Spatium-Tempus

NavView User Guide

4D Nav, LLC

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Revision Record

Rev	Date	Comment
1.0	Aug 5, 2014	Initial draft
1.1	Oct 25, 2014	Updates to Calculations section to reflect software developments
2.0	Jan 20, 2016	Updated to reflect continued software development
3.0	Oct 19, 2018	Updated to reflect software as of October 2018
4.0	Dec 3, 2021	Updated to be current with NavView v3.4.1

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1 Introduction

This section provides an overview of the basics for the NavView software from typical installation to navigating the program.

NavView is a comprehensive positioning and navigation software package for offshore construction. The base package can be augmented by modules to extend its application to specialized operations from rig moves complete with anchor handling tug support to real time anchor catenary modelling.

NavView can operate as a standalone system with a single NavView running on a vessel providing positioning and navigation for that vessel and if present, its other vehicles such as ROVs and subsea assets.

Alternatively, it can be operated as part of a network where multiple NavView clients run as standalone positioning and navigation and/or remote monitoring systems. Communications between these are handled by NavView Network Services via LAN, WAN and the Internet. Each NavView client updates the data under its control, e.g., vehicle configuration and positions, and receives data provided by other clients for display and monitoring. Configurations are stored in a database and accessed by connected clients. Transient real-time data such as vehicle positions are published to connected subscribers.

NavView can be installed with Roles and Privileges enabled. This provides the level of operator interface depending on role assigned. Roles options are as follows:

Username	Password
Not Logged In	N/A
User	user
Online	online
Supervisor	supervisor
Admin (Administrator)	admin

1.1 Software

NavView runs on IBM PC compatible computers and supports the following operating systems:

- Windows 7 Professional w/ SP1 64 bit
- Windows 10 Professional 32* and 64 bit

* If installed on a 32 bit OS, the AutoCAD RealDWG 2020 is not supported and therefore NavView will not display CAD files.

The NavView installation includes and installs the following required supporting software:

- Microsoft .NET Framework 4.7.2
- Microsoft C++ Redistributables 2017
- Autodesk RealDWG
  - o Supports access of DWG files for display of graphic backgrounds, vehicle outlines, etc.
- Microsoft SQL Server Compact Edition
  - o Supports EPSG geodetic database (see Geodesy Section for details)

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Page 1
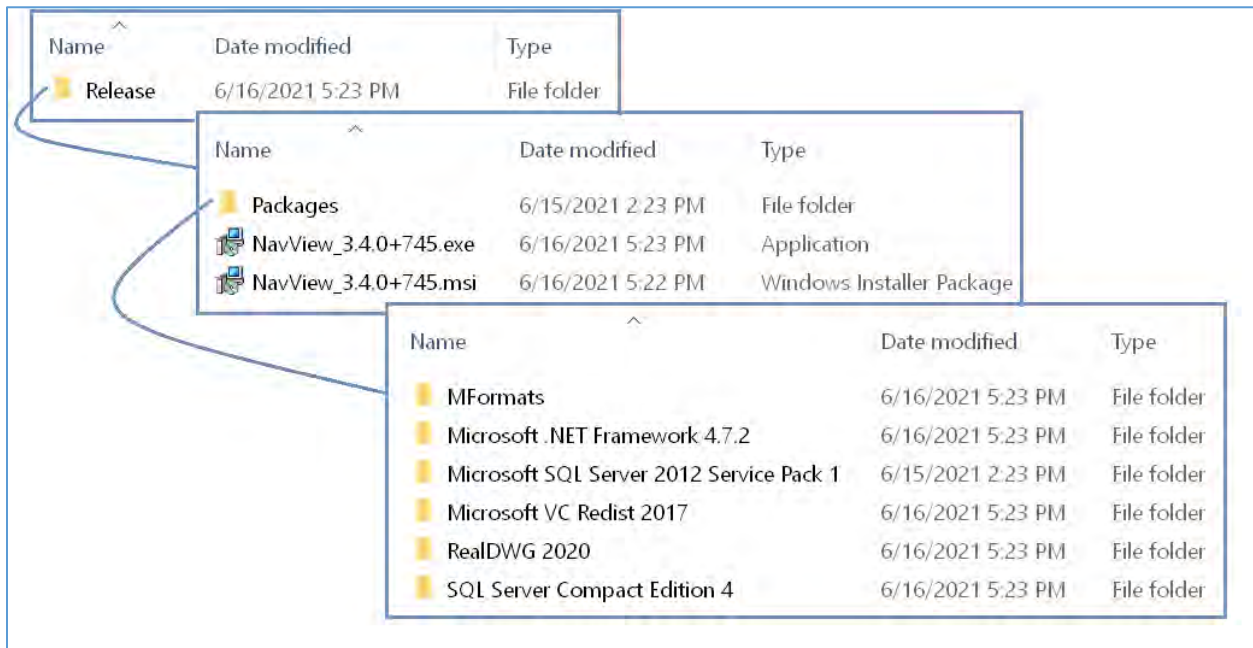
- Microsoft SQL Server Express LocalDB
  - Supports digital terrain model
  - Supports the data logging
- Microsoft SQL CLR Types

The following software is optional and not included in the installation:

- MongoDB
  - Supports NavView network services (configurations, files, etc.)
  - Required if NavView remote clients are to be used
- Redis
  - Supports NavView network services (transient data)
  - Required if NavView remote clients are to be used
- Microsoft SQL Server Management Studio (SSMS)
  - Supports management of both SQL Server Express and localdb databases
- Microsoft SQL Server Express
  - Required if Supports sharing of a single SQL Server instance by multiple distributed NavView clients
  - Required for Remote NavView database operations

1.1.1 NavView Installation Package

The NavView installation package consists of an installer and supporting 3rd party software. The folder structure and contents of the installation package are shown below. The NavView version is given in the application and installer file names. In this example, the version is NavView v3.3.0+745.

1.1.2 Installing/Updating NavView

The steps to follow to install NavView are given here.

Note: When installing NavView, if presented with a message stating that Windows protected your PC (see below), click on **More Info** and select **Run Anyway.**

Note: Going from Nav View v3.3 to 3.4 is considered a minor upgrade. Going from v3 to v4 is considered a major upgrade.
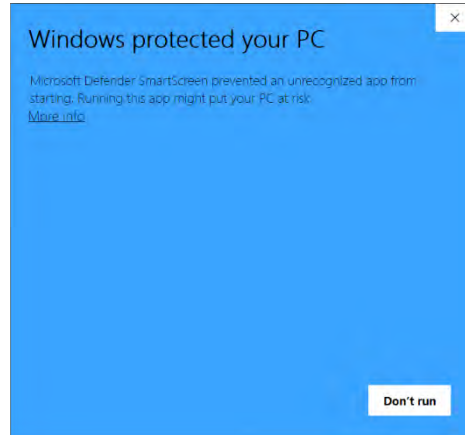
1. Launch File Explorer
2. Copy the Release folder to the computer NavView is to be installed on
3. If applying a minor upgrade NavView, e.g., 3.3 to 3.4
   a. Double click on the Microsoft Software Installer (msi), in this example NavView_3.4.0+745.msi
   b. Go to step 7
4. If installing NavView on a computer for the first time or if installing a major upgrade, e.g., from version 3.3 to 4.0
   a. Go to step 5
5. Double click on the Application, in this example NavView_3.4.0+745.exe to launch the installer
6. The first page of the install wizard presents the **Terms and Conditions** under which the supporting software can be installed and used
   a. To continue with the installation
      i. Check the **I agree to the license terms and conditions** box
      ii. Click **Install**
      iii. When asked by Windows if you wish to allow the software to be installed click **Ok**; or
   b. To exit the installation, click **Close**

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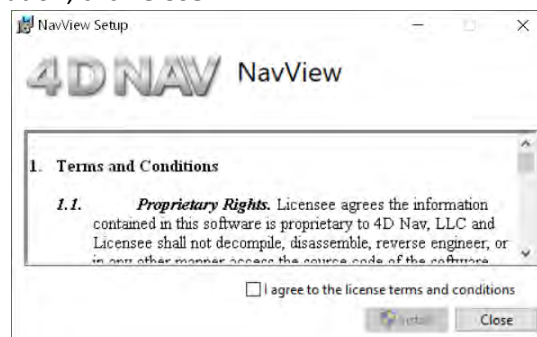
c. The installer will then install the 3rd party software included in the Packages folder displaying a progress bar as it proceeds, accept any defaults if presented with options

Note: The NavView installer will not overwrite newer versions of any of the 3rd party software if found on the computer.

7. The second page of the install wizard presents the **End-User License Agreement** under which the NavView software can be installed and used
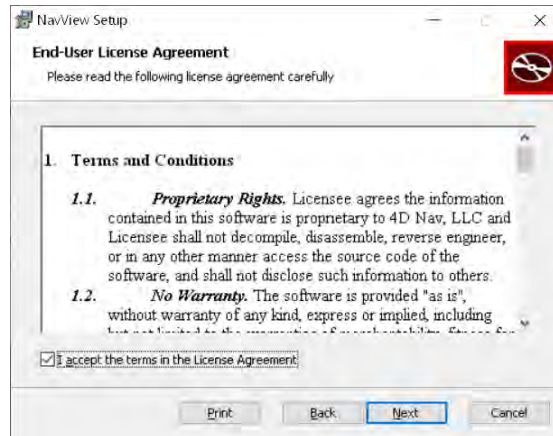
a. To continue with the installation
     i. Check the **I accept the terms in the License Agreement** box
     ii. Click **Next**; or
b. To exit the installation, click **Cancel**

8. On the third page of the wizard (License Settings), if you are not installing NavView on a network and using the KEYLOK network dongle, click **Next** and go to step 9, otherwise
a. Check the **Use KEYLOK network server** box
b. Enter the IP address of the computer on the network that the dongle is plugged into
c. Leave the default Port at 4242
d. Click **Next**
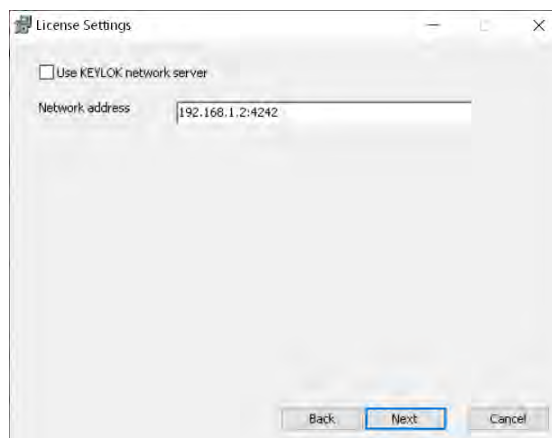
9. At the **Ready to install NavView** page, click **Install** to launch the *msi* to install NavView, **Back** to return to check your previous wizard settings or **Cancel** to exit the installation

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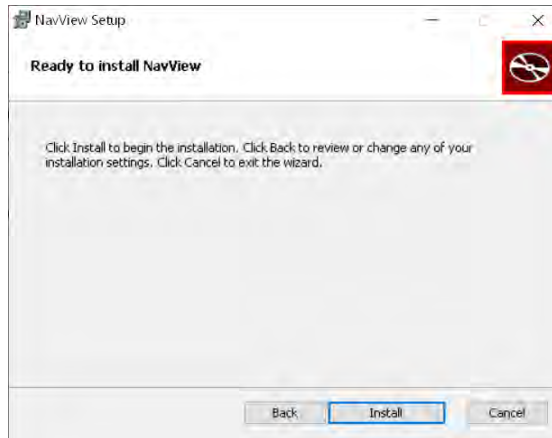
10. Once the NavView installation has completed, you can either launch NavView upon closing the wizard by checking the **Launch NavView** box and then clicking **Finish**, or just click **Finish** to exit the installer
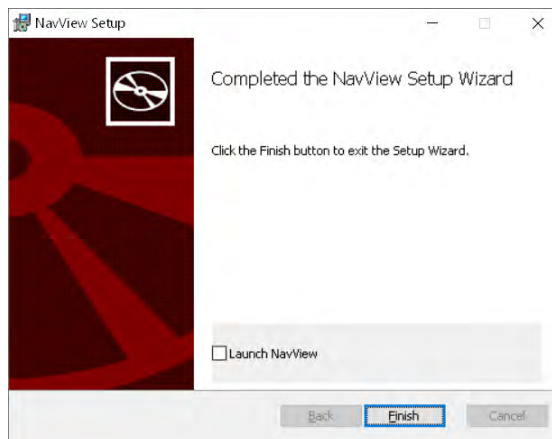
11. Once the installation has completed, just click **Close** on the last page of the wizard
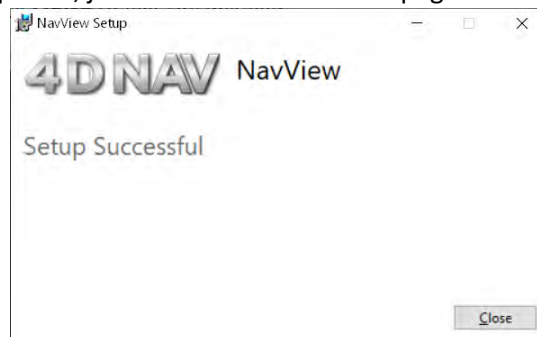
12. If at any time during the installation, you are presented with a page that reports the failure of the installation
    a. Click on the hypertext link in the page to open the installation log file
    b. Save this log file and send it to 4D Nav at support@4dnav.com

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1.1.3 Optional Software: SQL Server Express and SQL Server Management Studio

If SQL Server Express is required, it and SQL Server Management Studio (SSMS) must both be installed. These can be downloaded directly from the Microsoft website. Alternatively, contact 4D Nav for an installation package.

Note: If NavView is to be used for data logging using the SQL localDB that is installed as part of the NavView installation, it is recommended SSMS be installed to facilitate database management.

Note: SQL Express and SQL Server Management Studio are only to be installed on the computer being used as the *server* for the NavView network.

1.1.3.1 Installing SQL Server Express

When installing SQL Server Express, please note the following settings:

1. Feature Selection: Only **Database Engine Services** is required
   a. Click **Unselect All**
   b. Check the **Database Engine Services** box
2. Server Configuration:
   a. SQL Server Database Engine: Default Startup Type is Automatic, leave at default
   b. SQL Server Browser: Default Startup Type is **NOT** Automatic, change it to Automatic
3. Database Engine Configuration:
   a. Server Configuration tab: Leave at default Windows Authentication
   b. Data Directories tab: Default for all folders is C:\Program Files\Microsoft SQL Server and folders in this folder, these can be changed to direct database files to be logged to a different folder but unless familiar with SQL Server it is recommended to leave default settings

1.1.3.2 Configuring SQL Server Express

The following details the configuration of SQL Server and SSMS regardless of the source of the installation.

1. Create the SQL Express *admin* user
   a. Launch SQL Server Management Studio
      i. Click on the Windows Start icon and type SSMS
      ii. Click on SQL Server Management Studio when it is listed

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b. Initial connection to SQL Server
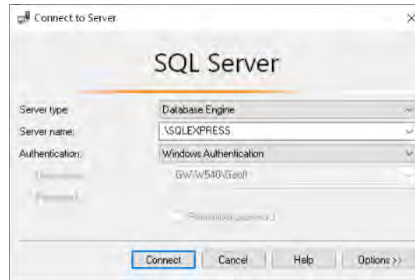
i. Server Type: Should default to those just installed, if not select Database Engine
ii. Server name: Should default to those just installed, if not select/enter PCname\SQLEXPRESS
iii. Authentication: Leave at default Windows Authentication
iv. Click **Connect**
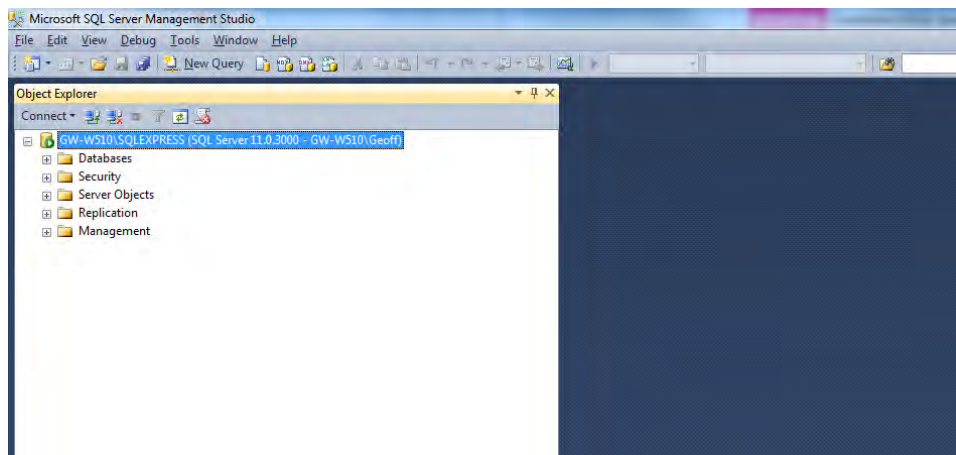
1. In the Object Explorer, right mouse click on the server (top of tree) and select Properties
    1. In Select a page, select Security

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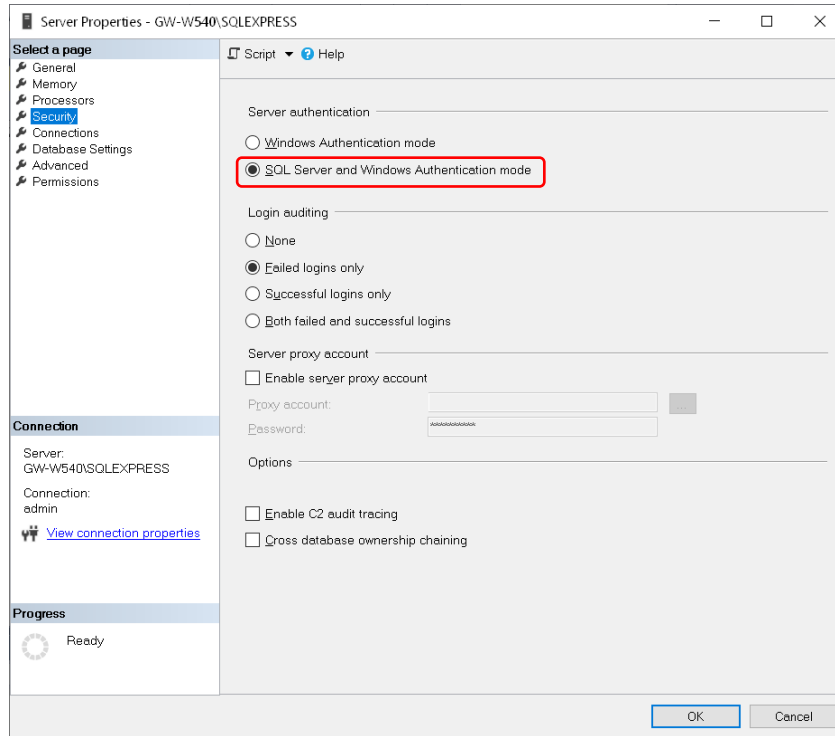
a. In Server Authentication, select SQL Server and Windows Authentication mode

2. In Select a page, select Connections
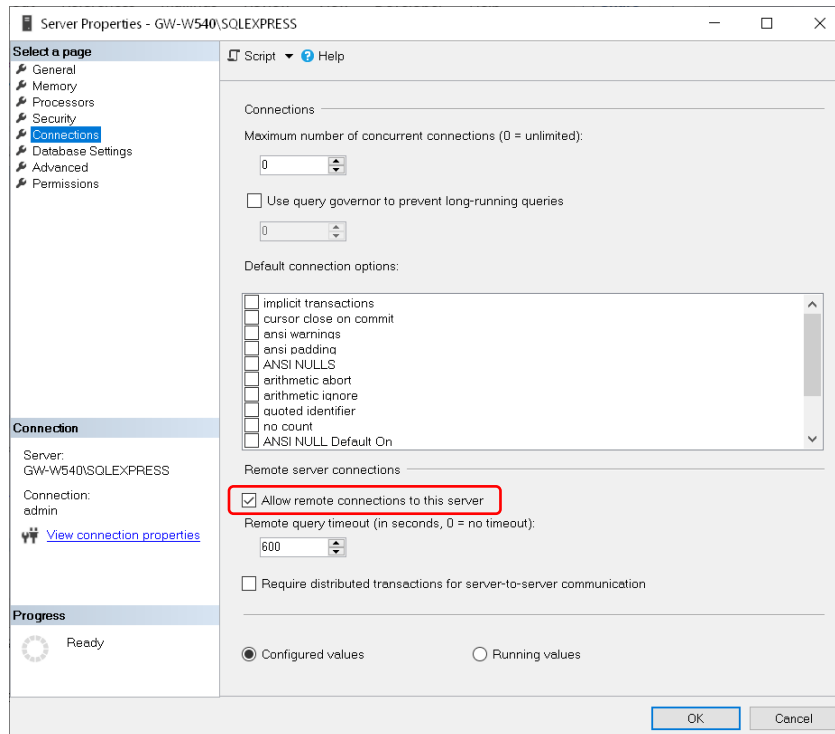
a. Confirm **Allow remote connections to the server** is checked

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3. Click **OK**

2. In the Object Explorer, right mouse click on Security, select New then Login…
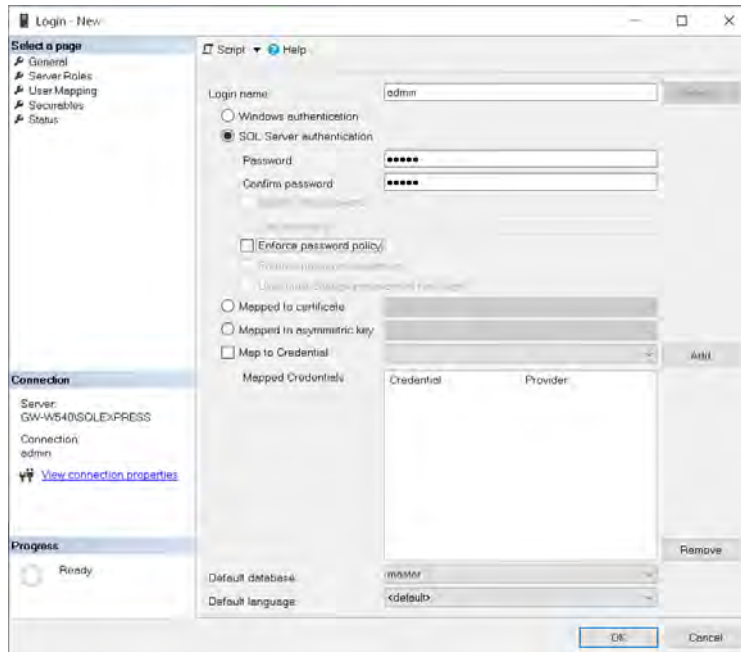
4. In Select page, select General (default)

    1. Login name: Enter *admin*

    2. SQL Server authentication: Select this option

    3. Password *admin*

    4. Confirm password: admin

    5. Enforce password policy: Uncheck

5. In Select page, select Server Roles

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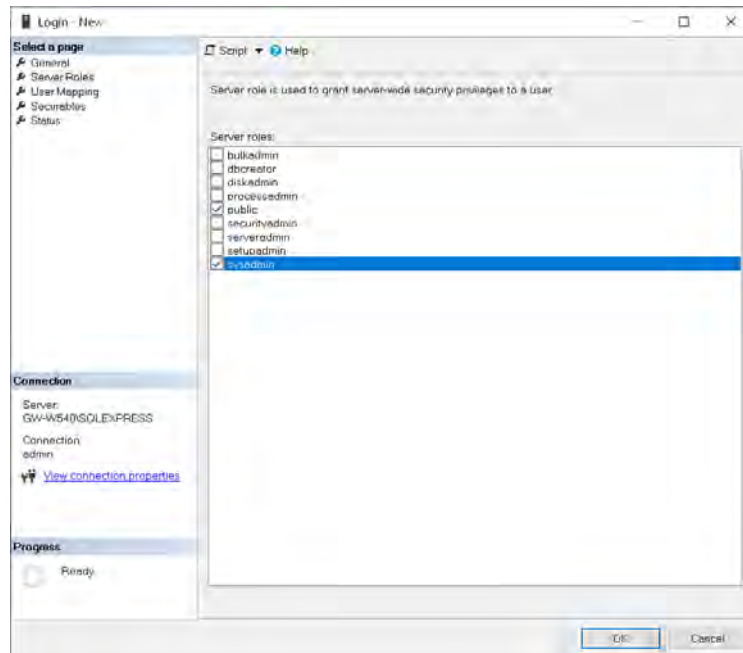
6. Public: Confirm this is checked

7. Sysadmin: Check

6. Click **OK**

3. Exit SQL Server Management Studio

2. Confirm settings

a. Reboot PC

b. Launch SQL Server Management Studio
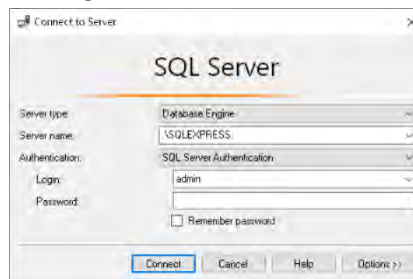
c. Server Type: Should default to those just installed, if not select Database Engine

d. Server name: Should default to those just installed, if not select/enter PCname\SQLEXPRESS

e. Authentication: Select SQL Server Authentication

f. Login: admin

g. Password: admin

h. Click **Connect**

i. Confirm SQL Server Management Studio connects to the SQL Server database instance

3. Configure SQL Express for remote access

a. Configure SQL Server to listen on a static port

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  i. Click on the Windows icon and type in Computer Management and click on the app when it appears

  ii. Expand Services and Applications > SQL Server Configuration Manager > SQL Server Network Configuration and select Protocols for SQLEXPRESS
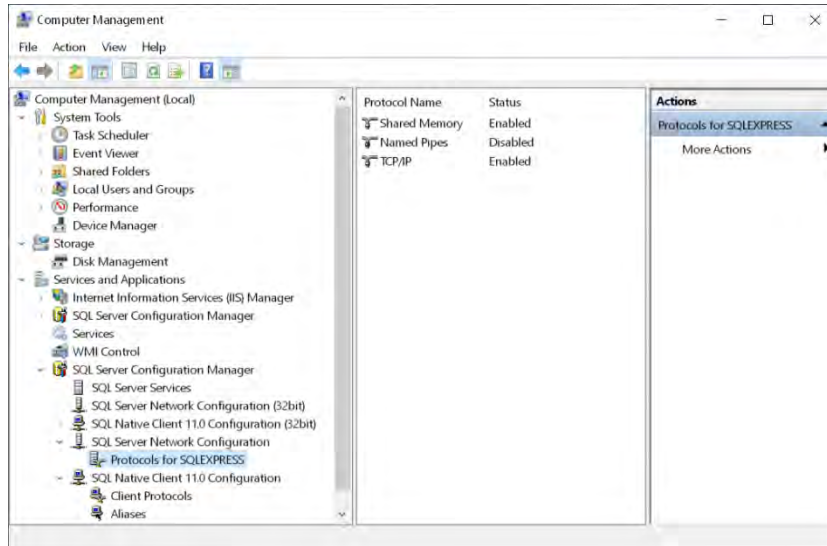
  iii. Double click on TCP/IP to open the TCP/IP Properties dialog
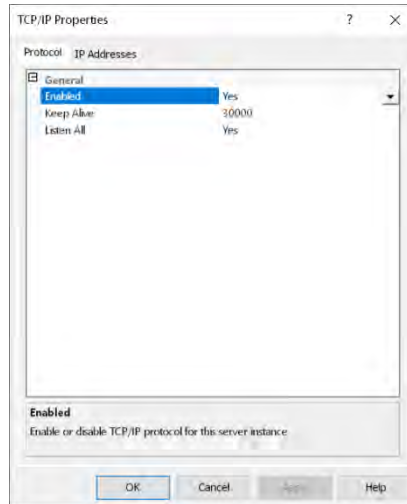
   1. In the Protocol tab

    a. Enabled: From the drop down list to select Yes

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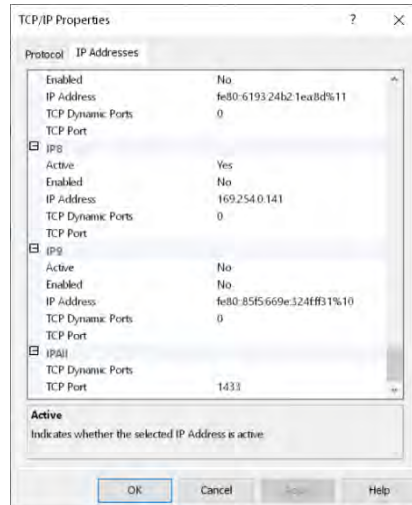
2. In the IP Address tab, scroll to the bottom to IPAll
   a. TCP Dynamic Ports: Clear this entry, make sure it is blank
   b. TCP Port: 1433
3. Click OK

iv. Restart the service
   1. Expand Services and Applications > SQL Server Configuration Manager and select SQL Server Services
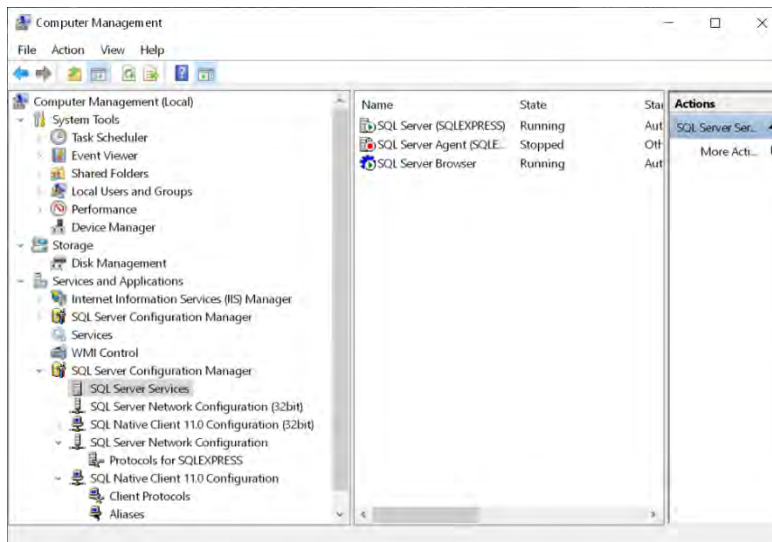
   2. Right mouse click on SQL Server (SQLEXPRESS) and click Restart
   3. Right mouse click on SQL Server Browser and click Restart

4. Configure Windows Firewall
   a. Access the Windows Defender Firewall with Advanced Security application
      i. Click on the Windows icon
      ii. Type in Windows Firewall and click on the Windows Defender Firewall with Advanced Security application when it appears

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iii. Click on Inbound Rules
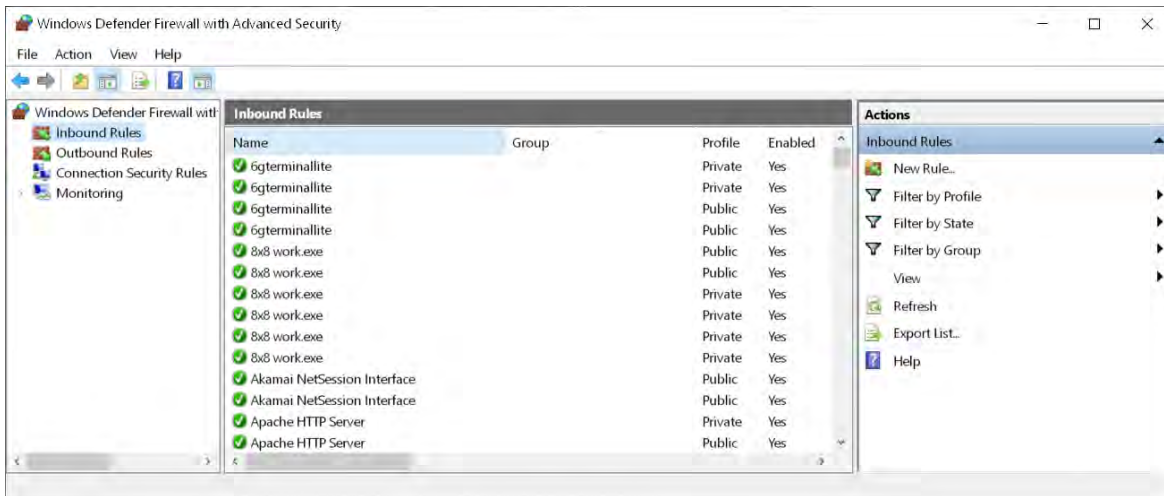
b. Add a Port exception for TCP Port 1433
   i. Click on New Rule to launch the New Inbound Rule Wizard
   ii. Rule Type Step: Select Port and click Next
   iii. Protocol and Ports Step: Select TCP and enter 1433 for Specific Local Ports, click Next
   iv. Action Step: Select Allow the connection, click Next
   v. Profile Step: Check all 3 boxes (Domain, Private and Public), click Next
   vi. Name Step: Enter a suitable name, e.g., "SQL - TCP Port 1433", click Finish

c. Add a Port exception for UDP Port 1434
   i. Click on New Rule to launch the New Inbound Rule Wizard
   ii. Rule Type Step: Select Port and click Next
   iii. Protocol and Ports Step: Select UDP and enter 1434 for Specific Local Ports, click Next
   iv. Action Step: Select Allow the connection, click Next
   v. Profile Step: Check all 3 boxes (Domain, Private and Public), click Next
   vi. Name Step: Enter a suitable name, e.g., "SQL - UDP Port 1434", click Finish

d. Add a Program exception for sqlserver.exe
   i. Click on New Rule to launch the New Inbound Rule Wizard
   ii. Rule Type Step: Select program and click Next
   iii. Program Step: Select This program path and click Browse
       1. Navigate to C:\Program Files\Microsoft SQL Server\MSSQLXX.SQLEXPRESS\MSSQL\Binn and select sqlserver.exe

Note: The highlighted XX in the SQL Server path represents the version and will vary between installations.

       2. Click Next
   iv. Action Step: Select Allow the connection, click Next

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v. Profile Step: Check all 3 boxes (Domain, Private and Public), click Next

vi. Name Step: Enter a suitable name, e.g., "SQL - sqlserver", click Finish

e. Add a Program exception for sqlbrowser.exe

i. Click on New Rule to launch the New Inbound Rule Wizard

ii. Rule Type Step: Select program and click Next

iii. Program Step: Select This program path and click Browse

1. Navigate to C:\Program Files (x86)\Microsoft SQL Server\90\Shared and select sqlbrowser.exe

2. Click Next

iv. Action Step: Select Allow the connection, click Next

v. Profile Step: Check all 3 boxes (Domain, Private and Public), click Next

vi. Name Step: Enter a suitable name, e.g., "SQL - sqlbrowser", click Finish

f. Confirm you have the following Inbound Rules added as shown below

Inbound Rules

Name	Group	Profile	Enabled	Action	Override	Program	Local Address	Remote Address	Protocol	Local Port
SQL - sqlservr.exe		All	Yes	Allow	No	%Progra...	Any	Any	Any	Any
SQL-sqlbrowser.exe		All	Yes	Allow	No	%Progra...	Any	Any	Any	Any
SQL-TCP 1433		All	Yes	Allow	No	Any	Any	Any	TCP	1433
SQL-UDP 1434		All	Yes	Allow	No	Any	Any	Any	UDP	1434

g. Close the Windows Defender Firewall with Advanced Security application

1.1.4 Optional Software: MongoDB and Redis

MongoDB and Redis are two separate software packages. When installed, they create services that are automatically started when Windows launches. These can be downloaded directly from the respective web sites. Alternatively, contact 4D Nav for an installation package.

Note: MongoDB and Redis are only to be installed on the computer being used as the *server* for the NavView network.

1.1.4.1 Installing and Configuring MongoDB

When installing MongoDB using the msi downloaded from the website, the following steps are to be followed to install it as required for NavView.

Note: Installation options may vary with newer versions of MongoDB. The following are intended as a guide. The key point is the need to configure the binding IP to enable any PC to connect to the service.

1. Execute the respective msi
2. Use the default options during installation, resulting in
   a. The service automatically starts with Windows
   b. Uses default port 27017
   c. Adds the appropriate firewall rules
3. Using File Explorer, navigate to C:\Program Files\MongoDB\Server\n.n\bin (n.n is the respective version of MongoDB, if 4.0.10 has been installed this will be 4.0)

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4. Open the mongod.cfg file using an editor that will allow you to save it in a Program Files folder after making changes
5. Locate and edit the "bindIp" setting as follows
    a. bindIp: 0.0.0.0
6. Save the mongod,cfg file
7. Restart the mongodb service

1.1.4.2 Installing and Configuring Redis

When installing Redis using the msi downloaded from the website, the following steps are to be followed to install it as a service that automatically starts with Windows.

Note: Installation options may vary with newer versions of Redis. The following are intended as a guide. The key point is the need to configure the binding IP to enable any PC to connect to the service.

1. Execute the respective msi
2. Use the default options during installation, resulting in
    a. The service automatically starts with Windows
    b. Uses default port 6379
3. Using File Explorer, navigate to C:\Program Files\Redis
4. Open the redis.windows-service.conf file using an editor that will allow you to save it in a Program Files folder after making changes
5. Locate and edit the "bind" and "protection mode" settings as follows
    a. bind 0.0.0.0
    b. protected-mode no
6. Save the redis.windows-service.conf file
7. Restart the Redis service

1.2 Software Upgrades

1.2.1 NavView

To upgrade NavView, simple execute the Microsoft Software Installer (NavView_x.x.x+YYY.msi), either directly from Windows Explorer or the Run command line. It is important to note that updating a system, the update be applied to all computers on a network.

1.2.2 Device Drivers

Updates for existing devices and new devices are provided in the form of a DLL. To implement, stop NavView if it is running, copy the DLL into the *Program Files (x86)\4D Nav\NavView\Devices* folder, replacing the existing DLL in the case of an upgrade, and then re-launch NavView.

1.2.3 RealDWG

RealDWG upgrades are considered a major upgrade to NavView, therefore will be updated when the NavView_x.x.x+YYY.exe is run.

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1.2.4 Microsoft Software

This includes the .NET Framework, Microsoft C++ Redistributable, SQL Server Compact, SQL Server LocalDB, SQL CLR Types and if installed, SQL Server Express. It is recommended that once installed, these be kept up to date using the Windows Update option.

1.3 License Security

NavView is secured with KEYLOK USB dongles or Cloud Controlled Network Floating Licenses. The licensing supports the following security features:

- Standalone and network applications
- Module control
- Reprogrammable in the field

NavView can be run without a license for the following purposes:

- NavView remote client to monitor and view operations
- Setup and test device input
- Project preparation (database setup, vehicle configurations, etc.)
- Extract setting from previous project configurations
- Simulation for training and familiarization

Licenses are programmable to enable the inclusion of specific application modules and are necessary to enable the flow of observation data from devices.

If NavView has detected a license, it will display **License Valid** in the window title. If a license is not detected, it will display **Unlicensed** in the title bar.

It is important to note that without a license any data received from a device, beyond being decoded and displayed in the respective device status window, is not available for use in anyway. This includes the replaying of raw sensor data.

If Roles and Privileges are enabled in NavView, the user must log in as an administrator in order to make any changes to the licensing settings.

1.3.1 USB Dongle

To use the KEYLOK USB dongle

1. Plug the dongle into an available USB port
2. Launch NavView and log in as Administrator
3. From the Home ribbon, click on **License** in **General** group

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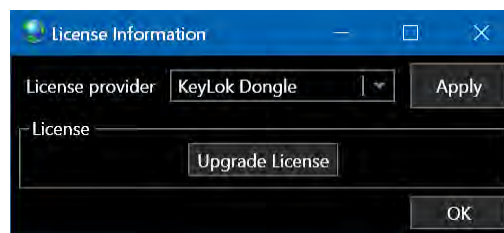
4. Confirm the License provider selected is KeyLok Dongle and if not
   a. Select KeyLok Dongle in the License provider dropdown
   b. Click Apply
5. Click OK to close dialog

1.3.1.1 Updating a Dongle

If a change to the licensing controlled by a dongle is required, the user will be provided with a unique onetime use update AUTHORIZE.DAT file. To apply this, follow these steps:

1. Ensure the dongle to be updated is plugged into the PC
2. Copy the AUTHORIZE.DAT file to this PC, location is not critical
3. Launch NavView and log in as Administrator
4. From the Home ribbon, click on **License** in **General** group
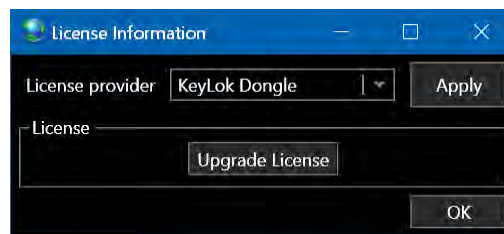
5. Confirm the License provider selected is KeyLok Dongle
6. Click Upgrade License
7. When asked if you want to reprogram the dongle, click Yes to continue or No to abort
8. Navigate to the location the AUTHORIZE.DAT file was copied to and select it and click Open
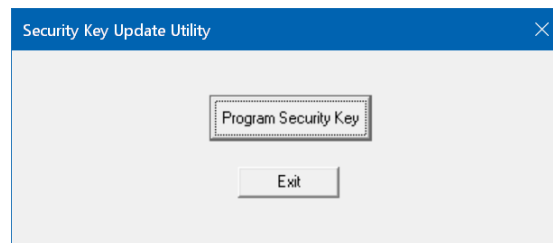
9. From the Security Key Update Utility view, click **Program Security Key** to continue with the reprogramming of the dongle, Exit to abort
10. A window will pop up showing the serial number of the dongle detected, confirm it is the correct dongle, then click **OK** (note that this view only displays for a short period and if you do not click OK before it closes you will need to start the update process over)
11. If successful, the UPDATE COMPLETE window will appear, click OK to complete the process (this window will also only appear for a short period, if you do not click OK it will close anyway but the reprogramming of the dongle will still have been affected)

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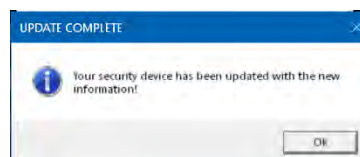
12. If unsuccessful, an ERROR window will display detailing the reason the reprogramming failed, report this to 4D Nav if you cannot resolve the issue
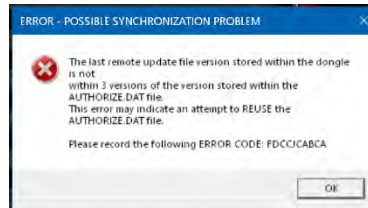
1.3.2 Cloud Controlled Network Floating License

Cloud Controlled Network Floating licenses are activated as **sessions**. A license is activated when a session is opened and de-activated when the session is closed.

Note: Unless a session is checked out, an open session is valid for 2 hours by virtue of the validation cycle. NavView attempts to contact the software license server once an hour to validate the associated license. If this fails, 3 more attempts are made at 20 minute intervals. If these fail, the license is revoked, NavView reverts to an unlicensed state and the license is available.

Note: If NavView is exited without closing the current session it can be relaunched in a licensed state if the session has not expired or been revoked.

Note: Once the session is opened the associated license is not available for others to use until the session is closed, revoked or expires.

Note: If a session is checked out, NavView does not attempt to contact the software license server and the session expires at the end of the checkout period.

When using the Cloud Controlled Network Floating licenses on a NavView computer that is on the internet and is able maintain good internet connectivity during the use of NavView, Online activation and deactivation can be used.

When using the Cloud Controlled Network Floating licenses on a NavView computer that is not on the internet or if it is the connection is poor and inconsistent, Offline activation and deactivation can be used.

1.3.2.1 Activate License Online

1. From the Home ribbon, click on **License** in **General** group to open the **License Information** dialog
2. If not already configured for Cloud Controlled Network Floating licenses
   a. From the **License provider** dropdown select **Cloud Controlled Network Floating License**
   b. Click **Apply** to apply the license type and expand the dialog for controlling license sessions

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3. In the **Session Details** section

a. Enter the **License ID** (provided by 4D Nav)
b. Enter the **Password** (provided by 4D Nav)
c. Without expanding the dropdown, click **Open Session**
d. The dialog will populate with the license information

    i. **Session ID**: The unique GUID assigned to this session
    ii. **Allocated until date**: Date/time of the next time NavView will check for the licenses validity online and update the session period
    iii. **Seats available**: Number of licenses left that are available for other users to open
    iv. **Total seats**: The total number of licenses associated with this License ID

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4. Click **OK** to close this dialog

1.3.2.2   Licensing Errors

If an NavView reports an error when activating a license, contact 4D Nav and provide the error number.

1.3.2.3   Deactivate License Online

5. Open the **License Information** dialog
6. Without expanding the dropdown, click **Close Session**

7. A message stating that a NavView license is not present will appear, close it by clicking **OK**
8. Click **OK** to close the License Information dialog

1.3.2.4   Activate License Offline

7. Open the **License Information** dialog
8. In the **Session Details** section

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a. Enter the License ID (provided by 4D Nav)
b. Enter the Password (provided by 4D Nav)
c. From the Open Session dropdown, select **Offline Request**, the **Offline License Request** window will open
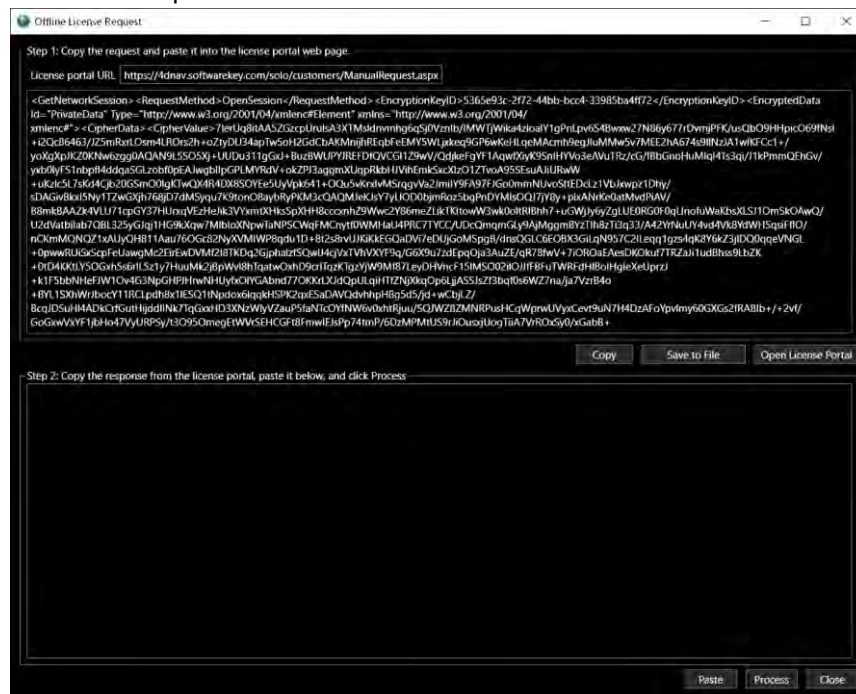
9. If the computer is currently offline, got to step 10, otherwise continue here
   a. Click **Copy** to copy the text displayed in the Step 1 panel to the clipboard
   b. Click the **Open License Portal** button

Note: If the computer is currently online, it is recommended that the user just use standard process to open the session (see Activate License Online)

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Note: Do not close the **Offline License Request** window.

c. In the License Portal that opens in your browser
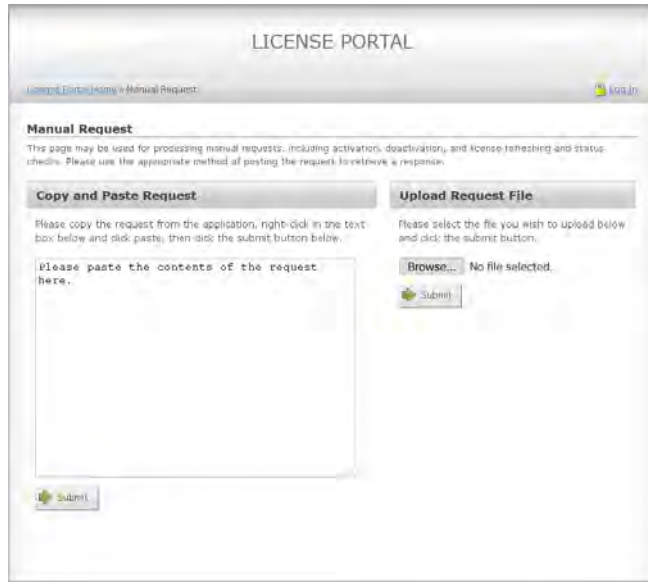
i. Right mouse click in the panel on the left (where it says, "Please paste the contents of the request here.") and click Paste

ii. Click the **Submit** button below this panel

d. When the License Portal refreshes
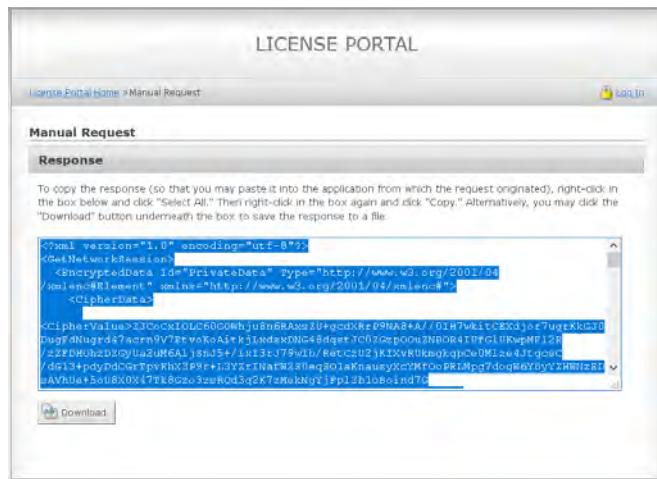
i. Right mouse click in the panel and click on **Select All**

ii. Right mouse click in the panel and click **Copy** the contents to the clipboard

e. Return to NavView and in the **Offline License Request window**

i. Click **Paste** to paste the text from the License Portal into the Step 2 panel

ii. Click **Process** to apply the license

iii. If successful, the **Offline License Request** window will close

10. If the computer is currently offline, in the **Offline License Request** window

a. Click **Save to File** to save the text displayed in the Step 1 panel to a file

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b. Copy this file to a computer that is on the internet
c. From the computer the file was copied to, open a web browser and go to https://4dnav.softwarekey.com/solo/customers/ManualRequest.aspx
d. On the **License Portal** page under **Upload Request File**
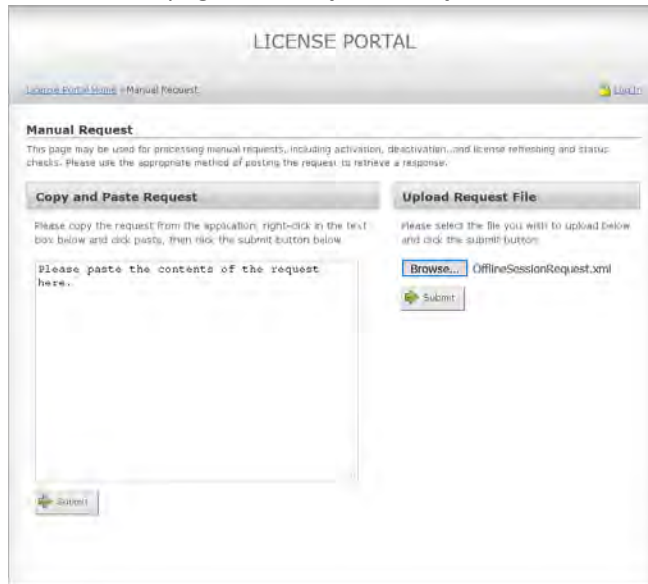
    i. Click **Browse** and navigate to and select the file copied from the NavView computer
    ii. Click **Submit**

e. When the **License Portal** refreshes
    i. Click **Download** and save the response as a file
    ii. Copy this file to the NavView computer
f. On the NavView computer, open the new file in a text editor
    i. Right mouse click in the text and click on **Select All**
    ii. Right mouse click in the text and click **Copy** to copy the contents to the clipboard
g. Return to NavView in the **Offline License Request window**

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i.   Click **Paste** to paste the contents of the clipboard into the Step 2 panel
ii. Click **Process** to apply the license
iii. If successful, the **Offline License Request** window will close
11. The **License Information** dialog will populate with the license information

a. **Session ID**: The unique GUID assigned to this session
b. **Allocated until date**: Date/time of the next time NavView will check for the licenses validity online and update the session period
c. **Seats available**: Number of licenses left that are available for other users to open
d. **Total seats**: The total number of licenses associated with this License ID
e. Click **OK** to close this dialog

1.3.2.5   Deactivate Offline License

1. Open the **License Information** dialog
2. If the computer is currently online with internet access, in the **License Information** dialog in the **Session Details** section
    a. Click the **Close Session** button
    b. A message stating that a NavView license is not present will appear, close it by clicking **OK**
    a. Click **OK** to close the License Information dialog
3. If the computer is currently not online or is experiencing poor, intermittent internet access, In the **License Information** dialog in the **Session Details** section
    a. Expand the **Close Session** dropdown and select **Offline Request**
    b. In the **Offline License Request window**

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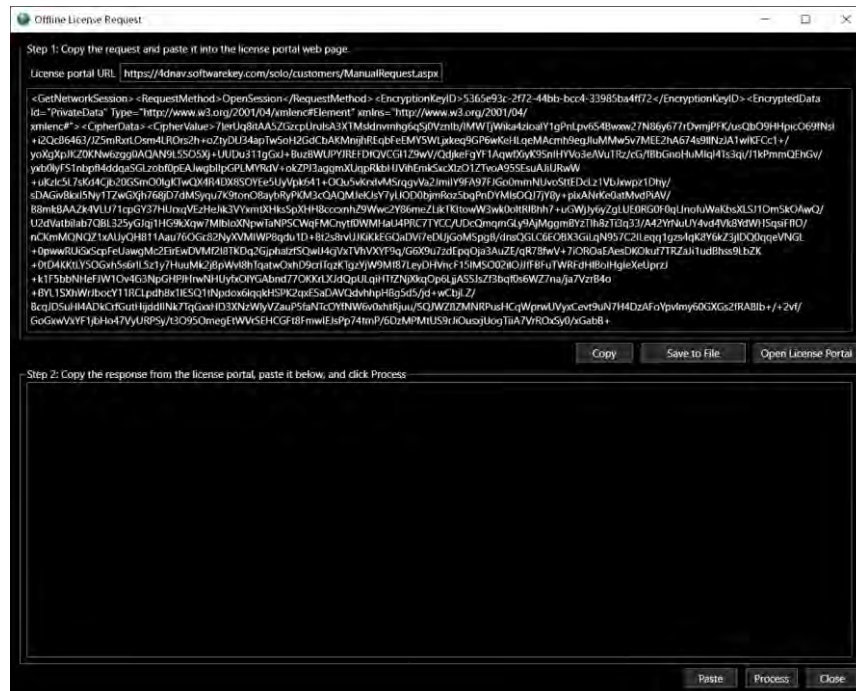
    i. Click **Save to File** to save the text displayed in the Step 1 panel to a file

c. Copy this file to a computer that is on the internet

d. From the computer the file was copied to, open a web browser and go to https://4dnav.softwarekey.com/solo/customers/ManualRequest.aspx

e. On the **License Portal** page under **Upload Request File**

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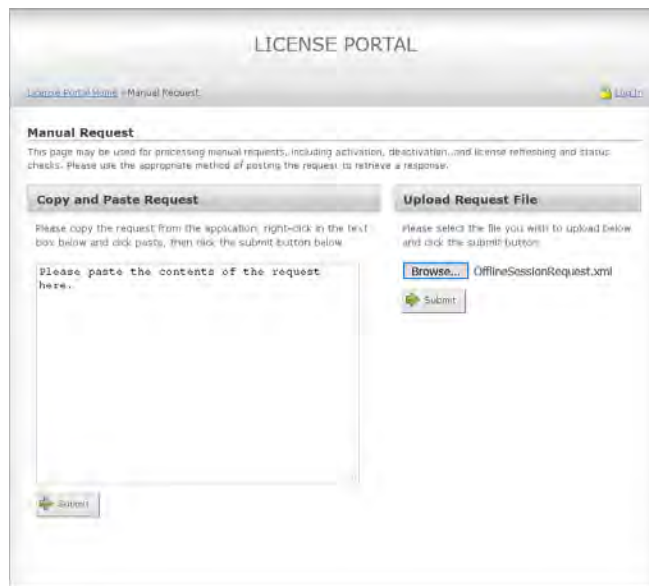
   i. Click **Browse** and navigate to and select the file copied from the NavView computer

   ii. Click **Submit**
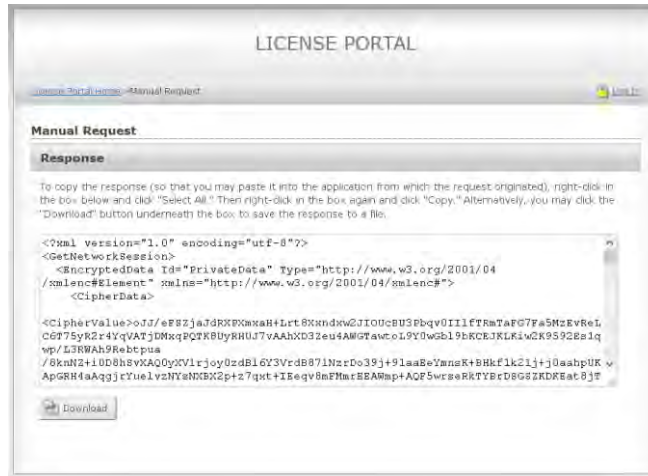
  f. When the **License Portal** refreshes

   i. Click **Download** and save the response as a file

   ii. Copy this file to the NavView computer

  g. On the NavView computer, open the new file in a text editor

   i. Right mouse click in the text and click on **Select All**

   ii. Right mouse click in the text and click **Copy** to copy the contents to the clipboard

  h. Return to NavView in the **Offline License Request window**

   i. Click **Paste** to paste the contents of the clipboard into the Step 2 panel

   ii. Click **Process** to apply the license

   iii. If successful, the **Offline License Request** window will close

 4. A message stating that a NavView license is not present will appear, close it by clicking **OK**

 5. Click **OK** to close the License Information dialog

1.3.2.6 Unavailable License

If when attempting to open a session, no licenses/seats are available the user will be presented with the following message. If this is encountered, contact 4D Nav.
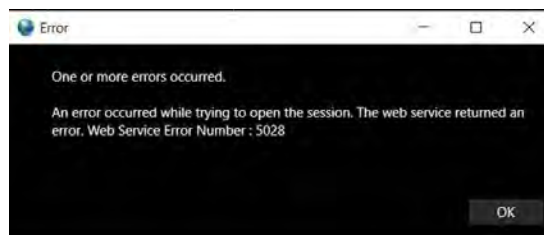
1.3.2.7 Session Check Out

When a Cloud Controlled Network Floating license is used on a NavView computer with no or poor internet access, it is recommended that the session opened with that license be **checked out**. When

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checked out, NavView will use the license for the period specified during the checkout process without attempting to validate over the internet. Upon expiry of the period, NavView will revert to unlicensed, and the license will once again be available to be activated.

The option to check out a session is only available after a session is opened. The following steps are based on a session already being opened.

Note: A checked out session cannot be checked back in. Once a session is checked out the associated license is not available to anyone else until the checkout period has expired, at which point the license becomes available again.

1. Open the **License Information** dialog
2. in the **Session Check In/Out** section

     a. Enter the number hours to check the license out for in **Check out Duration (hours)**

Note: Maximum period a session can be checked out for is 30 days or 720 hours.

     b. If the computer currently has internet access

        i. Click the **Check Out** button without expanding the dropdown list

        ii. When prompted to confirm the check out, click **Yes** or **No** accordingly

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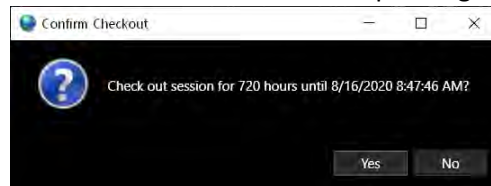
  iii. The **License Information** dialog now displays the Checkout status of the session

  iv. Click **OK** to close this dialog

 c. If the computer currently does not have internet access

  i. Expand the Check Out drop down and click on Offline Request

  i. When prompted to confirm the check out, click **Yes** or **No** accordingly and the **Offline License Request** window will open

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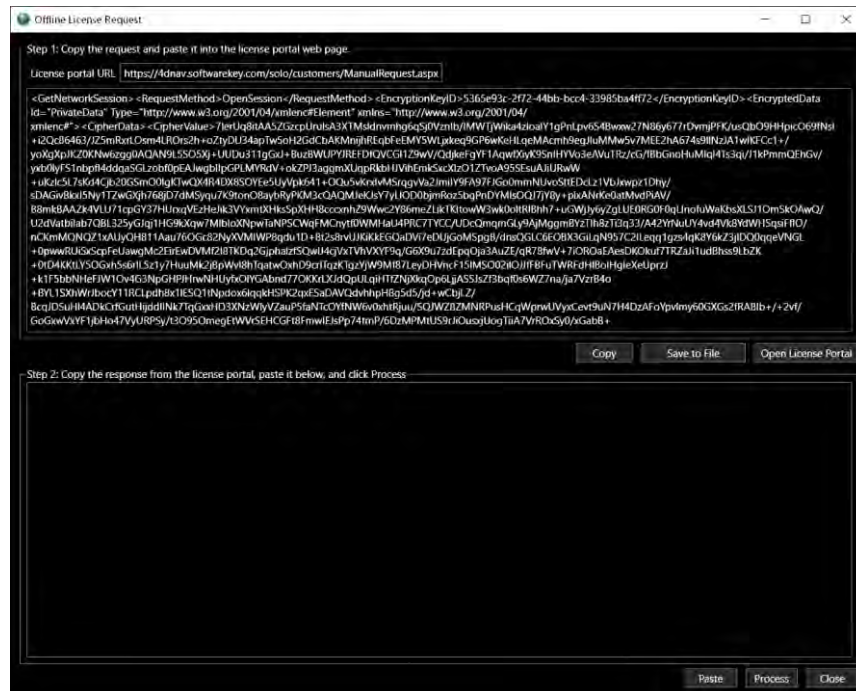
ii.   Click **Save to File** to save the text displayed in the Step 1 panel to a file

iii.   Copy this file to a computer that is on the internet

iv.   From the computer the file was copied to, open a web browser and go to https://4dnav.softwarekey.com/solo/customers/ManualRequest.aspx

v.   On the **License Portal** page under **Upload Request File**
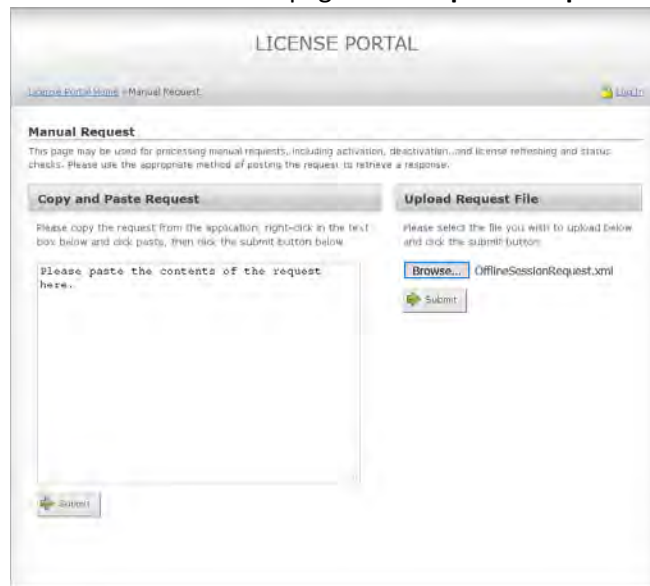
a.   Click **Browse** and navigate to and select the file copied from the NavView computer

b.   Click **Submit**

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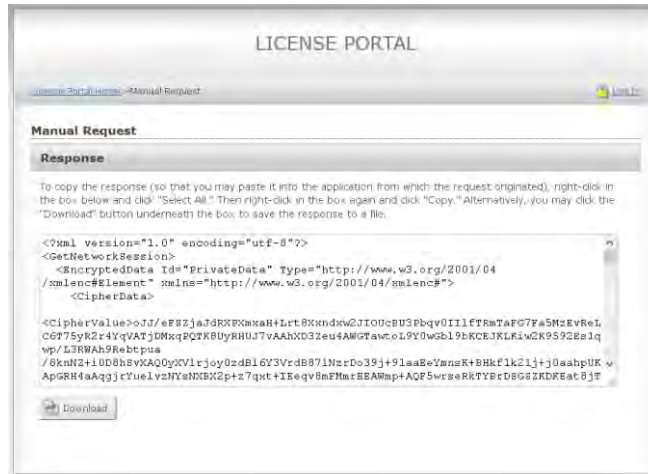
vi.   When the **License Portal** refreshes
    a. Click **Download** and save the response as a file
    b. Copy this file to the NavView computer
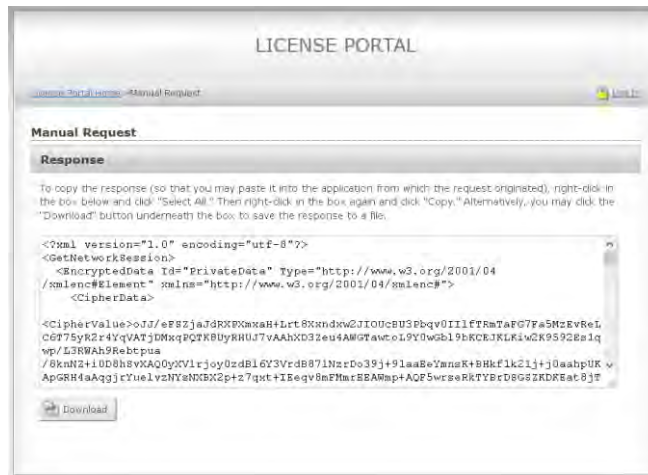vii.   On the NavView computer, open the new file in a text editor
    a. Right mouse click in the text and click on **Select All**
    b. Right mouse click in the text and click **Copy** to copy the contents to the clipboard
viii. Return to NavView in the **Offline License Request window**
    a. Click **Paste** to paste the contents of the clipboard into the Step 2 panel
    b. Click **Process** to apply the license
    c. If successful, the **Offline License Request** window will close
ix.   The **License Information** dialog will display the Check Out status

x.   Click **OK** to close this dialog

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1.4 User Roles and Privileges

NavView supports .NET framework role-based security to ensure only authenticated and authorized users have access to restricted application functionality and configuration. The intent is to assist in preventing users inadvertently making critical configuration changes to NavView.

Note: By default, Roles and Privileges are enabled. If it is desired that they not be enabled, this must be requested when the NavView installation is provided by 4D Nav as it is a setting when creating the installation.

The following Roles are supported. Throughout the User's Guide where applicable, the Role with the required privilege level to execute or access the respective setting or feature will be identified.

- User, e.g., ROV Pilot, Bridge supervisor (default Role)
    - Username: user
    - Password: user
- Supervisor, e.g., Project surveyor
    - Username: supervisor
    - Password: supervisor
- Administrator, e.g., Party Chief
    - Username: admin
    - Password: admin

Note: The default role is a User which is considered to always be logged in

At any time, a user can log into NavView to execute an action that requires that user's Role privileges, and then log out.

1.4.1 Roles Status/Access

On the right side of the ribbon a drop-down box displays the current Roles status and provides access to the appropriate Roles control. For example, if a user (other than User) is logged in, the respective username is displayed and if the drop-down is clicked, the option to log out is presented and can be clicked. If no one is logged in, i.e., NavView is operating with the default User, the status is displayed as *Not logged in* and if the drop-down is clicked the option to log in is presented and can be clicked.

Note: If Roles is not enabled, this control is not present.

1.4.2 Roles Log In/Out

Clicking on Log In in the Roles control in the ribbon pops up the log in prompt shown below where the user enters their username and password and clicks on the Log In button. In addition, should it be desired that the user not accidentally remain logged in the Timeout box can be checked and the desired elapsed time before NavView will automatically log the user out can be entered before clicking the Login button.

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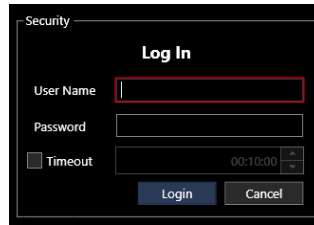
Clicking on Log Out in the Roles control in the ribbon pops up the log out prompt shown below.
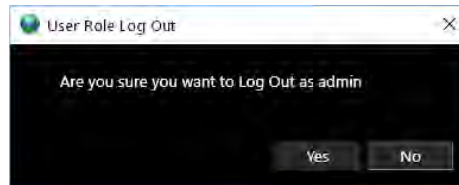
1.5 Navigating NavView

NavView follows the standard approach to program presentation and navigation. The NavView window has a Quick Access Toolbar (QAT), a File Menu, and Ribbons. Some windows have a context sensitive ribbon tab that is displayed as part of the main ribbon when that window has the focus.

Right mouse clicking on the ribbon or QAT pops up a menu allowing the operator to control the location of the QAT and whether the ribbon is to be minimized or not.

Note: The contents of the ribbons and therefore the options and views are dependent upon the modules activated and available.

1.5.1 Quick Access Toolbar
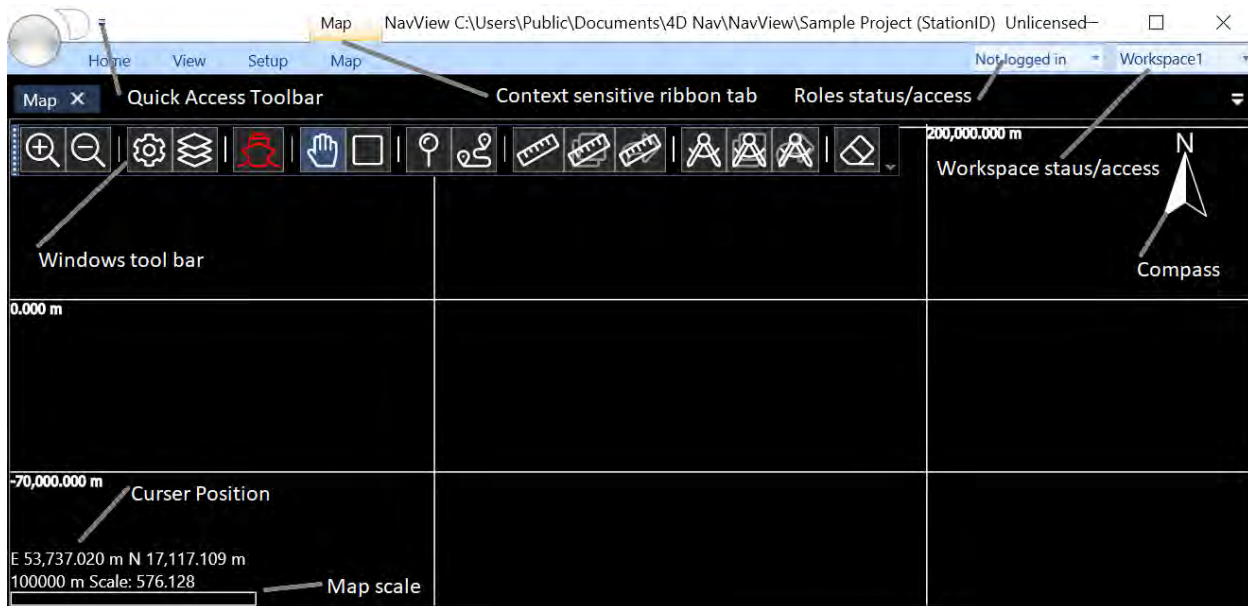
The Quick Access Toolbar (QAT) is a configurable toolbar. Items in the ribbon that are accessed on a regular basis, e.g., Waypoints, can be added to the QAT to simplify access, as well as auto hide the ribbon menu.

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To add a button to the QAT, right mouse click on that button in the ribbon and select *Add to Quick Access Toolbar*. Once added, right mouse clicking on that button in the ribbon will show the *Add to Quick Access Toolbar* option greyed out.

To remove a button from the QAT, right mouse click on that button in the QAT and select *Remove from Quick Access Toolbar*. Once removed, right mouse clicking on that button in the ribbon will show the *Add to Quick Access Toolbar* option available again.

1.5.2   File Menu

The File Menu provides access to project options Open, New, Import, Save As, Exit and, if Roles are enabled, Log In/Out. Clicking Open or New launch the respective wizard. These are discussed in detail in the Projects section.

1.5.3   Workspace Status/Access

On the right side of the ribbon is a drop-down box that displays the name of the currently selected Workspace. If the drop-down is clicked a list of workspaces present is displayed and the desired workspace can be selected.

1.5.4   Ribbons

The ribbons provide access to the NavView features, options and configurations dependent upon the modules licensed in use. These are summarized in this section to provide a basic map to NavView for the user. Some icons in the ribbons are dependent upon modules and licenses present. Details can be found in the respective Guide sections.

Note: If Roles is enabled and an item is not available to the currently logged in user, it will not be enabled in the ribbons.

1.5.4.1   Home Ribbon

The Home ribbon provides access to tools and supporting data files.
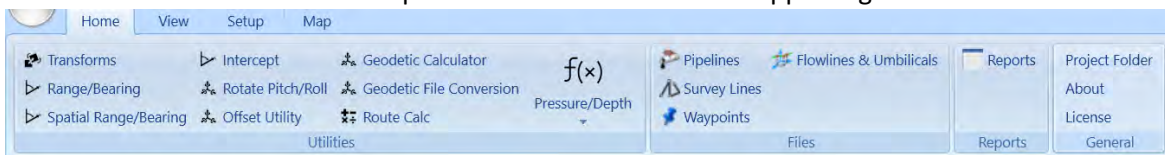
- Utilities:

    Transforms: Utility to perform Datum transforms and coordinate conversions

    Range/Bearing: Utility to perform geographic/grid direct and inverse calculations

    Spatial Range/Bearing: Utility to perform geographic/grid inverse coordinate operation and project the distance to the terrain/seafloor

    Intercept: Utility to calculate the intercept position and time from one dynamic vehicle to another

    Rotate Pitch/Roll: Utility to rotate attitude from one heading to another

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Offset Utility: Utility to calculate offset locations based on reference or remote positions

Geodetic Calculator: Utility to calculate geographic/grid positions

Geodetic File Conversion: Utility to convert a file from one geodetic system to another

Route Calc: Utility to calculate a position along a line and offline distances relative to a selected route, survey line or pipeline and vice versa, plus calculate the map projection, ellipsoid and spatial distances to a specified target along the same route from this position (used for Cut to Length operations).

Pressure to Depth: Utility to calculate depth from pressure

- Files:

  Pipelines: Opens the pipeline entry and configuration window

  Survey Lines: Opens the survey line entry and configuration window

  Waypoints: Opens the waypoint entry and configuration window

  Flowlines & Umbilicals: No longer supported

- Reports:

  Reports: Opens the Report dialog from which configuration reports can be generated

- General:

  About: Displays current version of software installed, the software support email address and what is enabled in the license

  Project Folder: Launches File Explorer to the respective Project\Local\Station folder

  License: License configuration

1.5.4.2 View Ribbon

The View ribbon provides access to open windows for viewing and monitoring operations.

Note: Most windows can have multiple independently configured instances opened simultaneously. However, there are some windows that only support a single instance being opened at any one time. These are designated in the following summary by an asterisk.

- Windows:

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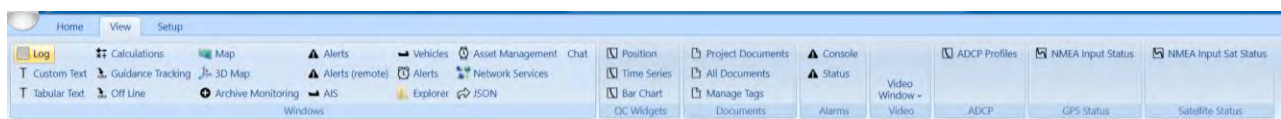
Log: Audit log window

Custom Text: Comprehensive configurable text window

Tabular Text: Comprehensive configurable dual column text window

Calculations: Calculation status and monitoring window

Guidance Tracking: Bulls eye style guidance window

Offline: Bar style offline guidance window

Map: Configurable 2D map view

3D Map: Configurable 3D view

Archive Monitoring: Displays data archive control

Alerts: Listing of configured Alerts and their state.

Alerts (remote): Listing of configured Alerts on Remote NavView stations and their state.

AIS: Tabular display of all real time AIS vehicles being tracked

Vehicles: Tabular display of all real time and remote vehicles being tracked

Alerts: Displays a listing of alerts

Explorer*: NavView system explorer view

Asset Management: Opens the Asset Management view (see Asset Management section for details)

Network Services: Status and configuration of network service updating

JSON: Status of publishing of JSON data to endpoint

Chat: Opens a Chat window used to chat with other NavView clients on the network

- QC Widgets:

    Position: Configurable chart display and comparison of position data

    Time Series: Configurable time series window

    Bar Chart: Configurable bar chart display

- Documents:

    Project Documents: Not supported in standard NavView

    All Documents: Not supported in standard NavView

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Manage Tags: Not supported in standard NavView

- Alarms:

  Console: Tabular display of alarm status

  Status: List of configured alarms

- Video:

  View Window: Access to selection of video feeds to display

- ADCP

  ADCP Profiles: Display of captured ADCP data

- GPS Status

  NMEA Input Status: Display SV sky plot with tracking and positioning statistics (dependent on NMEA input message selection)

- Satellite Status

  NMEA Input Sat Status: Display bar charts representing satellite SNR and solution PRN range residuals

1.5.4.3 Setup Ribbon

The Setup ribbon provides access to the configuration of the components that control how NavView is used.
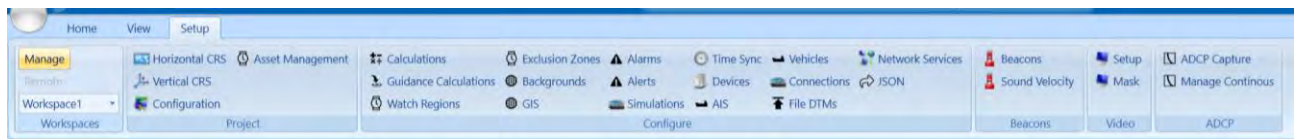
- Workspaces

  Manage: Manage and configure workspaces

- Project:

  Horizontal CRS: Configuration of the horizontal CRS to be used for the project and their associated transformations

  Vertical CRS: Configuration of the Vertical CRS

  Configuration: Configuration of the project details and display preferences

  Asset Management: Configure access to the Asset Management service

- Configure:

  Calculations: Configuration and management of calculations

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Guidance Calculations:　　Configuration and management of guidance items

Watch Regions:　　Configure Watch Regions

Exclusion Zones:　　Configure Exclusion Zones

Backgrounds:　　Manage the base configuration of background drawings

GIS:　　Configuration and management of GIS layers

Alarms:　　Configuration of system alarms

Alerts:　　Configuration of alerts

Simulations:　　Opens the simulation window from which simulators are added, removed, configured and manipulated

Time Sync:　　Configuration and monitoring of time synchronization settings

Devices:　　Opens the IO Devices window from which devices can be added, removed, configured and monitored

AIS:　　Integration and configuration of AIS devices

Vehicles:　　Configuration and management of vehicles including static offsets

Connections:　　Configuration and management of the connections, e.g., Articulated Frame

File DTMs:　　Option to load DTM from XYZ ASCII grid, ESRI ASCII grid, or flat without requiring enabling of Database Services

Network Services:　　Configuration of the NavView network service connection

JSON:　　Configure a JSON *Vessel Report Set* sent to an HTTP cloud service

ADCP Capture:　　Configure the capture of ADCP data for processing and analysis

Manage Continuous: Opens the Manage ADCP Logging view where ADCP Profiles can be setup

- Beacons:

  Beacons:　　Configuration and management of acoustic beacons required for USBL operations

  Sound Velocity:　　Import and management of sound velocity profiles for review and analysis and use with Pressure to Depth calculations

- Video

  Setup:　　Setup video channels

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Mask:	Configure the masking of the video input to select area to be used for processing

1.5.4.4 Data Ribbon

The Data ribbon is a context sensitive ribbon that is present when Database Services are enabled. It provides access to the configuration of quick and average position fixes.

- Position Fixes

Quick Fixes:	Configuration of Quick Fixes
Active Fixes:	Access Position Fixes view where position fixes can be controlled and managed
Query:	Access query window where position fixes can be accessed from database
New:	Launch Position Fix creation wizard
Fix Profiles:	Manage Fix Profiles that are used to simplify setting up Position Average Fixes locally and executing Position Average Fixes remotely
Remote Fixes:	Position Fix from a Remote System

1.5.4.5 Map Ribbon

The Map ribbon is a context sensitive ribbon that is present when a 2D Map view is open and has the focus. It provides access to the configuration and control of the map display. Its features are detailed in the Windows Map Window section.

1.5.4.6 3D Map Ribbon

The 3D Map ribbon is a context sensitive ribbon that is present when a 3D Map view is open and has the focus. It provides access to the configuration and control of the map display. Its features are detailed in the Windows 3D Map section.

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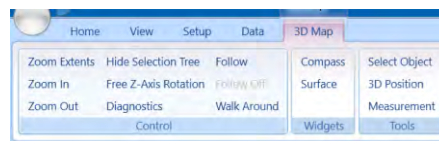
1.5.4.7 Window Toolbars and Ribbon Tabs

Several windows support their own tool bars. These include ones that appear in the top left corner of the respective window when the mouse is in that window (e.g., Map window) and permanent tool bars at the top of the window (e.g., IO devices window).

Several windows also have their own context sensitive ribbon tabs (e.g., 3D Map window). These are added to the ribbon when the window is open and has the focus. Note that regardless of how many of a given windows of the same type are opened, the context sensitive ribbon is only added once.

1.5.5 Window Docking

NavView supports flexible window management and docking. This enables the operator to easily configure the workspace to optimize the viewing area for their requirements.

When a window is opened it is placed in its default location in the main window. These default locations vary for each window. If multiples of the same window type are opened, they are initially added as tabs to the window the first is located in.

A window can be a Document window, a Dockable/Tool window or a Floating window. These determine how they behave. Like the default location, each window when initially opened has its own default window type. For example, a Text window defaults to a dockable window, a Map window defaults to a document window. The types are illustrated in below.

| **DOCUMENT WINDOW** | **DOCKABLE/TOOL WINDOW** | **FLOATING WINDOW** |
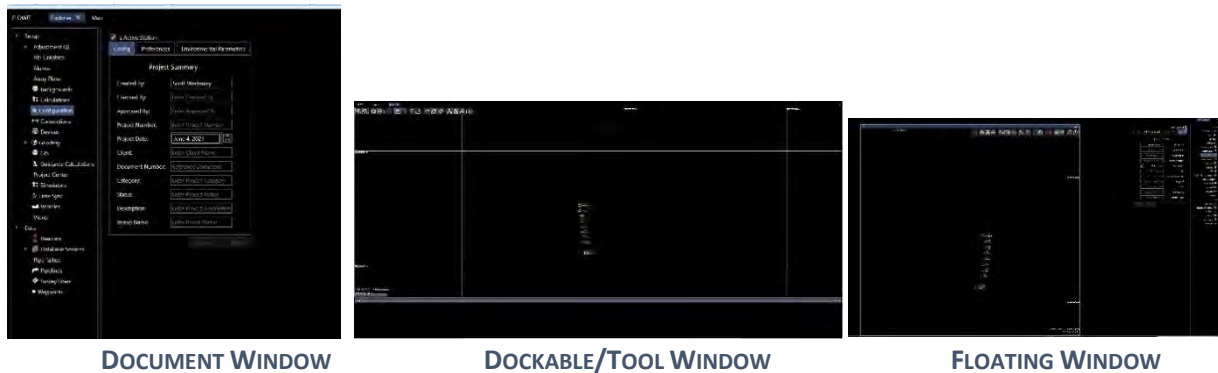
Document window features are as follows:

- Are always open and visible
- Cannot be dragged and relocated as a whole (unless containing a single tab which can be dragged)
- Cannot be closed (each tab must be closed, closing the last tab closes the window)
- Have a ⯯ button that when clicked list those windows it contains
    - Clicking on a window in this list will select the respective tabbed window for display
- Windows contained within the parent window
    - Are tabbed at the top with their title in the respective tab
    - Closed by clicking the 'X' associated with that window/tab
    - Can be relocated by clicking on the tab and dragging

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Dockable/Tool window features are as follows:

- Has title bar
- Can be dragged and relocated by clicking the title bar and dragging
- Cannot be closed as whole (each tab must be closed, closing the last tab closes the window)
- Windows within the parent window
    - Are tabbed at the bottom of the parent window with their title in the tab
    - Can be relocated by clicking on the tab and dragging
- Has ⬇ 📌 buttons where
    - Clicking the ⬇ button displays a list of options
        - Float: Pops the window associated with the currently selected tab out to become a floating window
        - Dock as a Tabbed Document: Docks the window associated with the currently selected tab in a Document window
        - Auto Hide: Toggles the Auto Hide setting for the entire window (see Pin/Unpin below)
        - Close: Closes the window associated with the currently selected tab
    - Clicking the 📌 button toggles the Pin and Unpin setting for the entire window
        - Pin: Window stays open and visible
        - Unpin: Window auto hides against the respective side, respective tab displays when it is moused over

Floating window is a type of Dockable window whose distinct features are as follows:

- Is always visible and in front of Document and Dockable windows
- Can be relocated by clicking in the title bar and dragging
- Has ⬇ ⬜ buttons where
    - Clicking the ⬇ button displays a list of options
        - Dock: Docks the window in a Dockable window
        - Dock as a Tabbed Document: Docks the window in a Document window
        - Close: Closes the window
    - Clicking the ⬜ button maximizes the window to the full extent of the workspace

When a window is being dragged the options for docking are presented by docking icons as shown in **Error! Reference source not found.**. To employ the desired icon to place the window being dragged, the mouse is placed over the icon and the left mouse button released. The docking feature of each icon is detailed below.

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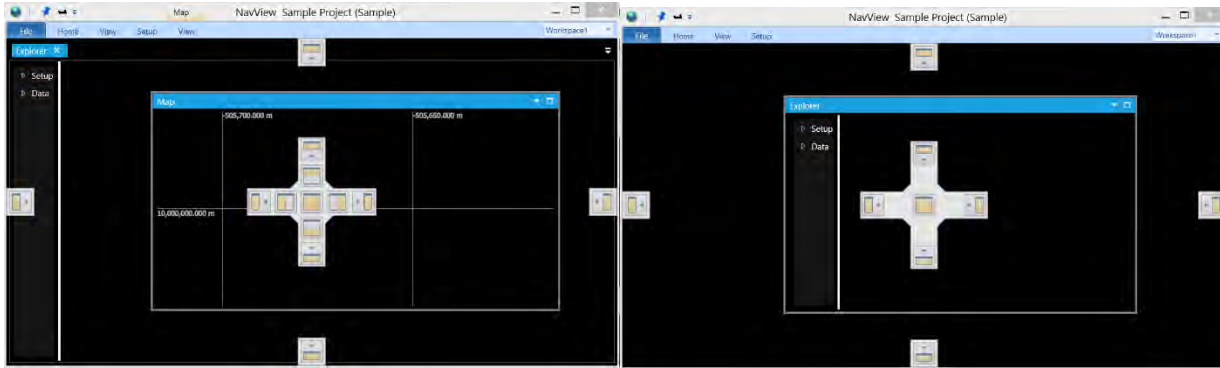
This icon is displayed at each edge of the workspace. Releasing the window over this icon pins the window the respective edge as a Dockable window.

This icon is displayed in the center of the window the mouse is currently in (referred here as the target window). The individual icons making up this larger icon each represent a docking option. The presence of the individual icons depends upon the type and configuration of the target window, how other windows already present within the window are placed.

Releasing the window over this icon pins the window as a Dockable window against the respective edge of the target window. This option is present when the target widow is a Document or Dockable window but not if it is a Floating window.

Releasing the window over this icon puts the window in the respective portion of the target window as the same type of window as the target. This option is present when the target window is a Document or Floating window but not if it is a Dockable window.

Releasing the window over this icon adds the window to the target window as a tab of the same type as the target window. This option is present in all target windows.

1.5.6   Workspace

NavView supports multiple workspaces providing the operator with another means to manage the viewing area. A workspace is essentially the viewing area associated with NavView, including any windows that have been dragged outside of the application's window. Each workspace can be configured independently with respect to the windows displayed and their arrangement. When switching between workspaces, only those windows associated with the selected workspace are displayed, including any that lie outside of the application window.

1.5.6.1   Managing Workspaces

The creation and removal of workspaces is done via the Workspaces Manager, opened by clicking on the Manage button in the Workspaces section of the Setup ribbon.

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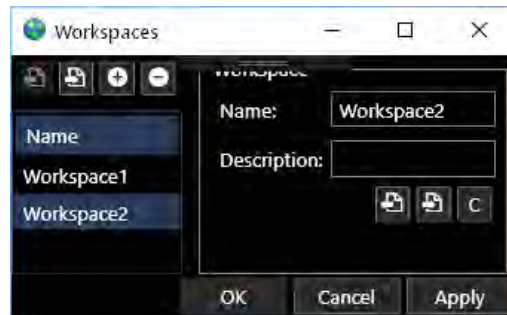
o Left Panel: Displays the name of the current workspaces

    ⬛ Click to export the workspace layout collection

    ⬛ Click to import a workspace layout collection

    ⬛ Click to add a workspace

    ⬛ Click to remove the selected workspace

o Right Panel: Displays the name and description of the workspace selected in the left panel

    ⬛ Click to export this workspace layout

    ⬛ Click to import a workspace layout

    ⬛ Click to clear the workspace

To apply changes made, click **Apply**, to revert click **Cancel**.

1.5.6.2   Remote

The Remote Workspace feature allows the user to access any workspace of any Station present on any NavView client on the network for viewing and configuring before pushing back to the source Station for application.
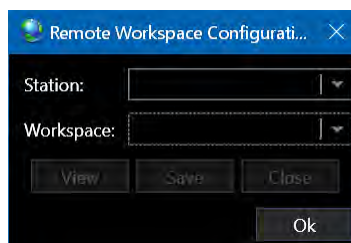
o Station:
- o Drop down listing all Stations of all NavView clients present on the network configured for the project
- o Select the Station whose Workspace is to be viewed
o Workspace:

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- o Drop down listing all workspaces configured for the selected Station
- o Select the workspace to be viewed
- o View:
  - o Click to display the selected workspace
  - o Edit if desired
- o Save:
  - o Once completed viewing and editing, click Save to save the workspace on the source NavView's Station and trigger its refresh if currently being displayed
- o Close/OK
  - o Closes this dialog

1.5.6.3 Switching Workspace

See Workspace Status/Access.

1.6 Technical Support

4D Nav provides technical support via our online Help Desk at https://4dnav.zendesk.com. Submission of issues and suggestions to the help desk ensures that they are directed to the appropriate person and addressed in a timely fashion.

The Help Desk allows you to

- Submit a request (issue, suggestion, etc.)
- Track request submitted by yourself and anyone else in your company
- Access the NavView knowledge base

1.6.1 How to Sign on to the Help Desk

1. Using an internet browser, navigate to https://4dnav.zendesk.com
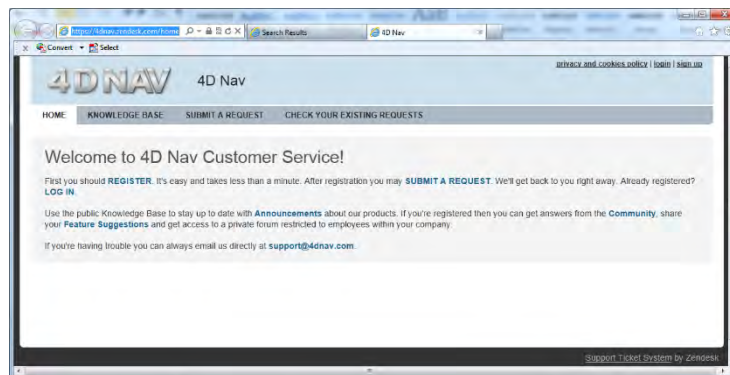
2. Click **Sign Up** in the top right corner of the page

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   a. Complete the entries and click **Sign me up!**

Note: A valid e-mail address is required, a confirmation e-mail is sent to the address entered that must be responded to complete the sign up process.

   b. Respond to the confirmation e-mail sent to the e-mail account entered

3. When the confirmation e-mail is received, click on the included link to confirm your e-mail address, this will open the Help Desk so you can create your password and complete the e-mail address confirmation process

1.6.2   How to Submit a Request

1. Log onto the Help Desk and click on Submit A Request
2. Complete the form and click Submit

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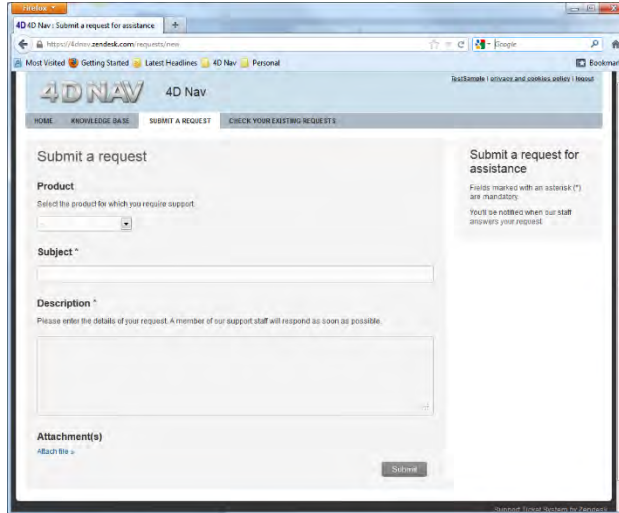
1.6.3   How to Track a Request

1. Log onto the Help Desk and click on Check Your Existing Requests

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2   NavView Basics

This section provides an overview of the basic concepts employed by NavView.

NavView can be installed with Roles and Privileges enabled. This provides the level of operator interface depending on role assigned. Roles options are as follows:

Username	Password
Not Logged In	N/A
User	user
Online	online
Supervisor	supervisor
Admin (Administrator)	admin

2.1 Pub/Sub Design

The terms publish, subscribe and observations are used throughout this user guide. NavView employs a Pub/Sub design for moving data through the program. This is the process of 'publishing' data for others to 'subscribe' to and use. Data is published as 'observations', a normalization of the data that enables its efficient flow through NavView and between NavView clients. Observations can be raw data such as those published by devices or processed data such as that published by calculations. Subscribers may use the observations for further processing or simply for display.

The pub/sub design is also used to publish change notifications to alert subscribers to changes. Subscribers receive the alerts and take the appropriate action. This process is used by NavView clients to alert other clients of changes in configurations and data such as waypoints that require the subscribing clients to retrieve the changes from a SQL server database via NavView Network Services.

2.2 Vehicle Local Coordinate Reference Frame and CRP

Each vehicle or object uses a local Cartesian coordinate reference frame centered on an operator specified Common Reference Point or CRP. All calculations, offsets, outlines and shapes are referenced to this CRP.

The sign convention for the local coordinate reference frame is as follows:

- Y axis coincides with the vehicle's centerline, positive forward, negative aft
- X axis is perpendicular to the Y-axis such that the XY plane is parallel to the vehicle's main horizontal surface (e.g. deck), positive starboard, negative port
- Z axis is the vertical axis perpendicular to the XY plane, positive up, negative down

It is important when preparing vehicle 3D shape files (XAML) that the origin matches that those that are to represent the same vehicle are created using the same CRP. This is not critical for outline files because NavView supports translating the origin of these to match the CRP.

2.3 Pitch and Roll Sign Convention

The sign convention for pitch and roll used by NavView is as follows:

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Pitch: Positive bow up

Roll: Positive starboard side down

It is important to note that if a device provides pitch and/or roll data, it is displayed in the decode panel of the device status view with the sign convention as received to enable confirmation that the incoming data is being received and decoded correctly. If this sign convention does not match NavView's, the sign convention will need to be changed accordingly before publishing the pitch/roll observation.

2.4   Units of Measure

All unit conversion parameters and units used by NavView are in accordance with the standard Unit of Measure table from Energistics, formerly Petrotechnical Open Standards Consortium (POSC). More information on the unit table can be found at: http://www.energistics.org/.

In NavView, all individual distance and depth data have an associated native unit, i.e. the units that it is originally entered or loaded as. For example, if prompted for an offset distance and 100m is entered, NavView accepts this value as 100m and maintains it in its native units of meters. It is only converted to different units if it is to be used with another data value that is in different units or the operator has specified that data type is to be displayed in different units. In both cases, it is converted accordingly as part of the data manipulation or display, but the original data is unchanged. This eliminates the problem of rounding when converting data, either upon entry or loading, and subsequent manipulation.

2.5   Active Station

The term Active Station refers to the state of NavView device outputs. If a station is active, all output devices are active and transmitting data as configured. If a station is not active, all output devices are disabled, i.e. the outputs are formatted and prepared but are not transmitted.

This control enables an online secondary system to be configured identically to a primary online system but not output data preventing conflicts and collisions that would disrupt the reception of data at the receiving end. Should the primary system fail, the secondary system can be set to active and its outputs enabled providing a seamless transition to the backup.

The Active Station setting can be configured when creating a new station as part of the New Project and Open Project wizards. It can also be controlled in the same wizards when loading or importing an existing station through an override option that allows the operator to override the Active Station setting of the station being loaded or imported and configure it as desired.

The Active Station setting can also be configured from the Project Configuration view.

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3 Geodesy

If Roles and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In	Cannot add, edit or remove a Horizontal or Vertical CRS
User	Cannot add, edit or remove a Horizontal or Vertical CRS
Online/Supervisor	Cannot add, edit or remove a Horizontal or Vertical CRS
Admin (Administrator)	Can add, configure/edit or remove a Horizontal or Vertical CRS

3.1 EPSG Database

NavView has adopted the European Petroleum Survey Group (EPSG) Geodetic Parameter Set maintained and published by the Geomatics Committee of the International Association of Oil and Gas Producers (OGP) (http://www.epsg.org/). This dataset includes parameters for Coordinate Reference Systems (CRS), coordinate operations and units, each with its own unique identifier.

The NavView installation and update processes copy the EPSG database included in the installation package to the following folder:

C:\ProgramData\4D Nav\Geodesy\EPSG

Note: When User defined Horizontal CRS and transformations are added to NavView, these are written to the EPSG database file located in this folder. If a NavView update is applied, the EPSG database file located in this folder will be overwritten resulting in the loss of these. Therefore, it is recommended that when using User defined CRS and/or transformations, a backup copy of the EPSG database file be kept so it can be copied back to the above folder after any NavView updates.

3.2 Coordinate Reference Systems

NavView uses EPSG Horizontal and Vertical CRS. A Horizontal CRS can be Geographic 2D or Projected.

A Geographic 2D CRS is used for positioning on the surface of an ellipsoid, i.e., latitude and longitude. Associated with the Geographic 2D CRS is a datum defining the relationship of the CRS to the earth. An example of a Geographic 2D CRS is *WGS 84*.

A Projected CRS is used for positioning on a map projection. A Projected CRS always has a source Geographic CRS and therefore an associated datum. Examples of a Projected CRS are *WGS 84 / UTM zone 31N*, whose source Geographic CRS is WGS 84, and *ED50 / UTM zone 31N*, whose source Geographic 2D CRS is ED50.

A Vertical CRS uses the direction of gravity in the definition of the height and depth of a position. An example of a Vertical CRS is Mean Sea Level (MSL).

Note: EPSG also supports a Geographic 3D CRS for position on and above/below the ellipsoid. However, NavView supports the use of a separate EPSG based Vertical datum in conjunction with either the Geographic 2D or Projected CRS. This is referred to as a Compound CRS.

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In addition, NavView supports user defined CRS for cases where the EPSG database does not address the requirements. These are added to the local copy of the EPSG database and available for use in the same manner as standard EPSG CRS are.

NavView allows the operator to add multiple Horizontal CRS to be used as required for a given project, one of which at any given time is set to be the Working CRS. This enables NavView to support switching back and forth between contiguous map projection zones in real time and to accept and output positions in a CRS other than WGS 84 or the local working datum. The former facilitates operations that start in one zone and finish in another, such as a rig move. The latter is of particular interest when working with USBL and DP systems that are configured to present and accept positions in WGS 84 UTM.

Note: Only a Projected CRS can be set to Working because the Working requires both map projection and geographic coordinate support.

Note: NavView automatically adds the WGS 84 Geographic 2D CRS, EPSG code 4326. This CRS cannot be removed.

Note: When NavView opens a new project, the Projected CRS WGS 84 / World Mercator, EPSG code 3395, is automatically added and set to Working.

A single Vertical CRS is supported.

3.3 Transformations

The transformations supported by NavView are as defined by EPSG and included in the EPSG database.

In addition, NavView supports user defined transformations for cases where the EPSG database does not address the requirements. These are added to the local copy of the EPSG database and available for use in the same manner as standard EPSG transformations are.

The following user defined transformations are included with the EPSG database shipped with NavView installations:

4. EPSG Code 99010 ITRF2014 to NAD27(1)
    a. Source CRS: ITRF2014 EPSG Code 9000
    b. Target CRS: NAD27 EPSG Code 4267
5. EPSG Code 99020 ITRF2014 to NAD83(CSRS)(1)
    a. Source CRS: ITRF2014 EPSG Code 9000
    b. Target CRS: NAD83(CSRS) EPSG Code 4617
6. EPSG Code 99030 ITRF2014 to ETRS89(1)
    a. Source CRS: ITRF2014 EPSG Code 9000
    b. Target CRS: ETRS89 EPSG Code 4258
7. EPSG Code 99040 ITRF2008 to NAD27(1)
    a. Source CRS: ITRF2008 EPSG Code 8999
    b. Target CRS: NAD27 EPSG Code 4267
8. EPSG Code 99050 ITRF2014 to WGS84(1)
    a. Source CRS: ITRF2014 EPSG Code 9000
    b. Target CRS: WGS84 EPSG Code 4326

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9. EPSG Code 99060 ITRF2014 to NAD83(2011)(1)
    a. Source CRS: ITRF2014 EPSG Code 9000
    b. Target CRS: NAD83(2011) EPSG Code 6318
10. EPSG Code 99061 ITRF2014 to NAD83(2)
    a. Source CRS: ITRF2014 EPSG Code 9000
    b. Target CRS: NAD83 EPSG Code 4269

3.4 Coordinate Operations

The NavView geodesy supports standard coordinate operations, changing coordinates from one CRS (source) to another CRS (target). Conversions refer to coordinate changes where the datum of the source and target CRS is the same. For example, the conversion of WGS 84 / UTM zone 31N map projection coordinates to WGS 84 geographic coordinates. Transformations refer to coordinate changes where the datum of the source and target CRS are different. For example, WGS 84 to ED50.

3.5 Access Geodesy Configuration

The Geodesy configuration is viewed and configured via the Project Explorer or the Setup ribbon.

1. Expand Setup Ribbon
2. Click the Horizontal CRS button in the Project section
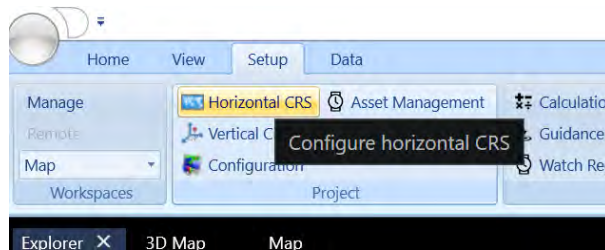
FIGURE 3-1 HORIZONTAL CRS CONFIGURATION ACCESS

3. Click the Vertical CRS button in the Project section
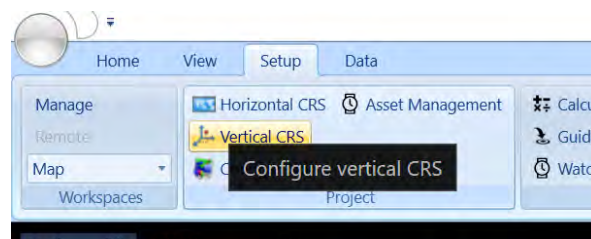
FIGURE 3-2 VERTICAL CRS CONFIGURATION ACCESS

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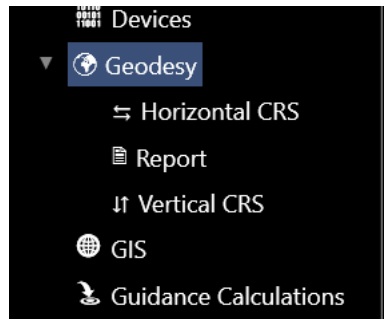
FIGURE 3-3 GEODESY ACCESS IN EXPLORER

3.6 Using the Horizontal CRS View

The Horizontal CRS view presents the Horizontal CRS and associated coordinate operations for review and editing. The view has two main tabs: Horizontal CRS and Transformations. Each of these displays a list of the respective items in the left panel and associated Details and Test tabs in the right panel. The Details tab includes hypertext (underlined blue text) that when clicked expand to provide additional information for that item.

3.6.1 Horizontal CRS Tab
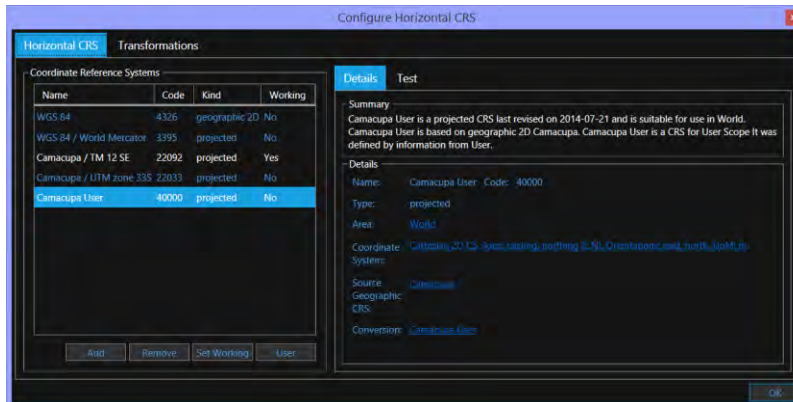
FIGURE 3-4 HORIZONTAL CRS - DETAILS TAB

Coordinate Reference Systems lists the Horizontal CRS currently setup for use in NavView in a data grid sortable by columns.

Name: EPSG name or user entered name

Code: EPSG code, including those assigned to user created CRS

Kind: Projected or geographic 2D

Working: Yes if CRS is the Working Projected CRS, No if not

Details tab display the parameters for the selected CRS. Click on the hyperlinks in the Details to view the EPSG details for that item.

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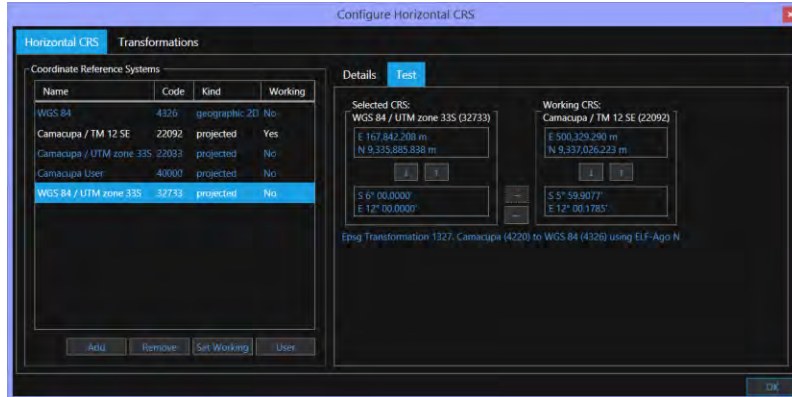
FIGURE 3-5 HORIZONTAL CRS - TEST TAB

Test tab displays the coordinate operations for the selected CRS with respect to the Working CRS.

Selected	Coordinate Operations
Projected CRS:	Selected Projected coordinate conversion to/from its source Geographic 2D CRS coordinates
	Selected source Geographic 2D coordinate transformation to/from Working Projected CRS source Geographic 2D CRS
	Working Projected coordinate conversion to/from its source Geographic 2D CRS coordinates
Geographic 2D:	Selected source Geographic 2D coordinate transformation to/from Working Projected CRS source Geographic 2D CRS
	Working Projected coordinate conversion to/from its source Geographic 2D CRS coordinates
Working CRS:	Working Projected coordinate conversion to/from its source Geographic 2D CRS coordinates

3.6.2 Transformations Tab
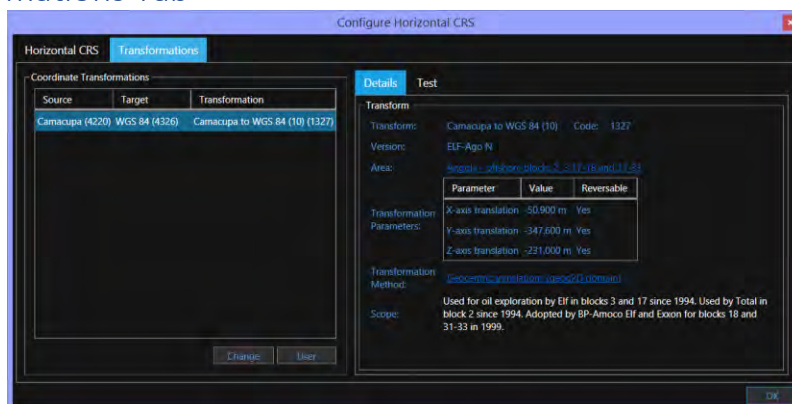
FIGURE 3-6 TRANSFORMATIONS – DETAILS TAB

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Coordinate Transformation lists all the coordinate transformations required to support transformations between any of the CRS currently setup for use in NavView. These are displayed in a data grid sortable by columns.

Source:	EPSG or user assigned name and code of the source geographic 2D CRS
Target:	EPSG or user assigned name and code of the target geographic 2D CRS
Transformation:	EPSG or user assigned name and code of the transformation

Details tab display the parameters for the selected transformation. Click on the hyperlinks in the Details to view the EPSG details for that item.

FIGURE 3-7 TRANSFORMATIONS - TEST TAB

Test tab displays the coordinate operation for the selected transformation, Source Geographic 2D CRS coordinate transformation to/from the target Geographic 2D CRS.

3.6.3 Add a Horizontal CRS to NavView

All CRS that are required for a specific NavView application must be added to be available for use. This includes the Working CRS to be used for the general NavView operation as well as any required to support special operations such as position output, input or included in a report where the position is not on either the WGS84 or Working CRS. For example, providing WGS84 UTM coordinates for a DP system.

In addition, if a project spans multiple map projection zones, i.e., multiple Projected CRS, each of these must be added.

1. Access the Horizontal CRS view

2. Select Horizontal CRS tab

3. Click Add to launch a wizard to step through the searching for and adding of a CRS

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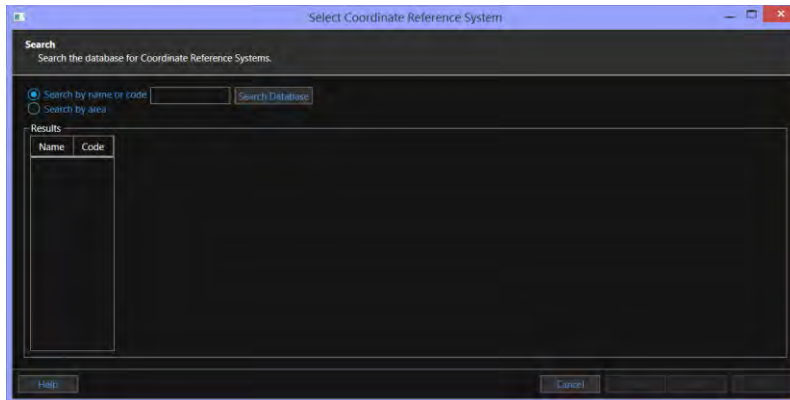
FIGURE 3-8 SELECT CRS - SEARCH BY NAME OR CODE

4. Select Search by name or code if either have been provided
   a. Enter the EPSG code or name in the associated entry box and click Search Database

Note: The EPSG code and name options include user created CRS. These are assigned an EPSG code when assigned and added to the local database.

Note: When entering a name, the search looks for those EPSG CRS whose name or alias contains the entry after removing the blanks (whitespaces) in both the entry and CRS name and alias. For example, entering **ed50** will result in a list of all EPSG CRS with ED50 in the name, such as ED50 and ED50 / TM 0 N; entering **ed50/utm** will result in a list of ED50 / UTM zone 28N to ED50 / UTM zone 38N.

Note: When entering the EPSG CRS code, the search is specific and only lists the EPSG CRS with that exact code.

5. Or select Search by area if unsure of the EPSG code or name of the required CRS
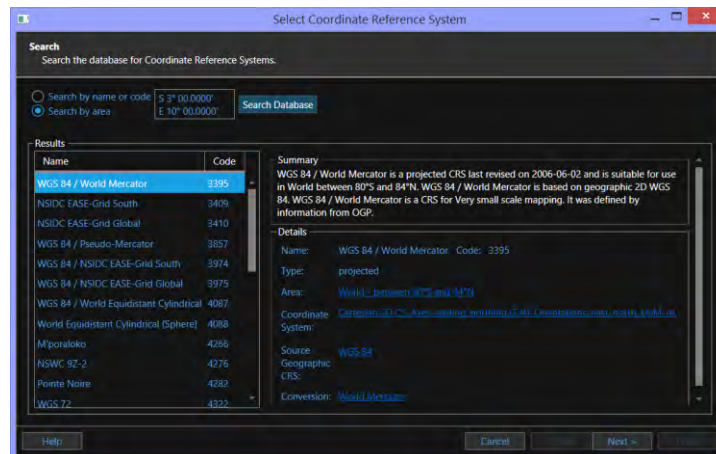
FIGURE 3-9 SELECT CRS - SEARCH BY AREA

   a. Enter a position within the work area and click Search Database

6. If the search is unsuccessful, Search failed will display in red below the entry box

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7. If the search is successful, the dialog will expand to list the EPSG CRS found to match the entry

FIGURE 3-10 SELECT CRS - FOUND CRS

a. Selecting a CRS from the list will display the respective CRS details in the right panel.
b. Clicking on any hyperlink will expand that item to display its details
c. If the search does not result in the required CRS, repeat the search process, otherwise
d. Select the desired CRS in the list, confirm the details, then click Next

Note: If the CRS selected is a Geographic 3D CRS, the Next button will not enable. NavView does not support the selection of Geographic 3D CRS for use.
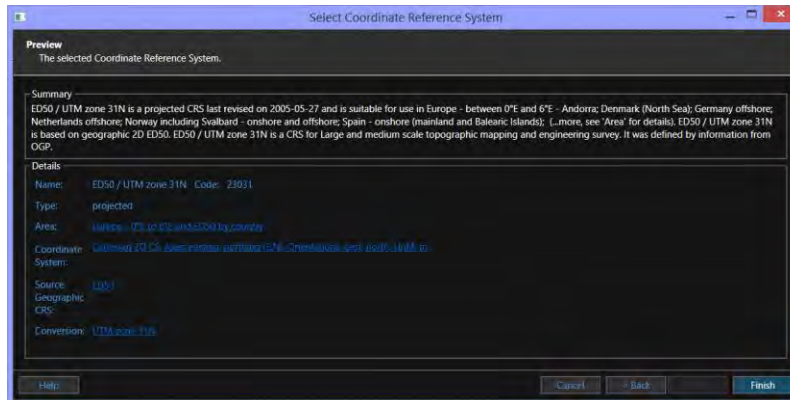
FIGURE 3-11 SELECT CRS - FINISH SELECTION

e. Review the details to confirm they define the required CRS
   i. Click Finish if correct
   ii. Click Back or Cancel if not

8. You will be prompted with an option to set the newly added CRS as the working , answer accordingly

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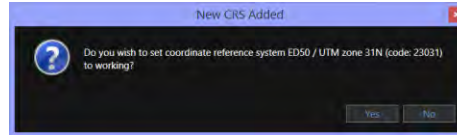
FIGURE 3-12 NEW CRS - SET TO WORKING PROMPT

9. You will be prompted with an option to go directly to configuring the associated transform, answer accordingly
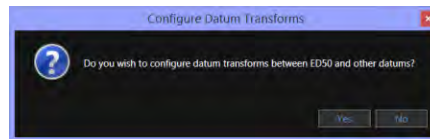
FIGURE 3-13 NEW CRS - CONFIGURE TRANSFORM PROMPT

10. Answering No in step 9 will result in returning to the Configure Horizontal CRS window Horizontal CRS tab with the new CRS listed, answering Yes will result in returning to the Configure Horizontal CRS window Transform tab (see Configure Transformations)

3.6.4 Create and Change a User Projected CRS

A user can add and configure a Projected CRS to address cases where an existing EPSG CRS does not apply.

Note: The User CRS is added to the local copy of the EPSG database and is then available to be added as one of the CRS to be used by NavView. It is not automatically added to the Horizontal CRS in use by NavView.

1. Access the Horizontal CRS view

2. Select Horizontal CRS tab

3. Click User to display all the User created CRS currently present in the database
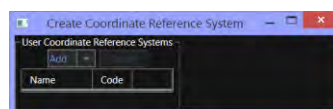
FIGURE 3-14 USER PROJECTED CRS

Note: All User created CRS present in the local EPSG database are displayed in this view.

4. To add a new CRS, click the Add split button and select to add either a Transverse Mercator or Lambert Two Standard Parallel Projected CRS

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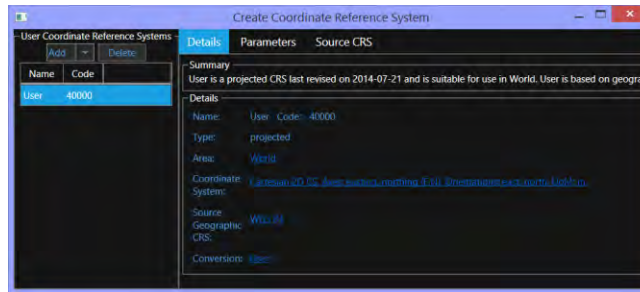
FIGURE 3-15 USER CRS - TRANSVERSE MERCATOR OPTION

    a. NavView will look for and use the lowest available EPSG code that can be assigned to the user CS and generate a default Projected CRS and add it to the database

Note: The allowed range of codes is 40000 to 49999

    b. The new CRS will be added to the list and ready for configuration

5. To configure a User CRS, select it in the list
    a. **Details tab** presents and behaves here as it does in the main Horizontal CRS view, displaying the CRS parameter summary complete with hypertext allowing the operator to view greater details
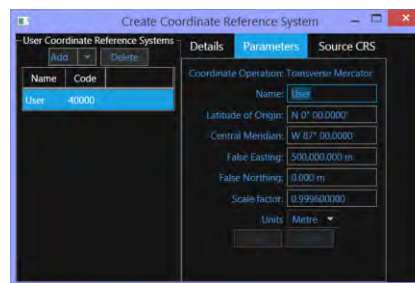
FIGURE 3-16 USER CRS - PARAMETERS TAB

    b. **Parameters tab** presents the respective map projection parameters for review and editing
       i. Edit as required
      ii. Click Save to save changes
     iii. Click Revert to dump changes and revert to last saved parameters

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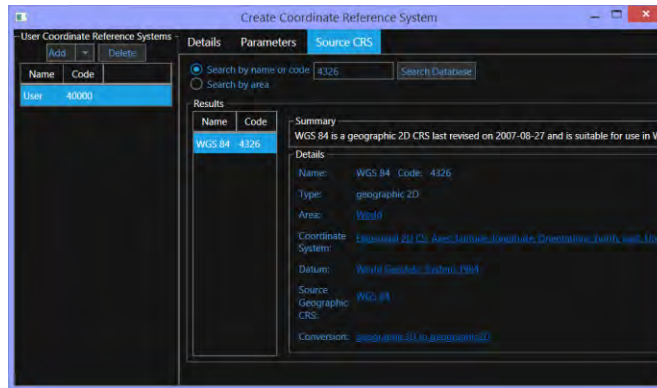
FIGURE 3-17 USER CRS - SOURCE CRS TAB

c. **Source CRS tab** presents current source CRS (default is WGS 84, code 4326), this tab behaves in the same manner as the search database page in the wizard for Add a Horizontal CRS

　　　i. Enter the EPSG name or code of the required Geographic 2D CRS, or a position in the work area

　　　ii. Click Search Database

　　　iii. If the search is unsuccessful, Search failed will display in red below the entry box

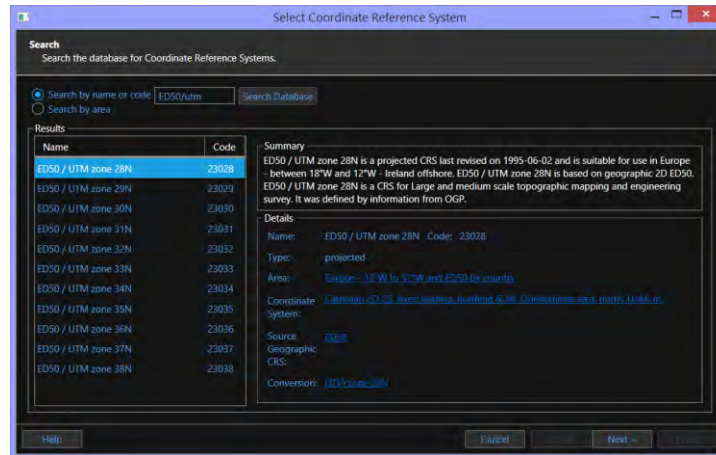　　　iv. If the search is successful, the dialog will expand to list the EPSG CRS found to match the entry

　　　v. Select the appropriate CRS and review the details for this CRS

　　　vi. Click Save to save the selection as the Source CRS

　　　vii. Click Revert to dump changes and revert to last saved Source CRS

6. Close the window by clicking the X

3.6.5 Set the Working Projected CRS

NavView requires that one Projected CRS be always set as the Working CRS.

1. Access the Horizontal CRS view

2. Select Horizontal CRS tab

3. Select the CRS to be set to Working

4. Click Set Working

5. This CRS in the list will show Yes in the Working column

Note: Only Projected CRS can be set to Working. The Set Working button is therefore only enabled when a Projected CRS that is not already set to Working is selected.

3.6.6 Remove a Horizontal CRS from NavView

If a CRS currently added to NavView is no longer required, it can be removed. Note that this does not remove it from the EPSG database.

1. Access the Horizontal CRS view

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2. Select Horizontal CRS tab

3. Select the CRS to be removed

4. Click Remove

5. Respond to the confirmation prompt accordingly
    a. Yes to continue with the action and remove the CRS
    b. No to abort the process and leave the CRS added to NavView

Note: The Remove button will only enable if the selected CRS can be removed. The WGS 84 CRS, code 4326, and the CRS set Working cannot be removed.

3.6.7 Delete a User Projected CRS
If a User created CRS is no longer required, it can be deleted from the local EPSG database.

1. Access the Horizontal CRS view

2. Select Horizontal CRS tab

3. Click User to display all the User created CRS currently present in the database

4. Select the CRS to be removed from the EPSG database

5. Click Delete

6. Respond to the confirmation prompt accordingly
    a. Yes to continue with the action and delete the CRS from the database
    b. No to abort the process and leave the CRS in the database

Note: A User created CRS cannot be removed if it is currently added to those CRS used by NavView. If such a User created CRS is selected, the Delete button will not be enabled.

7. Close the window

3.6.8 Configure Transformations
NavView automatically adds a coordinate operation place holder for transformations between every possible pairing of different Geographic CRS added to NavView. These may be added directly as Geographic 2D CRS or indirectly as the Source Geographic 2D CRS of a Projected CRS. These require configuration as there is often more than one transformation option for a given pairing.

1. Access the Horizontal CRS view

2. Select Transformations tab

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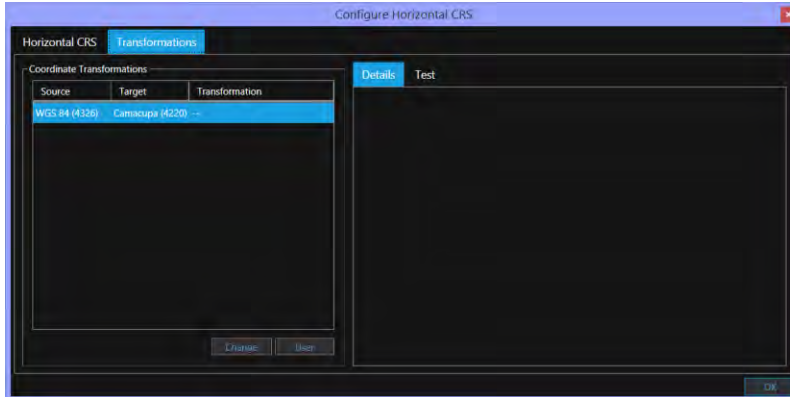
FIGURE 3-18 CONFIGURE TRANSFORMATIONS

3. Select the Transformation to configure

Note: If the Transformation has been previously configured, the details for the current setting will display in the Details tab. If it has not been configured, no information is displayed in this tab.

4. Click Change to display a list of transformations that apply to the respective source and target CRS
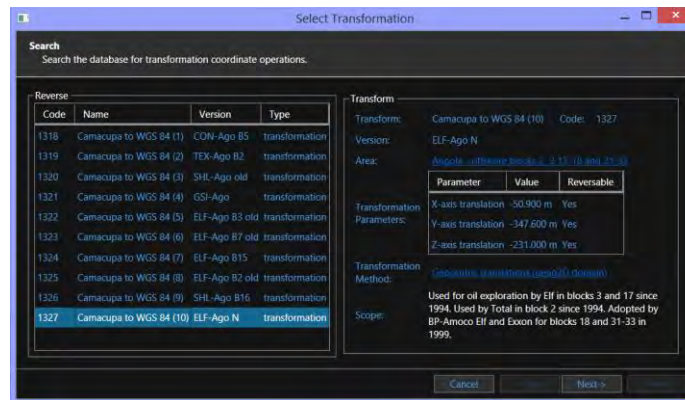
FIGURE 3-19 SELECTING FROM AVAILABLE TRANSFORMATIONS

a. Selecting a Transformation from the list will display the respective details in the right panel.
b. Clicking on any hyperlink will expand that item to display its details
c. Select the desired Transformation and click Next

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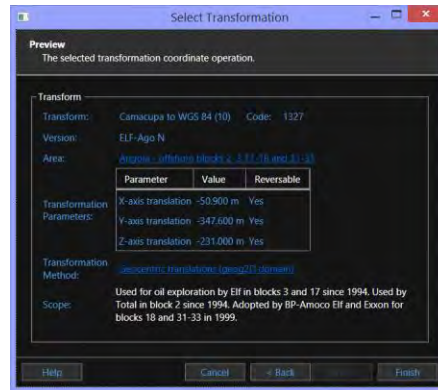
FIGURE 3-20 REVIEW SELECTED TRANSFORMATION

  d. Review the details to confirm they define the required Transformation
      i. Click Finish if correct
      ii. Click Back or Cancel if not

5. The newly configured Transformation will display in the Horizontal CRS tab with the respective source and target CRS

3.6.9 Create and Change a User Transformations

A user can add and configure a transformation to address cases where an existing EPSG transformation does not apply. The transformation is added to the local copy of the EPSG database and is then available to be selected as part of Configure Transformations.

Note: The sign convention supported for the NavView User transformation is the Coordinate Frame Rotation (EPSG code 1032) for source CRS to target CRS as summarized below. For further information, see Coordinate Conversions and Transformations including Formulas, OGP Publications 373-7-2 available at Guidance Note 7 Part 2 (tiny.cloud)

Translation Vector (dX, dY, dZ): Added to the position vector in the source CRS to obtain the position vector in the target CRS.

Rotations (rX, rY, rZ): Applied to the coordinate reference frame, positive is clockwise rotation looking out from the origin in the positive direction of respective axis.

Scale: Applied to the position vector in the source CRS to obtain the position vector in the target CRS.

Note: If the transformation parameters to be used are provided in Position Vector Transformation convention, the translation and scale parameters are applied as is in the Coordinate Reference Frame convention, but the rotation sign convention is reversed.

1. Access the Horizontal CRS view

2. Select Transformations tab

3. Click User

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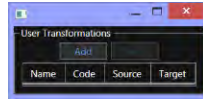
FIGURE 3-21 CREATE USER TRANSFORMATION

Note: All User created transformations present in the local EPSG database are displayed in this view by Name, EPSG Code, Source CRS and Target CRS.

4. To add a new transformation, click Add
   a. NavView will look for and use the lowest available EPSG code that can be assigned to the user transformation, generate a default transformation and add it to the database

Note: The allowed range of codes is 50000 to 59999

   b. The new transformation will be added to the list and ready for configuration

5. To change a transformation, select it in the list

FIGURE 3-22 USER TRANSFORMATION PARAMETERS

6. Configure the transformation

   Source CRS: Select a CRS from the drop-down list populated by those Geographic 2D CRS present in NavView

   Target CRS: Select a CRS from the drop-down list populated by those Geographic 2D CRS present in NavView

Note: If a previously User created Transformation has as its Source and/or Target CRS, a CRS that is no longer present in NavView, it will still display in the respective list.

