

CueTip

# Vertical Datum Grid Files for Tidal Datum Support in GeoCue



Applies to GeoCue, versions 2013 and above.

---

GeoCue Group  
January 14, 2015  
Revision 3.0

## Introduction

The NOAA Mean High Water (MHW) files (mhw.gtx) and the corresponding TSS files (tss.gtx) can be used to create GeoCue vertical datum grid files that support the Mean High Water Tidal datum in GeoCue. One MHW/TSS pair exists for each of the thirty eight NOAA defined coastal project areas. This note describes the GeoCue workflow for creating and inserting the necessary files into GeoCue so that the MHW tidal datum is available in the set of GeoCue vertical coordinate systems. By following through this process using the other NOAA provided files one may also make MLLW and the other tidal datums available:

**DTL - Diurnal Tide Level:** The arithmetic mean of mean higher high water and mean lower low water.

**MHHW - Mean High High Water:** The average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch.

**MHW - Mean High Water:** The average of all the high water heights observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch.

**MLLW - Mean Low Low Water:** The average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch.

**MLW - Mean Low Water:** The average of all the low water heights observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch.

**MTL - Mean Tide Level:** The arithmetic mean of mean high water and mean low water.

# Vertical Datum Grid Files for Tidal Datum Support in GeoCue

## 1. Creating the GeoCue Vertical Datum Grid Files

### 1.1. Project Creation

NOAA’s VDatum utility (available from NOAA’s NGS website) should be installed on the workstation, or at least the various project area data folders (one for each project area, i.e. *ALmobile02\_8301*). Also, the parent folder should contain the *tidal\_area.inf* file, as this file contains the formal name and version information for each installed project area.

Then, start GeoCue and create a new project, with parameters set as shown below (Figure 1). The GPS Time Format option does not matter in this case since no LIDAR data is involved in this generation process, so just choose one of the available options.

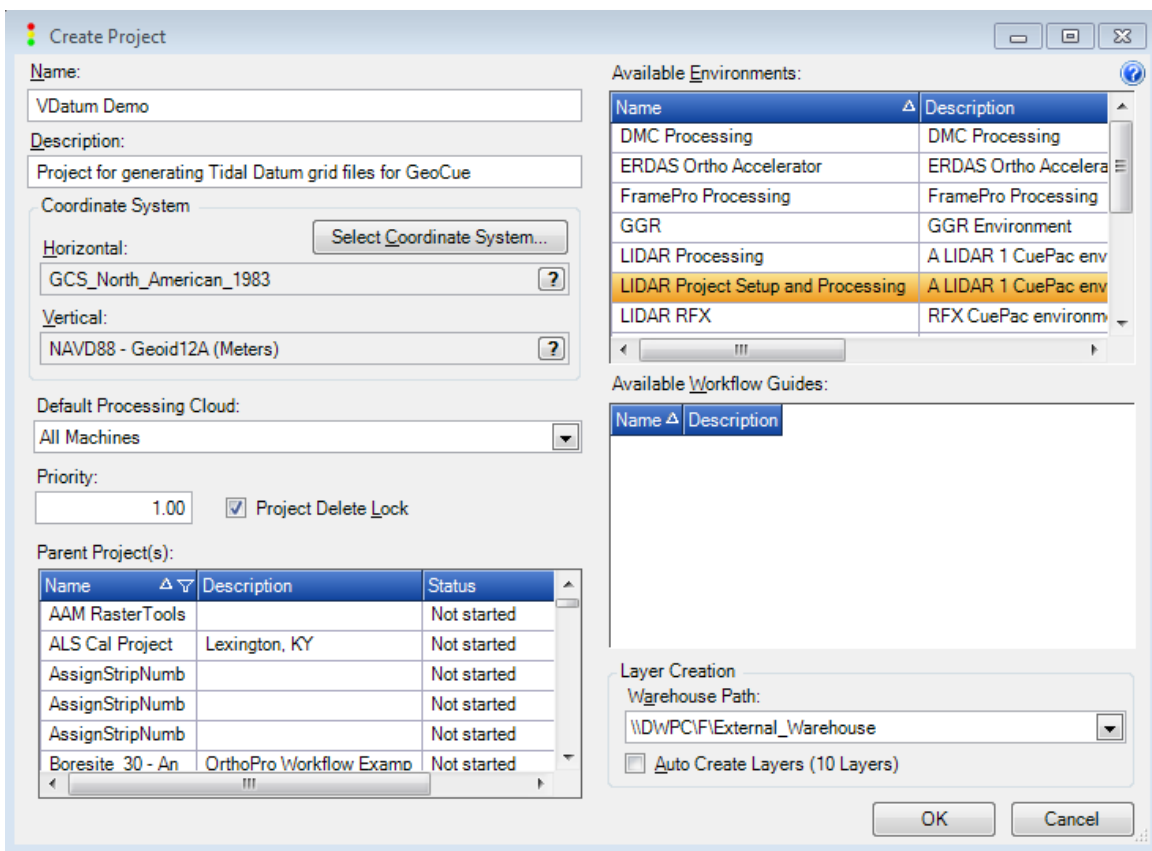


Figure 1 - Create Project Dialog

## 1.2. Import TSS GTX Files

Start Import Files by clicking its icon on the Utilities toolbar. You can import a single file, or set of files, but for this example, we will import all the files for all the available VDatum project areas.



Select 'Add Folder... ' and browse to the VDATUM install folder, typically *C:\VDatum*, then click OK.

On the folder options dialog (Figure 2) be sure to check both checkboxes and type *gtx* in the 'Extensions' textbox, then click OK.

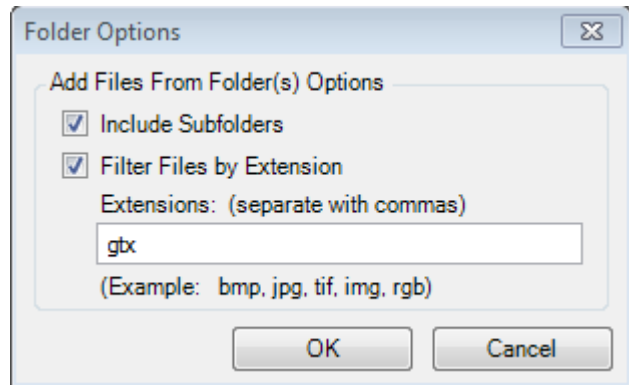


Figure 2 - Folder Options

In the File column header of the Import Files dialog, set the filter to **tss.gtx** (if both upper and lower case selections appear, you may select either).

