



TerraBuilder®

Version 6.0

Datasheet

www.SkylineGlobe.com

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Overview

This component of Skyline's product suite merges aerial photos, satellite images, and digital elevation models, reprojecting data into a common reference projection, for use as a base terrain layer or as a raster layer in TerraExplorer projects. TerraBuilder project files, containing all the project's raster files and their resolution pyramids, can take two forms: an uncompressed TerraBuilder Project (TBP), and a compressed, stream-optimized 3D terrain database (MPT).

For projects that are subject to frequent changes, using a TBP saves the time and resources needed to create an MPT each time a source file is updated, added or removed. Projects that are not subject to frequent changes and that are served to a large number of concurrent users can be streamed more efficiently, requiring fewer system resources, if saved as an MPT.

TBP and MPT files can be made available to remote TerraExplorer clients as well as WMS clients with WMS service by publishing the files to TerraGate, which streams them via the Terrain Service and Web Map Service (WMS). TBP streaming also requires use of the TerraGate DirectConnect extension.

Product Main Features

TerraBuilder has the following features:

- ◆ Efficient handling of massive databases. No size limitation.
- ◆ Multi-processor, multi-computer local network workload distribution.
- ◆ Highly realistic, detailed scenes.
- ◆ Data compression for minimizing disk storage and network bandwidth.
- ◆ Supports most standard data formats for source data.
- ◆ Additional support for new data source formats via a plug-in interface.
- ◆ 64-bit file pointers allow quick access to databases exceeding terabyte file sizes.
- ◆ Automatic merging (mosaic) of source data of different spatial resolutions.
- ◆ Advanced user interface for automatic or manual database customization.
- ◆ Powerful preview options and features.
- ◆ Numerous editing tools allow the expansion of user-defined layers.
- ◆ Import of server-based raster files.
- ◆ Intuitive ribbon user interface.
- ◆ Interface with TerraCatalog, a catalog database of geographic data.
- ◆ Complete localization support.

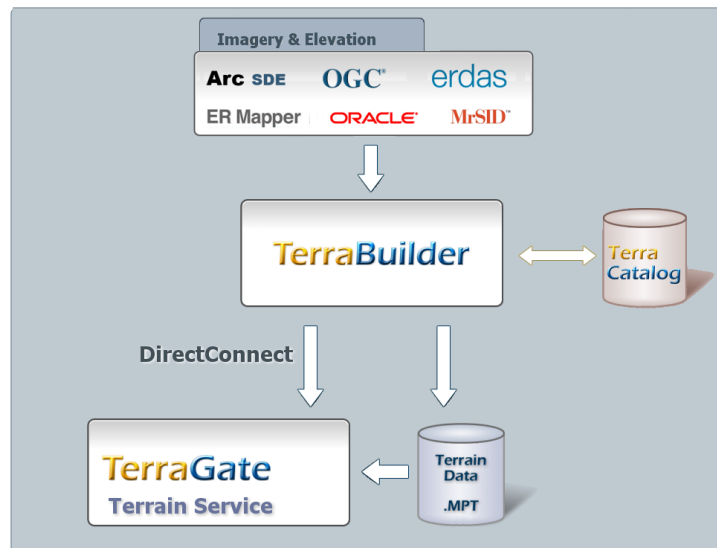


Figure 1: TerraBuilder Data Flow

Terrain Database

Terrain Database File (MPT)

The terrain database (MPT) is a compressed, multi-resolution, stream-optimized file that includes all source information and applied manipulations in the TerraBuilder project. The terrain database is used locally or published by TerraGate to Internet or Intranet users.

TerraBuilder's new terrain database format (MPT v3) offers improved imagery and elevation quality, while reducing file size and optimizing bandwidth capacity.

