NavView User Guide – Utilities

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01	A	Initial release	SW	GAW	GAW	November 05, 2024

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1 INTRODUCTION

NavView **Utilities** is located in the **Home** ribbon and provides the user with the following functions.

- Transforms
- Range/Bearing
- Spatial Range/Bearing
- Intercept
- Rotate Pitch/Roll
- Offset Utility
- Geodetic Calculator
- Geodetic File Conversion
- Route Calculator
- Cut to Length
- Pressure/Depth

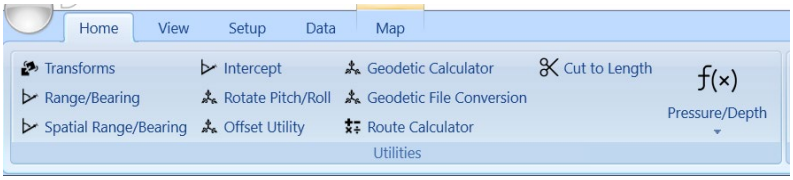


FIGURE 1 HOME RIBBON – UTILITIES

2 UTILITY FUNCTIONS

Each utility function will be detailed in the following sections.

2.1 TRANSFORMS

This utility is used to perform datum transformation and geographic/projected coordinate conversions.

Select **Transforms** from the **Utilities** section of the **Home** ribbon to open the Conversions and Transforms dialog.

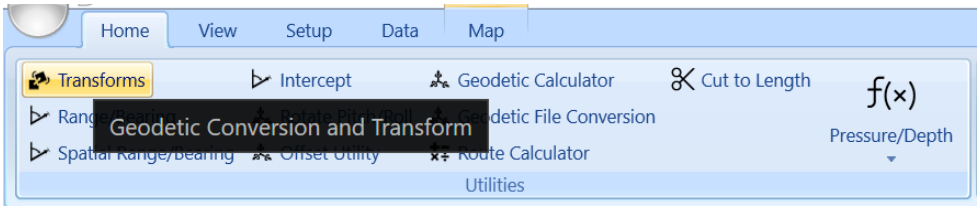


FIGURE 2 TRANSFORMS – UTILITIES

Note: The working CRS geodetics is used for the conversion and transform calculation.

1. **Conversion Tab**

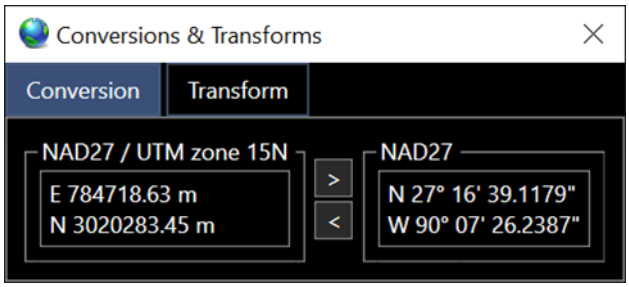


FIGURE 3 CONVERSIONS & TRANSFORMS DIALOG

a. In left panel enter grid coordinates
b. Click > button to convert to geographic coordinates, shown in right panel
   Or
c. In right panel enter geographic coordinates
d. Click < button to convert to grid coordinates, shown in left panel

2. **Transform Tab**

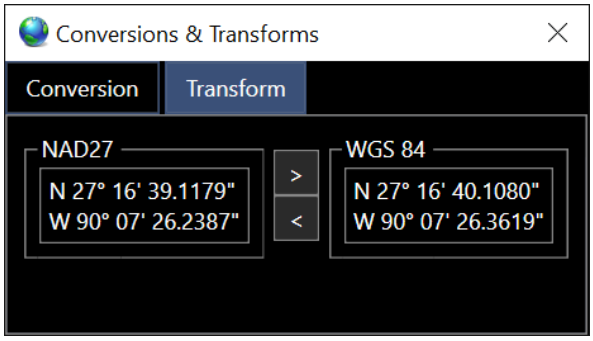


FIGURE 4 CONVERSIONS & TRANSFORMS DIALOG - TRANSFORM TAB

a. In left panel enter working CRS geographic coordinates
b. Click > button to convert to WGS 84 geographic coordinates, shown in right panel
   Or
c. In right panel enter WGS 84 geographic coordinates
d. Click < button to convert to working CRS geographic coordinates, shown in left panel

2.2 RANGE/BEARING

This utility is used to perform geographic/grid direct and inverse calculations.

Note: The working CRS is used in the direct and inverse calculation.

Select **Range/Bearing** from the **Utilities** section of the **Home** ribbon to open the Direct/Inverse dialog.

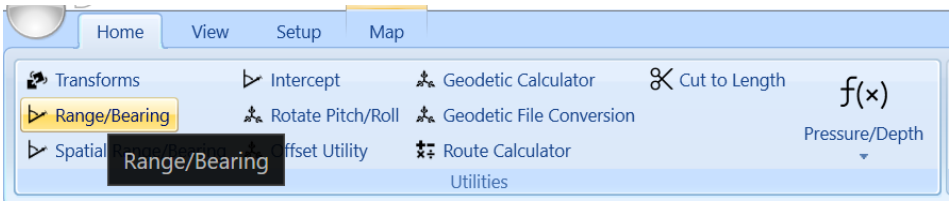


FIGURE 5 RANGE/BEARING – UTILITIES

1. **Direct Tab** calculates a coordinate using a given starting coordinate, distance and bearing.

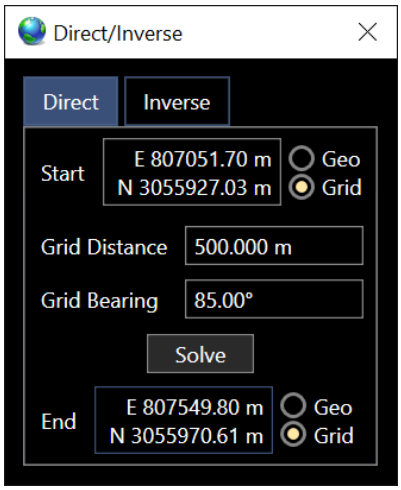


FIGURE 6 DIRECT/INVERSE DIALOG - DIRECT TAB

a. Enter Start coordinate (Geo/Grid)
b. Enter Distance, grid (using grid coordinate) or true (using geographic coordinate)
c. Enter Bearing, grid (using grid coordinate) or true (using geographic coordinate)
d. Click Solve to perform direct calculation
e. Solution displays the calculated coordinate (grid or geographic)

2. **Inverse Tab** calculates a range and bearing from a start to end coordinate. Solution is given in grid and geographic.