Click the 'Select...' button in the 'Target Layer Parameters' group box. Click 'Create Layer...' and enter **TSS** for 'Name' and select GTX\_VDATUM for 'Layer Type'. Use the project horizontal coordinate system, which should be selected by default. Click OK.

For 'Entity Name' select 'Use File Basename Only'. **Be sure to check** 'Include Folder Name'. This will prefix the entity names with the subfolder name. This is required to make them unique, since all the files are named identically as *tss.gtx*.

Finally, make sure the entity type is set to TSS\_VDATUM, and verify that the 'Filtered/Total Files' correctly reflects the number of TSS files you are importing (see top of dialog). There are many .GTX files in the VDatum project folders. Make sure you are only selecting the TSS files. If not, check the filtering and/or clear and re-browse to the correct location. An example of a properly set dialog is shown below (Figure 3). Click 'Start' to begin the import.

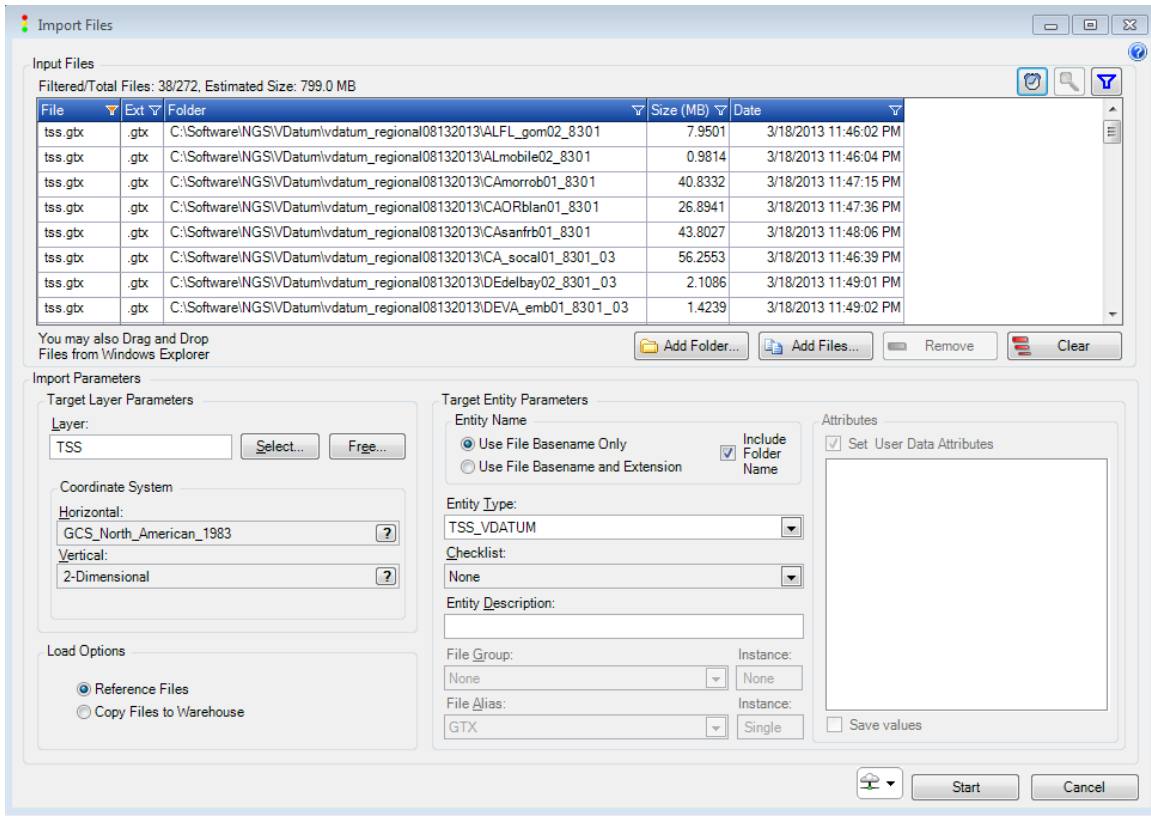


Figure 3 - Import TSS Files

If enabled, an “in-progress” icon will appear in the Table of Contents (TOC), around the visibility icon to the left of the layer name. When the icon becomes green, the import is complete. Select the fit icon to set the footprints of the imported TSS files. The image below (Figure 4) shows TSS entities in light green, superimposed over a US map. The Southern California TSS entity is then selected and the file’s header information is shown in the attributes pane (Figure 5).

Note that the US states are available in .SHP file format in the GeoCue Common Folder, under Support Data\ESRI Data\USA NAD83. These may be imported to a polygon layer with the ‘Create Entity>Import Geometry from CAD\SHP File’ command.