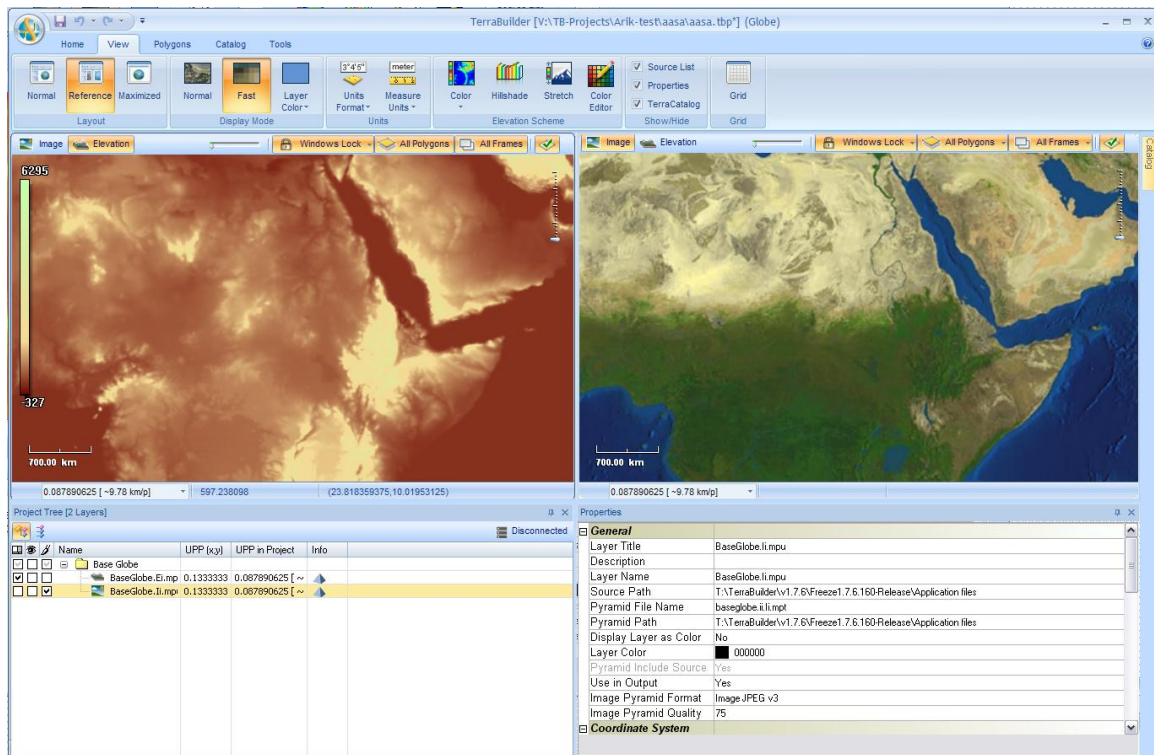


Figure 2: TerraBuilder Interface

TerraBuilder allows you to share the workload of massive 3D database creation simultaneously between several computers and multi-CPU platforms. Using TerraBuilder fusers, every computer on the network stands-by for MPT creation, adding its computing power to the 3D terrain generation process.

A TerraBuilder fuser is an application that allows TerraBuilder on another computer to utilize the resources of the fuser computer for the generation of an MPT file. The fuser operates as a copy of TerraBuilder on the client machine, adding its resources to the MPT generation process. The fuser remains idle until activated by the Master computer on the network.

Direct Connect Project

TerraBuilder DirectConnect, together with TerraGate, allows you to fly directly over a TerraBuilder Project (TBP), saving the time and resources needed to create a 3D terrain database (MPT). You can add your raster MPT files to a TerraBuilder project, perform all the required manipulations, and make the project immediately accessible through TerraGate to clients over the network.

Later, existing MPT files can be updated or removed and new layer MPT's added, to show variations of the original information.

DirectConnect can stream any TerraBuilder supported raster source that either has an internal resolution pyramid (e.g., MrSid, ECW) or for which a resolution pyramid (MPT or MPU) was created by TerraBuilder. If a source does not have a resolution pyramid, DirectConnect can still stream it, if its maximum visible UPP is set to its UPP in the project.

TerraBuilder DirectConnect can manipulate and combine multiple source files, of various formats and projections as well as unlimited size and resolution. TerraBuilder DirectConnect uses TerraBuilder fusers to exploit the combined computing power of any available server-side computers. This provides scalability for the resources needed to handle the performance-demanding workload of on-the-fly 3D terrain database creation.

Raster Layers

Imagery Layers

In TerraBuilder, you can load aerial, satellite or other raster data of different formats, coordinate systems and spatial resolutions to generate the 3D terrain texture. TerraBuilder fuses all imagery sources into a seamless mosaic that is draped over the respective elevation model.

