



## **Eye4Software Hydromagic 10.1**

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# 1 Introduction

Eye4Software Hydromagic is an hydrographic survey package, which can be used to map areas using a GNSS receiver and echo sounder. Use the software to import, view and edit your maps, display your position and to record depths (create soundings). The software will work with almost any GNSS receiver and echo sounder, and can be used on any desktop, laptop or netbook computer running Windows 7 (SP1) or higher. The software has been tested successfully on the following Microsoft Windows operating systems:

- ✓ Windows 7 (32 bit);
- ✓ Windows 7 (64 bit);
- ✓ Windows 8 (32 bit);
- ✓ Windows 8 (64 bit);
- ✓ Windows 8.1 (32 bit);
- ✓ Windows 8.1 (64 bit);
- ✓ Windows 10 (64 bit);
- ✓ Windows 11 (64 bit).

Some application examples:

- ✓ Record depth data using a GNSS receiver and echo sounder;
- ✓ Show your current position and depth on a (down)loaded map;
- ✓ Convert your soundings to a regularly spaced XYZ data (DTM);
- ✓ Convert your soundings to different file formats;
- ✓ Import and geo-reference side scan sonar images;
- ✓ Import NMEA0183 log data files and convert them to soundings;
- ✓ Show cross-sections and calculate volumes;
- ✓ Design and generate theoretical DTM's (channel design);
- ✓ Create depth contours and save them as AutoCAD DXF or ESRI shapefiles;
- ✓ Add comments, symbols or routes to your maps;
- ✓ Perform real-time positioning on research and hydrographic survey vessels;
- ✓ Fishing industry, for instance to navigate inside the assigned fishing parcels;
- ✓ View GIS features on shapefiles, CAD and S57 (ENC) data;
- ✓ Convert data between various hydrographic data file formats;
- ✓ Create and upload routes to your USV's autopilot for autonomous data collection;
- ✓ Log dredging progress with the Hydromagic Dredging package;

## 1.1 Supported Hardware

### Supported Hardware

The list below is just an indication, the software will probably work with more models then the ones that are displayed below.

### Supported Echosounders

- |                                     |                        |
|-------------------------------------|------------------------|
| ✓ NMEA0183 Compatible Echosounders; | ✓ Simrad EA200 series; |
| ✓ Cee Hydrosystems Ceestar;         | ✓ Simrad EA300 series; |
| ✓ Cee Hydrosystems Ceeducer pro;    | ✓ Simrad EA400 series; |
| ✓ Elac Hydrostar LAZ4300;           | ✓ Simrad EA500 series; |
| ✓ Elac LAZ4100;                     | ✓ Simrad EA600 series; |

- ✓ Elac STG 721C;
- ✓ Innerspace Technologies 440S;
- ✓ Innerspace Technologies 448;
- ✓ Innerspace Technologies 449;
- ✓ Innerspace Technologies 455;
- ✓ Innerspace Technologies 456;
- ✓ Knudsen 320 series;
- ✓ Navitronic Navisound 2000;
- ✓ SyQwest Bathy 500DF;
- ✓ SyQwest Bathy 500MF;
- ✓ SyQwest Bathy 1500C;
- ✓ Ohmex SonarMite;
- ✓ Odom DigiTrace;
- ✓ Odom EchoTrac DF3200 MK II;
- ✓ Odom EchoTrac MK III;
- ✓ Odom EchoTrac CV100;
- ✓ Odom EchoTrac CV200;
- ✓ Odom EchoTrac CV300;
- ✓ Odom EchoTrac CVM;
- ✓ Odom HydroTrac;
- ✓ Odom HydroTrac II;
- ✓ STN Atlas Deso 11;
- ✓ STN Atlas Deso 14;
- ✓ STN Atlas Deso 15;
- ✓ STN Atlas Deso 17;
- ✓ STN Atlas Deso 20;
- ✓ STN Atlas Deso 22;
- ✓ STN Atlas Deso 25;
- ✓ STN Atlas Deso 30;
- ✓ STN Atlas Deso 35;
- ✓ STN Atlas Deso 350M;
- ✓ Reson Navisound 110;
- ✓ Reson Navisound 205;
- ✓ Reson Navisound 210;
- ✓ Reson Navisound 215;
- ✓ Reson Navisound 420;
- ✓ Reson Navisound 630DS;
- ✓ Unabara Hydrobook
- ✓ Unabara Hydro-2F

### Supported GNSS (GPS) Receivers

- ✓ NMEA0183 Compatible GNSS Receivers;
- ✓ NMEA0183 Compatible DGPS Receivers;
- ✓ NMEA0183 Compatible RTK Receivers;
- ✓ Garmin USB GPS receivers using the PVT protocol;
- ✓ Trimble RTK Receivers;

### Supported Tide Receivers

- ✓ MGB Tech MTU821-D;
- ✓ MGB Tech MTU821-W;
- ✓ Ohmex TidaLite;
- ✓ Vyner MK2;

### Supported AIS Receivers

- ✓ AdvanSea AIS RX-100;
- ✓ Digital Yacht AIS100;
- ✓ Digital Yacht AIS200PRO;
- ✓ Digital Yacht AIS200N2K;
- ✓ Digital Yacht ANT200;
- ✓ Digital Yacht iAIS;
- ✓ EuroNav AIS-2-NMEA;
- ✓ EuroNav AIS-2-USB;
- ✓ Furuno FA30;
- ✓ Icom MXA-5000;
- ✓ Nasa AIS Engine 1;
- ✓ Nasa AIS Engine 2;
- ✓ Nasa AIS Engine 3;

- ✓ Smart Radio SR161;

### Supported Motion Sensors

- ✓ TSS1 Compatible Motion Sensors;
- ✓ SBG Systems SBG01;

### Supported Total Stations

- ✓ Total stations supporting the pseudo NMEA GGA format;
- ✓ Total stations supporting the Trimble Geodimeter format;

## 1.2 Supported File Formats

### Supported raster / elevation map formats (for import)

- Arc/Info ASCII Grid files (\*.arc);
- BSB nautical map files (\*.kap);
- GeoTIFF / TIFF files (\*.tif);
- Graphical Interchange Format (GIF) files (\*.gif);
- JPEG Image files (\*.jpg);
- Microsoft Windows Bitmap files (\*.bmp);
- Portable Network Graphics files (\*.png);
- XYZ gridded elevation data (ASCII or binary).

### Supported vector map formats (for import)

- AutoCAD DXF Drawing files (\*.dxf);
- ESRI Shape files (\*.shp);
- Keyhole Markup Language files (\*.kml);
- Microstation ISFF DGN Design files (\*.dgn);
- S57 Electronic Nautical Chart files (\*.000);
- S63 Electronic Nautical Chart files (\*.000);
- Arc/Info Coverage files (\*.e00);
- Arc/Info Generate files (\*.gen);
- Atlas Boundary files (\*.bna);
- GeoJSON map Files (\*.json);
- Idrisi vector format files (\*.vct);
- MapInfo TAB files (\*.tab);
- Openstreetmap export files (\*.osm).

### Supported side scan sonar formats (for import)

- Humminbird sonar files (\*.dat);
- Imagenex SportScan files (\*.81s);
- Imagenex YellowFin files (\*.872);
- Lowrance sonar SL2 files (\*.sl2);

- Lowrance sonar SL3 files (\*.sl3);
- Triton XTF files (\*.xtf).

### Supported raster / elevation map formats (for export)

- XYZ gridded elevation data (\*.asc);

### Supported vector map formats (for export)

- AutoCad DXF Drawing files (\*.dxf);
- ESRI Shape files (\*.shp);
- Keyhole Markup Language files (\*.kml);
- Keyhole Markup Language files (\*.kmz);

### Supported raw data formats (for import)

- NMEA0183 ASCII log files (\*.txt);
- Triton XTF files (\*.xtf);
- SEG-Y files (\*.seg);
- CEE HydroSystems project files (\*.csc);
- CSV ASCII log files;
- Generic Sensor Format (GSF) files (\*.gsf)
- Hypack RAW data files (\*.raw);
- Kongsberg Simrad raw data files (\*.raw);
- ODEC files (HydroBox format) (\*.odc);
- ODEC files (StrataBox format) (\*.odc);
- ODEC files (Bathy 2010 format) (\*.odc);
- Odom raw data files (\*.dso);
- Hydromagic raw data files (\*.raw);
- Innomar SES2000 raw data files (\*.ses);
- Innomar SES2000 raw data v3.0 files (\*.ses3);
- Lowrance SL2 raw data files (\*.sl2);
- Lowrance SL3 raw data files (\*.sl3);
- Knudsen KEB raw data files (\*.keb);
- Reson S7K formatted files (\*.s7k).

### Supported raw data formats (for export)

- Generic Sensor Format (GSF) files (\*.gsf)
- NMEA0183 ASCII log files (\*.txt);
- Triton XTF files (\*.xtf);
- SEG-Y files (\*.seg);
- CSV ASCII log files (\*.csv);
- Hypack RAW data files (\*.raw);

## 2 Configuration

### 2.1 Installation

#### System Requirements

The software requires a computer (laptop, tablet or desktop PC) which is capable of running Microsoft Windows 7 or later. The software will not work on Windows XP or earlier versions of the Windows operating system. If you want to run Hydromagic using XP, you have to use version 8.2 which can be found in the [download archive](#) on our website. Please note that technical support may no longer available for older versions. If you didn't install an operating system yet, we recommend you to use Microsoft Windows 10, as Windows XP and 7 are no longer maintained by Microsoft.

Depending on the operating system installed, you can download the 32 or 64 bit version of the Hydromagic software. The 32 bit version of the software will work on all supported operating systems, while the 64 bit version is optimized for 64 bit versions of the Microsoft Windows operating system. The 64 bit version of Hydromagic will not run on 32 bit operating systems. The advantage of using the 64 bit version is that it is able to allocate more memory at once.

When you are going to post-process soundings (3D, contour generation, matrix generation etc.), we recommend a computer with at least a dual-core processor and 4 Gigabyte of free RAM. You will also need sufficient space on the hard disk to store maps, soundings and matrix files. When storing echogram envelope data from a capable echo sounder, it is recommended to record the data on a solid state drive (SSD).

#### Downloading the software

The software can be downloaded from the [download page](#) on our website. Depending on whether you already own a license, and the operating system you are running (32- or 64 bit), select one of the four downloads offered on this page. The download size will be approximately 80 megabytes. Please note that some components have to be installed later on, such as [geoid models](#), [NTv2 datum correction grids](#) and grid shift grids.

**Download demo (trial) version**

The demo downloads are not protected by a dongle, and can be run by **first time users** who want to try the software free of charge. Some functions like printing, reporting, post processing and the exporting of data are disabled in the demo version.

NOTE: To test the post-processing capabilities of the software, the software can also be [rented for a month](#), or used on a pay-per-use base via [GeoCloud](#).

[Download Hydromagic Demo Version 9.0.64.0406 \(64-bit\)](#)      [Download Hydromagic Demo Version 9.0.32.0406 \(32-bit\)](#)

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**Download full (licensed) version**

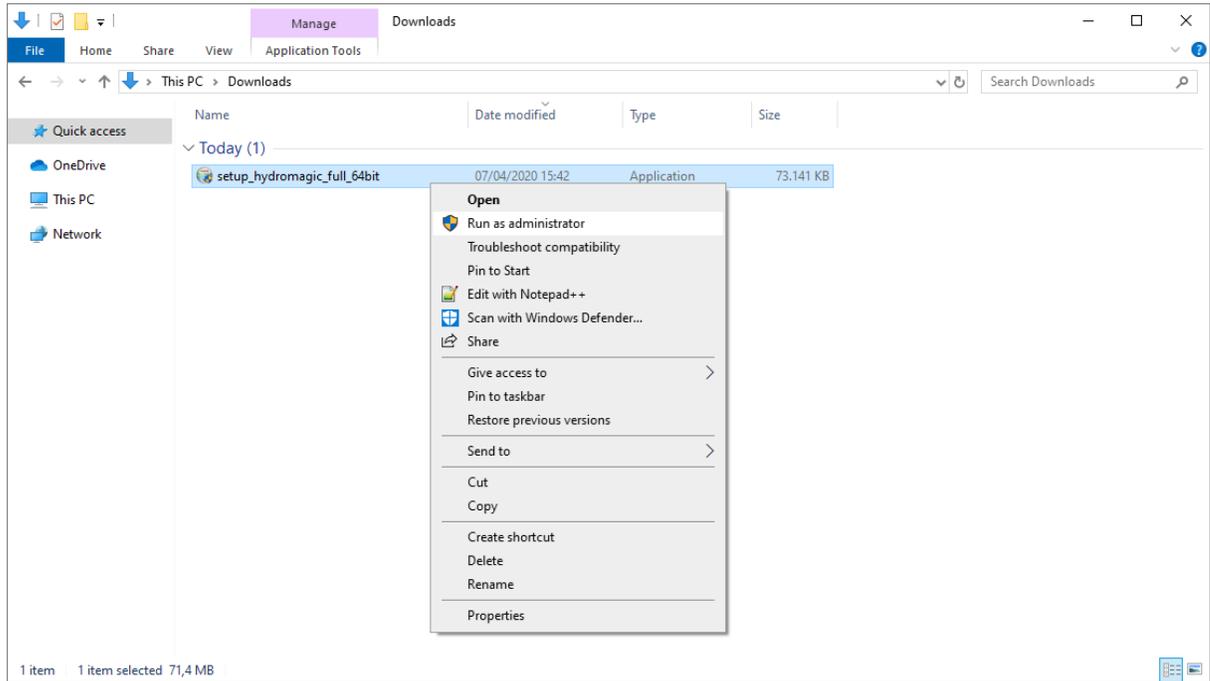
The full downloads are protected by an USB dongle or software license, and can only be used by **registered users** who received a dongle or software license in order to run the software.

[Download Hydromagic Full Version 9.0.64.0406 \(64-bit\)](#)      [Download Hydromagic Full Version 9.0.32.0406 \(32-bit\)](#)

**Select the appropriate download link for your operating system and license.**

#### Launching the installer

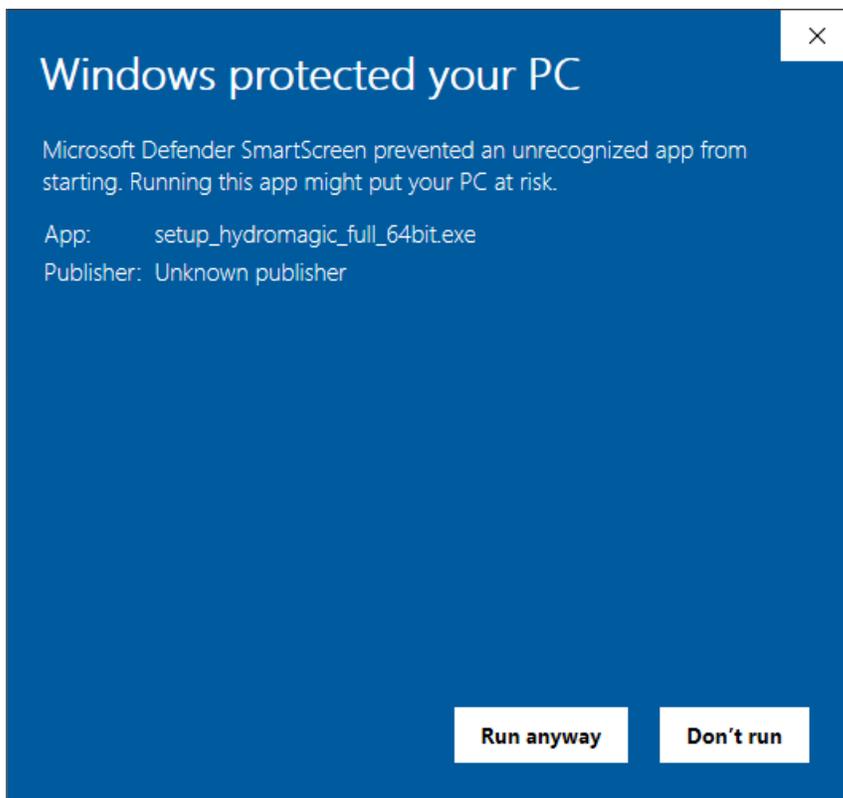
To install the software, execute the download executable. It is recommended to run the installer with "Administrator" privileges to make sure all files can be installed and setup information can be stored in the Windows Registry. To execute the installer with "Administrator" privileges, locate the file in your download folder, right click it, and select the "Run as Administrator..." option from the context menu. At this moment a Administrator password might be required in order to continue. Please contact your system administrator for more information.



***It is recommended to run the installer with "Administrator" privileges.***

## Microsoft Defender SmartScreen

Depending on the operating system used and the security settings used on your computer, a blue window may be displayed executed by the built-in "Microsoft Defender SmartScreen" application. When this windows shows up, first click "More Information", and then click the "Run anyway" button to start the Hydromagic installer.



*In case a "Microsoft Defender SmartScreen" window is shown, just click "Run anyway".*

## Welcome Screen

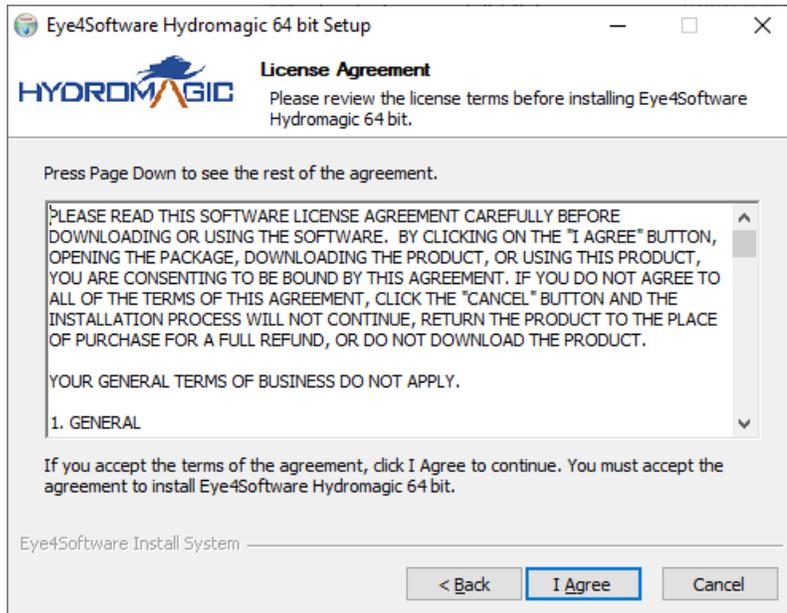
After accepting one or more security popup windows from the Windows operating system, the welcome screen of the installer should now be visible. The first page of the "setup wizard" is just a welcome screen which can be skipped by clicking the "Next" button.



*The welcome screen of the setup wizard. Click "Next" to continue.*

## The software's EULA

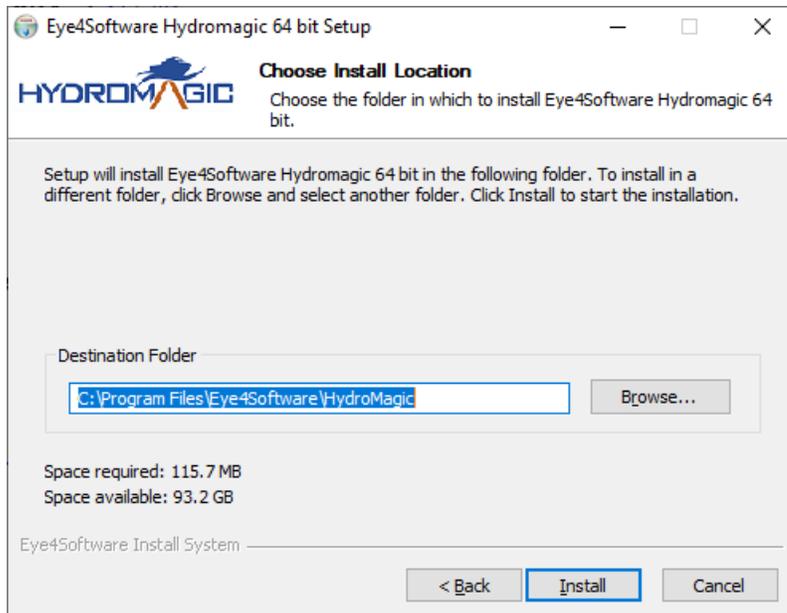
Before continuing the software install, please read our [end user license agreement](#) carefully and click the "I Agree" button to agree and continue the installation.



**Please read the end user license agreement and click "I Agree" to accept it and continue.**

## Selecting the installation location

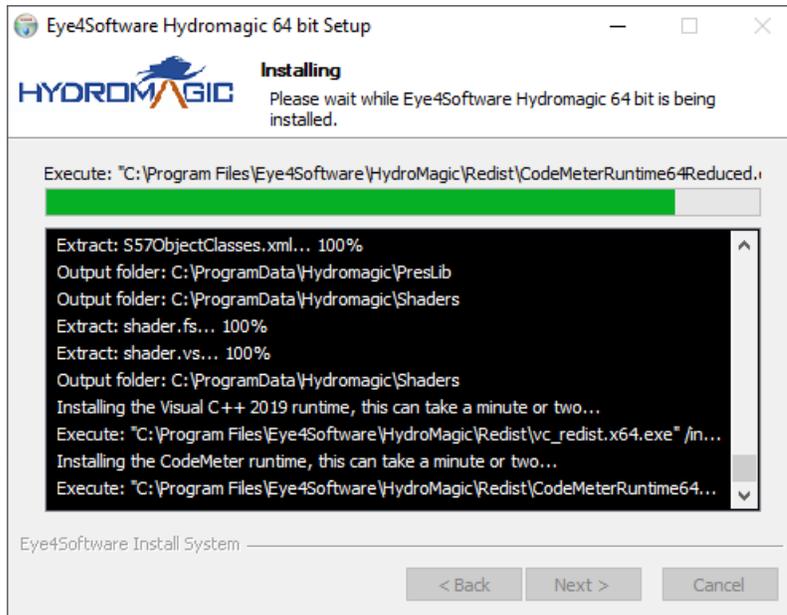
Now you have to select the installation folder, or just click "Next" to use the default folder, which is the "Program Files" folder on the same disk as your Windows installation resides.



**Select a folder in which to install the software and click "Next".**

## The installation process

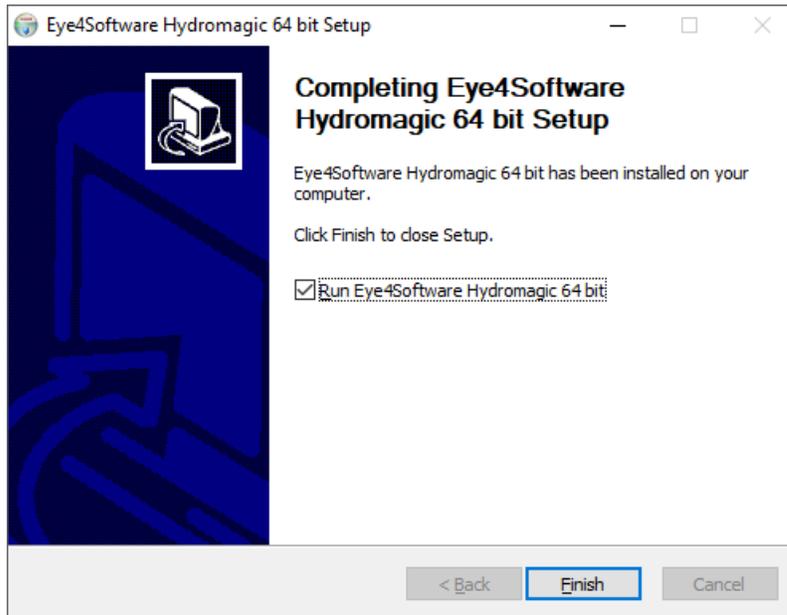
After selecting the installation folder, the setup wizard will extract the program files to the specified folder. When finished it will install two third party components, the Microsoft Visual C++ 2019 runtime as well as a runtime which allows your license to be installed, or the [dongle](#) to be accessed. This process may take up to five minutes.



*The setup wizard will now copy and install files to the selected program folder.*

## Finished

After copying all files, the last page of the setup wizard will be displayed. Click "Finish" to close the installer. When you leave the "Run Eye4Software Hydromagic" box ticked, the software will start automatically after a few seconds.



*On the last page, you can choose whether to start the software after closing the installer.*

## Uninstalling the software

When you want to uninstall the software, for instance when switching to another computer, or before upgrading to a new version, please follow the steps below. This process is different for Windows 7 and Windows 10:

### Windows 7

To uninstall Hydromagic on Windows 7 first ensure that Hydromagic Survey has been closed. Once closed, go to your Start Menu and then Control Panel. In the Control Panel, select the option to uninstall a program (located under the Programs category); the window that appears may take a moment to populate with a list of installed applications. Once the list populates, locate "Eye4Software Hydromagic" in the list of installed applications and right-click on "Eye4Software Hydromagic" and choose Remove.

### Windows 8, 8.1, 10 and Windows 11

To uninstall Hydromagic on Windows 8 (and newer) first ensure that Hydromagic Survey has been closed. Once closed, go to your Start Menu, right click and select the "Programs and Features" item. When you click on this option you will be brought to a new window that may take a moment to populate with a list of installed applications. Once the list populates, locate "Eye4Software Hydromagic" in the list of installed applications, right click and choose "Uninstall/Change".

## 2.2 Activation

### Software Protection

Eye4Software Hydromagic is protected against unauthorized use by an (USB) dongle, or by installing a software based, computer bound, license on the computer. Upon ordering or renting the full version of the

software, either the dongle is shipped, or an activation link will be send. This depends on the license type ordered.

## Computer bound license

Since version 8.4 of the software, the software can also be activated with a so called 'computer bound license'. When the customer chooses a computer bound license instead of a physical dongle, an URL is generated for each computer the user is allowed to run the software on. This license doesn't require any shipping, so delivery times are close to zero. It is not possible to transfer this kind of license from one computer to another. For more information on how computer bound licenses work, please check [this document](#).

## Dongle

Make sure the dongle is inserted in the USB socket correctly. Two LED's (red and green) will lit up shortly after insertion. When you start the software, and the following error message is displayed, either the dongle is not inserted correctly, or it doesn't contain the correct license(s) for the version(s) you are trying to run.



*This error appears when not valid license has been found on your PC.*

## Dongle troubleshooting

In some cases the software displays this error, even when the dongle has been inserted. Only in rare cases this is caused by a faulty dongle.

When you encounter this error message while the dongle has been inserted, please perform the following steps first:

**- Make sure the dongle has been inserted fully;**

When the device isn't inserted correctly in the USB socket of the computer, the dongle isn't going to be recognized by Windows.

**- Try different USB sockets on your PC;**

Some devices won't work with USB 3.0 sockets on your computer, trying another port might help. This check also rules out defective or not connected USB sockets on your computer.

**- Make sure the CodeMeter runtime is installed;**

The CodeMeter runtime is used by Windows and Hydromagic to access the dongle.

When this piece of software is missing the dongle might not work.

The CodeMeter runtime is installed during the Hydromagic installation. For some reason the installation may have been corrupted, you can reinstall it by reinstalling Hydromagic.

**- Check whether the dongle shows up in the Windows explorer as an USB drive;**

This is a good indication to see whether Windows has detected and installed the device driver software for the dongle.

When the dongle doesn't show up you might try another computer. When the dongle shows up, but isn't recognized by the software, please request a license update.

**- Try the dongle on another PC.**

After performing the above steps, it can be possible the dongle still isn't working. In this case, repeat the steps on another PC. If still not working, please contact support.

### Getting version and licensing information

In order to get information on the (build) version used and the licensing status of the product, select the "About Hydromagic..." option from the "Help" menu.

A dialog box will be displayed containing licensing status, dongle or software license serial number (if applicable) as well as the version and build number. Please provide this information when contacting technical support. We can use this information to check your support contract status.



## Dongle Form Factors

When ordering a new Hydromagic license, a USB dongle will be shipped to the address supplied during the ordering process.

In case you don't have any USB ports available for a USB dongle, we can also supply a dongle in one of the following form factors:

- ✓ PC-Card
- ✓ Express Card
- ✓ CF-Card
- ✓ SD-Card
- ✓ micro SD-Card

Please contact sales for more information on these alternatives.

Please note that an additional fee may apply.



## 2.3 Hardware Configuration

### 2.3.1 Configuring a NMEA0183 compatible GNSS or RTK receiver

The most important device required for this software to be usable, is a GNSS or RTK receiver. At this moment, all GNSS and RTK receivers with a NMEA0183 compatible data output are supported. It does not matter whether the NMEA0183 sentences are send over a serial port, USB port, Bluetooth connection or network connection. In this tutorial we talk about a "GNSS receiver", since the term "GPS receiver" is outdated, because most receivers these days are capable of using satellites from multiple constellations, like GLONASS, Galileo, Beidou and more.

The GNSS receiver is used to get position, elevation (ellipsoidal height and MSL height), course over ground, speed over ground and information on GNSS fix quality and precision. When using a RTK receiver in RTK fixed mode (correction data required), you should be able to get [real time tide](#) information as well, by using the high accuracy ellipsoidal height and a [geoid model](#).

In order to connect a GNSS receiver, you need to have at least one serial port available (unless the receiver is connected via Bluetooth). If there is no port available, you can add a serial port by using an USB-to-serial converter or a NMEA0183 data combiner equipped with an USB port. Most RTK receivers also have the ability to connect them via Bluetooth - This also requires less cables running through your boat.



#### *Trimble GNSS receivers and antenna's*

When using an USB-to-serial converter, make sure it is connected to an USB port at the time you are going to configure the receiver. When using Bluetooth, make sure the device has been [paired and](#)

[connected](#) to your computer. Because an USB-to-serial converter can cause minor (some brands major) delays (latency) in communications, we recommend to use a multi port serial adapter instead. Multi port serial adapters are available as PCI cards as well as PC-Cards for use in laptops.

In addition to NMEA0183 data over a serial device, Hydromagic is able to read NMEA0183 data over TCP/IP connections. This allows you to transfer data over, for instance an Ethernet or WiFi connection. Both TCP and UDP protocols are supported.

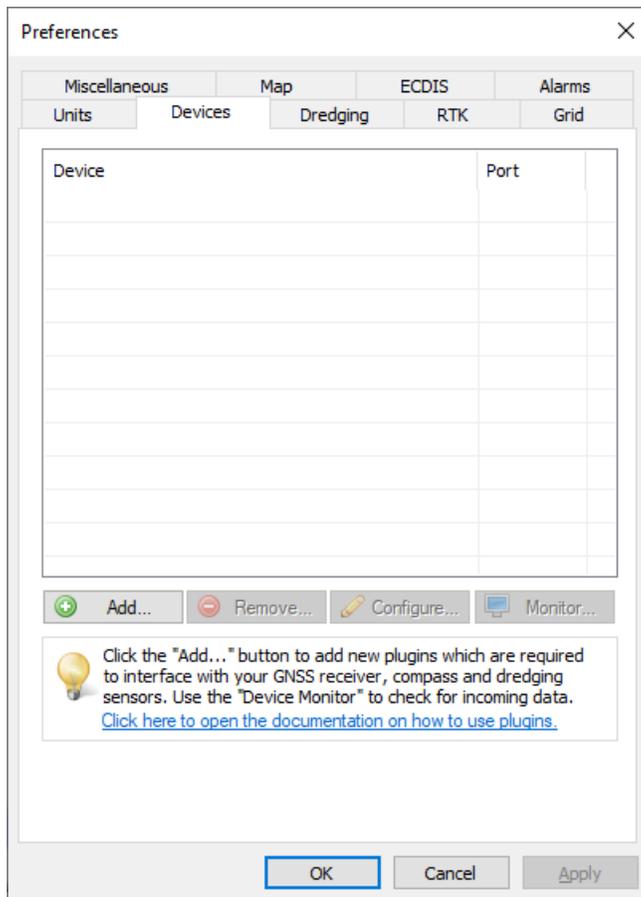
### Supported NMEA0183 sentences for GNSS and RTK receivers

Hydromagic is able to decode the following NMEA0183 sentences transmitted by GNSS and RTK receivers:

Sentence	Description
\$GPGGA	Global Positioning System Fix Data, Time and Position
\$GPGLL	Geographic Position - Latitude and Longitude
\$GPGMP	Projected Position - Easting, Northing and Elevation
\$GPGSA	GNSS DOP and Active Satellites
\$GPGSV	Satellites in view
\$GPRMC	Recommended Minimum Navigation Information
\$GPVTG	Track Made Good and Ground Speed
\$GPZDA	GNSS Time
\$PTNL,GGK	Trimble RTK positioning data and ellipsoidal height

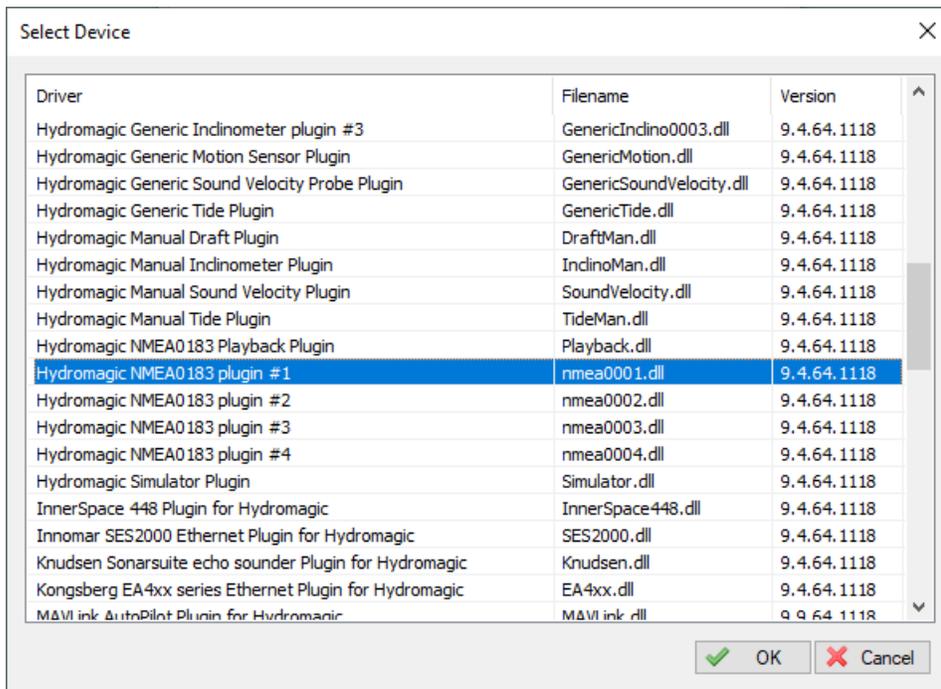
### Configuration

To add a NMEA0183 compatible device to the configuration, select "Preferences..." from the "Options" menu (or click the "Options" button in the toolbar) and select the "Devices" tab:



Select the "Devices" tab from the "Preferences" window.

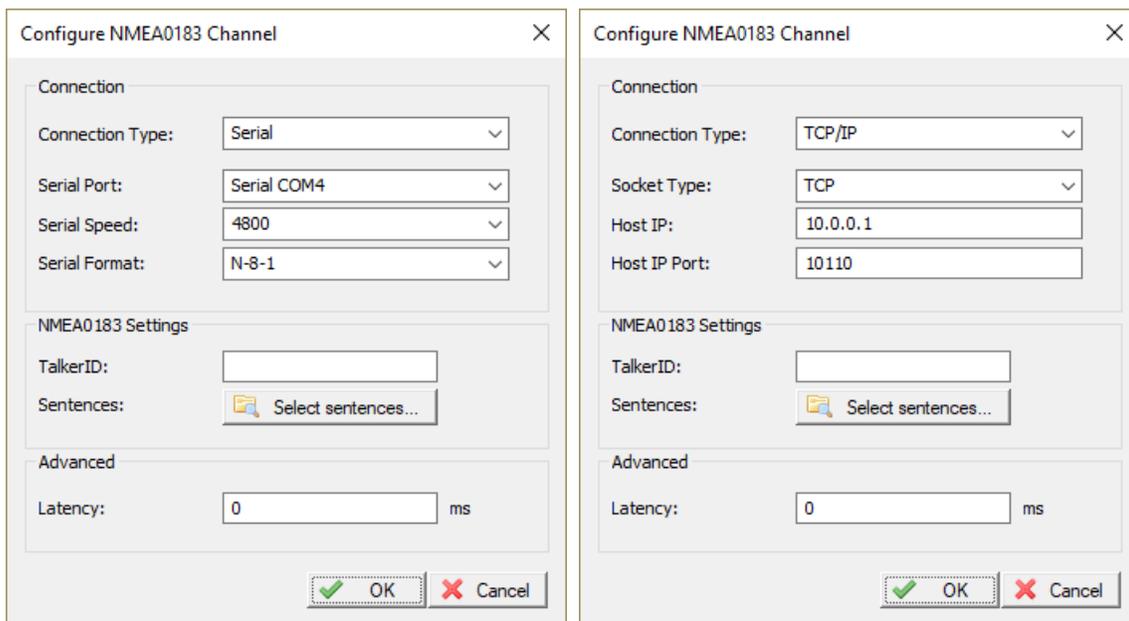
In the devices tab, click the "Add..." button to load a NMEA0183 [plugin](#). You can load a maximum of four (4) NMEA0183 plugins simultaneously. Next, select the first available "NMEA0183 plugin" in the "Select Device" dialog which appears after clicking the "Add..." button and click "OK" to show the plugin's configuration options.



Select one of the "Hydromagic NMEA0183" plugins from the list and click "OK".

## Communication Settings

After the plugin has been loaded, a configuration dialog is displayed where you can pass the required information to the plugin.



### Connection Type

The NMEA0183 plugin supports two types of connection types: serial and TCP/IP (networked). When a device is connected through an USB, Bluetooth or serial connection, you have to select the "Serial"

option. In cases where the device is connected using an Ethernet cable or WiFi connection, you have to select the "TCP/IP" option from the "Connection Type" drop down box. When switching between the "Serial" and "TCP/IP" connection type, the function of the edit and selection boxes in the "Connection" section will change as shown in the screen shots above.

## Serial communication settings

### Serial port

Use this drop down box to select the COMxx number of the serial port the device is connected to. This can be either a regular serial port, or a virtual serial port, which is used by USB-to-serial and Bluetooth adapters.

### Serial speed

The default serial baud rate for NMEA0183 devices is 4800 bps. However, some hardware use other speeds (for instance, an AIS receiver will use 38400 bps). When configuring a GNSS or RTK receiver, the serial speed can sometimes deviate from the standard. 9600, 19200 and 38400 bps are mostly used on these devices.

### Serial format

You can leave this setting at it's default value (8,N,1). Devices that use NMEA0183 protocol with other settings are very rare.

## Network communication settings

### Socket type

Use the "Socket Type" drop down box to select the TCP/IP protocol used. Possible values are "TCP" and "UDP". Please refer to the hardware vendor or manual to see which options are supported. Most devices support both protocols.

### Host IP

The IP address of the device. This value is required only for TCP connections. For UDP connections, just provide a valid port number.

### Host IP port

Enter the IP (TCP or UDP) port number the device is listening on here. For most wireless NMEA0183 devices, the port 10110 is used, which is the reserved port for NMEA0183.

## Miscellaneous settings

### Latency

Latency (sometimes called lag) is the time between a measurement has been made (for instance a position fix, or depth) and when the serial data is received by the application. If this value is known for a certain device, you can enter it here to get more accurate soundings, since the timestamps will be corrected when processing the [raw data files](#).

## NMEA0183 Talker ID settings

### Talker ID

Use this option to filter NMEA0183 sentences by talker ID.

It sometimes happens that both echo sounder and GNSS receiver are transmitting GNSS sentences, in this case you can either select the GNSS receiver or echo sounder by specifying "GP", "GN" or "SD" in this field.

### Talker ID for multi constellation receivers

When using a multi constellation GNSS or RTK receiver, sometimes sentences are sent multiple times with different talker id's. For instance the data for GLONASS starts with '\$GL', the data for GPS with '\$GP', the data for Beidou with '\$BD', etc. In these cases the combined data starts with '\$GN' which stands for GNSS. **To avoid duplicate data to be recorded, set the talker id to 'GN'.**



Some multi constellation data examples

```
$GPGGA,164343.00,3208.4408001,N,08048.1630431,W,4,08,1.21,-1.9491,M,-32.0232,M,1.0,00
$GPGGA,164344.00,3208.4407115,N,08048.1629118,W,4,08,1.21,-1.9434,M,-32.0232,M,1.0,00
$GPGGA,164345.00,3208.4406172,N,08048.1627910,W,4,08,1.21,-1.9208,M,-32.0232,M,1.0,00
```

**Good: Only position data with 'GP' talker. No need to set filter.**

```
$GNGGA,105338.00,0544.85881818,N,05356.94900227,W,4,17,0.6,5.383,M,-
34.351,M,1.0,0004*6C
$GNGGA,105339.00,0544.85795724,N,05356.95023683,W,4,17,0.6,5.370,M,-34.351,M,1.0,0004
$GNGGA,105340.00,0544.85695547,N,05356.95129001,W,4,17,0.6,5.391,M,-34.351,M,1.0,0004
```

**Good: Only position data with 'GN' talker. No need to set filter.**

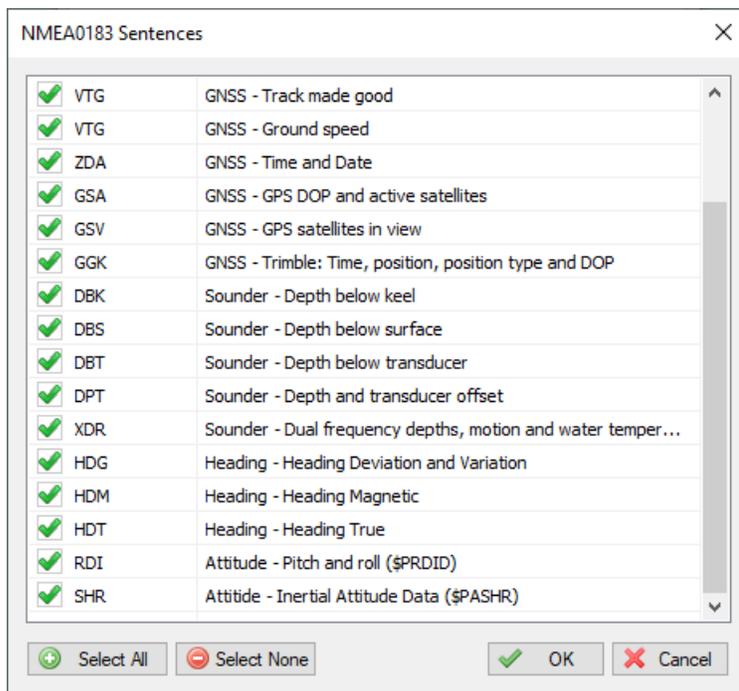
```
$GNGGA,060358.00,4039.8688766,N,02957.8791974,E,4,14,0.7,170.368,M,,0.44,0000*38
$GPGGA,060358.00,4039.8688766,N,02957.8791974,E,4,08,0.7,170.368,M,,0.44,0000*2B
$GLGGA,060358.00,4039.8688766,N,02957.8791974,E,4,06,0.7,170.368,M,,0.44,0000*39
$GNGGA,060359.00,4039.8684222,N,02957.8804691,E,4,14,0.7,170.373,M,,0.43,0000*3A
$GPGGA,060359.00,4039.8684222,N,02957.8804691,E,4,08,0.7,170.373,M,,0.43,0000*29
$GLGGA,060359.00,4039.8684222,N,02957.8804691,E,4,06,0.7,170.373,M,,0.43,0000*3B
```

**Bad: Duplicate position data where only talker id differs. Set filter to 'GN'.**

### NMEA0183 sentence settings

To select which NMEA0183 sentences will be decoded, and which ones will be ignored on this channel, click the "Select sentences..." button. The dialog that appears allows you to select which sentences are

used. For most GNSS devices, selecting only the "GGA" sentence will suffice. If you choose to use the heading and speed calculated by the GNSS device, you should also select the "VTG" sentence.



**Select which NMEA0183 sentences are handled and which ones are ignored.**

### Filtering redundant data (or configuring the GNSS output sentences)

Some GNSS receivers use different sentences to send for instance the position data to the computer. To avoid duplicate data, the best is to configure the GNSS receiver to only output the most important sentences like GGA and VTG (starting from Hydromagic version 10, the GST sentence can be utilized as well). When it is not possible to change the output of the GNSS receiver, use the sentence settings to filter out unwanted duplicates. Find some examples of good and bad NMEA0183 outputs below:

```
$GPGGA,160359.00,1853.86383519,N,07010.07906236,W,4,11,0.8,212.022,M,-43.831,M,3.0,00
$GPVTG,199.57,T,,M,0.16,N,0.30,K,D*3F
$GPGGA,160400.00,1853.86379049,N,07010.07907892,W,4,11,0.8,212.012,M,-43.831,M,1.0,00
$GPVTG,197.85,T,,M,0.18,N,0.33,K,D*33
```

**Good: No duplicate data here. No need to set filter, recommended NMEA0183 output settings for GNSS receivers.**

```
$GPRMC,133652.90,A,4554.0847900,N,00608.6707562,E,001.970,171.5,061218,0.0,W,D*21
$GPVTG,171.540,T,171.540,M,1.970,N,3.648,K,D*20
```

**Bad: RMC already includes speed and heading, so no need for VTG here.**

```
$GPGGA,121317.00,5301.5951868,N,00541.2031037,E,4,09,0.8,42.087,M,,0.85,0020*19
$GPGGK,121317.00,031518,5301.5951868,N,00541.2031037,E,3,09,1.9,EHT42.087,M*7E
$PTNL,GGK,121317.00,031518,5301.5951868,N,00541.2031037,E,3,09,1.7,EHT42.087,M*4D
```

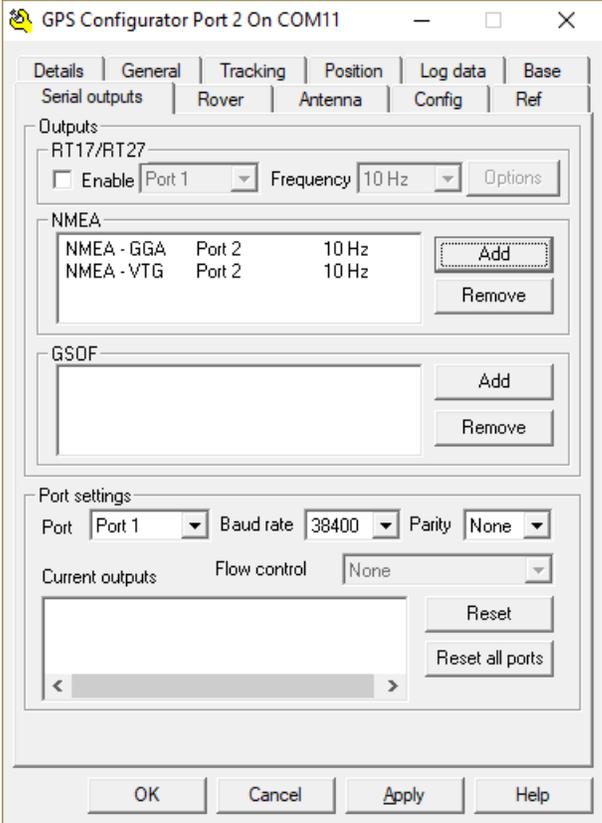
```
$GPGLL,5301.5951868,N,00541.2031037,E,121317.00,A,D*66
```

**Really bad:** The same position is transferred using 4 sentences. Use GGA or GGK only.

**NMEA0183 output rates**

The output rate is the number of times a particular NMEA0183 sentence is calculated and broadcast by the GNSS or RTK receiver. By default, for most receivers, the output rate is 1Hz which equals one time per second. Although Hydromagic works perfectly with an update rate of 1Hz, it is recommended to set it a little higher to improve accuracy. When for instance the echo sounder has an output rate of 10Hz, the Hydromagic software will calculate the positions for these soundings.

It is doing this by taking the position before and after the echo sounder ping. The more positions there are, the higher the accuracy. This is especially true when surveying at high speeds, or when there are sudden course or speed differences in your track. We recommend you to set the GNSS receiver at the same output rate as the echo sounder, or at least at the closest as possible value. How to set this value differs per GNSS or RTK receiver. Please contact your dealer or refer to the manual for more information.



**Modifying NMEA0183 serial output settings on a RTK receiver (Trimble)**

**Testing the GNSS receiver**

When everything has been configured correctly, and the GNSS has been switched on and has a valid fix, the position fields in the "Navigation View" should have green values:



### 2.3.2 Configuring a NMEA0183 compatible echo sounder

Most echo sounders these days do support their own proprietary output format, as well as the more standardized NMEA0183 protocol. If your echo sounder does not support the NMEA0183 protocol, you should be able to configure it using one of the [plug-ins](#) shipped with Hydromagic. When you are unable to find a suitable plugin, and the echo sounder is capable of outputting ASCII data, you might want to try the "[Generic echo sounder plugin](#)".

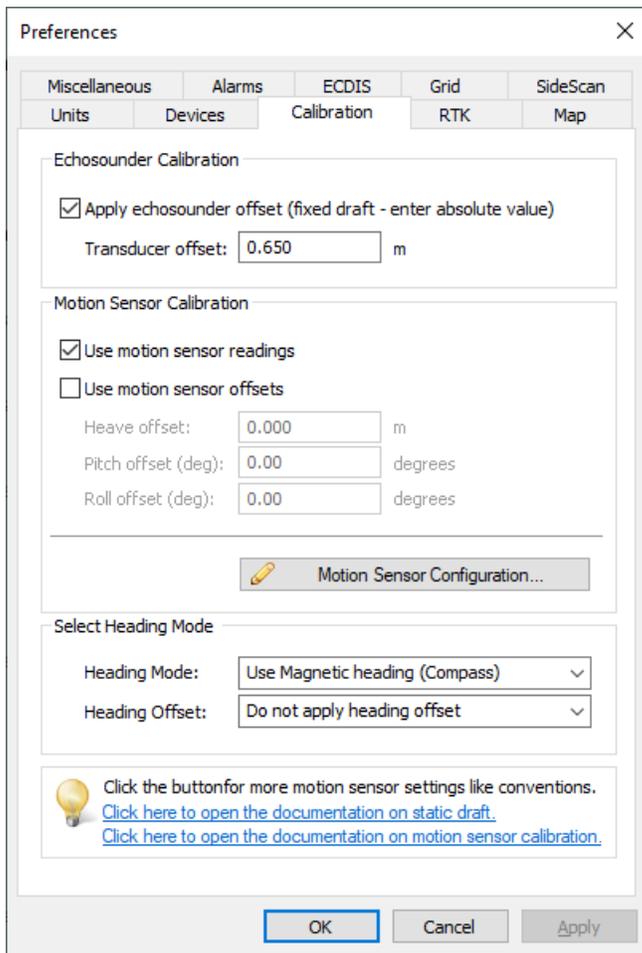
In order to connect an echo sounder, you need to have at least one serial port available. If there is no port available, you can add a serial port by using an USB-to-serial converter, Serial-to-Ethernet converter or a NMEA0183 data combiner equipped with an USB port. Some newer models might have the ability to connect them via Bluetooth. Please use USB-to-Serial converters with caution since they may cause latency. A couple of more advanced echo sounders can be connected directly over Ethernet by using one of the dedicated echo sounder plugins (for instance: [CeeScope](#), [Odom MK3](#), [Knudsen](#) and others).



***A dual frequency hydrographic grade echo sounder from Odom.***

When using an USB-to-serial converter, make sure it is connected at the time you are going to configure the sounder. When using Bluetooth, make sure the device has been paired and connected to your computer. Because an USB-to-serial converter can cause minor (some brands major) delays (latency) in communications, we recommend to use a multi port serial adapter instead. Multi port serial adapters are available as PCI cards as well as PC-Cards for use in laptops.

In addition to NMEA0183 data over a serial device, Hydromagic is able to read NMEA0183 data over TCP/IP connections. This allows you to transfer data over, for instance an Ethernet or WiFi connection. Both TCP and UDP protocols are supported.



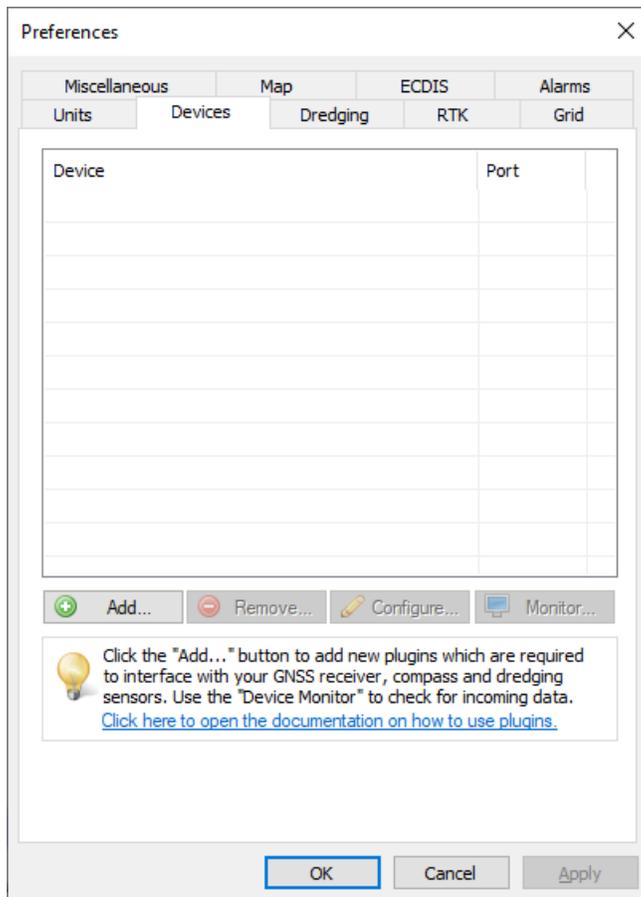
The screenshot shows the 'Preferences' dialog box with the 'Calibration' tab selected. The 'Echosounder Calibration' section has the checkbox 'Apply echosounder offset (fixed draft - enter absolute value)' checked, with a text input field containing '0.650' and a unit 'm'. The 'Motion Sensor Calibration' section has 'Use motion sensor readings' checked and 'Use motion sensor offsets' unchecked. Below these are three text input fields: 'Heave offset: 0.000 m', 'Pitch offset (deg): 0.00 degrees', and 'Roll offset (deg): 0.00 degrees'. A button labeled 'Motion Sensor Configuration...' is located below these fields. The 'Select Heading Mode' section has 'Heading Mode' set to 'Use Magnetic heading (Compass)' and 'Heading Offset' set to 'Do not apply heading offset'. At the bottom, there are 'OK', 'Cancel', and 'Apply' buttons. A lightbulb icon and text provide instructions: 'Click the button for more motion sensor settings like conventions. [Click here to open the documentation on static draft.](#) [Click here to open the documentation on motion sensor calibration.](#)'

**After configuring your echo sounder, please enter "static draft" when needed.**

After configuring the communication settings and testing the plugin, you also have to check the [echo sounder offset](#) configuration to enter the offset between the transducer and the waterline (also known as static draft calibration).

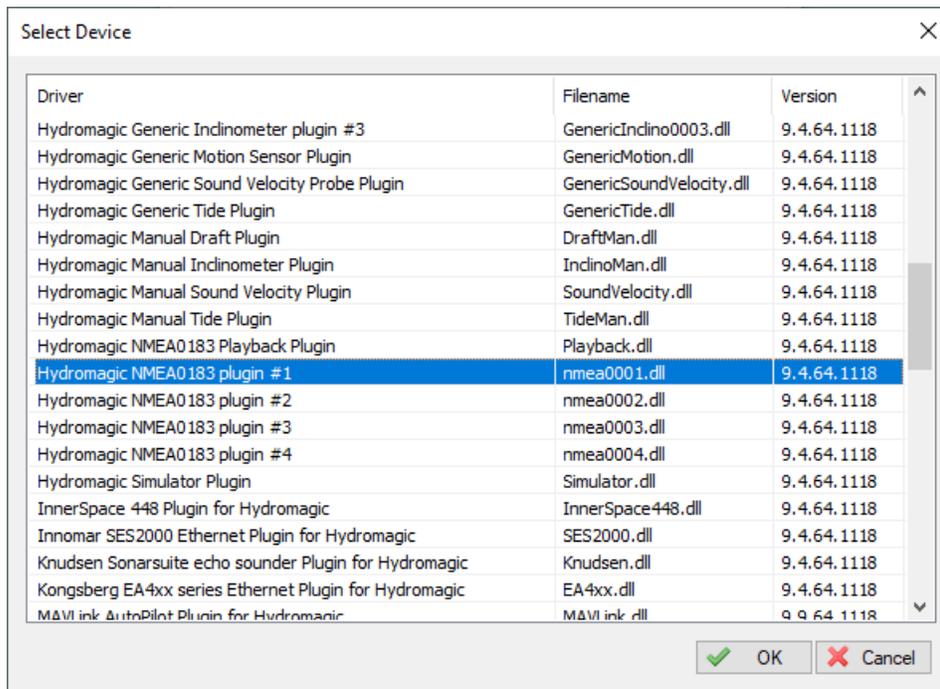
## Configuration

To add a NMEA0183 compatible device to the configuration, select "Preferences..." from the "Options" menu and select the "Devices" tab:



Select the "Devices" tab from the "Preferences" window.

In the devices tab, click the "Add..." button to load a NMEA0183 plugin. You can load a maximum of four (4) NMEA0183 plugins simultaneously. Next, select the first available "NMEA0183 plugin" in the "Select Device" dialog which appears after clicking the "Add..." button and click "OK" to show the plugin's configuration options.



Select one of the "Hydromagic NMEA0183" plugins from the list and click "OK".

## Communication settings

After the plugin has been loaded, a configuration dialog will be displayed where you can pass the required information before loading the plugin. This information has to be entered only once, and will be stored into the main Hydromagic configuration file.

### Connection type

The NMEA0183 plugin supports two types of connection types: serial and TCP/IP (networked). When a device is connected through an USB, Bluetooth or serial connection, you have to select the "Serial" option. In cases where the device is connected using an Ethernet cable or WiFi connection, you have to select the "TCP/IP" option from the "Connection Type" drop down box. When switching between the "Serial" and "TCP/IP" connection type, the function of the edit and selection boxes in the "Connection" section will change as shown in the screen shots above.

## Serial communication settings

### Serial port

Use this drop down box to select the COMxx number of the serial port the device is connected to. This can be either a regular serial port, or a virtual serial port, which is used by USB-to-serial and Bluetooth adapters.

### Serial speed

The default serial baud rate for NMEA0183 devices is 4800 bps. However, some hardware is using other speeds (for instance, an AIS receiver will use 38400 bps). When configuring an echo sounder, the serial speed can sometimes deviate from the standard. 4800, 9600, 19200 and 38400 bps are mostly used on these devices.

### Serial format

You can leave this setting at its default value. Devices that use NMEA0183 protocol with other settings are very rare.

## Network communication settings

### Socket type

Use the "Socket Type" drop-down box to select the TCP/IP protocol used. Possible values are "TCP" and "UDP". Please refer to the hardware vendor on which option is supported. Most devices support both protocols.

### Host IP

The IP address of the device. This value is required only for TCP connections. For UDP connections, just provide a valid port number.

### Host IP port

Enter the IP (TCP or UDP) port number the device is listening on here. For most wireless NMEA0183 devices, the port 10110 is used, which is the reserved port for NMEA0183.

## Miscellaneous settings

### Latency

Latency (sometimes called lag) is the time between a measurement has been made (for instance a position fix, or depth) and when the serial data is received by the application. If this value is known for a certain device, you can enter it here to get more accurate soundings, since the timestamps will be corrected when processing the raw data files.

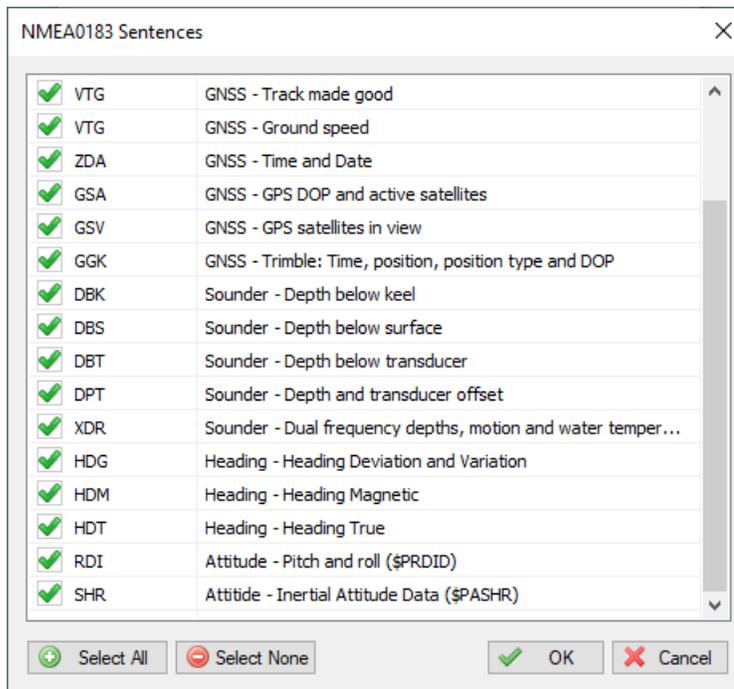
## NMEA0183 protocol settings

### Talker ID

Use this option to filter NMEA0183 sentences by talker ID. It sometimes happens that both the echo sounder and GNSS receiver are transmitting GNSS sentences, in this case you can either select the GNSS or echo sounder by specifying "GP", "GN" or "SD" in this field.

### Sentences

To select which NMEA0183 sentences will be decoded, and which ones will be ignored on this channel, click the "Select sentences..." button. The dialog that appears allows you to select which sentences are used. For most echo sounders devices, it is safe to select all sentences, since most of the times only one sentence is used. When the depth values starts flipping between two values, most probably the echo sounder is sending both DBS and DBT sentences. In this case, use either DBS with echo sounder draft set to zero, or set the draft and select the DBT sentence only.



Select which NMEA0183 sentences are handled and which ones are ignored.

## Supported NMEA0183 sentences for echo sounders

Sentence	Description
\$SDDBK	Depth below keel
\$SDDBS	Depth below surface
\$SDDBT	Depth below transducer
\$SDDPT	Depth and keel offset
\$SDXDR	Dual frequency depth (below transducer)

## Testing the echo sounder configuration

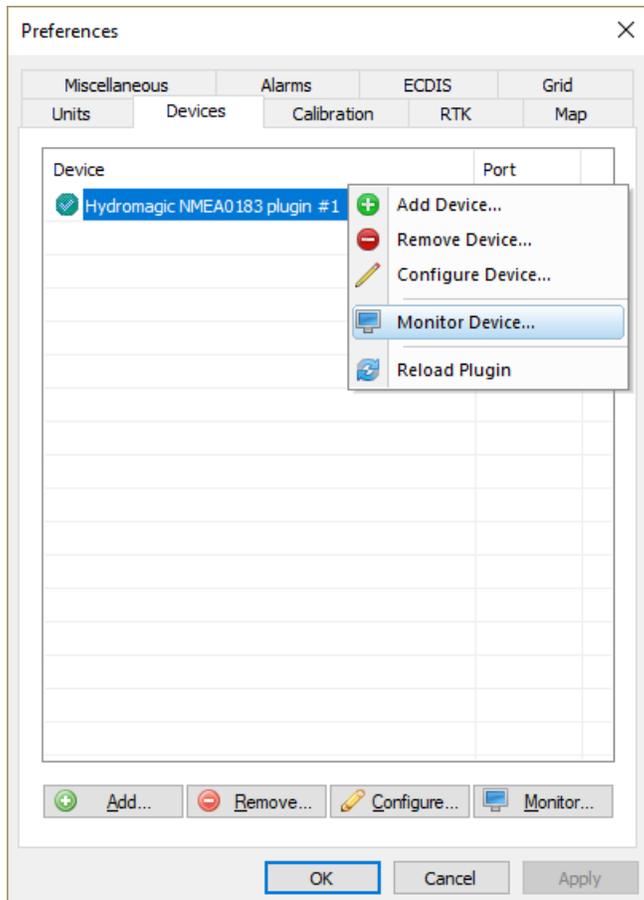
When everything has been configured correctly, and the sounder has been switched on, depth field in the "Data View" should display a depth value in green. Please note that some echo sounder output a valid depth value only when the transducer is in the water.

Depth	
Sounder Hi	2.00 m
Sounder Lo	2.00 m
Corrected	2.00 m

## Troubleshooting the NMEA0183 plugin

When no data is displayed, you can check whether data is coming in by using the "Communications Monitor": Open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "Hydromagic NMEA0183 plugin" and

click the "Monitor..." button. The communication monitor appears. When the monitor displays garbled data or no data at all, the serial port or serial speed setting might be incorrect. When you encounter problems getting the serial port to receive data, we suggest you to have a look at our YouTube tutorial on troubleshooting serial communications using the puTTY software (free software).



Start the "Communications Monitor" to see incoming NMEA0183 data.

### 2.3.3 Pairing and configuring Bluetooth hardware (Windows 7)

#### Setting up Bluetooth hardware

These days, most GNSS receivers and even some echo sounder have the ability to transfer data over Bluetooth. This manual page explains how to pair, connect and configure a Bluetooth connected device to be used with Hydromagic running on Windows 7. For instructions on how to setup Bluetooth hardware under Windows 10, please refer to the "Configuring Bluetooth hardware (Windows 10)" page. In order to connect a Bluetooth device to your computer, it needs to have a built in Bluetooth radio. When it is not built in, you can visit your local computer store to buy a Bluetooth radio which can be plugged into a free USB socket.

#### Pairing the device

In order to use a Bluetooth device on your computer, it needs to be 'paired' first. During this process the device is discovered and connected to the computer. In some cases a pin-code is needed as authentication method. To start the pairing process, locate the Bluetooth icon in the Windows System Tray. The Windows System Tray is located at the bottom-right of your screen (when your taskbar is at

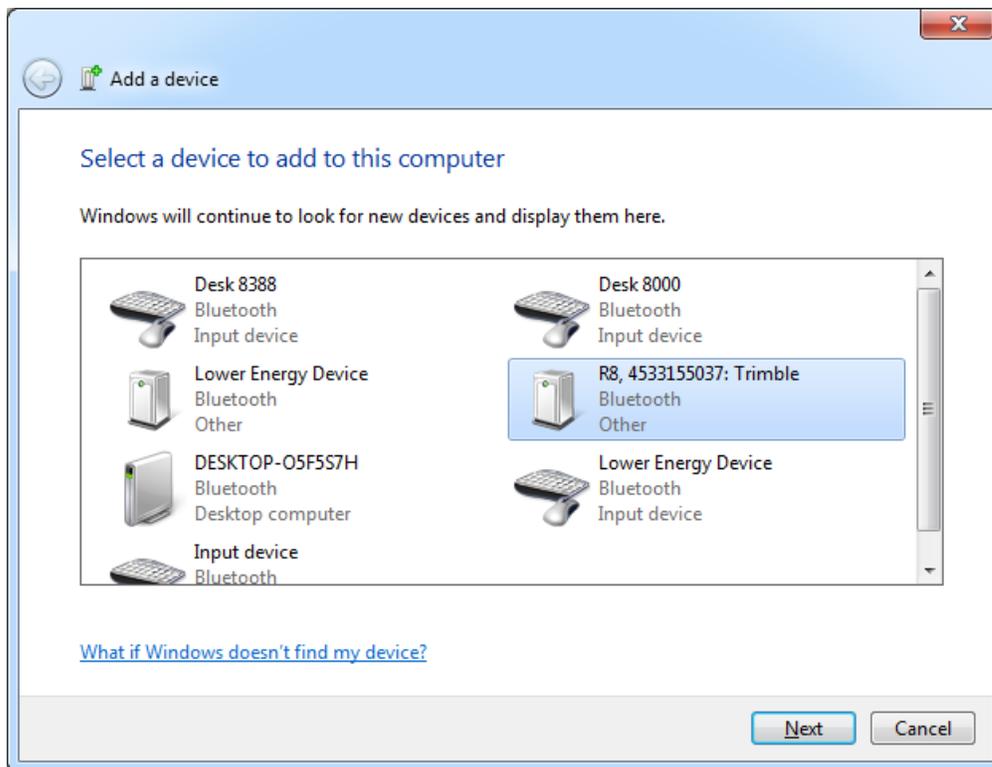
the bottom of the screen). Click the Bluetooth icon, and from the popup menu that appears, select the 'Add Bluetooth Device' option.



*The Bluetooth icon in the system tray.*

### Searching for the device

Windows will now automatically search for any Bluetooth device in range. Sometimes a device will show up as unknown device. It sometimes takes up to a minute till the correct name is displayed. Make sure that the device has been switched on. Some devices require to be set in 'Discoverable' mode. Please refer to the user manual for instructions on how this is done. It might take up to a minute for the device to show up in the list of discovered devices. When it appears, select it and click the 'Next' button to proceed to the next step.

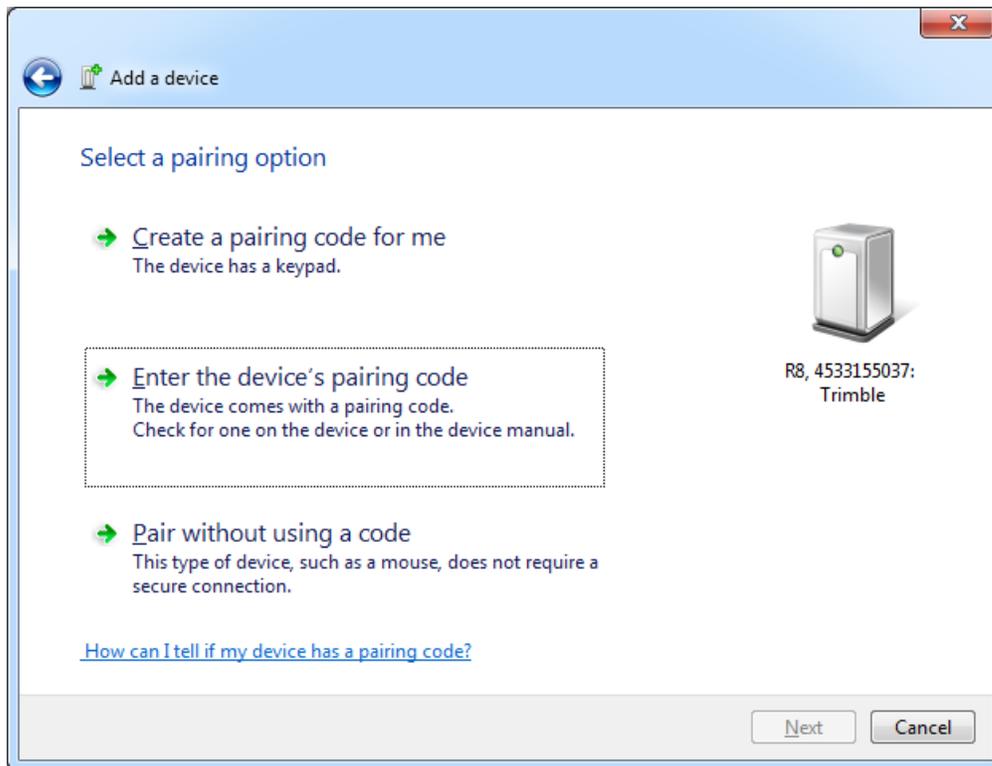


*Select the device you want to pair, and click "Next" to continue.*

### Pairing options

The next dialog shows the pairing options. When you are sure the device doesn't require a pairing code, select the 'Pair without using a code option'. In practice, most devices require a simple pairing code like '0000' or '1234'.

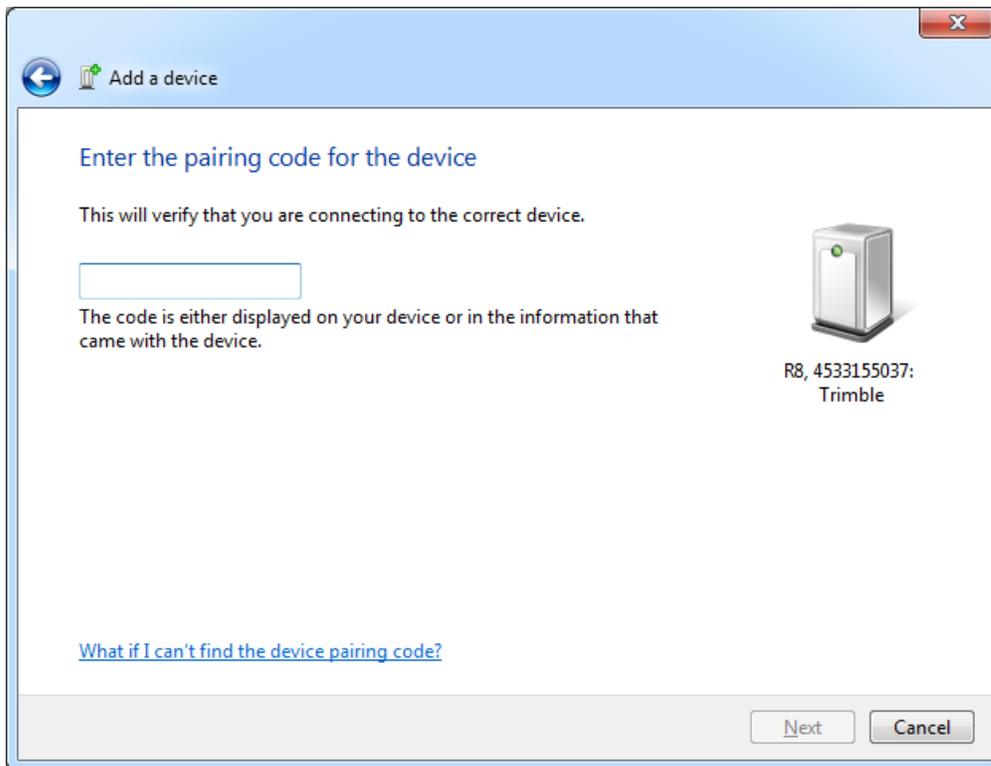
When the device requires a pairing code to be entered in order to pair with your computer, select the 'Enter the device's pairing code' option to enter the pairing code.



**For most hardware, a pairing code is required. Select the second option in this case.**

### Entering the pairing code

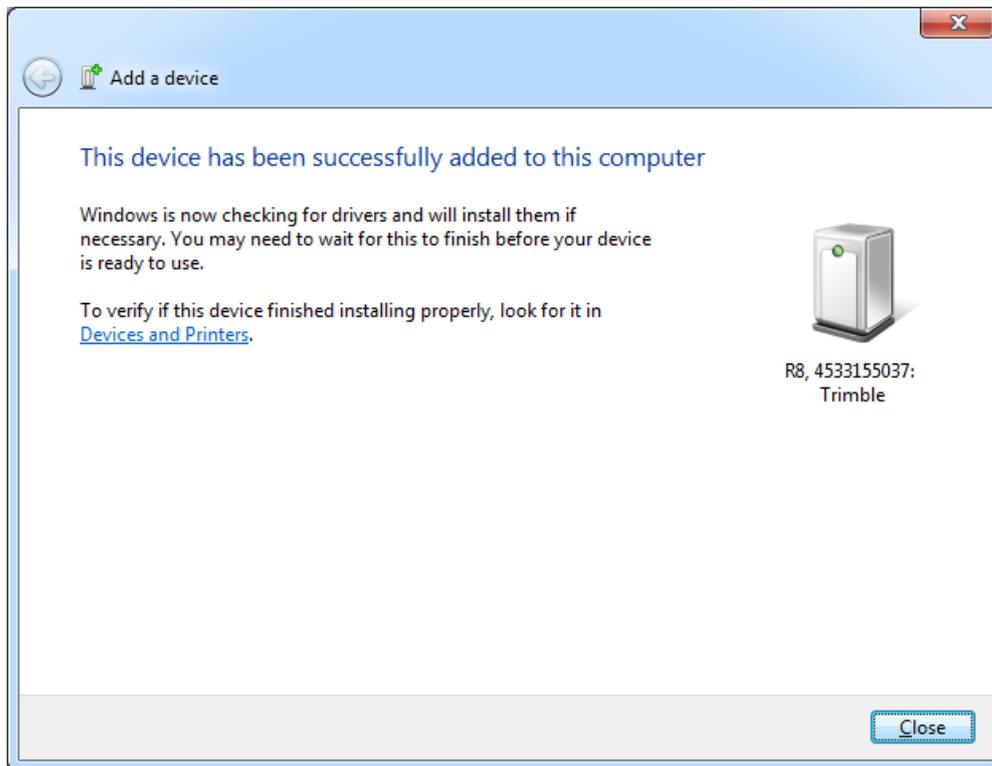
When you have selected to pair the device using a pairing code, an additional dialog where you can enter the pairing code will show up. Most devices use '0000' or '1234'. If this does not work, please refer to the user manual or contact your dealer. Enter the pairing code and click the 'Next' button to connect to the device.



*Enter the pairing code for the device. In most cases this will be 0000 or 1234.*

### Completing the installation of the device

When a successful connection has been made, it may take some time to install the device drivers required to use the device. Please wait for a minute or so, and click the 'Close' button when the device is ready for use.



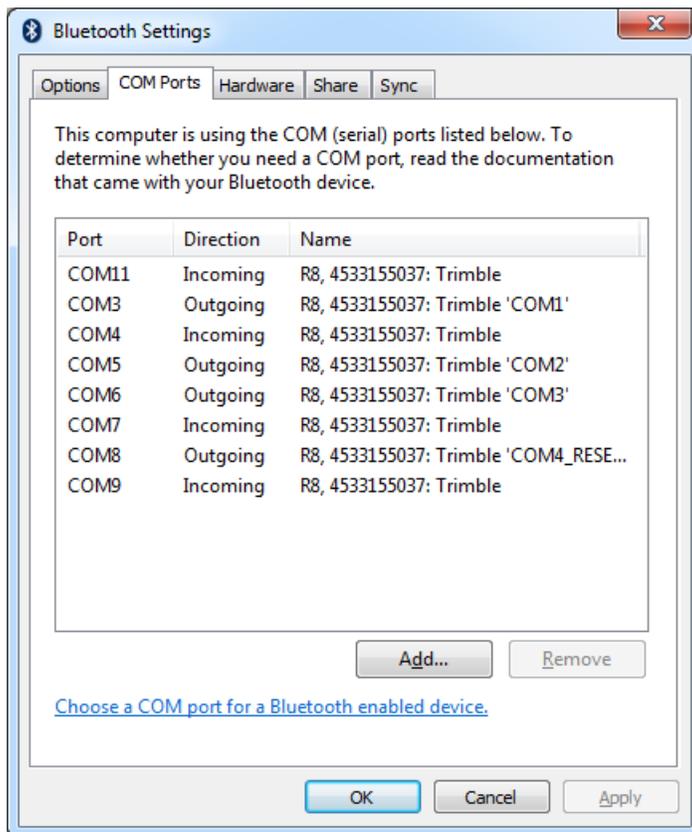
*The device has been successfully added to your computer.*

## Configuring Hydromagic

In order to use the device in Hydromagic, it has to be added in the Hydromagic device list. In Hydromagic, devices can be connected through an Ethernet connection, WiFi or a serial port. When using Bluetooth, one or more virtual serial ports will be created on your computer. You have to select one of these ports when configuring the device. To do so, you need the serial port number. To get a list of all serial ports exposed by the device, click the Bluetooth icon in the Windows System Tray and select 'Open Settings' option.

## Selecting the correct serial port

After selecting the 'open Settings' option, a new dialog should appear containing three tabs. Select the 'COM Ports' tab. Please note that a device, like for instance our Trimble R8 receiver can have more than one serial port.



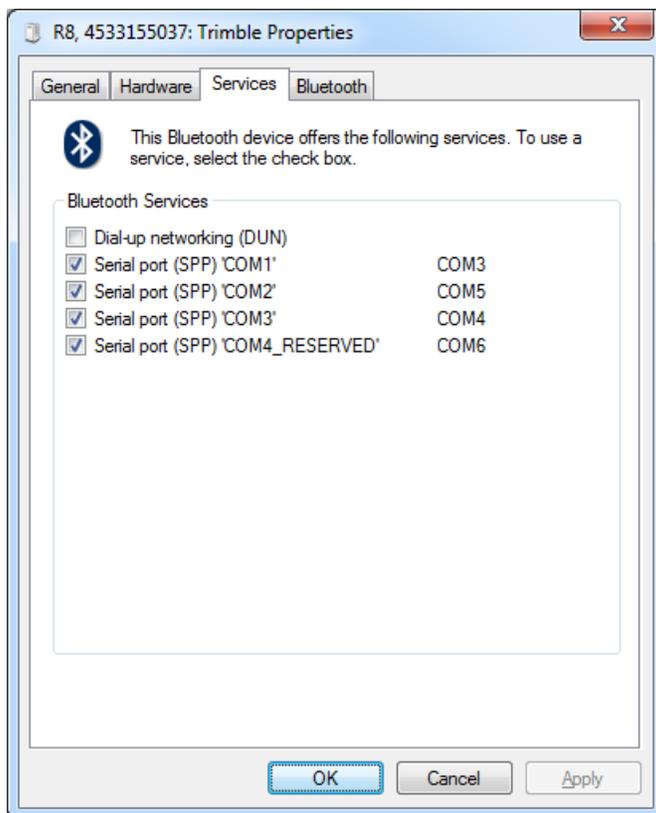
**Use the Port which is assigned to the incoming direction.**

The data from the GNSS receiver or echo sounder is always transferred over an 'Incoming Port'. For instance, when we use the first Bluetooth serial port on our R8, we have to use 'COM4'. Just remember the serial port number and proceed to one of the following steps to finish the configuration:

Configuring an NMEA0183 compatible GNSS or RTK receiver  
Configuring an NMEA0183 compatible echo sounder

#### **Troubleshooting: When no serial ports are displayed**

When the list in the screenshot above is empty (when no available serial ports are displayed), click the Bluetooth icon in the Windows System Tray and select the 'Show Bluetooth Devices' option. In the 'Devices and Printers' window that appears, right click your Bluetooth device and select the 'Properties' option from the popup menu. A tabbed window should now appear. In this window, click the 'Services' tab and check the serial ports you want to use:



***Make sure the "Serial Port" services are selected (when visible).***

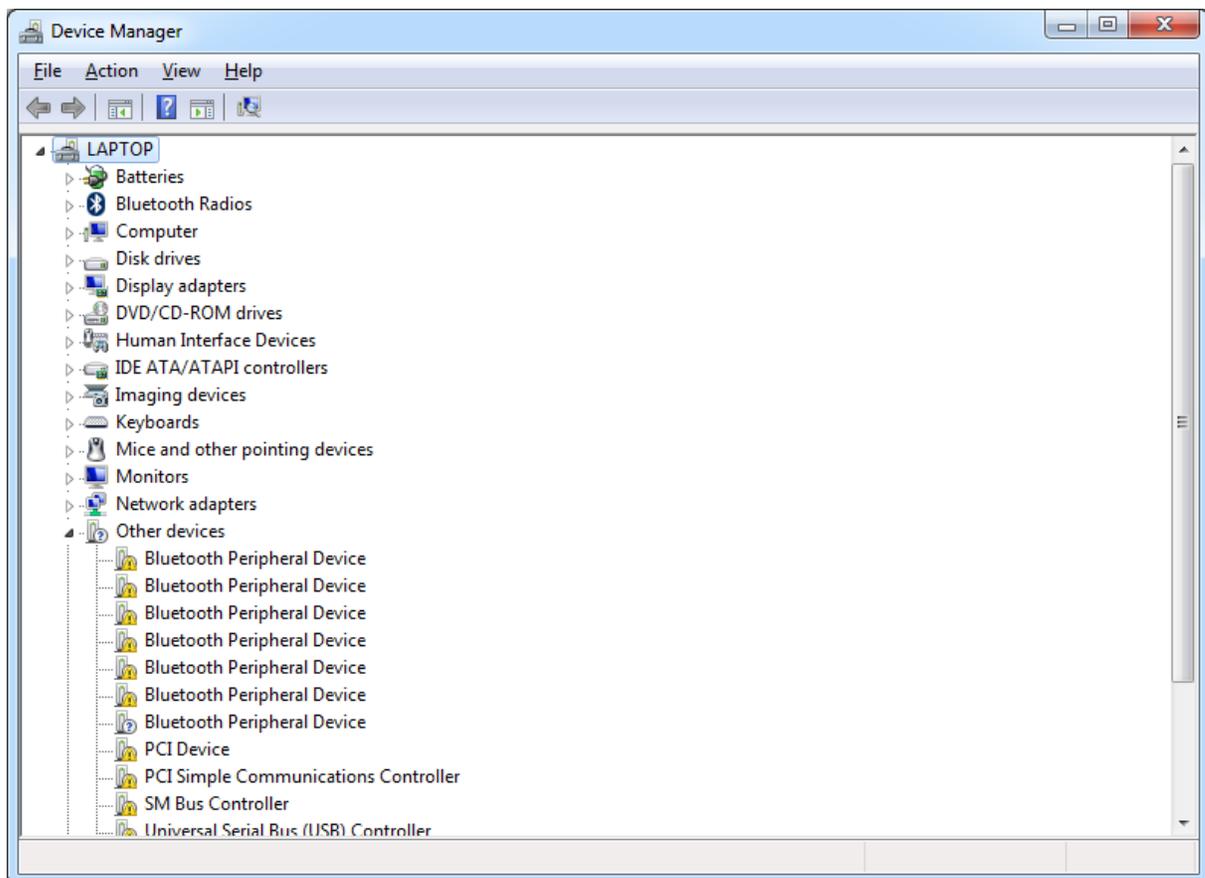
When the list of services remains empty, chances are that some drivers have not been installed properly. The following paragraph contains some instructions which will probably solve this problem.

Click 'OK' to store the settings and close the window. Windows will no install the device drivers for the serial ports in the background. When completed, repeat the instructions in the previous paragraph to determine the serial port number needed to setup the device in Hydromagic.

#### **Troubleshooting: When no services are displayed**

When no serial ports are displayed, and when no Bluetooth services are available for the device, most likely Windows failed to install the device drivers for the Bluetooth device.

You can check this using the 'Windows Device Manager'. To start this tool, click the start button, type "device manager" and press enter. In the dialog that appears, locate and expand the 'Other Devices' item:



*Use the device manager to check whether your Bluetooth hardware drivers have been loaded.*

When one or more 'Bluetooth Peripheral Device' items are listed with an exclamation mark in front, it means Windows was unable to install device drivers.

You can try the following steps to resolve the issue:

- Unplug and plug your USB Bluetooth dongle when no internal Bluetooth radio is used;
- Reboot the machine to see whether the drivers start to work after starting up again;
- From the 'Bluetooth Radios' section, uninstall and reinstall the device driver;
- Update the device driver from the vendor's CD-ROM or website instead of using the default Windows driver;
- Even installing another vendor's Bluetooth device driver will solve the problem sometimes !

When the 'Bluetooth Peripheral Devices' disappear from the 'Other Devices' is most probably solved. Go to the services tab as described in the previous paragraph to enable the services.

## 2.3.4 Pairing and configuring Bluetooth hardware (Windows 10)

### Setting up Bluetooth hardware

These days, most GNSS receivers and even some echo sounder have the ability to transfer data over Bluetooth. This manual page explains how to pair, connect and configure a Bluetooth connected device to be used with Hydromagic running on Windows 10.

For instructions on how to setup Bluetooth hardware under Windows 7, please refer to the "[Configuring Bluetooth hardware \(Windows 7\)](#)" page.

In order to connect a Bluetooth device to your computer, it needs to have a built in Bluetooth radio. When it is not built in, you can go to your computer store to buy a Bluetooth radio which can be plugged into a free USB socket.

### Pairing the device

In order to use a Bluetooth device on your computer, it needs to be 'paired' first. During this process the device is discovered and connected to the computer. In some cases a pairing code is needed as authentication method.

To start the pairing process, locate the Bluetooth icon in the Windows System Tray. The Windows System Tray is located at the bottom-right of your screen (when your taskbar is at the bottom of the screen).

Click the Bluetooth icon, and from the popup menu that appears, select the 'Add Bluetooth Device' option.

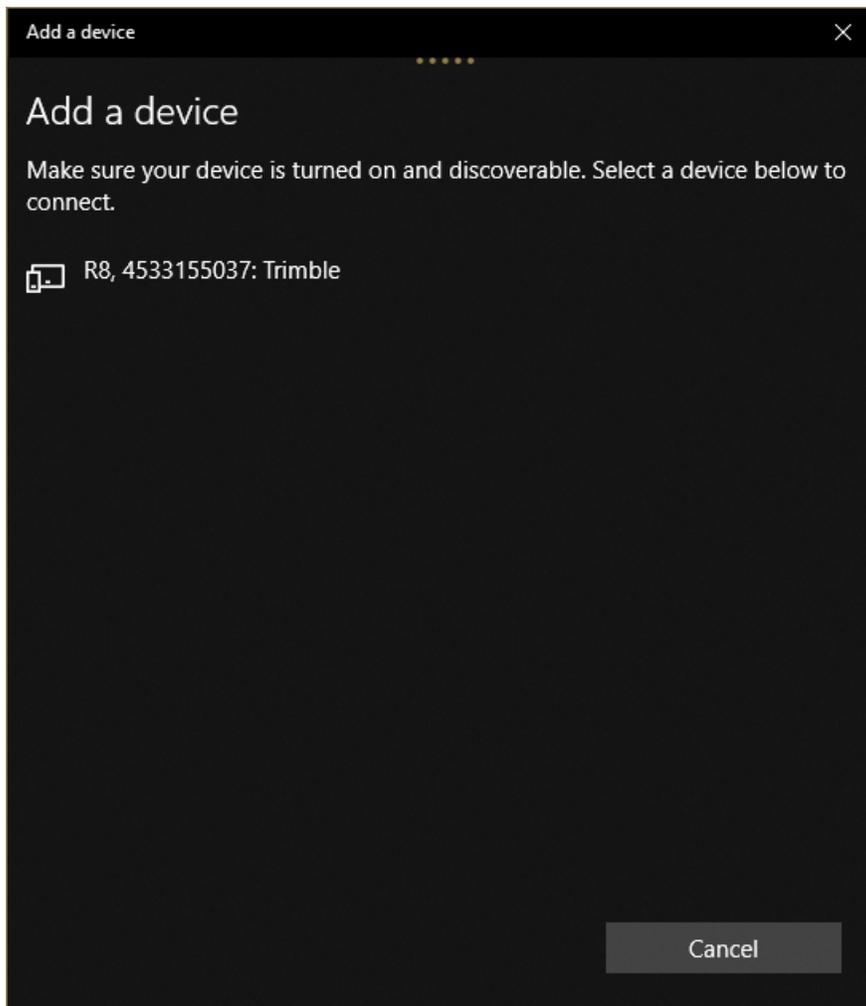


### Searching for the device

To start searching for the device, click the "The add Bluetooth or other device' option at the top of the window. Next, we have to select which of device we are going to add, so we select the 'Bluetooth' option here.

Make sure that the device has been switched on. Some devices require to be set in 'Discoverable' mode. Please refer to the user manual for instructions on how this is done.

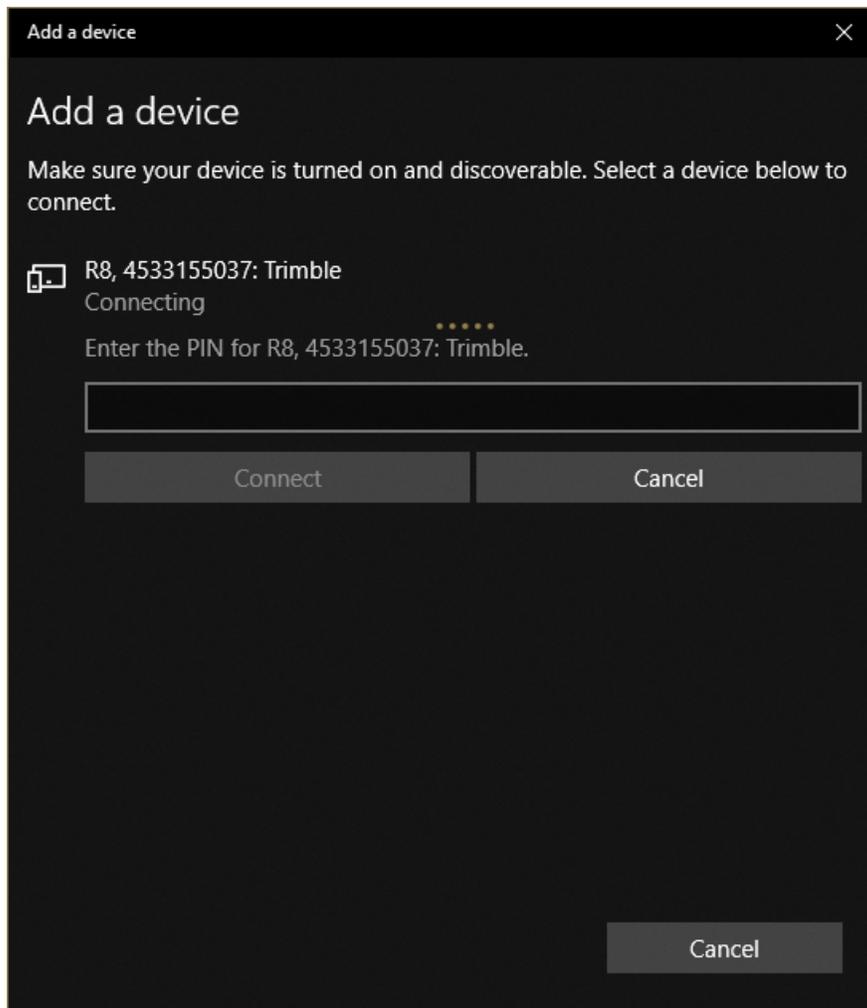
It might take up to a minute for the device to show up in the list of discovered devices. When it appears, just click it to connect and proceed to the next step.



*Select the device you wish to pair from the list and click "Connect".*

### Entering the PIN code

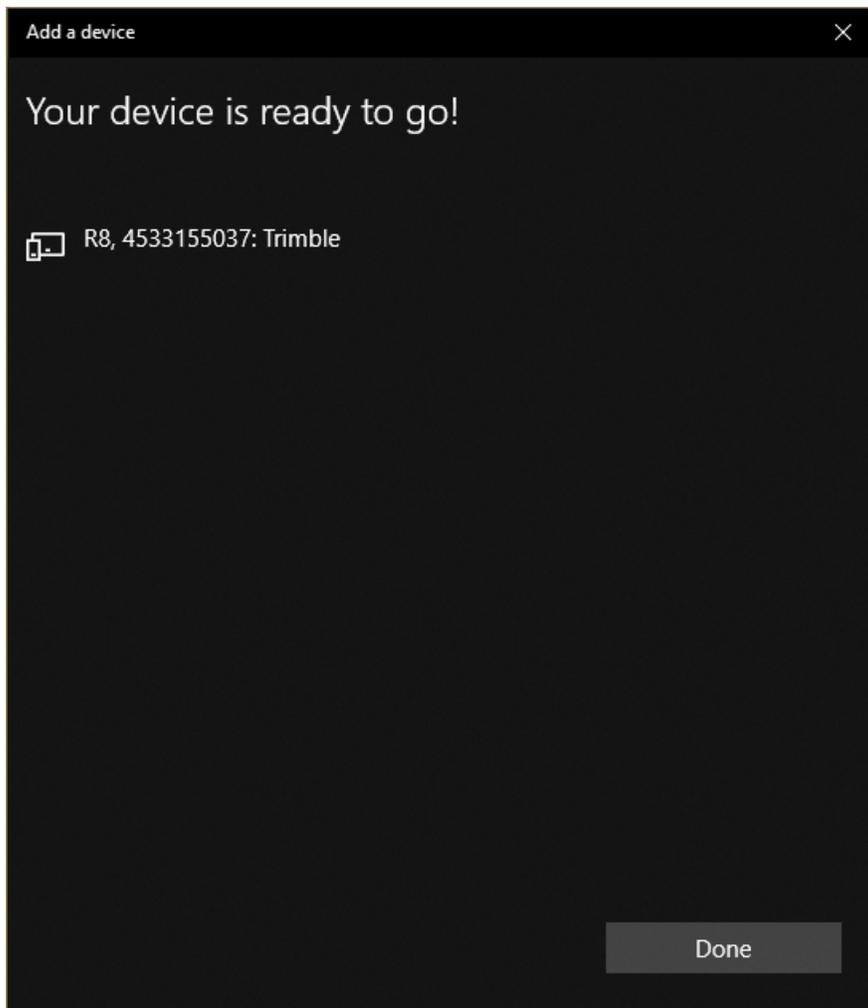
When pairing, sometimes a PIN code is requested when connecting for the device to the first time. Most devices use '0000' or '1234'. If this does not work, please refer to the user manual or contact your dealer. When asked, enter the PIN code and click the 'Connect' button to proceed to the next step.



*When a pincode is required, enter it here (most commonly used 0000 or 1234).*

### Completing the installation of the device

When a successful connection has been made, it may take some time to install the device drivers required to use the device. Please wait for a minute or so, and click the 'Done' button when the device is ready for use.



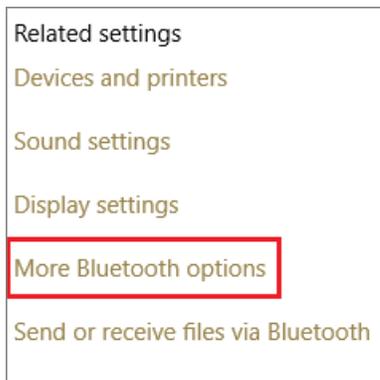
*Click the 'Done' button when the device is ready for use.*

## Configuring Hydromagic

In order to use the device in Hydromagic, it has to be added in the Hydromagic device list. In Hydromagic, devices can be connected through an Ethernet connection, WiFi or a serial port. When using Bluetooth, one or more virtual serial ports will be created on your computer. You have to select one of these ports when configuring the device.

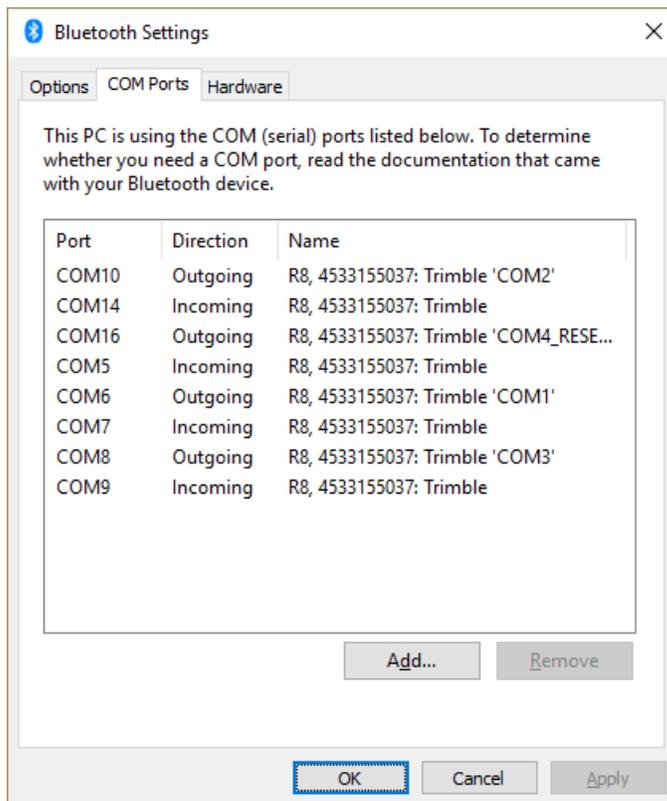
To do so, you need the serial port number. To get a list of all serial ports exposed by the device, select the 'More Bluetooth Options' option at the right side of the window.

When you already closed the 'Bluetooth and other devices' settings window, just click the Bluetooth icon in the Windows System Tray.



### Selecting the correct serial port

After selecting the 'More Bluetooth Options' option, a new dialog should appear containing three tabs. Select the 'COM Ports' tab. Please note that a device, like for instance our Trimble R8 receiver can have more than one serial port.



**Use the Port which is assigned to the incoming direction.**

The data from the GNSS receiver or echo sounder is always transferred over an 'Incoming Port'. For instance, when we use the first Bluetooth serial port on our R8, we have to use 'COM7'.

Just remember the serial port number and proceed to one of the following steps to finish the configuration:

- Configuring an NMEA0183 compatible GNSS or RTK receiver

- Configuring an NMEA0183 compatible echo sounder

## 2.4 Software Configuration

### 2.4.1 Static draft

#### Echo sounder offset (draft)

The echo sounder offset can be used to correct the difference between the depth outputted by the echo sounder, and the real depth.

This offset is also called static or fixed draft. Dynamic draft (depending on the speed of the vessel) can be corrected when processing your raw data files.

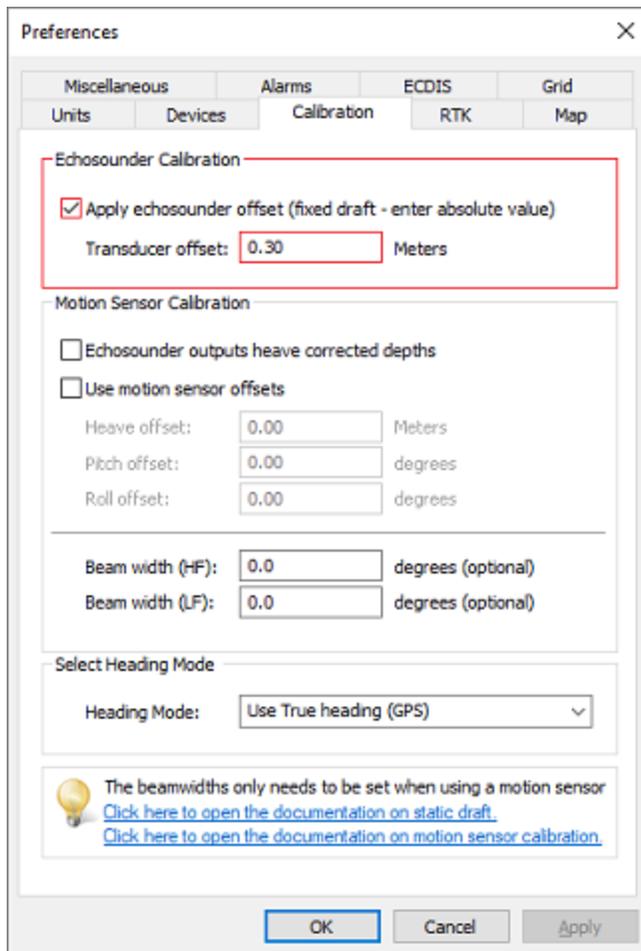
The transducer of the echo sounder measures the water level from the bottom of the transducer to the bottom of the river.

The height of the water which is above the bottom of the transducer has to be added to the echo sounder output, and can be entered here.

Most echo sounders have the option to enter the distance between the water surface and the transducer, so in this case you do have to disable this option, or you can use it for other corrections.

#### Entering the echo sounder offset

To enter an offset for the echo sounder, select "Preferences..." from the "Option" menu. In the dialog that appears, select the "Calibration" tab. You should see the following dialog:



**The static draft can be entered in the "Calibration" tab.**

The value entered is added to the depth (both high and low frequency depths) reported by the echosounder.

To subtract from the sounders value (in case of depth below keel), just prefix the value with the minus sign "-".

To disable the correction, just remove the tick from the "Apply Echosounder Offset" checkbox, or click the "Reset" button to load the defaults.

## Raw data files

**Please make sure the echosounder offset is measured and entered into the software before recording any data.**

**The depth written in the raw data files is the depth corrected with the echo sounder offset !**

```

RAW00001 - Notepad
File Edit Format View Help
NAM RAW00001
CMT
VIS 1
HUN 9001
VUN 9001
PRJ 28992
DTM 4289
ELL 7004
PRM 8901
GEO 0
ANT 0.000
DFT 0.200 < Static draft setting in Hydromagic
VER 9.0
BLD 9.0.64.91007
DPT 00000008 00000000 1553239378.728 0.000 0.000 0.000
TRC 00000000 00000002 1553239378.728 0.000 DA00003.48 m < Depth reported by echo sounder
DPT 00000002 00000002 1553239378.728 0.000 0.000 3.680 < Depth stored in raw data file
TRC 00000000 00000001 1553239378.771 0.000 $GNGLL,5232.4881328,N,00609.2422394,E,071810.00,A,D*70
POS 00000003 00000001 1553239378.771 0.000 207022.010 506256.824 0.000 0.000 6.154037323 52.541468880
TRC 00000000 00000001 1553239378.771 0.000 $GNGGK,071810.00,032219,5232.4881328,N,00609.2422394,E,3,12,1.44,EHT43.0394,M*6E
TRC 00000000 00000001 1553239378.772 0.000 $GNRMC,071810.00,A,5232.4881328,N,00609.2422394,E,2.27,213.44,220319,0.0,E,D*20
POS 00000003 00000001 1553239378.772 0.000 207022.010 506256.824 0.000 0.000 6.154037323 52.541468880
SPD 00000000 00000001 1553239378.772 0.000 4.2
HDG 00000001 00000001 1553239378.772 0.000 213.44 0.00

```

*The depth data received is corrected with the static draft before saving.*

## Using RTK

When you are measuring the elevation of the river bed using a RTK receiver, and the offset between the transducer and GPS antenna is fixed, you can just enter this offset in the RTK settings tab. However, we recommend to fill out both the antenna and transducer offset separately in case you ever need the absolute water depths.

## NMEA0183 compatible echo sounders

When using a NMEA0183 compatible echo sounder, whether to enter an offset depends on the NMEA0183 sentence(s) used to retrieve the depth data.

Sentence	Depth Value	Correction
\$SDDBK	Depth below keel	Enter the distance between the keel of the ship and the water surface.
\$SDDBS	Depth below surface	No correction is needed, as the depth is measured from the water surface.
\$SDDBT	Depth below transducer	Enter the distance between the transducer and the water surface.
\$SDDPT	Depth	The offset configured in the echo sounder is used.

*Some NMEA0183 depth sentences supported by Hydromagic.*

## 2.4.2 Motion sensor calibration

### Motion sensors

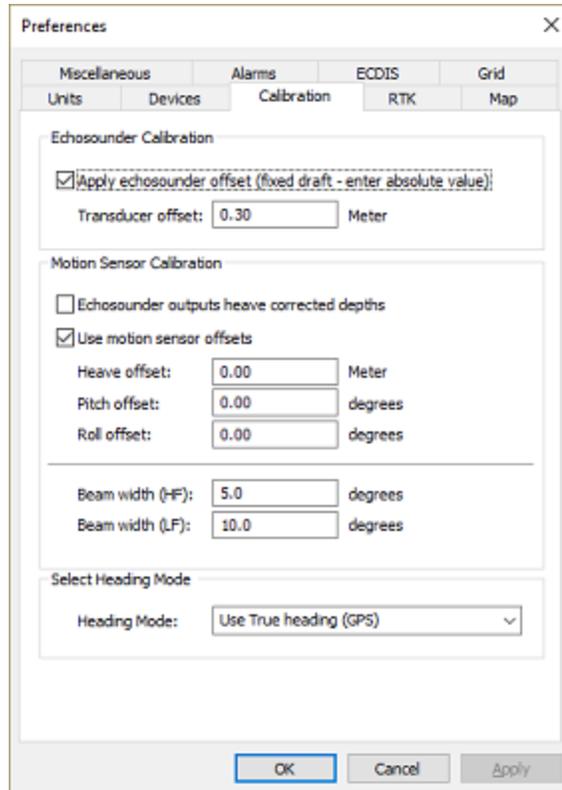
Since Hydromagic version 6.0, the software has built in support for motion sensors. Motion sensors can be used to correct your soundings for heave, pitch and roll.

In Hydromagic, motion sensors are configured using hardware plugins supplied with the software. Supported devices include Teledyne TSS, SBG Systems, IMU and compatible hardware.

## Motion sensor calibration

A motion sensor can be calibrated in the "Motion Calibration" section of the preferences window. To open this tab, select "Preferences..." from the options menu, and select the "Calibration" tab.

The following window should appear:



**Enable the "Use motion sensor offsets" option to calibrate your motion sensor.**

## Echo sounder heave offset

Heave is used to correct the vertical motion of the vessel, caused by for instance, waves. It is important to disable heave compensation by a motion sensor when heave is corrected within the hydrographic echo sounder. For this, select the "Echosounder outputs heave corrected depths" check box. The heave offset box will be disabled.

## Motion sensor offsets

To use offsets for your motion sensor, or to tare / calibrate your device, enable the offsets by checking the "use motion sensor offsets" check box.

Use the motion sensor offset fields to correct the roll (x), pitch (y) and heave (z) offsets outputted by a motion sensor. Enter the heave offset in the vertical units used by your project (normally meters), the pitch and roll offsets are always in degrees.

In case you want to tare your sensor, just click the "Set" button to set all values automatically when the sensor is connected and the vessel is stable (for instance when docked).

To disable calibration, click the "Reset" button to set all values to their defaults.

When done, just click "OK" to apply the values. In the data view the heave, pitch and roll values should now contain valid values.

## 2.4.3 Vessel shape and offsets

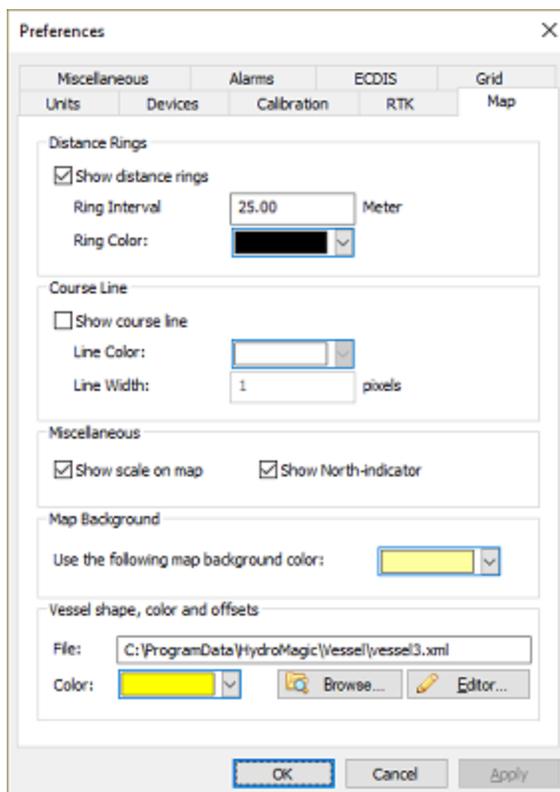
### Vessel shape and offsets

Using the built in "Vessel Editor" you can specify how the vessel should be drawn on the map. It also allows you to set the exact location of the sensors, like transducer and GPS antenna.

The position of the sensors is used to calculate the offset between the GPS position and the transducer position when the vessel's heading is known.

### The vessel editor

To start the "Vessel Editor" utility, open the preferences dialog by selecting "Preferences..." from the "Options" menu. In the preferences dialog, select the "Map" tab, and click the "Editor..." button as shown in the screen shot below:

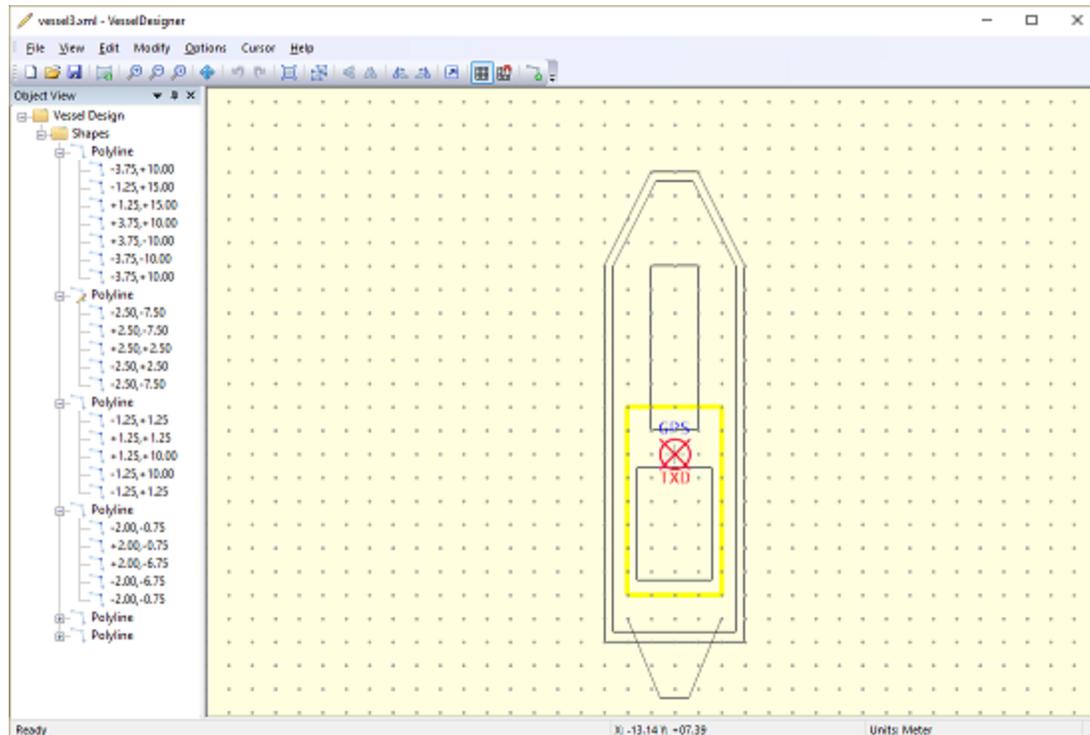


**Click the "Editor..." button to start the "Vessel Designer"**

The vessel editor will be started and will display the vessel as specified in the "File" field. If no vessel file has been specified yet, it opens with a blank project.

## Loading designs

Hydromagic is shipped with a couple of example vessel files. To load one of these files into the vessel editor, select the "Open Design..." option from the "File" menu. By default, all vessel designs are stored in the "C:\ProgramData\Hydromagic\Vessel" folder.



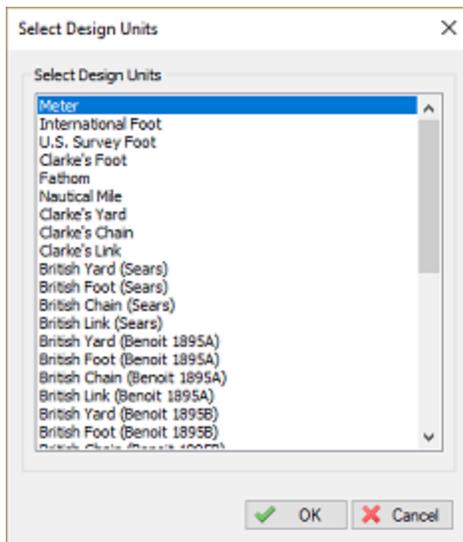
**Use the "Vessel Designer" to create or alter vessel or dredger shapes, and to set sensor offsets.**

## Creating a new design

To create a new design, just select "New Design" from the "File" menu. If you have unsaved data, the application will prompt you to save it now.

After creating a new project, make sure you select the units for your new design first. This can be done by clicking the currently selected units in the status bar, or by selecting the "Units..." option from the "Options" menu.

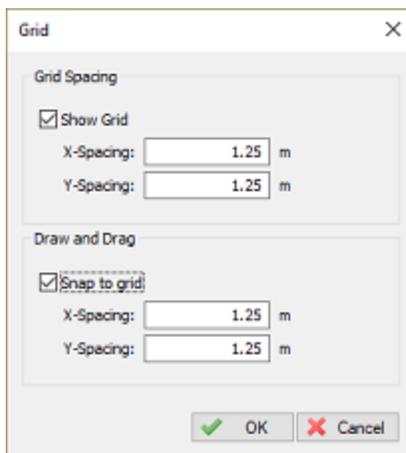
The best is to select the same units that are used in the drawing you have as reference. In case you forgot to select the correct units, you can always convert all coordinates by using the "Scale Features" option.



*Select the units of your choice.*

## Grid options

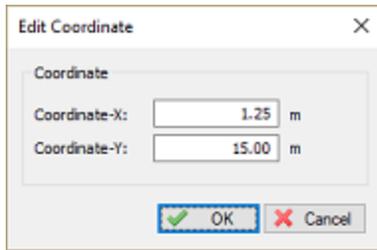
To change grid options, select "Grid" from the "Options" menu. Using the grid options, you can display a grid which can be used as guidance when placing objects. The grid can also be used to snap objects to, both options can be enabled or disabled.



*Use the grid as guidance when drawing.*

## Adding and modifying features

To add a line segment or polygon to the design, select "Draw Polyline" from the "Cursor" menu. To change the location of a single point, you can either drag the point around using the mouse, or alter the coordinates manually by right clicking the point, and select the "Edit Vertex..." option.



*You can enter vertex coordinates manually.*

## Removing features

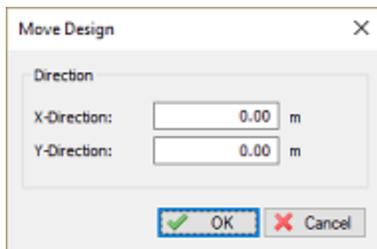
Existing segments can be modified by using drag and drop. To remove features from the design, right click on the shape in the "Object View" windows, and select "Remove Polyline". To remove a single point (vertex) from a line segment or polygon, right click the point and select the "Remove Vertex..." option from the context menu.

## Moving features

In the vessel designer, features can be moved by entering the amount of units it has to move (shift) in the given directions. To move features, click the "Move" button in the toolbar.

In the dialog box that appears, enter how many units the object has to move on the X and Y axes.

A negative value on the X axis means the object will be moved to the left. A negative value on the Y axis means the object will be moved down.



*Move the design.*

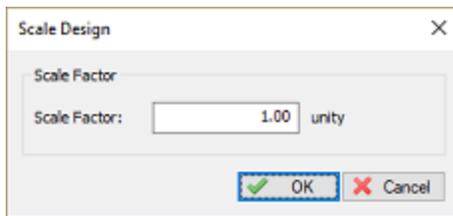
## Scaling features

To scale the design by a specified amount, click the "Scale" button. Alternatively, you can select the "Scale" option from the "Modify" menu.

In the dialog that appears, enter the scale factor. All coordinates will be multiplied with this value.

Entering a value greater than 1.0 increases the size of the design. When entering a number smaller than 1.0 the size decreases.

This function can also be used to convert a design from, for instance, feet to meters. In this example you would enter a scale factor of 0.3048.



**Scale the design.**

## Mirror features

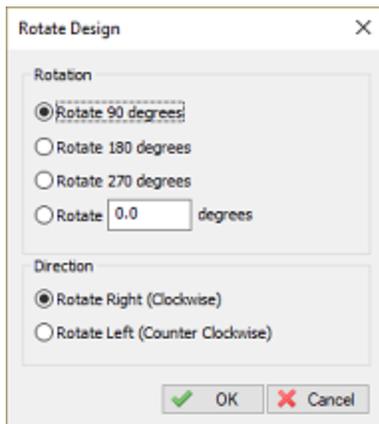
Objects can be mirrored horizontally or vertically by clicking one of the mirror buttons in the tool bar. Alternatively, you can select these options from the "Modify" menu.

To undo a mirroring action, just perform the action again to restore the object to its current shape.

## Rotate features

Using the rotate function you can rotate an object around its origin by any amount of degrees. Objects can be rotated clockwise or counter clockwise.

To start the rotating tool, click either the "Rotate Left" or "Rotate Right" button in the tool bar. Alternatively, you can select these options from the "Modify" menu.

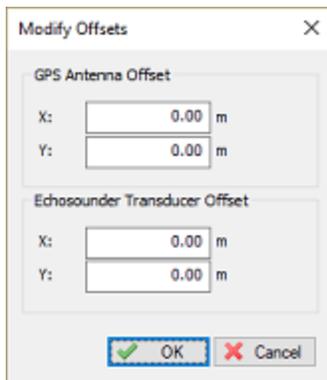


**Rotate the design clockwise or counterclockwise.**

## Setting sensor position offsets

You will notice two circles labeled "TXD", and "GPS". The "TXD" circle can be dragged onto the vessel to mark the location of the transducer, the "GPS" circle is used to mark the location of the GPS antenna.

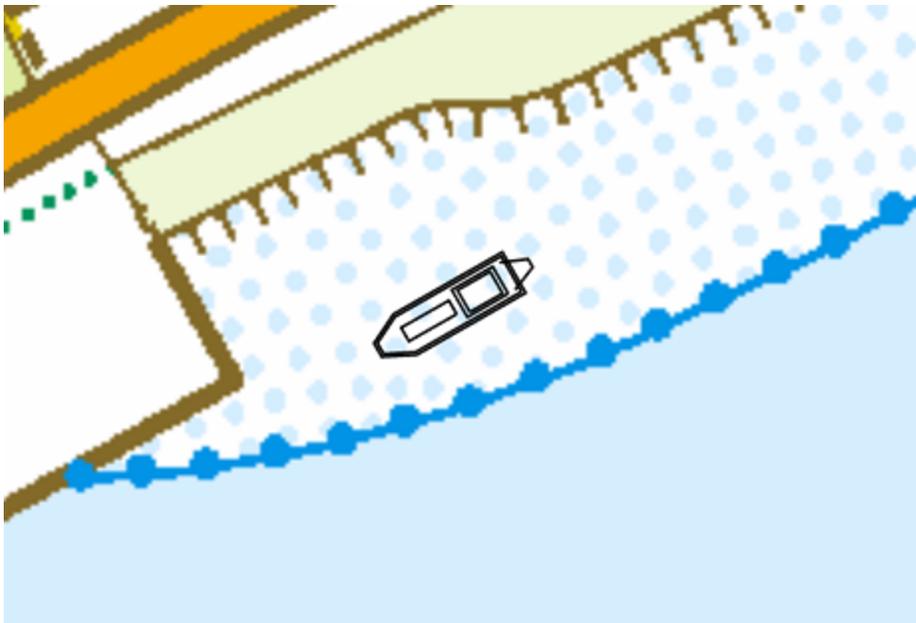
Instead of dragging the offset positions using the mouse, you can set them manually as well. To do so, select the "Offsets" option from the "Modify" menu.



*Offsets can also be entered manually.*

## Saving designs

After the design has been completed, and the GPS and transducer locations have been selected, you can save your design by selecting "Save Design..." from the "File" menu. Now you can close the "Vessel Editor" and select the design in the Hydromagic Survey software. When a valid GPS position is available, the ship will be drawn on the map using the specified vessel shape:



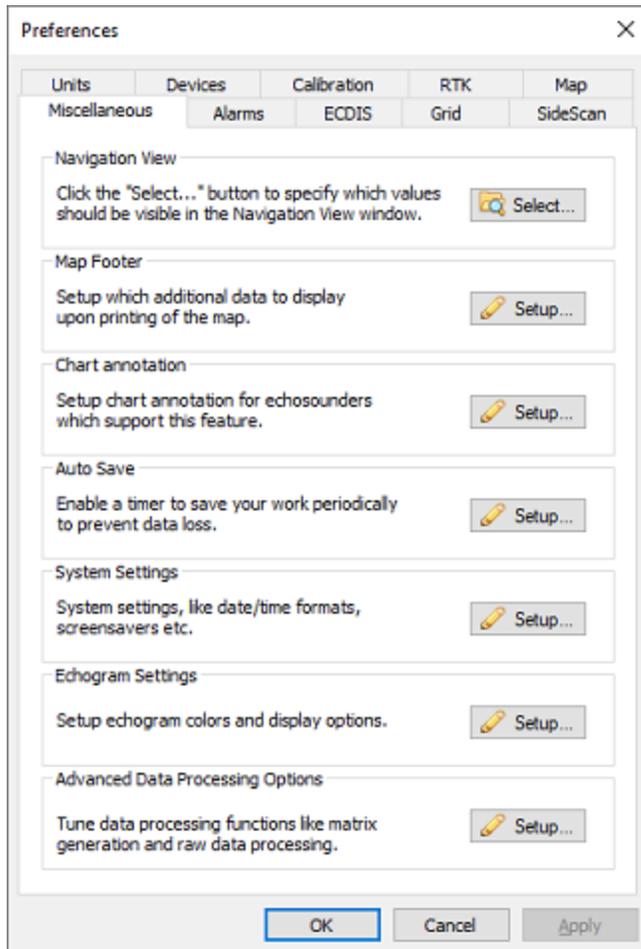
*Example of a vessel shape created in the "Vessel Designer".*

## 2.4.4 System Settings

### System Settings

The system settings window allows you to adjust some system wide settings, such as date and time formats and power saving behaviors. To access the system settings window, first select the "Preferences..." item from the "Options" menu to open the preferences dialog. In the preferences dialog,

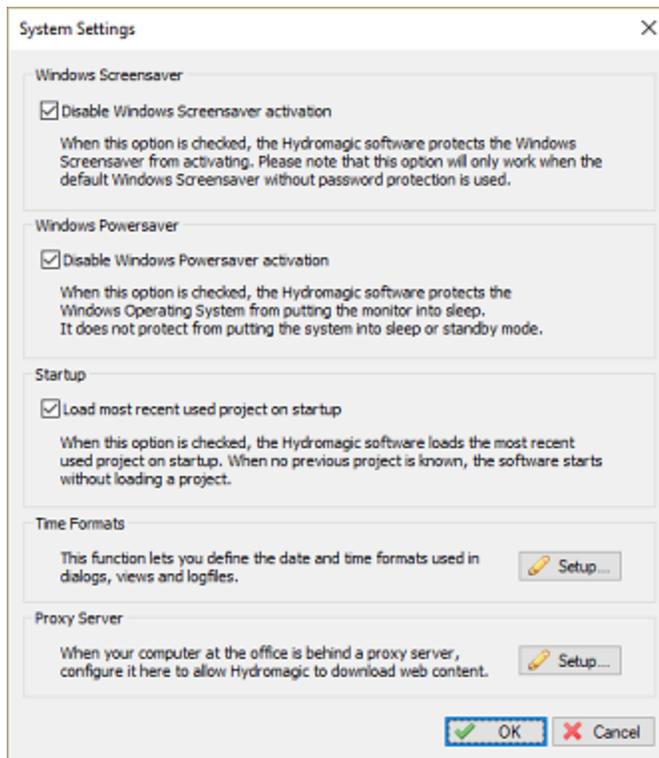
select the "Miscellaneous" tab, and click the "Setup..." button in the "System Settings" section as shown below:



Click the "Setup..." button in the "System Settings" section.

## The system settings dialog

After clicking the "Setup..." button, the following dialog appears:



*The "System Settings" dialog appears.*

## Windows screen saver

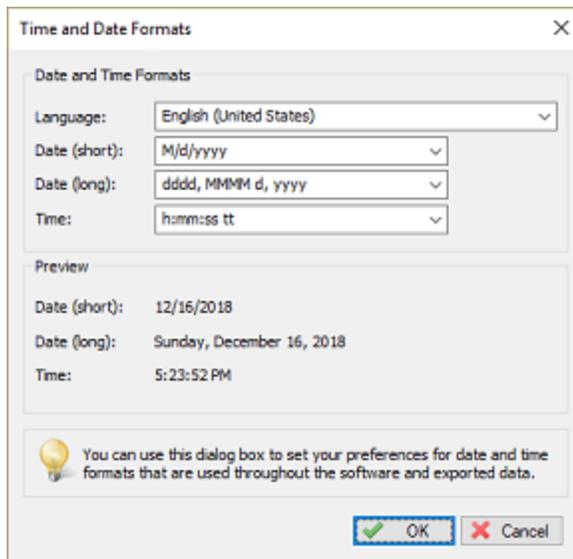
When the "Disable Windows Screensaver activation" option has been selected, Hydromagic prevents Windows from starting the screen saver as long as the Hydromagic application has focus. Please note that this option only works when a screen saver without password protection is used. This option prevents situations where your screen blanks when you do not touch the mouse or keyboard for some time when performing a survey.

## Windows power saver

When the "Disable Windows Powersaver activation" option has been selected, Hydromagic prevents Windows from putting the monitor or laptop display in sleep mode as long as the Hydromagic application has focus. This option prevents situations where your screen blanks when you do not touch the mouse or keyboard for some time when performing a survey.

## Time Formats

Use this option to specify the time and date formats used in Hydromagic for log files, exported ASCII data, screen dumps and printing. Click the "Setup..." button to access these settings.



**Customize day and time formats for exported data**

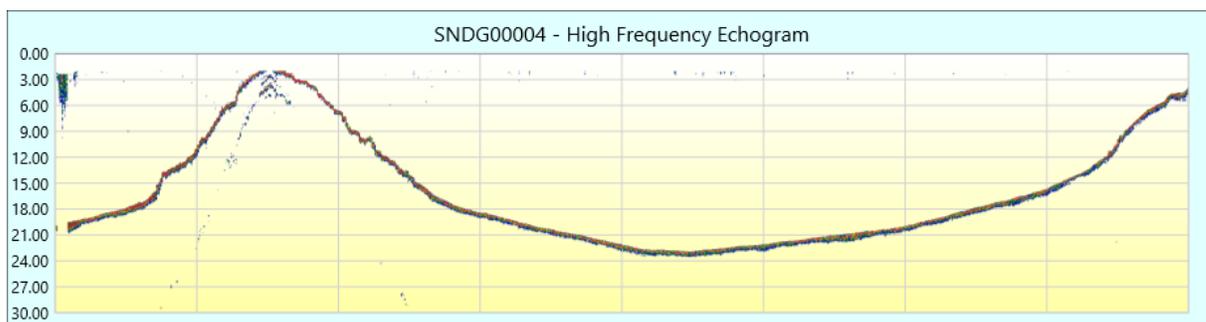
To change the time and date formats, select your language and country using the "Language" selection. After selecting the language, the dialog displays the possible date and time formats for this language. You can preview the settings in the "Preview" pane. To apply the settings, click "OK".

## 2.4.5 Echogram settings

### Echograms in Hydromagic

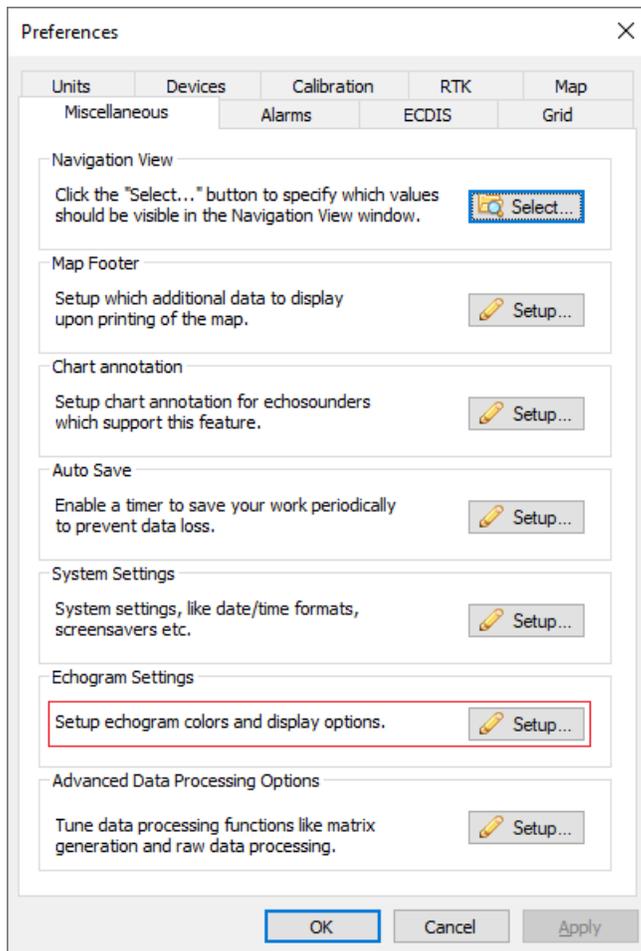
In Hydromagic an echogram is a graph which displays measured depth versus time elapsed. When supported by your echosounder, it is even possible to view the sonar echo envelope from the entire water column.

An echogram display is used in some real time displays, such as the echogram for high and low frequency data, the echogram for sub-bottom data, the echogram digitizer and the echogram export in the soundings list.



### Loading the echogram settings dialog

To access the echogram settings window, first select the "Preferences..." item from the "Options" menu to open the preferences dialog. In the preferences dialog, select the "Miscellaneous" tab, and click the "Setup..." button in the "Echogram Settings" section as shown below:



## The echogram settings dialog

After clicking the "Setup..." button, the following dialog appears:

Echogram Display Preferences

Echogram Preferences

Minimum depth value: 0.00 ft  Autodetect depth range

Maximum depth value: 25.00 ft

Maximum update rate: 10 Hz (only applies to real time displays)

Echogram offset: 0.00 ft (for instance: draft correction)

Echogram Filter

Display return signals with an intensity higher then: 10 % of max intensity.

Display return signals with an intensity lower then: 100 % of max intensity.

Echogram Colors

Color

Add Color...

Insert Color...

Modify Color...

Delete Color

Clear All Colors...

Reverse Schema

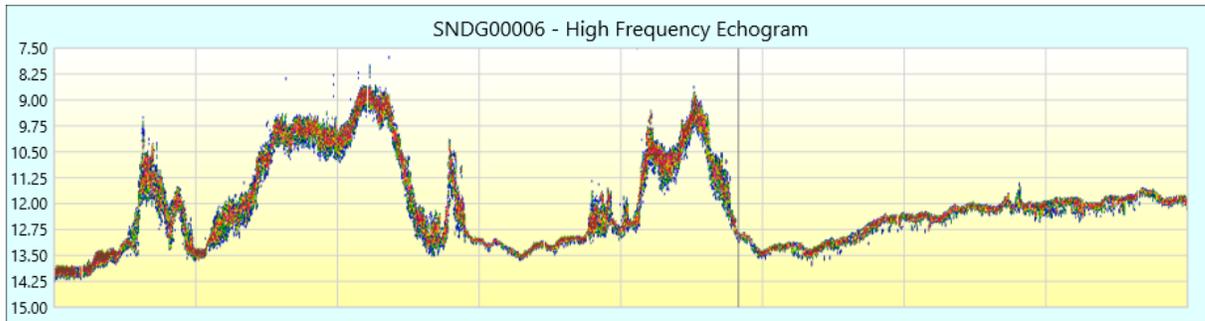
Select Preset...

Color values on top of the above list are used for high intensity return signals while the values at the bottom are used for low intensity return signals. To use default color values, click "Clear All Colors...", select "Yes" and click "OK".

OK Cancel

## Setting a custom echogram range

By default the range (minimum and maximum depth in graph) is detected automatically. If you want to set the range manually, for instance to zoom in on the data, uncheck the "Autodetect depth range" checkbox and use the 'Minimum depth value' and 'Maximum depth value' text boxes to view a specific range as shown in the example below:



### Maximum update rate

With the 'maximum update rate' option you can set how often the echogram display can be refreshed per second. Please note that this option is only applicable for the real-time echogram displays since the other ones will only be redrawn when they are being zoomed or when settings are changed.

When you are using a laptop or desktop computer without an advanced graphics processing unit, sometimes an high update rate can cause the computer or software to slow down a bit. In these cases, you can select a lower update rate using this setting.

### Echogram offset

This option allows you to correct the whole echogram image with a fixed offset or draft value. For instance when you need to apply a draft after the data has been recorded, and no draft has been set in the sounder use this setting to apply a correction.

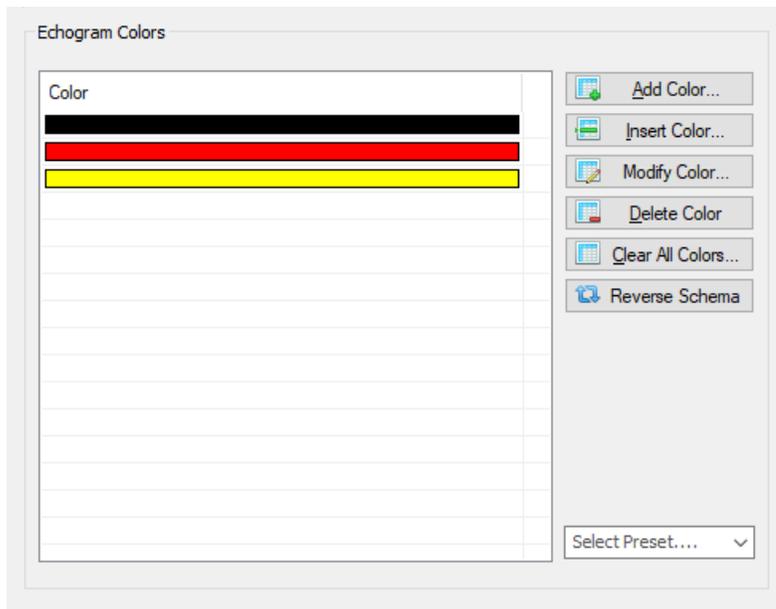
### Echogram filter

The minimum and maximum filter values can be used to control which return echo intensities are displayed in the echogram. You can use this filter to eliminate noise or to suppress the display of the transmit pulse.

### Echogram colors

The echogram color editor can be used to define your own color ranges to use for the echogram. Use the buttons on the right to add, remove or insert colors. You can also choose one of the many pre-defined color schema's:

- Gold (Black, Red and Yellow);
- Four (Red, Green, Yellow and Blue);
- RGB (Red, Green, Blue and Yellow);
- HSV (Rainbow Colors);
- Grayscale (Black, Gray and White);
- Blue (Blue and White);
- Green (Green and White);
- Red (Red and White);
- RedBlue (Red, White and Blue);
- SIMRAD (Simrad Colors);
- Unabara (Use with Unabara sub bottom profilers).



## 2.4.6 Unit Settings

### Units

In the "Units" tab in the preferences window, you can select the desired units for speed, area and volumes.

You can also find the selection for the geographic coordinates formatting here.

### Modifying unit settings

To access the unit settings, first select the "Preferences..." item from the "Options" menu to open the preferences dialog.

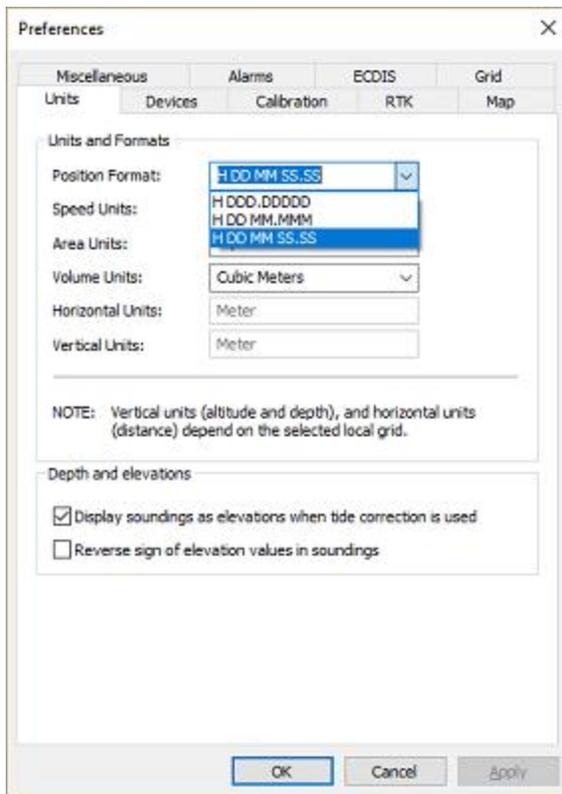
In the preferences dialog, select the "Units" tab:



### Geographic position format

The position format defines how geographic (latitude and longitude) coordinates will be displayed throughout the software.

This settings will be applied to the data window, cursor position in the status bar and all dialogs which display WGS84 coordinates.



### Speed units

Speed is displayed in the data window, but is also used in some other dialogs where speed is a factor, like the dynamic draft profile dialog.

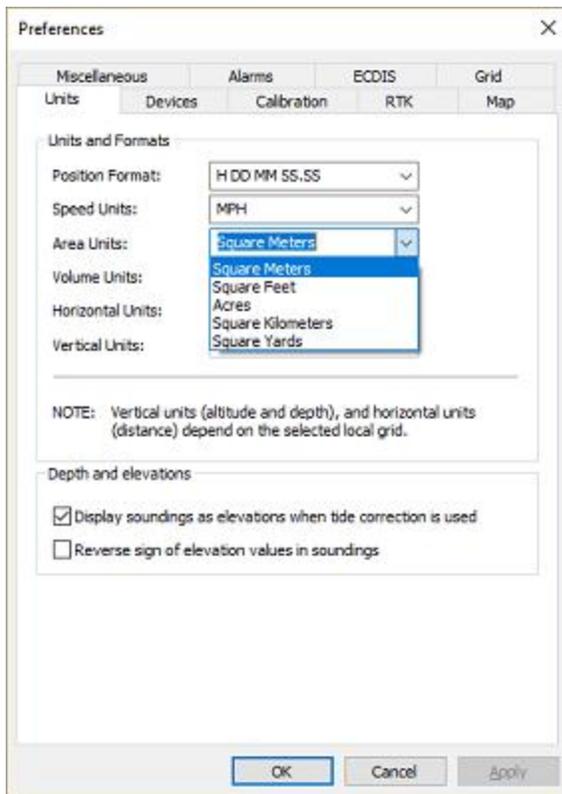
Supported units for speed are Miles per Hour, Kilometers per Hour, Knots and Meters per Second.



## Area units

Area's are used for instance in the area calculation tool, but also in generated volume reports (matrix, cross sections and staging volumes).

Supported units for area are Square Meters, Square Feet, Square Kilometers, Square Yards and Acres.



### Volume units

Volumes are mainly used in generated volume reports (matrix, cross sections and staging volumes). Supported units for volumes are Cubic Meters, Cubic Inch, Cubic Yard, Cubic Feet, Barrels and Gallons.



## Horizontal units

Horizontal units are used to display easting and northing positions and will be used in distance calculations as well.

Horizontal units are part of the geodesy settings and need to be set before creating a new project. They cannot be modified here.

The image shows a software dialog box titled "Modify Coordinate Reference System". It is divided into several sections:

- Coordinate System:** Name: NAD83(2011) / North Carolina (ftUS); Area: United States.
- Ellipsoid:** Ellipsoid: GRS 1980; Axis: 6378137; Flattening: 298.2572221.
- Datum:** Datum: NAD83(2011); Prime Meridian: Greenwich; Transformation: None.
- Units:** Horizontal: U.S. Survey Foot; Vertical: U.S. Survey Foot. This section is highlighted with a red border.
- Map Projection:** Method: Lambert Conformal Conic 2SP; False Easting: 2000000; False Northing: 0; Central Meridian: -79; Origin Latitude: 33.75; Parallel North: 36.16666667; Parallel South: 34.33333333.

At the bottom right, there is a "Local Grid..." button and "OK" and "Cancel" buttons.

## Vertical units

Vertical units are used for altitude, depth, tides and elevations.

Vertical units are part of the geodesy settings and need to be set before creating a new project. They cannot be modified here.

The screenshot shows the 'Modify Coordinate Reference System' dialog box. The 'Vertical' unit is highlighted with a red box. The dialog is divided into several sections: 'Coordinate System', 'Units', 'Ellipsoid', 'Map Projection', and 'Datum'. The 'Vertical' unit is set to 'U.S. Survey Foot'.

Section	Parameter	Value	
Coordinate System	Name:	NAD83(2011) / North Carolina (ftUS)	
	Area:	United States	
Ellipsoid	Ellipsoid:	GRS 1980	
	Axis:	6378137	
	Flattening:	298.2572221	
Datum	Datum:	NAD83(2011)	
	Prime Meridian:	Greenwich	
	Transformation:	None	
Units	Horizontal:	U.S. Survey Foot	
	Vertical:	U.S. Survey Foot	
Map Projection	Method:	Lambert Conformal Conic 2SP	
	False Easting:	2000000	U.S. Survey Foot
	False Northing:	0	U.S. Survey Foot
	Central Meridian:	-79	
	Origin Latitude:	33.75	
	Parallel North:	36.1666667	
	Parallel South:	34.3333333	

## Sound velocity units

Sound velocity units are used to display the sound velocity (sound of speed). It is displayed in the data window and the sound velocity profile editor.

These units are auto detected by the vertical units setting. When Feet (International or U.S. Survey) is used, it will be displayed in Feet per Second, otherwise in Meters per Second.

## 2.4.7 Map footer settings

A map footer is a section with text that is projected over the map in the lower left corner of exported or printed maps or views.

This footer contains information on the project, like surveyor name, project description, date and the units and projection used.

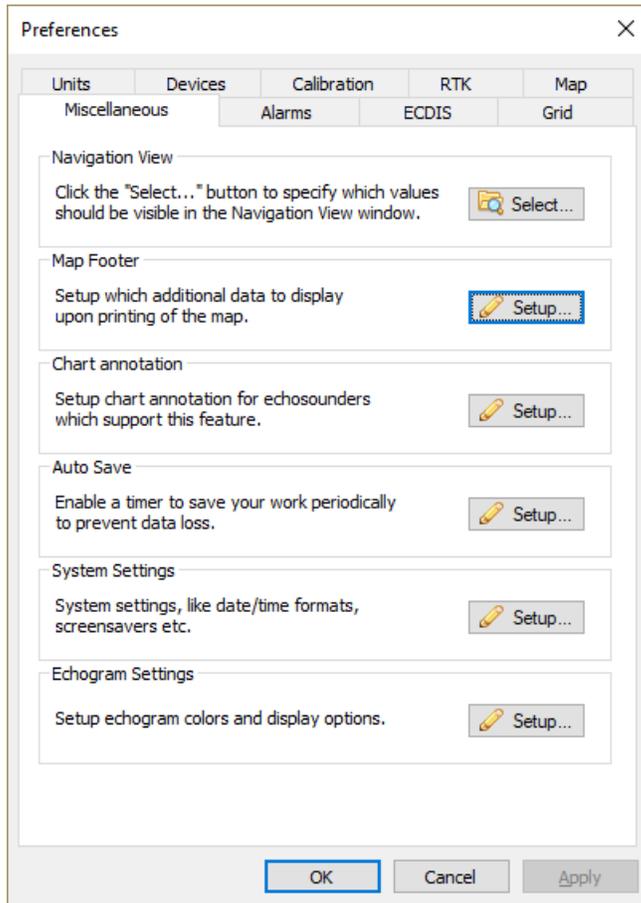
You can choose whether you want to have a footer displayed on your exported or printed map or not.

Hydromagic Demo Project			
Generated for demo purposes			
WGS 84 / UTM zone 23S	H: Meter	V: Meter	21/12/2018

*Example of a map footer added by Hydromagic on exporting your screen.*

## Modifying map footer settings

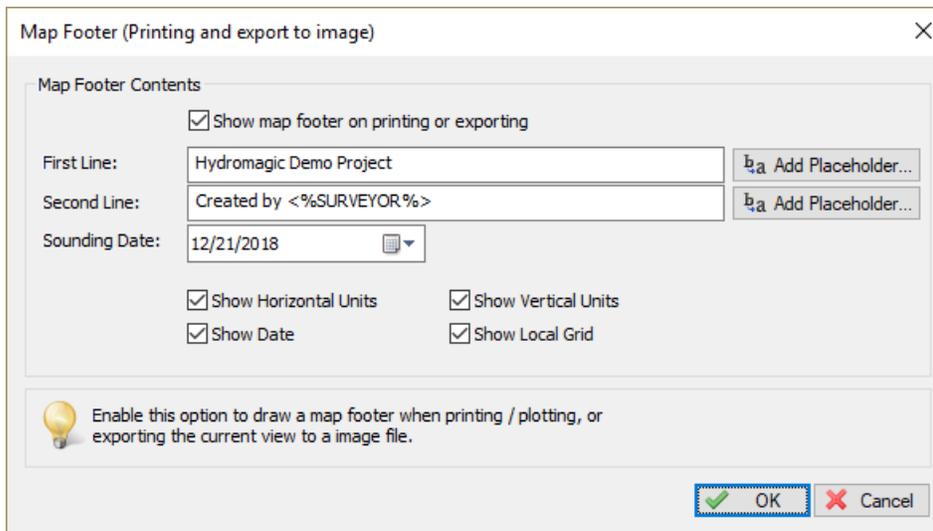
To access the map footer settings, first select the "Preferences..." item from the "Options" menu to open the preferences dialog. In the preferences dialog, select the "Miscellaneous" tab, and click the "Setup..." button in the "Map Footer" section as shown below:



**The map footer configuration can be found under the "Miscellaneous" tab.**

### Setting the map footer text

The first two lines of text in the map footer can contain static text, combined with placeholders (optional). Static text means that this text is entered exactly the way it has been entered.



Map Footer (Printing and export to image)

Map Footer Contents

Show map footer on printing or exporting

First Line: Hydromagic Demo Project

Second Line: Created by <%SURVEYOR%>

Sounding Date: 12/21/2018

Show Horizontal Units  Show Vertical Units

Show Date  Show Local Grid

 Enable this option to draw a map footer when printing / plotting, or exporting the current view to a image file.

**The map footer content settings dialog.**

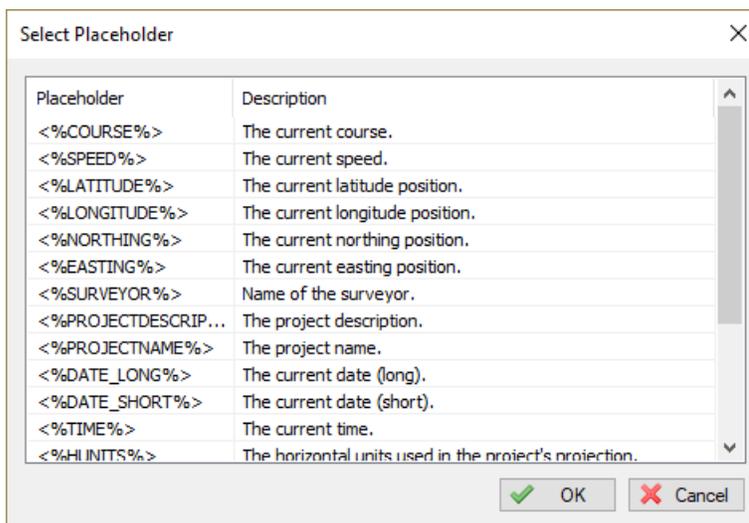
When inserting a placeholder, this placeholder will be replaced with a project variable when the map is exported or printed.

To insert one of the placeholders that are recognized by the software, click the "Add Placeholder..." button for that line.

When one of the "Add Placeholder..." buttons has been clicked, the "Select Placeholder" dialog will be shown.

Just select an item from the list, and click "OK" to insert the placeholder into your line of text.

The various placeholders can be found in this dialog along with an explanation on how they will be replaced with project variables.



Select Placeholder

Placeholder	Description
<%COURSE%>	The current course.
<%SPEED%>	The current speed.
<%LATITUDE%>	The current latitude position.
<%LONGITUDE%>	The current longitude position.
<%NORTHING%>	The current northing position.
<%EASTING%>	The current easting position.
<%SURVEYOR%>	Name of the surveyor.
<%PROJECTDESCRIP...>	The project description.
<%PROJECTNAME%>	The project name.
<%DATE_LONG%>	The current date (long).
<%DATE_SHORT%>	The current date (short).
<%TIME%>	The current time.
<%HUNITS%>	The horizontal units used in the project's projection.

**The placeholder selection dialog.**

## Map footer optional settings

### Sounding date

To include the sounding data into the map footer, make sure that the "Show Date" check box has been checked.

Next click the date selection control to select which date to display in the footer. This is usually the date the sounding has been performed.

By default today's date has been selected. To configure how the date will be formatted, please refer to the "Time Formats" section at the end of the System Options manual page.

#### **Show horizontal units**

Include the horizontal units (easting and northing units) used in the coordinate reference system into the map footer.

#### **Show vertical units**

Include the vertical units (depth and elevation units) used in the coordinate reference system into the map footer.

#### **Show Local Grid**

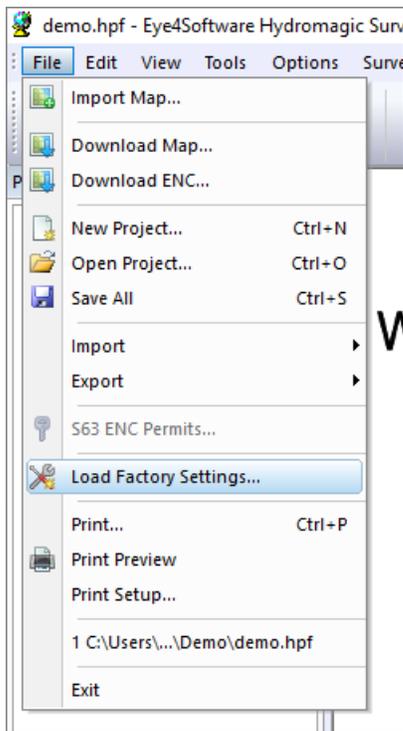
Checking this check box causes the local coordinate reference system name to be included into the map footer.

### **2.4.8 Factory Reset**

#### **Factory Reset**

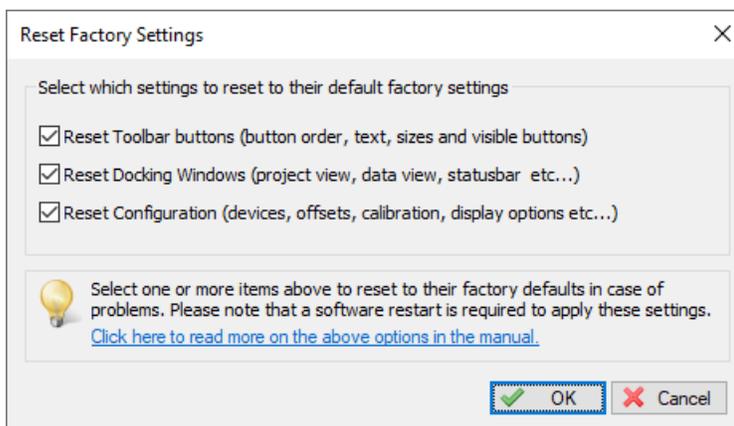
The factory reset option in Hydromagic can be used to restore configuration items in Hydromagic to their original settings.

This can be used in case of problem, for instance when you want to start over with a clean configuration, when you are missing toolbar items, or when windows disappear.



The 'Factory Reset' tool allows you to select which parts of the configuration are reset, there is no need to delete all settings at once.

To start the 'Factory Reset' tool, select the "Load Factory Defaults..." option from the "File" menu.



### Reset Toolbar Options

When this option has been selected, the default toolbar layout will be loaded for the main window. Use this option when buttons are missing, the toolbar won't show up, or buttons are mixed up for whatever reason.

### Reset Docking Windows

This option restores the original positions of the docking windows like the 'Project Explorer' and the 'Data View'.

Use when one of the docking or popup windows is no longer visible and you cannot restore it by hiding and then showing it.

### Reset Configuration

Please use this function with caution since it removes all your settings like plugin configurations, colors, units and map settings.

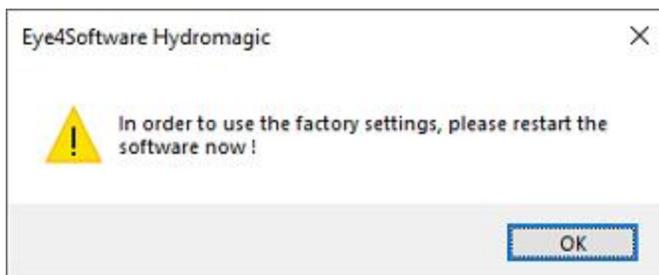
It restores the configuration to the default values. You can use the "Export Configuration" option to backup your configuration first.

### Reset geodesy database

This option restores the database containing all map projections, datums, ellipsoids etc from a backup. Use this in case the software reports problems with this database. Please note that any custom map projections will be lost when restoring this database.

### Applying the factory defaults

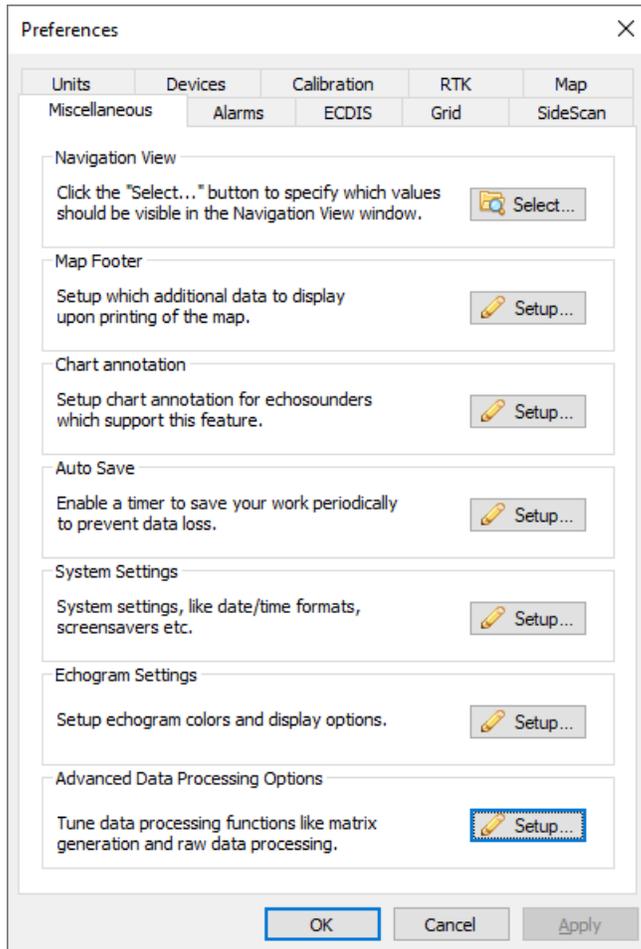
After selecting one or more options, click the "OK" button to reset the selected items to factory defaults. The software prompts you to restart the program because the settings will be restored the next time it is started.



## 2.4.9 Advanced data processing options

Advanced data processing options should be used with care. Please make sure that you fully understand what you are doing before altering these settings. In some cases, our support staff can instruct you to change one of these settings, in case your data processing job fails with the current (default) settings.

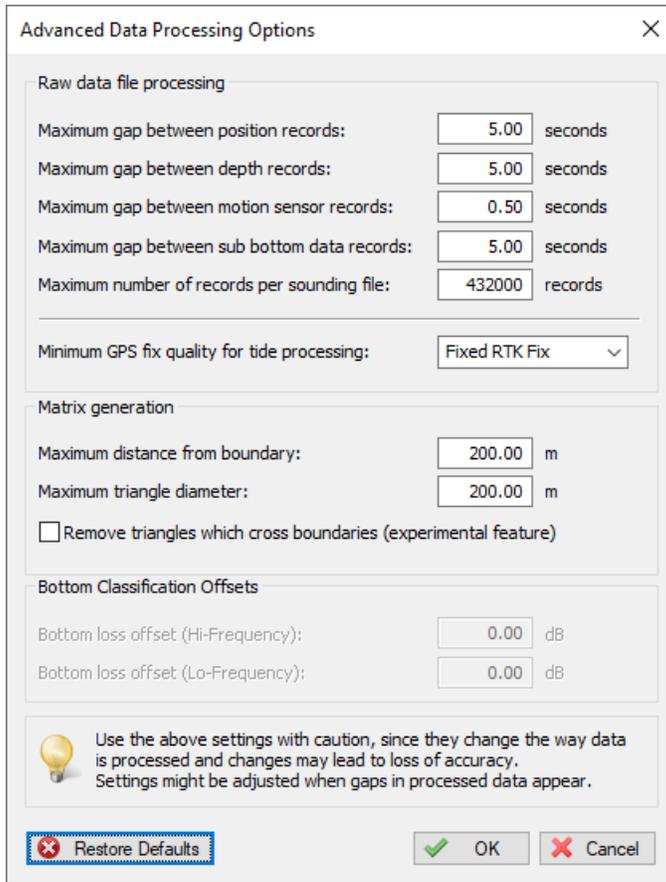
Advanced data processing options are mainly used when converting raw data into soundings, but a couple of values are used in other tools as well (for instance: matrix generation). To open the "Advanced Data Processing Options" settings dialog, select the "Preferences..." option from the "Options" item in the top (main) menu bar. A collection of tabs with settings will appear, next select the "Miscellaneous" tab and click the "Setup..." button in the "Advanced Data Processing Options" section of the tab (located at the bottom of the tab).



**Click the "Setup..." button in the "Advanced Data Processing Options" section of the "Miscellaneous" tab.**

## Restore Defaults

After modifying one of the advanced data processing options, you can always reset the settings to their default values by clicking the "Restore Defaults" button. A confirmation box will appear, asking you whether you want to overwrite your changes. Click "Yes" and then "OK" to store the default settings.



Advanced Data Processing Options

Raw data file processing

Maximum gap between position records: 5.00 seconds

Maximum gap between depth records: 5.00 seconds

Maximum gap between motion sensor records: 0.50 seconds

Maximum gap between sub bottom data records: 5.00 seconds

Maximum number of records per sounding file: 432000 records

Minimum GPS fix quality for tide processing: Fixed RTK Fix

Matrix generation

Maximum distance from boundary: 200.00 m

Maximum triangle diameter: 200.00 m

Remove triangles which cross boundaries (experimental feature)

Bottom Classification Offsets

Bottom loss offset (Hi-Frequency): 0.00 dB

Bottom loss offset (Lo-Frequency): 0.00 dB

Use the above settings with caution, since they change the way data is processed and changes may lead to loss of accuracy. Settings might be adjusted when gaps in processed data appear.

Restore Defaults OK Cancel

Click the "Restore Defaults..." button to load the default settings.

## Raw data file processing options

These options only apply to the generation of sounding files from recorded raw data files in the "[Sounding Wizard](#)". The options are mainly used to limit the maximum gaps between data, the maximum number of records per sounding and the least required GNSS quality when processing position and tide data. This option is only present in Hydromagic Survey since it does not apply to Hydromagic Dredging.

### Maximum gap between position records

When your GNSS signal is lost for some time, Hydromagic will interpolate the positions between the closest position fixes (dead reckoning). The more time elapses, the more inaccurate the calculated positions and elevations will be. Using this setting, you can limit the time that calculated positions will be used. When this time has been exceeded, position data will be discarded, resulting in (small) gaps in the generated soundings. When you have a stable GNSS signal with an update of at least 1Hz, and with this setting set to 2 seconds, you should be fine in most cases.

### Maximum gap between depth records

When depth values are missing, for instance when the sounder was unable to digitize the depth from the returning ping, gaps may be present in your raw data file. By default Hydromagic will interpolate the depths between the two closest measurements from the time stamp of the missing sounding. Using this value, you can limit the time that calculated depths will be used. When this time has been exceeded, depth data will be discarded, resulting in (small) gaps in the generated soundings.

### Maximum gap between motion sensor records

When motion sensor records are missing, you might want to check your motion sensor first, since for some reason the data comes in delayed (slow PC), or there is a problem with the wiring. Using this setting you can set the maximum allowed gap in this data, but since motion data is updated so frequently, it might sometimes be better to completely remove the motion data when a problem occurs. To remove all motion sensor data, use the "[Table Editor](#)" in the "Sounding Wizard".

### Maximum gap between sub bottom data records

Basically the same as for depth records, however since this value is less important, you can enter an alternate maximum allowed data gap here.

### Maximum number of records per sounding file

Limits the number of records written to a sounding file. This function makes sure sounding files aren't getting too big which can cause processing soundings to be slow. It is recommended to split your survey into multiple raw data files to avoid this (for instance one raw data file per cross section). When your generated sounding exceeds this limit, you might want to increase the data interval of the sounding in the "Sounding Wizard".

### Minimum GNSS fix quality for tide processing

When calculating the current tide value from the elevation reported by your GNSS receiver, Hydromagic checks whether the position quality is "RTK Fixed", if not, the elevation value is considered to inaccurate to calculate the tide level. In some cases you might want to override this setting, for instance when the GNSS quality hasn't been reported since you are importing position data from a file format which does not include the GNSS quality information, or when the GNSS receiver sporadically loses RTK Fix. Please note, that the longer the RTK Fix has been lost, the more inaccurate the data will become.

In cases where you imported the data from a data file using the "Raw Data Import Wizard", set this value to either "Unknown" or "Autonomous". When your raw data sometimes reported "RTK Float" or "DIFF" as GNSS quality, select this value. However when the RTK Fix status is lost for multiple seconds, you might want to sort out this issue on the hardware side first.

Raw data file processing	
Maximum gap between position records:	<input type="text" value="5.00"/> seconds
Maximum gap between depth records:	<input type="text" value="5.00"/> seconds
Maximum gap between motion sensor records:	<input type="text" value="0.50"/> seconds
Maximum gap between sub bottom data records:	<input type="text" value="5.00"/> seconds
Maximum number of records per sounding file:	<input type="text" value="432000"/> records
Minimum GPS fix quality for tide processing:	<input type="text" value="Fixed RTK Fix"/>

*Raw data file advanced data processing options section.*

## Matrix generation options

This settings apply to most tools where a matrix file is generated:

Generation of matrix files [from one or more soundings](#);  
Generation of matrix files [from cross sections with elevation info](#);  
Generation of matrix files [from vector charts \(DXF\)](#);  
Generation of empty matrix files in Hydromagic Dredging.

### Maximum distance from boundary

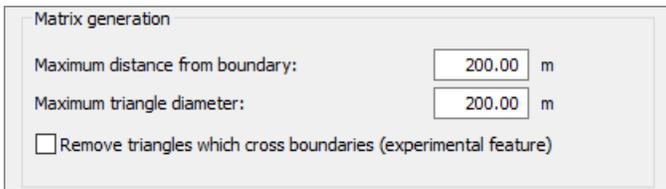
Defines the maximum distance of a point outside the selected boundary or boundaries, to be included in the matrix generation. When a sounding (depth value) is further away from the boundary, it will be ignored.

### Maximum triangle diameter

When generating a matrix, all soundings will be connected using triangles, this is also called triangulation or a TIN model. This setting checks the maximum radius for the generated triangles and removes triangles which exceed the maximum setting (they contain the least accurate data).

### Remove triangles which cross boundaries

When a triangle crosses one or more boundary lines (for instance an island) it will be ignored. Although this is an experimental function, it should be useful when you have islands.



Matrix generation

Maximum distance from boundary:  m

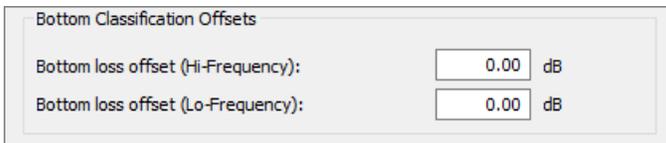
Maximum triangle diameter:  m

Remove triangles which cross boundaries (experimental feature)

*Matrix generation advanced data processing options section.*

## Bottom classification offsets

This function allows you to enter an offset for bottom loss for high and low frequency. This function is only available for sounders which return bottom loss information, like the [Unabara Hydro-2F](#). The values can be entered after such a plugin has been loaded. Enter the values in decibel, the corrections will be applied in the "[Sounding Wizard](#)" when converting the raw data to soundings.



Bottom Classification Offsets

Bottom loss offset (Hi-Frequency):  dB

Bottom loss offset (Lo-Frequency):  dB

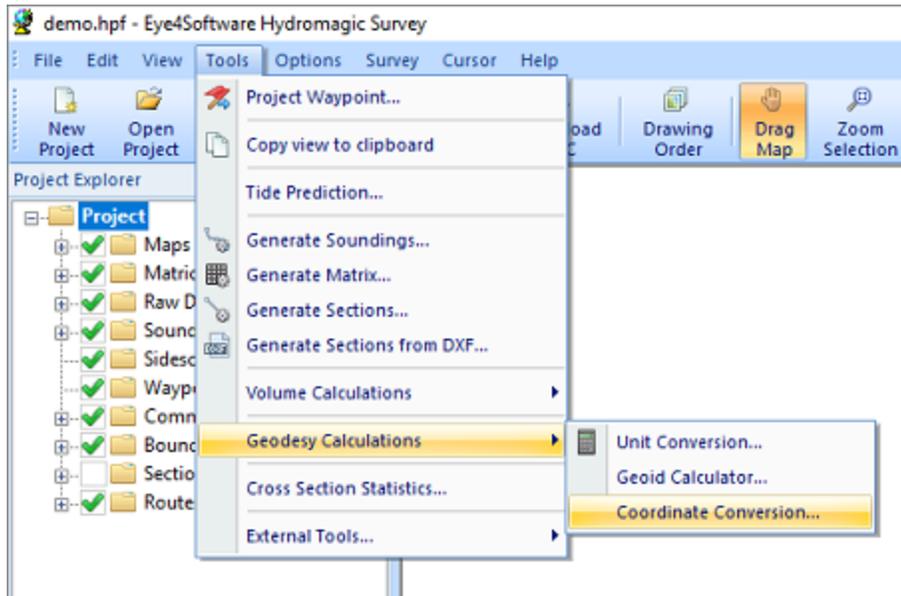
*Bottom classification advanced data processing options section.*

## 2.5 Geodesy Configuration

### 2.5.1 Manage Ellipsoids

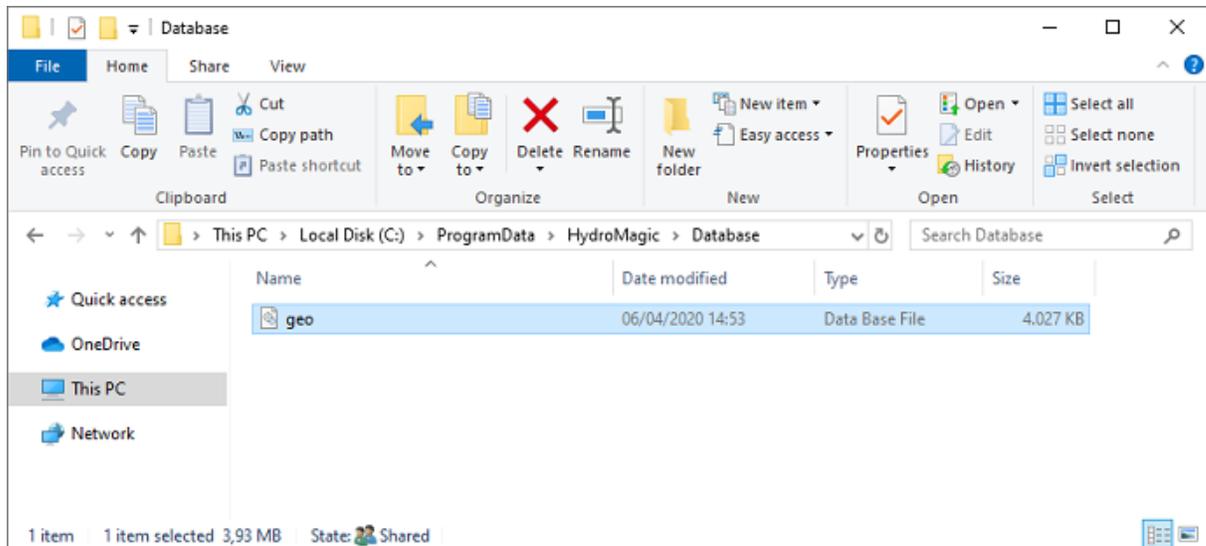
#### Manage Ellipsoids - Eye4Software Coordinate Calculator

We recommend to manage your geodesy configuration database from the "Eye4Software Coordinate Calculator" which is a freeware tool which is shipped with Hydromagic. To start the "Coordinate Calculator", select "Geodesy Calculations" => "Coordinate Conversion..." option from the "Tools" menu as shown below:



Select the "Coordinate Conversion..." option to start the Coordinate Calculator.

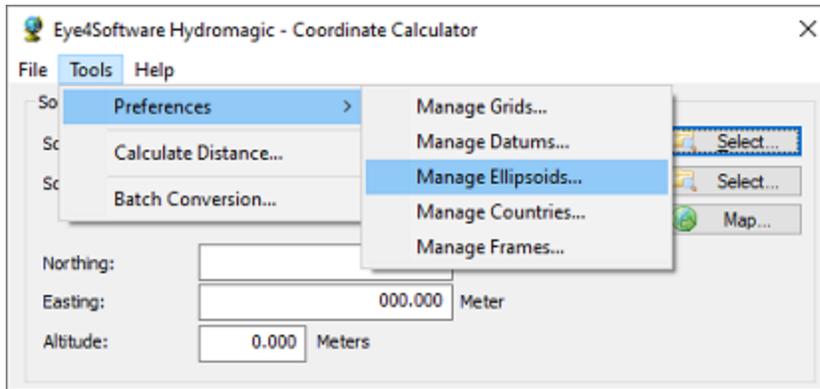
The database containing all geodesy definitions, like ellipsoids, datums, coordinate systems and correction grids is stored in the "C:\ProgramData\Hydromagic\Database\" folder, and it is shared by multiple applications, like Hydromagic Survey, Hydromagic Dredging and the Coordinate Calculator. Most of its content has been taken from the EPSG geodetic database and it will be updated regularly.



All geodesy definitions are stored in a shared database file.

## Managing Ellipsoid Definitions

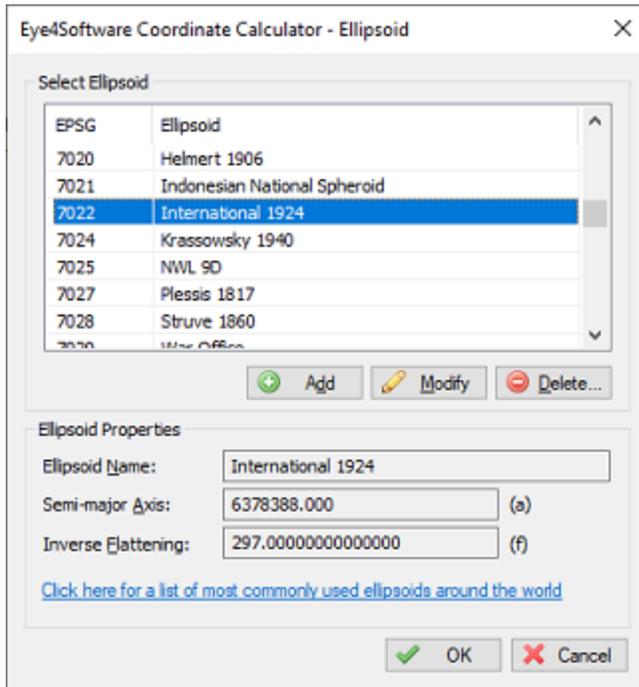
To open the "Manage Ellipsoids" window, select "Tools" => "Preferences" => "Manage Ellipsoids..." from the menu. Using this window, you will be able to view, delete or modify existing ellipsoid definitions, or to add your own. For a list of ellipsoids that are already in the database, [click here](#).



The "Ellipsoids" dialog can be opened from the "Tools" menu.

### Ellipsoid List

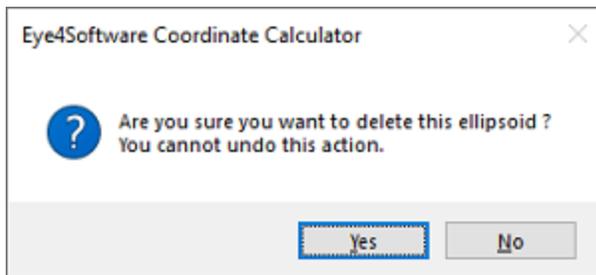
When clicking an item in the list, its parameters are displayed below the list. You can edit these parameters by clicking the "Modify" button.



By clicking on an Ellipsoid in the list, you can view its parameters.

### Deleting an ellipsoid

Although not recommended, you can delete an ellipsoid definition, by selecting an item from the list and clicking the button "Delete". The software will show a popup window to confirm that you are sure you want to delete. Please note that you won't be able delete ellipsoids that are in use by a datum definition.



*You have to confirm deletion of an ellipsoid definition.*

## Modifying an ellipsoid

You can modify an ellipsoid by clicking the "Modify" button after you selected an ellipsoid from the list. After clicking the button, the "OK" button text will change to "Save". Clicking the "Save" button will save the modifications, clicking "Cancel" will keep the old data.

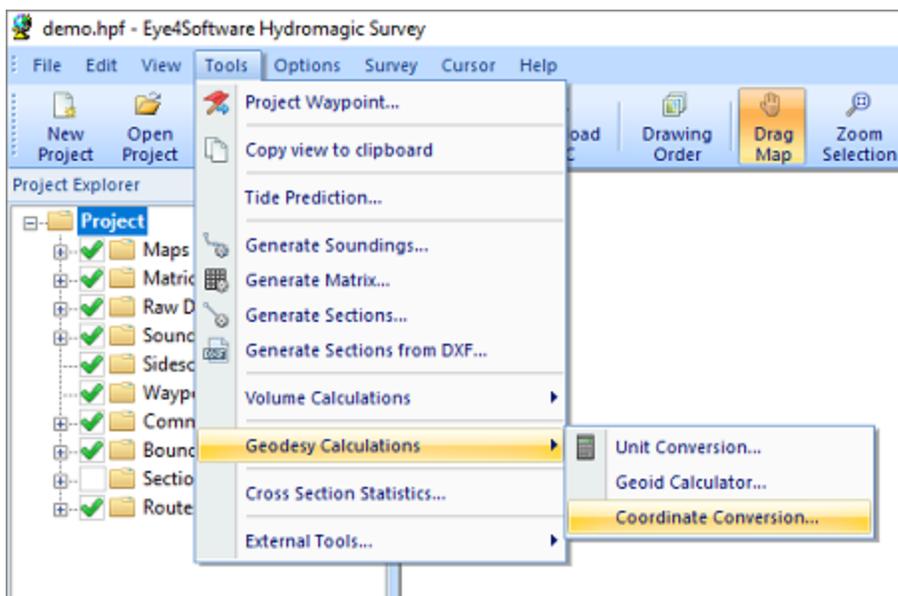
## Adding an ellipsoid

To add a new ellipsoid definition, click the "Add" button. When adding a new definition, it is required to specify a name for this ellipsoid, otherwise it cannot be saved. Other required fields are "Semi-Major Axis" and "Inverse Flattening". Click the "Save" button to store the newly created ellipsoid, by clicking cancel the input is ignored and you will return to the list.

## 2.5.2 Manage Datums

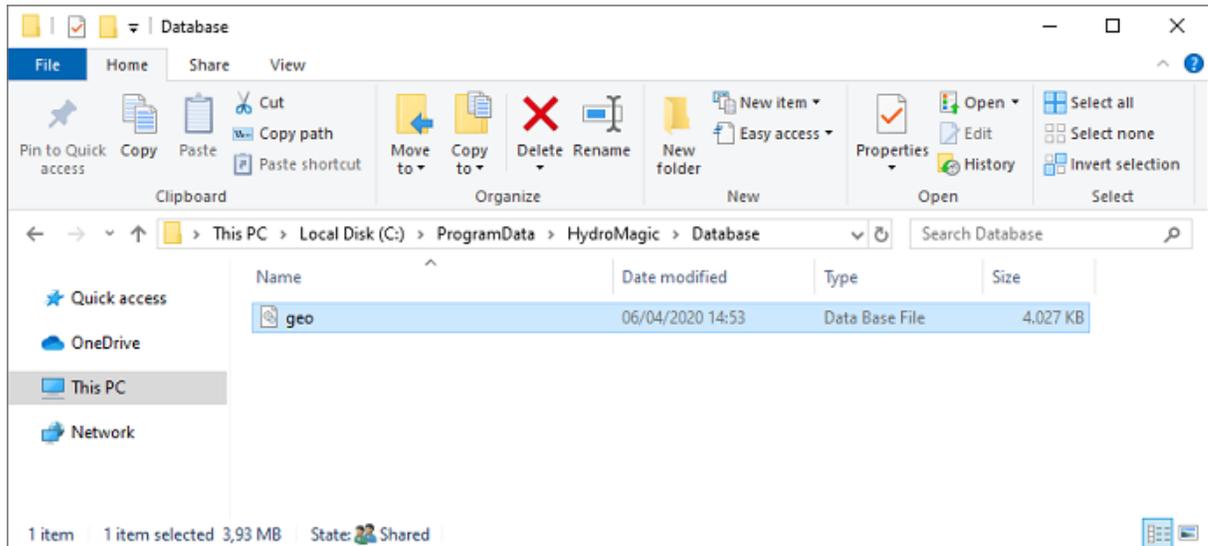
### Manage Datums - Eye4Software Coordinate Calculator

We recommend to manage your geodesy configuration database from the "Eye4Software Coordinate Calculator", which is a freeware tool which is shipped with Hydromagic. To start the "Coordinate Calculator", select "Geodesy Calculations" => "Coordinate Conversion..." option from the "Tools" menu as shown below:



*Select the "Coordinate Conversion..." option to start the Coordinate Calculator.*

The database containing all geodesy definitions, like ellipsoids, datums, coordinate systems and correction grids is stored in the "C:\ProgramData\Hydromagic\Database\" folder, and it is shared by multiple applications, like Hydromagic Survey, Hydromagic Dredging and the Coordinate Calculator. Most of its content has been taken from the EPSG geodetic database and it will be updated regularly.



**All geodesy definitions are stored in a shared database file.**

### Supported Transformations

In Hydromagic, you need to set the transformation parameters to convert to WGS84 for each newly created datum. The following transformation methods are supported:

- None (no transformation needed);
- Molodensky (3 parameters);
- Bursa Wolf (7 parameters);
- NADCON;
- HARN/HPGN;
- NTv2.

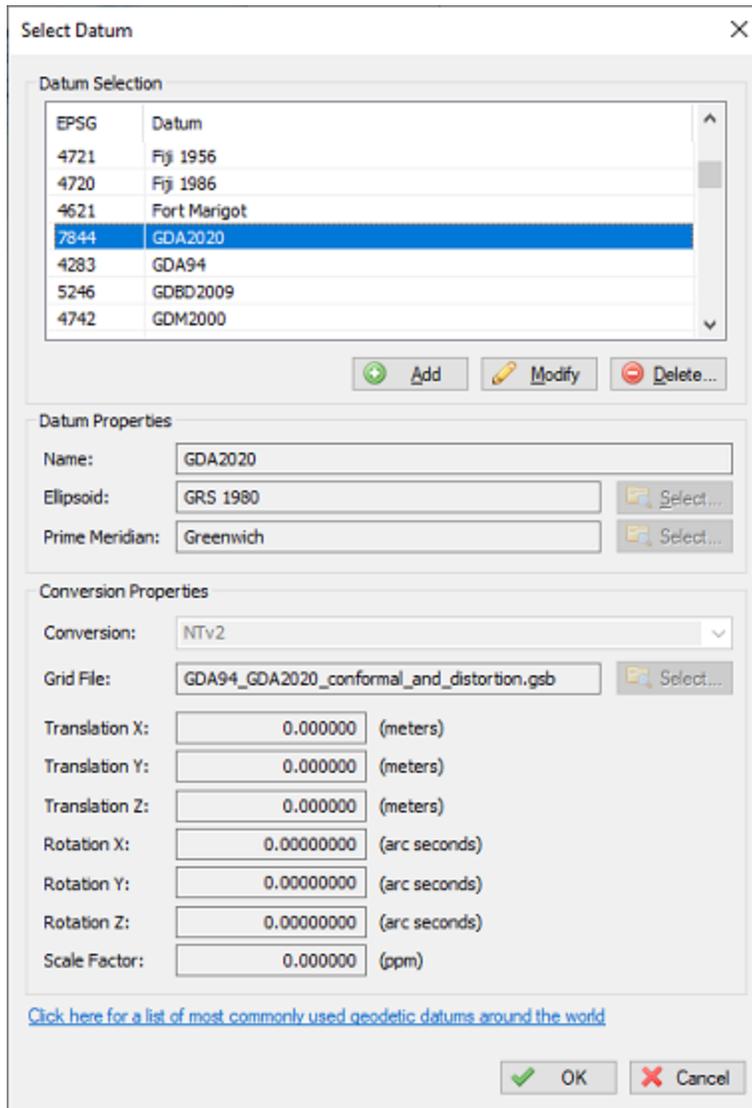
### Grid files

The last three methods mentioned above do not require parameters, but you have to specify a valid grid file. For NADCON and HARN/HPGN, files for North America are shipped with the product.

To add your own NADCON, HARN or NTv2 files, just copy the file to the "NADCON" or "NTv2" folder in the "Program Data/Hydromagic" installation directory.



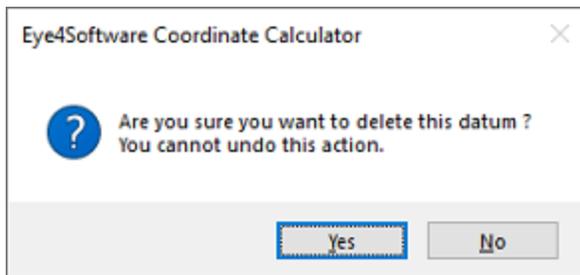
When clicking an item in the list, its parameters are displayed below the list. You can edit these parameters by clicking the "Modify" button.



*The "Datums" dialog can be opened from the "Tools" menu.*

### Deleting a datum

You can delete an datum definition, by selecting an item from the list and clicking the button "Delete". The software will show a popup to confirm that you are sure you want to delete. Please note that you cannot delete datums that are used in a grid definition.



*You have to confirm deletion of a datum definition.*

### Modifying a datum

You can modify a datum by clicking the "Modify" button after you selected a datum from the list. After clicking the button, the "OK" button text will change to "Save". Clicking the "Save" button will save the modifications, clicking "Cancel" will keep the old data.

### Adding a datum

To add a new datum definition, click the "Add" button. When adding a new definition, it is required to specify a name for this datum, as well as the ellipsoid used. Other fields are optional and are defaulting to 0.0 when not used.

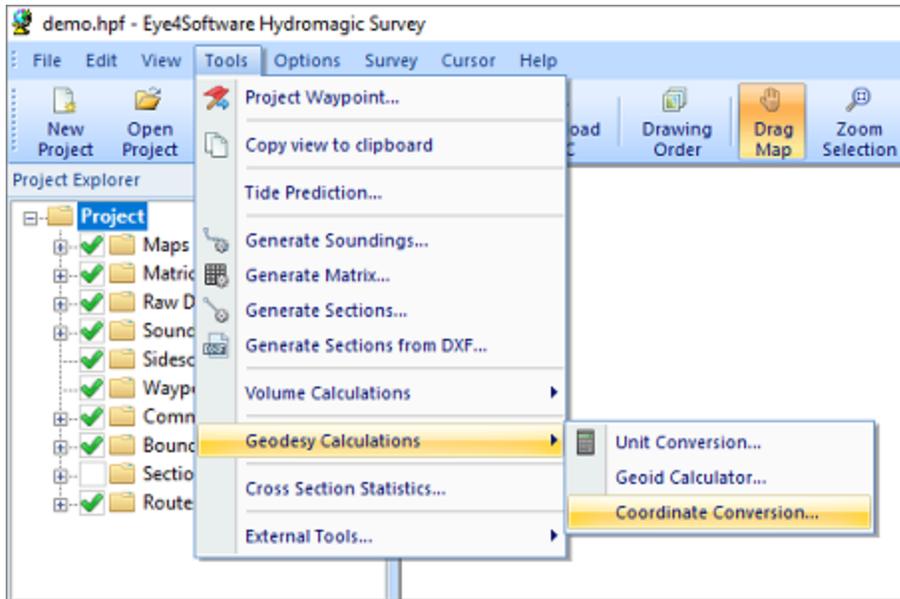
Please note that the X,Y and Z translations have to be entered in Meters, the X,Y and Z rotations are entered in arc seconds. If you have a datum definition that uses radians, you have to convert from radians to arcseconds first: 1 radian = 206 264.806 arcseconds.

Click the "Save" button to store the newly created datum, by clicking cancel the input is ignored and you will return to the list.

## 2.5.3 Manage Grids

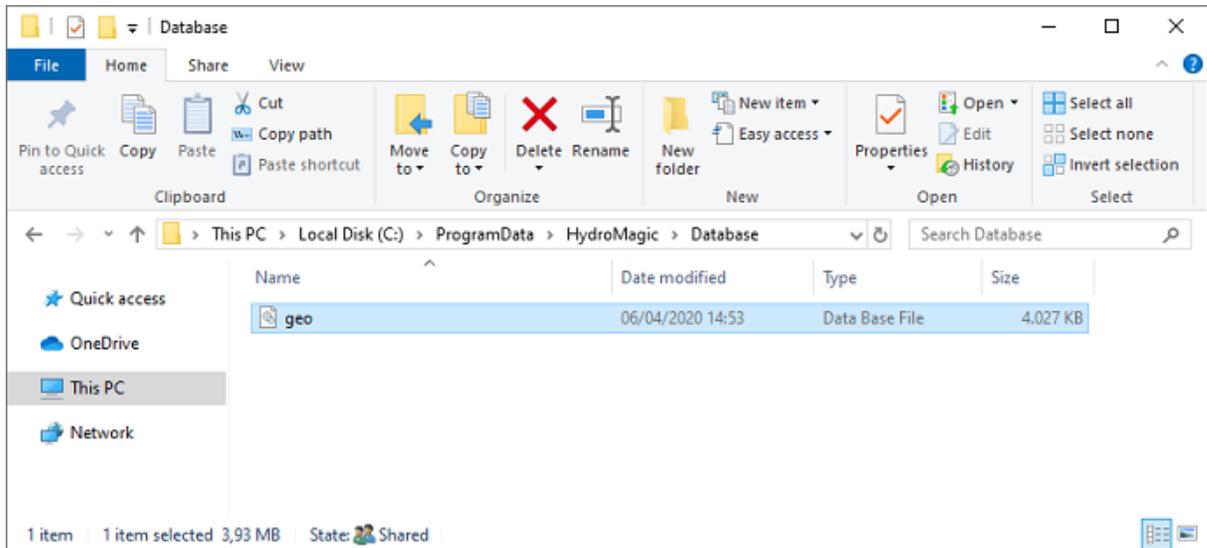
### Manage Grids - Eye4Software Coordinate Calculator

We recommend to manage your geodesy configuration database from the "Eye4Software Coordinate Calculator" which is a freeware tool which is shipped with Hydromagic. To start the "Coordinate Calculator", select "Geodesy Calculations" => "Coordinate Conversion..." option from the "Tools" menu as shown below:



Select the "Coordinate Conversion..." option to start the Coordinate Calculator.

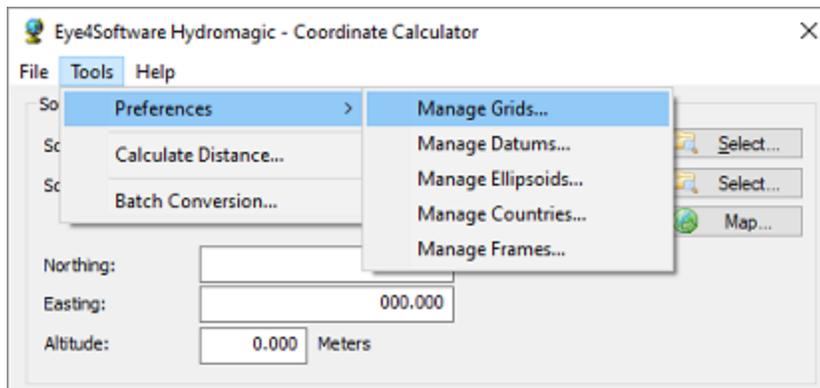
The database containing all geodesy definitions, like ellipsoids, datums, coordinate systems and correction grids is stored in the "C:\ProgramData\Hydromagic\Database\" folder, and it is shared by multiple applications, like Hydromagic Survey, Hydromagic Dredging and the Coordinate Calculator. Most of its content has been taken from the EPSG geodetic database and it will be updated regularly.



All geodesy definitions are stored in a shared database file.

