Skyline® it's your world™

TerraExplorer® Pro Version 8.0

User Guide

Skyline Software Systems Inc.

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CHAPTER 1 INTRODUCTION

About TerraExplorer

TerraExplorer is a cutting-edge 3D GIS desktop viewer and creator that provides powerful tools and a high-resolution 3D environment in which to view, query, analyze and present geospatial data.
With TerraExplorer's robust and extensive capabilities, realistic 3D visualizations can be created by overlaying the terrain with unlimited data layers, 3D models, virtual objects and more.

Analysis

In addition to basic measurement and analysis tools for distance, slope, area, and volume measurements, TerraExplorer features advanced and robust capabilities for line of sight, shadow display and query, comparison and elevation difference, cross section, clip box, buffer query, flood analysis, terrain profile, and more.

Display

Imagery and elevation layers of unlimited size and resolution in a wide range of formats can be overlaid on the terrain and seamlessly integrated with feature layers and multi-resolution, stream-optimized 3D mesh model layers for easy visualization, access, and analysis of 3D geospatial data. If a new layer is based on a source that uses a different coordinate system, the layer can be reprojected to the project's coordinate system.

Point, line, and polygon features can be displayed and used to display advanced layer information based on their attribute data. TerraExplorer also includes an extensive set of objects: 2D and 3D, dynamic, buildings, models, point cloud models and video, that can be displayed on the terrain, as well as advanced terrain objects that allow terrain modification within TerraExplorer Pro. A flexible clipboard mechanism and sophisticated duplication tools make it easy to copy, paste, and position objects on the terrain.

Realism is enhanced with environment settings that include lighting effects, horizon distance, fog color, sky texture, cloud display, and shadow color.

Spatial Queries

TerraExplorer provides advanced capabilities for manipulating feature and 3DML data and analyzing spatial relationships. Various spatial operations can be performed on a layer’s features, including merging features into a single feature, clipping one polygon from another, exploding a multi-part feature into its individual component features, and exporting selected features to a new file.

Complex spatial and attribute queries are supported. Features can be filtered based on attribute value or based on their spatial relationship with a specified polygon, line point or object. A buffer zone can be defined to include features within a certain radius of the selection.

Publishing Data

SkylineGlobe Server streamlines the TerraExplorer workflow, enabling complete projects and layers to be optimized and published directly from TerraExplorer Pro to the cloud server. Through a single publishing operation, the data is made available to all TerraExplorer clients: Desktop, Mobile, and TerraExplorer Fusion, as well as standard geospatial clients such as WFS/WFS-T/WMS/WMTS/3D Tiles (Cesium).

Creating and Sharing 3D Presentations

TerraExplorer’s presentation tools enable you to create a presentation, in which you communicate a specific view of the 3D World, by combining a customized flight route with a particular display of the project. Your presentation consists of one or more steps, in each of which you control the display of the

3D World, including current camera position, layer and object visibility, system time, and popup messages and captions. Presentations can be easily converted to standard video files.

Optimization

Advanced tools allow conversion of model files and of point cloud data from various formats to a stream-optimized Skyline-proprietary format for improved display performance as well as download rate. The Extract Terrain tool extracts and creates a subset of a local or remote terrain database for easy distribution.

Product Highlights

- Efficient streaming of raster, feature, and 3D mesh layer (3DML) data over standard networks.
- Interactive drawing tools to create and add 2D and 3D objects, labels, modify terrain objects, and buildings on a 3D terrain model.
- Loads 3D models, video, and geo-referenced information layers
- Supports editing and saving of layers to GIS standard file formats.
- Communicates with external local and web applications using standard COM interface. Controls all static and dynamic objects, information layers and application content.
- Robust set of tools for measurement and terrain analysis.
- Hyperlink feature links specific areas, or objects, to web pages, applications, and databases.
- Integrates text and web content messages.
- Presentation tool enables sharing of geographical information through dynamic presentations.
- Creates movies, as AVI, from any presentation.
- Takes snapshots of the 3D Window and saves them to external files.
- Powerful tool for creating 3DML data sets from point layers with individually referenced 3D models.
- Users can easily share, post, find, and load necessary geographic data for a TerraExplorer project by logging in to SkylineGlobe Server.
- Publishing tool to create project directory ready for distribution to external users. Additional publishing options enable extraction and publishing of a geographic subset of the project for offline users.
- Provides improved level of security for local and remote users.
- Advanced Ribbon customization options allow external developers to integrate new custom tools into the TerraExplorer Ribbon.
- Export the 3D Window, Project Tree and Navigation Map as ActiveX controls.

Embedded Mode

All TerraExplorer versions can run as embedded ActiveX controls in any Windows application or Web page. Using the power of the TerraExplorer API, developers can interact between the application or the web page and the TerraExplorer controls.

TerraExplorer has several ActiveX controls, including:

- The 3D Window
- The Project Tree
- The Navigation Map window

The TerraExplorer embedded mode is an integrated feature in all TerraExplorer products.

Data Flow

TerraExplorer can be used in a local desktop environment, accessing terrain and content data directly, or in a network environment via the SkylineGlobe Server, Skyline's private cloud solution. SkylineGlobe Server provides streaming services for all your spatial data types including terrain (MPT/TBP), map (raster-WMS/WMTS), feature (WFS/WFS-T), 3D Mesh (3DML, OGC 3D Tiles, I3S/SLPK), and point cloud (CPT, OGC 3D Tiles). Individual geospatial layers and complete projects can be directly uploaded and published to the cloud server from TerraExplorer or other Skyline client applications, thus streamlining your workflow and eliminating the need for any server-side login after initial installation. Through a single publishing operation, data is made ready for consumption by all TerraExplorer clients: Desktop, Mobile, and TerraExplorer Fusion, as well as standard geospatial applications.

SkylineGlobe Server DirectConnect enables you to serve terrain databases defined by the TerraBuilder project file (TBP) to TerraExplorer clients and any application that reads the standard OGC WMS/WMTS protocol, eliminating the need for time-consuming re-creation of complete MPT files. This is critical for projects whose source data is constantly being updated or modified. DirectConnect leverages cache technology and support for multi-core and multi-computer processing to provide scalability and accelerate the publishing of massive data sets.

TerraExplorer Resources

Information about the application and about your application license is easily accessible from the **File** menu .

To open TerraExplorer resources:

- On the **TerraExplorer** menu , point to **Resources** and then select one of the following:

Resource	Description
TerraExplorer Help (F1)	Opens TerraExplorer's Help files.
TerraExplorer Programmer's Guide	Provides access to the TerraExplorer Programmer's Guide Help files
TerraExplorer Quick Guide	Opens TerraExplorer's Quick Start Guide, which helps you find your way around TerraExplorer.
Interactive Tutorial	Provides a set of samples written with TerraExplorer API. It allows executing samples to see their effects and reviewing the source code of each sample.
TerraExplorer Knowledge Base	Opens Skyline's knowledge base, a centralized repository of information about TerraExplorer and other Skyline applications.
License Manager	Opens the License Manager tool.
About TerraExplorer	Displays basic license and product information.

TerraExplorer Family

The TerraExplorer family of products is a range of 3D visualization clients that enables users to interact with, edit and annotate a geo-referenced 3D environment. TerraExplorer can be used in a local desktop environment, accessing terrain and content data directly, or in a network environment via the SkylineGlobe server.

- **TerraExplorer Desktop** – A cutting-edge 3D GIS desktop viewer and creator that provides powerful tools and a high-resolution 3D environment in which to view, query, analyze and present geospatial data. With TerraExplorer's robust and extensive capabilities and ever-increasing interoperability, stunningly realistic 3D visualizations can be created by overlaying the terrain with unlimited data layers, 3D models, virtual objects and more.
- **TerraExplorer Fusion** – Web-based 3D geospatial viewer that enables you to view and analyze high-resolution, stunningly realistic 3D content right in your web browser with no download or installation required. TerraExplorer Fusion, enables viewing of most online layers and objects published by TerraExplorer Pro, performing measurements and analysis operations, and customizing web applications tailored to any customer needs.
- **TerraExplorer for Mobile** – A 3D GIS viewer for Android and Apple iOS devices that enables you to view high-resolution, realistic SkylineGlobe 3D content. The TerraExplorer for Mobile app can display most of your spatial databases including 3D city layers and feature layers, and it provides powerful tools to query, analyze and present your data on the go. TerraExplorer for Mobile seamlessly accesses online data from Skyline's SkylineGlobe server and other OGC-compliant servers, and quickly loads online TerraExplorer projects.

TerraExplorer Desktop

TerraExplorer Desktop is available in three versions, offering increasing levels of functionality:

- **Viewer** – Users can navigate through and perform advanced terrain analysis of high-resolution 3D world environments created by fusing aerial and satellite photography, terrain elevation data and other 2D and 3D information layers. TerraExplorer Viewer also provides basic editing capabilities, including loading of online 2D and 3D layers as well as selected offline formats.
- **Plus** – Adds loading of all 2D and 3D offline formats, feature layer editing and querying, advanced objects and drawing tools, a set of tools for professional usage, and the advanced Pro API interfaces.
- **Pro** – Adds publishing capabilities as well as uploading of data to SkylineGlobe cloud, and advanced data conversion tools.

All tools, developed using the TerraExplorer Pro API, can be activated by TerraExplorer Pro and TerraExplorer Plus.

TerraExplorer Plus

TerraExplorer Plus, available as a stand-alone application, or as an embedded runtime ActiveX module, offers similar capabilities to TerraExplorer Pro with the following limitations:

- Advanced objects can be created and edited only by using the regular API, and not by ICommand:
  - Buildings
  - Dynamic objects
  - Video (on terrain and billboard)

  - Modify terrain
  - Hole on terrain
- Feature layer operations can be performed only by using the regular API, and not by ICommand:
  - Spatial and attribute queries
  - Feature editing (modifying geometry or attribute values)
  - Creation of new layers
- A project cannot be published as a Viewer Kit.
- The terrain cannot be extracted to MPT or VRML.
- No access is available to the advanced Drawing tools (Duplicate Objects, Create Power Line, etc.).
- No access is available to the Convert Models to XPL tool.
- No access is available to the Convert Models Layers to 3DML tool.

CityBuilder Extension

TerraExplorer's CityBuilder extension includes powerful mesh layer conversion tools that vastly increase TerraExplorer's compatibility with third party viewers and editors. With the CityBuilder extension, mesh layers in a range of formats can be imported and converted to Skyline's proprietary 3DML format, and 3DML's can be exported to other mesh layer formats or to individual OBJ models so you can easily extract precisely the area you need. For users with the CityBuilder extension, these capabilities are fully integrated in the TerraExplorer Pro GUI. Alternatively, they can be used from the standalone CityBuilder.exe application found in your installation folder.

Capabilities

The following capabilities are only supported in TerraExplorer with a CityBuilder extension:

- **Export to Models, Point Clouds and ATAK** – Export polygonal areas of a 3DML, e.g., buildings, to individual 3D models (in OBJ, DAE, GLB, FBX formats), LAS point cloud layers, or ATAK.
- **Export to Mesh** – Export 3DML to OGC 3D Tiles (tileset.json) or I3S/SLPK formats.
- **Export Sections of Mesh** – Export sections of a mesh layer using clip polygons on the clipboard.
- **Import and Convert OpenScene Graph (OSGB) Layers** – Import and convert OSGB layers to the stream optimized, 3DML mesh layer format. This enables them to be streamed with SkylineGlobe Server.
- **Import and Convert OGC 3D Tiles (tileset.json) Layers** – Import and convert 3D Tiles mesh layers to the stream optimized, 3DML mesh layer format. This enables them to be streamed with SkylineGlobe Server.

TerraExplorer C2MP Extension

The TerraExplorer family includes the C2MP extension (available in Viewer, Plus, and Pro versions) that provides a unique set of command & control and mission planning features for military and defense users. The extension includes the following tools:

- MultiTracking (Cursor-on-Target, Predator, GPS Tracking)
- FalconView Interface

- MIL-STD-2525C Annotator
- ACO Import
- GRG Creation
- Coordinate Marker
- Route Planner
- DAFIF Import
- Enhanced Data Library support (creation and import)
- Legend Creator

TerraExplorer Comparison Table

The TerraExplorer Comparison Table below compares the different capabilities of each of the products in the TerraExplorer family. All products are based on TerraExplorer Pro, with each offering a different subset of TerraExplorer Pro commands.

TerraExplorer Pro commands are accessible programmatically either from the standard API or from the ICommand interface. ICommand is an API call that simulates a user click on the TEP Ribbon or menus, activating a TerraExplorer command.

Most operations can be performed by both methods. To create a polygon, for example, you can use the Creator.CreatePolygon(...) API to create a polygon and set all the parameters programmatically. Alternatively, you can call ICommand.Execute (1012,5) (the equivalent of clicking Create Polygon on the Ribbon). This call opens the property sheet and lets the user add the polygon and set its properties manually, like in TerraExplorer Pro.

A few commands (e.g., Publish Project) are only available via the GUI or the ICommand interface, and not programmatically from the standard API.

Note: When an online project (from a SkylineGlobe Server) is opened in TerraExplorer Viewer, the API is automatically upgraded to Plus level. Plus level API allows you to utilize all TerraExplorer Plus functionalities using API calls, including the ICommand interface.

Legend

✓ – Available in the User Interface and the API

Online – Available only when loading layers from SkylineGlobe Server

Limited – Only some of the capabilities are available

Capability	Fusion (Web)	Mobile	Desktop Viewer	Desktop Plus	Desktop Pro
View and Navigate					
View objects, layers, and features	✓	✓	✓	✓	✓
Free flight	✓	✓	✓	✓	✓
Fly to locations and objects	✓	✓	✓	✓	✓

Play presentations with a series of different views of the 3D World	✓	✓	✓	✓	✓
Underground mode	✓		✓	✓	✓
Indoor navigation			✓	✓	✓
Multiple coordinate systems			✓	✓	✓
Navigation tools (GPS tracking and target)				✓	✓
VR - Oculus Rift and Quest				✓	✓
Stereo viewing				✓	✓
Multi-user collaborative sessions				✓	✓
Change project settings				✓	✓
Create presentations			✓	✓	✓
Create movie from presentation				✓	✓
Inspect photos used to generate PhotoMesh model				✓	✓
Analysis					
Distance and area measurement	✓	✓	✓	✓	✓
Volume analysis	✓	✓	✓	✓	✓
Contour and slope maps	✓	✓	✓	✓	✓
Shadow effect	✓	✓	✓	✓	✓
Viewshed and line of sight	✓	✓	✓	✓	✓
Terrain profile	✓	✓	✓	✓	✓
Viewshed and shadow queries			✓	✓	✓
Cross section and clip box	Limited		✓	✓	✓
Comparison tools	Limited		✓	✓	✓
Threat dome				✓	✓
Flood analysis				✓	✓
Buffer penetration query				✓	✓
Elevation difference				✓	✓
Data Layers					
View imagery, elevation, 3D mesh, point cloud and feature layers	✓	✓	✓	✓	✓
Load imagery and elevation layers			Online	✓	✓
Load 3D Mesh layers (3DML)			✓	✓	✓
Load 3D Tiles			✓	✓	✓
Load feature layers			Limited	✓	✓
Load point cloud layers			✓	✓	✓
Load BIM (3DML)			✓	✓	✓

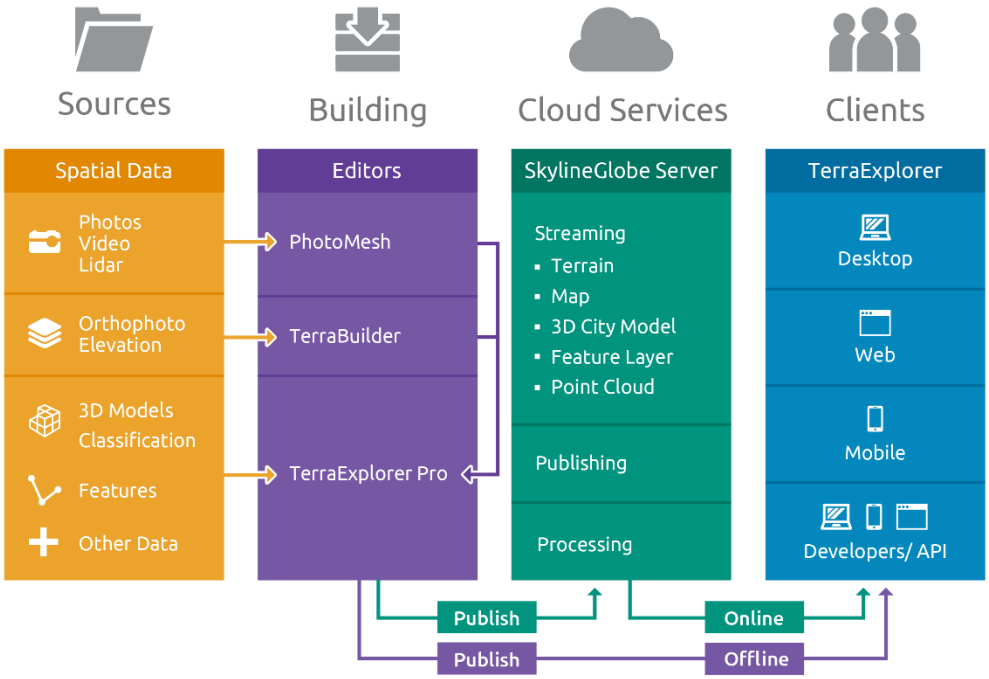
Feature layer: Spatial and attribute queries	✓			✓	✓
Feature layer: Edit attributes				✓	✓
Feature layer: Edit geometry				✓	✓
Feature layer: Create new layers				✓	✓
Classify 3D Mesh layer				✓	✓
Scale and Rotate 3D Mesh Layer				✓	✓
Objects and Effects					
View 2D and 3D primitives and objects	✓	✓	✓	✓	✓
View dynamic objects	✓	✓	✓	✓	✓
View water and particle effects	✓	✓	✓	✓	✓
Add weather and environment effects			✓	✓	✓
Add 2D and 3D primitives and objects		✓	Limited	✓	✓
Add and edit dynamic objects				✓	✓
Add and edit video objects				✓	✓
Flatten and cut terrain and mesh layers				✓	✓
Add and edit particle objects				✓	✓
Add and edit water effects				✓	✓
Advanced drawing tools (Duplicate Objects, Create Pipe Lines, Create Power Lines and more)				✓	✓
Mark mesh imperfections for implementation in PhotoMesh				✓	✓
Conversion Tools					
Create raster layer LOD pyramid				✓	✓
Convert and import BIM (IFC/FBX)				✓	✓
Convert and import LAS/LAZ/E57				✓	✓
Convert and import 3D Tiles and OSGB					✓
Convert model to XPL					✓
Export 3DML to 3D Tiles and SLPK					✓
Export 3DML to OBJ					✓
Publishing Tools					
Save project to Fly, KML and KMZ formats			✓	✓	✓
Publish online kit (desktop, mobile, web)					✓
Publish offline kit (desktop, mobile)					✓

Extract layers in area	✓
Upload data layers to SkylineGlobe cloud	✓

SkylineGlobe Product Suite

The SkylineGlobe software suite sets the standard for 3D desktop and web-based applications, enabling an enterprise to build and efficiently publish realistic 3D environments that can be explored, queried, analyzed, and edited by desktop, web, and mobile clients. The suite includes:

- **Editors** – PhotoMesh, TerraBuilder, and TerraExplorer Pro
- **Cloud Services** – Streaming, Storing, and Cataloging
- **Clients** – Desktop, Mobile, and Web applications



SkylineGlobe Product Suite

The SkylineGlobe Enterprise solution is scalable, with licenses to support from ten to tens of thousands of concurrent users.

Whether deploying a desktop, mobile or web-based application, SkylineGlobe Enterprise provides a full Application Programming Interface (API) allowing you to customize it according to your requirements. Because SkylineGlobe Enterprise is based on open OGC standards such as WFS and WMS, it can operate as a seamless 3D interface with other existing, legacy systems within the organization.

"On the fly" data fusion from disparate and distributed sources without data pre-processing allows you to keep your 3D environment current and relevant.

Skyline's range of products allows users to design an implementation customized to meet their requirements. Deployment options include the ability to work in a networked or disconnected (off-line) mode and make content available to the public or keep it restricted to secure networks and authorized users. Highly efficient streaming server technology supports large enterprise deployments with minimal hardware requirements.

Editors

Skyline offers powerful applications for generating, editing, and publishing 3D terrain and urban model databases from a wide variety of data types.

TerraBuilder

TerraBuilder is a 3D terrain database creator with professional-grade tools for manipulating and merging orthophotos, DEM and DSM raster files of different sizes and resolutions. The resulting photo-realistic, geographically accurate terrain database (MPT) can be made available to local TerraExplorer clients or published to remote clients using the SkylineGlobe Server.

PhotoMesh

Skyline's breakthrough PhotoMesh application fully automates the building of high-resolution, textured, 3D mesh models from oblique and nadir photographs and LiDAR captured from street view, drones, UAV, and airplanes. PhotoMesh results can be generated in standard 3D model (3DML, OSGB, DAE, OBJ), raster (Orthophoto, DSM, DTM) and point cloud (LAS) formats. Mesh layers can be transformed into powerful geospatial data that fully supports spatial operations and attribute queries, by loading it into TerraExplorer and classifying it with feature layer polygons.

TerraExplorer Pro

TerraExplorer Pro is a powerful GIS tool for merging unlimited, geo-referenced 3D terrain, 3D mesh, LiDAR, BIM, raster, and feature layers into a 3D high-resolution, geospatial environment. The project and all its individual layers can be directly uploaded and published to SkylineGlobe cloud server from TerraExplorer. Through a single publishing operation, the project and its individual layers are made available to all TerraExplorer clients: Desktop, Mobile, and TerraExplorer Fusion, as well as standard geospatial clients. TerraExplorer Pro also provides powerful tools and a high-resolution 3D environment in which to view, query, analyze and present geospatial data.

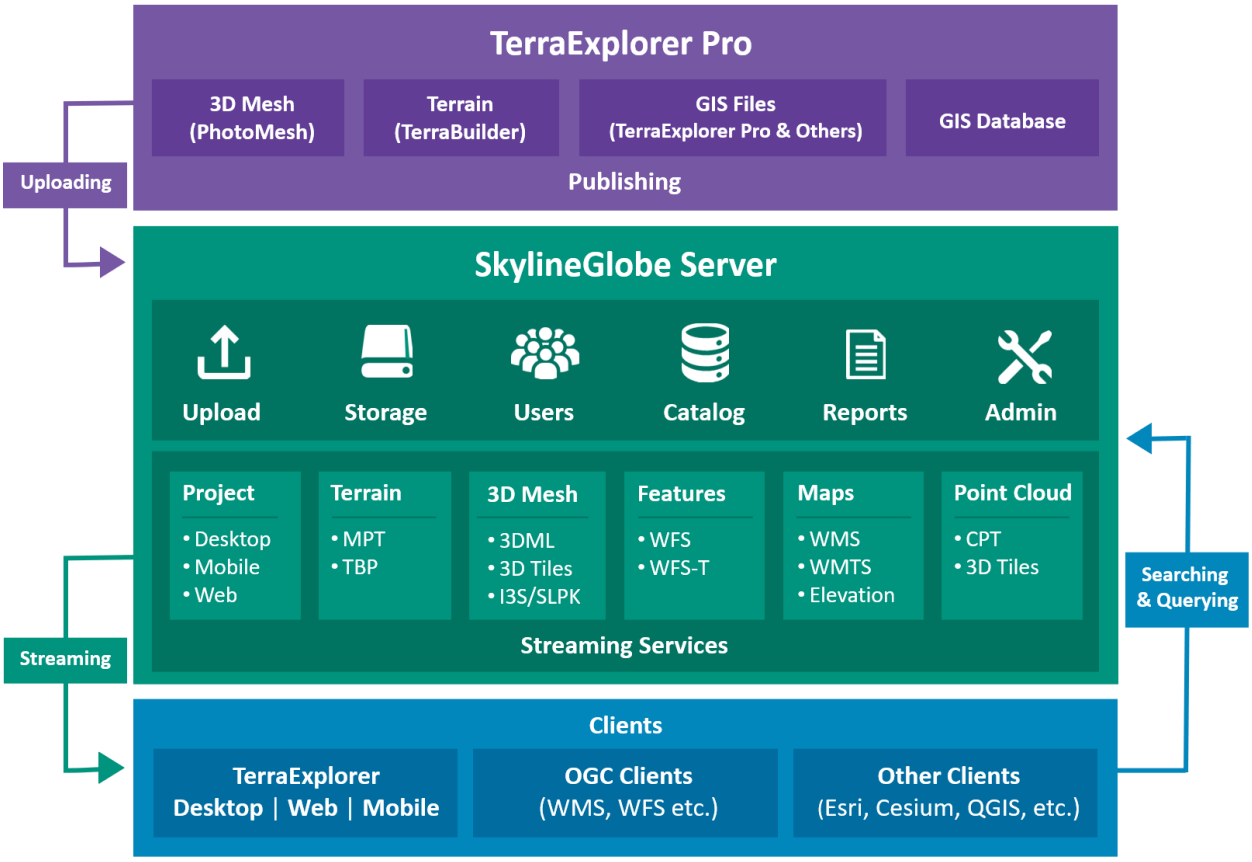
Cloud Services

SkylineGlobe Server (SGS) is a private cloud solution that provides a comprehensive set of web services for publishing, storing, managing, and streaming 3D spatial data. SkylineGlobe Server provides streaming services for all your spatial data types including terrain (MPT/TBP), map (raster-WMS/WMTS), feature (WFS/WFS-T), 3D Mesh (3DML, OGC 3D Tiles, I3S/SLPK), and point cloud (CPT, OGC 3D Tiles). All data on your server is cataloged and referenced so clients can easily find the specific published layer required. Your data is kept safe by multiple security layers, including restriction of each user group to predefined data folders and a robust user authentication mechanism.

The server's built-in complete user access control system allows easy management of users, groups, and administrative roles controlling the server-side storage and client-side view/edit permissions.

SkylineGlobe Server is compliant with the following OpenGIS Implementation Specifications:

- OpenGIS® Web Feature Service (WFS) Implementation Specification
- OpenGIS® Web Feature Service Transactions (WFS-T) Implementation Specification
- OpenGIS® Web Map Service (WMS) Implementation Specification
- OpenGIS® Web Map Tiling Service (WMTS) Implementation Specification



SkylineGlobe Terrain Service

Powerful terrain service technology for streaming terrain data stored either in Skyline optimized terrain databases (MPT) or in terrain databases defined by the TerraBuilder project file (TBP) to remote TerraExplorer clients and any application that reads the standard OGC WMS/WMTS protocol.

SkylineGlobe Feature Service

Powerful feature service technology for streaming point, polyline, and polygon feature layers from files and from the Oracle, SQL server, PostGIS and ArcSDE databases to remote TerraExplorer clients and any application that reads the standard OGC WFS protocol. The Feature Service can stream most TerraExplorer supported feature layer formats. It also supports advanced spatial and attribute queries from TerraExplorer and other WFS clients. With SGS's support for WFS-T (Web Feature Service-Transactional), remote clients can edit (create, delete, and update features) the feature layer and save changes to the data source.

SkylineGlobe Maps Service

Powerful maps service technology for streaming most TerraExplorer supported raster layer formats to remote TerraExplorer clients and any application that reads the standard OGC WMS/WMTS protocol. The layers are streamed as WMS/WMTS tiles in JPEG and PNG formats.

SkylineGlobe 3D Mesh Service

Powerful 3D city model service technology for streaming 3D Mesh Layer (3DML) databases from 3DML files to remote TerraExplorer clients. 3D mesh layers (3DML) are high-resolution, textured, 3D mesh models that have been compressed and stream-optimized to accelerate loading speed and efficiently handle memory. The 3D Mesh Service also exposes the data as OGC 3D Tiles for Cesium based clients.

SkylineGlobe Point Cloud Service

Powerful point cloud service technology for streaming multi-resolution and stream-optimized point cloud data from CPT files to remote TerraExplorer clients. The Point Cloud Service also exposes the data as OGC 3D Tiles for Cesium based clients.

Clients

Skyline offers a range of 3D visualization clients that enable users to interact with, edit and annotate a geo-referenced 3D environment. Users can customize the database with data from a network, local drive, or the Internet. Overlaying data specific to the user's requirements onto a 3D map creates a targeted, interactive picture that can meet the needs of a diverse user base and the specific requirements of each individual user. Skyline's client applications can be used in a local desktop environment, accessing terrain and content data directly, or in a network environment via the SkylineGlobe server.

TerraExplorer Desktop

A cutting-edge 3D GIS desktop viewer and creator that provides powerful tools and a high-resolution 3D environment in which to view, query, analyze and present geospatial data.
With TerraExplorer's robust and extensive capabilities and ever-increasing interoperability, stunningly realistic 3D visualizations can be created by overlaying the terrain with unlimited data layers, 3D models, virtual objects and more.

TerraExplorer Fusion

Web-based 3D geospatial viewer that enables you to view and analyze high-resolution, stunningly realistic 3D content right in your web browser with no download or installation required. TerraExplorer Fusion, enables viewing of most online layers and objects published by TerraExplorer Pro, performing measurements and analysis operations, and customizing web applications tailored to any customer needs.

TerraExplorer for Mobile

TerraExplorer for Mobile is a customizable, 3D GIS viewer for Android and Apple iOS devices that enables you to view high-resolution SkylineGlobe 3D content. The TerraExplorer for Mobile app can display most of your spatial databases including 3D city layers and feature layers, and it provides powerful tools to query, analyze and present your data on the go. TerraExplorer for Mobile seamlessly accesses online data from Skyline's SkylineGlobe server and other OGC-compliant servers, and quickly loads online TerraExplorer projects.

CHAPTER 2 GETTING STARTED

Software and Hardware Requirements

Requirement	Description
Operating System	Windows® 10 /11 – 64 bit.
System Memory	2 GB of RAM (4 GB or more recommended). For 4K render mode - 4 GB of RAM (8 GB or more recommended).
Graphics Processing Unit (GPU)	1 GB of memory (2 GB or more recommended). Dedicated GPU is recommended. For 4K render mode - 2 GB of memory (4 GB or more recommended). For optimal performance and stability when using GeForce RTX graphics cards, it is recommended to install the NVIDIA Studio Driver (SD) instead of the Game Ready Driver (GRD).
Processor	4 cores (8 cores recommended).
Browser	Microsoft Internet Explorer 11 or higher.
Additional Software	.Net Framework 4.6.1 required.

License Mechanism

TerraExplorer is protected by a licensing mechanism that controls its operation, license term, and available capabilities. A license file issued by Skyline determines the licensing mechanism used.

The following licensing mechanisms are available for TerraExplorer:

- Local Hardware Protection (USB Key)
- Local Hardware Protection (HASP Key)
- Workstation Dependent Software License
- Skyline Floating License Server
- HASP Floating License

Local Hardware Protection (USB Key)

A USB key is a physical hardware key delivered with the TerraExplorer Pro software package that plugs into the USB port of the computer – to allow the operation of the product. Verify that the USB key is plugged into the USB port before starting TerraExplorer Pro.

Local Hardware Protection (HASP Key)

In some cases, Gemalto's HASP key solution is used instead of a USB key. The HASP key is a physical hardware key delivered with the TerraExplorer Pro software package that plugs into the USB port of the computer – to allow the operation of the product. Verify that the HASP key is plugged into the USB port before starting TerraExplorer Pro. To use a HASP key, the necessary driver must be downloaded and installed on your computer. **See** "Manual Installation of the HASP Driver" in this chapter for information.

Workstation Dependent Software License

Another type of license is the workstation dependent software license. This license does not require any hardware protection but is limited to a specific computer. Before working with the workstation dependent software license, you must first register to get a license locked to your computer. It cannot be transferred without repeating the registration process.

Skyline's Floating License Server

The license information can also be obtained using a floating license server which enables a number of licenses to be shared among a larger number of users. When an authorized user wants to run TerraExplorer, the user requests a license from the license server, and if one is available, the license server allows TerraExplorer to run. When the user finishes running TerraExplorer, the license is returned to the license server for use by other users. **See** "Configuring TerraExplorer to Use the Skyline Floating License Server (SFLS)" and "Checking Out Licenses on the Client Side" in this chapter for information.

Floating licenses can also be "checked out" enabling them to function as machine dependent licenses, so that they require no connection to the license server when in use. The availability of licenses for checkout and the length of the check out period are defined by the licensing server. Licenses can be checked out either by the client via the License Manager, or on the server side via the Floating License Server Manager. Licenses checked out by a client can be checked back in, but licenses checked out from the server side, are permanently removed from the license pool.

HASP Floating License

In some cases, Gemalto's NetHASP solution is used instead of Skyline's Floating License Server. The NetHASP key is a physical hardware key delivered with the TerraExplorer Pro software package that plugs into the USB port of the server computer along with installation of the NetHASP License Manager software. It allows a predetermined number of concurrent users on the same network to use TerraExplorer, according to the license level defined by Skyline, without an individual hardware key on each of their computers.

License Manager

The TerraSuite License Manager allows the user to view and update the current license level.

To activate the License Manager:

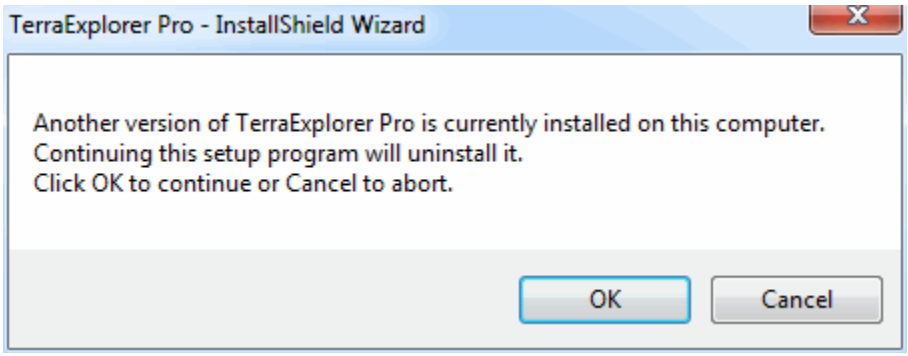
- From the **TerraExplorer** menu , point to **Resources**, and then click **License Manager** or
- Click **Start** > **All Programs** > **Skyline TerraExplorer Pro** and then click **License Manager**.

Installing TerraExplorer Pro

To install TerraExplorer Pro:

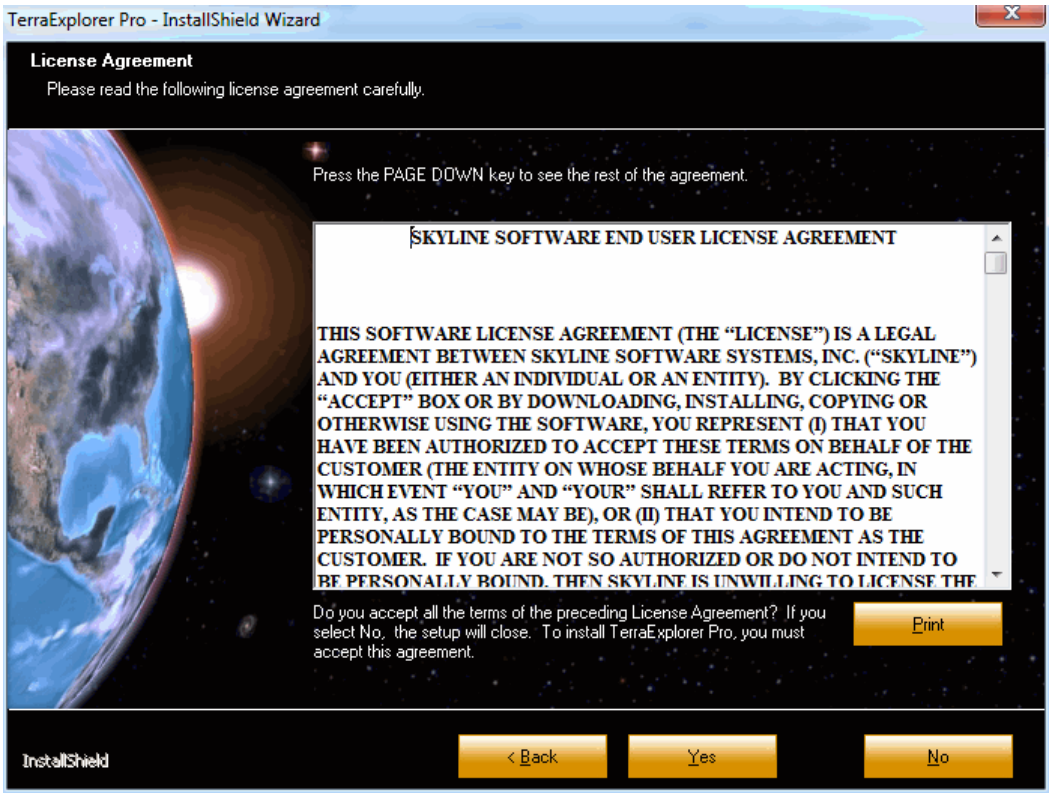
Note: On some operating systems, administrative privileges may be required.

1. If you have an old version of TerraExplorer Pro running, close it before continuing with the installation.
2. On your computer, browse to the **setup.exe** file and double-click. The setup program checks for an existing TerraExplorer Pro on your computer. If there is another version of TerraExplorer Pro installed already on your computer, a dialog is displayed confirming that you want to uninstall the current version.



InstallShield Wizard

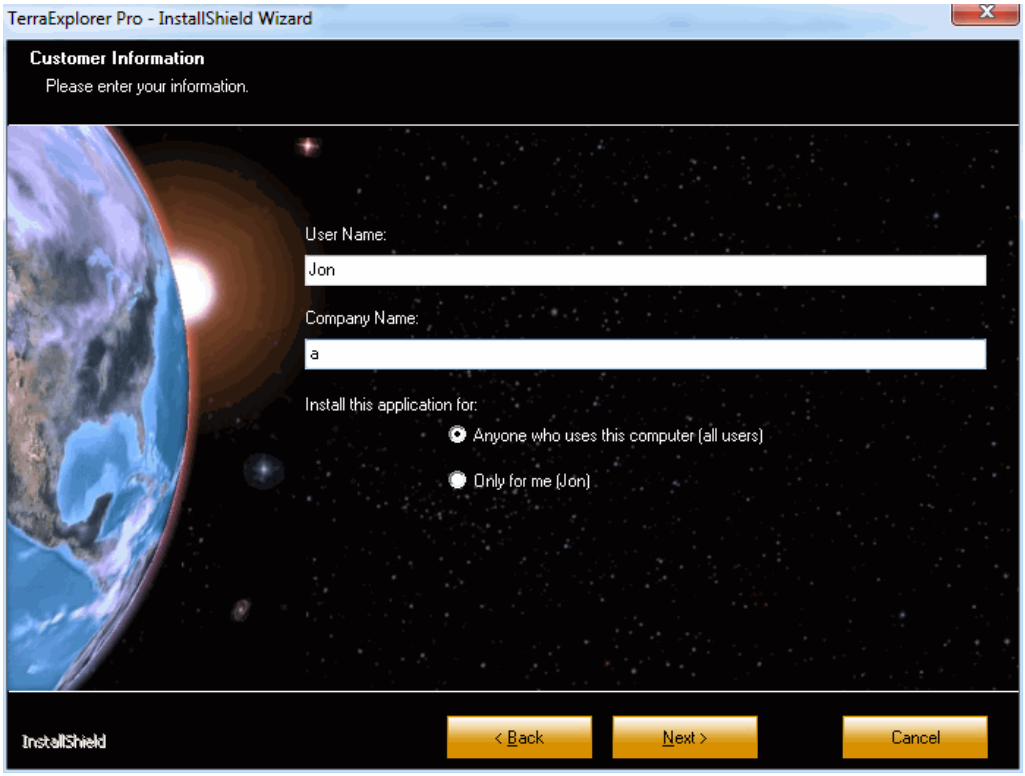
3. Click **OK** to uninstall. The InstallShield Wizard is displayed.
4. Click **Next**. The License Agreement is displayed.