Supported Imagery Data:

- MrSID (.sid)
- Tiff Format (.tif, .itiff)
- TiLe Text file (.tlt)
- Triangle elevation as color (.tri)
- Projection Text file (.prj)
- Erds Imagine (.img)
- Mip Terrain (.mpt)
- Gdal Gif (.gif)
- Gdal Nitf (.ntf)

- Gdal Jpeg (jpg)
- Gdal Jpeg2000 (.jp2, .j2k, jpc)
- Gdal Tiff (.tif)
- Gdal Img (.img)
- Gdal Cib
- ER-Mapper JPEG2000 (.jp2, .j2k, .jpc)
- Windows Bitmap (.bmp)
- No Stream Bitmap (.bmp)
- No Stream Jpeg (.jpg)
- No Stream Gif (.gif)
- Undefined Raw
- Multi Channel (.mcn)
- ERDAS IMAGINE (.img)
- ER-Mapper (.ecw)
- ER-Mapper Server (.ecwp)
- NGA CIB (a.toc)
- NGA CADRG (a.toc)
- NGA ADRG (a.toc)
- Oracle Spatial Database
- ECW Image Web Server
- TerraGate Server (.tgate)
- Image MPU (.li.mpu)
- ArcSDE Raster Server (.sde)
- Web Catalog Service (CSW)
- Web Map Server (.wms)

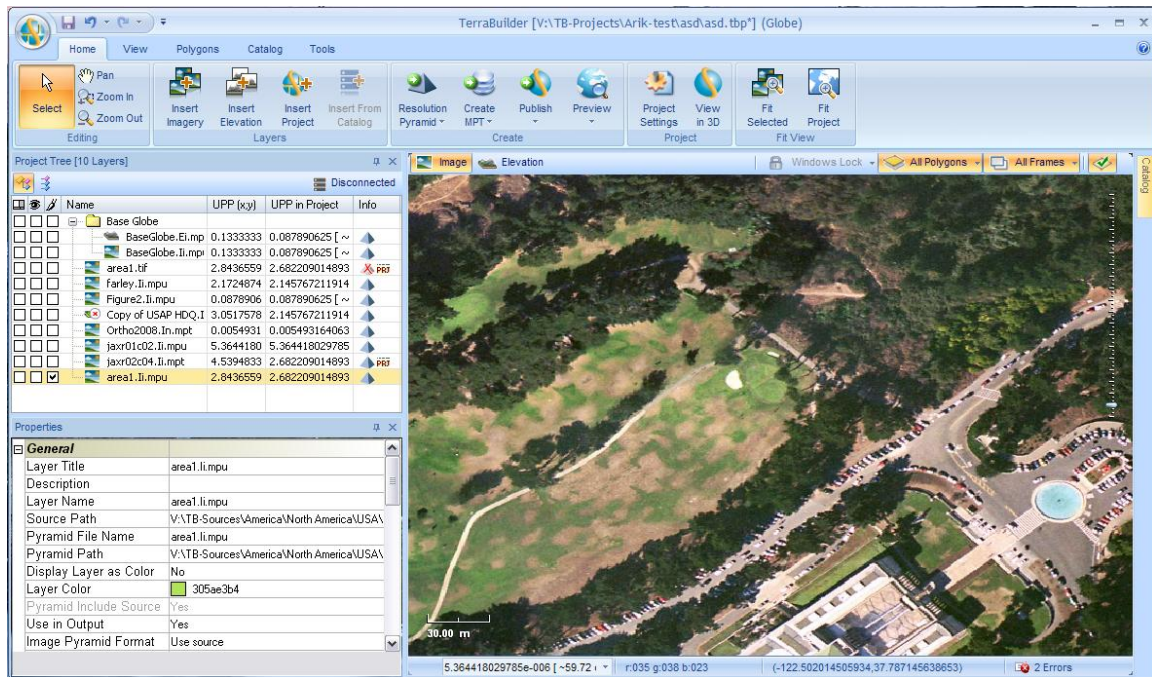


Figure 3: High Quality Imagery source

Elevation Layers

In TerraBuilder, you can load raster or irregular-grid elevation data of different formats, coordinate systems and spatial resolutions to generate the 3D terrain model. TerraBuilder fuses all elevation sources into a seamless surface that is merged together with the respective imagery data.