### Manage Grid Definitions

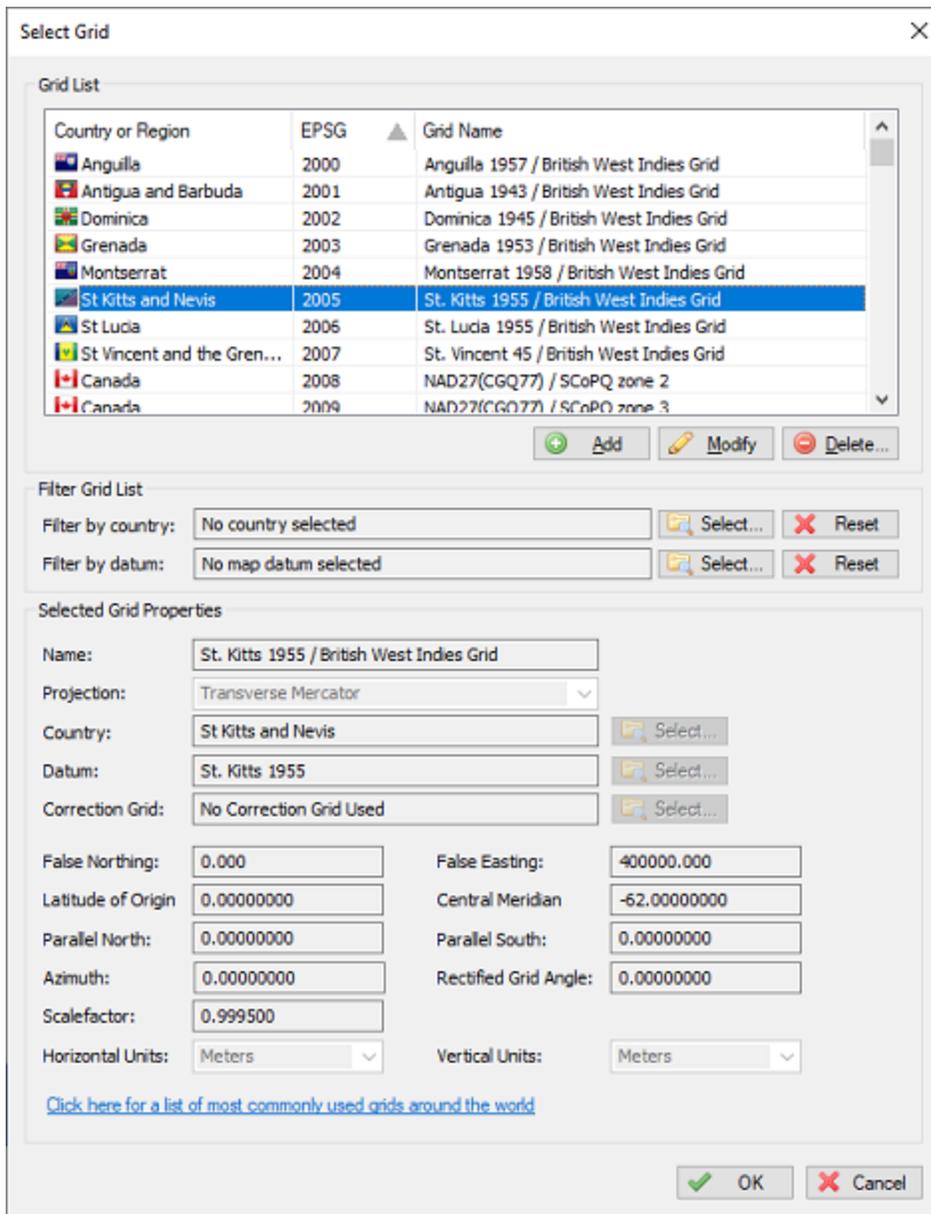
To open the "Manage Grids" window, select "Tools" => "Preferences" => "Manage Grids" from the menu. Using this window, you will be able to view, delete or modify existing grid definitions, or to add your own. For a list of map grids that are currently in the database, [click here](#).



*The "Manage Grids" dialog can be opened from the "Tools" menu.*

### Grid list

When clicking an item in the list, its parameters are displayed below the list. You can edit these parameters by clicking the "Modify" button.

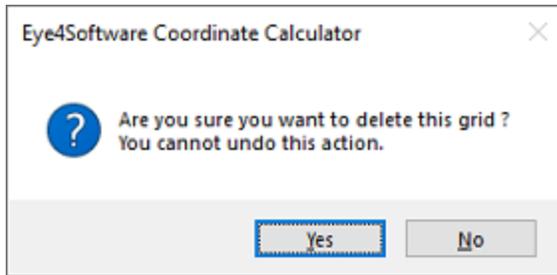


Select a grid to show or alter its properties.

The map grid list can be sorted by clicking on the list columns. You can sort the list by country, grid name and geodetic datum used. A map grid definition is displayed by the flag of the country where it applies to. If a grid can be used in multiple countries or regions, instead of a flag, a globe is displayed.

### Deleting a grid

You can delete an datum definition, by selecting an item from the list and clicking the button "Delete". The software will show a popup to confirm that you are sure you want to delete. When clicking "Yes" the grid will be deleted.



*You have to confirm deletion of a grid definition.*

## Modifying a grid

You can modify a grid by clicking the "Modify" button after you selected a grid from the list. After clicking the button, the "OK" button text will change to "Save". Clicking the "Save" button will save the modifications, clicking "Cancel" will keep the old data.

## Adding a grid

To add a new grid definition, click the "Add" button. When adding a new definition, it is required to specify a name for this grid, as well as the datum and projection used. Depending on the chosen projection, the input fields are enabled or disabled. The table below shows what fields are required for the different projections:

Projection	SCALE	FALSE_N	FALSE_E	LAT_0	LON_0	PAR_1	PAR_2	AZI	RECTGRD
Lambert Conformal Conic 1 SP	x	x	x	x	x	-	-	-	-
Lambert Conformal Conic 2 SP	-	x	x	x	x	x	x	-	-
Lambert Azimuthal Equal Area	-	x	x	x	x	x	x	-	-
Transverse Mercator	x	x	x	x	x	-	-	-	-
Oblique Stereographic	x	x	x	x	x	-	-	-	-
Polar Stereographic	-	x	x	x	x	-	-	-	-
Oblique Mercator	-	x	x	x	x	-	-	-	-
Hotine Oblique Mercator	-	x	x	x	x	-	-	x	x
Swiss Oblique Mercator	-	x	x	x	x	-	-	-	-
Albers Equal Area Conic	-	x	x	x	x	x	x	-	-
Mercator 1SP	x	x	x	x	x	-	-	-	-
Mercator 2SP	-	x	x	x	x	x	-	-	-
Mollweide	-	x	x	-	x	-	-	-	-
Eckert IV	-	x	x	-	x	-	-	-	-
Eckert VI	-	x	x	-	x	-	-	-	-
Cassini	-	x	x	x	x	-	-	-	-
Krovak	x	x	x	x	x	x	-	x	-

Selecting a country is not required, but the country can be used to sort lists by country, if the grid does not apply to a simple country, just select "Earth", "Europe", "Asia" etc... When you want to use other units for the Northing and Easting values calculated ( default is Meters ), you can also select the units to be used. Please note that when changing this, you also have to enter the False Northing and False Easting in these units. Units currently supported are:

- Meters
- Kilometers
- International Foot
- British Foot
- Clarke's Foot
- Gold Coast Foot
- Indian Foot
- British Foot (Sears)
- U.S. Survey Foot
- Link
- Clarke's Link
- British Link (Sears)
- U.S. Survey Link
- Statute Mile
- U.S. Survey Mile
- Chain
- Clarke's Chain
- British Chain (Sears)
- U.S. Survey Chain

Click the "Save" button to store the newly created grid, by clicking cancel the input is ignored and you will return to the list.

## 2.5.4 Manage Geoids

### Introduction

In Hydromagic, a geoid model is used to calculate the separation between the local vertical datum and the WGS84 ellipsoidal height.

Each geoid model is in fact a simple binary file containing separation values in a regularly spaced grid.

The geoid files have the file extension ".geo" and are stored in the "\\ProgramData\\Hydromagic\\Geoids" folder on your harddrive.

To access the "\\ProgramData\\Hydromagic" folder, please select the "Open Program Data Folder..." option from the "Help" menu.

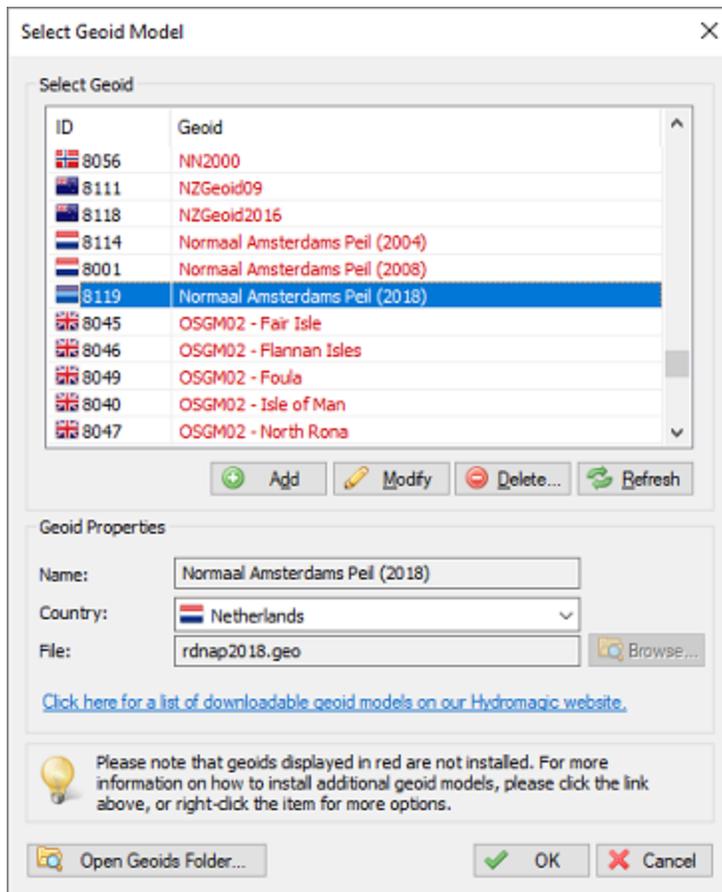
To open the "Manage Geoids" window, select the "Coordinate Systems" => "Manage Geoids" option from the "Tools" menu.

Using this tool, you will be able to add new, remove or alter geoid definitions in the built in database.

Please note that not all geoids are installed by default. Geoid models that are configured, but not installed, are displayed in **red**.

These geoids can be downloaded from our website:

<http://www.eye4software.com/hydromagic/documentation/geoid-models/>



## Geoid List

When clicking an item in the list, its parameters are displayed below the list. You can edit these parameters by clicking the "Modify" button.

The altered parameters can be saved by clicking the "Save" button, or discarded by clicking the "Cancel" button.

## Deleting a geoid

You can delete a geoid definition, by selecting an item from the list and clicking the button "Delete".

The software will show a popup to confirm that you are sure you want to delete the selected item.

Please note that the geoid file will not be deleted and can still be used.

## Modifying a geoid

You can modify a geoid model by clicking the "Modify" button after you selected a geoid model from the list.

After clicking the button, the "OK" button text will change to "Save". Clicking the "Save" button will save the modifications, clicking "Cancel" will keep the old data.

## Adding a geoid

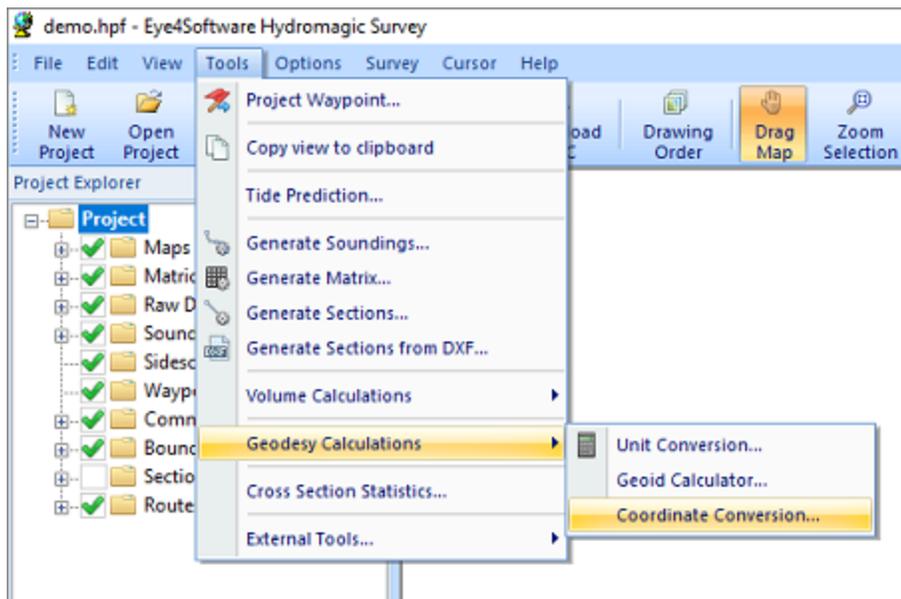
To add a new geoid model definition, click the "Add" button. When adding a new definition, it is required to specify a name for this geoid as well as the file containing the separation values.

Click the "Save" button to store the newly created datum, by clicking cancel the input is ignored and you will return to the list.

## 2.5.5 Manage Countries

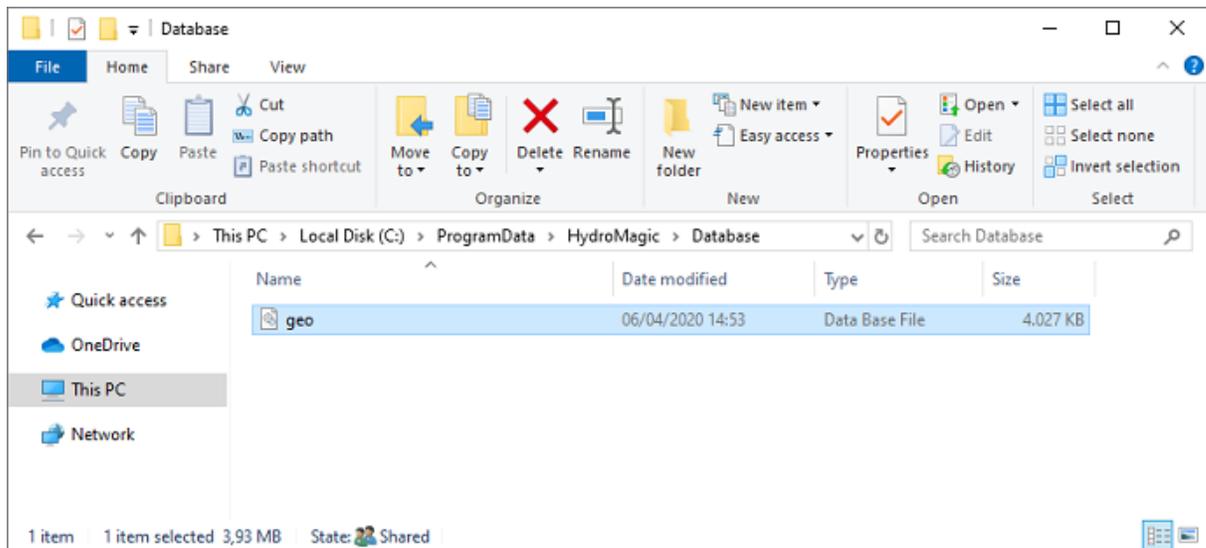
### Manage Countries - Eye4Software Coordinate Calculator

We recommend to manage your geodesy configuration database from the "Eye4Software Coordinate Calculator" which is a freeware tool which is shipped with Hydromagic. To start the "Coordinate Calculator", select "Geodesy Calculations" => "Coordinate Conversion..." option from the "Tools" menu as shown below:



Select the "Coordinate Conversion..." option to start the Coordinate Calculator.

The database containing all geodesy definitions, like ellipsoids, datums, coordinate systems and correction grids is stored in the "C:\ProgramData\Hydromagic\Database\" folder, and it is shared by multiple applications, like Hydromagic Survey, Hydromagic Dredging and the Coordinate Calculator. Most of its content has been taken from the EPSG geodetic database and it will be updated regularly.

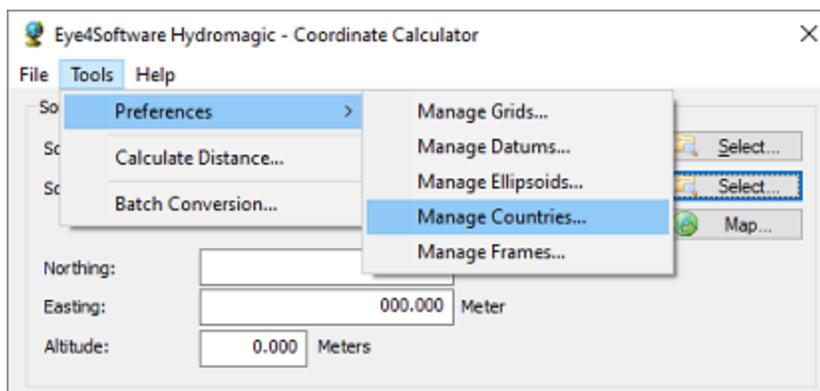


*All geodesy definitions are stored in a shared database file.*

## Manage Country Definitions

To open the "Manage Countries" window, select "Options" => "Preferences" => "Manage Countries..." from the menu. Using this window, you will be able to view, delete or modify existing country / region definitions, or to add your own.

NOTE: The use of countries or regions is not required to perform coordinate calculations. It is only added to provide a mechanism to sort the map grids by the region or country they are used for.



*The "Countries" dialog can be opened from the "Tools" menu.*

## Country

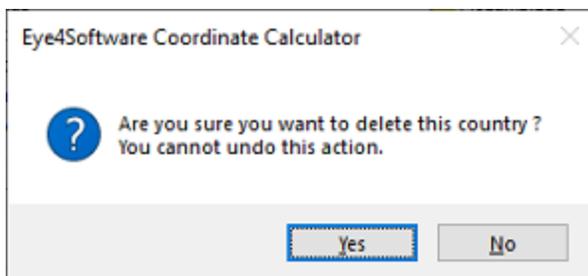
When clicking an item in the list, its parameters are displayed below the list (country name and flag file name). You can edit these parameters by clicking the "Modify" button.



*Click a country to view or alter its properties.*

### Deleting a country

You can delete a country definition, by selecting an item from the list and clicking the button "Delete". The software will show a popup to confirm that you are sure you want to delete. Please note that you cannot delete countries that are used in a grid definition.



*You have to confirm deletion of a country definition.*

### Modifying a country

You can modify a country by clicking the "Modify" button after you selected a country from the list. You can for instance translate the country name to your own language, or modify previously created regions. The flag associated with the country or region can be changed by clicking the "Browse" button. How to add your own symbols or flags is described in the "Adding a country" section below. After clicking the button, the "OK" button text will change to "Save". Clicking the "Save" button will save the modifications, clicking "Cancel" will keep the old data.

### Adding a country

To add a new country definition, click the "Add" button. When adding a new definition, it is required to specify a name for this country. Specifying a symbol or flag for this country is optional, when no image has been specified a globe is displayed in the grid list. If you want to add your own symbol, convert this symbol to a 16x16 PNG Image file and copy this file to the "Flags" folder in the program directory. You can select a flag or symbol by clicking the "Browse" button. The software ships with flags for most countries around. Click the "Save" button to store the newly created datum, by clicking cancel the input is ignored and you will return to the list.

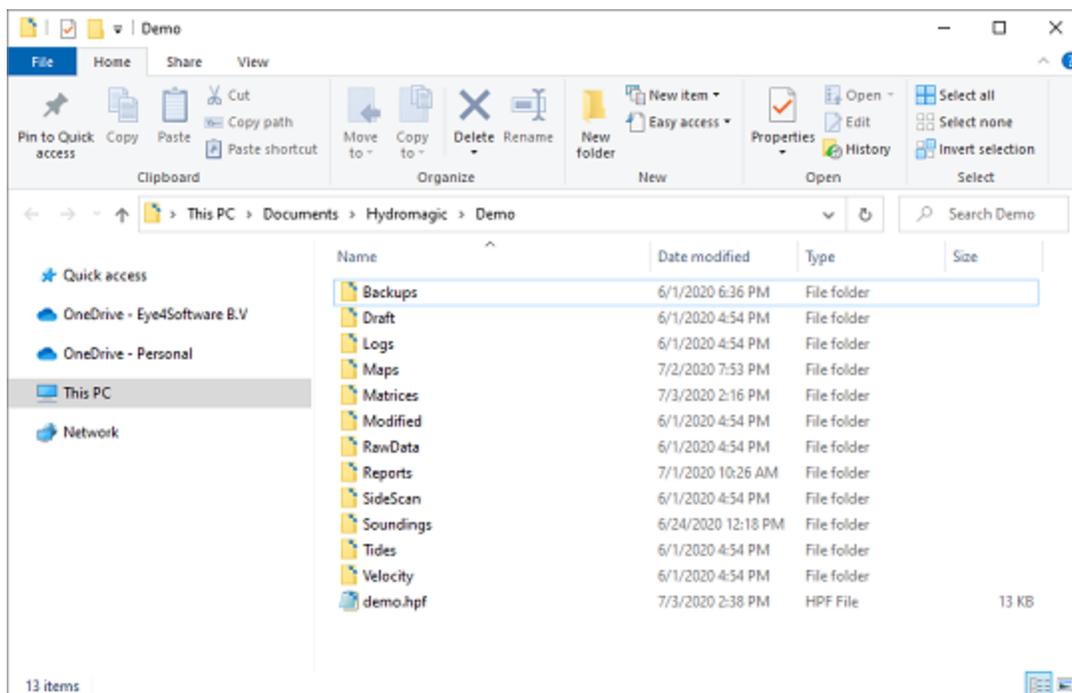
## 3 User Interface Features

### 3.1 Projects

#### Hydromagic Projects

Hydromagic organizes a set of background maps, raw data files, polls, map overlays, and boundaries as projects. Each project has its own projection settings, the surveyor's name and associated project description, and is stored in a separate folder on the disk.

The project settings are saved in a "Hydromagic Project File" with the file extension ".HPF". These files are saved in XML format and, although not recommended, can be changed with any text editor.



*Example on how a Hydromagic project is organized on disk.*

#### Hydromagic project folders

Some folders, such as "Draft", "Reports", "Tides" and "Velocity" are intended to keep the project organized. The "Backups", "Maps", "Matrices", "Modified", "RawData" and "Soundings" folders are required to run the software and will be (re)created automatically by the software upon loading of the project by the software. Hydromagic projects can be shared by Hydromagic Survey and Hydromagic Dredging.

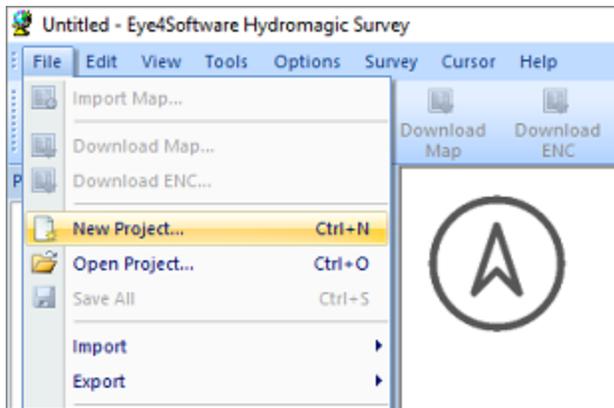
Folder	Description
Backups	Folder to store backups from raw data files, the project file and the configuration
Maps	Folder to store imported and downloaded maps
Matrices	Folder used to store matrices generated from soundings or dredging matrices
Raw Data	Folder where raw data files are recorded during hydrographic surveys
Modified	Folder where modifications to raw data files are stored

Soundings	Folder where soundings generated from raw data files are stored
Logs	Folder to store user defined dredging logs generated in Hydromagic Dredging
Sidescan	Folder where imported sidescan data files are stored
Draft	Folder to store draft files generated by the draft file editor
Tides	Folder to store tide files generated by the tide file editor
Reports	Folder to store PDF reports generated by one of the volume calculation tools
Velocity	Folder to store sound velocity files

**Folders created when creating a new Hydromagic project.**

## Creating a new project

The first thing to do when you start working with the software is to create a project. That is, of course, when there is no project available to load. To create a new project, select "New Project..." from the "File" menu in the Hydromagic application.



Select the "New Project..." option to start a new project.

When a project is currently loaded, you are asked if you want to save and discard changes. The following dialog box is displayed. Just fill in the required fields and click the "Create" button to create a blank project.

In the "Create new project" dialog, you can enter the project's name and coordinate system.

## Project Name

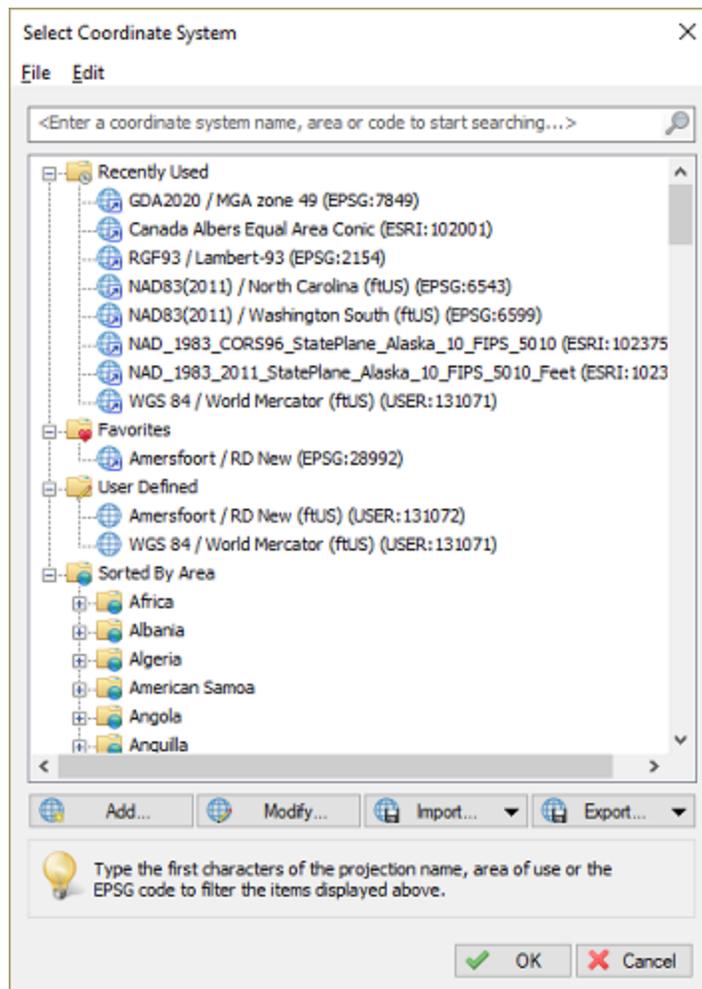
Enter a descriptive name for the project. This name is also used as the folder name for the project on the disk. Note that this name cannot contain any of the following characters: '|', '/', ';', '\*', ':', '?', '"', '<', and '>'. The reason you can not use these, is because Windows forbids to use them in file names.

## Project Location

Here you can select the location where the project will be saved. By default, the "Hydromagic" folder is selected under the "My Documents" folder.

## Map Projection

Select the map projection that will be used in this project by clicking the "Select ..." button. Please note that you cannot change the map projection after the project has been created..



*Select a coordinate reference system for your new project.*

## Project Description

You can enter a description for the project here. The use of this field is optional. The value of this field can be selected as part of the map footer text.

### Surveyor

You can enter the name(s) of the surveyor(s) here. The use of this field is optional. The value of this field can be selected as part of the map footer text.

## Project Explorer

Your project and its contents can be viewed and modified using the "Project Explorer". It can be used to download maps, import maps or data, remove items, starting utilities and much more.

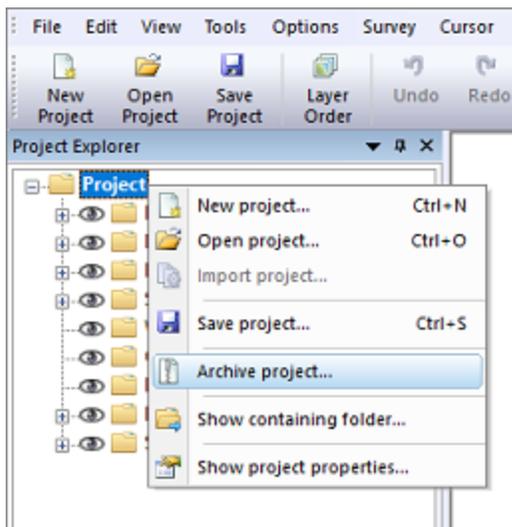
In addition to the maps, you can also access raw data, soundings, sidescan data, routes, waypoints, boundaries and matrices here. For more options, just right-click with your mouse on an item to get a popup menu.

When the "Project Explorer" isn't visible it could be hidden or closed. To restore it, select the "Project Explorer" option from the "View" menu.

### Backup projects

Using the "Project Explorer" it is possible to backup or archive your entire project with just a couple of mouse clicks. To do so, right click the project root in the "Project Explorer" and select the "Archive project..." option.

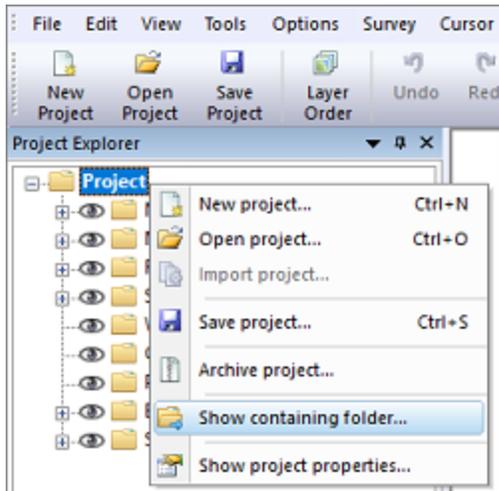
A file dialog will appear, allowing you to set the name and location of the output file. The backup can be written as either a ZIP, TAR or ISO file. Click "OK" to generate the file.



**Select the "Archive project..." option to send your project files to a ZIP archive.**

### Open project folder

To open a Windows Explorer window containing the contents of the project, right click the root of the project in the "Project Explorer" and select the "Show containing folder..." option. This might come in handy when, for instance, you want to manually copy or backup files from or to your project.

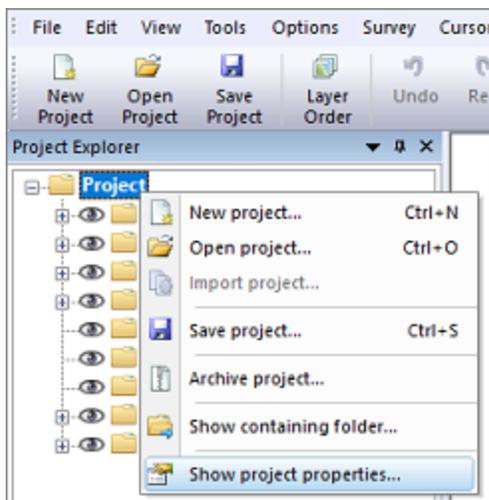


Select the "Show containing folder..." option to open your project files in Windows Explorer.

### Alter project properties

This function can be used to alter some project properties like the surveyors name and the project description. It is not possible to change the projection, units and project name once a project has been created. To use a different project after your survey, just create a new project with the correct projection, and [import the recorded raw data](#) files.

To show or modify these properties, right click the root of the project in the "Project Explorer" and select the "Show project properties..." option. When done editing, just click the "OK" button to store the modifications.



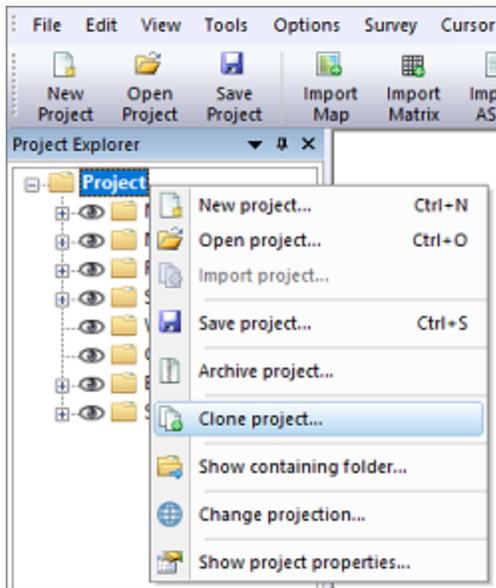
Select the "Show project properties..." option to view or alter project properties.

### Cloning a project

This feature has been added since version 9.0 after having a couple of requests for it. In some scenarios you will survey the same area a couple of months later, but you would like to have a separate project without going through the [map download](#), [drawing of the boundary](#) and [section generation](#) again.

This is where the 'Clone Project' function comes in handy. You can let Hydromagic generate a new project for you based on an existing project. You will be able to choose the new project name as well as which items will be copied from the existing project.

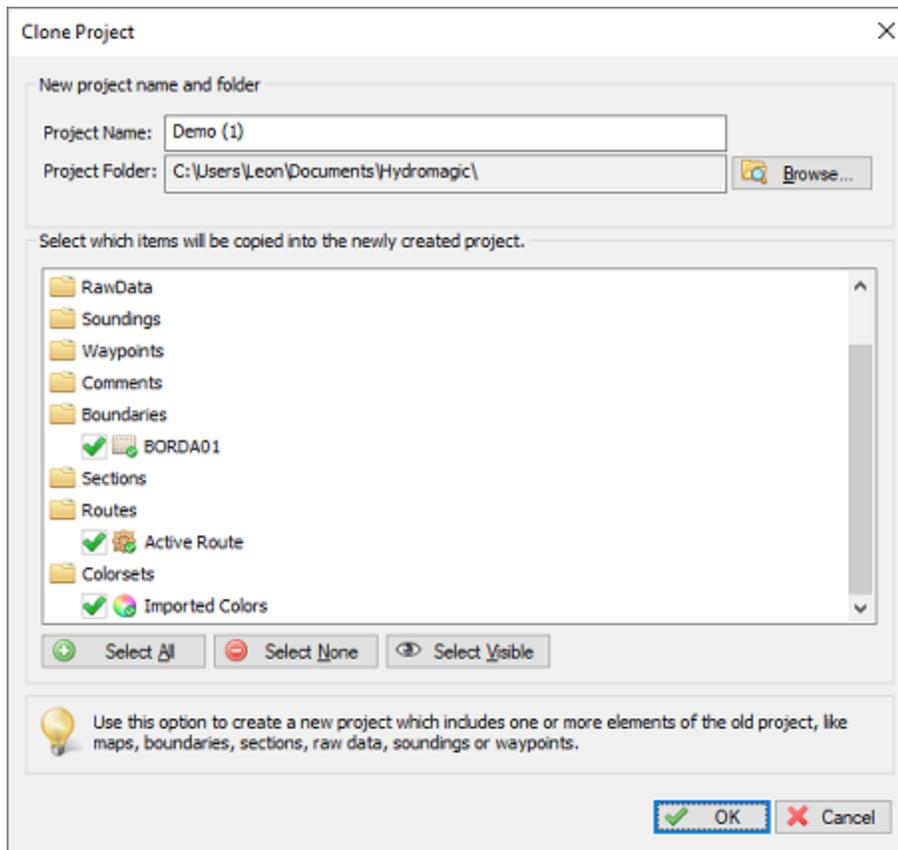
To clone a project, right click the root of the project in the "Project Explorer" and select the "Clone Project..." option:



Select the "Clone Project..." option to generate a customized copy of your project.

The following dialog should now appear, already showing you a suggestion for the name of the new project. Of course you can alter the project name to suit your needs. By default, the root folder should contain the location where all your projects are. If you are using a different location for your project root, you might want to change the "Project Folder" value by clicking the "Browse..." button.

From the tree, select the items you want to keep in the new project. In most cases this includes the maps, boundaries and sections. After selecting the items, click the "OK" button to create the new project. When the project has been created successfully, you can click the "Yes" button in the message box that appears to load the newly generated Hydromagic project. In case of problems, you can always check the content of the [Activity Views](#) "Processing" tab.

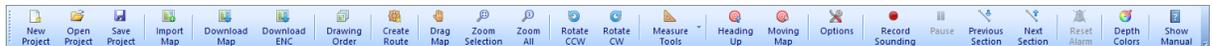


Select the items you wish to transfer to the new project and click "OK".

## 3.2 Toolbar

### Toolbar

The toolbar contains a selection of the most common used features, so they can be accessed with a single mouse click. The toolbar can be [fully customized](#), it is for instance, possible to remove buttons which are never used. This makes the program more user-friendly.



**Toolbar with the default buttons included - button selection after clean install.**

### Toolbar Buttons

In this paragraph the functions of all available buttons are described. Please note that not all buttons will be visible by default. The buttons described below are sorted by function: project functions, import and export functions, data recording functions, map display functions and miscellaneous functions.

#### Project Functions



#### New Project

Asks whether you want to save the current project, closes it, and starts a new one.

**Open Project**

Opens an existing Hydromagic project which has been created in Hydromagic Survey or Hydromagic Dredging earlier.

**Save Project**

Forces saving of the currently opened Hydromagic project (if any).

**Import and Export Functions****Print Preview**

Shows a print preview and other printing options. Use this to print the current view.

**Import Map**

Using this function, you can import an existing [vector](#) or [raster](#) map into your project.

**Import Matrix**

This button starts the "Import XYZ data" tool which allows you to [import matrix data](#) from an ASCII file.

**Add Matrix**

To add an existing matrix, [generated](#) using Hydromagic Survey or Hydromagic Dredging to your project, use this option.

**Import ASCII**

To import matrix, sounding, comment, waypoint or route data from an ASCII file, click this button.

**Download Map**

Starts the built-in [map downloading tool](#), allowing you to download background maps for your project.

**Download ENC**

Starts the built-in [Electronic Navigational Charts downloading tool](#), allowing you to download maps for your project.

**Export KML file**

This function allows you to [export](#) a selection of your project's items to a Google Earth KML or KMZ file.

**Export ASCII file**

This function allows you to export a selection of your project's items (waypoints, soundings, matrices, routes or comments) to an ASCII file.

**Export View**

This function creates a snapshot of your map display and saves it as an [image file](#).

## Map Display Functions



### Drawing Order

Allows you to [change the order](#) in which maps are drawn in the [map display](#).



### Undo

Undo the latest operation in the map display, for instance, when you accidentally remove or deleted a map overlay item.



### Redo

Redo the latest undo operation in the map display.



### Pan Up

Move the current map view up (Same as arrow up key).



### Pan Down

Move the current map view down (Same as arrow down key).



### Pan Left

Move the current map view left (Same as arrow left key).



### Pan Right

Move the current map view right (Same as arrow right key).



### Drag Map

Set the active cursor mode to "panning", allowing you to drag the map around using the mouse.



### Show Info

Set the active cursor mode to "info", click an object to [show more information](#) (vector maps and matrices only).



### Zoom In

Set the active cursor mode to "zoom in", click the map to zoom in.



### Zoom Out

Set the active cursor mode to "zoom out", click the map to zoom out.



### Zoom Selection

Set the active cursor mode to "zoom window", select a rectangle on the map display to zoom.



### Zoom All

Selects a zoom level which displays all project items (zoom extends).



### Rotate CCW

Rotates the map display 15 degrees counter clockwise (CCW).



### North Up

Reset map orientation to zero degrees (north up), or heading up, when selected.



### Rotate CW

Rotates the map display 15 degrees clockwise (CW).



### Rotate

Rotates the map display clockwise (CW) by a specified number of degrees.



### Measure Tools

Provides access to the measurement tools sub menu (distance, bearing, [area](#) and instant cross section utilities).



### Draw Boundary

Starts the boundary drawing mode. Click the map display to add points and right-click to stop drawing.



### Heading Up

Draw the map display in course up mode. Click again to switch back to north up (or the previously selected orientation).



### Moving Map

Zoom to current location. Map will be zoomed (and follows) to vessel's position.

## Miscellaneous Functions



### Create Route

Creates a new route for your autopilot using the built-in [route planner](#) (Hydromagic Survey only).



### Options

Open the preferences window.



### Generate Soundings

Starts the "[Sounding Generation Wizard](#)", which allows you to convert raw data into soundings.



### Reset Alarm

Resets an [alarm](#) when it triggers.



### Depth Colors

Edit color schemas and color legend settings.



### About

Shows the software about box containing version and [licensing information](#).



### Show Manual

Opens the offline (this) manual, which is very useful when you do not have an active Internet connection on your vessel..

## Data Recording Functions



### Event

Store event mark or send [annotation](#) to the connected echo sounder.



### Record

Toggle [recording](#) of raw data or dredging log.



### Pause

Pause [recording](#) of raw data (do not close active file).



### Previous Section

Activate previous cross-section or planned line (used for [helmsman display](#)).



### Next Section

Activate next cross-section or planned line (used for [helmsman display](#)).



### Save Position

Clicking this button will save the current GNSS position as a new [waypoint](#).

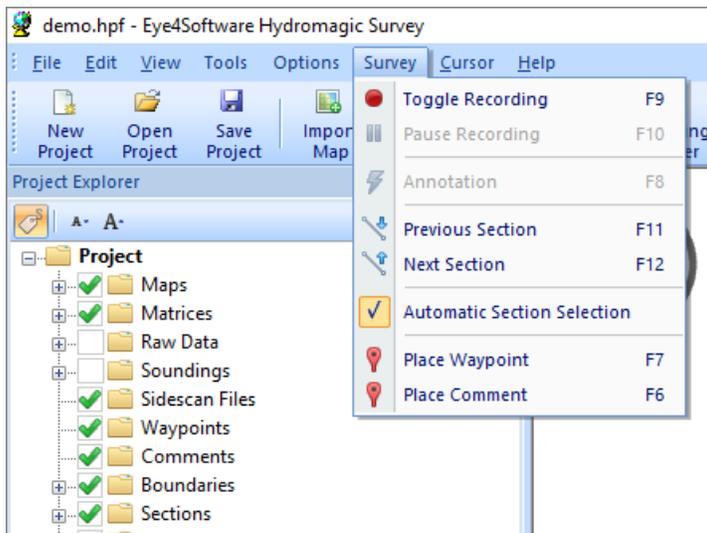
## 3.3 Accelerator Keys

### Accelerator keys

An accelerator key, is a key on your keyboard which you can press to quickly access a menu item, toolbar button or other function. This can be used for frequently used functions, such as starting or stopping [recording a raw data file](#). When using an accelerator key, you do not longer have to use the mouse while trying to navigate your vessel at the same time.

### Default accelerator keys

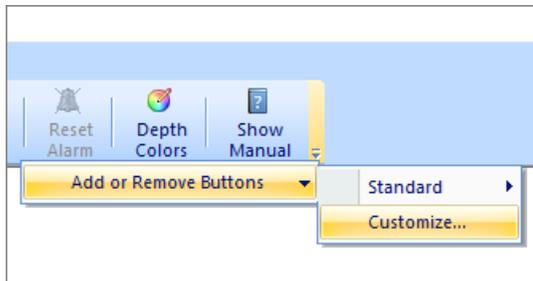
A couple of accelerator keys are already defined after installation of the software. These keys provide direct access to the functions in the "Survey" menu (amongst others) as shown in the screen shot below. When you want to restore the default accelerator keys, just select the "Reset Toolbar buttons (button order, text, sizes and visible buttons" option from the "Reset Factory Settings" window.



**Accelerator keys for menu items are shown next to the menu items.**

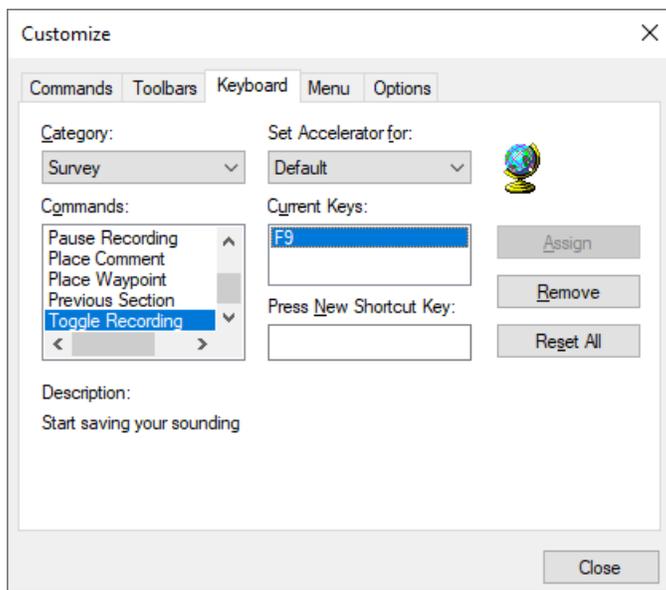
## Adding and modifying accelerator keys

In addition to the standard accelerator keys, there is the possibility to add keys by your own, to modify accelerators, or to reset all accelerators to their default values. To do so, click the small arrow at the right of the [tool bar](#), and select the "Customize..." option from the "Add or Remove buttons..." menu, as shown below:



**Click the arrow right to the toolbar to customize accelerator keys.**

In the dialog which appears, click the "Keyboard" tab to access the accelerator keys configuration:

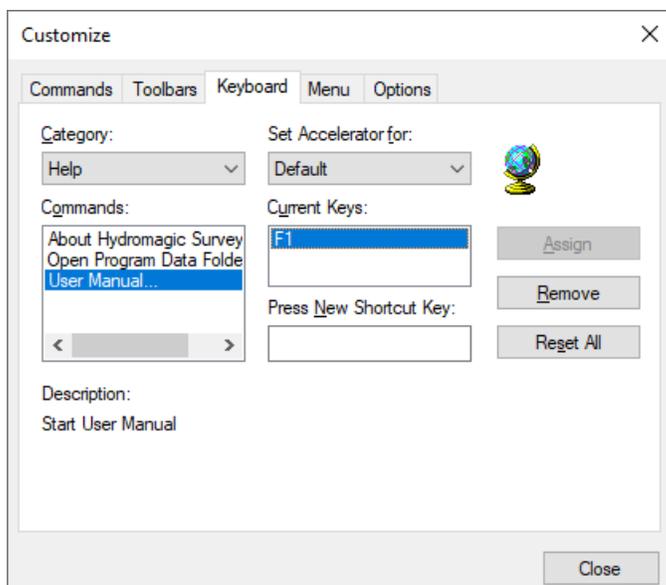


**Click the "Keyboard" tab to access the accelerator key settings.**

To create a new accelerator, for instance, the F1 key to access the offline user manual, select the menu item you want to associate with the F1 key as described in the following steps:

- For the "Category" drop down box select "Help", and for "Commands" select "User Manual...";
- Click the "Press New Shortcut Key" field with your mouse;
- Now press the key you want to use, this can also be a combination of keys, for instance, CTRL + F9, in this case we just press F1;
- Click the "Assign" button to select the key;
- Finished, you can now click the "Close" button to save your changes.

After performing the steps above, you should see something like this:



**Press the F1 key while in the "Press New Shortcut Key" box.**

To reset all accelerator keys to their default values, just click the "Reset All" button.

## 3.4 Data View

### Introduction

The data view is used to display all incoming data from the hardware.

The data view is integrated in the Hydromagic environment as a docked window.

By default, it is displayed left of the map display.

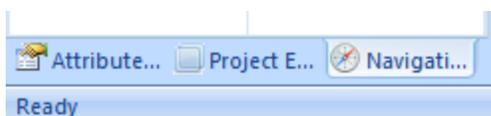
The following information can be displayed in this view:

- ✓ Current position in WGS84 latitude and longitude;
- ✓ Current position in UTM coordinates;
- ✓ Current position in the selected local grid;
- ✓ Altitude, course and speed;
- ✓ (D)GPS fix quality and used satellite(s) count;
- ✓ DGPS beacon ID and age;
- ✓ PDOP, HDOP and VDOP;
- ✓ Motion sensor data: heave, pitch and roll;
- ✓ Current Time;
- ✓ Navigation information;
- ✓ Dredging information.

Navigation Data	
Position (WGS84)	
Latitude	N 51°08'39.90"
Longitude	E 003°48'51.18"
Position (Local Grid)	
Northing	0000000.00
Easting	0000000.00
Depth	
Sounder Hi	2.10
Sounder Lo	0.00
Corrected	<b>2.10</b>
Tide	
Manual	0.00
Receiver	0.00
Course	
Course	157.1 °
Speed	
Ground	<b>0.1 kmh</b>
GPS Information	
Sats	10
Fix	DGPS Fix
Diff Age	999
Beacon	0000
Time	13:42:42 GMT
Dilution Of Precision	
PDOP	2.00
HDOP	1.20
VDOP	1.60

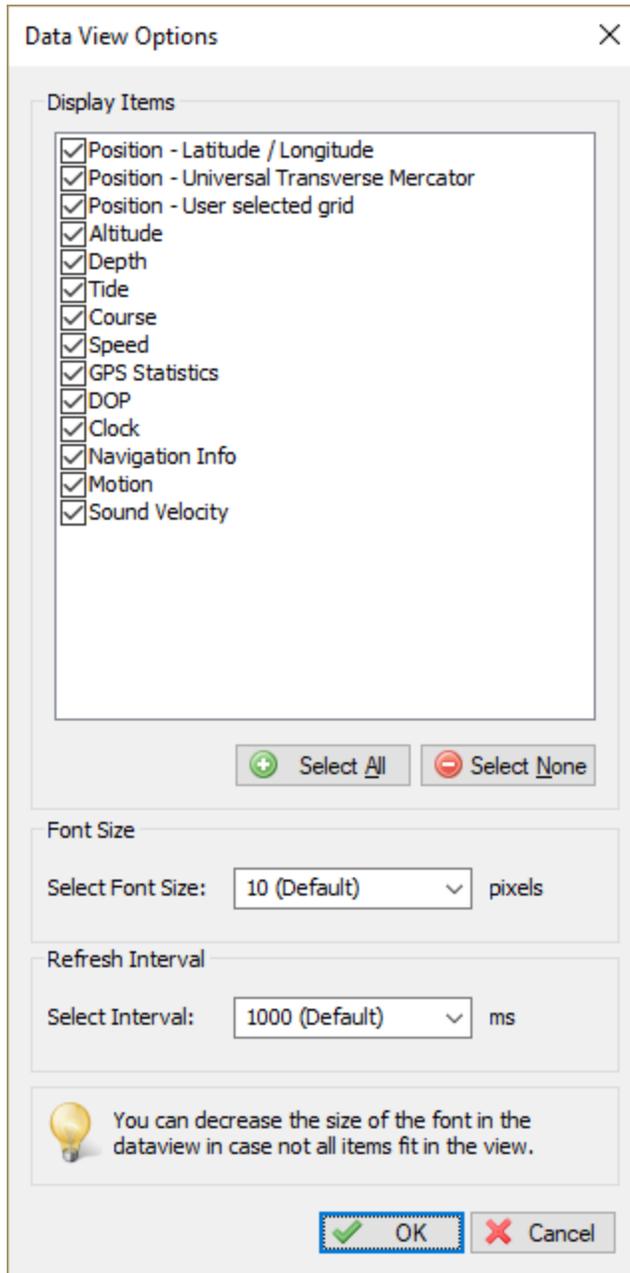
### Showing or hiding the data view

By default, the data view is displayed as a docked tabbed window. If you want to show or hide this window, just select the "Navigation Data" option from the "View" menu. Sometimes the windows is already displayed, but as a tabbed window. You have to select the "Navigation Data" tab to bring the window to the foreground. This tabs look like the image below:



## Select items to display

You can easily modify the data view by showing and hiding items. By showing only the needed information, the display will become more well organized. To select the items to display, right-click on the data view to show the following dialog. You can just select the items to display, by checking them.



## Position - Latitude / Longitude

Your current GPS position in WGS84 latitude and longitude format. It is possible to change the display format used. The display format can be modified from in the "Units" tab in the preferences window ("Preferences..." from the "Options" menu ).

## Position - Universal Transverse Mercator

Your current GPS position in UTM (Universal Transverse Mercator). The UTM zone is automatically detected using your current position, and will also be displayed. The UTM coordinates are displayed in northing and easting meters.

## Position - User Selected Grid

Your current GPS position displayed in either easting and northing or latitude and longitude, depending on the local map grid used to display the current map. This projection is the same as the projection displayed in the status bar at the bottom of the screen.

## Altitude

Altitude of the GPS antenna. Depending on the GPS, this can be the altitude above sea level, or the altitude above the geoid. The altitude can be displayed in meters or feet. The current altitude unit setting can be modified from the "Units" tab in the preferences window ( "Preferences..." from the "Options" menu ).

## Depth

Displays both the low and high frequency (if applicable) depths returned by the echosounder as well as the depths corrected with the current (RTK) tide value.

## Tide

Displays the current tide value. Depending on the settings, either the manual, RTK or tide receiver tide will be displayed.

## Course

Course calculated by the GPS. Also known as course over ground.

## Speed

Speed calculated by the GPS. Also known as speed over ground. The speed can be displayed in miles per hour, meters per second, knots and kilometers per hour. The current altitude unit setting can be modified from the "Units" tab in the preferences window ( "Preferences..." from the "Options" menu ).

## GPS Statistics

This option can be selected to retrieve more information on the GPS fix. This section in the data view includes the quality of the GPS fix (no fix, GPS fix, DGPS fix, etc...), the number of satellites used and some basic information on the DGPS reference station used (not available when using EGNOS/WAAS).

## DOP

This option can be selected to enable the DOP (Dilution Of Precision) section in the data view. It shows PDOP (overall dilution of precision or position dilution of precision), HDOP (horizontal dilution of precision) and VDOP (vertical dilution of precision).

## Dredging

Display information on the ongoing dredging process. When using the Hydromagic Dredging edition of the software, enabling this option will display dredging depth as well as position information on the dredging equipment used.

## Motion

Display motion information received from a motion sensor, IMU or echosounder with built in motion or heave sensor.

Enabling this option will display heave, roll and pitch information in the data view.

## Clock

Just displays the current PC date and time in GMT (Greenwich Mean Time).

## Navigation Info

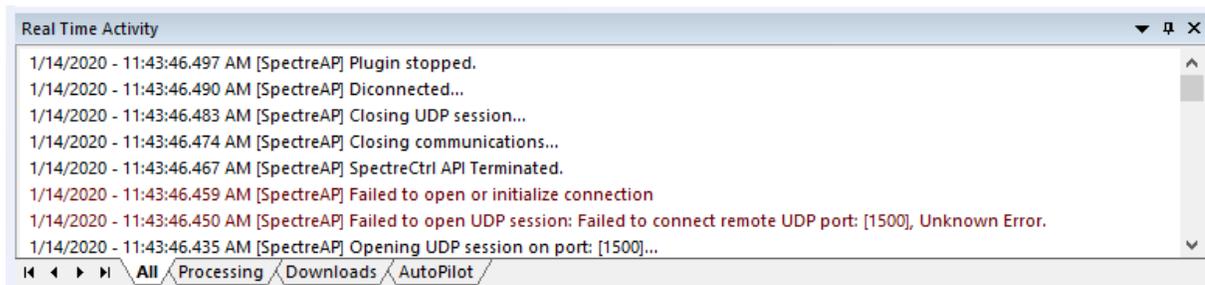
When the software is used in waypoint-to-waypoint navigation, enabling this option will cause the data view to show bearing and distance to waypoint.

## 3.5 Activity View

The activity view (since Hydromagic 9.0) is a window that is docked below the map view, which shows all kinds of real-time information. In earlier versions, this information could be accessed by opening the 'Event Log View', which has been deprecated as of version 9.0.

The reason for the activity view was to supply direct feedback when something fails, or to show more information about ongoing processes such as data-processing. For instance, when a plugin did not load, this will be reported directly in the activity view, so you know right away that something is wrong.

It can also be used to receive real-time information on devices connected to Hydromagic, or to get status updates from your autopilot.



## Activity View Tabs

The activity view will always have three tabs. More tabs might be displayed depending on which plugin(s) you have loaded:

All

The 'All' tab will display all general information like plugins that were loaded, maps that have been imported and all system errors.

Sometimes more detailed information is sent to the 'Processing' tab, for instance when you are loading a map, the loading process will be displayed in the 'Processing' tab.

### **Processing**

The 'Processing' tab will show information on all processing jobs like importing maps, parsing files, loading projects, post processing data and far more. When you process data and for some reason you do not get the desired result, please consult this tab for more information on the problem.

### **Downloads**

When downloading files from the web, such as background maps, nautical charts or geoid models, the download process will be displayed here. You can find the web URL's used to download the content, and in case of problems you can find the cause of the error here (i.e. website down, or document not found).

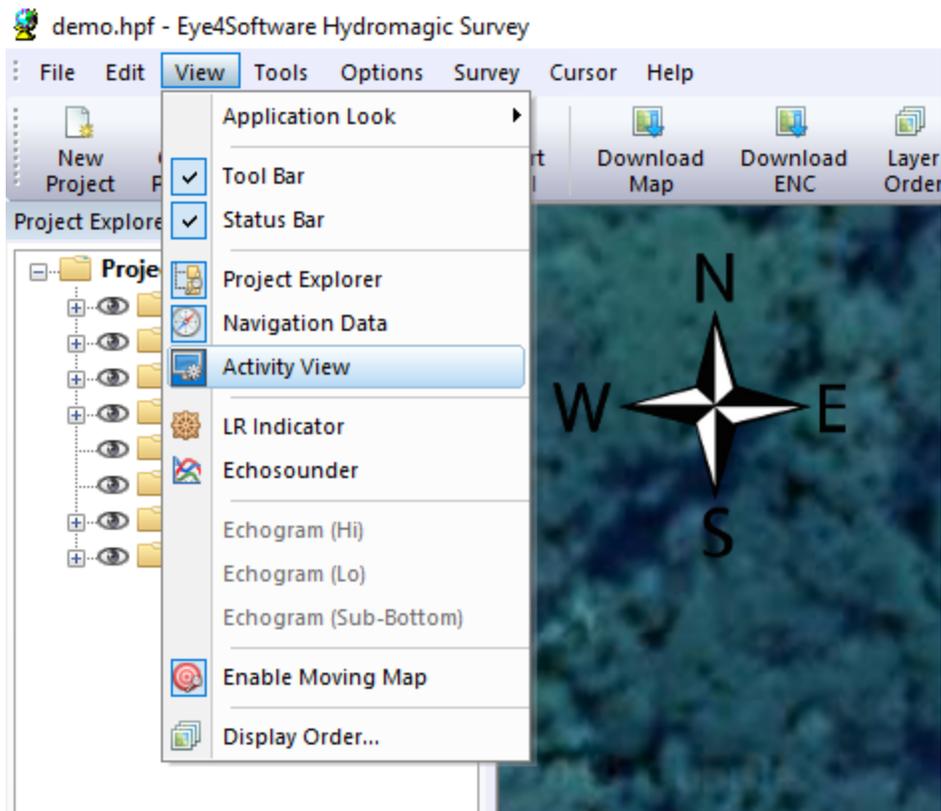
### **Autopilot**

When an autopilot sends status updates (for instance waypoint reached or route uploaded), you can view them in the 'Autopilot' tab. This tab is hidden when no autopilot plugin has been loaded. Please refer to this document for more info on using autopilots with Hydromagic.

### **Showing or hiding the activity view**

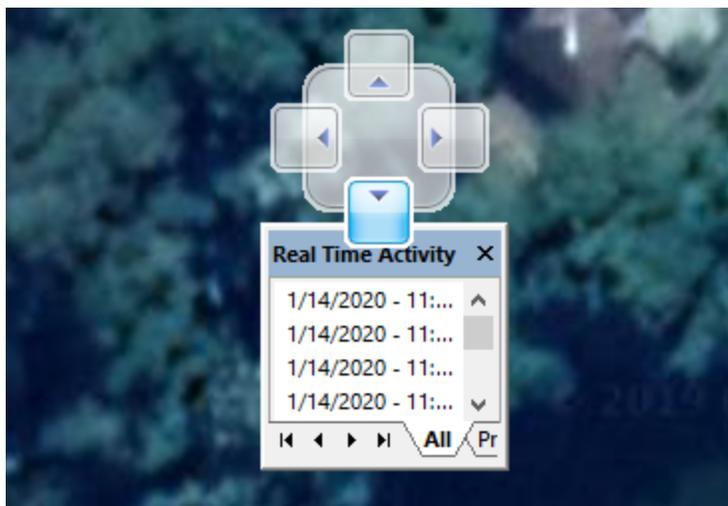
By default, the activity view is docked at the bottom of the Hydromagic application, below the map display. Using the gripper just above the title bar of the activity view you can resize it so you can control how much vertical space it takes away from the map display.

When the activity view is hidden, or when you want to temporarily get rid of it (although not recommended), you can toggle its visibility by clicking the "Activity View" menu item in the "View" menu (shown below).



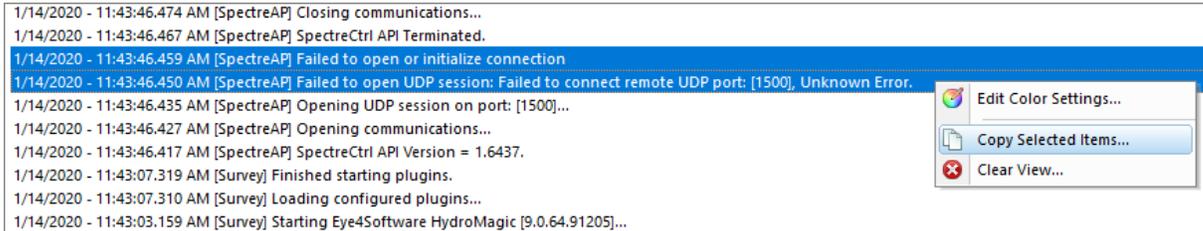
### Docking the view below the map display

When you enable the activity view and it is not properly docked below the map display (i.e. displayed as a floating window), just use the mouse and left click the mouse on the title bar of the activity view window. While holding the left mouse button down, drag it into the 'down arrow' button as displayed below.



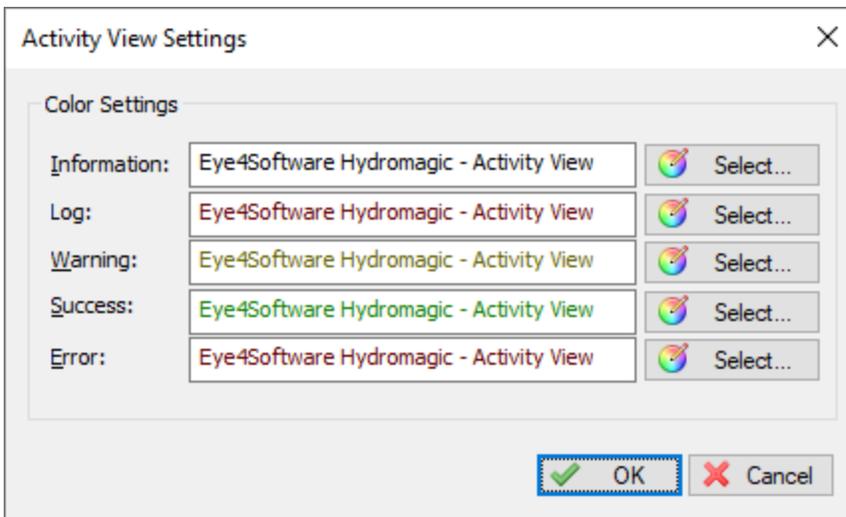
### Copy text from the activity view

To copy text from the activity view, for instance when you need support on an error, hold down the 'CTRL' key when clicking one or multiple lines in the view. When you have selected all the text you want to copy, right click on one of the selected items and choose the "Copy Text" option from the popup menu that appears. Now you can use the "CTRL" + "V" key combination to paste the text in an email or text document.



## Customizing text colors used in the activity view

Tracing information in the activity view uses distinct colors for error, success, warning, logging and information messages. For instance, errors are displayed in red, while success messages are colored green. To change the color for each type of message, simply right click the activity view and choose the "Edit Color Settings..." menu item to start customizing.



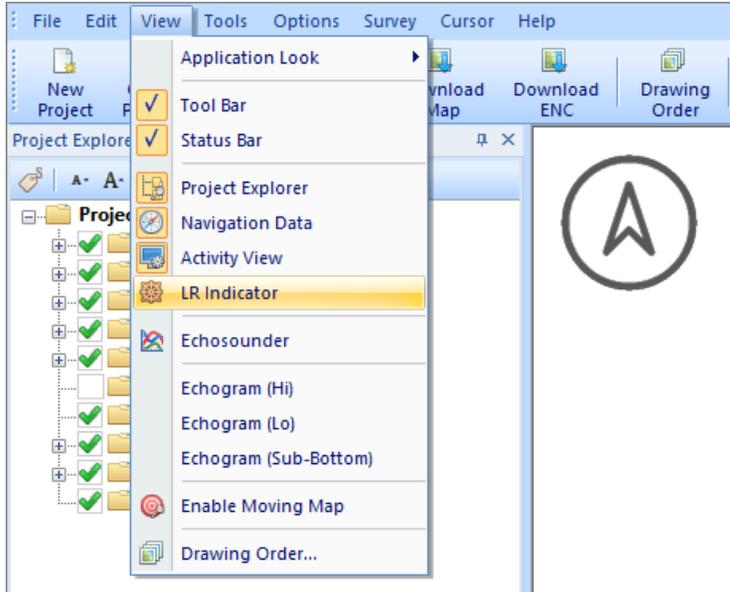
## 3.6 Helmsman Display

### Helmsman Display

The helmsman display (also known as LR-indicator) in Hydromagic can be used to display the cross track error (XTE) when navigating on planned survey (or dredging) lines. It provides you with information on in which direction to steer to follow the planned lines as accurate as possible. This function is also available in Hydromagic Dredging to provide dredge head guidance, for instance to create trenches.

### Activating the helmsman display

The helmsman (or LR-indicator) display can be activated, by selecting the "LR Indicator" option from the "View" => "Instruments" top menu. The display will now be displayed, however, it won't display any useful information until a valid GNSS position is available, and a cross section or planned survey line has been selected.

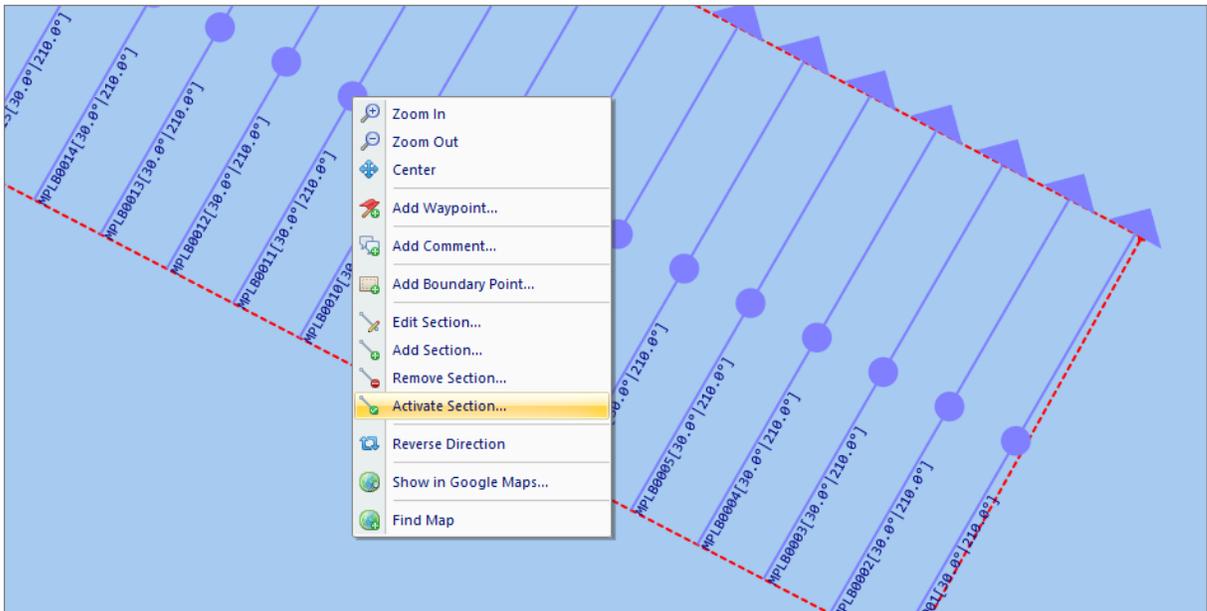


Select the "LR-Indicator" option from the "View" menu.

### Activating a survey line

Because the cross track error displayed is calculated from the position of your vessel relative to a line, you have to tell the software which planned survey line you want to follow. Please note that in Hydromagic, there is no difference between a planned survey line and a cross section. Cross sections can be used in volume calculations, cross section displays and as planned survey lines. There are several ways to select a cross section:

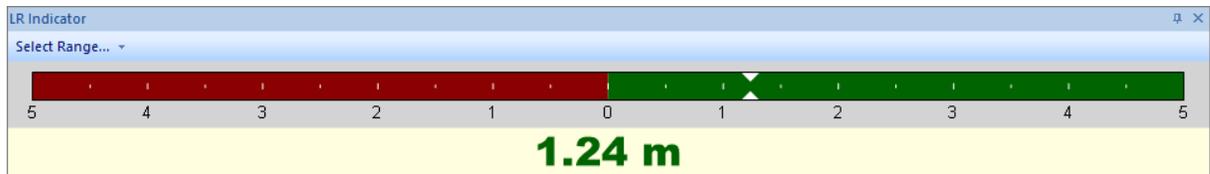
- Right click on the center of a (cross) section, and select the "Activate Section" option from the popup menu;
- Select a cross section by using the F11 and F12 function keys;
- Right click a cross section in the project explorer and select the "Set Active" option;



Right click a section and choose the "Activate Section" option to activate.

### Using the display to steer

When a valid position is available and a cross section has been selected the helmsman display is indicating the distance between your vessel and the line, as well as the direction you need to steer:



The helmsman display show your direction and distance to the selected section" option to activate.

The value displayed is the distance to the line in the horizontal units selected in the current map projection. When the value is displayed in red, it means you are on the port side (left) of the line, and you have to steer to the starboard side (right). When the value is displayed in green, it means you are on the starboard side (right) of the line, and you have to steer to the port side (left). The line which is used to calculate the cross track error (the line that is activated) is highlighted in yellow on the chart display.

## 3.7 Area Measurements

### Introduction

Eye4Software Hydromagic offers a variety of tools to calculate or measure the area covered by a sounding, map feature or other object. The results of an area measurement are displayed using one of the following units:

- Acres;
- Hectares;
- Square Meters;
- Square Kilometers;
- Square Yards;

- Square Feet.

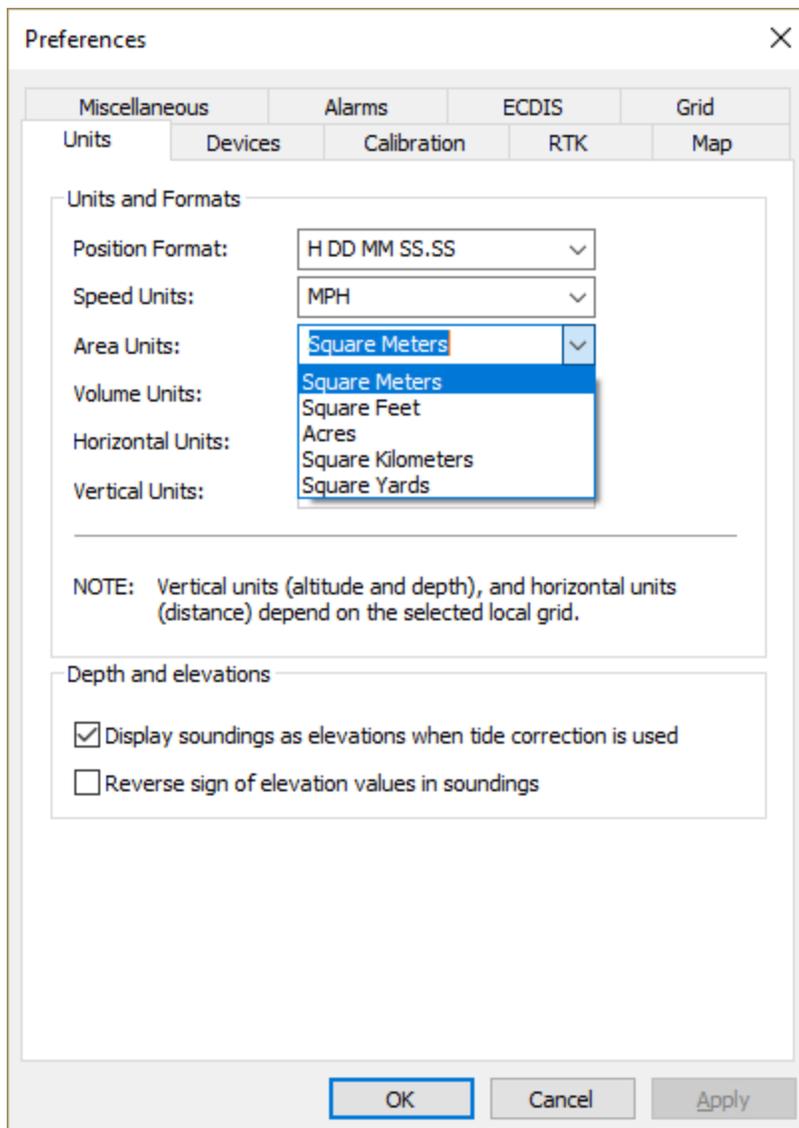
Areas are calculated by converting all coordinates of the selected area to vectors. The calculated vectors are passed to a cross-product formula used to calculate the total area of the object measured.

### Setting area units

Before performing an area measurement, make sure your preferred area units have been set!

To specify the units used for area calculation, open the "Preferences" dialog, by selecting "Preferences..." from the "Options" menu. Now click on the "Units" tab. For more info on how to set units, please refer to the "[Unit settings](#)" page.

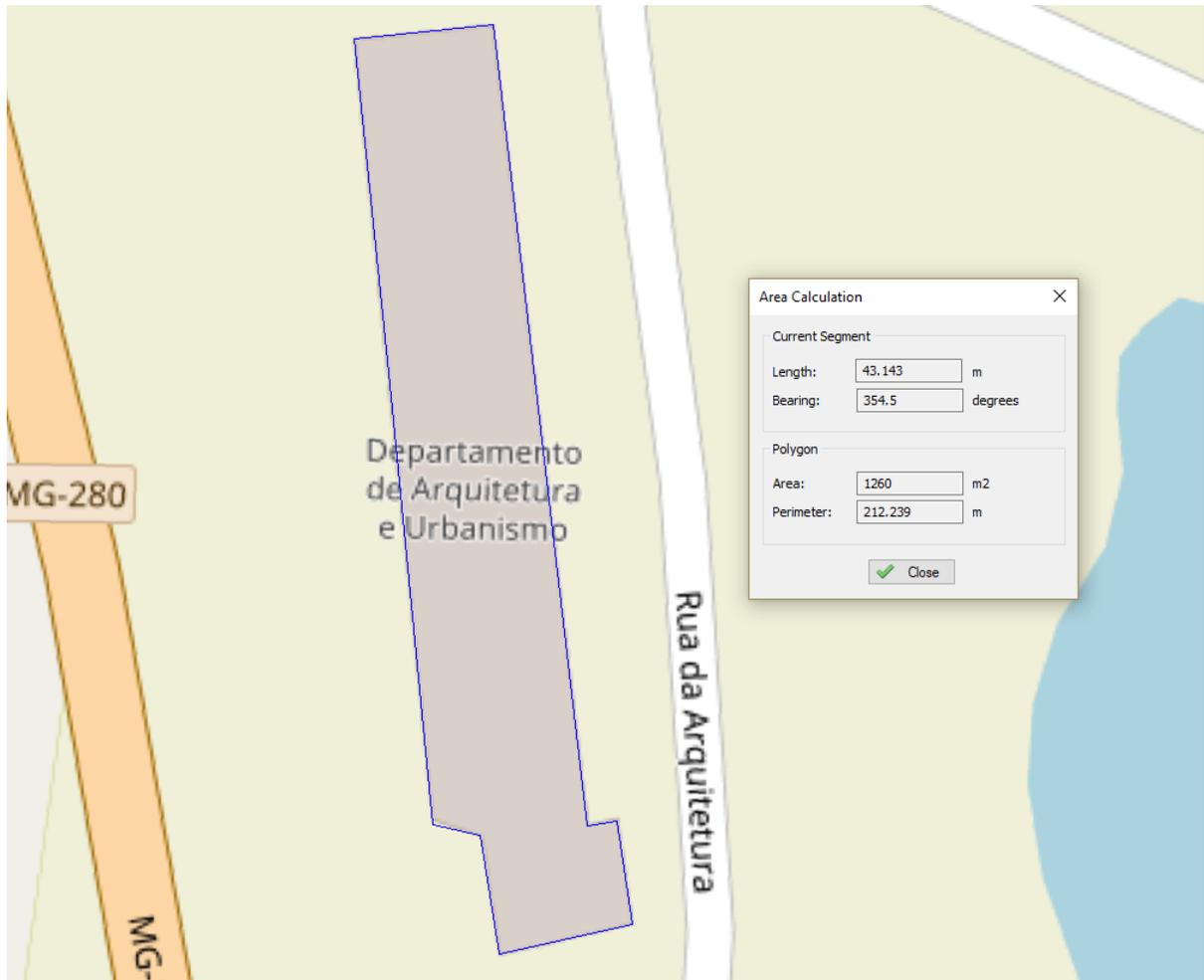
Use the "Area Units" drop down box to select the preferred units, and click the "OK" button to store the new setting.



## Measuring the area of a map object

Areas of map objects can be calculated by selecting the corner coordinates of the polygon using the mouse. To get the most accurate results, make sure that the object is zoomed in at the maximum zoom level.

Now select the "Area" cursor tool by selecting "Area" from the "Cursor" menu. All you have to do is select all the corners of the object, as shown in the screen shot below:



You will notice a blue line drawn around the object. A dialog box appears on top on the map showing the current area and perimeter of the map object. When you finished measuring, just click the right mouse button to dismiss the dialog box, and return to the previous mouse mode.

## 3.8 Coordinate calculator

### Introduction

Hydromagic has a built in coordinate calculator tool, which can be used to convert a single projected (easting/northing) or geographic (latitude/longitude) coordinate. This tool can, for instance, be used to

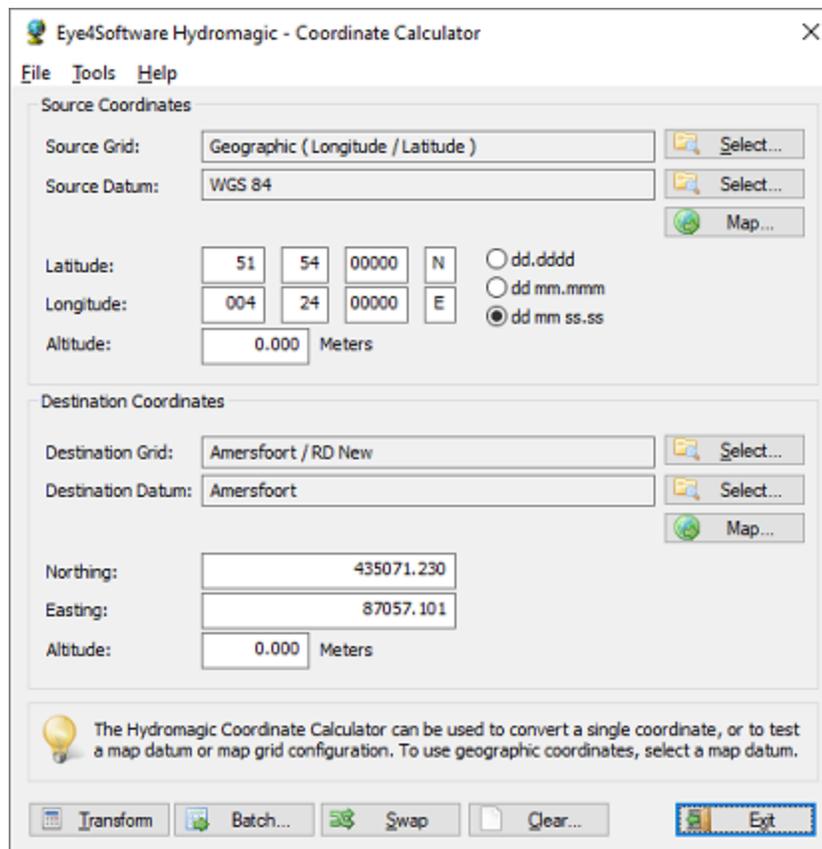
check whether configured map grids and map datum are working correctly. All map datums, grids and ellipsoids configured in Hydromagic can be used with this conversion tool.

The following calculations are supported:

- Convert geographic coordinates to projected coordinates;
- Convert projected coordinates to geographic coordinates;
- Transform geographic coordinates between different map datums;
- Convert projected coordinates from one coordinate reference system to another;
- Convert geographic coordinates between different latitude and longitude formats.

### Start the Coordinate Calculator

You can start the Coordinate Calculator by selecting "Coordinate Calculator..." from the "Tools" menu in the main window. After selecting this option, the following window should appear:



*The main screen of the "Eye4Software Coordinate Calculator".*

### Using the Coordinate Calculator

To perform a coordinate conversion, you have to enter the following information:

- Source map datum or map grid;
- Destination map datum or map grid;
- Source coordinates, geographic or projected;
- The format used for the geographic source coordinates (optional);

- The source altitude (optional);

## Source Coordinates section

### Source grid

In this field, the name of the source map grid is displayed. When the source coordinate is in geographic coordinates, the text: "Geographic Longitude / Latitude" is displayed here. To set the source coordinates to geographic coordinates, you have to select a map datum instead of a map grid.

### Source datum

In this field, the name of the source datum is displayed. When a map grid is selected, this field displays the map datum used in this map grid. To set the source coordinates to projected coordinates, you have to select a map grid instead of a map datum.

### Source coordinates (X)

Depending on whether you selected a map grid or not, this field is used to enter the source easting (X) or longitude coordinate. When using a map grid, the units of the X-axis are displayed ( for instance: meters, feet, links etc... ). When using a map datum, geographic coordinates are displayed as specified with the radio buttons.

### Source coordinates (Y)

Depending on whether you selected a map grid or not, this field is used to enter the source northing (Y) or latitude coordinate. When using a map grid, the units of the Y-axis are displayed ( for instance: meters, feet, links etc... ). When using a map datum, geographic coordinates are displayed as specified with the radio buttons.

### Map button

When you click the "Map..." button, the software will convert the source coordinates entered to a WGS84 geographic coordinates, and displays this position as a marker in a Google Maps web page. This way you can check whether the correct coordinates have been entered.

### Source geographic format

When using geographic coordinates, 3 radio buttons are shown, you can use these buttons to select the geographic format:

- Decimal Degrees;
- Degrees, Decimal Minutes;
- Degrees, Minutes, Seconds.

When a map grid is selected, these buttons are hidden, and the coordinates are always displayed in northing and easting (projected) units.

## Destination Coordinates section

### Destination grid

In this field, the name of the destination map grid is displayed. When the destination coordinate is in geographic coordinates, the text: "Geographic Longitude / Latitude" is displayed here. To set the destination coordinate to geographic coordinates, you have to select a map datum instead of a map grid.

#### **Destination datum**

In this field, the name of the destination geodetic datum is displayed. When a map grid is selected, this field displays the map datum used in this map grid. To set the destination coordinate to projected coordinates, you have to select a map grid instead of a map datum.

#### **Destination coordinates (X)**

Depending on whether you selected a map grid or not, this field is used to display the calculated projected coordinates. When using a map grid, the units of the X-axis are displayed ( for instance: meters, feet, links etc... ). When using a map datum, geographic coordinates are displayed as specified with the radio buttons.

#### **Destination coordinates (Y)**

Depending on whether you selected a map grid or not, this field is used to display the calculated projected coordinates. When using a map grid, the units of the Y-axis are displayed ( for instance: meters, feet, links etc... ). When using a map datum, geographic coordinates are displayed as specified with the radio buttons.

#### **Map button**

When you click the "Map..." button, the software will convert the destination coordinates to WGS84 geographic coordinates, and displays this position as a marker in a "Google Maps" webpage. This way you can check whether the correct coordinates have been entered or calculated.

#### **Destination geographic format**

When using geographic coordinates, 3 radio buttons are shown, you can use these buttons to select the geographic format:

- Decimal Degrees;
- Degrees, Decimal Minutes;
- Degrees, Minutes, Seconds.

When a map grid is selected, these buttons are hidden, and the coordinates are displayed in northing and easting (projected) units.

### **Buttons**

#### **Transform**

Using the transform button you can perform the actual map grid or map datum conversion. The source coordinates are always used as input, and the calculated result is displayed in the destination coordinates section.

#### **Swap**

When clicking the "Swap" button, all the values of the source and destination coordinates sections are swapped. This allows you to perform a reverse calculation without the need to re-enter all information.

#### **Clear**

By clicking the "Clear" button, all fields and settings are reset to their default values.

#### **Close**

Closes the window after saving the current settings and values.

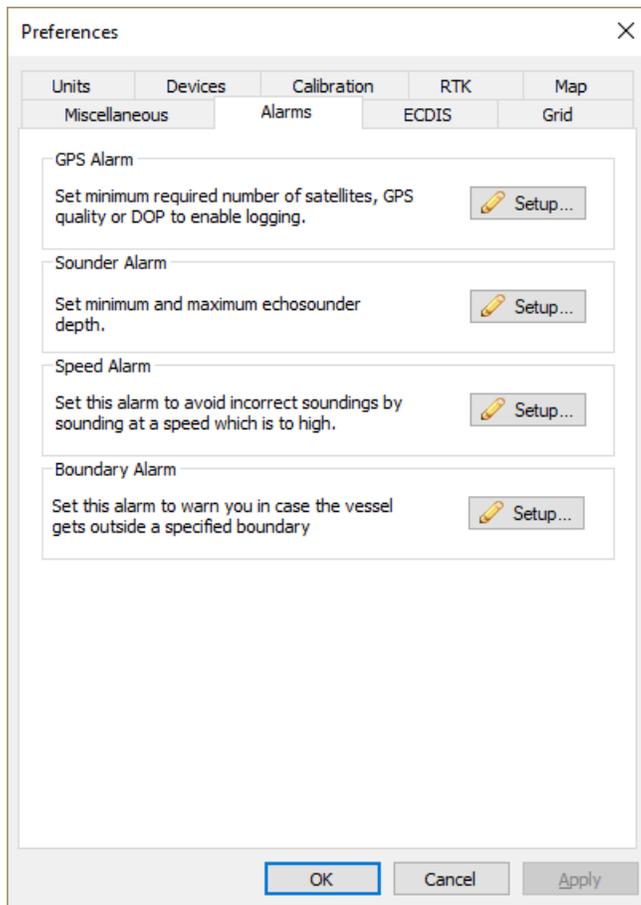
## **3.9 Alarms**

### **Alarms in Hydromagic**

In Hydromagic, alarms can be configured to alert you, or stop recording a sounding, when specified conditions are (not) met. Alarms can be applied to GPS accuracy, position, speed, echo sounder depth and boundary (geofencing).

We recommend to use at least the alarm for the GPS accuracy to avoid recording invalid data for hours. For instance, when the RTK fix has been lost, you want to know this immediately to avoid recording with invalid tide values.

To setup alarms, first select the "Preferences..." item from the "Options" menu to open the preferences dialog. In the preferences window, please select the "Alarms" tab to setup alarms:



### GPS or RTK receiver alarms

To setup alarms on the GPS / RTK equipment, click the "Setup..." button in the "GPS Alarm" section. To enable alarms for GPS, check the "Enable alarm on invalid and inaccurate GPS positions" option. You will now be able to configure other options:

GPS Alarm

Enable alarm on invalid and inaccurate GPS positions.

GPS Tresholds

Minimum GPS quality value: RTK Fixed

Minimum GPS satellite count: 8

Maximum HDOP value: 1.5

Maximum DGPS age: 0

Require DGPS beacon id: 0

Actions

Pause recording

Sound alarm

OK Cancel

### Minimum GPS quality value

Use this option to make sure only positions are recorded when the GPS is, for instance, in RTK Fixed or differential GPS mode.

Possible values include:

- No Fix
- GPS Fix
- DGPS Fix
- RTK Float
- RTK Fixed

When using tide corrections using RTK, it is recommended to use this option with "RTK Fixed" selected, so you will be notified when RTK tides are disabled.

### Minimum GPS satellite count

This options can be used to use only position fixes with a minimum number of satellites in view to ensure accuracy. For a valid 2D fix, at least 3 satellites are required, for a 3D fix, you need at least 4 satellites. It is recommended to set this value to 6 or higher.

### Maximum HDOP value

Activates alarm when the HDOP (Horizontal Dilution of Precision) value exceeds a defined threshold. Recommended value is 2.0.

### Maximum DGPS age

The DGPS age indicates the age of the correction data in seconds. When this value goes up, it often means that the differential GPS or RTK correction signal is temporary lost. In most scenario's this value will not exceed the value of 5-6. It is recommended to set this value to 10.

### Require DGPS beacon id

This option can be used when a DGPS or RTK correction signal is used. When another beacon is received then the one that is expected, it may result in inaccurate positions, for instance when a reference station is at a too great distance. Set this value to the beacon ID that is displayed directly at a successful setup of your reference station.

### Sounder alarms

To setup alarms on the echo sounder equipment, click the "Setup..." button in the "Sounder Alarm" section. Sounder alarms are available in the Hydromagic Survey edition only.

To enable alarms for sounders, check the "Enable alarm on invalid and out-of-range soundings" option. You will now be able to configure other options:

The screenshot shows a dialog box titled "Sounder Alarm" with a close button (X) in the top right corner. The dialog is divided into three sections:

- Sounder Alarm:** Contains a checked checkbox labeled "Enable alarm on invalid and out-of-range soundings."
- Sounder Limits:** Contains two input fields. The first is "Minimum Depth:" with the value "0.30" and the unit "Meter". The second is "Maximum Depth:" with the value "30.00" and the unit "Meter".
- Actions:** Contains two checked checkboxes: "Pause recording" and "Sound alarm".

At the bottom of the dialog, there are two buttons: "OK" (with a green checkmark icon) and "Cancel" (with a red X icon).

#### Minimum Depth

Sets the minimum depth that is expected to be returned from the sounder. This value is not corrected, but compared to the raw depth returned.

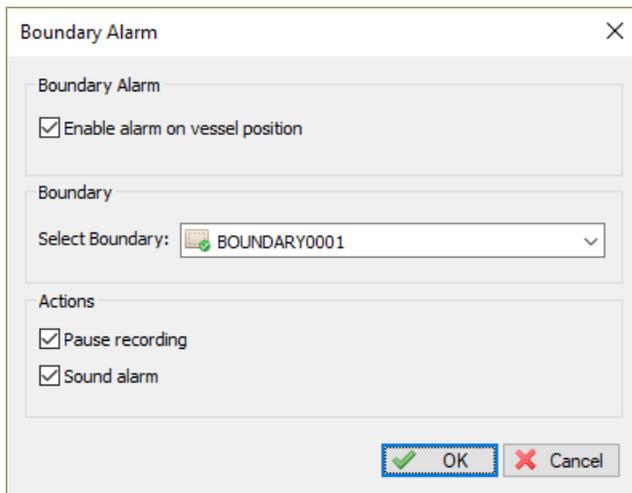
#### Maximum Depth

Sets the maximum depth that is expected to be returned from the sounder. This value is not corrected, but compared to the raw depth returned.

### Boundary alarms

To setup an alarm on the dredging area boundary, click the "Setup..." button in the "Boundary Alarm" section. Boundary alarms are available only in the Hydromagic Dredging edition.

To enable an alarm for boundaries, check the "Enable alarm on dredge head location" option. You will now be able to configure other options:



The screenshot shows a dialog box titled "Boundary Alarm" with a close button (X) in the top right corner. It is divided into three sections: "Boundary Alarm", "Boundary", and "Actions".

- Boundary Alarm:** Contains a checked checkbox labeled "Enable alarm on vessel position".
- Boundary:** Contains a label "Select Boundary:" followed by a dropdown menu showing "BOUNDARY0001".
- Actions:** Contains two checked checkboxes: "Pause recording" and "Sound alarm".

At the bottom right, there are two buttons: "OK" (with a green checkmark icon) and "Cancel" (with a red X icon).

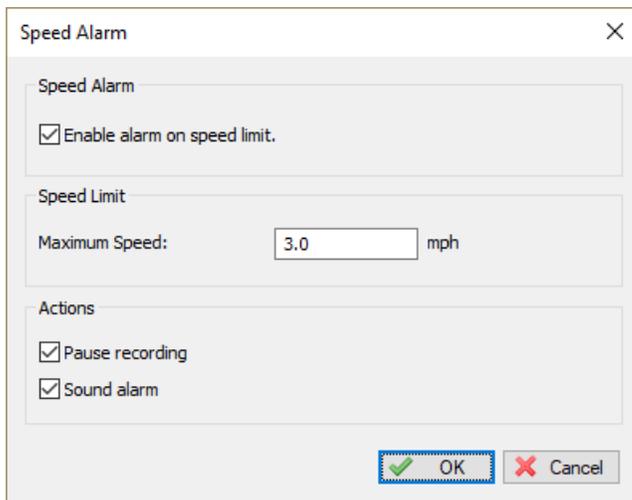
### Selected Boundary

The selected boundary is used to check the dredging position. When the dredge head is outside of the selected boundary, the alarm will be triggered.

### Speed alarms

To setup an alarm on the speed of the vessel, click the "Setup..." button in the "Speed Alarm" section. Speed alarms are available in both the Hydromagic Survey and Dredging editions.

To enable an alarm for speed, check the "Enable alarm on speed limit" option. You will now be able to configure other options:



The screenshot shows a dialog box titled "Speed Alarm" with a close button (X) in the top right corner. It is divided into three sections: "Speed Alarm", "Speed Limit", and "Actions".

- Speed Alarm:** Contains a checked checkbox labeled "Enable alarm on speed limit".
- Speed Limit:** Contains a label "Maximum Speed:" followed by a text input field containing "3.0" and the unit "mph".
- Actions:** Contains two checked checkboxes: "Pause recording" and "Sound alarm".

At the bottom right, there are two buttons: "OK" (with a green checkmark icon) and "Cancel" (with a red X icon).

### Maximum Speed

The maximum speed of the vessel during survey or dredging operations. Due to latency errors, the recommended maximum speed for performing surveys is 4 km/h.

### Alarm options

### Pause sounding recording

When the "Pause sounding recording" option is enabled, the recording of the current sounding is suspended when the alarm is activated.

You have to press the record button again to resume recording.

### Sound Alarm

When the "Sound alarm" option is enabled, then a sound is played when the alarm is activated. In addition to the sound, a big red banner with the text 'ALARM' is displayed in the map view.



You can reset the alarm by clicking the reset alarm button in the tool bar:



**NOTE: When using sound alarm(s), make sure your sound hardware is enabled and the volume is turned on.**

## 3.10 Query objects

### Introduction

Hydromagic allows you to use the mouse to select a map feature or coordinate on the map, and to return more information on objects found at this location.

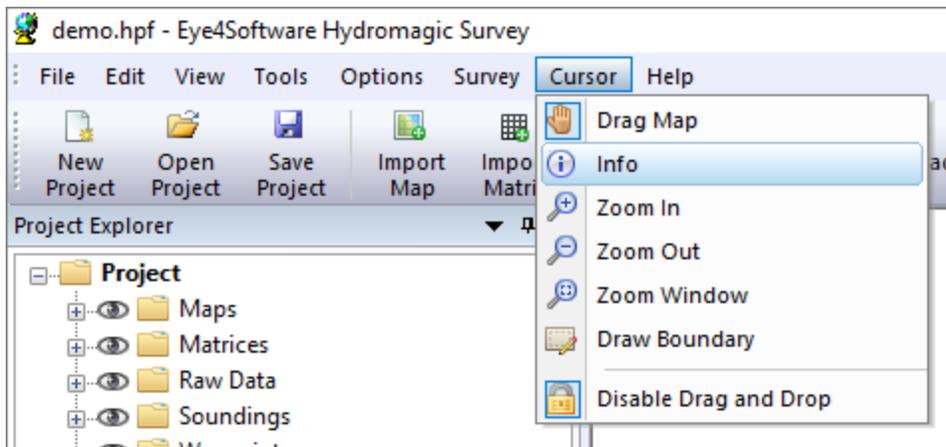
You can use this feature to get more information on a CAD or GIS feature, or to retrieve depth at any given location (within the boundaries of a loaded or generated matrix).

You can access this feature by clicking the  button in the toolbar.

### Querying depth values

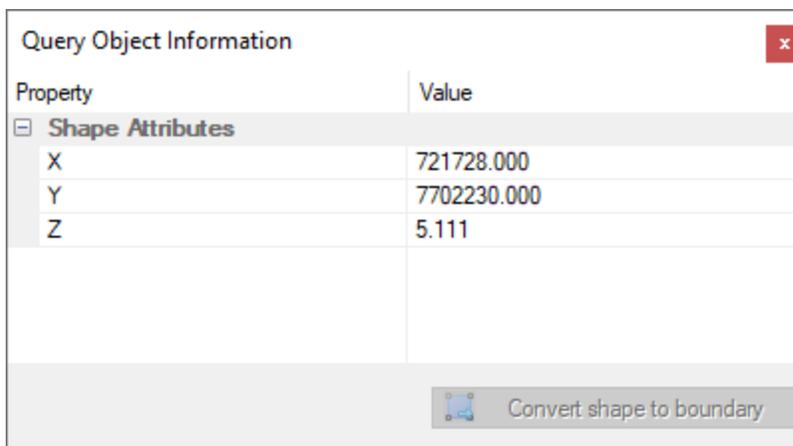
In order to retrieve depth information using the mouse, make sure a matrix is loaded or generated, and set to active.

You can activate (which means that is the matrix selected for operations) a matrix by right-clicking it in the "Project Explorer" and selecting the "Set Active" option as shown below:



After selecting the matrix you want to use, set the cursor to "Query Object" by selecting the  button in the toolbar.

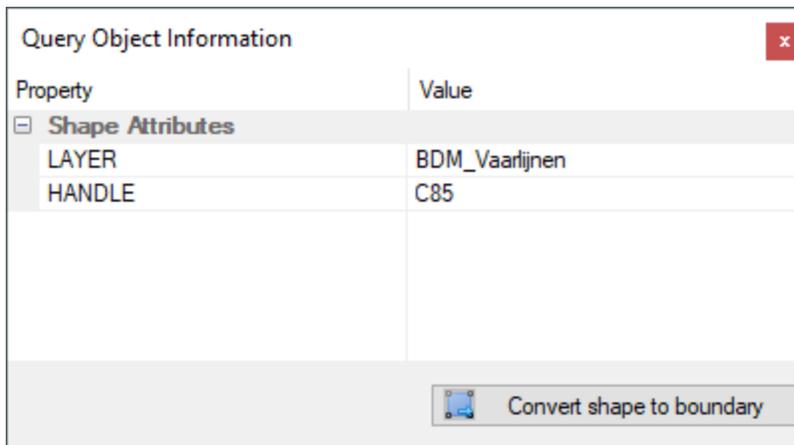
You can now click anywhere within the boundaries of the matrix to retrieve depth information. The depth, interpolated from the four nearest cells, will be calculated and displayed as shown below:



When ready, right click on the map to dismiss the dialog and reset the mouse mode to "Pan".

### Querying CAD or GIS features

In order to retrieve information on a object or feature on a CAD or GIS (vector) map, make sure the map is visible. You can now click on the object you want to retrieve information for. When an object has been found near the cursor, the "Query Object Information" dialog will be displayed. In this example we are querying a CAD object from a DXF file, so the DXF layer and handle are displayed.



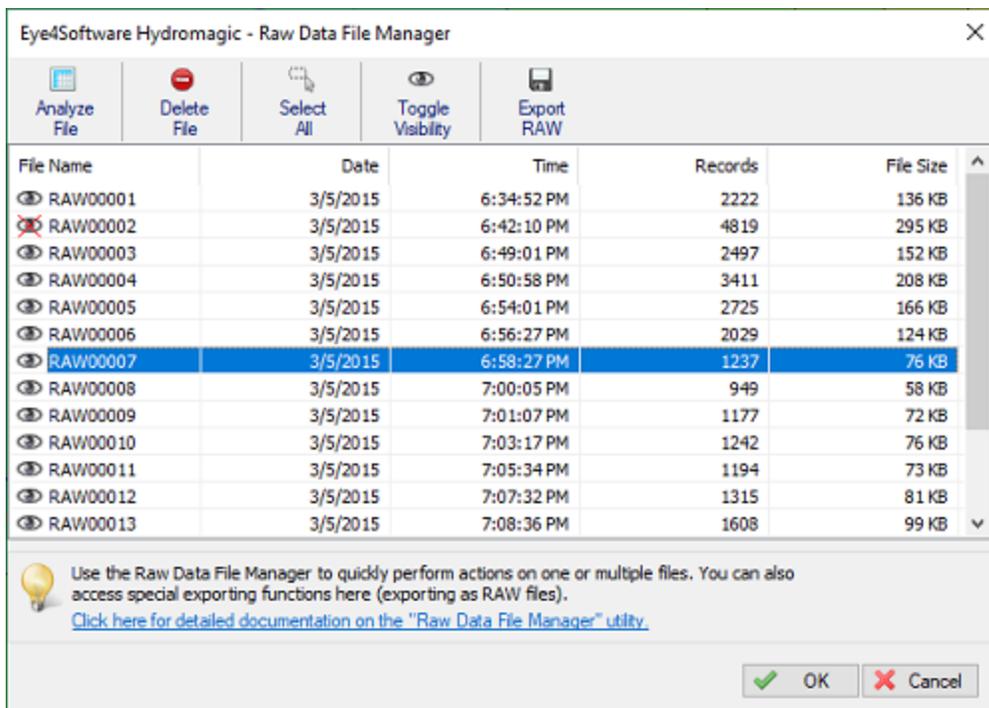
### Converting CAD or GIS features to shorelines or boundaries

As you may have noticed, the dialog contains a button with the caption: "Convert shape to boundary". This function will allow you to import the shape of a boundary directly from a loaded CAD or GIS file. Just select the object you want to use, and select the "Convert shape to boundary" option.

## 3.11 Raw data manager

### Raw data files manager

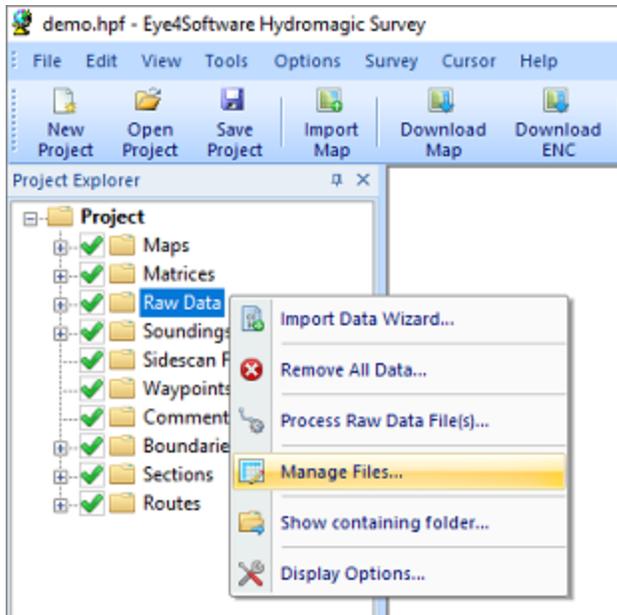
The "Raw data files manager" can be used to apply operations on more than one raw data file at a time. The manager window lists all raw data files recorded or imported in the project, and allows you to select multiple raw data files in order to toggle visibility, remove or export files. The list of raw data files also shows you the creation or recording date, the start time, the records count and file size.



*The raw data files manager shows a list of raw data files in the project.*

## Opening the raw data files manager

The "Raw data files manager" can be opened from the "Project Explorer", which is normally situated on the left side of the main program window. If not visible yet, select "Project Explorer" from the "View" menu, locate the "Raw Data" folder in the "Project Explorer", and right-click this folder with the mouse. From the context menu which appears, select the "Manage Files..." option as shown below:



*Right click the "Raw Data" folder and select "Manage Files..."*

## Tool bar

The tool bar contains buttons for most of the options offered by the raw data files manager. First select the files in the list, by clicking multiple items while holding the CTRL button. Of course it is possible to just select a single item. To select all items on a device with touch screen, simply press the "Select All" button.



*The tool bar contains buttons for the most commonly used operations*

## Analyze File

Use the "Analyze File" button to show the contents of a single raw data file. With this option you can show the depth, position, motion and other records along with their time stamps. This function can only be accessed when only one file has been selected. Please see the Analyzing recorded raw data manual page for a detailed description of this function.

Analyze raw data file

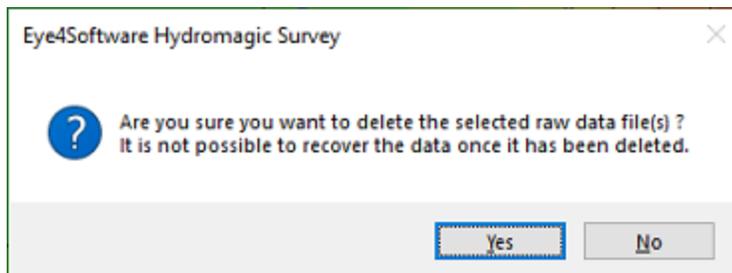
Time	Easting	Northing	Ellipsoid	MSL	UTC
6:58:28.139 PM	721717.890	7702179.501	651.209	657.624	00000.000
6:58:29.139 PM	721718.593	7702179.714	651.240	657.655	00000.000
6:58:30.139 PM	721719.183	7702180.114	651.211	657.626	00000.000
6:58:31.139 PM	721719.770	7702180.597	651.199	657.615	00000.000
6:58:32.139 PM	721720.346	7702181.183	651.221	657.637	00000.000
6:58:33.139 PM	721720.870	7702181.905	651.210	657.626	00000.000
6:58:34.139 PM	721721.381	7702182.714	651.221	657.636	00000.000
6:58:35.139 PM	721721.899	7702183.582	651.213	657.629	00000.000
6:58:36.139 PM	721722.426	7702184.523	651.198	657.614	00000.000
6:58:37.139 PM	721722.985	7702185.509	651.206	657.622	00000.000
6:58:38.139 PM	721723.587	7702186.491	651.212	657.628	00000.000
6:58:39.139 PM	721724.200	7702187.489	651.191	657.607	00000.000
6:58:40.139 PM	721724.827	7702188.509	651.189	657.605	00000.000
6:58:41.138 PM	721725.444	7702189.549	651.213	657.629	00000.000
6:58:42.138 PM	721726.038	7702190.627	651.211	657.627	00000.000
6:58:43.138 PM	721726.629	7702191.773	651.236	657.652	00000.000
6:58:44.138 PM	721727.214	7702192.959	651.230	657.646	00000.000
6:58:45.139 PM	721727.804	7702194.179	651.228	657.644	00000.000
6:58:46.139 PM	721728.408	7702195.393	651.200	657.617	00000.000
6:58:47.139 PM	721729.061	7702196.572	651.204	657.619	00000.000

Reload Prev Data Next Data Thursday, March 5, 2015 RAW00007 POSITION

Use the analyzer to view the contents of a raw data file.

## Delete File

You can delete one or multiple raw data file(s) from your hydrographic survey by clicking the "Delete File" button. Before you can access this button you have to select either one or multiple files in the raw data files list. Before files are permanently deleted, you first have to confirm you want to delete the selected raw data files by clicking the "OK" button in the confirmation dialog which will be shown:



You always have to confirm removal of raw data files.

## Select All

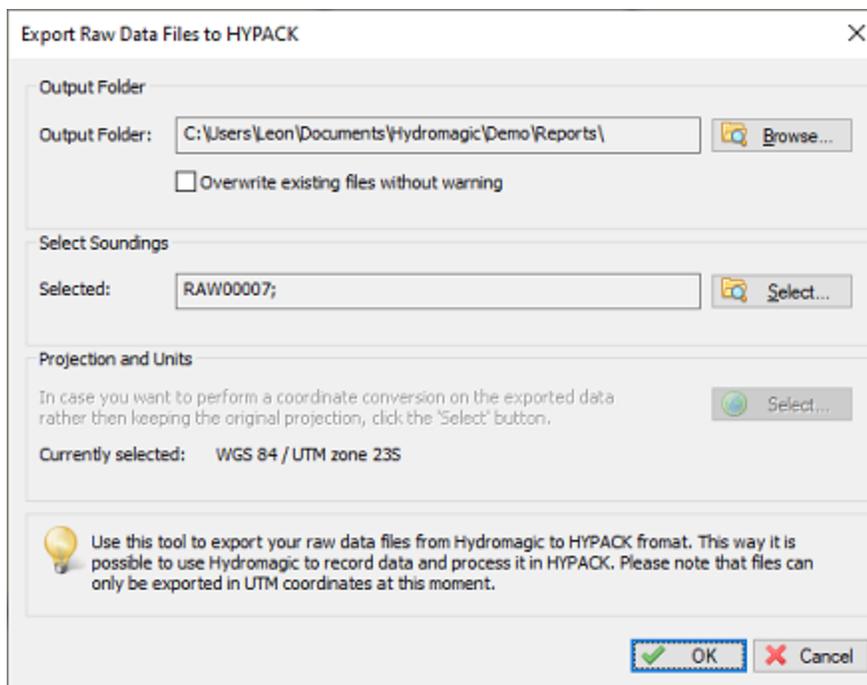
With the "Select All" button the current selection will be reversed, which means that when none of the files has been selected, clicking this button will select all files. This button has been added to the tool bar to allow touch screen users to select or deselect all files by simply clicking a button.

## Toggle Visibility

Use the "Toggle Visibility" button to toggle the visibility (show or hide) of the items selected in the raw data file list. From the "Project Explorer" it is possible to toggle visibility of raw data files, but you have to toggle them one-by-one, since there is no way to select multiple items at once. If you want to, for instance, hide all raw data files, the easiest method to do this, is to open the raw data files manager from the "Project Explorer", then click the "Select All" button followed by clicking the "Toggle Visibility" button.

## Export RAW

The "Export RAW" button allows you to export the selected raw data files to another data format. At this moment it is only possible to export the raw data files to HYPACK raw data format. This might be useful in case you want to process the collected soundings in HYPACK.

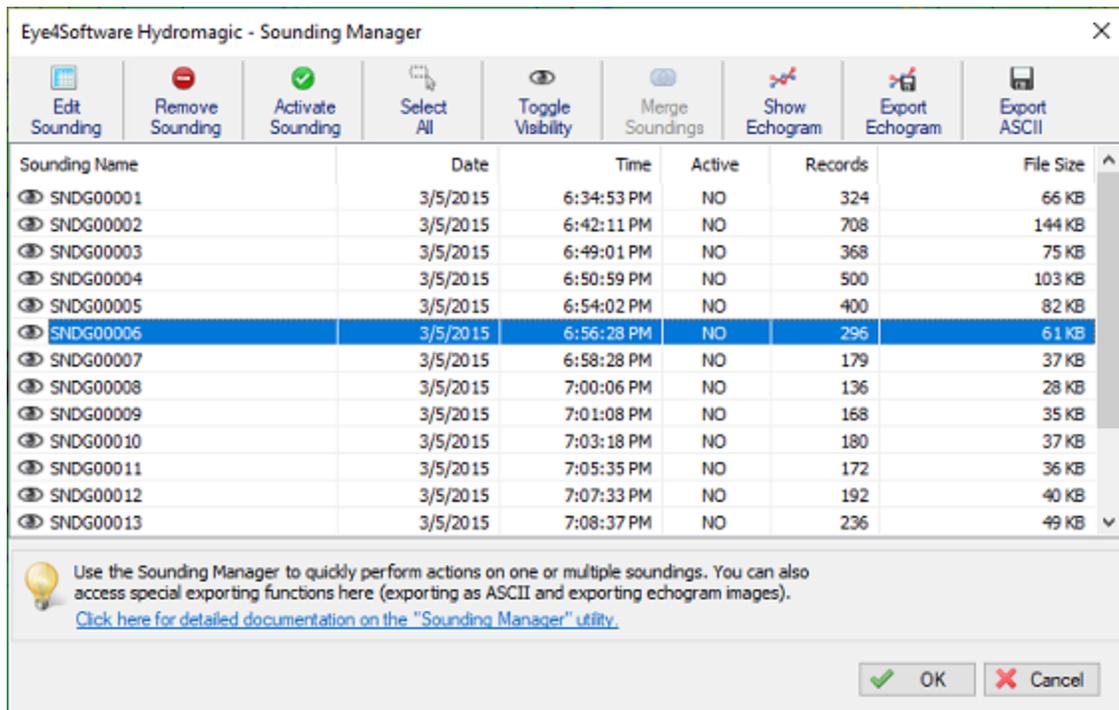


*Raw data files can be exported as HYPACK raw data files.*

## 3.12 Sounding manager

### Sounding Manager

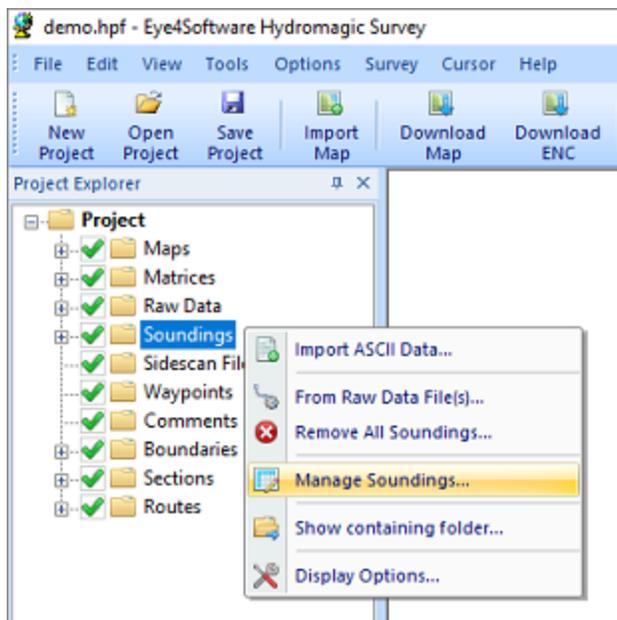
The "Sounding Manager" can be used to apply operations on more than one sounding file at a time. The manager window lists all sounding files [generated](#) or [imported](#) in the project, and allows you to select multiple sounding files in order to toggle visibility, remove or [export](#) files. The list of sounding files also shows you the creation or recording date, the start time, the records count and file size.



The sounding manager shows a list of sounding files in the project.

## Opening the sounding manager

The "Sounding Manager" can be opened from the "[Project Explorer](#)", which is normally situated on the left side of the main program window. If not visible yet, select "Project Explorer" from the "View" menu, locate the "Soundings" folder in the "Project Explorer", and right-click this folder with the mouse. From the context menu which appears, select the "Manage Soundings..." option as shown below:



Right click the "Sounding" folder and select "Manage Soundings..."

## Tool bar

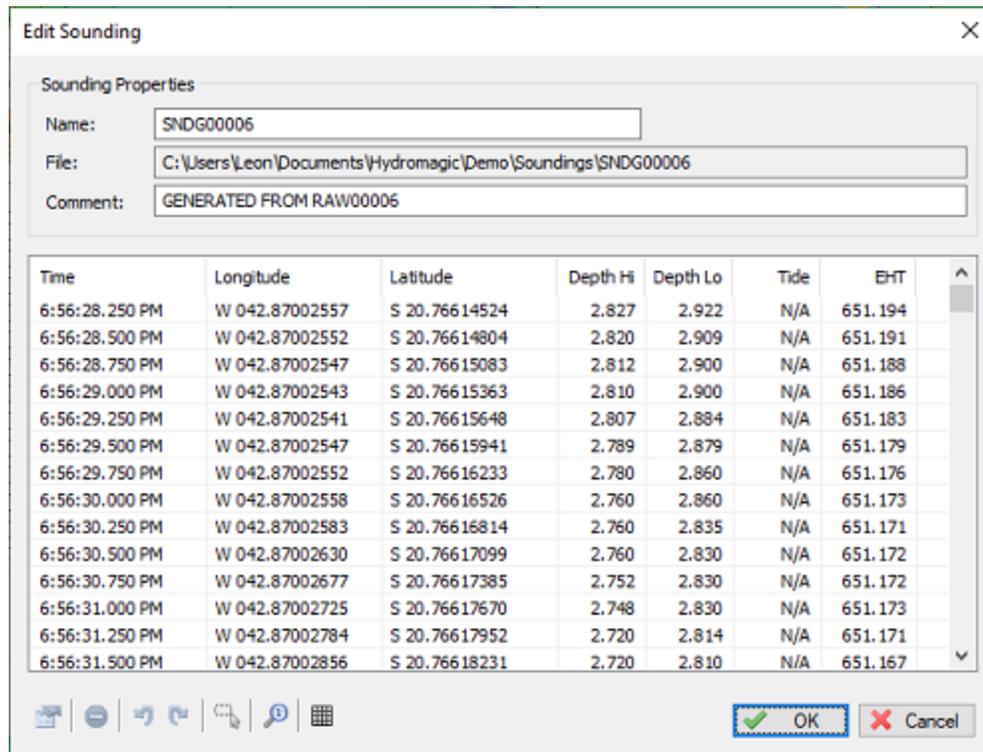
The tool bar contains buttons for most of the options offered by the sounding manager. First select the files in the list, by clicking multiple items while holding the CTRL button. Of course it is possible to just select a single item. To select all items on a device with touch screen, simply press the "Select All" button.



The tool bar contains buttons for commonly used operations on sounding files.

## Edit Sounding

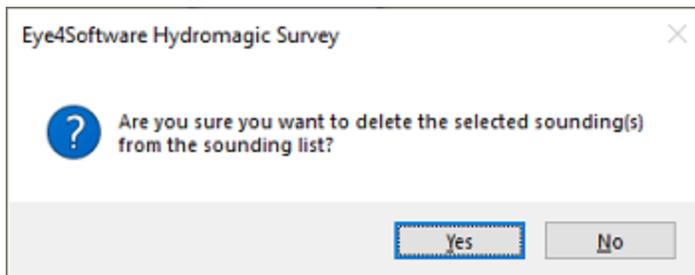
The "Edit Sounding" button launches the sounding editor and loads the currently selected sounding file. This function can only be accessed when a single selection has been made. The "Sounding Editor" allows you to view sounding records (pings) in detail and it can be used to alter depth values or to remove pings.



The sounding editor can be used to alter depth values or to remove pings.

## Remove Sounding(s)

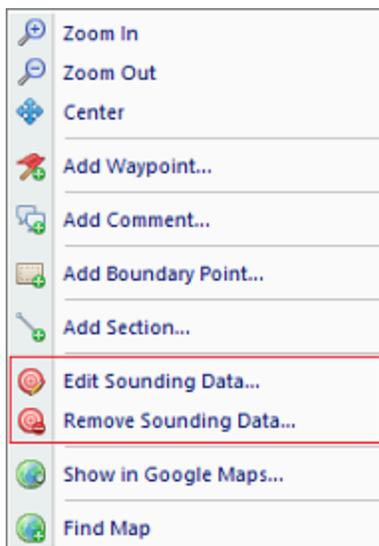
You can delete one or multiple sounding file(s) from your hydrographic survey by clicking the "Remove Sounding" button. Before you can access this button you have to select either one or multiple soundings in the sounding files list. Before soundings are permanently deleted, you first have to confirm you want to delete the selected sounding files by clicking the "OK" button in the confirmation dialog which will be shown:



*You always have to confirm removal of sounding files.*

## Activate Sounding

When a sounding has been marked as "Active", this means that you can modify this sounding from the map display. You can right click pings in the active sounding and select the "Edit Sounding" data option to modify the raw high and low frequency depths, you can drag pings to another position, or you can remove ping records from the sounding. You can only edit the sounding which has been set as active this way, all other soundings will remain "Read-Only". To change the sounding which is currently selected, select the sounding and click the "Activate Sounding" button.



*Extra options for the activated sounding in the map display window.*

## Select All

With the "Select All" button the current selection will be reversed, which means that when none of the soundings has been selected, clicking this button will select all soundings. This button has been added to the tool bar to allow touch screen users to select or deselect all soundings by simply clicking a button.

## Toggle Visibility

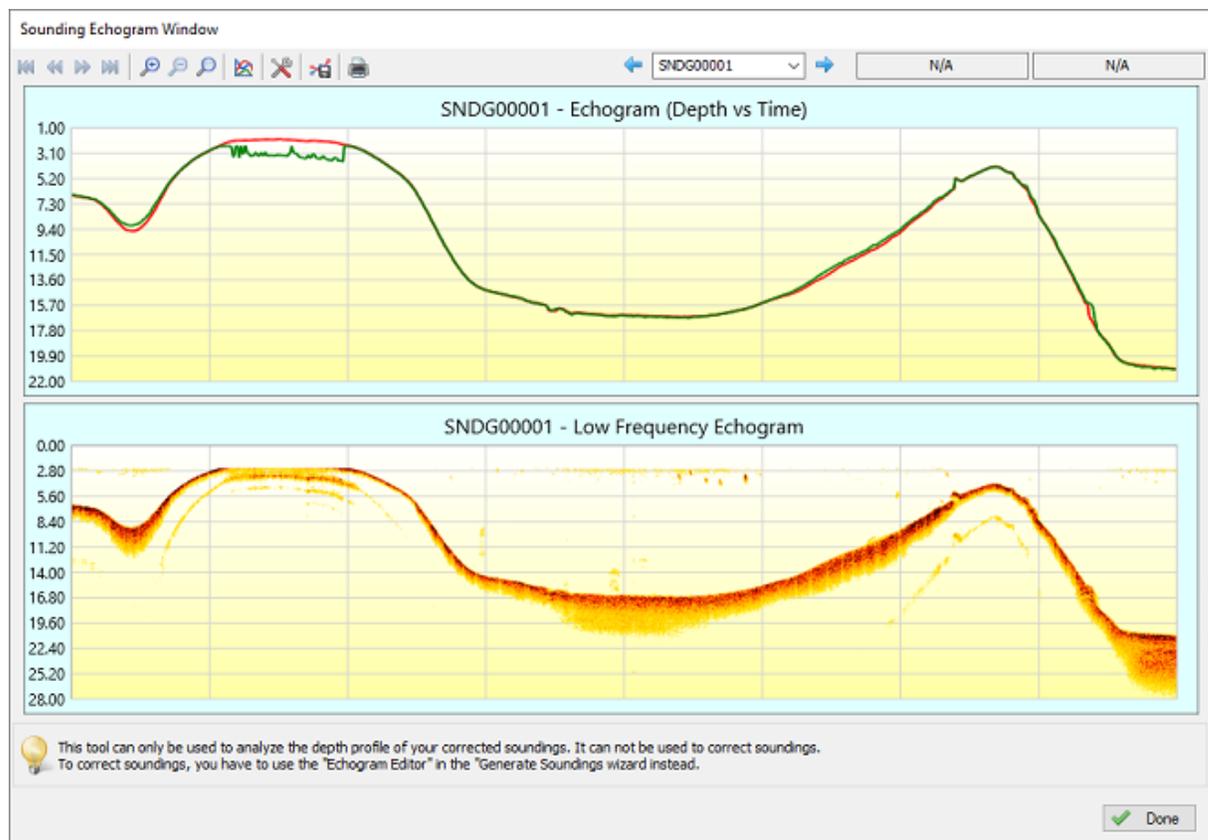
Use the "Toggle Visibility" button to toggle the visibility (show or hide) of the items selected in the sounding file list. From the "Project Explorer" it is possible to toggle visibility of sounding files, but you have to toggle them one-by-one, since there is no way to select multiple items at once. If you want to, for instance, hide all soundings, the easiest method to do this, is to open the sounding manager from the "Project Explorer", then click the "Select All" button followed by clicking the "Toggle Visibility" button.

## Merge Soundings

When you want to merge (or join) multiple soundings into a single sounding file, select the soundings to include in the new sounding file and click the "Merge Soundings" button. The newly created sounding will be displayed in the sounding list. The first available name will be assigned to this sounding, but you will be able to change the name in the "Sounding Editor".

## Show Echogram

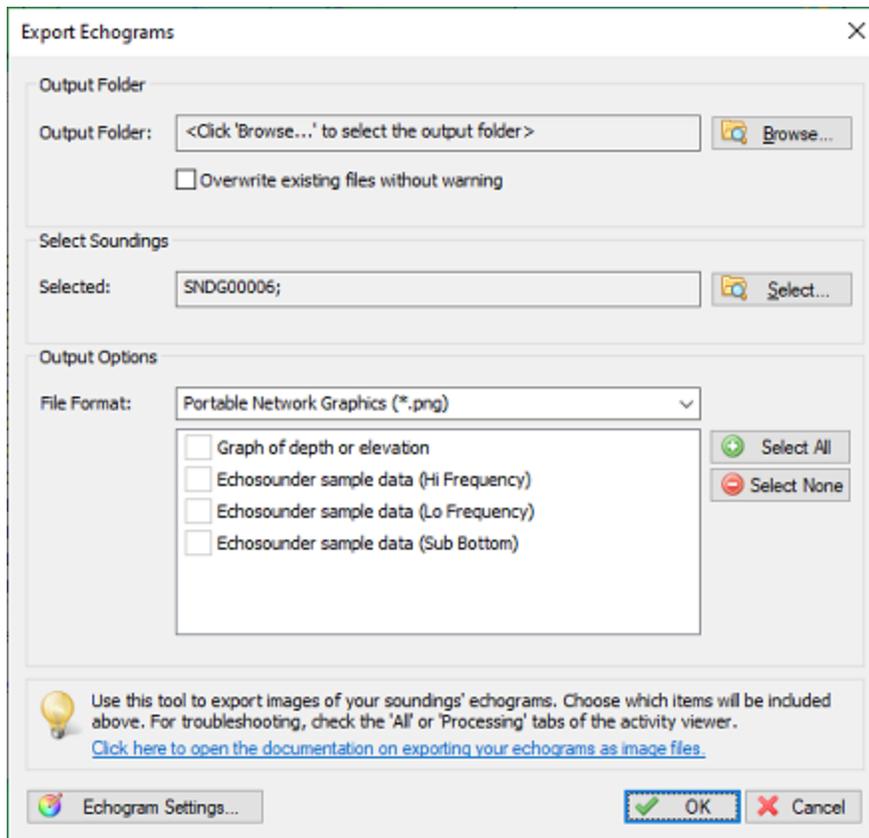
Click the "Show Echogram" button to show all echograms for the currently selected sounding. Depending on the echo sounder used, the digitized depths and the echo envelope will be displayed for the sounding. For more information on how to customize the echo envelope display, please have a look at the "[Echogram settings](#)" manual page.



*Use the "Show Echogram" button to show both the digitized and echo envelope data.*

## Export Echogram

The "Export Echogram" button opens the "Export Echograms" utility, which allows you to export the echogram containing the digitized depth data as an image file. In addition to the digitized data, depending on the echo sounder used, it can also be used to export an image of the full echo envelope for high or low frequency soundings or sub-bottom return signals.



**Export your digitized echogram and echo envelope data as image file(s).**

## Export ASCII

Using the "[Export Soundings](#)" tool, it is possible to store your [filtered sounding data](#) in plain ASCII format, so that sounding data can be imported in Microsoft Excel or other third party (GIS) software. You can export multiple sounding files at once, just select the soundings to export and click the "Export ASCII" button.

You can export the contents of your Hydromagic sounding files as plain ASCII.

## 3.13 Import raw data

### 3.13.1 Import NMEA0183 ASCII log files

NMEA0183 log files are files where NMEA0183 data is recorded from devices like GPS and echosounder.

Instead of sending the data directly to Hydromagic in real time, the data was recorded on for instance a SD-Card.

This method is often used on USV's (unmanned survey vessels) when it is not possible to establish a direct link to the shore.

In these cases the data is stored on an onboard SD-Card or any other removable storage device.

```
$GPGGA,222525.20,6804.42753000,N,16251.36499361,W,2,08,1.1,305.895,M,2.577,M,1.2,0029*6C
$GPVTG,240.20,T,,M,0.24,N,0.44,K,D*3A
$SDDBT,0.91,f,0.28,M,0.15,F*30
$SDDBT,0.91,f,0.28,M,0.15,F*30
$GPGGA,222525.40,6804.42750707,N,16251.36503441,W,2,08,1.1,306.227,M,2.577,M,1.4,0029*69
$GPVTG,236.70,T,,M,0.23,N,0.43,K,D*3E
$SDDBT,0.91,f,0.28,M,0.15,F*30
$HCHDG,312.5,,,*47
```

```

$SDDBT,0.91,f,0.28,M,0.15,F*30
$GPGGA,222525.60,6804.42748134,N,16251.36507432,W,2,08,1.1,306.555,M,2.577,M,1.6,0029*64
$GPVTG,227.46,T,,M,0.24,N,0.44,K,D*3B
$SDDBT,0.91,f,0.28,M,0.15,F*30
$SDDBT,0.91,f,0.28,M,0.15,F*30
$GPGGA,222525.80,6804.42746479,N,16251.36504080,W,2,08,1.1,306.793,M,2.577,M,1.8,0029*60
$GPVTG,222.82,T,,M,0.23,N,0.43,K,D*36
$SDDBT,0.91,f,0.28,M,0.15,F*30
$SDDBT,0.91,f,0.28,M,0.15,F*30
$HCHDG,312.5,,,,*47
$GPGGA,222526.00,6804.42745489,N,16251.36500786,W,2,09,1.1,306.908,M,2.577,M,2.0,0029*64

```

*Content of a NMEA0183 log file (5 Hz position interval / 10 Hz depth interval)*

### Timing errors with NMEA0183 logs

However, there is a big drawback when it comes to using NMEA0183 log files: Because depth records aren't timestamped in NMEA0183, it is impossible to get the actual time difference between the position and depth data which may cause the depth positions to be shifted. When the position update interval is low errors can be up to several meters which makes the data unusable.

When the data is processed by Hydromagic, you won't have this problem because the incoming data is timestamped as soon as the data comes in.

You can easily calculate the maximum error of the depth positions in NMEA0183 imports by dividing the speed in meter per seconds by the position data interval. When your USV is going 5 kilometer per hour, this means the maximum error with a position update of 1 Hz can be:

5 Kmh = 3.1 Mph = 1.39 meter per second divided by 1 update per second (1Hz) = 1.39 meter max position error

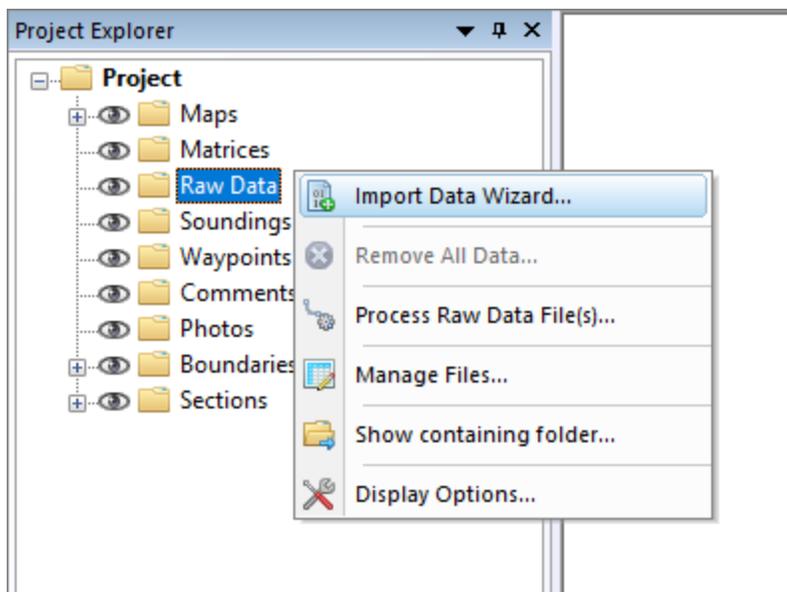
To fix this issue, set the NMEA0183 sentences containing a time stamp to a higher output rate. Hydromagic can parse time synchronization data from either GGA or ZDA sentences. When one of these sentences is set to an output rate of for instance 10Hz, the error is becoming acceptable:

5 Kmh = 3.1 Mph = 1.39 meter per second divided by 10 updates per second (10Hz) = 0.139 meter max position error

### Starting the raw data import wizard

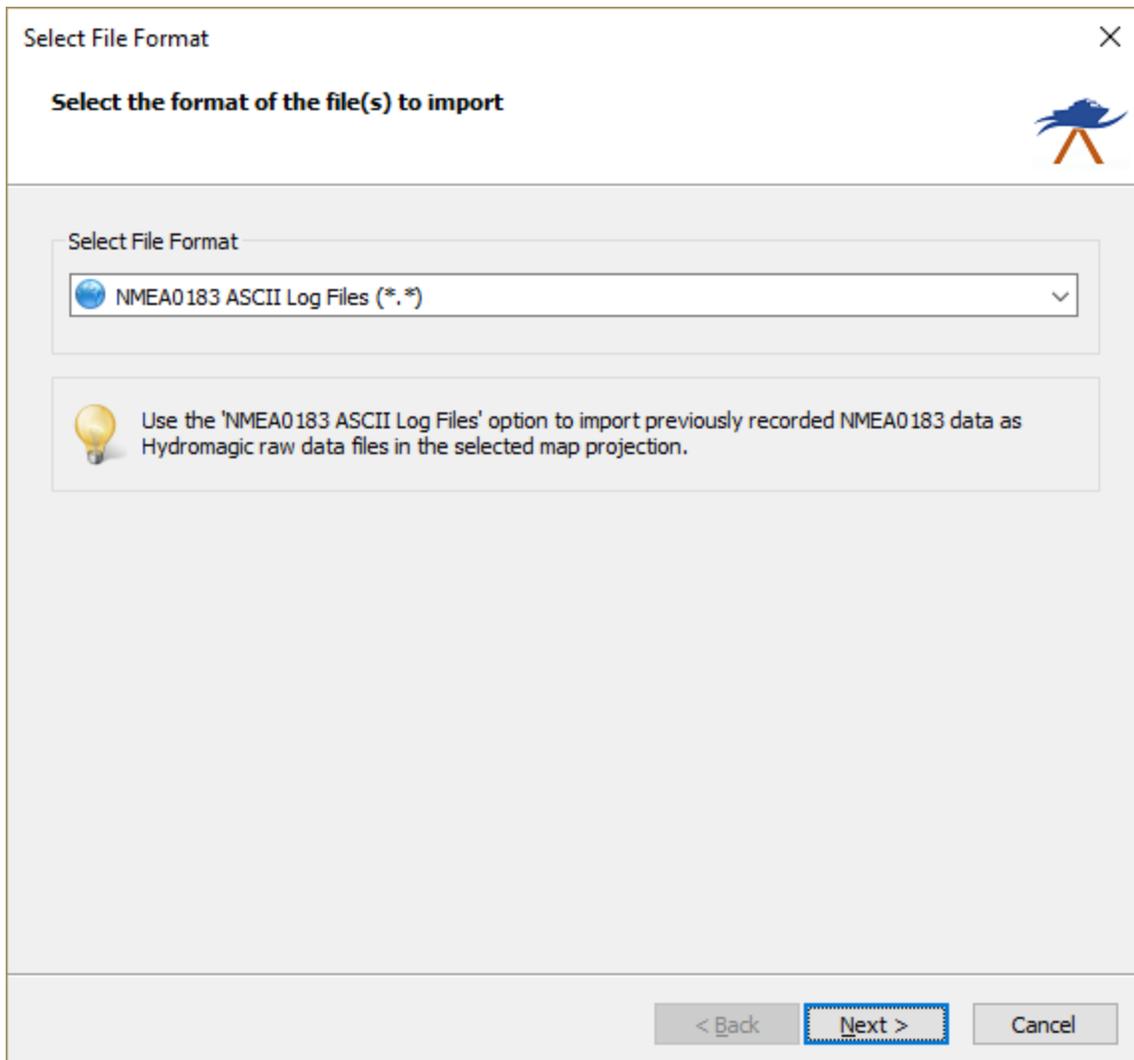
All file formats which Hydromagic is able to convert to raw data files, can be imported through the raw data import wizard.

To start the wizard, right-click the 'Raw Data' folder in the 'Project Explorer' and select the 'Import Data Wizard...' option.



### Select file format

The first page of the wizard allows you to set the format of the file(s) we wish to import. Since this tutorial is about importing NMEA0183 data, we select the 'NMEA0183 ASCII Log Files (\*.\*)' option from the drop-down list.

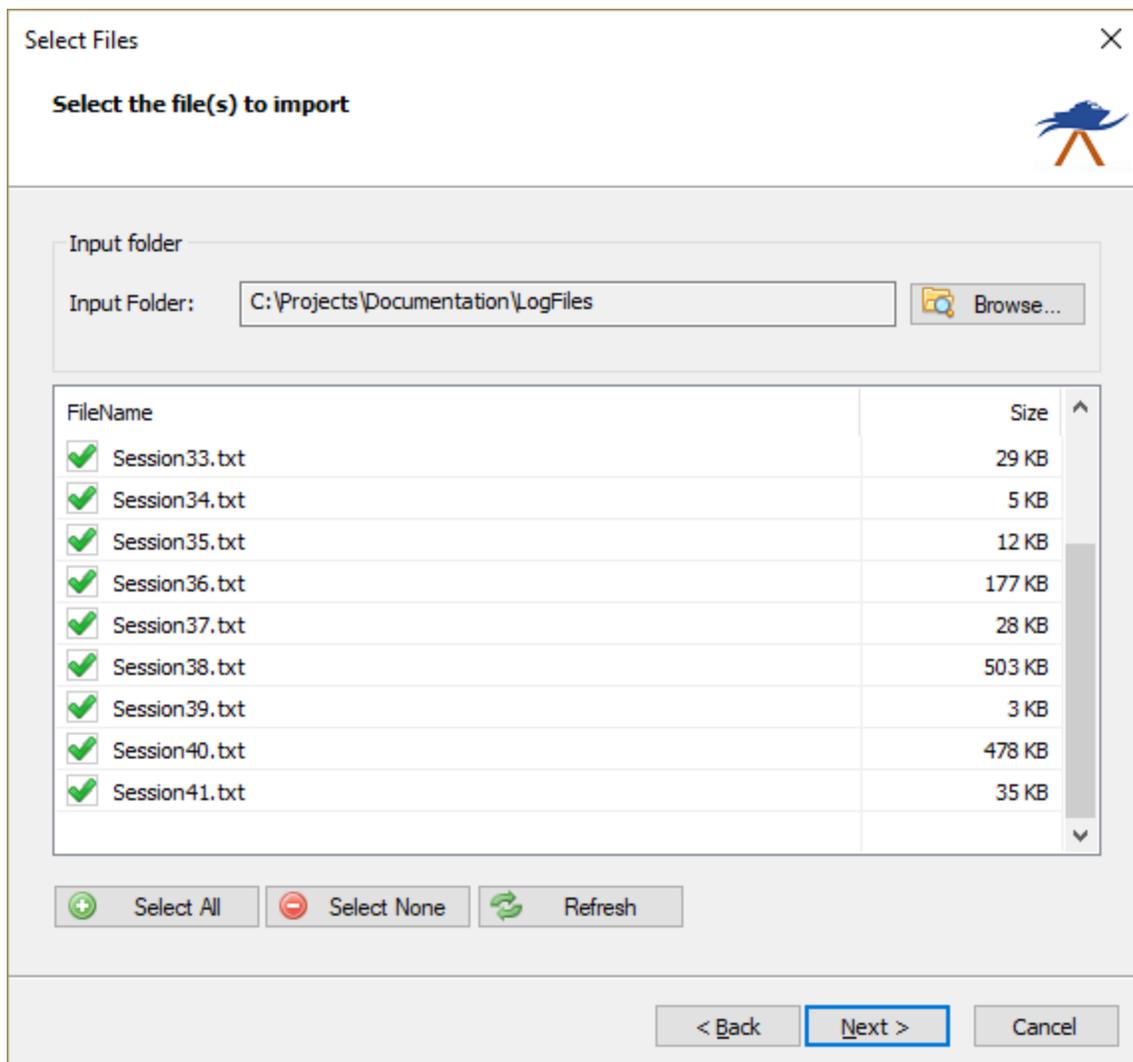


### Select file(s) to import

In the second page of the wizard you can select which files to import.

Click the 'Browse...' button to select the folder on your computer where the files are stored.

After changing the folder the file list is reloaded, and you can use the check boxes to select one or more file(s) to import.



## Import options

With some file formats, including NMEA0183, some additional options have to be set in order to import and interpret the data in the file correctly.

This is shown in the optional third step of the import wizard. When no options have to be set, this third page is skipped.

## Projection and units

You can see the projection setting has been disabled, because position data in NMEA0183 is always in WGS84 geographic coordinates.

Also there is no need to set the units used in the file, because the units are mentioned in the NMEA0183 sentences and conversions are performed automatically.

## NMEA0183 sentence

Use this settings to select the NMEA0183 sentence used to extract depth from the log file. Possible settings are: \$SDDPT, \$SDDBK, \$SDDBS, \$SDDBT and \$SDXDR.

Sentence	Description
\$SDDBK	Depth below keel
\$SDDBS	Depth below surface
\$SDDBT	Depth below transducer
\$SDDPT	Depth and keel offset
\$SDXDR	Extended Transducer Information (may contain dual frequency depth)

### Sounder offset

Use this box to set the transducer offset to be used. This is the distance between the bottom of the transducer to the waterline.

This settings is also called the static draft. If unknown, it is possible to leave this value zero and correct it later in the "Sounding Wizard".

### Sounding date

To add correct date and time information to your sounding, you can use the "Date" and "Time zone" settings.

The time of the positions is stored in the NMEA0183 data as GMT time, so the correct time zone is required to convert the times to local time.

This settings are optional, however, if the sounding is going to be used with tide files, you will need the correct timestamps on your data !

**Advanced Settings**

**Advanced Settings**

**Projection and Units**

If the coordinates used in the file(s) are not in WGS84 Latitude-Longitude Projection, select the projection used by clicking on the 'Select' button.

Currently selected: WGS 84

**Depth**

NMEA Sentence: \$SDBT Sounder Offset: 0.35 meter

**Sounding Date**

Date: 12/17/2018

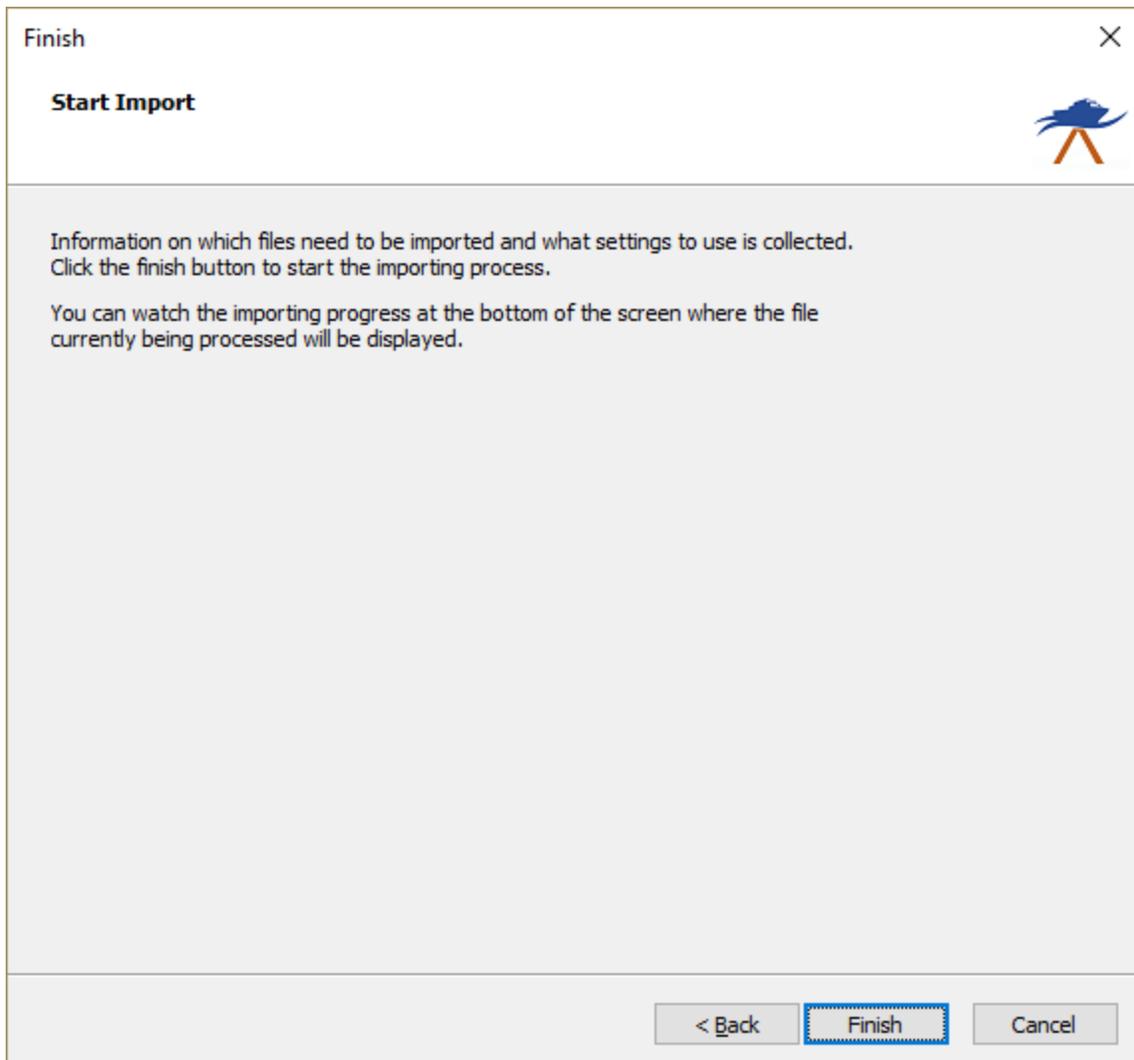
Timezone: (UTC+01:00) Amsterdam, Berlin, Bern, Rome, Stockholm, Vienn

< Back Next > Cancel

## Starting the import

When the format, the files and the additional options has been set, you can start the import process by clicking the 'Finish' button on the last page of the wizard.

The file currently processed is displayed in the statusbar at the bottom of the screen and the wizard shows a message box stating 'File(s) successfully imported as raw data file(s)' as soon as the process has completed. Click 'OK' to close the dialog and the imported files will be centered in the map view (only when they contain position data).



### Checking the imported raw data file(s)

When the import has completed, you can right-click the generated raw data files, and select 'Analyze Data...' to inspect the imported values and timestamps.

### 3.13.2 Import Triton Extended Format (XTF) files

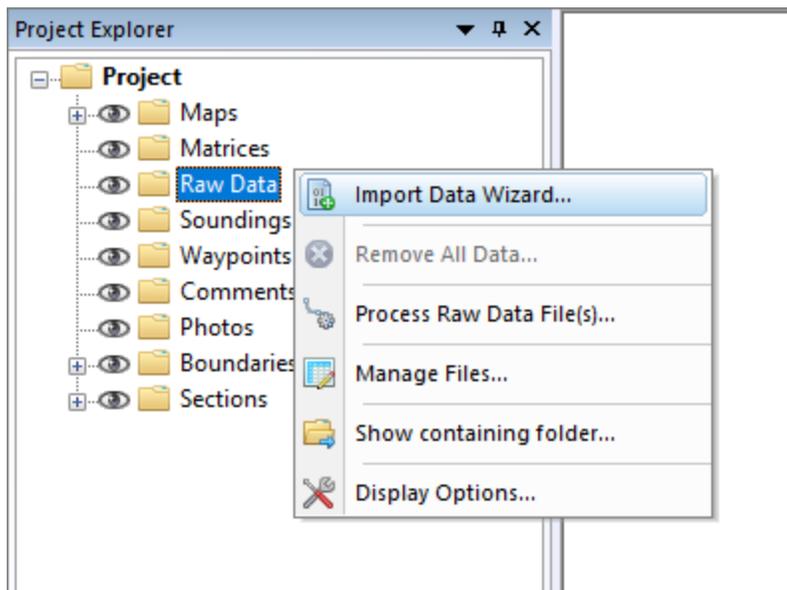
eXtended Triton Format (XTF) is a file format developed by Triton Imaging, Inc for recording hydrographic survey data. XTF is the most commonly used format for this type of information in the hydrographic survey industry. XTF supports sources including side scan sonar, shallow seismic, single beam and multibeam bathymetry, as well as associated position, time and altitude information. An XTF file consists out multiple data structures placed sequentially in the file. This way the file format can easily be extended with new functionality. At this moment Hydromagic can read and convert the following data structures from an XTF file:

- XTFFILEHEADER;
- CHANINFO;
- XTFPINGHEADER;
- XTFBATHYHEADER;
- XTFATTITUDEDATA;
- XTFNOTESHEADER;
- XTFPINGCHANHEADER.

You can now use the raw data import wizard to use the data in Hydromagic Survey, or use the data in [Hydromagic Dredging](#) (after processing the raw data and generating a matrix file from the soundings). To import side scan sonar data from a XTF file, use the [side scan sonar import wizard](#) instead.

### Starting the raw data import wizard

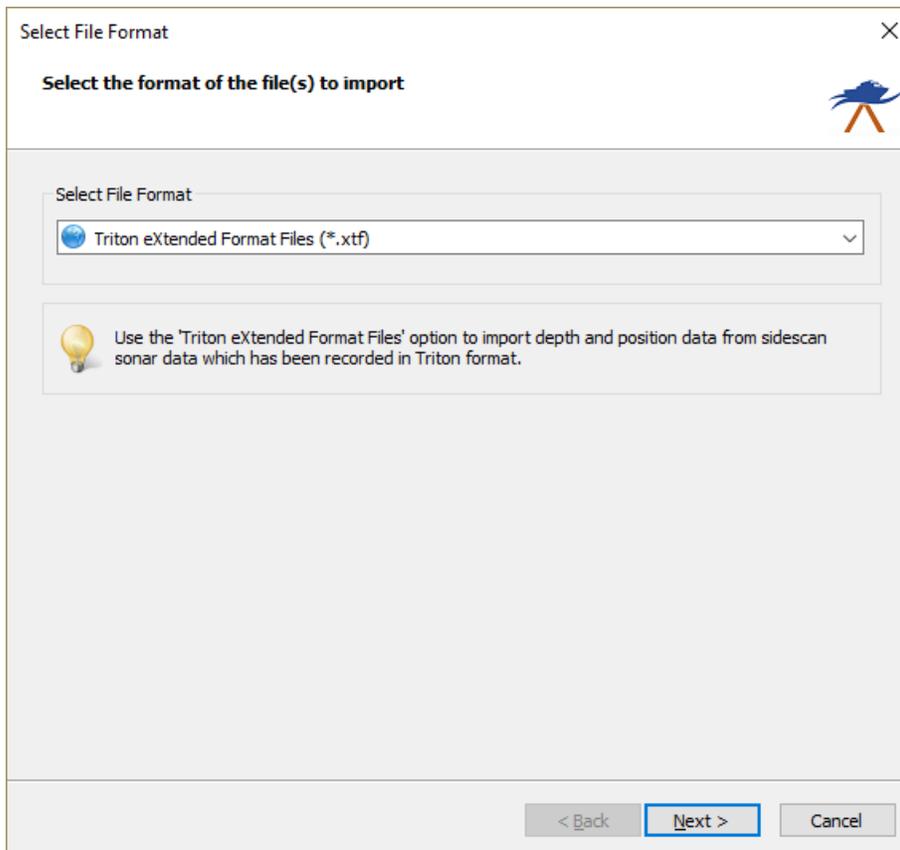
All file formats which Hydromagic is able to convert to proprietary raw data files, can be imported through the "Import Data Wizard". To start the wizard, right-click the "Raw Data" folder in the "[Project Explorer](#)" and select the 'Import Data Wizard...'  
option:



*The "Import Data Wizard" can be launched from the "Project Explorer".*

### Select file format

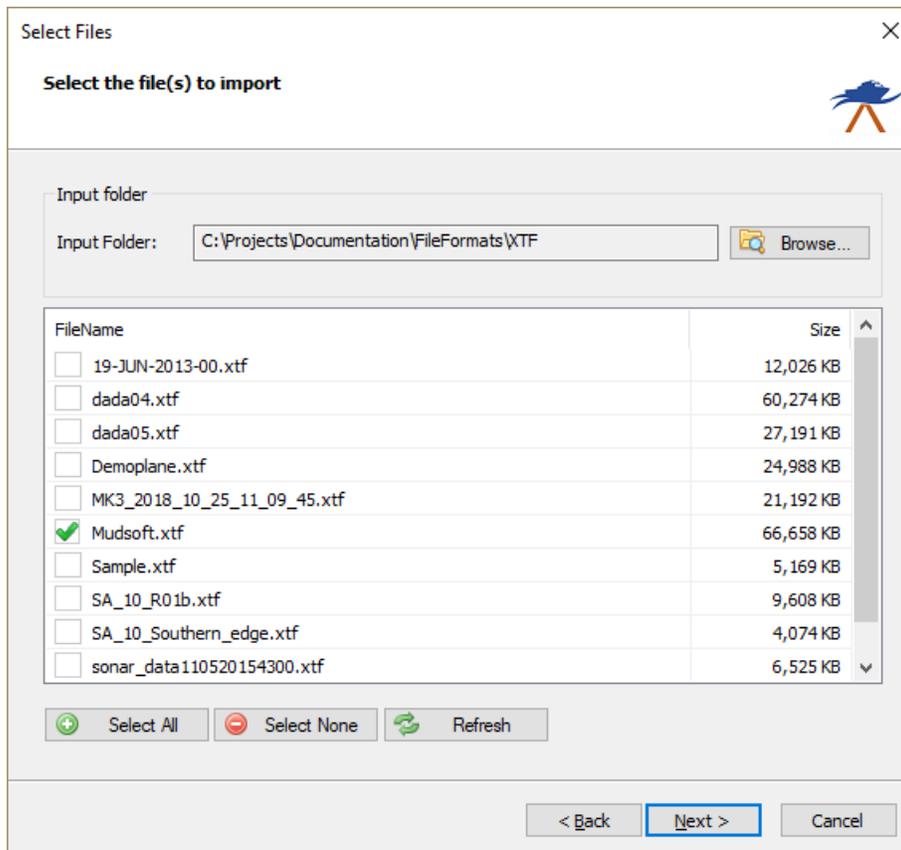
The first page of the wizard allows you to set the format of the file(s) we wish to import. Since this tutorial is about importing XTF data, we select the 'Triton eXtended Format Files (\*.xtf)' option from the drop-down list.



Select the "Triton eXtended Format Files" format from the dropdown list.

### Select file(s) to import

In the second page of the wizard you can select which files to import. Click the 'Browse...' button to select the folder on your computer where the files are stored. After changing the folder the file list is reloaded, and you can use the check boxes to select one or more file(s) to import at a time. After changing the folder the file list is reloaded, and you can use the check boxes to select one or more file(s) to import.



Select the file(s) to import. You can import multiple files at a time.

## Import options

When the vessel's X and Y positions in the XTF file are projected coordinates rather than WGS84 geographic coordinates, this page allows you to set the coordinate reference system used in the XTF file.

Advanced Settings

**Advanced Settings**

Projection and Units

If the coordinates used in the file(s) are not in WGS84 Latitude-Longitude Projection, select the projection used by clicking on the 'Select' button.

Currently selected: WGS 84

Depth

NMEA Sentence: \$SDBBT Sounder Offset: 0.00 meter

Sounding Date

Date: 12/17/2018

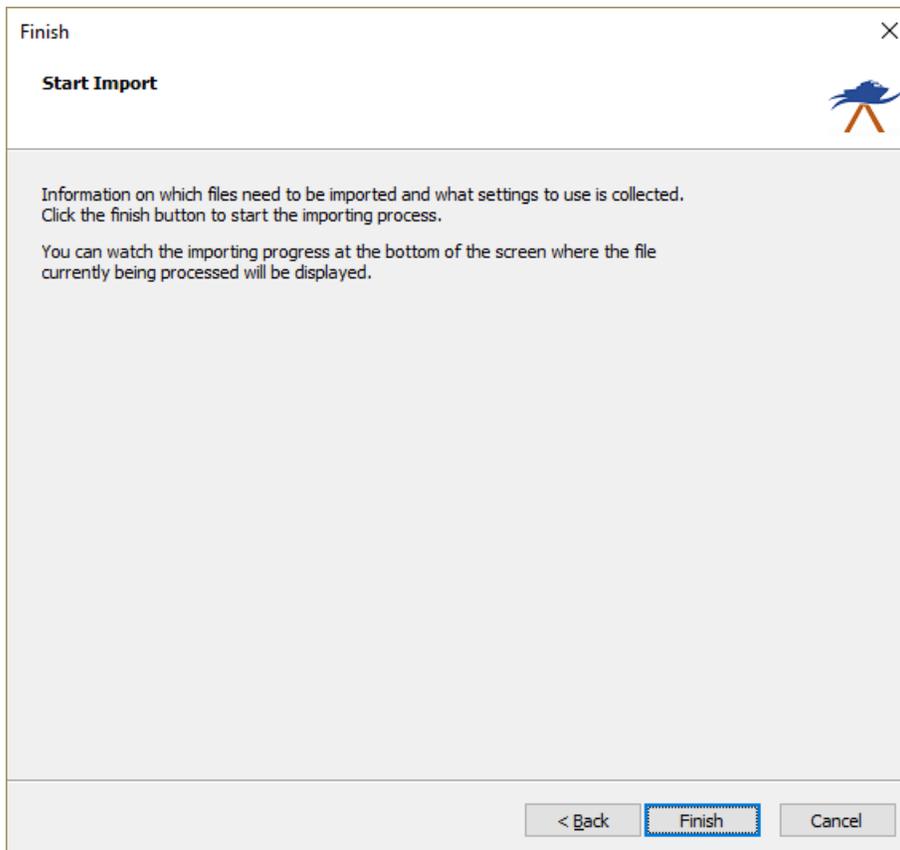
Timezone: (UTC +01:00) Belgrade, Bratislava, Budapest, Ljubljana, Prague

< Back Next > Cancel

**Click the "Select..." button to select a projection when the file is other than WGS84.**

## Starting the import

When the format has been selected and the file(s) have been selected, you can start the import process by clicking the 'Finish' button on the last page of the wizard. The file currently processed is displayed in the status bar at the bottom of the screen and the wizard shows a message box stating 'File(s) successfully imported as raw data file(s)' as soon as the process has completed. Click 'OK' to close the dialog and the imported files will be centered in the map view (only when they contain position data). After importing raw data files, you can [download a background map](#) of the covered survey area using the built-in map downloading tool.



*After clicking the "Finish" button, the import process will start.*

### Checking the imported raw data file(s)

When the import has completed, you can right-click the generated raw data files, and select "[Analyze Data...](#)" to inspect the imported values and timestamps. When the import did not complete successfully, you can refer to the "Processing" tab of the [activity view](#) for more details on the error shown.

### 3.13.3 Import SEG-Y files

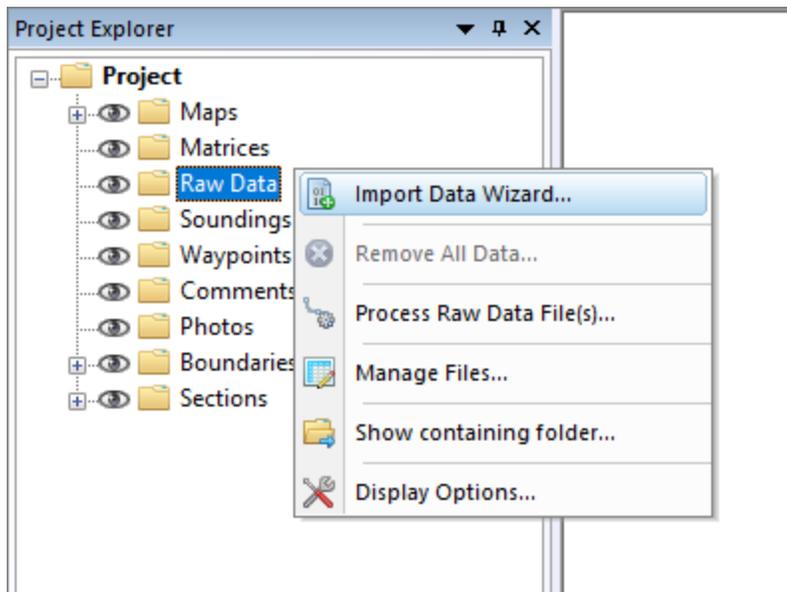
The SEG-Y (sometimes SEG Y) file format is one of several standards developed by the Society of Exploration Geophysicists (SEG) for storing geophysical data. It is an open standard, and is controlled by the SEG Technical Standards Committee, a non-profit organization.

SEG-Y files are also suitable for storing bathymetric data, and some echosounder brands, including Innomar, Knudsen and SyQwest, are using this file format to export position, depth and echogram data.

### Starting the raw data import wizard

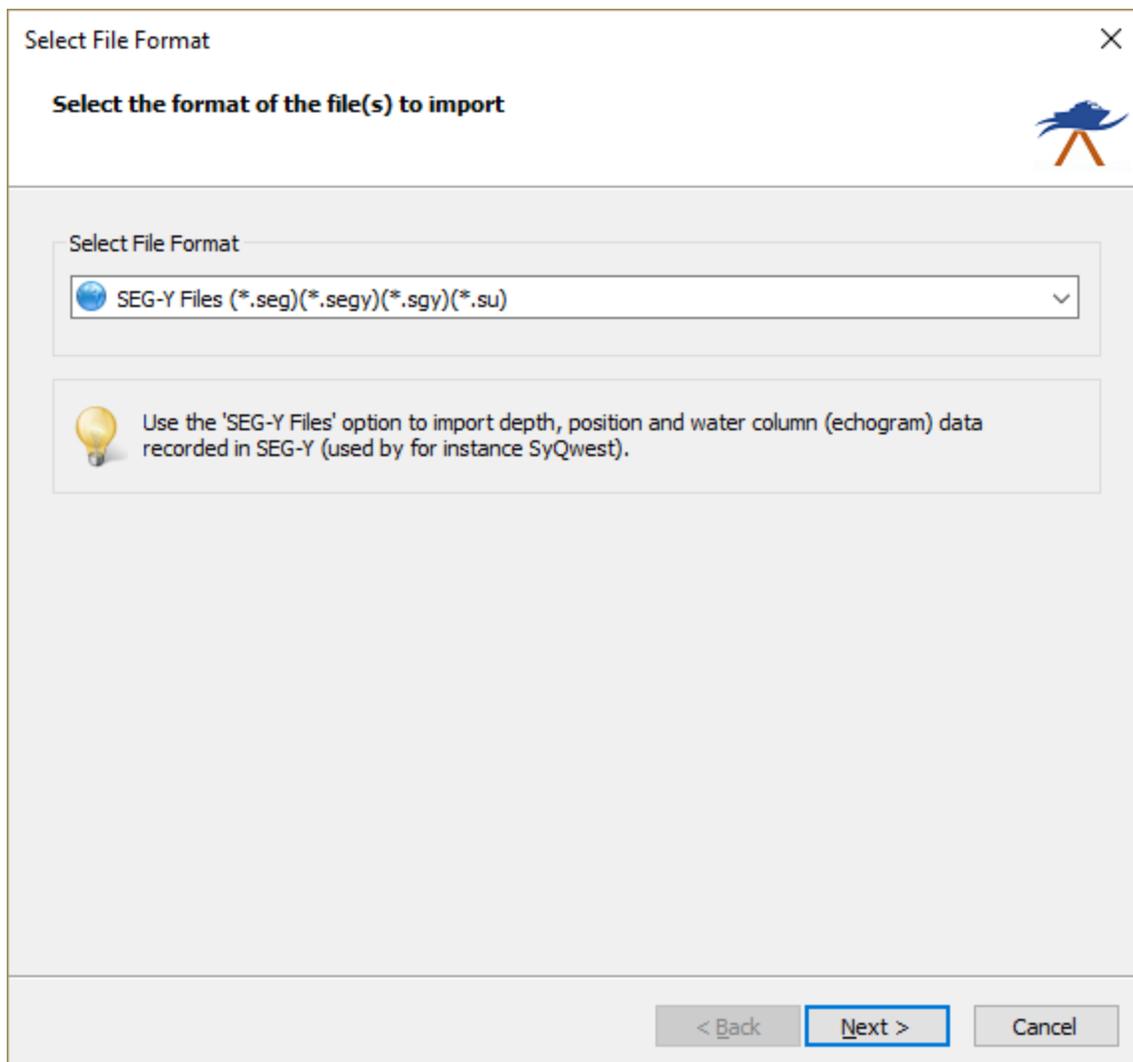
All file formats which Hydromagic is able to convert to raw data files, can be imported through the raw data import wizard.

To start the wizard, right-click the 'Raw Data' folder in the 'Project Explorer' and select the 'Import Data Wizard...' option.



### Select file format

The first page of the wizard allows you to set the format of the file(s) we wish to import. Since this tutorial is about importing SEG-Y data, we select the 'SEG-Y Files (\*.seg)(\*.segy)(\*.sgy)(\*.su)' option from the drop-down list.

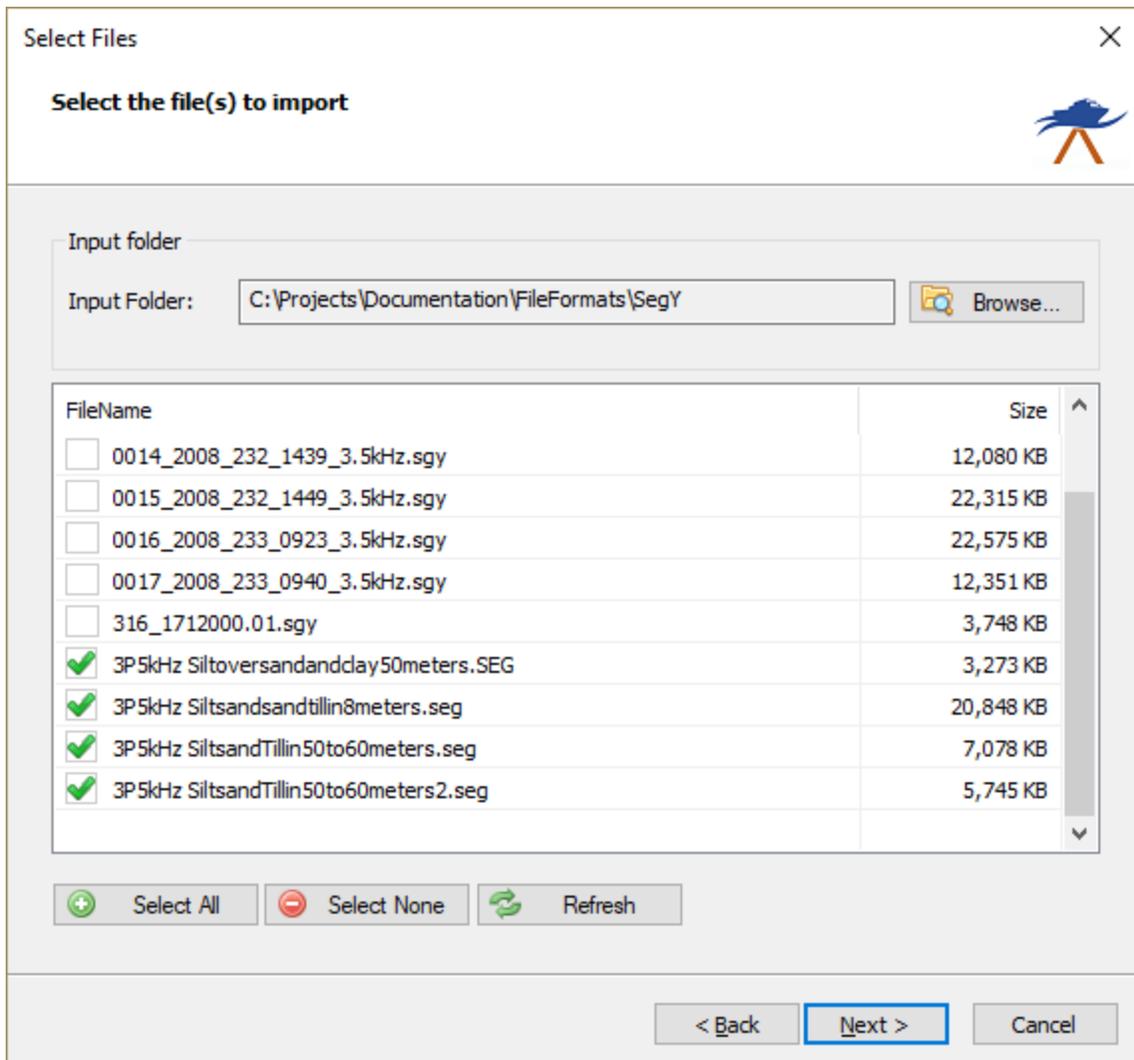


### Select file(s) to import

In the second page of the wizard you can select which files to import.

Click the 'Browse...' button to select the folder on your computer where the files are stored.

After changing the folder the file list is reloaded, and you can use the check boxes to select one or more file(s) to import.



### Import options

When the coordinate reference system used in the SEG-Y file is not equal to WGS84 geographic coordinates, you can change the projection to convert from by clicking the 'Select...' button.

**Advanced Settings**

**Advanced Settings**

**Projection and Units**

If the coordinates used in the file(s) are not in WGS84 Latitude-Longitude Projection, select the projection used by clicking on the 'Select' button.

Currently selected: WGS 84

**Depth**

NMEA Sentence: \$SDBT Sounder Offset: 0.00 meter

**Sounding Date**

Date: 12/17/2018

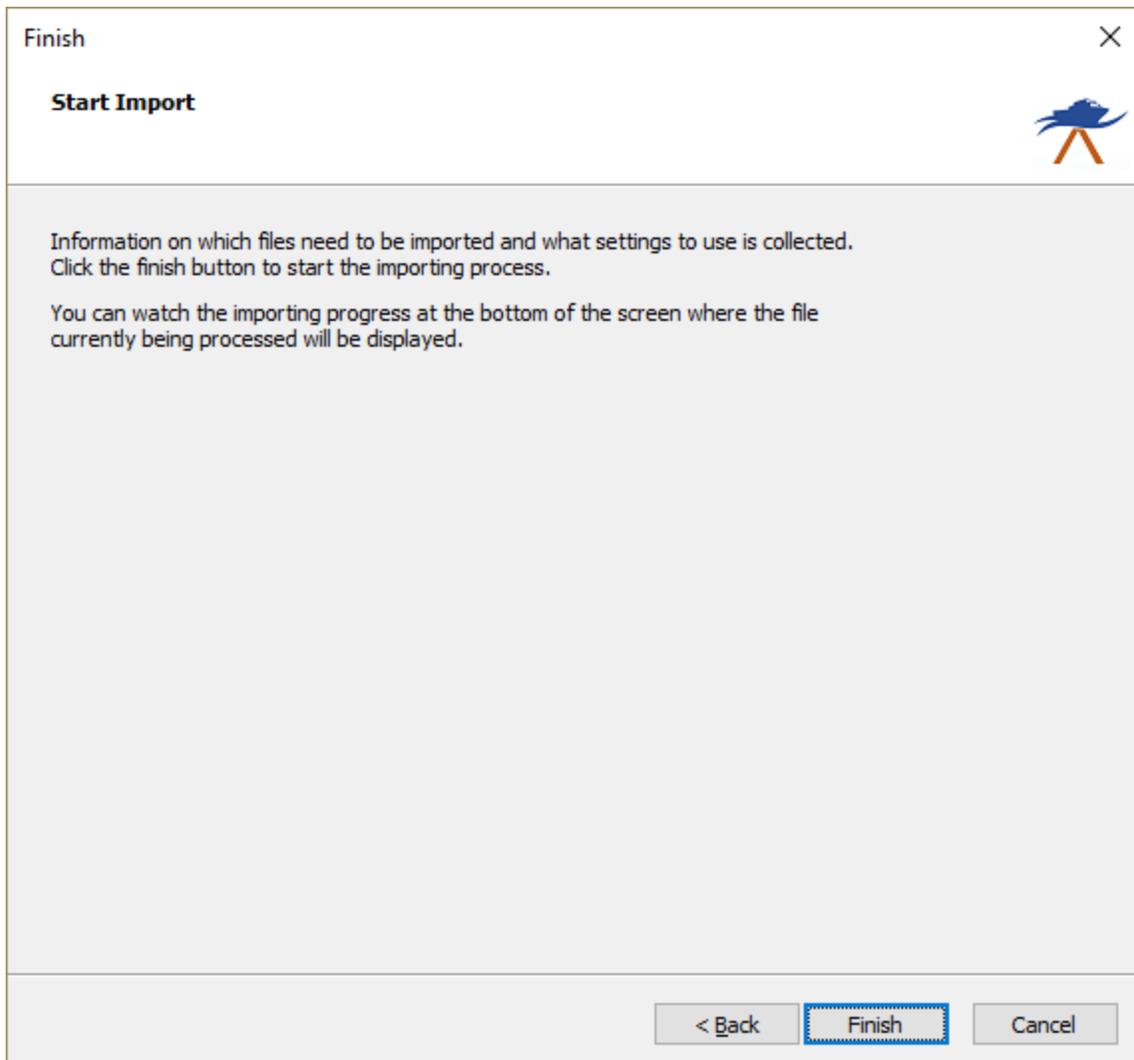
Timezone: (UTC+01:00) Belgrade, Bratislava, Budapest, Ljubljana, Prague

< Back Next > Cancel

## Starting the import

When the format, the files and the additional options has been set, you can start the import process by clicking the 'Finish' button on the last page of the wizard.

The file currently processed is displayed in the statusbar at the bottom of the screen and the wizard shows a message box stating 'File(s) successfully imported as raw data file(s)' as soon as the process has completed. Click 'OK' to close the dialog and the imported files will be centered in the map view (only when they contain position data).



### Checking the imported raw data file(s)

When the import has completed, you can right-click the generated raw data files, and select 'Analyze Data...' to inspect the imported values and timestamps.

#### 3.13.4 Import CEE HydroSystems project files

CEE HydroSystems projects are loaded by selecting one or more .CSC file(s). When there is binary water column sample data available, these are stored in one or multiple CSA files (usually 1.csa). These CSA files reside in a folder with the same name as the CSC file, which is located in the same folder as the project file. You can find these folders in the 'logged\_data' folder of your system's SD-Card.

All data is stored along with high precision timestamps. The digitized depths, NMEA0183 position strings and (optional) motion sensor data are stored in the CSC file, which is human readable since an ASCII format is used. Some example data can be found below:

```
VER 3.0.10 3.0.3 3.0.3 "CEE-MB rev 3.0"  
TME 19/06/2018 22:56:50 LOCAL_TIME 0min
```

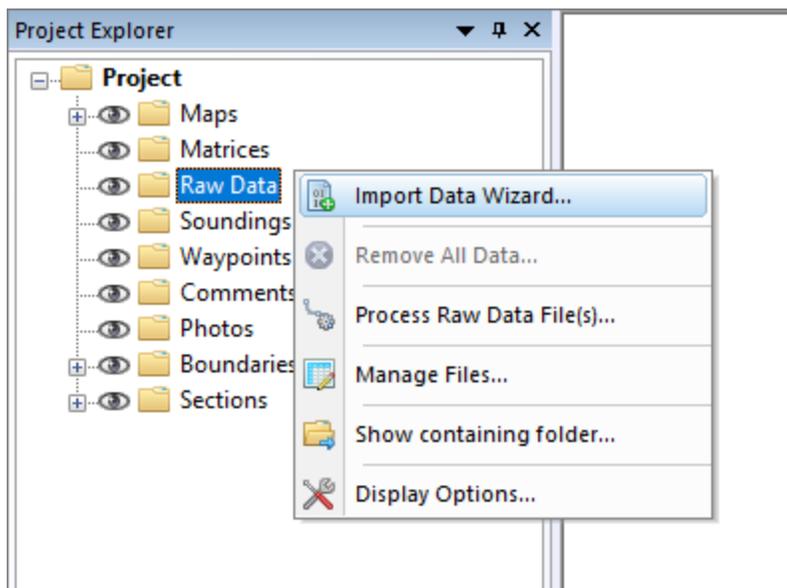
```
DEV 0 NOV628 EXTERNAL CMR+ 0.00 "GNSS Novatel628"  
DEV 1 0.00 0.00 1500.0 m/s MANUAL "Echosounder A (HF)"  
DEV 2 0.00 0.00 1500.0 m/s MANUAL "Echosounder B (LF)"  
DEV 7 "EVENT Button"  
EOH  
HCP 10 82606707 :053D0B 0000U 0074 0110  
ECH 2 82606721 009.92  
ECH 1 82606721 010.03  
MSG 0 82606724  
$GPGGA,225646.80,3341.8629,S,15106.9026,E,4,14,0.9,160.80,M,23.10,M,00,0000*70  
HCP 10 82606754 :053D0B 0000U 0076 0109  
ECH 2 82606780 009.93  
ECH 1 82606780 010.03  
HCP 10 82606801 :053D0B 0000U 0077 0109  
ECH 2 82606838 009.92  
ECH 1 82606838 010.04  
HCP 10 82606841 :033D58 0000U 0078 0108  
HCP 10 82606895 :033D58 0000U 0079 0107  
ECH 2 82606897 009.92  
ECH 1 82606897 010.04  
MSG 0 82606921 $GPZDA,225647.00,19,06,2018,,*63  
MSG 0 82606935  
$GPGGA,225647.00,3341.8629,S,15106.9026,E,4,14,0.9,160.80,M,23.10,M,01,0000*78
```

*Content of a CEE HydroSystems .CSC project file (position, heave and dual frequency depths)*

## Starting the raw data import wizard

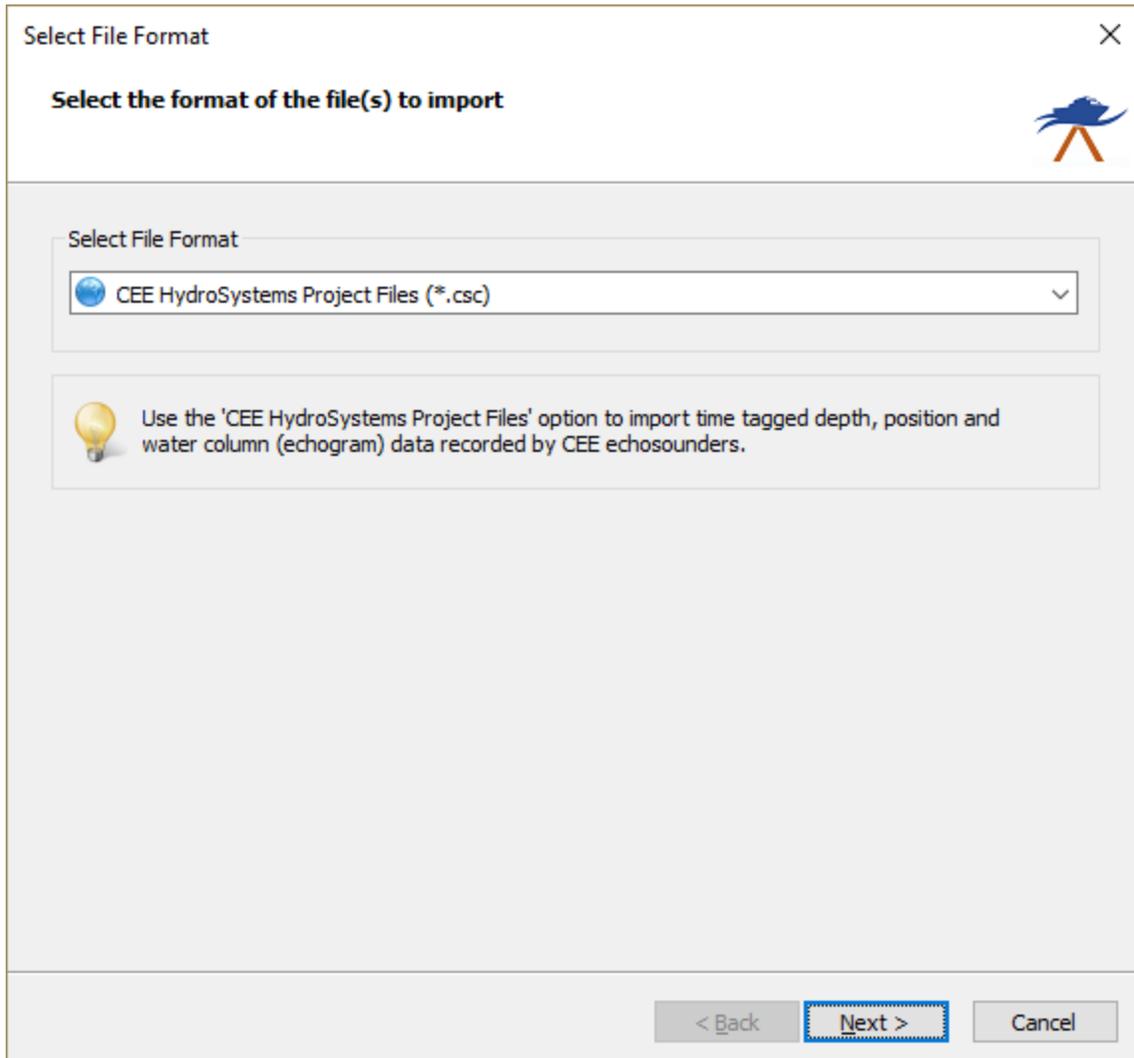
All file formats which Hydromagic is able to convert to raw data files, can be imported through the raw data import wizard.

To start the wizard, right-click the 'Raw Data' folder in the 'Project Explorer' and select the 'Import Data Wizard...' option.



## Select file format

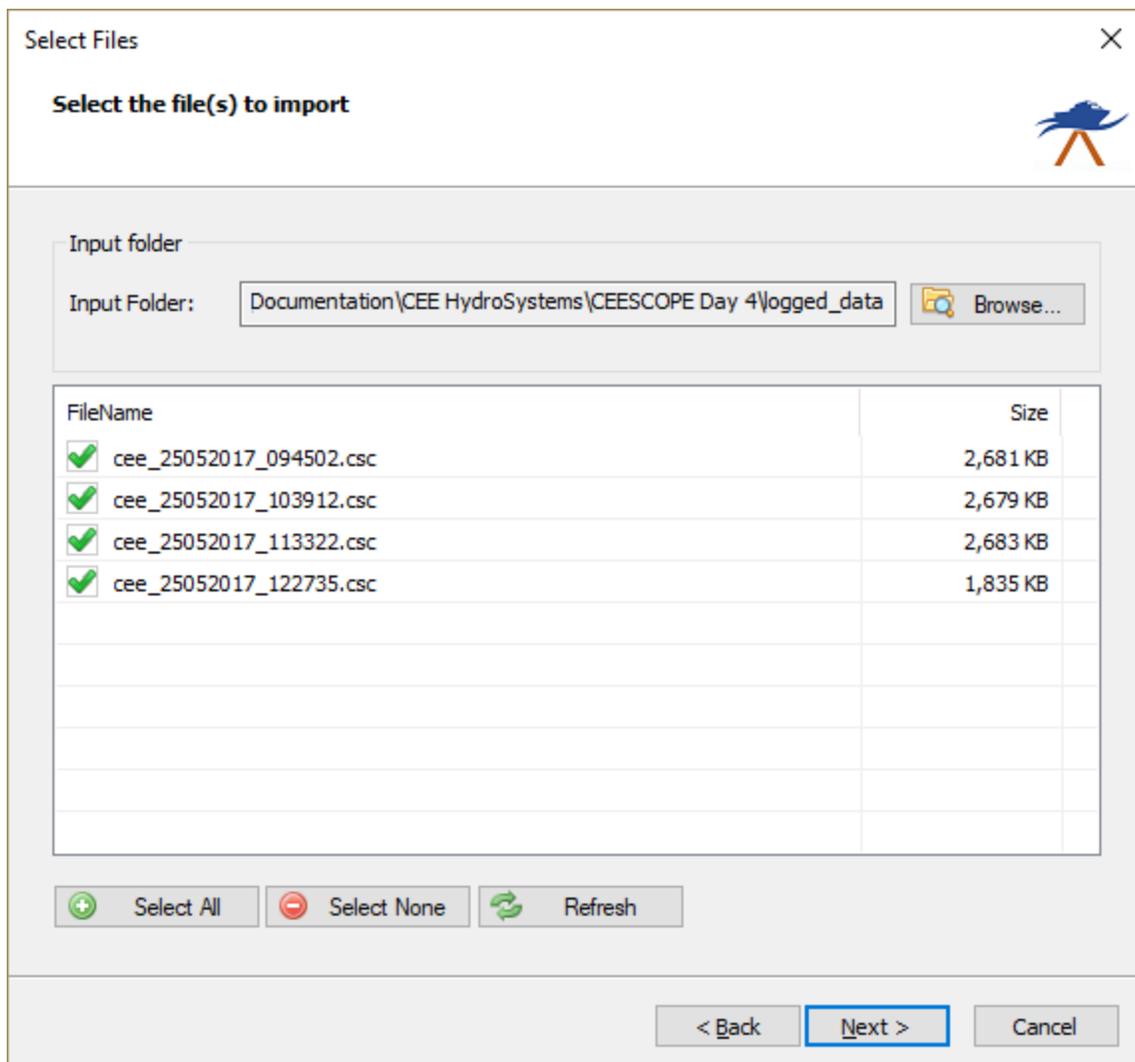
The first page of the wizard allows you to set the format of the file(s) we wish to import. Since this tutorial is about importing CEE HydroSystems data, we select the 'CEE HydroSystems Project Files (\*.csc)' option from the drop-down list.



## Select file(s) to import

In the second page of the wizard you can select which files to import. Click the 'Browse...' button to select the folder on your computer where the files are stored.

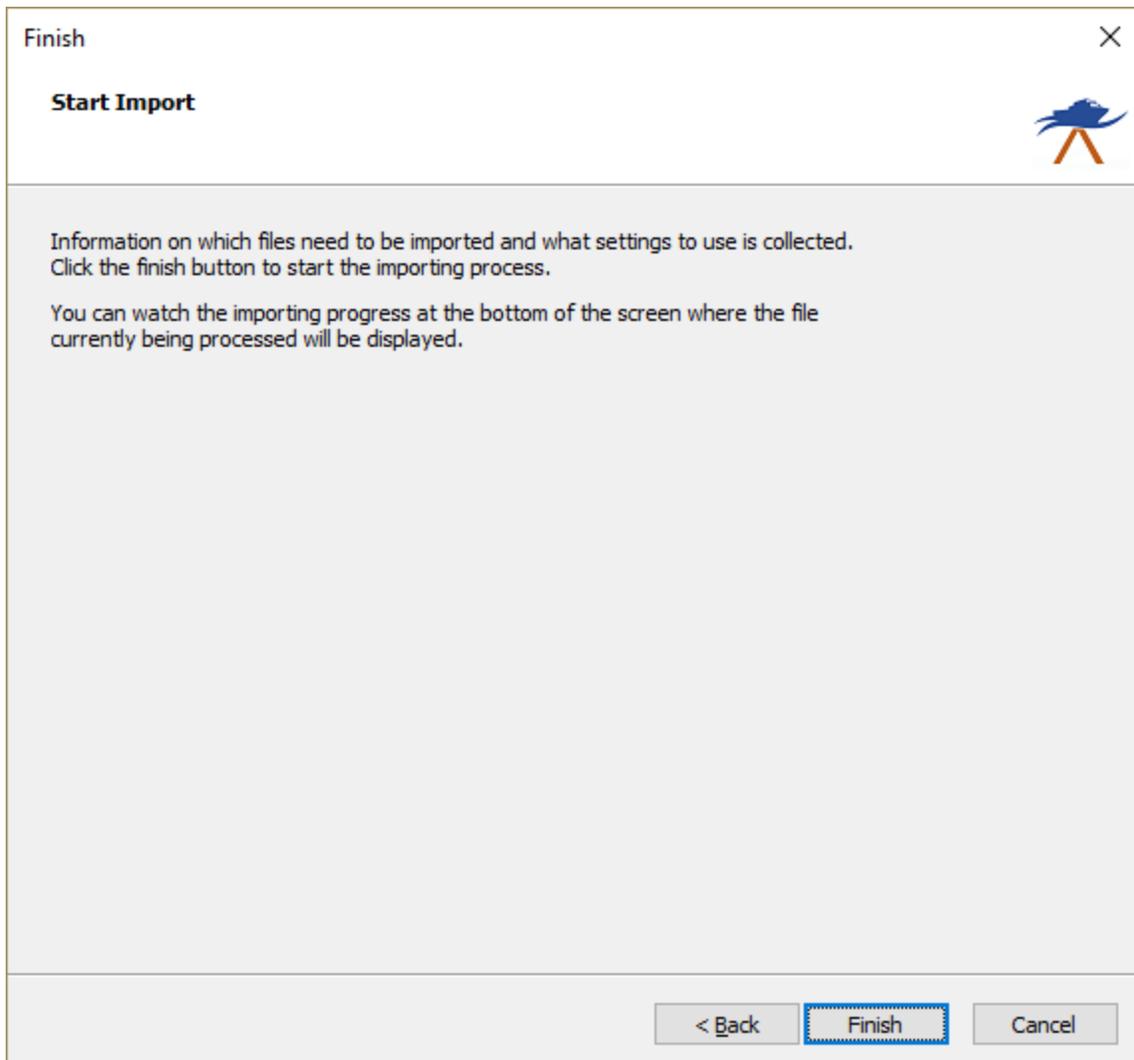
After changing the folder the file list is reloaded, and you can use the check boxes to select one or more file(s) to import.



### Starting the import

When the format, the files and the additional options has been set, you can start the import process by clicking the 'Finish' button on the last page of the wizard.

The file currently processed is displayed in the status bar at the bottom of the screen and the wizard shows a message box stating 'File(s) successfully imported as raw data file(s)' as soon as the process has completed. Click 'OK' to close the dialog and the imported files will be centered in the map view (only when they contain position data).



### Checking the imported raw data file(s)

When the import has completed, you can right-click the generated raw data files, and select 'Analyze Data...' to inspect the imported values and timestamps.

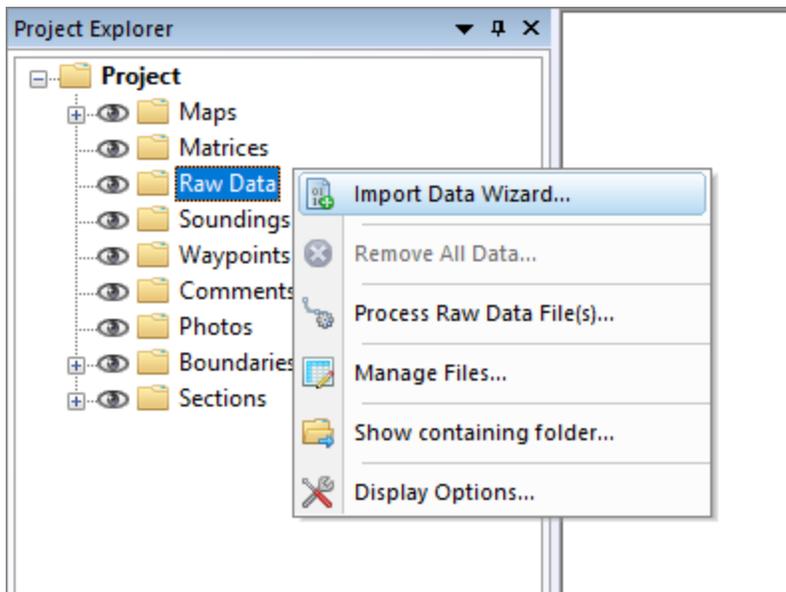
When binary water column sample data has been imported from one or more CSA files, this data can be viewed by right-clicking the raw data file and selecting the 'Digitize Echogram...' option.