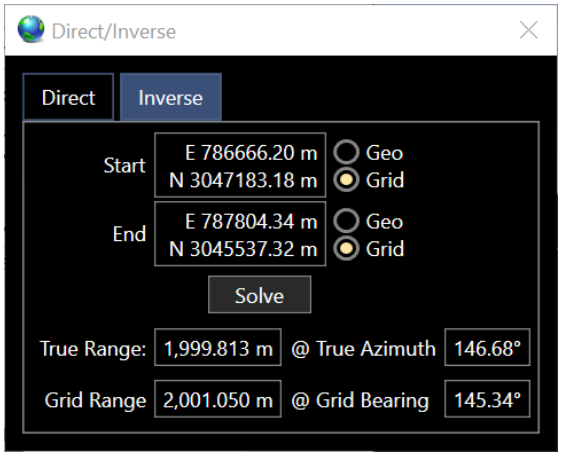


FIGURE 7 DIRECT/INVERSE DIALOG - INVERSE TAB

a. Enter Start coordinate (Geo or Grid)
b. Enter End coordinate (Geo or Grid)
c. Click Solve
d. Solution is given as true range/bearing (ellipsoid) and grid range/bearing (projection)

2.3 SPATIAL RANGE/BEARING

This utility is used to perform geographic/grid inverse calculation and project the distance to the terrain/seafloor (slope distance).

Select **Spatial Range/Bearing** from the **Utilities** section of the **Home** ribbon to open the Spatial Inverse dialog.

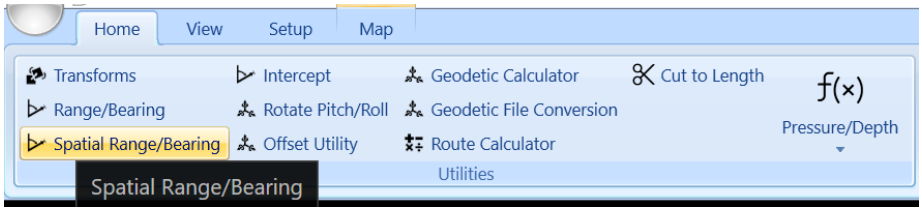


FIGURE 8 SPATIAL RANGE/BEARING – UTILITIES

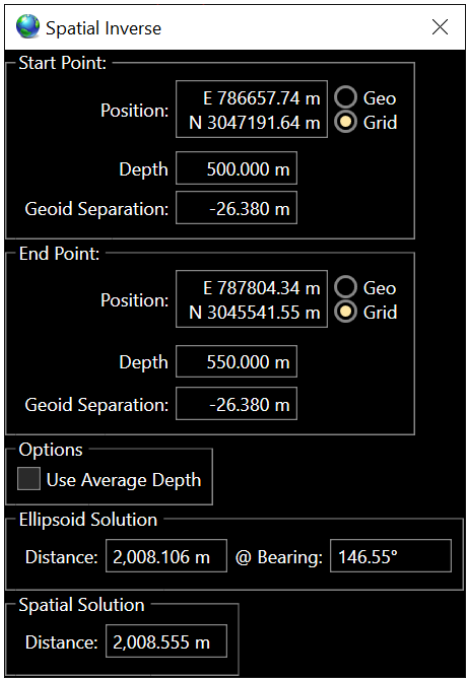


FIGURE 9 SPATIAL INVERSE DIALOG

1. **Start Point**
   a. Enter Start Point grid or geo coordinates
   b. Enter Start Point depth
   c. Enter Start Point geoid separation
2. **End Point**
   a. Enter End Point grid or geo coordinates
   b. Enter End Point depth
   c. Enter End Point geoid separation
3. **Options**

   Check the box to use the average of Start Point depth and End Point depth in the calculation.
4. **Ellipsoid Solution**

   Distance and bearing on the ellipsoid from Start Point to End Point.
5. **Spatial Solution**

   Slope distance calculated on the terrain/seabed.

2.4 INTERCEPT

Utility to calculate the intercept position, range, direction, and travel time from one dynamic vehicle to another.

Select **Intercept** from the **Utilities** section of the **Home** ribbon to open the Intercept Calculator dialog.

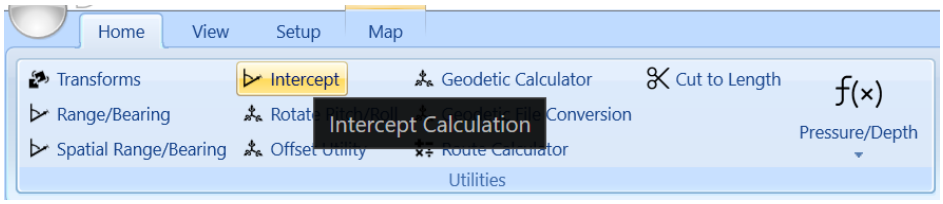


FIGURE 10 INTERCEPT – UTILITIES

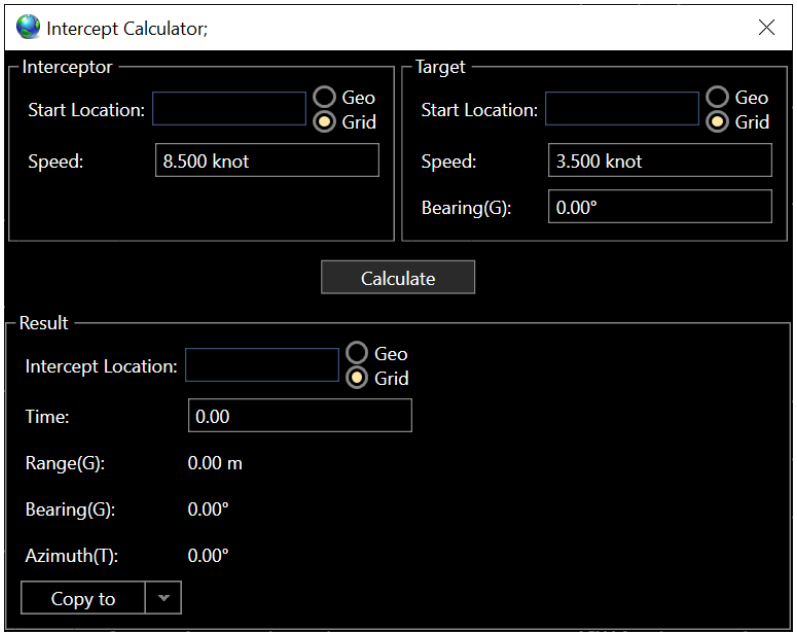


FIGURE 11 INTERCEPT CALCULATOR DIALOG

1. **Interceptor**
   a. Enter the Start Location of the vehicle to intercept the Target coordinates
   b. Enter the Speed of the Interceptor
2. **Target**
   a. Enter the Start Location the Target coordinates
   b. Enter the Speed of the Target
   c. Enter the course of the Target as a grid bearing

3. Click **Calculate** to solve for the intercept.
    - **Intercept Location:** Coordinates of point of interception
    - **Time:** Travel time to intercept location (h.hh)
    - **Range (G):** Grid distance from Interceptor start location to point of interception
    - **Bearing (G):** Grid direction from Interceptor start location to point of interception
    - **Azimuth (T):** True direction from Interceptor start location to point of interception
    - **Copy to:** The Intercept Location coordinates can be copied to either Pipe Tally or Create Waypoint

2.5 ROTATE ROLL/PITCH

Utility to rotate attitude from one heading to another.

