



# NavView User Guide – Utilities

Document:4DN\_NVUG\_A02\_01ARelease:01Revision:AReleased:11/5/20244D Nav, LLC

REL	REV	ISSUE DESCRIPTION	PREPARED	REVIEWED	APPROVED	DATE
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

	Home	View	Setup	Data	Мар			
🌮 Tra	nsforms		▹ Intercept		🙏 Geodetic	Calculator	🛠 Cut to Length	f(×)
Rar	nge/Bearing	3	🙏 Rotate Pit	ch/Roll	k Geodetic	File Conversion	1	Proceuro/Dopth
▶ Spa	atial Range/	'Bearing	🙏 Offset Util	ity	Route Ca	lculator		Fressure/Depth ▼
					Utilities			

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.

Home	View	Setup	Data	Мар			
<ul> <li>Transforms</li> <li>Range Geode</li> <li>Spattar Kange/</li> </ul>	bearing a	<ul> <li>Intercept</li> <li>ersion and</li> <li>Onset Out</li> </ul>	t Transfo	Geodetic Geodetic Rodte Ca Utilities	Calculator File Conversion	X Cut to Length	f(×) Pressure/Depth

FIGURE 2 TRANSFORMS - UTILITIES

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



# 1. Conversion Tab

€ Conversions & Transforms ×					
Conversion	Transform				
NAD27 / UT E 784718.63 N 3020283.	M zone 15N - 3 m 45 m	> <	NAD27 N 27° 16' 39.1179" W 90° 07' 26.2387"		

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

Conversior	×		
Conversion	Transform		
NAD27 N 27° 16' 3' W 90° 07' 2	9.1179" 6.2387"		WGS 84 N 27° 16' 40.1080" W 90° 07' 26.3619"

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 dutton 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.

Home	View Setup	Мар		
<ul> <li>Transforms</li> <li>Range/Bearing</li> <li>Spatial Range</li> </ul>	▷ Intercept ★ Rotate Pit c/Bearing		Cut to Length	f(×) Pressure/Depth

FIGURE 5 RANGE/BEARING - UTILITIES

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

Direct/Inverse					
Direct	Inve	erse			
Start	E 807051.70 m O Geo N 3055927.03 m O Grid				
Grid D	Grid Distance			n	
Grid Be	earing	85.0	)0°		
	Solve				
End	End E 807549.80 m Geo N 3055970.61 m Grid				

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.

Home View	Setup Map			
P Transforms	➤ Intercept	🙏 Geodetic Calculator	X Cut to Length	f(v)
▶ Range/Bearing	🙏 Rotate Pitch/Roll	🙏 Geodetic File Conversion		J(×)
▹ Spatial Range/Bearing	🙏 Offset Utility	<b>‡</b> Route Calculator		Pressure/Deptn
Spatial Range/	/Bearing	Utilities		

FIGURE 8 SPATIAL RANGE/BEARING - UTILITIES



Spatial Inverse		$\times$		
- Start Point:				
Position:	E 786657.74 m O Geo N 3047191.64 m O Grid			
Depth	500.000 m			
Geoid Separation:	-26.380 m			
End Point:				
Position:	E 787804.34 m O Geo N 3045541.55 m O Grid			
Depth	550.000 m			
Geoid Separation:	-26.380 m			
Options				
Use Average De	pth			
Ellipsoid Solution –				
Distance: 2,008.106 m @ Bearing: 146.55°				
Spatial Solution				
Distance: 2,008.555 m				

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.

Home View	Setup Map	
🌮 Transforms	▶ Intercept & Geodetic Calculator & Cut to Length	f(×)
	Rotate Intercept Calculation	Brossure/Depth
▹ Spatial Range/Bearing	A Offset Utility XF Route Calculator	Fressure/Deptri
	Utilities	

FIGURE 10 INTERCEPT - UTILITIES

Intercept Calo	culator;		×
Interceptor —		┌ Target ———	
Start Location:	O Geo O Grid	Start Location:	O Geo O Grid
Speed:	8.500 knot	Speed:	3.500 knot
		Bearing(G):	0.00°
Desult	Calc	ulate	
Intercept Locati	on: O Ge	o id	
Time:	0.00		
Range(G):	0.00 m		
Bearing(G):	0.00°		
Azimuth(T):	0.00°		
Copy to	*		

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.

