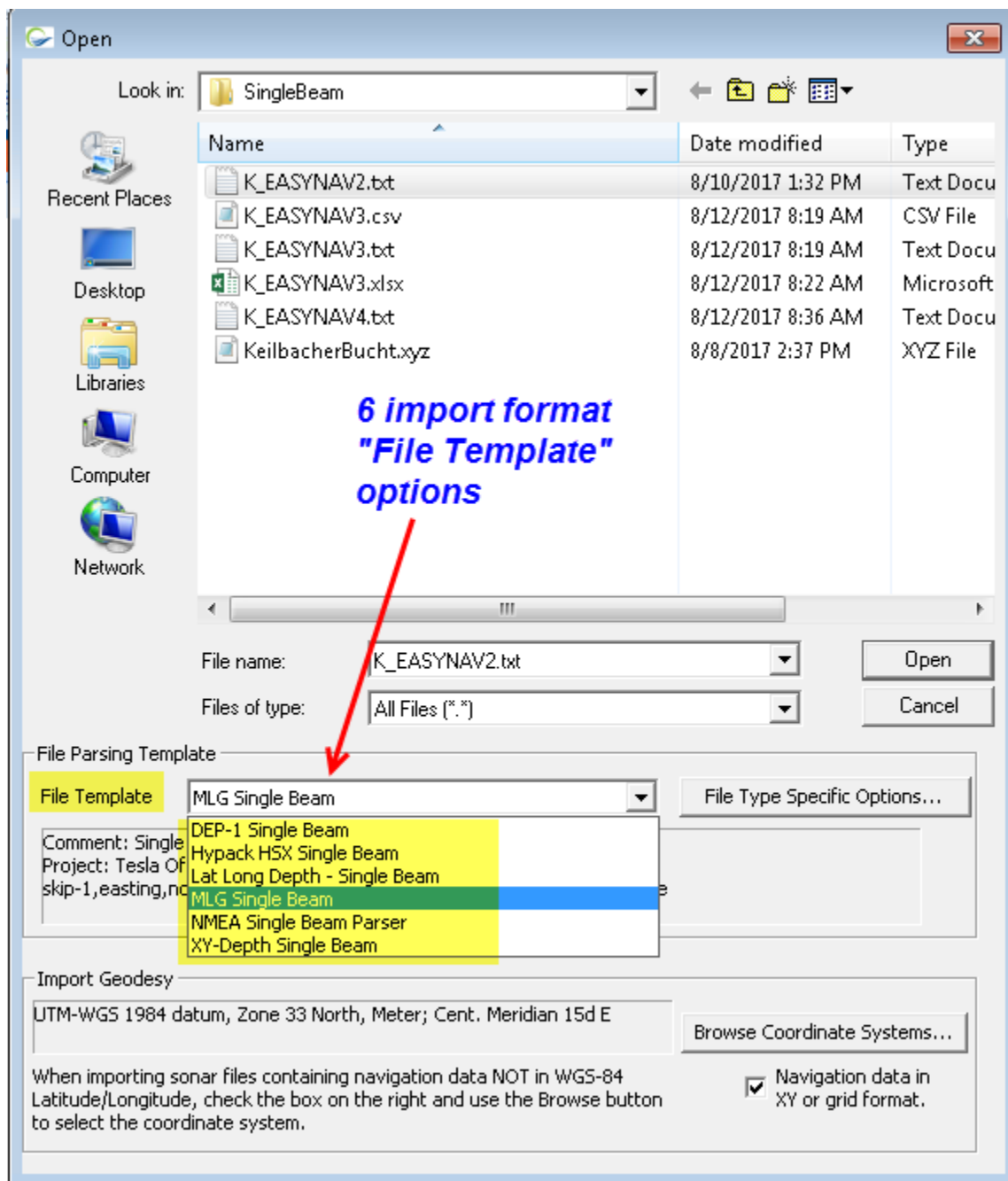
3.2.1 Import File Types

In SonarWiz version 7.00.0008, we currently list 3 import formats for single-beam data, which show as choices in the IMPORT OPEN dialog here:



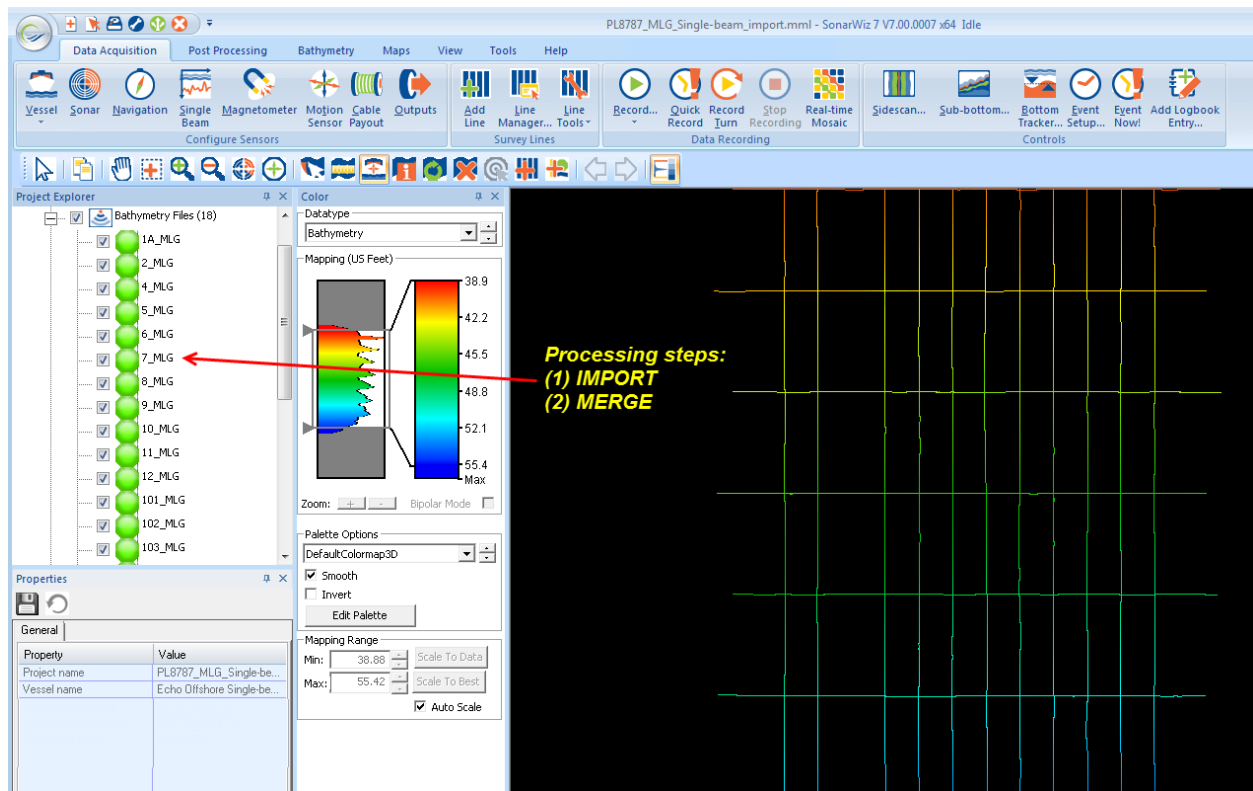
3.2.2 Import Template Choices

After specifying the import file, you select the import format "template":

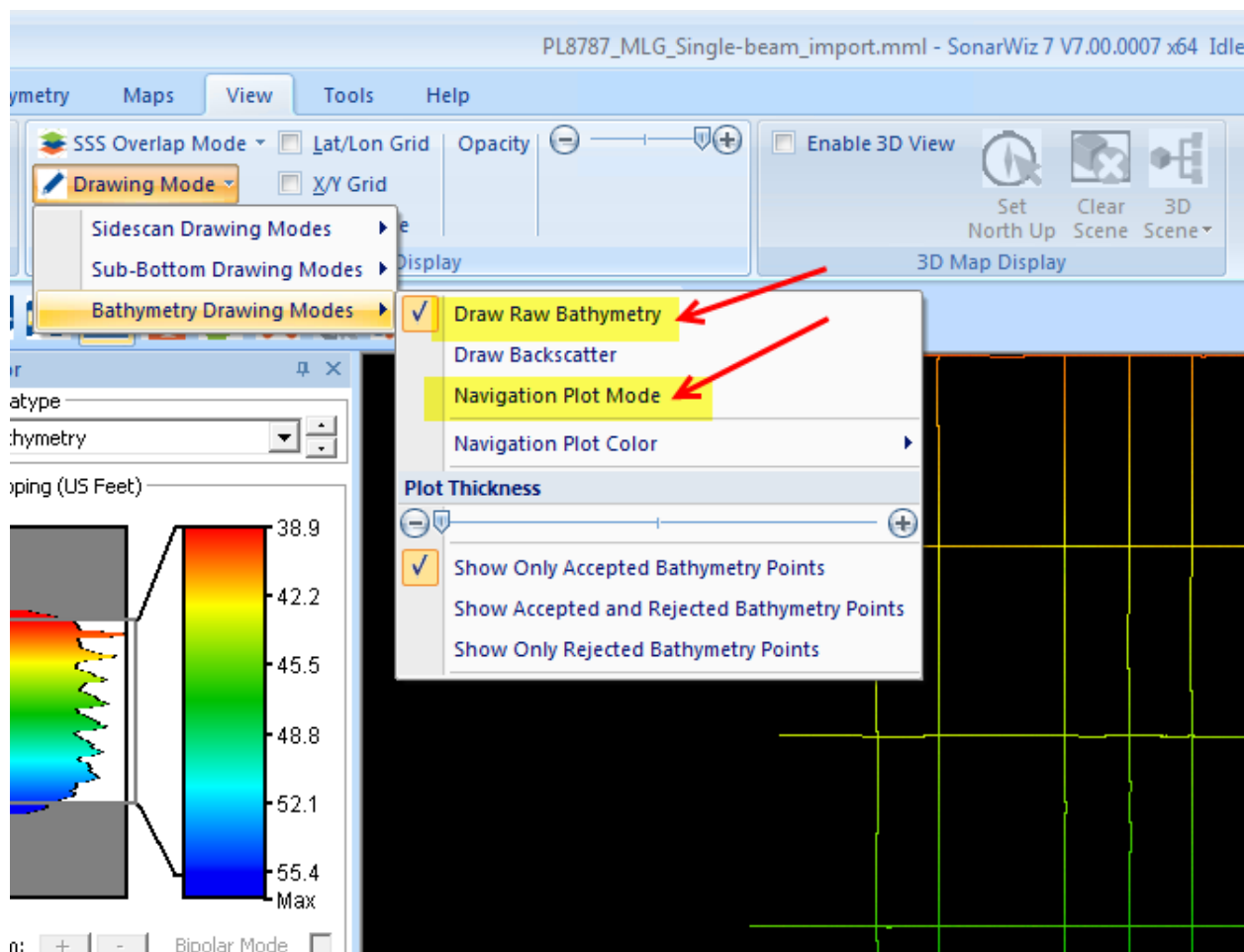


3.3 Single-beam Import Formats Supported

When you import single-beam data, it appears in your Project Explorer as a BATHYMETRY file:



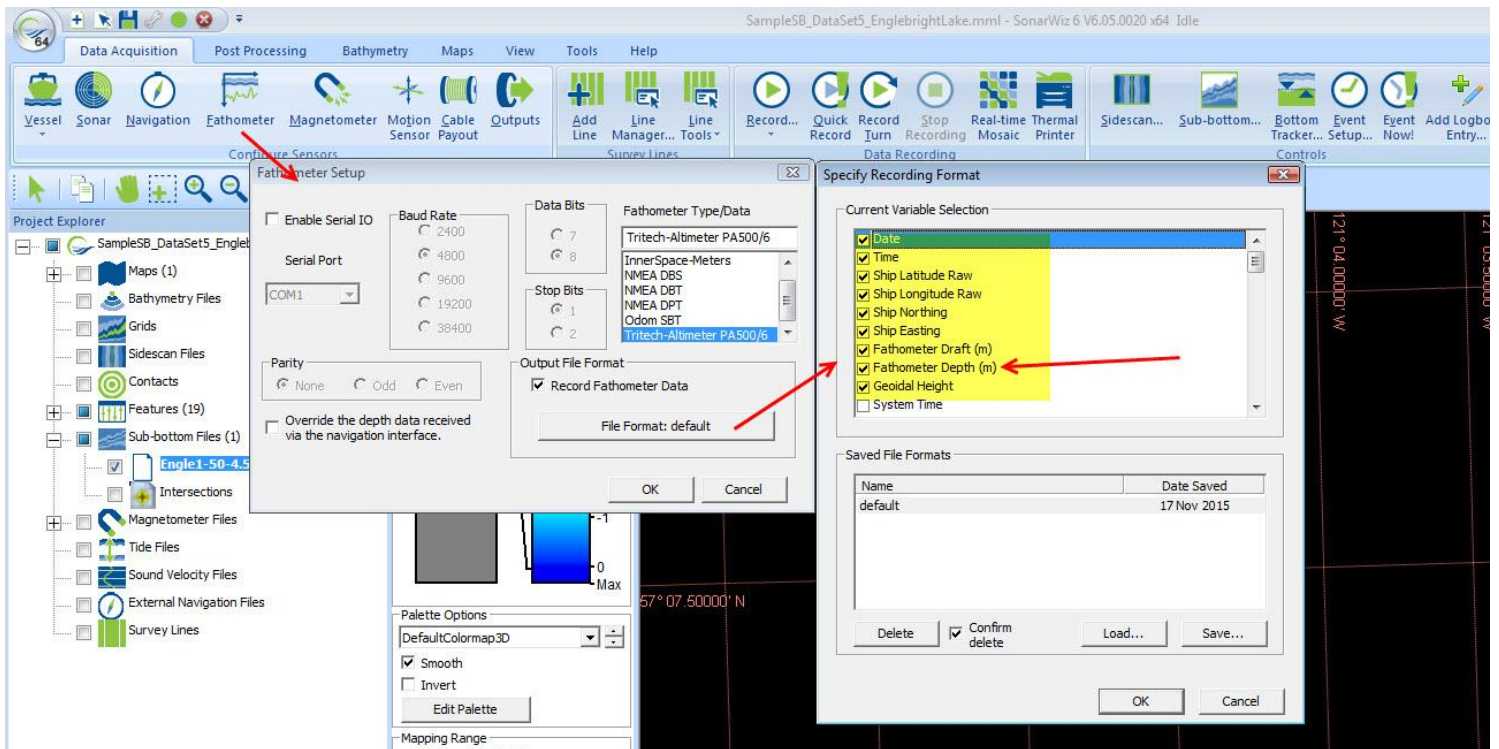
The data may be display using NAVIGATION TRACK or BATHYMETRY view options:



You may create a GRID from the data after you have MERGED it and the status is GREEN in the project explorer (see below, a section about gridding).

3.3.1 DEP-1 format

This format imports DEP files when saved in a particular format by fathometer survey in older versions of SonarWiz:



This particular first DEP format has the following fields.

Example sentence:

08-20-17,15:32:20.16,37.8166124933,-88.8067678883,236850.1,1037735.8,0.000,0.250,-34.00,0.250

Format:

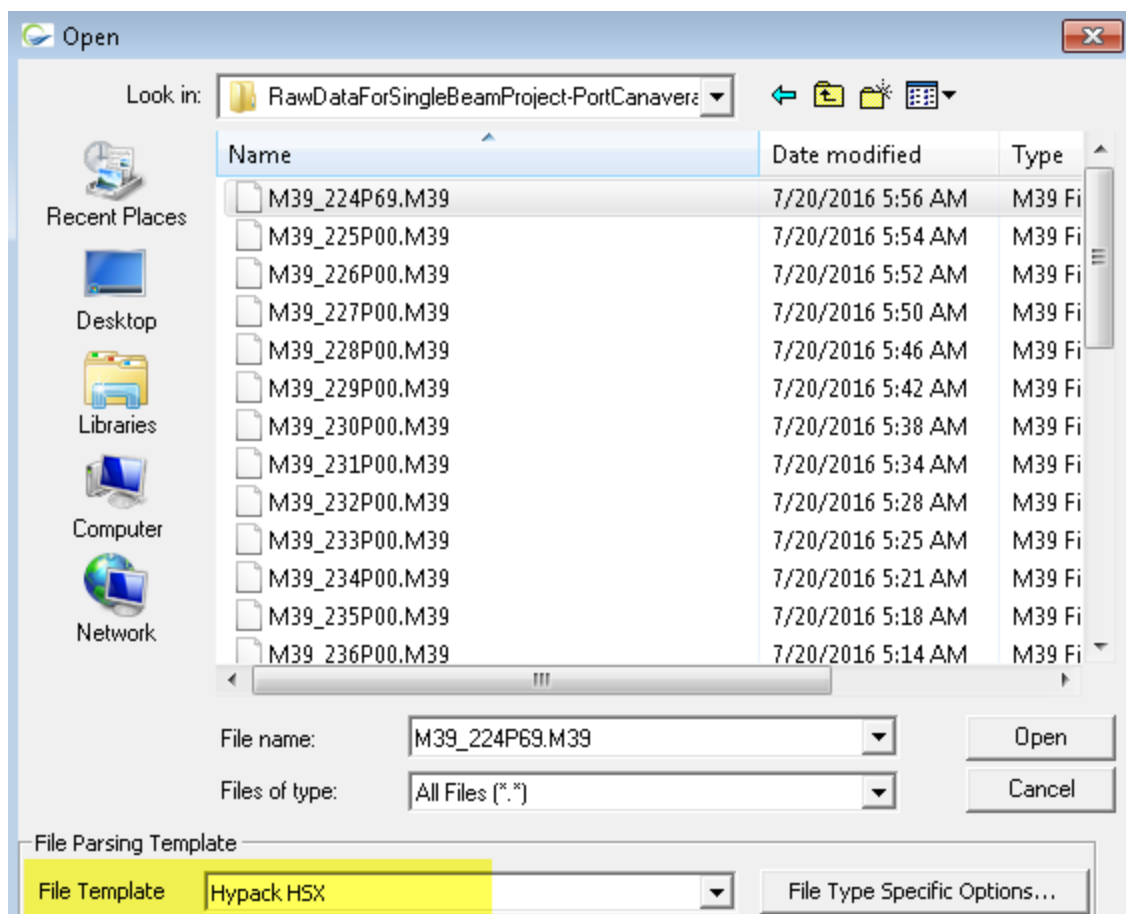
Lines per record: 1
Column name record: None
Initial skip count: 0
Record delimiters: Newline
Number of fields: 10
Fields delimited by: single delimiter character
Field delimiter: comma

Template format details

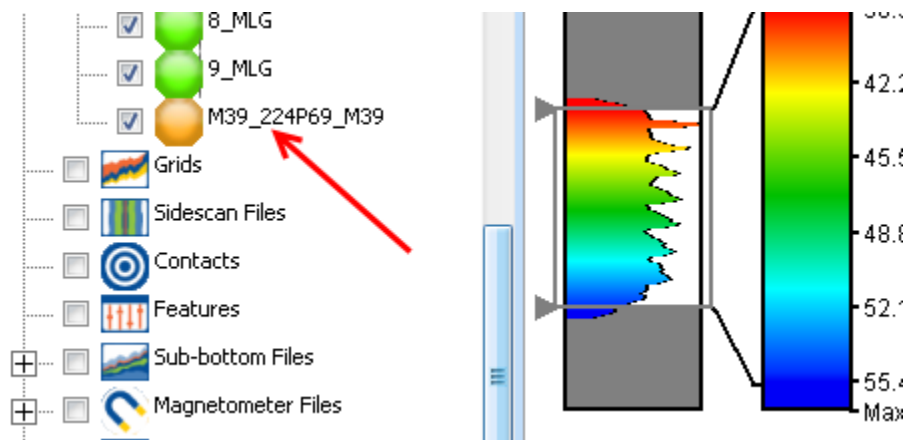
Field	Name	Type	Format
0	Date	Date	MM/DD/YY
1	Time	Time	HH:MM:SS.sss
2	Latitude	Geocoord	DDD.ddd
3	Longitude	Geocoord	DDD.ddd
4	Easting	Geocoord	float
5	Northing	Geocoord	float
6	SKIP	float	0.000
7	Depth	float	0.250
8	SKIP	float	34.00
9	SKIP	float	0.250

3.3.2 HSX Format

This is a coded parser section of SonarWiz, created to read HSX-format files where single-beam data had been saved inside. Import like this:



The status will be ORANGE in Project Explorer:



Then MERGE the file and it will become visible as depth-scaled bathymetry data in the project (very similar to regular bathymetry process).

3.3.3 Lat Long Depth - Single Beam format

This format imports from a simple CSV file:

Example sentence:

37.8166124933,-88.8067678883,12.77

Format:

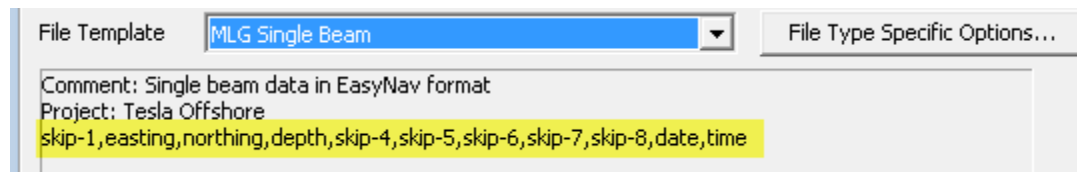
Lines per record: 1
 Column name record: None
 Initial skip count: 0
 Record delimiters: Newline
 Number of fields: 3
 Fields delimited by: single delimiter character
 Field delimiter: comma

Template format details

Field	Name	Type	Format
0	Latitude	Geocoord	DDD.ddd
1	Longitude	Geocoord	DDD.ddd
2	Depth	float	12.77 meters

3.3.4 MLG Single Beam

This format is template-based, and imports data in sentences formatted like this:



Example sentence format:

Fix, SBES X, SBES Y, Water Depth, Mag X, Mag Y, nT, Mag Alt, Fix Interval (in feet), MM-DD-YYYY, HH:MM:SS

Example sentence data:

***,2078027.8,-240744.8,469.6F,2076364.0,-241080.8,46091.814,38.7F,492.1,07-17-2016,19:26:34,80.4

This format was implemented as a demonstration for a QiNSY-based export of CSV data, to be imported as single-beam.

Example file:

```

***,2078027.8,-240744.8,469.6F,2076364.0,-241080.8,46091.814,38.7F,492.1,07-17-2016,19:26:34,80.4,
***,2078034.7,-240743.5,469.5F,2076375.7,-241078.4,46091.802,39.0F,492.1,07-17-2016,19:26:35,80.2,
***,2078041.7,-240742.1,469.5F,2076385.9,-241076.3,46091.691,39.9F,492.1,07-17-2016,19:26:36,80.1,
***,2078048.7,-240740.9,469.5F,2076394.5,-241074.5,46091.531,39.9F,492.1,07-17-2016,19:26:37,80.2,
***,2078055.5,-240739.8,469.5F,2076402.2,-241072.8,46091.455,40.0F,492.1,07-17-2016,19:26:38,80.4,
***,2078062.4,-240738.7,469.5F,2076409.3,-241071.3,46091.365,39.9F,492.1,07-17-2016,19:26:39,80.3,
***,2078069.3,-240737.4,469.9F,2076416.3,-241069.9,46091.144,39.8F,492.1,07-17-2016,19:26:40,80.2,

```

The only fields imported and used are easting, northing, depth, date, and time. All other fields are read in, but skipped (ignored).

3.3.4.1 Units Information

- 1) The suffix on the depth value indicates the units where 'M' = meters, 'F' = Fathoms, 'f' = feet.
- 2) The code that converted the depth value from meters to a range in seconds uses down and back time that the bathy engine needs.
- 3) The template parser now (7.00.0008 and later) considers the units flag and applies the correct scalar to put the data in metric units internally.

3.3.4.2 Format Tips

Please use COMMA separator, and have NO header line - just data lines in the file, else START TIME and END TIME will not be parsed properly, and the import may work, but the line will not MERGE as bathymetry data.

3.3.5 NMEA Single Beam Parser

This format supports import of TXT files containing NMEA-0183 messages like DPT or DBT. Examples to follow soon.