Select **Rotate Pitch/Roll** from the **Utilities** section of the **Home** ribbon to open the Rotate Pitch/Roll dialog.

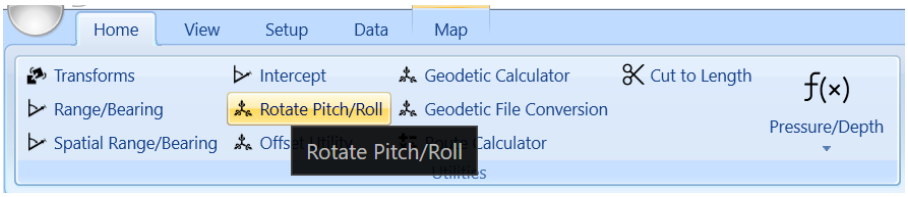


FIGURE 12 ROTATE PITCH/ROLL – UTILITIES

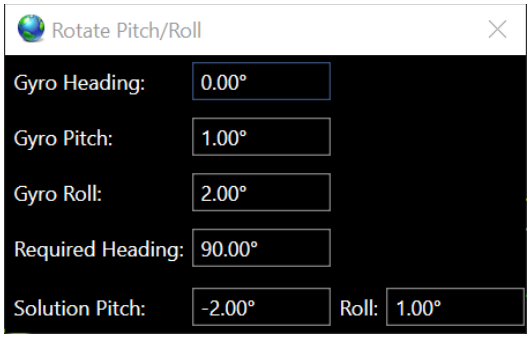


FIGURE 13 ROTATE PITCH/ROLL DIALOG

1. Enter the Gyro Heading to rotate from, ddd.dd.
2. Enter the Gyro Pitch, dd.dd.
3. Enter the Gyro Roll, dd.dd.
4. Enter the Required Heading to rotate the pitch and roll, ddd.dd

2.6 OFFSET UTILITY

Utility to calculate offset locations based on reference or remote positions.

Select **Offset Utility** from the **Utilities** section of the **Home** ribbon to open the Offset Utility dialog.

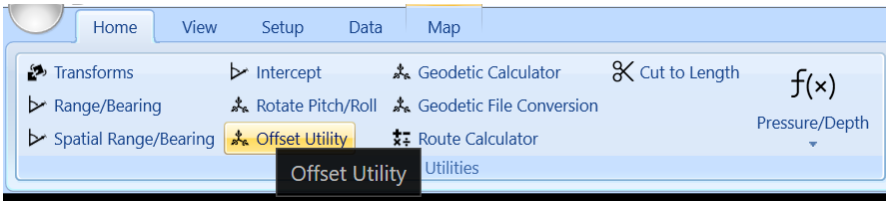


FIGURE 14 OFFSET UTILITY – UTILITIES

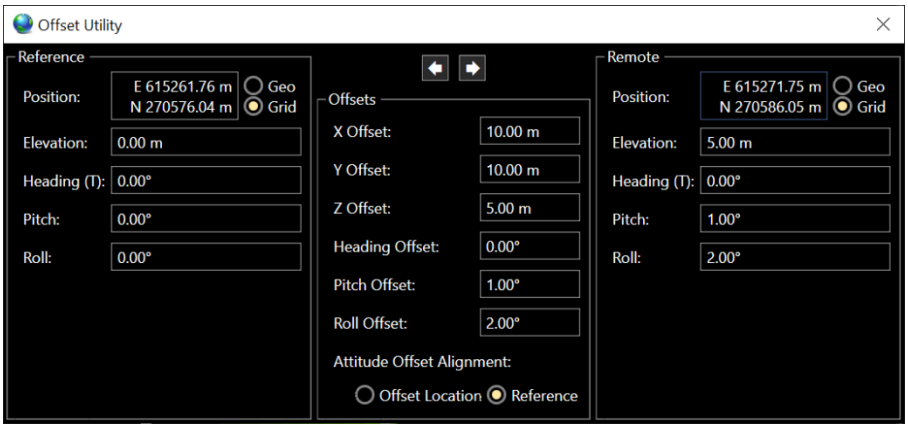


FIGURE 15 OFFSET UTILITY DIALOG

1. To calculate the **Remote** Position, Elevation, Heading, Pitch and Roll.
   a. Enter Reference coordinates in the Position box
   b. Enter Reference Elevation, if required
   c. Enter Reference Heading
   d. Enter Reference Pitch
   e. Enter Reference Roll
   f. In the Offsets panel,
      I. Enter the X,Y,Z offset from reference to remote
      II. Enter Heading Offset (rotation) at remote if not aligned to the reference heading
      III. Enter attitude offsets at remote
   g. Click  to apply offsets to the reference to calculate remote

Note: Under Attitude Offset Alignment, select if the attitude forward axis is aligned at the reference or at the remote. This determines how the attitude is calculated. See examples below.

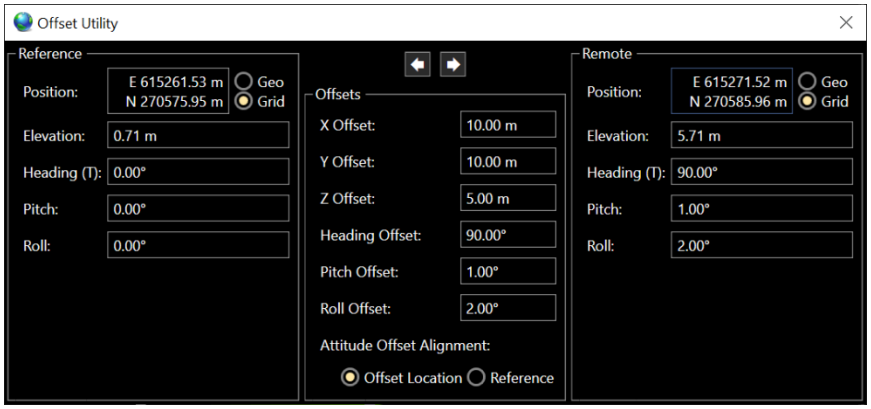


FIGURE 16 ATTITUDE ALIGNMENT – OFFSET LOCATION

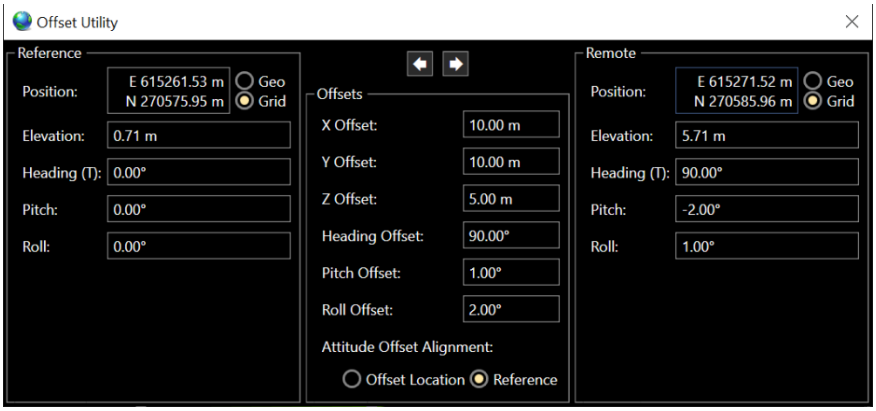


FIGURE 17 ATTITUDE ALIGNMENT – REFERENCE LOCATION

2. To calculate the **Reference** Position, Elevation, Heading, Pitch and Roll from the **Remote** use the same procedure as in step 1 above and click  button.