# CueTip

## Vertical Datum Grid Files for Tidal Datum Support in GeoCue

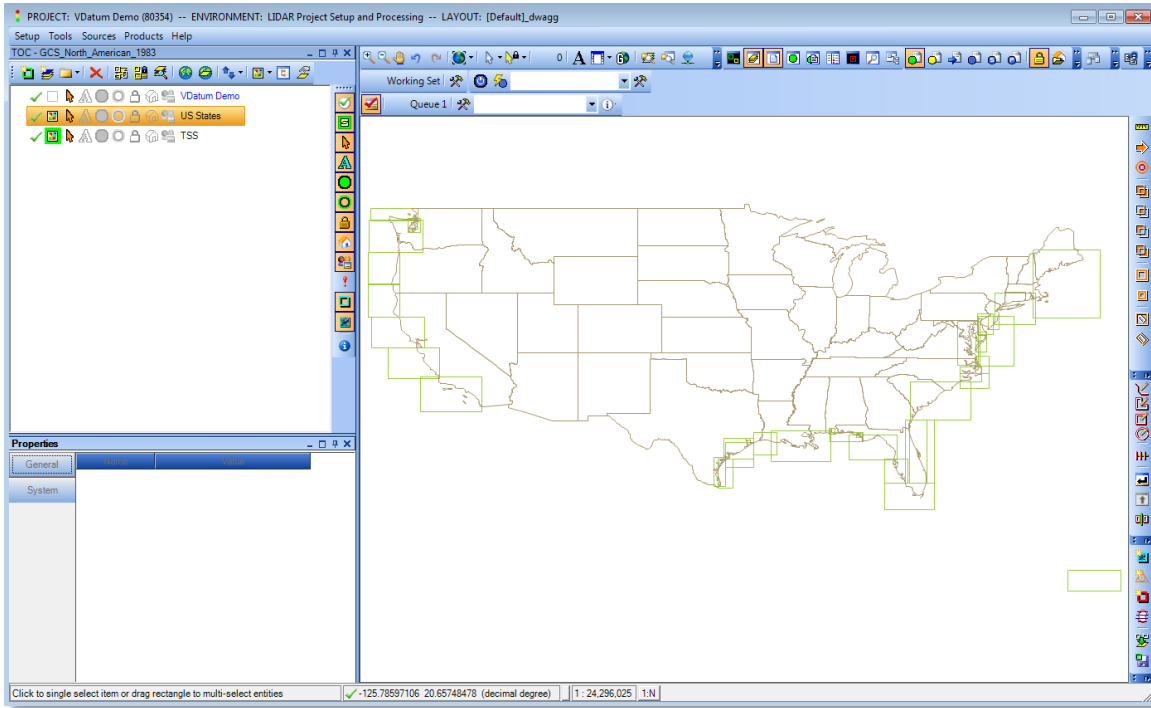


Figure 4 - Imported TSS Entities

Properties		Attributes	
General	Name: CA_socal01_8301_03-tss		
System	Name	Value	Description
Files	deltaLat	0.001	delta latitude
	deltaLon	0.001	delta longitude
Load File Pa...	Description		Description
VDatum	LLLat	32.11	lower-left latitude
	LLLon	237.86	lower-left longitude
	nCols	5,101	number of columns
	nRows	2,891	number of rows
	URLat	35	upper-right latitude
	URLon	242.96	upper-right longitude
	SubfolderName	MHW	SubfolderName

Figure 5 TSS File Header Info

Select the Files tab to see the path to the tss.gtx file.

### 1.3. Import Tidal Datum GTX Files

## Vertical Datum Grid Files for Tidal Datum Support in GeoCue

---

NOTE: This is very similar to the TSS import process above, but has an additional step at the end for selecting the correct file alias to which to import. Be careful not to omit this step!

Start Import Files. Select 'Add Folder...' and browse again to the VDATUM install folder and click OK. On the folder options dialog, check both checkboxes, type **gtx** in the 'Extensions' textbox, then click OK.

In the File column header of the Import Files dialog, set the filter to the desired tidal datum. For example, for Mean High Water set the filter to **mhw.gtx** or for Mean Low Low Water set the filter to **mlw.gtx** (if both upper and lower case selections appear, you may select either).

Click the 'Select...' button in the 'Target Layer Parameters' group box. Click 'Create Layer...' and enter an appropriate layer name, for example **MHW**, and select GTX\_VDATUM for 'Layer Type'. Use the project horizontal coordinate system, which should be selected by default. Click OK.

For 'Entity Name' select 'Use File Basename Only'. **Be sure to check** 'Include Folder Name'. This will prefix the entity names with the subfolder name. This is required to make them unique, since all the files are named identically as *mhw.gtx*.

Make sure the entity type is set to MHW\_VDATUM. This will set the checklist to "VDatum MHW V2". Set the 'File Group' to **None**. This is important, since the MHW entity type supports more than one file alias and Import Files will attempt to attach the imported files to the wrong file alias!

Verify that the 'Filtered/Total Files' correctly reflects the number of MHW files you are importing (see top of dialog). If not, check the filtering and/or clear and re-browse to the correct location. An example of a properly set dialog is shown below (Figure 6). Click 'Start' to begin the import.