3.3.6 XY- Depth Single Beam format

This format imports from another simple CSV file:

Example sentence:

236850.1,1037735.8,12.77

Format:

Lines per record:	1
Column name record:	None
Initial skip count:	0
Record delimiters:	Newline
Number of fields:	3

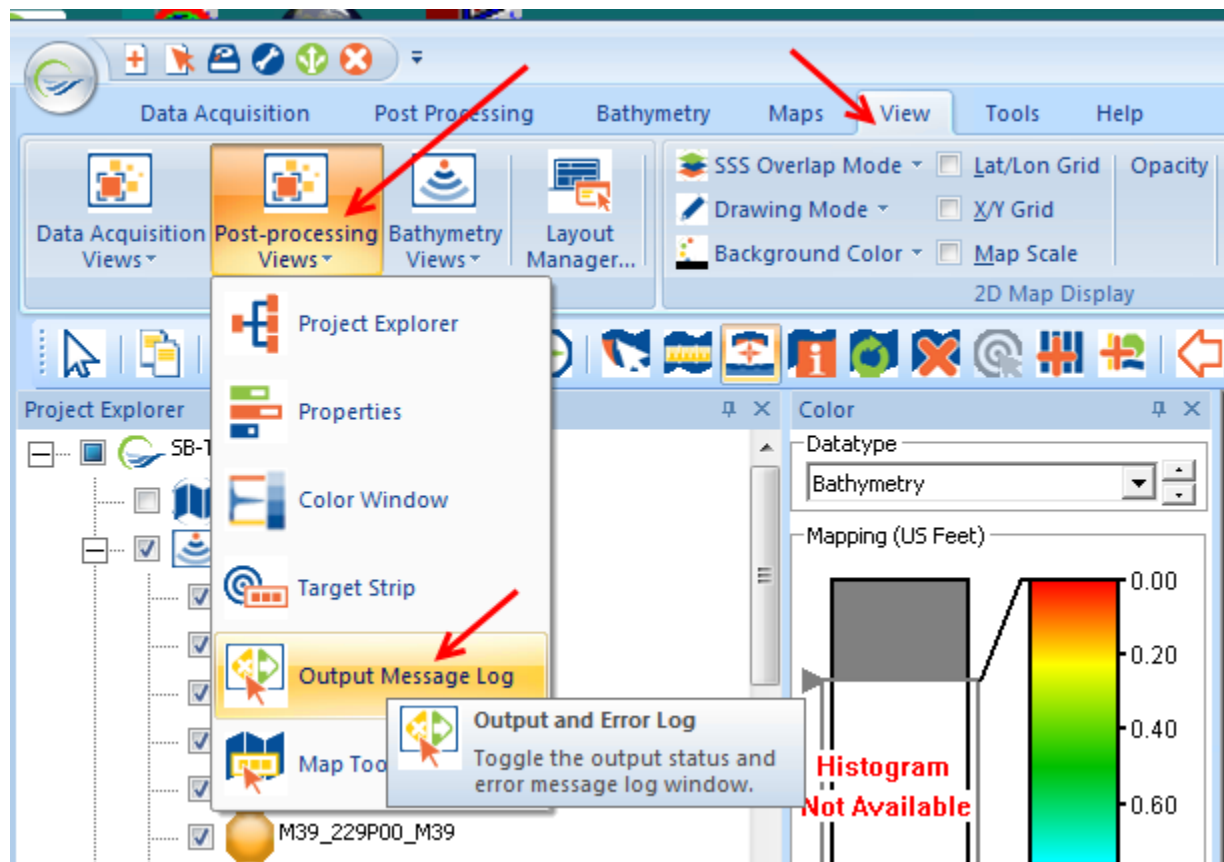
Fields delimited by: single delimiter character
 Field delimiter: comma

Template format details

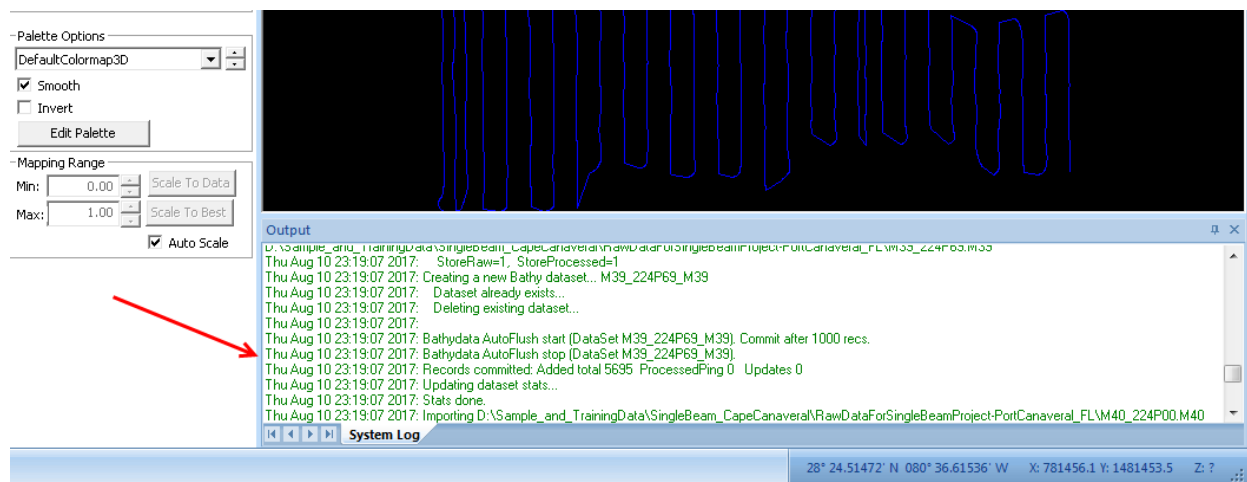
Field	Name	Type	Format
0	Easting (X)	Geocoord	float
1	Northing (Y)	Geocoord	float
2	Depth	float	12.77 meters

4 Import Results

If all goes well, your import worked, but watch the OUTPUT MESSAGE LOG for red error messages. This is an optional GUI section you can enable using View -> Post-processing Views -> Output Message Log like this:

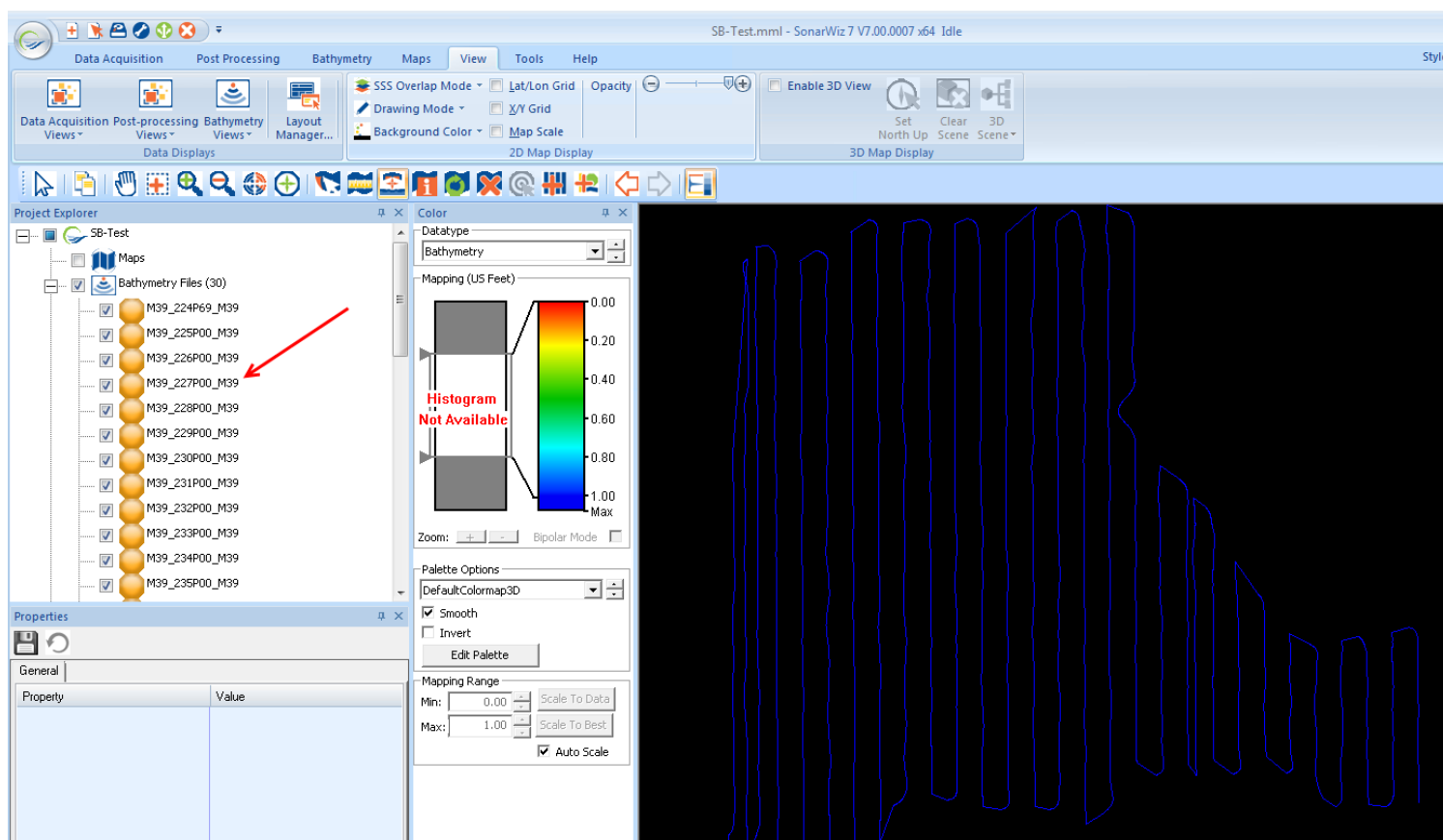


Looking at these English language message will give you, and the support team, a helping hand understanding what went wrong, in case there are any red error messages showing here (mine is docked below the map view):