## 3.13.5 Import Kongsberg Simrad raw data files

### Starting the raw data import wizard

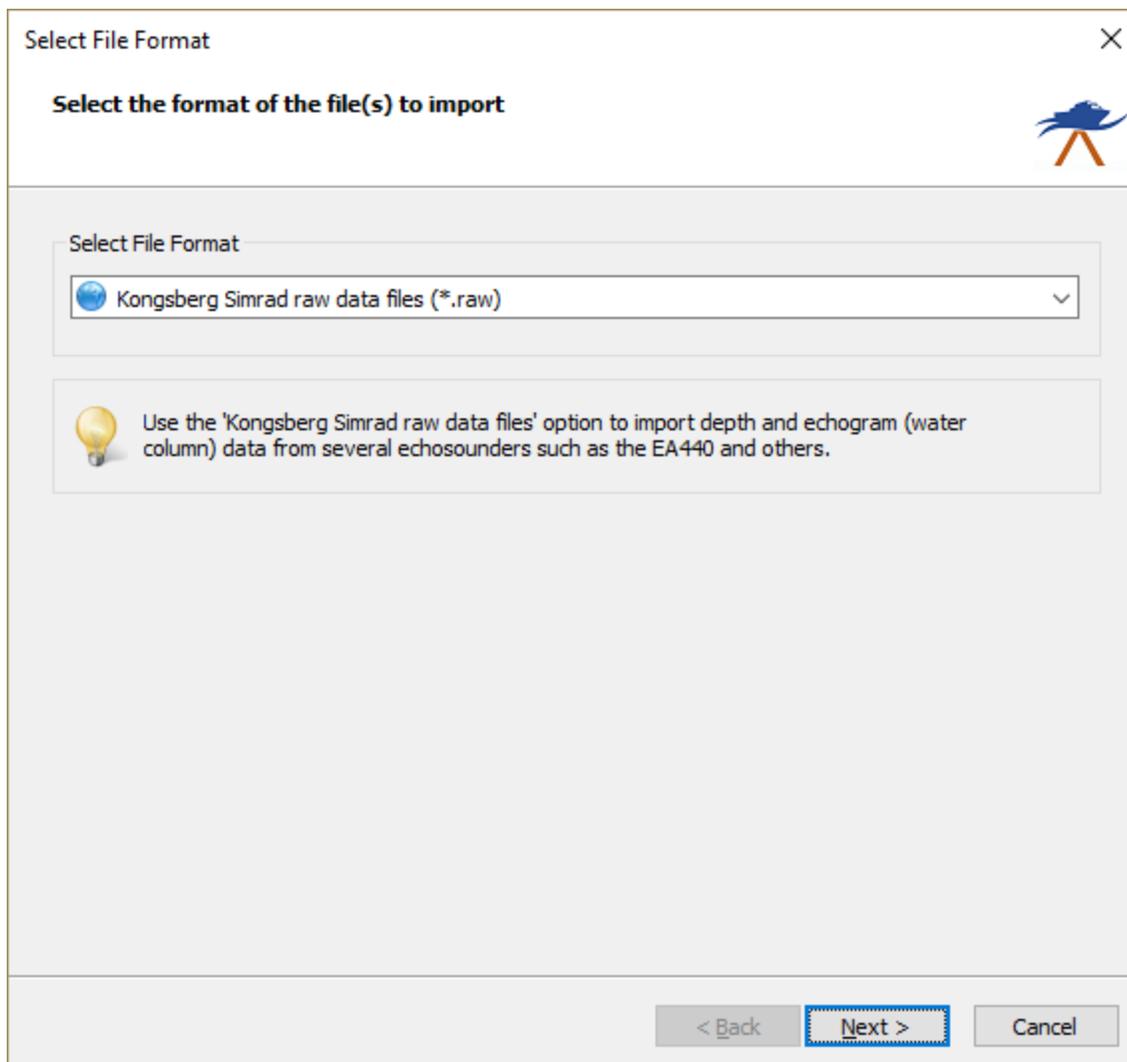
All file formats which Hydromagic is able to convert to raw data files, can be imported through the raw data import wizard.

To start the wizard, right-click the 'Raw Data' folder in the 'Project Explorer' and select the 'Import Data Wizard...' option.

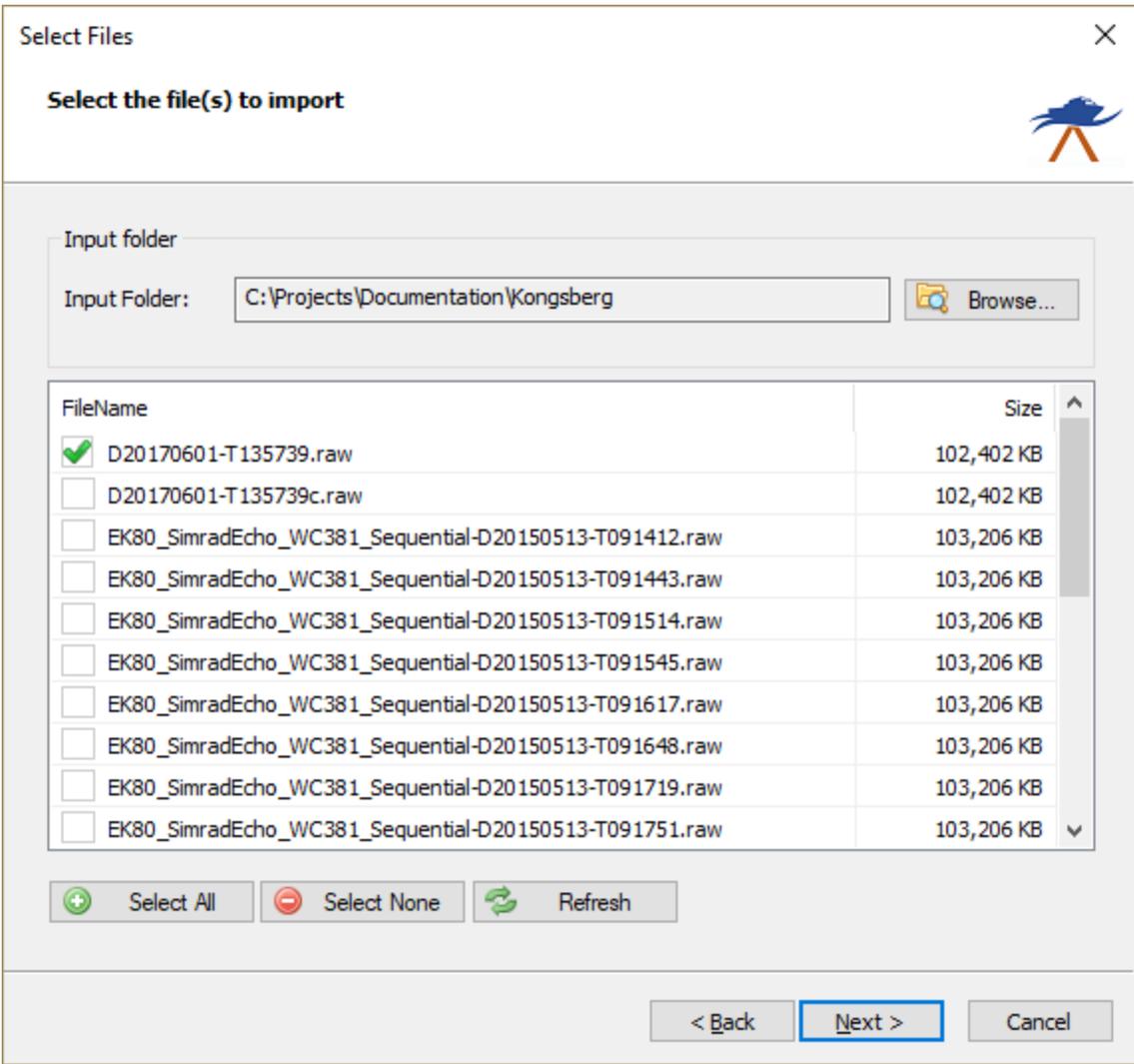


### Select file format

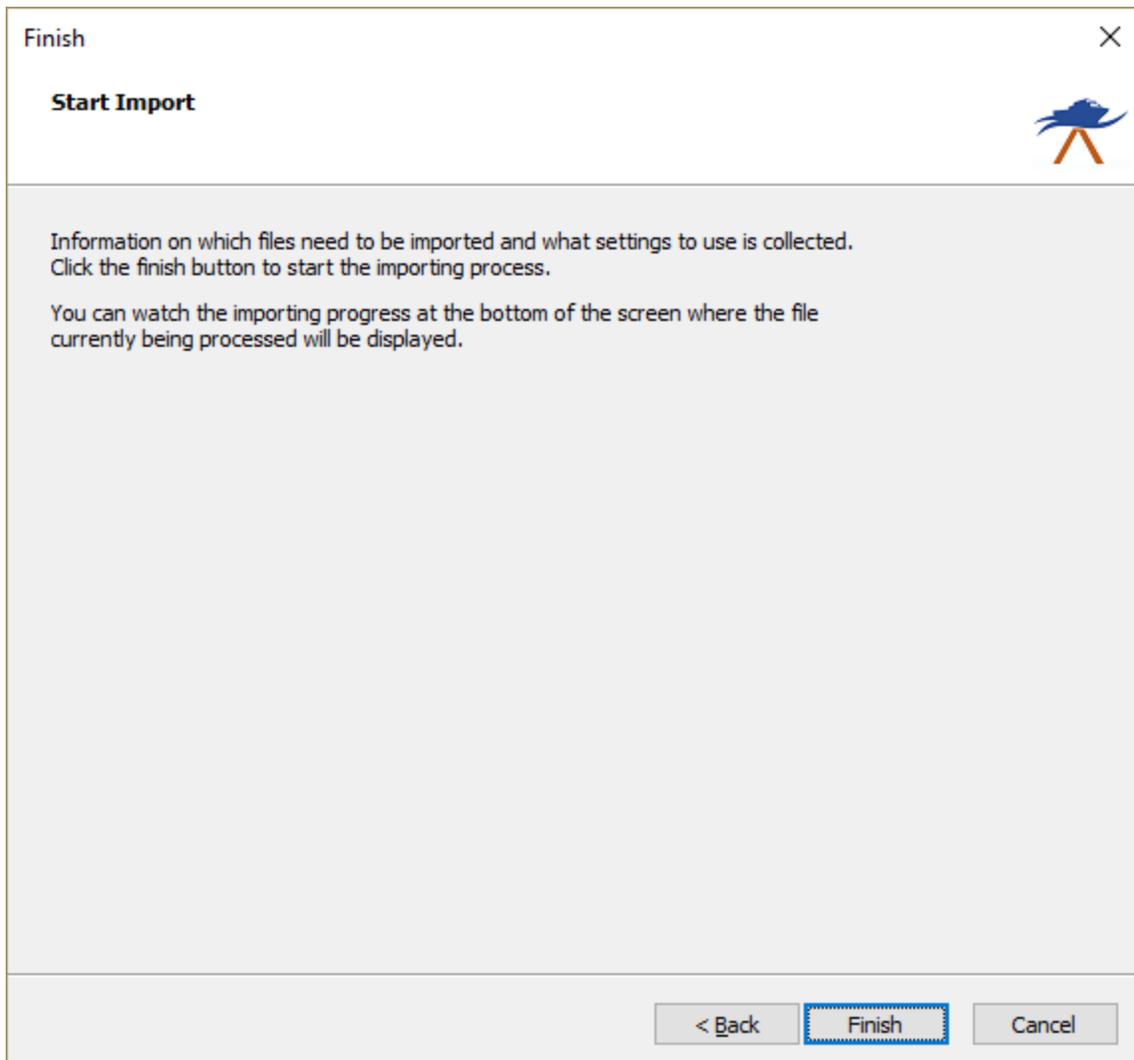
The first page of the wizard allows you to set the format of the file(s) we wish to import. Since this tutorial is about importing NMEA0183 data, we select the 'NMEA0183 ASCII Log Files (\*.\*)' option from the drop-down list.



Select file(s) to import



Starting the import



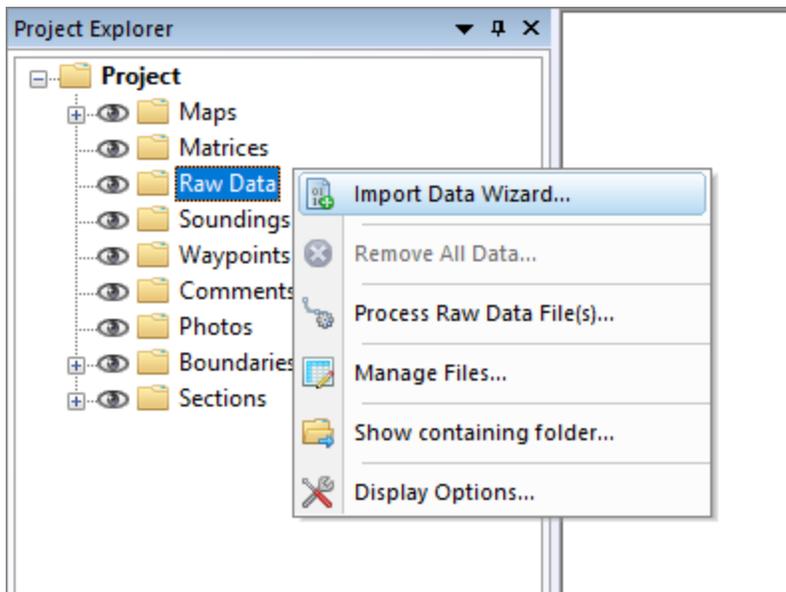
### 3.13.6 Import ODOM raw data files

Use the 'Odom raw data files' option to import depth and water column data recorded with an Odom echosounder through Odom eChart.

#### Starting the raw data import wizard

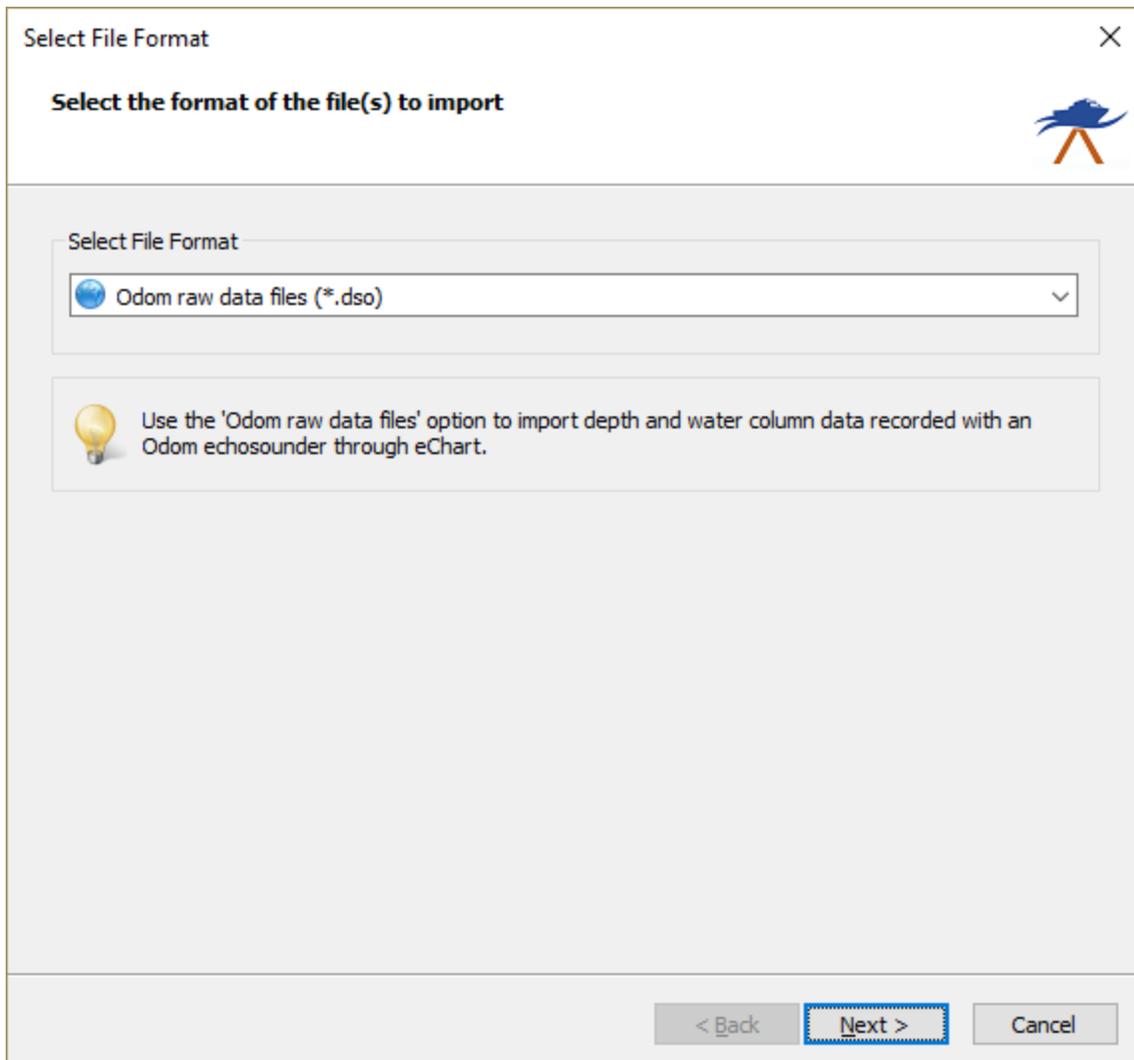
All file formats which Hydromagic is able to convert to raw data files, can be imported through the raw data import wizard.

To start the wizard, right-click the 'Raw Data' folder in the 'Project Explorer' and select the 'Import Data Wizard...' option.



### Select file format

The first page of the wizard allows you to set the format of the file(s) we wish to import. Since this tutorial is about importing Odom raw data, we select the 'Odom raw data files (\*.dso)' option from the drop-down list.

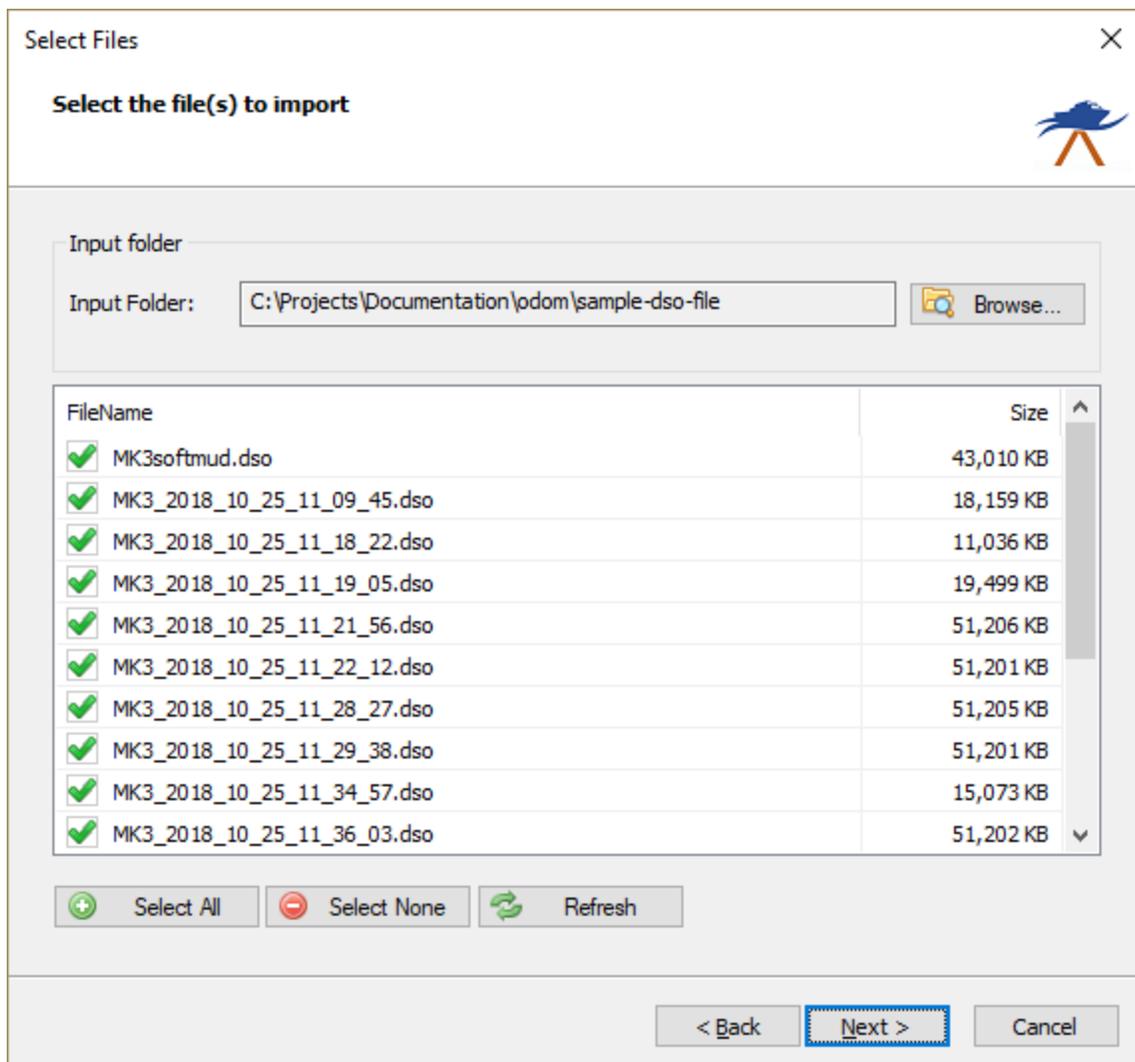


Select file(s) to import

In the second page of the wizard you can select which files to import.

Click the 'Browse...' button to select the folder on your computer where the files are stored.

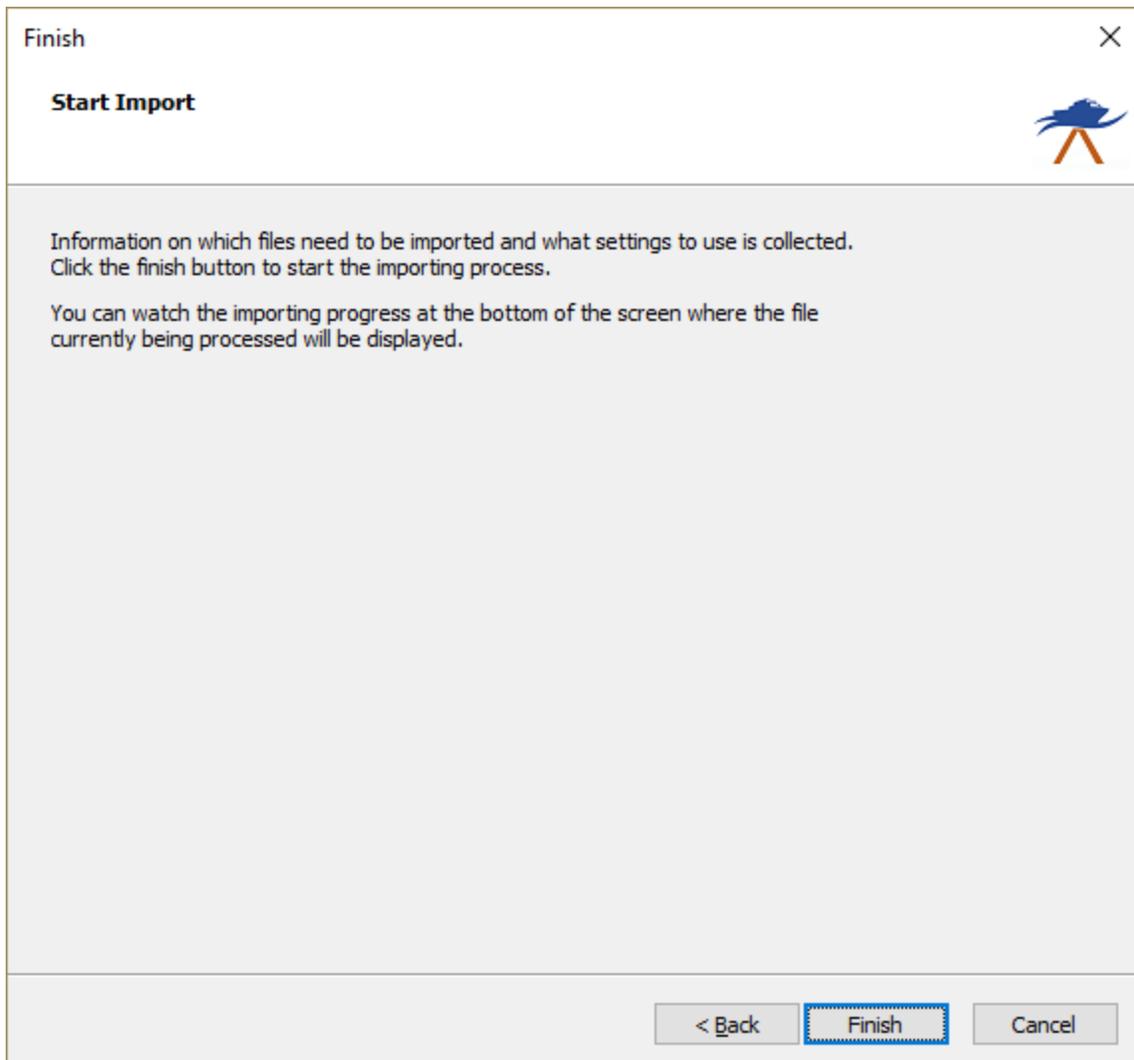
After changing the folder the file list is reloaded, and you can use the check boxes to select one or more file(s) to import.



## Starting the import

When the format, the files and the additional options has been set, you can start the import process by clicking the 'Finish' button on the last page of the wizard.

The file currently processed is displayed in the statusbar at the bottom of the screen and the wizard shows a message box stating 'File(s) successfully imported as raw data file(s)' as soon as the process has completed. Click 'OK' to close the dialog and the imported files will be centered in the map view (only when they contain position data).



### Checking the imported raw data file(s)

When the import has completed, you can right-click the generated raw data files, and select 'Analyze Data...' to inspect the imported values and timestamps.

### 3.13.7 Import Hydromagic raw data files

Hydromagic raw data files

The function of importing Hydromagic raw data files, is to be able to transfer Hydromagic raw data files from one project to another. While transferring from one project to another, a coordinate and / or unit conversion will be performed when needed.

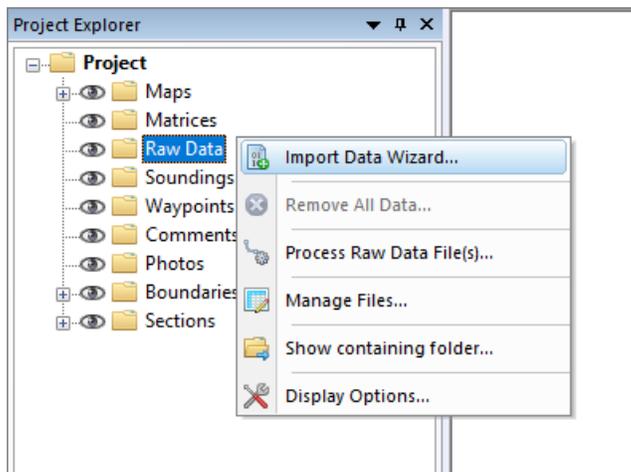
```
NAM RAW00001
CMT
VIS 0
HUN 9002
VUN 9002
```

```
PRJ 3656
DTM 4759
ELL 0
PRM 0
DFT 0.000
ANT 0.000
VER 8.1
BLD 8.1.64.8220
DPT 00000002 00000001 1478695419.814 0.000 0.000 3.250
DPT 00000002 00000001 1478695419.865 0.000 0.000 3.217
DPT 00000002 00000001 1478695419.916 0.000 0.000 3.217
DPT 00000002 00000001 1478695419.968 0.000 0.000 3.184
TRC 00000000 00000001 1478695419.979 0.000 $GPGGA,164340.00,3208.4410895,N,08048.1
POS 00000007 00000001 1478695419.979 0.000 2061073.948 111897.838 -111.545 -6.482
GPS 0000000F 00000001 1478695419.979 0.000 5 8 29 1
DOP 00000001 00000001 1478695419.979 0.000 1.21 0.00 0.00
DPT 00000002 00000001 1478695420.019 0.000 0.000 3.184
TRC 00000000 00000001 1478695420.016 0.000 $GNZDA,164340.00,09,11,2016,00,00*70
TRC 00000000 00000001 1478695420.026 0.000 $GNVTG,117.544,T,,M,0.6451,N,1.1947,K,D
SPD 00000000 00000001 1478695420.026 0.000 1.2
HDG 00000001 00000001 1478695420.026 0.000 117.54 0.00
DPT 00000002 00000001 1478695420.070 0.000 0.000 3.184
DPT 00000002 00000001 1478695420.122 0.000 0.000 3.184
```

*Content of an Hydromagic raw data file*

## Starting the raw data import wizard

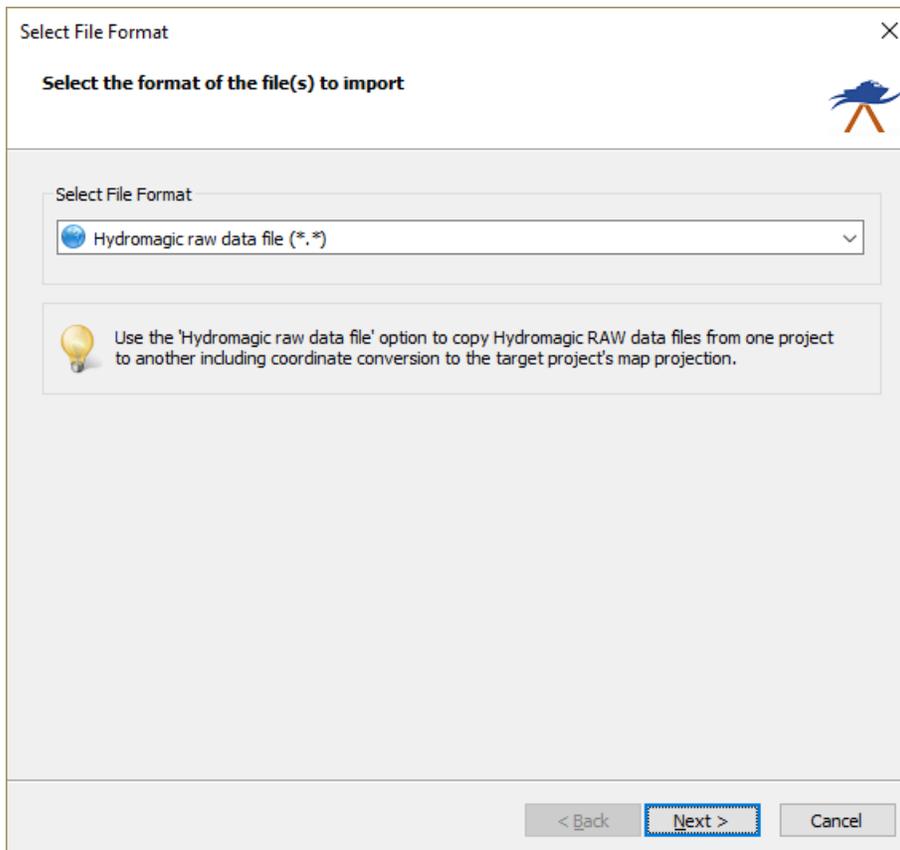
All file formats which Hydromagic is able to convert to raw data files, can be imported through the raw data import wizard. To start the wizard, right-click the 'Raw Data' folder in the 'Project Explorer' and select the 'Import Data Wizard...' option.



*Start the import wizard from the "Project Explorer"*

## Select file format

The first page of the wizard allows you to set the format of the file(s) we wish to import. Since this tutorial is about importing Hydromagic data, we select the 'Hydromagic raw data file (\*.\*)' option from the drop-down list.

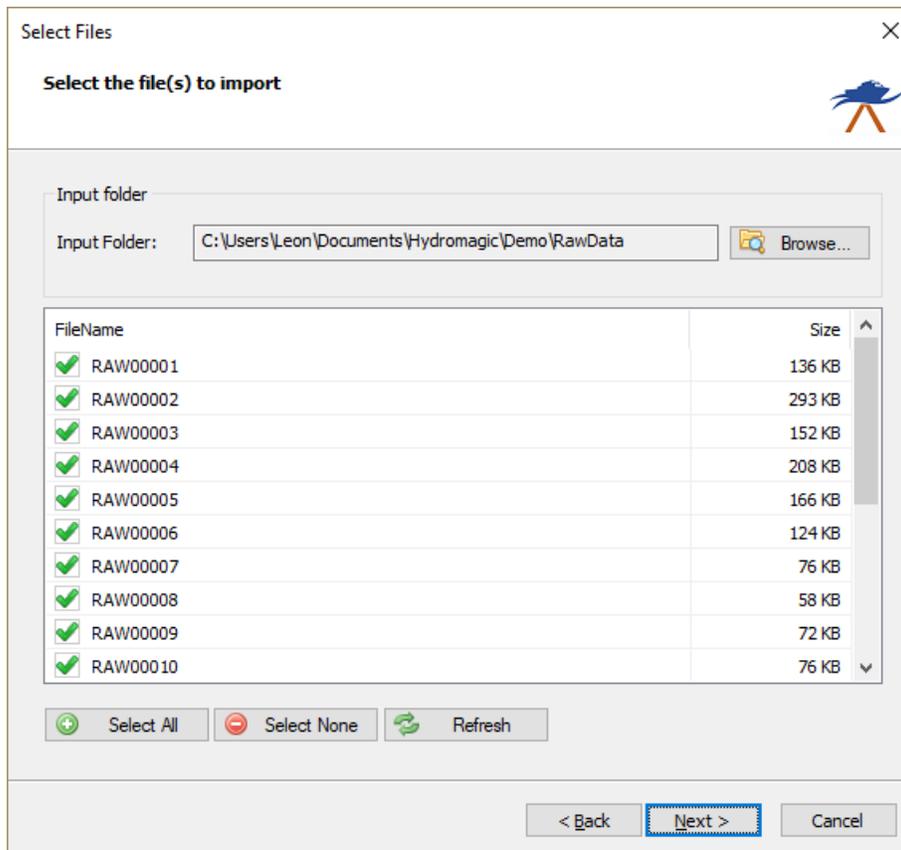


**Select the 'Hydromagic raw data file' option to import Hydromagic data.**

### Select file(s) to import

In the second page of the wizard you can select which files to import. Click the 'Browse...' button to select the folder on your computer where the files are stored.

After changing the folder the file list is reloaded, and you can use the check boxes to select one or more file(s) to import.

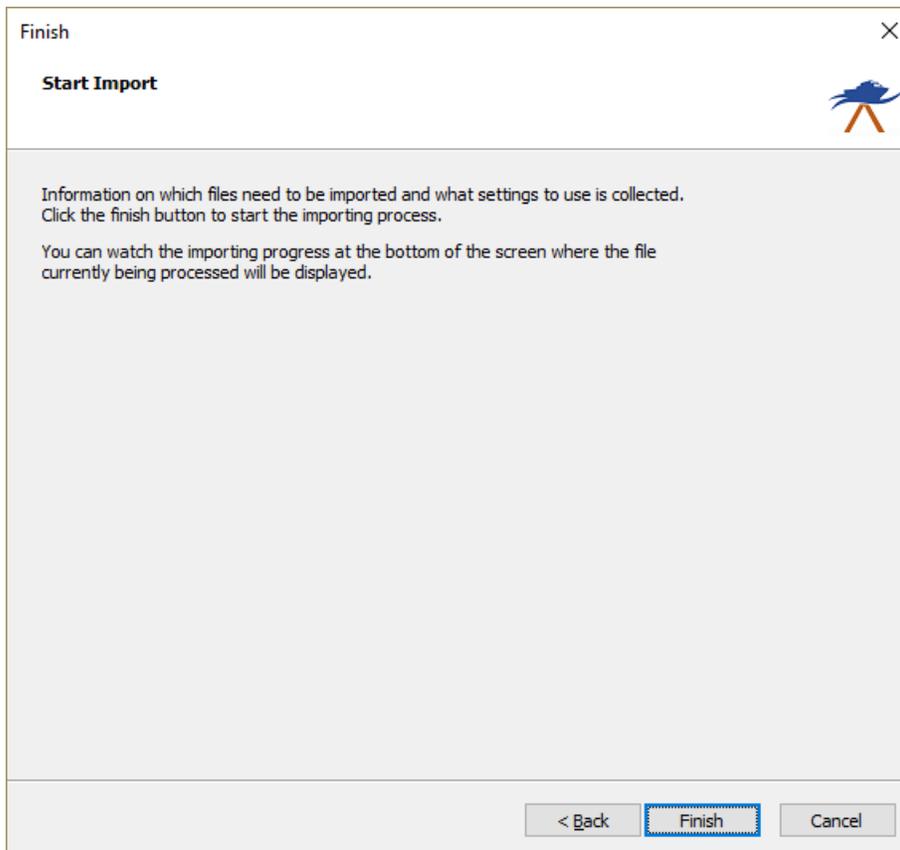


*Use the check boxes to select the files you wish to import.*

## Starting the import

When the format, the files and the additional options has been set, you can start the import process by clicking the 'Finish' button on the last page of the wizard.

The file currently processed is displayed in the statusbar at the bottom of the screen and the wizard shows a message box stating 'File(s) successfully imported as raw data file(s)' as soon as the process has completed. Click 'OK' to close the dialog and the imported files will be centered in the map view (only when they contain position data).



Click the "Finish" button to start the import process.

### Checking the imported raw data file(s)

When the import has completed, you can right-click the generated raw data files, and select 'Analyze Data...' to inspect the imported values and timestamps.

## 3.13.8 Import Hypack raw data files

### HyPack raw data files

Raw data files in HyPack are used to store all incoming data with high precision timestamps. Hydromagic allows users to import projects previously recorded in HyPack.

```

FTP NEW 2
VER 11.1.6.15
INF " " " " " " 0.983268 0.000000 0.000000
ELL WGS-84 6378137.000 298.257223563
PRO TME -63.000000 0.999600 0.000000 0.000000 0.000000 500000.0000 0.0000
DTM 0.00 0.00 0.00 0.000000 0.000000 0.000000 0.000000
GEO ??? 0.000
HVU 1.0000000000 1.0000000000
TND 13:46:16 12/01/2010 300
DEV 0 276 "Simulation" 1 C:\HYPACK 2011\devices\testdev.dll 9.0.1.1
OFF 0 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
LIN 2
PTS 454484.00 4945231.00

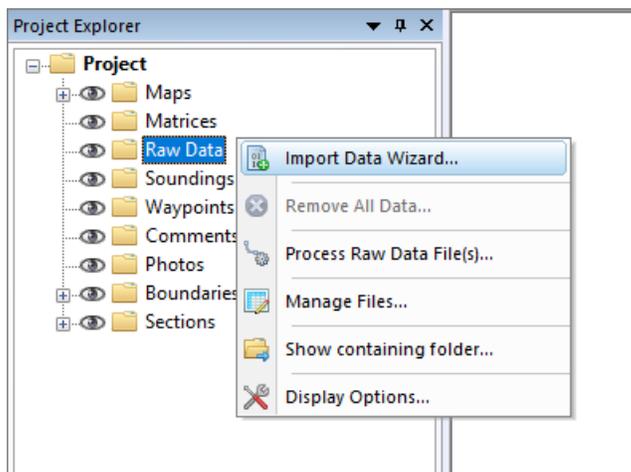
```

```
PTS 455477.00 4942150.00
LBP 454484.00 4945231.00
LNN 1
LTP 0.00 0.00
LTP 500.00 60.00
LTP 2500.00 60.00
LTP 3000.00 0.00
EOL
EOH
TID 0 49573.654 0.776
EC1 0 49573.971 62.800
TID 0 49573.971 0.835
POS 0 49573.971 454468.123 4945274.185
TID 0 49573.971 0.835
POS 0 49574.590 454469.702 4945271.288
EC1 0 49574.590 62.900
TID 0 49574.590 0.886
EC1 0 49574.901 63.100
TID 0 49574.901 0.927
POS 0 49574.901 454472.047 4945266.988
TID 0 49574.901 0.927
POS 0 49575.525 454474.392 4945262.687
EC1 0 49575.525 63.200
TID 0 49575.525 0.960
EC1 0 49575.839 63.400
TID 0 49575.839 0.983
POS 0 49575.839 454476.784 4945258.299
TID 0 49575.839 0.983
POS 0 49576.461 454479.129 4945253.999
FIX 99 49576.534 1 454479.129 4945253.999
```

*Example HyPack raw data file*

## Starting the raw data import wizard

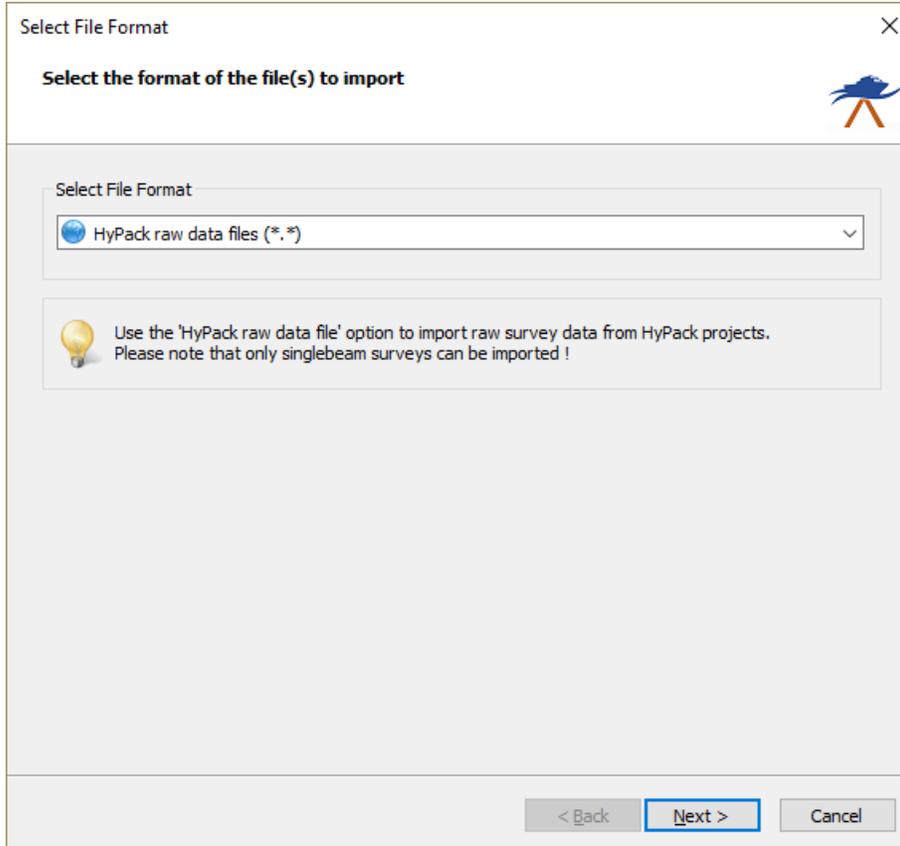
All file formats which Hydromagic is able to convert to raw data files, can be imported through the raw data import wizard. To start the wizard, right-click the 'Raw Data' folder in the 'Project Explorer' and select the 'Import Data Wizard...' option.



*Start the import wizard from the "Project Explorer"*

## Select file format

The first page of the wizard allows you to set the format of the file(s) we wish to import. Since this tutorial is about importing HyPack raw data, we select the 'HyPack raw data files (\*.\*)' option from the drop-down list.

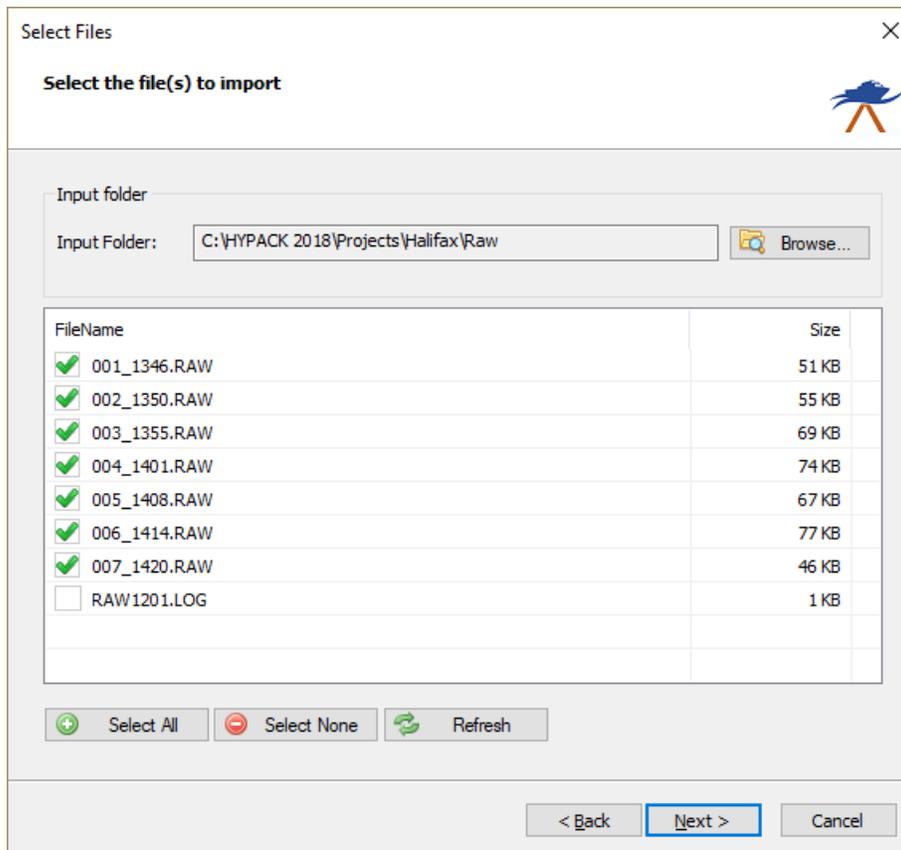


**Select the "HyPack raw data files" option to import HyPack raw sounding data.**

### Select file(s) to import

In the second page of the wizard you can select which files to import. Click the 'Browse...' button to select the folder on your computer where the files are stored.

After changing the folder the file list is reloaded, and you can use the check boxes to select one or more file(s) to import.

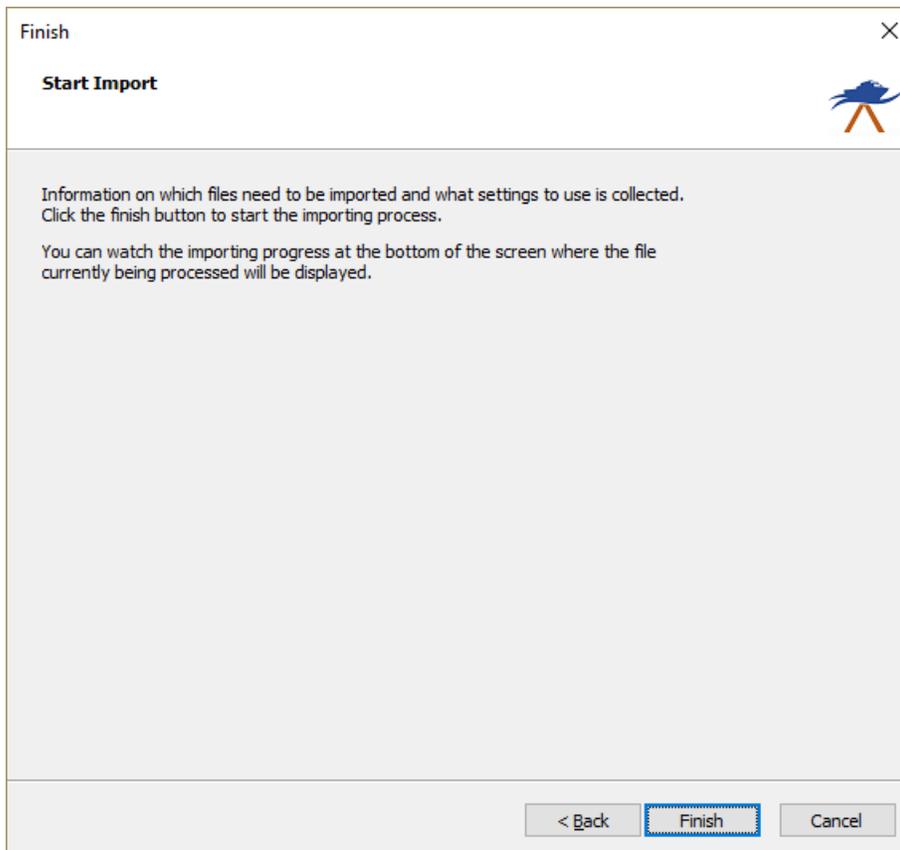


*Use the check boxes to select the files you wish to import.*

## Starting the import

When the format, the files and the additional options has been set, you can start the import process by clicking the 'Finish' button on the last page of the wizard.

The file currently processed is displayed in the status bar at the bottom of the screen and the wizard shows a message box stating 'File(s) successfully imported as raw data file(s)' as soon as the process has completed. Click 'OK' to close the dialog and the imported files will be centered in the map view (only when they contain position data).



*Click the "Finish" button to start the import process.*

### Checking the imported raw data file(s)

When the import has completed, you can right-click the generated raw data files, and select 'Analyze Data...' to inspect the imported values and timestamps.

## 3.14 Export raw data

### 3.14.1 Export Triton Extended Format (XTF) files

eXtended Triton Format (XTF) is a file format developed by Triton Imaging, Inc for recording hydrographic survey data. XTF is the most commonly used format for this type of information in the hydrographic survey industry. XTF supports sources including side scan sonar, shallow seismic, single beam and multibeam bathymetry, as well as associated position, time and altitude information. An XTF file consists out multiple data structures placed sequentially in the file. This way the file format can easily be extended with new functionality.

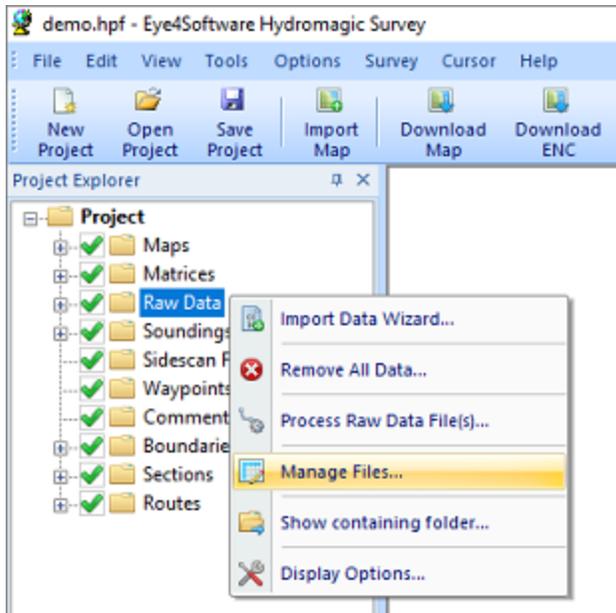
At this moment Hydromagic can export single beam (sub bottom) data as XTF. The following XTF records are supported when writing XTF files:

- XTFFILEHEADER;
- CHANINFO;
- XTFPINGHEADER;
- XTFBATHYHEADER;
- XTFATTITUDEDATA;
- XTFNOTESHEADER;

- XTFPINGCHANHEADER.

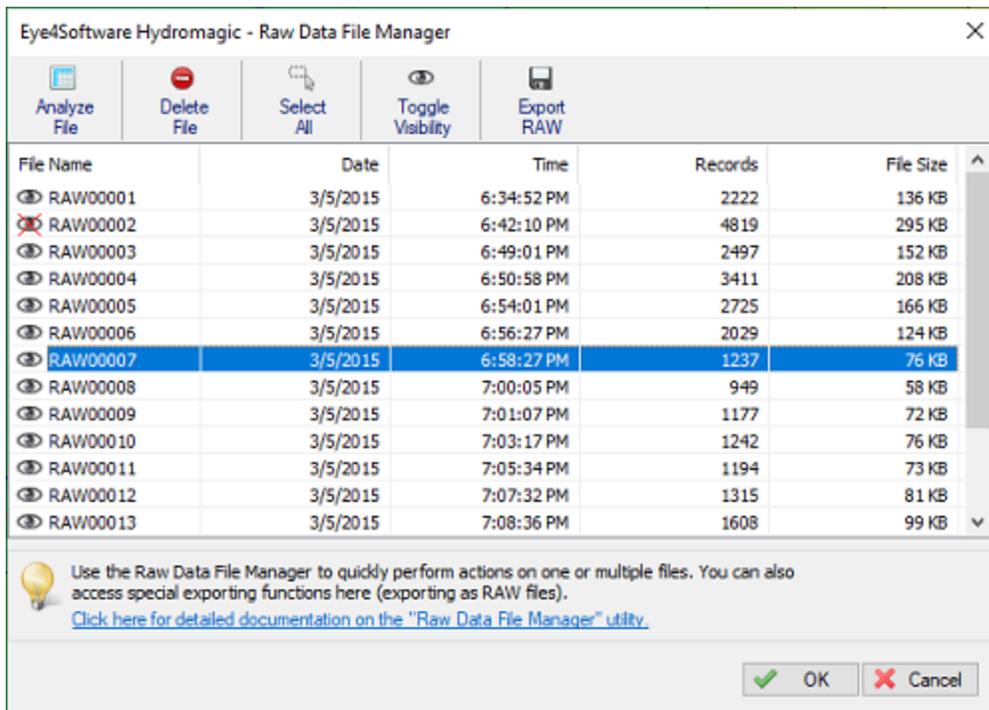
## Starting the XTF export tool

The XTF export tool can only be started from the "[Raw Data File Manager](#)" in Hydromagic Survey. This option is not available in [Hydromagic Dredging](#), since no raw data files are used in this application. First open the "Raw Data File Manager" by right-clicking the "Raw Data" folder in the "Project Explorer". From the pop up menu which appears, select the "Manage Files..." option.



**Right click the "Raw Data" folder and select "Manage Files..."**

In the "Raw Data File Manager", multiple export options are offered, including [HYPACK](#), [SEG-Y](#) and XTF format. Using the exporting tools, you can export one or more files. Select the raw data files you want to export and click the "Export XTF" button to start the XTF export tool.



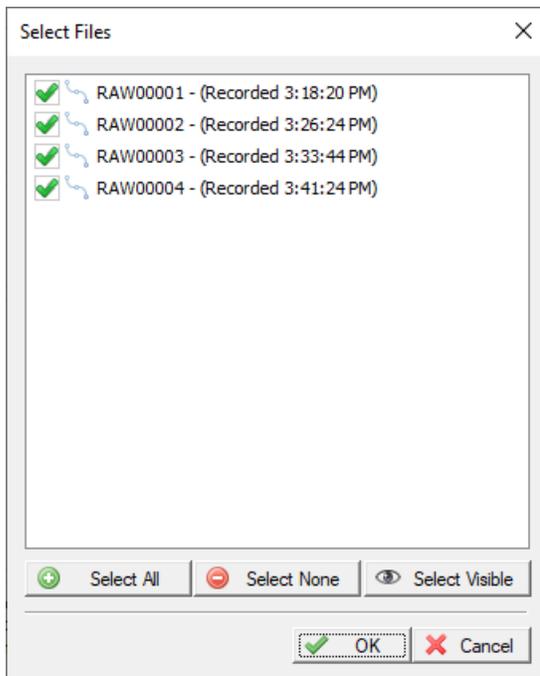
*The raw data files manager shows a list of raw data files in the project.*

### Select output folder

Click the "Browse..." button to select in which folder the XTF files will be written. By default the "Exports" folder in your project map will be used, unless you selected another folder in the past. When one or more files already exist you will be notified. To force replacement of existing files, check the "Overwrite existing files without warning" check box.

### Select file(s) to export

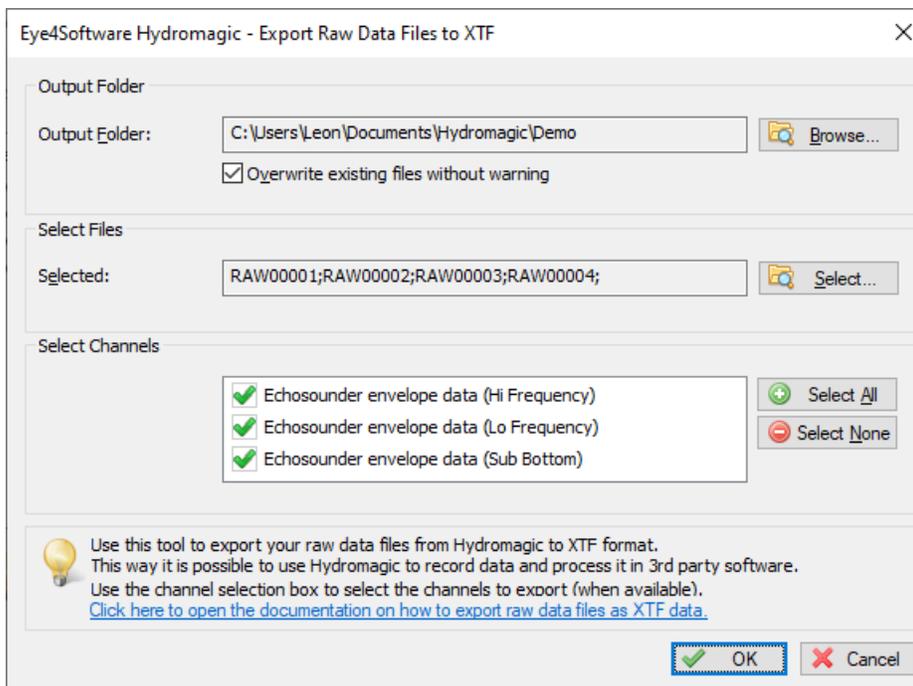
When you didn't select any file from the "Raw Data File Manager" tool before opening the XTF export tool, you can select the files to export by clicking the "Select..." button. From the windows that opens, you can select the files to be exported by setting the checkboxes.



Select which raw data files will be included in the export.

### Select channels to export

Check the channels you want to include in the export. You can choose the regular echo sounder channels (low and high frequency) as well as sub bottom data channels. When the echo envelope samples are available they will be stored in the generated XTF files as well. You can click the "OK" button to start the export process. When the export did not complete successfully, you can refer to the "Processing" tab of the [activity view](#) for more details on the error shown.



Select which channel(s) to export, and click OK to start the export process.

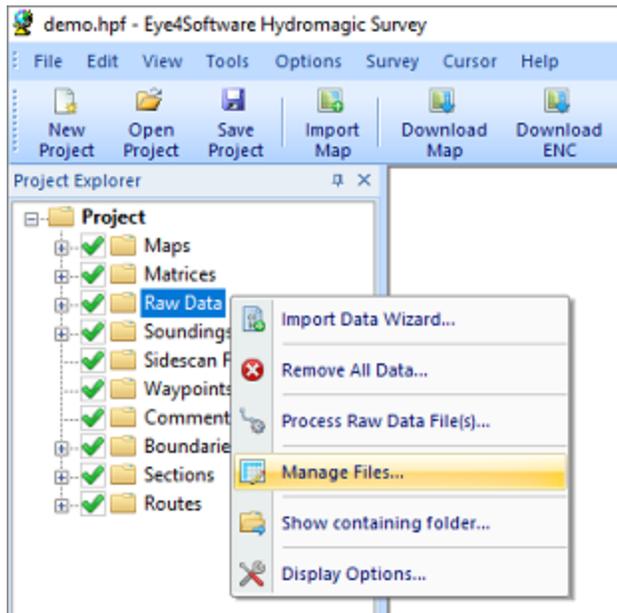
### 3.14.2 Export SEG-Y files

#### SEG-Y files

The SEG-Y (sometimes SEG Y) file format is one of several standards developed by the Society of Exploration Geophysicists (SEG) for storing geophysical data. It is an open standard, and is controlled by the SEG Technical Standards Committee, a non-profit organization. SEG-Y files are also suitable for storing bathymetric data, and some echo sounder brands, including Innomar, Knudsen and SyQwest, are using this file format to export position, depth and echogram data. At this moment Hydromagic can only export single beam (sub bottom) data as SEG-Y.

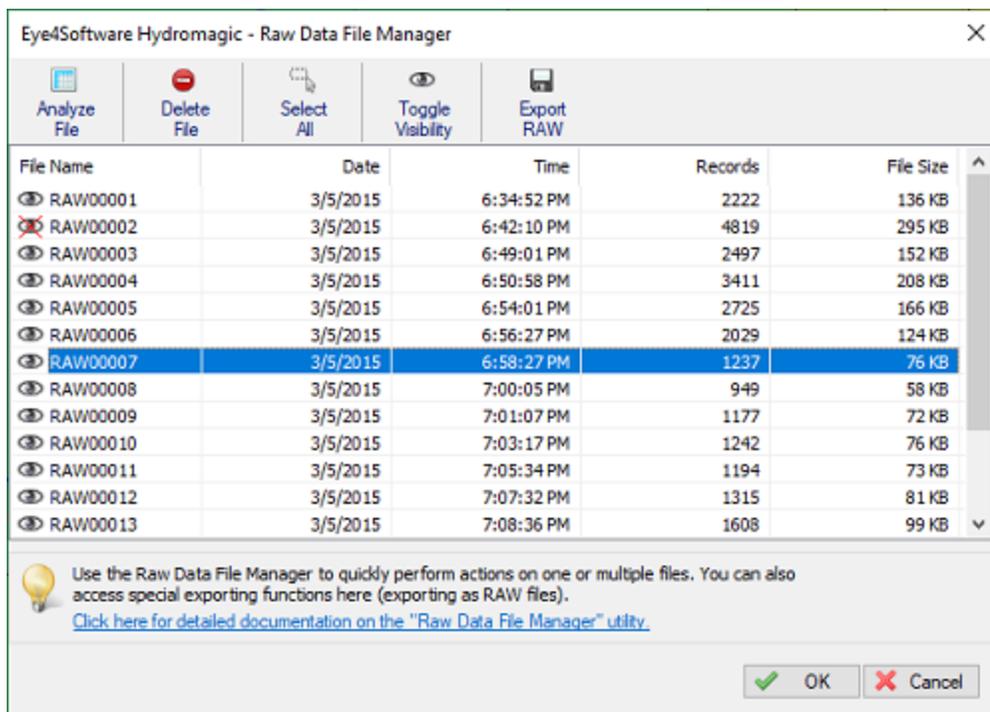
#### Starting the SEG-Y export tool

The SEG-Y export tool can only be started from the "[Raw Data File Manager](#)" in Hydromagic Survey. This option is not available in [Hydromagic Dredging](#), since no raw data files are used in this application. First open the "Raw Data File Manager" by right-clicking the "Raw Data" folder in the "Project Explorer". From the pop up menu which appears, select the "Manage Files..." option.



**Right click the "Raw Data" folder and select "Manage Files..."**

In the "Raw Data File Manager", multiple export options are offered, including HYPACK, SEG-Y and XTF format. Using the exporting tools, you can export one or more files. Select the raw data files you want to export and click the "Export SEG-Y" button to start the SEG-Y export tool.



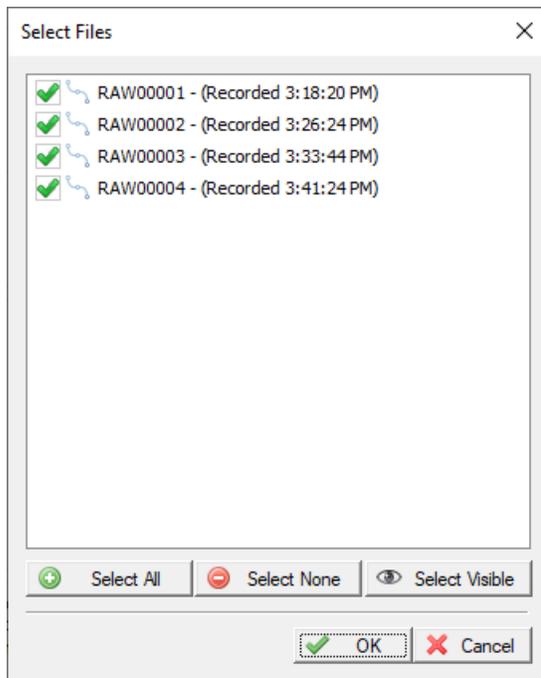
*The raw data files manager shows a list of raw data files in the project.*

### Select output folder

Click the "Browse..." button to select in which folder the SEG-Y files will be written. By default the "Exports" folder in your project map will be used, unless you selected another folder in the past. When one or more files already exist you will be notified. To force replacement of existing files, check the "Overwrite existing files without warning" check box.

### Select file(s) to export

When you didn't select any file from the "Raw Data File Manager" tool before opening the SEG-Y export tool, you can select the files to export by clicking the "Select..." button. From the windows that opens, you can select the files to be exported by setting the check boxes.



*Select which raw data files will be included in the export.*

### Select channel to export

Check the sounding channel you want to export. For SEG-Y files, only one channel can be saved at a time. To export multiple channels, export them one by one, and adjust the "File Name Prefix" value to indicate what is stored in the file. You can choose the regular echo sounder channels (low and high frequency) as well as sub bottom data channels. When echo envelope samples are available they will be stored in the generated SEG-Y files as well. You can click the "OK" button to start the export process. When the export process did not complete successfully, you can refer to the "Processing" tab of the [activity view](#) for more details on the error shown.

Eye4Software Hydromagic - Export Raw Data Files to SEG-Y

Output Folder

Output Folder: C:\Users\Leon\Documents\Hydromagic\Demo\Exports Browse...

Overwrite existing files without warning

Select Files

Selected: RAW00001;RAW00002;RAW00003;RAW00004; Select...

Channel

Sounding Channel: Hi-Frequency Echogram

File Name Prefix: HF\_

Use this tool to export your raw data files from Hydromagic to SEG-Y format. This way it is possible to use Hydromagic to record data and process it in 3rd party software. Use the channel selection box and file name prefix to assign sounding channels to different files. [Click here to open the documentation on how to export raw data files as SEG-Y data.](#)

OK Cancel

Select which channel to export, and click OK to start the export process.

### 3.14.3 Export HYPACK raw data files

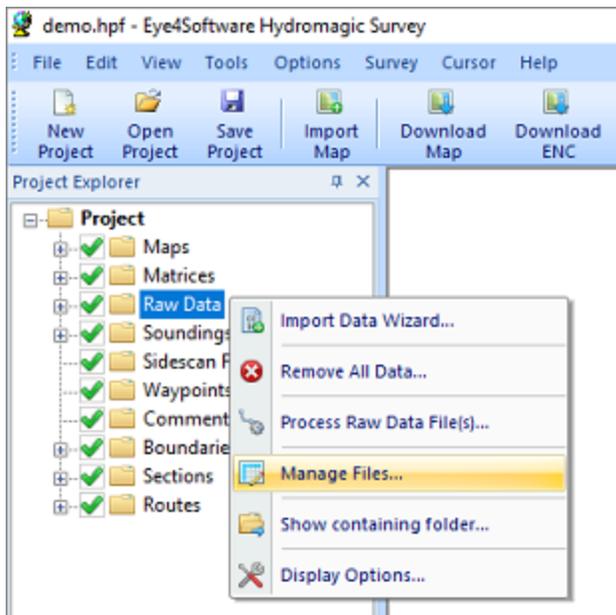
HYPACK raw data files

This feature can be used to transfer raw data recorded in Hydromagic to HYPACK. This may come in handy for users which own a license for both software packages. At this moment Hydromagic can export single beam (sub bottom) data as HYPACK raw data. The following data record types are supported when writing HYPACK raw data files:

- EC1 - Echo sounder record - single frequency;
- EC2 - Echo sounder record - dual frequency;
- POS - Position record;
- GYR - Gyro or compass record;
- RAW - Raw position data;
- QUA - GNSS Quality data record;
- TID - Tide observation record;
- MSG - Trace information (NMEA0183);
- HCP - Motion sensor data record.

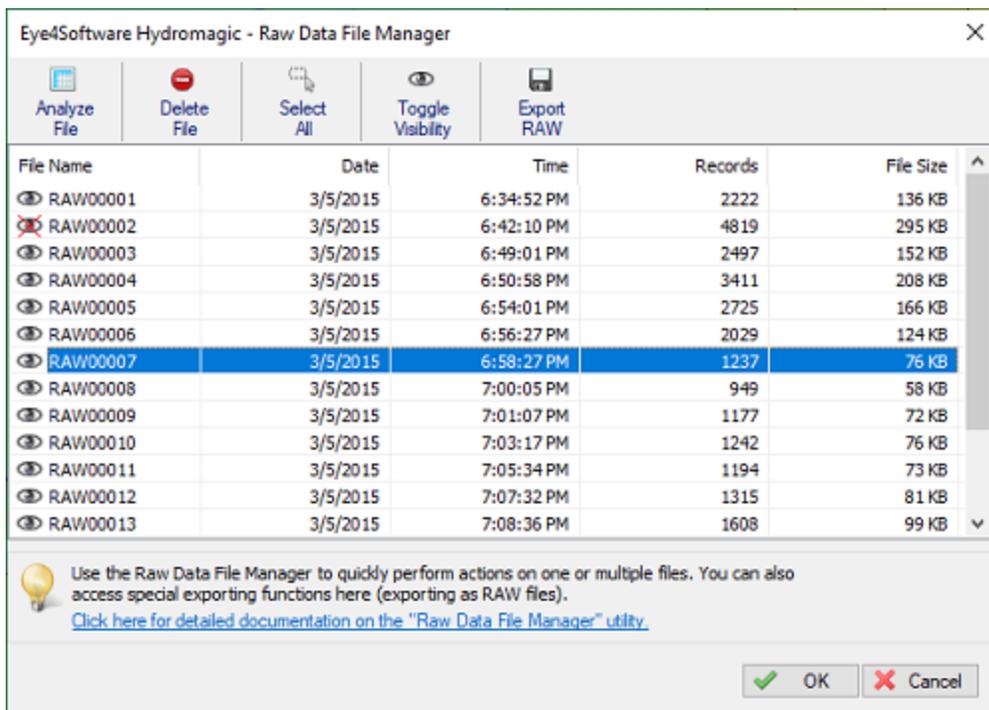
#### Starting the HYPACK export tool

The HYPACK export tool can only be started from the "[Raw Data File Manager](#)" in Hydromagic Survey. This option is not available in [Hydromagic Dredging](#), since no raw data files are used in this application. First open the "Raw Data File Manager" by right-clicking the "Raw Data" folder in the "Project Explorer". From the pop up menu which appears, select the "Manage Files..." option.



Right click the "Raw Data" folder and select "Manage Files..."

In the "Raw Data File Manager", multiple export options are offered, including HYPACK, [SEG-Y](#) and [XTF](#) format. Using the exporting tools, you can export one or more files. Select the raw data files you want to export and click the "Export HYPACK" button to start the HYPACK export tool.



The raw data files manager shows a list of raw data files in the project.

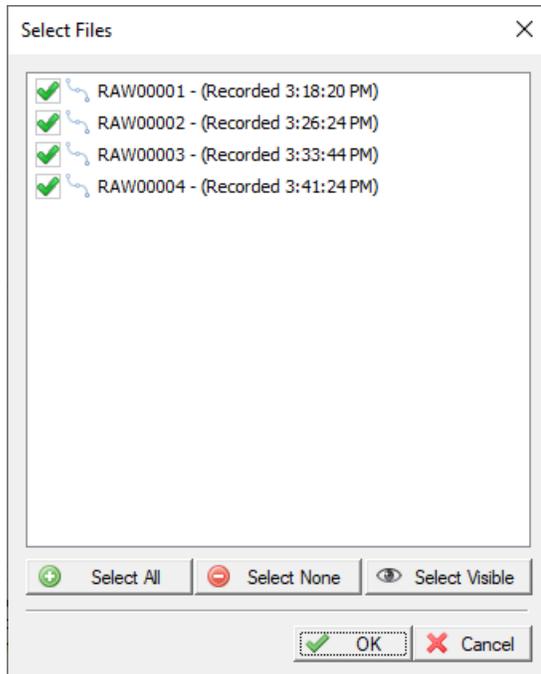
### Select output folder

Click the "Browse..." button to select in which folder the HYPACK files will be written. By default the "Exports" folder in your project map will be used, unless you selected another folder in the past. When

one or more files already exist you will be notified. To force replacement of existing files, check the "Overwrite existing files without warning" check box.

### Select file(s) to export

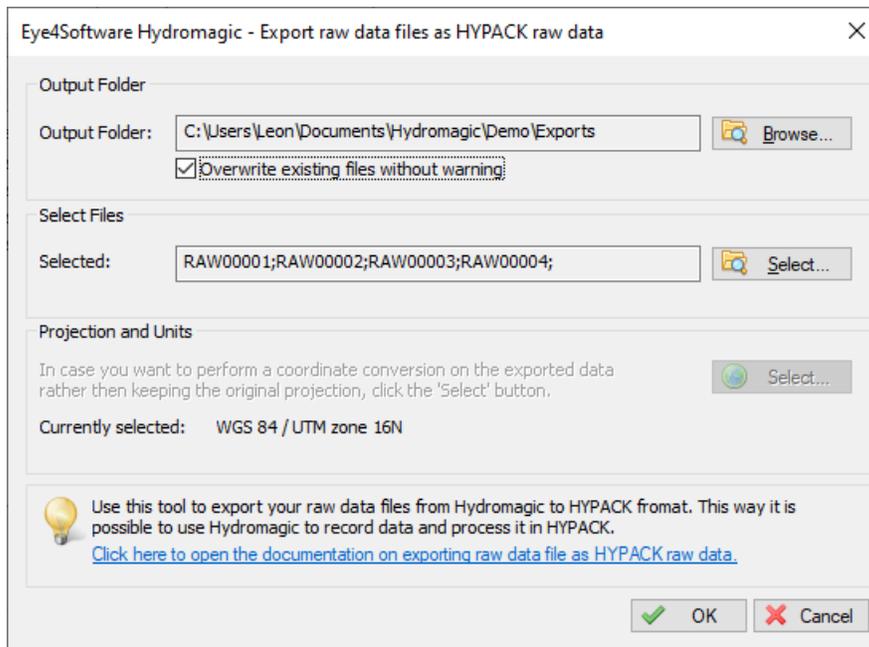
When you didn't select any file from the "Raw Data File Manager" tool before opening the HYPACK export tool, you can select the files to export by clicking the "Select..." button. From the windows that opens, you can select the files to be exported by setting the check boxes.



*Select which raw data files will be included in the export.*

### Projection

The tool will automatically select a suitable UTM projection when exporting the data. The tool is limited to UTM zones only, to avoid interchangeability issues. Please make sure that the imported raw data files are all in the same UTM zone. After selecting the raw data files to export, the tool will show the detected UTM zone. You can click the "OK" button to start the export process. When the export process did not complete successfully, you can refer to the "Processing" tab of the activity view for more details on the error shown.

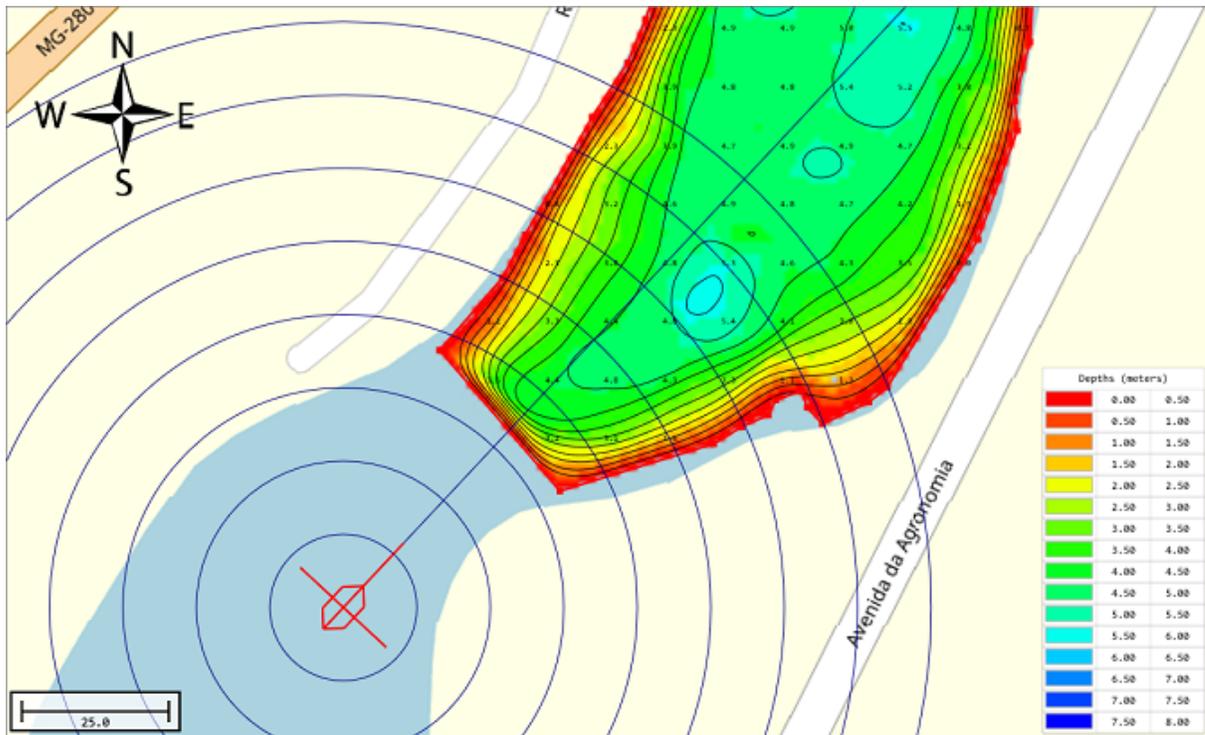


**After selecting the raw data files, the detected UTM zone will be displayed.**

## 4 Map display / Background maps

### 4.1 Map display customization

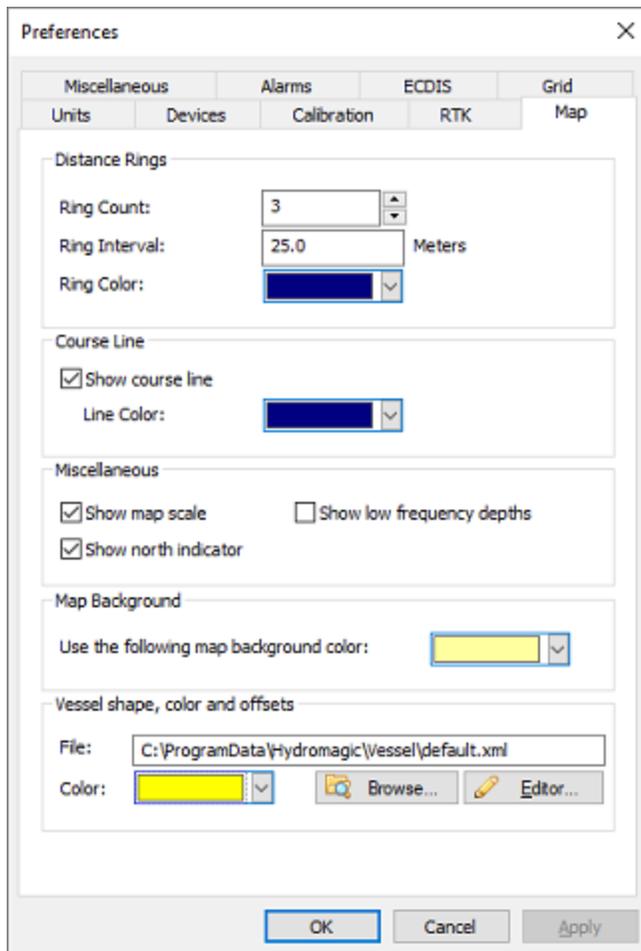
In Hydromagic, most of the screen space is taken up by the map display. This display shows, among other things, the background map, the hydrographic data collected and the location of your vessel. Extra information can also be added such as waypoints, comments, boundaries and planned lines. In this document we will go into more detail about how this display can be further adapted to our wishes.



*The map display in Hydromagic showing the vessel position with distance rings and course line.*

#### Select which items are shown

To select the items shown, open the global preferences dialog by selecting the "Preferences..." option from the "Tools" menu. In the dialog that appears, open the map display options by clicking the "Map" tab.



*Customize the map display using the "Map" tab in the preferences dialog.*

## Distance Rings

With the "Ring Count" option set to any value higher than zero, a set of rings will be drawn around the ship at fixed intervals. Use this function, for example, to see at a glance how far away the objects are from the boat. Another useful option is to set the interval to the distance between survey lines to get some sort of guidance. In addition to setting the distance between the rings and the number of rings, it is also possible to choose a drawing color for the rings, which is clearly visible against the background.



*Distance rings around your GNSS position at a specified interval.*

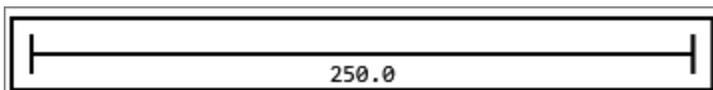
### Course Line

The course line can be used to see where the vessel is going. Please note that the course line is indicating the correct heading only when the NMEA0183 output of your GPS or RTK receiver outputs this information and the vessel is moving. Alternatively, a compass or RTK heading sensor can be used to determine the correct course.

To display the course line, simply enable the "Show course line" option. In addition, you can set the line color and width to improve visibility.

### Show map scale

By checking the "Show map scale" check box, the scale indicator can be included at the bottom left of the screen. This scale indicator gives an idea of the zoom factor that is currently being used. This setting also applies when printing the map display content. The distance shown in the scale indicator is in the horizontal units associated with the selected map coordinate system.



*The map scale will be drawn in the lower-left corner of the display.*

### Show north indicator

The "north indicator" shows the true north of the map display. By default, the map view is always to the north (rotated zero degrees), but changes when you rotate the map view using one of the [tool bar buttons](#) below. To include this indicator in the map view, check the "Show north indicator" check box. This setting also applies when printing the map display content.



*The map rotation buttons in the tool bar.*

## Show low frequency depths

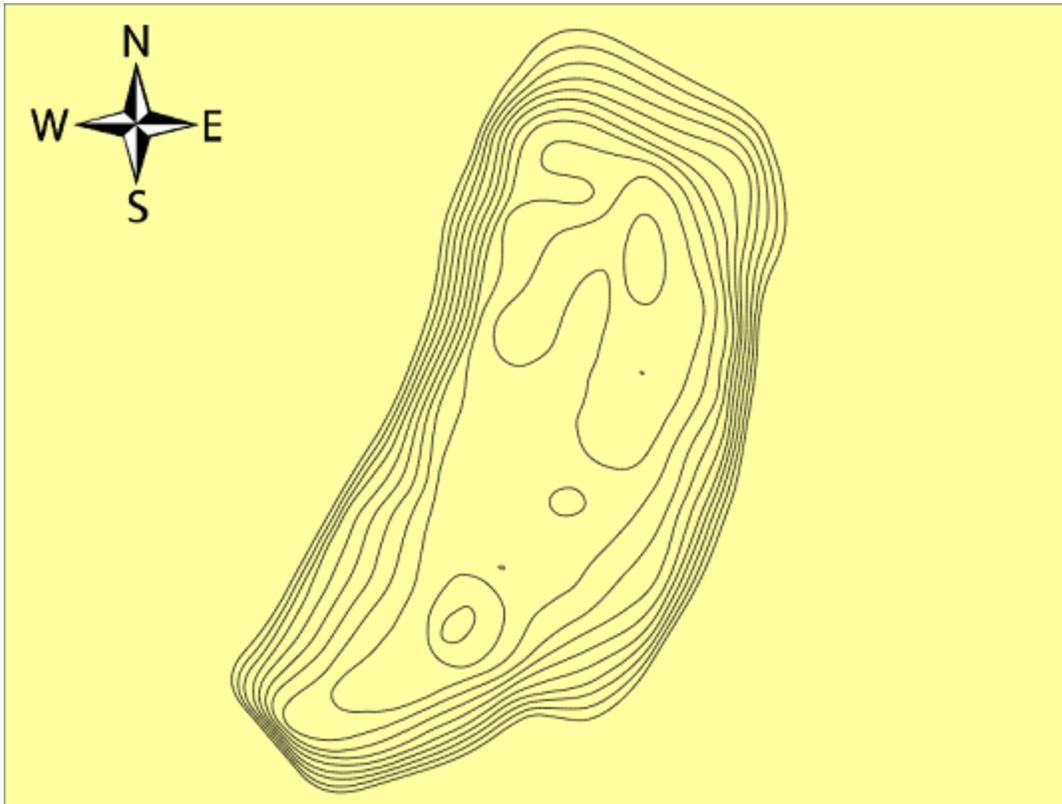
In Hydromagic software versions earlier than 9.0, only the high frequency depth of the raw data or processed sounding was shown on the map. Now it is possible to display the low frequency measured depths instead (when a dual frequency echo sounder is used). Please note that this setting does not affect [generated matrices](#) as they are generated statically with only one frequency.

It is important to ensure that you disable this feature when loading a project that has been recorded with a single frequency echo sounder, as otherwise no depths will be visible

## Map background color

With the background color setting, the color that can be seen behind objects, such as waypoints, depths, maps and other map attributes, can be chosen. However, this color cannot be seen behind raster maps that consist of image files such as maps downloaded with the [map download tool](#).

However, when a vector map is used, such as an AutoCAD DXF file, it may sometimes be necessary to choose a different background color to make the map more clearly visible. To adjust the color, click on the downward pointing arrow next to the colored area.



*Map display background color set to yellow.*

## Vessel shape color and offsets

When the GPS antenna and the echo sounder transducer are not directly above each other, it is very important to indicate the locations of these sensors relative to the boat. This can be done with the help of the "vessel designer" tool, which is described in more detail on the "[Vessel shape and offsets](#)" page.

When this does not apply to your vessel, and you are happy with the default vessel shape, you can always change the vessel shape color by clicking on the downward pointing arrow next to the colored area

## Customizing the way raw data files, soundings and matrices are displayed

Since it is possible in Hydromagic to set the presentation of raw data files, soundings and matrices separately, these settings cannot be found under the general map display settings. To set how these are displayed, right-click on the relevant folder and select the "Display Settings ..." option.

## 4.2 Loading Maps

### Loading Maps

When starting a [new project](#), it is recommended to load a map of the survey area. The map can then be used as guidance to setup your [boundaries](#), [cross sections](#) and [routes](#). Hydromagic supports a wide range of both [vector](#) and [raster](#) map formats, including:

- S-57 Electronic Nautical Charts;
- S-63 Electronic Nautical Charts;
- ESRI Shape Files;
- ARC/INFO Export Files;
- ARC/INFO Generate Files;
- ARC/INFO binary coverage files;
- ARC/INFO ASCII grid files;
- Atlas BNA boundary files;
- BSB nautical maps (version 3);
- GeoTIFF files;
- AutoCad DXF files;
- Microstation DGN files;
- PNG,GIF,JPEG and BMP image files;
- USGS Digital Line Graph files;
- OpenStreetMap XML files;
- IDRISI vector files.

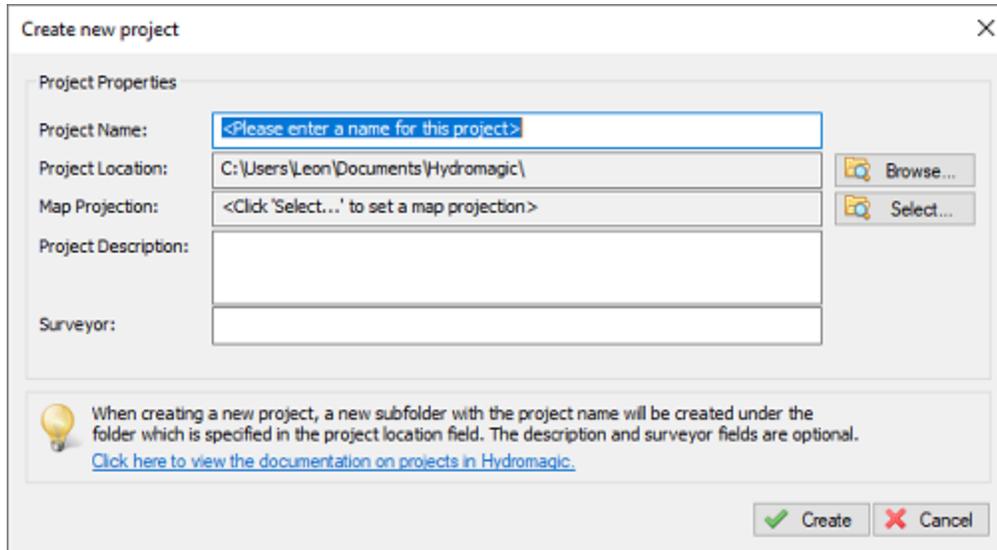
### Downloading Maps

In case no map data is available for the area to be surveyed, you can download maps from web sources automatically by entering the map's boundaries. How to do this is discussed in more detail in the chapter "[Downloading Maps](#)".

### Creating a new project

Before you will be able to add background maps, you should have loaded an existing project, or you have to create a new project. To do so, select the "New Project..." option from the file menu, fill out the required fields and click "OK".

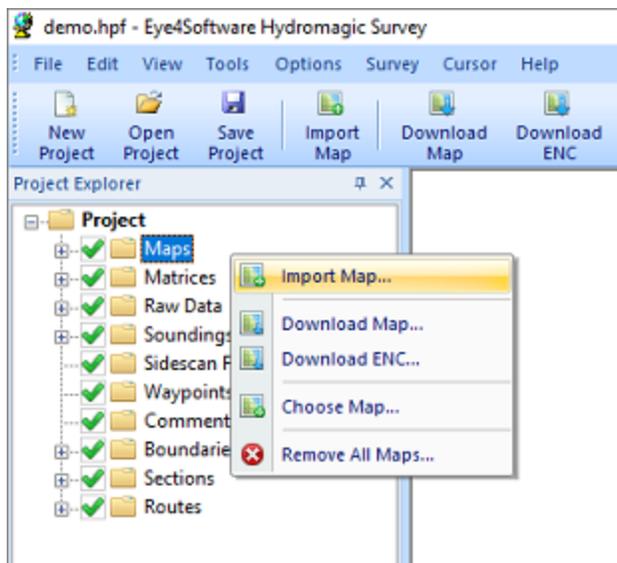
It is important to provide the correct projection for your new project, because you will not be able to change this at a later time.



*You have to create or open a project before you can import maps.*

## Importing maps

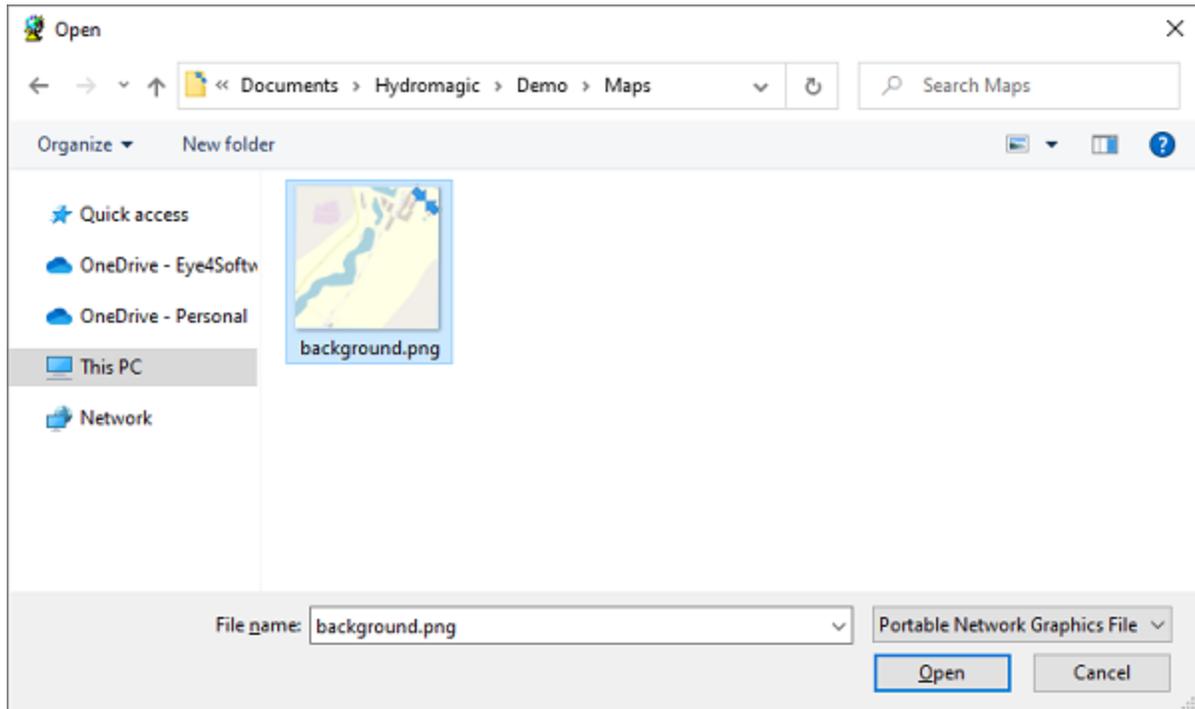
Maps are imported into the project, this means that the next time you open the project, the map will be loaded automatically. To import a map to the project, right click the "Maps" folder in the "Project Explorer" and select the "Import Map..." option. When the "Project Explorer" has been closed, you can also import a map using the menu bar by selecting the "Import Map..." from the "File" => "Import" menu. You can also click the "Import Map" button in the [tool bar](#).



*Right click the "Maps" folder in the "Project Explorer" to add a new map to the project.*

## Selecting Files

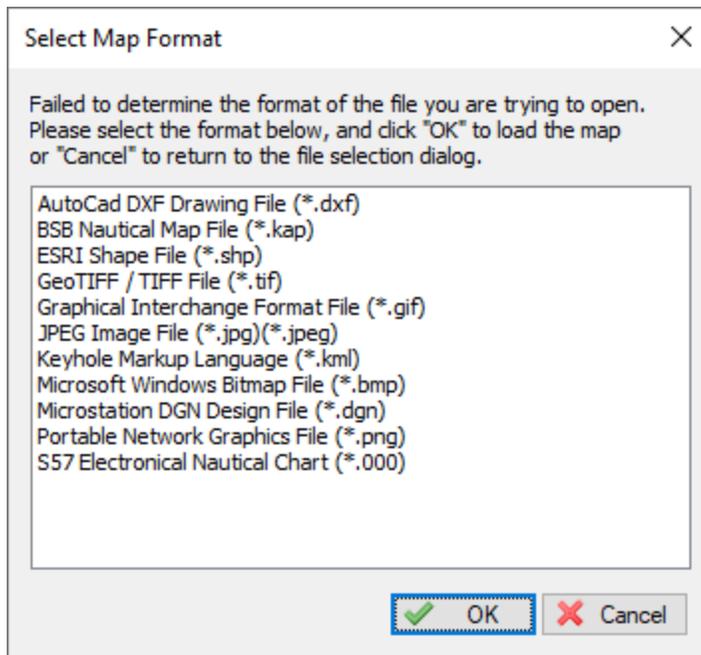
A file open dialog will be presented. By default all supported map formats are displayed. You can select one or more maps and click "OK" to load them into the project. When you have selected a file which is not already present in the "Maps" folder of your Hydromagic project on the disk, it will ask you whether you want it copied to the "Maps" folder. It is recommended to do this, otherwise you will lose the background maps when transferring the Hydromagic project to another computer.



*Select the file format and file name(s) for the files you to import into the loaded Hydromagic project.*

### Loading the selected map(s)

After selecting one or more map files in the file selection dialog, click the "OK" button to load and add the files to the project. When no file type has been set in the file open dialog, and the software doesn't know which format the map is, it will ask you as shown below. In this case select the correct file format for the selected files and click "OK".



*When the file format isn't set and the file extension unknown, Hydromagic may ask you for the file format.*

## 4.3 Loading IHO S-57 ENC's

### Loading IHO S-57 ENC's

S-57 is a standard for electronic navigational charts defined by the IHO (International Hydrographic Organization). S-57 is used for most official hydrographic charts around. Hydromagic supports both unencrypted and encrypted (S-63) charts. It is a [vector format](#) which contains features (lines, areas and points) and attributes like depth, symbol, lights etc.

### Obtaining S-57 maps

S-57 charts are available online (for free) for the following countries:

- United States (Inland and coastal waters);
- Austria (Inland);
- Belgium (Inland);
- Bulgaria (Inland);
- Croatia (Inland);
- Czech Republic (Inland);
- Germany (Inland);
- Hungary (Inland);
- Netherlands (Inland);
- Romania (Inland);
- Serbia (Inland);
- Slovakia (Inland);
- Swiss (Inland).

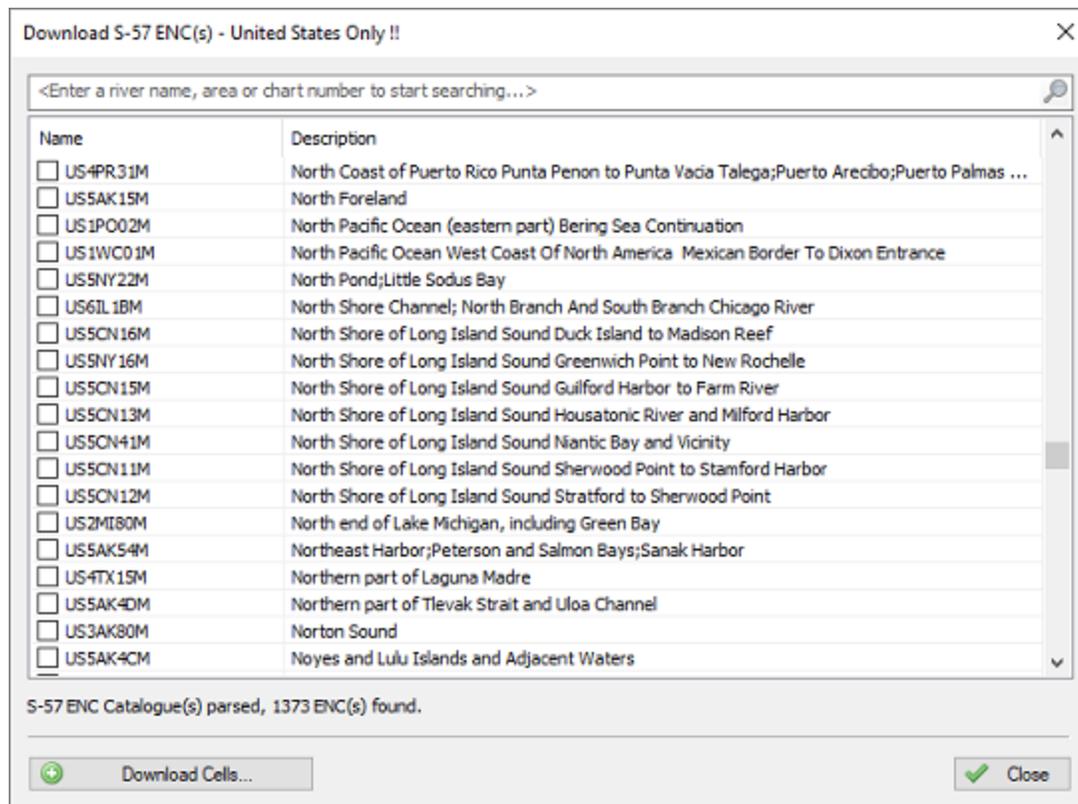
A more detailed list of sources for S-57 data can be found on our website:

<https://www.eye4software.com/hydromagic/documentation/download-s-57-encs/>. For other countries,

data can only be purchased in S-63 format. S-63 is the encrypted version of S-57 charts, also called SENC's (System Electronic Navigational Charts). For more information on S-63, please refer to the [next chapter](#).

## ENC Downloader

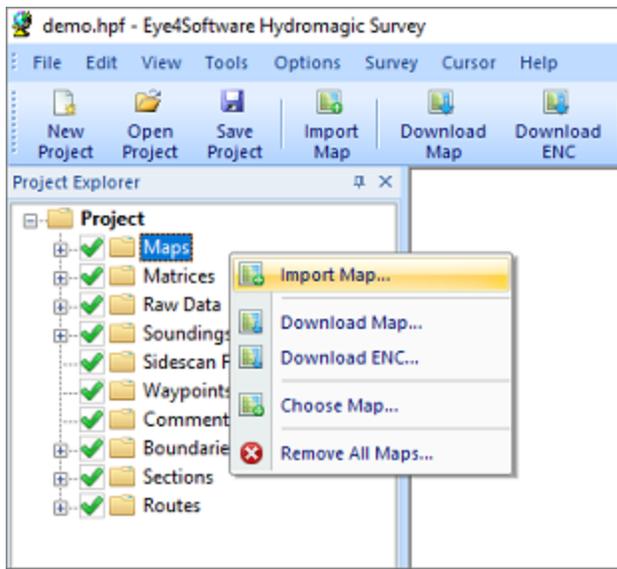
When you need navigational charts for the United States, you can also use the built in [ENC downloader function](#) (from Hydromagic version 9.0). This map downloader can be launched by selecting the "Download ENC..." function from the "File" menu, or by clicking the "Download ENC" button in the [tool bar](#).



*For the United States, you can use the built in ENC download tool as well*

## Loading S-57 maps

IHO S-57 charts can be loaded into Hydromagic by right clicking the "Maps" folder in the "Project Explorer", and selecting the "Import Map..." option as shown in the screen shot below. The file extension for both S-57 and S-63 charts is ".000". The software will auto-detect whether the selected chart is [encrypted](#) (S-63) or not.



Right click the "Maps" folder in the "Project Explorer" to add a new ENC to the project.

## 4.4 Loading IHO S-63 ENC's

### Introduction

IHO S-63 is a standard for encrypting, securing and compressing electronic nautical charts, also known as ENC's. The standard is using CRC32, SHA1, DSA and Blowfish algorithms to ensure protected delivery of nautical charts. Most commercial ENC's on the market today are protected using the S-63 standard.

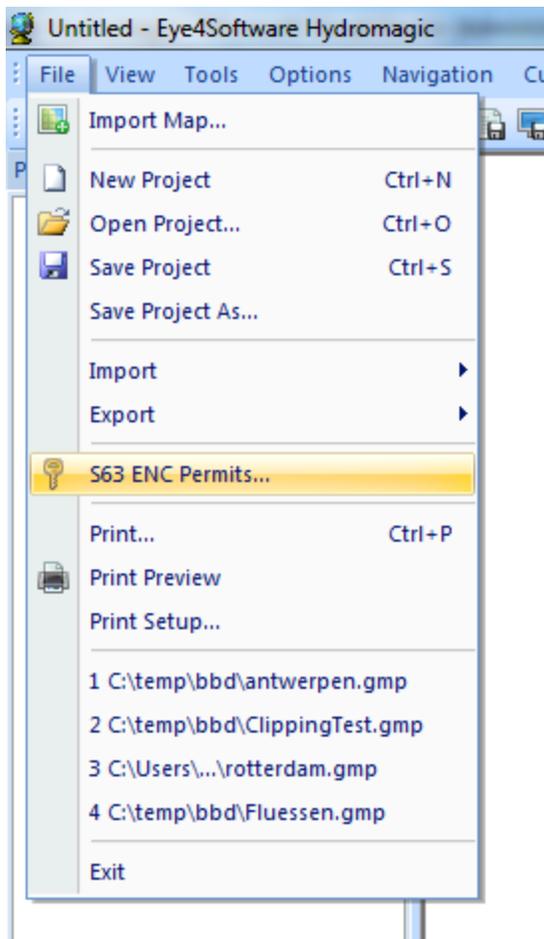
Each software installation contains a unique hardware id which is encrypted and cannot be read by the user. Charts purchased for this software will work on this installation of the software only. The hardware id is encrypted using the OEM and manufacturer id forming the 'Userpermit' which is used to purchase ENC's.

### Purchasing ENC's

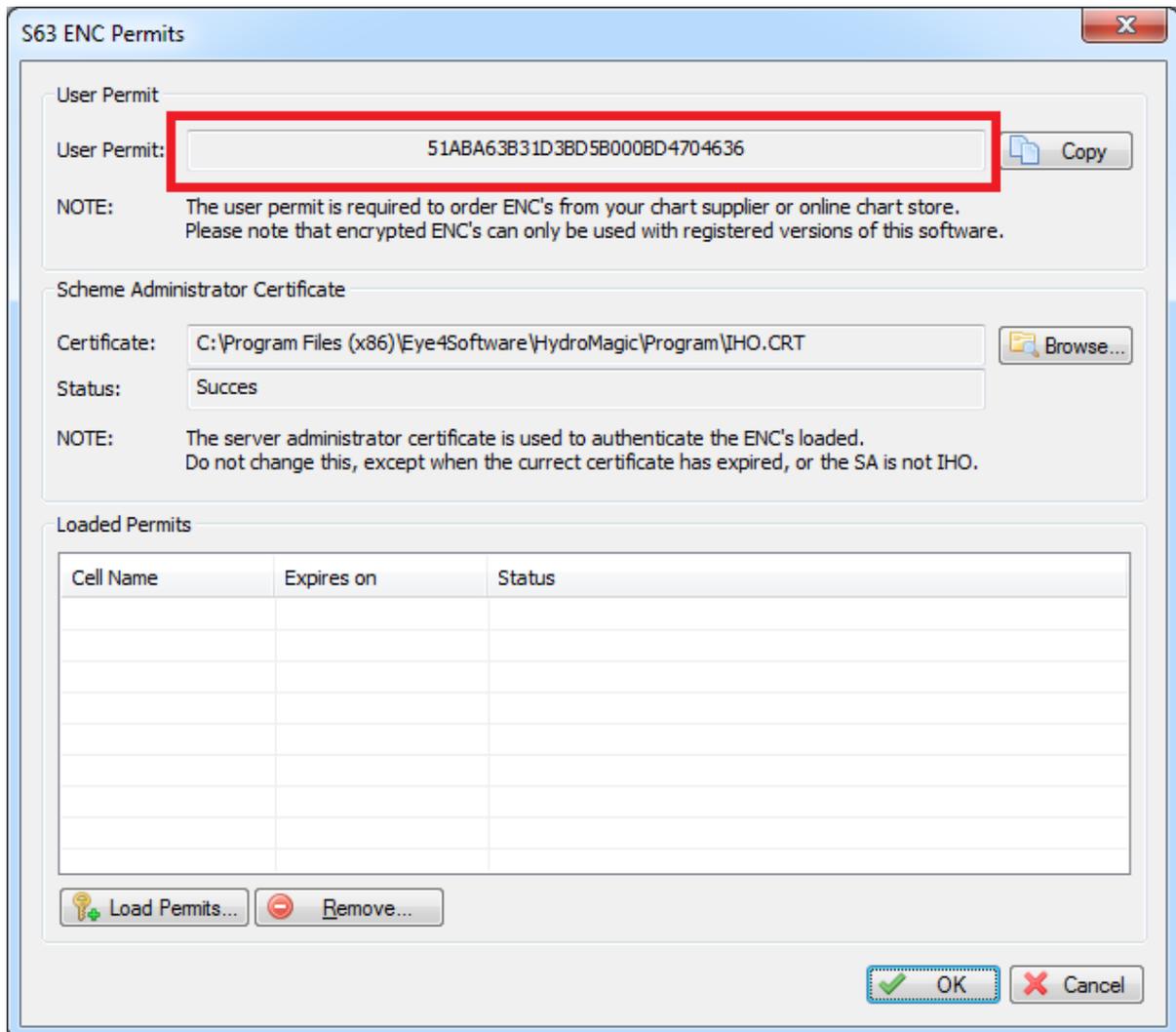
S-63 ENC's can be purchased through your local marine supplies dealer, or online reseller. In order to purchase ENC's you need the 'Userpermit', and register it with the online chart store or your local reseller. Because the hardware id is encrypted in the Hydromagic registration code or hardlock, it is only possible to use S-63 ENC's in registered versions of the software. It is not possible to load these charts when using a trial version.

### Obtaining the userpermit

To obtain the userpermit for your software installation, select the "S63 ENC Permits..." option from the "File" menu, as shown in the screenshot below:



This will launch the "S63 ENC Permits" dialog, which contains the userpermit, and can be used to activate purchased ENC's. When you are using a registered version of the software, the dialog should contain the userpermit which can be used to purchase ENC's.

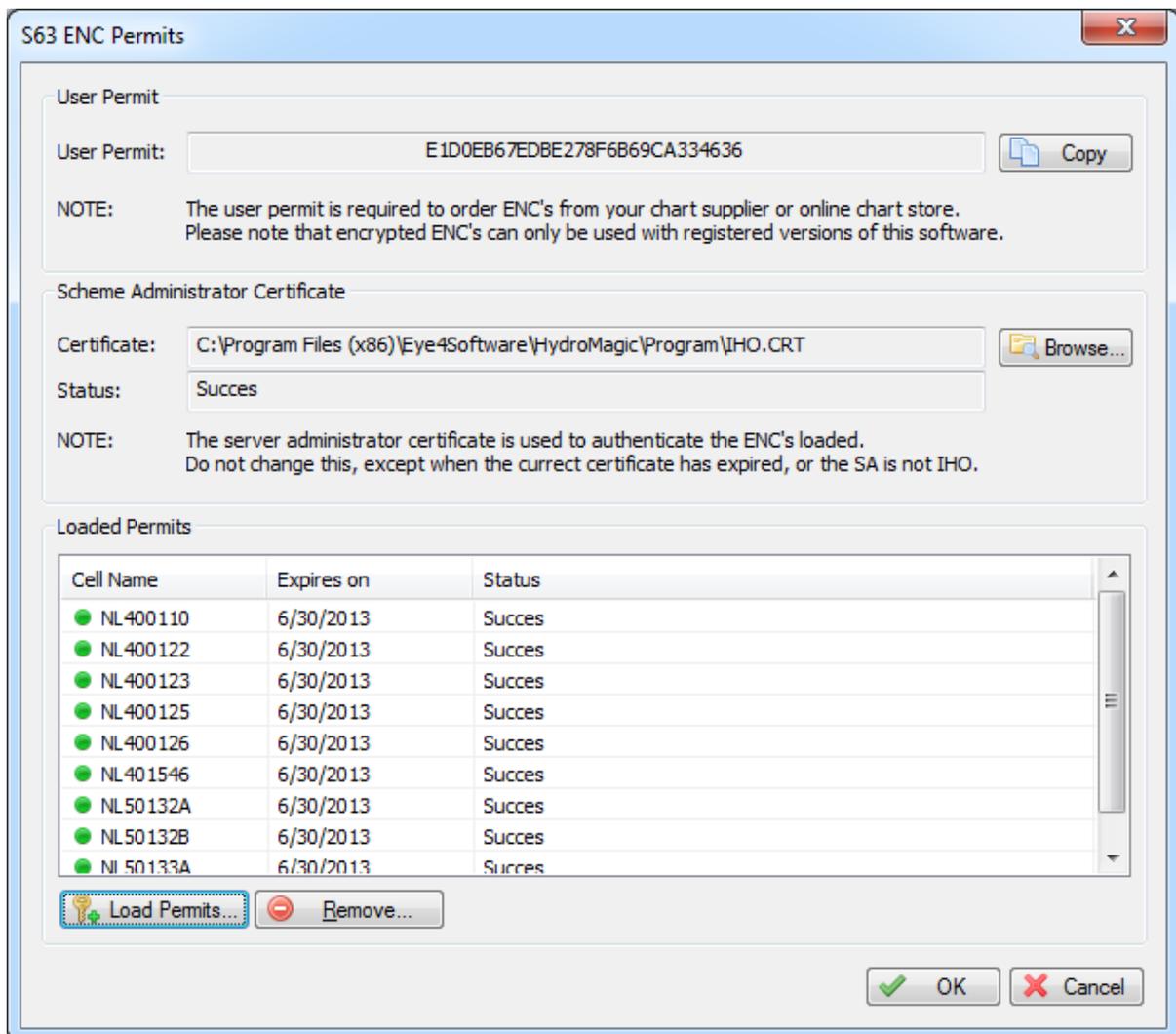


### Activation of purchased ENC's

When purchasing ENC's you will receive a "PERMIT.TXT" file from your reseller containing the 'Permits' for the purchased ENC's. After importing this file, you will be able to load these. To do so, relaunch the permits dialog by selecting "S63 ENC Permits..." from the "File" menu.

You can now load the "PERMIT.TXT" file, by clicking the "Load Permits..." button, and selecting the received permit file. You only have to do this once, imported permits will be stored until the software is reinstalled.

When the file has been imported successfully, you will see something like this:



In most cases the reseller can supply you with a "ENC Base CD" containing all the charts for your region. If not, you can download the charts, depending on your reseller, from [Primar](#) or [IC-ENC](#).

When the ENC's and permits are correctly installed, just select "Import Map..." from the "File" menu, and select the ENC you want to load. When trying to load an enc that has not been purchased, you will receive error SSE 11 as shown in the table below.

When an error occurs during the import of permits, or when loading an ENC, you will receive one of the errors described in section 4.4.5. In case of an error, contact your ENC reseller.

Error Code	Meaning
SSE01	Self Signed Key is invalid.
SSE02	Format of Self Signed Key file is incorrect.
SSE03	SA Signed Data Server Certificate is invalid.
SSE04	Format of SA Signed DS Certificate is incorrect.

Error Code	Meaning
SSE05	SA Digital Certificate (X509) file is not available. A valid certificate can be obtained from the IHO website or your data supplier.
SSE06	The SA Signed Data Server Certificate is invalid. The SA may have issued a new public key or the ENC may originate from another service. A new SA public key can be obtained from the IHO website or from your data supplier.
SSE07	SA signed DS Certificate file is not available. A valid certificate can be obtained from the IHO website or your data supplier.
SSE08	SA Digital Certificate (X509) file incorrect format. A valid certificate can be obtained from the IHO website or your data supplier.
SSE09	ENC Signature is invalid.
SSE10	Permits not available for this Data Server. Contact your data supplier to obtain the correct permits.
SSE11	Cell Permit not found. Load the permit file provided by the data supplier.
SSE12	Cell Permit format is incorrect. Contact your data supplier and obtain a new permit file.
SSE13	Cell Permit is invalid (checksum is incorrect) or the Cell Permit is for a different system. Contact your data supplier and obtain a new or valid permit file.
SSE14	Incorrect system date, check that the computer clock (if accessible) is set correctly or contact your system supplier.
SSE15	Subscription service has expired. Please contact your data supplier to renew the subscription license.
SSE16	ENC CRC value is incorrect. Contact your data supplier as ENC(s) may be corrupted or missing data.
SSE17	Userpermit is invalid (checksum is incorrect). Check that the correct hardware device (dongle) is connected or contact your system supplier to obtain a valid userpermit.
SSE18	HW_ID is incorrect format.
SSE19	Permits are not valid for this system. Contact your data supplier to obtain the correct permits.
SSE20	Subscription service will expire in less than 30 days. Please contact your data supplier to renew the subscription license.
SSE21	Decryption failed no valid cell permit found. Permits may be for another system or new permits may be required, please contact your supplier to obtain a new license.
SSE22	SA Digital Certificate (X509) has expired. A new SA public key can be obtained from the IHO website or from your data supplier.
SSE23	Non sequential update, previous update(s) missing try reloading from the base media. If the problem persists contact your data supplier.
SSE24	ENC Signature format incorrect, contact your data supplier.
SSE25	The permit has expired. This cell may be out of date and MUST NOT be used for Primary NAVIGATION.
SSE26	This ENC is not authenticated by the IHO acting as the Scheme Administrator.

Error Code	Meaning
SSE27	ENC is not up to date. A New Edition, Re-issue or Update for this cell is missing and therefore MUST NOT be used for Primary NAVIGATION.

## 4.5 Supported Raster Formats

### Raster maps

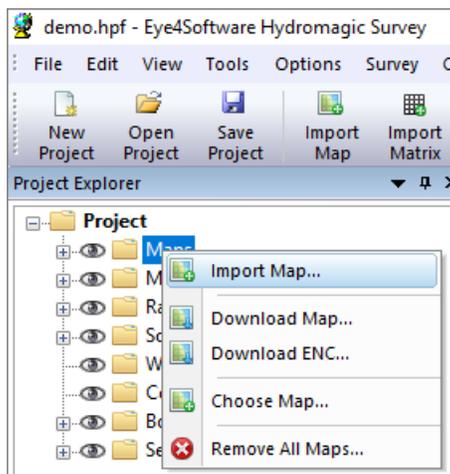
The software is shipped only with a couple of demo maps, because it is not doable to bundle it with all the most recent and detailed maps all over the world. To make sure almost any map can be loaded, a wide range of [file formats](#) is supported. This makes that Hydromagic can be used with the most common used map formats. Two types of maps are supported: [vector maps](#) and raster maps. The list below show some information on some of the raster map formats supported.

### Supported Raster Maps

Raster maps are basically bitmap images. They only contain some image data, and in some cases (GeoTIFF) some geo-referencing information. These maps do not support high zoom levels, because they are limited by the number of pixels the map is stored in. The following raster formats are supported:

- Arc/Info ASCII Grid files;
- BSB nautical map files;
- GeoTIFF / TIFF files;
- Graphical Interchange Format (GIF) files;
- JPEG Image files;
- Microsoft Windows Bitmap (BMP) files;
- Portable Network Graphics (PNG) files;
- XYZ gridded elevation data (ASCII or binary);

You can import a vector map into your project by right clicking the "Maps" folder in the "Project Explorer" and selecting the "Import Map..." option from the context menu as shown in the screenshot below:



**Right-click the "Maps" folder in "Project Explorer" to import a raster map.**

## GeoTIFF



GeoTIFF files are based on the TIFF (Tagged Image File Format) standard. This format allows you to insert all sorts of tags into an image file. GeoTIFF uses this to store information on calibration info and / or projection information in the file. When you try to load a map that only contains the calibration info (X,Y boundaries and scale information), you will be asked to set the projection parameters for the map.

## JPG, GIF, TIF, BMP and PNG image files



It is possible to use your own images to project routes, waypoints, tracks and real time position on. These images can be downloaded from the web (for instance, image created with Google Earth or maps exported from "OpenStreetMaps.org", or created by scanning paper maps. To use these images, they must have been geo-referenced calibrated in order to be used. A map is geo-referenced when it is shipped with projection and world files. When downloading an street map or satellite image from the built-in map downloading tool, these files will be generated by the software.

## BSB Nautical Charts



BSB map files are raster charts designed especially for nautical charts. They are used by several authorities like NOAA. Nautical maps can often be downloaded for free in the BSB format. When loading BSB files in Hydromagic, the map is displayed directly, because all geo-referencing and coordinate reference system info is included in the map. BSB maps use Lambert Conformal Conic, Mercator and Polyconic projection.

## 4.6 Supported Vector Formats

The software is shipped only with a couple of demo maps, because it is not doable to bundle it with all the most recent and detailed maps all over the world. To make sure almost any map can be loaded, a wide range of [file formats](#) is supported. This makes that Hydromagic can be used with the most common used map formats. Two types of maps are supported: vector maps and [raster maps](#). The list below show some information on some raster map formats that are supported.

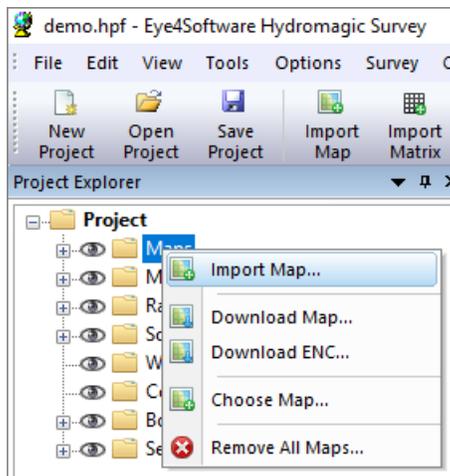
### Supported vector maps

Vector maps are files that contain objects instead of image data. A typical example of an object can be a line, point, polyline, polygon and more. Sometimes these objects are also associated with some user data or a row in a data table. Because the vector objects are drawn at runtime, there is no limitation on the zoom level like raster maps. The following vector formats are supported:

- AutoCAD DXF Drawing files;
- ESRI Shape files (SHP);
- Keyhole Markup Language files (KML);
- Microstation ISFF DGN Design (DGN) files;
- S57 Electronic Nautical Chart files;
- S63 Electronic Nautical Chart files;
- Arc/Info E00 Coverage files;
- Arc/Info Generate files;

- Atlas BNA Boundary files;
- GeoJSON map Files;
- Idrisi vector format files;
- MapInfo TAB files;
- Openstreetmap export files.

You can import a vector map into your project by right clicking the "Maps" folder in the "Project Explorer" and selecting the "Import Map..." option from the context menu as shown in the screenshot below:



**Right-click the "Maps" folder in "Project Explorer" to import a new map.**

### AutoCad DXF files



DXF stands for Drawing eXchange Format, and was developed by AutoDesk and is used in AutoCad software products. It is a vector format, this means the file contains objects rather than just image information ( pixels ). AutoCad DXF files are not designed to store georeferencing information, so after loading a DXF map, you will be asked to set the projection parameters.

### Microstation DGN files



DGN is a vector format used in Microstation CAD software. The software currently only supports the ISFF (Integrgraph Standard File Formats) DGN format. The newer V8 DGN format is not supported yet. In ISFF format, all objects are stored as blocks into a single file. Each Microstation design file starts with a TCB element, containing global information on the file, like scale, units and extends.

### ESRI shape files



ESRI shapefiles are vector maps often used to exchange data between GIS and CAD applications. Like DXF files, it contains objects rather than image information. An ESRI shapefiles consists out of 3 parts, a .shp, .dbf and .idx file. The database and index files are ignored by GPS Mapping Studio, it only uses the .shp file which contains the map objects. The .dbf database file is only used by GIS applications. Map calibration info is extracted from the shp file. When loading an ESRI shapefile, you have to set the projection parameters by hand.

## 4.7 Downloading Maps

### Downloading background maps

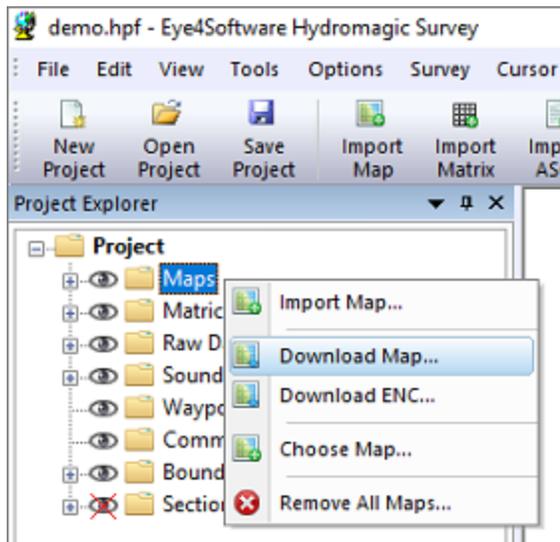
In circumstances where an [Electronic Nautical Chart](#) or [CAD drawing](#) of your survey area is not available, you can use the built-in background map download feature in Hydromagic. It allows you to use street maps or satellite imagery from Google, Bing or OpenStreetMaps as background [\(raster\)image](#) for your [project](#).

The map tiles are downloaded from the provider of YOUR choice (Internet connection required, so it is recommended to prepare this in advance when you are in the office), and combined to form a map (raster)image, and geo-referenced to the projection you use in your project. Therefore you must select the map projection you are going to use before downloading any maps (during the creation of the Hydromagic project).

***Please note that storing map tiles locally breaks the terms of service for a couple of popular data providers like Google, Bing, and ArcGIS Online. Use this function at your own risk !***

### Map downloading tool

To start the map downloading tool, right click the "Maps" folder in the "Project Explorer", and select the "Download Map..." option from the pop up menu, as shown in the image below. Alternatively, you can select the "Download Map..." option from the "File" menu.



***The map downloading tool can be started from the Project Explorer.***

The background map download tool allows you to download street maps or satellite imagery from the following providers:

- OpenStreetMaps;
- Google;
- Bing (Virtual Earth);
- Nokia OVI maps;
- MapQuest maps;
- ArcGIS map service.

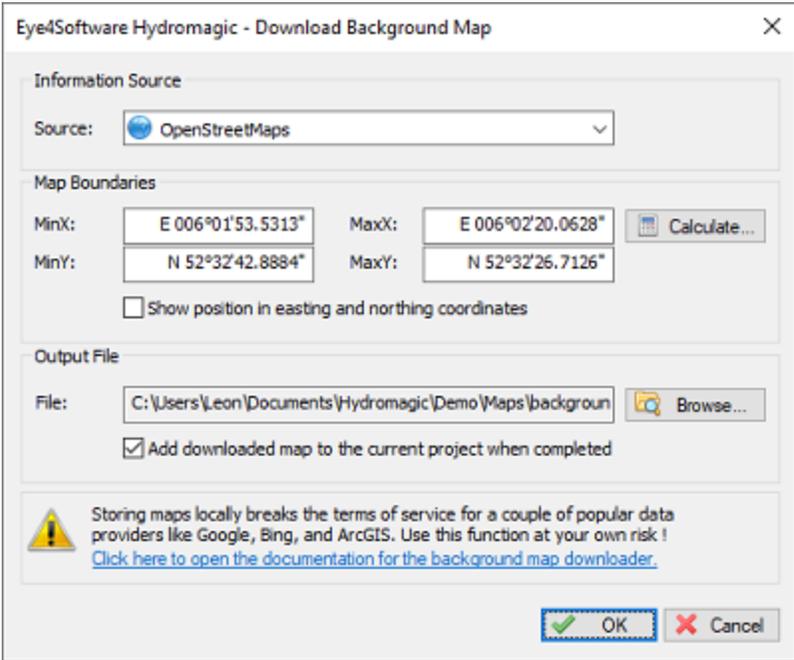
### Setting area and options

In order to download maps, you have to select the area you need a map for, and which provider you want to use. Use the "Information Source" selection box to select the provider and the type of map (street, satellite or hybrid).

The next step is to select the area. Select the smallest area as possible, because the smaller the area, the higher the zoom level and level of detail. You have to enter the upper-left and lower-right WGS84 coordinates of the area you are surveying in.

Because the maps are downloaded as 256 x 256 pixel image tiles, it is likely that the actual downloaded area is a bit larger than the requested area. You can obtain the coordinates by using a map viewer like Google Earth or others, or use the "Area selection tool" which is discussed in the next paragraph.

Finally, select the name of the output file (the file where the map is stored) and whether to add the map to the project directly. Depending on the type of map you are using, the image is stored as PNG (Portable Network Graphics) or JPG (JPEG-Compressed) file.



**The build-in background map downloading tool allows you to download and import a map for almost any location on the globe.**

### Area selection tools

As an alternative to manually entering the coordinates, you can calculate the map boundaries from a waypoint, raw data file, sounding, boundary, current location or an address. To do so click the "Calculate..." button. The following dialog will appear:

Select Download Area

Map Area Selection

Use current GPS position as center

Use address as center:

Use waypoint coordinates as center:

Calculate map boundaries from raw data file:

Calculate map boundaries from sounding:

Calculate map boundaries from boundary:

Find Address..

RAW00001

SNDG00001

BORDA01

Map Dimensions

Width: 500.00 m

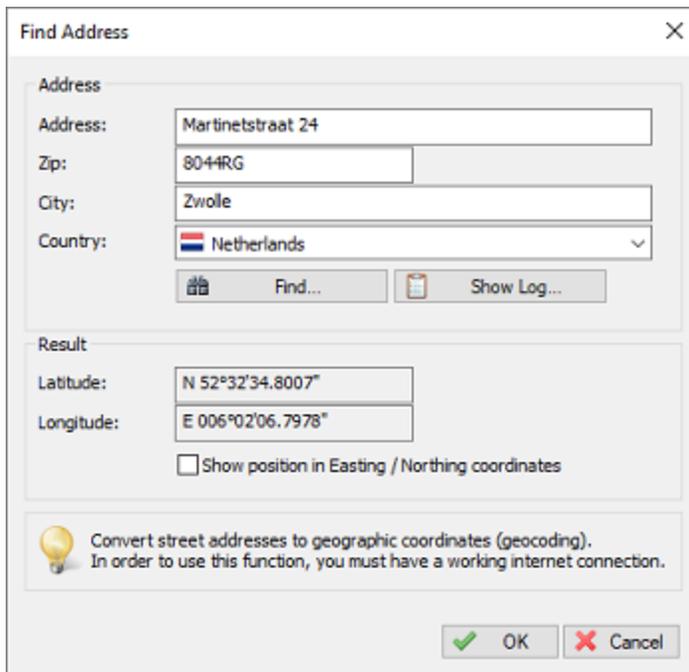
Height: 500.00 m

OK Cancel

**The map downloading tool offers multiple options to determine the map area.**

The first three options (GPS Position, Address and Waypoint) can be used to specify the center of the map. To calculate the map extends, you have to enter the map dimensions. When using one of the last three options (raw data file, sounding or boundary), the map dimension entries are disabled, and the boundaries are copied directly from the area covered by the selected file, sounding or boundary.

Please note that when using the "Find Address..." tool, make sure you are connected to the Internet in order to perform a Geo-Coding lookup. When facing problems with the address lookup tool, click the "Show Log..." button to get more detailed information on the problem.

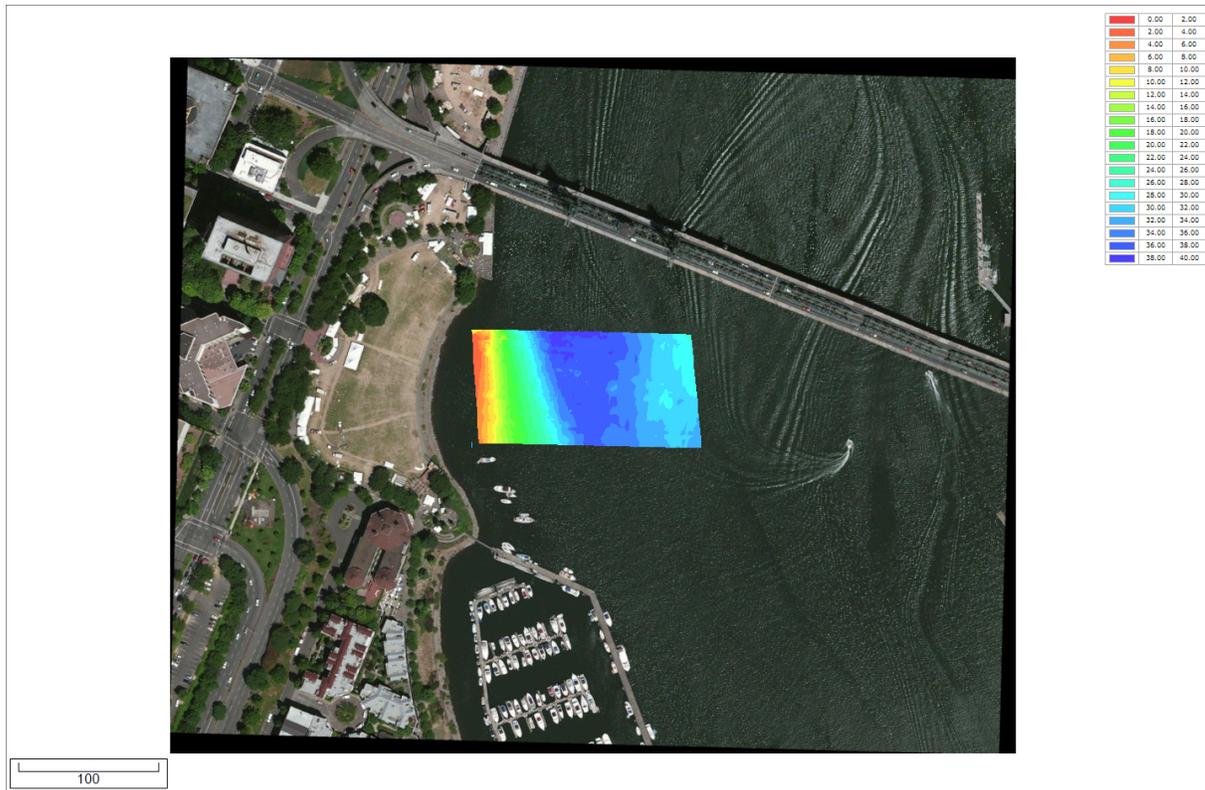


*You can use a street address as center of the map download area.*

## Download

To start downloading, just click the "OK" button. Please note that you have to be connected to the Internet at this moment. The download progress is shown in the status bar. The download time varies per provider, but should be between the 15 seconds and 2 minutes. Please be patient when the tool doesn't seem to be responding, this can happen when data is coming in slowly.

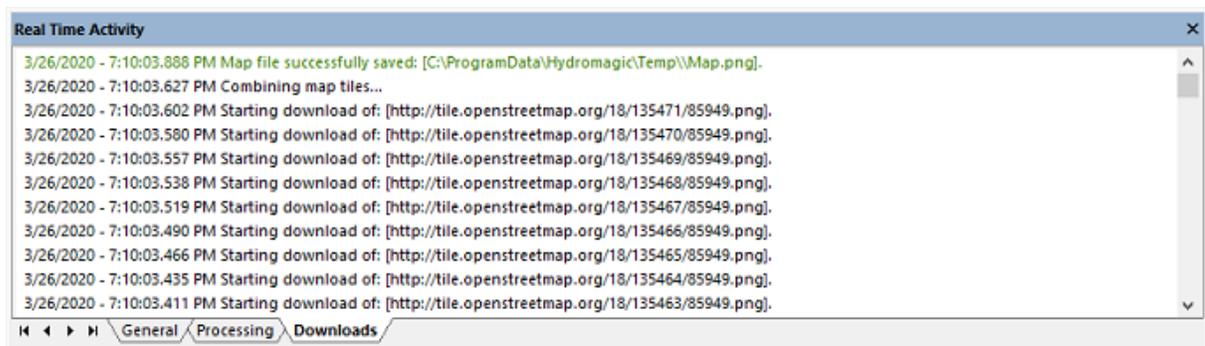
First, the tiles are downloaded and merged into a larger images, which is geo-referenced using the projection set. When downloading has been completed, and the "Add downloaded map to the current project when completed" option has been checked, the map will be added to the current Hydromagic project and displayed.



*Example of downloaded satellite imagery loaded as background image.*

## Troubleshooting

When a map download fails, make sure that your Internet connection is working. If this is the case, try whether you are able to download a map from a different data source. You click the "Download" tab of the [Activity View](#) to get more information on the issue:



*Download progress and issues will be displayed in the activity view.*

## 4.8 Downloading Electronic Navigational Charts

### Downloading Electronic Navigational Charts (S-57)

Since version 9.0 of Hydromagic, a built-in map downloader was added that enables you to download Electronic Navigational Charts (ENCs) in S-57 format directly from the internet. Make sure you download this at the office since an internet connection is required or otherwise data costs can be charged.

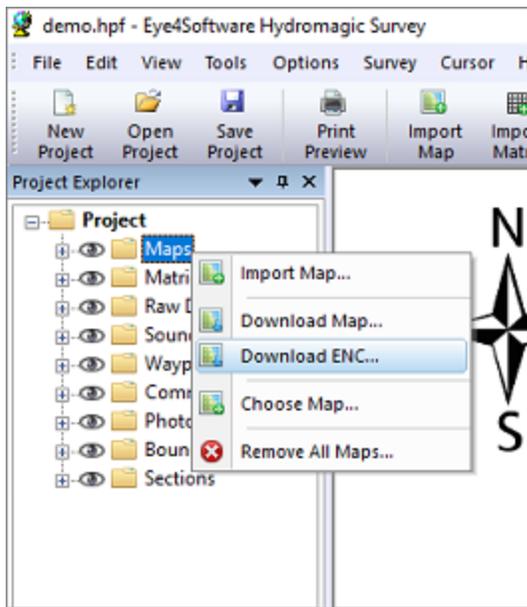
At the moment only maps for the United States are available. In the future also other countries will be added. All NOAA coastal (ENC) and USACE inland charts (IENC) can be downloaded using this feature.



*Example of an IHO S-57 cell downloaded and imported in Hydromagic*

### Download ENC tool

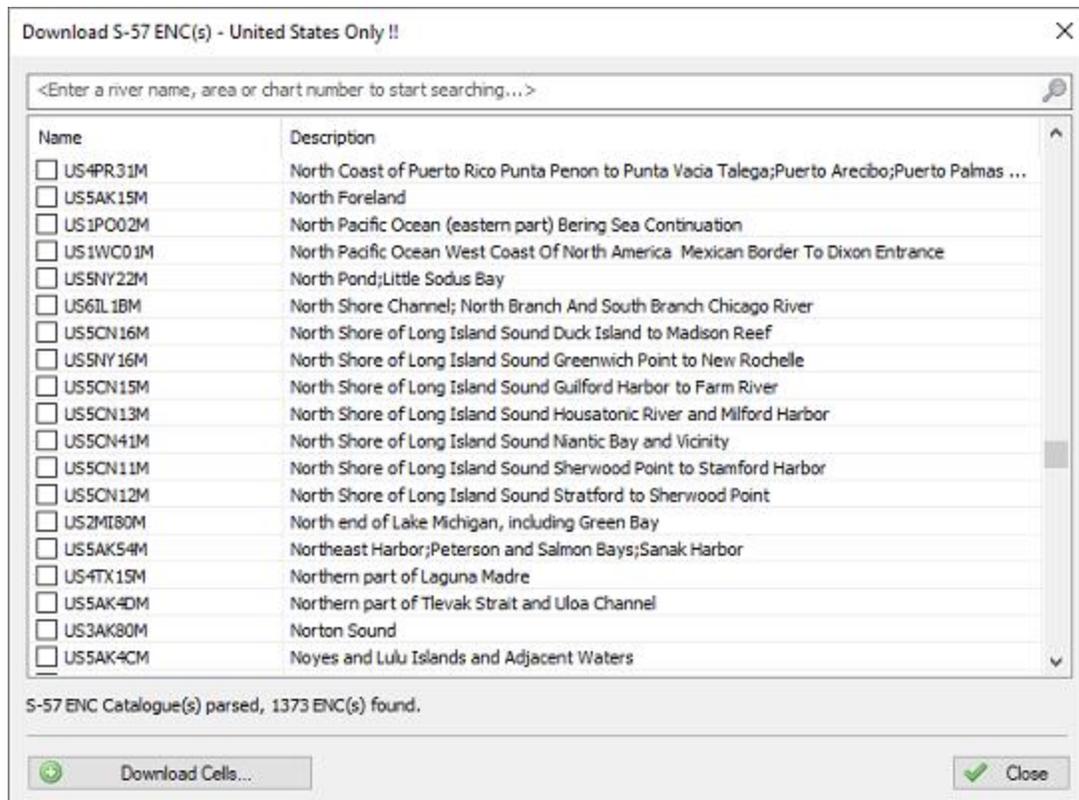
To start the map downloading tool, right click the "Maps" folder in the "Project Explorer", and select the "Download ENC..." option from the popup menu as shown in the image below.



Select "Download ENC..." from the "Maps" popup menu.

## Selecting charts

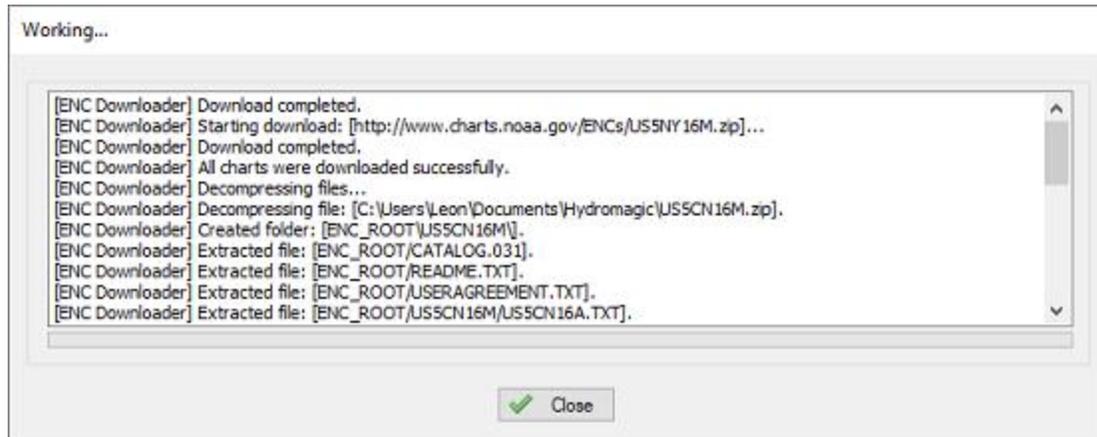
In the dialog that appears, you can select the charts to download by checking the box in front of the chart number. You can use the search field to search by chart name, area or number. The list will be filtered while you type.



Select the charts from the IHO chart catalogue by checking the items you want to download.

## Download charts

After selecting the charts to be included into the project, click "Download Cells..." to download the S-57 cells. While the software is downloading and installing the maps, the current progress will be shown.



*During the download, a window shows the progress of the downloading and installing process.*

When the chart(s) has been downloaded and installed, click the "Close" button to close the progress window. The selected chart(s) will be automatically loaded now.

## 4.9 Managing Maps

### Map Management Module

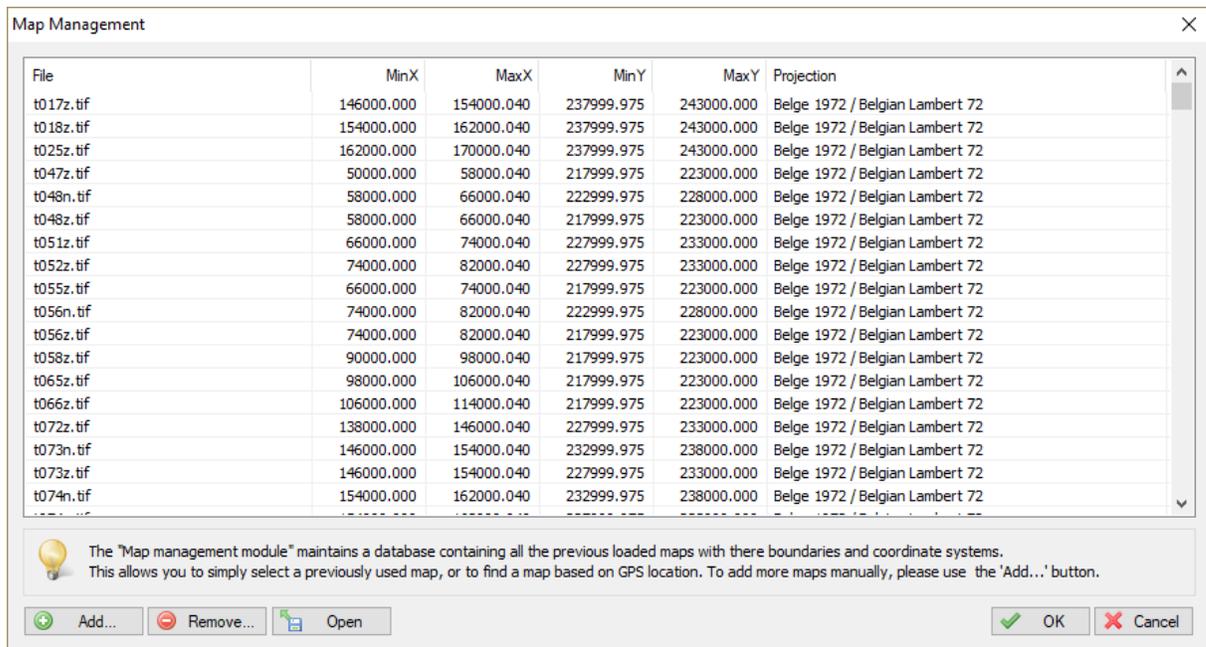
In Hydromagic, the map management module is a tool that allows you to quickly find the correct map for the area you are working in. When downloading or importing maps, information about these maps, like projection and geo-referencing is automatically added to a database. When you need one of the maps in this 'cache' later, you can add it to your new project by double-clicking.

When starting a project, you can refer to the map management module to open a map that is suitable for the new project, which means that it should match the coordinate reference system which is used in your new project.

### Launching map management

The map management window can be opened by selecting "Map Management..." from the "Options" item in the main window menu. Depending on whether you already loaded or created projects, the list of maps will be empty or contain a couple of items.

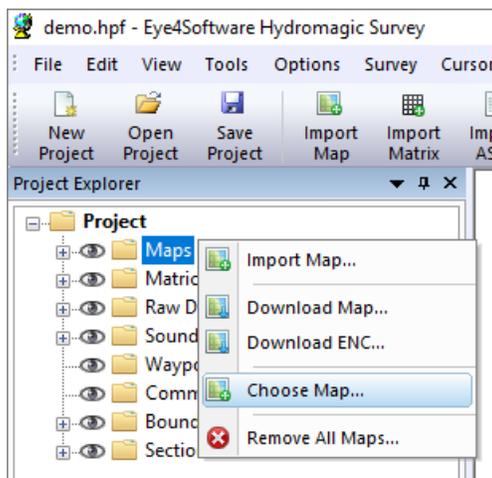




*The map management window contains a collection of imported maps.*

## Adding a map to your project

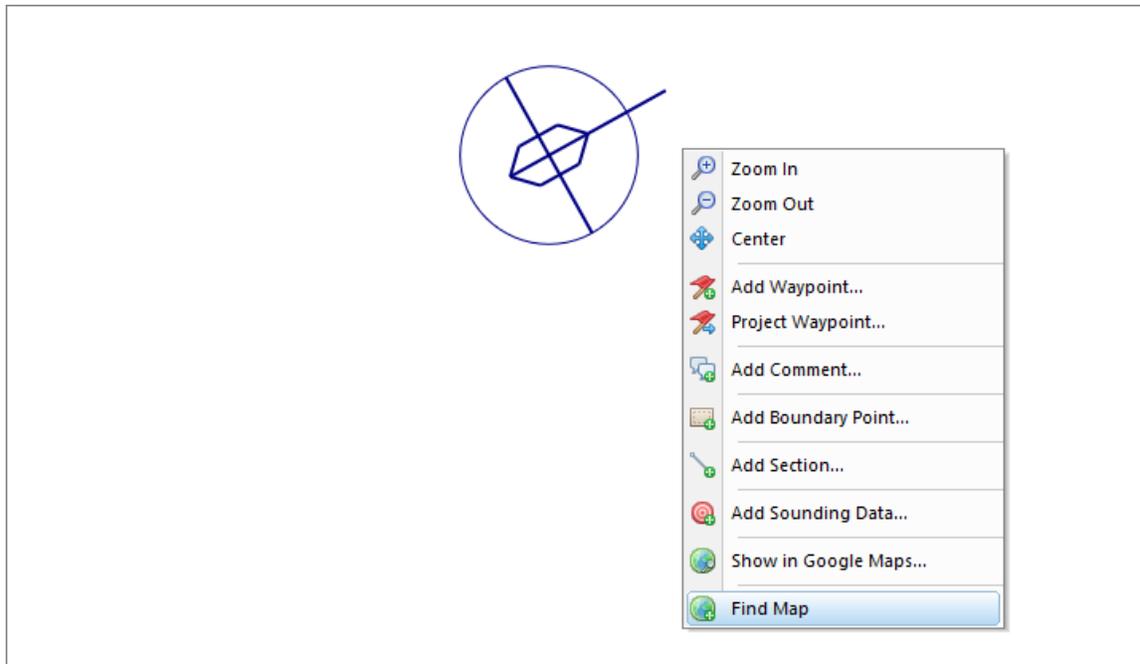
To add a recently loaded map to your project, just right click on the 'Maps' folder in the 'Project Explorer' and select the 'Choose...' map option. When the map management window shows up, just double click the map you want to include into your project.



*Select a map from the map management window by selecting the "Choose..." option from the context menu.*

## Finding a map

When a valid GNSS position is available, and your vessel is displayed on the map view, you can try to load a map from the map management database automatically. When a map is available for the area you are in, it will be automatically added to the project and loaded. To search for a map, right click in the map view window and select the "Find Map" option from the context menu:



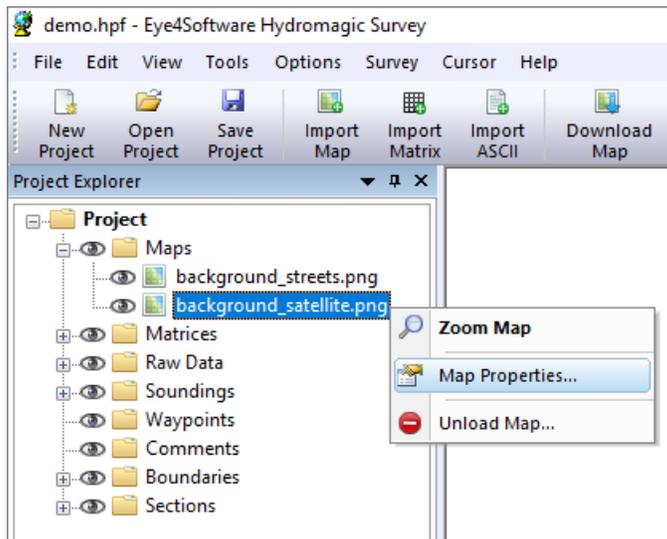
*Try finding a suitable map in the map management database.*

## 4.10 Layer properties and display options

### Layer properties and display options

In Hydromagic, each map or matrix has its own layer which contains the map itself, but also information on the type of map, the boundaries, dimension, scale and other meta-data. The layer properties dialog allows you to view this information and to adjust display options for [raster maps](#), like opacity and brightness.

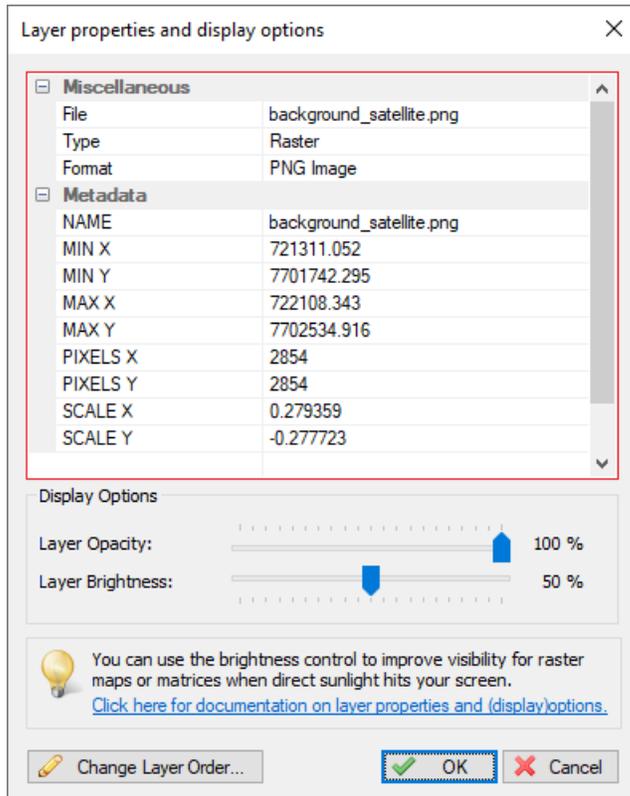
You can access this dialog by right-clicking on the map or matrix in the project explorer, and selecting the "Map Properties" options from the context menu:



*Select the "Map Properties..." option from the context menu.*

## Layer Meta-Data

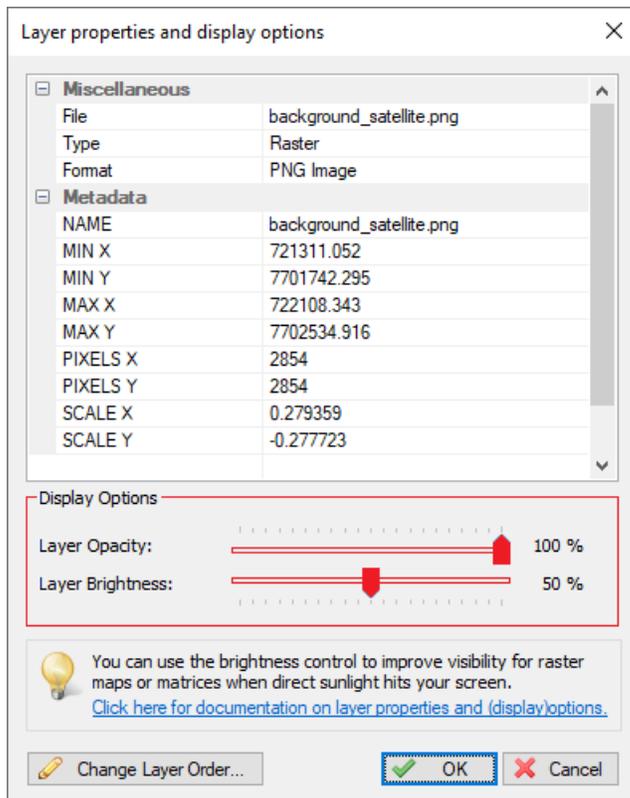
The first part of the dialog shows you some information on the layer, such as image size, scale, map boundaries, file name and layer type:



*The layer properties window shows map information and meta-data.*

## Layer Display Options

The layer display options allow you to adjust the display settings for raster and [matrix](#) map images. This setting will be disabled when you use this dialog on [vector maps](#). Please be careful when using the brightness option on matrix map images since it will distort colors, so the depth colors displayed will not match the color legend anymore.



*Use the sliders to adjust display options like brightness and opacity.*

## Layer Opacity

By default the opacity of a layer is 100 percent, which means it will fully cover the background color or layers behind it. By decreasing the opacity value using the slider, the layer will become more transparent so layers which are hidden after it will 'shine through', as in the example below. The opacity is stored in your project file, so this setting is not volatile. When moving the slider, the new setting will applied instantly, so you can see the result while adjusting the slider.



*Partially transparent satellite image over a street map*

*Partially*

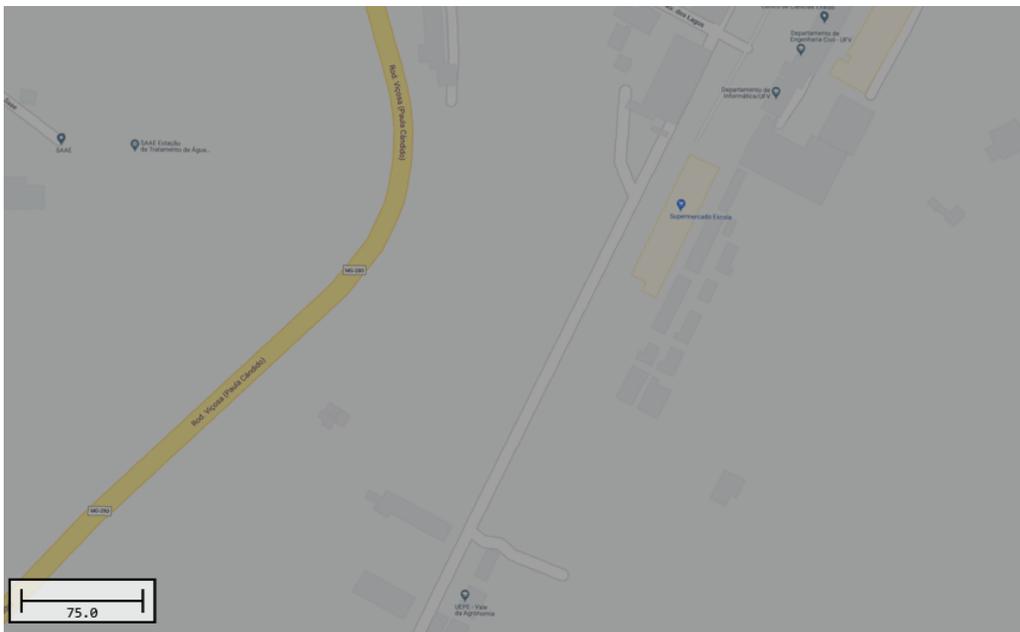
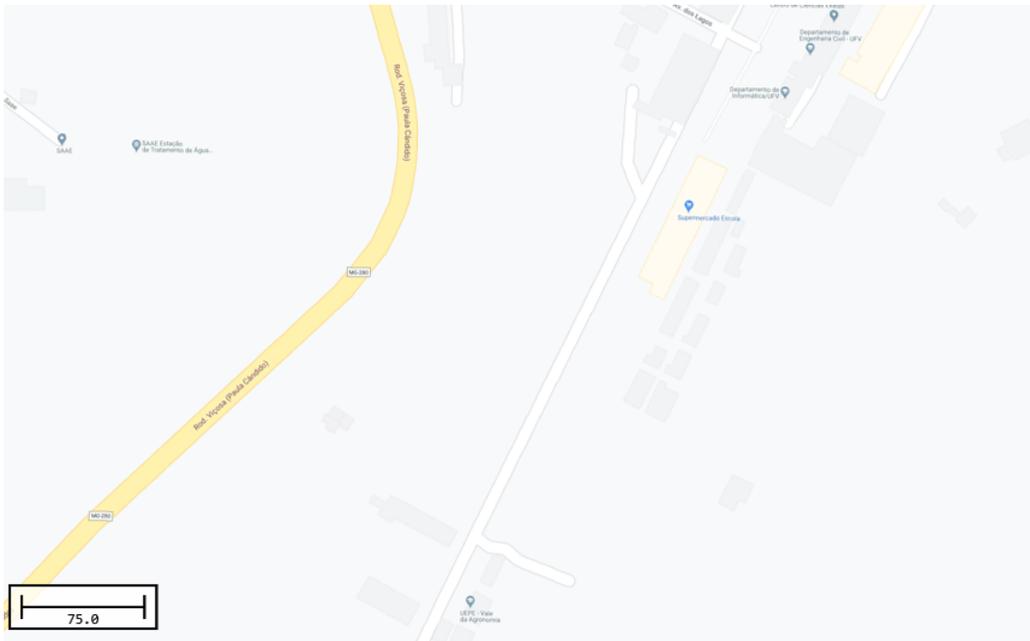
### Layer Brightness

The layer brightness option can be used to adjust the brightness for your background maps. This option is provided mainly to improve the visibility of satellite images when you are using your laptop outside on the boat when it is sunny weather. When you are using street maps, you can decrease brightness to have a better view on overlays such as map boundaries and the active route. You can adjust brightness value by using the brightness slider. When moving the slider, the new setting will be applied instantly, so you can see the result while adjusting the slider. The brightness setting will be stored in your project file. The default value for brightness is 50 percent.



*Satellite image with default brightness.  
image with increased brightness.*

Satellite

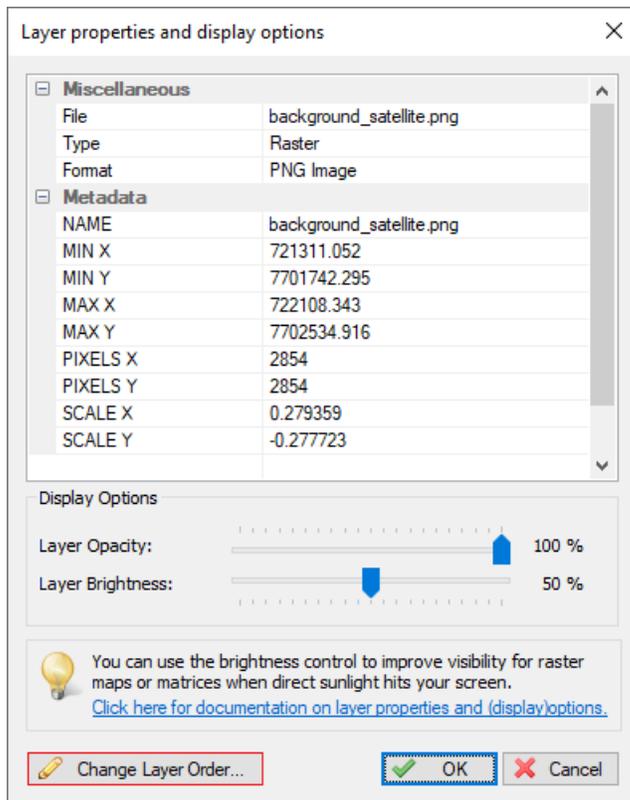


**Street map image with default brightness.**  
**Street map image with decreased brightness.**

**Street map**

## Layer Order

In addition to setting the layer opacity to show multiple layers at once, you can adjust the layer drawing order by clicking the "Change Layer Order..." button". By default the map that was imported, downloaded or generated the last will be displayed on top of other maps. You can change this order using this tool.



To change the layer drawing order, click the "Change Layer Order..." button.

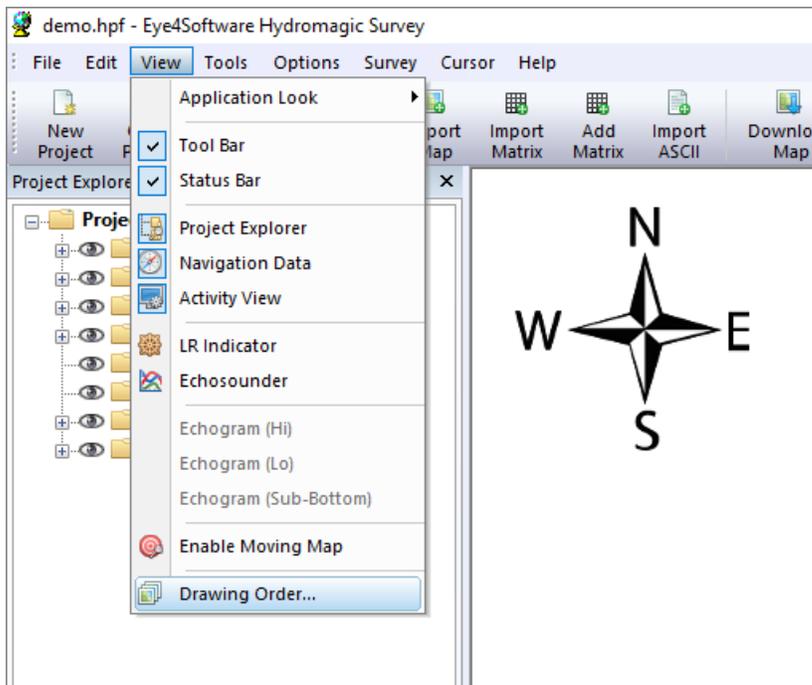
## 4.11 Changing drawing order

### Changing map drawing order

In Hydromagic, the map or matrix which has been loaded or generated last, will be drawn on top of other maps (layers). In cases where a map (partially) covers another map, you can control the order in which the maps are drawn to uncover the map. When using multiple maps, always draw vector maps on top of raster maps (unless the raster maps have transparency). You can also use this option to place vector maps on top of a matrix created by Hydromagic.

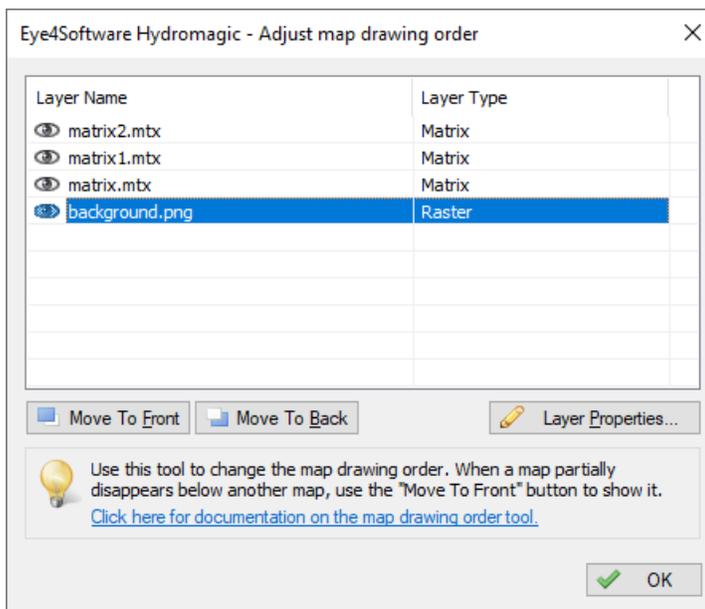
### Map drawing order tool

To change the map order, select "Drawing Order..." from the "View" menu. Depending on your tool bar configuration, you might also have the "Drawing Order" button which can be used as a shortcut for the menu item.



**To change the map drawing order, select "Drawing Order..." from the "View" menu.**

Select the map you want to move to the front or back and then click the "Move To Front" or "Move To Back" buttons to change the drawing order. Changes will be applied to the map display directly. To accept the new drawing order, click "OK" to close the tool. To adjust the brightness or transparency of the selected map, click the "Layer Properties..." button to open layer properties and display options



**Use the map drawing order tool to adjust the order in which maps are drawn.**

The "check" icon in front of the layer names shows whether a map has been set to invisible in the "Project Explorer". The map drawing order, transparency, brightness and visibility settings are all stored in your project file.

## 4.12 Placing waypoints

### Placing waypoints

A waypoint can be defined as a marked position on a map, somewhere on the earth, with known coordinates. A waypoint can be part of a route. In GPS receivers, a waypoint is a point that can be selected as a coordinate to navigate to, or it can be used to just display a symbol on a map.

In Hydromagic, you can add a waypoint to the map to mark a position with a symbol and small text. For larger descriptions, you can place a [comment](#). A waypoint can also be included in routes which can be created using the [built-in route planner](#).

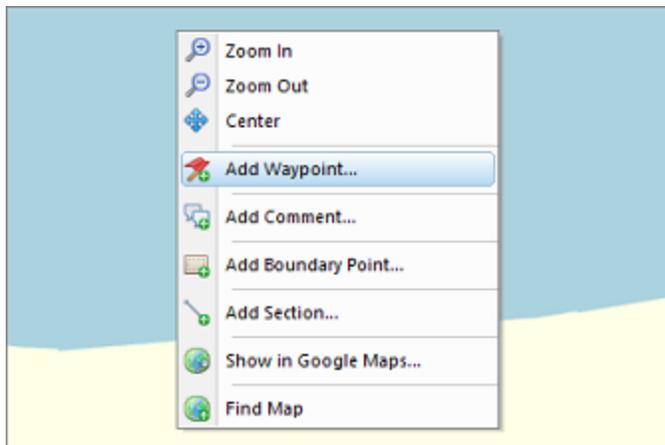


*Example of a waypoint placed on the background map.*

### Creating a waypoint

In Hydromagic, there are multiple ways to create a waypoint. You can create one manually from the "Waypoint Manager", using the "[Project Waypoint](#)" tool, or by right-clicking on the map. The easiest way is by clicking on the map so the waypoint is placed directly at the position pointed by the mouse cursor.

Zoom and pan over the background map until you find the position where you want to place the waypoint. Place the mouse cursor at this position, and click the right mouse button. From the context menu which appears, select the "Add Waypoint..." function to create and edit the new waypoint.



*Select the "Add Waypoint..." option from the context menu.*

In this window, you can set some additional information about the waypoint, like the name the symbol to be drawn on the map. It is also possible to customize the way the text label is presented (background color, text color and transparency). The "Attach Photo" section can be used to link a filename of a photo to the waypoint.

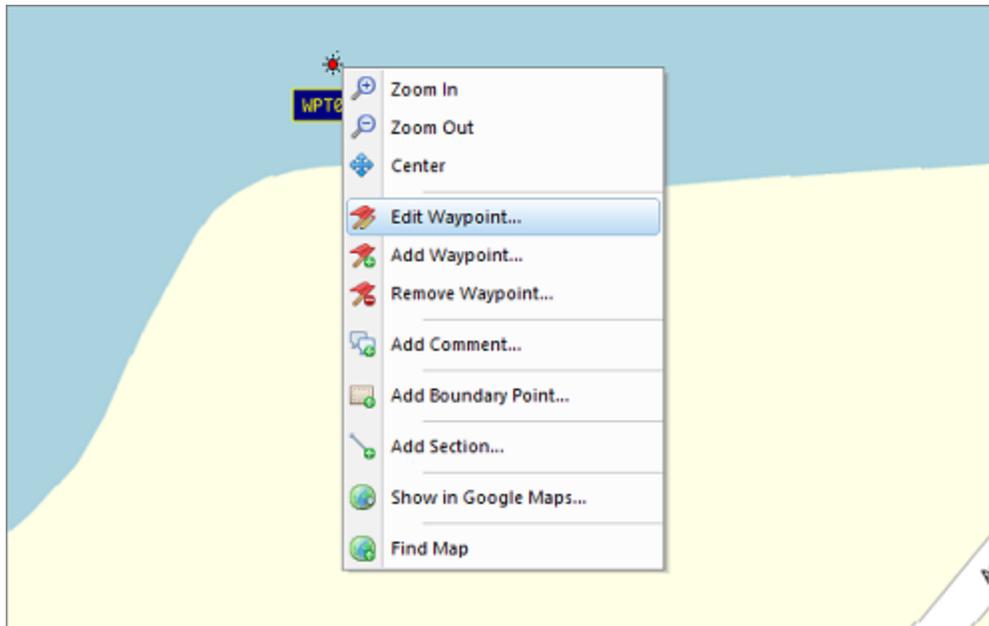
The positions are already set when you create the waypoint from the map. If you are creating the waypoint from the "Waypoint Manager", the current GNSS position is used. You can toggle the coordinate fields to display either the WGS84 or projected positions, by checking the "Show position in Northing / Easting coordinates" check box. You may alter the positions before saving the waypoint by clicking "OK".

The screenshot shows the "Edit Waypoint(s)" dialog box. It is organized into three main sections: "Waypoint", "Label", and "Attach Photo".  
- In the "Waypoint" section, the "Label" field contains "WPT005". The "Easting" field has the value "721485.917" and the "Northing" field has "7702000.813". A "Find Address..." button is located to the right of the Easting field. The "Symbol" dropdown menu is set to "Navaid, Red". A checkbox labeled "Show position in northing / easting coordinates" is checked.  
- In the "Label" section, the "Text Color" dropdown is set to yellow, and the "Label Color" dropdown is set to blue. The "Draw waypoint label" checkbox is checked, while the "Transparent label" checkbox is unchecked.  
- In the "Attach Photo" section, the "Image File" field contains the text "<Click the 'Browse...' button to select an image>". Below this field are "Show..." and "Browse..." buttons.  
- At the bottom of the dialog are "OK" and "Cancel" buttons.

*Use the dialog which appears to customize the waypoint presentation.*

## Modifying waypoints

To modify a waypoint after it has been placed on the map, select the waypoint with the mouse (the mouse cursor should change from arrow to hand) and click the right mouse button, and select "Edit Waypoint..." as shown below. You will be able to alter all its properties including the waypoint location. To remove a waypoint from your map, you can select the "Remove Waypoint..." option from the menu instead.



Select the "Edit Waypoint..." option to modify an existing waypoint.

## Moving waypoints

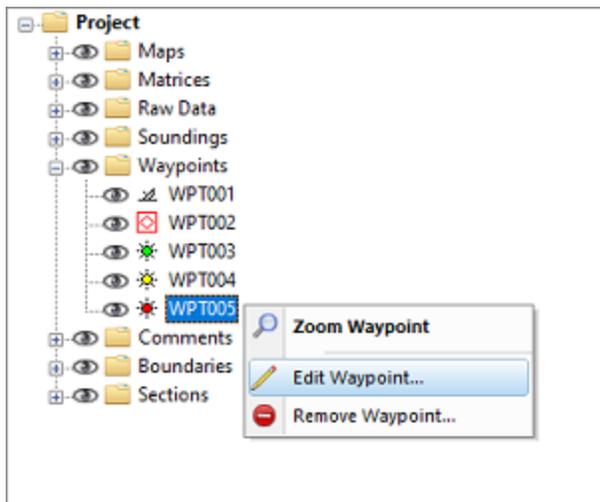
To move a waypoint, you can modify a waypoint's coordinates manually as described above, or you can use the mouse to drag the waypoint to its new position. In order to move a waypoint, you have to make sure the "Lock Objects" function has been switched off first (version 9.0 and older only). You can find this function on the [toolbar](#) and in the "Cursor" menu at the top of the screen. After switching off this function, select the waypoint symbol with the mouse, click and hold the left mouse button and drag the waypoint to its new location.



Switch off to move waypoints.  
(version 9.0 and older only!)

## Waypoints in the "Project Explorer" view

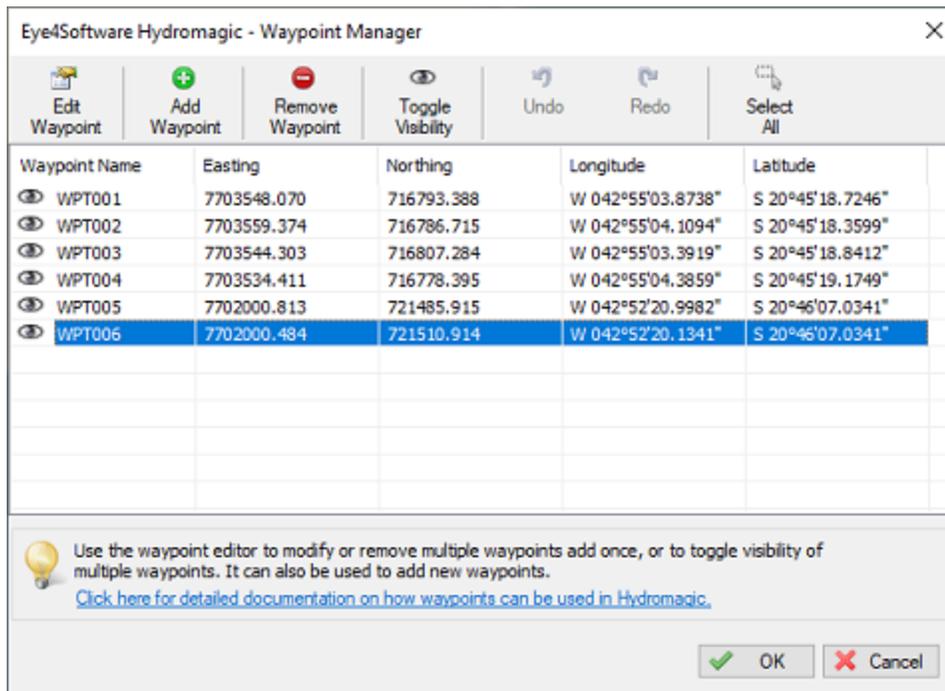
Each waypoint that is part of your project can be found in the "Project Explorer" view. When the "Project Explorer" is not visible, you can show it by selecting the "Project Explorer" option from the "View" menu at the top of the screen. The waypoints will be displayed when expanding the "Waypoints" folder in the project tree. You can right-click a waypoint to show more option, or double-click it to center the map on a waypoint position.



Waypoints can be accessed from the "Project Explorer" view as well.

## Waypoint Manager

To view a list off all the waypoints in your [project](#), you can open the "Waypoint Manager", by right clicking the "Waypoints" folder in the "Project Explorer" and selecting the "Manage Waypoints..." option. It can be used to toggle the visibility of multiple waypoints at once, or to delete a selection of waypoints.



The "Waypoint Manager" allows you to perform operations on multiple waypoints at once.

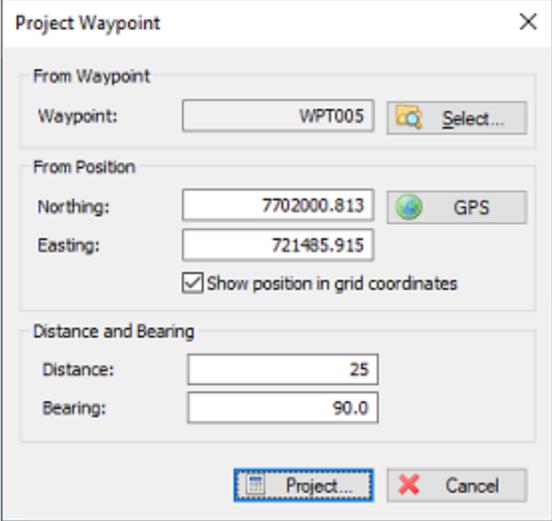
## 4.13 Projecting Waypoints

### Projecting a waypoint

When projecting a waypoint, you basically create a waypoint on a certain distance and heading from a known position. In Hydromagic, there are multiple ways to project a waypoint. You can project the

waypoint from another waypoint, a position on the map, a manually entered position or the current GPS position. In this example, we will project a waypoint, using another waypoint as a reference.

To open the "Project Waypoint" window, select the "Tools" => "Project Waypoint" option from the menu. The following window will appear:



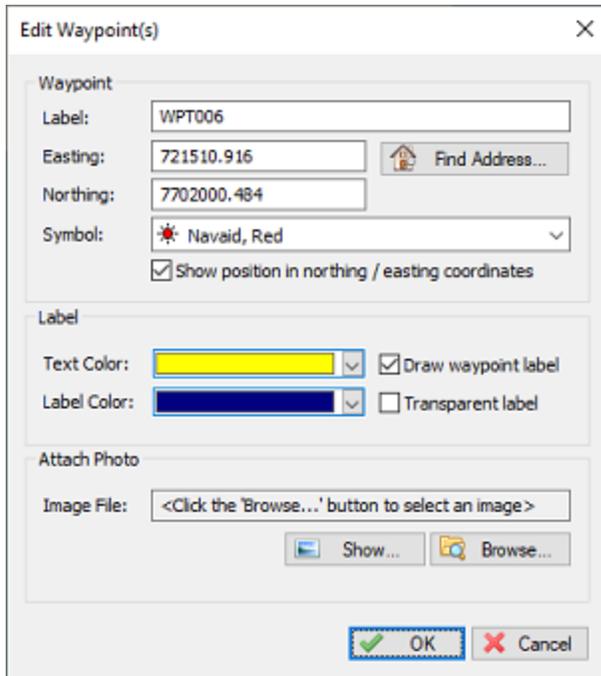
*Use the "Project Waypoint" tool to project a new position with an existing waypoint as reference.*

In this window, you will find 2 buttons, a "Select..." button, to select the source waypoint, and a "GPS" button which can be used to automatically enter the current GPS position as source location. For this example, we will use another waypoint, so we click the "Select..." button and choose a waypoint from the list. If there is no waypoint in the list, you can walk through the [Creating Waypoints](#) tutorial to create a one. Once you selected a waypoint, the coordinates of this waypoint are copied into the Latitude / Longitude fields. For this example, we will create a new waypoint at 100 meters and a 45 degrees course from the selected waypoint. After we entered these values, we click "Project...".

When you want to place a new waypoint at a position projected from your current GNSS receiver position, click the "GPS" button to copy your current position into the coordinate fields. These coordinate fields can also be used to enter a reference position manually. Depending on the state of the "Show position in grid coordinates", you can enter the coordinate either in WGS84 or projected coordinates (your project's coordinate reference system will be used).

### Saving the waypoint

An "Edit Waypoint" window will appear with the location of the projected waypoint already entered. You can now modify the waypoint's attributes such as waypoint name and symbol. Note that when a new waypoint is created, by default the symbol and label properties are inherited from the last created waypoint. This might be very handy when creating multiple waypoints which should use the same attributes.



**Edit Waypoint(s)**

Waypoint

Label: WPT006

Easting: 721510.916  Find Address...

Northing: 7702000.484

Symbol:  Navaid, Red

Show position in northing / easting coordinates

Label

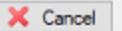
Text Color:   Draw waypoint label

Label Color:   Transparent label

Attach Photo

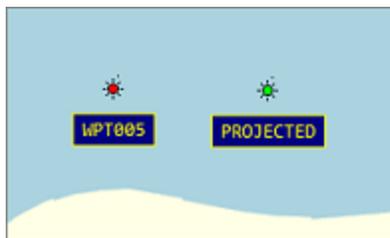
Image File: <Click the 'Browse...' button to select an image>

 Show...  Browse...

 OK  Cancel

*A new waypoint will be created with the projected coordinates.*

When done, click "OK" to save the waypoint. When looking at the map, you will find the new "PROJECTED" waypoint projected at an angle of 90 degrees and a distance of 25 meter from the selected waypoint.



*An example of a projected waypoint.*

## 4.14 Placing comments

### Using comments in Hydromagic

In Hydromagic, it is possible to add comments or labels to your maps. You can use comments or labels to, for instance, mark places, or to add extra text to the map before sending it to a printer or plotter. You can place comments using any color or Windows font, with or without background.

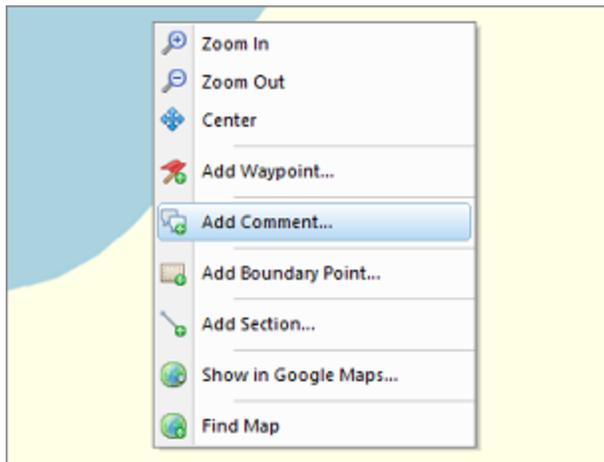
Comments can also be exported to AutoCAD DXF or Google Earth KML together with the other project items using either the "Export AutoCAD DXF" and "Export KML" tools.



*Example of a customized comment as map overlay.*

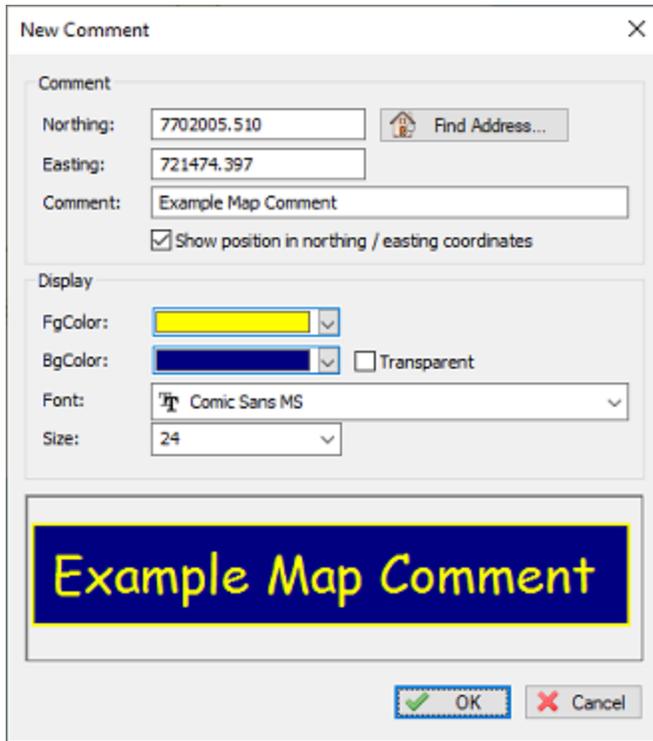
### Adding a comment

There are multiple ways to add a comment. You can create one manually from the "Comment Manager", or click on the map to place a comment at the current mouse position. The easiest way is by clicking on the map. Zoom and pan over the map until you find the position you want to place a comment. Click the right mouse button, when pointing the mouse to the position, and select the "Add Comment..." option:



*Right click the map and select the "Add Comment..." option to place a new comment.*

You will notice that the position of the comment is already filled out. In this window, you can add a comment to store with the project. You can also change the fore- and background colors and the font used to draw the comment on the map. In the preview area you can see an example of how your comment is going to display based upon the currently selected font name, font size and color settings.



Customize how the comment will look in the "New Comment" tool.

## Moving Comments

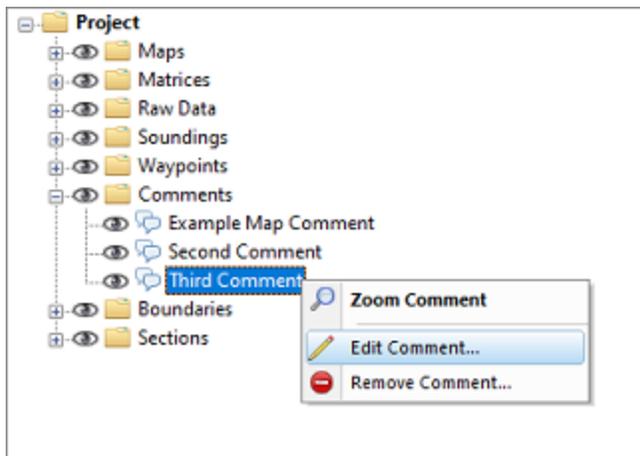
To move a comment, you can modify a comment's coordinates manually as described above, or you can use the mouse to drag the comment to its new position. In order to move a comment, you have to make sure the "Lock Objects" function has been switched off first. You can find this function on the toolbar and in the "Cursor" menu at the top of the screen. After switching off this function, select the comment symbol with the mouse, click and hold the left mouse button and drag the comment to its new location.



Switch off to move comments.  
(Version 9.0 or older only!)

## Comments in the "Project Explorer" view

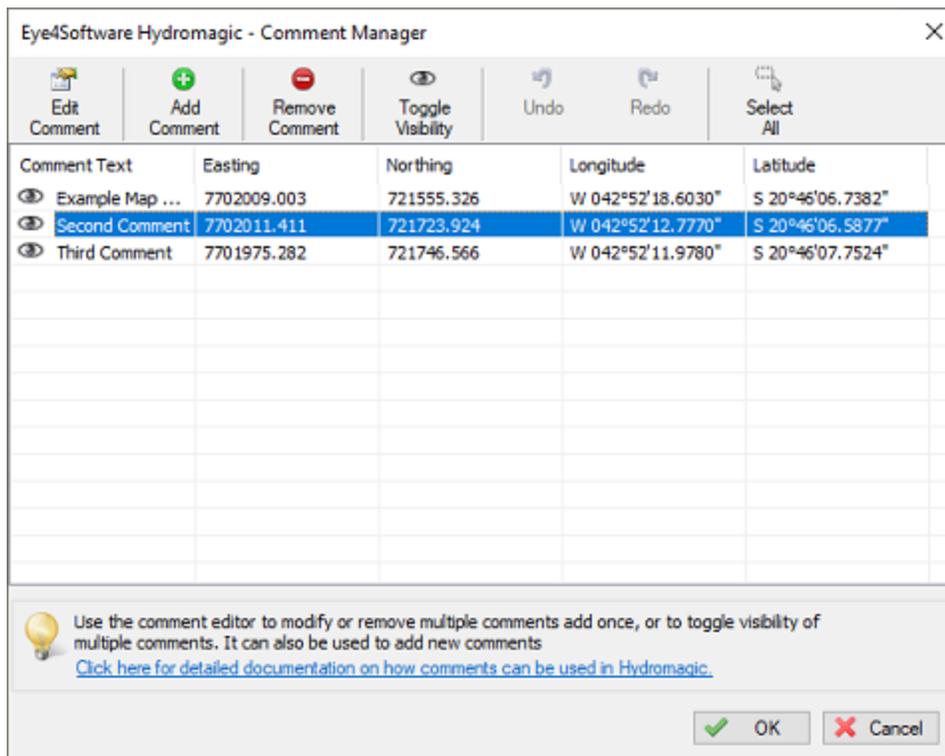
Each comment that is part of your project can be found in the "Project Explorer" view. When the "Project Explorer" is not visible, you can show it by selecting the "Project Explorer" option from the "View" menu at the top of the screen. The comments will be displayed when expanding the "Comments" folder in the project tree. You can right-click a comment to show more option, or double-click it to center the map on a comment position.



Comments can be accessed from the "Project Explorer" view as well.

## Comment Manager

To view a list of all the comments in your project, you can open the "Comment Manager", by right-clicking the "Comments" folder in the "Project Explorer" and selecting the "Manage Comments..." option. It can be used to toggle the visibility of multiple comments at once, or to delete a selection of comments.



The "Comment Manager" allows you to perform operations on multiple comments at once.

## 4.15 Creating Boundaries

### Boundaries

A boundary is required when using volume calculations. It is also used to specify for which area we want to create a matrix or contours, or to specify a clipping region for certain graphical operations. The easiest way to create a boundary is by drawing a polygon on the map, but it is also possible to enter the coordinates by hand.

### Create by using the mouse

To start a new boundary, just click "Boundary Drawing Tool" button in the toolbar: (  ).

Secondly, use the mouse to select the corners of the area by left-clicking the on corner locations in the map. When finished, click the right mouse button to store the boundary. The new created boundary should now appear in the "Project Explorer". By default a new boundary is named "BOUNDARYXXXX" where "XXXX" is the number of the boundary. Boundaries are drawn as red, dotted lines. The boundary points are drawn as red rectangles.



### Modify by using the mouse

To modify a created boundary, regardless whether it has been created by entering coordinates or by using the mouse, can be modified by dragging it's corner point around. First, you have to activate the boundary you want to alter. This can be done by right-clicking on the boundary name in the "Project Explorer", and selecting the "Set Active" option. It is only possible to drag the points around when the "Disable Drag and Drop" options is turned off (enabled by default). This can be done from the "Cursor" menu.

### Create by entering coordinates

When your client has supplied a list of coordinates for the area you have to survey, you can also create a boundary by manually entering these points. To do so, right-click the "Boundaries" folder in the "Project Explorer" and select the "Add Boundary..." option. The following dialog will appear:

Record#	Northing	Easting
000001	474570.92	244130.45
000002	474576.52	244148.54
000003	474584.41	244160.71
000004	474624.21	244356.74
000005	474635.06	244365.62
000006	474649.86	244484.03
000007	474639.99	244499.49
000008	474638.68	244523.17
000009	474638.02	244534.35
000010	474638.68	244556.39
000011	474599.21	244545.21
000012	474599.21	244539.29
000013	474598.88	244535.24

The table shows the coordinates of the corners of the boundary. The toolbar at the bottom of the dialog allows you to insert, delete or alter the coordinates.

This dialog can also be used to modify boundaries created by using the mouse, or to rename a previously created boundary:

Button	Function
	Edit the selected coordinate.
	Add a new coordinate to the list.
	Insert a new coordinate before the selected coordinate.
	Deletes the selected coordinate(s).
	Clears the list (delete all coordinates).
	Reload the list.
	Show selected coordinate on the map.
	Toggle coordinates between WGS84 and local grid.

## Removing a boundary

A boundary can be removed by right-clicking on the boundary name in the "Project Explorer" and by selecting the "Remove Boundary..." option. After a confirmation, the boundary will be removed from the project.

## 4.16 Cross Sections

### Cross Sections in Hydromagic

In Hydromagic, cross sections are 2D or 3D poly-lines which can be used for multiple purposes:

- As guidance lines when steering your boat during the survey (with or without help of the built-in [Helmsman display](#));
- To generate and [export cross sections](#) of your channel after surveying;
- When [calculating volumes](#) using cross sections;
- To create routes for your automatic pilot module using the built in [route planner](#);

Cross sections are also called "planned lines" or "survey lines" in some software packages. In Hydromagic, cross sections are stored in the [project file](#) and can be transferred to another project by exporting the as ASCII data. Cross sections can be placed manually, generated by the software or [imported from a CAD program](#) that supports the DXF file format (for instance AutoCAD)

### Defining the survey area

When using automatic placement, cross sections are generated to fill a specified boundary. To use this option, you must first [draw a boundary](#) around the survey area to be surveyed. If you [download a background map](#) of your survey area first, things will get a lot easier. If there are islands or other obstacles, such as vessels or jetties, in the area, make sure to draw separate boundaries for them as well. This allows the software to prevent the cross sections from crossing them.