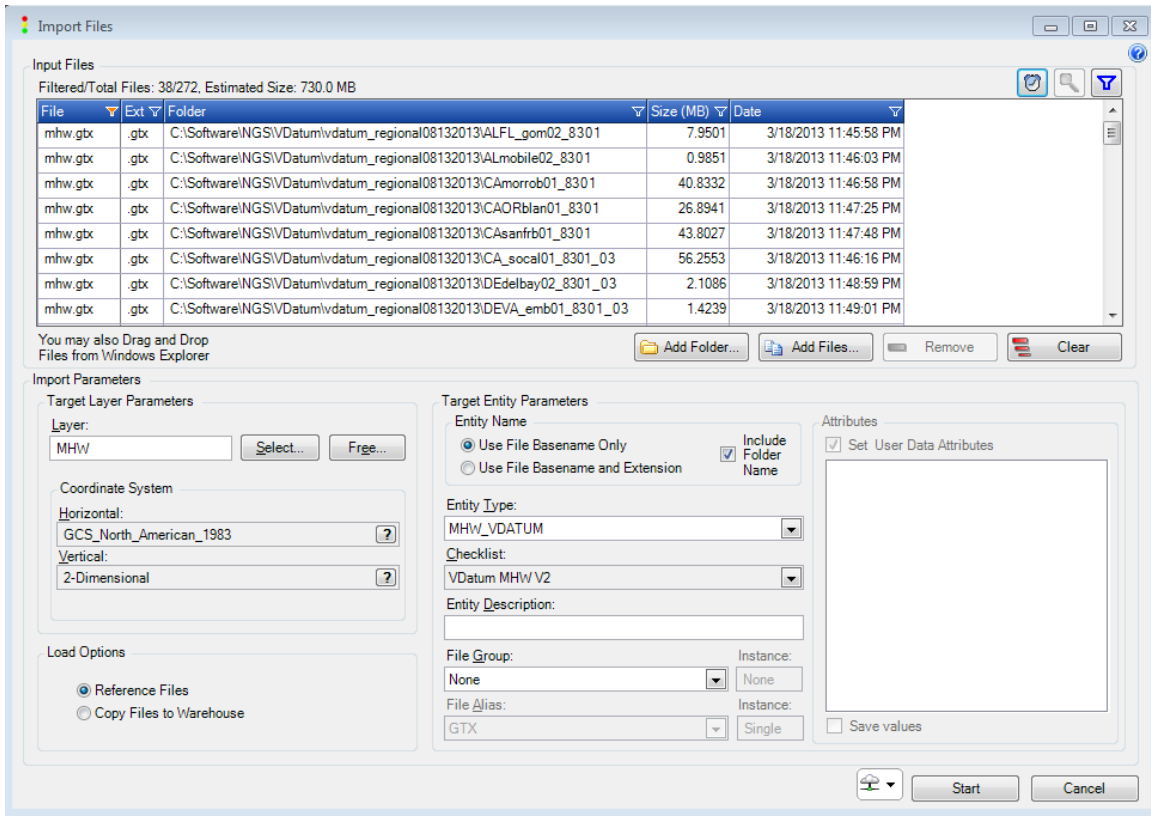


Figure 6 - Import MHW Files

If enabled, an “in-progress” icon will appear in the Table of Contents (TOC), around the visibility icon to the left of the layer name. When the icon becomes green, the import is complete. The image below (Figure 7) shows MHW entities in orange. The Southern California TSS entity is then selected and the file’s header information is shown in the attributes pane (Figure 8).

# CueTip

## Vertical Datum Grid Files for Tidal Datum Support in GeoCue

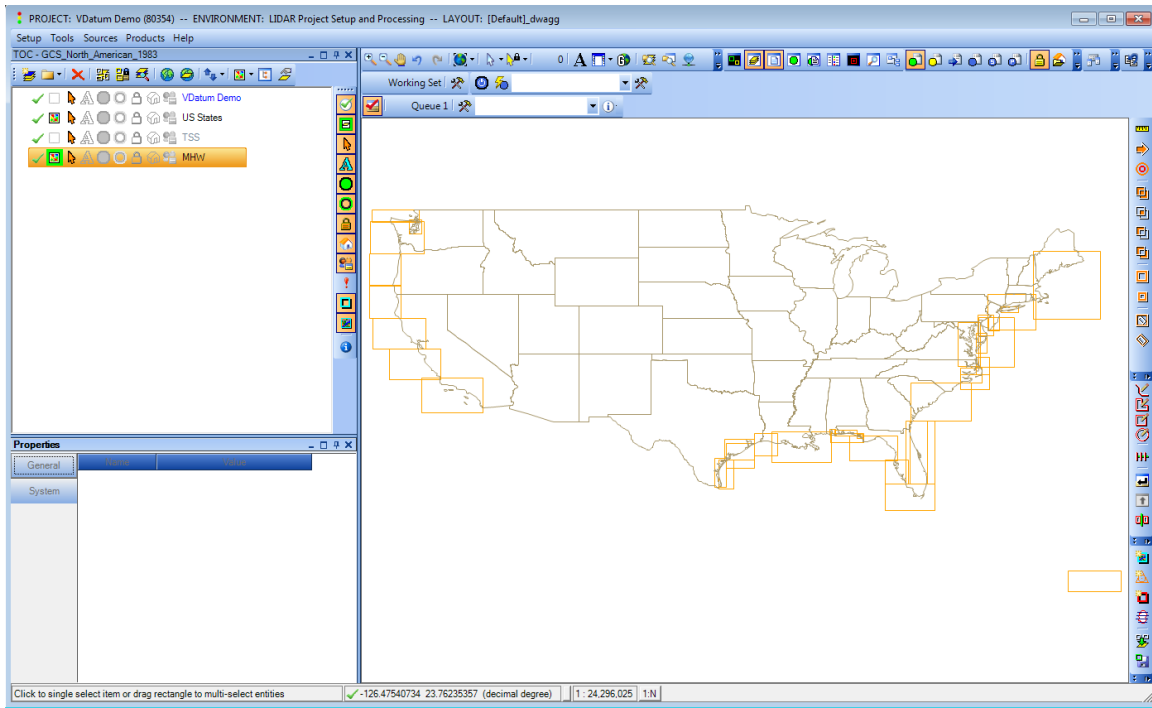


Figure 7 - Imported MHW Entities

Properties		Attributes	
General	Name: CA_social01_8301_03-mhw		
System	Name	Value	Description
Links	deltaLat	0.001	delta latitude
	deltaLon	0.001	delta longitude
Files	Description	Description	
Load File Pa...	LLLat	32.11	lower-left latitude
	LLLon	237.86	lower-left longitude
VDatum	nCols	5,101	number of columns
	nRows	2,891	number of rows
	URLat	35	upper-right latitude
	URLon	242.96	upper-right longitude
	SubfolderName	MHW	SubfolderName

Figure 8 - MHW File Header Info

Select the Files tab to see the path to the mhw.gtx file.



# Vertical Datum Grid Files for Tidal Datum Support in GeoCue

## 1.4. Associating TSS Entities to Tidal Datum Entities

GeoCue uses “Links” to associate entities together that are related. In this case, a TSS is required for each Tidal datum, e.g. MHW, to produce grid files that GeoCue needs to implement that Tidal datum. In this example, each MHW entity will need a link to its corresponding TSS entity. GeoCue’s ‘Make Link’ dialog makes this easy, since the entities are geographically coincident, or nearly so.

First, open the ‘Make Link’ dialog (Figure 9) from the ‘Link’ toolbar.



If the toolbar is not displayed, in the MapView, right-click, Toolbars and check ‘Link’.

To create links in GeoCue, the item that owns the link (the MHW entity in our case) must be in the working set, and the target of the link (the TSS entity) must be selected. Select all the MHW entities to the working set. An easy way to do this is to right-click the MHW layer and select ‘Add Layer Entities to Working Set’. Then right-click the TSS layer and select ‘Select Layer Entities’. On the Make Link dialog, choose ‘All Working Set Entities’ and VDATUM\_TSS as the Link Setting. To automatically pick the correct TSS for each MHW, we’ll use ‘Target Spatial Filtering’: choose the ‘Target Intersects Source, with the ‘Use Best Intersecting’ checkbox checked. The dialog should appear as shown in Figure 9.