Supported Elevation Data:

- Window Bitmap (.bmp)
- ER-Mapper (.ecw)
- ER-Mapper Server (.ecwp)
- Gdal Dted (.dt?)
- Gdl USGS Ascii Dem (.dem)
- Gdal USGS SDTS Dem (.ddf)
- Gdal Arc/Info Binary rid (.adf)
- Gdal Img (.img)

- Gdal Tiff (.tif)
- Erdas Imagine (.img)
- Mip Terrain (.mpt)
- Elevation MPU (.Ei.mpu)
- NGA DTED (DMED)
- No Stream Bitmap (.bmp)
- No Stream Jpeg (.jpg)
- No Stream Gif (.gif)
- Geo Raw (.grw)
- Undefined Raw
- Tiff Format (.tif)
- TiLe Text file (.tlt)
- Triangle Elevation (.tri)
- Projection Text file (.prj)
- Web Map Server (.wms)
- TerraGate Server (.tgate)
- ArcSDE Raster Server (.sde)
- ECW Image Web Server
- Oracle Spatial Database
- Web Catalog Service (CSW)

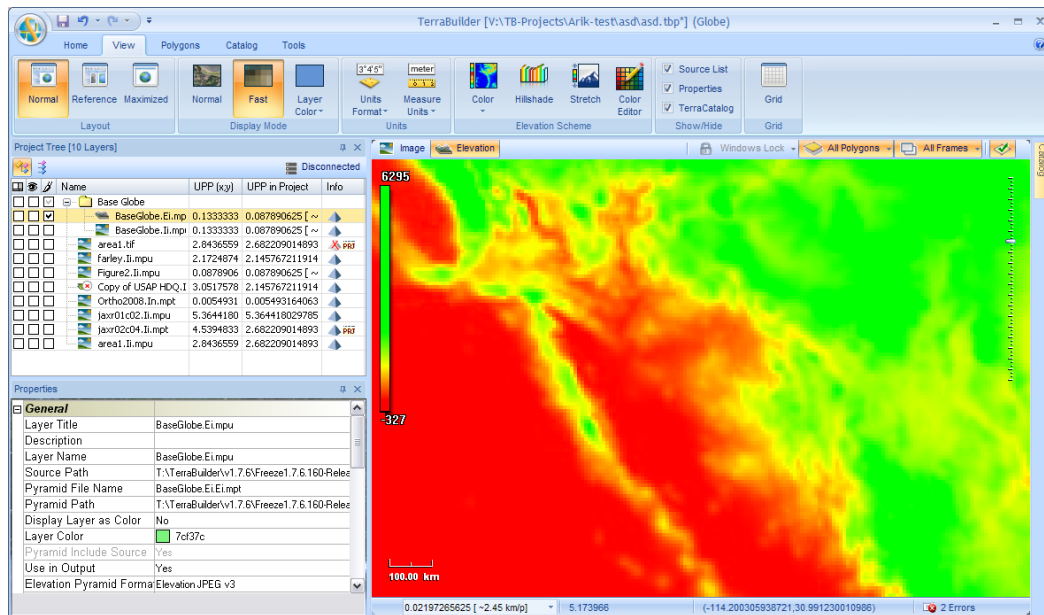


Figure 4: Elevation source

Coordinate Systems

The coordinate system describes the method by which the data locates positions in the world. Each coordinate system is associated with its Well Known Text (WKT) description, a simple structured, text-based format that is easy to store and share between systems (**See:** <http://www.geoapi.org/2.0/javadoc/org/opengis/referencing/doc-files/WKT.html>). The coordinate system continues to be defined also by four standard parameters, Group, System, Datum and Units, in order to provide backward compatibility.

Globe projects use a latitude and longitude coordinate system based on the Earth's dimensions to create a spherical terrain database. Planar projects use a variety of coordinate systems to create a flat terrain database.

All project layers must use the same coordinate system. If you add a layer to a project that uses a different coordinate system than the one you set when you started the project, TerraBuilder reprojects (converts) the layer's data, so that the same location is described, but in the project's coordinate system. If a layer does not include coordinate system information or TerraBuilder is unable to read

this information, you must supply the coordinate system information so that TerraBuilder can reproject the layer.