2.7 GEODETIC CALCULATOR

Utility to calculate geographic/grid positions from one geodetic system to another.

Select **Geodetic Calculator** from the **Utilities** section of the **Home** ribbon to open the Geodetic Calculator dialog.

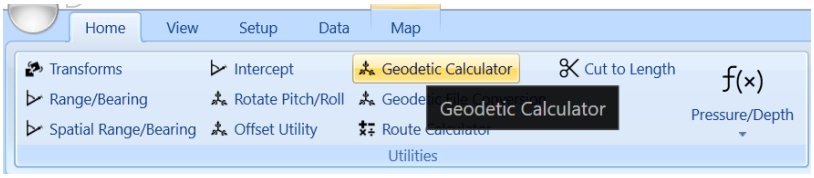


FIGURE 18 GEODETIC CALCULATOR – UTILITIES

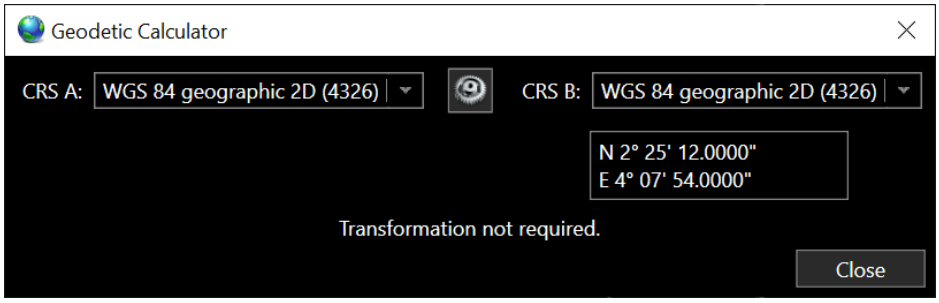


FIGURE 19 GEODETIC CALCULATOR DIALOG

1. **CRS A:** Select available Coordinate Reference System from the drop-down. To add additional CRS, click the button.
2. **CRS B:** Select available Coordinate Reference System from the drop-down. To add additional CRS, click the button.
3. Enter coordinates in the appropriate box then click the arrow to calculate.

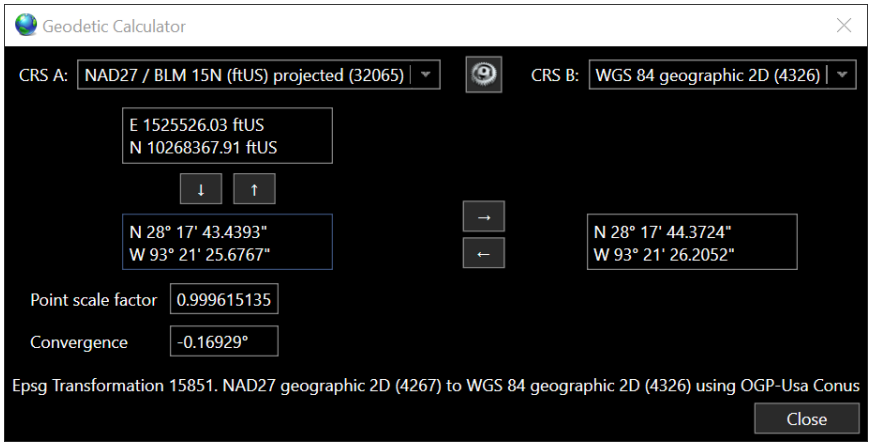


FIGURE 20 GEODETIC CALCULATOR – CALCULATION

Note: The transformation path is shown at the bottom of the dialog window.

2.8 GEODETIC FILE CONVERSION

Utility to convert a coordinate file from one geodetic system to another.

Select **Geodetic File Conversion** from the **Utilities** section of the **Home** ribbon to open the Geodetic File Conversion Utility dialog.

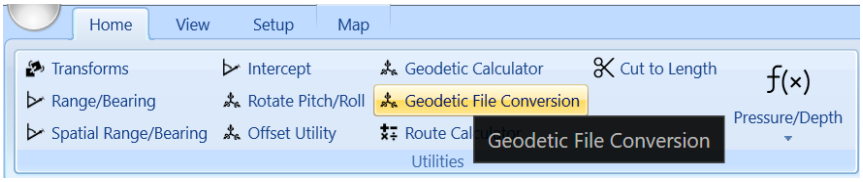


FIGURE 21 GEODETIC FILE CONVERSION – UTILITIES

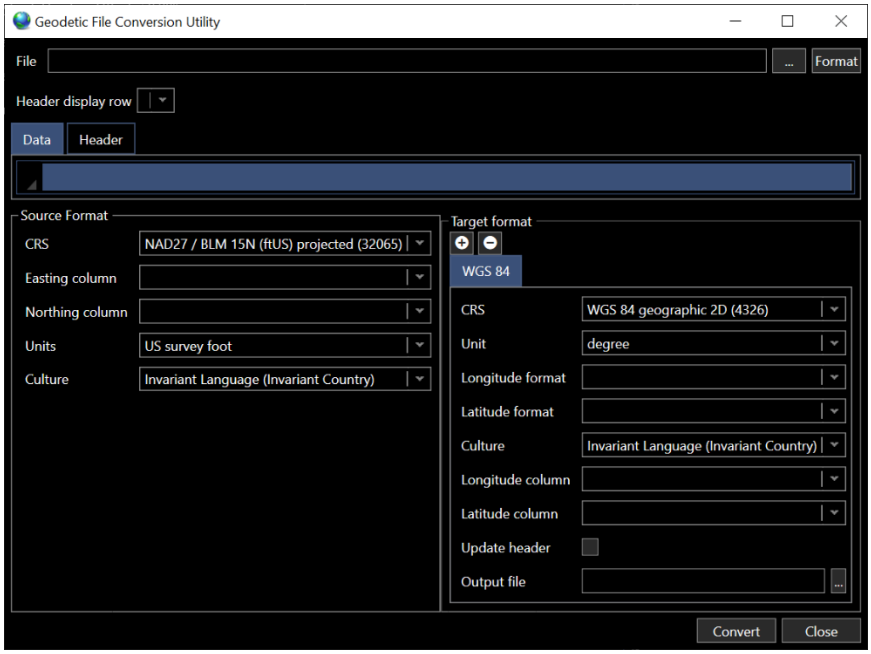


FIGURE 22 GEODETIC FILE CONVERSION DIALOG

1. Select file to convert using the browse ... button. The file path will be shown in the **File** box.
2. Click Format button to open the **Input File Format** dialog.