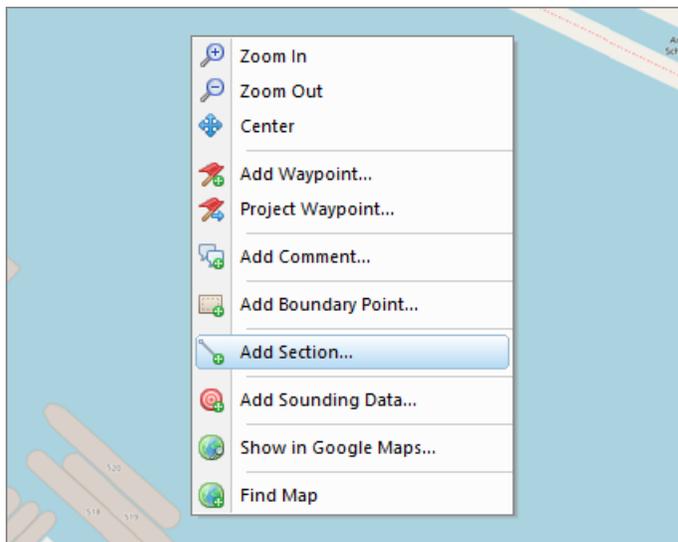


*The first step is to down(load) a map and draw a boundary around the area to be surveyed.*

### Drawing a guidance line (optional)

When using the built-in auto placement tool, you have to set the direction of the cross sections. This will often be perpendicular to the dock or shore, or when performing a survey on a pond or lake, parallel to the direction of the wind, which makes it easier to sail straight lines. You can either set the direction of the lines by hand, by entering a heading in degrees, or you can use the direction of an existing cross section. We recommend to use the latter method.

In this example, we will draw a guidance line parallel to the jetty, so we can use it to generate parallel as well. We do this by manually placing a line. You can also use this method to place additional lines after you finished generating lines with auto placement. To draw a new section, right-click the map display and select the "Add Section..." option from the popup menu:



**To create a new cross section by hand, right click the map and select "Add Section..."**.

After selecting the "Add Section..." option, the "Edit Cross Section" dialog will appear. At this moment we do not alter settings, other than give it a name, like "Guidance" since we are using this line as a guidance line for the cross sections we are going to generate. After clicking the "OK" button, a cross section will be placed at the cursor location. Now you can use the mouse to drag it to the correct position.

A screenshot of the "Edit Cross Section" dialog box. The dialog has a title bar with a close button (X). It is divided into three sections: "Section Properties", "Location", and "Profile".  
- "Section Properties": Name: DK0002, Length: 42.866 m, Azimuth: 352.00 degrees.  
- "Location": Start X: 244534.034, End X: 244528.068, Start Y: 474595.459, End Y: 474637.907.  
- "Profile": A graph titled "Cross Section" with a vertical axis from -10.00 to 10.00 and a horizontal axis from 0.00 to 45.00. Below the graph are buttons: Edit..., Auto..., Swap, Depth, Previous, and Next. At the bottom right are OK and Cancel buttons.

Section Properties
Name: DK0002
Length: 42.866 m
Azimuth: 352.00 degrees

Location
Start X: 244534.034
End X: 244528.068
Start Y: 474595.459
End Y: 474637.907

Profile

Cross Section

The graph shows a coordinate system for the cross section profile. The vertical axis (depth) ranges from -10.00 to 10.00. The horizontal axis (distance) ranges from 0.00 to 45.00. The graph area is currently empty.

Buttons: Edit..., Auto..., Swap, Depth, Previous, Next, OK, Cancel

**Just enter a name for the guidance cross section, and click "OK".**

Use the center point of the section to drag it to another place, or the starting and ending points to re-size and rotate it. In this example we will place the line parallel to the shore:



**When using automatic placement, it is recommended to draw a "guidance line" first.**

## Generating perpendicular cross sections

When the boundary and guidance sections have been drawn, we can fire up the "Generate Cross Sections" tool. The easiest way to access this tool, it to right click the "Sections" folder in the "Project Explorer" and selecting the "Generate Sections..." option. Alternatively, this option can be found under the "Tools" menu as well.

Generate Cross Sections

Survey Direction

Line Direction: 206.27 degrees (or select value below)

Set same as section: <Select Existing Section>

Set perpendicular to: Guidance

Boundaries and Spacing

Line Interval: 10.0 m

Select Boundaries: BOUNDARY0001; Select...

Labels

Section Name Prefix: (optional, prefix added to section names)

Section Name Start: 1 (optional, starting number for section names)

Advanced Settings

Use alternating section directions for route planning (please use caution when exporting profiles).

Use this tool to generate regularly spaced parallel 'Cross Sections'.  
To determine the correct line direction, you could use the distance measuring tool.  
[Click here to open the documentation on how to use cross sections and how to generate them.](#)

OK Cancel

**Use the "Generate Cross Sections" tool to generate cross sections perpendicular to the guidance line.**

To generate lines perpendicular to the guidance line, we select the name of the guidance line for the "Set perpendicular setting". You will notice that the "Line Direction" has been set to the direction perpendicular to the guidance line. Also select the boundary for the survey area, as well as the boundaries for obstacles or islands (if any). Depending on the survey area, choose the spacing between the lines. This might be ten till twenty meters for large areas and as low as 5 meter when surveying near the shore or drop-off. We will discuss the other settings in the following paragraphs. When ready to generate the cross sections, click "OK" and the result should look like this:



**Example of cross sections generated perpendicular to the guidance line.**

## Generating parallel cross sections

**Generate Cross Sections** ✕

---

**Survey Direction**

Line Direction:  degrees (or select value below)

Set same as section:  ▼

Set perpendicular to:  ▼

---

**Boundaries and Spacing**

Line Interval:  m

Select Boundaries:  📁 Select...

---

**Labels**

Section Name Prefix:  (optional, prefix added to section names)

Section Name Start:  (optional, starting number for section names)

---

**Advanced Settings**

Use alternating section directions for route planning (please use caution when exporting profiles).

---

💡 Use this tool to generate regularly spaced parallel 'Cross Sections'.  
 To determine the correct line direction, you could use the distance measuring tool.  
[Click here to open the documentation on how to use cross sections and how to generate them.](#)

**Use the "Generate Cross Sections" tool to generate cross sections parallel to the guidance line.**

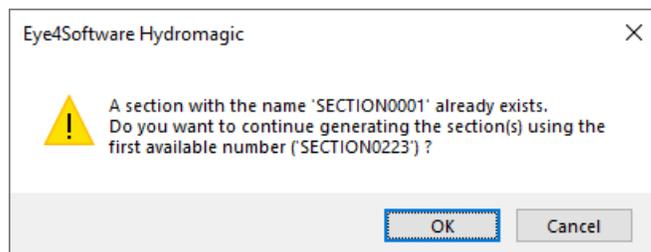
To generate cross sections parallel to the guidance line, we follow the same steps as in the previous paragraph. In order to get the lines parallel to the guidance line, we now select the name of the guidance line for the "Set same as section" option.



*Example of cross sections generated parallel to the guidance line.*

## Cross Section Names

Normally, the name of a cross section consists of a number. To provide more clarity about a cross section, or to group them, the section number can be preceded by a short text. This setting is optional. To set a prefix for the cross section name, enter this value in the "Section Name Prefix" field. During cross section generation, Hydromagic will automatically check that there are no duplicate names generated. If this is the case, a notification will be shown suggesting another initial number, which can be selected in the "Section Name Start" field, or you can accept the suggestion by clicking "OK".



*When there is a cross section name conflict, the software will notify you and suggest an alternative name.*

## Moving, resizing and rotating cross sections

After automatic or manual placement, you still might want to adjust the position of some of the cross sections. You can move a cross section without altering its length or direction by hovering the mouse over the "dot" which is in the center of the section. As soon as the mouse cursor changes into a hand shape, you can click the right mouse button and move it to another place.

This works the same for the length or direction, but in this case you have to grab the arrow or start of the section with the mouse and move around. Now you will be able to rotate and change the length, but the cross section's center will remain on the same place. When modifying cross sections like this, you can always press "Control"+"Z" on your keyboard to undo an action in case you made a mistake.



*Grab a cross section with the mouse to rotate, move and resize.*

## Delete cross sections

There are two ways to delete a single cross section:

1. Right-click the center anchor point of the cross section in the map, and select "Remove Section" from the pop up menu;
2. Right-click the cross section name in the "Project Explorer" and select "Remove Section."

To delete all cross sections, right click the "Sections" folder in the "Project Explorer" and select "Remove All...". After confirmation, all cross sections will be removed from the project.

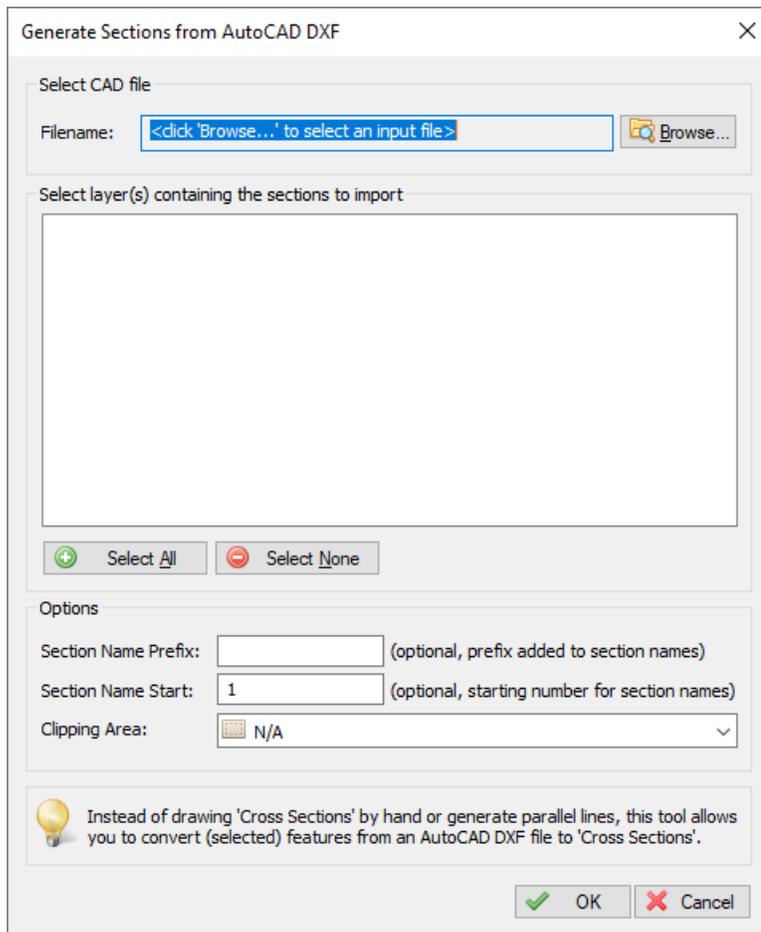
## 4.17 Cross Sections from CAD

### Import cross sections from AutoCAD DXF file(s)

Instead of placing cross sections [by hand](#) or using a [boundary](#), it is also possible to import them directly from an AutoCAD DXF drawing. To use this method, please make sure you use a separate layer in AutoCAD to store these lines.

### Import dialog

To start importing the line data used to create sections, select the "Generate sections from DXF..." option by right clicking the "Sections" folder in the project view. If the project view is not visible, you can show it by selecting "Project Explorer" from the "View" menu.

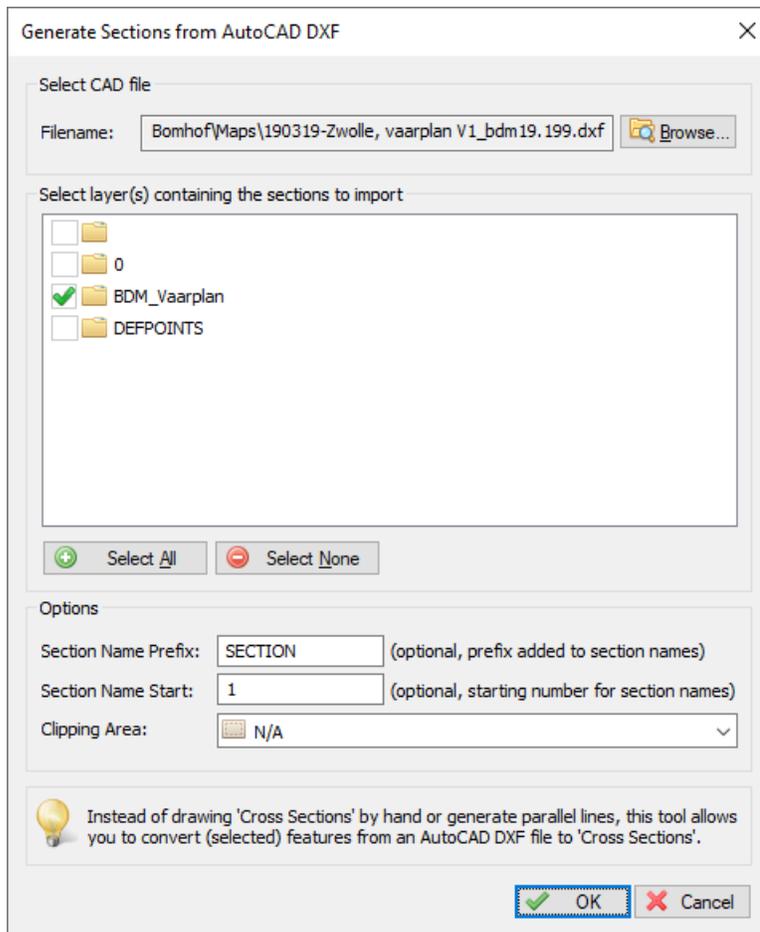


***The generate cross sections from AutoCAD DXF file importing tool***

## Select the drawing file

First, you have to click the "Browse..." button to select an AutoCAD DXF file. If your AutoCAD file is saved in the DWG format, you can export it to DXF by using the 'DXFOUT' command in AutoCAD.

When a valid file has been selected, the layer names will be loaded and displayed in the dialog.

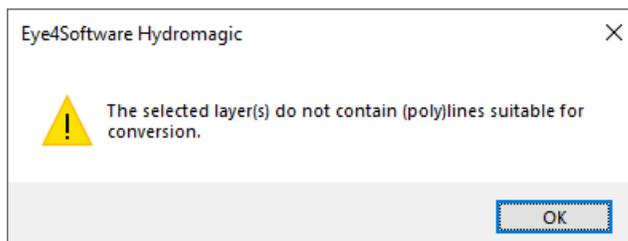


**Select the AutoCad layer(s) that contain the cross sections**

## Select layer(s)

After the AutoCAD file has been loaded, you have to select one or more layer(s) containing the line data to be used. You can select one or more layers, please note that only 'LINE', 'POLYLINE' and 'LWPOLYLINE' entities can be converted into cross sections.

When the selected layers do not contain lines, or unsupported line entities, the following error message will be displayed when starting the import process:



**When the selected layers do not contain lines in the correct format, Hydromagic will notify you.**

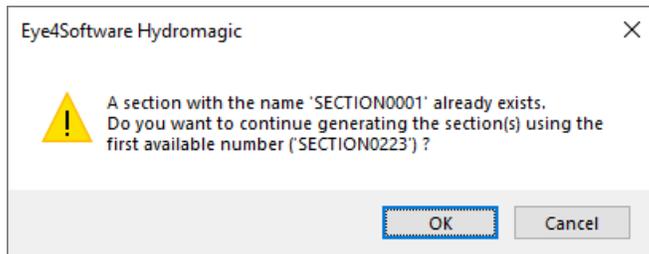
## Section name prefix

Normally, the name of a cross section consists of a number. To provide more clarity about a cross section, or to group them, the section number can be preceded by a short text. This setting is optional.

### Section name start

All section names are numbered. This optional setting allows you to specify which number to start numbering with.

During numbering, Hydromagic will automatically check that there are no duplicate numbers generated. If this is the case, a notification will be shown suggesting another initial number.



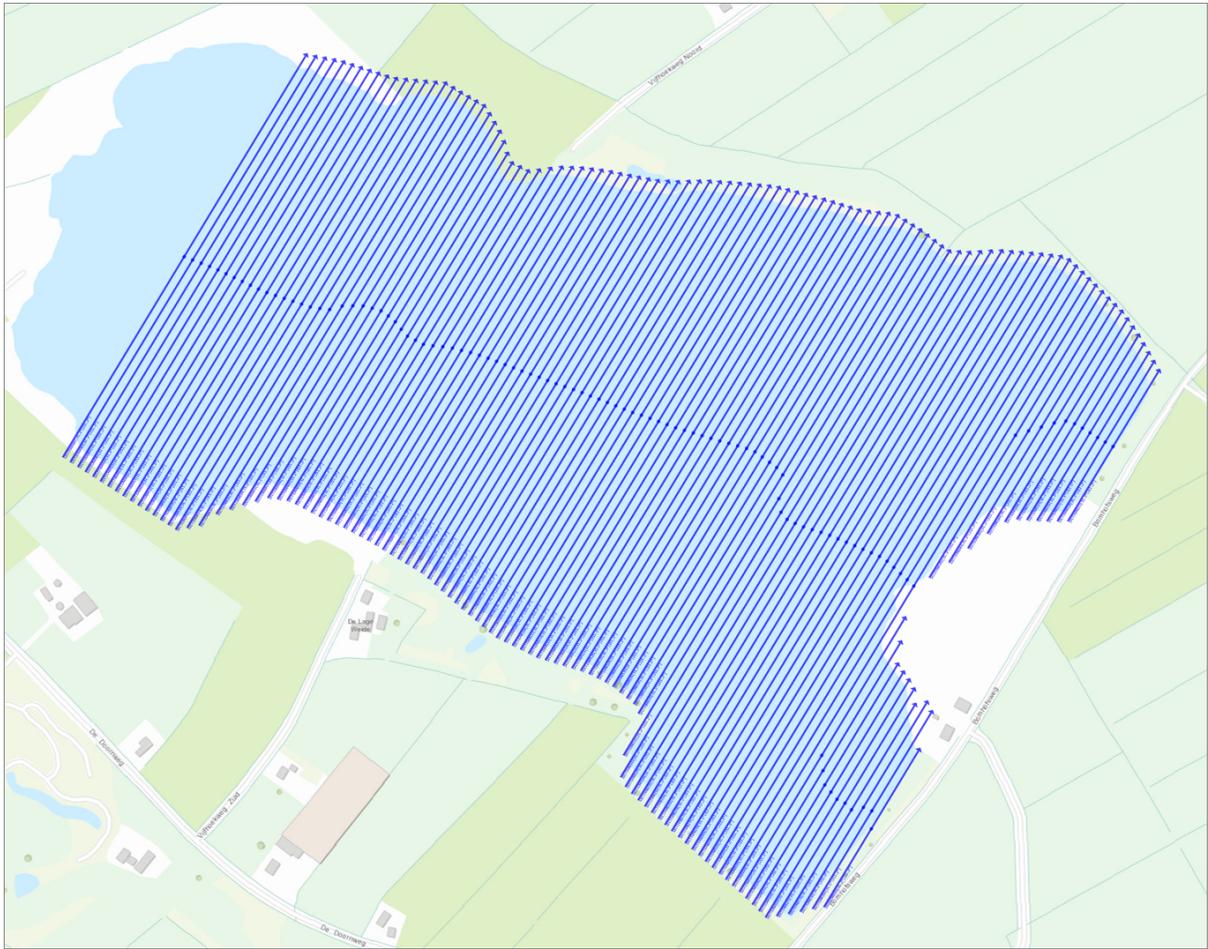
***In case of numbering conflicts, Hydromagic will suggest another initial number***

### Clipping Area

When a clipping area is selected, all lines will be clipped within this area. When clipping area is set to "N/A" all lines will be loaded "AS IS". To use clipping, draw a [boundary](#) first.

### Starting import

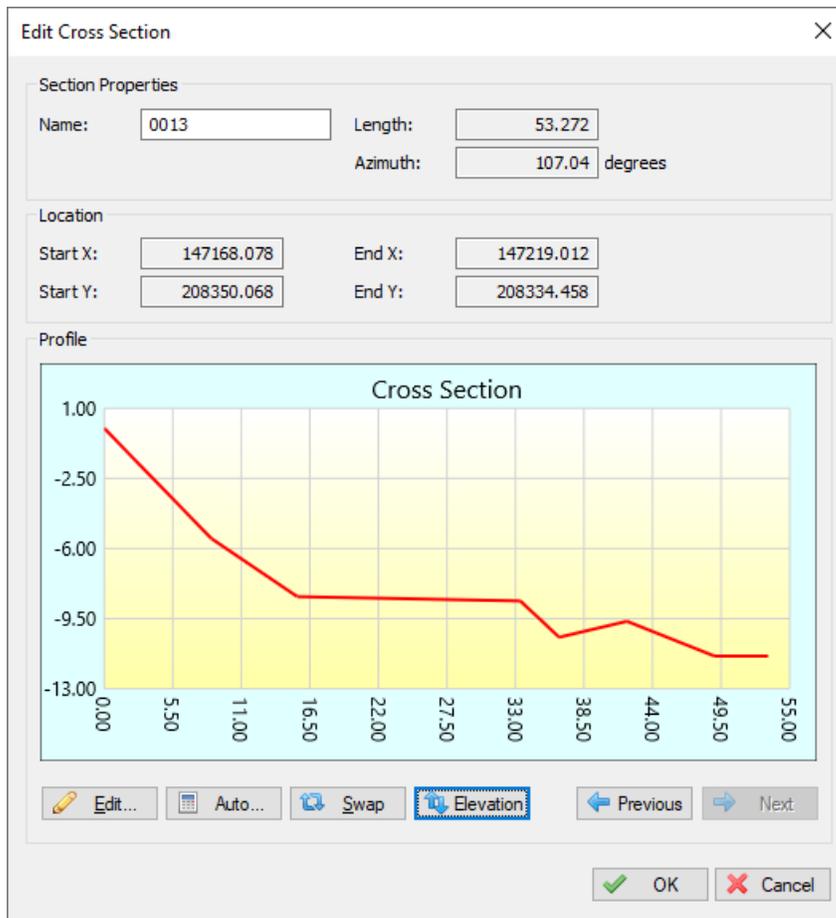
To start creating cross sections, just click "OK". After a few seconds you will see the imported lines in your project. The dialog box will close automatically on successful cross sections generation.



**Sections generated from DXF file shown above**

## 2D vs 3D lines

In Hydromagic you use cross sections for [volume calculations](#) or to define a [channel design](#) as well. When importing cross sections from an AutoCAD DXF file, Hydromagic will automatically detect whether the line contains different Z-Values. When this is the case the Z-Values are automatically stored into a cross section profile as shown below:



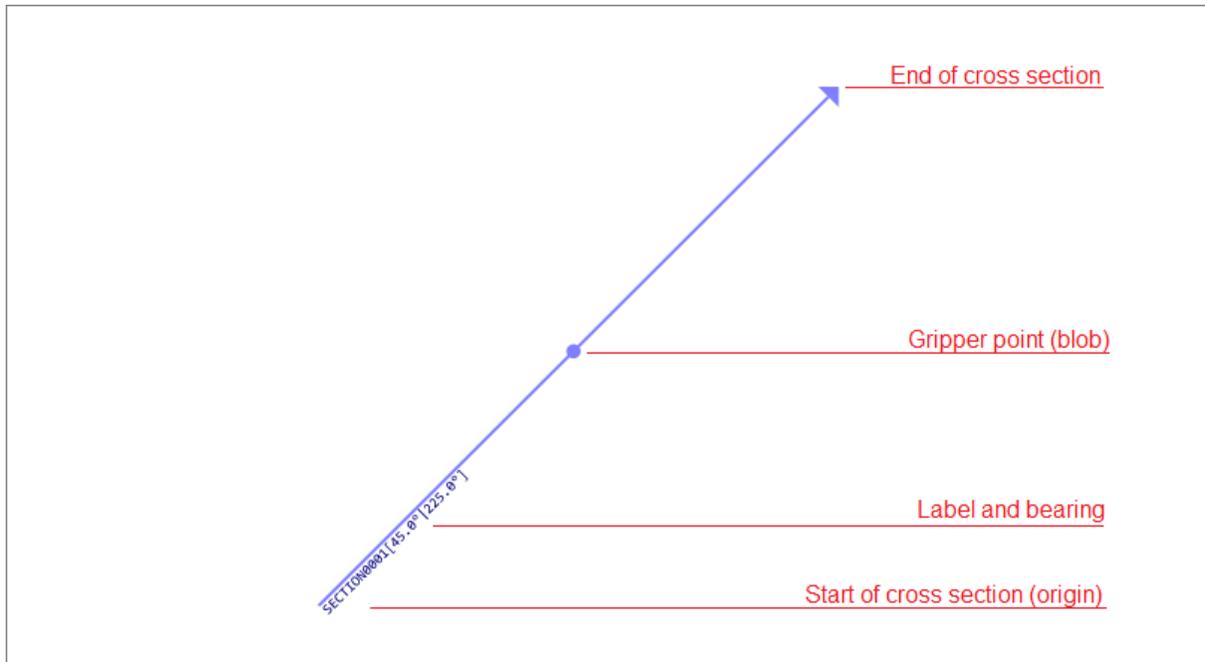
*Example of an imported cross section with Z-values defined.*

In order to set the Z-values of polyline vertices in AutoCAD, you need a version of AutoCAD that supports 3D. This means that these lines cannot be generated with AutoCAD LT.

## 4.18 Channel Design

In Hydromagic, a channel design is used for [volume calculations using cross sections](#) or to generate a reference matrix for [dredge monitoring](#). A channel design is generated by modifying the depth or elevation profiles of generated cross sections. Cross section profiles are stored as pairs of distance and level data, where the distance is the distance measured from the start of the section (indicated by the label in the map view, while the end of the section is drawn as an arrow).

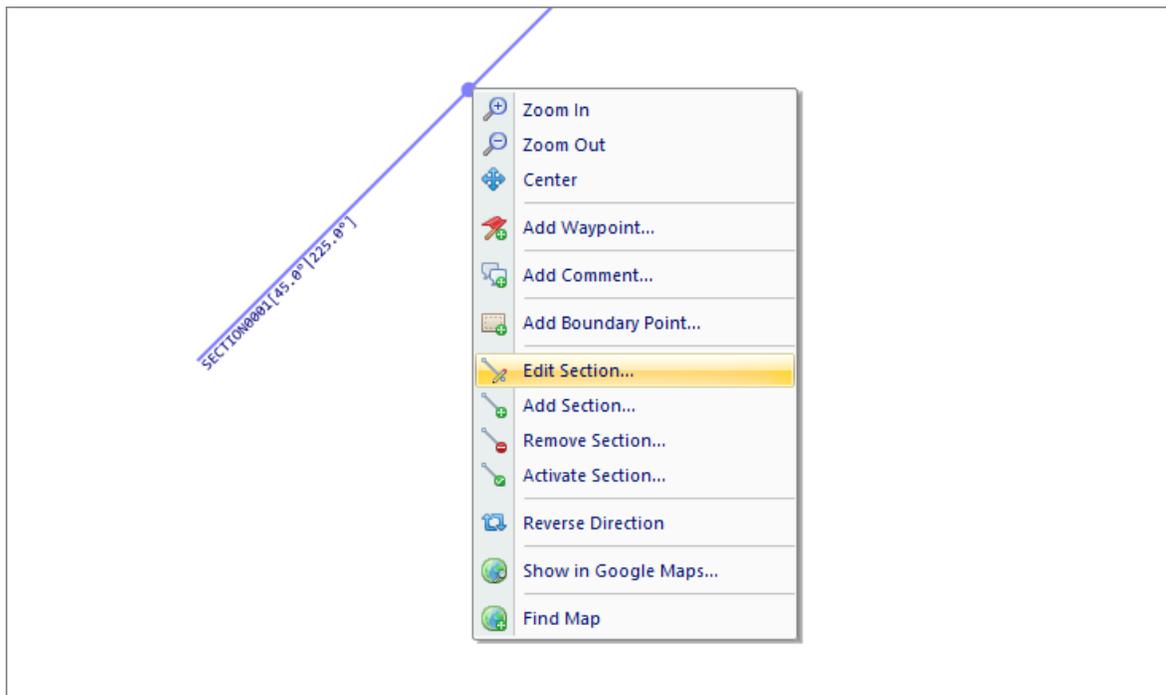
When the depth and the slope of the shore are known, it is possible to calculate depths or elevations on the cross sections automatically. Before creating a channel design, you first have to draw a [boundary](#) of the area and [generate sections](#) for this area.



**A cross section starts at the label and ends with an arrow. The profile distance or offset is measured from the start.**

## Calculating depth or elevation profiles

To alter a cross section's profile, just right click on the gripper point in the map display, and select "Edit Section..." option from the pop-up menu.



**Right-click on the gripper point in the map display, and select "Edit Section..." option.**

When first editing a cross section, you will notice the profile display is empty, this is because no depths are stored by default. In this example, we will create a channel with a maximum depth of 5 meters and a slope of 50 percent.

**Edit Cross Section**

Section Properties

Name:  Length:  m  
Azimuth:  degrees

Location

Start X:  End X:   
Start Y:  End Y:

Profile

Cross Section

-10.00  
-5.00  
0.00  
5.00  
10.00

0.00 4.50 9.00 13.50 18.00 22.50 27.00 31.50 36.00 40.50 45.00

Edit... Auto... Swap Depth Previous Next

OK Cancel

**Right click the section, and select "Edit Section..." to modify the selected cross section.**

This means, that for each 2 meters, the bottom depth increases with 1 meter. When the bottom depth increases with 1 meter for each 4 meter extra distance from the shore, the slope is 25%. To calculate profiles from this setting, click the "Auto..." button. The following dialog should now appear:

Generate Section Profiles

Section Properties

Generate profiles by using min/max/slope:

Shore Level:  m

Bottom Level:  m

Include slope at start of section

Include slope at end of section

Slope ratio:  (0-100 %)

Generate profiles by using a template file:

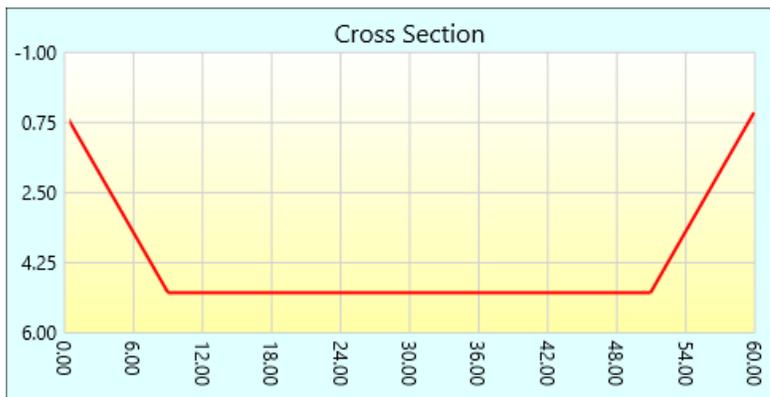
Apply these settings to the following sections

<input checked="" type="checkbox"/> DK0001	<input checked="" type="checkbox"/> DK0013	<input checked="" type="checkbox"/> DK0025	<input checked="" type="checkbox"/> DK0037
<input checked="" type="checkbox"/> DK0002	<input checked="" type="checkbox"/> DK0014	<input checked="" type="checkbox"/> DK0026	<input checked="" type="checkbox"/> DK0038
<input checked="" type="checkbox"/> DK0003	<input checked="" type="checkbox"/> DK0015	<input checked="" type="checkbox"/> DK0027	<input checked="" type="checkbox"/> DK0039
<input checked="" type="checkbox"/> DK0004	<input checked="" type="checkbox"/> DK0016	<input checked="" type="checkbox"/> DK0028	<input checked="" type="checkbox"/> DK0040
<input checked="" type="checkbox"/> DK0005	<input checked="" type="checkbox"/> DK0017	<input checked="" type="checkbox"/> DK0029	<input checked="" type="checkbox"/> DK0041
<input checked="" type="checkbox"/> DK0006	<input checked="" type="checkbox"/> DK0018	<input checked="" type="checkbox"/> DK0030	<input checked="" type="checkbox"/> DK0042
<input checked="" type="checkbox"/> DK0007	<input checked="" type="checkbox"/> DK0019	<input checked="" type="checkbox"/> DK0031	<input checked="" type="checkbox"/> DK0043
<input checked="" type="checkbox"/> DK0008	<input checked="" type="checkbox"/> DK0020	<input checked="" type="checkbox"/> DK0032	<input checked="" type="checkbox"/> DK0044
<input checked="" type="checkbox"/> DK0009	<input checked="" type="checkbox"/> DK0021	<input checked="" type="checkbox"/> DK0033	<input checked="" type="checkbox"/> DK0045
<input checked="" type="checkbox"/> DK0010	<input checked="" type="checkbox"/> DK0022	<input checked="" type="checkbox"/> DK0034	<input checked="" type="checkbox"/> DK0046
<input checked="" type="checkbox"/> DK0011	<input checked="" type="checkbox"/> DK0023	<input checked="" type="checkbox"/> DK0035	<input checked="" type="checkbox"/> DK0047
<input checked="" type="checkbox"/> DK0012	<input checked="" type="checkbox"/> DK0024	<input checked="" type="checkbox"/> DK0036	<input checked="" type="checkbox"/> DK0048

This tool can be used to generate elevation values for a cross section, which can be used to in exports or volume calculations. To calculate the slope ratio, divide the change in depth by the change in distance and multiply with 100.

Using the "Generate Section Profiles" dialog, you can generate a profile for one or more sections.

In the left section of the dialog, you can enter the channel design parameters, in the right section, you can select the cross sections you want to apply these parameters to. In this example, the depth at the shoreline should be half a meter, at the waterway axis, the depth should be 5 meters. The slope used is 50 percent. Click the "OK" button to apply these settings. The graph display will now look like this:



An automatically generated profile using a slope on both sides of the channel.

You can check the other sections by browsing through them using the next and previous buttons.

## Manual Editing

In cases where calculation is not usable, for instance when a different slope is used on either sides, or when a section is not placed between shores, you have to enter the distance and depth values manually. To do so, click the "Edit..." button to open the profile editor:

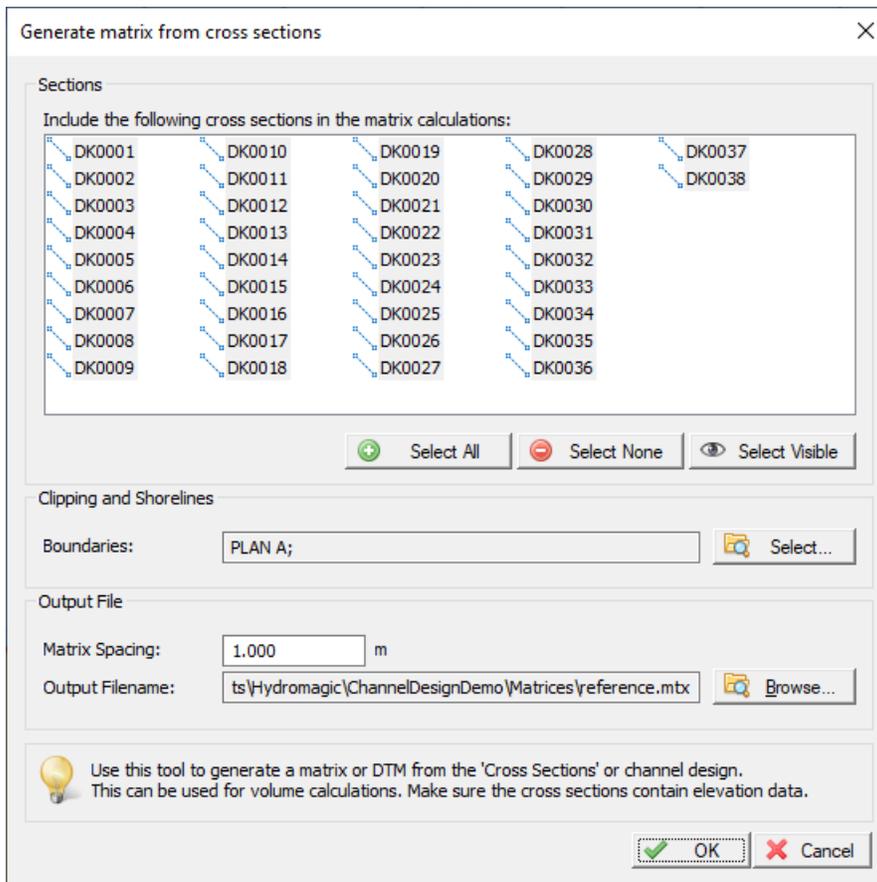


*A depth or elevation profile can also be edited manually by entering values.*

The table on the left of the dialog allows you to alter, insert and delete distance-depth pairs. Changes which are made, are directly visible in the graphical display. When done, just click "OK" to store your design.

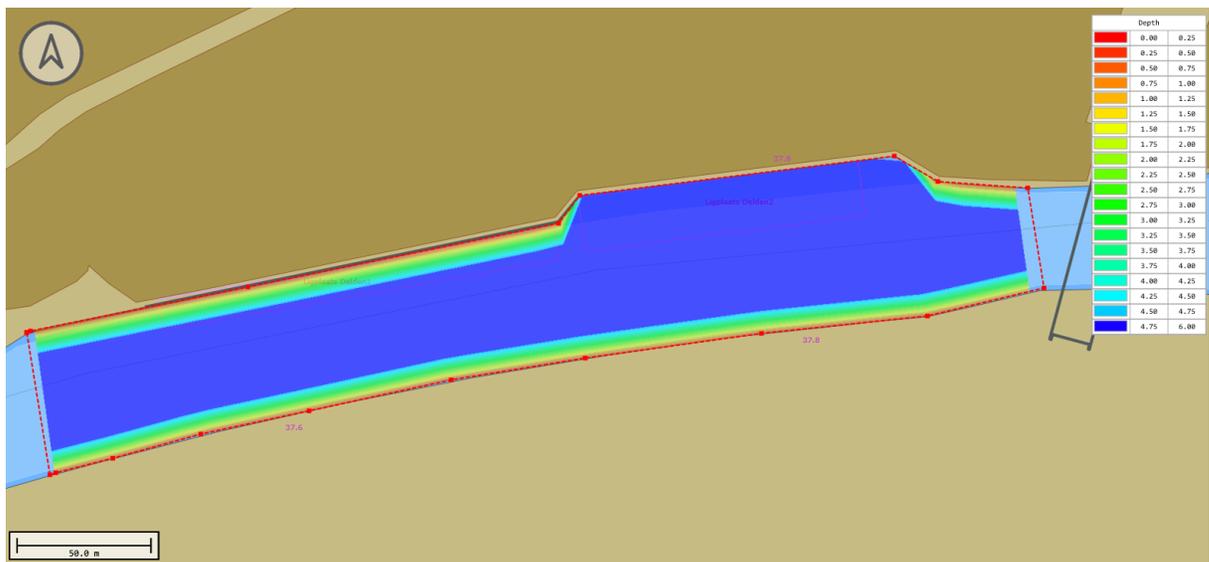
### Checking the profiles

The quickest way of checking whether all profiles have been created correctly, is by [creating a matrix using cross sections](#). To do so, select the "Generate Matrix..." option from the "Sections" folder in the "Project Explorer".



**Right click the "Generate Matrix..." option to build a matrix from cross section profiles.**

Select the correct boundary (in most cases the boundary used for auto placement of the sections), a file name for the matrix, and the spacing used (can be larger for a test, for volume calculation, use the same spacing as the matrix created from the sounding). Click "OK" and check the result.



**Reference matrix generated from a channel design - Please do not forget to select a color schema to visualize the matrix.**

## 4.19 Route Planner

### Hydromagic Route Planner

In Hydromagic, the built in route planner can be used to combine sections and waypoints into a route. Routes can be used to program autopilots, or can be drawn as a map overlay to guide you during surveys.

At this moment only the CEE HydroSystems CEEPILOT and Dynautics SPECTRE autopilots are supported for route uploads.

In order to upload routes directly to this hardware, a plugin needs to be loaded. How to load the plugin will be explained in the following paragraph.

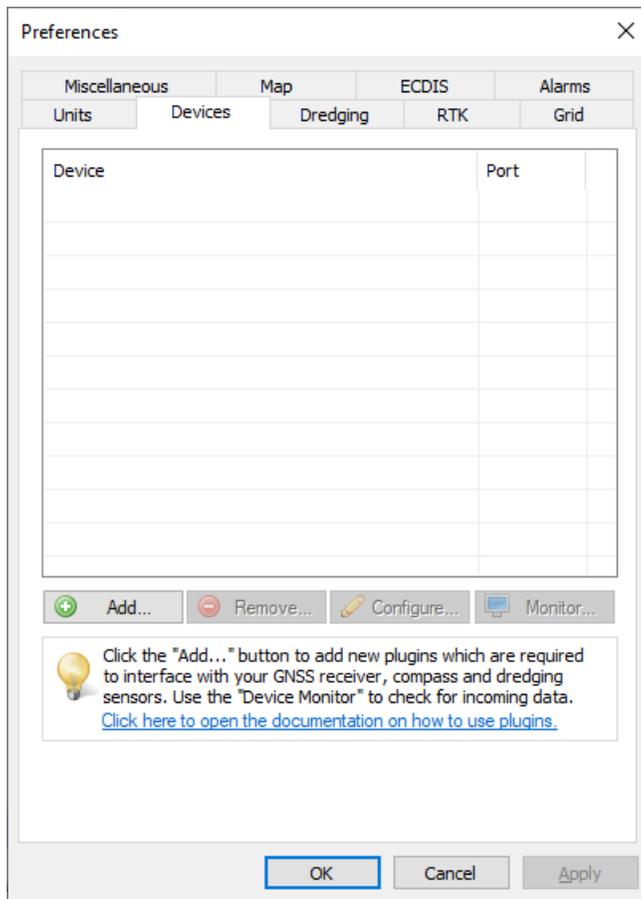
It is also possible to upload routes using a 3rd party software package like Mission Planner.

To allow the routes to be used in other software packages, Hydromagic can export routes in various file formats:

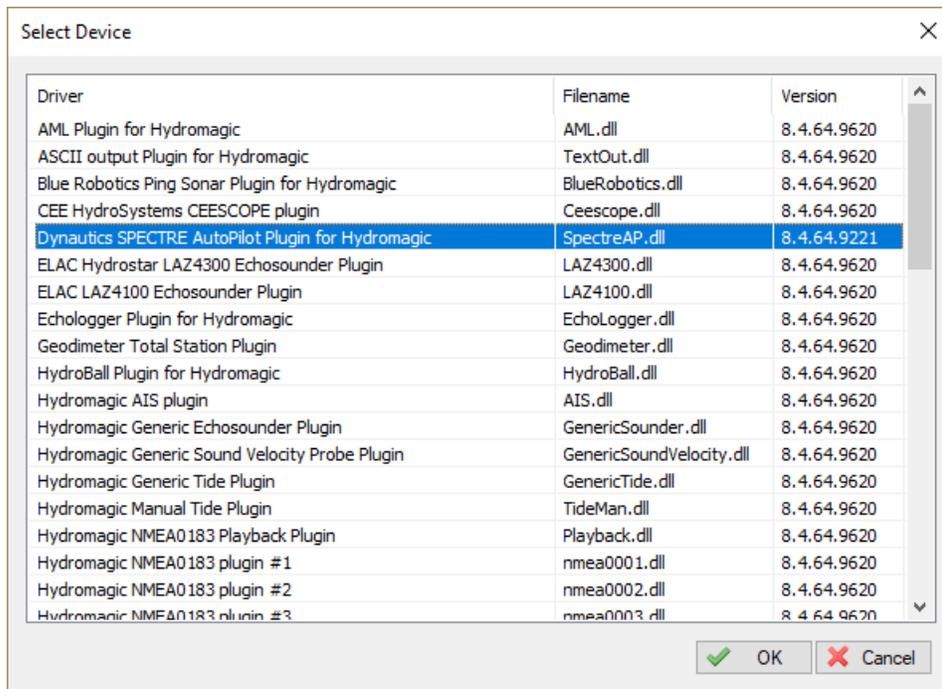
- NMEA0183 ASCII Files;
- GPX GPS Exchange Data Files;
- GQC MavLink / Mission Planner Data Files;
- ASCII Import / Export Files.

### Loading the autopilot plugin

To load the auto pilot plugin for the CEEPILOT, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



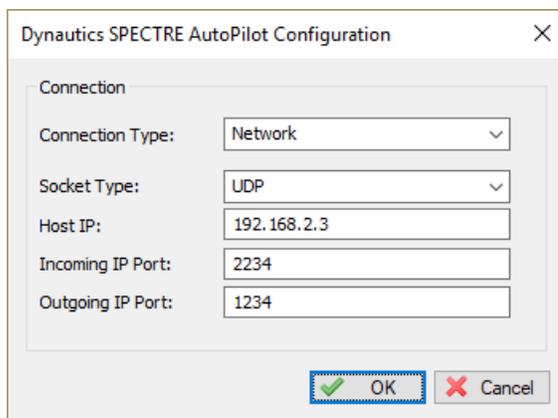
A list of available plugins will be displayed. In this list, select the "Dynaotics SPECTRE AutoPilot Plugin" and click "OK" to load and display the plugin's user interface.



## Configuring the autopilot plugin

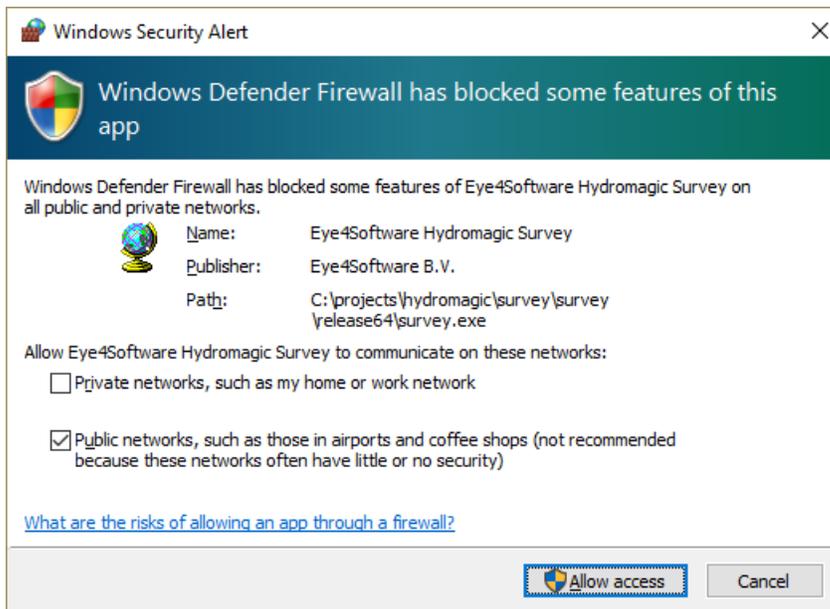
When the plugin loads, a dialog with some required settings will appear first. Since the CEEPILOT is connected via WiFi, we have to enter the network settings (UDP).

Make sure the incoming UDP port is set to '2234' and '1234' for the outgoing UDP data. The IP address depends on the wireless network configuration.



## Starting the plugin

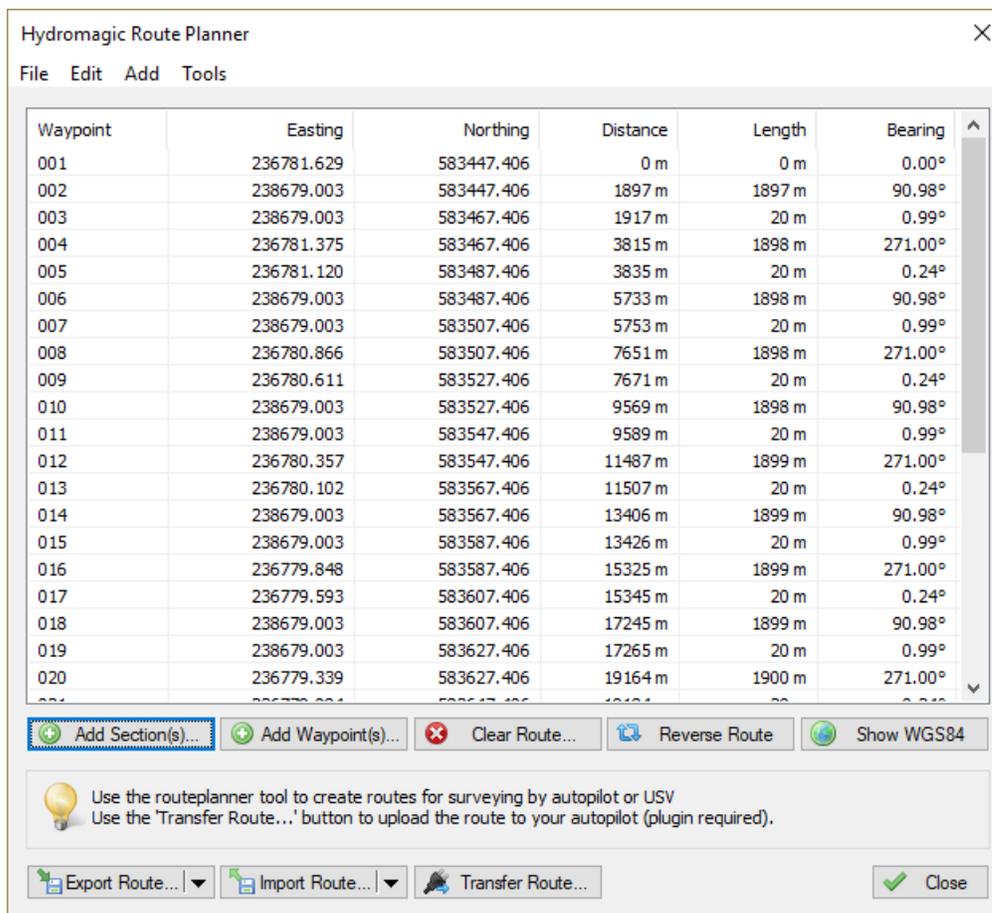
When the ports have been configured, click the "OK" button to save the settings and start the plugin. In case the Windows Firewall has been enabled on your computer, you will see the following popup window appear:



***Allowing the CEEPILOT data through the firewall***

## Starting the route planner

You can start the route planner tool by selecting the "Router Planner..." option from the "Tools" menu at the top of the Hydromagic application. A window similar to the screenshot below should appear. When the "Transfer Route..." button is grayed out, it means no autopilot plugin has been loaded.



## Creating routes

A route can be created by adding [sections](#) and [waypoints](#) to the route list. For sections, first the starting point will be added followed by the ending point. You can reverse sections by right clicking the sections center in the map, and select the 'Reverse' option from the popup menu.

To add a section, click the "Add Section(s)..." button. You can select one or multiple sections at once. To add a waypoint, click the "Add Waypoint(s)..." button. You can select one or multiple waypoints at once.

To (re)move route points, just right click the list view for more options:

Waypoint	Easting	Northing	Distance	Length	Bearing
001	236781.629	583447.406	0 m	0 m	0.00°
002	238679.003	583447.406	1897 m	1897 m	90.98°
003	238679.003			20 m	0.99°
004	236781.375			1898 m	271.00°
005	236781.120			20 m	0.24°
006	238679.003			1898 m	90.98°
007	238679.003			20 m	0.99°
008	236780.866			1898 m	271.00°
009	236780.611			20 m	0.24°
010	238679.003			1898 m	90.98°
011	238679.003			20 m	0.99°
012	236780.357			1899 m	271.00°
013	236780.102			20 m	0.24°
014	238679.003			1899 m	90.98°
015	238679.003			20 m	0.99°
016	236779.848			1899 m	271.00°
017	236779.593			20 m	0.24°
018	238679.003			1899 m	90.98°
019	238679.003	583627.406	17265 m	20 m	0.99°
020	236779.339	583627.406	19164 m	1900 m	271.00°

## Importing and exporting route data

The tool offers a couple of options for importing or exporting route files. This functionality is offered to allow you to use other software for route creation or uploading. The import and export options can also be used to transfer routes between different Hydromagic projects.

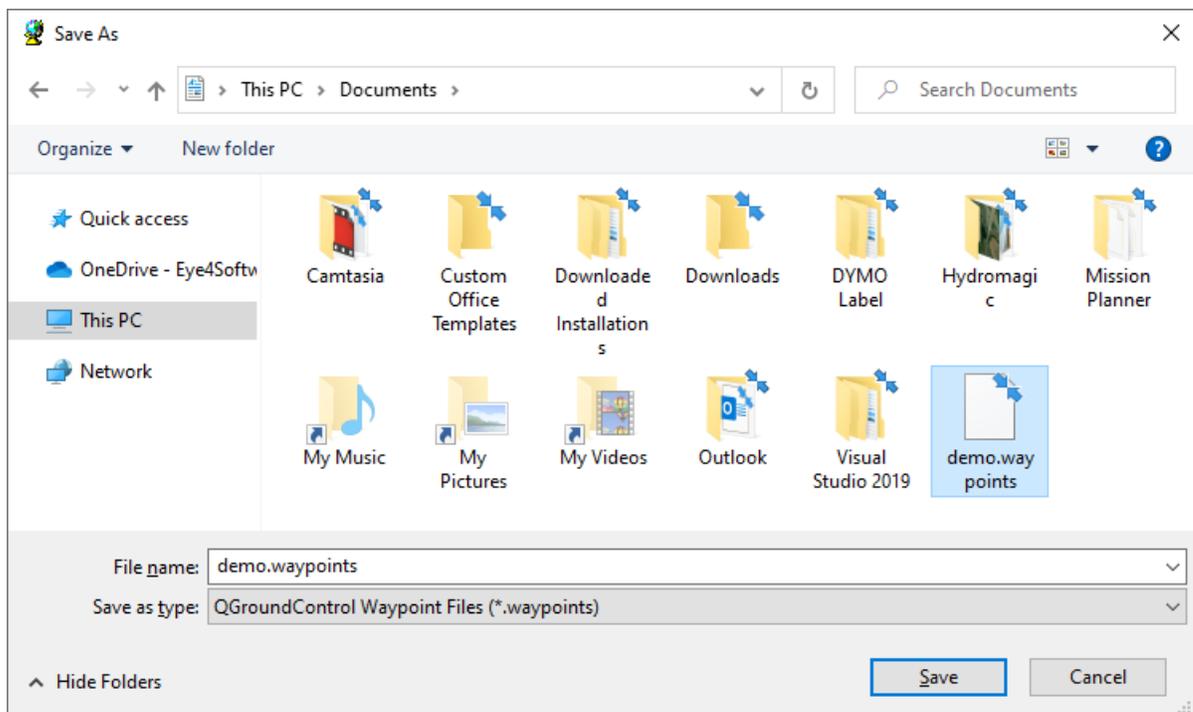
When you created the route in other software, and you want to show or upload the route in Hydromagic, use the "Import Route..." button. Please note that any existing route will be overwritten when a route file is imported.

When the route has been created, and you want to use a third party software tool to upload the route into other hardware, use the "Export Route..." button. Please note that all exported coordinates are in the WGS84 coordinate reference system.

## Exporting a route to Mission Planner (MavLink)

The route planner could also be used to create routes and send them to MavLink compatible hardware via Mission Planner. If you haven't installed a copy of Mission Planner already, you can download it from the ArduPilot website.

First create your route as explained in this document. After creating the route, click the "Export Route..." button and select the "Export QGC..." option from the dropdown menu. In the "Save As" dialog that appear, choose a filename and save the file.



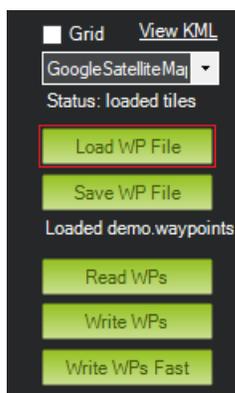
**Export the route as MavLink waypoints file**

Now you can start the Mission Planner software, and select the "Flight Plan" mode in the toolbar on top of the screen. The software will now switch to planning mode and there should appear a new panel at the right hand of your screen.

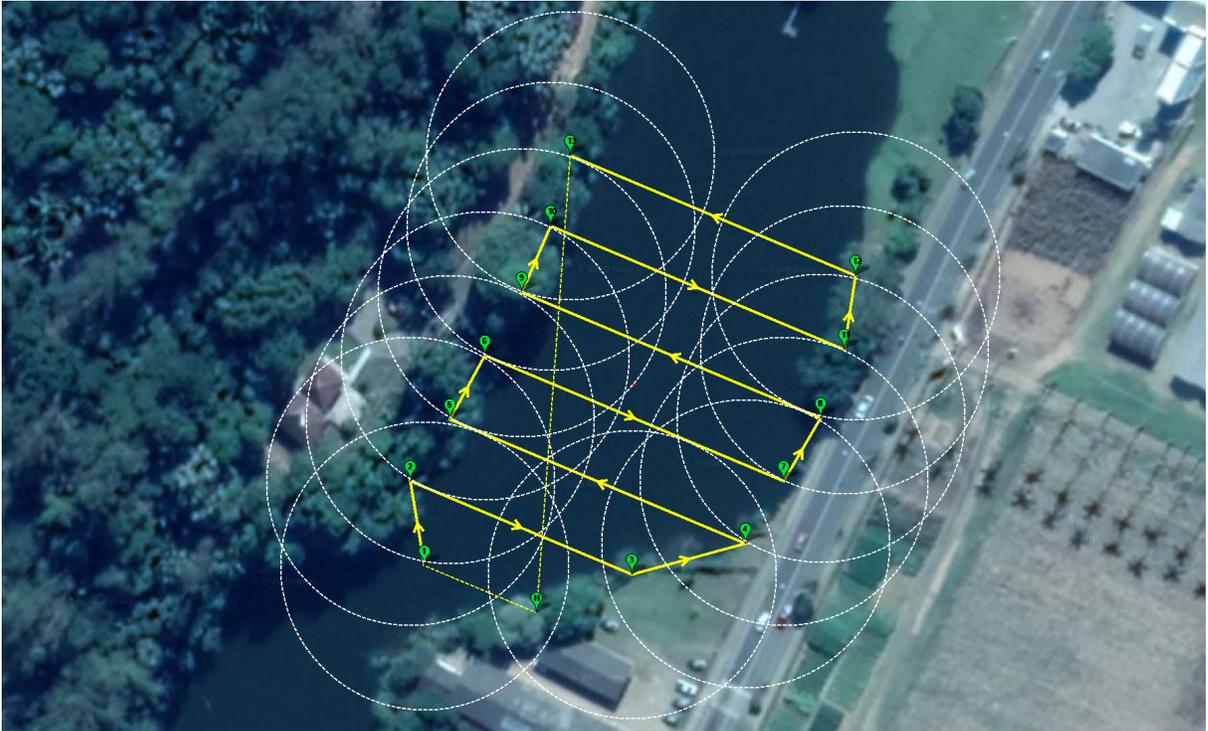


**Switch to planning mode by clicking the flight plan button**

In this new panel, click the "Load WP File" button and select the QGC waypoints file you just created with Hydromagic.



Your route should now be visible as map overlay in Mission Planner. When you have connected a MavLink compatible autopilot, click the "Write WPs" button to store the waypoints in your autopilot.



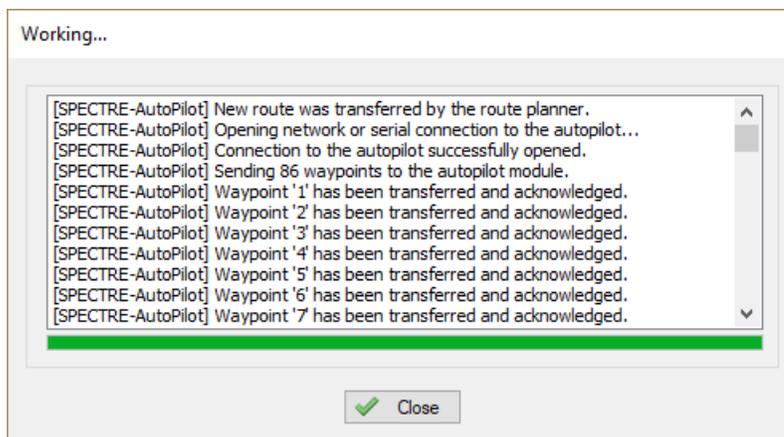
*Example of an exported route imported into Mission Planner*

## Uploading routes

After a route has been entered you can upload it into the autopilot. Please make sure that you have to specify at least two points. Also make sure to program the point where the USV should return. You can use a waypoint for this.

To start the upload process, just click the "Transfer Route..." button. When this button has been grayed out, it means that you have to load the "Dynaotics SPECTRE AutoPilot Plugin" first.

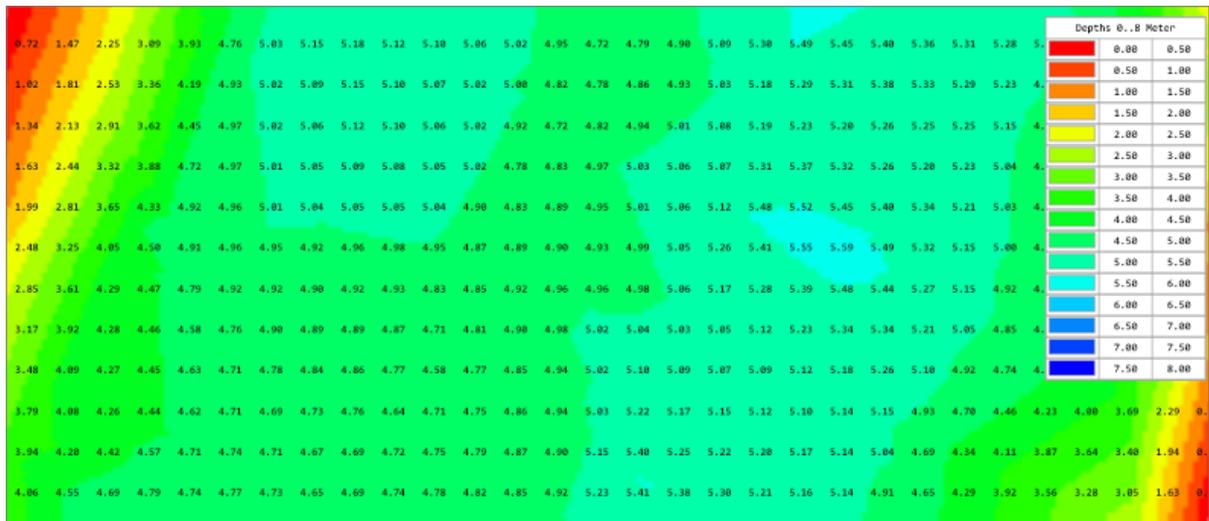
After starting the upload the following progress dialog will be showed, stating which route or waypoint is currently being uploaded. When contacting support with upload issues, please send a screenshot of this dialog.



## 4.20 Depth colors and color legend

### Depth Colors

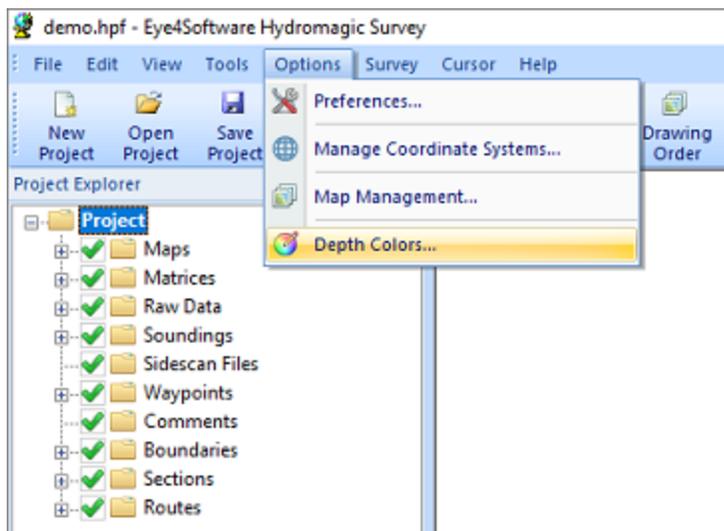
In Hydromagic, depths or elevation values can be drawn in colors so it is easier to see, for instance, which areas are deeper than others. By defining a color set, you can create a mapping between depth (or elevation) values and colors which are used when [matrices](#), raw data tracks or soundings are drawn. You can generate a single color set, or multiple, for instance to have a different color set for depth and elevation values. Color sets are defined per [project](#), since depth ranges may be different for various sounding locations.



*Example matrix overlay with cell colors assigned via an user defined color set.*

### Manage color sets

To create or alter color sets, open the "Manage Color Sets" tool by selecting the "Depth Colors..." option from the "Options" menu, or by clicking the "Depth Colors" in the [tool bar](#) (when tool bar is visible and button has been added to the collection of standard buttons):



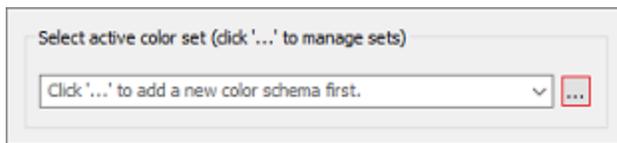
*Select the "Depth Colors..." option from the "Options" menu*

*to start defining color sets.*

### Creating (the first) color set

After creating a new project, the project does not contain any color sets. This means that depths will be displayed in black and matrices can be drawn in black text only. To create a color set, click the "..." button next to the color set selection drop down box. In the dialog which appears, click the "Add..." button.

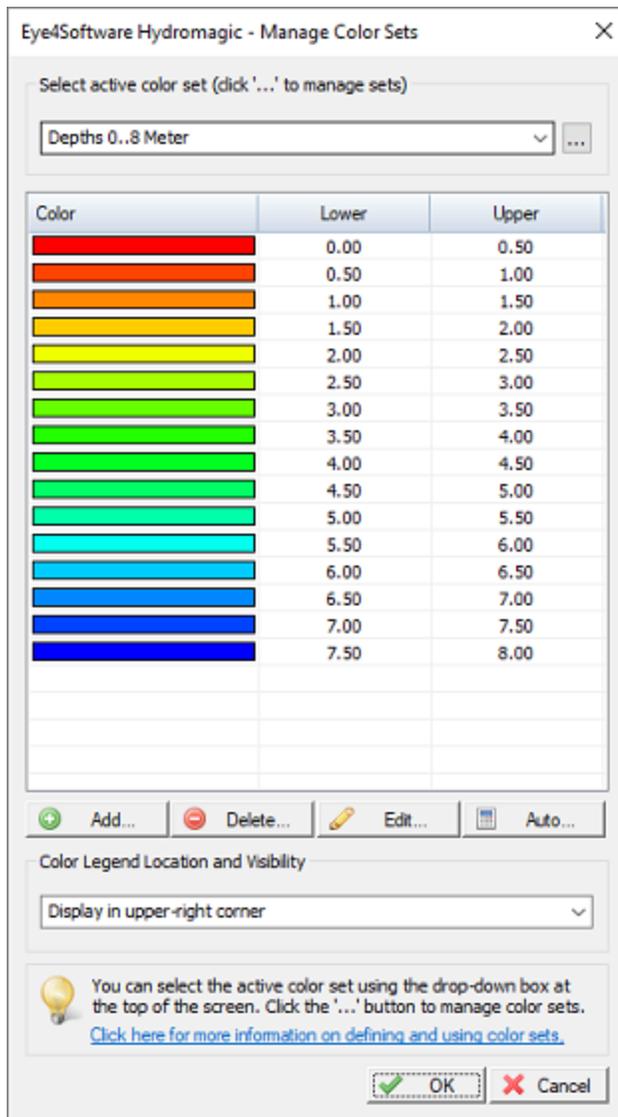
Enter a descriptive name for the set, since it will be displayed in the header of the color legend as well. After clicking "OK" to set the name, select the newly created color set and click "Close". The newly created color set is now set to active. In case you ever want to rename the color set, use the "Rename..." button.



*Click the "..." button to alter, remove or add color sets*

### Defining colors

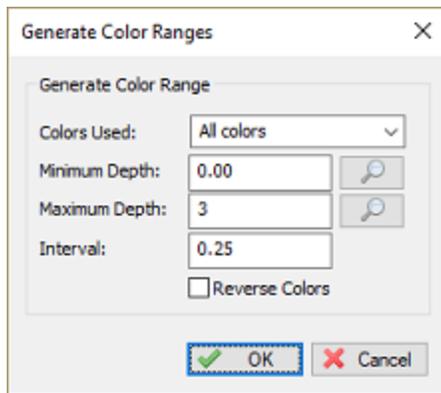
To define or alter color ranges for a color set, first select the color set you want to modify by selecting it from the drop down box at the bottom of the screen. Once selected, the colors associated with the set will be displayed in the color list. The easiest and fastest way to generate color ranges for the color set is by calculating them automatically. To do so, click the "Auto..." button.



**The colors for the selected color set are displayed in the list.**

Using the "Generate Color Ranges" tool, you can just enter the minimum and maximum depths, an interval and select which colors to use. In case you do not know the color range, you can detect the minimum and maximum values automatically by clicking the buttons with the 'magnifier glass' on it. These buttons will only work when a valid sounding has been generated or loaded.

Please note that a maximum of 30 colors can be used per color set. When an error is displayed stating the generation of color ranges will result in more than 30 ranges, just increase the "Interval" value. Generated depth ranges can be altered or removed at any time.



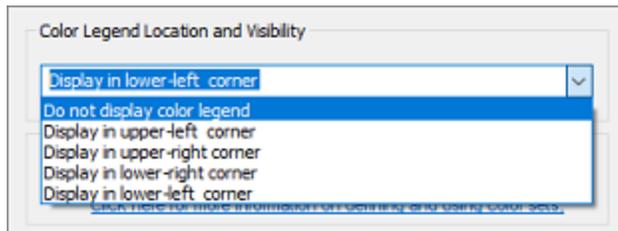
Click the "Auto..." button to calculate ranges for your color set.

## Displaying a color legend

A legend for the defined color set can optionally be displayed in one of the corners of the map display. Use the drop down box to select the location. Possible values are:

- Do not display color legend;
- Display in upper-left corner;
- Display in upper-right corner;
- Display in lower-right corner;
- Display in lower-left corner.

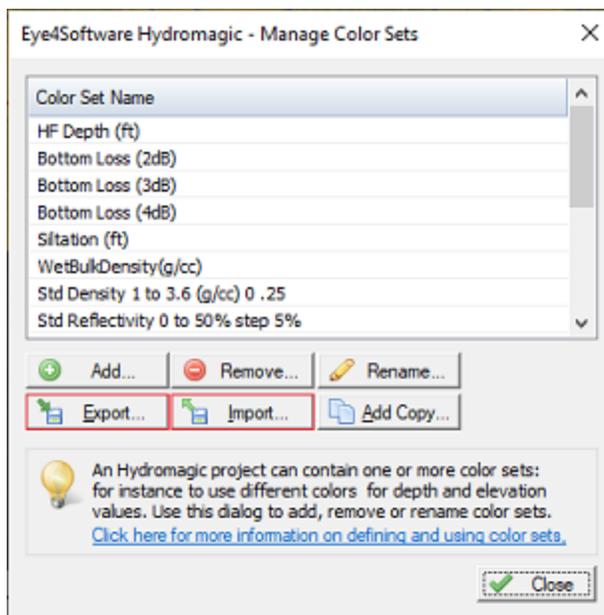
When using the "Final Product Editor" the legend might be displayed at another position. This setting only controls the position of the legend in the [map display](#).



Select the location of the color legend using the drop down box.

## Exporting and importing color sets

Color sets can be backed up easily for archiving, or to import them into another project, which might come in handy if you use the same color set in different projects. To export the color sets defined in a project, click the "..." button to open the list of color sets and click the "Export..." button to save the colors. From the second project, open the same window and use the "Import..." function to import the color set file.



***Use the import and export functions to transfer color sets between projects.***

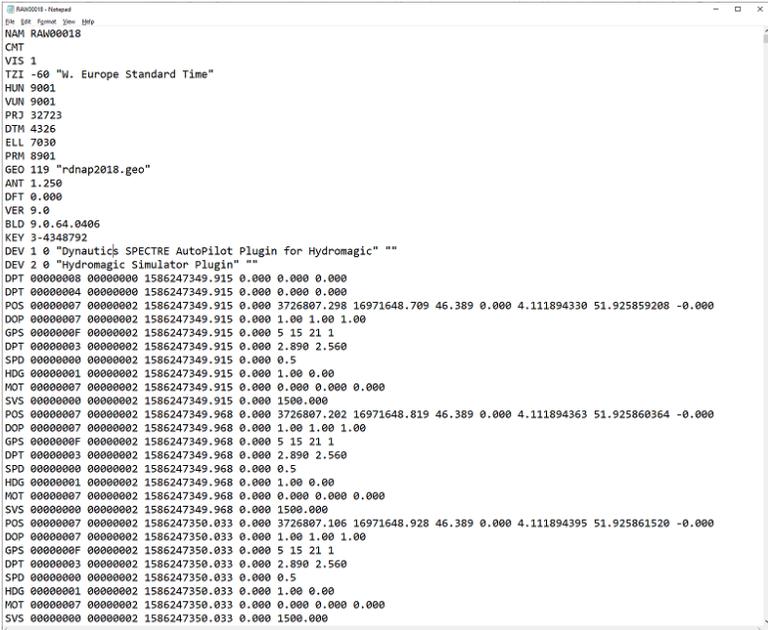
The color importing and exporting functions can be used in the "[3D Terrain Viewer](#)" application as well. This allows you to display 3D terrains in the same colors as defined in your project.

## 5 Recording Data

### 5.1 Getting Started

#### Introduction

Since Hydromagic Survey version 6.0, sensor data isn't [recorded](#) directly to a sounding file, like it used to be in for instance, version 5.2. All sensor data is now time tagged with millisecond accuracy, and stored into plain ASCII text files, called raw data files:



```

NAM RAN00018
CMT
VIS 1
TZI -60 "W. Europe Standard Time"
HUN 9001
VUN 9001
PRJ 32723
DTM 4326
ELL 7030
PRM 8901
GEO 119 "rdnap2018.geo"
ANT 1.250
DFT 0.000
VER 9.0
BLD 9.0.64.0406
KEY 3-4348792
DEV 1 0 "DynaTics SPECTRE AutoPilot Plugin for Hydromagic" ""
DEV 2 0 "Hydromagic Simulator Plugin" ""
DPT 00000000 00000000 1586247349.915 0.000 0.000 0.000
DPT 00000004 00000000 1586247349.915 0.000 0.000 0.000
POS 00000007 00000002 1586247349.915 0.000 3726807.298 16971648.709 46.389 0.000 4.111894330 51.925859208 -0.000
DOP 00000007 00000002 1586247349.915 0.000 1.00 1.00 1.00
GPS 0000000F 00000002 1586247349.915 0.000 5 15 21 1
DPT 00000003 00000002 1586247349.915 0.000 2.890 2.560
SPD 00000000 00000002 1586247349.915 0.000 0.5
HDG 00000001 00000002 1586247349.915 0.000 1.00 0.00
MOT 00000007 00000002 1586247349.915 0.000 0.000 0.000 0.000
SVS 00000000 00000002 1586247349.915 0.000 1500.000
POS 00000007 00000002 1586247349.968 0.000 3726807.202 16971648.819 46.389 0.000 4.111894363 51.925860364 -0.000
DOP 00000007 00000002 1586247349.968 0.000 1.00 1.00 1.00
GPS 0000000F 00000002 1586247349.968 0.000 5 15 21 1
DPT 00000003 00000002 1586247349.968 0.000 2.890 2.560
SPD 00000000 00000002 1586247349.968 0.000 0.5
HDG 00000001 00000002 1586247349.968 0.000 1.00 0.00
MOT 00000007 00000002 1586247349.968 0.000 0.000 0.000 0.000
SVS 00000000 00000002 1586247349.968 0.000 1500.000
POS 00000007 00000002 1586247350.033 0.000 3726807.106 16971648.928 46.389 0.000 4.111894395 51.925861520 -0.000
DOP 00000007 00000002 1586247350.033 0.000 1.00 1.00 1.00
GPS 0000000F 00000002 1586247350.033 0.000 5 15 21 1
DPT 00000003 00000002 1586247350.033 0.000 2.890 2.560
SPD 00000000 00000002 1586247350.033 0.000 0.5
HDG 00000001 00000002 1586247350.033 0.000 1.00 0.00
MOT 00000007 00000002 1586247350.033 0.000 0.000 0.000 0.000
SVS 00000000 00000002 1586247350.033 0.000 1500.000
  
```

**Example of a Hydromagic raw data file opened in Notepad.**

#### Advantages of using raw data files

##### Time Tagging

In a sounding, position values are combined with depth measurements and possibly motion and tide correction data. Because the data is not received at exactly the same time, the offset between a depth and position measurement must be calculated. This is done when generating a corrected sounding file from a raw data file using the "[Sounding Wizard](#)".

##### Latency

In hydrography, latency is the time elapsed between sending out a ping by the echosounder, and the time the serial data with the depth value is received at the computer's serial port. When this value is known (usually between 10 and 100 milliseconds), the delay is subtracted from the recorded timestamp to get an even better accuracy.

The higher the speed of the vessel during a recording, the bigger the error because of latency will be. When you are not able to apply latency corrections, don't go to fast !

##### Data Security

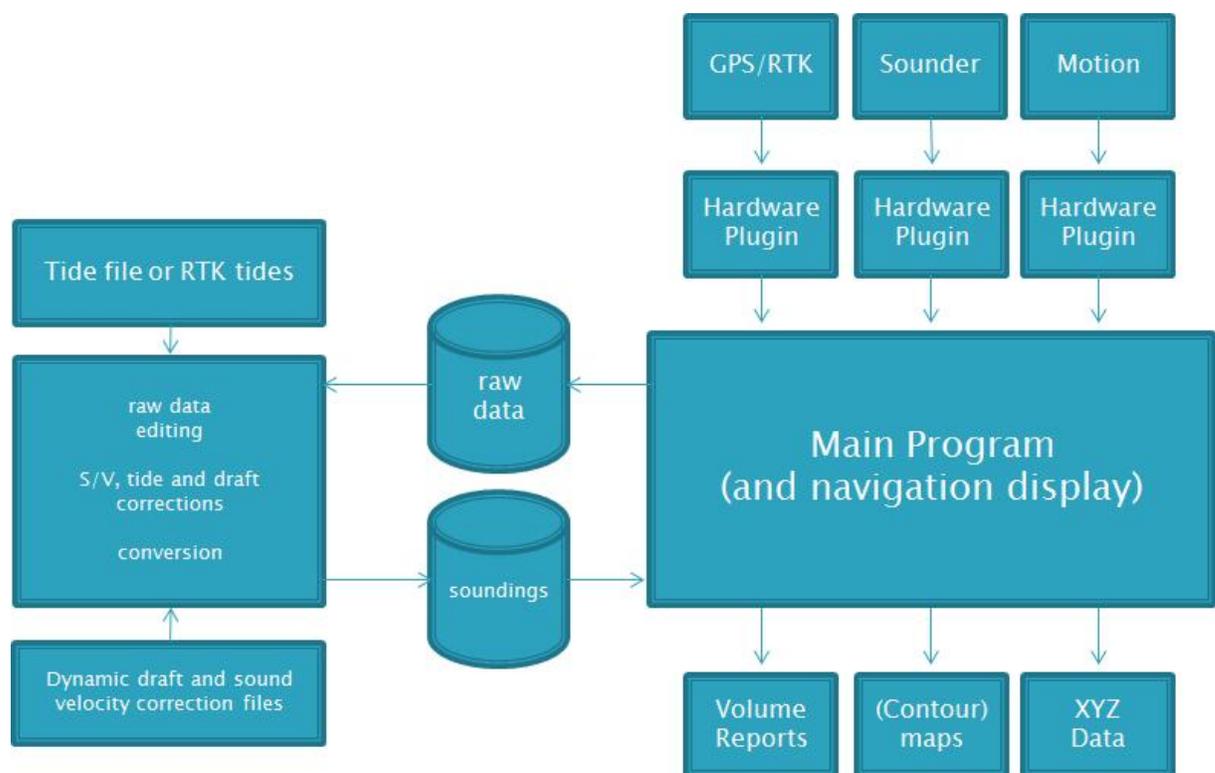
Because the raw data is never altered after you complete recording data, you will never lose any data by performing invalid corrections to your data.

Just use the "Generate Sounding Wizard" again to edit your original data and create a sounding file which can be used for further processing.

### Data Editing

Eye4Software Hydromagic keeps two copies of the raw data files on file. One copy is the original data, which is never altered, and the second one is the modified data.

You can alter the modified raw data over and over again until you are satisfied, and create a sounding file from it. If the data becomes corrupted, just revert back to the original data.



## 5.2 Creating a new singlebeam sounding

### Creating Soundings

Before you can create a new sounding it is recommended to perform the following checklist:

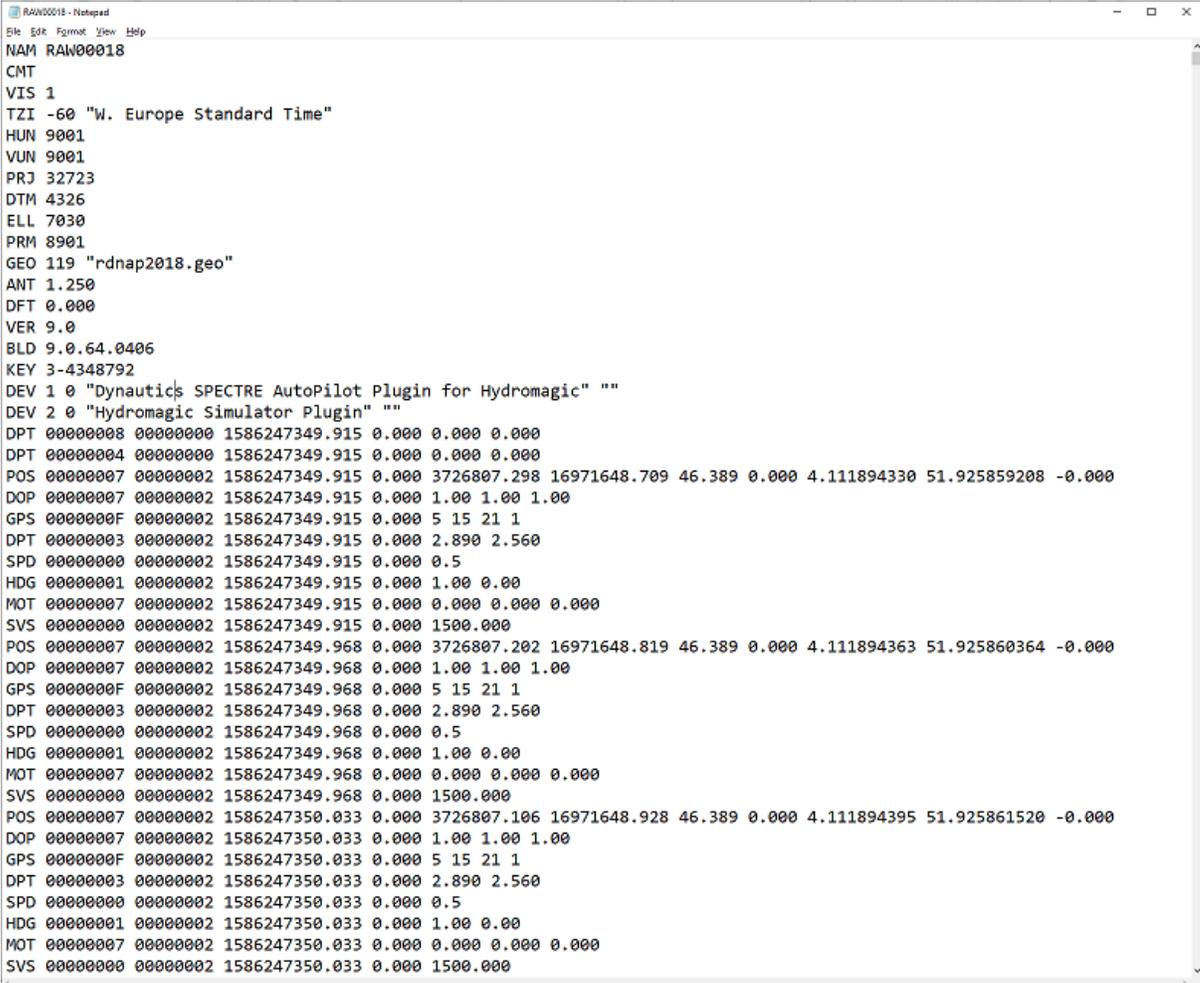
- You have opened an existing or created a new [project](#);
- Make sure the position is valid, and the GPS or RTK receiver has good reception;
- Check whether a depth is indicated in the "[Data View](#)";
- Check the [echo sounder offset](#) (also known as static or fixed draft);
- When using a motion sensor, make sure it is [calibrated](#);
- Check the PC's time and date, this is important when using tide correction;
- When using real time [RTK tide](#) information, make sure the antenna offset and correct geoid model are selected;

- Check the PC's time and date, this is important when using [manual tide](#) correction.
- It is recommended to enable the "auto save" function, please see below for more information.

The next step is to [open](#) or [download](#) a background map, although is not required, it can be used to check whether your GNSS position is still correct, and the software is still writing new records to the raw data file.

## Recording raw data

A sounding is created in two steps. First you are going to record raw data. All position, motion and depth data is time stamped and stored into an ASCII file. The second step is to correct the raw data and generate soundings from it.



```

RAW00018 - Notepad
File Edit Format View Help
NAM RAW00018
CMT
VIS 1
TZI -60 "W. Europe Standard Time"
HUN 9001
VUN 9001
PRJ 32723
DTM 4326
ELL 7030
PRM 8901
GEO 119 "rdnap2018.geo"
ANT 1.250
DFT 0.000
VER 9.0
BLD 9.0.64.0406
KEY 3-4348792
DEV 1 0 "DynaTics SPECTRE AutoPilot Plugin for Hydromagic" ""
DEV 2 0 "Hydromagic Simulator Plugin" ""
DPT 00000008 00000000 1586247349.915 0.000 0.000 0.000
DPT 00000004 00000000 1586247349.915 0.000 0.000 0.000
POS 00000007 00000002 1586247349.915 0.000 3726807.298 16971648.709 46.389 0.000 4.111894330 51.925859208 -0.000
DOP 00000007 00000002 1586247349.915 0.000 1.00 1.00 1.00
GPS 0000000F 00000002 1586247349.915 0.000 5 15 21 1
DPT 00000003 00000002 1586247349.915 0.000 2.890 2.560
SPD 00000000 00000002 1586247349.915 0.000 0.5
HDG 00000001 00000002 1586247349.915 0.000 1.00 0.00
MOT 00000007 00000002 1586247349.915 0.000 0.000 0.000 0.000
SVS 00000000 00000002 1586247349.915 0.000 1500.000
POS 00000007 00000002 1586247349.968 0.000 3726807.202 16971648.819 46.389 0.000 4.111894363 51.925860364 -0.000
DOP 00000007 00000002 1586247349.968 0.000 1.00 1.00 1.00
GPS 0000000F 00000002 1586247349.968 0.000 5 15 21 1
DPT 00000003 00000002 1586247349.968 0.000 2.890 2.560
SPD 00000000 00000002 1586247349.968 0.000 0.5
HDG 00000001 00000002 1586247349.968 0.000 1.00 0.00
MOT 00000007 00000002 1586247349.968 0.000 0.000 0.000 0.000
SVS 00000000 00000002 1586247349.968 0.000 1500.000
POS 00000007 00000002 1586247350.033 0.000 3726807.106 16971648.928 46.389 0.000 4.111894395 51.925861520 -0.000
DOP 00000007 00000002 1586247350.033 0.000 1.00 1.00 1.00
GPS 0000000F 00000002 1586247350.033 0.000 5 15 21 1
DPT 00000003 00000002 1586247350.033 0.000 2.890 2.560
SPD 00000000 00000002 1586247350.033 0.000 0.5
HDG 00000001 00000002 1586247350.033 0.000 1.00 0.00
MOT 00000007 00000002 1586247350.033 0.000 0.000 0.000 0.000
SVS 00000000 00000002 1586247350.033 0.000 1500.000

```

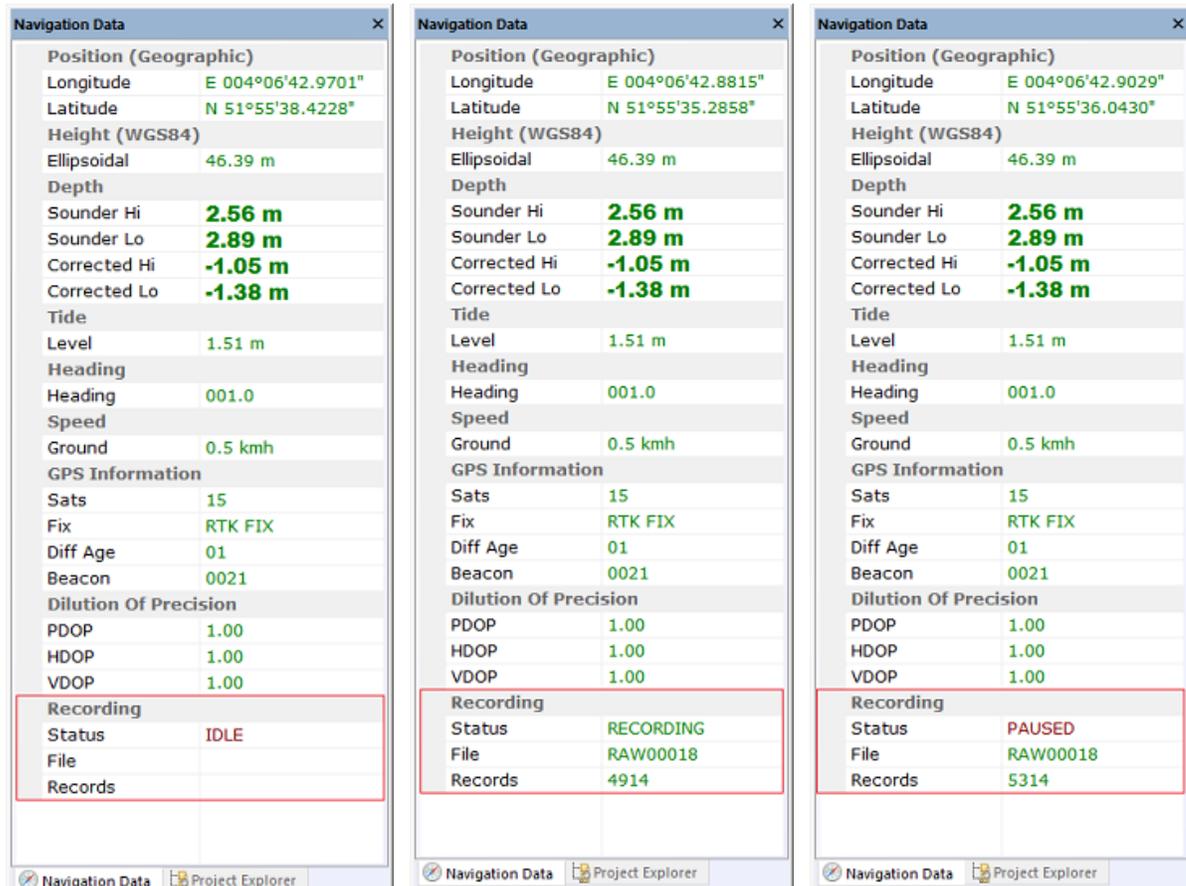
*Example of a Hydromagic raw data file opened in Notepad.*

## Recording raw data files

When you are ready to start your survey, just click the "Record" button (  ) to start recording all sensor data to a newly created raw data file. Raw data files are generated every time you start a new recording. Raw files are named RAW0001, RAW0002, RAW0003 etc. You can record the complete area to a single file, or start a new data file for each surveyed line (we recommend the latter). To check the recording

status, check the recording indicator right on the status bar, or check the "Recording" section in the "Data View" display as shown by the screen shots below.

To pause a recording without generating a new recording, just click the "Pause" button () instead. When clicking the pause button again, the recording will resume writing data to the same raw data file.



The figure shows three screenshots of the 'Navigation Data' window, illustrating the recording status. Each window displays the same navigation data, but the 'Recording' section at the bottom is highlighted with a red box.

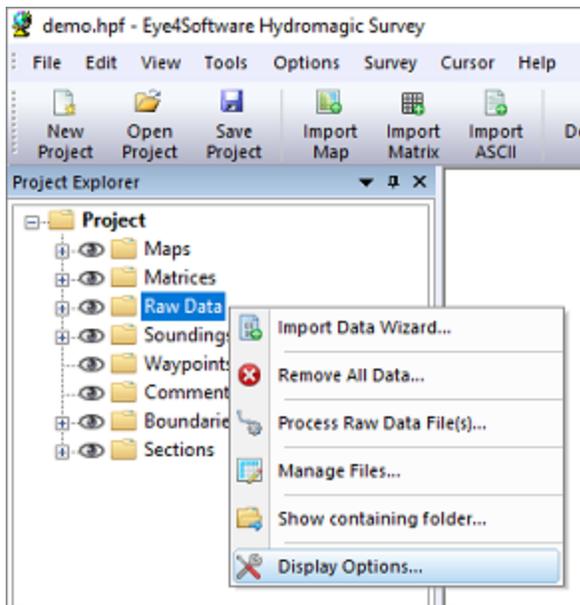
Recording Status	Status	File	Records
No raw data recording	IDLE		
Data recording active	RECORDING	RAW00018	4914
Data recording paused	PAUSED	RAW00018	5314

The navigation data shown in all three screenshots is as follows:

Position (Geographic)	
Longitude	E 004°06'42.9701"
Latitude	N 51°55'38.4228"
Height (WGS84)	
Ellipsoidal	46.39 m
Depth	
Sounder Hi	2.56 m
Sounder Lo	2.89 m
Corrected Hi	-1.05 m
Corrected Lo	-1.38 m
Tide	
Level	1.51 m
Heading	
Heading	001.0
Speed	
Ground	0.5 kmh
GPS Information	
Sats	15
Fix	RTK FIX
Diff Age	01
Beacon	0021
Dilution Of Precision	
PDOP	1.00
HDOP	1.00
VDOP	1.00

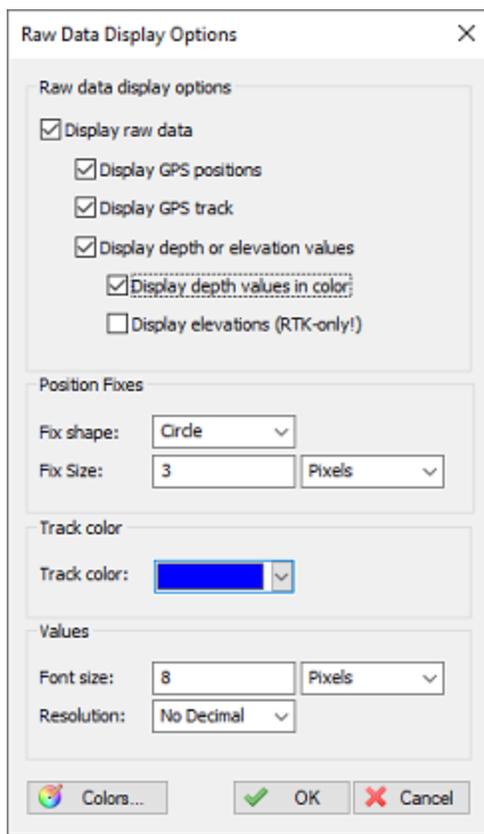
## Displaying raw data files

During recording, recorded raw data will be displayed as map display overlay. Please note, that at this stage, only the uncorrected raw depth (not elevation!) and position data is written to the display. Elevations and corrected values will only be displayed when the raw data has been [converted to a sounding](#). However, when you are recording data with [RTK tides](#) enabled, you can show corrected data during the survey by enabling the "Display elevations" option in the display options window (see below).



**Right click the "Raw Data" folder and select "Display Options..."**

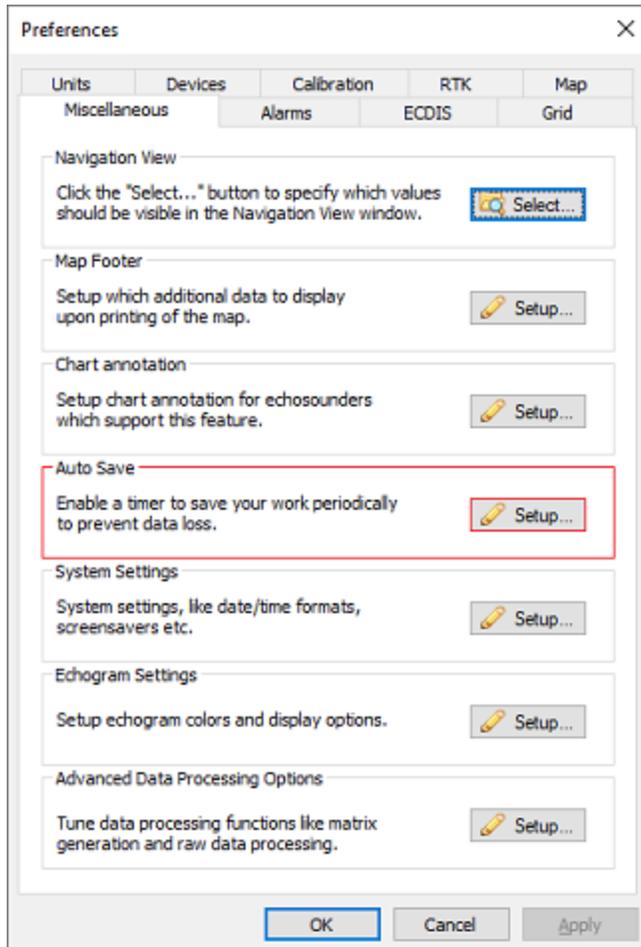
To change the way raw data files are displayed (as track, positions or depth values), right click on the "Raw Data" folder in the "Project Explorer" and select the "Display Options..." option. A dialog box is presented allowing you to specify how all raw data files are displayed on top of the background map:



**Customize the way raw data files are displayed.**

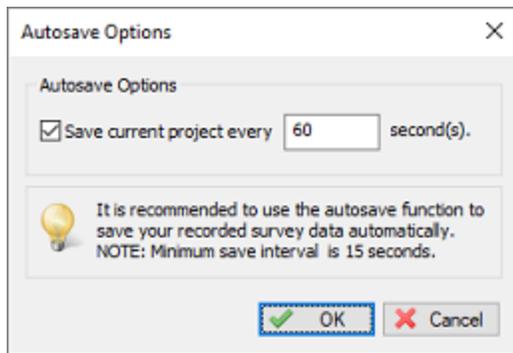
## Auto save option

To prevent data loss, for instance due to a PC crash or AC power failure, it is recommended to use the "AutoSave" option. When this option is enabled all project data (including raw data and sounding files) will be saved to disk at the specified interval.



**The auto save option is located at the "Miscellaneous" tab.**

To change the auto save option, select "Preferences..." from the "Options" menu, and click the "Miscellaneous" tab. You will see an "Auto save" section at the bottom of this window. Now click the "Setup..." button in this section. Enable the check box when you want to use auto save, and enter an interval (minimum 1 minute). Click the "OK" button to apply the changes.



*Make sure you enable the auto save function to prevent data-loss.*

### Manually saving the raw data

Raw data can be saved at any time by just clicking the "Save" button in the toolbar (). It will be saved into the "RawData" folder of [your project](#).

## 5.3 Events and annotation

### Using events and annotations

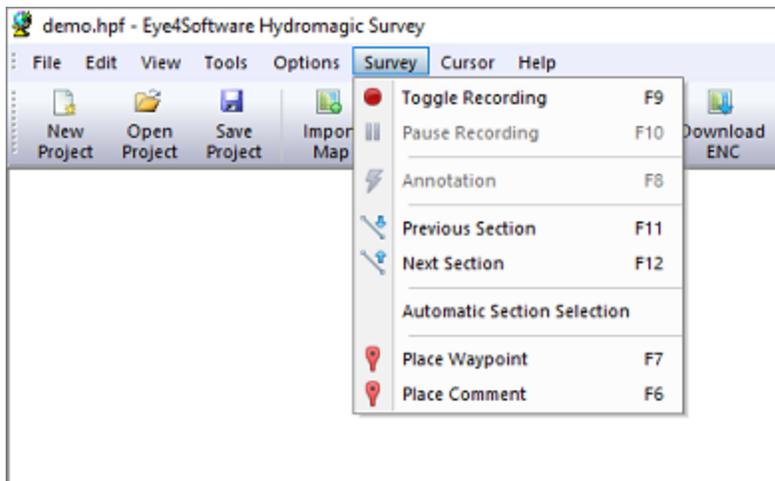
In Hydromagic, it is possible to mark places of special interest during surveys by sending an annotation marker to the echosounder or built-in echogram display. There are also shortcuts to place a map overlay, such as a waypoint or comment at the current GPS or RTK position.

### Accelerator Keys

To enable quick access to the functions described in the introduction above, we recommend you to setup accelerator keys for them. By default, the following accelerator keys are already defined for some operations during surveys:

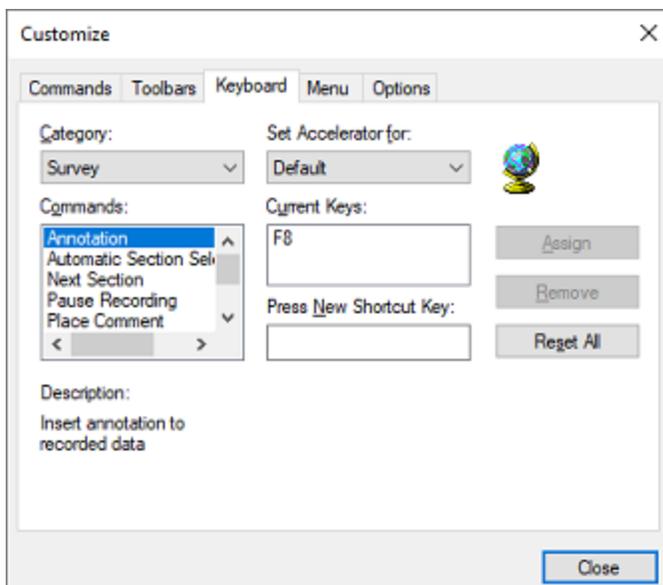
- F6 - Place comment at current GPS position;
- F7 - Place waypoint at current GPS position;
- F8 - Store event and annotate echosounder or echogram;
- F9 - Toggle recording (start/stop);

Please note that these functions can also be accessed through the main menu. Just click the 'Survey' item from the main menu which can be found at the top of the Hydromagic window.



**Access the event and annotation functions from the Survey menu.**

When you are using a tablet, and do not have a full keyboard, you can associate some of these functions with other keys (for instance tablet keys) as well. For more information on how to assign accelerator keys (or keyboard shortcuts), please refer to the [Accelerator Keys](#) manual entry.



**Use accelerator keys to quickly access event and annotation functions.**

## Placing a comment

By pressing the F6 key on your keyboard, or selecting the 'Place Comment' function from the 'Survey' menu, Hydromagic will create an empty comment with the current GPS position as center coordinate. This allows you to place a textual note on the map. Please note that this comment is not send to the echosounder, echogram or raw data file. Comments will be stored in XML format in the project file. Comments can also be exported as ASCII text using the "Export ASCII Data" tool.

Please see the ['Adding Comments'](#) manual entry for more information on what map comments are and how they can be used.

**New Comment**

Comment

Latitude: N 51°55'32.1627"

Longitude: E 004°06'43.0925"

Comment: Rock Formation

Show position in northing / easting coordinates

Display

FgColor:

BgColor:   Transparent

Font: Arial Black

Size: 10

**Rock Formation**

***Place a comment at the current GPS position.***

## Placing a waypoint

By pressing the F7 key on your keyboard, or selecting the 'Place Waypoint' function from the 'Survey' menu, Hydromagic will create an empty waypoint with the current GPS position as center coordinate. This allows you to place a symbolic note on the map. Please note that this waypoint is not send to the echosounder, echogram or raw data file. Waypoints will be stored in XML format in the project file. Waypoints can also be exported as ASCII text using the "Export ASCII Data" tool.

Please see the ['Adding Waypoints'](#) manual entry for more information on what map waypoints are and how they can be used.

**Place a waypoint symbol at the current GPS position.**

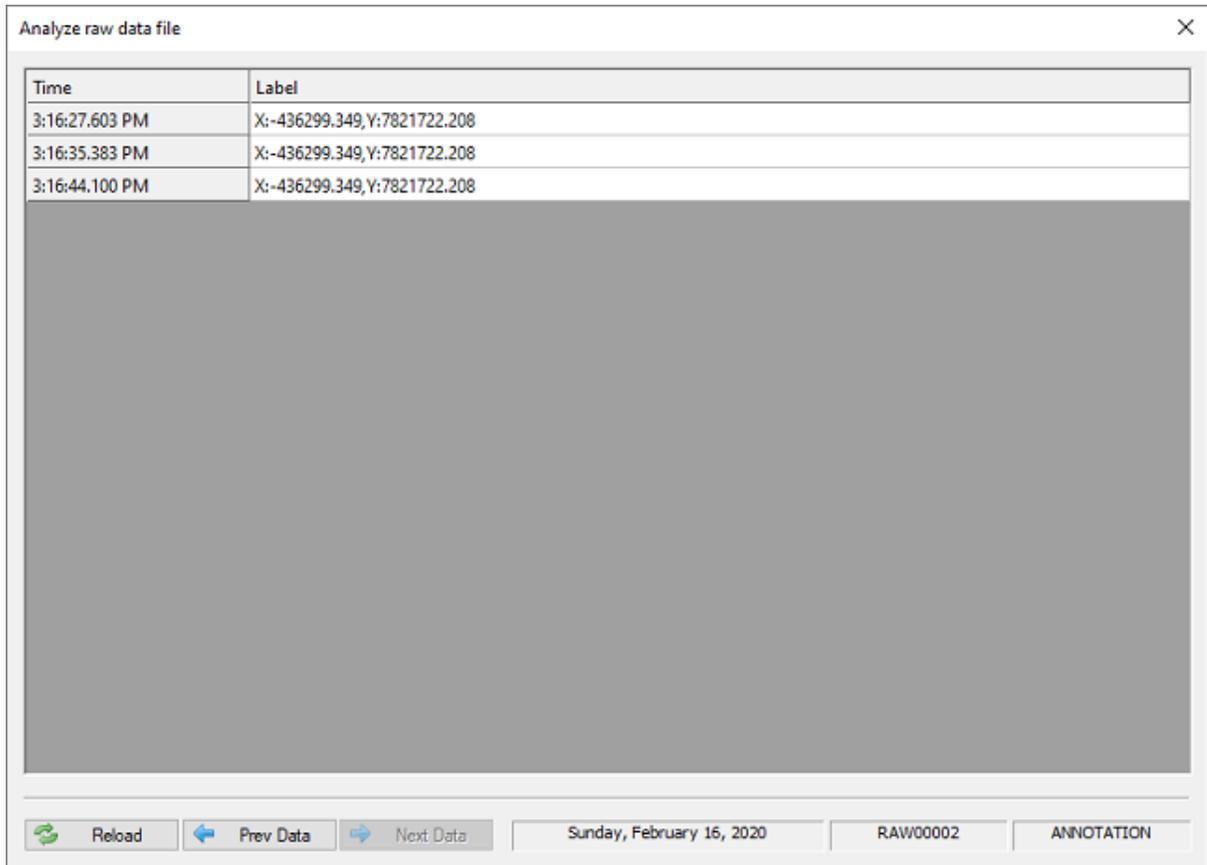
## Sending annotation marks

While you are using the 'Place Comment' and 'Place Waypoint' to make annotations on the background map for your survey area, you can use the 'Annotation' function to mark a location on the echogram which is currently recording. These annotations can be customized and will be on echograms, in the raw data files or on the paper in your echosounder (more on this in one the next paragraphs).

To insert an annotation in the echogram, just press the 'F8' key on the keyboard. The annotation will be formatted as configured and stored in the raw data file. When you later view the echogram, the annotations will show up as purple lines:



**Example of an echogram containing annotations (easting and northing coords).**



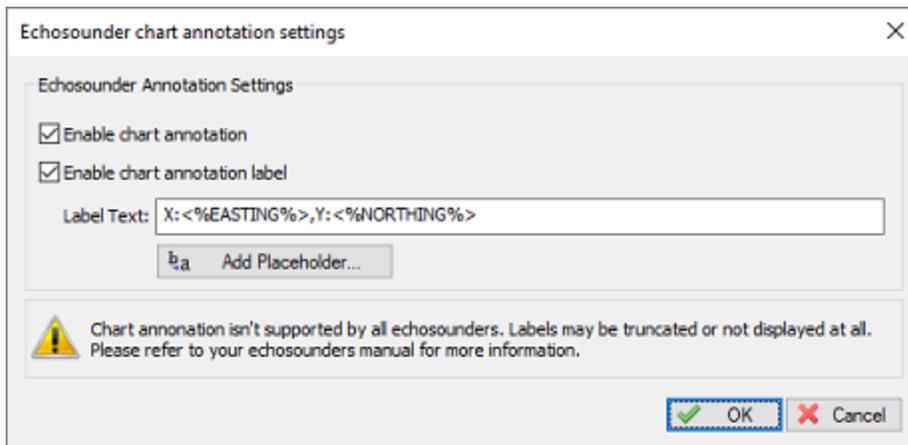
Time	Label
3:16:27.603 PM	X:-436299.349,Y:7821722.208
3:16:35.383 PM	X:-436299.349,Y:7821722.208
3:16:44.100 PM	X:-436299.349,Y:7821722.208

*Example of annotation data stored in a raw data file (easting and northing coords).*

### Customizing annotation text

When adding an annotation mark to your raw sounding, you can use a fixed text, empty line or format the text using placeholders, for instance when you want to insert real time data, like the current time, position, heading or speed.

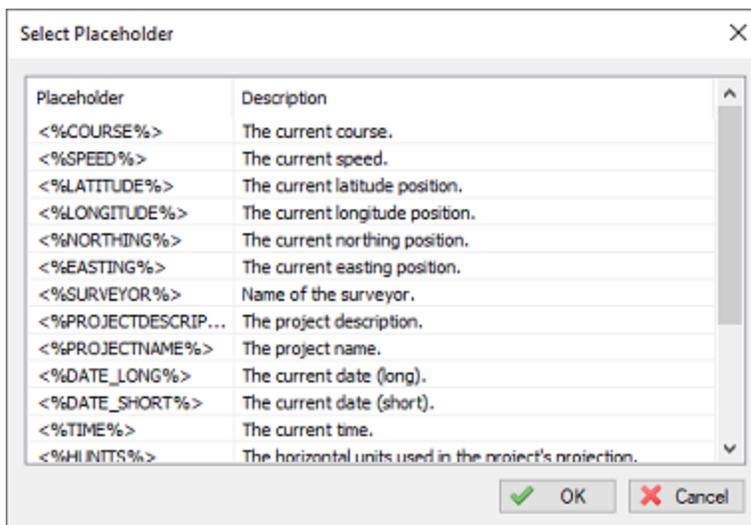
To customize the annotation text, first select the "Preferences..." option from the "Options" menu. Then click the 'Miscellaneous' tab and click the "Setup..." button in the "Chart Annotation" section. The following dialog will now appear. To enable annotations to be stored, check the 'Enable chart annotation' option. This will allow you to insert annotation lines without labels.



***In Hydromagic you can use the above dialog to customize annotation text.***

When you want to place labels along with the annotation lines, please check the 'Enable chart annotation label' box as well. You can use the label text line to customize the label. To use real time data in your labels, click the 'Add Placeholder...' button to insert placeholders.

In the example above, when inserting an annotation mark, the current easting and northing position will be displayed next to the marker line.



***Combine static text with placeholders to add real time data to your labels.***

Sending annotation markers to thermal paper

Some echo sounders which contain a thermal recorder have the ability to write annotation marks directly on the thermal paper. Sometimes they can only print a line, and sometimes some label text as well. Most sounders will limit the maximum amount of text written to 80 characters.

There are also some modern sounders which have the ability to receive annotation data and display it on a built in screen. A couple of Hydromagic plugins have the ability to send out annotation data to an echo sounder:

- STN ATLAS Deso 11/14/15 Echosounder Plugin;
- STN ATLAS Deso 17 Echosounder Plugin;

- STN ATLAS Deso 20/22/25 Echosounder Plugin;
- Odom EchoTrac SBT/DBT Plugin
- Syqwest Hydrobox Plugin;
- Knudsen 320 Echosounder Plugin;
- ELAC LAZ4100 Echosounder Plugin;
- Reson NaviSound 200 Series Plugin;
- Simrad EA300 Plugin;
- Simrad EA500 Plugin.



*An echosounder capable of writing annotation marks to thermal paper (Odom EchoTrack).*

## 5.4 RTK tide corrections

### Using RTK tide corrections

Using a RTK receiver in fixed mode, you have X, Y and Z coordinates with an high accuracy ( $< 2$  cm ). Using the Z coordinate (also known as ellipsoidal height), you can calculate the current tide level in real-time, making it no longer necessary to have a tide gauge connected to the software, or to correct the sounding afterwards.

## Requirements

In order to calculate tide levels in real-time, you need a RTK receiver with a valid correction signal. This correction signal can be provided by a GSM / GPRS ( NTRIP ) service provider, UHF base station or your own base station on a known location. When your RTK receiver does not have a built in cellular modem to make connection to the Internet, but your computer does have an active Internet connection, you can use the ['Hydromagic NTRIP Plugin'](#) to feed RTCM correction data into your RTK receiver. When you are surveying at a remote location without any data coverage, you can also use the "[Post Processing Kinematic](#)" method.

You also need a local geoid model. This is a file containing geoid - ellipsoid separation values for the area or country you are performing your survey.

Hydromagic ships with a couple of geoid models, including Belgium, the Netherlands and North America. Additional geoid models can be downloaded free of charge from the "[geoid download page](#)". If no geoid model is available for your area, please [contact support](#) for assistance.

To perform the calculation, you also need to know the exact distance between the receiving element of your RTK antenna and the water surface.

## Receiver Output

To retrieve the ellipsoidal height from your RTK receiver, it should have an NMEA0183 data output, supporting either the \$GPGGA or \$PTNL,GGK sentence as shown in the examples below:

```
$PTNL,GGK,453049.0,0,3728.455440850,N,12215.253291068,W,3,9,2.0,EHT35.7424,M*
```

*Trimble proprietary message for RTK position*

```
$GPGGA,042629.00,3242.86076286,S,15133.15384408,E,4,12,1.1,6.573,M,26.799,M,1.0,0000*51
```

*Standard NMEA0183 sentence for GPS or RTK fix data*

When the Trimble proprietary NMEA0183 message is used, the ellipsoidal height is provided directly in the sentence, in the example above it is in the ellipsoidal height (10) "EHT35.7424" field.

For standard NMEA0183, the ellipsoidal height is calculated from the M.S.L. (9) height and geoidal separation (11) field. In this case the ellipsoidal height is calculated by using the formula below: In the example above, the ellipsoidal height is  $6.573 + 26.799 = 33.372$  meter.

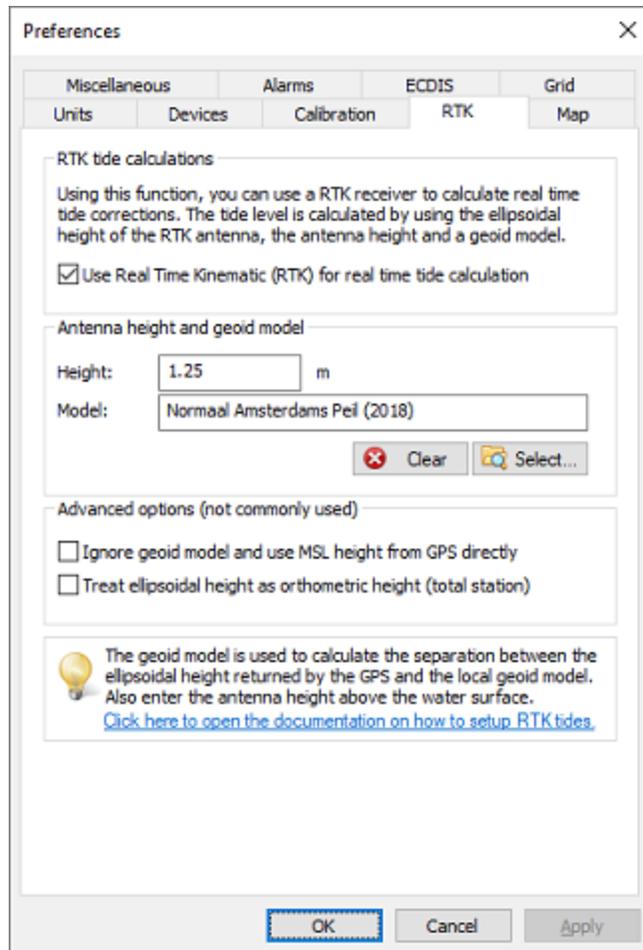
```
Ellipsoidal Height = M.S.L. Height + Geoidal Separation
```

*Formula for calculating ellipsoidal height from NMEA0183 GGA sentence*

Please note that the M.S.L. ( Mean Sea Level ) height value returned by the GPS is calculated using the global EGM96 geoid model, and isn't accurate enough to use for your surveys. This is why you have to provide a local geoid model instead.

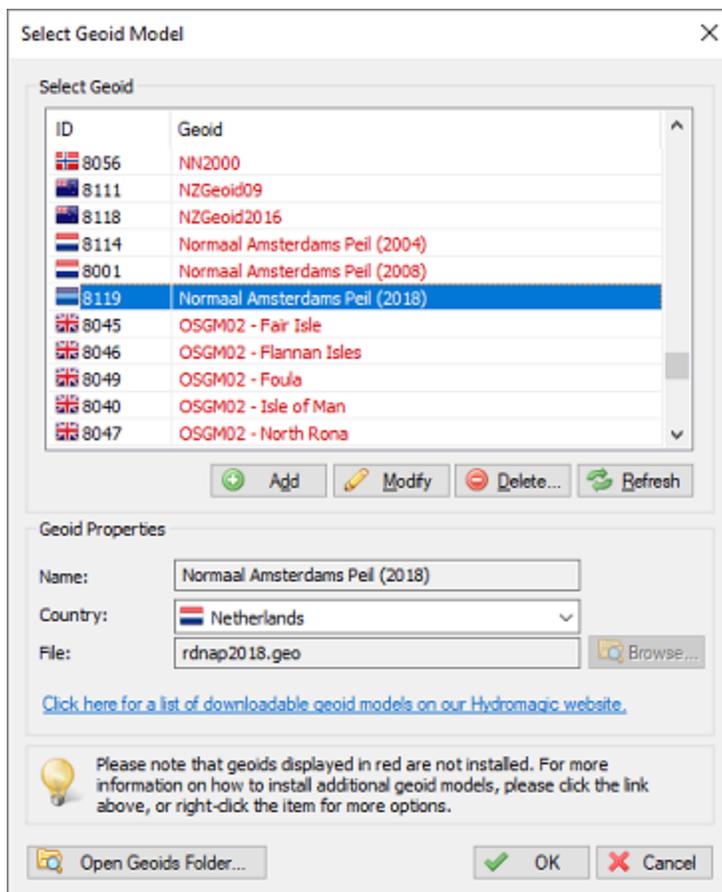
## RTK Configuration

In order to configure Hydromagic to use RTK tides, open the preferences dialog by selecting "Preferences..." from the "Options" menu. To view the RTK configuration, click the "RTK" tab. You should see following dialog:



**RTK settings tab in the preferences dialog.**

To enable tide calculation, you have to check the "Use Real Time Kinematic (RTK) for real time tide calculation" box. When checked, you can alter the other configuration options. First you have to enter the height of the antenna above the water surface. Make sure to measure this distance as accurate as possible, an error in this measurement is directly converted to an error in the tide level. Secondly, select the geoid model used in your area by clicking the "Select..." button.

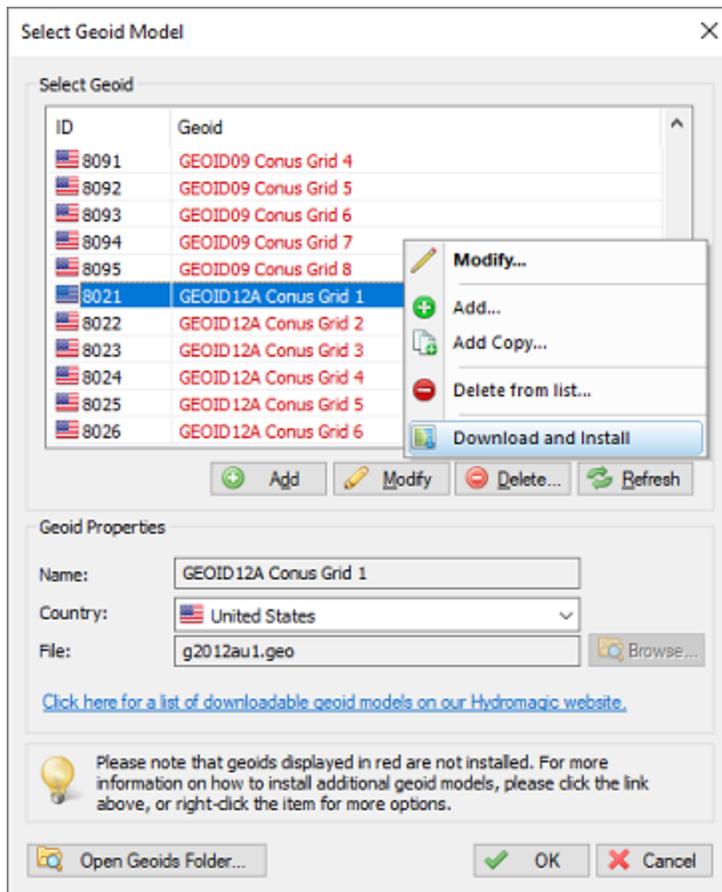


Click "Select" to choose a geoid model.

When finished configuring, just click "OK" to apply the settings.

## Downloading additional geoid models

When selecting a geoid from the list, you may have noticed that some models are displayed in 'red' while others are displayed in 'black'. Geoid models that are displayed in 'black' are already installed because they were shipped with the Hydromagic installer. When you need to use a geoid model that is displayed in 'red', you have to download it first. To do so, right-click the model and select the 'Download and Install' option from the popup menu:



**When not installed, select the "Download and Install" option.**

After downloading and installing, the geoid model should be displayed in 'black'. If not there was a problem with the download. You might want to retry another time, or download and install the geoid model manually, which is explained on the "geoid download page". When a geoid file for your area is not available on our website, you can also try to convert a third-party geoid file to Hydromagic geoid file format using the [Geoid Converter](#) utility which is shipped with the Hydromagic software.

## Advanced Settings

Normally you do not have to use these settings. In some cases they are needed though to get a good result on the height readings. When your height measurement is far off, please try these settings to see whether they fix the error. Another cause of height measurement errors is selecting a missing geoid model. Always check whether the geoid model used is installed (see previous paragraph).

### Ignore geoid model and use MSL field from GPS directly

Some newer RTK rovers have the ability to load a geoid model internally. This means that the orthometric height is already calculated by the rover. In these cases the orthometric height is returned in the MSL field of the NMEA0183 GGA sentence. If this is the case, select this option. Also use this option when you are using "Post Processing Kinematic" and the orthometric heights are returned in the PPK correction file.

### Treat ellipsoidal height as orthometric height

This options should be used when a total station is used which outputs XYZ data in a pseudo NMEA0183 GGA sentence. In this case no geoid model will be applied and the ellipsoid height field is used as orthometric height directly.

## Testing RTK and geoid calculations

In order to test RTK tide calculations, connect and power on your RTK receiver and make sure you have a valid RTK fix. The next step is to check the values in the "[Navigation Data](#)" window. If this view isn't visible, you can activate it by selecting "Navigation Data" from the "View" menu.



Position (WGS84)	
Latitude	S 32.714601
Longitude	E 151.552368
Position (Local Grid)	
Northing	5226715.22
Easting	5036019.13
Altitude / Height	
MSL	6.47 m
EHT	33.26 m
Depth	
Sounder Hi	2.80 m
Sounder Lo	0.00 m
Corrected	29.55 m
Tide	
Manual	0.00 m
Receiver	0.00 m
RTK	32.35 m
Course	
Course	348.7 °
Speed	
Ground	0.0 m/s
GPS Information	
Sats	13
Fix	RTK Fix
Diff Age	01
Beacon	0000
Time	04:27:33 GMT
Dilution Of Precision	
PDOP	2.70
HDOP	0.90
VDOP	2.30

You have to check the following:

- The EHT (Ellipsoidal Height) is displayed in the data view. If missing, check the NMEA0183 configuration of your RTK receiver.
- When using the Trimble proprietary NMEA0183 sentence, the M.S.L. field can be 0.00.
- You should have RTK Fix in the GPS Information section.
- The RTK tide value is displayed in green.

## Start recording

When the conditions above match, you can just start a new recording and proceed with your survey. When generating a sounding from your raw data files, you will be able to correct the tide settings if needed.

## 5.5 Analyzing recorded raw data

### Recording data

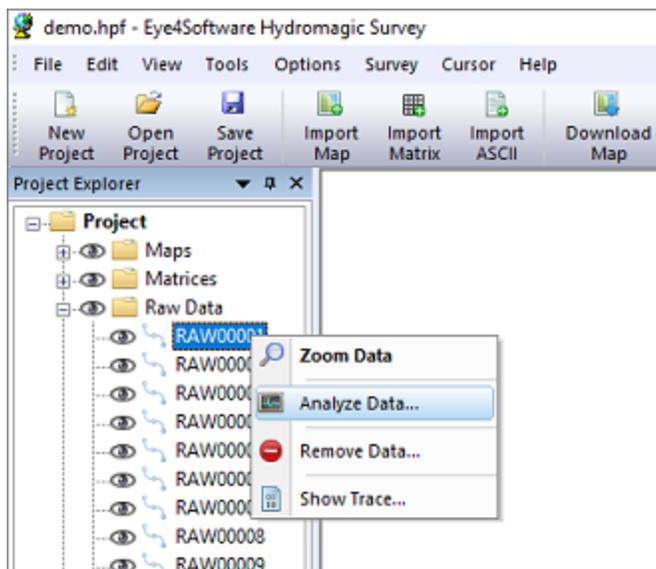
In Hydromagic all data coming in from devices (using plugins) is recorded into ASCII formatted, human readable raw data files. When performing a survey you might want to start with a single run and check your raw data first before collecting the rest of your data.

You can have a preview of the collected data using the data analysis window. When your sounder is capable of recording the full echogram envelope (which is recorded as binary data for performance reasons), you might want to use the "Echogram Digitizer" tool to check this data as well.

### Starting the data analysis window

The data analysis window does not have much more functionality than grouping data in separate tables. Data is displayed in a spreadsheet view and is provided with timestamps indicating the exact time the data was received and stored (with one millisecond resolution).

To open a raw data file, to view its contents, locate the file by expanding the 'Raw Data' folder in the 'Project Explorer' which should normally reside on the left part of the screen. Right-click the raw data file you want to analyze and select the 'Analyze Data...' option from the pop-up menu that appears at the mouse cursor location.



*Right click the raw file and select 'Analyze Data...' to view its contents.*

### Using the data analysis window - Depths

After starting the window, it first shows the collected echo sounder depth values. Please note that Hydromagic adds transducer draft before writing depths to the raw data file. This means that the depths reported should be equal to the depth below the transducer with the static draft added to this value.

Analyze raw data file

Time	Depth (Lo)	Depth (Hi)
6:35:39.639 PM	N/A	4.93
6:35:39.744 PM	5.22	N/A
6:35:39.837 PM	N/A	4.92
6:35:39.941 PM	4.98	N/A
6:35:40.045 PM	N/A	4.91
6:35:40.140 PM	5.26	N/A
6:35:40.244 PM	N/A	4.93
6:35:40.338 PM	5.00	N/A
6:35:40.442 PM	N/A	4.92
6:35:40.538 PM	5.00	N/A
6:35:40.641 PM	N/A	4.91
6:35:40.735 PM	5.01	N/A
6:35:40.839 PM	N/A	4.92
6:35:40.944 PM	5.00	N/A
6:35:41.037 PM	N/A	4.93
6:35:41.141 PM	5.00	N/A
6:35:41.235 PM	N/A	4.93
6:35:41.339 PM	5.00	N/A
6:35:41.438 PM	N/A	4.92
6:35:41.542 PM	5.26	N/A

Reload Prev Data Next Data Thursday, March 5, 2015 RAW00001 DEPTH

***Depth values recorded with a dual frequency echo sounder.***

Please note, that when using a single frequency echo sounder, the low frequency column will contain only 'N/A' values.

At the bottom of the screen the name of the raw data file, raw data type as well as the recording date are displayed. To select other data to display, just click the 'Prev Data' and 'Next Data' buttons.

### Using the data analysis window - Bottom Parameters

The second page which comes after the page containing the depth values contains bottom parameters. These parameters are recorded only by a couple of echo sounders, so you might notice that this screen might contain no values.

Analyze raw data file

Time	HFBL	LFBL	rHF	rLF	dHF	dLF	pHF	pLF
2:00:26.023 PM	23	20	7	10	1.14	1.24	92	86
2:00:26.093 PM	23	20	7	10	1.14	1.23	92	87
2:00:26.153 PM	23	20	7	10	1.14	1.22	92	87
2:00:26.216 PM	23	19	7	11	1.14	1.25	92	86
2:00:26.286 PM	23	19	7	11	1.14	1.27	91	85
2:00:26.346 PM	22	19	8	11	1.16	1.26	91	85
2:00:26.423 PM	22	19	8	11	1.17	1.25	90	86
2:00:26.473 PM	22	19	8	11	1.17	1.27	90	85
2:00:26.543 PM	21	19	9	11	1.18	1.27	90	85
2:00:26.623 PM	21	19	9	11	1.18	1.26	90	85
2:00:26.673 PM	21	19	9	11	1.18	1.25	90	86
2:00:26.733 PM	21	19	9	11	1.18	1.27	89	85
2:00:26.813 PM	21	19	9	11	1.19	1.27	89	85
2:00:26.863 PM	21	19	9	12	1.19	1.28	89	84
2:00:26.933 PM	20	18	10	13	1.21	1.31	88	83
2:00:26.983 PM	20	18	10	13	1.22	1.31	88	83
2:00:27.083 PM	20	18	10	12	1.22	1.30	87	84
2:00:27.133 PM	20	17	10	14	1.23	1.35	87	81
2:00:27.183 PM	20	17	11	14	1.24	1.35	86	80
2:00:27.253 PM	19	17	11	14	1.25	1.34	86	81

Reload Prev Data Next Data Thursday, August 29, 2019 RAW00001 BOTTOM

**Bottom information values recorded with an Unabara Hydro-2F echo sounder.**

Although this page isn't used by most customers, we decide it to place it directly after the depth page because it is related to echo sounder information. Parameters that will be displayed here when available include:

- Bottom Loss - High Frequency;
- Bottom Loss - Low Frequency;
- Reflectivity - High Frequency;
- Reflectivity - Low Frequency;
- Density - High Frequency;
- Density - Low Frequency;
- Porosity - High Frequency;
- Porosity - Low Frequency;

### Using the data analysis window - position data

The third page contains position information as recorded by your GNSS/RTK receiver or total station. When using [RTK tides](#), you should have a valid Ellipsoid height value in the third column. If this field is empty or intermittent, please check your GPS configuration as your receiver is sending out incorrect, too less or redundant NMEA0183 sentences.

Analyze raw data file

Time	Easting	Northing	Ellipsoid	MSL
6:34:53.169 PM	721667.477	7702175.689	651.200	657.616
6:34:54.169 PM	721668.348	7702176.655	651.192	657.607
6:34:55.169 PM	721669.196	7702177.620	651.158	657.573
6:34:56.169 PM	721670.044	7702178.594	651.164	657.580
6:34:57.169 PM	721670.866	7702179.624	651.160	657.576
6:34:58.169 PM	721671.645	7702180.748	651.164	657.580
6:34:59.169 PM	721672.432	7702181.921	651.185	657.601
6:35:00.169 PM	721673.221	7702183.112	651.187	657.603
6:35:01.169 PM	721674.016	7702184.321	651.179	657.595
6:35:02.169 PM	721674.816	7702185.561	651.175	657.591
6:35:03.169 PM	721675.644	7702186.809	651.204	657.620
6:35:04.168 PM	721676.491	7702188.066	651.195	657.611
6:35:05.168 PM	721677.361	7702189.314	651.171	657.587
6:35:06.168 PM	721678.247	7702190.551	651.159	657.575
6:35:07.168 PM	721679.124	7702191.784	651.159	657.576
6:35:08.168 PM	721680.010	7702193.019	651.152	657.568
6:35:09.169 PM	721680.861	7702194.276	651.183	657.599
6:35:10.169 PM	721681.709	7702195.538	651.181	657.597
6:35:11.169 PM	721682.540	7702196.814	651.182	657.598
6:35:12.169 PM	721683.358	7702198.090	651.178	657.595

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 RAW00001
 POSITION

**Position information containing height information recorded at 1Hz intervals.**

The first two columns contain the position information like projected eastings and northings. Please note that your raw data file contains geographic WGS84 positions as well. These are not displayed since they are only used when reprojecting or [importing the raw data file](#). Make sure that you have a valid position in this table with an update rate of at least once per second.

### Using the data analysis window - heading data

Heading information is required only when your echo sounder transducer is not at the exact horizontal position as your GPS antenna. In this case it has to be present to be able to calculate the position offset between the two sensors.

The first column shows true heading, which is in most times calculated by the GPS (only when moving) and send to the software using the VTG NMEA0183 sentence. When the second column is used, the heading is a magnetic heading provided by a (flux)compass, gyro or IMU.

Analyze raw data file

Time	True	Magnetic
6:34:53.172 PM	39.66	N/A
6:34:54.172 PM	41.08	N/A
6:34:55.172 PM	40.75	N/A
6:34:56.171 PM	37.78	N/A
6:34:57.171 PM	37.85	N/A
6:34:58.172 PM	34.33	N/A
6:34:59.172 PM	32.74	N/A
6:35:00.172 PM	32.18	N/A
6:35:01.172 PM	31.72	N/A
6:35:02.172 PM	32.42	N/A
6:35:03.172 PM	32.60	N/A
6:35:04.171 PM	34.22	N/A
6:35:05.171 PM	32.87	N/A
6:35:06.171 PM	35.31	N/A
6:35:07.171 PM	33.80	N/A
6:35:08.171 PM	34.49	N/A
6:35:09.172 PM	33.17	N/A
6:35:10.172 PM	32.35	N/A
6:35:11.172 PM	31.92	N/A
6:35:12.172 PM	31.25	N/A
6:35:13.171 PM	33.88	N/A

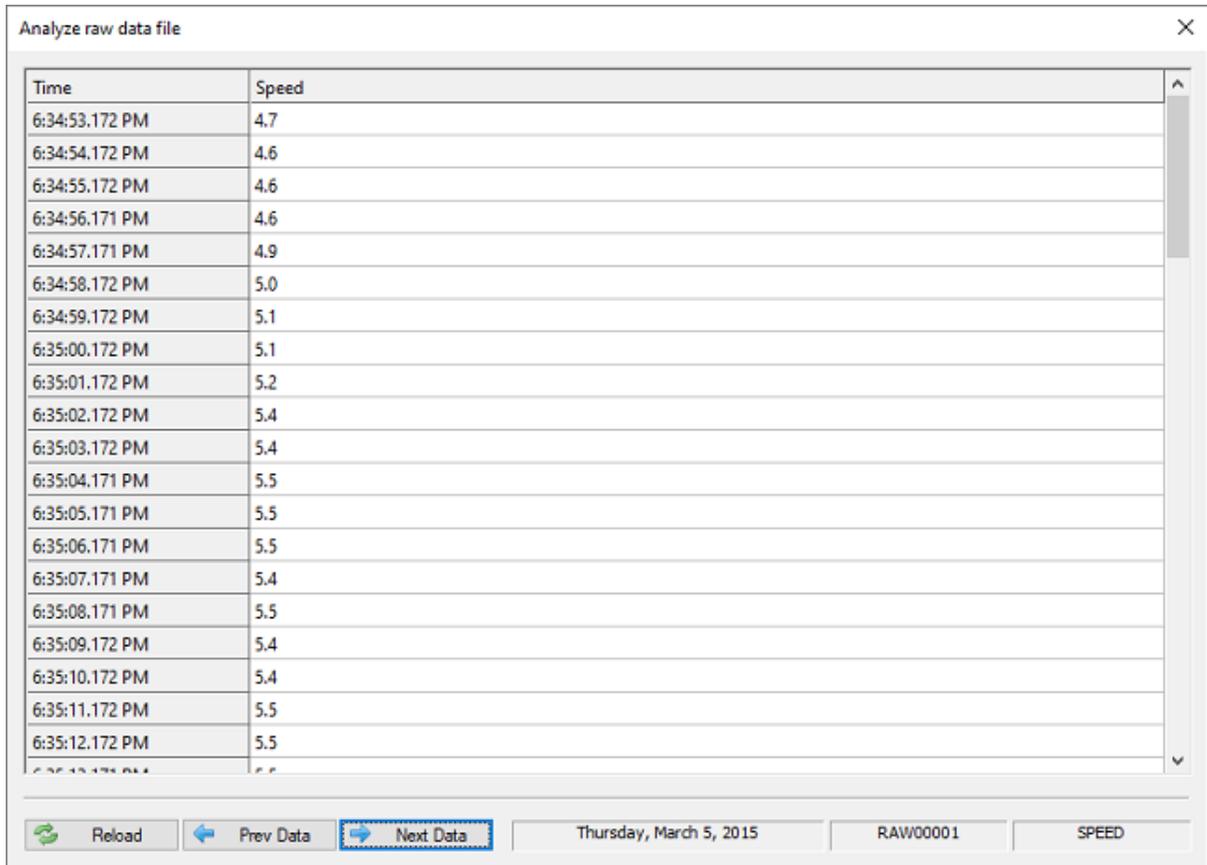
 Reload
  Prev Data
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 RAW00001
 HEADING

***True heading information recorded at 1Hz intervals.***

When both true and magnetic heading are stored, you can instruct Hydromagic which one to use by selecting either true or magnetic heading under the 'Calibration' tab in the preferences screen.

### Using the data analysis window - speed data

When processing Hydromagic raw data files, speed is not used. It is however recorded to be able to check the speed the data was recorded on, and for future purposes (for instance the ability to calculate missing position data points by using speed and course). Speed is normally reported by the GPS receiver.



Time	Speed
6:34:53.172 PM	4.7
6:34:54.172 PM	4.6
6:34:55.172 PM	4.6
6:34:56.171 PM	4.6
6:34:57.171 PM	4.9
6:34:58.172 PM	5.0
6:34:59.172 PM	5.1
6:35:00.172 PM	5.1
6:35:01.172 PM	5.2
6:35:02.172 PM	5.4
6:35:03.172 PM	5.4
6:35:04.171 PM	5.5
6:35:05.171 PM	5.5
6:35:06.171 PM	5.5
6:35:07.171 PM	5.4
6:35:08.171 PM	5.5
6:35:09.172 PM	5.4
6:35:10.172 PM	5.4
6:35:11.172 PM	5.5
6:35:12.172 PM	5.5

*Speed information recorded at 1Hz intervals.*

### Using the data analysis window - GPS Quality

When [using RTK to calculate tide levels](#), make sure that all GPS quality records have the 'RTK FIX' status before proceeding with your survey. When it switches between RTK FIX, RTK FLOAT and AUTO, it is possible that your radio link or cellular signal is lost sometimes, and you might want to fix this issue first.

This table also contains information on the number of satellites used in the position calculation, the differential beacon id used (for instance WAAS, EGNOS or LF Beacon) and the age of the correction data (in seconds). To have a look at the DOP data, you have to proceed to the next page by clicking the 'Next Data' button.

Analyze raw data file

Time	Fix	Sats	Beacon	Age
6:42:37.147 PM	RTK FIX	09	0000	02
6:42:38.147 PM	RTK FIX	09	0000	02
6:42:39.147 PM	RTK FIX	10	0000	02
6:42:40.147 PM	RTK FIX	10	0000	01
6:42:41.147 PM	RTK FIX	10	0000	02
6:42:42.147 PM	RTK FIX	11	0000	01
6:42:43.147 PM	RTK FIX	10	0000	02
6:42:44.148 PM	RTK FIX	10	0000	02
6:42:45.148 PM	RTK FIX	10	0000	02
6:42:46.148 PM	RTK FIX	10	0000	02
6:42:47.147 PM	RTK FIX	10	0000	02
6:42:48.147 PM	RTK FIX	10	0000	03
6:42:49.147 PM	RTK FIX	11	0000	01
6:42:50.147 PM	RTK FIX	11	0000	01
6:42:51.147 PM	RTK FIX	11	0000	02
6:42:52.147 PM	RTK FIX	11	0000	01
6:42:53.147 PM	RTK FIX	11	0000	02
6:42:54.147 PM	RTK FIX	10	0000	02
6:42:55.152 PM	RTK FIX	10	0000	02
6:42:56.147 PM	RTK FIX	10	0000	02

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  Next Data
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 RAW00002
 GPS

**Check the GPS quality data for the fix status, especially when using RTK tides.**

Using the data analysis window - DOP Values

DOP stands for Dilution Of Precision and is reported by a GNSS receiver to specify error propagation as a mathematical effect of navigation satellite geometry on positional measurement precision. Hydromagic stores three types of DOP values:

- HDOP - Horizontal Dilution Of Precision;
- VDOP - Vertical Dilution Of Precision;
- PDOP - Position Dilution Of Precision;

These three values are stored in the raw data file in order to have the ability to filter out erroneous position records during data processing.

Analyze raw data file

Time	HDOP	VDOP	PDOP
2:00:26.565 PM	0.62	0.00	0.00
2:00:26.565 PM	0.62	0.70	0.94
2:00:26.565 PM	0.62	0.70	0.94
2:00:27.561 PM	0.62	0.00	0.00
2:00:27.561 PM	0.62	0.70	0.94
2:00:27.561 PM	0.62	0.70	0.94
2:00:28.534 PM	0.62	0.00	0.00
2:00:28.534 PM	0.62	0.70	0.94
2:00:28.534 PM	0.62	0.70	0.94
2:00:29.562 PM	0.62	0.00	0.00
2:00:29.562 PM	0.62	0.70	0.94
2:00:29.562 PM	0.62	0.70	0.94
2:00:30.517 PM	0.62	0.00	0.00
2:00:30.517 PM	0.62	0.70	0.94
2:00:30.538 PM	0.62	0.70	0.94
2:00:31.562 PM	0.62	0.00	0.00
2:00:31.562 PM	0.62	0.70	0.94
2:00:31.562 PM	0.62	0.70	0.94
2:00:32.559 PM	0.62	0.00	0.00
2:00:32.559 PM	0.62	0.70	0.94

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DOP

#### ***Dilution Of Precision for the reported GPS position.***

The horizontal dilution of precision is reported by the 'GGA' NMEA0183 sentence while all three sentences are reported by the 'GSA' sentence. This explains why there are sometimes records without the VDOP/PDOP values in the example above (the records generated from the GGA sentence).

#### **Using the data analysis window - Tide Data**

Tide levels are in most cases calculated from the antenna elevation of a RTK receiver by using a fixed offset and geoid model. When RTK tide is used, tide values are not stored inside the raw data file since they are calculated and applied when converting raw data to soundings.

When you have connected a tide receiver, or when you use the [manual tide plugin](#) to adjust the tide level manually during the survey, these values are written to the raw data file and will be displayed in the tide data table.

#### **Using the data analysis window - Motion Data**

A motion sensor can be used to compensate for the motion of the vessel during the survey. The depth and position will be adjusted by using the heave, pitch and roll values received from the motion sensor during post processing. Use this page to check the values sent by the motion sensor. Please note that some sensors only provide pitch and roll without heave.

Time	Heave	Pitch	Roll
7:41:46.228 PM	0.03	5.05	-1.39
7:41:46.332 PM	0.03	5.00	-1.35
7:41:46.428 PM	0.03	4.93	-1.31
7:41:46.534 PM	0.00	4.83	-1.28
7:41:46.629 PM	0.00	4.75	-1.26
7:41:46.733 PM	0.00	4.67	-1.26
7:41:46.827 PM	0.00	4.62	-1.28
7:41:46.931 PM	0.00	4.65	-1.32
7:41:47.025 PM	0.00	4.68	-1.34
7:41:47.127 PM	0.00	4.76	-1.40
7:41:47.230 PM	0.00	4.86	-1.43
7:41:47.334 PM	0.00	4.94	-1.44
7:41:47.432 PM	0.00	5.03	-1.49
7:41:47.530 PM	0.00	5.12	-1.52
7:41:47.625 PM	0.00	5.17	-1.55
7:41:47.729 PM	0.00	5.20	-1.56
7:41:47.827 PM	0.00	5.21	-1.55
7:41:47.934 PM	0.00	5.21	-1.55
7:41:48.026 PM	0.00	5.18	-1.53
7:41:48.128 PM	0.00	5.14	-1.52

Reload   Prev Data   Next Data   Thursday, April 12, 2018   RAW00001   MOTION

*Heave, pitch and roll data reported by a motion sensor.*

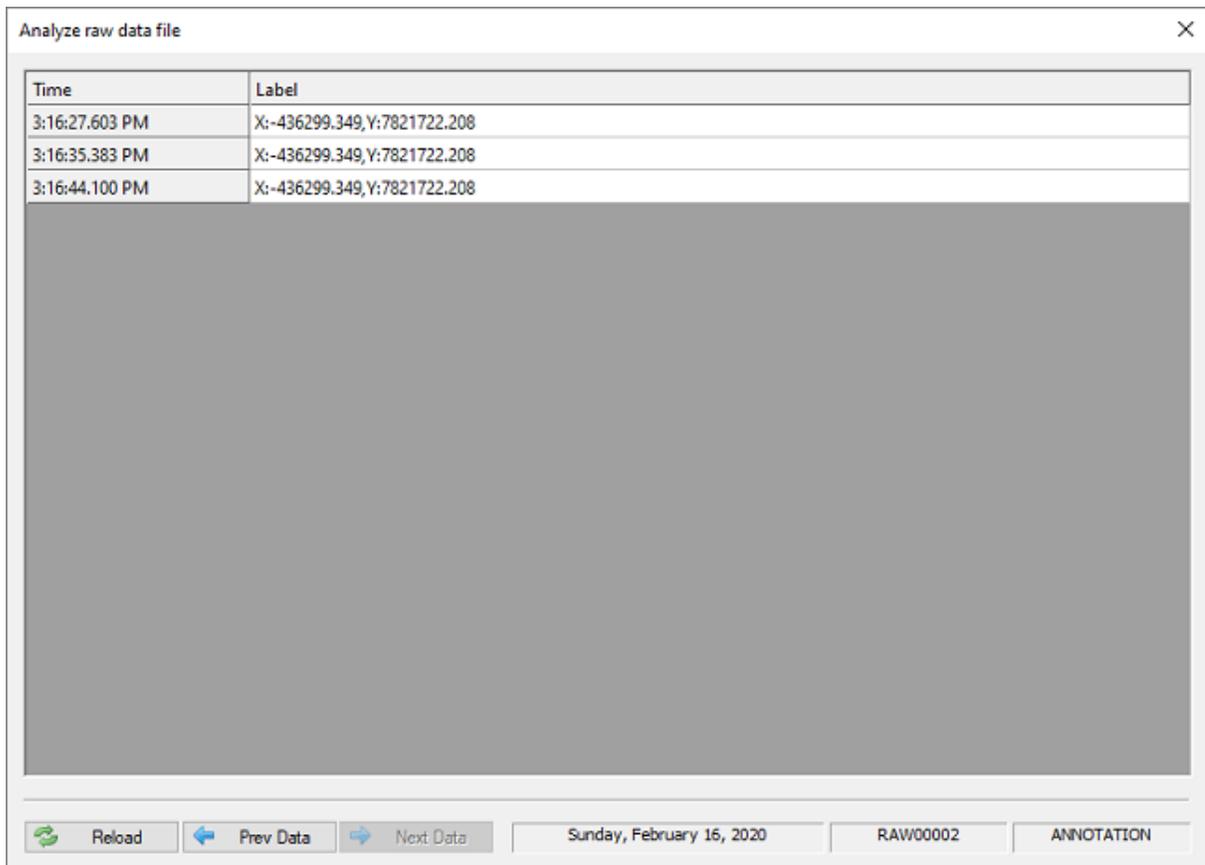
### Using the data analysis window - Sound Velocity Data

By default echo sounders calculate the depth by using a speed of sound of 1500 meters per second. In some cases, for instance at sea with salt water this value may differ. This can be corrected afterwards during post processing by using the sound velocity editor.

When connecting a sound velocity profiler or by using the [Hydromagic Manual Sound Velocity plugin](#) sound velocity corrections are stored into the raw data file. Sound velocity correction data collected during the survey will be displayed in this table.

### Using the data analysis window - Annotation Marks

During a survey you can press the 'F8' key to store [events or annotation marks](#) in the raw data file. The purpose is to mark a special position on the map or echogram data.



The screenshot shows a software window titled "Analyze raw data file" with a close button (X) in the top right corner. The window contains a table with two columns: "Time" and "Label". Below the table is a large grey rectangular area, likely representing an echogram. At the bottom of the window, there is a control bar with several buttons: "Reload" (with a refresh icon), "Prev Data" (with a left arrow icon), "Next Data" (with a right arrow icon), a date field showing "Sunday, February 16, 2020", a file name field showing "RAW00002", and a label field showing "ANNOTATION".

Time	Label
3:16:27.603 PM	X:-436299.349,Y:7821722.208
3:16:35.383 PM	X:-436299.349,Y:7821722.208
3:16:44.100 PM	X:-436299.349,Y:7821722.208

***Annotation marks inserted into the echogram by the user.***

Depending on the format defined for the annotation marks, an event with or without label is inserted into the data. This table shows the times and labels for the annotation marks inserted.

## 6 Single beam processing

### 6.1 Getting Started

#### Single beam processing

In Hydromagic Survey [version 6.0 and higher](#), recorded data is saved as 'raw data files'. To create filtered, corrected and synchronized sounding data, that can be used to calculate volumes, depth contours, digital terrain models and more, we need to process the previously [recorded raw data](#) files.

#### The sounding wizard

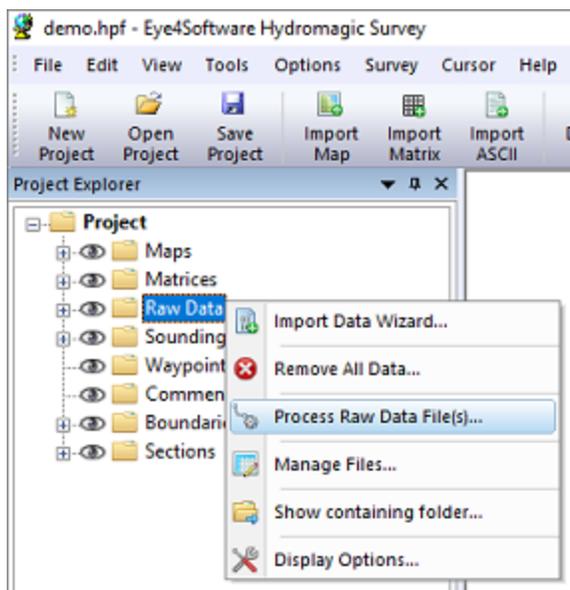
The sounding wizard is one of the most important tools in the Hydromagic Survey software. It allows you to convert one or more raw data files into (corrected) sounding files.

The sounding wizard leaves the original recorded data intact (in the "RawData" project folder) and creates a second set of data files to track all the changes you made (in the "Modified" project folder).

This method allows you to do corrections and filtering over and over again until you are fully satisfied with the result. Might the data become corrupted, just instruct the wizard to start over with the original raw data files.

#### Starting the sounding wizard

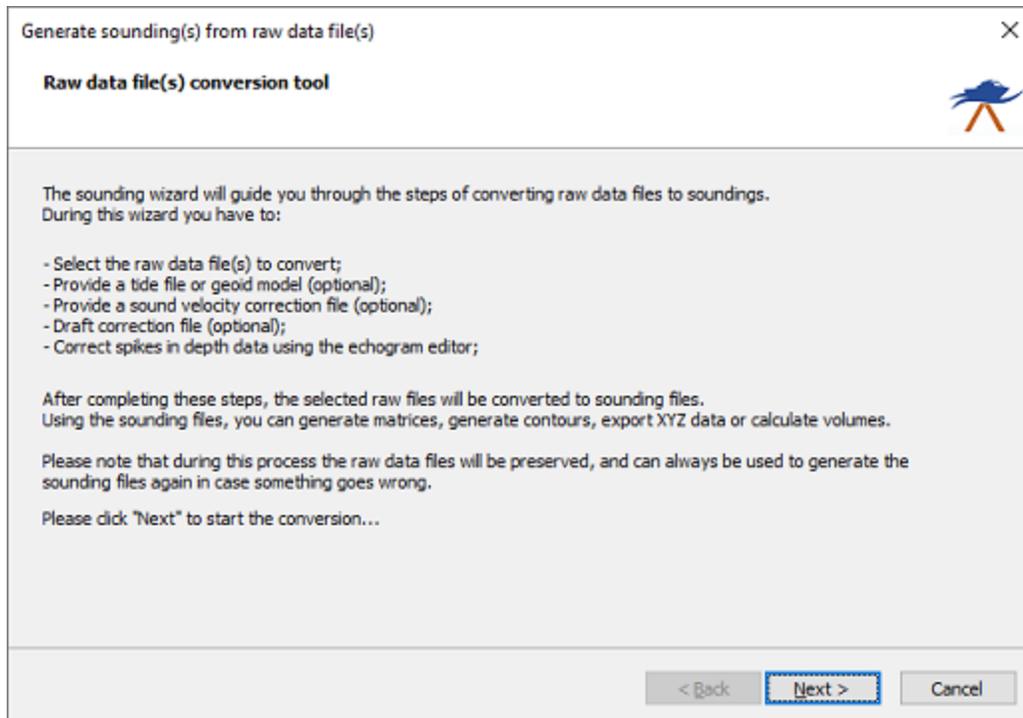
When you finished recording one or more raw data file(s), you can combine data from these files into sounding files. To do so, you have to select the "Generate Soundings..." option from the "Tools" menu. Alternatively, you can start this wizard by right clicking the "Raw Data" folder in the project tree and selecting the "Process Raw Data File(s)..." option from the pop up menu that appears as shown below:



Select the "Process Raw Data File(s)..." option from the pop up menu.

#### The introduction page of the sounding wizard

You are now ready to create sounding files by performing a couple of steps which will be discussed in the next chapters. The first page of the wizard tells you what to expect in the few next steps. After quickly reading this information, click "Next" to proceed to the [raw data selection](#) step.



*The first page of the sounding wizard show some information on the steps to follow.*

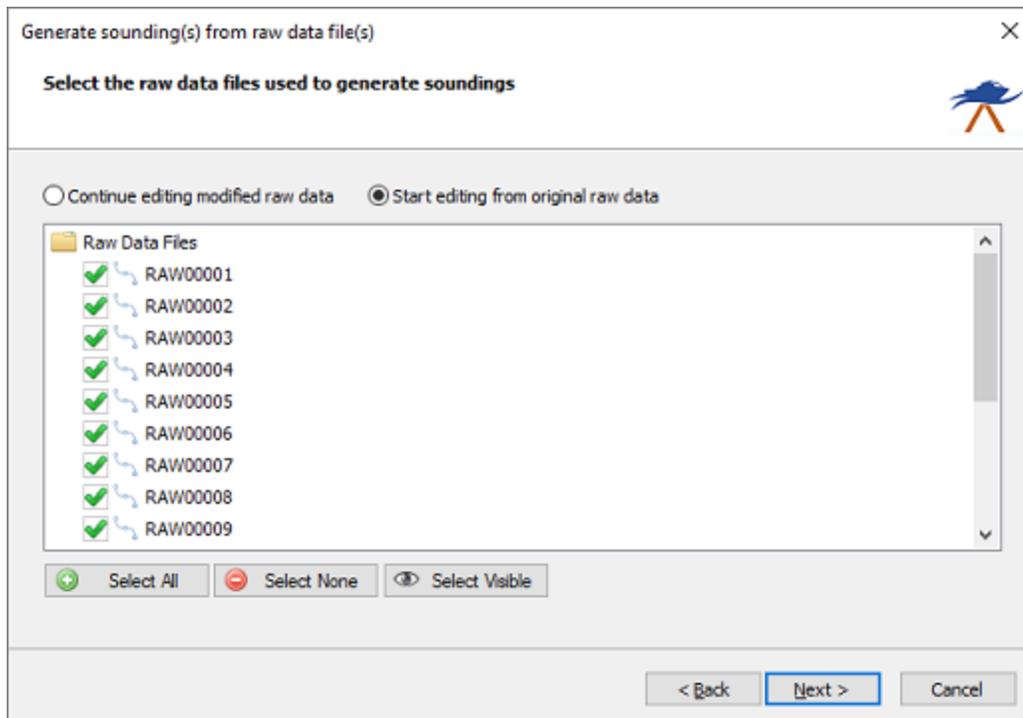
## 6.2 Selecting Files

### Selecting Files

The next step in this process is selecting the raw data files you want to include in the process. By default all visible files are selected. The first time you are running the sounding wizard on the raw data files, the "Start editing from original raw data" option is selected. This means that you want to start editing the files from scratch.

The second time you run the wizard, and you have made modifications, the "Continue editing modified raw data" option will be selected and you can further process your modified files. In case you want to start over with the original raw survey data, just select the "Start editing from original raw data" option.

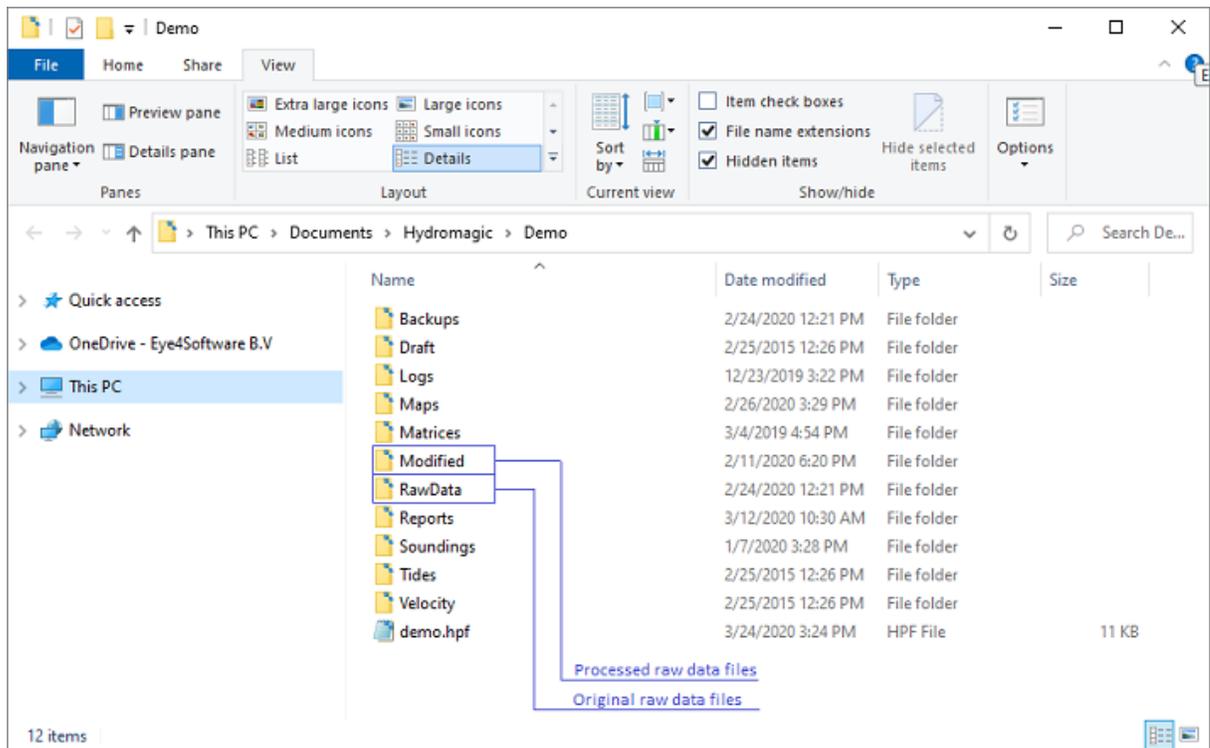
After selecting the files to process, click the "Next" button to proceed to the [tide correction](#) step.



*Select which raw data set you want to process.*

## Modified Data

Please note that the original recorded raw data is never altered. All modifications are stored as a copy in the "Modified" folder of your projects folder on the hard disk. When you choose to start editing the original raw data, the modified data of the previous sessions will be overwritten, thus rolling back all your previous (modification and filtering) actions in this wizard.



*The original recorded data and modified data files are kept in separate folders.*

## 6.3 Tide Correction

### Tide correction settings

The next step in the conversion process is to specify whether and how the sounding needs to be corrected for tides. We will discuss the different tide options below. When you are not in a tidal area or only depth values are required (not elevations), you can select the first option ("Do not use tide corrections"), and click the "Next" button to proceed to the [sound velocity and dynamic draft corrections page](#).

Generate sounding(s) from raw data file(s)

**Tide correction settings**

Do not use tide corrections, do not alter depth values;  
 Use tide gauge or manual measurements as stored in raw data file;  
 Elevations from RTK receiver or total station are orthometric heights (ignore geoid model);  
 Elevation source:   
 Use tide correction file (\*.tid):   
   
 Use geoid model:   
 Antenna Offset:  ft

Please select the desired method to calculate height from depths using tide corrections.  
 To alter the geoid model or antenna offset, go to the "Preferences" dialog and choose the "RTK" tab.  
[Click here to open the documentation for the tide correction settings page.](#)

*On the third page of the wizard you can configure the tide or vertical datum settings.*

### Option #1 - Do not use tide corrections, do not alter depth values

When the survey data collected is not related to tidal fluctuations, and you do not have to measure against a local vertical datum such as NAVD88, you can use this option. With this option selected the soundings will be copied to the sounding file(s) as they are without tide correction. In your final products you can only export depth values, not elevations.

### Option #2 - Use tide gauge or manual measurements as stored in raw data file

If a tide gauge is used, you have to select the "Use tide gauge measurements" option. With this option selected, Hydromagic will use tide adjustments recorded in the raw data file (by a plugin communicating with a tide gauge). You should also use this option when you did use the "[Hydromagic Manual Tide plugin](#)" to store tide measurements during your survey.

Manual Tide Plugin for Hydromagic

**1.25**

*Use the second option when the "Hydromagic Manual Tide Plugin" has been used.*

### Option #3 - Elevation from RTK receiver or total station are orthometric heights

When calculating the tide level with RTK, Hydromagic expects the elevation data stored in the raw data file to be relative to the WGS84 ellipsoid. To convert this elevation to the local datum, a geoid model will be applied when converting the raw data into a sounding file. In some cases this is unwanted behavior:

- When the RTK receiver is reporting elevation data relative to the local datum (when a geoid model has been loaded in the receiver);
- When a total station has been used, since they report the elevation relative to the local datum.

In these cases, you must select the third option in order to prevent from the geoid model to be applied twice. When this option has been selected, the geoid model configured in Hydromagic will be ignored. When set, the antenna height will still be applied.

When using this option, you have to let the software know which elevation from NMEA0183 data sent by the RTK receiver or total station we need to use. More information about these fields can be found on the [RTK Tide Corrections page](#).

You can have a look at the raw data files to see which of the fields contain the correct elevation value by using the [data analysis window](#):

Analyze raw data file

Time	Easting	Northing	Ellipsoid	MSL	UTC
12:40:57.477 PM	122308.105	487617.676	43.815	0.879	00000.000
12:40:58.477 PM	122308.096	487617.653	43.771	0.835	00000.000
12:40:59.477 PM	122308.088	487617.671	43.815	0.879	00000.000
12:41:00.477 PM	122308.082	487617.706	43.781	0.845	00000.000
12:41:01.477 PM	122308.071	487617.743	43.798	0.862	00000.000
12:41:02.477 PM	122308.075	487617.768	43.793	0.857	00000.000
12:41:03.477 PM	122308.068	487617.806	43.810	0.874	00000.000
12:41:04.477 PM	122308.053	487617.828	43.776	0.840	00000.000
12:41:05.477 PM	122308.055	487617.856	43.834	0.898	00000.000
12:41:06.477 PM	122308.033	487617.973	43.798	0.862	00000.000
12:41:07.477 PM	122307.997	487618.031	43.798	0.862	00000.000
12:41:08.477 PM	122307.980	487618.089	43.818	0.882	00000.000
12:41:09.477 PM	122307.954	487618.071	43.808	0.872	00000.000
12:41:10.478 PM	122307.925	487618.116	43.814	0.878	00000.000
12:41:11.477 PM	122307.903	487618.121	43.808	0.872	00000.000
12:41:12.478 PM	122307.888	487618.151	43.833	0.897	00000.000
12:41:13.476 PM	122307.894	487618.192	43.833	0.897	00000.000
12:41:14.477 PM	122307.898	487618.174	43.782	0.846	00000.000
12:41:15.477 PM	122307.909	487618.188	43.800	0.864	00000.000
12:41:16.477 PM	122307.942	487618.146	43.788	0.852	00000.000

Reload Prev Data Next Data Wednesday, October 12, 2016 RAW00001 POSITION

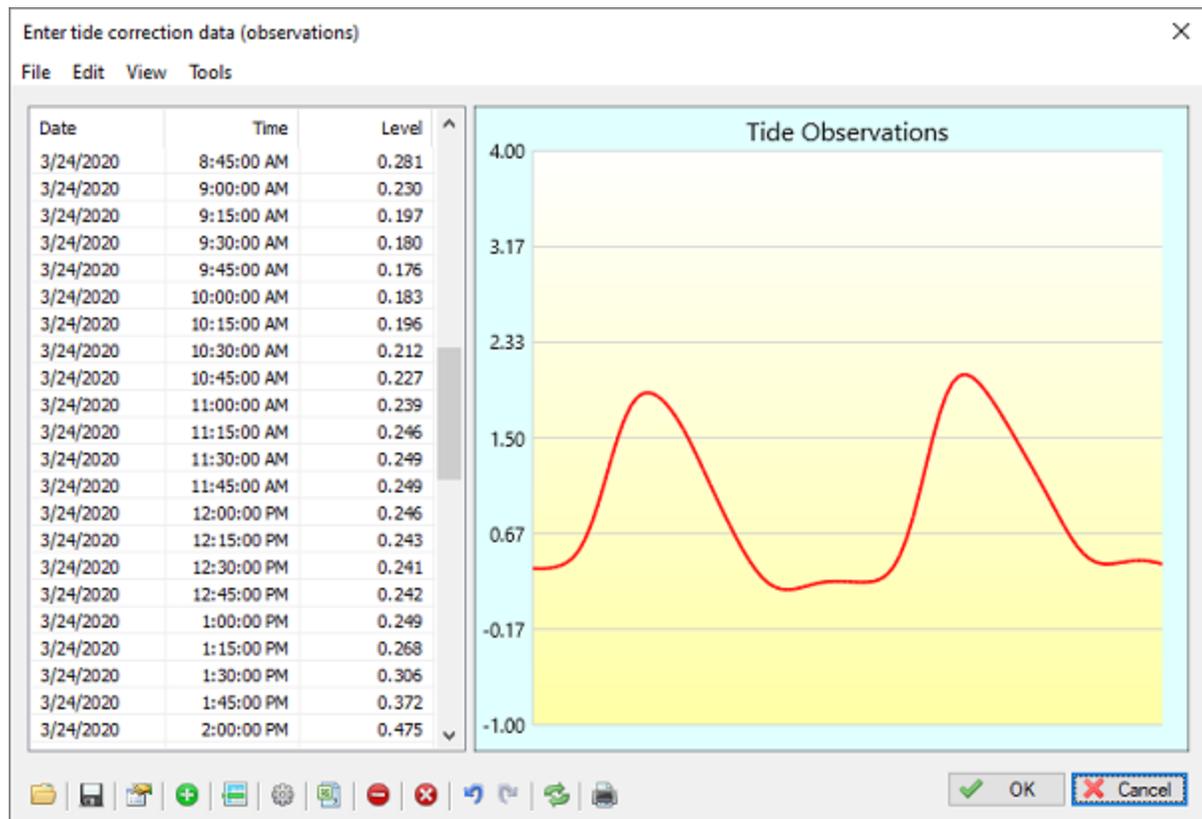
Use the raw data analysis window to check which data field contains the correct elevation value.

### Option #4 - Use tide correction file

When you want to use tide corrections without special hardware such as a RTK receiver or tide gauge, select this option.

It allows you to create a tide correction file where you can enter the tide observations made during the survey manually, or use the tide prediction tool to generate a tide file.

You can start [the tide file editor](#) by clicking the "Editor..." button, or just select an existing Hydromagic tide file by clicking the "Browse..." button.



Use the "Tide File Editor" to generate or modify a Hydromagic tide file.

### Option #5 - Use geoid model

When using a RTK receiver the tide level of the water you are surveying is calculated by using the high precision elevation data corrected by the selected [geoid model](#) and antenna height. This only works when your RTK receiver is in RTK fix mode, or when the collected position data is post-processed using PPK.

When using this setting, the geoid model and antenna height as configured in the "RTK" tab of the preferences window will be applied. These global RTK settings are also displayed on this wizard page (marked in red in the image below):

Generate sounding(s) from raw data file(s)

**Tide correction settings**

Do not use tide corrections, do not alter depth values;

Use tide gauge or manual measurements as stored in raw data file;

Elevations from RTK receiver or total station are orthometric heights (ignore geoid model);

Elevation source:

Use tide correction file (\*.tid):

Use geoid model:

Antenna Offset:  ft

Please select the desired method to calculate height from depths using tide corrections. To alter the geoid model or antenna offset, go to the "Preferences" dialog and choose the "RTK" tab. [Click here to open the documentation for the tide correction settings page.](#)

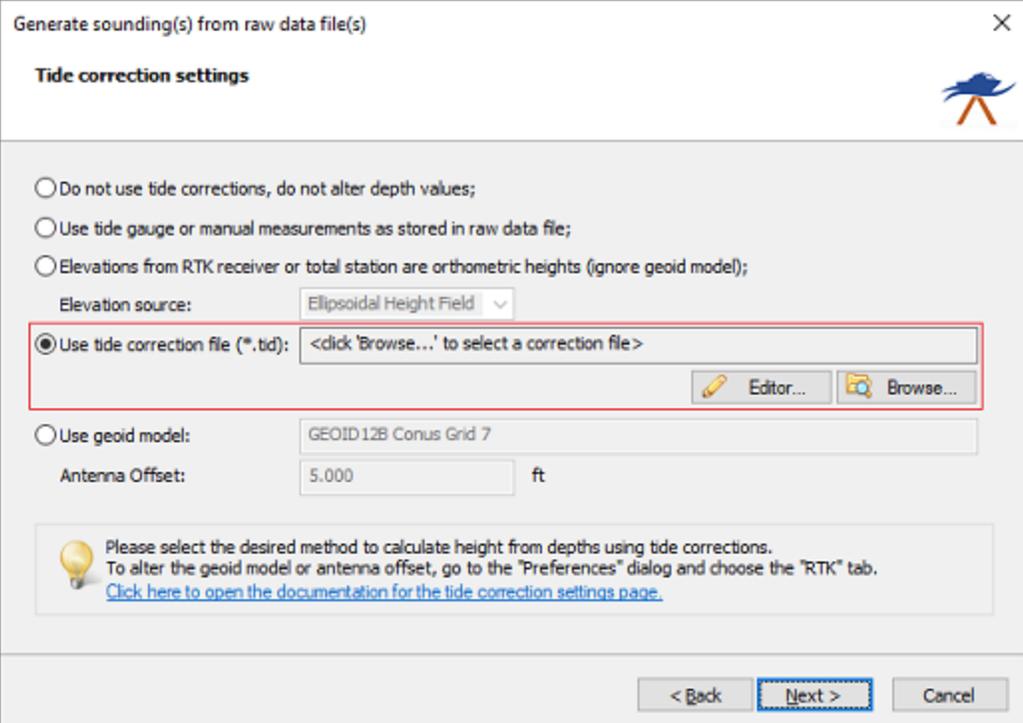
*When option #5 is selected, the global RTK settings will be used.*

## 6.4 Tide File Editor

### Tide File Editor

In Hydromagic, the tide observations file editor utility is used to create, alter or import tide files. Tide files include time and tide level information, and can be used to correct soundings (or convert to a local vertical datum).

The tide observations file editor is part of the "[Sounding Wizard](#)", and can be found on the "[Tide Correction](#)" page. This is the third page in the wizard and lets you select the preferred tide method used to generate tide corrected soundings.



Generate sounding(s) from raw data file(s)

**Tide correction settings**

Do not use tide corrections, do not alter depth values;

Use tide gauge or manual measurements as stored in raw data file;

Elevations from RTK receiver or total station are orthometric heights (ignore geoid model);

Elevation source:

Use tide correction file (\*.tid):

Use geoid model:

Antenna Offset:  ft

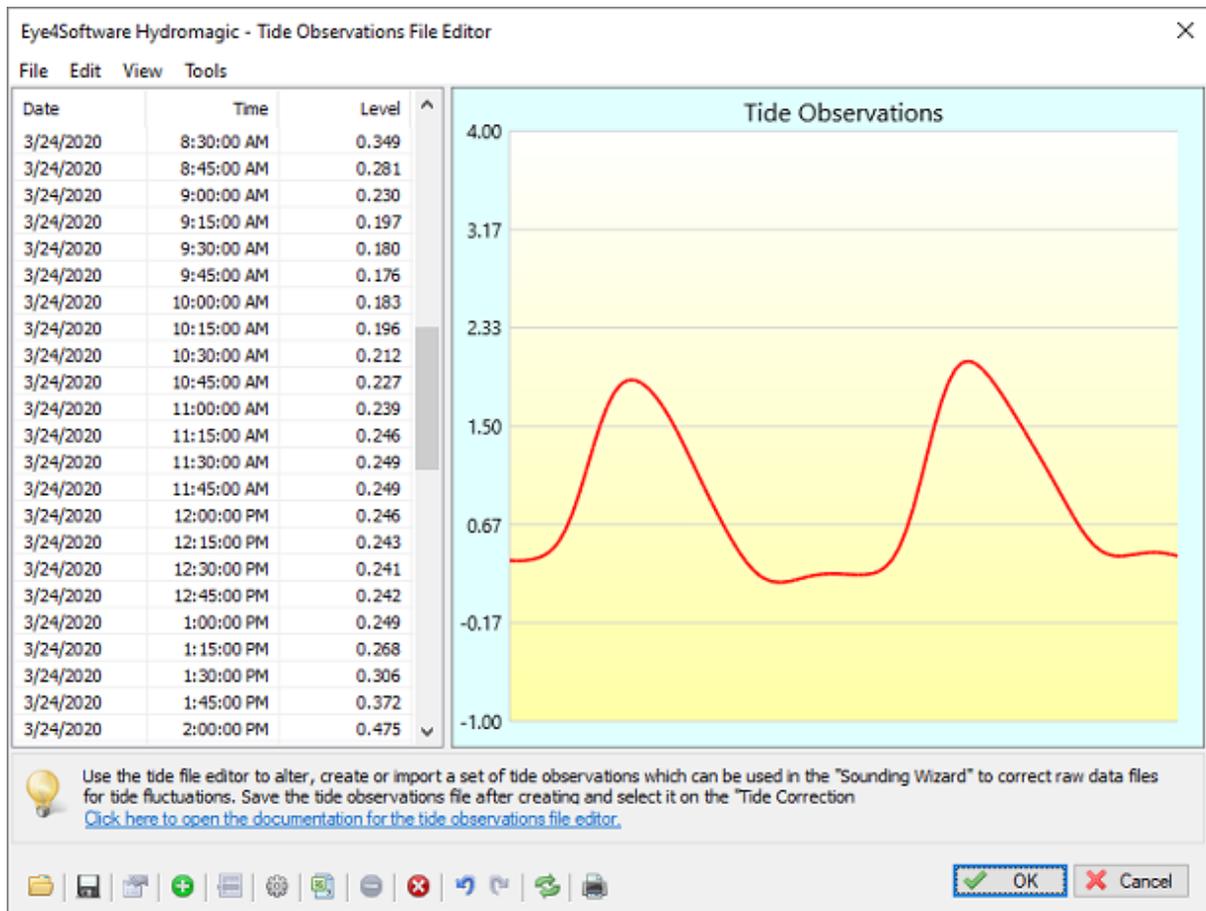
Please select the desired method to calculate height from depths using tide corrections. To alter the geoid model or antenna offset, go to the "Preferences" dialog and choose the "RTK" tab. [Click here to open the documentation for the tide correction settings page.](#)

< Back **Next >** Cancel

To use a tide correction file, select the "Use tide correction file" option in the "Sounding Wizard".

### Starting the tide file editor utility

To start the tide file editor, you have to set the tide method in the wizard to "use tide correction file". The "Editor..." and "Browse..." buttons will now be enabled. To start the editor, just click the "Editor..." button.



Screenshot of the tide observations file editor with a tide file loaded.

### Tide file editor toolbar

All functions of the editor can be accessed through the toolbar at the bottom of the window. The table below shows the function of the various buttons.

Button	Function
	Load tide observations from an existing Hydromagic tide file.
	Save tide observations to a Hydromagic tide file.
	Modify the selected tide observation.
	Add a new tide observation to the table.
	Insert a new tide observation to the table before the selected record.
	Generate multiple tide observations with a specified level, interval, begin and ending time.
	Start the importing tool to import tide observation data from an ASCII file.
	Remove the selected tide observation.
	Remove all tide observations (clear data).
	Undo the latest operation.
	Redo the latest undone operation.
	Reload the table and graph.



Send the tide observations graph to the printer.

## Using the tide file editor

The tide file editor can be used in two ways. You can enter all the observations manually, or you could choose to import them from an ASCII file. When using the ASCII import tool, you can select the columns which contain time and level, as well as the format of the fields. If you are having trouble importing a third party tide file, please contact our support department so we can help you.

## Importing tide values

To import tide values from an ASCII file, click the "Start the importing tool" button (see buttons table above). The dialog below will be displayed. When the ASCII file contains data for one day only, we recommend you to set a fixed date.

First you have to select an input file. You can search for a file by clicking the "Browse..." button.

The fields where the time and tide values are stored have to be set in order to correctly parse the ASCII data. The field separator field has to be set as well. Lines not containing this separator and the number of fields required will be skipped.

You can click the "View..." button to view the layout of the file. Click the "OK" button to start importing data. Not satisfied with the results ? Just remove all records and start over !

Import Tide Observations
✕

**File**

Filename:

Field separator:

**Date**

Date mode:

Fixed date:

Field number:  (first field = 1)

Field format:

**Time**

Field number:  (first field = 1)

Field format:

**Level**

Field number:  (first field = 1)

Units:

When the software failed to detect the correct observation date from the ASCII file, please select the "Fixed Date" option for "Date Mode" and enter the date by hand. [Click here to open the documentation for the tide observations file editor.](#)

*The software allows you to import tide observations from ASCII files.*

## Generate observations

It is possible to generate a couple of records at a specified time interval for you. When these records are generated, all you have to do is enter the correct tide levels. To do so, click the button "Generate multiple tide observations" (see buttons table above):

*Generate tide observations with the same level in a specified timespan*

When using the example above, there will be created seven records, starting at 6:45:10 PM and the last one at 7:45:10. The interval will be 10 minutes and the values will be pre-set to 1.23 meters. After closing this tool, just double click the generated records to set the correct levels.

## Saving your work

After you have entered or imported the tide observations needed to correct the sounding files, click the save button and supply a valid file name. Finally close the editor by clicking the "OK" button, and select the tide file by clicking the "Browse..." button in the ["Sounding Wizard"](#).

## 6.5 Draft and Sound Velocity

### Draft and sound velocity corrections

More information on sound velocity and dynamic draft corrections can be read below. When you are not going to use either draft or sound velocity corrections, make sure both check boxes are unchecked and click the "Next" button to proceed to the [data correction page](#).

Generate sounding(s) from raw data file(s)

**Sound velocity and dynamic draft corrections**

Use sound velocity correction file (when unchecked, realtime data from sound velocity probe will be used).

Select velocity correction file: C:\ProgramData\HydroMagic\Velocity\example.vel

Sounder sound velocity: 1500.00 meter per second

Editor... Browse...

Use dynamic draft correction file (when unchecked, a connected heave sensor or RTK will be used).

Select draft correction file: C:\ProgramData\HydroMagic\Draft\example.dft

Editor... Browse...

If you want to specify a sound velocity or draft correction file, you can do it here.  
To create or alter an existing correction file, click one of the "Editor..." buttons.  
[Click here to open the documentation for the sound velocity and dynamic draft correction settings page.](#)

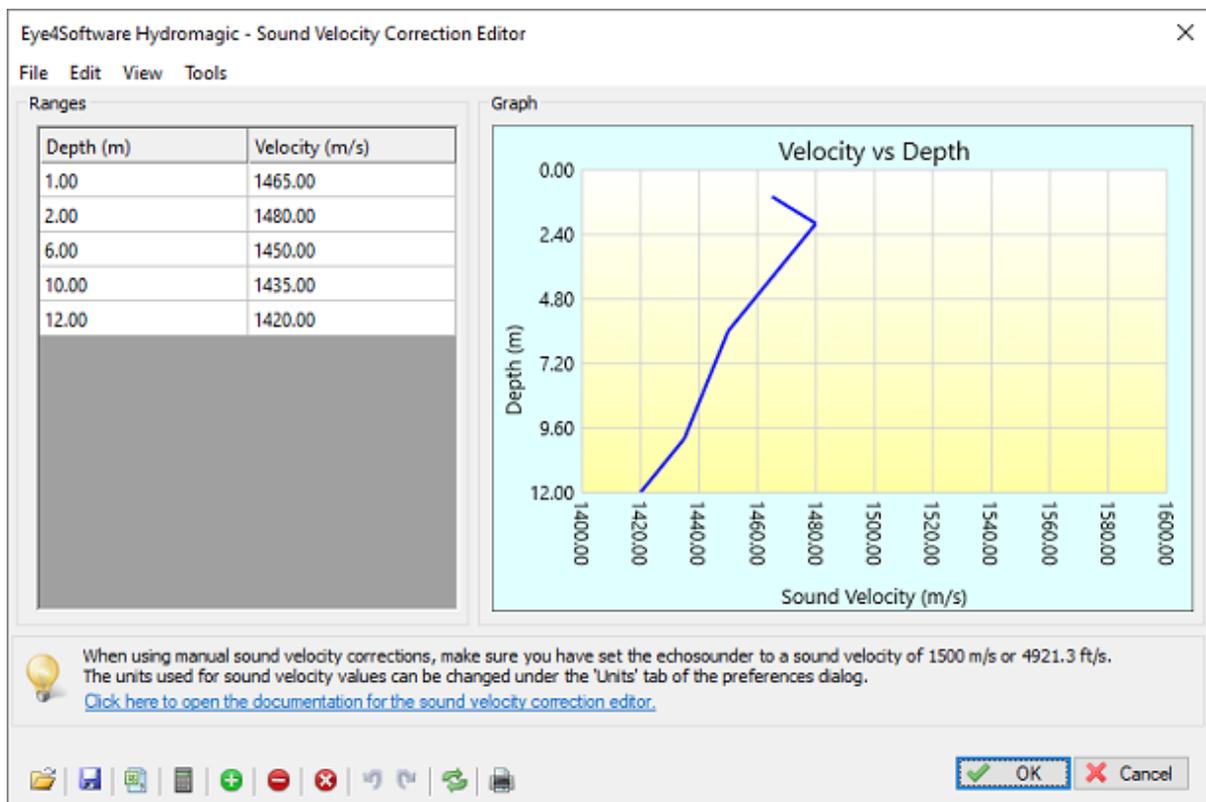
< Back Next > Cancel

*When applicable, setup sound velocity and dynamic draft corrections on this page.*

## Sound velocity corrections

An echosounder calculates depth by sending a pulse and measuring the time it takes to get to the ocean floor and back. With this time and the speed of sound through the water, the depth is calculated.

For fresh water, the speed of sound is 1500 meters per second, however, for salt water this speed depends on the salinity, temperature and depth (pressure). Using the sound velocity correction option you can correct your sounding for salt water. Please do not use this function if this correction is already used in the echosounder. To generate a sound velocity correction file, click the "Editor..." button to start the sound velocity file editor.

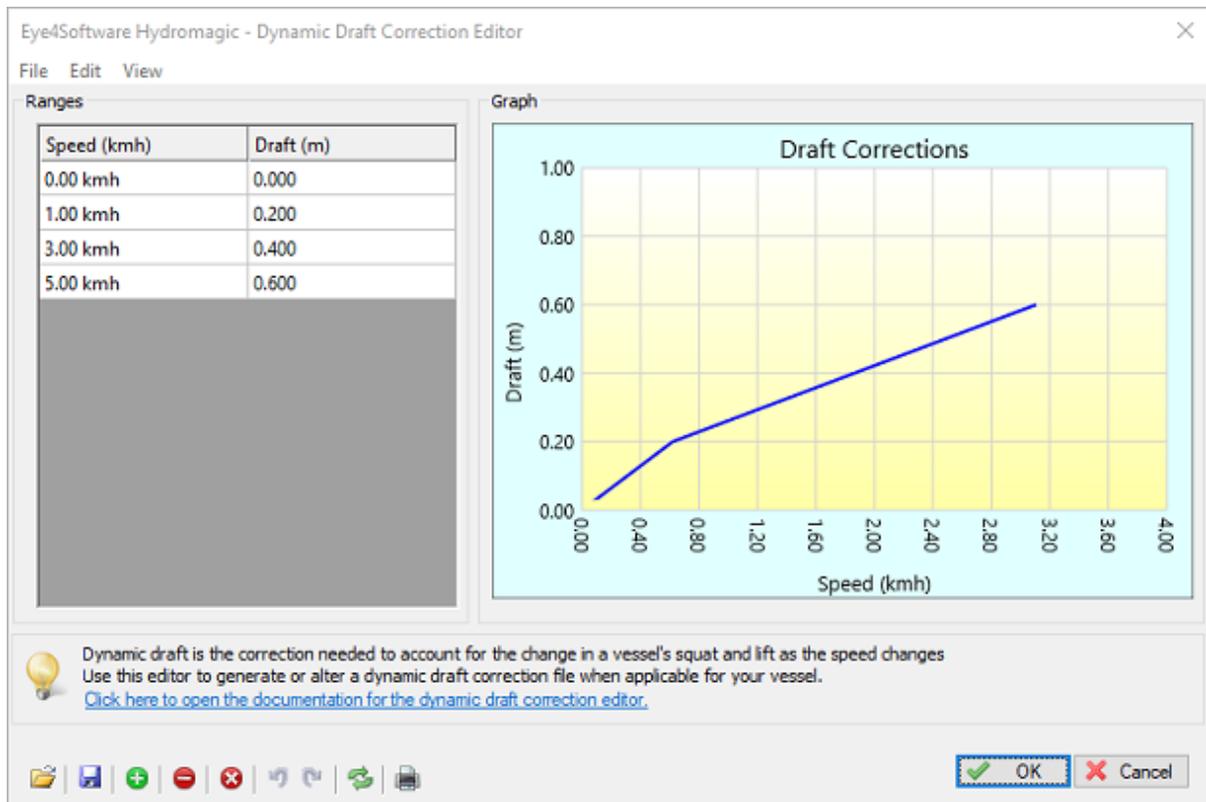


*Use the sound velocity editor to generate or alter sound velocity profile files when applicable.*

## Dynamic draft corrections

Dynamic draft corrections can be used to correct the downwards motion of the ship.

For instance, when using a speedboat, you may notice that when the speed increases, the rear of the ship lowers while the front raises. This is what we call dynamic draft, and depends on the speed of the vessel. You can correct for this motions by creating dynamic draft correction table (speed versus draft). To generate a dynamic draft correction file, click the "Editor..." button to start the dynamic draft correction file editor.



*Use the dynamic draft editor to generate or alter dynamic draft profile files when applicable.*

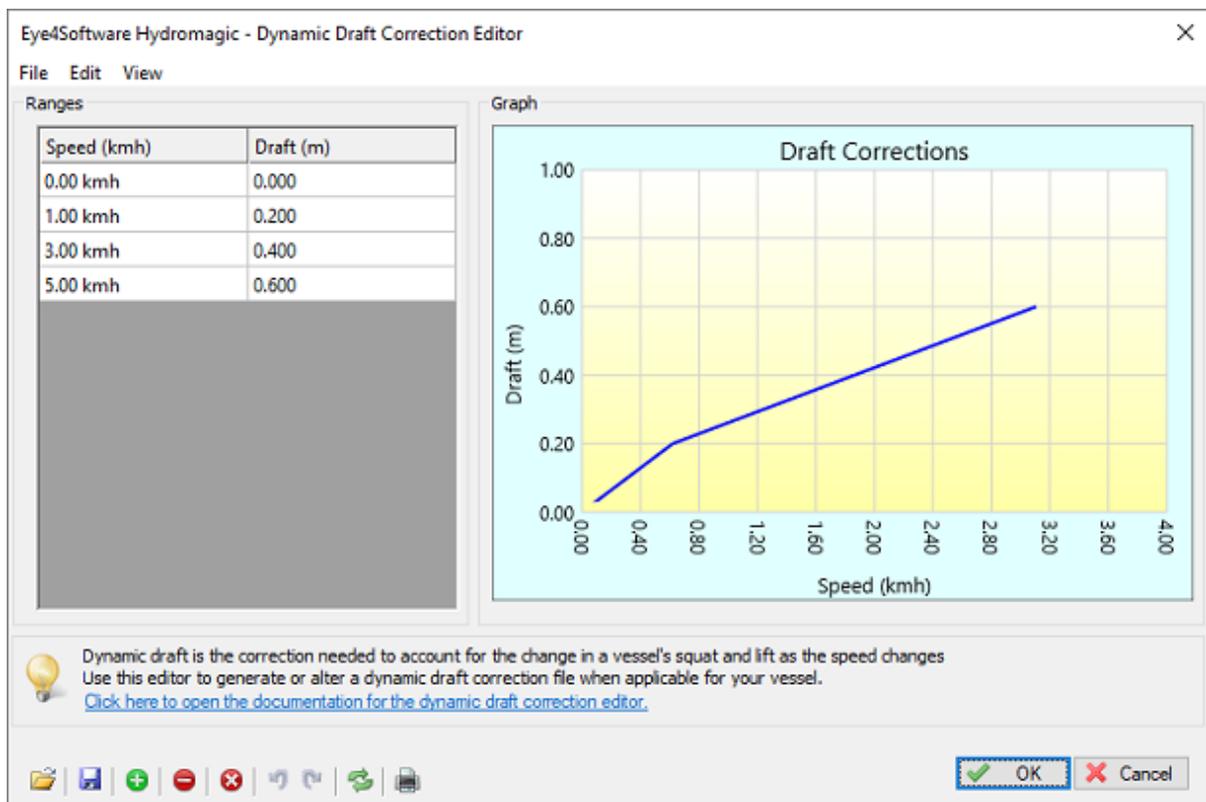
## 6.6 Dynamic draft correction file editor

### Dynamic Draft Correction Editor

The purpose of the dynamic draft correction editor is to alter or dynamic draft correction profile files which can be used by Hydromagic to [correct soundings](#). When surveying using [RTK tides](#), you don't have to correct for dynamic draft.

### Dynamic draft corrections

After starting the dynamic draft correction editor, you will start with a blank profile. You can add new records to this profile or open an existing profile file for modification. You can open or save file via the "File" menu. When opening the example dynamic draft file which ships with the Hydromagic ("example.dft"), the editor should look like this:



Use the dynamic draft editor editor to generate or alter dynamic draft editor profile files when applicable.