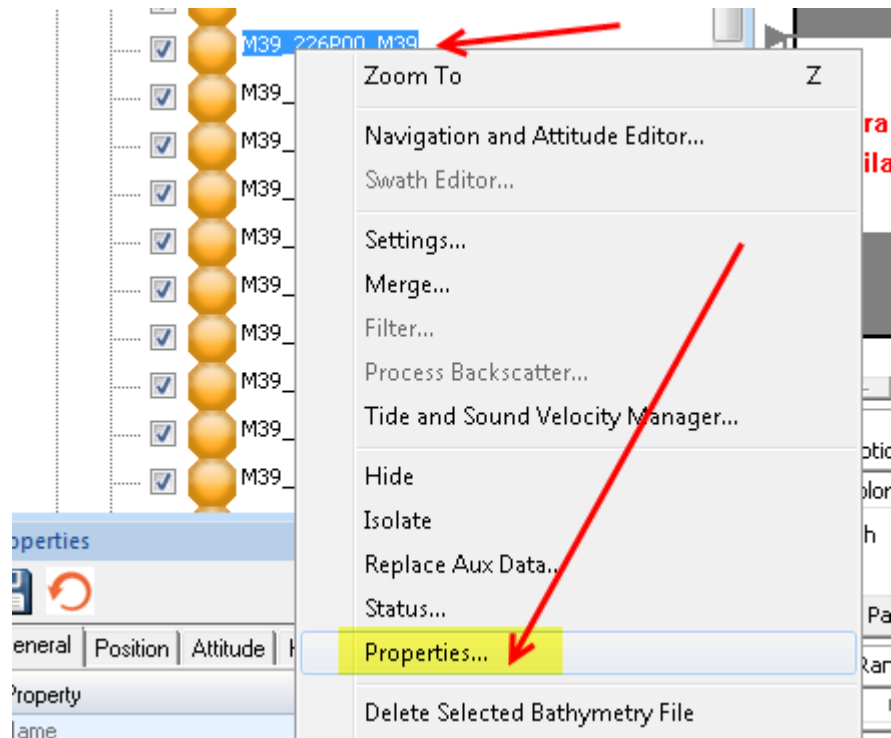


4.1.1 Project Explorer View - ORANGE status imported bathymetry files

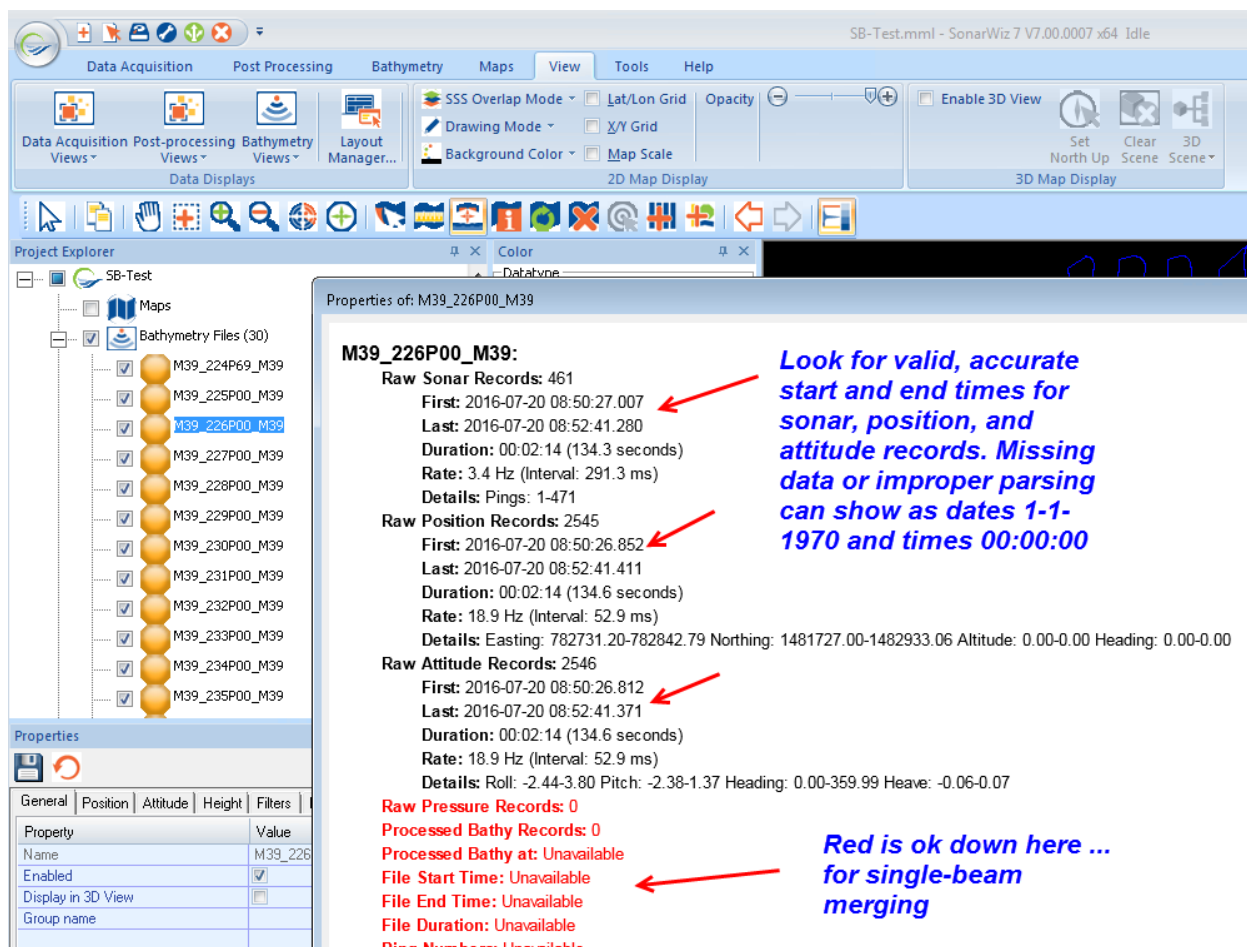
Here's the set of Cape Canaveral files (30) imported but not yet merged:



Your map view will show navigation tracks, because there's nothing else to show yet. But check the PROPERTIES of a few lines to see if they will likely merge. Right-click on a line in the left-side Project Explorer and select PROPERTIES:

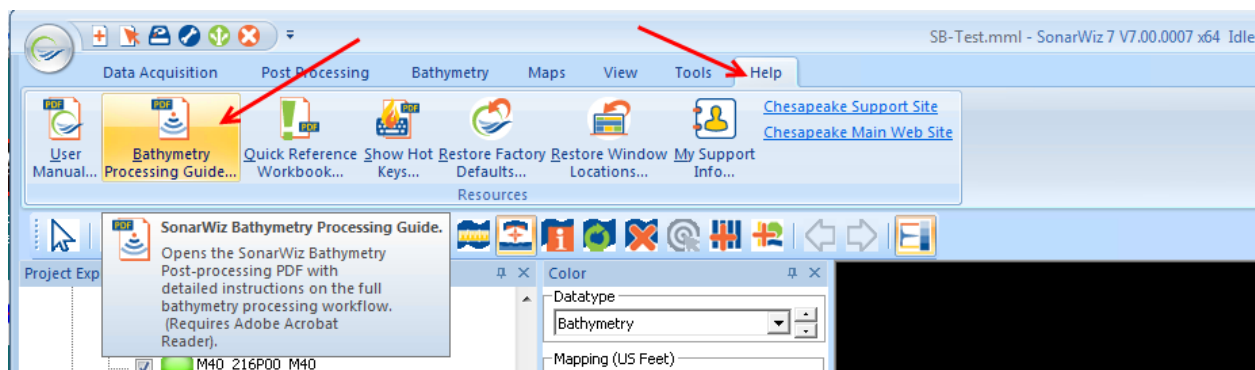


What to look for here ... no RED sections at the top, or missing/invalid date/time data:



5 Data Adjustments - Vessel Definition and MERGE Operation

Single-beam data has 2 main characteristics, position and depth. But the rest of the project can contribute depth and position adjustments, using the basic bathymetry settings, sound-velocity, and tide adjustment options. For process workflow, other than what you read here, please refer to the Bathymetry Processing Guide available under these GUI buttons:

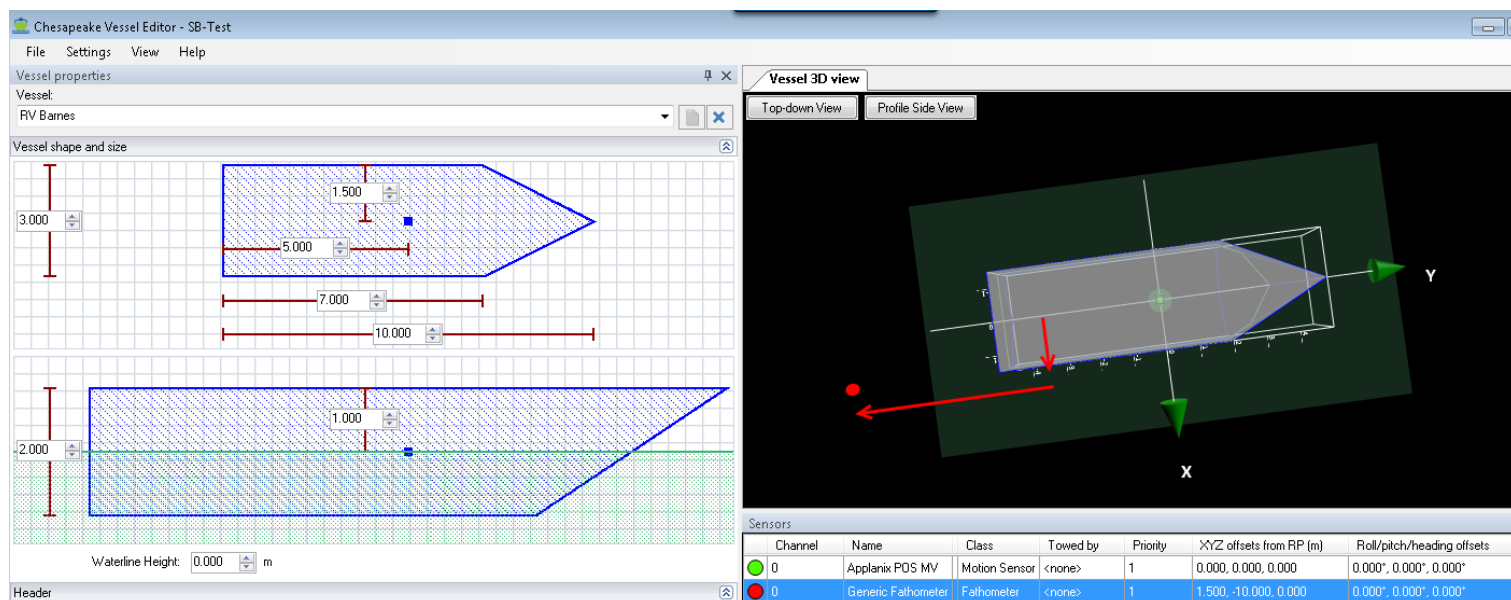


Use bathymetry process information from the Bathymetry Processing Guide to make adjustments for sound-velocity and tides for your single-beam project. The depth data of single-beam after import are much like bathymetry data, in that the same merge operation is done to integrate settings, filters, sound-velocity, and tide effects, to adjust the depth values.

5.1 Position Adjustment - Vessel Definition and Layback Options

You should define the single-beam sensor for your project in the VESSEL EDITOR and save it, before merging your data. The basic sensor to add in a single-beam project is a single-beam fathometer - and generic is fine to use. The key definition here is sensor position with respect to the reference point of the vessel, and the GPS position.

If you define no GPS sensor, its position is inferred to be the reference point (RP) of the vessel. Then offsets for X,Y,Z in the single-beam sensor will be offsets relative to the GPS antenna position. Here's a good example vessel to use to consider the starboard/port positioning of the single-beam sensor - showing positive and negative values and what they mean ... very similar to a layback sheave-offset definition for earlier SonarWiz sidescan layback computations:



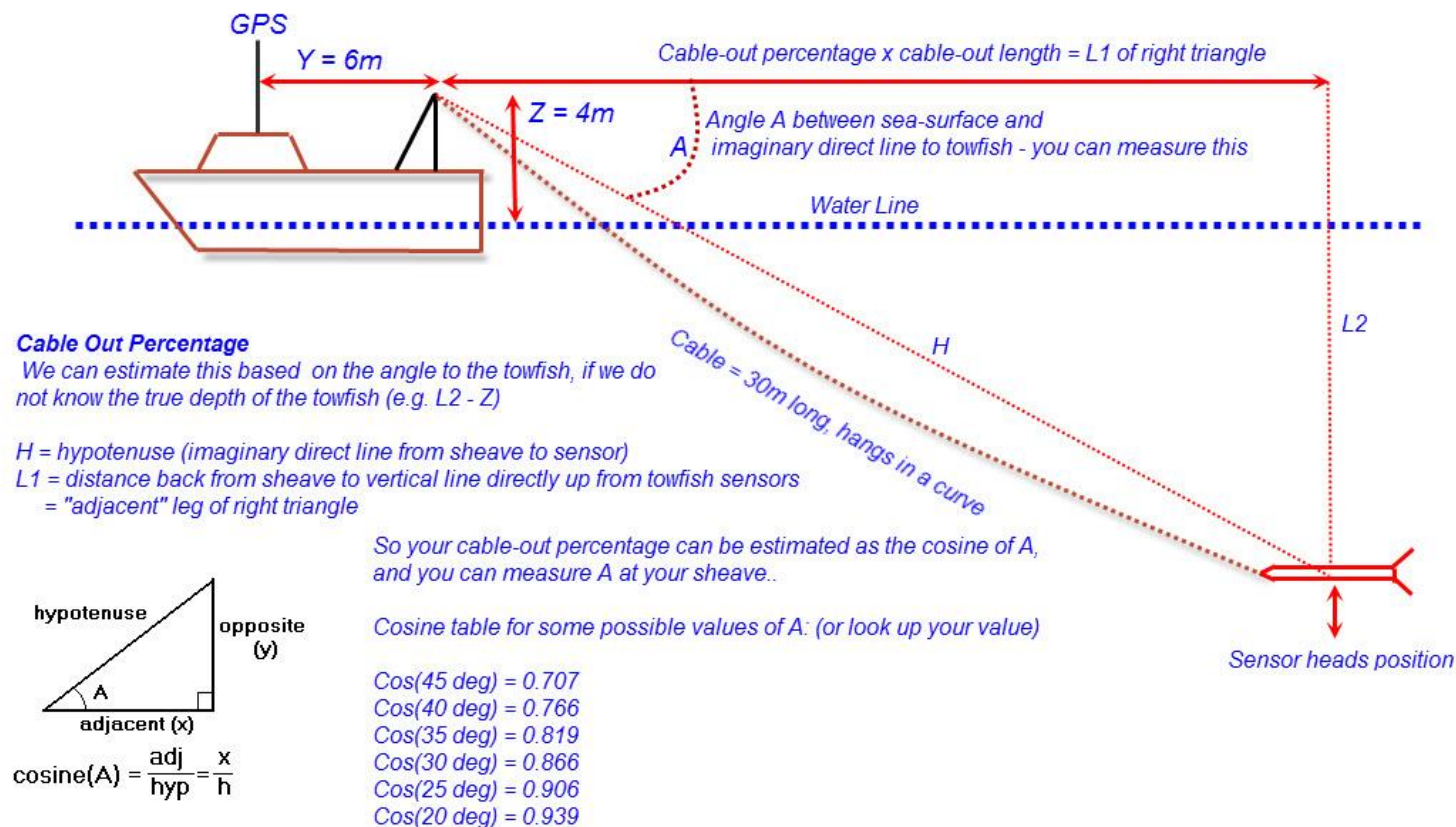
This example single-beam sensor is defined as a generic fathometer, and is positioned at:

X= 1.5m (starboard from the GPS antenna) and

Y = -10.0 m (trailing behind GPS antenna by 10m, like layback).

You need to compute your own layback here, if the single-beam sensor is on a cable. Use the same math we use for sheave-offset and compute a percent cable-to use as a layback (Y value).