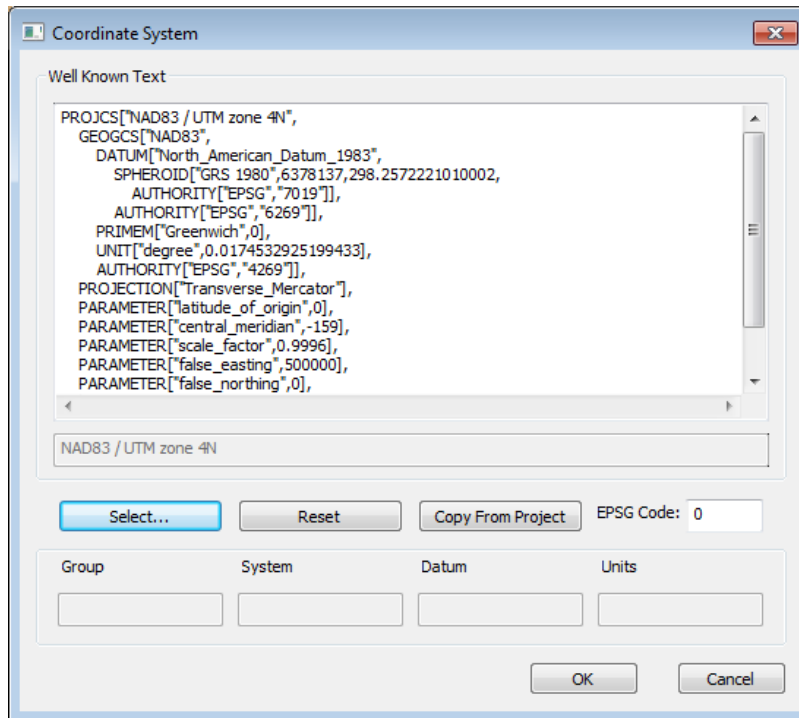


Figure 5: Select Coordinate System

Layer Manipulation

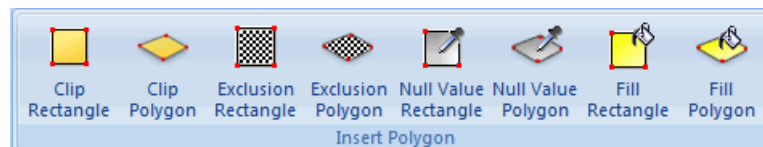
You can manipulate the sources you have imported to your project, clipping, resizing, moving and recoloring layers, as required, to create a photo-realistic, geographically accurate database. Some layer information is modified in the Properties Sheet, while other information is changed in the layer windows. The following techniques are used to manipulate layers:

Polygon Operations

Draw polygons and rectangles in the Working Window to clip layers, erase a selected color or elevation value, or fill a particular area with a color or elevation value. A polygon/rectangle can be applied to any number of layers simultaneously.

TerraBuilder supports four types of polygon operations:

- ◆ **Clip** - The clip polygon/rectangle is used mainly to mark the areas of the layer you wish to include in the final project. All areas outside the clip polygons will automatically fill with a lower resolution layer covering the same area.
- ◆ **Exclusion** - The exclusion polygon/rectangle is used mainly to cut away areas of the layer you do not wish to include in the final project. All areas within the exclusion polygons will automatically fill with a lower resolution layer covering the same area.
- ◆ **Fill Color/Elevation** - The Fill Color polygon/rectangle is used mainly to cover elements that you do not want to show in the final output, such as: military facilities or private land. The Fill Elevation is mainly used to crop elevation (e.g. elevation values below a high tide mark) or replace elevation values (e.g., cover an area with a flat elevation to hide secure information).
- ◆ **Remove Null Value** - The Remove Null Value polygon/rectangle is used to remove unwanted values that represent non existing values or transparency. If there are several layers of sources, removing a value from a top layer exposes the layers below it according to the UPP levels and the order in the Ordered Source List. The Tolerance margin is used to define the permissible deviation from the specified value when the color or elevation values are irregular.



Insert Polygon Group on TerraBuilder Ribbon

Adjustment of Color and Elevation Parameters

Modify the RGB levels of an image layer in the layer's Properties Sheet. You can either enter precise luminosity, gamma and saturation values or adjust the RGB histogram. Elevation values can be scaled in the layer's Properties Sheet in order to adjust elevation layers that are defined with reference to a baseline other than sea level, or in units other than meters.

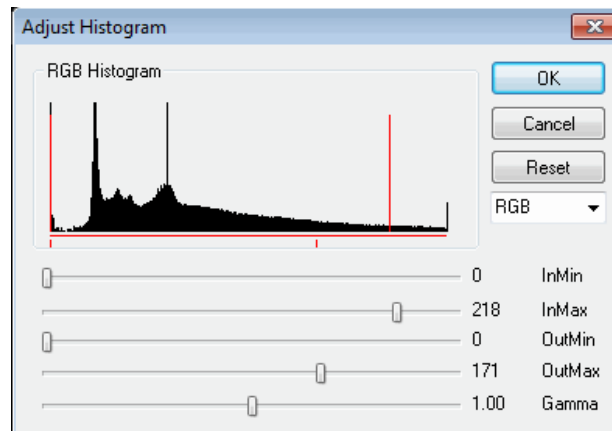


Figure 6: Color Adjustment Dialog

Modification of Layer Dimensions and Resolution

In a layer's Properties Sheet, you can modify a layer's coordinates and resolution level (UPP).