   Coordinate Frame Rotation: Enter the respective transformation parameters paying particular attention to the sign convention, including a suitable name

   a. Click Save to save changes
   b. Click Revert to dump changes and revert to last saved parameters

Note: Until Save is executed, a newly created transformation is not saved to the local EPSG database.

7. Close the view

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3.6.10 Delete a User Transformation

If a User created transformation is no longer required, it can be deleted from the local EPSG database.

1. Access the Horizontal CRS view

2. Select Transformations tab

3. Click User to display all the User created transformations currently present in the database

4. Select the transformation to be removed from the EPSG database

5. Click Delete

6. Respond to the confirmation prompt accordingly
   a. Yes to continue with the action and delete the transformation from the database
   b. No to abort the process and leave the transformation in the database

Note: A User created transformation cannot be removed if it is currently in use by NavView. If such a User created transformation is selected, the Delete button will not be enabled.

7. Close the window

3.6.11 Test Coordinate Operations

NavView supports a coordinate operations test feature to simplify the confirmation that the geodesy is correctly configured. This is available in the Test tab for both the Horizontal CRS and Transformations tab of the Horizontal CRS view.

The test coordinate operations available in the Horizontal CRS tab depend upon the CRS present and the one selected and always involve the Working Projected CRS.

Selected CRS	Supported Coordinate Operations
Geographic 2D CRS	Transformation between Selected Geographic 2D CRS' Source Geographic CRS and the Working Projected CRS' Source Geographic CRS
	Conversion between the Working Projected CRS' Source Geographic CRS and its projection

FIGURE 3-23 HORIZONTAL CRS - TEST TAB GEOGRAPHIC 2D CRS COORDINATE OPERATION

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Projected CRS Transformation between Selected Geographic 2D CRS' Source Geographic CRS and the Working Projected CRS' Source Geographic CRS

       Conversion between the Selected Projected CRS' Source Geographic CRS and its projection

       Conversion between the Working Projected CRS' Source Geographic CRS and its projection
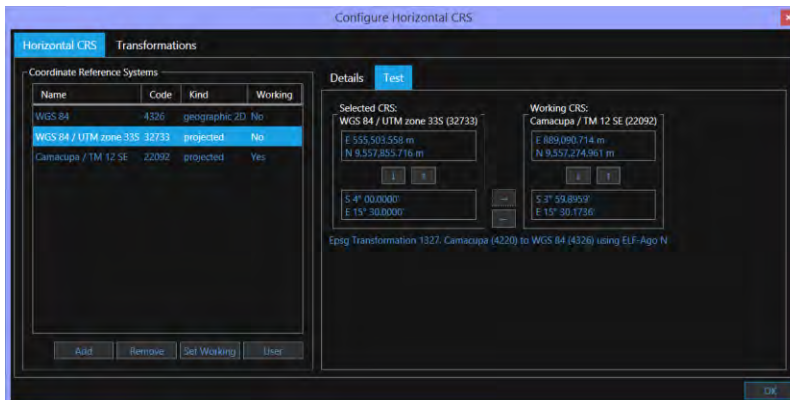
FIGURE 3-24 HORIZONTAL CRS TEST TAB - PROJECTED CRS COORDINATE OPERATIONS

Working CRS   Conversion between the Working Projected CRS' Source Geographic CRS and its projection
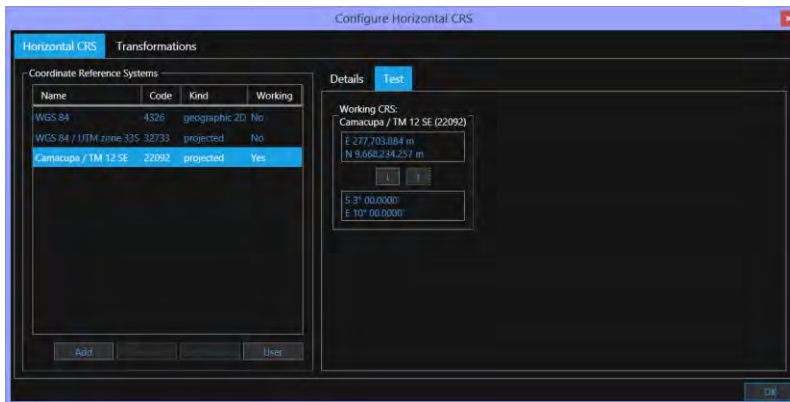
FIGURE 3-25 HORIZONTAL CRS - TEST TAB WORKING CRS COORDINATE OPERATIONS

The test operation available in the Transformations tab is a transformation between the Source and Target CRS of the selected Transformation.

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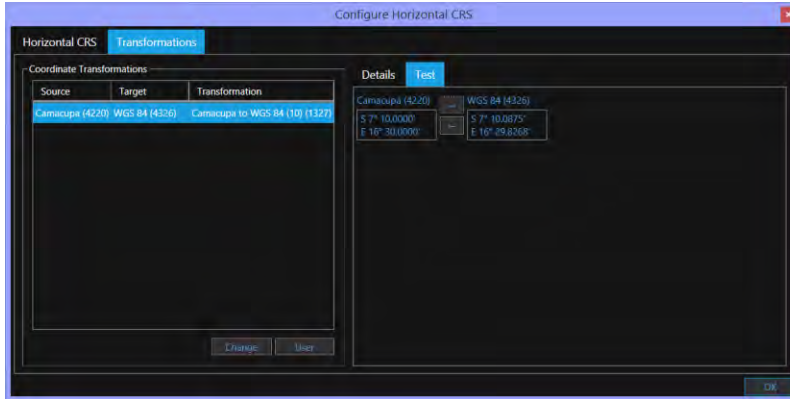
FIGURE 3-26 TRANSFORMATIONS TEST TAB - COORDINATE OPERATION

Note: Coordinates are displayed based on the respective Projected CRS units and NavView Preference settings.

3.6.11.1 Horizontal CRS Test Coordinate Operations

1. Access the Horizontal CRS view

2. Select the Horizontal CRS tab

3. Select the Horizontal CRS to test

4. Select the Test tab
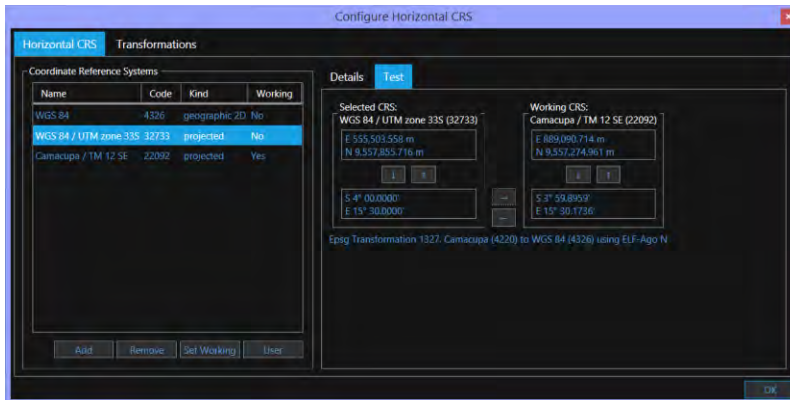
FIGURE 3-27 HORIZONTAL CRS COORDINATE OPERATION EXAMPLE

5. Enter a coordinate in the appropriate entry box and click an arrow pointing away from that box to automatically perform all possible coordinate operations using the entered coordinate as the base

3.6.11.2 Transformations Test Coordinate Operation

1. Access the Horizontal CRS view

2. Select the Transformations tab

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3. Select the Transformation to test

4. Select the Test tab
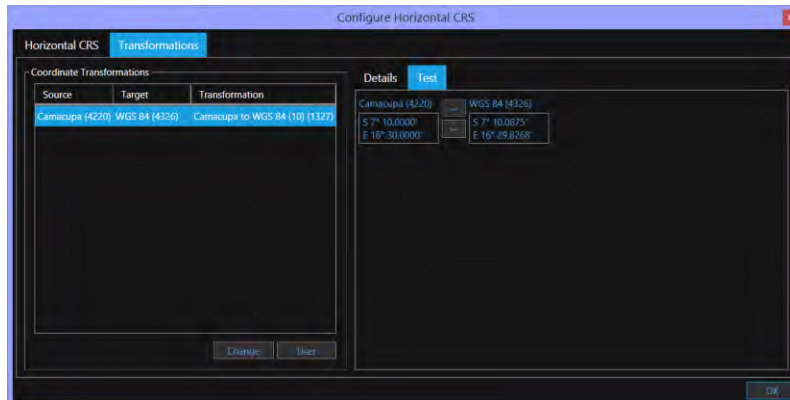
FIGURE 3-28 EXAMPLE TRANSFORMATIONS COORDINATE OPERATION

5. Enter a coordinate in the appropriate entry box and click the arrow pointing away from that box to perform the transformation coordinate operation

3.7 Using the Vertical CRS View

The Vertical CRS defines the vertical datum and the default vertical units used by NavView when dealing with elevation, depth and height terms. In some cases, such as the import of a digital terrain model (DTM) the vertical CRS and units defaults to the Working Vertical CRS but can be edited to reference another vertical CRS. However, in the case of 3D model files, these must be in the same units as the Working Vertical CRS.

The Vertical CRS view presents the Vertical CRS and associated coordinate operations for review and editing. The view has two main tabs: Vertical CRS and Transformations. Each of these displays a list of the respective items in the left panel and associated Details and Test tabs in the right panel. The Details tab includes hypertext (underlined blue text) that when clicked expand to provide additional information for that item

3.7.1 Vertical CRS Tab

Coordinate Reference Systems lists the Vertical CRS currently setup for use in NavView in a data grid sortable by columns.

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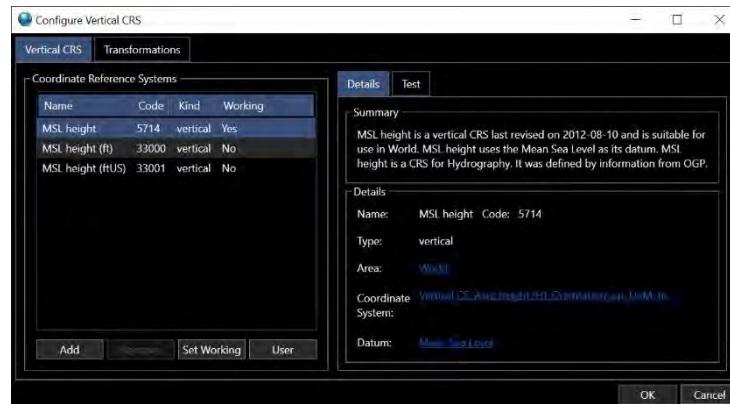
FIGURE 3-29 VERTICAL CRS

Name: EPSG name or user entered name
Code: EPSG code, including those assigned to user created CRS
Kind: Vertical
Working: Yes if CRS is the Working Vertical CRS, No if not

Details tab display the parameters for the selected CRS. Click on the hyperlinks in the Details to view the EPSG details for that item.

Test tab does not display anything.

3.7.2 Transformation Tab
The Vertical CRS transformation involves an offset to relate one Vertical CRS to another.
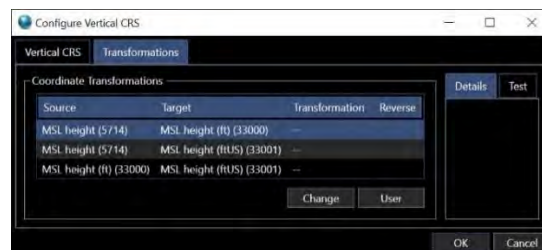
FIGURE 3-30 VERTICAL CRS TRANSFORMATIONS - DETAILS TAB

Coordinate Transformation lists all the coordinate transformations required to support transformations between the Vertical CRS currently setup for use in NavView. These are displayed in a data grid sortable by columns.

Source: EPSG or user assigned name and code of the source vertical CRS
Target: EPSG or user assigned name and code of the target vertical CRS
Transformation: EPSG or user assigned name and code of the transformation

Reverse: Indicates if transformation is applicable to being used to transform from source CRS to target CRS and back

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Details tab display the parameters for the selected transformation. Click on the hyperlinks in the Details to view the EPSG details for that item.

FIGURE 3-31 VERTICAL **CRS** TRANSFORMATIONS - TEST TAB

Test tab displays the coordinate operation for the selected transformation, Source Vertical CRS coordinate transformation to/from the target Vertical CRS.

3.7.3 Add a Vertical CRS

All Vertical CRS that are required for a specific NavView application must be added to be available for use. By default, NavView loads the following vertical CRS:

- MSL height, EPSG code 5714
- MSL height (ft), EPSG code 3300
- MSL height (ftUS), EPSG code 33001

If a one or more other vertical CRS are required, they must be added.

1. Access the Vertical CRS view

2. Click the Add button to launch a wizard to step through the searching for and adding of a vertical CRS
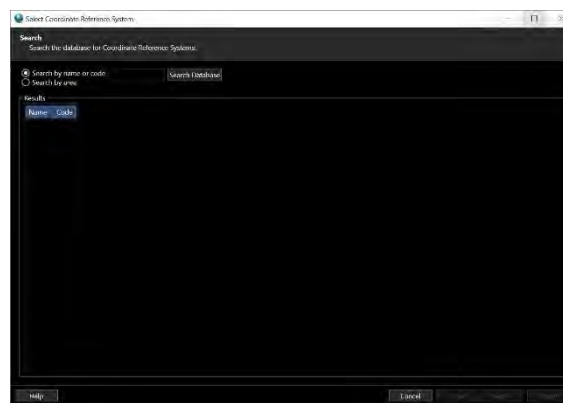
FIGURE 3-32 ADD VERTICAL **CRS** – SEARCH BY NAME OR CODE

3. Select Search by name or code if either have been provided
   a. Enter the EPSG code or name in the associated entry box and click Search Database

Note: The EPSG code and name options include user created CRS. These are assigned an EPSG code when created and added to the local database.

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Note: When entering a name, the search looks for those EPSG CRS' whose name or alias contains the entry after removing the blanks (whitespaces) in both the entry and CRS name and alias. For example, entering **msl** will result in a list of all EPSG vertical CRS with msl in the name, such as MSL depth, MSL height, etc.

Note: When entering the EPSG CRS code, the search is specific and only lists the EPSG CRS with that exact code.

4. Or select Search by area if unsure of the EPSG code or name of the required CRS
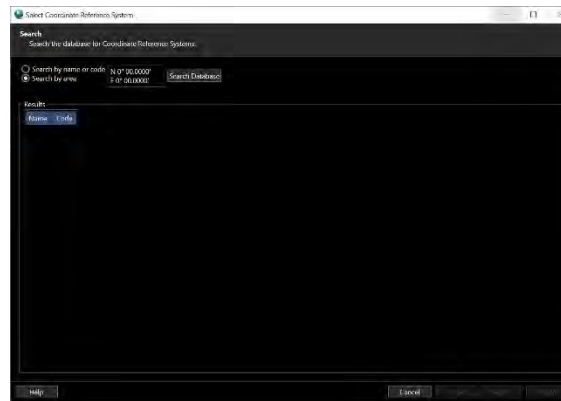
FIGURE 3-33 ADD VERTICAL CRS - SEARCH BY AREA

   a. Enter a position within the work area and click Search Database
5. If the search is unsuccessful, Search failed will display in red below the entry box

6. If the search is successful, the dialog will expand to list the EPSG CRS found to match the entry
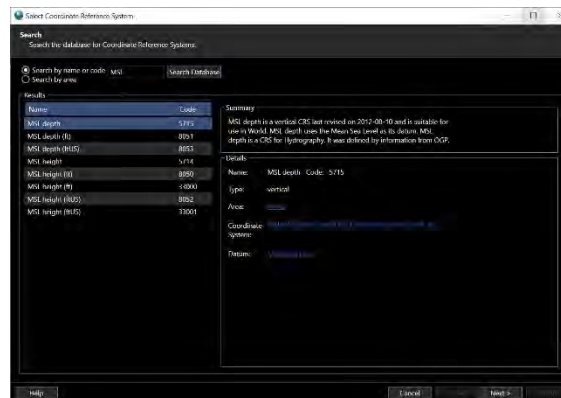
FIGURE 3-34 ADD VERTICAL CRS - FOUND CRS

   a. Selecting a CRS from the list will display the respective CRS details in the right panel.
   b. Clicking on a hyperlink will expand that item to display its details
   c. If the search does not result in the required CRS, repeat the search process, otherwise
   d. Select the desired CRS in the list, confirm the details, then click Next

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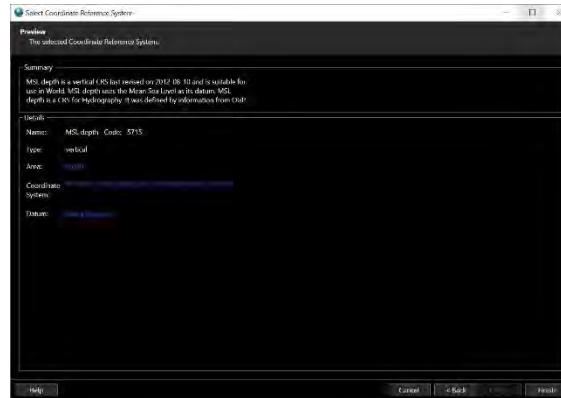
FIGURE 3-35 ADD VERTICAL CRS - FINISH SELECTION

  a. Review the details to confirm they define the required CRS
      i. Click Finish if correct
      ii. Click Back or Cancel if not

7. You will be prompted with an option to set the newly added CRS as the working , answer accordingly
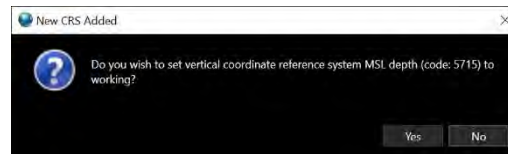
FIGURE 3-36 ADD VERTICAL CRS - SET TO WORKING PROMPT

3.7.4 Create and Change User Vertical CRS

A user can add and configure a Vertical CRS to address cases where an existing EPSG CRS does not apply.

Note: The User CRS is added to the local copy of the EPSG database and is then available to be added as one of the CRS to be used by NavView. It is not automatically added to the Vertical CRS in use by NavView.

1. Access the Vertical CRS view

2. Select Vertical CRS tab

3. Click User to display all the User created Vertical CRS currently present in the database

FIGURE 3-37 USER VERTICAL CRS

4. To add a new CRS, click the Add button
   a. NavView will look for and use the lowest available EPSG code that can be assigned to the user CRS and generate a default Vertical CRS and add it to the database

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Note: The allowed range of codes is 40000 to 49999

      b. The new CRS will be added to the list and ready for configuration

5. To configure a User Vertical CRS, select it in the list

      c. **Details tab** presents and behaves here as it does in the main Vertical CRS view, displaying the CRS parameter summary complete with hypertext allowing the operator to view greater details

FIGURE 3-38 USER VERTICAL TAB - PARAMETERS

      d. **Parameters tab** presents the respective CRS parameters for review and editing

          i. **Name:** Enter an appropriate name for the new CRS

          ii. **Coordinate System:** From the drop-down list select the option that combines the desired orientation (up positive or down positive) and units

          iii. **Datum:** from the drop-down list select the datum, if it is not present, click the Add button and enter a name and origin for the CRS

      e. Click **Save** to save the parameters, or click **Revert** to dump the changes

6. Close the window by clicking on the X

3.7.5 Set the Working Vertical CRS

NavView requires that one Vertical CRS be always set as the Working Vertical CRS.

1. Access the Vertical CRS view

2. Select Vertical CRS tab

3. Select the Vertical CRS to be set to Working

4. Click Set Working

3.7.6 Remove a Vertical CRS from NavView

If a Vertical CRS currently added to NavView is no longer required, it can be removed. Note that this does not remove it from the EPSG database.

1. Access the Vertical CRS view

2. Select Vertical CRS tab

3. Select the Vertical CRS to be removed

4. Click Remove

5. Respond to the confirmation prompt accordingly

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a. Yes to continue with the action and remove the CRS
b. No to abort the process and leave the CRS added to NavView

3.7.7 Delete a User Vertical CRS from EPSG Database
If a User created Vertical CRS is no longer required, it can be deleted from the local EPSG database.

1. Access the Vertical CRS view

2. Select Vertical CRS tab

3. Click User to display all the User Vertical CRS currently present in the database

4. Select the Vertical CRS to be removed from the EPSG database

5. Click Delete

6. Respond to the confirmation prompt accordingly
    a. Yes to continue with the action and delete the CRS from the database
    b. No to abort the process and leave the CRS in the database

Note: A User created CRS cannot be removed if it is currently added to those CRS used by NavView. If such a User created CRS is selected, the Delete button will not be enabled.

7. Close the window

3.7.8 Configure Vertical Transformations
NavView automatically adds a coordinate operation place holder for transformations between every possible pairing of the Vertical CRS added to NavView. These require configuration as there may be more than one transformation option for a given pairing.

1. Access the Vertical CRS view

2. Select Transformations tab
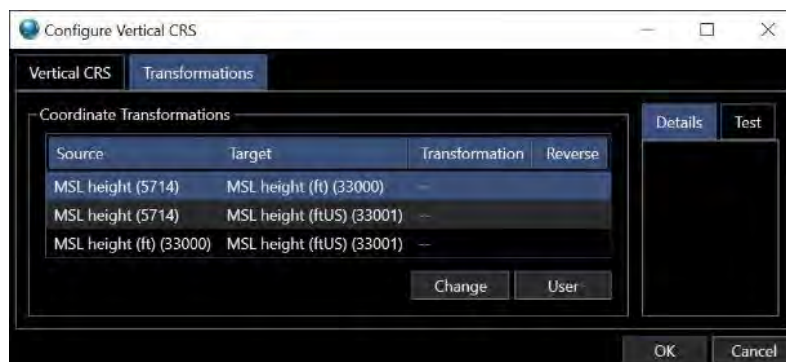
FIGURE 3-39 VERTICAL CRS TRANSFORMATION TAB

3. Select the transformation to configure

Note: If the Transformation has been previously configured, the details for the current setting will display in the Details tab. If it has not been configured, no information is displayed in this tab.

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4. Click Change to display a list of transformations that apply to the respective source and target CRS
   a. Selecting a Transformation from the list will display the respective details in the right panel.
   b. Clicking on any hyperlink will expand that item to display its details
   c. Select the desired Transformation and click Next
   d. Review the details to confirm they define the required Transformation
      i. Click Finish if correct
      ii. Click Back or Cancel if not

Note: If no transformations are detected as being applicable for the selected transformation none are listed, click Cancel.

5. The newly configured Transformation will display in the Transformation tab with the respective source and target CRS

3.7.9 Create and Change a User Vertical Transformation

A user can add and configure a transformation to address cases where an existing EPSG transformation does not apply. The transformation is added to the local copy of the EPSG database and is then available to be selected as per Configure Vertical Transformations.

1. Access the Vertical CRS view

2. Select Transformations tab

3. Click User
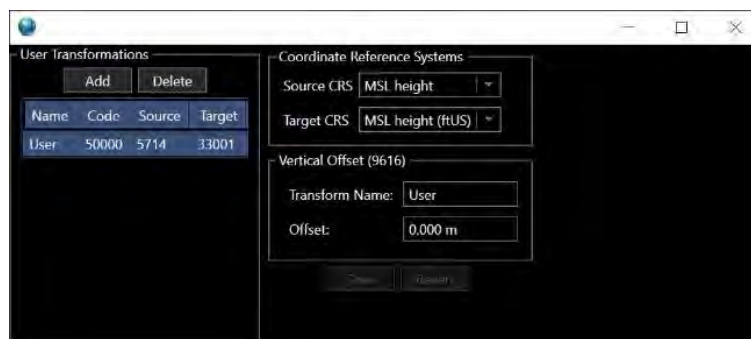
FIGURE 3-40 USER VERTICAL TRANSFORMATION

4. To add a new a new transformation, click Add
   a. NavView will look for and use the lowest available EPSG code that can be assigned to the user transformation, generate a default transformation and add it to the database

Note: The allowed range of codes is 50000 to 59999

   b. The new transformation will be added to the list and ready for configuration

5. To change a transformation, select it in the list

6. Configure the transformation

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Source CRS: Select a CRS from the drop-down list populated by those Vertical CRS present in NavView

Target CRS: Select a CRS from the drop-down list populated by those Vertical CRS present in NavView

Note: If a previously User created Vertical Transformation has as its Source and/or Target CRS, a CRS that is no longer present in NavView, it will still display in the respective list.

Transform Name: Enter a suitable name

Offset: Enter the offset to be added to the Source CRS elevation to obtain the Target CRS elevation

a. Click Save to save changes
b. Click Revert to dump changes and revert to last saved parameters

Note: Until Save is executed, a newly created transformation is not saved to the local EPSG database.

7. Close the view

3.7.10 Delete a User Vertical Transformation from EPSG Database

If a User created Vertical Transformation is no longer required, it can be deleted from the local EPSG database.

1. Access the Vertical CRS view

2. Select Transformation tab

3. Click User to display all the User Vertical Transformations currently present in the database

4. Select the Vertical Transformation to be removed from the EPSG database

5. Click Delete
6. Respond to the confirmation prompt accordingly

a. Yes to continue with the action and delete the transformation from the database
b. No to abort the process and leave the transformation in the database

Note: A User created transformation cannot be removed if it is currently in use by NavView. If such a User created transformation is selected, the Delete button will not be enabled.

7. Close the window

3.7.11 Vertical Transformation Tests

NavView provides a test feature to confirm that a selected vertical transformation is correctly configured.

1. Access the Vertical CRS view

2. Select Transformation tab

3. Select the vertical transformation to test

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4. Select the Test tab
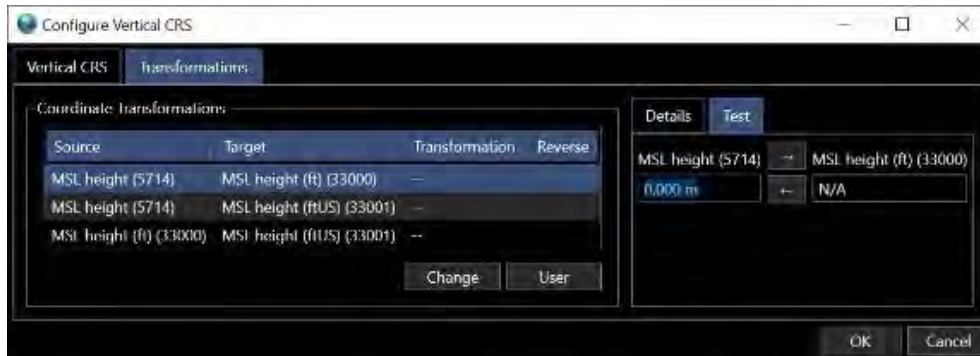
FIGURE 3-41 VERTICAL TRANSFORMATION TEST

5. Enter an elevation in the Source CRS (left) and click the arrow pointing to the right

6. Confirm that the transformation offset is added to the Source CRS elevation to obtain the correct Target CRS elevation

7. Enter an elevation in the Target CRS (right) and click the arrow pointing to the left

8. Confirm that the transformation offset is subtracted from the Target CRS elevation to obtain the Source CRS elevation

9. Click OK to close the window

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4 Projects

This section provides an overview how projects are created, opened, and edited in NavView.

4.1 Overview

NavView uses the concept of *Projects* and *Stations* to define the overall configuration and setup of the software for a construction operation or project and the NavView clients in use for the project. These concepts and how they are applied are detailed in this section.

If Roles and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In	Cannot Open, create New, Import or Save a project
User	Cannot Open, create New, Import or Save a project
Online/Supervisor	Can Open, create New and Save a project; Cannot Import a project
Admin (Administrator)	Can Open, create New, Import and Save a project

4.1.1 Project

In NavView terms, a project is a specific set of configurations and supporting files associated with a construction project or specific phase of a project. These are divided into three basic levels. The top level involves the configuration information that is required for and common to the entire project. This includes geodesy and project details. The next level involves the supporting files and data that are *Shared* for the project, for example, background drawings, digital terrain model (DTM) files, 2 dimensional and 3 dimensional visual object files, etc. The final level involves configurations and data specific to each of the NavView clients, also referred to as Stations, deployed for the project operation, for example device, calculation and vehicle configurations. These are considered to be *Local*.

Projects can be created, edited and opened as required. This capability can be used by the operator to easily switch between projects or configurations specific to different operations within a single project.

4.1.2 Station

A station is a NavView client involved in a project configured to meet a specific requirement. Examples of a station are the online survey NavView system, an ROV van NavView system providing vehicle tracking and monitoring for ROV operators, a DPS NavView system providing vehicle tracking and monitoring as well as limited control of operations for the DPOs, and a remote NavView system operating as the online system on a support vessel. A station uses the project configuration as the base for its configuration but is then refined with station configuration options such as devices interfaced with, vehicles added and their configuration and presentation options, etc.

Note: A Station is a specific instance of NavView client and is not to be confused with a vessel or vehicle configuration. A single vessel may have multiple stations deployed throughout each meeting a specific requirement for the manipulation and presentation of data, any one of which may define and configure one or more vehicles. A single vessel may also have only a single station that includes the definition and configuration for that vessel only.

The configuration for a NavView station is considered to be *Local* to that station.

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Note: It is important to be aware that NavView utilizes and assigns *Globally Unique Identifiers* or *GUID*s to all objects involved with a station's configuration making each station itself unique. As a result, a station is not to be duplicated within a project, i.e., do not manually copy an existing Local station folder in a project and use for another station.

4.2 Project Folder

NavView utilizes a specific project folder structure and while the user is not constrained to follow this structure for all aspects of the configuration, it is recommended. The project folder structure follows the aforementioned concept of *Shared* and *Local*. It is designed to facilitate local and remote operations. Figure 4-1 shows the project folder hierarchy. Each NavView client has a copy of the Project folder.

Project folders contain two primary subfolders: Local and Shared. Within the Local folder are subfolders containing the configuration for specific stations based on that station's name. These include device interface configuration, calculations configuration, vehicles configuration, workspace window layout, etc. These folders and files are placed here by NavView and must be located here.

Note: It is not necessary for any one station to have the Local station folders for all stations on the network, only that for itself.
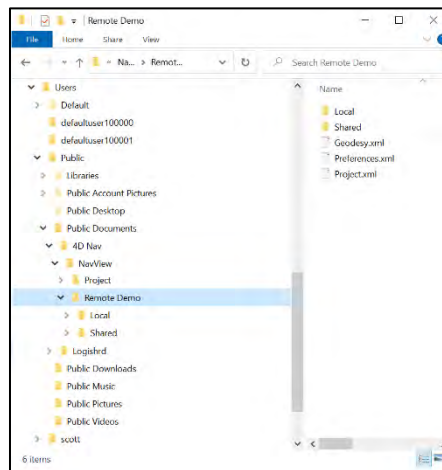

FIGURE 4-1 PROJECT FOLDER STRUCTURE

Those project files that are of a more general nature and may wish to be available to other NavView systems via the data server are in the Shared folder. These include files such as vehicle shapes, waypoints, pipelines, rig moves, etc. NavView automatically creates the Shared folders shown in Figure 4-1. The user must populate them accordingly.

The critical project configurations that are used by all NavView stations are in the project folder itself, specifically addressing Geodesy, Preferences and Project.

While it is possible to utilize files in NavView that are not located within the respective project folder, it is strongly recommended that this be avoided. Keeping the project self-contained promotes file and project management, simplifies archiving and facilitates technical support because the project can easily be replicated by loading the project.

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Note: File paths are saved to the respective configuration files relative to the project folder. Therefore, selecting files that are located outside of the project folder can result in paths that are easily broken.

4.3 Create a New Project

Projects are created using the New Project wizard. This steps the user through creating the project and configuring the critical component (Geodesy) after which the user can work through the remaining configuration process by directly accessing the respective configuration dialogs and windows. These will generally be Devices, Calculations and Vehicles in this order to setup how incoming data will be used. This will be followed by opening and configuring views to monitor operation and present the data in a way to accomplish the goals of the project, e.g., 2D views, 3D views, route guidance, etc.

Note: If Roles are enabled, only a user with Supervisor or Administrator privileges can create a new project.

1. Launch the New Project wizard by expanding the File menu and clicking on New; or

2. From the No Project Loaded Dialog, click on New

3. Enter the name of the new project. This should be descriptive but not long. Note that the wizard will not let you use the name of an existing project. Click Next.
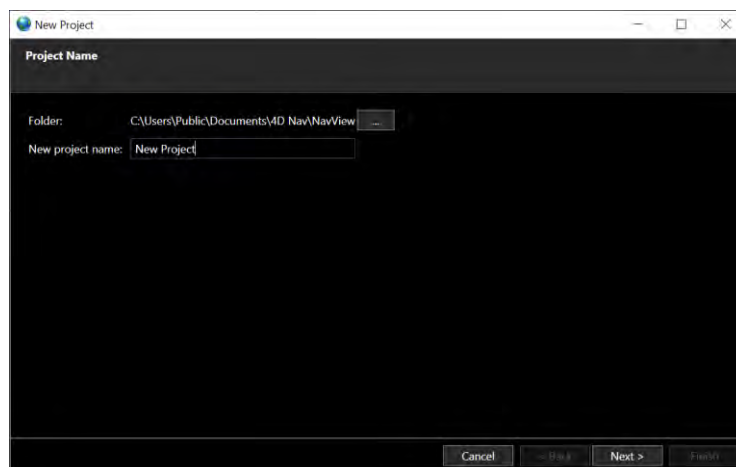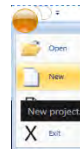

FIGURE 4-2 PROJECT WIZARD - PROJECT NAME PAGE

4. Configure the Horizontal CRS (see Geodesy section for details)

Note: When creating a new project on a NavView remote that will connect to an existing project on the MongoDB and Redis services, i.e., the Horizontal CRS(s) and transformation(s) have already been setup and configured on the online licensed NavView, do not make any changes on this page, just click Next. This remote will get the configuration from the server when it is connected to the network services.

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FIGURE 4-3 PROJECT WIZARD - HORIZONTAL CRS PAGE

    a. If the default working Horizontal CRS is the desired CRS and no other CRS are to be added click Next, otherwise click Add to select a CRS from the EPSG database or User to add a user defined CRS.

        i. Upon adding a CRS, you will be asked if you wish to

            1. Set the newly added CRS to working, click Yes or No accordingly.

            2. Configure datum transforms for the new CRS, click Yes or No accordingly.

        ii. Repeat step (a.) as required for the Horizontal CRS required for the project.

    b. Click Next

  5. Configure the Vertical CRS (see Geodesy section for details) and click Next

Note: When creating a new project on a NavView remote that will connect to an existing project on the MongoDB and Redis services, i.e., the Vertical CRS has already been configured on the online licensed NavView, do not make any changes on this page, just click Next. This remote will get the configuration from the server when it is connected to the network services.
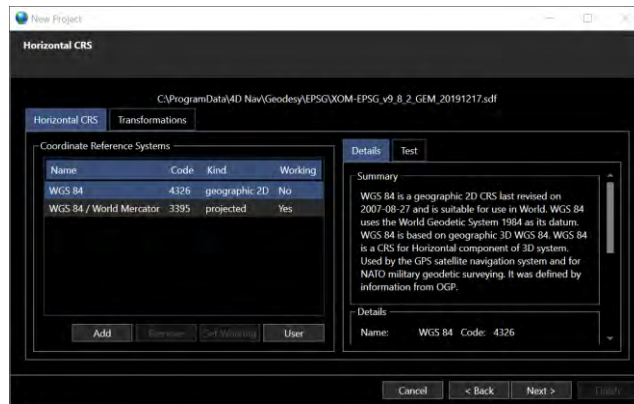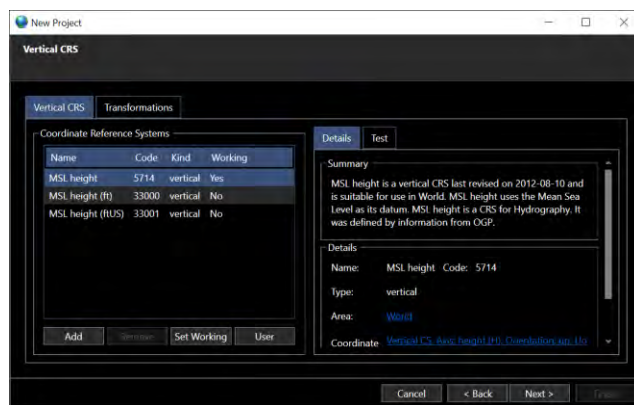

FIGURE 4-4 PROJECT WIZARD - VERTICAL CRS PAGE

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6. Edit the Project Configuration (see Configuration for details) and click Next
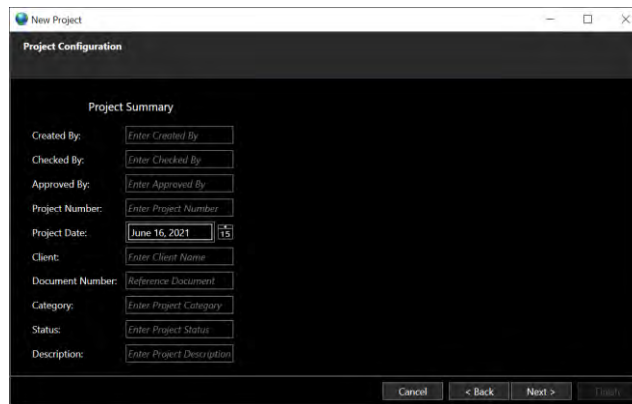

FIGURE 4-5 PROJECT WIZARD - PROJECT CONFIGURATION

7. Configure the Preferences for the units and format used to display data in NavView (see Preferences for details) and click Next
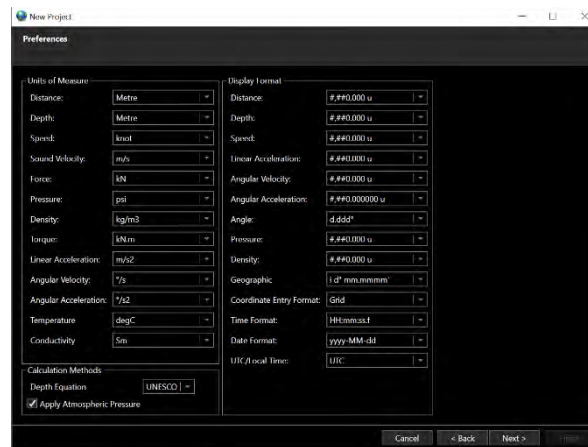
FIGURE 4-6 PROJECT WIZARD - PREFERENCES PAGE

8. Specify the station to implement during the new project creation
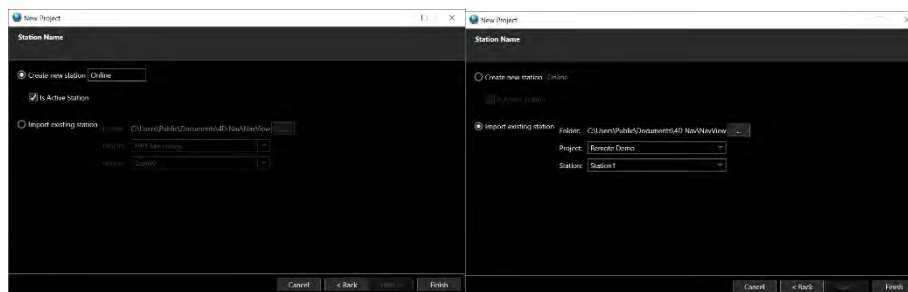

FIGURE 4-7 PROJECT WIZARD - STATION NAME PAGE

a. If a new station is to be created

i. Select **Create new station**

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ii.   Enter the name to use

iii. Specify if new station is active or not by checking or unchecking the **Is Station Active** box. If a station is set Active any outputs it is configured for, e.g., configurable output for a video overlay system will be enabled for output. If a station is not set as Active outputs are not enabled.

b. If an existing station is to be used

i.   Select **Import existing station**

ii.   From the **Project** drop-down list, select the existing NavView project that the station to import is part of

iii. From the **Station** drop-down list, select the existing NavView station from those present in the selected project to import

iv. Specify if station is to be active or not by checking or unchecking the **Is Active Station** box in the Project Configuration window

Note: The option to import an existing station into a new project facilitates the reuse of one that has already been configured and will be used in the new project in the same or very similar configuration. For example, on a permanent NavView installation on a construction vessel the configuration for the online survey station will generally be unchanged for the most part from one project to the next. This station will usually include the configuration for the devices interfaced with, vehicle configurations, etc. The option to import it from an existing project into the new project streamlines the setup process from project to project without introducing the issue of GUID conflicts created if the folder is simply copied in Windows Explorer and loaded.

9. If modules and features are present that require specific project configuration, e.g., Anchor Module, the respective wizard pages will display after the Station page. Complete these and continue with the wizard.

10. Click Finish to complete the creation of the new project and base configuration. NavView will create the project folder and specific base sub-folders shown in Figure 4-8 under Public Documents\4D Nav\NavView\ and then be ready to proceed with the rest of the configuration.
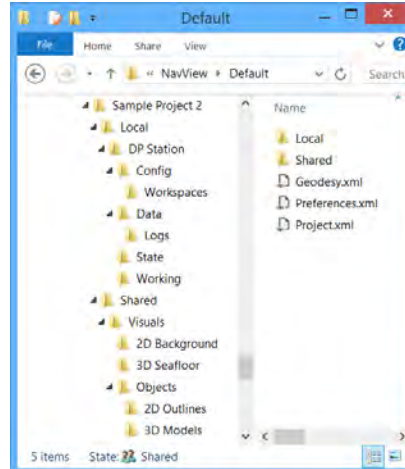
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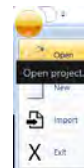Page 81

FIGURE 4-8 PROJECT WIZARD - FOLDERS CREATED

11. (Optional) Upon completing the new project wizard and prior to proceeding with the configuration of the project, supporting files should be copied into the respective folders, e.g., dwg files to be used as backgrounds for 2D views into Shared\Visuals\2D background, dwg/veh/shp files to be used for vehicle outlines into Shared\Visuals\Objects\2D Outlines, and xaml model files into Shared\Visuals\Objects\3D Models. This are then available during the configuration process.

12. Proceed to access the individual configuration dialogs and windows to continue the configuration.

4.4 Open an Existing Project

The user has the option to open an existing project and station or create a new station in an existing project. This facilitates opening a previously setup station and project (e.g., opening a station and project in the field after setting it up in the office) and setting up client NavView systems in a multi-NavView spread (e.g., online secondary, DP and ROV stations on a construction vessel).

Note: If Roles are enabled, only a user with Supervisor or Administrator privileges can create a new station.

1. Launch Open Project wizard by expanding the File menu and clicking on Open; or

2. From the No Project Loaded Dialog, click Open

3. Select the project from the dropdown list and click Next

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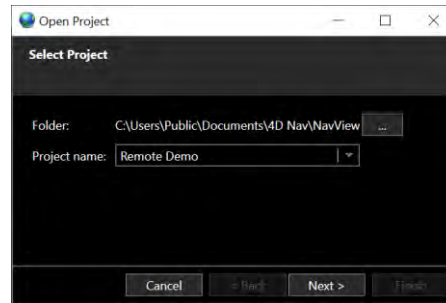Revision: 4.0
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FIGURE 4-9 OPEN PROJECT WIZARD - SELECT PROJECT PAGE
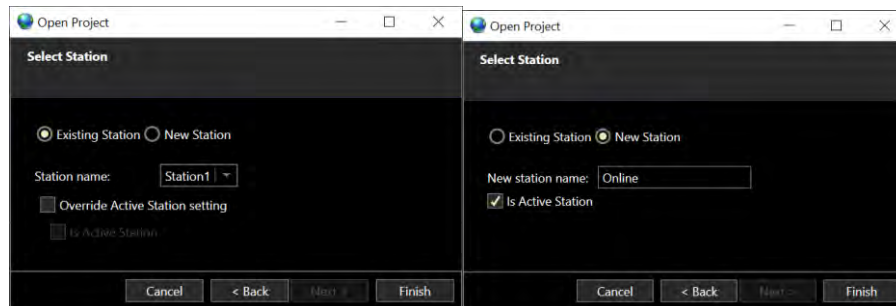
4. Specify the station to use for the project

FIGURE 4-10 OPEN PROJECT WIZARD – SELECT STATION PAGE

a. If an existing station in the project is to be used

    i. Select **Existing Station**

    ii. Select the station from drop down list of those present in the project being opened

    iii. Specify if the existing station's Active Station setting is to be overridden by checking or unchecking the **Override Active Station** setting box

    iv. If overriding the existing station's Active Station setting, specify if station is to be active or not by checking or unchecking the **Is Active Station** box

b. If creating a new station in the project

    i. Select **New Station**

    ii. Enter the new station name

    iii. Specify if new station is Active or not by checking or unchecking the **Is Station Active** box

c. Click Finish

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4.5 Launch a Project on Start Up

When NavView is launched it loads the last project and station it was configured for when it was exited. This information is contained in the file *C:\Program Data\4D Nav\NavView\Settings.xml*. If this file has been deleted or if either the specified project or station folder cannot be located, the operator is prompted to open an existing project or create a new one via the prompt shown is Figure 4-11.
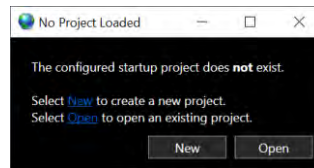

FIGURE 4-11 NO PROJECT LOADED DIALOG

New   Launches the new project wizard

Open   Launches the open project wizard

X   Closes the dialog but does not close the application. A project may still be opened or created from the main menu.

4.6 Import a Station

NavView supports the option to import a previously created station simplifying their reuse for multiple projects. This can be useful when creating a project in the office for deployment in the field that involves multiple stations that do not change between projects. For example, an Anchor project can often re-use stations for the rig and each anchor tug.

Note: If Roles are enabled, only a user with Supervisor or Administrator privileges can import a station.

1. Access the Import Station by expanding the File menu and clicking on Import

2. **Project**: Select the existing NavView project that contains the station to be imported
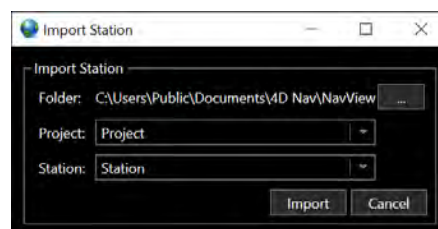

FIGURE 4-12 IMPORT STATION DIALOG

3. **Station**: Select the station to import from those present in the selected project

4. Click **Import**

    a. If the station already exists in the project, you will be asked if you want to overwrite the station, answer Yes to overwrite the station or No to abort the import process and return to the Import Station dialog

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5. If the import is successful, you will be prompted to open the new (imported) project station, answer Yes to switch to the new station or No to remain with the current station and return to the Import Station dialog

6. Click Cancel or x to close the dialog.

4.7 Edit a Project

Editing the project in this case refers to accessing and editing the configuration that was setup as part of the new project wizard. These are as follows.

4.7.1 Geodesy

This is accessed by clicking the Horizontal CRS and/or Vertical CRS buttons in the Project section of the Setup ribbon, or alternatively clicking on the same in the Explorer window. See the Geodesy section for details.

Note: If Roles are enabled, only users with Supervisor or Administrator privileges can edit the Geodesy. Others can view the settings but not change them.

4.7.2 Project Configuration

This is accessed by clicking the Configuration button in the Project section of the Setup ribbon, or alternatively clicking on the same in the Explorer window. This provides access to the Project Configuration page. This page has the Config Preferences and Environmental Parameters Tabs. These configurations are discussed in detail here.

Note: All users can edit the project configurations.

Any changes to any tabbed or non-tabbed options will activate the Apply button. Clicking the Apply button applies all the changes regardless of the tab displayed at the time and leave the window open.

Clicking the OK button applies all the changes regardless of the tab displayed at the time and closes the window.

4.7.3 Active Station

Above all the tabs, the checkbox **Active Station** provides the option to control if the station is to be active (outputs are enabled) or not active (outputs are disabled).

4.7.4 Configuration Tab

The Config tab enables the user to enter general project information to assist project management and tracking.
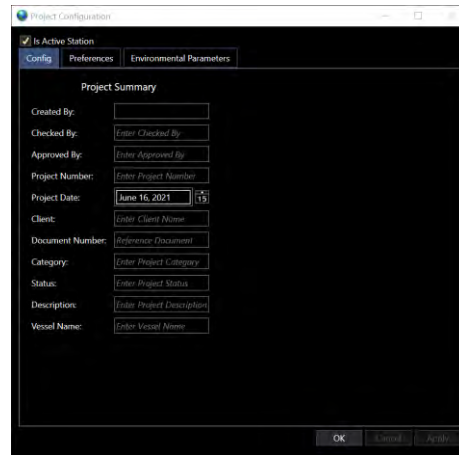
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FIGURE 4-13 PROJECT CONFIGURATION - CONFIG TAB

4.7.5 Preferences

The Preferences configuration enables the user to configure the default units and format for the presentation and entry of data in windows, dialogs and reports. In the case that window/report specific control of the units and/or formats is supported, the default are those set in Preferences.
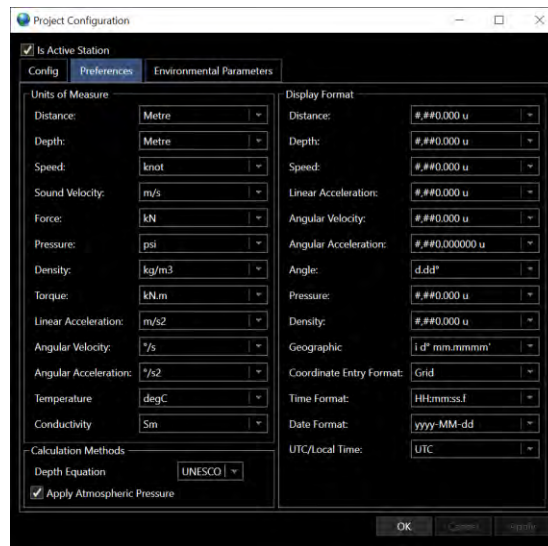

FIGURE 4-14 PROJECT CONFIGURATION - PREFERENCES TAB

4.7.6 Units of Measure

Select the units to be used when displaying data. These settings will also dictate the units assumed when data is loaded or entered without a unit designation. If units are included in any data loading and entry process, the data is loaded and accepted in those units.

4.7.7 Display Format

Select the format to be used to display the respective data. In general, the following apply to these settings:

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- Options are presented in a drop-down list.

- The number of decimal places to display is indicated by the number of the respective format type after the decimal place

  o For distances, depths, speed and density the number 0's

  o For angles the number of d's if the format is to be degrees and decimal degrees, m's if the format is to be degrees minutes and decimal of minutes, etc.

- For time the number of f's following the seconds (ss)

- The use of a delimiter between thousands and hundreds is indicated by creating the digit spaces to the left of the 1s with '#'

- The presence of a unit term is indicated by the presence of a 'u'.

- The location of the hemisphere term is indicated by the location of the 'I'.

4.7.8 Environmental Parameters

The Environmental parameters view is shown in Figure 4-155. These are primarily for Metrology projects.
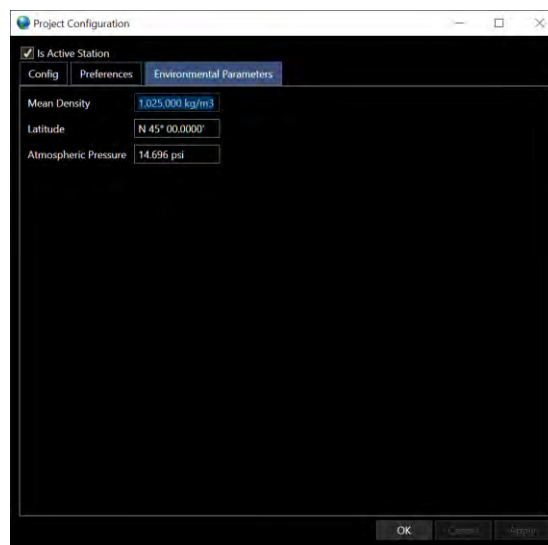

FIGURE 4-15 PROJECT CONFIGURATION – ENVIRONMENTAL PARAMETERS TAB

The mean density of the water column, as determined by a CTD cast is entered here, in the units specified in the Preferences view. The project latitude and atmospheric pressure are entered here as well, in the chosen formats.

The Environmental parameters entered in this view are very important for correctly calculating depth from pressure. The calculation method is specified on the Preferences tab.

Note: The Depth From Pressure calculation is configured independently of these settings.

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5 Devices

This section provides an overview of how devices are added and configured in the NavView software.

5.1 Overview

The term *devices* refers to the peripheral hardware interfaced to NavView to provide data to NavView (e.g., GPS receivers, gyros, ROV sensor suites) and/or accept data from NavView (e.g., video overlay systems).

The data received from devices is decoded and displayed for monitoring purposes and published as observations to be used in calculations. The decoded data is also available for selection to be output by other devices.

Device configuration is saved and loaded to and from the IO.xml file in the project's Local\Station\Config folder.

If Roles and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In	Cannot add, configure/edit or remove a device
User	Cannot add, configure/edit or remove a device
Online/Supervisor	Cannot add, configure/edit or remove a device
Admin (Administrator)	Can add, configure/edit or remove a device

5.2 IO Devices Window

The Devices window is accessed by clicking the Devices button in the Configuration section of the Setup ribbon. Control and monitoring of devices is done using the Devices window.
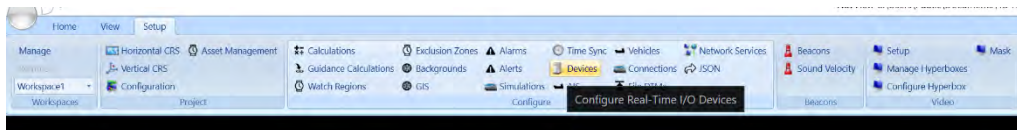

FIGURE 5-1 SETUP RIBBON - DEVICES BUTTON

FIGURE 5-2 IO DEVICES WINDOW

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Alternatively, the IO Devices view can be accessed from the Explorer view by selecting Devices under the Setup branch.

The tool bar provides access to the configuration and monitoring features for devices. The data grid provides an overview of the devices present and their status, ● indicates status is OK or enabled, ● indicates the status is bad or disabled. The following details the data grid columns.

- Type
    - o Device type, i.e., the NavView name of the device added as given in the respective device list.
- Name
    - o Name assigned to the device by the operator.
- I/O Config
    - o Interface parameters

- Comms Status
    - o Status of the communication protocol, status is considered OK as follow:
        - Serial Port: Valid existing port selected
        - TCP/IP Client: Connected to remote host
        - TCP/IP Server: Socket is bound to specified local port
        - TCP/UDP: Socket exists
        - File: Write to file is enabled
- I/O Status
    - o Status of the message reception/transmission, status is considered OK as follow:
        - In the case of an input device, if the expected message(s) are being successfully received and decoded
        - In the case of an output device, if it has been configured and is outputting data
- Recording
    - o State of raw data recording

Control and monitoring of devices is accessed via the IO Devices window.

5.3 Add a Device
Note: If Roles are enabled, only users with Supervisor or Administrator privileges can add a device.

1. Access the IO Devices window

2. Click the drop-down list box in the tool bar to open the list of supported devices. See Figure 5-3

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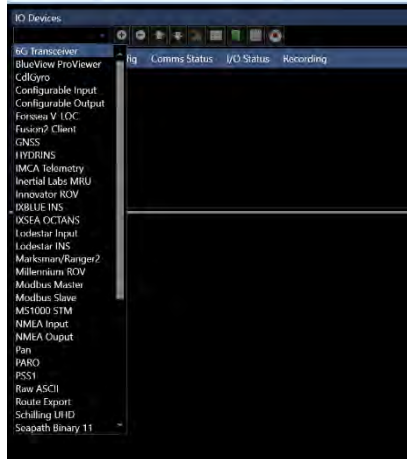
FIGURE 5-3 SUPPORTED DEVICE LIST

3. Select the device to add

4. Click the button, the Configure Device I/O dialog will open. See Figure 5-4
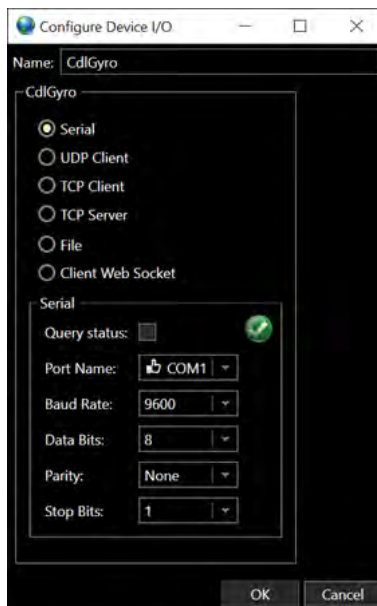

FIGURE 5-4 CONFIGURE DEVICE I/O

5. Configure the device communications (see Configure Device Communication Parameters)

6. On clicking OK in the Configure Device I/O dialog the device will be added to the bottom of the device list in the data grid

The supported devices are:

- 6G Transceiver
- BlueView ProViewer
- CDL Gyro

- Configurable Input (operator configurable input messages and fields)

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- Configurable Output (operator configurable output messages and fields)
- Forssea V-LOC
- Fusion2 Client
- GNSS
- HYDRINS
- IMCA Telemetry (input of TEL messages)
- Inertial Labs MRU
- Innovator ROV
- IXBLUE INS
- IXSEA Octans
- Lodestar Input (Sonardyne Lodestar interface)
- Lodestar INS
- Marksman/Ranger2
- Millennium ROV
- Modbus Master
- Modbus Slave
- MS1000 STM
- NMEA Input (standard and proprietary NMEA messages)
- NMEA Output (standard NMEA messages)

- Pan (Sonardyne PAN control interface)
- PARO (Paroscientific Digiquartz Depth Sensor)
- PSS1
- Raw ASCII
- Route Export
- Schilling UHD (standard UHD ROV message)
- Seapath Binary 11
- Serial Radio Telemetry
- SICK Laser
- Simrad EM3000 MRU
- Sonardyne PSONALL (Fusion PSONALL message)
- Subsea Telemetry
- Total Station
- TRDIPD0
- TRDIPD4
- TRDIPD6
- Tritech Profiler
- Tritech Winson
- TSS (Teledyne TSS1 and TSS3 messages)
- ULS Laser
- USBL
- ValeportSV

5.4 Remove a Device

Note: If Roles are enabled, only users with Supervisor or Administrator privileges can remove a device.

1. Access the IO Devices window
2. Select the device to remove in the data grid
3. Click the 🔵 button
4. When prompted to confirm that the device is to be removed, click Yes or No accordingly

5.5 Move Devices

Note: If Roles are enabled, only users with Supervisor or Administrator privileges can move a device.

1. Access the IO Devices window
2. Select the device to move in the list
3. Click the 🔵 button to move the device up the list one spot

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4. Click the ⬇ button to move the device down the list one spot

Note: The order of the devices in the list does not affect the operation or performance of the devices.

5.6 Configure Device Communication Parameters

Note: If Roles are enabled, only users with Supervisor or Administrator privileges can configure a device's communication parameters.

1. Access the IO Devices window
   a. Select device to configure in the data grid
   b. Click the 🔧 button to open the Configure Device Communications dialog (see Figure 5-5); or
   c. Right mouse click on the device and click on Configure Comms; or

2. From the respective Device Status window, click the 🔧 button

3. Enter the Name to display this device as, it is recommended that the name used is representative and descriptive of the device, e.g., Port GPS

4. Select the desired communication protocol, the respective configuration options will present in the lower group box, configure accordingly (these are detailed in the following sections)

5. Click Apply to apply the changes and leave the dialog open; or

6. Click OK to apply the changes and close the dialog; or

7. Click Cancel to abort the changes and close the dialog

Note: Clicking the Cancel button after applying the changes (clicking Apply) does not revert to the pre-applied settings, it just closes the dialog.

5.6.1   Serial

The use of the term serial refers to the use of a Windows recognized serial port for the input and output of data. These may be physical ports on the computer or virtual ports on an Ethernet serial server, as long as Windows recognizes them as ports.

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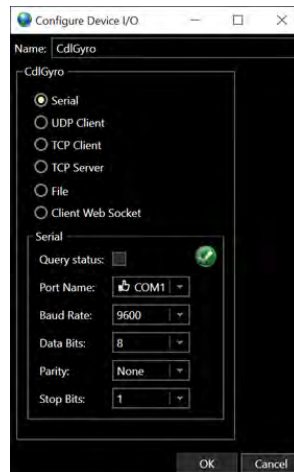www.4dnav.com

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**FIGURE 5-5 DEVICES I/O - SERIAL CONFIGURATION**

When a device is added, it defaults to the Serial protocol. If it has been changed and it is to be changed back, this is done by selecting the **Serial** radio button. The serial port parameters can then be configured.

5.6.1.1   Query status

- Check this box to instruct NavView to query all available serial ports to determine their availability

Note: To query a port's availability, NavView attempts to open it. This can cause a port to be reset on some Ethernet serial servers depending upon their configuration (e.g., RealComm mode) resulting in a communications failure of other applications connected to the port. To eliminate this possibility, the user has the option to *Query status* of the ports or not to determine their availability. The default is off. The setting persists until NavView is exited where relaunching it resets to unchecked.

5.6.1.2   Port Name

- This drop-down list box contains all ports that NavView has determined to be present

- Click ← to display the list and select the desired port
  - If the Query status is not checked and the port has not previously been selected for this device, a is displayed next to the port name
  - If the port is available, a is displayed next to the port name
  - If the port is in use by another NavView device or another application, a is displayed next to the port name

5.6.1.3   Status

- The status of the selected port is indicated by either a green check mark or a red X .

- If the selected port exists and was successfully accessed by NavView, this is indicated by a green check mark.

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- If the selected port either does not exist or it does but NavView was unable to access it perhaps due to it currently being in use by another application, this is indicated by a red X.

Note: The status is generally only indicated with a red X if a project file is loaded and a serial port that was previously successfully assigned and used is now not present or is in use by another application.

5.6.1.4 Baud Rate

- This drop-down list box contains supported baud rates.
- Click ← to display the list and select the desired baud rate setting.

5.6.1.5 Data Bits

- This drop-down list box contains data bit options.
- Click ← to display the list and select the desired data bit setting.

5.6.1.6 Parity

- This drop-down list box contains parity options.
- Click ← to display the list and select the desired parity setting.

5.6.1.7 Stop Bits

- This drop-down list box contains stop bit options.
- Click ← to display the list and select the desired stop bit setting.

5.6.2 UDP Client

NavView supports interfacing using UDP client protocol.

Select **UDP Client** by clicking the respective radio button. The parameters can then be set.

FIGURE 5-6 DEVICES I/O - UDP CLIENT CONFIGURATION

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5.6.2.1 Local UDP Port – UDP Receive

- Enter the Port to listen to for incoming data

5.6.2.2 Status

- The status of the entered port is indicated by either a green check mark ✅ or a red X ❌.

- If the entered port exists and was successfully accessed by NavView, this is indicated by a green check mark.

- If the entered port either does not exist or it does but NavView was unable to access it, this is indicated by a red X.

5.6.2.3 Transmit To UDP Remotes – UDP Transmit

Add

- To transmit data as an output port, a destination must be configured.

- The default is IP 127.0.0.1 Port 5000

- To configure a destination that is already present, click in the respective box and make the desired changes.

- To add a destination, click the Add button and edit the IP address and Port number accordingly.

Delete

- To delete a destination, select it in the list

- Click the Delete button

5.6.3 TCP Client

NavView supports interfacing using TCP/IP client protocol.

FIGURE 5-7 DEVICES I/O - TCP CLIENT CONFIGURATION

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Select **TCP Client** by clicking the respective radio button. The parameters can then be set.

5.6.3.1   Server Address

- Enter the TCP server address

5.6.3.2   Server Port

- Enter the server port to use.

5.6.3.3   Status

- The status of the entered IP address is indicated by either a green check mark ✅ or a red X ❌.
- If the entered address exists and was successfully accessed by NavView, this is indicated by a green check mark ✅.

- If the entered address either does not exist or it does but NavView is unable to access it, this is indicated by a red X ❌.

5.6.3.4   Receive timeout (ms)

- Enter the timeout period the TCP client will wait before disconnecting and starting the reconnect attempt sequence

5.6.4 TCP Server

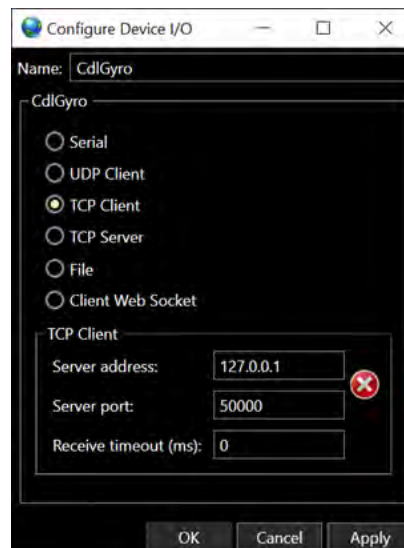NavView supports interfacing using TCP/IP server protocol.
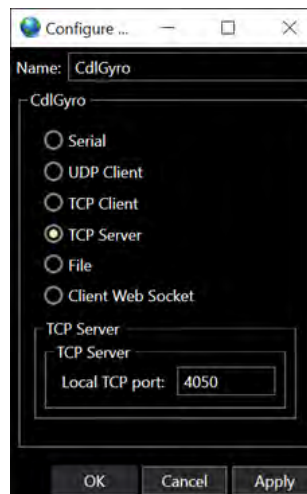
FIGURE 5-8 DEVICES I/O - TCP SERVER CONFIGURATION

Select **TCP Server** by clicking the respective radio button. The parameters can then be set.

5.6.4.1   Local TCP Port

- Enter the Port to listen for incoming connections

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5.6.5   File

NavView supports directing a device's output to a file. Select **File** by clicking the respective radio button and configure as required. The file created uses a **.DAT** ending.

FIGURE 5-9 DEVICES I/O - FILE CONFIGURATION

5.6.5.1   File name

- Enter base target file name; or
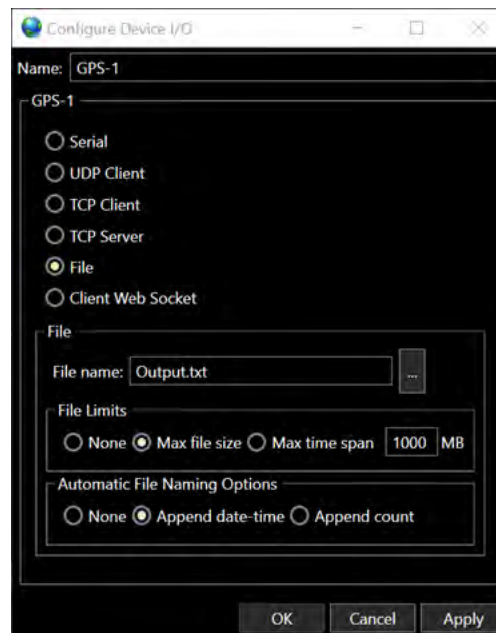
- Click on [ ] to browse to target folder and enter base file name

5.6.5.2   File Limits Options

- Controls the creation of new files

- Select **None** to disable new file creation based on file size or elapsed time

- Select **Max file size** to control the creation of new files based on file size
    o Enter the maximum file size in megabytes
    o If the adding of the next record to the current file will result in the file size exceeding the maximum file size specified, a new file is created, and data is written to it

- Select **Max time span** to control the creation of new files based on elapsed time
    o Enter the time span for the file in hh:mm:ss.f
    o When a file is created the start time is set as is the end time based on the time span
    o When a record is to be written to file, if the time is past the calculated end time, a new file is created, and the data is written to it

5.6.5.3   Automatic New File Naming Options

- Controls the naming of files

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Page 97

- Select **None** if the same file is to be used to write all data to
    - o The base file name is used
    - o If a **File Limits** option is enabled and it triggers a new file, the file is overwritten
    - o Applicable when a log of the data is only required in case of an incident, i.e., if after 12 hours nothing has occurred to require the position history of all vehicles, roll the file over and start a new 12 hour window of data logged

- Select **Append date-time** to create unique file names based on date and time of file creation
    - o If a **File Limits** option is enabled and it triggers a new file, the date and time the new file is created is appended to the base file name (base_file_name-[ddmmmyyy-hhmmss].DAT)

- Select **Append count** to create unique file names based on an incrementing count
    - o Enter a **Count** value to be used as the next count

Note: The count value displayed is the current next count value to use.

    - o If a **File Limits** option is enabled and it triggers a new file, the count is incremented and appended to the base file name (base_file_name-[count].DAT)
    - o Before using the new file NavView checks to ensure that an existing file with the new file name in the respective folder does not already exist, if it does the count is incremented and the check repeated until a unique file name is determined

5.6.5.4 Enable/Disable Writing to File
- The enabling and disabling of writing to file is controlled from the Devices Window tool bar

- When a device that has been configured for **File** is selected in the data grid either a button or button is displayed in the tool bar
    - o Click the button to enable writing to file, the button changes to
    - o Click the button to disable the writing to file, the button changes to

Note: If a target file has not been assigned, clicking the will not enable the write to file and the button will not change.

5.7 Configure Device Application
Note: If Roles are enabled, only users with Supervisor and Administrator privileges can configure a device's application.

1. Access the IO Devices window
    a. Select device to configure in the data grid
    b. Click the button to open the respective configuration dialog; or
    c. Right mouse click on the device and select Device Settings; or

2. From the respective Device Status window, click the button

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Note: Each device has a specific configuration. Details for each device are given in Device
Documentation.

5.8 Monitoring a Device
There are 2 primary views for monitoring device operation.

5.8.1   Device Status Window
1. Access the IO Devices window
    a. Select device to configure in the data grid
    b. Click the [icon] button to open the Device Status window; or
    c. Right mouse click on device and select Device Window

The Device Status window enables the monitoring of the messages, both incoming and outgoing, and in the case of incoming, the decoded information and the observations published.

The port configuration, device configuration and display of the terminal window can be accessed directly from the Device Status window via the buttons at the top left of the window.

For most devices, the Device Status window has two tabs, ASCII Decode and Data. Those devices that vary from this are detailed in the respective device documentation.
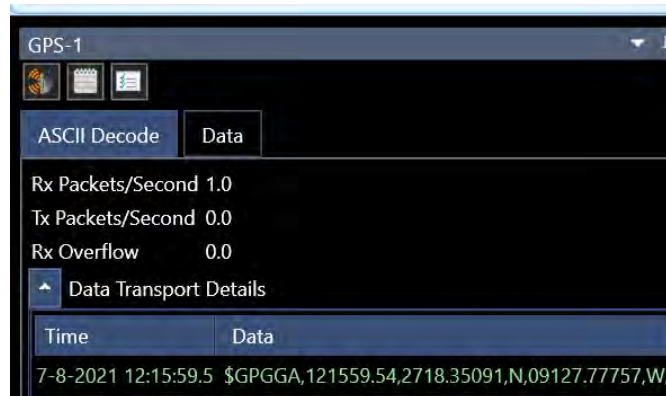
FIGURE 5-10 DEVICE STATUS WINDOW

5.8.1.1 ASCII Decode Tab
- The ASCII Decode tab provides information on the packets received and transmitted per second and a receive buffer overflow status.

- In the Data Transport Details bottom portion of the tab, the messages, both transmitted and received, are displayed along with their system time stamp. This is a scrolling display with the newest message at the top.

Note: Outgoing data is displayed in blue, incoming data is displayed in green.

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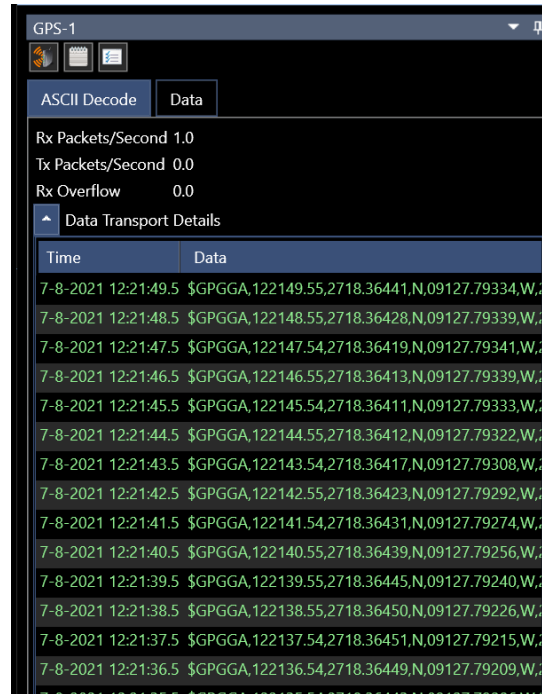
FIGURE 5-11 DEVICE STATUS WINDOW - ASCII DATA TAB

5.8.1.2 Data Tab

- The Data Tab provides a display of the messages detected, the decoded data and the observations created from the data. Figure 5-12 shows the Device Status window, Data Tab for an NMEA Input device.
- The left panel displays the messages received, e.g., GGA
- Selecting the message displays the decoded data in the right panel
- Expanding the messages displays the observations generated by the device
- Selecting an observation displays the published observation data in the right panel

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FIGURE 5-12 DEVICES - DEVICE STATUS WINDOW - DATA TAB

5.8.2 Device Terminal Window

1. Access the IO Devices window
   a. Select device to configure in the data grid
   b. Click the ▦ button to open the Device Status window; or
   c. Right mouse click on the device and select Show Comms; or

2. From the respective Device Status window, click the ▦ button

The Device Terminal window provides the means to monitor exactly what is being received on the port. This window displays all bytes received at the port in hexadecimal and ASCII. This then provides a good trouble shooting tool when determining what is being received by NavView.
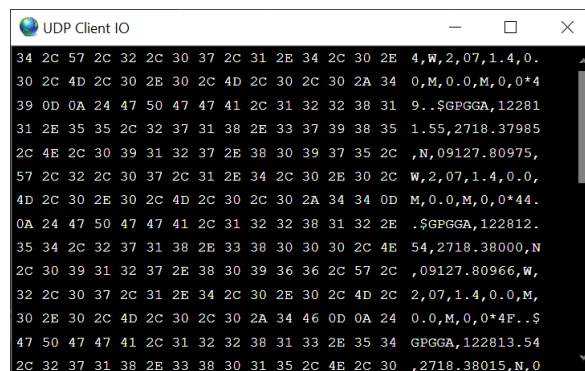
FIGURE 5-13 DEVICES WINDOW - TERMINAL WINDOW

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Note: The Terminal window does not update on every byte received, rather it updates once per second writing all bytes received since the last update to the window.

5.9 Raw Data Logging

NavView supports the logging of data received by a device in its native format with its Globally Unique Identifier (GUID) and associated system timestamp for each message logged.

The folder and file structure is as follows:

- ◢ Project
  - ◢ Local
    - ◢ Station
      - ◢ Data
        - ◢ RawData
          - ◢ Device
            - ◢ Date
              - Time.4dn
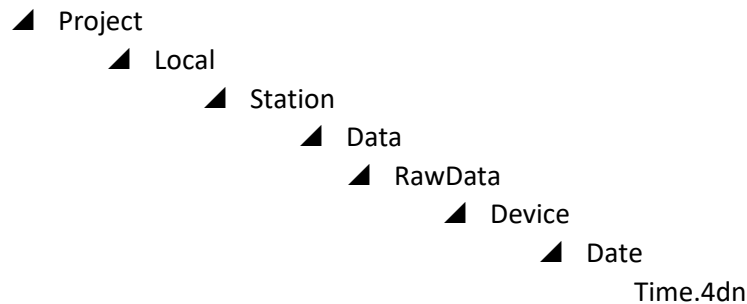
Where time is **hhmmss** for the time the file was created.

1. Select device in the data grid to log raw data
   a. Click the 🔴 button to toggle between enable and disable raw data logging for that device; or
   b. Right mouse click on the device and select Toggle Recording
   c. This can be repeated to log more than one device

2. When enabled, a ✅ will display in the Recording column of the data grid for the respective device

3. When disabled, a ❌ will display in the Recording column of the data grid for the respective device

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6 Calculations

This section provides an overview of how calculations are created and configured.

6.1 Overview

The term *Calculations* refers to the application of select observations in a specific algorithm to generate a new set of observations. The resulting observations from a calculation can be used in the same way as any other observation, e.g. as input to another calculation, application to a vehicle for positioning, monitoring via time series window, output to another system, etc., depending upon the requirements.

This section details the calculation types, how they are managed including adding, removing, configuring, applying and monitoring.

Note: If Roles are enabled, only users with Supervisor or Administrator privileges can add, edit or remove calculations.

6.2 Calculation Types

The following lists the Calculation types NavView supports and their basic application:

- Rigid Body Calculation
    - Provides a body state and associated observations that can be used to position objects/vehicles

- Kalman Filter Calculation
    - Provides a body state and associated observations that can be used to position objects/vehicles

- Static Draft Calculation
    - Provides an elevation observation that can be used as input to another calculation, e.g. Rigid Body, where elevation is important for associated processing such as anchor catenary modelling

- Seabed Elevation Calculation
    - Provides an elevation observation based on a body data source elevation, e.g. an ROV Vehicle or Calculation, and an Altitude sensor

- Relative Lever Arm Calculation
    - Calculates the lever arm for selected position and elevation data sources based on a reference body, e.g. use a known DGPS derived vehicle position to check another DGPS antenna lever arm

- Predicted Position
    - Provides the position and heading predicted ahead an operator configured time

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- Depth From Pressure Calculation
    - Provides an elevation observation from pressure data that can be used as input to another calculation, e.g. where this is used as the depth of a vehicle, or logged to be used with sound velocity data to generate sound velocity profiles
- Generic Calculation
    - Create observations by applying basic mathematical equations to multiple data source observations, e.g. add a Tilt Direction derived from pitch and roll to a Reference Heading to determine the Tilt Azimuth

- Heading From Positions Calculation
    - Provides a heading observation that can be used as input to another calculation

- Lookup
    - Returns a value in a CSV Table an example would be a Layback based on a Station or KP of lay vessel

- DTM Elevation Calculation
    - Provides an elevation observation from the DTM based on a position observation data source

- Relative Position (Dynamic Body) Calculation
    - Relative position calculations of remote targets using observations from a total station mounted on a dynamic body (e.g. Vessel)

- Relative Position (Static) Calculation
    - Relative position calculations of remote targets using observations from a total station mounted on a static object (e.g. on land)

- Rigid Transform (Local) Calculation
    - The Rigid Transform (Local) calculation will determine the best-fitting rigid transformation that aligns two sets of corresponding points in a local framework to provide a position, applicable to precise relative positioning between a static and dynamic object using the results of a Relative Position (Dynamic Body) Calculation

- Rigid Transform (Geographic) Calculation
    - The Rigid Transform (Geographic) calculation takes geographic coordinates from one body and transforms them to another to provide a position

- Angular Acceleration Algorithm Calculation
    - Provides an angular acceleration observation for input to another calculation, e.g. Remote Motion Algorithm, when this observation is not available directly from a sensor

- Remote Motion Algorithm Calculation
    - Provides linear velocity and acceleration observations and a heave observations for monitoring heave and/or motion at any given static or dynamic point associated with a vehicle

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6.3 Error Propagation

Calculations propagate the position error from device input to calculation output. Where applicable, the configuration of devices includes the option to enter standard deviations for the observations they publish, or alternatively the standard deviations or accuracies included in the device input can be used. Entry of offsets, whether at the device, calculation or vehicle level, also include the option to enter standard deviations for each component. As a result, NavView is able to perform rigorous error propagation incorporating not just the input data accuracy but also the accuracy of the translation to the respective final locations.

The resulting error ellipse data is available for display and monitoring with the vehicle the respective calculation is associated with. This includes a graphical representation in the Map view.

6.4 Managing Calculations

Calculations are managed from the Configure Calculations dialog. This can be accessed from the Setup ribbon by clicking on Calculations in the Configure section (see Figure 6-1).

FIGURE 6-1 SETUP RIBBON – CALCULATIONS

Alternatively, Calculations can be managed from the Explorer window by selecting Calculations under the Setup branch.
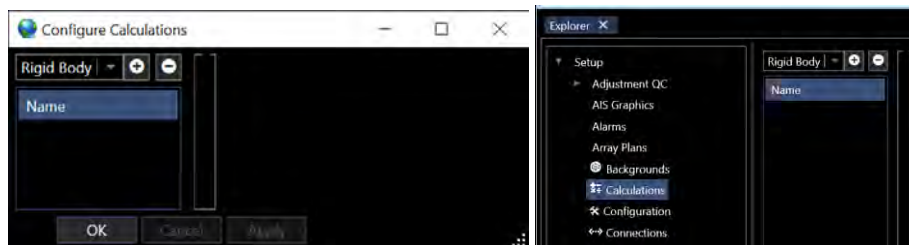
FIGURE 6-2 CONFIGURE CALCULATIONS VIEWS

6.4.1 Add a Calculation

A calculation can be added from the Configure Calculations views (see Figure 6-2) or directly from a Vehicle configuration. Once added, it can be configured. The configuration can also be done and/or edited later.

6.4.1.1 Add a Calculation from the Configure Calculations View

1. Access the Configure Calculations view

2. Click the drop-down list and select the calculation type to add

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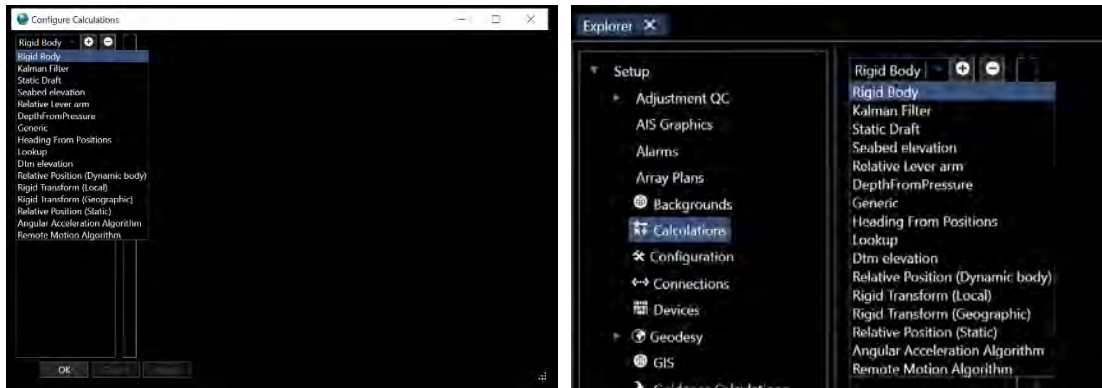
FIGURE 6-3 ADDING A CALCULATION FROM CONFIGURE CALCULATIONS VIEWS

3. Click the ⊕ button

6.4.1.2 Add a Calculation from a Vehicle

A Calculation that provides a Body State can be created directly from the vehicle configuration.

1. Access the Vehicle configuration, either via the Add Vehicle wizard or the Configure Vehicle view (see Vehicles section).
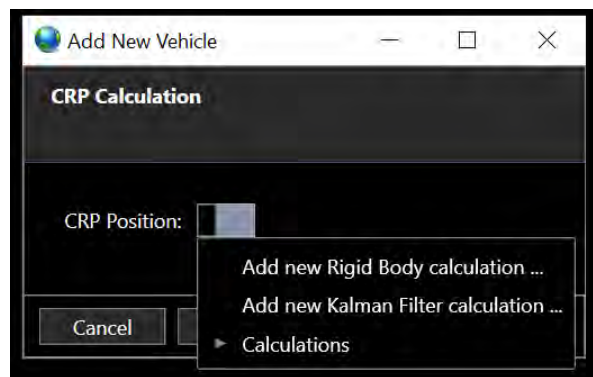
FIGURE 6-4 ADD A CALCULATION VIA VEHICLE CONFIGURATION

2. Click the CRP Position drop-down list and click on **Add new Rigid Body calculation…** or **Add new Kalman Filter calculation…**

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FIGURE 6-5 BODY STATE CALCULATION ADDED VIA VEHICLE CONFIGURATION

6.4.2 Remove a Calculation

1. Access the Configure Calculation view
2. Select the calculation to remove
3. Click the ⊟ button
4. When prompted, answer Yes to continue and remove the calculation or No to abort the process

6.4.3 Edit a Calculation

A calculation can be configured when it is added. Alternatively, it can be configured and/or edited at a later time. The steps to follow to access the calculation configuration are given here. The specific configuration is dependent upon the type of calculation and is detailed later in this section.
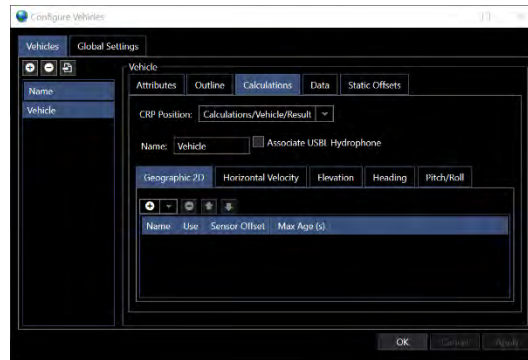
1. Access the Configure Calculation view from Calculations in the Setup Ribbon
2. Select the Calculation to edit

or

3. From the Explorer window, expand the Calculations branch
4. Select the Calculation to edit

or

5. Access the Configure Vehicles view from Vehicles in the Setup Ribbon
6. Select the Vehicle with which the calculation to edit is associated
7. Select Calculations tab

or

8. From the Explorer window, expand the vehicles branch
9. Expand the branch for the Vehicle with which the calculation to edit is associated
10. Select Calculations branch

then

11. Edit the calculation
12. Click the Apply button

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Note: When a change is made in the Configure Calculations dialog, the *Apply* and *Cancel* buttons will become active.

- Click the Apply button to apply the changes. The changes will not be applied if the dialog is closed without applying first.
- Click the Cancel button to revert all changes made since the last time the Apply button was clicked.
- Click the OK button to close the dialog.

6.5 Configuring Calculation Input Observations

All calculations require the assignment and configuration of input observations. For most calculations, this involves selecting one or more of the appropriate observation sources and configuring their relationship with the CRP.

In the case of the Rigid Body, Kalman Filter and Static Draft (for the Pitch/Roll observations) calculations, multiple observations(Devices) for any one type can be added but only one of these is used for the calculation, the rest are available for monitoring and use in the case the used observation source fails, see Automatic Failover. For these calculations, the configuration also includes organizing the sequence of the observations in the calculation and configuring their use and failover state.

These calculations present a common user interface for this. This section details the managing and configuring of the input observations applicable to these Calculations. Those that do not follow this approach are detailed in the respective section.

This example uses a Rigid Body calculation.

To Add an observation source:
Click the tab to select the observation type to be configured (e.g. Geographic 2D, Horizontal Velocity, Elevation, Altitude, Heading or Pitch/Roll)
Click on the ◻ in the ⊕◻ button to display a hierarchical list of the available respective observation sources

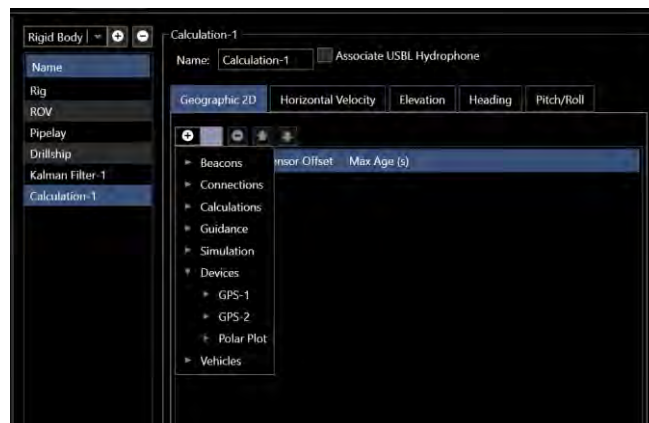**FIGURE 6-6 ADDING AN OBSERVATION**

Navigate to and select the desired observation source to add it to the data grid

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Repeat these steps to add all required observation sources for a specific observation type

Note: Once an observation is added to a calculation, it will no longer appear in the respective list of available observations for that calculation. It is still available for adding to other calculations.

Note: The Elevation and Pitch/Roll observations' options include **Fixed** which enable the user to assign a fixed value for these data to be applied in the calculation. In the case of the Elevation observation this can be used to ensure the correct relationship of a calculation and therefore a vehicle to the water surface for correct representation in the 3D View.

Note: The Heading observation's options include **Fixed** which enables the user to assign a fixed heading value to the calculation, and **CMG** which uses the Course Made Good (CMG) as determined from the Geographic 2D data as the heading. Since heading is required for a calculation to be considered to be valid and useable, it is recommended that this be considered only as the final option for the failover feature.

To Remove an observation source:
- Click the tab to select the observation type to be removed
- Select the observation to be removed in the data grid
- Click the ⊟ button

To move an observation's place in the list, i.e. change the failover order:
- Click the tab to select the observation type to be configured
- Select the observation to be moved in the data grid
- Click the ⬆ or ⬇ button to move the observation down or up one spot

Note: The order the observations appear in the data grid are critical where the automatic failover is used, as this dictates the order they are used in the case of one or more failing.

Once added to the calculation, each observation, whose options are comprised of some combination of the following depending on the type, is configured by direct editing of the cells in the data grid:
- **Use**: Controls the use of the observation in the calculation
  - If this observation is to be used for the calculation, either as the sole observation to be used, or as one of several to be used with the failover feature, check the Use box (default)
  - If this observation is not to be used in the calculation but to be included so it can be monitored against those that are used, uncheck this box
- **Sensor Offset**: These offsets relate the source to the calculation's CRP, click in this cell to expand it to enable editing of the offsets and their standard deviations

Note: Offsets are *From* the CRP *To* the Sensor where
- X: - is to port; + is to starboard
- Y: - is to the stern; + is to the bow
- Z: - is down; + is up

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FIGURE 6-7 SENSOR OFFSETS ENTRY

Note: The sensor offset units default to the Preference Distance setting units. Offsets can be entered using other units by adding the respective indicator, e.g. "ft" after the value.

Note: Sensor offsets are only available for configuration for those observations they are applicable to, i.e. Geographic 2D and Elevation.

> **Max Age**: Enter the age at which this observation data is considered to have failed thus triggering either a failover (if multiple observations are present and set to Use) or simply the cessation of this data input to the calculation

Note: In the case of the Geographic 2D or Heading observation, the cessation of either of these observation types updating the calculation will result in the calculation to fail.

> **C-O:** Enter the Calculated minus Observed correction for the observation, this value is added to the observed data before it is used

Note: The C-O is a correction to the sensor data and is applied before any other processing is performed on the data, e.g. before applying offsets or attitude corrections.

Note: C-O corrections are only available for configuration for those observations they are applicable to, i.e. Elevation, Heading and Pitch/Roll.

FIGURE 6-8 SENSOR C-O ENTRY

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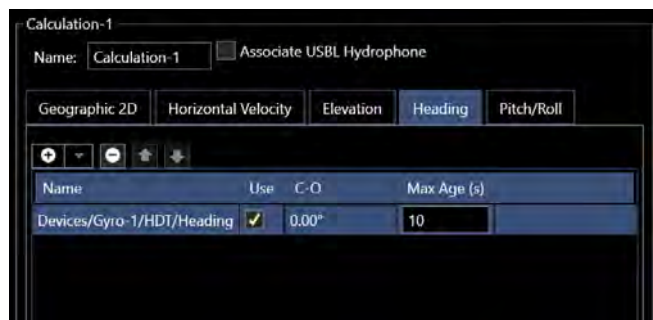
Repeat the Add process for all required observations for the calculation

FIGURE 6-9 EXAMPLES OF OBSERVATIONS ADDED TO RIGID BODY CALCULATION

6.6 Automatic Failover

Select calculations (Rigid Body, Kalman Filter and Static Draft) support multiple observations of any one type to be added to the calculation. However, only one is actually applied to the calculation. Which one is used is controlled by a combination of the Use flag and the order the observations appear in the respective data grid.

If multiple observations of one type are added but only one has its Use box checked, this is the only one that will be used for the calculation. Should this observation source fail, the calculation will stop updating.

If multiple observations of one type are added and more than one has its Use box checked, NavView's automatic failover feature is activated. In this case it is important that the observations be organized in the order they are to be used in the case of failure of any one or combination of them. Each source is configured to be used or not used in the switchover process by checking or unchecking their Use box, and if to be used, how long after a source is deemed to not be providing acceptable data, i.e. fails for the length of time set as its Max Age, is the switch to the next source in the list to take place. When a source that has failed recovers, it is reverted to as the source for that observation type to the calculation.

Note: The term Fail refers to unacceptable data being published by the respective source. This may be based on one or more of the following:

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- The device or the respective interface has failed and is no longer providing data to NavView
- Messages are being received but are failing validation
- Messages are being received but failing operator configured minimum tolerances for use, e.g. GPS position is single point and not differentially corrected

The failover list of observation sources is unlimited in the number that can be added. When a source fails, NavView switches to the next in the list that is currently providing acceptable data. If no source is providing acceptable data, the calculation fails. As each source recovers and starts to provide acceptable data again, NavView switches to the one highest in the list as the source to provide data to the calculation.

6.7 Rigid Body Calculation

The Rigid Body calculation is a general position solution for a CRP that incorporates the following observation types.

- Geographic 2D
- Horizontal Velocity
- Elevation
- Heading
- Pitch/Roll

When any of the aforementioned observations associated with the calculation is updated by the respective source, it is added to a fading history of that observation maintained by the calculation. When a Geographic 2D observation update is received, the fading histories for the other observation types are used to interpolate, or extrapolate depending on the available data, the respective values for the Geographic 2D observation epoch. The calculation then publishes a Body State and the following observation types for this epoch

11. Geographic 2D
12. Horizontal Velocity
13. Elevation
14. Heading
15. Pitch/Roll

Note: The Rigid Body calculation at a minimum requires a Geographic 2D observation and heading data, the latter either as a Heading observation or set to Fixed or CMG, in order to publish any observations, i.e. update any users of the calculation. If an Elevation observation and/or a Pitch/Roll observation are available, they will be used and published accordingly but they are not necessary.

Note: The observation published by a Rigid Body calculation can be used as observation sources for other calculations.

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6.7.1 Multiple Observation Sources and Automatic Failover

Only one observation source of each type is used in the Rigid Body calculation. However, multiples of any type can be added, monitored and configured for Automatic Failover (see Automatic Failover).

6.7.2 Horizontal Velocity

The Rigid Body calculation calculates a smoothed horizontal velocity (speed) based on the Geographic 2D position updates. It also supports the adding of Horizontal Velocity observation sources to the calculation, e.g. from NMEA VTG messages. The operator has the option to specify if the calculated Horizontal Velocity value is published with the Body State or if the fading history of Horizontal Velocity observations added to the calculation is used to provide the value published with the Body State.

6.7.3 Configure the Rigid Body Calculation

The configuring of a Rigid Body calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

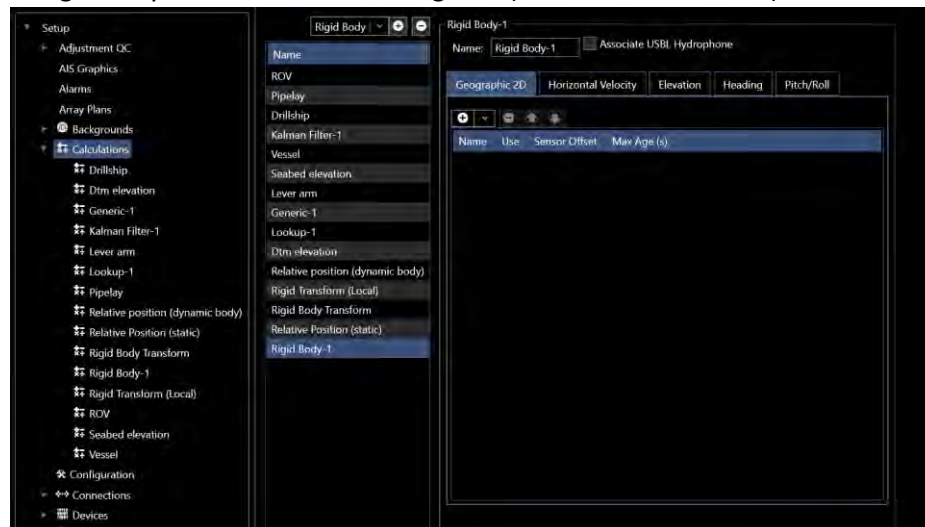1. Access the Rigid Body calculation to be configured (see Edit a Calculation)

FIGURE 6-10 RIGID BODY CONFIGURATION

2. **Name**: Enter a name for the calculation, it is recommended that the name be kept short but still indicative of the calculation sources and/or purpose

3. **Associate USBL Hydrophone**: See USBL

4. **Use Observed Velocity**: See Horizontal Velocity
   a. Check this box if the fading history of the Horizontal Observation source(s) is to be used as the source of the Horizontal Velocity observation published for the calculation epoch
   b. Uncheck this box if the calculated horizontal velocity is to be published

5. Configure the observations as required (see Configuring Calculation Input Observations)

6. Click Apply (if present, dependent upon the view used)

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6.7.4 Monitoring the Rigid Body Calculation

The Rigid Body calculation is monitored with the Calculation window. This is opened from the View ribbon by clicking on the Calculations button in the Windows section.
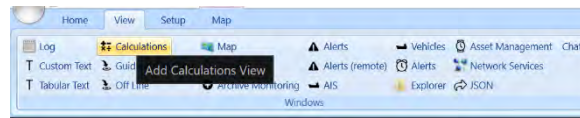

FIGURE 6-11 VIEW RIBBON - CALCULATIONS VIEW

The Calculations window displays the current calculations in the left panel in a tree that can be expanded to display the associated observations and their sources. The status of the calculations and their observations are indicated by (good) and (bad).

The right panel displays details for the selection made in the left panel. If a Rigid Body calculation is selected, all observations associated with the calculation are displayed (see Figure 6-12). If a specific observation type is selected, just the observations of that type are displayed (see Figure 6-13). If a specific observation is selected, the right panel does not display anything.
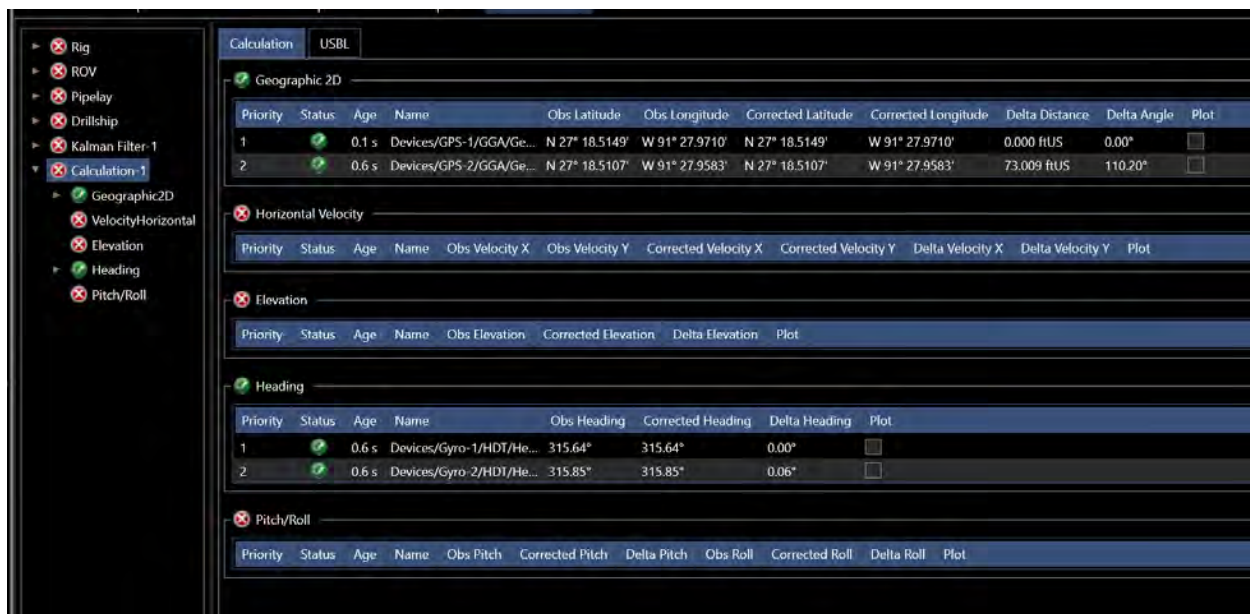

FIGURE 6-12 CALCULATIONS WINDOW - RIGID BODY CALCULATION - ALL DATA SOURCES DISPLAYED

Calculations right panel details include the following:

Priority: The priority assigned as per the order within a multi-observation source list

Status: if the data is valid and not timed out, if the data is not valid or has timed out

Age: Age of the current data

Name: Names assigned by the operator for the observation source

Obs *s*:   Raw observation, i.e. not translated for offsets, where *s* is the data type

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The number of Obs columns correspond to the number data items associated with the observation type, e.g. a Geographic2D observation has latitude and longitude whereas Heading has just heading

Corrected *s*: Corrected observation, e.g. translated to the CRP or C-O applied, where s is the data type
The number of columns corresponds to the number of data items associated with the observation type

Delta *s*: The variation of observation types of priority 2 and lower compared to the priority 1 observation
The number of columns corresponds to the number of data items associated with the observation type

Plot: Check this box to generate a time series plot of the associated observation in the lower portion of the right panel (see Figure 6-13)

FIGURE 6-13 CALCULATIONS WINDOW - RIGID BODY CALCULATION – HEADING DATA WITH PLOT

6.8 USBL Calculation

The method for applying USBL data for positioning surface and subsea vehicles and objects depends upon the data being provided by the USBL system, position or Cartesian data, and in the case of the latter, the USBL system's reference point. The basic process is as follows:

1. Data is received at the USBL device

2. Is the data Position/Depth?
   a. Yes:
      i. Identify the beacon associated with the data
      ii. Publish the Geographic2D and Elevation observations on the beacon's data source
      iii. Go to 5
   b. No: Go to 3

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3. Is the data Cartesian (XYZ)?
   a. Yes:
      i. Is the data relative to the ship's bow?
         1. Yes:
            a. Apply USBL system offsets to translate XYZ data to the transducer
            b. Apply USBL calibration corrections
            c. Publish USBL observations
         2. No:
            a. Publish USBL observations
      ii. Go to 4
   b. No: No further processing
4. When the Rigid Body calculation that has been created for the vehicle to which the USBL transducer is attached and the USBL observation data source has been assigned receives USBL observations
   a. Identify the beacon associated with the data
   b. Interpolate/extrapolate a Rigid Body CRP position, elevation, heading, pitch and roll for the USBL data epoch
   c. Apply NavView sensor offsets to translate this CRP position and elevation to the point the USBL data is relative to
   d. Apply the USBL observations to determine position and elevation of the beacon
   e. Publish the Geographic2D and Elevation observations on the beacon's data source
   f. Go to 5
5. Assign beacon Geographic2D and Elevation observations to the calculation to be used for the vehicle the beacon is associated with

The following sections provides details for using USBL data.

6.8.1 Beacon Data Sources

USBL beacons are identified by a channel, also referred to as an ID. Data received from a USBL system includes the ID of the beacon the data is for. When NavView processes the USBL data it looks for a beacon with the same ID in the NavView beacon file and if found, publishes the resulting Geographic2D and Elevation observations on that beacon's data source. If a match is not found, a record that a match cannot be found is written to the log file and no observations are published for that beacon. Therefore, all beacons that are to be used by NavView must be added to the NavView Beacon file (see Acoustics).

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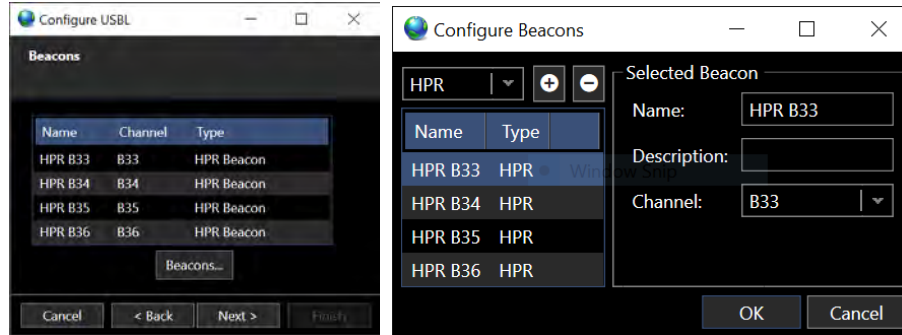Released: 12/3/2021

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FIGURE 6-14 NAVVIEW BEACONS

It is important to note that USBL systems can also output data for the vessel that the USBL hydrophone is mounted on. In this case, a beacon with the respective ID assigned as its channel must be added to the beacon file even though it is not an actual beacon. This enables the required matching so the respective Geographic2D and Elevation observations can be published.

In hierarchical lists of data sources, the beacon data sources are listed under Beacons as shown in Figure 6-15 Beacon Data Sources
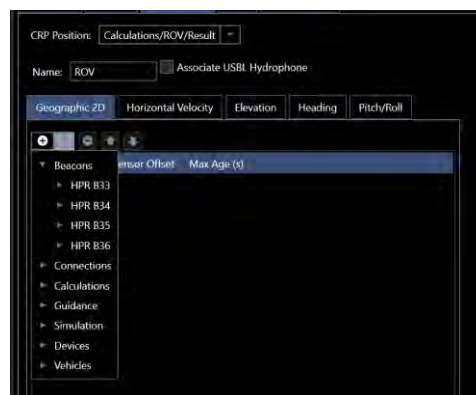
FIGURE 6-15 BEACON DATA SOURCES

See the Acoustics section for details regarding the managing of Beacon files.

6.8.2 Using USBL Position Data

USBL systems can be interfaced with gyros and GPS units enabling them to calculate and output beacon position and depth. Upon receipt of this data at the device level, NavView looks for a match in its beacon file and if found, publishes the Geographic2D and Elevation observations on that beacon's data source directly.

USBL systems can also use seafloor LBL arrays to determine the position of beacons or the USBL hydrophone itself. The data output may be beacon position and depth in which case upon receipt of this data at the device level, NavView looks for a match in its beacon file and if found, the device publishes the Geographic2D and Elevation observations on that beacon's data source directly. Alternatively, the output may be a position relative to the center of the LBL array. In this case, upon receipt of this data at the device level, NavView looks for a match in its beacon file and if found, translates the relational data

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from the known LBL array center to a position and then proceeds to publish the Geographic2D and Elevation observations on that beacon's data source directly.

These published Geographic 2D and Elevation observations are available for use as any other similar observations published by devices are, including being selectable for Rigid Body and Kalman Filter calculations.

No USBL specific calculation configuration or processing is required by NavView to handle USBL position data

6.8.3 Using USBL Cartesian Data

USBL systems can also be configured to output Cartesian coordinates, XYZ distances from the USBL system's reference point to the beacon. These may be ship referenced (relative to the vessel's bow) or earth referenced (relative to True north). In either case, the device publishes the following USBL observations:

- USBL
    - These are translated to the USBL transducer and have the USBL calibration corrections applied
    - These are assigned to a Rigid Body or Kalman Filter calculation to position the associated beacon

- USBL-RAW (Calibration) (see the Acoustics section)
    - These are the raw untranslated and uncorrected USBL cartesian data as received from the device
    - These are only assigned to a USBL Calibration as the USBL data source

USBL observations are assigned to the Rigid Body calculation that is configured for the vehicle the USBL transducer pole (also referred to as the hydrophone) is mounted on. When this calculation receives the observations it looks for a match in the NavView beacon file. If found it translates the XYZ data to a beacon position and depth which are published as Geographic 2D and Elevation observations on that beacon's data source. These published Geographic 2D and Elevation observations are available for use as any other observations are, including being selectable for Rigid Body and Kalman Filter calculations.

NavView requires a specific configuration of the Rigid Body calculation for handling USBL Cartesian data. This section details this configuration.

6.8.3.1 Configure the Rigid Body Calculation for a USBL Hydrophone

When using USBL XYZ Cartesian data, NavView requires that a Rigid Body calculation be configured specifically for the vehicle the USBL hydrophone is mounted on. The USBL hydrophone is then associated with this calculation enabling assigning of USBL observation data source(s) to the calculation. Thus a surface position can be associated with the USBL data to determine beacon positions.

The configuring of a Rigid Body calculation for USBL can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

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1. Access the Rigid Body calculation that has been created to position the vessel that the USBL transducer pole is mounted on (see Edit a Calculation)

2. Complete standard configuration of calculation (see Configuring Calculation Input Observations)

3. Check the Associate USBL Hydrophone box, this will result in a USBL tab being added (see Figure 6-16)
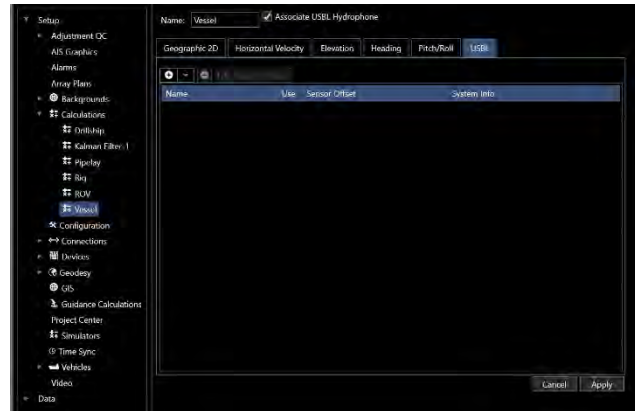

FIGURE 6-16 RIGID BODY CALCULATION - USBL HYDROPHONE OPTION

4. Select the USBL tab

5. Click on the ⬇ in the ⊕⬇ button to display a list of the available USBL observation data sources, select the one to use

FIGURE 6-17 RIGID BODY CALCULATION - USBL SELECTION

Note: Multiple USBL observation data sources can be added. In this way, vessels with multiple USBL systems can be setup in NavView so the one in use is automatically used.

Note: Assign a Usbl data source to a Rigid Body Calculation, **never** a Usbl-RAW data source.

Note: Dual pole systems are not supported.

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a. **Use**: Check if the USBL source is to be used
b. **Sensor Offset:** Enter the offsets from the CRP to the USBL sensor, see USBL Offsets for details regarding configuring these
c. **System Info**: This cell displays the configuration for the USBL device. Unlike other configuration items, these cannot be edited directly in the cell as they are associated with the observation source device, see USBL Offsets for details regarding configuring these
d. **Edit device Settings:** Click this button to access the respective device's configuration

6. Click Apply (if present, dependent upon the view used)
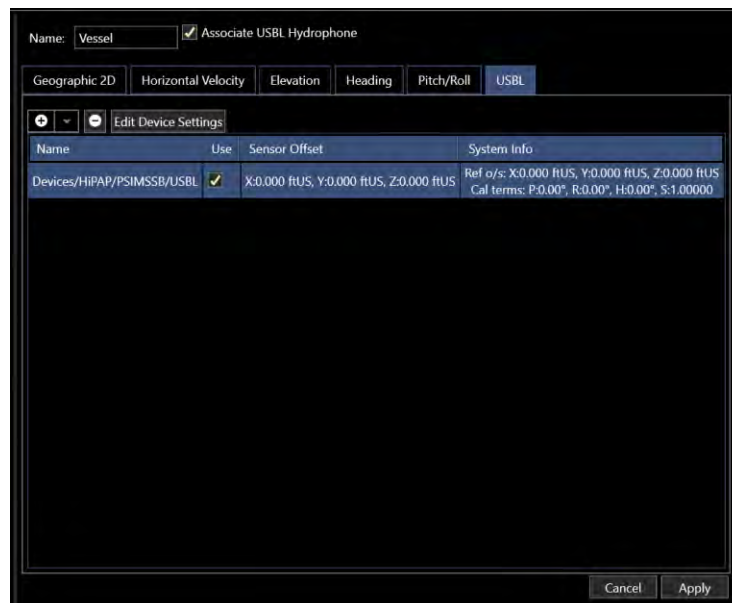
FIGURE 6-18 RIGID BODY CALCULATION – USBL TAB

6.8.3.2 USBL Offsets

In order to correctly configure NavView to process USBL Cartesian data, it is important to understand the offsets involved. These include those entered in the USBL system and those entered in NavView.

USBL systems support the entry of offsets to define the relationship between the USBL transducer pole and the position on the vessel that the output Cartesian data is referenced to, known as the USBL reference point. This reference point is typically the vessel's center of gravity (COG) because the USBL output will be for the Dynamic Positioning (DP) system which uses the COG as its reference point. The Cartesian coordinate data output by the USBL system is relative to this reference point, not the transducer pole.

In NavView, there are two offset entry points for USBL related offsets, one at the device level and one at the calculation level.

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6.8.3.2.1 DEVICE: USBL SYSTEM OFFSETS

The offsets at the device level enable the user to enter the offsets that are in the USBL system which in turn enables NavView to translate ship referenced Cartesian coordinates it receives from the USBL system, from the USBL reference point back to the transducer pole.

Note: The USBL system's offsets are only required to be entered in NavView if and only if NavView is applying a USBL calibration correction to the USBL data as this must be applied to the Cartesian coordinates as they relate to the transducer.

Note: If the USBL output is earth referenced Cartesian coordinates, NavView does not perform a translation of the data to the transducer and the USBL system's offsets entered in NavView can be set to 0.0.

Note: If NavView is not applying the USBL calibration to the USBL data, there is no benefit to translating the Cartesian coordinates back to the transducer pole so these offsets can be set to 0.0.

6.8.3.2.2 CALCULATION: USBL SENSOR OFFSETS

The NavView offsets entered at the calculation level relate the sensor to the CRP. In the case of USBL observations, the sensor refers to the point that the USBL observations published by the device are relative to. This may or may not be the hydrophone.

Note: If the USBL device has translated the Cartesian coordinates to the transducer pole, the calculation Sensor Offsets are from the CRP to the transducer pole.

Note: If the USBL device has not translated the Cartesian coordinates to the transducer pole, these offsets are from the CRP to the USBL reference point.

6.8.3.2.3 CASE 1: USBL OUTPUTS SHIP REFERENCED CARTESIAN COORDINATES AND NAVVIEW IS APPLYING USBL CALIBRATION CORRECTIONS

1. In the USBL device configuration for USBL System Offsets
    a. Enter the offsets that are entered in the USBL system using the sign convention of USBL reference point to the transducer (see Figure 6-19**Error! Reference source not found.**)
    b. NavView will
        i. Translate the XYZ data to relate to the transducer
        ii. Apply the USBL calibration corrections
        iii. Identify the beacon from the NavView Beacon list and if found, publish the corrected XYZ values relative to the transducer as Usbl observations for that beacon

Note: NavView will also publish the raw untranslated and uncorrected XYZ values as Usbl-RAW observations for use in USBL Calibration data collection and processing.
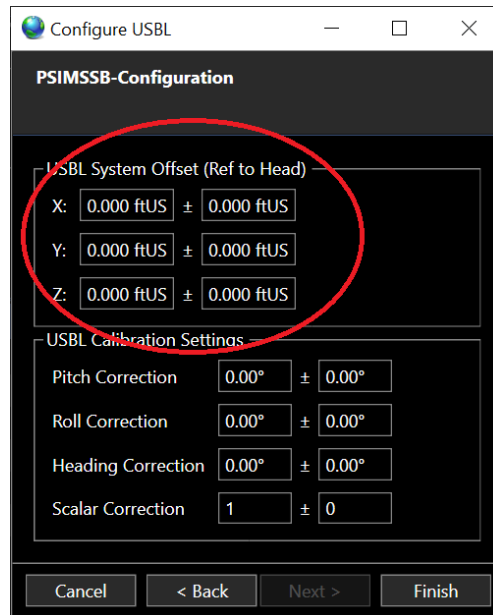
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FIGURE 6-19 USBL SYSTEM OFFSETS
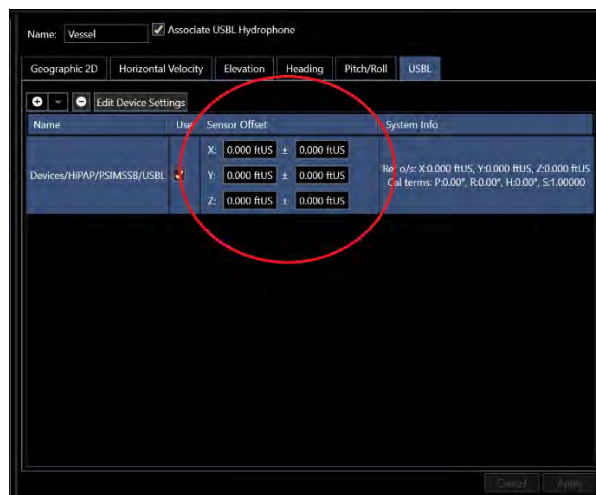

FIGURE 6-20 USBL OBSERVATION SENSOR OFFSETS

2. In the Rigid Body calculation on the USBL tab
   a. Enter the Sensor Offsets from the CRP to the transducer (see Figure 6-20)
   b. NavView will
      i. Determine a position and depth for the transducer for the USBL data epoch
      ii. Apply the USBL XYZ data, transducer position and depth and vessel heading to calculate a position and depth for the beacon
      iii. Publish the position and depth as observations associated with that beacon

6.8.3.2.4   CASE 2: USBL OUTPUTS EARTH REFERENCED CARTESIAN COORDINATES OR NAVVIEW IS NOT APPLYING USBL CALIBRATION
   1. In the USBL device configuration

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       a. Enter 0.0 for the USBL System Offsets (see Figure 6-19)

       b. NavView will

          i. Identify the beacon from the NavView Beacon list and if found, publish the XYZ values as received from the device, i.e. relative to the USBL reference point, as USBL observations for that beacon

Note: NavView will also publish these XYZ values as USBL-RAW observations for use in USBL Calibration data collection and processing.

   2. In the Rigid Body calculation on the USBL tab

       a. Enter the Sensor Offsets from the CRP to the USBL reference point (see Figure 6-20)

       b. NavView will

          i. Determine a position and depth for the USBL reference point for the USBL data epoch

          ii. Apply the USBL XYZ data, transducer position and depth and vessel heading to calculate a position and depth for the beacon

          iii. Publish the position and depth as observations associated with that beacon

For details regarding the configuration of the USBL device, see Appendix Device Documents.

6.8.4 Using Beacon Geographic2D and Elevation Observations

The Geographic2D and Elevation observations published on a beacon's data source are available for application in the same as any other similar observations, including being applied to a Rigid Body or Kalman Filter calculation created to position a subsurface vehicle or object. When accessing the hierarchical observation data source list, they are listed under Beacons (see Figure 6-15).

6.9 Kalman Filter Calculation

The Kalman Filter (KF) is an estimation algorithm developed and published by R.E. Kalman in 1960. In NavView, the Kalman Filter calculation is used to create a smoothed position based on various inputs. The KF maintains the state of a vehicle's position and velocity, along with standard deviations of those values. It calculates an estimated position and velocity between actual sensor updates, and the estimates are further refined at subsequent updates.

Like the Rigid Body calculation, the Kalman Filter calculation is a general position solution for the CRP of a vehicle. The Kalman Filter incorporates the following observation types:

- Geographic 2D
- Horizontal Velocity
- Elevation
- Heading
- Pitch/Roll

The Elevation, Heading, and Pitch/Roll observation types are handled as with the Rigid Body Calculation.

The KF maintains an estimate of the position and velocity along with standard deviations, also known as the state. The calculation is updated at a set time interval. At each time update, a new state is estimated based on the previous state. With knowledge of the current position, and the direction in which a body

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is moving, the algorithm calculates a new position and velocity, with the estimated standard deviations growing with time.

When position or velocity updates are received, they are used to correct the states. The magnitude of the effect of the update on the state is known as the Kalman Gain. This is determined based on the standard deviations of the incoming data vs. the estimated standard deviations of the state. NavView uses the standard deviation of the incoming data in order to bias towards either the position updates, the velocity updates, or the estimated state. For instance, an ROV tracking the seabed could receive relatively rapid and accurate updates of velocity updates from a Doppler Velocity Log system, while at the same time receiving noisy and slower absolute position updates. The KF algorithm will take this data into account to provide a realistic estimate of the body's position and motion, such that it does not move directly towards every position update, but uses the position updates to keep the estimate from drifting from reality.

It is important that the sensor inputs into the Kalman Filter calculation have the correct standard deviations assigned.

The Kalman Filter calculation publishes a Body State and the following observation types at each epoch.

- Geographic 2D
- Horizontal Velocity
- Elevation
- Heading
- Pitch/Roll

6.9.1 Multiple Observation Sources and Automatic Failover

Only one observation source of each type is used in the Kalman Filter calculation. However, multiples of any type can be added, monitored and configured for Automatic Failover (see Automatic Failover).

6.9.2 Configure the Kalman Filter Calculation

The configuring of a Kalman Filter calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Kalman Filter calculation to be configured (see Edit a Calculation)
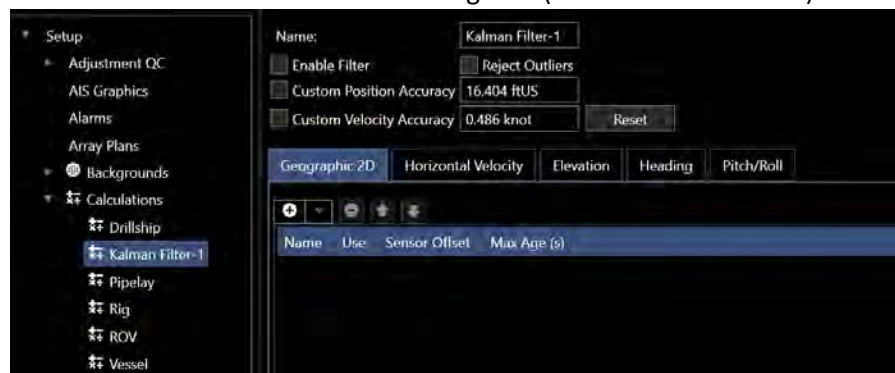
FIGURE 6-21 CONFIGURE KALMAN FILTER CALCULATION

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2. **Name**: Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Enable Filter:** This enables the user to easily turn on and off the application of the Kalman Filter
   1. Check this box to activate the Kalman Filter calculation to generate results
   2. Uncheck this box to deactivate the Kalman Filter and generate results as if a Rigid Body calculation

4. **Reject Outliers:** Check this box to reject any data that is outside the Kalman Filter estimate

5. **Custom Position Accuracy:** Check the box to assign an accuracy to be used by the calculation

6. **Custom Velocity Accuracy:** Check the box to assign an accuracy to be used by the calculation

7. **Reset:** Clicking this button resets the Kalman Filter to its default state

8. Configure the observations as required (see Configuring Calculation Input Observations)

Note: The horizontal velocity observation is used in the Kalman Filter.

Note: The resetting of the Kalman Filter to its default state includes setting the estimated standard deviations to very large values such that any new observations are accepted. This may be used for situations where tracking has just restarted and due to old estimated position in a different location, new observations are being rejected.

9. Click Apply (if present, dependent upon the view used)

6.9.3 Monitoring the Kalman Filter Calculation

The Kalman Filter calculation is monitored with the Calculation window. This is opened from the View ribbon by clicking on the Calculations button in the Windows section.

FIGURE 6-22 VIEW RIBBON - CALCULATIONS VIEW

The Calculations window displays the current calculations in the left panel in a tree that can be expanded to display the associated observations and their sources. The right panel displays details for the selection made in the left panel. The various statuses are indicated by ☑ (good/accepted) and ☒ (bad/old/rejected). The status of the Kalman Filter calculation will be ☒ if one of the observation sources is missing, or if the incoming data is rejected by the calculation. Individual observations will be ☒ if the incoming data is missing or older than the maximum allowed age.

For the Kalman Filter if a specific observation type is selected in the left panel, just the observations of that type are displayed in the right panel with the same information and display options as in the case of a Rigid Body calculation (see Calculations right panel details in Monitoring the Rigid Body Calculation). If a specific observation is selected, the right panel does not display anything.

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If a Kalman Filter calculation is selected in the left panel, the right panel displays an overview of the Kalman Filter operation, including time series plots, and direct access to the calculation's controls (see Figure 6-23). This enables the user to monitor the performance of the incoming observations and how they differ from the calculated state estimates.

FIGURE 6-23 KALMAN FILTER CALCULATION MONITORING

The monitoring display consists of three main parts: the status grid, the calculation control interface Reset Calculation, and the time series displays.

6.9.3.1 Kalman Filter Status Grid

The Kalman Filter algorithm operates with Geographic2D observations and with optional velocity observations. If no velocity observations are present, the calculation is able to estimate a velocity based on the history of the position observations.

The grid consists of 4 rows: **Latitude, Velocity North, Longitude** and **Velocity East**. For each of these data items, the estimated value output from the Kalman Filter with a standard deviation is provided, the latest real observation is shown with a standard deviation. The age of the latest incoming observation is shown, followed by the status.

The status in this case indicates ▣ (good) if the observation has been accepted by the filter, and ▣ (bad) if the observation has been rejected by the filter.

6.9.3.2 How to Read the Time Series Data

When the Kalman Filter is just starting, the position and velocity sigma values will be very large. As data is received and the estimation begins to calculate, these errors will reduce greatly. If the filter is operating correctly, the error of position and velocity will increase with each calculation epoch, at a near constant rate, and then be brought back down by a subsequent update, so there will be a saw tooth pattern (Figure 6-24).

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FIGURE 6-24 KALMAN FILTER VELOCITY SIGMA TIME SERIES

Likewise, the residuals increase with time in between observation updates, as the calculation is estimating new positions and velocities, while the latest updated value remains the same. Each incoming observation will reduce the position residual back to near zero, as long as that observation is accepted by the filter.
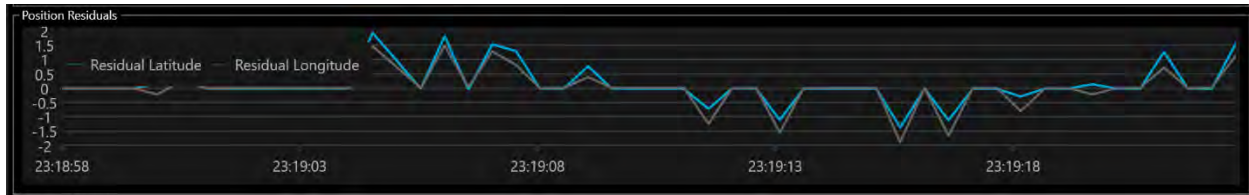
FIGURE 6-25 KALMAN FILTER POSITION RESIDUALS

In Figure 6-25 it can be seen that the position residual is centered around zero in the both latitude and longitude, however the Latitude residual increases and then decreases, which is in time with the position or velocity updates.

Figure 6-26 shows the expected results of a correctly tuned Kalman Filter in the Map window. The yellow vehicle is using a Rigid Body Calculation with a geographic2D observation coming at 3 second intervals, similar to what would be the case for a USBL position update. The Kalman Filter calculation has the green snail trail. Note that although the raw Geographic 2D appears to the left and right of the track, it follows the same trend as the Kalman Filter calculation.

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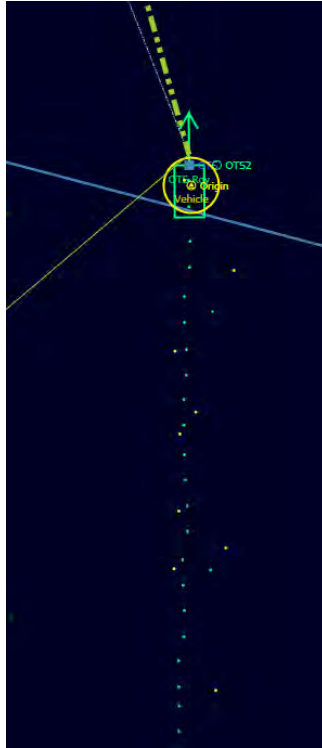
FIGURE 6-26 KALMAN FILTER MAP VIEW

The difference between a new observation and the estimated observation is known as the innovation. NavView uses a normalized innovation filter to automatically reject erroneous data. The innovation is scaled using the Kalman gain, which results in a unitless scalar value which will remain close to 1 for good data. Anything above 2.7 is rejected by the filter. In practice, this means that any observation further than approximately 2.7 * sigma (99%) away from the predicted position is rejected.

6.10 Static Draft Calculation

The Static Draft calculation accepts draft and attitude sensor input to determine a draft value for a CRP. The following observation types are supported as inputs:

- Geographic 2D
- Pitch/Roll

The calculation publishes the following observations:

- Elevation

This calculation operates on a timer executing every 5 seconds. Each sensor's draft is reduced to the CRP by applying the attitude data and an average of these is calculated and published as an Elevation observation.