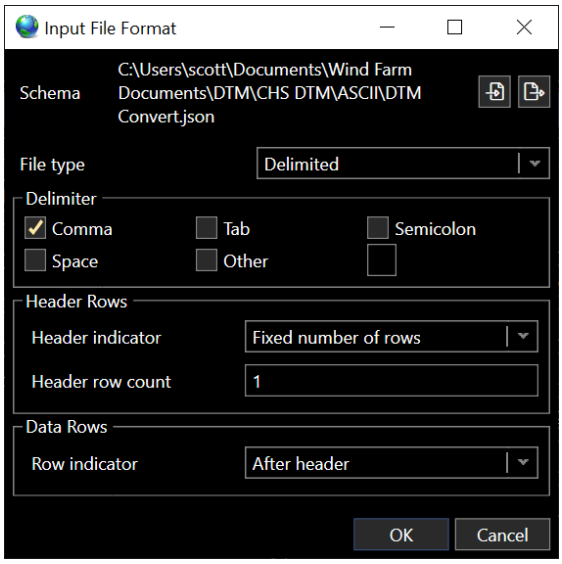


FIGURE 23 INPUT FILE FORMAT DIALOG – DELIMITED FILE TYPE

a. If an input file format has been previously saved, it can be imported using the button
b. Select the File type from the drop-down, Delimited, or Fixed width

- **File Type Delimited**, see Figure 24
  I. Check the box(s) that define the Delimiter
  II. Define the Header Rows using the Header indicator drop-down
  III. Define the Data Rows using the Row indicator drop-down
- **File Type Fixed Width**

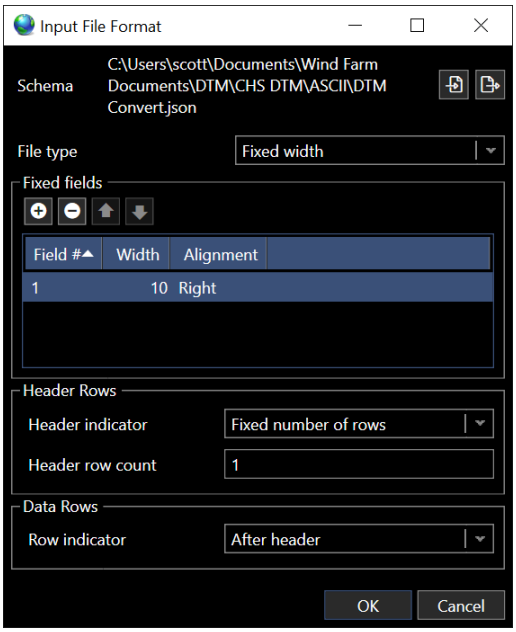
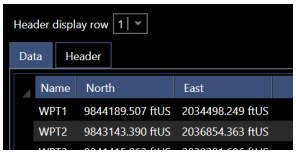


FIGURE 24 INPUT FILE FORMAT DIALOG – FIXED WIDTH FILE TYPE

I. To add a Fixed field, click the add button 
II. Define Field width and alignment
III. Define the Header Rows using the Header indicator drop-down
IV. Define the Data Rows using the Row indicator drop-down

c. The format can now be saved to a file for future use by clicking on the export  button

3. The Header Tab displays the header read from imported file. 

4. Select the Header row to be displayed from the drop-down. 

5. The Data Tab, see Figure 26, is used to define the Source data format and Target data format. The parsed data from the imported file is displayed in the data panel.

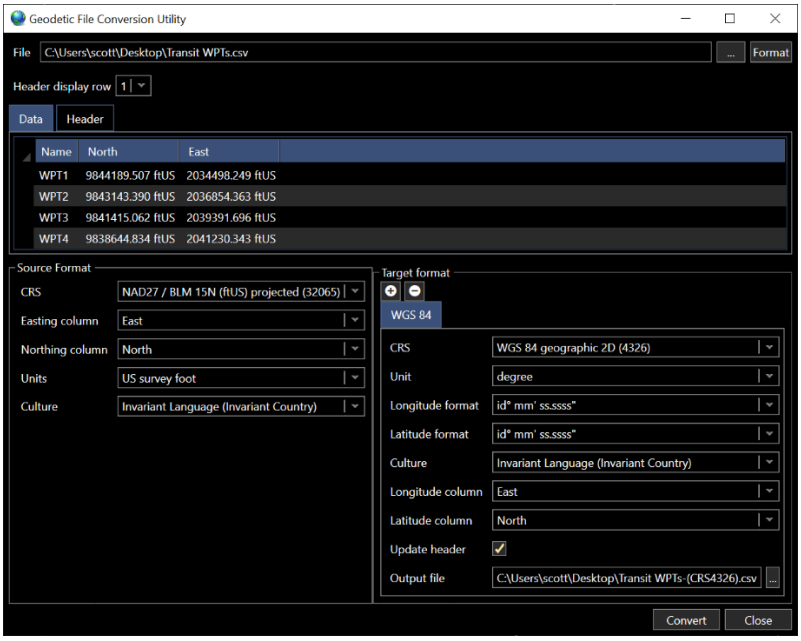


FIGURE 25 GEODETIC FILE CONVERSION DIALOG – DATA TAB

- **Source Format**
  a. Select the source CRS from the drop-down. The horizontal CRS needs to be added to NavView to be available
  b. Assign data columns from drop-down
  c. Select data units from drop-down
  d. Select culture from drop-down. Used to format unit separators
- **Target Format**

  Multiple target formats can be added using the add button. To remove a target format, click the remove button.
  a. Select the target CRS from the drop-down. The horizontal CRS needs to be added to NavView to be available
  b. Select target units from the drop-down
  c. Select unit format from drop-down
  d. Select culture from drop-down. Used to format unit separators
  e. Assign data columns from drop-down
  f. Check Update Header box to assign headers to target data columns when converted
  g. Click the browse button to create an Output file. The file path is displayed in the Output file box

6. Click **Convert.**

2.9 ROUTE CALCULATOR

Utility to calculate a point on route position from a route station and offset, inversely a route station and offset can be calculated from a point on route position. Calculation methods available are Grid, Geodesic and Rhumb line.

Select **Route Calculator** from the **Utilities** section of the **Home** ribbon to open the Route Station Calculator dialog.