License Agreement

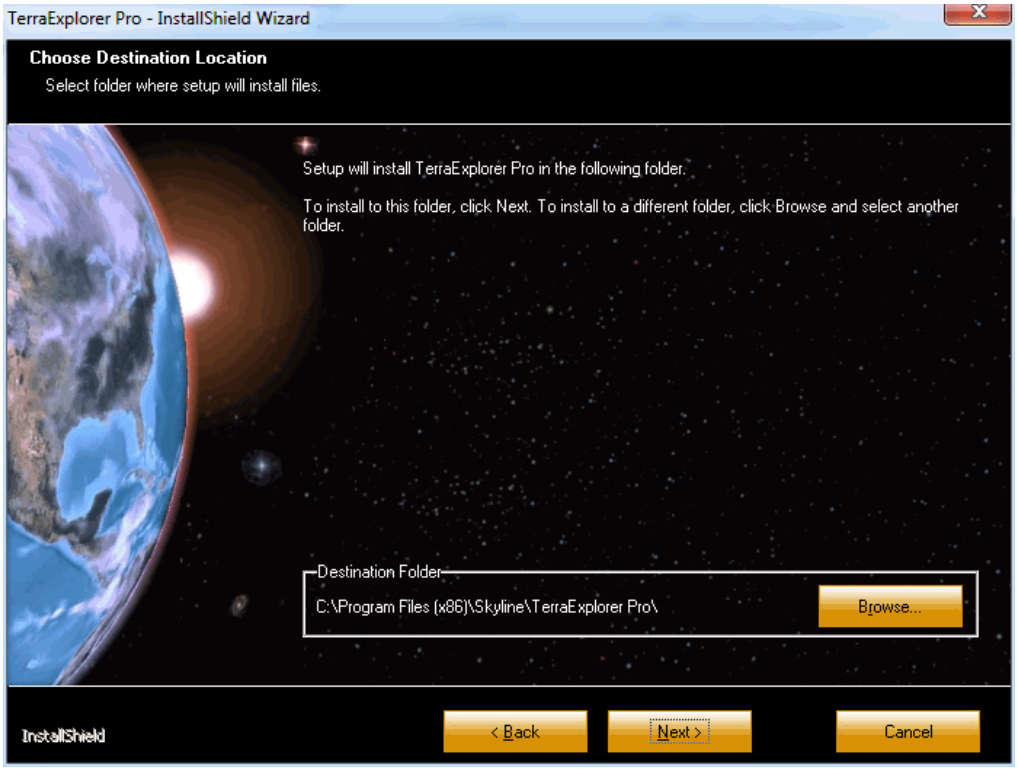
5. Click **Yes** to agree to the license agreement terms and continue the installation. The Customer Information dialog is displayed.

   Note: This dialog is displayed only for users with administrative privileges.



Customer Information Dialog

6. Enter the required customer information, and click **Next**. The Choose Destination Location dialog is displayed.



Choose Destination Location Dialog

7. Browse to the desired location for the TerraExplorer Pro installation, and click **Next**. The Ready to Install the Program dialog is displayed.



Install Dialog

8. Click **Install**. The installation copies the files to the destination folder.

   Note: The .FLY file extension is associated with the last TerraExplorer or TerraExplorer Pro application you have installed. If you want to change the association, open the application you want to associate the .FLY file extension with, click **TerraExplorer Options**, and on the **General** tab, click **Set as Default**. If you wish to keep using TerraExplorer as your default viewer for .FLY files you should reinstall TerraExplorer after installing TerraExplorer Pro.

Manual Installation of the HASP Driver

If your software was delivered with a HASP license key, you can manually install the required HASP driver.

To install the HASP driver:

1. Download the HASP driver zip file: Sentinel_LDK_Run-time_setup.
2. Unzip the file to a temporary directory, and run the HASPUserSetup.exe file.
3. Follow the installation wizard instructions to complete the installation.

Silent Installation of TerraExplorer Pro

TerraExplorer Desktop can be installed without a user interface by running the setup with Windows Installer command line parameters.

- Preparing the Silent Installation File

- Silently Installing TerraExplorer
- Automating License Configuration

Preparing the Silent Installation File

To prepare the silent installation file:

1. Place the standard TerraExplorer installer in a temp folder.
2. Run the following (case sensitive) command from the command line to create the ISS file, and then let the installation finish:

   ```
   Setup.exe /r /f1"C:\setup.iss"
   ```

3. Copy the C:\setup.iss file to the temp folder.

Silently Installing TerraExplorer

To install TerraExplorer silently:

Note: If a TEZ named setup.tez is placed next to the TerraExplorer installation file during installation, it will automatically be installed.

1. Call:

   ```
   Setup.exe /s /f1[FullPath2issFile] /hide_progress /V"Silent=1"
   ```

   where [FullPath2issFile] gives the full path to the iss file in the temp folder (e.g., C:\temp\setup.iss).

2. If you want to install to a custom directory, include the following:

   ```
   Setup.exe /s /f1[FullPath2issFile] /hide_progress /V"Silent=1 CustomInstallDir=c:\[foldername]"
   ```

   where [foldername] is the name of the custom directory.

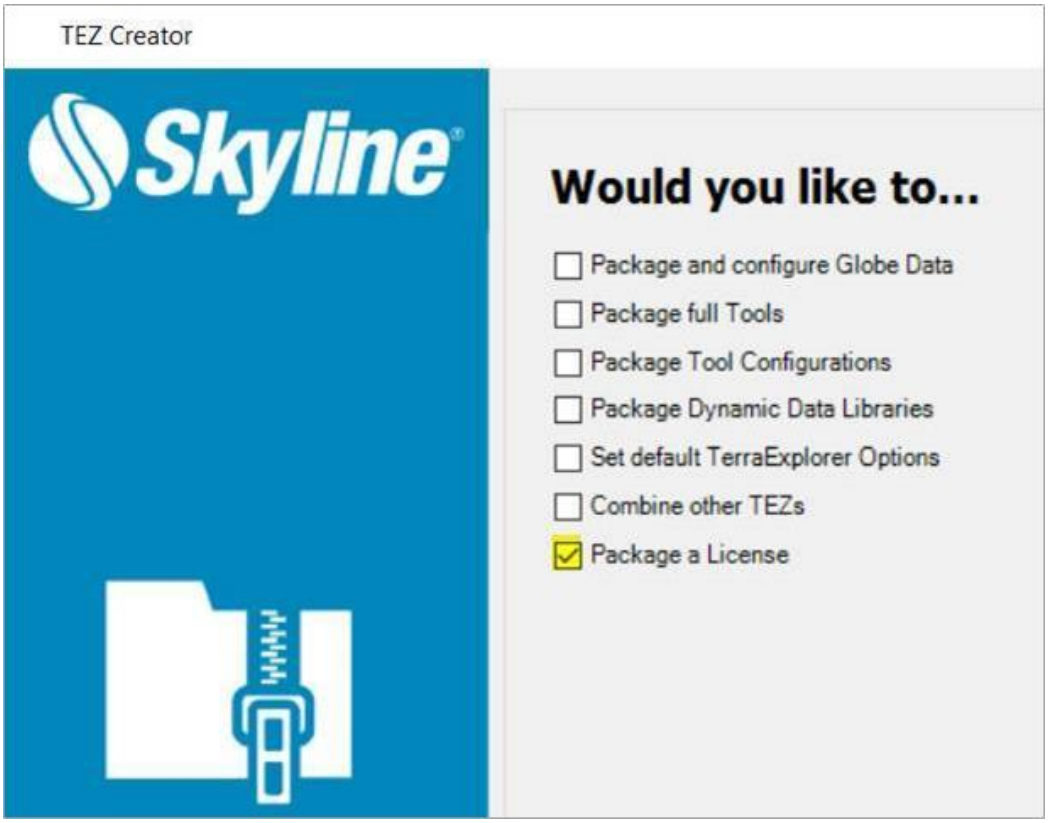
   Note: You can build a wrapper installer that automatically executes the steps above.

Automating License Configuration

To automate license configuration, use TerraExplorer's TEZ Creator:

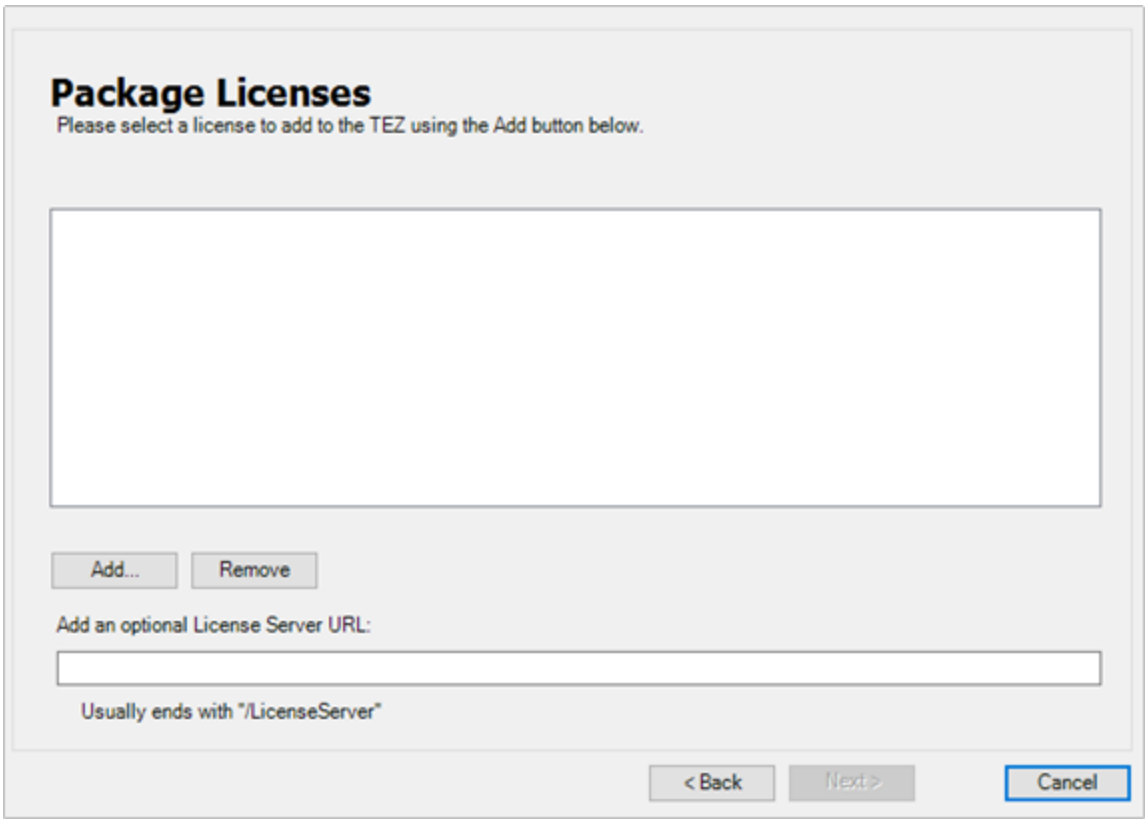


1. Open **TerraExplorer**, and run the **Make TEZ** tool from the **Tools** tab. The TEZ Creator wizard opens.



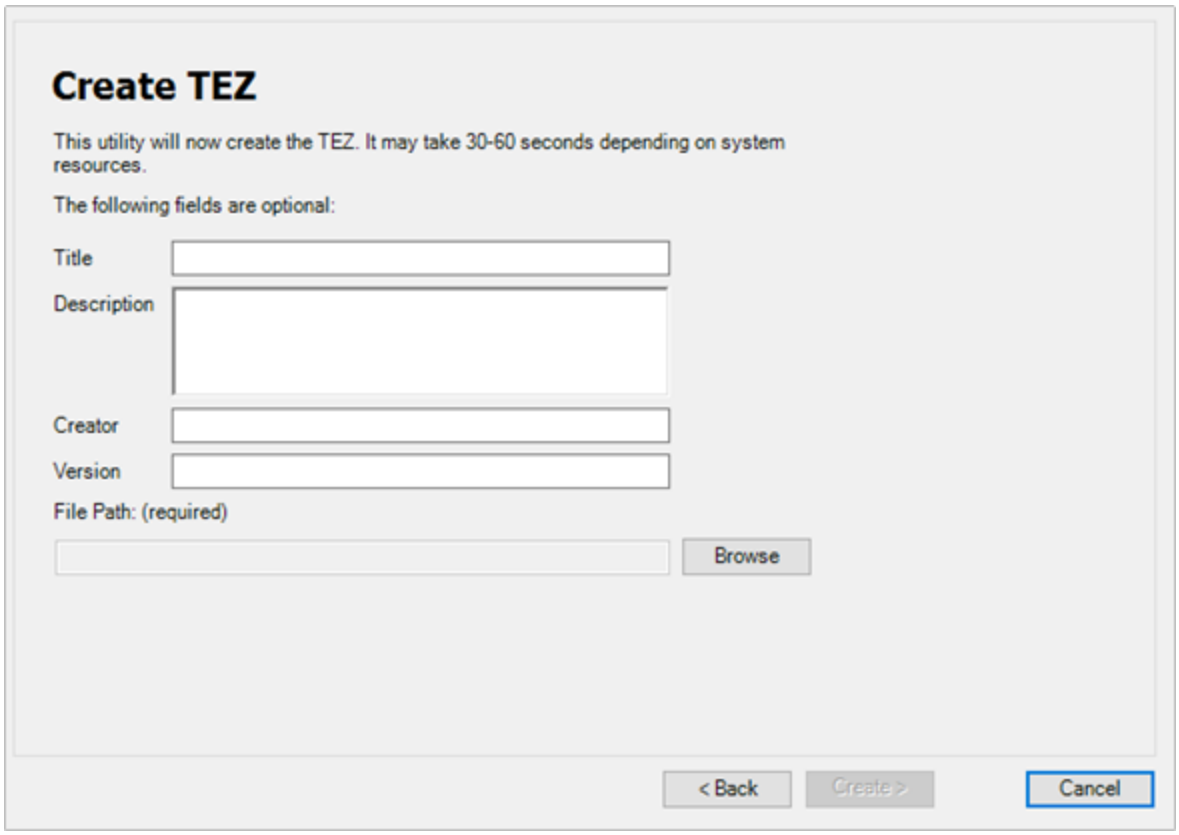
TEZ Creator Wizard

2. Select the **Package a License** option. The Package Licenses dialog is displayed.



Package Licensed Dialog

3. In the **Package Licenses** dialog, click **Add** and browse to one or more license files.
4. If you are packaging a license that is on a Skyline Floating License Server, enter the server's URL.
5. Click **Next**. You can skip the installation wizard's next step: Select Certificate for Signing, and click **Next** again. The Create TEZ dialog is displayed.



Create TEZ Dialog

6. In the **File Path** field, browse to the directory in which to create the TEZ file, and type the following name for the file: *setup.tez*
7. Click **Save**, and then click **Create.**
8. Place **setup.tez** next to the TE **setup.exe** to silently install the license TEZ when the setup file is run.

Uninstalling TerraExplorer Pro

The Uninstall feature lets you quickly remove all folders and files that you installed to your hard disk during the installation procedure.

To uninstall TerraExplorer Pro:

1. Exit the TerraExplorer Pro application.
2. On the Microsoft Windows desktop, click **Start** > **Skyline TerraExplorer Pro** > **Uninstall TerraExplorer Pro**. The Uninstall dialog is displayed.
3. Follow the on-screen instructions until all TerraExplorer Pro program files are removed.

Note: The .FLY file extension is associated with the last TerraExplorer or TerraExplorer Pro application you have installed. If you uninstalled TerraExplorer Pro but wish to keep using TerraExplorer as your viewer for .FLY files you should reinstall TerraExplorer.

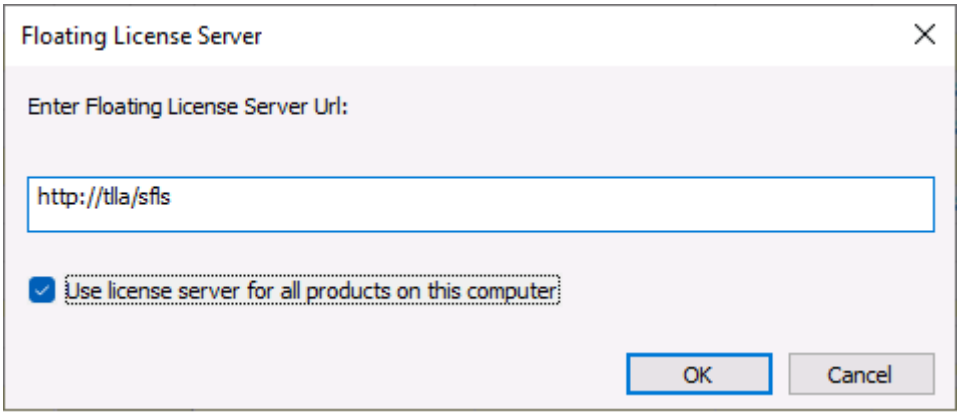
Configuring TerraExplorer to Use the Skyline Floating License Server (SFLS)

Each machine that is sharing the floating license for TerraExplorer must be configured with the address of the Floating License Server.

Note: The Skyline Floating License should be installed on the server before configuring it on each of the machines that is sharing the license.

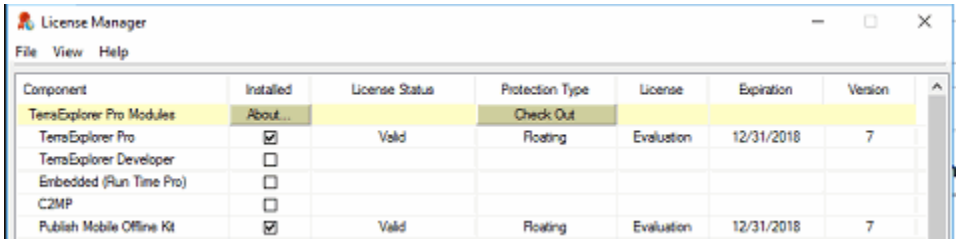
To configure TerraExplorer to the SFLS address:

1. Open the License Manager. **See** "License Manager" in this chapter for information.
2. If the Skyline Floating License received from Skyline was not used in the installation (i.e., placed next to the **setup.exe** file in the installation folder), from the **File** menu, select **Load License File**, and browse to the license file.
3. To set the floating license server URL, from the **File** menu, select **Set Floating License Server**. The Floating License Server dialog box is displayed.



Floating License Server

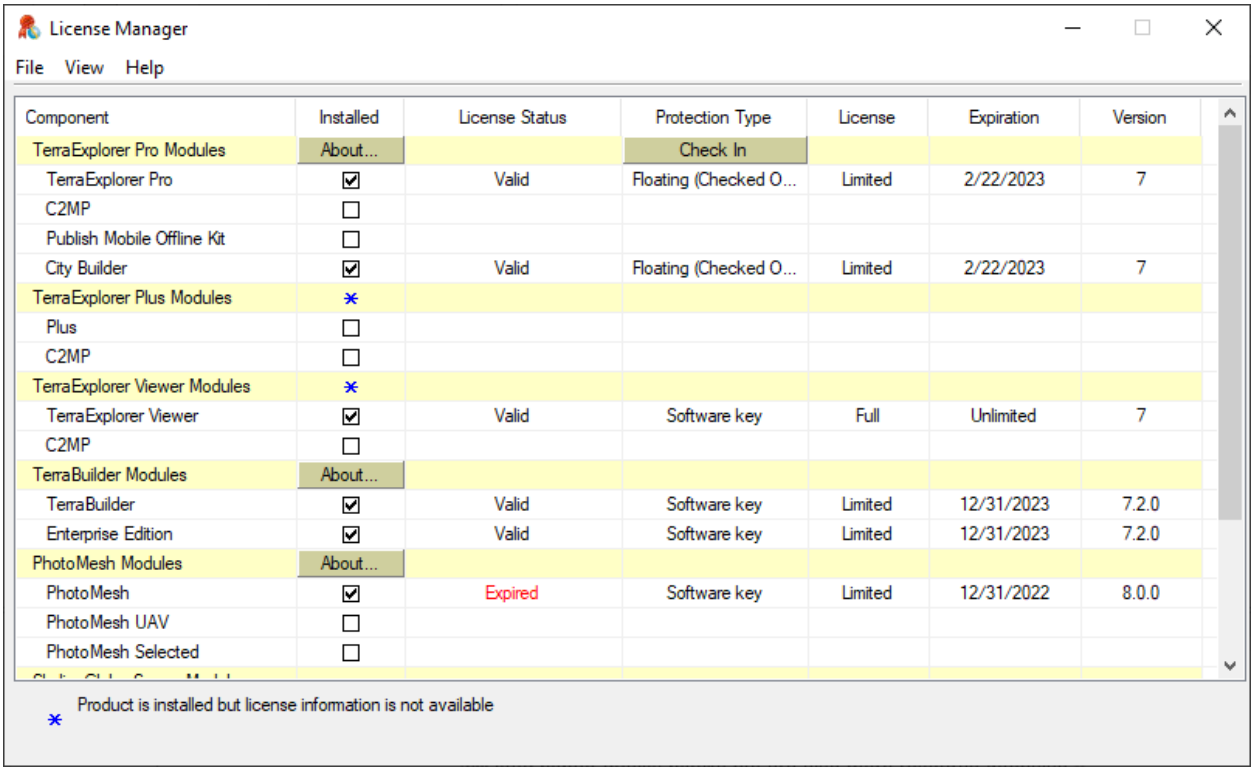
4. Enter the floating license server URL, e.g., http://<server_name>/SFLS.
5. If you want to override the protection type set in the currently loaded license file for each product on the computer, select **Use license server for all products on this computer**.
6. The licenses table will refresh, and the license manager will appear as in the following example (version and expiration information will vary based on the hosted license):



Checking Out Licenses on the Client Side

To check out a license:

1. Close the application for which you want to check out a license.
2. Open the License Manager, and under the section for the desired application select Check Out. The Application Protection Type field will refresh and read Floating (Checked Out). When the License Server Products page is refreshed, the Checked out count will have increased by the number of licenses checked out.



To check a license back in:

- Open the **License Manager** and select Check In**.**

See the SFLS Setup Guide for more information.

Starting TerraExplorer Pro

You can start TerraExplorer Pro by doing one of the following:

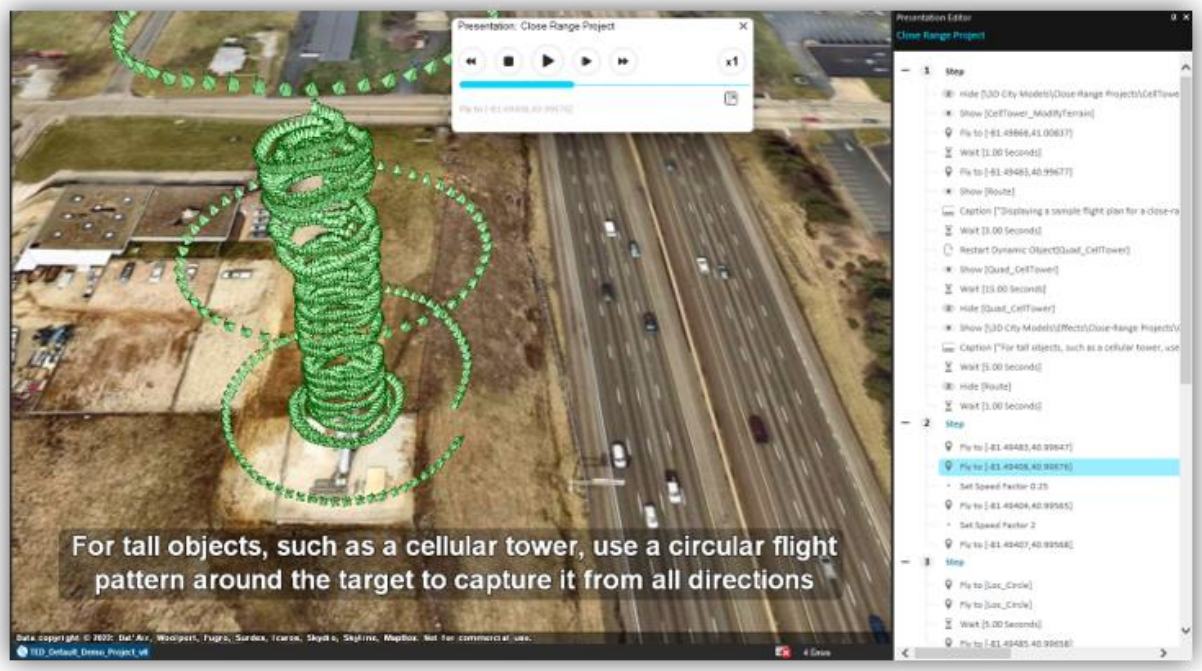
- Click **Start** > **Skyline TerraExplorer Pro** > **TerraExplorer Pro**.
- Click the **TerraExplorer Pro** icon on your desktop.
- Double-click on any .FLY file or any link to a .FLY file on an HTML page.

After the TerraExplorer Pro **Start** page appears, you are ready to open or create a FLY project.

CHAPTER 3 NEW FEATURES IN RELEASE 8.0

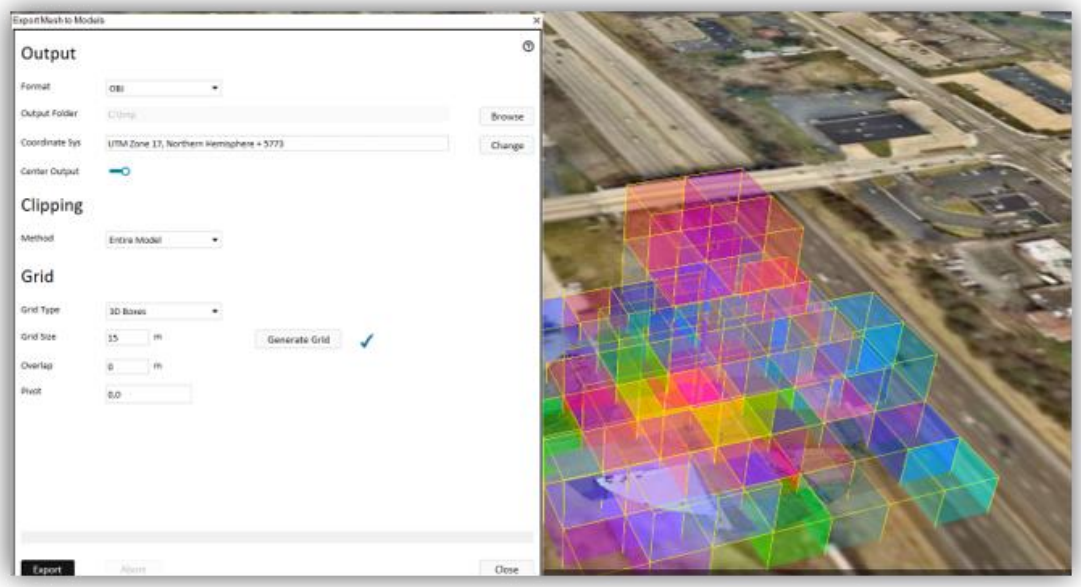
Presentation Tool Overhaul

Our completely redesigned presentation tool GUI is more intuitively organized to simplify your workflow, streamlining the process of creating and customizing your settings like captions and speed for each action. The revamped Presentation Tool features 'steps,' which function as chapter-like headings that organize your presentation actions and offer increased flexibility in displaying your presentation. With the new presentation tool, you can easily add locations to your route or display objects simply by dragging them from the Project Tree into the Presentation Editor. New presentation operations have been added as well, including the option to enable contour and slope maps, as well as display shadows.



New 3D Mesh Layers Export Options

TerraExplorer 8.0 introduces significant improvements to 3D Mesh Layer Export functionalities. Users can now export entire mesh layers or specific sections to a range of data types, including 3D models (in OBJ, DAE, GLB, and FBX formats), LAS point cloud layers, and ATAK files. The updated Export tool offers robust control over multiple aspects of the export process, such as grid type, grid size, area selection methods, and coordinate system adjustments. Importantly, the tool supports both 2D grids and 3D boxes, enabling you to manage complex three-dimensional data and allowing features like tall buildings or utility poles to be vertically segmented into multiple files.



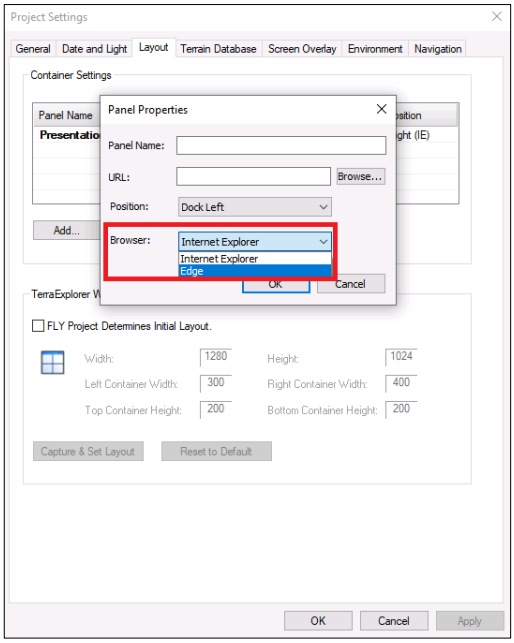
HoloLens Mixed Reality Mode

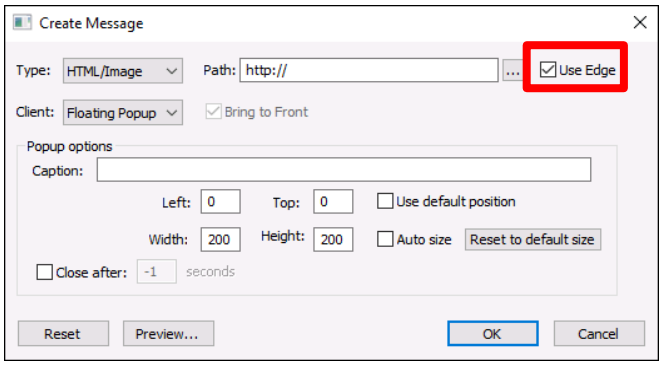
Uncover the potential of augmented reality (AR) visualization for collaborative decision making in the battlefield and headquarters. Our new HoloLens plug-in allows you to view the TerraExplorer 3D view as a lifelike 3D hologram through HoloLens 2 immersive headsets. This mode offers a virtual table whose dimensions can be customized and whose location is determined simply by the placement of a QR code, simplifying the setup process. With support for head tracking and intuitive controls as well as multi-user support, users can effortlessly navigate and analyze their 3D environment, for more informed tactical planning and strategic execution.



Microsoft Edge

Skyline now offers the option to utilize Microsoft Edge browser control for rendering advanced HTML and JavaScript within containers and popup windows. This feature gives users the option to load web pages that incorporate new technologies not supported by the IE browser control. Users now have the flexibility to choose between this newer Edge browser and IE (legacy) for displaying content.





Google Earth 3D Tiles

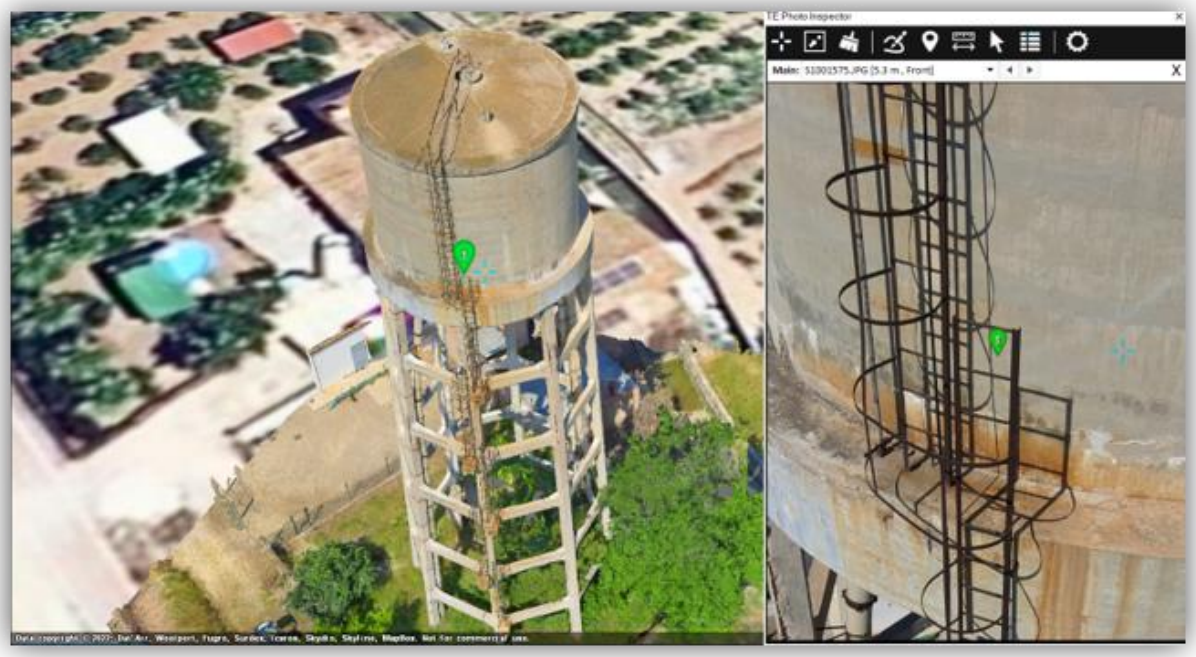
TerraExplorer 8.0 now provides enhanced support for the new Google Earth Photorealistic 3D Tiles service, covering more than 2,500 cities across the globe. You can seamlessly combine your high-resolution PhotoMesh 3D mesh models with the Google Earth background for a comprehensive 3D viewing and analysis experience. Utilize the TerraExplorer 'Load 3D Tiles' option, along with your Google API key, to integrate Google Earth models.



Photo Inspector Improvements

Photo Inspector's latest updates enhance inspection workflows. Key improvements include:

- Performance Boost: While Photo Inspector continues to support various photo formats, a significant enhancement is the newly added option to stream the multi-resolution, tiled SMPT format generated by PhotoMesh. These optimized files are published to SkylineGlobe Server, facilitating faster online photo viewing by minimizing the necessity to load the entire photo.
- Flexible Inspection Layers: Photo Inspector now supports enterprise-level inspection layers not initially created within the tool, while also freeing you from the constraints of its predefined attribute fields.
- Offline Kit Publishing: The 'Extract and Publish Area as Offline Kit' option now enables you to publish your 3D models alongside the source photos, allowing Photo Inspector to function with offline kits.
- BIM Attribute Information: Easily include information on a mesh model such as material information or geometric data within your inspection reports using new mechanism to copy the relevant attribute information from the associated BIM model.



Improvements to Analysis Tools

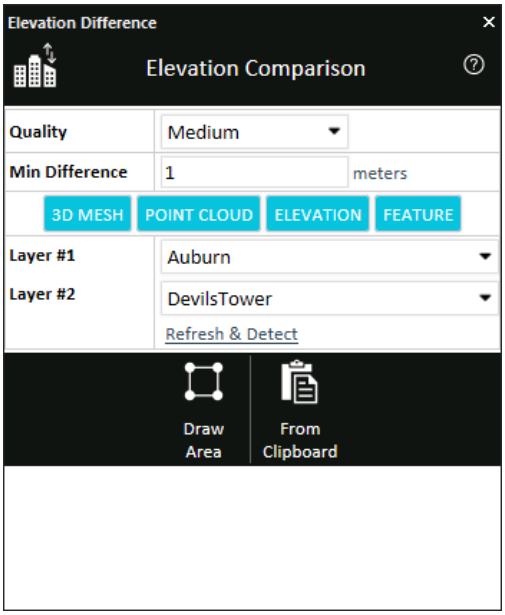
Terrain Profile Tool

We've upgraded the Terrain Profile tool by adding a new Compare Mode, which allows for side-by-side terrain profile analysis of two different layers on the same graph. To ensure precise calculations, visibility for all other layers is temporarily disabled during this comparison and restored afterward. An additional enhancement links the terrain profile graph to the 3D Window - when hovering over any point in the terrain profile, a corresponding symbol is displayed in the 3D Window, pinpointing the exact location on the graph line.



Elevation Comparison Tool

The Elevation Comparison tool has been updated to consolidate and extend its layer comparison functionalities. You can now evaluate elevation differences between two layers of various types: elevation, feature, point cloud, or 3D mesh.



Threat Dome

A new "Skyline Base" output type has been introduced as a variant of the existing "Skyline" output type. This enhancement adds lines that radiate from the viewer's position to the perimeter of the ring, which is formed by the outline of the visible terrain and objects.



Dome



Dome Base



Skyline



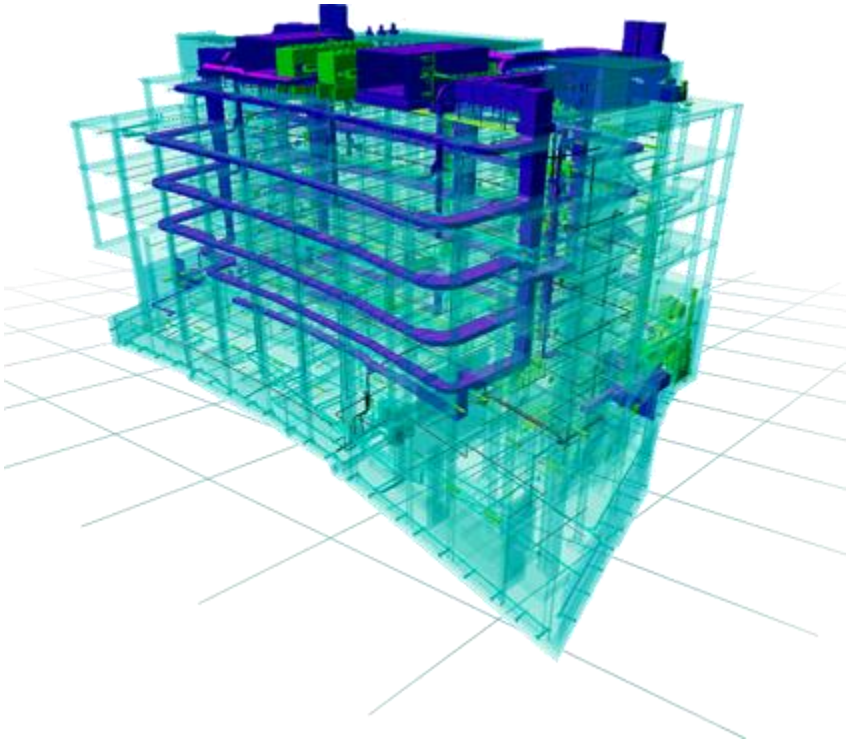
Skyline Base

Working with SkylineGlobe Server

- Integrated SSO Authentication: TerraExplorer users can now enjoy a simplified login process when accessing SkylineGlobe Server 8.0, thanks to the newly integrated Single Sign-On (SSO) authentication. This feature is compatible with commercial Identity Providers like Google Workspace and Facebook, as well as enterprise identity provider servers, all supported by the OpenID protocol. This enhancement not only eases the login process but also adds an extra layer of security.
- **Flexible Project Updates:** When publishing a project that was opened from SkylineGlobe Server, you now have the option to either publish it as a completely new project or update the existing one. When choosing to update, a new version is created on the server, ensuring that users always have access to the most up-to-date information. Administrators can manage which version to serve to TerraExplorer clients via the SGS Manager.
- Grid Shift (TIFF, GSB, and GTX) Files: TerraExplorer 8.0 introduces a more dynamic approach to managing TIFF, GSB, and GTX grid shift files, enhancing the transformation between coordinate systems with different datums. When your project's Well-Known Text (WKT) references a grid shift file that's missing locally, TerraExplorer now automatically downloads the required file from the PROJ-data folder on the connected SkylineGlobe Server. For users without a server connection, the default source is https://cdn.proj.org. You can also customize this URL by editing the proj.ini file located in the proj subdirectory of your installation directory.

Enhanced Support for BIM Models

TerraExplorer 8.0 has bolstered its support for Building Information Modeling (BIM) by introducing compatibility with a broader range of IFC formats. These now include IFC 2x3, IFC 4, IFC 4x1, IFC 4x2, and IFC 4x3 (specifically IFC 4x3_rc1 and IFC 4x3_rc2). The coordinate system for BIM models is automatically read from the data, but users have the flexibility to change it as needed. The new release also extends support for planar projections. For data lacking built-in coordinates, users can now manually define the position for enhanced control and customization.