6.10.1 Configure the Static Draft Calculation

The configuring of a Static Draft calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Static Draft calculation to be configured (see Edit a Calculation)

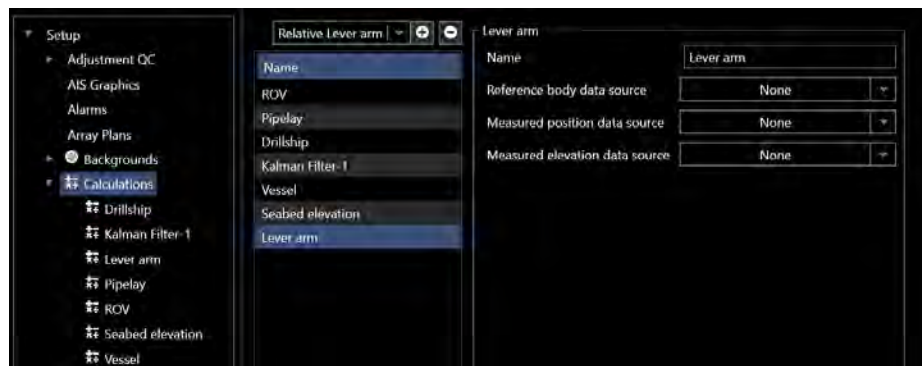4D Nav, LLC
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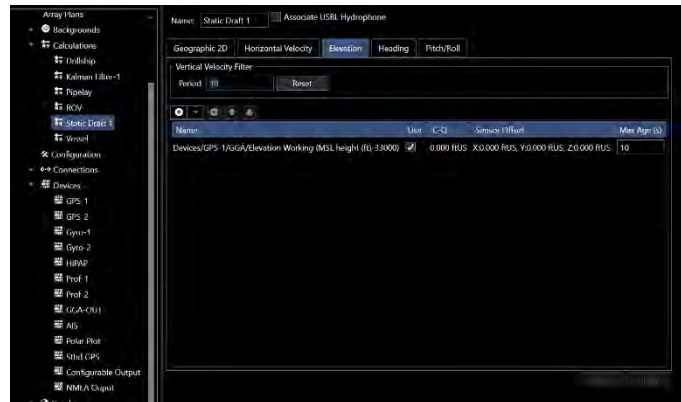
FIGURE 6-27 STATIC DRAFT CALCULATION

2. **Name**: Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Elevation Observations:** Add the Elevation observations providing the draft data (see Configuring Calculation Input Observations)

Note: The draft observation sources added are used in the calculation if their Use box is checked. Automatic failover does not apply to these observation sources. If one fails, it simply stops being used in the draft calculation.

4. **Pitch/Roll Observations:** Add the Pitch/Roll observations providing the attitude data required to reduce the draft sensor data to the CRP (see Configuring Calculation Input Observations)

Note: Automatic failover applies to the Pitch/Roll observations (see Automatic Failover).

5. Click Apply (if present, dependent upon the view used)

6.10.2 Monitoring the Static Draft Calculation
The resulting angular acceleration can be monitored using the Time Series window.

FIGURE 6-28 TIME SERIES - STATIC DRAFT

6.11   Seabed Elevation Calculation
The Seabed Elevation calculation provides a seabed elevation base on a body data source elevation, e.g. an ROV vehicle, and an Altitude sensor.

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6.11.1 Configure the Seabed Elevation Calculation

The configuring of a Seabed Elevation calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Seabed Elevation calculation to be configured (see Edit a Calculation)
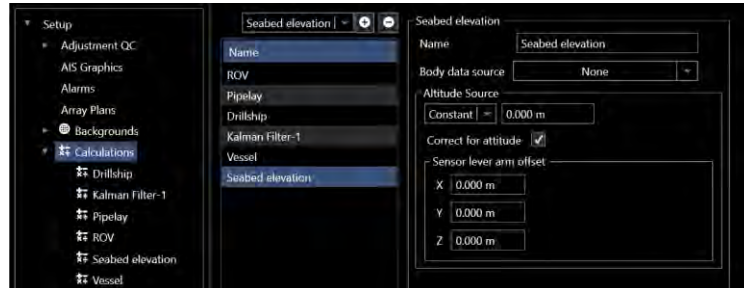
FIGURE 6-29 SEABED ELEVATION CONFIGURATION

2. **Name:** Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Body Data Source:** Select the elevation source to be used from the drop-down list

4. **Altitude Source:** Altitude can be entered as a constant value or taken from an observation.

5. **Correct for Attitude:** The option to correct for attitude is available if pitch/roll data is available

6. **Sensor Lever Arm Offset:** Enter the offsets from the elevation sensor to the body reference point

6.12 Relative Lever Arm Calculation

The Relative Lever Arm calculates the lever arm for selected position and elevation data sources based on a reference body, e.g. use a known DGPS derived vehicle position to check another DGPS antenna lever arm

6.12.1 Configure the Relative Lever Arm Calculation

The configuring of the Relative Lever Arm calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Relative Lever Arm calculation to be configured (see Edit a Calculation)

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FIGURE 6-30 RELATIVE LEVER ARM CONFIGURATION

2. **Name:** Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Reference Body Data Source:** From the drop-down list select the reference body

4. **Measured Position Data Source:** From the drop-down list select the position source to calculate the lever arm to

5. **Measured Elevation Data Source:** From the drop-down list select the elevation source to calculate the lever arm to

6.13 Predicted Position

The Predicted Position calculation calculates a future position, heading and linear velocity (speed) of a body using the body's current position, linear velocity, heading, angular velocity (Rate of Turn) and look ahead time.

6.13.1 Configure the Predicted Position

The configuring of a Predicted Position calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Predicted Position calculation to be configured (see Edit a Calculation)
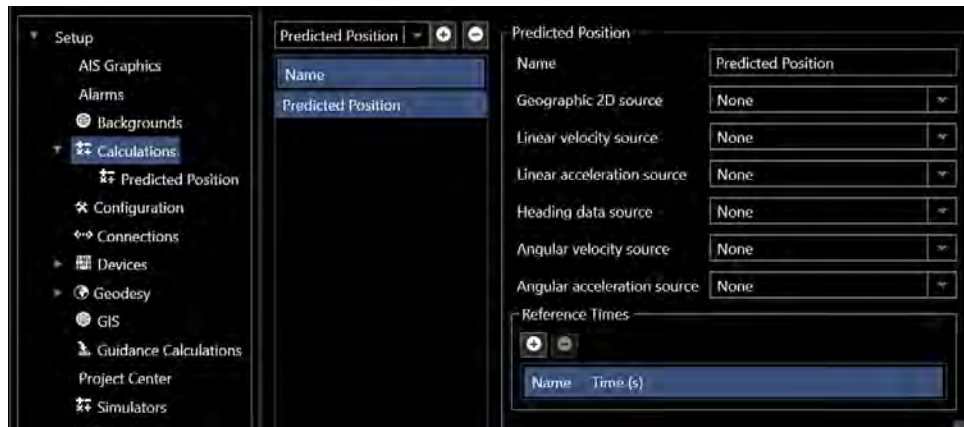
FIGURE 6-31 PREDICTED POSITION CONFIGURATION

2. **Name:** Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Geographic 2D source:** Select geographic 2D source of the body

4. **Linear velocity source:** Select the linear velocity source of the body

5. **Linear acceleration source:** Select the linear acceleration source of the body

Note: The linear velocity and linear acceleration are required to be World Referenced.

6. **Heading data source:** Select the heading source of the body

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7. **Angular velocity source (Rate of Turn):** Select the angular velocity source of the body

8. **Angular acceleration source:** Select the angular acceleration source of the body

9. **Reference Times:** The time of the predicted position is from current time + look ahead in seconds (s). The prediction time is added using the button, this adds a configurable time as shown in
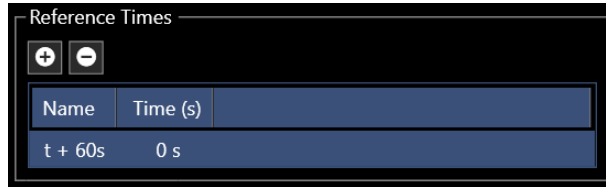
FIGURE 6-32 PREDICTED POSITION - REFERENCE TIMES

    a. **Name:** Enter a name for the time reference
    b. **Time (s):** Enter the time for the prediction in seconds

6.13.2 Monitoring Predicted Position Calculation

The calculated Predicted Position can be displayed as any observation type for monitoring purposes, e.g. in a Text Window, Time Series window, etc.

6.14 Depth From Pressure Calculation

The Depth From Pressure calculation calculates depth from a pressure observation using either the UNESCO or density algorithm. The calculation requires the following observation type:

- Pressure

Optionally, it can also accept the following observations instead of using a static manual data entry of the same:

- Pressure (Atmospheric)
- Geographic2D

This calculation publishes the following observations:

- Elevation
- Inputs
  - o Pressure (Atmospheric)
  - o Density
  - o Geographic2D
  - o Pressure (Raw)

This calculation operates on a timer updating at 2Hz if there is new data.

6.14.1 Configure the Depth From Pressure Calculation

The configuring of a Depth From Pressure calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

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1. Access the Depth From Pressure calculation to be configured (see Edit a Calculation)
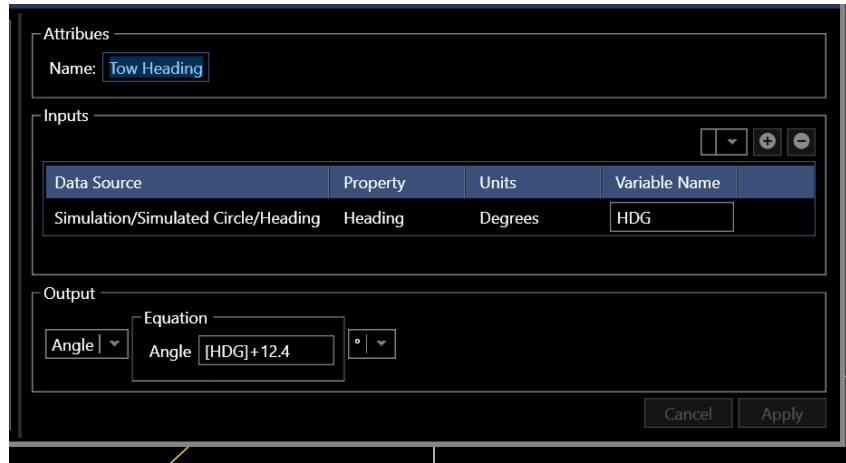
2. **Name**: Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Pressure Source:** Select the pressure source to be used as a raw pressure source

4. **Equation:** Select the calculation to be used to convert pressure to depth

   a. **UNESCO**: The UNESCO equation refers to the 1980 Equations of State of Seawater, published in the UNESCO technical paper 44, referenced as UNESCO 1983. This equation uses a standard world ocean density, and takes input of pressure and latitude.

   b. **Density**: The density equation requires a mean density of the water column, which can be determined from a Conductivity Temperature Density (CTD) profile of the water column. The Density value is entered into the Density text box and used for this calculation.

   The density equation is as follows:

   $$\boldsymbol{Depth} = \frac{\boldsymbol{P*0.70307}}{\boldsymbol{d}} * \left(\frac{\boldsymbol{G_{std}}}{\boldsymbol{G_{local}}}\right)$$

   0.70307 = psi to meters conversion for water of standard density

   P = Pressure in PSI

   d= mean density of the water column.

   G_{std} = Standard gravity 9.80665 m/sec^2

   G_{local} is the local gravity from the International association of Geodesy, Special Bulletin on Geodesy (1970) ref: Anon 1970

   $$G_{local} = G_e * (1 + 0.0053024 * sin^2\phi - 0.000059 * sin^2(2\phi))$$

   G_{e} = 9.7803184 m/sec^2

   c. **Dynamic:** Calculates depth using density from water column profile integrated to the input pressure. Provides most accurate result of three options

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5. **Real-time atmospheric pressure:** Check this box if the atmospheric pressure comes from a live pressure source

6. **Atmospheric Pressure:** If the real time atmospheric pressure option is checked, select the real time pressure observation source from this drop down list, otherwise enter the atmospheric pressure to be used in the calculation

Note: The atmospheric pressure is subtracted from the pressure source prior to the depth being calculated.

7. **Real Time Position:** Check this box to enable the use of a real time position observation for the latitude used in the pressure to depth calculation

8. **Location:** If the real time position is option is checked, select the real time position observation source that is to provide the latitude for the calculation, otherwise enter a position to be used in the calculation

9. **Gravity Gradient:** Select the gravity gradient to use from the drop-down list

10. **Gravity Equation:** Select the gravity equation to use from the drop-down list

11. Click Apply (if present, dependent upon the view used)

6.14.2 Monitoring Depth From Pressure Calculation

The calculated Elevation can be displayed as any observation type for monitoring purposes, e.g. in a Text Window, Time Series window, etc.

6.15 Generic Calculation

The Generic calculation creates observations by applying basic mathematical equations to multiple data source observations, e.g. add a Tilt Direction derived from pitch and roll to a Reference Heading to determine the Tilt Azimuth.

6.15.1 Configure the Generic Calculation

The configuring of a Generic calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Generic calculation to be configured (see Edit a Calculation)

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FIGURE 6-34 GENERIC CALCULATION CONFIGURATION DIALOG

2. **Name:** Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Inputs:** From the drop-down list select the data sources for the calculation and click the ⊕ button to add it to the list of variables that will be available for the calculation

    a. NavView will automatically increment the variable names alphabetically, e.g. A,B,C etc. These variables can be edited and a single letter or multiple letters like HDG

4. **Output:** From the drop down select the observation type the calculation result is to be published as, this allows the user to utilize the calculated result as a different observation type than used in the calculation. For example, if a Depth is used in the calculation but the output is set to be a Distance, the result can be used as a Distance observation elsewhere, but not as a Depth.

5. **Equation** Enter a calculation equation to apply to the data sources that can evaluate to a value to generate an observation output

    a. Variables are contained in box brackets
    b. Operators that can be used include:
        i. Plus: +
        ii. Minus: -
        iii. Divide: /
        iv. Multiply: *
        v. Modulo: %
        vi. Sine: Math.Sin()
        vii. Cosine: Math.Cos()
        viii. Tangent: Math.Tan()
        ix. π: Math.PI
        x. Absolute: Math>Abs()
        xi. Round Down: Math.Floor()
        xii. Round Up: Math.Ceiling()
        xiii. Brackets: ()

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6. **Units** From the drop down list, select the units to use for the result. This list will be populated based on the Output data

6.16 Heading From Positions Calculation

The Heading From Positions calculation determines an average heading from 2 or more positions. The calculation accepts the following observation type:

- Geographic 2D

The calculation publishes the following observations:

- Heading

This calculation operates on a timer updating once a second. All +possible pairings of the Geographic 2D observations are made and using their positions and sensor offsets, True heading values determined for them. The average of these is published as a Heading observation.

6.16.1 Configure the Heading From Position Calculation

The configuring of a Heading From Position calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Heading From Position calculation to be configured (see Edit a Calculation)
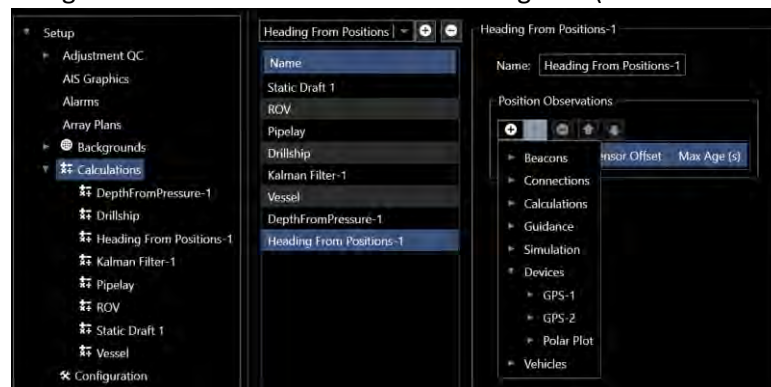
FIGURE 6-35 HEADING FROM POSITIONS CALCULATION

2. **Name**: Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Position Observations:** Add the Position observations to be used for the heading calculations and configure accordingly (see Configuring Calculation Input Observations)

Note: All of the Geographic 2D observations added are used in the calculation if their Use box is checked. Automatic failover does not apply to these observation sources. If one fails, it simply stops being used in the calculation.

4. Click Apply (if present, dependent upon the view used)

6.16.2 Monitoring the Heading from Position Calculation

Monitoring of this calculation is done using the Time Series QC Widget or displayed in a text window

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FIGURE 6-36 HEADING FROM POSITIONS TIME SERIES

6.17 Lookup

The Lookup calculation returns a value in a csv file corresponding to an input data source. The csv file contains a table of numbers in two columns. The data source looks at the values in the first column and then publishes the corresponding value in the second column. An example would be a calculated Layback based on a Station or KP of lay vessel.

6.17.1 Configure the Lookup Calculation

The configuring of a Lookup calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Lookup calculation to be configured (see Edit a Calculation)
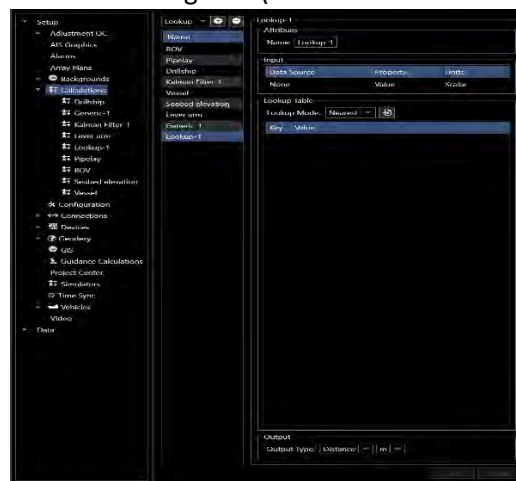
FIGURE 6-37 LOOKUP CONFIGURATION

2. **Name:** Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Input:** Select the data source which will correspond to the first column in the table. This can be defined as *Atleast, Interpolate or Nearest*

4. **Lookup Table:** Select the csv file to be used in the lookup calculation by clicking [icon]. The values in the table will be displayed in the Lookup Table panel

5. **Output:** Select the output type from the drop-down list

6.18 DTM Elevation Calculation

The DTM Elevation calculation generates an elevation observation from a DTM based on a position observation data source and an Altitude source.

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6.18.1 Configure the DTM Elevation Calculation

The configuring of a DTM Elevation calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the DTM Elevation calculation to be configured (see Edit a Calculation)

FIGURE 6-38 DTM ELEVATION CONFIGURATION

2. **Name:** Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Position Data Source:** From the drop-down list select the position source to determine the corresponding elevation from the DTM

4. **Altitude Source**

    a. Select if Altitude source is an Observation (default) or a Constant

    b. If a Constant

        i. Enter a value

    c. If an Observation

        i. From the drop down populated by all available Distance observation sources, select the one representing the altitude

        ii. Enter a multiplier to be applied to the observation value, e.g. enter -1.0 if the value's sign requires reversing

        iii. Enter a C-O to apply to the observation value after application of the multiplier

        iv. Enter the age of data to apply before the calculation will fai

6.19 Relative Position (Dynamic Body) Calculation

The Relative Position (Dynamic Body) calculations computes positions of remote targets using observations from total stations. The total stations would be setup on previously established body control points with known offsets to the body CRP. The remote targets would be mounted on previously established body control points with known offsets to the remote body CRP. The total station offsets are

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entered in the Lever Arm Offset section of the configuration page. The total station horizontal angle RO can be set directly in the total station using the local angle from the total station occupation point and RO point relative to the vessel centerline. Note that the angle is a local angle not a heading.

The calculation outputs:

- Remote target elevation
- Remote target Geographic2D
- Lever arm (body) X,Y,Z

The Lever Arm (body) X,Y,Z is referenced to the local Cartesian frame of the body the total Stations are setup on.

6.19.1 Configure the Relative Position (Dynamic Body) Calculation

The configuring of a Relative Position (Dynamic Body) calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Relative Position (Dynamic Body) calculation to be configured (see Edit a Calculation)
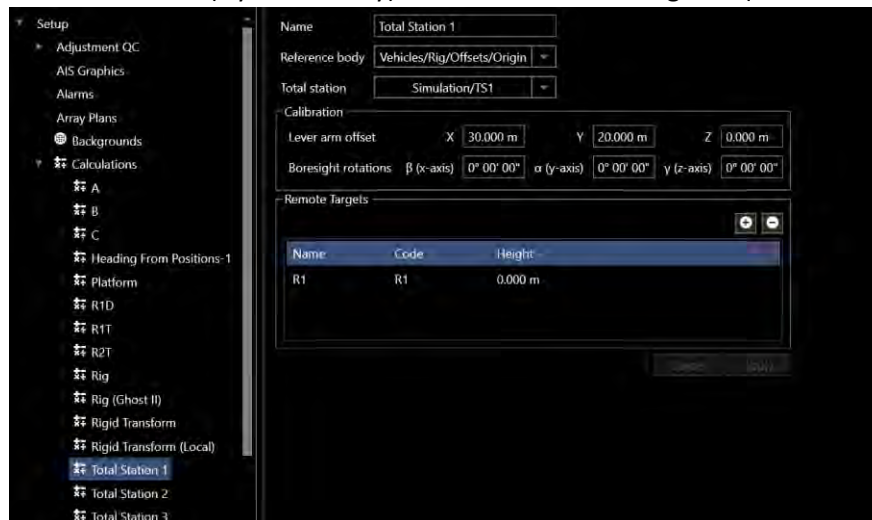
FIGURE 6-39 RELATIVE POSITION (DYNAMIC BODY) CONFIGURATION

2. **Name:** Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Reference Body:** Select the body from the drop-down list the total station is mounted on. This must be referenced to the body Origin/CRP

4. **Total Station:** Select the total station from the drop-down list of devices

5. **Calibration:** When the total station reference plane is not coincident with the vessel reference plane

    o **Lever Arm Offset:** Total Station local offset from reference body CRP

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- o **Boresight Rotations:** Any known total station axis misalignments can be entered here also the total station RO local angle can be entered here instead of entering the angle in the total station. The sign convention for the rotations about X, Y and Z follow the right handed CRS convention.

6. **Remote Targets:** Target associated with the Total Station. The target is added using ⊕ button

   - o **Name:** Name given to target

   - o **Code:** Code given to target

   - o **Height:** Height of target from a vertical reference plane. This would be used to solve for a 3D solution

Note: Multiple instances of total stations can be configured.

6.20 Rigid Transform (Local) Calculation

The Rigid Transform (Local) calculation will determine the best-fitting rigid transformation that aligns two sets of corresponding points to solve for a position observation. For a 2D solution a minimum of two reference points in the set is required. This calculation takes as an input the remote target lever arm (body X,Y,Z) that was calculated from the Relative Position (Dynamic) calculation the other input is the corresponding static offset on the body the target is mounted. The calculation transforms local coordinates (body Cartesian coordinates) into a second coordinate system (Geographic2D).

The calculation outputs:
- Remote target elevation, Geographic2D and Lever Arm transformation data.
- Body origin elevation, Geographic2D and heading

6.20.1 Configure the Rigid Transform (Local) Calculation

The configuring of the Rigid Transform (Local) calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Rigid Transform (Local) calculation to be configured (see Edit a Calculation)
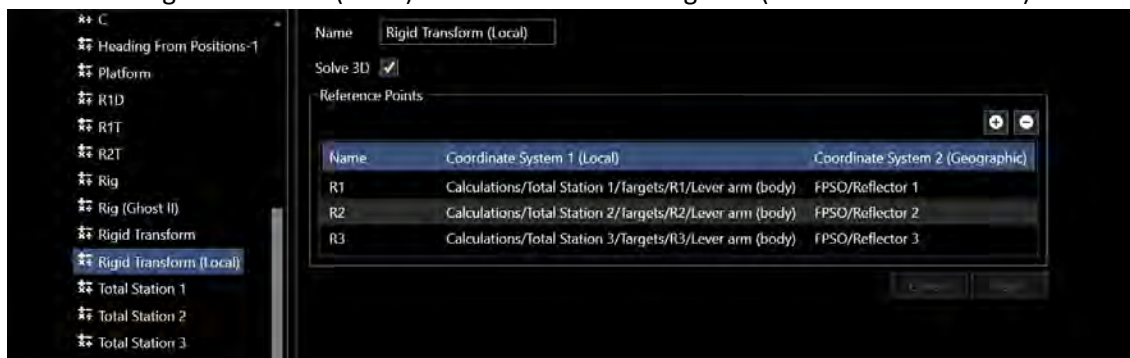
FIGURE 6-40 RIGID TRANSFORM (LOCAL) CONFIGURATION

2. **Name:** Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Solve 3D:** Check this box if a 3D solution is required

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4. **Reference Points:** Select reference points for transformation

   o **Name:** Name of remote target

   o **Coordinate System 1 (Local):** Target lever arm calculated from Relative Position (Dynamic) calculation

   o **Coordinate System 2 (Geographic):** Is the rigid body that the targets are on

6.21 Rigid Transform (Geographic) Calculation

The Rigid Transform (Geographic) calculation takes geographic coordinates from one body and transforms them to another. This calculation takes as an input the remote target geographic position as generated from the corresponding total station calculation the other input is the rigid body containing the remote target offsets.

The calculation outputs:

- Body state origin elevation, Geographic2D, heading
- Remote target Geographic2D transformation data

6.21.1 Configure the Rigid Transform (Geographic) Calculation

The configuring of the Rigid Transform (Geographic) calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Rigid Transform (Geographic) calculation to be configured (see Edit a Calculation)
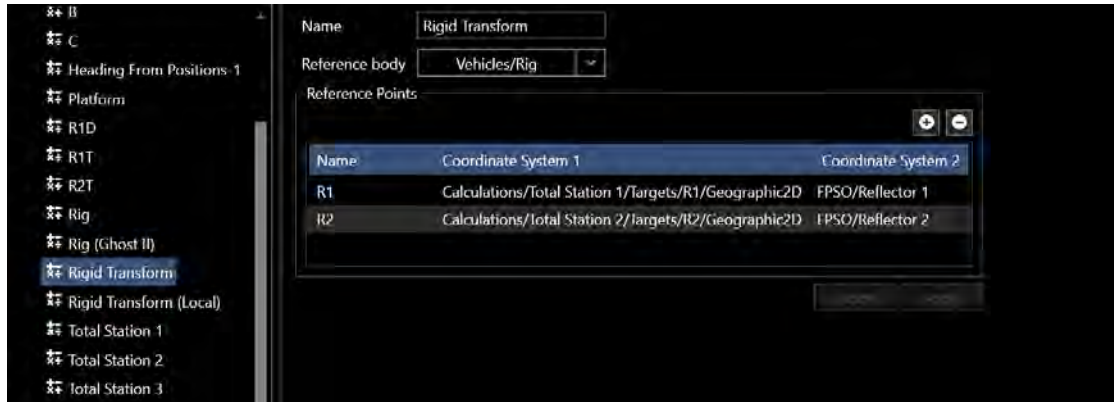
FIGURE 6-41 RIGID TRANSFORM (GEOGRAPHIC) CONFIGURATION

2. **Name:** Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Reference Body:** Select the body that has the reference positioning system

4. **Reference Points:** Select reference points for transformation

   o **Name:** Name of remote target

   o **Coordinate System 1:** Target Geographic2D data source from the corresponding total station calculation

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o **Coordinate System 2:** Rigid body that the remote targets are on

6.22 Relative Position (Static) Calculation

The Relative Position (Static) calculation uses total station observations to compute positions of remote targets. The total station would be mounted on a static platform (e.g. shore based control). The occupation and backsight would be coordinated and these points are assigned as waypoints.

 The calculation outputs:

- Target elevation and Geographic2D

6.22.1 Configure the Relative Position (Static) Calculation

The configuring of the Relative Position (Static) calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Relative Position (Static) calculation to be configured (see Edit a Calculation)
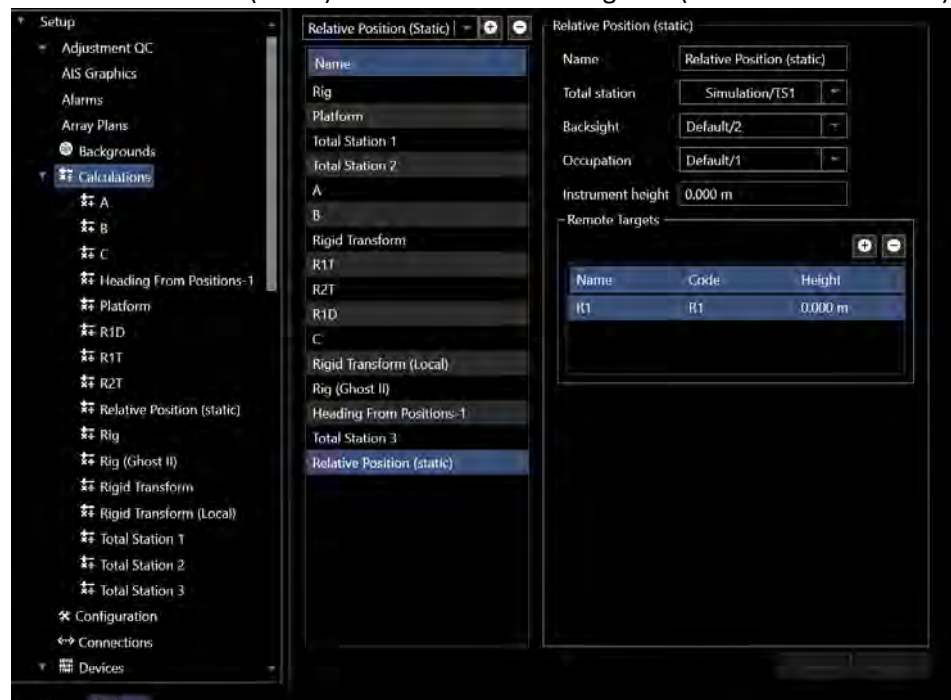
FIGURE 6-42 RELATIVE POSITION (STATIC) CONFIGURATION

2. **Name:** Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Total Station:** Select the total station to be used from the drop-down list

4. **Backsight:** Select the backsight to use from the drop-down list, e.g. waypoint

5. **Occupation:** Select the occupation to use from the drop-down list, e.g. waypoint

6. **Instrument Height:** Enter instrument height for a 3D solution

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7. **Remote Targets:** Add a remote target using ⊕ button

   o **Name:** Name of remote target

   o **Code:** Code of remote target

   o **Height:** Height of remote target from a vertical reference plane

6.23 Angular Acceleration Algorithm Calculation

In order to calculate Remote Motion (see Remote Motion Algorithm) the angular acceleration of a point on the rigid body is required. This is not readily available from motion sensors and therefore must be calculated.

Note: Angular velocity and angular acceleration are the same for all the points on the rigid body

The Angular Acceleration Algorithm calculation accepts the following observation type:

- Angular Velocity

The calculation publishes the following observation:

- Angular Acceleration

6.23.1 Configure the Angular Acceleration Algorithm Calculation

The configuring of an Angular Acceleration Algorithm calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

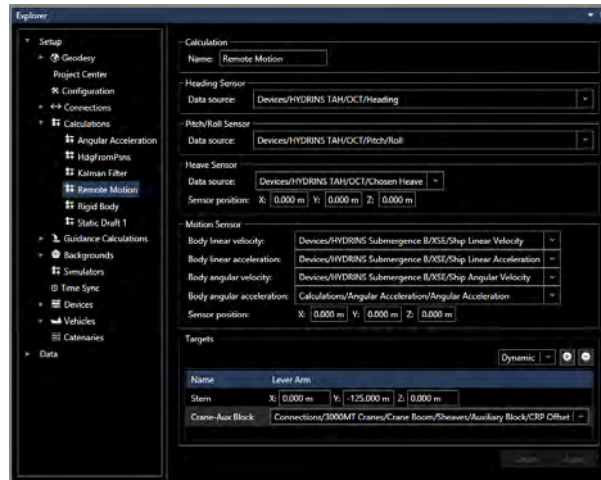1. Access the Angular Acceleration Algorithm calculation to be configured (see Edit a Calculation)

FIGURE 6-43 ANGULAR ACCELERATION ALGORITHM CALCULATION

2. **Name**: Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Body angular velocity**: From the drop-down list of all available sources of Angular Velocity observations, select the one to use in the calculation

4. **Filter type**: From the drop-down list, select the filter to apply

   a. **Exponential moving average:** Type of infinite impulse response filter that applies weighting factors to the observations that decrease exponentially over time never reaching zero, i.e. the weight applied to each observation in the sample decreases exponentially as they age. This is handled by multiplying the difference between the

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newest observation and the current average by α, where α =2.0 / (1.0 + sample size), and adding the result to the average.

b. **Modified moving average:** This is an exponential moving average where α =1.0 / sample size, i.e. the weighting decrease at a lesser rate than for the Exponential moving average.

c. **Simple moving average:** This is an unweighted moving average where with each new observation added to the sample, the oldest observation is dropped and the average is simply the sample average.

d. **Fading memory:** This is a weighted average where the impact of the newest observation is determined by the filter gain. The difference between the newest observation and the current average is multiplied by 1 – Gain and added to the current average. The higher the Gain, the less impact the newest observation has on the average. A Gain of 0 results in no filtering.

5. **Sample Size/Gain:** This is filter type dependent:

a. If Exponential moving average or Modified moving average or Simple moving average, enter the sample size.

b. If Fading memory, enter the gain to use from 0.0 to 0.95 to apply where 0.0 is no filtering and 0.95 is high filtering.

6. Click Apply (if present, dependent upon the view used)

6.23.2 Monitoring the Angular Acceleration Algorithm Calculation

The resulting angular acceleration can be monitored using the Time Series window.

FIGURE 6-44 TIME SERIES - ANGULAR ACCELERATION

6.24 Remote Motion Algorithm Calculation

The Remote Motion Algorithm calculation provides the remote heave and/or motion for a given static or dynamic offset. The following input observation types are supported:

- Heading
- Pitch/Roll

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- Heave
- Linear Velocity
- Linear Acceleration
- Angular Velocity
- Angular Acceleration

This calculation publishes the following observations, depending upon the configuration:

- With Heave and Pitch/Roll sensors assigned:
  - Remote Heave
- With Body Linear/Angular Velocity/Acceleration sensors assigned:
  - Linear Velocity (Body referenced)
  - Linear Acceleration (Body referenced)
- With Heading, Pitch/Roll and Body Linear/Angular Velocity/Acceleration sensors assigned:
  - Linear Velocity (World referenced)
  - Linear Acceleration (World referenced)

The calculation publishes observations based on updates of the input sensors.

When a heave observation is received, the validity of the pitch/roll data is checked and if accepted, a remote heave is calculated for all defined targets and published as a Heave observation.

When any one of the linear or angular velocity or acceleration observations is received, the body referenced and world referenced Linear Velocity and Linear Acceleration observations are published.

Note: When using the Remote Motion calculation, the NavView CRP should be selected to coincide with the vehicle's COG.

6.24.1 Motion Sensor Configuration and Output

It is important that the operation of the motion sensor used for this calculation and its output are understood.

Are the values output relative to the sensor's location or some other point as defined by a lever arm?

Most sensors support an option to enter a lever arm to relate its location to the vehicle's center of gravity (COG). This improves the modelling of the motion by the sensor. It is recommended this be applied in the sensor's configuration.

6.24.2 Configure the Remote Motion Algorithm Calculation

The configuring of a Remote Motion Algorithm calculation can be done when the calculation is first added or after. Therefore, the following steps start with the accessing of the calculation to be configured.

1. Access the Remote Motion Algorithm calculation to be configured (see Edit a Calculation)

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FIGURE 6-45 REMOTE MOTION ALGORITHM CALCULATION

2. **Name**: Enter a name for the calculation, it is recommended to keep the name short but still indicative of the calculation sources and/or purpose

3. **Heading Sensor**
   a. Required to calculate and publish World referenced Linear Velocity and Linear Acceleration observations
   b. From the drop-down list of available Heading observation providers, select the desired source

4. **Pitch/Roll Sensor**
   a. Required to calculate and publish Remote Heave observations
   b. Required to calculate and publish World referenced Linear Velocity and Linear Acceleration observations
   c. From the drop-down list of available Pitch/Roll observation providers, select the desired source

5. **Heave Sensor**
   a. Required to calculate and publish Remote Heave observations
   b. From the drop-down list of available Heave observation providers, select the desired source
   c. If the heave data input is not relative to the CRP, enter the offsets of the point that the heave data is relative to from the CRP

6. **Motion Sensor**
   a. Required to calculate and publish Body and World referenced Linear Velocity and Linear Acceleration observations
   b. From the drop-down lists of each of the respective available observation providers, select the desired source
   c. If the motion sensor observations are not relative to the CRP, enter the offsets of the point that the motion sensor observations are relative to from the CRP

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Note: The offsets are only required for the linear velocity and acceleration observations. A single set of offsets are presented because only linear velocity and acceleration data from the same sensor should be used in the calculation. The rotational velocity and acceleration observations do not require an offset.

7. **Targets**
    a. Add the static or dynamic targets that the remote heave and/or remote motion are to be calculated for

    b. **Static Target**
        i. From the drop-down list, select Static
        ii. Click the button to add a Static target to the data grid
        iii. Edit the newly added target in the data grid by clicking in the respective cell
            1. **Name:** Enter a name for target
            2. **Lever Arm - X:** Enter the X offset (- to port, + to starboard) from the CRP to the target point
            3. **Lever Arm - Y:** Enter the Y offset (- aft, + forward) from the CRP to the target point
            4. **Lever Arm - Z:** Enter the Z offset (- down, + up) from the CRP to the target point

    c. **Dynamic Target**
        i. From the drop down list, select Dynamic
        ii. Click the button to add a Dynamic target to the data grid
        iii. Edit the newly added target in the data grid by clicking in the respective cell
            1. **Name:** Enter a name for target
            2. **Lever Arm:** From the drop-down list of available dynamic offsets, e.g. Crane Connection, select the one to calculate remote Motion for

    d. To remove an existing target
        i. Select the target in the data grid
        ii. Click the button

Note: You are not prompted to confirm the removal of a Target and a removal cannot be reversed by clicking the cancel button.

8. Click Apply (if present, dependent upon the view used)

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6.24.3 Monitoring the Remote Motion Algorithm Calculation

The results of the Remote Motion Algorithm can be monitored using the Time Series window.
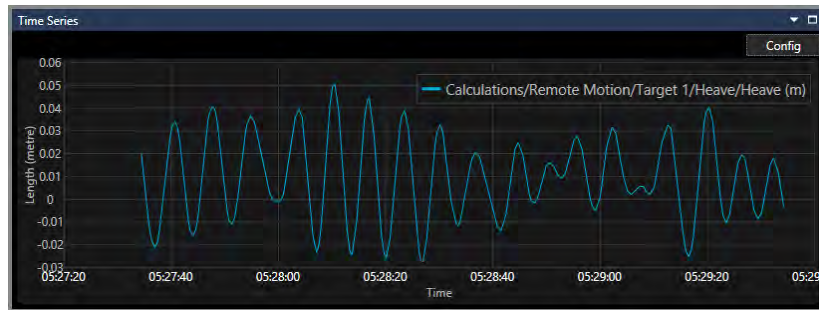
FIGURE 6-46 TIME SERIES - REMOTE HEAVE
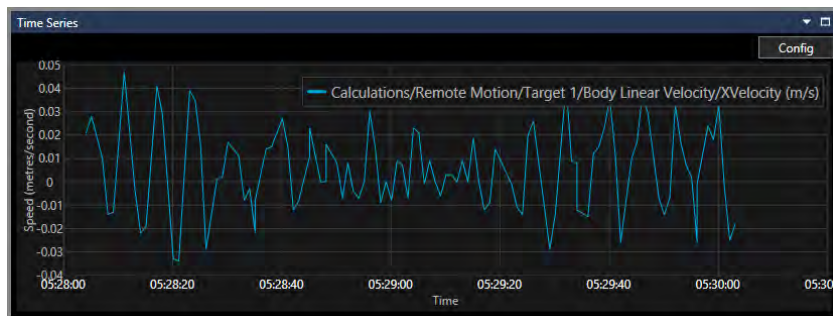
FIGURE 6-47 TIME SERIES - REMOTE LINEAR VELOCITY
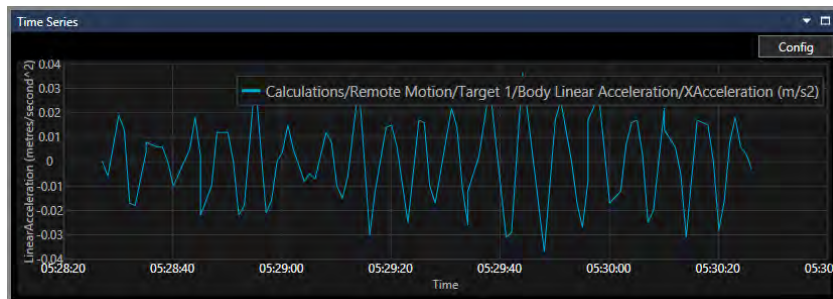
FIGURE 6-48 TIME SERIES - REMOTE LINEAR ACCELERATION

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7 Vehicles

This section details the adding, configuring, and monitoring of vehicles.

7.1 Overview

The term *vehicle* refers to any dynamic or static, surface, or sub-surface object that is to be positioned and oriented using a calculation and monitored with respect to its surroundings and other vehicles. These include dive support vessels (DSV), construction support vessels (CSV), remotely operated vehicles (ROV) and structures being positioned and placed as part of construction work.

If Roles and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In	Cannot add, configure/edit or remove a vehicle
User	Cannot add, configure/edit or remove a vehicle
Online/Supervisor	Cannot add, configure or remove a vehicle; Can change vehicle name, outline and add/edit Static Offset
Admin (Administrator)	Can add, configure/edit or remove a vehicle

7.2 Vehicle Static Offsets and Tracking Points

Vehicles are not restricted to using a single tracking point. Instead, a calculation that provides the positioning for the vehicle's CRP is assigned to the vehicle and the position of all static offsets, i.e., offsets defining specific unchanging points on the vehicle, is updated at every calculation update. The CRP and all static offsets are available for selecting as the point of interest for guidance and/or centering on rather than a single, specific tracking point.

7.3 Real Time and Remote Vehicles

NavView supports real time and remote vehicles. A real time vehicle is one that has been added to and configured on the local NavView station. A remote vehicle is one that has been added and configured on another NavView station and is available for display on the local NavView station through the deployment and use of the NavView network services. See the **Networking** section for details.

7.4 Vehicle Management

Vehicles are managed via the Configure Vehicles dialog opened by clicking on the Vehicles button in the Configure section in the Setup ribbon.

Note: If Roles are enabled, only users with Supervisor or Administrator privileges can add, edit, or remove vehicles.
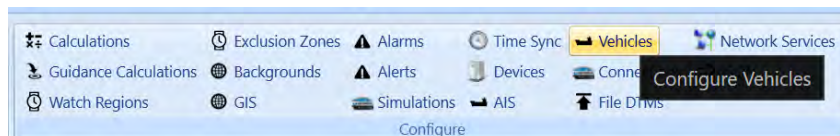
FIGURE 7-1 SETUP RIBBON - VEHICLES BUTTON

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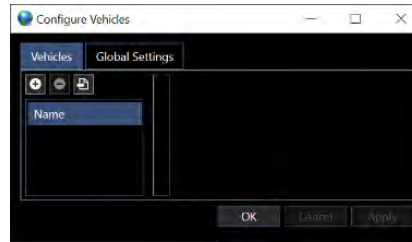
FIGURE 7-2 CONFIGURE VEHICLES DIALOG

Note: When a change is made in the Configure Vehicles dialog, the *Apply* and *Cancel* buttons will become active.

- Click the Apply button to apply the changes and keep the dialog open
- Click the Cancel button to revert changes made since the last time the Apply button was clicked and keep the dialog open
- Click the OK button to apply changes and close the dialog.

Alternatively, the Vehicles can be managed via the Explorer view.

FIGURE 7-3 EXPLORER VIEW - VEHICLES

7.4.1 Add a Vehicle

Access the **Configure Vehicles** view via the Setup ribbon or Explorer view (see Figure 7-1 and Figure 7-3)

1. Click the ⊕ button to launch the **Add New Vehicle** wizard

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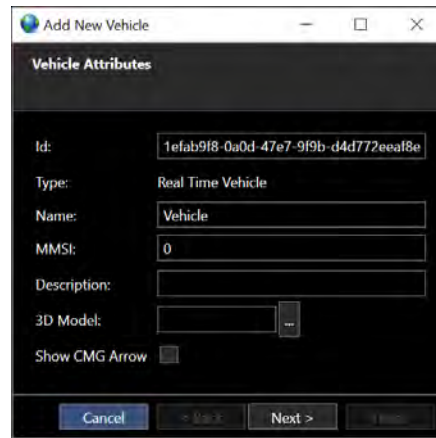
FIGURE 7-4 NEW VEHICLE WIZARD - ATTRIBUTES PAGE

2. Edit the **Attributes** page
    a. **Id:** Global Unique Identifier (**GUID**) is populated by default and should be left as is for internal use by NavView
    b. **Name**: Enter a name for the vehicle

    c. **MMSI**: Enter the Mobile Maritime Service Identity (MMSI) for the vessel being represented by the vehicle (optional)

Note: NavView supports tracking vessels using the input from an Automatic Identification System (AIS). The vessel data provided by the AIS includes the vessel's MMSI. NavView uses the MMSI to match vessels being received via the AIS with those being positioned by NavView. When a match is made, NavView decides which to use for the display of that vessel, the AIS data or the NavView data. If the NavView data has failed for any reason, NavView uses the AIS data to display the vessel. Otherwise, it uses the NavView data.

    d. **Description**: Enter a description of the vehicle (optional), this is used when displaying metadata

    e. **3D Model**: Click the ▪ button to browse for the 3D model file to represent the vehicle in the 3D view (optional) from the supported file formats, clicking in the text control allows the scrolling left to right to view the full path ad file name
        i. xaml
        ii. 3ds
        iii. obj
        iv. objz
        v. lwo
        vi. stl

Note: 3D model files are unitless. NavView loads the files based on the XY units being the same as the Working Horizontal CRS units and the Z units being the same as the Working Vertical CRS units (see Geodesy). Therefore, the files must be created to match these respective units.

    f. **Show CMG Arrow:** Check the box to display the Course Made Good vector arrow

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Note: The CMG Arrow is configured in the Global Settings Tab

   g. Click **Next**

3. Edit the **Configure Outline** page
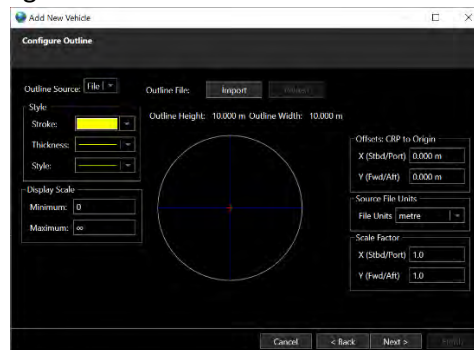
FIGURE 7-5 NEW VEHICLE WIZARD – CONFIGURE OUTLINE PAGE

   a. **Outline Source:** From the drop-down list select how the outline will be created. The two options are from a file or by dimensions. If file is selected, then go to Import. If dimensions are selected see Figure 7-6
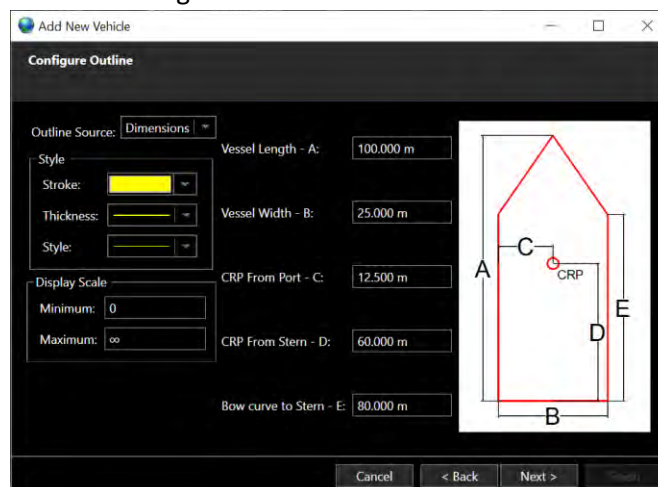
FIGURE 7-6 NEW VEHICLE WIZARD – CONFIGURE OUTLINE PAGE – DIMENSIONS

   b. **Outline File:** Displays the current outline file path and name

   c. **Import**: Click to browse for the 2D outline file to use to represent the vehicle in the 2D views, select from the following supported formats:
   - AutoCAD dwg/dxf files
   - Navipac shp files
   - WinFrog veh files
   - Vessel xaml files (3D Model)

   d. Depending upon the file type selected, a **Select AutoCAD Layer** (dwg/dxf) or **Select Vehicle to Load** (veh) prompt displays, select the layer/vehicle accordingly and click OK, if a Navipac shp file is selected no prompt will appear

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e. The shape will display in the window
   i. A red cross shows the vehicle CRP relative to the outline
   ii. Blue lines define the outline's XY axis and origin
   iii. The outline extents are displayed as the **Outline Height** and **Outline Width**
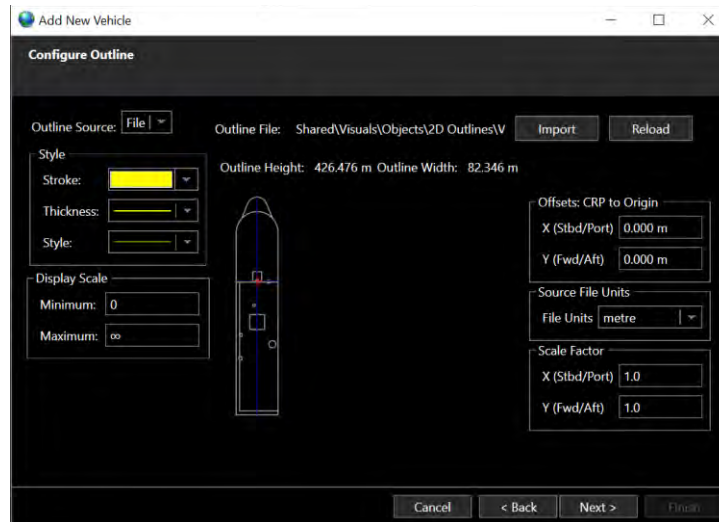
FIGURE 7-7 NEW VEHICLE WIZARD – CONFIGURE OUTLINE PAGE – IMPORTED OUTLINE FILE

f. **Offsets: CRP to Origin**: By default, the outline origin and vehicle CRP are set to the same point, if the outline file origin does not correspond to the CRP, enter the X and Y offsets from CRP to outline origin to correctly relate the outline to the CRP, e.g., if the CRP is 10.0m aft and 5m port of the origin, enter X +5 and Y +10 to translate the CRP from the vehicle outline origin

g. **Source File Units**: From the drop-down list select the outline drawing units. NavView uses this selection to show the outline size correctly in Map display

h. **Scale Factor:** The outline can be scaled using the X and Y scale factor values

i. **Style:** Assign outline color, line thickness and line style

j. **Display Scale:** Map scale limits to display outline. Default Minimum is set to zero (0) and the default Maximum is set to infinity (∞). The outline will only be visible on the Map display if the map scale is within the limits set here

k. Click **Next**

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4. Edit the **CRP Calculation** page
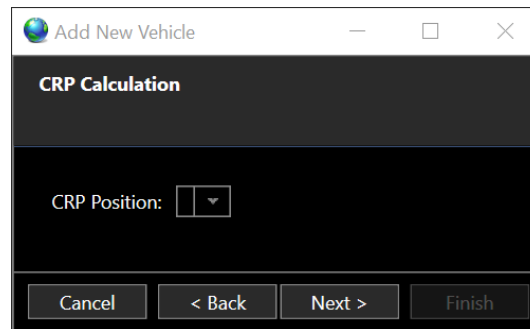
FIGURE 7-8 NEW VEHICLE WIZARD - CRP CALCULATIONS PAGE

a. **CRP Position**: Click the drop-down to view the options that will provide the positional data for this vehicle from the following options:

  i. **Calculations:** All Calculations that have been configured prior to opening the Vehicle wizard are listed by name, selecting one of these displays the respective Calculations view for review and editing if required. Also, a new Rigid Body or Kalman Filter calculation can be created. See adding Calculations section
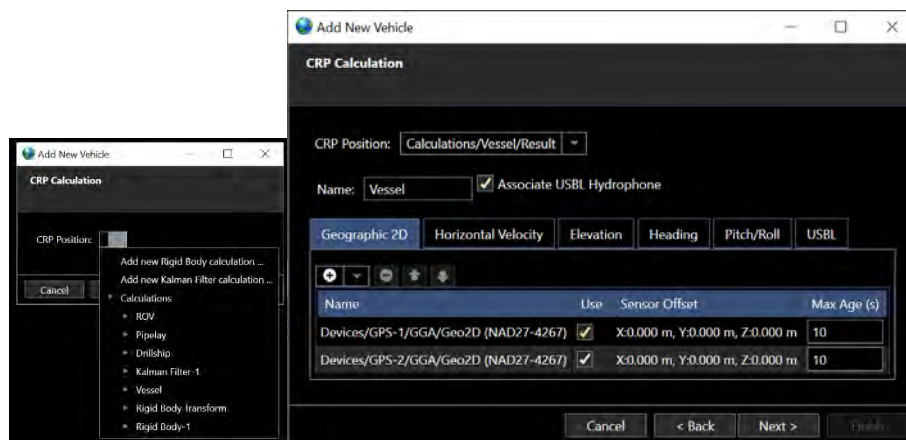
FIGURE 7-9 NEW VEHICLES WIZARD - CRP CALCULATIONS PAGE - EXISTING CALCULATION

Note: This is not a copy of the selected calculation, i.e., editing the Calculation here is the same as editing it via the Configure Calculations dialog.

  ii. **Connections:** All connections that have been added prior to opening the Vehicle wizard that provide position and heading are listed by name, selecting one of these results in the displaying of the selected Connection by name

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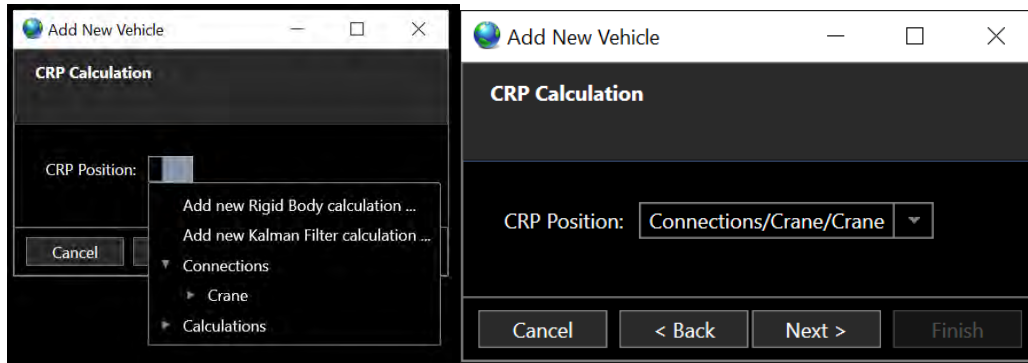
FIGURE 7-10 NEW VEHICLES WIZARD - CRP CALCULATIONS PAGE - EXISTING CONNECTION

    iii.   **Add new Rigid Body calculation:** Selecting this option opens a Rigid Body Calculation view ready to be configured
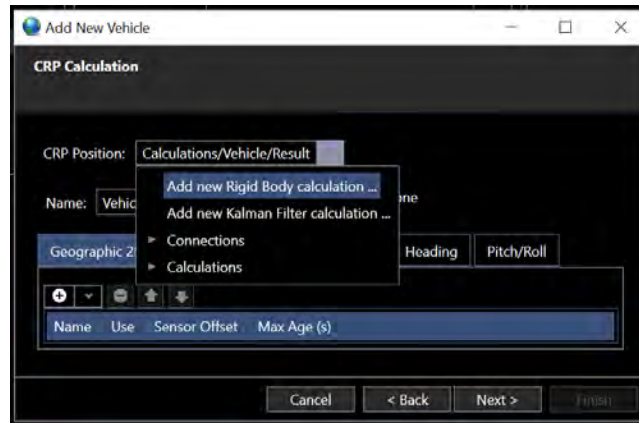
FIGURE 7-11 NEW VEHICLES WIZARD - CALCULATIONS PAGE - NEW RIGID BODY CALCULATION

    iv.   **Add new Kalman Filter calculation:** Selecting this option opens a Kalman Filter Calculation view ready to be configured
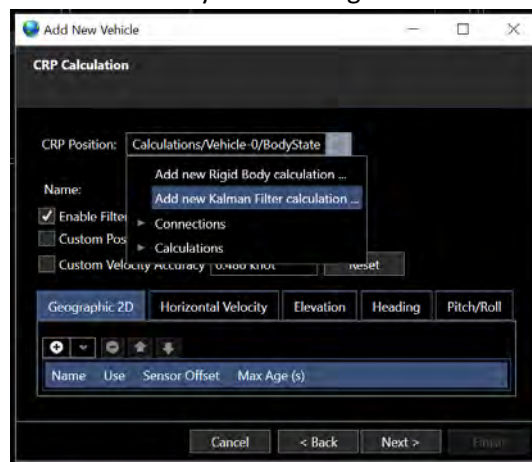
FIGURE 7-12 NEW VEHICLES WIZARD - CALCULATIONS PAGE - NEW KALMAN FILTER CALCULATION

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Note: See Calculations section for details regarding configuring a Calculation.

    b. Select the desired option, edit as required

    c. Click Next

5. Edit **Offset Locations**

From this page, offsets are added to the vehicle and configured for graphical presentation, measurement accuracy, history, and tolerance display options. By default, an Origin offset with 0.0 for all offset measurements is added to the vehicle.
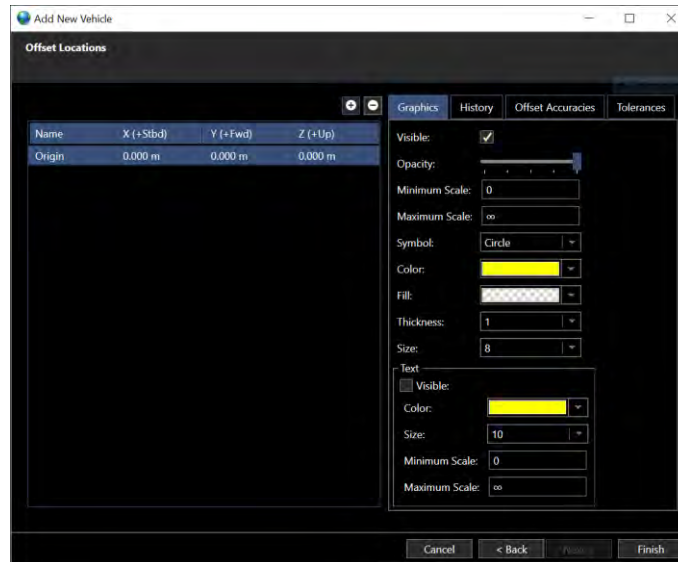
FIGURE 7-13 NEW VEHICLES WIZARD - OFFSET LOCATIONS PAGE

    a. To add an offset, click the ⊕ button and a new offset will show in the data grid

    b. To remove an offset, select it in the data grid and click the ⊖ button

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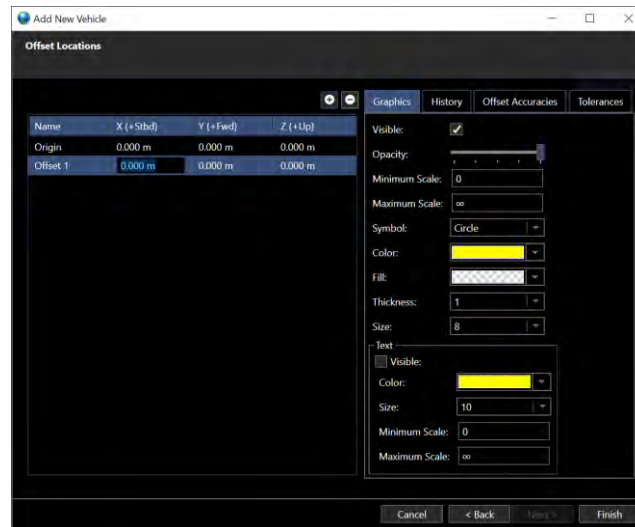
FIGURE 7-14 NEW VEHICLE WIZARD - OFFSET LOCATIONS PAGE - OFFSET ADDED

c.   Edit the offset name and XYZ values (see Figure 7-14), note that offsets are from the CRP to the sensor where:

i.   Click in the **Name** cell to be edited, enter the desired name

Note: Be careful selecting a name, this name is used in all hierarchical trees where offsets are listed and on the Map view if the respective map layer option is enabled. A long name can be problematic from a viewing perspective.

ii.   Click in the **X** or **Y** or **Z** cell to be edited, enter the respective offset

Note: Sign convention is based on from CRP to offset point as follow:
X: - to port; + to starboard
Y: - to the stern; + to the bow
Z: - down; + up

d.   Edit the **Graphics** presentation (see Figure 7-14), this controls the display of the offset location and annotation in Map views

i.   Select the offset to edit in the data grid

ii.   In the **Graphics** tab, configure the following options:

1.   **Visible:** Check to enable the display of the offset in the Map view

2.   **Opacity:** Using the slider, set the opacity (brightness) to display the offset symbol and text where all the way to the left is an opacity of 0 and the offset will not display and all the way to the right is an opacity of 1 and the offset will display brightly

3.   **Minimum Scale:** Map scale limits to display the offset symbol. Default Minimum is set to zero (0)

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4. **Maximum Scale:** Map scale limits to display the offset symbol. Maximum is set to infinity (∞)

Note: The offset symbol will only be visible on the Map display if the map scale is within the minimum and maximum scale limits set here

5. **Symbol:** From the drop-down list select the symbol shape used to represent the offset in the Map views

6. **Color:** From the drop-down list select the offset symbol Color

7. **Fill:** From the drop-down list select the offset symbol Fill (pattern)

8. **Thickness:** From the drop-down list select the offset symbol line Thickness

9. **Size:** From the drop-down list select the offset symbol Size

10. **Text:** To display the offset name, check the Visible box and use the drop-down list boxes to configure the text Color, Size and Scale

Note: Even if the Text Visible box is checked, it will not display unless the Visible box for the offset graphics at the top is checked.

Note: The offset text will only be visible on the Map display if the map scale is within the minimum and maximum scale limits set here

e. Edit the **History** (see Figure 7-15), this controls the capture and display of a history of points in any open Map view
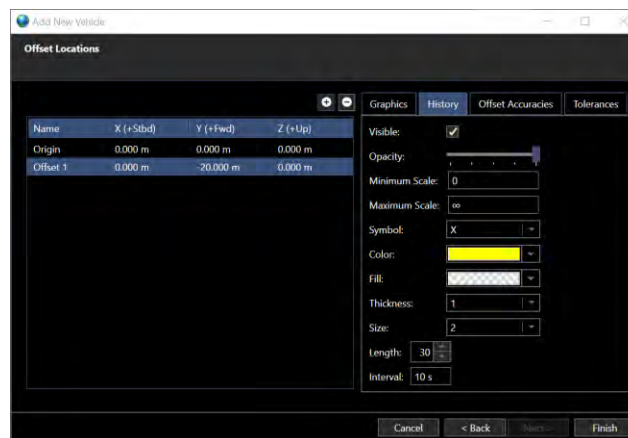
FIGURE 7-15 NEW VEHICLE WIZARD - OFFSET LOCATIONS PAGE - HISTORY TAB

i. Select the offset to edit in the data grid

ii. Click the **History** tab, configure the following options:

1. **Visible:** Check this box to enable the history to be displayed on a Map View

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2. **Opacity:** Using the slider, set the opacity (brightness) to display the history where all the way to the left is an opacity of 0 and the history will not display and all the way to the right is an opacity of 1 and the history will display brightly

3. **Minimum Scale:** Map scale limits to display the history symbol. Default Minimum is set to zero (0)

4. **Maximum Scale:** Map scale limits to display the offset symbol. Maximum is set to infinity (∞)

Note: The offset symbol will only be visible on the Map display if the map scale is within the minimum and maximum scale limits set here

5. **Symbol:** From the drop-down list select the symbol shape used to represent the history in the Map views

6. **Color:** From the drop-down list select the history symbol Color

7. **Fill:** From the drop-down list select the history symbol Fill (pattern)

8. **Thickness:** From the drop-down list select the history symbol line Thickness

9. **Size:** From the drop-down list select the history symbol Size

10. **Length:** Set the number of points to maintain in the history

11. **Interval:** Enter the interval in seconds between points in the history

f. Edit the **Offset Accuracies** (see Figure 7-16), used in the error propagation for the offset position

FIGURE 7-16 NEW VEHICLE WIZARD - OFFSET LOCATIONS PAGE - OFFSET ACCURACIES TAB

i. Select the offset to edit in the data grid

ii. Click the **Offset Accuracies** tab, configure the following options:

1. Enter the 1 sigma accuracies (standard deviation) of the offset measurements

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g. Edit the **Tolerances** (see Figure 7-17), this controls the display in the Map views of the estimated accuracy of the offset position, either that determined through rigorous error propagation by NavView or as estimated by the user
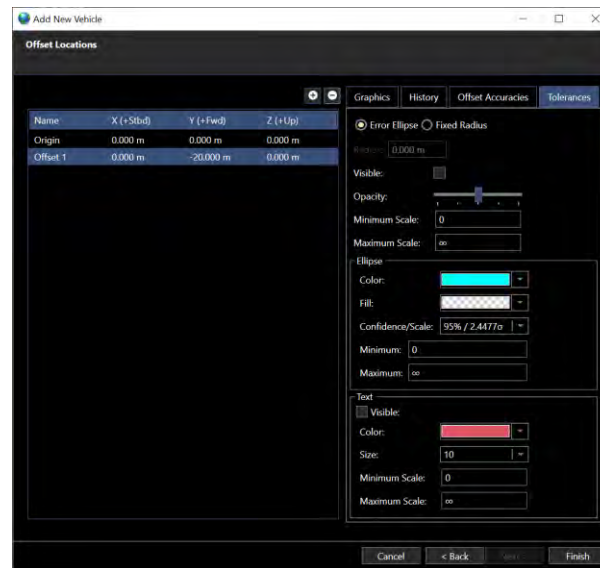
FIGURE 7-17 NEW VEHICLE WIZARD - OFFSET LOCATIONS PAGE - TOLERANCES TAB

  i. Select the offset to edit in the data grid

  ii. Click the **Tolerances** tab, configure the following options:

    1. Select the display option to use:
      a. **Ellipse:** Selecting this displays the error ellipse resulting from the error propagation
      b. **Fixed Radius:** Selecting this displays an error circle of a fixed radius as estimated by the user

    2. **Radius:** Enabled if **Fixed Radius** is selected above, enter the radius of the circle to display

    3. **Visible:** Check this box to display the **Tolerance** ellipse or circle

    4. **Opacity:** Using the slider, set the opacity (brightness) to display the offset symbol and text where all the way to the left is an opacity of 0 and the tolerance will not display and all the way to the right is an opacity of 1 and the tolerance will display brightly

    5. **Ellipse:** If **Ellipse** is selected above, from the drop-down boxes configure the ellipse Color, Fill (Pattern), Confidence (level)/Scale and Map scale limits to apply to the ellipse

Note: The error ellipse will only be visible on the Map display if the map scale is within the minimum and maximum scale limits set here. Default Minimum is set to zero (0) and the default Maximum is set to infinity (∞)

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6. **Text:** To display the tolerance specifics (e.g., semi-major axis a length), check the Visible box and use the drop-down list boxes to configure the text Color, Size, Minimum Scale and Maximum Scale

Note: The text will only be visible on the Map display if the map scale is within the minimum and maximum scale limits set here. Default Minimum is set to zero (0) and the default Maximum is set to infinity (∞)

Note: Even if the Text Visible box is checked, it will not display unless the Visible box for the tolerances at the top is checked.

     h. Complete adding offsets

6. Click **Finish** to complete the wizard

7. The new vehicle is listed and highlighted (selected) in the **Name** data grid or added to the tree under Vehicles in the Explorer view
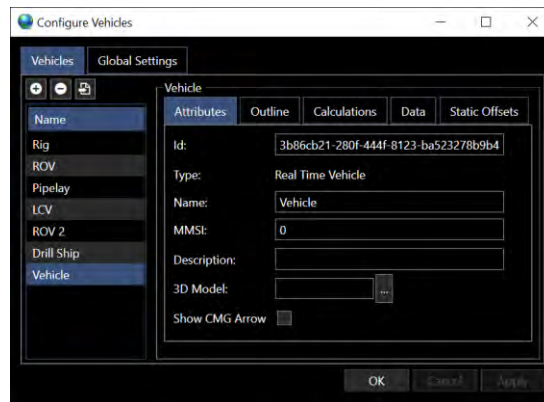
FIGURE 7-18 CONFIGURE VEHICLES VIEW – VEHICLE ADDED

7.4.2 Edit Vehicle

1. Access the **Configure Vehicles** view via the Setup ribbon or open the Explorer view (see Figure 7-1 and Figure 7-3Figure 7-3) or via the Vehicles on the Ribbon View Tab. Right click on the vehicle in the list to be edited

2. In the Configure vehicles view
   a. Select the vehicle to be edited, right panel displays a tabbed view with a tab to match each of the pages in the New Vehicle wizard
   b. Select the tab for the respective vehicle configuration to be edited

3. In the Explorer view
   a. Expand the tree under Setup > Vehicles and select the vehicle to edit
      i. The right panel displays a tabbed view with a tab to match each of the pages in the New Vehicle wizard
      ii. Select the tab for the respective vehicle configuration to be edited

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b. Or expand the tree under the vehicle to be edited to display Attribute, Outline, Calculation and Static Offsets branches
       i. Select the branch for the respective vehicle configuration to be edited
       ii. The right panel displays a view that matches the respective page in the wizard

Note: If the selected vehicle is a Remote Vehicle, the Calculations tab will not be present.

4. Edit the configuration

5. Click the **Apply** to apply the changes or **Cancel** to abort the changes

7.4.3 Remove Vehicle

1. Access the **Configure Vehicles** view via the Setup ribbon or open the Explorer view

2. In the Configure vehicles view
    a. Select the vehicle to be removed
    b. Click the ⊖ button

3. In the Explorer view
    a. Expand Setup branch and select Vehicles to display the Configure Vehicles view in the right panel
    b. Select the vehicle to be removed
    c. Click the ⊖ button

4. Answer the prompt to confirm the deletion of the vehicle accordingly

Note: Only the station that created a vehicle can remove that vehicle, i.e., a Remote vehicle cannot be removed.

7.5 Monitoring

The Vehicles window displays a summary of vehicle position and navigation information. It provides a simple monitoring tool. It is opened by clicking the vehicles button in the Windows section of the View ribbon.
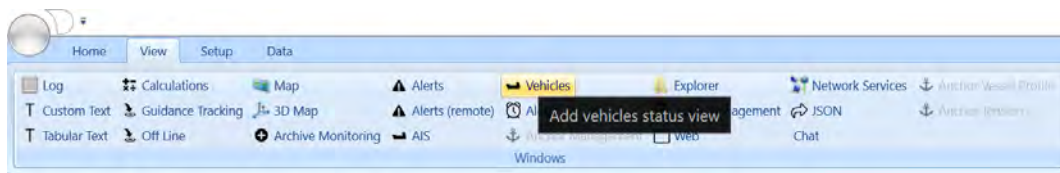
FIGURE 7-19 VIEW RIBBON - VEHICLES BUTTON

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The information displayed can be edited by right mouse clicking in the window to open a popup menu.

FIGURE 7-21 STATUS INFORMATION TO BE DISPLAYED POPUP MENU

If an item is already configured to be displayed a checkmark will appear against it. Click on any item to toggle its display on and off. The changes are immediate, and the popup menu will close.

To access a vehicle's configuration, right mouse click on that vehicle in the window and select Configure Vehicle from the pop-up menu (see Figure 7-21).

Note: If a data type set to display does not have a data source assigned, e.g., if pitch and roll are selected to display but no pitch and roll observations have been assigned, the cell displays "N/A".

Note: If a data type has a data source assigned and displays "N/A" it indicates a problem with the data source.

Vehicle status can also be monitored in the Custom Text, Tabular Text and 2D windows.

In the Custom Text and Tabular Text windows, the display of data that has aged can be configured. The default is for it to be displayed in strikeout text as shown in Figure 7-22.

FIGURE 7-22 TABULAR TEXT – OLD VEHICLE POSITION

In the Map view, if a vehicle stops positioning its outline will start to fade disappearing completely when the age of the data reaches 5 minutes.

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8 Windows

8.1 Overview

NavView supports a variety of graphical and alphanumerical windows to monitor operations. For the most part, these are accessed via the View ribbon, though some are accessed via the Setup ribbon due to their combined configuring and monitoring purpose.

If Roles and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In	Can add, configure or edit all windows
User	Can add, configure or edit all windows
Online/Supervisor	Can add, configure or edit all windows
Admin (Administrator)	Can add, configure or edit all windows
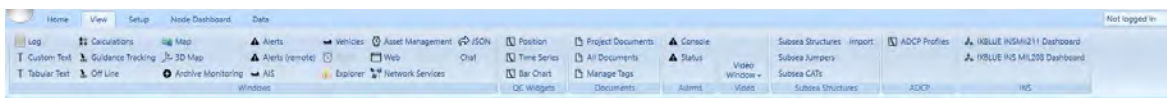
FIGURE 8-1 VIEW RIBBON
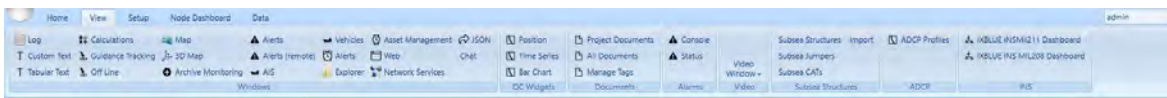
FIGURE 8-2 SETUP RIBBON

8.1.1 Open a Window

To open a window simply click on its icon in the ribbon.

Most windows can have an unlimited number of instances opened in a workspace, but some may only be opened once. These specifics are noted in the respective window's section.

Each window has a default location it opens to. This is detailed in the respective window's section.

8.1.2 Configure a Window

If the window has a configurable component or tools specific to it, these can be accessed by one or more of the following methods:

- Right mouse click in the window to pop up a menu
- Tool bar on the top or left of the window
- Context sensitive tab added to the ribbon when the window has the focus

The available configuration and tools will be noted in the respective window's section.

8.1.3 Close a Window

This is window type specific. Refer to Window Docking in the Introduction section.

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8.1.4 Configuration Files

The settings for a window are written to configuration files and stored in workspace specific folders. These are named based upon the window type and its index "n", e.g. MapViewModel_n.xml, where "n" is the count of that specific window within the total number of windows of that type that are open in a given workspace. When a window is opened, NavView determines the index of the next window of that type to open and looks for a configuration file that matches the window type and index in the respective workplace folder. If a match is found, that configuration file is loaded and used as the configuration for the newly opened window. If a match isn't found, the window is opened with default configuration.

8.1.5 Available Windows

- Log Window
- Text Windows
    - Tabular Text Window
    - Custom Text Window
- Calculations (see Calculations section)
- Map Window
- 3D Map
- Explorer Window
- QC Widgets
    - Position QC Widget
    - Time Series QC Widget
    - Bar Chart QC Widget
- Guidance Tracking
- Off Line

- Archive Monitoring
- Alerts/Alerts (remote) (see Alerts section)
- AIS
- Vehicles (see Vehicles section)
- Network Services
- Chat
- Web (View)
- JSON (see JSON Exchange section)
- GPS Status
- GPS Satellite Status
- Video (see Video section)
- ADCP (see ADCP section)

8.2 Log Window

A log file containing trace messages generated by NavView such as reports of errors encountered by the software, events such as when a calculation observation failover occurs, and general operational information such as remaining space available for data recording, is written to the folder Project/[Station]/Data/Logs. Each record has a UTC time stamp. One file is created for each day based on UTC time, and is named based on date, e.g. yyyy-mm-dd.log. These are ASCII files and can be opened to review operation and assist trouble shooting.

The Log window displays the records written to the log file since the launch of NavView. It can span multiple log files.

To open the Log window, click the icon labeled Log in the Windows section of the View ribbon. The window will open as a document window in the main part of the workspace. If a document window already occupies that space it will be added to it as a tab.

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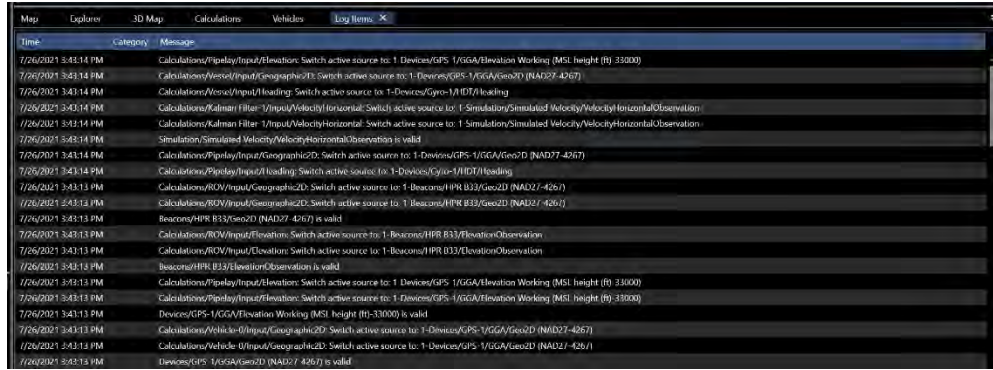
FIGURE 8-3 LOG WINDOW

Right mouse clicking in the window pops up a menu with the single item Clear. Clicking this clears the window. It has no impact on the log file.

Note: If Roles are enabled, user must have Supervisor or Administrator privileges to be allowed to clear the window.

Note: Only one Log window can be open in a workspace at a time.

8.3 Text Windows

NavView supports two text displays: Custom Text and Tabular Text. These have similar features but vary in their presentation. Both support multiple lines, but the Custom Text can have a varying number of items per line whereas the Tabular Text supports a single item per line.

The common features are detailed here, followed by details for each specific text window.

8.3.1 Available Data

The data that is available for display is wide ranging. The following lists the basic data groups from which items can be selected:

- System:
    - Time

- Connection: Displays the data for selected connections, e.g.
    - Pipeline Layback
        - Attributes
        - Vessel Tracking
        - Layback Route Guidance
        - Layback Guidance
        - Touchdown Monitoring
        - Reference to Monitor Guidance

- Observations: Displays the observations associated with the following data sources
    - Beacons
    - Acoustics
    - Connections

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- o Calculations
- o Guidance
- o Simulation
- o Devices
- o AIS Service
- o Vehicles
- o Archive
- o DVL Calibration
- o ADCP Profiles

- Guidance: Displays the data associated with the respective guidance objects
  - o System: Guidance objects automatically created by NavView, e.g. for the Pipeline Layback connection
    - Layback guidance
    - Touchdown monitoring
    - Reference to monitor
  - o User: Guidance objects created by the user, dependent upon the guidance type: Point to Point, Point to Route, Point to 3D Line, 3D line to 3D line
- Vehicles: Displays the data associated with each vehicle and its offsets, including:
  - o Attributes
  - o Coordinate
  - o Position errors
  - o Elevation
  - o Heading
  - o Pitch/Roll
  - o Velocity
  - o Offsets
- Data Archive
  - o Database name
  - o Database maximum size
  - o Database size
  - o Available diskspace
  - o Session name
  - o Recording active (status)
  - o Last write time

8.3.2 Data Status

The Text Items selected for display get their data from various sources such as Vehicles, Guidance Calculations, and Devices. Status flags **Ok**, **Warning**, and **Error** can be assigned to the data such that its status can be monitored wherever it is accessed, e.g. for display in a text window. Both text windows support assigning the color to be used to display data based on its status.
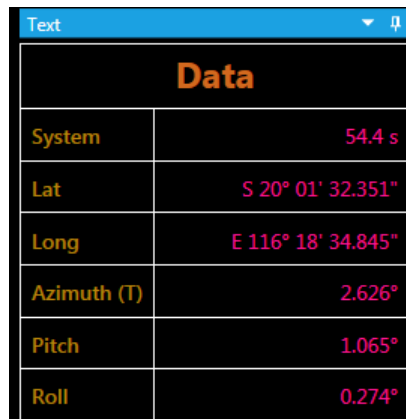
If data is expected from a source at a certain interval but is not received for a specified amount of time, the data is considered stale. Both text windows support options to indicate stale data by displaying it using ~~strike through~~ and/or causing it to flash.

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8.3.3 Tabular Text Window

The Tabular Text window is opened by clicking on the **Tabular Text** button on the View ribbon. The window opens as a Dockable window pinned to the right side of the workspace. If a dockable window is already located there, the Tabular Text window is added as a tab.

Note: If Roles are enabled, any user can open a Tabular Text Window.

Note: It is possible to open as many Tabular Text Windows as desired.

FIGURE 8-4 TABULAR TEXT WINDOW

The window format is a two (2) column table (see Figure 8-4) consisting of the following three components:

- Header:
    - Spans both columns
    - Operator set text
    - Multiple headers can be added enabling separation of data
- Label:
    - Occupies left column
    - Operator set text
    - Can be disabled
- Value:
    - Occupies right column
    - Displays the data associated with the item selected
    - In the Configure Text Window dialog, the full hierarchical path for the item is shown
    - Format and units based on those set in Preferences

The font style, size, weight and color are operator configurable independently for each component. The value has additional configuration options to indicate the data state.

The Tabular Text window supports direct access to the configuration for the data sources of the data displayed (see Configure Item Data Source). This facilitates accessing those displayed items that can change as the project progresses and require updates to their configuration, e.g. guidance targets.

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8.3.3.1   Configure the Tabular Text Window

To configure the tabular text window, right mouse click in the window. If the right mouse click is in an area of the window with no items displayed, a single option Configure is presented. Clicking on this opens the Configure Text Window dialog (see Figure 8-5). If the right mouse click is on a display item in the window, 2 options are presented, Configure Text Window and Configure *Item* where *Item* is the parent of the displayed item clicked on, e.g. if a vehicle position, the option presented is Configure Vehicle. Clicking on Configure Text Window opens the Configure Text Window dialog. Clicking on the other option opens the respective configuration dialog.
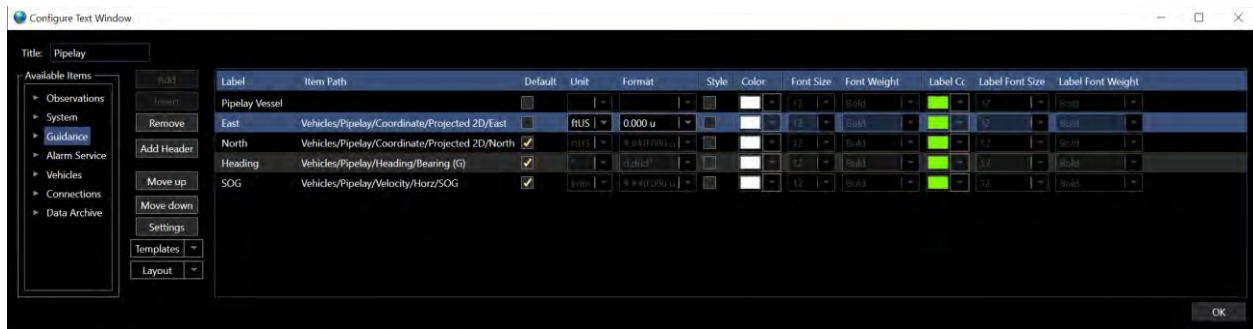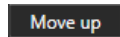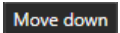
FIGURE 8-5 TABULAR TEXT CONFIGURATION DIALOG

The dialog includes a hierarchical tree on the left listing those items that can be selected for display, configuration controls in the form of buttons are in the middle, and a data grid on the right listing those items selected for display. The following details these controls for the configuration are described below.
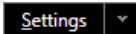
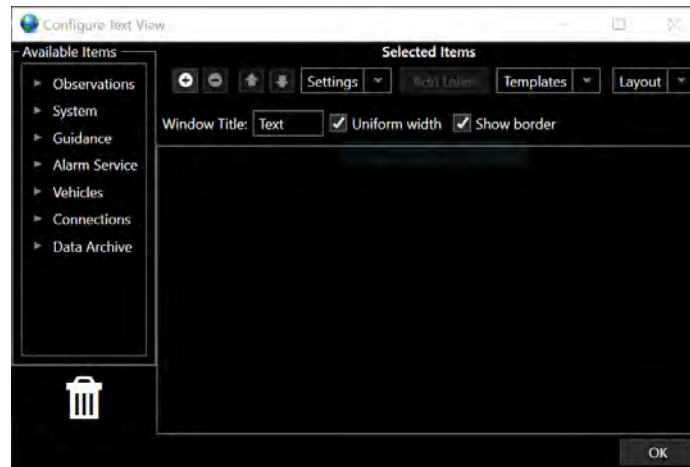|	
Title	Supports editing the title displayed at the top of the window and in the tab when window is tabbed.
Available Items	A hierarchical tree of the items available for display. Not all items themselves can be added as they may be parent items with child items that can be added to the display. For example, the Coordinate item in Figure 8-5 cannot be added, but its child items Geographic2D and Projected2D and their child items can be added. The **Add** and **Insert** buttons are enabled when the selected item in the available items list can be added to the display.
Add	Adds the currently selected item in the Available Items tree to the bottom of the display items data grid. Double clicking on the item in the Available Items tree has the same result.
Insert	Inserts the currently selected item in the Available Items tree in the display items data grid above the currently selected item in that grid. Note that the insert button is not available if the top item is selected in the data grid.
Remove	Removes the currently selected item from the display items data grid.
Add Header	Adds a new header to the bottom of display items data grid.

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| Move up | Moves the currently selected item in the display items data grid up by one position. Note that the Move Up button is not enabled if the top item is selected. |

| Move down | Moves the currently selected item in the display items data grid down by one position. Note that the Move Down button is not enabled if the bottom item is selected. |

| Settings ▾ | Click the Settings button to display Configure Style dialog, see Modify Style for details |

| Templates ▾ | Accesses the Templates options, see Text Templates for details. |

| Layout ▾ | Accesses the Layout options, see Text Layouts for details. |

8.3.3.2   Displayed Items Data Grid

The displayed items data grid added items custom editing of individual items. The columns are as follows.

- **Label:** Name of item to be displayed in the tabular text window can be edited by right click in the cell

- **Item Path:** Full hierarchical path of the item. Right click on the path opens a Configure Item prompt

Note: If a Header is added it spans both columns, Label and Item Path, the header name can be edited

- **Default:** If this option is selected, the display will use the project configured (refer to Configuration Preferences) unit and format for the data display in the text window

- **Unit:** If the default option is selected, the unit in the cell will be grayed out. If the default option is not selected, the unit can be changed from the drop-down. The selected unit will be displayed in the text window

- **Format:** If the default option is selected, the unit format in the cell will be grayed out. If the default option is not selected, the unit format can be changed from the drop-down. The selected unit format will be displayed in the text window

- **Style:** If this is selected, the options are enabled for applying a custom style for the selected row. If not selected, the style used will be taken from Configure Style accessed with the settings button and the cells will be grayed out

- **Color:** A custom color for the selected row can be assigned for the unit if Style is enabled

- **Font Size:** A custom font size for the selected row can be assigned for the unit if Style is enabled

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- **Font Weight:**   A custom font weight for the selected row can be assigned for the unit if Style is enabled

- **Label Color:**   A custom label color for the selected row can be assigned for the label if Style is enabled

- **Label Font Size:**   A custom label font weight for the selected row can be assigned for the label if Style is enabled

- **Label Font Weight:**   A custom label font size for the selected can be assigned for the label if Style is enabled

8.3.3.3 Add Header

1. Open the Configure Text Window dialog
2. Click Add Header to add a header to the bottom of the display item data grid
3. Select the new header in the display item data grid and using Move up and/or Move down position the header where desired
4. Click in the header cell and edit the text

8.3.3.4 Add Display Item

- Open the Configure Text Window dialog

- Expand the Available Items hierarchical tree and navigate to the item to be displayed

- Click Add or **double click** on the item to add it to the bottom of the display item data grid

- Select the new item in the display item data grid and using Move up and/or Move down position the item where desired

- Click in the new item's label cell and edit the text

8.3.3.5 Insert Display Item

1. Open the Configure Text Window dialog
2. Select the item in the display items data grid that the new item is to be added above
3. Expand the Available Items hierarchical tree and navigate to the item to be displayed
4. Click Insert to insert it above the item selected in display item data grid
5. Click in the new item's label cell and edit the text

8.3.3.6 Remove Item

1. Open the Configure Text Window dialog
2. Select the item in the display items data grid to be removed
3. Click Remove to remove it

8.3.3.7 Modify Label or Header Text

1. Open the Configure Text Window dialog

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2. Click in the new item's label or header cell and edit the text

8.3.3.8   Modify Label, Header, Value and Background Properties

1. Open the Configure Text Window dialog

2. Click **Settings** to open the Configure Style dialog. See Figure 8-6
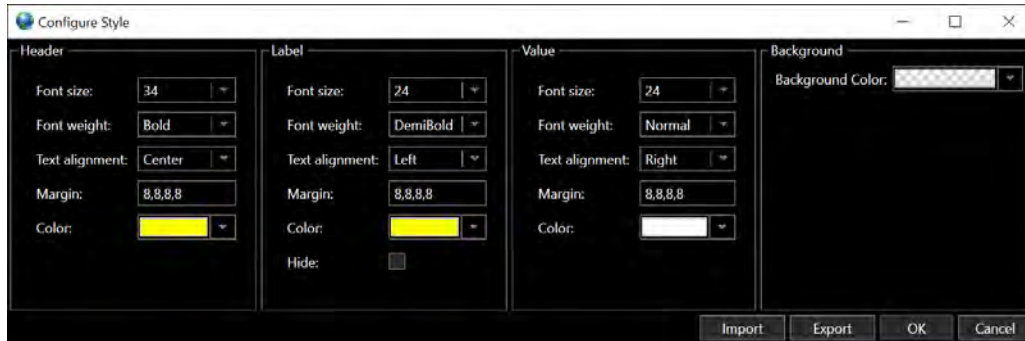
FIGURE 8-6 TABULAR TEXT SETTINGS CONFIGURE STYLE DIALOG

3. From the respective drop-down boxes, configure the Font size, Font weight and Color

4. From the Text alignment drop-down box, select the horizontal alignment of the text in the cell

5. In the Margin control enter the margins for the text in the cell where the order is *Left, Top, Right, Bottom*

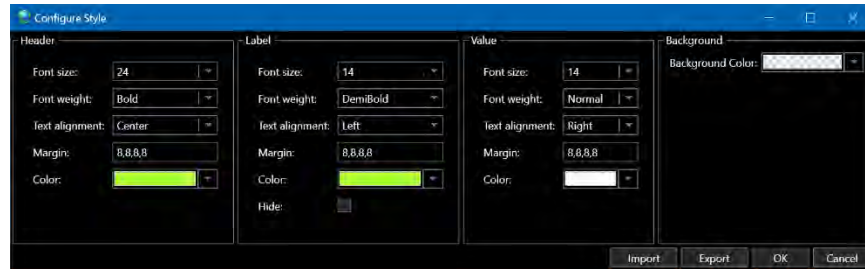**Note:**   The application of the margins is partially dependent upon the selected alignment, i.e. if the alignment is set to Left a Right margin may not appear to impact the location of the text in the cell.

6. Click OK to save the settings or Cancel to abort

Note: Stale Data goes Strike Through, this is not configurable

8.3.3.9   Configure Item Data Source

This feature provides quick access to the source of the data being displayed. For example, if the range and bearing from a vehicle to a waypoint (a point to point guidance object) is being displayed, the configuration for that guidance object can be quickly accessed to change the target waypoint directly from the Tabular Text window.

1. Right mouse click in the Tabular Text cell displaying the respective data to display a pop up menu, if the item supports direct access of its configuration this menu will have 2 items: Configure Text Window and Configure *ssss* where *ssss* is the data source type, e.g. if the item is a Vehicle position this will display Configure Vehicle

2. Click on the second menu item to display the respective configuration dialog

3. Make the required changes and click Apply to apply the changes and keep the dialog open, click OK to apply the changes and close the dialog, or click Cancel to abort the configuration

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8.3.4 Custom Text Window

The Custom Text window provides a comprehensive configurable display capable of presenting virtually any data received and generated by NavView. The flexibility of the presentation is illustrated in Figure 8-7, Figure 8-8 and Figure 8-9.

Note: If Roles are enabled, any user can open and edit a Text window.

Note: Multiple Text windows can be open in a workspace at any one time.
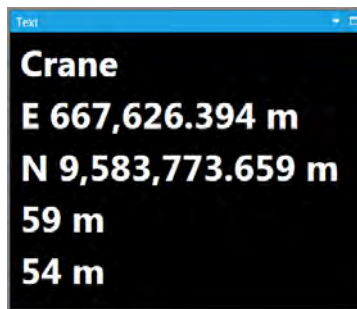
FIGURE 8-7 TEXT WINDOW – SINGLE COLUMN - NO BORDERS
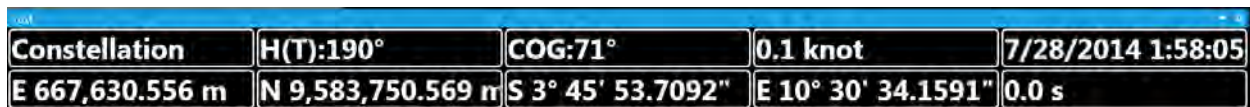
FIGURE 8-8 TEXT WINDOW – HORIZONTAL, UNIFORM WIDTH WITH BORDERS
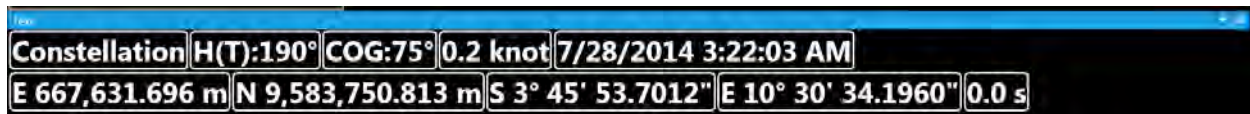
FIGURE 8-9 TEXT WINDOW - HORIZONTAL WITH BORDERS

To open the Text window click the icon labeled Custom Text in the View ribbon (See Figure 8-10). The window will open as a dockable window at the bottom of the workspace. If a dockable window already occupies that space the Text window will be added to it as a tab. The window can also be changed to floating.
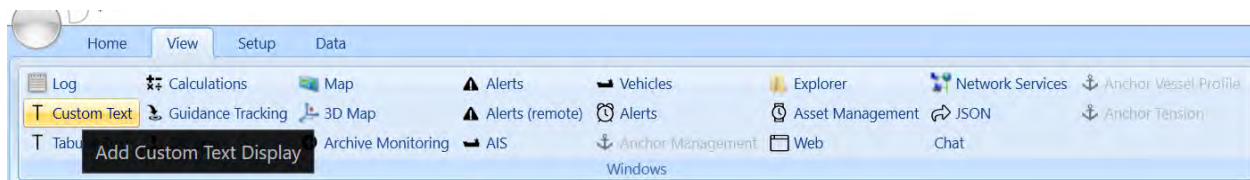
FIGURE 8-10 CUSTOM TEXT - VIEW RIBBON

8.3.4.1 Configure the Text Window

The configuration dialog is opened by right clicking in the window and selecting the lone pop up menu item… Configure.

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FIGURE 8-11 TEXT WINDOW CONFIGURATION DIALOG

The dialog includes a hierarchical tree on the left listing those items that can be selected for display, configuration controls on the top of the right panel, and a data grid on the bottom of the right panel representing the text window. The following details the controls for the configuration.

Available Items A hierarchical tree of the items available for display. Not all items themselves can be added as they may be parent items with child items that can be added to the display. Items are added to the display by left mouse clicking on an item in this tree and dragging it to the desired location in the display items data grid. An empty row must be available to drag an item into the grid. A row is added by clicking the add button 🞥.

Drag items that are no longer to be displayed from display items data grid to the Trash Can.

Adds a row to the bottom of the list of existing rows.

Removes the selected row.

Note: Select a row by clicking at the very left edge of the row or one of the items in the row (not a label).

Moves the selected row up. This button is disabled if the top row is selected.

Moves the selected row down. This button is disabled if the bottom row is selected.
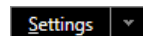
Drops down a list of items supporting configuration: Label, Value and Background. Select an item to open the respect view configuration dialog.
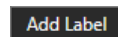
Adds a label to the selected row.

Accesses the Templates options from the drop-down list, see

Optionally

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Click Import to navigate to a previously saved Style configuration file and import it to set the Style settings

Click Export to save the current Style settings to a file for later use

Text Templates for details.

Layout ▼	Accesses the Layout options from the drop-down list, see Text Layouts for details.
Window Title	Enter the title to display in the window's title bar or tab when it is tabbed or when it is docked
Uniform width	Check this box to display the cells in each row uniformly distributed with equal widths. Note this uniformity is row by row, i.e. the cells in a row with 3 items will not have the same widths as those in a row with 4 items. Figure 8-8 illustrates a window with **Uniform width** enabled, Figure 8-9 is the same window without **Uniform width** enabled.
Show border	Check this to display each cell with a border. Figure 8-7 is an example of no borders, Figure 8-8 is an example with borders.
Data Grid	Represents the multi-row Text window (see Figure 8-12). Left mouse clicking on an item and dragging it to the trash can removes that item from the display. The contents of a Label can be edited by clicking in the respective cell and entering the desired text.
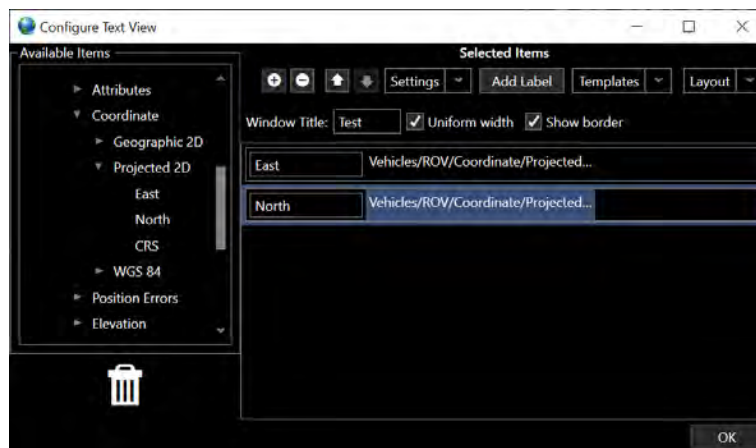
FIGURE 8-12 CUSTOM TEXT CONFIGURATION WITH DATA ITEMS

8.3.4.2   Add a Row
1. Open the Configure Text Window dialog
2. Click the ⊕ button to add a row to the bottom of the display items

8.3.4.3   Remove a Row
1. Open the Configure Text Window dialog

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
2. Select a row to remove by clicking on an item in the row to be removed (not a label) or on the left edge of the row

3. Click the ⊟ button to remove the selected row

Note: The ⊟ button is not enabled if a row is not selected.

8.3.4.4   Move a Row

1. Open the Configure Text Window dialog
2. Select a row to move by clicking on an item in the row (not a label) or on the left edge of the row
3. Click the ⬆ button to move the selected row up or the ⬇ button to move the row down.

Note: The ⬆ button is not enabled if the top row is selected, the ⬇ button is not enabled if the bottom row is selected.

8.3.4.5   Add a Display Item

1. Open the Configure Text Window dialog
2. Expand the Available Items hierarchical tree and navigate to the item to be displayed
3. Left mouse click on it and drag it to the desired row and location in the display items

8.3.4.6   Add a Label

1. Open the Configure Text Window dialog
2. Select a row by clicking on an item in the row or on the left edge of the row
3. Click the Add Label button to add a label to the end of the selected row
4. Left mouse click on the edge of the label cell to drag it to the desired location
5. Click in label cell to edit the label text

Note: To drag a label, the very edge of the respective cell must be clicked on as clicking anywhere else on the cell access the cell for editing.

8.3.4.7   Modify Label Text

1. Open the Configure Text Window dialog
2. Click in the label cell and edit the text

8.3.4.8   Move a Display Item or Label

1. Open the Configure Text Window dialog
2. Left mouse click on the item/label and drag it to the new desired row and location

Note: When a cell is moused over, the area that must be clicked on to drag the item/label is highlighted.

8.3.4.9   Remove a Display Item or Label

o Open the Configure Text Window dialog
o Left mouse click on the item/label to remove and drag it to the trash can

8.3.4.10 Modify Style

1. Open the Configure Text Window dialog
2. Click Settings to open the Configure Style dialog

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FIGURE 8-13 CONFIGURE STYLE

3. From the respective drop-down boxes, configure the Font size, Font weight and Color
4. From the Text alignment drop-down box, select the desired alignment of the text in the cell
5. In the Margin control enter the margins for the text in the cell where the order is *Left, Top, Right, Bottom*

Note: The application of the margins is partially dependent upon the selected alignment, i.e. if the alignment is set to Left a Right margin may not appear to impact the location of the text in the cell.

6. Check the Hide box in the Label options if the Label is not to be displayed, i.e. only the values are displayed
7. In the Background panel, select the desired background color from the drop down list
8. Click OK to apply the settings and close the dialog, Apply to apply the settings and leave the dialog open or Cancel to abort
9. Optionally
   a. Click **Import** to navigate to a previously saved Style configuration file and import it to set the Style settings
   b. Click **Export** to save the current Style settings to a file for later use

8.3.5 Text Templates

Text templates are used to quickly build up text windows based on predefined settings. They provide the means to create a specific display configuration for a selected data source type, e.g. a Vehicle, that can then be used for any of that data source type. For example, if a template is configured for a Vehicle data source, it can be opened and a vehicle selected to use it and the window will be populated with the respective information for that vehicle. Text templates can be created for tabular and custom text windows.

Text templates are stored in isolated storage on the system and thus are not kept with the individual project. This way it is possible to make the template once on a given PC and apply it to any project.

Text templates can also be exported to an xml file for easy importing for use with other NavView installations, where they are then imported.

Text Templates are managed from the Configure Templates dialog.

8.3.5.1 Manage Text Templates
   o Open either a Tabular or Custom Text Configure Text Window dialog

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o Click the **Templates** ▼ drop-down and click on Manage to open the Configure Templates dialog
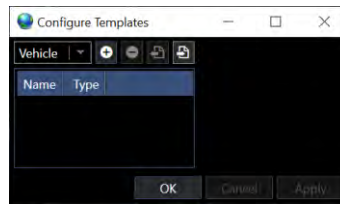
FIGURE 8-14 CONFIGURE TEXT TEMPLATES DIALOG

8.3.5.2 Add a Text Template

1. Open the Configure Template dialog (see Manage Text Templates)
2. Click the drop-down list in the top left of the dialog to display those base data source types that support the application to a template, these are module and configuration dependent and can include the following:
   a. Point to point guidance (listed as P->P Guidance)
   b. Point to route guidance (listed as P->R Guidance)
   c. Vehicle
   d. Vehicle Offset
   e. Profiler
   f. Layback connection (listed as Pipeline Layback)
   g. Text Item
3. Select the desired type and click the ⊕ button to add the template to the list ready to be configured (see Figure 8-15 for an example of a Vehicle type)
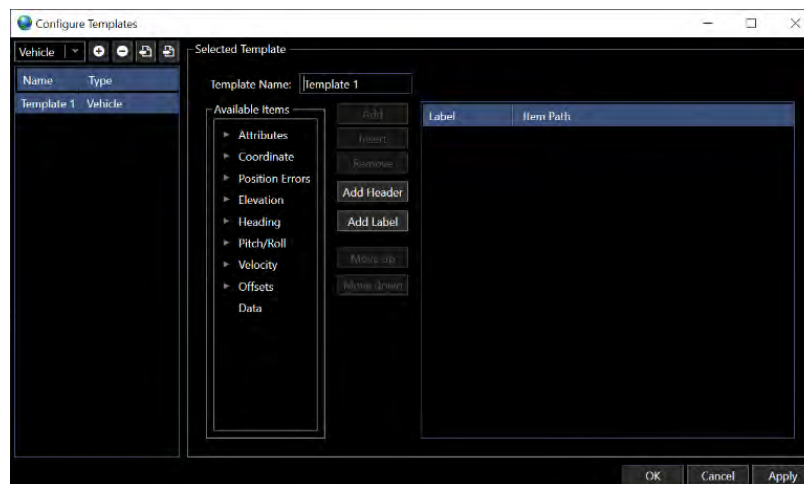
FIGURE 8-15 TEXT TEMPLATE - VEHICLE TYPE

8.3.5.3 Configure a Text Template

1. Open the Configure Template dialog (see Manage Text Templates)
2. Select the template to edit in the list, this will result in the display of a view similar to the Tabular Text configuration dialog in the right panel

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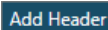
Note: The Available Items listed in the hierarchical tree are dependent upon the data source type selected and are therefore a subset of what is available in a standard Tabular Text configuration dialog.

3. Configure the text view display items as you would a Tabular Text view (see Tabular Text Window) with the following exceptions:
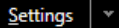
Template Name: Instead of an option to enter a window title, enter a name for the template, it is recommended this be short but representative of the templates application.

Add Label — Adds a label. If the template is used for a Tabular Text window, any labels that have been added are ignored. If the template is used for a Custom Text window, the labels are displayed as usual.

Add Header — Adds a header. If the template is used for a Tabular Text window, any headers that have been added are displayed as usual. If the template is used for a Custom Text window, the headers are ignored.

Settings — Edit font size, font weight, text alignment, margins and colors for data in text window.

Note: Any template created regardless of whether from a Tabular Text or Custom Text configuration dialog can be used by both the Tabular and Custom Text windows. The Tabular Text window will display as configured in the template. The Custom Text window displays the items on a single line in the order they appear in the template display item data grid.

4. Click Apply to apply changes without closing the dialog, or click OK to apply the changes and close the dialog, or click Cancel to revert any changes made since the last time Apply was clicked

8.3.5.4 Remove a Text Template
1. Open the Configure Template dialog (see Manage Text Templates)
2. Select the template to remove in the list of templates
3. Click the ⊟ button to remove the template

8.3.5.5 Export a Text Template
4. Open the Configure Template dialog (see Manage Text Templates)
5. Select the template to export in the list of templates
6. Click the ⊟ button to open the Windows Save As dialog
7. Navigate to the destination folder. See Figure 8-16 for default folder

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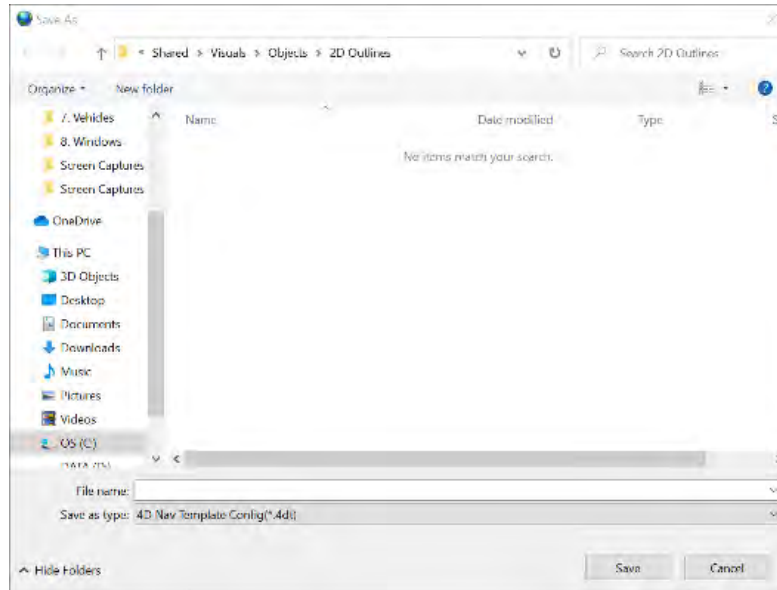
FIGURE 8-16 TEXT TEMPLATE EXPORT DEFAULT FOLDER

8. Enter a suitable file name

Note: NavView automatically appends the extension "4dt".

9. Click **Save**

8.3.5.6 Import a Text Template

9. Open the Configure Template dialog (see Manage Text Templates)
10. Click the 🖻 button to open the Windows Open dialog
11. Navigate to and select the NavView template file (*.4dt). See Figure 8-16 for default folder
12. Click **Open**
13. The template is added to the list of templates

Once a template is imported, it can be edited for the specific application. It can also be resaved.

Note: The same template can be imported multiple times, each one subsequently edited as required. In this way, a template can actually be used as a template itself.

8.3.5.7 Apply a Text Template

1. From the text window that the template is to be applied to, click the [Templates ▼] drop-down and click on Apply to expand the dialog to display a Add a Templated Item to View dialog. See Figure 8-17

Note: The Apply option will only be enabled if at least one template has been created.

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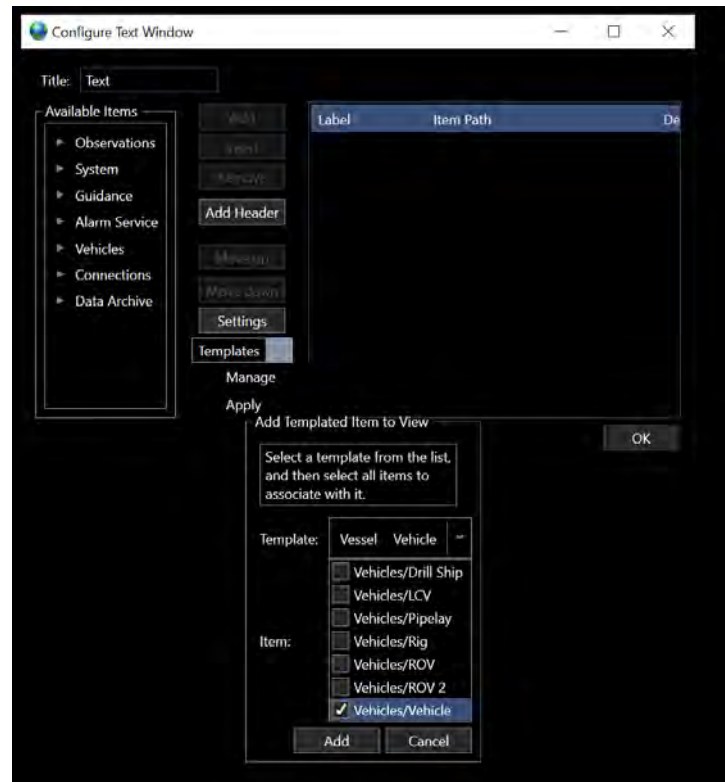
FIGURE 8-17 APPLY TEXT TEMAPLATE DIALOG

2. From the Template drop down list, select the template to use
3. A list of those base data source items that are supported by the selected template is displayed, check the box of those that are to use the template and be added to the text window
4. Click **Add** to apply the selections and add templates for each to the text window, or **Cancel** to abort

When applying a template the display built for each selected base data source using the template is appended to the bottom of the existing display in the order they appeared in the drop down list from which they were selected. In the case of a Tabular Text window, a set of rows that matches the template is added for each base data source. In the case of a Custom Text window, a row for each base data source is added.

Once a template is added to a window, it becomes part of the configuration and can be edited in the normal manner.

8.3.6 Text Layouts

NavView's Text Layouts feature enables the saving of specific text window configurations for later loading and use. This is useful when switching back and forth between different tasks on a given project that require the display of different data for monitoring. With saved text layouts it is possible to close a text window that are not needed at the time but easily restore them later when needed.

Text layouts are stored in the file TextLayouts.xml in the current project and station's config folder.

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8.3.6.1 Save a Text Layout

1. From the Tabular Text or Custom Text window whose layout is to be saved, open the Configure Text dialog
2. Click the **Layout** button and from the drop-down list, select **Save** to open the Save Layout dialog
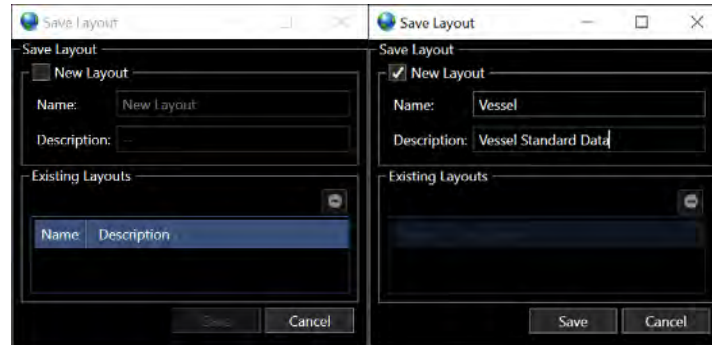
FIGURE 8-18 TEXT LAYOUTS - SAVE LAYOUT

3. If a new layout:
   a. Check the **New Layout** box
   b. **Name:** Enter a name for the layout
   c. **Description:** Enter a description for the layout

4. If an existing layout that is to be updated
   a. Select the layout from the Existing Layouts list

5. Click **Save** to save the layout or **Cancel** to abort
   a. In the case of updating an existing layout, answer the prompt confirming the overwriting of the existing configuration accordingly
   b. The Save Layout dialog closes regardless of which button is clicked

8.3.6.2 Load a Text Layout

2 From the Tabular Text or Custom Text window whose layout is to be replaced, open the Configure Text dialog
3 Click the **Layout** button and from the drop-down list, select Load to open the Load Layout dialog
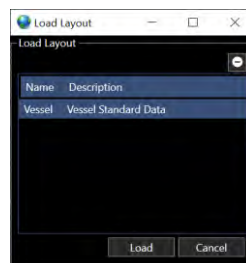
FIGURE 8-19 TEXT LAYOUTS - LOAD LAYOUT

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4   Select the layout to load from List

5   Click **Load** to load the layout, **Cancel** to abort

6   If the current window contains display items, a warning that the loading of the layout will clear the existing layout will appear, answer accordingly

8.3.6.3   Remove a Text Layout

1.   From the Tabular Text or Custom Text window whose layout is to be removed, open the Configure Text dialog

2.   Click the ![Layout] button and from the drop-down list, select Save to open the Save Layout dialog or Load to open the Load Layout dialog

3.   Select the layout to remove in the Existing Layouts list
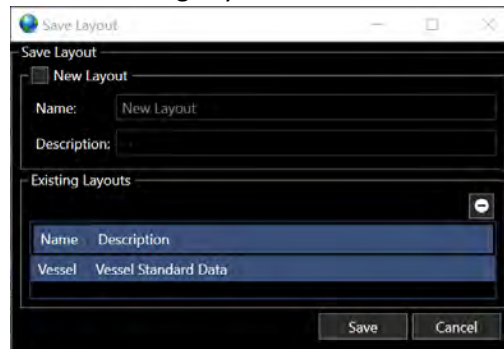
FIGURE 8-20 REMOVE TEXT LAYOUT DIALOG

4.   Click the ![button] button

5.   Answer the deletion confirmation prompt accordingly

8.4   Map Window

The Map window presents a 2 dimensional top-down view of the work area, providing a comprehensive means to monitor the operation of NavView for a surveying application. It is opened by clicking on the Map icon in the Windows section in the View ribbon. The window opens as a document window in the center of the workspace. If a document window is already in that location it will open as a tab in that window.

When a Map window has the focus, a context sensitive Map tab is added to the ribbon. This provides access to Map specific tools and features. These are also available using the Map view's tool bar.
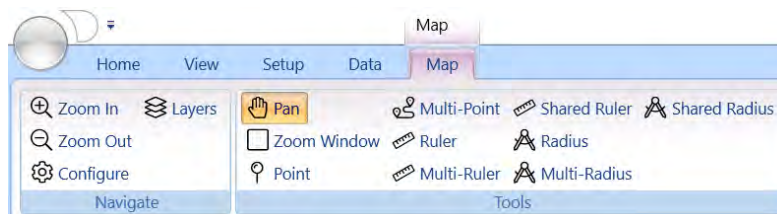
FIGURE 8-21 MAP WINDOW CONTEXT SENSITIVE RIBBON TAB

Note: If Roles are enabled, any user can open and edit a Map window. The exception being the project level configuration of the backgrounds.

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Note: Multiple Map windows can be open in a workspace at any one time. The Map window needs to be changed to a floating window, this is done by left clicking on the Map View Tab and dragging the window

Note: If positioning fails on a vehicle, its outline will start to fade, disappearing completely when the age of the data reaches 5 minutes.
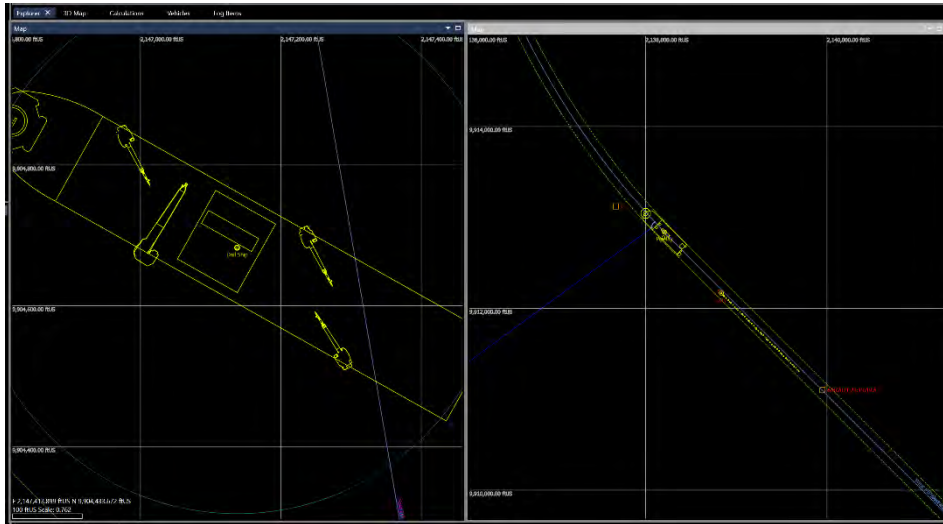
FIGURE 8-22 MULTIPLE MAP WINDOW EXAMPLE

2.5.1 Background Displays

NavView supports the use of AutoCAD *.dwg and *.dxf and ESRI *.shp files as backgrounds for the Map views. The **Configure Backgrounds** dialog (see Figure 8-24) is opened by clicking on the Background button in the ribbon's Setup tab in the Configure section (see Figure 8-23). At the project level, the user manages the background files to load for the project and therefore be available for use in the Map windows from this dialog. If the NavView is deployed on a network utilizing NavView Network Services, this project level background configuration and the drawings are distributed to all NavView clients connected on the network. This is beneficial for ensuring that all NavView clients on a network remain in synchronization.

Note: If Roles are enabled, only users with Supervisor privileges and higher can add and remove background files and edit the settings. Users with lower privileges can only view the configuration.
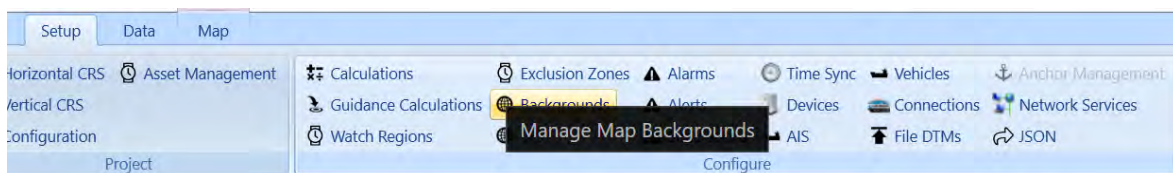
FIGURE 8-23 SETUP TAB - CONFIGURE BACKGROUNDS

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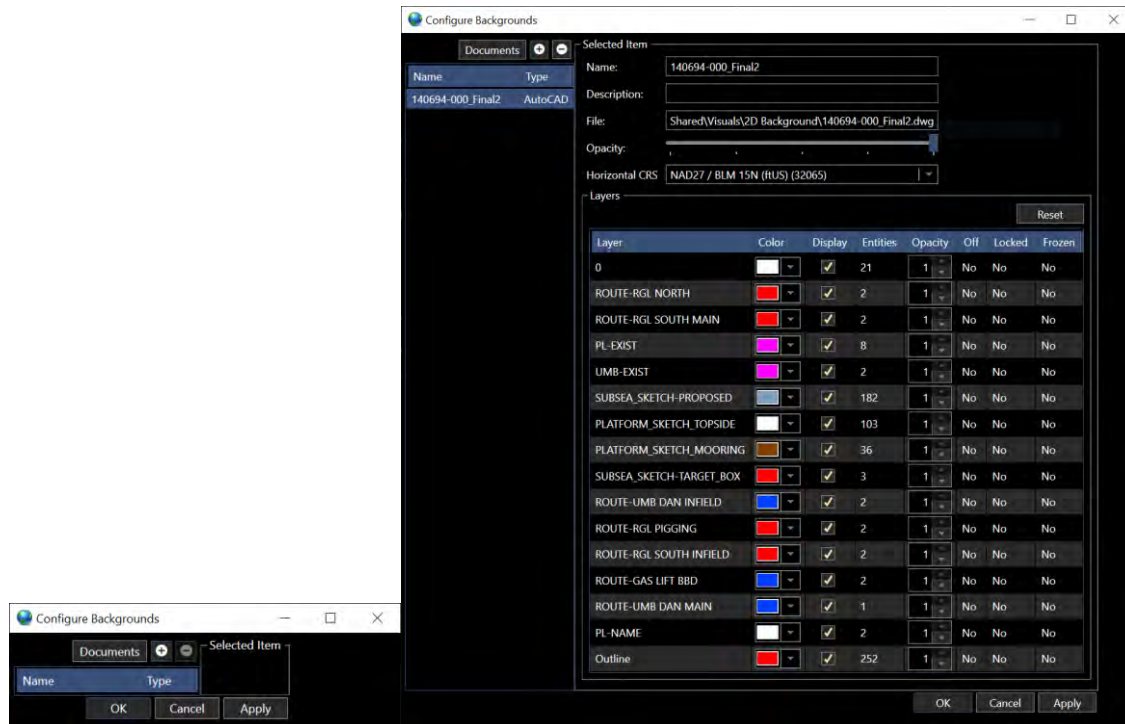
FIGURE 8-24 CONFIGURE BACKGROUNDS DIALOG

When a Map window is opened on any NavView client on the network, any Local station configured on that client, by default all layers of all the configured background files are enabled for display. Control of the display of the background layers can be exercised for each Map window independently using the Layer option in the respective Map window's tool bar (see **Map Layers**).

Note: Changes made to the background's configuration are applied to all open Map windows on any client.

8.4.1.1   Add a Background File

- Open the Configure Backgrounds dialog
- Click the ⊕ button to open the Load Background File dialog from the project's Shared\Visuals\2D Background folder
  - The default file type is both *.dwg and *.shp, this can be changed to just one or the other from the file type drop-down list
  - If the file to load is not located In Shared\Visuals\2D Background, navigate to the folder where the file(s) is located
  - Select 1 or more files (file types can be mixed)
  - Click **Open**
- The files are added to the list displaying the file name and the file type with the first file selected, or only one file if only one was selected, the file is highlighted and presented in the right panel ready for configuration (see **Edit a Background File Display Settings**)
- Repeat as required to load all the desired files

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Note: There is no limit to the number of background drawings that can be displayed, but the level of detail and number of entities should be considered in conjunction with processor and graphic capabilities of the computer being used.

8.4.1.2   Remove a Background File

1. Open the Configure Backgrounds dialog
2. Select the file to remove in the list

Note: Only 1 file can be removed at a time.

3. Click the ⊖ button
4. Respond to the file removal confirmation prompt accordingly

8.4.1.3   Edit a Background File Display Settings

1. Open the Configure Backgrounds dialog

2. Select the file to edit from the list to display the associated configuration in the Selected Item group box to the right

3. Edit the settings

   Name: Enter a name to use for the background. This will be displayed wherever the background files are presented for use and manipulation, e.g. in the Map window Layer list. The default name is the respective file's name with the extension removed.

   Description: Enter a description for the background (optional)

   File: Displays the name and path of the file associated with this background

   Opacity: Use the slider to control the opacity of the drawing, to the right is opaquer, to the left is more transparent.

   Horizontal CRS: Select the Horizontal CRS from the drop-down list that the background file uses, default is the Working Horizontal CRS at the time the file is added. A background file is only available for use and displayed when the current Working Horizontal CRS matches the Horizontal CRS assigned to the file.

   If the selected background file is a *.shp file, the above is the extent of the configuration options, go to step 4.

   If the selected background file is a *.dwg file, the layers and their settings are displayed in a **Layers** data grid. Selected settings can be changed. To facilitate editing, the data grid can be sorted by clicking in the desired column header. Changes are saved as part of the NavView configuration, they are not written out to the dwg file.

Note: When sorting by Color, it may appear that the sort fails because different colors are grouped or appear out of order. This is due to the hexadecimal value that represent the colors and are used to sort by.

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Layer: Name of the layer. Cannot be edited.

Color: Color used to display the layer entities. Can be edited. Clicking on color box pops up a color list from which to select the color to use for the layer.

Display: Display setting for layer. Can be edited. Clicking in the checkbox toggles the display on and off.

Note: If a layer that is **Locked** in the AutoCAD file is toggled from its dwg setting, a warning to the operator that the layer is Locked and therefore it may be best not to change the display setting appears, respond accordingly.

Note: If a layer is set to not display from this configuration level, it cannot be toggled to display at the Map level via that window's tool bar Layers tree but even though the respective checkbox in that tree can be checked.

Entities: The number of entities on the layer. Cannot be edited. It is suggested that when optimizing responsiveness of NavView, layers with a large number entities be examined to determine if they can be set to not display.

Opacity: This is the opacity of the layer. Can be edited. Opacity is rated from 0 to 1, 0 being transparent (essentially invisible) and 1 being opaque (very bright). Click in the cell and enter a value or use the ⊡ to adjust the setting.

Off: The on/off setting for the layer. Cannot be edited.

Locked: The locked setting for the layer. Cannot be edited.

Frozen: The frozen setting for the layer. Cannot be edited.

Reset: Click this button to reset the layer settings back to those of the original drawing.

4. Click **Apply** to apply the changes and leave the dialog open, or OK to apply the changes and close the dialog or **Cancel** to revert any changes not yet applied and leave the dialog open.

1.1.1 Configuration

The configuration of the individual Map windows involves the basic background and centering options and the map entity layer control.

8.4.1.4 Basic Map Configuration

The basic configuration of the window is performed via the Configure Map dialog (see Figure 8-25). This is accessed by right clicking in the window and selecting Configure from the pop-up menu or clicking on the ⚙ button in the tool bar.

Note: Changes to settings in the Configure Map dialog take effect immediately upon being made, they do not require the dialog to be closed with the **OK** button to apply.

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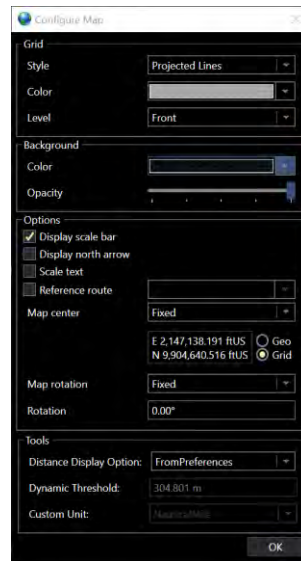
FIGURE 8-25 MAP WINDOW CONFIGURATION DIALOG

1. **Grid Settings**

    Style: Controls the map projection and/or geographic graticules displayed, select from the drop-down list options: None, Projected Lines, Projected Ticks, Geographic Lines or Geographic Ticks

    Color: Controls the color used to display the graticules and their labels, select from the drop-down list

    Level: Controls the placement of the Grid, either in Front of all objects/layers displayed or in Back of all objects/layers

2. **Background Settings**

    Color: Controls the color used for the background, select from the drop-down list

    Opacity: Slider controls the opacity of the background (note if the background is Black this has no effect), to the right is more opaque, to the left is more transparent

3. **Options Settings**

    Display Scale Bar: Checking the box displays the Scale bar in the Map view

    Display North Arrow: Checking the box displays the north arrow in the Map view

    Scale Text: Checking the box results in the text annotating waypoints, survey line nodes, etc. to scale with the zoom in and out, text size increases when zooming in, decreases when zooming out

    Reference Route: Selecting this will add the cursor KP/DCC as a text to the bottom left corner of the map view

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Map Center: The three options available from the drop-down list are **Fixed**, **Follow** and **Center**

Selecting **Fixed** a coordinate entry box appears, enter a coordinate to center the window on

Selecting **Follow** two drop-down list controls appear, Track Primary and Track Secondary each containing all objects available to select from in a hierarchical tree. Expand this and navigate to and select the object to follow and the window will center on this object. If the object moves outside the window bounds the window will redraw centered on the object. Selecting an object in both Primary track and Secondary Track the window will redraw to keep both objects in the Map window

Note: The list of available objects includes static objects such as waypoints, if one of these is selected the window will simply redraw centered on this object.

Selecting **Center** as in the case of the Follow option, two drop-down list controls appear, Track Primary and Track Secondary each containing all objects available to select from in a hierarchical tree. Expand this and navigate to and select the object to center on and the window will center on this object. Selecting an object in both Primary track and Secondary Track the window will redraw to keep both objects in the Map window. If an object moves outside the window bounds the window will no redraw centered on the object.