Hydromagic draft correction files are stored as simple ASCII files, so you should also be able to edit these files with your favorite text editor. Please note that the depths and speed values are in meters and kilometers per hour, so when you prefer imperial units you should probably use the editor instead:

```
0.00 0.00
1.00 0.20
3.00 0.40
5.00 0.60
```

*ASCII Contents of a Hydromagic dynamic draft correction file.*

### Adding records manually

You can add new records to the table by clicking the "Plus" button, or by pressing the "Insert" key on your keyboard. A new data row will be added in which you can enter a new depth - sound velocity pair. To remove a record, select it in the table and press the "Delete" key on your keyboard or by clicking the "Minus" button. To clear the entire table, click the button marked with an "X" or select "Remove All..." from the "Edit" menu.

To undo or redo an operation you can use the "Undo" and "Redo" buttons in the tool bar, or select the "Undo" and "Redo" options from the "Edit" menu. (or use the dedicated shortcut keys for these operations: Control-Z and Control-Y).

Eye4Software Hydromagic - Dynamic Draft Correction Editor

File Edit View

Ranges

Speed (kmh)	Draft (m)
0.00 kmh	0.000
1.00 kmh	0.200
3.00 kmh	0.400
5.00 kmh	0.600

Graph

Dynamic draft is the correction needed to account for the change in a vessel's squat and lift as the speed changes. Use this editor to generate or alter a dynamic draft correction file when applicable for your vessel. [Click here to open the documentation for the dynamic draft correction editor.](#)

OK Cancel

*Double-click on a table cell to alter its contents.*

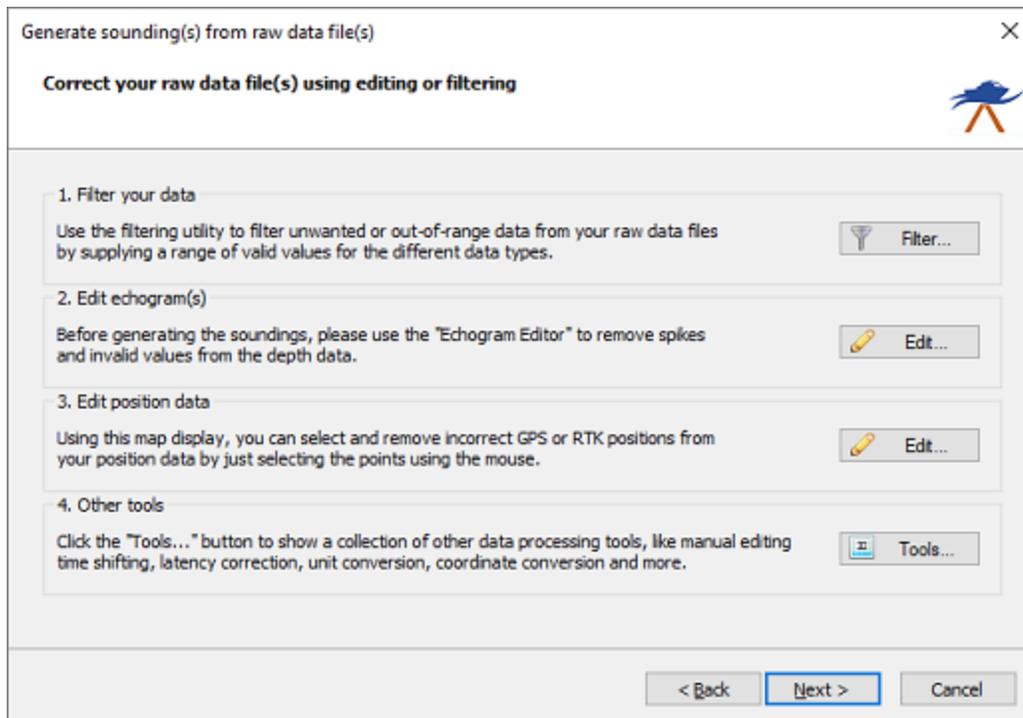
### Saving the correction file

When all speed - draft correction pairs have been entered into the table, select the "Save..." option from the "File" menu. After saving the file, it can now be selected in [the sound velocity and dynamic draft corrections page](#).

## 6.7 Correcting Data

### Correcting data

The sounding wizard offers a large collection of tools to correct your raw data files. It contains a [data filtering utility](#), [echogram editor](#), [position editor](#) and [much more](#). After correcting all raw data files, click the "Next" button to proceed to the [final step](#).



*The data correction page of the sounding wizard offers multiple tools to correct your raw data.*

### Option #1 - Filter your data

Use the [filtering utility](#) to filter unwanted or out-of-range data from your raw data files by supplying a range of valid values for the different data types. It is recommended to use this function to remove peaks and zero's from your sounding data before you edit the sounding using the echogram editor.

### Option #2 - Edit echogram(s)

The [echogram editor](#) allows you to remove spikes, null soundings and other errors directly from the echogram. All you have to do is select the invalid data and click the "remove selection" button.

### Option #3 - Edit position data

The [position editor](#) can be used to remove invalid (GNSS) position fixes from the raw data. You can also use this tool to remove any data which is outside of a predefined boundary.

### Option #4 - Other tools

By clicking the "Tools..." button, a second screen is displayed with a collection of [miscellaneous tools](#), including: [device latency correction](#), [time correction](#), [manual editing](#), [PPK processing](#) and [offsets](#).

## 6.8 Filter Tool

### Raw data filtering tool

Using the "Raw Data Filtering" tool should be your first step in order to clean your data. By removing obvious errors in measurement data, such as depth values lower then your static draft (echo sounder

offset), or position observations calculated when, for example, the RTK fix was lost, you save yourself valuable time in the next step of the data cleansing process.

**Eye4Software Hydromagic - Raw Data Filtering**

**Position Data**

Filter position data

Minimum fix status: No Fix

Minimum satellite count: 6

Maximum HDOP value: 2.00

Maximum VDOP value: 2.00

Maximum PDOP value: 2.00

**Elevation and Tides**

Filter elevation data

Minimum ellipsoid height: 42.00

Maximum ellipsoid height: 45.00

Minimum M.S.L. height: 0.00

Maximum M.S.L. height: 0.00

Minimum Tide value: 0.00

Maximum Tide value: 0.00

**Depth Data**

Filter depth data

Minimum Depth (Hi-Freq): 0.30

Maximum Depth (Hi-Freq): 30.00

Minimum Depth (Lo-Freq): 0.30

Maximum Depth (Lo-Freq): 30.00

**Motion Data**

Filter motion data

Minimum heave value: 0.00

Maximum heave value: 1.00

Maximum pitch value (absolute): 22.5

Maximum roll value (absolute): 22.5

Use this raw data filtering tool to remove raw data records which contain out of range data. You can use this functionality for instance to filter out invalid depths readings (or zero values), GNSS positions with low accuracy or invalid motion data.  
[Click here to open the documentation for the raw data filtering tool.](#)

Apply Cancel

**Use the "Raw Data Filtering" tool to remove records with out of range values from your raw data file(s).**

### Position data

You can use this option to filter out unreliable position data. This is especially important when the elevation data reported by your GNSS receiver is used to calculate tide levels. To enable this filter, check the "Filter position data" check box first. When enabled, you can enter maximum values for the dilution of precision data as well as the minimum satellite count and GNSS fix quality.

When your project relies on RTK-Fixed position data, you might want to delete all position records which are generated while the RTK-fix was temporarily lost. If this is the case, it is recommended to select "RTK Fixed" option for the "minimum fix status" setting. Please do not use this filter when you plan to correct your positions with [PPK \(Post Processing Kinematic\)](#).

### Depth data

It is recommended to use this option before the echogram editor, because you can use this to filter out spikes and zero values. Just check the "Filter depth data" checkbox and enter the minimum and maximum expected depth for the low and high frequency soundings.

### Motion data

You only need this feature when using a motion sensor for pitch, roll and heave. Check the "Filter motion data" checkbox and enter the maximum angles for pitch and roll, and the expected range for the heave

corrections received from either the echo sounder or motion sensor. Skip this option when no motion sensor was used during the survey.

### Start Filtering

When all options have been configured, just click the "Apply" button to start the filtering process. When one of the filters has been applied, a new modified raw data file is written in the "Modified" folder in your project root.

## 6.9 Echogram Editor

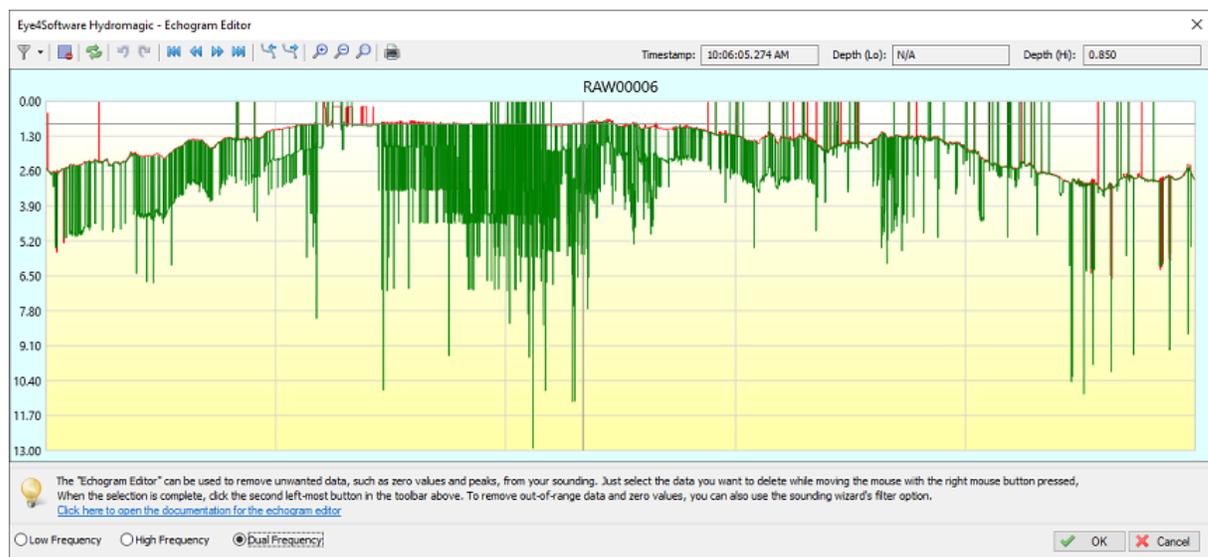
### Echogram editor

The echogram editor is the most powerful tool in Hydromagic to remove sounding errors by using an echogram. Because an echogram is displayed, which shows the relation between time and depth, you can easily see which data does not make sense and take appropriate actions.

In the echogram editor you have the following tools to clean the echo sounder data:

- Range filter - similar to the one in the filter tool
- Data selection and remove - select data to remove using the mouse;
- Median filter - use a "median filter" to filter out small spikes and smooth the data;
- Mean filter - use a mean filter to filter out small spikes and smooth the data;

The example below shows an echogram before filtering. In this example we will first filtered out the zero values using the range filter, then the largest spikes will be removed using the mouse and finally the median filter will be applied to smooth the data.

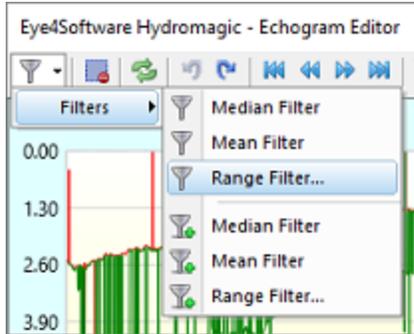


**Example of an echogram with lots of spikes and noise.**

### Range Filter

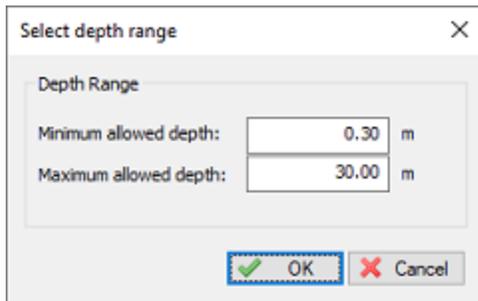
When you didn't apply this filter by using the [filter tool](#), you can filter out of range data from within the echogram editor as well, otherwise you can skip this step and proceed to the removing of the spikes using your mouse.

Looking at the example above, as you can see there are spikes starting at 0.00 meters, which are obviously measurement errors (the echo sounder couldn't detect the bottom so it returned zero depth instead). To filter the data by range, click the small arrow next to the left-most button and select the first "Range Filter..." option, or the second to apply the filter to all [selected raw data files](#).



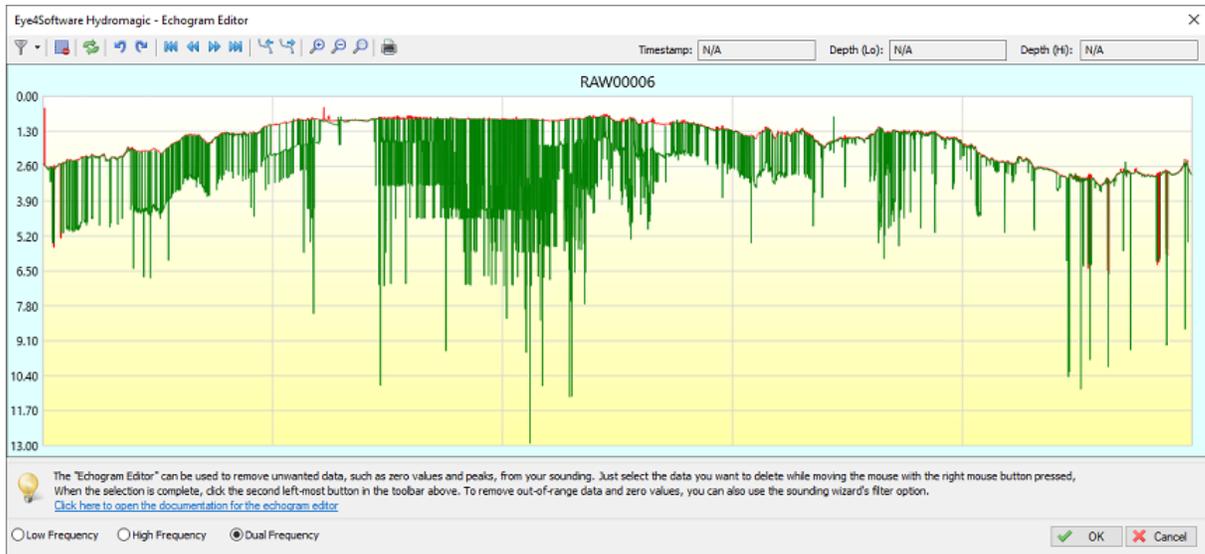
**Use the range filter tool to filter out spikes starting at zero.**

Now enter the minimum and maximum allowed depths. Especially the minimum depth is important here: For the minimum depth value it is recommended to set the [static draft](#) (echo sounder offset) plus approximately 0.3 meter (or 1 foot), since most echo sounders are unlikely to report (accurate) depths below this value. For instance, when the distance between the transducer and the waterline is 0.60 meter, add 0.90 meter as lowest possible value.



**Select the minimum and maximum allowed depth values.**

Click "OK" to apply the filter. Changes should be visible in the echogram immediately:



**Spikes starting at the water surface are now removed thanks to the range filter.**

## Removing the remaining spikes by hand

The remaining spikes can be removed by hand. Just remove spikes which are larger than a couple of millimeters on the screen: small spikes will be smoothed out when applying the median filter after this step. When using a dual frequency echo sounder, it is recommended to remove the spikes for one channel at a time. You can switch between "Low Frequency", "High Frequency" and "Dual Frequency" by clicking the boxes at the bottom of the window. When dual frequency is selected, you can select both low and high frequency spikes or data for deletion, when working on a single channel, only the data selection for this channel will be deleted.

When you accidentally removed too much data, just click the "Undo" button or press "Control"+"Z" on your keyboard to undo the last step. In the unlikely scenario that everything has been lost beyond repair, just go to the [file selection page](#) and choose the "Start editing from original raw data" option to start from the original raw data.

To remove a single or a collection of spikes, click and hold the right mouse button and draw a rectangle around the 'peaks' of the spikes. To make things easier, you can use the scroll wheel on your mouse to zoom in and out on the data, so you can select with more accuracy.

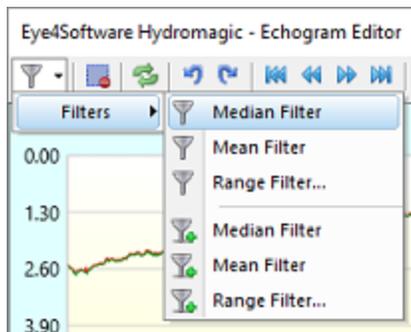
When the selection seems okay, just press the "DEL" key on your keyboard to remove the data, or click the second left-most button in the echogram editor's tool bar. Repeat this step until you are satisfied with the result.



**The example echogram as shown above, but after finishing the manual spike removal. Only small spikes remain visible**

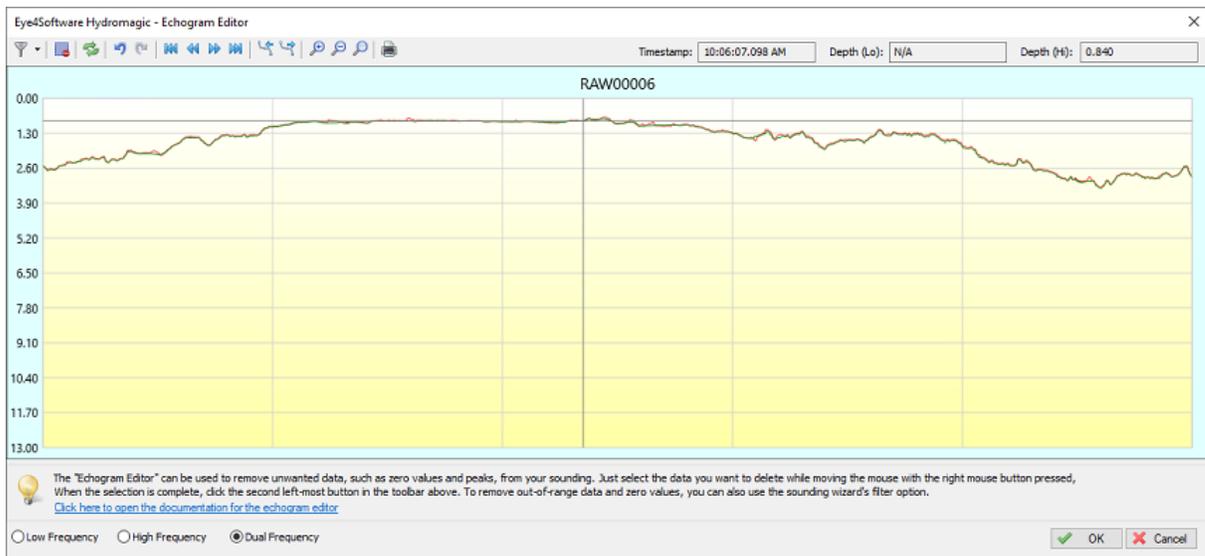
## Median and Mean filters

The median and mean filters can be used to further smooth the data which also suppressed the latest small spikes that were left behind after the manual spike removal process. To apply the median filter, click the small arrow next to the left-most button in the toolbar above and select the first "Median Filter..." option, or the second to apply the filter to all selected raw data files.



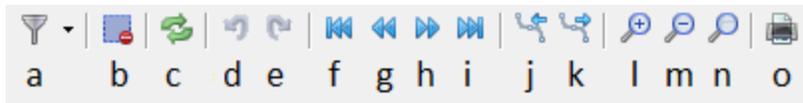
**Use the median filter tool to further smooth the data after manual spike removal.**

You can apply the median filter multiple times until the desired smoothing level has been reached. When there are still spikes, you can remove them by hand and then apply the median filter again. The mean filter can also be used to smooth the data, although we recommend to use the median filter since it leaves the data more intact. When we applied smoothing we should end up with a smooth, filtered echogram like the one below:



**Same echogram as the first example on this page, but after filtering, spike removal and smoothing.**

### Echogram editor tool bar



#### (a) - Remove Selection

To remove spikes and zero value, you can select the data by clicking and holding the right mouse button.

When the invalid data has been selected, click this button to remove it from the data file.

#### (b) - Filter echogram (remove spikes!)

Use one of the built in data smoothing and filtering to remove spikes and noise from the data. Supported filter algorithms include median and mean filtering.

#### (c) - Reload echogram

Reload the echogram from disk

#### (d) - Undo operation

Use this button when you removed data by accident. This button undoes the last operation.

#### (e) - Redo operation

Redo an operation which has been undone.

#### (f) - Scroll to begin

Scroll to the beginning of the echogram, only available when zoomed in.

**(g) - Scroll back**

Scroll back one screen, only available when zoomed in.

**(h) - Scroll forward**

Scroll forward one screen, only available when zoomed in.

**(i) - Scroll to end**

Scroll to the end of the echogram, only available when zoomed in.

**(j) - Select the previous data file**

Select to the previous raw data file in the collection of files you are currently editing.

**(k) - Select the next data file**

Select to the next raw data file in the collection of files you are currently editing.

**(l) - Zoom In**

Zoom in on the data which is currently visible.

**(m) - Zoom Out**

Zoom out on the data which is currently visible.

**(n) - Zoom All**

Reset all zoom operations, shows all data in the file.

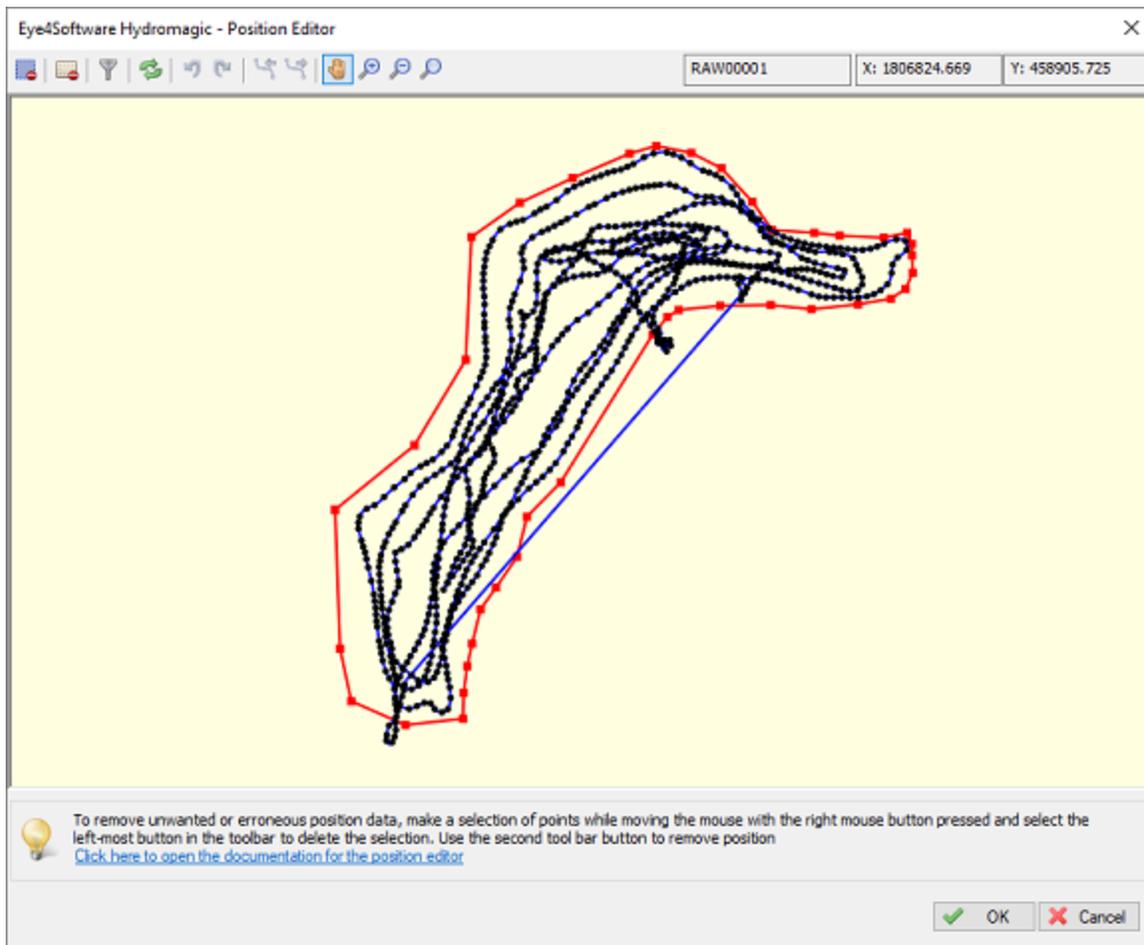
**(o) - Print echogram**

Send the current echogram view to a printer or plotter.

## 6.10 Position Editor

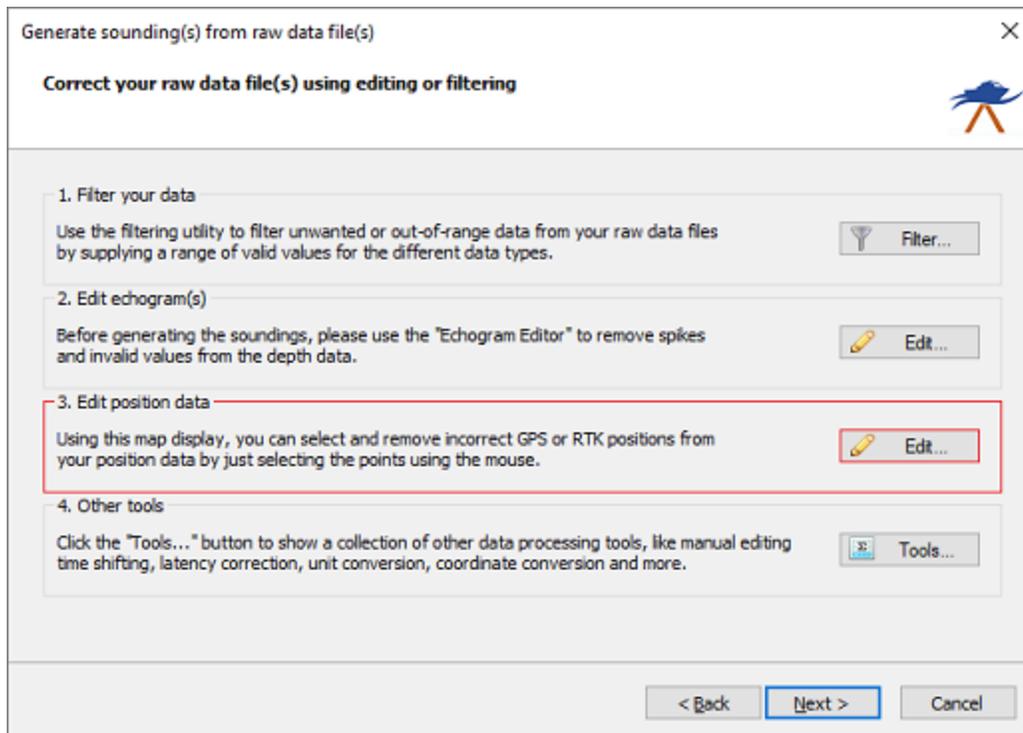
### Position editor

The position editor allows you to quickly remove any unwanted or erroneous position fixes from a raw data file. You can also use this tool to quickly remove any data which is outside the project's boundaries and no longer needed.



***Use the position editor to remove unwanted or erroneous position data from a raw data file.***

The position editor is part of the "Sounding Wizard" and can be found on the the data correction page. To start the position editor, just click the "Edit..." button in the "Edit position data" section shown below:



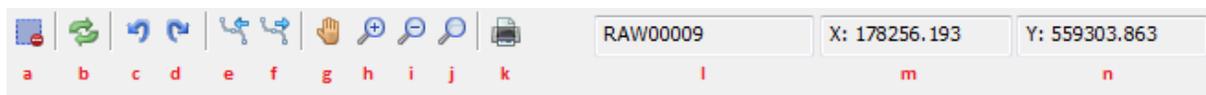
*The position editor can be found on the data correction page of the "Sounding Wizard".*

## Using the position editor

Using the position editor is very easy. Just select the positions you want to remove with the mouse with the right button pressed. When the selection is done, click the remove "selection button" to remove the unwanted positions from the raw data file.

When done editing the positions or GPS fixes, click the "OK" button to save your changes. To discard, click "Cancel". When positions has been removed, a new modified raw data file is written in the "Modified" folder in your project root.

## Position editor toolbar



### (a) - Remove Selection

To remove invalid or out of bounds GPS positions, you can select the data by moving the mouse while press and holding the right button.

When the invalid data has been selected, click this button to remove it from the data file.

### (b) - Reload positions

Reload the GPS positions from disk.

### (c) - Undo operation

Use this button when you removed data by accident. This button undoes the last operation.

**(d) - Redo operation**

Redo an operation which has been undone.

**(e) - Select the previous data file**

Select to the previous raw data file in the collection of files you are currently editing.

**(f) - Select the next data file**

Select to the next raw data file in the collection of files you are currently editing.

**(g) - Toggle panning**

When the panning mode has been selected, you can drag the map around with your mouse cursor while holding the left mouse button.

**(h) - Zoom in**

Zoom in on the data which is currently visible.

**(i) - Zoom out**

Zoom out on the data which is currently visible.

**(j) - Zoom all**

Reset all zoom operations, shows all data in the file.

**(k) - Print echogram**

Send the current echogram view to a printer or plotter.

**(l) - File indicator**

Show the name of the file you are currently editing. To change the file, click the 'e' or 'f' button.

**(m) - Position display**

Displays the X or easting position of the mouse cursor.

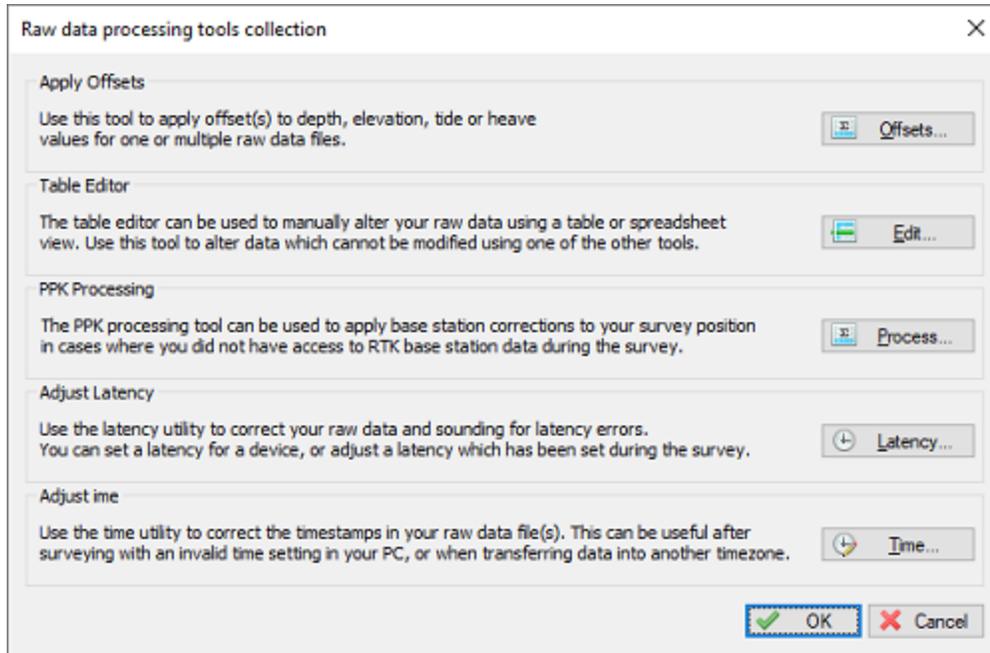
**(n) - Position Display**

Displays the Y or northing position of the mouse cursor.

## 6.11 Miscellaneous Tools

### Miscellaneous processing tools

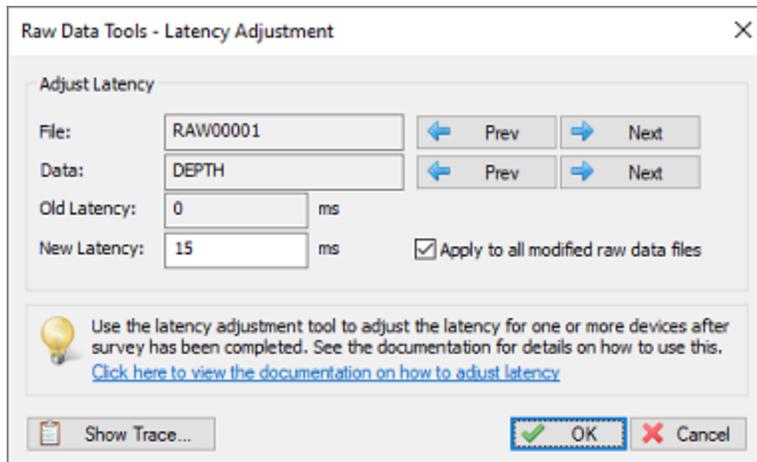
The "data processing tools collection" can be opened by clicking the "Tools..." button in the data correction step of the "generate sounding wizard". A screen with an overview of the various processing tools is displayed and should look like the screenshot below:



*The (advanced)processing tools collection part of the "Sounding Wizard".*

## Latency Adjustment

Use the latency utility to correct your raw data and sounding for latency errors after data has been collected. You can set a latency for a device, or adjust a latency which has been set during the survey. Click the "Latency..." button to start the "Latency Adjustment Tool".



*Fix latency errors with the latency adjustment tool.*

## Time Adjustment

Use the time utility to correct the timestamps in your raw data file(s). This can be useful after surveying with an invalid time setting in your PC, or when transferring data into another timezone. Click the "Time..." button to start the "Time Adjustment".

Raw Data Tools - Time Adjustment

Specify the amount of time to shift

Hours:       Seconds:   
Minutes:       Milliseconds:   
Direction:      

Raw data selection

Files:

Data type selection

Type(s):

Use the time adjustment tool to shift your data in time, which might be useful when the data is recorded when there was a problem with time(zone) settings. [Click here to view the documentation on how to adjust timestamps](#)

*Fix time(zone) setting errors with the time adjustment tool.*

## Offsets

Use the offsets utility to apply offset(s) to depth, elevation, tide or heave values for one or multiple raw data files. Click the "Offsets..." button to start the "[Offsets tool](#)".

Raw Data Tools - Apply Offsets

Echosounder Offsets

Depth (Hi):  Meters

Depth (Lo):  Meters

Swap high and low frequency depths

Elevation Offsets

Tide Receiver:  Meters

Mean Sea Level:  Meters

Ellipsoidal Height:  Meters

Heave Correction:  Meters

Motion Sensor Offsets

Ship Roll:  degrees

Ship Pitch:  degrees

Swap sign - roll (+/-)

Swap sign - pitch (+/-)

Position Offsets

Easting:  Meters

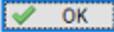
Northing:  Meters

Raw data selection

Raw Data Files:

 [Select...](#)

 Use this tool to set fixed vertical or motion data offsets for the selected data. Please note that the 'Tide' offset is only applied to tide receiver data (not RTK). [Click here to view the documentation on how to apply offsets to raw data.](#)

*Use the offsets utility to apply various offsets to your raw data files.*

## Table Editor

Use the table editor to edit records manually, or to delete ranges of records. Because manual processing takes a lot of time, this is the last option to use. Click the "Edit..." button to start the ["Table Editor"](#).

Raw Data Tools - Table Editor

POSITION RAW00002

Time	Easting	Northing	Ellipsoid	MSL	UTC
2:41:00.016 PM	198961.267	506352.542	51.325	4.408	134100.000
2:41:01.007 PM	198961.269	506352.557	51.338	4.421	134101.000
2:41:02.012 PM	198961.289	506351.105	50.765	3.848	134102.000
2:41:03.018 PM	198961.293	506351.105	50.775	3.858	134103.000
2:41:04.008 PM	198961.304	506351.103	50.772	3.855	134104.000
2:41:05.014 PM	198961.298	506351.091	50.785	3.868	134105.000
2:41:06.020 PM	198961.303	506351.092	50.785	3.868	134106.000
2:41:07.012 PM	198961.314	506351.067	50.785	3.868	134107.000
2:41:08.017 PM	198961.302	506352.567	51.371	4.454	134108.000
2:41:09.023 PM	198961.323	506351.056	50.781	3.864	134109.000
2:41:10.029 PM	198961.329	506351.040	50.761	3.844	134110.000
2:41:11.020 PM	198961.331	506351.043	50.785	3.868	134111.000
2:41:12.010 PM	198961.333	506351.016	50.761	3.844	134112.000
2:41:13.017 PM	198961.334	506351.007	50.753	3.836	134113.000
2:41:14.021 PM	198961.341	506350.998	50.752	3.835	134114.000
2:41:15.027 PM	198961.331	506352.516	51.308	4.391	134115.000

In cases where the other tools offer no solution, the table editor can be used to manually edit the raw data. You can change data here or delete a selection of data.  
[Click here to view the documentation on how to modify raw data manually](#)

OK Cancel

*Use the table editor to manually alter or delete data.*

## PPK Processing

The PPK Processing tool can be used to replace low-accuracy position data in your raw data files with sub-centimeter accuracy position data by applying "Post Processing Kinematic" files generated by for instance the free "RTKLib" software package. Click the "Process..." button to start the [PPK Processing Tool](#).

Raw Data Tools - Post Processing Kinematic

Select PPK Correction Data File

File Name:

Coordinate Options

Input file has easting and northing coordinates (projected)

Input file has longitude and latitude coordinates (geographic)

Coordinate Format:

Coordinate Reference System

If the coordinates stored in the file are not in WGS84 geographic coordinates, select the coordinate system used by clicking on the 'Select' button.

Currently selected: WGS84

Define PPK file format or select pre-defined format from list

Predefined File Type:

Date Format:  (select correct order)

Time Format:  (select correct order)

Comment Prefix:

Date Field #:

Time Field #:

X or Longitude Field #:

Y or Latitude Field #:

Geoid or Ellipsoid Field #:

Time Offset:  minutes

 The Post Processing Kinematic function can be used to correct position data using PPK correction files generated with for instance RTKLib.  
[Click here for detailed documentation on how to use PPK in Hydromagic.](#)

Use the PPK processing tool to apply PPK correction files to your raw position data.

## 6.12 Latency adjustment tool

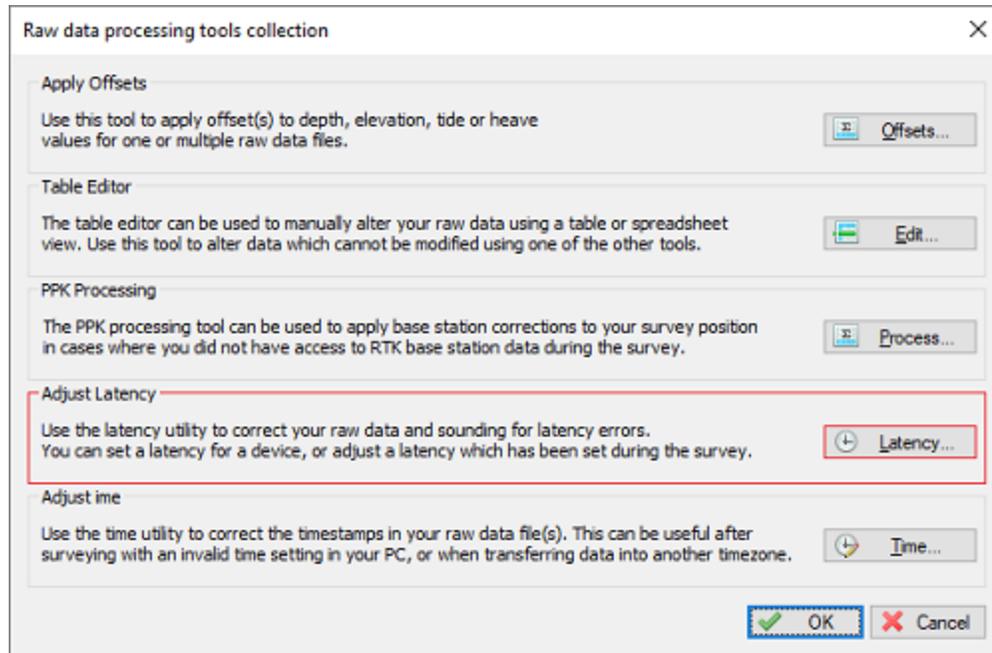
### Raw Data Tools - Latency Adjustment Tool

In Hydromagic, latency is the difference in time between taking a measurement and the time that this data is received and processed at one of the Hydromagic plugins. For example, this is when a GNSS receiver calculates the position and when Hydromagic is ready to write the data record to disk.

This delay can cause position errors when it is large enough, because Hydromagic is using timestamps of incoming data to calculate the positions of soundings received between position updates. The higher the speed of the vessel during the survey, the larger these errors can become. To calculate this error, you can multiply the delay in seconds by the speed in meters per second. This means that when surveying at a speed of 5 kilometers per hour, an error of 14 centimeters can occur if there is a delay of 100 milliseconds (0.100 second) in the received and processed data.

When you have the option to measure this delay, you can enter it in the [plugin](#) settings. In case you discover the delay after the survey is completed, you can use the latency adjustment tool to correct it afterwards.

The latency adjustment tool is part of the "Sounding Wizard" and can be found on the [raw data processing tools page](#). To start the position editor, just click the "Latency..." button in the "Latency" section as shown below:



*The latency adjustment tool can be found on the data correction page of the "Sounding Wizard".*

## Detecting latency for your GNSS receiver

Detecting latency for your GNSS receiver is the easiest. Make sure to enable the "ZDA" NMEA0183 sentence and compare the time this message has been received with the time from your computer. Note that this only works if your computer is synchronized with a time server. You can use the "Show Trace" button to view the incoming NMEA0183 data in the original raw data file:

```

3/18/2020|2:40:53.019 PM|$GPZDA,134053.020,18,03,2020,00,00*5E
3/18/2020|2:40:54.010 PM|$GPGGA,134054.00,5232.58150816,N,00602.11427370,E,1,7,1.3,
3/18/2020|2:40:54.026 PM|$GPZDA,134054.020,18,03,2020,00,00*59
3/18/2020|2:40:55.015 PM|$GPGGA,134055.00,5232.58224474,N,00602.11427476,E,1,6,2.0,
3/18/2020|2:40:55.015 PM|$GPZDA,134055.020,18,03,2020,00,00*58
3/18/2020|2:40:56.006 PM|$GPGGA,134056.00,5232.58224721,N,00602.11427776,E,1,6,2.0,
3/18/2020|2:40:56.022 PM|$GPZDA,134056.020,18,03,2020,00,00*5B
3/18/2020|2:40:57.012 PM|$GPGGA,134057.00,5232.58224632,N,00602.11428281,E,1,6,2.0,
  
```

*Example of some ZDA NMEA0183 sentences recorded with a Trimble GNSS receiver.*

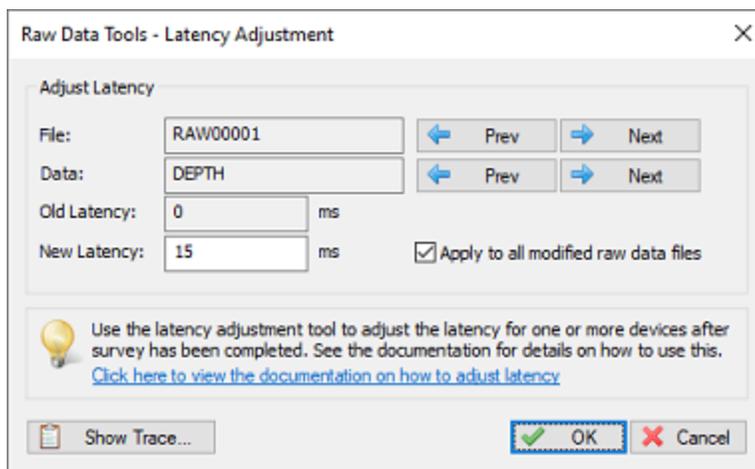
As you can see in the example above, the difference between the GNSS clock and the PC clock is up to 6 milliseconds (position error of 8 mm at 5 km / h). So you don't need to correct it. When you encounter higher values, calculate the average and use it for GNSS latency. Note that there will be a larger error due to time zone differences. Only compare the seconds values, as underlined in the example above !

## Detecting latency for your echo sounder

The latency for an echo sounder may be more difficult to determine. The method often used is by surveying a slope in two directions (forward and backward). When you record and display this on the map, the depth values for the forward and backward direction should match when latency is set correctly. Run this tool and increment the latency value for your sounder until you get the best results. It is important to check the generated soundings for the result.

## Adjusting latency values

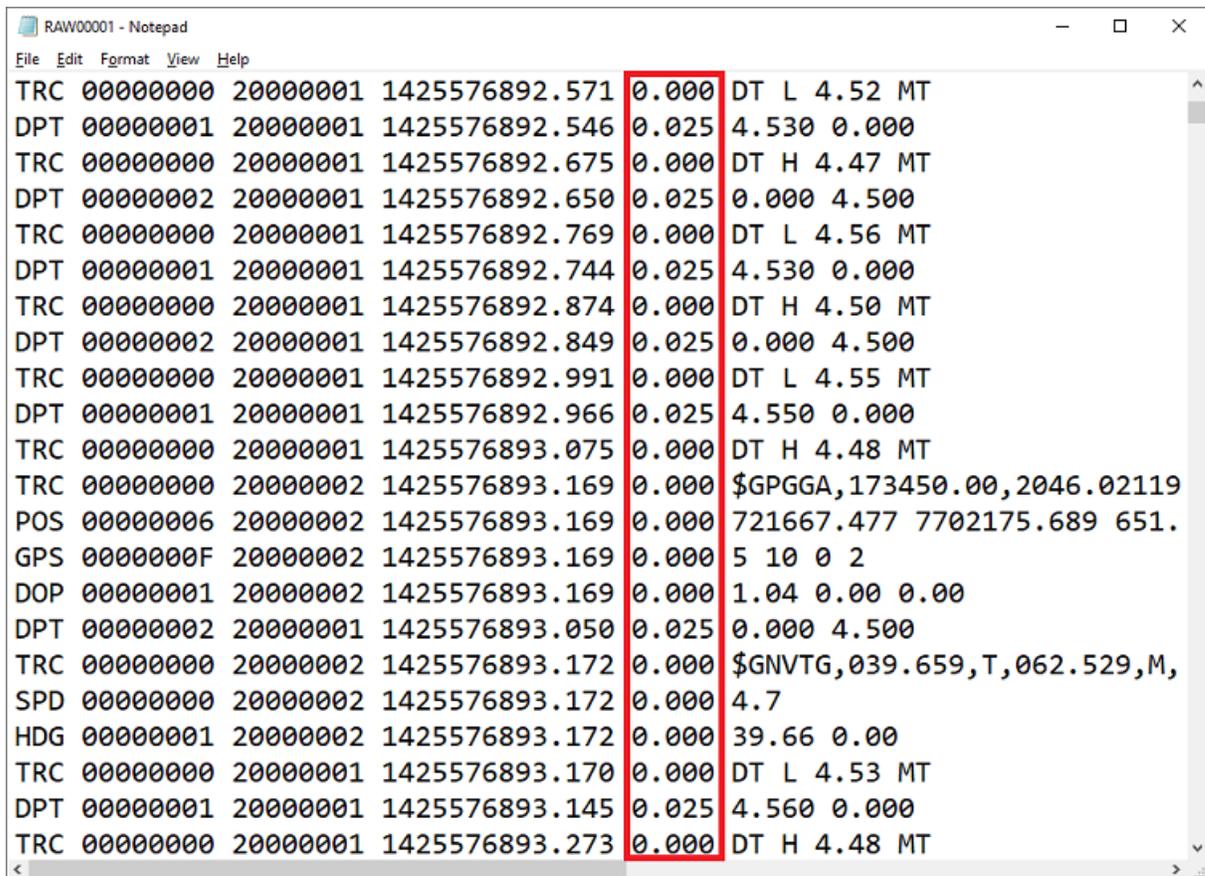
In Hydromagic raw data files, the timestamp and latency values are stored separately. This means the current latency setting is known, and you can adjust it with the possibility to undo the setting. The latency adjustment tool allows you to set the latency for position, depth and motion data separately:



**Fix latency errors with the latency adjustment tool.**

You can click the "Prev" and "Next" buttons to step through the various raw data files to see the current settings. The second pair of "Prev" and "Next" buttons can be used to select the raw data type (position, depth or motion). If you want to apply the new latency setting to all raw data files, you must check the "Apply to all modified raw data" option.

In order to see the result of the correction, generate sounding(s) and check the results in the map viewer. When the result gets worse, decrease the latency, otherwise increase the latency. After changing the latency values of one or more raw data files, the changes are saved in the "Modified" raw data folder. This does not affect your [original survey data](#).



```
RAW00001 - Notepad
File Edit Format View Help
TRC 00000000 20000001 1425576892.571 0.000 DT L 4.52 MT
DPT 00000001 20000001 1425576892.546 0.025 4.530 0.000
TRC 00000000 20000001 1425576892.675 0.000 DT H 4.47 MT
DPT 00000002 20000001 1425576892.650 0.025 0.000 4.500
TRC 00000000 20000001 1425576892.769 0.000 DT L 4.56 MT
DPT 00000001 20000001 1425576892.744 0.025 4.530 0.000
TRC 00000000 20000001 1425576892.874 0.000 DT H 4.50 MT
DPT 00000002 20000001 1425576892.849 0.025 0.000 4.500
TRC 00000000 20000001 1425576892.991 0.000 DT L 4.55 MT
DPT 00000001 20000001 1425576892.966 0.025 4.550 0.000
TRC 00000000 20000001 1425576893.075 0.000 DT H 4.48 MT
TRC 00000000 20000002 1425576893.169 0.000 $GPGGA,173450.00,2046.02119
POS 00000006 20000002 1425576893.169 0.000 721667.477 7702175.689 651.
GPS 0000000F 20000002 1425576893.169 0.000 5 10 0 2
DOP 00000001 20000002 1425576893.169 0.000 1.04 0.00 0.00
DPT 00000002 20000001 1425576893.050 0.025 0.000 4.500
TRC 00000000 20000002 1425576893.172 0.000 $GNVTG,039.659,T,062.529,M,
SPD 00000000 20000002 1425576893.172 0.000 4.7
HDG 00000001 20000002 1425576893.172 0.000 39.66 0.00
TRC 00000000 20000001 1425576893.170 0.000 DT L 4.53 MT
DPT 00000001 20000001 1425576893.145 0.025 4.560 0.000
TRC 00000000 20000001 1425576893.273 0.000 DT H 4.48 MT
```

*Example Hydromagic raw data file with latency for echo sounder set to 25 milliseconds.*

## 6.13 Time adjustment tool

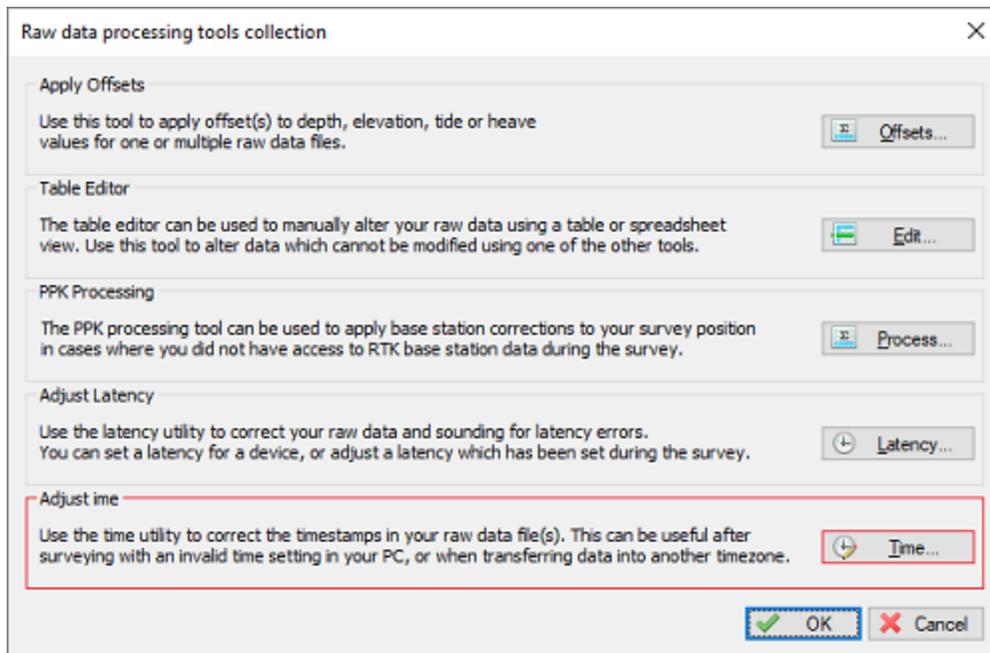
### Raw Data Tools - Time Adjustment Tool

The time adjustment tool can be used to shift the timestamps in the raw data files with a specified amount. You can apply the shift to a selection of raw data files or raw data types, like position, depth, motion, tide, heading, speed or sound velocity. Most probably, you are going to use this tool for one of the following scenarios:

- While [recording data](#), the time or timezone of your computer was set incorrectly;
- One of the devices used built in time stamps, but the time zone used was wrong;
- After [importing raw data](#) files without setting the proper date.

When data has been shifted in time, it is impossible for the "Sounding Wizard" to combine the data to generate soundings. This is especially true in cases where you want to apply a [tide observation](#) or [post processing kinematic correction file](#) on a dataset which has the timestamps wrong. This is where the time adjustment tool comes to the rescue.

The Time adjustment tool is part of the "Sounding Wizard" and can be found on the [raw data processing tools page](#). To start the position editor, just click the "Time..." button in the "Time" section as shown below:



*The time adjustment tool can be found on the data correction page of the "Sounding Wizard".*

## Adjusting Time

To apply a time shift, just enter the values for hours, minutes, seconds and milliseconds and select the direction (forward to add the selected amount of time to the timestamps, or backward to subtract). With the "Select..." buttons you can select the raw data file(s) and raw data type(s) to apply the time adjustment to.

After changing the timestamp values of one or more raw data files, the changes are saved in the "Modified" raw data folder. This does not affect your [original survey data](#).

Raw Data Tools - Time Adjustment

Specify the amount of time to shift

Hours: 6      Seconds: 0  
Minutes: 0      Milliseconds: 0  
Direction: Forward      Reset All...

Raw data selection

Files: RAW00001;RAW00002;      Select...

Data type selection

Type(s): POSITION,DEPTH,MOTION,TIDE,HEADING,SPEED,SOUNDEVELOLOCITY      Select...

Use the time adjustment tool to shift your data in time, which might be useful when the data is recorded when there was a problem with time(zone) settings.  
[Click here to view the documentation on how to adjust timestamps](#)

OK      Cancel

*Fix time(zone) setting errors with the time adjustment tool.*

## 6.14 Apply Offsets

The "Apply Offsets" tool can be used to apply fixed offsets to a couple of vertical measurements, including depth, tide, mean sea level, ellipsoidal height and heave.

The tool can be used to correct or inverse motion sensor data as well.

To start applying offsets to your data, click the "Offsets" button from the "Data processing tools collection" screen, which can be opened by clicking the "Tools..." button on [page 5](#) of the sounding wizard.

Raw Data Tools - Apply Offsets
✕

**Echosounder Offsets**

Depth (Hi):  Meters

Depth (Lo):  Meters

Swap high and low frequency depths

**Elevation Offsets**

Tide Receiver:  Meters

Mean Sea Level:  Meters

Ellipsoidal Height:  Meters

Heave Correction:  Meters

**Motion Sensor Offsets**

Ship Roll:  degrees

Ship Pitch:  degrees

Swap sign - roll (+/-)

Swap sign - pitch (+/-)

**Position Offsets**

Easting:  Meters

Northing:  Meters

**Raw data selection**

Raw Data Files:

 Select...

 Use this tool to set fixed vertical or motion data offsets for the selected data. Please note that the 'Tide' offset is only applied to tide receiver data (not RTK). [Click here to view the documentation on how to apply offsets to raw data.](#)

 Reset All...
 OK
 Cancel

## Configuring offset options

### Depth

Use the "Depth (Hi)" and "Depth (Lo)" fields to correct the measured depth. You can use this function when you created a sounding without, or with an incorrect transducer offset.

### Tide

Use the "Tide" field to apply a fixed offset to the tide values. This function can be used to apply a fixed tide, or to correct your tide receiver or RTK tide measurements.

### Mean Sea Level

Use the "Mean Sea Level" field when you use the MSL field from your GPS to calculate tide levels. This is only used in rare cases where a geoid has been programmed in the RTK receiver, and the MSL field is used to output the height relative to a vertical datum.

### Ellipsoidal Height

Use the "Ellipsoidal Height" field to correct the height measured by a RTK receiver. This correction can be useful when an incorrect antenna height was configured during surveys.

### Heave

Use the "Heave" field to correct heave values in cases where the heave sensor wasn't correctly calibrated before performing a survey. You can calibrate the heave sensor in the "Calibration" tab of the "Preferences" dialog.

### Roll and Pitch

Use the "Roll" and "Pitch" fields to correct these motion values when an IMU wasn't correctly calibrated before performing a survey. You can calibrate IMU sensors in the "Calibration" tab of the "Preferences" dialog.

### Swap roll and pitch sign

Use this function to swap the angle direction of your IMU in cases where the following conventions are not met:

Positive roll value => starboard up;  
Positive pitch value => stern up;  
Negative roll value => port up;  
Negative pitch value => bow up;

When your IMU works the other way around for one of the motion directions, check the box to invert the value before using it to correct your sounding data.

### Data Selection

You can apply the offsets to a single or all raw data files. In most cases, when an invalid setting was used during the entire survey, you have to apply the corrections to all files.

To start processing the data, click the "OK" button. This should not take longer than a couple of seconds, depending on the size of the data.

## 6.15 Table Editor

### Table editor

The table editor allows you to modify any value, except for timestamps, in a raw data file directly. It is recommended to use this editor only in cases where any of the other tools can't be used. You can also use this editor to analyze and export raw data.

Raw Data Tools - Table Editor

POSITION RAW00002

Time	Easting	Northing	Ellipsoid	MSL	UTC
2:41:00.016 PM	198961.267	506352.542	51.325	4.408	134100.000
2:41:01.007 PM	198961.269	506352.557	51.338	4.421	134101.000
2:41:02.012 PM	198961.289	506351.105	50.765	3.848	134102.000
2:41:03.018 PM	198961.293	506351.105	50.775	3.858	134103.000
2:41:04.008 PM	198961.304	506351.103	50.772	3.855	134104.000
2:41:05.014 PM	198961.298	506351.091	50.785	3.868	134105.000
2:41:06.020 PM	198961.303	506351.092	50.785	3.868	134106.000
2:41:07.012 PM	198961.314	506351.067	50.785	3.868	134107.000
2:41:08.017 PM	198961.302	506352.567	51.371	4.454	134108.000
2:41:09.023 PM	198961.323	506351.056	50.781	3.864	134109.000
2:41:10.029 PM	198961.329	506351.040	50.761	3.844	134110.000
2:41:11.020 PM	198961.331	506351.043	50.785	3.868	134111.000
2:41:12.010 PM	198961.333	506351.016	50.761	3.844	134112.000
2:41:13.017 PM	198961.334	506351.007	50.753	3.836	134113.000
2:41:14.021 PM	198961.341	506350.998	50.752	3.835	134114.000
2:41:15.027 PM	198961.331	506352.516	51.308	4.391	134115.000

In cases where the other tools offer no solution, the table editor can be used to manually edit the raw data. You can change data here or delete a selection of data.  
[Click here to view the documentation on how to modify raw data manually](#)

OK Cancel

Use the table editor to manually alter raw data file content.

## Using the table editor

Data in the table editor is sorted per sensor type:

- Depth
- Position
- Heading
- Speed
- GPS information
- Tide
- Motion
- DOP
- Sub Bottom information

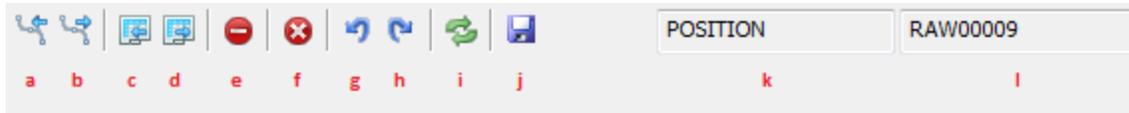
You can use the buttons (c) and (d) to switch between the different tables.

To alter values in the table editor, just double click a cell in the data grid and type the new value. Press enter, or click another cell with the mouse when done.

In addition to modifying values, it is also possible to delete one or more data rows using the toolbar.

When done editing raw data, click the "OK" button to save your changes. To discard, click "Cancel" When data has been altered, a new modified raw data file is written in the "Modified" folder in your project root.

## Table editor toolbar



### (a) - Select the previous data file

Select to the previous raw data file in the collection of files you are currently editing.

### (b) - Select the next data file

Select to the next raw data file in the collection of files you are currently editing.

### (c) - Select the previous data table

Select to the previous table in the raw data file. This allows you to switch between data types.

### (d) - Select the next data table

Select to the next table in the raw data file. This allows you to switch between data types.

### (e) - Remove Selection

To remove one or multiple data rows, select the rows and click this button to remove them. This action can be undone by using the undo operation button.

### (f) - Empty Table

Removes all values from a single table. For instance if you want to remove tide or motion information from the raw data file completely. This action can be undone by using the undo operation button.

### (g) - Undo operation

Use this button when you removed data by accident. This button undo's the last operation.

### (h) - Redo operation

Redo an operation which has been undone.

### (i) - Reload

Reloads the table with data from disk.

### (j) - Export

With this function, you can save the contents of the current data table directly to a human readable ASCII file.

### (k) - Table

Displays the name of the currently selected data table.

#### (I) - File

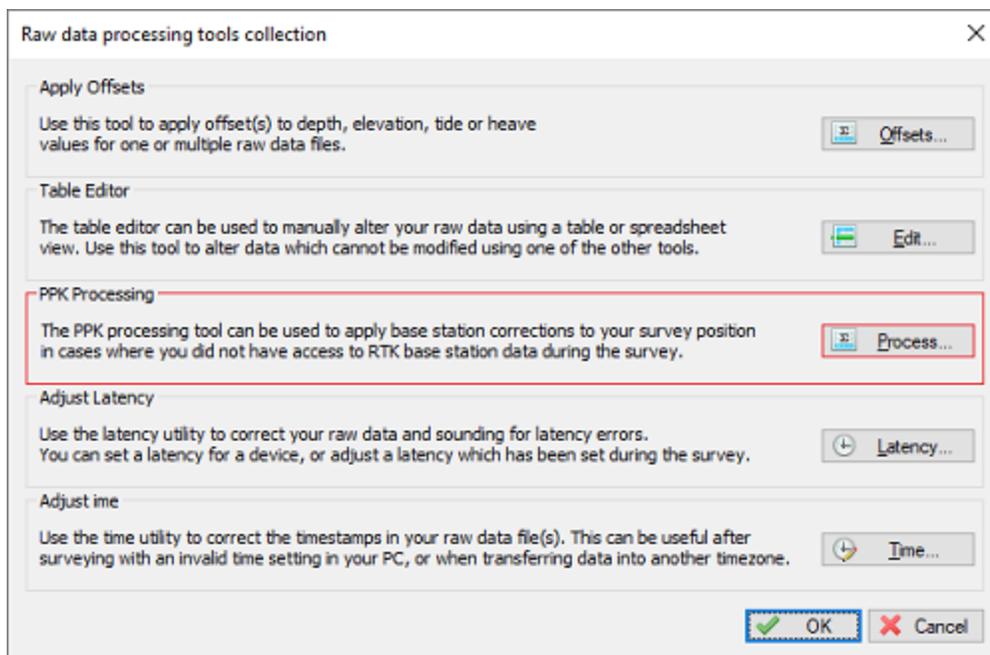
Displays the name of the file that is currently being edited.

## 6.16 PPK processing

Post Processing Kinematic is used when sub-centimeter position accuracy is required, but when there is no possibility to measure with this accuracy in real-time. Real Time Kinematic might not be possible when you are surveying in a remote area, where you do not have access to Internet or a cellular network to get correction data into your GNSS receiver. In these cases you record the raw satellite observations using your GNSS rover and corrections will be applied after the survey by downloading correction (RINEX) data from a nearby base station.

When using PPK in Hydromagic, make sure that, even when the accuracy is low and the raw satellite observations are recorded by your rover, you still continue to record the position data in Hydromagic. These position records will later be merged with the PPK position data generated by, for instance, [the RTKPOST utility of RTKLib](#).

The PPK processing tool part of the "Sounding Wizard" and can be found in the tools collection page. To start the PPK processing tool, just click the "Process..." button in the "PPK Processing" section as shown below:



*The PPK processing tool can be found in the tools collection of the "Sounding Wizard".*

### Using the PPK processing tool

In the PPK processing tool you have to select the PPK file to use. Since there are numerous different PPK file formats, you have to specify the layout used in the file. By default the settings for RTKLib files are loaded:

**Apply Post Processing Kinematic Data** [X]

Select PPK Correction Data File

File Name:

 Browse...  View...

Coordinate Options

Input file has easting and northing coordinates (projected)

Input file has longitude and latitude coordinates (geographic)

Coordinate Format:

Coordinate Reference System

If the coordinates stored in the file are not WGS84 geographic coordinates, select the coordinate system used by clicking on the 'Select' button.

 Select...

Currently selected: WGS84

Define PPK file format or select pre-defined format from list

Predefined File Type:

Date Format:

Time Format:

Comment Prefix:

Date Field #:

Time Field #:

X or Longitude Field #:

Y or Latitude Field #:

Geoid or Ellipsoid Field #:

Time Offset:  minutes  Test...

 The Post Processing Kinematic function can be used to correct position data using PPK correction files generated with for instance RTKLib. [Click here for detailed documentation on how to use PPK in Hydromagic.](#)

OK  Cancel

**The PPK processing tool can be found in the tools collection of the "Sounding Wizard".**

The first step is to select an input file by clicking the "Browse..." button. After selecting the file, you can use the "View..." button to inspect the contents of the file. This should look like the example below, when you did use the free RTKLib software to [generate your PPK correction file\(s\)](#):

```
% program      : RTKPOST ver.2.4.3 b33
% inp file     : H:\RINEX\50370790.20o
% inp file     : H:\RINEX\nieu0791.20o
% inp file     : H:\RINEX\50370790.20*
% obs start    : 2020/03/19 11:48:39.0 GPST (week2097 388119.0s)
% obs end      : 2020/03/19 11:53:43.0 GPST (week2097 388423.0s)
% pos mode     : kinematic
% freqs        : L1+L2
% solution     : combined
```

```

% elev mask : 10.0 deg
% dynamics : off
% tidecorr : off
% ionos opt : broadcast
% tropo opt : saastamoinen
% ephemeris : broadcast
% amb res : fix and hold
% val thres : 3.0
% antennal : ( 0.0000 0.0000 0.0000)
% antenna2 : ( 0.0000 0.0000 0.0000)
% ref pos : 52.587204096 6.281890713 61.3318
%
% (lat/lon/height=WGS84/ellipsoidal,Q=1:fix,2:float,3:sbas,4:dgps,5:single,6:ppp,ns=
% GPST latitude(deg) longitude(deg) height(m) Q ns sdn(m)
2020/03/19 11:48:39.000 52.553810731 6.062372670 44.3737 1 8 0.0049
2020/03/19 11:48:40.000 52.553810753 6.062372617 44.3673 1 8 0.0050
2020/03/19 11:48:41.000 52.553810756 6.062372676 44.3731 1 8 0.0051
2020/03/19 11:48:42.000 52.553810713 6.062372680 44.3719 1 8 0.0051
2020/03/19 11:48:43.000 52.553810713 6.062372678 44.3759 1 9 0.0048
2020/03/19 11:48:44.000 52.553810728 6.062372678 44.3817 1 9 0.0054
2020/03/19 11:48:45.000 52.553810720 6.062372688 44.3844 1 9 0.0053
2020/03/19 11:48:46.000 52.553810696 6.062372709 44.3813 1 9 0.0053
2020/03/19 11:48:47.000 52.553810730 6.062372702 44.3882 1 9 0.0053
2020/03/19 11:48:48.000 52.553810723 6.062372714 44.3839 1 9 0.0053
2020/03/19 11:48:49.000 52.553810722 6.062372721 44.3861 1 9 0.0053
2020/03/19 11:48:50.000 52.553810710 6.062372722 44.3820 1 10 0.0067

```

**Example of a PPK correction file as generated using RTKPOST.**

We will explain the different settings by using the example above. In the Hydromagic PPK processing tool you have to specify the field indexes, as well as the coordinate, date and time field formats, so it knows which field represents which value. Looking at the example above, you can see that the date is the first field, the time is the second field, the latitude coordinate in the third field, the longitude coordinate in the fourth field and finally the elevation is in the fifth field. Configure this field order first. Please note that this setting may be different depending on the tool you are using to generate PPK correction files:

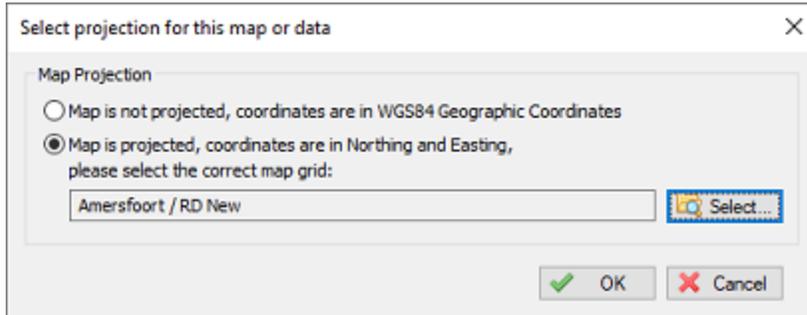
Date Field #:	<input type="text" value="1"/>	▲ ▼
Time Field #:	<input type="text" value="2"/>	▲ ▼
X or Longitude Field #:	<input type="text" value="4"/>	▲ ▼
Y or Latitude Field #:	<input type="text" value="3"/>	▲ ▼
Geoid or Ellipsoid Field #:	<input type="text" value="5"/>	▲ ▼

**Set the field indexes according to the field assignment in the PPK correction file.**

Some files are writing comments at the start of the file as well. You can see in the example above, that the RTKPOST utility uses a percent sign to mark comment lines. We have to tell Hydromagic to skip those lines, so we enter a percent sign as "Comment Prefix" setting. Also make sure to set the "Date Format" and "Time Format" settings, so they match the time and date format used in the correction file. This is a very important setting, since the records are matched with Hydromagic raw data file records by using the time and date stamps.

## Using files with projected coordinates

While this is not the case when using RTKLib, it might be possible to encounter a file where the coordinates are stored as projected easting and northing coordinates. In this case, select the "Input file has easting and northing coordinates" option in the "Coordinate Options" section. You also need to click the "Select..." button in the "Projection" section to tell the software in which coordinate reference system those coordinates are.



Select the projection in case of projected coordinates, otherwise set to "WGS84".

## Testing the settings

When you have configured all the settings in the PPK processing dialog, please click the "Test..." button before applying the corrections to your raw data file(s). The software will now try to parse the correction file and shows the first 500 records of information found in the file. Make sure the timestamps and the latitude/longitude/elevation values are correct. When this is the case, it is safe to click the "OK" button to apply the correction data to your raw data file(s).

Time	Longitude	Latitude	Elevation
3/18/2020 - 1:40:17.000 PM	6.035233076	52.543019769	54.019
3/18/2020 - 1:40:18.000 PM	6.035233062	52.543019800	54.024
3/18/2020 - 1:40:19.000 PM	6.035232978	52.543019796	54.031
3/18/2020 - 1:40:20.000 PM	6.035232989	52.543019807	54.021
3/18/2020 - 1:40:21.000 PM	6.035232972	52.543019900	54.046
3/18/2020 - 1:40:22.000 PM	6.035232956	52.543019808	54.050
3/18/2020 - 1:40:23.000 PM	6.035232890	52.543019781	54.054
3/18/2020 - 1:40:24.000 PM	6.035232882	52.543019837	54.052
3/18/2020 - 1:40:25.000 PM	6.035232881	52.543019835	54.074
3/18/2020 - 1:40:26.000 PM	6.035232870	52.543019815	54.071
3/18/2020 - 1:40:27.000 PM	6.035232921	52.543019721	54.064
3/18/2020 - 1:40:28.000 PM	6.035232864	52.543019709	54.097
3/18/2020 - 1:40:29.000 PM	6.035232760	52.543019716	54.097
3/18/2020 - 1:40:30.000 PM	6.035232733	52.543019783	54.122
3/18/2020 - 1:40:31.000 PM	6.035232708	52.543019834	54.124
3/18/2020 - 1:40:32.000 PM	6.035232702	52.543019842	54.137
3/18/2020 - 1:40:33.000 PM	6.035232694	52.543019841	54.133
3/18/2020 - 1:40:34.000 PM	6.035232765	52.543019783	54.129
3/18/2020 - 1:40:35.000 PM	6.035232755	52.543019872	54.133
3/18/2020 - 1:40:36.000 PM	6.035232692	52.543019929	54.140
3/18/2020 - 1:40:37.000 PM	6.035232634	52.543019791	54.146

*Test the settings before applying the corrections to your raw data files - Example test result file shown above.*

## Applying the corrections

After testing the settings, click the "OK" button to apply the settings. Please note that the corrections will be applied to the modified raw data files only. Your original raw data files will stay intact, so you can always roll back the PPK actions by starting the "Sounding Wizard" with the [original data](#). The software will open a notepad files that shows a report of the affected position records along with the shift in position after correction.

```

PostProcessingKinematic_20200331_110957.txt - Notepad
File Edit Format View Help
Post Processing Kinematic - Processing file: [RAW00002]...

Time      Easting      Northing      Delta(x)  Delta(y)  Delta(z)
134100    0198960.906  0506350.558  000.361   001.984   -02.834
134101    0198960.909  0506350.552  000.360   002.005   -02.817
134102    0198960.899  0506350.559  000.390   000.546   -03.416
134103    0198960.900  0506350.551  000.393   000.554   -03.391
134104    0198960.905  0506350.552  000.399   000.551   -03.385
134105    0198960.903  0506350.541  000.395   000.550   -03.357
134106    0198960.904  0506350.549  000.399   000.543   -03.370
134107    0198960.906  0506350.524  000.408   000.543   -03.359
134108    0198960.904  0506350.539  000.398   002.028   -02.768
134109    0198960.920  0506350.529  000.403   000.527   -03.354
134110    0198960.909  0506350.543  000.420   000.497   -03.399
134111    0198960.909  0506350.533  000.422   000.510   -03.354
134112    0198960.911  0506350.535  000.422   000.481   -03.365
134113    0198960.913  0506350.544  000.421   000.463   -03.368
134114    0198960.914  0506350.557  000.427   000.441   -03.356

```

*After applying the correction data, a record showing the affected position records will be opened in notepad.*

## 6.17 Generate Soundings

### Generate Soundings

When you have corrected your data, configured tide settings and selected correction files for draft and sound velocity, the software has gathered all the information to combine all raw data records into a sounding file. In a sounding file, depth, tide, motion and position information are synchronized by using the recorded timestamps, and written at fixed intervals. The "Sounding Wizard" will write a separate sounding file for each selected raw data file.

You can choose to write soundings at a fixed interval defined in seconds, use the position fix interval, or you could use the moments at which a depth measurement has been received. The recommended setting is to use a fixed interval of one second.

Generate sounding(s) from raw data file(s)

**Set sounding output options**

Name Prefix:

Record Interval:  Calculate a sounding every:  seconds (0,2 - 10,0)

Calculate a sounding every:  m

Calculate a sounding for every received position fix;

Calculate a position fix for every depth measurement;

Do not warn when about to overwrite existing files

Hide raw data files from map after conversion has completed

Generate and show a report with statistics of the sounding creation process

Enter an interval at which data records will be calculated and click the "Finish" button. If your soundings need to be further corrected, restart the wizard and choose "Continue editing modified raw data" on the second page. [Click here to open the documentation on how to set sounding output options.](#)

< Back Finish Cancel

*At the last page of the wizard, you will be setting the sounding file output options.*

## Generate sounding options

### Name Prefix

When a raw file is converted to a sounding, it will keep the assigned number. Using the name prefix setting, you can add a prefix to the file name. For instance, when the name prefix is set to 'SNDG', a raw file named 'RAW0006' will be named 'SNDG0006' after conversion. The raw data file the new sounding originates from will be written in the "Description" field of the sounding.

### Record interval

The interval at which soundings are calculated. You can use a fixed interval or use the same interval at which the GPS or echosounder sends its data. The interval depends on the resolution needed and the size of the survey area. When a raw data file covers a very large area (>100.000 soundings) it is recommended to use a lower interval, for instance one second. Using a very small interval on large data sets may slow down other post processing utilities.

### Overwrite existing files

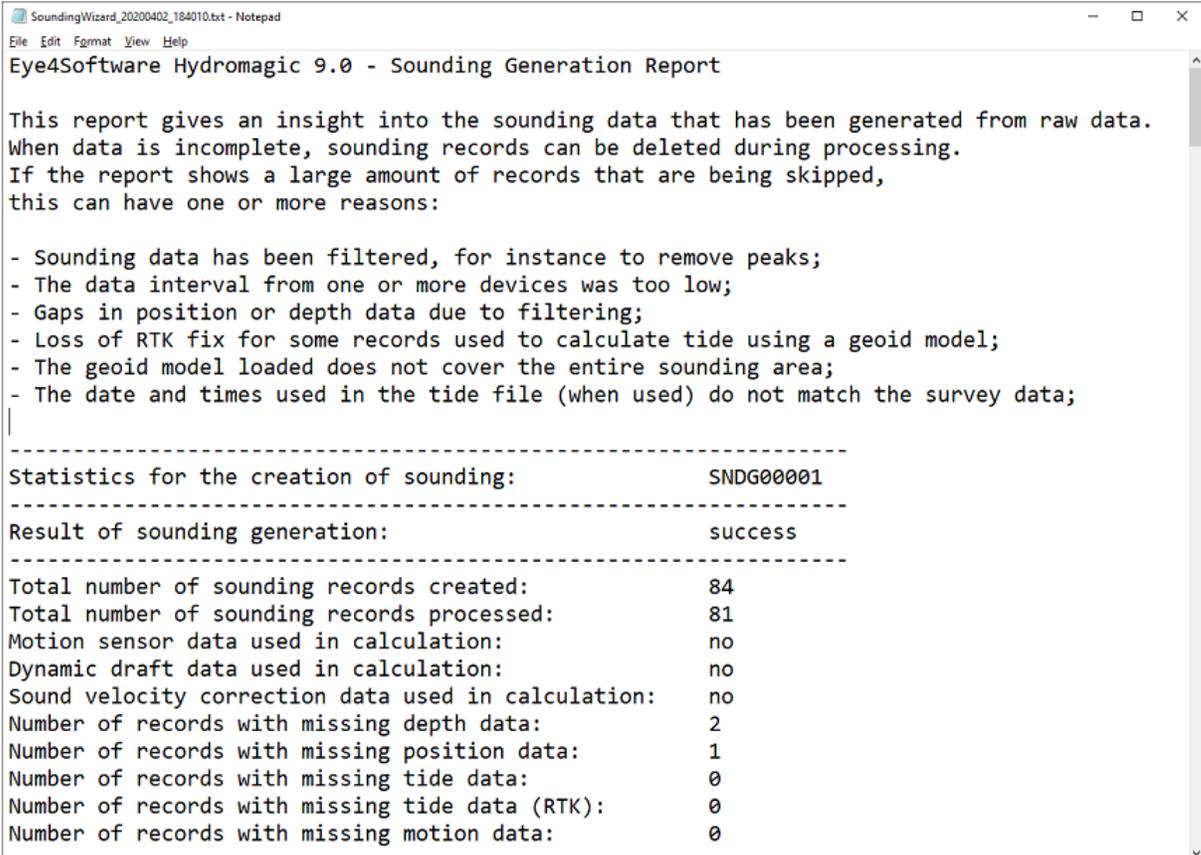
Using the wizard it is possible to generate a sounding file over and over again until you are fully satisfied with all settings and corrections. Checking the "Do not warn when about to overwrite existing files" box will omit a warning message when you are about to overwrite a previously generated sounding file.

### Hide raw data files

When the "Hide raw data files from map after conversion has completed" option has been checked, raw data files which have a sounding file counterpart will automatically be set to invisible to not interfere with the sounding file drawn in the map display.

## Reporting

When a lot of records seem to gone missing in the sounding files, select the "Generate and show a report with statistics of the sounding creation process" option. This report will give some insight on why certain raw data records aren't processed, for instance because there are gaps in the data, GNSS solution quality was low, PPK or tide data didn't cover the whole raw data file or incomplete geoid data.



```

SoundingWizard_20200402_184010.txt - Notepad
File Edit Format View Help
Eye4Software Hydromagic 9.0 - Sounding Generation Report

This report gives an insight into the sounding data that has been generated from raw data.
When data is incomplete, sounding records can be deleted during processing.
If the report shows a large amount of records that are being skipped,
this can have one or more reasons:

- Sounding data has been filtered, for instance to remove peaks;
- The data interval from one or more devices was too low;
- Gaps in position or depth data due to filtering;
- Loss of RTK fix for some records used to calculate tide using a geoid model;
- The geoid model loaded does not cover the entire sounding area;
- The date and times used in the tide file (when used) do not match the survey data;

-----
Statistics for the creation of sounding:                SNDG00001
-----
Result of sounding generation:                        success
-----
Total number of sounding records created:            84
Total number of sounding records processed:          81
Motion sensor data used in calculation:              no
Dynamic draft data used in calculation:              no
Sound velocity correction data used in calculation:  no
Number of records with missing depth data:          2
Number of records with missing position data:        1
Number of records with missing tide data:            0
Number of records with missing tide data (RTK):     0
Number of records with missing motion data:         0

```

**Example of a sounding generation report with statistics on raw data to sounding conversion.**

## Generate sounding

When ready, click Finish. After a few seconds, depending on the amount of raw data, the wizard closes and the generated soundings will be visible in the project explorer. From now on, the sounding is also available as a human readable ASCII file in the "Soundings" folder of your project. In this example, with the interval of the records set to one second, your sounding should look like this when opened in the sounding editor:

Edit Sounding

Sounding Properties

Name: SNDG00001

File: C:\Users\Leon\Documents\Hydromagic\Demo\Soundings\SNDG00001

Comment: GENERATED FROM RAW00001

Time	Longitude	Latitude	Corr Hi	Corr Lo	Tide	EHT
6:35:47.000 PM	W 042°52'13.3155"	S 20°45'59.0430"	5.012	5.060	N/A	651.166
6:35:46.000 PM	W 042°52'13.3445"	S 20°45'59.0857"	5.020	5.080	N/A	651.178
6:35:45.000 PM	W 042°52'13.3730"	S 20°45'59.1284"	5.030	5.080	N/A	651.189
6:35:44.000 PM	W 042°52'13.4017"	S 20°45'59.1705"	5.030	5.070	N/A	651.191
6:35:43.000 PM	W 042°52'13.4309"	S 20°45'59.2119"	4.980	5.036	N/A	651.181
6:35:42.000 PM	W 042°52'13.4602"	S 20°45'59.2531"	4.930	5.003	N/A	651.173
6:35:41.000 PM	W 042°52'13.4894"	S 20°45'59.2946"	4.920	5.000	N/A	651.164
6:35:40.000 PM	W 042°52'13.5188"	S 20°45'59.3364"	4.920	5.073	N/A	651.145
6:35:39.000 PM	W 042°52'13.5477"	S 20°45'59.3785"	4.896	5.004	N/A	651.153
6:35:38.000 PM	W 042°52'13.5760"	S 20°45'59.4209"	4.818	4.903	N/A	651.162
6:35:37.000 PM	W 042°52'13.6039"	S 20°45'59.4632"	4.730	4.786	N/A	651.166
6:35:36.000 PM	W 042°52'13.6312"	S 20°45'59.5054"	4.700	4.760	N/A	651.173
6:35:35.000 PM	W 042°52'13.6584"	S 20°45'59.5482"	4.700	4.760	N/A	651.164
6:35:34.000 PM	W 042°52'13.6855"	S 20°45'59.5913"	4.734	4.800	N/A	651.151

OK Cancel

*Example of a sounding generated with fixed one second intervals.*

To get more information on a single sounding record (we also call this a single ping in Hydromagic), just double click the row you want the details for. When sub-bottom data parameters are available, an additional "Bottom..." button should appear which opens an additional dialog showing bottom parameters.

Ping Data

Sounding Record

Sounding: SNDG00001

Date: 3/5/2015

Time: 6:35:40.000 PM

Sounding Coordinates

Longitude: W 042°52'13.5188"

Latitude: S 20°45'59.3364"

Show position in Easting / Northing coordinates

Depth Information

Depth (Lo): 5.073

Depth (Hi): 4.920

Additional Information

Speed: 5.6

Heading: 33.5

Ellipsoidal Height: 651.145

Orthometric Height: -6.419

Mean Sea Level: 657.564

Corrections

Tide Correction: N/A

Draft: N/A

Heave: N/A

Pitch: N/A

Roll: N/A

Sound Velocity: N/A

S/N Corr (Lo): N/A

S/N Corr (Hi): N/A

Sensor Values

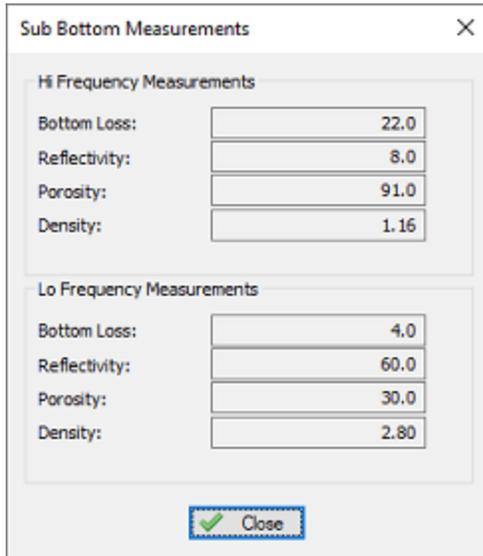
Value #1: 5.000

Value #2: N/A

Value #3: N/A

OK Cancel

*Double-click a data row to see all the details for the record (ping).*



The image shows a dialog box titled "Sub Bottom Measurements" with a close button (X) in the top right corner. It is divided into two sections: "Hi Frequency Measurements" and "Lo Frequency Measurements". Each section contains four rows of data, each with a label and a numerical value in a text box.

Hi Frequency Measurements	
Bottom Loss:	22.0
Reflectivity:	8.0
Porosity:	91.0
Density:	1.16

Lo Frequency Measurements	
Bottom Loss:	4.0
Reflectivity:	60.0
Porosity:	30.0
Density:	2.80

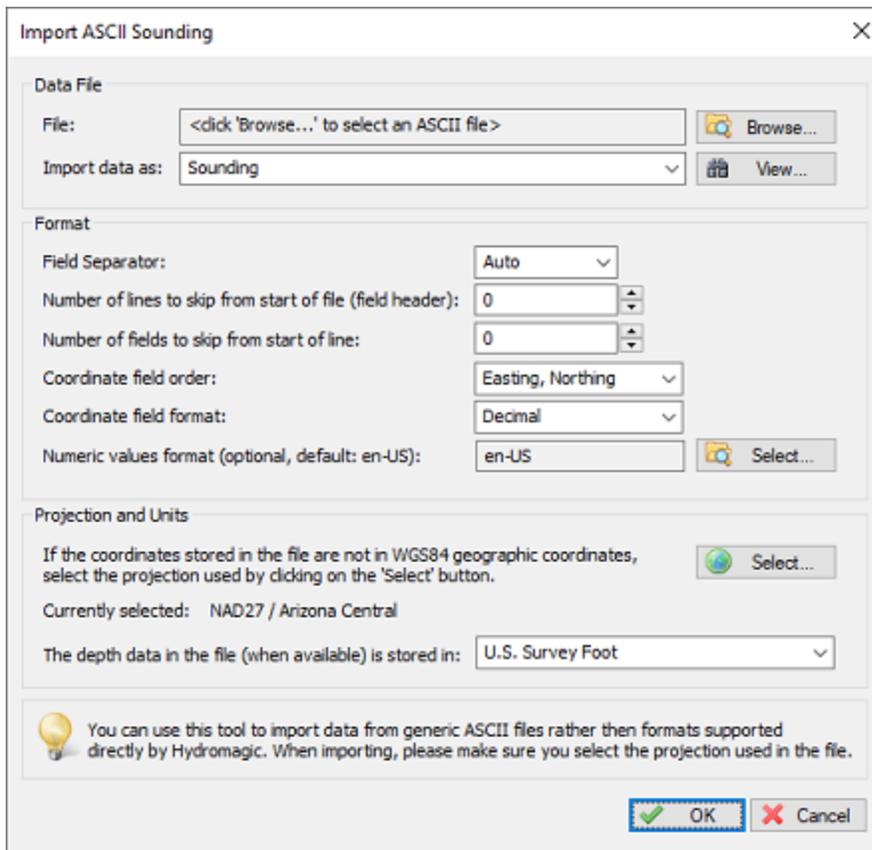
At the bottom of the dialog box is a "Close" button with a green checkmark icon.

*Additional pop up dialog containing sub-bottom measurements (only when available).*

## 6.18 Import Soundings

### Importing sounding data

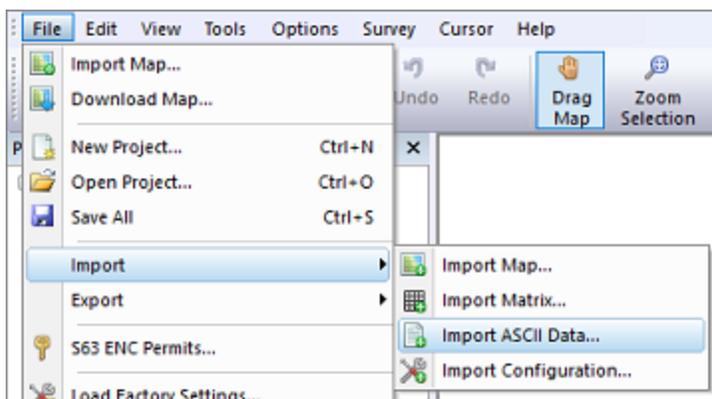
The ASCII import function in Hydromagic allows you to import soundings written in ASCII format. For instance, to import a sounding exported from another Hydromagic project, or created with other software.



*The import ASCII sounding dialog which allows you to import (amongst others) sounding data.*

## Open the "Import ASCII Data" dialog

The dialog can be opened by selecting "File"=>"Import"=>"Import ASCII Data..." from the main menu. Depending on your software configuration there could be a shortcut button in the toolbar as well.



*One way to open the ASCII import tool is via the "File" => "Import" item in the main menu.*

## Select input file

Click the "Browse..." button to select the file to be imported. All files will be displayed, there is no file extension filter applied. Some file extensions that are commonly used for ASCII files include: \*.ASC, \*.TXT, \*.LOG and \*.CSV.

Since version 9.1, Hydromagic supports reading of ASCII files saved as regular text files (ANSI), UTF8, UTF8-BOM or UNICODE encoding, since the software will automatically detect the file encoding used. When using an older version, make sure the ASCII file is saved as ANSI or UTF8 (which would be the case in most scenarios).

The imported file is never modified by this software. This dialog can also be used to import [boundaries](#), [matrices](#) and [waypoints](#). Make sure that the "Import data as" option has been set to "Sounding" when you want to import a sounding.

Import ASCII Sounding

Data File

File: <click 'Browse...' to select an ASCII file> Browse...

Import data as: Sounding View...

Format

Field Separator: Boundary, Waypoints

Number of lines to skip from start of file (field header): 0

Number of fields to skip from start of line: 0

Coordinate field order: Easting, Northing

Coordinate field format: Decimal

Numeric values format (optional, default: en-US): en-US Select...

Projection and Units

If the coordinates stored in the file are not in WGS84 geographic coordinates, select the projection used by clicking on the 'Select...' button. Select...

Currently selected: NAD27 / Arizona Central

The depth data in the file (when available) is stored in: U.S. Survey Foot

You can use this tool to import data from generic ASCII files rather than formats supported directly by Hydromagic. When importing, please make sure you select the projection used in the file.

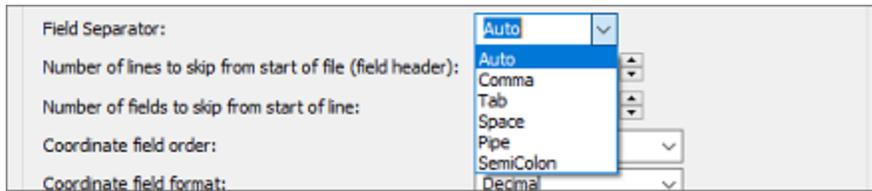
OK Cancel

**To interpret the selected ASCII file as sounding data, select "Sounding".**

## Field Separator

This value is set to "Auto" by default, which means that the software will try to detect which character is used to separate the data fields in the ASCII file.

In most cases you do not have to adjust this value. Use only when the automatic setting does not work for you.



Select the separator used between the values or use "Auto" to detect automatically.

## Skipping lines and fields

In cases where the data does not start on the first line of the file (for instance, when header names are present), you can skip these lines by increasing the "Number of lines to skip from start of file" setting.

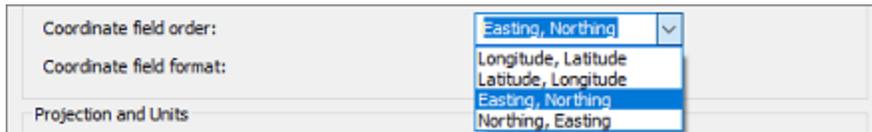
The "Number of fields to skip from start of line" option can be used in cases where there are fields before the actual XYZ data, for instance, record id's. You can use the "View" button to show the contents of the ASCII file to see whether these options apply to your input file.

## Coordinate field order

This option is to set the order of the fields in the file. The following is supported:

- Latitude, Longitude;
- Longitude, Latitude;
- Northing, Easting;
- Easting, Northing;

When a third field is present in the file, it will be interpreted as depths. Most software stores soundings in XYZ format, so selecting "Easting, Northing" here would probably work in most cases.

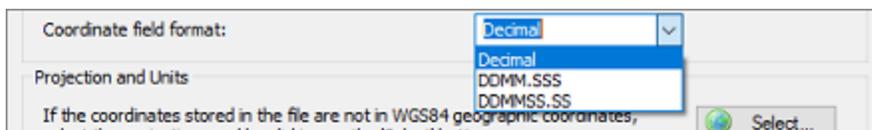


Select the order of coordinate fields in the file.

## Coordinate field format

When the input files contains values in geographic format (i.e. latitude and longitude), and the coordinates are stored in degrees, minutes and seconds format, or degrees and minutes format, use this option to select the correct value.

When coordinates are stored in decimal values, leave the default "Decimal" option selected.



When importing geographic coordinates, select the format used.

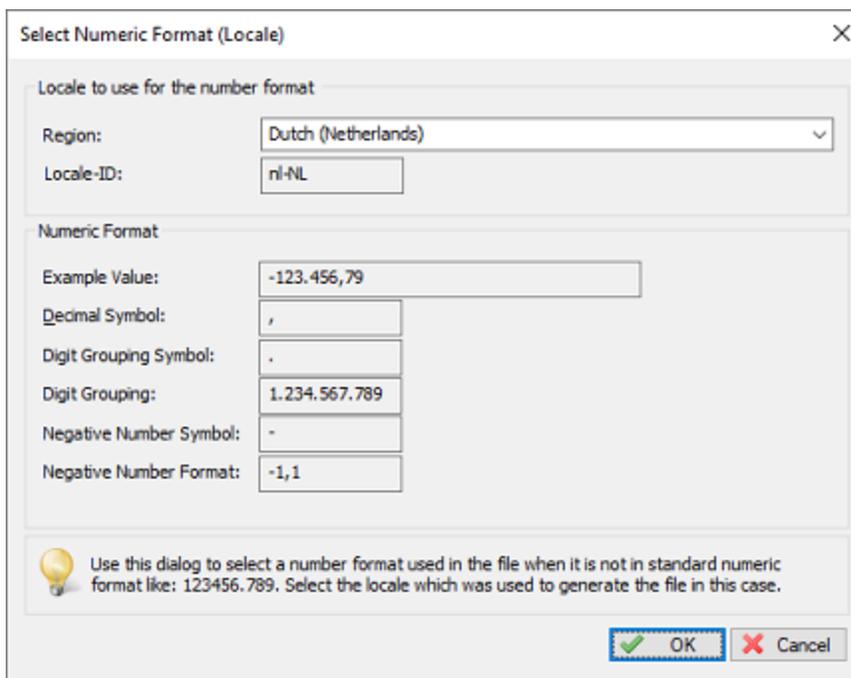
## Numeric values format

In most cases you will encounter files where floating point values are stored in a format where a dot is used as decimal separator. It is possible, that in some cases the data has been exported by third party software using a different format. For instance a comma could be used as decimal separator, or the minus symbol is behind the value instead of in front of it.



**Click the "Select..." button next to the "numeric value format" to change the locale.**

To define another floating point number format to be used when parsing the ASCII file, click the "Select..." button next to the "Numeric field format" setting so select another format (also called locale). In the dialog box that appears, select the region or locale that was used to generate the file. Examples of the number format will be updated while you browse to the countries.

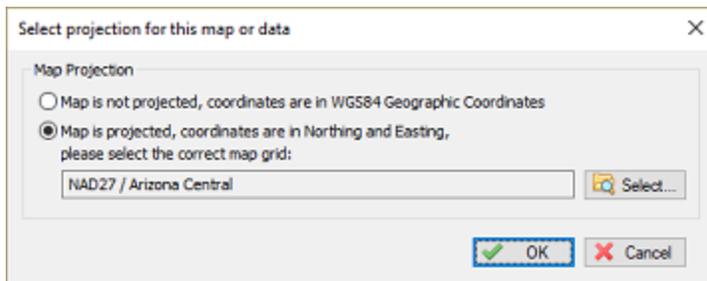


**Use the numeric format dialog box to try out various formats.**

Please note that you do not have to select the same locale as was used to generate the ASCII file. As soon as the number format matches you should be good.

## Projection and Units

The software needs to now which projection is used in the file (only when Northing and Easting coordinates are used instead of Latitude and Longitude), so it can be referenced to WGS84 coordinates. When altitude or depth values are present in the file, you also have to select the (vertical) units used.



**Make sure to select the coordinate reference system used in the file when different from the current project.**

## Importing the file

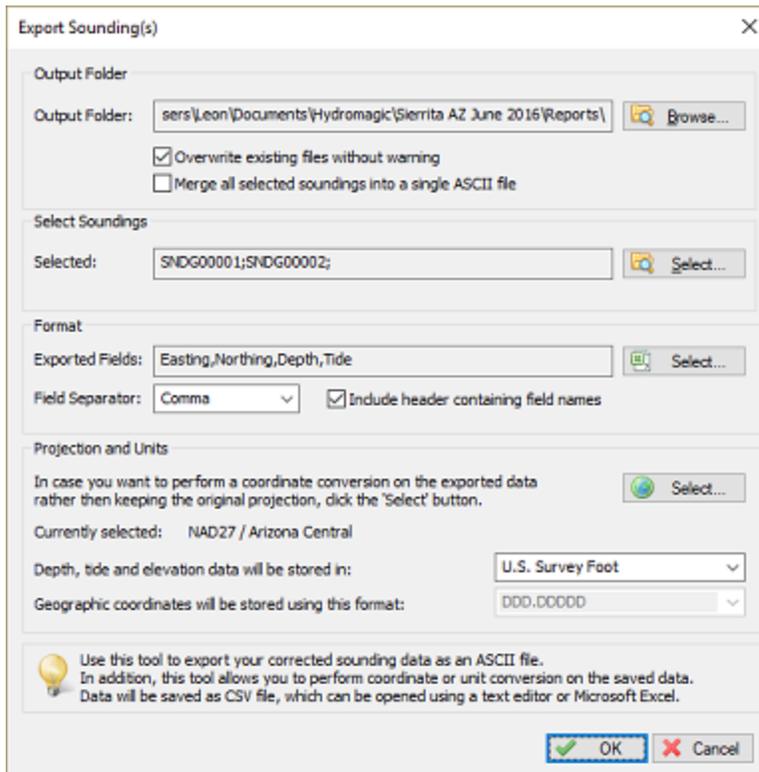
Just click "OK" to start processing the ASCII file. When all parameters were entered correctly, the imported sounding should appear in the "Project Explorer". In case of problems, you can always check the content of the [Activity View's](#) "Processing" tab.

## 6.19 Export soundings

Importing and exporting soundings

Using the sounding export function, it is possible to export soundings in ASCII format for use in other applications. It is also useful to backup separate sounding files from a project, for instance to import them into another project or just for archiving.

The [ASCII import function](#) allows you to import soundings written in ASCII format. For instance, to import a sounding exported from another Hydromagic project, or created with other software.

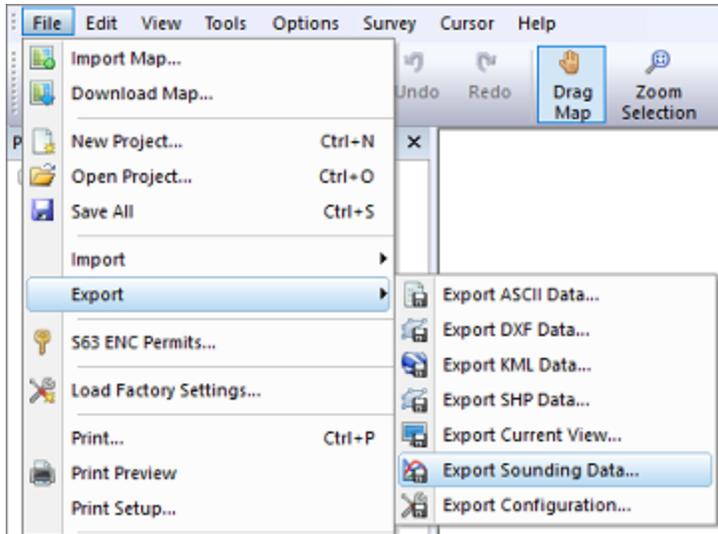


*Use the sounding export tool to backup or transfer soundings.*

## Exporting sounding data

The sounding export function allows you to export your soundings in ASCII format. You can use this feature to create backups of your work, or when you want to use the data in other applications.

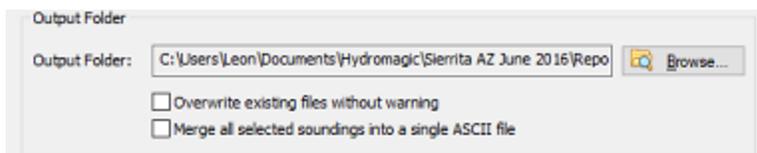
To start, open the "Export Sounding" dialog by selecting "File" => "Export" => "Export Sounding Data..." from the main menu.



*The sounding export function can be found under the export menu.*

## Select output folder

Click the "Browse..." button to select the destination folder for the data to export. All selected soundings will be stored in the same selected folder.



*Select the folder in which the output files will be written.*

## "Overwrite existing files without warning"

When this option has been enabled (checked), there will be no confirmation when you did export the soundings before to the same folder.

All existing ASCII sounding data in the selected folder will be overwritten by the new data directly.

## "Merge all selected soundings into a single ASCII files"

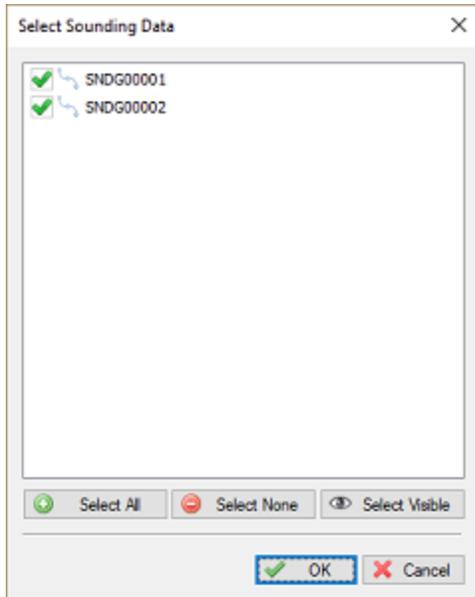
By default, each sounding selected for export will be written as a separate file.

When this option has been enabled, all sounding data will be merged into a single ASCII file instead.

## Select soundings

To select which soundings will be exported, click the "Select..." button in the "Select Soundings" section.

A selection dialog containing all soundings will be displayed making it easy to make a selection.



*Select the items to export by setting checks.*

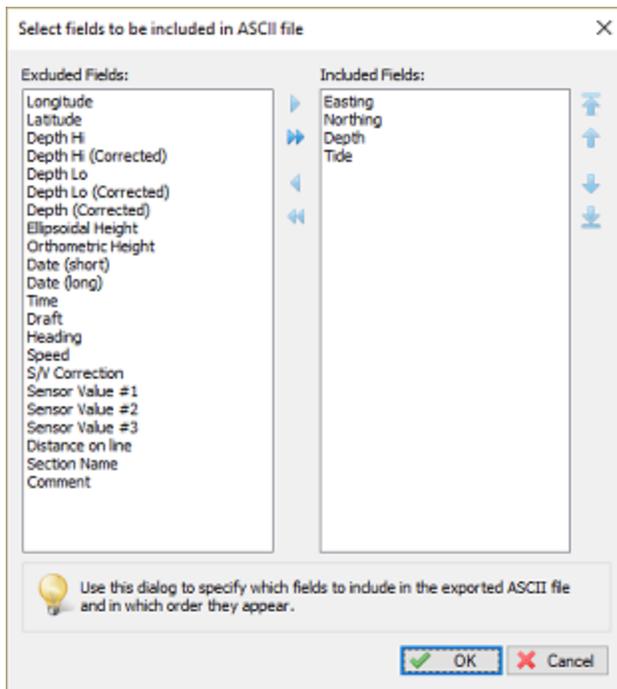
### Select format options and field order

The output format is fully customizable, the following fields can be selected for export:

- Longitude;
- Latitude;
- Easting;
- Northing;
- Depth (raw depth);
- Depth (corrected depth);
- Elevation;
- Ellipsoidal height;
- Orthometric height;
- Date;
- Tide;
- Time;
- Draft;
- Heading;
- Speed;
- Sound velocity correction.

To customize the exported fields, and the field order, click the "Select..." button. The following dialog will be shown allowing you to select the fields.

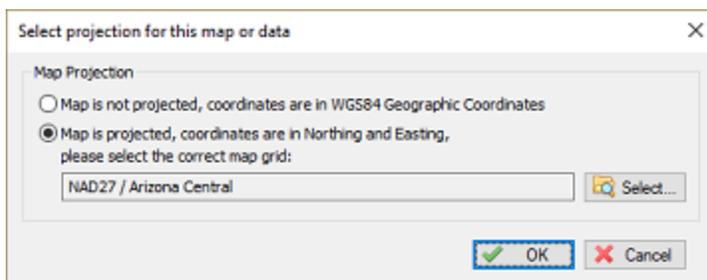
Click "OK" to confirm and return to the "Export ASCII" dialog.



*The ASCII file can be customized by choosing the fields to include.*

## Select map projection and units

It is possible to store the file using another coordinate reference system than the one you are currently using in your project. To change the output coordinate system, click the "Select..." button and select the coordinate system, or select the WGS84 when using geographic coordinates. In this section you can also specify in which units the depth should be written to the ASCII file.



*Select the coordinate system to use for the output file.*

## Starting the export

Just click "OK" to start writing the file. When all parameters were entered correctly, the exported file(s) should appear in the folder you selected.

## 7 Post Processing

### 7.1 Shoreline data

#### Shoreline data

The shoreline data option can be used to enter depth data for places you cannot reach using your vessel, for instance, because the water is too shallow.

It can also be used to specify a line of equal depth, for instance where the water reaches the shore.

For instance, in the example below, you would set the depth for all points on the line to zero:



#### Drawing a shoreline

In order to draw a shoreline using hand, for instance when it is possible to use an accurate map, select the "Draw Boundary" option from the "Cursor" menu.

Now you can click the points that make the line segments for the shoreline. When finished, just click the right mouse button to store the line.

When you finished drawing the shoreline the "Edit Boundary" dialog box will appear. A shoreline is basically a special type of boundary in Hydromagic.

To store the line or area just drawn as a shoreline, select one or multiple options:

Edit Boundary / Island / Shoreline

Edit View

Boundary Properties

Name: BOUNDARY0001

Perimeter: 8 ftUS Area: 0.237 m2

Include the elevation of this boundary in matrix generation

Use as a shoreline only and draw shape as an open poyline

Easting	Northing	Elevation
769016.036	313017.107	0.000
769017.024	313017.144	0.000
769018.076	313017.319	0.000
769019.082	313017.347	0.000
769017.384	313015.547	0.000

Add Remove Insert Clear... Level...

When the elevation(depth) values of a boundary, island or shoreline are used, the shape is drawn on the map in green, or red when used as boundary only.

OK Cancel

### "Include the elevation of this boundary in matrix generation"

When this option has been checked, the shape drawn will be closed and is used as a regular boundary with one exception:

You can set the Z-values for this area so the depths or elevations along the boundary line is taken into account when generating matrices or performing volume calculations.

Use this option when you want to define an island or the shore of a pond of lake and you want to set the depths or elevations at the shore(s).

When an area contains Z-values (shoreline data) it will be drawn in GREEN.

When neither of the shoreline option are checked, the area is used as boundary / clipping area only and will be drawn in RED.

### "Us as a shoreline only and draw shape as an open polyline"

When selecting this option, all points on the line will have Z-values which will be included on matrix generations.

Since the line will be treated as an open polyline, it cannot be used as boundary or island shape.

Use this option to include a single shore on one side of an area with additional (manually measured) depth or elevation points.

When an area contains Z-values (shoreline data) it will be drawn in GREEN.

When neither of the shoreline option are checked, the area is used as boundary / clipping area only and will be drawn in RED.



### Entering manually

When you want to enter the shoreline manually, for instance when you have measured the shoreline coordinates from the shore using a RTK rover, right click on "Boundaries" in the "Project View" and select "Add Shoreline".

The following dialog should now appear, allowing you to enter all measured coordinates in the spreadsheet.

Click the "Add..." button to add new records.

Edit Boundary / Island / Shoreline

Edit View

Boundary Properties

Name:

Perimeter:  ftUS      Area:  m2

Include the elevation of this boundary in matrix generation

Use as a shoreline only and draw shape as an open polyline

Easting	Northing	Elevation
769016.036	313017.107	0.000
769017.024	313017.144	0.000
769018.076	313017.319	0.000
769019.082	313017.347	0.000
769017.384	313015.547	0.000

 When the elevation(depth) values of a boundary, island or shoreline are used, the shape is drawn on the map in green, or red when used as boundary only.

## Setting depth values

When the shoreline connects points with the same depth value, for instance zero, you can set all Z values at once by clicking the "Level..." button and entering the value.

Please note that in cases where you are going to use the shoreline in calculations with elevations, you have to enter the elevation instead of depths here,

Enter Value

Value

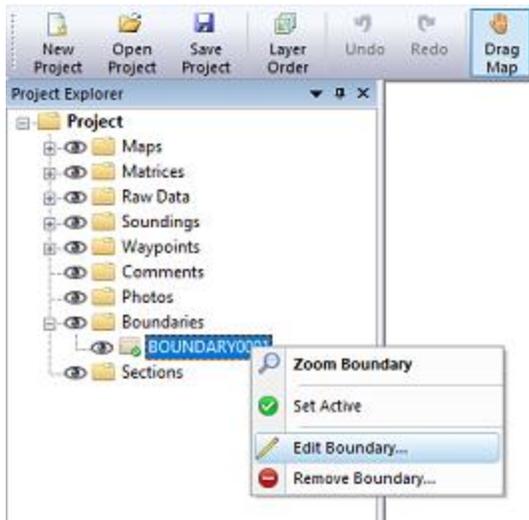
Value:  ftUS

## Modifying shoreline data

To modify the positions in shoreline data, you can use the mouse to drag and drop the positions on the map.

When you want to modify positions manually, or you want to alter the depth values, you have to use the "Edit Boundary" dialog.

To open this dialog, right click on the boundary you want to modify in the "Project View" and select the "Edit Boundary..." option.



## Applying shoreline data

Shoreline data can be used when generating matrices, and thus also calculating volumes (using matrices).

When generating a matrix, you can specify which shorelines you want to include by clicking the "Select..." button.

In the dialog that appears, check the boundaries (shorelines) you want to include and click "OK":



## 7.2 Generate and Display Matrix

### Introduction

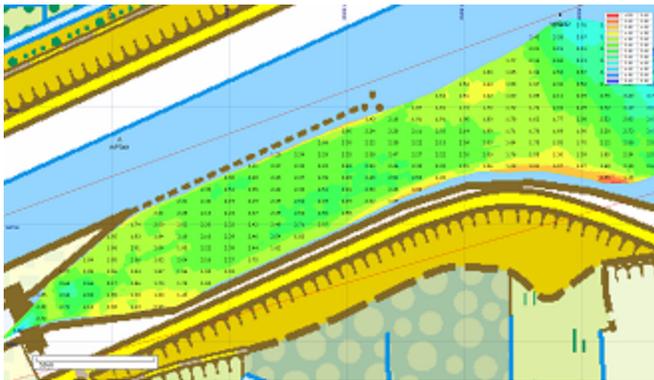
In Hydromagic, a matrix is a collection of regularly spaced depths, which can be projected over the map as color or text.

This is also known as a digital terrain model or DTM.

During the generation of a matrix from a sounding, the scattered data points are converted to regularly spaced data using a TIN (Triangulated Irregularly Network). This TIN is generated using a Delaunay triangulation algorithm.

All new data points are generated by "filling" the triangles, which have been formed from the scattered data.

The image below shows a color matrix which has been generated using TIN (data points at 0.25 meter interval).



*Example matrix generated from sounding and boundary data.*

## Generating a matrix

To generate a matrix, you must have loaded either a valid sounding or a shoreline containing depth or height information.

Without sounding or shoreline data, it is not possible to generate a matrix.

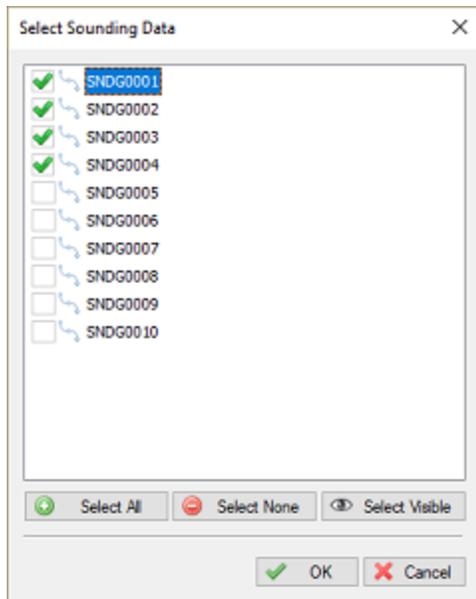
In order to generate the matrix, you have to specify some settings.

To do so, open the "Generate Matrix" dialog by selecting "Generate Matrix..." from the "Tools" menu:

*Use the "Generate Matrix" utility to generate a matrix by using a TIN algorithm.*

## Sounding data

Select from which sounding(s) you wish to generate the matrix. By clicking the "Select..." button, you will be able to select one or more soundings that will be used to calculate the triangulation from which the matrix or digital terrain model will be generated.

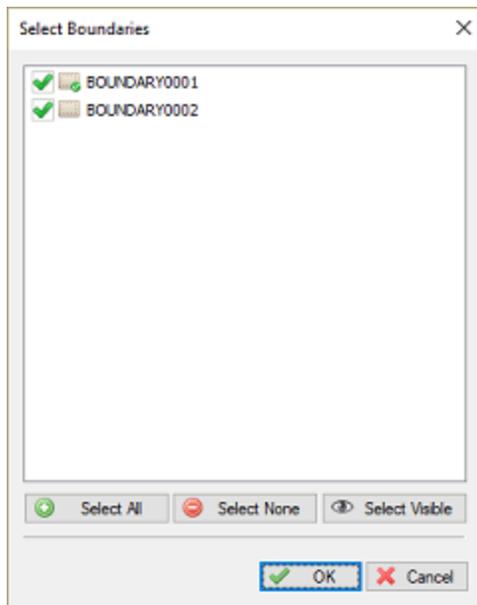


**Select which sounding(s) to include in the matrix generation by checking boxes.**

### Boundaries or shoreline data

In Hydromagic, boundaries can be used to define a shoreline, a clipping area or an island. When a boundary is defined as a shoreline, including the boundary will automatically include the data points defined on this line.

When an island or clipping boundary is selected, it will be used to determine which areas should be filled with data and which are not. This can be used in cases when only a part of the sounding areas has to be interpolated. When no boundary has been selected, the data points of the selected soundings will be used to determine the area that needs to be filled with data.



*Select which boundaries to include in the matrix generation by checking boxes.*

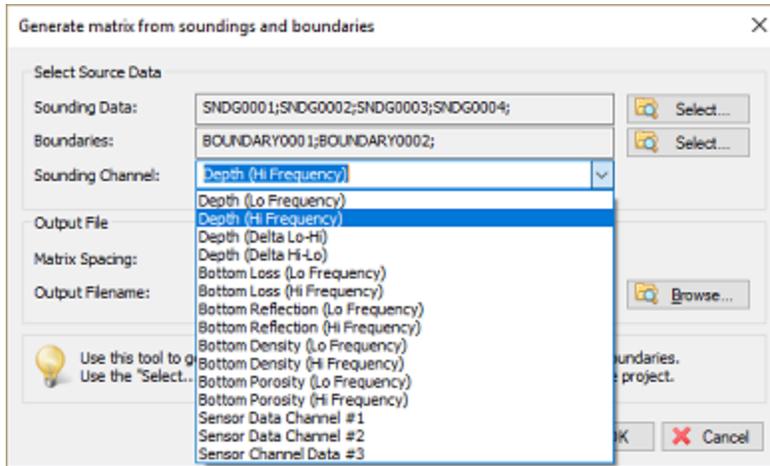
### Sounding channel

You can use this setting to select which data of the sounding is used to generate the matrix. This can be one of the following values:

- Depth recorded with the low frequency channel of your echo sounder;
- Depth recorded with the high frequency channel of your echo sounder;
- Elevation recorded with the low frequency channel of your echo sounder;
- Elevation recorded with the high frequency channel of your echo sounder;
- The difference in depth between the high and low frequency channel (Low - High);
- The difference in depth between the high and low frequency channel (High - Low);
- Bottom loss (low frequency);
- Bottom loss (high frequency);
- Bottom reflection (low frequency);
- Bottom reflection (high frequency);
- Bottom density (low frequency);
- Bottom density (high frequency);
- Bottom porosity (low frequency);
- Bottom porosity (high frequency);
- Sensor data channel 1;
- Sensor data channel 1;
- Sensor data channel 2;
- Sensor data channel 3;

When soundings contain tide information, the "Elevation (Hi Frequency)" option will be selected by default. If you want to generate the matrix using the corrected depth values, without tide correction, select the "Depth (Hi Frequency)" option instead. When the selected soundings don't contain tide information, the "Depth (Hi Frequency)" is selected by default.

Please note that information on bottom loss, reflection, density and porosity will only be available on certain types of echo sounders. The sensor data channels can be used to store for instance magnetometer or temperature data.



Select the data source for the matrix cells from the drop down selection.

### Matrix spacing

You can select the spacing of the regularly spaced data here. The same spacing is applied to both the X and Y axis. The spacing has to be entered in the same units as used for the map projection.

Which spacing to use depends on the zoom scale you are using. For an overview of a large area, you can use 2.5 meter. When zooming in on a smaller area, the best is to use values between 0.25 and 1.00 meter.

Please note that when using a larger spacing, it will be generated and displayed faster than a more dense matrix.

### Output file name

Enter the name of the file that is generated here. This setting is required. Use the browse button to select the output folder and file name. The data will be added to the current project and stored in a separate ASCII XYZ file at the desired location.

### Generating the matrix

Finally, click the "OK" button to start the process. It should take a couple of second, you can watch the progress in the status bar of the main window.

After generation, you will notice the matrix has been added to the project. Depending on the configuration, the newly generated matrix will be drawn over the map.

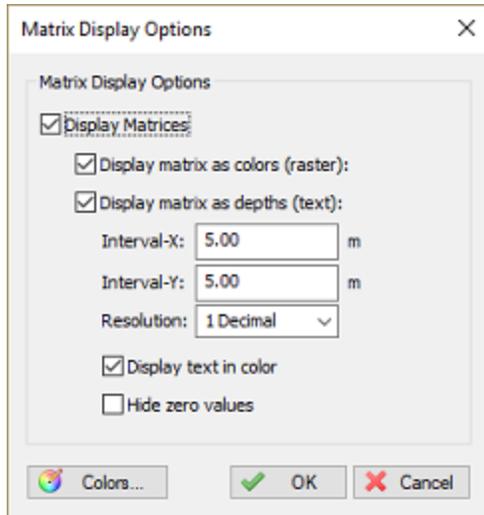
### Displaying the matrix

There are more ways of showing the matrix on the map. In the example near the top of this page, it is displayed at both colors and text at a 5x5 meter interval.

It is also possible to not show it (and just use the matrix to export data), to show it with colors only (using the defined color ranges) or to show its depths as text.

To change settings on how the matrix is shown, right click the "Matrices" folder in the "Project Explorer" and select the "Display Options" option from the popup menu.

A dialog with all matrix settings will be displayed. It should look like the screenshot below:



*The matrix display can be customized.*

### Display Matrices

Using this check box you can toggle the displaying of matrix files on the map. When matrix display is disabled, all other options will be disabled.

### Display matrix as colors

When enabling this option, the matrix is displayed as a color grid on top of the map. The "Colors..." button will also be enabled, so you can start creating the color ranges for your sounding.

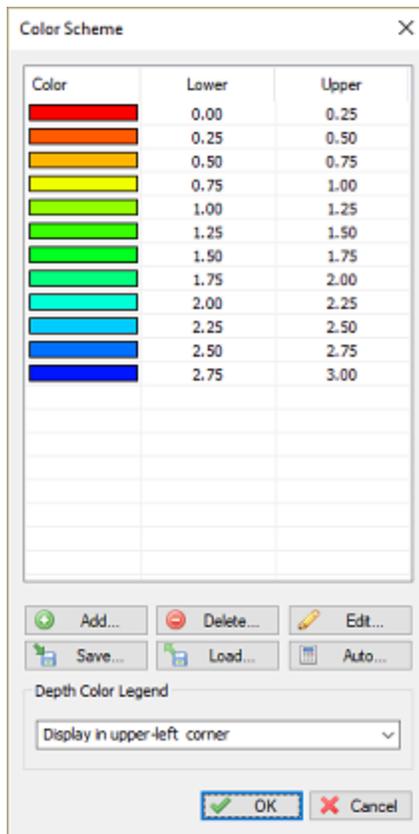
### Display matrix as depths

Instead of drawing the matrix as a color grid, you can also choose to draw depth values at fixed intervals. Depending on the size of the matrix, you have to adjust the text intervals in a way that the text's on the map do not intersect. The text spacing can be set in horizontal and vertical direction separately.

### Display text as colors

When this option has been checked, text is drawn in color, indicating the depth range. You cannot combine this option with the "Display matrix as colors" option.

## Color Ranges

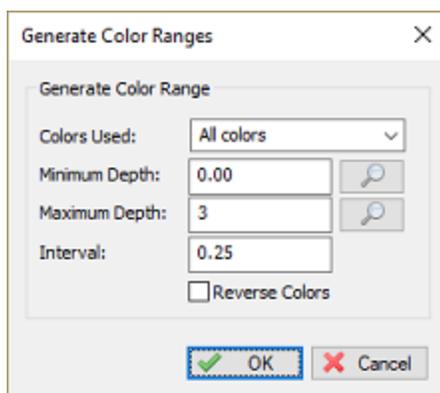


In this dialog, you will be able to add, remove or modify color ranges by clicking one of the buttons at the bottom of the list. To change a range, just double click on it, and change the settings. In case you want to store the color scheme you designed for other projects, you can store it in a separate XML file using the "Save..." button. Just use the "Load..." button in the other project to retrieve this scheme.

### Display color legend

The second section contains the settings for the color legend which is displayed as map overlay when colors are displayed. You can turn it on or off here.

### Generate color ranges



It is also possible to create a color scheme using a min, max and step value.

To do so, select the "Auto..." button, and select the lower and upper range, next specify the interval between the ranges.

This tool will generate max 30 ranges, so it is important to choose the correct interval.

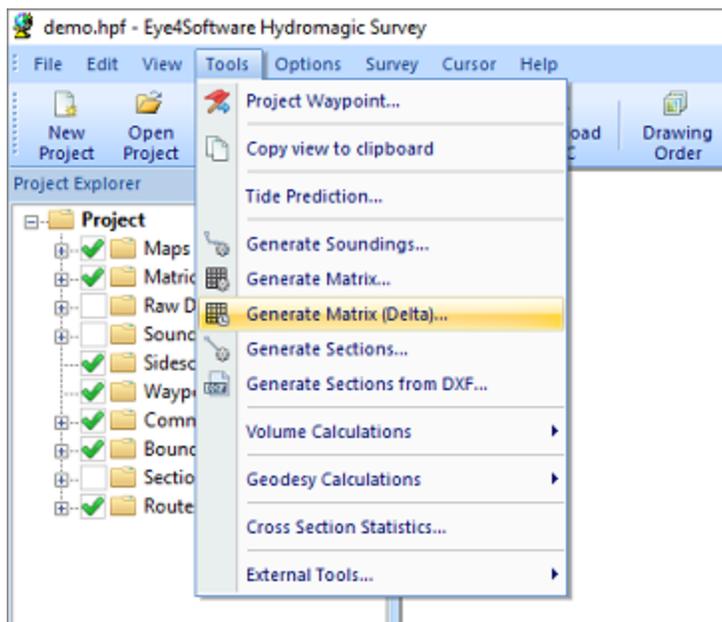
## 7.3 Generate and display delta matrices

### Generate and display a delta matrix

In Hydromagic, a matrix is a collection of regularly spaced depths, which can be projected over the map as color or text. Such data is also referred to as a digital terrain model or DTM.

A matrix can be generated from a collection of soundings and boundaries, or by comparing two existing matrices. The latter method can be used to visualize the difference between two matrices, for instance a matrix generated with a pre-dredging sounding and a matrix generated with a post-dredging sounding. You can also compare matrices generated from two regular soundings at a different time, so you can visualize, for instance, sediment building up.

The new matrix is generated by comparing cell values in both matrices. Make sure the matrices overlap as much as possible and use the same cell spacing. To generate a matrix by comparing two existing matrices, select the "Generate Matrix (Delta)..." option from the "Tools" menu in Hydromagic Survey:



*To compare matrices, select the "Generate Matrix (Delta)..." option from the "Tools" menu.*

### Selecting the source data

In the delta matrix generation tool, you first have to select the two matrices you want to use to generate the delta matrix. For matrix file 1, you select the sounding with the oldest time stamp (or pre-dredging) sounding and for matrix file 2 the newest matrix (or post-dredging matrix). The layer selection boxed will be disabled when there is only one layer present in the matrix file. When a matrix file has been

generated in Hydromagic Dredging, multiple layers can be used. For each layer, the type of data will be shown (in the screenshot below, both layers contain high frequency depth data).

Eye4Software Hydromagic - Generate Matrix (Delta)

Select Source Data

Matrix 1 - File Name: Matrix - January 2019.mbx (pre-dredging)

Matrix 1 - Layer: Layer 1 (Depths: Hi Frequency) (select layer)

Matrix 2 - File Name: Matrix - February 2019.mbx (post-dredging)

Matrix 2 - Layer: Layer 1 (Depths: Hi Frequency) (select layer)

Output File

Output Filename: C:\Users\Leon\Documents\Hydromagic\Demo\Matrices\Dredging - Progress.mf

Browse...

Color Options

Automatically generate and activate a color set

Color Set Name: Delta Matrix

Color Selection: HSV colors

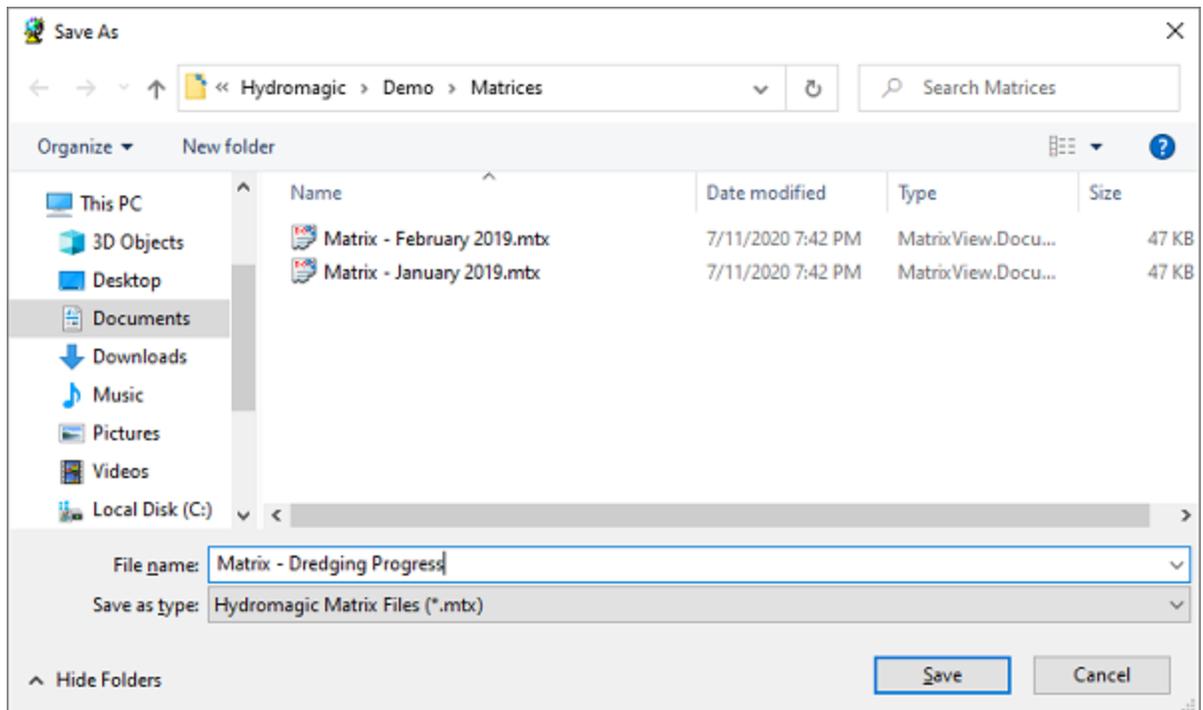
Use this tool to generate a matrix of differences between two matrix files. This will show information on the amount of material dredged, or sediment building up between different soundings. [Click here to open the documentation for the delta matrix generation tool.](#)

OK Cancel

**Before generating a "delta matrix", you have to select the matrices to compare.**

## Selecting the output file

To select the location and file name for the output file to be generated, click the "Browse..." button. You are allowed to select an existing file. In this case the software will ask you to confirm if you want to overwrite the existing file. If the file is not already part of the project, it will be added to the project tree automatically. Matrix files are written in binary format and are not human readable. To export the generated matrix file in ASCII format, use the Export ASCII file tool.



Select an existing or enter a new file name in the "Save As" file dialog.

## Generate a matching color set

If you want, you can generate a color set for the resulting matrix automatically. To do so, simply enable the "Automatically generate and activate a color set" option by checking the checkbox in the "Color Options" section. You also have to enter a name for the new color set, so it can be identified in the list of color sets. This newly generated color set will be saved with the project.

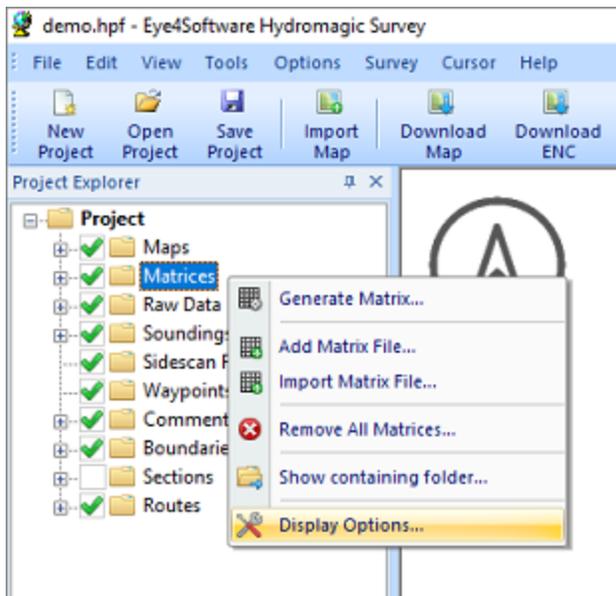
The color set is generated by detecting the minimum and maximum differences in the matrices which are being compared, and the minimum color interval is calculated to limit the number of colors to a maximum of 30. You can select the colors used using the "Color Selection" drop down box.

## Generating the matrix

Finally, click the "OK" button to start the process. It should take a couple of seconds, you can watch the progress in the status bar of the main window. The generated matrix will be added to your project automatically and it will be displayed using the colors of the generated color set (if this option was enabled). When no colors are visible, please check the matrix display options as described in the next paragraph.

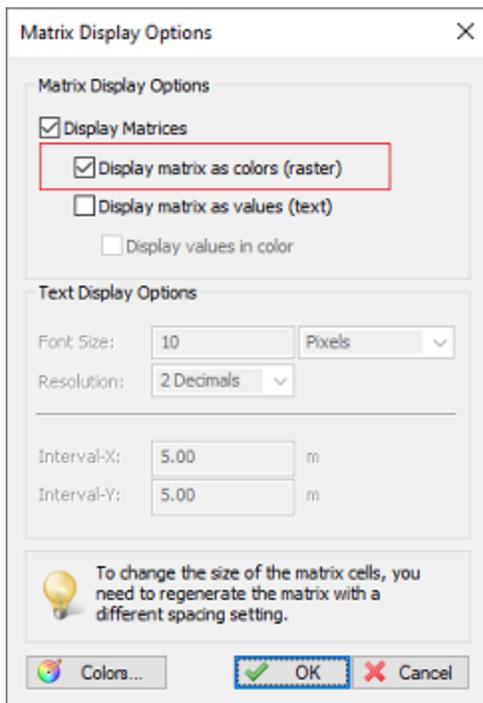
## Displaying the matrix as colors

To change the settings for displaying matrices, right click the "Matrices" folder in the "Project Explorer", and select the "Display Options..." option from the popup menu:



**Right click the "Matrices" folder and select the "Display Options..." option.**

To show the matrix as colored cells, make sure the "Display matrix as colors (raster)" option has been checked. This will cause the matrix to be drawn using the selected or generated color set.



**Select the "Display matrix as colors (raster)" option.**

## 7.4 Generate Matrix from Sections

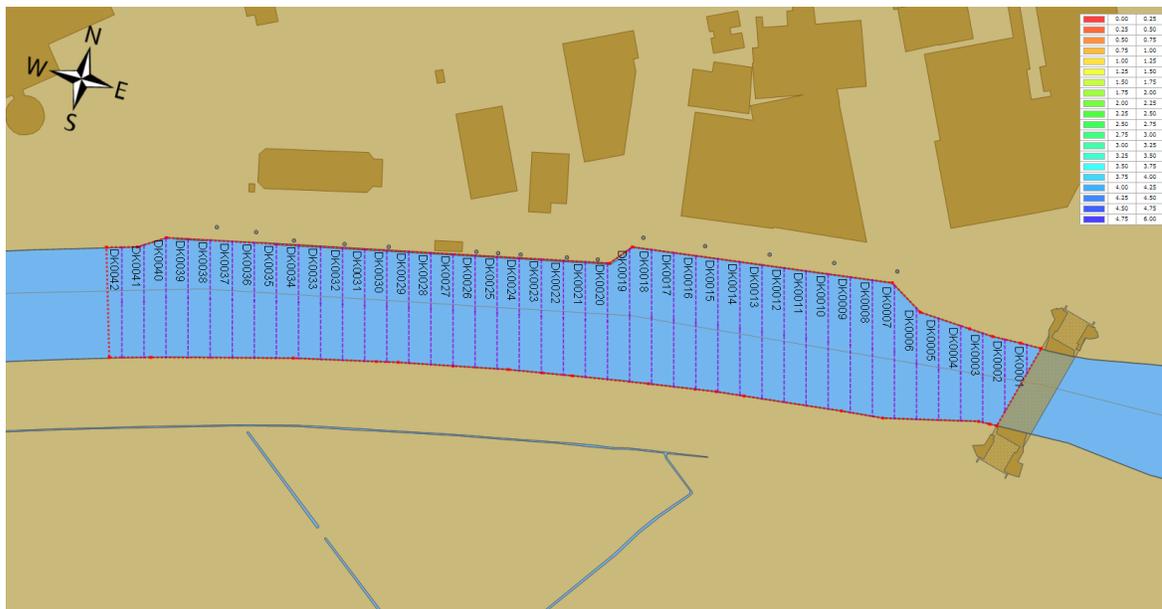
### Generating a reference matrix from sections

A reference matrix that can be used to perform volume calculations can be created from:

- ✓ a recorded sounding;
- ✓ collection of sections, also known as channel design;
- ✓ a vector chart which contains 3D vectors.

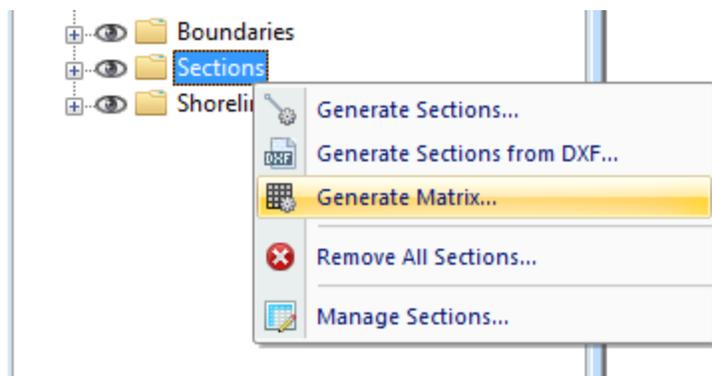
### Channel Design

When comparing the matrix created from a sounding with a matrix created from a channel design, we can calculate the amount of material which has to be (re)moved in order to get the result as in the channel design.

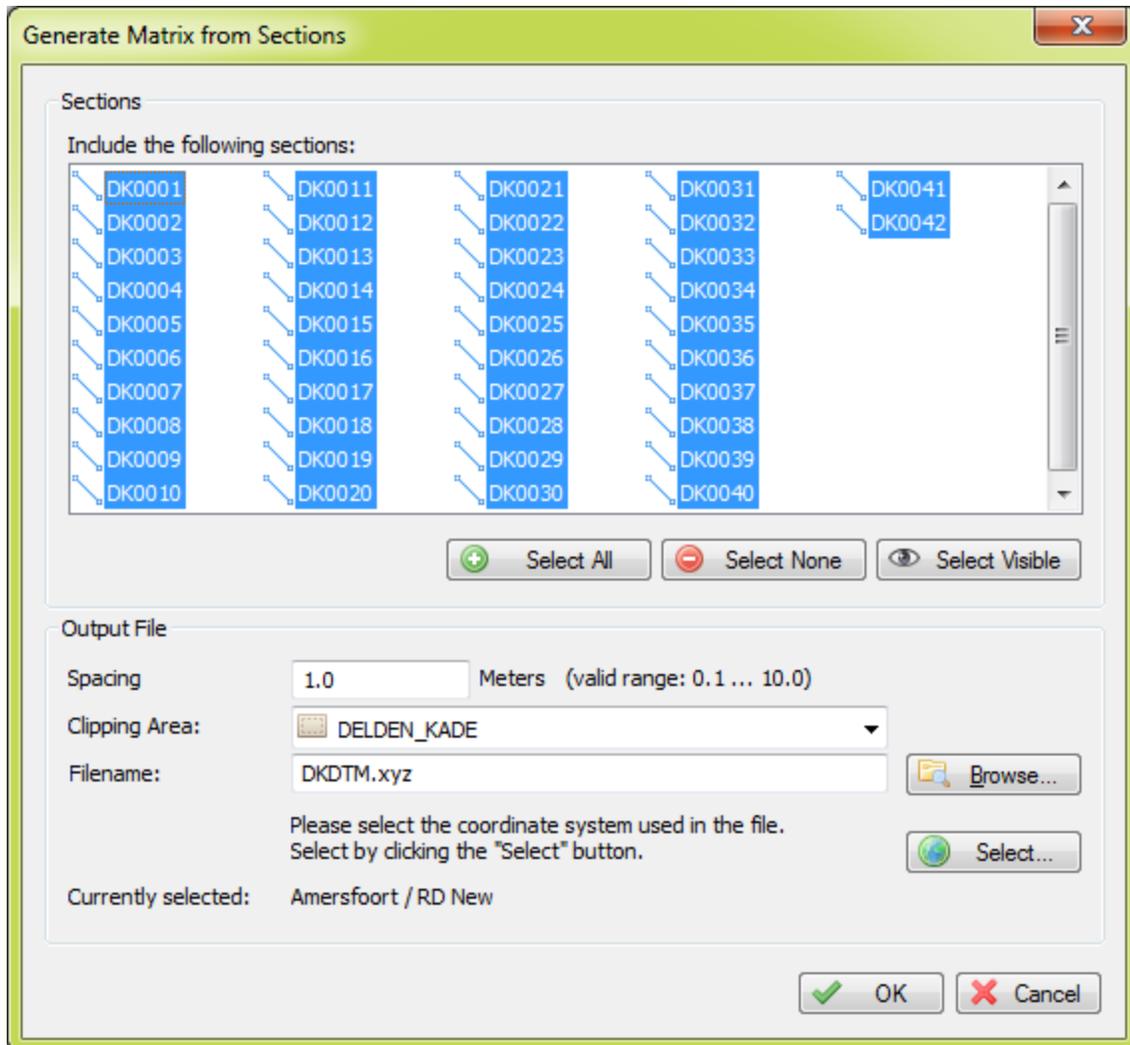


### Generate the matrix

To start creating a matrix from the channel design, right click on the "Sections" folder in the "Project Explorer" and select the "Generate Matrix..." options as shown below:



After selecting this option the "Generate Matrix from Sections" will be displayed, as shown in the image below:



### Sections

Select which sections you want to include in the matrix calculation. In most cases you select all sections, which can be done by clicking the "Select All" button.

To deselect all sections, click the "Select None" button. To select only section that are set as visible in the project, click "Select Visible".

### Spacing

Set the required spacing. Please note that when using the volume calculation using matrices, this spacing should be equal to the one used in the matrix generated from the sounding.

### Clipping Area

Select which area or boundary will be used to indicate the clipping area of the matrix generated from the sections. This value is required.

### Filename

Click the "Browse..." button to select a folder and file name for the generated matrix. The matrix is saved as an ASCII file containing all the XYZ pairs calculated by this tool using TIN.

### Projection

To save the XYZ data in a different projection than the current one, click the "Select..." button to change the projection.

Coordinates will be converted during saving to the output file.

## Starting generation

When all parameters has been set, the matrix will be calculated and added to the project. During the generation process, a progress bar will be shown in the status bar.

When finished and loaded, you will see something similar to the image below:



## 7.5 Generate Matrix from CAD

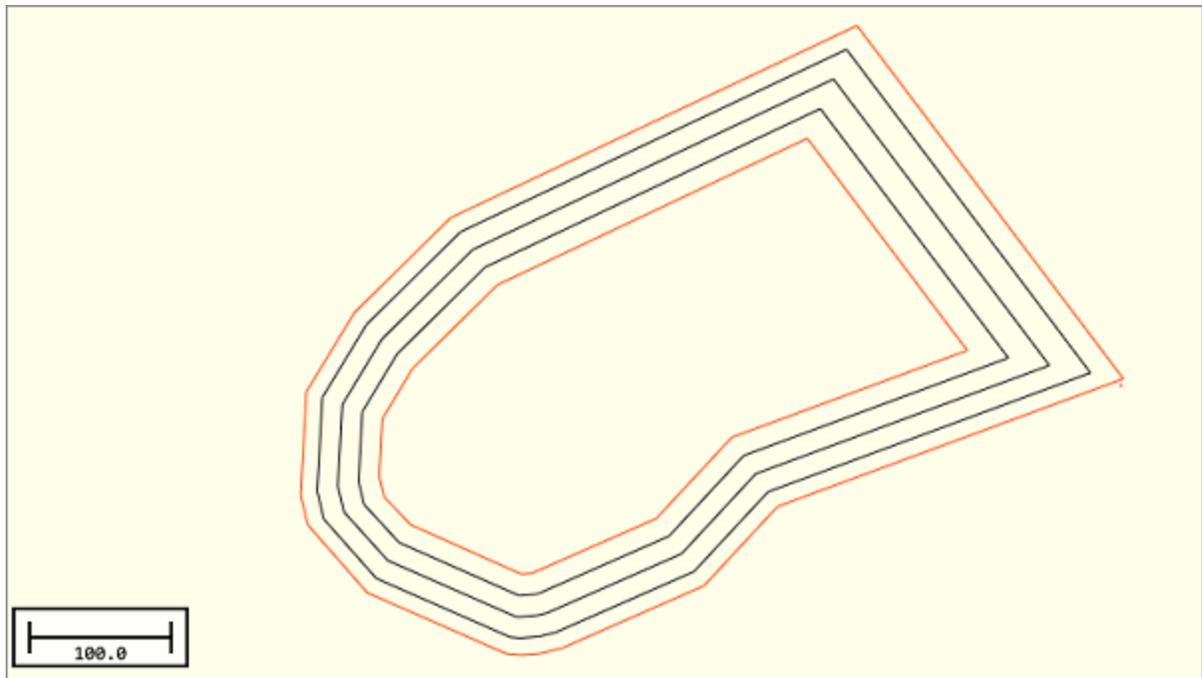
### Generating a reference matrix from CAD or vector maps

A reference [matrix](#) that can be used to perform volume calculations can be created from:

- one or more soundings;
- [shoreline](#) information;
- collection of [cross sections](#), also known as channel design;
- a [vector chart](#) which contains 3D vectors.

### CAD drawing

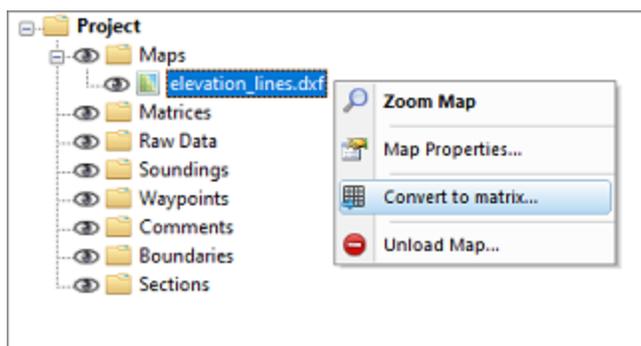
This is perhaps the easiest way to create a reference matrix (DTM or digital terrain model), provided that an AutoCAD DXF or MicroStation design of the area is available (and of course, contains elevation information). From the vectors collected from the CAD file, a TIN model is generated from which heights are calculated. When comparing the matrix created from a sounding, with a matrix created from a CAD drawing, we can calculate the amount of material which has to be removed or added in order to get the result as defined in the CAD drawing (dredging volumes). A sample CAD design of how to construct a basin is displayed below:



*Example of an AutoCAD DXF drawing containing elevation lines.*

## Starting the tool

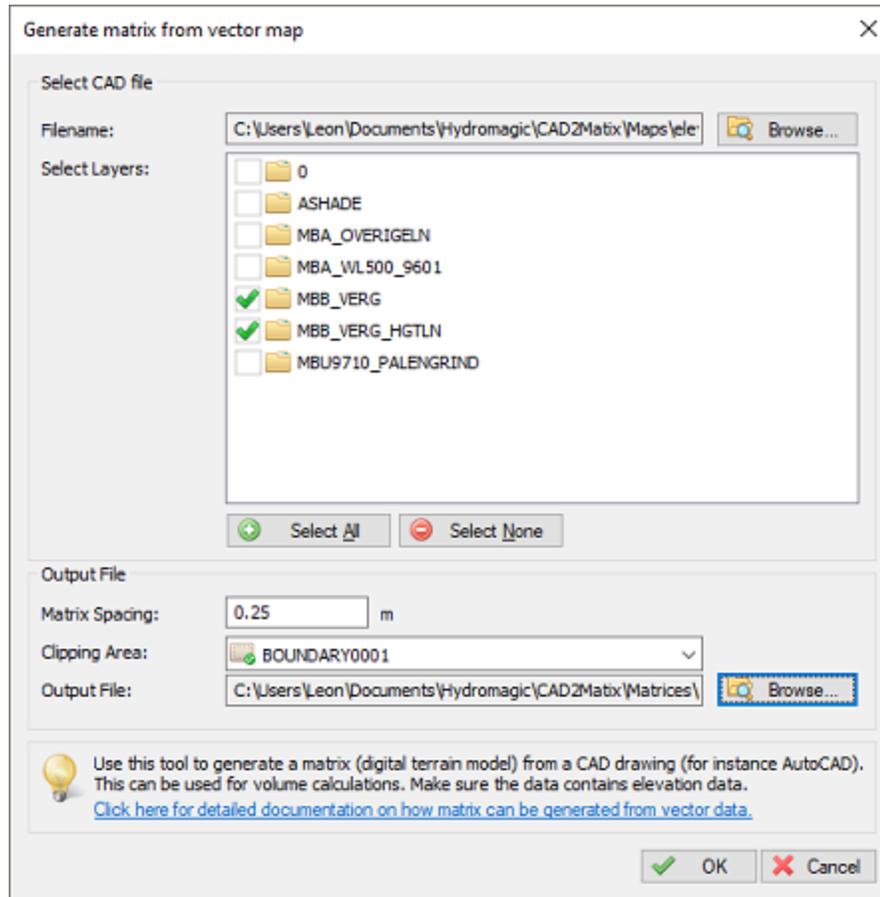
To start the conversion, please make sure you have [imported](#) the CAD drawing ([vector map](#)) into the project. When it displays correctly in the map view, right click on the loaded DXF or DGN CAD file in the "Project Explorer", and select the "Export to Matrix..." option. This will launch the "matrix from vector" tool."In this tool you can select the CAD file as well the name(s) of the layer(s) you want to include in the calculation.



*Select the "Convert to Matrix..." option from the context menu.*

## Using the conversion tool

Use the drop-down box to select the map layer which contains the features which contain the elevation information you wish to use in the matrix generation. It is recommended to draw these lines in a separate layer in your file. Click the "Select..." button to select the layers to include in the calculation.



**Browse for an AutoCAD DXF file and select the DXF layers to include.**

## Matrix spacing

Set the required spacing. Please note that when using the volume calculation using matrices, this spacing should be equal to the one used in the matrix generated from the sounding, otherwise it cannot be used in volume calculations.

## Clipping area

Select which area or [boundary](#) will be used to indicate the clipping area of the matrix generated from the AutoCAD file. You can for instance [convert the outer polyline to a boundary](#). When you want to disable clipping, select the default option "NONE".

## Output file

Click the second browse button to select a folder and file name for the generated matrix. The matrix is saved as a binary file containing all the XYZ pairs calculated by this tool using a TIN model.

## Starting generation

When all options have been set, click the "OK" button to start the matrix generation process. The software will collect all usable vertices (coordinates) from the AutoCAD drawing and creates a TIN model of the data to calculate the matrix with fixed cell sizes. After generation, the matrix will be loaded and added to the project. During the generation process, a progress bar will be shown in the status bar. When finished and loaded, you will see something similar to the image below:

### Vector Map

Use this control to select the vector map to generate the matrix from. Please note that only vector maps are displayed here, raster maps do not contain elevation information. By default the "Active Layer" is selected in this control.

### Layer Filter

Enter the names of the layers that should be included in the calculation. To enter multiple names, just separate them using semicolons. This field is required, when left blank, there will be no generation of matrix data.

### Spacing

Set the required spacing. Please note that when using the volume calculation using matrices, this spacing should be equal to the one used in the matrix generated from the sounding.

### Clipping Area

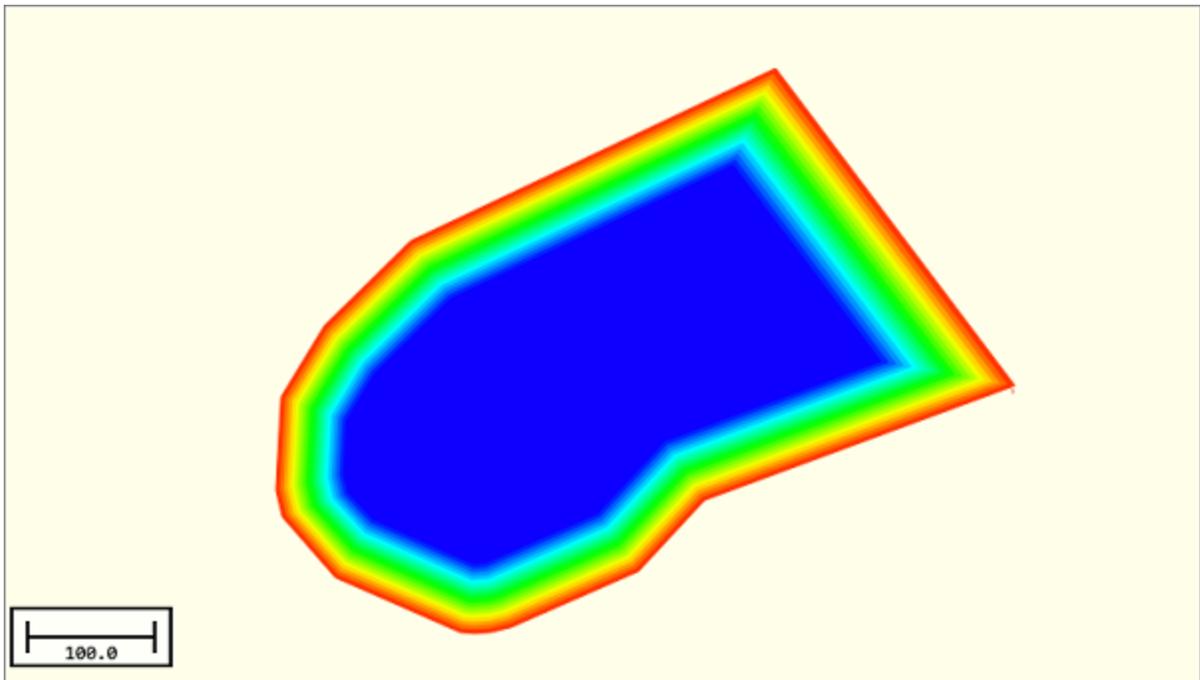
Select which area or boundary will be used to indicate the clipping area of the matrix generated from the sections. When you want to disable clipping, select the default option "<No Clipping>".

### File

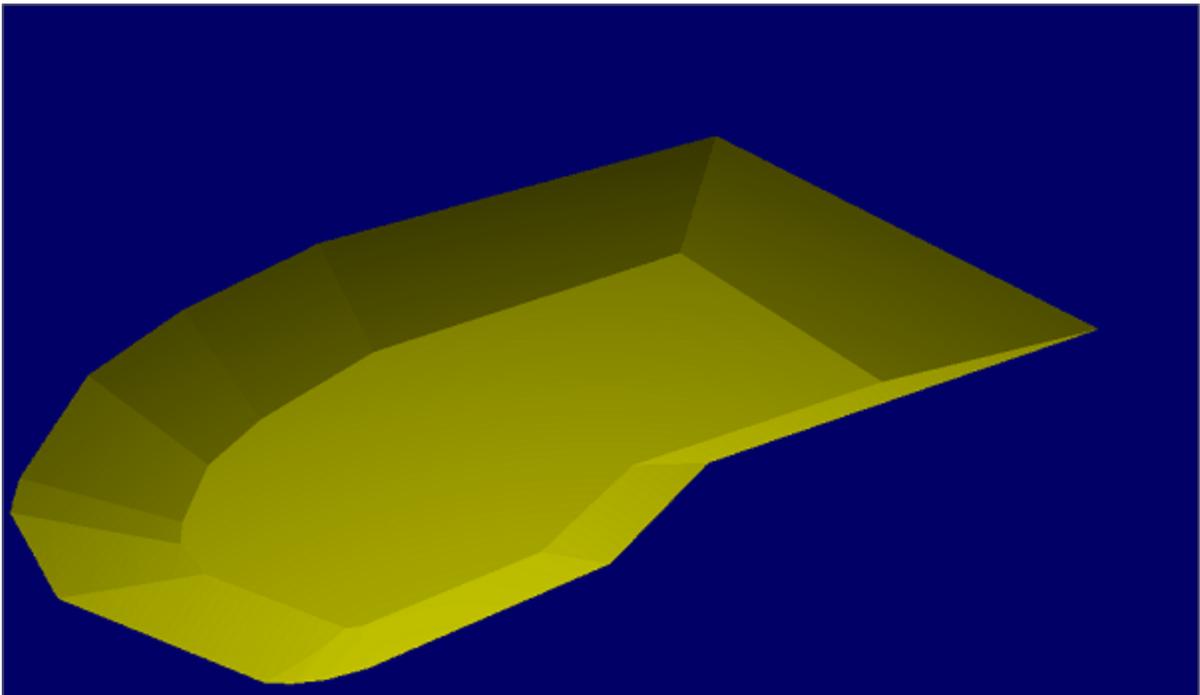
Click the "Browse..." button to select a folder and file name for the generated matrix. The matrix is saved as an ASCII file containing all the XYZ pairs calculated by this tool using TIN.

## Starting generation

When all options have been set, click the "OK" button to start the matrix generation process. The software will collect all usable vertices (coordinates) from the AutoCAD drawing and creates a TIN model of the data to calculate the matrix with fixed cell sizes. After generation, the matrix will be loaded and added to the project. During the generation process, a progress bar will be shown in the status bar. When finished and loaded, you will see something similar to the image below:



*The generated matrix in 2D.*



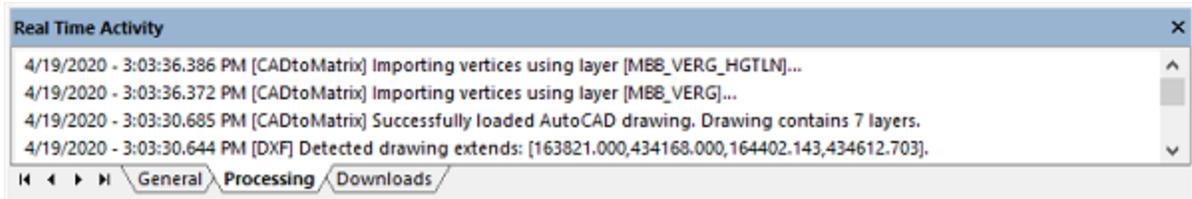
*The generated matrix in 3D.*

## Troubleshooting

When the matrix failed to generated or display, please check the following:

- Is the AutoCAD DXF file in the same coordinate system as your project ?
- Do the select the layers containing the 3D shapes ?

- Is the generated matrix even visible in the "Project Explorer" ?
- Did you set the matrix color ranges ?
- Check the matrix display settings;
- Are there any errors in the "Processing" tab of the activity view ?



You can check the "Processing" activity view tab for errors.

## 7.6 Import Matrix from ASCII XYZ data

### Import Matrix from ASCII XYZ data

In Hydromagic, a matrix is a collection of regularly spaced depths, which can be projected over the map as color or text.

Such data is also referred to as a digital terrain model or DTM.

The software allows you to import matrix data from other sources through an ASCII file.

A 3rd matrix file can be imported for further processing in Hydromagic, as background map or for volume calculation purposes.

The import tool allows you to import the data from various ASCII formats.

During the import process it can perform coordinate conversion, unit conversion, resampling (up and down sampling) and clipping.

### Starting the importing tool

To start importing matrix data, start the tool by selecting "Import Matrix..." from the "File" => "Import" menu.

Please note that a licensed version of Hydromagic is required in order to use this tool.

Import Matrix or XYZ data

Input Filename

Filename: C:\Users\Leon\Documents\Matrix\_10-01-2019.txt

View... Browse...

Coordinate Options

Input file has easting and northing coordinates (projected)

Input file has longitude and latitude coordinates (geographic)

Coordinate Format: DDD.DDDDDD

Field Assignment

Easting or Longitude field index: 1 (default: 1st field)

Northing or Latitude field index: 2 (default: 2nd field)

Depth or Elevation field index: 3 (default: 3rd field)

Tide field index: 0 (optional: 0 = ignore)

Projection and Units

If the coordinates stored in the file are not WGS84 geographic coordinates, select the projection used by clicking on the 'Select...' button.

Currently selected: WGS 84 / UTM zone 23S

The depth, tide or elevation data in the file is stored in: Meter

Output Options

Cell Spacing: 1.0 m

Clip data by using border(s): <None selected, optional> Select...

Use this tool to generate and load Hydromagic Matrix files from ASCII data sources. Data will be interpolated using the given cell spacing. In order to add a existing Hydromagic Matrix file to the project, use the "Add Matrix..." option.

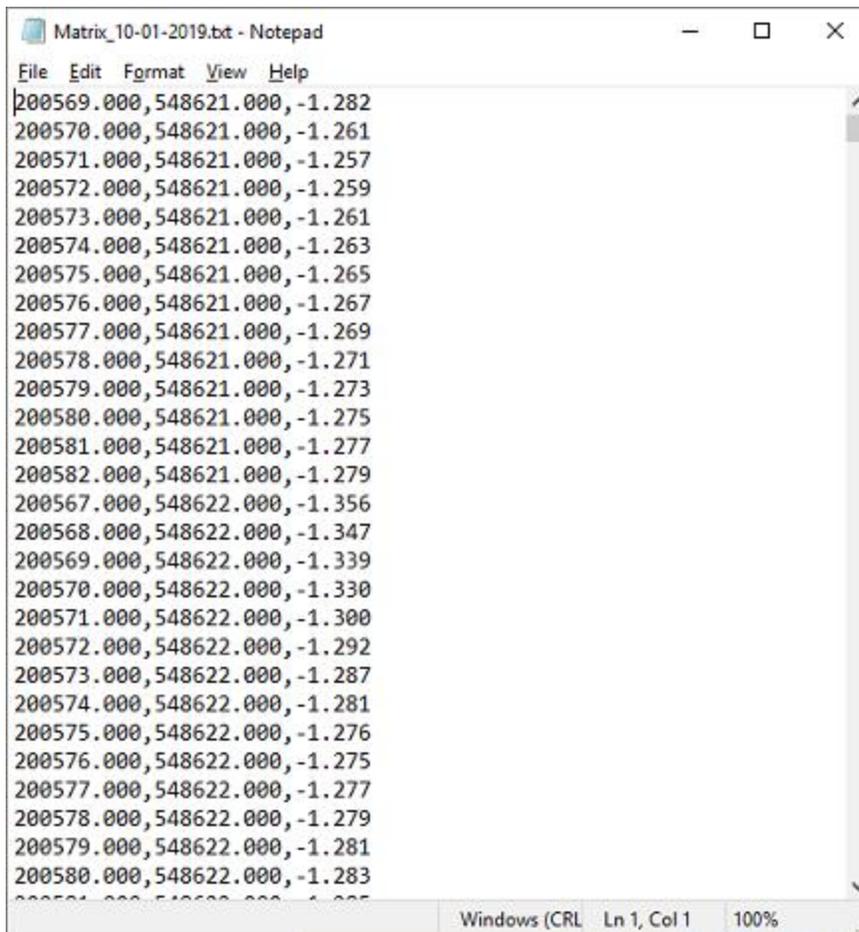
OK Cancel

## Select and preview the source data

The first step is to select the data that is going to be imported. You can select the source file after clicking the "Browse..." button.

Next, you can click the "View..." button to analyze the data. Use this option to determine which data layout is used inside the file. This info is required for the next step.

Looking at the source data, please determine which coordinate format is used, what the order of the fields is and which projection and units are used.



```
File Edit Format View Help
200569.000,548621.000,-1.282
200570.000,548621.000,-1.261
200571.000,548621.000,-1.257
200572.000,548621.000,-1.259
200573.000,548621.000,-1.261
200574.000,548621.000,-1.263
200575.000,548621.000,-1.265
200576.000,548621.000,-1.267
200577.000,548621.000,-1.269
200578.000,548621.000,-1.271
200579.000,548621.000,-1.273
200580.000,548621.000,-1.275
200581.000,548621.000,-1.277
200582.000,548621.000,-1.279
200567.000,548622.000,-1.356
200568.000,548622.000,-1.347
200569.000,548622.000,-1.339
200570.000,548622.000,-1.330
200571.000,548622.000,-1.300
200572.000,548622.000,-1.292
200573.000,548622.000,-1.287
200574.000,548622.000,-1.281
200575.000,548622.000,-1.276
200576.000,548622.000,-1.275
200577.000,548622.000,-1.277
200578.000,548622.000,-1.279
200579.000,548622.000,-1.281
200580.000,548622.000,-1.283
```

## Coordinate Options

While in most cases the data source will be in easting and northing coordinates, the data might be in geographic coordinates sometimes.

When this is the case, click the "Input file has longitude and latitude coordinates" and select the position format in the drop down list.

## Field assignment

The field assignment options are used to indicate which field is what. You can determine the field numbers by looking at the source data.

Please note that the first field is field number one. A field number of zero indicates "Not in use" and can only be selected for the tide level.

In the example above, you would select 'one' for easting, 'two' for northing and 'three' for the depth, or in this particular case the elevation.

## Projection and Units

When the projection of the imported data, or the depth units are different then the ones used in the current project, please select them in this section.

During the import, coordinates and depths will automatically be converted. When the source coordinates are geographic, select WGS84 as projection.

## Cell Spacing

The XYZ data will be converted to a regularly spaced grid or matrix. You have to specify the distance between the cells here.

The cell spacing will be the same in both horizontal and vertical direction.

Hydromagic will generate a new grid using this setting by creating a so called TIN model of the input data.

The TIN model is used to interpolate depth or elevation values at the cell positions.

## Boundaries

In Hydromagic, boundaries can be used to define a shoreline, a clipping area or an island.

When an island or clipping boundary is selected, it will be used to determine which areas should be filled with source data and which are not.

To select an area to fill with the source data, click the "Select..." button to select one or more boundaries to use as clipping area.

The setting is optional. When no boundary has been selected, all data will be imported.



## Generating the matrix

Finally, click the "OK" button to start the process. It should take a couple of seconds, you can watch the progress in the status bar of the main window.

After generation, you will notice the matrix has been added to the project.

Depending on the configuration, the newly generated matrix will be drawn over the map.

## 7.7 Generate Depth Contours

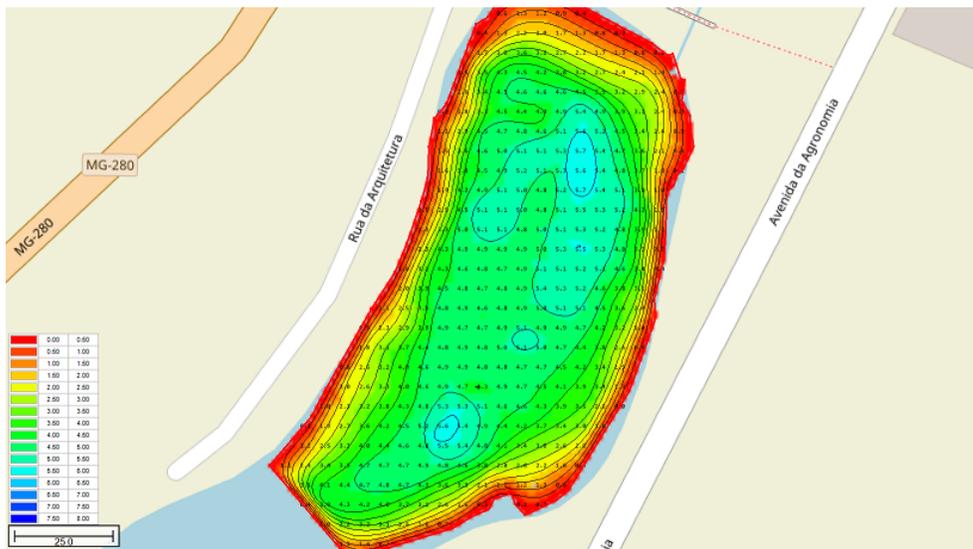
Contour lines are lines connecting points with the same depth, elevation or other data. Contour lines are also known as iso-lines.

During the generation of contour lines from a sounding, the scattered points are converted to regularly spaced data using a TIN (Triangulated Irregularly Network). This TIN is generated using a Delaunay triangulation algorithm.

After this step, Hydromagic calculates the contour lines by determining the positions where the depth contour crosses the calculated triangles.

All these lines are connected to each other, and stored as a vector layer, which is saved as an AutoCAD DXF file and added to the current Hydromagic project.

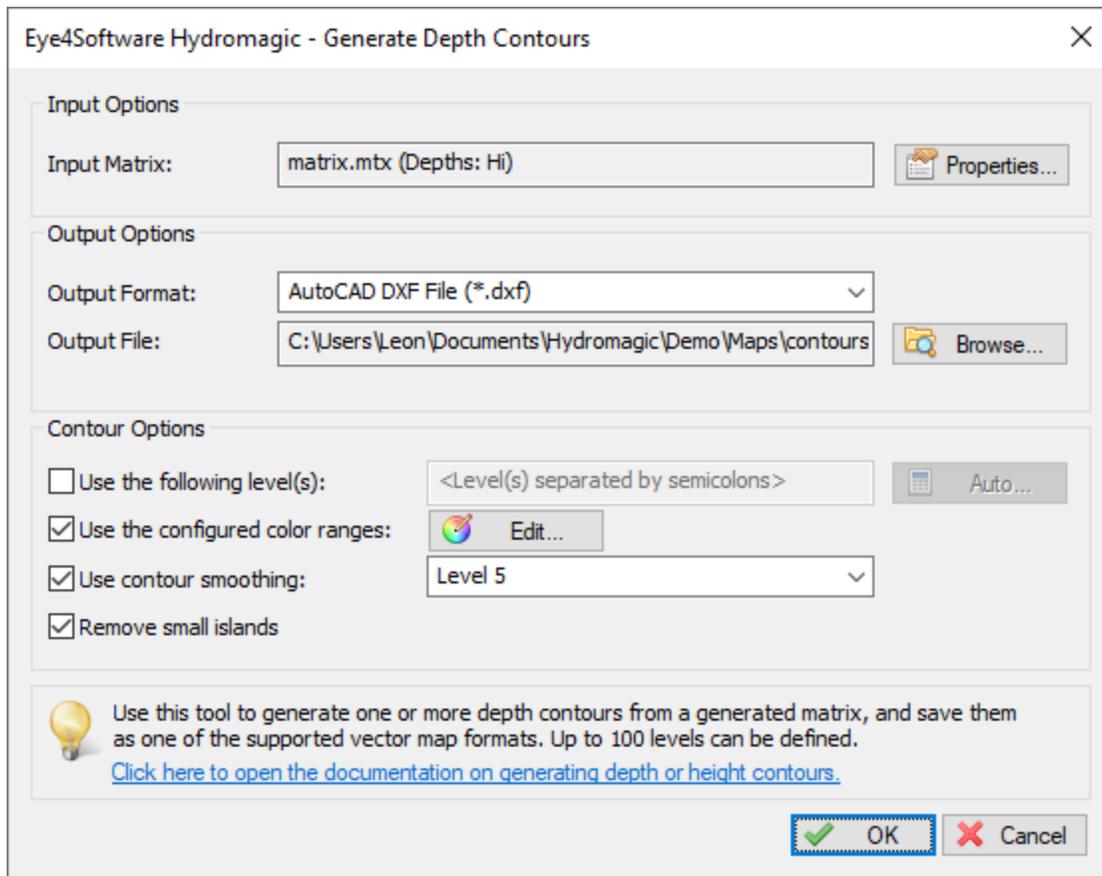
In addition, the generated contours can be smoothed using a B-spline interpolation algorithm in cases where you do not want unnatural looking sharp edges in the contour lines.



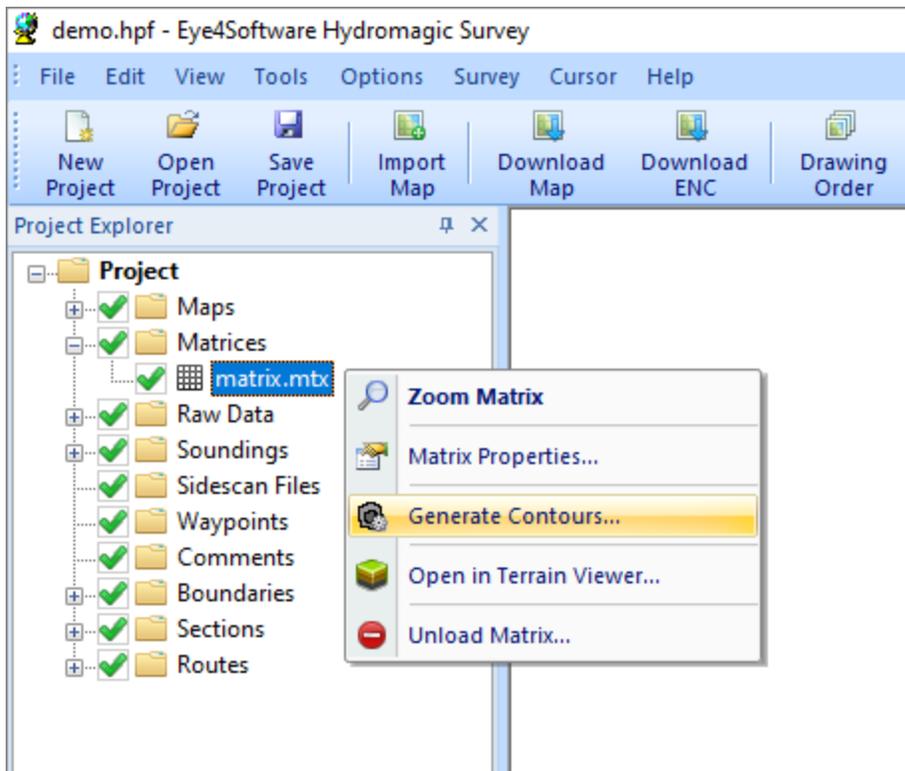
### Creating contours

To generate depth contours, you must have [created a matrix](#) first.

A matrix can be generated from depth data, bottom information data or other sensor data like temperature.



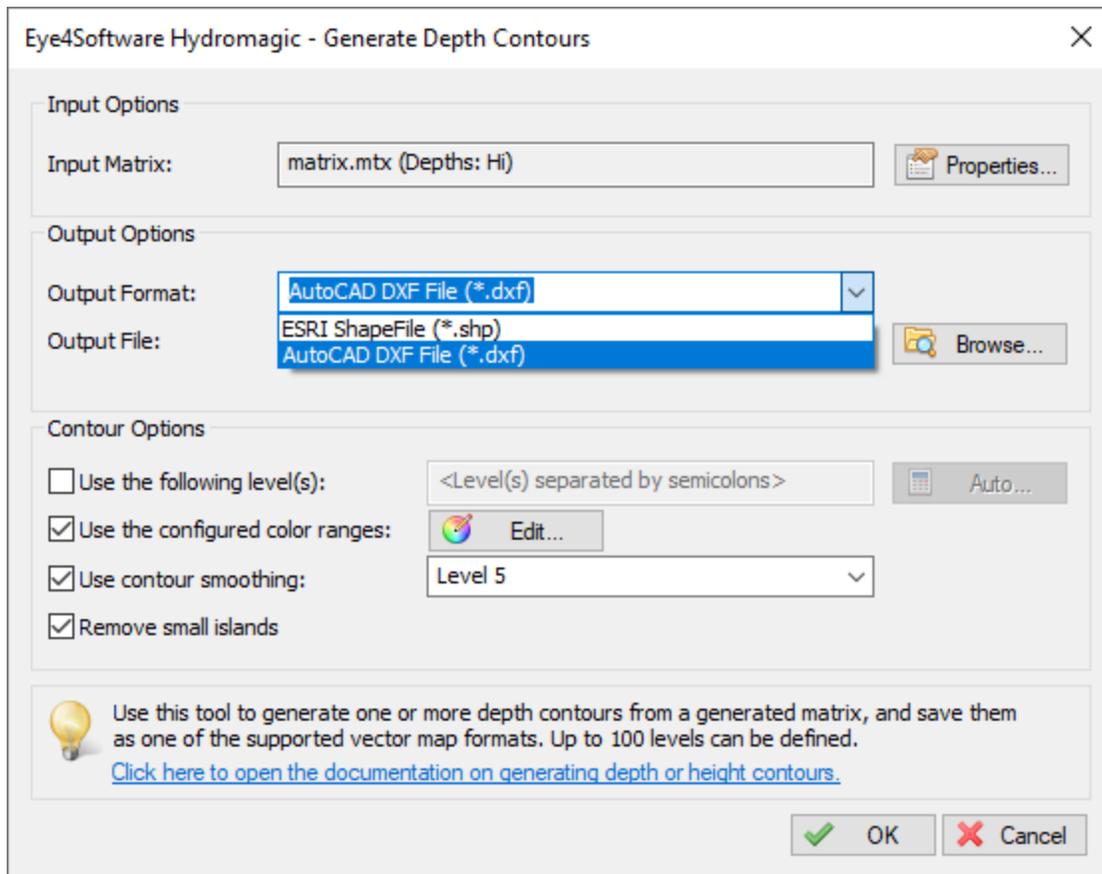
Open the "Generate Contours" tool, by right clicking the matrix you want to use as data source, and select the "Generate Contours..." option from the popup menu:



## Output options

### Output Format

Use the output format drop down box to select in which file format you want to save the contour shapes. At this moment the supported file formats are: AutoCAD DXF file (default), Microstation DGN file and ESRI shapefile.



### Output File

The generated contour lines will be written to a file with the selected output format and added to the project.

Click the "Browse..." button to select the location and file name of the output file.

When the file name already exists, the software asks you whether to overwrite the existing file first.

### Write WKT projection file

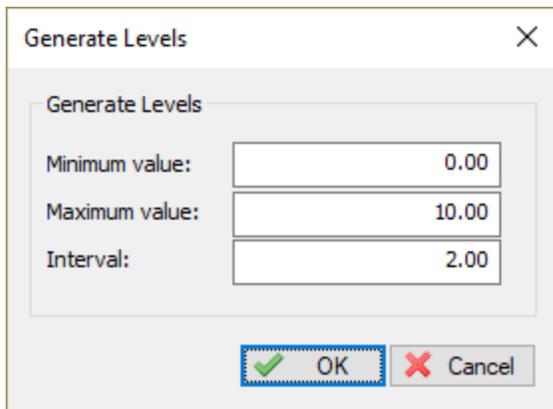
Enabling this option causes the contouring tool to write projection information for the generated file to an OGC WKT projection file.

When this file is present in the same folder as the file itself, and as long the file isn't renamed, you do not have to select a map projection each time the file is loaded.

## Contour options

### Contour Levels

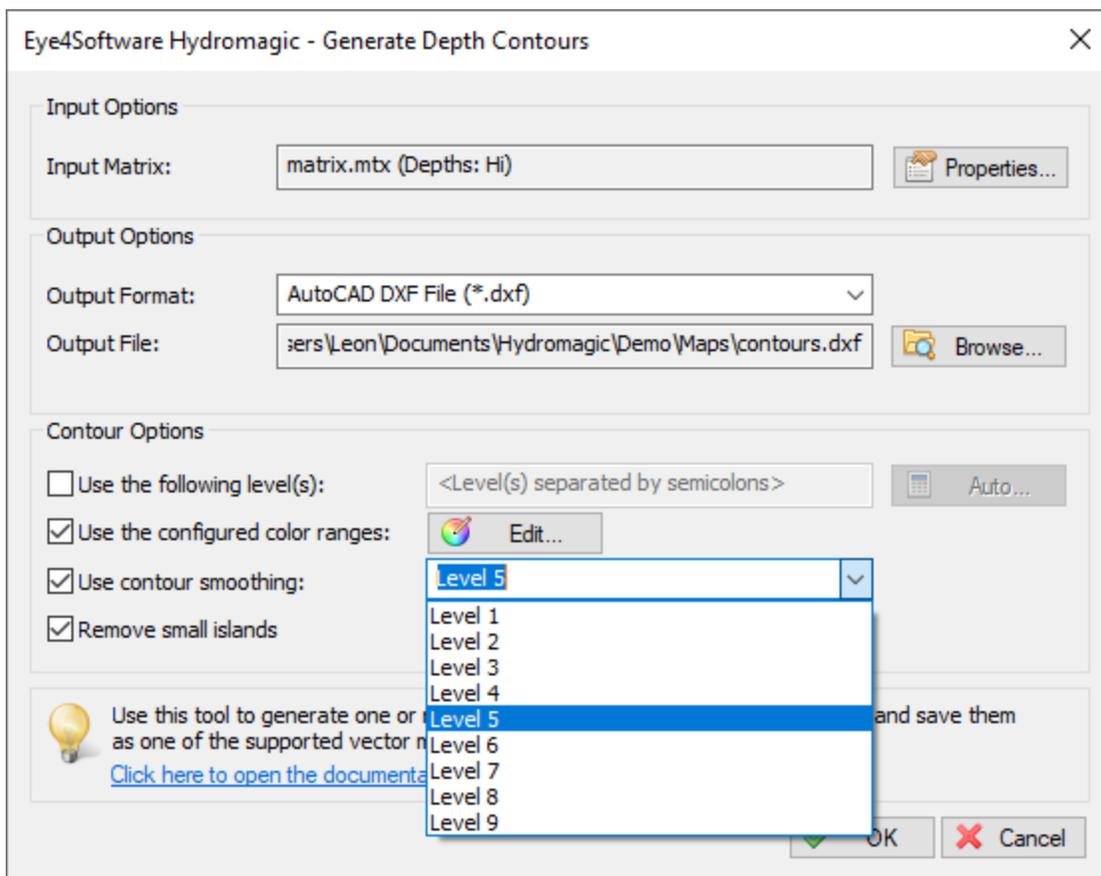
You can generate contours using fixed level(s), or use color ranges. You can also combine the two options. Using a fixed level can be useful, to display a reference line (for instance the dredging depth) to see what's above and below this line. You can enter multiple levels by separating them using semicolons. When using the color ranges, the levels displayed as colors will be accentuated.



### Contour smoothing

When generating depth contours from a TIN model containing large triangles, it happens often that sharp edges appear in the contour lines. To make the lines look more pleasant for the eye, you can enable the "Use contour smoothing" option to use a B-Spline algorithm to smoothen the lines. Please note that choosing a higher smoothing level will slow down the contour generation process.

The level settings allows you to set the degree of smoothing. When using level 1, just a little bit of smoothing is applied, while level 9 applies the most. A good value to start with is level 5. When contours are starting to cross, you might want to try a lower level.



## Finish

When all settings are correct, click the "OK" button to finish the process. The software will now create the TIN model, and generate the contour lines. You will have to wait a couple of seconds, depending on the number of records your sounding contains. When ready, the dialog will disappear, and the contours are drawn on the screen.

## Managing contours

### Show / Hide contours

To temporary hide or show a collection of contour lines, just click the "eye" icon in front of the contour name.

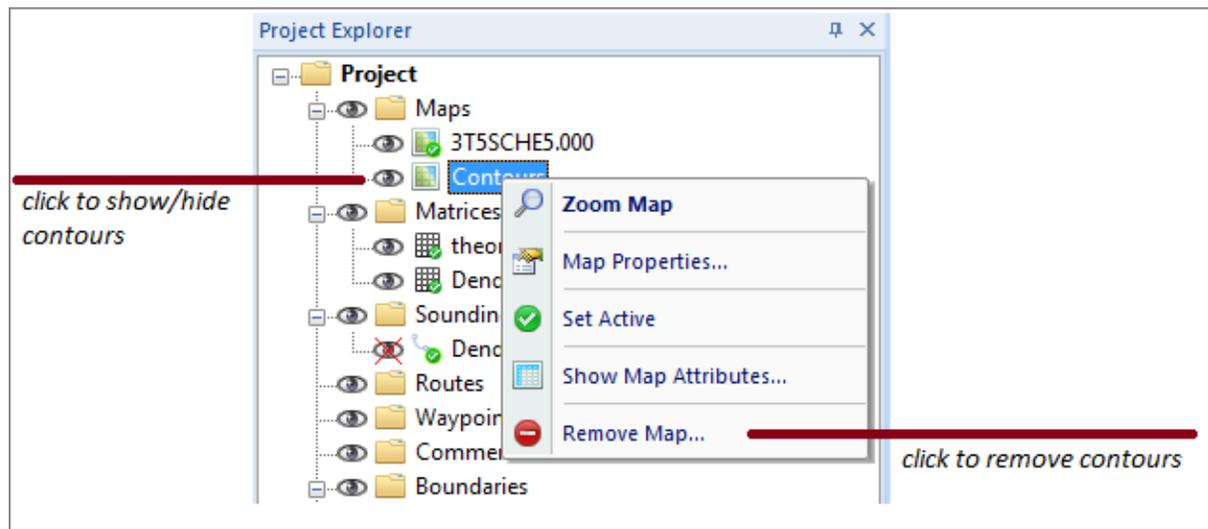
When hidden, the contour is still loaded, but just not shown on the screen.

### Delete contours

To remove a collection of contour lines from your project, look for the name in the "Project Explorer" and right click on it.

Please note that the contour map is only removed from the project. The file will not be deleted and stay in the project folder.

Select the "Remove Map..." option from the popup menu, and confirm the action.

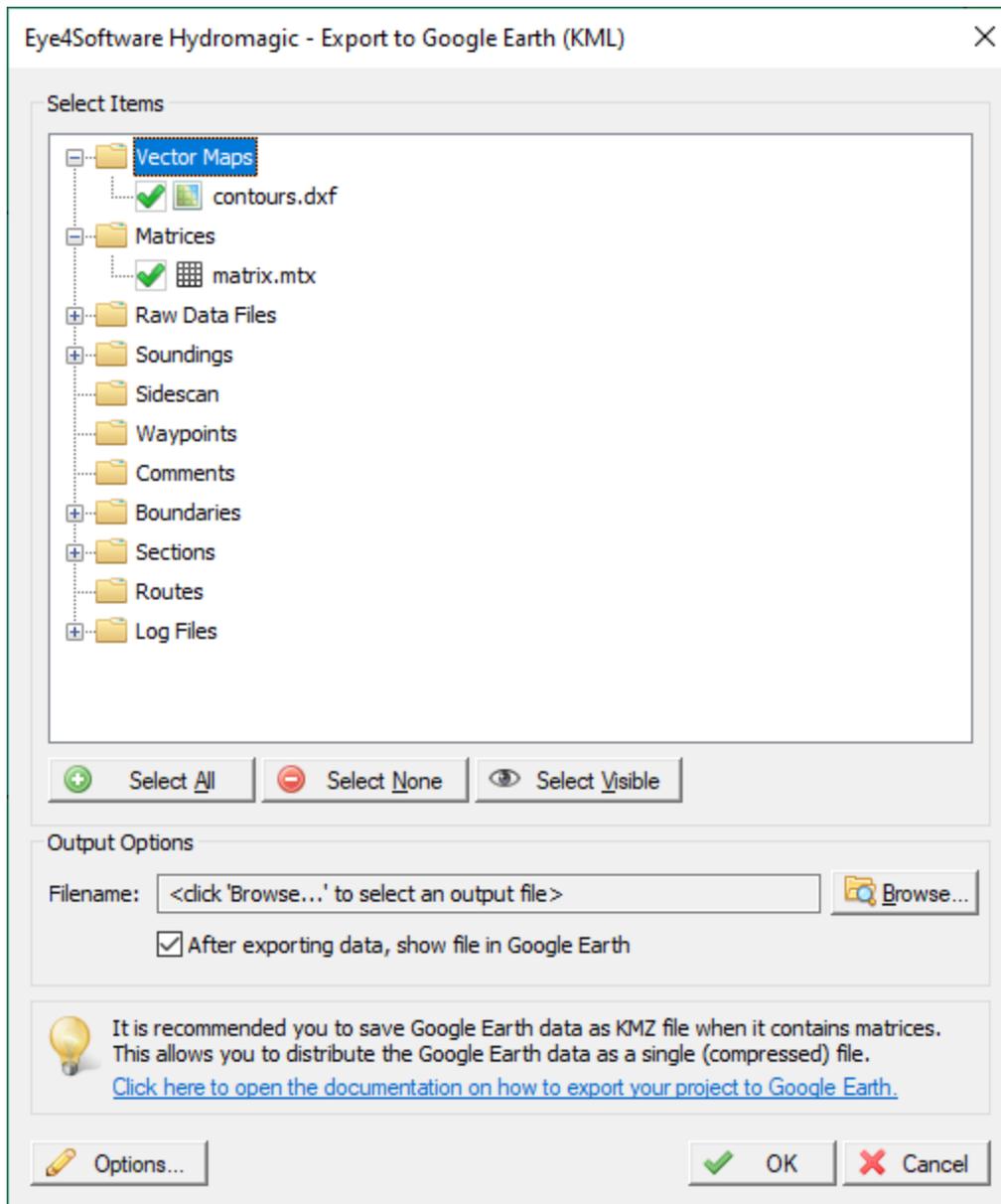


## Export contours to Google Earth



Once the contours have been generated and added to the project, you can also export the contours as Google Earth KML file.

You can open the "Export KML data" tool directly from the "File" => "Export" menu.



## 7.8 Volume Calculation (Matrix)

### Volume calculation using matrix

The matrix volume calculation tool can be used in two ways: to calculate the difference in volume between two matrices (for example: pre-dredge and post-dredge), or between a matrix and a fixed level. The latter option can be used to calculate the area and volume of a pond or basin or tank (you can also use [staging volume calculations](#) for this).

To use this option for volume calculation, you must first have [generated a matrix](#) from your [corrected sounding\(s\)](#). This tool calculates volumes by multiplying the difference between depth in the selected matrices with the dimensions of a single matrix cell. When comparing matrices, make sure that they are both generated with the same matrix spacing (cell size) setting.

To start the matrix volume calculation tool, select the "Matrix Volumes..." option from the "Tools" => "Volume Calculations" menu. The following dialog will be shown:

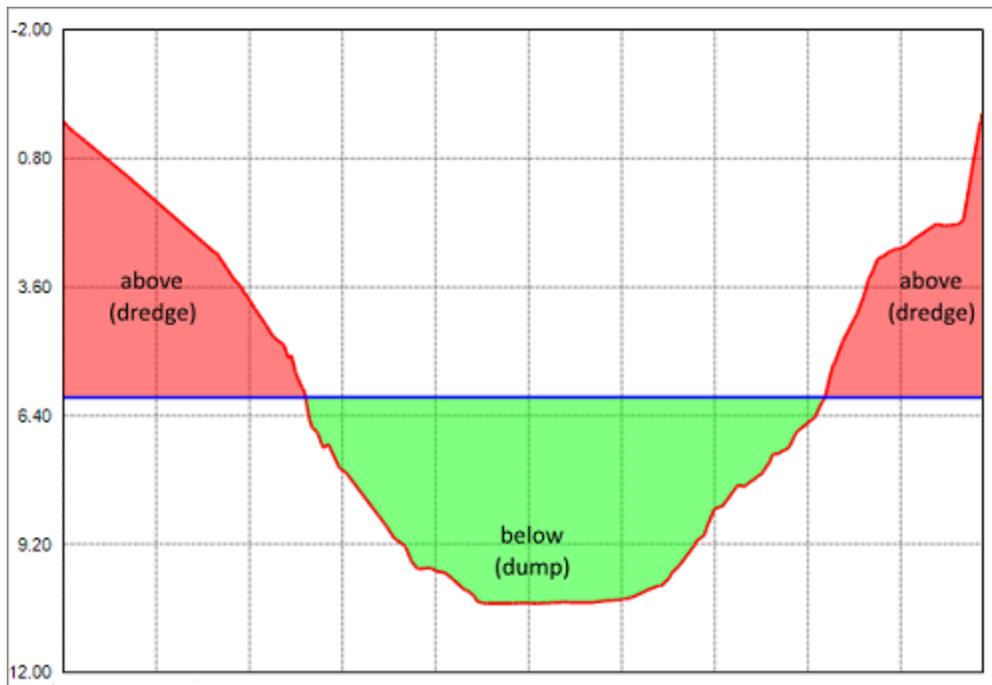
Select two matrices or one matrix and a fixed level to calculate volumes.