Cable Out - Layback - Cosine-Estimation Diagram, Rev 1.0 1/14/2016



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When you decide what value of Y to use, just put it into your vessel definition as a NEGATIVE value - e.g. a single-beam sensor on a cable trailing 30m behind the boat means use Y = -30.0 m for the vessel Y value.

5.2 Depth Adjustment Options

5.2.1 Depth - Waterline and Z value Adjustments

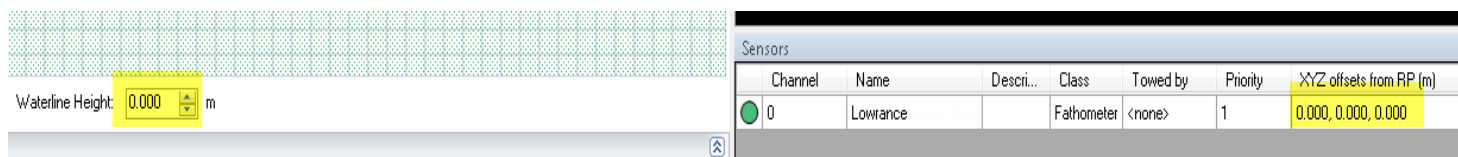
When you define the single-beam sensor for your project in the VESSEL EDITOR and save it, before merging your data, you should carefully set WATERLINE and Z values for the fathometer sensor. Overall the water-depth = sensor depth (Z) BELOW waterline, plus altitude.

If they are both 0.00, no adjustment occurs. If one or the other is NOT at the reference point, make adjustments so that the correct difference between the WATERLINE and Z is made, to set sensor depth below waterline. This depth-below-waterline is then added to the sensor altitude as recorded in the single-beam numbers, and gives you the water depth.

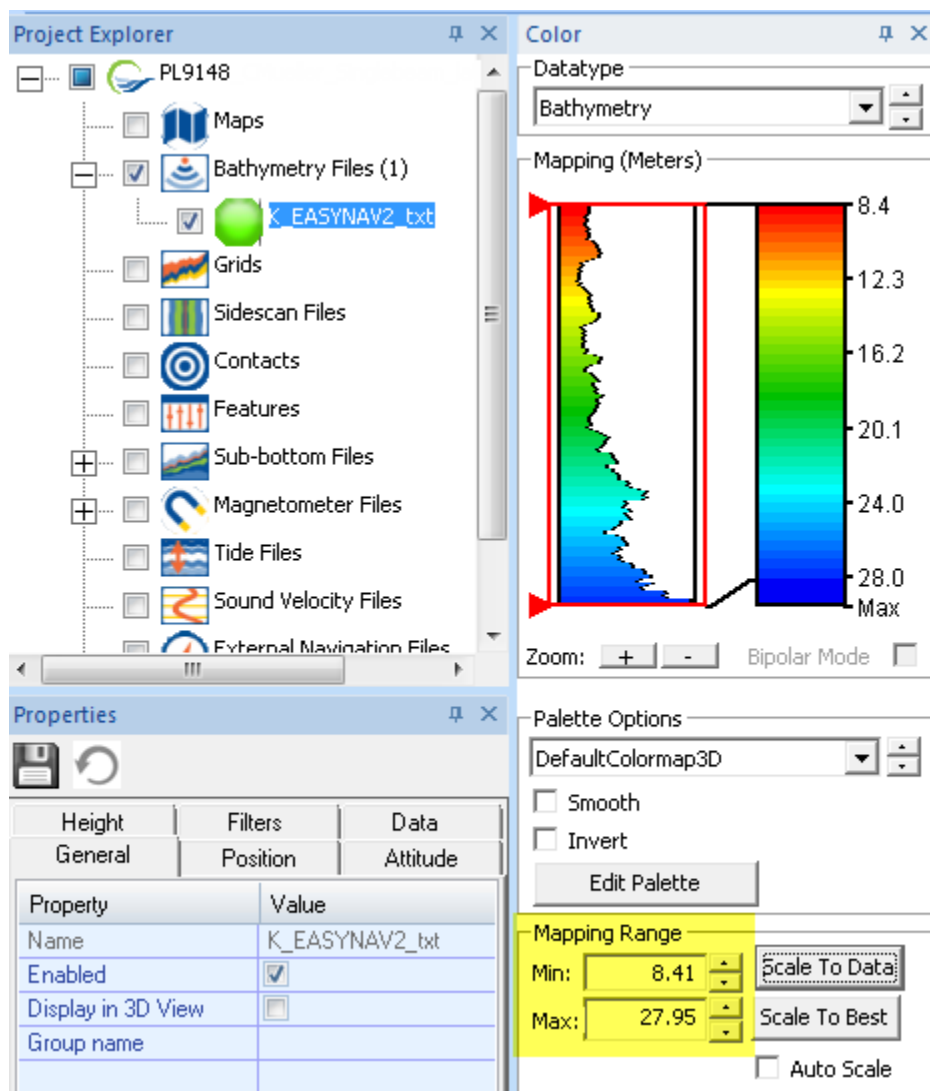
5.2.1.1 Example 1: Z and Waterline effects - equal values 1

Data depth range (in file) = 8.41M - 27.95M. Waterline = 0.00M Z = 0.00M

Vessel is set up like this:



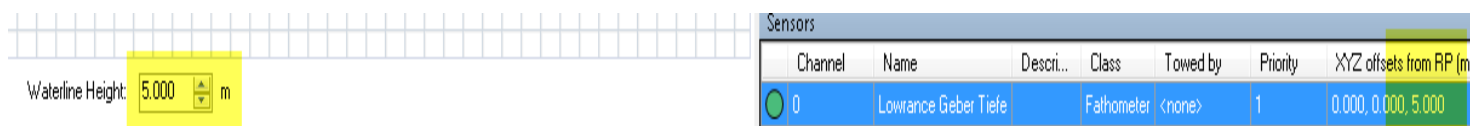
Resulting MERGE then SCALE TO DATA in Color Window for single-beam file looks like this:



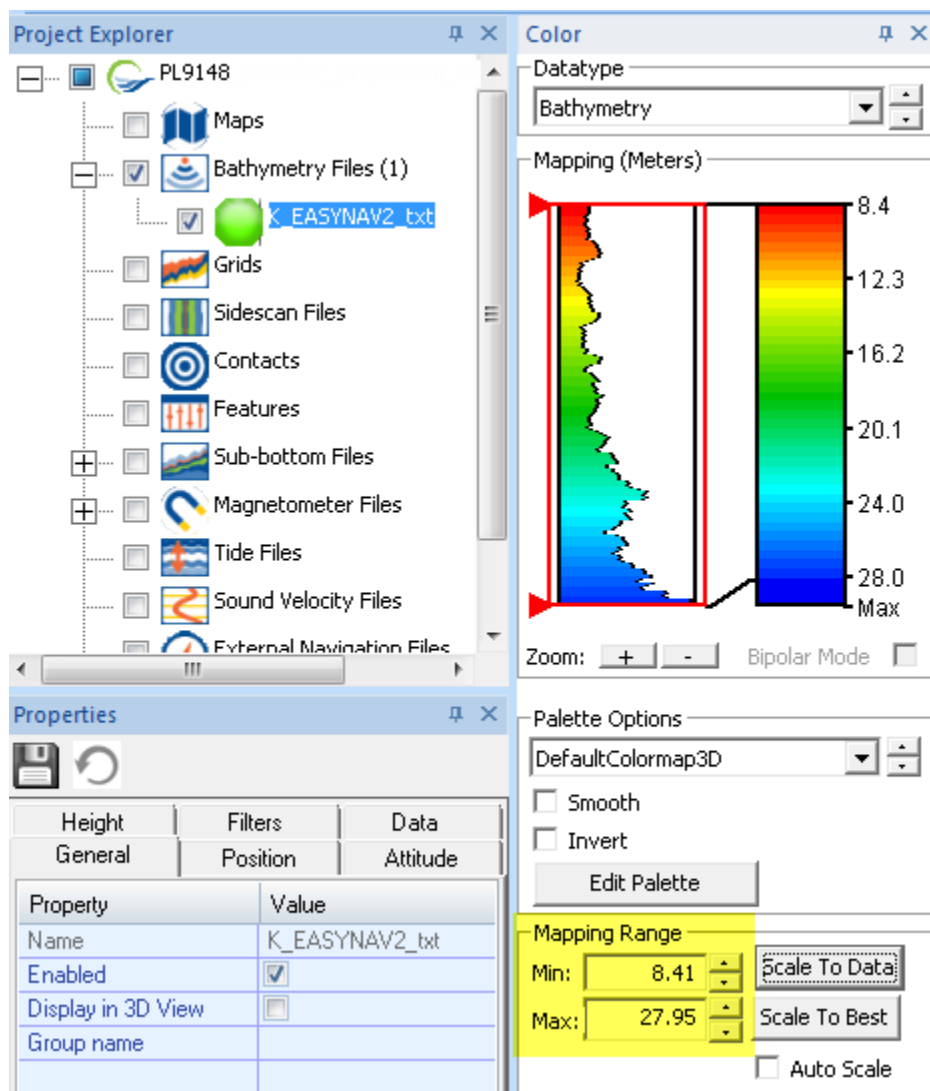
5.2.1.2 Example 2: Z and Waterline effects - equal values 2

Data depth range = 8.41M - 27.95.0M. Waterline = 5.0m Z = 5.0m

Vessel is set up like this:



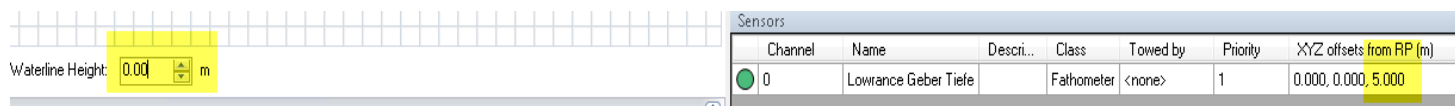
In this example, waterline and Z are both 5m from the reference point, but since they are equally far away, the overall data depth does not change:



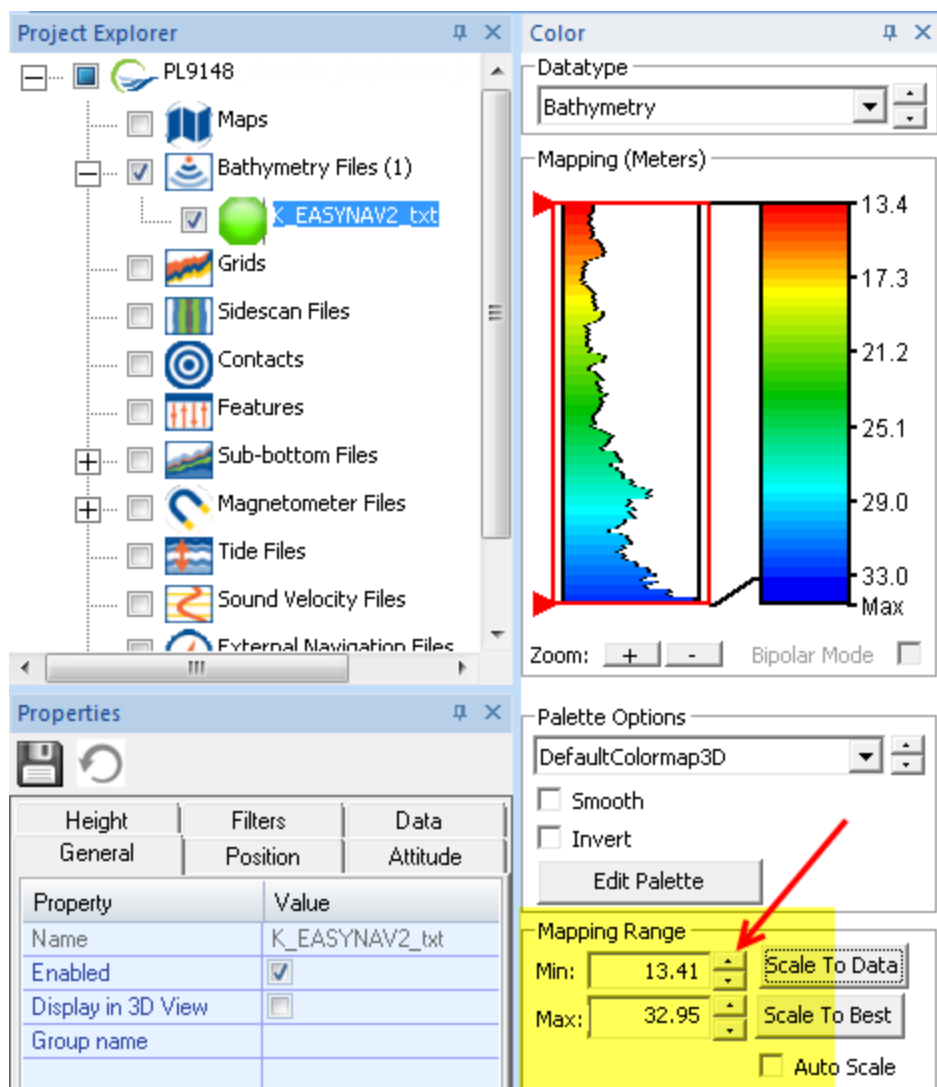
5.2.1.3 Example 3: Z and Waterline effects - different values 1

Data depth range = 8.41M - 27.95M. Waterline = 0.00M Z = 5.0M

Vessel edit values:



Data Depth viewed in Color Window after merge:



Here the effect of adding $Z = 5.0$ can be seen in the resulting depth numbers in the data ... 5m deeper.