Stability Improvements and Bug Fixes

3D Tiles and Other Mesh Layers

Resolved various issues related to loading, import, and export:

- Fixed crash of TerraExplorer when loading or converting certain 3D Tiles.
- Corrected display issues affecting some 3D Tiles imported and converted to 3DML.
- Addressed problem causing generation of incorrect bounding boxes when exporting to 3D Tiles.

Loading of Different Input Formats

Provided fixes for various input formats including DXF, GLB, and OBJ that did not load properly or caused TerraExplorer to crash.

API Improvements

Addressed multiple API issues including the following:

- IWindow.PixelToObjects did not return on terrain lines.
- IRouteWaypoints.GetWaypoint returned incorrect orientation information.
- ITerrain.GetGroundHeightInfo returned inaccurate elevation values.
- IAnalysis.QueryElevationBuffer sometimes returned inexact elevation values.
- INavigate.SetPosition and INavigate.ZoomIn did not work properly in 2D and 2D North modes.

Publishing to SkylineGlobe Server and Offline/Local Kits

Resolved bugs related to projects published to SkylineGlobe Server and to offline/local kits:

- Fixed incorrect application of feature layers' geometry Z value.
- Corrected issue causing exclusion of imagery layers from published kit.
- Corrected the display of feature layer textures.

Importing BIM:

- Fixed incorrect application of coordinate system information.
- Resolved bug that prevented editing of coordinate system information.
- Fixed issue affecting correct positioning of some IFC models.
- Resolved issue causing incorrect generation of bounding boxes of some imported IFC.
- Corrected issue causing TerraExplorer to crash when editing BIM attributes from Attribute Table.

Point Cloud Conversions

- Fixed bugs affecting conversion of LAS and e57 point clouds to CPT.

Photo Inspector

- Resolved Photo Inspector bug that prevented moving and dragging photos inside the Photo Inspector window when working in Windows Server 2019 environment.

WMS Layers

- Resolved issues causing incorrect or failed display of loaded WMS layers.

Scale and Rotate Tool

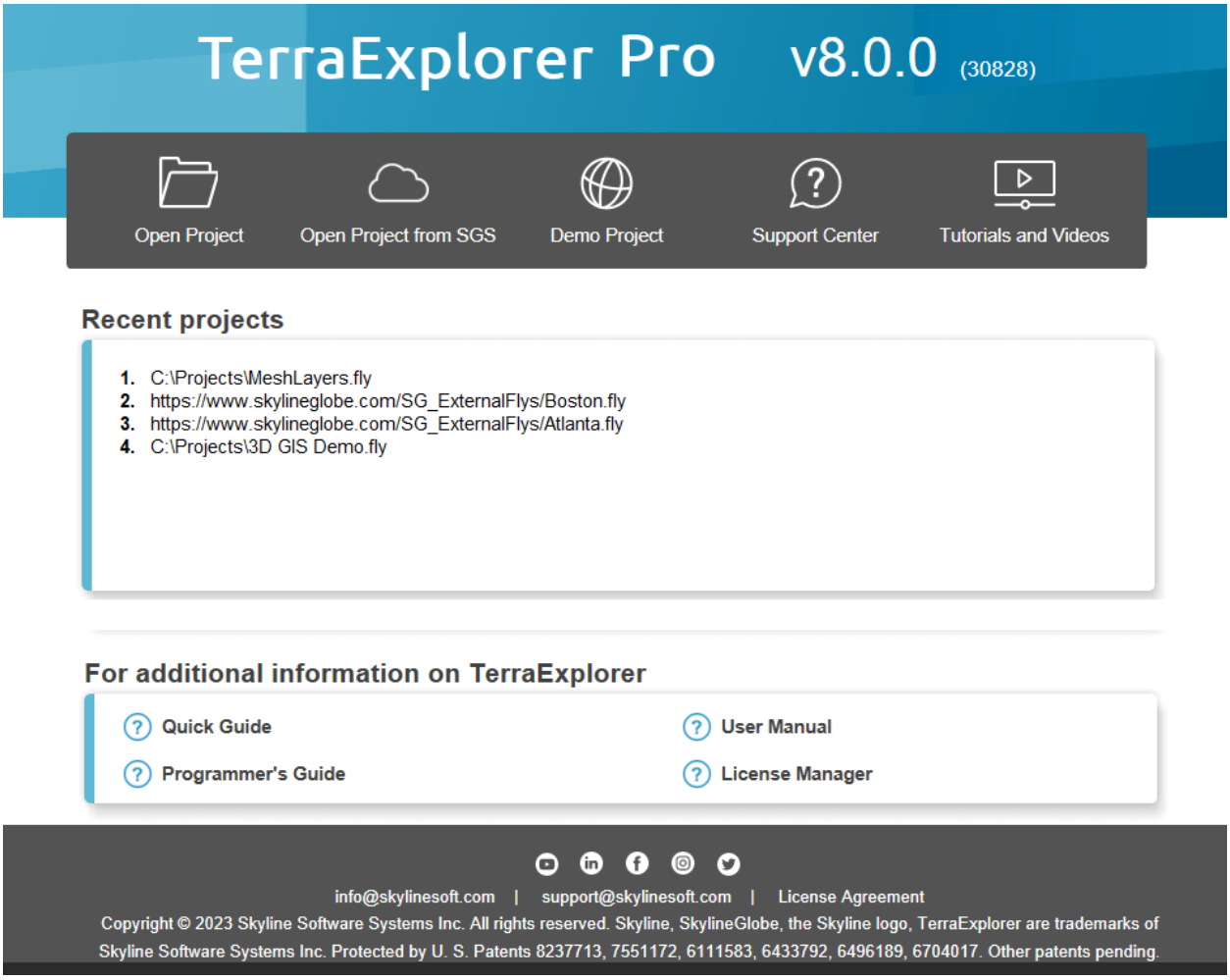
- Scale and Rotate tool now works properly even for large mesh layers.

CHAPTER 4 BASIC CONCEPTS

Start Page

The Start Page is the first page you see after opening TerraExplorer Pro from the **Program Files** menu or from the desktop icon.

When you start TerraExplorer Pro by selecting a .FLY file or link, TerraExplorer Pro opens the project directly and does not show the Start Page. The Start Page also appears after you close your current project.



TerraExplorer Pro Start Page

Start page options:

- **Open Project** – Opens a dialog in which you can browse to a project file.
- **Open Project from SGS** – Opens the SkylineGlobe Layers dialog so you can load a project from SGS. You can load an MPT/TBP remote database file or a FLY/KML project file.
- **Demo Project** – Opens a .fly with detailed feature, raster, and mesh layers.

- **Support Center** – Opens Skyline's knowledge base, a centralized repository of information about TerraExplorer and other Skyline applications.
- **Tutorials and Videos** – Opens Skyline's YouTube channel with videos demonstrating TerraExplorer's key features.
- **Recent Projects** – Opens one of your recent TerraExplorer projects.
- **Quick Guide** – Opens TerraExplorer's Quick Start Guide, which helps you find your way around TerraExplorer.
- **Programmer's Guide** – Provides access to the TerraExplorer Programmer's Guide Help files
- **User Manual** – Opens TerraExplorer's Help files.
- **License Manager** – Opens the License Manager tool.
- **Contact Business and Sales** – Opens the Contact Skyline page on Skyline's website.
- **Technical Support** – Opens the Skyline Technical Support page on Skyline's website.
- **License Agreement** – Displays the TerraExplorer software license agreement on the main window.

Application Layout

The TerraExplorer display is divided into four primary panels:

Panel	Description
3D Window	The heart of TerraExplorer Pro. In this window, you view the terrain and overlaid content in 3D.
Project Tree	Contains a list of all the items in the project organized in a tree structure. **See** "Using the Project Tree" chapter for further information.
Navigation Map	Provides quick and easy navigation through the entire terrain. It shows the location and direction of view of the camera. The Navigation Map window offers a simple mechanism to integrate file-based maps into the application. With the support of the TerraExplorer Pro COM interface, web-based maps can also be integrated as part of the HTML window. **See** the "Navigation Map" chapter for further information.
Error/Message Log	The TerraExplorer log records and displays warnings, messages, and errors to help you troubleshoot any TerraExplorer issue. **See** "Error/Message Log" in this chapter for more information.

The Project Tree, Navigation Map and 3D Window can be arranged in five different standard layouts:

Standard Layouts

Five standard layouts are available:

- Normal
- Maximize
- Full Screen

- Stereo
- AR/VR

To select a standard layout:

- On the **View** tab, in the **Layout** group, click one of the following layout options:

Layout Option	Description
Normal	TerraExplorer restored to normal size. If the layout was customized (**See** "Customized Layouts" below), then it is restored to the customized layout.
Maximize	TerraExplorer application maximized to entire screen. Docked panels set to auto-hide mode, and Ribbon minimized (**See** "Auto-Hide" in this chapter for more information).
Full Screen	3D Window maximized to entire screen, and Ribbon hidden (Alt + Enter).
Stereo	Side-by-side stereo view on any supporting displays (**See** "Viewing in Stereo" in this chapter for more information).
AR/VR	Two options are available: ▪ Oculus Rift/Quest - TerraExplorer is compatible with the Oculus Rift S and Quest 2 virtual reality systems, which enable you to use slight, natural head movements to easily fly through the 3D world. ▪ Axiom Holographic Table – TerraExplorer is compatible with Axiom's holographic wall and table, for an immersive viewing experience. To activate the holographic table mode, contact Axiom Holographics for a full deployment kit. "

Note: In Normal or Maximize layout, the size of each of these panels can be adjusted by moving their borders.

To move a border:

- Rest the cursor on the partition until it changes to a double-headed arrow, and then drag horizontally or vertically.

Viewing in Stereo

Stereo viewing provides added depth and realism to the 3D visualization. It uses a standard technique of rendering two images – one for the left eye and one for the right – side by side on the screen. Supporting displays (screens and projectors) use various methods to deliver the proper view to each eye, thus conveying true-to-life 3D depth perception.

To view in stereo mode:

- On the **View** tab, in the **Layout** group, click **Stereo**.

Multiple Windows in One Panel

The application's panels can include any number of additional HTML windows in addition to the standard window. Using the tab mechanism, you can switch between the windows.

Any HTML page can be displayed on the HTML window. This window is based on the Internet Explorer browser and supports all features supported by the latest Internet Explorer browser installed on your

machine. HTML windows can be added as fixed windows, using the container settings, or as hyperlink messages.

Using the capabilities of the TerraExplorer Pro COM interface, HTML pages can communicate with other elements of TerraExplorer Pro.

Customized Layouts

You can create the application layout that is most convenient for you by repositioning panels (e.g., the Navigation Map, Project Tree, Error/Message Log, or any of the TerraExplorer Tools) on the screen.

To reposition a panel:

1. Click the panel's title bar and drag the panel from its current location. A guide diamond with four arrows appears.
2. If you want the panel to float in front of the other application panels, drag it to the desired location.
3. If you want to dock the panel, do the following:
   a. Drag the panel towards the location where you want to dock it, and then rest the cursor on the guide diamond arrow that best corresponds to the desired docking location. A shaded blue outline of the panel appears in the area where the panel will dock.
   b. Release the mouse button to dock the panel in the area indicated.

Note: All TerraExplorer Tools initially open in the same location - at the bottom, left side of the screen. When multiple tools are opened simultaneously, a tab displays for each tool on the bottom of the tool window. If you want to move one of these tools to a different screen location, click the tool's tab and drag it, as described in the steps above.

Hiding and Displaying Panels

The Project Tree, Navigation Map, Error/Message Log, and Tool Windows can be hidden from view, leaving more room on your screen for the 3D Window.

Hide

To hide a panel entirely, do any of the following:

- On the **View** tab, in the **Show/Hide** group, clear the check boxes of the panels you want hidden.

  Note: This option is only available for the Project Tree and Navigation Map.

- Right-click the panel's title bar, and from the shortcut menu, select **Hide.**
- Click the X on the right side of the panel's **title bar**.

To restore a panel that was hidden:

- On the **View** tab, in the **Show/Hide** group, select the check box of the panel you want restored or reopen the tool. For the Error/Message Log, click the  icon below the 3D Window.

Auto-Hide

When a panel is in auto-hide, a tab appears on an edge of the screen that controls the panel's display. When the cursor rests on the tab, the panel displays, and when it is moved away from the tab and the displayed panel, the panel disappears.

To auto-hide a panel:

- Click the pushpin icon  on the panel's title bar.

To view an auto-hidden panel:

- Move the cursor over the panel's tab.

  Note: If you want to hide the panel again, move the cursor off the panel.

To restore a panel from auto-hide, do either of the following:

- Right-click the panel's title bar, and from the shortcut menu, clear the **Auto Hide** option.
- Click the pushpin icon on the panel's title bar.

Message Bar

The Message bar displays a variety of text and HTML messages. Any hyperlink message for objects, presentations or any other item in the system can be displayed on the Message bar. The Message bar cannot include multiple windows. Anytime a new message appears, it overrides the previous one. The Message Bar is a mandatory auto-hide window and cannot be removed.

The Message Bar can display the following information:

- Hyperlink messages for objects, presentations, locations and tree messages.
- Start project message.
- System information messages that display the loading and saving status.
- Present measurement information (when the Measure feature is used).
- Information by external applications and HTML pages using the COM interface.

TerraExplorer Ribbon

Similar to the Microsoft Office Ribbon, that is a component of the Office Fluent user interface, the TerraExplorer Ribbon organizes all commands in logical groups, which are collected together under tabs. Each tab relates to a type of activity, such as navigating in the map or working with objects. To reduce clutter on your screen, certain tabs, such as the Feature Layer and 3D Mesh Layer tabs are displayed only when their commands are needed.

There are eight primary tabs in TerraExplorer:

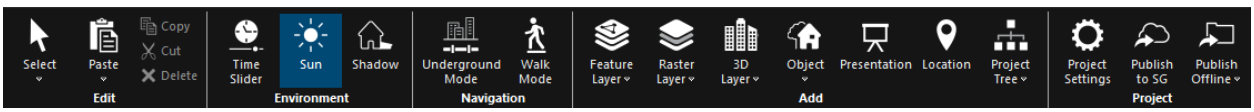
- Home
- Analysis
- Layers
- Objects
- Effects
- Navigation
- View
- Tools

The **File** menu  located at the upper left-hand corner of the application, replaces the TerraExplorer button of previous versions. The following commands are available from this menu:

Command	Shortcut Key	Activity
New	CTRL+N	Creates a new TerraExplorer Pro project. **See** "Creating a New .FLY Project" in this chapter for information.
Open	CTRL+O	Opens an existing TerraExplorer Pro project (.FLY file). **See** "Loading an Existing Project" in this chapter for information.
Save	CTRL+S	Saves the current project. **See** "Save Project" in this chapter for information.
Save As	CTRL+SHIFT+S	Saves the current project using a different name. **See** "Save As…" in this chapter for information.
Publish		Prepares the project for distribution to external users, through one of the following methods: ▪ Publishing the project and all its layers and resources to SkylineGlobe Server, Skyline's private cloud solution. Through a single publishing operation, the project is made available to desktop, mobile and TerraExplorer Fusion clients, as well as standard geospatial clients such as WFS/WFS-T/WMS/WMTS/3D Tiles (Cesium). ▪ Creating an easily distributable local or offline kit, or KMZ file. **See** the "Publishing TerraExplorer Projects" chapter for information.
Print…	CTRL+P	Prints the current 3D View. The print option opens the Print dialog and allows you to select the destination printer.
Resources		Opens resources that help you learn how to use the application or that display license information (e.g., Online Help, Programmer's Guide, License Manager, Interactive Tutorial). **See** "TerraExplorer Resources" in the "Introduction" chapter for information.
Close	CTRL+F4	Closes the current project and opens the Start Page. **See** "Closing a Project" in this chapter for information.
TerraExplorer Options		Opens a dialog in which you determine your working environment (e.g., cache size, navigation mode, units, screen overlay. **See** "Using TerraExplorer Options" for information

Home Tab

The Home tab contains standard commands for project management.

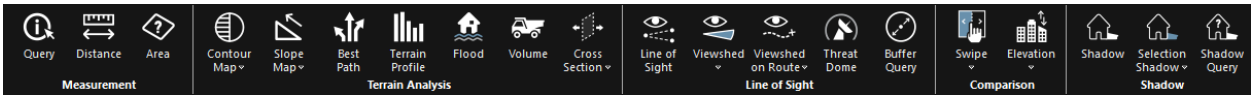


Home Tab

Group	Description
Selection	**See** "Selecting Objects for Editing" and "Cutting, Copying, and Pasting Objects" in the "Working with Objects" chapter for information.
Environment	**See** "Date and Time" and "Light Source" in the "Basic Concepts" chapter and "Shadow Tools" in the "Analysis Tools" chapter for information.
Navigation	**See** "Underground Navigation" in the "Navigating in the 3D World" chapter and "Walk Mode" in the "Navigating in the 3D World" chapter for information.
Add	**See** the "Working with Objects", "Presentations", "Feature Layers", "Imagery and Elevation Layers", "3D Mesh Layers", "Complex Layers", "Point Cloud Layers", and "Using the Project Tree" chapters and "Creating Locations" in the "Navigating in the 3D World" chapter for information.
Project	**See** the "Setting the Project" chapter and "Publishing TerraExplorer Kits" in this chapter and "Publishing a Project to SkylineGlobe Server" in the "Publishing TerraExplorer Projects" chapter for information.

Analysis Tab

The Analysis tab contains commands for performing measurements and terrain analysis.

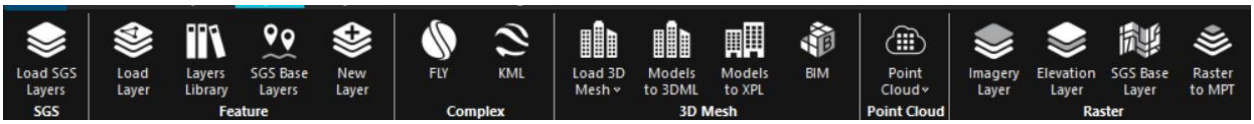


Analysis Tab

Group	Description
Measurement	**See** "Measurement Tools" in the "Analysis Tools" chapter for information.
Terrain Analysis	**See** "Terrain Analysis Tools" in the "Analysis Tools" chapter for information.
Line of Sight	**See** "Line of Sight Tools" in the "Analysis Tools" chapter for information.
Comparison	**See** "Comparison Tools" in the "Analysis Tools" chapter for information.
Shadow	**See** "Shadow Tools" in the "Analysis Tools" chapter for information.

Layers Tab

The Layers tab contains commands for adding layers to the project and for converting data to formats which provide better performance.

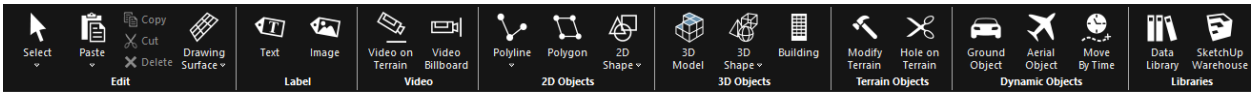


Layers Tab

Group	Description
SGS	**See "**Loading SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter for information.
Feature	**See** the "Feature Layers" chapter for information.
Complex	**See** the "Complex Layers" chapter for information.
3D Mesh	**See** the "3D Mesh Layers" chapter for information.
Point Cloud	**See** the "Point Cloud Layers" chapter for information.
Raster	**See** the "Imagery and Elevation Layers" chapter for information.

Objects Tab

The Objects tab contains commands for adding objects to the 3D World.

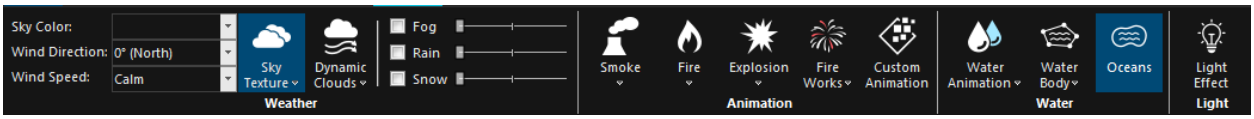


Objects Tab

Group	Description
Edit	**See** "Selecting Objects for Editing", "Using Drawing Surfaces", and "Cutting, Copying, and Pasting Objects" in the "Working with Objects" chapter for information.
Label	**See** "Text and Image Labels" in the "Objects and Labels" chapter for information.
Video	**See** "Video on Terrain and Video Billboard" in the "Objects and Labels" chapter for information.
2D Objects	**See** "2D Objects" in the "Objects and Labels" chapter for information.
3D Objects	**See** "3D Objects" in the "Objects and Labels" chapter for information.
Terrain Objects	**See** "Terrain Objects" in the "Objects and Labels " chapter for information.
Dynamic Objects	**See** "Dynamic Objects" in the "Objects and Labels" chapter for information.
Libraries	**See** "Loading Objects from the Data Library" and "Loading Objects from Sketchup Warehouse" in the "Working with Objects" chapter for information.

Effects Tab

The Effects tab contains commands for creating and setting environment and weather effects and animations



Effects Tab

Group	Description
Weather	**See** "Weather Effects" in the "Effects" chapter for information.
Animation	**See** "Animation Effects" in the "Effects" chapter for information.
Water	**See** "Water Effects" in the "Effects" chapter for information.
Light	**See** "Light Effects" in the "Effects" chapter for information.

Navigation Tab

The Navigation tab contains commands for navigating in the 3D Window.

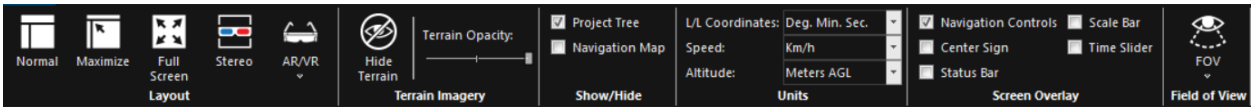


Navigation Tab

Group	Description
3D Mode	**See** "3D Modes" in the "Navigating in the 3D World" chapter for information.
Navigate to	**See** "Navigating Using Ribbon Controls" in the "Navigating in the 3D World" chapter for information.
Navigation Modes	**See** "Navigating in Walk Mode" in the "Navigating in the 3D World" chapter for information.
Map	**See** the "Navigation Map" chapter for information.
Navigation Aid	**See** "GPS Tracking," "Target," "Look Around Tool", "Obtaining Address Details" and "Multiple Coordinate Systems" in the "Navigating in the 3D World" chapter.

View Tab

The View tab contains commands for changing your view, layout, and overlay of the 3D Window.

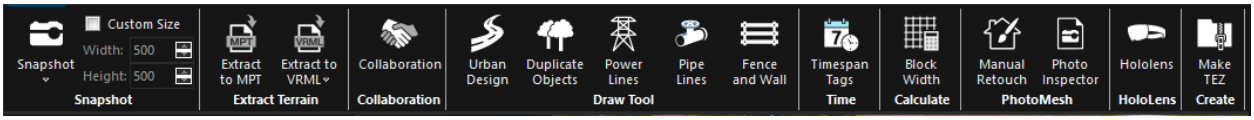


View Tab

Group	Description
Layout	**See** "Standard Layouts" in the "Basic Concepts" chapter for information.
Terrain Imagery	**See** "Terrain Opacity" and "Hide Terrain" in the "Basic Concepts" chapter for information.
Show/Hide	**See** "Hiding and Displaying Panels" in the "Basic Concepts" chapter for information.
Units	**See** "Units" in the "Basic Concepts" chapter for information.
Screen Overlay	**See** "Using Screen Overlay" in the "Basic Concepts" chapter for information.
Field of View	**See** "Field of View" in the "Basic Concepts" chapter for information.

Tools Tab

The Tools tab contains commands that manage layout and display modes.



Tools Tab

Group	Description
Snapshot	**See** "Snapshot Tool" in the "Working with Tools" chapter for information.
Extract Terrain	**See** "Extracting Terrain to MPT", "Extracting Terrain to VRML", and "Extracting Terrain to Zebra" in the "Working with Tools" chapter for information.
Collaboration	**See** "Collaboration Tool" in the "Working with Tools" chapter for information.
Draw Tool	**See** "Drawing Tools" in the "Working with Tools" chapter for information.
Time	**See** "Timespan Tool" in the "Working with Tools" chapter for information.
Calculate	**See** "Block Width Tool" in the "Working with Tools" chapter for information.
PhotoMesh	**See** "Marking a Mesh Layer for Retouching" in the "Mesh Layers" chapter and "Photo Inspector Tool" in the "Working with Tools" chapter for information.
HoloLens	**See** "HoloLens Extension" in the "Working with Tools" chapter for information. This tool appears on the Tools tab following the installation of the HoloLens TEZ file.
Create	**See** "TEZ Creator Tool" in the "Working with Tools" chapter for information.

Feature Layer Tab

The Feature Layer tab is only displayed when a layer is selected. It contains commands for editing and querying layers and displaying layer properties.



Feature Layer Tab

Group	Description
Layer	**See** "Setting and Editing Feature Layer Properties " in the "Feature Layers" chapter for information.
Selection	**See** "Working with Features" in the "Feature Layers" chapter for information.
Edit	**See** "Feature Layer Operations" in the "Feature Layers" chapter for information.
Attributes	**See** "Searching and Performing Operations by Attribute (Attribute Table Tool)" in the "Feature Layers" chapter for information.
Load and Save	**See** "Saving Feature Layers" in the "Feature Layers" chapter for information.

3D Mesh Layer Tab

The 3D Mesh Layer tab is only displayed when a 3DML is selected. It contains commands for editing and querying mesh layers, classifying them, displaying their properties, and saving/exporting them.



3D Mesh Layer Tab

Group	Description
General	**See** "Setting and Editing 3D Mesh Layer Properties", "Display Tools", and "Modifying a 3D Mesh Layer" in the "3D Mesh Layers" chapter for information.
Mesh Layer	**See** "Exporting Mesh Layers to Other Formats", and "Exporting Mesh Layer to Models" in the "3D Mesh Layers" chapter for information.
Volume Classification	**See** "Classifying Layers and Objects Using Feature Layers" in the "Feature Layers" chapter for information.
Classification Layer	**See** "Editing Feature Layer Properties", "Saving Layer Changes to the Original Data Source", and "Saving Layer Changes to a New File" in the "3D Mesh Layers" chapter for information.
Selection	**See** "Selecting Features from the 3D Window" and "Spatial Queries" in the "3D Mesh Layers" chapter for information.

Attributes	**See** "Searching and Performing Operations by Attribute (Attribute Table Tool)" and "Editing Feature Attributes" in the "3D Mesh Layers" chapter for information.

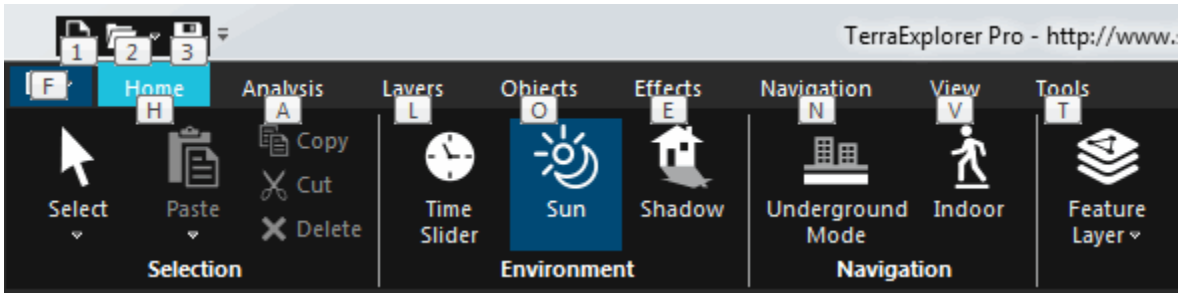
Shortcut Keys

Most commands can be accessed through a keyboard shortcut. You do not need to remember these shortcuts, however, since they display on the screen as "Key Tips" when you press the ALT key.

Note: Some alternate shortcut keys appear in this documentation in parentheses in the section where the command is explained.

To use a shortcut key:

1. Press **ALT**. The Key Tips are displayed over each main tab and over each command on the Quick Access toolbar.



TerraExplorer Key Tips

2. Press the letter or number shown in the Key Tip over the tab/command that you want to use.
3. If you pressed a letter over one of the tabs, that tab is displayed showing Key Tips over the enabled commands. Press the letter of the required command.

Note: Pressing ALT a second time hides the Key Tips.

Quick Access Toolbar

The Quick Access toolbar is a customizable toolbar that contains a set of commands that are independent of the tab that is currently displayed. Commands can be added or deleted from the Quick Access toolbar, according to each user's needs and convenience.

Adding/Deleting Commands from the Quick Access Toolbar

The Quick Access toolbar can be customized in two ways:

- By right-clicking the required commands on each tab.

  Note: This method is recommended for addition/deletion of just a few commands.

- By opening a dialog in which you select the commands to include in the Quick Access toolbar.

  Note: This method is recommended for extensive modification of the Quick Access toolbar.

Adding/Deleting Commands by Right-Clicking

To add or delete a command:

1. If you want to add a command to the Quick Access toolbar, do the following:
   a. On the required tab, right-click the command you want added to the Quick Access toolbar.
   b. From the shortcut menu, select **Add to Quick Access Toolbar**. The command is added to the Quick Access toolbar.
2. If you want to delete a command from the Quick Access toolbar, do the following:
   a. On the **Quick Access** toolbar, right-click the command you want to delete.
   b. From the shortcut menu, select **Remove from Quick Access Toolbar**. The command is deleted from the Quick Access toolbar.

Adding/Deleting Commands Using the Customize Dialog

To add or delete commands from the Customize dialog:

1. Right-click anywhere on the **Ribbon**.
2. From the shortcut menu, select **Customize Quick Access Toolbar**. The Customize dialog is displayed.
3. From the **Choose commands from** dropdown list, select the grouping whose commands you want to add or remove from the Quick Access toolbar. The options include all of TerraExplorer's Ribbon tabs, as well as File and Print Preview.
   The Commands section displays all of the commands that are available on the selected option. The section on the right side of the dialog displays all the commands in all tabs that are presently included on your Quick Access toolbar.
4. If you want to add a command, select it in the **Commands** list and click **Add**.
5. If you want to remove a command, select it in the section on the right side of the dialog, and click **Remove**.
6. If you want to change the order in which the commands are displayed on the Quick Access toolbar, in the section on the right side of the dialog, select the command whose position you want changed and use the arrow keys on the right to shift its position on the toolbar.
7. If you want to restore the Quick Access toolbar its default group of commands, click **Reset**.
   Note: The default commands included in the Quick Access toolbar are: New, Open and Save.
8. Click **OK**.

Moving the Quick Access Toolbar

The Quick Access toolbar can be located in either of the following locations:

- Upper-left corner, above the Ribbon (default location) - Maximizing your workspace.
- Below the Ribbon - With more convenient access from your work area.

To move the Quick Access toolbar from its current location:

1. Right-click anywhere on the **Ribbon**.
2. From the shortcut menu, select Show Quick Access Toolbar Below the Ribbon/ Show Quick Access Toolbar Above the Ribbon.

Creating and Opening a Project

You can do either of the following:

- Create a New .FLY Project
- Load an Existing Project

Creating a New .FLY Project

To create a new .FLY project:

From the **File** menu , select **New** (Ctrl +N). The **Open Terrain Database** dialog is displayed.

1. Enter the name of the local or remote MPT database, or browse to the required local database. **See** "Opening a Remote Database (MPT or DirectConnect Project) from SkylineGlobe Server" in this chapter for information.
2. If you instead want to open a low resolution MPT included in the installation folder, type: "%localterrain%".
3. Click **OK**.

Opening a Remote Database (MPT or DirectConnect Project)

A remote database is an MPT file or a TerraBuilder DirectConnect project (TBP) published to a SkylineGlobe server.

To open an MPT/TBP file from a SkylineGlobe server:

- Use: <Layer Name>@<SkylineGlobe Server URL>:<Port Number>/SG
  (e.g., washington-dc.12345.mpt@tglobe.skylineglobe.com/SG)

  Note: The Port Number is only required when not using the default port 80.

  Note: When opening an MPT or TBP file from a SkylineGlobe server (that is configured to use SSL) over a secure connection (SSL), use <Layer Name>@<SkylineGlobe Server URL>:<Port Number>**$**/SG

To open an MPT/TBP file from a legacy TerraGate server:

- Use: <Layer Name>@<name of the TerraGate server or IP address

Loading an Existing Project

To load an existing project from file:

1. From the **File** menu , point to **Open** and select **Open Project from File**. The **Open** dialog is displayed.
2. Enter a file name or URL, or browse to an existing .FLY file in your file system.

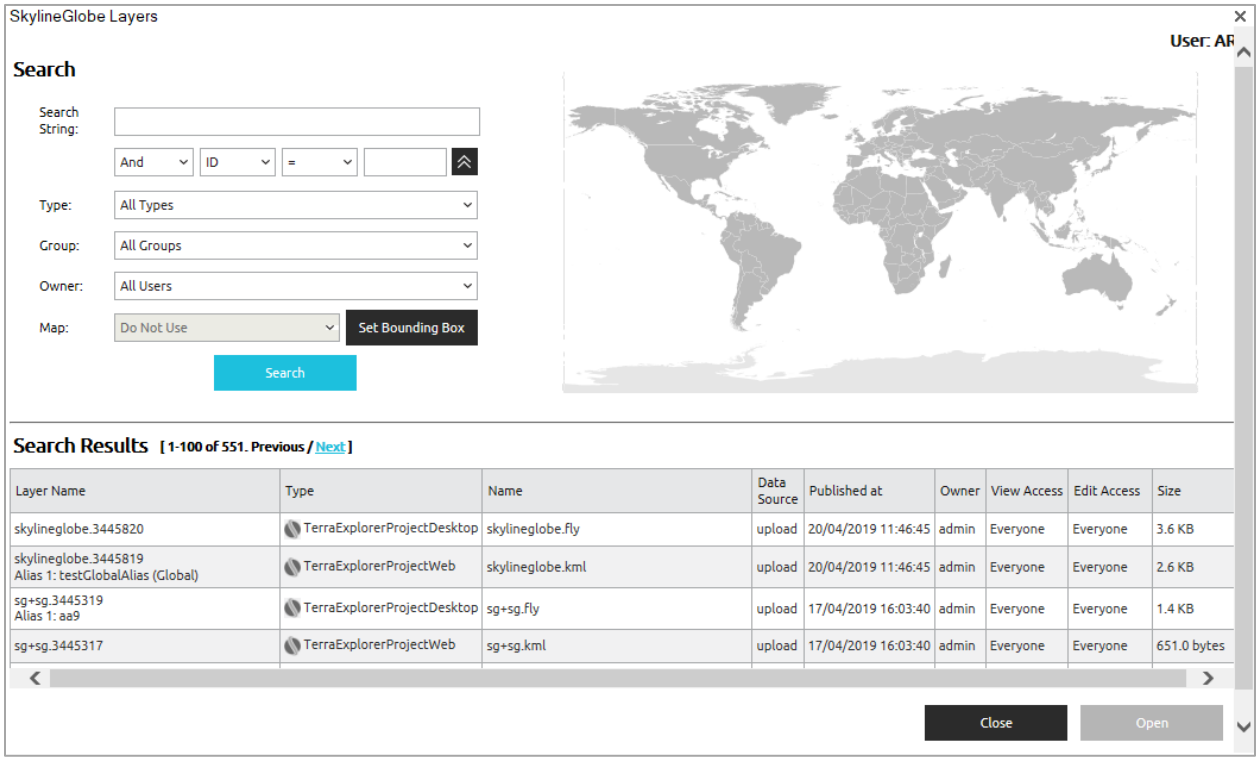
   Note: If you use a URL, you must enter the complete address, including the file name. For example: http://www.skylineglobe.com/SkylineGlobeLayers/SG_ExternalFlys/skylineglobe7.fly

Note: You can also open a .FLY project by double-clicking on any .FLY file in your file system or any link to a .FLY file on an HTML page. If the TerraExplorer Basic viewer, and not TerraExplorer Pro, is your default viewer for .FLY files, you can still use this feature by opening TerraExplorer Pro and then selecting the .FLY file or link.

Note: At any point while loading a project, you can hit the ESC key to abort.

To load an existing project from SkylineGlobe Server:

1. From the **File** menu, point to **Open** and select **Open Project from SkylineGlobe**.
2. If you aren't already logged in to a SkylineGlobe Server, the Login SkylineGlobe Server dialog is first displayed. Click **Log in** to connect to a server. **See** "Logging In to a SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for more information.
3. The **SkylineGlobe Layer** dialog is displayed showing all project layers on your SkylineGlobe server.



SkylineGlobe Layers Dialog

4. Select the required project layer and click **Load**.

Saving a Project

When you save your project, it is saved to a .FLY file, a file that contains all the project settings and content. The .FLY file does not include the actual terrain databases (MPT file) or any other loaded 2D or 3D files. It only contains pointers to the local or remote files.

The names of the external files are stored in the .FLY file in their full path format. You can copy .FLY files to other locations in your local system, but not to remote computers or servers.

Note: You can create projects for distribution, either on an external storage device or on network servers, by publishing the project. **See** the "Publishing TerraExplorer Projects" chapter for information.

Save Project

To save a project:

- From the **File** menu , select **Save** (Ctrl + S).

Save As…

To save a project under a different name or in a different directory:

1. From the **File** menu , select **Save As**.
2. In the **Save Project As** dialog, select a path and type a new project name.
3. Click **Save**.

Export to KML

A TerraExplorer project can be exported to an OGC KML file. KML uses a tag-based structure with nested elements and attributes and is based on the XML standard. All tags are case-sensitive and must appear exactly as they are listed in the OpenGIS® KML Encoding Standard (OGC KML) reference. The export process preserves TerraExplorer object properties as accurately as possible by translating TerraExplorer objects to their equivalent KML geometries. If there is no KML element that precisely represents a TerraExplorer object, TerraExplorer uses the closest match.

The following translations are performed:

TerraExplorer 2D objects	Equivalent KML geometry
Rectangle, regular polygon, ellipse, circle	Polygon
Arc: ▪ Fill opacity =0	Line string
▪ Fill opacity >0	Polygon
Arrow: ▪  style	Polyline
▪  styles	Polygon
Image label, text label	Point
Video on terrain	Does not export.

TerraExplorer 3D objects	Equivalent KML object
Box, sphere, cone, cylinder, 3D arrow, pyramid	3D model
Building	3D model
3D Model (that does not contain DAE)	Label
Modify Terrain	Does not export.
Hole on terrain	Does not export.
Multi-polygon	Multi-polygon
Polygon with hole	Polygon with hole
3D Polygon ▪ with altitude = 0 relative to terrain	Polygon
▪ with altitude ≠ 0 relative to terrain	3D Model
Rectangle with texture, polygon (only with 4 vertices) with texture, imagery layer. **Note:** Only if their resources contain the following formats: jpeg, BMP, tif, png, gif.	Ground overlay

When exporting a project with a presentation to KML, the following Tour tags are exported (Tag, Parent Tag):

- <gx:Tour> <gx:Document>
- <gx:PlayList> <gx:Tour>
- <gx:FlyTo> <gx:PlayList>
- <gx:duration> <gx:FlyTo>
- <gx:flyToMode> <gx:FlyTo>
- <Camera> <gx:FlyTo>
- <gx:AnimationUpdate> <gx:Tour>

To export a project to a KML file:

1. On the **File** menu , point to **Save As, an**d then select **Export Project to KML**.
2. In t**he Save Project As** dialog, select a path and type a new project name.
3. Click **Save**.

Closing a Project

To close a project:

- From the **File** menu , select **Close**. If you haven't saved changes, a dialog is displayed asking whether you want to save your changes.

Note: When the application is in minimized mode, it stays open, but stops processing. All routes, flights, dynamic objects, etc. halt their movement. No CPU power is consumed in this mode. When the application is restored, all movement resumes from the point at which it was halted. The TerraExplorer Pro application is also halted when the 3D Window is completely covered by other applications.