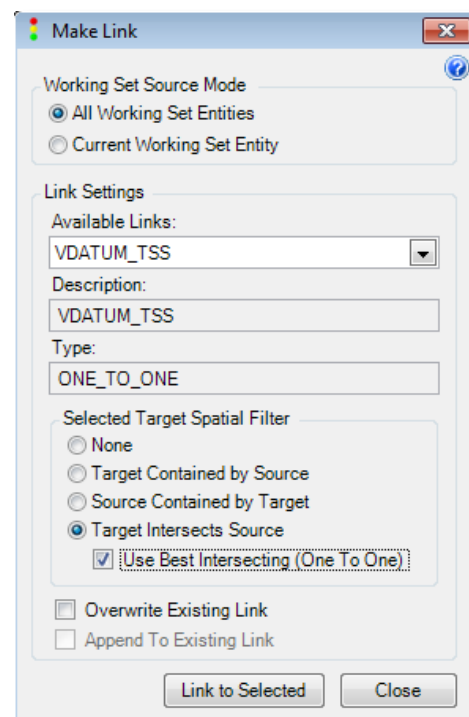


Figure 9 - Make Link Dialog

Note that a Queue is created and its toolbar displayed above the MapView showing the target entities of the linking process (the TSS entities). You may notice that fewer target entities were linked than the number of available MHW entities. This is because several TSS entities represent TSS files that are identical and the same TSS entity is the target of more than one MHW entity. Since the TSS files are identical, this is not a problem currently. If in the future, files with the same footprint exist, but are different, they will have to be linked individually with the Make Link tool.

## 1.5. Generating the GeoCue Tidal Datum Grid Files

Select all of the desired Tidal Datum entities, in this example the MHW entities, to the working set. The VDatum MHW V2 Checklist (Figure 10) will be visible in the Checklist Pane.

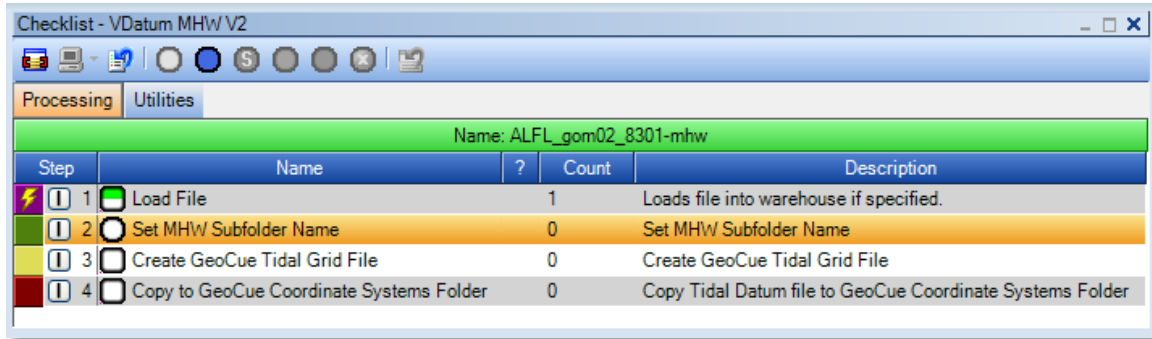


Figure 10 - VDatum MHW V2 Checklist

In the Checklist pane, select the 'Set MHW Subfolder Name' checklist step. Click the 'Set State in Progress' icon to bring up the Set Attributes dialog (

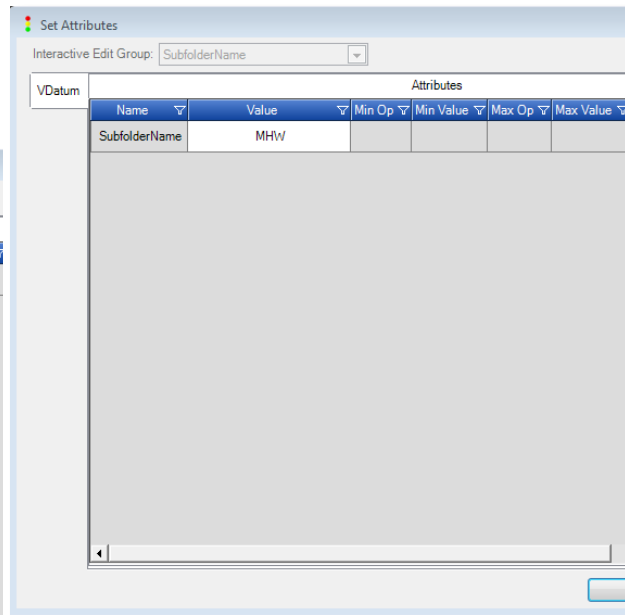
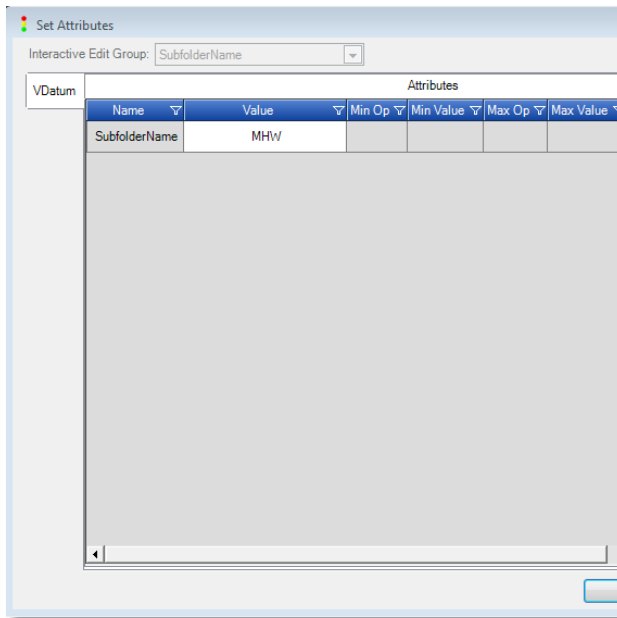


Figure 11 - Set Attributes Dialog

Figure 11).

Note in the properties pane in Figure 8 that the SubfolderName attribute is defaulted to MHW. This subfolder is used in the GeoCue coordinate system structure to organize the vertical datums. For instance, the original MHW files use the default Subfolder Name, "MHW", and so are located under

“Vertical Data\Tidal\MHW”, while the updates in GeoCue 2013 were added using a subfolder name of “MHW - 13Aug2013”, hence are located in “Vertical Data\Tidal\MHW - 13Aug2013”. This helps organize the coordinate systems when selecting them from the coordinate picker dialog (Figure 12). This whole process may be repeated for the other available Tidal datums such as MLLW by simply modifying the subfolder name at this point to correspond with the .gtx files selected earlier. Click on Set to set the SubFolderName attribute and dismiss the dialog.