Clipping and Moving Layers

A layer boundary frame and layer extent frame are automatically created in the Working Window when you add a new source to the project. By moving the layer boundary frame, you move the layer and define its boundaries. The layer extent frame acts like a clip rectangle that is specific to that layer.

Manual Source Positioning

You can define the geographical coordinates of a layer with respect to the coordinates of other reference layers. This allows you to view a layer whose coordinates are unknown, and set its coordinates by inserting a number of tie points in both this layer and the layers with known coordinates. Each tie point appears in both layers, and represents identical physical features.

Tools

Measurement Tools

TerraBuilder provides two measurement tools for use in the layer windows:

- ◆ Measure Distance

- ◆ Measure Area

Convert Z ASCII Elevation

The Convert Z ASCII Elevation tool converts an ASCII file of Elevations to a GRW (binary Geo Raw) file for use as an elevation source for TerraBuilder Projects. The file must contain a list of numbers, where each number is the elevation of a point. The points form a uniform grid (the geographical space between every two points must be equal in X-axis and Y-axis). The file cannot have any header.

Convert XYZ ASCII Elevation

The Convert XYZ ASCII Elevation tool converts XYZ ASCII files to GRW (binary Geo Raw) files for use as elevation sources for TerraBuilder Projects. The XYZ file must contain a uniform grid of points (the geographical space between every two points must be equal in X-axis and Y-axis).

Triangulate Irregular Elevation Grid

The Triangulate Irregular Elevation Grid tool converts XYZ, DXF and other vector files to TRI (Triangulated) files for use as elevation sources for TerraBuilder Projects. The Triangulate Irregular Elevation Grid tool creates a multi resolution elevation file. This file can be divided into tiles that can be used individually for calculations. Since it is difficult to triangulate with large datasets, breaking a large file into tiles is recommended. An additional benefit is that using tiles uses fewer resources and saves time. This tool can automatically calculate an optimal tile division.

The file formats that can be triangulated using the Triangulate Irregular Elevation Grid tool are:

- ◆ XYZ – converts the .xyz ASCII points' format to TRI format.
- ◆ DXF – converts the .dxf points' format, points' and break lines' format or Tin (triangulated) format into a TRI format.
- ◆ QUE – converts the .que format to the TRI format.

- ◆ 001 – converts the .001 format to the TRI format.
- ◆ REG – Converts the .reg format to the TRI format.
- ◆ GD – converts .lf and .pf formats to the TRI format.

Gather Tiled Files

The Gather Tiled Files tool gathers several files into a custom number of Tile Text File (TLT) source files for TerraBuilder. This allows you to load several files into TerraBuilder as one file, or as a specified number of custom-tiled source files.

These files must all have the same Units Per Pixel, and must be located in the same folder.