## Volume calculation conventions

In Hydromagic, the following conventions are used when calculating volumes:

Sounding data above the fixed reference or channel design is used to calculate the "above volume". This is normally the amount of material that has to be dredged in order to get the channel design. Sounding data below the fixed reference or channel design is used to calculate the "below volume". This is normally the amount of material that has to be dumped in order to get the channel design. When sounding data doesn't contain tide information, a value higher then the reference value is considered below. Please note that when a vertical reference (datum) is used, it is the other way around. In this case values less then the reference value are used to calculate the below values.

The following image shows an example of a volume calculation (in "depth mode") with above and below values:



*This image shows the difference between "above" and "below" volume values.*

## Volume calculation tool

To start the matrix volume calculation tool, select the "Volumes (Matrix)" option from the "Tools" menu. The following dialog will be shown:

### Selecting Matrices

#### Matrix 1

Use this setting to specify the matrix generated from your sounding, or when using two matrices, the matrix generated from the post-dredge sounding.

#### Matrix 2

Use this setting to specify the matrix generated from your pre-dredge sounding or a matrix [generated from a 3D CAD file](#) or [channel design](#). In case you are calculate the volume of a basin or pond, select the "<Use Fixed Level>" option, and enter the level of the water surface. When no [tide correction](#) is used, this value is 0.00.

### Calculate Volumes

Click the "Calculate" button to calculate areas and volumes for the selected matrices. Calculated values are split in totals, above reference (Matrix 2) and below reference (Matrix 2).

#### Totals

This section will display the total area and volume for the whole sounding. The processed area means the amount of overlap between the two matrices used. When a fixed level is used, the overlap is always 100% and the processed area will be the same as the total area.

### Below Reference

Area and volume below the level found in Matrix 2 (see volume calculation conventions paragraph)

### Above Reference

Area and volume above the level found in Matrix 2 (see volume calculation conventions paragraph)

## Reports

Click the "Report" button to calculate area's and volumes from the selected matrices. This function creates a PDF report containing the calculated areas and volumes. Please note that PDF reader software needs to be installed on your computer. In Windows 10 you can use the built in "Reader" application.

 Eye4Software Hydromagic Survey 9.0 Volumes Report - Matrices				
Metadata				
Name	Value			
Project Name	Matrix_Of_Pond			
Surveyor				
Date	Monday, April 6, 2020			
Horizontal Units	U.S. Survey Foot			
Vertical Units	U.S. Survey Foot			
Projection	NAD83 / Oklahoma North (ftUS)			
Matrix Information				
Name	Value			
Matrix 1	Matrix_Of_Pond.mbx			
Matrix 2	Fixed Level ( 0.00 )			
Cell Size	1.00 ft			
Average level difference	9.20 ft			
Matrix Coverage				
	Area (ft2)	Area (%)		
Overlapped area	120603	100.0	100.0	
Non overlapped area	0.000	0.0	0.0	
<b>Total area</b>	<b>120603</b>	<b>100.0</b>	<b>100.0</b>	
Volumes				
	Area (ft2)	Area (%)	Volume (ft3)	Volume (%)
Below reference	120603	100.0	1110147	100.0
Above reference	0.000	0.0	0.000	0.0
Equals reference				
<b>Total volume</b>	<b>120603</b>	<b>100.0</b>	<b>1110147</b>	<b>100.0</b>

Click the "Report..." button to generate a PDF report for the volume calculations.

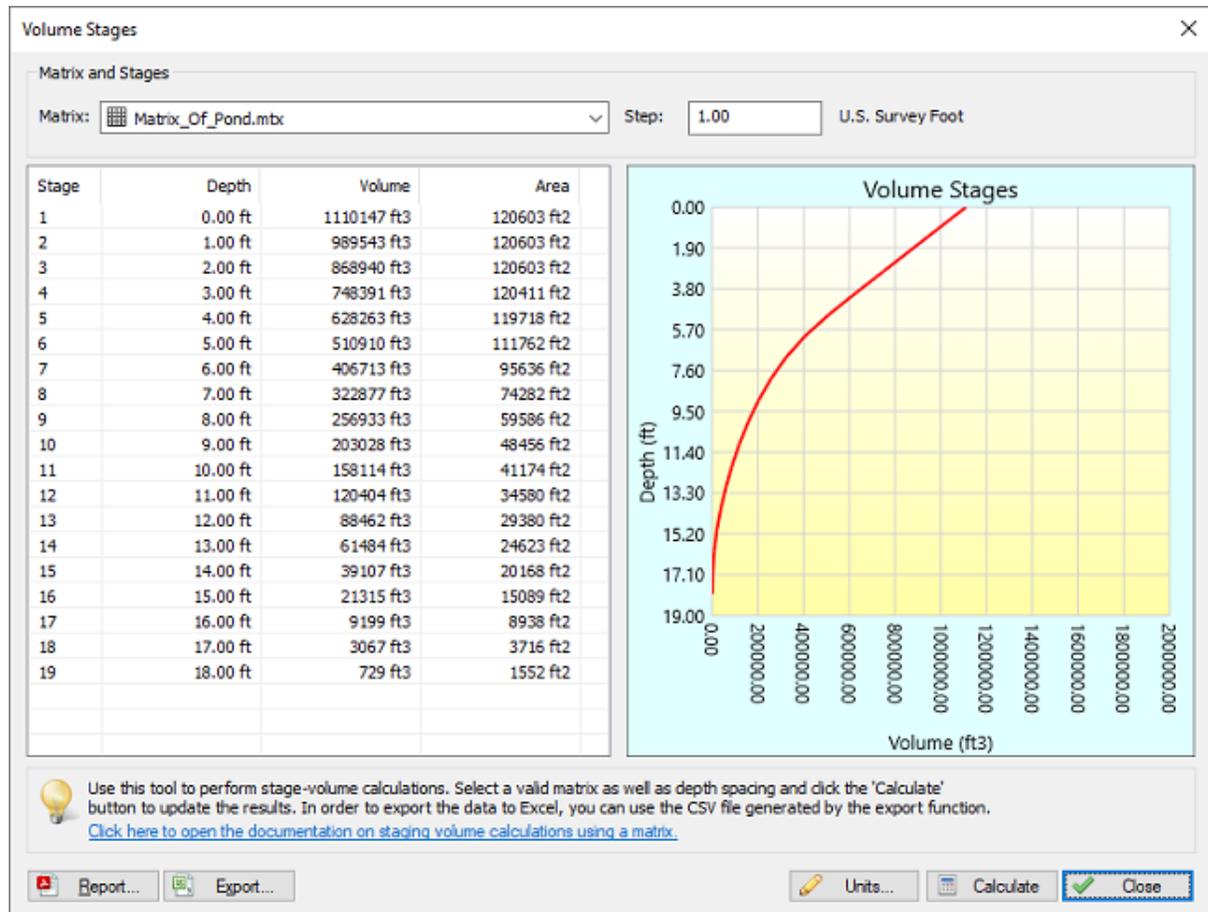
## 7.9 Volume Calculation (Stages)

### Volume Calculation (Stages)

This volume calculation method is used to calculate the volume under various stages (levels) of water in, for example, frac pits and other water reservoirs. To calculate stages, you must first [generate a matrix](#) from your [processed sounding](#).

### Start the tool

To start the staging volumes tool, select the "Volume Calculations" => "Staging..." from the "Tools" menu. Next, select the matrix you want to use for staging volume calculations from the "Matrix" drop down control as shown below:



*Staging volume calculations for pits and ponds in Hydromagic.*

### Adjust spacing

The spacing between the stages can be selected. The default value is 1.00 meter. The interval can be selected in the "Step" field and the minimum value is 0.1 meter. After changing the selected matrix or step, click the "Calculate" button to update the results. The unit used for the step is the same as the vertical units for the coordinate reference system used (US Survey Feet in the example above).

### Exporting to Microsoft Excel

To export the calculated stages to Microsoft Excel, click the "Export..." button. Next choose the file name of the exported data. The data is stored as comma separated values (CSV) file, which can be

opened in most software including Microsoft Excel. Below is an example of the above data imported in Microsoft Excel:

Stage	Depth	Volume	Area
1	1	0	11101473
2	2	1	9895433
3	3	2	8689403
4	4	3	7483913
5	5	4	6282633
6	6	5	5109103
7	7	6	4067133
8	8	7	3228773
9	9	8	2569333
10	10	9	2030283
11	11	10	1581143
12	12	11	1204043
13	13	12	884623
14	14	13	614843
15	15	14	391073
16	16	15	213153
17	17	16	91993
18	18	17	30673
19	19	18	7293
20			
21			

The staging volume calculations imported in Excel through the CSV file format.

### Creating a report

In addition to Excel exports, it is also possible to generate a PDF report containing the calculated stages. To create a PDF report, click the "Report..." button and supply the software with a valid PDF file name. By default PDF reports are generated under the "Reports" folder in your project folder. To view reports, you should have a PDF Viewer installed like "Acrobat Reader" or FoxIt" reader. Windows 10 users can use the build in "Reader" application as well.



Eye4Software Hydromagic Survey 9.0  
Stages Report (Depth vs Volume)

Metadata

Name	Value
Project Name	Oklahoma
Surveyor	
Date	Monday, April 6, 2020
Horizontal Units	U.S. Survey Foot
Vertical Units	U.S. Survey Foot
Projection	NAD83 / Oklahoma North (ftUS)

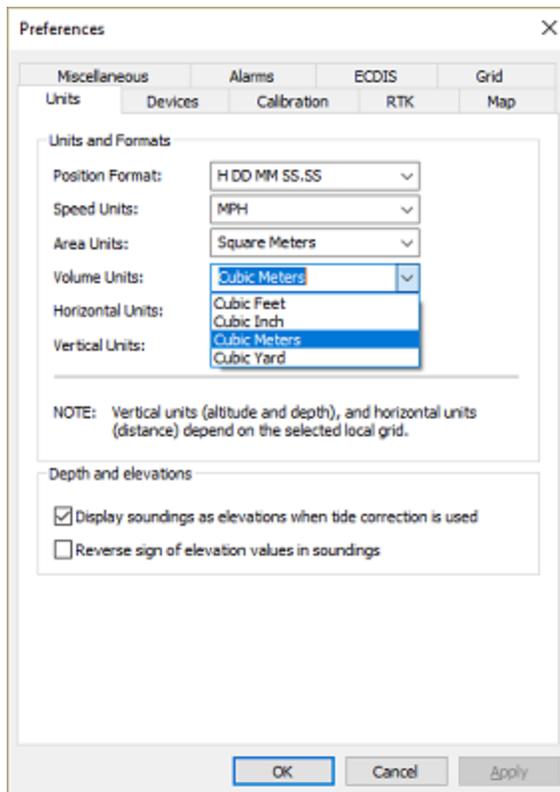
Stages

Stage	Depth	Volume	Area
1	0.00 ft	1110147 ft <sup>3</sup>	120603 ft <sup>2</sup>
2	1.00 ft	989543 ft <sup>3</sup>	120603 ft <sup>2</sup>
3	2.00 ft	868940 ft <sup>3</sup>	120603 ft <sup>2</sup>
4	3.00 ft	748391 ft <sup>3</sup>	120411 ft <sup>2</sup>
5	4.00 ft	628263 ft <sup>3</sup>	119718 ft <sup>2</sup>
6	5.00 ft	510910 ft <sup>3</sup>	111762 ft <sup>2</sup>
7	6.00 ft	406713 ft <sup>3</sup>	95636 ft <sup>2</sup>
8	7.00 ft	322877 ft <sup>3</sup>	74282 ft <sup>2</sup>
9	8.00 ft	256933 ft <sup>3</sup>	59586 ft <sup>2</sup>
10	9.00 ft	203028 ft <sup>3</sup>	48456 ft <sup>2</sup>
11	10.00 ft	158114 ft <sup>3</sup>	41174 ft <sup>2</sup>
12	11.00 ft	120404 ft <sup>3</sup>	34580 ft <sup>2</sup>
13	12.00 ft	88462 ft <sup>3</sup>	29380 ft <sup>2</sup>
14	13.00 ft	61484 ft <sup>3</sup>	24623 ft <sup>2</sup>
15	14.00 ft	39107 ft <sup>3</sup>	20168 ft <sup>2</sup>
16	15.00 ft	21315 ft <sup>3</sup>	15089 ft <sup>2</sup>
17	16.00 ft	9199 ft <sup>3</sup>	8938 ft <sup>2</sup>
18	17.00 ft	3067 ft <sup>3</sup>	3716 ft <sup>2</sup>
19	18.00 ft	729 ft <sup>3</sup>	1552 ft <sup>2</sup>

Click the "Report..." button to generate a staging volume report as PDF file.

## Changing units

To create a report in other units, for instance cubic feet instead of cubic meters, click the "Units..." button to open the "Units and Formats" tab from the global preferences dialog. In this tab you can select other units for areas and volumes. After changing units, click "OK" and the volumes will be recalculated automatically.



*Change the units for volume and area in the unit settings tab.*

## 7.10 Volume Calculation (Sections)

### Volume Calculation using cross-sections

This volume calculation tool uses [cross sections](#) to calculate the total volume of a river section. Please note that this method is only suitable in scenarios where the cross sections are almost the same length and have the same direction.

To calculate the volume, the difference between the depths or elevations is converted to an area and multiplied with the distance between the cross sections.

To calculate volumes for frac pits, reservoirs or ponds, we recommend the use of the [Stages](#) method. In order to use this tool, you should already have generated [soundings](#) and cross sections.

This tool can be used to:

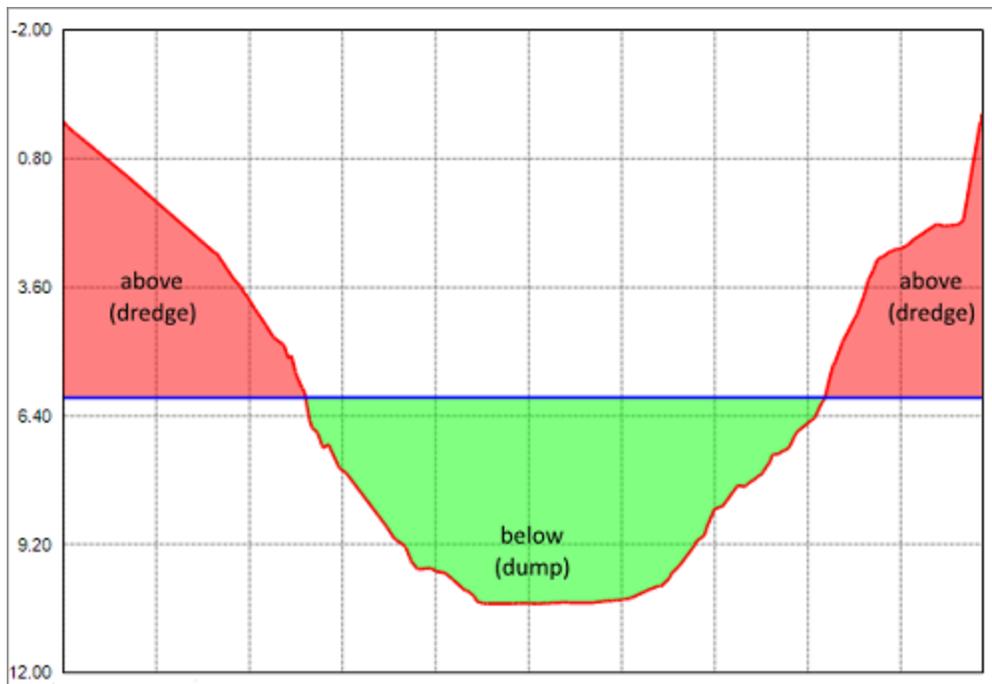
- Calculate the total volume of a river section;
- Calculate the amount of sediment by comparing the same soundings at low and high frequency;
- Calculate the volume difference between two soundings, for instance, post- and pre dredging;
- Calculate the amount of volume to be removed compared to a channel design;
- Print graphical views of cross sections;
- Generate dredging volume reports.

## Volume calculation conventions

In Hydromagic, the following conventions are used when calculating volumes:

Sounding data above the fixed reference or channel design is used to calculate the "above volume". This is normally the amount of material that has to be dredged in order to get the channel design. Sounding data below the fixed reference or channel design is used to calculate the "below volume". This is normally the amount of material that has to be dumped in order to get the channel design. When sounding data doesn't contain tide information, a value higher than the reference value is considered below. Please note that when a vertical reference (datum) is used, it is the other way around. In this case values less than the reference value are used to calculate the below values.

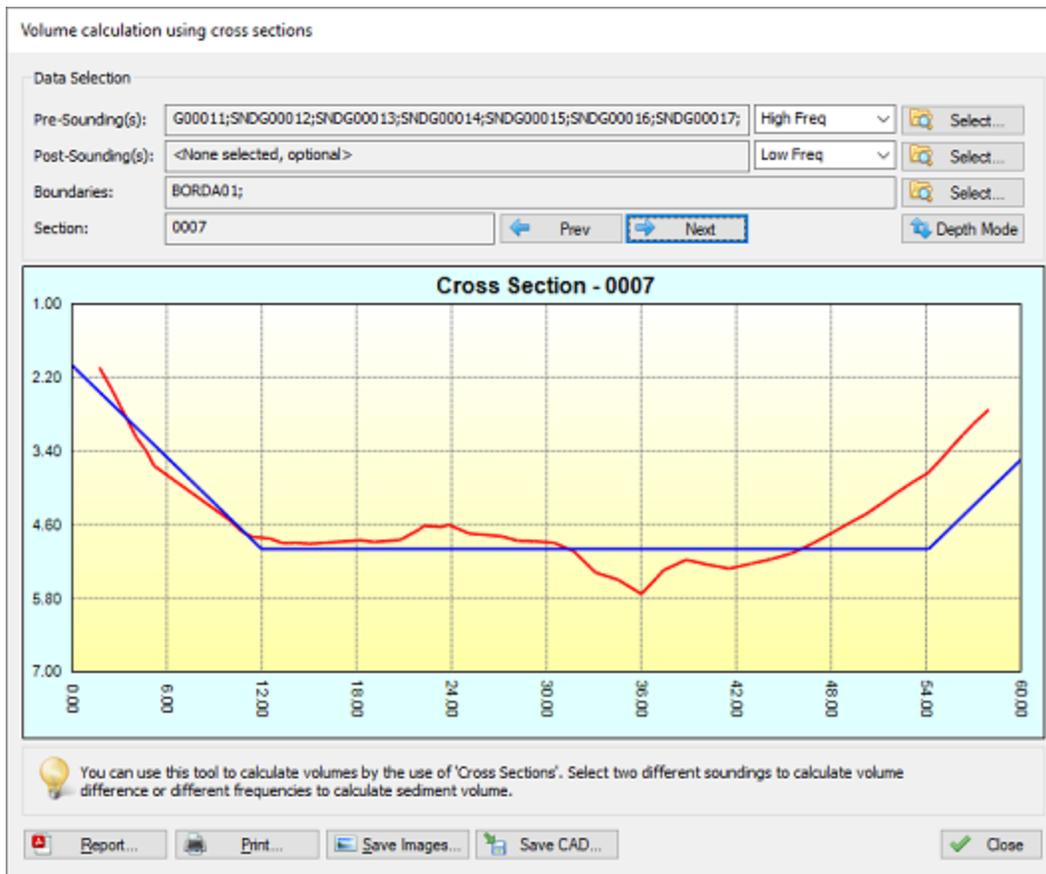
The following image shows an example of a volume calculation (in "depth mode") with above and below values:



*This image shows the difference between "above" and "below" volume values.*

## Volume calculation tool

To start the matrix volume calculation tool, select the "Volumes (Sections)" option from the "Tools" menu. The following dialog will be shown:



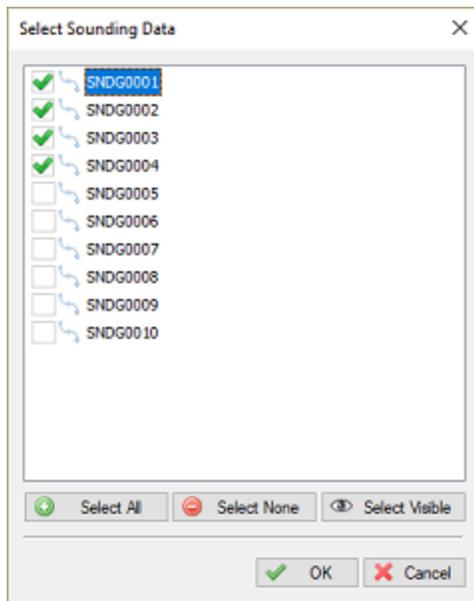
*Use the cross sections volume calculation tool to determine dredging volumes.*

## Data selection

Which data has to be selected depends on how to use the tool. Use the pre- and post soundings to select the soundings to use in the calculation.

When you want to calculate the amount of sediment, you select the same sounding in both input boxes, and select different frequencies. In case you end up with negative values, just swap the selected frequencies or the values selected in the "Pre-Sounding(s)" and "Post-Sounding(s)" fields.

For dredging volumes, select the soundings created before the dredging operations in the "Pre-Sounding(s)" field, and the soundings created after the dredging operations in the "Post-Sounding(s)" field.



**Select which sounding(s) to include in the volume calculation by checking boxes.**

The use of [shorelines](#) is optional. The same shorelines will be used for the pre- and post soundings.



**Select which boundaries to include in the volume calculation by checking boxes.**

### View cross sections

When the data has been loaded, you can check the result in the graph by using the "Prev" and "Next" buttons. When "NO DATA" is displayed in the graph, it means that there are no soundings or shorelines near the cross section.

The pre sounding will be displayed in red, the post sounding in green, while the [channel design](#) is displayed in blue. You can click the "Depth Mode" button to switch between depths and elevations.

## Reporting

To generate a volumes report, click the "Report..." button. Please note that this function does not work in the demo version of the software. Next, you have to provide a location and file name for the PDF report to be generated. By default PDF reports are generated under the "Reports" folder in your project folder. To view reports, you should have a PDF Viewer installed like "Acrobat Reader" or "FoxIt PDF Viewer". Windows 8, 8.1 and 10 users can use the build in "Reader" application as well.

## Print

When clicking the print button, graphs for all sections will be send to the printer. Together with the PDF report generated, you have a full report on for instance the performed dredging operations.

## Save Images

To save all the graphs as image files, use the "Save Images..." option. This will generate image files containing 4 graph views each in the specified folder. These images can be used to include in other documents.

## 7.11 Export to Google Earth

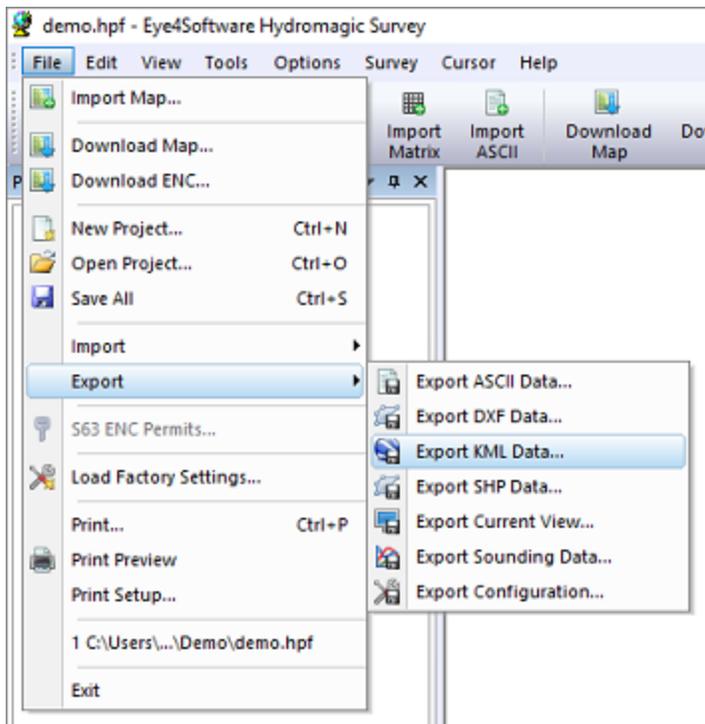
### Export to Google Earth KML/KMZ files

KML (Keyhole Markup Language) is a XML format used by Google Earth to load overlays. KML can contain point, polyline and polygon data, as well as one or more references to raster overlays (image files). It is also possible to script complete Google Earth presentations into a KML file.

At this moment, Eye4Software Hydromagic supports point, line and polygon features, as well as attributes, styles and ground overlays. Eye4Software Hydromagic is able to both import and export Google Earth KML files. This document describes how to export them.

### Exporting Data

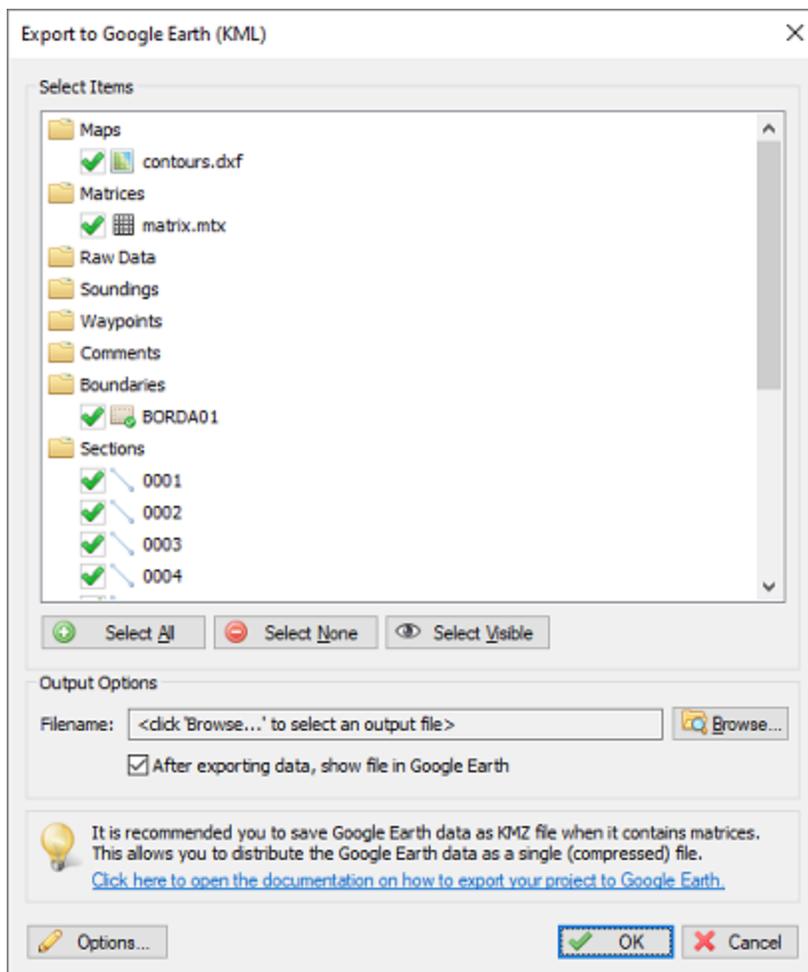
In Hydromagic, it is possible to convert soundings, vector maps, matrices, boundaries, comments, waypoints and cross section lines (planned lines) to Google Earth KML files. When exporting a matrix, depending on the options you select, an image file is generated and loaded in Google Earth as a so called "ground overlay". A matrix can be exported using depth values as well. To start exporting data, select the "Export KML Data..." option from the "File" => "Export" menu as shown below:



Select the "Export KML Data..." option from the "File" => "Export" menu

### Selecting data to export

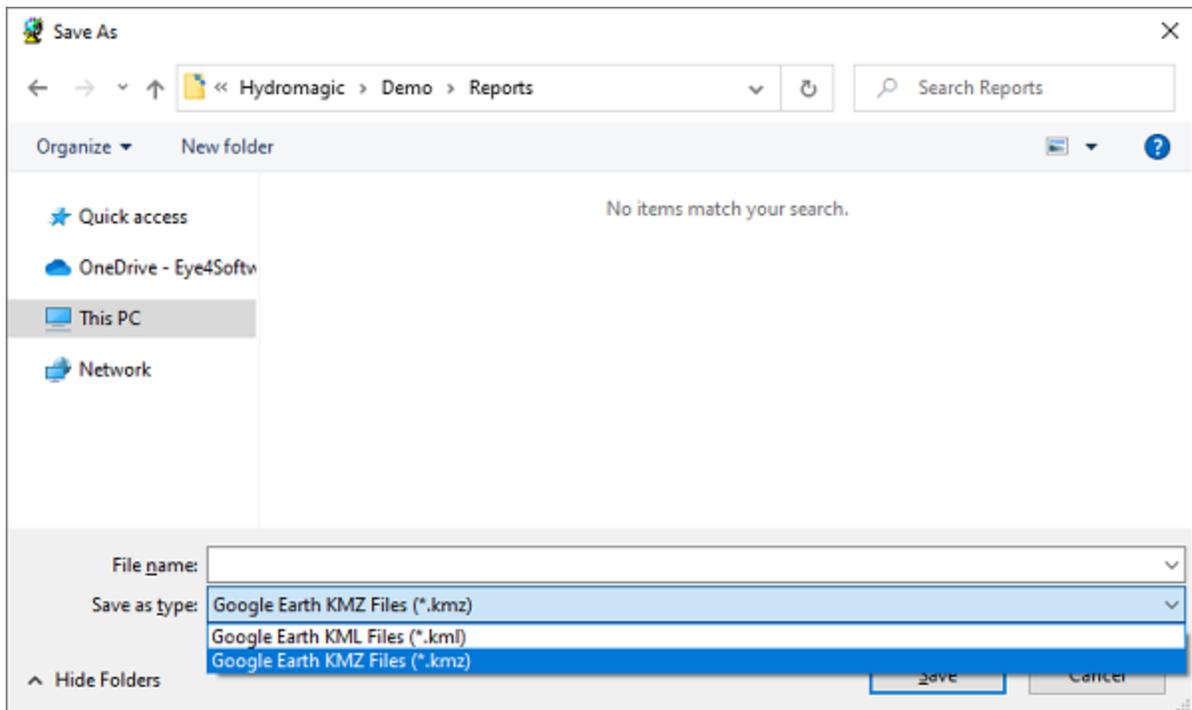
In the dialog that appears, you will see a list of all items that can be converted to KML. Just check the items you wish to export. By default, all visible items are selected. To reset the selection, click "Select None", to select all items, click "Select All".



**Select the Hydromagic project items you wish to export to the generated KML or KMZ file.**

### Select output file

The next step is to select a location to store the exported data. You can save the data as a KML or (compressed) KMZ file. Click the "Browse..." button to open a save file dialog, and enter the name for the file. In the save file dialog, you can also choose between the "KML" or "KMZ" formats. Please note that you must select "KMZ" when a matrix file is part of the selected items.



Select the preferred file format. When exporting matrix data you **MUST** select KMZ.

## KML Export Options

The KML export options instruct the software on how various Hydromagic project items are converted to Google Earth items. Since Google Earth may display items differently than Hydromagic, you can fully customize the way matrices, soundings and raw data are converted to KML data. To specify how depth values are exported as KML, just click the "Options..." button. In the dialog that appears you can adjust the following preferences:

- Matrix text interval in X direction;
- Matrix text interval in Y direction;
- Use colored text or black text;
- Number of decimals for matrix depths;
- Number of decimals for sounding depths;
- Number of decimals for raw data file depths;
- Whether to include the matrix image or not;
- Whether to draw the position track for soundings and raw data files.

KML export settings for matrix, soundings and raw data files are independent of how they are displayed on the screen. To alter these settings, click the "Options..." button at the bottom of the KML export tool. To configure how depths are drawn on your display, from the "Project Explorer", right click either the "Matrices", "Raw Data" or "Soundings" folder and select the "Display Options..." option.

**KML Export Options**

**Matrix to KML Options**

Interval-X: 5.00 m

Interval-Y: 5.00 m

Decimals: 2 Decimals

Draw as image overlay

Draw values in color

**Sounding to KML Options**

Interval: 5.00 m

Decimals: 2 Decimals

Draw track

Draw values

Draw values in color

**Raw Data to KML Options**

Interval: 5.00 m

Decimals: 2 Decimals

Draw track

Draw values

Draw values in color

Use the above options to configure how Hydromagic data will be converted into KML file objects (placemarks). In order to view the generated KML data, Google Earth has to be installed on the computer.  
[Click here to open the documentation on how to export your project to Google Earth.](#)

OK Cancel

**Configure how depth values are transformed into KML data with the KML Options dialog.**

## KML Format

When using the KML file format, a KML file is generated as well as an image file (PNG) for each exported matrix. The image files are stored in the same folder as the location of the KML file. When not exporting matrices or large amounts of vector data, KML is probably the best option for you.

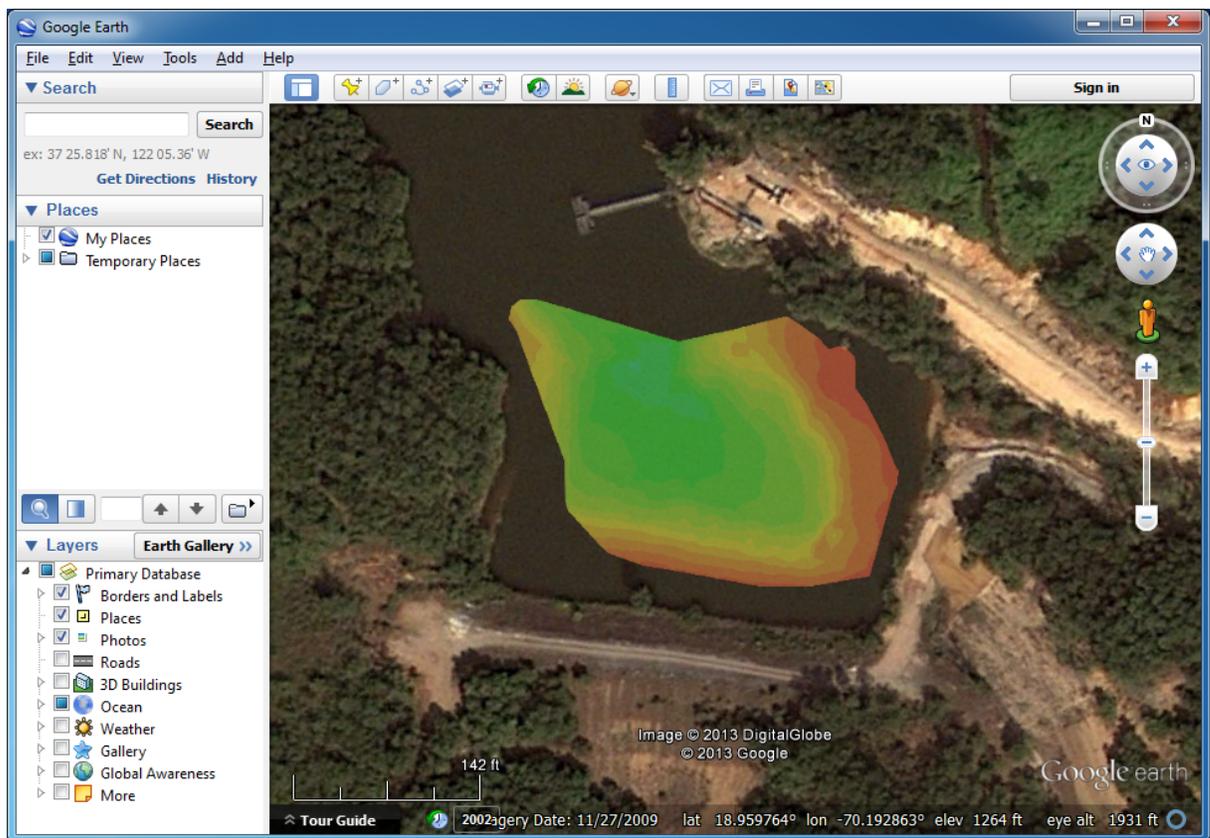
## KMZ Format

If you are going to export matrices, or large amounts of vector data, KMZ is the best choice. A KMZ file is a zipped archive containing a main KML file (doc.kml) and, in case of exporting image data such as matrices, some image files. When using the KMZ file format, you can always transfer the data by distributing a single KMZ file.

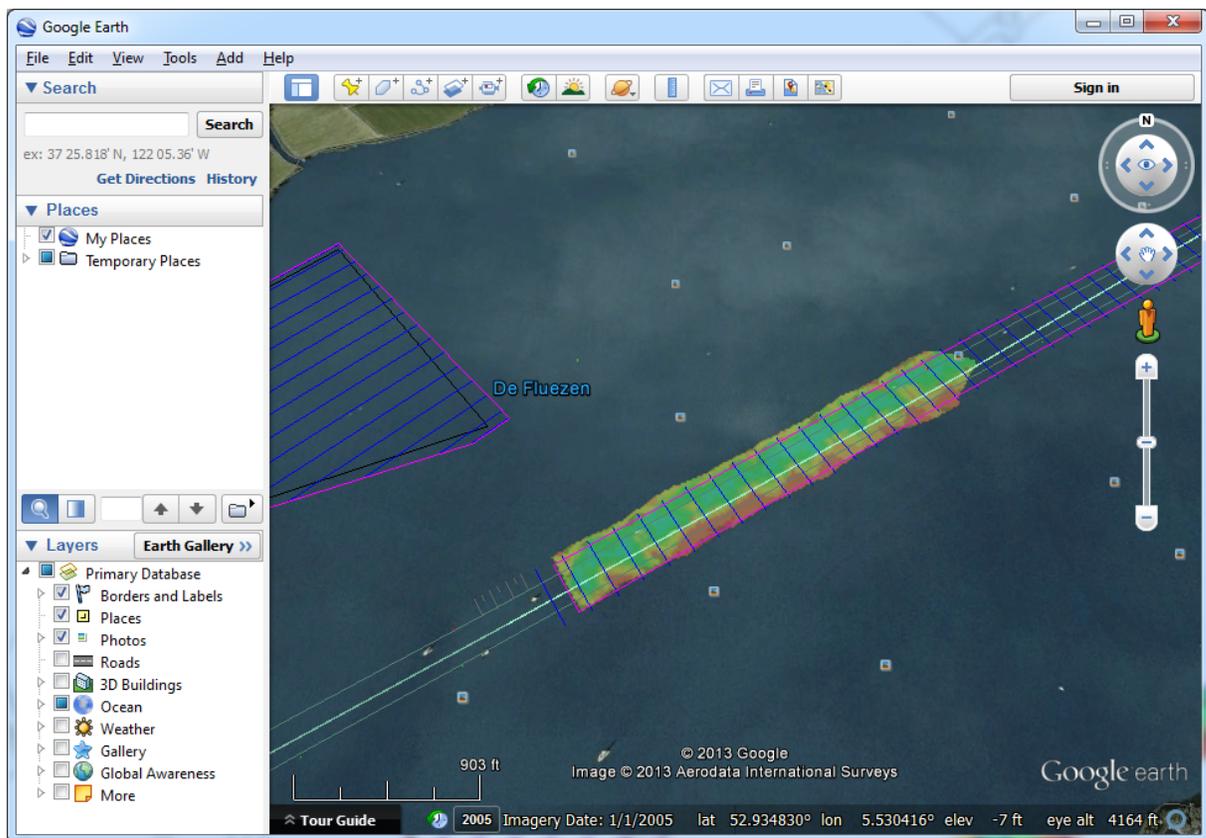
## Starting the export

Just click "OK" to start the export. For small files, this takes only a couple of seconds, for large projects it can take a couple of minutes. You can watch the progress in the status bar at the bottom of the screen. When finished, you can view the details of the generation process in the "Processing" tab of the [Activity View](#).

## Examples of exported KML files



Example of a single matrix exported as KMZ file



Example of a single matrix with vector chart exported as KMZ file

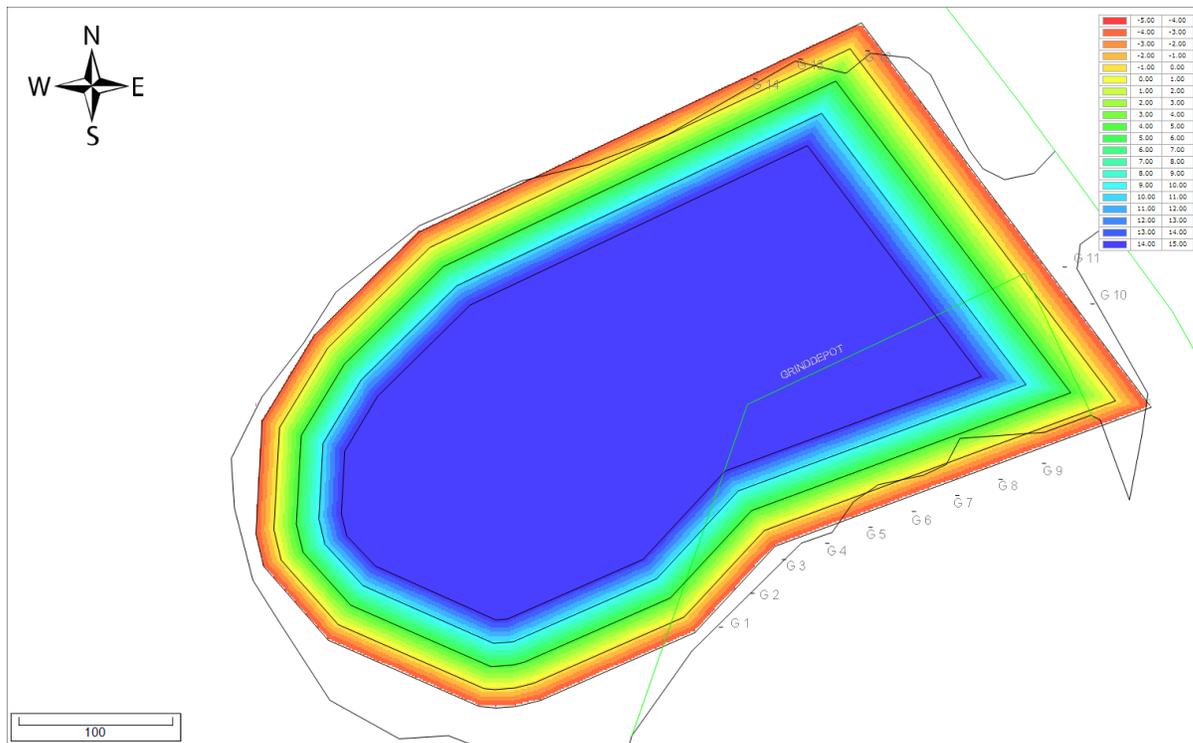
## 7.12 Export to AutoCAD DXF

### Introduction

After a sounding has been completed, it is possible to export both the background map (vector maps only), and the regularly spaced soundings (matrix) to an AutoCAD DXF file for further processing.

AutoCAD DXF files can be opened using AutoCAD, or you can use other CAD software such as Qcad, or import the data in other GIS packages.

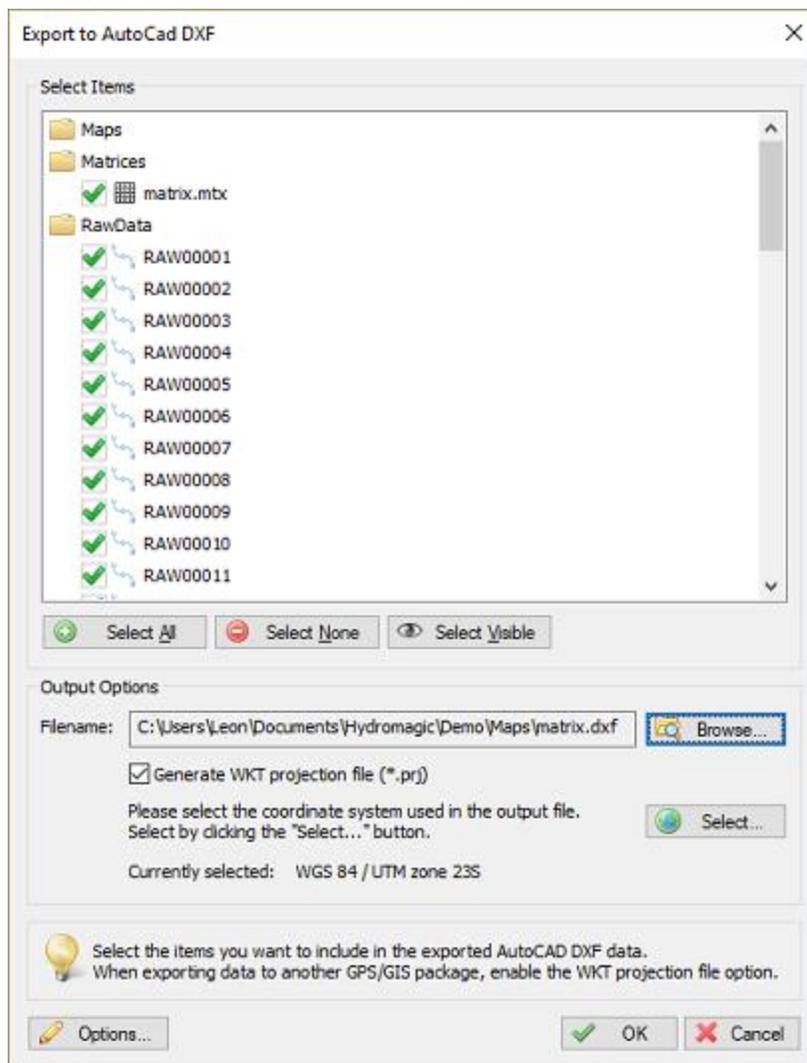
After you have created a matrix of your sounding, sections or map, you should have something like this:



### Starting the DXF Export tool

The DXF Exporting tool can be started by selecting the "Export" => "Export DXF Data" from the "File" menu.

The following window should appear:



## Select Items

First, you have to select the items you wish to export as DXF features. The following Hydromagic objects can be exported to DXF:

- Vector Maps.
- Matrices
- Planned Survey Lines (Sections);
- Soundings;
- Raw data;
- Boundaries (shorelines);
- Comments;
- Waypoints;

Just enable the checkbox in front of the objects you want to include in the final DXF file. To reset the selection, click the "Select None..." button, to select all objects, click "Select All...".

Please note that only vector maps can be converted to DXF format. It is not possible to embed raster maps into a DXF file.

For a list of supported vector formats, please have a look at [this document](#).

## Output options

### File name

Next, you have to select a file name for the DXF file. Click the "Browse..." button to select a file. If a file already exists, you will be prompted. If no extension has been supplied, .dxf will be appended.

### Projection

It is possible to write the DXF data using another map projection than the one which is used in your current project.

To do so, click the "Select..." button to choose the map projection for the output file.

### Generate WKT projection file

When this option has been selected, an ESRI WKT compatible projection file will be written, allowing other software to set the correct map projection for the DXF file.

## DXF Export (Text) Options

Some project items can only be exported to AutoCAD DXF files when they are converted to text. This is especially true for Hydromagic Matrix files. Since they are displayed in the software as an image file, only the textual part can be exported.

For raw data files and soundings, the track and the depth values can be displayed depending on the configuration made in this dialog box.

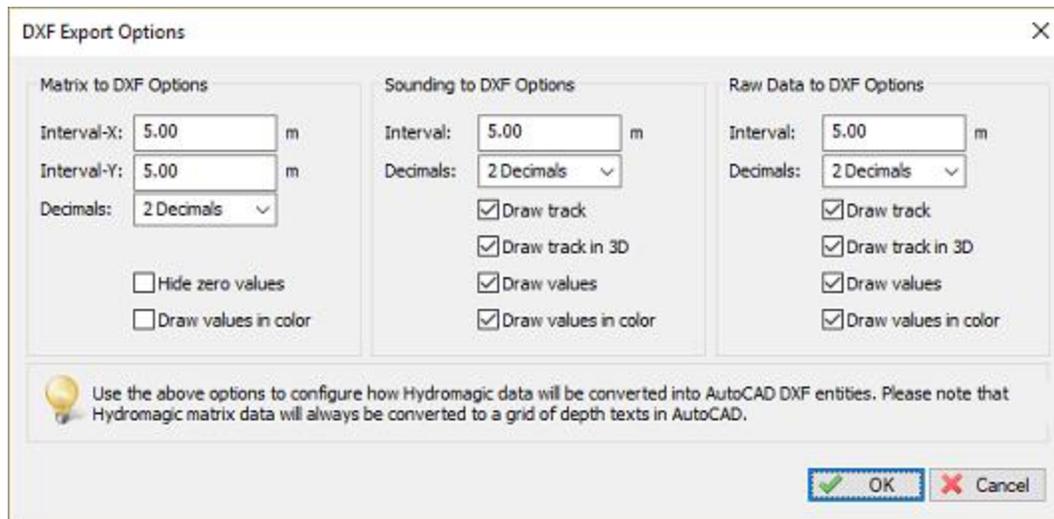
To specify how depth values are exported as DXF, just click the options button. In the dialog that appears you can adjust the following preferences:

- Matrix text interval in X direction;
- Matrix text interval in Y direction;
- Use colored text or not;
- Display void or zero values or not;
- Include Z-Values when drawing a track or not;
- Display textual Z-Values for a sounding or raw data file or not.

DXF export settings for matrix, soundings and raw data files are independent of how they are displayed on the screen.

To alter these settings, click the "Options..." button at the bottom of the DXF export tool.

To adjust how depths are drawn on your display, from the "Project Explorer", right click either the "Matrices", "Raw Data" or "Soundings" folder and select the "Display Options" option.

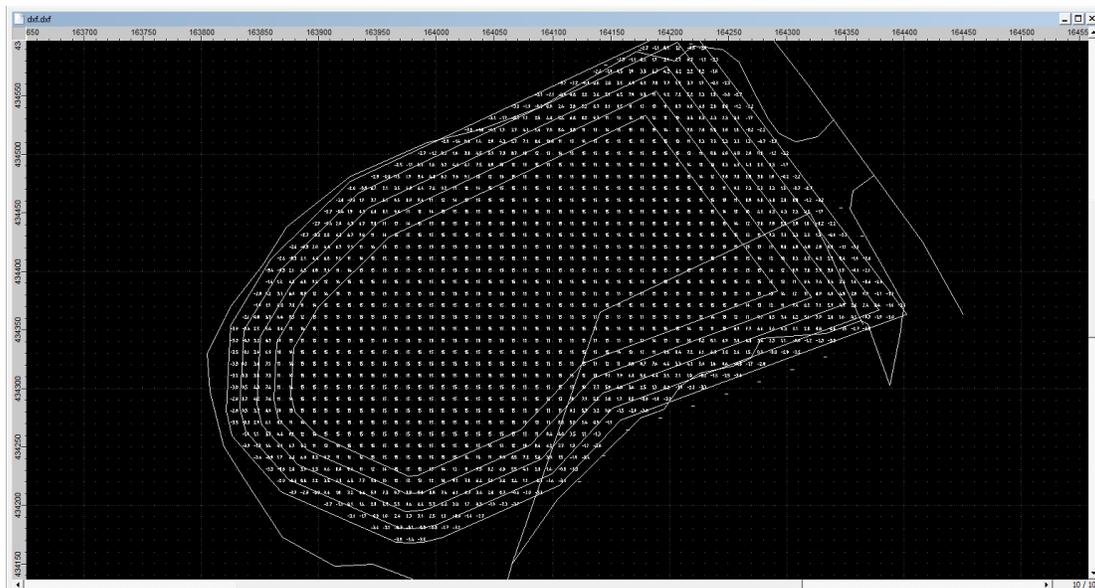


## Starting the export process

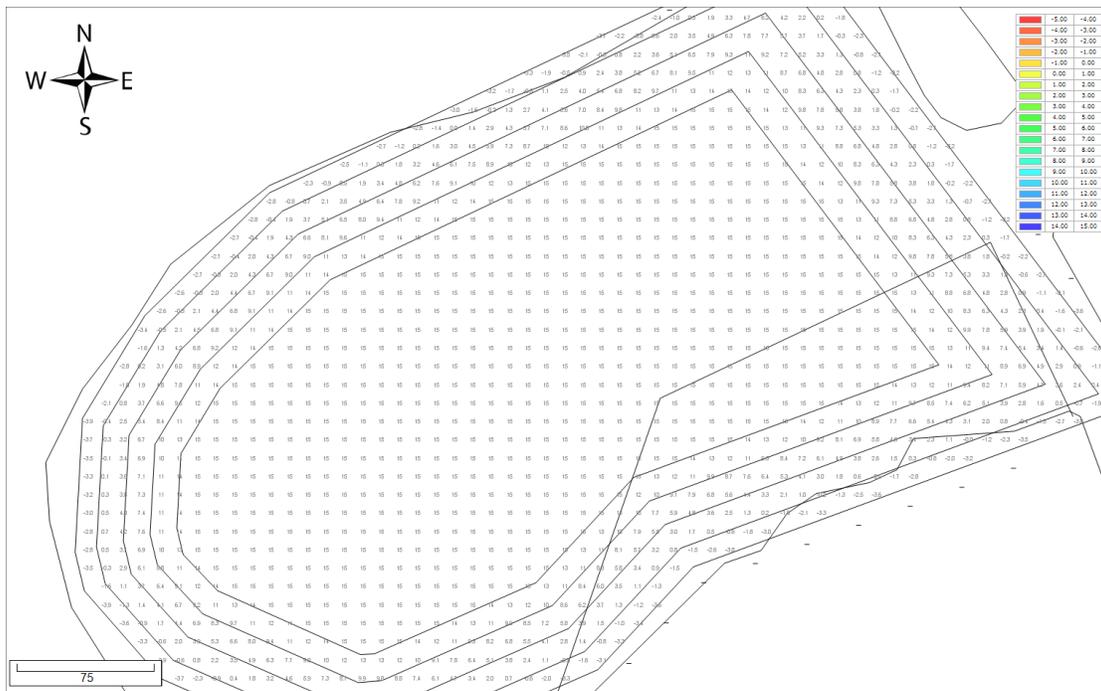
When all parameters are setup correctly, click "OK" to start the export. A progress indicator will appear at the bottom at the screen, and the window will close after a couple of seconds.

You can now open the DXF file in most CAD programs, it is also possible to use the generated DXF file as a background map in Hydromagic.

Opened in a CAD editor, the result will be (depending on your settings):



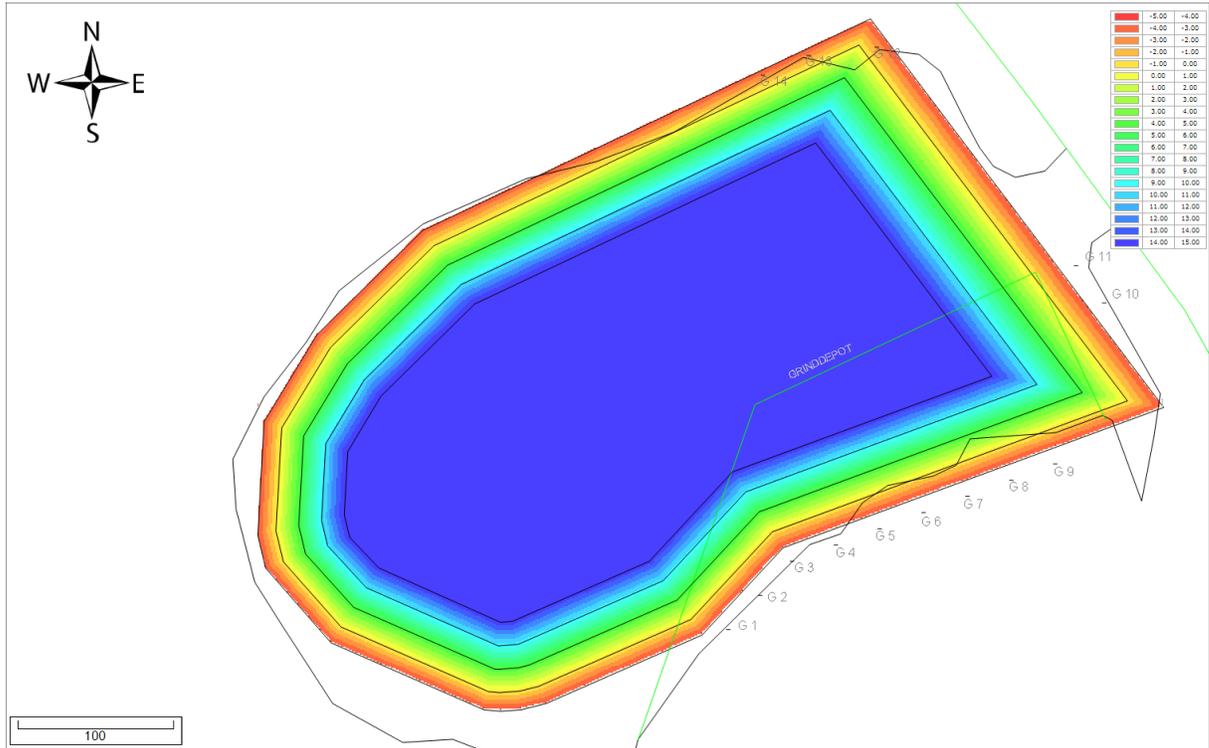
Opened in QCad



Opened in Hydromagic

## 7.13 Export to ESRI Shape

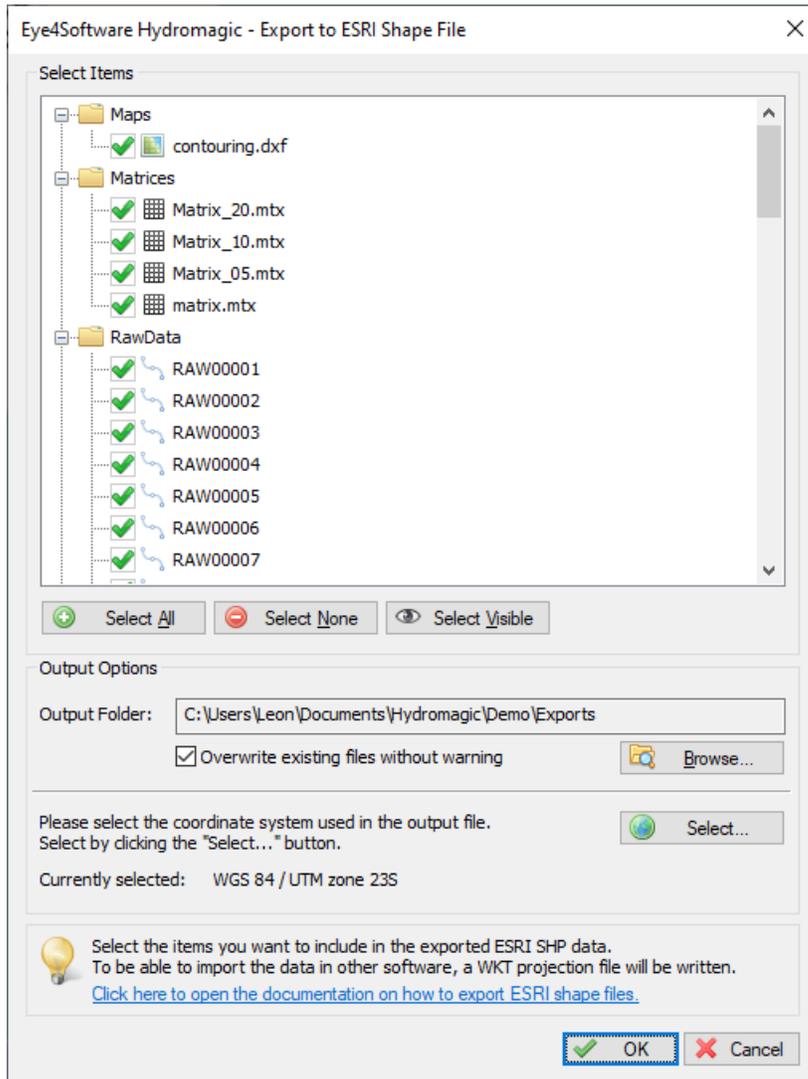
After a sounding has been completed, it is possible to export both the background map ([vector maps](#) only), and the regularly spaced sounding files ([matrices](#)) in ESRI shape file format, for example, for further processing in other software packages which support the ESRI shape file format. ESRI Shape files are supported in most GIS packages, including QGIS, ESRI and much more. After you have created a matrix of your sounding, sections or map, you should have something like this:



**Example of a matrix file generated in Hydromagic.**

### Starting the ESRI Shape export option

The ESRI Shape export option can be started by selecting the "Export" => "Export ESRI Shape Data" from the "File" menu. The following window should appear:



Use the ESRI shape export function to save your project data in shape file format.

## Select items

First, you have to select the items you wish to export as Shapes. The following Hydromagic objects can be converted to ESRI shape files:

- Maps (vector maps only);
- Matrices;
- Planned Survey Lines (Sections);
- Soundings;
- Boundaries;
- Comments;
- Waypoints;
- Routes;
- Logfiles.

Just enable the check box in front of the objects you want to include in the final ESRI Shape file. To reset the selection, click the "Select None..." button, or to select all objects, click "Select All...". ESRI Shape files can only

contain point, line and polygon features. Hydromagic converts the selected data to one of these feature types automatically. For depths, the Z-coordinates of the point, line or polygon vertices are used. Please note that only vector maps can be converted to ESRI Shape format. It is not possible to embed raster maps into a ESRI Shape file. For a list of supported vector formats, please have a look at [this document](#).

## Output options

### File name

Next, you have to select an output file name for the ESRI Shape file. Click the "Browse..." button to select a file. If the specified file already exists, you will be prompted. If no extension has been supplied, the default ESRI Shape extension (.shp) will be appended.

### Projection

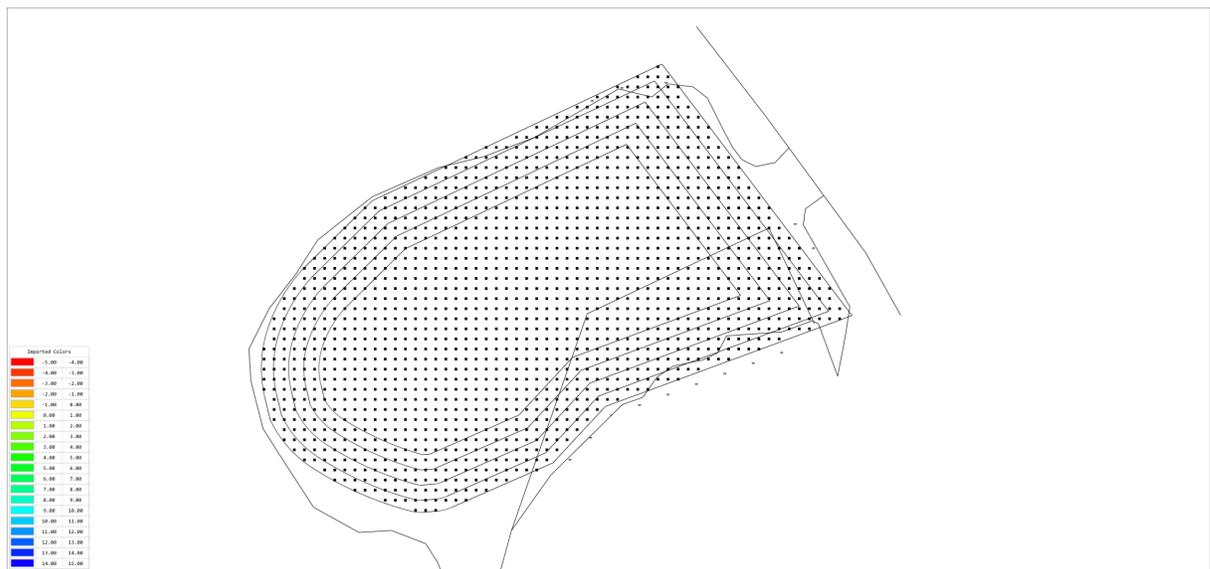
It is possible to write the ESRI Shape data using another map projection than the one which is used in your current project. To do so, click the "Select..." button to choose the map projection for the output file.

### Overwrite existing files without warning

When this option has been selected, the software will overwrite existing files without prompting.

## Starting the export process

When all parameters are setup correctly, click "OK" to start the export. A progress indicator will appear at the bottom at the screen, and the window will close after a couple of seconds. You can now open the ESRI Shape file in most GIS programs, it is also possible to use the generated ESRI Shape file as a background map in Hydromagic.



**The map and matrix example after being exported a ESRI shape file. Each point is a matrix depth (spacing 10 meters).**

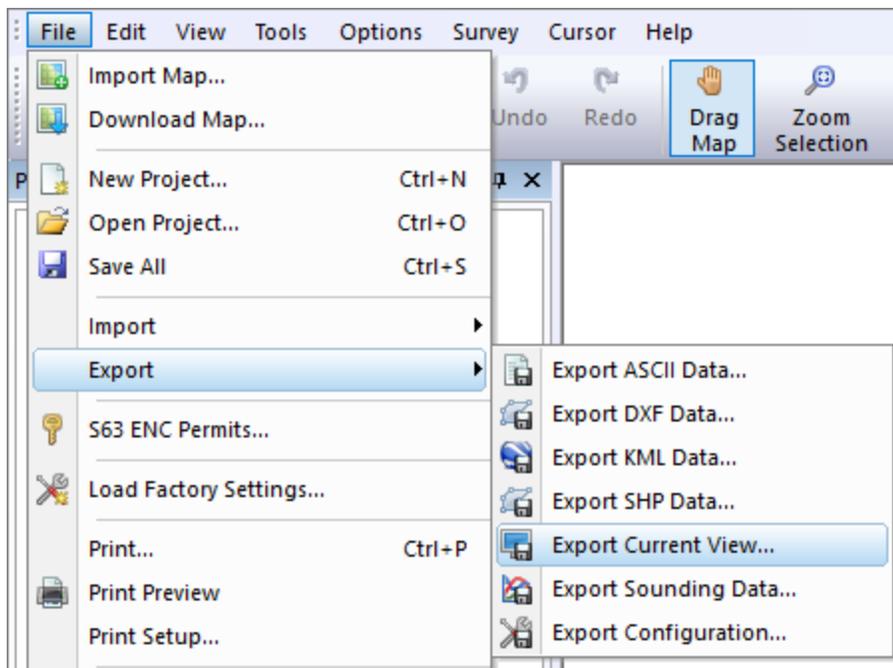
## 7.14 Export current view

Using Eye4Software Hydromagic, it is possible to save your current map view (including overlays like soundings, boundaries, raw data, waypoints and comments) as an image file.

The software can also generate the world and projection files for you, so you will be able to load the image file directly in other GPS or GIS mapping software, without the need to calibrate the map.

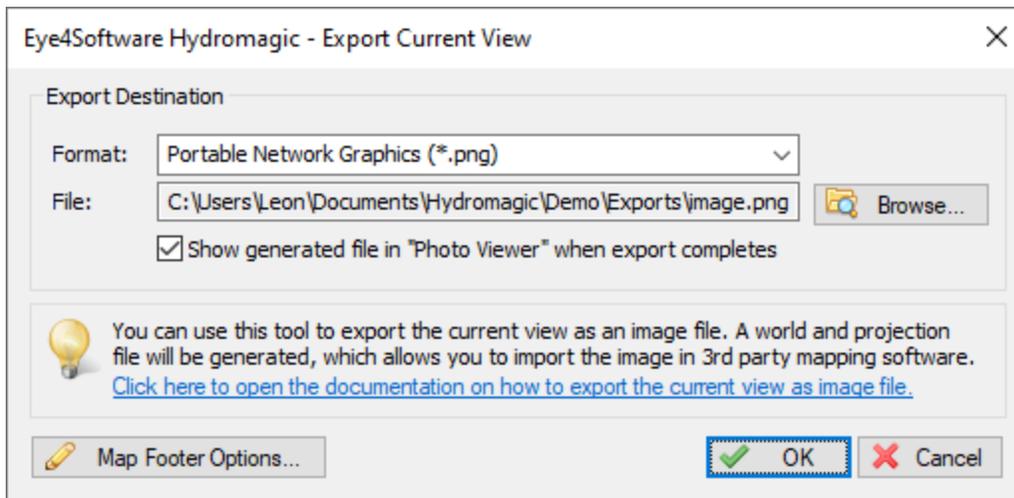
### Exporting the view

In order to export the current map view as an image file, select "Export" => "Export Current View..." from the "File" menu.



Export current view dialog

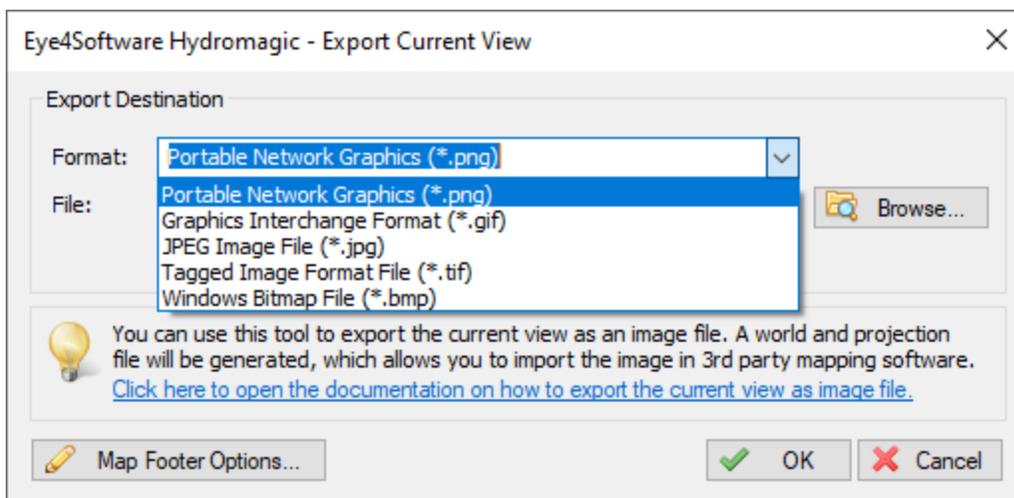
After a few seconds (time needed to capture the image), the following dialog should appear:



## Output file format

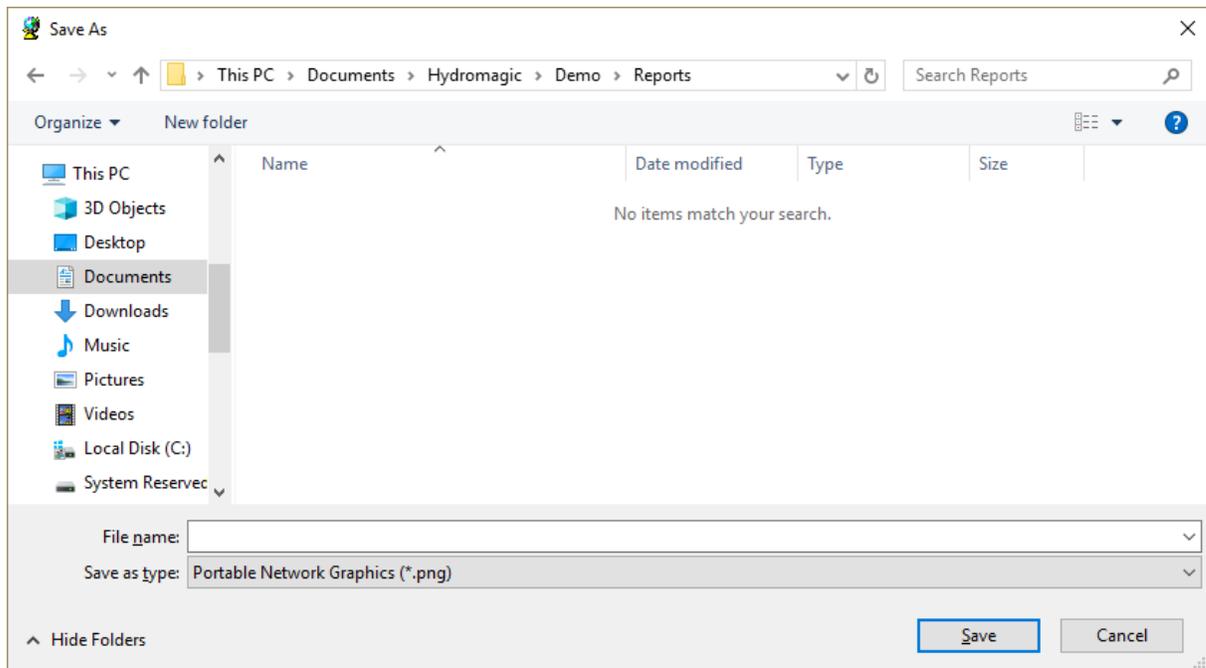
Before selecting an output file, select the image format you want to use to save the image file. Hydromagic can store images in one of the following file formats:

- Graphics Interchange Format (\*.gif);
- Portable Network Graphics (\*.png);
- JPEG Image Files (\*.jpg);
- Tagged Image Format Files (\*.tif);
- Windows Bitmap Files (\*.bmp).



## Output file

First, you have to select the output format and the file name of the image file. After selecting the format, use the "Browse..." button to select the folder and file name. When you have selected a file that already exists, the software will ask whether you want to overwrite this file.



## Generate World File

In cases where you want to import the exported image file into another GPS or GIS mapping software product, you have to enable this option.

The software stores the upper-left coordinates and the pixel sizes (scale) in the world file.

Depending on the image format you are using, the world file will have the following file extension:

- GIF World File - gfw;
- PNG World File - pgw;
- JPG World File - jgw;
- TIF World File - tfw;
- BMP World File - bpw;

```

3.726715
0
0
-3.726715
242435.599588
476855.346680

```

**Example of a world file**

## Projection Files

The software can generate a ESRI WKT or PROJ.4 projection file for you. Together with a world file for geo-referencing the image, this enables the screen shot to be imported in most GPS/GIS software packages.

The generated projection file will always have the ".prj" extension, irrespective of the selected format.

```
PROJCS["Amersfoort / RD New",  
  GEOGCS["Amersfoort",  
    DATUM["Amersfoort",  
      SPHEROID["Bessel 1841",6377397.155,299.1528128,  
        AUTHORITY["EPSG","7004"]],  
      AUTHORITY["EPSG","6289"]],  
    PRIMEM["Greenwich",0,  
      AUTHORITY["EPSG","8901"]],  
    UNIT["degree",0.01745329251994328,  
      AUTHORITY["EPSG","9122"]],  
    AUTHORITY["EPSG","4289"]],  
    UNIT["metre",1,  
      AUTHORITY["EPSG","9001"]],  
    PROJECTION["Oblique_Stereographic"],  
    PARAMETER["latitude_of_origin",52.15616055555555],  
    PARAMETER["central_meridian",5.387638888888889],  
    PARAMETER["scale_factor",0.9999079],  
    PARAMETER["false_easting",155000],  
    PARAMETER["false_northing",463000],  
    AUTHORITY["EPSG","28992"],  
    AXIS["X",EAST],  
    AXIS["Y",NORTH]]]
```

*Example of an ESRI WKT projection file*

## Adding a map footer

It is possible to add a map footer to the exported image, which is also done when printing the screen. To select whether the map footer is included, and how the fields are filled, click the "Map Footer Options..." button.

**Map Footer (Printing and export to image)**

**Map Footer Contents**

Show map footer on printing or exporting

First Line:

Second Line:

Sounding Date:

Show Horizontal Units       Show Vertical Units

Show Date       Show Local Grid

Enable this option to draw a map footer when printing / plotting, or exporting the current view to a image file.

## Exporting the map

Just click "OK" to start the export. The software will now write the selected files. You can monitor the progress in the status bar at the bottom of the screen.

Depending on whether you checked the "Show image after export" the created image will be shown in the Windows Photo Viewer.

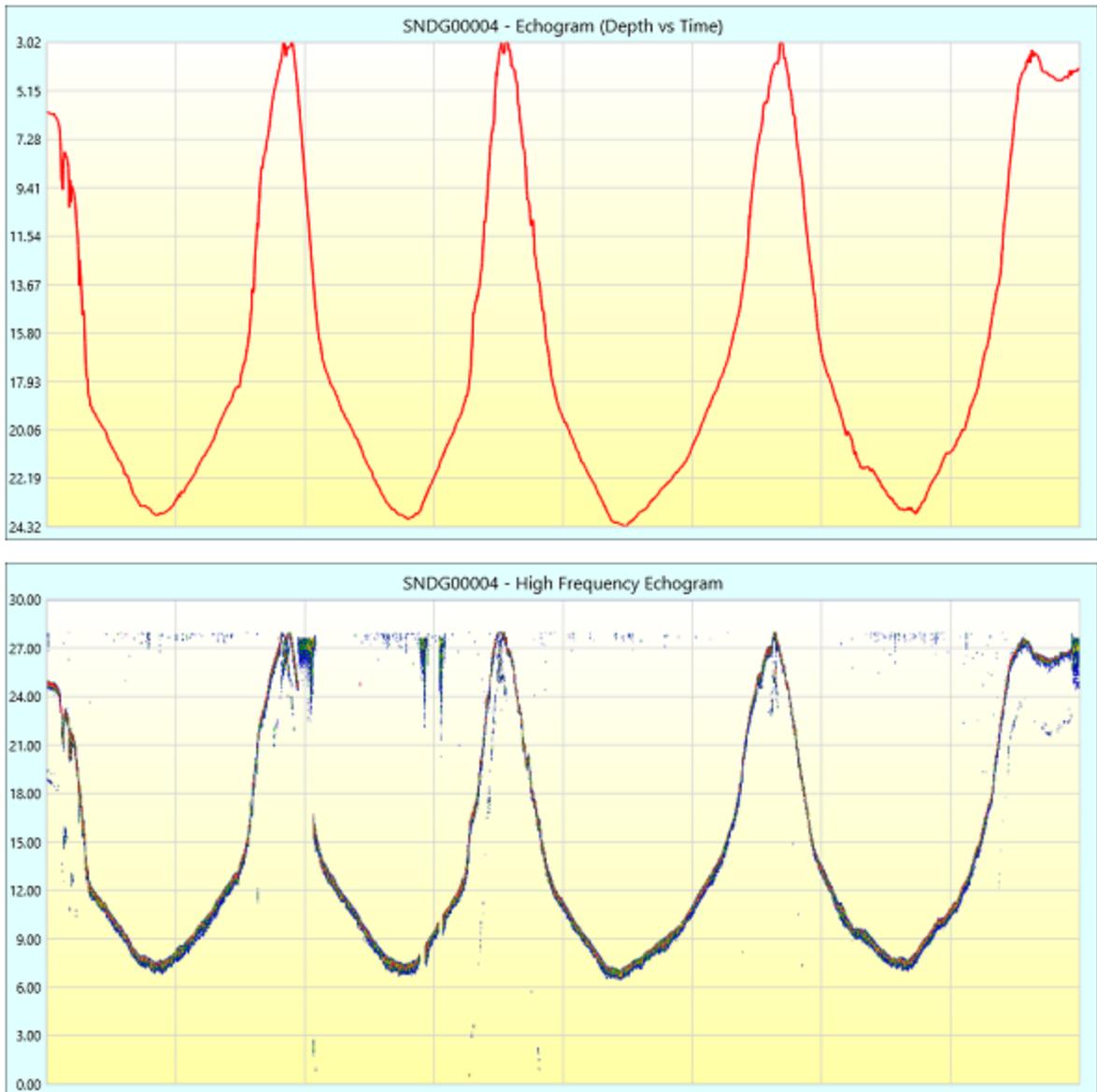


## 7.15 Export echograms

### Export echograms as images

After a sounding has been completed, it is possible to export echogram, water column information (also called return echo envelope data) or sub bottom data (when available) as an image file. Multiple output formats such as: PNG, JPG, GIF, TIF and BMP are supported. The resulting image files will be put together into a single folder (one file for each sounding). The files can be edited, or copied into your reports directly.

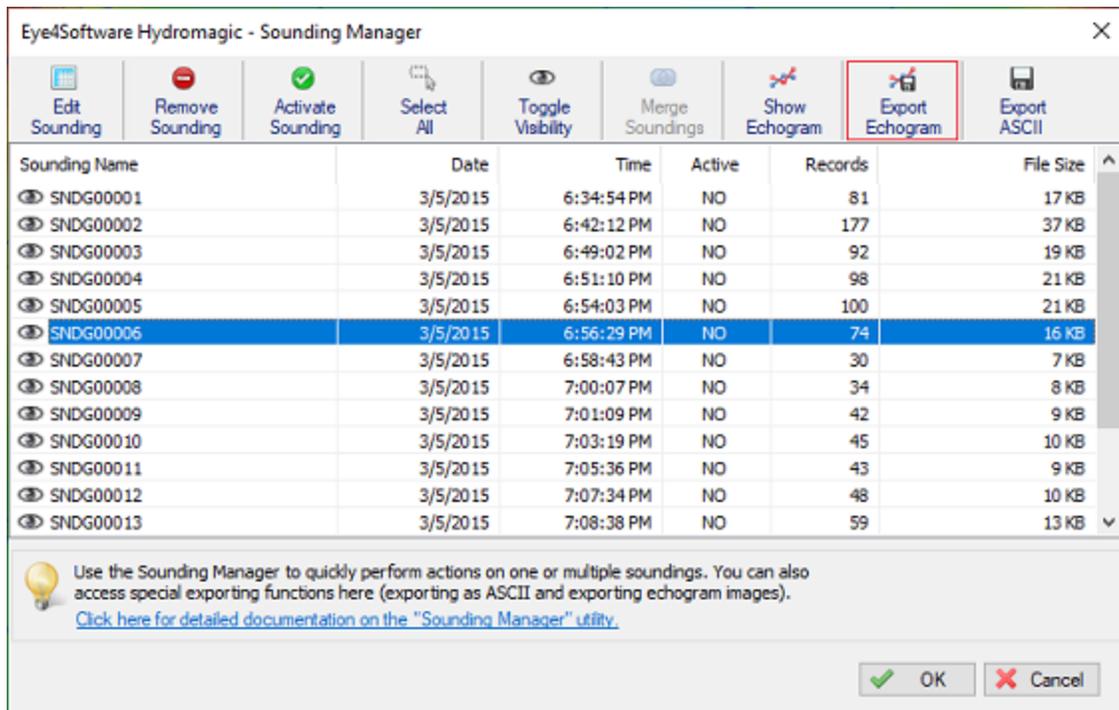
NOTE: This feature was added in version 9.0 of Hydromagic Survey. If you encounter difficulties generating these image files, please run the sounding wizard again as your sounding data might be in an older format. Running the [sounding wizard](#) will update the soundings to version 9.0 compatible sounding files without altering the data.



*Example of a digitized depth echogram and return echo envelope combined in a single image file.*

### Echogram export tool

To start exporting echogram data as images, locate the "Soundings" folder in the "Project Explorer", which will be in most cases on the left side of the screen. Right click the folder and select the "Manage Soundings..." option from the popup menu that appears to launch the [Sounding manager](#).



Click the "Export Echogram" button in the "Soundings Manager".

To start the echogram export tool, select the soundings you want to export and click the "Export Echogram" button in the tool bar. The echogram export tool will now be displayed. In this tool you select the location for the exported images, the image format, soundings and the echograms you want to export.

## Configuring the export settings

Prior to exporting the images, there are some options to configure:

### Output Folder

Click the "Browse..." button to select in which folder the image files will be written. This can be a folder under your Hydromagic project root, any another location on your harddrive or even a network share. After selecting a new folder it will be displayed in the dialog. The dialog will also remember the file location for the next time you use this tool.

### Select Soundings

By default, the soundings selected in the sounding list will be displayed here. Using the "Select..." button you will be able to alter this selection.

### File Format

Select the file format of your choice for the creation of the image files. Supported image formats include:

- Graphics Interchange Format (\*.gif);
- Portable Network Graphics (\*.png);
- JPEG Image Files (\*.jpg);
- Tagged Image Format Files (\*.tif);

- Windows Bitmap Files (\*.bmp).

### Selected Echograms

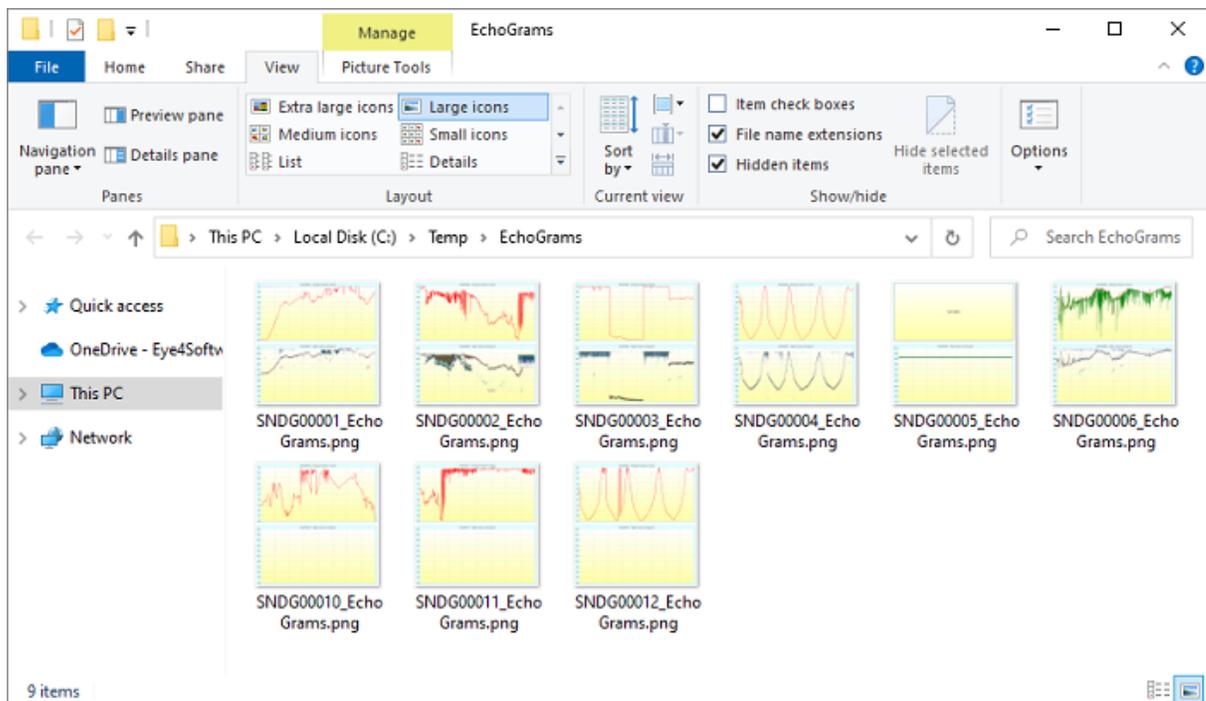
Check the items you wish to see. The software doesn't detect which items can be exported, so all possible options are displayed. When a type of echogram is not available for your sounding, an empty frame stating "No Data" will be inserted into the image file.

### Echogram Settings

To alter the way the sample data (echosounder envelope data) will be displayed, click the "Echogram Settings..." button. You can select another color schema, range or offset here. Please note that [these settings](#) are shared with the echogram digitizer and real time echogram displays.

### Starting the image export process

Click the "OK" button to start the export process. Depending on the number of soundings and the selected items, this will take up to a minute. When ready the folder where the files are written will be opened so you have access to the images right away.



*When exporting echograms for multiple soundings, they are written into the same folder on your disk.*

## 7.16 Export Cross Sections

### Export Cross Sections to AutoCAD DXF Format

After a sounding has been completed, it is possible to export both the background map (vector maps only), and the regularly spaced soundings (matrix) to an AutoCAD DXF file for further processing.

In addition to these objects, you can also create an export of the side views of a channel, also called cross sections.

The software will export all generated cross sections to a single DXF file.

These cross sections can then be modified and plotted, or copied to another DXF file, for instance the exported DXF matrices.



### Defining the cross section locations

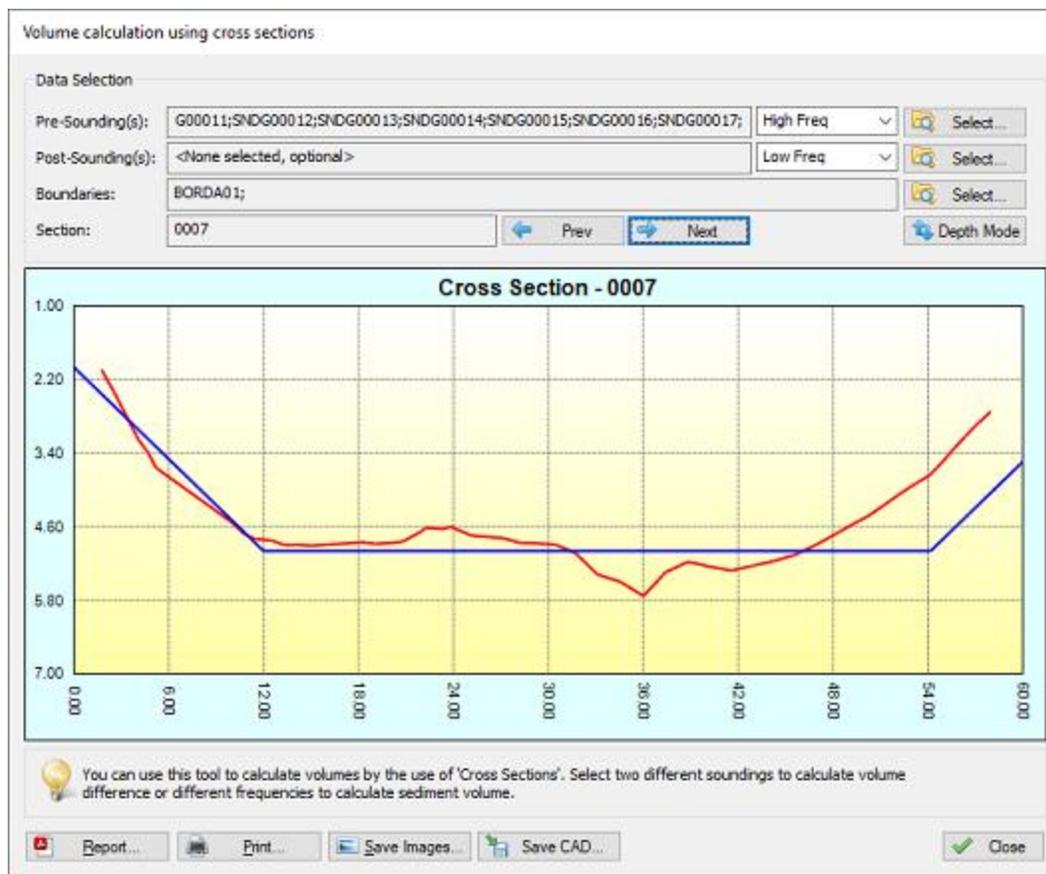
In order to generate cross sections, you have to set the locations of the cross sections. There are various ways to do this:

- Placing sections manually;
- Generating sections using a boundary;
- Importing cross sections from AutoCAD.

### Generating the cross sections

You can generate the cross sections from the cross sections volume calculation tool in Hydromagic. To start the matrix volume calculation tool, select the "Volumes (Sections)" option from the "Tools" menu.

The following dialog will be shown:

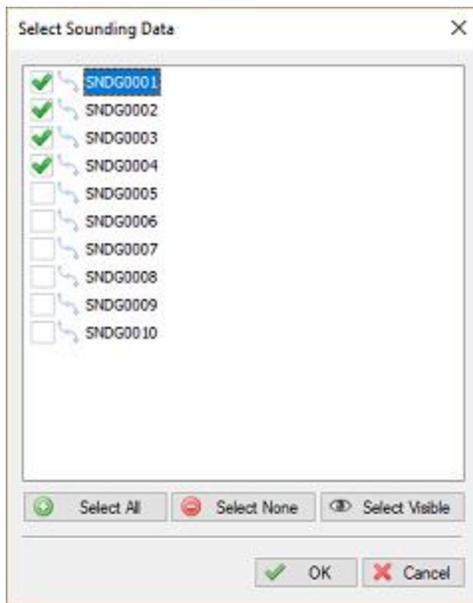


## Data selection

Which data has to be selected depends on how to use the tool.  
Use the pre- and post soundings to select the soundings to use in the calculation.

When you want to calculate the amount of sediment, you select the same sounding in both input boxes, and select different frequencies.  
In case you end up with negative values, just swap the selected frequencies or the values selected in the "Pre-Sounding(s)" and "Post-Sounding(s)" fields.

For dredging volumes, select the soundings created before the dredging operations in the "Pre-Sounding(s)" field,  
and the soundings created after the dredging operations in the "Post-Sounding(s)" field.



The use of shorelines is optional. The same shorelines will be used for the pre- and post soundings.



### View cross sections

When the data has been loaded, you can check the result in the graph by using the "Prev" and "Next" buttons.

When "NO DATA" is displayed in the graph, it means that there are no soundings or shorelines near the cross section.

The pre sounding will be displayed in red, the post sounding in green, while the channel design is displayed in blue.

You can click the "Depth Mode" button to switch between depth and elevation.

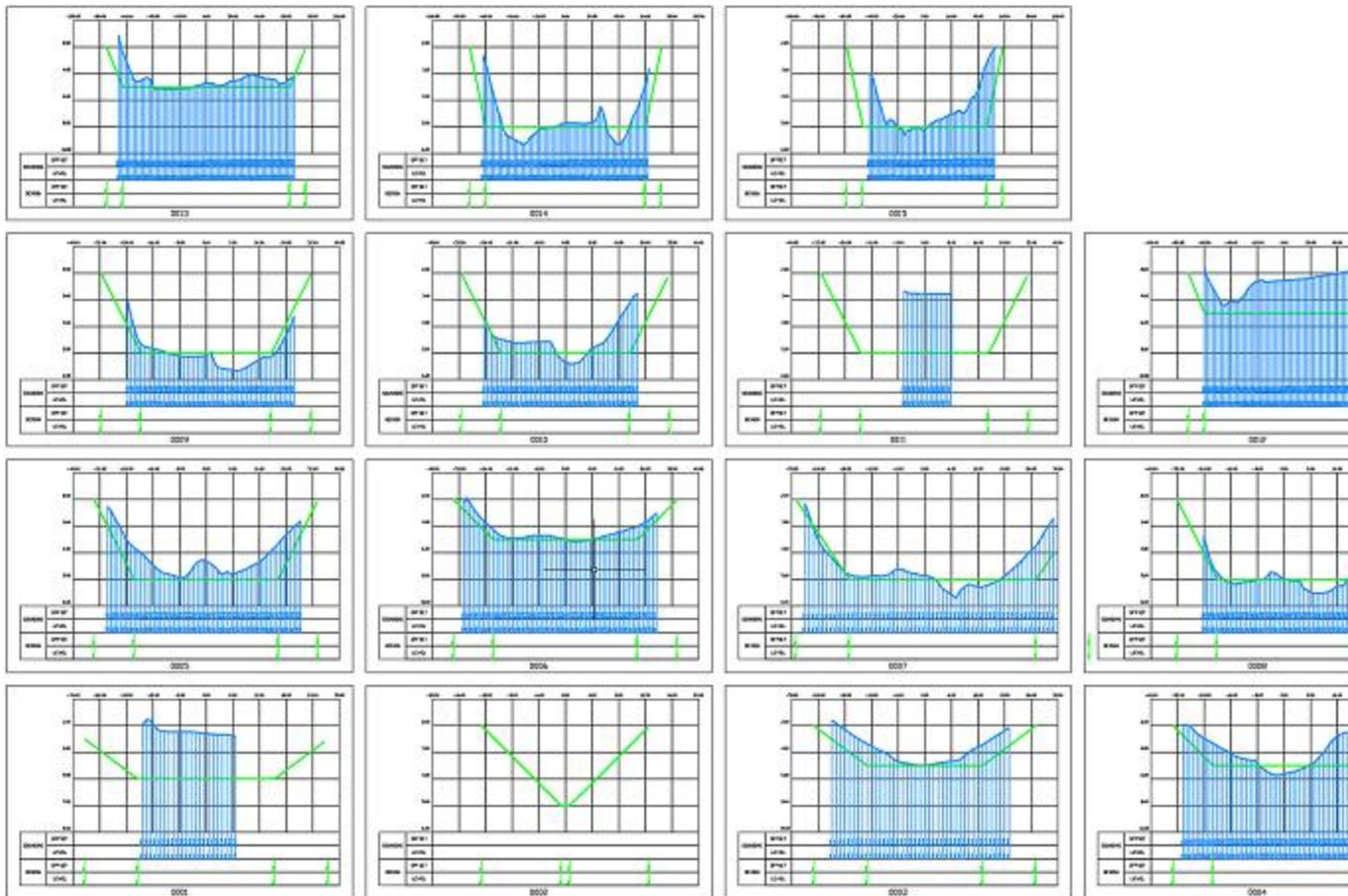
When all sections are displaying correctly, you are ready to export the data as AutoCAD DXF file.

### Starting the export process

When everything has been setup correctly (included soundings and boundaries), you can export the cross sections data as CAD format.

To do so, just click the "Save CAD" button and supply a valid DXF file name.

A popup will be shown whether the export was successful. The DXF file can be opened in AutoCAD or other CAD programs supporting the DXF file format.



## 8 Side Scan Sonar

### 8.1 Loading side scan sonar data

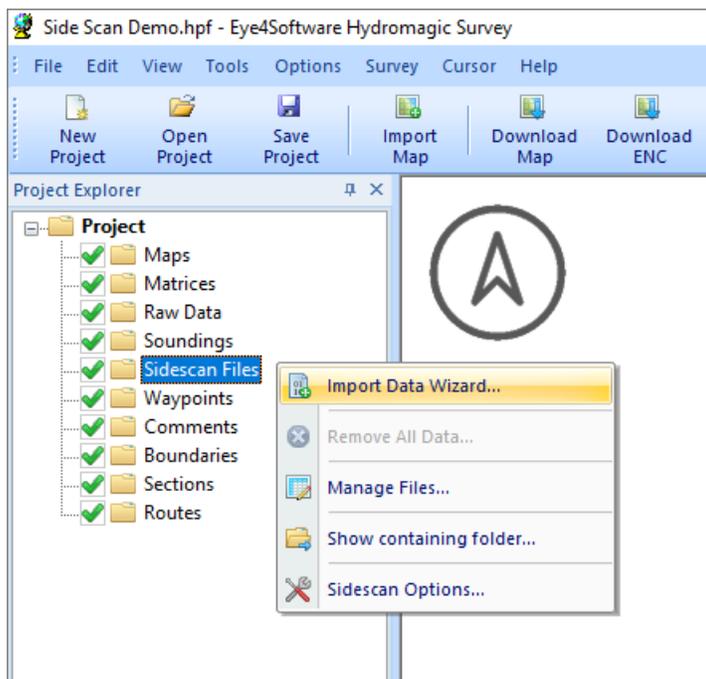
Enter topic text here.

### 8.2 Side scan configuration

Enter topic text here.

### 8.3 Import Triton XTF side scan data

Since Hydromagic Survey version 9.1, it is possible to import side scan sonar data from XTF files. XTF stands for eXtended Triton Format and is a file format which is widely used to store bathymetric data, like single beam soundings, side scan data and multi beam bathymetry. Before you import side scan data, make sure a project has been created or loaded with the correct map projection. If the map projection isn't suitable for the selected side scan data files, the import process will result in distorted images. To start the side scan data import wizard, locate the "Side scan Files" folder in the "Project Explorer" and right-click the folder with the mouse. From the context menu which appears, please select the "Import Data Wizard..." option as shown in the screenshot below:



Select the "Import Data Wizard..." option to import side scan data into your Hydromagic Survey project.

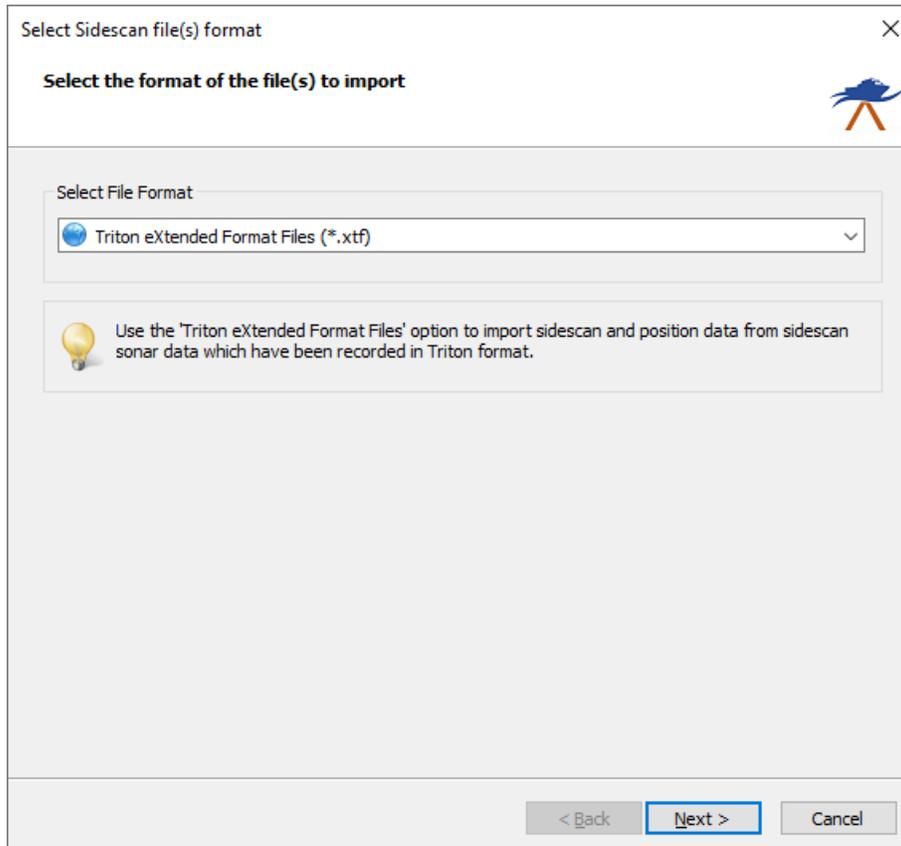
### Select the correct sides can data file format

Hydromagic is able to import various side scan data formats, including:

- Triton XTF side scan data files;
- [Humminbird side scan data files](#);

- [Lowrance side scan data files.](#)

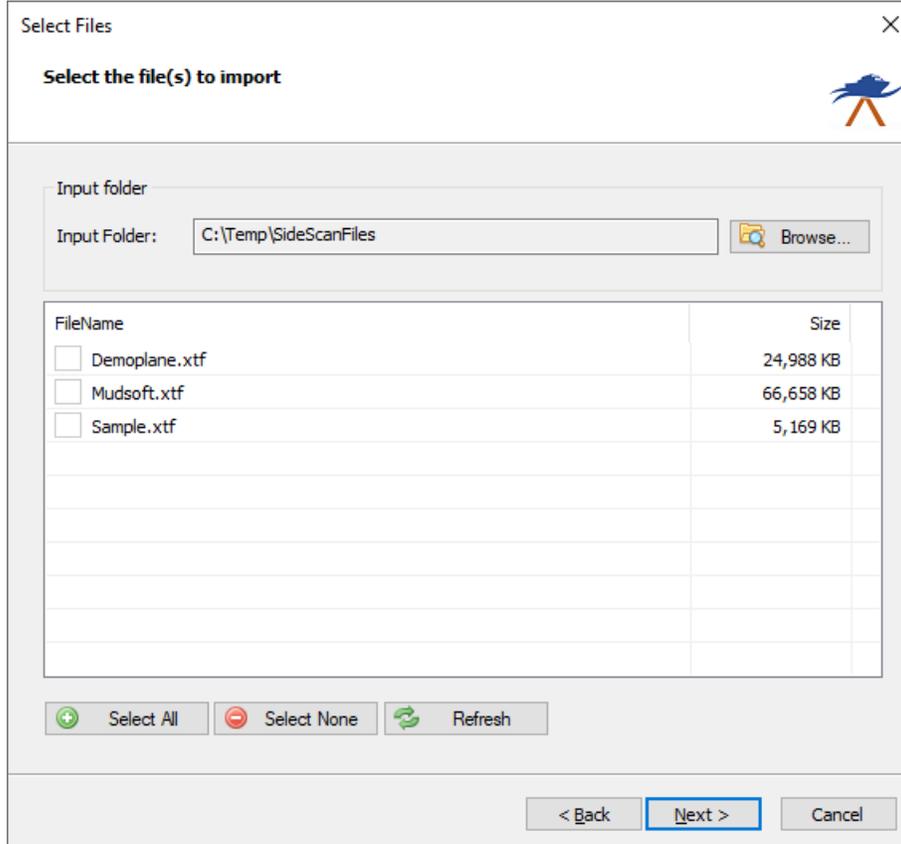
To import side scan data from a Triton XTF file, we select the "Triton eXtended Format Files (\*.xtf)" option in the first page of the data import wizard. When selected, click the "Next" button to continue to the next page where we are going to select the files to be imported.



Select the "Triton eXtended Format Files (\*.xtf)" option from the drop down list.

## Selecting sonar files

To select the files to import, you have to select in which folder they are copied. This can be done by clicking the "Browse..." button. After selecting the folder, click "OK", and Hydromagic will automatically scan for Triton XTF files and shows them in the list:



**Select the files to be imported by checking the check boxes.**

Select the files you wish to import into your Hydromagic Survey project by checking the check boxes in front of the file names. To import all files at once, simply click the "Select All" button. When selection has completed, click the "Next" button to go to the next page of the wizard where we are going to adjust the import settings.

## Triton XTF Import Options

Please take some time to review the settings in the "Sidescan Import Options" page. Once set correctly, the values will be stored for the next time you use the wizard. Especially the sound velocity setting is imported, since an incorrect setting may cause objects to display closer or further from the vessel than they are.

### Sound Velocity

The sound velocity is needed to calculate the range from the number of samples. Using an invalid range can cause objects to appear closer or further from the vessel than they are actually are. Depending on the [selected units](#), you have to specify the sound velocity in either meters per second or feet per second. When unsure, use the default 1500 meters per second value. When the sound velocity is set to 1500 meters per second, the sound velocity value stored in the XTF file will be used instead. Any other value will override the sound velocity value stored in the file.

### Limit return samples

Use this option to specify the number of return signal samples will be processed by the software. You can use this setting to avoid overlapping side scan images. When a value of zero has been entered, this setting will be

ignored and all samples are processed and converted to image pixels.

### Side scan data filter

The filter can be used to filter noise from the side scan data. A couple of filters can be selected to process the data:

- Smoothing Mean;
- Smoothing Gaussian;
- Smoothing Median;

Feel free to experiment with the filter setting to see what is working the best for your data. When you want to make sure objects aren't affected by filtering, select the "Disabled" option. This will cause the wizard to skip data filtering when importing side scan data.

### Side scan data clipping

With the clipping option, you can select a [boundary](#) to clip the resulting side scan image overlay. All pixels not within the boundary won't be calculated. Click the "Select..." button to select one or more (islands can be defined) boundaries, or ignore this setting to import all data.

Sidescan Import Options

Select sidescan import options

Sound Velocity

Sound Velocity: 1500.00 m/s

Swath options

Limit number of return samples per channel: 0 (0 = no limit)

Filter

Apply smoothing filter on the data: Smoothing Median

Clip data

Clip all sidescan data outside this boundary: <None selected, optional>

Select...

Sidescan Hardware Settings...

< Back Next > Cancel

The "Side scan Import Options" page can be used to customize some settings before importing side scan data.

### Adjust Gain Settings

For some files, additional gain settings need to be set to get the same color intensity for pixels as the distance from the nadir increases. You can set a time varying gain (10logR, 20logR, 30logR or 40logR) to compensate spreading loss, as well as a correction factor for attenuation of return signals due to sound absorption in the water. Since both unprocessed and processed data from various brands of side scan sonar equipment can be stored in XTF files, the ideal setting will differ from file to file. It might be needed to experiment with the different settings. To calculate the theoretical sound absorption in decibel per meter, you can click "Calculate..." to launch the sound absorption calculator. You have to copy and paste the the decibel per meter value into the wizard. After adjusting the gain settings, please click "Next" to go to the last page of this wizard.

Adjust Gain Settings

Specify gain settings

Gain Settings

Time Varying Gain: 20logR

Compensate Attenuation: 0.000 Calculate... (Enter a value in dB/meter)

< Back Next > Cancel

***The gain settings can be used to correct the side scan image for spreading and sound absorption losses.***

Sound Absorption Calculator

Measurements

Frequency: 455 kHz

Temperature: 20 Celsius

Depth: 10 Meter

Salinity: 35 ppt

Acidity: 8 pH

Result (Absorption)

Absorption: 0.136 db/meter

1.0318 power factor

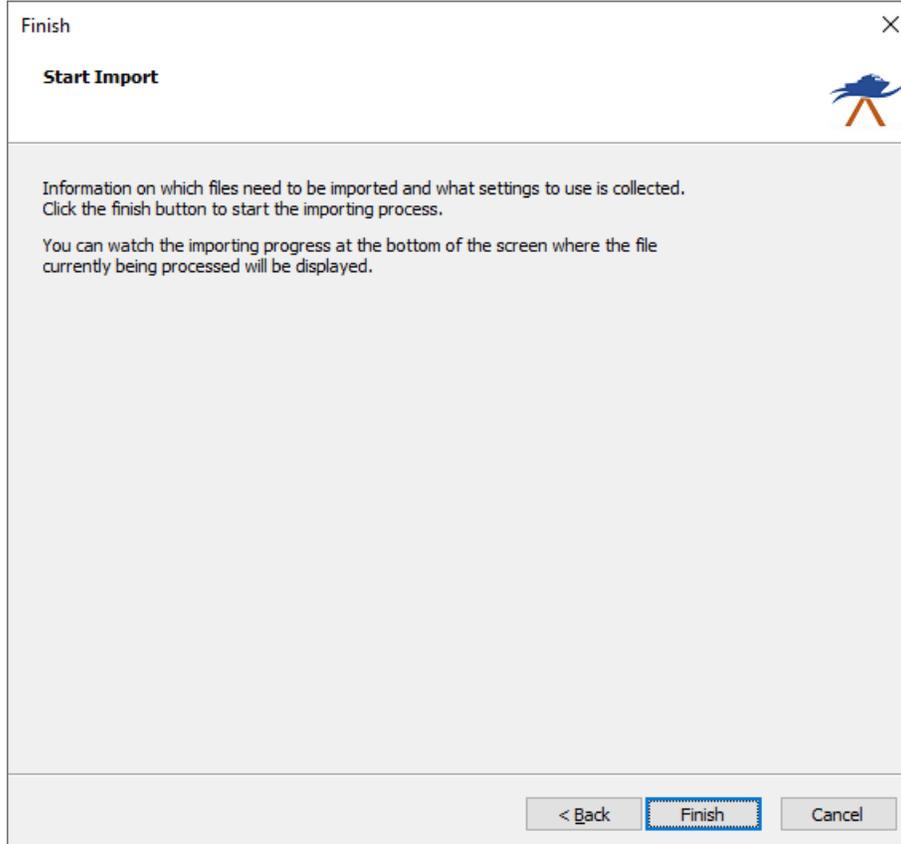
HYDROMAGIC

Calculate Close

*The "Sound Absorption Calculator" can be used to calculate the attenuation value.*

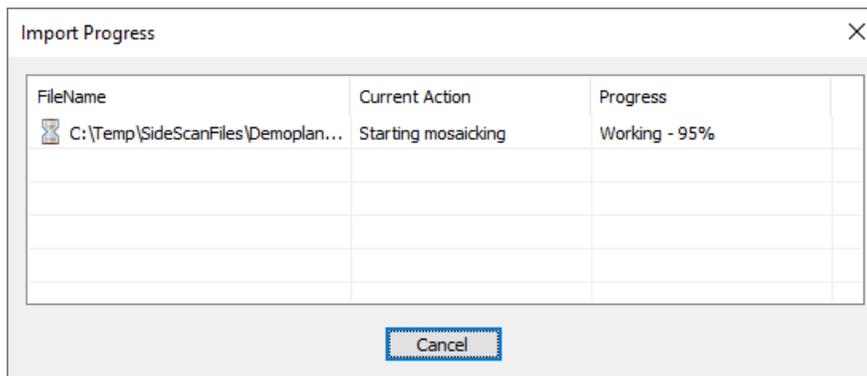
### Starting the import process

After selecting the data format, files, import and gain settings, you can click "Finish" to start the import process. A progress window will show the importing progress of for the selected sidescan files. In case of problems, make sure you always check the "Processing" tab of the [real time activity view pane](#).



**Click the "Finish" button of the last wizard page to start the data import.**

When all files have been processed, they will appear in the project manager, and as map overlays in the map display window. To change the color schema for the images, right click the "Sidescan Files" folder in the "Project Manager" and select the "Sidescan Options..." menu item.

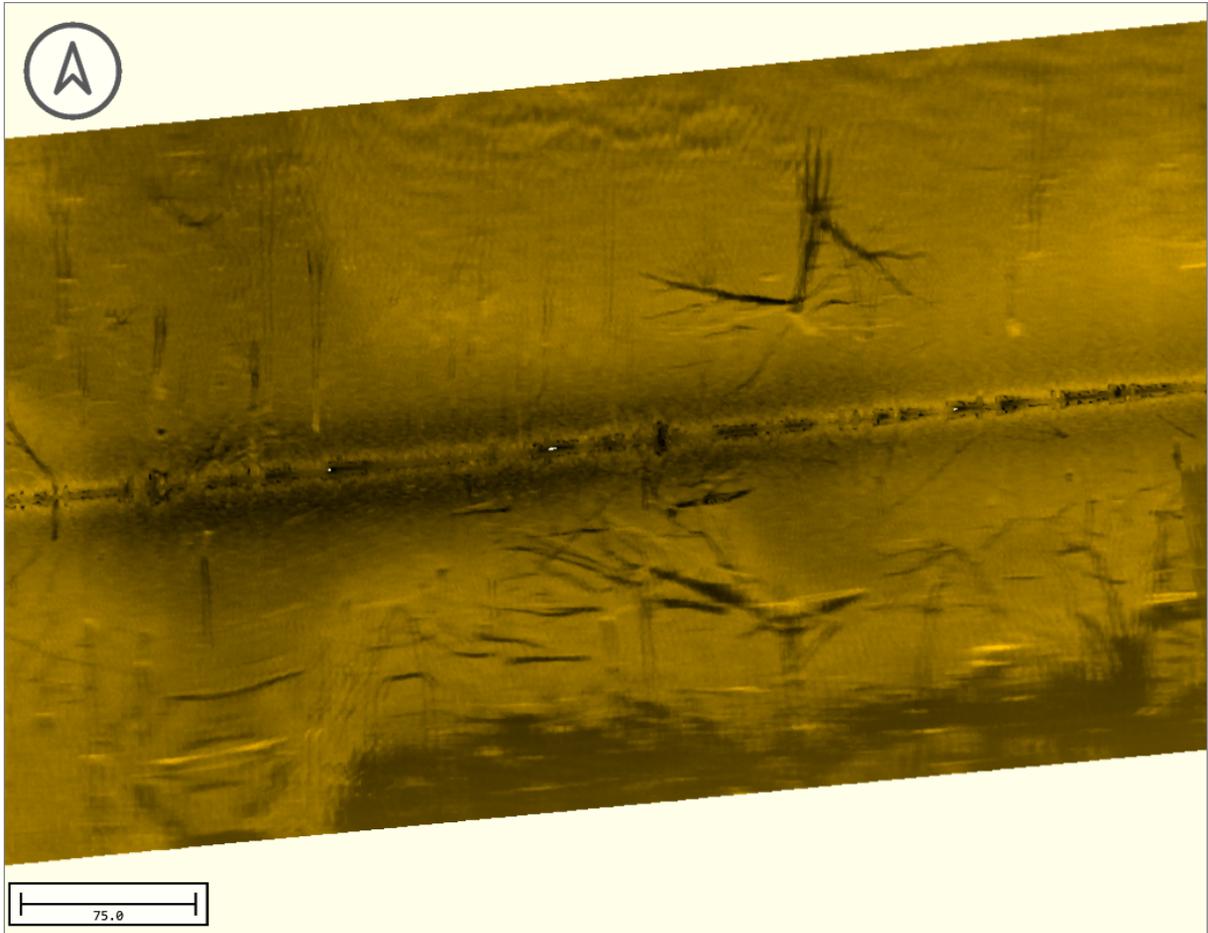


**A progress window will show the progress of the importing process.**

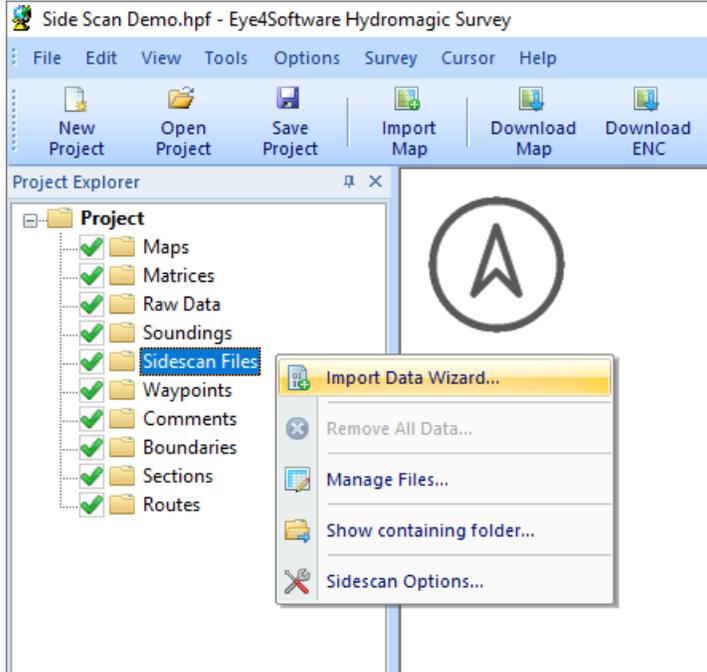
## 8.4 Import Humminbird side scan data

Since Hydromagic Survey version 9.1, it is possible to import side scan sonar data from recreational side scan sonar units like Humminbird. Humminbird will write multiple files per recording, but it is important to select the "DAT" file after the side scan files have transferred to your PC. Before you import side scan data, make sure a

project has been created or loaded with the correct map projection. If the map projection isn't suitable for the selected side scan data files, the import process will result in distorted images.



*Example of a Humminbird sidescan data file imported in Hydromagic Survey.*



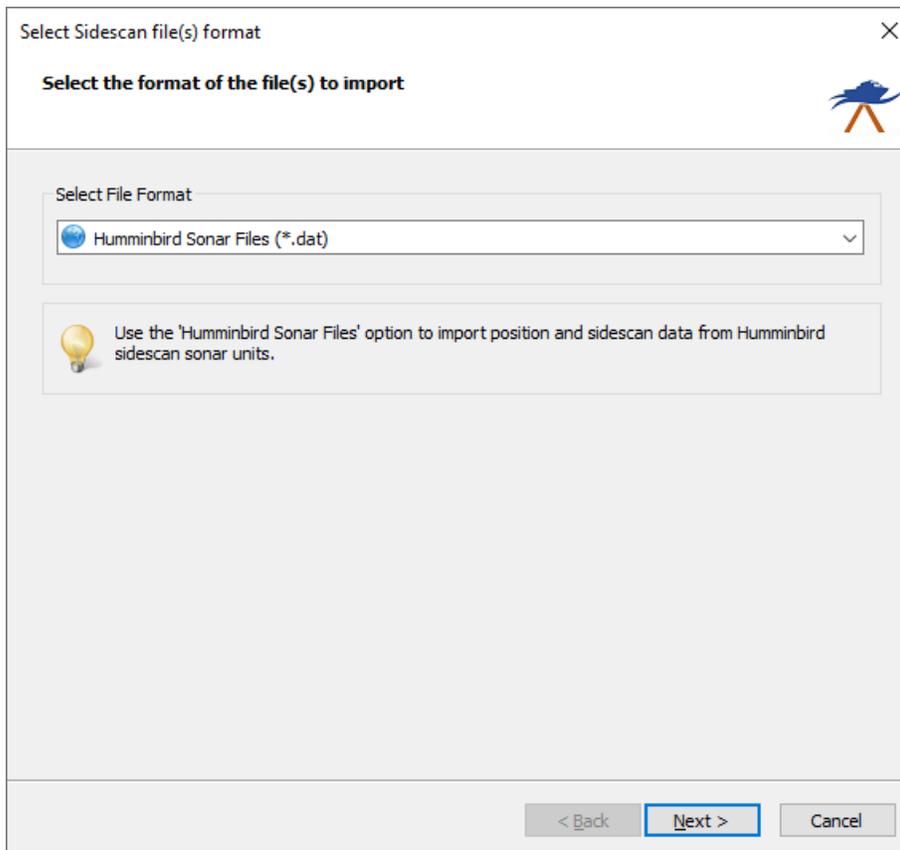
Select the "Import Data Wizard..." option to import side scan data into your Hydromagic Survey project.

## Select the correct sides can data file format

Hydromagic is able to import various side scan data formats, including:

- [Triton XTF side scan data files:](#)
- Humminbird side scan data files;
- [Lowrance side scan data files.](#)

Since this manual page is on how to import data from Humminbird units, we select the "Humminbird Sonar Files (\*.dat)" option in the first page of the data import wizard. When selected, click the "Next" button to continue to the next page where we are going to select the files to be imported.



Select the "Humminbird Sonar Files (\*.dat)" option from the drop down list.

## Selecting sonar files

To select the files to import, you have to select in which folder they are copied. This can be done by clicking the "Browse..." button. Please note that each Humminbird sonar file is stored in a separate folder, however the "DAT" file we have to load should be one level higher in the folder structure. So please do not select the "R00xxx" folder itself, but the folder where the "R00xxx" folders are located. After selecting the folder, click "OK", and Hydromagic will automatically scan for Humminbird DAT files and shows them in the list:

Select Files

Select the file(s) to import

Input folder

Input Folder: C:\Temp\SideScanFiles  Browse...

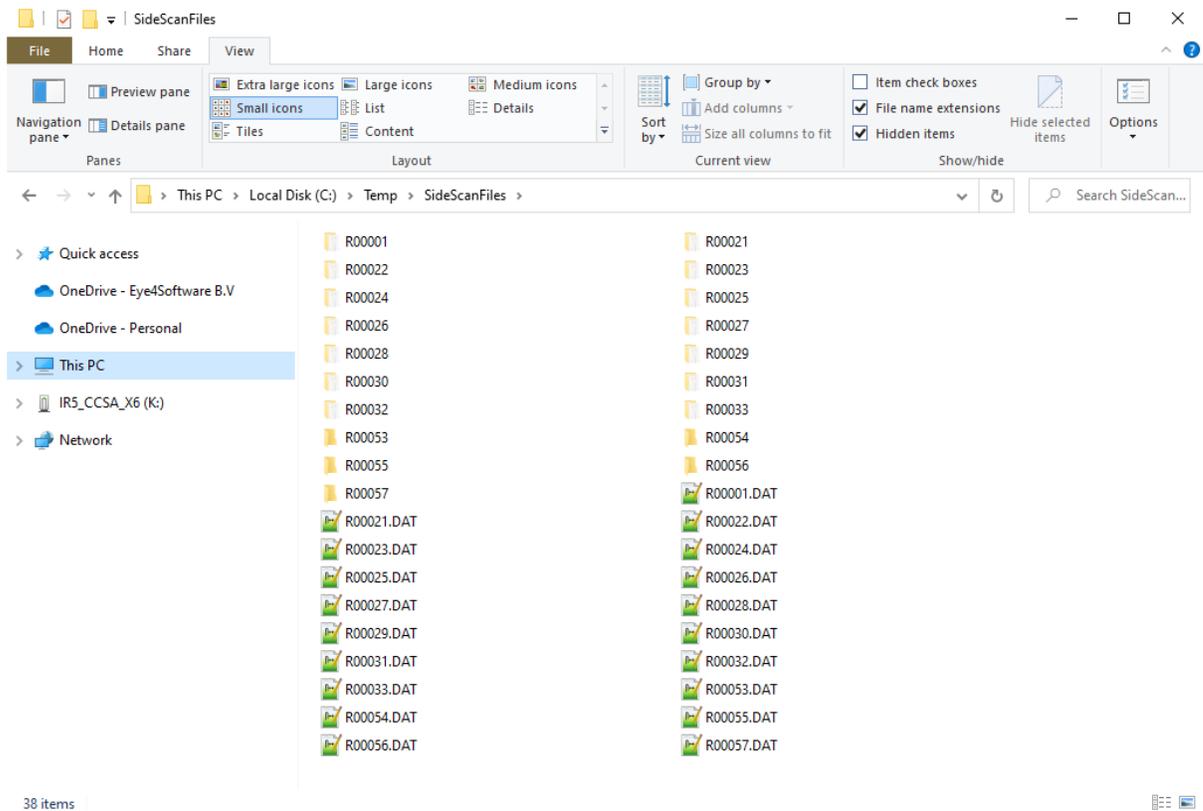
FileName	Size
<input type="checkbox"/> R0001.DAT	1 KB
<input type="checkbox"/> R00021.DAT	1 KB
<input checked="" type="checkbox"/> R00022.DAT	1 KB
<input checked="" type="checkbox"/> R00023.DAT	1 KB
<input checked="" type="checkbox"/> R00024.DAT	1 KB
<input checked="" type="checkbox"/> R00025.DAT	1 KB
<input type="checkbox"/> R00026.DAT	1 KB
<input type="checkbox"/> R00027.DAT	1 KB
<input type="checkbox"/> R00028.DAT	1 KB
<input type="checkbox"/> R00029.DAT	1 KB

 Select All  Select None  Refresh

< Back **Next >** Cancel

**Select the files to be imported by checking the check boxes.**

Select the files you wish to import into your Hydromagic Survey project by checking the check boxes in front of the file names. To import all files at once, simply click the "Select All" button. When selection has completed, click the "Next" button to go to the next page of the wizard where we are going to adjust the import settings.



***Make sure you select the folder where the "Humminbird DAT files" are located.***

## Humminbird Import Options

Please take some time to review the settings in the "Sidescan Import Options" page. Once set correctly, the values will be stored for the next time you use the wizard. Especially the sound velocity setting is imported, since an incorrect setting may cause objects to display closer or further from the vessel than they are.

### Sound Velocity

The sound velocity is needed to calculate the range from the number of samples. Using an invalid range can cause objects to appear closer or further from the vessel than they are actually are. Depending on the [selected units](#), you have to specify the sound velocity in either meters per second or feet per second. When unsure, use the default 1500 meters per second value.

### Limit return samples

Use this option to specify the number of return signal samples will be processed by the software. You can use this setting to avoid overlapping side scan images. When a value of zero has been entered, this setting will be ignored and all samples are processed and converted to image pixels.

### Side scan data filter

The filter can be used to filter noise from the side scan data. A couple of filters can be selected to process the data:

- Smoothing Mean;

- Smoothing Gaussian;
- Smoothing Median;

Feel free to experiment with the filter setting to see what is working the best for your data. When you want to make sure objects aren't affected by filtering, select the "Disabled" option. This will cause the wizard to skip data filtering when importing side scan data.

### Side scan data clipping

With the clipping option, you can select a [boundary](#) to clip the resulting side scan image overlay. All pixels not within the boundary won't be calculated. Click the "Select..." button to select one or more (islands can be defined) boundaries, or ignore this setting to import all data.

**The "Side scan Import Options" page can be used to customize some settings before importing side scan data.**

### Adjust Gain Settings

For some files, additional gain settings need to be set to get the same color intensity for pixels as the distance from the nadir increases. You can set a time varying gain (10logR, 20logR, 30logR or 40logR) to compensate spreading loss, as well as a correction factor for attenuation of return signals due to sound absorption in the water. Since both unprocessed and processed data from various brands of side scan sonar equipment can be stored in XTF files, the ideal setting will differ from file to file. It might be needed to experiment with the different settings. To calculate the theoretical sound absorption in decibel per meter, you can click "Calculate..." to launch the sound absorption calculator. You have to copy and paste the the decibel per meter value into the wizard. After adjusting the gain settings, please click "Next" to go to the last page of this wizard.

Adjust Gain Settings ×

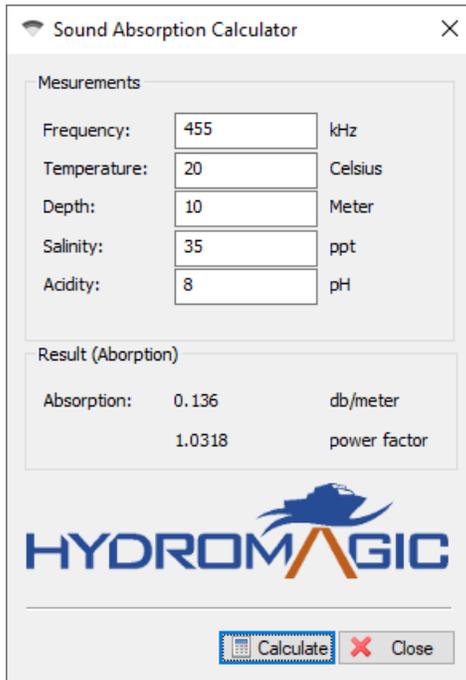
**Specify gain settings** 

Gain Settings

Time Varying Gain:  ▾

Compensate Attenuation:   (Enter a value in dB/meter)

*The gain settings can be used to correct the side scan image for spreading and sound absorption losses.*



The screenshot shows a dialog box titled "Sound Absorption Calculator" with a close button (X) in the top right corner. The dialog is divided into two main sections: "Measurements" and "Result (Absorption)".

**Measurements:**

Frequency:	455	kHz
Temperature:	20	Celsius
Depth:	10	Meter
Salinity:	35	ppt
Acidity:	8	pH

**Result (Absorption):**

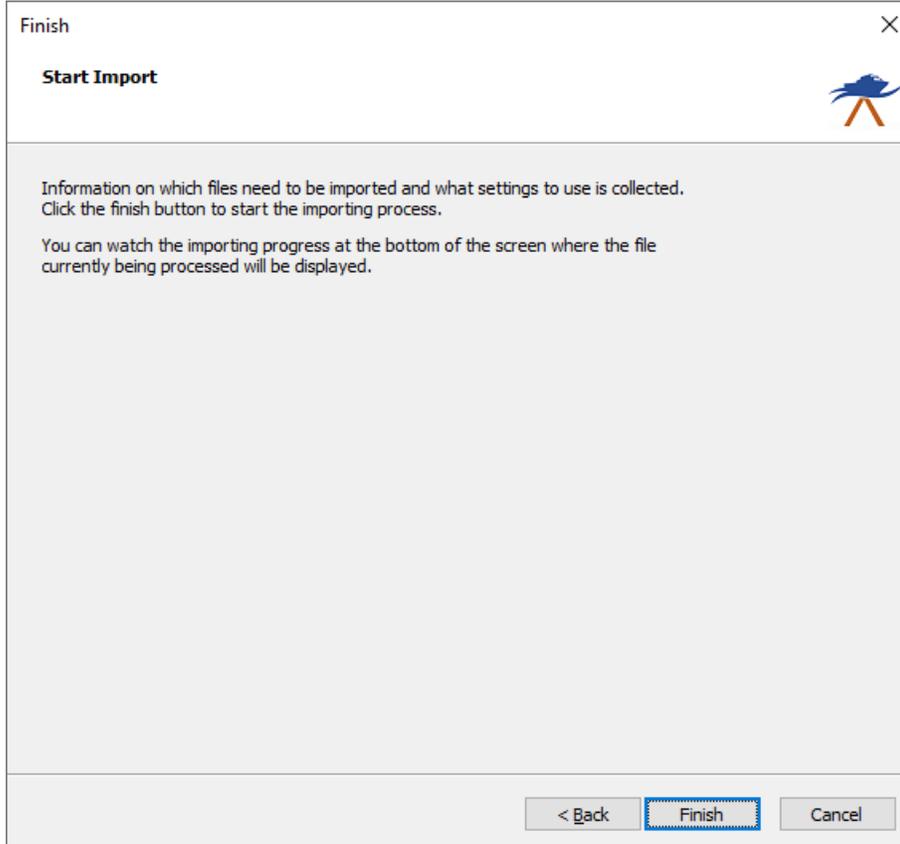
Absorption:	0.136	db/meter
	1.0318	power factor

At the bottom of the dialog, there is a logo for "HYDROMAGIC" and two buttons: "Calculate" and "Close".

*The "Sound Absorption Calculator" can be used to calculate the attenuation value.*

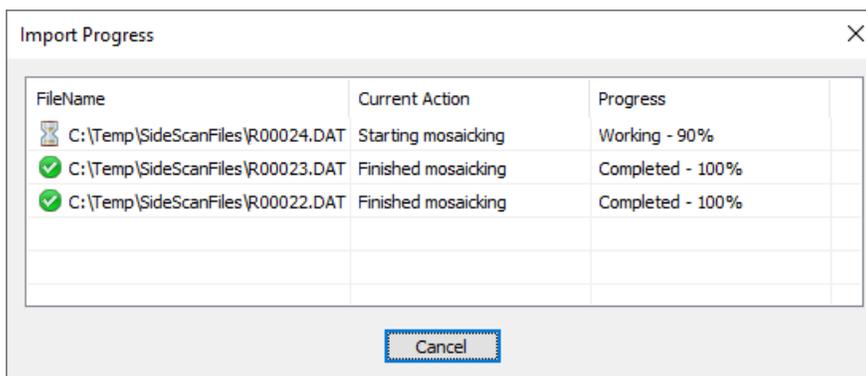
### Starting the import process

After selecting the data format, files, import and gain settings, you can click "Finish" to start the import process. A progress window will show the importing progress of for the selected sidescan files. In case of problems, make sure you always check the "Processing" tab of the [real time activity view pane](#).



**Click the "Finish" button of the last wizard page to start the data import.**

When all files have been processed, they will appear in the project manager, and as map overlays in the map display window. To change the color schema for the images, right click the "Sidescan Files" folder in the "Project Manager" and select the "Sidescan Options..." menu item.

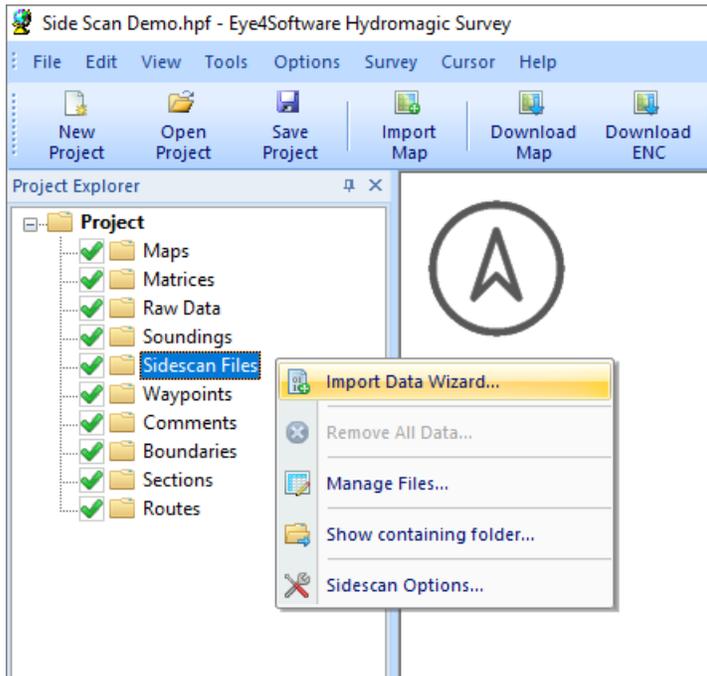


**A progress window will show the progress of the importing process.**

## 8.5 Import Lowrance side scan data

Since Hydromagic Survey version 9.1, it is possible to import side scan sonar data from recreational side scan sonar units like Lowrance. Lowrance side scan sonar data can be recorded in a single file with the "SL2" extension. In the near future, Hydromagic is going to support "SLG" and "SL3" file import as well. Before you

import side scan data, make sure a project has been created or loaded with the correct map projection. If the map projection isn't suitable for the selected side scan data files, the import process will result in distorted images. To start the side scan data import wizard, locate the "Sidescan Files" folder in the "Project Explorer" and right-click the folder with the mouse. From the context menu which appears, please select the "Import Data Wizard..." option as shown in the screenshot below:



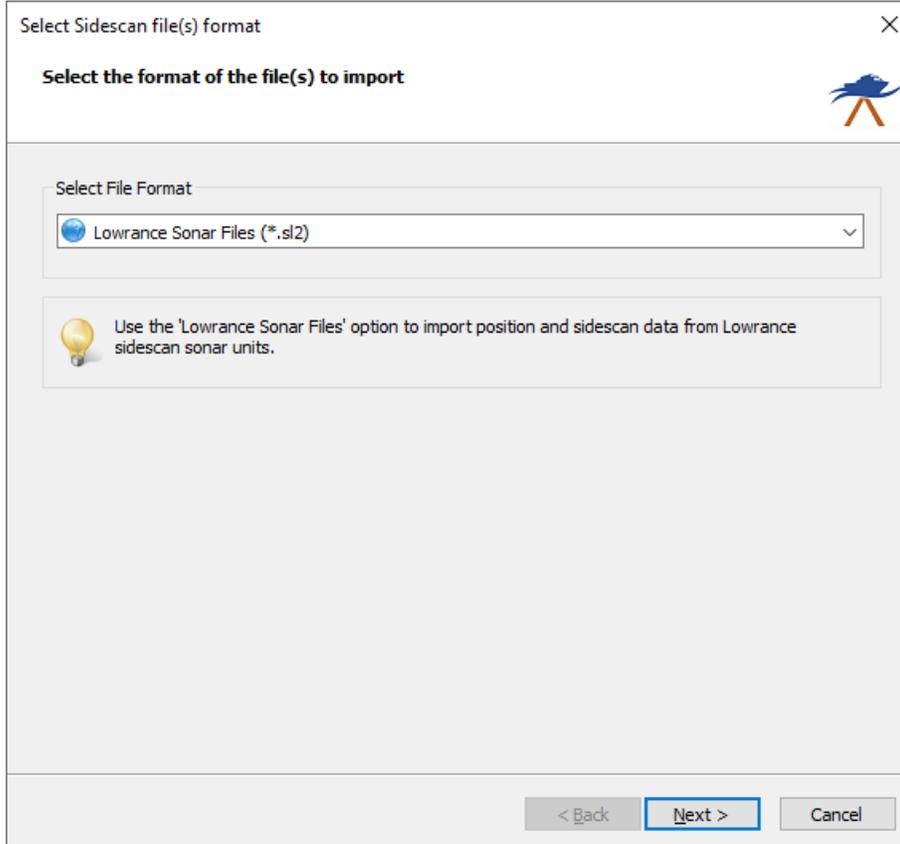
Select the "Import Data Wizard..." option to import side scan data into your Hydromagic Survey project.

### Select the correct sides can data file format

Hydromagic is able to import various side scan data formats, including:

- [Triton XTF side scan data files](#);
- [Humminbird side scan data files](#);
- Lowrance side scan data files.

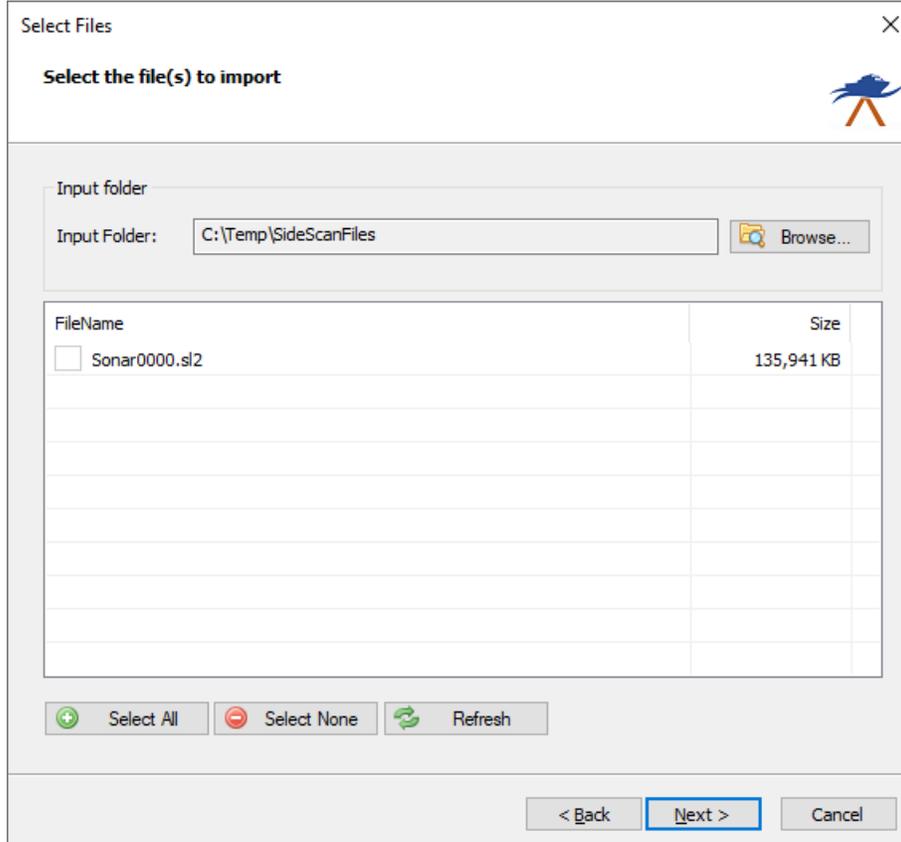
To import side scan data from a Triton XTF file, we select the "Triton eXtended Format Files (\*.xtf)" option in the first page of the data import wizard. When selected, click the "Next" button to continue to the next page where we are going to select the files to be imported.



Select the "Lowrance Sonar Files (\*.sl2)" option from the drop down list.

## Selecting sonar files

To select the files to import, you have to select in which folder they are copied. This can be done by clicking the "Browse..." button. After selecting the folder, click "OK", and Hydromagic will automatically scan for Lowrance SL2 files and shows them in the list:



**Select the files to be imported by checking the check boxes.**

Select the files you wish to import into your Hydromagic Survey project by checking the check boxes in front of the file names. To import all files at once, simply click the "Select All" button. When selection has completed, click the "Next" button to go to the next page of the wizard where we are going to adjust the import settings.

## Lowrance Import Options

Please take some time to review the settings in the "Sidescan Import Options" page. Once set correctly, the values will be stored for the next time you use the wizard. Especially the sound velocity setting is imported, since an incorrect setting may cause objects to display closer or further from the vessel than they are.

### Sound Velocity

The sound velocity is needed to calculate the range from the number of samples. Using an invalid range can cause objects to appear closer or further from the vessel than they are actually are. Depending on the [selected units](#), you have to specify the sound velocity in either meters per second or feet per second. When unsure, use the default 1500 meters per second value.

### Limit return samples

Use this option to specify the number of return signal samples will be processed by the software. You can use this setting to avoid overlapping side scan images. When a value of zero has been entered, this setting will be ignored and all samples are processed and converted to image pixels.

### Side scan data filter

The filter can be used to filter noise from the side scan data. A couple of filters can be selected to process the data:

- Smoothing Mean;
- Smoothing Gaussian;
- Smoothing Median;

Feel free to experiment with the filter setting to see what is working the best for your data. When you want to make sure objects aren't affected by filtering, select the "Disabled" option. This will cause the wizard to skip data filtering when importing side scan data.

### Side scan data clipping

With the clipping option, you can select a [boundary](#) to clip the resulting side scan image overlay. All pixels not within the boundary won't be calculated. Click the "Select..." button to select one or more (islands can be defined) boundaries, or ignore this setting to import all data.

Sidescan Import Options

Select sidescan import options

Sound Velocity

Sound Velocity: 1500.00 m/s

Swath options

Limit number of return samples per channel: 0 (0 = no limit)

Filter

Apply smoothing filter on the data: Smoothing Median

Clip data

Clip all sidescan data outside this boundary: <None selected, optional>

Select...

Sidescan Hardware Settings...

< Back Next > Cancel

**The "Side scan Import Options" page can be used to customize some settings before importing side scan data.**

### Adjust Gain Settings

For some files, additional gain settings need to be set to get the same color intensity for pixels as the distance from the nadir increases. You can set a time varying gain (10logR, 20logR, 30logR or 40logR) to compensate spreading loss, as well as a correction factor for attenuation of return signals due to sound absorption in the

water. Since both unprocessed and processed data from various brands of side scan sonar equipment can be stored in XTF files, the ideal setting will differ from file to file. It might be needed to experiment with the different settings. To calculate the theoretical sound absorption in decibel per meter, you can click "Calculate..." to launch the sound absorption calculator. You have to copy and paste the the decibel per meter value into the wizard. After adjusting the gain settings, please click "Next" to go to the last page of this wizard.

Adjust Gain Settings

Specify gain settings

Gain Settings

Time Varying Gain: 20logR

Compensate Attenuation: 0.000 Calculate... (Enter a value in dB/meter)

< Back Next > Cancel

***The gain settings can be used to correct the side scan image for spreading and sound absorption losses.***

**Sound Absorption Calculator**

Measurements

Frequency: 455 kHz

Temperature: 20 Celsius

Depth: 10 Meter

Salinity: 35 ppt

Acidity: 8 pH

Result (Absorption)

Absorption: 0.136 db/meter

1.0318 power factor

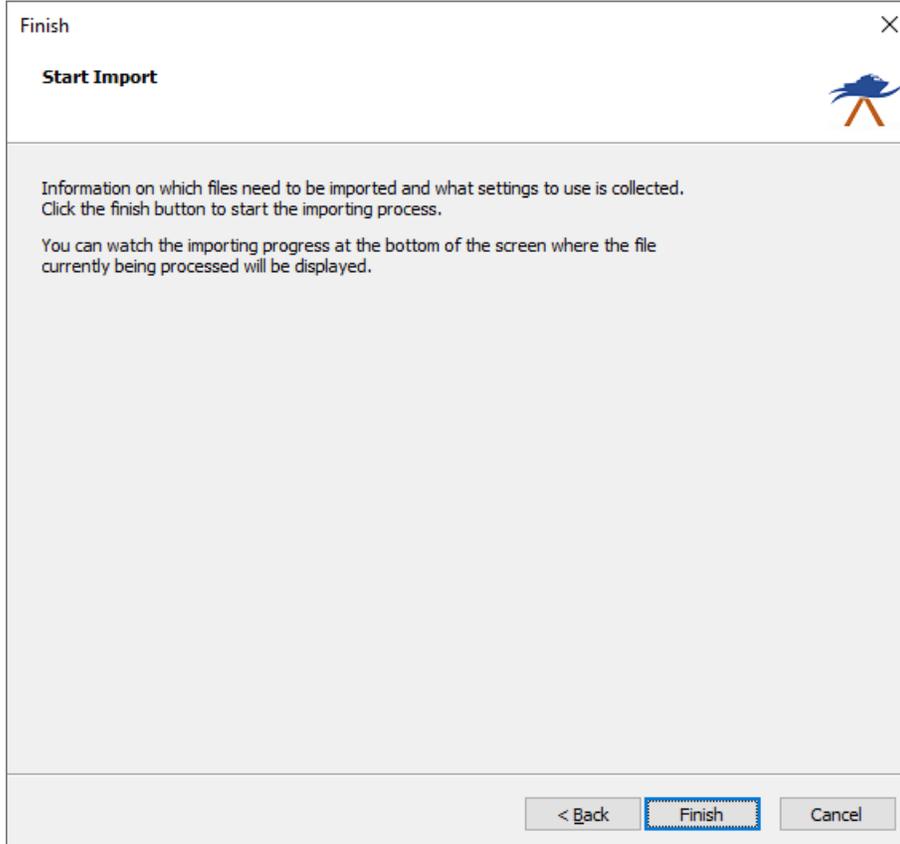
**HYDROMAGIC**

Calculate Close

*The "Sound Absorption Calculator" can be used to calculate the attenuation value.*

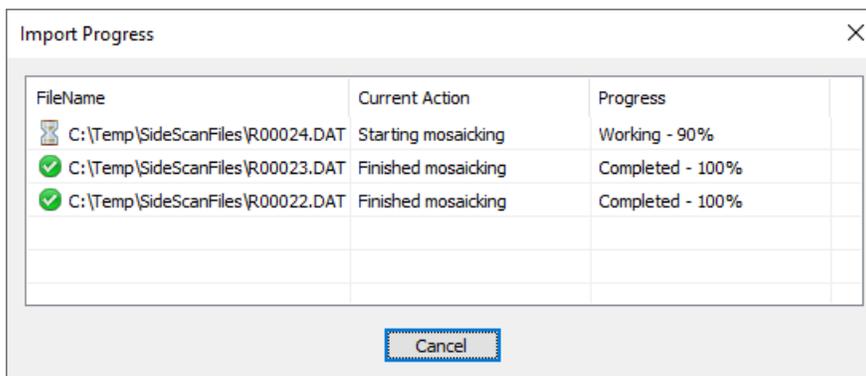
### Starting the import process

After selecting the data format, files, import and gain settings, you can click "Finish" to start the import process. A progress window will show the importing progress of for the selected sidescan files. In case of problems, make sure you always check the "Processing" tab of the [real time activity view pane](#).



**Click the "Finish" button of the last wizard page to start the data import.**

When all files have been processed, they will appear in the project manager, and as map overlays in the map display window. To change the color schema for the images, right click the "Sidescan Files" folder in the "Project Manager" and select the "Sidescan Options..." menu item.



**A progress window will show the progress of the importing process.**

## 9 Dredging

### 9.1 Hydromagic Dredging

#### Monitoring and recording dredging progress

The Hydromagic Dredging package is a module shipped with Hydromagic that allows you to monitor dredging progress. It needs a separate license, and can be purchased with or without the Hydromagic Survey software. The software can log the dredging file as a series of points or by updating a XYZ matrix file. Please note that this feature needs additional sensors to be installed (inclino sensors). Currently the software works for cutter, hopper and backhoe / excavator dredges.

#### Depth vs Elevation

Dredging data can be monitored in either depth or elevation mode. In depth mode, the absolute dredging depth below the waterline is recorded. This option must only be used when the water level is constant. When the water level is variable (tides), the dredging depth is no longer useful, since the tide level isn't logged with the depth (only in the log files, not the matrix).

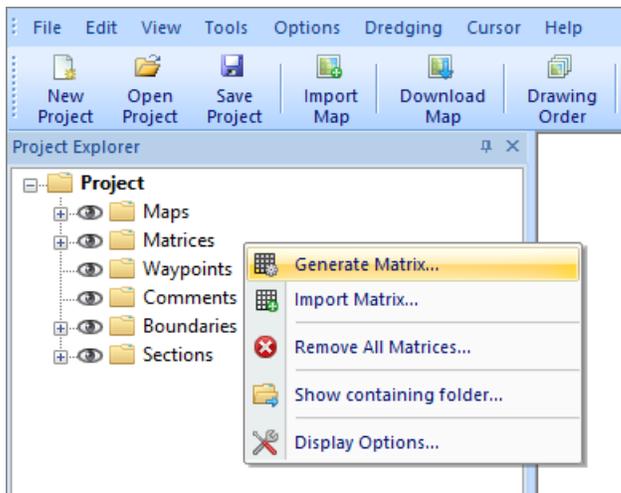
When the water level isn't constant, always use elevation mode. In this mode the dredging depth is stored as an elevation relative to the local height datum (for instance NAVD88). To use this mode, the correct water level has to be entered, or measured with RTK. More information on how to determine the water level with RTK can be found here. To enter the water level manually, select the "Set Tide Level..." option using the manual tide plugin.

#### Creating an empty matrix

When recording dredging data, data can be stored in a user defined log file as well as in a matrix. A matrix is basically a file that contains XYZ coordinates with a fixed cell distance. During the dredge process the cell's will be updated with the maximum dredging depth and displayed as map overlay.

Before we can update a matrix with our data, we have to create an empty one. To do so we first have to specify the area to cover. This should be done by drawing a [boundary](#) first.

When the boundary has been created, make sure the "Project Explorer" is visible ("Project Explorer" from the "View" menu) and right click on the "Matrices" folder.



Select the "Generate Matrix..." option from the popup menu to start a new matrix file.

From the popup menu, select the "Generate Matrix..." option. The "Generate Empty Matrix" dialog appears:

**Generate an empty or pre-filled matrix file which can be used to record dredging depths or elevations**

The matrix file used in Hydromagic has three layers. It is possible to set a preset value in one of the three (pre dredge, dredge and post dredge) layers. To simply monitor dredge progress, just leave the boxes unchecked so all layers are filled with void values.

You can adjust the space of the cells. A cell spacing of 0.5 means that dredging data is stored in a 50 x 50 cm grid. You also need to select a file name and the boundary you created to define the area for the

matrix. When you are happy with the settings, just press "OK" to proceed with matrix creation. After successful creation the new matrix will be displayed in the project explorer.

## Start recording

When you are ready to start recording, just click the "Record" button (🔴) to start recording the XYZ positions of the dredge. Log data files are generated every time you start a new recording. Matrix updating will be performed on the matrix which is set as "Active" in the "Project Explorer".

To pause a recording without generating a new log file, just click the "Pause" button (⏸) instead. When clicking the pause button again, the recording will resume writing data to the same log data file.

During recording, log files should increase in size, display depths on the map and the matrix file should update when the vessel is moving and the dredging depth increases. If nothing is logged, or no matrix updates are visible, please perform the following checklist:

- Is the dredging layer of the matrix selected (button with the blue bar in the middle);
- Is the dredging depth more than the minimum value to be logged in "Preferences" => "Dredging";
- Is the dredging depth more than the preset value entered during the matrix creation (N/A when void was selected);
- Are any alarms triggered as this can pause the recording of data;
- Is the dredging position outside the boundary used to generate the matrix;
- Check the log and matrix display options in the "Project Explorer";
- Are there color ranges defined for the dredging depths recorded;
- Is the matrix used for recording set as active (right click => "Set Active" in project explorer);
- Are the dredging depth and vessel position displayed in green in the "Data View";

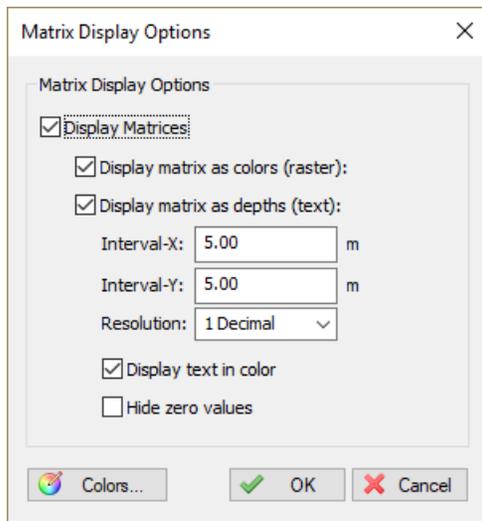
## Matrix Display Options

There are more ways of showing the matrix on the map. You can for instance display it as both colors and text at a specified interval.

It is also possible to not show it (and just use the matrix to export data), to show it with colors only (using the defined color ranges) or to show its depths as text.

To change settings on how the matrix is shown, right click the "Matrices" folder in the "Project Explorer", and select the "Display Options..." option from the popup menu.

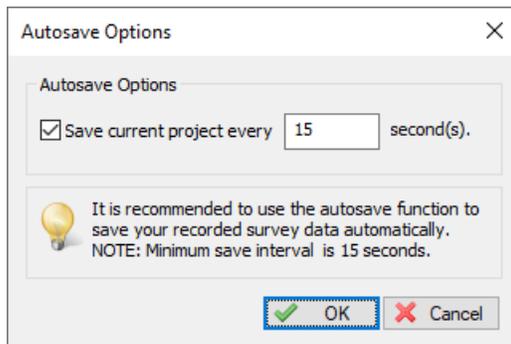
A dialog with all matrix settings will be displayed. It should look like the screen shot below:



## Auto save option

To prevent data loss, for instance due to a PC crash or AC power failure, it is recommended to use the "AutoSave" option. When this option is enabled all project data (including matrix data and log files) will be saved at the specified interval.

To change the auto save option, select "Preferences..." from the "Options" menu, and click the "Miscellaneous" tab. You will see an "Auto save" section at the bottom of this window. Now click the "Setup..." button in this section. Enable the check box when you want to use auto save, and enter an interval (minimum 1 minute). Click the "OK" button to apply the changes.



**Use the auto save option to prevent data loss.**

## Manually saving dredging data

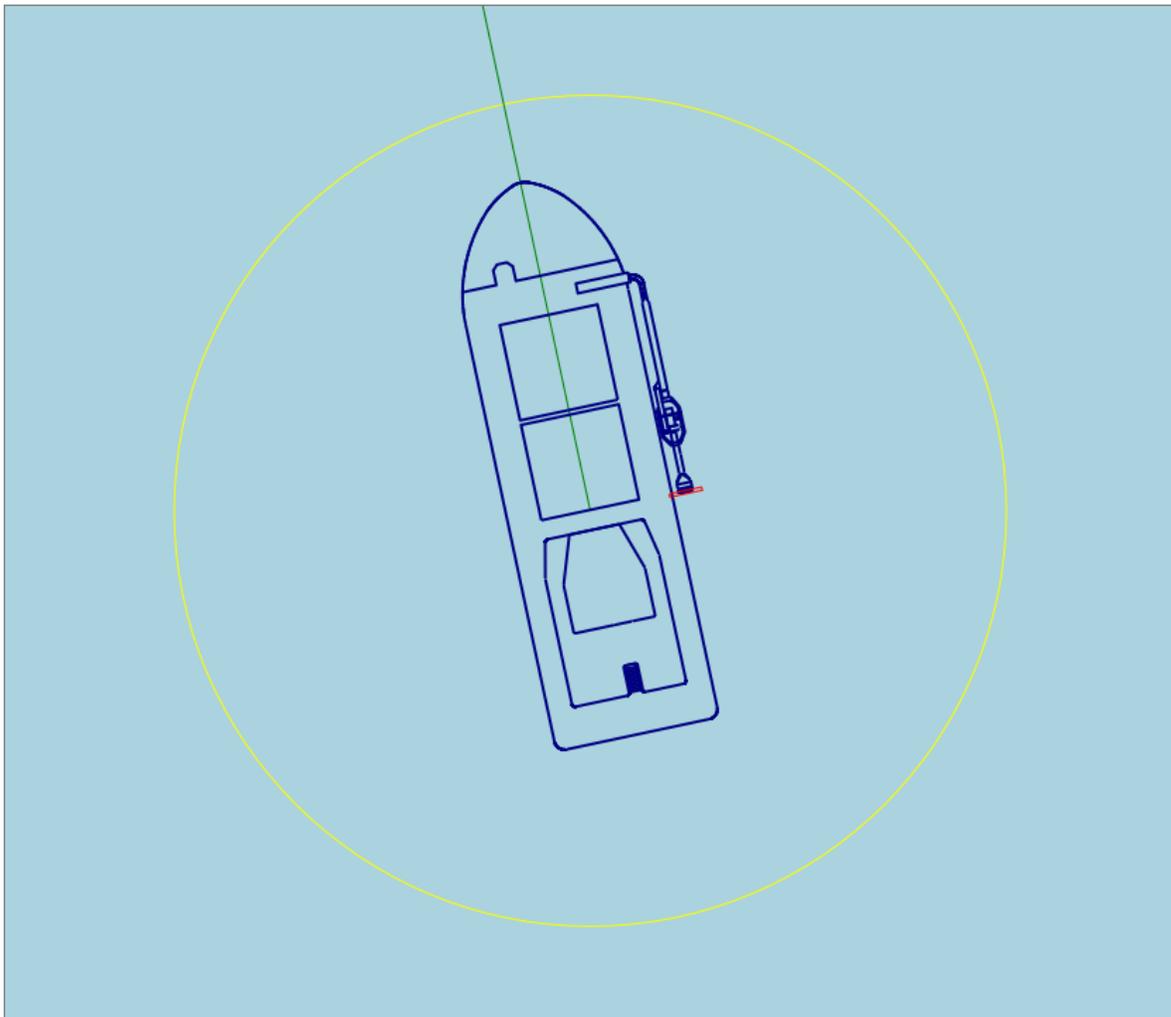
Log files can be saved at any time by just clicking the "Save" button in the tool bar (📁). It will be saved into the "Logs" folder of your project.

## 9.2 Configuring Vessels

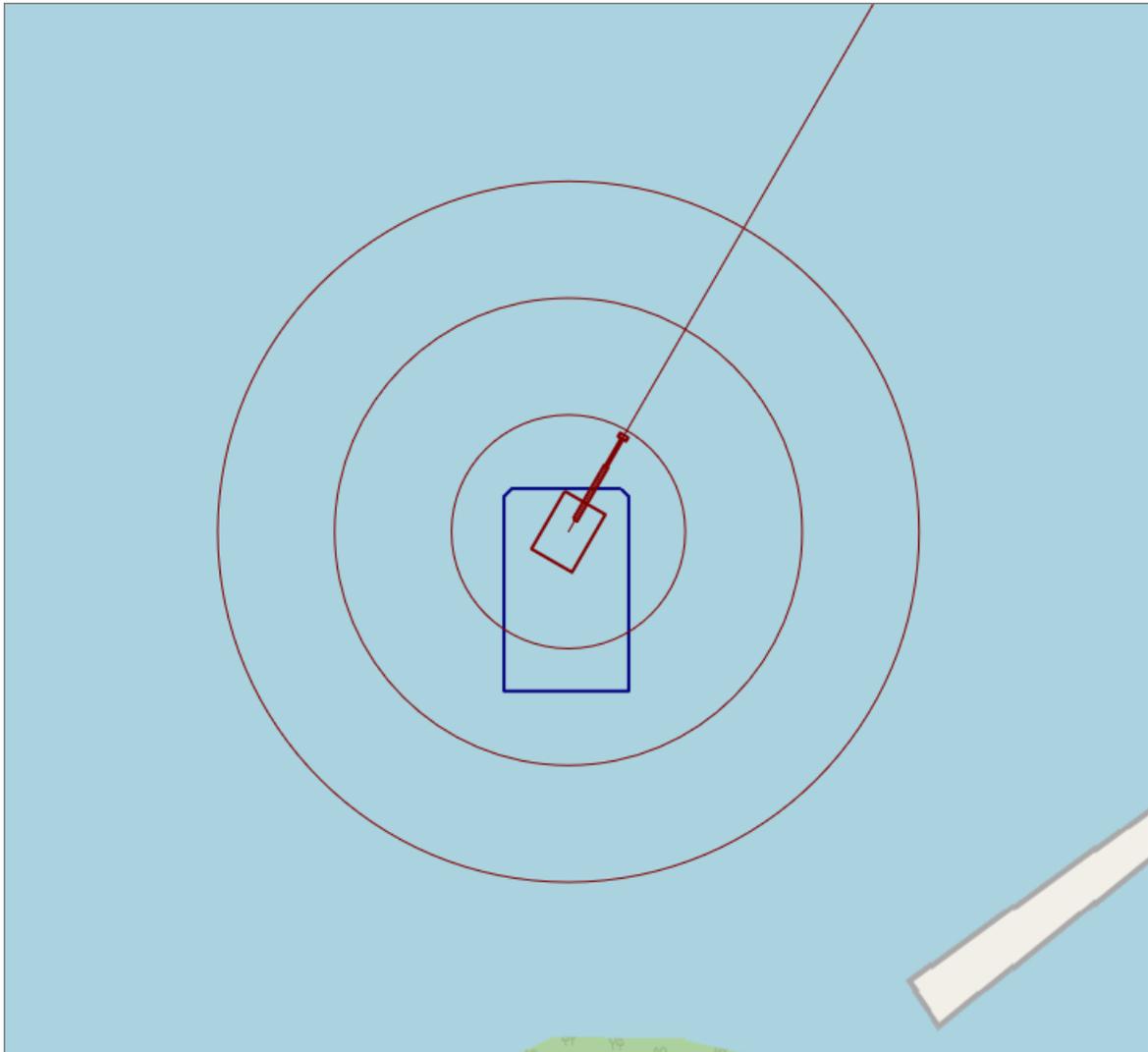
### Vessels in Hydromagic Dredging

In Hydromagic Dredging, a vessel object is used to represent a moving object like a dredger, barge or an excavator. A moving object can be configured as a vessel when it has been equipped with its own (GNSS) positioning system. When configuring dredging equipment, like a suction tube, cutter ladder or backhoe dredger, a vessel is used as a 'base' for this equipment.

Most of the time, for instance when you are configuring a trailing suction hopper dredger or cutter dredger, the dredging equipment is attached to the vessel, and you only have to configure the primary vessel. In the event that an excavator is placed on a barge, and both the barge and excavator are equipped with a positioning system, you have to configure both vessels to show them both in the navigation display. The images below show the difference between a single and dual vessel configuration:



**Single vessel configuration. The dredging equipment is attached directly to the vessel or barge.**

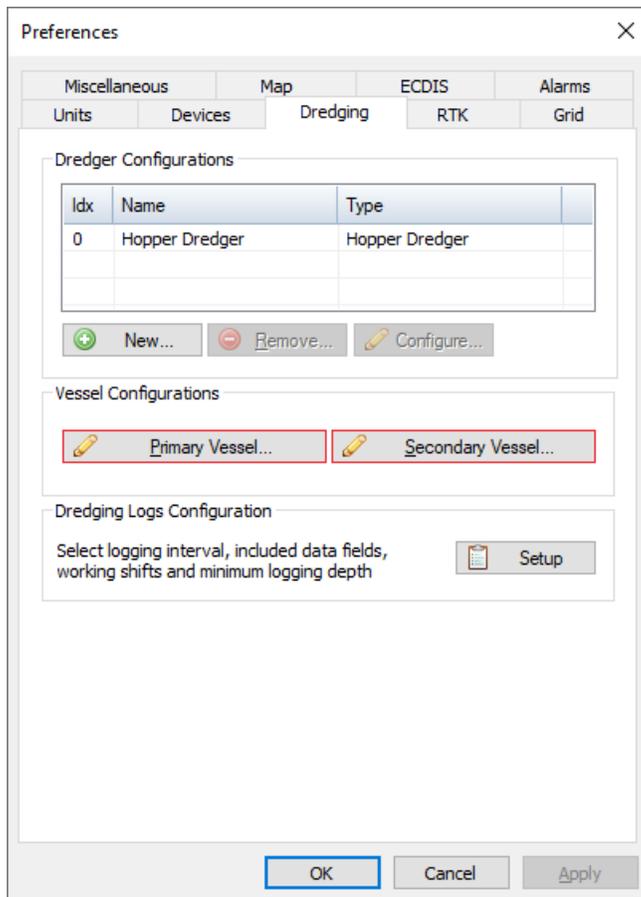


*Dual vessel configuration. The excavator (red) has its own positioning system and can move around the barge (blue).*

### Configuring Vessels

To change the description, shape, color or other map display settings of a vessel, select "Preferences..." from the "Options" menu and select the "Dredging" tab. On this tab, you will find two buttons labeled "Primary Vessel..." and "Secondary Vessel...". Click the "Primary Vessel..." button to setup your vessel or barge. The "Secondary Vessel..." button can be used to setup, for example, an excavator which is on the barge.

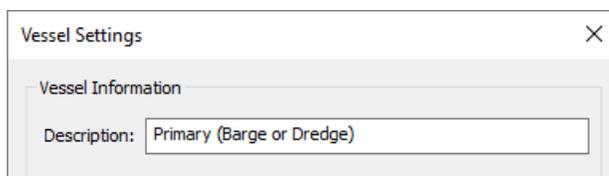
***NOTE: When two vessels are drawn in the display view despite of having only one vessel configured, just un-check all the data sources in the secondary vessel configuration screen to get rid of the second shape. See the "Selecting data sources" paragraph for more information.***



Configure the vessel's from the "Dredging" tab.

## Vessel Description

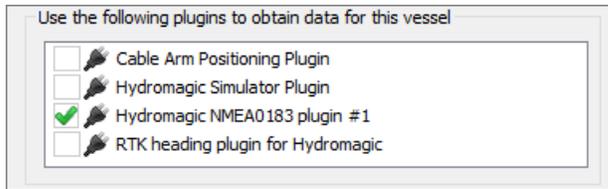
You can enter a vessel description in this field, for instance "Barge" or "Excavator". When configuring dredging equipment you can select the 'base' vessel by selecting this name. This is also the name which is displayed when including the vessel name in user defined log files. It is not allowed to use special characters here (except for spaces).



Enter a descriptive name for the vessel.

## Selecting data sources (plugins)

By checking the check boxes, you can select which data sources (or plugin data) is used to set the vessel's position, heading, speed and motion (pitch and roll). When only one vessel needs to be configured, check all the boxes for the primary vessel and un-check all boxes in the secondary vessel's configuration. No need to select dredging sensors here, unless they provide draft, pitch or roll information.

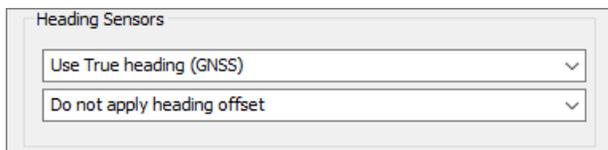


*Select the plugins used to position the selected vessel.*

## Heading sensor configuration

Some plugins for position can report both magnetic and true heading. For instance when data is coming in via a data combiner, or when a GNSS device contains a built in magnetic compass. True heading is a heading calculated by movement, for instance by calculating heading between the current and previous position. When a magnetic compass or gyro has been installed, select the magnetic heading rather than a true heading, since a magnetic heading is also reliable when the vessel is not moving (or very moving slowly).

When using a RTK or GNSS heading sensor, it is sometimes needed to apply an additional offset. For instance when antenna's are placed next to each other instead of parallel to the vessels direction. In this case select a 90 or 270 degrees offset.

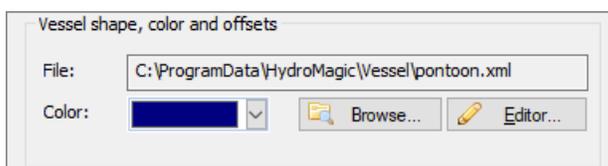


*Select which heading sensor to use, either a compass or calculated heading.*

## Vessel shapes and color

In this section you must provide a shape file for the vessel. This can be the shape of a barge, vessel or excavator. When you are configuring an excavator on a barge, where both the excavator and barge are equipped with their own positioning system, you have to select the barge shape for the primary vessel and the excavator shape for the secondary. Click the "Browse..." button to select a vessel shape. Hydromagic ships with a collection of vessel shapes which are installed in the "Vessel" folder. By clicking the "Editor..." button you will launch the "[Vessel Designer](#)", which can be used to draw or modify vessel shapes, or to import vessel shapes from AutoCAD DXF files.

You can select other vessel colors, for instance make sure the vessel contrasts with the background map (i.e. dark color when a street map or vector map is used, or yellow to improve visibility on a satellite image).



*Select the vessel (top view) shape file to be used in the map view.*

## Distance rings

With the "Ring Count" option set to any value higher than zero, a set of rings will be drawn around the ship at fixed intervals. Use this function, for example, to see at a glance how far away the objects are from the boat. Another useful option is to set the interval to the distance between survey lines to get

some sort of guidance. In addition to setting the distance between the rings and the number of rings, it is also possible to choose a drawing color for the rings, which is clearly visible against the background.

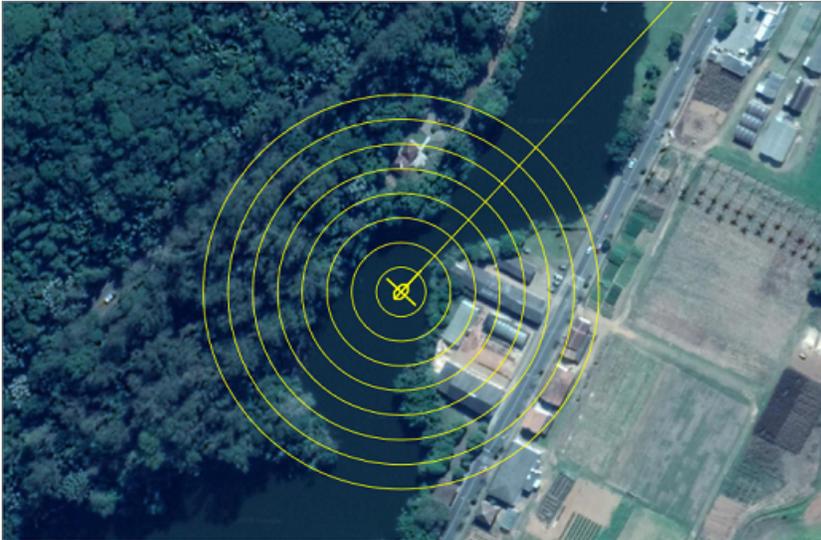
Distance Rings

Ring Count:

Ring Interval:  m

Ring Color:

*Distance rings can be used to see how far away objects are.*



*Distance rings around your GNSS position at a specified interval.*

## Course Line

The course line can be used to see where the vessel is going. Please note that the course line is indicating the correct heading only when the NMEA0183 output of your GPS or RTK receiver outputs this information and the vessel is moving. Alternatively, a compass or RTK heading sensor can be used to determine the correct course.

Course Line

Show bearing

Line Width:  pixels

Line Color:

*Check the show bearing option to display a course line on the map display.*

## Saving the settings

Click the "OK" button to save your changes. When more than one vessel needs to be displayed on the map display, just repeat this step for the secondary vessel by clicking the "Secondary Vessel..." button on the "Dredging" tab in the global preferences window.

Vessel Settings

Vessel Information

Description: Primary (Barge or Dredge)

Use the following plugins to obtain data for this vessel

- Hydromagic Simulator Plugin
- Cable Arm Positioning Plugin
- Hydromagic NMEA0183 plugin #1
- Hydromagic NMEA0183 plugin #2

Heading Sensors

Use True heading (GNSS)

Do not apply heading offset

Vessel shape, color and offsets

File: C:\ProgramData\HydroMagic\Vessel\TSHD\_Vessel.xml

Color:  Browse... Editor...

Distance Rings

Ring Count: 3

Ring Interval: 10.00 m

Ring Color:

Course Line

Show bearing

Line Width: 1 pixels

Line Color:

In Hydromagic, a "Vessel" is used to represent a moving object with its own positioning system, like a barge or excavator.  
[Click here for documentation on how to configure vessels.](#)

OK Cancel

*An example vessel configuration using the first NMEA0183 plugin for positioning.*

## 9.3 Configuring Dredging Equipment

### Dredging Equipment

---

In Hydromagic Dredging, you can configure one or more pieces of dredging equipment depending on the license you have bought. Three different license models are available:

### **Single Head License**

With the single head license you can monitor one dredge head only. This option will probably be sufficient for most cutter and trailing suction hopper dredgers. This license limits the number of dredge heads that will be recorded to just one. You are allowed to configure multiple pieces of equipment, but only one can be used at a time.

### **Dual Head License**

To monitor a trailing suction hopper dredger with two suction tubes, you need the dual head license to be able to monitor two dredge head positions at a time.

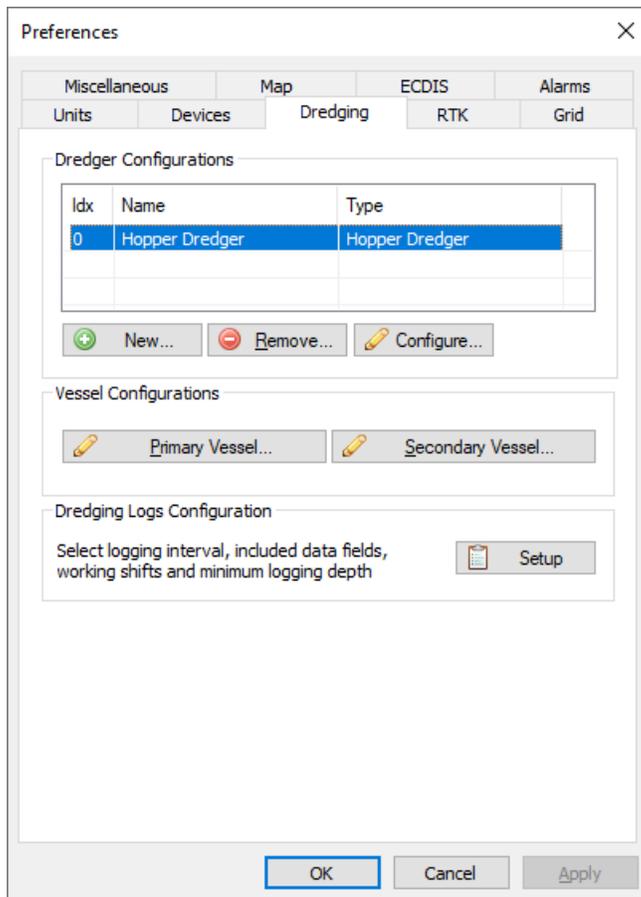
### **Excavator or Backhoe License**

To monitor the position of an excavator or backhoe dredger, you need this license. It supports monitoring of the excavator position, rotation and you can display the barge and excavator independently.

## **Dredging Equipment Configuration**

Dredging equipment can be configured by selecting a vessel, attachment position and by adding the segments that make up the dredging equipment, for instance, when configuring a backhoe dredger, you select the barge, position on the deck and the cabin, boom, stick and bucket segments. Because of this modular approach, you can configure almost every type of equipment. For instance, when your excavator contains a second boom, you just load the standard excavator configuration and adapt it by just adding a new boom segment.

To start configuring dredging equipment, select the "Preferences..." option from the "Tools" menu and select the "Dredging" tab. In the "Dredger Configurations" list, the already configured items will be displayed. You can remove the existing item(s) by selecting them one by one and clicking the "Remove..." button. Now you can add a new configuration item by clicking the "New..." button.



Click the "New..." button to add a new dredging equipment configuration.

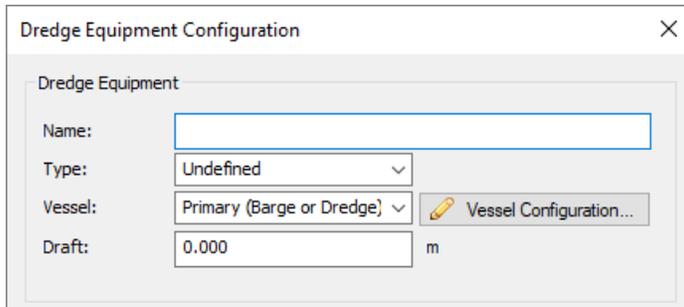
### Adding new equipment

After clicking the "New..." button the "Dredge Equipment Configuration" dialog will be shown. In this manual, we will call each suction tube, excavator or other tool "Dredge Equipment". First add a name for the equipment. This is how we can select it in the data or digging views. This is also the name written to the log file when the "Dredge Name" field is included. Since it could be written to a file, no special characters other than alphanumeric characters and spaces are allowed. Good examples are: "Hopper Dredger (STBD)", "Hopper Dredger (PORT)", "Cutter" or "Excavator".

Use the "Type:" drop down box to select the type of equipment. Examples include: "Excavator", "Backhoe", "Cutter" and "Hopper". It is important to set this option correctly, otherwise you wont be able to configure the dredge segments correctly.

Dredging equipment has to be associated with a 'Vessel' to which it has been attached. You can select a vessel from the drop-down list. For all configurations other than excavators, you should choose the first option (Primary). You can read more on vessels in the "Configuring Vessels" document.

After selecting the vessel, click the "Vessel Configuration..." button to select the shape file used to display the vessel itself.



The first section of the dialog contains some important global settings.

### Attachment Point Coordinates

The dredging equipment is always attached to the vessel. In order to calculate the correct easting and northing coordinates for the dredge head, you have to enter the coordinates of the attachment point relative to the vessel's center point. After importing a drawing of your vessel into the "Vessel Designer", you can place a pivot point at the attachment position to read out the XYZ coordinates of this point as shown in the image below.

Regarding the vessels center point, it doesn't really matter how you center your vessel around the (0, 0, 0) coordinate in the vessel designer, as long as all sensors are relative to this point (attachment point, draft sensor and GNSS antenna).

Determining the attachment point(s) on the vessel

PIVOT POINT VESSEL

**OPTIONAL:**

Place the pivot point at the location where the suction tube or trunnion is attached to the vessel and click the "Offsets" button to show the coordinates which can be used as attachment point.

For dredging segments the pivot point is mandatory, it instructs Hydromagic where to connect the next segment.

Since a vessel can have more than one dredger to it, the attachment point is in this case entered in the "Dredge Equipment Configuration" dialog.

**VESSEL SHAPE(S)**  
 Vessel shapes can be drawn by hand, or imported from an AutoCAD DXF file.

The attachment points can be determined by analyzing a drawing of the vessel in the "Vessel Designer".

## Logging and display options

In the logging and display options section, you can select whether or not to use the dredge head position to update the matrix or log file. You can also disable alarms for this dredge head. This can be useful when you have two suction tubes on a hopper dredger and a sensor on one of the tubes is malfunctioning. In this case, you can still log data from one dredge head only.

Logging and display options

- Use this equipment to update the matrix
- Use this equipment to update the dredging log
- Include this equipment on the map view (top view)
- Apply configured alarms to this equipment

*Various (logging) options for the selected dredge equipment.*

## Dredge Segments

In the dredge segments section, you can add all the segments that make up the dredge equipment. The following segments can be defined:

- Cutter Dredger: Ladder and cutter head;
- Trailing Suction Dredger: Trunnion, ladder and dredge head;
- Excavator: Base, cabin, boom, stick, quick attachment, dog bones and bucket;

Use the "Add..." button to start adding a new segment. With the "Edit..." button you can access calibration options or change the length or length of a segment. It is important to add the segments in the correct order. The segment which is attached to the vessel comes first, and the dredge head or excavator bucket last. You can change the order of the segments by selecting the item you want to move, and clicking the up and down arrows to move the item up or down the list.

For more information on the types of segments, and how to configure them, please refer to the "Configuring Dredger Segments" manual page.

Name	Type	Length
Trunnion	Trunnion	0.645
Ladder	Ladder	14.715
Head	Dredge Head	N/A

*In the "Dredge Segments" section you can define the segments of your dredge equipment.*

## 9.4 Configuring Dredger Segments

### Configuring Dredge Segments

In Hydromagic Dredging, dredging equipment is configured by adding dredge segments. A dredge segment is any moving part of the dredger, for instance:

- Cutter Dredger: Ladder and cutter head;
- Trailing Suction Dredger: Trunnion, ladder and dredge head;
- Excavator: Base, cabin, boom, stick, quick attachment, dog bones and bucket;

- This configuration method allows you to compose almost any dredger configuration by just adding segments. Each set of segments is called dredging equipment. You can have multiple dredging equipment items configured in Hydromagic Dredging. Dredging equipment can be connected to a vessel using an attachment point.

## Adding a segment

When adding a new segment, the "Configure Dredge Segment" dialog will be displayed. In this dialog you select the type of segment to be added, the shape file used to visualize the segment on the screen and the data source which controls the movement of this segment (inclino sensor, bubble sensor, rotation sensor, etc...).

Configure Dredge Segment

Dredge Segment

Name: Ladder

Type: Ladder

Segment shape file

Shape File: (2D): cutter\_ladder.xml

Browse... Editor...

Segment Length

Segment Length: 14.715 m  Auto Scale Shape File(s)

Data Source(s) - Plugins Used

Plugin Name	Sensors Used
Cable Arm Positioning Plugin	Indino #1 (Vert)

Add Remove... Edit.. Calibration...

Use this dialog to configure dredge equipment segments or items. In Hydromagic Dredging, a segment is a moving part of the dredge equipment, like a boom, ladder, stick, bucket or dredgehead.

[Click here for documentation on how to configure dredging equipment segments.](#)

OK Cancel

**Adding a new segment to the dredge equipment definition.**

## Selecting the segment type

First you have to define the type of segment to be added. The different segment types are explained in detail below:

### Base

The base of an excavator, the part where the wheels are attached to. This type can only be used when configuring an excavator. When the excavator is attached directly to the vessel (i.e. a backhoe dredger),

skip this segment and start with the 'Cabin'. Hydromagic assumes the base is always at a fixed position on the vessel, which means you only have to define a shape for the base.

### **Cabin**

The cabin of an excavator, which is where the operator controls it. This segment type can be used for an excavator or backhoe dredger. If the cabin can rotate relative to the 'base', and it does not have its own GNSS positioning system with heading, you have to define a rotational sensor in the data source settings. Please note that the rotation of the cabin will not be displayed in 2-dimensional side views.

### **Boom**

The 'boom' of an excavator is the first vertically moving segment attached to the cabin of the excavator or backhoe dredger. This segment should be equipped with an inclino sensor to report the vertical angle of the segment.

### **Stick**

The 'stick' of an excavator is the second vertically moving segment which is placed between the 'boom' and 'bucket'. This segment should be equipped with an inclino sensor to report the vertical angle of the segment.

### **Bucket**

The bucket can be attached to the stick directly or via a 'quick attachment'. When a quick attachment is used, configure this segment before adding the bucket to the segment list. When the inclino sensor is mounted on one of the dog bone segments rather than on the bucket directly, click the "Settings..." button to enter the dimensions of the dog bone segments.

### **Trunnion**

When a suction tube or ladder is connected to the side of the vessel, it is connect via a part called the 'trunnion'. This parts adds an additional horizontal offset to the dredge position. When configuring a hopper dredger, add the trunnion segment first.

### **Ladder**

A ladder can be a vertically (and sometimes horizontally) moving segment where the cutter head or dredge head is connected to. Some trailing suction hopper dredges, with a greater depth range, might have two or even three ladder segments between the vessel and the dredge head.

### **Dredge Head**

Configure a dredge head to enter the dimensions of the dredge head. It is important to enter the correct width for the dredge head so the matrix can be updated accordingly. When the dredge head shape is in the ladder shape file, just set the length of this segment to zero, and enter the head dimensions only by clicking the "Settings..." button.

### **Cutter Head**

Configure a cutter head to enter the dimensions of the cutter head. It is important to enter the correct width for the dredge head so the matrix can be updated accordingly. When the cutter head shape is in

---

the ladder shape file, just set the length of this segment to zero, and enter the head dimensions only by clicking the "Settings..." button.

### Segment Shape File

The segment shape file is a collection of lines which represent one of the dredger segments. This file is used to present the user with a top or side view of the dredger. For each moving segment you have to specify a shape file. Hydromagic is shipped with a collection of files for different dredge segment types. Using the 'Vessel Editor' tool, you can draw your own shapes, or import shapes created in AutoCAD.

### Segment Length

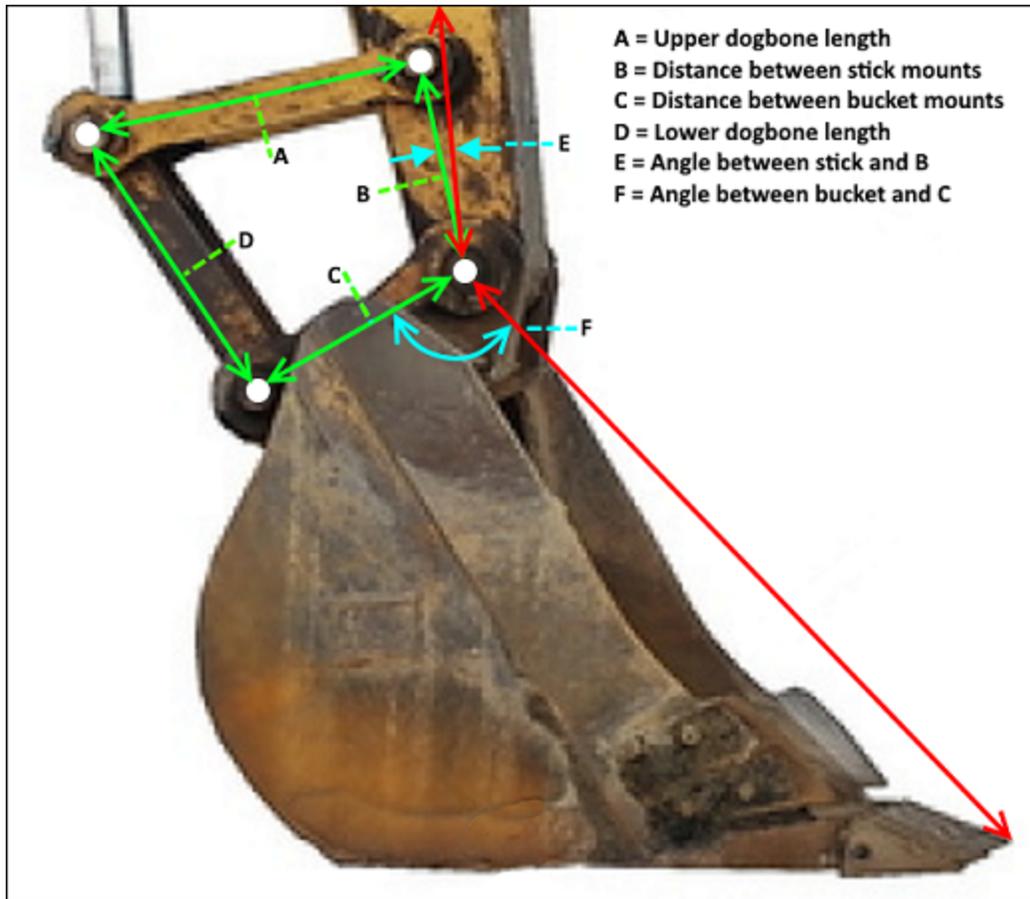
### Data Sources

## 9.5 Dogbones configuration on excavators

### Excavator dog bones configuration

To prevent the bucket sensor from being damaged, it is often placed above it on the so called dog bone. The dog bone is a piece of metal with the shape of a dog bone which is attached to the stick. When the sensor is placed here, additional calculations should be made to calculate the angle of the bucket.

The formula needed to calculate the bucket angle requires some additional parameters, like the dimensions of some parts, as well as the angles between them. Have a look at the image below to see what needs to be entered:



*Enter the dimensions of the 'Dog Bone' segments when sensor is not placed on the bucket*

### Entering the dog bone dimensions

To enter these variables, select the "Preferences..." option from the "Options" menu. Next click the "Dredging" tab and double-click the excavator in the dredging equipment list. In the list of segments, locate the "Bucket" and double click it. Now click the "Settings..." button next to the segment type.

Configure Dredge Segment

Dredge Segment

Name:

Type:

Segment shape file

Shape File: (2D):

Segment Length

Segment Length:  m  Auto Scale Shape File(s)

Data Source(s) - Plugins Used

Plugin Name	Sensors Used
Cable Arm Positioning Plugin	Incino #3 (Vert)

 Use this dialog to configure dredge equipment segments or items. In Hydromagic Dredging, a segment is a moving part of the dredge equipment, like a boom, ladder, stick, bucket or dredgehead.  
[Click here for documentation on how to configure dredging equipment segments.](#)

**The bucket settings can be found in the dredge segment configuration dialog.**

You can now enter the dimensions and angles of the dog bones. You can enter the lengths in any unit you want, as long as the unit used is the same for all four length values. The angle values should be entered in degrees. To test the configuration, you can simulate the excavator sensors by using the "Excavator Simulator" plugin which is shipped with the product.