Coordinate System

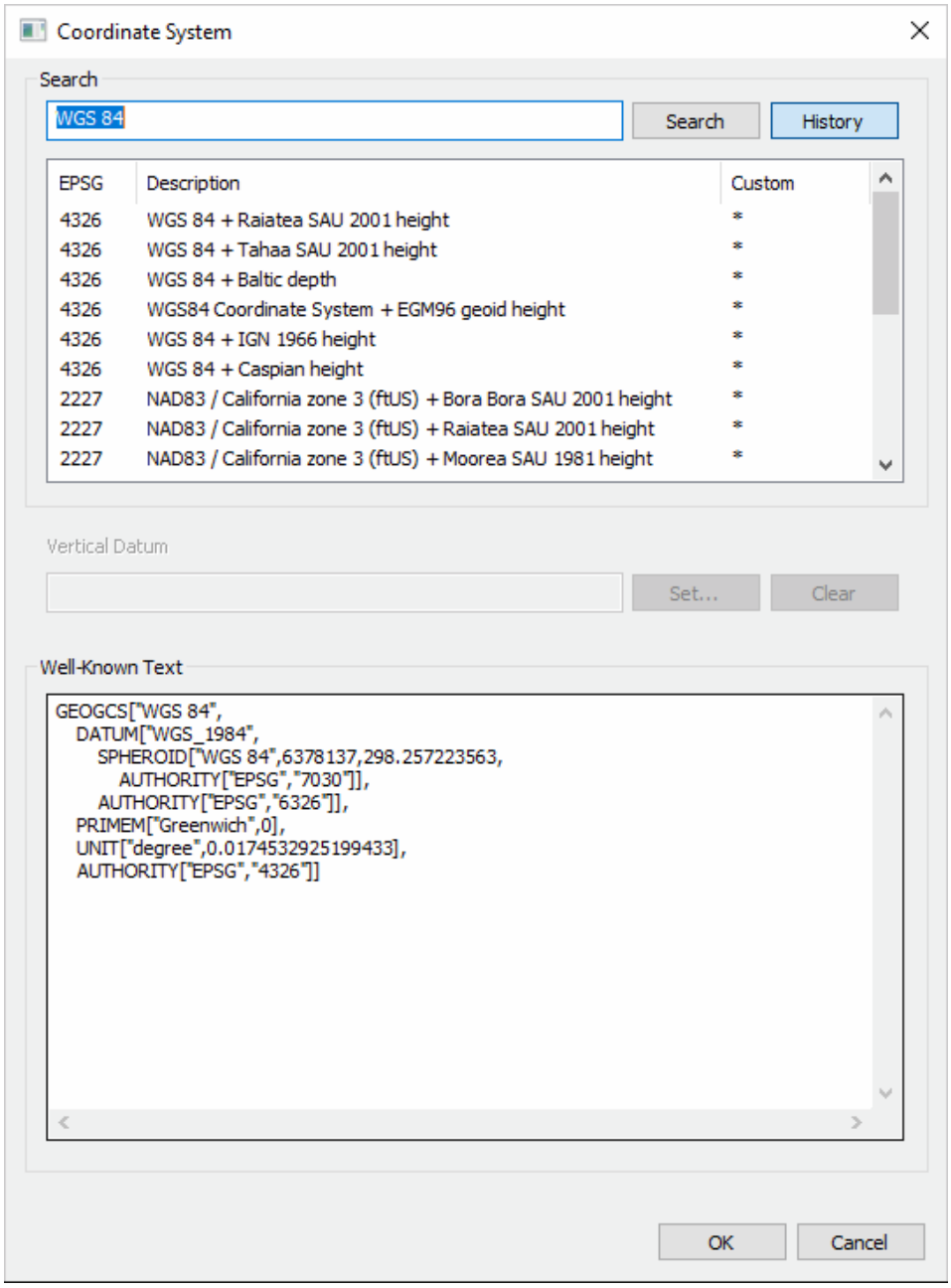
A coordinate system is a reference system used to represent the locations of project data within a common coordinate framework. A coordinate system can be projected (X, Y), geographic (latitude-longitude), or geocentric (X, Y, Z). Each coordinate system is defined by a Well-Known Text (WKT) definition string, a simple structured, text-based format for spatial reference system information that is easy to store and share between systems (**See** http://portal.opengeospatial.org/files/?artifact_id=999 and https://en.wikipedia.org/wiki/Well-known_text_representation_of_coordinate_reference_systems). A coordinate system can optionally include a vertical datum that defines the origin for height values.

All project layers must be displayed in the terrain coordinate system. When you add a new layer to a project, TerraExplorer tries to read its coordinate system. If TerraExplorer is able to do so, it automatically reprojects the layer to the project's coordinate system. If the layer does not include coordinate system information or TerraExplorer is unable to read this information, you can indicate the coordinate system of this source, as provided by the data supplier, in the Coordinate System dialog. TerraExplorer then converts the layer data to the project's coordinate system. Although the source file retains its original coordinate system, it is placed on the terrain according to the reprojection parameters.

Coordinate System Dialog

The Coordinate System dialog is a high-level dialog that allows you to select, view, and edit a coordinate system. You can also use this dialog to define new coordinate systems that are not already defined. This dialog is accessed in the following cases:

- The coordinate system of a project's base MPT is reprojected from the Project Settings, Terrain Database tab. **See** "Terrain Database" in the "Setting the Project" chapter for information.
- The coordinate system of a feature or raster layer is changed from the layer's property sheet (In the **Projection Group**, in the **Coordinate System** field, click **Set**.).
- An imagery or elevation layer does not have coordinate information or TerraExplorer cannot read it from file - in this case, the Coordinate System dialog directly opens.
- A navigation map's coordinate system is changed from the Navigation Map Settings dialog. **See** "Reprojecting a Navigation Map" in the "Navigation Map" chapter for information.



Coordinate System Dialog

To select a coordinate system:

1. Enter the coordinate system information using one of the following methods:
   - Click **History** and select one of the recently used coordinate systems. The last 20 coordinate systems used are saved in the History for future use.
   - In the **Search** field, type the EPSG code or a phrase from the Coordinate system Description, as indicated by the supplier, and click **Search**. Then select the required result from the search results displayed directly below.
   - In the **Well Known Text** section, type the WKT. The Well Known Text representation of spatial reference systems, regulated by the Open Geospatial Consortium (OGC), provides a standard

textual representation for coordinate system information. You can edit an existing WKT. **See** "https://www.opengeospatial.org/standards/wkt-crs" for more information.

Note: A custom coordinate system is listed with all the other coordinate systems, with an asterisk in the Custom column.

2. If the coordinate system includes a vertical datum, click **Set** and select a vertical datum from the list of supported datums.

   Note: If the WKT of your coordinate system references a particular grid shift file that was not bundled with the TerraExplorer installation, you can add the file by downloading it and placing it in the required directory. **See** "Adding Grid Shift Files" in this chapter for information.

3. Click **OK**.

To delete coordinate systems from History:

1. Click **History**, and then in the list of coordinate systems, right-click the required custom system, and select one of the following:
   - **Delete the selected item** – To delete only the selected item.
   - **Delete all the history items** – To clear all coordinate systems from the History.
2. Click **OK**.

Adding Grid Shift (TIFF, GSB, and GTX) Files

TerraExplorer uses GeoTIFF grid shift files to shift and transform between some coordinate systems that have different datums. For backward compatibility, GSB and GTX grid shift files are also currently supported. When the Well-Known Text (WKT) of one of the coordinate systems in your project references a particular grid shift file, TerraExplorer first checks your local computer for the file in the following locations and downloads it:

- %AppData%\Skyline (e.g., C:\Users\[user name]\AppData\Roaming\Skyline\gdal_proj_data)
- Proj subdirectory of installation directory (e.g., C:\Program Files\TerraExplorer\proj)
- %ProgramData%\Skyline\gdal_proj_data (e.g., C:\ProgramData\Skyline\gdal_proj_data)

If the file was not found on your computer, TerraExplorer dynamically downloads the necessary grid shift file from the PROJ-data folder on the currently connected SkylineGlobe Server. If you are not connected to a server, the default is https://cdn.proj.org. A different URL can be set in the *proj.ini* file found in the *proj* subdirectory of the installation directory. SkylineGlobe Server v8.0 and GDAL v3's coordinate system reprojection library are required for dynamic download of grid shift files. **See** "Use reproject by GDAL starting from version 3" in the "Using TerraExplorer Options" chapter for more information.

Grid shift files can also be preloaded for offline use, as described below.

To preload a grid shift file, find and install the missing file:

1. Generally, when one of the coordinate systems in your project references a particular grid shift file that was not found on your computer, a notification will display in the coordinate system dialog or in the Error/Message Log with a link to a page with the required grid shift file. The grid shift file on this page is packaged as a TEZ, a TerraExplorer zip file that enables the grid shift file to be installed without manually copying the file into a specific folder. In this case, download the TEZ and then simply double-click the file to install. **See** "Package Grid Shift Files" in the "Working with Tools" chapter for more information. TerraExplorer will save the grid shift file to %ProgramData%\Skyline\gdal_proj_data (e.g., C:\ProgramData\Skyline\gdal_proj_data). If

TerraExplorer is unable to save to that folder, it will save to %AppData%\Skyline\gdal_proj_data (e.g., C:\Users\[user name]\AppData\Roaming\Skyline\gdal_proj_data).

2. If no TEZ was made available to you with the missing grid shift file, see the following page with download links to many common grid shift files. Download the required zip file and extract the grid shift file to %ProgramData%\Skyline\gdal_proj_data (e.g., C:\ProgramData\Skyline\gdal_proj_data). If you do not have the necessary permissions to copy to this path, you can also copy the grid shift file to either of the following directories:
   - %AppData%\Skyline (e.g., C:\Users\[user name]\AppData\Roaming\Skyline\gdal_proj_data)
   - Proj subdirectory of installation directory (C:\Program Files\TerraExplorer\proj)

   Note: Additional common grid shift files are available from the following websites:
   - https://github.com/OSGeo/proj-datumgrid/tree/master/
   - https://vdatum.noaa.gov/download.php
   - https://raw.githubusercontent.com/OSGeo/proj.4/gh-pages/proj.pdf
   - https://proj.org/resource_files.html

If a reference to the grid shift file is missing in the VERT_CS section of the WKT, determine what grid shift file is required, and do the following:

1. Add a reference to the required grid shift file within the WKT's VERT_DATUM object that is under the VERT_CS object:

```
EXTENSION["PROJ4_GRIDS","[Name of Grid Shift File]"
```

E.g.,

```
COMPD_CS["RGF93 / Lambert-93 + NGF-IGN69 height",
    PROJCS["RGF93 / Lambert-93",
    ...,
    AUTHORITY["EPSG","2154"]],
VERT_CS["NGF-IGN69 height",
    VERT_DATUM["Nivellement General de la France - IGN69",2005,
          EXTENSION["PROJ4_GRIDS","RAF18.gtx"],
    AUTHORITY["EPSG","5119"]],
    UNIT["metre",1,AUTHORITY["EPSG","9001"]],
    AXIS["Up",UP],AUTHORITY["EPSG","5720"]]
]
```

2. Find and install the missing grid shift file as described above.

Using Screen Overlay

There are several controls and indicators that can be displayed in the 3D Window to orient you and help you navigate:

- Navigation Controls
- Center Sign
- Status Bar
- Scale Bar

- Date and Time Slider

To display/hide a screen overlay element:

- On the **View** tab, in the **Screen Overlay** group, select/clear the required element's check box.

Navigation Controls

The navigation controls and virtual joystick enable you to rotate, tilt or zoom in or out of the terrain, free fly in the 3D World and change the camera tilt and plane direction. **See** "Navigating Using On-Screen Navigation Controls" in the "Navigating in the 3D World" chapter for more information.



Navigation Controls

Center Sign

The Center Sign displays the 3D Window center point.



Center Sign

Status Bar

The status bar displays:

- The longitude, latitude, altitude, and direction of the plane/camera. Clicking on the status bar opens the Jump to Location panel. **See** "Jump to Location Panel" in the "Navigating in the 3D World" chapter for further information.
- The current terrain buffering level in a graphical format. The display quality indicator represents the current terrain resolution for the area shown in the 3D Window, compared to the estimated maximum resolution available in the terrain database. The graphic bar indicates values from 0%-100% of quality.
- Copyright text (**See** "Screen Overlay" in the "Setting the Project" chapter).



Status Bar

Scale Bar

The scale bar shows the ratio of a distance in the 3D virtual World to the corresponding distance in the actual world.

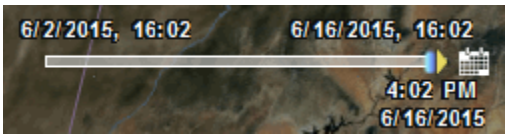
Date and Time Slider

The Date and Time Slider enables you to modify the current date and time so you can view each area of terrain in the date and time range that you require. If the sun is used as the project's light source, the displayed light on the terrain corresponds to the sunlight there is on the terrain at the hour and date indicated by the blue marker on the slider. The objects displayed on the terrain at each selected time correspond to the timespans that were set for these objects. The timespan for an object or group can be set in its property sheet.

Note: Project startup settings for the date and time can be set in the **Atmospheric Effects** tab in the **Project Settings** dialog. **See** "Date and Light Effects" in the "Setting the Project" chapter for information.

To use the Date and Time slider:

1. On the **Home** tab, in the **Environment** group, click **Time Slider**. The Date and Time slider is displayed on the upper left corner of the 3D Window.



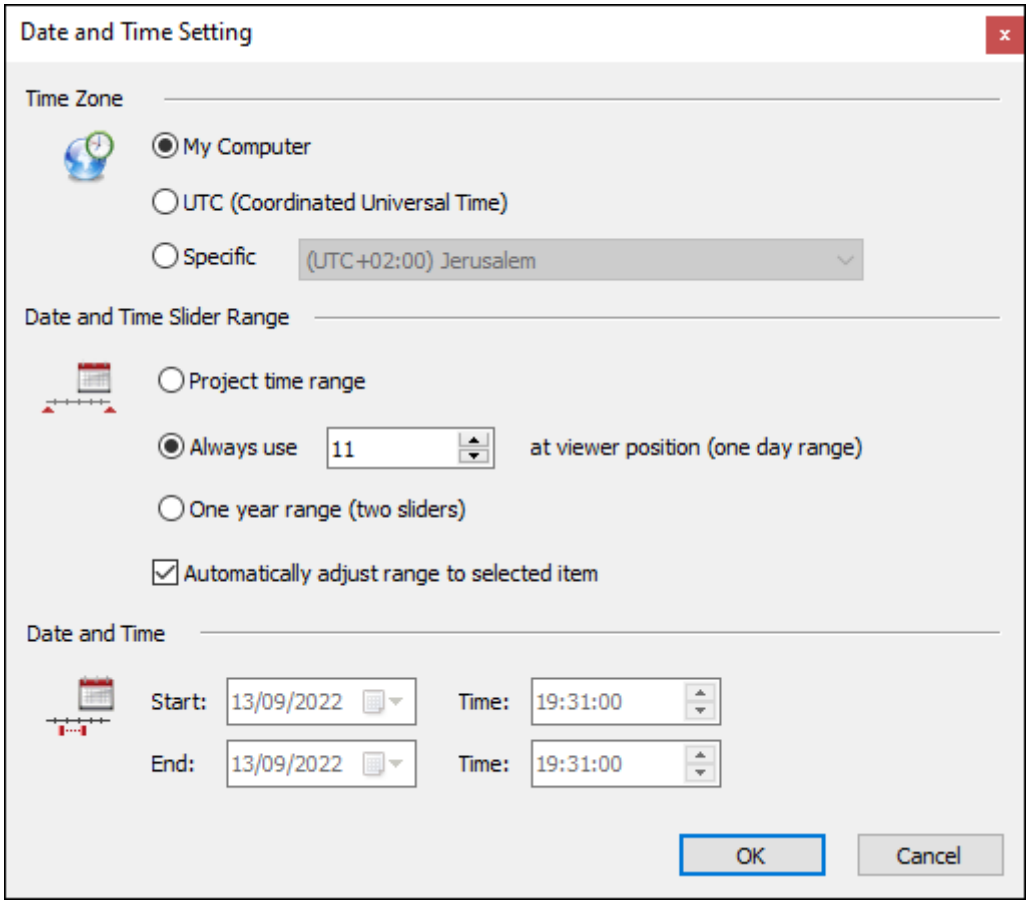
Date and Time Slider

2. You can display TerraExplorer elements for a particular time and date or for a time range.
   - If you want to display data for a specific time and date, drag the blue marker and yellow arrow  together to the required date and time on the slider.
   - If you want to display data whose timespans fall anywhere in a time range, drag the blue marker to the start point of the time range and the yellow arrow to the endpoint of the time range . **See** "Timespan" in the "Working with Tools" chapter for more information on timespans.

   Note: The yellow arrow displays on the time slider only when the **Project time range** or **Automatically adjust range to selected item** settings are selected in the Date and Time Setting dialog. **See** below.

   Note: If the sun is used as the project's light source, the displayed light on the terrain corresponds to the sunlight there is on the terrain at the hour indicated by the blue marker.

3. Click **Date and Time Settings**  to the right of the slider to select a mode. The Date and Time Setting dialog is displayed.



Date and Time Setting Dialog

4. Select one of the following time zones. The time zone you select determines which time zone is used for the time you select in the Date and Time Setting section in the same dialog.
   - **My computer -**Your local time zone.
   - **UTC** (coordinated Universal Time) - UTC time (GMT + 0:00).
   - **Specific** - The time zone you select from the dropdown list.
5. Control the interval of time for which you can view objects and features with timespans by selecting a date and time range for the date/time slider:
   - Project time range



   The slider's time range corresponds to the project's time range. Date and hour adjustments are both made on the same slider.
   - Always use <> at viewer position



The slider's time range is 24 hours.
This option also requires you to select a specific time which will be the default current time (until the time is changed on the slider).

- One year range (two sliders)



The time slider's range is 24 hours and the date slider's range is one year.

6. If you want the date and time sliders ranges to automatically readjust to correspond to the timespan of the selected item, select the **Automatically adjust range to selected item** check box.
7. Set the project's **current** time and date or time range.

   Note: The current date and time can only be set when Project time range is selected above and there are objects or groups in the project for which timespans were set.

   - If you want to set a specific current time and date, set the **same** Start and End Date and Time. The blue marker and yellow arrow are displayed together on the slider .
   - If you want to set a current time **range** so that all objects and features whose timespans fall anywhere in the range display, set a Start Date and Time, and then set an End Date and Time. The blue marker on the slider indicates the Start Date/Time and the yellow arrow indicates the End Date/Time .

   Note: Start and end date and time must be within the project range.

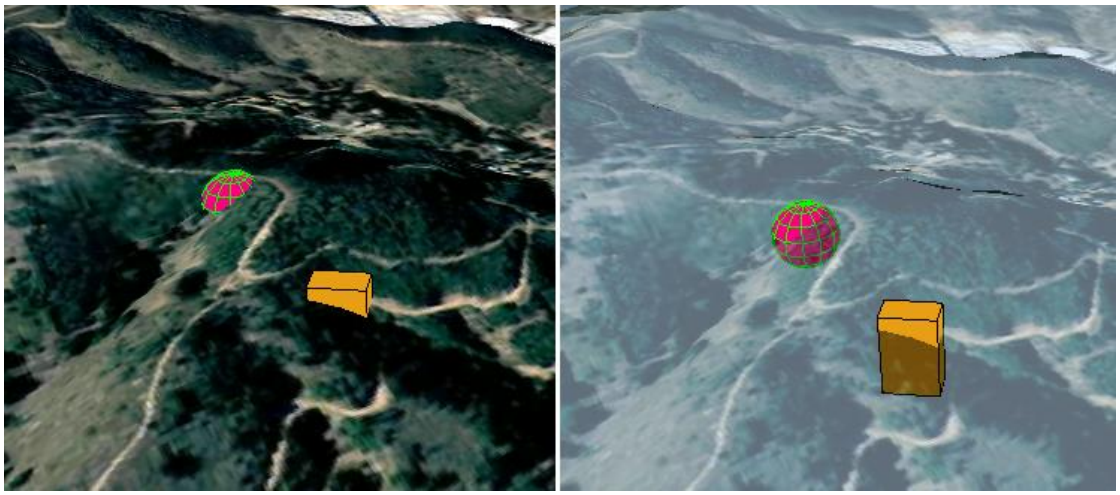
3D Window Viewing Options

The following settings affect the view in the 3D Window:

- Terrain Opacity
- Hide Terrain
- Field of View
- Units

Terrain Opacity

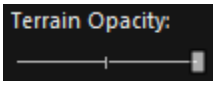
You can set the opacity of the terrain in the 3D Window. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent. When the opacity is less than 100% (opaque) objects that are submerged in the terrain become visible through it.



Terrain Objects with Controlled Terrain Opacity

To change the terrain opacity:

- On the **View** tab, in the **Terrain Imagery** group, drag the **Terrain Opacity** slider.



Terrain Opacity Slider

Hide Terrain

You can hide the terrain texture (the terrain appears as a black image).

To toggle the display of the terrain on/off:

- On the **View** tab, in the **Terrain Imagery** group, click **Hide Terrain**.

Field of View

The field of view is the size of the camera's viewing angle, or the zoom level of the camera. TerraExplorer Pro's field of view ranges from 15 to 90 degrees, with 53 degrees set as the default.

A wider field of view (larger angle) allows you to see more, with a decreased zoom level. A narrower field of view (smaller angle) allows you to see less, with an increased zoom level. In some cases, you also experience reduced performance of the TerraExplorer Pro application with a field of view less than 53 degrees.

To set the camera's field of view:

- On the **View** tab, click **FOV** and select one of the values.

Units

You can change the units used throughout TerraExplorer Pro. Changing the unit settings substantially changes the display of your project: inputs and outputs, panels, property sheets, and Head Up displays are all affected. Elevation, speed, distance and more, are affected by coordinate settings.

To change units:

- On the **View** tab, in the **Units** group, select the speed, altitude, and coordinate units:

Parameter	Description
Lat-Long Coordinates	
Decimal	Presents coordinate values in a decimal degrees format. This option is only available when the terrain is defined in the Lat-Long coordinate system.
Degrees; Minutes; Seconds	Presents coordinate values in a degrees, minutes and seconds format. This option is only available when the terrain is defined in the Lat-Long coordinate system.
Degrees, Decimal Minutes	Presents coordinate values in a degrees and decimal minutes format. This option is only available when the terrain is defined in the Lat-Long coordinate system.
Speed	
Km/h	Sets the display units for speed to kilometers per hour.
Mph	Sets the display units for speed to miles per hour.
Knots	Sets the display units for speed to knots.
Altitude Units	
Above Ground Level (AGL)	Displays altitude values as meters or feet above ground level.
Absolute Values	Displays altitude values as meters or feet above the terrain database vertical datum base ellipsoid.

Light Source

You can turn the sunlight source on or off. When turned on, the sun, moon and sun flare objects are positioned based on the project's current time, date and time zone, and the sun is used as the project's light source. The sunlight affects the lighting on the terrain and on building objects.

Note: You can display a shadow effect based on the sun’s position for an entire scene (including terrain and all 3D models, objects, and buildings), or for specific 3D objects in the 3D Window. The shadows dynamically update when the system date and time is changed. **See** "Shadow Tools" in the "Analysis Tools" chapter for more information.

To toggle the sunlight source on/off:

- On the **Home** tab, in the **Environment** group, click **Sun**.

Note: Project startup settings for the light source can be set in the **Date and Light** tab in the **Project Settings** dialog. **See** "Date and Light Effects" in the "Setting the Project" chapter for further information.

Error/Message Log

The TerraExplorer log records and displays warnings, messages, and errors to help you troubleshoot any TerraExplorer issue. Logs can be exported and sent to Skyline support:

- **Errors** - Alerts users of critical problems.
- **Warnings** - Alerts users of conditions they should be aware of, which might cause problems in the

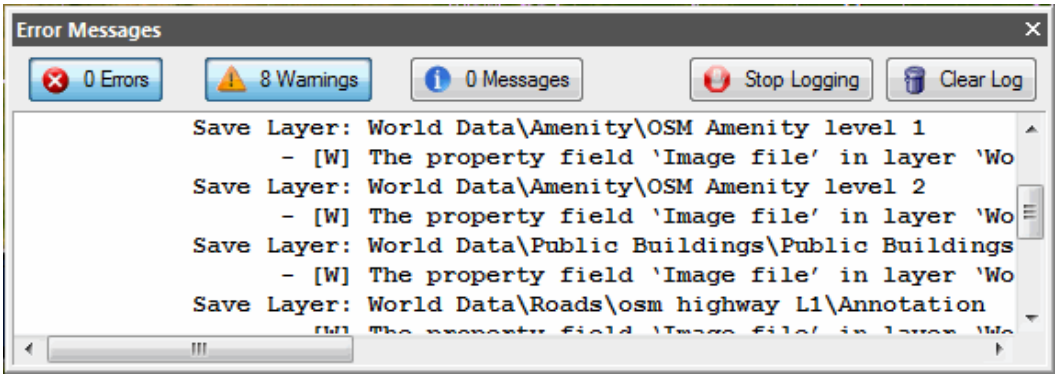
future.

- **Messages** - Records various activities.

Viewing the Log

To view the log:

1. Click **Log** on the bottom of the 3D Window. The log opens.



Error, Message, and Warning Log

2. Click the **Warnings**, **Messages** and **Errors** buttons to toggle the display of their respective messages on and off.

Clearing the Log

To clear the log:

- At the top of the log, click **Clear Log**.

Stop Logging

To stop logging:

- At the top of the log, click **Stop Logging**.

Hiding the Log

To hide the log:

- On the top right corner of the log, click the X.

Dragging and Dropping Files in TerraExplorer

TerraExplorer's drag and drop capability supports all raster and feature layer, image label, 3D model, 3DML, and CPT formats, in addition to, FLY, KML, KMZ, TBP, and MPT files. A single or multiple files can be dragged and dropped anywhere on the 3D Window or Project Tree or to specific Project Tree groups. Each dropped file is added to the current project as the TerraExplorer object that is the best match for the respective file based on an analysis of the file's properties as well as other factors. All file types supported in TerraExplorer can be dragged and dropped into TerraExplorer, and are loaded into the project as follows:

File Type	How Loaded
FLY dropped onto TerraExplorer Start page (no project open)	Project file
FLY (project already open)	Project layer
MPT dropped onto TerraExplorer Start page (no MPT already open)	Terrain database
MPT (MPT already open)	Ignored
Geo-referenced layer	Loaded in correct location on terrain
Non-geo-referenced layer	Placed at the center of the 3D Window
Feature layer	Loaded with default settings
Raster layer: width & height < 1000px	Image label
Raster layer: width & height > 1000px, elevation-specific file format	Elevation layer
Raster layer: width & height > 1000px, not elevation-specific file format	Imagery layer
Model dropped on polyline feature	Dynamic object with the polyline as its path

CHAPTER 5 NAVIGATING IN THE 3D WORLD

About Navigating

There are several ways to navigate in the 3D environment:

- In the 3D Window, use the mouse, keyboard, Ribbon commands, navigation controls, and joystick to navigate freely in the 3D World.
- Use the Project Tree to fly to predefined locations or objects, or to play a presentation.
- Use the Navigation Map to jump to and view locations in the 3D World.
- Use the TerraExplorer Pro COM interface to develop unique and customized navigation tools. See TerraExplorer Programmer's Guide.

Searching for an Address or Location

You can search for a specific address or location or obtain address information for any point on the terrain. The search provider is dependent on the SkylineGlobe Server that TerraExplorer is currently connected to. If you aren't already logged in to the required SkylineGlobe Server, log in to the server. **See** "Logging In to a SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.

To search:

- In the **Project Tree**, **Search here** field, type a search term. **See** "Search Tool" in the "Using the Project Tree" chapter for information on additional search options.

To fly to a specific coordinate:

- In the **Project Tree**, **Search here** field, type the coordinates using the following syntax:
  - **Coord:** Lon, Lat or X, Y - Fly to coordinate.
  - **MGRS:** MGRS coordinate - Fly to MGRS coordinate

Obtaining Address Details

To obtain address details for a specific location:

1. On the **Navigation** tab, in the **Navigation Aid** group, click **Point to Address**. The Point to Address panel is displayed.
2. Navigate to the desired location on the terrain and click. The location address is displayed in the Point to Address panel.
3. While the Point to Address panel is open, you can click again on any point on the terrain to find its address. Repeat for as many points as you require.
4. If you want to close the Point to Address tool, click the x on the upper right corner of the panel.

Navigating to Objects

You can perform the following flight actions on objects:

- Fly to Object
- Jump to Object
- Pre-Defined Flight Patterns

To perform an object's activation action, do either of the following:

- In the **Project Tree**, double-click the required object. The specific activation action set in the object's property sheet is performed.
- In the **Project Tree**, right-click the required object, and then select one of the options from the shortcut menu.

Menu Option	Description	
Fly to Object	Flies from the current location directly to the selected object. The camera stops at the object's "Viewing Distance". ▪ For static objects, the camera flies directly to the object, by the shortest flight path, and stops. ▪ For dynamic objects, the camera continues to follow the object.	
Jump to Object	Jumps directly to the object. The camera stops at the object's "Viewing Distance".	
View Object	This option's sub-menu contains a list of pre-defined flight patterns that compass about the object. When you play a flight pattern, the default flight time of the camera for a one round trip around the point of interest is 15 seconds.	
	Circle Pattern	Performs a circle flight pattern around the object. The camera always faces the specified object.
	Oval Pattern	Performs an oval flight pattern around the object. The camera always faces the specified object. The first radius is set to the distance parameter and the second radius is set to one-half of the distance parameter.
	Line Pattern	Performs a tight oval flight pattern around the object/location. The camera always faces the specified object. The first radius is set to the distance parameter and the second radius is set to one-tenth of the distance parameter.
	Arc Pattern	Performs a vertical arc flight above the object/location. The camera always faces the specified object. The radius is set according to the distance parameter.
	For objects, the View submenu also contains a set of pre-defined view angles around the object. The camera stops at the object's "Viewing Distance" from the object's location. For dynamic objects, the camera continues to follow the object until the user stops it or performs another action.	
	Behind Object	To view the object from behind
	Above Object	To view the object from above
	From Below	To view the object from below

	From Right	To view the object from the right-hand side
	From Left	To view the object from the left-hand side
	From Behind and Above	To view the object from behind and above (45 degrees)
	Cockpit View	To view the world from the object's pivot point. The camera is set to the object's roll, tilt and direction angles. In this mode, the dynamic object is hidden.
	Projector View	Available for Video On Terrain objects only. This is for viewing the world from the video projector's position. The camera is set to the projector's roll, tilt and direction angles.
	From Ground Point	To view the object from the ground. After selecting this option, select a ground point on the terrain from which you want to view the object. **Note:** The "View From Ground Point" action cannot be defined as the activation action for the object because it requires a reference point on the terrain.

Stopping a Flight to or Around an Object

To stop a flight to or around an object, do any of the following:

- Click anywhere in the **3D Window** and then press the spacebar.
- Right-click anywhere in the **3D Window**, and from the shortcut menu select **Stop**.
- In the **Project Tree**, right-click the object's name, and from the shortcut menu select **Stop**.

Free Flight

You can navigate freely in the 3D World using the mouse, keyboard, navigation controls and the joystick.

Navigating Using the Mouse

The mouse is the main tool for controlling the free flight in the 3D World. With the mouse on the 3D Window, you can control the direction and tilt angle of the camera, slide to the sides, zoom in and out, and fly around points of interest on the terrain.

You can set the preferred navigation mode in the TerraExplorer options. **See** "Navigation" in the "Using TerraExplorer Options" chapter for further information.

From the Ribbon's Navigation tab, you can switch between Drag (default) and Slide modes. The Turn and tilt mode is not available from the Ribbon.

Mouse Navigation Mode	Cursor	Description
Drag mode		The mouse controls the movement of the terrain.
Slide mode		The mouse controls the movement of the camera.
Turn and tilt mode		The mouse controls the movement of the tilt of the camera and direction of the plane.

Navigating in the Drag Mode

To navigate in the drag mode:

1. Click and hold the mouse button on a location in the terrain.
2. Drag the mouse  to the sides forward, and backward. The terrain location on which you clicked is dragged along with the cursor.
3. Change the following drag mode flight parameters using your mouse as described below:

Parameter	Description
West - East - North - South	Drag forward, backward, and to the sides of the 3D Window while pressing the mouse button. The terrain location on which you clicked is dragged along with the cursor.
Altitude	Rotate the wheel button and press CTRL to change the plane and camera altitude.
Zoom	Rotate the wheel button to zoom in or out, in relation to the center point. You can also double-click on the terrain to zoom in to the selected point.
Terrain Tilt Angle	While pressing CTRL or the wheel button, drag the mouse along a vertical axis of the 3D Window. The terrain tilts around the terrain center point in the direction of the drag.
Terrain Rotation	While pressing CTRL or the wheel button, drag the mouse along a horizontal axis of the 3D Window. The terrain turns around the terrain center point in the direction of the drag.

Navigating in the Slide Mode

To navigate in the slide mode:

1. Click and hold the mouse button on a location in the terrain.
2. Drag the mouse  to slide forward, backward and to the sides.

   The altitude of the plane and the tilt angle determines the speed of the slide. The closer you are to the ground the slower the movement is. When looking to the horizon, the forward and backward movement is accelerated to allow an easier navigation in the world.
3. Change the following slide mode flight parameters, by using your mouse as described below:

Parameter	Description
West-East-North-South	Slide up, down, and to the sides of the terrain. The plane and camera follow the direction of the cursor.
Altitude	Rotate the wheel button and press CTRL to change the plane and camera altitude.
Zoom	Rotate the wheel button to zoom in or out, in relation to the center point. You can also double-click on the terrain to zoom in to the selected point.
Speed	To increase the speed of the plane and camera, drag the cursor farther away from the 3D Window center in the direction of your terrain destination. To decrease the speed of the plane and camera drag the cursor closer to the 3D Window center while staying in the direction of your terrain destination.
Turn and Tilt	Click CTRL or press the wheel button while flying to switch to turn and tilt movements while in the slide mode. **See** "Navigating in the Turn and Tilt Mode" in this chapter for further information**.**

Navigating in the Turn and Tilt Mode

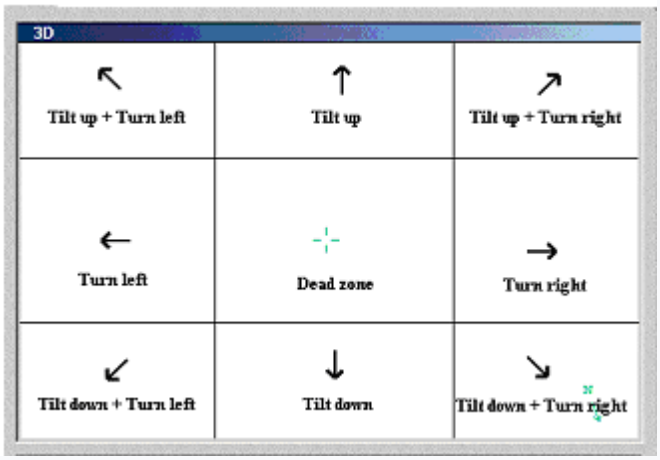
To navigate in the turn and tilt mode:

1. Click on the **3D Window** to change the plane or the camera direction and tilt angles.

   The inner area of the 3D Window is a "dead zone". Clicking in this area does not affect the direction or tilt angles. The outer area is divided into eight zones (**See** illustration below). The further the mouse is from the center point the faster the direction or tilt change.

2. Click and drag the mouse to other areas and even outside the 3D Window to change the mouse operations.

3. Change the following turn and tilt mode flight parameters, using your mouse as described below:

Parameter	Method
Tilt angle and turning direction	While pressing the mouse button, drag the pointer to the following 3D Window zones to perform the following: 

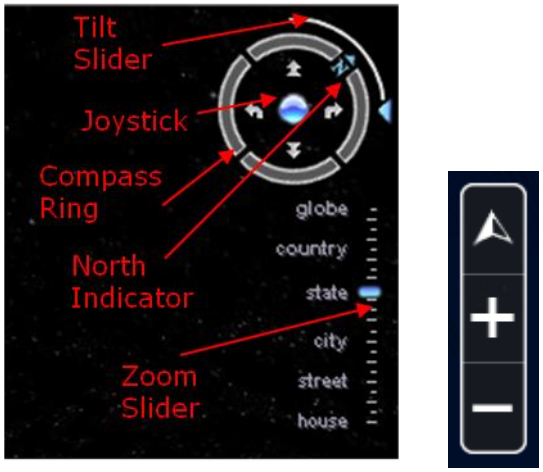
Altitude	Rotate the wheel button and press CTRL to change the plane and camera altitude.
Zoom	Rotate the wheel button to zoom in or out, in relation to the center point. You can also double-click on the terrain to zoom in to the selected point.
Speed	To increase the tilt and turning speed of the plane and camera drag the cursor farther away from the 3D Window center in the direction of your tilting and turning. To decrease the tilt and turning speed of the plane and camera drag the cursor closer to the 3D Window center while staying in the direction of your tilting and turning.
Slide	Click CTRL or the wheel button while flying to switch to slide movements while in the turn and tilt mode. **See** "Navigating in the Slide Mode" in this chapter for further information**.**

Navigating Using On-Screen Navigation Controls

Two options are available for displaying Navigation Controls:

- Advanced navigation control
- Simplified navigation control

The type of navigation controls is selected in the Screen Overlay tab of the Options menu. **See** "Screen Overlay" in the "Using TerraExplorer Options" chapter for information.



Advanced Navigation Control and Simplified Navigation Control

To navigate in the 3D Window using the advanced navigation control:

- Click the navigation controls to rotate, tilt or zoom in or out of the terrain.

Navigation Control	Description
Tilt Slider	Move the Tilt slider to change the plane tilt.
North Indicator	Click the N indicator in the compass ring to turn the plane to face north.

Compass Ring	Click and turn the compass ring to change the plane direction.
Joystick	The virtual joystick enables you to free fly in the 3D World in an intuitive manner, similar to real-life flying. With the virtual joystick, you can fly backward, forward and sideways. You can also perform the same action by using the up/down and left/right arrows around the joystick.
Zoom Slider	Click and drag the elevation slider to zoom in and out. You can also click the globe, country, state, city and street levels.

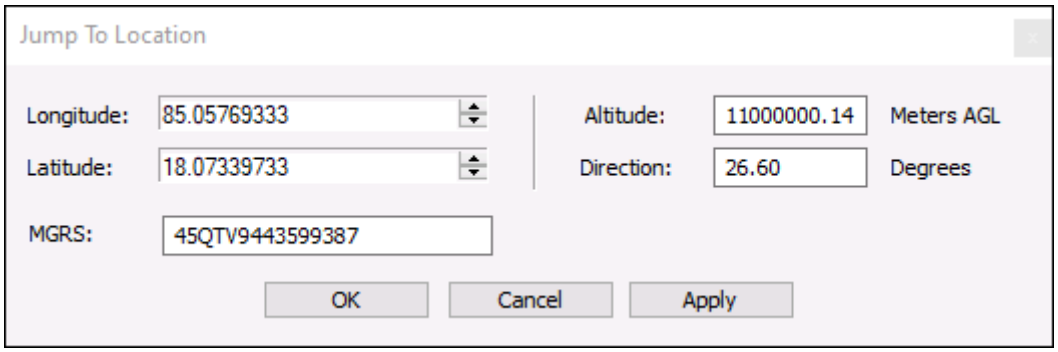
To navigate in the 3D Window using the simplified navigation control:

- Click the navigation controls to turn North or zoom in or out of the terrain.

Navigation Control	Description
	Turn the plane to face north.
	Zoom in.
	Zoom out.

Jump to Location Panel

Using the Jump to Location panel, you can jump to a location using its longitude, latitude, altitude, direction, and MGRS values.



Jump to Location

To use the Jump to Location panel:

1. Click on the coordinates section of the Status Bar to display the panel, and enter the required values.

   Note: The Status Bar must be showing in order to open the Jump to Location panel. **See "**Using Screen Overlay**"** and **"**Status Bar" in the "Basic Concepts" chapter for more information.

Field	Description
Longitude	Enter the new location's East-West values.
Latitude	Enter the new location's North-South values.

Altitude	Enter the required altitude value. **Note**: The altitude is limited to the minimum value defined in the Altitude settings in TerraExplorer Settings. **See** "Navigation" in the "Setting the Project" chapter for more information.
Direction	Enter the required direction angles of the plane and the camera.
MGRS	The required location's Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.

Note: The Jump to Location Panel displays the altitude and location values in the system's units. **See** "View" in the "Using TerraExplorer Options" chapter for further information on how to change the display units.