Figure 12 - Tidal Datum Picker Dialog

In the Checklist pane, select the ‘Create GeoCue Tidal Grid File’ checklist step. The ‘Dispatch Automatic to Cloud’ icon defaults to ‘On’ and it is a good idea to allow the processing to be dispatched, even if just to the local machine, as this gives an easy way to abort the processing if needed. Click the ‘Set State in Progress’ icon. If no cloud has been preset, then select the machine(s) in the resulting Dispatch dialog, then click OK. GeoCue’s fill symbology can be used to see the progress as the grid files are being generated.

### 1.6. Installing the GeoCue Tidal Datum Grid Files in GeoCue

Once the ‘Create GeoCue Tidal Grid File’ step has completed, the grid and support files have been created in a GeoCue warehouse associated with the layer on which they were generated, but are not yet part of GeoCue’s Vertical Coordinate Systems. You can see a list of the files generated, and their paths, by viewing the GC Grid file group (Figure 13) in the Files tab of the properties pane (lower-left corner of GeoCue). Note the highlighted portion of the file path shows how the SubFolderName attribute is used.

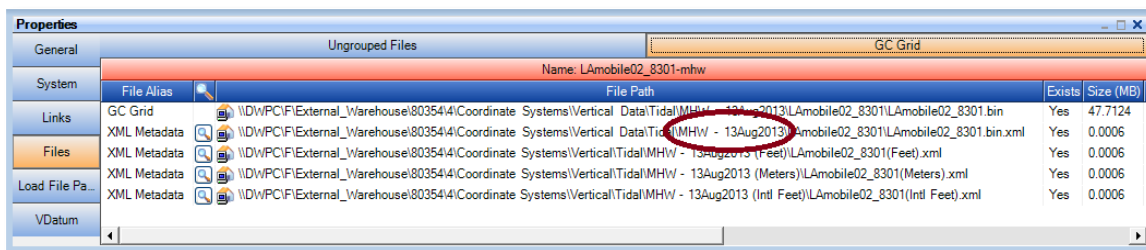


Figure 13 GC Grid File Group

# Vertical Datum Grid Files for Tidal Datum Support in GeoCue

---

Note that you can import these files (.BIN's), as entities, in a manner similar to how the MHW and TSS files were imported, by using Import Files and selecting a layer type of GCGrid\_VDATUM. That optional process includes making and viewing rasters which show a detailed footprint of the valid area of each grid file. That workflow is documented below in **Viewing Coverage of GeoCue Vertical Datum Grid Files**.

The last checklist step, 'Copy to GeoCue Coordinate Systems Folder', completes the grid file creation process by copying the files to the appropriate locations in the Coordinate Systems folder, located in the GeoCue Common folder. This step also automatically runs the 'Update Coordinate Systems List' step, which is available from the GeoCue Server Database Manager, and is required to be run any time files are added or removed from the GeoCue Coordinate Systems folder.

## 1.7. Removing Grid Files From GeoCue

If you later wish to remove, as opposed to overwrite, some existing coordinate systems files, you'll need to remove those files/folders from the Vertical/Vertical Data folders and run the 'Update Coordinate Systems List' step manually using the database manager. The Vertical/Vertical Data folders are located in the GeoCue Common folder, Coordinate Systems. The GeoCue Common folder is typically found on the GeoCue server machine at: \\<Server Name>\GeoCue. You can run the GeoCue Database Manager on the server to locate the folder if need be.

## 2. Viewing Coverage of the GeoCue Vertical Datum Grid Files

### 2.1. Introduction

GeoCue Tidal Grid files can be imported into GeoCue for viewing by using Import Files. The entity type for importing these files has a checklist step, 'Generate Valid Area Raster', which can be used to create a raster image file that shows the detailed footprint of the valid area of the grid file.

### 2.2. Location of the Grid Files

The GeoCue grid files are typically either in a GeoCue warehouse location, corresponding to the layer from which they were generated, or they are already installed in GeoCue's vertical coordinate systems folder. Locate those in the warehouse by opening the GeoCue project and selecting an MHW entity. On the entity's Files tab, select the GC Grid File Group, and read the path for the GC Grid File Alias. For files already installed in GeoCue, browse to <GeoCue Common Folder>\Coordinate Systems\Vertical Data\Tidal\MHW. As with importing the MHW/TSS files, you can import individual files, or all those beneath a parent folder.

### 2.3. Importing the Grid Files

Start the Import Files dialog. For this example, we'll assume the files have already been copied to the GeoCue Common folder and we'll add all the .bin files in the GeoCue Tidal\MHW – 13Aug2013 folder. Click 'Add Folder...' and browse there. Typically this is \\<GeoCue Server Name>\GeoCue\_Common\Coordinate Systems\Vertical Data\Tidal\MHW – 13Aug2013.

## Vertical Datum Grid Files for Tidal Datum Support in GeoCue

On the Folder Options dialog, check both checkboxes, type **bin** in the Extensions textbox, then click OK.

Click the 'Select...' button in the 'Target Layer Parameters' group box. Click 'Create Layer...' and enter **GC Tidal Grids** for 'Name' and select GCGrid\_VDATUM for 'Layer Type'. Click OK.

For 'Entity Name' select 'Use File Basename Only'. **Do not check** 'Include Folder Name'. The grid files in GeoCue have unique names already, unlike the MHW and TSS files.

Finally, make sure the entity type is set to GCGrid\_VDATUM, and the checklist set to VDatum GCGrid V2. Verify that the 'Filtered/Total Files' correctly reflects the number of grid files you are importing (see top of dialog). There are many .bin files in the GeoCue common folder. Make sure you are only selecting those under the Tidal/MHW – 13Aug2013 folder. If not, clear and re-browse to the correct location. An example of a properly set dialog is shown below (Figure 14). Click 'Start' to import the files.