*Enter the dog bone lengths and angles in the Excavator Bucket Configuration dialog.*

## 9.6 Excavator or backhoe calibration

### Excavator or backhoe calibration

To determine the position of the various moving segments on an excavator (boom, stick, bucket etc...), angle or gravity sensors are mounted on these segments to tell the software their position. Since it is not always possible to mount the sensors absolutely in line with the segment, or they can be a little off, you have to calibrate the sensors.

In Hydromagic Dredging, calibration can be done by adding an offset to all measurements. You could use a leveler and correct all values by hand, but since the segments off the excavator form a triangle, we can use math to fix this problem.

Preparation

Before starting the calibration process:

- Make sure all sensors are powered on and connected to the system;
- Check whether the correct plugin for your dredging system has been loaded;
- Check whether sensor values are coming in;
- Make sure that the segment lengths are entered correctly;
- Make sure the dog bone dimensions have been entered when the sensor is not placed on the bucket itself.

To start the calibration tool, select the "Preferences..." option from the "Options" menu. Next click the "Dredging" tab and double-click the excavator in the dredging equipment list. When the equipment is configured as excavator or backhoe dredger, the "Calibrate Excavator..." button should be visible.

**Dredge Equipment Configuration** ✕

---

**Dredge Equipment**

Name:

Type:  🔧 Calibrate Excavator....

Vessel:  🔧 Vessel Configuration...

Draft:  m

---

**Attachment Point Coordinates (relative to selected vessel center)**

Coordinate X:  m

Coordinate Y:  m

Coordinate Z:  m

---

**Logging and display options**

Use this equipment to update the matrix

Use this equipment to update the dredging log

Include this equipment on the map view (top view)

Apply configured alarms to this equipment

---

**Dredge Segments**

Name	Type	Length
Base	Base	1.800
Boom	Boom	11.280
Stick	Stick	5.920
Bucket	Bucket	2.960

➕ Add
➖ Remove...
🔧 Edit..
⬆️
⬇️

---

💡 Use this dialog to configure dredge equipment which is attached to the selected vessel or barge. When configuring an excavator which has RTK on the cabin, configure the cabin as a vessel rather than a segment.

[Click here for documentation on how to configure dredging equipment.](#)

✔ OK
✖ Cancel

Click the "Calibrate Excavator..." button to open the calibration tool.

## Positioning the excavator

Before starting the calibration, we have to position the excavator to form a triangle while the bucket is vertically and with the tooth at the same level as the barge deck or the ground. The image below should make things more clear.

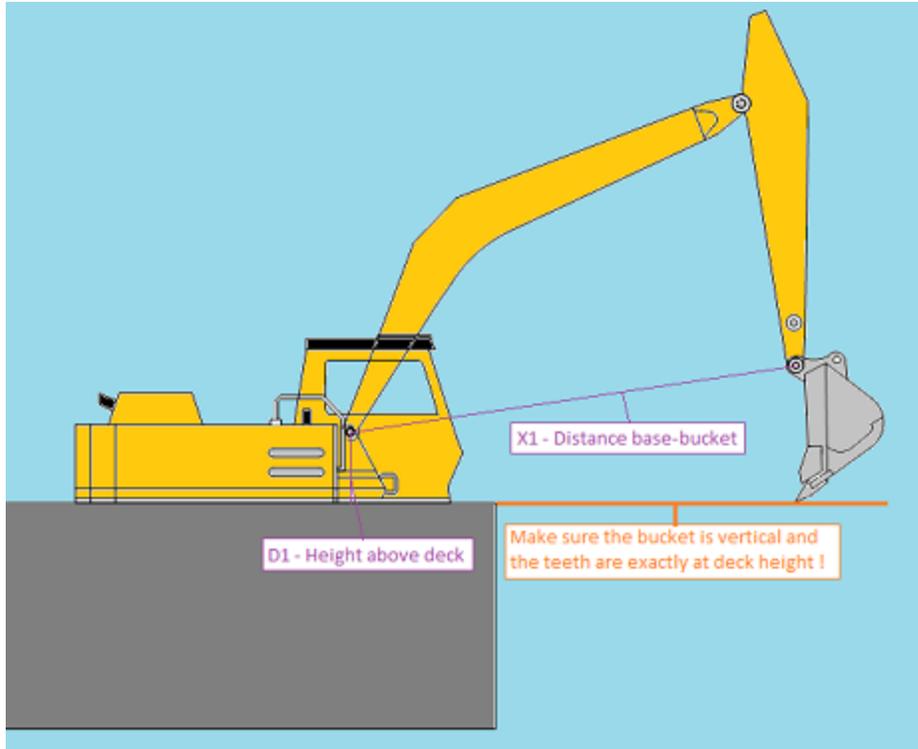
When the excavator is in the correct position, you have to do two measurements:

### X1 Measurement

Measure the distance between the joint on the base to the joint on the bucket. Please note that the length has to be measured between the center of the joints. If needed convert the length to meters and write it down.

### D1 Measurement

Measure the distance between the joint on the base and the ground or deck of the vessel. Please note that you have to measure from the center of the joint. If needed convert the length to meters and write it down.



**Measure the D1 and X1 distances in order to calibrate your excavator or backhoe.**

### Starting the calibration tool

When measurements have been taken, the excavator is still in the correct position and the sensors are sending data, we can start the calibration tool. Please go back to the excavator settings and locate and click the 'Calibration...' button.

The parameters needed for the calibration are the segment lengths as well as the X1 and D1 values we measured. The lengths are already filled in, you only have to supply the X1 and D1 value.

Calibrate Excavator Sensors

Enter measured distances

L1:	11.28	m	Offset #1:	45.00	deg
L2:	5.92	m	Offset #2:	45.00	deg
L3:	2.96	m	Offset #3:	45.00	deg
H1:	4	m			
X1:	12	m			

To calculate the calibration values for the sensors, place the bucket vertically and against the ground. H1 is the distance between the ground and the boom. X1 is the distance between the boom and bucket joints.

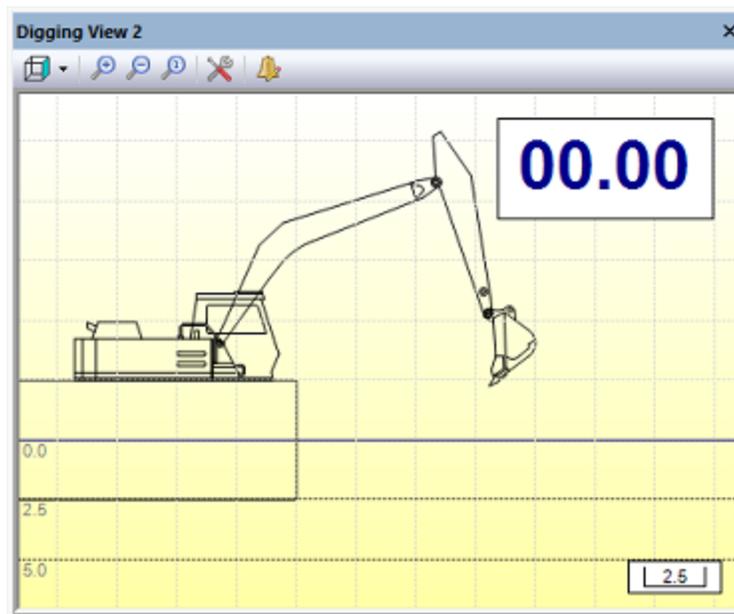
[Click here for more detailed documentation on excavator or backhoe calibration.](#)

Calculate Reset OK Cancel

Enter the 'X1' and 'D1' measurements and click 'Calibrate' to calibrate the angle sensors.

Before doing so, reset any previous calibrations by clicking the 'Reset' button. After you have filled in the correct values, click the 'Calculate' button. The software will display the suggested calibration settings. Now click 'OK' to accept them

After calibration the dredging view should display the same positions as the 'real' excavator.



The digging view should look like this after calibration.

## 9.7 Configuring an echo sounder

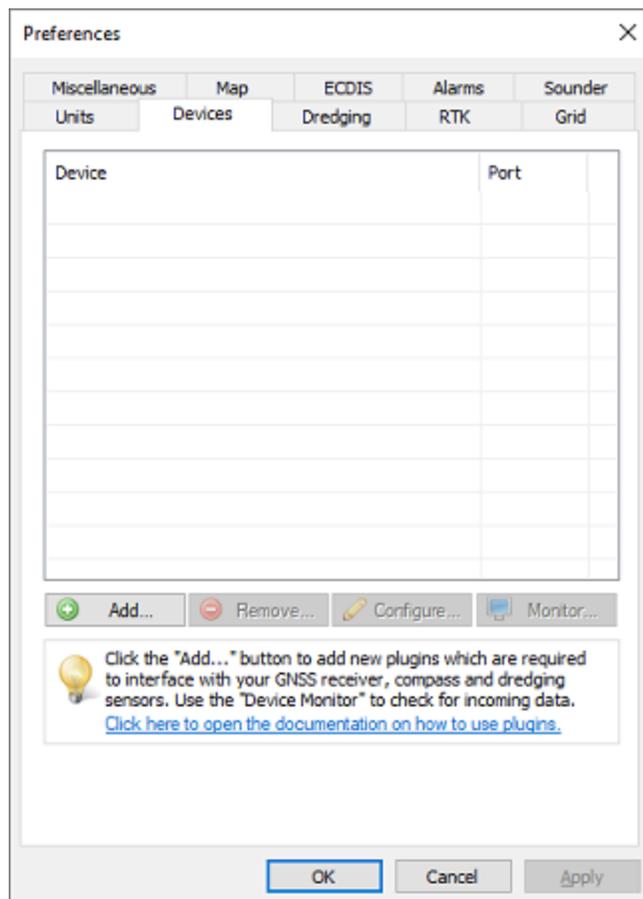
### Configuring an echo sounder in Hydromagic Dredging

In Hydromagic Dredging, it is possible to connect an echo sounder, and display the depth below the dredger. You can even use the echo sounder to update a layer of the current matrix with the current depth for the matrix cell. This manual page explains how to load the plugin for an echo sounder, display the depth in the data view and how to configure the dredging software to be able to store depth readings.

Please note that the dredging software can not be used to perform hydrographic surveys. The resolution of the sounding locations is limited by the cell size of the matrix and no post processing functions are offered. You will not be able to perform sound velocity, motion and latency corrections on the soundings. To perform a high accuracy post-dredging survey, the Hydromagic Survey software should be used.

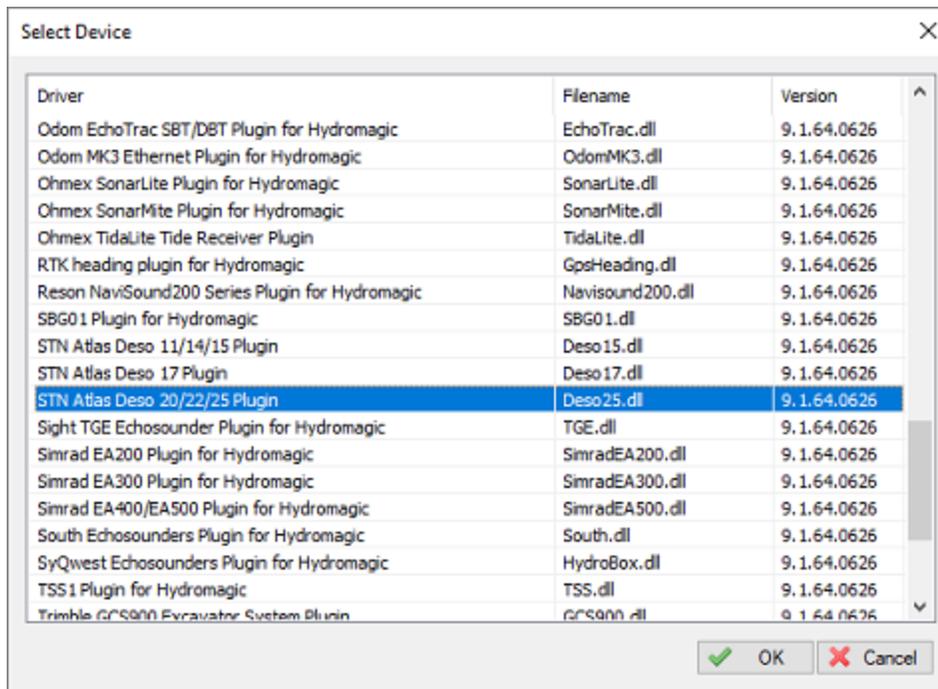
### Loading an echo sounder plugin

In Hydromagic, a plugin is a piece of software between the actual hardware (RTK receiver, echo sounder, motion sensor etc) and the Hydromagic Survey or Hydromagic Dredging software. To be able to read data from an echo sounder, an echo sounder plugin has to be loaded and configured first. To load a plugin, select the "Preferences..." option from the "Tools" menu and select the "Devices" tab:



**Open the "Devices" tab in the "Preferences" dialog to load a plugin.**

When a plugin for the echo sounder has not been loaded yet, click the "Add..." button to select a plugin to load. After selecting the plugin in the list, you have to configure the communication parameters for the serial port or Ethernet connection to start reading data. For more detailed information on loading and configuring plugins, please check the ["General information on using plugins"](#) page.

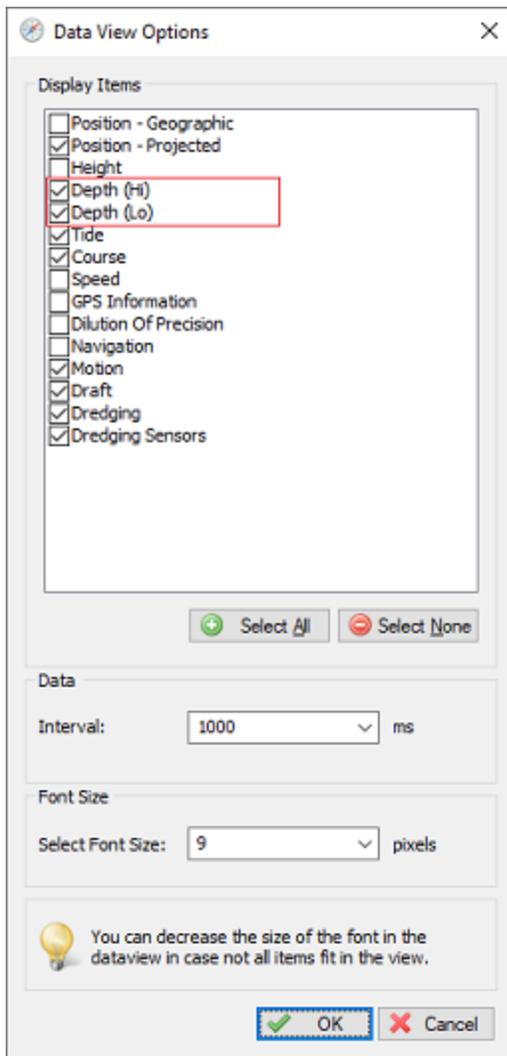


*Select a plugin for your echo sounder when not already done so.*

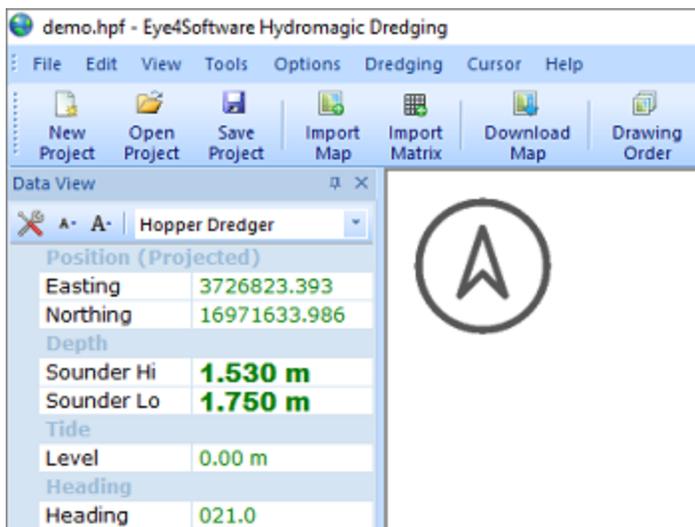
## Displaying echo sounder depth measurements

When done loading and configuring the echo sounder plugin, the green check before the plugin description in the "Devices" tab indicates that data is coming in and recognized as depth information. Now that data is coming in the depth(s) should be displayed in the "[Data View](#)" display. When the depth is not displayed in the data view, right click on the window and check the "Depth (Lo)" or "Depth (Hi)" items to enable depth display.

In case data is coming in, and no depth is displayed, make sure to check your vessel settings. The vessel using the echo sounder should have the echo sounder plugin selected in its data source list.



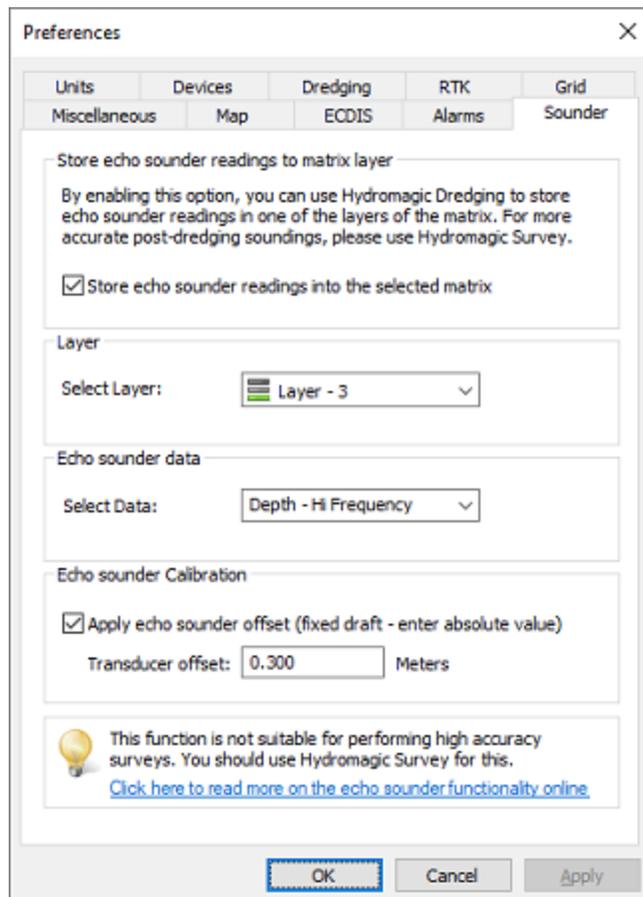
**Check the "Depth" options to show echo sounder depth readings.**



**Dual frequency depth readings in the "Hydromagic Data View".**

## Updating a matrix layer with echo sounder readings

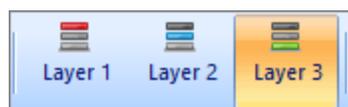
Another use of the echo sounder installed on the dredge, is to update matrix cells with the last echo sounder reading. Please note that the last value is stored, since the echosounder probably should detect that the depth of a cell has increased after dredging. To configure the echo sounder to perform matrix cell updates, select the "Preferences..." option from the "Options" menu and select the "Sounder" tab.



**Configure matrix updates in the "Sounder" tab.**

### Select layer to be updated

First of all, you have to enable this option by checking the "Store echo sounder readings into the selected matrix" check box. This enables the other settings in the dialog. By default the "Post Dredging" layer (layer #3) will be updated. You can however select layer 1 and 2 as well. Please note that layer 2 is also updated by the dredge head. To show the matrix updates for the selected layer, you can switch between the different matrix views by clicking the appropriate button in the tool bar:



**Select the correct matrix layer to show the matrix updates.**

### Select echo sounder data

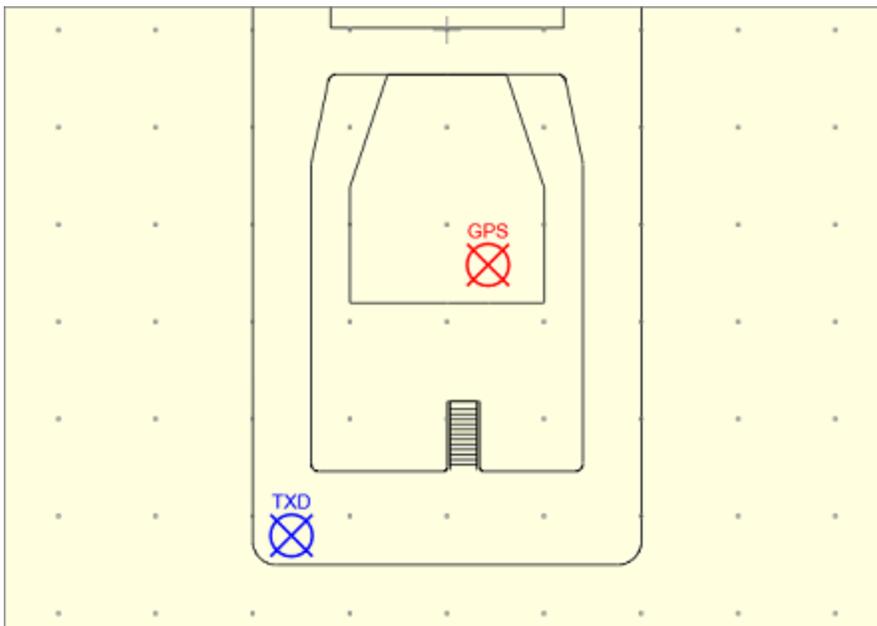
With the "Select Data" switch, you can select which echo sounder readings are recorded. At this moment, this switch can be used to toggle between high and low frequency echo sounder depths. When using a single frequency sounder, set this to "Depth - Hi Frequency". With a dual frequency sounder you might want to select the "Depth - Lo Frequency" option to record the depth of the bottom ignoring the mud on top of it.

### Echo sounder draft

If draft hasn't been set in the echo sounder, check the "Apply echo sounder offset" check box and enter the absolute value of the distance between the bottom of the transducer and the water surface. This value will automatically be added to the depth reported by the echo sounder plugin.

### Setting the horizontal transducer offset

When your echo sounder transducer is not directly below your GNSS antenna, make sure you configure the horizontal offset. This can be done in the "[Vessel Designer](#)". When the matrix is being updated, double check that the cell updated is actually at the echo sounder's position.



*It is important to make sure the echo sounder transducer location has been set in the "Vessel Designer".*

### Start Recording

Click the "Record" button to start recording data, this works the same as recording dredge head position data. Both echo sounder and dredge head data will be stored into the matrix simultaneously. With the matrix visible and the correct layer selected, the depth readings should be visible at the echo sounder location:



*Example of recorded echo sounder data.*

## 9.8 Dredger Configuration Examples

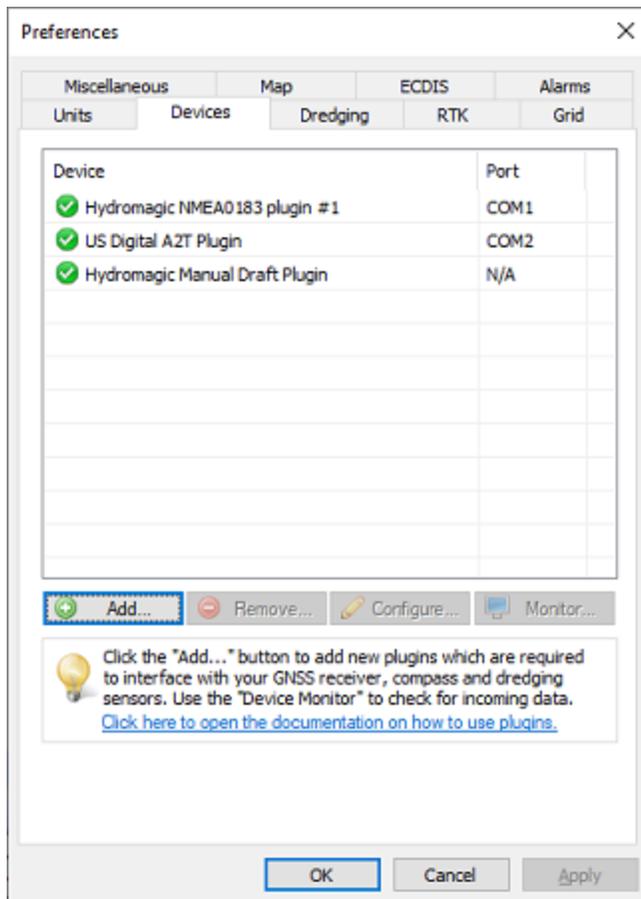
### 9.8.1 Trailing Suction Hopper Dredger

#### Trailing suction hopper dredger configuration

This document is a step-by-step tutorial on how to configure the Hydromagic Dredging software to monitor the dredge head of a trailing suction hopper dredger. In this example we assume an angle sensor (inclinometer sensor) has been mounted to the suction tube. Hydromagic will also support hopper dredgers equipped with pressure or bubble sensors. When encountering any problems by following this document, please contact our support department for assistance.

#### Loading plugins

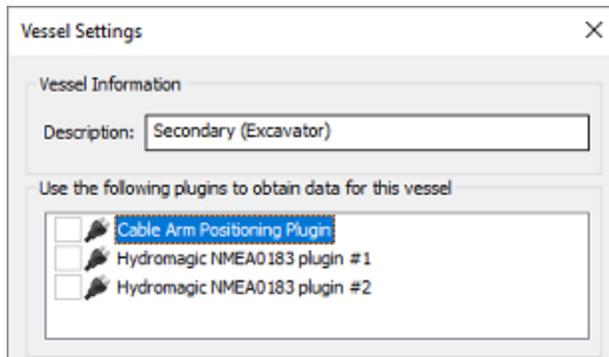
First off all, you have to load the plugins which are going to be used to get data like vessel position, heading, suction tube angle and draft into the software. Which plugins to load depends entirely on the dredger type and the brand or type of sensors used. In any case you have to load a plugin to retrieve position data from your GNSS receiver. This is usually one of the generic NMEA0183 plugins.



**When a plugin is providing data, there should be a green check in front of the plugin's name.**

## Configuring the vessel

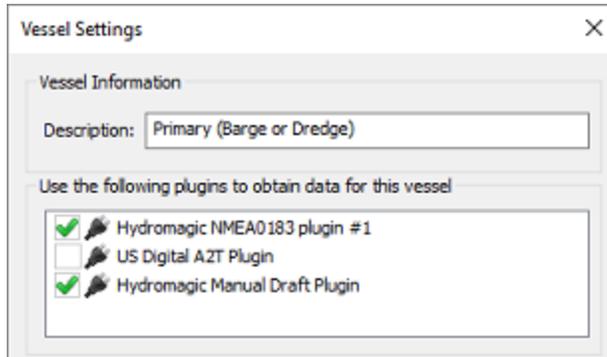
For this type of dredger we only need to configure the primary vessel. First we have to disable the secondary vessel by de-selecting its data sources (if not already done). To do so, select "Preferences..." from the options menu and click the "Dredging" tab. Now click the "Secondary Vessel..." button, and remove the checks for all of the plugins listed.



**De-select all data sources for the secondary vessel.**

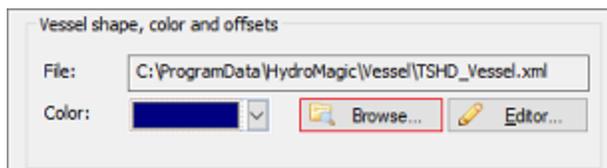
For the hopper, the primary vessel will be used. Go back to the dredging tab of the preferences window and click the "Primary Vessel..." button. Make sure that all plugins which are required are loaded at this

point. In the data source section, check the boxes in front of all the plugins which provide position information for the vessel. In most cases, this means all the plugins providing vessel position, vessel heading and the vessel's dynamic draft (pressure sensor). Sensors attached to the suction tube do not have to be selected here.



**Select all data sources used to positioning the primary vessel.**

To display the hopper dredge in the map and digging views, the shape file for the vessel needs to be set. You can create or alter vessel shapes in the [Vessel Designer](#). This tool can also be used to scale one of the shapes shipped with the software (located in "C:\ProgramData\Hydromagic\Vessel") to the dimensions of your own vessel. It is important to use accurate dimensions for all shapes used in the dredging software (vessel and dredge equipment shapes).



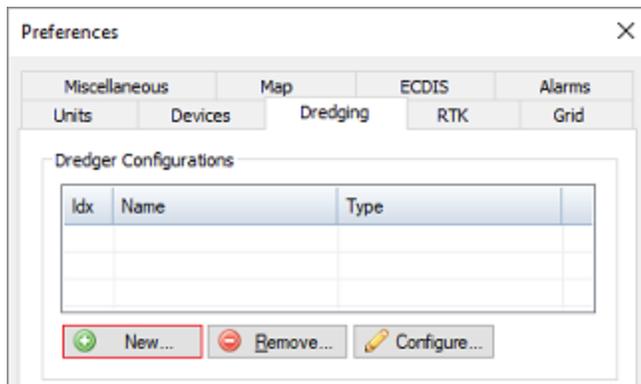
**To select a shape for the vessel, click the "Browse..." button to locate a vessel XML file.**

For information on the other vessel settings in this dialog (like heading sensors, distance rings and course line options), please refer to the "[Configuring Vessels](#)" manual page.

## Configuring the dredging equipment

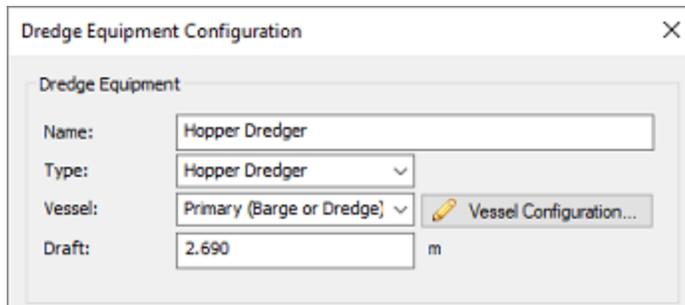
We will now configure the dredging equipment by defining the shapes, dimensions and sensors for the different parts that make up the suction tube. When the hopper dredger has been equipped with two suction tubes, we will have to perform this step for both tubes.

Go back to the "Dredging" tab in the preferences screen, and remove any dredger configurations which are already defined here. When the list is empty, click the "New..." button to create a new configuration.



To create a new configuration, click the "New..." button.

## Configuring global dredger options



Set the dredger type to "Hopper Dredger" and select the "Primary Vessel" as vessel.

## Configuring dredger segments

In Hydromagic Dredging, dredging equipment is configured by combining so called "Segments" to form a complete dredging system. General information on how this works, and which type of "segments" are supported can be found in the ["Configuring Dredger Segments"](#) manual entry. A hopper dredger is configured by combining a "Trunnion", "Ladder" and "Dredge Head" segment as we will explain in the following paragraphs. For each segment you add, you have to select the type ( "Trunnion", "Ladder" or "Dredge Head" ), and an optional "friendly name".

### Trunnion Offset

On a trailing suction hopper dredger, the suction tube is connected to the vessel via a so called "Trunnion". This trunnion can be above the water line, like in this example, or a "Sliding Trunnion" could be used, which means the suction tube will slide downwards through the "Sliding Trunnion". In the latter case the trunnion is located under the water surface. From the trunnion, the suction tube makes a ninety degrees angle causing an extra horizontal offset. To calculate this offset, we start with adding a "Trunnion Segment".

**Configure Dredge Segment** [X]

**Dredge Segment**

Name:

Type:

**Segment shape file**

Shape File: (2D):

**Segment Length**

Segment Length:  m

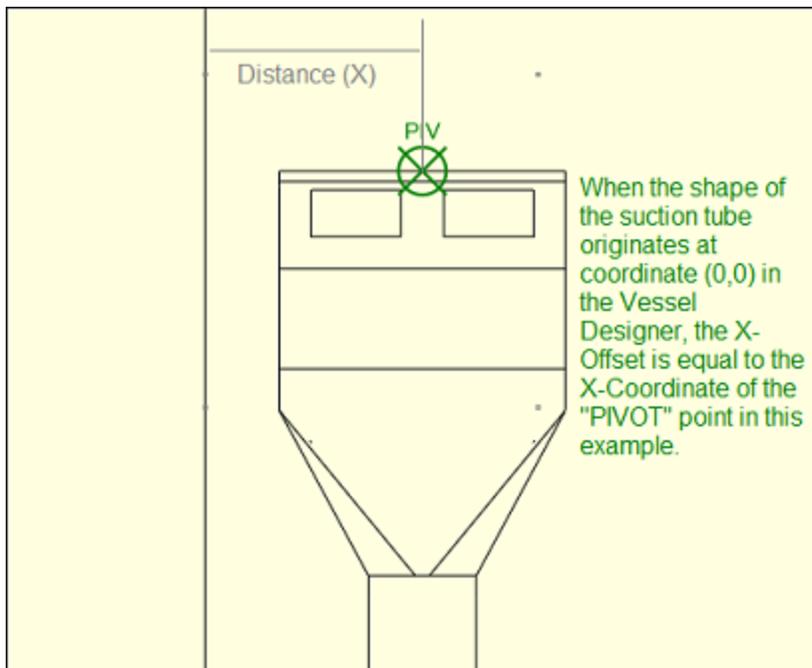
**Data Source(s) - Plugins Used**

Plugin Name	Sensors Used
-------------	--------------

Use this dialog to configure dredge equipment segments or items. In Hydromagic Dredging, a segment is a moving part of the dredge equipment, like a boom, ladder, stick, bucket or dredgehead.  
[Click here for documentation on how to configure dredging equipment segments.](#)

**Add a "Trunnion" segment to specify a horizontal offset between trunnion and dredge head.**

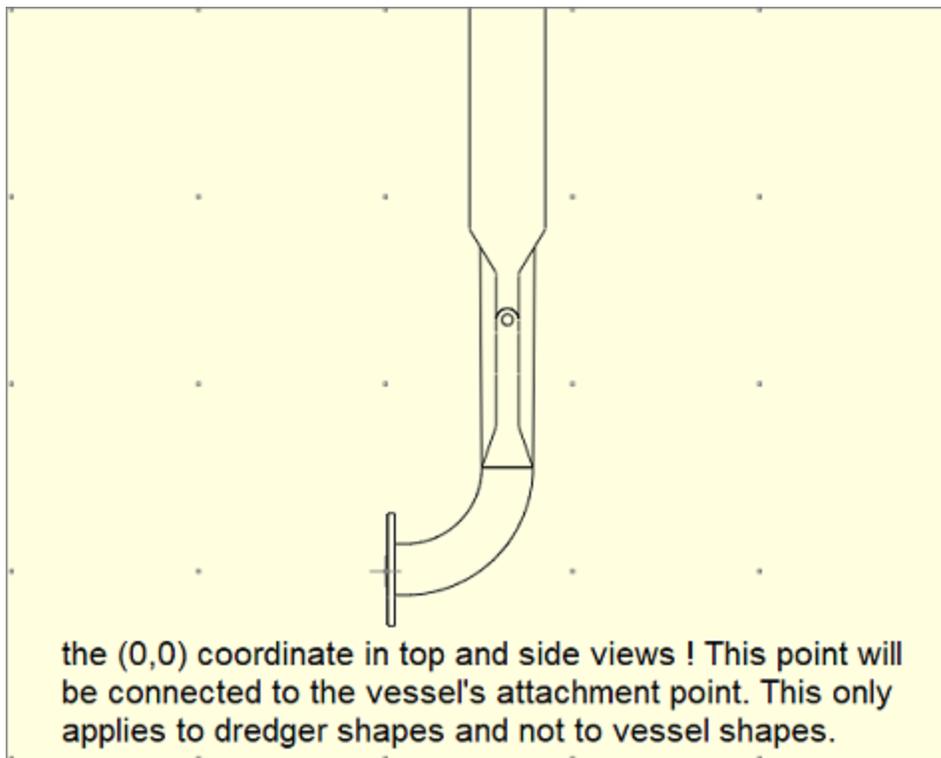
When configuring a "Trunnion Segment", only the exact distance from the hull till the center of the dredge head is entered in the "Segment Length" field. A shape or data source can not be entered here.



*The trunnion offset equals the distance between dredge head center and the hull of the vessel.*

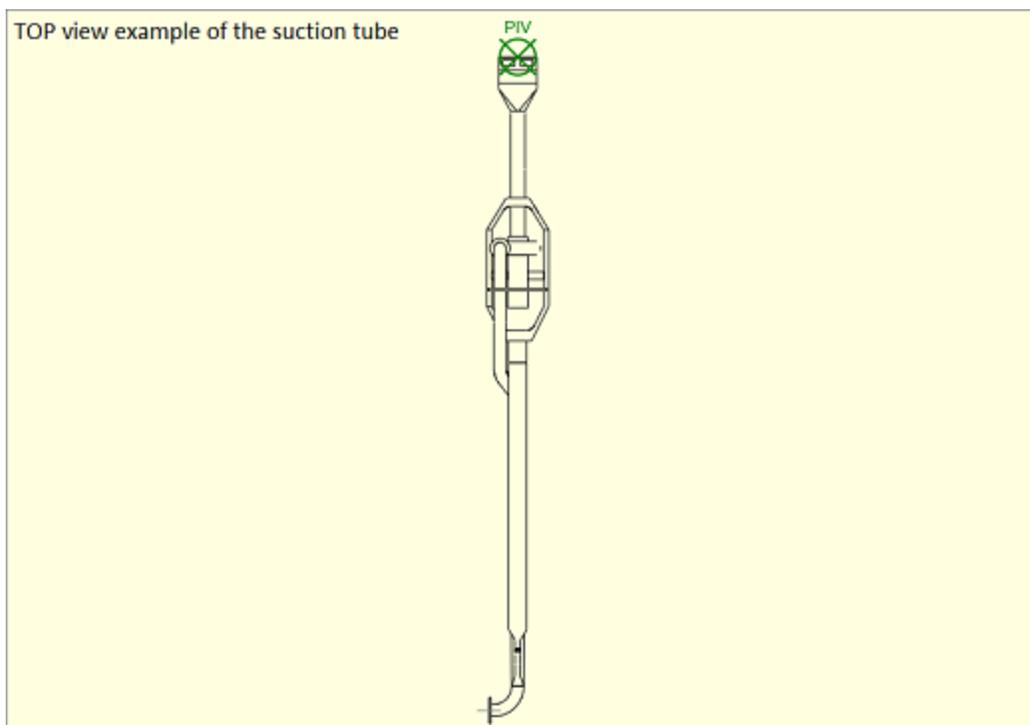
## Suction Tube

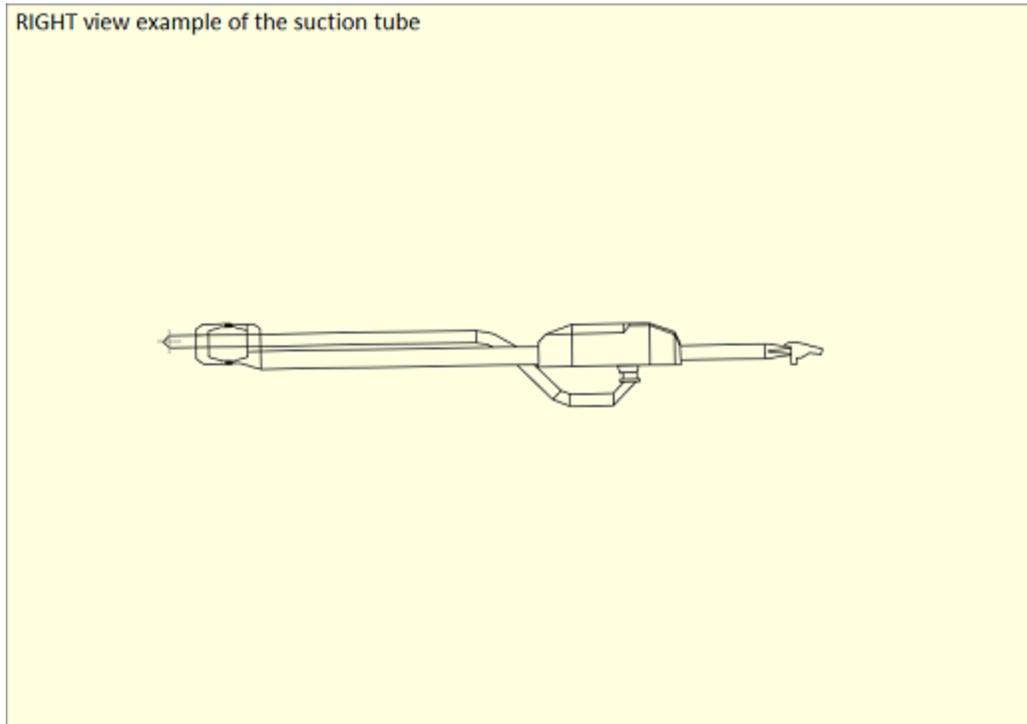
This is the most important segment of the dredging system. You can select it by changing the "Type" selection box to "Ladder". Make sure your shapes have the correct dimensions and the "Segment Length" is measured as accurate as possible. You have to measure the tube length from the trunnion center to the end of the dredge head. When drawing a shape of the suction tube in the "[Vessel Designer](#)", make sure the shape originates at coordinates (0,0):



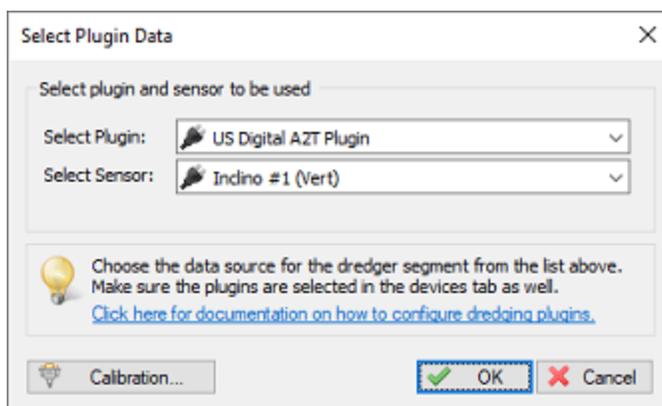
*Dredger shapes should originate from the (0,0) coordinate in the Vessel Designer.*

Depending on which views are required, you can draw the vessel and dredge segments for the various views. The "TOP" view will be used in the map display and is mandatory ! For the top view, you draw the suction tube parallel to the Y-axis starting at (0,0) and facing upwards. For the side view you start at (0.0) and the shape will be parallel to the X-axis as shown in the examples below:



**Example of TOP view shapes for a suction tube****Example of RIGHT view shapes for a suction tube**

You also have to select which sensor is providing position information for this segment. For a suction tube, this should be an inclinometer sensor or pressure (bubbler) sensor. Make sure all plugins have been loaded as explained in the first paragraph, and click the "Add..." button to select the device. When a plugin interface with more than one sensor, you can select the sensor from the second drop-down box. In most cases, only one data source will be used (except when using two separate sensors and plugins to monitor horizontal movement as well).



Click the "Add..." button to select the plugin and sensor.

**IMPORTANT: The most important setting is the "Segment Length". As soon this is measured correctly (or lookup the dimensions using a CAD drawing), your dredging depth will be correct. Incorrect dimensions in the shapes only result in a top or side view drawing which is less accurate, but it will affect your depth reading !**

Configure Dredge Segment

Dredge Segment

Name: Suction Tuibe

Type: Ladder

Segment shape file

Shape File: (2D): TSHD\_Tube.xml

Browse... Editor...

Segment Length

Segment Length: 14.715 m

Data Source(s) - Plugins Used

Plugin Name	Sensors Used
US Digital A2T Plugin	Incino #1 (Vert)

Add Remove... Edit.. Calibration...

Use this dialog to configure dredge equipment segments or items. In Hydromagic Dredging, a segment is a moving part of the dredge equipment, like a boom, ladder, stick, bucket or dredgehead.  
[Click here for documentation on how to configure dredging equipment segments.](#)

OK Cancel

**Add a "Ladder" segment to define the shape and length of the suction tube itself.**

## Dredge Head

The dredge head segment is used only to configure the dimensions of the dredge head. Only when the dredge head moves independent from the suction tube, it should be configured with its own shape and data source (plugin). When we finished adding the trunnion and one or more suction tubes, we add the "Dredge Head" segment. Just click the "Add..." button from the "Dredge Equipment Configuration" dialog, and set the "Type" setting to "Dredge Head". You will notice a "Settings..." button will become visible. Click this button and add the dredge head width and height.

**Dredge Head Configuration**

Dimensions of the dredge head segment

Width:  m

Length:  m

Active matrix spacing

Spacing-X:  m

Spacing-Y:  m

***Dredge head dimensions are used to calculate which matrix cells need to be updated.***

The dredge head dimensions are used to calculate the footprint size of the dredge head, so [the matrix](#) can be updated accordingly.

**Configure Dredge Segment**

Dredge Segment

Name:

Type:

Segment shape file

Shape File: (2D):

Segment Length

Segment Length:  m

Data Source(s) - Plugins Used

Plugin Name	Sensors Used

Use this dialog to configure dredge equipment segments or items. In Hydromagic Dredging, a segment is a moving part of the dredge equipment, like a boom, ladder, stick, bucket or dredgehead.  
[Click here for documentation on how to configure dredging equipment segments.](#)

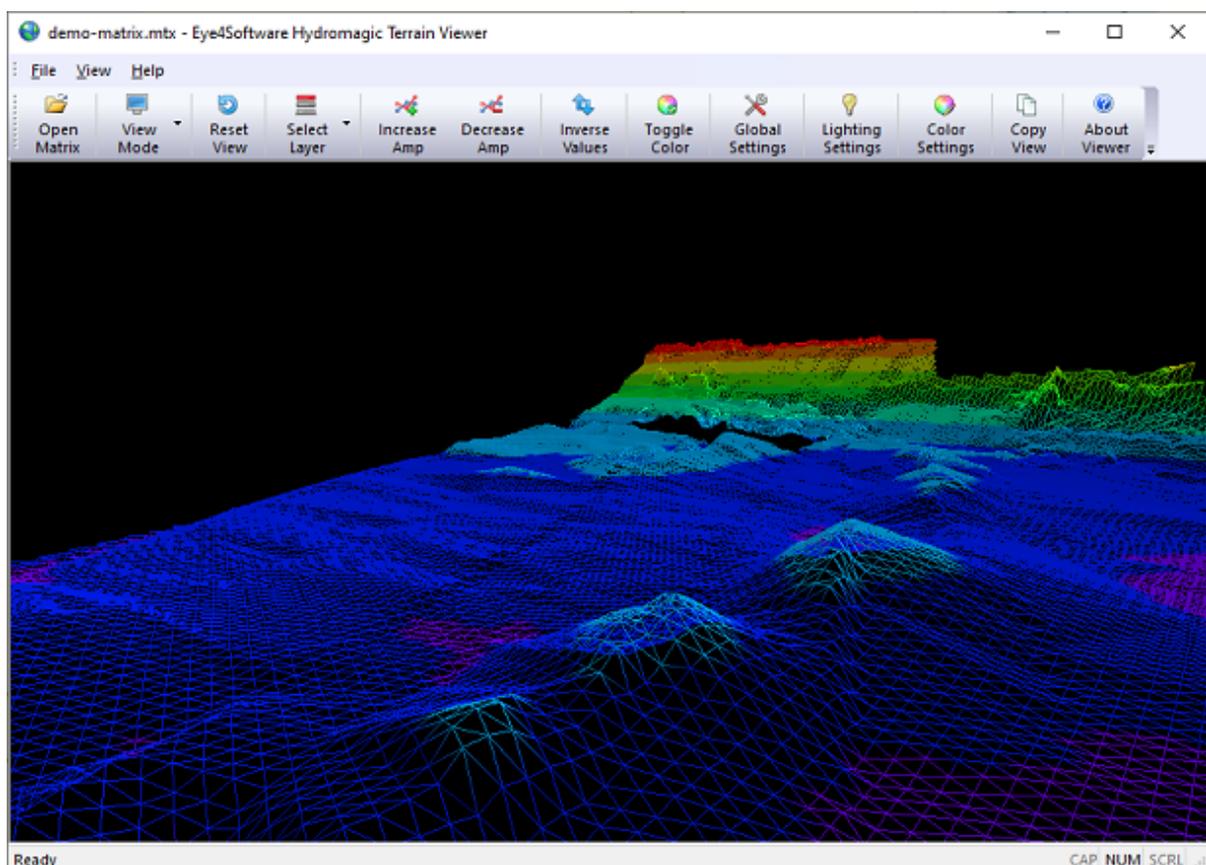
***Add a "Dredge Head" segment to define the dimensions of the dredge head.***

## 10 Utilities

### 10.1 3D Terrain Viewer

#### Hydromagic 3D Terrain Viewer

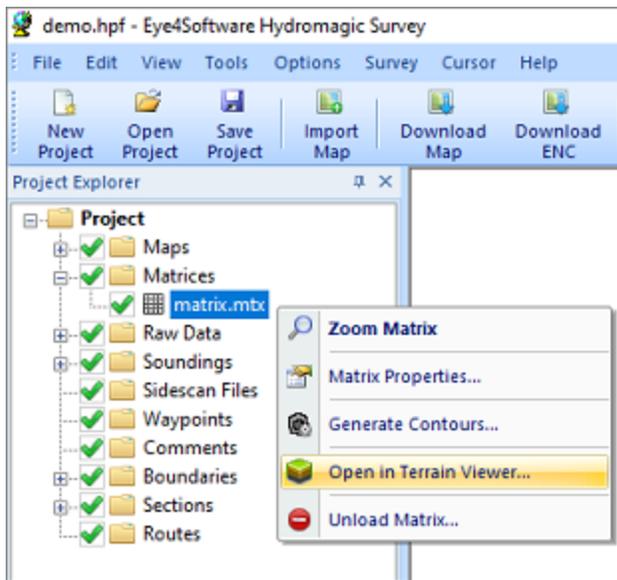
The Hydromagic 3D Terrain Viewer is a stand alone utility which can be used to view generated matrices like a 3D surface, point cloud or wire frame. The view generated by the terrain viewer gives an accurate image of the bottom of the surveyed area, and you will see which area's need more filtering in the blink of an eye. You can use the terrain viewer to view matrices generated in both Hydromagic Survey and Hydromagic Dredging.



*The main screen of the 3D Terrain Viewer shows a detailed image of the bottom.*

#### Starting the Hydromagic Terrain Viewer

The tool is installed in the "Program" folder under the installation folder of the software. It can be started using Windows Explorer, or by locating the software under the Windows Start Menu. Alternatively, you can start the "Terrain Viewer", by right clicking a generated or loaded matrix in the "Project Explorer", and selecting the "Open in Terrain Viewer..." option."



Start the "Terrain Viewer" by right clicking a matrix.

### Loading a matrix file

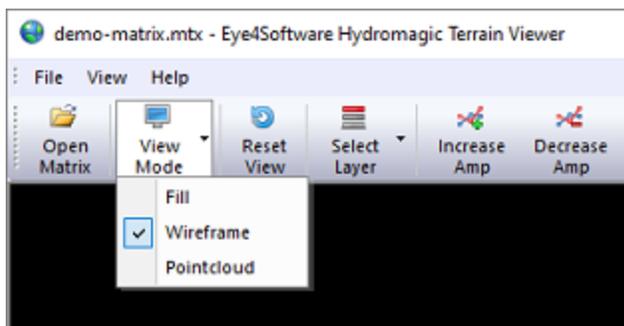
When opening the terrain viewer from the "Project Explorer", the selected matrix file is automatically loaded. When starting the software directly from the Windows start menu or Hydromagic program folder, no matrix will be loaded and you can open a matrix file (\*.mtx) by clicking the "Open Matrix" button in the tool bar, or selecting the "Open..." option from the "File" menu.

### View Modes

A matrix file can be viewed in 3D in different view modes:

- Fill - All matrix cells are divided in triangles and filled with a solid color;
- Wireframe - All matrix cells are divided in triangles and the outlines of the triangles are drawn;
- Pointcloud - All matrix cells are drawn as pixels with the associated color and offset;

When drawing the matrix as a wireframe or pointcloud, the line width and pixel size can be adjusted by clicking the "Global Settings" button in the tool bar. To change the current view mode, click the "View Mode" button to select the desired mode from the drop down menu, as shown in the screen shot below:



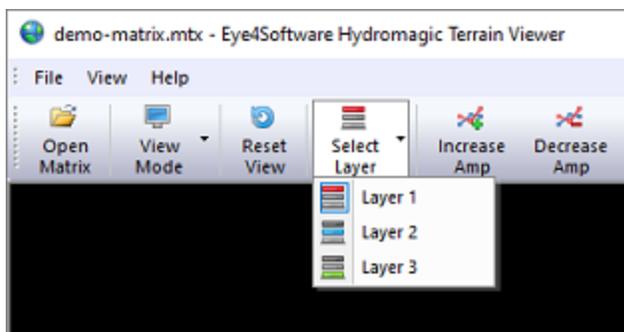
Selecting a different view from the "View Mode" menu.

### Rotating and zooming

The terrain can be viewed from different angles and distances. Just imagine a camera that is rotated around the object to view it from a different angle. By zooming in and out, basically this virtual camera moves closer towards or further away from the object. You can control the rotation around the object by moving the mouse while holding the right mouse button. To zoom in and out, use the scroll wheel on your mouse. If you want to return the "Camera Position" to the start position, click the "Reset View" button in the tool bar.

## Layers

Depending on which Hydromagic software is used to generate the matrix, it can contain only one or multiple layers. In Hydromagic Survey only one layer will be created, while Hydromagic Dredging will create three layers by default (pre-dredging, dredging and post-dredging). To select which layer of the matrix is shown in the terrain viewer, click the "Select Layer" button to select the active layer from the drop down menu as shown in the screen shot below:



*Switch between different layers using the "Select Layer" menu.*

## Amplification (Z-Values)

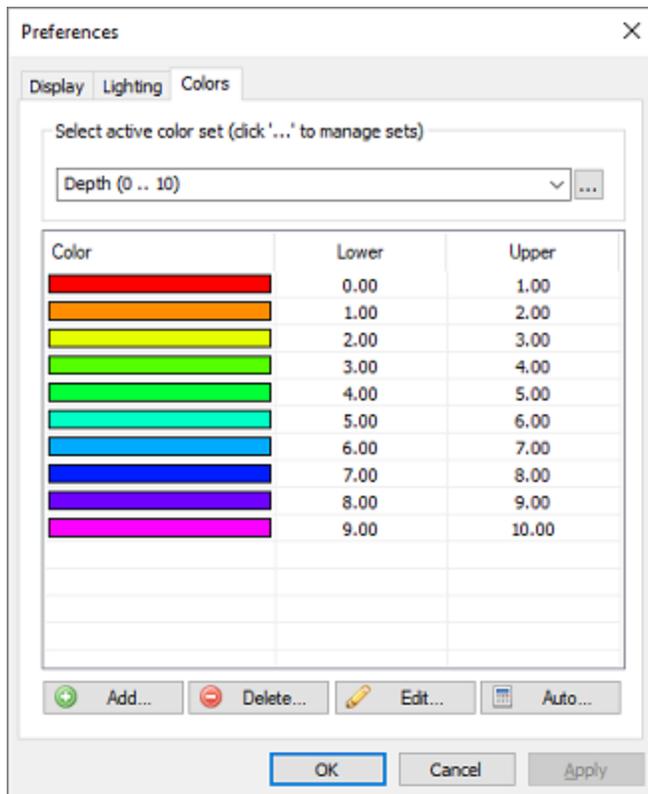
By default, the matrix 3D model is scaled equally in all directions. In some cases, for instance, when you want to view a large area, it might be useful to adjust the Z scaling to exaggerate the depth or elevation levels to be more clearly visible. You can do this by using the "Increase Amp" and "Decrease Amp" buttons in the tool bar. Alternatively, you can set the amplification level manually by clicking the "Global Settings" button and using the "Factor" setting in the "Amplification" section.

## Inverse Values

When you load a matrix with elevation values instead of depth values, the terrain might be mirrored in Z-Direction. In these cases, just click the "Inverse Values" button to mirror the Z-Values of the model.

## Color Settings

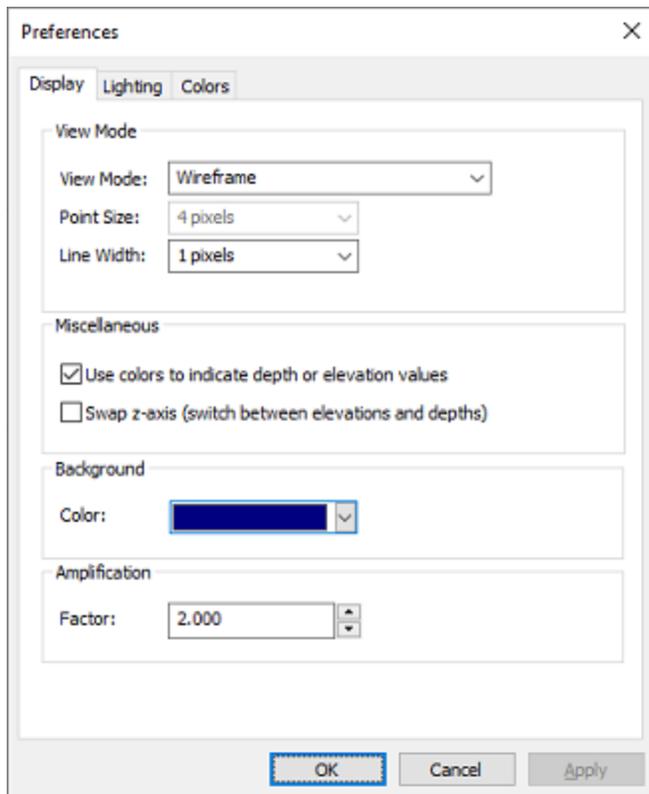
In the "Terrain Viewer", 3D terrains can be viewed in multiple colors or a single color. To switch between single and multiple color mode, click the "Toggle Color" button. When in color mode, different depth or elevation levels will have different colors, just as you used to when displaying matrices in the survey or dredging program. To configure color ranges, click the "Color Settings" button. You can create multiple color ranges which can be set automatically. You can also import color schema's created in either the survey or dredging program.



*From the "Colors" tab, you can create, import or configure color sets.*

## Global Settings

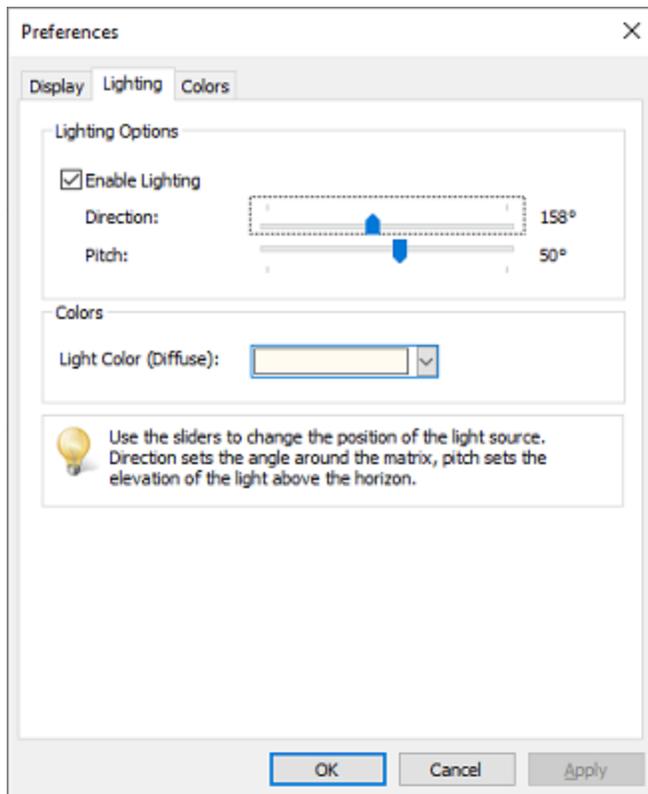
Click the "Global Settings" button to change some global and miscellaneous settings, like background color, amplification factor, view mode and more. Some of the settings can also be accessed directly by the tool bar, including the "View Mode", "Miscellaneous" and "Amplification" settings. In this dialog, you can also change the point size and line width for the "Wireframe" and "Pointcloud" view modes.



*From the Display tab, you can alter some global and miscellaneous settings.*

## Lighting Settings

In the "Lighting Settings" can be used to define an optional light source. By default the objects drawn will "emit light" by themselves. When enabling lighting, you can create shadow effects by setting the direction of the light. To use an alternate light source, click the "Lighting Settings" button and check the "Enable lighting" check box. With the "Direction" and "Pitch" sliders you can move the light source around the 3D model. When moving a slider, the new position of the light is applied to the model directly so changes will become visible instantly.

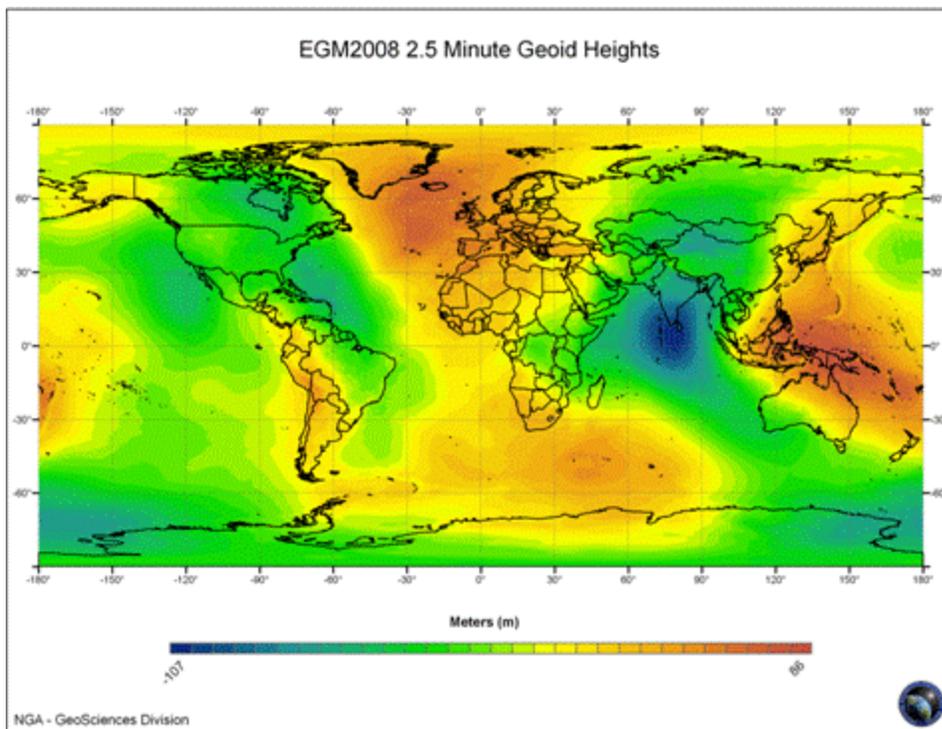


*Create shadow effects by setting an alternate light source.*

## 10.2 Using the EGM2008 geoid model

### Using the EGM2008 geoid model

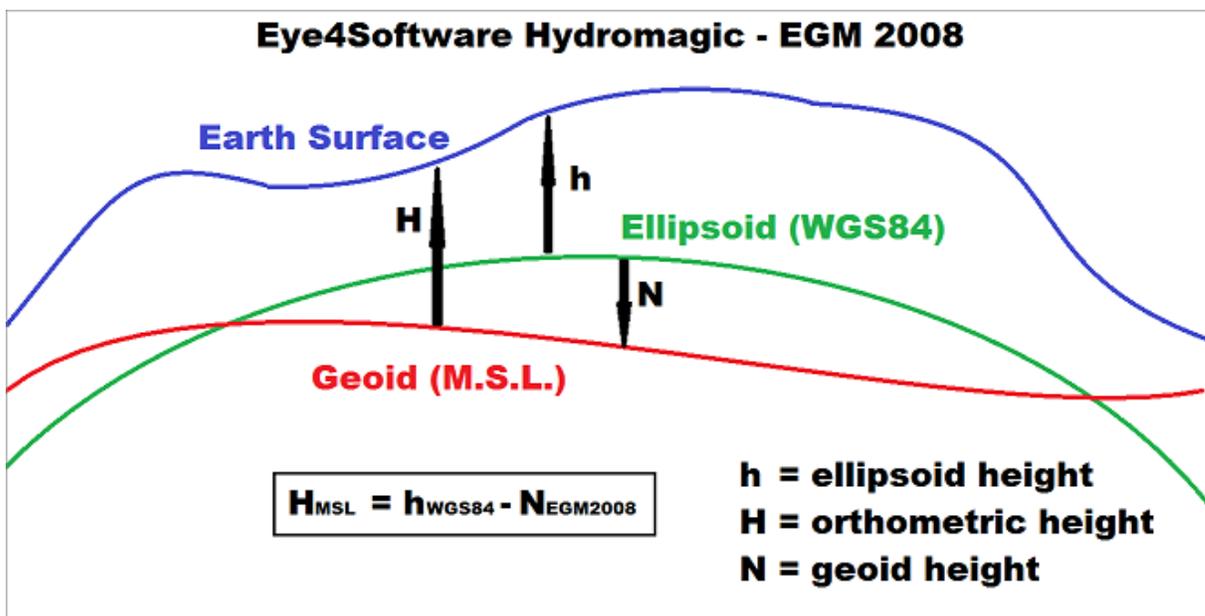
EGM2008 is short for Earth Gravitational Model 2008. It is the successor of EGM96 and EGM84 and it is supplied by the U.S. National Geospatial-Intelligence Agency (NGA) EGM Development Team. The EGM2008 model has a cell size of 1.0 x 1.0 minute, resulting in a grid of 10801 rows x 21600 columns containing 4 byte IEEE float values defining the difference between the WGS84 ellipsoid height and Mean Sea Level (MSL).



The EGM 2008 geoid model (image courtesy of NGA).

The EGM2008 model can be used to calculate the height offset between the WGS84 ellipsoidal height and the Mean Sea Level (MSL) on any place on the globe.

To calculate the height offset, the four points nearest to the current position are retrieved from the geoid file. With this four values, a height offset is calculated using Bi-cubic interpolation. The Mean Sea Level (MSL) is calculated by subtracting the calculated offset from the WGS84 ellipsoidal height.



The relation between ellipsoidal height and EGM 2008 (MSL).

Because the data file containing all grid values is very large (it contains about 233 million data points), it would cause Hydromagic to consume 1 Gigabyte of additional memory.

To solve this issue, Hydromagic is shipped with an utility called 'EGM2008Util' which allows you to extract a specified region from the EGM2008 data file, and convert it to an Hydromagic geoid file.

### Downloading the EGM2008 data file

Before using the utility, you need to download the large EGM2008 data file from the NGA website. You need the following file:

[Und\\_min1x1\\_egm2008\\_isw=82\\_WGS84\\_TideFree\\_SE.gz](http://und_min1x1_egm2008_isw=82_WGS84_TideFree_SE.gz)

This file name might change sometimes, but it is important that you use the 1x1 minute, small endian, WGS84 variant. At this moment the file can be downloaded using [this link to the NGA website](#).

After downloading, unzip the GZipped file, and copy the extracted file to a folder accessible to the EGM2008 Utility. Alternatively, you can find this file in the Hydromagic [download archive](#) as well.

### Using the EGM2008 utility

The EGM2008 utility can be started from the Windows start menu. It can also be found in the 'Program' folder in the installation directory. After starting the utility, the following screen should appear:

*The EGM2008 geoid conversion utility is shipped with Eye4Software Hydromagic.*

### Input

Use the input section to specify the input data file as downloaded from the NGA website.

The utility will check the file and return an error when the incorrect file is used.

Please note that the utility only works when using the 1x1 minute data file.

## Output

Specify the file name of the Hydromagic geoid file here. The file should be placed in the "/ProgramData/Hydromagic/Geoids/" folder, otherwise you won't be able to select it in Hydromagic. By default, this folder will be displayed in the "Save As..." dialog. The file written will have the same format as geoid files download directly from the Eye4Software website.

Please remember the file name used for this part of the EGM2008 grid, you need it when importing it into Hydromagic.

## Selection

In the "Selection" section, you can select the area which you want to export. Please note that the maximum area size is 2x2 degrees (equal to 14400 data points).

To specify either a coordinate on the southern or western hemisphere, use the '-' (minus) sign. The software will warn you in case the selected area is too big.

## Generating the geoid file

When ready, click the "Start" button to generate the geoid file. When this process has been completed, you can close the utility using the "Close" button.

The last step is adding the geoid model in Hydromagic. To do so, please refer to the "[Manage Geoids](#)" chapter in the manual.

## 10.3 License Updater

### Hydromagic Licensing

Licensed versions of the Hydromagic software are protected against unauthorized use with a dongle or hardlock device. When purchasing of the software, a dongle will be shipped to you containing licenses for the products you bought, and for the most recent versions only.

When you decide to purchase an additional product later (for instance, adding a survey license to a dredging package), an additional license has to be added to the dongle. To do so, the "License Updating Tool" is required to add this license to the dongle remotely, so we do not have to provide you with a whole new dongle.

### License Updater

The tool is installed in the "Program" folder under the installation folder of the software. It can be started using Windows Explorer, or by locating the software under the Windows Start Menu. Alternatively, you can start the "License Updating Tool" by selecting "External Tools" => "License Updater..." option from the "Tools" menu in Hydromagic Survey or Hydromagic Dredging.

The screenshot shows the "Eye4Software Hydromagic - License Updating Tool" window. It features a "Select Hydromagic dongle to update" section with a "Serial No:" dropdown menu showing "2-2419211", a "Refresh" button, and an "Advanced..." button. Below this is the "License Files" section, which has two radio button options: "Generate a license request for us" (selected) and "Import a new license which has been emailed to you:". Each option has a "Filename:" text box and a "Browse..." button. At the bottom of the window, there is a "HYDROMAGIC" logo, a "Start" button with a green checkmark, and a "Close" button with a red X. A lightbulb icon and a paragraph of text are also present, along with a blue hyperlink.

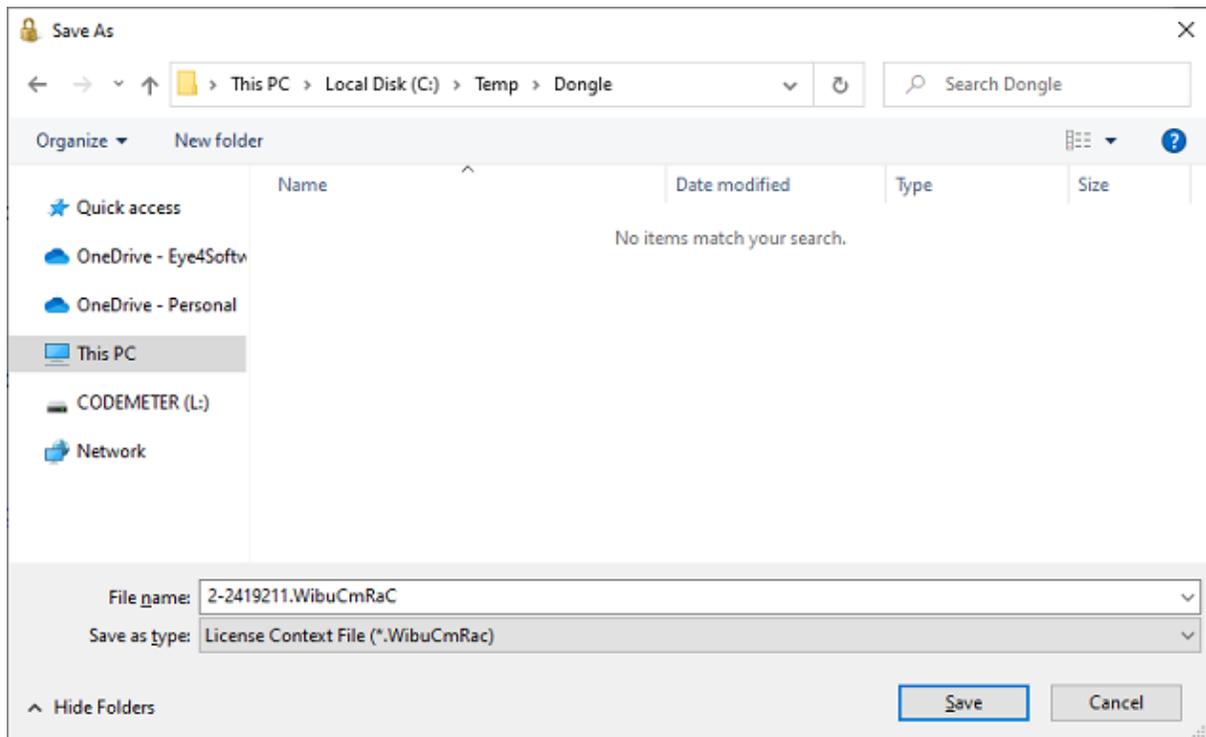
Use the "License Updating Tool" to request or import a license update for a new version.

## Adding a license

In order to add a new license to your existing Hydromagic dongle, purchase from your local reseller, or using the sales page on our website. In case you want to upgrade the software you are using to the latest version, all you need is a valid support contract.

After purchasing the license, you have to email a license request file to us. This request contains the encrypted contents of your dongle, and is needed to add licenses.

To generate a license request, select the "Generate a license request for us" option, and select an output file. It is recommended to store the file in the "My Documents" folder using the default name as displayed in the "Save As" dialog box. Click the "Save" button to select the file, and click the "Start" button to generate the license request file.



**Save the license request file and email it to our support desk.**

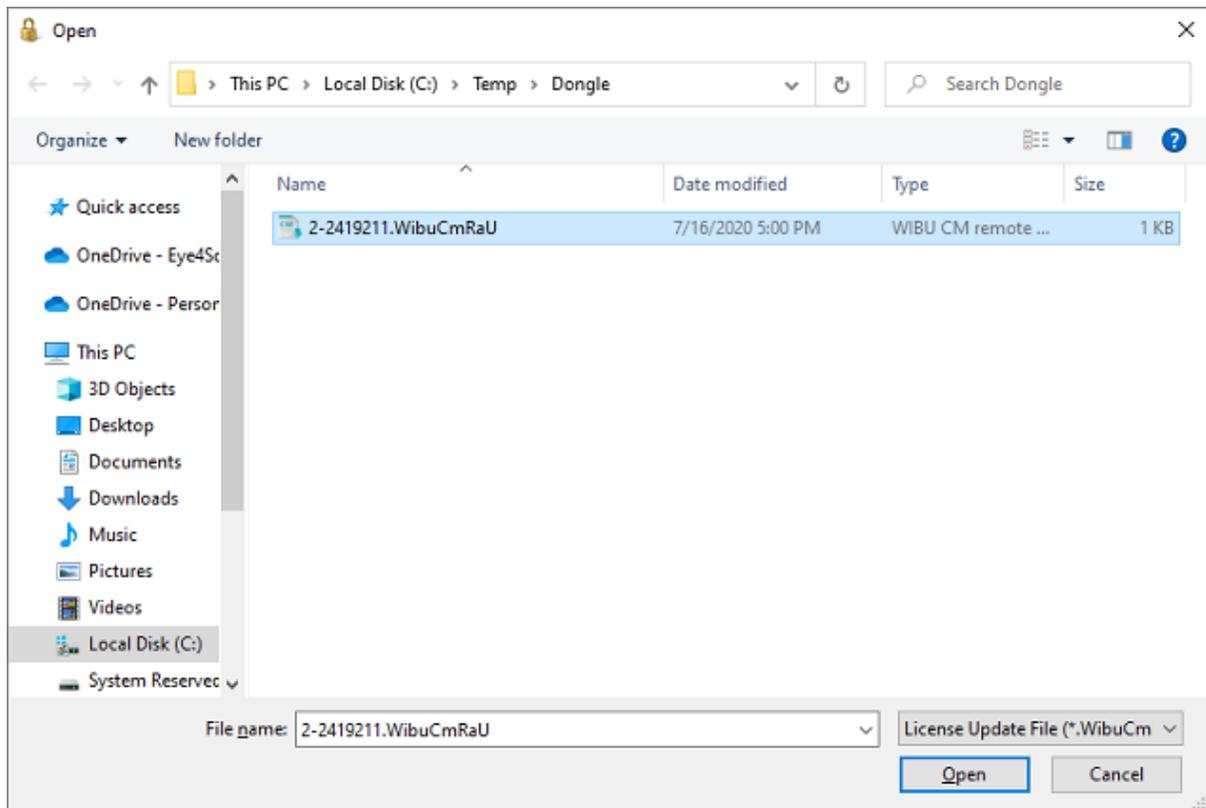
### Emailing the license request

After the license request has been saved, you have to email the license request file ( .wibuCmRaC extension ) as an attachment to our support desk at [support@eye4software.com](mailto:support@eye4software.com). You will receive the license after it has been processed by our staff. Please note that this is a manual process so it can take up to 24 hours until you receive the email with the license update.

### Applying the license update

After receiving the email with the license update file ( .wibuCmRaU extension ), please save the attachment to a folder accessible to the license updating software, for example your "My Documents" folder. If you have closed the application in the mean time, just start it again. This time you have to select the "Import a new license which has been emailed to you" option.

Next, click the "Browse..." button to locate the received license file and click "Open" after you selected the received file. Now click the "Start" button to program the new license(s) in your Hydromagic dongle.



*Open the file sent to you by email to program the update(s) into the dongle.*

### Updating the certified time

We recently had a case where we were unable to process a license request because the dongle did contain an invalid certified time. If this is the case, our support desk will point you to this paragraph, you do not have to execute this step unless told by our staff. To update the certified time, select the dongle in the Serial Number drop down box and click the Advanced button. In the dialog box that appears, click the "Update" button in the "Certified Time" section. When successful, click "OK" and generate a license request again and send it by email as described in the "Adding a License" paragraph above.

## 10.4 Geoid Converter

### Geoid Conversion

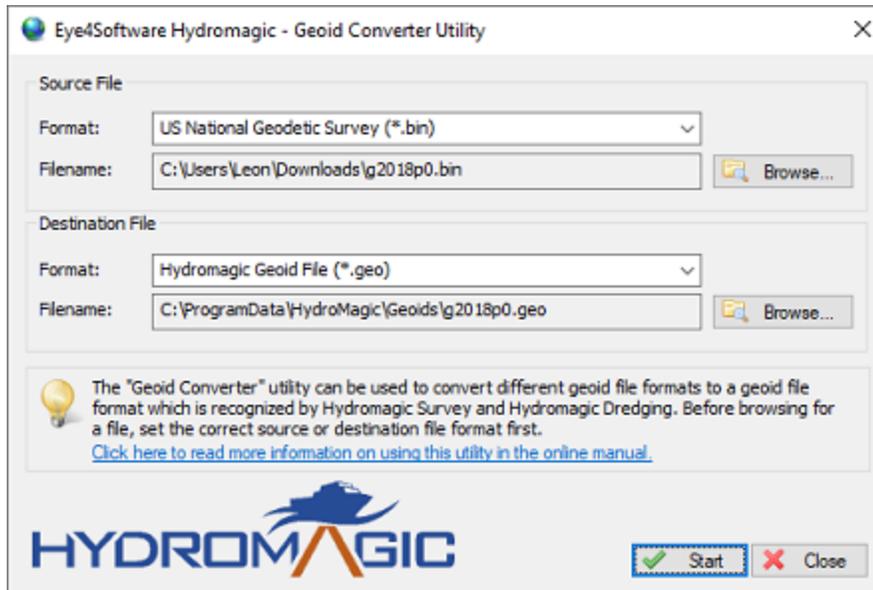
The "Geoid Converter" utility is a freeware utility, shipped with Eye4Software Hydromagic, which can be used to convert geoid files between different formats. Although the utility is shipped with Hydromagic it can be used as a stand alone tool as well.

The main goal of the software is to enable Hydromagic users to convert third-party geoid files to a format which can be read by the Hydromagic software. There are so many different geoid file formats around that we decided to use our own format, and create an external tool to get files converted to our internal format.

The following geoid file formats are currently supported:

- Hydromagic Geoid File Format (GEO Files);
- Trimble Geoid File Format (GGF Files);

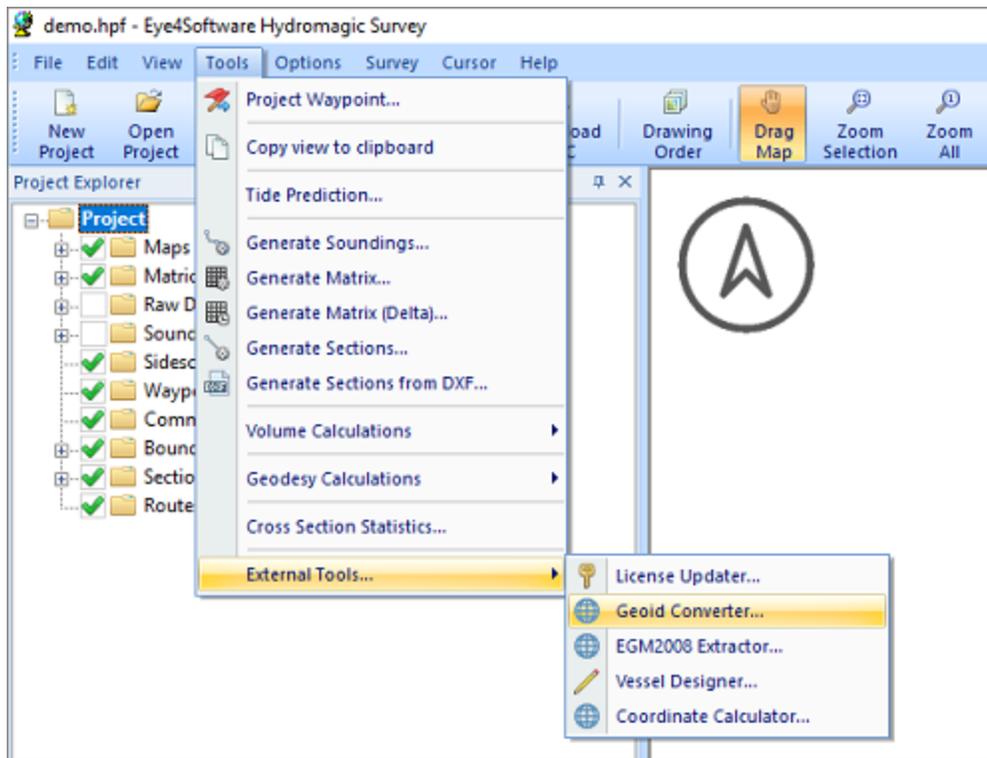
- Carlson Geoid File Format (GSF Files);
- US National Geodetic Survey (NGS) File Format (BIN Files);
- Natural Resources Canada Files (BYN Files);
- Surfer V6 Binary Grid Files (GRD Files);
- NOAA VDATUM grid file (GTX Files);
- AusGeoid File Format (Australian Geoids);
- French ASCII Geoid Files (MNT Files);
- ASCII Geoid Files.



*The "Geoid Converter" utility allows you to convert geoid data to another file format.*

## Geoid Converter

The tool is installed in the "Program" folder under the installation folder of the software. It can be started using Windows Explorer, or by locating the software under the Windows Start Menu. Alternatively, you can start the "Geoid Converter" utility by selecting "External Tools" => "Geoid Converter..." option from the "Tools" menu in Hydromagic Survey or Hydromagic Dredging.



*The "Geoid Converter" utility can be launched from the "Tools" menu.*

## Converting Files

Converting geoid files with the "Geoid Converter" Utility is very straightforward. All you have to do is to select a source and destination format. You can use any combination of source and destination formats (although it doesn't make sense to set the source and destination formats to the same). Please note that some of the formats are only available for reading.

After selecting the formats, use the "Browse..." buttons to select an input and output file. In order to use geoid files in Hydromagic, the destination file has to be written in the Hydromagic "Geoids" folder which is selected by default. For destination files other than the Hydromagic Geoid Files, you can select another location as well.

When done, click the "Start" button and the conversion process should start. Converting a single file usually only takes a couple of seconds.

## ASCII Files

The Geoid File Conversion Utility supports two ASCII geoid file formats at this moment. Because there are a lot of different types of ASCII geoid files, the types supported are described in the next chapters. When encountering an ASCII format not yet supported, please contact our support desk so we can check if it is worth implementing this format in the conversion utility.

### ASCII Geoid Height Grid File (\*.grd)

You should use this option for a file which contains a header value contained by separation values for each cell. The header contains six values in the following order: South boundary, north boundary, west boundary, east boundary, vertical cell size and horizontal cell size.

```

27.00000    36.97500   -14.00000   -0.02500    0.02500    0.02500
52.383     52.342     52.302     52.257     52.205     52.147     52.073     51.978
51.864     51.742     51.619     51.498     51.378     51.261     51.144     51.029
50.916     50.805     50.695     50.588     50.484     50.391     50.301     50.212
50.122     50.029     49.930     49.821     49.700     49.571     49.437     49.298
49.155     49.006     48.853     48.697     48.539     48.379     48.220     48.063
47.912     47.767     47.631     47.503     47.385     47.275     47.175     47.083
46.998     46.917     46.838     46.760     46.682     46.606     46.534     46.469

```

### ASCII XYZ Geoid File (\*.txt)

This option is used for geoid files which consist entirely out of ASCII XYZ pairs as shown in the example below. These files do not have a header and calculate the number of rows, columns, boundaries and cell sizes directly from the XYZ records in the file.

```

41449.795 3845328.858 24.700
43449.799 3845328.878 24.613
45449.803 3845328.897 24.516
47449.807 3845328.916 24.429
49449.811 3845328.935 24.342
51449.815 3845328.954 24.255
53449.819 3845328.973 24.178
55449.823 3845328.992 24.091
57449.827 3845329.012 24.004
59449.831 3845329.030 23.917
61449.835 3845329.049 23.830
63449.839 3845329.068 23.743

```

### French Geoid File (\*.mnt)

The French MNT format is used by the IGN in France to store geoid models for the French mainland, as well as French overseas territories like: Guadeloupe, Martinique, French Guiana, Mayotte and Reunion. The direction in which the ellipsoidal heights are stored differ and depends on the area. This direction is encoded in the file header. Below is an example of a MNT file:

```

44.910 45.405 -13.095 -12.420 0.045 0.045 4 1 1 1 0. Mayotte SHOM 1953
44.91    -13.095 -20.852 99
44.91    -13.05  -20.653 99
44.91    -13.005 -20.439 99

```

### AusGeoid Files

AusGeoid files are ASCII files used to store Australian Geoid models like AUSGeoid93, AUSGeoid98, AUSGeoid09 and AUSGeoid2020. Although most of these models are already available in Hydromagic format, you might want to convert files by your own. More information on the AUSGeoid can be found on the "Geoscience Australia" website (<http://www.ga.gov.au/ausgeoid/>). Below is an example of a AUSGeoid file:

```
AUSGeoid09_GDA94_V1.01
```

```
www.ga.gov.au
```

GEO	-2.493	S39	0	0.000	E143	0	0.000	-6.19	-5.86
GEO	-2.452	S39	0	0.000	E143	1	0.000	-6.24	-5.79
GEO	-2.411	S39	0	0.000	E143	2	0.000	-6.19	-5.86
GEO	-2.368	S39	0	0.000	E143	3	0.000	-6.30	-5.86
GEO	-2.328	S39	0	0.000	E143	4	0.000	-6.24	-5.71

## 10.5 NMEA0183 Checksum Calculator

The NMEA0183 Checksum Calculator is a freeware tool which is shipped with Eye4Software Hydromagic. It can be used by hardware or software developers to make sure their device or software transmits correct NMEA0183 sentences. If NMEA0183 sentences are rejected by the Hydromagic software for no reason, you can also check the validity of received or logged NMEA0183 sentences using this tool.

**Generate or check NMEA0183 checksums with the freeware tool.**

### NMEA0183 Checksums

When a device is transmitting NMEA0183 sentences, a checksum may be added to the end of the message. If this is done, an asterisk (\*) will appear first, followed by the hexadecimal representation of the XOR binary operation of all characters between the '\$' and the '\*'. This checksum is two characters long (hexadecimal characters in the range 0..F). Example: \$TTSSS,FIELD,1,FIELD,2,FIELD,,\*5C.

```

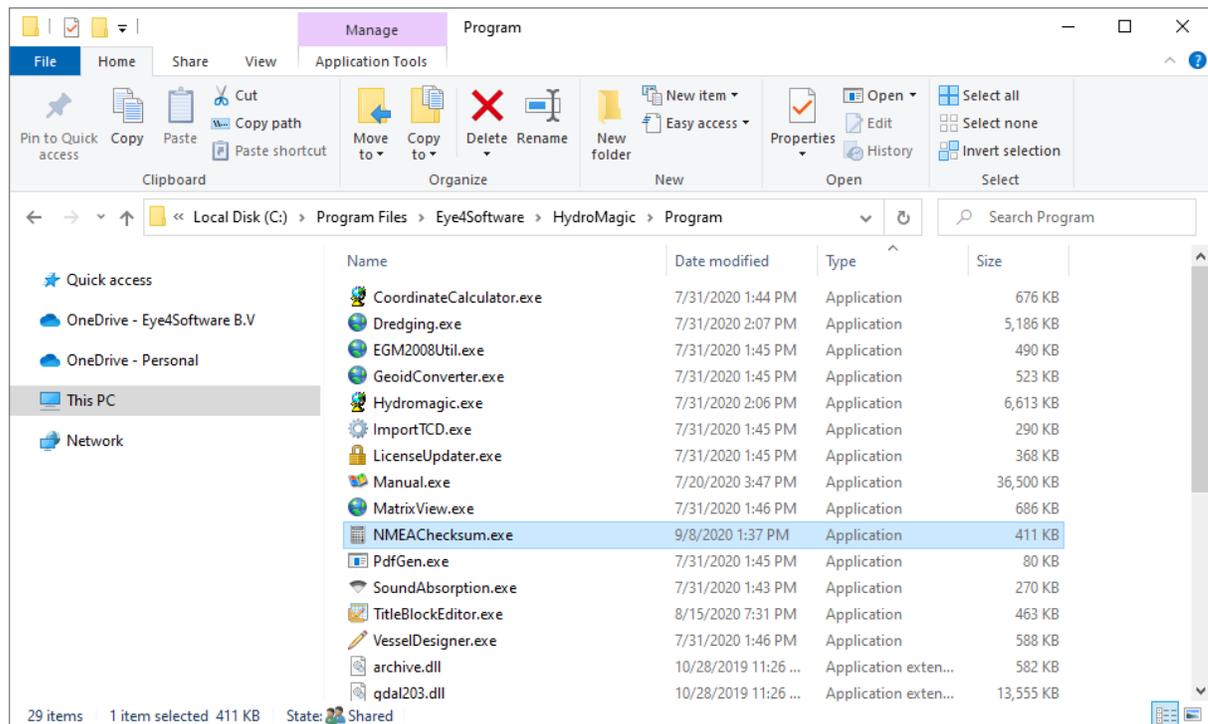
$GPGSV,3,1,11,13,77,300,49,07,18,065,43,05,41,196,49,21,12,306,*7B
$GPGSV,3,2,11,15,44,293,49,30,50,067,49,28,51,123,46,24,03,247,28*71
$GPGSV,3,3,11,27,00,002,,08,10,031,36,20,06,327,*42
$GLGSV,3,1,11,80,68,050,44,72,11,322,,88,13,007,,79,14,039,44*66
$GLGSV,3,2,11,71,63,314,49,73,42,213,47,70,60,149,45,69,03,142,41*6F
$GLGSV,3,3,11,81,04,046,24,87,06,324,,74,01,222,*50$GAGSV,1,1,00,,,*68
$GPZDA,103707.00,07,02,2020,,*61

```

**NMEA0183 data fragment with checksum values highlighted.**

## Starting the tool

The tool can be found in the installation folder of Hydromagic. In most cases it is installed in "C:\Program Files\Eye4Software\Hydromagic\Program\" or "C:\Program Files (x86)\Eye4Software\Hydromagic\Program\" when using the 32 bit version of the software on a Windows 64 bit operating system. Start the tool by double clicking or tapping the "NMEAChecksum.exe" executable program.



**The NMEA0183 Checksum Calculator can be found in the Hydromagic installation folder.**

## Calculating a checksum

To calculate a checksum for a NMEA0183 which doesn't contain a checksum field already, you can use the first section of the application. First paste your NMEA0183 sentence in the input field and click the "Calculate" button to generate the same sentence with the checksum field included. For example, when pasting the sentence "\$GPVTG,230.0,T,231.3,M,3.0,N,5.6,K,D" into the text box, the generated sentence in the result section will be: "\$GPVTG,230.0,T,231.3,M,3.0,N,5.6,K,D\*24". In this case the calculated checksum is 0x24 hexadecimal.

Calculate Checksum for a NMEA0183 sentence

Sentence:

*Use the first section of the tool to calculate the checksum for a NMEA0183 sentence.*

### Validating a NMEA0183 sentence

To check whether a NMEA0183 sentence including a checksum field is valid, paste the NMEA0183 sentence in the text box in the second section of the application. When clicking the "Check" button, both the reported and calculated checksum will be placed. When they match the NMEA0183 sentence is valid. For example, when pasting the sentence "\$GPVTG,230.0,T,231.3,M,3.0,N,5.6,K,D\*24" in the second text box, the calculated checksums will appear in the result section like this: "Sentence Checksum = [0x24], Calculated Checksum = [0x24], Result = OK". This function also checks for invalid characters which are not supported by the NMEA0183 standard.

Check validity of a NMEA0183 sentence with checksum included

Sentence:

*Use the first section of the tool to calculate the checksum for a NMEA0183 sentence.*

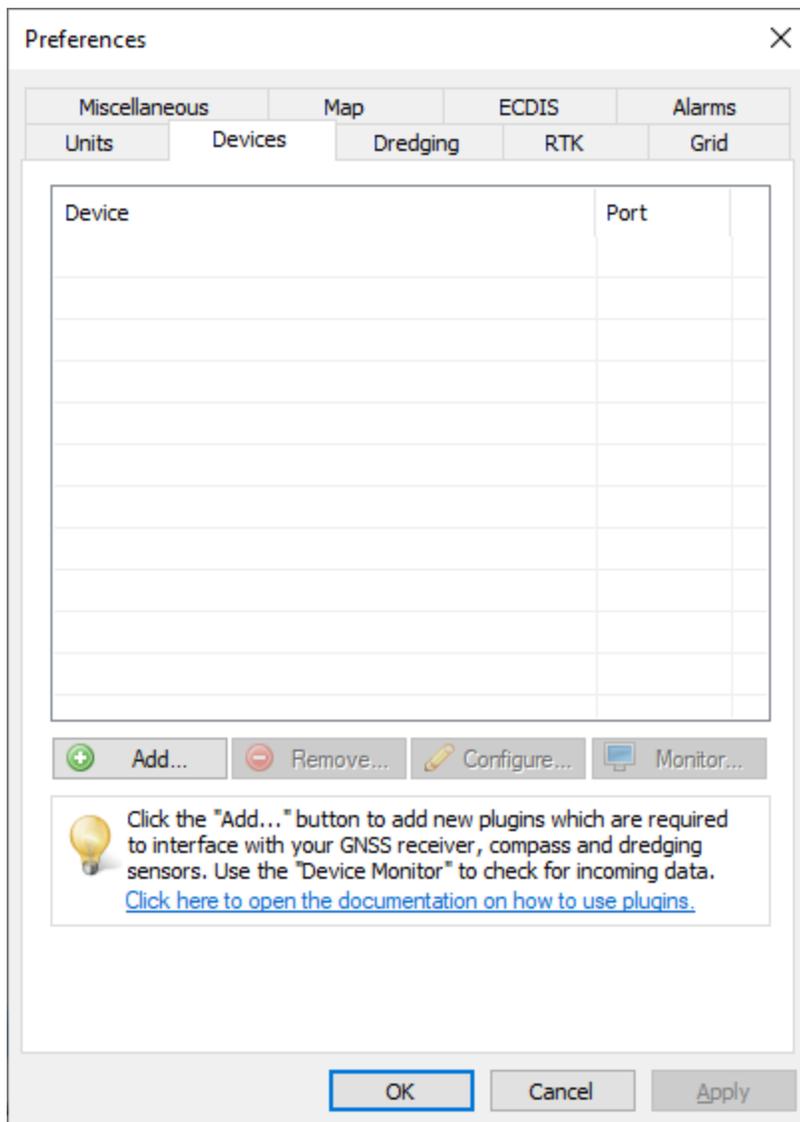
# 11 Plugins

## 11.1 General information on using plugins

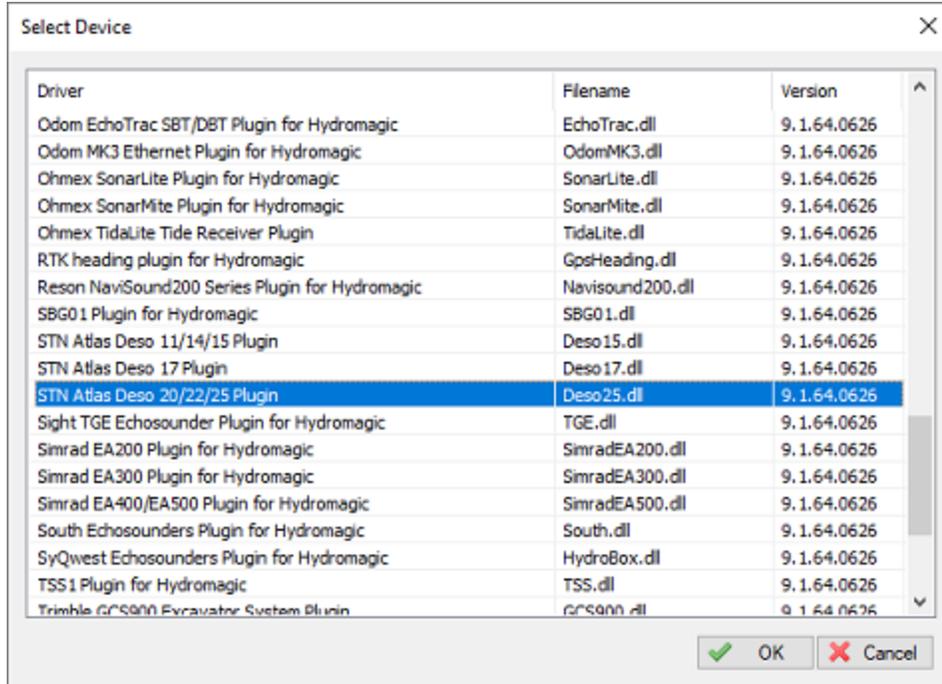
In Hydromagic, a plugin is a small piece of software which is loaded when requested. In most cases, plugins are used to add compatibility for a piece of hardware such as an echo sounder, positioning device, motion sensor or a manual input like tide or sound velocity. By using separate plugins (Windows DLL files), it is possible to add support for hardware or a new feature without having to re-install the Hydromagic software, just copying a DLL file and restart the software will suffice.

### Loading a plugin

To load any plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.

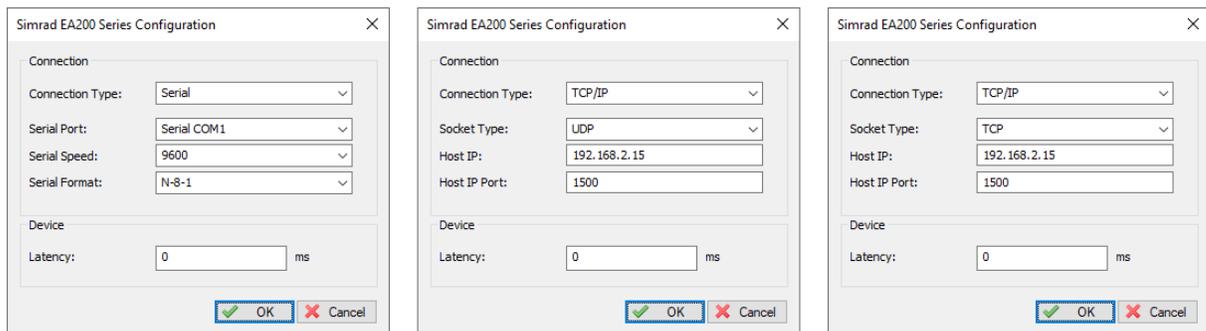


A list of available plugins will be displayed. The list is sorted alphabetically and displays the name of the plugin, the DLL filename and the version number. All plugins are located in the "Plugins" folder under the installation folder, for instance: "C:\Program Files\Eye4Software\HydroMagic\Plugins". If you ever need to add or replace a plugin DLL, this is the place to copy the received file to.



## Configuring a plugin

The configuration screen might be slightly different on the various plugins. However plugins which are used to connect to a device like an echo sounder or a position device always need some information on how to connect to the device. Most plugins allow you to connect a device through a serial port (or USB to serial converter), or Ethernet using the TCP or UDP internet protocols.



When configuring a device which is connected to a serial port, via an USB to serial converter or Bluetooth you have to use "Serial" as connection type. The software automatically detects all serial ports present in Windows and you can select one using the "Serial Port" drop down.

To switch between a serial and an Ethernet connection, just change the connection type from "Serial" to "TCP/IP". When the connection type is set to "TCP/IP" you can use the second drop down box to switch between the "TCP" and "UDP" internet protocols.



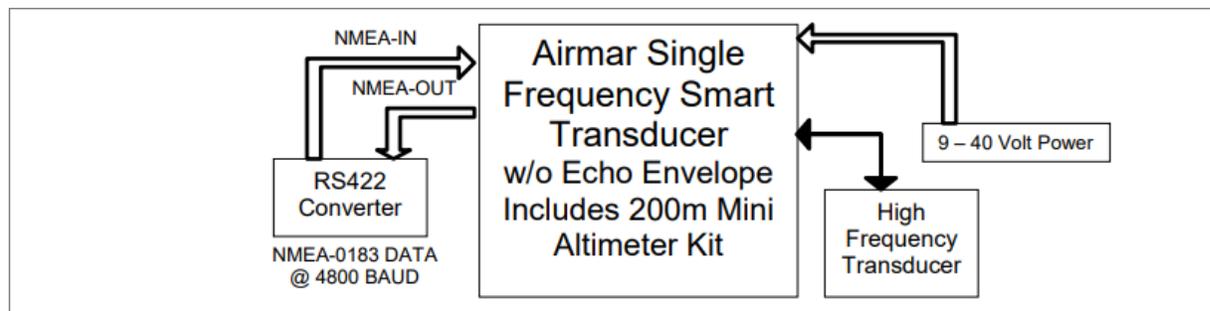


If your EchoRange doesn't support the output of an echo envelope (this is an add-on and not available on all models), only (dual frequency) depth data is outputted on the serial port. In this case, you can use the regular NMEA0183 plugin which decodes the depth data from the XDR NMEA0183 sentences. The rest of this document does not apply to echo sounders without the echo envelope output add-on !

When you own an echo sounder with an echo envelope output, there is no need to load a NMEA0183 plugin, since the depth value is reported on the echo envelope serial ports as well.

### EchoRange(TM) Single Frequency Smart Transducer (Without echo envelope output)

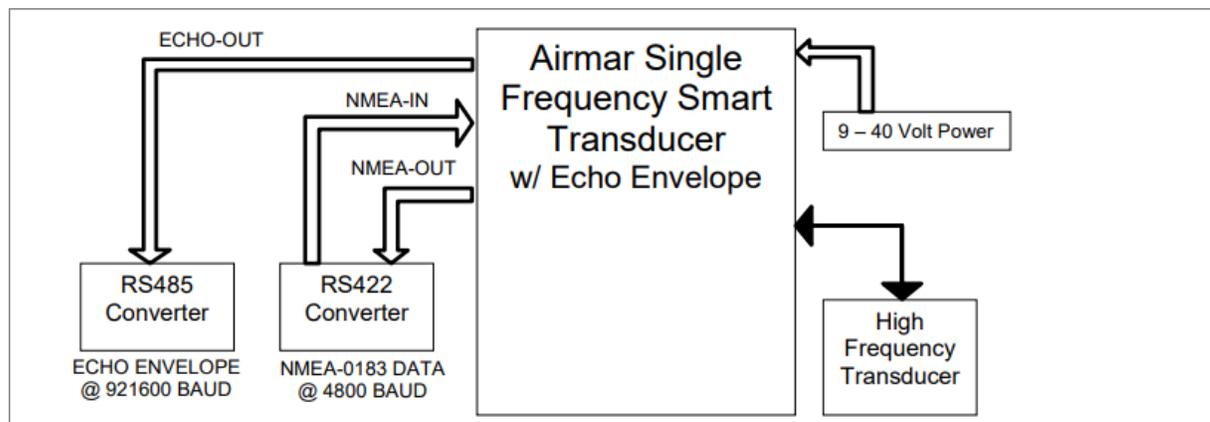
This EchoRange model comes with a high frequency transducer only and can communicate with acquisition software using a RS-422 serial port only. The only protocol supported on this serial port is NMEA0183. When you own such a model, just use one of the NMEA0183 plugins to interface with this echo sounder.



Connections on the EchoRange(TM) Single Frequency Smart Transducer (Without echo envelope output)

### EchoRange(TM) Single Frequency Smart Transducer (With echo envelope output)

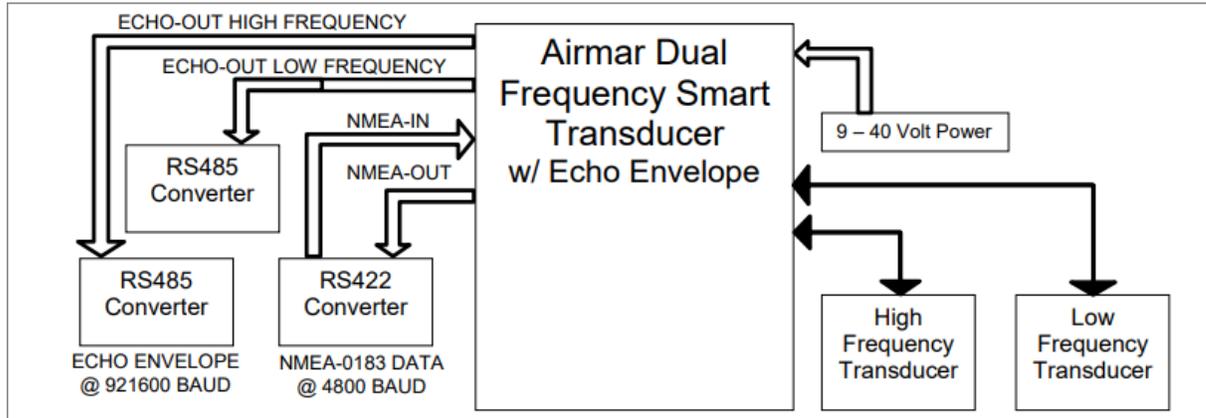
This EchoRange model comes with a high frequency transducer only and can communicate with acquisition software over a RS-422 serial port using the NMEA0183 protocol. A second port, which is a RS-485 serial port, is supplied to broadcast the echo envelope using a proprietary protocol with a serial speed of 921600 bits per second. For this model, you only need to load the high frequency plugin in Hydromagic ("Airmar EchoRange Plugin - Hi Frequency Channel").



Connections on the EchoRange(TM) Single Frequency Smart Transducer (With echo envelope output)

### EchoRange(TM) Dual Frequency Smart Transducer (With echo envelope output)

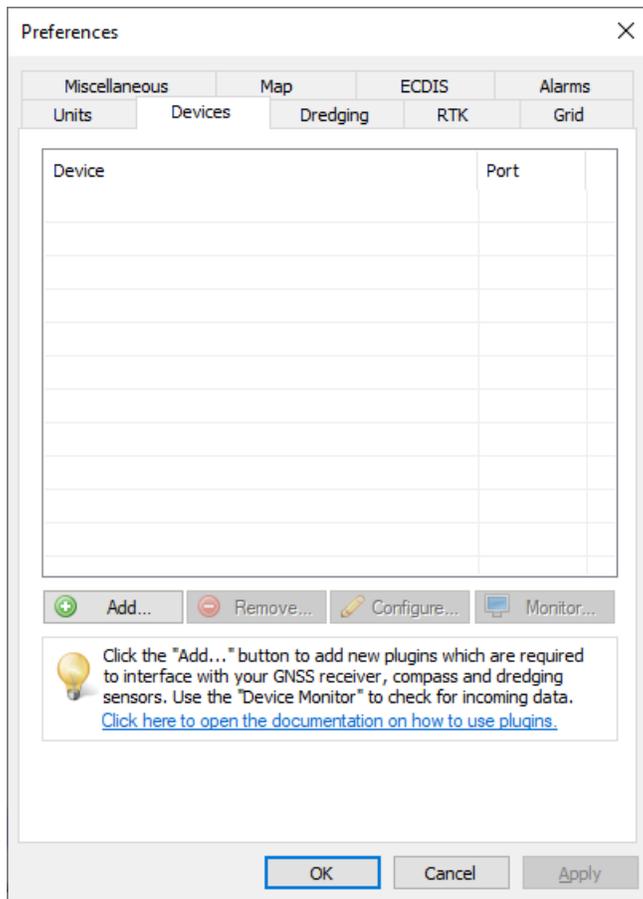
This EchoRange model comes with a dual frequency transducer and can communicate with acquisition software over a RS-422 serial port using the NMEA0183 protocol. A second and third port, which are RS-485 serial ports, are supplied to broadcast the echo envelope for the high and low frequencies using a proprietary protocol with a serial speed of 921600 bits per second. For this model, you will need to load both the Hydromagic EchoRange plugins in order to get the echo envelope data for both channels into the software.



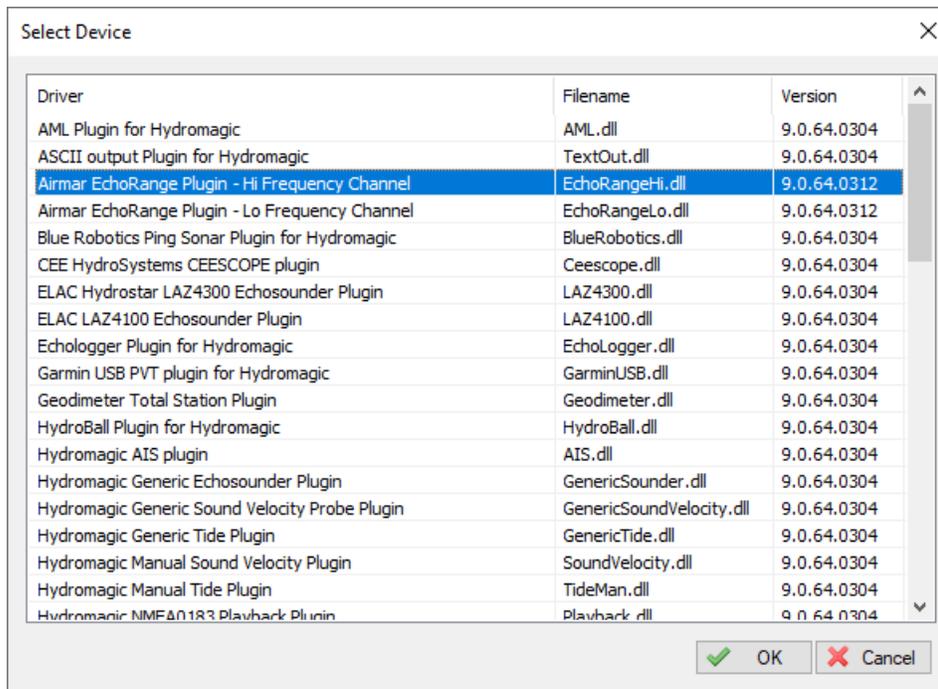
**Connections on the EchoRange(TM) Dual Frequency Smart Transducer (With echo envelope output)**

### Loading the EchoRange (High Frequency) plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



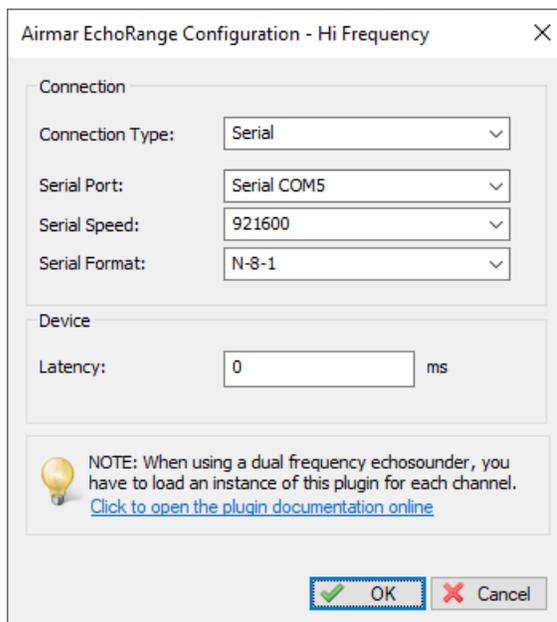
A list of available plugins will be displayed. In this list, select "Airmar EchoRange Plugin - Hi Frequency Channel" and click "OK" to load and display the plugin's user interface.



## Configuring the EchoRange plugin

When the plugin loads, a dialog with some required settings will appear first.

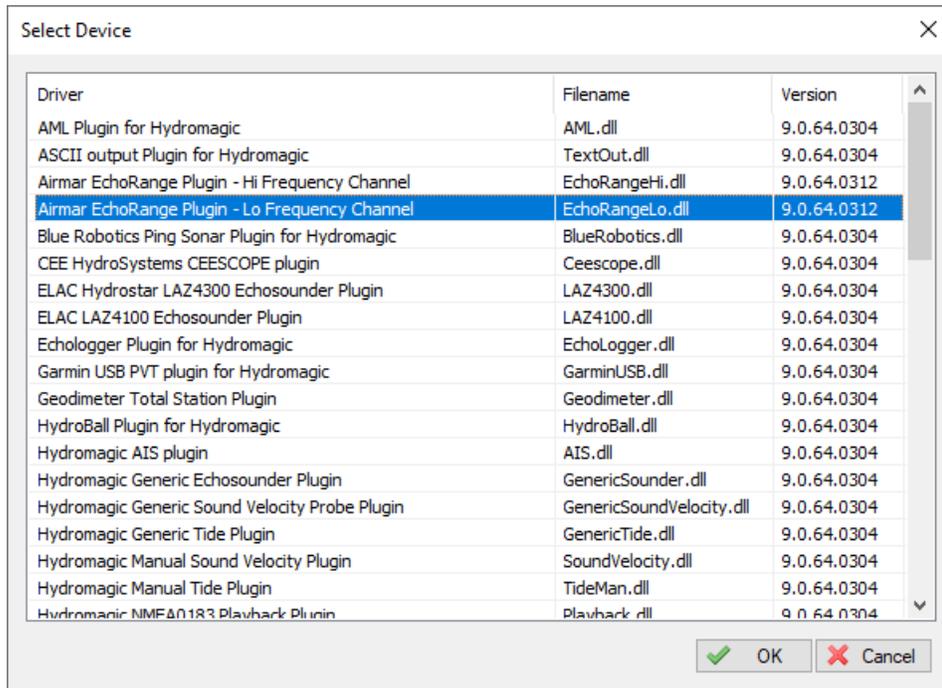
In the dialog, please select the serial port the sounder is connected to. The default baudrate used to transmit echo envelope data is 921600 bps.



## Loading the plugin for the second channel (Low Frequency)

When you own an AirMar EchoRange which is able to output an echo envelope for both high and low frequency, you need to load an additional plugin for the second (low frequency) channel. From the device

list, click the "Add..." button and select the "AirMar EchoRange Plugin - Lo Frequency Channel from the list.



When the configuration windows of the plugin appears, enter the serial port for the low frequency data. Please make sure you do not use the same serial port as the one configured in the high frequency plugin. The default serial port speed for this second channel is also 921600 bps.

### Testing the sounder

When the sounder has been connected and configured, click "OK" to store the settings and start the plugin.

There should be a green icon in front of the plugin name when data is coming in successfully.

When no data is coming in, most of the times the incorrect serial port or speed has been selected.

## 11.3 CEE-LINE plugin

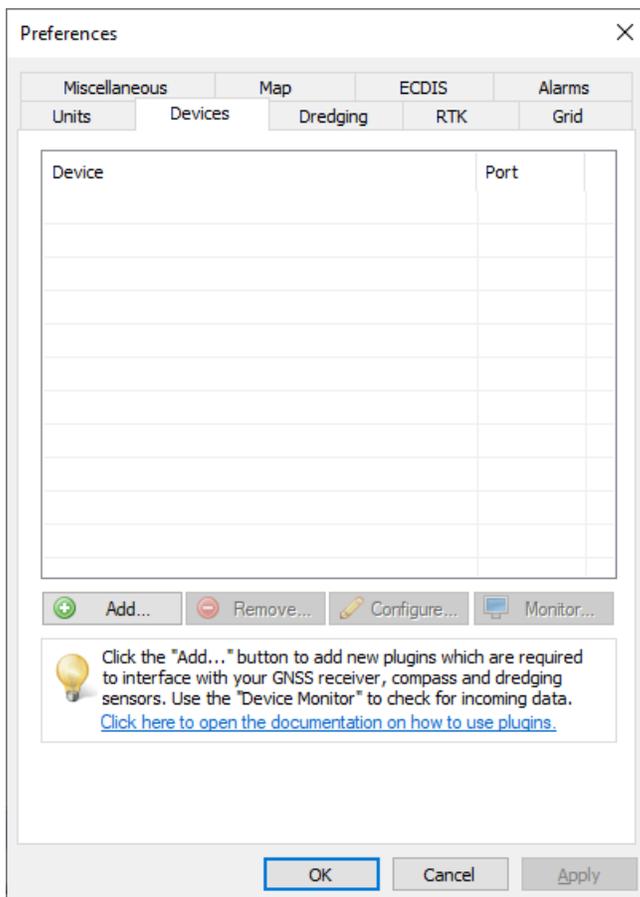
The CEE-LINE plugin is a plugin with graphical user interface designed to connect your CEE HydroSystems CEE-LINE echo sounder device. It will transfer (dual frequency) digitized depth data to the Hydromagic application. Using the graphical user interface, you can also adjust some sounder parameters during your survey like range, ping rate, gain, draft, TVG mode and more.



The CEE HydroSystems CEE-LINE echo sounder (image courtesy of CEE-HydroSystems)

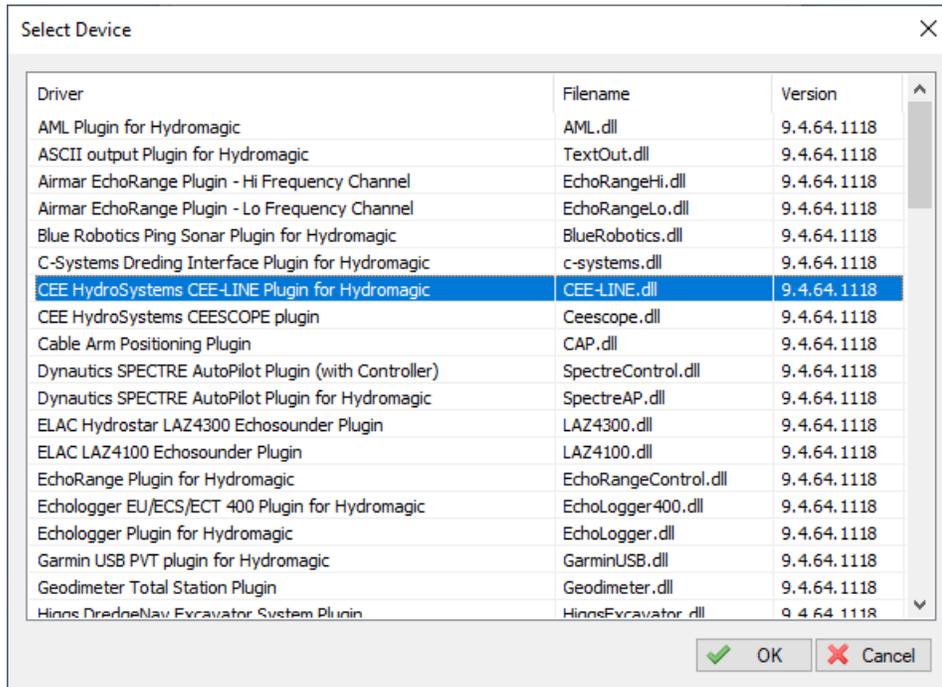
### Loading the CEE-LINE plugin

To load the CEE-LINE plugin, open the preferences window, by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



Click the "Add..." button in the "Devices" tab.

A list of available plugins will be displayed. In this list, select the "CEE HydroSystems CEE-LINE Plugin for Hydromagic" and click "OK" to load and display the plugin's user interface (configuration).



Select the "CEE HydroSystems CEE-LINE Plugin for Hydromagic" from the list.

## Configuring the CEE-LINE plugin

When the plugin loads, a dialog with some required settings will appear first. You have to select the serial port settings (or network settings in case the sounder has been connected using a serial to Ethernet converter), the protocol used, and whether you want to control the sounder with values in feet or meters (for range, draft, blanking and index).

**CEE-LINE Plugin Configuration**

**Connection**

Connection Type:

Serial Port:

Serial Speed:

Serial Format:

**Device**

Protocol:

Latency:  ms

**Control Window**

Units:

 When using a dual-frequency model of the CEE-LINE, make sure to use a protocol which supports dual frequency, like Odom or DESO25.

**Configure communication and unit settings first.**

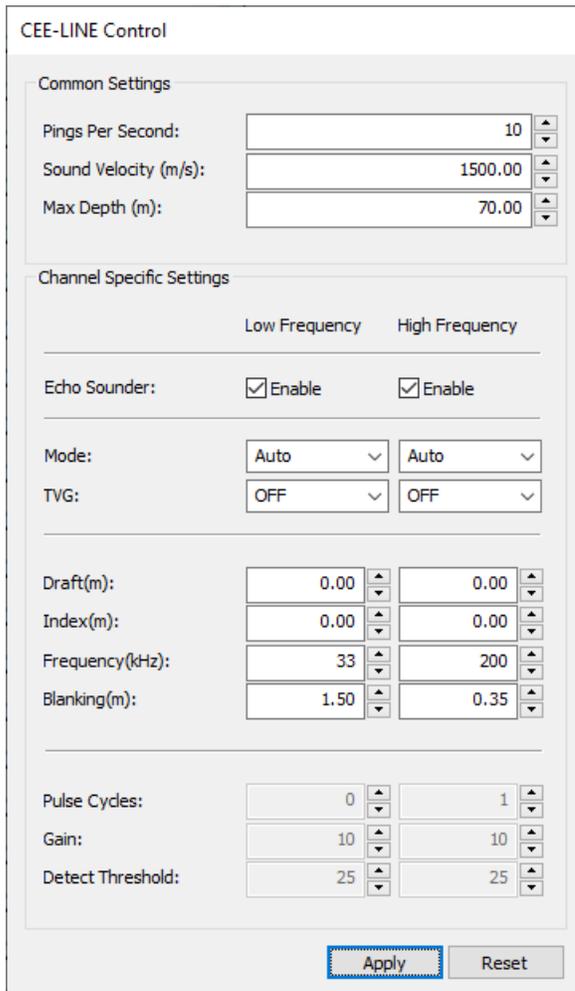
When you are unsure which serial speed you must select, close Hydromagic and launch the "CEE-LINE Connect" software, since this software will auto-detect the serial speed used. In the plugin configuration dialog, the serial port drop-down box will automatically list all available serial ports on your computer. Please select the correct one, or switch the connection type to "TCP/IP" in case the sounder is connected using a serial to Ethernet converter.

The echo sounder supports multiple protocols to send the digitized depth information to the software. You can detect and change the currently selected output format by using the "CEE-Line Connect" software. When using a dual frequency transducer, make sure to select a protocol which can handle dual frequency depths, like the Odom DBT, Sonarmite DFX or DESO25 protocol. The following protocols are supported by the Hydromagic CEE-LINE plugin:

- ODOM DBT;
- NMEA0183 DBT;
- NMEA0183 DBS;
- CEESTAR;
- DESO25;
- CEEDUCER;
- SONARMITE OLD;
- SONARMITE NEW;
- SONARMITE DFX.

## Starting the plugin

When the communication settings, protocol and units have been configured, click the "OK" button to save the settings and start the plugin. After a few moments, and when the plugin can communicate with the sounder (it will first auto-detect which model has been connected), a popup which can be used to control the echo sounder will be visible:



**The control window allows you to change echo sounder settings**

### Testing the echo sounder

When data is received, you should be able to see the depth and position information in the [data window](#). If no data is displayed, you can check whether data is coming in by using the "Communications Monitor":

Open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "CEE HydroSystems CEE-LINE Plugin for Hydromagic" and click the "Monitor..." button. The communication monitor appears, and should display depth information coming in using the protocol selected in the "CEE-LINE Connect" software. When the monitor does not display any incoming data, the serial port or serial speed setting might be incorrect.

When you encounter problems getting the serial port to receive data, we suggest you to have a look at our YouTube tutorial on [troubleshooting serial communications using the puTTY software](#) (free software).

### Controlling the echo sounder

Once the communication with the echo sounder has been established, it will load the settings which are

currently stored in the echo sounder and display them in the echo sounder control display. Depending on whether you have a dual frequency sounder or not, one or two columns with settings will be enabled. After making a change, click the "Apply" button to save the settings to the sounder. Settings will be stored in non-volatile memory, so when you connect the sounder the next time, they should still be there.

To reset all values to their factory defaults, click the "Reset" button. Please note that when storing settings, the incoming data will pause for one or two seconds, so it may result in a small gap in your raw data file when you are recording data when making changes.

The following echo sounder settings can be changed from the control window of this plugin:

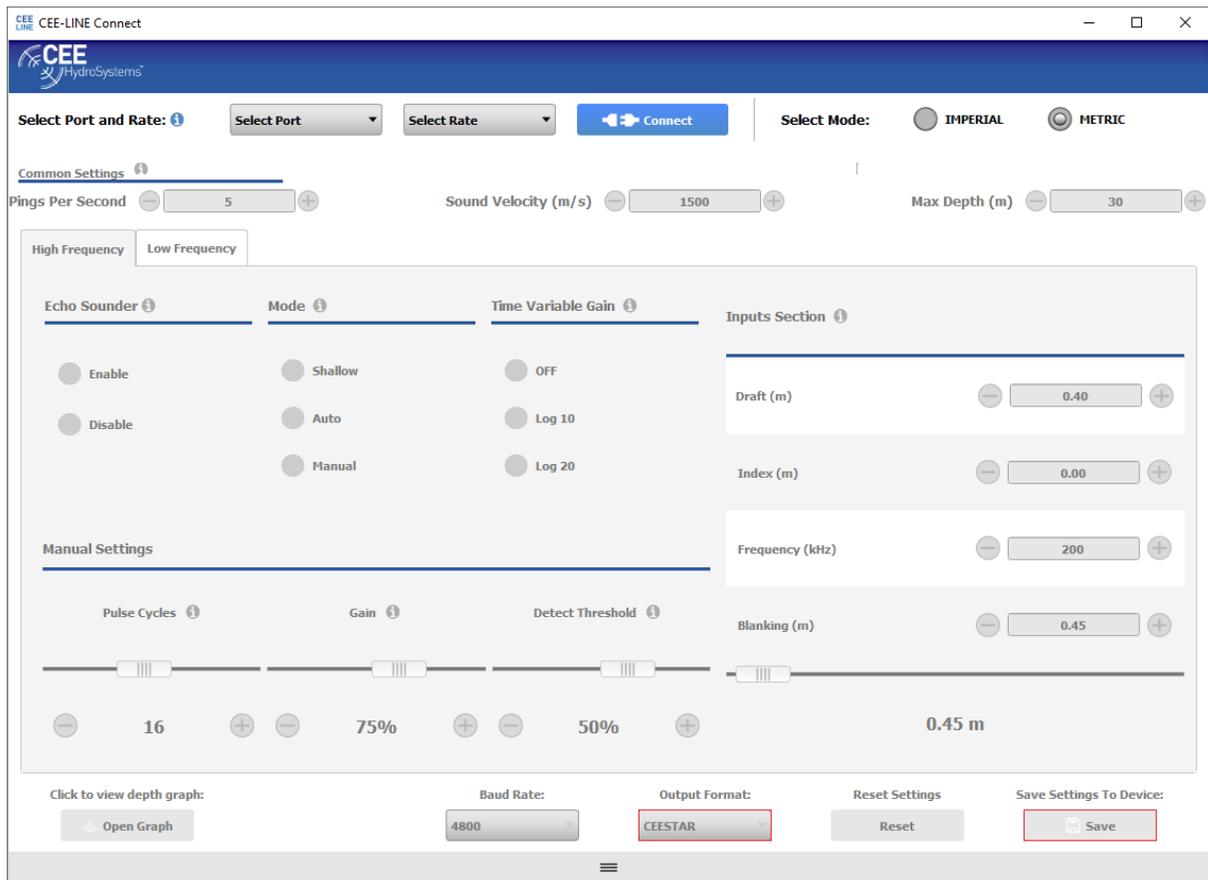
- Pings per second: Number of measurements per second;
- Sound Velocity: Speed of sound through the water, default 1500 m/s;
- Max depth: Range of the echo sounder;
- Mode: Echo sounder mode, shallow, auto or manual settings;
- TVG: Time variable gain setting;
- Draft: Distance between water surface and transducer (static draft);
- Index: Additional offset, sounder starts digitizing at this depth;
- Frequency: The transmitter frequency can be changed - to match your transducer;
- Blanking: Echo's below this depth will be ignored;
- Pulse Cycles: Pulse length or number of pulses transmitted;
- Gain: Adjust receiver gain in decibel;
- Detect Threshold: signal strength required to digitize depth.

When the echo sounder is set to "AUTO" mode, it is not possible to change the "Pulse Cycles", "Gain" and "Detect Threshold" values. If you want to fine-tune the sounder with those settings, please set the "Mode" setting to "MANUAL". For detailed information on all echo sounder settings, please refer to the "CEE-LINE ECHO SOUNDER User Manual" since it covers all settings in detail.

### Changing the output format used by the CEE-LINE sounder

To use the CEE-LINE with one of the other plugins shipped with Hydromagic (without using the control window), the serial output format of the CEE-LINE can be set to, for instance DESO-25, when you want to use the DESO-25 plugin instead. To do so, start the "CEE-LINE Connect" application which is shipped with the echo sounder and click connect to make a connection to the sounder. After connecting, you can select the output format at the bottom of the window (see screenshot below). After selecting the format, click the "Save" button to store the new setting.

Depending on the output format selected, the CEE-LINE can, besides the documented CEE-LINE plugin, also be connected by using the "STN ATLAS DESO 20/22/25", "Ohmex Sonarmite" or "Odom EchoTrac SBT/DBT" plugins, which also ship with older versions of Eye4Software Hydromagic.



You can change the output format used by the CEE-LINE sounder from the CEE-LINE Connect application.

## 11.4 CEESCOPE Plugin

The CEESCOPE plugin is a plugin with graphical user interface designed to connect your CEE HydroSystems CEESCOPE or CEE ECHO echo sounder device.

It will transfer position, depth, motion and full water column echogram data to the Hydromagic application.

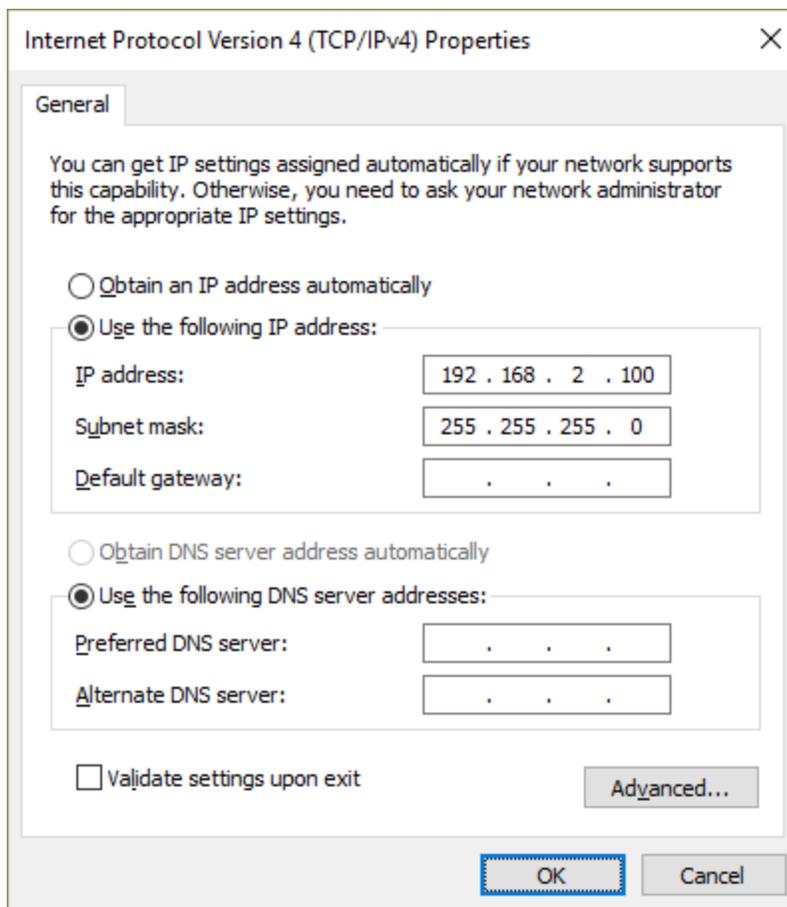


### Configuring the Ethernet adapter

Since the CEESCOPE is connected via an Ethernet cable to your computer directly, you have to configure your network adapter to be able to communicate to the device directly.

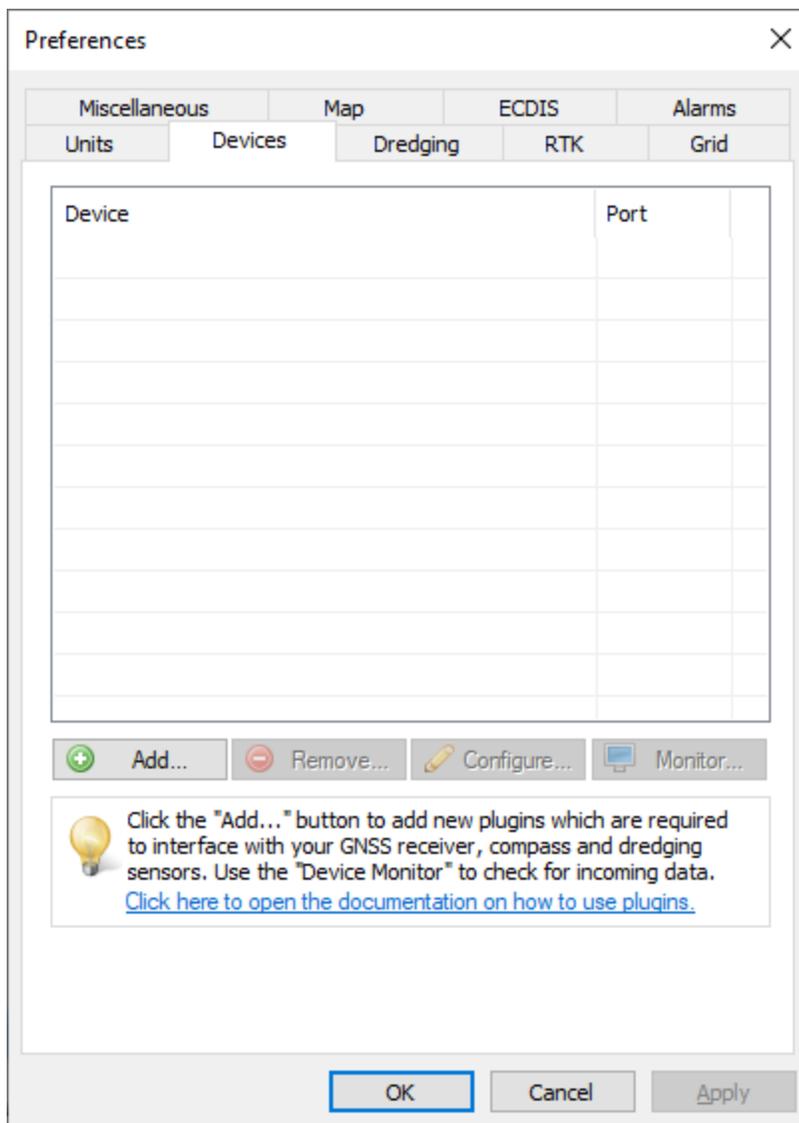
By default, under Windows, network adapters are configured to contain a DHCP server to obtain their configuration.

Since no LAN network will be present, you have to enter a static IP (TCP/IPv4) address.

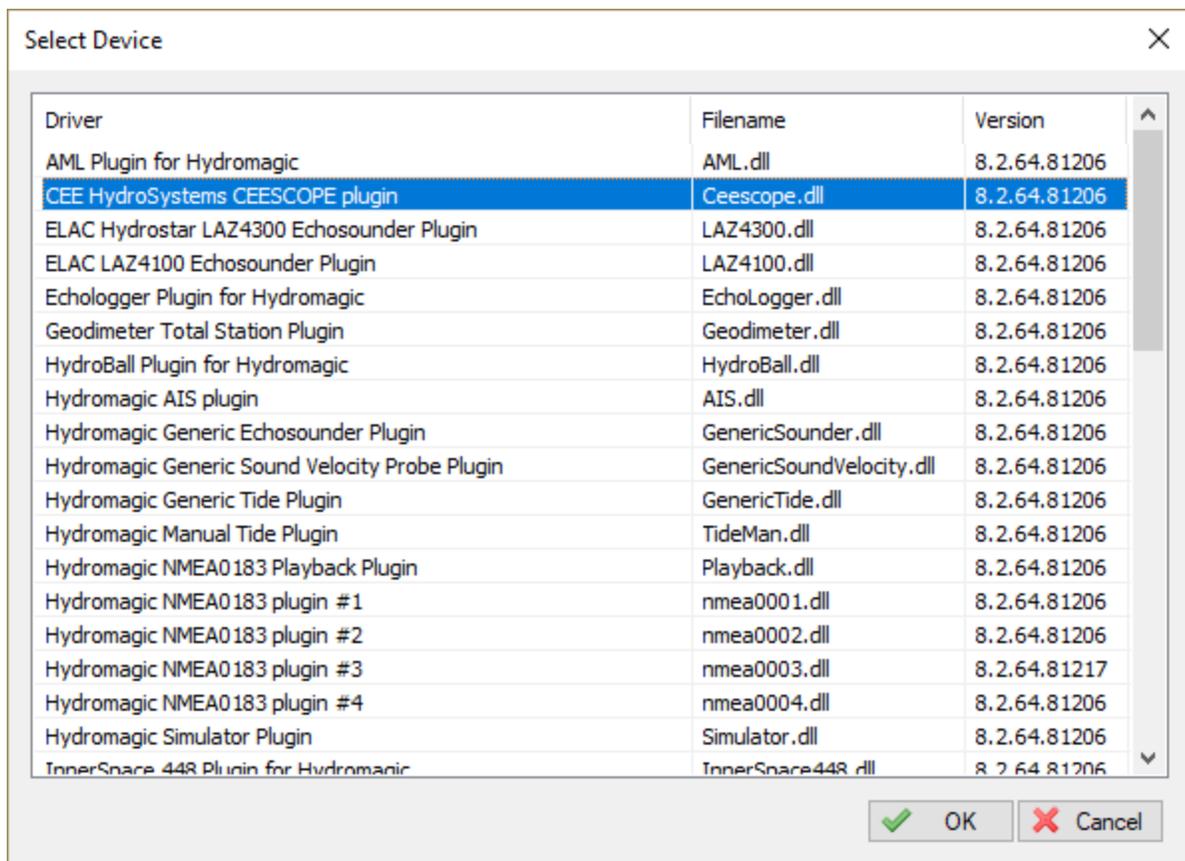


### Loading the CEESCOPE plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



A list of available plugins will be displayed. In this list, select the "CEE HydroSystems CEESCOPE Plugin" and click "OK" to load and display the plugin's user interface.



## Configuring the CEESCOPE plugin

When the plugin loads, a dialog with some required settings will appear first. You have to set network (UDP) ports to use for the transfer of navigation and acoustic data packets.

In most cases, you can use the defaults. With factory settings, UDP port 1234 is used to transfer the RTK position data routed through the sounder to the client software. UDP port 1235 is used to transfer the acoustic data packets, containing the depth, range, draft and the echogram data.

CEESCOPE Ethernet Plugin Configuration

TCP/IP Settings

UDP Port (Position): 1234 (default: 1234)

UDP Port (Sounder): 1235 (default: 1235)

Channel Assignment

Hi Frequency: Channel A (default: 'A')

Lo Frequency: Channel B (default: 'B')

Advanced

Latency: 0 ms

Use CEESCOPE internal timestamps

IMPORTANT: Use the internal timestamps only when no other plugins are used. Make sure you set the latency to zero when using this option !

OK Cancel

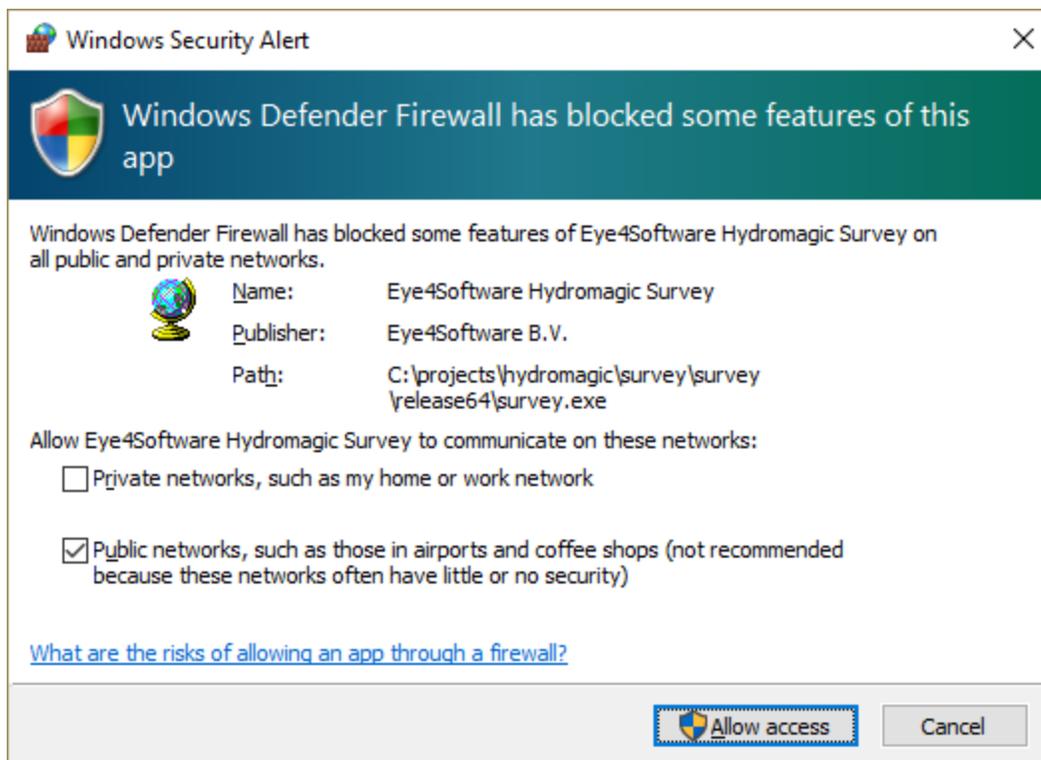
### Use CEESCOPE internal timestamps

When the position data is transferred via the echo sounder, and no other time critical plugins are loaded in Hydromagic, it is recommended to enable this option.

When this option has been enabled, the CEESCOPE will time tag all depth and position data with internal timestamps. When using these timestamps, you do not have to set the latency setting.

### Starting the plugin

When the ports have been configured, click the "OK" button to save the settings and start the plugin. In case the Windows Firewall has been enabled on your computer, you will see the following popup window appear:



Make sure you click the "Allow Access" button to allow Hydromagic to send and receive data on the configured UDP ports.

When you click the "Cancel" button, access to the sounder will be blocked and you won't receive any data from the sounder !

When the laptop is not connected to the Internet and is only used to communicate with the echo sounder, you can decide to shut down the Windows Firewall entirely. It is also recommended to try this in case of connection issues.

After allowing the connection, there should be a green icon in front of the plugin, indicating data is coming in successfully.

### Testing the sounder

When data is received, you should be able to see the depth and position information in the data window. To have a look at the echogram data, select "Echogram(Hi)" or "Echogram(Lo)" from the View menu.

## 11.5 Echologger Plugin

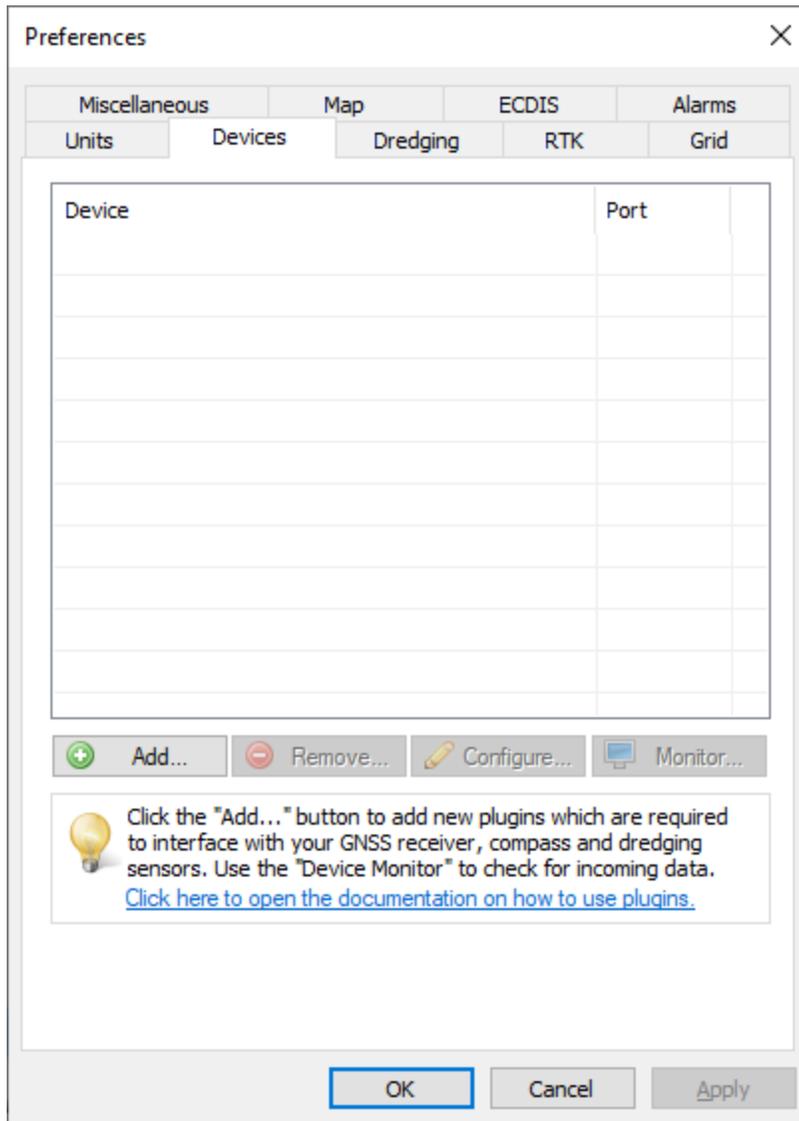
The Echologger plugin is a plugin with graphical user interface designed to control your Echologger EU400 or D24 device.

When loaded it also transfers depth, motion and echogram data to the Hydromagic application.

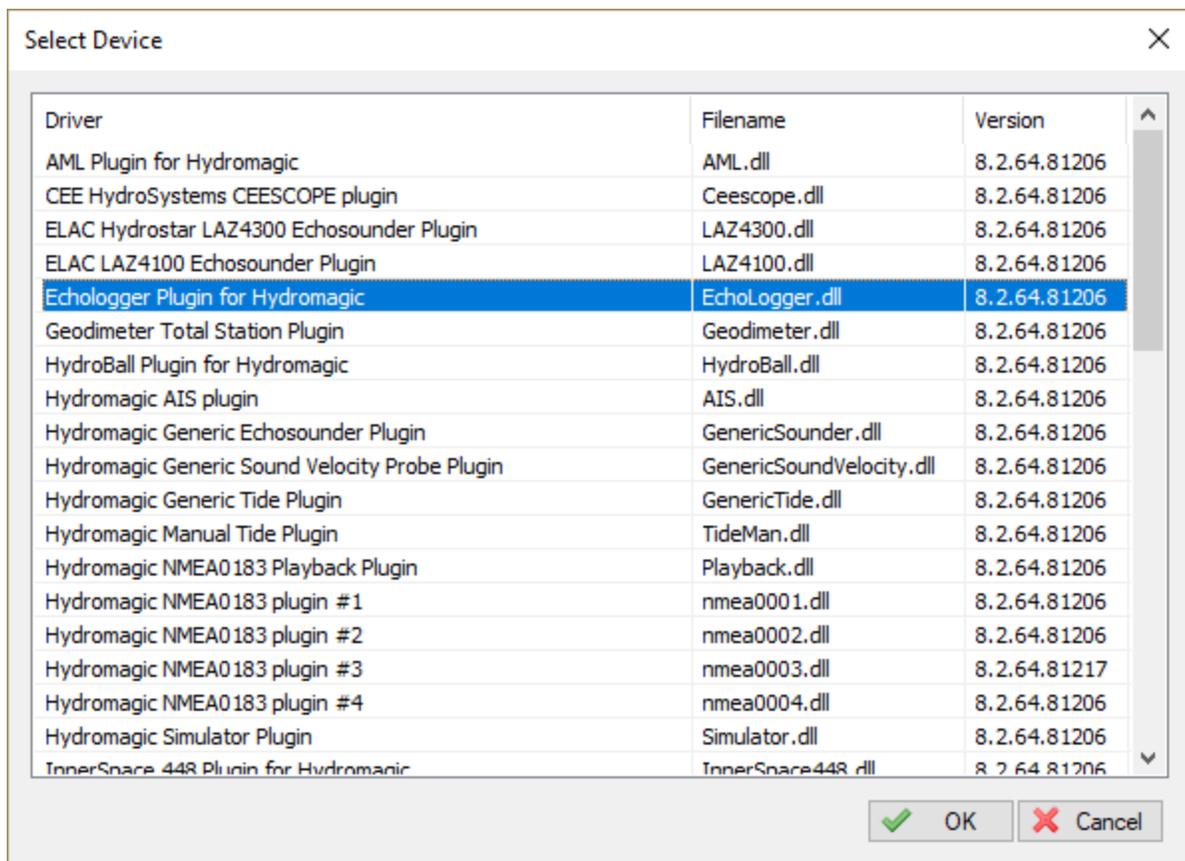
### Loading the Echologger plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu.

In the window that appears, select the "Devices" tab. Next click the "Add..." button.



A list of available plugins will be displayed. In this list, select the "Echologger Plugin" and click "OK" to load and display the plugin's user interface.



## Configuring the EchoLogger plugin

When the plugin loads, a dialog with some required settings will appear first.

You have to set the communications options, echo sounder model and the data transfer protocol to use.

The screenshot shows the 'EchoLogger Configuration' dialog box. It is titled 'EchoLogger Configuration' and has a close button (X) in the top right corner. The dialog is organized into three main sections:

- Connection:** This section contains four dropdown menus:
  - Connection Type: Serial
  - Serial Port: Serial COM15
  - Serial Speed: 115200
  - Serial Format: N-8-1
- Select type and protocol:** This section contains one dropdown menu:
  - Protocol: D24 (ASCII, 10BITS)
- Echosounder Mode:** This section contains one dropdown menu:
  - Mode: Dual Frequency

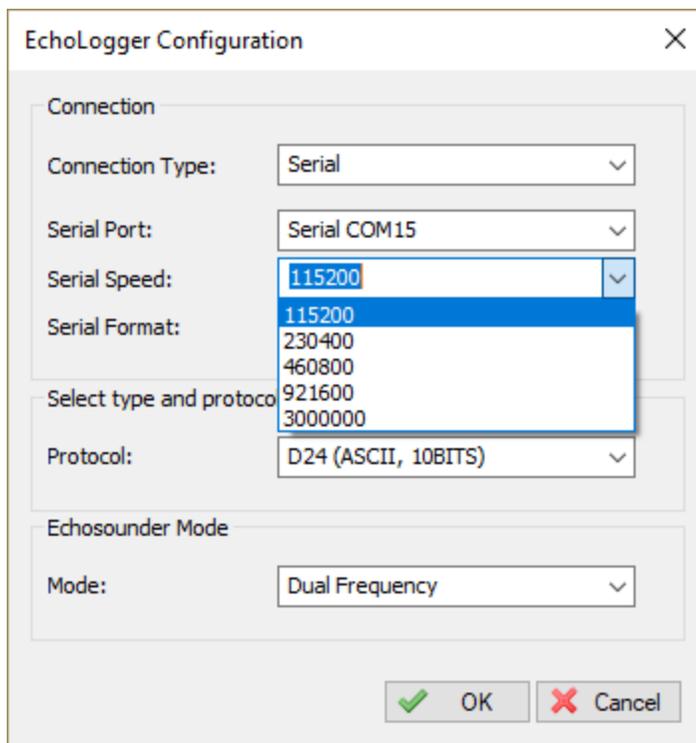
At the bottom of the dialog, there are two buttons: 'OK' (with a green checkmark icon) and 'Cancel' (with a red X icon).

### Communications settings

When using the default configuration, the echo sounder connects with the computer using an USB cable. When plugged in, a virtual serial port will be created in Windows and you have to select this serial port.

The serial speed is 115200 bps when factory settings are used.

The Echologger also supports higher speeds like 230400, 460800 and 921600 bps.



When a high sample and data interval is used it is recommended to use one of these higher speeds. We will discuss how to setup the sounder for this speeds in the next chapter.

### Changing the Echologger's serial speed

To change the speed of the echologger's serial port, you need a piece of serial terminal software like Putty.

A lot of serial terminal software packages can be downloaded free of charge from the Internet. In this example we will use Putty.

When you installed Putty, first open a serial connection to the echo sounder with the default serial port speed which should be 115200 bps.

Make sure Hydromagic has been closed or the plugin has been removed, otherwise the port will already be opened.

First we have to set the echologger into command mode: When data comes in, press enter until the > sign appears on a new line and the data stops coming in.

At this point enter one of the following commands, depending on the desired speed:

```

0
##DataEnd

#F 200000 Hz*55
$SDZDA,045822.04,01,01,1970,00,00*40
$SDDBT,0.461,f,0.140,M,0.067,F*01
$SDMTW,25.1,C*02
$SDXDR,A,0.4,D,PTCH,A,0.5,D,ROLL*4A
$SDXDR,A,49.04,P,EMA*26
>

```

- #baudrate 115200 <ENTER>;
- #baudrate 230400 <ENTER>;
- #baudrate 460800 <ENTER>;
- #baudrate 921600 <ENTER>;

When the command succeeds, the echo sounder will send back "OK" on a new line.  
To apply the new baudrate, issue the '#reset' command and disconnect the terminal software.

```

$SDZDA,050001.56,01,01,1970,00,00*4A
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDMTW,25.1,C*02
$SDXDR,A,0.4,D,PTCH,A,0.5,D,ROLL*4A
$SDXDR,A,0.90,P,EMA*16

>#baudrate 921600
OK
>

```

You should now be able to use the echo sounder with the plugin using the newly selected serial speed.

### Select echo sounder model and serial protocol

At this moment we have tested the EU400 and D24 echo sounders, but other Echologger models should work as well.

Each model has another set of serial protocols that can be used. You have to select the desired protocol in the plugin configuration.

Which protocol you should use depends on which data you want to retrieve from the echo sounder.

### Binary protocol

NOTE: Not supported yet. Recommended protocol when transferring echogram data. When not (yet) available use the ASCII protocol instead.

### ASCII protocol

When the ASCII protocol has been selected, all data will be transferred to the Hydromagic software. This includes depth, motion, temperature and echogram data.

The sampled return data can be sampled as 10 or 12 bit data values depending on this setting.

### NMEA0183 protocol

When the NMEA0183 protocol has been selected, the echo sounder will transfer depth, motion and temperature data to the Hydromagic software.

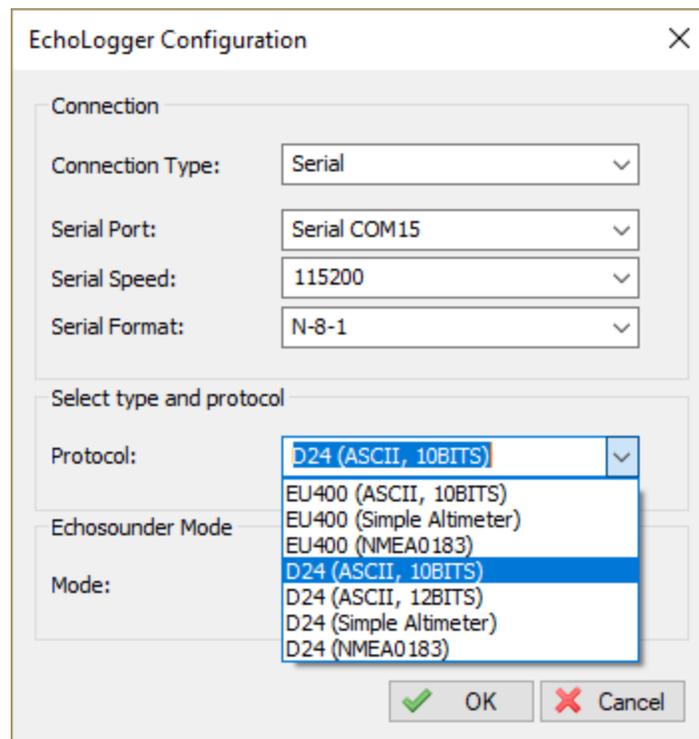
Echogram data needed to display and store full water column data won't be available.

When you do not the echogram data, use this option to reduce the amount of data transferred.

### Simple altimeter protocol

This is the most simple data transfer protocol available. Only the digitized depth is transferred.

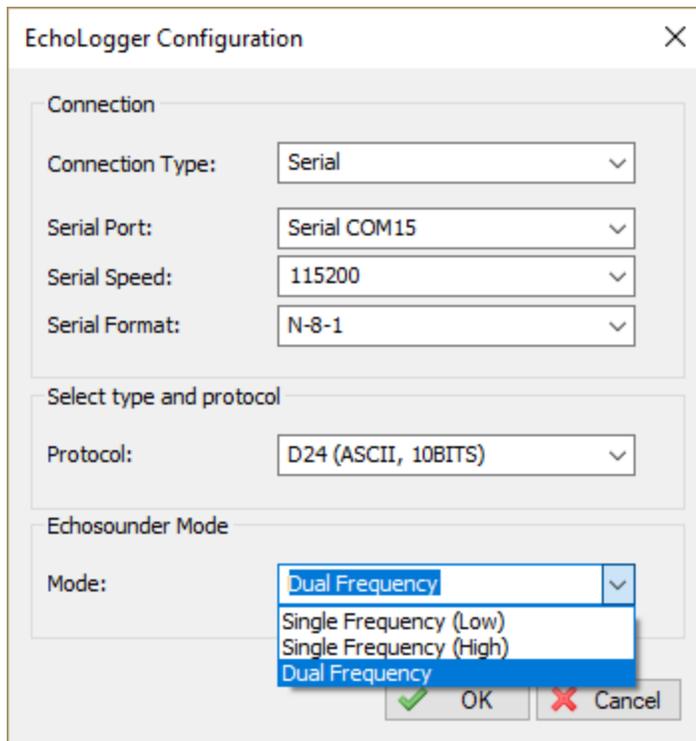
There is no real need to use this option, when no echogram data is needed, use the NMEA0183 option.



### Select echo sounder mode

This option is only needed when using a dual frequency model like the Echologger D24 revision 2.0 and higher.

You can select which frequency you want to use, or select dual frequency mode when supported by your sounder.

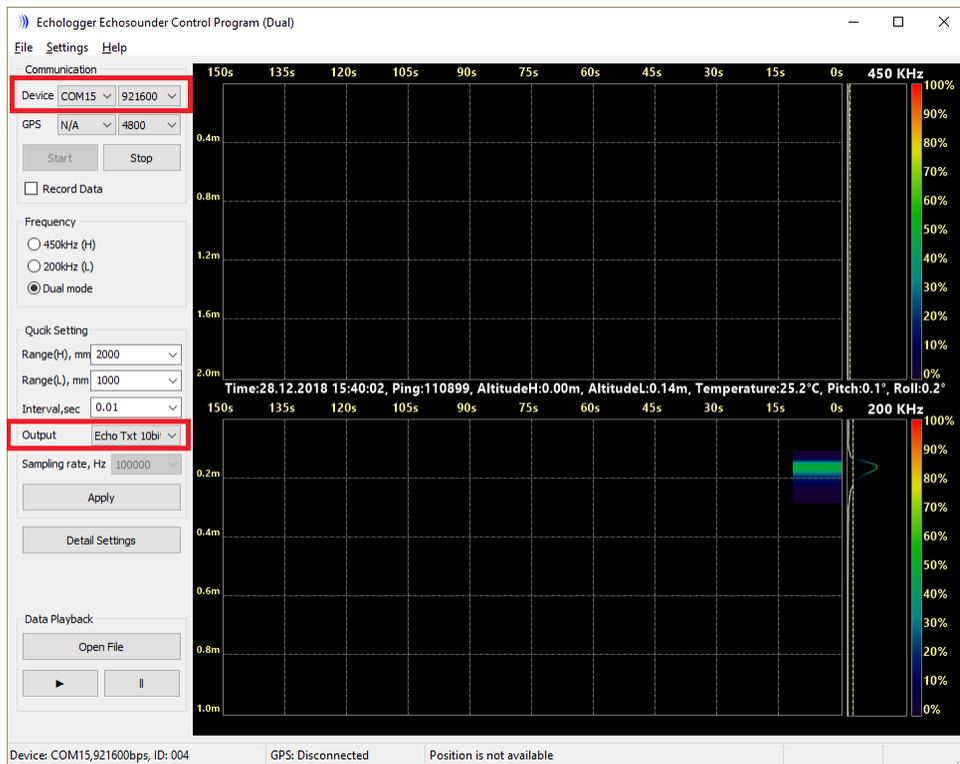


### Testing the sounder

When the sounder has been connected and configured, click "OK" to store the settings and start the plugin.

There should be a green icon in front of the plugin name when data is coming in successfully.

When no data is coming in, most of the times the incorrect serial port or speed has been selected. Also make sure the correct protocol has been chosen. You can check the current port, speed and protocol with the GUI application shipped with the sounder:



When data is received, you should be able to see the depth and motion sensor information in the data window.

To have a look at the echogram data, select "Echogram(Hi)" or "Echogram(Lo)" from the View menu.

### Controlling the echo sounder

When the plugin has been loaded and the communication with echo sounder has been established, you should be able to modify some settings.

For more information on the settings which can be modified, please refer to your Echologger manual.

Depending on the echo sounder model and the selected echo sounder mode, you will be able to control one or two channels.

Please note that applying the new settings can take a couple of seconds. During this time there will be a small gap in the collected data.

EchoLogger Control

Transmitter

	Low Frequency	High Frequency	
Range:	1	2	meter
TX Length:	100	50	uS
Interval	0.01		second(s)
TX Power:	-30.0		dB

Receiver

	Low Frequency	High Frequency	
Gain:	24.0	18.0	dB
TVG spread coef.	20	15	
TVG absorb:	0.09	0.08	dB/m
Attenuator:	0	0	uS

Altimeter

	Low Frequency	High Frequency	
Deadzone:	150	300	mm
Threshold:	10	5	percent
Offset:	0.0	0.0	mm
Sound Speed	1500.00		m/s

 [Apply](#)

### EchoLogger Control

**Transmitter**  
Range:  meter  
TX Length:  uS  
Interval:  second(s)  
TX Power:  dB

**Receiver**  
Gain:  dB  
TVG spread coef.:   
TVG absorb:  dB/m  
Attenuator:  uS

**Altimeter**  
Deadzone:  mm  
Threshold:  percent  
Offset:  mm  
Sound Speed:  m/s



## 11.6 Garmin USB-GPS plugin

The Garmin USB GPS Plugin can be used to connect various Garmin hand-held GPS models with Hydromagic. Most Garmin GPS models also support NMEA0183 output, but very often the data cable for this is sold separately.

Position data from the hand-held is also available via the USB port using Garmin's proprietary 'PVT protocol'. PVT stands for 'P'osition, 'V'elocity and 'T'ime. This Hydromagic plugin is able to connect to the USB device driver and decode the PVT sentences sent by the Garmin GPS.

### Supported Garmin GPS models

Although the list may not be complete, as new models come out on a regular bases, it contains some of the models that can be connected using the Garmin USB plugin:

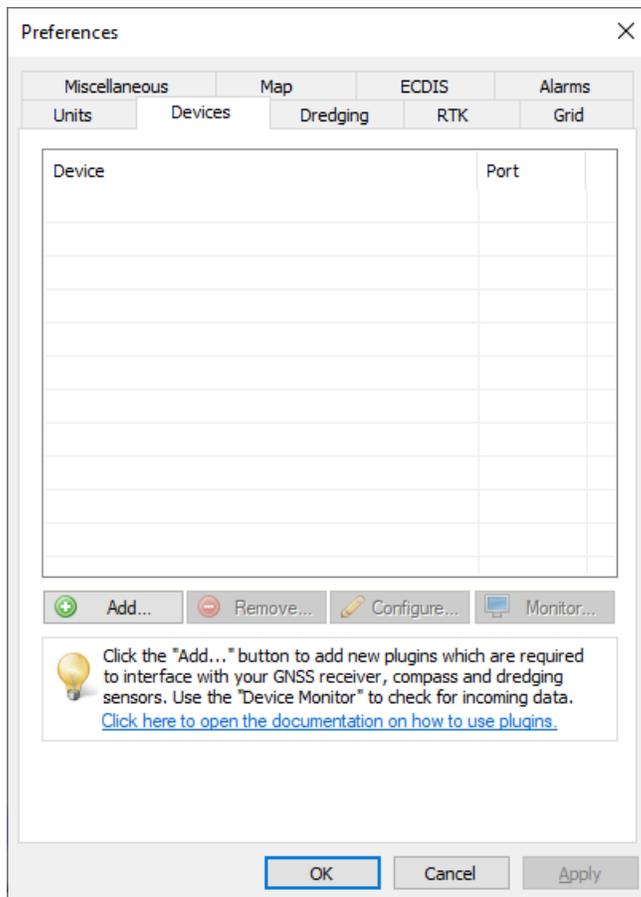
- GPS 18x, GPS 18x LVC, GPS18x-5Hz;
- eTrex series (old units such as the Legend H, Legend HCx, Summit Cx, Venture Cx or Vista HCx);
- GPSMap 60CSx, GPSMap 60CS or GPSMap 60;
- GPSMap 62stc, GPSMap 62st, GPSMap 62sc, GPSMap 62s or GPSMap 62 (firmware older than 3.40);
- GPSMap 64st, GPSMap 64s or GPSMap 64;

- GPSMap 76CSx, GPSMap 76CS or GPSMap 76C;
- GPSMap 78s, GPSMap 78sc or GPSMap 78 (firmware older than 3.40);
- Oregon series;
- Montana series;
- Rino 6xx series;

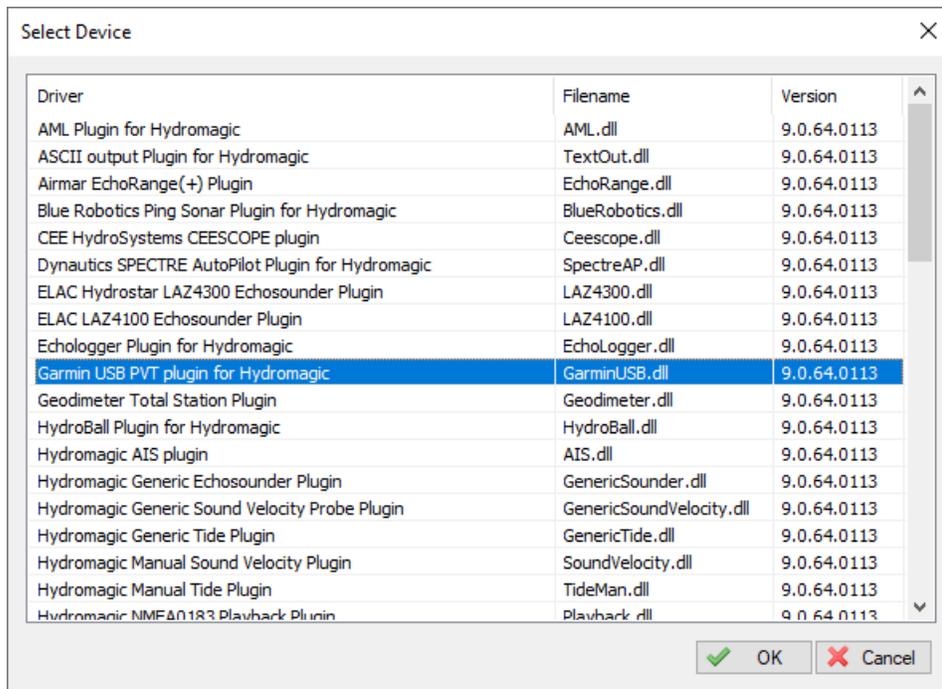
NOTE: By default the GPS18 series will sent NMEA0183 sentences over the USB port. To switch to PVT mode, you will have to use the proprietary \$PGRMC1 command. Please refer to the GPS18 users manual for more information.

### Loading the Garmin USB GPS plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



A list of available plugins will be displayed. In this list, select the "Garmin USB PVT plugin for Hydromagic" plugin and click "OK" to load the plugin. Since this device has its own device driver under Windows, no serial port or speed has to be selected, so the plugin is loaded without showing a configuration dialog first.



## Unloading the Garmin USB GPS plugin

To unload the GPS heading plugin, open the preferences window by selecting "Preferences..." from the "Options" menu.

In the window that appears, select the "Devices" tab. Next select the "Garmin USB PVT plugin for Hydromagic" and click the "Remove..." button.



When you have two GNSS or RTK receivers placed in a line perpendicular or parallel to the vessel's length, the heading of the vessel can be calculated by using the Vincenty's formula on the geographic coordinates outputted by the GNSS or RTK receivers. When the vessel turns, both the locations of the antenna's will change and a new heading is calculated.

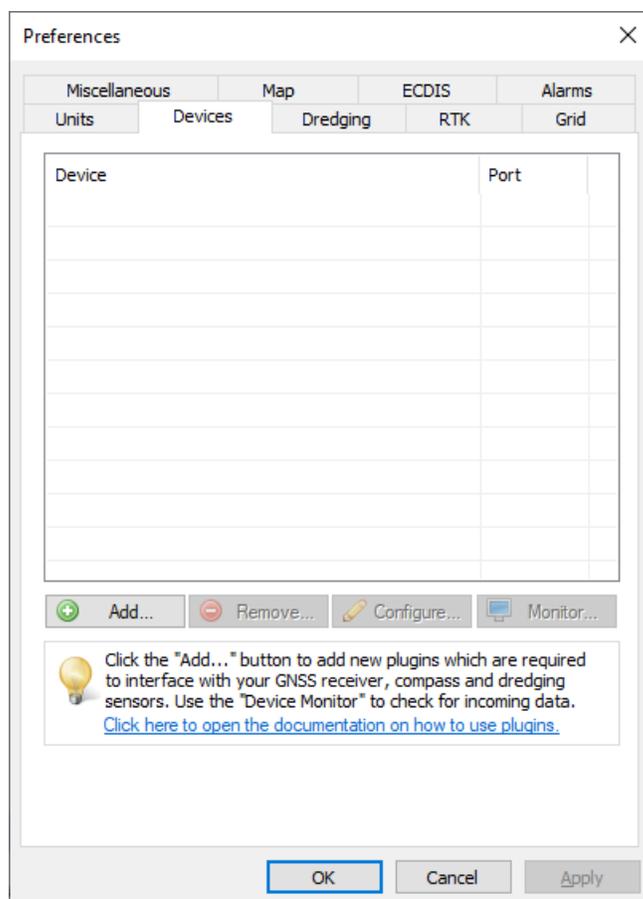
### GNSS or RTK receiver?

Regular GNSS receivers without correction signal should do fine. It is correct that they have a rather big error (up to three meters), but since the antennas are so close to each other, the factors that will lead to a position error are almost the same for both, making that the calculated heading is not far off.

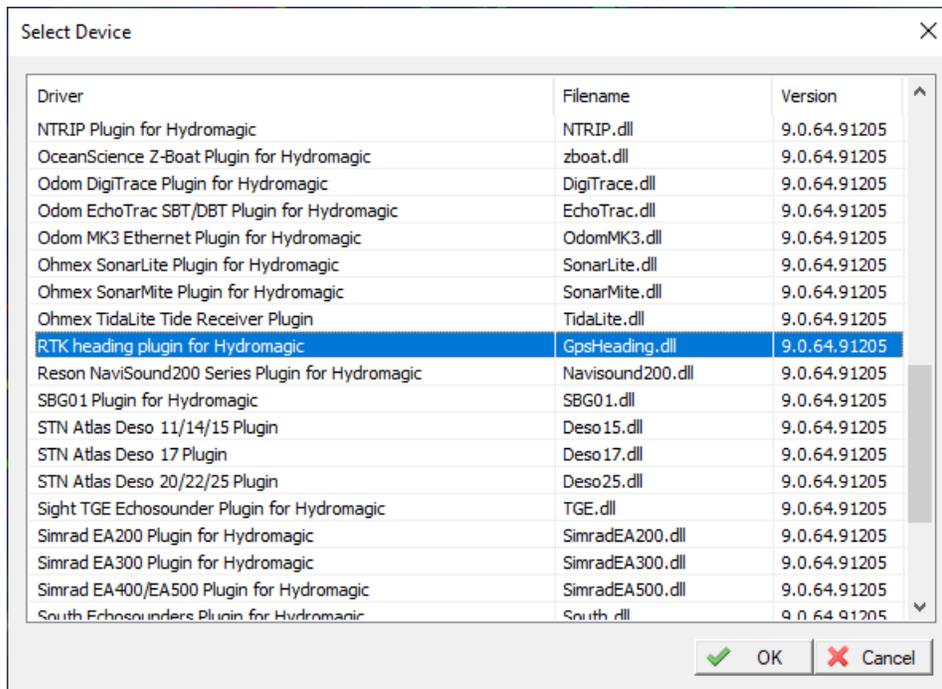
However, in the scenario when using two separate receivers, at some moments one receiver could use other satellites than the other, or one is receiving a SBAS signal while the other is not. When you also have to take tides in account, you should definitely go for a RTK receiver.

### Loading the GNSS heading plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



A list of available plugins will be displayed. In this list, select the "RTK heading plugin for Hydromagic" plugin and click "OK" to load and display the configuration dialog.



## Configuring the GNSS heading plugin

### Serial Communications

First you must to configure the serial communications with the GNSS receivers. For each GNSS, select the serial port number and speed. The receivers can be connected via a serial port or Bluetooth serial connection.

As you can see in the configuration dialog, there is a primary and secondary GNSS. The primary GNSS is the one the software is going to use for the vessel's position. The secondary GNSS will be used to calculate the heading only. When you define the GNSS position in the 'Vessel Designer', always use the position of the primary GNSS antenna.

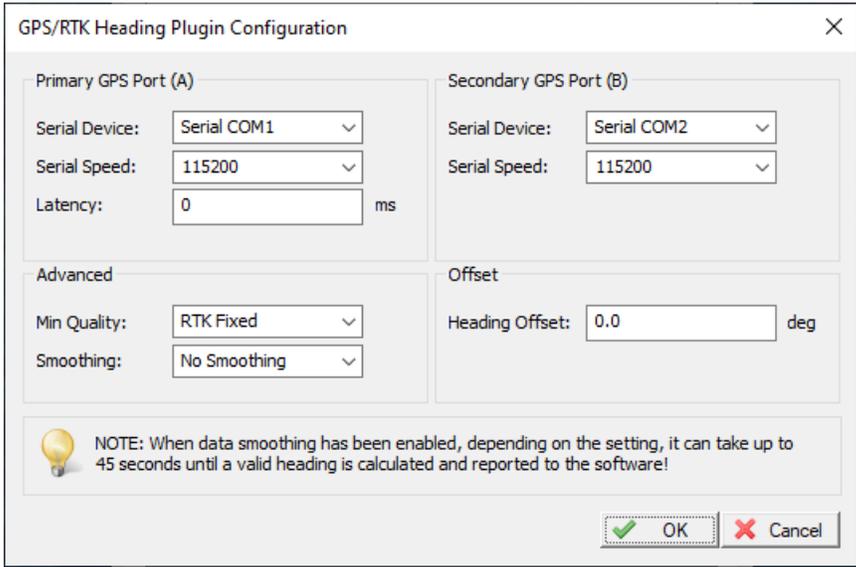
### Offset

This field allows you to enter an offset which will be applied to the calculated heading. When the GNSS antennas are lined up in the length of the vessel, you can leave this settings on zero degrees. When the GNSS antennas are positioned next to each other, you will notice that there is a difference of 90 degrees between the vessel and the calculated heading. In this case you must enter an offset of +90.0 or -90.0 degrees.

### Advanced Settings

Depending on the GNSS system you are using (RTK or not), select the GNSS quality to expect so heading is calculated when both receivers have the same fix state. When using RTK receivers, please set this value to 'RTK Fixed' for the highest accuracy.

The smoothing option is optional, when you found the calculated heading to unstable, you can smooth it out with this function. Should not be needed when using RTK receivers though. When using a smoothing level, it might take somewhat longer to get a heading calculation (up to forty-five seconds).



The screenshot shows a dialog box titled "GPS/RTK Heading Plugin Configuration" with a close button (X) in the top right corner. The dialog is divided into four main sections:

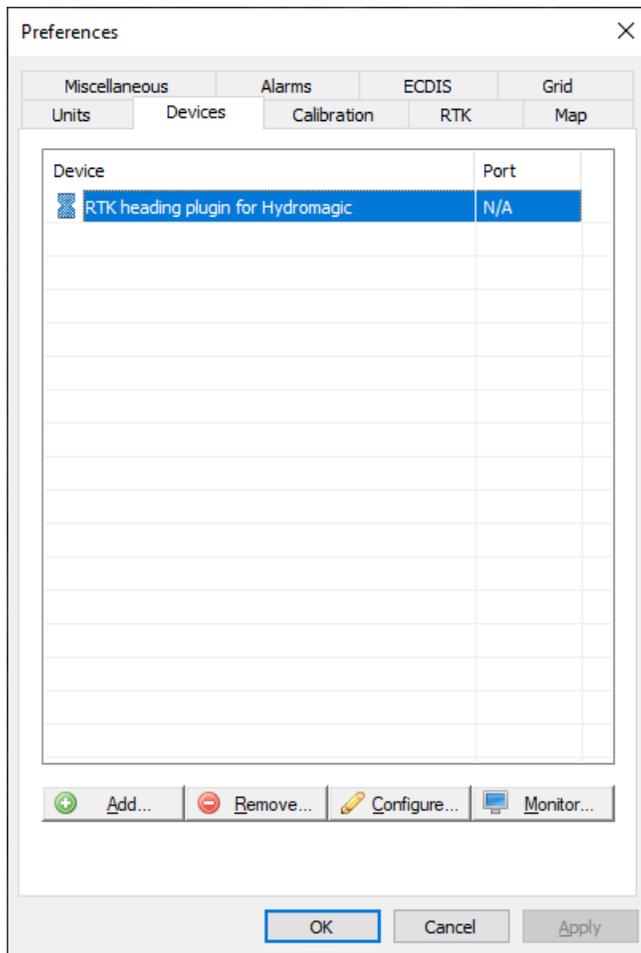
- Primary GPS Port (A):** Contains three fields: "Serial Device" (dropdown menu with "Serial COM1" selected), "Serial Speed" (dropdown menu with "115200" selected), and "Latency" (text input field with "0" and "ms" label).
- Secondary GPS Port (B):** Contains three fields: "Serial Device" (dropdown menu with "Serial COM2" selected), "Serial Speed" (dropdown menu with "115200" selected), and "Latency" (text input field with "0" and "ms" label).
- Advanced:** Contains two fields: "Min Quality" (dropdown menu with "RTK Fixed" selected) and "Smoothing" (dropdown menu with "No Smoothing" selected).
- Offset:** Contains one field: "Heading Offset" (text input field with "0.0" and "deg" label).

At the bottom of the dialog, there is a note with a lightbulb icon: "NOTE: When data smoothing has been enabled, depending on the setting, it can take up to 45 seconds until a valid heading is calculated and reported to the software!". Below the note are two buttons: "OK" (with a green checkmark icon) and "Cancel" (with a red X icon).

## Unloading the GNSS heading plugin

To unload the GNSS heading plugin, open the preferences window by selecting "Preferences..." from the "Options" menu.

In the window that appears, select the "Devices" tab. Next select the "RTK heading plugin for Hydromagic" and click the "Remove..." button.



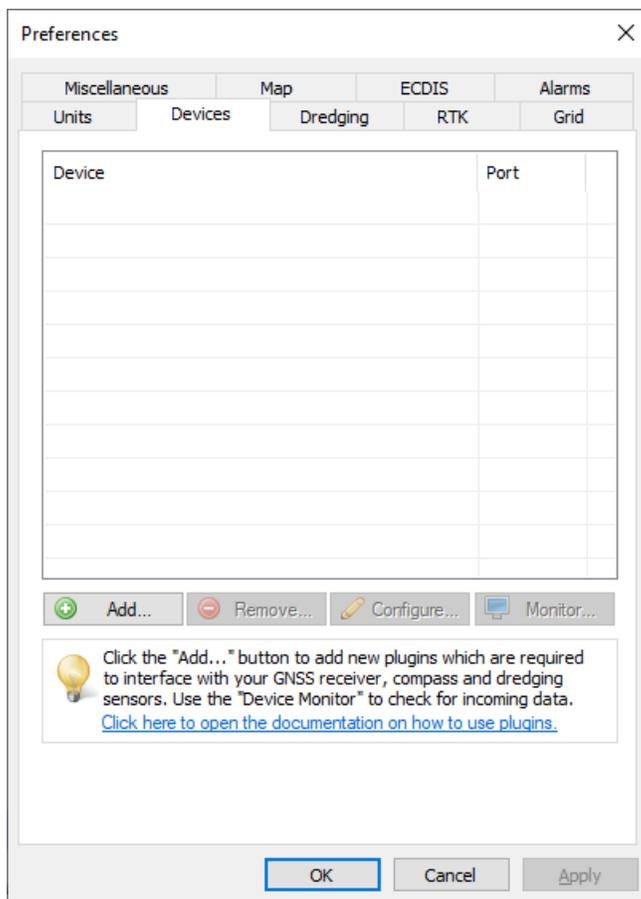
## 11.8 Generic echo sounder plugin

The generic echo sounder plugin can be used to decode serial data from an echo sounder without a dedicated plugin. In this generic plugin, you can define the data format which is expected to be received from the sounder.

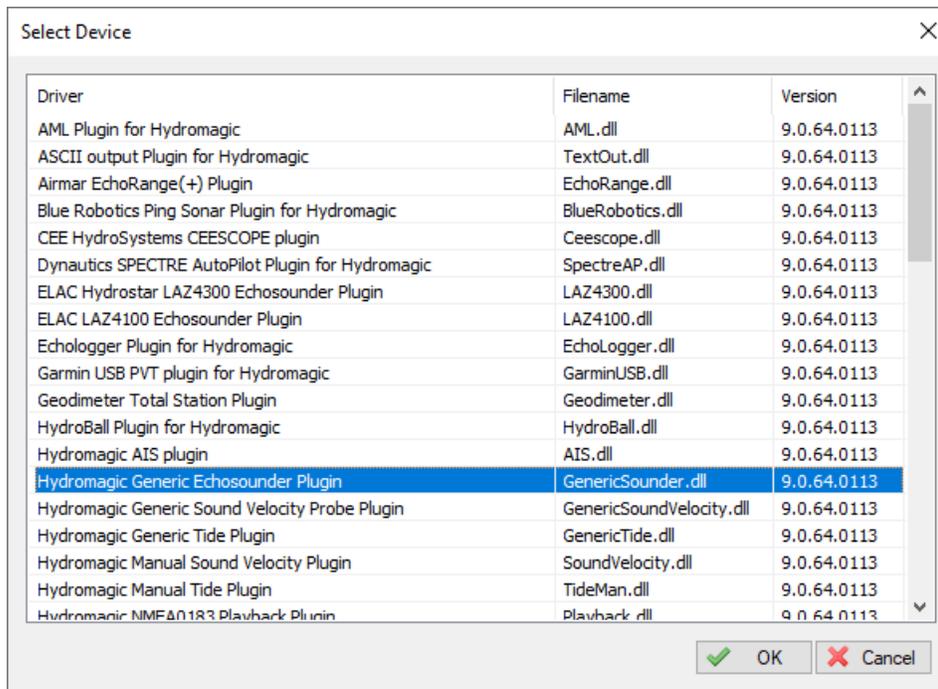
By defining a header, a depth value offset, a depth value length and an optional scale, you should be able to decode data from almost any echosounder (as long as the output is in ASCII).

### Loading the generic echo sounder plugin for Hydromagic

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



A list of available plugins will be displayed. In this list, select the "Hydromagic Generic Echosounder" plugin and click "OK" to load and display the configuration dialog.



## Configuring the generic echo sounder plugin

### Serial or Ethernet Communications

First you must to configure the serial or Ethernet communication with the echo sounder. This plugin supports incoming data over a serial port, TCP or UDP. For more information on this, please see the General information on using plugins document.

### Configuring the data format

In this example we will show an example on how to configure a custom data format. Although there is a dedicated plugin for the DESO25 data format, we will use it as an example here:

```
DA 32.08 m
DB 31.83 m
DA 32.04 m
DB 31.81 m
```

### Frequencies

In the configuration you can check whether the sentences start with a fixed header, the start of the depth data, the length of the depth data and whether a scale has to be applied (only when depth value isn't in meters). The above sample data reports both high and low frequency depths so we check both the 'Use Hi Frequency' and 'Use Lo Frequency' boxes.

To distinguish between the low and high frequency sentences we enter the headers, 'DA' for high frequency, 'DB' for low frequency (this could be the other way around depending on transducer configurations). Now the software knows to treat the sentence containing the 'DA' header as high frequency value and the sentence starting with 'DB' as low frequency value.

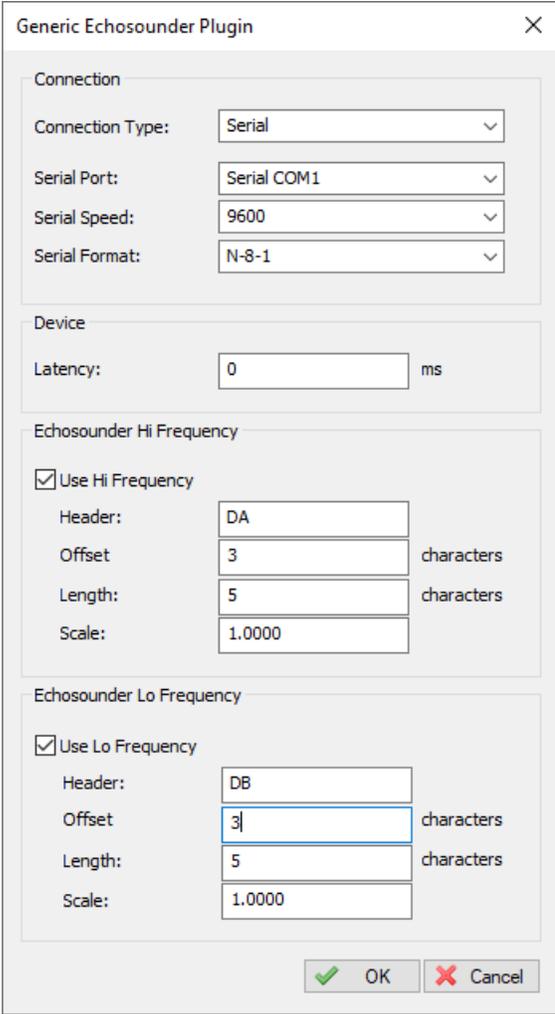
## Depth Value

Now we need to tell the software where the actual depth is. Please note that this only will work when the depth is sent as an ASCII (readable) value. Also note that the characters are zero indexed, which means that the first character is at index zero (D = 0, A = 1 etc..).

The depth value starts at index '3' and is '5' characters long. This is the same for both frequencies, so we enter 3 as start offset and 5 for length. For size always counter the number of digits including the dot (.).

## Scale / Units

Use a scale only when the depth is not in meters. For instance, when the depth is in centimeters, please use 0.01, when the depth is in feet, used .3048 to convert to meters.



The screenshot shows the 'Generic Echosounder Plugin' configuration window. It is divided into several sections:

- Connection:** Includes dropdown menus for 'Connection Type' (Serial), 'Serial Port' (Serial COM1), 'Serial Speed' (9600), and 'Serial Format' (N-8-1).
- Device:** Includes a text input for 'Latency' (0) and the unit 'ms'.
- Echosounder Hi Frequency:** Includes a checked checkbox 'Use Hi Frequency' and input fields for 'Header' (DA), 'Offset' (3) characters, 'Length' (5) characters, and 'Scale' (1.0000).
- Echosounder Lo Frequency:** Includes a checked checkbox 'Use Lo Frequency' and input fields for 'Header' (DB), 'Offset' (3) characters, 'Length' (5) characters, and 'Scale' (1.0000).

At the bottom, there are 'OK' and 'Cancel' buttons with green and red checkmarks respectively.

## Unloading the generic echo sounder plugin

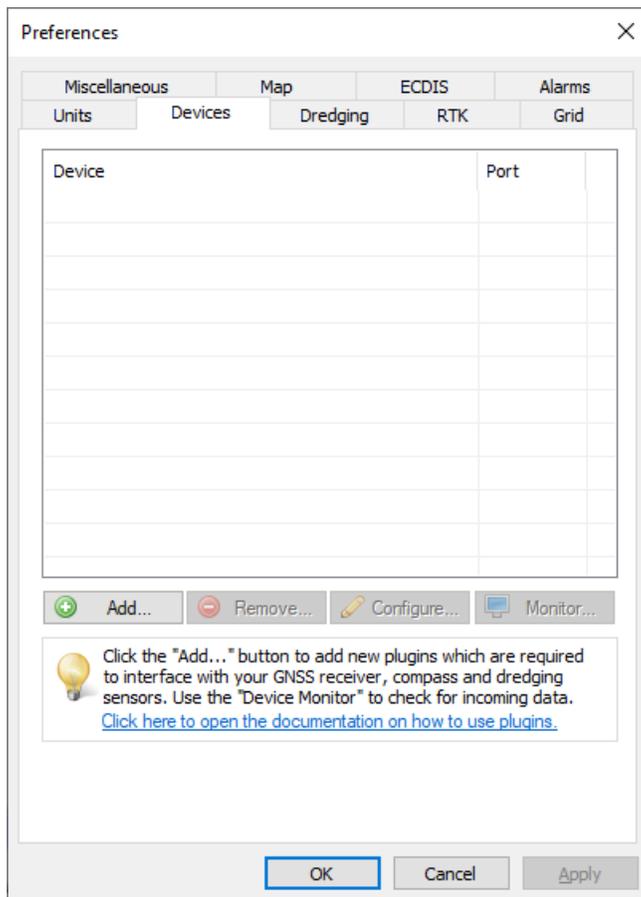
To unload the generic echo sounder plugin, open the preferences window by selecting "Preferences..." from the "Options" menu.



sensor's user manual on how to switch between the modes (if supported).