Map rotation: The two options from the drop-down list are **Fixed** and **Follow**

Selecting **Fixed** a rotation entry box appears, the orientation of the Map view will be rotated by the value entered in the rotation box

Selecting **Follow** a source drop-down list will be shown containing all objects available to select from in a hierarchical tree. Expand this and navigate to and select the object to follow and the window will rotate around this object. As the object changes orientation the Map view will follow. A rotation tolerance value can be entered, the smaller the value the more sensitive the map view rotation will be. An application would be a heads up display of a vessel

4. **Tools Settings**

Distance Display Options: The three options from the drop-down list available are **From Preferences**, **Dynamic** and **Override**

Selecting **From Preferences**, the ruler/radius text values displayed on the Map view will be in the units selected in the Project Configuration/Preferences

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Selecting **Dynamic**, the ruler/radius text values displayed on Map view will be units selected in the Project/Preferences, over the value set in Threshold the text will use the unit selected in Custom Unit

Selecting **Override,** the ruler/radius text values displayed on Map view will be units selected in Custom Unit

- **OK**   Closes dialog, it is not required to close with OK to apply changes as they are applied as they are made

8.4.1.5   Map Layers Control

Objects are displayed in the Map window on Layers, e.g. waypoints (including the visuals assigned to them), vehicles, vehicles' offsets, etc. The display of these layers can be controlled to optimize the display for the intended purpose.

The control for all layers, including the background drawing files, can be accessed by clicking the ⬚ button in the Map window tool bar or right mouse clicking in the Map widow and selecting Layers from the pop-up menu. This displays a hierarchical tree listing all layers present in the Map view (see **Error! Reference source not found.**) grouped according to type, e.g. vehicles. This can be expanded to drill down to a specific single layer. Clicking in the check box associated with a specific layer toggles that layer on/off. Clicking in the check box associate with any grouping toggles that group on/off. For example, in **Error! Reference source not found.**, clicking in the box next to ROV/Offset/Origin turns the symbol and label for this offset on the vehicle ROV on and off in the Map view. Clicking in the box next to ROV listed under Vehicles turns the display of that vehicle's outline and its label plus the symbol and label for all of its offsets on and off. Clicking in the box associated with Vehicles toggles the display of all vehicles on and off.
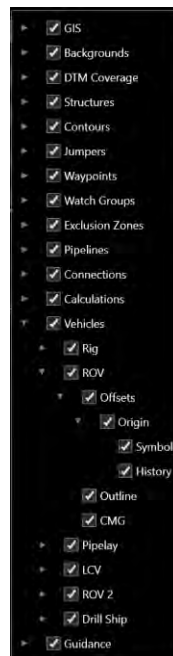
FIGURE 8-26 MAP WINDOW - AVAILABLE LAYERS LIST

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Note: If a layer in a background file has been set to not display at the project level configuration (see Edit a Background File Display Settings), it will still be listed in this tree but checking or unchecking the associated box cannot override the project level setting to not display.

Note: If a background file has been assigned a CRS other than the current Working Horizontal CRS, the background will be listed in this tree but will have no layers associated with it.

Note: All configuration settings for the Map window are written to the respective configuration file with the exception of Layer control for Vehicles. Therefore, whenever NavView opens a Map window from a configuration file, whether upon the launching of the program, opening a project and station or opening a Map window for which a configuration file exists, the Layer settings for **Vehicles** default to display all vehicles and their offsets and must be configured anew.

8.4.2 Tools

The tools for the Map window can be accessed via the window's tool bar, the window's context sensitive ribbon Map tab, with a right mouse click in the window and with the mouse directly.

8.4.2.1 Zoom In/Out

Zooming in and out can be done by clicking the ⊕ and ⊖ buttons in the Map window tool bar or the Zoom In and Zoom Out buttons in the context sensitive Map tab in the ribbon. Zooming in and out with these buttons steps the window in or out maintaining the same window center.

The Map window can also be zoomed in and out using the mouse scroll wheel. When zooming with the mouse wheel, the real world position of the mouse is maintained and the window redraws accordingly. This facilitates using the scroll wheel to both zoom in and out and re-centering.

8.4.2.2 Panning

The Map window can be panned by clicking the 🖑 button in the Map window tool bar or by clicking and holding the left mouse button down, or clicking and holding the scroll button down, and moving the mouse to drag the window around. If either the Ruler or Coordinate Picker are active, clicking and holding down the scroll bar option must be used.

Note: Panning automatically resets the centering option to Fixed.

Note: If **Map Center** is configured for **Follow** the Map will redraw back to the object the map is centered on.

8.4.2.3 Measure Distance/Measure Radius Tool

Clicking the 📏 button activates the Measure Distance tool, when active the button is highlighted 📏. Clicking on the button again deactivates the tool.

To use the Measure Distance tool to make a measurement, place the cursor on the point in the Map window from which a distance and/or bearing to another point is desired, click and hold the left mouse button down and drag the cursor to the second point. A line is drawn from the starting point to the end

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point. The line is annotated with the distance and bearing in the format and units of which are as configured in Preferences

By clicking and holding the left mouse button down on the end point icon ⊕ the point can be dragged to a new location
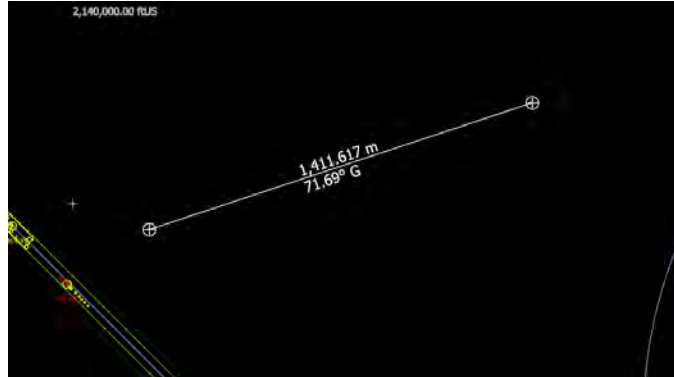
FIGURE 8-27 MEASURE DISTANCE EXAMPLE

Multiple Measure Distance tools can be drawn and displayed simultaneously by clicking the ⬚ button this activates the Measure Distances tool. See Figure 8-28
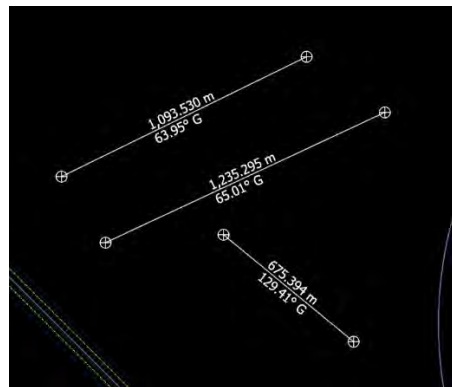
FIGURE 8-28 MEASURE DISTANCES EXAMPLE

To use a ruler across multiple maps click on the ⬚ button this activates the Measure Distances across maps tool. See Figure 8-29

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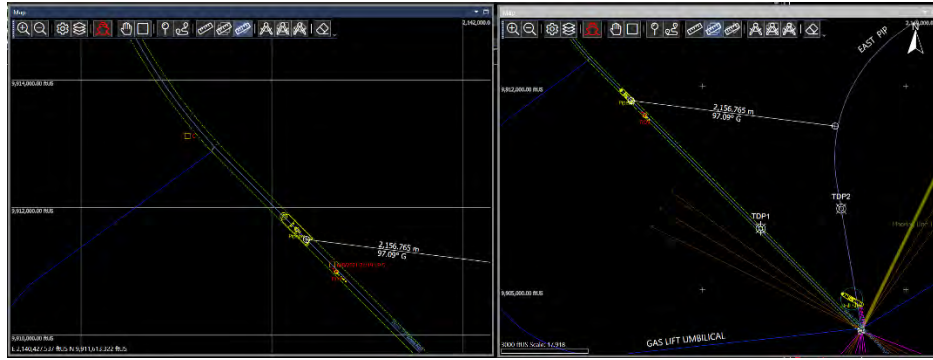
FIGURE 8-29 MEASURE DISTANCES ACROSS MAPS EXAMPLE

To measure a radius click on the to activate the Measure Radius tool. See Figure 8-30

By clicking and holding the left mouse button down on the end point icon the point can be dragged to a new location

FIGURE 8-30 MEASURE RADIUS EXAMPLE

To measure multiple radiuses click on the button to activate the Measure Radiuses tool. See Figure 8-31
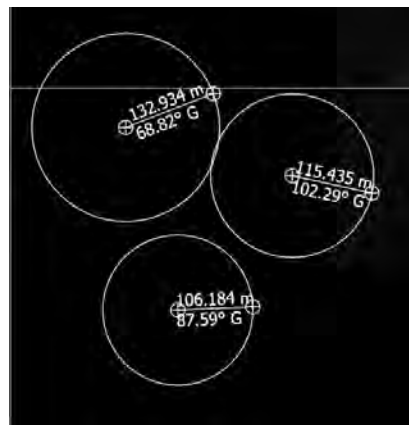
FIGURE 8-31 MEASURE RADIUSES EXAMPLE

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To measure radius across multiple maps click on the ⚖ button to activate the Measure Radiuses Across Maps tool. See Figure 8-32
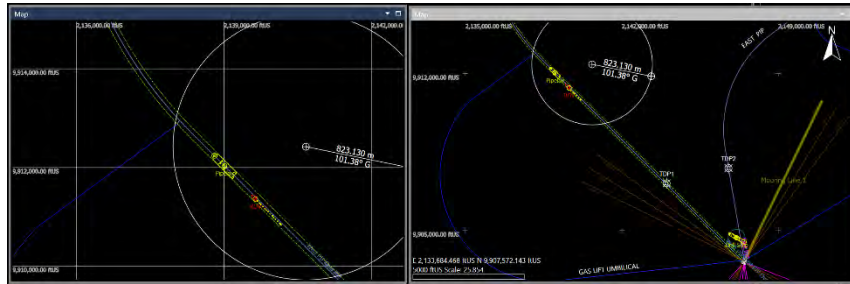
FIGURE 8-32 MEASURE RADIUSES ACROSS MAPS EXAMPLE

To erase measurements from the map window click on the erase button ⬦.

Right mouse clicking on a point or a line presents a pop up menu whereby the user can delete the selected object or copy it.

To delete, select the Delete menu item.

To copy the start and/or end points of the last measurement made, move the mouse away from the end point and right mouse click on the measurement annotation to display a Copy To… menu with the options to copy to Clipboard, 3D Line, Move Plan, Pipeline, Survey Line, Watch Group, Exclusion Zone and Waypoint. See Figure 8-33

Note: In the case of multiple rulers/radiuses present, the Copy To… feature copies the start and end points of the last measurement made.
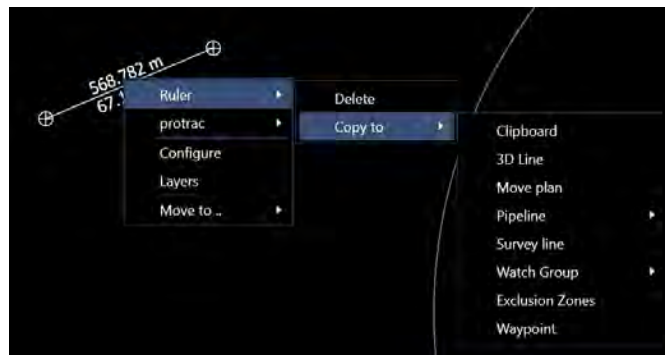
FIGURE 8-33 MEASUREMENT COPY TO POP-UP

Copy to Clipboard: Both points are copied to the clipboard as map projection coordinates in meters.

Copy to 3D Line: The 3D Line dialog is displayed with a 2 node line named based on the time created added and selected. The measurement starting point is set the start of line and the measurement end point as the end of line. This can be edited as required and accepted by clicking OK or aborted by clicking Cancel. Upon

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clicking cancel, a warning "There are unsaved changes. Would you like to save them?" will appear, click No to continue the aborting process (clicking yes will save the 3D line).

Copy to Move Plan: Copies the start and end coordinate Move Plan File

Copy to Pipelines: The Configure Pipeline dialog is displayed with a 2 node line. The measurement starting point is set the start of line and the measurement end point as the end of line. This can be edited as required and accepted by clicking OK or aborted by clicking Cancel. Upon clicking cancel, a warning "There are unsaved changes. Would you like to save them?" will appear, click No to continue the aborting process (clicking yes will save the Pipeline).

Copy to Survey Line: The Survey Lines dialog is displayed with a 2 node survey line. The measurement starting point is set the start of line and the measurement end point as the end of line. This can be edited as required and accepted by clicking OK or aborted by clicking Cancel. Upon clicking cancel, a warning "There are unsaved changes. Would you like to save them?" will appear, click No to continue the aborting process (clicking yes will save the survey line).

Copy to Watch Group: The Create Region dialog is displayed to enter region name, region type and buffer distance. When finished click okay this will display the Configure Watch Groups dialog which contains the two end points of the measurement.

Copy to Exclusion Zones: The Create Region dialog is displayed to enter region name, region type and buffer distance. When finished click okay, the two end points of the measurement will be in the Regions tab of the Configure Exclusion Zones dialog.

Copy to Waypoint: A Waypoint dialog is displayed with the measurement starting point as the coordinate. The information can be edited as required and accepted by clicking OK which will result in it being added to the waypoints or ignored and not added to the waypoints by clicking Cancel. This process is repeated for the measurement end point.

8.4.2.4   Point/Multi-point Picker

Clicking the ⬚ button activates the Single Point Coordinate Picker feature. This is an interactive feature that allows the operator to graphically define Watch Groups, Exclusion Zones and Waypoints. In addition coordinates can be copied to the clipboard. When active, the button is highlighted (⬚).

When activated a box appears in the top left of the window. The coordinates being 'picked' are defined by left mouse click in the map window whereupon a ➕ icon is drawn and the coordinate is displayed in the box. Each time the left button is clicked the previous point is removed and the new one displayed.

FIGURE 8-34 COORDINATE PICKER BOX

The point created using the Single Point Coordinate Picker can be copied for use elsewhere by mouse right click on point picked to display the Copy To pop-

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up menu, see Figure 8-35. See section 8.4.2.3 Measure Distance/Measure Radius Tool for description of each Copy To item.
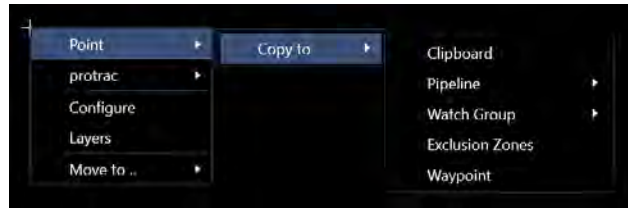
FIGURE 8-35 SINGLE POINT PICKER COPY TO MENU

Clicking the ⬚ button activates the Multi Point Coordinate Picker feature. This is an interactive feature that allows the operator to graphically define 3D Lines, Move Plans, Pipelines, Survey Lines, Watch Groups, Exclusion Zones and Waypoints. In addition coordinates can be copied to the clipboard. When active, the button is highlighted (⬚).

The coordinates being 'picked' are defined by left mouse click in the map window. The points picked are displayed with connecting lines with the line annotated with distance and bearing, this replaces the coordinate box displayed when using the Single Point picker. See Figure 8-36

By clicking and holding the left mouse button down on a point icon ⬚ the point can be dragged to a new location.
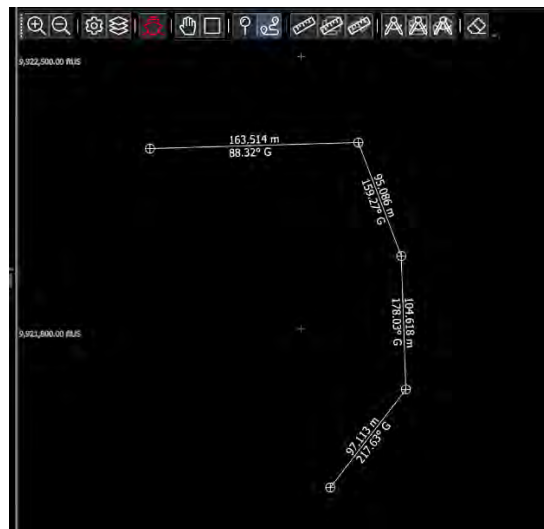
FIGURE 8-36 MULTI-POINT COORDINATE PICKER EXAMPLE

The points created using the Multi-Point Coordinate Picker can be copied for use elsewhere by mouse right click on the line annotation to display the Delete/Copy To pop-up menu, see Figure 8-37. See section 8.4.2.3 Ruler for description of each Copy To item.

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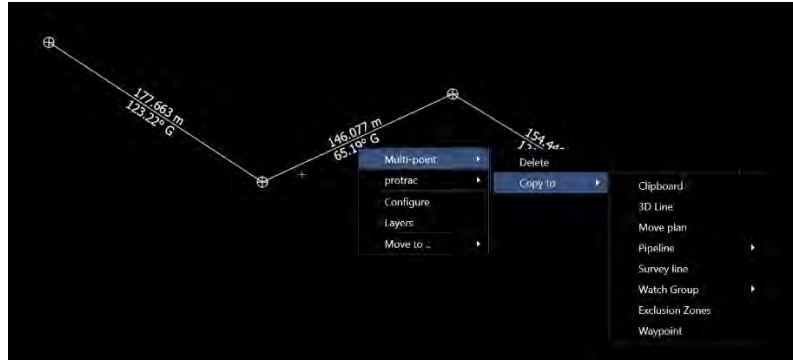
FIGURE 8-37 MULTI-POINT PICKER POP-UP MENU

8.4.2.5 Follow Reset

If the Follow mode has ever been configured for a Map window (see Basic Map Configuration), the Follow mode button in the tool bar can be used to enable and disable it. If this option has not been set, this button has no affect.

If the Follow mode is not enabled, this button displays as ![icon]. Clicking it will enable the Follow mode for the target object that it was last configured for. The tool tip for the button will give the name of the Follow target. If the Follow mode is enabled, the button displays as ![icon]. Clicking it will disable the Follow mode. The tool tip in this state displays the name of the Follow target that will be disabled.

8.4.2.6 Move To…
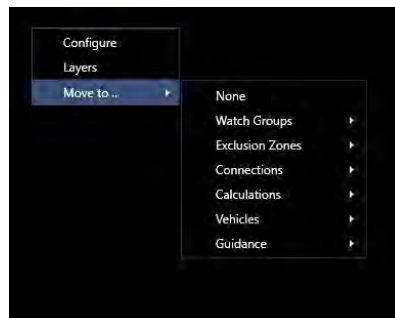
FIGURE 8-38 MAP WINDOW - MOVE TO OPTION

Right mouse clicking in the Map window displays a pop-up menu. Mouse over the Move to.. ▶ item to display a list of sources of objects that can be selected to move the center of the Map window to. Continue to roll over the list items displayed to expand the respective source down to the base objects, e.g. Vehicles expands down to specific offsets. Selecting one of the base objects causes the window to redraw with the selected object at the center.

Note: If the Follow mode is enabled, using the Move to feature disables it.

8.4.3 Short Cuts

Short cuts to common configurations are available via the Map window. These are access using the right mouse button in the window.

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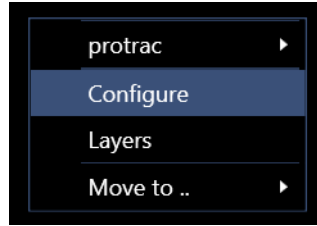
FIGURE 8-39 MAP CONFIGURATION SHORT CUT

8.4.3.1   Editing - Waypoints

Waypoint information can be accessed for viewing and editing from the Map window. Right mouse click on the waypoint (or its label or a line in its 2D outline) and select Edit from the pop-up menu that appears. Click on this to pop up the waypoint dialog for that waypoint. This can be edited with the changes applied by clicking OK or discarded by clicking Cancel.

FIGURE 8-40 MAP VIEW - EDIT WAYPOINT POP-UP MENU
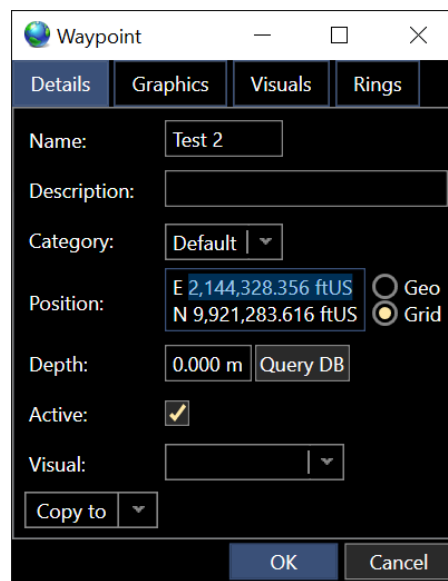
FIGURE 8-41 WAYPOINT EDIT WINDOW

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8.4.3.2   Editing - Survey Lines and Pipelines

Survey Lines and Pipelines information can be accessed for viewing and editing from the Map window. Right mouse click on any segment and select Edit from the pop-up menu to open a configuration dialog from which the line can be edited. See Figure 8-42 and Figure 8-43
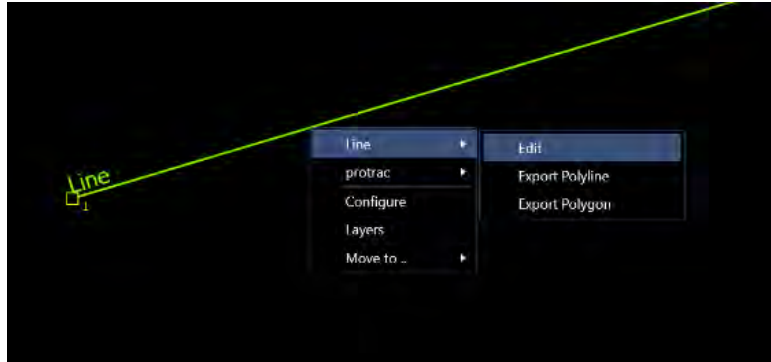
FIGURE 8-42 MAP VIEW - EDIT SURVEY LINE POP-UP MENU
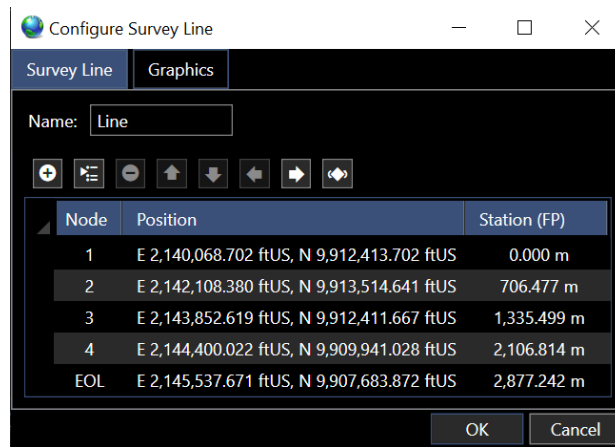
FIGURE 8-43 EDIT SURVEY LINE WINDOW

To apply the changes made, whether made graphically or directly within the dialog or some combination, click **OK** in the configure dialog. To cancel all changes, whether made graphically or directly within the dialog or some combination, click Cancel in the configure dialog.

In the case of pipelines, the pop-up menu from the right mouse click displays the Edit option and Segment Details. Clicking on these provides the following information:
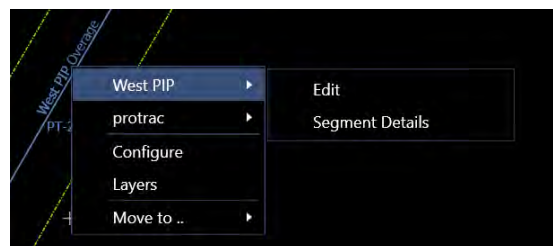
FIGURE 8-44 MAP VIEW - PIPELINES POP-UP MENU

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Edit: Opens the Configure Pipeline dialog (see Figure 8-45).
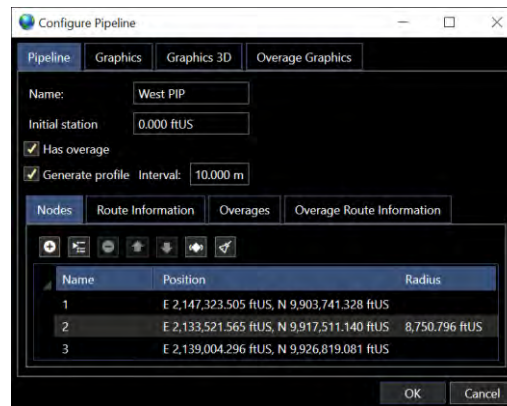
FIGURE 8-45 MAP VIEW - CONFIGURE PIPELINE DIALOG

Segment Details: Opens a Segment window displaying a summary of the selected segment data (see Figure 8-46)

FIGURE 8-46 PIPE LINE - SEGMENT DETAILS

8.4.3.3   Create an Object from a Polyline

If an AutoCAD dwg file is displayed as a background in a Map window, right clicking on a Polyline will display a menu allowing the operator to create an Asset, 3D Line Connection, Pipeline, Flowline, Umbilical, Survey Line, Exclusion Zone or Watch Group from the selected polyline. Click on the object to be created in the menu and the respective Configuration dialog will open allowing the editing of the resulting object.

1. Position the cursor over a polyline in the Map window and right mouse click

2. From the resulting menu (see Figure 8-47), select the type to create from the polyline

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Note: If the selected object in the background drawing is not a polyline, a warning will appear alerting the operator of this and the process will abort.
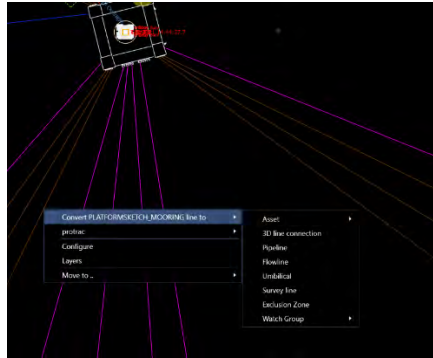
3. The respective configuration dialog will appear, for example, if Create Survey Line is selected the Configure Survey Line dialog as shown in Figure 8-48 will appear
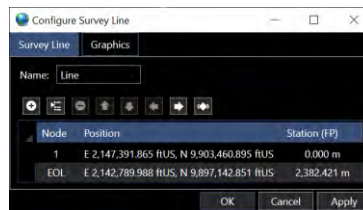
FIGURE 8-48 MAP VIEW CONFIGURE SURVEY LINE DIALOG

Note: If creating a Survey Line from a polyline an Import Polyline dialog is opened before the Configure Survey Line Configuration dialog.

4. Edit as required and click Apply to accept the object and add it to the respective collection and leave the dialog open, or click **OK** to do the same but close the dialog, or click **Cancel** to abort the process and close the dialog

Note: Once a polyline is added as one type of object, it cannot be added as another type until the first is removed from NavView because subsequent right mouse button clicks detect the object, not a polyline.

8.4.3.4 Guidance Setup

A Guidance calculation can be quickly set up directly from the Map window complete with a tabular Text widow displaying the data.

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11. Right mouse click on the intended From object, waypoint or a vehicle, to open a menu displaying Edit and Guidance (see Figure 8-49)

FIGURE 8-49 MAP VIEW – GUIDANCE SHORT CUT

FIGURE 8-50 MAP WINDOW - GUIDANCE DIALOG

12. Click on Guidance to open a Guidance Wizard (see Figure 8-50 for example for a vehicle as the From object), edit the dialog accordingly

13. **Track From:** Select the From object from this drop-down list
    a. If a waypoint was selected as the From object, it will be the only item in this drop down list
    b. If a vehicle was selected as the From object, this drop down list contains its static offsets to selected from

14. **Track To:** This presents a hierarchical tree of all objects that can be selected as the track To targets

15. **New Window:** Check this box if the data for from this new guidance object is to display in a new Tabular Text window, uncheck if it is to display in an existing Tabular Text window

16. **Target Window:** If the New Window box is not checked, using this drop-down list select the existing Tabular Text window to add this guidance object's data to

Note: If an existing Tabular Text window is selected, the rows for this guidance object will added to the bottom of the selected window.

17. **Title Location:** Specify where the guidance object's 'title' is to be placed in the respective window
    a. **Top:** Selecting Top results in the name of the To target being added as a Header followed by the data
    b. **Side:** Selecting Side results in the name of the To target being added as an item with the label Name and the value the name of the To Target followed by the data

18. If a line (e.g. Survey Line, Pipe Line, Flow Line, etc.) was selected as the To target, go to step 22

19. **Heading Display:** Select if the data to be displayed is Grid or True (geographic)

20. **Distance Display:** Select if the data to be displayed is Grid or True (geographic)

21. **Slope Distance:** Check the box if the range displayed is to be slope distance, if unchecked the range will be a horizontal distance

22. Click Apply to apply the Guidance Wizard this will open the Configure Text Window to edit the text configuration.

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Note: If a Track To target was selected before closing with the X, a warning stating "There are unsaved changes. Would you like to save your changes?" appears. Clicking Yes will result in the wizard configuration being applied, clicking No or closing with the X will continue the abort process.

If the Track To target is a waypoint, the guidance data displayed is the target name, range and bearing (see the Tabular Text window in Figure 8-51 titled Waypoint). If the Track To target is a line, the guidance data displayed is the target name, station, distance off line from the current line segment and the distance to the end of the current line segment as shown in the Tabular Text window in Figure 8-51 titled Survey Line.

In the case of creating a new Tabular Text window, once created it is just another Tabular Text window and can be manipulated and edited accordingly.

FIGURE 8-51 MAP WINDOW - GUIDANCE SHOTRCUT TABULAR TEXT WINDOWS

8.5 3D Map

The 3D Map window presents an easily interpreted real-time 3D view of seabed infrastructure, surface vessels, mid-water cables and other objects such as buoys, ROVs or deployed packages. The content of the scene is project-specific and requires either properly-formatted 3D models that can be drawn in the scene, or special setup to allow calculation of specific models on the fly, such as dynamic riser lines. In addition to objects, a Digital Terrain Model (DTM) representing the seabed over the project area may also be drawn. Figure 8-52 below displays partial views of typical scenes containing structures and jumpers in a subsea field.
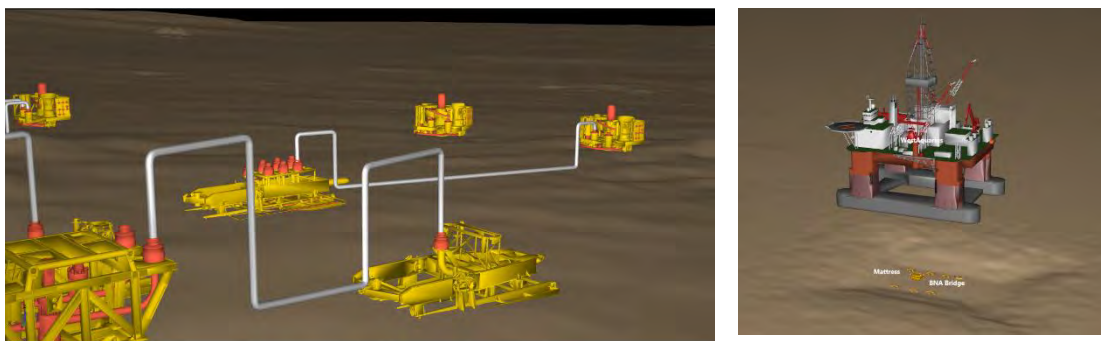
FIGURE 8-52 PARTIAL 3D SCENES

If Roles and Privileges are enabled, any user can open and edit a 3D Map window.

Note: To properly display the 3D Map, a **Project Center** position must be defined. This is done via the Explorer view. If this is updated while a 3D Map view is opened, it must be closed and re-opened to apply the new Project Center.

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Note: Multiple 3D Map windows can be open in a workspace at any one time.

To open a 3D Map window, click the 3D Map icon in the View ribbon. The window will open as a document window in the main part of the workspace. If a document window already occupies that space it will be added to it as a tab.

When a 3D Map window has the focus, a context sensitive 3D Map tab is added to the ribbon. This provides access to 3D Map specific tools and features.

See **Database Services** for details on loading the DTM.
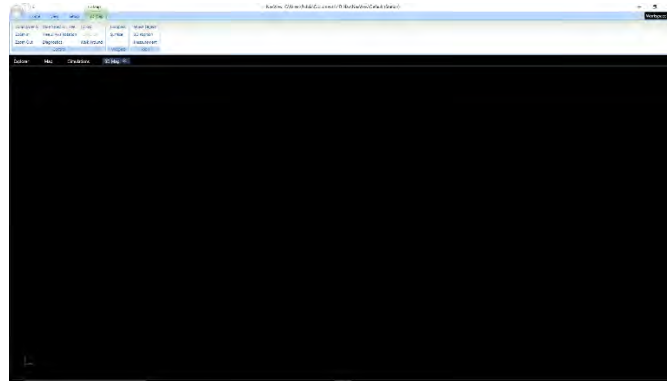
FIGURE 8-53 DEFAULT 3D VIEW

8.5.1 Basic Operations

In many cases users will be introduced to NavView after the site project has already been configured. This section describes basic operations that may be executed in the 3D view, using the assumption that the 3D scene has already been configured and loaded from a project file. Details describing the procedures for loading 3D objects will be discussed later in the document.

8.5.1.1 Mouse Actions

The mouse is the primary user interface tool when interacting with the 3D scene. Supported mouse actions are detailed here.

8.5.1.2 Pan

Panning through the scene is done with a left button click and drag operation. When the left button is released the pan operation is stopped. It can also be done with a mouse scroll wheel click and drag operation.

8.5.1.3 Zoom

Zooming in and out of the scene is done by rotating the mouse wheel. A forward rotation zooms in while a reverse rotation zooms out.

8.5.1.4 Rotate

Rotating the scene is done with a right-click and drag operation. When the right mouse button is clicked a light-gray bull's eye appears in the view at the rotation center point. If an object is selected from the selection tree the rotation center will be located at that object's origin. The rotate actions are summarized below:

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1. Right-click and drag left: Rotates scene to the left.
2. Right-click and drag right: Rotates scene to the right.
3. Right-click and drag up: Rotates scene up (towards a top-down view).
4. Right-click and drag down: Rotates scene down (towards a seabed-level view).

By default, rotations beneath the seabed are restricted. This restriction may be removed if there is a reason to do so as will be discussed later in the document.

8.5.1.5   Selection Tree

The selection tree appears on the left side of the 3D view when the mouse is inside the view. When the mouse is moved outside the 3D scene the selection tree fades from the view.

Note: The display of the selection tree can be turned off, see Hide Selection Tree.

From the selection tree the user can:

16. Select an object to center
17. Hide or show specific objects or categories of objects
18. Toggle object labels on or off
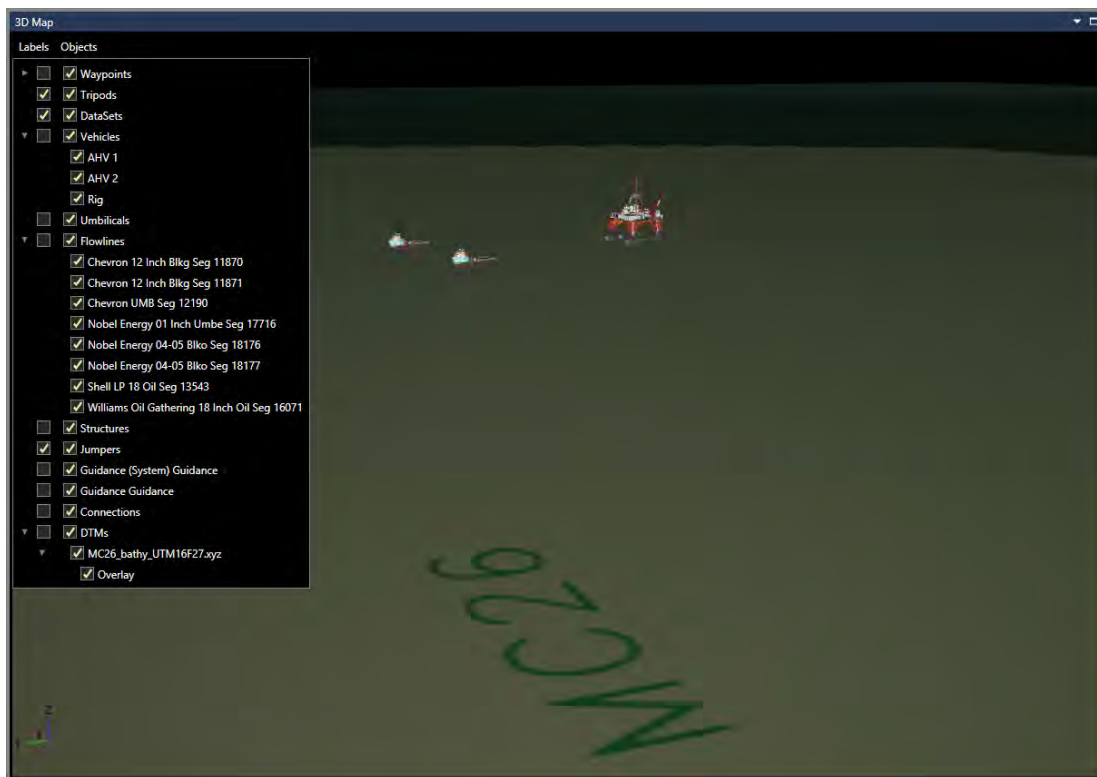
FIGURE 8-54 3D VIEW WITH SELECTION TREE

Figure 8-54 shows a 3D Map view with the Selection Tree. The tree lists the categories of graphical objects such as vehicles, structures, umbilicals, etc., that are supported in the view. Clicking on the

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arrow at the left of a category expands that branch displaying the associated items that are present in NavView as illustrated for Vehicles, Flowlines and DTMs in this figure. Categories that do not have an arrow beside them are empty. For example, in this case there are no Structures, Jumpers, Connections, etc.in the project because no arrow is visible beside these categories.

Clicking on an item in a branch will cause the view to re-center on that object with the camera looking directly at the object. This makes it very easy to navigate to any object of interest.

The first column of checkboxes controls the visibility of the labels for a category. Checking one of these boxes turns on the display of labels for all objects in that category. Unchecking one of these boxes turns the display of labels for all objects in that category off.

Note: Control of the display of labels is by category, not by individual object.

The second column of checkboxes controls the display of objects in the 3D Map view. Checking the box associated with a category, e.g. Structures, turns on the display of all objects of that category type. Unchecking the box associated with a category turns off the display of all objects of that category type. Checking the box associated with a specific object turns on the display of that object. Unchecking the box associated with a specific object turns off the display of that object.

Note: The display of any single object or group of objects is determined by the last action, e.g. unchecking the box associated with a category will turn off the display of all objects in that category regardless of the display setting of each individual object in that category.

8.5.1.6   3D Map Context Sensitive Tab

When a 3D Map window has the focus a context sensitive tab is added to ribbon. This tab presents users with several tools and operations that may be used to modify the 3D scene or to execute special functions inside the scene.

FIGURE 8-55 3D MAP CONTEXT SENSITIVE TAB

8.5.1.7   Controls

This set of functions directly affect the scene or how the user interacts with the scene.

8.5.1.7.1   ZOOM EXTENTS

When the **Zoom Extents** button is clicked the scene is immediately changed to a top-down (plan) view from a high altitude. This may be considered essentially a view 'reset' to a known camera angle and position. The operation does not necessarily zoom to the entire extents of the project area, so the true extents of the terrain may not be visible. This is intentional as zooming to true extents can cause objects on the seabed to disappear from the view when the project area is very large, and this can make the user's perception of where the camera is pointing more difficult.

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8.5.1.7.2   ZOOM IN

Clicking the **Zoom In** button decreases the scale of the scene by one zoom level.

8.5.1.7.3   ZOOM OUT

Clicking the **Zoom Out** button increases the scale of the scene by one zoom level.

8.5.1.7.4   HIDE SELECTION TREE

Clicking the **Hide Selection Tree** button toggles the display of selection tree on and off.

8.5.1.7.5   FREE Z-AXIS ROTATION

By default, scene rotation in the z-axis is restricted to prevent accidentally flipping the scene such that the camera is looking upwards from beneath the seabed. When this happens it can be very confusing to the user, but the default setting generally prevents this occurrence.

In some cases it may be desirable to look at the scene from beneath the seabed. If this is required the **Free Z-Axis Rotation** toggle removes the restriction.

8.5.1.7.6   DIAGNOSTICS

Diagnostic information relating to the 3D view may be toggled on or off by clicking the **Diagnostics** button. When turned on, the information is displayed in the upper-right corner and lower-left corner of the 3D Map as shown in Figure 8-56.
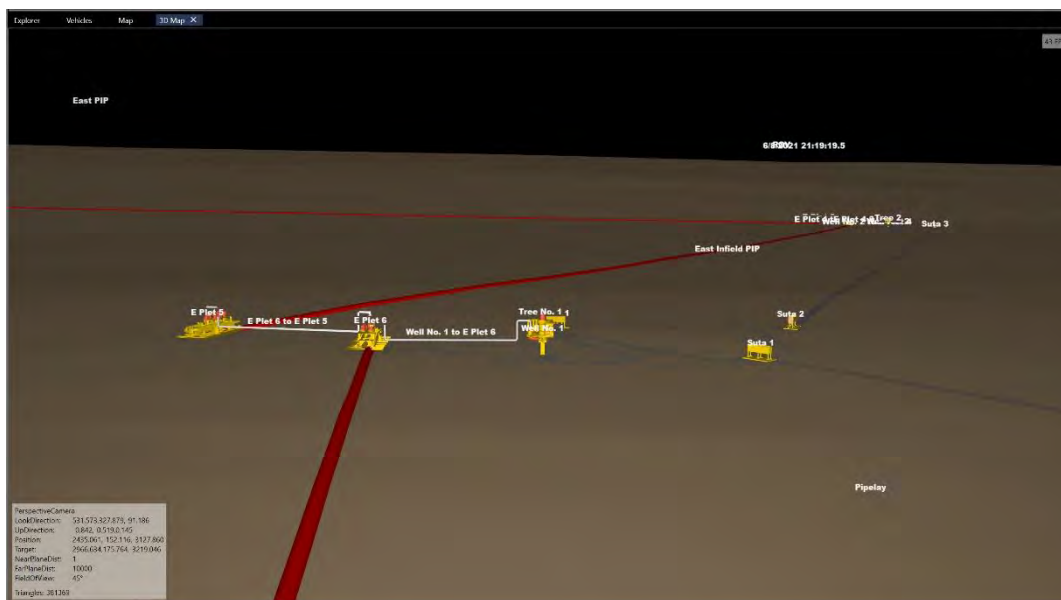
FIGURE 8-56 3D MAP VIEW - DIAGNOSTIC DATA

Note: The diagnostic information is to assist trouble shooting. It is not expected that it would generally be displayed.

8.5.1.7.7   FOLLOW/FOLLOW OFF

Clicking on the Follow item opens the Follow options dialog.

12. Select the vehicle to be followed from the drop-down list

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13. Click Follow to apply the settings, click Cancel to abort this configuration

Figure 8-57 shows the Follow mode active using the 3rd Person perspective.
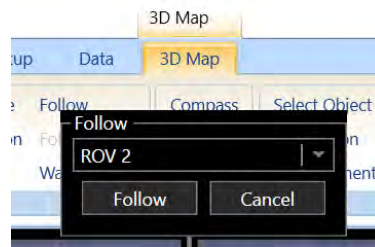
Clicking the Follow Off item toggles this feature off.

8.5.1.7.8   WALK AROUND/INSPECT

Toggles between Walk Around and Inspect camera modes.

Walk Around:

      Zoom In/Out: Camera move in/out in the direction of the cursor

      Pan: Scene moves in the direction of the cursor

      Rotate: Scene rotates about point indicated by the cross-hairs set when the right mouse button is first clicked

Inspect: Camera remains fixed and the scene moves.

      Zoom In/Out: Scene moves towards/away from the camera

      Pan: Scene moves in the direction of the cursor

      Rotate: Scene rotates about the camera

8.5.1.8   Widgets

These are graphical gadgets that may be added to the scene to provide additional context or data. Clicking a widget button adds the widget to the scene. Clicking the button a second time removes the widget from the scene. Each available widget is described in more detail below.

8.5.1.8.1   COMPASS WIDGET

Clicking the **Compass** button adds the compass widget to the scene. The compass presents the direction of the camera view looking into the scene in grid degrees. When the compass is first added to the scene, or when the mouse is moved over top of the compass, a move handle is made visible. The move handle may be grabbed by the mouse and the compass moved to any preferred location on the view. Figure 8-58 shows the compass.

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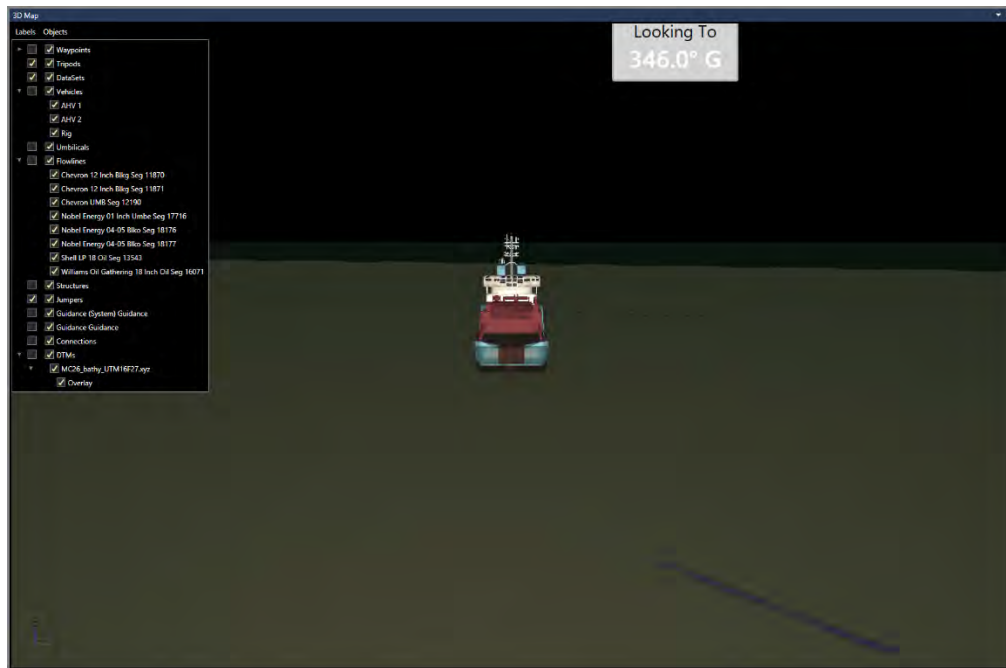
FIGURE 8-58 3D MAP – FOLLOW MODE WITH COMPASS

8.5.1.8.2   SEA SURFACE

A glassy sea surface can be added to or removed from the scene by clicking the **Sea Surface** button. The surface is drawn at an elevation of zero (MSL) and may be used for visual effect and reference.

Note: The surface is only drawn over that area where a DTM is present.

8.5.1.9   Tools

Tools allow the user to execute more complex operations within the scene from measuring between 3D objects to creating terrain. Only one tool may be selected at any time because tools require mouse input. When a tool is selected it will automatically close any previously selected tool.

8.5.1.9.1   SELECT OBJECT TOOL

Clicking the **Select Object** tool enables certain 3D objects in the scene to be selected by double-clicking on that object. When an object is selected it will be highlighted by a blue rectangle drawn around the object. Double-clicking on the same object a second time will de-select the object. Any number of objects may be selected at the same time.

Note: Not all objects support the Select Object feature, e.g. waypoint 3D models. If double-clicking on an object does not highlight the object then it is likely the object is not selectable.

Once an object has been selected, right clicking in the 3D Map window pops up a context menu listing all selected objects. Mousing over an object in the list will present options associated with that item. Click on one of these to execute that option.

Note: At this time the only operation that can be executed is the display of general metadata describing the selected object.

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Figure 8-59 illustrates the context pop up menu with 2 objects selected and the metadata for one of these.
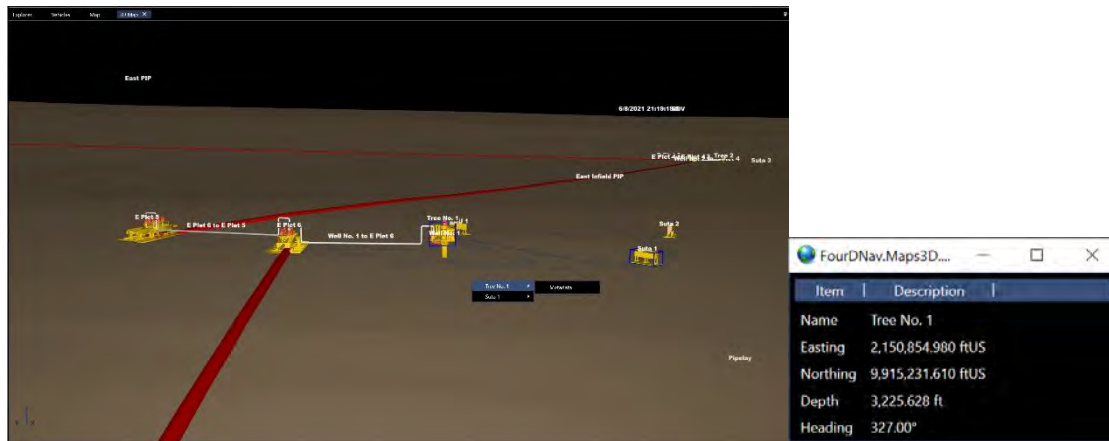
FIGURE 8-59 3D MAP - SELECTED STRUCTURES AND METADATA

8.5.1.9.2   3D POSITION TOOL

The **3D Position** tool allows a position and seabed depth to be displayed. Clicking the **3D Position** button enables the tool. When enabled double clicking anywhere on the terrain will result in the position and depth of that point to be displayed. A red sphere identifies the point and a view window above the sphere displays the position data. Double clicking at a different location in the scene will remove the previous point and create a new one at the second location. Figure 8-60 shows an example of a 3D Position point.

FIGURE 8-60 3D MAP – 3D POSITION

8.5.1.9.3   MEASUREMENT TOOL

The measurement tool enables users to measure distances and angles between two objects located in the 3D Map window. Clicking on the **Measurement** button enables the tool. A measurement consists of a start point and an end point, which may be placed on the scene by double clicking near the desired measurement point. After the first double click action the start point will be placed in the scene. This is seen as a green cross displayed directly beneath a red, green and blue fine adjustment tool as shown in Figure 8-61.

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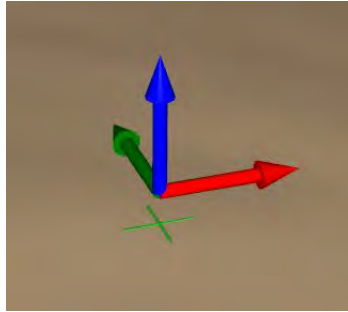
FIGURE 8-61 3D MAP - MEASUREMENT FINE ADJUSTMENT TOOL

The red arrow enables fine adjustment in the x-axis, the green arrow in y-axis and the blue arrow in the z-axis. To move the green cross marker in any axis, press either the **Shift**, **Ctrl** or **Alt** key and left mouse click and drag on the desired arrow (green, red or blue) along the axis of the selected arrow. This single axis motion allows very precise positioning of the marker in all 3 dimensions.

When the end measurement point is placed into the scene by double-clicking at a second location measurement lines are drawn in the scene describing the slant-range, horizontal range and vertical range between the two points. This is demonstrated in Figure 8-62.
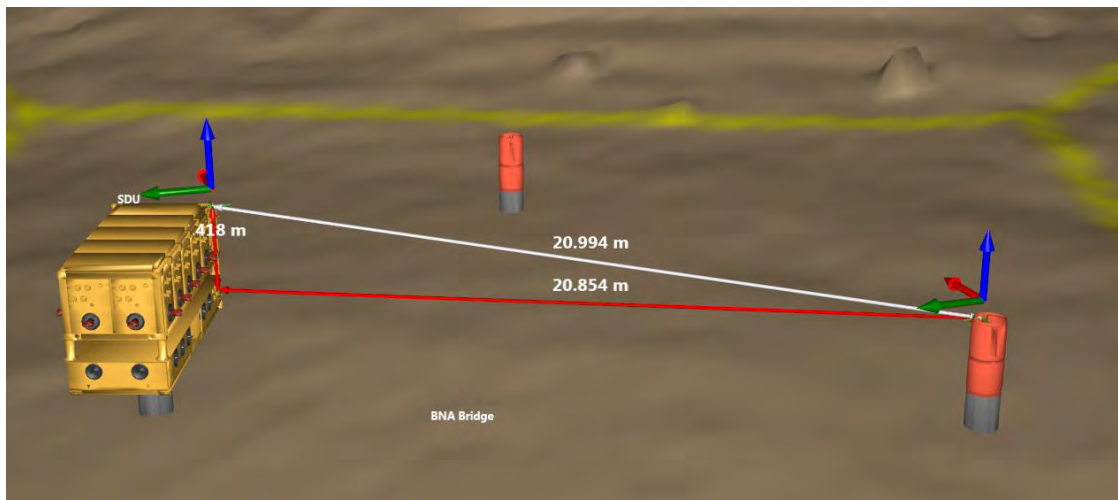
FIGURE 8-62 3D MAP - MEASUREMENT BETWEEN 2 POINTS

Fine adjustments can be made after the first point is set or after both points are set. For example, Figure 8-63 shows the difference between the measurement point in Figure 8-62 before and after centering on the wellhead. The measurement values will update automatically as the cross marker is moved in each axis.

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FIGURE 8-63 3D MAP - MOVING THE MEASUREMENT TOOL

Additional measurement detail (see Figure 8-64) may be viewed by right clicking the mouse button and selecting the **Measurement Detail** option from the context menu.

FIGURE 8-64 3D MAP - MEASUREMENT TOOL REPORT

Most of the values on the report are self-evident. A brief explanation of each value is shown below.

Measurement Pair

- Start: Identifies the 1st selected point
- End: Identifies the 2nd selected point
- Easting: Easting coordinate of each point
- Northing: Northing coordinate of each point
- Depth: Depth below sea level of each point
- Altitude: Height above seabed of each point

Distances

- Grid: The trigonometric plane (x,y) distance between the two points
- True: The true (ellipsoid) distance between the two points
- Terrain: The distance between the two points as if it were measured using a flexible cable laying on the seabed
- Slope: The hypotenuse distance between the two points
- Slope Angle: The z-axis slope angle in degrees

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<u>Start - End Deltas</u>

6. Delta East: Difference between Start and End easting coordinates
7. Delta North: Difference between Start and End northing coordinates
8. Delta Depth: Difference between the Start and End depths

8.6 Explorer Window

The Explorer window provides an overview of NavView using a two-panel window with a hierarchical tree in the left and the details of the item selected in the tree in the right. The contents of the tree are dependent upon the configuration of NavView and the modules present. Figure 8-65 illustrates this with the Setup branch in the left panel expanded to the individual items in Geodesy and Horizontal CRS selected and its details displayed for review and editing in the right panel.
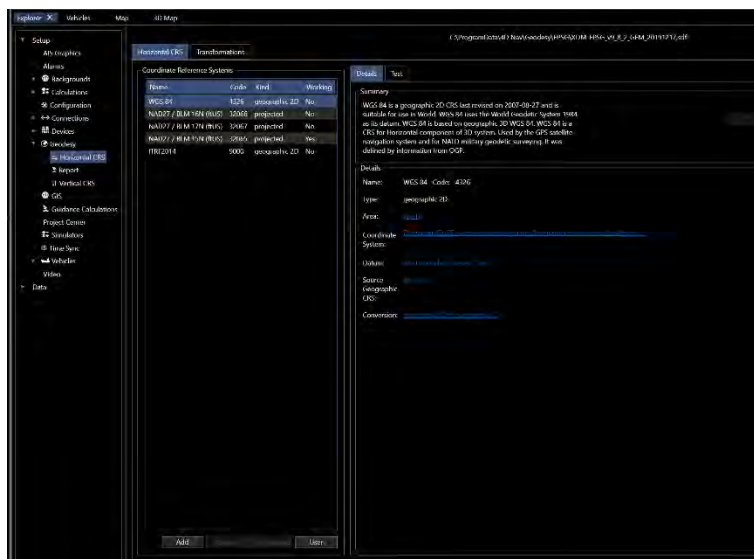
FIGURE 8-65 EXPLORER WINDOW

The Explorer window is opened by clicking on the Explorer icon in the Windows section of the View ribbon tab. The window opens as a document window in the center of the workspace. If a document window is already in that location it will open as a tab in that window.

The majority of the items listed in the tree can also be accessed, viewed and edited using a specific window or dialog. Others are only accessible from the Explorer window. The Explorer provides the option to view and access these from a single place.

For details on the information displayed in the Explorer window and how to use it, refer to the specific sections or sub-sections in this guide.

8.7 QC Widgets

Qc Widgets are windows that provide real time monitoring and comparison of observations. There are 2 types of QC Widgets: Position and Time Series. The QC Widgets are opened from the View tab on the Ribbon. The windows will open as a dockable window pinned to the left edge of the workspace. If a dockable window already occupies that space it will be added as a tab in that window.

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FIGURE 8-66 QC WIDGET

8.7.1 Position QC Widget

The Position QC Widget supports the comparison of multiple positions against a primary. The comparison can be viewed as a chart centered on the primary position or table listing the observations and the range and bearing from the primary position to the secondary positions (see Figure 8-67).

1. To open the window, click on the Position item in the QC Widgets section of the View ribbon

2. Right click anywhere in the window and select **Edit** from the context menu to display the Config Position Monitor window
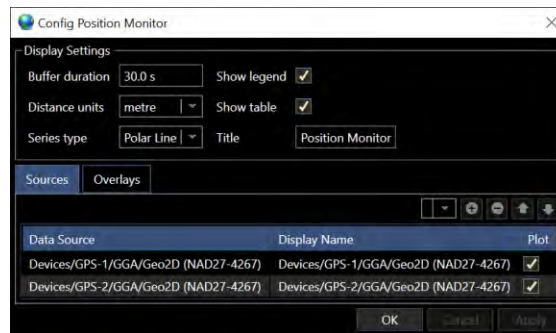
FIGURE 8-67 POSITION QC WIDGET - CONFIG POSITION MONITOR

The Config Position Monitor contains Display Settings, Sources Tab and Overlays Tab.

a. **Display Settings**

- **Buffer Duration:** How long data will be kept in view, e.g. setting of 30 s removes data older than 30 seconds

- **Distance Units:** From the drop-down list select units to be displayed in the Position Monitor Window

- **Series Type:** From the drop-down list select the graphical representation type, Polar Line or Polar Scatter, to display the position comparison

- **Show Legend:** Check the box to show a legend in the Position Monitor window

- **Show Table:** Check the box to show the position's data in a table format in the Position Monitor window

- **Title:** Enter a name to be displayed on the Position Monitor window header

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b. **Sources Tab**

Click the ⬛ button to display a hierarchical tree of observations to select from, navigate to the desired position observation and click on it, click ⊕ to add selection to the Data Source table. Repeat to add all the position observations to be monitored and compared. To re-order the observations, select the observation to move and click the ⬆ button to move it up the order or the ⬇ button to move it down the order

Note: The observation at the top of the list is considered to be the Primary, all other observations will be compared to this.

To remove an observation, select it in the list and click the ⊖ button

c. **Overlays Tab**

A circular overlay can be superimposed on top of the polar display, e.g. expected tolerance circle

- **Value:** Enter the radius for the circular overlay to be displayed, the value is in the units set in Distance Units above

- **Color:** From the drop-down list select the color of the circular overlay

- **Thickness:** Option to change the thickness of the circular overlay

- **Opacity:** Enter an opacity value from 0 to 1, 1 being the most opaque

- **Plot:** Check the box to display the overlay

3. Click **Apply** to accepted changes, **Ok** to finish, or **Cancel** to board the operation
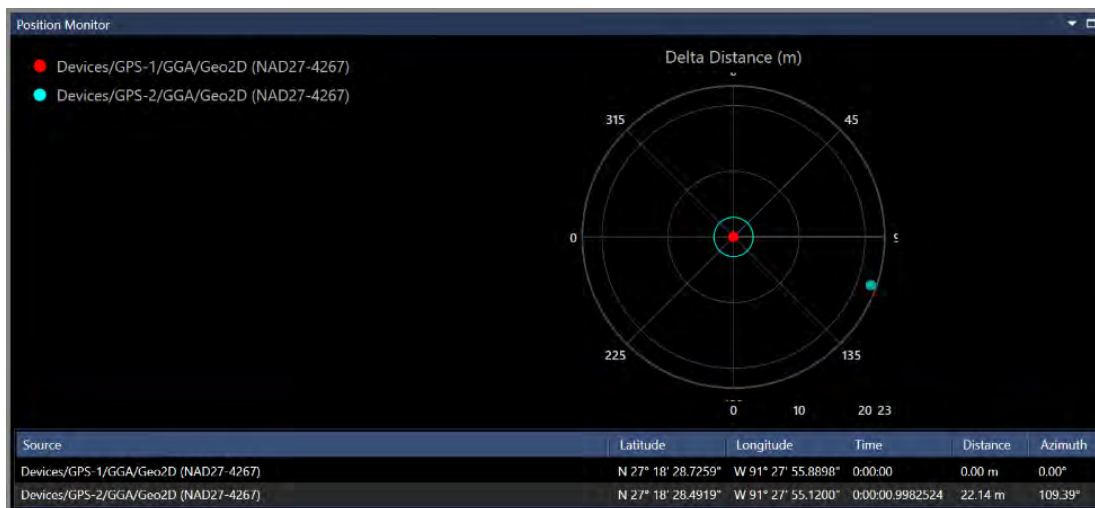
FIGURE 8-68 POSITION QC WIDGET – POSITION MONITOR WINDOW

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8.7.2 Time Series QC Widget

The Time Series QC Widget supports the monitoring and comparison of observations in a time series plot.

1. To open the window, click on the Time Series item in the QC Widgets section of the View ribbon

2. Right click anywhere in the window and select **Edit** from the context menu to display the Config Time Series Monitor window
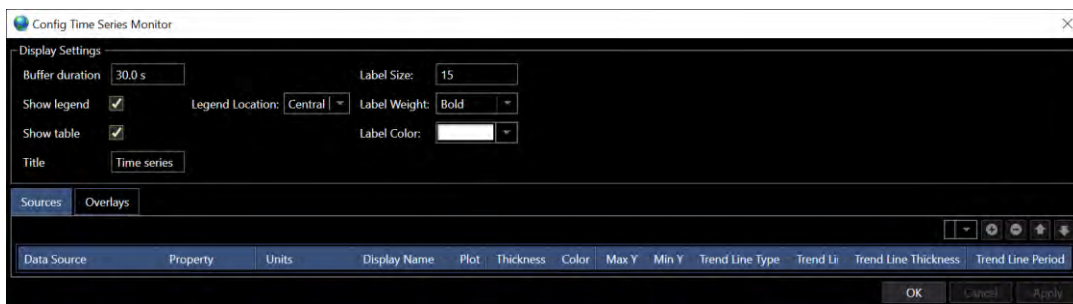
FIGURE 8-69 TIME SERIES QC WIDGET - CONFIG TIME SERIES MONITOR

The Config Time Series Monitor contains Display Settings, Sources Tab and Overlays Tab.

a. **Display Settings**
- **Buffer Duration:** How long data will be kept in view, e.g. setting of 30 s removes data older than 30 seconds

- **Show Legend:** Check the box to show a legend in the Time Series window

- **Show Table:** Check the box to show the data in a table format in the Time Series window

- **Title:** Enter a name to be displayed on the Time Series window header

- **Legend Location:** From the drop-down list select where the legend will be positioned in the window

- **Label Size:** Enter the text size for the label

- **Label Weight:** From the drop-down list select the weight the label text will be displayed

- **Label Color:** From the drop-down list select the label color

b. **Sources Tab**
Click the ⬛▾⚙ button to display a hierarchical tree of observations to select from, navigate to the desired and click on it, click ➕ to add selection to the Data Source table. Repeat to add all the observations to be monitored and compared. To re-order the observations, select the observation to move and click the ⬆ button to move it up the order or the ⬇ button to move it down the order. To remove an observation, select it in the list and click the ➖ button.

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- **Property:** Select the added Observation's Property to display

Note: Some observation types provide multiple data (also referred to as Properties) that can be selected to display in the time series. For example, selecting PitchRoll observations provides access to Pitch, Roll, Pitch standard deviation (SigmaPitch), Roll standard deviation (SigmaRoll) and Age.

- **Units:** Select the units to display the property in

- **Display Name:** The default name is the Data Source this can be edited by operator

- **Plot:** Check the box to display the time series plot in the window

- **Thickness:** Thickness of the time series line

- **Color:** From the drop-down list select the color of the time series line

- **Max Y:** Maximum limit of the Y-axis to display

- **Min Y:** Minimum limit of the Y-axis to display

- **Trend Line Type:** From the drop-down list select the type of trend line of the data to display

- **Trend Line Color:** From the drop-down list select the color for the trend line

- **Trend Line Thickness:** Thickness of trend line

- **Trend Line Period:** How many data items are used to average

3. Click **Apply** to accepted changes, **Ok** to finish, or **Cancel** to board the operation
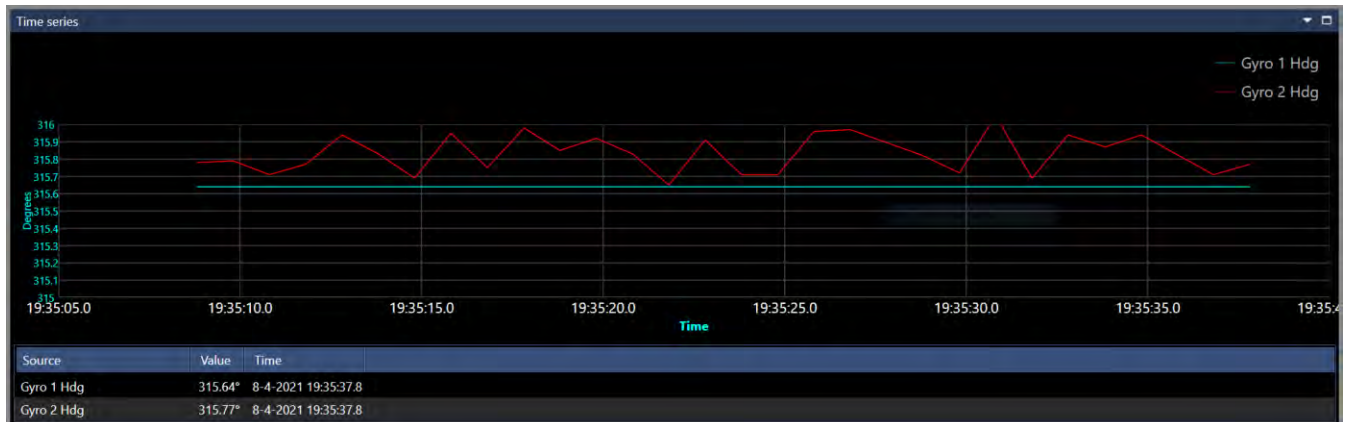
FIGURE 8-70 QC WIDGET - TIME SERIES

8.7.3 Bar Chart QC Widget

The Bar Chart QC Widget supports the monitoring and comparison of observations in a time series plot as a bar instead of a line.

1. To open the window, click on the Bar Chart item in the QC Widgets section of the View ribbon

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2. Right click anywhere in the window and select **Edit** from the context menu to display the Config Time Series Monitor window
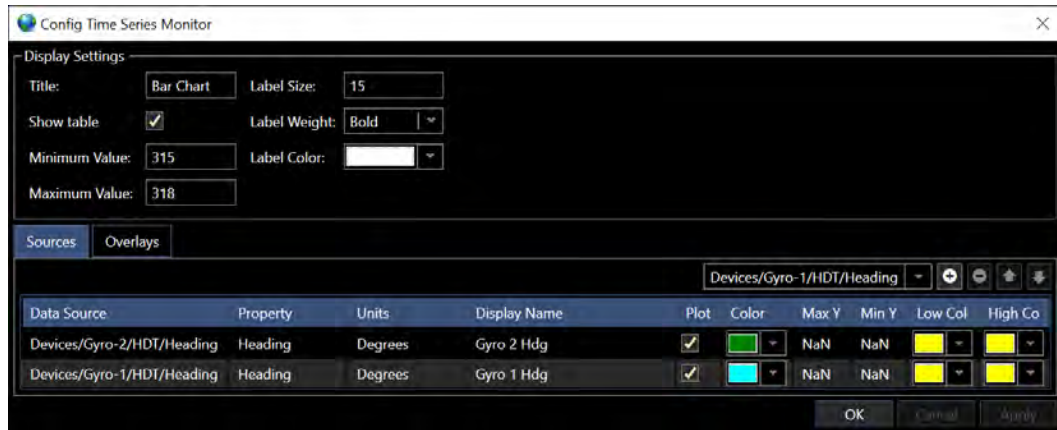
FIGURE 8-71 BAR CHART QC WIDGET - CONFIG TIME SERIES MONITOR

The Config Time Series Monitor contains Display Settings, Sources Tab and Overlays Tab.

a. **Display Settings**

- **Title:** Enter a name to be displayed on the Bar Chart window header

- **Show Table:** Check the box to show the data in a table format in the Bar Chart window

- **Minimum Value:** Minimum limit of the Y-axis to display

- **Maximum Value:** Maximum limit of the Y-axis to display

- **Label Size:** Enter the text size for the label

- **Label Weight:** From the drop-down list select the weight the label text will be displayed

- **Label Color:** From the drop-down list select the label color

b. **Sources Tab**

Click the ⬛ button to display a hierarchical tree of observations to select from, navigate to the desired and click on it, click ➕ to add selection to the Data Source table. Repeat to add all the observations to be monitored and compared. To re-order the observations, select the observation to move and click the ⬆ button to move it up the order or the ⬇ button to move it down the order. To remove an observation, select it in the list and click the ➖ button.

- **Property:** Select the added Observation's Property to display

Note: Some observation types provide multiple data (also referred to as Properties) that can be selected to display in the time series. For example, selecting PitchRoll observations provides access to Pitch, Roll, Pitch standard deviation (SigmaPitch), Roll standard deviation (SigmaRoll) and Age.

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- **Units:** Select the units to display the property in

- **Display Name:** The default name is the Data Source this can be edited by operator

- **Plot:** Check the box to display the Bar Chart in the window

- **Color:** From the drop-down list select the color of the Bar Chart

- **Max Y:** Set a maximum threshold for the data source. If the value is above this quantity, the bar will be displayed using the High Warning Color

- **Min Y:** Set a minimum threshold for the data source. If the value is below this quantity, the bar will be displayed using the Low Warning Color

- **Low Color:** From the drop-down list select the color to be used for the Low Warning Color

- **High Color:** From the drop-down list select the color to be used for the High Warning Color

c. **Overlays Tab**
   A linear overlay can be displayed on Bar Chart, this could be used to show a value of interest

   - **Value:** Enter the value of the linear overlay to be displayed, the value is in the units of the data source

   - **Color:** From the drop-down list select the color of the linear overlay

   - **Thickness:** Option to change the thickness of the linear overlay

   - **Opacity:** Enter an opacity value from 0 to 1, 1 being the most opaque

   - **Plot:** Check the box to display the overlay

3. Click **Apply** to accepted changes, **Ok** to finish, or **Cancel** to board the operation

FIGURE 8-72 QC WIDGET – BAR CHART

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8.8 Guidance Tracking

Guidance tracking provides a polar display (see Figure 8-74) of a selected Guidance Calculation (see Guidance Calculation section) **From** object to the **To** object. Guidance Tracking is accessed from the View Ribbon (see Figure 8-73).
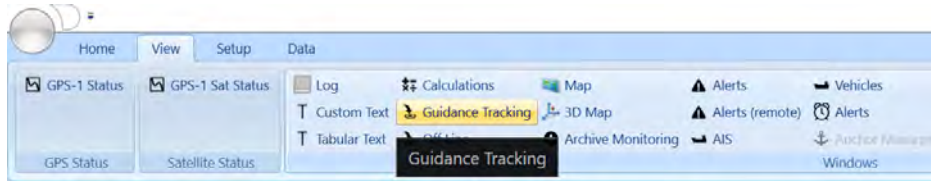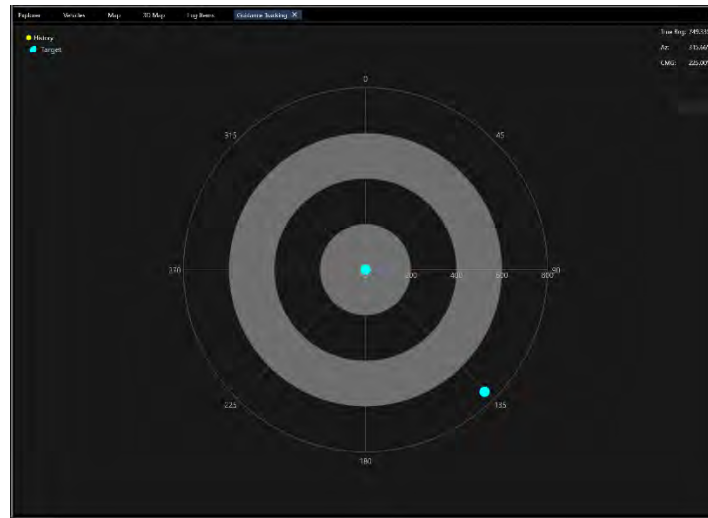
FIGURE 8-74 GUIDANCE TRACKING WINDOW

8.8.1 Guidance Tracking Configuration

The information displayed on the Guidance Tracking window is configured by a mouse right click within the window. This will open a pop-up menu (see Figure 8-75) giving the option of configuring the information to display or save chart as a PNG.
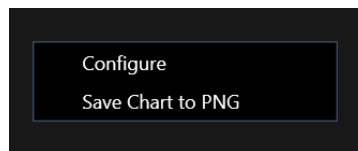
FIGURE 8-75 GUIDANCE TRACKING POP-UP MENU

Selecting Configure opens a Configure Guidance Tracking dialog (see Figure 8-76).

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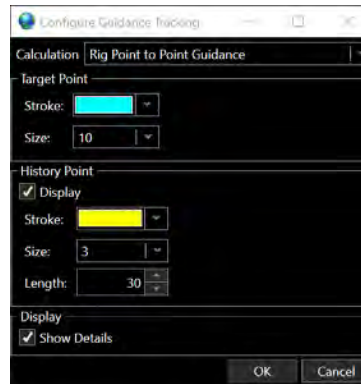
FIGURE 8-76 CONFIGURE GUIDANCE TRACKING DIALOG

Configuration contains the following:

- **Calculation:** From the drop-down list select the guidance calculation of interest to display. The drop-down list contains the guidance calculations setup in the Guidance Calculation function.

- **Target Point**
  - o **Stroke:** From the drop-down list select the color to use for the target icon
  - o **Size:** From the drop-down list select the target icon size

- **History Point**
  - o **Display:** Check the box to enable target history
  - o **Stroke:** From the drop-down list select the color to use for the history icon
  - o **Size:** From the drop-down list select the history icon size
  - o **Length:** From the drop-down list select the number of target historical data to display

- **Display:** Check the box to display numerically the guidance data in the upper right-hand corner of the Guidance Tracking window. The data displayed is From>To True Range, From>To Azimuth and Course Made Good (CMG).

8.9 Off Line

The Off Line window shows a horizontal bar depicting the offline of the selected Point to Route Guidance Calculation **From** object relative to the **To** object (route) see Figure 8-78. Off Line is accessed from the View Ribbon (see Figure 8-77).
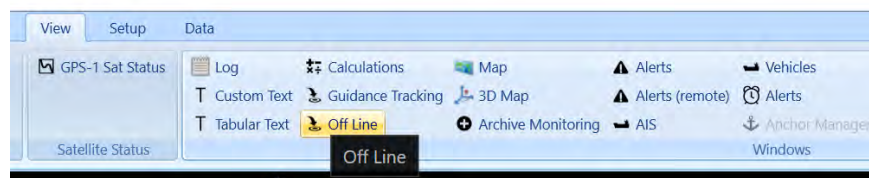
FIGURE 8-77 OFF LINE - VIEW RIBBON

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FIGURE 8-78 OFF LINE WINDOW

8.9.1 Off Line Configuration

The information displayed on the Off Line window is configured by a mouse right click within the window, this will open a pop-up menu (see Figure 8-79) to configure the display (see Figure 8-80).

FIGURE 8-79 OFF LINE POP-UP MENU
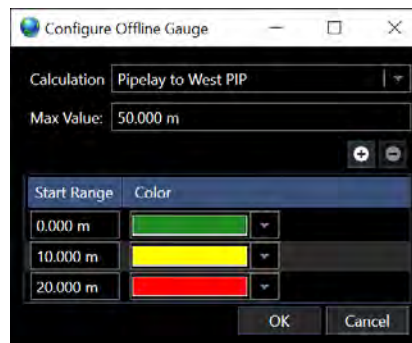
FIGURE 8-80 CONFIGURE OFFLINE GAUGE

Configuration contains the following:

- **Calculation:** From the drop-down list select the Point to Route Guidance Calculation of interest. The selected calculation is displayed in left side of the window header

- **Max Value:** Enter a value which sets the ± range from 0 to be displayed on the horizontal bar

- **Start Range:** The offline bar can be configured to change colors based on the Start Range values. In the example above the bar is green from 0.00m to 10.00m offline, the bar would change to yellow when the offline is greater than 10.00m and finally to red if the offline is greater than 20.00m. Additional Start Range intervals can be added with the Add Button 🞉 or removed using the Remove Button 🗕.

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8.10 Archive Monitoring

Archive Monitoring window displays the Data Archive/Logging status. The window is accessed from the View Ribbon (see Figure 8-81). This is not configurable.
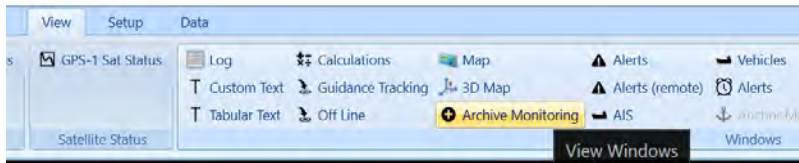
FIGURE 8-81 ARCHIVE MONITORING - VIEW RIBBON
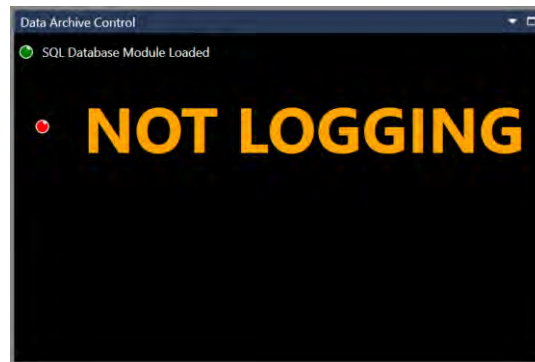
FIGURE 8-82 ARCHIVE MONITORING - NOT LOGGING

FIGURE 8-83 ARCHIVE MONITORING - LOGGING

8.11 AIS

List display of current AIS vessels from the input in Devices, this is accessed from the View Ribbon (see Figure 8-84).

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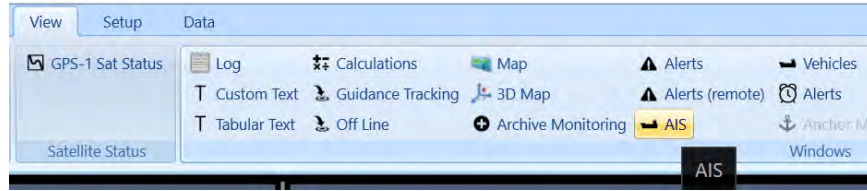
FIGURE 8-84 AIS - VIEW RIBBON

FIGURE 8-85 AIS VESSELS LIST WINDOW

There is the option to edit individual AIS vessels by mouse right click on the Vessel Name in the list (see Figure 8-86).
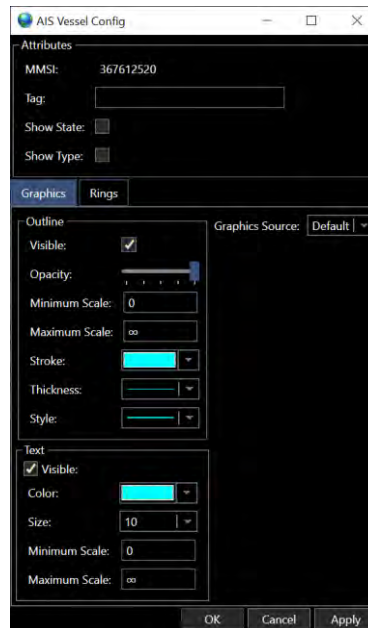
FIGURE 8-86 AIS VESSEL CONFIG DIALOG

- **Attributes**
  - **MMSI:** Vessel MMSI number
  - **Tag:** Optional tag to specify something about the target. This will be displayed on the map view of AIS targets
  - **Show State:** Check the box to show details about the state of the AIS target on the map view
  - **Show Type:** Check the box to show details about the type of AIS target, such as Cargo, Passenger, etc.

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- **Graphics Tab**
  - o **Outline**

    Visible: Check the box to show vessel outline in map view

    Opacity: Adjust the opacity of the outline using the slider

    Maximum/Minimum Scale: Outline will be visible in map view if map scale is within the limits set here

    Stroke: From the drop-down list select the outline color

    Thickness: From the drop-down list select the line thickness for the outline

    Style: From the drop-down list select the line style for the outline

  - o **Text**

    Visible: Check the box to show vessel text in map view

    Color: From the drop-down list select the text color

    Size: From the drop-down list select the text size

    Maximum/Minimum Scale: Text will be visible in map view if map scale is within the limits set here

  - o **Graphics Source:** The vessel's outline can be left as a default shape or can be customized by select an option from the drop-down list

8.12 Network Services

The Network Services window (see Figure 8-88) displays the status of the network service and supports configuration of publishing intervals so the user can optimize the performance. This is accessed from the View Ribbon (see Figure 8-87).
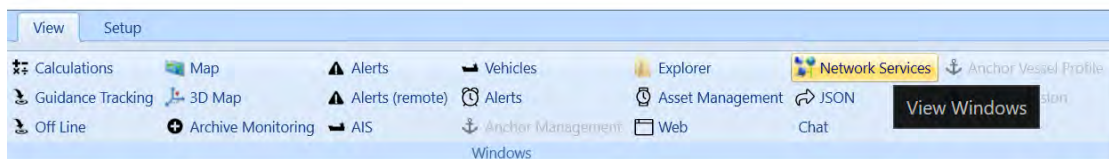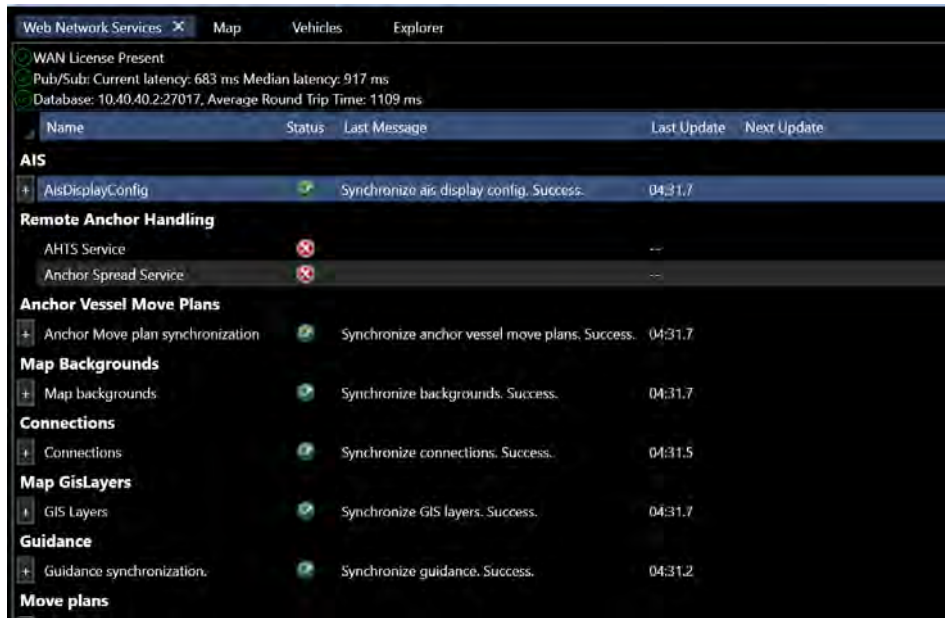
FIGURE 8-87 NETWORK SERVICES - VIEW RIBBON

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FIGURE 8-88 NETWORK SERVICES WINDOW

Network Services window provides network connection details located at top left corner of the window. The information grid is listed in columns by Name, Status, Last Message and Next Update.

- **Name:** Items in NavView connected to
- **Status:** ⬤ connection successful, ⊗ connection not available or disabled
- **Last Message:** connection status message
- **Last Update:** elapsed time since last update
- **Next Update:** time remaining till next update

The performance of the Network can be optimized by disabling unnecessary connections. Under the Name column, select the item to disable by expanding the item using the ⊞ button then uncheck the Enabled box (see Figure 8-89)

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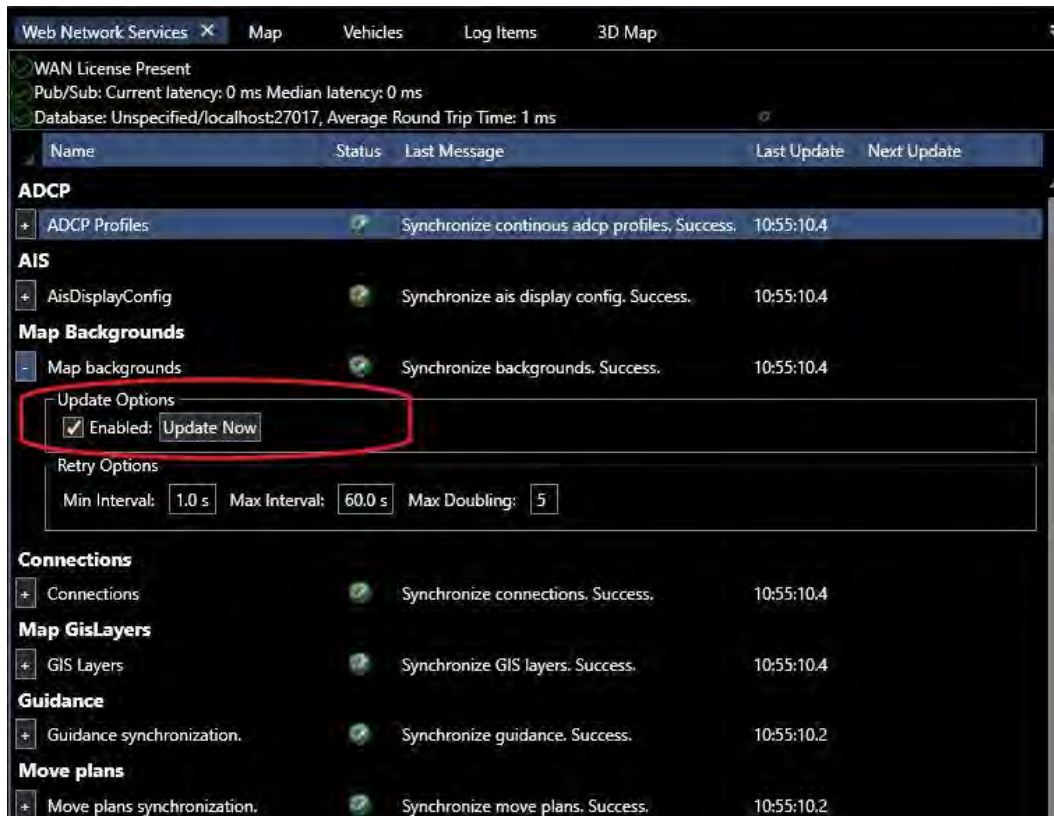
FIGURE 8-89 NETWORK SERVICES CONFIGURATION

8.13 Chat

NavView supports chat between NavView instances connect to the network services. This is accessed from the View Ribbon (see Figure 8-90).

FIGURE 8-90 CHAT - VIEW RIBBON

8.14 Web (View)

Web View opens a window supporting the entry of a URL to access content available on the network. This can be video broadcast over the internet by the 4D Nav video system (see Figure 8-92) or a web GUI to monitor and access equipment connected on the network, e.g. an Ethernet Serial Server (see Figure 8-93). All that is required is the full address to link to. The view is opened from the View Ribbon (see Figure 8-91).

Note: The full URL must be typed in, e.g. http://192.168.2.104/ and https://www.google.com/. NavView does not automatically complete the entries.

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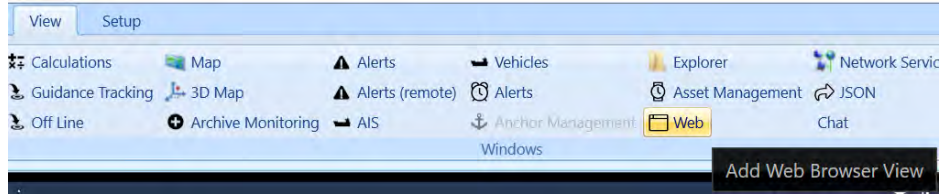
FIGURE 8-91 WEB (VIEW) - VIEW RIBBON

FIGURE 8-92 WEB VIEW – VIDEO STREAM
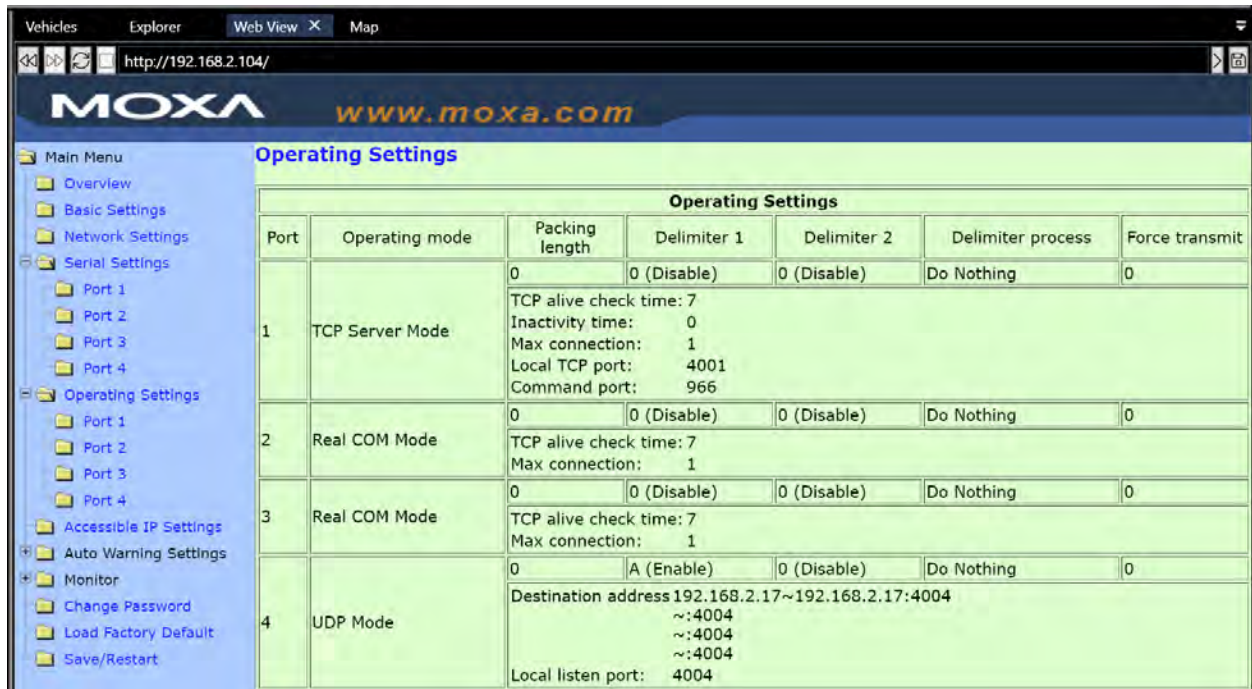
FIGURE 8-93 WEB VIEW - PERIPHERAL EQUIPMENT GUI

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8.15 GPS Status

The GPS Status window provides a sky plot and summary for the respective GNSS solution. An icon is generated for each NMEA Input device configured with the required messages, specifically GGA, GSV, GSA and VTG. GPS input that is detected and placed in a section in the View ribbon labeled **GPS Status** is where **GPS** is the user defined name for the device.
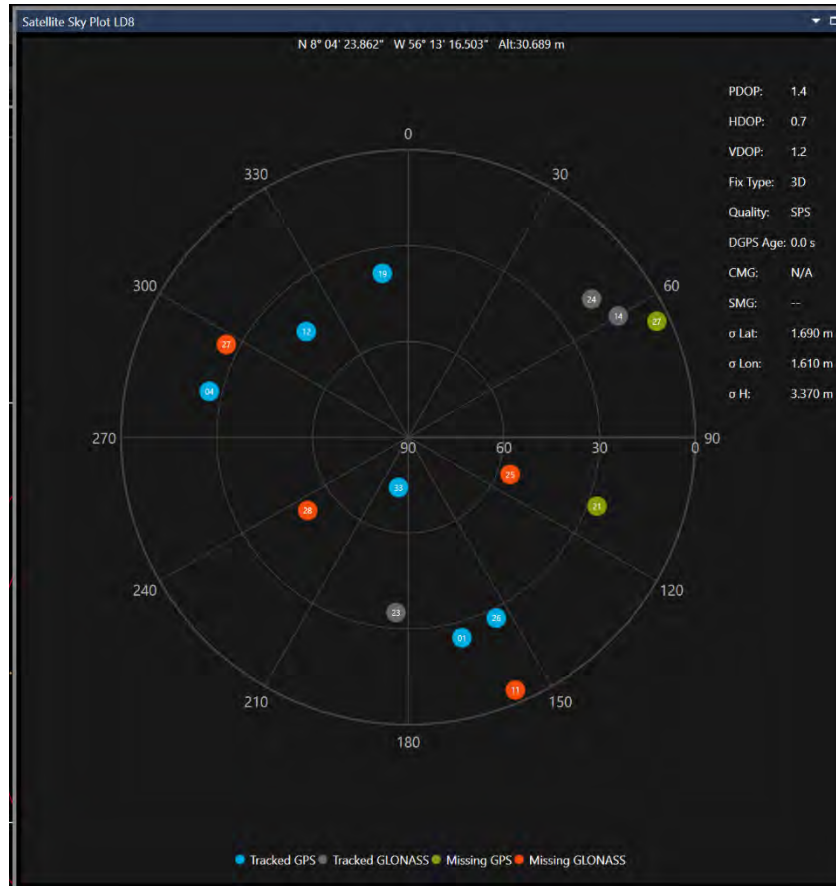
FIGURE 8-94 GPS STATUS WINDOW

The window will open as a dockable window pinned to the right edge of the workspace. If a dockable window already occupies that space it will be added as a tab in that window.

The information displayed and the associated NMEA message is as follows:

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- Raw GPS antenna position (GGA)
- Sky plot of Satellite positions and elevation (GSV)
  - [12] Tracked GPS satellite
  - [23] Tracked GLONASS satellite
  - [27] Not tracked (missing) GPS satellite
  - [25] Not tracked (missing) GLONASS satellite
- DOP values (GSA)
- Fix type, e.g. 3D GPS (GGA)
- Quality, e.g. Diferrential (GGA)
- Course and speed made good (VTG)
- Position Accuracies (from GST message)

There is no configuration associated with this window.

Note: Only one window per GPS device can be open in a workspace at a time.

8.16 GPS Satellite Status

The Satellite Status window provides a view of the respective GNSS device's tracking and solution status in terms of satellite Signal to Noise Ratio (SNR) and satellite Range Residuals as a bar chart. An icon is generated for each NMEA Input device configured with the required messages, specifically GRS and GSV. GPS input that is detected and placed in a section in the View ribbon labeled **GPS Sat Status** where **GPS** is the user defined name for the device.
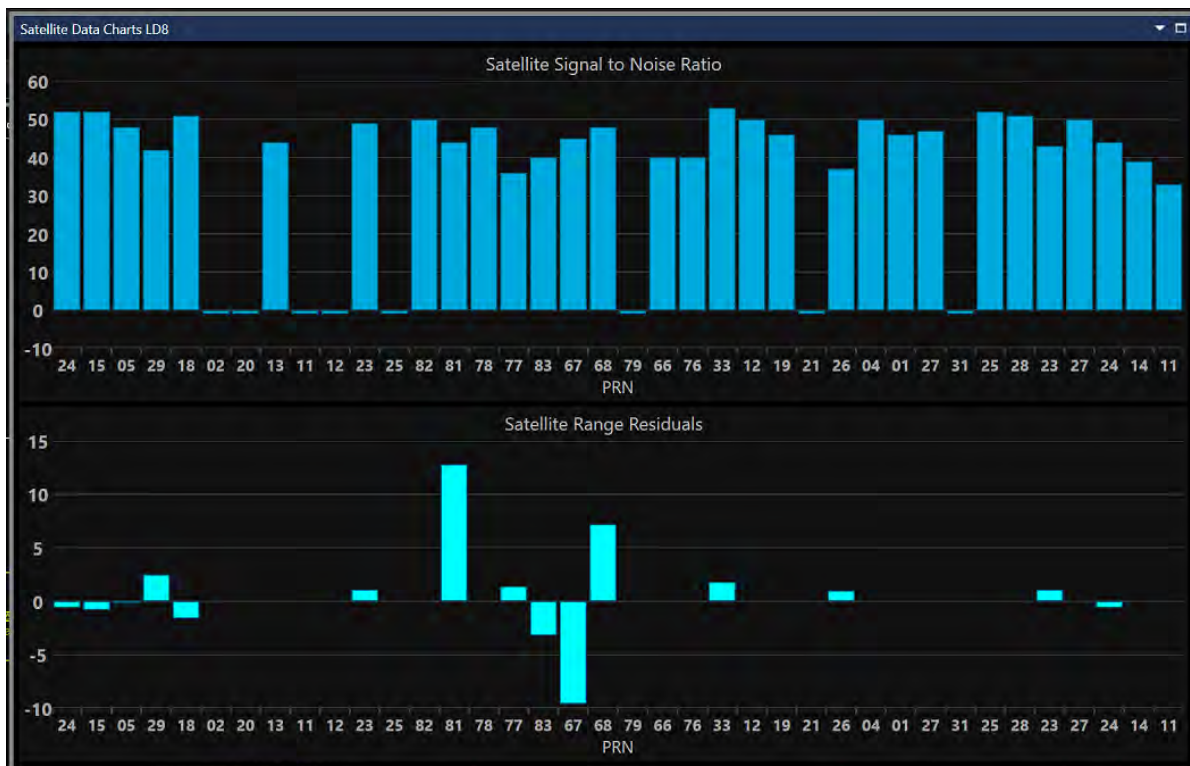
FIGURE 8-95 GPS SATELLITE STATUS VIEW

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9 Pipelines

NavView uses several supporting files including waypoints, survey line, pipelines. This section covers the creation and editing of pipelines.

9.1 Overview

A pipeline in NavView represents the design route of a real-world pipeline or cable. This can be displayed in Map and 3D Map views, selected for a Point to Route Guidance and tracked via the Layback Connection for pipe laying. NavView maintains a local Pipelines.xml file in the Local\[Station]\Working folder. Pipelines are also maintained in the NavView database used for distributed systems (see Network Services section).

If Rolls and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In	Cannot add, load, import, edit or remove pipelines
User	Can add, load, import, edit pipelines but cannot remove pipelines
Online/Supervisor/ Administrator	Can add, load, import, edit and remove pipelines

9.2 Pipelines Window

The Pipelines window is opened by clicking on the Pipelines button in the Files section of the Home Ribbon Tab (see Figure 9-1) or Explorer (see Figure 9-2). This window provides access to all Pipelines for creating and editing (see Figure 9-3)
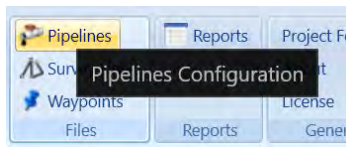
FIGURE 9-1 PIPELINES WINDOW- HOME RIBBON TAB
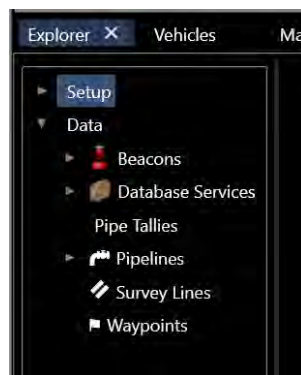
FIGURE 9-2 PIPELINES WINDOW – EXPLORER

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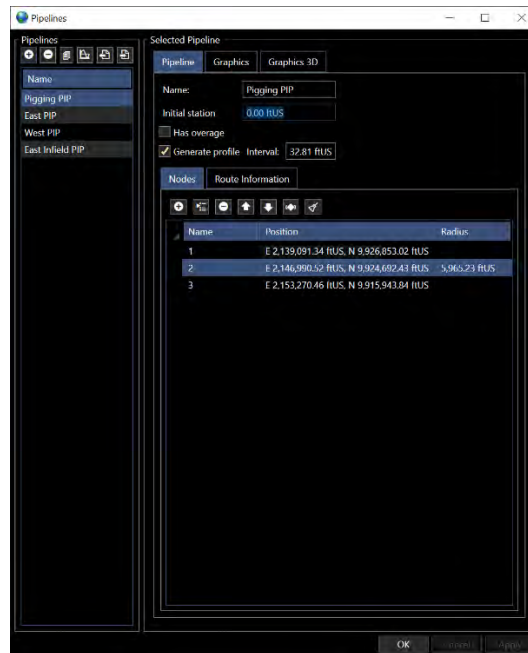
FIGURE 9-3 PIPELINES WINDOW

The Pipelines window (shown in Figure 9-3) consists of the following elements:

1. **Pipeline List**

This lists the pipelines that currently loaded in NavView.

2. **Pipelines Toolbar**

The pipelines toolbar provides the means to manipulate the pipelines list as a whole, but not the individual settings of each pipeline.

-   Click to add a pipeline

-   Click to remove the selected pipeline

  A prompt will appear asking for confirmation before deletion of the pipeline

-   Click to create a copy of the selected pipeline

  The new pipeline will have the same name with (Copy) appended

Note: Overage loops are not copied

-   Click to create alignment route from multiple segments in the selected pipelie

-   Click to export the selected pipeline to a file

-   Click to import a pipeline from a text file

3. **Selected Pipeline View**

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This displays the details of the selected pipeline for review and editing.

- **Pipeline Tab**

  - **Name:** Name assigned to the pipeline

  - **Initial Station:** Offset applied to the stationing. For instance, if the stationing starts at an arbitrary point after the start of the route which needs to be tracked, this feature allows correct stationing in NavView

  - **Has Overage:** Allows overages to be configured and added to pipeline

  - **Generate Profile:** Generates a 3D model of the pipeline in the 3D map

  - **Interval:** Spacing along pipeline the DTM is queried to generate the profile

- **Nodes Tab**
  Allows for editing of the nodes in the pipeline. This view consists of the following elements:

  - **Name**: Name of the node. The name is optional but can be displayed on the map for easy interpretation

  - **Position**: Position of the node. The position can be edited by clicking in this column

  - **Radius**: Radius of the node. Entering a radius greater than 0 makes the node into an intersection point, for which a curve will be calculated along with a Point on Curve (PC) at the start of the curve and a Point on Tangent (PT) at the end of the curve

  - **Nodes Toolbar**
    Used for adding, removing, and sorting nodes

     Adds a new node to the bottom of the nodes list

     Inserts a new node above the currently selected node

     Removes the currently selected node

     Moves the currently selected node up in the list

     Moves the currently selected node down in the list

     Reverses the Node order

     Validate the route, checks for any errors in the route data

- **Route Information Tab**
  The Route Information tab is shown below in Figure 9-4. This provides details on the entire route. If a radius is entered for a node in the Nodes tab, NavView will consider that point an intersection point, and will generate a curve segment which consists of a beginning of curve and tangent point, based on the specified radius.

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FIGURE 9-4 ROUTE INFORMATION TAB
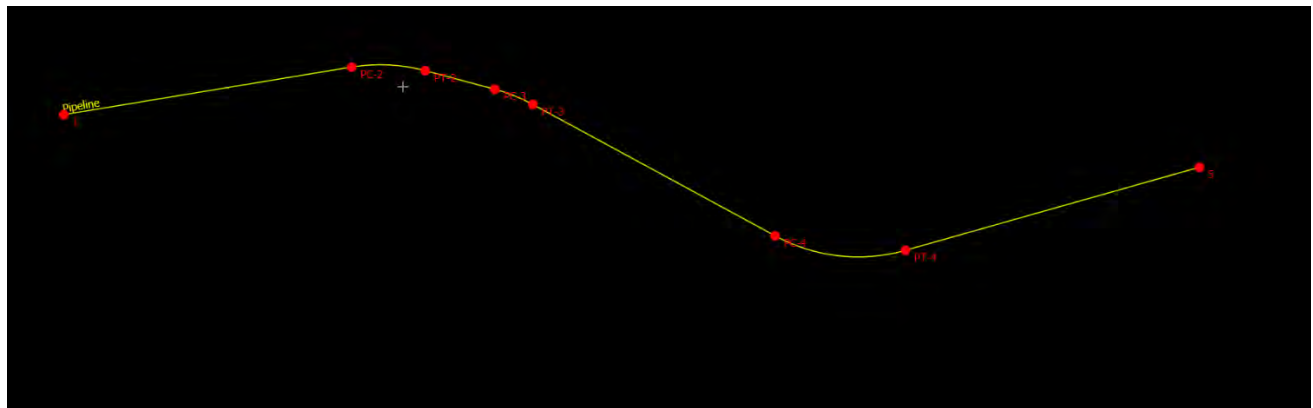
FIGURE 9-5 CURVE ON MAP

Figure 9-5 shows a curve represented on a map display. Note that the curve point (PC) and the tangent point (PT) take the name of the intersection point node after a dash. In this example the intersection point is called "2", so "PC-2" and "PT-2" are generated.

The curve points are automatically generated using the intersection point and the radius and cannot be edited.

- **Node Details**
  Clicking on a node in the Route information tab opens a node details window. The node details window is based on the type and location of the node that is selected, and provides information about the segments connected to that node. The two types of segment details views are shown below in Figure 9-6

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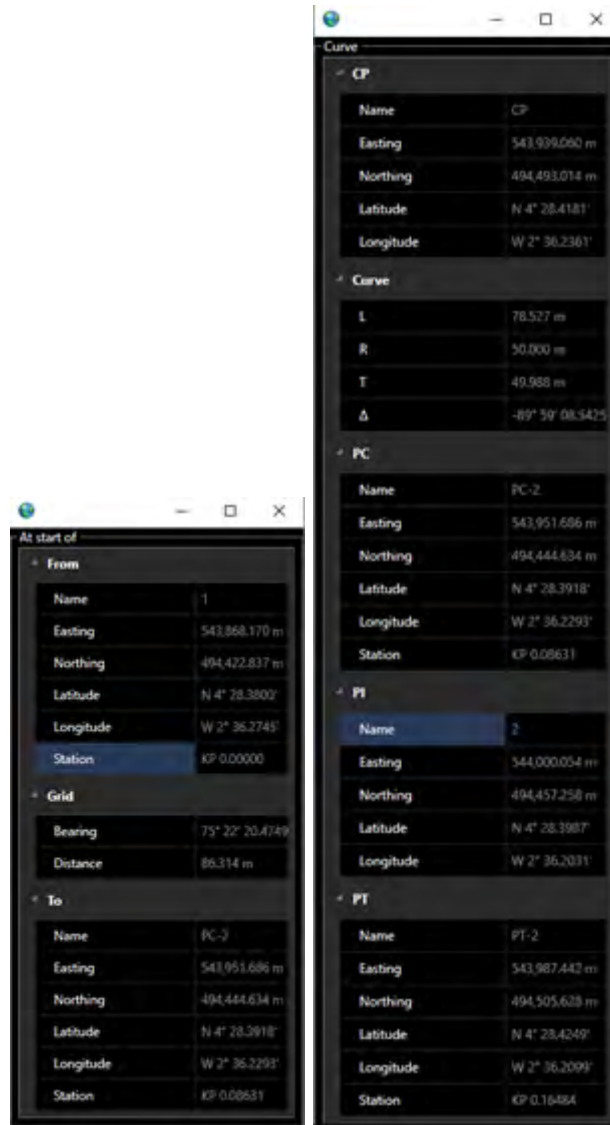
FIGURE 9-6 LINE AND CURVE SEGMENT DETAILS

- **Overages Tab**
  The Overages Tab (see Figure 9-7) is available when the "Has Overages" has been checked. This view allows overages to be configured and added to route. This view consists of the following:

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FIGURE 9-7 OVERAGES TAB

- o **Name:** Name assigned to the overage

- o **Description:** Description assigned to the overage

- o **Start Station:** Start station of the overage

Note: Overage loops cannot be added on a curve.

- o **Loss (True):** Distance to lose from pipeline

- o **Overage Side:** Side of the pipeline the overage is to go at the start

- o **Overage Style:** Assign half for overage to be applied to one side., assign full for overage to be distributed evenly on both sides

- o **Radius:** Assign radius for overage to be applied

- • **Overage Route Information Tab**
  The Overage Route Information tab is shown below in Figure 9-8. This provides details on the entire route with added overage

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FIGURE 9-8 OVERAGE ROUTE INFORMATION TAB

- **Graphics Tab**
  In the Graphics tab, it is possible to control all aspects of the visibility of the line, nodes, and associated text items. The Graphics display is shown below in Figure 9-9
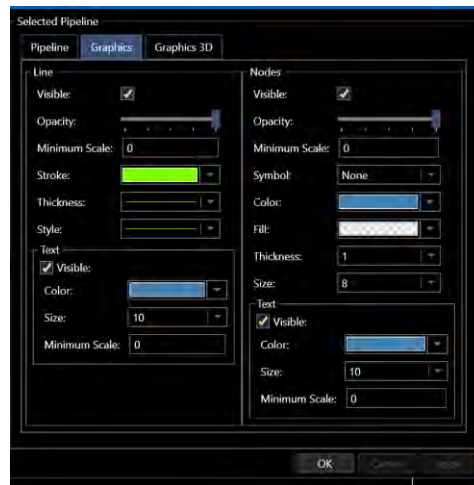
FIGURE 9-9 GRAPHICS TAB

Note: The **Minimum Scale** setting is based on the Map view scale as displayed in the Map views when the **Display scale bar option** is enabled (see Windows section). As the Map view is zoomed in, the scale increases, as it is zoomed out the scale decreases. The pipeline will display when the scale is greater than the Minimum Scale setting.

- **Graphics 3D Tab**
  In the Graphics 3D tab, it is possible to control all aspects of the visibility of the line, line color and line diameter. The Graphics 3D display is shown below in Figure 9-10

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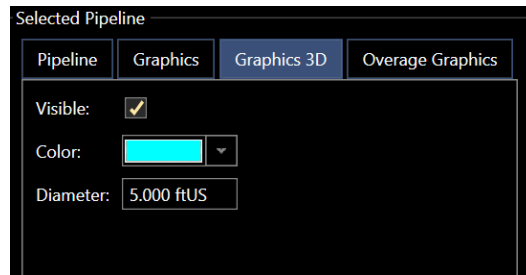
FIGURE 9-10 GRAPHICS 3D TAB

- **Overage Graphics**

    In the Overage Graphics tab, it is possible to control all aspects of the visibility of the line, nodes, and associated text items. The Graphics display is shown below in Figure 9-9
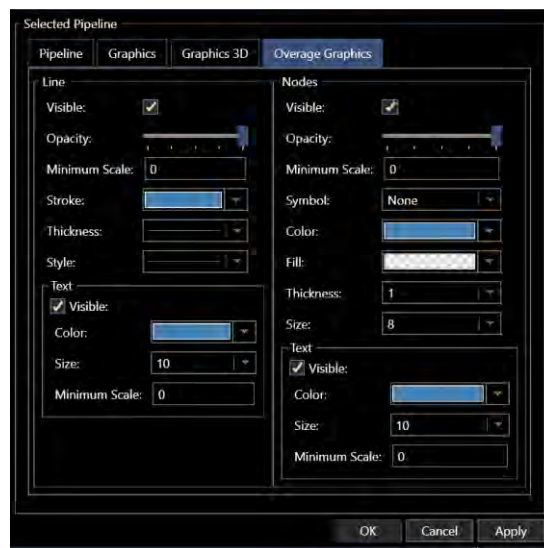
FIGURE 9-11 OVERAGE GRAPHICS TAB

9.3   Add a Pipeline

A pipeline can be added in several ways, from the map and pipelines window

9.3.1   Add a Pipeline from the Pipelines Window

1. Open the Pipelines window

2. Click the ⊕ button

3. A pipeline is created and displayed in the selected pipeline view

4. Edit the new pipeline as required

5. Click **Apply** to save the changes, but keep the window open. Click **Cancel** to discard changes and keep the window open, or click **Ok** to save the pipeline and close the window

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9.3.2   Add a Pipeline from the Map View

1. In a Map window, activate the Multi-Point Coordinate Picker ⌖ or Ruler ◰ (see Map Window in the Windows section for details)

    a. Create at least two points in the Map

    b. To create a pipeline, right mouse click with the mouse over any of the points or line annotation and select **Copy To… Pipeline**

    c. The Configure Pipeline window will appear with the newly created pipeline selected for review and editing

2. In the Map window, select an existing pipeline from the map background by mouse right click with the pointer on the pipeline

    a. From the pop-up menu select **Convert …. Polyline to** then select **Pipeline**

    b. The Configure Pipeline window will appear with the newly created pipeline selected for review and editing

3. Click **OK** to accept the pipeline and add it to Pipelines (if the pipelines window is open, you will see the line added to the bottom of the list)

4. Click **Cancel** to discard the pipeline

9.4   Create a Route Alignment from a Pipeline

The route alignment tool generates a pipeline with curves given a pipeline that does not contain curves.

1. Open the Pipelines view

2. Select the pipeline that is to be the base for the route alignment

3. Click the ◰ button

4. When prompted to enter an external distance, enter a value for the mid ordinate to use for calculating the curves to apply and click OK

5. A new pipeline will be generated with the name of the base pipeline with the "-Alignment-X u" where X is the mid ordinate distance used and u is the units with curves added to the nodes

Note: If a curve with the entered mid ordinate value is not possible due to the length of the associated segments, curve(s) will be added such that sequential PT (Point on Tangent or end of curve) and PC (Point on Curve or start of curve) are coincidental.

9.5   Remove a Pipeline

1. Open the Pipelines window

2. Select an existing pipeline

3. Click the ⊖ remove button

9.6   Edit a Pipeline

Pipelines can be edited from the pipelines window or from the map view. These operations are described below.

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9.6.1   Edit a Pipeline from the Pipelines Window

1. Open the Pipelines Window

2. Select the pipeline to be edited

3. Edit the pipeline as required. The pipeline can be edited using the ⊕ 🗎 ⊖ ⬆ ⬇ ◆ ◁ pipeline editing toolbar

   a. Click the ⊕ Add Button to add a new node to the pipeline

   b. Click the 🗎 Insert Button to the insert a node above the selected node

   c. Click the ⊖ Remove Button to remove the selected node from the list

   d. Click the ⬆ Move Up Button to move the selected node up one position

   e. Click the ⬇ Move Down Button to move the selected node down one position

   f. Click the ◆ Reverse Node Order Button to reverse the Node order of the survey line

   g. Click the ◁ Validate the Route Button to check the route for errors

4. Click **Apply** to save the changes and keep the window open. Click **Ok** to save the changes and close the window, or click **Cancel** to discard the changes but keep the window open

9.6.2   Edit a Pipeline from the Map View

1. Right click on a pipeline in the Map View to bring up the survey line Pop-Up menu (see Figure 9-12)
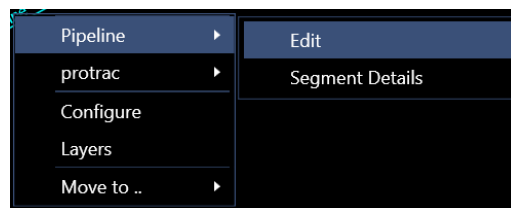
FIGURE 9-12 EDIT PIPELINE POP-UP MENU

2. Click **Edit** to open the Configure Pipeline window (see Figure 9-13)

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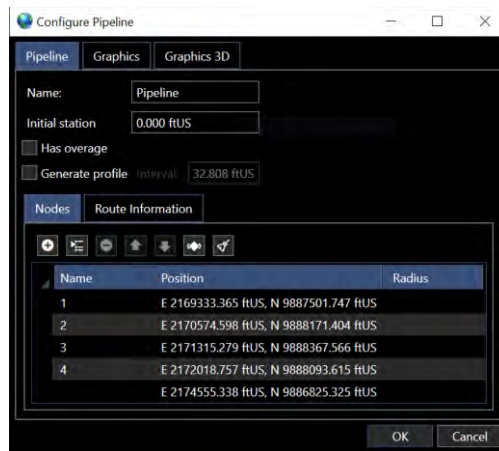
FIGURE 9-13 CONFIGURE PIPELINE WINDOW

In addition, the pipeline nodes are highlighted with grips which can be selected and dragged (see Figure 9-14)
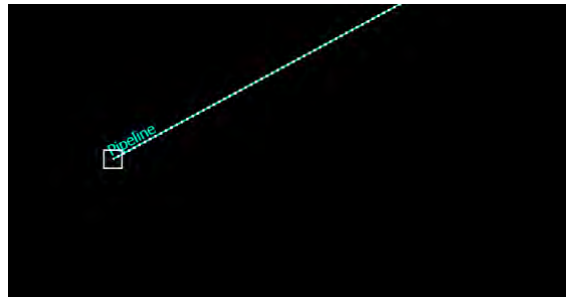
FIGURE 9-14 PIPELINE GRIP

3. Drag a node to the desired location, and the node coordinates will update in the Configure Pipeline Dialog

4. Right clicking on the line while in Editing Mode will display a context menu with an Insert Node option. Click this option to insert a new node at the mouse coordinates (see Figure 9-15)
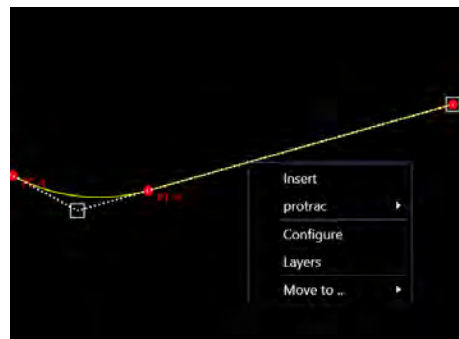
FIGURE 9-15 INSERT NODE POP-UP

5. Right clicking on a node while in Editing Mode will display a context menu with a Remove Node option. Click this option to remove the node (See Figure 9-16)

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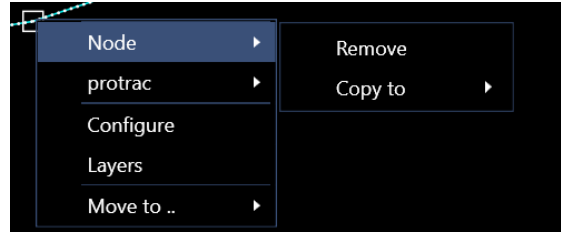
FIGURE 9-16 REMOVE NODE POP-UP

9.7 Export Pipelines

Pipelines can be exported from the Pipelines Window to a CSV text file.

The default extension for survey line export is *.csv. The file contains one line for each node in the pipeline route in the following format: Node Name, Easting, Northing, Elevation, Radius

1. Open the Pipelines Window

2. Select one single pipeline

3. Click the ⊡ Export Button, this will open an export configuration dialog (see Figure 9-17). Mouse over each item in the dialog for explanation
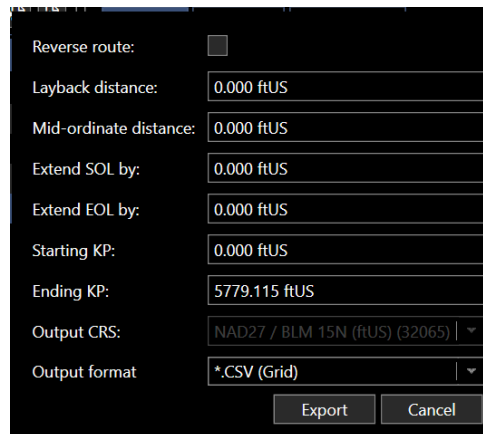
FIGURE 9-17 EXPORT CONFIGURATION DIALOG

4. Click **Export** to open a save file dialog. Select a location and filename and click **Save** to export the pipeline, or **Cancel** to abort the operation

9.8 Import Pipelines

The Import option allows the user to load a pipeline route from file and add this to existing pipelines. On a networked system, this will result in the updating of the pipelines for all NavView systems on the network.

NavView supports custom import of any ASCII text data in a file. The input settings are configurable for delimited or for offset from start of line, as described below.

1. Open the pipelines Window

2. Click the ⊡ Import Button to launch the Open file dialog

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3. Browse to the file to import, select and click Open

4. The Import Route Data wizard is launched on the first page, File Settings (see Figure 9-18)
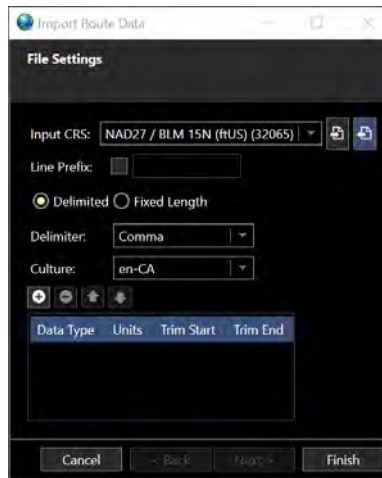
FIGURE 9-18 IMPORT ROUTE DATA - FILE SETTINGS

- **Input CRS:** From the drop down list of Horizontal CRSs present in NavView, select the CRS the points to be imported are on

- **Line Prefix:** Check the box if there is a line prefix and enter the prefix in the box

- **Delimited/Fixed Length:** Select the data format

- **Delimiter:** Select the field delimiter from the respective drop-down list options;

    o Comma
    o Space
    o Tab
    o Custom: selection of this option enables entry of the delimiter character

- **Culture:** From the drop-down list select the country numerical format

- **Load Settings:** Click to load saved route import settings from a file

- **Save settings:** Click to save the current route import settings to a file

5. Click the button to add an entry to the data grid for every field in the record, whether the field is to be used in the import or not

- **Data Type:** Select the data type contained in the field, if the field is not to be used, select Unknown

- **Units:** Select the units or format that applies to the field and data type
    a. String, e.g. Name, no applicable selection
    b. Angle, e.g. Latitude or Heading, select the format (note that radians are not supported)
    c. Date/Time, select the format
    d. Length, e.g. Elevation or Depth, select the units

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e. Other, e.g. Speed or Force, select units

- If **Delimiter** is comma, tab, space or custom
  o **Trim Start:** Enter the number of characters to trim from the start of the field value, e.g. if a field containing Depth contains "D 567.89", 2 would be entered to trim the "D " before reading the value

  o **Trim End:** Enter the number of characters to trim from the end of the field value, e.g. if a field containing Depth contains "567.89 D", 2 would be entered to trim the "D" before reading the value

- If **Delimiter** is Field Size
  o **Field Start:** Enter the zero-based index of the start of the field, e.g. the index of the first character in a record is 0, the index of the 10th character is 9

  o **Field Size:** Enter the length of the data in the field

Note: When using fixed length and Field Size, use the setting of the field start and field size to Trim unwanted start and end characters.

- To **Move** a selected field up or down to re-order its place in the record, select the field and click either the or button

6. Click **Finish** to import the pipeline route and append them to the existing pipelines in NavView

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10 Survey Lines

NavView uses several supporting files including waypoints, survey line, pipelines. This section covers the creation and editing of survey lines.

10.1 Overview

A survey line is a reference route in NavView that can be displayed on the map view and selected for Point to Route Guidance to aid in navigation. NavView maintains a local SurveyLines.xml file in the Local\Station\Working folder. Survey Lines are also maintained in the NavView database used for distributed systems (see Network Services section).

If Rolls and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In	Cannot add, load, import, edit or remove survey lines
User	Can add, load, import, edit survey lines but cannot remove survey lines
Online/Supervisor/ Administrator	Can add, load, import, edit and remove survey lines

10.2 Survey Lines Window

The Survey Lines window is opened by clicking on the Survey Lines button in the Files section of the Home Ribbon Tab (see Figure 10-1) or Explorer (see Figure 10-2). This window provides access to all survey lines for creating and editing (see Figure 10-3)
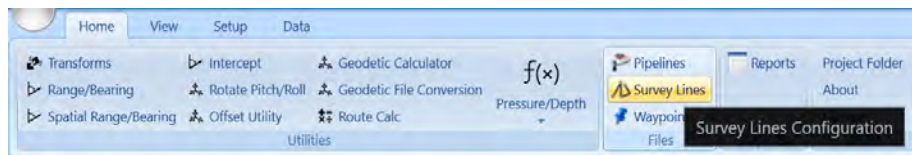
FIGURE 10-1 SURVEY LINES - HOME RIBBON TAB
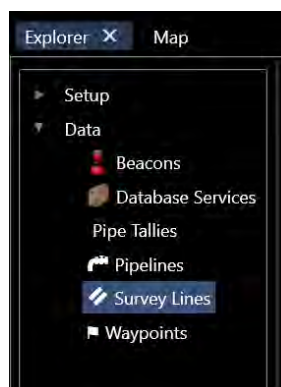
FIGURE 10-2 SURVEY LINES - EXPLORER

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The Survey Lines Window contains the following components:

1. **Tool Bar**

The survey lines tool bar provides the means to manipulate the survey lines and perform various tasks. Its options are listed below.

 Click to add a new survey line to the list.

 Click to remove the selected survey line from the list. This button is inactive if no survey line is selected.

 Click to open the popup to create a grid of survey lines. This functionality is described below.

 Click to create a line parallel to the selected survey line. This button will only be enabled if a survey line is selected.

 Click to create a line perpendicular to the selected survey line. This button will only be enabled if a survey line is selected.

 Click to the export the selected survey line to a file.

 Click to import a survey line from a text file.

2. **Survey Lines List**

All survey lines currently in the database are listed by name below the toolbar (see Figure 10-4)

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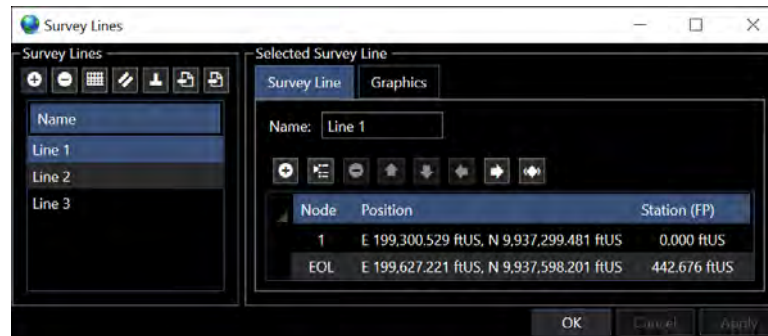
FIGURE 10-4 SURVEY LINES WINDOW – LINES ADDED

3. **Selected Survey Line**

The selected survey line display consists of two tabs. The **Survey Line** tab allows for the editing of the name and the points in the line. The **Graphics** tab allows for the editing of map display properties for the line. The options are described below.

- **Survey Line Tab**
  - o **Name**   The name assigned to the survey line. This will be displayed on the screen and used as a reference in the list of survey lines.
  - o **Survey Line Editing Toolbar**

    The survey line editing toolbar allows for the manipulation of the selected survey line, including adding, inserting, reordering nodes, and extending the ends of the line.

  - o **Survey Line Node List**

    The survey line Node List contains the positions and stations/KP of the selected survey line (see **Error! Reference source not found.**). Its properties are as follows:

FIGURE 10-5 SURVEY LINE NODE LIST

Node – Name of the selected Node. The survey line nodes are named such they can be easily identified on the map or in the list.

Position – The position of the node can be edited within the list view by clicking on the position column in the row that is to be edited. The coordinate editing view will be displayed

Station – The station, either in Kilometer Posts (KP) or Foot Posts (FP), is presented in this column. This is calculated based on the positions of the nodes and is not editable by the user.

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- **Graphics Tab**

  In the graphics tab, it is possible to control all aspects of the visibility of the line, nodes, and associated text items. The graphics display is shown below in Figure 10-6.
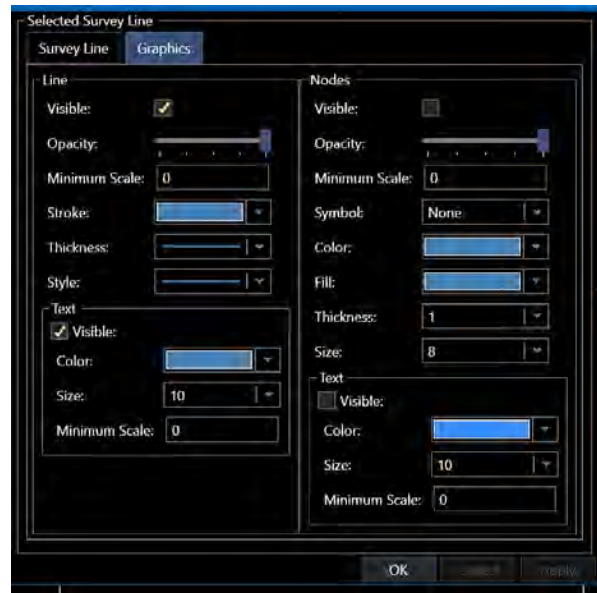
FIGURE 10-6 SURVEY LINE GRAPHICS TAB

Note: The Minimum Scale setting is based on the Map view scale as displayed in the Map views when the **Display scale bar option** is enabled (see Windows section). As the Map view is zoomed in, the scale increases, as it is zoomed out the scale decreases. The survey line will display when the scale is greater than the Minimum Scale setting.