	Home	View	Setup	Data	Мар				
🌮 Trai	nsforms		▶ Intercept	a R	🐛 Geodetic	Calculator	🛠 Cut to Length	f(x)	
▶ Range/Bearing			🙏 Rotate Pitc	h/Roll	🖕 Geodetic	File Conversion		J (^)	
▹ Spatial Range/Bearing			* Offset Rot	ate Pito	h/Roll			Fressure/Deput	
					UHIIHI				

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.

F	lome View	Setup	Data	Мар							
<ul><li>✤ Transfo</li><li>▶ Range,</li><li>▶ Spatial</li></ul>	orms /Bearing Range/Bearing	<ul> <li>Intercept</li> <li>Rotate Pi</li> <li>Offset Ut</li> </ul>	tch/Roll . ility 호구	Geodetic Geodetic Route Ca	Calculator File Conversion Iculator	X Cut to	Length	f(×) Pressure/Depth			
		Off	set Utility	Utilities							
FIGURE 14 OFESET UTILITY - UTILITIES											
-		I IGOILE I									
Offset Utili	ty					Pamoto		×			
Position:	E 615261.76 r N 270576.04 r	n O Geo n O Grid	Offsets ——			Position:	E 615 N 270	5271.75 m O Geo 0586.05 m O Grid			
Elevation:	0.00 m		X Offset:	Ŀ	0.00 m	Elevation:	5.00 m				
Heading (T):	0.00°		Y Offset:	Ŀ	0.00 m	Heading (T):	0.00°				
Pitch:	0.00°		Z Offset:		5.00 m	Pitch:	1.00°				
Roll:	0.00°		Heading Off	set:	0.00°	Roll:	2.00°				
			Pitch Offset:		.00°						
			Roll Offset:	ć	2.00°						
			Attitude Off	set Alignme	ent:						
			Offset	t Location	O Reference						

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.



🔮 Offset Utili	ty				×
- Reference —				Remote ——	
Position:	E 615261.53 m O Geo N 270575.95 m O Grid	Offsets		Position:	E 615271.52 m O Geo N 270585.96 m O Grid
Elevation:	0.71 m	X Offset:	10.00 m	Elevation:	5.71 m
Heading (T):	0.00°	Y Offset:	10.00 m	Heading (T):	90.00°
Pitch:	0.00°	Z Offset:	5.00 m	Pitch:	1.00°
Roll:	0.00°	Heading Offset:	90.00°	Roll:	2.00°
		Pitch Offset:	1.00°		
		Roll Offset:	2.00°		
		Attitude Offset Align	ment:		
		Offset Locatio	n 🔿 Reference		
🔮 Offset Utili	FIGURE 16 ATTI	TUDE ALIGNM	ient – Of	FSET LO	CATION ×
- Reference —				Remote —	
Position:	E 615261.53 m O Geo N 270575.95 m O Grid	Offsets		Position:	E 615271.52 m O Geo N 270585.96 m O Grid
Elevation:	0.71 m	X Offset:	10.00 m	Elevation:	5.71 m
Heading (T):	0.00°	Y Offset:	10.00 m	Heading (T):	90.00°
Pitch:	0.00°	Z Offset:	5.00 m	Pitch:	-2.00°
Roll:	0.00°	Heading Offset:	90.00°	Roll:	1.00°
		Pitch Offset:	1.00°		

🔮 Offset Utili	ty				×
Reference —				Remote	
Position:	E 615261.53 m O Geo N 270575.95 m O Grid	Offsets		Position:	E 615271.52 m O Geo N 270585.96 m O Grid
Elevation:	0.71 m	X Offset:	10.00 m	Elevation:	5.71 m
Heading (T):	0.00°	Y Offset:	10.00 m	Heading (T):	90.00°
Pitch:	0.00°	Z Offset:	5.00 m	Pitch:	-2.00°
Roll:	0.00°	Heading Offset:	90.00°	Roll:	1.00°
		Pitch Offset:	1.00°		
		Roll Offset:	2.00°		
		Attitude Offset Aligr	nment:		
		O Offset Locatio	on 🔘 Reference		

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.

	Home	View	Setup	Data	Мар			
<ul><li>➢ Tra</li><li>➢ Rar</li><li>➢ Spa</li></ul>	nsforms nge/Bearing atial Range/	g /Bearing	<ul> <li>Intercept</li> <li>Rotate Pit</li> <li>Offset Uti</li> </ul>	ch/Roll	<mark>☆ Geodetic</mark> ☆ Geode <mark>tic</mark> ☆ Route C	Calculator Geodetic (	Cut to Length Calculator	f(×) Pressure/Depth
					Utilities			

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 statement 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.