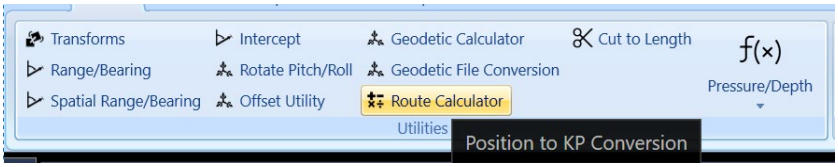


FIGURE 26 ROUTE CALCULATOR – UTILITIES

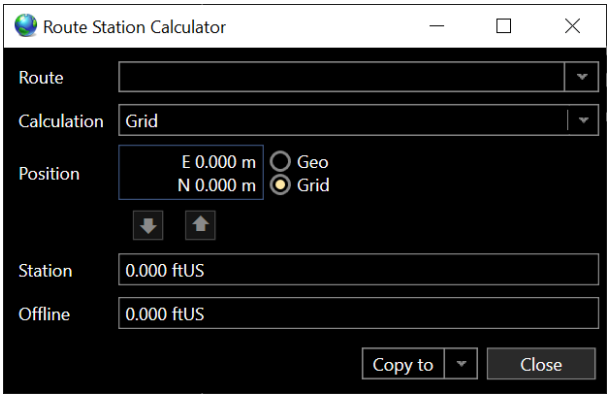


FIGURE 27 ROUTE STATION CALCULATOR

1. Select the Route from drop-down.
2. Select the Calculation method from the drop-down. Grid, Geodesic or Rhumb line.
3. Enter position.
4. Click  to calculate route Station and Offset.
   OR
5. Enter route Station and Offset.
6. Click  to calculate position

Note: Route Station is entered and displayed as distance along the route. Offline is (-) port side of route forward and (+) starboard side of route forward.

Note: Position can be copied to a Waypoint or to a Pipe Tally

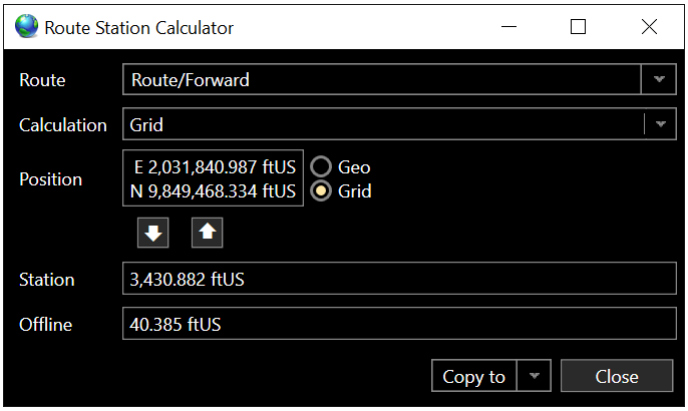


FIGURE 28 ROUTE STATION CALCULATOR EXAMPLE

2.10 CUT TO LENGTH

Utility to calculate a point on route position from a route station and offset, inversely a route station and offset can be calculated from a point on route position. Grid, ellipsoid and spatial distances from point on route position to a specific target (i.e. Cut to Length) can also be calculated in the utility.

Note: Spatial distance calculations require a seabed profile of the selected route. The profile is generated by enabling *Generate Profile* of the selected route, in *Pipelines Configuration*. If a DTM of the route is in NavView, the seabed profile is taken from the DTM. If there is no DTM available then the profile generated is horizontal.

Select **Cut to Length** from the **Utilities** section of the **Home** ribbon to open the Route Calculations dialog.