5.2.1.4 Example 4 - Water level = 3.0m and Z=5.0m

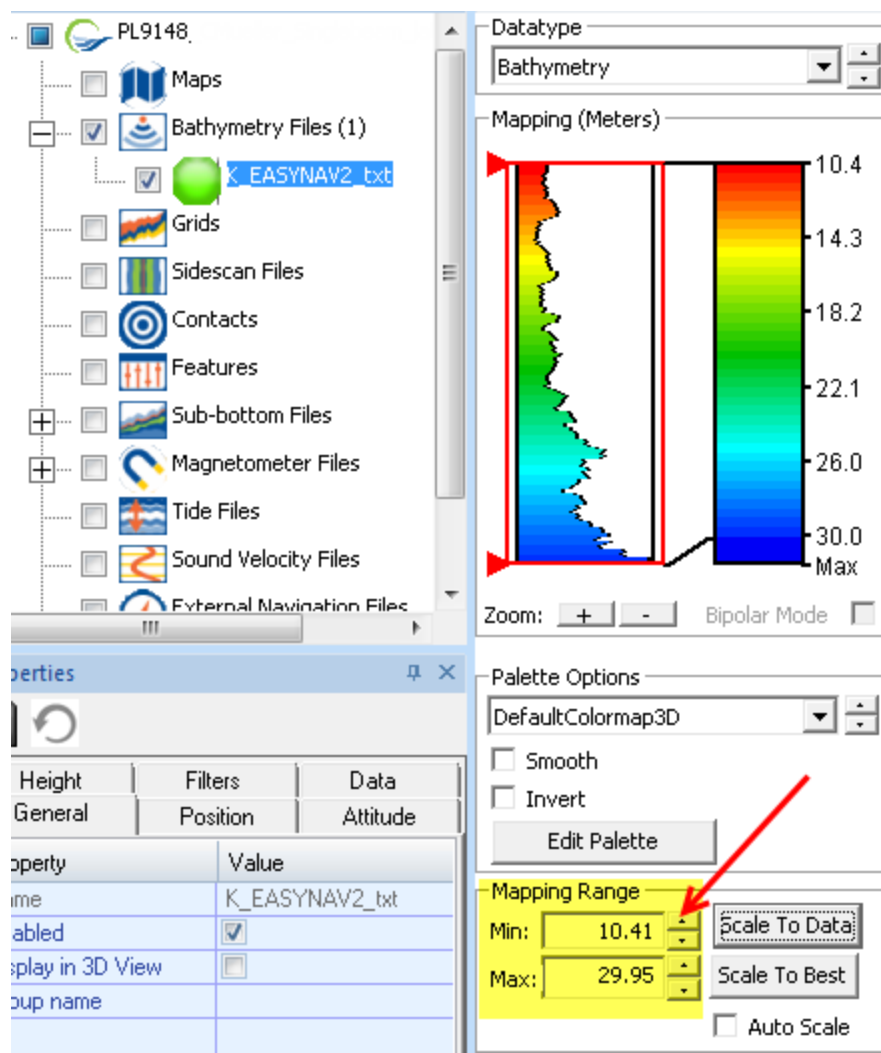
One more example will help. What if water level is 3m below the reference point, and Z is 5m below the reference point? What would be the effect on the depth values in the output?

Data depth range = 8.41M - 27.95M. Waterline = 3.0M $Z = 5.0M$

Vessel edit values:

Waterline Height: 3.000 m	Channel	Name	Descri...	Class	Towed by	Priority	XYZ offsets from RP (m)
	0	Lowrance Geber Tiefe		Fathometer	<none>	1	0.000, 0.000, 5.000

Data depth showing after merge:



So you can see that the difference between the waterline setting and Z value matters. If you say the sensor is at Z=5m below RP, but waterline is 3m below RP, the "depth" of the sensor below waterline is 2m and this gets added to the overall data depths in the single-beam data, which are "altitude" depths. Overall the water-depth = sensor depth (Z) BELOW waterline, plus altitude.

5.2.2 Depth - Sound Velocity and Tide Effects

Bring in and apply sound-velocity data and tide to your single-beam project the same way you would for a bathymetry project. You can adjust settings to take these two effects into account when merging.

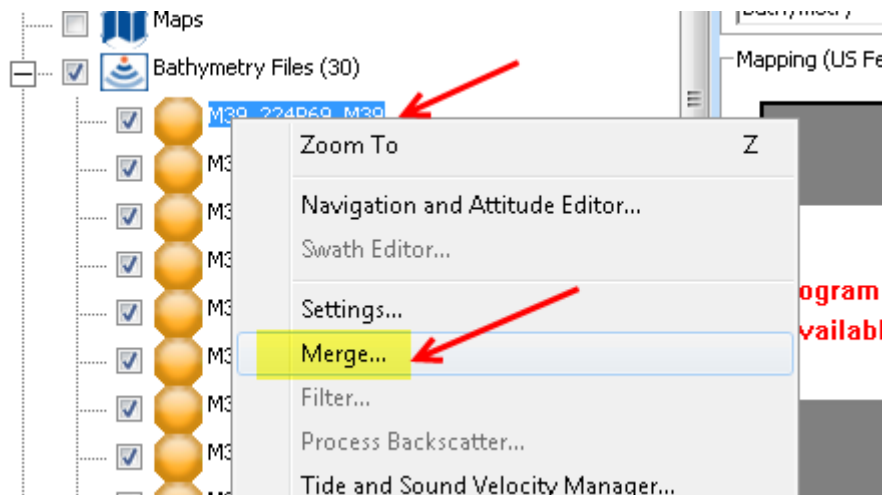
5.3 Digital Filtering

You can adjust all the digital filter settings during the merge step, just as if this was a bathymetry project - like static box filter, dynamic box filter, etc.

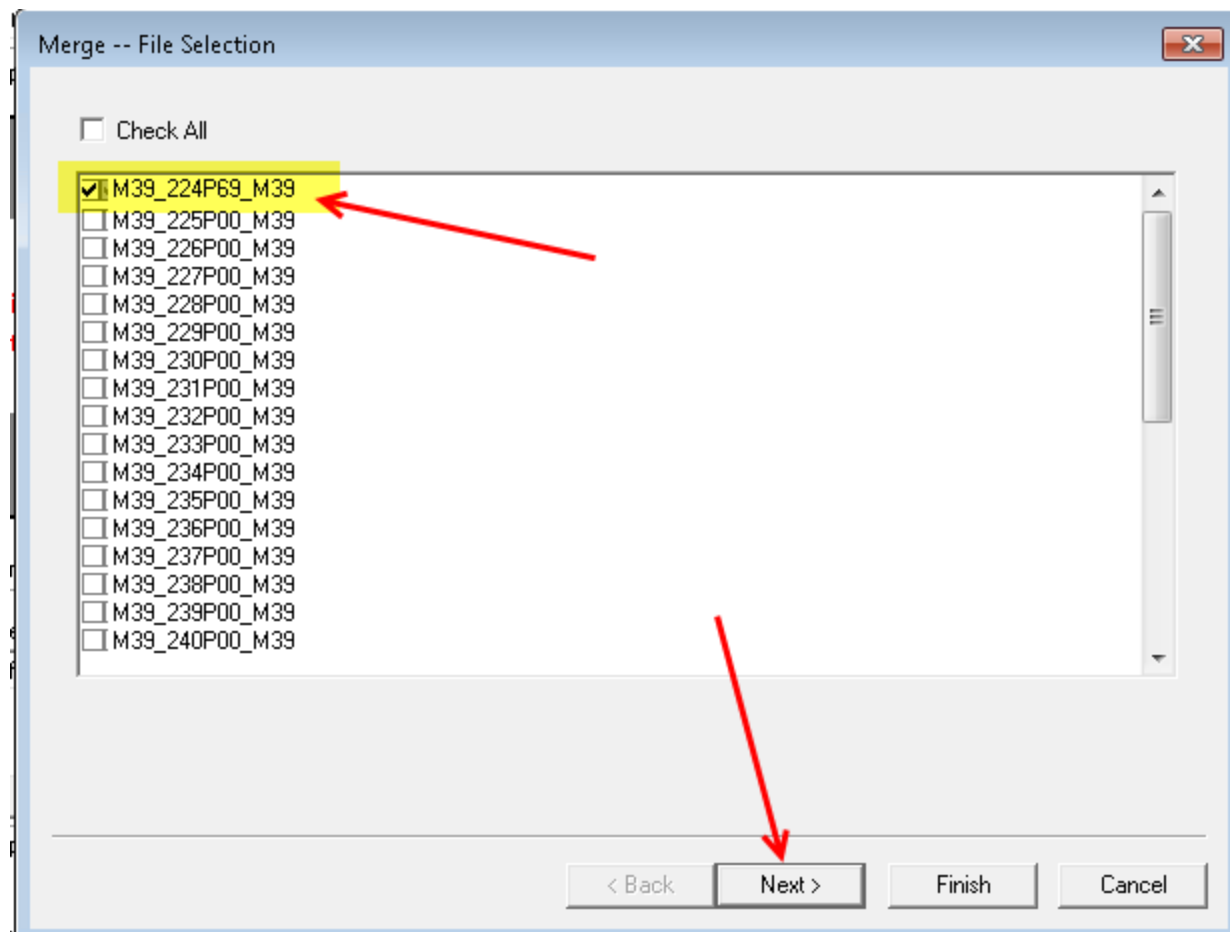
6 MERGE Step in Single-beam Post-processing

This is a major step, where you convert ALL the adjustments defined, into position and depth effects in your single-beam results. You will go through the exact same merge process screen-dialog sequence as if this were bathymetry data process. Here is a set of example merge screen-dialogs from the Cape Canaveral SB-test project:

(1) Right-click a selected line and select MERGE:



(2) In the next dialog, select a line to merge, and click NEXT:



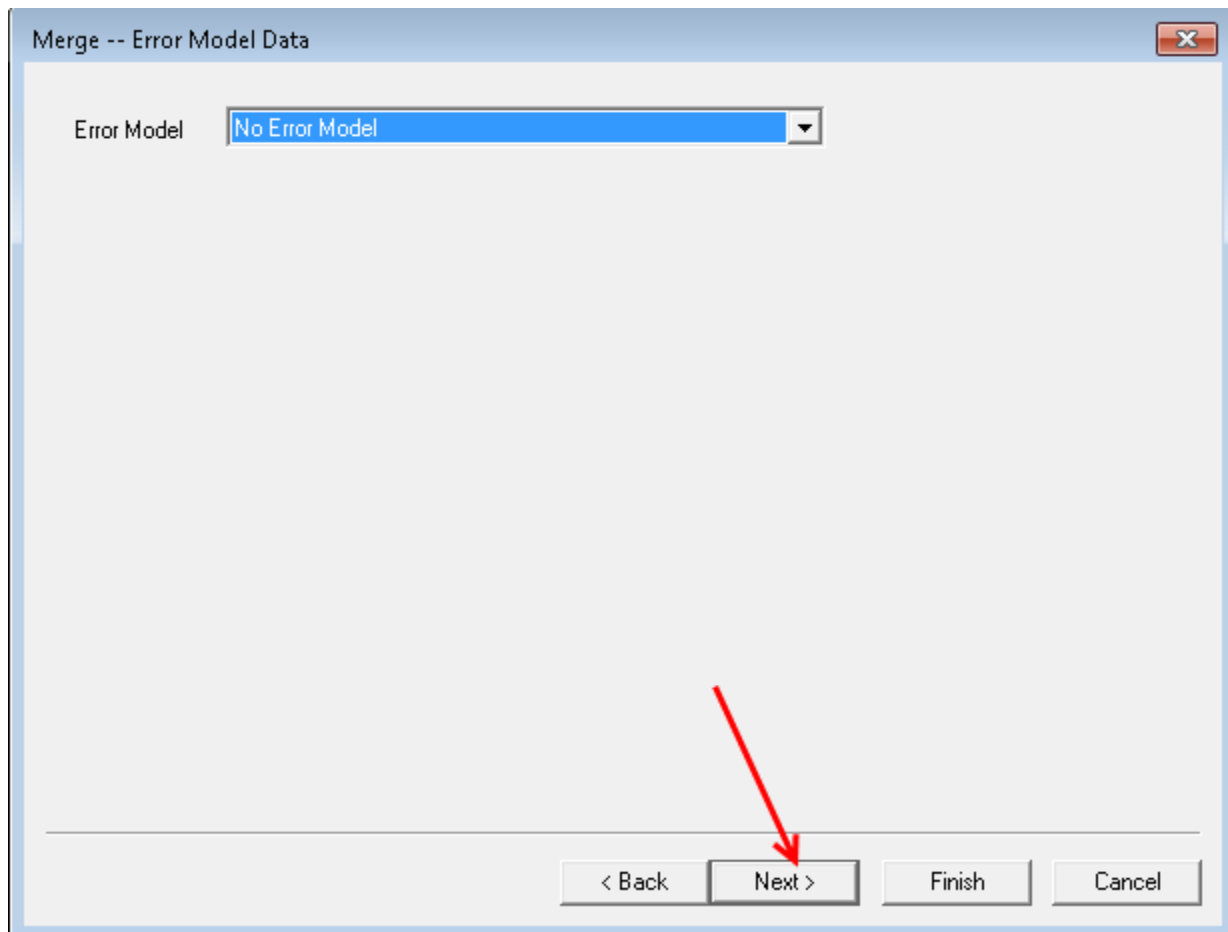
(3) Verify that the VESSEL selected and defined for the project, is selected for the MERGE step, then click NEXT:

Merge -- Auxiliary Data Selection

Property	Value
Position	
Vessel	RV Barnes
Meters to Units	3.280840
Position Source	Internal
Attitude Settings	
Attitude Source	Internal
Apply roll	Yes
Apply pitch	Yes
Apply heading	Yes
Reverse Roll Angle Sign	No
Reverse Pitch Angle Sign	No
Reverse Heading Angle Sign	No

< Back Next > Finish Cancel

(4) Unless you need to apply CUBE theory to your findings, just click NEXT here (no error model):



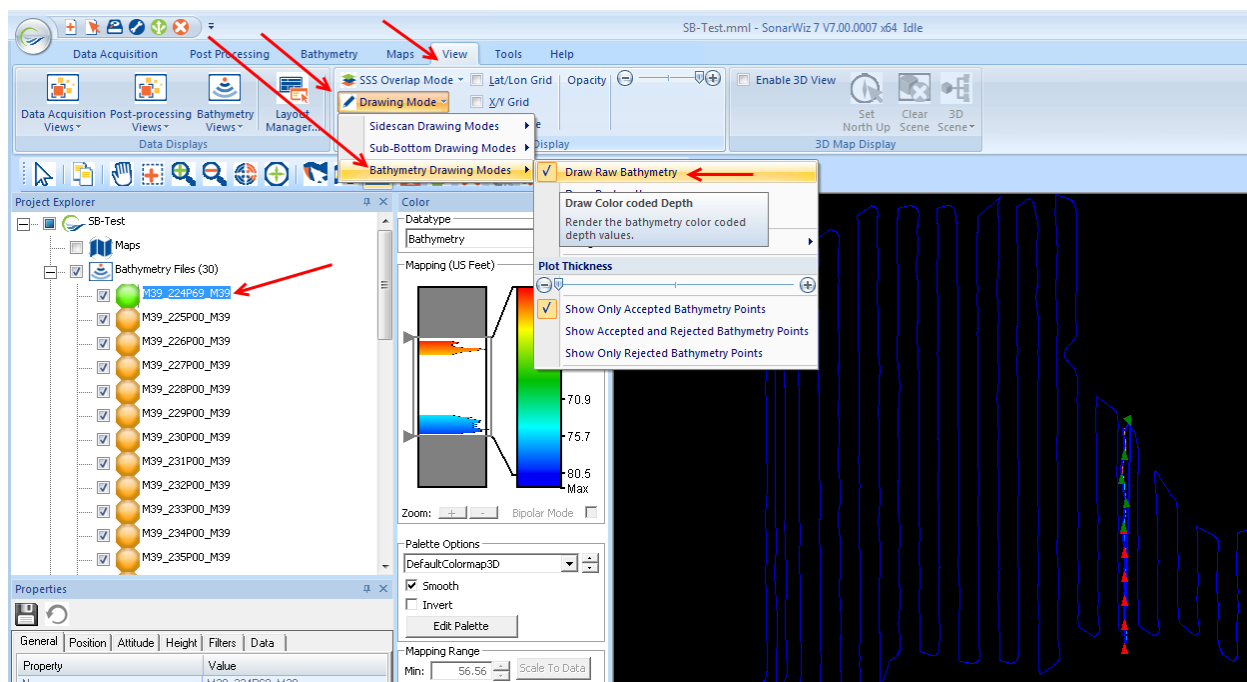
(5) Finally, set any filters you decide to use (typically on subsequent, not the first merge), then click FINISH:

Property	Value
Density Bin Width	1.000000
Density Bin Height	0.500000
Density Minimum Count	5
Static Box Filter	
Enable Static Box Filter	No
Filter Minimum Depth	No
Filter Maximum Depth	No
Filter Minimum Horizontal Range	No
Filter Maximum Horizontal Range	No
Minimum Depth	2.000000
Maximum Depth	200.000000
Minimum Horizontal Range	-150.000000

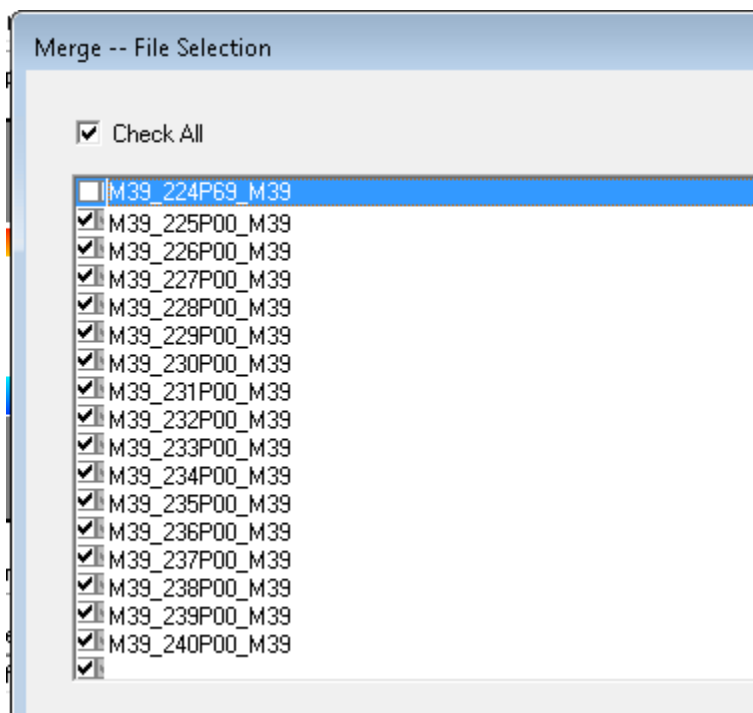
< Back Next > **Finish** Cancel

6.1 Expected Merge Results - One Line

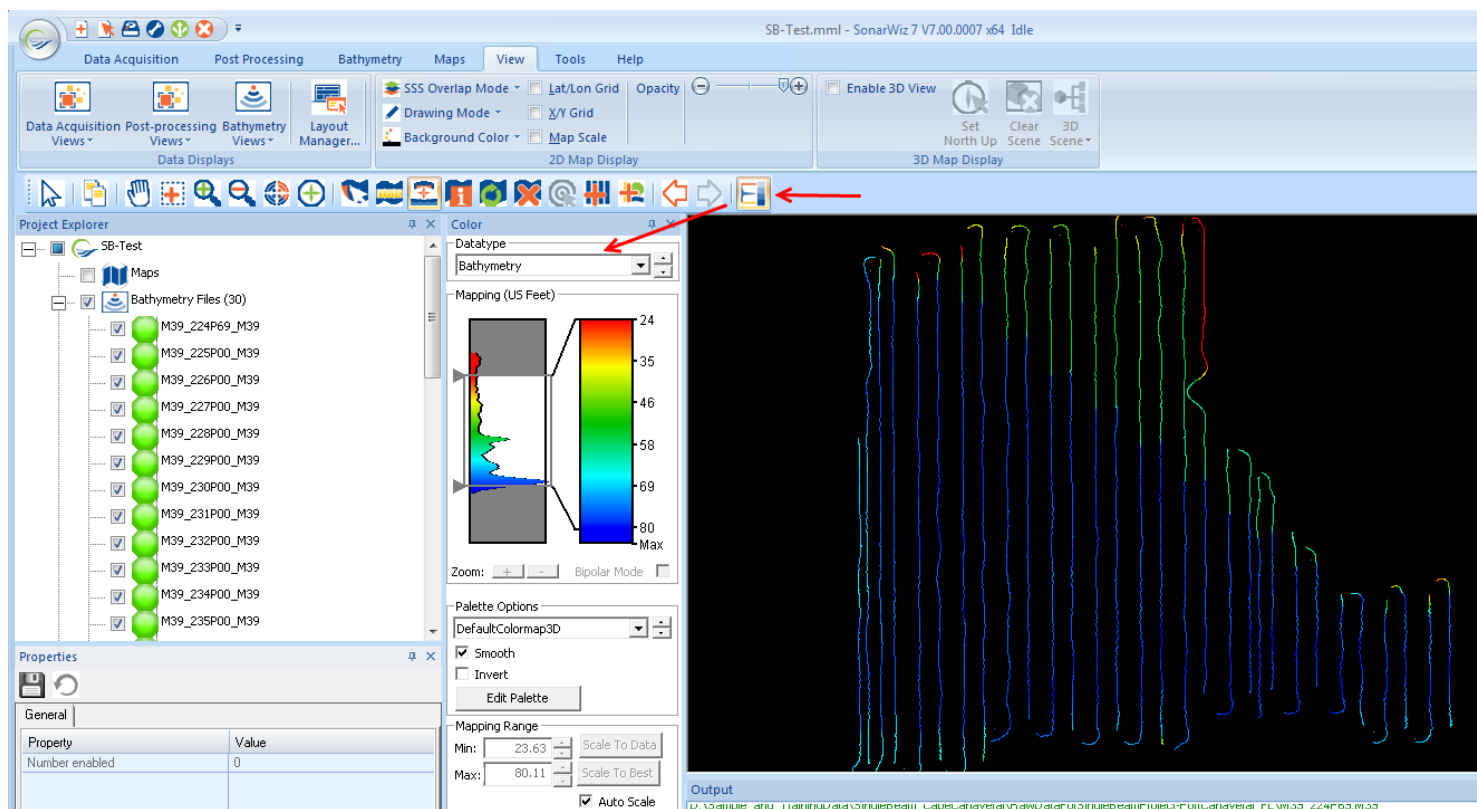
Select to view bathymetry, and observe that a successful merge changes your Project Explorer line-status icon to GREEN:



Then merge the rest of the lines using the same settings:

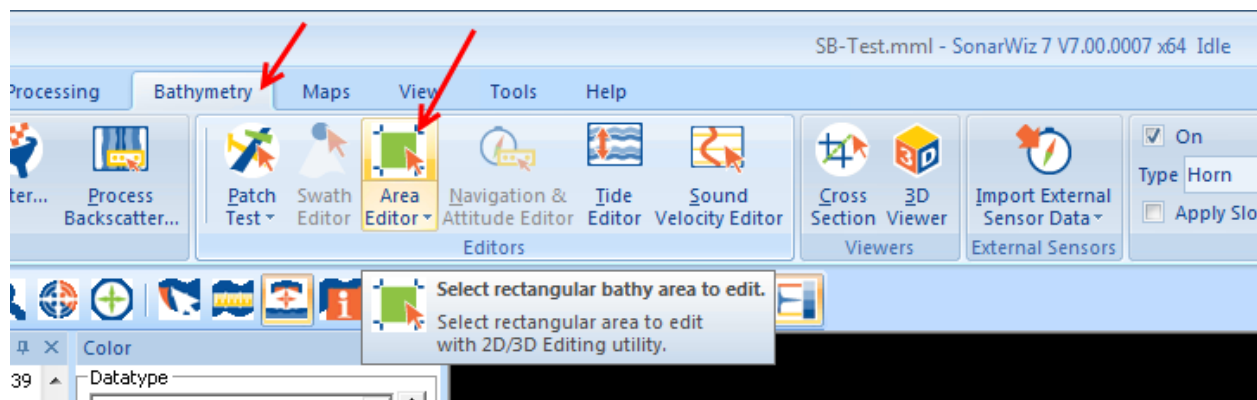


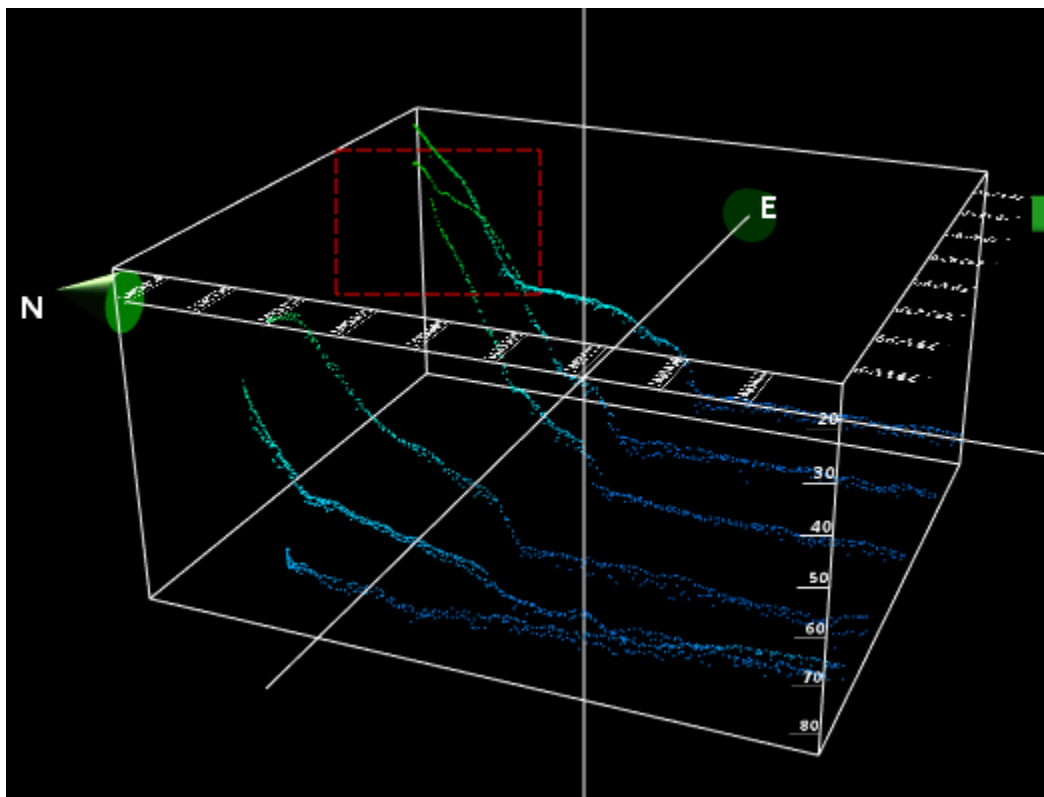
The entire example "mosaic" here is shown after having opened a Color Window and adjusted it by selecting a datatype (use bathymetry for single-beam data), a color palette, and use AUTO SCALE or de-select that and try SCALE TO DATA.



6.2 Adjustments - Area Editing Example

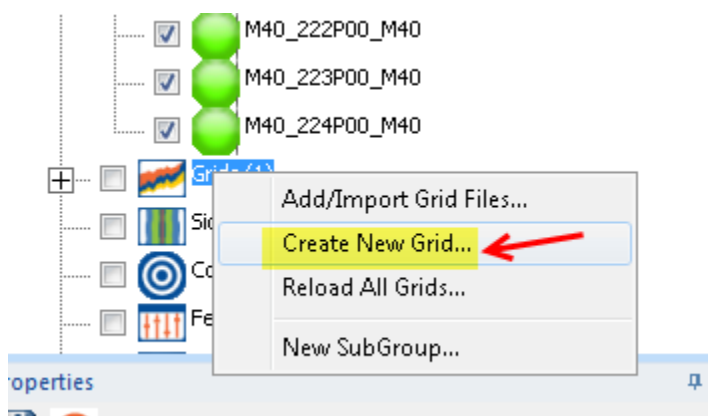
You can use bathymetry editors like AREA EDIT and SWATH EDIT to adjust your single-beam point-cloud through automated or manual filtering:



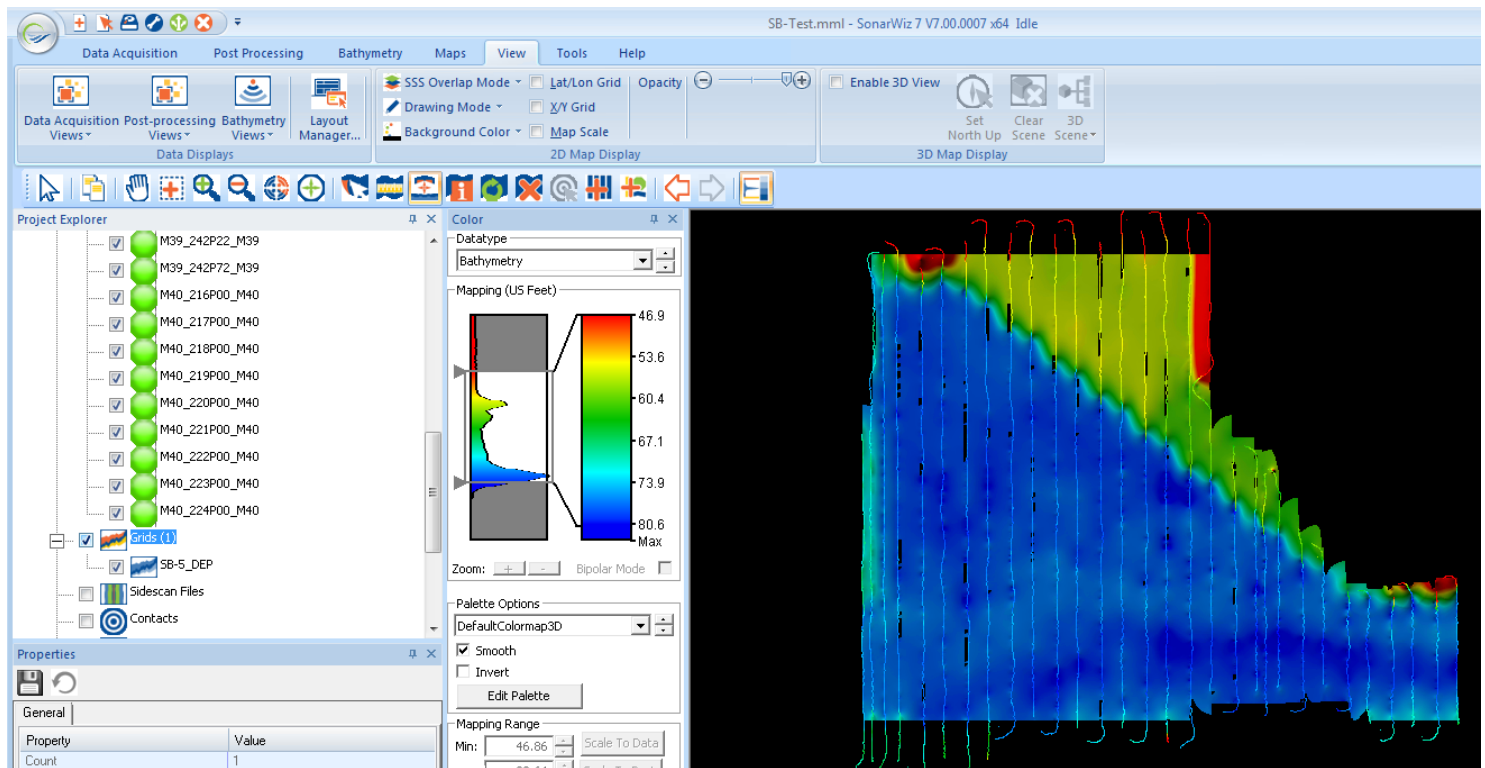


6.3 Another View - Gridding Your Data

Try selecting GRIDS -> Create Grid and grid your single-beam selected files, using bathymetry depth type options. The results can help interpolate and create an estimated seafloor in between your recorded nadir lines, and it can be very convincing:



Example median-depth grid result of this survey:

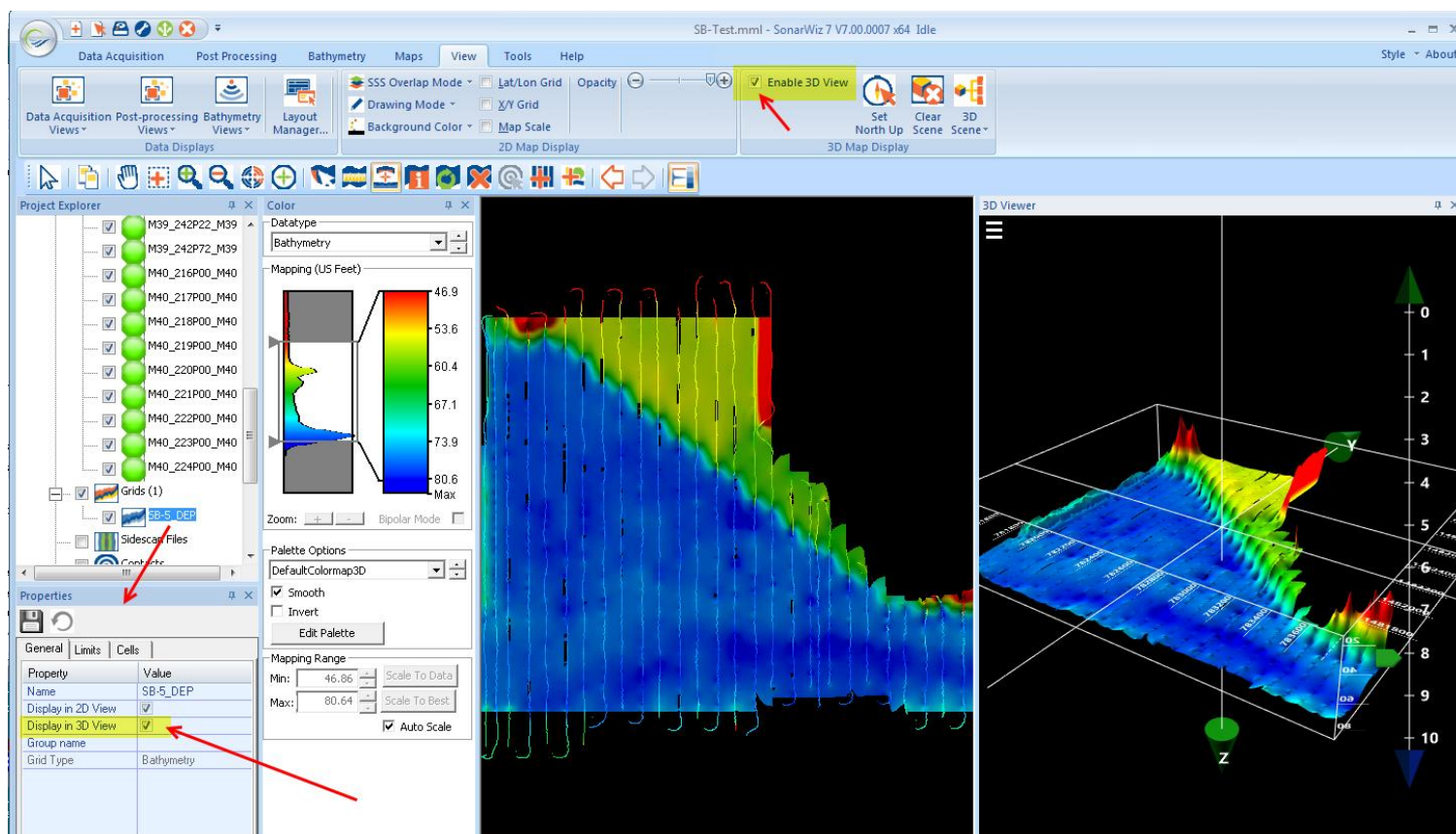


See our separate gridding tutorial PDF here:

http://www.chestech-support.com/download/ctisupport/Sonarwiz_6/UserDocs/SonarWiz_GriddingOptions.pdf

Note that all the same bathymetry DEPTH gridding options apply to single-beam depth gridding.

Of course if there's a grid to view, seeing it in 2D and 3D both, is interesting:



7 Document History

Rev 2, 8/18/2017 - Explanation of licensing options added, as well as a careful set of examples for waterline/Z value interactions in seeing numbers affecting overall water depth in final results after merge.

Rev 1 - created 8/10/2017 to document EASYNV MLG-format single-beam import template format, recording in general, and import and post-processing tips, per SonarWiz version 7.00.0007.