🧶 Geodetic C	alculator		×
CRS A: NAD	27 / BLM 15N (ftUS) projected (32065)	ORS B:	WGS 84 geographic 2D (4326)
	E 1525526.03 ftUS N 10268367.91 ftUS		
	1 t		
	N 28° 17' 43.4393" W 93° 21' 25.6767"	→ ←	N 28° 17' 44.3724" W 93° 21' 26.2052"
Point scale f	actor 0.999615135		
Convergence	e -0.16929°		
Epsg Transform	nation 15851. NAD27 geographic 2D (4267) to	o WGS 84 geogra	phic 2D (4326) using OGP-Usa Conus Close

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.

1	Home View	Setup Map			
	nansforms	➢ Intercept	🙏 Geodetic Calculator	X Cut to Length	f(x)
	▶ Range/Bearing	🙏 Rotate Pitch/Roll	📩 Geodetic File Conversion		J(^)
	▹ Spatial Range/Bearing	🙏 Offset Utility	Seodetic F	ile Conversion	Pressure/Deptn
			Utilities		

FIGURE 21 GEODETIC FILE CONVERSION - UTILITIES



Geodetic File Cor	version Utility			-		$\times$
File						Format
Header display row	•					
Data Header						
Source Format —			Target format			
CRS	NAD27 / BLM 15N (ftUS) projected (32065	)   ~	<b>€</b>			
Easting column		<b>•</b>	WGS 84			
Northing column		<b> </b> •	CRS	WGS 84 geographic 2D (4326)		•
Units	US survey foot	•	Unit	degree		<b> </b> •
Culture	Invariant Language (Invariant Country)	· •	Longitude format			· •
			Latitude format			<b>•</b>
			Culture	Invariant Language (Invariant G	Countr	y)   ~
			Longitude column			· •
			Latitude column			
			Update header			
			Output file			
		L		Convert		Close

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.

🔮 Input File Format		—		$\times$			
C:\Users\scott\ Schema Documents\DT Convert.json	Documents\Wii M\CHS DTM\AS	nd Farm SCII\DTM	H	9			
File type	Delimited			*			
_ Delimiter							
Comma Ta	ab	Sem	icolon				
Space Other							
Header Rows							
Header indicator	Fixed numbe	r of rows		<b>•</b>			
Header row count	1						
Data Rows							
Row indicator	After header			<b>•</b>			
		OK	C	ancel			

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
  - Check the box(s) that define the Delimiter ١.
  - Define the Header Rows using the Header indicator drop-down II.
  - III. Define the Data Rows using the Row indicator drop-down
- **File Type Fixed Width**

Q Input Fil	e Format				_		$\times$
Schema	C:\Users\ Docume Convert.j	\scott\D nts\DTN json	ocum A\CHS	ents\Wi DTM\A	nd Farm SCII\DTM		₽
File type			Fixed width				•
Fixed fields	; •						
Field #▲	Width	Align	ment				
1	10						
Header Ro	ws —						
Header in	dicator		Fixed	l numbe	r of rows		<b>•</b>
Header ro	w count		1				
Data Rows							
Row indicator			After header				×
					OK		Cancel

FIGURE 24 INPUT FILE FORMAT DIALOG - FIXED WIDTH FILE TYPE

- To add a Fixed field, click the add button 🖸 ١.
- 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  ${f P}$ button
- 3. The Header Tab displays the header read from imported file.



Header Name,North,East

Data

- 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.



Geodetic File Conversion Utility – E										
File	C:\Use	's\scott\	Desktop\Tra	insit WPTs.csv						Format
Hea	der displi	ay row	1   *							
Dat	ta He	ader								
	Namo	North		Eact						
	WPT1	98441	89.507 ftUS	2034498.249 ftUS						
	WPT2	98431	43.390 ftUS	2036854.363 ftUS						
	<b>W</b> РТ3	98414	15.062 ftUS	2039391.696 ftUS						
	WPT4	98386	44.834 ftUS	2041230.343 ftUS						
- Sou CR Eas No Un Cu	rce Form S ating colu rthing co its Iture	imn Humn	NAD27 / BL East North US survey fr	M 15N (ftU5) projec	ted (32065)   *     *   *   *   *   *   *		Target format General CRS Unit Longitude format Latitude format Latitude column Latitude column Update header	WGS 84 geographic 2D (4326) degre id* mm' sssss* id* mm' sssss* Invariant Language (Invariant Country) East North V		
							Output file	C:\Users\scott\Desktop\Transit WPTs-(	CRS432	5).csv
								Conv	ert	Close

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.