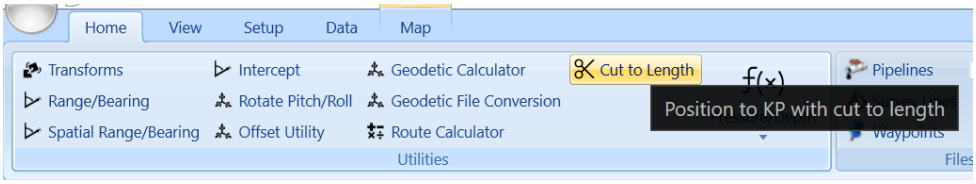


FIGURE 29 CUT TO LENGTH – UTILITIES

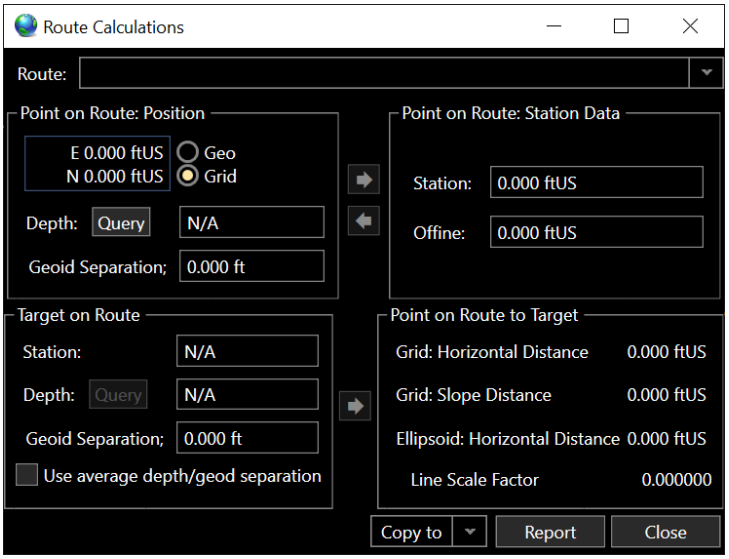


FIGURE 30 ROUTE CALCULATIONS DIALOG

1. Select the Route from drop-down.

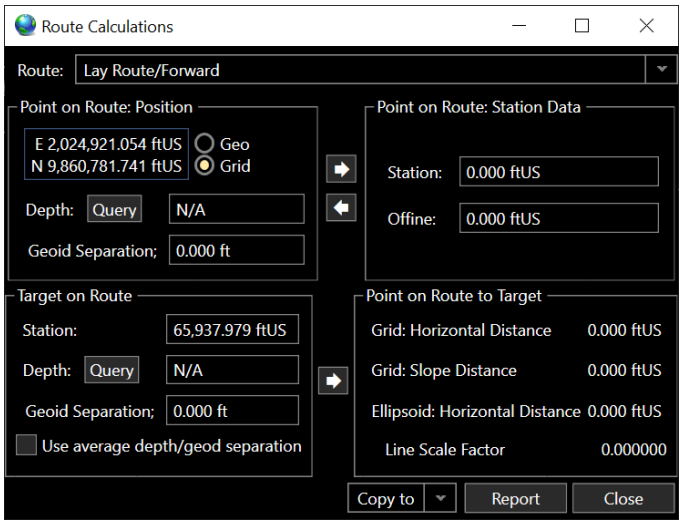


FIGURE 31 ROUTE SELECTION – WITHOUT ROUTE PROFILE

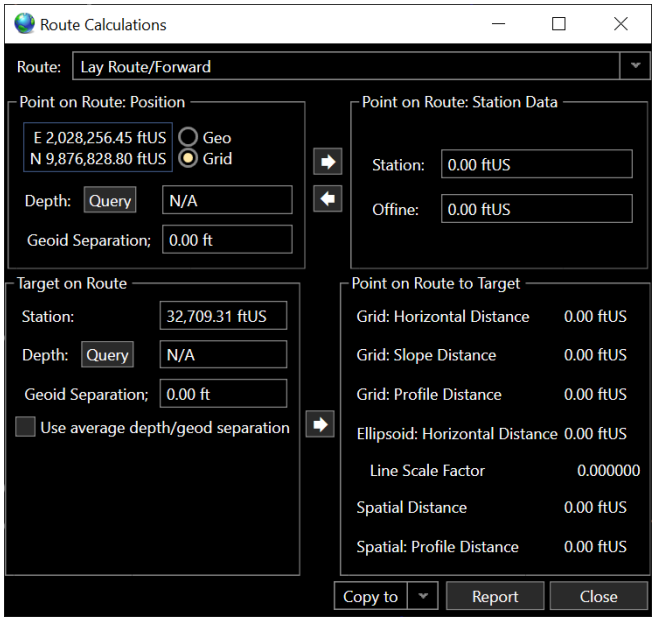


FIGURE 32 ROUTE SELECTION – WITH ROUTE PROFILE

2. To calculate **Station Data** from Point on Route position.

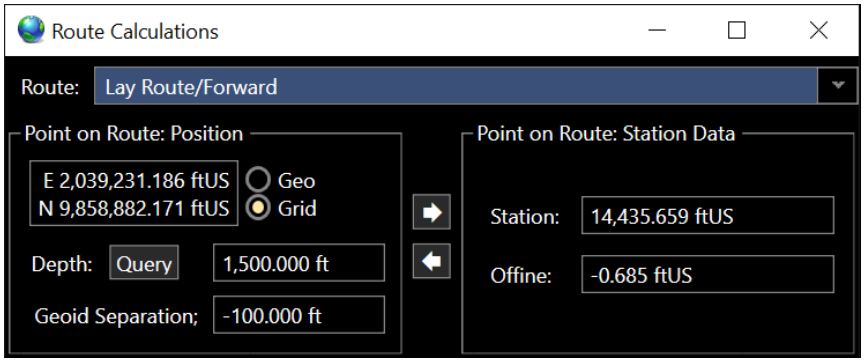


FIGURE 33 STATION DATA FROM POINT ON ROUTE POSITION

a. Enter point Position
b. Enter Depth at point, if a DTM is available the depth can be obtained by clicking the Query button
c. Enter Geoid Separation at point
d. Click  button to calculate the Station Data

Note: Station is given as along route distance. Offline is (-) port side of route forward and (+) starboard side of route forward.

3. To calculate **Point on Route Position** from Station Data.

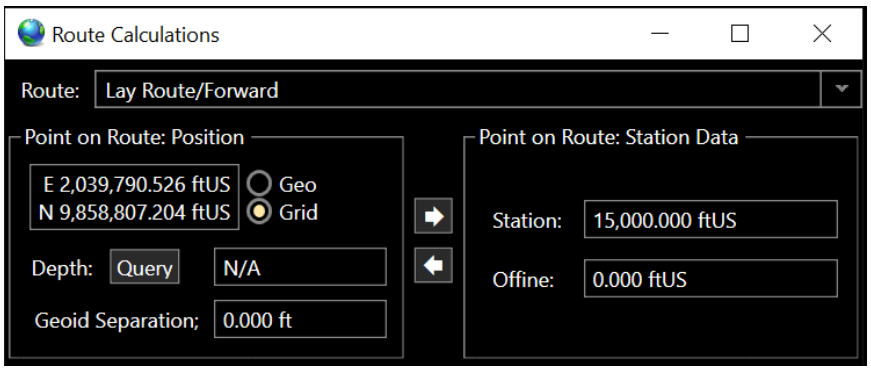


FIGURE 34 POINT ON ROUTE POSITION FROM STATION DATA

a. Enter Station as along route distance
b. Enter Offline distance (-) port side of route forward and (+) starboard side of route forward
c. click the button to calculate Point on Route Position

4. To calculate **Point on Route to Target (Cut to Length).**
   a. Enter Target on Route station, station is entered as along route distance
   b. Enter depth at target, if a DTM is available the depth can be obtained by clicking the Query button
   c. Enter geoid separation at target
   d. If Average depth/geoid separation is selected, the geoidal separation and depth from each end is averaged and applied to both ends
   e. Click the button to execute calculation
5. The calculated Target position can be copied to Pipe Tally or Create Waypoint by clicking on the Copy to drop-down.
6. A Route Calculation Report is generated by clicking on the Report button.

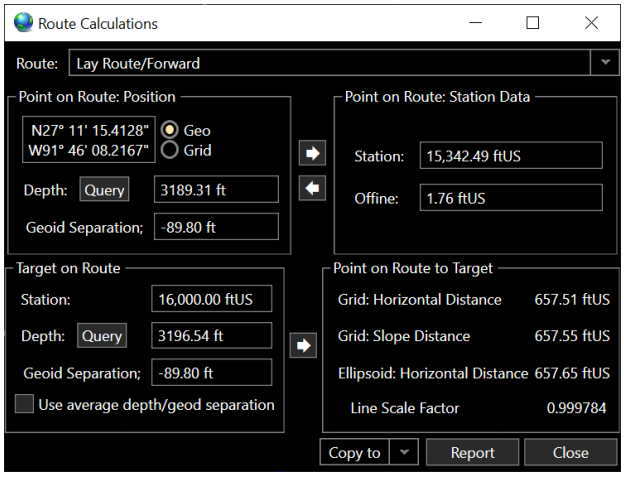


FIGURE 35 POINT ON ROUTE TO TARGET RESULTS EXAMPLE - WITHOUT ROUTE PROFILE

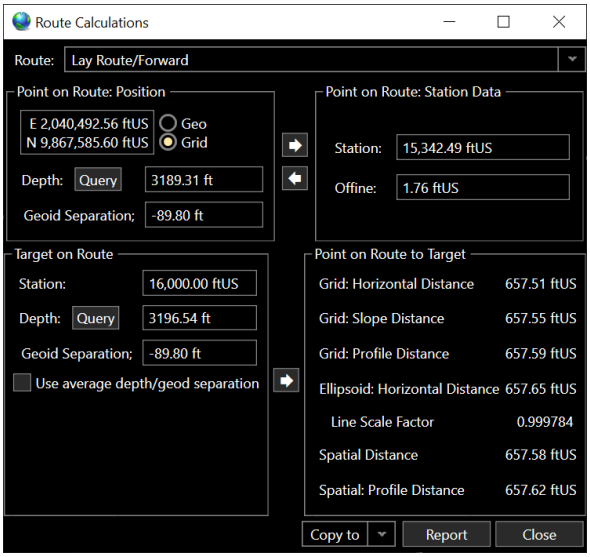


FIGURE 36 POINT ON ROUTE TO TARGET RESULTS EXAMPLE – WITH ROUTE PROFILE

- **Grid: Horizontal Distance** – Horizontal Grid distance from Point on Route to Target
- **Grid: Slope Distance** - Slope Grid distance from Point on Route to Target using depths at each end
- **Grid**: **Profile Distance** – Grid distance following the route profile
- **Ellipsoid**: **Horizontal Distance** - Horizontal distance (Geodesic) from Point on Route to Target on the working ellipsoid
- **Line Scale Factor** – Ratio between grid distances and ellipsoidal horizontal distances
- **Spatial Distance** – Slope distance at depth/elevation
- **Spatial Profile Distance** – Spatial distance following the profile at depth/elevation

2.11 PRESSURE TO DEPTH CALCULATIONS

Utility to calculate depth from pressure. Available calculation options are UNESCO, Density and Dynamic.