2. Click **OK**.

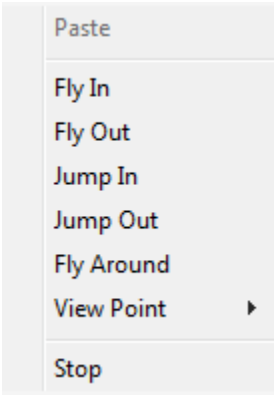
Navigating Using the 3D Window Shortcut Menu

To navigate using the 3D Window shortcut menu:

- Right-click any location in the 3D Window to open the 3D Window shortcut menu.

  Note: You can open the 3D Window shortcut menu even when the camera is in a pre-defined flight or while playing a presentation.

When the mouse pointer is placed over the terrain or over the sky, the 3D Window shortcut menu is opened. When the pointer is placed over an object, additional entries are added to the menu allowing you to perform flight patterns around the selected object.



3D Window Shortcut Menu

Command	Description
Fly In	Fly closer and centered to the selected point. To stop the flight: ▪ Click the terrain or right-click again and select **Stop**.
Fly Out	Fly away and centered from the selected point.

	To stop the flight: ▪ Click the terrain or right-click again and select **Stop**.
Jump In	Jumps to the selected point while keeping it centered.
Jump Out	Jumps away from the selected point while keeping it centered.
Fly Around	Starts a circle pattern flight around the selected point. To stop the flight: ▪ Either right-click again and select **Stop**, or press the SPACE key.
Viewpoint	Starts the selected pattern flight around the selected point. To stop the flight: ▪ Either right-click again and select **Stop**, or press the SPACE key.
Stop	Stop the movement of the plane.

Navigating Using Ribbon Controls

To navigate using Ribbon controls:

- On the **Navigation** tab, click the required command:

Navigation Menu Command	Activity
Zoom	Zooms in or out from the center of the view to a distance according to the following presets in the sub-menu: House, Street, City, State, Country, Globe.
North	Turn the plane to face north.
Rotate	Flies in a circle pattern around the terrain coordinate at the center of the 3D Window.
Follow	Click and select a navigation pattern. If an object is selected, you can also select a predefined view angle.

Navigating Using the Keyboard

The keyboard is another device with which you can control the plane and camera positions in the world.

You can use the keyboard in a free flight mode (alone or together with other control devices, such as the mouse and joystick).

You can also use the keyboard while performing a pattern flight around a location or object, or even while playing a presentation.

Keyboard Command	Activity
Speed	Use the speed keys to accelerate and decelerate the plane. ▪ **A**: Increases speed until you reach maximum forward speed. ▪ **<SHIFT> A**: Doubles the rate at which the speed increases.

	▪ **Z**: Reduces speed until you reach maximum reverse speed. ▪ **<SHIFT> Z**: Doubles the rate at which the speed decreases. ▪ **<SPACE>**: Stops the flight (set the speed to zero).
Altitude	Use the altitude keys to move up and down. ▪ **S**: Moves up. ▪ **<SHIFT> S**: Moves up at a higher rate. ▪ **X**: Moves down. ▪ **<SHIFT> X**: Moves down at a higher rate.
Tilt	The keyboard Up and Down arrows control the camera tilt. ▪ **Up Arrow:** Changes the camera or plane angle upwards. ▪ **Down Arrow**: Changes the camera or plane angle downwards.
Direction	The keyboard Left and Right arrows control the plane direction. ▪ **Left Arrow:** Changes the plane or camera direction to the left. ▪ **Right Arrow:** Changes the plane or camera direction to the right.
Slide and Zoom	Use the slide keys to move the plane to the left or right during a free flight session. When performing a flight pattern, or an attachment to an object, a location or a point of interest on the terrain, you can use these keys to zoom in and out from the center point or object. ▪ **Q**: Slides to the left/zoom out. ▪ **<SHIFT> Q**: Slides to the left/zoom out, at a faster rate. ▪ **W**: Slides to the right/zoom in. ▪ **<SHIFT> W**: Slides to the right/zoom in, at a faster rate.

Navigating Using the Joystick

In addition to the other navigation modes, TerraExplorer Pro supports a game device (joystick) as unique navigation mode.

Using a joystick, you can simulate a more realistic plane movement in the 3D World. In the same way as a real plane behaves, you can use a joystick to roll to the sides, change direction and tilt up and down to change the altitude.

Note: The joystick movements always affect the plane's tilt and direction angles even when the mouse and keyboard are set to affect the camera angles. TerraExplorer Pro supports different types of joysticks. From a regular 2-axis 2-buttons to a complex Point of View (POV) control. If the connected joystick does not support all the features necessary to perform a free-flight you can use it together with other flight controls such as the keyboard, the mouse and the Navigation Controls. TerraExplorer also supports use of 3D navigation devices, including 3DConnexion

SpaceNavigator™, SpaceExplorer™, SpaceTraveler™ and SpacePilot™, which enable you to navigate with greater ease, speed and precision.



Joystick Configuration

Note: Joystick configuration may vary between computers. Please refer to the joystick or Game Controllers settings under the Window's Control Panel dialog for further information on joystick configuration on your computer.

Joystick Configuration	Description
Plane Tilt	Moving the joystick downwards and upwards affects the plane's tilt angle and results in the altitude change of the plane. ▪ Move the stick forwards to change the flight angle downwards. ▪ Move the stick backwards to change the flight angle upwards.
Plane Roll	Moving the joystick to the left and right affects the plane's roll angle and changes the direction of the plane. ▪ Move the stick left to roll to the left. ▪ Move the stick right to roll to the right.
Speed	The plane's speed is controlled from the joystick's main buttons. ▪ Press Button 1 to increase the speed (until you reach maximum speed). ▪ Press Button 2 to reduce the speed (until you reach minimum speed). The joystick's speed is defined in the Navigation tab of the Project Settings dialog. **See** "Navigation" in the "Setting the Project" chapter for further information.

If your joystick has a Point of View (POV) button, additional controls are available:

Control	Activity
Camera Tilt	Moving the POV button downwards and upwards affects the camera's tilt offset from the plane's tilt angle. ▪ Move the POV stick up to angle the camera upwards. ▪ Move the POV stick down to angle the camera downwards.
Camera Direction	Moving the POV button to the left and right affects the camera's direction offset from the plane's direction angle. ▪ Move the POV stick to the left to angle the camera to the left. ▪ Move the POV stick to the right to angle the camera to the right.

Note: When navigating using the joystick, it is recommended to open the Jump to Location panel or display a compact or full navigation controls. In many cases, there is a discrepancy between the camera and plane angles, in the tilt axis and the direction axis. This discrepancy may cause strange and unpredictable movement. By viewing the Jump to Location panel or navigation control displays, you can detect these cases and prevent them.

Using Touch Screens

Navigating Using Touch Gestures

TerraExplorer Pro supports several gestures for 3D Window navigation:

- **One finger drag** - Move the terrain
- **Two finger drag** - Rotate the terrain
- **Two finger pinch** - Zoom in/out
- **Double tap** - Fly in
- **Long tap** - Open shortcut menu

Navigation Controls

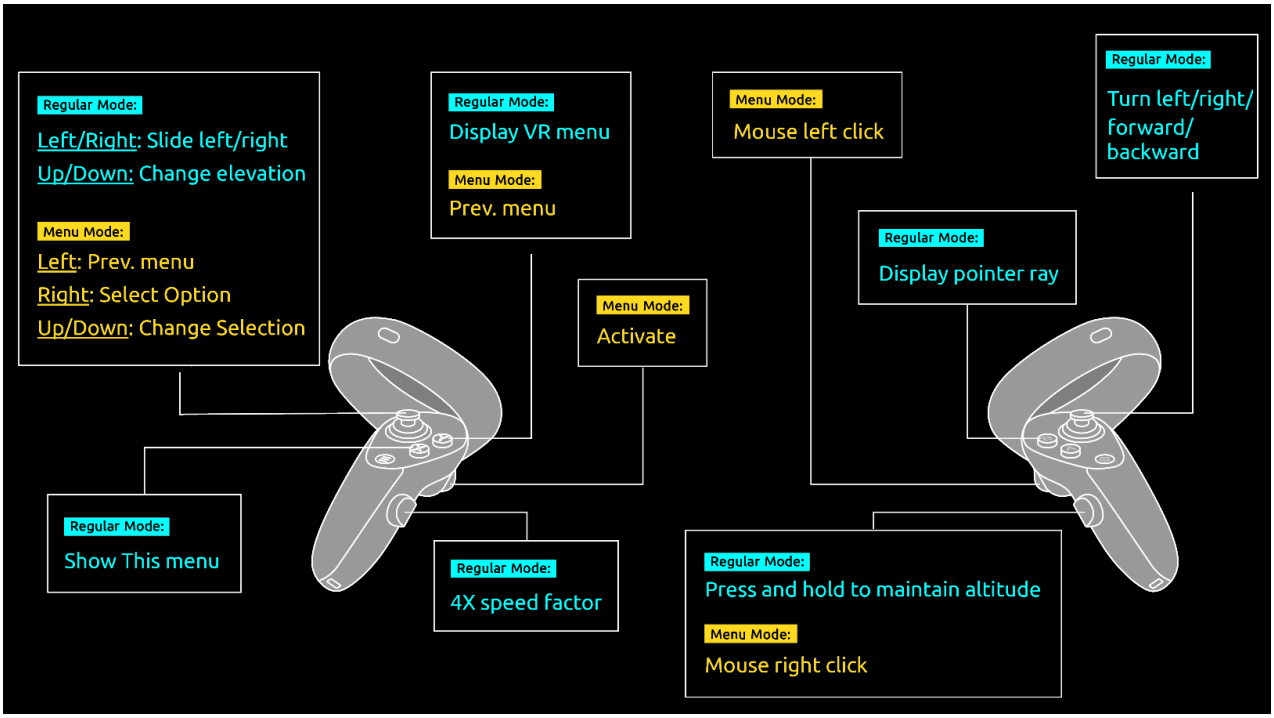
Simplified navigation controls offer basic controls while conserving screen real estate:

-  - Turn the plane to face north.
-  - Zoom in.
-  - Zoom out.

See "Navigating Using On-Screen Navigation Controls" in this chapter for more information.

Oculus Rift and Quest Controls

Navigate intuitively through Skyline's 3D World and perform most TerraExplorer commands using the Oculus Rift S and Quest 2 controllers. **See** "Standard Layouts" in the "Basic Concepts" chapter for information on switching the TerraExplorer layout to the Oculus VR option.



Action	Oculus Rift and Quest Controls
Navigation	
Slide left and right	Move left thumbstick left and right (Regular mode).
Change elevation	Move left thumbstick forward and backward (Regular mode).
Turn left/right/forward/backward	Move right thumbstick (Regular mode).
Maintain current altitude	Press and hold grip on right controller (Regular mode).
Accelerate	Press and hold grip on left controller (Regular mode).
Cast ray from your hand controller to the 3D virtual world	Press B button on right controller (Regular mode).
Menus	
Open the previous menu	Press Y button on left controller (Menu mode) OR move left thumbstick left (Menu mode).
Close menu if displaying root menu	Press Y button on left controller (Menu mode)
Change menu selection	Move left thumbstick forward and backward (Menu mode).
Activate selected menu item	Press trigger on left controller (Menu mode) OR Move left thumbstick right (Regular mode).
Left-click	Press trigger on right controller.

Right-click	Press grip on right controller.

3D Modes

3D Modes determine how the terrain should be displayed in the 3D Window, as a 3D model, a flat 2D surface, or as a 2D model facing North. The 2D and 2D North navigation modes feature true orthographic rendering mode that provides a clearer measure of distance between objects such as buildings and their relative sizes.

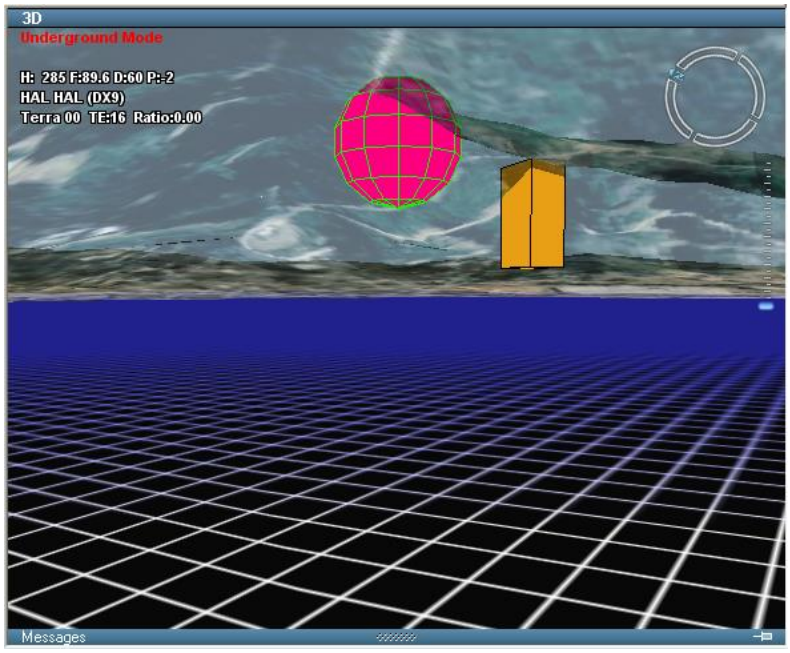
To set the 3D mode:

- On the **Navigation** tab, in the **3D Mode** group, click one of the following commands:

Mode	Icon	Description
3D Mode	3D	Allows full 3D navigation.
2D Mode	2D	Forces the camera to always look straight down.
2D Mode Face North	2DN	Forces the camera to always look straight down and North.

Underground Navigation

The underground navigation mode allows you to explore the subsurface of the terrain. You can navigate under the terrain's surface and through buildings. A subsurface grid navigation aid appears when you navigate below the terrain, allowing you to navigate the same way as above ground.



Navigating in Underground Mode

To fly in underground mode:

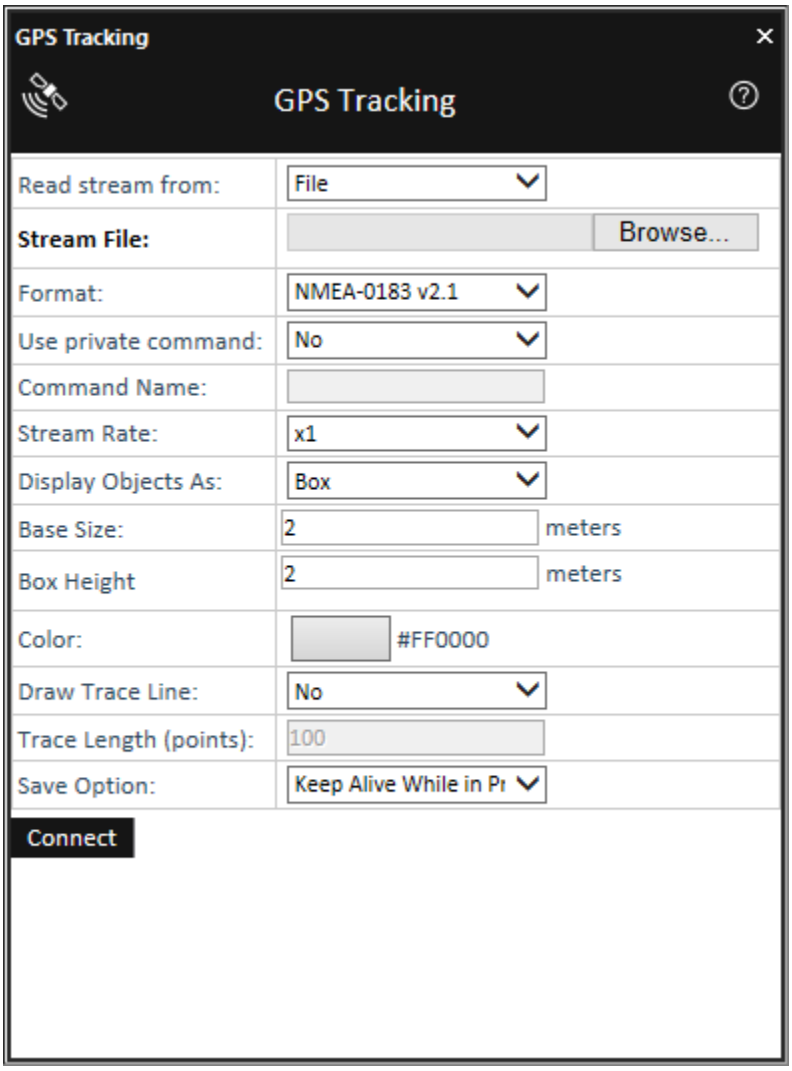
1. On the **Home** tab, in the **Navigation** group, click **Underground Mode**.
2. Use any of the techniques mentioned above to navigate in the 3D environment. You can freely go through the terrain surface in any direction.

GPS Tracking

The GPS Tracking tool creates 2D or 3D objects and moves them according to position information, in NMEA format that it reads directly from a GPS or communication device through a USB or COM port or from a local or remote file.

The GPS tool supports multiple entities in a single device and allows fast forwarding capabilities when reading the information from files.

You can display the GPS-moving objects in a variety of 2D or 3D graphic representations, and add trace lines trailing the object routes.



GPS Tracking Tool

Using the GPS Tracking Tool

To use the GPS Tracking tool:

1. On the **Navigation** tab, in the **Navigation Aid** group, click the arrow under **GPS** and select **GPS Tracking**.
2. Enter the following information:

Field	Description
Read stream from	Select the location of the positioning stream.
Stream File	Select **File** and type the file name or click the **Browse** button to set the NMEA file. Select **COM1, COM2, COM3** or **COM4** to define the COM port where the GPS, or communication device, is connected. **Note**: The GPS Tracking tool supports GPS and communication devices connected to a USB port that simulate COM communication. You should select the COM port the USB driver selected when it logged in to the system.
Format	Select the format of the communication stream. The GPS Tracking currently supports only NMEA-0183 format.
Use private command	Select whether you want to use a **Private command** to identify the names of the different entities in a single stream. **Note**: If the private command tag is not set, all entities in the stream are treated as the same object.
Command Name	If you selected Yes in the Use private command field, type the name of the **NMEA tag** (e.g., &Pxxx) that contains the identifier of each entity.
Stream Rate	If a **File** was selected as the source of the stream, you can accelerate the playing of the object movements by selecting a **Stream rate** larger than **x1**. The GPS Tracking tool reads the time stamp on each entity location. When the fast-playing option is selected, the time delay between two locations, as defined in each location block Time tag, is divided by the Stream rate parameter.
Display Objects As	Select the **Display Object As** parameter to define the graphic representation of the GPS entities. The next parameters that display vary depending on the selected **Display Object As** type.
Color	Set the color for the trace line and for objects, when selecting 2D or 3D primitives. Click the **Color**  button and select a color from the color palette.
Draw Trace Line	Select **Yes** to add a trace line trailing the object.
Trace Length (points)	Set the **Trace Length** parameter to define the length of the line. The Trace Length defines the number of locations, preceding the current location, connected by the trace line.
Save Option	Set the Save options. ▪ Select **Delete at Disconnect** to delete the objects and trace lines when the stream is finished or disconnected.

- Select **Keep Alive While in Project** to keep the objects and trace lines in your projects until you close the FLY file.
- Select **Save in FLY Project** to save the objects and trace lines in your FLY file.

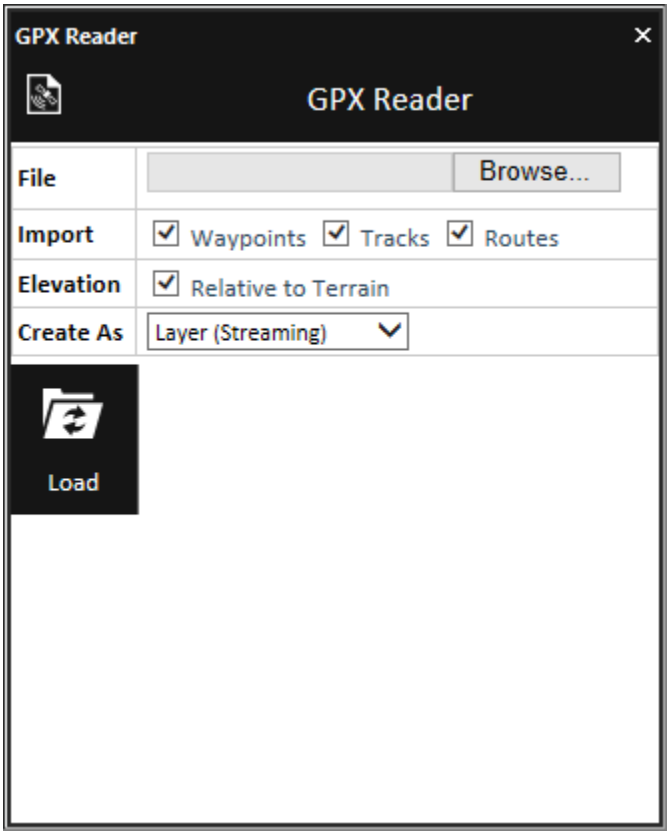
3. Click **Connect** to connect to the GPS stream. If you want to disconnect, click **Disconnect**.

GPX Reader

GPX is an XML schema designed as a common GPS data format to describe waypoints, tracks, and routes. The GPX Reader reads GPX files and displays their waypoint and track data in the 3D Window, storing the GPX data in the project either as groups of point objects or as feature layers.

To load GPX data:

1. On the **Navigation** tab, in the **Navigation Aid** group, click the arrow under **GPS**, and select **GPX Reader**. The GPX Reader is displayed.



GPX Reader

2. Browse to the required GPX file.
3. Select the check boxes of the data you want to import:
   - **Waypoints –** The route's waypoints.
   - **Tracks –** The waypoints for each of the route's tracks.
   - **Routes –** The route's tracks and waypoints.

4. If you want to ignore the elevation values in the GPX file, select **Relative to Terrain**. All waypoints and route/track polyline are displayed directly on the terrain.
5. Select one of the **Create As** options:

Option	Description
Layer	
If Waypoints are selected for import, a feature layer is created for all the route's waypoints. If Tracks are selected for import, then for each track in the route the following are created: ▪ A polyline object with the track's path ▪ A point shapefile with the waypoints of that track If Routes are selected for import, then both of the above are created.	
Layer (Streaming)	Create streaming point shapefile layers with the route's waypoints under the application AppData.
Layer (Entire)	Create point shapefile layers with the route's waypoints under the application AppData.
Group	Create a group with waypoint objects. If Waypoints are selected for import, image label objects are created for each of the waypoints. If Tracks are selected for import, then for each track in the route the following are created: ▪ A polyline object with the track's path ▪ Image label objects for each of the track's waypoints

6. Click **Load**. The GPX data is displayed in the 3D Window and a group of layers/objects is created in the Project Tree.

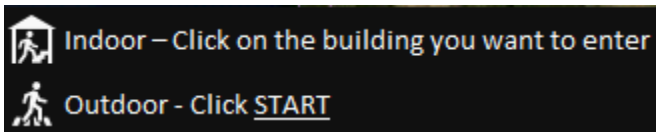
Walk Mode

The Walk Mode Navigation controls enable easier navigation within confined spaces, x-ray vision and collision detection. Direction control buttons provide for greater control and finer adjustments to movement.

Navigating in Walk Mode

To navigate in Walk Mode:

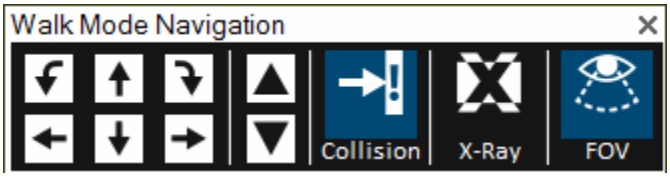
1. On the **Home** tab, in the **Navigation** group, click **Walk Mode**. The Walk Mode Navigation dialog is displayed.



Walk Mode Navigation

2. If you want to navigate outdoors, click **Start**.
3. If you want to navigate indoors, click the building you want to enter. This building can be any 3D model (e.g., 3dml, .x, .xpl, .dae or .flt) and include interior modeling of the different floors and rooms.
4. After clicking on the building entry location or the dialog link, navigation controls are displayed.

Note: Collision detection is automatically turned on and navigation mode automatically switches to Slide mode. Collision detection can be switched off from the Walk Mode Navigation panel, while Slide mode can be switched off from the Navigation tab.



Walk Mode Navigation Controls

5. Navigate using the navigation controls:

Control	Description	Control	Description
	Turn counterclockwise	Collision	Toggle collision detection on and off. When collision detection is on, any collision with a solid structure, i.e., any object whose fill opacity is greater than 50%, while navigating within the 3D model, will stop movement.
	Forward		
	Turn clockwise	X-Ray	Toggle x-ray vision on and off. When x-ray vision is on, the model becomes semi-transparent, enabling you to see through all model walls.
	Up		
	Left	FOV	Adjusts the field of view.
	Backward		
	Right		Exit from walk mode
	Down		

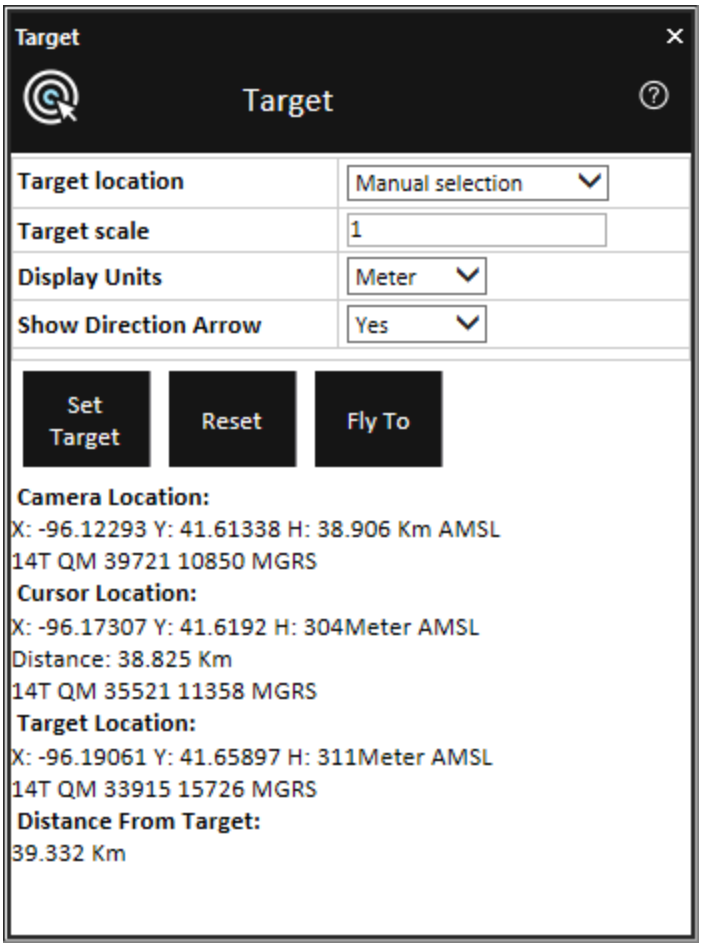
6. If you want to exit from walk mode, on the **Home** tab toggle off the Walk Mode command or click the **x** in the Walk Mode Navigation control panel.

Target

The Target tool continuously tracks the distance and direction to a specific target.

To use the Target tool:

1. On the **Navigation** tab, in the **Navigation Aid** group, click **Target**. The Target dialog opens.



Target Dialog

2. Enter the following information:

Field	Description
Target Location	Select either: ▪ Numeric Entry ▪ Manual Selection If you select Numeric Entry, enter the X, Y, and H values.
Target Scale	Select the type of target marking object.
Display Units	Select the display units to be used for distance/height information.
Show Direction Arrow	Select **Yes** if you want to display the direction-to-target arrow.

3. Click **Set Target**.
4. If you are using Manual Selection as the Target-Set-Mode, click on the terrain or on any object in the 3D Window.
5. The tool displays the Camera Location, Cursor Location, Target Location and Distance from Target values according to the selected units.
6. To reset this tool, click **Reset**.

7. To fly to the target location, click **Fly to**.

Look Around Tool

The Look Around tool serves as a virtual stationary observation deck, enabling you to analyze the view from a specific position. Using the controls, you can easily adjust your direction and tilt and zoom in and out.

To use the Look Around tool:

1. On the **Navigation** tab, in the **Navigation Aid** group, click **Look Around**. The Look Around controls are displayed.



Look Around Controls

2. Move the slider to adjust the zoom. The distance between the viewer position and the center of the screen is displayed in the bottom right corner.

   Note: When the Look Around tool is opened, the navigation mode is automatically switched to Turn and Tilt. **See** "Navigating in the Turn and Tilt Mode" in the "Navigating in the 3D World" chapter. You can change the mode as required.

Locations

A location defines the geographical coordinates of a point on the terrain as well as the position from which the point is to be viewed. By double-clicking on a location name in the Project Tree the camera can perform a flight, jump to the location or play one of the predefined patterns (circle, oval, line or arc).

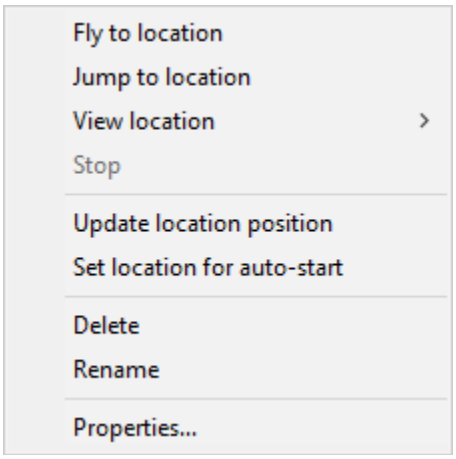
Viewing a Location

To view a location, do either of the following:

- In the **Project Tree**, double-click a location to perform the location's activation action. The specific activation action set in the location's property sheet is performed.

  Note: When you play a flight pattern, the default flight time of the camera for one round trip around the point of interest is 15 seconds.

- In the **Project Tree**, right-click and select one of the following options from the shortcut menu:



Location Shortcut Menu

Option	Activity
Fly to Location	Flies from the current location directly to the selected location
Jump to location	Jumps directly to the location's position
View Location	This option's sub-menu contains a list of pre-defined flight patterns that compass about the location. ▪ **Circle Pattern**: Performs a circle flight around the location. The camera always faces the specified location. The radius is set according to the distance parameter. ▪ **Oval Pattern**: Performs an oval flight pattern around the location. The camera always faces the specified location. The first radius is set to the distance parameter and the second radius is set to half of the distance parameter. ▪ **Line Pattern**: Performs a tight oval flight pattern around the location. The camera always faces the specified location. The first radius is set to the distance parameter and the second radius is set to one-tenth of the distance parameter. ▪ **Arc Pattern**: Performs a vertical arc flight above the location. The camera always faces the specified location. The radius is set according to the distance parameter.

Stopping a Flight to or Around a Location

To stop a flight to or around a location:

- Right-click anywhere in the **3D Window**, and from the shortcut menu select **Stop**.

  or

- In the **Project** Tree, right-click the location's name, and from the shortcut menu select **Stop.**

Creating Locations

To create a new location in the current camera position:

1. In the **Project Tree**, select the required group or click in the root area if you want to create the location in the root folder.
2. On the **Home** tab, in the **Add** group, click **Location**.
3. Type a name for the location or accept the default and press ENTER.

Note: When you create a location, by default, the activation action is Fly to, and no message is displayed. If you want to change the activation action or add a message, open the property sheet and make the required modifications. **See** "Editing Locations" in this chapter for more information.

The location of interest is set to the terrain coordinate at the center of the 3D Window. If there is no terrain at the center of the view (the camera is facing the sky), the location of interest is set to a distance of two times the current altitude of the camera above the terrain.

Note: When you create a location, the point of interest is set only to the terrain coordinate of the center of the 3D Window and is not affected by any 2D or 3D models in front of the terrain.

Editing Locations

To edit a location:

1. In the **Project Tree**, right-click the required location, and select **Properties** from the shortcut menu. The Location property sheet opens.
2. Modify the Location property sheet parameters as required.

Location Parameter	Activity
General	
Name	Type the description or name of the location. This text appears in the Project Tree as the name of the location.
Activation Action	Select the action to perform when selecting the location from the Project Tree.
Message	The message associated with the location. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Location	
Altitude Method	Sets the altitude method to be used by the location: ▪ Select **Relative to Terrain** to place the location of interest at a specified altitude above the ground. ▪ Select **Absolute** to place the location of interest at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	Enter the altitude above the ground for the specified location.
X	Enter the X-coordinate of the location of interest.
Y	Enter the Y-coordinate of the location of interest.

MGRS	The coordinates of the location of interest in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Direction	Enter the horizontal angle of the camera when viewing the location.
Tilt	Enter the vertical angle of the camera when viewing the location.
Viewing Distance	Enter the distance between the camera and the specified location. This property also affects the radius of the flight patterns.
Set Location	Click the **Capture** button to define the current camera position as the selected location. The updated coordinates for the location appear in the Location property sheet.
View Location	Click this button to jump to the set location.

Updating Locations to the Current Camera Position

You can update a location according to the current camera position.

To update a location according to the current camera position, do either of the following:

- In the **Project Tree**, right-click the required location, and select **Update location position** from the shortcut menu.

  or

- In the location's **property sheet**, in the **Set Location** parameter, click **Capture**.

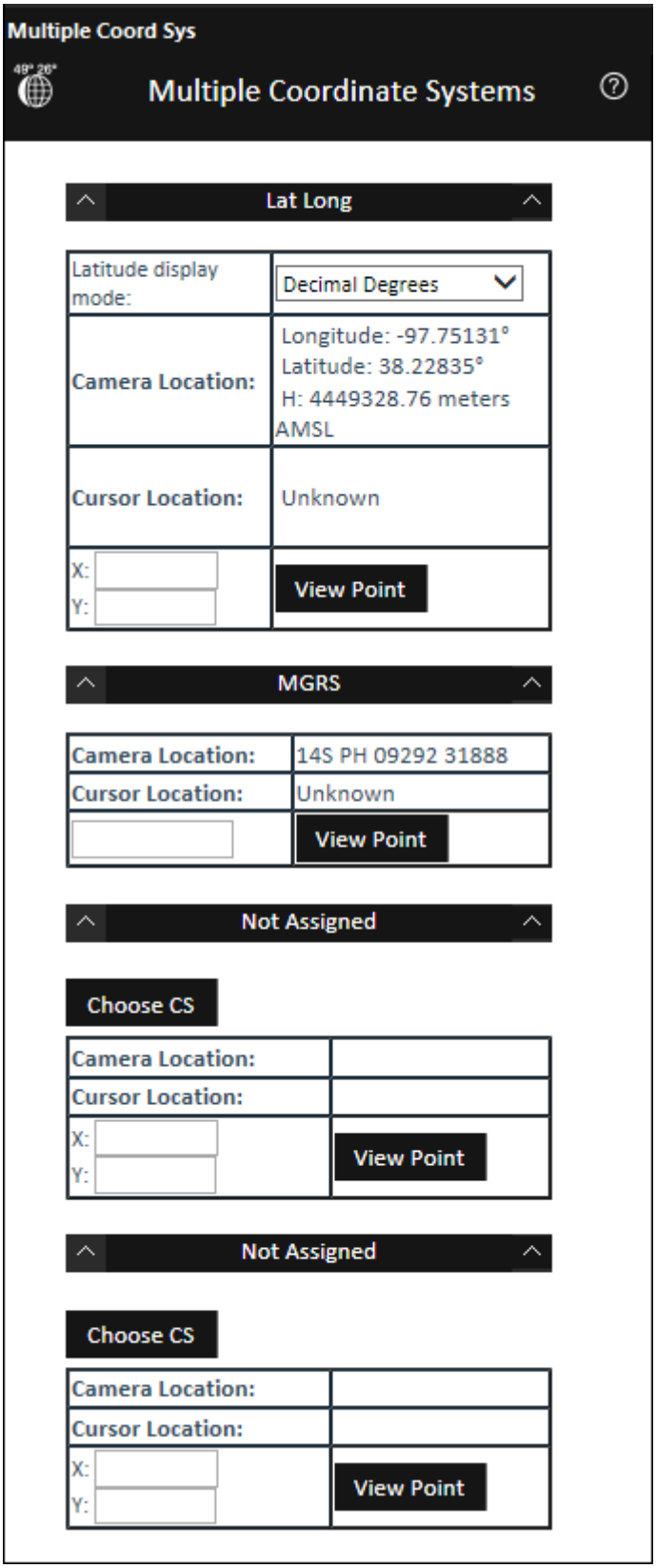
Setting Locations for Auto-Start

You can assign a location for the Auto-Start procedure of the project. In this case, the project starts with the camera viewing the location or performing the location's activation action.

See "Setting the Auto-Start Procedure" in the "Setting the Project" chapter for further information on how to set locations for the Auto-Start procedure.

Multiple Coordinate Systems

The Multiple Coordinate Systems tool projects the current camera/cursor coordinates to a user-selectable coordinate system. The tool always displays the Lat-Long and MGRS coordinate systems.



Multiple Coordinate Systems Tool

Using the Multiple Coordinate Systems Tool

To use the Multiple Coordinate Systems tool:

1. On the **Navigation** tab, in the **Navigation Aid** group, click **Multiple Coord Sys**. The Multiple Coord Sys dialog opens.
2. In the **Lat Long** section, select the **Latitude display** mode:
   - Decimal Degrees
   - Degrees, Decimal Minutes
   - Degrees, Minutes, Seconds
3. If you want to add another coordinate system, in one of the **Not Assigned** sections, click **Choose CS**. The Coordinate System dialog opens. Enter the required information. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
4. If you want to view to a location based on the assigned coordinate system, in the Lat-Long section, type the X and Y coordinates of the desired location and click **View Point**.

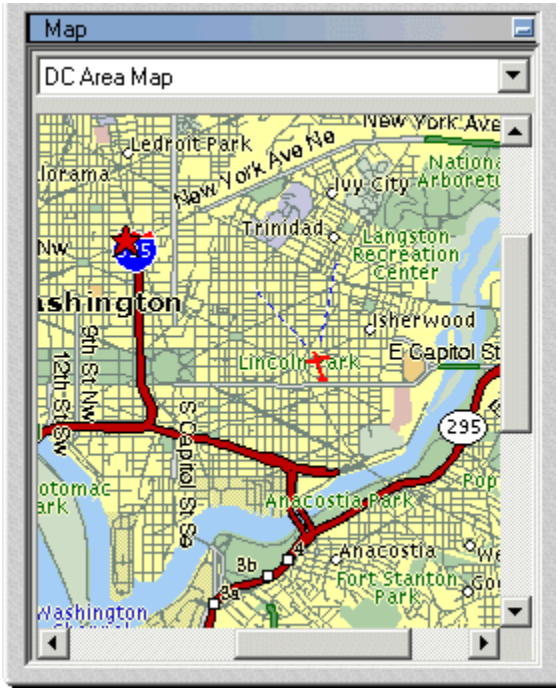
   Note: The camera itself is not positioned at the XY coordinates that are entered but rather it is positioned to **view** the XY coordinates from a certain distance and angle.

CHAPTER 6 NAVIGATION MAP

About the Navigation Map

The Navigation Map window provides quick and easy navigation through the entire terrain. It shows a raster-based map and the location and direction of the camera view on the map. The Navigation Map window offers a simple mechanism to integrate file or server-based maps into the application.

The Navigation Map supports the same file formats and servers as are supported for raster layers. **See** "Loading Raster Layers" in the "Imagery and Elevation Layers" chapter for information.



The Navigation Map Window

Current Location Indicator

The Navigation Map marks the camera's location and field of view. The indicator shows the direction of the plane's flight as a red plane icon, and the direction and field of the camera's view as two blue lines.



Location Indicator

By default, the indicator is in the center of the Navigation Map. If the plane is located near the edge of the map, the location indicator may be off the center.

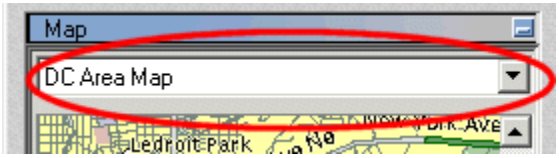
In case the plane is located outside the area of the map, the location indicator is not present.

Using the Navigation Map

If the Navigation Map is not displayed, on the **View** tab, in the **Show/Hide** group, select the **Navigation Map** check box.