10.3 Add a Survey Line

A survey line can be added in several ways, both from the map view and the Survey Lines Window.

10.3.1 Add a Survey Line from the Survey Lines Window

10.3.1.1 Add a Single Survey Line

1. Open the Survey Lines Window

2. Click the ⊕ Add Button

3. A survey line is crated and displayed in the selected survey line view. It has the default name of "Line", and two nodes labelled SOL and EOL

4. Edit the new survey line as required

5. Click **Apply** to save the survey line and leave the window open, **Cancel** to discard it and leave the window open, **OK** to save the Survey Line and close the window

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10.3.1.2 Add a Grid

The grid pattern tool creates a series of survey lines centered on a point, at a specified orientation. The following steps describe how to add a grid pattern of survey lines.

1. Open the Survey Lines Window

2. Click the ⊞Grid Button

3. The Grid Pattern popup is displayed. This is shown below in Figure 10-7
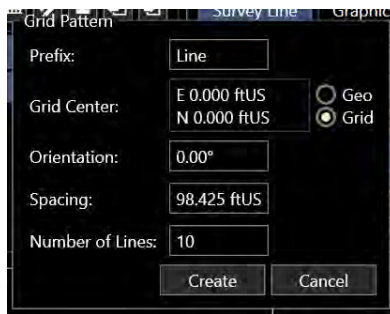
FIGURE 10-7 GRID PATTERN CONFIGURATION

4. Enter the prefix for the grid pattern lines

5. Enter the center coordinates for the grid pattern, either in Geographic or Grid coordinates

6. Specify the orientation of the grid (G°)

7. Enter a spacing between lines

8. Enter the number of lines

9. Click **Create** to create the grid of lines or **Cancel** to abort the operation

10. The grid pattern will be added to the Survey Lines List as a series of individual lines with the naming format: <Prefix>+/-<Offset>, where the +/- will indicate whether the line is to the port or starboard of the original orientation. The lines are created both along the specified orientation and perpendicular to it. The lines associated with the specified orientation are identified with (V).

11. The created grid lines are normal Survey lines and can individually be further edited for name, color, etc.

10.3.1.3 Add a Parallel Line

1. Open the Survey Lines Window

2. Select an existing survey line

3. Click the ✎Parallel Button

4. The parallel popup box is displayed, as shown in Figure 10-8

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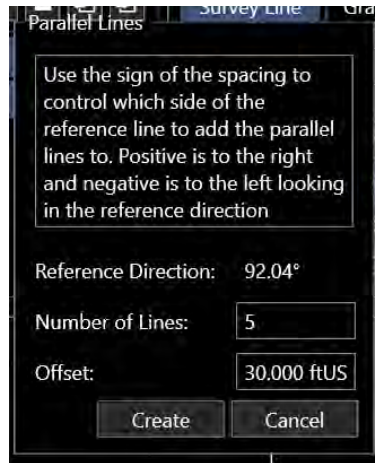
FIGURE 10-8 PARALLEL SURVEY LINE CONFIGURATION

5. The reference direction displayed is the direction of the source line in (G°) if it has only two nodes and one segment between those nodes. If there are multiple nodes on the line, the reference direction will show 0°.

6. The sign of the offset is used to set which side of the source line the new lines will be located. A positive offset results in the parallel lines to the starboard side, looking along the original line, and a negative offset results in the parallel lines being created to the port side.

7. Edit the number of lines and offset settings as necessary, and click **Create** to create the parallel lines, or **Cancel** to abort the process.

10.3.1.4 Add a Perpendicular Line

1. Open the Survey Lines Window

2. Select an existing survey line in the list

3. Click the ⊥ Perpendicular Button

4. The perpendicular popup box is displayed, as shown in Figure 10-9.

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Use the sign of the offsets to
control which side of the
reference line the perpendicular
line falls on. Positive is to the
right and negative is to the left
looking in the reference direction

Reference Direction: 92.04°

Along line distance: 0.000 ftUS

Starting offset: 0.000 ftUS

Ending offset: 300.000 ftUS

Create   Cancel

FIGURE 10-9 PERPENDICULAR LINE CONFIGURATION

5. The reference direction is the orientation of the first segment of the source line in °G

6. Along line distance is the distance from the start of the line at which the perpendicular line will cross the source line. A negative number can be entered to specify a perpendicular line that which crosses prior to the start of the source line. If there are multiple segments, NavView will determine the orientation of the segment at the specified along line distance and create a line perpendicular to that orientation.

7. Starting offset is the distance from the source line where the perpendicular line starts, and Ending offset is the distance from the source line the perpendicular line ends. The sign convention for the Starting and Ending Offsets is based on looking along the source line, positive to the right or starboard of the source line, negative to the left or port of the source line. Entering positive distances for both offsets will create a line perpendicular to the source line and wholly to the right of the source line. Entering negative distances for both offsets will create a line perpendicular to the source line and wholly to the left of the source line. Entering positive and negative offsets will create a perpendicular line that crosses the source line.

10.3.2 Add a Survey Line from the Map View

10.3.2.1 Using a Map Tool

1. In a Map window, activate the MultiPoint Coordinate Picker or Ruler (see Map Window in the Windows section for details)

2. Create at least two points in the Map

3. Right mouse click with the mouse on any of the line segments or the associated annotation, mouse over the resulting pop up menu item **Ruler** in the case of using or Multi-point in the case of using and select **Copy To… Survey Line**

Note: Right mouse clicking with the cursor over one of the line's or ruler's nodes will result in the pop menu item **Node** appearing. See the Waypoints section for further details for this option.

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4. The Configure Survey Lines Window will appear with the newly created survey line selected for review and editing

10.3.2.2 From a Polyline

1. In the Map window, select an existing polyline in the map background by right mouse clicking with the pointer on the line

2. From the pop-up menu select **Convert …. Polyline to** then select **Survey Line**

3. In the **Import Polyline** dialog, enter the **Simplification tolerance** value to be used in the application of the Douglas-Peuker algorithm to the polyline and click **OK** to import the line or **Cancel** to abort the import

FIGURE 10-10 IMPORT POLYLINE TO SURVEY LINE CONFIGURATION

Note: To optimize the import of polylines comprised of many points very closely spaced, e.g., a polyline generated from an as-laid survey with points centimetres apart, NavView applies the Douglas-Peuker algorithm. The objective of this algorithm is to generate a simplified line similar to the original with fewer points where similar means that the maximum distance between the original and the simplified lines is less than or equal to the Simplification tolerance. As applied in NavView, the objective is to create a line with a workable number of points that still represents the original line to an acceptable level, the acceptable level being the Simplification tolerance.

4. The **Configure Survey Line** dialog will appear allowing editing of the points and graphics used to display the line, edit as desired (see section 10.5.1) and click **Apply** to add the survey line and leave the dialog open, **OK** to add the survey line and close the dialog or **Cancel** to discard the survey line and close the dialog

10.4 Remove a Survey Line

1. Open the Survey Lines Window

2. Select an existing survey line

3. Click the Remove Button

10.5 Edit a Survey Line

Survey lines can be edited from the survey lines window or from the map view. These operations are described below.

10.5.1 Edit a Survey Line from the Survey Lines Window

1. Open the Survey Lines Window

2. Select the survey line to be edited

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3. Edit the survey line as required. The survey line can be edited using the survey line editing toolbar.

   a. Click the 🔵 Add Button to add a new node to the end of the survey line with a default position of 1.0" of longitude to the east of the last node

   b. Click the 🔳 Insert Button to the insert a node above the selected node with a default position of 0°N 0°E

   c. Click the 🔴 Remove Button to remove the selected node from the list

   d. Click the 🔼 Move Up Button to move the selected node up one position

   e. Click the 🔽 Move Down Button to move the selected node down one position

   f. Click the ◀ Split Button to split the line into two lines, using the selected node as the last node in the existing line, and the first node of the new line

   g. Click the ▶ Extend Button to bring up the extend line popup, as shown in Figure 10-11
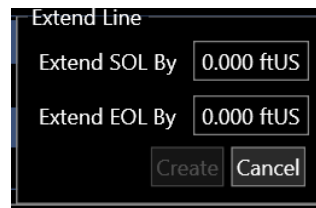
FIGURE 10-11 CONFIGURE LINE EXTENSION

   The first node of the line will be moved along the reverse of the starting azimuth by the distance specified in **Extend SOL By** while the last node will be moved further along the ending azimuth by the distance entered in **Extend EOL By**

   h. Click the ◀▶ Reverse Node Order Button to reverse the Node order of the survey line

4. Click **Apply** to save the changes and keep the window open. Click **Ok** to save the changes and close the window, or click **Cancel** to discard the changes but keep the window open

10.5.2 Edit a Survey Line from the Map View

1. Right click on a survey line in the Map View to bring up the survey line Pop-Up menu (see Figure 10-12)
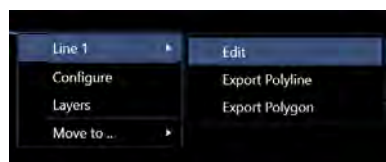
FIGURE 10-12 EDIT SURVEY LINE POP-UP MENU

2. Click **Edit** to open the Configure Survey Line window (see Figure 10-13)

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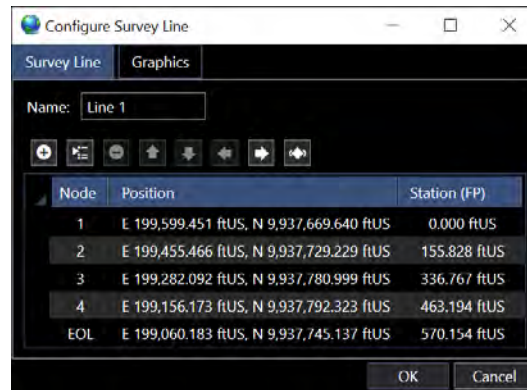
FIGURE 10-13 CONFIGURE SURVEY LINE DIALOG

In addition, in the Map view the survey line nodes are highlighted with grips which can be selected and dragged (see Figure 10-14). Changes can be made via the dialog and the Map view.
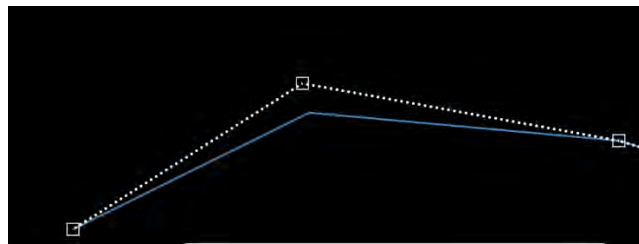
FIGURE 10-14 SURVEY LINE GRIP

3. Left mouse click on a node and drag it to the desired location, the node's coordinates will update in the Configure Survey Line Dialog

4. Right clicking on the line while in Editing Mode will display a context menu with an Insert node option. Click this option to insert a new node at the mouse coordinates (see Figure 10-15)
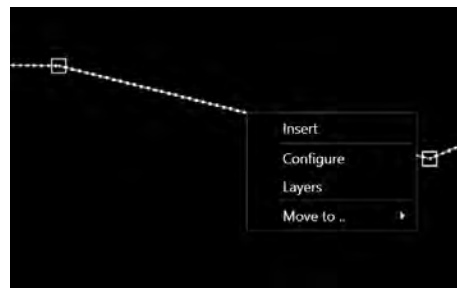
FIGURE 10-15 INSERT NODE POP-UP

RIGHT CLICKING ON A NODE WHILE IN EDITING MODE WILL DISPLAY A CONTEXT MENU WITH A NODE > REMOVE OPTION. CLICK THIS OPTION TO REMOVE THE NODE (SEE

5. Figure 10-16)

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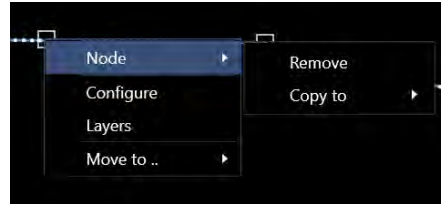
FIGURE 10-16 REMOVE NODE POP-UP

6. To apply the changes made, click **OK** in the Configure Survey Line dialog, or **Cancel** to abort the changes

10.6 Export Survey Lines

Survey lines can be exported from the Survey Lines Window to a CSV text file.

The default extension for survey line export is *.rln. The file contains one line for each node in the Survey Line in the following format: Easting, Northing

1. Open the Survey Lines Window

2. Select one single survey line

3. Click the 🖺 Export Button

4. A save file dialog is displayed. Select a location and filename and click **Save** to export the line, or **Cancel** to abort the operation

10.7 Import Survey Lines

The Import option allows the user to load a survey line from file and add this to existing survey lines. On a networked system, this will result in the updating of the survey lines for all NavView systems on the network.

NavView supports custom import of any ASCII text data in a file. The input settings are configurable for delimited or for offset from start of line, as described below. The file extension must be either *.txt or *.csv to import the file

1. Open the Survey Lines Window

2. Click the 🖺 Import Button to launch the Open file dialog

3. Browse to the file to import, select and click Open

Note: Multiple files can be selected to be imported. In this case, steps 4 to 5 are repeated for each file selected.

4. The Import Route Data wizard is launched on the first page, File Settings (see Figure 10-17)

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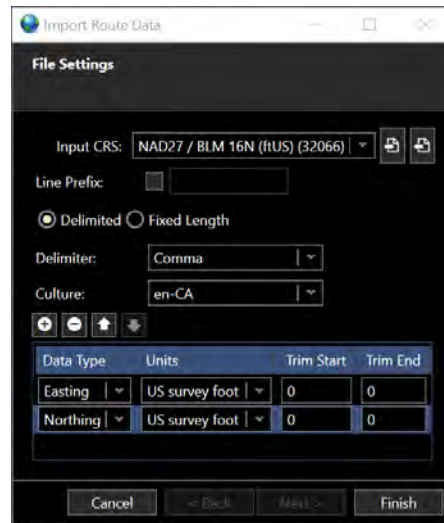
FIGURE 10-17 IMPORT ROUTE DATA - FILE SETTINGS

- **Input CRS:** Select the survey line source CRS from the drop-down list

- **Line Prefix:** Check the box if there is a line prefix and enter the prefix in the box

- **Delimited/Fixed Length:** Select the data format

- **Delimiter:** Select the field delimiter from the respective drop-down list options
  - Comma
  - Space
  - Tab
  - Custom: selection of this option enables entry of the delimiter character

- **Culture:** From the drop-down list select the country numerical format

- **Load Settings:** Click [icon] to load saved route import settings from a file

- **Save settings:** Click [icon] to save the current route import settings to a file

5. Click the [icon] button to add an entry to the data grid for every field in the record, whether the field is to be used in the import or not

- **Data Type:** Select the data type contained in the field, if the field is not to be used, select Unknown

- **Units:** Select the units or format that applies to the field and data type
  a. String, e.g., Name, no applicable selection
  b. Angle, e.g., Latitude or Heading, select the format (note that radians are not supported)
  c. Date/Time, select the format
  d. Length, e.g., Elevation or Depth, select the units
  e. Other, e.g., Speed or Force, select units

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- If **Delimiter** is comma, tab, space or custom
    - **Trim Start:** Enter the number of characters to trim from the start of the field value, e.g., if a field containing Depth contains "D 567.89", 2 would be entered to trim the "D " before reading the value

    - **Trim End:** Enter the number of characters to trim from the end of the field value, e.g., if a field containing Depth contains "567.89 D", 2 would be entered to trim the "D" before reading the value

- If **Delimiter** is Field Size
    - **Field Start:** Enter the zero-based index of the start of the field, e.g. the index of the first character in a record is 0, the index of the 10th character is 9
    - **Field Size:** Enter the length of the data in the field

Note: When using fixed length and Field Size, use the setting of the field start and field size to Trim unwanted start and end characters.

- To **Move** a selected field up or down to re-order its place in the record, select the field and click either the 🔼 or 🔽 button

5. Click **Finish** to import the survey line and append them to the existing survey lines in NavView

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11 Waypoints

NavView uses several supporting files including waypoints, survey line, pipelines. This section covers the creation and editing of waypoints.

11.1 Overview

A waypoint is a location of interest available for display in 2D and 3D views and for tracking by a vehicle to monitor the vehicle's spatial relationship with it. NavView maintains a local waypoints.xml file in the Local\Station\Working folder. Waypoints are also maintained in the NavView database used for distributed systems (see Network Services section).

If Rolls and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In	Cannot add, load, import, edit or remove waypoints
User	Can add, load, import, edit waypoints but cannot remove waypoints
Online/Supervisor/ Administrator	Can add, load, import, edit and remove waypoints

11.2 Waypoints Window

The Waypoints window is opened by clicking on the Waypoints button in the Files section of the Home Ribbon Tab (see Figure 11-1) or Explorer (see Figure 11-2). This window provides access to all waypoints for creating and editing (see Figure 11-3).
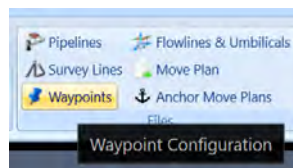
Figure 11-1 Waypoints - Home Ribbon Tab

FIGURE 11-2 WAYPOINTS - EXPLORER

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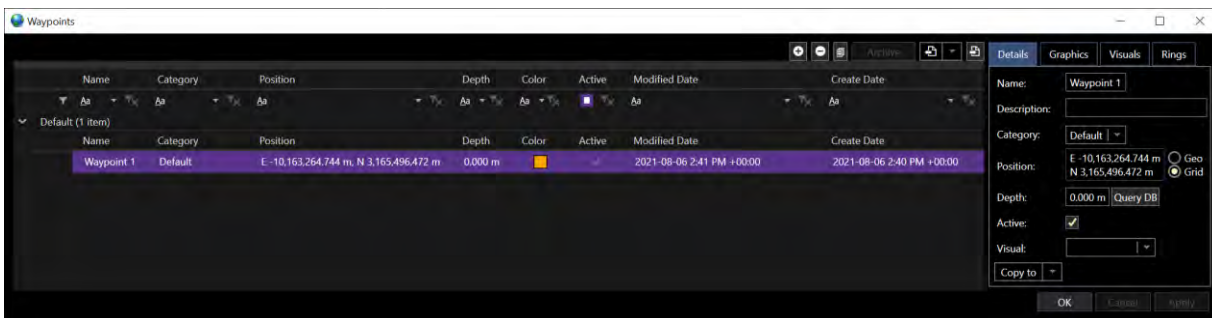
FIGURE 11-3 WAYPOINTS CONFIGURATION WINDOW

The Waypoints configuration window consists of the following components:

1. **Waypoint List (Data Grid)**

    All waypoints are listed in the data grid. The data grid provides an overview of the basic waypoint information: Name, Category, Position, Depth, Color, Active status, Modified Date, Created Date and Waypoint Dialog. The position is displayed in geographic or grid (based on the Coordinate Entry Format setting in Preferences, see Projects section). Note that if this setting is changed while this window is open, it must be closed and reopened to reflect the change.

2. **Toolbar**

    The toolbar provides the means to manipulate the waypoints

     Click to add a waypoint, this button is inactive if a point has been added or copied but not saved or discarded

     Click to remove the selected waypoint, a prompt will appear asking for confirmation for deletion as the waypoint will be removed for all NavView systems on the network

     Click to add copy of the selected waypoint and its attributes, this button is inactive if a point has been added or copied but not saved or discarded

     Click to export the waypoints to a CSV file, either just the Basic information or Expanded

     Click to launch the waypoint import process

Note: Waypoints can be sorted using the sorting tool in the data grid

3. **Waypoint Dialog**

    This displays the details and visual data for the selected waypoint for review and editing (see Figure 11-4).

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FIGURE 11-4 WAYPOINT DIALOG-DETAILS TAB

- **Details Tab**
  - **Name:** Name assigned to the waypoint
  - **Description:** Description of Waypoint
  - **Category:** Assign the way point to a category by creating a new category by entering a name in the box or select an existing category from the drop-down list
  - **Position:** Position for the waypoint, can be displayed in geographic or grid, controlled by selecting the appropriate radio button to the right
  - **Depth:** The depth of the waypoint (elevation would be a negative value)
  - **Query DB:** If a DTM has been loaded, it can be queried for a depth at the waypoint location by clicking this button, it may take several second for the Depth to update with the result of the query, it is not necessary to wait for this before editing other settings
  - **Active:** Check the box to make the waypoint active

Note: If a Waypoint is not set to Active, it will not appear in any listings of Waypoints for selection, e.g., for a Guidance Calculation, nor display, e.g., in Map views. If an Active waypoint is in use for a Guidance Calculation, it cannot be set to not Active until it is removed from the Guidance Calculation. If an attempt is made to do so, a message box will appear alerting the user to its use.

- **Visual:** Select the visual file group to automatically set the 2D and 3D files to be used for the display of the waypoint in the 2D and 3D views (see **Visuals Tab**
  -)

Note: A Visual file group consists a 2D outline file and a 3D model file with the same file name located in the respective Shared/Visuals/Objects/2D Outlines and 3D Model folders. At launch, NavView scans these two folders for files with matching names and add these to a list. This list is available in the **Visuals** drop down.

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o **Copy To:** From the drop-down list select where to copy the waypoint coordinates, currently only Pipe Tally is available
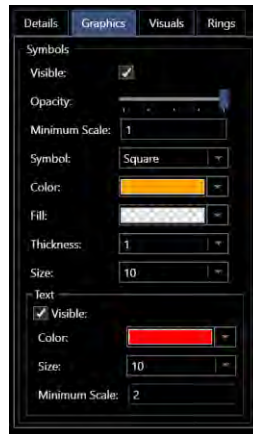
FIGURE 11-5 WAYPOINT DIALOG - GRAPHICS TAB

- **Graphics Tab**
  - **Symbols**

    Visible: Check the box to make waypoint symbol visible in map view

    Opacity: Adjust the opacity of the waypoint symbol using the slider

    Minimum Scale: Minimum scale the symbol will display in the Map view

Note: The Minimum Scale setting is based on the Map view scale as displayed in the Map views when the **Display scale bar option** is enabled (see Windows section). As the Map view is zoomed in, the scale increases, as it is zoomed out the scale decreases. The waypoint will display when the scale is greater than the Minimum Scale setting.

    Symbol: From the drop-down list select the waypoint symbol

    Color: From the drop-down list select the waypoint color

    Fill: From the drop-down list select the waypoint symbol fill

    Thickness: From the drop-down list select the waypoint symbol line thickness

    Size: From the drop-down list select the waypoint symbol size

  - **Text**

    Visible: Check the box to make waypoint text visible in map view

    Color: From the drop-down list select the waypoint text color

    Size: From the drop-down list select the waypoint text size

    Maximum Scale: Minimum scale the text will display in the Map view

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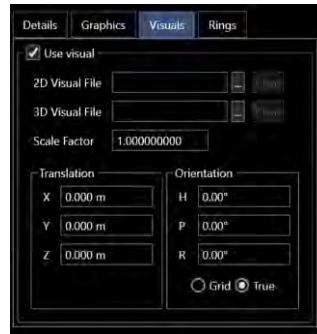
FIGURE 11-6 WAYPOINT DIALOG - VISUALS TAB

- **Visuals Tab**

  o **Use Visual:** Check this box if a 2D outline and/or a 3D model is to be displayed at the waypoint location

  o **2D Visual File:** Displays the name of the 2D outline file selected (mouse over to display the complete path and file name), if a file is not selected no 2D outline is displayed regardless of the Use Visual setting

    Browse to select the 2D outline file (.dwg) to display using ▣ button

    Click clear to remove the existing file selected

  o **3D Visual File:** Display the name of the 3D model outline file selected (mouse over to display the complete path and file name), if a file is not selected no 3D model is displayed regardless of the Use Visual setting

    Browse to select the 3D model file .xaml (recommended), .3ds, .obj, .lwo, or .stl format to display using ▣ button

    Click clear to remove the existing file selected

  o **Scale factor:** Enter the scale factor to apply to the 2D and 3D visual, default is 1

Note: NavView loads the 2D and 3D files using the units set for Distances in Preferences (see Projects section). If the units for these files are not the same as the Distance units, the display of the files can be scaled as required using the **Scale Factor**.

  o **Translation/Orientation** control the placement of the 2D and 3D visuals relative to the actual waypoint location, i.e. what point of the visual will be placed at the waypoint location.

      Translation: Enter the XYZ offsets in the visuals' local coordinate reference frame from the point on the visual, that is to be located at the waypoint, to the visuals' origin

      Orientation: Enter the heading (H), pitch (P) and roll (R) to be applied to the visuals for display.

      Grid/True: Select the heading type for the entered heading

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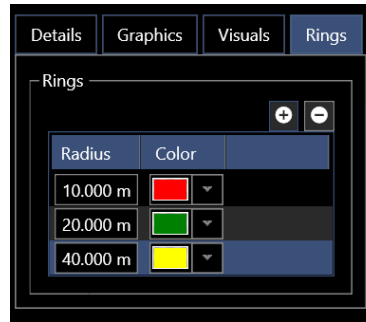
FIGURE 11-7 WAYPOINT DIALOG - RINGS TAB

- **Rings Tab**
  Controls the drawing of rings about the waypoint location. A ring is added using the ⊕ button or removed using the ⊖ button. The radius of the ring from the waypoint origin and the ring display color are user defined

4. **Apply**: This button becomes active when a change is made to the currently selected waypoint configuration or when a new waypoint is added, click it to apply the changes and/or save the new waypoint and leave the window open

Note: If the Apply button is active but is not clicked before another waypoint in the data grid is selected, a prompt stating "There are unsaved changes. Would you like to save your changes? appears. Click to **Yes** save the changes, click **No** to discard the changes

5. **Cancel:** This button becomes active when a change is made to the currently selected waypoint configuration or when a new waypoint is added, click to discard the changes without saving, including the newly added waypoint, and leave the window open

11.3 Add a Waypoint
A waypoint can be added several ways.

11.3.1 Add a Waypoint from the Waypoints Window
1. Open the Waypoints window from the Home/Files Ribbon or from Explorer/Data
2. Click ⊕ in the tool bar
3. A temporary waypoint is created with a default position and a name based on the date and time it was created and displayed in the Waypoint dialog
4. Edit the new waypoint as required
5. Click **Apply** to save the waypoint and leave the window open, **Cancel** to discard it and leave the window open, **OK** to save the waypoint and close the window

11.3.2 Add a Waypoint from the Map View
1. In a Map window, activate the Coordinate Picker (see Map Window in the Windows section for details)

2. Create point(s) in the Map

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3. To add all points created, right mouse click in the Coordinate Picker balloon or with the mouse over any of the points and select **Copy To… Waypoints**

4. Waypoint dialogs will appear one at a time for each point present in the Coordinate Picker for review and editing

   a. Click **OK** to accept the waypoint and add it to the Waypoints (if the waypoints window is open, you will see the waypoint added to the bottom of the list)

   b. Click **Cancel** to discard the waypoint

Or…

1. In a Map window, activate the Ruler (see Map Window in the Windows Section for details)

2. Create a ruler as desired

3. Right mouse click and select **Copy To… Waypoints**

4. Waypoint dialogs will appear first for the ruler start point and then for the ruler end point for review and editing

   a. Click **OK** to accept the waypoint and add it to the Waypoints (if the waypoints window is open, you will see the waypoint added to the bottom of the list)

   b. Click **Cancel** to discard the waypoint

11.4 Copy a Waypoint

1   Open the Waypoints window

2   Select a waypoint in the list to copy

3   Click ▣ in the tool bar

4   A temporary copy of the selected waypoint is created and displayed in the Waypoint dialog

5   Edit the new waypoint as required

6   Click **Apply** to save the waypoint and leave the window open, **Cancel** to discard it and leave the window open, **OK** to save the waypoint and close the window

11.5 Remove a Waypoint

1. Open the Waypoints window

2. Select the waypoint(s) to remove in the list

3. Click ▣ in the tool bar

4. A prompt asking for confirmation of removal appears highlighting the fact that this will also remove the waypoint from all NavView systems that are part of the NavView network, answer accordingly

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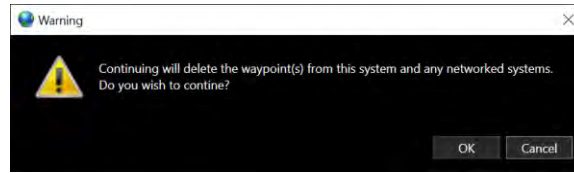
FIGURE 11-8 WAYPOINT REMOVAL CONFIRMATION PROMPT

5. If prompt answered with OK, waypoint is removed and the list updated to reflect this

11.6 Edit a Waypoint

A waypoint can be edited several ways.

11.6.1 Edit a waypoint from the Waypoint Window

1. Open the Waypoints window

2. Select the waypoint in the list that is to be edited, the waypoint will display in the Waypoint Dialog to the right

3. Edit as required

4. Click Apply to save the changes

5. Click OK to close the window

11.6.2 Edit a Waypoint from the Map View

1. In a Map window, right mouse click on a waypoint and then click on **Edit** when the pop up menu appears

2. A **Waypoint** dialog opens for the selected waypoint, edit as required

3. Click **OK** to save the changes and close the window

4. Click **Cancel** to close the window without saving the changes

Note: To select a waypoint with the right mouse click, the cursor must be on the waypoint symbol or the label, if a 2D outline is in use, the waypoint label.

11.7 Export Waypoints

1. Open the Waypoints window

2. Click the ⬚▾ button to select the export option, Basic or Expanded

   a. Basic: Name, Latitude, Longitude, Northing, Easting, Depth and Active status

   b. Expanded: Basic plus (if Visuals enabled for the waypoint) Visual type (2D or 3D), Visual status, 2D/3D outline file, Scale Factor, X Offset, Y Offset, Z Offset (Translation), Heading, Pitch Roll, Heading type (True or Grid)

3. Navigate to target folder and enter file name

4. Click Save

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11.8 Import Waypoints

The Import option allows the user to load a file of waypoints and append these to the existing Waypoints list in NavView. On a networked system, this will result in the updating of the waypoints for all NavView systems on the network.

1. Open the Waypoints window

2. Click the 🖻 button to launch the Open file dialog

3. Navigate to the file to import, select and click Open

4. The Import Waypoints wizard launches on the first page, File Settings (see Figure 11-9)

FIGURE 11-9 WAYPOINT IMPORT WIZARD – FILE SETTINGS

- **Line Prefix:** Check the box if there is a line prefix and enter the prefix in the box

- **Delimited/Fixed Length:** Select the data format

- **Delimiter:** Select the field delimiter from the respective drop-down list, options are;
  - Comma
  - Space
  - Tab
  - Custom: selection of this option enables entry of the delimiter character

- **Culture:** From the drop-down list select the country numerical format

- **Load Settings:** Click 🖻 to load saved waypoint import settings from a file

- **Save Settings:** Click 🖻 to save the current waypoint import settings to a file

a. Click the ⊕ button to add an entry to the data grid for every field in the record, whether the field is to be used in the import or not

b. For each field (line in the data grid)

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i. **Data Type:** Select the data type from the drop-down list contained in the field, if the field is not to be used, select Unknown

ii. **Units:** Select the units or format from the drop-down list that applies to the field and data type
   1. String, e.g. Name, no applicable selection
   2. Angle, e.g. Latitude or Heading, select the format (note that radians are not supported)
   3. Date/Time, select the format
   4. Length, e.g. Elevation or Depth, select the units
   5. Other, e.g. Speed or Force, select units

iii. If **Delimiter** is comma, tab, space or custom
   o **Trim Start:** Enter the number of characters to trim from the start of the field value, e.g. if a field containing Depth contains "D 567.89", 2 would be entered to trim the "D " before reading the value

   o **Trim End:** Enter the number of characters to trim from the end of the field value, e.g. if a field containing Depth contains "567.89 D", 2 would be entered to trim the " D" before reading the value

iv. If **Delimiter** is Field Size

   o **Field Start:** Enter the zero-based index of the start of the field, e.g. the index of the first character in a record is 0, the index of the 10th character is 9
   o **Field Size:** Enter the length of the data in the field

Note: When using Fixed Length and Field Size, use the setting of the field start and field size to Trim unwanted start and end characters.

v. To move a selected field up or down to re-order its place in the record, select the field and click either the ⬆ or ⬇ button

5. Click **Next** to review (see Figure 11-10) the import as configured, if acceptable click **Finish** to import the waypoints and append them to the existing waypoints in NavView, if changes are required click Back to edit the field settings
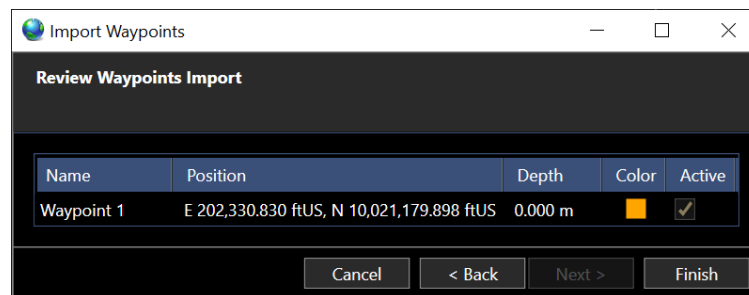
FIGURE 11-10 WAYPOINT IMPORT REVIEW

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12 Guidance Calculations

12.1 Overview

NavView supports the ability to navigate using Guidance Calculations. The source and destination of the guidance calculation are known as the **From** and **To** objects. These objects can be one of the following types:

- **Point**   A Guidance Point refers to a single point, which may or may not be moving. For instance, a waypoint is a static point which does not have a velocity. A vehicle is considered a point because it is tracked using a single reference point (CRP), but it is capable of moving, thus the point has a velocity associated with it

- **Route**   A Guidance Route is a series of nodes connected by segments, this could be many things, such as a pipeline, survey line, or catenary line.

- **3D Line** A 3D line in standard NavView is represented as a 3D Polyline Connection (refer to Connections section)

It is possible to create a guidance calculation in the following configurations:

- **Point to Point:** Waypoint to Waypoint, Vehicle to Waypoint, Vehicle to Vehicle, etc.

- **Point to Route:** ROV to Pipeline, Vessel to Survey Line, etc.

- **Point to 3D Line:** ROV to Mooring Line, etc.

- **3D Line to 3D Line:** Umbilical to Mooring Line, etc.

When configuring a new guidance calculation, the type of calculation is chosen by NavView based on the type of **To** and **From** objects. It is then possible to modify the calculation within that type. For instance a Point to Point calculation between an ROV and a waypoint, the **From** and **To** objects can be changed to different waypoints or vehicles, but it is not possible to select a line/route for one of those items.

If Rolls and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In/User	Cannot add, edit or remove guidance calculations
Online/Supervisor/ Administrator	Can add, edit and remove guidance calculations

12.2 Guidance Calculations Window

The guidance window is accessed by clicking the Guidance Calculations button in the Configuration section of the Setup Ribbon (see Figure 12-1) or Explorer (see Figure 12-2). Creation and editing of guidance calculations is done from the Configure Guidance Calculation window (see Figure 12-3).

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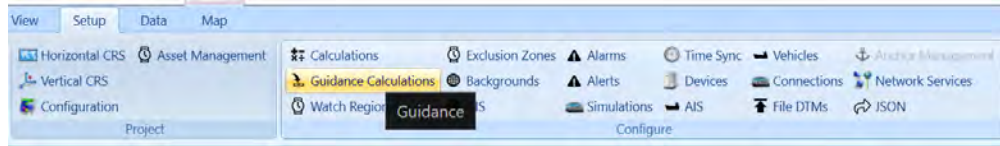
FIGURE 12-1 GUIDANCE CALCULATIONS - SETUP TAB RIBBON

FIGURE 12-2 GUIDANCE CALCULATIONS - EXPLORER
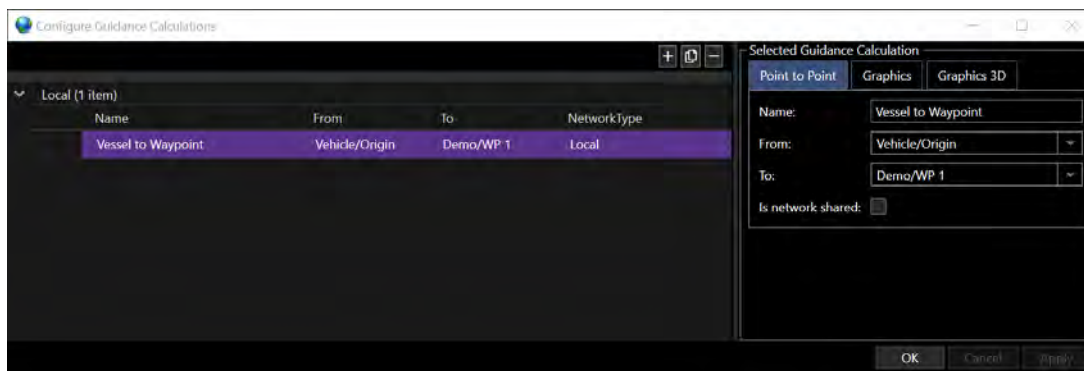
FIGURE 12-3 CONFIGURE GUIDANCE WINDOW

The Configure Guidance Window consists of the following components:

1. **Toolbar**

      Click this button to add a new guidance calculation

      Click this button to remove the selected guidance calculation.

      Click to copy the selected item

2. **Guidance Calculation List**
    All guidance calculations are listed in the data grid. The data grid provides an overview of the guidance information:
    o   Name

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o   From
o   To
o   Network Type

3.   **Selected Guidance Calculations Dialog**
     The dialog contains three tabs for configuration and editing:

     o   Details Tab
     o   Graphics Tab
     o   Graphics 3D Tab
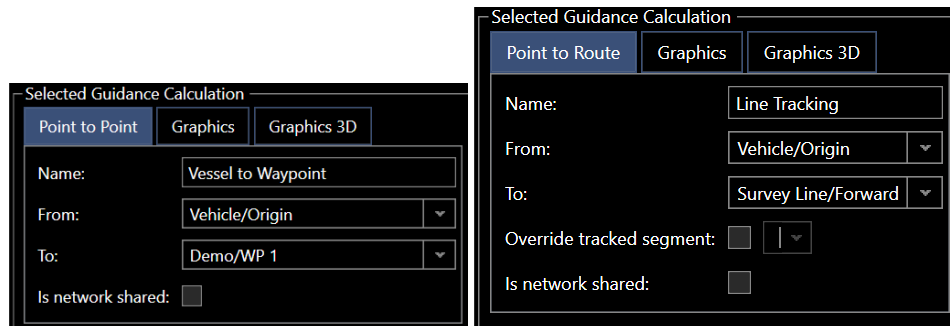
FIGURE 12-4 SELECTED GUIDANCE CALCULATIONS DETAILS TAB

12.3 Add a Guidance Calculation

1.   Click the ⊞ button

2.   The Add Guidance Calculation Dialog is displayed (Figure 12-5)
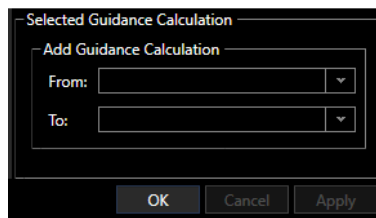
FIGURE 12-5 ADD GUIDANCE CALCULATION DIALOG

3.   Expand the **From** drop-down button to select the *From* object. The **From** items are either points or 3D polylines and are presented in a hierarchical tree as shown in Figure 12-6 where the last items in any branch are available for selection.

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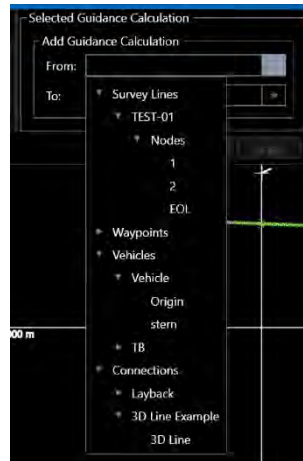
FIGURE 12-6 SELECT FROM OBJECT

4. Expand the **To** drop-down button to select the *To* object. The **To** items are either DTMs, points, lines or 3D polylines and are presented in a hierarchical tree as shown in (see Figure 12-7). In the case of Survey lines and pipe lines, if being selected as a line versus one of its nodes, the direction the line is being tracked must be selected.
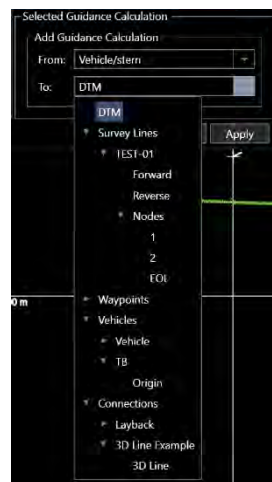
FIGURE 12-7 SELECT TO OBJECT

Note: Upon clicking on an item that is selected as a *From* object, the menu will close. Objects that are not available to be a *From* object will not be selectable and will not close the menu. To abort choosing an item, click outside of the menu

5. Once configured, click the **OK** button to add the Guidance Calculation and close the window, click the **Apply** button to add the Guidance Calculation and leave the window open or click the **Cancel** but to abort the process and leave the window open

12.4 Remove a Guidance Calculation

1. Select a guidance calculation in the list

2. Click the ⊟ remove button

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3. A dialog will appear asking for confirmation of the removal, click **Ok** to proceed

12.5 Edit Guidance Calculation

Guidance Calculations can be edited from the Configure Guidance Calculations window (see Figure 12-3).

1. Open Guidance Calculation window

2. Select Guidance Calculation to be edited

3. Edit the selected Guidance Calculation using the Selected Guidance Calculation dialog

- **Details Tab**

  The details tab header will depend on the type of guidance calculation that has been created (see Figure 12-4).

  o **Name:** The name of the guidance calculation is automatically created by NavView upon creation of the calculation, based on the *From* and *To* object names, this is editable by the user

  o **From:** The *From* object can be changed from the **From** drop-down list

  o **To:** The *To* object can be changed from the **To** drop-down list

Note: Some items in the list are not selectable and thus will not close the menu when clicking on them, such as the Vehicles header.

Note: Pipelines/Survey Lines appear in the list of guidance point to point objects because it is possible to select their individual nodes.

Note: If the calculation is a Point to Route calculation, only Guidance Routes will be available to choose from

  o **Is network shared:** Check box if the selected Guidance Calculation is to be shared on the network

  o **Override tracked segment:** Check box to force tracking to a specific segment from the drop-down list

- **Graphics Tab**
  This Graphics tab consists of the following options (see Figure 12-8)

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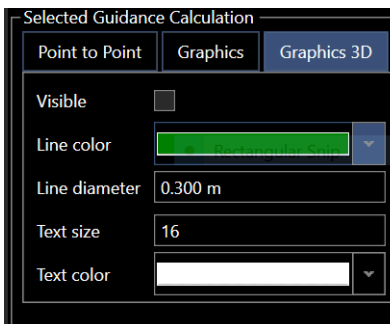Released: 12/3/2021

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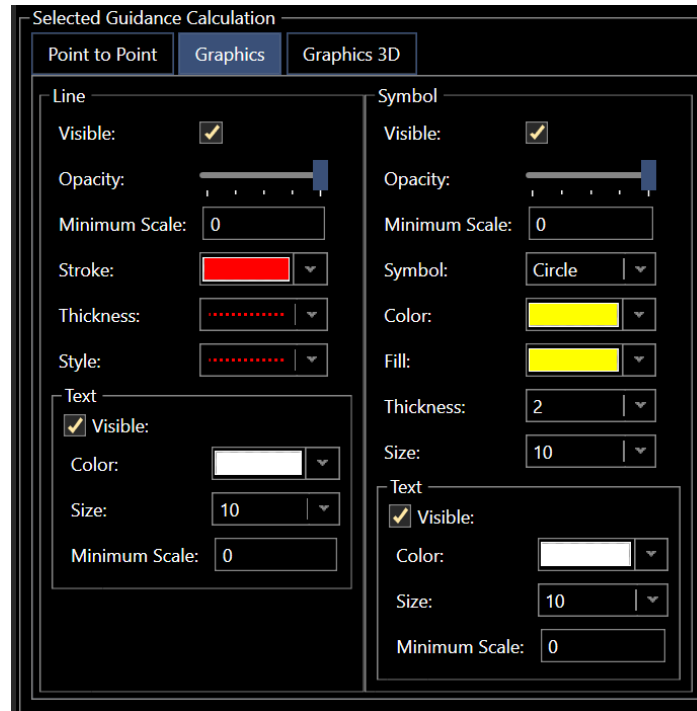
FIGURE 12-8 GUIDANCE CALCULATION - GRAPHICS TAB

- o **Line**

   Visible: Check the box to display a rubber band line for the selected guidance in Map View

   The Guidance Calculation graphics will show a line from the *From* point to the *To* point for a Point to Point guidance (see Figure 12-9)

   Opacity: Control the opacity of the line displayed using the slider, left being transparent and right being opaque

   Minimum: Line will be visible in map view if map scale is greater than limits set here

   Stroke: From the drop-down list select the line color

   Thickness: From the drop-down list select the line thickness

   Style: From the drop-down list select line style

   Text: Annotation added to guidance line. Check the box to display annotation in map view (see Figure 12-9). Text color and size is selectable from the drop-down lists. Annotation will be visible in map view if map scale is within the limits set in Minimum/Maximum Scale

Note: To be able to display the annotation in map view the line must be made visible

- o **Symbol**

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Visible: Check the box to display a symbol at the guidance calculation *From* reference point in Map View

Opacity: Control the opacity of the symbol displayed using the slider, left being transparent and right being opaque

Minimum Scale: Symbol will be visible in map view if map scale is greater than limits set here

Symbol: From the drop-down list select the icon for the symbol

Color: From the drop-down list select the color for the symbol

Fill: From the drop-down list select the color for the symbol fill

Thickness: From the drop-down list select the line thickness for the symbol

Size: From the drop-down list select the symbol size

Text: Annotation added to the symbol, this being the guidance name. Check the box to display annotation in map view. Text color and size is selectable from the drop-down lists. Annotation will be visible in map view if map scale is within the limits set in Minimum/Maximum Scale

Note: To be able to display the annotation in map view the symbol must be made visible
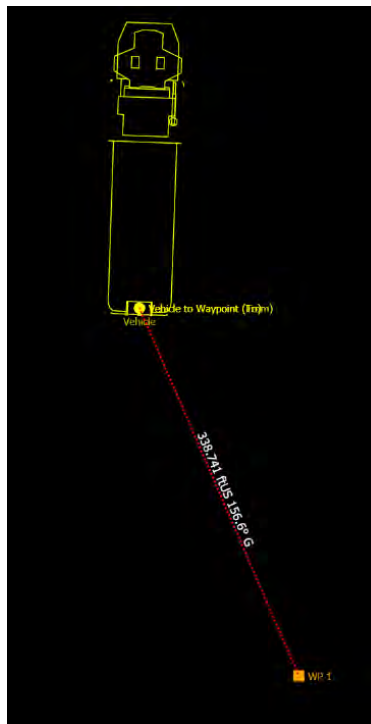
FIGURE 12-9 GUIDANCE CALCULATION GRAPHICS POINT TO PONT EXAMPLE

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In the case of a Point to Route guidance calculation the currently tracked segment will be highlighted (see Figure 12-10)
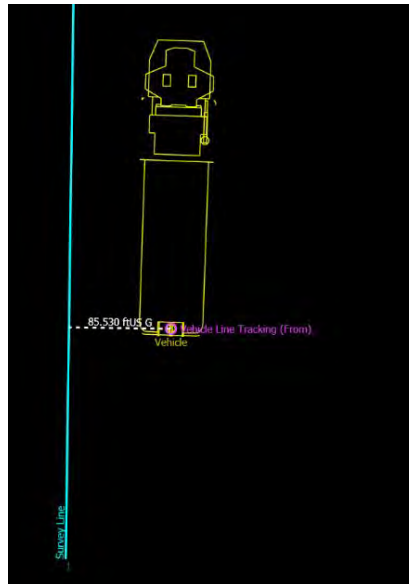
FIGURE 12-10 GUIDANCE CALCULATION GRAPHICS POINT TO ROUTE EXAMPLE

- **Graphics 3D Tab**
  This Graphics 3D tab consists of the following options (see Figure 12-11)

FIGURE 12-11 GUIDANCE CALCULATION - GRAPHICS 3D TAB

- o **Visible:** Check the box to display a rubber band line for the selected guidance in Map View

- o **Color:** From the drop-down list select the color for the line

- o **Line diameter:** Enter a value for the line diameter

- o **Text Size:** Enter value for text size

- o **Text color:** Select text color from the drop-down list

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FIGURE 12-12 GUIDANCE CALCULATION GRAPHICS POINT TO 3D LINE EXAMPLE
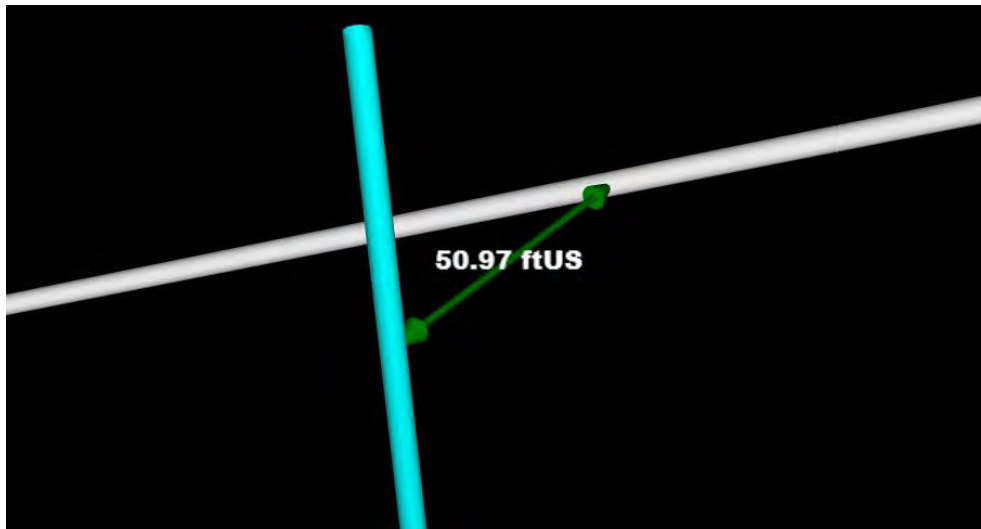
FIGURE 12-13 GUIDANCE CALCULATION GRAPHICS 3D LINE TO 3D LINE EXAMPLE

12.6 Guidance Displays

Guidance information within NavView can be viewed using Text windows, the Guidance Tracking window, 2D/3D Map and/or the offline display.

12.6.1 Guidance in the Text Windows

There are several data items created by a guidance calculation which are available for selection (see Figure 12-14) to display in the text windows. For details on the management of text windows, refer to the Windows section of this documentation.

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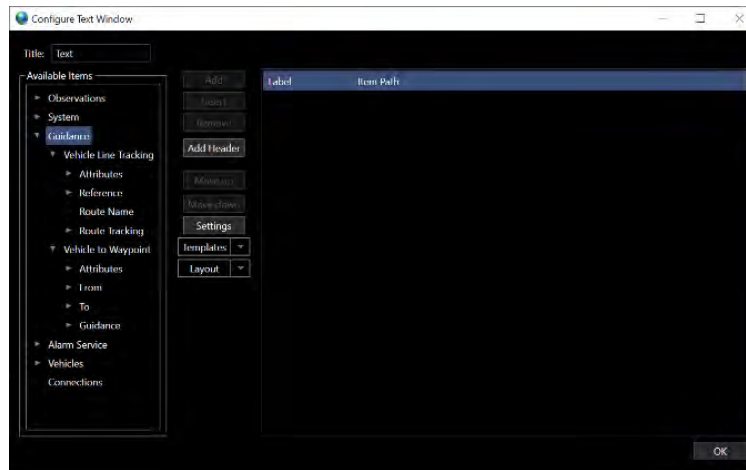
FIGURE 12-14 CONFIGURE TEXT WINDOW – GUIDANCE

12.6.1.1 Point to Point Guidance Text

The Point to Point Guidance creates a hierarchy of items to select from which includes a Point Text for each item, and details on the relative position and velocities.

- Point to Point Guidance (Name at the top)

    o Attributes
        - Name
        - Description
        - From Name
        - To Name
        - From Path
        - To Path

    o From
        - Bearing
        - Attitude
        - Vertical Velocity
        - Name
        - Coordinate
        - Elevation
        - Velocity

    o To
        - Bearing
        - Attitude
        - Vertical Velocity
        - Name
        - Coordinate
        - Elevation
        - Velocity

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- o Guidance
  - Relative Range/Bearing
  - Relative Velocity
  - Time of Intercept
  - Time to Intercept

12.6.1.1.1 VELOCITY MADE GOOD

Velocity Made Good (VMG) is the relative velocity of the objects, in the direction of the bearing between the objects. This can be likened to a vehicle approaching a target: the velocity made good is the velocity directly towards the target, where the total velocity of the body, could be greater than this value.
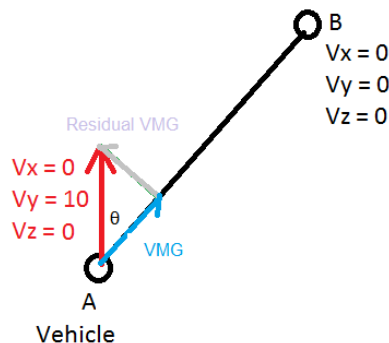
FIGURE 12-15 VELOCITY MADE GOOD EXAMPLE

Figure 12-15 describes a simple scenario. Vehicle A is moving at velocity 10 in the Y direction, and 0 in other directions, as denoted by the red arrow. The velocity made good is the projection of this velocity on the vector towards point B, as denoted by the blue line.

12.6.1.1.2 HORIZONTAL VELOCITY MADE GOOD

This is the horizontal component of the velocity made good. This is often useful for surface vessels where the vertical component is not relevant. In the example in Figure 12-15, the horizontal velocity made good will be equal to the total VMG, as there is no relative velocity in the Z direction.

12.6.1.1.3 VERTICAL VELOCITY MADE GOOD

Vertical velocity made good is the pure vertical component of VMG. This is useful for scenarios such as determining when an object will surface or how long it will take to reach the bottom at a constant rate, showing crane payout speed, etc.

12.6.1.1.4 RESIDUAL VELOCITY MADE GOOD

The Residual VMG is the wasted component of the velocity, ie, the velocity that is perpendicular to the direction of interest. In Figure 12-15, Residual VMG is denoted by the gray arrow, and it can be seen that this is perpendicular to the vector between the two points.

12.6.1.1.5 TIME OF INTERCEPT

The time at which the intercept is predicted to take place, at the current velocity is calculated. Note that if the VMG is negative, as when the two points are moving away from each other, there will be no predicted time of intercept.

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TOI = Current Time + (Slope Distance) / VMG

12.6.1.1.6 TIME TO INTERCEPT
The time remaining until the intercept will take place.

TTI = (Slope Distance) / VMG

12.6.1.2 Point to Route Guidance Text
The Point to Route Guidance Text creates a hierarchy to select from which contains attributes, as well the details of the *From* point (shown as Reference), and the relative distances and velocities to the route in question. The hierarchy is shown below.

- Point to Route (Name is shown)
  - Attributes
    - Name
    - Description
    - From Name
    - To Name
    - From Path
    - To Path
  - Reference
    - Bearing
    - Attitude
    - Vertical Velocity
    - Name
    - Coordinate
    - Elevation
    - Velocity
  - Route Name
  - Route Tracking
    - Segment Tracking Data
    - Velocity Relative to Route
    - To SOL
    - To EOL
    - SOL to EOL

12.6.1.3 Point to 3D Line/3D Line to 3D Line
The Point to 3D Line (3D Polyline Connection) Guidance Text creates a hierarchy to select from which contains attributes and guidance information to the 3D Line in question. The hierarchy is shown below.

- Point to 3D Line (Name is shown)
  - Attributes
    - Name
    - Description
    - From Name

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- To Name
- From Path
- To Path

o Guidance
- Reference Position
- Target Position
- Azimuth (T)
- Vertical Angle
- Range (G)
- Delta (G)

12.6.1.4 Guidance Text Window

A wide variety of information from guidance calculations is available to be displayed on screen. Figure 12-16 shows a typical text view for Point-to-Point guidance. Figure 12-17 shows a typical text view for a Point to Route guidance. Figure 12-18 shows a typical text view for a Point to 3D Line guidance.

Name	Vehicle to Waypoint
From Name	Origin
To Name	WP 1
Range (G)	380.96 ftUS
Bearing (G)	174.81°
Range (T)	380.20 ftUS
Azimuth (T)	172.77°
Horizontal Velocity Made Good	-0.776 knot
ETA	12:03:03.5

FIGURE 12-16 GUIDANCE POINT TO POINT TEXT EXAMPLE

Guidance	Vehicle Line Tracking
Vehicle	Vehicle
Vehicle Reference	Origin
Route Name	Survey Line/Forward
Station	STA 1+73.5550
DCC	84.49 ftUS
Route Distance From SOL	173.56 ftUS
Route Distance To EOL	1387.07 ftUS

FIGURE 12-17 GUIDANCE POINT TO ROUTE TEXT EXAMPLE

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FIGURE 12-18 GUIDANCE POINT TO 3D LINE TEXT EXAMPLE
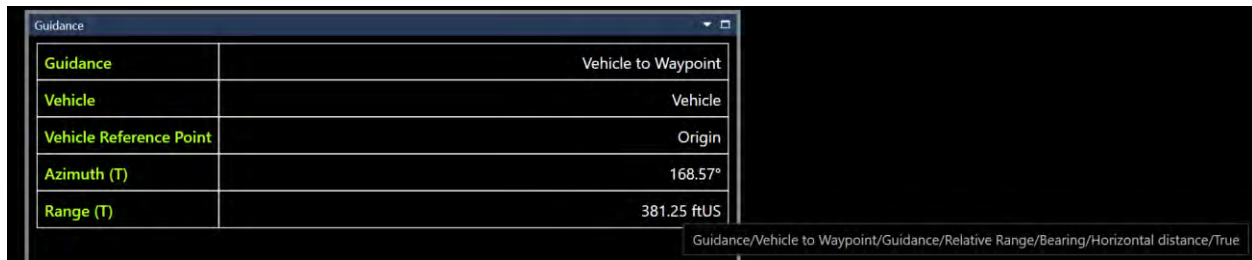
FIGURE 12-19 GUIDANCE ITEM PATH

The guidance item path can be displayed by putting the mouse pointer over the item as shown in Figure 12-19

12.6.2 Guidance Tracking Window

The Guidance Tracking Window is used to show a zoomed in view of a Point to Point guidance, with a historical trail, to help guide the *From* item to the *To* item. The window is accessed from the View Tab of the Ribbon by clicking the **Guidance Tracking** button (see Figure 12-20).
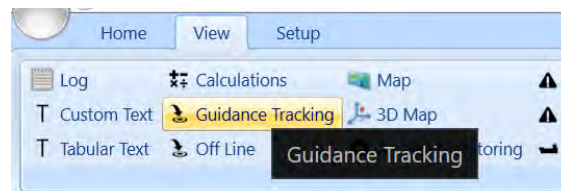
FIGURE 12-20 GUIDANCE TRACKING - VIEW TAB

The Guidance Tracking Window (see Figure 12-21) shows a polar view, with the *To* object always at the center and the item to the north is the *From* object. The yellow trail is the history of previous locations.

The radial scale uses the units configured in Preferences/Distance, so in the example in Figure 12-21 the *From* object is between the 300 ftUS ring and the 400 ftUS ring. The details view in the top right corner shows the True Range, True Azimuth and CMG between the objects.

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FIGURE 12-21 GUIDANCE TRACKING WINDOW

12.6.2.1 Configuring the Guidance Tracking Window

1. Right click anywhere on the guidance tracking window

2. Select **Configure** from the context menu

3. The Configure Guidance Tracking Window dialog is displayed, as seen in Figure 12-22. Configure as necessary

4. Click OK to save changes, Cancel to discard changes

The properties of the configure window are described below:

- **Calculation:** Select the guidance calculation to be displayed in the tracking view from the drop-down list

- **Target Point**
  - o **Stroke:** Choose the color of the from and to symbols
  - o **Size:** Choose the size of the from and to symbols

- **History Point**
  - o **Display:** Check box to display history
  - o **Stroke:** Choose the color of the history symbols
  - o **Size:** Choose the size of the history symbols
  - o **Length:** Select how many history points to display

- **Display**
  - o **Show Details:** Check the box to display the True Range, Azimuth (T) and CMG in the Guidance Tracking View

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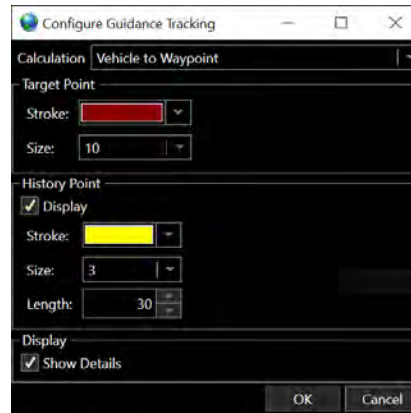
FIGURE 12-22 CONFIGURE GUIDANCE TRACKING WINDOW

Note: A Point to Route guidance calculation can be chosen for the guidance tracking view. It will show the guidance calculation to the end of segment.

12.6.3 Offline Display

The Offline Display is used to show the offline distance from a Point to Route calculation. The display is accessed by clicking the **Offline** button in the View Tab of the Ribbon (see Figure 12-23).
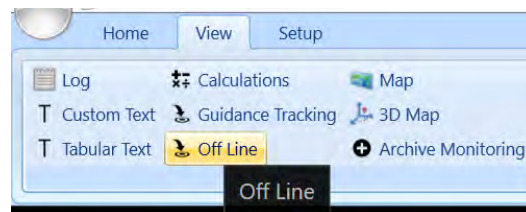
FIGURE 12-23 OFFLINE - VIEW TAB
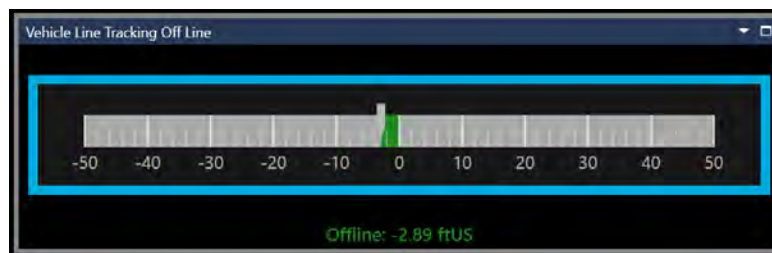
FIGURE 12-24 OFFLINE DISPLAY

The offline display (see Figure 12-24) shows a number bar centered at zero and showing a user configurable plus or minus amount. This shows the Offline Distance value from the Point to Route calculation, to the right for positive values, where the reference point is to the starboard side of the line, and to the left for negative values, where the reference point is to the port side of the line, looking forward along the line.

12.6.3.1 Configuring the Offline Display

1. Right click anywhere in the Offline Display window

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2. Click **Configure** on the context menu which appears

3. Edit settings as required
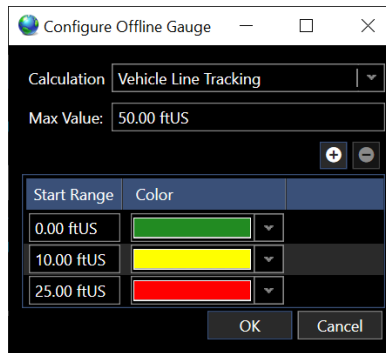
FIGURE 12-25 CONFIGURE OFFLINE GAUGE DIALOG

- **Calculation:** Select the Point to Route Guidance Calculation to be used in the offline display from the drop-down list

- **Max Value:** The maximum extent to the right and left side of the scale. Any offline values greater than this number will show the fully to one side, but the display does not auto scale

- **Range Thresholds:** The range thresholds allow for the color of the bar to change when the offline distance goes outside of certain specifications. By default when the offline window is first created, the max value is set to 25 ft or meters depending on the working unit, and range thresholds are created at 10ft/m and 20ft/m

Note: It is not possible to modify the range or remove the first item in the list, but it is possible to change the color

4. Click **OK** to save changes or **Cancel** to discard them

12.6.3.1.1 ADDING A RANGE THRESHOLD

1. Open the Configure Offline Display dialog

2. Click the ⊕ add button

3. A new range threshold is added to the bottom of the list

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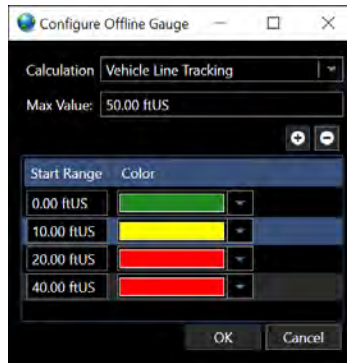
FIGURE 12-26 ADDED RANGE THRESHOLD

Note: When a new range threshold is added, it automatically is given the double of the range of the previous item in the list and the same color.

- o **Start Range:** Range from the center line at which the bar will indicate the color of this range threshold. To edit the range value, click in the text box of the item in the Start Range column and type a new distance.

- o **Color:** The color with which to fill the offline display bar once the distance has exceeded the specified range. To change the color, click the drop-down button to expand the color picker and choose a new color. Figure 12-27 and Figure 12-28

- o show the offline display when the offline distance has exceeded the parameter specified, the bar is filled with the color configured in the settings.
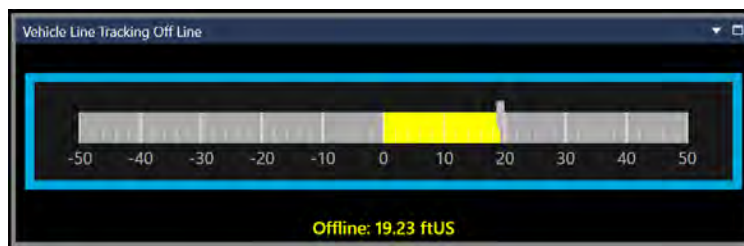
FIGURE 12-27 YELLOW OFFLINE DISPLAY
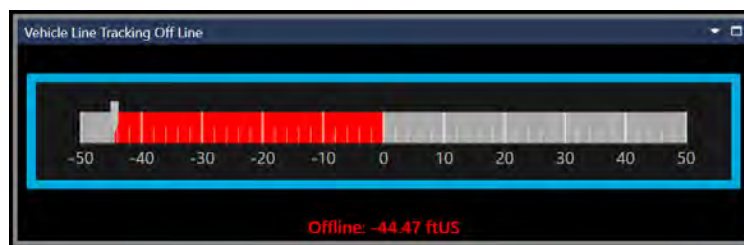
FIGURE 12-28 RED OFFLINE DISPLAY

4. Click **OK** to save changes or **Cancel** to discard them

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12.6.3.1.2 REMOVING A RANGE THRESHOLD

- Open the configure offline display dialog

- Select a Range Threshold from the list

- Click the remove button

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13 Timing

NavView supports precise timing and time stamping of data using both absolute and relative timing. It utilizes the .NET Framework high resolution StopWatch timer that enables NavView to measure the elapsed time since start-up with a precision of approximately 100 nanoseconds. This elapsed time since start-up is referred to as *system time*. The system time is converted to Universal Time Coordinated (UTC) by adding a UTC offset. If NavView is synchronized to an external UTC time source, this offset is determined using a synchronization algorithm. The conversion of system time to synchronized UTC is only performed at the presentation level, either to the user-interface or to an output (file, I/O, etc.).

If Roles and Privileges are enabled, the user must be logged in with Supervisor or Administrator privileges.

13.1 Synchronization

NavView supports the synchronization of system time to UTC time by computing the offset of the system time from an external UTC time reference using a robust filtering algorithm. The external time reference can be the local PC clock, a 1 PPS pulse and corresponding message, a device input message that contains UTC time (e.g., $--ZDA) or the 4D nav network services.

If Network Time Protocol (NTP) or similar is used to synchronize the PC clock, NavView determines the offset from system time to the UTC reference by sampling the local clock and the system time. The difference between these two values is the filter input value.

If NavView is synchronized to 1PPS, each pulse is time stamped with system time and the associated UTC reference time is extracted from the corresponding input message. The difference between these two times is the filter input value.

If NavView is synchronized to an input message time, then each message is time stamped with system time and the UTC time reference value is extracted from the message. The difference between these two times is the filter input value.

If NavView is synchronized to the network services, then each network timing message is time stamped with system time and the UTC time reference value is extracted from the message. The difference between these two times is the filter input value. This option requires that one of the NavView clients on the network is synchronized using one of the above options.

13.2 Configuring Time Synchronization

1. Identify the method of synchronization to be used
   a. If synchronizing to a 1PPS input, add and configure the NMEA Input device accordingly. See the Devices Section and NMEA Input Device document for details

Note: the 1PPS input option is only available for NMEA Input devices using a serial port.

   b. If synchronizing to a message, e.g., NMEA ZDA, add and configure the NMEA Input device accordingly. See the Devices Section and NMEA Input Device document for details

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c. If an NTP is in use, no device is required

d. If Network Services, ensure Network Services are enabled and one of the NavView clients on the network are configured to Publish the time sync over the network

2. From the Configure section of the Setup tab in the ribbon, click the **Time Sync** button (see Figure 13-1)
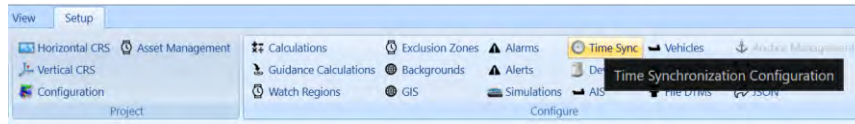
FIGURE 13-1 SETUP RIBBON - TIME SYNC BUTTON

3. The **Time Synch** dialog will appear defaulted to **Disabled** for the **Synchronization Source Method**

4. **Method:** Click the drop-down and select the method and respective data source
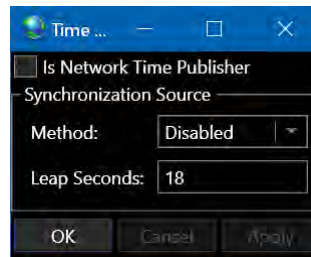
FIGURE 13-2 TIME SYNCHRONIZATION CONFIGURATION – DISABLED DEFAULT
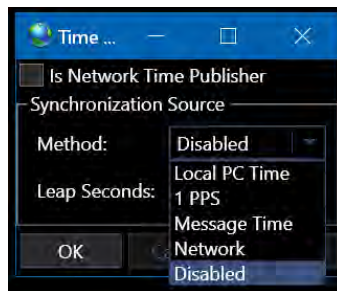
FIGURE 13-3 TIME SYNCHRONIZATION METHOD OPTIONS

a. **Local PC Time:** Select if an NTP is in use and NavView is to be synchronized to the PC clock

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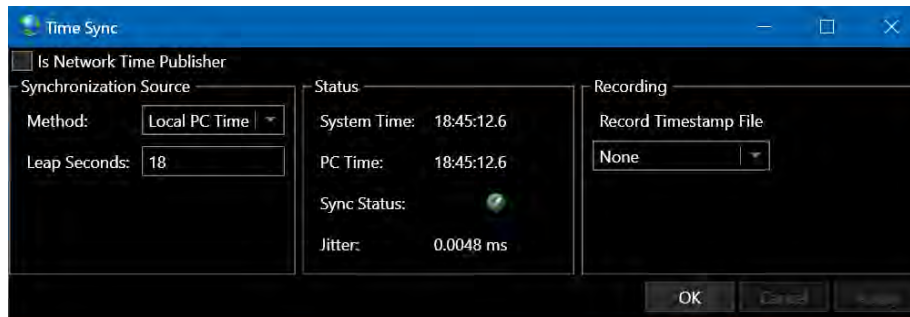
FIGURE 13-4 TIME SYNC SOURCE - LOCAL PC TIME

    i. No synchronization mode specific configuration is required

b. **1PPS:** Select if NavView is to be synchronized to a 1 PPS input
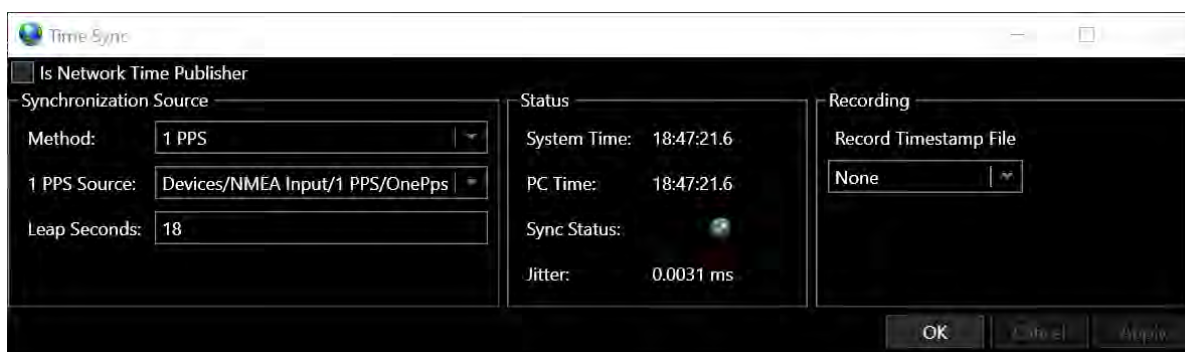
FIGURE 13-5 TIME SYNC SOURCE - 1 PPS

    i. **1PPS Source:** From the drop-down list, select the device that is the source of the 1 PPS

c. **Message Time:** Select if NavView is to be synchronized to a NMEA message time
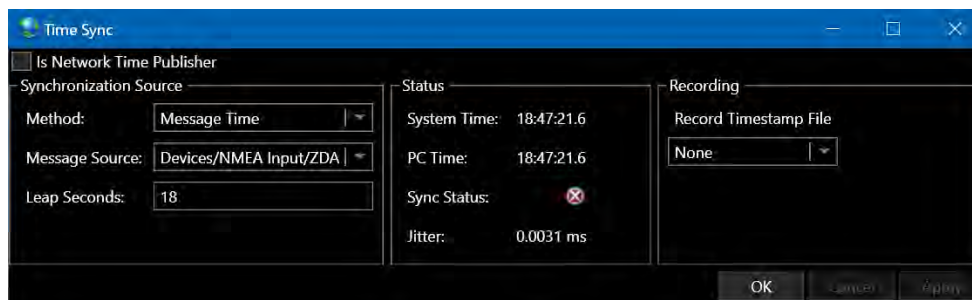
FIGURE 13-6 TIME SYNC SOURCE - MESSAGE TIME

    i. **Message Source:** From the drop-down list, select the device and message that is the source of the message to be used, e.g., ZDA

d. **Network:** Select if one of the licensed NavView clients on the network is configured to provide time sync over the network (see step 6.)

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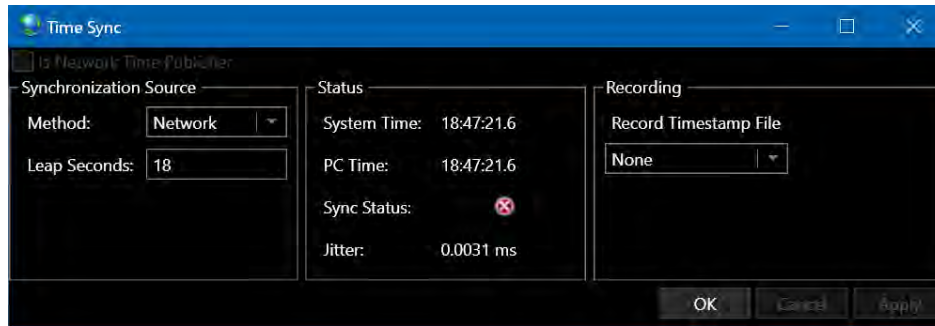
FIGURE 13-7 TIME SYNC SOURCE - NETWORK

  e. **Disabled:** Select if NavView is not to be synchronized to a reference time

5. **Leap Seconds:** Enter the leap seconds, GPS – UTC (default is the leap seconds at the time the respective NavView installation MSI was created)

6. **Is Network Time Publisher:** Checking this checkbox sets this NavView client to publish time sync messages over the network via Network Services
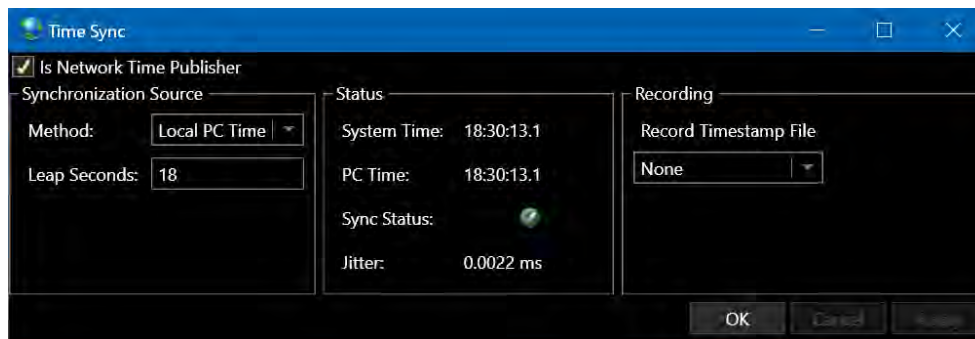
FIGURE 13-8 IS NETWORK SOURCE OPTION

Note: If NavView is set to Is Network Time Publisher, for the time message to be published over the network services it needs to be enabled in the Web Network Services view as shown below. Note that when a NavView is enabled as the Time Sync Publisher the Time Sync Receiver status will state Time message discarded because it does not use the time message received via the network since it is the source of the same. For further details, see the Network Services section.
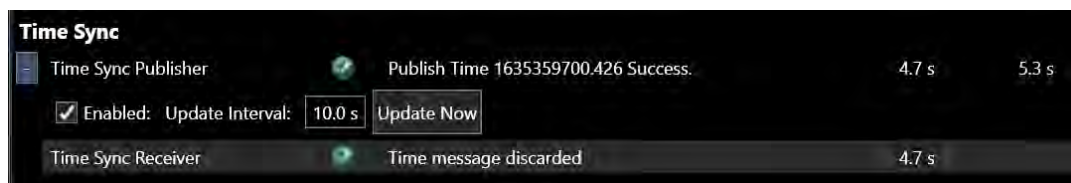
FIGURE 13-9 WEBE NETWORK SERVICES - TIME SYNC ITEM

7. **Record Timestamp File:** If it desired that timestamp data is to be logged, select the format to log in. This file is used to relate the system time logged with raw device data files and event files to UTC.

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a. **None:** No time synchronization time stamp file is required, i.e., raw device data logging is not active

b. **ASCII:** Time synchronization time stamp file is logged in a human readable ASCII text format and is supported for raw data processing and playback.

c. **Binary:** Time synchronization time stamp file is logged in a binary format; this is the most space efficient format and is supported for raw data processing and playback.

8. Click **Apply**

9. Click **OK**

13.3 Monitoring Synchronization

The synchronization is monitored with the Time Sync dialog (see Figure 13-10). The key indicators are the Sync Status and Jitter.
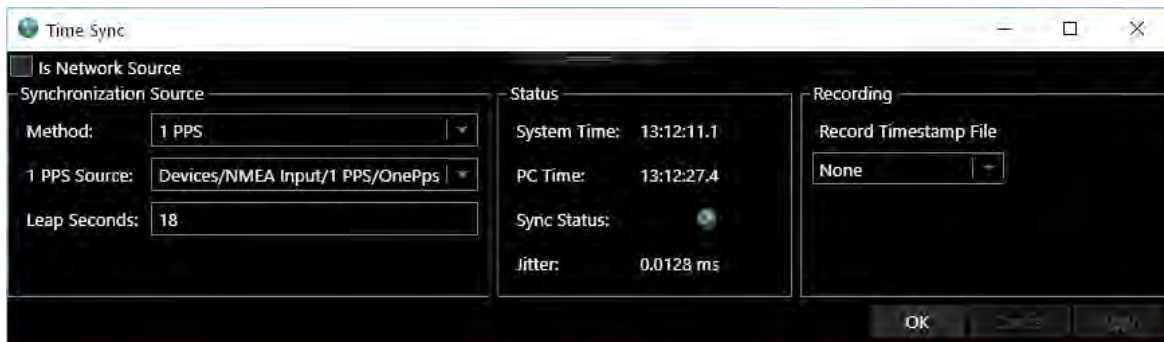
FIGURE 13-10 TIME SYNCHRONIZATION MONITORING

System Time: Displays NavView system time in Local or UTC as per the Preferences setting

Computer Time: Displays the PC time in Local or UTC as per the Preferences setting

Sync Status: LED indicates the status of the data source and synchronization, ▣ indicates the message associated with the configured Method is being received and successfully applied, ▣ indicates it is not (this state is displayed if the synchronization is not enabled).

Jitter: Displays the root mean square (RMS) of the synchronization jitter in seconds, i.e., the variation of the offset of the system time value from the external UTC time reference, cycle to cycle. This should be a small value, e.g., the jitter in Figure 13-10 is an example of synchronizing to a 1PPS signal from a GPS receiver where the jitter is 0.01 milliseconds.

13.4 Time Synchronization File

The time synchronization file is logged to a *TimeSync* folder in the respective station's raw data folder (e.g., *Project\Local\Station\RawData\TimeSync* where Station is the specific NavView station logging the data). Within the TimeSync folder, folders are created and named for each day (e.g., *2015-11-24* for November 24, 2015). The time synchronization file itself is placed in the respective day folder and

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named for the UTC time when the file is started (e.g., *152726.csv* is and ASCII file started at 3:27:26pm UTC). The file contains the system time, the respective UTC time offset and the filter's jitter for that epoch.

13.5   Data Time Stamping

All NavView data and observations are precisely time stamped with system time to an accuracy of 1ms. This includes the data received by a device as well as the observations resulting from a calculation. It is important to note that regardless of the time synchronization method in effect, the system time associated with data and observations is used for epoch matching, interpolation, etc., to ensure precise relative accuracy.

Note: In the case of a device, if NavView is synchronized to UTC using 1PPS and the source hardware providing data is also precisely synchronized to UTC and includes a time of data in the data message, it is recommended that the device configuration in NavView be set to use Message time.

The system time is also logged with the raw data. The offset between system time and UTC can be logged to a time file for future reference and post-processing.

When replaying logged raw sensor data, the system time logged with the raw data is used to ensure precise relative timing accuracy between the respective data inputs. The UTC time file is used to provide the respective UTC times.

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14 Database Services

14.1 Overview

NavView supports comprehensive data logging ranging from basic logging for normal construction operations, to more specialized applications such as position fix averaging, DVL calibration and USBL calibration.

NavView's Database Services uses SQL Server databases. SQL Express LocalDB is installed with NavView to provide a basic minimum logging medium. NavView can optionally connect to any instance of SQL Server or SQL Express available on the network. The main difference between an instance of SQL Express LocalDB and SQL Server or SQL Express is that a LocalDB instance is available only to the NavView application running on the same PC, where a single instance of SQL Server or SQL Express installed on a network is available to all NavView clients with network access.

Note: There should only be a single instance of SQL Server on a vessel based NavView network. All NavView systems onboard are to be configured to connect to this instance. They will all log to and access the databases on this server.

NavView manages the databases and the features that use them, including logging and querying across multiple databases, in the Database Services section of the Explorer window under the Data branch (see Figure 14-1).
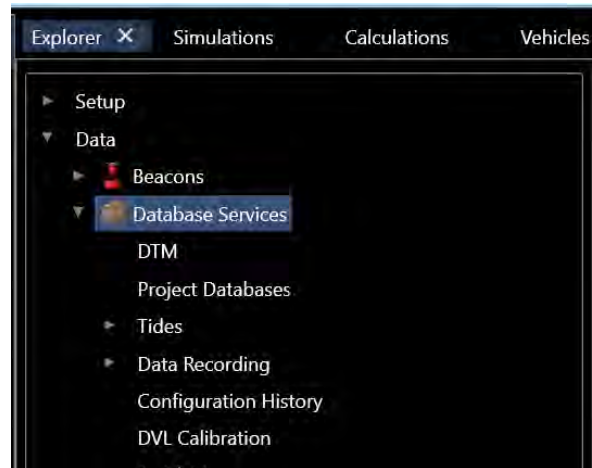
FIGURE 14-1 DATABASE SERVICES - EXPLORER

These services and their applications are detailed here.

If Roles and Privileges are enabled, the user must log in as Online, Supervisor or Admin in order to configure the Database Services.

14.2 Configuring Database Services

In order to use any Database Service the user must follow these steps:

1. Enable the services

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2. Select the instance of SQL Server to connect to

3. Select and configure the authentication type to use

4. Configure the services, including the target folder of the associated database files in the case of localdb

5. Test the connection

6. Apply the connection

These steps are broken down here.

Note: When using SQL Server or SQL Express, a User (admin) with a password (admin) must be added to SQL with permission to create databases and administer bulk operations. For details on installing and configuring SQL, refer to section 1.2.3 Optional Software: SQL Server Express and SQL Server Management Studio.
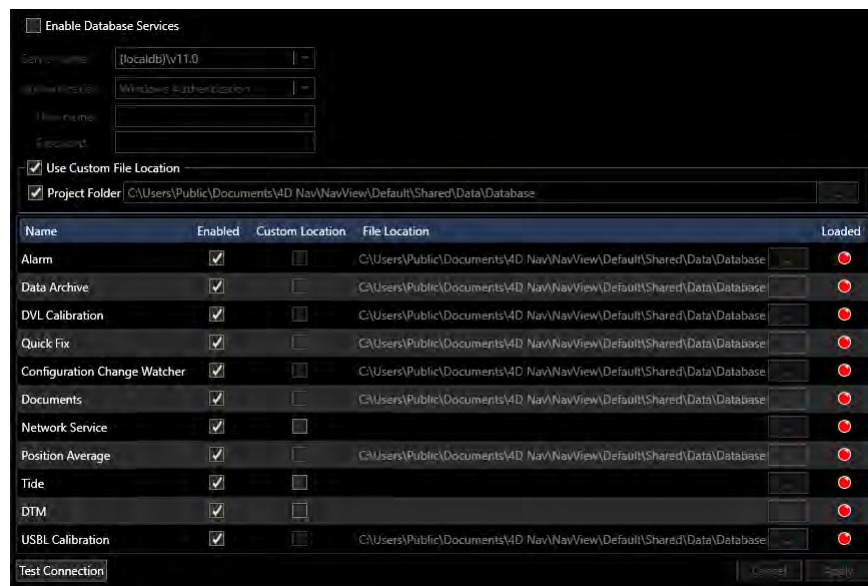
FIGURE 14-2 DATABASE SERVICES - SERVER CONFIGURATION

14.2.1 Configure Server

1. Open the Explorer window and navigate the tree to select **Database Services** as shown in Figure 14-1 to access the connection configuration shown in Figure 14-2.

2. **Enable Database Services**: Check this box to enable database services, this will activate the options for selecting the SQL Server

3. **Server name:** Select the server to connect to from the drop-down list

   - Selection of the server determines the configuration options.

   - The default is the **(localdb)\v11.0**, the local SQL server installed with NavView.

   - If a different server is desired than that displayed, such as SQL Server or SQL Express, click on **<Browse for more…>**. NavView will detect all versions of (localdb) on the local

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PC and all SQL Server and SQL Express instances present on the network. From the list generated, select the desired database and click OK. If the desired server instance is not present in the list a server name can be typed into the editable Server name combo box using the format [Computer name or IP address]\[SQL Server instance name].
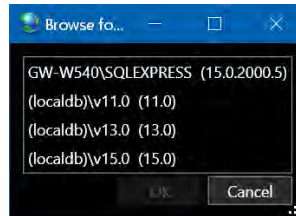
FIGURE 14-3 DATABASE BROWSE RESULTS

Note: NavView only supports the version of localdb installed with NavView, (localdb)\v11.0.

Note: NavView supports all versions of SQL Server and SQL Express.

4. **Authentication:** From this drop down list, select the authentication method to use to access and create databases

- **Windows Authentication:** Select this option to use the current Windows user's credentials to connect with the database.

- **SQL Server Authentication:** Select this option to use a SQL Server login account to connect with the database.
  - o **User Name**: admin
  - o **Password:** admin

Note: Windows Authentication is only recommended when the (localdb) is used. Otherwise use SQL Authentication.

Note: The User name and Password given here are based on the instructions given in section 1.2.3 Optional Software: SQL Server Express and SQL Server Management Studio being followed.

14.2.2 Configure Database Services for localdb

The use of SQL LocalDB enables a flexibility not available with other database server options, specifically designating where the database files will be saved. The default is the [Project]\Shared\Data\Database folder. Using this location simplifies project management and archiving since all data saved to databases for the project is contained within the NavView project folder.

1. **Custom Database File Location:** Check this box to enable assigning the location for the database files.

2. **Project Folder**: Check this box to direct the database files to the current project folder, specifically the [Project]\Shared\Data\Database folder.

3. **Browse button:** If the Project Folder box is not checked, click this button to browse to and select the target folder for the database files.

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Note: The **Custom Database File Location** option is not checked, the database files are written to the localdb\v11.0 default location, i.e. Users\[UserName] folder.
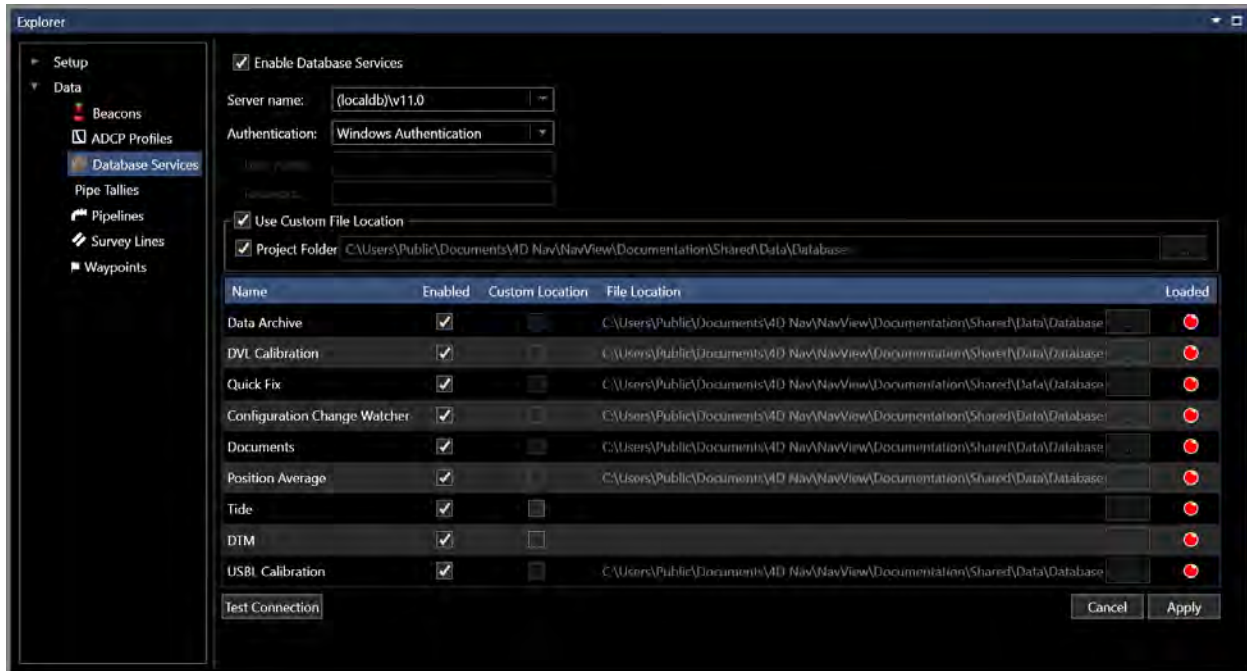
4. Figure 14-4 Configure (localdb)\v11.0 Database Services
   - In the data grid in the section of the window displaying the database services supported by NavView, select those services to be loaded and used

Note: If the user is not familiar with the NavView services and which will be used for their application, it is recommended that the default setting of all services being Enabled be used.

- **Name**: Name of the database service
  - **Data Archive:** Supports comprehensive data recording, querying and exporting
  - **DVL Calibration:** Supports Doppler Velocity Log (DVL) calibration
  - **Quick Fixes:** Supports configurable single button fixing
  - **Configuration Change Watcher:** Supports tracking and logging of NavView configuration changes
  - **Documents:** NA
  - **Position Average:** Supports comprehensive position fix data recording, reporting, querying and exporting
  - **Tides:** Supports loading and application of tide data
  - **Digital Terrain Model:** Supports loading and managing of DTMs
  - **USBL Calibration:** Supports data logging for USBL Calibration

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- **Enabled**: Check/uncheck the respective boxes to select those services that are to be used

- **Custom Location**: In the case of the Tide and DTM services, the target folder for the associated database files can be overridden by checking this box, then clicking the associated Browse button to navigate to and select the desired target folder

- **File Location:** Displays the target folder for the associated database files if a Custom File Location is used

Note: In the case of Tide and DTM database files, the File Location is only displayed if the Custom File Location is overridden.

- **Loaded**: Traffic light indicating status of service

  🔴 Indicates the service is not loaded, will display if service is not enabled or if it is enabled but unable to load. Mousing over the Name or Loaded cell will show a tool tip detailing the problem.

  🟢 Indicates the service is enabled and successfully loaded.

Note: The selection of database services can be edited at any time, including after the database services have been enabled and used.

14.2.3 Configure Database Services for SQL Server or SQL Express

The use of SQL Server or SQL Express is required if other computers, including other NavView clients, require access to the databases.

FIGURE 14-5 CONFIGURE SQL EXPRESS DATABASE SERVICES

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1. In the data grid in the section of the window displaying the database services supported by NavView, select those services to be loaded and used

14.2.4 Test and Apply Database Service Connection

1. Click **Test Connection** to confirm that the configuration is correct and the user has the required privileges to create databases and administer bulk operations
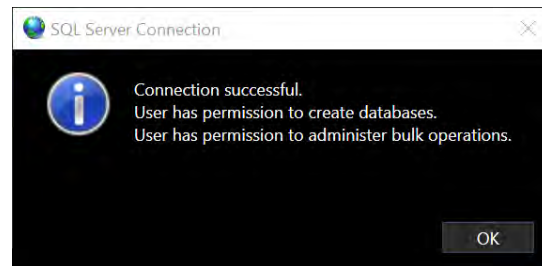
FIGURE 14-6 SUCCESSFUL CONNECTION TEST RESULTS

2. Click OK to complete test.

Note: If this test fails, investigate the database instance configuration and server Roles before proceeding to step 3. The most likely reason for a failed connection test is insufficient server privileges assigned to the SQL user account.

3. Click Apply

4. Monitor the loading of the services, the icon in the Loaded column will turn from red to green as each is successfully loaded

14.3 Data Recording

NavView supports extensive data recording options. The logged data can be queried, and the results exported for use in 3rd party software.

14.3.1 Configure Data Recording

1. Open the Explorer window and navigate the tree to select **Data Recording** (see Figure 14-7)
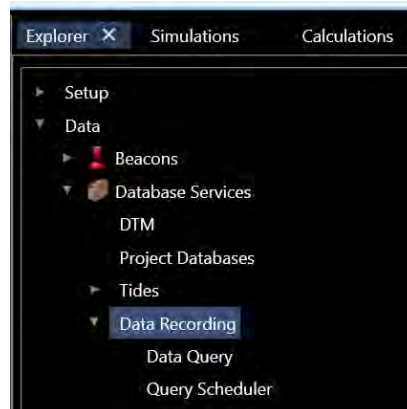
FIGURE 14-7 DATA RECORDING - EXPLORER

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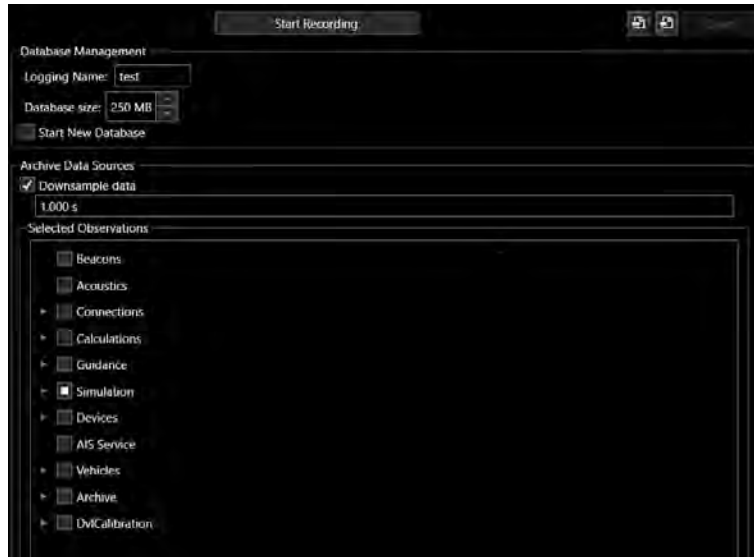
FIGURE 14-8 CONFIGURE DATA RECORDING

2. In **Database Management** (see Figure 14-8)

    a. **Logging name**: Data recording databases are by default named **[Project Name] - Archive(n)** where Project Name is the name of the current NavView project and n is an incrementing database count/id. This name can be augmented by adding a user defined name that is appended to the default name. This facilitates subsequent data querying by allowing the operator to name databases based on tasks (e.g. Gyro Calibration) or project stages (e.g. Pre-Lay) making it easier to identify which databases are relevant when performing queries.

Note: Once a Logging Name is entered, it will continue to be used until it is either cleared or changed. Therefore, it is strongly recommended that this entry be checked prior to starting any data logging session to confirm it is still relevant.

    b. **Database size**: Enter the maximum size of the databases. Selecting the maximum database size is a balance between optimizing performance and file management, i.e. few large databases versus many small databases. Be aware that SQL Express and SQL localdb each have a maximum database size of 10 GB so do not set a maximum size larger than this or data will be lost.

    To enter the maximum size, either type it in or use the up/down arrows. NavView interprets the entry as MB regardless of any abbreviation entered.

Note: When logging data, NavView monitors the recording of data to the current database and as the size approaches the maximum, it creates the next database so that switching between databases is seamless and no data is lost.

    c. **Start New Database**: Check this box to force NavView to start a new database when the data recording is next started. If this box is not checked, the current active database is written to when data recording is started.

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d. **Export Template** **:** Clicking this button enables the user to save the current configuration, both the Database Management and Archive Data Sources, to a *.4dl file as a template. This allows multiple logging scenarios to be created and saved for later use.

e. **Import Template** : Clicking this button enables the user to browse to and select a previously exported *.4dl file to load the Database Management and Archive Data Sources configuration.

f. **Save**: When recording is started, the Database Management and Archive Data Sources configuration is saved. In order to save the configuration without starting logging the user must click this Save button.

3. In **Archive Data Sources**, configure the logging interval and the data to be logged

a. **Downsample data**: Check this box to enable control of the data recording interval. This addresses instances where the rate of observations published by a single data source are much greater than what is required to be logged, e.g. an MRU outputting at 80Hz. If this is unchecked, all data for all selected data sources is logged.

i. If checked, enter the logging interval, i.e. the minimum interval at which to accept an observation of the same type from the same data source. Entry is in time format, e.g. 10 seconds entered as 10, 1 minute as 1:00 or 60, etc.

Note: Entering 0 for the **Downsample data** setting results in all data for the selected data sources to be logged.

b. **Selected Observations:** Select those data sources to be logged

i. Data sources are presented in a hierarchical tree with the parent data source, e.g. Calculations, at the top level and branches descending through each child level until the base sources for that branch is reached, e.g. Calculations\Vehicle\ Heading or Calculations\Vehicle\Offsets\Origin\Heading.

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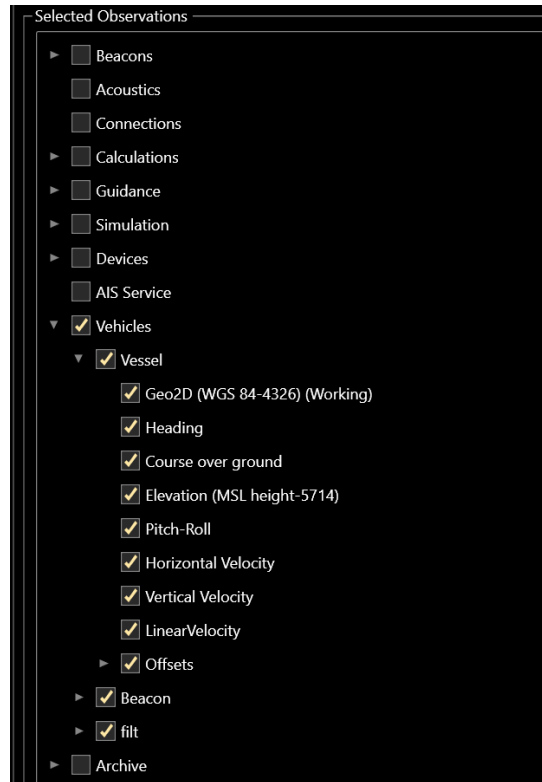
FIGURE 14-9 EXPANDED DATA SOURCE TREE

    ii.   A data source can be checked and unchecked at any level and the action will be applied to all children of that source

    iii.   A check mark in a box indicates that source and all those below it are selected to be logged

    iv.   An empty box indicates that source and all those below it are not selected to be logged

    v.   A filled square in a box indicates that some but not all sources below it are selected to be logged

Note: If an observation source is added to the project after setting up the data recording items, e.g. a Vehicle or Device, if any observations generated by the new source are to recorded, the Data Recording must be stopped (see section 14.3.3.2), the items selected for recording, and the recording started again.

Note: There are redundancies in the Selected Observations. For example, Figure 14-10 shows the same 2D Geographic observation selected via the Vehicle branch and the Devices branch. However, users are warned not to be overly selective in an attempt to minimize media space when logging data in case the required data is overlooked and not logged.

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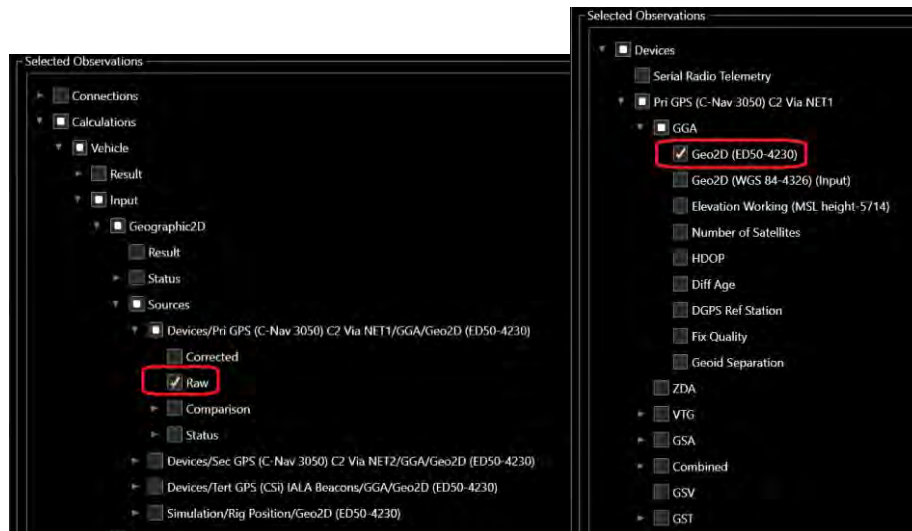
FIGURE 14-10 DATA RECORDING - REDUNDANCIES

14.3.2 Start Recording

1. Open the Explorer window and navigate the tree to select **Data Recording** (see Figure 14-7)

2. Click **Start Recording**

3. Data recording starts and the view changes to a data recording monitoring view

Note: It may take several seconds to start the initial recording session as NavView addresses database management, including creating a database if required.
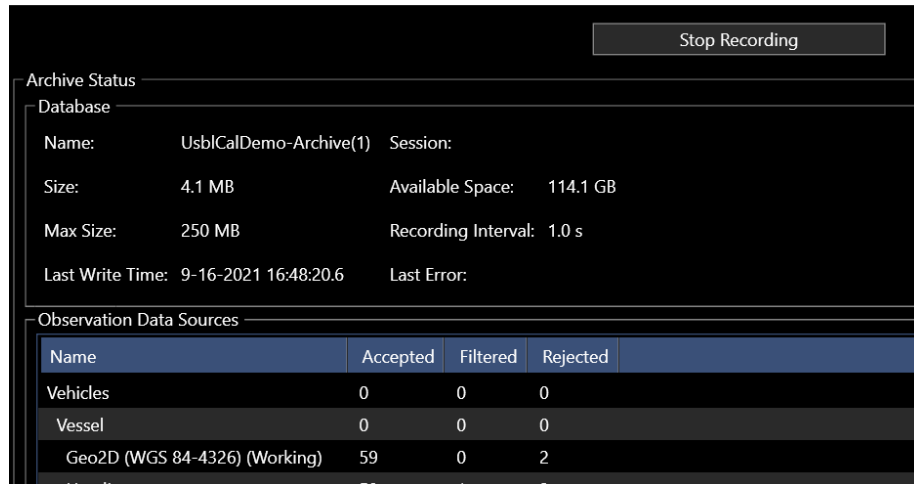
Note: Data recording takes place regardless of whether the Explorer window is open or not, or if the Database Services item is selected and visible.

14.3.3 Monitor Recording

Data recording can be monitored via the Explorer view, data recording information available for display in Text windows and a specific Archive Monitoring view.

14.3.3.1 Explorer View

When data recording is active, open the Explorer window and navigate the tree to select **Data Recording**, the data recording status is displayed in **Archive Status**

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- **Database** information
  - o **Name:** Name of the database being written to
  - o **Size:** Current size of the database being written to
  - o **Max Size:** The maximum size for the databases is displayed
  - o **Available Space:** The current available space remaining on the server
  - o **Recording Interval:** If Downsampling is enabled, the recording interval is displayed
  - o **Last Write time:** Date and time of the last data written to the database

- **Observation Data Sources** recording summary and status in a data grid
  - o **Name:** Name of each data source being recorded, listed hierarchically with the parent(s) of any child source being logged also listed whether the parent(s) themselves are being logged in order that the branch any data source belongs to is clearly evident
  - o **Accepted:** The number of data records logged
  - o **Filtered:** The number of records that have been discarded and not recorded based upon the **Downsample** setting, i.e. logging interval

Note: The use of **Downsample** is recommended when one or more of the data sources to be recorded have very high update rates, e.g. pitch and roll from an MRU device can often be input to NavView 50Hz and higher. In most cases it is not necessary to record all this data and the impact of logging it all would then be wasted space used for the database.

  - o **Rejected:** The number of records that have been rejected, this value should only increment when the first database is created as NavView initiates the data recording, these are the records that occurred between the clicking of **Start**

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Recording and the actual starting of the recording. This value should not change while recording is active.

14.3.3.2 Text Views

Information regarding the state and status of the data recording can be displayed in a Text view. Figure 14-12 shows the display options available under Data Archive and Observations > Archive.
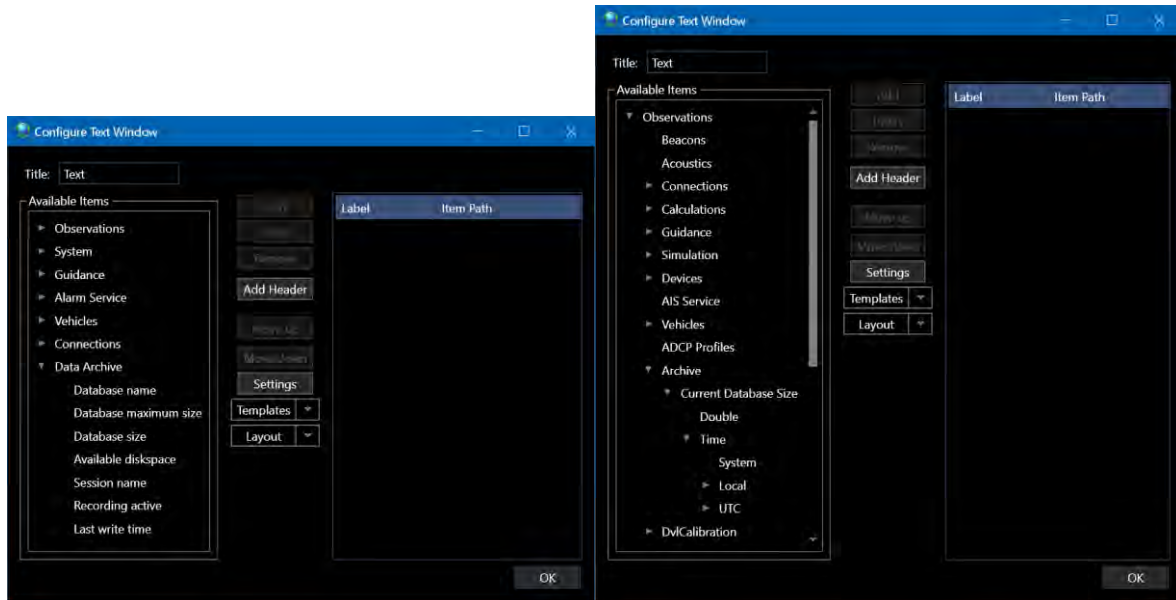
FIGURE 14-12 DATA RECORDING MONITORING - TEXT VIEW

14.3.3.3 Data Archive View

Data recording can also be monitored using the Archive Monitoring window. This is opened from Data Archive icon in the View ribbon as shown in Figure 14-13. The resulting window in a not data recording state and a data recording state is shown in Figure 14-14. When in a recording state, the information displayed mimics the Explorer View.
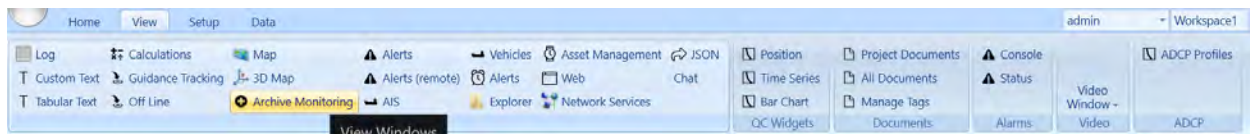
FIGURE 14-13 VIEW RIBBON - ARCHIVE MONITORING VIEW

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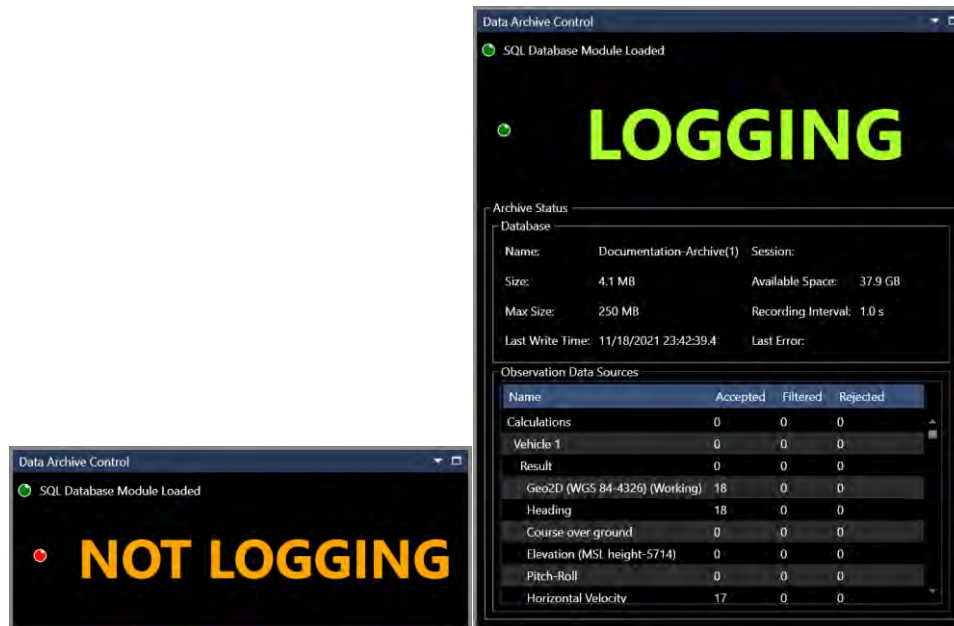
FIGURE 14-14 ARCHIVE MONITORING WINDOW

14.3.4 Stop Recording

1. Open the Explorer window and navigate the tree to select **Data Recording** (see Figure 14-7)

2. Click **Stop Recording**

3. The view will revert to the data recording configuration view

14.3.5 Data Query

NavView supports querying of the recorded data to enable the extraction of selected observations for viewing and export in a comma delimited file format. Data can also be exported to various types within NavView itself, including Waypoints, Pipelines, Survey Lines, and Umbilicals/Flowlines.

Note: A database can be queried even if it is the current database and is being written to while the data query is being executed.

Note: SQL Server and SQL Express databases can be queried by any NavView client on the network that has been configured to connect to the server.

o Open the Explorer window and navigate the tree to select **Data Query** under **Data Recording**

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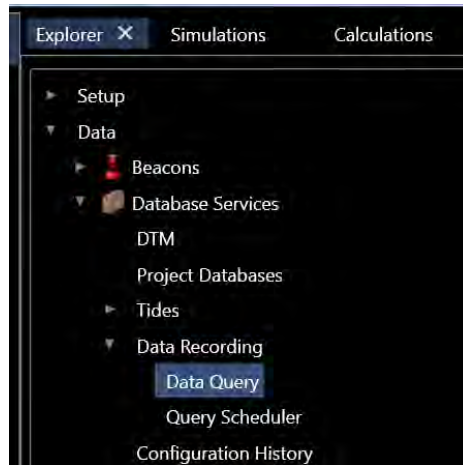
FIGURE 14-15 DATA QUERY - EXPLORER
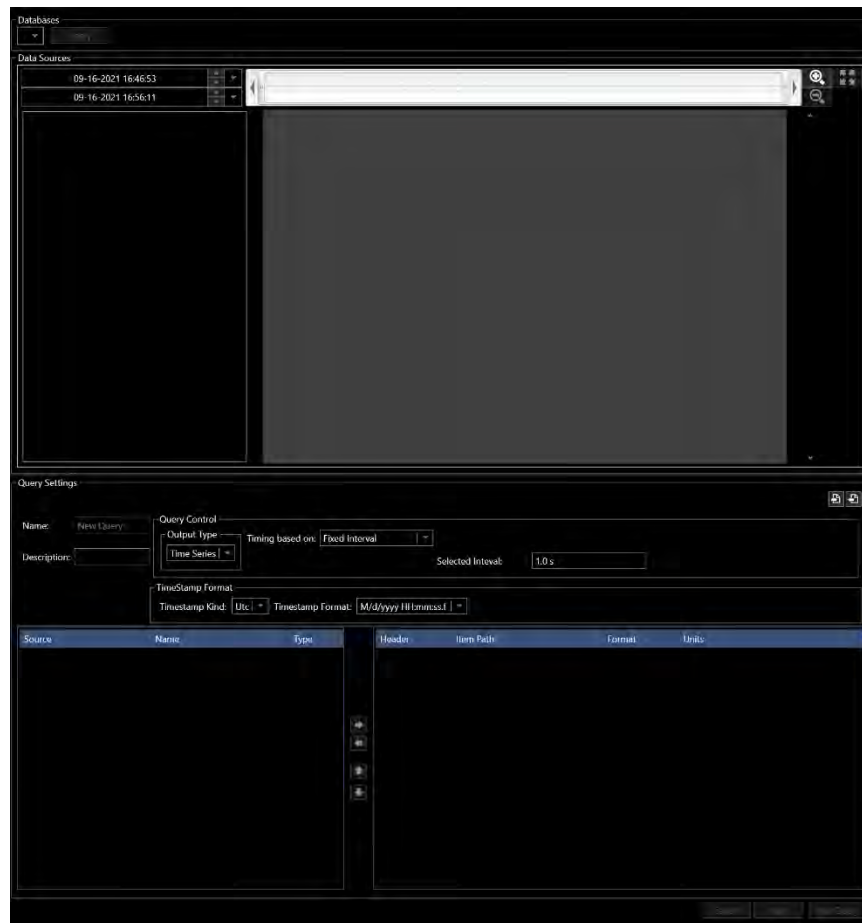
FIGURE 14-16 DATA QUERY VIEW

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o **Databases**: Select the database(s) to query from the available archive databases loaded in the project that are listed in this dropdown and checking/unchecking the associated check box (see Figure 14-17).
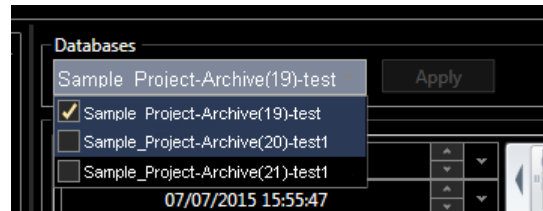
FIGURE 14-17 SELECT DATABASES

o **Data Sources:** Select the time frame and the data sources to query

  o **Data Timeline:** Select the time frame to query data for using the timeline (see Figure 14-18).
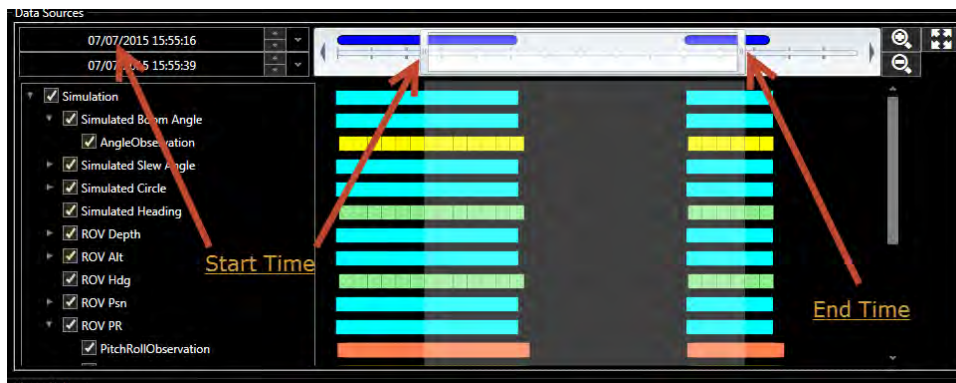
FIGURE 14-18 DATA TIMELINE

  o **Start Time** A date and time may be entered for the start time of the query. The left side of the selection window updates to match the time in the date/time box. If the selection window is moved, the time in the box will update.

  o **End Time** Similarly, the end time of the query can be controlled both from the right edge of the selection window, and from the time entered in the lower box. Time is displayed in the currently selected time format (either UTC or local).

  o **Zoom Buttons** The zoom buttons are used to update the view to get a closer look at the data. Once the start and end time have been updated with the date/time boxes or the sliders, the [icon] zoom in button will become highlighted. Clicking this option will zoom the view so that the selected area fills the entire width.

  o The [icon] zoom out button will zoom the previously selected range, one step back.

  o The [icon] zoom extents button will zoom out to the entire range of data in the selected databases.

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Note: The default Start Time is the start time of the oldest of the databases selected, and the default End Time is the end time in the newest database selected at the time of the Apply button being clicked.

- o **Data Sources Indicators** The presence of data is shown by the data indicators. This consists of a data source tree on the left, and data bars on the right panel.
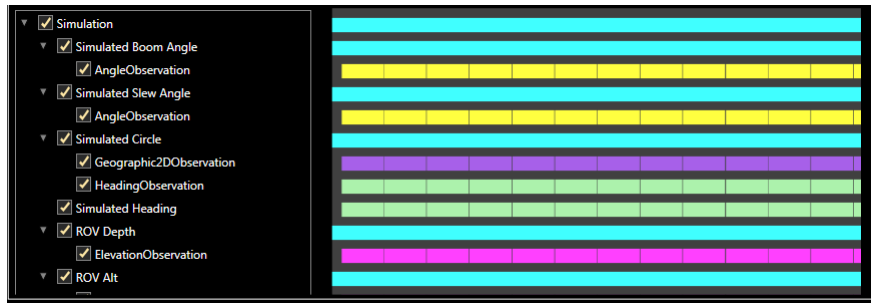
FIGURE 14-19 DATA INDICATORS

Data sources that have been selected as part of the data tree but do not directly provide data are shown by an aqua bar covering the selected time period. As an example, Figure 14-20 shows the "Simulated Circle" data source being selected, described by an aqua colored bar. The simulated circle data source itself does not have any observations, but it acts as a parent data source for the sub items, Geographic2DObservation and HeadingObservation.
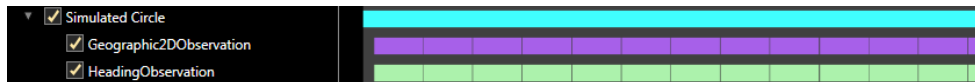
FIGURE 14-20 SELECTED DATA SOURCES

The ToolTip for a parent data source will provide the time period spanned by the Logging session of which it is derived, while the tooltip for a child observation data source will show the actual data of the observation (see Figure 14-21).
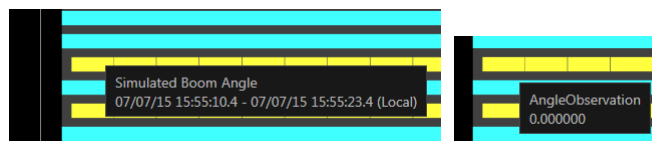
FIGURE 14-21 TOOLTIP FOR PARENT DATA SOURCE VS CHILD DATA SOURCE

The data sources available are color coded according to type, as shown in the following table:

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Data Type	Color
Geographic2D (latitude, longitude)	
Elevation	
Heading	
Pitch/Roll	
Other	

- o **Data Tree:** Select the data to query from the hierarchical tree in the left panel that lists the data that was recorded for the specified time frame by checking or unchecking the associated check box. Only the data sources selected will be made available to query specific data from.

Note: It is recommended to only select those data sources that contain the data to be queried. This minimizes the amount of observation types listed to be selected from when configuring the Query itself.

Note: Only data from that recording session will appear in this tree, not all real time data sources available in the project. This enables data to be queried offline by a system that does not have the same real time setup.

- o **Query Settings:** Once the start and end times and data sources are configured the query can be configured. The query settings panel is shown in Figure 14-22.

The data grid on the left, referred to here as the Available Data Sources, contains all the data sources that were selected in the data source tree. The columns are:

- **Source:** The path of the selected data source, i.e. Vehicles/Vehicle Name/
- **Name:** The name of the data source, together with the source forms the full path
- **Type:** Shows the type of observation associated with the data source

The data grid on the right, referred to here as the Selected Data Sources, contains those data sources selected to query for. The columns are:

- **Header:** The user assigned column header for query result
- **Item Path:** The data source path and data name (see above)
- **Format:** The user assigned format for the query result
- **Units:** The user assigned units the query result is to be output in

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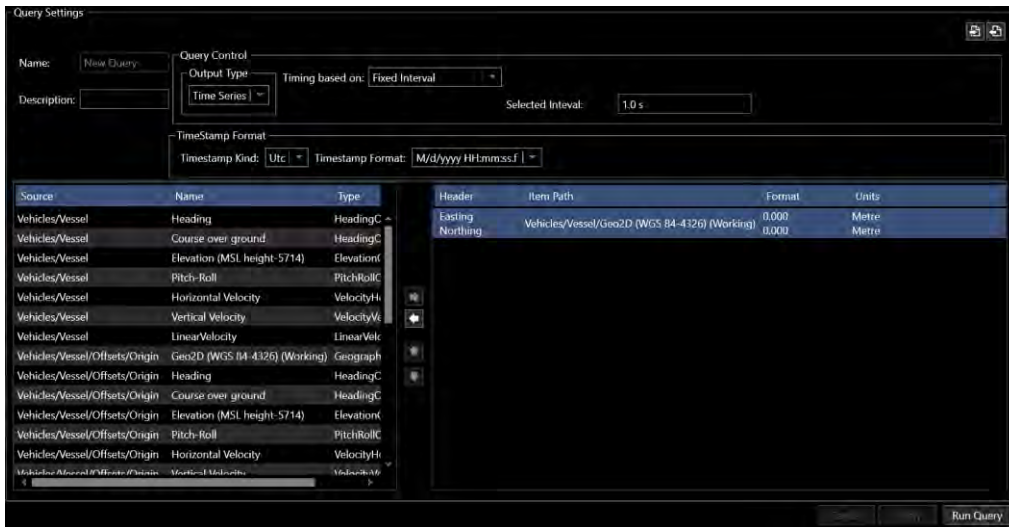
FIGURE 14-22 QUERY SETTINGS

- **Add items to the query**
  - Select one or more data sources from the Available Data Sources and click the ⬛ to move them to the Selected Data Sources.
  - Adding a data source to the Selected Data Sources will create an **Add Formatter** dialog (see Figure 14-23) allowing the selection of the specific data to query in the case of data sources providing multiple values, e.g. Geographic2D, the text to appear in the query result column header, the units to use and the data format, e.g. number of decimal places, include units term, etc.

Note: It is recommended that the format not include unit abbreviations nor symbols as these will potentially make importing and analysis with 3rd party software difficult.
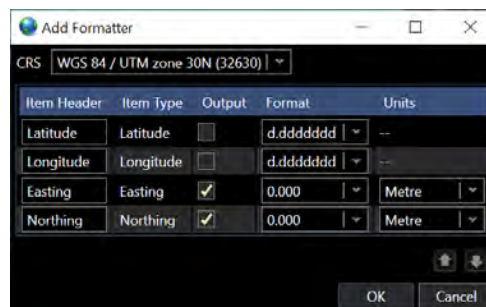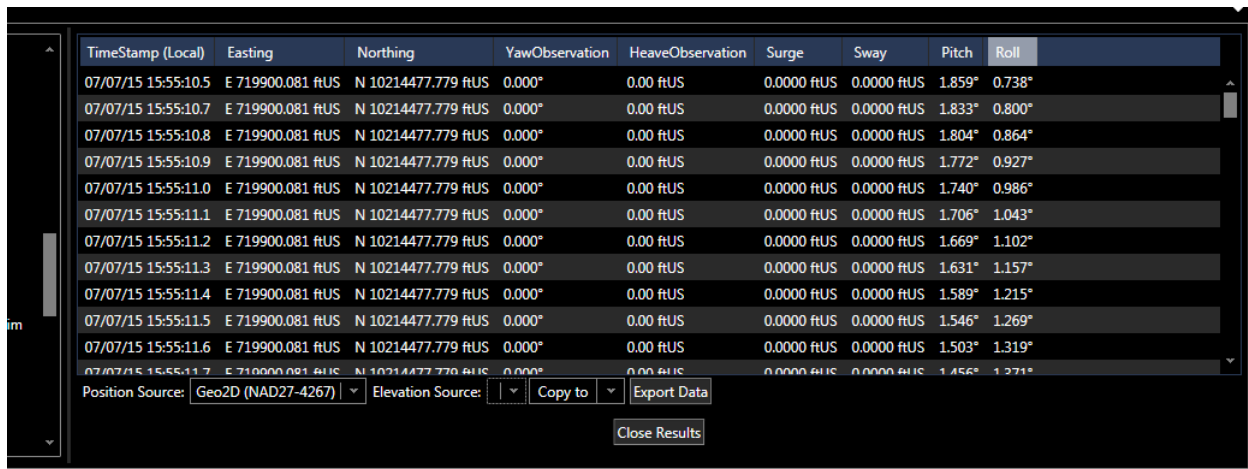
FIGURE 14-23 ADD FORMATTER DIALOG

- If one data source is added at a time, a dialog will appear so that the formatter can be configured prior to the observation being added to the selected list

- If multiple data sources are added at once, default settings are applied and all formatters are created and the data sources added to the selected list
  The formatters for the data sources already added to the data grid on the right can be edited

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- If the data source provides a single value, e.g. Pressure, double clicking on the Item Path cell will open the respective formatter dialog, but the Header and Format can be edited directly in the data grid by clicking in the respective cell
- If the data source provides multiple values, e.g. Geographic2D, double clicking on the data source (any cell) will open the respective formatter dialog

- **Remove items from the query**
  - Select the data source to be removed from the query in the Selected data Sources on the right
  - Click the [⬅] button to move it back the Available Data Sources
- **Change the items order**
  - Select the item to move in the Selected Data Sources and click the [⬆] button to move up in the order or the [⬇] to move it down in the order
- **Query Control:** Configure the query timing, see Query Control for details
  - Apply the Settings by clicking the **Apply** button
  - Run the query by clicking the **Run** button. Depending on the period of time queried, it could take several seconds or minutes to complete the query. A status indicator will appear, and when the query is complete, the list of result data will be shown.

5. **Results**: The query results are presented in a tabular data grid format, with headers set in the format configurations. An example output is shown in Figure 14-24.

FIGURE 14-24 DATA QUERY RESULTS

- **Export to CSV:** Use the **Export Data** button to save the resulting data as a CSV file.
  - Once the export has completed, the user will be prompted with a message stating how many records were exported and if they wish to open the file with the default Windows text editor, click Yes or No accordingly

Note: If there is no default text editor. NavView will throw an exception and abort the attempt to open the exported csv file.