Select the **Pressure/Depth** calculation option from the **Utilities** section of the **Home** ribbon to open the calculation dialog.

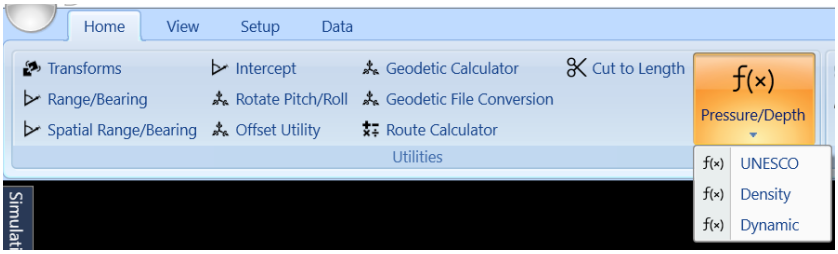


FIGURE 37 PRESSURE TO DEPTH – UTILITIES

2.11.1 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 IOGP conversion 136, EOS-80 standard ocean depth and takes input of latitude, surface pressure and observed pressure.

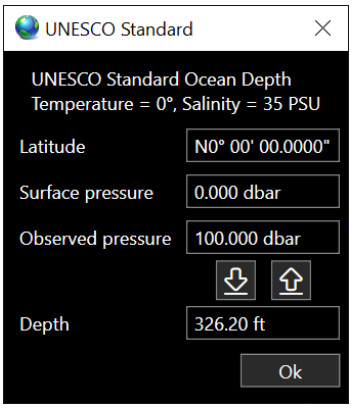


FIGURE 38 UNESCO STANDARD DIALOG

1. Enter Latitude of pressure/depth location.
2. Enter Surface pressure (air pressure).
3. Enter Observed pressure.
4. Click  button to convert pressure to depth.
5. Click  button to convert depth to pressure.

Note: The calculated depth units are as configured in Configuration/Preferences/Depth.

Note: Pressure input unit defaults to dbar but can be entered as a different unit by entering the unit after the value such as xx.xx psi, xx.xx mbar etc.

2.11.2 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 depth equation is as follows:

$$Depth = \frac{P*0.70307}{d} * \left(\frac{G_{std}}{G_{local}}\right)$$

0.70307 = psi to meters conversion for water of standard density

P = Pressure in PSI

d = mean density of the water column

Gstd = Standard gravity 9.80665 m/sec2

Glocal is the local gravity from the International association of Geodesy, Special Bulletin on Geodesy (1970) ref: Anon 1970

$G_{local} = Ge*(1+0.0053024*sin^2\phi - 0.000059*sin^2(2\phi))$

G_e = 9.7803184 m/sec2

ϕ = Latitude

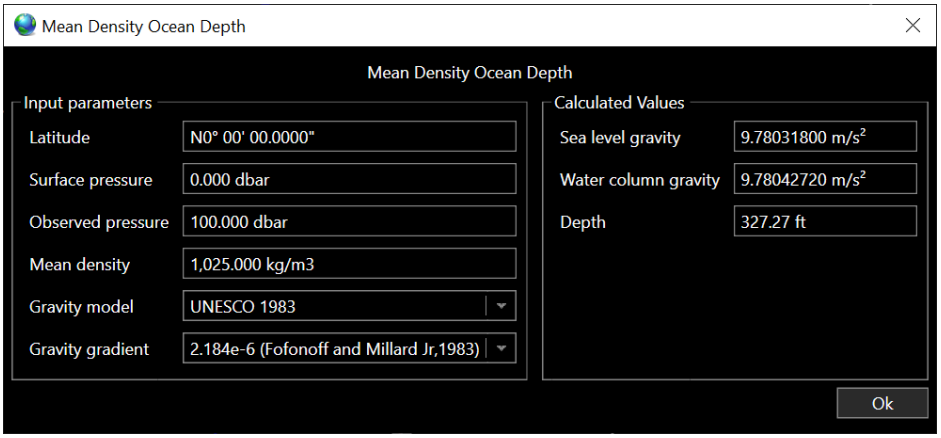


FIGURE 39 MEAN DENSITY OCEAN DEPTH DIALOG

1. Enter Latitude of pressure/depth location.
2. Enter Surface pressure (air pressure).
3. Enter Observed pressure.
4. Enter Mean density for the water column, taken from a CTD profile.
5. Select Gravity model from drop-down.
6. Select Gravity gradient from drop-down.

Note: The calculated depth units are as configured in Configuration/Preferences/Depth.

Note: Pressure input unit defaults to dbar but can be entered as a different unit by entering the unit after the value such as xx.xx psi, xx.xx mbar etc.

2.11.3 DYNAMIC

Dynamic calculation uses density from water column profile correlated to the input pressure. Provides most accurate result of three options.

Note: The Dynamic calculation implements dynamic depth equations described in IOGP Report 649 (Seawater Pressure to depth conversion). A combination of geopotential method and gravity settings must be chosen to adhere to this setup.

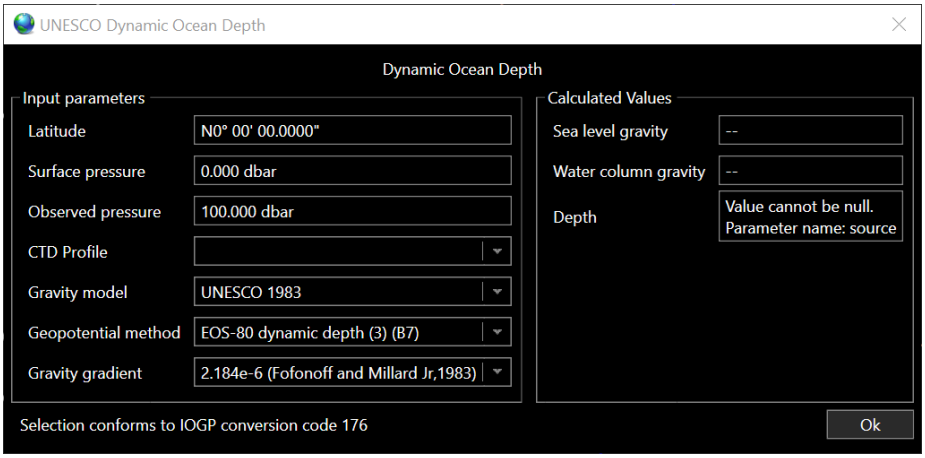


FIGURE 40 UNESCO DYNAMIC OCEAN DEPTH DIALOG

1. Enter Latitude of pressure/depth location.
2. Enter Surface pressure (air pressure).
3. Enter Observed pressure.
4. Select the CTD Profile loaded in NavView to be used for density in calculation.
5. Select Gravity model from drop-down.
6. Select Geopotential method from drop-down.
7. Select Gravity gradient from drop-down.

Note: The calculated depth units are as configured in Configuration/Preferences/Depth.

Note: Pressure input unit defaults to dbar but can be entered as a different unit by entering the unit after the value such as xx.xx psi, xx.xx mbar etc.