Selecting a Navigation Map

The Navigation Map window can contain more than one map for the same project. At the top of the Map Window, select the required Navigation Map from the dropdown list of available maps.



Select Map

Moving to any Location on the Terrain

Using a Navigation Map, you can jump directly to any place on the map.

To move to any location on the terrain, do either of the following:

- Double-click on any area of the navigation map to jump directly to the chosen location.

  or

- Right-click on the required spot on the map, and select **Jump** from the shortcut menu.

The plane movement in the 3D Window is synchronized with the plane indicator position on the navigation map.

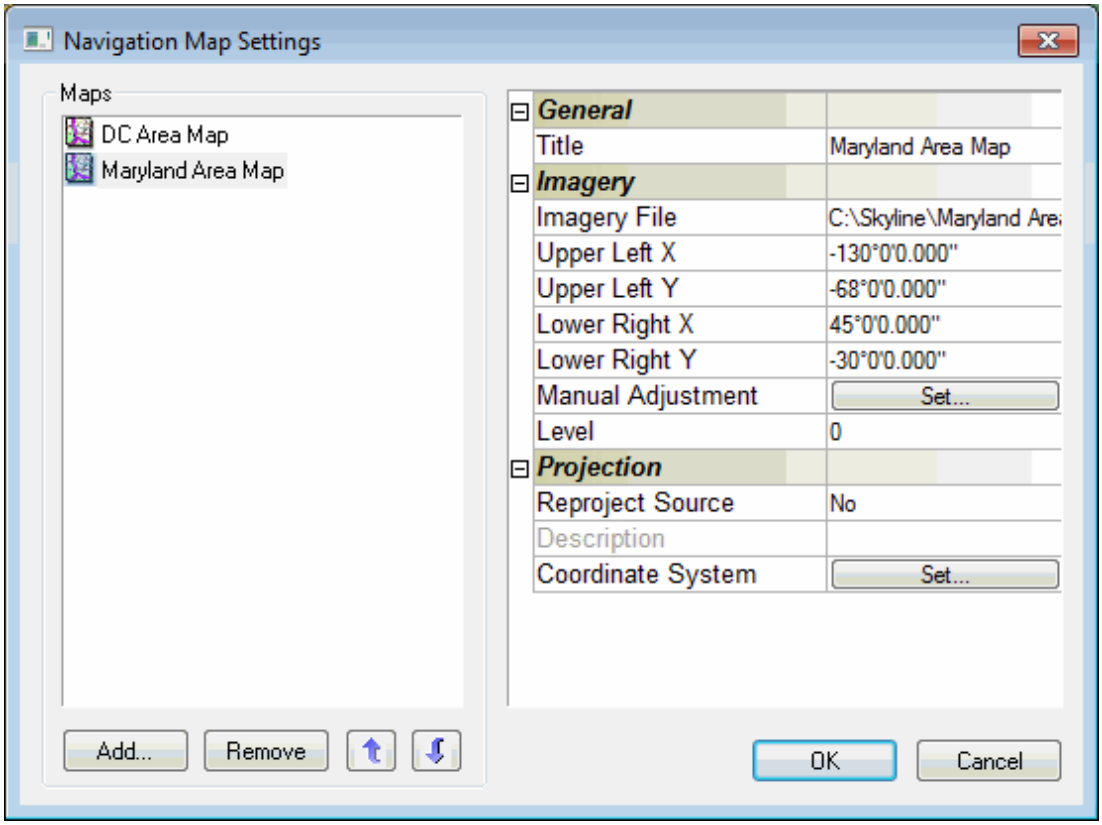
To turn-off synchronization:

- Right-click the map area, and toggle off the **Synchronize 3D** option.

Adding a Navigation Map to the Navigation Map Window

To add new maps to the Navigation Map window:

1. On the **Navigation** tab, in the **Map** group, click **Map**. The Navigation Map Settings dialog is displayed.



Navigation Map Settings

2. Click **Add**. The Open dialog is displayed.
3. Browse to the required map and click **Open**.

   Note: The Navigation Map supports the same file formats and servers as are supported for raster layers. **See** "Loading Raster Layers" in the "Imagery and Elevation Layers" chapter for information. It is strongly recommended to use a compressed format (JPEG or GIF) and not BMP, for Navigation Maps. This ensures maximum performance with slower Internet connections.
4. In the **Navigation Map Settings** dialog, define the property sheet parameters as required.
5. If the map is not referenced to the coordinate system of the terrain, do either of the following:
   - **Reprojection** - When the map is referenced to a different coordinate system than the coordinate system of the terrain. **See** "Reprojecting a Navigation Map" in this chapter for further information**.**
   - **Manual Adjustment** - When the map is not referenced to any coordinate system. **See** "Adjusting a Navigation Map Manually" in this chapter for further information**.**

Reprojecting a Navigation Map

When the navigation map is referenced to a coordinate system, which is different from the terrain coordinate system, the map must be reprojected.

To reproject a map:

1. On the **Navigation** tab, in the **Map** group, click **Map**. The Navigation Map Settings dialog is displayed.

2. In the **Maps** section, select the required map.
3. In the **Projection** section of the property sheet, in the **Reproject Source**, select **Yes** to enable reprojection of the source.
4. In the **Coordinate System** field, click **Set**. The Coordinate System dialog opens. Enter the source file's coordinate system information. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
5. Click **OK**.

Adjusting a Navigation Map Manually

Adjusting a navigation map manually is required when the navigation map is not referenced to any coordinate system. The manual adjustment is performed by pairing map locations with their terrain counterparts.

To manually adjust a navigation map, do the following:

1. On the **Navigation** tab, in the **Map** group, click **Map**. The Navigation Map Settings dialog is displayed.
2. In the **Maps** section, select the required map.
3. In the **Imagery** section of the property sheet, in the **Manual Adjustment** field, click **Set**. The Navigation Map Settings dialog is minimized.

   Note: If you want to restore the Navigation Map Settings dialog, double-click its title bar.
4. Enter the first map point by right-clicking on the map and selecting **Add Map Tie Point** from the shortcut menu.
5. Enter the matching Terrain point by right-clicking in the 3D Window and selecting **Add Terrain Tie Point** from the shortcut menu.
6. Repeat steps 4 and 5 for the second and third location matches. The Navigation Map Settings dialog is restored. Click **OK** to set the terrain points and close the dialog.

Setting the Maps Order in the Navigation Maps Window

You can set the order of the maps as they appear in the dropdown list of available maps in the Navigation Maps window.

To set the order of the maps:

1. On the **Navigation** tab, in the **Map** group, click **Map**. The Navigation Map Settings dialog is displayed.
2. Select the map you wish to move up or down the list.
3. Click the arrow buttons until the map is moved to the desired position on the list.

Deleting a Navigation Map from a Project

To delete a navigation map:

1. On the **Navigation** tab, in the **Map** group, click **Map**. The Navigation Map Settings dialog is displayed.
2. Select the map you wish to delete from the **Maps** panel.
3. Click **Remove**. A dialog is displayed confirming that you want to delete the selected map. Click **Yes** to delete or **No** to cancel.

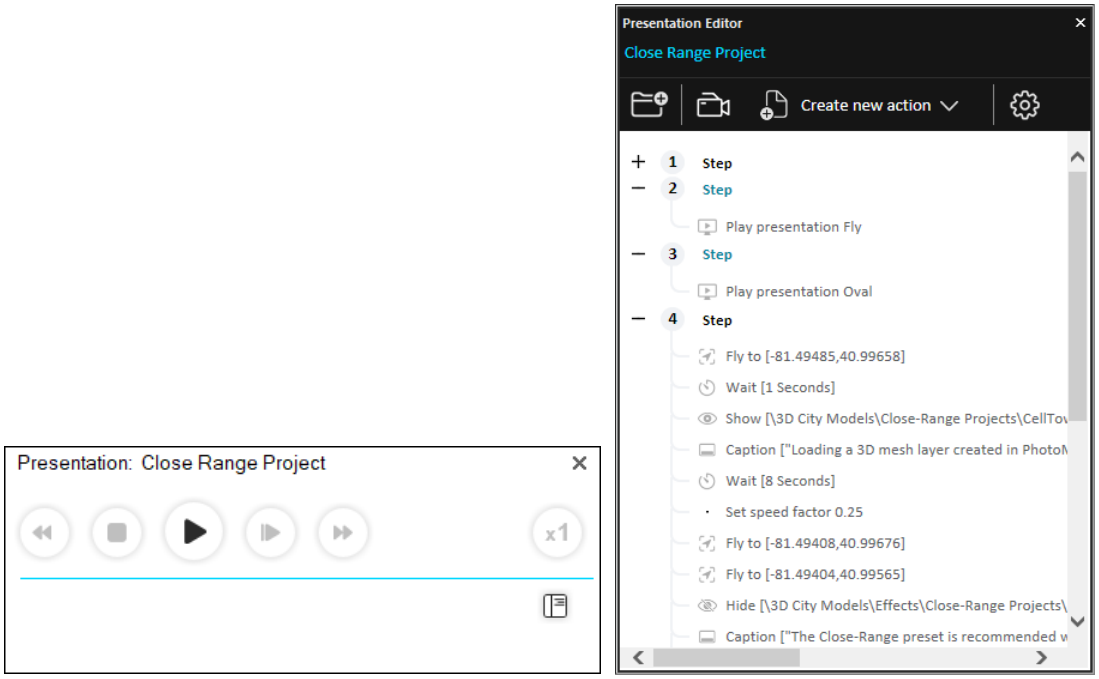
CHAPTER 7 PRESENTATIONS

About Presentations

Presentations combine a customized flight route with a particular display of the project. You can control the visibility of groups, objects, and messages during different points in the presentation, or show slope and contour maps and shadows. To create a flight route, you can either manually create a list of locations or record a route by navigating through the terrain and saving the exact path you followed.

Presentations consist of a series of actions, which are organized using steps, to help you structure your presentation. Steps are essentially "chapter" headings that provide increased flexibility for displaying a presentation by enabling you to quickly jump between different parts of the presentation.

The presentation controls are displayed when you select a presentation from the Project Tree or when you click Presentation on the Home tab. The control panel includes all of the controls necessary to play a presentation as well as a button to open the Presentation Editor for creating and editing a presentation.



Presentation Controls and Editor

Creating and Editing a Presentation

Presentations consist of a series of actions, which are organized into steps, to help you structure your presentation. Some of these actions define a customized flight route while others control the particular display of the project. Each action is added to the presentation from the "Create new action" dropdown list in the toolbar at the top of the Presentation Editor. This dropdown list as well as the other commands in the toolbar at the top of the Editor only display when the presentation has been stopped. When a presentation is playing or paused, the Editor displays without the top toolbar.

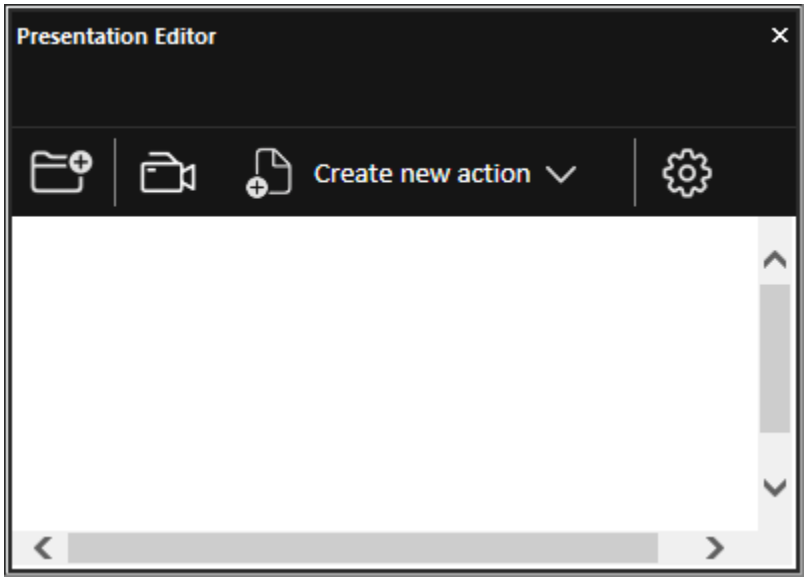
After a new action is created, it is added to the end of the actions list in the Presentation Editor. It can then be dragged and dropped into the required position in the list. If you want to add an action at a specific point, not at the end of the current list, select the action after which you want to add an action, and then select **Create New Action.**

An action in the presentation editor can be edited by right-clicking it and selecting **Edit**.

Opening and Closing the Presentation Editor

The Presentation Editor is used to create a new presentation or to edit or view the actions of an existing one:

- To create a new presentation, on the **Home** tab, in the **Add** group, click **Presentation**. Then in the presentation control panel, click **Open Presentation Editor** .
- To edit an existing presentation, in the **Project Tree**, click the presentation name, and then in the presentation control panel, click **Open Presentation Editor** .



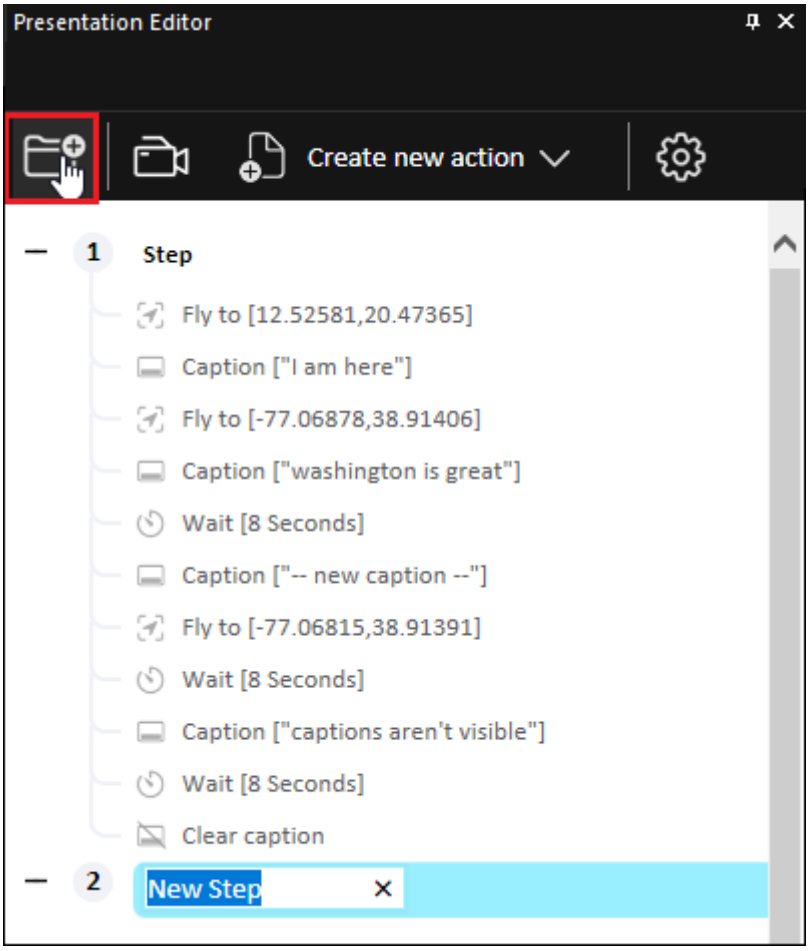
Presentation Editor

Creating Steps

Presentation steps are like "chapter" headings that organize your presentation actions and provide increased flexibility when displaying your presentation. With steps, you can quickly jump from one part of the presentation to another, using the Previous and Next buttons on the playback panel. This allows viewers to skip over certain presentation actions and focus on the content that's most relevant to them.

To create a step:

1. On the **Presentation Editor's** top toolbar, click **Create New Step** . A new step is added to the Presentation Editor.

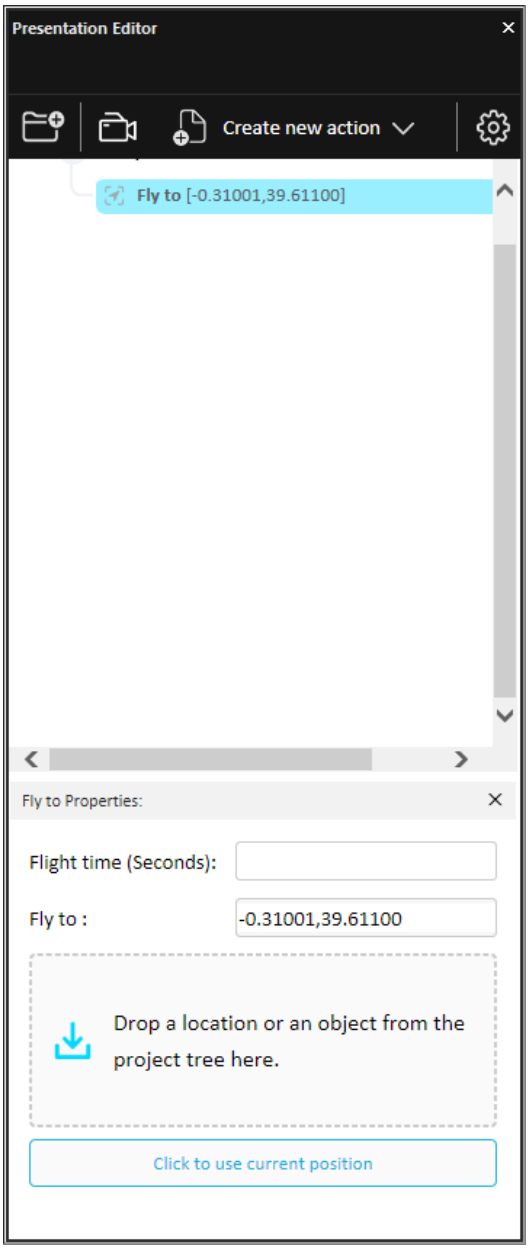


Creating New Steps in Presentation Editor

2. Type the name of the new step.
3. Set **Requires Click** to **True** to require a user click to advance to this step. Set this property to **False** to advance automatically.
4. Presentation actions can be dragged from one step to another to reorganize your presentation as required.

Creating a Locations Route

You can generate a route manually by creating a list of locations. Each location contains full flight information. If you define a route using individual locations, TerraExplorer Pro generates the route by computing a line that passes through each location. When a new location is created, it is added to the end of the actions list in the Presentation Editor. It can then be dragged and dropped into the required position in the list. If you want to add a location at a specific point, not at the end of the current list, select the action after which you want to add the location, and then select **Create New Action.**



Presentation Editor

To create a route using locations:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Fly to Location/Object**. The current location is added to the presentation.
2. If you want to change the location, do either of the following:
   - Fly to the required location and then in the **Presentation Editor**, click **Click to Use Current Position.** The Fly to action's property sheet in the Presentation Editor is updated with the coordinates of the current location.
   - Drag and drop a location or an object from the **Project Tree** into the **Presentation Editor**. The Fly to action's property sheet in the Presentation Editor is updated with the name of the location or object.

3. Enter a **Flight Time**. This determines the duration of the flight (in seconds) from the previous location to the location currently being defined. If no flight time is entered, the presentation will jump directly to the location. When playing a presentation from the beginning, TerraExplorer jumps directly to the first location regardless of the flight time defined for it in the Presentation Editor.

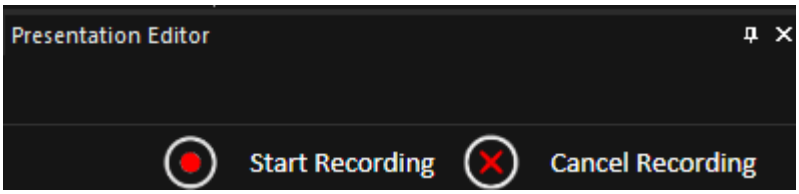
Creating a Recorded Route

Use the recorded route to fly through the terrain and save the exact path you followed. During playback, the route will be recreated precisely with the same timing between each location as when you recorded it.

Note: When you record a flight route, you do not capture screen overlay, field of view, sky color, or clouds coverage. These depend on the settings that are set before the presentation is played and will vary each time the presentation is played based on the settings at the time.

To record a flight:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Record Route**. The Presentation Editor's top panel displays Start and Cancel buttons.



2. Click **Start Recording** and then navigate in the **3D Window**, setting your desired route. Fly freely through the terrain (using the mouse, keyboard, navigation controls, Ribbon controls, joystick or Jump to Location panel), fly to a specific object or fly to a location. You can control the direction and tilt angle of the camera, slide to the sides, and zoom in and out. **See** the "Navigating in the 3D World" chapter for more information.
3. When you complete the flight path, on the **Presentation Editor** top panel, click **Stop Recording**. The route is added at the end of the Presentation Editor list. It can then be dragged and dropped into the required position in the list.

Following and Restarting a Dynamic Object

You can follow a dynamic object in your presentation.

To follow a dynamic object:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Restart Dynamic Object**.
2. Drag and drop the dynamic object you want to follow from the Project Tree into the Presentation Editor.
3. In the **Follow Dynamic Object** property sheet at the bottom of the Presentation Editor, select an Operation:
   - **Restart** - Restarts the dynamic object from the beginning of its route but does not fly to the location of the dynamic object or follow the object.
   - **Follow** – Flies to the location of the dynamic object and then follows it.
4. Set the **Follow Time** in seconds.

Setting Wait Times, Transitions and Sequence

At any point after creating your presentation, you can open the **Presentation Editor** to edit the order of the presentation's actions and steps. You can reorder actions/steps, copy, paste and delete them. By default, the transition between steps is manual (requires user click), but this can be overridden. The transition between actions within a step is always automatic. You set the time each action lasts by adding a "Set Wait Time" between actions.

Note: While a presentation is playing, you cannot edit actions/steps in the Presentation Editor.

To edit step/action transitions and order:

1. In the **Presentation Editor**, drag actions/steps to reorder steps as required.
2. If you want to delete a step, right-click it and click **Delete**. Use CTRL-click to multi-select steps for deletion.
3. If you want a step to follow automatically after the previous one, select the step in the Presentation Editor, and in its property sheet, set **Requires Click** to **False**.
4. To set the wait time between two actions, in the **Presentation Editor**, in the **Create New Action** dropdown list, select **Set Wait Time**. Then enter the number of seconds to wait in the Wait properties dialog.

Displaying Required Content on Application Screen

You can combine your presentation's customized flight route with a particular display of the project. Set the visibility of groups, objects, and messages during different points in the presentation, or show slope and contour maps and shadows. All of these actions are added to the presentation from the Presentation Editor's "Create New Action" dropdown list. After a new action is created, it is added to the end of the actions list in the Presentation Editor. It can then be dragged and dropped into the required position in the list. If you want to add an action at a specific point, not at the end of the current list, select the action after which you want to add an action, and then select **Create New Action.**

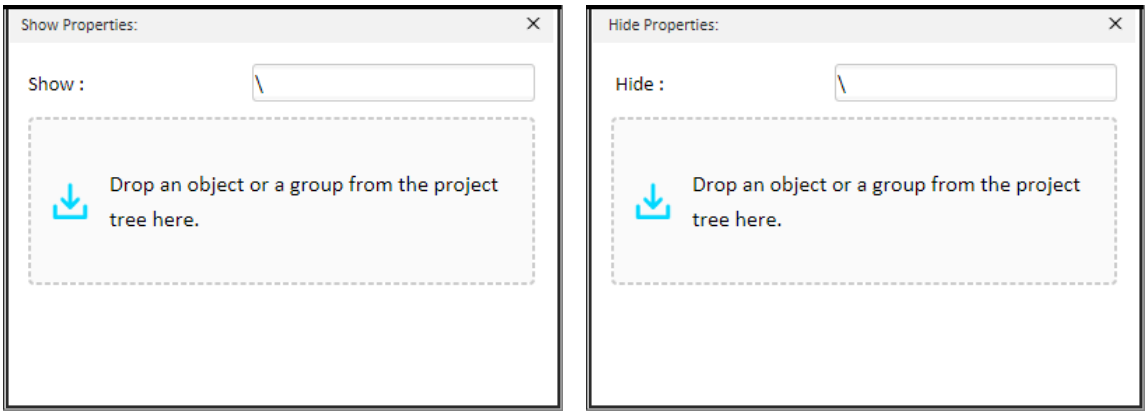
The following actions are available:

- Show or Hide Objects or Groups
- Add Captions
- Display Messages
- Set Time
- Underground Mode On or Off
- Play Another Presentation
- Show or Hide Slope Map
- Show or Hide Contour Map
- Show or Hide Shadows

Show or Hide Objects or Groups

To show/hide an object or group:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Show Object or Group** or **Hide Object or Group**. The Show/Hide property sheet is displayed on the bottom of the Editor.



Show/Hide Object Property Sheet

2. Drag and drop an object or group from the **Project Tree** into the **Presentation Editor**.

Add Captions

You can add a caption to a presentation**.** The captions are added at the bottom of the 3D Window.

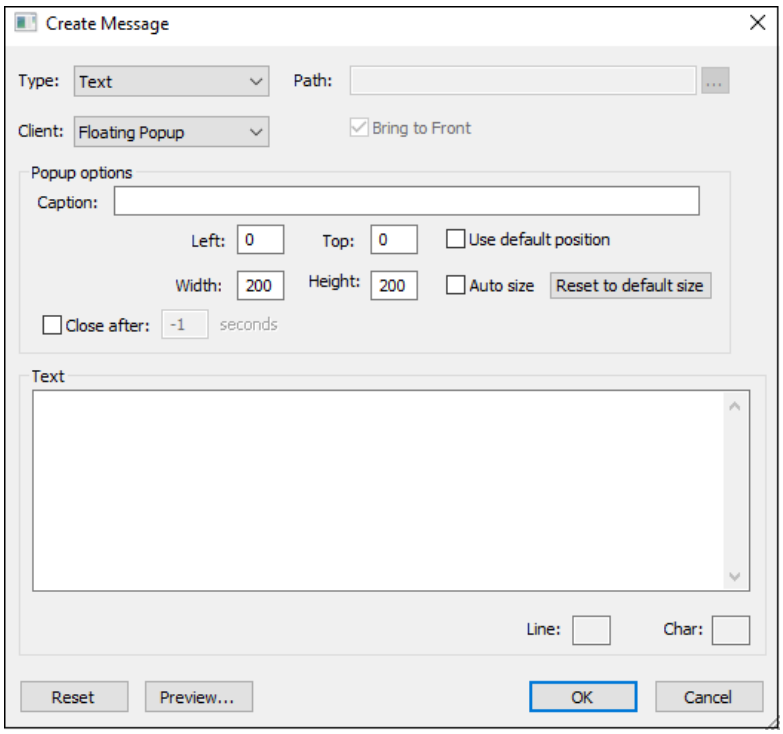
To add a caption to a presentation:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Create Caption**.
2. In the **Caption** property sheet at the bottom of the Presentation Editor, type the text for the caption.
3. Select the **Lifespan** for the caption:
   - Step – Entire step.
   - Time – For the number of seconds entered in the **Timeout** field.
   - Until Replaced – Leave caption until a new caption action in the presentation.
4. If you want to hide the last added caption while the presentation continues to run, in the **Presentation Editor**, in the **Create New Action** dropdown list, select **Clear Caption**.

Display Messages

To display a message:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Create Message Object**. The Create Message dialog is displayed.



Create Message Dialog

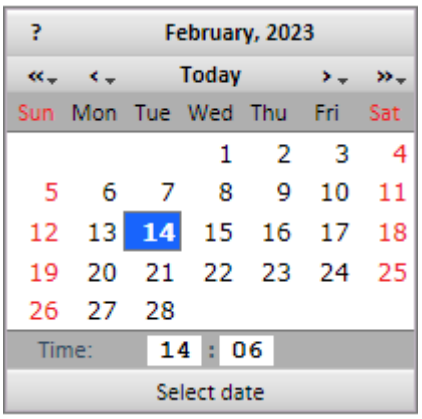
2. Create the required message. In the Create Message dialog, you can define the number of seconds that the message should display and the position of the message object in the 3D Window. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for information.
3. If you want to edit the message after closing the dialog, at the bottom of the **Presentation Editor**, click **Edit Message in TerraExplorer Message Editor**.

Set Time

The TerraExplorer time settings affect the visibility of objects and groups with set timespans.

To set the TerraExplorer date and time:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Set Time**.
2. In the property sheet at the bottom of the **Presentation Editor**, set the time and date.



Set Date and Time

Turn Underground Mode On or Off

To set underground mode on:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Turn Underground Mode On/Off**.
2. In the property sheet at the bottom of the Presentation Editor, set the **Underground Mode** to **True** to turn it on or to **False** to turn it off.

Play Another Presentation

You can launch another presentation from the current presentation.

To play another presentation within the current presentation:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Play Another Presentation**.
2. In the property sheet at the bottom of the Presentation Editor, drag and drop a presentation from the **Project Tree** into the **Presentation Editor**.

   Note: The secondary presentation's settings are independent of the primary presentation's settings. So for example, the play speed factor or looping mode set in the primary presentation do not affect these settings in the secondary presentation.

Show or Hide Slope Map

You can show or hide the global slope map.

To show or hide the slope map:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Show/Hide Slope Map**.
2. In the property sheet at the bottom of the Presentation Editor, set the **Show/Hide Mode** to **True** to show the map or to **False** to hide it.

Show or Hide Contour Map

You can show or hide the global contour map.

To show or hide the contour map:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Show/Hide Contour Map**.

2. In the property sheet at the bottom of the **Presentation Editor**, set the **Display** to **True** to show the map or to **False** to hide it.

Show or Hide Shadows

You can show or hide shadows.

To show or hide shadows:

1. In the **Presentation Editor**, in the **Create New Action** dropdown list, select **Show/Hide Shadows**.
2. In the property sheet at the bottom of the Presentation Editor, set the **Display** to **True** to show shadows or to **False** to hide them.

Setting Presentation Options

Presentation options are set from the Settings command, in the Presentation Editor.

To set presentation options:

1. In the toolbar, at the top of the Presentation Editor, click **Settings** **.**
2. In the **Settings** dialog, set the following:
   - **Loop Presentation** – Set to **True** to automatically restart the presentation when the end of the presentation is reached.
   - **Auto Play** – Set to **True** to automatically start the presentation when the project is opened.
   - **Play Speed Factor** – Set a play speed factor to increase or decrease the playback speed of the presentation.

Loading a KML with a Tour Element

A KML with a tour element that is loaded into a TerraExplorer project will open as a TerraExplorer presentation that can be edited (modify the route, add captions and operations, etc.) and played just like any natively-created one.

To load a KML layer:

- On the **Layers** tab, in the **Complex Layer** group, click the required layer type. Then in the Browse for feature layer dialog that is displayed, browse to the required file and click **Open**.

The following KML Tour tags are supported:

- <gx:Tour> <gx:Document>
- <gx:PlayList> <gx:Tour>
- <gx:FlyTo> <gx:PlayList>
- <gx:duration> <gx:FlyTo>
- <gx:flyToMode> <gx:FlyTo>
- <Camera> <gx:FlyTo>
- <gx:AnimationUpdate> <gx:Tour>

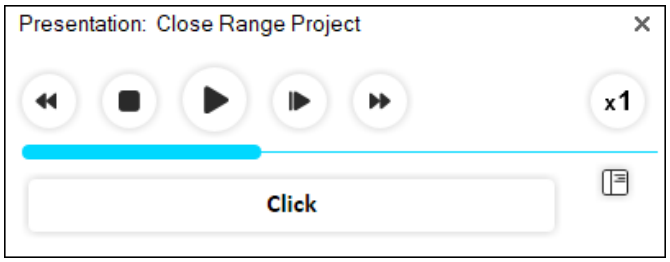
Playing a Presentation

During a presentation, it is possible to interact normally with the application, including navigating, closing any open popups, opening tools, etc.

To play a presentation:

1. If you want to play a presentation from the beginning, do one of the following:
   - In the **Project Tree**, double-click the required presentation.
   - In the **Project Tree,** right-click the required presentation, and select **Play** from the shortcut menu.
   - In the **Project Tree,** select the required presentation, and then on the **Presentation** control panel, click **Play**.
2. If you want to begin playing a presentation from a particular step, in the **Presentation Editor**, right-click the step from which you want to play. Then from the shortcut menu, select **Play from Here**.

   The presentation begins.



Presentation Control Panel

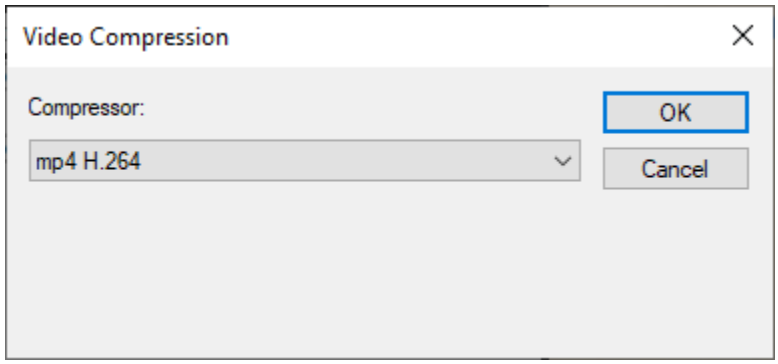
Command	Panel Button	Description
Previous Step		Jumps to the beginning of the step in the presentation. If you want to jump to the previous step, click the button a second time.
Stop		Stops the flight. When you click Play again, the presentation restarts from the beginning.
Play/Pause		Plays/Pauses the flight. Click again to resume the flight.
Next Action		Jumps to the next action in the presentation.
Next Step		Jumps to the next step in the presentation.
Open Presentation Editor		Opens the Presentation Editor.
Time Factor	x1	Select **X1** to play the presentation according to the timings recorded and set in the Presentation Editor or select one of the speed factors.

Creating Movies from Presentations

When creating a movie from any presentation in your project, you have the option to use either the MP4 format with H.264 codec or the Full Frames (Uncompressed) AVI format. Both formats allow for the recorded movie to be viewed in a variety of players and browsers, making it easy to share and distribute your presentation.

To create a movie from a presentation:

1. Create a presentation. **See** "Creating and Editing a Presentation" in this chapter for information.
2. In the toolbar, at the top of the **Presentation Editor**, click **Create Movie** .
3. In the **Settings** dialog, set the following:
   - **Frame Size** - Select the size of each frame or file in the movie. Select **Current Size** to use the current width and height of the 3D Window as the dimensions of the frame or choose from one of the other standards (including the industry standards for PAL and NTSC).
   - **Hide Screen Overlay** – Set to **True** to hide screen overlay when playing the presentation. **See** "Using Screen Overlay" in the "Basic Concepts" chapter.
4. Click **Create Movie**. The Video Compression dialog is displayed.



Video Compression Dialog

5. Select a compressor, and click **OK**. The Save As dialog is displayed.
6. Browse to where you want to save the movie, type a **File Name**, and click **Save**.

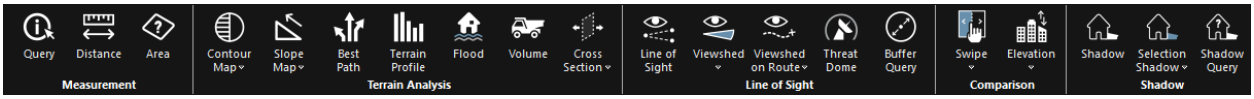
   The Creating Movie dialog is displayed.

   Note: A progress bar is shown in a Status box. This box includes a Stop button. If you stop the process before it is completed, the movie is created up to the moment you pressed the Stop button.

   The creation of the movie can take a few minutes.

CHAPTER 8 ANALYSIS TOOLS

Using Analysis Tools



Analysis Tab

The Analysis tools are accessed from the Analysis tab. To use a tool, click the required command:

Tool	Description
Measurements	
Query	Displays general information about any position or object in the 3D Window that is queried.
Distance	The distance tool measures and displays the following distances between two or more points in the 3D Window: ▪ Horizontal Distance ▪ Aerial Distance ▪ Vertical Distance

Area	The area tool measures and displays either of the following:
	▪ Terrain Area – Measures an area on the terrain, either:
	  ▪ Horizontal plane – The horizontal projection of the selected area.
	  ▪ Terrain surface - The surface area of the selected region taking into account terrain contours.
	▪ 3D Plane Area - Measures the area of a polygon on an arbitrary surface whose orientation is determined by the first three points selected.

Terrain Analysis	
Contour Map	Colorizes and/or overlays the terrain with contour lines, to indicate changes in elevation. A contour map can be displayed over the entire terrain and all 3DML layers or for a specified area of the terrain.
Slope Map	The Slope Map tools provide slope information for any of the following: ▪ **Global Slope Map** – Displays slope map for the entire terrain. ▪ **Slope Map Query** – Graphically represents slope values in a specified area using a color-coded point shapefile. ▪ **Slope Cursor** - Displays slope information in a specified radius around a selected point.

	▪ **Custom Slope Map**– Displays slope map for a specified area.
Best Path	Displays the best path between two locations on the terrain with slope limits.
Terrain Profile	Displays the terrain elevation profile along a path.
Flood	Assesses the land area covered by water in different water flooding scenarios.
Volume	Analyzes the amount of terrain removed or added to a selected Modify Terrain object.
Cross Section	Makes a horizontal or vertical straight cut to expose obscured sections of the 3D View.
Clip Box	Clips everything outside or inside of a selected box to help you focus on specific elements in your 3D project.
Line of Sight	
Line of Sight	Displays a visual marker for the existence of a line of sight from a single observer position to one or more positions in the world.
Viewshed	Calculate the view from a selected observer point or multiple observer viewpoints: ▪ **3D Viewshed** – Calculate and mark all areas on the terrain and on 3D models and objects that are visible from a selected point on the terrain. ▪ **2D Viewshed** - Calculate and mark all areas on the terrain that are visible from a selected point on the terrain. ▪ **Viewshed Query** - Analyzes the visibility of a selected area from multiple viewshed observer viewpoints.
Viewshed on Route	Displays a viewshed analysis from a series of points along a route: ▪ **3D Viewshed on Route by Speed** – Provides an animated representation of the terrain and objects that are visible as a dynamic object progresses along a defined route according to a set speed ▪ **3D Viewshed on Route by Time** – Provides an animated representation of the terrain and objects that are visible as a dynamic object progresses along a defined route over a defined time frame. ▪ **3D Viewshed on Route Query** – Analyzes the visibility of a selected area from multiple viewshed observer viewpoints along a route. ▪ **2D Viewshed on Route** - Provides an animated representation of the terrain that is visible as a dynamic object progresses along a defined route.
Threat Dome	Displays the visible volume from a given point on the terrain with a specified scan field and elevation angle.
Buffer Query	Detects all penetrations by 3D elements (e.g., 3D object or 3DML) to a set buffer zone of a selected polyline. Query points with breached buffer zones are colored in red. The output of the

	analysis is a point feature layer that graphically represents the locations along the line where a penetration to the buffer zone was found.
Comparison	
Swipe	The following swipe comparison tools are available: ▪ Swipe Layers - Helps you detect changes between two mesh, point cloud, or imagery layers in the same location by allowing you to horizontally swipe between them, dynamically revealing and hiding parts of each layer. ▪ Swipe Snapshots - Helps you create and compare snapshots showing different versions of the area in view in the 3D Window by showing or hiding objects in the Project Tree.
Elevation	Analyze the elevation difference between two layers: elevation, feature, point cloud or 3D mesh in a defined polygonal area.
Shadow	
Global Shadow	Cast a shadow from all buildings and 3D models.
Selection Shadow	Cast a shadow for selected objects.
Shadow Query	Calculates the sun-shadow ratio in a specified area, over a selected timespan.

Measurement Tools

The following measurement tools are available:

- Query
- Distance
- Area

Measurements can display dynamically as well as be saved in the Project Tree as TerraExplorer objects.

Information Query

The Information Query tool provides you with data about any point or object in the 3D World. For a point on the terrain, location and elevation information is provided, while for an object, the query also displays the object's perimeter and area. If the object selected was loaded from a layer with attribute information, the object's attributes are also displayed.

To use the information query tool:

1. On the **Analysis** tab, in the **Measurement** group, click **Query**.
2. Move the cursor over any point in the **3D Window**. When you move the cursor over an object, the object is highlighted.
3. Click on the point or object for which you require information.
   - In the Message Bar, TerraExplorer Pro displays the longitude, latitude and altitude.

Note: Military Grid Reference System (MGRS) coordinates are also displayed if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.

- The Query Results dialog is displayed, showing the longitude, latitude, and elevation. When an object is selected, general information about the object and attribute information, if available, is displayed.