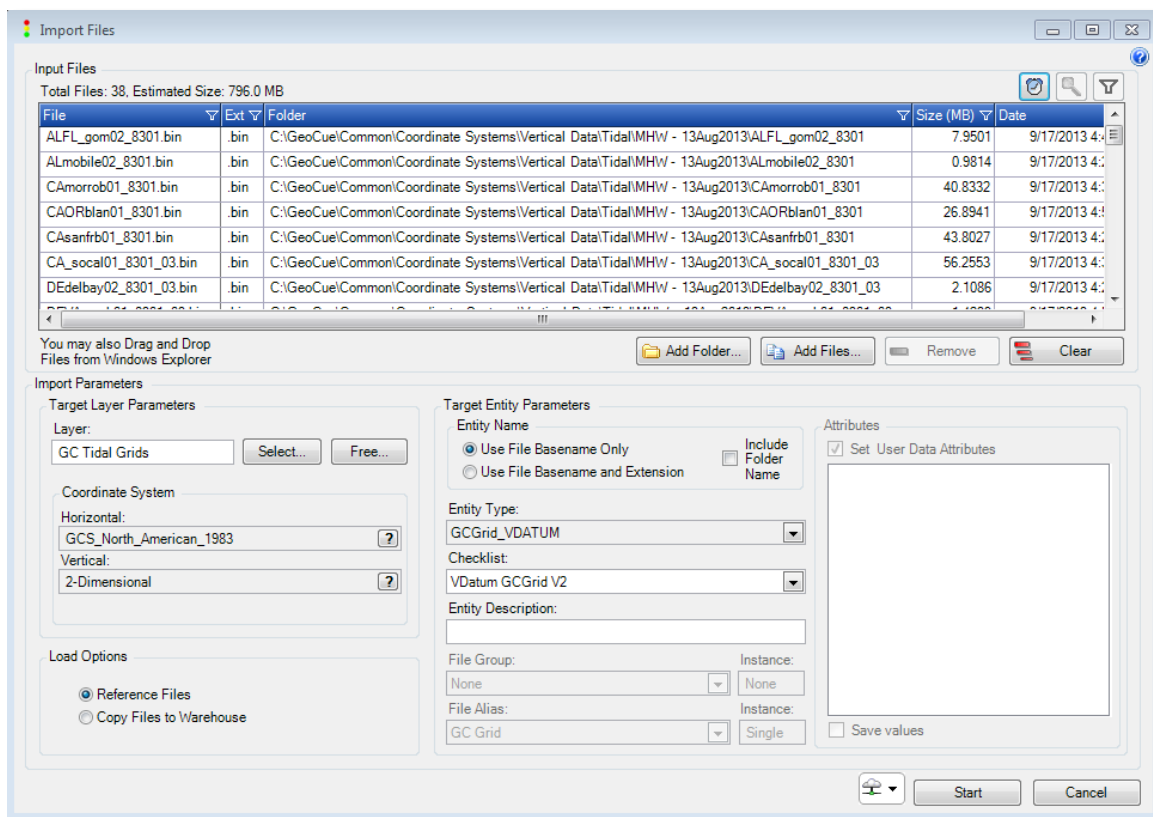


Figure 14 Import GC Grid Files

If enabled, an "in-progress" icon will appear in the TOC, around the visibility icon to the left of the layer name. When the icon becomes green, the import is complete. Click 'Fit' if the view is not already fitted. The image below (Figure 15) shows GCGrid entities in cyan.

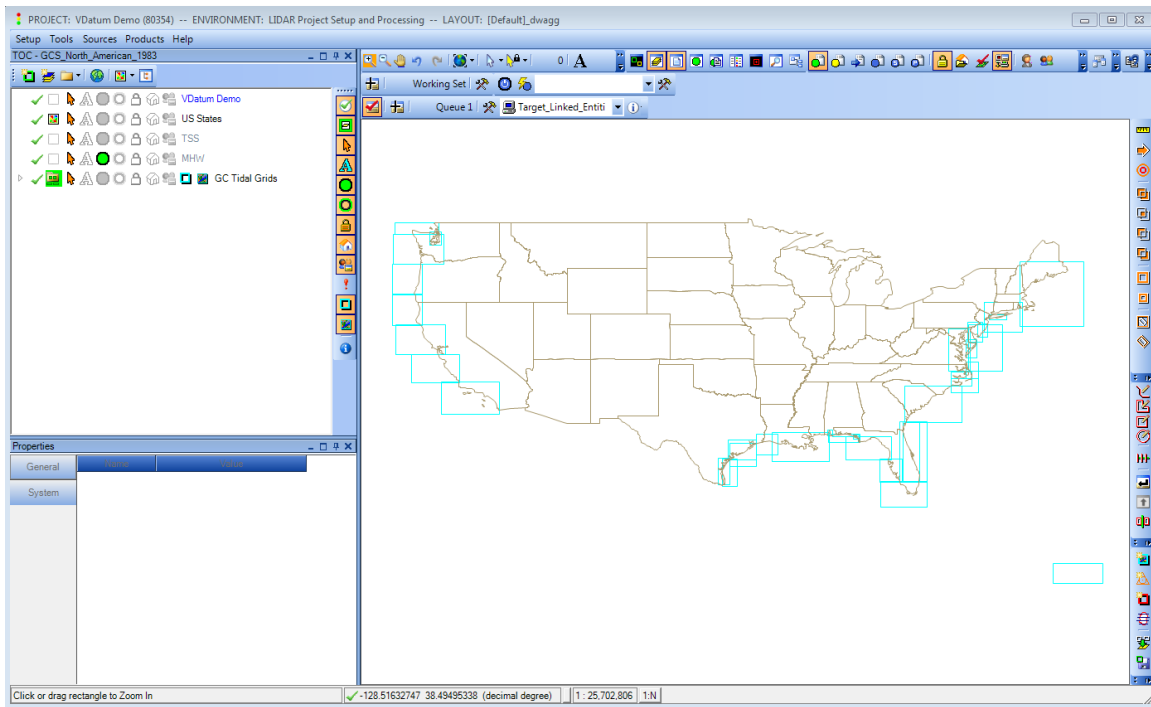


Figure 15 - Import GC Grid Entities

## 2.4. Creating the Valid Area Images

The GCGrid entities have three checklist steps, the first of which was set automatically when they were imported. The second step, Set Gray Value, is optional. Running this step allows you to change the grayscale value used to create the images. The range of values is 1-255; 200 is the default. For grids that overlap, it can be useful to set their grayscale values differently, to more easily distinguish their respective extents.