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- **Copy To:** If the queried data contains position sources (Geographic2D), it can be exported into various data types for use directly in NavView. The options are found by clicking the down arrow on the **Copy To** button. The options available are as shown below in.
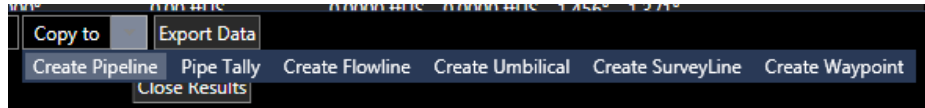
FIGURE 14-25 DATA QUERY RESULTS - COPY TO OPTIONS

The Create Flowline and Create Umbilical options work well when depth data is available as they generate a 3d line using the elevation source.

Pipeline and umbilical options do not use the passed in depth source, which is not required. Pipelines generate their depths from a DTM, and survey lines are tracking references with no depth component. See the working files section of the NavView documentation for further information on these data types.

Creating waypoints will create one waypoint for each epoch of data, so exercise caution if there is a great number of data times in the results.

- **Close Results:** Click to return to the query screen and perform additional queries.

14.3.5.1 Data Formatters

There are two main categories of data formatters: basic and multi. A basic formatter is used for those data sources that provide one value, also referred to as a data field, such as a heading, or length. A multi formatter is for data sources that provide multiple data fields, like Pitch/Roll, Surge/Sway and USBL observations.

Each data field will form one column in the data results. The data formatter controls how the data in that column is presented. This includes the following components:

- Header: The text that will display at the top of the column

- Format: How the value will display, i.e. number of decimal places, if a thousandths separator is used, if symbols will be included, and if the units will be included

- Units: The units the data will be in, if applicable

Basic formatters can be configured directly in the data grid (inline) as well as via a dialog, while multi formatters must be configured in the dialog. Figure 14-26 shows the configuration dialog and the inline configuration for a heading formatter, a single data field data source.

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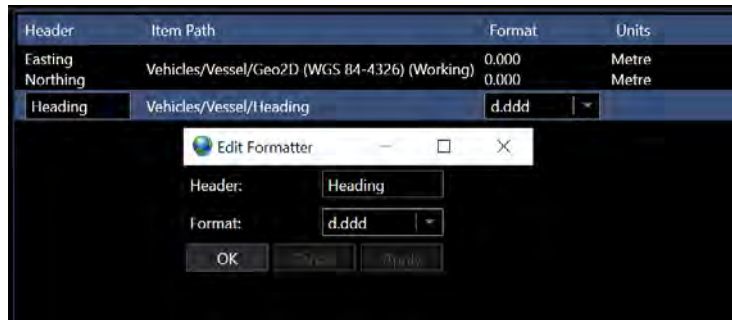
FIGURE 14-26 BASIC FORMATTER CONFIGURATION DIALOG

Figure 14-27 shows an example of a multi formatter configuration dialog. Each individual data field that is available in the data source is listed in a data grid and can be configured for a header, whether or not the data is to be included in the results, format and units selection (if available).
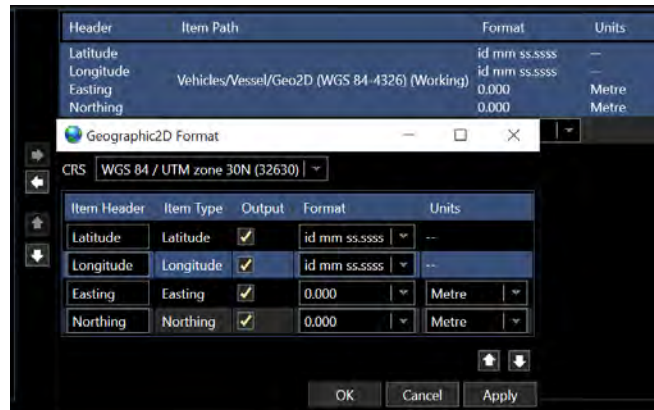
FIGURE 14-27 MULTI FORMATTER CONFIGURATION DIALOG

The format options are selectable from an applicable drop-down list as shown in Figure 14-28. If the desired format parameters do not appear in the list, it is possible to manually type in a format. For instance, there is no format to display 4 decimal places, so if this is required, simply type "0.0000" or "0.0000 u" to output a 4 decimal place result with or without a unit indicator (u).

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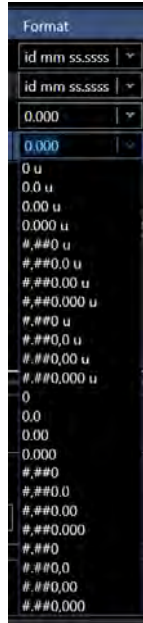
FIGURE 14-28 FORMAT OPTIONS

In the case of the formatter for Geographic positioning data, the formatter configuration allows for the selection of an output Coordinate Reference System. By default, the current working CRS will be selected when the formatter is created. This can be changed to select any other CRS currently added to the project. The data will be converted after query and the result output.
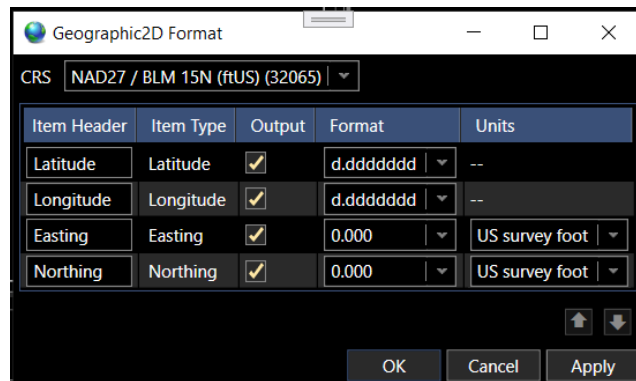
FIGURE 14-29 GEOGRAPHIC FORMATTER

14.3.5.2 Query Control

The query control has the option to output data as either a time series, or as a statistical roll-up.
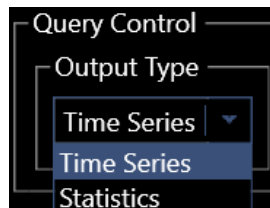
FIGURE 14-30 QUERY CONTROL-OUTPUT TYPE

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If the statistical option is chosen, the statistical function chosen in each formatter will be applied for the duration of the query, and one result output. If the time series option is selected, the output will be based on the timing selection.

14.3.5.2.1 TIME SERIES - TIMING CONTROL

Data for the queries are formed by querying the database with specific times based on one of the following options:

- Selected DataSource
- Fixed Interval
- Minimum Interval
- Manual Times

A linear interpolation based on the specified time is performed to retrieve data for each selected data source in the query. Details of each timing source are given below.

14.3.5.2.2 SELECTED DATASOURCE TIMING

A data source from the Selected Items list is selected as the source of the primary data epoch. Data is queried from the database for this data source. Data from all other data sources is then interpolated to match the time stamps of the primary data source.
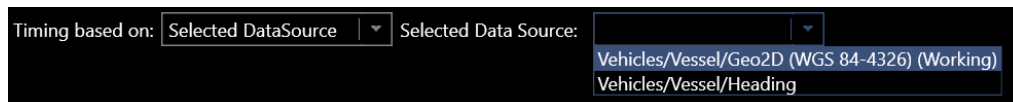
FIGURE 14-31 SELECTED DATA SOURCE TIMING EXAMPLE

For example, if Geographic2D data was received and logged at 3 second intervals and heading data was received and logged at 1 second intervals, it is recommended that the Geographic2D data source be selected as the primary data source. Then for each Geographic2D observation the closest preceding and following heading observations are used in a linear interpolation to determine the heading for the Geographic2D data epoch.

Note: It is recommended that the key data source observation type be selected as the Selected Data Source for this query type. For example, if investigating USBL data, select the USBL device data as the Selected Data Source so that other data is interpolated to its epoch.

14.3.5.2.3 FIXED INTERVAL TIMING

A fixed interval value is selected by the user. Data is then queried for all data sources, and a linear interpolation is performed at each time interval to derive a value for that epoch.
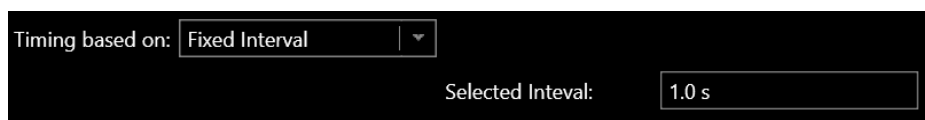
FIGURE 14-32 FIXED INTERVAL TIMING EXAMPLE

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14.3.5.2.4 MANUAL TIMES

With the Manual Times option, a list of specific times may be imported from a file. The Query will then use these specified times to interpolate all data formatters. The times file consists of a text file where one time value is stored on each row.

FIGURE 14-33 MANUAL TIMES TIMING

Click on [Config Time] to open the Manage Times window to import file containing specific times.
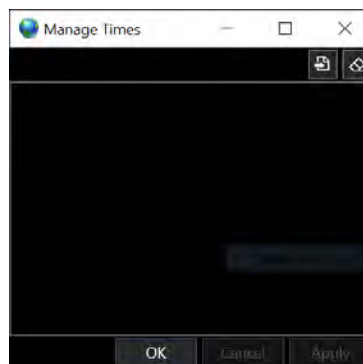
FIGURE 14-34 MANAGE TIMES IMPORT

14.3.5.2.5 MINIMUM INTERVAL

Minimum interval requires the selection of a primary data source, and a minimum time. Timestamps will be determined based on the data times of the primary data source, but if that data source comes in at a greater speed than the minimum interval to query, then the in between epochs will not be output. The other data sources will be linearly interpolated to match the epochs of the resulting primary data source epochs.
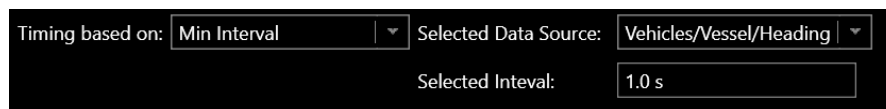
FIGURE 14-35 MINIMUM INTERVAL TIMING EXAMPLE

Note: The minimum interval option for the query is dependent upon the **Downsample** setting in use during the data recording. If data was logged at 1 minute intervals, the smallest applicable interval for a subsequent query is 1 minute. Setting it to anything less results in the same data being retrieved since the closest interval of available data is 1 minute.

Note: If a small interval is used for a large period of time, the query may time out. In this case an error is reported to the user. Acknowledge this and try with either shorter period, a larger interval or some combination of both.

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14.3.5.2.6 STATISTICAL OPTIONS

If the Statistics output type is selected, the available statistical methods are displayed as columns in the query configuration.

FIGURE 14-36 STATISTICAL OPTIONS

The available statistical methods are: Average, Min, Max, Standard Deviation. On each formatter, the checkbox must be checked for the desired statistical methods.

14.3.5.3 Export/Import of Query Settings

The query settings can be exported to a *.4dq file and subsequently be imported for future queries.

To export the settings, click the 🔲 button, navigate to the target folder, enter a suitable file name and save. To import a *.4dq file, click the 🔲 button, navigate to the source folder, select the desired file and open.

Note: In order to use the Query Schedule tool, the desired query settings must be configured and a *.4dq file exported.

14.3.6 Query Schedule

The Query Scheduler provides a means to automate data queries. The query is based on Multiple schedules can be created. The interface is shown below.

FIGURE 14-37 QUERY SCHEDULE

Each query consists of a CRON timing expression, a previously exported *.4dq query settings file, duration and interval settings, and an output folder. The schedule configuration view is shown in Figure 14-38.

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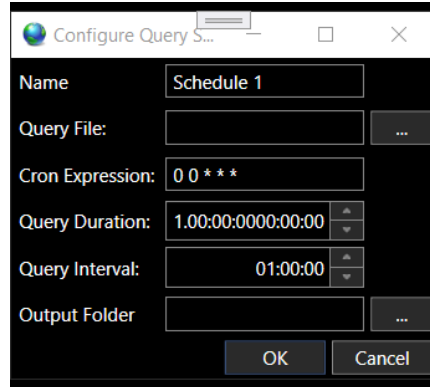
FIGURE 14-38 SCHEDULE CONFIGURATION

Options are described below:

- **Name:** Enter a name associated with the query schedule, to easily identify it.

- **Query File:** The path and *.4dq file name to use for the query. To select this, click the browse button, navigate to the source folder and select the desired *.4dq file.

- **CRON Expression**: A Cron expression allows for jobs or tasks to be scheduled at fixed intervals. The string consists of sub expressions, each one controlling a unit of time. For example '0(minute 0) 0(hour 0) *(every day of the month) *(every month of the year) *(every day of the week)' = '0 0 * * *'. The formatting of CRON expressions allow for great versatility in terms of how query schedules are set up. For more information, please consult https://en.wikipedia.org/wiki/Cron. The default when a query schedule is created is '0 0 * * *' which will run every day at midnight. NavView will check expression as entered for validity.

- **Query Duration**: The query duration determines the length of time from the start of the scheduled query to the end.

- **Query Interval:** The query interval describes the length of sub-queries. Over the course of a query duration, the query can be repeated multiple times, with each sub-query being the length of the query interval. As an example, in order for a to retrieve the average of data every hour over the course of a 24 hour period, and to run this query every day, the CRON expression would be set to '0 0 * * *', the Query Duration would be set to 1 day , or 24 hours, and the Query Interval would be set to 1 hour.

Note: The Query Duration and Query Interval entry format is d.HH:mm:ss.

- **Output Folder:** Choose a folder in which to output query files. The query files will be formatted with the schedule name and the time of the actual query.

Figure 14-39 shows the CRON expression, Query Duration and Query Interval settings for a data query to be run every 12 hours (noon and midnight) for the past 12 hours (figure on left) and every 24 hours (at midnight) for the previous 24 hours (figure on right).

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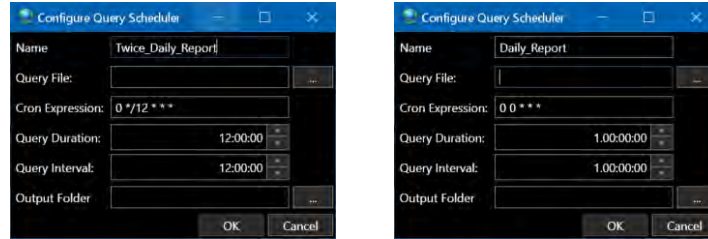
FIGURE 14-39 QUERY SCHEDULE EXAMPLES

14.4 Quick Fixes

Quick Fixes are a means to capture a snapshot of selected data at a specific epoch with the push of a single button. This feature is configurable and supports the creation of multiple Quick Fixes each designed to collect different task specific data. For example, for buoy deployment from the stern of a vessel a Quick Fix could be configured to log the position of the respective vehicle's Stern Roller offset and the parent Vehicle heading, the only data required to locate the point of deployment.

Note: The time of each specific observation logged by the Quick Fix is always recorded.

14.4.1 Quick Fix Configuration

1. Access the Configure Quick Fixes dialog:

    a. Click on the **Quick Fixes** icon in the Position Fixes section of the Data ribbon to open the **Configure Quick Fixes** dialog; or

    b. Open the Explorer window and navigate the tree to select **Quick Fixes** under **Data > Database Services** and click the **Manage…** button
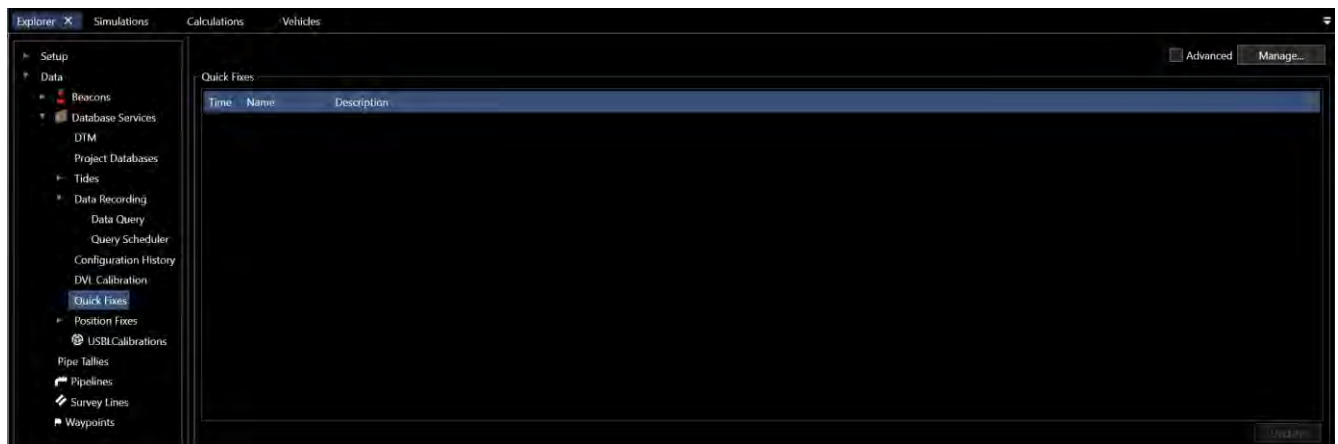
FIGURE 14-40 QUICK FIXES - EXPLORER VIEW

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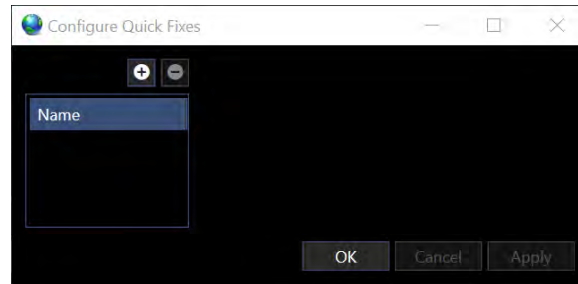
FIGURE 14-41 CONFIGURE QUICK FIXES - NO FIXES SETUP

2. Click the button to add a fix
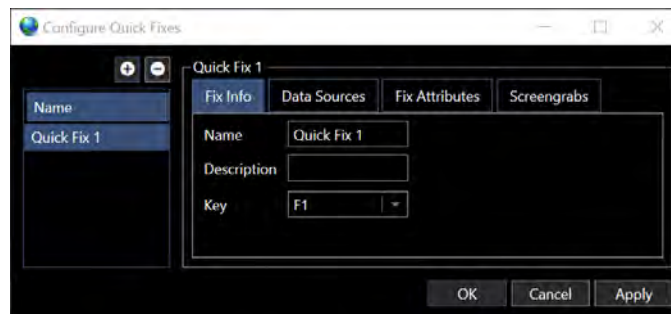
FIGURE 14-42 CONFIGURE QUICK FIXES - FILE INFO TAB

3. In the **Fix Info** tab (see Figure 14-42)
   a. Enter a **Name** for the fix

   b. Enter a **Description** for the fix (optional)

   c. Select a function **Key** from F1 to F12 to assign the Quick Fix to

   d. Click **Apply**

4. In the **Data Sources** tab (see Figure 14-43)

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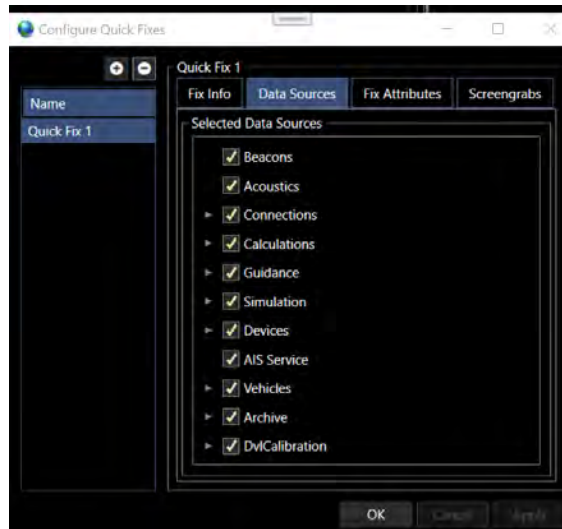
FIGURE 14-43 CONFIGURE QUICK FIXES - DATA SOURCES TAB

a. Expand the listed **Selected Data Sources** to navigate and select those data sources to be logged with the Quick Fix

   i. Data sources are presented in a hierarchical tree with the parent data source, e.g. Vehicles, at the top level and branches descending through each child level until the base sources for that branch is reached, e.g. Offset

   ii. A data source can be checked and unchecked at any level and the action will be applied to all children below the selected item

   iii. A check mark in a box indicates that source and all those below it are selected to be logged

   iv. An empty box indicates that source and all those below it are not selected to be logged

   v. A filled square in a box indicates that some but not all sources below it are selected to be logged

b. Click **Apply**

5. In the **Fix Attributes** tab

   The Fix attributes tab allows the user to set up data fields to be filled in when a fix is taken. It is possible to set up blank fields that can be typed in, by leaving the Possible Values field blank, or set up a dropdown list of possible values by typing them in as a comma separated list.

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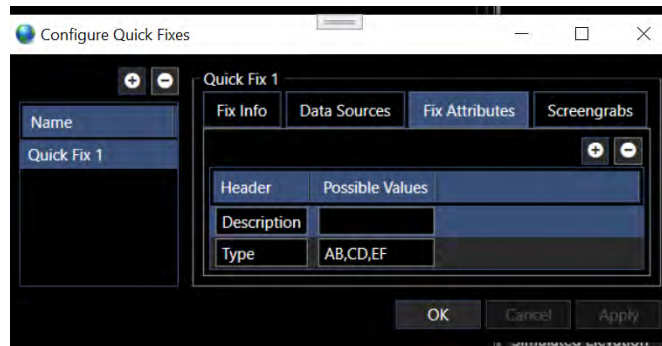
FIGURE 14-44 FIX ATTRIBUTES

In the above example, the Description field will prompt the user to type a description, and the Type field will allow the user to select from the options AB,CD,EF.
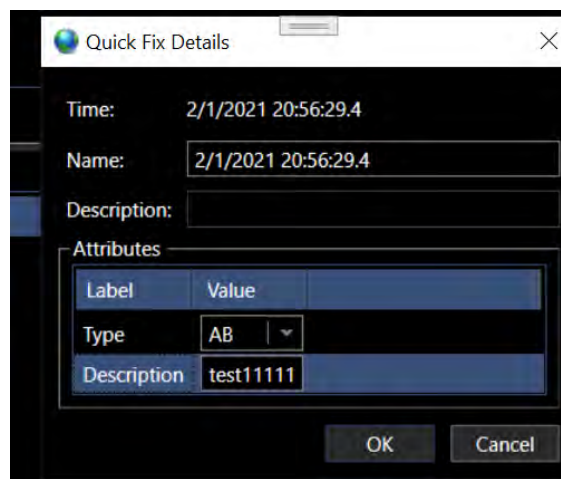
FIGURE 14-45 QUICK FIX - ATTRIBUTE ENTRY

6. **Screen Grabs**

   On the screen grabs tab, a video channel can be set up (configured in NavView video setup).
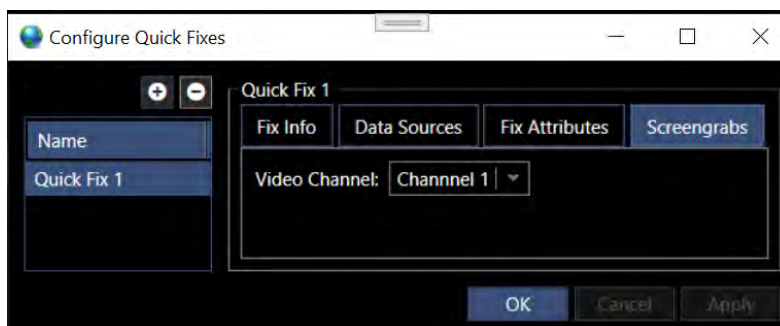
FIGURE 14-46 SCREEN GRABS

With a video channel selected, when the quick fix is taken, it will trigger a screen grab to be taken on the video channel. The screen grab will be stored in the screen grab output folder configured for that video channel.

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14.4.2 Take a Quick Fix

1. Press the respective function key
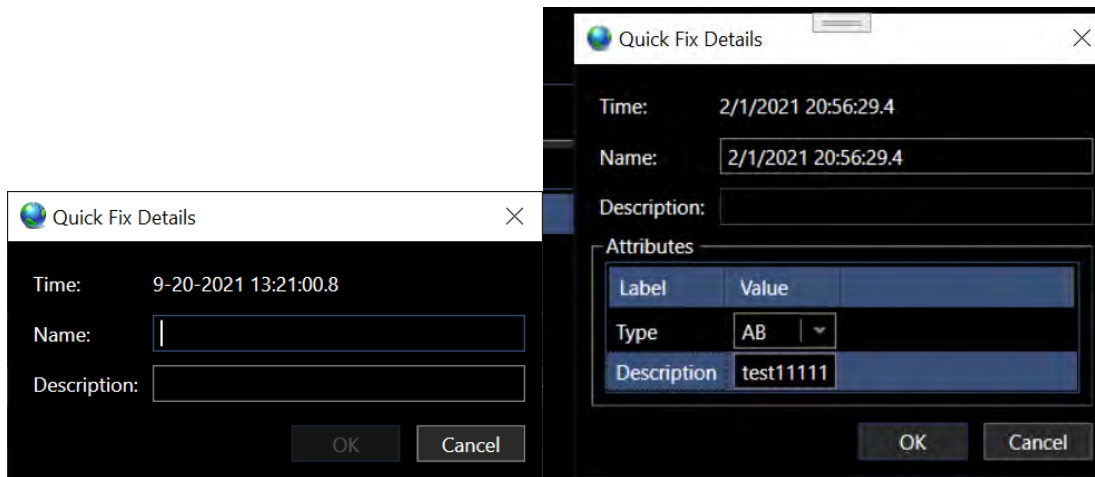
FIGURE 14-47 QUICK FIX DETAILS ENTRY

2. A dialog appears displaying the date and time of the fix, enter a **Name** and **Description** for the fix, and if Attributes have been configured for this fix type, enter/select entries accordingly

3. Click **OK** to save the Quick Fix, click **Cancel** to discard it

14.4.3 Use the Quick Fixes

The Quick Fixes are logged to a database. They can be accessed under Database Services in the Explorer window.

- Open the Explorer window and navigate the tree to select **Quick Fixes** under **Data > Database Services**
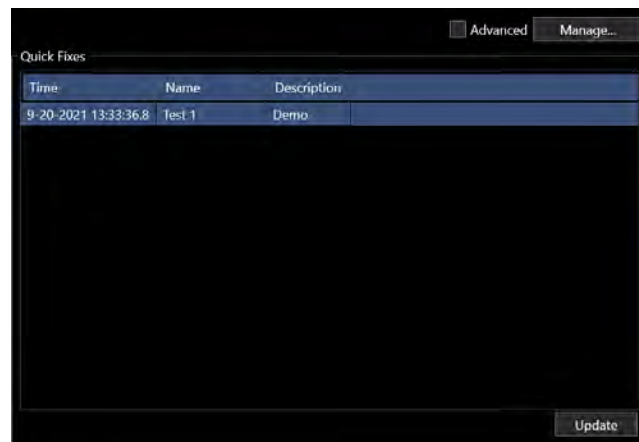
FIGURE 14-48 QUICK FIXES VIEW

- Select a Quick Fix in the data grid in the right panel. To expand the data sources and query settings view, click on the advanced box and click update.

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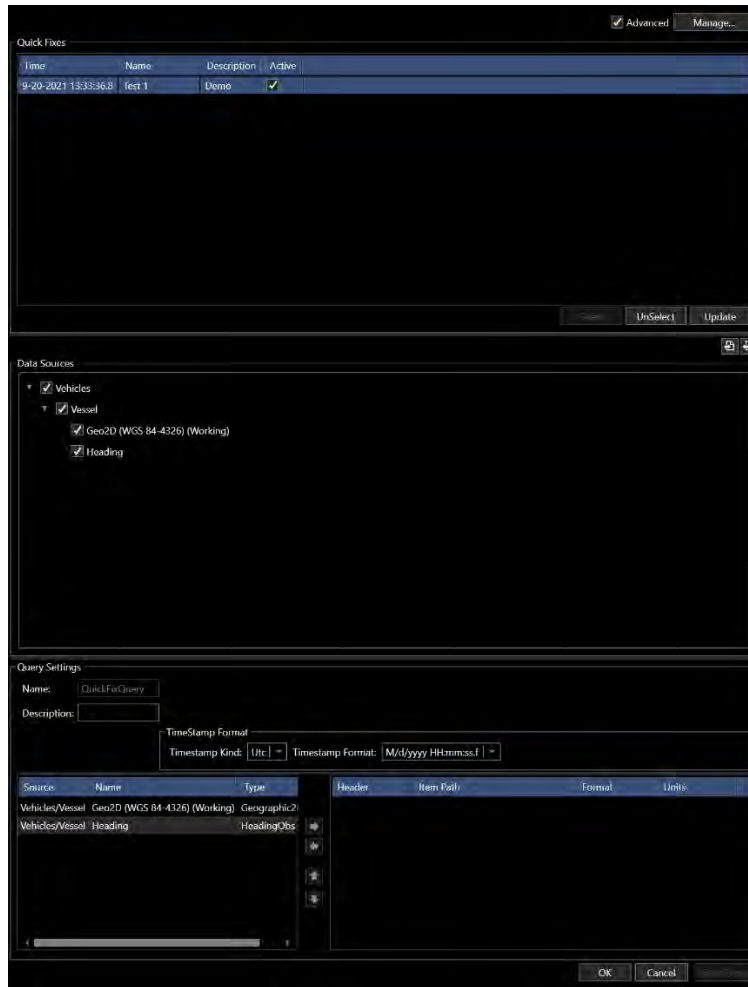
- **Data Sources Panel:** Populated with data sources that were configured for the respective fix and captured.
- **Query Settings Panel:** Setting options for the respective fix.
- **Time Stamp Format:** Configure timestamp to be Local or UTC and format
- The **Fix Data** grid displays the observation selected through the combination of the selected data source and selected observation type (see Figure 14-50).

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FIGURE 14-50 QUERY SETTINGS - DATA SOURCE GRID

- Select data source in left panel and move to right panel using the Button to configure the fix data format (see Figure 14-51 and Figure 14-52
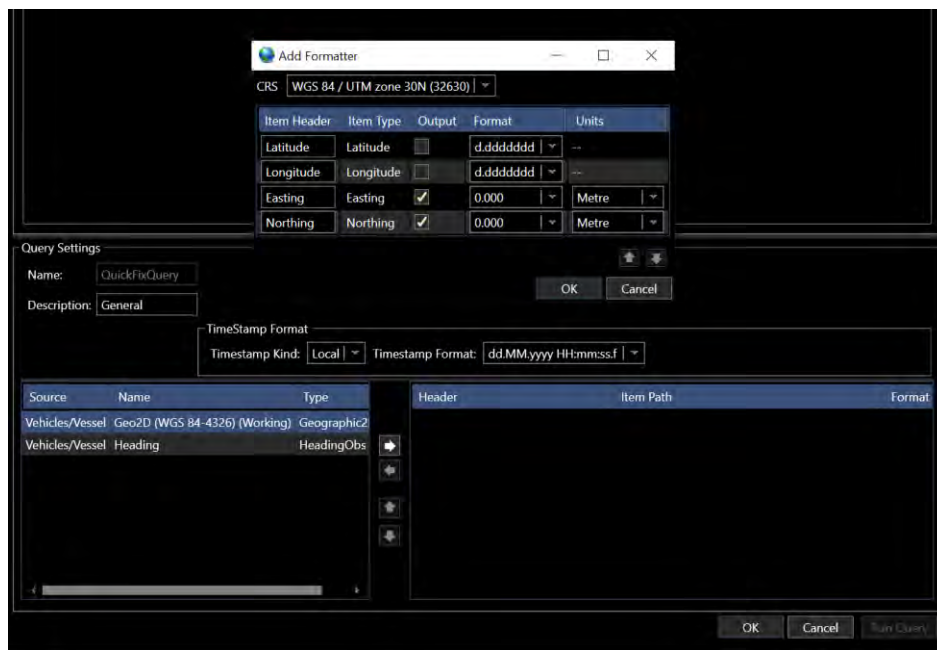
FIGURE 14-51 CONFIGURE FIX DATA FORMAT

FIGURE 14-52 FIX DATA FORMATTED

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
- Click [Run Query] to capture fix data (see Figure 14-53)

FIGURE 14-53 QUICK FIX QUERY RESULT

- From the **Copy to** drop-down select **Create Waypoint** or **Pipe Tally.** If Create Waypoint is selected, the Waypoint dialog is opened for editing. Click Okay to add this waypoint to the NavView waypoints. If Pipe Tally is selected, the Select Weld dialog is opened for editing.

- Click [Export Data] to generate a CSV file of the selected waypoints.

- Use the [⬇] to export the Query Settings to a file or click [⬆] to import a Query Settings file.

Note: If the selected data source does not contain a Geographic2D observation, there is insufficient information to create a waypoint with. In this case if the Create Waypoint option is clicked an Error message stating that *The sequence contains no elements* appears. A waypoint cannot be created. Acknowledge the error message to continue.

14.5 Position Fix

NavView provides a position average feature, referred to as Position Fix. This feature supports the capture of data to determine an average position complete with supporting histograms, comparison to a specified target and heading if desired, generation of a report and export of the data.

A Position Fix has two states:

1. Active
   - When a Position Fix is first created, it is Active
   - As long as it is Active, data can be recorded to it, starting and stopping indefinitely
2. Finalized
   - Once a Position Fix has been completed and no further data is to be logged, it is to be set to Finalized
   - Once Finalized no more data can be logged to it
   - Data can be reviewed and edited, reports generated

14.5.1 Add a Position Fix

Position Fixes are added using a Setup Fix Profile wizard to guide the user through the process. It is important to note that all settings made in the wizard can be edited later with the exception of the target database, and the vehicle and offset to be positioned.

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1. Launch the Position Fix wizard

   - Access the Active Fix view

     o Open the Explorer window and navigate the tree to select **Position Fixes/Active** under **Database Services**; or
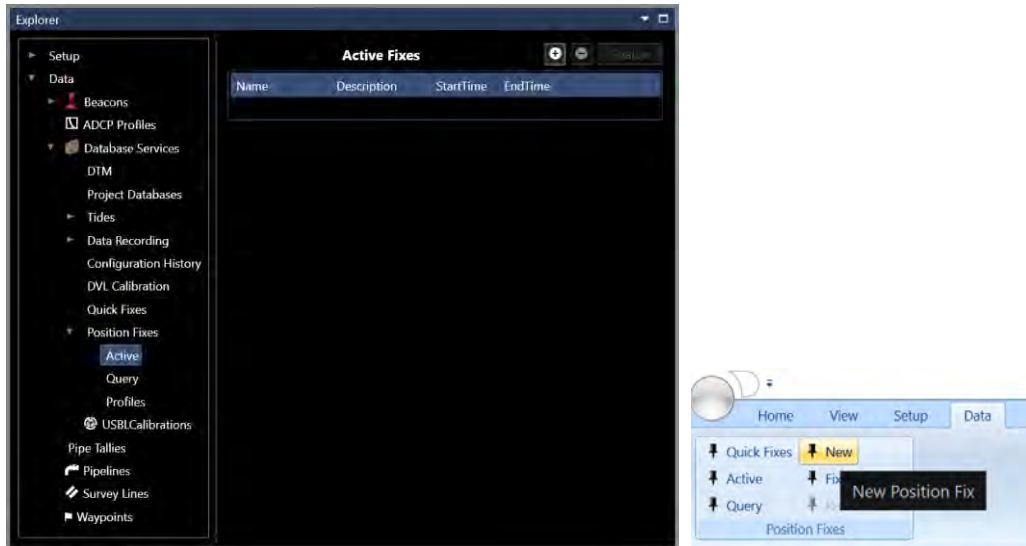
FIGURE 14-54 POSITION FIXES ACCESS

     o Click **Active** icon in the **Data** ribbon
   - Click the button (see Figure 14-54, left); or
   - Click the **New** button on the **Data** ribbon (see Figure 14-54, right).
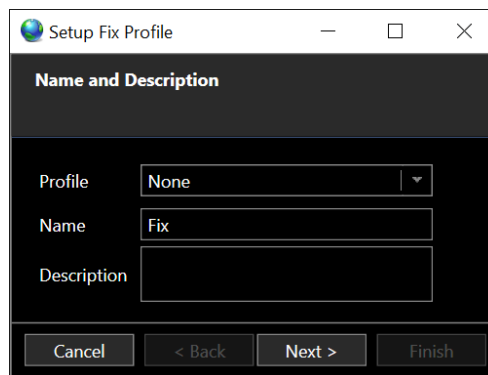
FIGURE 14-55 POSITION FIX WIZARD - NAME/DESCRIPTION PAGE

2. **Name and Description** page
   - If there is an existing profile created, it can be selected from the **Profile** drop-down

Note: Profiles allow the user to pre-configure oft repeated Position Fix configurations. They also enable execution of Position Fixes remotely.

   - Enter a **Name** for the fix

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- Enter a **Description** for the position fix

Note: The Name is used in the title of the Fix report. The Description is also included verbatim in the report.

- Click **Next**
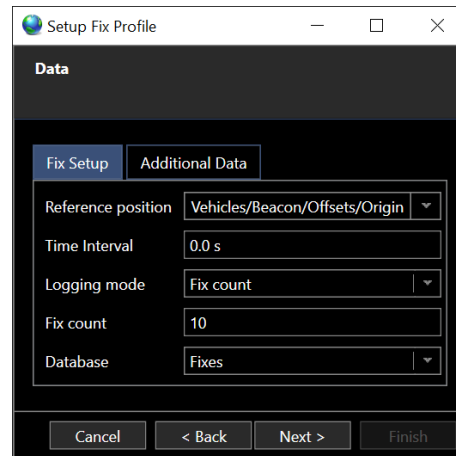
FIGURE 14-56 POSITION FIX WIZARD – CONFIGURE DATA COLLECTION

3. **Data** page
   - **Fix Setup Tab**
     - **Reference position:** From the drop-down list select the reference position to average.
     - **Time Interval:** Enter time interval to log data, an entry of 0 will result in data being logged on update.
     - **Logging mode:** From the drop-down select the logging options;
       - **Manual:** Operator manually starts and stops the data logging as desired
       - **Fix count:** Logging starts after clicking **Finish**, NavView automatically stops when the specified number of position observations are recorded.
       - **Elapsed time:** Logging starts after clicking **Finish**, NavView monitors the elapsed logging time and automatically stops the logging when the specified time period is reached.

Note: The operator is able to stop and start logging anytime prior to the specified number of fixes or elapsed time being reached. Once this is reached, NavView will only log more if the mode is set to **Manual;** or to **Elapsed Time** and the specified time is set greater than that which has already elapsed; or to **Total # Fixes** and the specified number of fixes is greater than the number of position observations logged so far.

- **Database:** Enter a name for a new database or select an existing database from the drop-down

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Note: The flexibility of the database(s) options for Position Fix recording allows the operator to create a database for each position fix, a database for groups of fixes, a database for an entire project, or some combination of these. The option used largely depends upon the project, the desired portability of the databases and simplifying database management from a naming and human friendly tracking perspective, i.e. easily recognizable and understood database names on the server.

- **Additional Data** tab
  This enables logging of additional data that can be used in the event that there are problems with the base data logged.
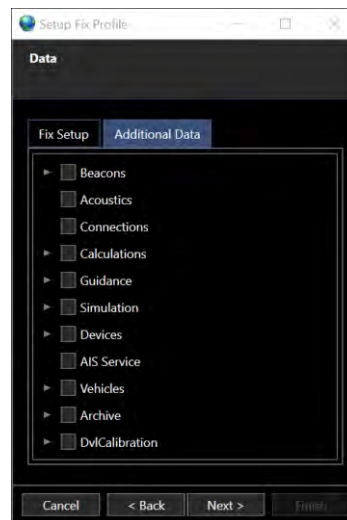
FIGURE 14-57 POSITION FIX - ADDITIONAL DATA SOURCES

- o Expand the available data sources to navigate and select those data sources to be logged

- o Data sources are presented in a hierarchical tree with the parent data source, e.g. Calculations, at the top level and branches descending through each child level until the base sources for that branch is reached, e.g. Devices/GPS Port/GGA

- o A data source can be checked and unchecked at any level and the action will be applied to all children of that source

- o A check mark in a box indicates that source and all those below it are selected to be logged

- o An empty box indicates that source and all those below it are not selected to be logged

- o A filled square in a box indicates that some but not all sources below it are selected to be logged

- o Click **Next**

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4. **Target** page
- If the Position Fix is being executed to determine position and/or heading relative to a design location and/or heading, e.g. a final well location relative to the design location, configure the design target location and heading
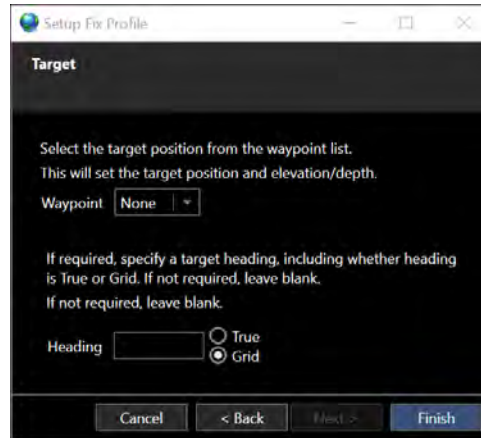
FIGURE 14-58 POSITION FIX WIZARD - CONFIGURE TARGET

- Select the **Waypoint** that defines the design target location from the existing waypoint list

- If there is specified design **Heading**, enter this value and specify if it is **True** or **Grid**

- Click **Finish**

The Position Fix data collection will start upon clicking Finish.

14.5.2 Position Fix Profiles

Position Fix Profiles can be created which contain commonly used settings, the profile can then be selected in the Position Fix wizard when adding a position fix. A profile can be created by selecting Fix Profiles in the Position Fixes section of the Data ribbon, see Figure 14-59. A profile can also be created in Explorer by selecting Profiles under Position Fixes, see Figure 14-60.
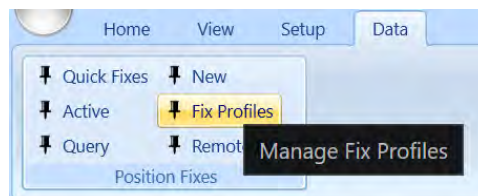
FIGURE 14-59 POSITION FIX PROFILES - DATA RIBBON

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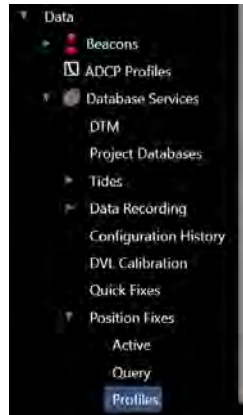
FIGURE 14-60 POSITION FIX PROFILES - EXPLORER

14.5.2.1 Adding a Position Fix Profile

1. Select profiles in the Data ribbon or in Explorer, this opens the Fix Profile Manager
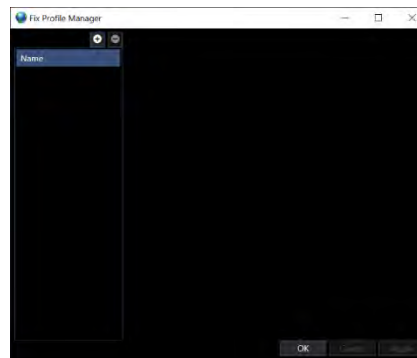
FIGURE 14-61 FIX PROFILE MANAGER

3. Click the add button to add a new profile, this displays the dialog to define the profile (see Figure 14-62).
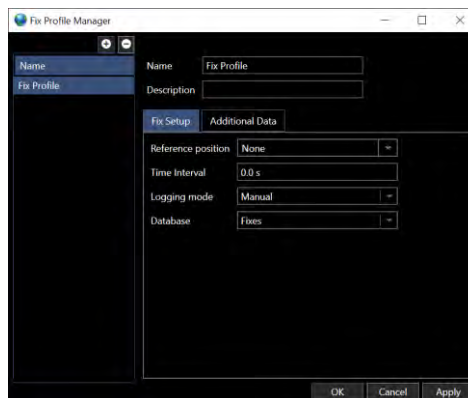
FIGURE 14-62 FIX PROFILE MANAGER DIALOG

- Define the profile
  - **Name:** Name for profile

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- **Description (Optional):** Description of profile

- **Fix Setup Tab:** See **Fix Setup Tab**

-

- **Additional Data Tab:** See **Additional Data** tab

-

14.5.3 Edit Position Fix Settings

Position fix settings can be edited if data collection for the fix is not active. This may be required to manipulate the data logging control, e.g. increasing the total number of fixes to log if additional data is desired. It is also enables the refining of the name and description for report purposes.

1. Access the Active Fixes view (see Access the Active Fix view

2. Select the position fix in the data grid to be edited (see Figure 14-63)
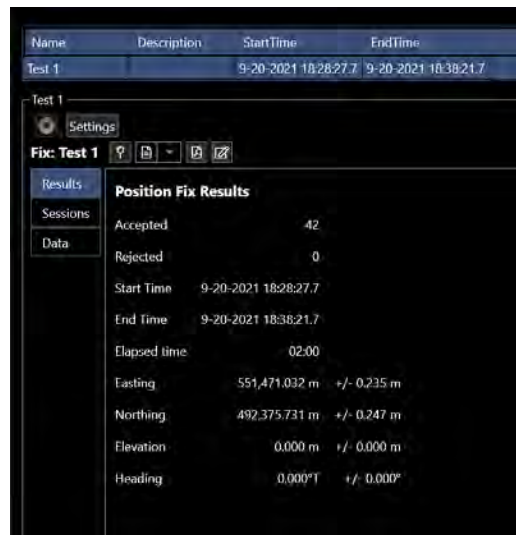
FIGURE 14-63 POSITION FIX TO BE EDITED

3. Click the **Settings** button to enable editing

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FIGURE 14-64 POSITION FIX EDIT DIALOG

- Edit the **Name** as desired

- Edit the **description** as desired

- Edit the data logging **Time Interval** as desired

- To change the logging **Mode**, select **Manual**, **Fix Count** or **Elapsed Time** from the associated drop- down list

- If **Fix Count** or **Elapsed Time** is selected, this value must be greater than that associated with any data collected for this fix to this point if additional data is to be logged

- If a **Target** has already been configured the target information will be displayed, if the **Target** has not already been configured the details can be entered into the fields

Note: The Target selection process in the Position Fix wizard only allows the selection of an existing waypoint. The editing of the Position Fix settings allows for setting the Target data to any position.

4. Click **Okay**

14.5.3.1 Remove a Position Fix

- Open the Explorer window and navigate the tree to select **Position Fixes/Active** under **Database Services** (see Figure 14-54)

- Select the position fix to be removed in the data grid (see Figure 14-65)

FIGURE 14-65 POSITION FIX TO BE REMOVED

- Click the ⊖ button to remove the fix from the database

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14.5.3.2 Configure Position Fix report

NavView supports a configurable Position Fix report. This report by default presents the Position Fix name as part of the title, the description and the results of the position fix average. The inclusion of plots and data is configurable. The configuration is accessed from the Position Fixes Summary view.

1. Open the Explorer window and navigate the tree to select **Position Fixes** under **Database Services** (see Figure 14-54)

2. Click **Configure Report** button ⬚ located in the summary toolbar (see Figure 14-66)

FIGURE 14-66 POSITION FIX - SUMMARY TOOLBAR
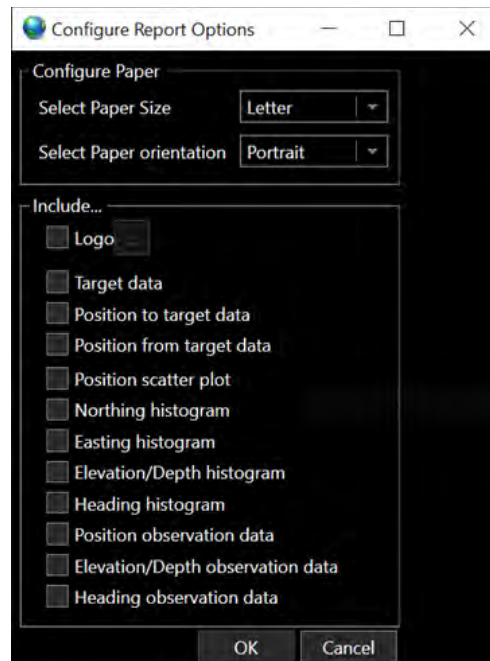
FIGURE 14-67 POSITION FIX - CONFIGURE REPORT OPTIONS

3. Configure the report options, these will be used for all reports generated until changed
   - **Configure Paper**
     - **Select Paper Size:** From drop-down, options are letter or A4
     - **Select Paper orientation**, options are portrait or landscape

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- o

- **Include**

  - o **Logo:** To incorporate a logo, check this box and click the ▢ button to browse and select the image to load (png, bmp, jpg, gif)

  - o **Target data:** Check this box to include the Target data and information in the report

  - o **Position to target data:** Check this box to include the spatial relationship from the position fix to the target, includes range and bearing in both geographic and grid, delta Northing, delta Easting, delta latitude, delta longitude, delta elevation/depth and delta heading in both geographic and grid

  - o **Position from target data:** Check this box to include the spatial relationship from the target to the position fix, includes same data as above

  - o **Position scatter plot:** Check this box to include a scatter plot of the position observations, if target data is selected the target position is included in the plot

  - o **Northing histogram:** Check this box to include a histogram plot of the Northing observations

  - o **Easting histogram:** Check this box to include a histogram plot of the Easting observations

  - o **Elevation/Depth histogram:** Check this box to include a histogram plot of the Elevation observations

  - o **Heading histogram:** Check this box to include a histogram plot of the heading observations

  - o **Position observation data:** Check this box to include a tabular presentation all of the position observations

  - o **Elevation/Depth observation data:** Check this box to include a tabular presentation all of the elevation observations

  - o **Heading observation data:** Check this box to include a tabular presentation all of the heading observations

Note: The report can be exported to Excel format. The option to include the observations is implemented to enable the export of the data to a file format that enables processing with other software packages.

4. Click **OK**

14.5.4 Active Position Fix View

To view and control a specific Position Fix, open the Explorer view and expand the tree to navigate to **Position Fixes** under **Database Services**. Expand this branch to select active or query. Active fixes will remain in the window until they are finalized. Fixes located in the active window can be logged to until they are finalized.

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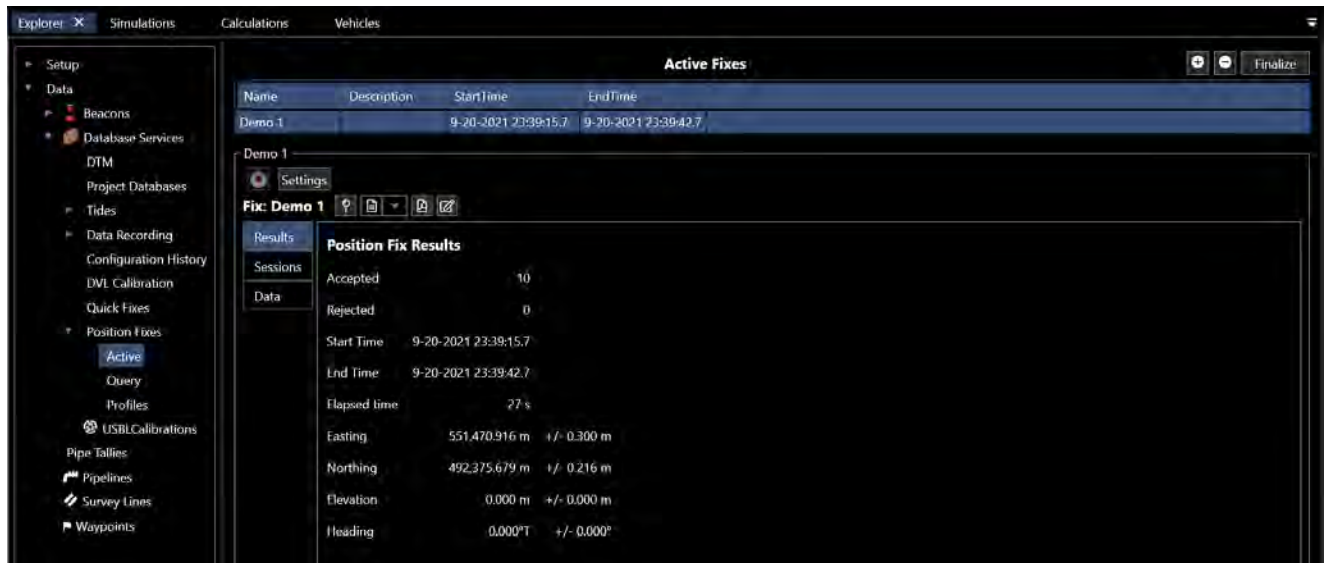
FIGURE 14-68 POSITION FIX VIEW

From this view (see Figure 14-68), the user can control the data logging, review and edit the data, create a waypoint from the results, export data and generate a report. The controls and use of this view are detailed here.

Once it is determined that no further data need be logged to a fix, it should be finalized. Select the fix and click ⬛ Finalize . It can still be accessed via the query window for reviewing, editing and generating reports.

14.5.4.1 Position Fix View Tool Bar

Logging Button: In this state indicates that logging is inactive. Click to start data logging, button will change to 🔴

Logging Button: In this state indicates that logging is active. Click to stop data logging, button will change to ⦿

Note: When data is logging, it is written to the database. The Position Fix view is updated with the latest data after every 2nd position observation is logged. When logging is stopped, the Position Fix view is updated with the last of the data regardless of how many observations are involved.

Create Waypoint Button: If data is present, clicking **Create Waypoint** creates a waypoint with the average position and elevation, with the same name as the position fix

Export Data: If data is present, clicking **Export Data** presents the options of exporting the data to a single comma delimited (CSV) file or multiple CSV files. Selection of either launches the Save File dialog. Navigate to the target folder and enter a file name and click Save. Upon completion of writing to the file(s), a message box appears summarizing the number of each observation type to which file.

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- **To single CSV file:** Data are written to a single file, e.g. Sample.csv, grouped by observation type

- **To multiple CSV files:** Data are written to individual observation specific files where the file name is based on the entered file name with an underscore and observation type appended, e.g. Sample_PSN.csv
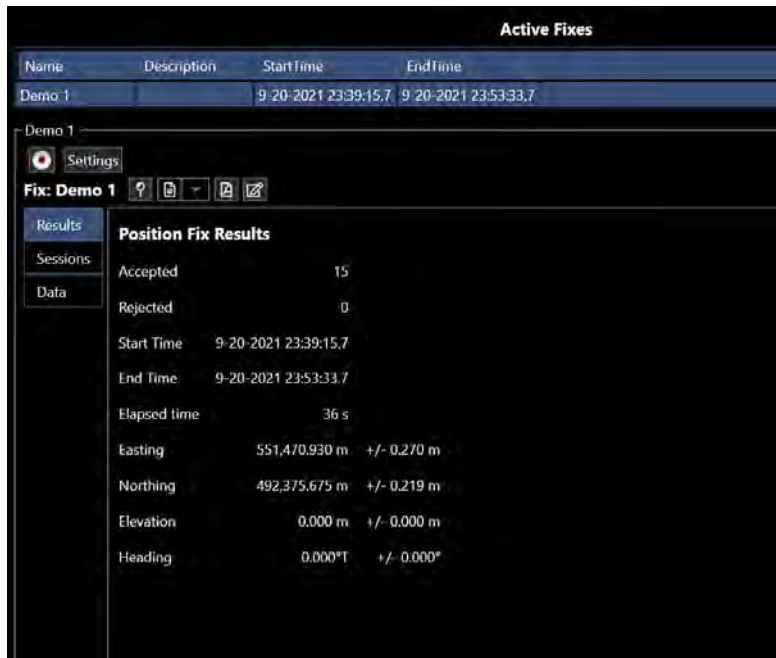
Generate Report: If data is present, clicking **Generate Report** generates a report for the position fix as configured in the Configure Report Options (see Figure 14-67)

14.5.4.2 Position Fix Data View

Within the Position Fix view, there is a sub-view that presents the data graphically for review and editing. This is referred to as the Position Fix Data view. The data presentation type is selected by clicking on the respective tab on the left side of the view. These views and their associated options are detailed here.

14.5.4.2.1 RESULTS TAB

Selection of the Results tab displays basic information about the position fix.

FIGURE 14-69 POSITION FIX RESULTS TAB

14.5.4.2.2 SESSIONS TAB

Selection of the Sessions tab (see Figure 14-70) displays an overview of the different recording sessions pertaining to the position fix. A session is created each time data logging is started and closed when the logging is stopped. If multiple recording instances have been initiated over the duration of a fix, they will be listed in the sessions tab. Unchecking the used checkbox for a session will prevent the data from that session being used in the position fix.

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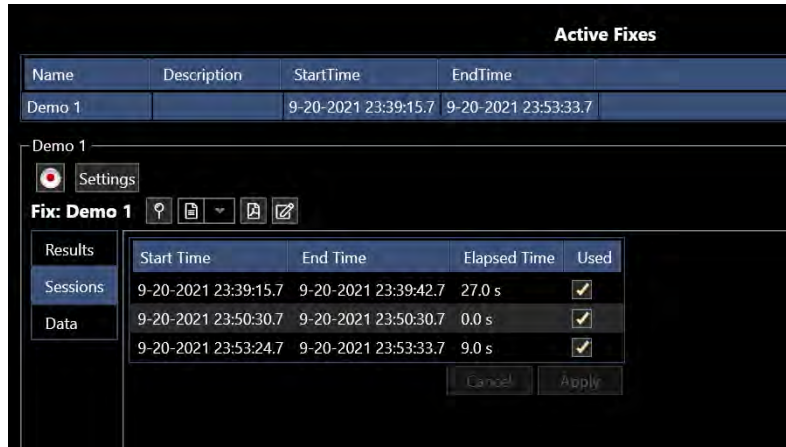
FIGURE 14-70 POSITION FIX SESSIONS TAB

14.5.4.2.3 DATA TAB

Selection of the Position tab (see Figure 14-72) displays a window with multiple tabs presenting options for viewing and editing the data. There are two primary tabs, Details and All Data. In addition, the user can select which data to view if additional data has been logged with the fix.

Selecting the Details tab presents the user with a set of tabs relevant for the review and editing of the selected data source. Selecting the All Data tab presents a view displaying all data logged with the fix.

14.5.4.2.3.1 DATA SOURCE

From the drop down list, select the data to display in the Details views.

14.5.4.2.3.2 ALL DATA TAB

Selecting the All Data tab presents a view listing all data logged for the fix in tabular view displaying an overview of the data logged.

Note: The Source selection does not affect this view.
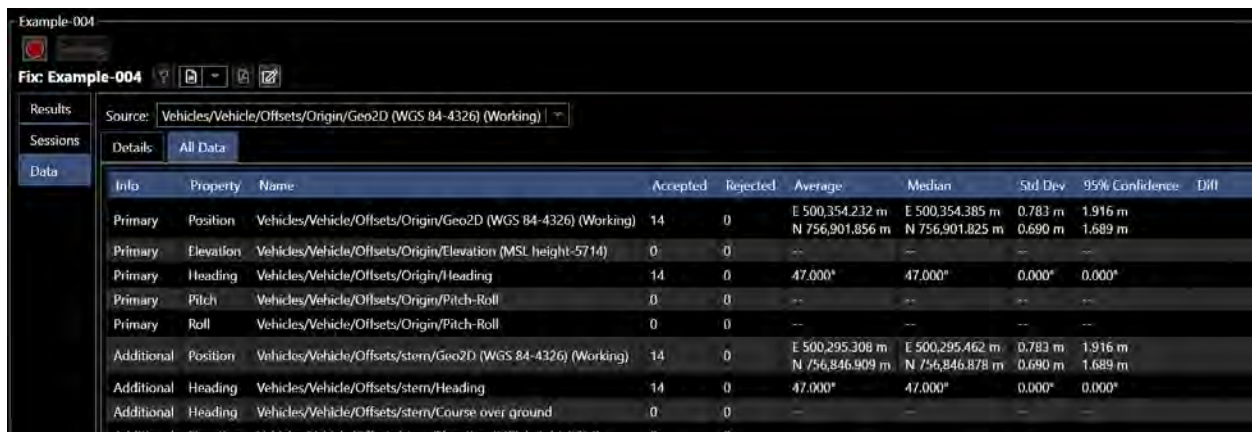
FIGURE 14-71 POSITION FIX WINDOW - DATA/ALL DATA TAB

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14.5.4.2.3.3 DETAILS - XY SCATTER TAB

This tab displays a scatter plot of the position fix position data complete with a tool bar with viewing and editing tools and a summary of the results. The default scatter plot scales to display all logged data and if configured, the target point. The following details the scatter plot view.

Note: This view is only present if the selected Source is a Geo2D observation.
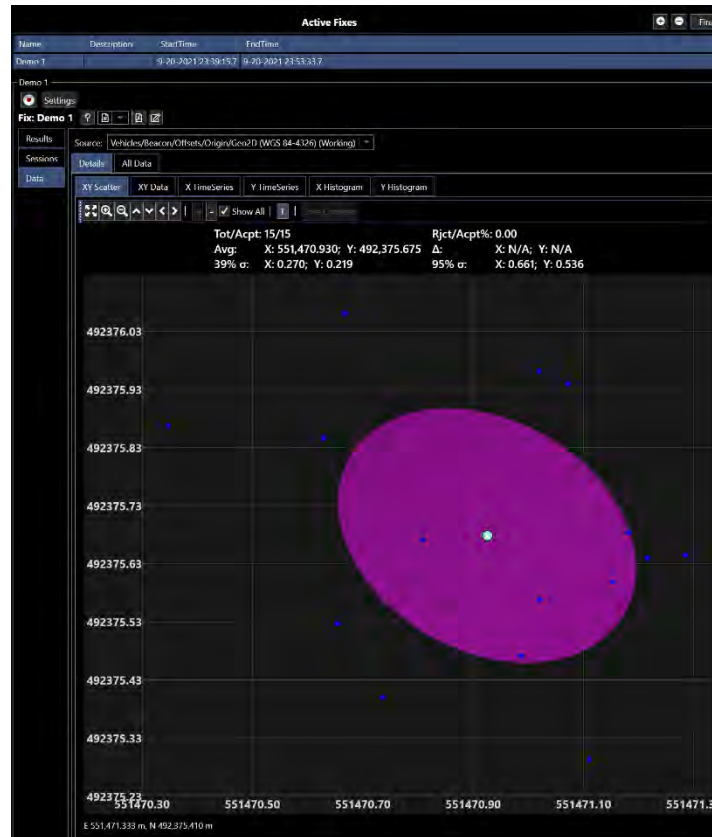
FIGURE 14-72 POSITION FIX DATA TAB

Note: The vertical and horizontal scale are not necessarily the same. It is important to ensure the scaling is known when interpreting the data.

- **Plot Features**

           Location of the data sample's average position

           If configured, location of target position

           An accepted in position

           A rejected position

           Error ellipse for data sample

- **Rollover**   Rolling the mouse over the error ellipse displays the error ellipse data

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- **Viewing Options**

  Click the *zoom extents* button to revert the scatter plot to the default scale and center

  Click the icons to zoom in and out

  Click the arrows to move the center of the display up, down, left and right respectively, note that these only have an effect if the view has been zoomed in and not showing the full extents of the data

  Rectangle Zoom: Left mouse click in the scatter plot and drag the mouse to capture a rectangle, release the mouse to zoom to that rectangle

  Scroll Wheel: Scrolling the mouse wheel zooms the scatter plot in and out while maintaining the absolute position of the mouse within the plot

- **Data Summary Features**

  Tot/Acpt: Ratio of total number of position observations to accepted

  Rjct/Acpt%: Percentage of number of rejected position observations vs. accepted

  Avg: Average position X (Easting) and Y (Northing)

  Δ: Delta from target position to average position, if target is configured, in X (Easting) and Y (Northing)

  39% σ: Standard deviation at 1 sigma (39% confidence level) in X (Easting) and Y (Northing)

  95% σ: Standard deviation at 95% confidence level in X (Easting) and Y (Northing)

- **Editing Tools**

  Click to accept the rejected point closest in distance to the average position, this button is not active if there are no rejected points

  Click to reject the accepted point furthest in distance from the average position, this button is not active if there are no accepted points

  If this box is checked, all rejected points will be displayed on the chart to the full extent. If box is unchecked, the rejected points outside of 1 sigma from the maximum extent of the accepted data will not be shown

  Toggle this button to turn on/off the target display on the chart

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Save: Click **Save** to write the changes made to the data

Left Mouse button: Click on a point in the scatter plot to toggle it between accepted/rejected

Note: It is important to note that NavView does not remove or alter any data in the position fix. Each observation written to the database has an edit flag associated with it that indicates if the observation is to be used (accepted) or not (rejected). Editing of the data is strictly restricted to accepting or rejecting a position observation, i.e. changing the use/don't use state of this flag. Any changes made to the state of this flag in the view are not written to the database until the **Save** button is clicked.

14.5.4.2.3.4 DETAILS - DATA TAB

Selecting the Data tab displays the selected Source data in table listing the timestamp, value(s), residual(s) and the option to use in the calculations by checking/unchecking a Used box. A Statistics panel to the right of the table displays the average(s) and standard deviation(s) at the 95% confidence level for the data.

Figure 14-73 shows the Data tab, shown as the XY Data tab, for 2DGeo Source. The table includes the timestamps, Y (Northing), X (Easting) and residuals in a data list format. The used check box can be unchecked to not include data in the position fix results.

FIGURE 14-73 POSITION FIX XY DATA TAB

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14.5.4.2.3.5 DETAILS - TIME SERIES TAB

Selecting the Timeseries tab displays the selected Source data as a timeseries. The data points can be graphically edited to reject/accept by left mouse click on the data point, rejected data point will appear as ☒ .

Figure 14-74 shows the TimeSeries tab, labelled as X TimeSeries here and displaying Eastings, where the selected Source is a 2DGeo observation..
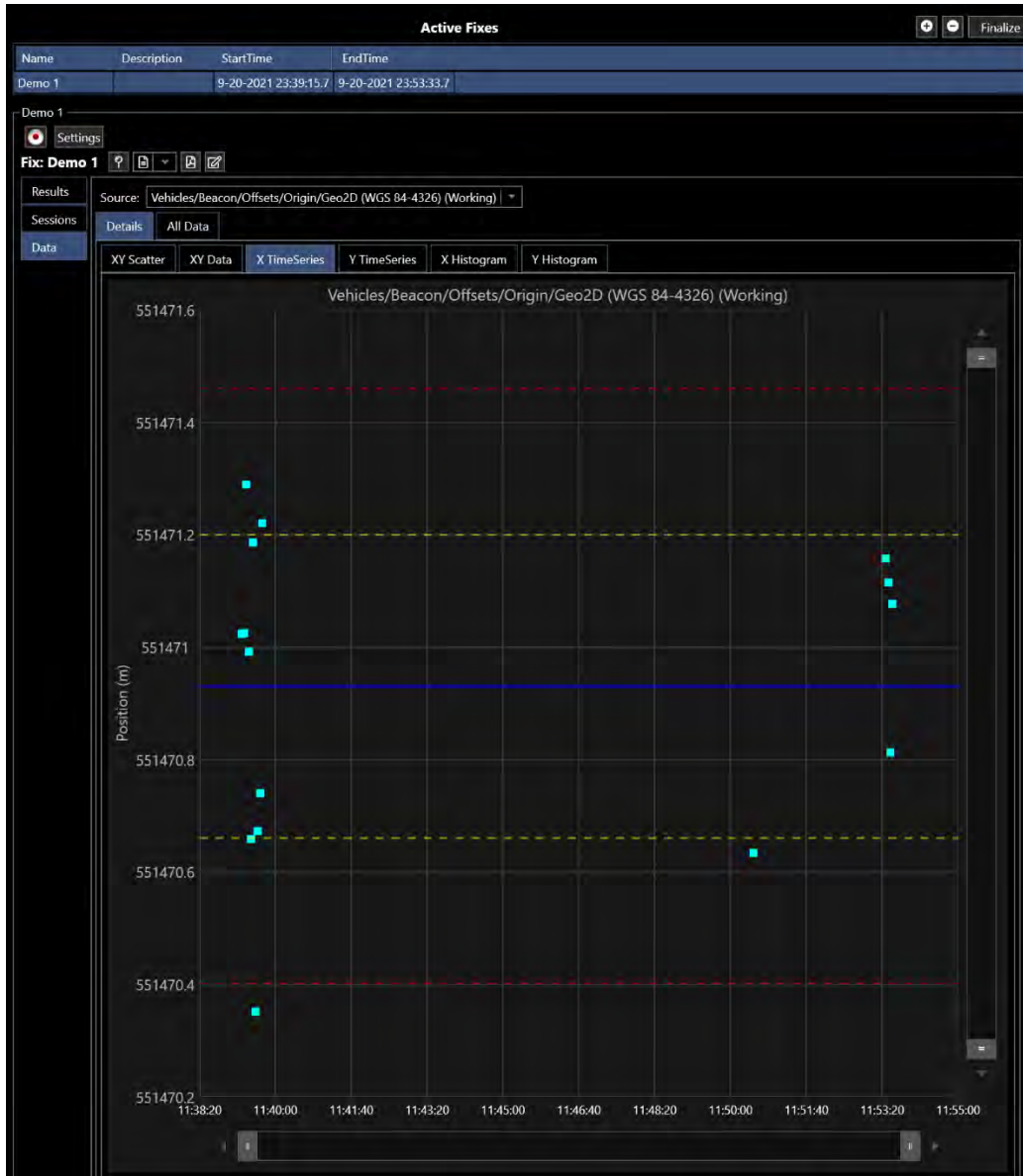
FIGURE 14-74 POSITION FIX X TIME SERIES TAB

14.5.4.2.3.6 DETAILS - Y TIME SERIES

When a the selected Source is a 2DGeo observation, a second Timeseries tab is available for selection. Figure 14-75 shows the Y TimeSeries tab display the Northing data in a time series.

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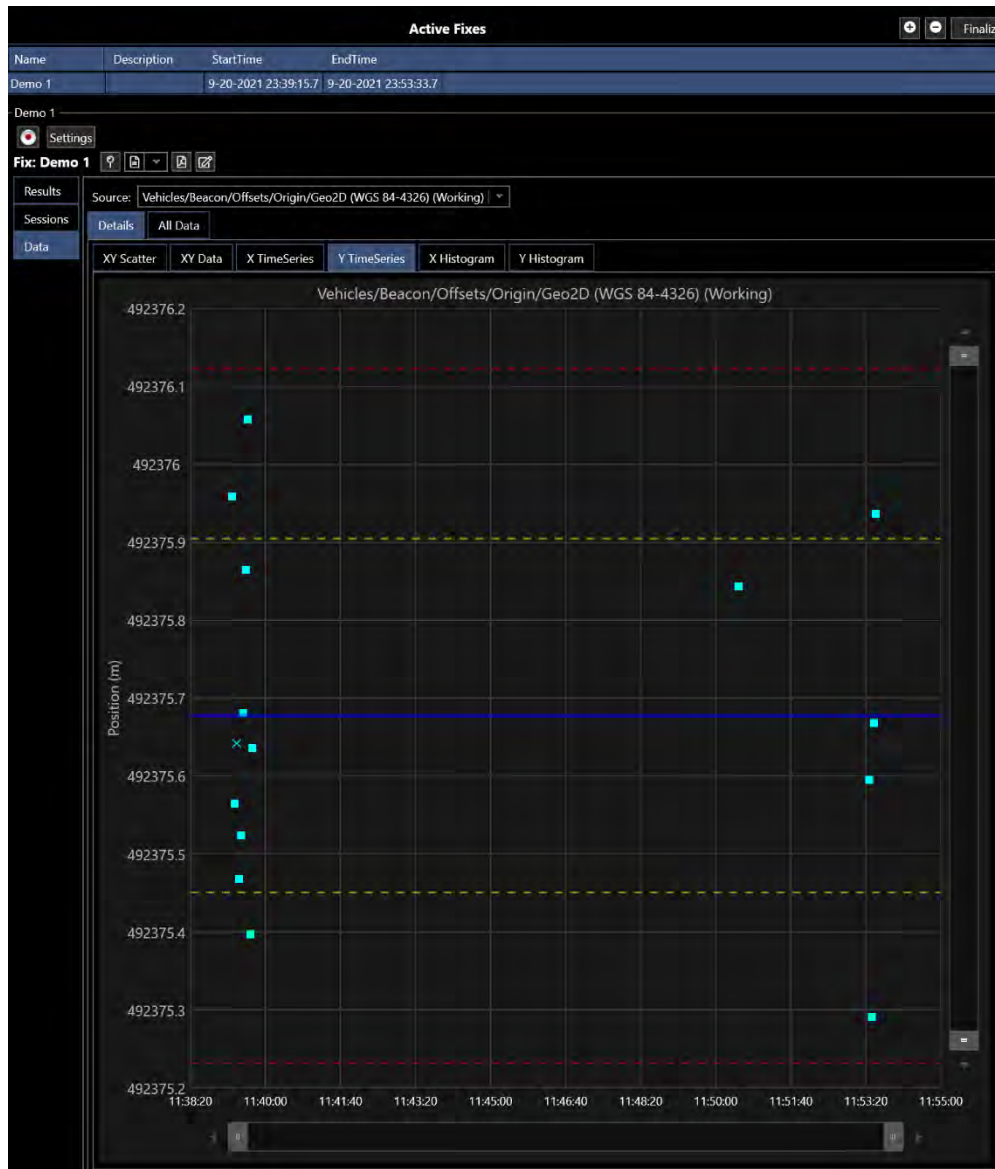
FIGURE 14-75 POSITION FIX Y TIME SERIES TAB

14.5.4.2.3.7 DETAILS - HISTOGRAM TAB

Selecting the Histogram tab presents the selected Source data in a histogram with the Normal Distribution Curve superimposed to assist evaluation of the data. The 1 sigma standard deviation range is displayed as a shaded area bounded with red vertical lines. The average value and the 1 sigma standard deviation is displayed at the top of the view.

Figure 14-76 shows the X Histogram tab for a 2DGeo Source.

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FIGURE 14-76 POSITION FIX VIEW - EASTING HISTOGRAM TAB

14.5.4.2.3.8 DETAILS - Y HISTOGRAM TAB

When the Source is a 2DGeo observation, a second Histogram tab is available, Y Histogram tab displaying Northings.

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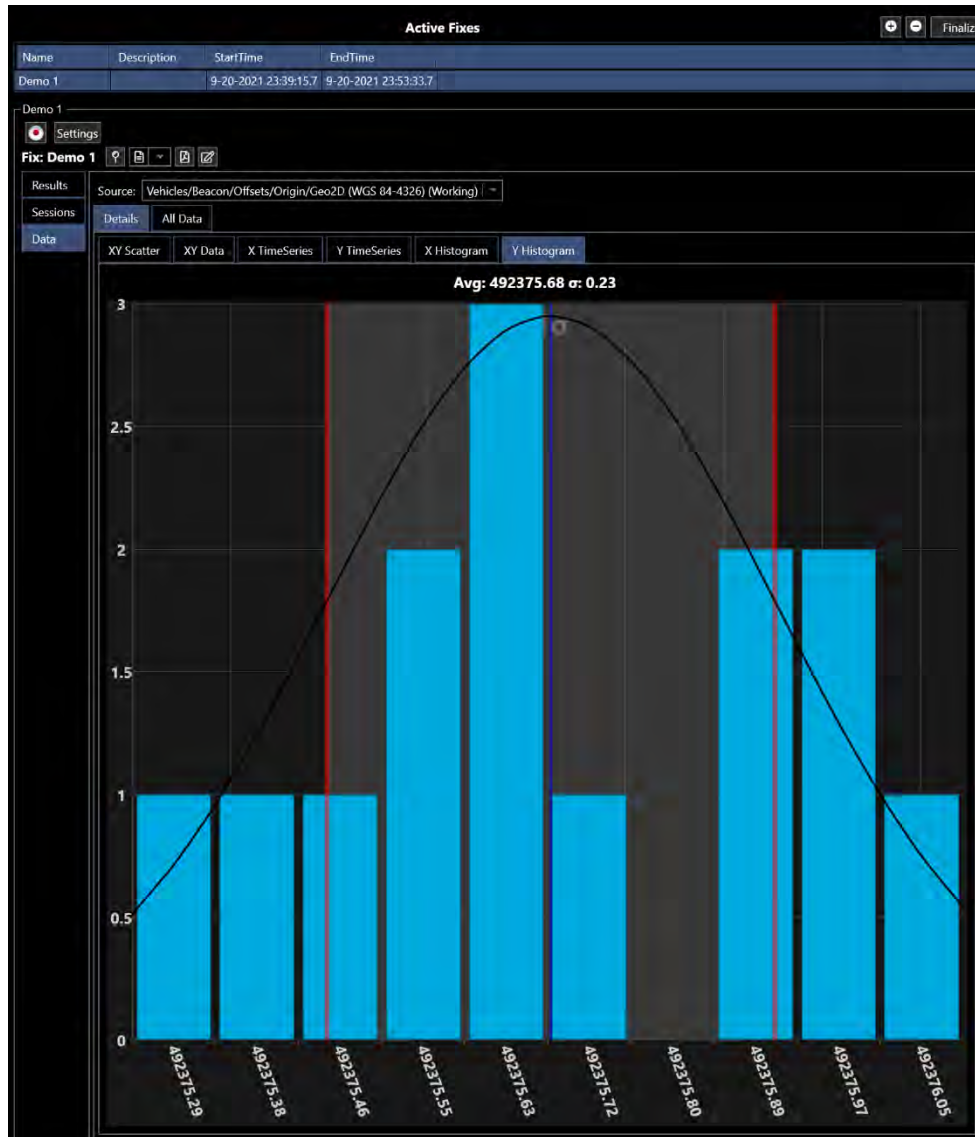
FIGURE 14-77 POSITION FIX VIEW - NORTHING HISTOGRAM TAB

14.5.5 Query Position Fix View

Finalized Position Fixes can be viewed using the Query feature in the Position Fixes section of the Data ribbon (see Figure 14-78) or in the Explorer view (see Figure 14-79).
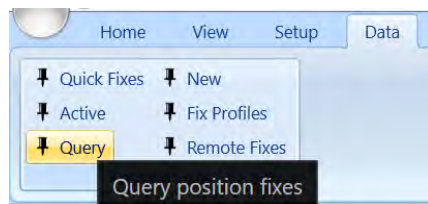
FIGURE 14-78 POSITION FIX QUERY - DATA RIBBON

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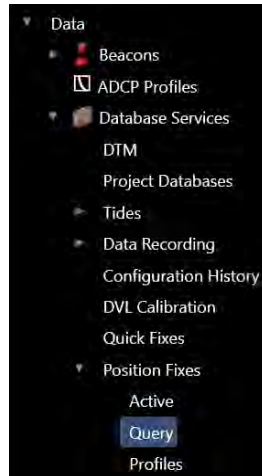
1. Select Query from the Data ribbon or Explorer, this opens the Position Fix Query dialog, see Figure 14-80

-   **Database:** From the drop-down select the database the desired position fix is stored in, this will populate the drop down list with those fixes present in the selected database

-   **Fix:** From the drop-down select the position fix to view

2. The selected position data will then be used to populate Selected Fix panel as shown in Figure 14-81. For details regarding working with the data from this view, refer to Position Fix View Tool Bar

3. and Position Fix Data View

4. .

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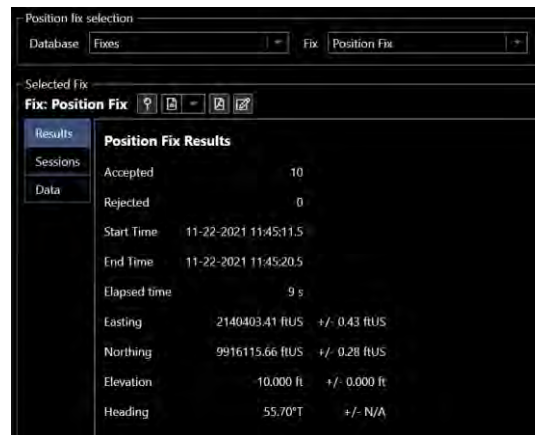
14.6 Digital Terrain Model

NavView supports loading and generating digital terrain models (DTM) used in depth queries for waypoints, pipeline profiles, anchor catenary modelling, pipelay catenary modelling, etc. The DTM can also be used to generate contour maps for display in Map views. Select DTM types that display the seafloor topology in 3D views.

The DTMs are loaded/generated via the Database Services, saved to the database server and made available to all NavView clients connected to the network. Multiple DTMs can be loaded simultaneously. When more than one DTM is available for a specific task, e.g. waypoint depth query, the user is presented with the appropriate options for the selection of the DTM to use.

Three data source options are available to load and generate the DTM from. These are listed here with their characteristics.

- o **XYZ ASCII file**
    - o Supports depth queries
    - o Displays seafloor topology in 3D views

- o **ESRI ASCII grid**
    - o Supports depth queries

- o **Flat DTM**
    - o Map projection grid coordinate based, i.e. requires Projected CRS
    - o Supports depth queries
    - o Displays seafloor topology in 3D views

The following sections detail the loading and use of DTMs.

14.6.1 DTMs, CRSs and Units

During the DTM import configuration, the Horizontal CRS and Vertical CRS that the data are referenced to are specified. When the DTM is loaded, the XYZ values are loaded and maintained as they exist in the source, no transformations or conversions are performed on the data, and the XYZ units defined for the respective CRS are implicitly used for the DTM XYZ values. Changing the Horizontal CRS or Vertical CRS of a DTM after it has been loaded (see Managing DTMs), does not change the DTM's XYZ values, just how the data is used.

When a depth query is made of a DTM, the position to be queried for is transformed to the DTM's Horizontal CRS and the depth determined for the position. The resulting depth is transformed from the DTM's Vertical CRS to the required CRS and returned.

If a DTM's Horizontal CRS is not the same as the current Working Horizontal CRS, the map layers for the respective coverage area and contours generated from it are not available for display in Map views and the DTM is not available for display in 3D Map views.

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14.6.2 Load a DTM

From the Explorer window, expand the Data > Database Services branch in the hierarchical tree and select DTM

FIGURE 14-82 DTM EXPLORER VIEW

Click the ⊕ ⌄ button and select from the options to load

From **XYZ ASCII File**
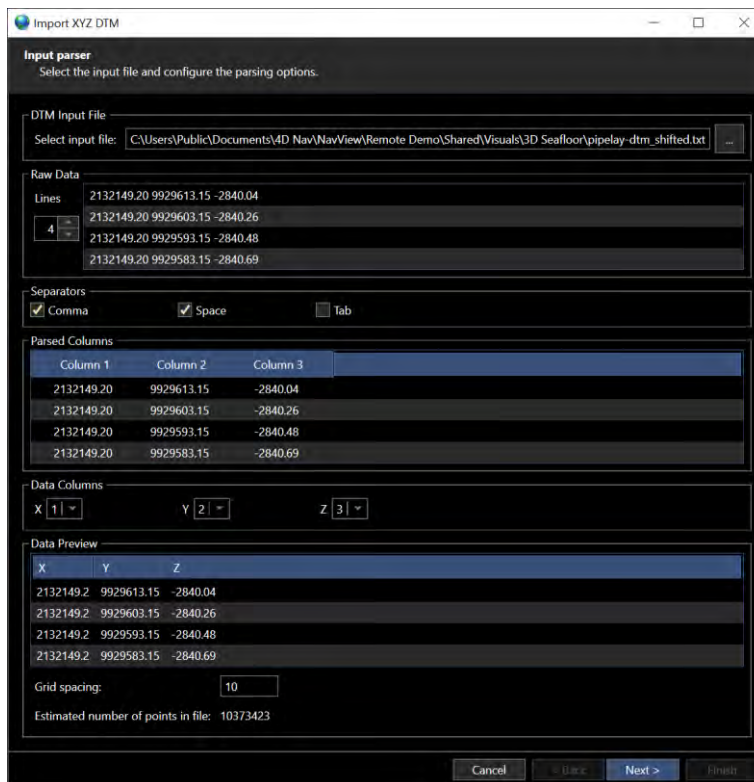
FIGURE 14-83 DTM - IMPORT XYZ ASCII DTM FILE

DTM Import File: Click the ⋯ button and navigate to and select the xyz file to import and click **Open**

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Note: The default file extensions are *.xyz, *.csv and *.txt.

Raw Data: Upon selection of a file, the first 4 records are displayed here. If XYZ data is not present in these records, i.e. the first four records are header records, use the ⬆⬇ button to increment/decrement the number of records displayed until XYZ data is present. Alternatively, enter a number directly. Each time this value is changed, NavView attempts to parse the first 3 fields of each record displayed as numbers and if successful determines that XYZ data is present in the record, even if it is not necessarily in the first three fields.

Note: The maximum number of records that can be displayed is 20. If the number of header records exceeds 20, the file will need to be edited to remove header records until they number 20 or less.

Note: The total number of data records displayed here is duplicated in the **Parsed Columns** data grid. The total number of records with XYZ data displayed here is duplicated in the **Data Preview** data grid.

Separators: Select the field separators present in the file by checking the associated boxes, confirm by reviewing the columns displayed in **Parsed Columns**

Parsed Columns: Displays the records showing in **Raw Data** as columns after parsing using the selected separators, enables confirmation of correct separators being selected and which column contains the X, the Y and the Z data

Data Columns: Select the column numbers for the XY Z data using the information displayed in the **Parsed Columns** data grid

Data Preview: Displays the XYZ data as it will be imported based on the separators and XYZ column selection configuration to confirm that the import is correctly defined. In addition, the estimated number of points in the selected file is displayed. For large files, this should be noted so the importing progress can be better monitored.

Note: It is important to note if the Z value displayed in the **Data Preview** is a positive or negative. The sign convention used by NavView when loading XYZ data is negative below the vertical datum (e.g. points on the seafloor), positive above (e.g. points onshore). If the Z values do not agree with this sign convention, the Z values will need to be inversed during the loading. This setting is on the next page in the DTM wizard.

Next: The Next button activates if the selected file name is valid and NavView has determined that XYZ data is present in the file. Click Next to go to step 3.

From **ESRI ASCII Grid**

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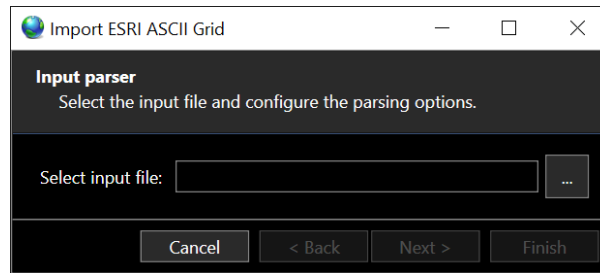
FIGURE 14-84 DTM - IMPORT ESRI ASCII GRID

Input Parser: Click the [...] button and navigate to and select the ESRI ASCII Grid file to import and click **Open**

Note: The default file extensions are *.asc and *.txt.

Next: The Next button activates after a file name has been selected. Click Next to go to step 3

From **Flat DTM**
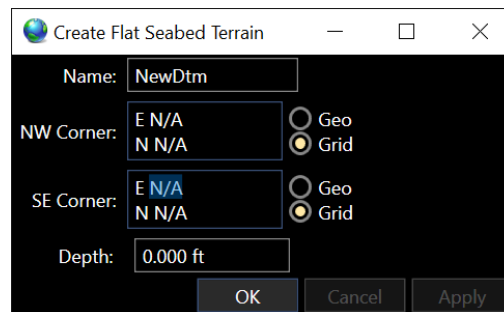
FIGURE 14-85 DTM - FLAT SEABED TERRAIN CONFIGURATION

Name: Enter a name for the DTM being created

NW Corner: Enter the coordinate defining the northwest corner for the area to be represented by the DTM

SE Corner: Enter the coordinate defining the southeast corner for the area to be represented by the DTM

Depth: Enter the depth of the DTM

Click **OK** to create the DTM and close the dialog, **Apply** to create the DTM and leave the dialog open, **Cancel** to abort the process and close the dialog

Go to step 4

Configure the DTM import options

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FIGURE 14-86 DTM - CONFIGURE IMPORT OPTIONS

Name: Enter the name the DTM is to be referred to, default is the name of the file being loaded

Horizontal CRS: Select the Horizontal CRS that the XY data are referenced to

Note: The respective Horizontal CRS must already be added to NavView, though in the case of Geographic 2D types, they may not need to be explicitly added. Geographic 2D CRS that are the Source Geographic CRS for Projected CRS that have been added are available. See the Geodesy section for details.

Note: The DTM XY units must match those of the selected Horizontal CRS. For example, in the case the selected Horizontal CRS is a Projected type, the units may be meters, feet, US feet, etc. In the case it is a Geographic 2D type, the units are degrees.

DTM Vertical CRS: Select the Vertical CRS the Z data are referenced to

Note: The DTM Z units must match those of the selected Vertical CRS.

Invert Z Value: Check this box if the Z value representing depths in the DTM being loaded is positive

Translate: Check this box if the DTM data is to be translated in one or more axis, e.g. made deeper or shallower to address a known variation relative to the selected vertical CRS

Delta X: Enter the distance the Easting/Longitude is to be shifted

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Delta Y: Enter the distance the Northing/Latitude is to be shifted

Delta Z: Enter the distance the elevation is to be shifted (a positive value makes the elevation higher)

Note: The Delta values are added to the DTM values.

Note: Entry of translation distances does not allow inclusion of units. The XY units are those of the Horizontal CRS, the Z units are those of the Vertical CRS.

Clip: Check this box if only a section of the DTM is to be loaded, e.g. the immediate area around a drill center

Min X: Enter the minimum Easting/Longitude of the rectangular area to be loaded

Min Y: Enter the minimum Northing/Latitude of the rectangular area to be loaded

Min Z: Enter the minimum elevation of the rectangular area to be loaded

Max X: Enter the maximum Easting/Longitude of the rectangular area to be loaded

Max Y: Enter the maximum Northing/Latitude of the rectangular area to be loaded

Max Z: Enter the maximum elevation of the rectangular area to be loaded

Note: The XY units must be those of the selected Horizontal CRS, the Z units must be those of the Vertical CRS.

Note: Clipping is a convenient way to prevent loading zero Z values which are often present in DTM data sets. The default Min/Max Z values address this while allowing deep Z data.

Mask: Check this box if a section of a DTM is not to be loaded, e.g. the area around a drill center from a low resolution DTM is not to be loaded if it will be covered by another higher resolution DTM

Min X: Enter the minimum Easting/Longitude of the rectangular area not to be loaded

Min Y: Enter the minimum Northing/Latitude of the rectangular area not to be loaded

Min Z: Enter the minimum elevation of the rectangular area not to be loaded

Max X: Enter the maximum Easting/Longitude of the rectangular area not to be loaded

Max Y: Enter the maximum Northing/Latitude of the rectangular area not to be loaded

Max Z: Enter the maximum elevation of the rectangular area not to be loaded

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Note: The XY units must be those of the selected Horizontal CRS, the Z units must be those of the Vertical CRS.

> **Finish:** Click Finish to load the selected DTM as configured

Monitor loading

> Upon commencing the loading of the DTM, a message box will appear stating **Loading points into memory** with the elapsed time since the start of the importing process displayed

Importing DTM

Loading points into memory.
3.0 s

Cancel
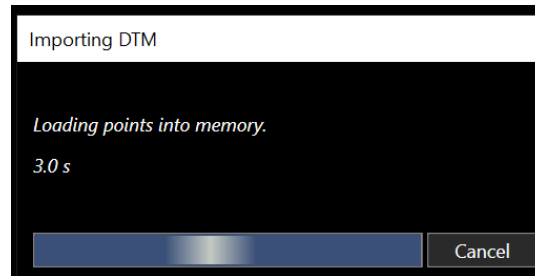
<p align="center"><small>FIGURE 14-87 DTM - MONITOR LOADING</small></p>

> When the importing of the DTM is completed, the message box will disappear and the user is returned to the Explorer view with the DTM branch displaying the loaded DTM

14.6.3 Managing DTMs

The DTMs loaded in NavView are managed from the Explorer window. This includes selecting a different Horizontal and/or Vertical CRS if the incorrect one was selected when loading, editing the name used for the DTM, adding a description and enabling and disabling its use.

1. From the Explorer window, expand the Data > Database Services branch in the hierarchical tree and select DTM (see Figure 14-88)

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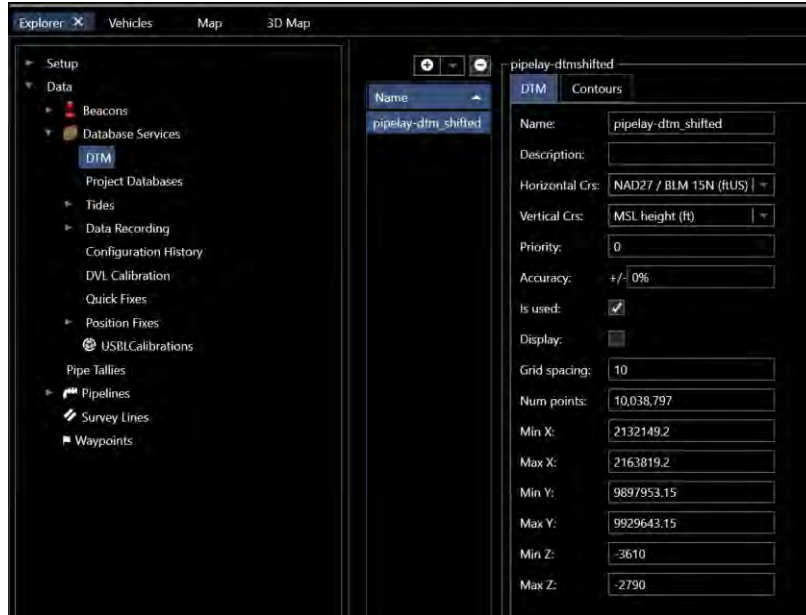
FIGURE 14-88 MANAGING DTMS

2. In the data grid listing those DTMs loaded into NavView by name, select the DTM to review and/or edit

3. From the **DTM Tab**, edit configuration and use as required
   - **Name:** Edit the name to be used when working with the DTM (when loaded from a file, the default is the file name)

   - **Description:** Enter/edit the description for the DTM, this is available as part of the DTM's metadata

   - **Horizontal CRS:** If the incorrect Horizontal CRS was selected when the DTM was loaded, the correct one can be selected

   - **Vertical CRS:** If the incorrect Vertical CRS was selected when the DTM was loaded, the correct one can be selected

   - **Priority:** If multiple DTMs are loaded, when NavView interrogates for a depth where DTMs overlap it will use the depth from the DTM with the highest priority. The lower the number, the higher the priority, e.g. 1 is higher priority than 2.

   - **Accuracy:** Is the accuracy of the DTM as a percentage of water depth, this is provided by the DTM provider. This value is entered here.

   - **Is Used:** Check this box if the DTM is to be used for depth queries

   - **Display:** Determines if the DTM will be displayed on the 3D Map. When display is turned off, the DTM can still be queried for depths along as *Is Used* is checked

   - **Grid Spacing:** The grid interval between point of the loaded DTM, this is calculated by NavView during loading.

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- **Apply/Cancel:** Click Apply to apply the changes made, Cancel to abort and revert to the previous settings

4. Review DTM attributes, these values cannot be edited
   - **Num Points:** The total number of points in the DTM

   - **Min X:** Minimum X in the Horizontal CRS units

   - **Max X:** Maximum X in the Horizontal CRS units

   - **Min Y:** Minimum Y in the Horizontal CRS units

   - **Max Y:** Maximum Y in the Horizontal CRS units

   - **Min Z:** Minimum Z in the Horizontal CRS units

   - **Max Z:** Maximum Z in the Horizontal CRS units

14.6.4 Contours from a DTM

NavView supports generating contours from any Projected CRS based DTM. Contours provide a visual representation of the seafloor topology in Map views. Figure 14-89 shows an example of a single set of contours created from a DTM and displayed as a layer in multiple Map views.
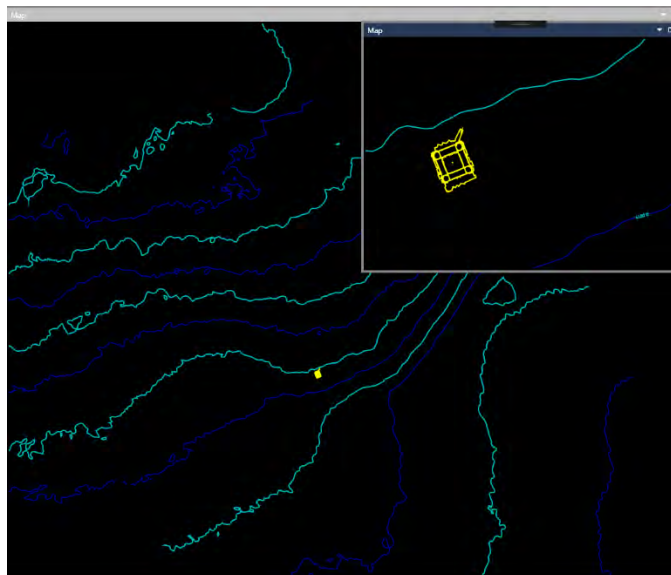
FIGURE 14-89 DTM CONTOURS

14.6.4.1 Generating Contours from a DTM

1. From the Explorer window, expand the Data > Database Services branch in the hierarchical tree and select DTM

2. In the data grid listing DTMs loaded into NavView by name, select the DTM whose contour configuration is to be edited and click the **Contours Tab** (see Figure 14-90)

Note: If the selected DTM is Geographic 2D based, the Contours tab does not display.

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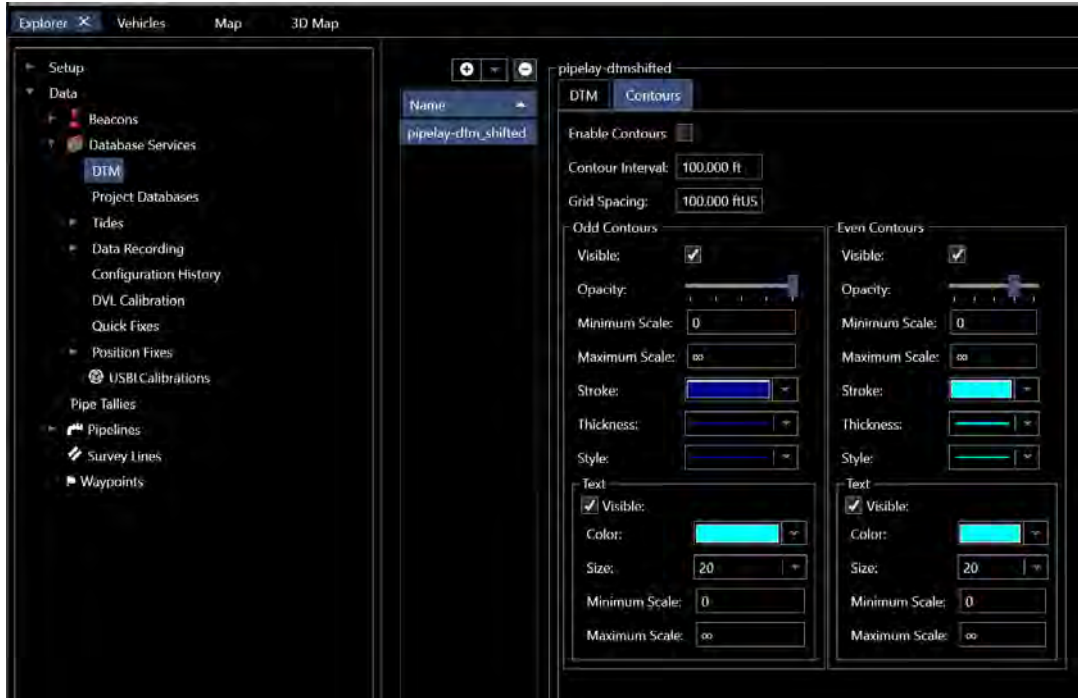
FIGURE 14-90 DTM CONTOUR CONFIGURATION

3. Configure the contour generation

    I.   **Enable Contours:** Check this box if the contours are to be generated

    II. **Contour Interval:** Enter the desired contour interval

    III. **Grid Spacing:** Enter the grid spacing to be used to generate the contours

Note: The grid spacing determines the horizontal resolution of the contour lines drawn on the map. If the grid spacing is too small the generation of the contours will take a long time while one that is too large will result in contours with low horizontal resolution. The goal is to use the largest grid spacing that still produces contours with an acceptable horizontal resolution. This may take several attempts to determine the optimum spacing for the application.

Note: When a new DTM is loaded into NavView the software calculates recommended default values for the contour interval and grid spacing.

    IV. **Odd Contours/Even Contours:** Configure the graphics to be used for alternating contours, referred to here as the odd and even contours

         *   **Visible:** Check this box if the respective contour is to be displayed

         *   **Opacity:** Using the slider, set the opacity (brightness) to display the contours and text, all the way to the left is an opacity of 0 and the contours will not display, all the way to the right is an opacity of 1 and the contours will display brightly

         *   **Minimum/Maximum Scale:** Contours will only be visible if the map scale is within the limits set here

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- **Stroke:** Select the color to draw the contour line in from the drop-down list

- **Thickness:** Select the thickness to draw the contour line with from the drop down list

- **Style:** Select the style to draw the contour line with from the drop down list

- **Text:**
    a. **Visible:** Check this box if the respective contour annotation is to be displayed

    b. **Color:** Select the color to draw the contour annotation in from the drop down list

    c. **Size:** Select the font size to use for the contour annotation from the drop down list

    d. **Minimum/Maximum Scale:** Contour text will only be visible if the map scale is within the limits set here

V. Click **Apply** to apply the configuration and if the **Enable Contours** is checked, generate the contours, or **Cancel** to abort the configuration changes

14.6.4.2 Contour Layers in Map Views

When contours are generated, they are added as a layer to all Map views. The display of these contours is controlled from the standard Map view Layers control feature. Figure 14-91 illustrates the display and layer control for two contour sets, one of high resolution and one of low resolution.
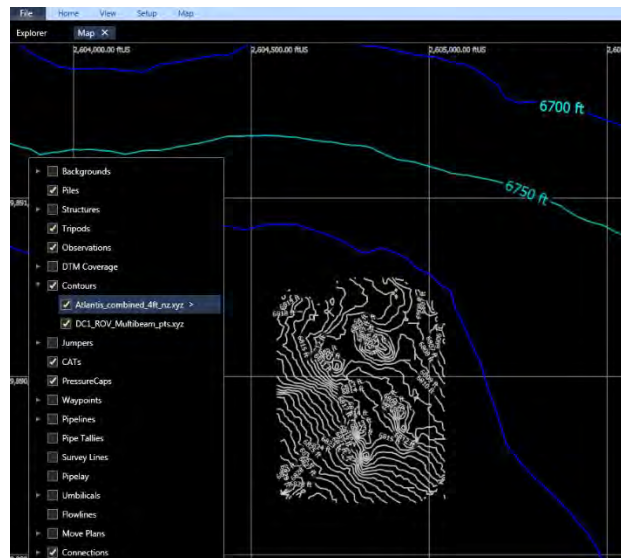
FIGURE 14-91 DTM MULTIPLE CONTOUR LAYERS

Contours are only available for display if generated from a DTM whose Horizontal CRS matches the Working Horizontal CRS.

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14.7 Configuration History

The **Configuration History** tool in NavView displays the configuration history via a query tool. To access the configuration history window, open the explorer window, expand data, database services and click on Configuration History.
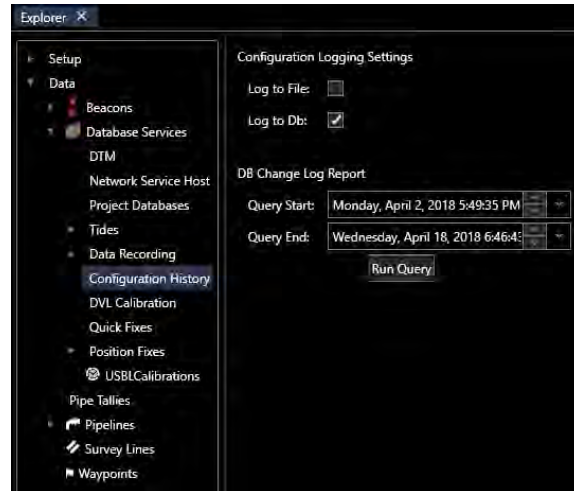
FIGURE 14-92 CONFIGURATION HISTORY

- **Configuration Logging Settings**
  - **Log to File:** If checked changes to the Project are logged to a file
  - **Log to DB:** If checked changes to the Project are logged to a database
- **DB Change Log Report**
  - **Query Start:** Enter date and time to start query
  - **Query End:** Enter date and time to start query

14.8 DVL Calibration

The DVL calibration tool in NavView uses a custom query from the standard data recording. The ROV must be navigated down a straight line while recording positions heading and DVL Data. NavView will then process the data and provide misalignments and scale factors which can be applied in the DVL settings.

There are three data streams required to calibrate a DVL sensor:

- Vehicle CRP Position (Geographic2D Observations)
- Vehicle Heading (Heading Observations)
- DVL Data (Horizontal Velocity Observations)

The Vehicle CRP input should be positioned without the DVL sensor. For the case of an ROV tracked using USBL this would be the corrected CRP position of the ROV based on beacon location. The vehicle heading used should be the corrected heading with C-O applied.

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It is recommended to log a test data set and run through the query process prior to starting the actual calibration, to verify that data is coming in from all sensors and logged in the correct locations.

14.8.1 Recording DVL Calibration Data

Navigate to the Data Recording item in Database Services on the Explorer. Set up a new recording session. It is recommended but not necessary to only record the items of interest for the calibration. Enter a Logging Name describing the DVL Cal, so the data can be easily located. Uncheck "Downsample Data" so that all data gets recorded.
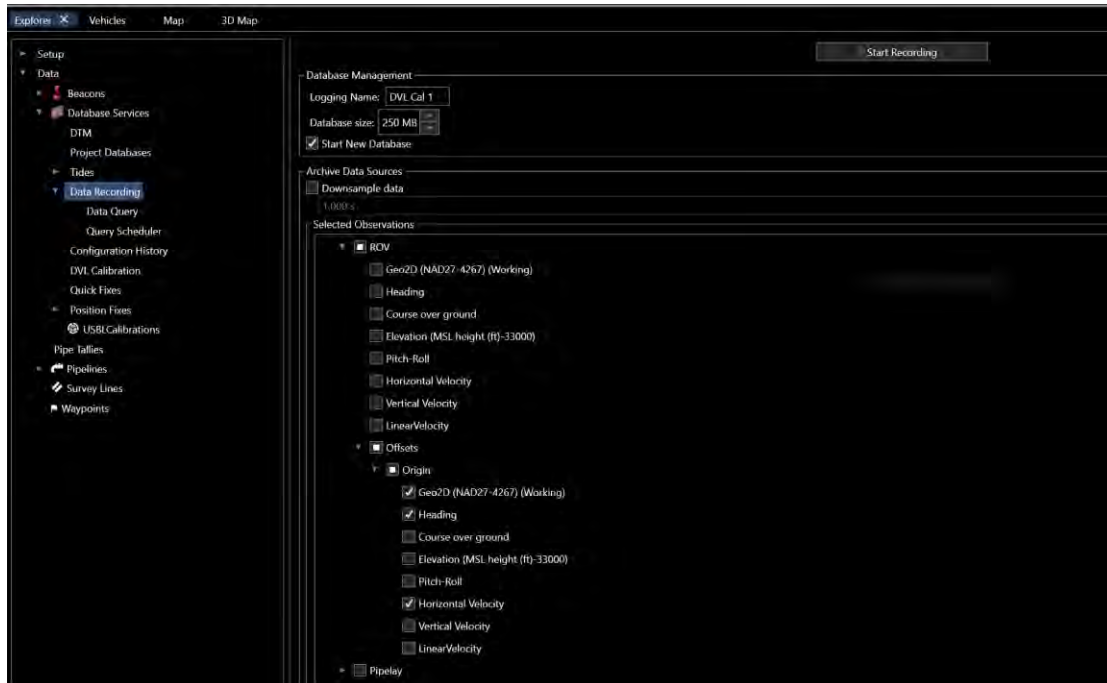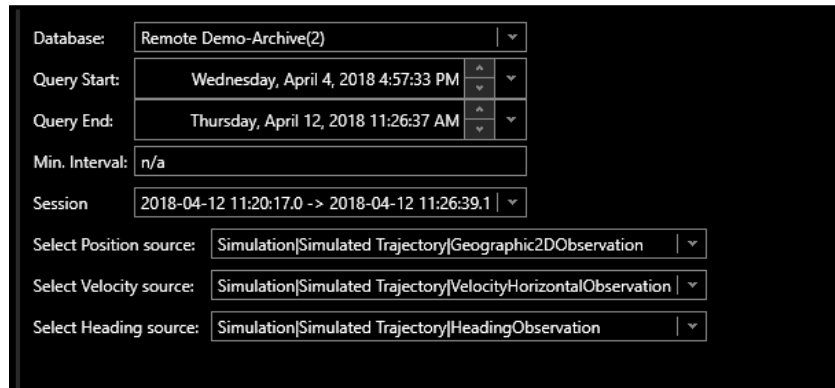
FIGURE 14-93 DVL CALIBRATION – DATA RECORDING

Start recording and navigate the vehicle down a straight line for approximately 100-200m meters. The length of navigation depends on the noise of the positioning system being used. If the system is positioned using LBL or USBL in shallow water where the accuracy is greater, then a shorter baseline could be used.

14.8.2 Data Query

1. Navigate to the DVL Calibration section under database services, as seen below.

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FIGURE 14-94 DVL DATA QUERY

I. **Database:** Select the database that was used to record the data for calibration.

II. **Query Start:** Defaults to when the database was created, this can be edited

III. **Query End:** Defaults to when the database was last written to, this can be edited

IV. **Min. Interval: Not Used**

V. **Session:** Each time data recording is started or stopped in NavView data logging, a new database session is created. These sessions are listed in a combo box for the selected database, by start and end time. Select the session that was used to record the DVL Calibration Data.

VI. **Select Position Source:** All position sources that were logged in the data recording session will be available. Select the source used to position the ROV without Kalman filter applied.

VII. **Select Velocity Source:** The velocity source is the DVL observations which are to be calibrated. Select the source logged during the data recording session.

VIII. **Select Heading Source:** The heading source is the corrected vehicle heading. This is required to apply to velocity data from the DVL to calculate a position track. Select the heading source for the ROV used during the data recording session.

Once the database, session, and data sources are selected, click **Run Query** at the bottom of the screen. Data for the three sources will be presented in a tabular form with timestamps for each observation as seen below.

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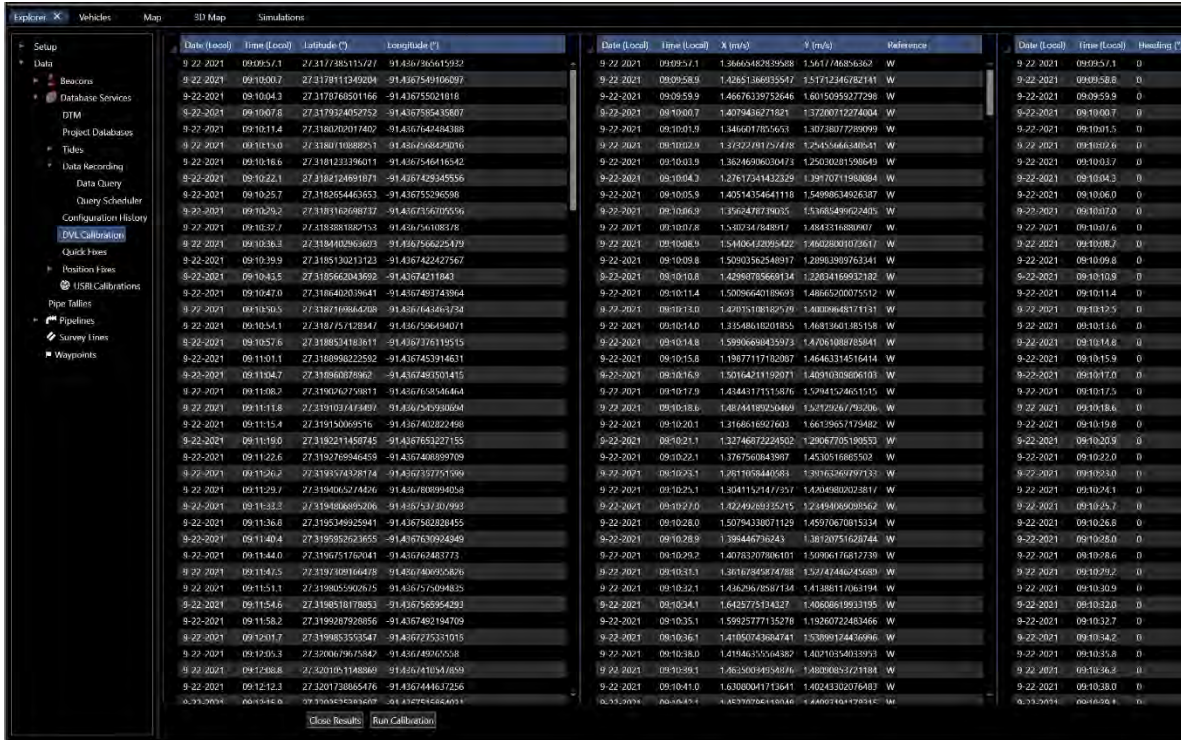
FIGURE 14-95 DVL CALIBRATION – RECORDED DATA

2. Click **Run Calibration** to open the calibration tool.

14.8.3 Calibration

The DVL Calibration tool window is shown below.
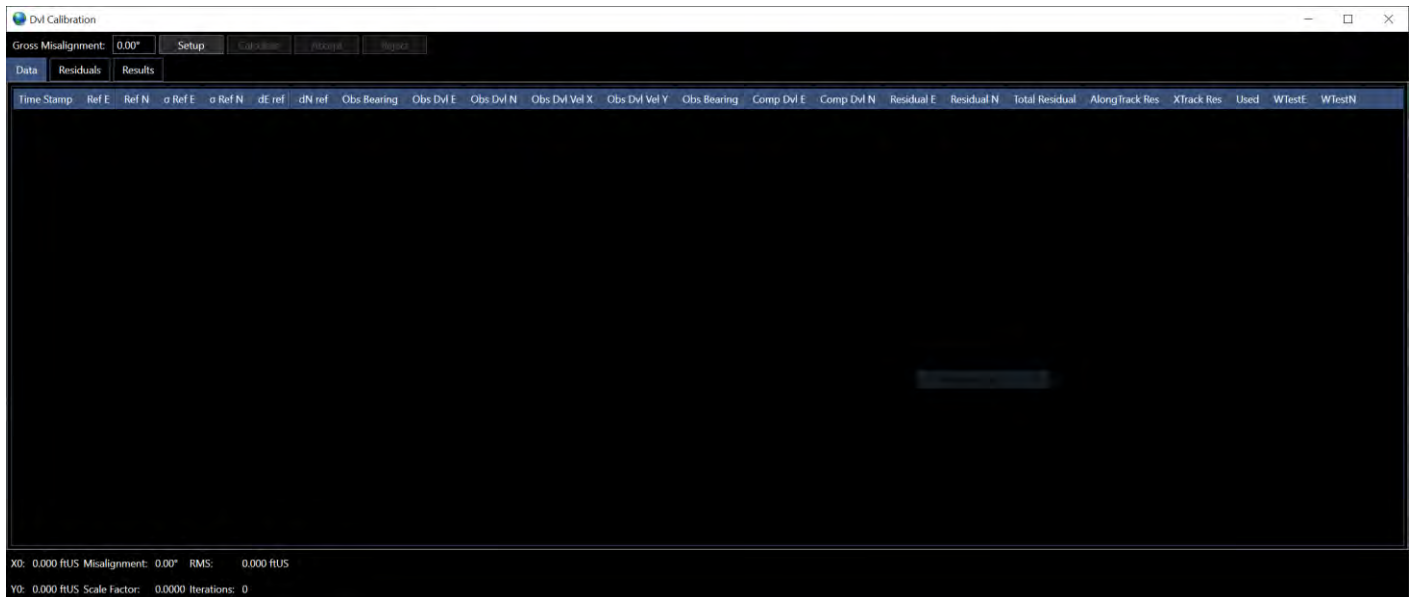
FIGURE 14-96 DVL TOOLS WINDOW

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There are a few simple command buttons along the top of the window:

- **Gross Alignment:** if the DVL unit is rotated from forward when mounted on the vehicle, this rotation is entered here, e.g. rotated 90° or 180°

- **Setup:** this will populate the data from the data query and reset any parameters.

- **Calculate:** will run the calibration routine on the data and provide results

- **Accept/Reject:** multiple data points can be selected simultaneously and accepted or rejected using these buttons.

The tabs in the window are as follows:

- **Data Tab:** The observations are presented here in a tabular format. Here, once the result is calculated, data can be selected for rejection, and residuals can be examined numerically (see Figure 14-97)

FIGURE 14-97 DVL CALIBRATION - DATA TAB

- **Residuals Tab:** On the residuals tab, residual data can be viewed as either **Track Relative**, **Eastings/Northings** or **Total**.

  - **Track Relative** residuals refer to data points relative to the trajectory of the vehicle, along track and cross track (see Figure 14-98)

  - **Easting/Northing** residuals are relative to north up.

  - **Total** shows the combined residual.

  If a high residual is identified on these charts, it is possible to Navigate to the Data tab and sort by the type of residual and reject that item. Once this is done, the calculation should be run again.

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FIGURE 14-98 DVL CALIBRATION - TRACK RELATIVE RESIDUALS TAB

- **Results Tab:** The results tab shows the results of each iteration in the least squares adjustment used to calculate the misalignments and scale factor. The shifts in value from each iteration of the calculation can be seen. If the result quickly converges in 2-4 iterations and has very small changes, it is likely an acceptable calculation. If the data changes dramatically and oscillates around a value, then the data should be re-examined to determine if there are any issues.
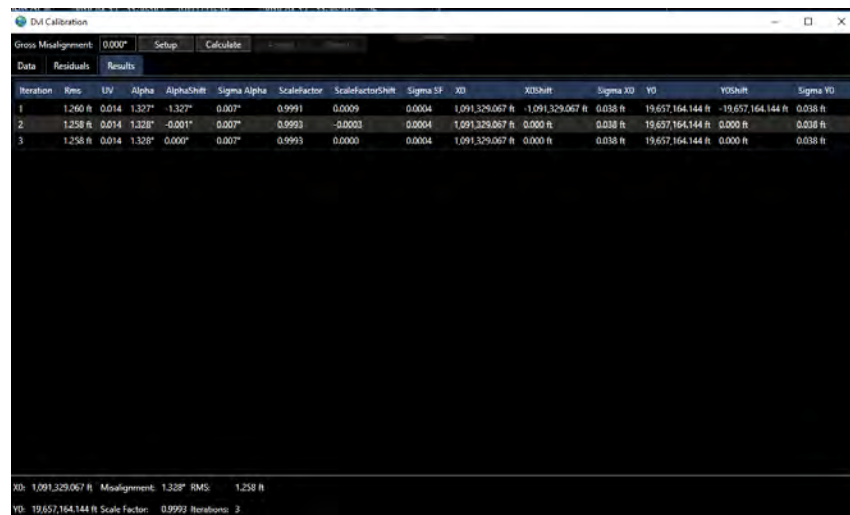
FIGURE 14-99 DVL CALIBRATION - RESULTS TAB

14.8.4 Methodology

The calibration routine calculates a location based only on dead reckoning of DVL Data and heading data then compares this to the position source location at each time epoch. The parameters of heading misalignment, scale factor, and starting position are adjusted using a least squares routine. Each

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iteration of least squares provides a shift for each of the parameters, as seen above. These are applied to the parameters, and the calculation is run again. Convergence is determined once the parameters are no longer changing.

14.8.5 Workflow

To calibrate the DVL, use the following steps (starting from loading into the calibration window).

1. Click the Setup button to load data into the calculation

2. Click Calculate to get an initial result

3. Look at the residuals tabs to get an idea of the size of the outliers. Also look at the RMS value shown at the bottom of the screen, and the parameter results to see if they make sense.

4. If outliers are found, return to the Data tab, Data can be sorted by: Residual E, Residual N, Total Residual, Along Track Residual, and Cross Track Residual by clicking on the table headers for those values. Sort the data by Total residual so that the greatest residuals in any direction will appear at the top of the list. Select these data items and click **Reject**

5. If data has been rejected, click **Calculate** again, and then re-examine the residuals and results. Repeat this process until satisfied.

14.8.6 Example

The example residuals below show very large along track residuals for the first few seconds of data collection (see Figure 14-100).

FIGURE 14-100 DVL CALIBRATION -HIGH RESIDUALS EXAMPLE

When examining the results of the calibration, there are 6 iterations and the final RMS is 2155 ft, and the shift in Alpha (heading misalignment) is 180 degrees on the last iteration. It appears that the calculation has not converged.

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FIGURE 14-101 DVL CALIBRATION-RESULTS NOT CONVERGED

The user would then return to the data tab and sort by Total Residual. The total residual for several observations is very large. Click the Reject button to not use this data (see Figure 14-102).

FIGURE 14-102 DVL CALIBRATION - RESIDUALS SORTED

Once this data was rejected, the Calculate button was clicked again. The resulting residuals tab is seen below:

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FIGURE 14-103 DVL CALIBRATION - RECALCULTED RESIDUALS

Here, it appears there are one or two observations that fall outside the 95% confidence (orange line) and as such could still be rejected and the calibration rerun.

At this point, the Results tab is examined which shows that convergence has been achieved. There are only 3 iterations, and on the last one the shift in all parameters is seen to be zero (see Figure 14-104).

FIGURE 14-104 DVL CALIBRATION - RESULTS CONVERGED

14.9 USBL Calibration

USBL calibrations determine the error in the mounting of the USBL transducer relative to the vessel's local coordinate reference frame. The results are correction values for pitch, roll and heading with an option for scaling that are applied to USBL observations before they are used.

This is covered in a sperate section, **USBL Box-In and Calibration**

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15 Connections

This section provides an overview of how connections are added and configured in the NavView software.

15.1 Overview

NavView's approach to towed or layback vehicles, ROV operations with a tether management system (TMS), and risers utilizes the concept of a Connection. A Connection is an object associated with (connected to) a vehicle that in most cases subscribes to the body state published by that vehicle and uses it as a reference for its own specific application. The results of the respective connections are published and available for display in the 2D and 3D views and available for display in alphanumeric windows and output via the configurable output device.

If Rolls and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In/User	Cannot add, edit or remove connections
Online/Supervisor	Cannot add or remove connections, can edit connections
Administrator	Can add, edit and remove connections

Connections are accessed and configured via the Setup ribbon (see Figure 15-1) or Explorer (see Figure 15-2). There is not a specific monitoring window as this depends upon the connection type and configuration.

FIGURE 15-1 SETUP RIBBON - CONNECTIONS

FIGURE 15-2 EXPLORER - CONNECTIONS

The connections supported are as follows:

- Straight Line Connection
- 3D Polyline Connection

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- User Observation Source Connection
- Towed Body Connection
- Articulated Frame Connection

- Crane Connection
- Layback Connection

These are detailed in the following sections.

15.2 Add a Connection

To add a connection, click the ← button in the Connections dialog window. This will display a list of the supported connections, select the desired connection type then click the ⊕ button to add the connection.
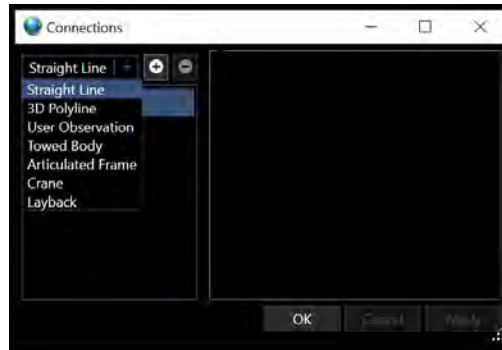
FIGURE 15-3 ADD CONNECTIONS - SUPPORTED CONNECTIONS

The Connections configuration dialog will open with the default settings for the respective connection. Figure 15-4 shows the configuration dialog resulting from selecting Straight Line
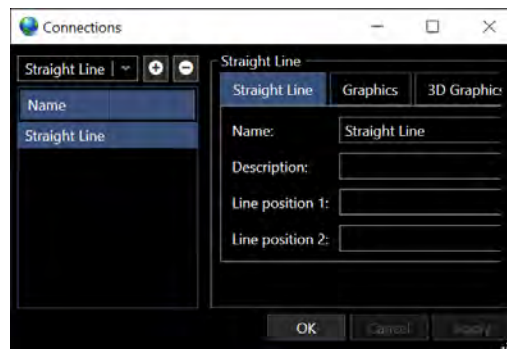
FIGURE 15-4 CONFIGURE CONNECTIONS EXAMPLE

15.3 Remove a Connection

To remove a connection, select the connection to be removed in the connection list under Name and click the ⊖ button

Note: When a connection is removed, the configuration is lost and needs to be reconfigured upon re-adding

15.4 Configure a Connection

The configuration of a connection is done via the Connections dialog.

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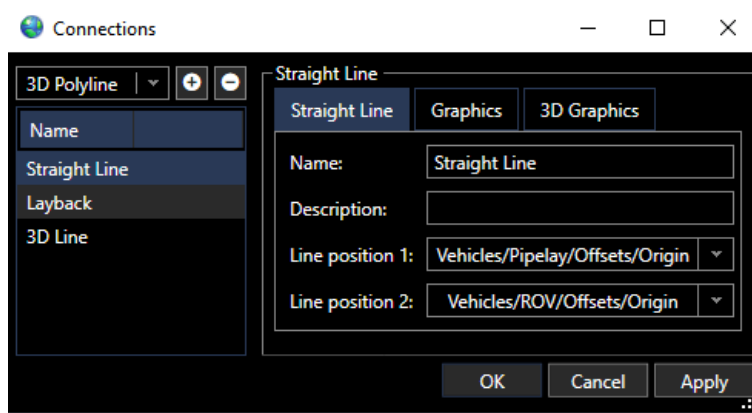
FIGURE 15-5 CONFIGURE CONNECTIONS DIALOG – MULTIPLE CONNECTIONS

Selecting the connection to configure in the list in the left panel of the dialog will present the respective configuration options in the right panel. Upon completing the configuration, click the Apply button to apply the changes and leave the dialog open, or click the OK button to apply the changes and close the dialog.

15.4.1 Straight Line Connection

The Straight Line connection is the simplest form of connection. It is used to associate selected points on two objects for the primary purpose of showing a simple straight line connection between them. An example application is the representation of an umbilical from a construction vessel to a suspended TMS and from the TMS to the ROV. The line between the objects is displayed in the 2D and 3D views and the spatial relationship information range, bearing and vertical separation is available for display and output.