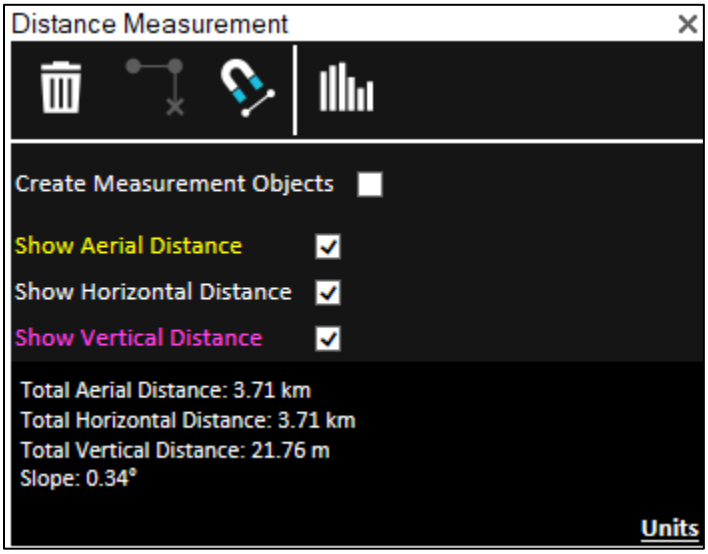
4. With the Information Query tool selected, you can click again on any point in the terrain to find its coordinates. Repeat for as many points as you wish.
5. On the **Analysis** tab, in the **Measurement** group, click **Query** again to close the Information Query.

Distance Tool

The Distance tool measures aerial, horizontal and vertical distance and slope between two or more points. You can also calculate and display the terrain elevation profile for the aerial measurement line.

To use the distance tool:

1. On the **Analysis** tab, in the **Measurement** group, click **Distance**. The Distance Measurement dialog is displayed with the following distance options:
   - **Create Measurement Objects** – Select the check box if you want to create measurement objects that will be accessible from the Measurement Objects folder in the Project Tree.
   - **Show Aerial Distance** – Show a yellow line marking the aerial distance, i.e., the actual distance between points, in the 3D Window. The aerial distance is calculated and displayed in the Distance Measurement dialog even if this option is not selected.
   - **Show Horizontal Distance** – Show a white line marking the horizontal distance between points in the 3D Window. The horizontal distance is calculated and displayed in the Distance Measurement dialog even if this option is not selected.
   - **Show Vertical Distance** – Show a purple line marking the vertical distance between points in the 3D Window. The vertical distance is calculated and displayed in the Distance Measurement dialog even if this option is not selected.



Distance Measurement

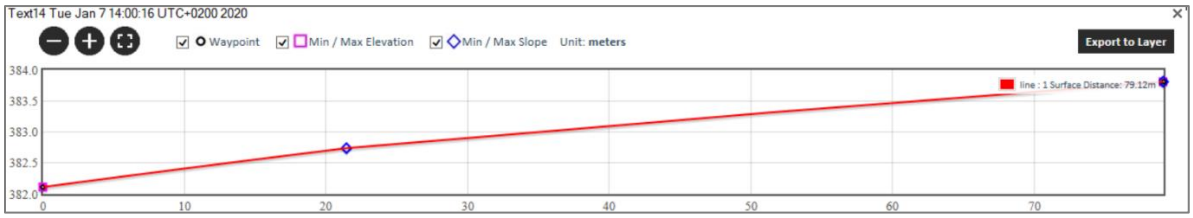
2. If you want to change measurement units, click the **Units** link. The Options dialog is displayed, showing the View tab. Modify the display options for Altitude and Distance and Measurement, and then click **OK**. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
3. If you want to snap the measurement points to an object's edge or vertex, click **Snap Based on Snapping Options** . TerraExplorer automatically detects all edges, i.e., intersections of two plane faces, and vertices, i.e., intersections of two polylines.
4. In the **3D Window**, click any point on the terrain or on an object to define the start point of the measurement. A yellow line extends from the start point. Drag the cursor to the next point and click again. Repeat to add as many segments as required. If you want to delete the last point added, click **Delete Point** .
5. Right-click to finish the measurement.
6. If you want to obtain the same measurement type between any two or more points in the terrain, with the Distance command selected, repeat steps 2-5 above.

   The Distance dialog displays the following measurements:

Measurement	Description
Total Aerial Distance	The aerial distance, i.e., the actual distance between the points. This measurement is the sum of the aerial distances between the points as you progress from the start point to the endpoint.
Total Horizontal Distance	The horizontal distance between the points. This measurement is the sum of the horizontal distances between the points as you progress from the start point to the endpoint.
Total Vertical Distance	The difference in elevation between the points. If you have marked more than two points, this measurement does not take into account the elevation values of the middle points.
Slope	The slope of the line between the first and last points. If you have marked more than two points, this measurement does not take into account anything other than the elevation at the start point and the elevation at the endpoint.

7. If you want to delete the measurement polyline in the 3D Window, click **Delete** .
8. If you want to display the terrain elevation profile along the drawn line, and related information such as maximum and minimum elevation values and slope, do the following:

   a. Click **Terrain Profile** . A terrain profile graph opens, displaying the terrain elevation profile.



Terrain Profile Graph

b. Use the Zoom in , Zoom out , and Zoom to full extent of data buttons to adjust the zoom as required.

c. Determine what information is indicated on the graph by selecting any of the following display options:

Waypoint	Select the check box to mark each of the polylines' waypoints on the graph with a .
Min/Max Elevation	Select the check box to mark each of the polylines' maximum and minimum points with a .
Min/Max Slope	Select the check box to mark each of the polylines' maximum and minimum slope with a .

d. If you want to export the terrain profile to a shapefile layer, click **Export to Layer**.

e. Point to any point on the graph to display the following values. If you want to display the values and jump to the point on the terrain, then click instead of pointing.

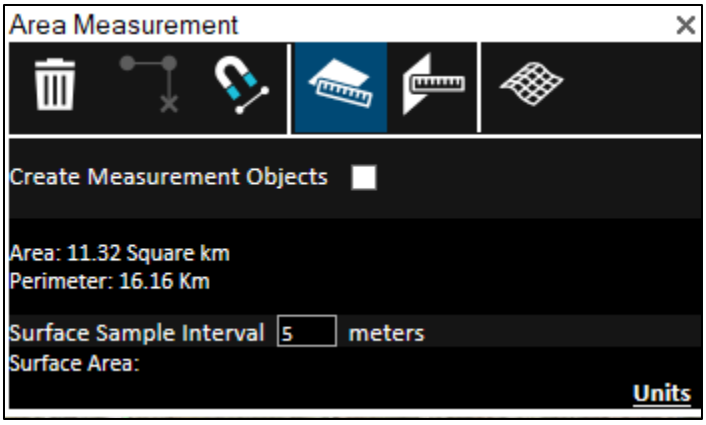
Value	Description
X	X-coordinate of the selected point.
Y	Y-coordinate of the selected point.
MGRS	The coordinates of the selected point converted to Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Elevation	Elevation value of the point above the terrain database vertical datum base ellipsoid.
Slope	Slope of the curve at the selected point

Area Tool

The Area tool allows you to calculate area on the terrain or on an arbitrary plane.

To use the area tool:

1. On the **Analysis** tab, in the **Measurement** group, click **Area**. The Area Measurement dialog is displayed.



Area Measurement Dialog

2. Click either of the following commands:
   - **Horizontal plane area (2D measurement)** - Calculate area on terrain. The area measured is the horizontal projection of the area you have outlined, even if some or all your selected area encompasses mountainous terrain.
   - **3D plane area** - Calculate area on an arbitrary plane. The polygon's orientation is determined by the first three points selected.
3. If you want to save the measurement in the Project Tree as a TerraExplorer object, select **Create Measurement Objects**.
4. If you want to change measurement units, click the **Units** link. The Options dialog is displayed, showing the View tab. Modify the display options for Altitude and Distance and Measurement, and then click **OK**. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
5. If you want to snap the measurement points to an object's edge or vertex, click **Snap Based on Snapping Options**. TerraExplorer automatically detects all edges, i.e., intersections of two plane faces, and vertices, i.e., intersections of two polylines. **See** "Setting Snapping Options" in the "Working with Objects" chapter for more information.
6. In the **3D Window**, click any point on the terrain/plane to define the start point of the measurement. Click to set the second point and then again for each additional point. Right-click to finish the measurement. If the boundary line of the measured area crosses itself, it turns red. If you want to delete the last point added, click **Delete Point**.
7. Right-click to finish the measurement. The Area dialog displays area and perimeter measurements.
8. If you want to calculate the surface area of the selected region taking into account terrain contours, do the following:
   a. In the **Surface Sample Interval** field, type the desired distance between terrain sample points.
   b. Click **Terrain Surface Area** (3D measurement). The terrain surface area measurement is displayed.
9. If you want to delete the area polygon in the 3D Window, click **Delete**.

Terrain Analysis Tools

The following terrain analysis tools are available:

- Contour Map Tools
- Slope Map Tools
- Best Path Tool
- Terrain Profile Tool
- Flood Tool
- Volume Tool
- Cross Section Tool
- Clip Box Tool

Contour Map Tools

The Contour Map tool creates a topographic map that portrays differences in terrain elevation by connecting points of equal elevation with contour lines or by coloring terrain according to varying altitudes. You can choose between the following:

- **Global Contour Map** - Apply contour colors to the entire terrain **and 3DML**with dynamically placed contour lines that provide coarse contours when zoomed out and detailed contours when zoomed in. Elevation labels appear only on the terrain and not on the 3DML.
- **Custom Contour Map** - An advanced map in which parameters such as coverage area (specified rectangular area or entire terrain), contour palette, and contour line interval can be customized, and a contour map object is added to the Project Tree. Contour colors and lines are only applied to the terrain, and not to 3DML layers.

Global Contour Map

To toggle on/off view of a global contour map:

- On the **Analysis** tab, in the **Terrain Analysis** group, click **Contour Map**. A contour map overlays the entire 3D Window, but no contour map object is created in the Project Tree.

  Note: If you want to create a contour map object for the entire terrain that will be listed in the Project Tree, create a custom contour map (**See** Custom Contour Map) and set the Coverage Area property in the property sheet to Entire Terrain.

Custom Contour Map

To create a custom contour map:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click the arrow next to **Contour Map**, point to **Custom Contour Map Object**, and then click one of the following options to indicate differences in terrain elevation:
   - **Contour Colors -** Apply different colors from a contour palette to each elevation level.
   - **Contour Lines** - Connect points of equal elevation with contour lines.
   - **Contour Colors and Lines -** Display both contour lines and contour colors.

   The Contour Map property sheet is displayed.

2. If you want to apply contour colors/lines only to terrain whose altitude is within a specific range, do the following:
   a. In the **Min/Max** section, in the **Use Min/Max** field, select **Yes**.
   b. Enter the **Minimum** (altitude) **value** and **Maximum** (altitude) **value**.
   c. Select the color you want to apply to all terrain with altitude values outside of the set range.
3. In the **Appearance** section, in the **Contour Palette** field, select a contour palette from the dropdown list.
4. In the **Appearance** section, in the **Contour Lines Color** field, click **Edit** and select a contour line color.
5. In the **Appearance** section, in the **Coverage Area** field, select the coverage of the contour map:
   - **Rectangle** - A designated rectangular area.
   - **Entire Terrain** - The entire terrain.
6. If you set the Coverage Area field to Entire Terrain, skip to step 7.
7. If you set the Coverage Area field to Rectangle, place the cursor in the 3D Window, and click to add the first corner. Then click a second time to add the opposite corner and complete the rectangle.
8. Continue to edit the contour map's parameters, or close the property sheet to finish the operation. **See** "Contour Map Property Sheet Parameters" in this chapter for information.
9. If you want to display a map legend that indicates which color represents each elevation value, right-click the contour map, and select **Show Legend** from the shortcut menu.

Note: After the contour map object has been created and set to display the contour lines, automatic tool tips are added to the contour lines. When the cursor is placed, in the 3D Window, above a contour line, a tool tip appears displaying the height value of the specific line. In addition, the tooltip entered in the Contour Map property sheet, is displayed when the cursor is placed over areas of colorized terrain.

Contour Map Property Sheet Parameters

Object Parameter	Activity
Min/Max	
Use Min/Max	Select **Yes** to only display contour colors and lines for areas of the terrain whose altitude value is between the Minimum Value and Maximum Value entered below. Select **No** to display contour colors and lines for all altitude values as set in the contour palette.
Minimum Value	This field is only enabled when "Use Min/Max" is set to Yes. Type the minimum altitude value for which contour colors and lines should be displayed.
Maximum Value	This field is only enabled when "Use Min/Max" is set to Yes. Type the maximum altitude value for which contour colors and lines should be displayed.
Color Outside of Range	This field is only enabled when "Use Min/Max" is set to Yes. Select how you want to color all the terrain whose altitude is not within the Min/Max range: ▪ **Transparent** - No color. ▪ **Red/Blue** - All water is colored in blue and the rest in red.

Appearance	
Name	Type the description or name of the contour map. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the object from the Project Tree.
Line Opacity	Enter the opacity for the contour and outline lines. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Display Style	Sets the style to display the contour map: ▪ Select **Contour lines** to display contour lines at set elevation values. ▪ Select **Contour colors** to represent varying altitudes in different colors according to the selected color scheme. ▪ Select **Contour Lines and contour colors** to display both contour lines and contour colors.
Coverage Area	Determines the coverage of the contour map. Select **Rectangle** to apply to a rectangular area, or **Entire Terrain** to apply to the entire terrain.
Contour Palette	Sets the palette style of the contour map. Select one of the available palettes. This field is enabled only when "Display Style" is set to "Contour Colors".
Fill Opacity	Enter the opacity for the contour map. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent. This field is enabled only when "Display Style" is set to "Contour Colors".
Contour Lines Color	Select the color for the contour lines. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff). This option is enabled only when "Display Style" is set to "Contour Lines".
Contour Lines Interval	Determines the elevation spacing between the contour lines. The base for the contour lines is at zero elevation above the terrain database vertical datum base ellipsoid.
Timespan	
Start Time	Click **Edit** and select the date and time when the contour map should first become visible.
End Time	Click **Edit** and select the date and time when the contour map should stop being visible.
Position	
X	Enter the X-coordinate for the rectangle's pivot point. The pivot is located at the center of the rectangle. Change this value to move the entire polyline.

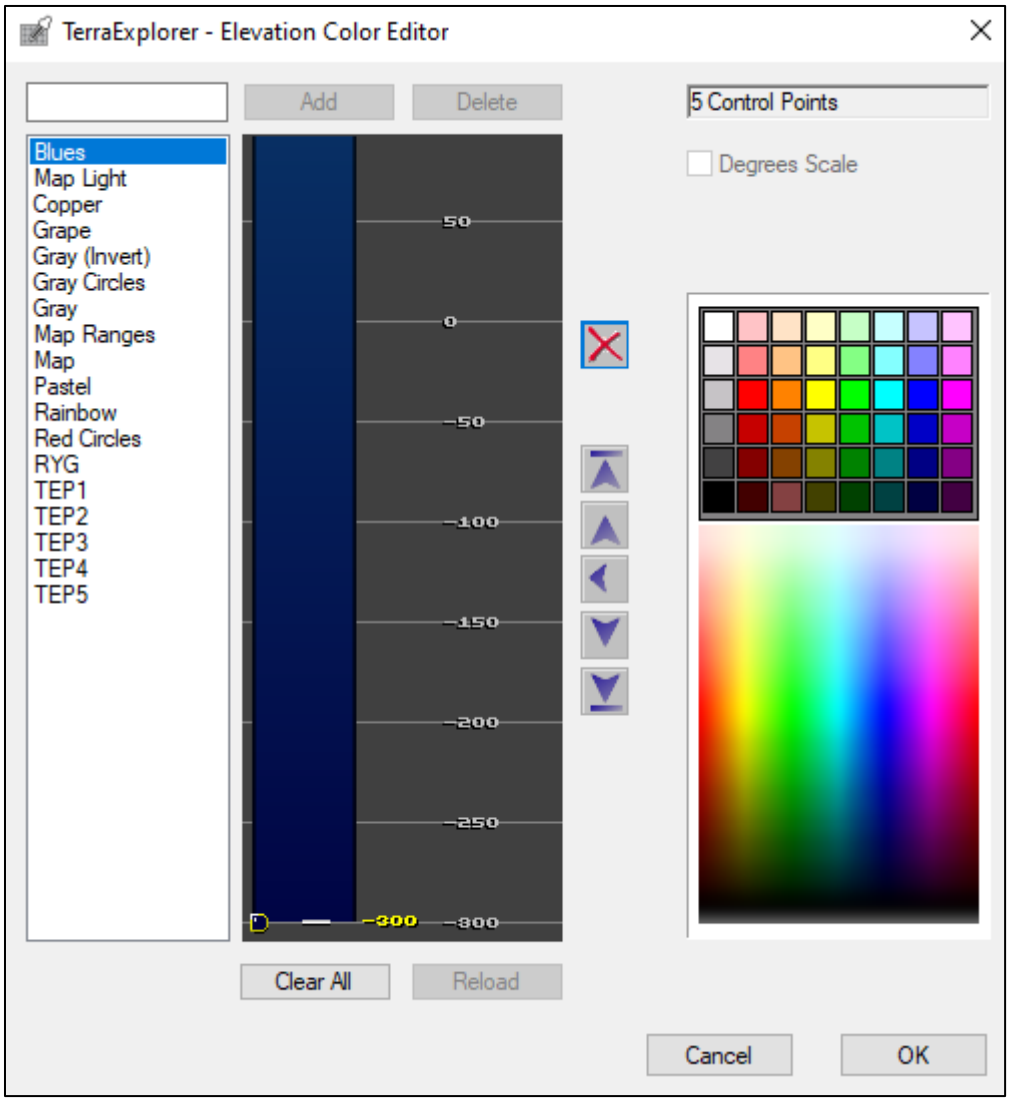
	This field is enabled only when "Coverage Area" is set to "Rectangle".
Y	Enter the Y-coordinate for the rectangle's pivot point. The pivot is located at the center of the rectangle. Change this value to move the entire polyline. This field is enabled only when "Coverage Area" is set to "Rectangle".
MGRS	The coordinates of the rectangle's pivot point converted to Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Yaw	Determines the direction angle of the contour map rectangle, along the vertical axis relative to north. Change this value to rotate the entire rectangle by a specified angle. This option is enabled only when "Coverage Area" is set to "Rectangle".
Geometry	
Length	Determines the length of the rectangle. This option is enabled only when "Coverage Area" is set to "Rectangle".
Width	Determines the width of the rectangle. This option is enabled only when "Coverage Area" is set to "Rectangle".
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the contour map. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the contour map based on its size.
Max. Visibility Distance	Sets the distance from the camera at which the contour map disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the contour map disappears.
General	
Show In Viewer	Determines if the contour map appears in the Project Tree when the file is viewed with the TerraExplorer Basic Viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.

Tooltip	Type a tool tip text to appear when the mouse cursor is placed over the contour map in the 3D Window. An automatic tool tip displaying the contour line height is created for the contour lines.
Order	Set the Draw Order of the contour map. Objects with higher Order values are drawn on top of objects with lower values.

Creating and Modifying Contour Palettes

To create or modify a contour palette:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click the arrow next to **Contour Map**, and then click **Contour Palettes**. The Elevation Color Editor dialog opens.



TerraExplorer - Elevation Color Editor

2. Do one of the following:
   - If you want to create a new contour palette, type the name of the new palette and click **Add**.

- If you want to modify an existing contour palette, select the required palette.

3. If you want to add a new control handle, in the color gradient/contour box, click the location of the required new handle.
4. If you want to delete a control handle, select it and click .
5. Navigate the color gradient/contour box using the five navigation buttons:

Button	Description
Up arrow with limit 	Jumps to the top control handle.
Up arrow without limit 	Jumps to the next control handle.
Left arrow 	Jumps to the currently selected control handle.
Down arrow without limit 	Jumps down to the next control handle.
Down arrow with limit 	Jumps to the bottom control handle.

6. Select the required control handle. Then click the color palette and select the required color for the section.
7. If you want to clear the color gradient contour box, click **Clear All**.
8. If you want to restart editing from the original scheme after changes have been made, click **Reload**. The original scheme is loaded on the color gradient/contour box.
9. Click **OK** to update all the schemes updated in the current session Elevation Color Editor.

Deleting a Contour Palette

To delete an existing palette:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click the arrow next to **Contour Map**, and then click **Contour Palettes**. The Elevation Color Editor dialog opens.
2. Select the required contour palette, and then click **Delete**. A warning message appears asking you to verify the Delete command.
3. Click **Yes** to verify or **No** to cancel.

Slope Map Tools

The Slope Map tools provide slope information for a specified area or the entire terrain. You can choose between the following:

- **Global Slope Map** - Applies default palette colors and direction arrows to entire terrain according to slope degree and aspect. Slope map colors are rendered on terrain textures as well as on 3DML layers.
- **Custom Slope Map** - An advanced slope map in which parameters such as coverage area (specified rectangular area or entire terrain), slope palette, and arrow color can be customized, and a slope map object is added to the Project Tree. The custom slope map can show degree and/or aspect (direction). Slope colors and arrows are only applied to the terrain, and not to 3DML layers.
- **Slope Map Query** – Graphically represents slope values in a specified area using a color-coded point shapefile that is added to the Project Tree.

- **Slope Cursor** - Displays slope information in a specified radius around a selected point.
- **Slope Palette** - Opens the Elevation Color Editor to allow creation of new slope palettes or modification of existing ones.

Global Slope Map

To toggle on/off view of a global slope map:

- On the **Analysis** tab, in the **Terrain Analysis** group, click **Slope Map**. A slope map overlays the entire 3D Window, but no slope map object is created in the Project Tree.

  Note: If you want to create a slope map object for the entire terrain that will be listed in the Project Tree, create a custom slope map (**See** Custom Slope Map) and set the Coverage Area property in the property sheet to Entire Terrain.

Custom Slope Map

To create a custom slope map:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click the arrow next to **Slope Map**, point to Custom Slope Map Object, and then click one of the following options:
   - **Slope Color Map** - Apply palette colors to the terrain according to degree of slope.
   - **Slope Directions** - Display on terrain arrows indicating the direction of the slope.
   - **Slope Color Map with Directions** - Display both slope colors and arrows indicating slope direction.

   The Slope Map property sheet is displayed.
2. In the **Slope Analysis property sheet**, in the **Appearance** section, in the **Coverage Area** field, select the coverage of the contour map:
   - **Rectangle** - A designated rectangular area.
   - **Entire Terrain** - The entire terrain.
3. If you set the Coverage Area field to Entire Terrain, skip to step 5.
4. If you set the Coverage Area field to Rectangle, place the cursor in the 3D Window, and click to add the first corner. Then click a second time to add the opposite corner and complete the rectangle.
5. Edit the slope map's parameters, or close the property sheet to finish the operation.
6. If you want to display the map's legend indicating which color represents each slope range, right-click the slope map, and select **Show Legend** from the shortcut menu.

Note: After the slope map object has been created and set to display the contour lines, automatic tool tips are added to the slope lines. When the cursor is placed, in the 3D Window, above a slope line, a tool tip appears displaying the slope of the specific line. In addition, the tooltip entered in the Slope Analysis property sheet is displayed when the cursor is placed over areas of colorized terrain.

Slope Analysis Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the slope map. This text appears in the Project Tree as the name of the object.

Activation Action	Select the action to perform when selecting the object from the Project Tree.
Display Style	Sets the style to display the slope map: ▪ Select **Slope arrows** to display arrows indicating where the slope increases and where it decreases. ▪ Select **Slope colors** to apply a color palette based on the steepness of the slope. ▪ Select **Slope arrows and colors** to display both slope colors and directions.
Coverage Area	Determines the coverage of the object. Select **Rectangle** to apply to a rectangular area, or **Entire Terrain** to apply to the entire terrain.
Slope Palette	Sets the palette style of the slope map. Select one of the available palettes. This option is enabled only when "Display Style" is set to Slope color map or Slope directions and color map.
Fill Opacity	Enter the opacity for the slope map. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Arrow Color	Select the fill color for the arrows. This option is enabled only when "Display Style" is set to Slope directions or Slope directions and color map. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Timespan	
Start Time	Click **Edit** and select the date and time when the map should first become visible.
End Time	Click **Edit** and select the date and time when the map should stop being visible.
Position	
X	Enter the X-coordinate for the rectangle's pivot point. The pivot is located at the center of the rectangle. Change this value to move the entire polyline. This field is enabled only when "Coverage Area" is set to Rectangle.
Y	Enter the Y-coordinate for the rectangle's pivot point. The pivot is located at the center of the rectangle. Change this value to move the entire polyline. This field is enabled only when "Coverage Area" is set to Rectangle.
MGRS	The coordinates of the rectangle's pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.

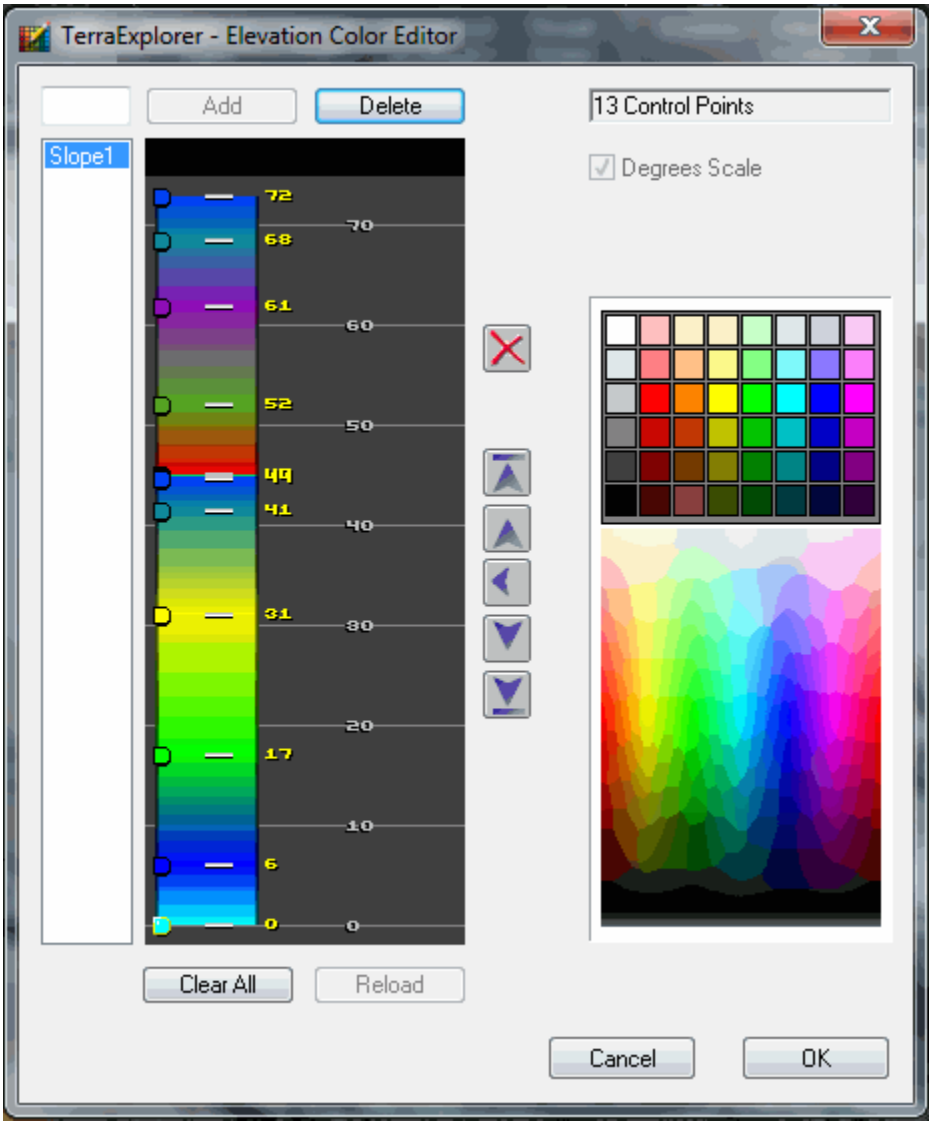
Yaw	Determines the direction of the slope map rectangle, along the vertical axis relative to north. Change this value to rotate the entire rectangle by a specified angle. This field is enabled only when "Coverage Area" is set to Rectangle.
Geometry	
Length	Determines the length of the rectangle. This field is enabled only when "Coverage Area" is set to Rectangle.
Width	Determines the width of the rectangle. This field is enabled only when "Coverage Area" is set to Rectangle.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the slope map. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when editing the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the map based on its size.
Max. Visibility Distance	Sets the maximal distance from the camera above which the slope map disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the slope map disappears.
General	
Show in Viewer	Determines if the slope map appears in the Project Tree when the file is viewed with the TerraExplorer Basic Viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the slope map colorized terrain area in the 3D Window. An automatic tool tip displaying the contour line height is created for the contour lines.
Order	Set the Draw Order of the slope map. Objects with higher Order values are drawn on top of objects with lower values.

Creating and Modifying Slope Palettes

Custom slope palettes can be created using the Elevation Color Editor.

To create or modify a contour palette:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click the arrow next to **Slope Map**, and then click **Slope Palettes**. The Elevation Color Editor dialog opens.



TerraExplorer - Elevation Color Editor

2. Do one of the following:
   - If you want to create a new slope palette, type the name of the new palette and click **Add**.
   - If you want to modify an existing contour palette, select the required palette.
3. If you want to add a new control handle, in the color gradient/contour box, click the location of the required new handle.
4. If you want to delete a control handle, select it and click .
5. Navigate the color gradient/contour box using the five navigation buttons:

Button	Description

▪ Up arrow with limit 	▪ Jumps to the top control handle.
▪ Up arrow without limit 	▪ Jumps to the next control handle.
▪ Left arrow 	▪ Jumps to the currently selected control handle.
▪ Down arrow without limit 	▪ Jumps down to the next control handle.
▪ Down arrow with limit 	▪ Jumps to the bottom control handle.

6. Select the required control handle. Then click the color palette and select the required color for the section.
7. If you want to clear the color gradient contour box, click **Clear All**.
8. If you want to restart editing from the original scheme after changes have been made, click **Reload**. The original scheme is loaded on the color gradient/contour box.
9. Click **OK** to update all the schemes updated in the current session Elevation Color Editor.

Deleting a Slope Palette

To delete an existing palette:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click the arrow next to **Slope Map**, and then click **Slope Palettes**. The Elevation Color Editor dialog opens.
2. Select the required slope palette, and then click **Delete**. A warning message appears asking you to verify the Delete command.
3. Click **Yes** to verify or **No** to cancel.

Slope Map Query

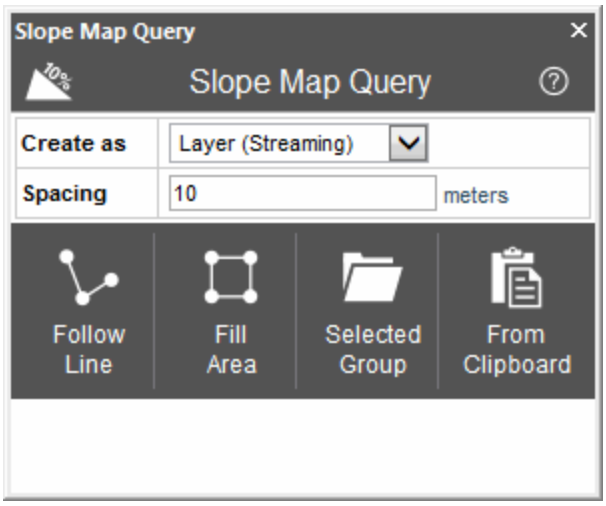
The Slope Map query tool calculates the slope value in a specified area. The area is defined by a drawn line or polygon, or by a selection of points, lines or polygons.

The output of the analysis is a point shapefile that graphically represents the slope values at different points in the specified area. Each point in the feature layer is color-coded according to the elevation model steepness:

- **Sky blue** = Slope value is lower than 6 degrees
- **Blue** = Slope value is between 6 - 17 degrees
- **Green** = Slope value is between 17 - 31 degrees
- **Yellow** = Slope value is between 31 - 38 degrees
- **Orange** = Slope value is between 38 - 45 degrees
- **Red** = Slope value is greater than 45 degrees

To use the Slope Map Query tool:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click the arrow next to **Slope Map**, and then click **Slope Map Query**. The Slope Map Query dialog opens.



Slope Map Query Tool

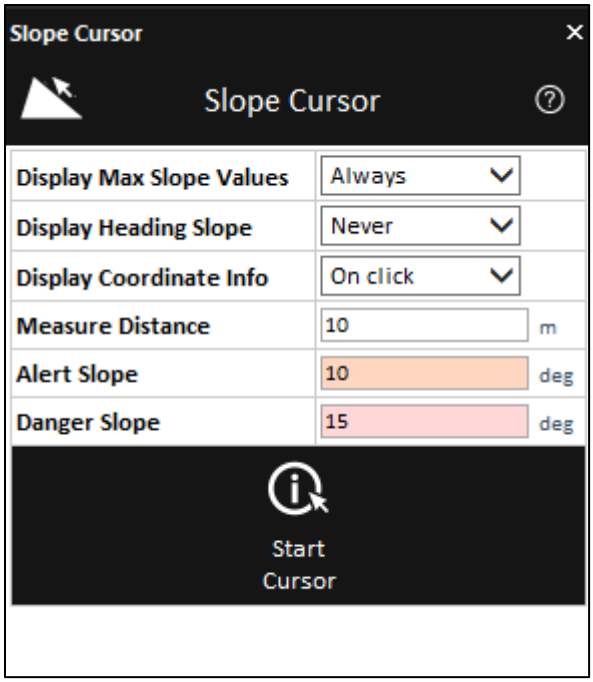
2. Select one of the **Create as** options:
   - Layer (Entire) - Create a feature layer under the application's AppData.
   - Layer (Streaming) - Create a streaming feature layer under the application's AppData.
3. In the **Spacing** field, type the horizontal and vertical spacing (in meters) between query points in the area for which the slope is being calculated.
4. Select one of the following methods of designating the area for which the slope map query should be calculated:
   - **Follow Line** - Query points are created along the drawn line.
   - **Fill Area** - Query points are created inside the drawn polygon.
   - **Selected Group** - Query points are created at all points, along all lines, or inside all polygons, in the selected group. Select the required group from the Project Tree, and then click **Selected Group**.
   - **From Clipboard** - Query points are created for all clipboard objects. Copy the required objects to the clipboard, and click **From Clipboard**.

Slope Cursor

The Slope Cursor tool displays slope information in a specified radius around a selected point.

To use the Slope Cursor tool:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click the arrow next to **Slope Map**, and then click **Slope Cursor**. The Slope Cursor dialog opens.



Slope Cursor Dialog

2. Set the Slope Cursor properties

Property	Description
Display Max Slope Values	Defines whether the maximum positive and maximum negative slope values are displayed. Choose between **Never**, **On Click** and **Always**.
Display Heading Slope	Defines whether the heading slope value is displayed. Choose between **Never**, **On Click** and **Always**. The heading is the current direction of the camera.
Display Coordinate Info	Defines whether the selected coordinate information is displayed. Choose between **Never**, **On Click** and **Always**.
Measure Distance	Defines the measurement radius around the center point.
Alert Slope	Apply colors to slope based on Alert rating levels.
Danger Slope	Apply colors to slope based on Danger rating levels.

3. Click **Start Cursor** to start the slope query.
4. Point to the terrain to view slope arrows showing the maximum positive and maximum negative slope angles for the selected point.
5. Left-click to recalculate slope values using a more precise method. The calculation may take a few seconds.
6. Right-click or click **Stop** to exit Slope Cursor mode.

Best Path Tool

The Best Path tool calculates the best path between two locations on the terrain without exceeding definable climb and descent slope limits.

The tool creates a line object marked on the ground representing the calculated path. The calculation takes into account the elevation values of the terrain and implements a heuristic algorithm. The parameters available for the search determine the time and probability of finding the best path.

Using the Best Path Tool

To use the Best Path tool:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click **Best Path**.
2. Set the required Best Path parameters.
3. With the cursor in the **3D Window**, click to define the start point for the path.
4. Click again to define the endpoint of the path.
5. Once the Best Path has been calculated, it displays in the 3D Window, and a Best Path analysis object is created in the Project Tree.
6. If you want to edit its parameters and recalculate it, make the required modifications in the property sheet and in the **Recalculate Path** click **Apply**.
7. If you want to move the path, click **Edit Nodes** , on the top bar of the property sheet, and move the node point to the required location.
8. Close the property sheet to end the operation.

Best Path Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the Best Path. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when the object is selected from the Project Tree.
Path Color	Select the color for the best path. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Position	
Start Location X	Enter the X-coordinate for the start location.
Start Location Y	Enter the Y-coordinate for the start location.
Start Location MGRS	The coordinates for the start location in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
End Location X	Enter the X-coordinate for the end location.
End Location Y	Enter the Y-coordinate for the end location.
End Location MGRS	The coordinates for the end location in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.

Settings	
Sample Interval	Enter the desired value (in meters) for the resolution of the measurement. This value represents the distance between sample points along the path. The smaller the sample interval, the more accurate the calculation, but the longer it takes to calculate.
Search Area Factor	Enter the desired value for the area of the calculation. This value represents the factor multiplying the distance between each two points giving the length of the search area rectangle. The width is set to half of the length.
Climb Slope Limit	Enter the climb slope limit (in degrees) that no part in the path can exceed.
Descent Slope Limits	Enter the descent slope limit (in degrees) that no part in the path can exceed. No part of the path can have a steeper slope than the negative value of this property.
Recalculate Path	Click this button to perform the calculation again with the updated parameters.
Timespan	
Start Time	Click **Edit** and select the date and time when the path should first become visible.
End Time	Click **Edit** and select the date and time when the path should stop being visible.
General	
Show in Viewer	Determines if the Best Path appears in the Project Tree when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the Best Path in the 3D Window.
Max. Visibility Distance	Sets the maximal distance from the camera above which the Best Path polygon disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the Best Path polyline disappears.

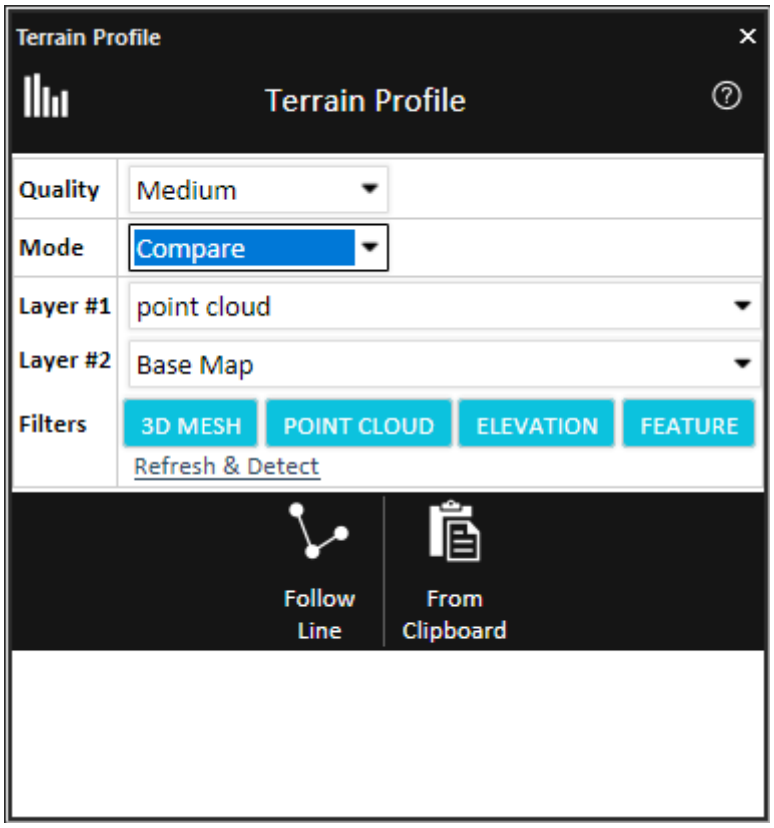
Once completed, a single line, marked on the terrain appears between the start and end locations. This line represents the best path between the two points under the constraints set by the slope parameters. At any time, you can change the start and endpoints, and the various parameters, and recalculate the path.