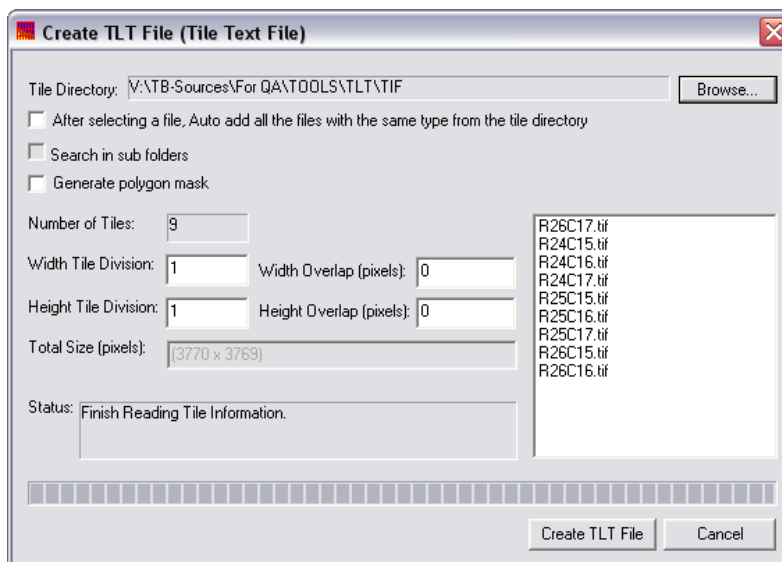


Figure 7: Gather Tiled Files Tool

Split and Merge MPU-MPT Files

The Split and Merge MPU-MPT Files Tool splits MPU and MPT files that were created using older TerraBuilder versions, into a more efficient Split format. It also merges Split MPU and MPT files into one MPU or MPT file.

The Split size is determined by the value entered in the System Preferences property page (Default value is 2 GB). You can select 640 MB, 700 MB, 2 GB, 4 GB, 4.7 GB or no split.

Secure Terrain Databases and TerraGate Servers

The Security tool enables you to increase the security of terrain databases (MPT) and local or remote TerraGate servers by adding User/Password protection. You can set permissions restricting viewing, editing, and extraction of the terrain database. You can also limit access to your resource for a specific time interval.

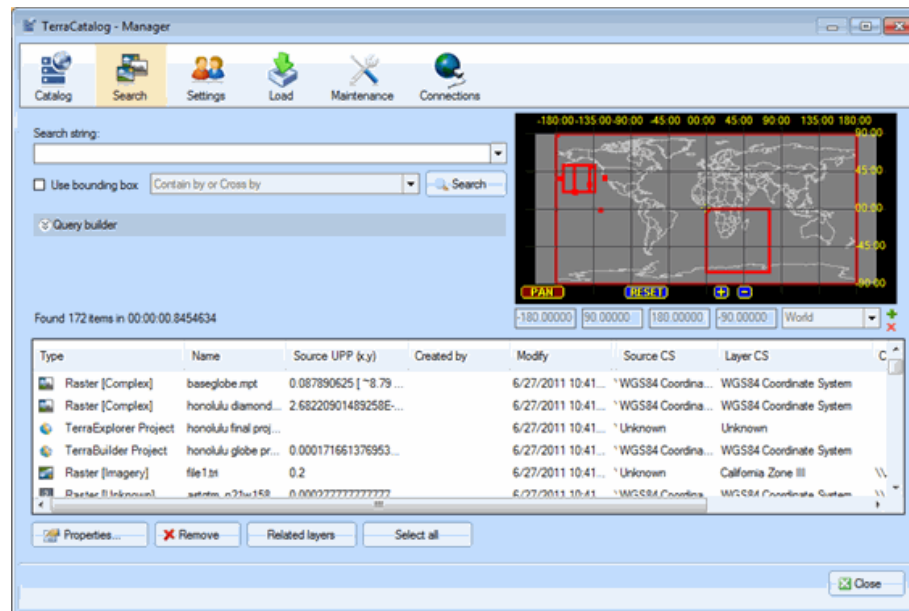
TerraCatalog

TerraCatalog, a new catalog database that stores, organizes and manages connections to imagery and elevation sources and projects, enables you to easily access the geographic data you require for a TerraBuilder project, as well as share your project with other users. The catalog can be searched by geographic properties or by attribute query.

Two modes are available for working with TerraCatalog:

- ◆ **Connect to Catalog** (only) - Catalog layers can be loaded into your project.
- ◆ **Bind to Catalog** - Every source or project loaded to your project and all modifications to the project are automatically updated in the catalog every time the project is saved.

TerraCatalog simplifies the interaction and collaboration of different users working with the same data sources. When a data source is modified, it can be easily updated for all projects using the same source. If alternative versions of a data source exist in the catalog, a user can easily replace the project's current version with any of the alternates.



TerraCatalog Search Dialog Box

System Requirements

- ◆ **Operating System** - Windows® XP / Vista / 7 / 2003 Server / 2008 Server.
- ◆ **Processor** - Pentium IV or equivalent. TerraBuilder works best in a multi-core environment and can utilize multiple CPU's and hyper-threaded processors.
- ◆ **System Memory** - 1 GB of RAM (8 GB or more recommended).
- ◆ **Video Card** - 128 MB of video memory (512 MB or more recommended). Required only for viewing in 3D.
- ◆ **Browser** - Microsoft Internet Explorer 7 or higher.
- ◆ **User Privileges** - Administrator privileges required for installation.

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