15.4.1.1 Configuring a Straight Line Connection

1. Open the Connections dialog, select Straight Line from the drop-down list and click the ⊕ button
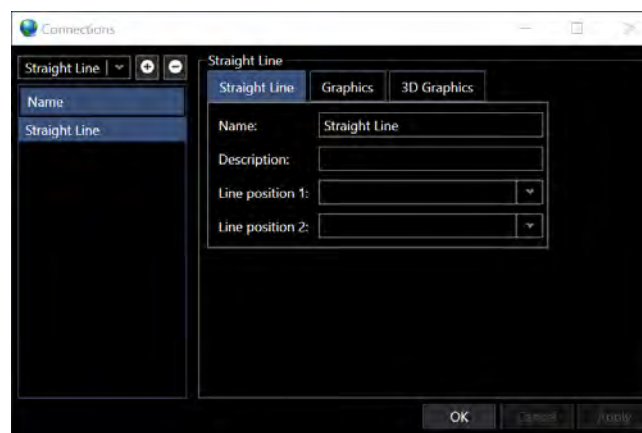
FIGURE 15-6 CONFIGURE STRAIGHT LINE CONNECTION DIALOG

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2. Select the Straight Line to be configured in the list in the left panel to display the respective configuration options in the right panel

3. Configure the **Straight Line** options

    a. **Name:** Enter the Name of the straight line, it is recommended that this be representative of the application

    b. **Description:** NavView supports a description attribute for objects such as connections, vehicles, waypoints, etc. to be displayed when the respective object is viewed or rolled over with the mouse in a graphics window, enter an appropriate description for the connection

    c. **Line Position 1:** From the Line Position 1 drop-down list, select the start point of the connection from the available options, see Figure 15-7

    d. **Line Position 2:** From the Line Position 2 drop-down list, select the end point of the connection from the available options, see Figure 15-7

Note: The Line Position 1 and 2 drop down lists are populated with Vehicles and their offsets and Waypoints.
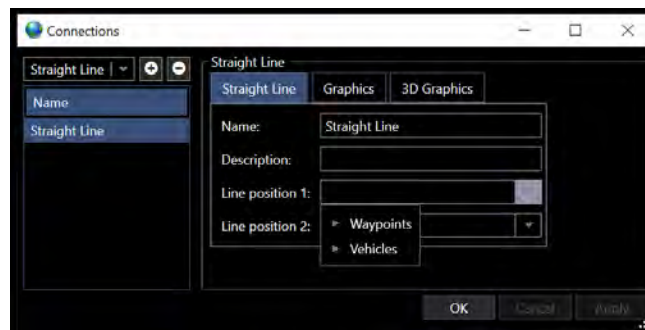
FIGURE 15-7 LINE POSITION OPTIONS

4. Configure the **Graphics** options
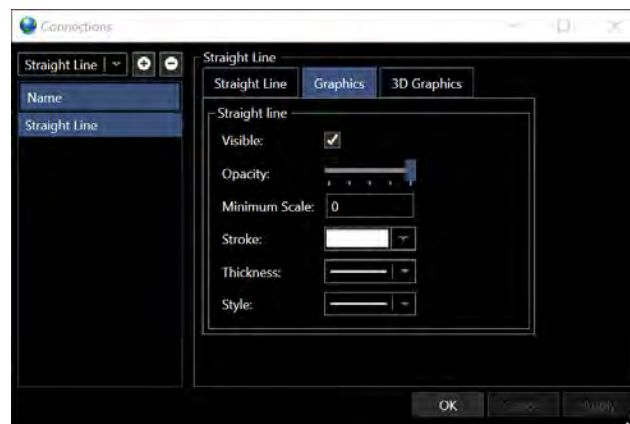
FIGURE 15-8 STRAIGHT LINE CONNECTION GRAPHICS TAB

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a. **Visible:** Select whether the straight line connection will be Visible in the 2D Map

b. **Opacity:** Drag the scroll bar to control the Opacity of the straight line connection

c. **Minimum Scale:** The connection line will be displayed in 2D Map if the map scale is greater than the value set here

d. **Stroke:** From the drop-down list, select the Color to use to display the straight line in the 2D Map

e. **Thickness:** From the drop-down list, select the Thickness to use to display the straight line in the 2D Map

f. **Style:** From the drop-down list, select the Style to use to display the straight line in the 2D Map
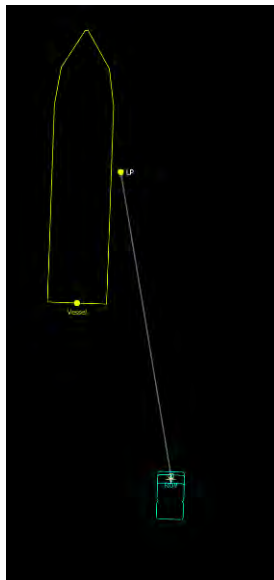
FIGURE 15-9 STRAIGHT LINE CONNECTION 2D EXAMPLE

5. Configure the **3D Graphics** options
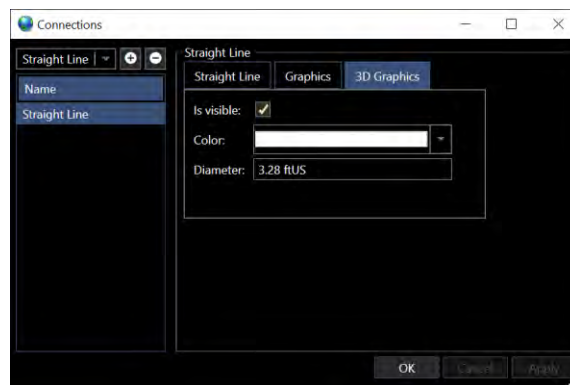
FIGURE 15-10 STRAIGHT LINE CONNECTION 3D GRAPHICS TAB

a. **Visible:** Select whether the straight line connection will be Visible in the 3D Map

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b.   **Color:** From the dropdown list select the Color to use to display the straight line in the 3D Map

c.   **Diameter:** Enter the Line Diameter of the line to be drawn to form the connection in the graphic windows

Note: The diameter applied to the 3D graphics setting may need to be larger than the actual diameter of the line being represented in order for it to be visible in the 3D view.

15.4.2 3D Polyline Connection

The 3D Polyline connection is created by entering or importing multiple X, Y, Z points to generate a 3D line. This line is then available for CPA Guidance Calculations and display in the 2D Map and 3D views.

15.4.2.1 Configuring a 3D Polyline

1.   Open the Connections dialog, select 3D Polyline from the drop-down list and click the button
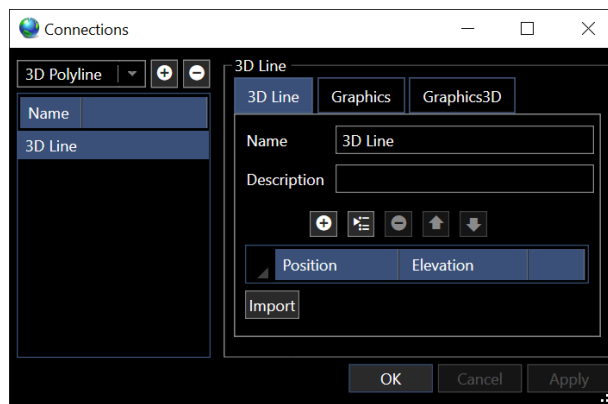
FIGURE 15-11 CONFIGURE 3D POLYLINE CONNECTION DIALOG

2.   Select the 3D Polyline to be configured in the list in the left panel to display the respective configuration options in the right panel

- Configure the **3D Line** options

a.   **Name:** Enter the Name of the 3D Polyline, it is recommended that this be representative of the application

b.   **Description:** NavView supports a description attribute for objects such as connections, vehicles, waypoints, etc. to be displayed when the respective object is viewed or rolled over with the mouse in a graphics window, enter an appropriate description for the connection

4.   Import 3D Polyline (if not importing a line, just entering points, go to step 5)
     a.   Click the Import button
     b.   Browse to the file containing the X, Y and Z data defining the 3D line and open it to open the Import 3D Line Data dialog

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FIGURE 15-12 3D POLYLINE FILE IMPORT DIALOG

c. ![icon] **:** If the import settings for the selected file format were previously saved to a *.4dr file, click this button to navigate to and select it to load

d. ![icon] **:** Once the import settings are set, click this button to save the settings to a *.4dr file for future use

e. **Input CRS:** Select the Horizontal CRS that the coordinates are referenced to from this drop down list, it is populated with the CRS that have been added to NavView

f. **Relative to reference point:** If the position data is relative to a specific location rather than absolute coordinates and elevations, i.e. delta X, delta Y and delta Z, check this box and enter the reference position, reference elevation and if the data is rotated relative to North, the rotation

g. **Line Prefix:** If the file records have a prefix identifying those records with the position and elevation, check this box and enter it

h. **Delimited/Fixed Length:** Select the data field format. In the case of Delimited, **s**elect the delimiter type. Selecting Custom allows the entry of a character not listed in the options

i. **Culture:** Select the culture the data is in. The default is **en-US** (English/US) where the decimal point is represented by a point. If **fr** (French) is selected, the decimal point is represented by a comma.

j. Configure the fields

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```
3D Polyline Data
#,E 756576.4,N 500196.9,D 0.0
#,E 756586.4,N 500206.9,D 50.0
#,E 756596.4,N 500216.9,D 150.0
#,E 756606.4,N 500226.9,D 250.0
#,E 756616.4,N 500236.9,D 350.0
#,E 756626.4,N 500246.9,D 450.0
#,E 756636.4,N 500256.9,D 650.0
```