<ul> <li>Transforms</li> <li>Range/Bearing</li> <li>Spatial Range/Bearing</li> </ul>	Intercept Rotate Pitch/Roll Offset Utility	<ul> <li>Geodetic Calcu</li> <li>Geodetic File C</li> <li>Route Calculate</li> <li>Utilities</li> </ul>	ilator 8 conversion or sition to KF	Cut to Leng	th f(×) Pressure/Depth
FIGUR	E 26 ROUTI	E CALCULA	TOR – L	JTILITIES	
Route Sta	tion Calculator		—		×
Route					*
Calculation	Grid				•
Position	E 0.000 r N 0.000 r	m O Geo m O Grid			
Station	0.000 ftUS				
Offline	0.000 ftUS	Г	-		
			Copy to 🛛 👻	Close	

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



Noute Sta		-		×	
Route	Route/Forward				•
Calculation	Grid				*
Position	E 2,031,840.987 ftUS N 9,849,468.334 ftUS O Geo O Grid				
Station	3,430.882 ftUS				
Offline	40.385 ftUS				
		Copy to	0 *	C	lose

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.

	Home	View	Setup	Data	Мар					
							( -			
🌮 Tr	ansforms		Intercept	Å.	Geodetic	Calculator	Cut to Lengt	h fur	🛛 产 Pipelines	
🗁 Ra	ange/Bearing		🤽 Rotate Pito	ch/Roll 🤽	Geodetic	: File Conversion	Po	sition to KP wit	h cut to lengt	es -
h.c	1.10 (0		•						in cut to lengu	
₽ SI	oatial Range/Be	earing .	The Offset Util	ity 🗴	<ul> <li>Route Ca</li> </ul>	alculator		*	vvaypoint	5
					Utilities					File

FIGURE 29 CUT TO LENGTH - UTILITIES



Route Calculations			-	
Route:				*
Point on Route: Position ————		Point on Ro	oute: Station Da	ta
E 0.000 ftUS       O Geo         N 0.000 ftUS       O Grid         Depth:       Query       N/A         Geoid Separation;       0.000 ft	+ +	Station: Offine:	0.000 ftUS	
Target on Route	] [	Point on Rou	te to Target —	
Station: N/A		Grid: Horizo	ntal Distance	0.000 ftUS
Depth: Query N/A	•	Grid: Slope I	Distance	0.000 ftUS
Geoid Separation; 0.000 ft		Ellipsoid: Ho	orizontal Distan	ce 0.000 ftUS
Use average depth/geod separation		Line Scale	Factor	0.000000
		Copy to 👻	Report	Close

FIGURE 30 ROUTE CALCULATIONS DIALOG

1. Select the Route from drop-down.

Route Calculations			—	$\Box$ ×
Route: Lay Route/Forward				*
Point on Route: Position		Point on R	oute: Station D	ata ———
E 2,024,921.054 ftUS O Geo N 9,860,781.741 ftUS O Grid	•	Station:	0.000 ftUS	
Depth: Query N/A	•	Offine:	0.000 ftUS	
Geoid Separation; 0.000 ft				
Target on Route		-Point on Rou	ute to Target –	
Station: 65,937.979 ftUS		Grid: Horizo	ontal Distance	0.000 ftUS
Depth: Query N/A		Grid: Slope	Distance	0.000 ftUS
Geoid Separation; 0.000 ft		Ellipsoid: He	orizontal Dista	nce 0.000 ftUS
Use average depth/geod separation		Line Scale	Factor	0.000000
		Copy to 🛛 👻	Report	Close

FIGURE 31 ROUTE SELECTION – WITHOUT ROUTE PROFILE



Route Calculations			_	
Route: Lay Route/Forward				*
Point on Route: Position ————		Point on Re	oute: Station D	ata ———
E 2,028,256.45 ftUS Geo N 9,876,828.80 ftUS Grid	•	Station:	0.00 ftUS	
Geoid Separation; 0.00 ft		Offine:	0.00 ftUS	
_ Target on Route		Point on Rou	ute to Target –	
Station: 32,709.31 ftUS		Grid: Horizo	ontal Distance	0.00 ftUS
Depth: Query N/A		Grid: Slope	Distance	0.00 ftUS
Geoid Separation; 0.00 ft		Grid: Profile	Distance	0.00 ftUS
Use average depth/geod separation	•	Ellipsoid: He	orizontal Dista	nce 0.00 ftUS
		Line Scale	Factor	0.000000
		Spatial Dist	ance	0.00 ftUS
		Spatial: Pro	file Distance	0.00 ftUS
		Copy to 👻	Report	Close