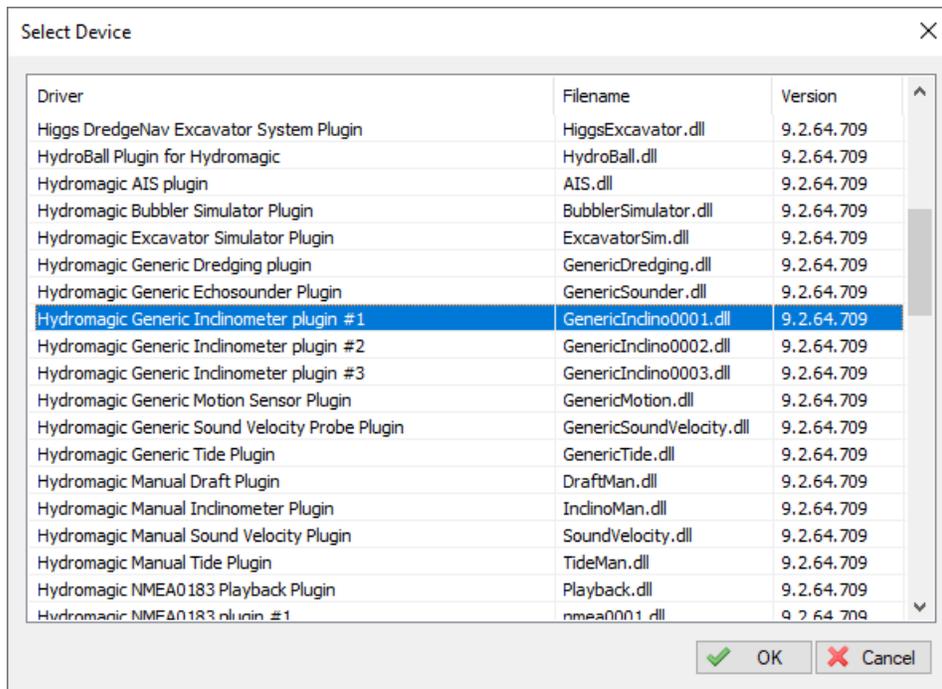
## Loading the generic inclinometer plugin for Hydromagic

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window which appears, select the "Devices" tab. Next click the "Add..." button.



**Select the "Devices" tab in the "Preferences" dialog.**

A list of available plugins will be displayed. In this list, select one of the "Hydromagic Generic Inclinometer" plugins, and click "OK" to load and display the configuration dialog.



Select one of the "Generic Inclinometer" plugins and click "OK".

## Configuring the generic inclinometer plugin

### Serial or Ethernet Communications

First you must configure the serial or Ethernet communication with the inclinometer sensor. This plugin supports incoming data over a serial port, Ethernet or WiFi. For more information on this, please see the [General information on using plugins](#) document.

### Configuring the data format

In this example we will show an example on how to configure a custom data format. Most sensors output the axis direction, a sign (+/-) and the angle value. Below is a sample ASCII output:

```
+21.365
+21.365
+21.365
+21.365
```

*Output of the TE Connectivity P-Series Inclinometer.*

```
POSITAL
ACS360 SC
SW01.86 HW05 R01
B2 P2 M64 P10
S#000000000000000000

157.16
157.19
157.15
157.24
```

157.13

**Output of the Posital Fraba Tiltix Inclinometer.**

**Header**

The header field is used to check whether the data line contains the data we need. For instance, if we use a dual axis sensor and we only want to read the vertical value, the angle values are prefixed by "X=" or "Y=" by most sensors. In this case we can enter "X=" or "Y=" in the header field, depending on which angle we want to use. When this field is empty, each data sentence is parsed.

Byte	1	1	6						1	1	1	6						1	1
Char	X	=	+	0	3	.	0	2	,	Y	=	-	1	7	.	4	5	CR	LF

**Example of a dual axis ASCII output sentence.**

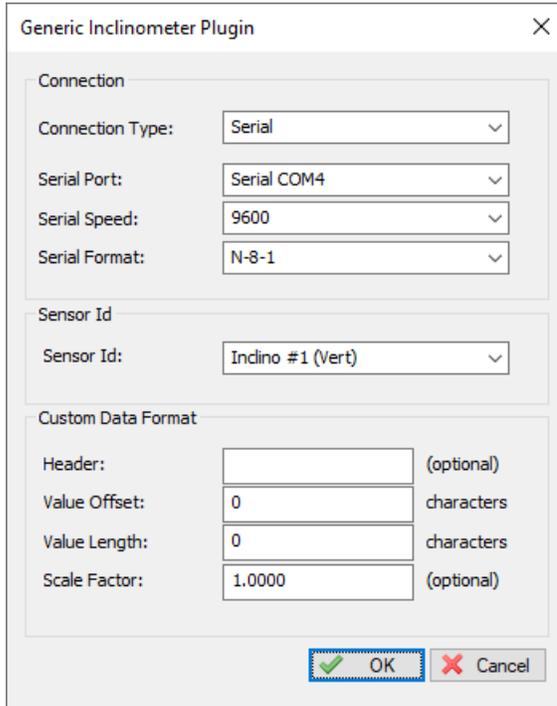
**Angle Value**

Now we need to tell the software where the actual angle value is in the data sentence. Please note that this only will work when the angle is sent as an ASCII (readable) value. Also note that the characters are zero indexed, which means that the first character is at index zero ("+" = 0, "2" = 1, "1" = 3 etc..).

The angle value starts at index '0' and is '6' characters long in our first example (the sign also counts as a character), and '5' characters long in the second examples. So we enter '0' as "Value Offset" and '5' or '6' for the "Value Length" setting. For the value length, always count the number of digits including the sign (+/-) and decimal dot (.).

**Scale / Units**

Use a scale only when the angle is not in degrees. For instance, when the anle is in hundreds of degrees, use 100.



The screenshot shows a dialog box titled "Generic Inclinometer Plugin" with a close button (X) in the top right corner. The dialog is organized into three main sections:

- Connection:** Contains four dropdown menus: "Connection Type" (set to "Serial"), "Serial Port" (set to "Serial COM4"), "Serial Speed" (set to "9600"), and "Serial Format" (set to "N-8-1").
- Sensor Id:** Contains one dropdown menu: "Sensor Id" (set to "Inclino #1 (Vert)").
- Custom Data Format:** Contains four input fields: "Header" (empty, with "(optional)" to its right), "Value Offset" (set to "0", with "characters" to its right), "Value Length" (set to "0", with "characters" to its right), and "Scale Factor" (set to "1.0000", with "(optional)" to its right).

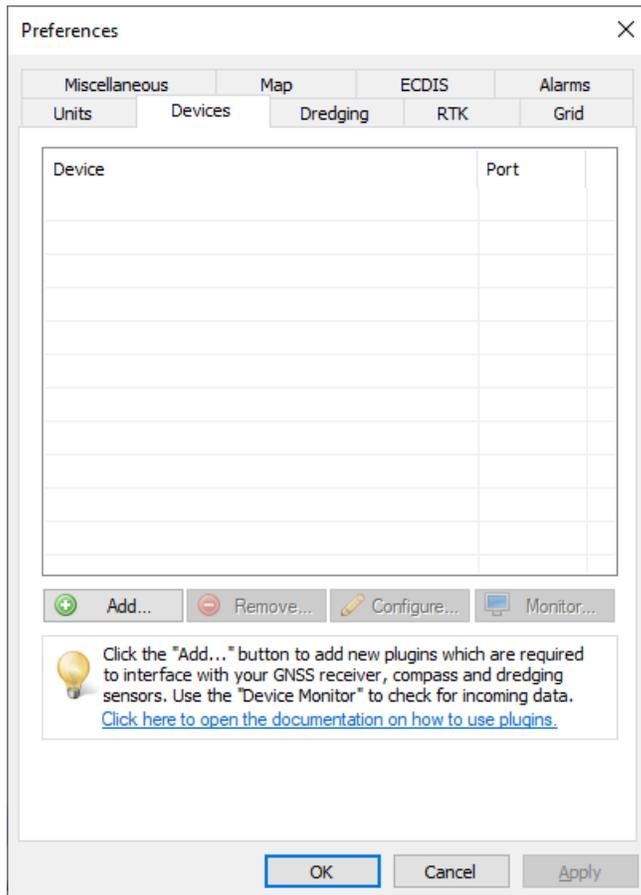
At the bottom of the dialog, there are two buttons: "OK" (with a green checkmark icon) and "Cancel" (with a red X icon).

*The Generic Inclinometer plugin configuration window.*

## Unloading the generic inclinometer plugin

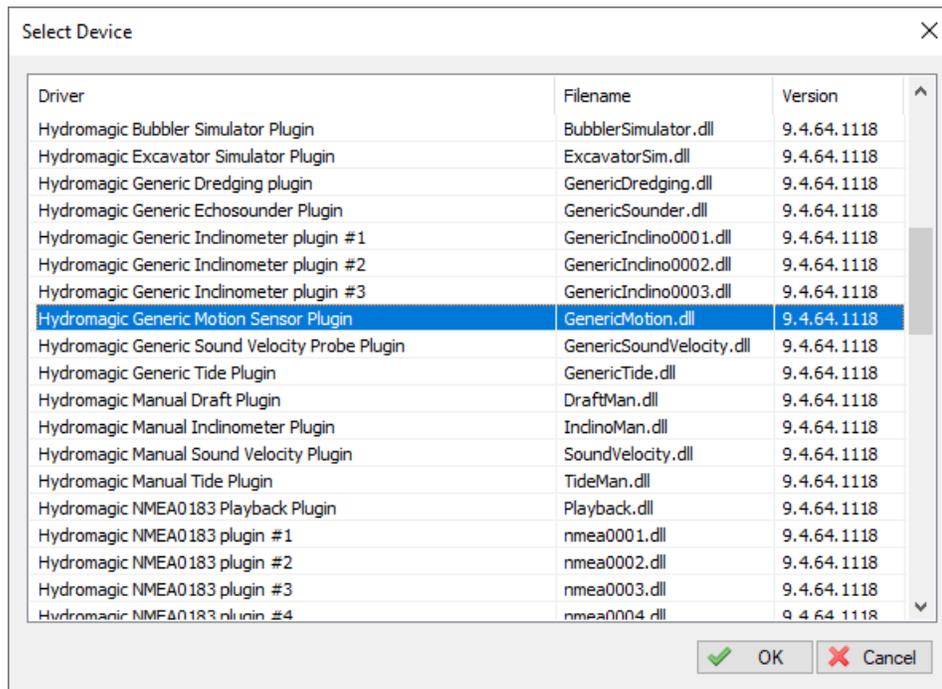
To unload the generic motion sensor plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "Hydromagic Generic Inclinometer" plugin and click the "Remove..." button.





**The devices tab in the "Preferences" dialog**

A list of available plugins will be displayed. In this list, select the "Hydromagic Generic Motion Sensor" plugin and click "OK" to load and display the configuration dialog.



Select the Hydromagic Generic Motion Sensor plugin from the list of plugins and click "OK".

## Configuring the generic motion sensor plugin

### Serial or Ethernet Communications

First you must to configure the serial or Ethernet communication with the motion sensor. This plugin supports incoming data over a serial port, Ethernet or WiFi. For more information on this, please see the [General information on using plugins](#) document.

### Configuring the data format

In this example we will show an example on how to configure a custom data format. Most sensors output the axis direction, a sign (+/-) and the angle value. Below is a sample ASCII (NMEA0183) output. In this example (taken from the VectorNav VN-100 IMU device), the first value after the header is yaw, the second value is the pitch and the third value the roll angle. The remaining values are raw IMU values and can be ignored.

```

$VNYMR,-093.897,-000.510,+000.958,-00.0096,+00.1950,+00.3955,-00.067,-00.127,-
09.647,+00.000068,-00.000370,+00.000722*68<CR><LF>
$VNYMR,-093.870,-000.510,+000.955,-00.0108,+00.1950,+00.3940,-00.080,-00.154,-
09.702,+00.000599,+00.000564,+00.000206*6E<CR><LF>
$VNYMR,-093.926,-000.518,+000.942,-00.0152,+00.2306,+00.4206,-00.106,-00.145,-
09.606,-00.000352,-00.001053,+00.000405*67<CR><LF>
$VNYMR,-093.927,-000.519,+000.942,-00.0190,+00.2320,+00.4218,-00.099,-00.139,-
09.745,+00.000562,+00.000372,+00.000552*6F<CR><LF>
$VNYMR,-093.929,-000.518,+000.941,-00.0177,+00.2320,+00.4190,-00.040,-00.159,-
09.618,-00.000242,+00.001208,+00.000450*6F<CR><LF>
$VNYMR,-093.933,-000.518,+000.941,-00.0165,+00.2266,+00.4263,-00.087,-00.185,-
09.668,-00.000175,-00.000868,-00.000178*63<CR><LF>
$VNYMR,-093.938,-000.518,+000.941,-00.0177,+00.2306,+00.4219,-00.117,-00.155,-

```

```

09.656,-00.000320,+00.000204,-00.000540*62<CR><LF>
$VNYMR,-093.941,-000.518,+000.940,-00.0190,+00.2306,+00.4275,-00.070,-00.159,-
09.601,-00.000146,+00.000892,+00.001445*64<CR><LF>
$VNYMR,-093.946,-000.518,+000.941,-00.0152,+00.2292,+00.4221,-00.090,-00.132,-
09.734,-00.000049,-00.000528,+00.001260*60<CR><LF>
$VNYMR,-093.947,-000.518,+000.940,-00.0203,+00.2280,+00.4232,-00.094,-00.171,-
09.634,+00.000315,+00.000059,-00.000090*67<CR><LF>
0123456789012345678901234567890123456789012345678901234567890123456789012
345678901234567890123456789

```

**Output data captured from the VectorNav VN-100 IMU device - Yaw, pitch and roll data is sent as NMEA0183 sentence.**

### Header

The header field is used to check whether the data line contains the data we need. When this field is empty, each data sentence is parsed. In this example, all values are in the same line (starting with \$VNYMR), so we leave the header field values empty. When for instance you are using a dual axis sensor where the pitch and roll angle values are prefixed by "X=" or "Y=" respectively, and only the vertical value is required, you must set the header value to "Y=".

### Angle values and lengths

Now we need to tell the software where the actual angle values are in the data sentence. Please note that this only will work when the angle is sent as an ASCII (readable) value. Binary data formats are not supported by this plugin. For binary formats a dedicated plugin needs to be developed. Also note that the characters are zero indexed, which means that the first character is at index zero (" \$" = 0, "V" = 1, "N" = 3 etc..).

The (yaw)angle value starts at index '7' and is '10' characters long in our example (the sign also counts as a character). For the value length, always count the number of digits including the sign (+/-) and decimal dot (.). In the same line, the pitch value starts at index '17' and the roll values at index '27'. All values are 10 characters in length.

### Scale / Units

Use a scale only when the angle is not in degrees. For instance, when the angle is in hundreds of degrees, use 100. In this example, scaling is not used, so the scale values should be set to '1.0'.

Generic Motion Sensor Plugin (Yaw-Pitch-Roll) X

Connection

Connection Type: Serial

Serial Port: Serial COM6

Serial Speed: 9600

Serial Format: N-8-1

Device

Latency: 0 ms

Motion - YAW

Header:

Offset: 7 characters

Length: 8 characters

Scale: 1.0000

Motion - PITCH

Header:

Offset: 16 characters

Length: 8 characters

Scale: 1.0000

Motion - ROLL

Header:

Offset: 25 characters

Length: 8 characters

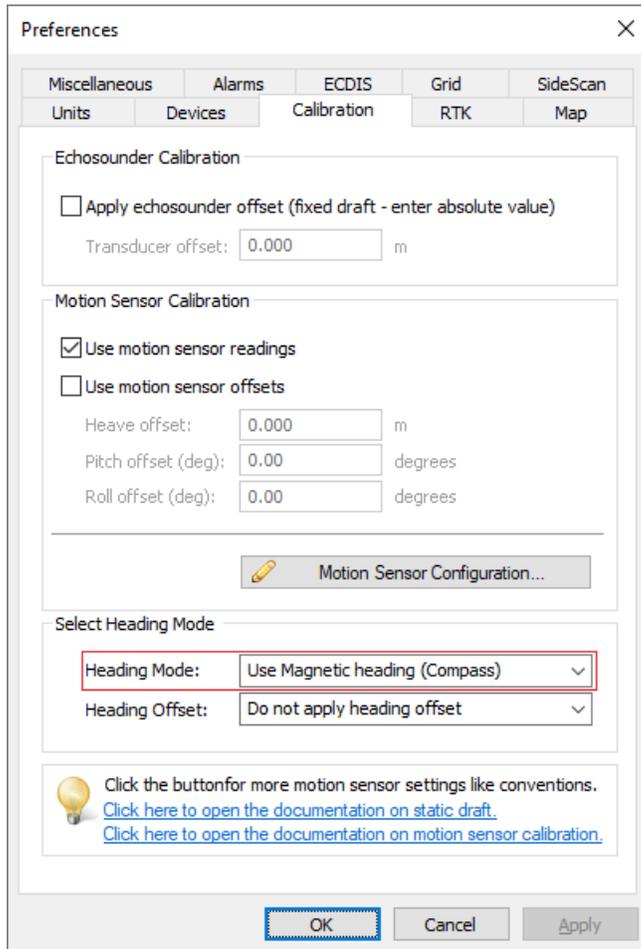
Scale: 1.0000

OK Cancel

*The Generic motion sensor plugin configuration window.*

## Using the "Yaw" value as vessel heading

When your motion sensor or IMU is capable of outputting the magnetic heading as well (like the sensor in the example above), you have to set the heading source to magnetic in the software. To do so, select the "Preferences" option from the "Options" menu, and select the "Calibration" tab in the "Preferences" window:



Select the "Use Magnetic Heading" option in the "Calibration" tab.

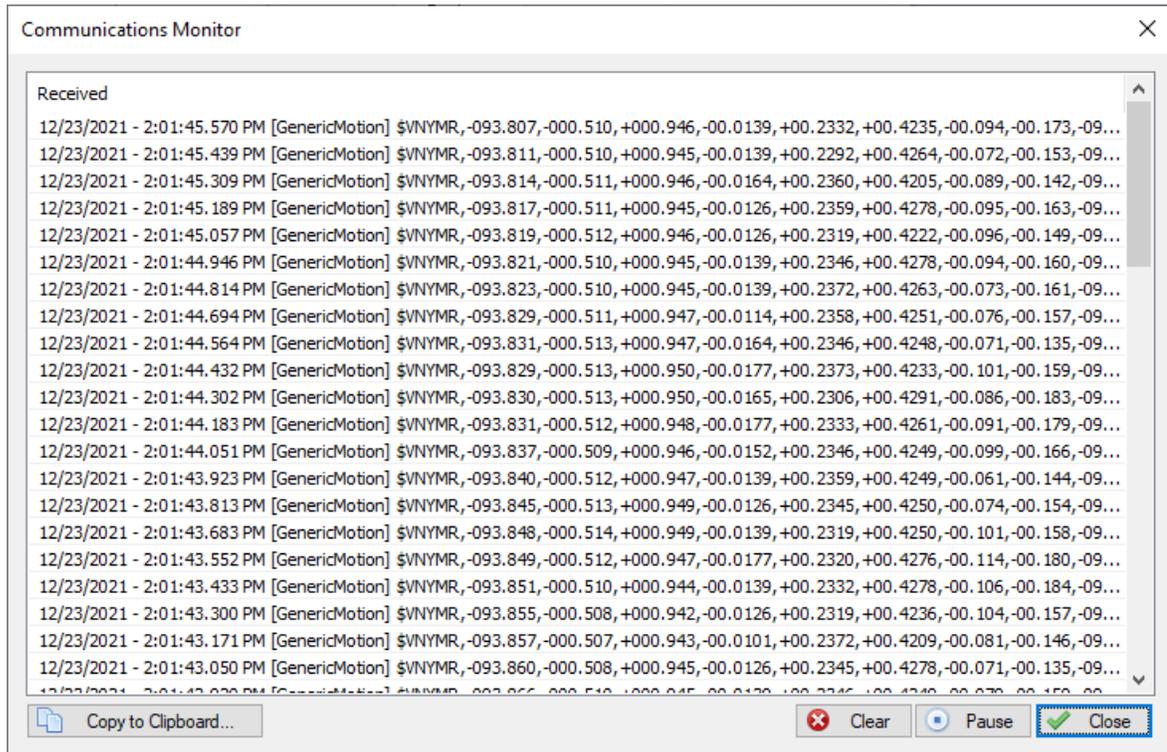
In this tab, select the "Use Magnetic Heading" option from the "Heading Mode" drop down list. After saving the selection by clicking the "OK" button, Hydromagic will use the IMU yaw value as heading for the vessel and data processing. To switch back to the heading reported by the GNSS receiver, set this value to "Use True Heading", this causes the software to use the "Course Over Ground" value instead.

## Testing the plugin configuration

When data is received, you should be able to see the incoming yaw, pitch and roll data information in the [data window](#). If no data is displayed, you can check whether data is coming in by using the "Communications Monitor". The "Communications Monitor" can also be used to determine which data format is used by the motion sensor.

Open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "Hydromagic Generic Motion Sensor" and click the "Monitor..." button. The communication monitor appears, and should display incoming ASCII or NMEA0183 sentences. When the monitor does not display any incoming data, the serial port or serial speed setting might be incorrect.

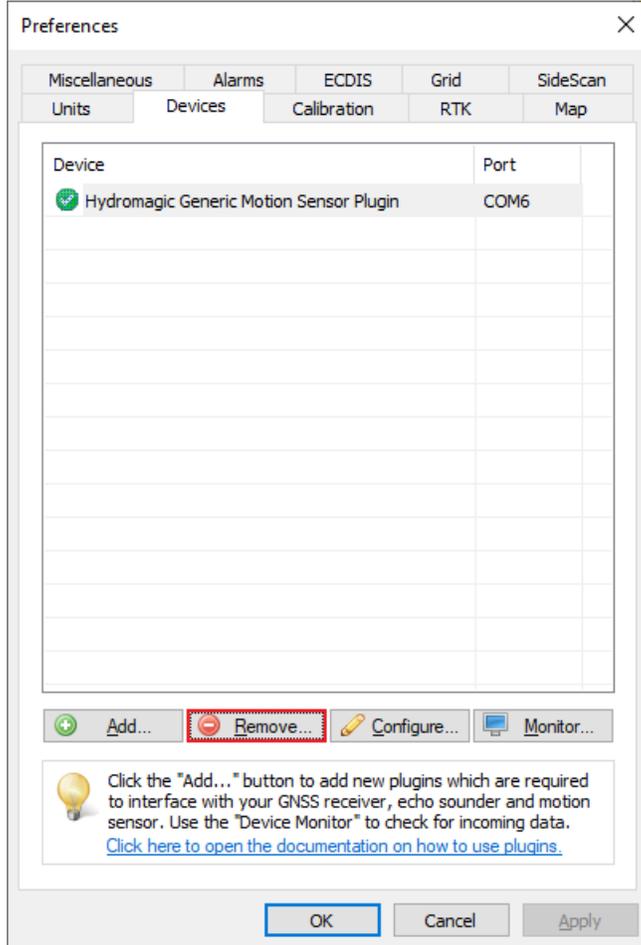
When you encounter problems getting the serial port to receive data, we suggest you to have a look at our YouTube tutorial on [troubleshooting serial communications using the puTTY software](#) (free software).



*Testing the generic motion sensor plugin settings using the device monitor.*

## Unloading the generic motion sensor plugin

To unload the generic motion sensor plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "Hydromagic Generic Motion Sensor" plugin and click the "Remove..." button.



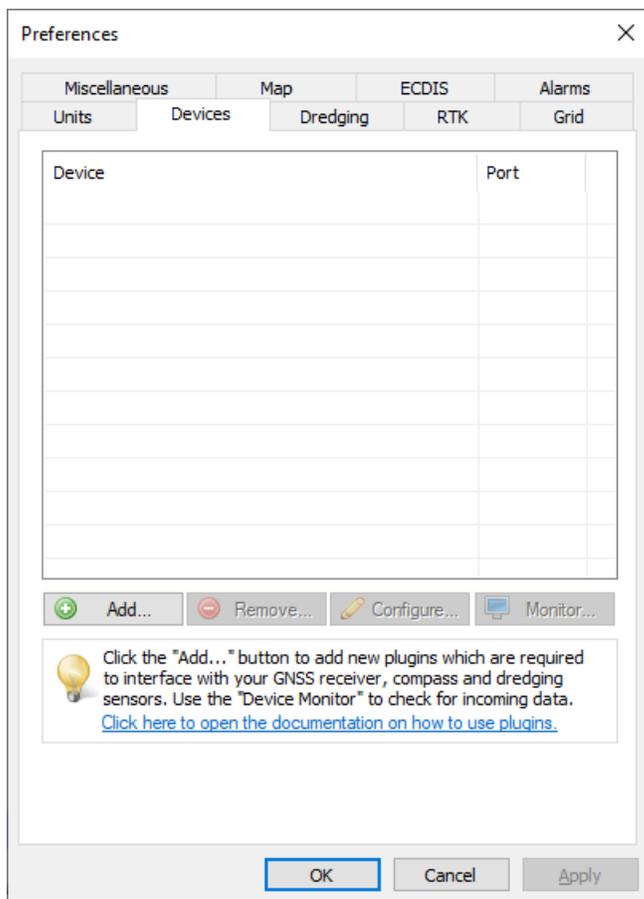
*Plugins can be unloaded by using the "Remove" button.*

## 11.11 Hydromagic ASCII output plugin

The Hydromagic ASCII output plugin allows you to send ASCII formatted data to a third party application using a serial port, TCP or UDP connection. You can define the data messages by yourself, by including placeholders that will be replaced with the actual position, depth, motion, tide data or more.

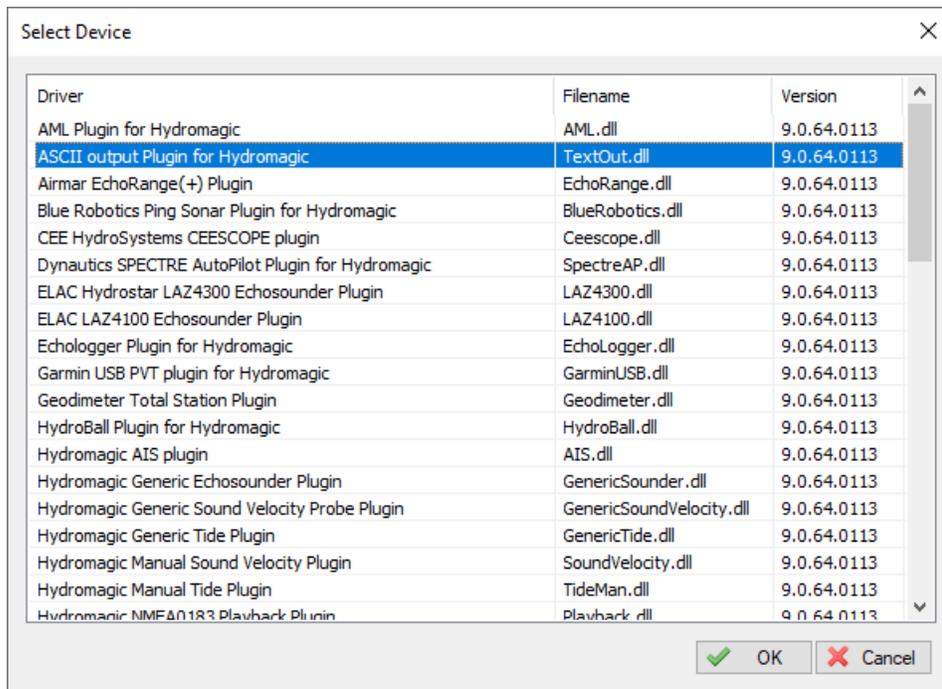
### Loading the ASCII output plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



**Click the "Add..." button to load a new plugin.**

A list of available plugins will be displayed. From this list, select the "ASCII Output Plugin for Hydromagic" and click "OK" to load and display the plugin's configuration window.

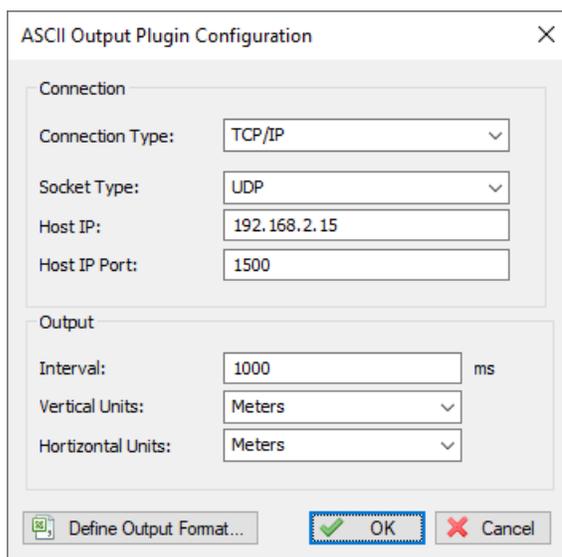


Select "ASCII output plugin for Hydromagic" from the list and click "OK".

## Configuring the communication settings

This plugin can send data over a serial port or an Ethernet or WiFi connection using TCP or UDP. Please note that when sending data over a serial port to another computer, you will need a so called "null-modem" cable (crossed rxd/txd wire pairs). For TCP and UDP you can use a WiFi access point or an Ethernet switch.

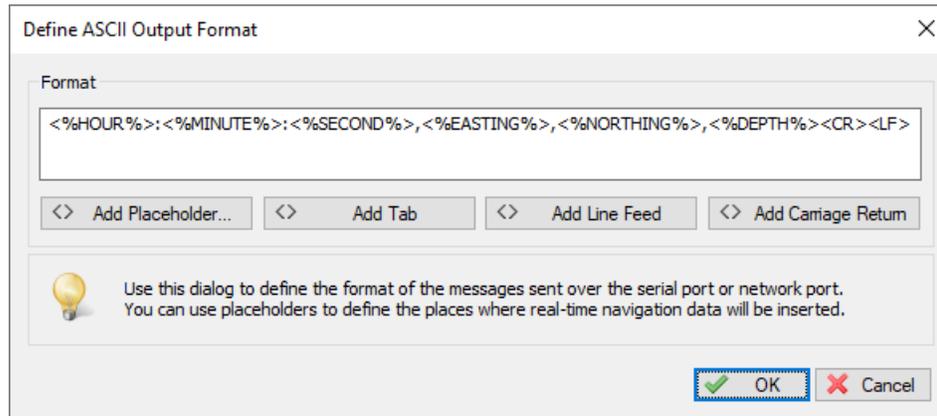
When the data has to be send to another computer using TCP or UDP, make sure you enter the host IP address of the target computer. Use the 'connection type' drop down box to switch between serial port and TCP/IP communication.



Configure the serial or TCP/IP communication settings.

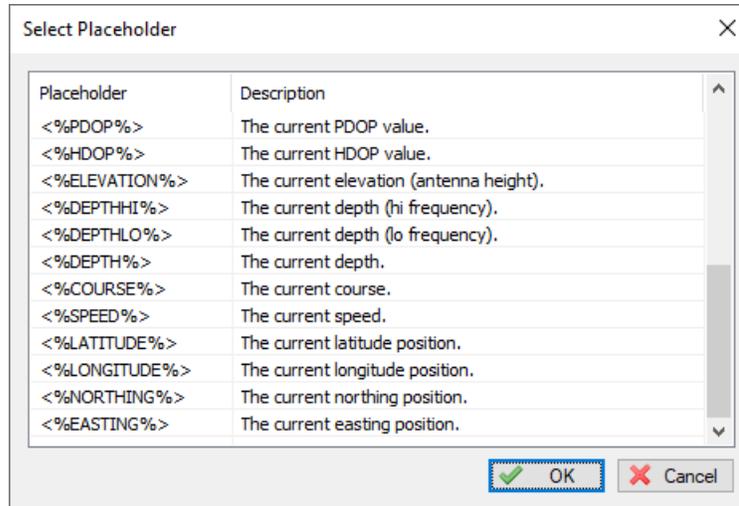
## Configuring the output string

After setting how the data will be send, you need to define the string that will be sent each time the interval timer expires. To do so, click the 'Define Output Format...' button. The example above sends out the current timestamp followed by the x, y and z coordinate.



**You can define the generated output string by using placeholders and custom text.**

The output string is configured by adding placeholders separated with separators such as a comma, semi column, pipe symbol etc.. To add a placeholder, simply click the "Add Placeholder" button. A selection dialog will be displayed which can be used to pick one.



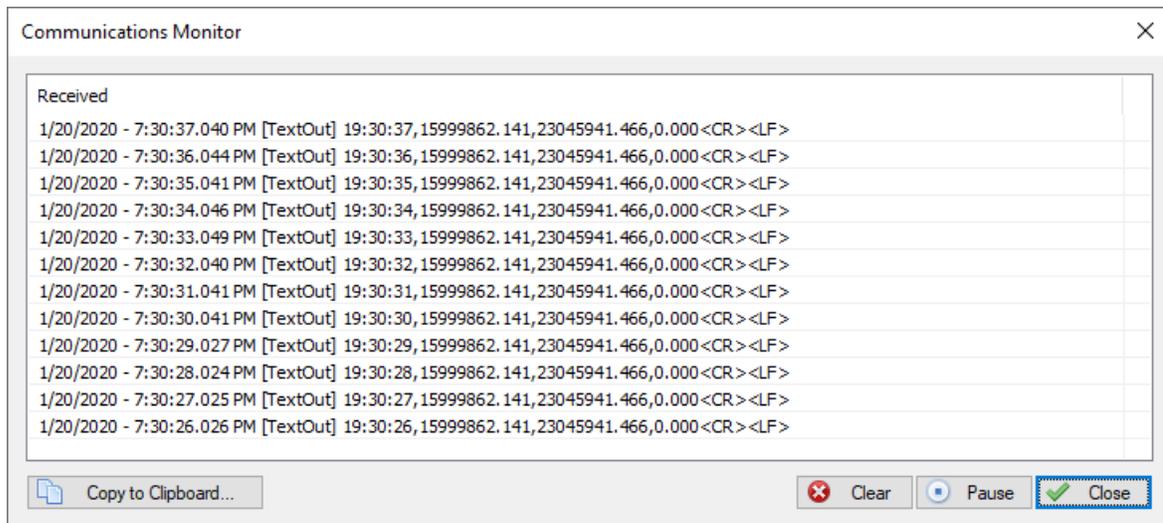
**Select one of the placeholders from the list.**

Please note, that you have to add the separator characters by yourself. When you want to separate the fields by tabs, please use the "Add Tab" button. When you completed adding all the required fields, please do not forget to terminate your string by adding a line-feed or carriage return. You can use the "Add Line Feed" or "Add Carriage Return" buttons to do so.

## Testing the configuration

To test the configuration as well as the resulting output data, go back to the list of plugins and select the "ASCII Output Plugin for Hydromagic" plugin. Next, click the "Monitor" button to have a look at the





**Use the "Communications Monitor" to test the configuration.**

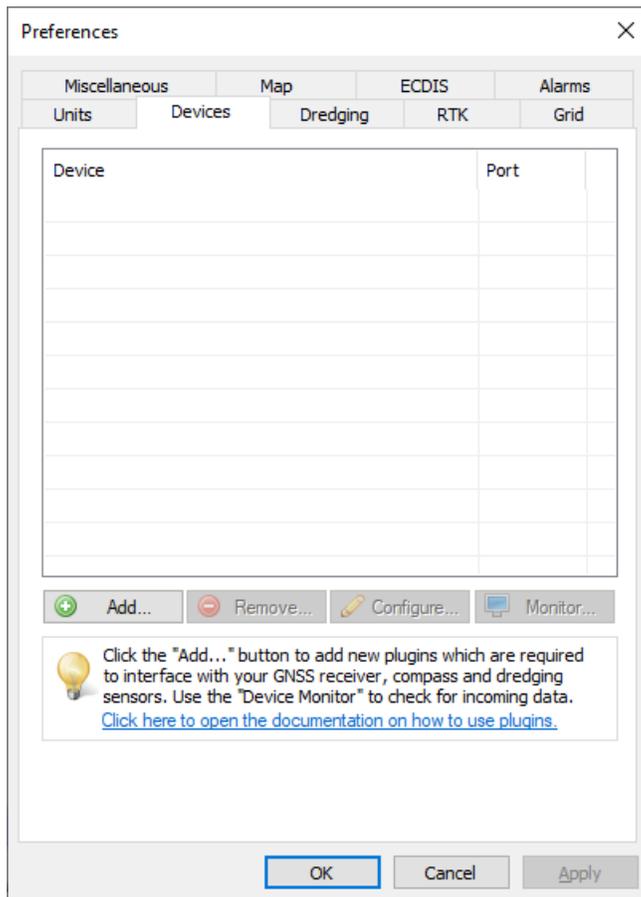
## Unloading the Hydromagic ASCII output plugin

To unload the generic echo sounder plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "ASCII Output Plugin for Hydromagic" and click the "Remove..." button.



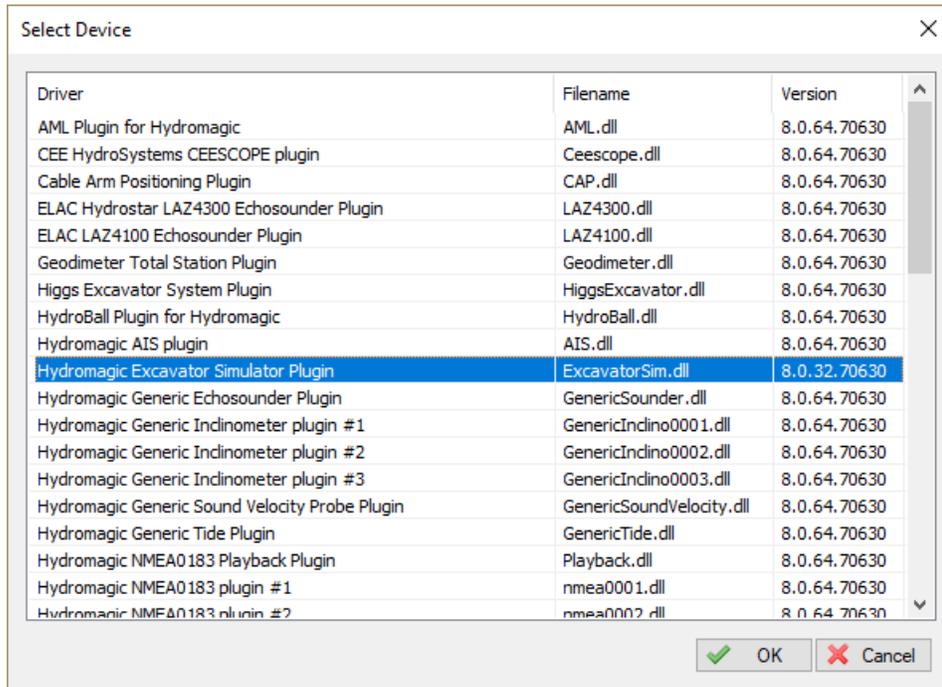
## Loading the excavator simulator plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



**In the preferences window, select the "Devices" tab.**

A list of available plugins will be displayed. In this list, select the "Hydromagic Excavator Simulator Plugin" and click "OK" to load and display the simulator.



Select the "Hydromagic Excavator Simulator Plugin" from the list.

## Using the simulator

In order to start pushing the simulator data into the application, click the "Start" button. To stop the simulation press "Stop". When started, the simulator will send angle data with 100 millisecond intervals.

Hydromagic Excavator Simulator

Boom  
Angle:  degrees

Stick  
Angle:  degrees

Bucket  
Angle:  degrees

Cabin  
Tilt X:  degrees  
Tilt Y:  degrees  
Yaw:  degrees

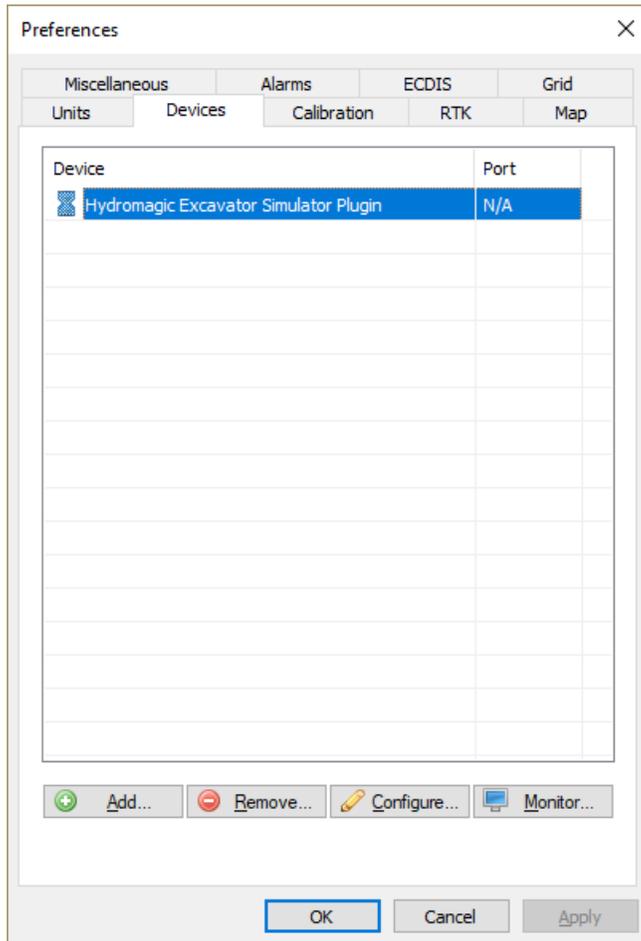
Draft  
Draft:  meters

 To close the simulator, remove the 'Excavator Simulator' from the devices list under 'Options' => 'Preferences'.

***Control excavator angles using the simulator.***

## Unloading the simulator

To unload the simulator, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "Hydromagic Excavator Simulator Plugin" and click the "Remove..." button.



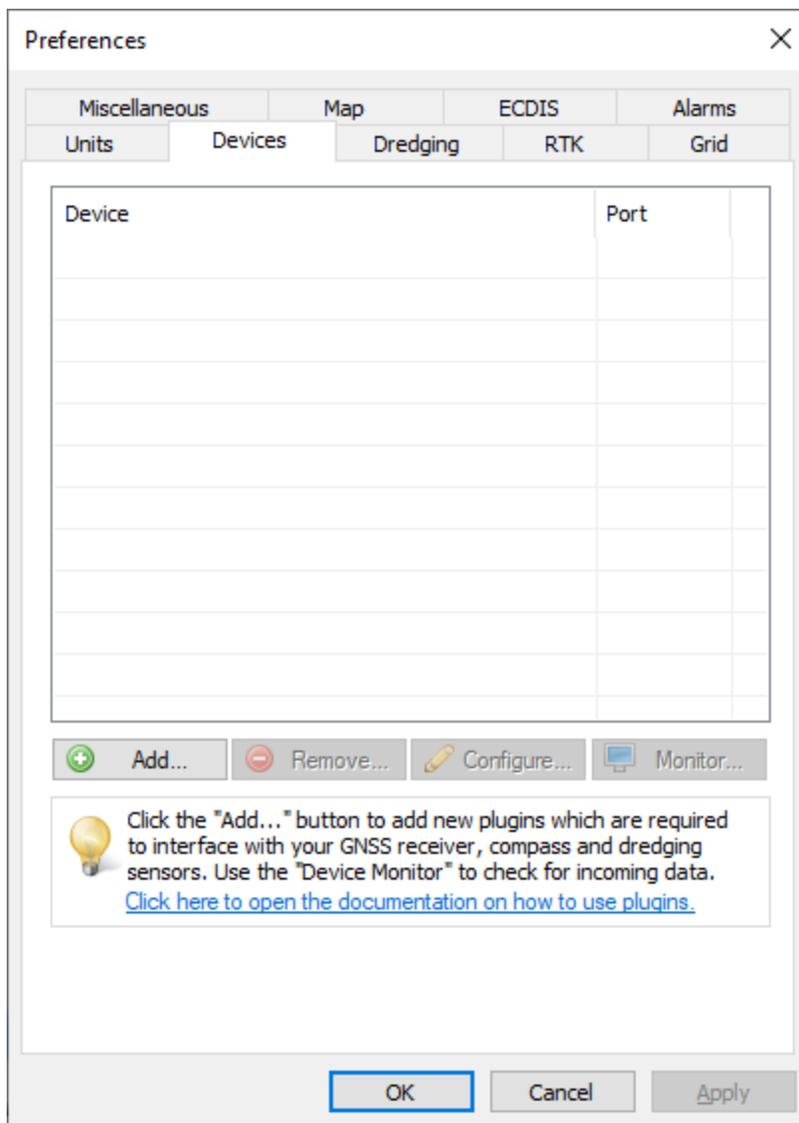
Click the "Remove" button to unload the simulator plugin.

## 11.13 Hydromagic NMEA0183 output plugin

The Hydromagic NMEA0183 output plugin allows you to send NMEA0183 formatted data to a third party application using a serial port, TCP or UDP connection. Position, depth, heading, speed and time will be included in the outgoing messages.

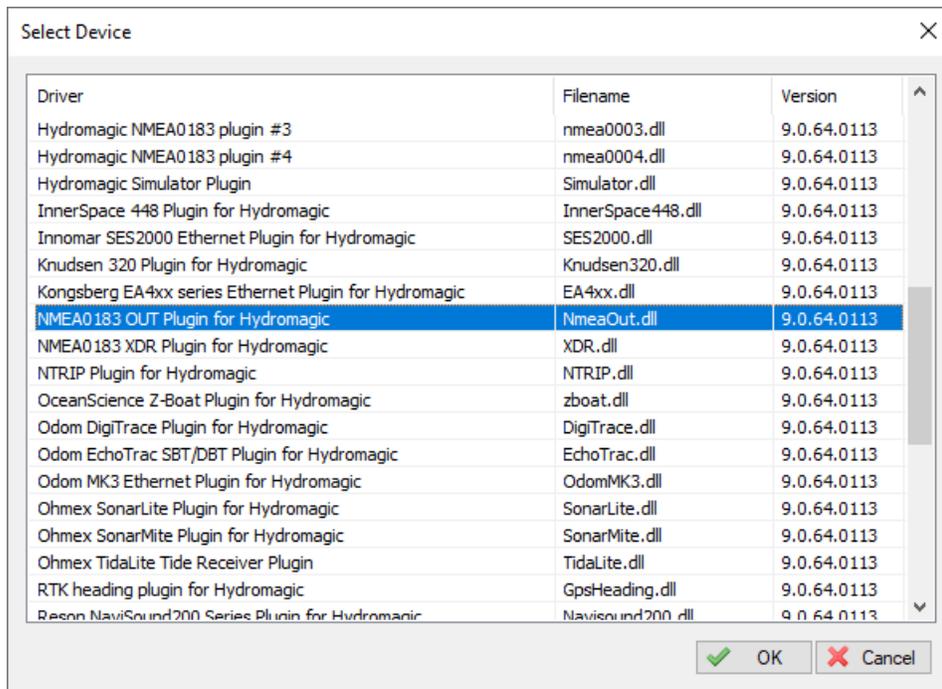
### Loading the NMEA0183 output plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



**Click the "Add..." button to load a new plugin.**

A list of available plugins will be displayed. From this list, select the "NMEA0183 OUT Plugin for Hydromagic" and click "OK" to load and display the plugin's configuration window.

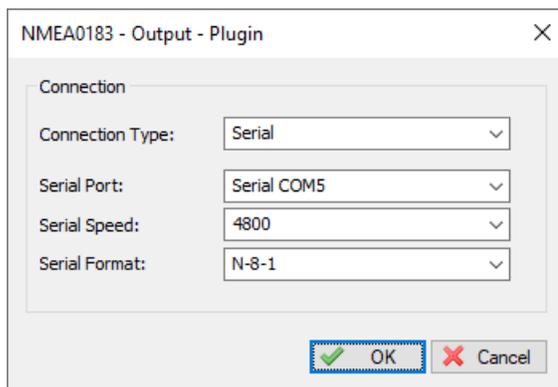


Select "NMEA0183 OUT Plugin for Hydromagic" from the list and click "OK".

## Configuring the communication settings

This plugin can send out data over a serial port or an Ethernet or WiFi connection using TCP or UDP. Please note that when sending data over a serial port to another computer, you will need a so called null-modem cable (crossed rxd/txd wire pairs). For TCP and UDP you can use a WiFi access point or an Ethernet switch.

When the data has to be send to another computer using TCP or UDP, make sure you enter the host IP address of the target computer. Use the 'connection type' drop down box to switch between serial port and TCP/IP communication.

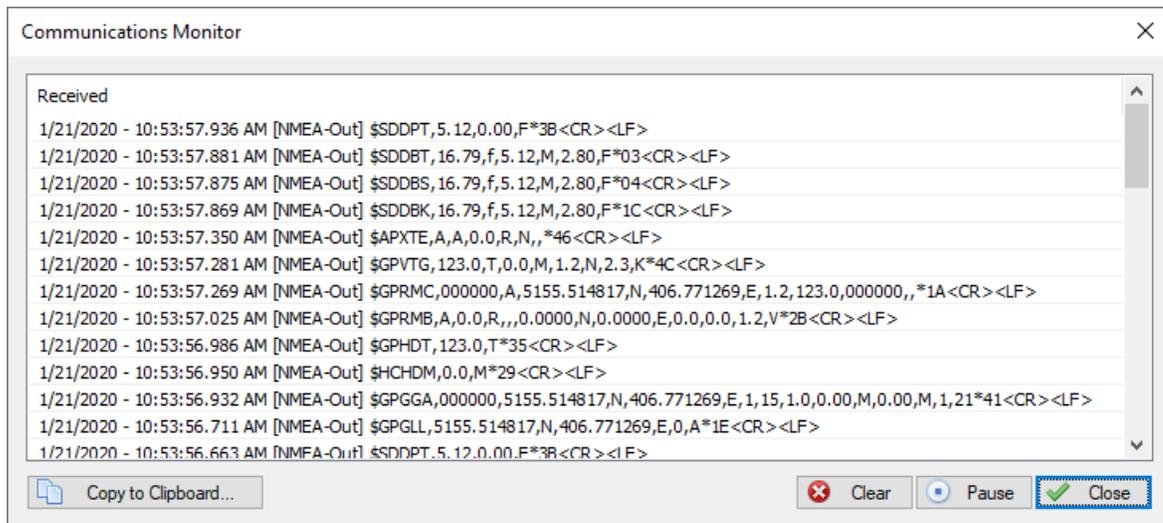


Configure the serial or TCP/IP communication settings.

## Testing the configuration

To test the configuration as well as the resulting output data, go back to the list of plugins and select the "NMEA0183 Output Plugin for Hydromagic" plugin. Next, click the "Monitor" button to have a look at the

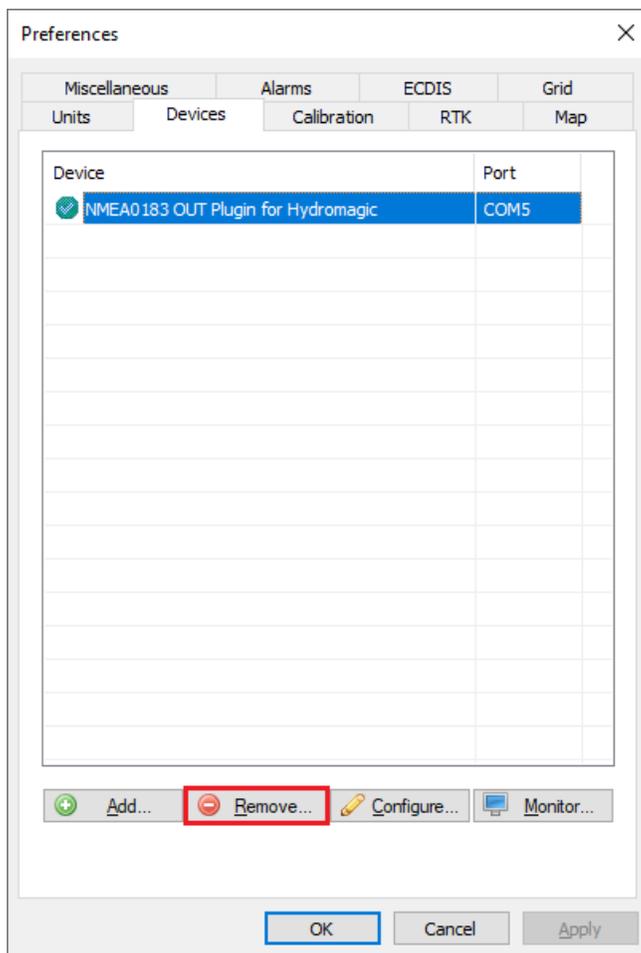




Use the "Communications Monitor" to test the configuration.

## Unloading the Hydromagic NMEA0183 output plugin

To unload the generic echo sounder plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "NMEA0183 OUT Plugin for Hydromagic" and click the "Remove..." button.



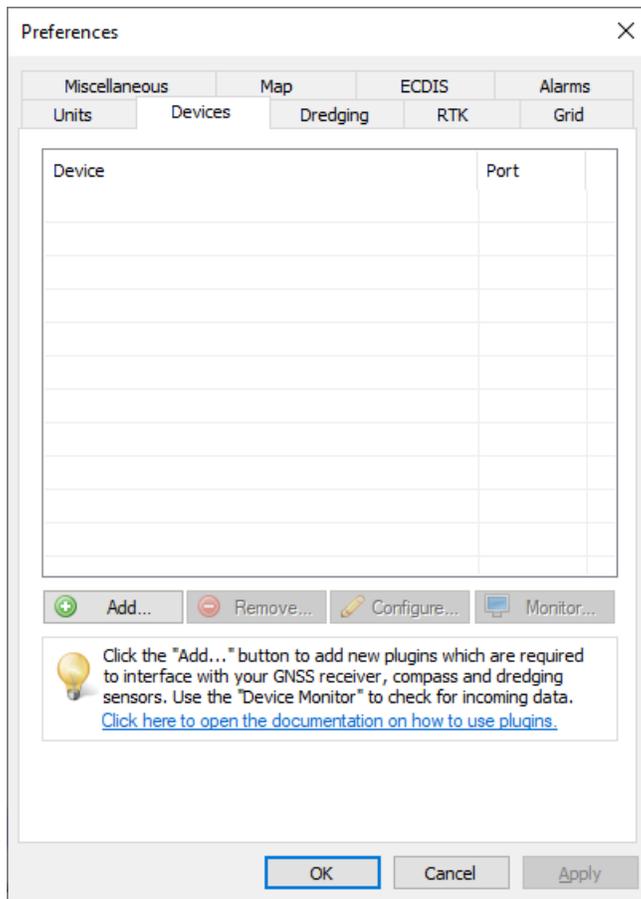
*Plugins can be unloaded using the "Remove" button.*

## 11.14 Hydromagic Manual Sound Velocity plugin

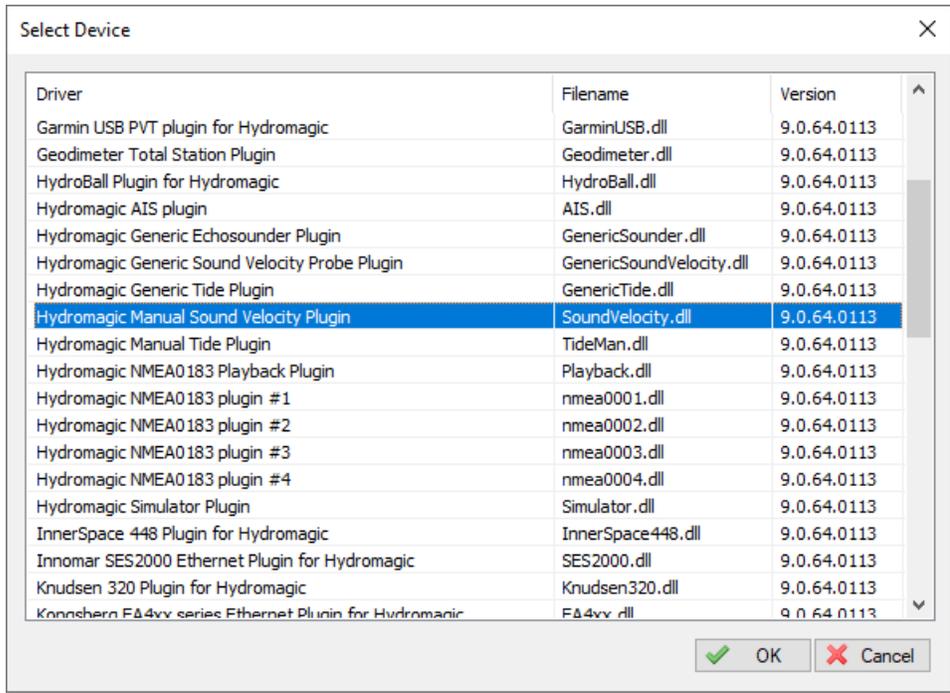
The Hydromagic Manual Sound Velocity Plugin is a plugin with graphical user interface designed to let you set the current sound velocity by hand. This allows you to enter sound velocity changes during the survey when no sound velocity profiler data is available.

### Loading the manual sound velocity plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.

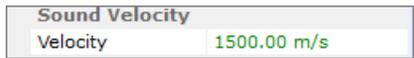


A list of available plugins will be displayed. In this list, select the "Hydromagic Manual Sound Velocity Plugin" and click "OK" to load and display the plugin's user interface.

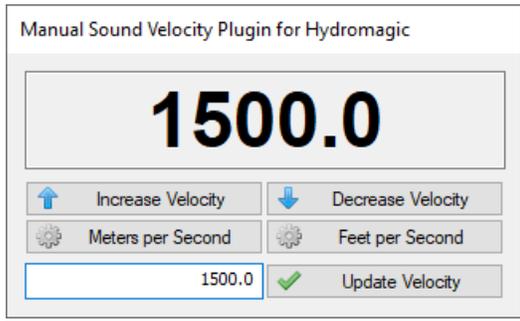


### Using the manual sound velocity plugin

As soon as the manual sound velocity plugin has been loaded it will add sound velocity measurements to the raw data when recording has been started. The sound velocity value is written to the start and end of raw data files, and when the sound velocity level has been changed by the user.



To change the sound velocity value you can use the 'Increase Velocity' and 'Decrease Velocity' buttons. To enter an exact value, enter the new sound velocity value in the edit field and click the 'Update Velocity' button to apply this value.



To switch between US and metric units (meters per second vs feet per second), use the "Meters per Second" or "Feet per Second" button. The current value will automatically be converted.

### Recording of manual sound velocity data

As soon as a recording is started, the current manual sound velocity value will be written to the RAW data file. The sound velocity value is also written to the end of raw data files, and when the sound velocity has been changed by the user:

```
NAM RAW00028
CMT
VIS 1
HUN 9003
VUN 9003
PRJ 6510
DTM 6318
ELL 7019
PRM 8901
GEO 0
ANT 0.000
DFT 0.000
VER 9.0
BLD 9.0.64.0113
KEY 3-4348792
DEV 1 0 "Hydromagic Manual Sound Velocity Plugin" ""
SVS 00000000 00000001 1579597036.045 0.000 1500.000
SVS 00000000 00000001 1579597037.030 0.000 1500.000
SVS 00000000 00000001 1579597038.030 0.000 1500.000
SVS 00000000 00000001 1579597039.024 0.000 1501.000
SVS 00000000 00000001 1579597040.024 0.000 1501.000
SVS 00000000 00000001 1579597041.028 0.000 1501.000
SVS 00000000 00000001 1579597042.025 0.000 1500.000
SVS 00000000 00000001 1579597043.029 0.000 1500.000
SVS 00000000 00000001 1579597044.030 0.000 1499.000
SVS 00000000 00000001 1579597045.025 0.000 1499.000
SVS 00000000 00000001 1579597046.030 0.000 1499.000
SVS 00000000 00000001 1579597047.028 0.000 1500.000
SVS 00000000 00000001 1579597048.024 0.000 1500.000
SVS 00000000 00000001 1579597049.027 0.000 1501.000
SVS 00000000 00000001 1579597050.027 0.000 1501.000
```

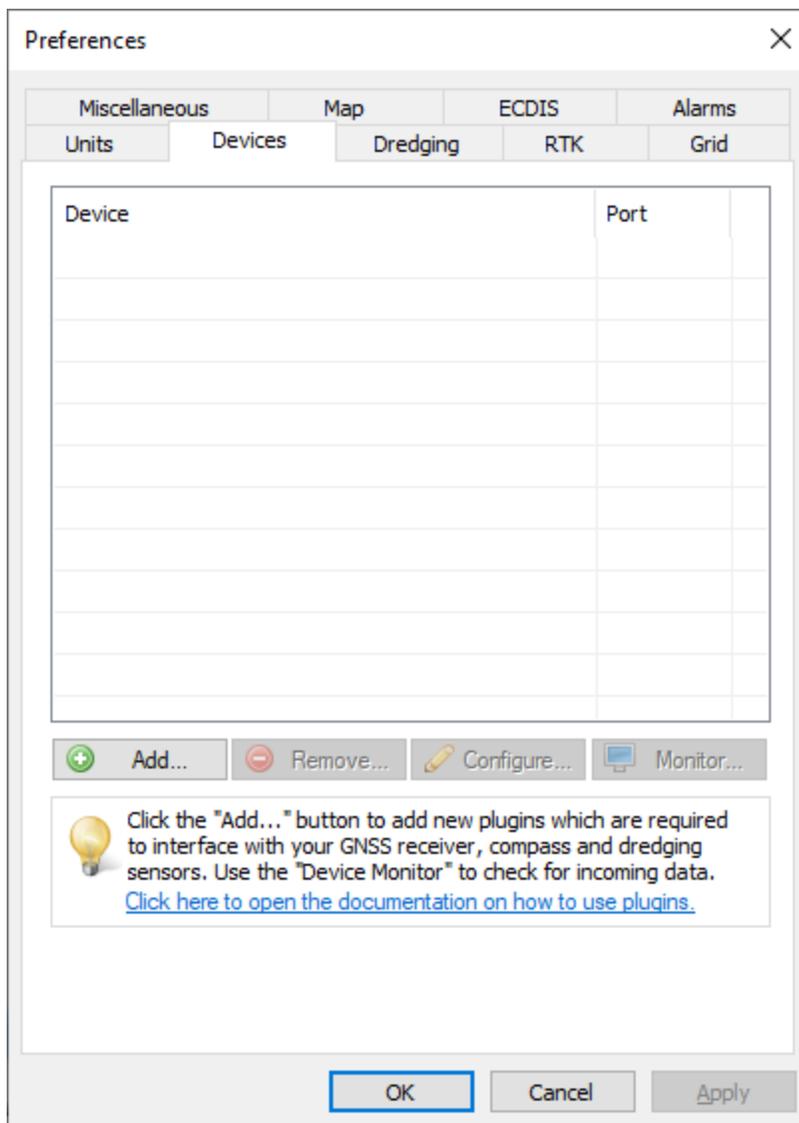
*Manual sound velocity data recorded in a Hydromagic RAW data file*

## Unloading the manual sound velocity plugin

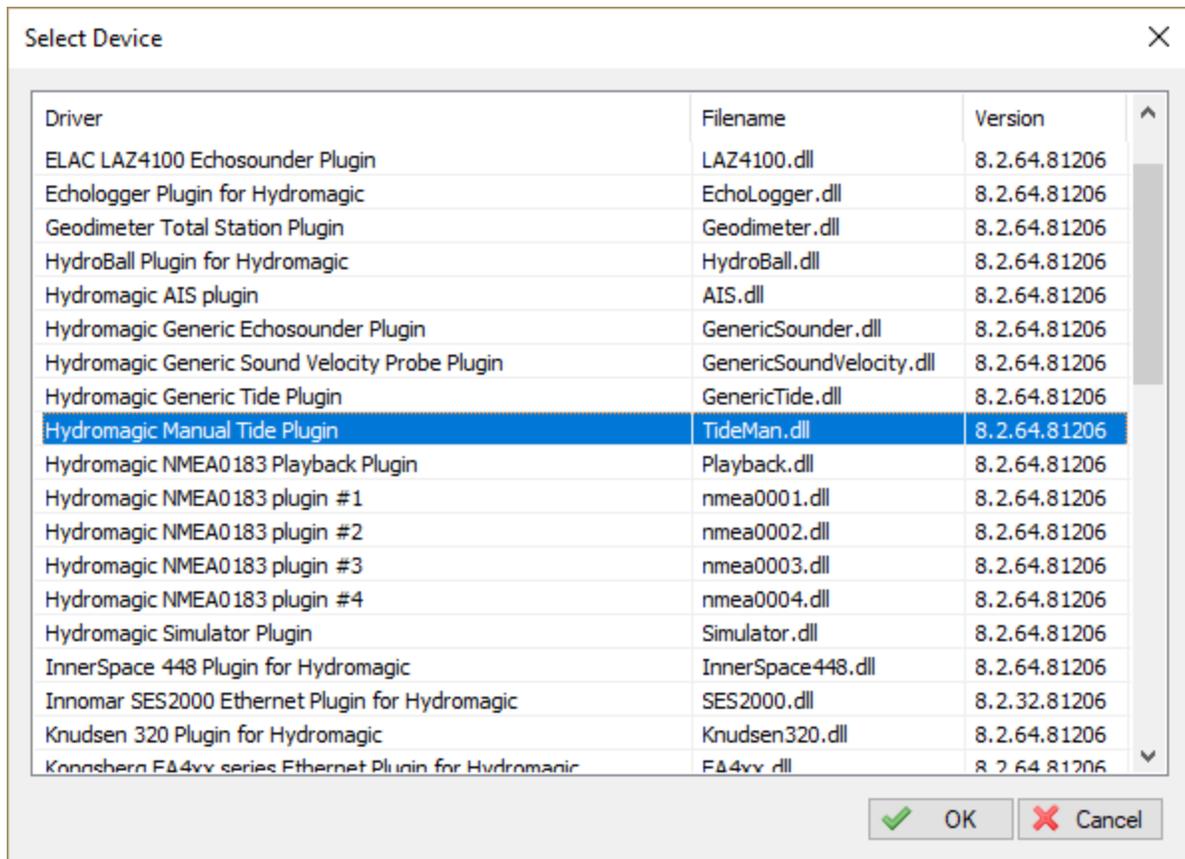
To unload the manual sound velocity plugin window, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "Hydromagic Manual Sound Velocity Plugin", right-click and select "Remove Device..." from the popup menu.

When the plugin is unloaded (either when removed from the devices list, or when the software is stopped), the current sound velocity and window position are stored. The next time the plugin is loaded, the user interface will be on the same screen location and the last known manual sound velocity value will be displayed.





A list of available plugins will be displayed. In this list, select the "Hydromagic Manual Tide Plugin" and click "OK" to load and display the plugin's user interface.



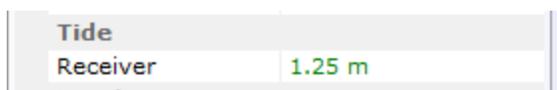
### Using the manual tide plugin

As soon as the manual tide plugin has been loaded it will add tide measurements to the raw data when recording has been started.

The tide value is written to the start and end of raw data files, and when the tide level has been changed by the user.

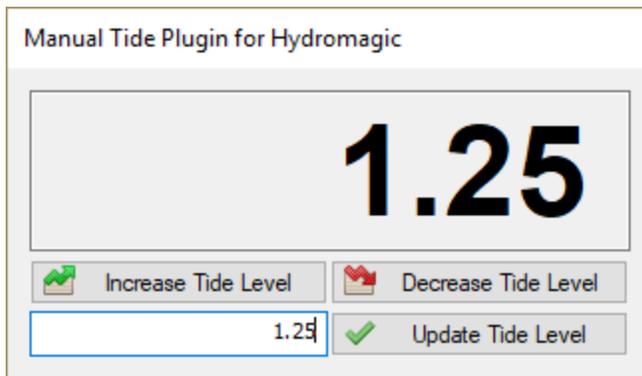
When the manual tide plugin is used, the tide level calculated from a RTK receiver or a tide receiver will be ignored.

Also the tide indication in the data view will toggle between 'RTK' and 'Receiver' tide value.



To change the tide level you can use the 'Increase Tide Level' and 'Decrease Tide Level' buttons.

To enter an exact value, enter the new tide value in the edit field and click the 'Update Tide Level' button to apply this value.



### Recording of manual tide data

As soon as a recording is started, the current manual tide level will be written to the RAW data file. The tide value is also written to the end of raw data files, and when the tide level has been changed by the user:

```

NAM RAW00002
CMT
VIS 1
HUN 9001
VUN 9001
PRJ 23090
DTM 4230
ELL 7030
PRM 8901
GEO 1
ANT 0.000
DFT 0.300
VER 8.2
BLD 8.2.64.81212
KEY 3-4157063
TID 00000001 00000001 1544982739.322 0.000 1.250
TID 00000001 00000001 1544982745.320 0.000 1.300
TID 00000001 00000001 1544982747.320 0.000 1.350
TID 00000001 00000001 1544982748.321 0.000 1.300
TID 00000001 00000001 1544982749.321 0.000 1.250

```

**Manual tide data recorded in a Hydromagic RAW data file**

### Unloading the manual tide plugin

To unload the manual tide plugin window, open the preferences window by selecting "Preferences..." from the "Options" menu.

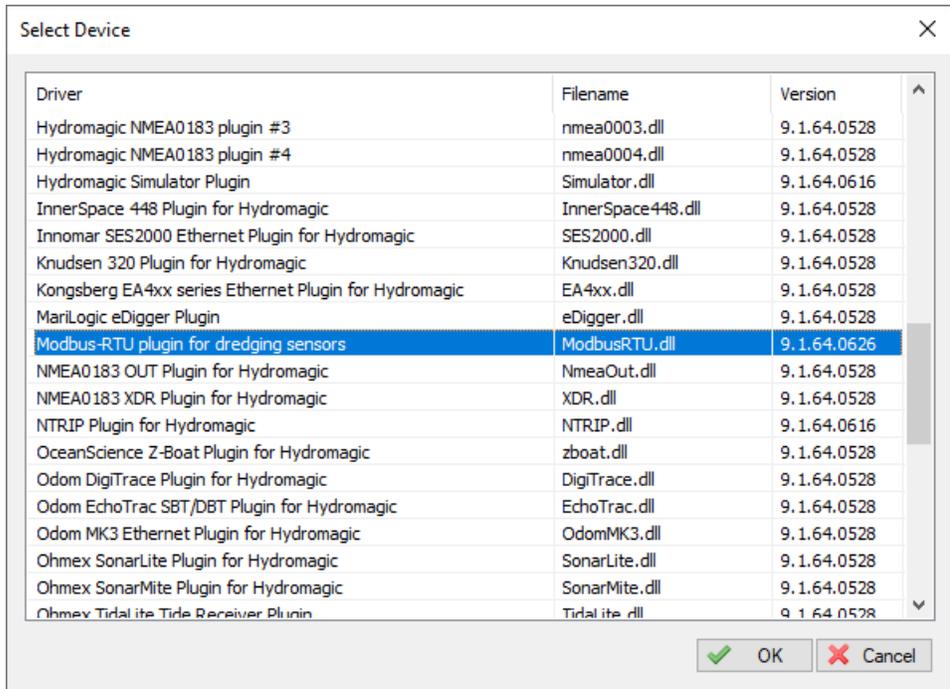
In the window that appears, select the "Devices" tab. Next select the "Hydromagic Manual Tide Plugin", right-click and select "Remove Device..." from the popup menu.

When the plugin is unloaded (either when removed from the devices list, or when the software is stopped), the current tide level and window position are stored.

The next time the plugin is loaded, the user interface will be on the same screen location and the last known manual tide value will be displayed.







Select the Hydromagic Modbus-RTU plugin from the list of available plugins.

## Configuring the Modbus plugin

### Serial Communications

First you must to configure the serial communications with the Modbus device(s). For Modbus-RTU, the default serial speed is 19200 bps and the 8E1 serial data format is used. Make sure you select this format, the 8N1 format, which is most often used, does not work for Modbus. Not all Modbus devices can be connected to a serial port directly. In some cases you will need a RS422/485 to RS232 converter in order to communicate with the sensor(s).

### Sensor Settings

With Modbus, sensor values are stored at register indices. For each sensor you have to configure the device address, start register, register length and a scale factor. In the first column, you have to map the register value to a sensor:

- N/A - Unused;
- P - Pitch value;
- R - Roll value;
- Y - Yaw value;
- V1 - Segment 1 vertical angle (ladder or boom);
- V2 - Segment 2 vertical angle (stick);
- V3 - Segment 3 vertical angle (bucket);
- H1 - Segment 1 horizontal angle;
- H2 - Segment 2 horizontal angle;
- H3 - Segment 3 horizontal angle;

You have to enter the register index and register length in the second and third field respectively. You can find the register indices for your sensor in the user manual. The values have to be entered as

hexadecimal values. When the user manual list them as decimal values, you can use the Windows Calculator in "Programmer Mode" to convert from decimal to hexadecimal. The length field is in words (a word is two bytes). The only valid values for this field are '01' and '02' (16 or 32 bit values).

Finally you have to enter a scale factor. Most sensors store angle values in hundreds of degrees, so the values stored in the registers have to be divided by 100. For instance a pitch roll sensor will report the angles in a -9000 ... +9000 range, so we enter a scale factor of 100 in such cases. Again, please refer to the user manual of the sensor for more information.

The screen shot below shows an example configuration for a Tiltix dual-axis sensor. When using factory settings, these sensors listen at device address "7F". This particular device stores the X-axis in hundreds of degrees at register 0x00, and the Y-axis angle value is stored at register 0x02. For both values, the size of the values is two words (four bytes). Using this settings, you should be able to configure almost any Modbus-RTU enabled device in Hydromagic.

Modbus-RTU plugin for Hydromagic Dredging

Connection

Connection Type: Serial

Serial Port: Serial COM19

Serial Speed: 19200

Serial Format: E-8-1

Sensors and Modbus configuration

Sensor:	Device:	Register:	Count:	Scale:
R	7F	00	02	100
P	7F	02	02	100
N/A	7F	02	02	100
N/A	7F	02	02	100

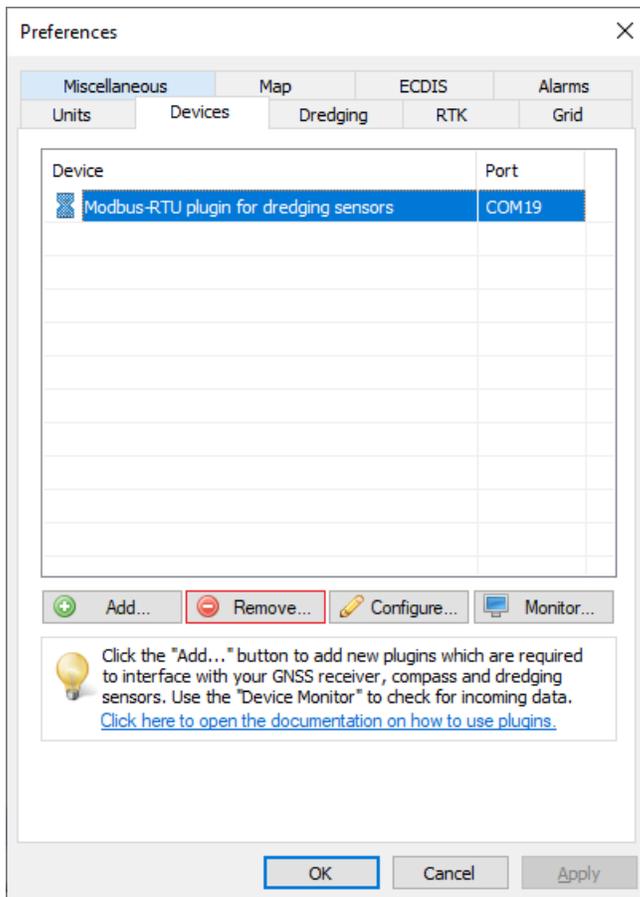
Please note that Modbus-RTU uses E-8-1 as serial port setting. Enter all values as hexadecimal, except for scale.  
[Click here to learn more on using Modbus enabled devices](#)

OK Cancel

*Configuration example for a Posital Fraba Tiltix dual axis sensor.*

## Unloading the Modbus-RTU plugin

To unload the Modbus-RTU plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "Modbus-RTU plugin for dredging sensors" and click the "Remove..." button.



Select the Modbus-RTU plugin and click the "Remove..." button to unload the plugin.

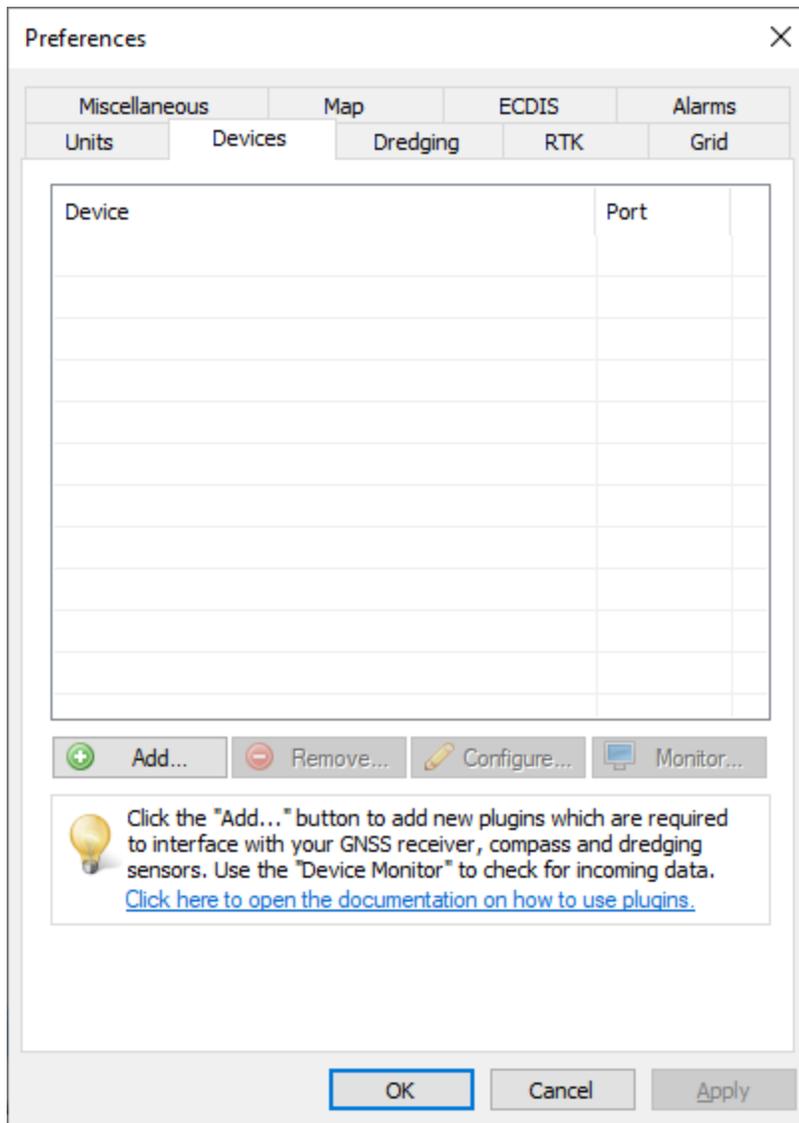
## 11.17 Hydromagic NMEA0183 Playback Plugin

The Hydromagic NMEA0183 Playback plugin is a plugin which allows you to send NMEA0183 data to the software as if it were received in real time. You can use this functionality to re-record NMEA0183 data, demo purposes and testing.

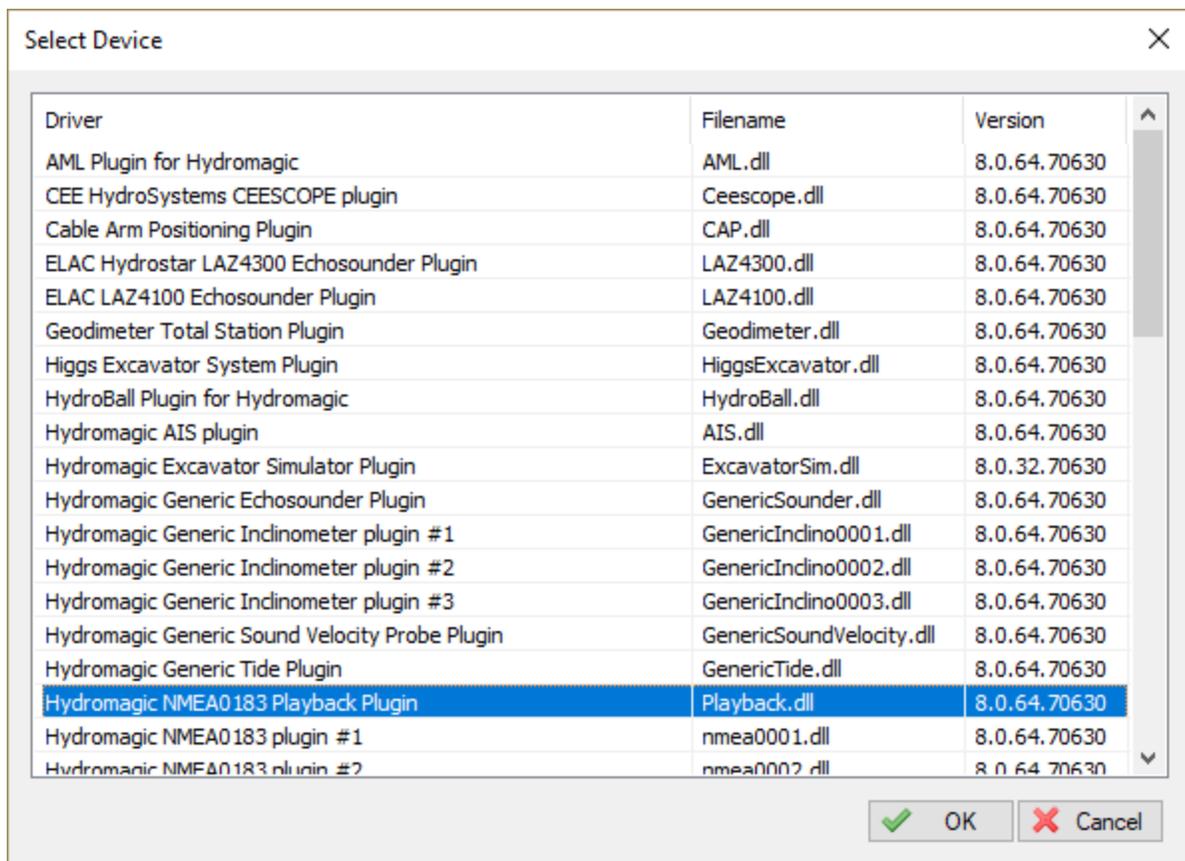
The NMEA0183 data is fed to the plugin by selecting a text file that contains NMEA0183 sentences. The sentences supported are the same as the ones that are supported in the regular NMEA0183 plugins. It is possible to simulate tide as well, using the manual tide buttons in the main tool bar.

### Loading the NMEA0183 Playback plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



A list of available plugins will be displayed. In this list, select the "Hydromagic NMEA0183 Playback Plugin" and click "OK" to load and display the playback plugin.



## Using the playback plugin

In order to start pushing the simulator data into the application, you have to select a valid NMEA0183 logfile first.

To do so, click the 'Browse...' button and select the file to replay. You can check whether the file is valid by clicking 'View...'.

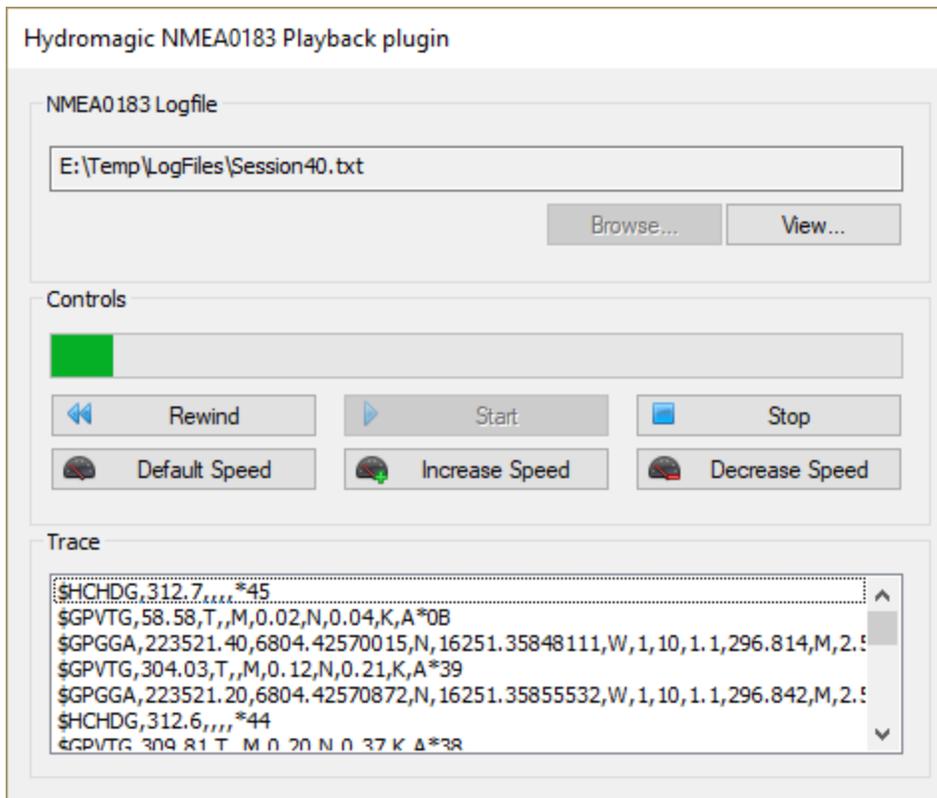
When a file is loaded, the 'Start' button will be enabled and clicking this button will start reading the NMEA0183 file sentence by sentence.

The data is decoded and sent to the survey or dredging application as it was raw data received from real NMEA0183 hardware.

You can pause playback at any time by clicking the 'Stop' button, or start from the beginning by clicking the 'Rewind' button.

The playback speed can be controlled with the 'Default Speed', 'Increase Speed' and 'Decrease Speed' buttons. By default, the playback rate is one sentence per 250 milliseconds.

To change the NMEA0183 logfile, press the 'Stop' button first. This stops the simulator and the 'Browse...' button will be enabled, allowing you to select a different file.



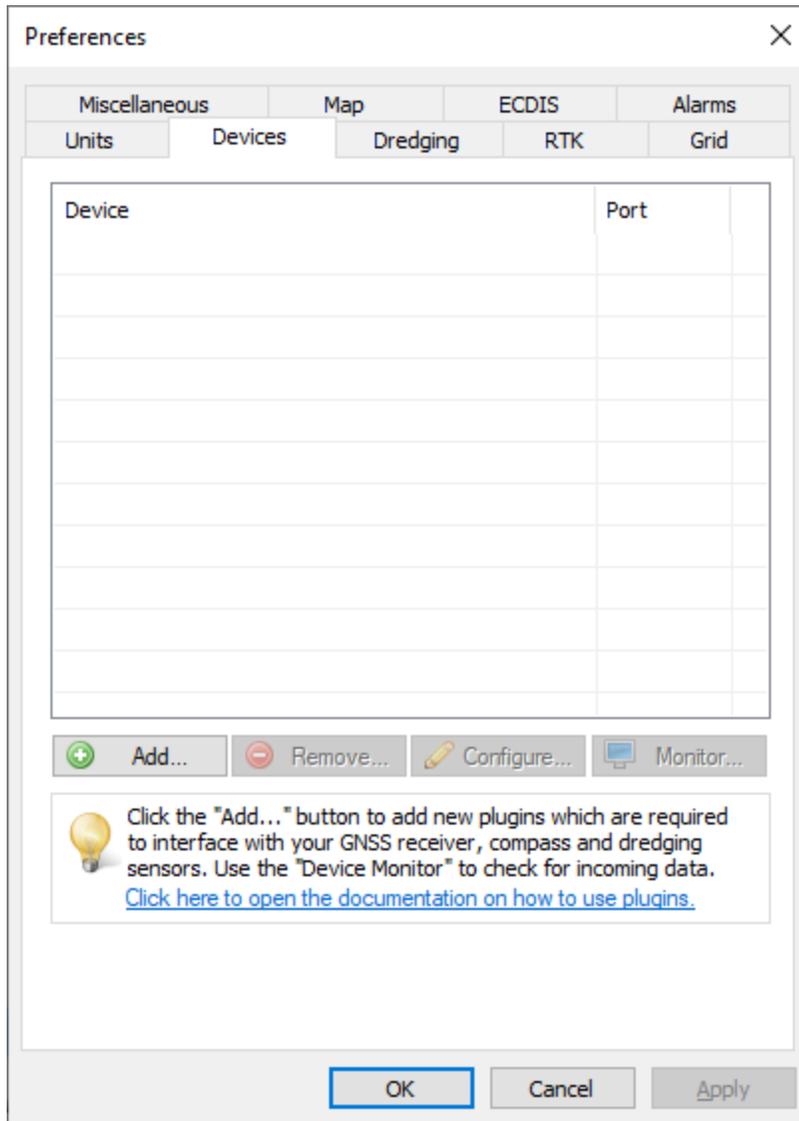
### Unloading the playback plugin

To unload the simulator, open the preferences window by selecting "Preferences..." from the "Options" menu.

In the window that appears, select the "Devices" tab. Next select the "Hydromagic NMEA0183 Playback Plugin" and click the "Remove..." button.

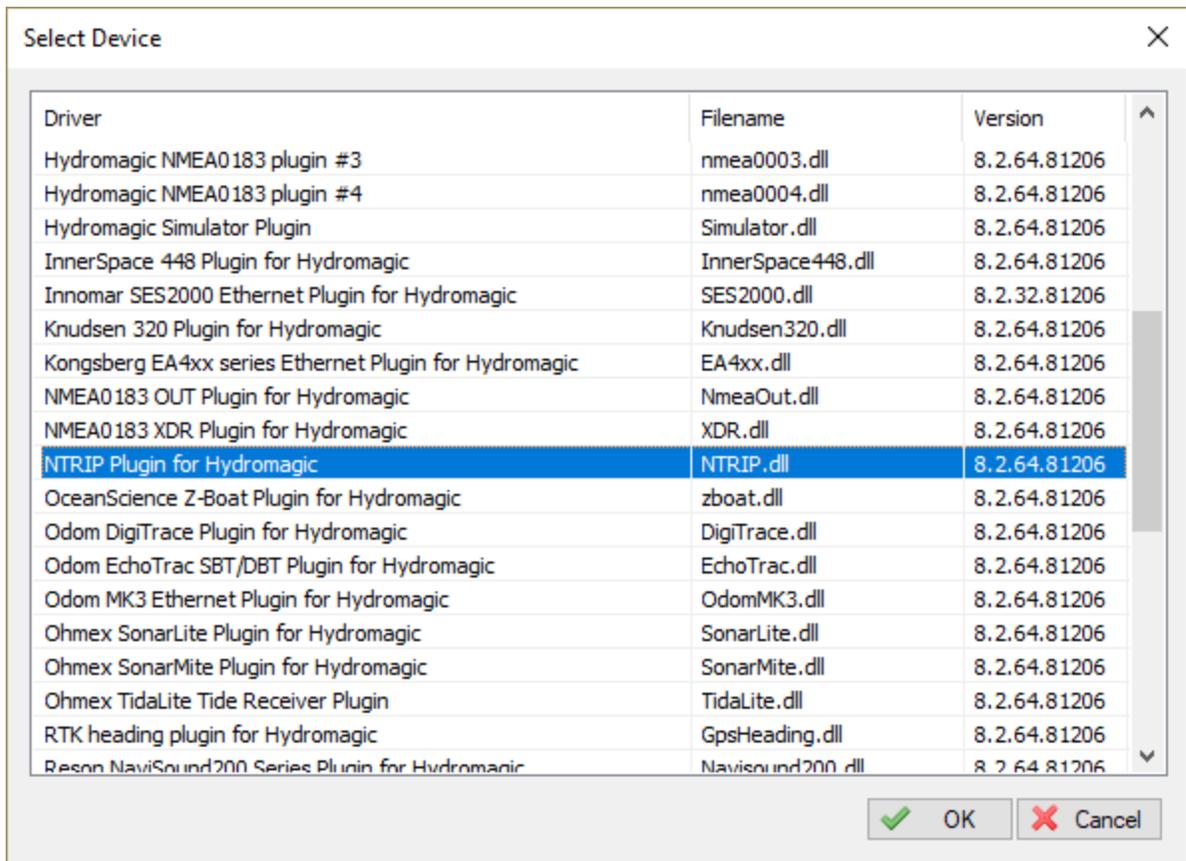


To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



A list of available plugins will be displayed.

In this list, select the "NTRIP Plugin for Hydromagic" and click "OK" to load the plugin.



### Configuring the NTRIP caster

In order to start forwarding RTCM data into the RTK rover using the NTRIP plugin, you have to configure the source of the data first.

These settings will be provided by your local NTRIP caster.

There are also some providers which you can try for free, although they might not always provide the same accuracy as paid services, but in some cases a free provider may provide enough accuracy for your application.

**Hydromagic NTRIP Plugin**

**NTRIP Caster Properties**

Hostname:  Port:

Username:

Password:

Stream:  

**RTCM Output Properties**

Connection Type:

Serial Port:

Serial Speed:

Serial Format:

**VRS (Virtual Reference System) Properties**

Send position data to NTRIP caster

Override GPS position:

Initial Longitude:  (decimal degrees)

Initial Latitude:  (decimal degrees)

OK  Cancel

When you have entered the IP address or host name and the authentication information, click the reload button to populate the drop-down list with the available streams and select the one that matches your application.

Separate streams may exist per area or constellations used. Again refer to the provider for more information on which stream to use.

When the plugin failed to populate the list, it may be because of a connection error. Please refer to the Hydromagic event log to find more information on the cause of the error.

### Configuring the RTCM output

In this section you can configure the way the data is forwarded to the RTK rover. This can either be via a serial or an Ethernet connection.

How this is configured depends on the RTK rover used. Make sure that the RTK rover is configured to listen for RTCM data on the serial or network port as well.

### Using VRS networks

VRS stands for 'Virtual Reference Station'. This means that a base station is simulated for your position by interpolating correction data received by a network of multiple reference stations in your country or area. In order to calculate the correction data for your location correctly, upon connection the plugin has to send a single NMEA0183 GGA sentence containing your geographic position.

Other than a regular base station, which is often configured with TCP/IP port 2101, a VRS network is sometimes on a separate TCP/IP port, in most cases 2102. If you want to use VRS, you might want to check the location of the VRS stream with your local provider.

When VRS is used, please check the 'Send position data to NTRIP caster' option. Without this option set, it is not possible to use VRS networks. Please note that your actual position will be disclosed to your provider.

## 11.19 Hydromagic Simulator Plugin

### Hydromagic Simulator Plugin

The Hydromagic Simulator Plugin is a plugin with graphical user interface designed to simulate various types of hardware.

This allows you to test drive or demonstrate the software without the need to connect actual hardware.

With the simulator you will be able to simulate the following input values:

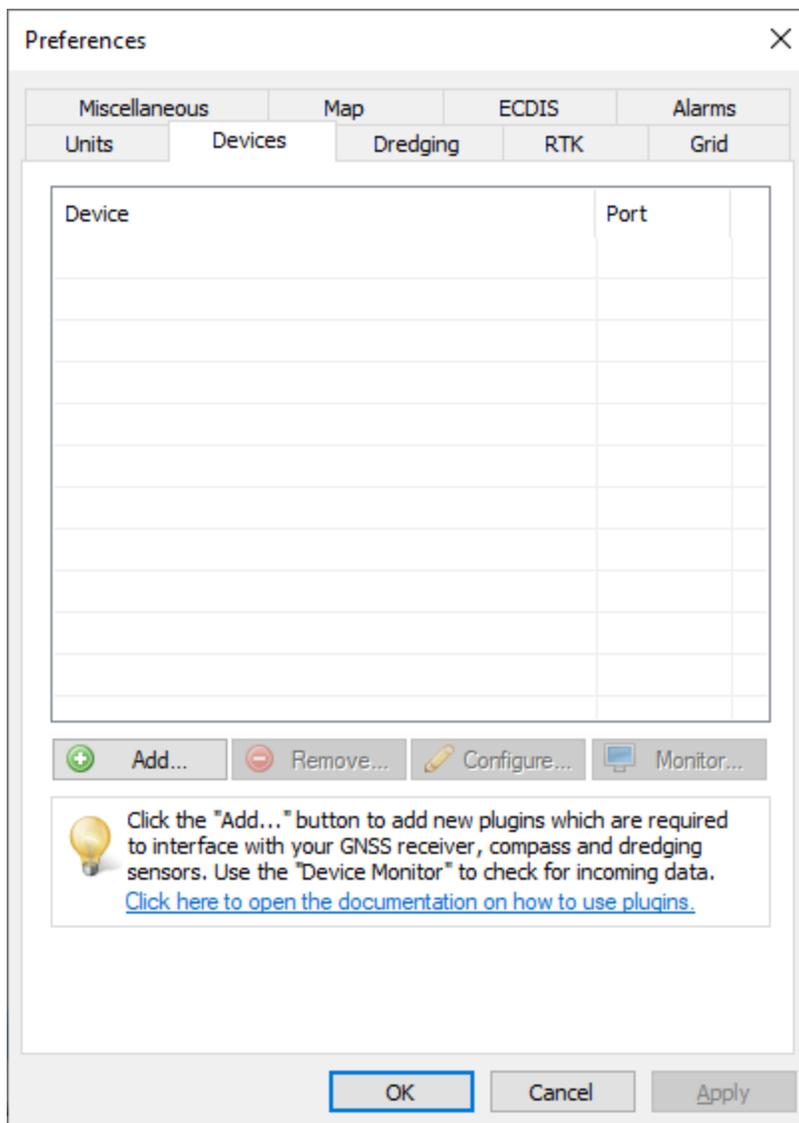
- ✓ GPS Position;
- ✓ Speed over ground;
- ✓ True heading;
- ✓ Echosounder depth (high frequency);
- ✓ Echosounder depth (low frequency);
- ✓ Motion (heave, roll and pitch);
- ✓ Sound velocity;

It is possible to simulate tide as well, using the manual tide buttons in the main toolbar.

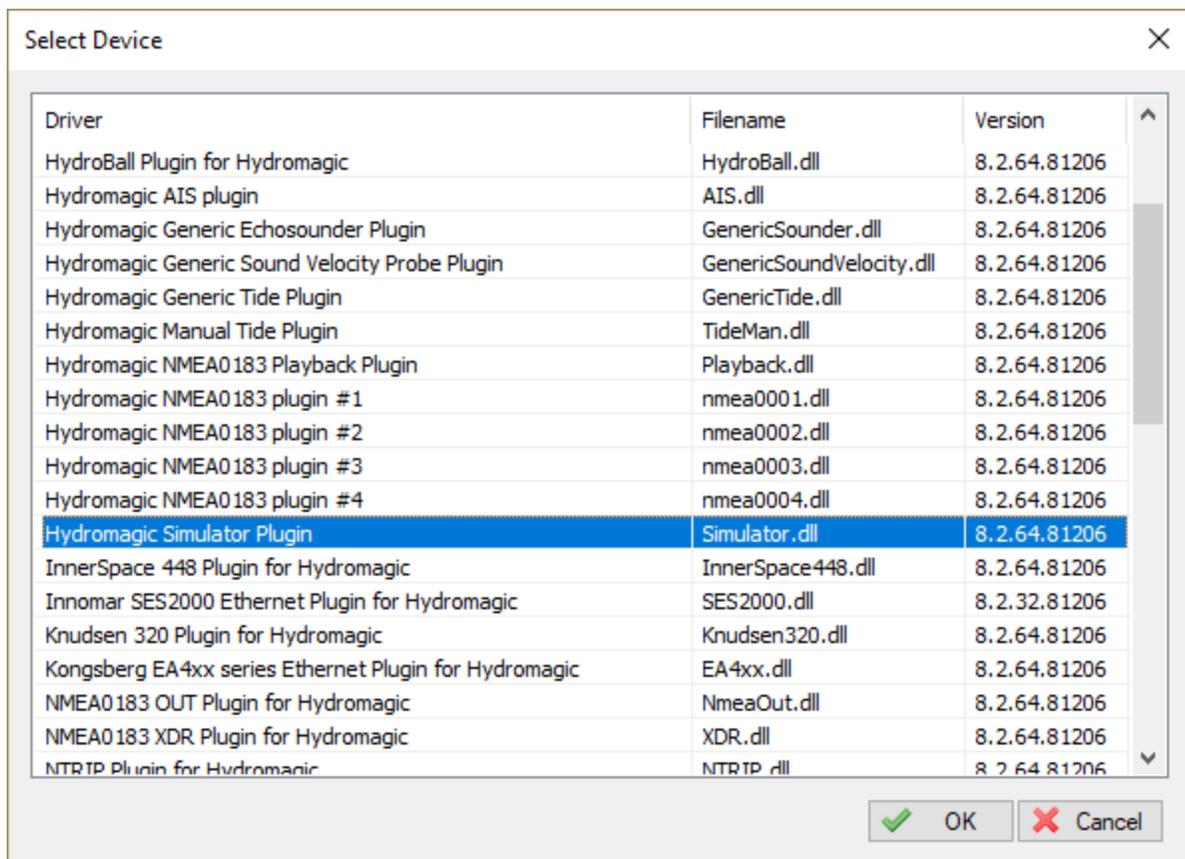
The simulator can be used in both Hydromagic Survey and Hydromagic Dredging.

### Loading the simulator plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



A list of available plugins will be displayed. In this list, select the "Hydromagic Simulator Plugin" and click "OK" to load and display the simulator.



## Using the simulator

In order to start pushing the simulator data into the application, click the "Start" button. To stop the simulation press "Stop". When started, the simulator will send data with 500 millisecond intervals.

Eye4Software Hydromagic Simulator

**Initial Position**

Longitude:   DD.DDDDDDDD  
 DD.MM.MMM  
 DD.MM.SS.SS

Latitude:

EHT:  meter

Fix:  ▾

**Movement**

Heading:  ▴ ▾ degrees

Speed:  ▴ ▾ knots

**Echo Sounder**

Simulate echo sounder

Depth Hi:  ▴ ▾ meter

Depth Lo:  ▴ ▾ meter

**Motion Sensor**

Simulate motion sensor

Roll:  ▴ ▾ degrees

Pitch:  ▴ ▾ degrees

Heave:  ▴ ▾ meter

**Sound Velocity**

Simulate sound velocity

Sound Velocity:  ▴ ▾ meters/second

 Click the "Reset" button to return to the initial position. When interfering with real hardware, the echo sounder, motion sensor or sound velocity simulator can be disabled. [Click here to read more on this plugin in the online manual.](#)

## Unloading the simulator

To unload the simulator, open the preferences window by selecting "Preferences..." from the "Options" menu.

In the window that appears, select the "Devices" tab. Next select the "Hydromagic Simulator Plugin" and click the "Remove" button.



- Knudsen sounder rack series 1604;
- Knudsen 1612 portable echo sounder;
- Knudsen mini sounder;
- Knudsen ROVer sounder;
- Knudsen Pinger;
- Knudsen 320N.

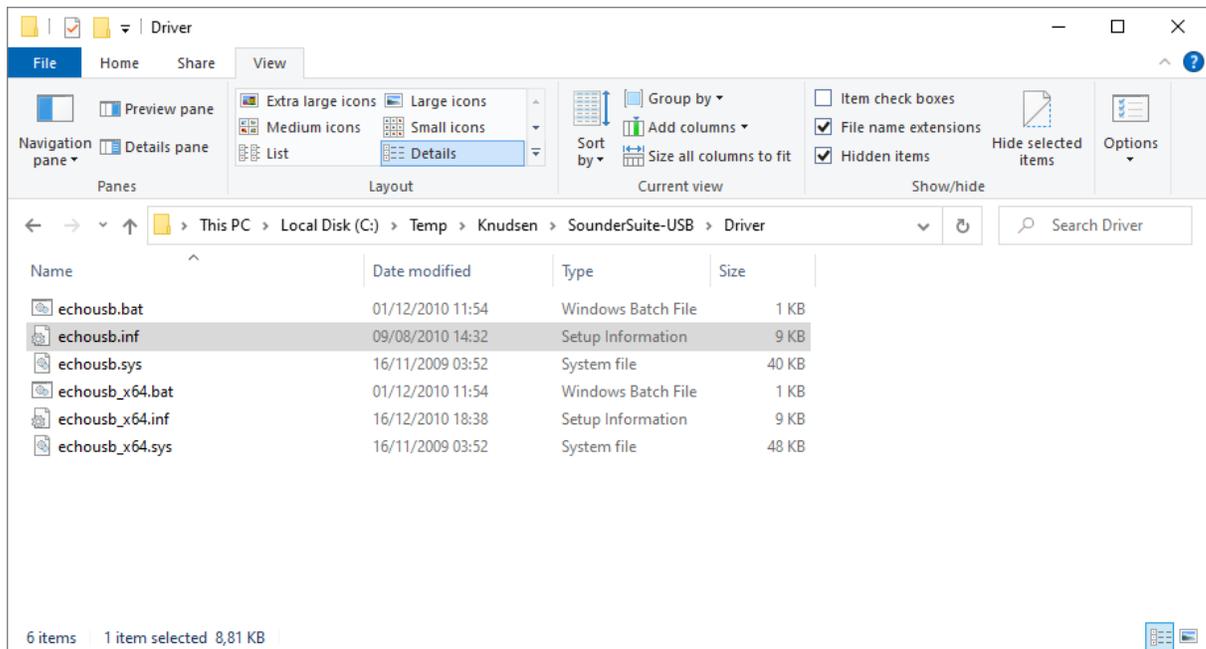


*The Knudsen 1602/1604 rack mounted echo sounder series.*

### **Installing the Windows device driver manually (USB models only)**

If your "SonarSuite" software package is already up and running, you can skip this chapter where we discuss how to install the device driver for the USB echo sounder models. For Ethernet models there is also no need for device driver installation, other than for your computer's network adapter itself, which is most likely already installed.

Please note that when you have received a software installer called "SounderSetup.exe" from Knudsen (on the included CD-ROM), you can use this installer instead of installing the drivers manually.



**The folder containing the USB device drivers on the Knudsen CD-ROM, USB stick or harddrive.**

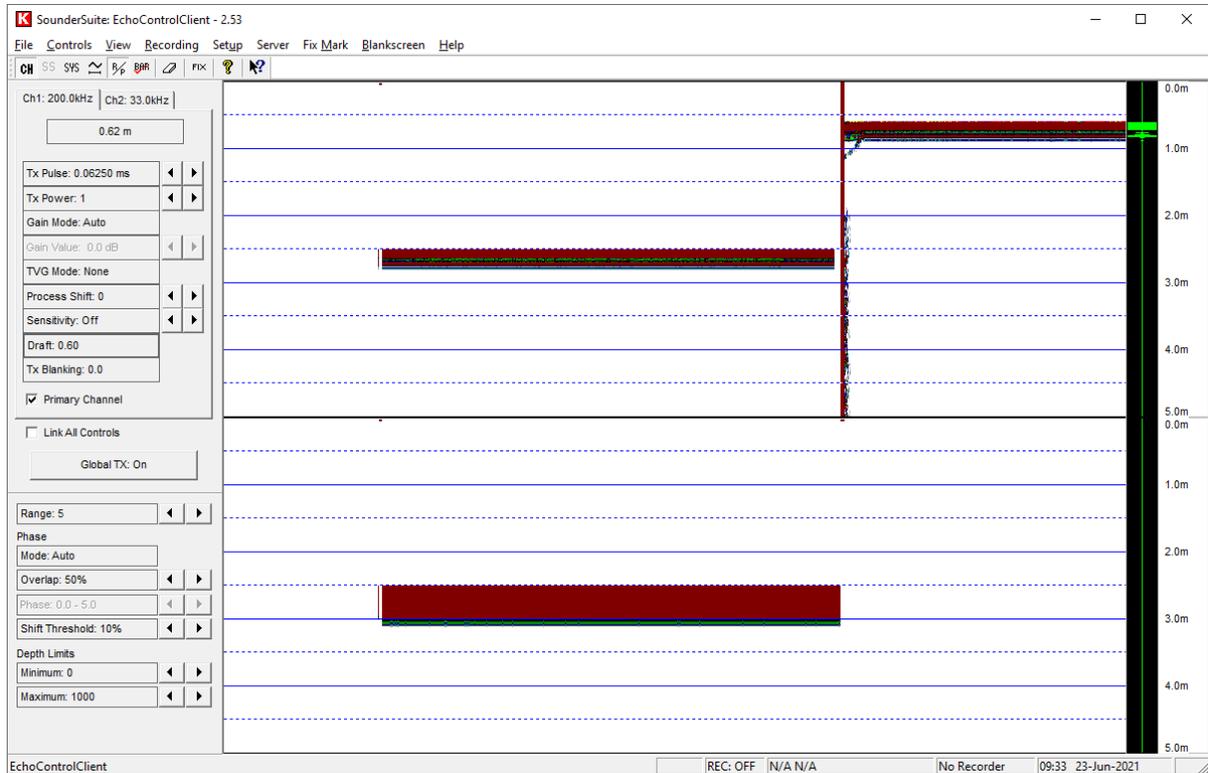
You can find the USB device drivers needed for installation on the CD-ROM shipped with the echo sounder. Since the drivers are (likely) not digitally signed for Windows 8, 8.1 and Windows 10, an additional step is required to allow them to be installed on your system. Please perform the following steps as explained in the "[Installing unsigned device drivers under Windows 10](#)" document before installing the drivers.

To install the drivers, go to the folder containing the driver files and right-click the "echousb.inf" or "echousb\_x64.inf" when running a 64-bit version of Windows, and select "Install" from the popup menu. After a few moments a popup telling you that the operation has been completed will be shown. You can now connect the sounder.

To check whether the driver installation was successful, launch the "Device Manager" by right-clicking the Windows start menu, and selecting "Device Manager". When the drivers are installed correctly, you should see an "EchoSounder" item in the list:



When using Hydromagic with a Knudsen sounder, you have to run the "EchoControlClient" simultaneously to control the echo sounder. Controlling the sounder is not possible via Hydromagic, it will only read data.

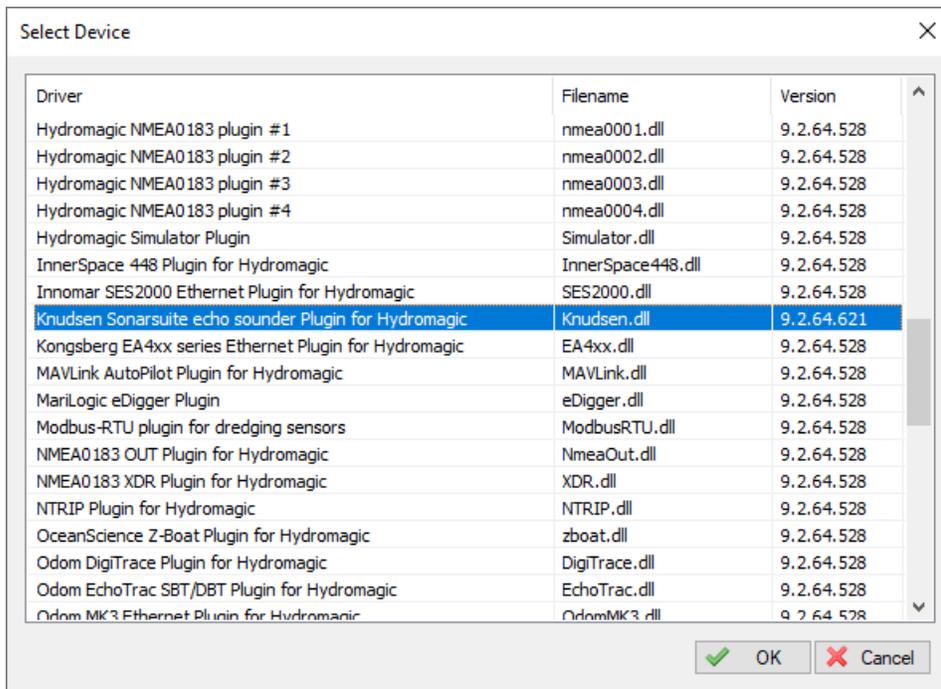


**Use the EchoControlClient to control the Knudsen echo sounder.**

### Loading the Knudsen echo sounder plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.

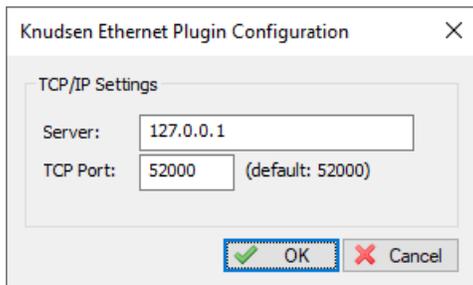




**Knudsen SonarSuite echo sounder plugin.**

### Configuring the plugin

When the plugin is selected and loaded, the configuration dialog for the plugin will be shown. In almost all cases you can accept the default settings. Just click "OK", unless the server has been configured on another TCP port, or when the "EchoControlServer" is running on a different computer or echo sounder.

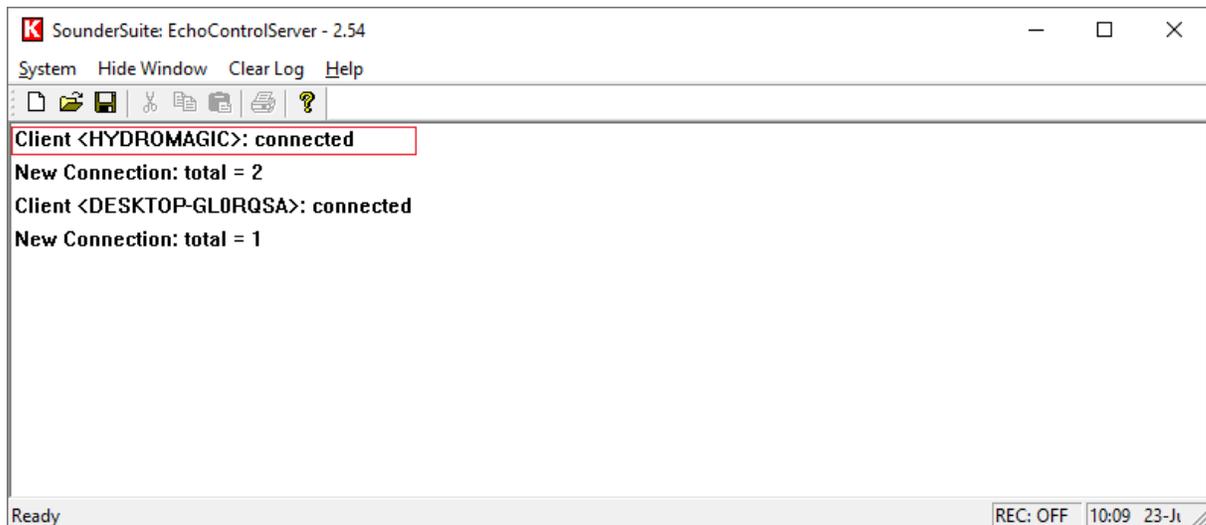


**The default settings can be used in most cases.**

### Testing the plugin

When the Knudsen software has been configured you should see depth data displayed in the data view (please make sure you have started the sounder in the "EchoControlClient" software!). If not, you can perform the following steps to troubleshoot the problem:

First check whether the connection between Hydromagic and the "EchoControlServer" has been established. Double click the Knudsen icon in the notification area to show the "EchoControlServer" log. When Hydromagic has been connected this will be shown in the log:

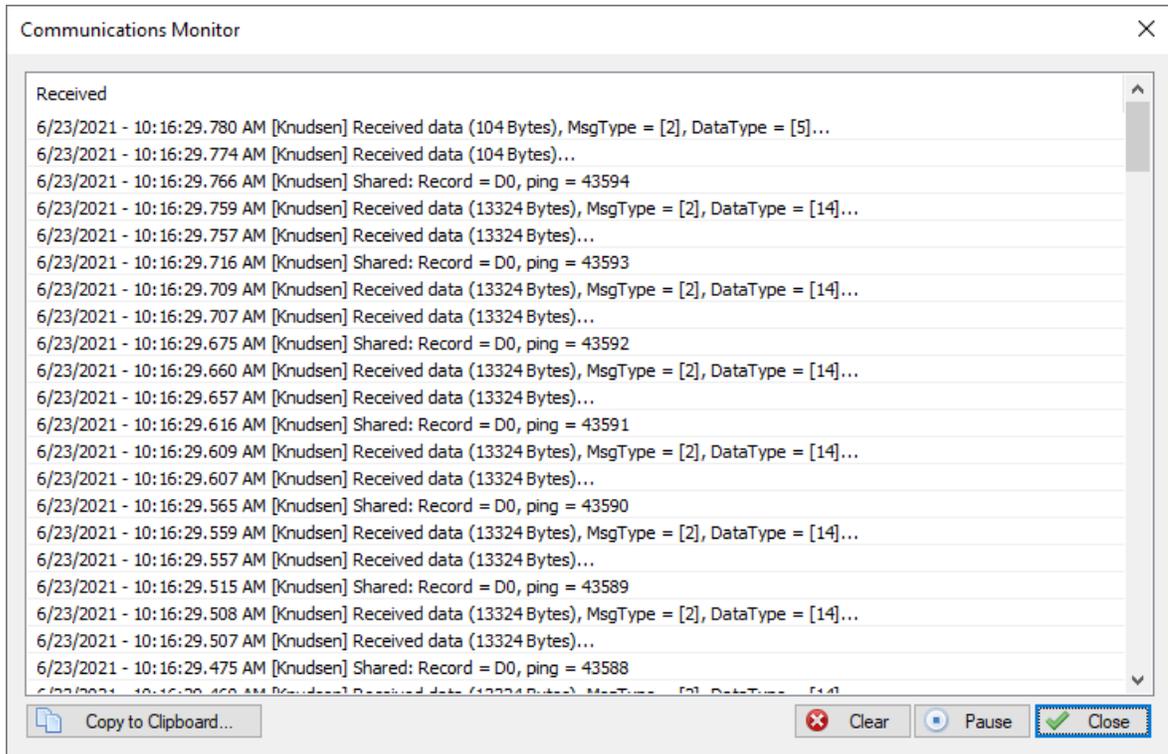


***Check the EchoControlServer log to verify the connection has been established.***

When no connection is established, most probably the software is using another TCP port, the IP address is incorrect, IPv4 is disabled or your firewall is blocking the request.

When a connection has been established and we still do not see any data appear, we can check the device monitor to check whether data is being sent to Hydromagic by the server: Open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "Knudsen SonarSuite echo sounder plugin for Hydromagic" and click the "Monitor..." button. The communication monitor appears, and should display packets coming in as shown below:

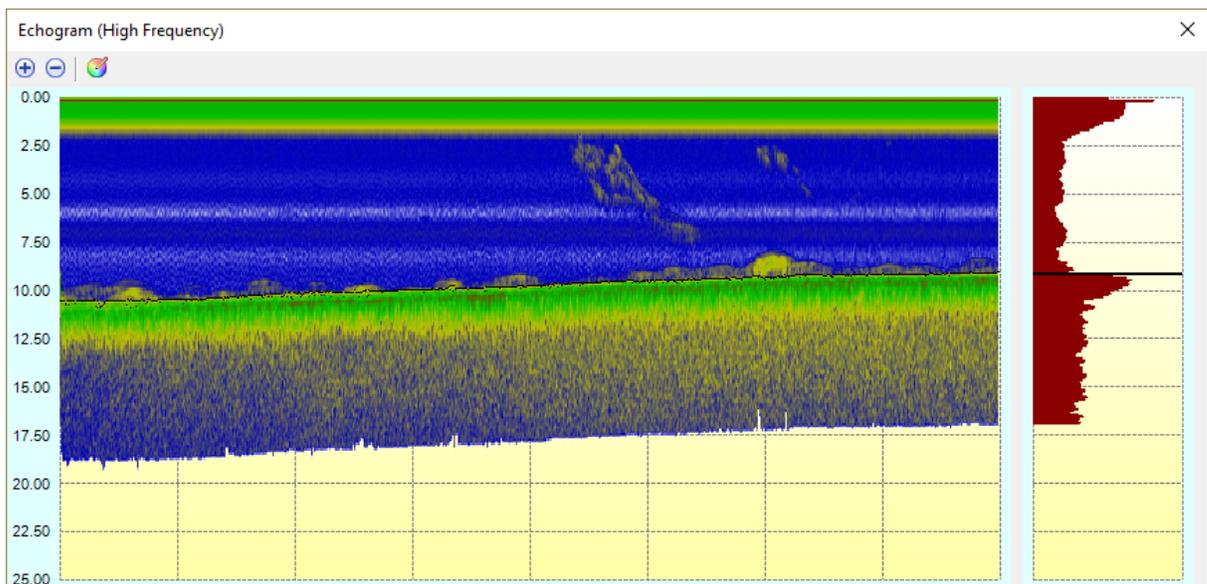
When no data is coming in, and Hydromagic is connected, please double-check that the sounder has been started from the "EchoControlClient" by clicking the "Global TX" button. If the sounder is working correctly, the following should be displayed in the device monitor:



**Incoming (TCP) data packets should be appear in the device monitor.**

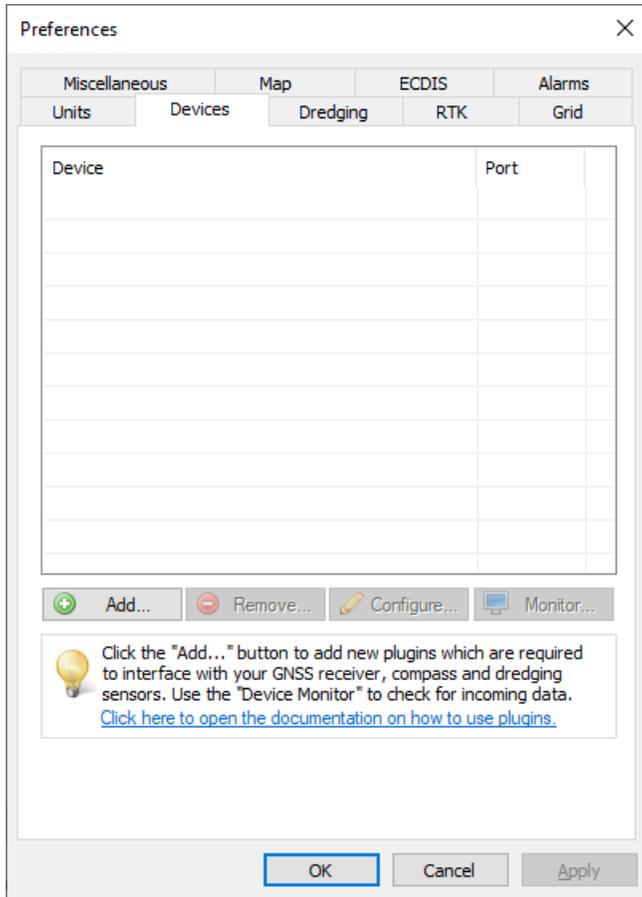
The window shows the number of incoming bytes, whether it is able to decode the data (MsgType and DataType) and which record type is used (record "D0" in this example). A DataType of 14 means that return envelope and depth information is received from the server. The software currently supports record types "D0" and "E0". When you encounter a different type, and no data is shown, please use the "Copy to Clipboard..." button to send the data to our support department for further assistance.

To check the incoming echogram data, select the 'Echogram (Hi)' or 'Echogram (Lo)' option from the View menu. The echogram should look like this:

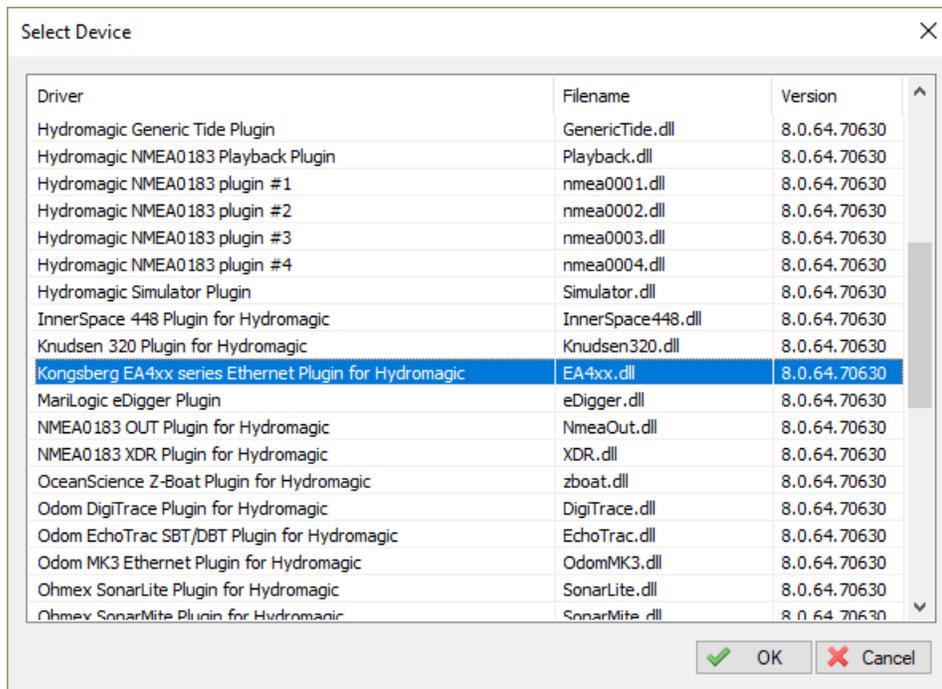




To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



A list of available plugins will be displayed. In this list, select the "Hydromagic Simulator Plugin" and click "OK" to load and display the simulator.



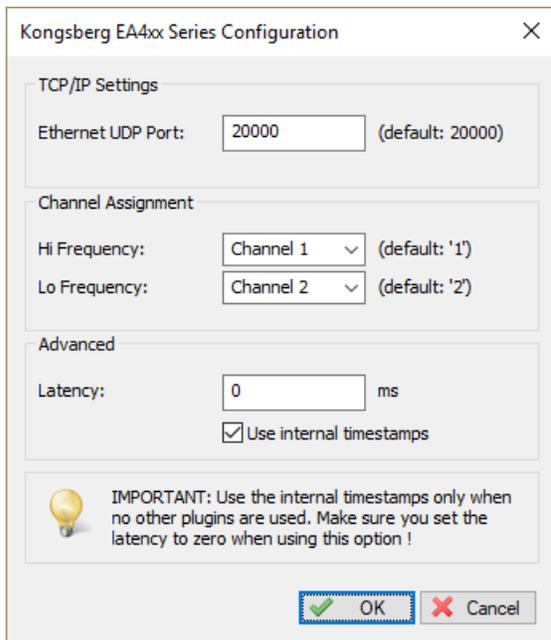
## Configuring the plugin

When the plugin is selected and loaded, the configuration dialog for the plugin will be shown. In almost all cases you can use the default settings.

Sometimes UDP port 20000 is already in use. In these cases use a different port number (you have to change this in the EA4xx software as well!).

Use the channel assignment to associated a transducer channel with either the Hi or Lo frequency depth. How to set this up depends on the echosounder configuration.

In most cases the first channel is connected to the high frequency transducer and the second channel to the low frequency transducer.

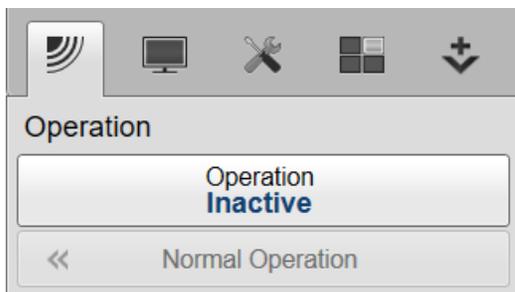


## Configuring the EA440 software (I/O)

In order to receive data from the sounder, the EA440 software has to be started and configured. Double click the "EA440" icon on your start menu, desktop or taskbar to start the software.

First we have to set the sounder to 'Inactive'. It is not possible to change output settings when the sounder is in 'Demo' or 'Active' mode.

To do so, select the leftmost tab in the pane on the right side of the screen, and change the Operation setting.

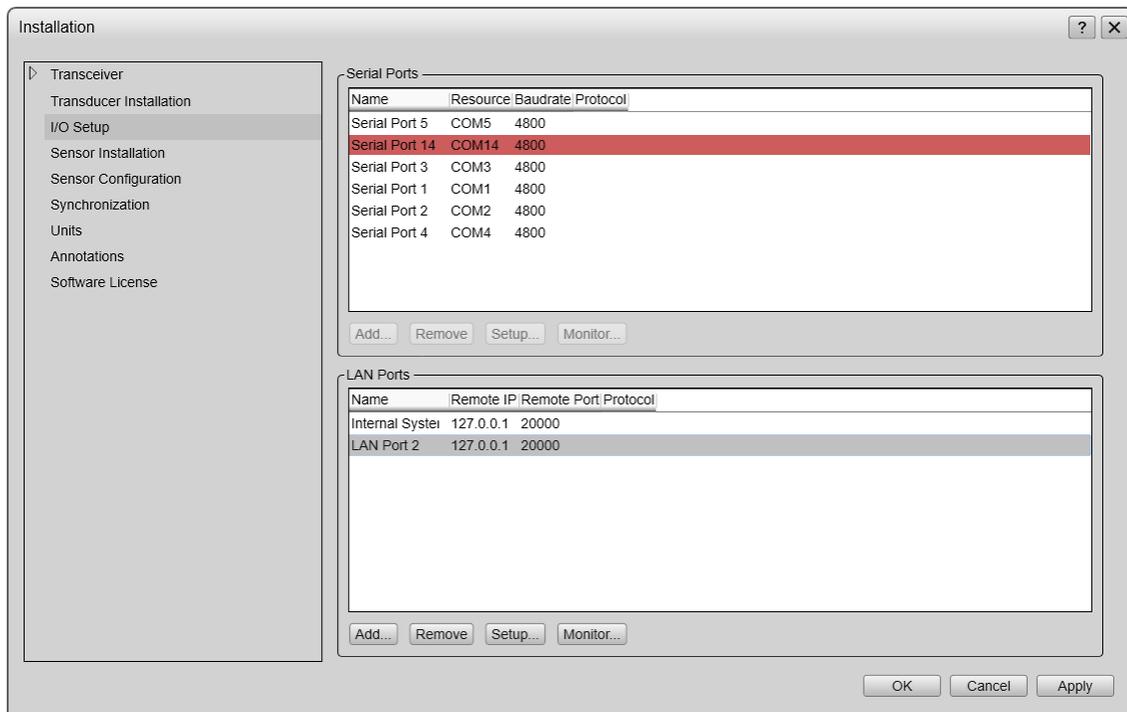


When done, select the tab in the middle (with the tools on it), and click the 'Installation' button. In the dialog that appears, select the 'I/O Setup' item on the left. The I/O Setup tab now appears. Click the "Add..." button directly below the list of ports in the "Lan Ports" section.

A new entry is created called 'LAN Port 2', with IP Address 127.0.0.1 and Port 20000.

When Hydromagic is not running on the same computer, select the new entry, click "Setup" and change the IP address to the one used by the computer running Hydromagic.

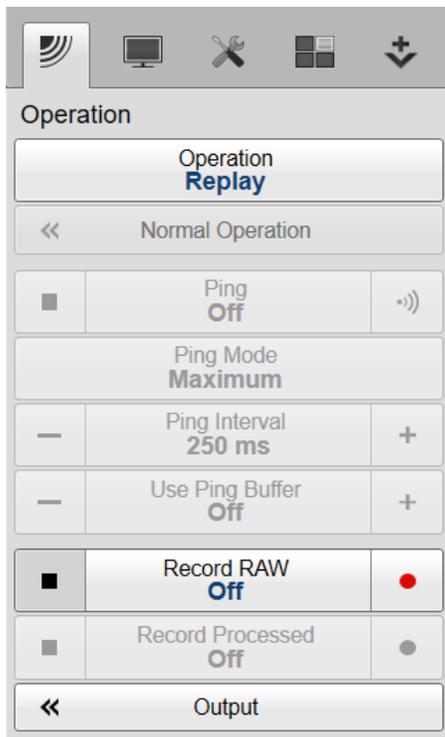
When completed, click "Apply" and "OK" to save the changes.



### Configuring the EA440 software (Echogram)

Next, return to the first tab, and change the Operation setting back to 'Normal' or 'Replay' when the sounder isn't connected.

After doing so, the 'Output' button will be enabled. Click the 'Output' button to configure the output format.



We will now configure the echogram output. Select the 'Processed Data Output' option in the screen that appears.

The only item in the 'Installed Outputs' list should be 'New' which can be used to add a new output. Select the 'New' item, and proceed to the section on the right. From the drop down box at the top of this section, select the 'Echogram' option.

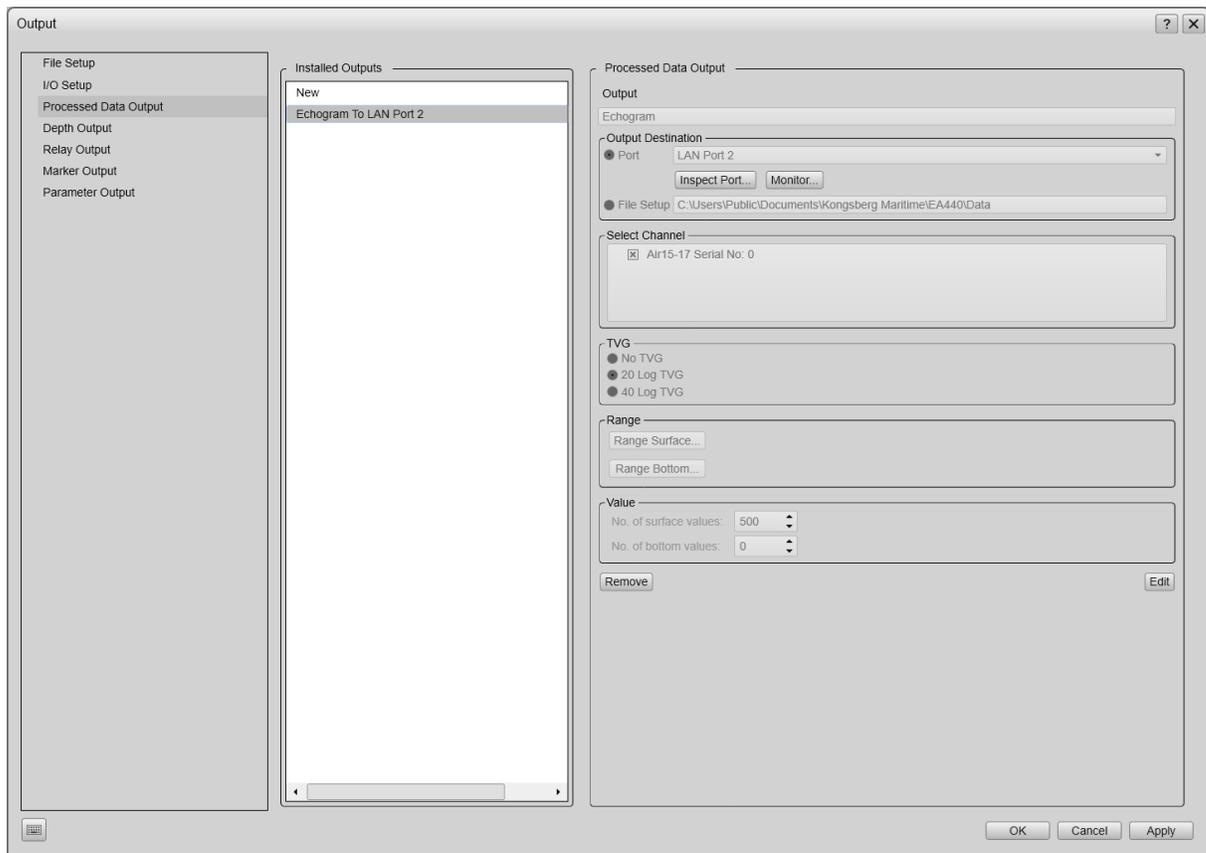
In the 'Output Destination' section, check the 'Port' radio and select the I/O port we created earlier, which is most likely called 'LAN Port 2'. Select the channels you want to output.

Please note that Hydromagic can only process one low frequency and one high frequency channel. When there are only one or two transducers listed, just check all.

For the TVG, select the '20 Log TVG' option. The other options just won't work. In the Range setting, click the buttons to set the range for the Surface and Bottom.

Hydromagic will only use the surface samples (when bottom is not used, the surface samples will cover the whole water column).

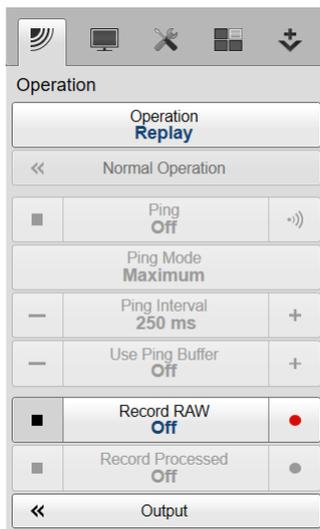
In the value section, set the number of samples for surface to 500 and the bottom sample count to 0. When finished, do not forget to click the 'Add' button to store this output profile. When starting the sounder or a simulation, the data should now be displayed in Hydromagic.



## Configuring the EA440 software (Digitized Depth)

Next, return to the first tab, and change the Operation setting back to 'Normal' or 'Replay' when the sounder isn't connected.

After doing so, the 'Output' button will be enabled. Click the 'Output' button to configure the output format.



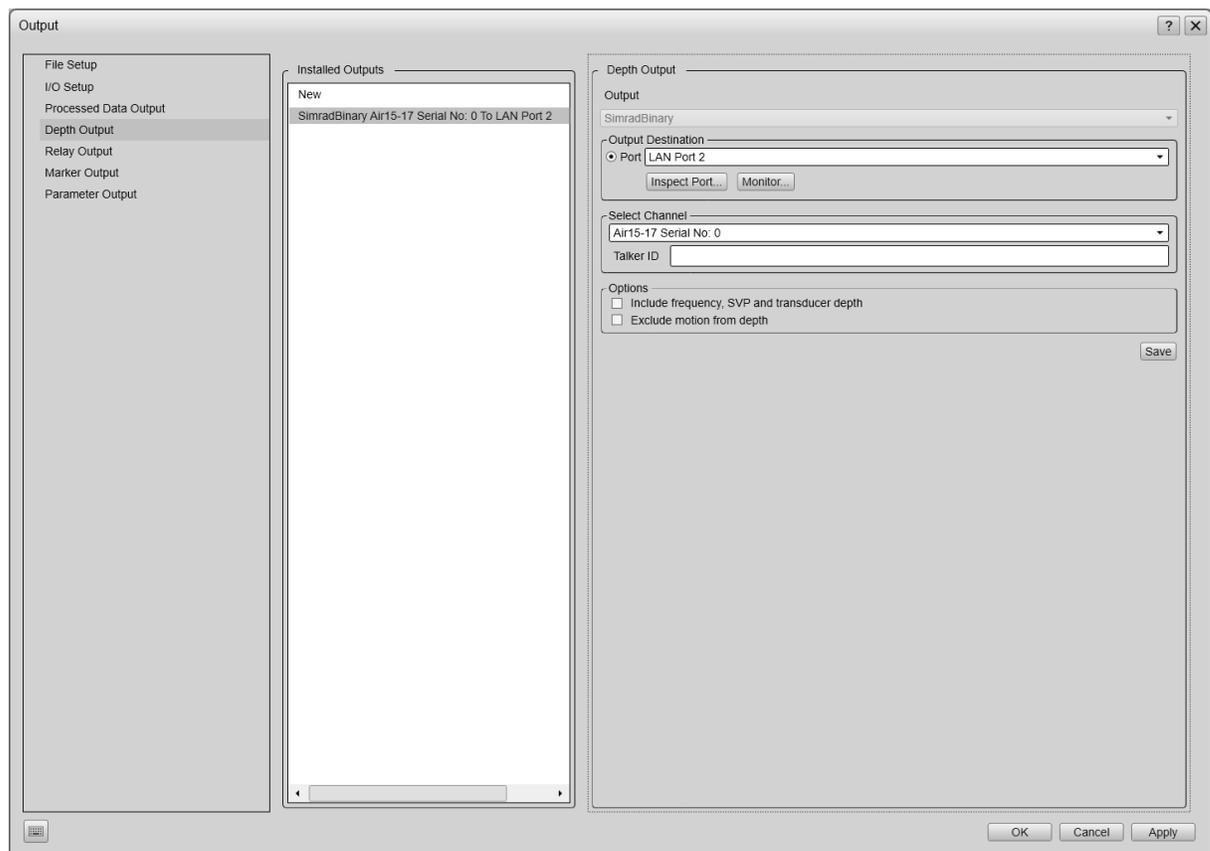
We will now configure the digitized depth output. Select the 'Depth Output' option in the screen that appears.

The only item in the 'Installed Outputs' list should be 'New' which can be used to add a new output. Select the 'New' item, and proceed to the section on the right. From the drop down box at the top of this section, select the 'SimradBinary' option.

In the 'Output Destination' section, check the 'Port' radio and select the I/O port we created earlier, which is most likely called 'LAN Port 2'.

Select the channels you want to output. Please note that Hydromagic can only process one low frequency and one high frequency channel.

When there are only one or two transducers listed, just check all.



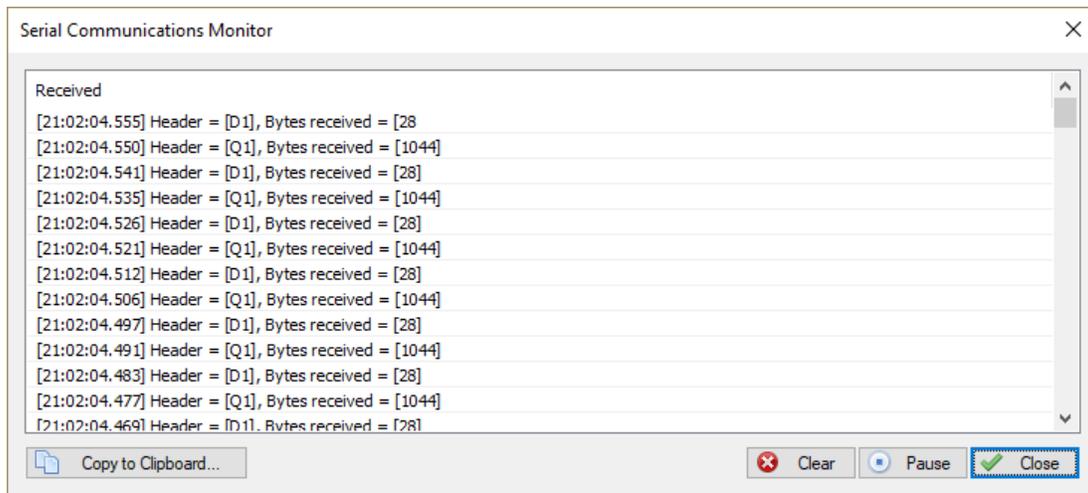
### Testing the plugin

When the EA440 software has been configured you should see depth data displayed in the data view. If not, you can perform the following steps:

Open the preferences window by selecting "Preferences..." from the "Options" menu.

In the window that appears, select the "Devices" tab. Next select the "Kongsberg EA4xx Series Ethernet Plugin for Hydromagic" and click the "Monitor..." button.

The communication monitor appears, and should display two different packets coming in as shown below:

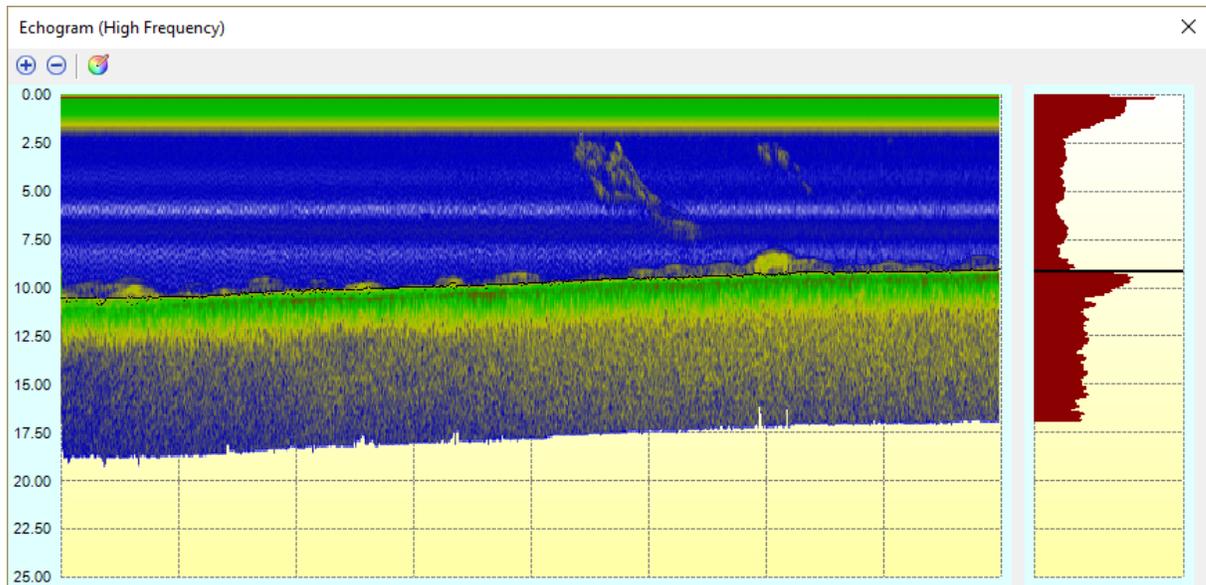


When the packet starting with 'Q1' or 'Q2' is received, it means that the echogram data has been setup correctly.

When the packet starting with 'D1' or 'D2' is received, it means that the digitized depth data has been setup correctly.

When neither of those two appear, most likely there is a problem with the configuration. In some cases you have to select another UDP port for LAN Port 2 (for instance 20002).

To check the incoming echogram data, select the 'Echogram (Hi)' or 'Echogram (Lo)' option from the View menu. The echogram should look like this:



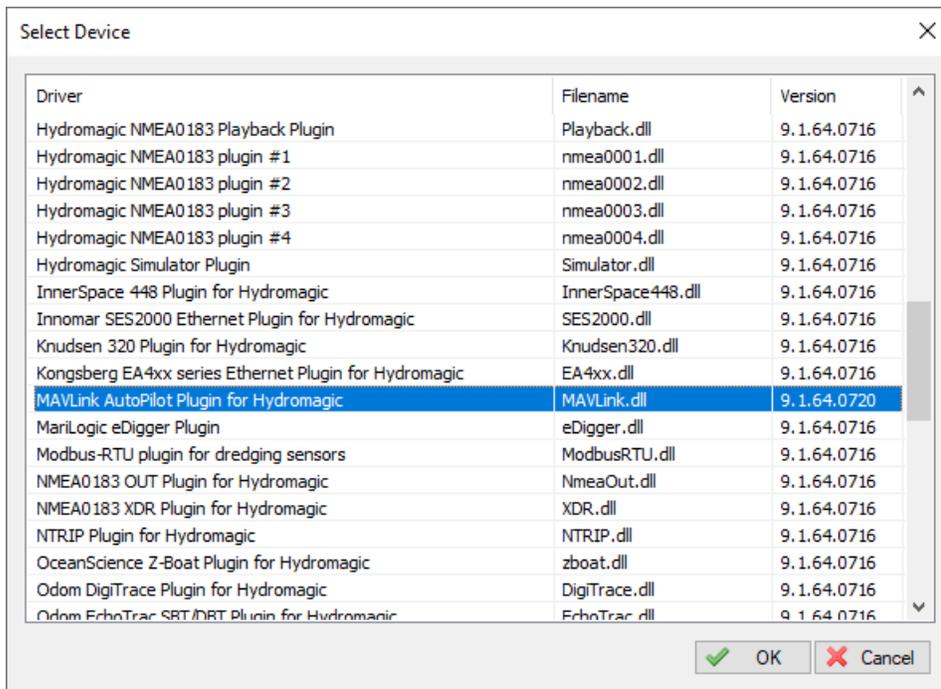
### Unloading the plugin

To unload the plugin, open the preferences window by selecting "Preferences..." from the "Options" menu.

In the window that appears, select the "Devices" tab. Next select the "Kongsberg EA4xx Series Ethernet Plugin for Hydromagic" and click the "Remove..." button.



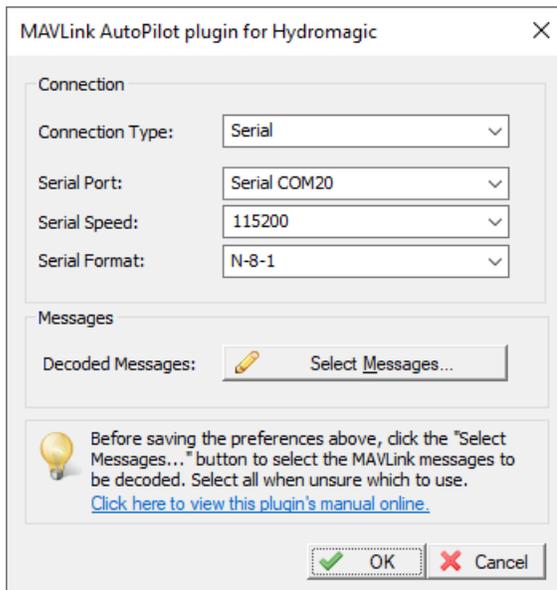




Select the "MAVLink AutoPilot for Hydromagic" plugin from the list of available plugins.

### Configuring the MAVLink plugin

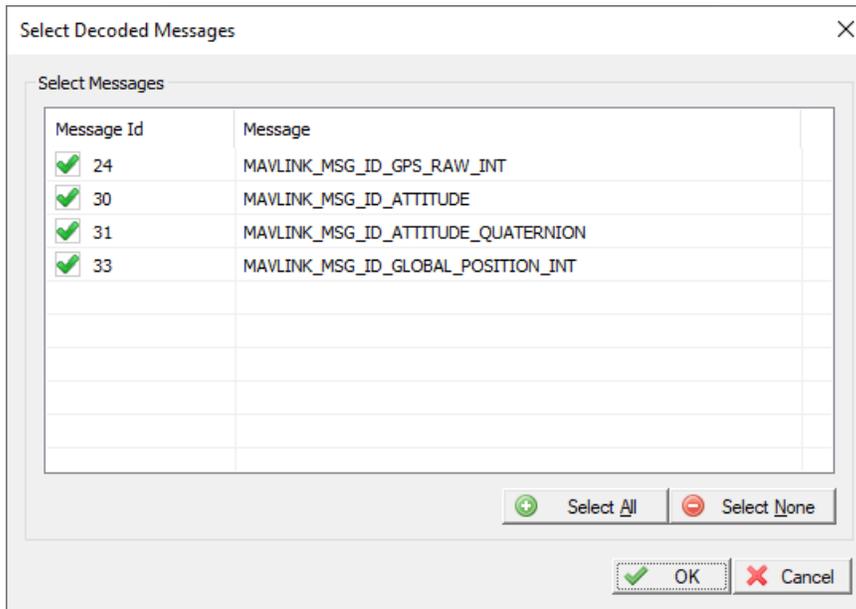
After loading the plugin, you have to select the connection parameters first. Please note that a MAVLink can be connected using a serial connection or a TCP/IP connection (for instance WiFi). First select the connection type from the drop down list and configure other connection parameters.



Configure communication settings for the MAVLink connection in the plugin window.

To define which MAVLink messages are decoded and handled by the Hydromagic software, click the "Select Messages..." button. Your version of the plugin might have more messages to choose from then

displayed in the screenshot below. Please refer to the "Supported Messages" paragraph for more details on these message types.



*Select which MAVLink protocol messages are handled by the plugin*

### Unloading the MAVLink plugin

To unload the MAVLink plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next select the "MAVLink AutoPilot Plugin for Hydromagic" and click the "Remove..." button.



### #33 - MAVLINK\_MSG\_ID\_GLOBAL\_POSITION\_INT

Just like message #24 this message contains position information. However the difference with message #24 is, that this message only contains a geographic position and speed vectors in x,y and z direction. When #24 is present, disable message number 33.

## 11.23 Odom Echotrac Plugin

The Odom Echotrac plugin can be used to retrieve (dual frequency) depth data from your Odom Echotrac echo sounder.

Since the Odom Echotrac serial output protocol has been adapted by various echo sounder manufacturers, you can use this plugin for any other echo sounder supporting the Odom DBT or SBT protocol.



The Odom Echotrac plugin supports the following Odom echo sounders.

Not listed are echo sounder from other brands which utilize the Odom DBT or SBT protocol:

- Odom Echotrac MK3;
- Odom Echotrac CV100;
- Odom Echotrac CV200;
- Odom Echotrac CV300;
- Odom Echotrac CVM;
- Odom Echotrac E20;
- Odom Hydrotrac II;

This plugin can only be used when the sounder is connected to the computer via a serial (RS232) connection.

When your Odom Echotrac echo sounder connects to your computer via an Ethernet cable, you should use the ["Odom Ethernet plugin"](#) instead.

## Odom Echotrac DBT protocol

DBT stands for "Dual Bottom Tracking" and can be used to transfer both single and dual frequency echo sounder data to the computer over a serial (RS232) connection.

The string contains an error and a fix mark flag, a frequency indicator and the depth value.

```
ET H 00016
ET H 00016
ET H 00017
ET H 00016
```

*Example Echotrac DBT data in single frequency mode (freq = high, units = feet)*

```
et B 00572 00576
et B 00577 00641
et B 00588 00645
et B 00580 00591
et B 00577 00592
et B 00574 00605
```

*Example Echotrac DBT data in dual frequency mode (freq = both, units = centimeters)*

## Odom Echotrac SBT protocol

DBS stands for "Single Bottom Tracking" and can be used to transfer both single frequency echo sounder data to the computer over a serial (RS232) connection. The string contains an error and a fix mark flag, a frequency indicator and the depth value.

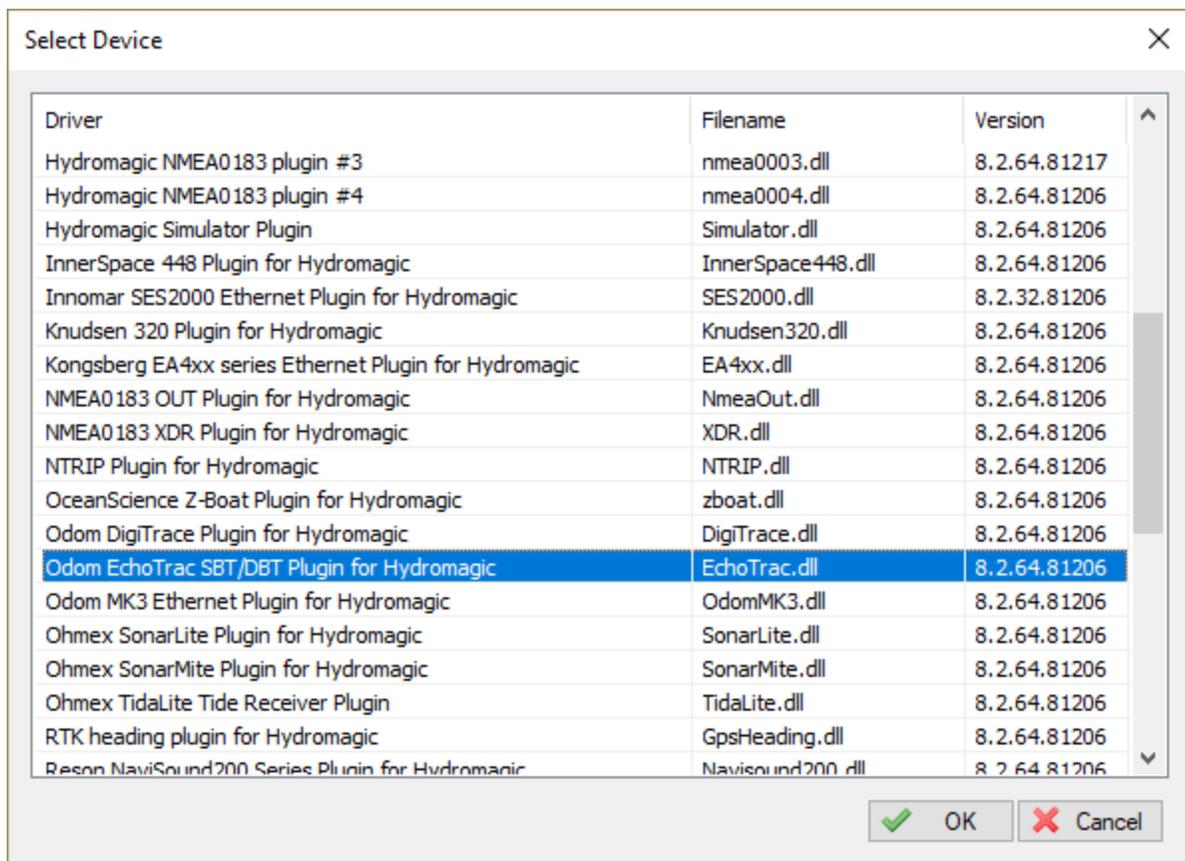
```
UPC,F, , 10.1,20,10,1.23,87, 10.3,18,13,1.32,82, 56.8
UPC,F, , 10.1,20,10,1.23,87, 10.5,18,13,1.31,83, 57.4
UPC,F, , 10.0,20,10,1.23,87, 10.4,18,13,1.32,82, 55.4
UPC,F, , 10.1,20,10,1.24,87, 10.5,18,13,1.31,83, 56.3
UPC,F, , 10.1,20,10,1.24,87, 10.3,18,12,1.30,83, 57.0
UPC,F, , 10.0,20,10,1.24,87, 10.3,18,13,1.32,82, 55.4
```

*Example Echotrac SBT data (freq = single, units = centimeters)*

## Loading the Odom Echotrac plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.





## Configuring the Odom Echotrac plugin

When the plugin loads, a dialog with some required settings will appear first. In order to get the plugin to work correctly, you have to configure the protocol and communication settings.

Odom Echotrac Configuration

Connection

Connection Type: Serial

Serial Port: Serial COM1

Serial Speed: 9600

Serial Format: N-8-1

Device

Latency: 0 ms

Odom Echotrac Protocol

Protocol: EchoTrac DBT

To connect an Odom echosounder using ethernet, please use the "OdomMK3" plugin.

OK Cancel

## Communication settings

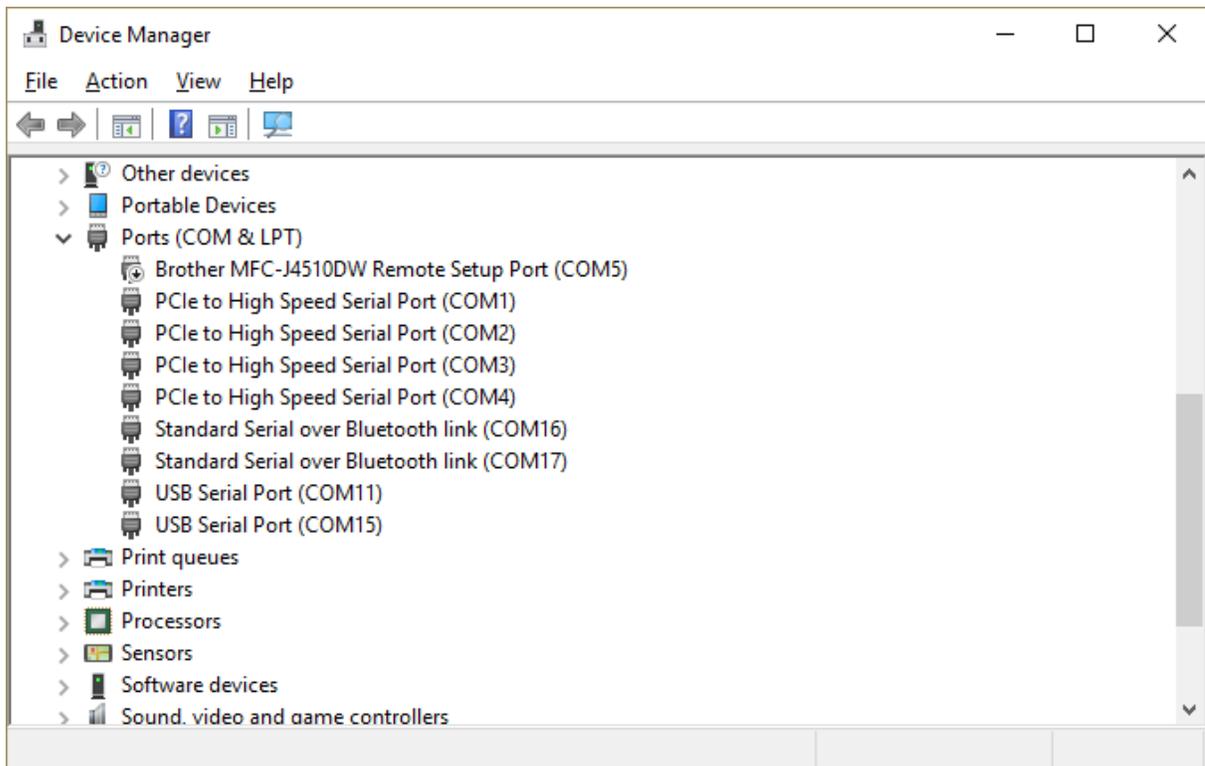
Since the echo sounder is most likely to be connected via a serial port, you have to select the serial port and its operating speed first.

When using an USB-to-Serial adapter cable, a virtual serial port will be created in Windows and you have to select this serial port.

The drop down box will be populated with all serial ports detected on the system.

To get more information on the ports available, please refer to the device manager.

The device manager can be found via the Control Panel in Windows.



### Selecting the protocol

Select the correct protocol depends on your sounder's configurations. In most cases the Echotrac DBT protocol will be used.

You can determine the protocol used by looking at the incoming data in the device monitor and compare it with the examples above.

### Starting the plugin

When the required settings have been configured, click the "OK" button to save the settings and start the plugin.

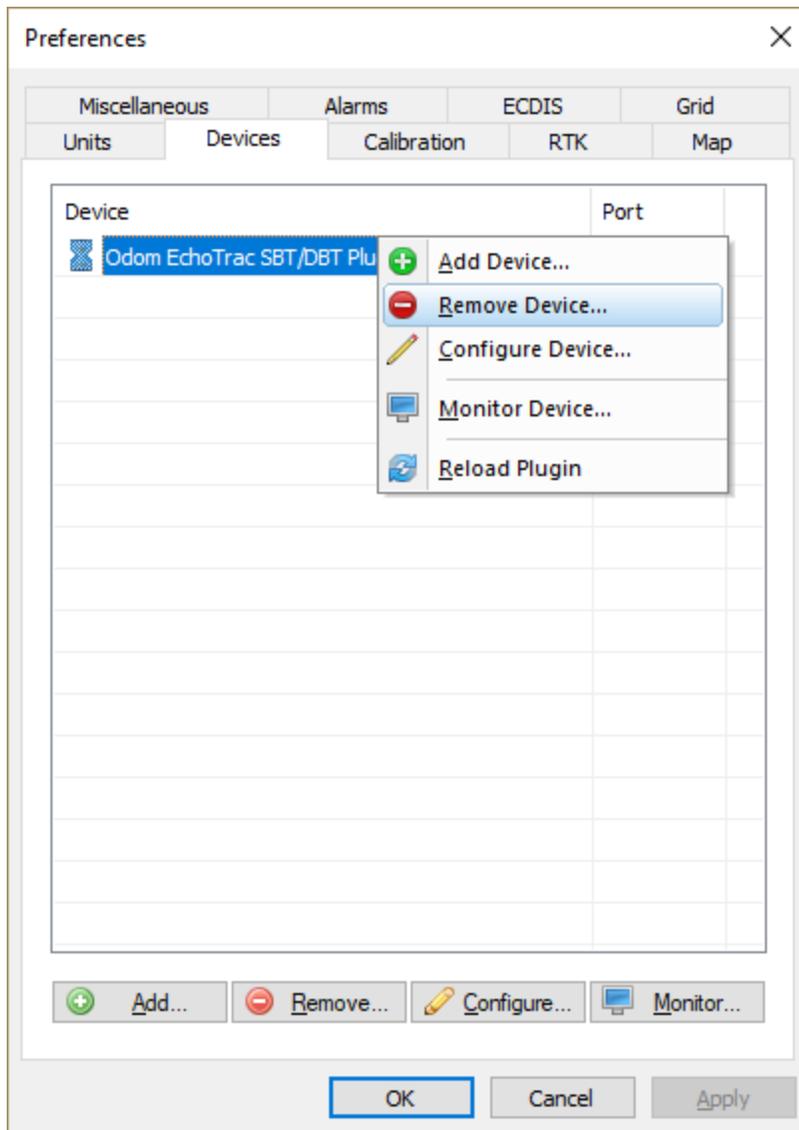
After a few seconds, there should be a green icon in front of the plugin, indicating data is coming in successfully.

### Testing the sounder

When data is received, you should be able to see the depth and position information in the [data window](#). To have a look at the echogram data, select "Echogram(Hi)" or "Echogram(Lo)" from the View menu.

### Unloading the Odom Echotrac plugin

To unload the Odom Echotrac plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next right-click the "Odom Echotrac SBT/DBT plugin for Hydromagic" plugin and select the "Remove Device..." option from the popup menu.



## 11.24 Odom Ethernet Plugin

The Odom Ethernet plugin is a plugin with graphical user interface designed to connect your Odom echo sounder using an Ethernet cable.

It will transfer position, depth, motion and full water column echogram data to the Hydromagic application.



The Odom Ethernet plugin supports the following Odom echo sounders:

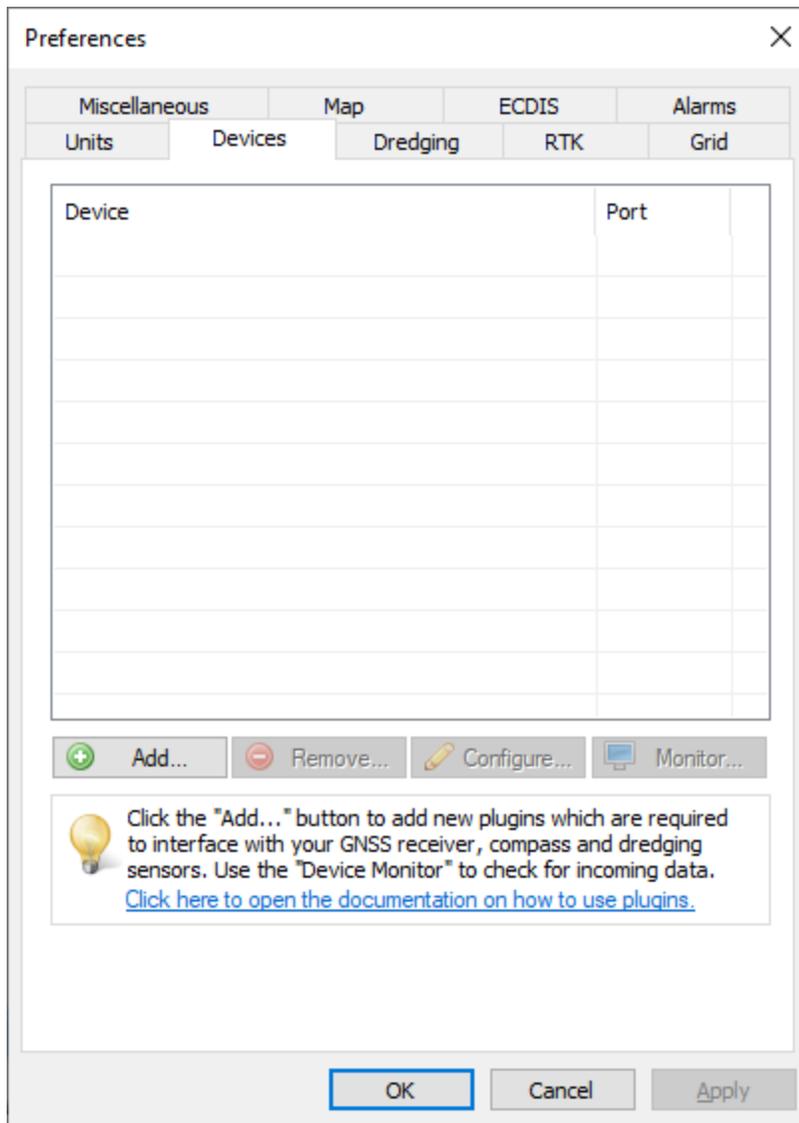
- Odom Echotrac MK3;
- Odom Echotrac CV100;
- Odom Echotrac CV200;
- Odom Echotrac CV300;
- Odom Echotrac CVM;
- Odom Echotrac E20;
- Odom Hydrotrac II;

When your echo sounder connects to your computer via a serial (RS232) cable, you should use the "Odom Echotrac SBT/DBT plugin" instead.

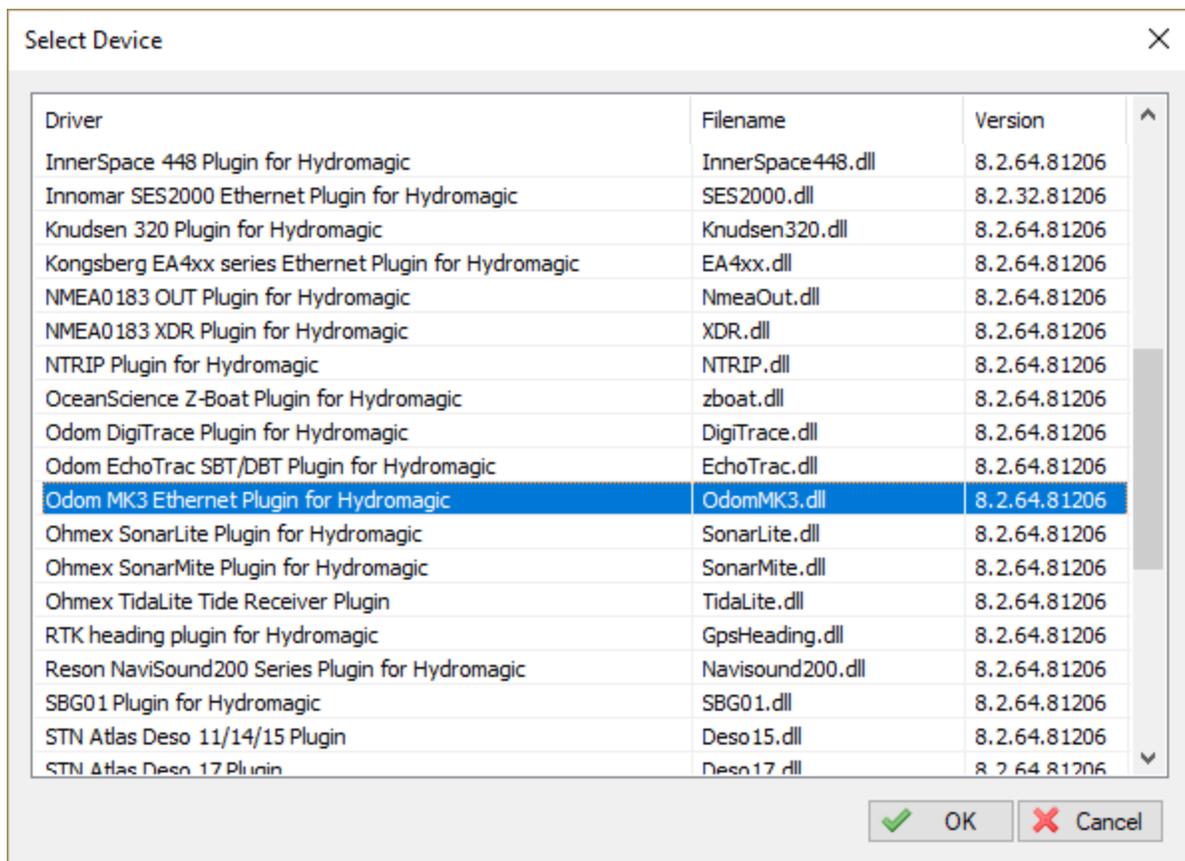
This plugin can only be used when the sounder is connected to the computer via Ethernet.

### Loading the Odom Ethernet plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.



A list of available plugins will be displayed. In this list, select the "Odom MK3 Ethernet plugin for Hydromagic" and click "OK" to load and display the plugins user interface.

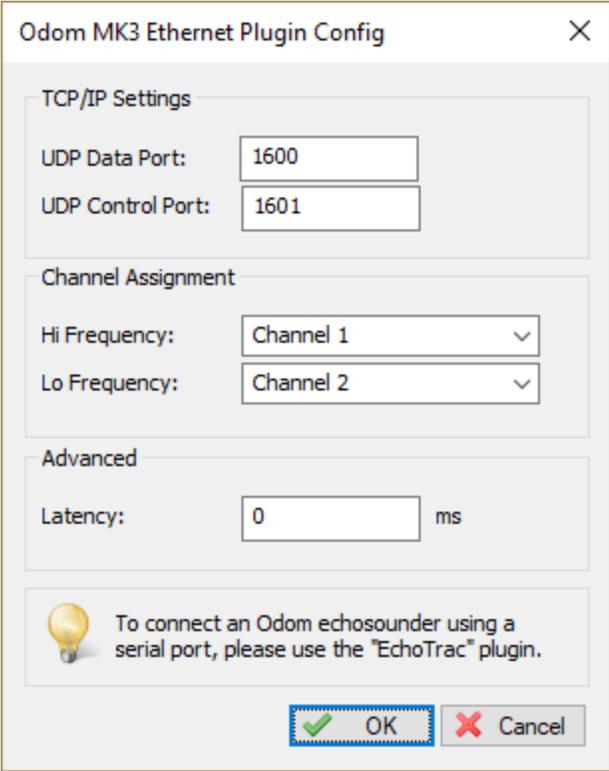


## Configuring the Odom Ethernet plugin

When the plugin loads, a dialog with some required settings will appear first. You have to set network (UDP) ports to use for the transfer of navigation and acoustic data packets.

In most cases, you can use the defaults. With factory settings, UDP port 1600 is used to output data like depth, position and motion.

UDP port 1601 is used to control the device. In Hydromagic the control port is only used to send annotation data.



Odom MK3 Ethernet Plugin Config

TCP/IP Settings

UDP Data Port: 1600

UDP Control Port: 1601

Channel Assignment

Hi Frequency: Channel 1

Lo Frequency: Channel 2

Advanced

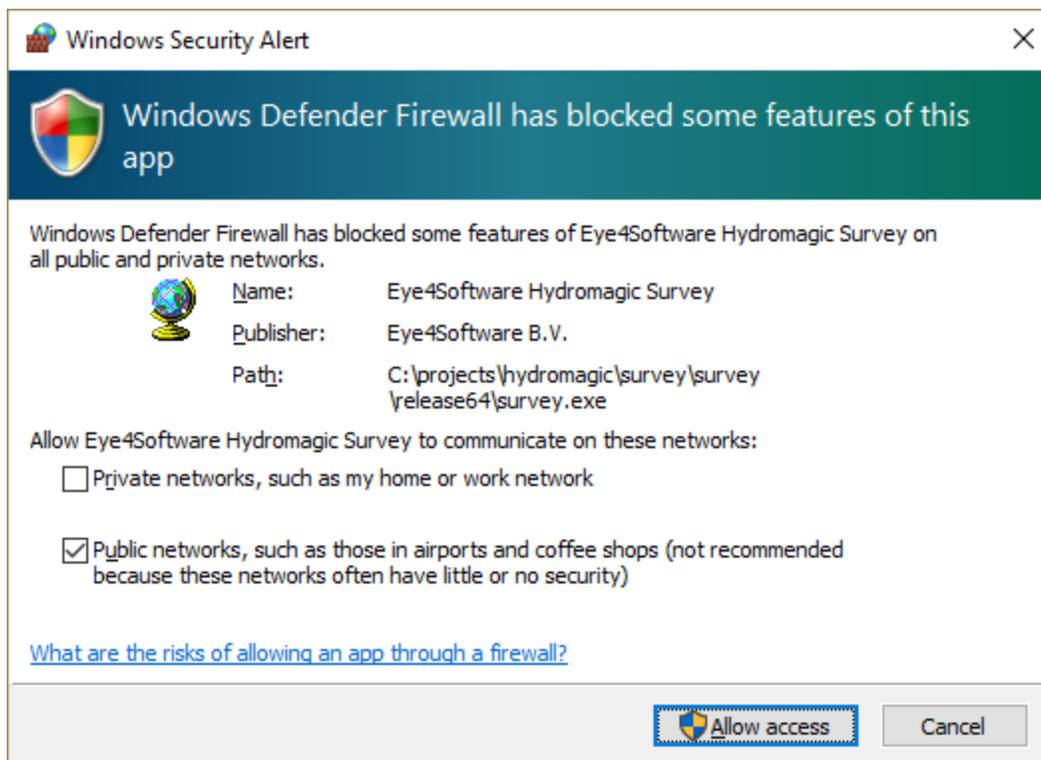
Latency: 0 ms

To connect an Odom echosounder using a serial port, please use the "EchoTrac" plugin.

OK Cancel

### Starting the plugin

When the ports have been configured, click the "OK" button to save the settings and start the plugin. In case the Windows Firewall has been enabled on your computer, you will see the following popup window appear:



Make sure you click the "Allow Access" button to allow Hydromagic to send and receive data on the configured UDP ports.

When you click the "Cancel" button, access to the sounder will be blocked and you won't receive any data from the sounder !

When the laptop is not connected to the Internet and is only used to communicate with the echo sounder, you can decide to shut down the Windows Firewall entirely. It is also recommended to try this in case of connection issues.

After allowing the connection, there should be a green icon in front of the plugin, indicating data is coming in successfully.

### Testing the sounder

When data is received, you should be able to see the depth and position information in the [data window](#). To have a look at the echogram data, select "Echogram(Hi)" or "Echogram(Lo)" from the View menu.

## 11.25 Unabara Hydro-2F Plugin

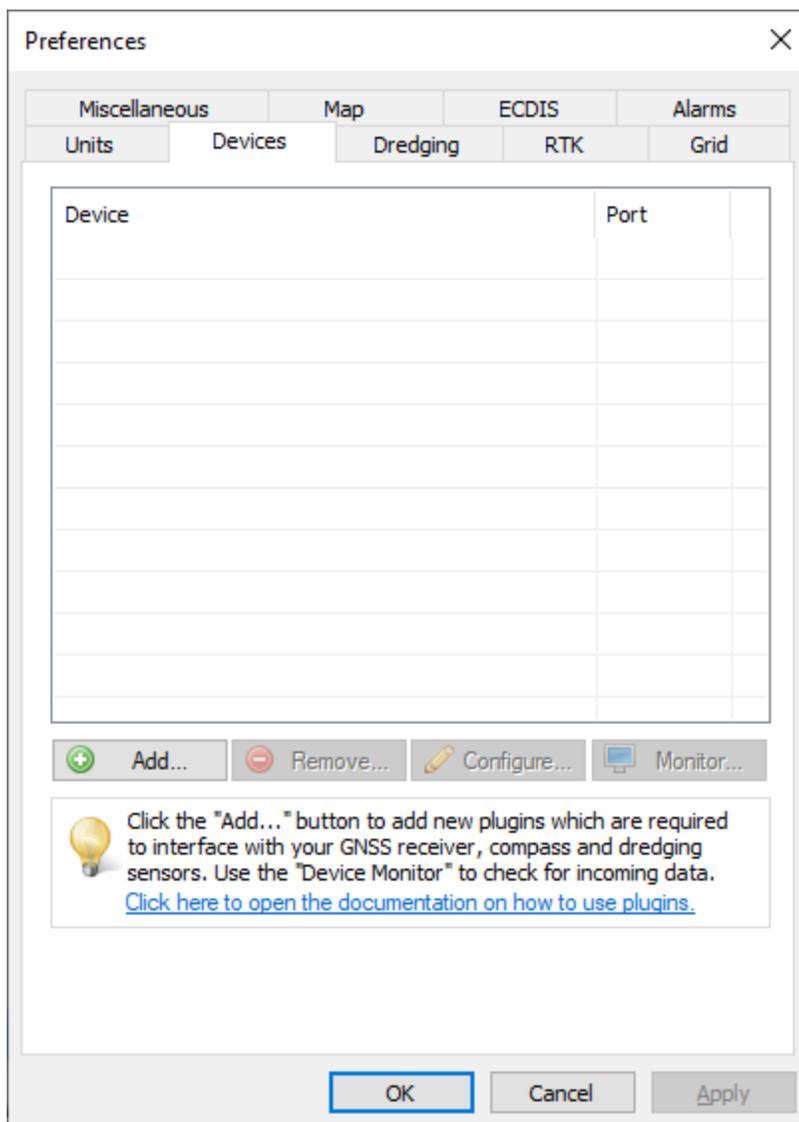
The Unabara Hydro-2F plugin is a which reads out dual frequency and bottom parameters and sends this information as raw data to Hydromagic. The plugin is able to read and store the following data from the echo sounder:

- Bottom depth (high frequency);
- Bottom depth (low frequency);
- Bottom loss (high frequency);
- Bottom loss (low frequency);
- Bottom reflection (high frequency);
- Bottom reflection (low frequency);
- Bottom density (high frequency);
- Bottom density (low frequency);
- Bottom porosity (high frequency);
- Bottom porosity (low frequency);

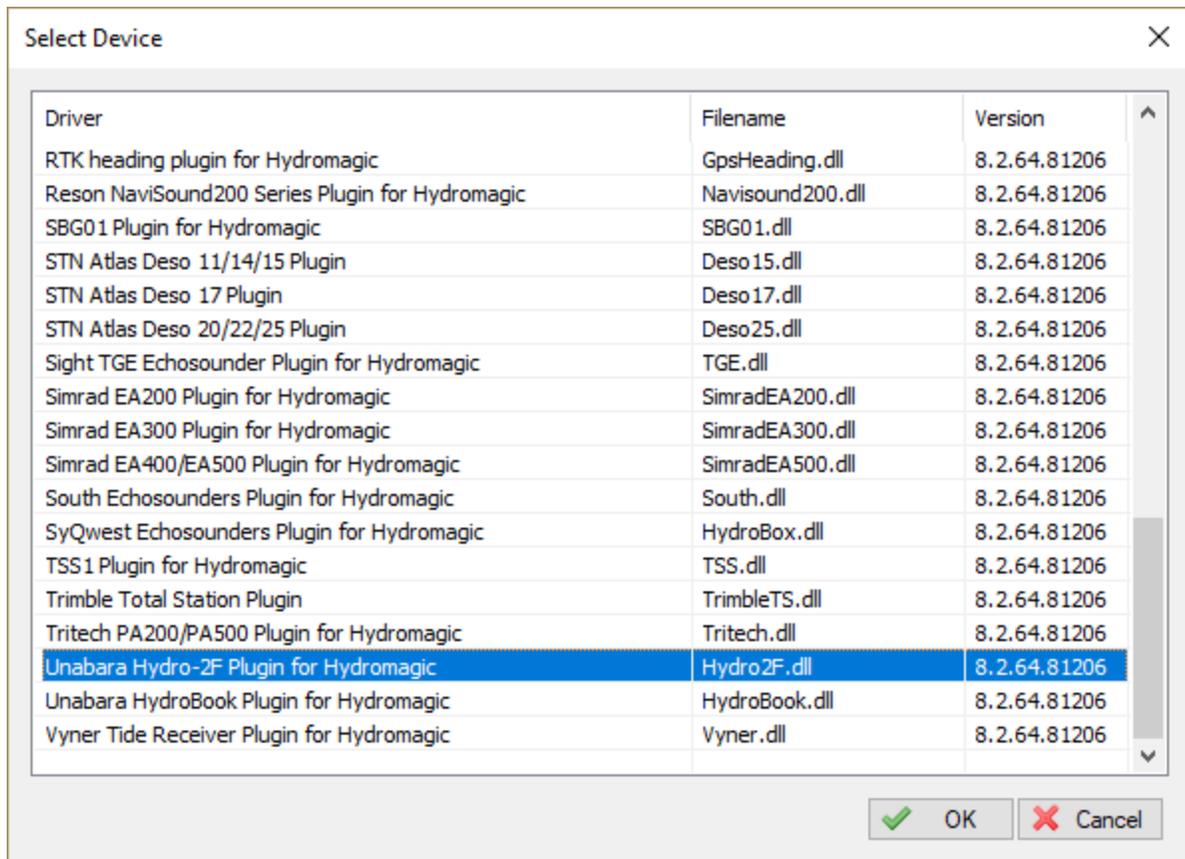
All the above parameters can be stored and processed in the Hydromagic software.

### Loading the Unabara Hydro-2F plugin

To load this plugin, open the preferences window by selecting "Preferences..." from the "Options" menu. In the window that appears, select the "Devices" tab. Next click the "Add..." button.

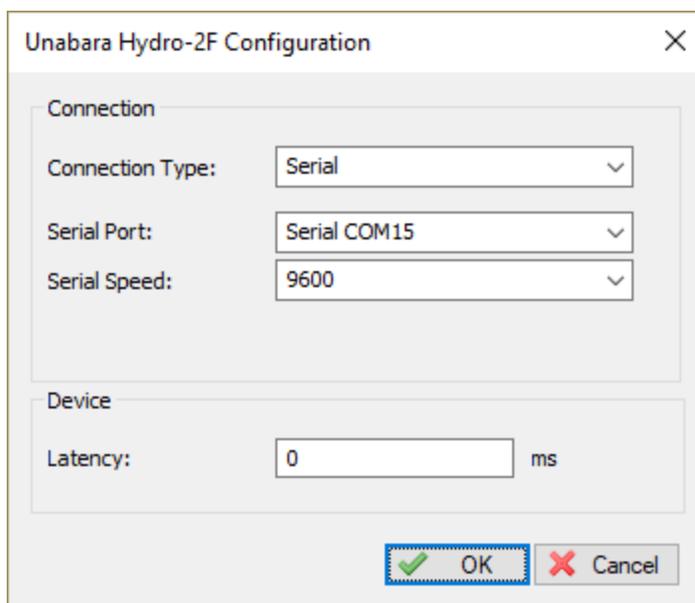


A list of available plugins will be displayed. In this list, select the "Unabara Hydro-2F Plugin for Hydromagic" and click "OK" to load and display the plugin's user interface.



### Configuring the Unabara Hydro-2F plugin

When the plugin loads, a dialog with some required settings will appear first. You have to set the communications options and the latency to include in the time calculations (optional).



## Communications settings

When using the default configuration, the echo sounder connects with the computer using an USB-to-Serial adapter cable. When plugged in, a virtual serial port will be created in Windows and you have to select this serial port.

Also make sure you select the correct serial port speed for the device.

## Selecting the correct output format

In order to retrieve the bottom information from the Hydro-2F, make sure the proprietary Hydro-2F data format has been selected. This format can be selected in the Hydro-2F application which is shipped with the sounder.

When configured correctly, the data send over the serial port should look like this:  
(Tip: Use the build-in communications monitor in Hydromagic to check!)

```
UPC,F, , 10.1,20,10,1.23,87, 10.3,18,13,1.32,82, 56.8
UPC,F, , 10.1,20,10,1.23,87, 10.5,18,13,1.31,83, 57.4
UPC,F, , 10.0,20,10,1.23,87, 10.4,18,13,1.32,82, 55.4
UPC,F, , 10.1,20,10,1.24,87, 10.5,18,13,1.31,83, 56.3
UPC,F, , 10.1,20,10,1.24,87, 10.3,18,12,1.30,83, 57.0
UPC,F, , 10.0,20,10,1.24,87, 10.3,18,13,1.32,82, 55.4
```

*Example of Unabara Hydro-2F serial data output.*

In case you want to operate the sounder with either the DESO20 or Odom Echotrac output, you need to use either the "STN Atlas DESO 20/22/25" or "Odom Echotrac" plugin shipped with Hydromagic.

## Testing the sounder

When the sounder has been connected and configured, click "OK" to store the settings and start the plugin. There should be a green icon in front of the plugin name when data is coming in successfully.

When data is received, you should be able to see the depth and motion sensor information in the data window. To have a look at the echogram data, select "Echogram(Sub)" from the view menu.

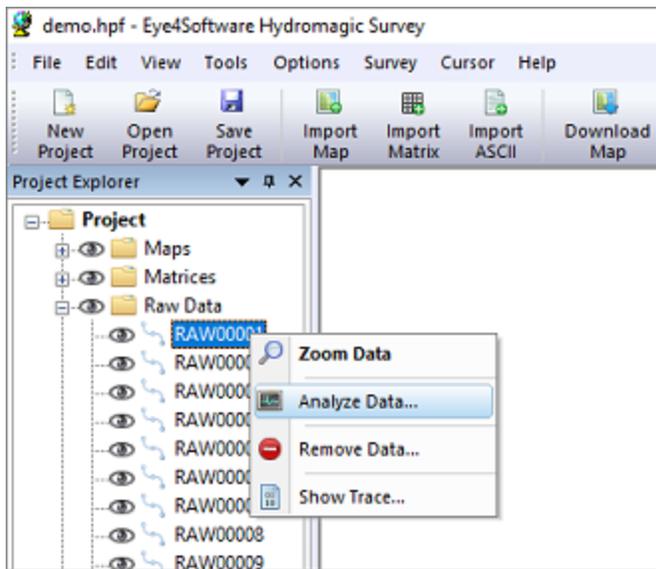
## Displaying bottom parameters

Besides dual frequency depth data, this echo sounder is also capable of collecting bottom information. Hydromagic contains a set of features to process this data.

To check whether this bottom information is coming in, create a new project and record some data with this echo sounder. How to setup a project and start recording data is discussed in this manual page.

After recording incoming data for a couple of seconds, bottom information already should have been stored in the active raw data file. The currently active raw data file name is displayed in the lower-right corner of the software.

To view the data, locate the active raw data file name in the "Project Explorer", and right click on it to open the context menu.



**Right click a raw data file to analyze its data.**

In the context menu that appears, select the "Analyze Data..." option. Click the "Next Data" button once to advance to the next page of data where the bottom information is displayed:

Analyze raw data file

Time	HFBL	LFBL	rHF	rLF	dHF	dLF	pHF	pLF
4:37:25.129 PM	24	22	7	8	1.11	1.16	93	91
4:37:25.370 PM	24	22	7	8	1.12	1.16	93	91
4:37:25.630 PM	24	22	6	8	1.11	1.16	93	91
4:37:25.900 PM	24	22	6	8	1.11	1.16	93	90
4:37:26.140 PM	24	22	6	8	1.10	1.16	94	90
4:37:26.426 PM	24	22	6	8	1.10	1.16	94	90
4:37:26.676 PM	24	22	6	8	1.11	1.16	93	91
4:37:26.959 PM	24	22	6	8	1.11	1.16	93	91
4:37:27.189 PM	24	22	6	8	1.11	1.16	93	91
4:37:27.459 PM	24	22	6	8	1.11	1.16	93	90
4:37:27.719 PM	24	22	6	8	1.11	1.16	93	90
4:37:27.970 PM	24	22	6	8	1.11	1.16	93	90
4:37:28.250 PM	24	22	6	8	1.11	1.17	93	90
4:37:28.500 PM	24	22	6	8	1.11	1.17	93	90
4:37:28.770 PM	24	22	6	8	1.11	1.17	93	90
4:37:29.032 PM	24	22	6	8	1.11	1.17	93	90
4:37:29.302 PM	24	22	6	8	1.11	1.17	93	90
4:37:29.554 PM	24	21	6	8	1.11	1.18	93	90
4:37:29.814 PM	24	21	6	9	1.11	1.18	93	90
4:37:30.069 PM	24	22	6	8	1.11	1.17	93	90

Reload   Prev Data   Next Data   Saturday, December 30, 2017   RAW00005   BOTTOM

**Example of bottom information collected with the Unabara Hydro-2F.**

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