```
#756576.4500196.9000.0
#756586.4500206.9050.0
#756596.4500216.9150.0
#756606.4500226.9250.0
#756616.4500236.9350.0
#756626.4500246.9450.0
#756636.4500256.9650.0
```


FIGURE 15-14 3D POLYLINE IMPORT - FIXED LENGTH

FIGURE 15-13 3D POLYLINE IMPORT - DELIMITED

i.   Click to add a field to the end of the list
ii.   Click to remove the selected field
iii.   Click to move the selected field up
iv.   Click to move the selected field down
v. **Data Type:** Click in the cell and select the data type from the drop down list
vi. **Units:** Click in the cell and select the units from the drop down list
vii. If **Delimiter** (see Figure 15-13 where the configuration shown will import the text file shown)
 1. **Trim Start:** Enter the number of characters to ignore at the start of the field, e.g. if the field starts with "E " enter 2
 2. **Trim End:** Enter the number of characters to ignore at the end of the field, e.g. if the field ends with " E " enter 2
viii. If **Fixed Length** (see Figure 15-14 where the configuration shown will import the text file shown)
 1. **Field Start:** Enter the column the field starts in
 2. **Field Size:** Enter the length of the field

Note: When entering the Field Start, note that the first character of a record is '0'.

 k. Click **Finish** to import the file
 l. Go to step 5 to review and edit the imported data

5. Enter/edit polyline point positions using the toolbar and clicking in Position and/or Elevation cell to edit that value

   Click to add a point to the 3D line

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Click to insert a point at selected location

Click to remove selected point from line

Click to move selected point up

Click to move selected point down
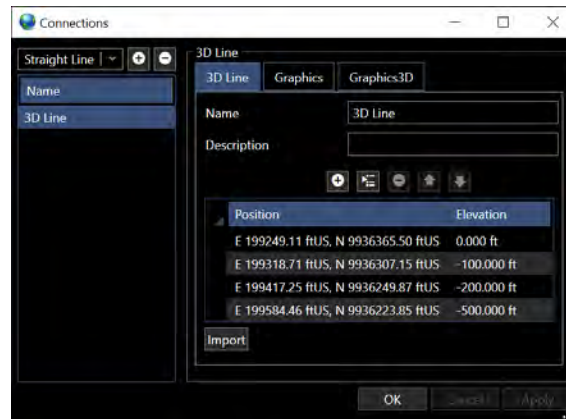
FIGURE 15-15 3D POLYLINE CONNECTION DATA GRID EXAMPLE

5. Configure the **Graphics** options
   Configuration as in the Straight Line Connection

6. Configure the **3D Graphics** options
   Configuration as in the Straight Line Connection[JL1]

7. Click **Apply** to apply the changes and keep the dialog open, **OK** to apply the changes and close the dialog, or **Cancel** to abort the configuration and leave the dialog open.

15.4.3 User Observation Source Connection[JL2][JL3]

User observation (simulated observation) will be shared to all remote stations. It provides control of an observation across the network, e.g. fixed heading, that is then available to be applied at any NavView client.

15.4.3.1 Configure a User Observation Source

1. Open the Connections dialog, select User Observation Source from the drop-down list

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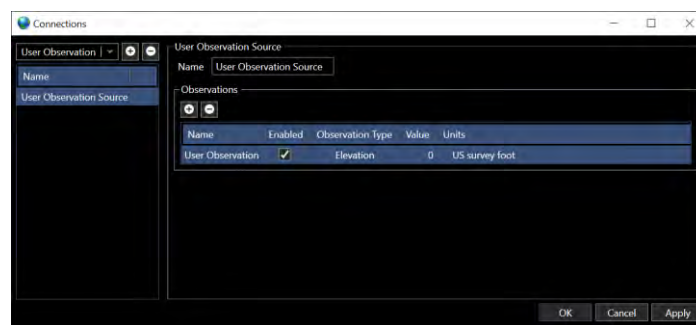
2. Select the User Observation Source to be configured in the list in the left panel to display the respective configuration options in the right panel

   a. **Name:** Enter the Name of the User Observation Source, it is recommended that this be representative of the application

3. Click the ⊕ button to add a specific Observation, Click the ⊖ button to remove a selected Observation

   a. **Name:** Edit name of observation

   b. **Enabled:** Check the box to enable observation for use

   c. **Observation Type:** This opens a list of observation types to choose from

   d. **Value:** Enter value to be used for the observation

   e. **Units:** This opens a list of units available to assign to the Value

15.4.4 Towed Body Connection

NavView supports positioning a *towed body* as a Connection. Three modes are supported:

- **Direction**
  - The towed body is positioned on an operator configured azimuth from the tow point on the reference vehicle, e.g. reference vehicle heading plus 180° for a point directly astern of the tow point
  - At each update of the tow point position the layback distance is applied to the tow point position on the configured azimuth to determine the towed body position
  - The configured Heading is used as the azimuth for each update

- **Follow**
  - From an initial operator assigned azimuth from the tow point on the reference vehicle, the towed body movement mirrors that of the tow point
  - At each update of the tow point position, the change in its position from the last update is calculated and applied to the last position of the towed body to determine the new towed body position
  - The configured Heading is used as the azimuth for the initial towed body position determination

- **Chase**
  - From an initial operator assigned azimuth from the tow point on the reference vehicle, the towed body position chases the tow point
  - At each update of the tow point position, the azimuth from the new tow point position to the last towed body position is calculated and used with the layback distance and new tow point position to determine the new towed body position

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o   The configured Heading is used as the azimuth for the initial towed body position determination

The Layback is calculated using the Pythagorean theorem where NavView knows the slope distance and the delta elevation from the tow point to the towed body. The slope distance is calculated from a cable out value and a scale factor called the Catenary factor that enables a rudimentary correction to the cable length to account for its catenary through the water column.

15.4.4.1 Configure a Towed Body

1. Open the Connections dialog, select Towed Body from the drop-down list and click the ⊕ button
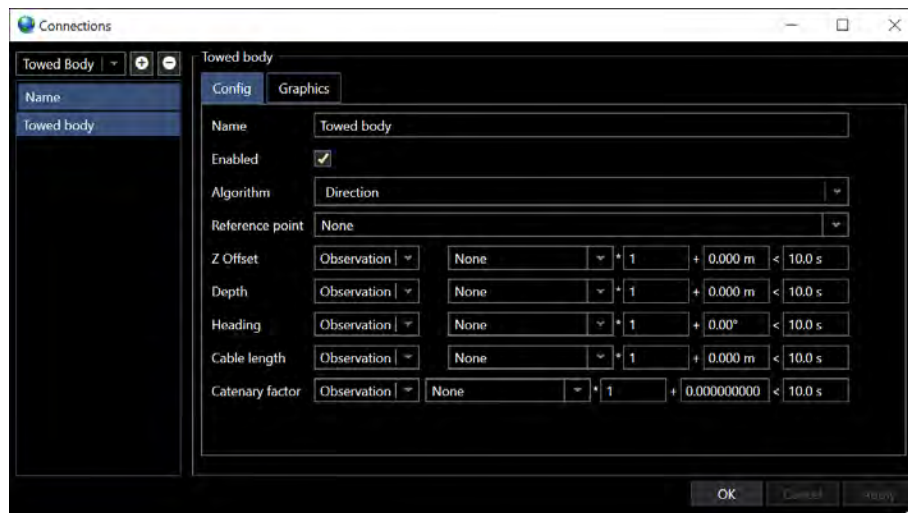
FIGURE 15-17 CONFIGURE TOWED BODY CONNECTION DIALOG

2. Select the Towed Body to be configured in the list in the left panel to display the respective configuration options in the right panel

3. Configure the Towed Body options

    a. **Config Tab** (see Figure 15-17)

        •   **Name:** Enter the name to identify the connection

        •   **Enabled:** Check or uncheck to enable or disable the towed body connection calculations

        •   **Algorithm:** Select Direction, Follow or Chase mode

        •   **Reference Point:** Select the tow point on the reference vehicle from the drop-down list of available options

Note: The selected Reference Point position, heading and course made good are used in the calculation of the towed body position depending on the Algorithm selected and the Heading configuration. Z Offset and Depth values are applied to the selected object's elevation to calculate the towed body positional data.

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Note: It is recommended that an offset representing the tow point be added to the vehicle towing the body and selected as the Reference point.

- **Z Offset:** The vertical distance from the reference point to the tow point, positive is up

- **Depth:** The vertical distance from the reference point to the towed body, positive is down

- **Heading:** The heading from the reference point to the towed body, positive clockwise from north

- **Cable Length:** The length of cable from the tow point to the towed body

- **Catenary Factor:** The scale factor used to convert the measured cable length to a slope distance from the tow point to the towed body

When configuring settings of the Towed Body the user can select between using a **Constant** or an **Observation** as follows:

- In the first dropdown, select **Constant**
- In the second control enter the value to use

or

- In the first dropdown, select Observation
- From the second dropdown, select the data source for the respective Observation type
- In the third control, enter a scalar if the Observation requires scaling before use
- In the fourth control, enter a C-O if the Observations requires correcting before use
- In the fifth control, enter the maximum age of data in seconds. If there is a loss of data, the towed body calculation will continue using last data received until it reaches the value set here

Note: The order of application of the scaler and C-O are as indicated by their order in the control, i.e. (Distance Observation * scaler) + C-O

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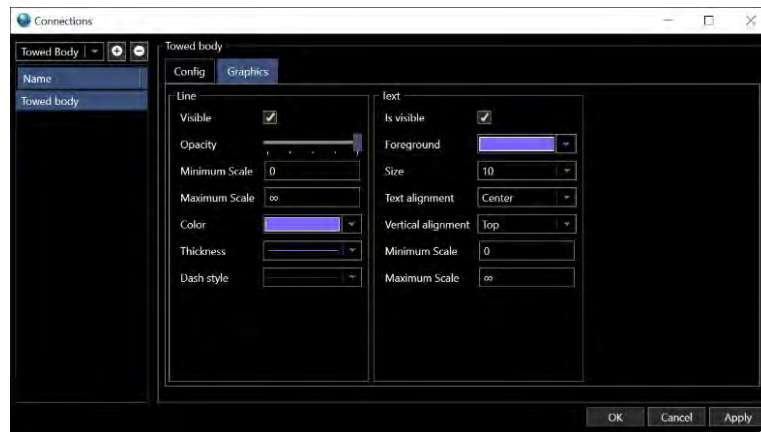
b. **Graphics Tab**

FIGURE 15-18 TOWED BODY CONNECTIONS DIALOG - GRAPHICS TAB

o **Line:** From the Reference Point to the Towed Body in the 2D Map view

o **Visible:** Check to control the display of the line on the Towed Body Connection layer

o **Opacity:** Drag the scroll bar to control the Opacity of the connection line

o **Minimum/Maximum Scale:** The connection line will be displayed in 2D Map if the map scale is within the values set here

o **Color:** Select the color to display the line in 2D Map

o **Thickness:** Select the line thickness to be displayed

o **Dash Style:** Select the line style to be displayed as, e.g. solid, dashed

o **Text:** Text annotating the connection line

o **Is Visible:** Check to display the text on the Towed Body Connection line

o **Foreground:** Select the color for the text

o **Size:** Select the font size for the text

o **Text Alignment:** Select the horizontal text alignment (Left, Right, Center and Justify) for the annotation

o **Vertical Alignment:** Select the vertical text alignment (Top, Middle and Bottom) for the annotation

o **Minimum/Maximum Scale:** The connection line annotation will be displayed in 2D Map if the map scale is within the values set here

Note: The Text will not display regardless of the **Is Visible** setting or the Minimum scale setting of the Line is not set to Visible and visible, i.e. if the Line is not drawn because its Minimum Scale setting has been exceeded, the text will also not display.

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15.4.5 Articulated Frame Connection

An articulated frame is a body which consists of two or more separate rigid frames connected by a defined joint. For simplicity each joint is assumed to have a single rotation angle about the X, Y, or Z axis. The next joint in the articulated frame is defined by a translation along the rigid frame from the previous joint. An articulated frame is created by defining a series of separately modeled rigid frames.

15.4.5.1 Configure an Articulated Frame

I.   Open the Connections dialog, select Articulated Frame from the drop-down list and click the ⊕ button
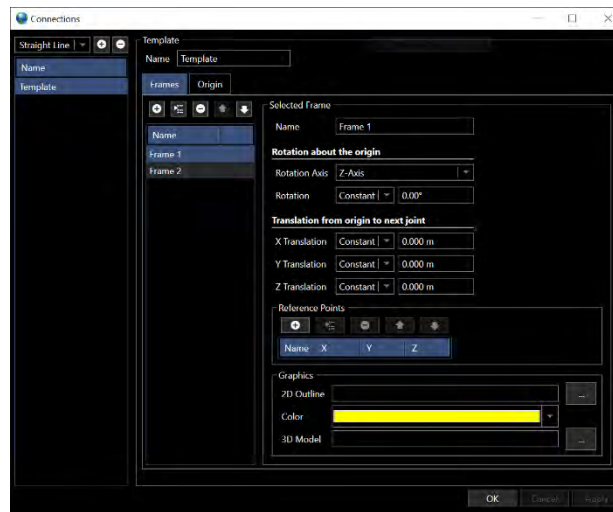
FIGURE 15-19 CONFIGURE ARTICULATED FRAME CONNECTION DIALOG

2. Select the Articulated Frame to be configured in the list in the left panel to display the respective configuration options in the right panel

3. Configure the selected Articulated Frame Connection options

   7   **Name:** Enter the Name for the Articulated Frame Connection, it is recommended that this be representative of the application

   8   **Frames Tab:** Configures the individual rigid frames that make up the articulated frame, see Figure 15-19

   6.   Toolbar

   ⊕ Click to add an individual frame

   Insert a new frame above the selected frame

   ⊖ Click to remove selected frame

   ⬆ Click to move up selected frame

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⬇ Click to move down selected frame

7. **Name:** The display name of the selected rigid frame, the name can be assigned by operator

8. **Rotation about the origin:** The coordinate system axis of each rigid frame is defined by a single rotation about the origin. The origin on each rigid frame is defined as the end point of the previous rigid frame, or by the defined reference body in the case of the initial rigid frame. This single rotation rotates the rigid frame from the previous rigid frame. All rotations are counter-clockwise positive. The initial axes are defined as follows:

   o **X-Axis:** The lateral axis, positive to starboard

   o **Y-Axis:** The longitudinal axis, positive forward

   o **Z-Axis:** The vertical axis, positive up

From the drop-down list select the axis of rotation which the rotation angle is to be applied.

5. **Rotation:** The rotation angle from the previous reference frame to this reference frame. This value can be defined as a constant value or can be read from an Angle data source

Rotation about the origin

Rotation Axis	X-Axis
Rotation	Constant ▾ 0.00°

- In the first dropdown, select **Constant**
- In the second control enter the value to use

Rotation about the origin

Rotation Axis	X-Axis	▾
Rotation	Observation ▾ None ▾ * 1 + 0.00° < 10.0 s	

- In the first dropdown, select Observation
- From the second dropdown, select the data source for the respective Observation type
- In the third control, enter a scalar if the Observation requires scaling before use
- In the fourth control, enter a C-O if the Observations requires correcting before use
- In the fifth control, enter the maximum age of data in seconds. If there is a loss of data, the towed body calculation will continue using last data received until it reaches the value set here

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Note: The order of application of the scaler and C-O are as indicated by their order in the control, i.e. (Distance Observation * scaler) + C-O

Note: If multiple rotations are required to define the new rigid frame coordinate system, then multiple rigid frames can be added sequentially with a zero translation.

23. **Translation from origin to next joint:** The origin of each subsequent rigid frame is defined by a translation from the origin of this rigid frame to the next rigid frame. The translation axes are the axes of this rigid frame after the rotation about the origin has been applied

   6. **X-Translation:** The translation along the rigid frame's x-axis to the next joint. This value can be defined as a constant value or can be read from a Distance data source

   7. **Y-Translation:** The translation along the rigid frame's y-axis to the next joint. This value can be defined as a constant value or can be read from a Distance data source

   8. **Z-Translation:** The translation along the rigid frame's z-axis to the next joint. This value can be defined as a constant value or can be read from a Distance data source
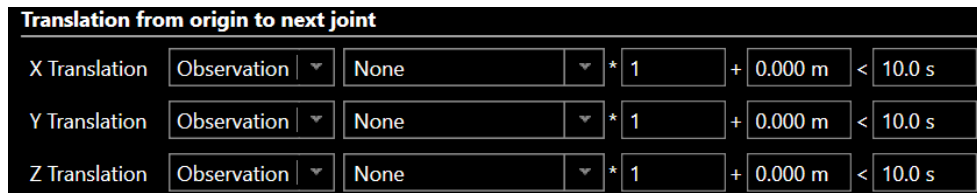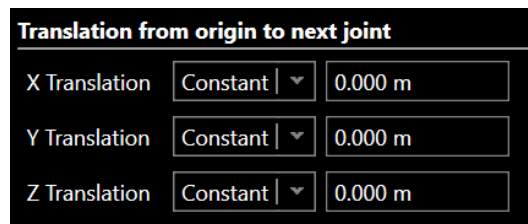
24. **Reference points:** Reference points are used to define any points of interest on the rigid frame. Reference Points are added using the toolbar. Each reference point is defined by:

   o **Name:** The display name for the reference point, the name can be assigned by operator

   o **X:** The distance along the X-Axis from the rigid frame origin to the reference point

   o **Y:** The distance along the Y-Axis from the rigid frame origin to the reference point

   o **Z:** The distance along the Z-Axis from the rigid frame origin to the reference point

The following values are computed for each reference point:

25. Geographic 2D coordinates

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26. Elevation
27. Local lever arm (X, Y, Z) from the origin of the articulated frame

Note: Reference points are displayed on map

- **Graphics:** The graphics section configures the graphics of the rigid frame

  o **2D Outline:** The drawing file used to render the rigid frame

  o **Color:** The rendered color of the 2D model

  o **3D Model:** the 3D model used to render the rigid frame

9 **Origin Tab:** The Origin tab configures the reference origin and rotation convention used to define the local cartesian coordinate reference system (LC-CRS) of the articulated frame
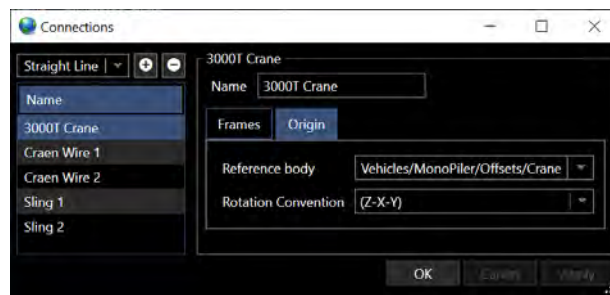
FIGURE 15-20 CONFIGURE ARTICULATED FRAME CONNECTION DIALOG - ORIGIN TAB

- **Reference body:** Defines the reference body state used to define the origin of the LC-CRS. All local lever arm (relative x, y, z) output observations are reference from the LC-CRS. The reference body is normally the origin of the vehicle on which the articulated frame is located. A valid body state including geographic 2D coordinates, elevation, heading, pitch, and roll is required to calculate the state of the articulated frame and all rigid frames.

- **Rotation convention:** Defines the rotation convention for applying the three rotation angles of the body state. The two possible choices are:

  o **Yaw-Pitch-Roll (Z-X-Y):** Defines the rotation order of (Rz * Rx * Ry) or (Ry * Rx * Rz)

    Rz is the rotation about the z-axis (heading axis)
    Ry is the rotation about the y-axis (roll axis)
    Rx is the rotation about the x-axis (pitch axis)

  o **Yaw-Roll-Pitch (Z-Y-X):** Defines the rotation order of (Rz*Ry*Rx) or (Rx*Ry*Rz)

15.4.6 Crane Connection

The Crane connection is used to derive the position of the crane sheave/hook using the host body crane pedestal position (rotation point), slew angle, boom angle and payout.

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15.4.6.1 Configure a Crane

1. Open the Connections dialog, select Crane from the drop-down list and click the ⊕ button
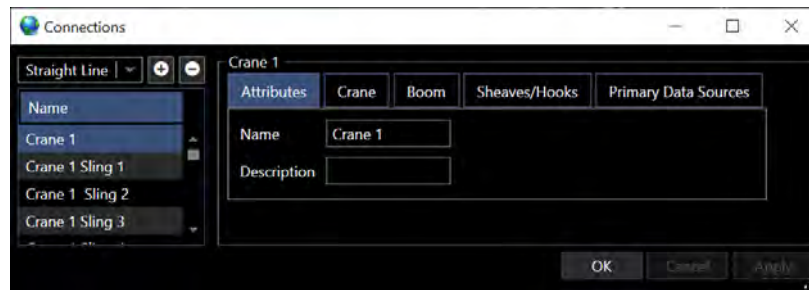
FIGURE 15-21 CONFIGURE CRANE CONNECTION DIALOG

2. Select the Crane to be configured in the list in the left panel to display the respective configuration options in the right panel

3. Configure the selected Crane Connection options

    a. **Attributes Tab** (see Figure 15-21)

        • **Name:** Enter the crane name to be displayed

        • **Description:** NavView supports a description attribute for objects such as connections, vehicles, waypoints, etc. to be displayed when the respective object is viewed or rolled over with the mouse in a graphics window, enter an appropriate description for the connection

    b. **Crane Tab**
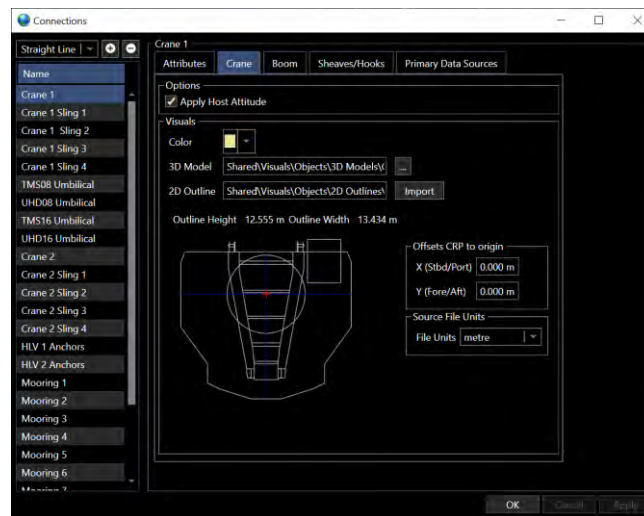
FIGURE 15-22 CONFIGURE CRANE CONNECTION DIALOG - CRANE TAB

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- **Options**

  o **Apply Host Attitude:** Check to apply the host vehicle's attitude data to the crane connection

- **Visuals**

  o **Color:** Select the crane color to be displayed

  o **3D Model:** select a 3D model to represent the crane using the browse button ▫ for display in 3D Map

  o **2D Outline:** Select a 2D outline to represent the crane using the import button for display in 2D Map

  o **Offsets CRP to origin:** Enter the (X,Y) offsets from the crane rotation point to the drawing origin

  o **Source File Units:** Select the units of the imported outline drawing

c. **Boom Tab**
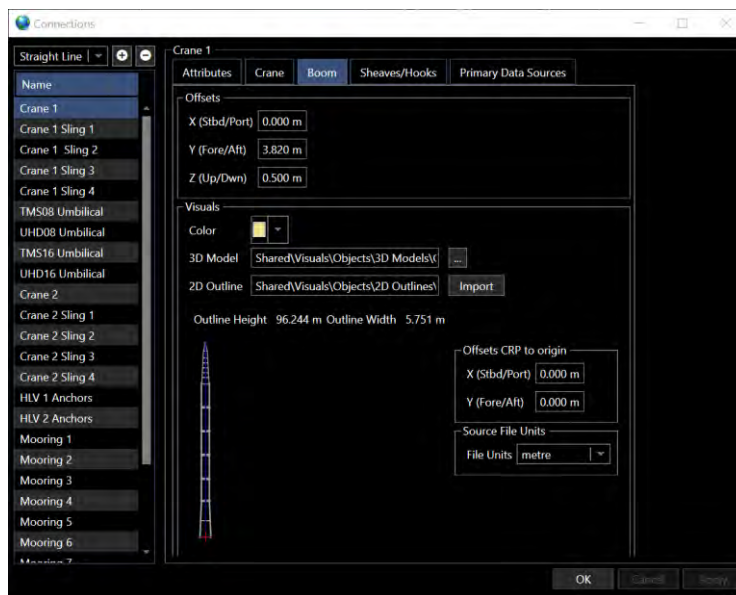
FIGURE 15-23 CONFIGURE CRANE CONNECTION DIALOG - CRANE TAB

- **Offsets**

  o **X (Stbd/Port):** Enter the X offset (+ to starboard, - to port) from the crane's rotation point to boom's CRP

  o **Y (Fore/Aft):** Enter the Y offset (+ to foreward, - to aft) from the crane's rotation point to boom's CRP

  o **Z (Up/Down):** Enter the Z offset (+ Up, - down) from the crane's rotation point to boom's CRP

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- **Visuals**

  o **Color:** Select the crane boom color to be displayed

  o **3D Model:** Select a 3D model to represent the boom using the browse button for display in 3D Map

  o **2D Outline:** Select a 2D outline to represent the boom using the import button for display in 2D Map

  o **Offsets CRP to Origin:** Enter the (X,Y) offsets from the crane rotation point to the drawing origin

  o **Source File Units:** select the units of the imported outline drawing

d. **Sheaves/Hooks Tab**
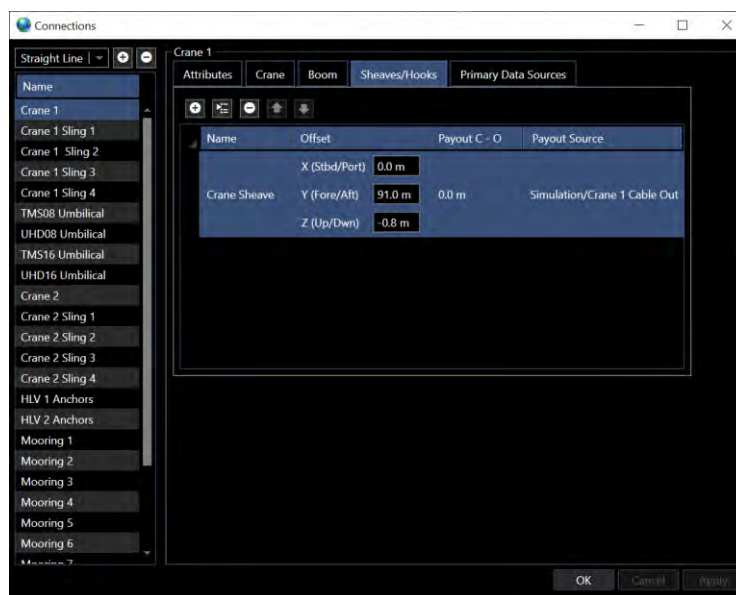
FIGURE 15-24 CONFIGURE CRANE CONNECTION DIALOG – SHEAVES/HOOKS TAB

- Toolbar

  Click to add an individual sheave/hook

  Insert a new sheave/hook above the selected sheave/hook

  Click to remove selected sheave/hook

  Click to move up selected sheave/hook

  Click to move down selected sheave/hook

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- **Name:** The display name of the selected sheave/hook, the name can be assigned by operator

- **Offset:** Enter the (X, Y, Z) offset from crane boom CRP to the sheave
- **Payout Source:** Select a payout source from the drop-down list

- **Payout C-O:** Enter C-O to be applied to the payout source

e. **Primary Data Sources Tab**
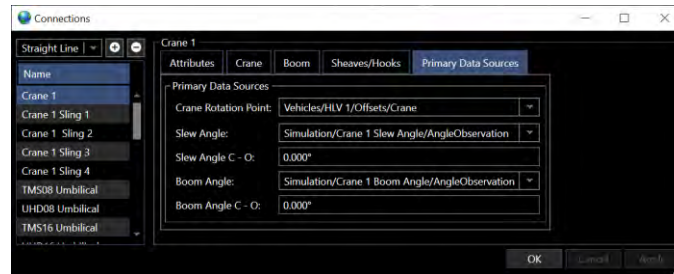
FIGURE 15-25 CONFIGURE CRANE CONNECTION DIALOG - PRIMARY DATA SOURCES TAB

- **Primary Data Sources**

  o **Crane Rotation Point:** Select from the drop-down list the positioning source for the crane rotation point, e.g. crane static offset assigned to a vessel

  o **Slew Angle:** Select from the drop-down list a crane slew angle source

  o **Slew Angle C-O:** Enter C-O to be applied to the slew angle source

  o **Boom Angle:** Select from the drop-down list a boom angle source

  o **Boom Angle C-O:** Enter C-O to be applied to the boom angle source

15.4.7 Layback Connection

A pipeline layback connection allows for the tracking of a pipeline with layback applied and a touchdown monitor selected.

15.4.7.1 Configuring a Layback Connection

1. Open the Configure Connections dialog, select the layback connection from the drop-down menu and click the ⊕ button

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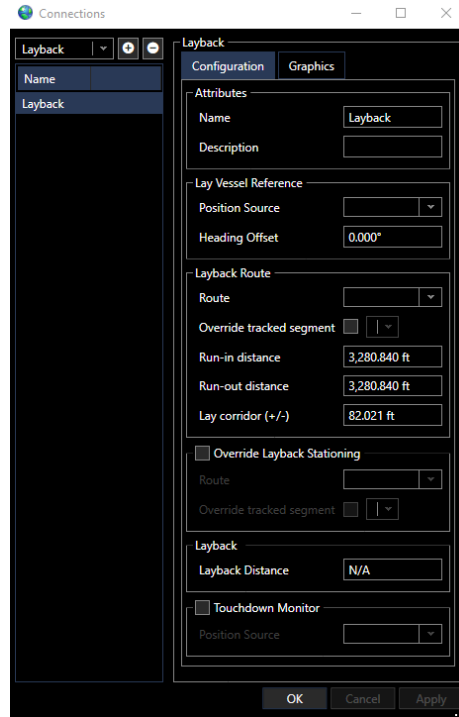
FIGURE 15-26 CONFIGURE LAYBACK CONNECTION DIALOG

2. Configure the Layback options

    a. **Configuration Tab** allows for editing the various pipeline characteristics for the layback connection (see Figure 15-26)

        - **Attributes**

            o   **Name:** Enter the Name of the layback connection, it is recommended that this be representative of the application

            o   **Description:** NavView supports a description attribute for objects such as connections, vehicles, waypoints, etc. to be displayed when the respective object is viewed or rolled over with the mouse in a graphics window, enter an appropriate description for the connection

        - **Lay Vessel Reference**

            o   **Position Source:** Choose a position source. Note that sources are listed in a hierarchical fashion. Below each vehicle its offsets are listed, as shown in Figure 15-27.

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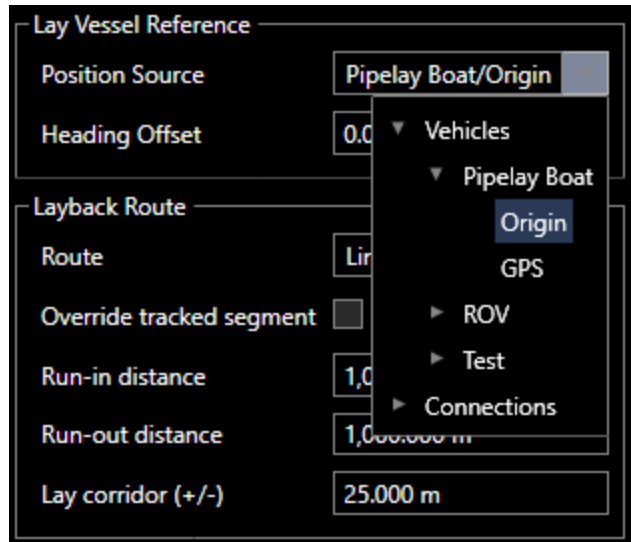
FIGURE 15-27 LAY VESSEL POSITION SOURCES

- o **Heading Offset:** Specify an offset to apply to the vessel heading when calculating the touchdown position. This allows for accurate tracking of the touchdown point when the vessel is laying at a heading other than directly forwards, such as when in close quarters with other vessels or rigs.

- **Layback Route**

  - o **Route:** Choose a pipeline from the list of pipelines currently loaded

  - o **Override Tracked Segment:** Choose this option to force NavView to track a specific segment on the pipeline for vessel reference

  - o **Run-in Distance:** Choose a distance to add to the start of the pipeline

  - o **Run-out Distance:** Choose a distance to add to the end of the pipeline

  - o **Lay Corridor:** Controls the width of the graphical corridor displayed on 2D Map

Note: Corridor is a distance on either side of the pipeline. An entry of 100ft will draw a line 100ft to the left, and another line 100ft to the right of the pipeline.

- **Override Layback Stationing:** Choose this option to force NavView to track a specific segment on the pipeline for touchdown monitoring

  - o **Route:** Select the pipeline

  - o **Override Tracked Segment:** Select specific segment of the pipeline

- **Layback** options include Fixed or Table

  - o **Fixed:** Enter Layback Distance, the distance from the lay vessel reference point to the calculated touchdown point

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      o **Table:** The layback can be looked up from a table which has Station and Layback data and applied to the connection calculation

Note: This will be in the direction of reverse vessel heading (positive is aft), with the heading offset applied. For instance, if the vessel heading is 0.00, and the heading offset is 00.0, the touchdown point is calculated at the layback distance, 180.0 degrees from the vessel reference point.

    •   **Touchdown Monitor:** Check the box if a vehicle will be used for touchdown monitoring

      o **Position Source:** Specify a vehicle to use as the touchdown monitor from the drop-down list

   b. **Graphics Tab** allows for editing the various symbols and lines associated with a pipeline connection
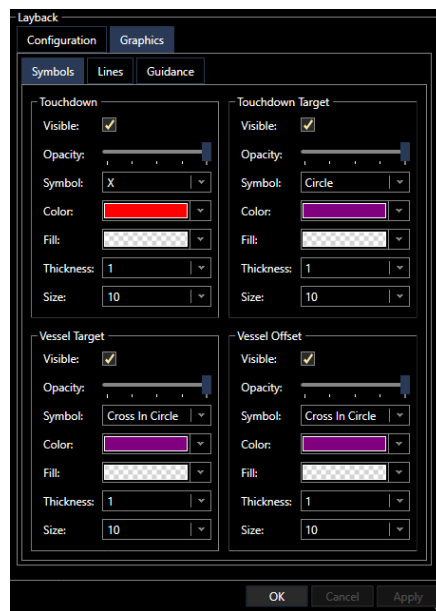
    •   **Symbols Tab**

      o **Touchdown:** This is the calculated touchdown point based on the layback and vessel heading

      o **Touchdown Target:** This is the desired touchdown point, which is at the same station as the calculated touchdown point, with no offline distance from the pipeline

      o **Vessel Target:** This is the vessel position which would be required for the calculated touchdown point to be at the desired touchdown point.

      o **Vessel Offset:** This is the vessel that is laying at a heading other than directly forwards, such as when in close quarters with other vessels or rigs.

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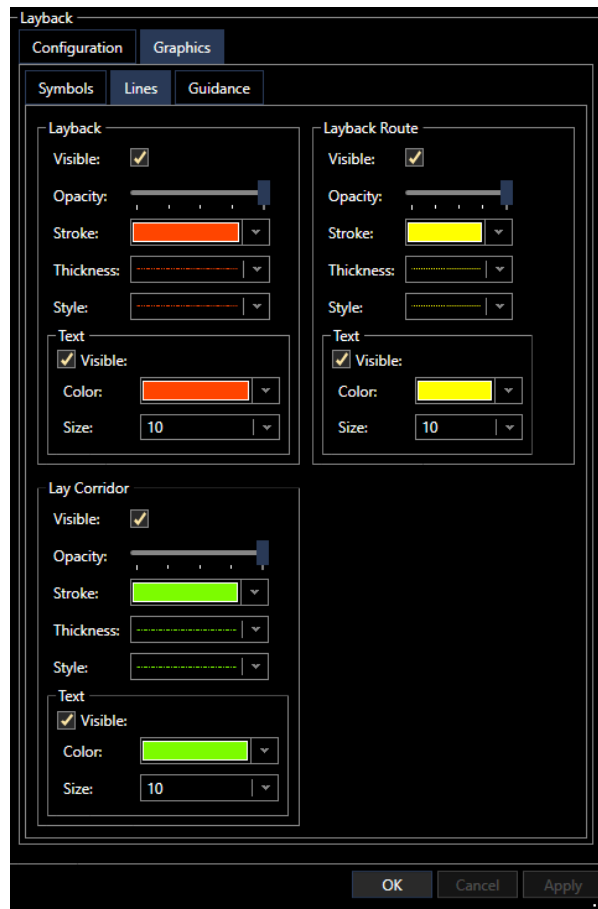
- **Lines Tab**

FIGURE 15-29 LAYBACK CONNECTION GRAPHICS TAB - LINES TAB

o **Layback:** This is a line connecting the reference offset of the lay vessel to the calculated touchdown point

o **Layback Route:** Also known as "Barge Track" this is the route which the vessel needs to follow

o **Lay Corridor:** If a lay corridor has been specified, its visible properties can be edited here.

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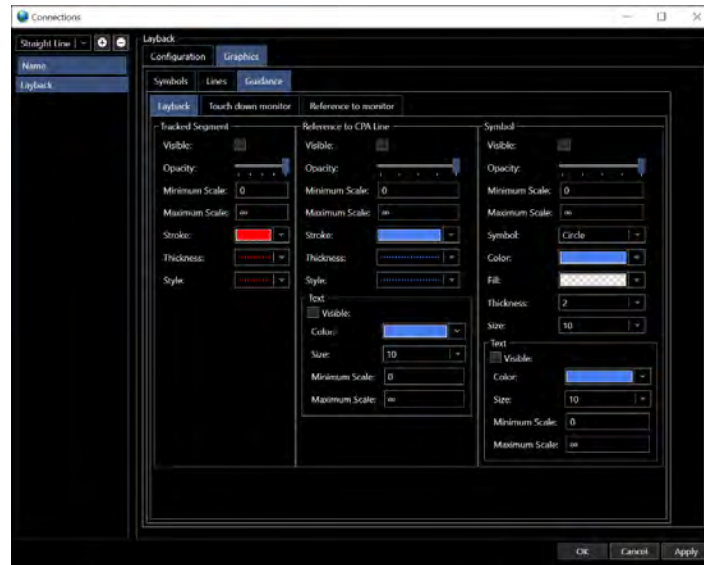
- **Guidance Tab**

- o **Layback Tab**

  - **Tracked Segment:** Route segment tracked by layback reference (touchdown)
  - **Reference to CPA Line:** Line from layback reference (touchdown) perpendicular to tracked segment. Layback reference to CPA annotation will be displayed when Text box is checked
  - **Symbol:** Icon for displayed for layback reference (touchdown). Reference annotation can be displayed by checking the Text box

- o **Touch down monitor Tab**

  - **Tracked Segment:** Route segment tracked by vehicle following touchdown such as a ROV
  - **Reference to CPA Line:** Line from vehicle following touchdown perpendicular to tracked segment. Vehicle to CPA annotation will be displayed when Text box is checked
  - **Symbol:** Icon displayed for vehicle following touchdown. Reference point annotation can be displayed by checking the Text box

- o **Reference to Monitor Tab**

  - **Line:** Line drawn from lay vessel reference to vehicle following touchdown. Line can be annotated by checking the text box
  - **Symbol:** Icon displayed for lay vessel reference point. Reference annotation can be displayed by checking the Text box

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16 USBL Box-In and Calibration

16.1 Overview

Depending on the version and modules present, NavView supports ultrashort baseline (USBL) and long baseline (LBL) acoustic systems to varying extents. This includes standard USBL positioning and USBL calibrations. This section details managing the beacons and executing USBL calibrations in NavView.

16.2 USBL Calibration

USBL calibrations determine the error in the mounting of the USBL transducer relative to the vessel's local coordinate reference frame. The results are correction values for pitch, roll and heading with an option for scaling that are applied to USBL observations before they are used.

Calibrations are often carried out in the USBL system directly and the results applied in the same. With this approach all systems using the USBL system, e.g. DP and survey systems, benefit from the application of the calibration corrections at the source. However, there are instances where this is not feasible or desirable and an alternative is required. NavView provides an alternative with its USBL Calibration feature. This feature can also be used to load and process USBL calibration data collected with WinFrog and HiPAP systems.

If Roles and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In/User	Cannot add or remove a calibration, can process completed calibration
Online/Supervisor/Administrator	Can add or remove a calibration, can process completed calibration

16.2.1 Accessing the USBL Calibration Feature

The USBL Calibration feature is part of the Database Services. Configure these as per the Database Services section ensuring that that the USBL Calibration service is enabled (Enabled check box is checked) and active (Loaded icon is green) as shown in Figure 16-1.
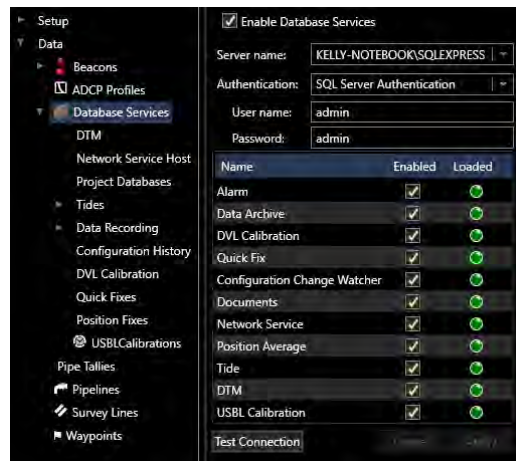
FIGURE 16-1 DATABASE SERVICES - USBL CALIBRATIONS ENABLED

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The USBL Calibration feature is accessed from the Explorer view by selecting the USBL Calibration under the Database Services item (see Figure 16-2).

The data collection and processing are presented in the right panel.

16.2.2 USBL Calibration States: Active & Completed

An Active Calibration is one that the data collection has not been completed. While in this state, the data collection settings can be edited and data can be collected but it cannot be processed to determine the USBL calibration values. Once the data collection is complete, the calibration is Finalized and set to Completed. In this state, the calibration can be processed to determine the calibration values.

16.2.3 USBL Data Collection Planning

NavView uses a wizard to step the user through the planning stages to create an Active Calibration.

1. Access the **USBL Calibration** feature in the Explorer view

2. In the **Active Calibration** section (see Figure 16-2) click the button to launch the wizard

3. **USBL Calibration Properties** page (see Figure 16-3)
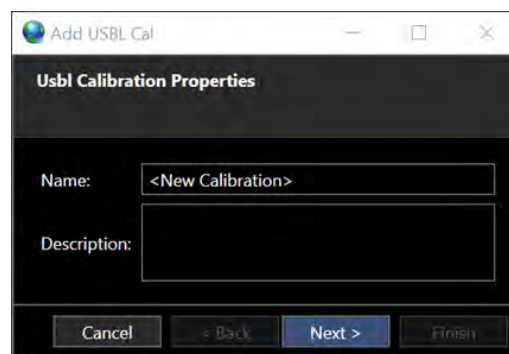
FIGURE 16-3 USBL CALIBRATION PLANNING WIZARD - CALIBRATION PROPERTIES

- **Name:** Enter a name for the calibration, recommend a brief name but providing sufficient information to identify the calibration, e.g. USBL Cal 2016-11-7

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- **Description:** Enter a description of the calibration, e.g. Initial calibration on Alpha Centauri project (optional)

4. Click **Next**

5. **Plan Beacon References** page

   Select the beacon from the dropdown menu that will be used for the box in and click the ⊕ button

Note: The beacon being used in the calibration must be added to **Beacons**, see section on Configure Beacons

FIGURE 16-4 USBL CALIBRATION PLANNING WIZARD - BEACON REFERENCES

- **Name:** Name of the beacon in the software (from Configure Beacons window)

- **Address:** Channel of the beacon in the system (from the Configure Beacons window)

- **Starting Location:** Enter the installed position of the beacon (Position average of beacon location if taken). If the **Fix** checkbox is checked, the position entered will be held and not adjusted during calibration

- **σ East:** Accuracies of USBL system on board vessel. If the box in is being performed in 1000m of water depth and the accuracy of the USBL system is 2% of water depth, enter 20m here

- **σ North:** Accuracies of USBL system on board vessel. If the box in is being performed in 1000m of water depth and the accuracy of the USBL system is 2% of water depth, enter 20m here

- **Elevation:** Elevation of the installed beacon. If the **Fix** box is checked, the elevation value entered will be held and not adjusted during calibration

- **σ Elevation:** Accuracies of USBL system on board vessel. If the box in is being performed in 1000m of water depth and the accuracy of the USBL system is 2% of water depth, enter 20m here

6. Click **Next**

7. **Plan USBL Calibration** Data Collection page

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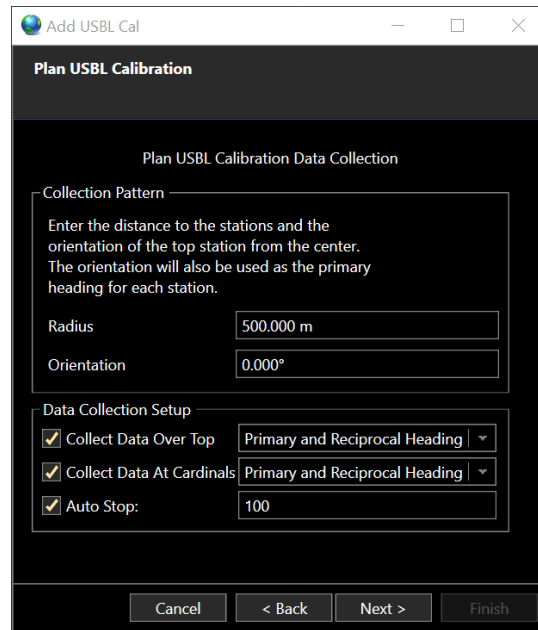
FIGURE 16-5 USBL CALIBRATION PLANNING WIZARD – DATA COLLECTION

- **Collection Pattern:**
  - **Radius:** Enter the radius of the circle about the calibration beacon the data collection points will be located on

  - **Orientation:** Enter the orientation angle (azimuth) to base the data collection pattern on, this will be the primary vessel heading at each collection point and used to calculate the **Top** collection point relative to the calibration beacon

- **Data Collection Setup:**
  - **Collect Data Over Top:** If data is to be collected directly over the calibration beacon check this box and select the heading option:
    a. **Primary and Reciprocal Heading**: Data collected with vessel on primary heading (pattern orientation) and 180° from this heading

    b. **Primary Heading only**: Data collected with vessel on primary heading (pattern orientation) only

    c. **Four Quadrant Headings:** Data collection with vessel on the primary heading (pattern orientation) and primary heading plus 90°, 180° and 270°

  - **Collect Data at Cardinals:** Check if data is to be collected at the cardinal points, i.e. the four data collection points generated from the calibration beacon, the radius and the orientation, orientation + 90°, orientation + 180° and orientation + 270° and select the heading option (see above)

  - **Auto Stop:** Check if the data collection at each location is to stop automatically after a specified number of USBL epochs are collected and enter the number to collect

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8. Click **Next**

9. **Select Database** page
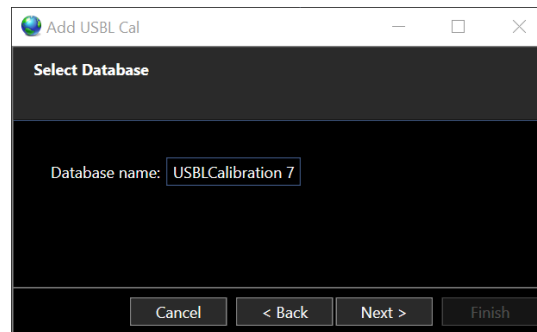
FIGURE 16-6 USBL CALIBRATION PLANNING WIZARD - SELECT DATABASE

- **Database Name:** Use the default database name that has been populated, or type in a new database name that corresponds to the box in or calibration, e.g. USBL Calibration 7. Each USBL Calibration, or box in, will have its own database

10. Click **Next**

11. **USBL Calibration Data Sources** page
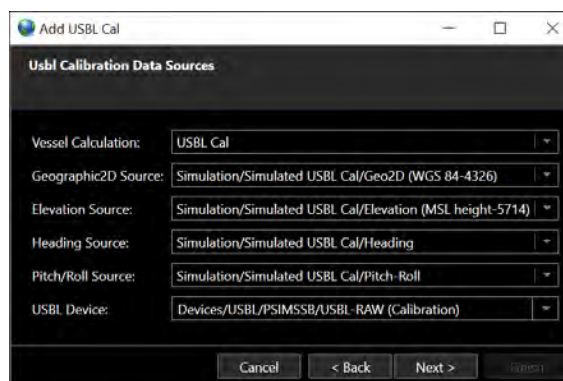
FIGURE 16-7 USBL CALIBRATION PLANNING WIZARD - DATA SOURCES

- **Vessel Calculation:** Select the vehicle calculation assigned to the vessel that will be performing the box in. This will auto populate all the primary data sources assigned to the vessel: Position, Elevation, Heading and Pitch/Roll.

- **USBL Device:** Select the USBL-Raw observation data source from the available USBL devices listed in the drop down list

Note: All data source fields and USBL device must have a valid data source selected. This includes the Pitch/Roll Source. If the respective Calculation does not have a suitable Pitch/Roll device source available, it must be set to Other > Fixed.

Note: The USBL system must be outputting bow referenced Cartesian XYZ data in order for the data to be valid and available for use in a USBL Calibration.

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Note: When a Calculation observation data source is selected, the associated sensor offsets and C-O terms applied in the Calculation are carried to the USBL calibration configuration and applied as is during the data collection. They can be edited later as required.

12. Click **Next**

13. **Calibration Steps** page

The calibration data collection locations with the associated vessel heading and the transit steps calculated based on the wizard entries are displayed (see Figure 16-8). In addition, the total distance involved in transiting for the data collection is presented. This can be used to assist estimating the time required to perform the calibration.
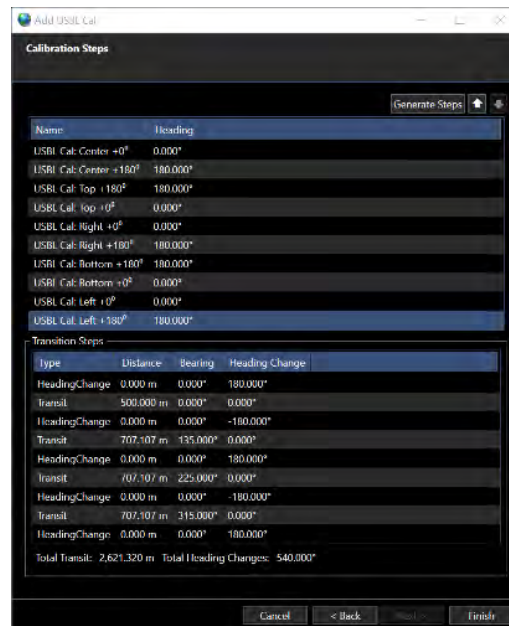
FIGURE 16-8 USBL CALIBRATION PLANNING WIZARD - CALIBRATION STEPS

- **Generate Steps:** Click to regenerate the steps based on the wizard entries aborting any changes made to the order from this page

- ⬆ : Supports rearranging collection steps, click to move the selected step up in the order

- ⬇ : Supports rearranging collection steps, click to move the selected step down in the order

14. Once satisfied with the wizard entries and results, click **Finish**

The USBL calibration plan setup is now added to the list of Active Calibrations and displayed in the right panel and is ready for review and data collection

Note: Waypoints can be generated for the calibration data collection points (see **Generate Waypoints**). These are then available to assist navigating between locations to optimize transiting.

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16.2.4 Edit an Active Calibration's Settings

Any active USBL calibration setup can be reviewed and edited, including one just completed with the USBL Planning wizard. This can be done prior to and during the data collection.

1. Access the **USBL Calibration** feature in the Explorer view

2. In the **Active Calibration** section (see Figure 16-2) select the calibration to edit

3. In the right panel, review and edit as required
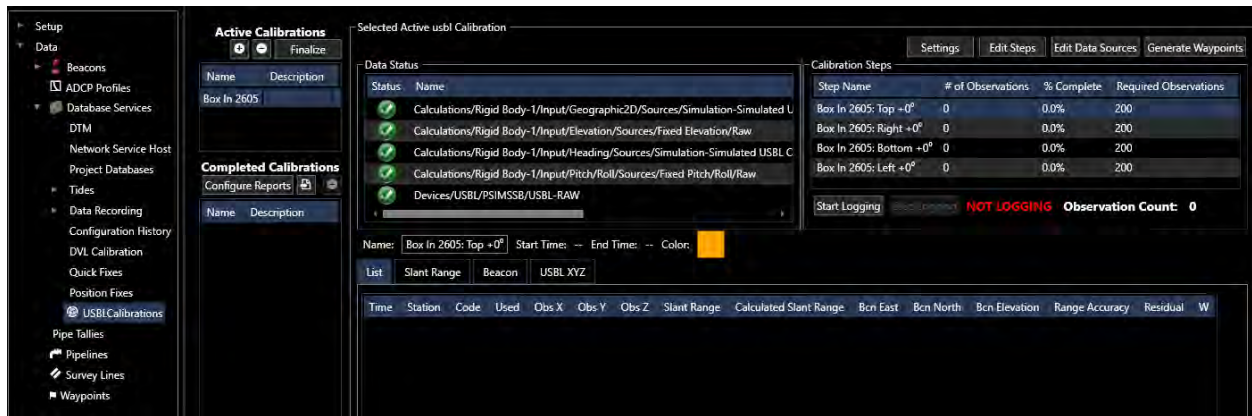
FIGURE 16-9 ACTIVE USBL CALIBRATION

- **Data Status:**
  - o **Data Status:** The status of the data sources is indicated by the LED, a ![green check] indicates the data source is valid and providing data, a ![red x] indicates the data source is either invalid or not receiving data and must be investigated, all must be ![green check] before data collection can be executed

4. **Settings:** Click to open USBL Calibration Control Settings dialog
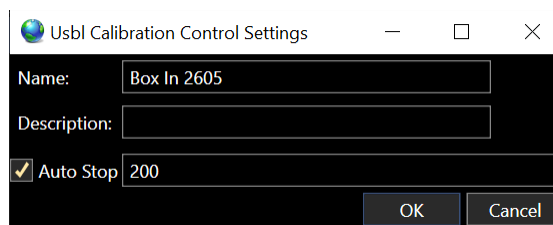
FIGURE 16-10 USBL CALIBRATION CONTROL SETTINGS DIALOG

- **Name:** Edit as desired
- **Description:** Edit as desired
- **Auto Stop:** Edit as desired

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Note: If **Auto Stop** is enabled and data has been collected for a step but must be recollected, the Auto Stop must either be disabled and the starting and stopping to recollect at this step be done manually; or the number of observations to collect increased accordingly and the data collection started again. The Auto Stop can then be reconfigured before proceeding with the data collection at subsequent steps.

- Click **OK** to accept changes

5. **Edit Steps** (If required)
   - **Plan Beacon References:** Edit as required (see step 4 in USBL Data Collection Planning)
   - Click **Next**
   - **Plan USBL Calibration Data Collection:** Review and edit as required (see step 5 in USBL Data Collection Planning)
   - Click **Next**
   - **Calibration Steps:** Review and edit as required (see step 13 in USBL Data Collection Planning)
   - Click **Finish**
6. **Edit Data Sources** (If required)
   - **USBL Calibration Data Sources:** Edit as required (see step 11 in USBL Data Collection Planning)
   - Click **OK** to accept changes
7. **Generate Waypoints:** Click to generate waypoints at the location of the data collection points
   - Review/Edit **Center Point** position, this being the calibration beacon initial position, see Figure 16-11
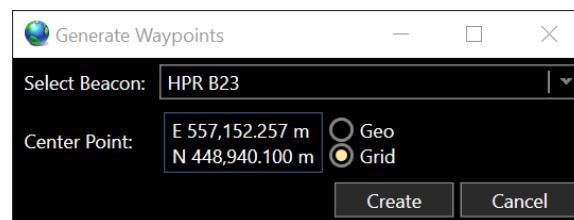
FIGURE 16-11 GENERATE WAYPOINTS

- Click **Create** to generate the waypoints, these will be displayed on map view see Figure 16-12

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FIGURE 16-12 CALIBRATION STEPS - MAP VIEW

8. **Calibration Steps:** The calibration data collection steps are listed in the data grid and are updated as data is collected
   - **Step Name:** Name of the step assigned by the wizard
   - **# of Observation:** Number of data epochs collected at the step
   - **% Complete:** Percentage of total number to collect collected to date
   - **Required Observations:** Total number of observations to collect

16.2.5 USBL Calibration Data Collection

Data can be collected for any Active Calibration, whether one just created or one where the data collection has previously been started. The following details the collection process for one for which the data collection has not yet started.

During the data collection process, the data can be monitored graphically in time series, histogram views and in map views.

1. Access the **USBL Calibration** feature in the Explorer view

2. In the **Active Calibrations** section (see Figure 16-2) select the calibration to collect data for

3. To start logging data, in **Calibration Steps**

   - Select the **Calibration Step** to log data for (it is recommended that the steps be executed in the order they are listed because these have been ordered to minimize transit times, but it is not mandatory)
   - Click the **Start Logging** button

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FIGURE 16-13 ACTIVE CALIBRATION - DATA COLLECTION DIALOG

o The **Start Logging** button will be disabled and the **Stop Logging** button will be enabled (see Figure 16-14)
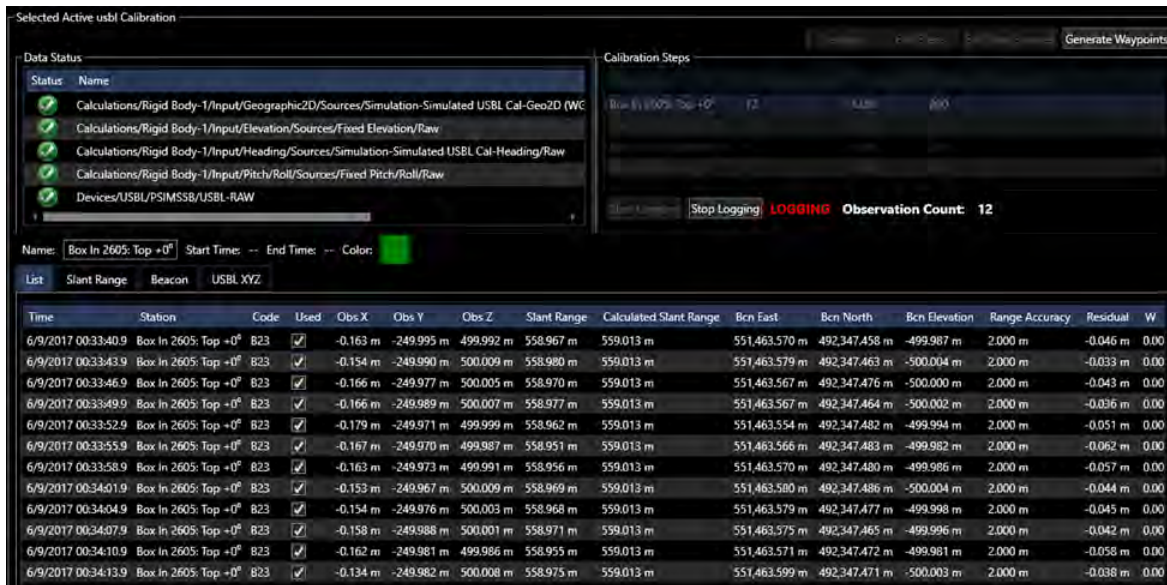
FIGURE 16-14 ACTIVE CALIBRATION - DATA LOGGING

o The status will change from **NOT LOGGING** to **LOGGING**

o The **Observation Count** will increment as observation epochs are collected

o The **Calibration Steps** data grid will become inactive preventing changes to the selected step being made while data is logged

o The data grid columns # of Observations and % Completed will update with each observation epoch collected

o The data tabs at the bottom of the panel will populate with the collected data providing the means to monitor the data quality

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o The calculated beacon position based on the selected data sources will plot in any open Map views in the color indicated

Note: At this stage of the process, the quality of the data is largely indicated by the calculated beacon positions for any given vessel heading. These will be grouped, even if in a very different location from those determined on another heading. The color coding of the beacon positions facilitates monitoring of this in the Map view.

4. To stop logging manually, in **Calibration Steps**

- Regardless of the Auto Stop setting, data collection can be stopped/paused at any time by clicking the **Stop Logging** button

  o The **Stop Logging** button will be disabled and the **Start Logging** button will be enabled
  o The status will change from **LOGGING** to **NOT LOGGING**
  o The steps in the data grid will become active allowing changes to the selected step to be made

- To continue logging data at the same location, click the **Start Logging** button

- To collect data for the next step
  o Select the next step to log data for

  o Wait for the vessel to complete required move/rotation

  o Click the **Start Logging** button

5. To stop logging based on **Auto Stop**, in Calibration Steps

- When the specified number of observations has been collected, logging will automatically stop
  o The **Stop Logging** button will be disabled and the **Start Logging** button will be enabled

  o The status will change from **LOGGING** to **NOT LOGGING**

  o The steps in the data grid will become active allowing changes to the selected step to be made

- To continue logging data at the same location

  o Click the **Settings** button and either

    o Disable the **Auto Stop** feature; or

    o Increase the number of observations to collect

    o Click **OK**

  o Click the **Start Logging** button

Note: After completing the data collection for this same point, do not forget to click the Settings button and reset the Auto Stop option accordingly before proceeding with the data collection.

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- To collect data for the next step

    o Select the next step to log data for

    o Wait for the vessel to complete required move/rotation

    o Click the **Start Logging** button

6. To monitor and review data during collection

    - Select the step to review the data for, this can be a step already completed or the step data currently being collected

        o If a step already completed is selected, the Start Time and End Time will display

    - Review the data in the tabs in the lower panel (see **Error! Reference source not found.** for details)

16.2.6 Finalizing a Calibration

Once the data collection for a calibration is completed and the data considered acceptable, it must be Finalized in order to proceed with the processing.

1. Access the **USBL Calibration** feature in the Explorer view

2. In the **Active Calibrations** section select the calibration to finalize

3. Click the **Finalize** button in Active Calibrations section

4. The selected calibration will be moved from the Active Calibrations list to the **Completed Calibrations** list where it can now be processed

16.2.7 USBL Calibration Data View

The Data view presents the data collected for a calibration for review and editing. This view is available for both Active and Completed calibrations. In the case of an Active calibration the data can be viewed and edited even while the data is being collected.

Note: Collected data can be edited in the Data List view or graphically in Slant Range, Beacon and USBL XYZ tabs. Data can be edited out graphically by clicking on the individual epoch. Data edited out graphically will be reflected in the Data List tab.

When viewing an Active calibration, the Data view is the only one presented and only that data for the selected step is displayed. When viewing a Completed calibration, the Data view is one of several tabs available for working with the calibration and all data is displayed.

The Data view presents the data for the collection step selected in the data grid.

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FIGURE 16-15 USBL CALIBRATION DATA VIEW -LIST TAB

16.2.7.1.1 LIST TAB

Displays the data in a data grid (see Figure 16-15)

- **Time:** Observation epoch

- **Station:** Data collection point

- **Used:** Checked if used in calibration, unchecked if not

- **Obs X/Obs Y/Obs Z:** Observed USBL XYZ values

- **Slant Range:** Slant range calculated from USBL observations

- **Calculated Slant Range:** Slant range calculated from initial entered calibration beacon position and transducer position (on vessel)

- **Bcn East/North/Elevation:** Calculated beacon position

- **Range Accuracy:** Standard deviation of USBL range data, taken from USBL device settings

- **Residual:** Slant range residual

- **W:** Normalized residual for W test

Note: In the case of an Active calibration, the calibration beacon depth has not been entered and the transducer position does not incorporate sensor offsets, so the calculated slant range, beacon position and residual values are not valid.

If a single epoch is selected, a summary of that epoch's data is displayed to the right (see Figure 16-16)

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FIGURE 16-16 USBL CALIBRATION DATA VIEW -LIST TAB - SINGLE EPOCH SELECTED

The application of the data can be edited by selecting a single or group of epochs in the data grid, right mouse clicking and clicking on Properties to open the Edit USBL Range Epochs dialog (see Figure 16-17). Any changes made are applied to all selected epochs. The options are detailed below.
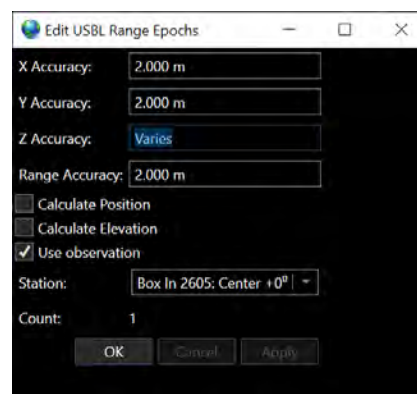
FIGURE 16-17 EDIT USBL RANGE EPOCHS DIALOG

- **X Accuracy:** Standard deviation of the reference position data X (Easting)

- **Y Accuracy:** Standard deviation of the reference position data Y (Northing)

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- **Z Accuracy:** Standard deviation of the reference elevation data Z

- **Range Accuracy:** Standard deviation of the USBL slant range

Note: The initial standard deviation values originate from the respective data source either entered manually or decoded from the input.

- **Calculate Position:** Controls how the transducer position is used in the solution: checking this box results in the calculated transducer position being used in the adjustment as an observation; unchecking this box results in the calculated transducer position being used as a known in the adjustment

- **Calculate Elevation:** Controls how the transducer elevation is used in the solution: checking this box results in the calculated transducer elevation being used in the adjustment as an observation; unchecking this box results in the calculated transducer elevation being used as a known in the adjustment

- **Use observation:** Controls if the epochs are used in the calibration adjustments: checked they are used; unchecked they are not

- **Station:** Displays the collection step the data is associated with

16.2.7.1.2 SLANT RANGE TAB

Displays the slant range observations or slant range residuals in a time series view (see Figure 16-18 and Figure 16-19) or the Histogram Tab shows slant range residuals in a histogram (see Figure 16-20).

The Time Series Tab presentation and editing options are the same for both the observations and the residuals.
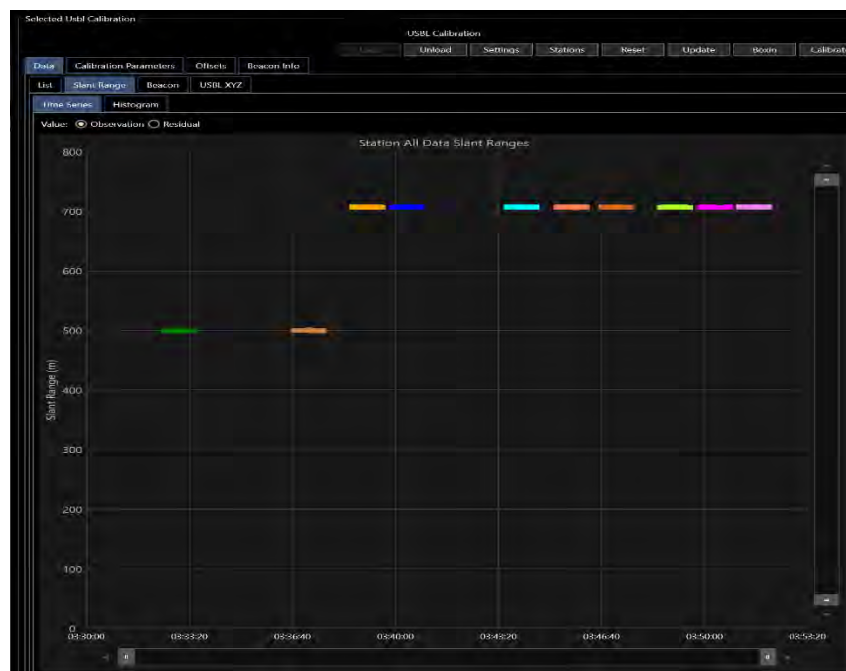
FIGURE 16-18 USBL CALIBRATION - DATA VIEW - SLANT RANGE TIME SERIES

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FIGURE 16-19 USBL CALIBRATION - DATA VIEW - SLANT RANGE RESIDUALS TIME SERIES

The components that are common to both the observation and residual time series displays are as follows:

- **Points:** Data Used in the calibration is displayed as a square
  Data not Used in the calibration is displayed as an X

- **Observation:** Select this option to display the slant range
- **Residual:** Select this option to display the slant range residuals

- **Slider Control:** Vertical and horizontal slider controls can be used to set the vertical and horizontal viewing window

- **Mouse Control**
  - **Zoom:** Use the scroll wheel to zoom in and out

  - **Rectangle Zoom:** Left mouse click and drag to create a rectangle to zoom to

  - **Mouse Over:** Mouse over a point to display the collection step data is associated with

- **Edit Data:** Double click on a point to toggle it enabled/disabled in the calibration

- **Apply:** Click to apply editing changes

- **Cancel:** Click to abort editing changes

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The additional data presented on the residual time series display are:

– – – – –	95% confidence error
– – – – –	Standard deviation
—————	Average value

The histogram view displays the residuals only (see Figure 16-20). The histogram view includes the following text and graphical information:
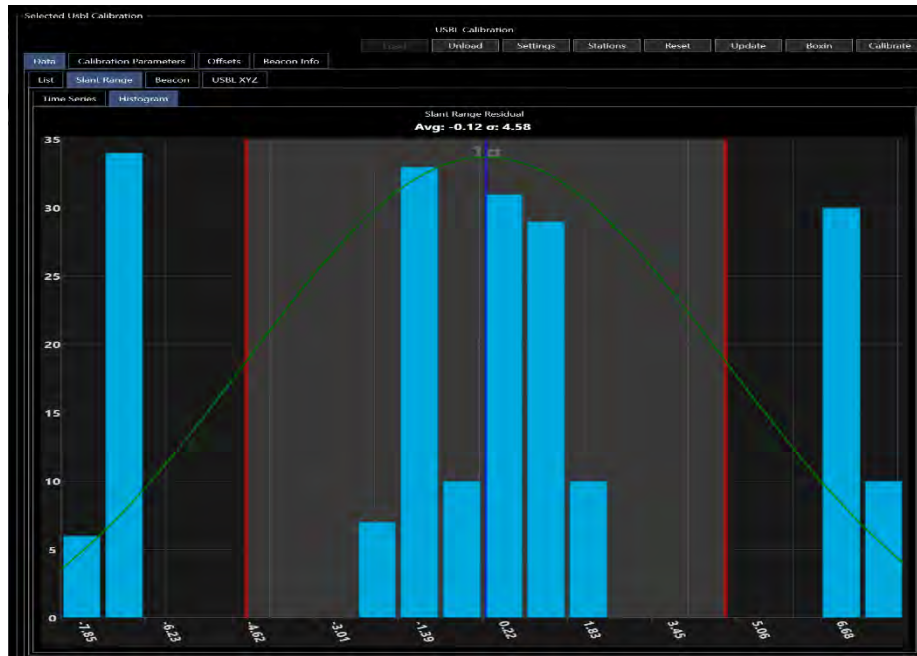
FIGURE 16-20 USBL CALIBRATION - DATA VIEW - SLANT RANGE HISTOGRAM

Average residual and 1 sigma standard deviation

—————	1 sigma standard deviation
—————	Normal distribution curve
—————	Average residual

The histogram display does not support editing of the data

16.2.7.1.3 BEACON TAB

The beacon tab displays the calculated beacon X/Y (Easting/Northing) and Z (Elevation) in time series (see Figure 16-21) and histogram (see Figure 16-22) views. The data displayed is selected using the radio buttons labelled X/Y and Z.

The display features and options are the same as those detailed for the Slant Range Tab.

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FIGURE 16-21 USBL CALIBRATION - DATA VIEW TAB - BEACON XY TIME SERIES
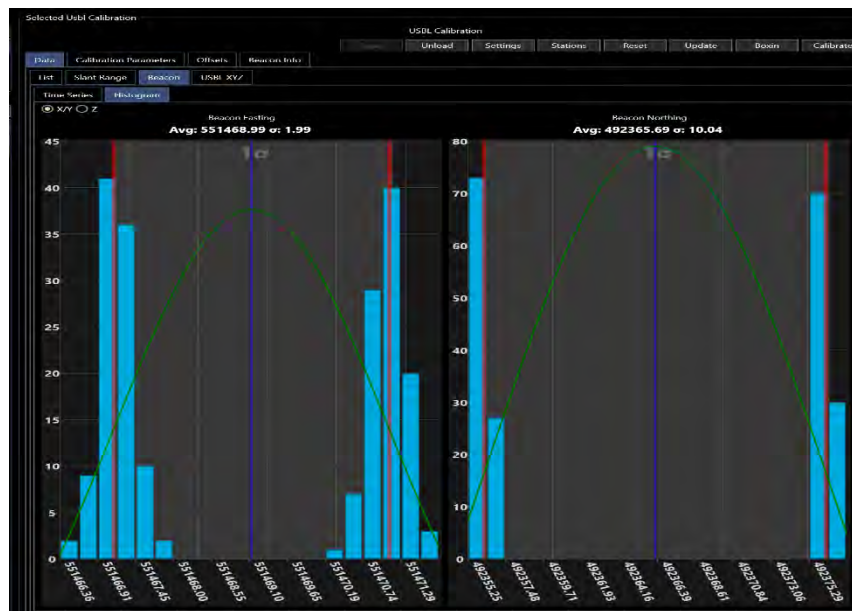
FIGURE 16-22 USBL CALIBRATION - DATA VIEW - BEACON XY HISTOGRAM

16.2.7.1.4 USBL XYZ TAB

The USBL XYZ tab displays the USBL observations and residuals in time series views (see Figure 16-23) and the residuals in a histogram view (see Figure 16-24). The data displayed is selected using the radio buttons labelled X, Y and Z.

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The display features and options are the same as those detailed for the slant range for the Slant Range Tab.
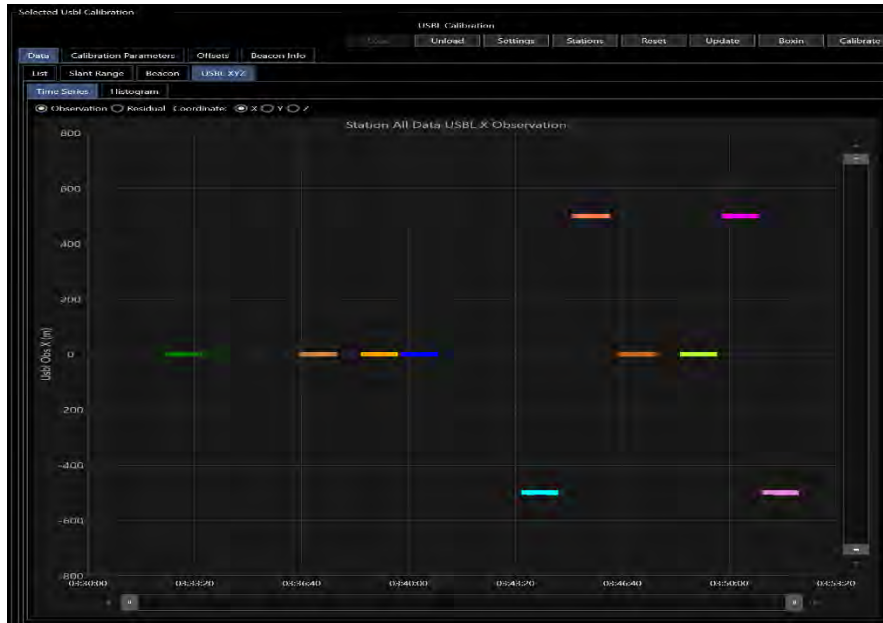
FIGURE 16-23 USBL CALIBRATION - DATA VIEW - USBL X TIME SERIES
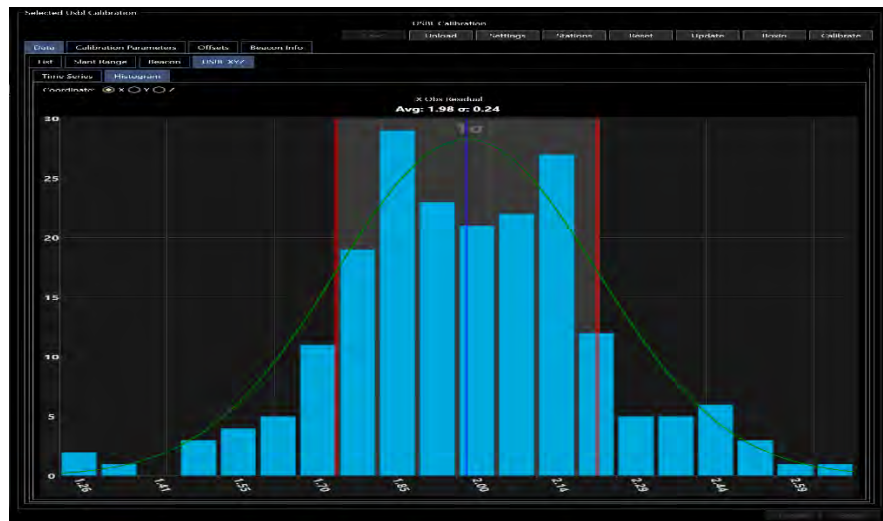
FIGURE 16-24 USBL CALIBRATION - DATA VIEW - USBL X HISTOGRAM

16.2.8 USBL Calibration Processing

A completed calibration can be processed to solve for the USBL calibration values. The calibration values can then be applied in NavView for the respective USBL device. The following details the steps to follow to process the data.

1. Access the **USBL Calibration** feature in the Explorer view

2. In the **Completed Calibration** section

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- Click the Configure Reports to configure what information is to be included in the final calibration report
- Select the completed calibration to process, the Selected Usbl Calibration view will populate with the logged calibration data (see Figure 16-25)

FIGURE 16-25 USBL CALIBRATION PROCESSING - CALIBRATION DATA

USBL Calibration Toolbar
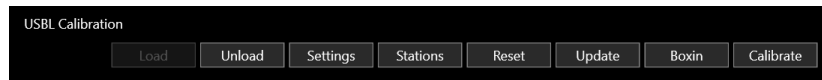
Click to load logged data set for selected calibration

Click to unload logged data set for selected calibration

Click to open Calibration Settings dialog to edit the Calibration name and/or description

Click to open Stations window which displays the logged steps. The name and color for each step can be edited also the data can be used or not used in the calibration by checking or unchecking the Used box at each step

Click to set calibration parameters to zero

Click to apply the current calibration parameters to the data and then updates the results on screen

Click to open the Boxin Setup dialog to run the boxin calculation

Click to run the calibration

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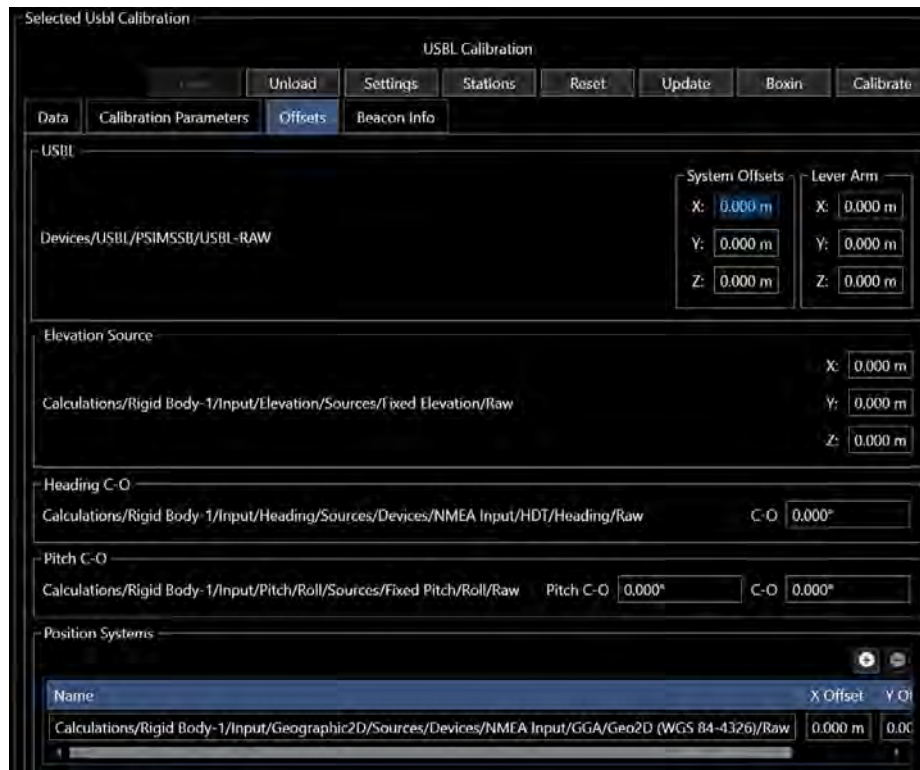3. Verify the offsets by clicking the **Offsets** tab (see Figure 16-26)

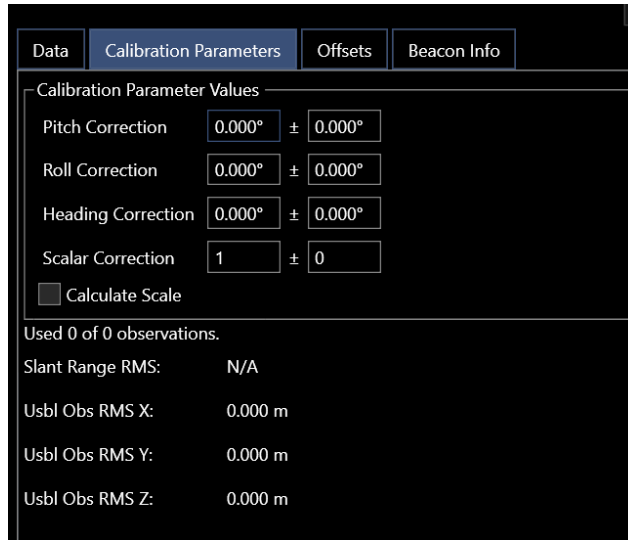FIGURE 16-26 USBL CALIBRATION PROCESSING - OFFSETS TAB

Note: All vessel offsets are automatically populated into the USBL calibration during initial setup. Verify all offsets are correct. If vessel offsets were edited after the calibration was already setup, they will have to be updated in the calibration offsets tab.

4. Set the Initial Beacon Position by clicking the **Beacon Info** tab (see Figure 16-27)

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FIGURE 16-27 USBL CALIBRATION PROCESSING - BEACON INFORMATION TAB

- **Selected Calibration Beacon:** Confirm this is set to the beacon used for the data collection
- **Beacon Info:**
  o **Name:** Edit if required
  o **Address:** Edit if required
  o **Description:** Edit if required
- **Starting**
  o **Coordinate:** Edit if a better approximate position for the beacon than that entered during the planning process is known
  o **Elevation:** Enter the best approximate for the beacon elevation
  o **σ East:** Edit the initial beacon Easting standard deviation as required
  o **σ North:** Edit the initial beacon Northing standard deviation as required
  o **σ Elevation:** Edit the initial beacon Elevation standard deviation as required
  o **Fix Position:** Check only if the beacon is at a known position, installed in a previously surveyed tripod or survey receptacle on a seafloor asset
  o **Fix Elevation:** Check only if the beacon is at a known elevation, installed in a previously surveyed tripod or survey receptacle on a seafloor asset
5. Review and edit the data by clicking the **Data** tab (see USBL Calibration Data View for details regarding viewing and editing data)
6. Configure calibration processing by clicking the **Calibration Parameters** tab (see Figure 16-28)

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FIGURE 16-28 USBL CALIBRATION PARAMETERS TAB

- Calibration Parameter Values
    - Confirm the USBL calibration parameters are at the initial values, i.e. pitch, roll and heading correction are 0.000°
    - If they are not, click the Reset button
    - Calculate Scale: Check if the USBL calibration adjustment is to solve for scale errors

Note: Calculate Scale generally not done because the scale correction determined will only be applicable to the current SVP in use.

7. Process the calibration
    - Click the **Calibrate** button to start the processing
        - A least squares adjustment to solve for the box in of the calibration beacon will execute
        - A least squares adjustment to solve for the USBL calibration correction values will execute
        - Upon the successful completion of the adjustments, the Calibration Results window will be displayed (see Figure 16-29)

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FIGURE 16-29 USBL CALIBRATION RESULTS DIALOG

- **Review the results**
  - **Beacon Info:** Displays the beacon name, address and description
  - **Starting:** Displays the initial beacon position and elevation with the respective σ values used in the box in adjustment
  - **Boxin Status**
    - **Boxin Calculated:** Indicates if the boxin adjustment was successfully performed
    - **Boxin Unit Variance:** Unit variance of the boxin least squares adjustment, should be close 1 though if not, it does not necessarily mean the boxin results are not acceptable
    - **Passed Chi Squared Test:** Indicates if this statistical test passed, though if it failed it does not necessarily mean the boxin results are not acceptable
  - **Computed:** Displays the beacon position and 1σ standard deviation resulting from the box in adjustment
  - **Calibration Parameter Values:** Displays the calculated USBL calibration values with the standard deviations. These values are to be copied to the respective USBL device's USBL Calibration Settings
  - **Summary** of the calibration processing:
    - Number of observations used and total available
    - RMS of the USBL slant range and XYZ data
8. **Report**

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To generate a calibration report, click Report, the resulting PDF document will be displayed and can then be exported as a pdf, xps or an Excel document. The contents of the report will contain the items selected in **Configure Reports** (see Figure 16-30 and Figure 16-31)
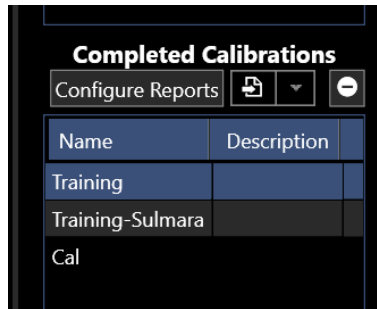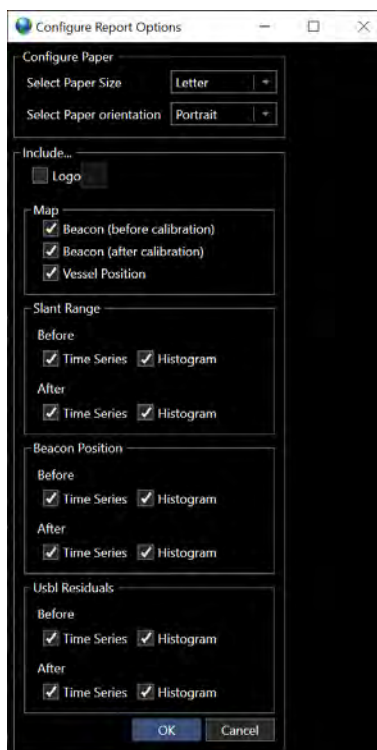

FIGURE 16-30 CONFIGURE REPORTS BUTTON

FIGURE 16-31 REPORT OPTIONS

Note: The beacon positions scatter plot after calibration can also be viewed in Map as a QC tool.

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17 Beacons

NavView supports ultrashort baseline (USBL) acoustic systems to varying extents. In order to do this, it requires information regarding the acoustic beacons in use. This is provided via the Beacons section in the Setup ribbon.
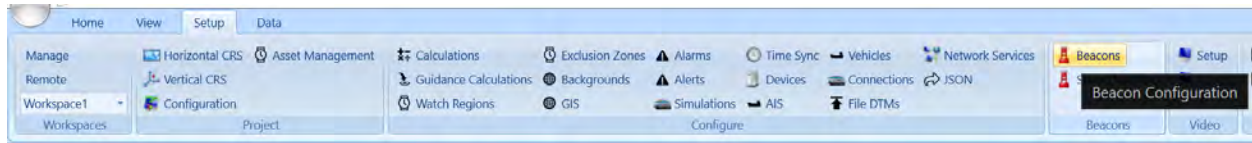

FIGURE 17-1 SETUP RIBBON – BEACONS

The configuration of beacons used for USBL tracking is covered in this section.

- HPR
- Generic USBL

If Rolls and Privileges are enabled, the following are what is allowed for each role:

Roles	Privileges
Not Logged In/User	Cannot add, edit or remove beacons
Online/Supervisor	Cannot add or remove beacons, can edit selected beacons
Administrator	Can add, edit and remove beacons

17.1 Beacon Configuration

1. From the Setup ribbon, click the Beacons icon (see Figure 17-1) to open the Configure Beacons dialog (see Figure 17-2)
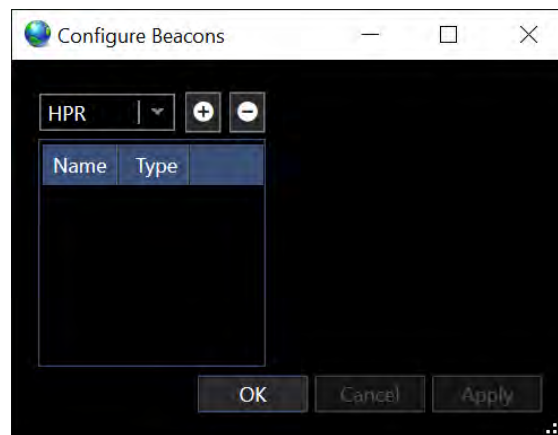

FIGURE 17-2 CONFIGURE BEACONS DIALOG

2. Alternatively, this dialog can be opened from various windows and setup wizards, e.g. USBL device settings wizard Beacons page, click on Beacons

17.1.1 Add a Beacon

1. Open the Beacons File Dialog (see Figure 17-2)

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2. From the drop-down list, select the type of beacon to add
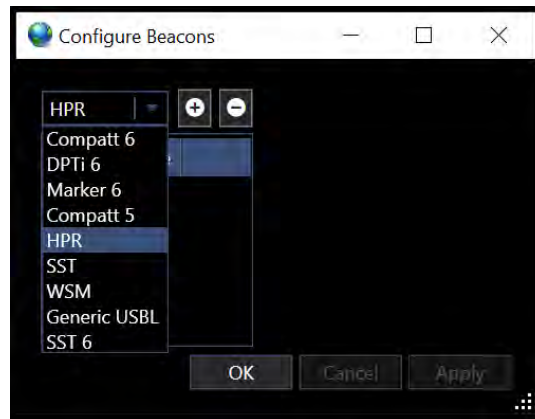

FIGURE 17-3 BEACON TYPES

Note: When the **Configure Beacons** dialog is opened from a task specific wizard or view, only the appropriate beacon types are available. For example, if opened from the USBL device settings wizard, only USBL beacons are listed.

3. Click the add ⊕ button

17.1.1.1 HPR Beacon
HPR beacon supports the Kongsberg FSK and Cymbal protocols
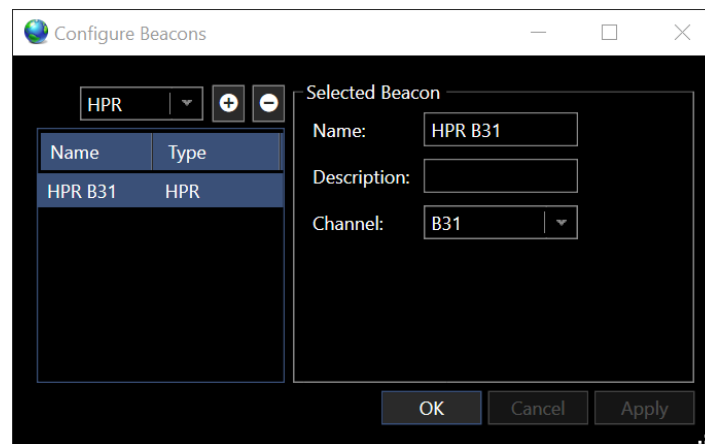
1. Select HPR from the drop-down list (see Figure 17-4)

FIGURE 17-4 HPR BEACON DIALOG

2. Click the add ⊕ button to add to the list

- **Name:** given to added beacon
- **Type:** Beacon type selected

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3. In the **Name** box, give the beacon a name that identifies it such as the beacon channel or what the beacon will be used for, e.g. ROV Primary

4. **Description** is optional

5. From the **Channel** drop-down, select the beacon channel. Channel options are FSK (B) or Cymbal (M)

17.1.1.2 Generic USBL Beacon

Generic USBL beacon is used for USBL systems such as HAINS where an id is assigned in the output string

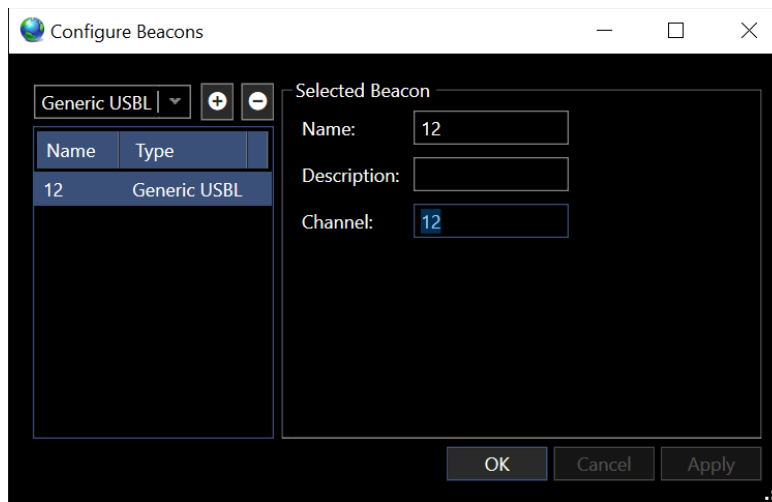1. Select Generic USBL from the drop-down list (see Figure 17-5)

FIGURE 17-5 GENERIC USBL DIALOG

2. Click the add button to add to the list

- **Name:** given to added beacon
- **Type:** Beacon type selected

3. In the **Name** box, give the beacon a name that identifies it such as the beacon channel or what it will be used for

4. **Description** is optional

5. Enter the **Channel** for the generic beacon to match the id in the data string being output from the USBL system

Note: The added beacons can be seen and edited in Explorer/Data/Beacons.

17.2 Using Beacons

NavView uses the beacons for tracking subsea objects using USBL systems. It is important to be aware that when a beacon is added it creates a unique object. It is this object that is associated with those features in NavView that can utilize the beacon data, e.g. Calculations, Text views, etc. Changes made to the configuration of existing beacons do not cause a break in this association.

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As an example, in the case of using beacons as primary and secondary position sources for an ROV, the beacon names should reflect the application, e.g. **ROV Primary** and **ROV Secondary**. Should one of these fail and be replaced by a beacon set to a different code than the original, the only change required in NavView is to access the respective beacon's configuration and update it to the new code. All existing associations such as the assignment of that beacon in a Calculation or configured to be logged to the database remain in place and these operations continue seamlessly.

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18 ADCP

This document describes the configuration and operation of the NavView ADCP Current Profiler module.

18.1   Overview

The ADCP module interfaces to Acoustic Doppler Current Profiler (ADCP) devices using the PD0 message. It parses the data from the instrument and displays in an intuitive and easy to understand interface for vessel officers or surveyors (see Figure 18-1).

FIGURE 18-1 LAYERS WITH PROFILE VIEW

The NavView current profiler allows the user to select a layer size to fit their needs, many small layers for fine grained data to feed into calculations, or just 3 layers for the water column for a quick display. The profiler module allows multiple profile calculations to be set up, pointing to the same instrument, configured to average in different ways, so the instrument can be set up with fine grained layers, and NavView can handle the data with fine grained layers for calculations, while at the same time averaging it all together for display.

18.2   ADCP Device Configuration

18.2.1 Add ADCP Device

The ADCP profile module relies on a device capable of outputting the RDI PD0 message. This is interfaced into NavView using the TrdiPD4 device driver.

1. Add device by clicking on Devices in the Configure section of the Setup ribbon (see Figure 18-2) alternatively devices can be accessed from Explorer. This opens the I/O Devices window (see Figure 18-3).

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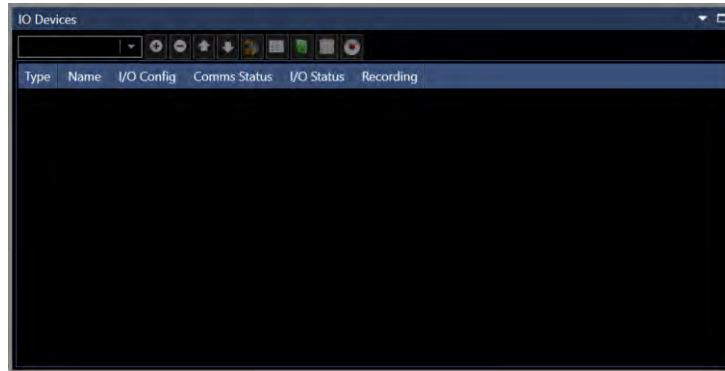FIGURE 18-2 SETUP RIBBON – I/O DEVICES

FIGURE 18-3 I/O DEVICE WINDOW

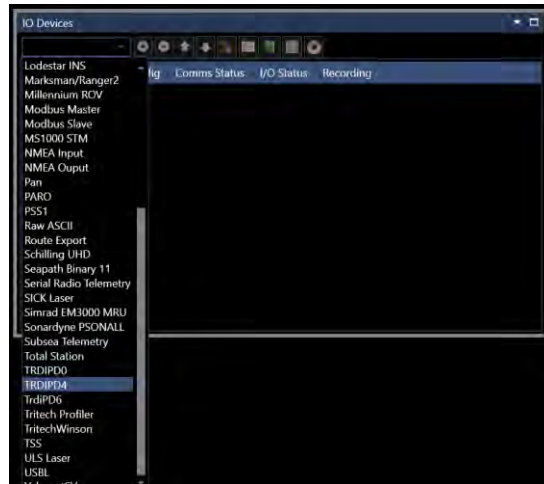2. From the drop-down, select the TrdiPD4 device (see Figure 18-4)

FIGURE 18-4 I/O DEVICE SELECTION

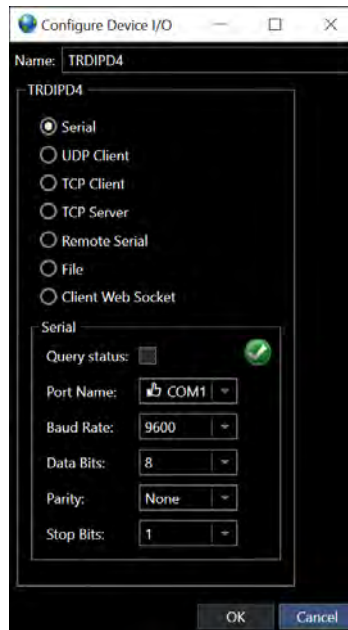3. Click the to add the device, this will open the Configure Device I/O window (see Figure 18-5).

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FIGURE 18-5 CONFIGURE I/O DEVICE WINDOW

Note: Refer to NavView documentation on device configuration.

4. Configure the ADCP device, click the [▣] configure device button on the device page to open the device configuration window (see Figure 18-6)
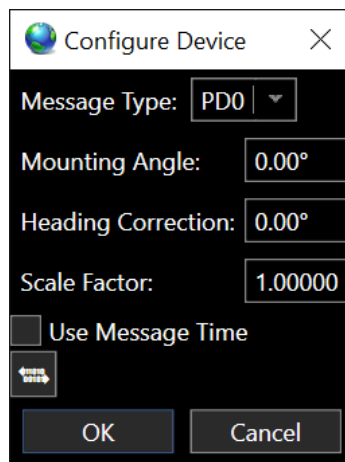

FIGURE 18-6 TRDI DEVICE CONFIGURATION

- **Message Type:** From drop-down select PD0

- **Mounting Angle:** Enter ADCP mounting misalignment

- **Heading Correction:** Enter value from DVL calibration, if not calibrated use default 0.00°

- **Scale Factor:** Enter value from DVL calibration, if not calibrated use default 1.000

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- **Use Message Time:** If checked, the timestamp of the data will be what comes in on the DVL message. If unchecked, the data will be timestamped by NavView at time of arrival

18.2.2 RDI Device Communication

NavView can send commands to an RDI ADCP Device using its command language. A console is available, allowing the user to manually send any command to the device and a wizard is also available with presets to quickly configure the device. The device control panel can be accessed from the following places: Button on the configure device window, button on the live current meter configuration window and from the current meter display window.
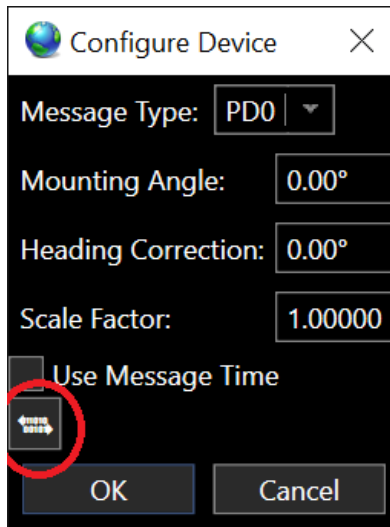
FIGURE 18-7 BUTTON TO ACCESS ADCP COMMAND CONSOLE

The command console is shown below in Figure 18-8 and its options are described below.

FIGURE 18-8 ADCP COMMAND CONSOLE

- **Break:** The break option sends a software communication break to the instrument. If the instrument is pinging, the break will cause it to stop, and put it into command mode, so that the

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instrument can be configured. Note that NavView will not send a hardware pulse break, only a software break. Older versions of RDI firmware may not be able to receive the software break.

Note: When the console window is opened, a break is automatically sent to the device to put it into configuration mode.

- **Get Status:** Sends a series of commands to the instrument to query its status. The response is displayed in the console window.

- **Save:** Sends a 'CK' command to the RDI device, which will save any changes made to its memory so that they will persist after a hardware restart.

- **Start:** Sends a 'CS' command to the instrument, which causes it to start pinging. To send further commands, a break must be sent again.

- **Setup:** Opens the Setup wizard. The wizard contains default settings for various working depths.

    I.   The first page of the setup wizard asks the user to choose a preset approximate range to seabed from the device, from the list (see Figure 18-9).
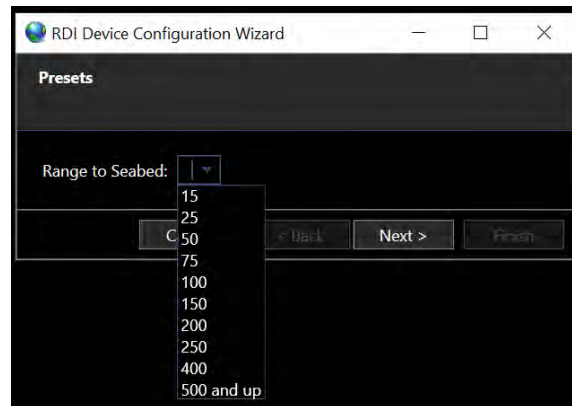
FIGURE 18-9 RDI DEVICE CONFIGURATION – PRESETS

    II.   Click Next to confirm the choice, this opens the Basic Configuration dialogs

    III.   Basic Configuration , this allows the user to set the following (see Figure 18-10)

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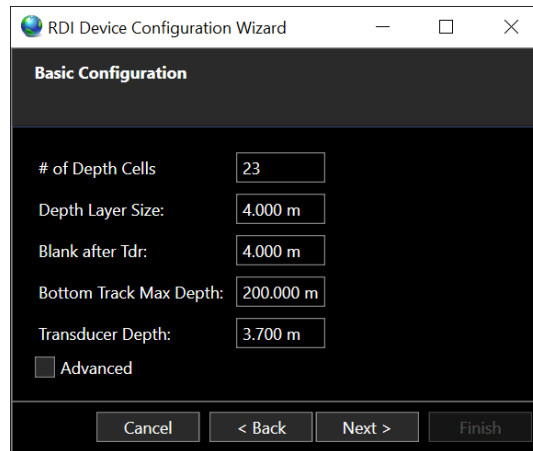
FIGURE 18-10 RDI DEVICE CONFIGURATION - BASIC CONFIGURATION

- **# of Depth Cells**

- **Depth Layer Size**

- **Blank after Tdr:** This is useful if the device does not extend beyond the keel of the vessel, in which case current returns at the transceiver may suffer from noise and turbulence. The default blank after Tdr is 4.0 m.

- **Bottom Track Max Depth:** The bottom track max depth limits the bottom track waiting time, which improves the update rate. At each preset range, the bottom track max depth defaults to twice the preset.

- **Transducer Depth: D**efault of 3.7 m, but can be modified to fit user needs

To access the advanced options in the wizard page, click the **Advanced** checkbox. The following advanced options are then provided:

- **Band:** Wideband or Narrow Band. Wideband is used for closer ranges, while narrow band is selected by default for long range (deeper) setups.

- **Pings Per Ensemble: D**efaults to 1, this can be used to cause the instrument to average over several data points before sending an update. NavView can handle averaging within its own calculations, so it is recommended to leave Pings Per Ensemble to 1.

- **Time Between Pings:** Default to 1 second of waiting before starting the next ping.

- **Time Between Ensembles:** Defaults to 2 seconds before starting the next ensemble (group of pings).

- **Transducer Alignment:** Angular transducer alignment correction factor. This can be used to apply a rotation to the data output by the instrument.

  IV. Click Next

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V. The Actions page has the following two options (see Figure 18-11).
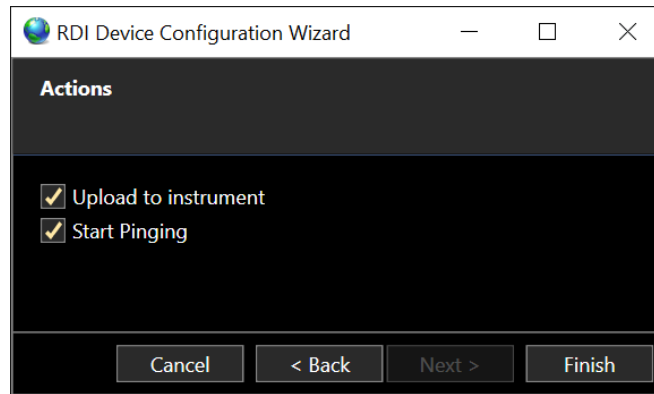

FIGURE 18-11 RDI DEVICE CONFIGURATION - ACTIONS PAGE

- **Upload to instrument:** If this option is checked (default), when the finish button is sent, a group of commands will be sent to configure the device with the options which have been selected in the wizard.

- **Start Pinging:** If this option is selected, the CS command will be sent to the device, so that it will start pinging.

VI. Click Finish

18.3 Setup Live ADCP Profile

To add a new profile, select the "Manage Continuous" button from the Setup ribbon, ADCP section (see Figure 18-12).

FIGURE 18-12 ADCP - SETUP RIBBON

There are two possible types of current profiles which can be added, Continuous or Static (see Figure 18-13).

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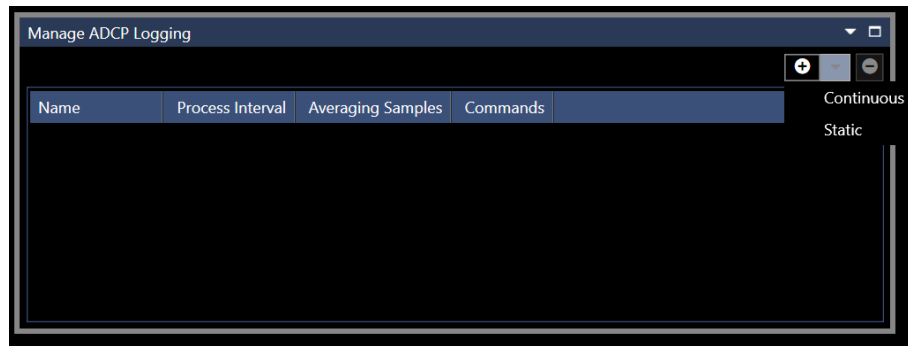
FIGURE 18-13 MANAGE CONTINUOUS WINDOW

18.3.1 Continuous Profile

To add a continuous profile to the list, select the **Continuous** option from the drop-down list of options (see Figure 18-13). This opens New ADCP Profiler Wizard window where all settings for the profile can be configured, as shown in Figure 18-14.
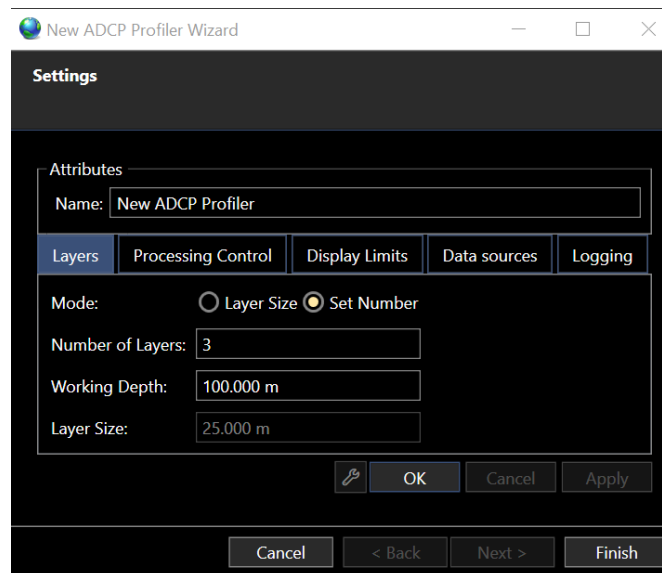
FIGURE 18-14 NEW ADCP PROFILE WIZARD - SETTINGS

- **Attributes**
  - o **Name:** Select a name for the profile, which can be used to easily identify it.

- **Layers Tab** (see Figure 18-14)
  - o **Mode:** Layer size or Set Number. With this option, the layer size can either be defined by setting the desired number of layers or a set number for the water depth. If the set number is selected, the Number of Layers and Working Depth options will be enabled. If the Layer Size option is selected, the Layer Size settings will be enabled below.
  - o **Number of Layers:** Specify the desired number of layers for the working depth. This will be used to calculate a layer size, however if data comes in from the instrument that is deeper

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than the set working depth, extra layers will be automatically added so that no data is missed.

- o **Working Depth:** Set the working depth, which is the expected depth where the system will be working. This does not affect the instrument itself. It is used in conjunction with the Number of Layers to calculate a layer size.

- o **Layer Size –** Here a layer size in distance units can be manually specified for the profile.

- **Processing Control Tab**

  The processing control tab of the continuous profile configuration is shown below in Figure 18-15.
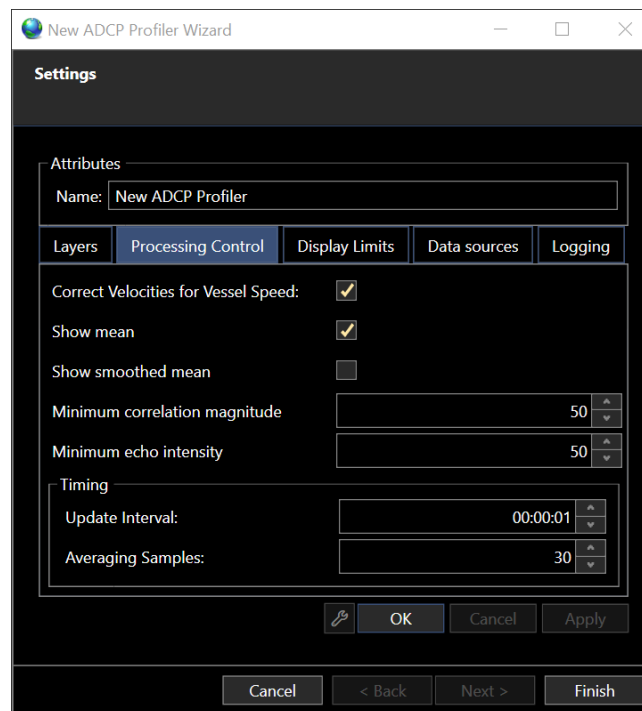
FIGURE 18-15 NEW ADCP PROFILE WIZARD SETTINGS - PROCESSING CONTROL TAB

- o **Correct Velocities for Vessel Speed:** With this option enabled, if a vessel speed source is specified, the speed of the vessel will be subtracted from the current data, such that the currents reported are the true water currents. With this option turned off the vessel speed is not removed and raw current is displayed, so if the vessel is moving, this will affect the result.

- o **Show Mean:** On the chart page, the "Show Mean" option will show the data averaged over a period of time, rather than the immediate data.

- o **Show Smoothed Mean:** With this option, the current profile will be smoothed for display to remove any spikes at various depths.

- o **Minimum Correlation Magnitude:** Data from the instrument includes certain statistics such as the correlation magnitude which has a range of 0 to 255. This minimum value will reject

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any data with a correlation smaller than the amount set. This can be used to reject poor quality data.

- o **Minimum Echo Intensity:** Data from the instrument includes the statistic of the echo intensity, where weaker return signals may be erroneous data. The echo intensity is on a scale from 0 to 255. This minimum value allows NavView to reject any data that is not strong enough to be considered good quality data.

- o **Timing Update Interval:** The update interval determines how often the calculation will be updated by NavView. At each update time, all new data from the instrument will be processed into the calculation.

- o **Averaging Samples:** The averaging samples option allows NavView to average out the current data per depth bin/layer. If set to 30 samples, then observations from the instrument will be averaged, as a running average. If the instrument is set to update at 1Hz, the data can be noisy, so NavView can smooth that result out with the running average.

- **Display Limits Tab**
The display limits tab of the configuration is shown below in Figure 18-16 and the options are described below.
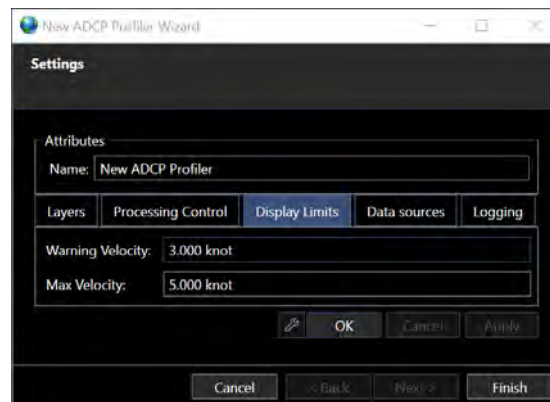
FIGURE 18-16 NEW ADCP PROFILE WIZARD SETTINGS - DISPLAY LIMITS TAB

- o **Warning Velocity:** Any current data with a magnitude greater than the value set here will appear in yellow to warn the user.

- o **Max Velocity:** Any current data with a magnitude greater than the value set here will appear in red to the user on the layers page. This value also sets the maximum range of the current meter chart.

- **Data Sources Tab**
The data sources tab is shown in Figure 18-17. This tab allows all data sources for the current profiler calculation to be set.
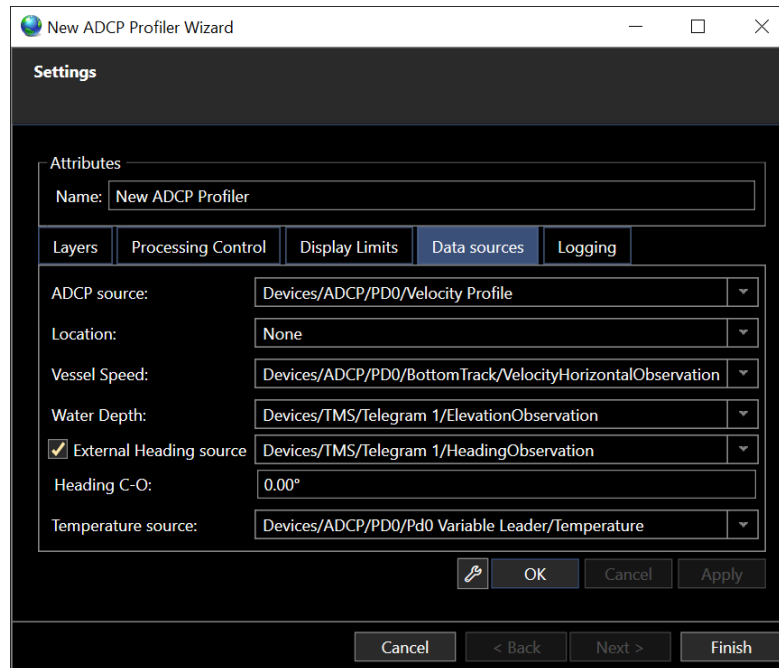
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FIGURE 18-17 DATA SOURCES TAB

o **ADCP Source:** This data source requires a PD0 configured device

o **Location:** Set to any position source, such as Vessel CRP or GPS. This is used to save a location with the current profile data when logging and for display of the current in the 3D View.

o **Vessel Speed:** Set to a Velocity Horizontal data source within NavView, such as a GPS VTG string, or INS speed output. This speed is optionally applied in the calculation to correct the raw current data.

o **Water Depth:** The water depth option expects any elevation type observation from within NavView. This is used to display the water depth on the main current profiler screen and is also used to reject data deeper than the water depth, as it would likely be erroneous data.

o **External Heading Source:** The heading source can be optionally selected (selected by checkbox). If the data is already corrected at source, and currents are coming in as geographic coordinates, then no external heading source is required. If the ADCP instrument is publishing instrument or ship referenced velocities, then the heading source is required.

o **Heading C-O:** Applies a correction factor to the external heading source, if the ADCP instrument is not aligned with the heading source.

o **Temperature Source:** RDI ADCP device has internal temperature sensors. Select the source here so that the temperature can be displayed on the main screen.

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- **Logging Tab**
  NavView can log all live current meter data to a file located in the project folder (see Figure 18-18).
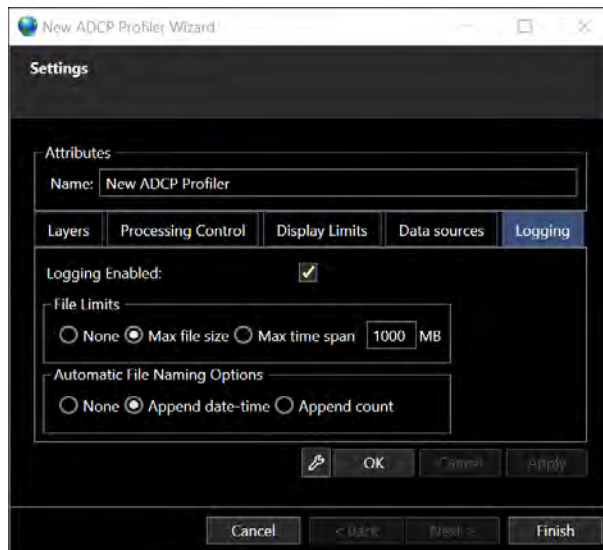
- o **Logging Enabled:** Turn logging on and off

- o **File Limits**
    - a. **None:** File will continue to grow indefinitely
    - b. **Max File Size:** A new file will be created when the max file size in MB is reached

- o **Max Time Span:** A new file will be created when the time span is reached

- o **Automatic File Naming Options**
    - a. **Append Date-Time:** A datetime in a standard format will be appended to each new file
    - b. **Append Count:** A count of files since the logging session started will be appended to the filename.

18.3.2 Static Profile

The static profile editing view is shown below in Figure 18-19.

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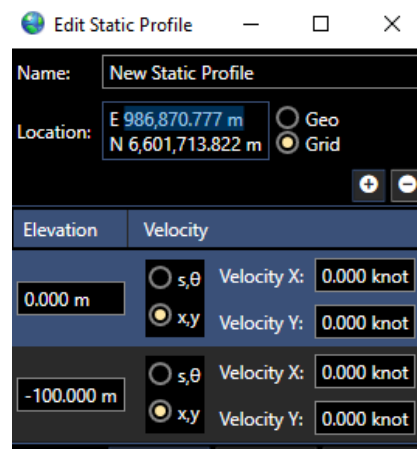
FIGURE 18-19 EDIT STATIC PROFILE

- **Name:** Specify a name for the static profile

- **Location:** The location can be specified. This is used for displaying the current profile on the 3D Map view.

Layers can be manually added to the static profile using the and buttons. Within each layer the following options are available.

- **Elevation:** The elevation reference for the layer, inverse of depth.

- **Velocity:** Velocity can be defined either as s, θ (speed, direction) or as X,Y where X is velocity in the east direction, and Y is in the north direction.

18.4 ADCP Profile Capture

1. To start, pause, finish and save a ADCP profile, click on the ADCP Capture button in the ADCP section of the Setup ribbon (see Figure 18-20). This opens the Live ADCP Live Capture Settings window (see Figure 18-21)
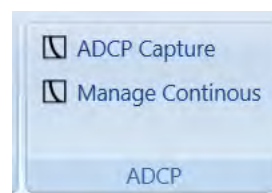
FIGURE 18-20 ADCP - SETUP RIBBON

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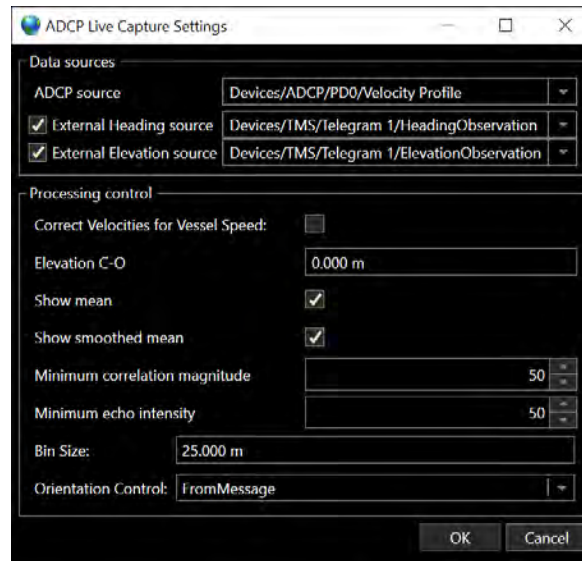
FIGURE 18-21 ADCP LIVE CAPTURE SETTINGS WINDOW

- **Data Sources**
  - o **ADCP source:** From drop-down select the ADCP device

  - o **External Heading source:** If using an external heading source, check the box and select source from drop-down

  - o **External Elevation source:** If using an external elevation source, check the box and select source from drop-down

- **Processing control**
  - o **Correct Velocities for Vessel Speed:** Check the box to apply vessel speed to current

  - o **Elevation C-O:** Enter value to apply external elevation source vertical offset from ADCP device

  - o **Show mean:** On the chart page, the "Show Mean" option will show the data averaged over a period of time, rather than the immediate data

  - o **Show smoothed mean:** With this option, the current profile will be smoothed for display to remove any spikes at various depths

  - o **Minimum Correlation Magnitude:** Data from the instrument includes certain statistics such as the correlation magnitude which has a range of 0 to 255. This minimum value will reject any data with a correlation smaller than the amount set. This can be used to reject poor quality data

  - o **Minimum Echo Intensity:** Data from the instrument includes the statistic of the echo intensity, where weaker return signals may be erroneous data. The echo intensity is on a scale from 0 to 255. This minimum value allows NavView to reject any data that is not strong enough to be considered good quality data

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- o **Bin Size:** Enter bin size (of elevation) to average data from DVL device

- o **Orientation Control:** Choose whether to use the ADCP orientation from the message or force it to use either up or down orientation. i.e if using a RDI DVL use From Message

2. Click Ok, this opens the Live ADCP Profile window (see Figure 18-22)
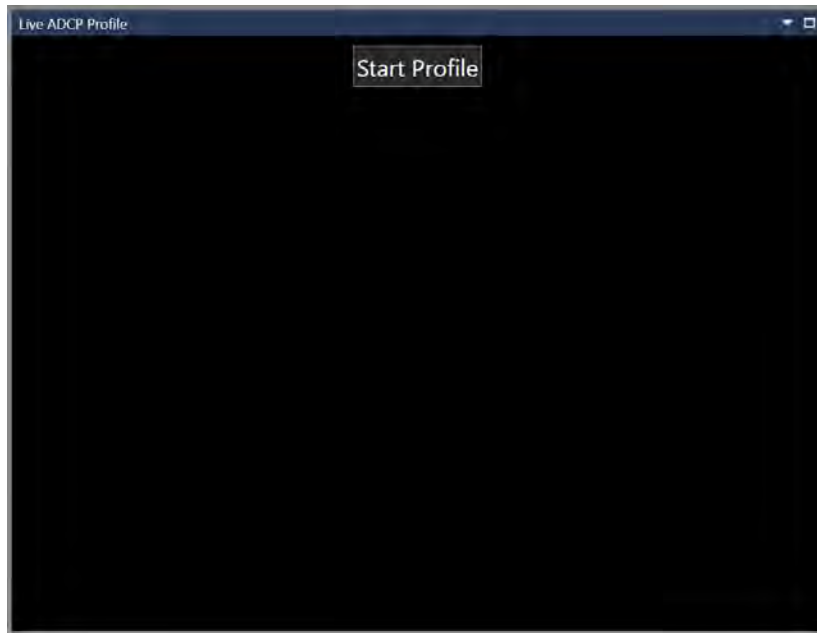
FIGURE 18-22 LIVE ADCP PROFILE – START

3. Click Start Profile, this opens the profile chart showing live ADCP data (see Figure 18-23)[JL4][JL5]

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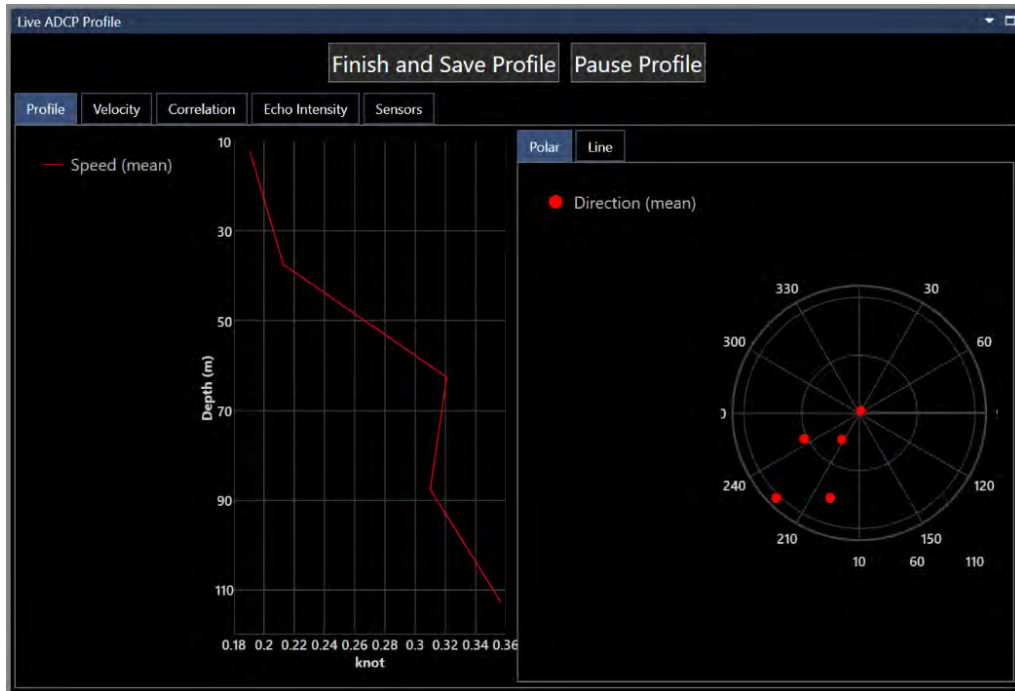
FIGURE 18-23 LIVE ADCP PROFILE – CHART VIEW

4. When profile is completed click on Finish and Save Profile, this opens a summary window (see Figure 18-24, click on the X in upper right corner of the window. This is saved for viewing using View ADCP Profiles.
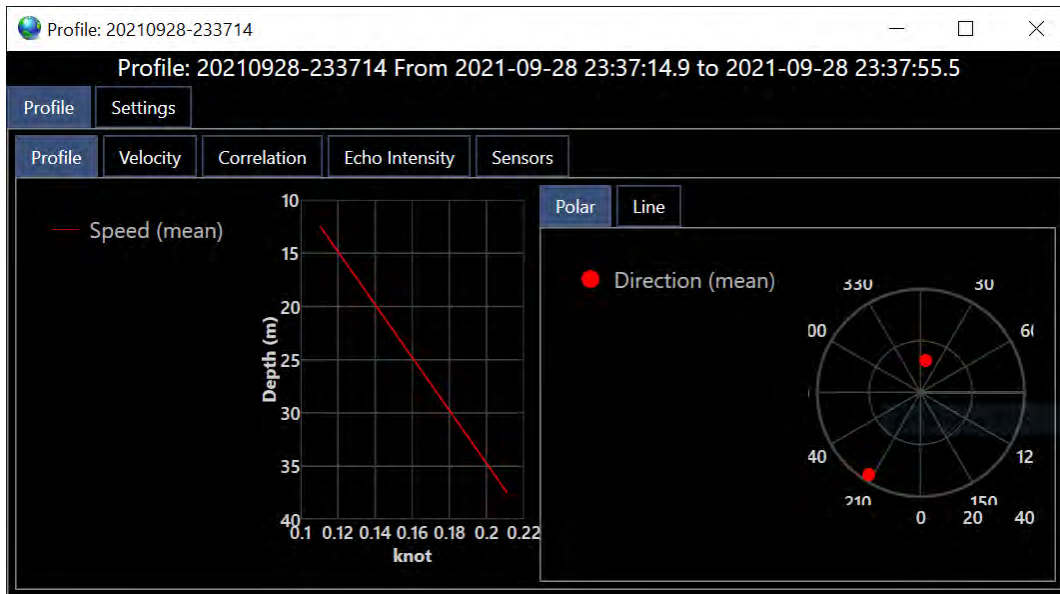
FIGURE 18-24 LIVE ADCP PROFILE SAVED

18.5 ADCP Visuals

ADCP profiles can be viewed from the View ribbon, ADCP section (see Figure 18-25).

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FIGURE 18-25 ADCP PROFILES - VIEW RIBBON

18.5.1 View Saved ADCP Profiles

1. Select ADCP Profiles from the ADCP section, View ribbon (see Figure 18-25) to view saved captured profiles (see Figure 18-26)

FIGURE 18-26 ADCP PROFILES - VIEW WINDOW

2. Select the saved profile from the profiles listed in the left panel to display.

18.5.2 View Live ADCP Profile

Live ADCP profiles can be viewed from the View ribbon, ADCP section

1. Select New ADCP Profiler from the ADCP section, View ribbon (see Figure 18-25) to view live profiles (see Figure 18-27)

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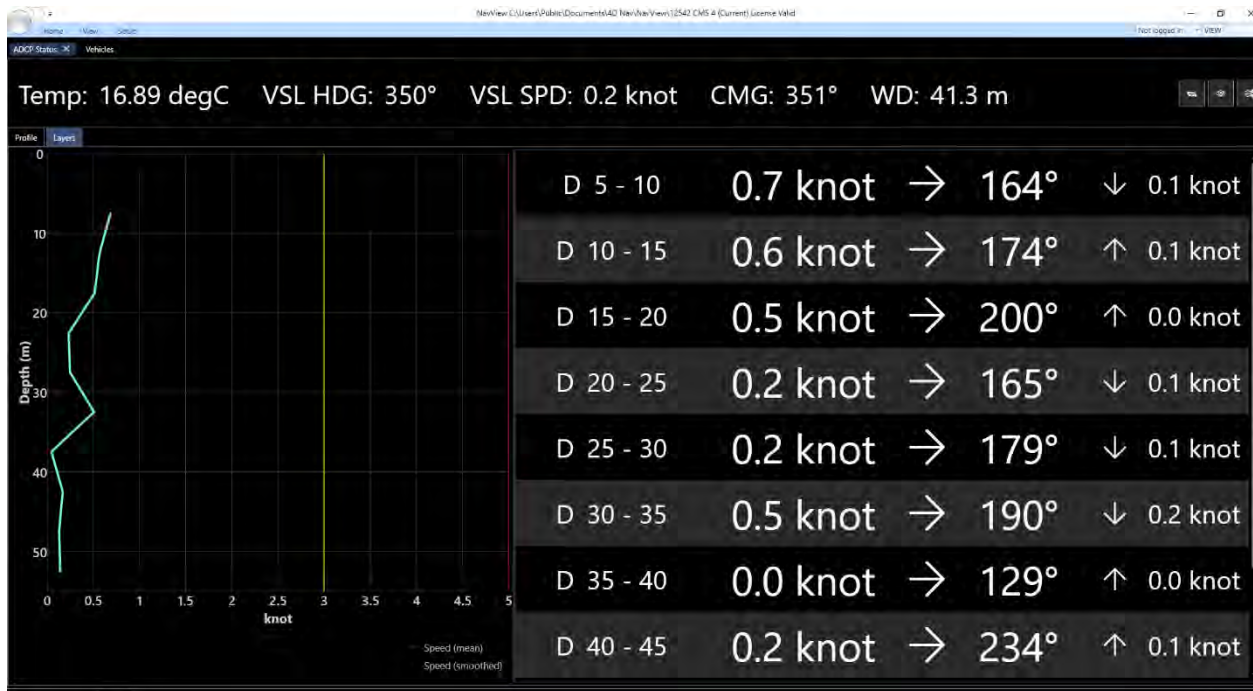
FIGURE 18-27 ADCP PROFILE WINDOW - LAYERS TAB

The top section of the view shows some summary details such as temperature, vessel heading, vessel speed, and course made good (CMG) and the water depth.

Below this, two tabs are available by default.

- **Layers Tab:** On this view, the current magnitude vs depth is shown in the chart on the left, followed by a row for each layer in the calculation, on the right (see Figure 18-27).

- **Profiles Tab:** On this view, the current magnitude vs depth is shown in the chart on the left and current direction on the right (see Figure 18-28)

On the direction chart, the range outward from the center represents the depth of the layer, while the angle on the polar plot indicates the current direction at that depth.

The current profile can also be viewed in the 3D Map, as seen in Figure 18-29.

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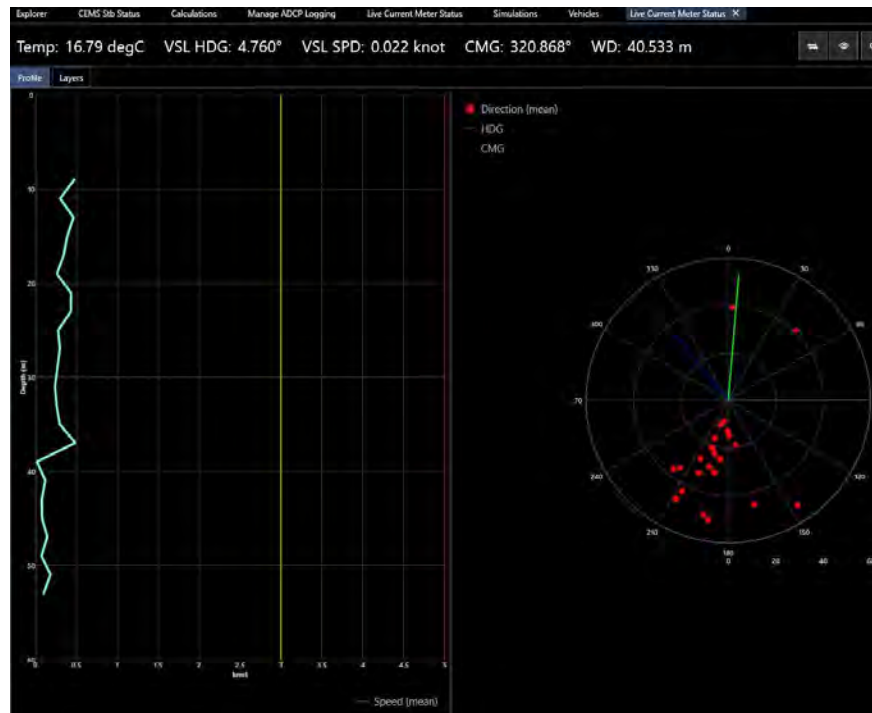
FIGURE 18-28 ADCP PROFILE WINDOW - PROFILES TAB
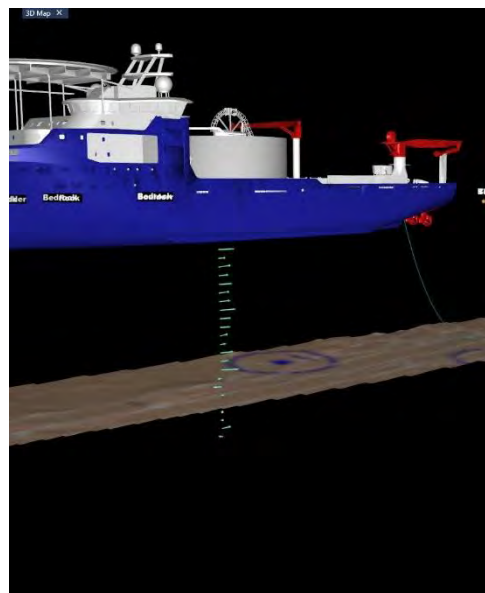
FIGURE 18-29 CURRENT PROFILE IN 3D MAP

18.5.3 Configuring Visuals

There are some configuration options available which are specific to the user interface display and are separate from the main configuration described above. The visual configuration is accessed by clicking

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the ⬚ Edit View Settings button on the current profile display view, this opens the Display Settings (see Figure 18-30).
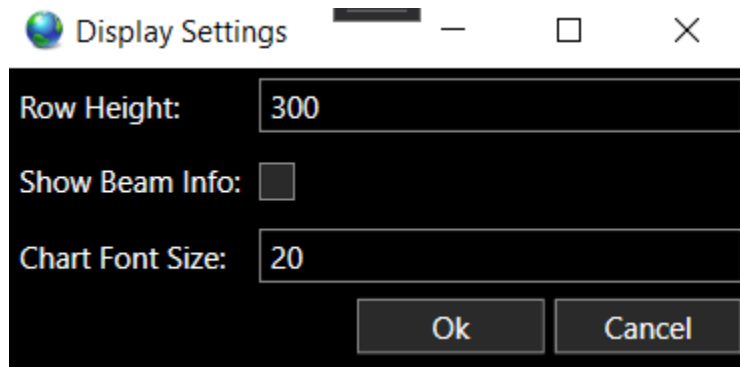
FIGURE 18-30 DISPLAY SETTINGS OPTIONS

- **Row Height (Pixels):** Controls how large each row will be shown in the layers tab. Default is 300 pixels but if using many small layers, a smaller layer height my be desired so that all layers can be displayed on screen at once.

- **Show Beam Info:** Adds extra tabs to the view with additional data for each individual beam from the instrument

- **Chart Font Size:** Sets the font size for the charts. Default is 20. This allows for easier viewing of the charts for vessel operators.

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19 Exclusion Zones

Exclusion Zones in NavView are regions defined by the user entry into which by user selected objects is continuously monitored. Should one of the selected objects enter an exclusion zone, an audio and visual alert is triggered on all stations on the network which have the module enabled.

If Roles and Privileges are enabled, a user must be logged in as a Online, Supervisor or Administrator to configure Exclusions Zones.

19.1 Managing Exclusion Zones

Exclusion Zones are managed from the Configure Exclusion Zones window (see Figure 19-2). This is accessed from the Setup ribbon by clicking on Exclusion Zones in the Configure section (see Figure 6-1). This includes the basic configuration, selection of dynamic objects to monitor, definition of the exclusion zones (regions) and how to display the exclusion zones and the associated alerts graphically in 2D Map views.
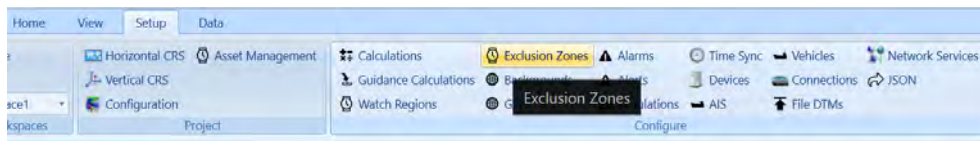
FIGURE 19-1 SETUP RIBBON – EXCLUSION ZONES
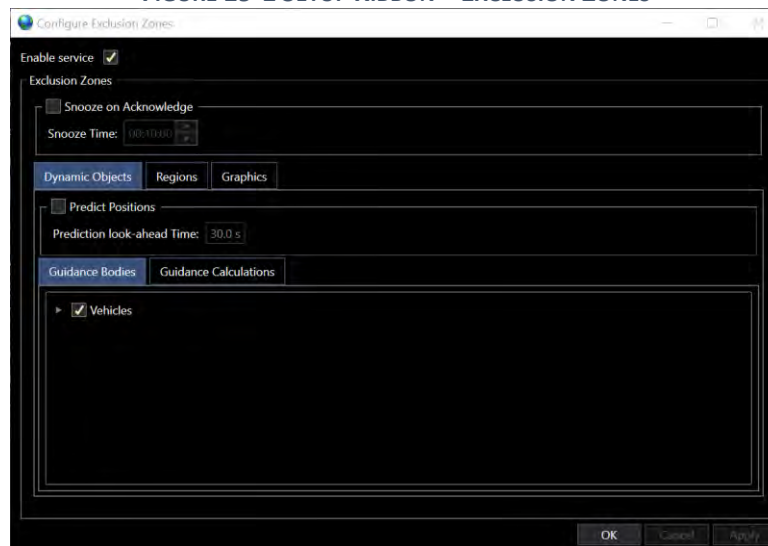
FIGURE 19-2 EXCLUSION ZONE CONFIGURATION WINDOW

19.1.1 Basic Configuration

These settings control the basic operation of exclusion zone monitoring.

1. **Enable service:** Check to enable service

2. **Snooze on Acknowledge:** Allows the user to set a time limit value where alerts will not be re-generated, e.g., if a vehicle enters an exclusion zone and an alert is triggered and acknowledged then leaves the exclusion zone. If the vehicle re-enters the exclusion zone within a specified

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period (Snooze Time), an alert is not generated but the zone region is highlighted. Check the box to enable this feature.

19.1.2 Dynamic Objects

Select those objects that are to be monitored for entry into exclusion zones from the **Dynamic Objects Tab**.

1. **Predict Positions:** Enable/disable application of predictive positioning in exclusion zone monitoring.

   If prediction is enabled, the system will use the velocity of a dynamic object to predict its future position based on the defined time. If any point on the line between the current position and future position intersects an exclusion zone, a warning will be generated.

2. **Guidance Bodies Tab:** Select the Guidance Bodies (Vehicles) that are to be monitored.

   The Exclusion Zone service uses an opt-out setup. This means that when a new Vehicle is added to the project it and all its Static Offsets are tracked as a guidance body by default, and if one ventures inside any of the regions, an alert will be triggered. To disable monitoring of a specific vehicle, go to the Guidance Body tab and uncheck it from the hierarchical list (see Figure 19-3).
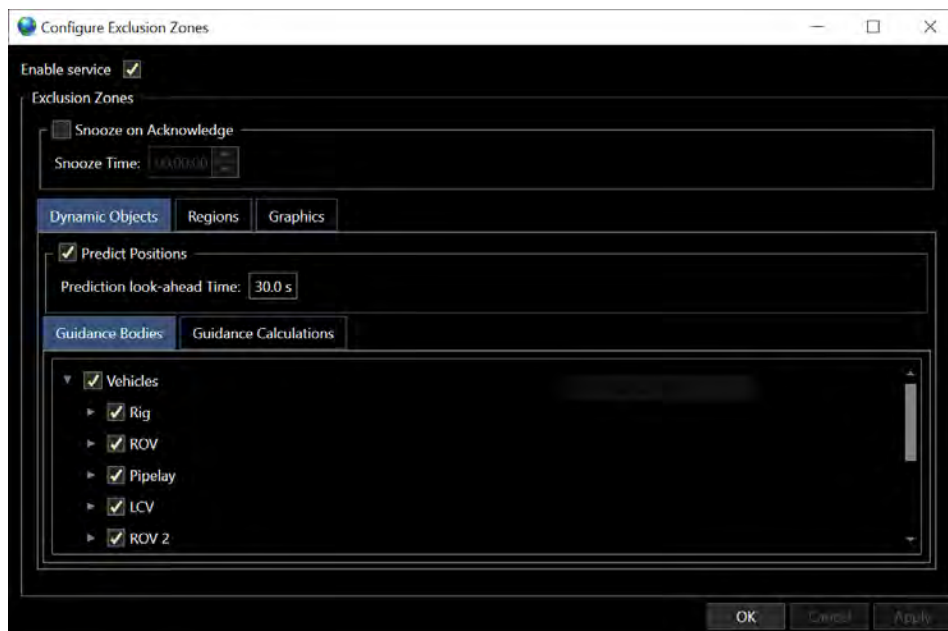
FIGURE 19-3 GUIDANCE BODIES TAB

Note: If a body has many static offsets, and they are all left on, then when it enters a region, the system will generate several alerts, one for each offset.

Note: If a vehicle offset or guidance calculation will be used as a region, it should be disabled in the Guidance Body tab, so it doesn't generate an alarm from itself.

3. **Guidance Calculations Tab:** Select Guidance Calculations to be monitored.

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The Exclusion Zone service uses an opt-out setup. This means that when a guidance calculation is added to the project it is tracked as a guidance calculation by default. In the case of guidance calculations, if the line between the From and the To objects of the calculation pass through any of the exclusion zones, an alert will be triggered. To not track an item, go to the Guidance Body tab and uncheck it from the hierarchical list (see Figure 19-4).

Note: The guidance calculation itself must have **Network Shared** enabled for it to be available in the Guidance Calculations tab.
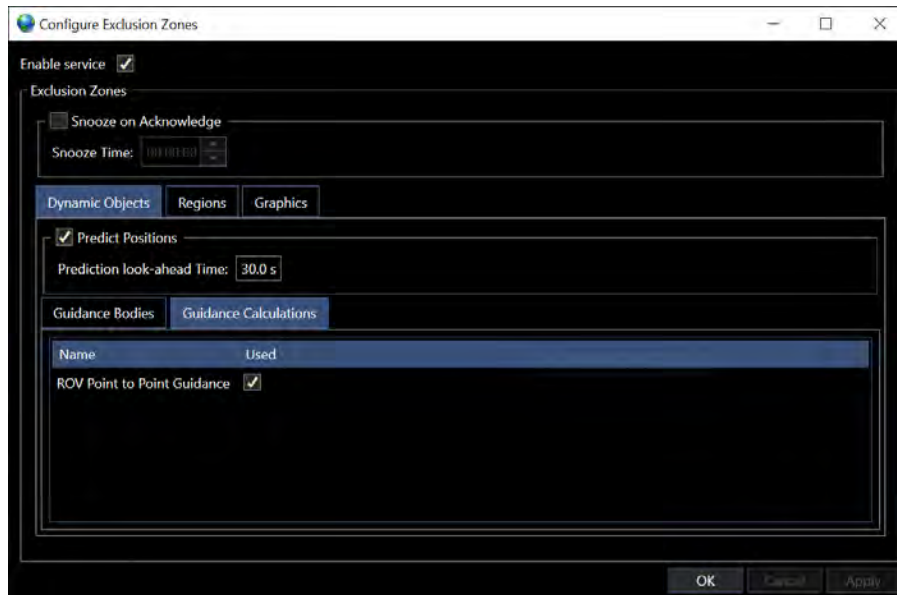
FIGURE 19-4 GUIDANCE CALCULATIONS TAB

19.1.3 Regions

A Region defines the exclusion zone that an object is not allowed to enter. Regions can be created from Static coordinates, a Dynamic Body or a Dynamic Line. Regions are added from the Configure Exclusion Zones window (seeFigure 19-5) or directly from a 2D Map view.

Note: In the case of adding a region from a 2D Map, spatial geometries can be created using the Point Picker and Multi-Point Picker tools and by right mouse clicking on any of the background polylines (GIS, AutoCAD, etc.) and converting these to a region.

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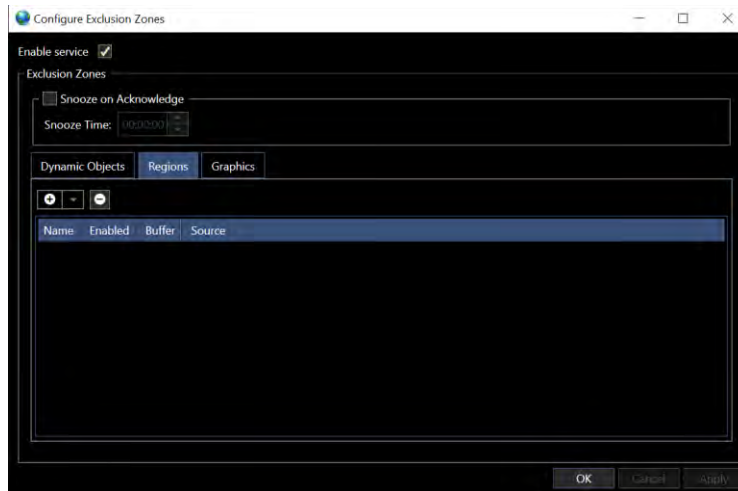
FIGURE 19-5 CONFIGURE EXCLUSION ZONE – REGIONS TAB

19.1.3.1 Static Region

A non-moving region. This can be added from the Configure Exclusion Zone window or directly from a 2D Map.

1. **Create a Static Region from the configuration window**
   a. Click on the [icon] to select the region type to create (see Figure 19-6).

FIGURE 19-6 REGION TYPES

   b. Select the **Static** option from the add button expansion menu. This will add a new geometry item to the list with a default buffer and empty geometry. The geometry field can then be edited (see Figure 19-7).
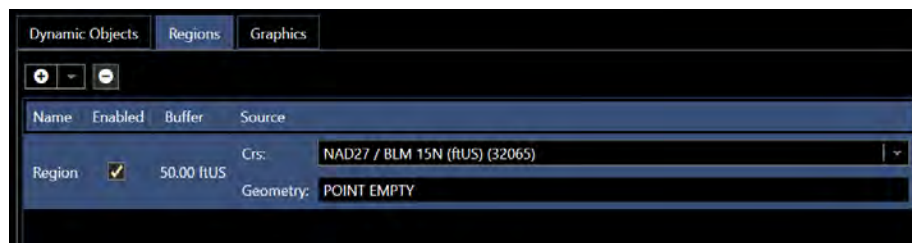
FIGURE 19-7 STATIC REGION

   c. **Name:** Enter a suitable name for the region
   d. **Enabled:** Use this function to turn on/off alerts associated with the region
   e. **Buffer:** Distance around a line or point used for the region geometry
   f. **Source:** Clicking in the Source cell causes it to expand to display
       i. **CRS:** Select the Coordinate Reference System of the static geometry data

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ii. **Geometry:** Enter or copy the geometry defining the region in Well-Known-Text (WKT) format

2. **Create a Static Region from a 2D Map view**

This approach uses either the single point picker ⌖, the multi point picker ⌖, or the capability to select a polyline from a background layer. The single point picker will define an area based on a radius around a single point, while the multi point picker allows the user to create more complex geometry. This process will generate the geometry in WKT format and apply it to define the region.

a. **Point Picker Tool**
   i. To set up a region based on a single point, select the point picker on the map view. click in the desired location on the map. Then right click on the point which has been created, and select copy to-> Exclusion zones (see Figure 19-8)
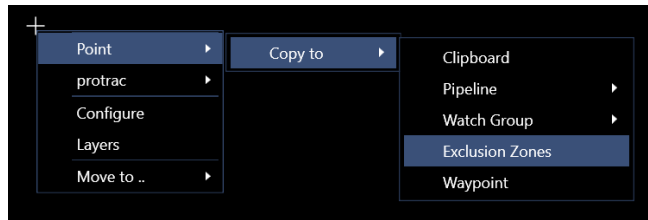
FIGURE 19-8 COPY SINGLE STATIC POINT TO EXCLUSION ZONE

   ii. In the resulting dialog (see Figure 19-9)
      1. **Name:** Enter a suitable name for the region
   2. **Buffer Distance:** Enter the distance to apply to the line/polygon to create the region
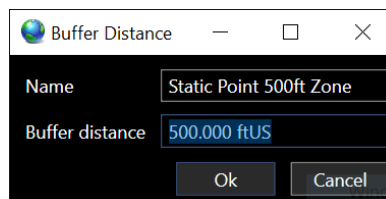
FIGURE 19-9 STATIC SINGLE POINT REGION DIALOG

   iii. The shape will then appear on the map view (see Figure 19-10) and will be added to the regions list in the exclusion zone configuration window (see Figure 19-11)
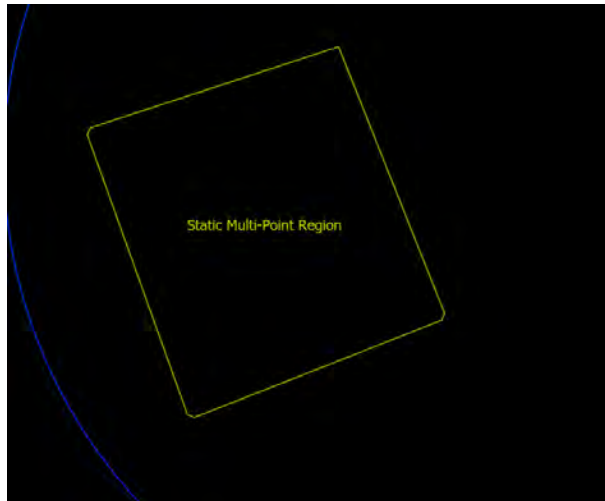
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FIGURE 19-10 STATIC SINGLE POINT REGION – MAP VIEW
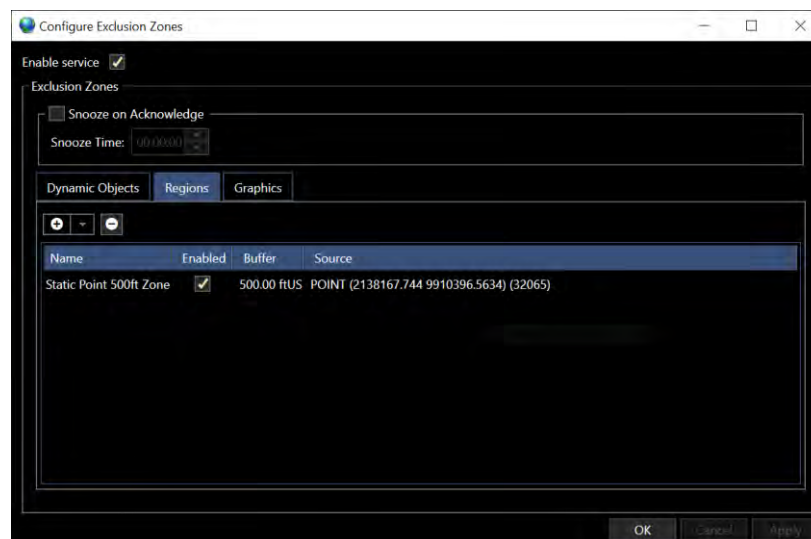
FIGURE 19-11 STATIC SINGLE POINT ADDED – CONFIGURATION WINDOW

b. **Multi-Point Picker Tool**

i. The multi point picker is used to create more complex regions. To use this tool, select the multi point picker on the map toolbar, and select 2 or more points on the map. If only two points are selected, only a line based region will be created. If more than 2 points are selected, a line or polygon based region can be created. Then right click on the line(s) which have been created, and select copy to-> Exclusion zones (see Figure 19-12)

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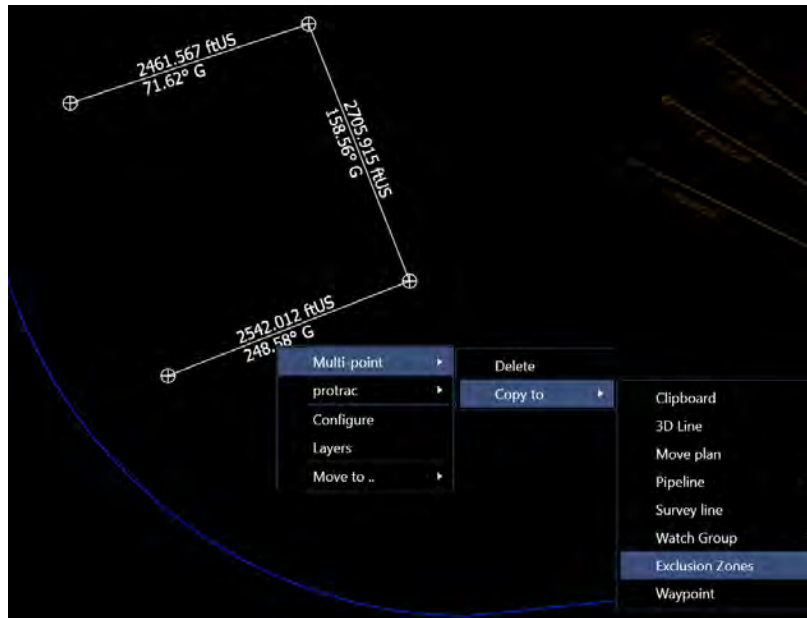
FIGURE 19-12 COPY STATIC MULTI-POINT TO EXCLUSION ZONE

    ii.   In the resulting Create Region dialog (see Figure 19-13)
        1. **Name:** Enter a suitable name for the region
        2. **Region Type:** From the drop down control, select if the region is to be:
            a. **Polygon**: If the selected polyline does not form a polygon itself, NavView will connect the end points to create a polygon. The buffer will be applied to the outside of the polygon to form the region.

Note: If the multi-point picker line has only 2 nodes and the Region type selected is Polygon, NavView will throw an error and abort the creation of the region.

            b. **Line**: The buffer will be applied to the polyline to create the region.
        3. **Buffer Distance:** Enter the distance to apply to the line/polygon to create the region
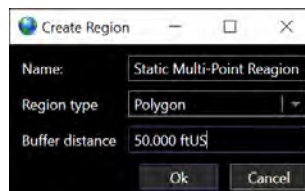
FIGURE 19-13 STATIC MULTI-POINT CREATE REGION DIALOG

        4. The shape will then appear on the map view (see Figure 19-14) and will be added to the regions list in the exclusion zone configuration window (see Figure 19-15)

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FIGURE 19-14 STATIC MULTI-POINT REGION – MAP VIEW
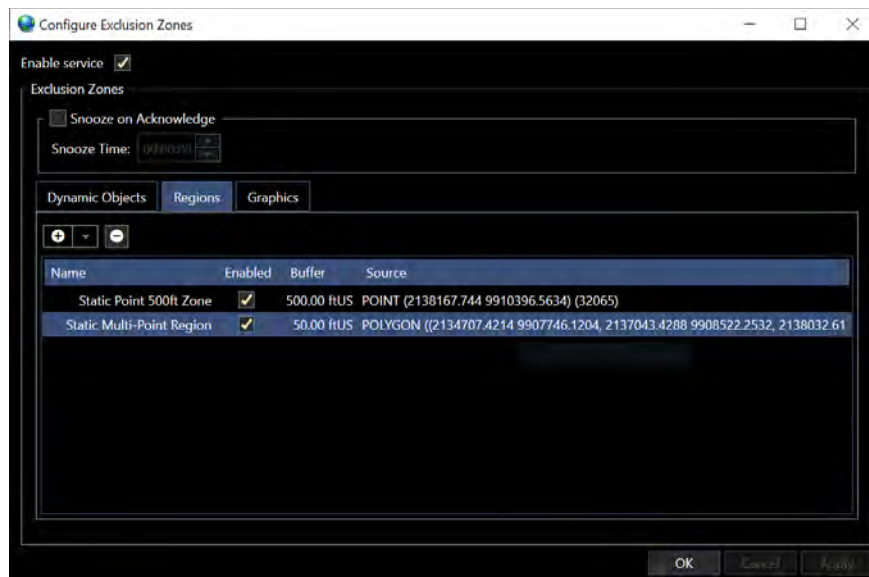
FIGURE 19-15 STATIC MULTI-POINT ADDED – CONFIGURATION WINDOW

a. **Background Polyline**
   i. Right mouse click on a polyline in the 2D Map view and select **Convert to > Exclusion Zone** as shown in Figure 19-16
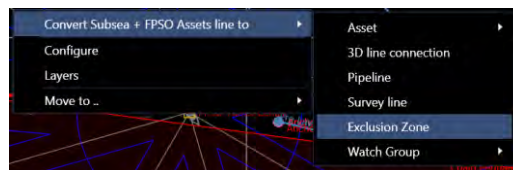
FIGURE 19-16 CONVERT POLYLINE TO EXCLUSION ZONE

   ii. In the resulting Create Region dialog (see Figure 19-17)
      1. **Name:** Enter a suitable name for the region

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2. **Region Type:** From the drop down control, select if the region is to be:
   a. **Polygon**: If the selected polyline does not form a polygon itself, NavView will connect the end points to create a polygon. The buffer will be applied to the outside of the polygon to form the region.
   b. **Line**: The buffer will be applied to the polyline to create the region.
3. **Buffer Distance:** Enter the distance to apply to the line/polygon to create the region
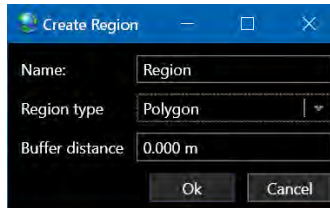
FIGURE 19-17 CREATE REGION DIALOG

iii. Click OK. The region will appear on the map view and will be added to the regions list in the exclusion zone configuration window

19.1.3.2 Dynamic Body Region

A region based on a dynamic body, such as a vehicle offset. Region will be a buffer circle around vehicle offset which will move with the dynamic body. This can only be added directly from the Configure Exclusion Zone window.

1. Select Dynamic Body region (see Figure 19-6)
2. **Name:** Enter a suitable name for the region
3. **Buffer:** Enter a buffer distance to be applied around the Dynamic Body
4. **Source:** From the Source column, select the data source from the vehicles and their offsets (see Figure 19-18)

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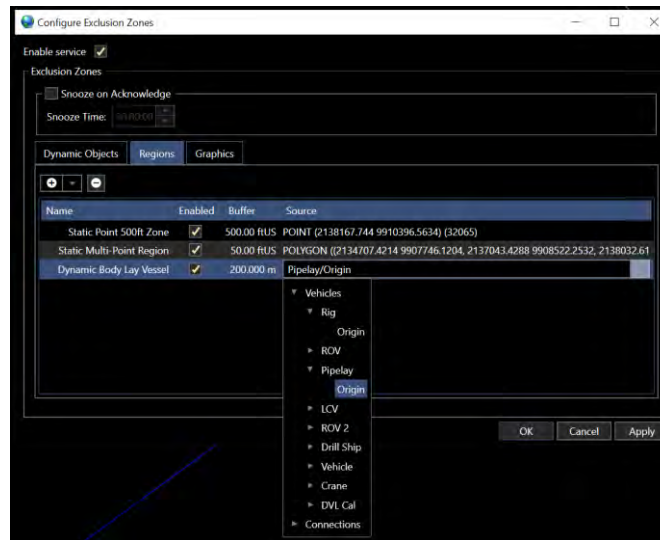
FIGURE 19-18 DYNAMIC BODY REGION - CONFIGURATION WINDOW

5. The image below shows a 200ft region around the pipelay vessel. This shape will continuously update and move with the vessel (see Figure 19-19)

FIGURE 19-19 DYNAMIC BODY REGION - MAP VIEW

19.1.3.3 Dynamic Line Region

Dynamic line regions allow for regions created from either guidance calculations or straight line connections in NavView. These regions can be added from the exclusion zone configuration window or from a 2D Map.

1. **Create a Dynamic Line Region from the Configure Exclusion Zones Configuration window**
    a. Select Dynamic Line region type from the region's configuration dialog (see Figure 19-6)
        i. **Name:** Enter a suitable name for the region
        ii. **Buffer:** Enter a buffer distance to be applied around the Dynamic Line

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iii. **Source:** Select the desired dynamic line from the drop down list of available dynamic lines such as Guidance Calculations and 3D Polyline Connections (see Figure 19-20)
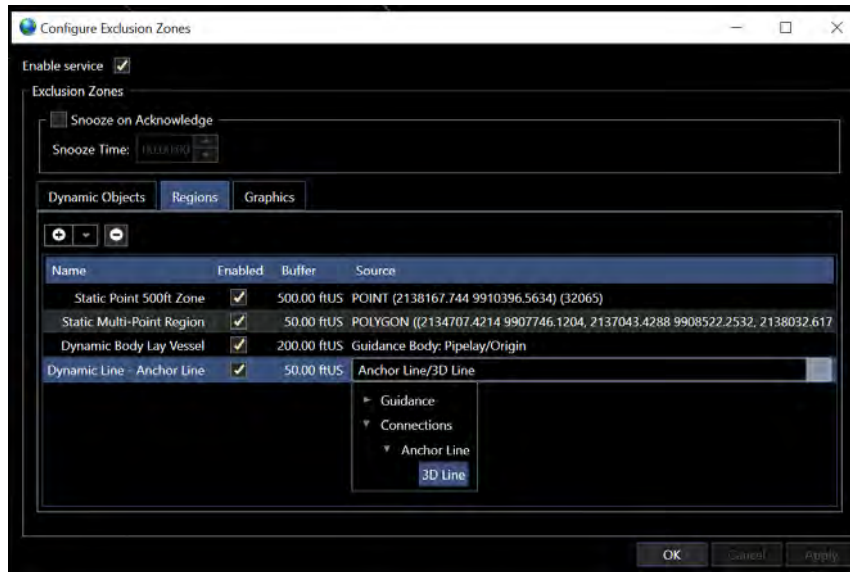
FIGURE 19-20 DYNAMIC LINE - CONFIGURATION WINDOW

b. The image below shows a 50ft region around an anchor line. This shape will continuously update and move with the platform (see Figure 19-21)
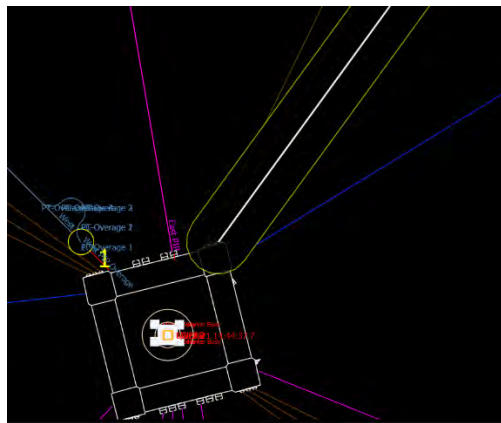
FIGURE 19-21 DYNAMIC LINE REGION – MAP VIEW

2. **Create a Dynamic Line Region from a 2D Map view**

Note: The graphics must be turned on for a guidance calculation for it to be available in the 2D Map view for selection.

a. Right click on the guidance calculation line and select the Exclusion/Watch Regions: [Name of Guidance calculation]-> Create New Exclusion Zone with: [Name of Guidance Calculation] option to create a new exclusion zone

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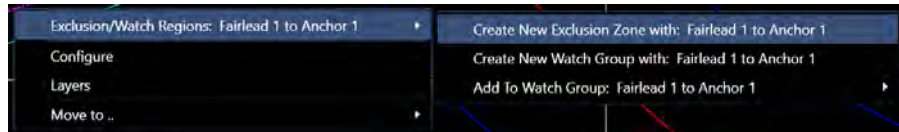
FIGURE 19-22 CREATE DYNAMIC LINE EXCLUSION ZONE FROM 2D MAP

b. The region will be added to the Configure Exclusion Zone window Regions list with the default name Line: [Name of Guidance Calculation] and a buffer distance of 50m which can be edited from this window

19.1.4 Graphics

This provides a standard graphics configuration view, like other parts of NavView, to configure the look of a non-triggered area as well as a triggered one (see Figure 19-23)

FIGURE 19-23 CONFIGURE EXCLUSION ZONES - GRAPHICS TAB

The only non-standard configurable item is **EM**, the size of exclusion zone label.

19.2   Monitoring Exclusion Zone Alerts

Alerts can be monitored visually on the map view and the Alert list window.

19.2.1 Map View

When a Dynamic Object intersects or goes inside an exclusion zone region, an alert will be triggered. When an alert is triggered, the graphics for the region on the map view (see Figure 19-24) will change to match the settings in Triggered Graphics (see Figure 19-23)

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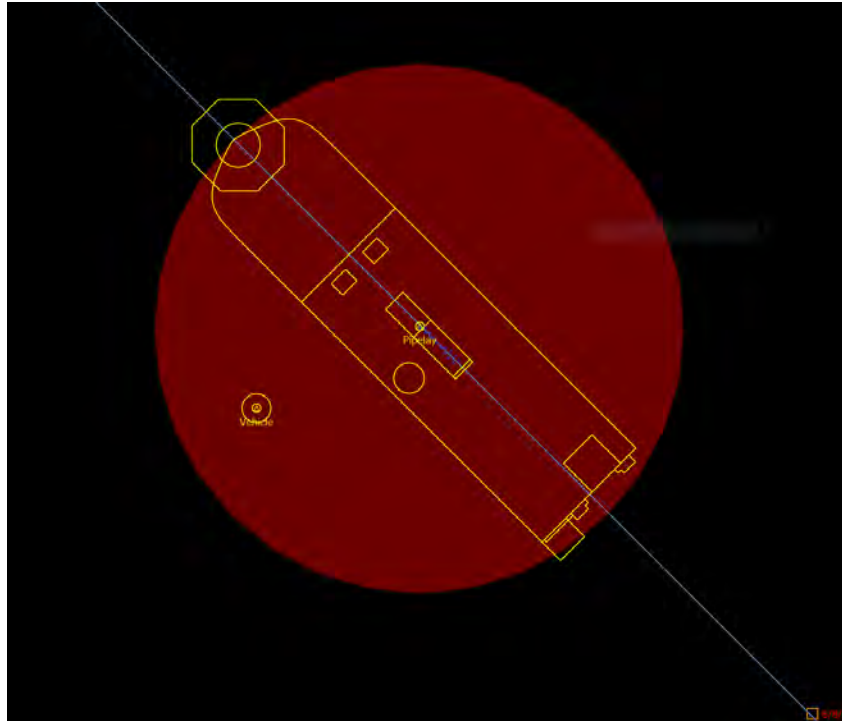
FIGURE 19-24 ALERT TRIGGERED - MAP VIEW

19.2.2 Alert List Window:

The alert list window (see Figure 19-26) is accessed from the View ribbon, Windows section (see Figure 19-25). If this window is not open when an Alert is triggered, it will automatically open.
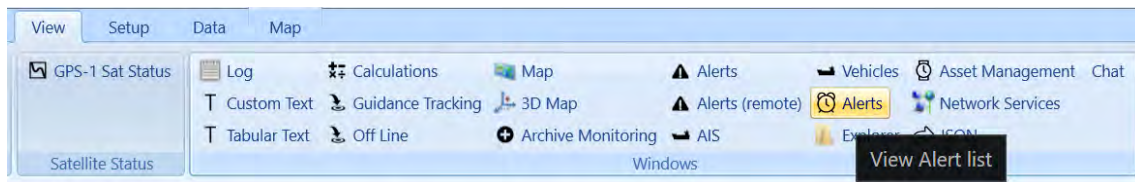
FIGURE 19-25 ALERT LIST – VIEW RIBBON

FIGURE 19-26 ALERT LIST WINDOW

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The Alerts table columns are as follows:

- **Type:** The type of alert icon (error, warning or information)
- **Time:** Time the event occurred
- **Event:** Message text of the event
- **Time Cleared:** Time Cleared, or '--' if it has not been cleared yet
- **Time Acknowledged:** Time Acknowledged, or '--' if it has not been acknowledged yet
- **State:** Indicates if the alert is cleared, acknowledged or still active
- **Module:** The alert list can handle alerts and information from other NavView modules, so the source of the alert is shown here
- **Top Buttons:** The buttons at the top of the alert window allow the user to filter what is displayed in the list, whether that be only errors, both errors and warnings, for information. It is also possible to filter out acknowledged items so only the most important information is shown

Note: Alerts/Alarms triggered are published to all stations on the network when triggered and not exclusive to a single station.

19.2.3 Alert List Configuration

The ⬚ button is used to open the alert list configuration dialog. The alert list configuration view controls the display of popup messages, as well as sound (see Figure 19-27)
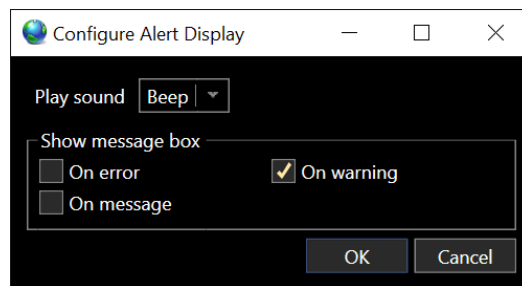
FIGURE 19-27 ALERT LIST - CONFIGURE ALERT DISPLAY DIALOG

1. **Play Sound:** The sound options include a variety of sounds to choose from for when an alert occurs. The alerts sounds in NavView use Windows system sounds, which allows it to leverage some added accessibility features in Windows 10.

   For added notification in case the system sound is turned off or speakers are unavailable, Windows 10 has a feature in system settings called 'Show visual alerts for audio notifications' which can be found by searching via the Start Menu (see Figure 19-28 and Figure 19-29).

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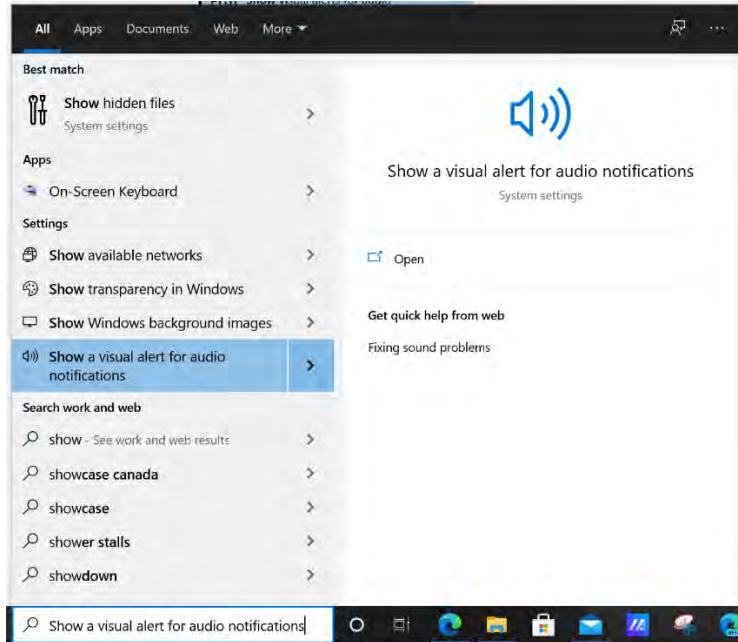
FIGURE 19-28 SHOW VISUAL ALERTS - WINDOWS 10
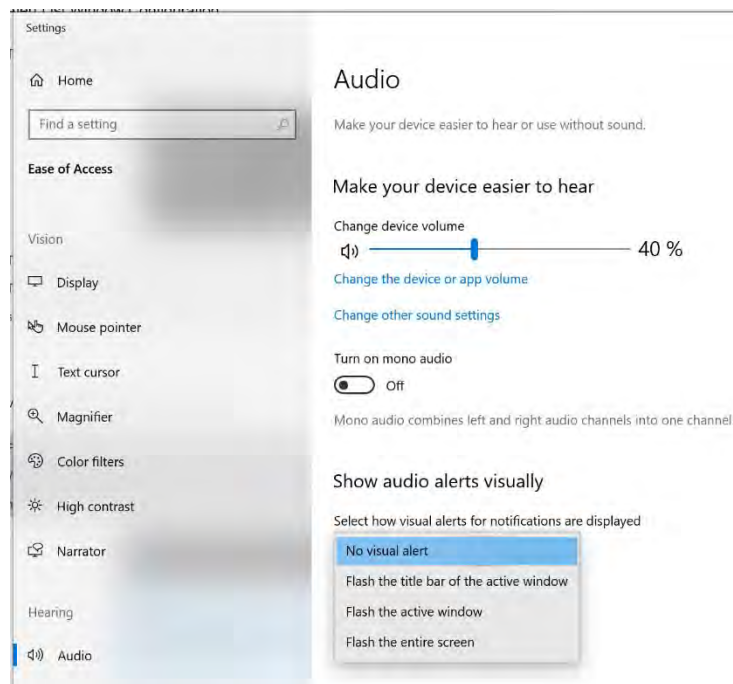
FIGURE 19-29 SHOW VISUAL ALERTS – CONFIGURATION - WINDOWS 10

2. **Show message box:** If the On error, On warning and/or On message checkboxes in the settings dialog are checked, a popup message will appear on screen whenever an alert occurs. This will pop up in the middle of the screen in front of all other windows but is non-modal, meaning it still allows the user to interact with NavView before clicking the OK button (see Figure 19-30)
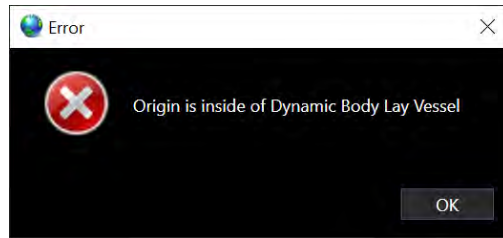
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FIGURE 19-30 ALERT POPUP WINDOW

19.2.4 Acknowledging Alerts

When an alert is currently active, meaning it has not yet been cleared, it will continue to flash and create sound if those options are enabled. The user can acknowledge the alert, which will silence the flashing and sound, but the alert will remain in the 'triggered' graphics state on screen and remain in the alert list window until it is cleared.

Alerts can be acknowledged by clicking on the checkmark button in the alert list table, or by right clicking on the alert, and selecting acknowledge from the context menu (see Figure 19-31)
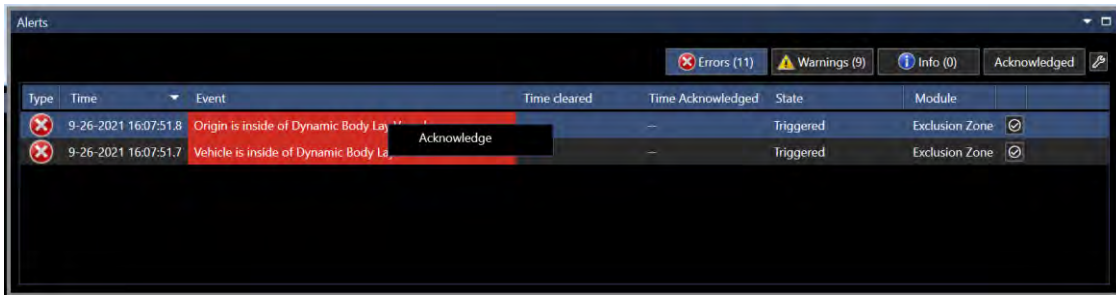
FIGURE 19-31 ALERT ACKNOWLEDGE - CONTEXT MENU

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NavView User Guide

20 Watch Regions

Watch regions are a NavView feature that allows a user to monitor one or more dynamic objects in relation to the boundaries of one of more areas and to trigger an alert when the dynamic objects are either inside or outside of the boundaries, depending on the alarm mode selected. A given set of dynamic objects and regions with the same alarm mode setting make up a Watch Group. Multiple Watch Groups can be added enabling a comprehensive range of monitoring options.

If Roles and Privileges are enabled, a user must be logged in as Online, Supervisor or Admin to be able to manage Watch Regions.

Note: Watch regions are distributed across network services to all connected NavView stations. Any change on one station is updated on all connected remote stations.

20.1 Managing Watch Groups

Watch groups are managed from the Configure Watch Groups window (see Figure 20-2). This is accessed from the Setup ribbon by clicking on Watch Regions in the Configure section (see Figure 6-1).
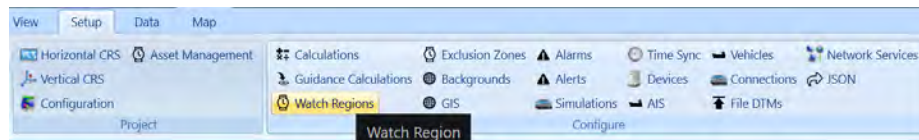
FIGURE 20-1 SETUP RIBBON - WATCH REGIONS
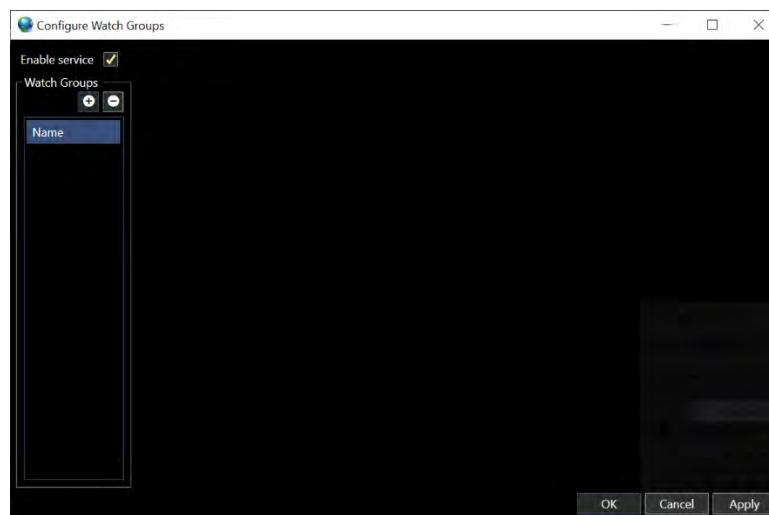
FIGURE 20-2 CONFIGURE WATCH GROUPS WINDOW

20.1.1 Enable Watch Regions

Use of the Watch Regions feature is controlled from the Configure Watch Groups window by checking or unchecking the **Enable service** box.

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20.1.2 Add/Remove a Watch Group

A Watch Group can be added from the Configure Watch Groups window (see Figure 20-2) or directly from the 2D Map view when creating a Watch region from the Map.

1. Click the ⊕ button in the Watch Groups panel of the Configure Watch Groups window; or

2. When adding a region directly from a 2D Map view, select New Watch Group in the pop up menu (see Configure Regions)

To remove a Watch Group

1. Select the Watch Group to remove in the left panel
2. Click the ⊖ button

20.1.3 Basic Configuration

1. Select the Watch Group to configure in the left panel (see Figure 20-3) to display the respective configuration in the Selected Watch Group panel on the right
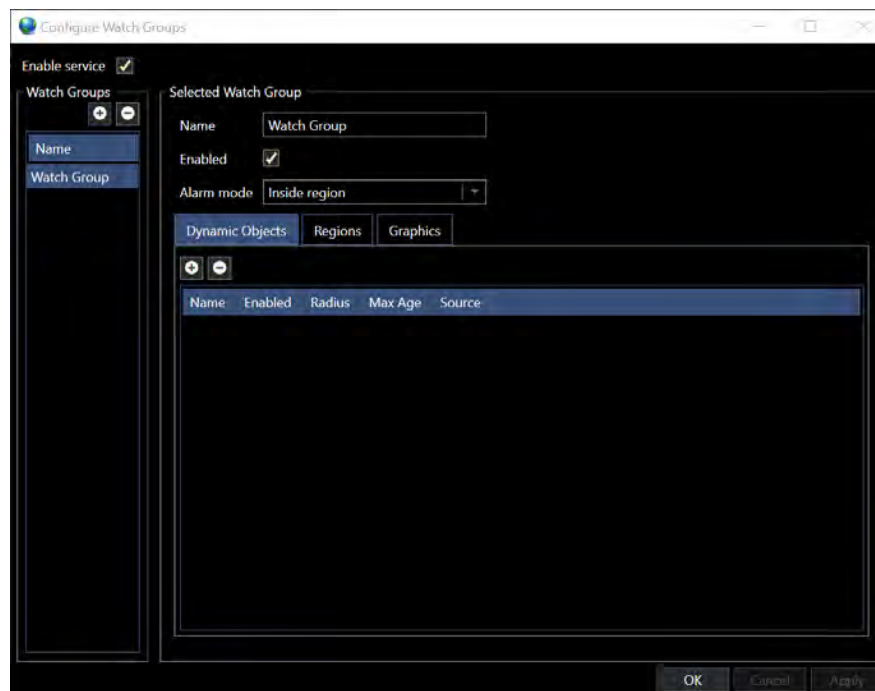
FIGURE 20-3 SELECTED WATCH GROUP CONFIGURATION

2. **Name:** Enter the name to be used to identify the watch group in the system

3. **Enabled:** If checked this watch group is evaluated against the configured constraints. If disabled, this watch group is not evaluated

4. **Alarm Mode:** Select the type of spatial constraint to evaluate between each configured dynamic object and spatial region

   a. **Inside region:** Generates an alert if any of the dynamic objects ENTERS into or over any of the region

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b. **Outside region:** Generates an alert if any of the dynamic objects EXITS outside of any of the regions

20.1.4 Configure Dynamic Objects

Dynamic objects define the dynamic spatial objects in the watch group relationship. Dynamic objects are any dynamic NavView object that publishes a 2D Geographic observation.

1. Select the Watch Group to configure in the left panel (see Figure 20-3**Error! Reference source not found.**) to display the respective configuration in the Selected Watch Group panel on the right

2. Click the ⊕ button to add a dynamic object; or

3. Click the ⊖ button removes the selected dynamic object

4. **Name:** Enter the name used to identify this dynamic object in any generated alerts

5. **Enabled:** If checked, this dynamic objects is evaluated against the regions of this group. If unchecked this dynamic object is ignored in the spatial calculation

6. **Radius:** Enter the distance to define a circle around the dynamic object. The spatial relationship is evaluated by comparing the spatial region around a dynamic object compared to each configured spatial region. The radius value is used to enlarge the region around the dynamic object. For example, if the radius is 50m the dynamic object is spatially represented as a circle with a radius of 50m around the coordinate that defines the current location of the dynamic object

7. **Max Age:** Enter the maximum age of the dynamic object's position before the position is no longer used in the spatial calculations. For example, if the max age is set to 60 seconds, this dynamic object is spatially evaluated only if its last updated position is <= 60 seconds. If the age is greater than 60 seconds this dynamic object is effectively disabled

8. **Source:** From the drop down list populated by all data sources that publish 2D Geographic observations, e.g. Vehicles, Calculations, select Devices, etc., select the data source to position the dynamic object

20.1.5 Configure Regions

A Region defines the watch region that an object is monitored against. Regions can be created from Static coordinates, a Dynamic Body or a Dynamic Line. Regions are added from the Configure Watch Regions window (see Figure 20-4) or directly from a 2D Map view.

Note: In the case of adding a region from a 2D Map, spatial geometries can be created using the Point Picker and Multi-Point Picker tools and by right mouse clicking on any of the background polylines (GIS, AutoCAD, etc.) and converting these to a region.
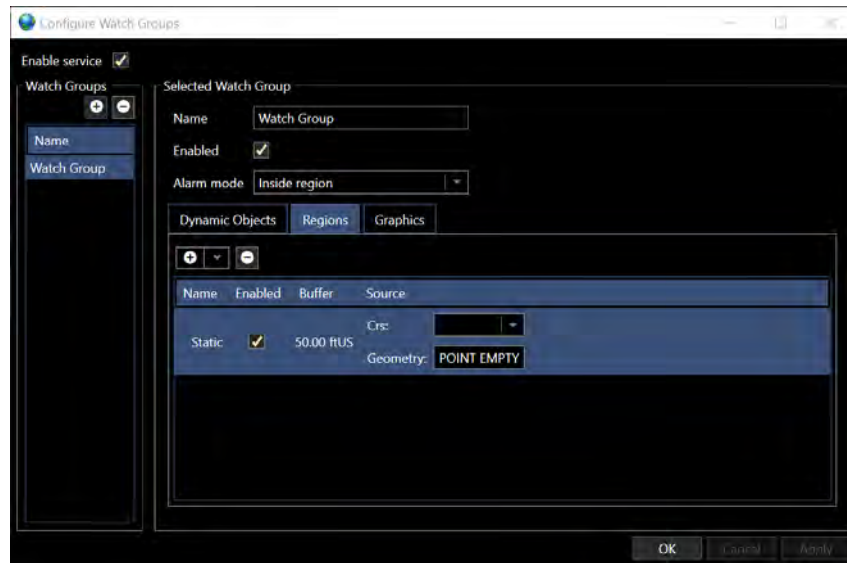
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FIGURE 20-4 CONFIGURE WATCH GROUP – REGIONS TAB

20.1.5.1 Static Region

A non-moving region. This can be added from the Configure Watch Groups window or directly from a 2D Map.

3. **Create a Static Region from the Configure Watch Groups window**
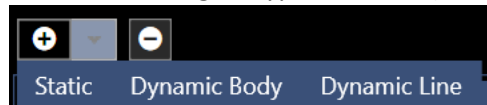   a. Click on the to select the region type to create (see Figure 19-6).

FIGURE 20-5 REGION TYPES

   b. Select the **Static** option from the add button expansion menu. This will add a new geometry item to the list with a default buffer and empty geometry. The geometry field can then be edited (see Figure 19-7).

FIGURE 20-6 STATIC REGION

   c. **Name:** Enter a suitable name for the region
   d. **Enabled:** Use this function to turn on/off alerts associated with the region
   e. **Buffer:** Distance around a line or point used for the region geometry
   f. **Source:** Clicking in the Source cell causes it to expand to display
      i. **CRS:** Select the Coordinate Reference System of the static geometry data

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ii. **Geometry:** Enter or copy the geometry defining the region in Well-Known-Text (WKT) format

4. **Create a Static Region from a 2D Map view**

This approach uses either the single point picker 📍, the multi point picker 🗺, or the capability to select a polyline from a background layer. The single point picker will define an area based on a radius around a single point, while the multi point picker allows the user to create more complex geometry. This process will generate the geometry in WKT format and apply it to define the region.

a. **Point Picker Tool**

i. To set up a region based on a single point, select the point picker on the map view. click in the desired location on the map. Then right click on the point (see Figure 19-8), and select copy to-> Watch Group >

1. Select New Watch Group to create a new Watch Group and add this as a region to it

2. Select [Watch Group Name] to add it to the selected existing Watch Group


FIGURE 20-7 COPY SINGLE STATIC POINT TO WATCH GROUP

ii. In the resulting dialog (see Figure 19-9)

1. **Name:** Enter a suitable name for the region

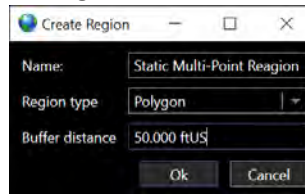2. **Buffer Distance:** Enter the distance to apply to the point to create the region
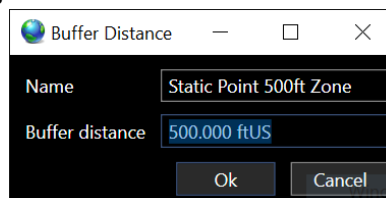
FIGURE 20-8 STATIC SINGLE POINT REGION DIALOG

iii. The shape will then appear on the map view (see Figure 19-10) and will be added to the regions list in the Configure Watch Groups window

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FIGURE 20-9 STATIC SINGLE POINT REGION – MAP VIEW

b. Multi-Point Picker Tool

　　i. The multi point picker is used to create more complex regions. To use this tool, select the multi point picker on the map toolbar, and select 2 or more points on the map. If only two points are selected, only a line based region can be created. If more than 2 points are selected, a line or polygon based region can be created. Then right click on the line(s) which have been created (see Figure 19-12) and select copy to-> Watch Group >

　　　　1. Select New Watch Group to create a new Watch Group and add this as a region to it

　　　　2. Select [Watch Group Name] to add it to the selected existing Watch Group
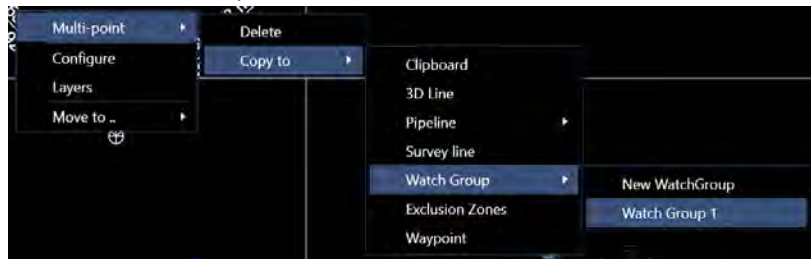
FIGURE 20-10 COPY STATIC MULTI-POINT TO WATCH GROUP

　　ii. In the resulting Create Region dialog (see Figure 19-13)

　　　　1. **Name:** Enter a suitable name for the region

　　　　2. **Region Type:** From the drop down control, select if the region is to be:

　　　　　　a. **Polygon**: If the selected polyline does not form a polygon itself, NavView will connect the end points to create a polygon. The buffer will be applied to the outside of the polygon to form the region.

Note: If the multi-point picker line has only 2 nodes and the Region type selected is Polygon, NavView will throw an exception and abort the creation of the region.

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b. **Line**: The buffer will be applied to the polyline to create the region.

3. **Buffer Distance:** Enter the distance to apply to the line/polygon to create the region
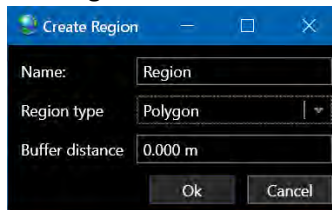

FIGURE 20-11 STATIC MULTI-POINT CREATE REGION DIALOG

    iii. The shape will then appear on the map view (see Figure 19-14) and will be added to the regions list in the Configure Watch Groups window

FIGURE 20-12 STATIC MULTI-POINT REGION – MAP VIEW

c. **Background Polyline**

    i. Right mouse click on a polyline in the 2D Map view (see Figure 19-16) and select Convert [polyline name] to -> Watch Group ->

        1. Select New Watch Group to create a new Watch Group and add this as a region to it

        2. Select Add -> [Watch Group Name] to add it to the selected existing Watch Group
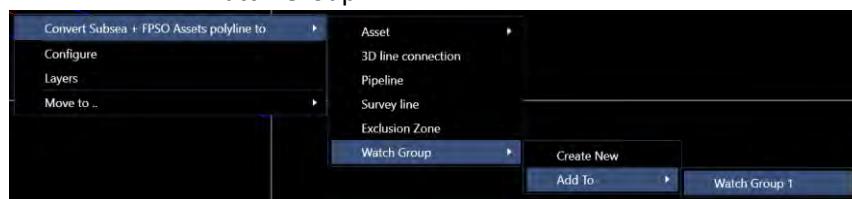
FIGURE 20-13 CONVERT POLYLINE TO WATCH GROUP

    ii. In the resulting Create Region dialog (see Figure 19-17)

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1. **Name:** Enter a suitable name for the region
2. **Region Type:** From the drop down control, select if the region is to be:
    a. **Polygon**: If the selected polyline does not form a polygon itself, NavView will connect the end points to create a polygon. The buffer will be applied to the outside of the polygon to form the region.
    b. **Line**: The buffer will be applied to the polyline to create the region.
3. **Buffer Distance:** Enter the distance to apply to the line/polygon to create the region

FIGURE 20-14 CREATE REGION DIALOG

iii. Click OK. The region will appear on the map view and will be added to the regions list in the Configure Watch Groups window

20.1.5.2 Dynamic Body Region

A region based on a dynamic body, such as a vehicle offset. The region will be a buffer circle around vehicle offset which will move with the dynamic body. This can only be added directly from the Configure Watch Groups window.

1. Select Dynamic Body region (see Figure 19-6)
2. **Name:** Enter a suitable name for the region
3. **Buffer:** Enter a buffer distance to be applied around the Dynamic Body
4. **Source:** From the Source column populated with the vehicles and their offsets, select the data source to use for the Dynamic Body (see Figure 19-18)

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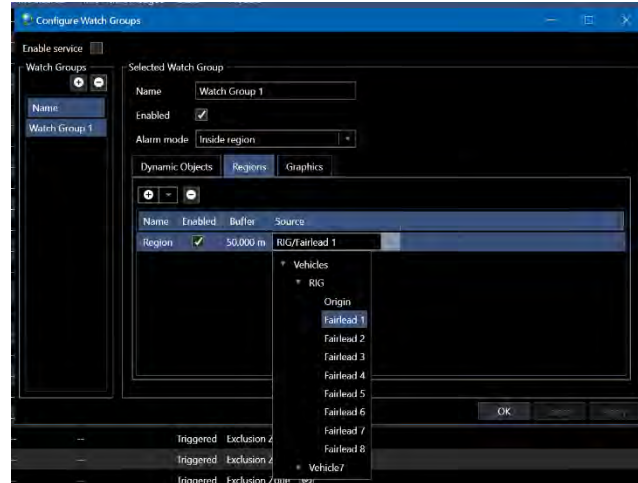
FIGURE 20-15 DYNAMIC BODY REGION - CONFIGURATION WINDOW

~~6.~~5. The image below shows a 200ft region around the pipelay vessel. This shape will continuously update and move with the vessel (see Figure 19-19)

Figure 20-16 Dynamic Body Region - Map View

20.1.5.3 Dynamic Line Region

Dynamic line regions allow for regions created from either guidance calculations or select connections in NavView. These regions can be added from the Configure Watch Groups window or from a 2D Map.

1. **Create a Dynamic Line Region from the Configure Watch Groups window**
   a. Select Dynamic Line region type from the region's configuration dialog (see Figure 19-6)
      i. Name: Enter a suitable name for the region
      ii. Buffer: Enter a buffer distance to be applied around the Dynamic Line
      iii. Source: Select the desired dynamic line from the drop down list of available dynamic lines such as Guidance Calculations, Straight Line Connections and 3D Polyline Connections (see Figure 19-20)

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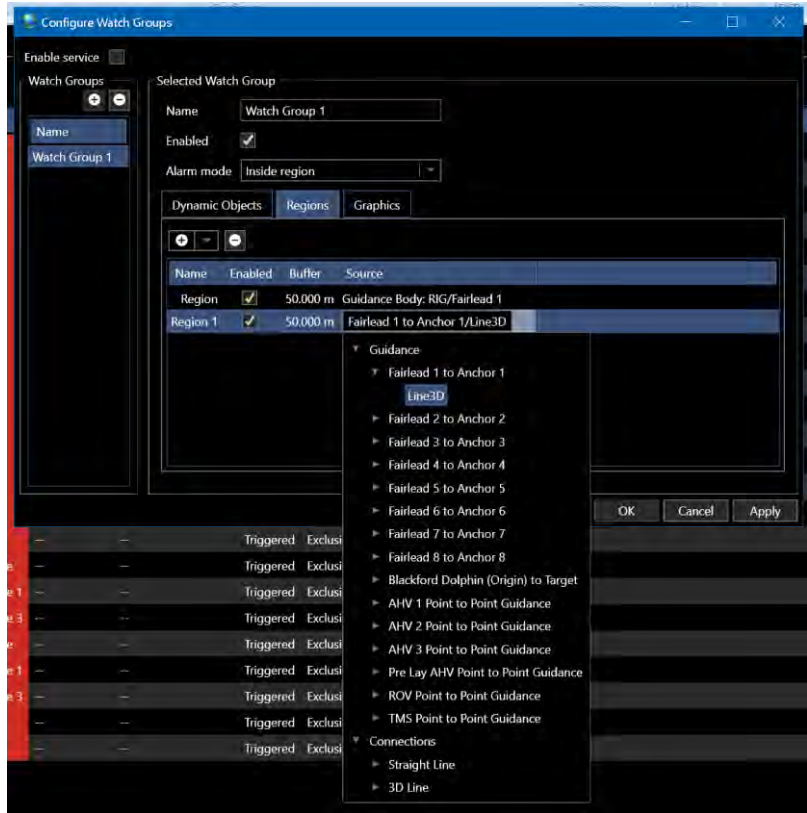
FIGURE 20-17 DYNAMIC LINE - CONFIGURATION WINDOW

.~~1~~22.   **Create a Dynamic Line Region from a 2D Map view**

Note: The graphics must be turned on for a guidance calculation for it to be displayed in the 2D Map view and therefore available for selection.

    c. Right click on the guidance calculation line and select the Exclusion/Watch Regions: [Name of Guidance calculation]->

        i. Create New Watch Group with: [Name of Guidance Calculation] option to create a new Watch Group with this as a region

        ii. Add to Watch Group [Name of Guidance Calculation] > [Watch Group] to add this region to an existing Watch Group
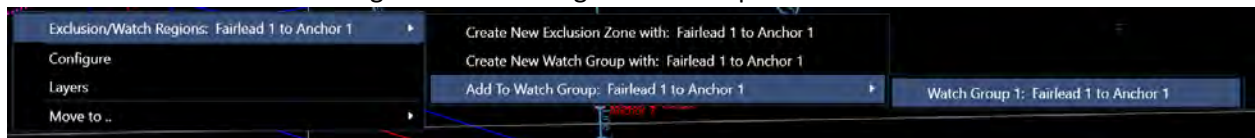
FIGURE 20-18 CREATE DYNAMIC LINE WATCH REGION FROM 2D MAP

    d. The region will be added to the Configure Watch Regions window Regions list with the default name Line: [Name of Guidance Calculation] and a buffer distance of 50m which can be edited from this window

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20.1.6 Graphics

This provides a standard graphics configuration view, similar to other parts of NavView, to configure the look of a non-triggered area as well as a triggered one (see Figure 20-19)
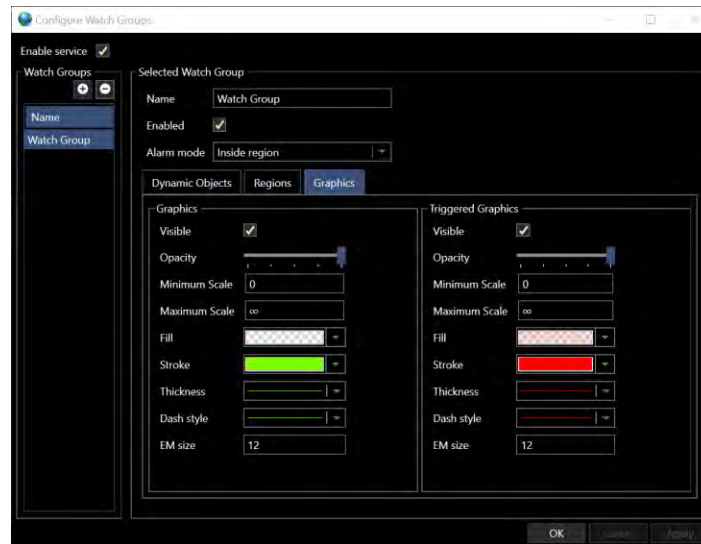
FIGURE 20-19 CONFIGURE WATCH REGIONS - GRAPHICS TAB

The only non-standard configurable item is **EM**, the size of exclusion zone label.

20.2 Monitoring Watch Region Alerts

Alerts can be monitored visually on the map view and the Alert list window.

20.2.1 Map View

For any given Watch Group, when a Dynamic Object either enters or leaves a Watch Region watch region, depending on the Alarm Mode setting an alert is triggered. When this is triggered, the graphics for the region on the map view (see Figure 20-20) will change to match the settings in Triggered Graphics (see Figure 20-19).

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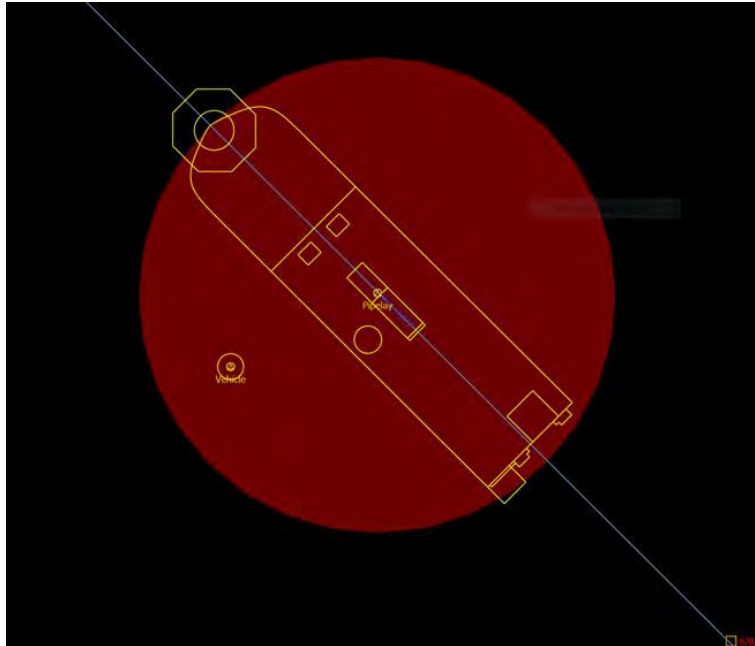
FIGURE 20-20 ALERT TRIGGERED – MAP VIEW

20.2.2 Alert List Window:

The alert list window (see Figure 19-26) is accessed from the View ribbon, Windows section (see Figure 19-25). If this window is not open when an Alert is triggered, it will automatically open.
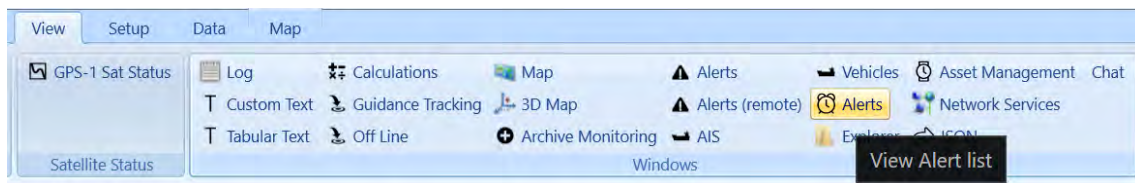
FIGURE 20-21 ALERT LIST – VIEW RIBBON

FIGURE 20-22 ALERT LIST WINDOW

The Alerts table columns are as follows:

- **Type:** The type of alert icon (error, warning or information)
- **Time:** Time the event occurred

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- **Event:** Message text of the event
- **Time Cleared:** Time Cleared, or '--' if it has not been cleared yet
- **Time Acknowledged:** Time Acknowledged, or '--' if it has not been acknowledged yet
- **State:** Indicates if the alert is cleared, acknowledged or still active
- **Module:** The alert list can handle alerts and information from other NavView modules, so the source of the alert is shown here
- **Top Buttons:** The buttons at the top of the alert window allow the user to filter what is displayed in the list, whether that be only errors, both errors and warnings, for information. It is also possible to filter out acknowledged items so only the most important information is shown

Note: Alerts/Alarms triggered are published to all stations on the network when triggered and not exclusive to a single station.

20.2.3 Alert List Configuration

The [wrench icon] button is used to open the alert list configuration dialog. The alert list configuration view controls the display of popup messages, as well as sound (see Figure 19-27)

FIGURE 20-23 ALERT LIST - CONFIGURE ALERT DISPLAY DIALOG

3. **Play Sound:** The sound options include a variety of sounds to choose from for when an alert occurs. The alerts sounds in NavView use Windows system sounds, which allows it to leverage some added accessibility features in Windows 10.

   For added notification in case the system sound is turned off or speakers are unavailable, Windows 10 has a feature in system settings called 'Show visual alerts for audio notifications' which can be found by searching via the Start Menu (see Figure 19-28 and Figure 19-29).
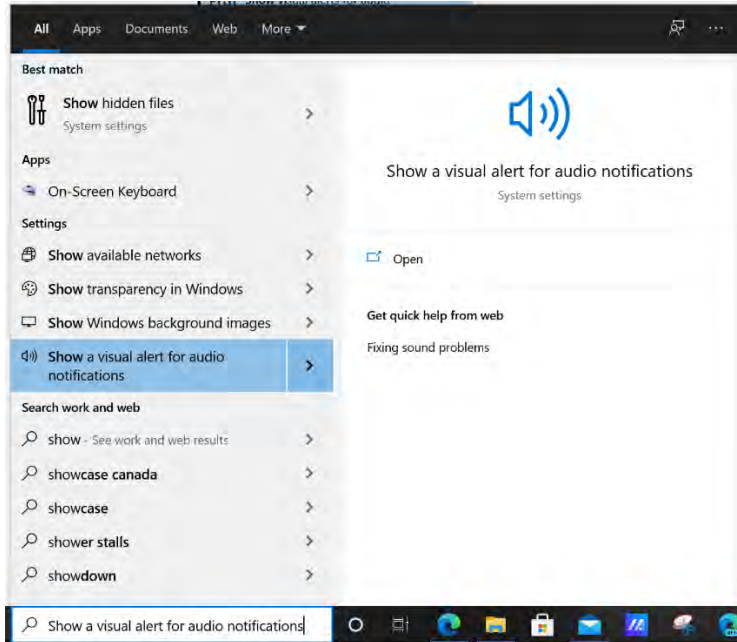
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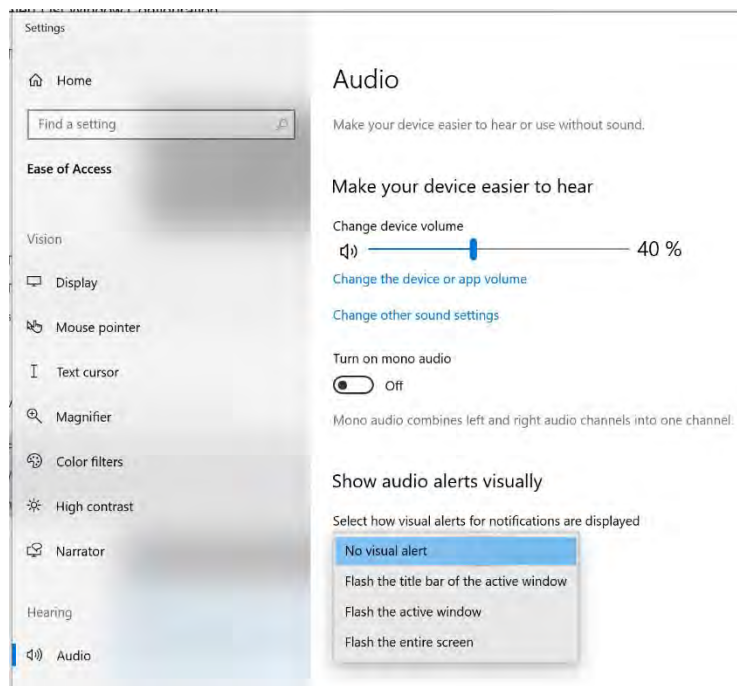**FIGURE 20-24 SHOW VISUAL ALERTS - WINDOWS 10**

FIGURE 20-25 SHOW VISUAL ALERTS – CONFIGURATION - WINDOWS 10

4. **Show message box:** If the On error, On warning and/or On message checkboxes in the settings dialog are checked, a popup message will appear on screen whenever an alert occurs. This will pop up in the middle of the screen in front of all other windows but is non-modal, meaning it still allows the user to interact with NavView before clicking the OK button (see Figure 19-30)
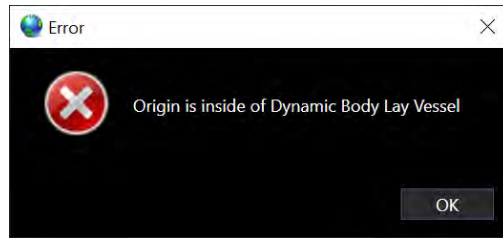
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FIGURE 20-26 ALERT POPUP WINDOW

20.2.4 Acknowledging Alerts

When an alert is currently active, meaning it has not yet been cleared, it will continue to flash and create sound if those options are enabled. The user can acknowledge the alert, which will silence the flashing and sound, but the alert will remain in the 'triggered' graphics state on screen and remain in the alert list window until it is cleared.

Alerts can be acknowledged by clicking on the checkmark button in the alert list table, or by right clicking on the alert, and selecting acknowledge from the context menu (see Figure 19-31)
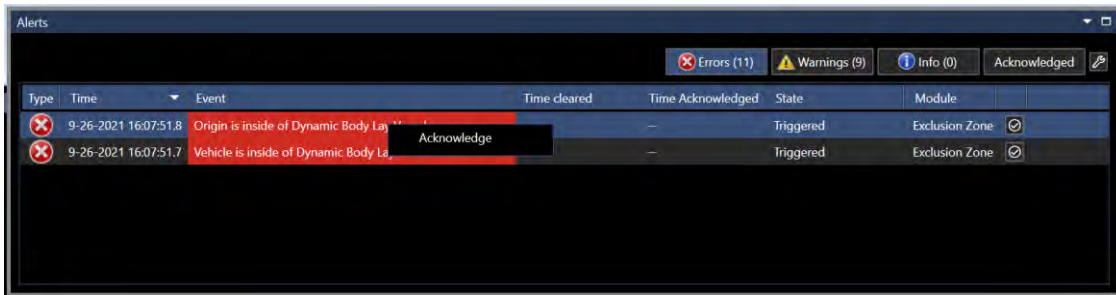
FIGURE 20-27 ALERT ACKNOWLEDGE - CONTEXT MENU

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21 Alerts

The Alerts feature enables a user to create multiple Alerts Groups, each consisting of cascading conditional tests of data against tolerances and if any of the tests fail an alert is generated. This is a very flexible tool and can be used to monitor any published observation. For example, an alert can be setup to warn if a vehicle heading deviates from a required heading.

Alerts configured and triggered on one instance of NavView are published to other NavView clients, licensed and licensed, connected to the same network services.

If Roles and Privileges are enabled, the user must be logged in as Online, Supervisor or Administrator to manage the Alerts.

21.1 Managing Alerts

Alerts are managed from the Alert Service Configuration window (see Figure 21-2). This is accessed from the Setup ribbon by clicking on Alerts in the Configure section (see Figure 6-1).
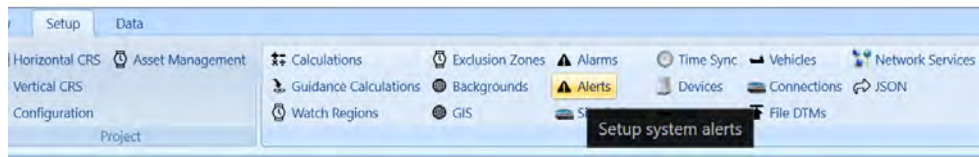
FIGURE 21-1 SETUP RIBBON - ALERTS

21.1.1 Add/Remove an Alert Group

An Alert Group is added from the Alert service configuration window (see Figure 21-2) .
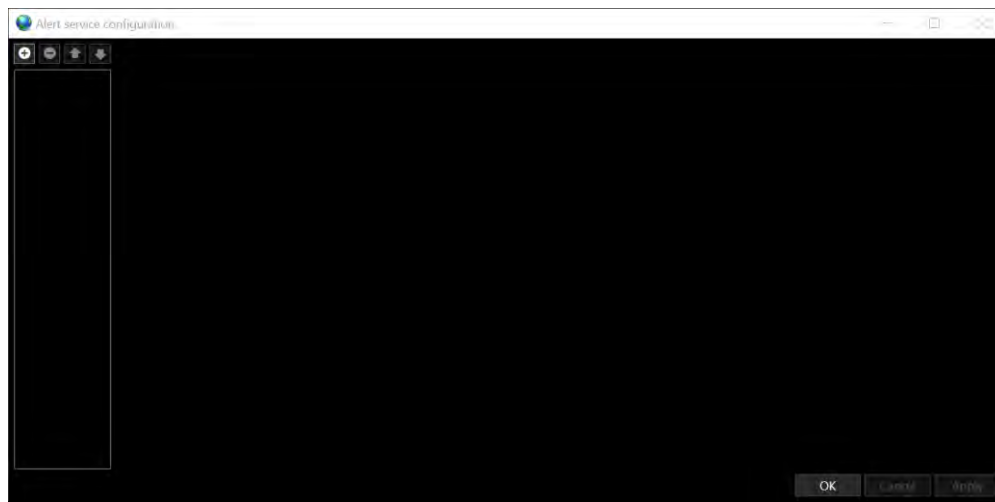
FIGURE 21-2 ALERT SERVICE CONFIGURATION WINDOW

4. Access the Alert service configuration window

5. Click ⊕ to create an Alert Group. This is where individual alerts are grouped together (see Figure 21-3)

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FIGURE 21-3 ALERT CONFIGURATION - GROUP ADDED

    a. **Name:** Assign a name to the group

6. Click [icon] to remove the selected Alert Group

21.1.2 Configure Alerts in a Group

Each Alert is comprised of one or more Conditions in a list. The Conditions are tested in the order they are listed and as soon as one fails, testing stops and an alert is triggered. The test logic is as follows

Condition 1: WHEN [Observation] [Threshold] [Threshold Logic]

Condition 2: [Logic] [Observation] [Threshold] [Threshold Logic]

Condition n: [Logic] [Observation] [Threshold] [Threshold Logic]

Where:

- Logic options are AND and OR
- Observation is configured by selecting a data source and then one of the properties of that source and the units to use
- Threshold options are IS ABOVE, IS BELOW, IS BETWEEN RANGE and IS OUTSIDE RANGE
- Threshold Logic are the values to test the observation/threshold against

1. To add an alert to the group, click [icon] under Alerts (see Figure 21-4)

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FIGURE 21-4 ADD INDIVIDUAL ALERT

2. **Name:** Assign a name to the alert
3. Configure the alert conditions (see Figure 21-5)

Note: When an Alert is added, the initial Condition is automatically added with the Logic selection set to WHEN. The first Condition Logic is always WHEN. If the order of Conditions is changed, the Logic is also changed such that the first Condition is set to WHEN and the one that was moved down is changed to AND.
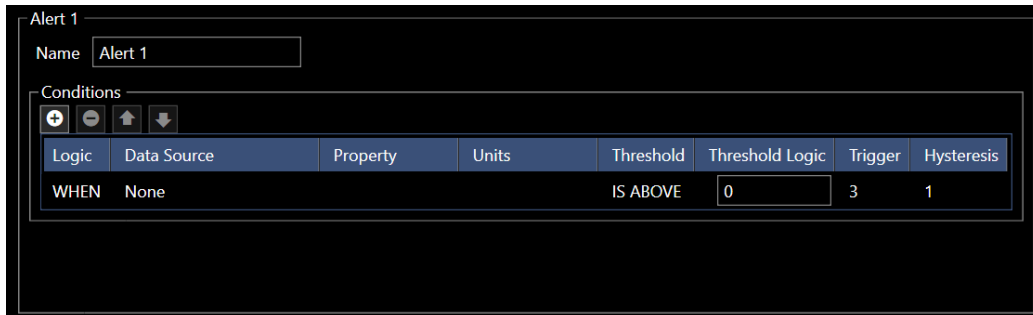

FIGURE 21-5 ALERT - CONDITIONS CONFIGURATION

a. **Logic:** WHEN is the only option available for the first Condition in a list. Subsequent Condition Logic options are AND and OR.
b. **Data Source:** Select Click in the respective cell to open the available data sources from the drop-down (see Figure 21-6)

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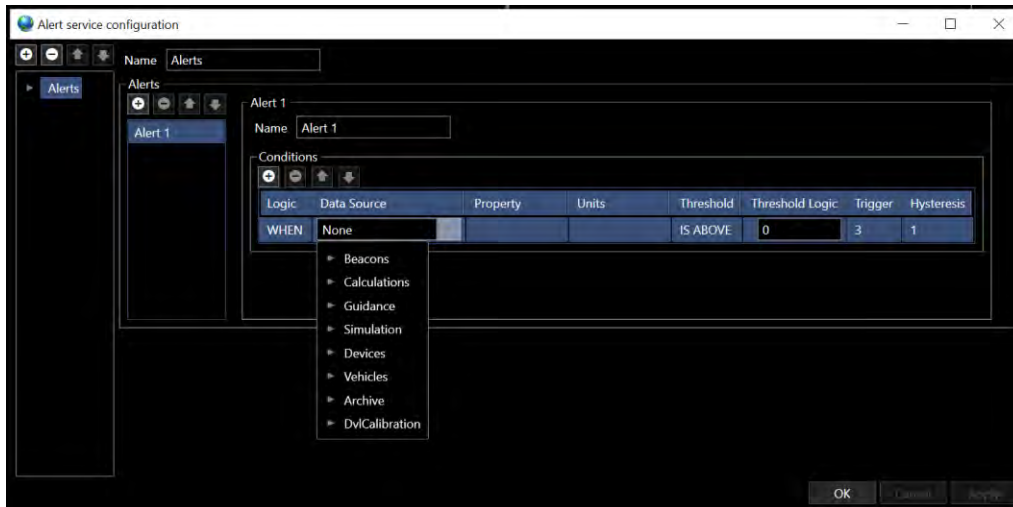
FIGURE 21-6 ALERT - DATA SOURCE SELECTION

c. **Property:** Depending on what data source was selected, the available properties can be found by clicking in the property box (see Figure 21-7)
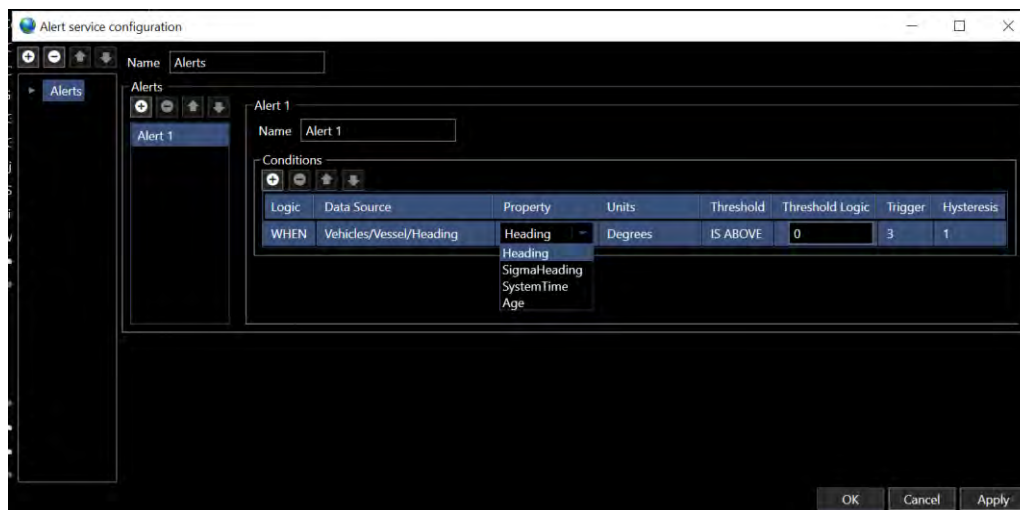
FIGURE 21-7 ALERT – PROPERTY SELECTION

d. **Units:** From the drop-down, select the units associated with the selected data source property to use for the test (see Figure 21-8)
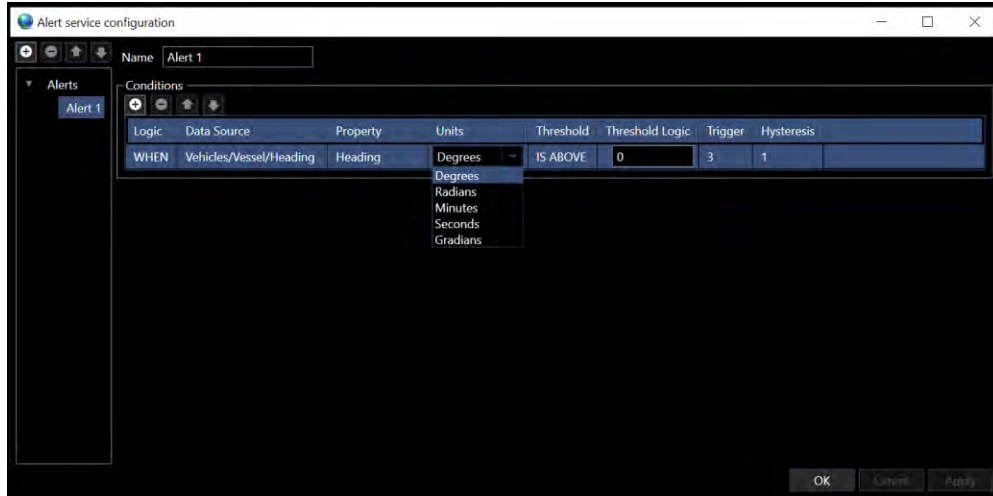
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e. **Threshold:** From the drop-down, select one of the following as a condition for the alert (see Figure 21-9)
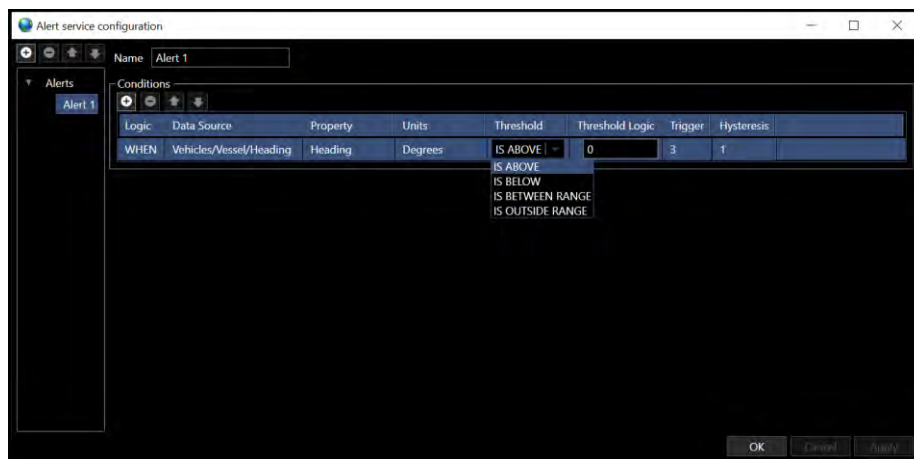
f. **Threshold Logic:** Enter value for Threshold condition to trigger alarm

g. **Trigger:** The number of times the condition needs to evaluate to true before triggering an alert. The lower the number the quicker the alert will respond, the higher the number the less responsive. The condition is evaluated every 5 seconds. The default is 3.

h. **Hysteresis:** The required change from the threshold limit(s) before resetting alert, clearing alert. For example, if the condition if the heading IS ABOVE 45 and an alert has been triggered by the heading going to 47, the alert won't reset and clear until the heading has gone below 44, 45 – 1. The default is 1.

i. If another Condition is to be added, click the ⊕ button in the Condition panel and repeat steps a to i until all Conditions for this Alert have been added

4. Repeat steps 1 to 3 until all Alerts to be added to the Group are added and configured

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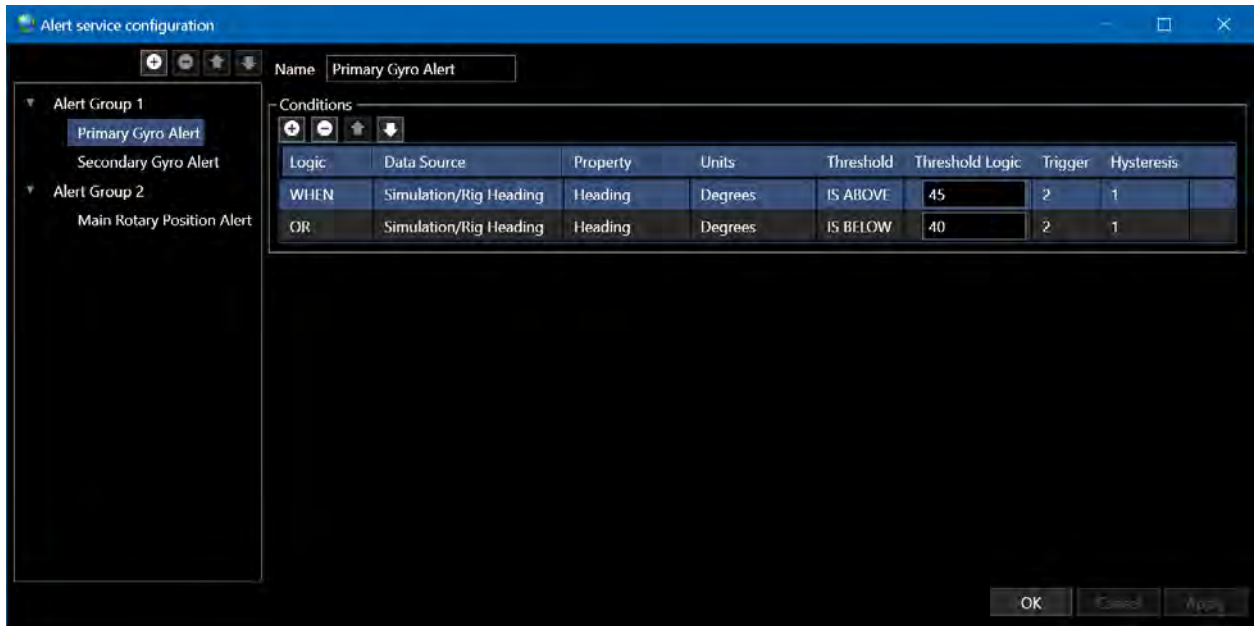
FIGURE 21-10 CONFIGURED ALERTS SERVICE

To remove an Alert or a Condition, select the Alert or Condition to remove and click the respective ⊖ button.

To reorder Conditions, select the Condition and click the ⬆ or ⬇ button.

Note: Alerts in a group can be reordered, as can Alert Groups, but the order of these does not impact application.

21.2   Monitoring Alerts

Alerts can be monitored on the NavView instance where they are configured and triggered (locally) and on any other NavView instance connected to the same network services (remotely).

21.2.1 Monitoring Alerts Locally

Local Alerts are monitored from the Alerts Service window. This is accessed from the View ribbon by clicking on Alerts in the Windows section (see Figure 21-11).
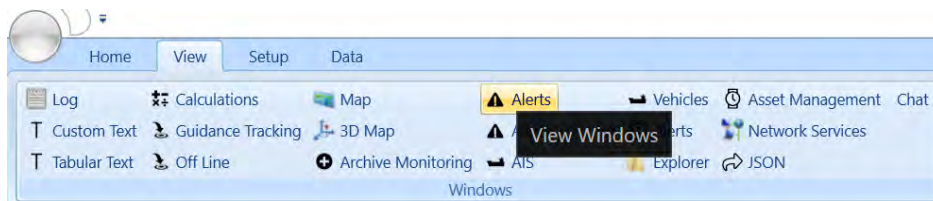
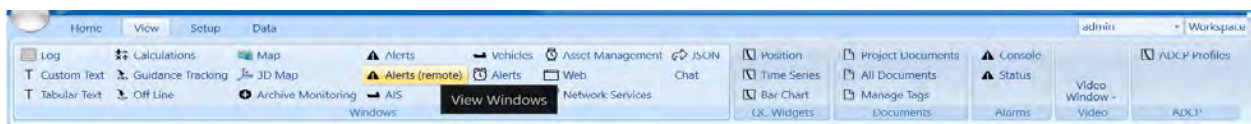FIGURE 21-11 VIEW RIBBON – WINDOWS

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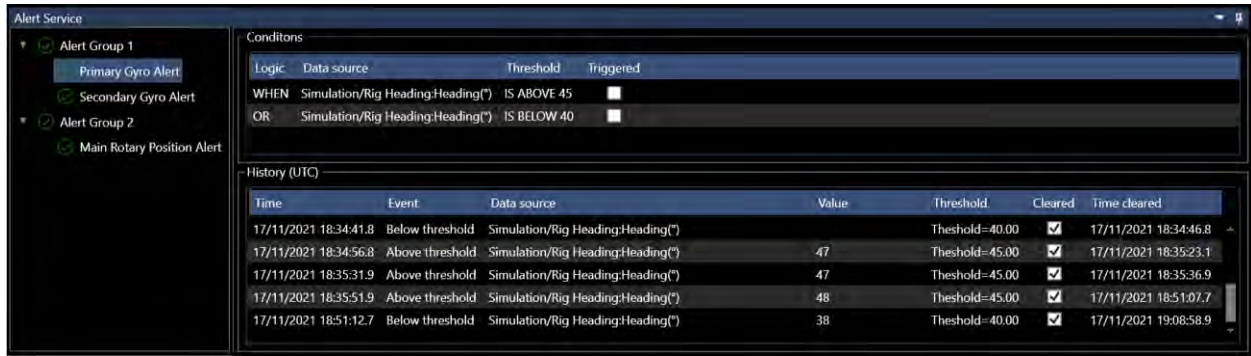
FIGURE 21-12 ALERT SERVICE VIEW WINDOW – ALL ALERTS CLEARED

FIGURE 21-13 ALERT SERVICE VIEW WINDOW –CONDITION TRIGGERED

The Alert Service View window lists all configured alerts and the individual alert condition status. There is also a panel with a rolling history of alert conditions. Figure 21-12 shows an alert not triggered. Figure 21-13 shows an alert triggered.

Note: When an Alert is triggered it is published to all stations on the network. It is not exclusive to a specific station.

Note: Alerts cannot be acknowledged.

21.2.2 Monitoring Alerts – Remotely

Remote Alerts are monitored from the Remote Alerts window. This is accessed from the View ribbon by clicking on Alerts (remote) in the Windows section (see Figure 21-14).

FIGURE 21-14 VIEW RIBBON - ALERTS (REMOTE)

The Remote Alerts window displays the source of the alerts in a tab at the top level of the window with the overall status of the alerts. In Figure 21-15, the source is the station Blackford Dolphin and the alert status is active as indicated by the ⊗ icon. In Figure 21-16 the alert status is all cleared as indicated by the ⊘ icon.

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In the Active tab, all currently triggered and active alerts are listed. If any alerts are active, this is shown in the tab by the ⊗ icon (see Figure 21-15). If there are no active alerts, i.e. all alerts have cleared, the this is indicated by the ✓ icon (see Figure 21-16).

In the Cleared tab, all alerts that have triggered since this instance of NavView was launched and susequently cleared are listed.

FIGURE 21-15 REMOTE ALERT SERVICE WINDOW - ACTIVE TAB

FIGURE 21-16 REMOTE ALERTS SERVICE WINDOW - CLEARED TAB

22 JSON Exchange

22.1 Overview

Shared JSON is an output from NavView that sends vehicle position updates to a cloud-based service for integration into third-party applications requiring real-time updates. The data is published in JSON format for ease of integration.

The cloud-based service is configured and managed by 4D Nav. For more information, please contact 4D Nav support.

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22.2 Published Data

The data is published in JSON format and includes the following fields.

Field	Data Type	Description
Id	string	Unique vessel Id in group
Timestamp	double	Posix timestamp in seconds from Jan 1, 1970
Easting	double	Vehicle easting in the working CRS
Northing	double	Vehicle northing in the working CRS
Elevation	double	Vehicle northing in the working CRS
Heading	double	Vehicle heading in degrees
Pitch	double	Vehicle pitch in degrees
Roll	double	Vehicle roll in degrees

TABLE 22-1 JSON PUBLISHED VEHICLE DATA

22.3 Configuring JSON

The configuration is accessed from the Setup ribbon.
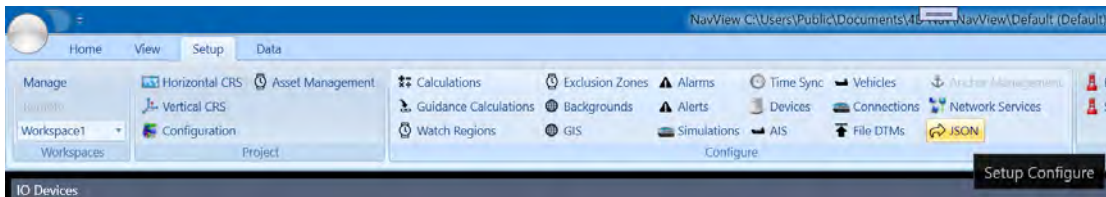
FIGURE 22-1 JSON - SETUP RIBBON
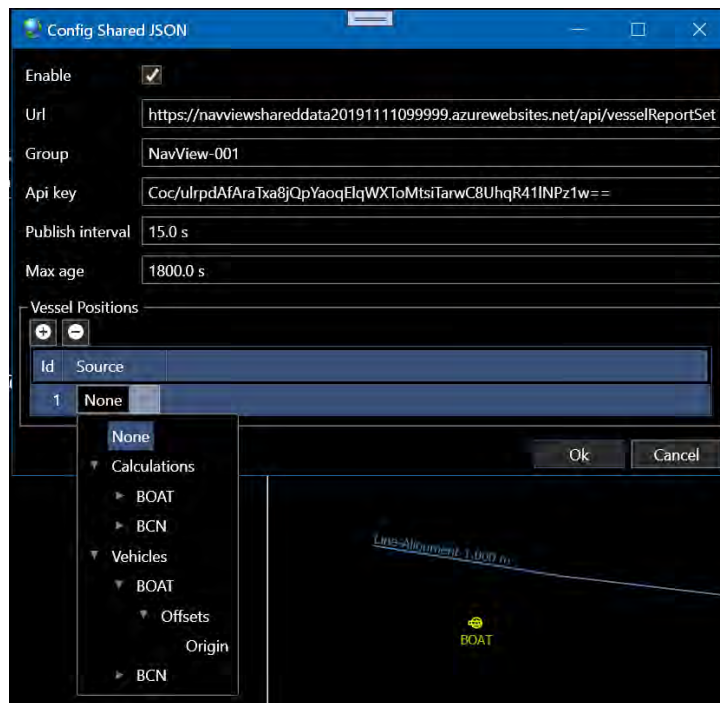
FIGURE 22-2 JSON CONFIGURATION DIALOG

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Urlb The publishing URL provided by 4D Nav.

Group: The group identifier used to uniquely identify this set of published data. This value must be unique when publishing data from multiple NavView systems.

Api Key: API key supplied by 4D Nav. This is required to publish data to the cloud-based service.

Publish interval: The interval between publishing events. Data is published to the service on this interval.

Max age: The maximum age of the individua vehicle positions. If the vehicle position is greater than this value, it is not published to the cloud-based service.

Vessel Positions: Use the + and – button to configure which vessels are published to the cloud-based service.

Id: Each selected vessel must have a unique Id which is used to uniquely identify the vessel in each group.

Source: Select from the NavView list of available body state providers, e.g. Calculations and Vehicles.

The following is an example of vehicle data in JSON format.

[{"Id":"WA","Timestamp":1597489078.345,"Easting":2515157.053,"Northing":9862735.187,"Elevation":0,"Pitch":0,"Roll":0,"Heading":180},{"Id":"UHD69","Timestamp":1597489078.43,"Easting":2515171.129,"Northing":9862787.026,"Elevation":-4905.84,"Pitch":0,"Roll":0,"Heading":200},{"Id":"UHD68","Timestamp":1597489078.386,"Easting":2515009.678,"Northing":9862930.898,"Elevation":-4779.528,"Pitch":0,"Roll":0,"Heading":172}]

22.4 Monitoring JSON

The monitoring view for this operation is accessed from the View Ribbon (see Figure 22-3). The resulting window displays the timestamp of the data published, what was published and what the target application replied with.
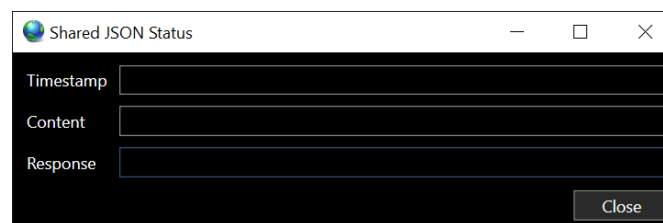

FIGURE 22-3 JSON - VIEW RIBBON

FIGURE 22-4 JSON WINDOW

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23 Network Services

This section provides an overview of NavView's Network Services configuration and monitoring

23.1 Overview

NavView can be operated as part of a network where multiple NavView clients run as standalone positioning and navigation and/or remote monitoring systems. Communications between these are handled by NavView Network Services over a Local Area Network (LAN), or a Wide Area Network (WAN). Each NavView client updates the data under its control, e.g., vehicle configuration and positions, and receives data provided by other clients for display and monitoring. Configurations are stored in a database and accessed by connected clients. Transient real-time data such as vehicle positions are published to connected subscribers.

Network Services are required for installations where multiple NavView clients on a network will need to share data, e.g. one with an online master NavView, ROV NavView, DP desk NavView, etc.

23.2 Software

Network Services require the following 3rd party software to be installed, they are not installed with the base package.

- MongoDB
    - Supports NavView Network Services (configurations, files, etc.)
    - Required if NavView remote clients are to be used
- Redis
    - Supports NavView Network Services (transient real-time data)
    - Required if NavView remote clients are to be used

MongoDB and Redis are two separate software packages. When installed, they create services that are automatically started when Windows launches. These can be downloaded directly from the respective web sites. Alternatively, contact 4D Nav for an installation package.

Note: MongoDB and Redis are only to be installed on the computer being used as the *server* for the NavView network. Refer to the NavView Introduction section for the details regarding the installation and configuring of MongoDB and Redis.

23.3 Configuring Network Services (Network Server)

The network server would typically reside in the online PC. Configuration of the Network Services on the online PC is as follows

1. Select **Network Services** from the Configure section of the Setup ribbon, this opens the Configure Network Services window (see Figure 23-2)

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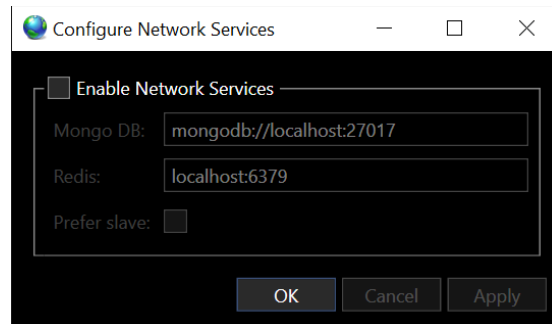**FIGURE 23-1 NETWORK SERVICES - SETUP RIBBON**

FIGURE 23-2 CONFIGURE NETWORK SERVICES WINDOW

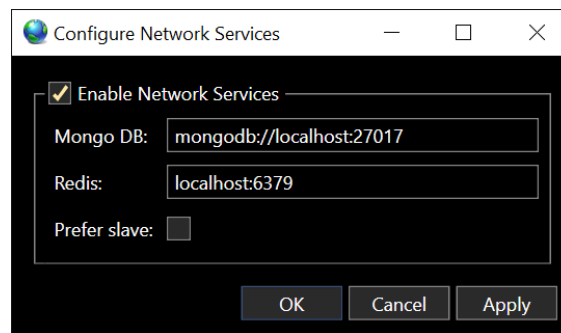2. Enable Network Services by checking the box

FIGURE 23-3 NETWORK SERVICES ENABLED

- **Mongo DB:** Displays the default server location (localhost) and default port number (27017) assigned during installation. Leave as default, refer to *Introduction* section for MongoDB installation and configuration

- **Redis:** Displays the default server location (localhost) and default port number (6379) assigned during installation. Leave as default, refer to *Introduction* section for Redis installation and configuration

3. Click **Okay** to start NavView Network Services

23.4 Configuring Network Services (Remotes)
Configuration of Network Services on the NavView remotes is as follows

1. Select **Network Services** from the Configure section of the Setup ribbon, this opens the Configure Network Services window (see Figure 23-2)
2. Enable Network Services by checking the box (see Figure 23-3)

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- **Mongo DB:** Replace *localhost* with the IP address of the network server PC (Online). Leave port number as 27017

- **Redis:** Replace *localhost* with the IP address of the network server PC (Online). Leave port number as 6379
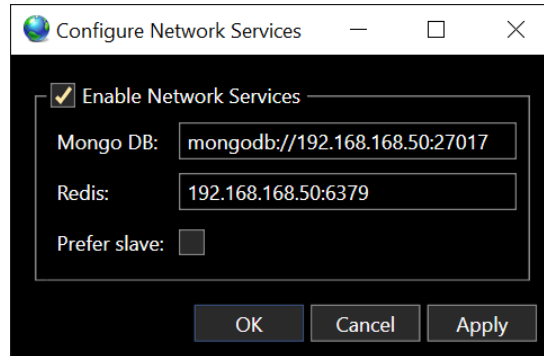

FIGURE 23-4 NETWORK SERVICES CONFIGURATION – REMOTE EXAMPLE

3. Click **Okay** to connect to the NavView Network Services and close the dialog or **Apply** to connect and leave the dialog open

23.5 Monitoring Network Services

The Network Services status can be viewed and configured on the server PC (online) and on the Remotes, access is the same for both. The information displayed is the same on both with the exception that the server PC shows transient real-time data being published and on the Remote shows transient real-time data being subscribed.

1. Select **Network Services** from the Windows section of the View ribbon, this opens the Web Network Services window (see Figure 23-6)
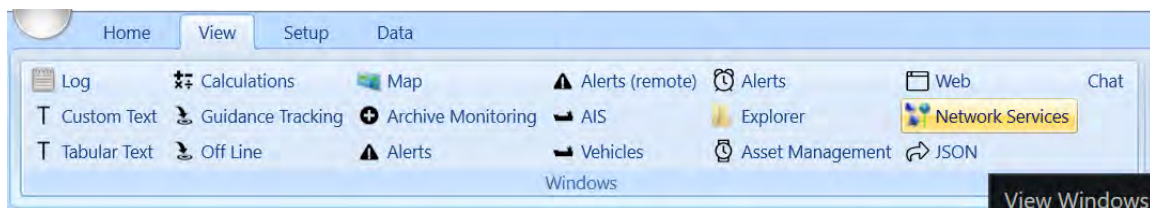
FIGURE 23-5 NETWORK SERVICES – VIEW RIBBON
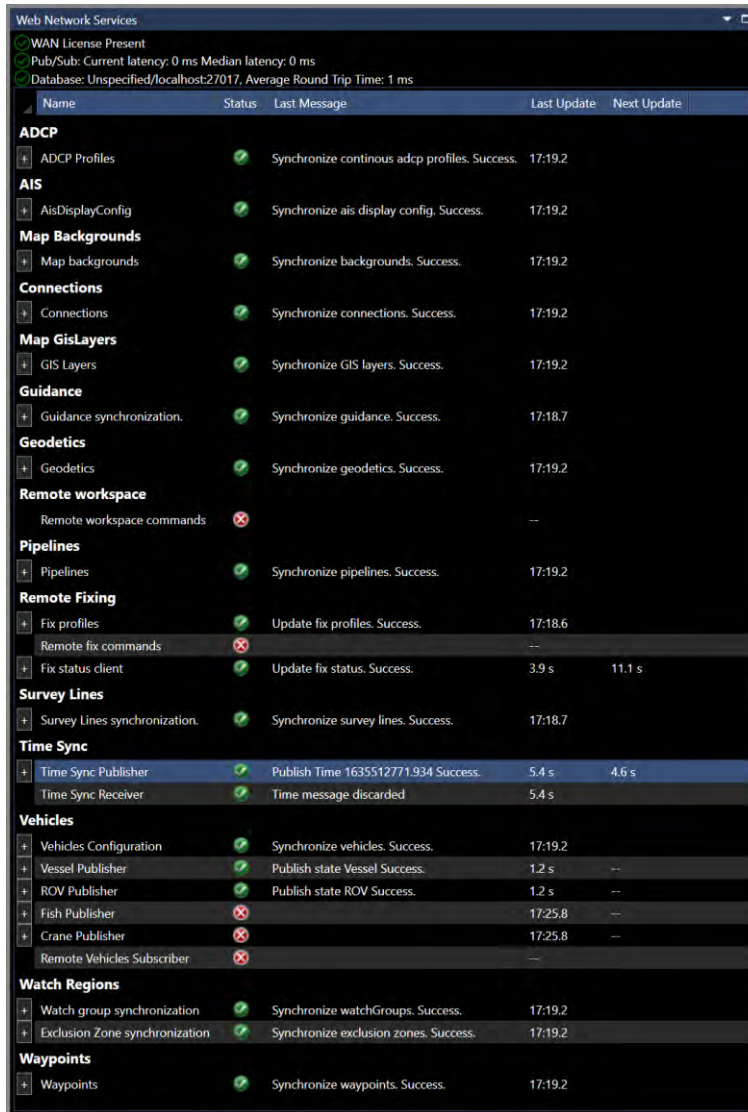
FIGURE 23-6 WEB NETWORK SERVICES WINDOW - ONLINE NAVVIEW

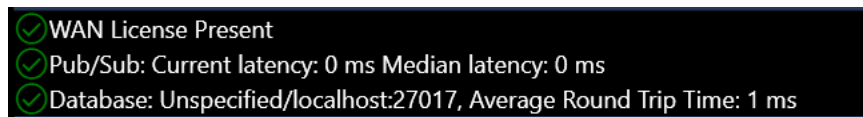The Web Network Services window contains at the top the network status.

FIGURE 23-7 NETWORK STATUS

- **WAN License Present:** If Network Services detects a WAN license, a is displayed. WAN is typically used for Remote NavView access using the internet or satellite (VSAT).

- **Pub/Sub:** If Network Services detects a connection to Redis, a is displayed and the connection latency is displayed.

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- **Database:** If Network Services detects a connection to MongoDB, a ✅ is displayed and the connection latency is displayed.

The window displays the NavView modules that are accessed in Network Services in a grid format.

- **Name:** Module name

- **Status:** ✅ displayed for a successful connection to the database

- **Last Message:** Displays last status message

- **Last Update:** Displays the elapsed time since last update to/from the database

- **Next Update:** Displays the time remaining for next update to/from database

Each module can be expanded by clicking on the ⊞ expand button below the module name to open Update Options and Retry Options.
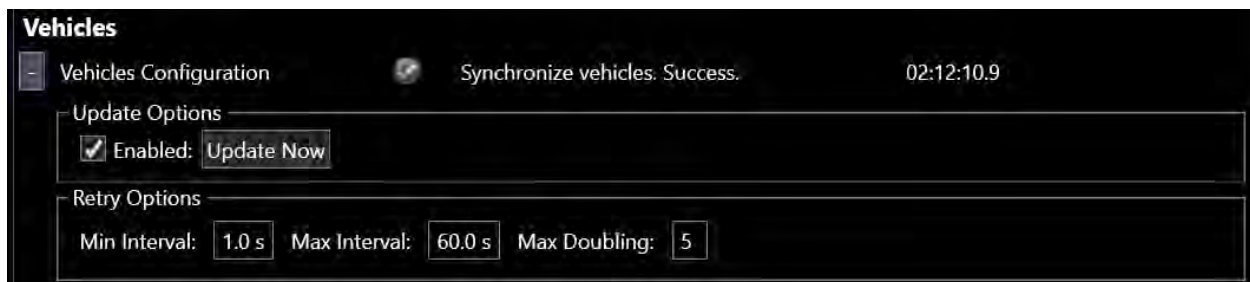

FIGURE 23-8 TYPICAL UPDATE/RETRY OPTIONS

- **Update Options:**
  a. To enable update for a module, check the **Enabled** box. Whenever a change is made to the module, update will be automatic. This will be reflected in the **Last Update** column and the elapsed time will reset to 0:00:00

  b. An update can be forced by clicking the **Update Now** button

- **Retry Options:** If network Services loses a sync to the database, a retry will commence using the settings below
  a. **Min Interval:** The time in seconds to start the retry connection

  b. **Max Interval:** The maximum time in seconds to attempt connection

  c. **Max Doubling:** The connection retry commences using the minimum interval set then doubles at each retry using the value set here, i.e., 1,2,4,8,16 (seconds) or until it reaches the maximum interval setting

Network Services on the server PC (Online) publishes transient real-time data that remotes can access (subscribe) to, see Figure 23-9.

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FIGURE 23-9 NETWORK SERVICES - TRANSIENT DATA PUBLISHER

To configure the publisher update settings, click the ⊞ expand button to open the update configuration, see Figure 23-10

FIGURE 23-10 PUBLISHER CONFIGURATION - SERVER PC

1. Check the **Enabled** box to publish real-time data to be used by the remotes

2. Updates will be published at the **Update Interval** value entered

3. Clicking **Update Now** forces an update

Network Services on the remotes subscribes to data that is published by the server PC, see Figure 23-11

FIGURE 23-11 SUBSCRIBER CONFIGURATION - REMOTE PC

The **Remote Vehicles Subscriber** display the published vehicle being received by the remote

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