FIGURE 32 ROUTE SELECTION - WITH ROUTE PROFILE

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

🍭 Rout	e Calculations			_		$\times$
Route:	Lay Route/Forward					*
Point or	n Route: Position		Point on Ro	oute: Station [	Data ——	
N 9,85	88882.171 ftUS	•	Station:	14,435.659 f	tUS	
Depth:	Query 1,500.000 ft	•	Offine:	-0.685 ftUS		
Geoid	Separation; -100.000 ft					

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.



Route Calculations			_		$\times$
Route: Lay Route/Forward					*
Point on Route: Position		-Point on Ro	oute: Station	Data —	
E 2,039,790.526 ftUS O Geo N 9,858,807.204 ftUS O Grid	•	Station:	15,000.000	ftUS	
Depth: Query N/A	•	Offine:	0.000 ftUS		
Geoid Separation; 0.000 ft					

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



Route Calculations			-		$\times$
Route: Lay Route/Forward					•
- Point on Route: Position		Point on Ro	oute: Station Da	ata ——	
E 2,040,492.56 ftUS N 9,867,585.60 ftUS O Grid	•	Station:	15,342.49 ftU	S	
Depth: Query 3189.31 ft	•	Offine:	1.76 ftUS		
Geoid Separation; -89.80 ft					
Target on Route		Point on Rou	te to Target —		
Station: 16,000.00 ftUS		Grid: Horizo	ntal Distance	657.5	51 ftUS
Depth: Query 3196.54 ft		Grid: Slope [	Distance	657.5	55 ftUS
Geoid Separation; -89.80 ft		Grid: Profile	Distance	657.5	59 ftUS
Use average depth/geod separation	•	Ellipsoid: Ho	rizontal Distan	ice 657.6	55 ftUS
		Line Scale	Factor	0.9	99784
		Spatial Dista	ince	657.5	8 ftUS
		Spatial: Prof	ile Distance	657.6	52 ftUS
		Copy to 👻	Report	Cl	ose

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.

	Home	View	Setup	Data				
<b>1</b> 25)	Transforms		▹ Intercept		🙏 Geodetic Calculator	X Cut to Length		f(x)
⊳	Range/Bearing	g	🙏 Rotate Pit	ch/Roll	🙏 Geodetic File Conversion		Droc	J (~)
⊳	Spatial Range,	/Bearing	🙏 Offset Uti	lity	<b>*</b> Route Calculator		Pres	sure/Depth
					Utilities		f(×)	UNESCO
S							f(×)	Density
mulat							f(×)	Dynamic

#### 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

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

- $G_e = 9.7803184 \text{ m/sec2}$
- $\phi$  = Latitude

🄮 Mean Density Oce	an Depth				×
	Mean Density Ocean	De	epth		
Input parameters —		1	Calculated Values		
Latitude	N0° 00' 00.0000"		Sea level gravity	9.78031800 m/s <sup>2</sup>	
Surface pressure	0.000 dbar		Water column gravity	9.78042720 m/s <sup>2</sup>	
Observed pressure	100.000 dbar		Depth	327.27 ft	
Mean density	1,025.000 kg/m3				
Gravity model	UNESCO 1983				
Gravity gradient	2.184e-6 (Fofonoff and Millard Jr,1983)				
				0	k

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.



🔮 UNESCO Dynamic Oc	ean Depth			×
	Dynamic Ocean I	Dept	h	
Input parameters ——			Calculated Values	
Latitude	N0° 00' 00.0000"		Sea level gravity	
Surface pressure	0.000 dbar		Water column gravity	
Observed pressure	100.000 dbar		Depth	Value cannot be null. Parameter name: source
CTD Profile	•	]		
Gravity model	UNESCO 1983	]		
Geopotential method	EOS-80 dynamic depth (3) (B7)	]		
Gravity gradient	2.184e-6 (Fofonoff and Millard Jr,1983)			
Selection conforms to IC	OGP conversion code 176			Ok

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.