To generate the rasters, simply add the GCGrid entities to the working set (right-click the layer, select 'Add Entities to Working Set'), make sure the 'Generate Valid Area Raster' checklist step is selected, then click the 'Set State in Progress' icon.

The image below (Figure 16) shows the resulting rasters, inserted in the GeoCue MapView using the transparency color.

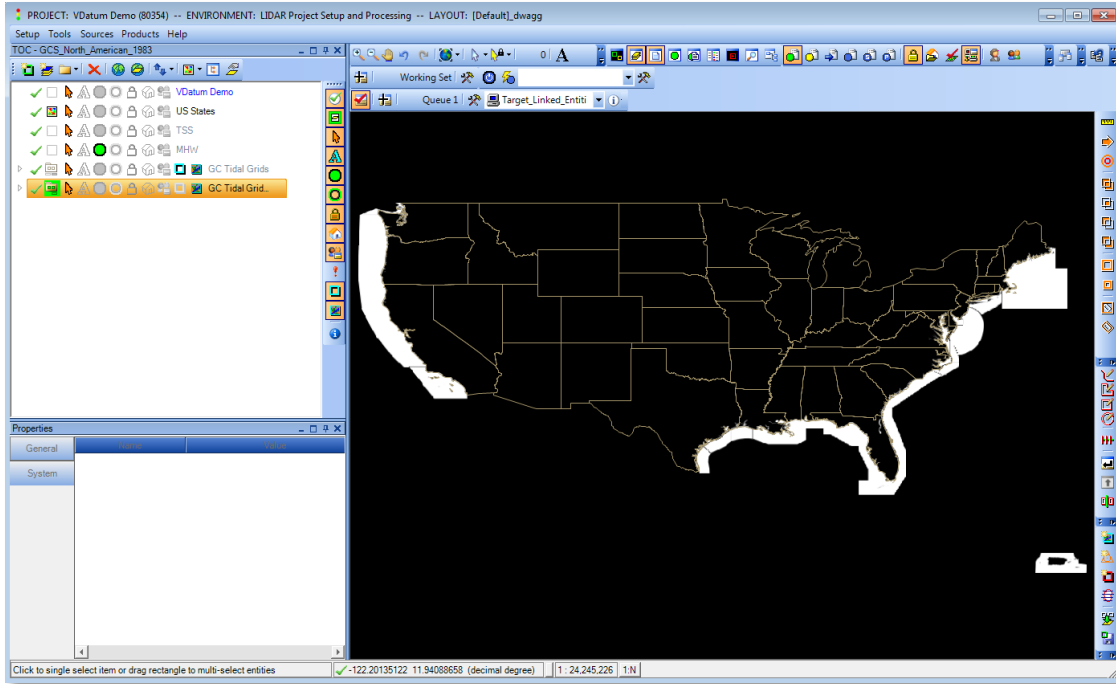


Figure 16 - Project Area Images

# Vertical Datum Grid Files for Tidal Datum Support in GeoCue

The following image (Figure 17) shows a set of neighboring images recreated with different gray scale values, to better show the boundaries between project areas. The only difference is that the Set Gray Value step was run on each prior to running the ‘Generate’ step, with different gray scale values, such as 75, 100, 125, 150, etc.

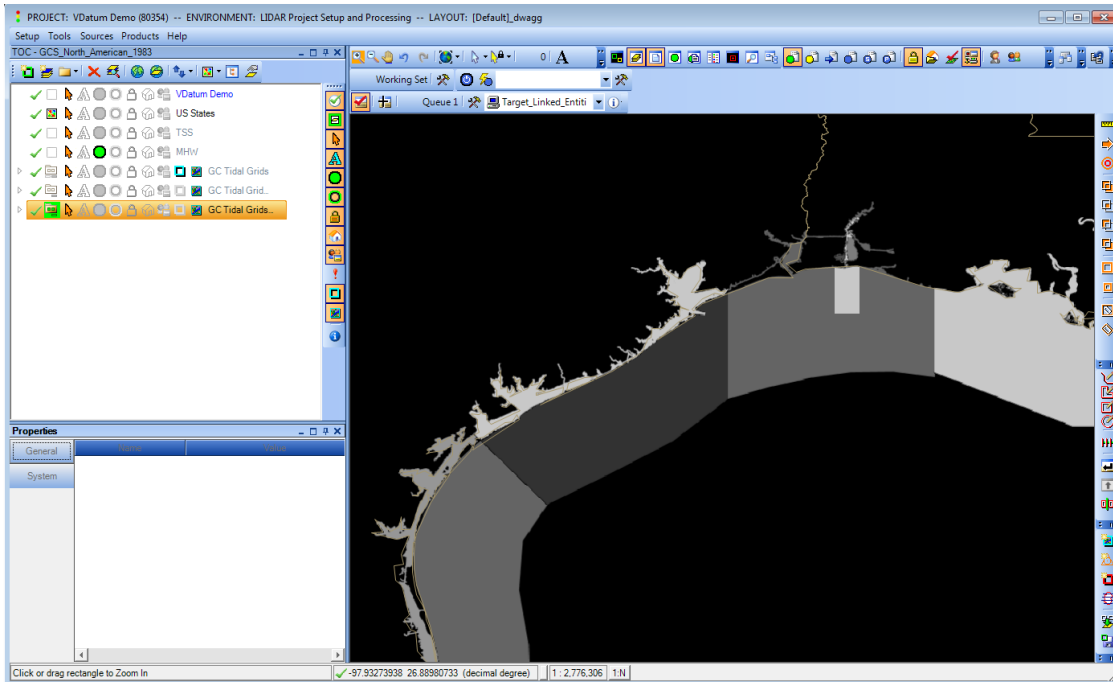


Figure 17 - Images Created Using Different Gray Scale Values

For information on this CueTip, contact:

GeoCue Group  
GeoCue Group, Inc.  
9668 Madison Blvd., Suite 202  
Madison, AL 35758  
[support@geocue.com](mailto:support@geocue.com)  
+1-256-461-8289

Find additional information and participate in our GeoCue Group user forums.

<http://support.geocue.com>