Terrain Profile Tool

The Terrain Profile tool displays the terrain elevation profile along a defined path, and related information on this profile such as maximum and minimum elevation values and slope. The terrain profile can also compare the terrain profile of two layers or of a layer and the base terrain.

To use the Terrain Profile tool:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click **Terrain Profile**. The Terrain Profile dialog is displayed.



Terrain Profile – Compare Mode

2. Enter the following parameters:

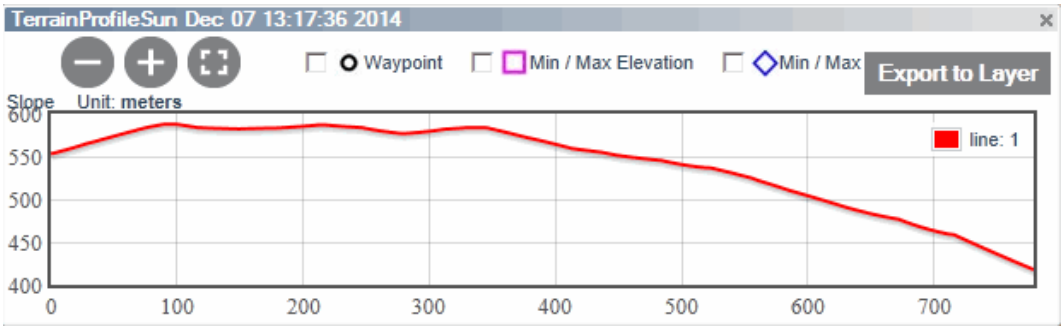
Parameter	Description
Quality	Determines the distance between sample points along the polyline for which the terrain profile is being calculated. High Quality will yield a more accurate result but take longer to calculate.
Mode	Select the profile mode. ▪ **Normal** – Display a profile only for the selected polyline(s). ▪ **Compare** – Generate terrain profiles for the path defined by the selected polyline for two different layers or for a layer and the base terrain, so that they can be easily compared.
Layer #1	Select the first layer for comparison. This property is only available if Compare is selected in the Mode field. Only layers that are calculated as

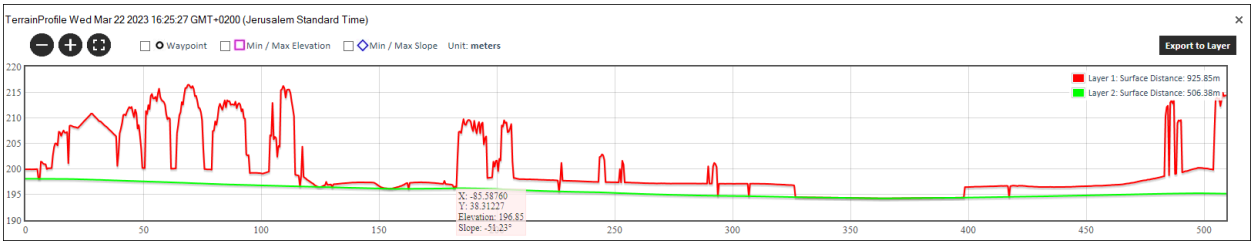
	part of the terrain's elevation (i.e., their "Ground Object" property is set to yes) are included in the dropdown lists.
Layer #2	Select the second layer for comparison. If you want to refresh the dropdown layers, and automatically detect and select the layers in current view, click **Refresh & Detect**. This property is only available if Compare is selected in the Mode field.
Filters	Toggle on the layer types which you want to include in the layer dropdown lists.

3. Select one of the following methods of designating the polyline(s) for which the terrain profile should be calculated:
   - **Follow Line –** A terrain profile is created along the drawn line. In the **3D Window**, left-click to place the line waypoints, and right-click to complete the line.

     Note: When a terrain profile is created by "Follow Line", a group is created in the Project Tree with the drawn line object.
   - **Selected Group –** A terrain profile is created for each of the polylines in the selected group. Select the required layer from the Project Tree, and then click **Selected Group**. This option is only available in Normal mode.
   - **From Clipboard** – A terrain profile is created for each of the polylines in the clipboard.

A terrain profile graph opens, displaying the terrain elevation profile.





Terrain Profile Graph

4. Use the Zoom in , Zoom out , and Zoom to full extent of data buttons to adjust the zoom as required.
5. Determine what information is indicated on the graph by selecting any of the following display options:

Waypoint	Select the check box to mark each of the polylines' waypoints on the graph with a .

Min/Max Elevation	Select the check box to mark each of the polylines' maximum and minimum points with a .
Min/Max Slope	Select the check box to mark each of the polylines' maximum and minimum slope with a .

6. If you want to export the terrain profile to a shapefile layer, click **Export to Layer**.

   Note: When a terrain profile created for multiple lines (in a group or from clipboard), is exported to a layer, the line color on the graph corresponds to the color of the points that make up the line in the layer.

7. Point to any point on the graph to display the following values. If you want to display the values and jump to the point on the terrain, then click instead of pointing.

Value	Description
X	X-coordinate of the selected point.
Y	Y-coordinate of the selected point.
Elevation	Elevation value of the point above the terrain database vertical datum base ellipsoid.
Slope	Slope of the curve at the selected point

When comparing between two layers, visibility is turned off for all layers in the area except for the two selected layers so all other layers don't interfere with the calculations. After the calculations are performed, the original visibility for all the layers is restored.

Flood Tool

The Flood tool assesses the land area covered by water in different water flooding scenarios. The result of the flood analysis process is a set of polygons showing the flooded areas.

Analysis can be performed based on either of the following scenarios:

- **Single Instance** - Water level rises once (initial water level set by user).
- **Continuous Rise** - Water level rising at a constant rate over a certain period of time (rate of rise and rise interval set by user).

Using the Flood Tool

To use the Flood tool:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click **Flood**.
2. In the **property sheet**, in the **Sample Interval** field, enter the desired distance between sample points.
3. In the **property sheet**, in the **Scenario Type** field, select a scenario:
   - **Single Instance** - Water level rises once.
   - **Continuous Rise** - Water level rising at a constant rate over a certain period of time.
4. If you selected Single Instance in step 4, in the **Water Level Rise** field, enter the initial water elevation in meters.
5. If you selected Continuous Rise in step 4, set the following parameters in the property sheet:
   - Water Rise Rate
   - Start Time

- End Time
- Time Sample Interval

6. In the **3D Window**, click a point to mark the center of the circular area to be analyzed.
7. Drag the mouse to set the required radius size and click again.

Note: If the Sample Interval (**See** below in property sheet) is smaller than necessary for an accurate assessment, a dialog is displayed asking if you want to increase the Sample Interval to a recommended value. Click **Yes** to increase the size, or **No** to keep the sample size as is.

The result of the flood analysis process is a set of polygons showing the flooded areas.

Flood Analysis Property Sheet Parameters

Parameter	Description
Sample Interval	Enter the desired value for the resolution of the measurement. This value represents the distance between terrain sample points. The smaller the sample interval, the more accurate the calculation, but the longer it takes to calculate.
Scenario	Select a scenario: ▪ **Single Instance** - Water level rises once. ▪ **Continuous Rise** - Water level rising at a constant rate over a certain period of time.
Water Level Rise	This field is only enabled when Single Instance is selected in the Scenario field. Enter the initial water elevation in meters.
Water Rise Rate	This field is only enabled when Continuous Rise is selected in the Scenario field. Enter the rate (meters/hour) that the water is rising.
Start Time	This field is only enabled when Continuous Rise is selected in the Scenario field. Select the time and date that the water level begins to rise.
End Time	This field is only enabled when Continuous Rise is selected in the Scenario field. Select the time and date that the water level stop rising.
Time Sample Interval	This field is only enabled when Continuous Rise is selected in the Scenario field. This value determines how many samples are taken between the Start Time and End Time. The smaller the sample interval, the more accurate the calculation, but the longer it takes to calculate.

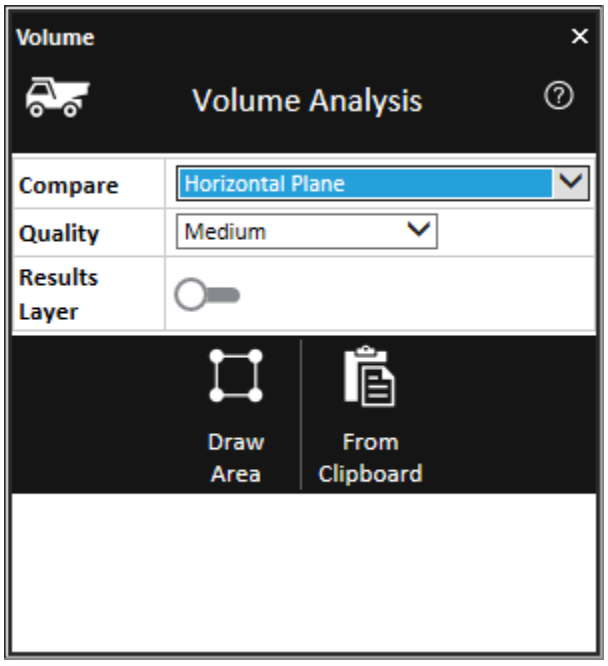
Volume Tool

The Volume Analysis tool analyzes the volume of the terrain or model removed or added by selected horizontal planes or modify terrain/3DML objects.

Using the Volume Analysis Tool

To use the Volume Analysis tool:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click **Volume**. The Volume Analysis dialog is displayed.



Volume Analysis Tool

2. In the **Compare** field, select one of the following analysis modes:
   - **Horizontal Plane** – Calculate the volume added or removed by a horizontal plane defined either by a polygon you now draw or by polygons already on the clipboard.
   - **Modify Terrain – Draw New** – Calculate the volume added or removed by a new Modify Terrain object that you now create.
   - **Modify Terrain – Select Existing** – Calculate the volume added or removed by the Modify Terrain object(s) selected from the list.
3. Enter the required parameters:

Parameter	Description
Select	This field is displayed only when Modify Terrain – Select Existing mode is selected. Select one or more Modify Terrain objects from the list. Use CTRL-click or SHIFT-click to multi-select. Click **Refresh list** to update the list if changes were made to the project.
Quality	Determines the accuracy level by which the analysis is performed. Select one of the following options: ▪ **Low** – Performs 16K samples

	▪ **Medium** – Performs 65K samples ▪ **High** – Performs 260K samples
Results Layer	Toggle the switch on to create a point shapefile representing each volume analysis result. The area and volume (removed or added) of each sample in the feature layer is stored in the Volume Area and Volume Difference attribute fields of the feature that represents the sample.

4. Perform the steps relevant to the selected mode:

Horizontal Plane Mode

- Select either of the following methods to mark your area of interest:
  - Draw Area – The area is marked by drawing a polygon in the 3D Window. If this option is selected, left-click in the 3D Window to place the polygon waypoints, and right-click to complete.
  - From Clipboard – Analysis is performed in the locations of all polygon clipboard objects. The polygons must be on the clipboard before selecting this option.

Modify Terrain – Draw New Object Mode

a. Click **Start Calculation**. The Modify Terrain property sheet is displayed.

b. In the 3D Window, left-click to place the polygon waypoints, and right-click to complete.

c. Close the property sheet to start calculation.

Modify Terrain – Select Existing Mode

a. In the **Select** field, select one of the project's modify terrain objects.

b. Click **Start Calculate**.
   - Draw Area – The area is marked by drawing a polygon in the 3D Window. If this option is selected, left-click in the 3D Window to place the polygon waypoints, and right-click to complete.
   - From Clipboard – Analysis is performed in the locations of all polygon clipboard objects.

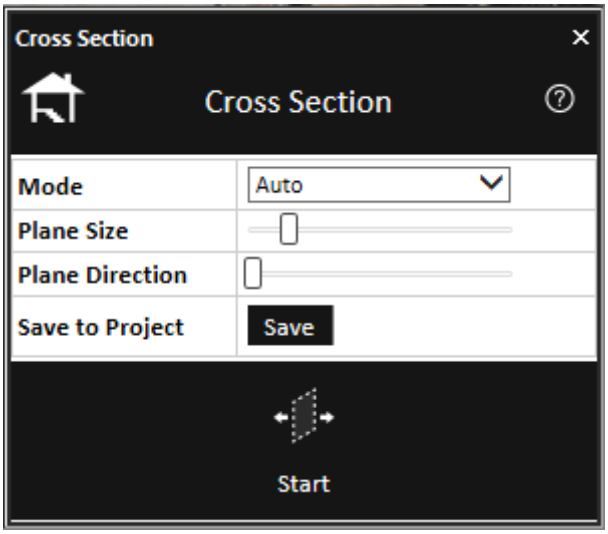
5. When calculation is complete, a dialog is displayed with the analysis results.

Cross Section Tool

The Cross Section tool makes a horizontal or vertical straight cut to expose obscured sections of the 3D View. The cross section slider increments are based on the Plane Size set and the distance between the camera and the plane when creating the cross section box, i.e., the narrower the plane and the closer the camera, the smaller the increments.

To use the Cross Section tool:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click **Cross Section**. The Cross Section dialog is displayed.



Cross Section Tool

2. Enter the following parameters:

Parameter	Description

Mode	Select the mode.
	▪ **Auto** – The direction of the cross section is automatically determined based on what the cursor is currently pointing at:
	  ▪ A vertical surface (e.g., side of a building) – Vertical cross section
	  ▪ The terrain or any horizontal flat surface (e.g., roof tops) – Horizontal cross section
	▪ **Horizontal** – Create horizontal cross sections.
	▪ **Vertical** – Create vertical cross sections.

Plane Size	Determines the size of the cross-section plane. Slide the slider to the right to increase the plane size, and left to decrease. **Note**: The initial size is defined according to the distance between the camera and the plane.
Plane Direction	Slide the Plane Direction slider to rotate the direction of the cross-section plane.
Save to Project	Click **Save** to create a cross section object in the Project Tree. **Note**: The cross-section object can then be activated by selecting the cross-section plane in the 3D Window or by double-clicking the object in the Project Tree.

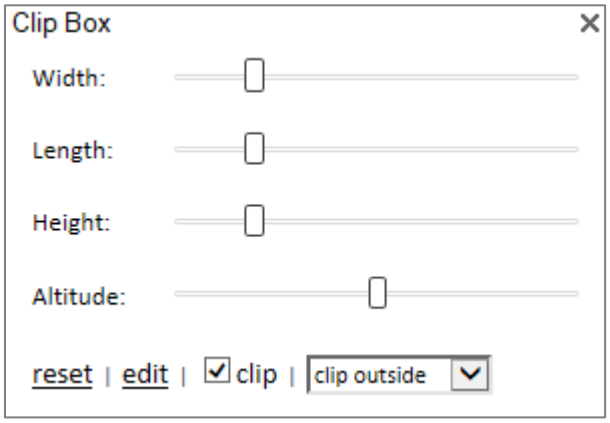
3. Click **Start**.
4. In the **3D Window**, click where you want to create a cross section. Then use the Cross Section slider to adjust the position of the cross-section plane. When cutting a horizontal cross section, slide the slider to the left to lower the plane (increasing the section being clipped), and right to raise it. When cutting a vertical cross section, slide the slider to the left to move the cross-section plane forward, and right to move it backward.
5. Click **Stop** to exit the particular cross section.

Clip Box Tool

The Clip Box tool clips everything except labels that are outside or inside of a selected box to help you focus on specific elements in your 3D project.

To use the Clip Box tool:

1. Draw a box around the area, e.g., building, you want to clip. **See** "Creating a 3D Shape – Box" in the "Objects and Labels" chapter for information.
2. In the **Project Tree**, select the box you want to use for the clipping operation.
3. On the **Analysis** tab, in the **Terrain Analysis** group, click **Cross Section** and select **Clip Box**. The Clip Box controls are displayed.



4. Use the Clip Box controls to change the dimensions of the box, and to determine the clip area: inside or outside the box:

Parameter	Description
Width	Determines the width of the box. Slide the slider to the right to increase the width, and left to decrease (5-500% of starting width).
Length	Determines the length of the box. Slide the slider to the right to increase the length, and left to decrease (5-500% of starting length).
Height	Determines the height of the box. Slide the slider to the right to increase the height, and left to decrease (5-500% of starting height).
Altitude	Determines the altitude of the box. Slide the slider to the right to move it up and left to move it down (range of +/- 500 meters from the starting altitude).
Clip outside/ Clip inside	Defines the area to be clipped.

5. Click **Reset** if you want to restore the original dimensions of the box.
6. Toggle the clipping action by selecting/unselecting the **Clip** check box.
7. Click **Edit** to close the Clip Box tool, and edit the box in the 3D Window using the object's resizers and rotators. **See** "Editing a 2D or 3D Object Using Object Handles" in the "Working with Objects" chapter for information.
8. Close the **Clip Box** controls to return to the normal view mode.

Line of Sight Tools

The following line of sight tools are available:

- Line of Sight Analysis Tool
- Viewshed Tool
- Viewshed on Route Tool
- Threat Dome Tool
- Buffer Query Tool

Line of Sight Tool

The Line of Sight tool provides a visual indication of whether specific locations in the 3D World can be seen from a selected position. The tool displays a visual marker for the existence of a line of sight from a single observer position to multiple positions in the world.

This feature takes into account the observer's viewpoint, direction of sight and distance of sight, to portray which locations can be viewed from the viewpoint, and which locations cannot be viewed. The observer and target positions can be set at any altitude above the terrain.

Using the Line of Sight Analysis Tool

To use the Line of Sight Analysis tool:

1. On the **Analysis** tab, in the **Line of Sight** group, click **Line of Sight**.
2. In the **Line of Sight Analysis** property sheet, enter the following parameters:
    a. In the **Analysis** section, in the **Sampling Interval** field, enter the desired value for the sample resolution of your measurement. This value represents the distance between terrain samples for the measurement along each line. A smaller sample size is more accurate but slower to calculate.
    b. In the **Observer** section, in the **Height** field, enter the desired value for the altitude of the observer.
    Note: The X and Y observer position fields in the Observer section are derived from the point you select in the 3D Window (see below). They only become enabled after you place the Observer point, so you can modify the values as required in the property sheet.
    c. In the **Targets** section, in the **Height** field, enter the desired value for the altitude of the target point or points.
3. Once you have set the necessary parameters, click the cursor to define your viewpoint for the observer.
4. Click in the **3D Window** to place the target points. You must place at least one point in the 3D Window.
5. Right-click to finish the operation. At this point, TerraExplorer Pro begins to calculate the line of sight. This process can take a few seconds.
6. Once the Line of Sight Analysis has been completed, you can edit the parameters and recalculate, or close the property sheet to finish the operation.

Once completed, a single line, or group of lines, marked on the terrain appear between the viewpoint and the endpoint. Target points that are visible from the observer viewpoint are colored green, whereas points that are not visible from the observer viewpoint are colored red.

Note: To perform another line of sight measurement, you must first close the property sheet either by clicking **Close**  on the property sheet, or by clicking again the Line of Sight command on the Analysis tab.

Line of Sight Property Sheet Parameters

Object Parameter	Activity
Observer	
All the fields in this section except Height are only enabled after the Observer viewpoint is selected in the 3D Window.	
X	Enter the X-coordinate for the observer position. Change this value to move the observer position.
Y	Enter the Y-coordinate for the observer position. Change this value to move the observer position.
MGRS	The coordinates of the observer position in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Height	Enter the desired value for the observer altitude.
Targets	
All the fields in this section except Height are only enabled after the Target points are selected in the 3D Window.	
Selected Point	Select which target point's position you want to edit.
Target X	The X-coordinate for the target position.
Target Y	The Y-coordinate for the target position.
Target MGRS	The coordinates of the target position in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Target Height	Enter the desired value for the altitude of the target point (or points).
Analysis	
Sampling Interval	Enter the desired value for the resolution of the measurement. This value represents the distance between sample points along each line. The smaller the sample interval, the more accurate the measurement, but the longer it takes to calculate.
Recalculate	Click this button to perform the calculation again with the updated parameters.
Appearance	
Name	Type the description or name of the Line of Sight. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when the object is selected from the Project Tree.

Timespan	
Start Time	Click **Edit** and select the date and time when the Line of Sight should first become visible.
End Time	Click **Edit** and select the date and time when the Line of Sight should stop being visible.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the Line of Sight observer position. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when editing the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance based on its size.
Max. Visibility Distance	Sets the maximal distance from the camera above which the Line of Sight disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the Line of Sight disappears.
General	
Show in Viewer	Determines if the Line of Sight appears in the Project Tree when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tool tip to appear when the mouse cursor is placed over the Line of Sight in the 3D Window.

Viewshed Tool

The Viewshed tools enable you to calculate the view from a selected observer point or multiple observer viewpoints:

- **3D Viewshed** – Calculate and mark all areas on the terrain and on 3D models and objects that are visible from a selected point on the terrain.
- **2D Viewshed** - Calculate and mark all areas on the terrain that are visible from a selected point on the terrain.
- **Viewshed Query** - Analyzes the visibility of a selected area from multiple viewshed observer viewpoints.

Note: To display a viewshed analysis from a series of points along a route, use the Viewshed on Route tools. **See** "Viewshed on Route" in this chapter for information.

The viewshed tool takes into account the viewpoint, direction of sight and distance of sight, when calculating which areas of the terrain are visible from the viewpoint, and which areas cannot be viewed. The viewpoint can be set at any altitude above the terrain.

Creating a 3D Viewshed

The 3D viewshed calculates and marks all areas on the terrain and on 3D models and objects that are visible from a selected point on the terrain.

To create a 3D viewshed:

1. On the **Analysis** tab, in the **Line of Sight** group, click **Viewshed**. The 3D Viewshed property sheet is displayed.
2. In the **3D Window**, click to define your viewpoint for the 3D viewshed, and then click again to define your desired endpoint (defining the distance of sight).
3. In the **3D Viewshed** property sheet, set the required parameters:

Object Parameter	Activity
Appearance	
Name	Type the description or name of the 3D viewshed. This text appears in the Project Tree as the name of the object.
Visible Area Color	Select the fill color of the areas that are visible from the viewpoint. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Visible Area Opacity	Enter the opacity for the visible area fill. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Hidden Area Color	Select the fill color of the areas that are not visible from the viewpoint. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Hidden Area Opacity	Enter the opacity for the hidden area fill. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Border Color	Select the color of the lines that define the boundaries of the viewshed area. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Border Opacity	Enter the opacity of the lines that define the boundaries of the viewshed area. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Viewer Position	
Altitude Method	Set the altitude method to be used for the viewer location: ▪ Select **Relative to Terrain** to place the location point at a specified altitude above the ground. ▪ Select **Absolute** to place the location point at a specified altitude above the terrain database vertical datum base ellipsoid.

Altitude	Enter the altitude above the ground for the viewer location.
X	Enter the X-coordinate of the viewer location.
Y	Enter the Y-coordinate of the viewer location.
MGRS	The coordinates of the viewer location in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Direction	Enter the horizontal angle of the camera when viewing the viewer location.
Pitch	Enter the tilt angle of the viewer position along its lateral axis relative to the horizon.
Settings	
Spherical Viewshed	Select **Yes** to create a full 360 degree sphere.
Horizontal FOV	Enter the horizontal angle limits, in degrees, of the viewshed. This field is unavailable when the **Spherical Viewshed** field is set to **Yes**.
Vertical FOV	Enter the vertical angle limits, in degrees, of the viewshed. This field is unavailable when the **Spherical Viewshed** field is set to **Yes**.
Distance	Enter the length of the viewshed analysis from the viewer in meters.
Quality	Accuracy level of the viewshed calculation.
Refresh Rate	Rate at which the viewshed is recalculated.
Timespan	
Start Time	Click **Edit** and select the date and time when the viewshed should start being visible.
End Time	Click **Edit** and select the date and time when the viewshed should stop being visible.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the viewshed. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the viewshed based on its size.
Max. Visibility Distance	Sets the distance from the camera at which the viewshed disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the viewshed disappears.
General	

Show in Viewer	Determines if the viewshed appears in the Project Tree when the file is viewed with the TerraExplorer Basic Viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information. **Note:** The message is triggered when the user double-clicks the Project Tree entry that represents the viewshed or clicks the viewshed's rays in the **3D Window** (clicking the hidden/visible areas does not trigger the message).

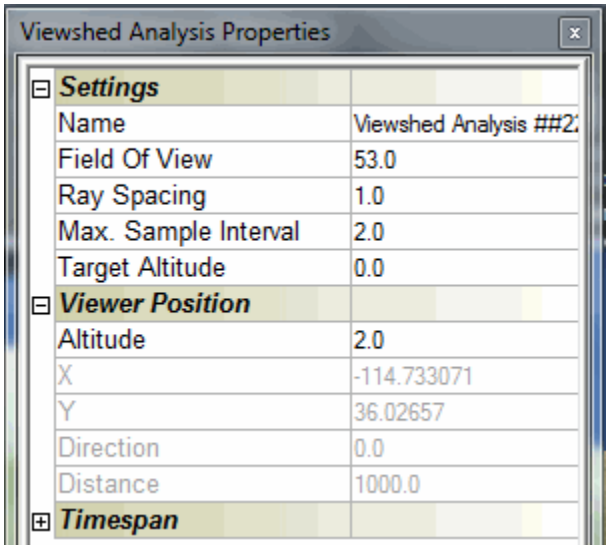
Once completed, the viewshed appears on the terrain as a sector of a circle, where the center point is the viewpoint and the arc is the endpoint (marking the end of the distance of sight analysis), and the 3D Viewshed object appears in the Project Tree. Within the sector, areas that are visible from the viewpoint are colored green (default color), whereas areas that are not visible from the viewpoint are colored red (default color).

Creating a 2D Viewshed

The 2D viewshed calculates and marks all areas on the **terrain** that are visible from a selected point on the terrain.

To create a viewshed:

1. On the **Analysis** tab, in the **Line of Sight** group, click the arrow next to **Viewshed**, and then click **2D Viewshed**.
2. In the **Viewshed Analysis** property sheet, set the required parameters:



Viewshed Analysis Property Sheet

Object Parameter	Activity
Settings	
Name	Type the description or name of the viewshed. This text appears in the Project Tree as the name of the object.
Field Of View	Enter a value representing the field of view (the default is 53°).
Ray Spacing	TerraExplorer samples several rays (lines of sight) in the area sector. Type the space between each ray (in degrees). The smaller the ray spacing, the more accurate the measurement, but the longer it takes to calculate.
Max. Sample Interval	Enter the desired value for the sample resolution of your measurement. This value represents the distance between terrain samples for the measurement along each ray. A smaller sample size is more accurate but slower to calculate.
Save Results	Select **Yes** to create a group in the Project Tree under which the measurement results are saved.
Target Altitude	Enter the required value for the target height.
Viewer Position	
Altitude	Enter the altitude above the ground for the viewer location.
X	Enter the X-coordinate of the viewer location (Read-only, derived from the points selected in the 3D Window).
Y	Enter the Y-coordinate of the viewer location (Read-only, derived from the points selected in the 3D Window).
MGRS	The coordinates of the viewer location in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Direction	Enter the horizontal angle of the camera when viewing the viewer location (Read-only, derived from the points selected in the 3D Window).
Distance	Distance of the viewshed (in meters) (Read-only, derived from the points selected in the 3D Window).
Timespan	
Start Time	Click **Edit** and select the date and time when the viewshed should start being visible.
End Time	Click **Edit** and select the date and time when the viewshed should stop being visible.

3. In the **3D Window**, click to define your viewpoint for the measurement, and then click again to define your desired endpoint (defining the distance of sight). The created group is locked and appears as a Viewshed icon in the Project Tree.

Once completed, the viewshed appears on the terrain as a sector of a circle, where the center point is the viewpoint and the arc is the endpoint (marking the end of the distance of sight), and the 2D Viewshed

object appears in the Project Tree. Within the sector, areas that are visible from the viewpoint are colored green, whereas areas that are not visible from the viewpoint are colored red.

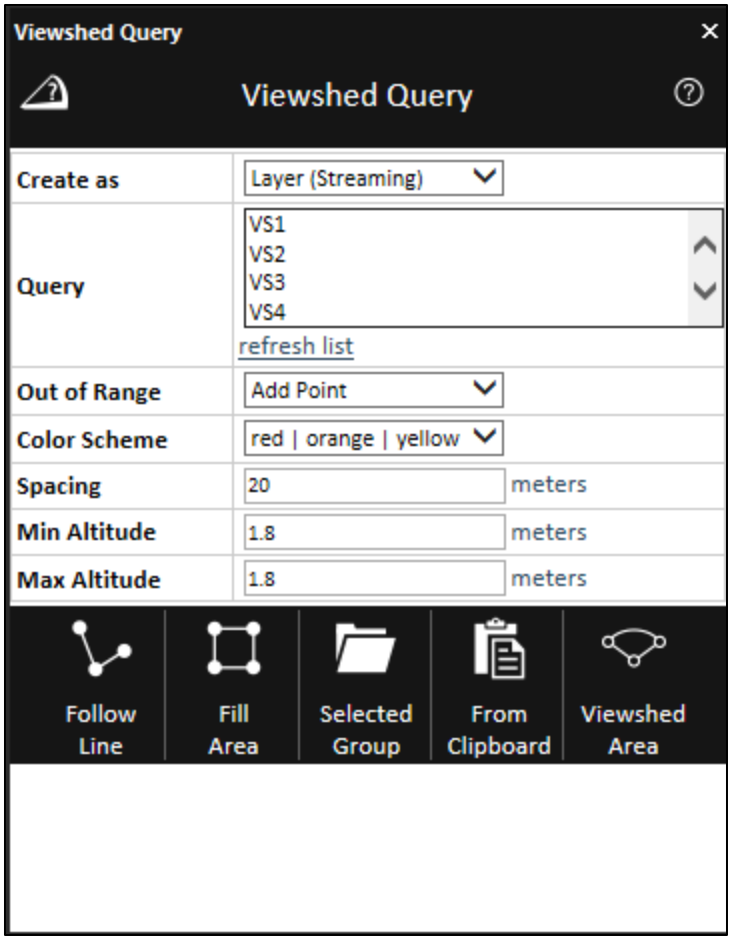
Viewshed Query

The Viewshed Query tool enables you to analyze the visibility from multiple viewshed observer viewpoints to a selected area. Based on the 3D viewshed analysis object, the tool computes the overall visibility of different points in the designated area. The output of the analysis is exported to a point shapefile that graphically represents the visibility of the different points. Two color schemes are available; one scheme only distinguishes between visible (green) and invisible (red), while the other one color codes the points according to their visibility percentage:

- **Green** = More than 80% of the selected viewsheds' observer viewpoints are visible from this point.
- **Yellow** = 50 - 80% of the selected viewsheds' observer viewpoints are visible from this point.
- **Orange** = 0-50% of the selected viewsheds' observer viewpoints are visible from this point.
- **Red** = 0% of the selected viewsheds' observer viewpoints are visible from this point.

To use the Viewshed Query tool:

1. On the **Analysis** tab, in the **Line of Sight** group, click the arrow next to **Viewshed**, and then click **3D Viewshed Query**. The Viewshed Query dialog is displayed.



Viewshed Query

2. Select one of the **Create as** options:

Option	Description
Layer (Entire)	Create a feature layer under the application's AppData.
Layer (Streaming)	Create a streaming feature layer under the application's AppData.

3. Enter the following parameters:

Parameter	Description
Query	The list displays all 3D viewsheds in the project. Only selected 3D viewsheds are taken into account when calculating the ratio between visible and invisible viewsheds. Click the required viewshed(s). Use CTRL-click or SHIFT-click to multi-select. Click **Refresh list** to update this list to the current project status.
Out of Range	Defines how to handle query points that are outside of the calculated areas of all selected 3D viewsheds. Select either: ▪ **Ignore Point** - Do not add points outside of the range of any selected 3D viewshed.

	▪ **Add Point** - Add points outside of the range of any selected 3D viewshed. These query points are considered to have 0% visibility and color coded in red.
Color Scheme	Defines the color coding scheme of the output points. Select either **red | green** or **red | orange | yellow | green**.
Spacing	Determines the horizontal and vertical spacing (in meters) between query points in the area for which the viewshed query is being calculated. The spacing property also defines the scale of the output points.
Min Altitude	Defines the altitude above ground level of the closest point to the ground.
Max Altitude	Defines the maximum altitude above ground level. If the Max Altitude is higher than the Min Altitude, the 3D Viewshed Query tool generates a matrix of points according to the Spacing value.

4. Select one of the following methods of designating the area for which the viewshed should be calculated:
   - **Follow Line –** Query points are created along the drawn line. In the **3D Window**, left-click to place the line waypoints, and right-click to complete the line.
   - **Fill Area –** Query points are created inside the drawn polygon.
   - **Selected Group –** Query points are created at all points, along all lines, or inside all polygons, in the selected feature layer. Select the required layer from the Project Tree, and then click **Selected Group**.
   - **From Clipboard** - Query points are created at all clipboard objects.
   - **Viewshed Area** - Query points are created exactly in the area of the selected 3D viewsheds.

Viewshed on Route Tool

The Viewshed on Route tools provide you with a graphical representation of the view on the terrain from a series of points (route):

- **3D Viewshed on Route by Speed** – Provides an animated representation of the terrain and objects that are visible as a dynamic object progresses along a defined route according to a set speed.
- **3D Viewshed on Route by Time** – Provides an animated representation of the terrain and objects that are visible as a dynamic object progresses along a defined route over a defined time frame.
- **3D Viewshed on Route Query**– Analyzes the visibility of a selected area from multiple viewshed observer viewpoints along a route.
- **2D Viewshed on Route** - Provides an animated representation of the terrain that is visible as a dynamic object progresses along a defined route

Note: When calculating the viewshed from a route, the field of view is automatically set to 360°.

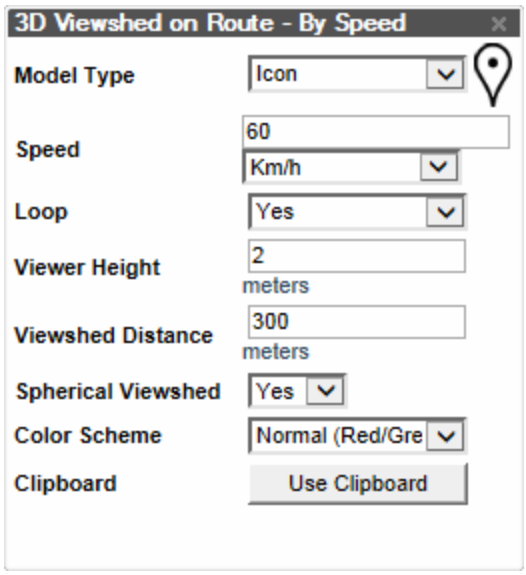
Creating a 3D Viewshed on Route – By Speed

The 3D viewshed on route – by speed provides an animated representation of the terrain and objects that are visible as a dynamic object progresses along a defined route according to a set speed.

To create a viewshed from a route – by speed:

1. On the **Analysis** tab, in the **Line of Sight** group, click the arrow next to **Viewshed on Route**, and then click **3D Viewshed on Route – By Speed**.

The 3D Viewshed on Route property sheet is displayed.



Viewshed on Route – By Speed Dialog

2. In the **Viewshed on Route dialog**, set the required parameters:

Property	Description
Model Type	Graphic representation of the dynamic object. Select one of the 3D models: **Car, Humvee** or **Tank, Icon** for a 2D image icon, or **Empty** for no graphic representation.
Speed	Speed of the dynamic object in **mph** or **km/h.**
Loop	Defines whether the dynamic object stops at the end of the path or loops back to the beginning.
Viewer Height	Altitude of your viewpoints.
Viewshed Distance	Distance of the 3D viewshed (in meters).
Spherical Viewshed	Select **Yes** to create a full 360 degree sphere.
Color Scheme	Select the colors that will represent the visible and non-visible areas from the viewshed.
Clipboard	Viewpoints are created at all clipboard objects.

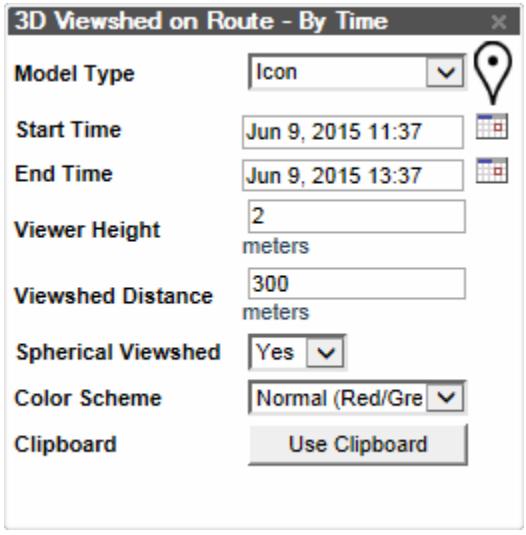
3. Once you have set the necessary parameters, click in the **3D Window** to define the first waypoint on your route. Drag and click the mouse to define the route's other waypoints. Right-click to finish. The Dynamic 3D Viewshed group appears in the Project Tree. As the dynamic object moves along the defined route according to the set speed, the viewshed dynamically changes providing an animated representation of the terrain and objects that are visible from each point on the route.

Creating a 3D Viewshed on Route – By Time

The 3D viewshed on route – by time calculates and dynamically marks the terrain and objects that are visible from an object as it moves along a defined route over the course of a set time frame.

To create a viewshed from a route – by time:

1. On the **Analysis** tab, in the **Line of Sight** group, click the arrow next to **Viewshed on Route**, and then click **3D Viewshed on Route – By Time**. The 3D Viewshed on Route property sheet is displayed.



Viewshed on Route – By Time Dialog

2. In the **Viewshed on Route** dialog, set the required parameters:

Property	Description
Model Type	Graphic representation of the dynamic object. Select one of the 3D models: **Car, Humvee** or **Tank, Icon** for a 2D image icon, or **Empty** for no graphic representation.
Start Time	The time the dynamic object begins moving along the defined route. The date and time slider automatically adjusts to correspond to the timespan defined by the Start Time and End Time.
End Time	The time the dynamic object reaches the end of the defined route.
Viewer Height	Altitude of your viewpoints.
Viewshed Distance	Distance of the 3D viewshed (in meters).
Spherical Viewshed	Select **Yes** to create a full 360 degree sphere.
Color Scheme	Select the colors that will represent the visible and non-visible areas from the viewshed.
Clipboard	Viewpoints are created at all clipboard objects.

3. Once you have set the necessary parameters, click in the **3D Window** to define the first waypoint on your route. Drag and click the mouse to define the route's other waypoints. Right-click to finish. The created 3D Viewshed on Route group appears in the Project Tree. When the time and date are adjusted in the Time and Date slider and the dynamic object moves along the defined route, the viewshed dynamically changes, providing a representation of the terrain and objects that are visible from each point on the route.

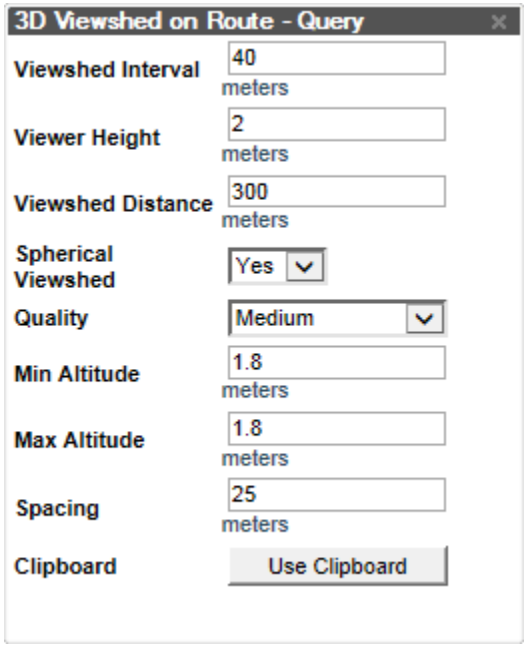
Querying a 3D Viewshed on Route

The Viewshed Query tool enables you to analyze the visibility from multiple viewshed observer viewpoints along a route to a selected area. Based on the 3D viewshed analysis object, the tool computes the overall visibility of different points in the designated area. The output of the analysis is exported to a point shapefile that graphically represents the visibility of the different points. Two color schemes are available; one scheme only distinguishes between visible (green) and invisible (red), while the other one color codes the points according to their visibility percentage:

- **Green** = More than 80% of the route's viewpoints are visible from this point.
- **Yellow** = 50 - 80% of the route's viewpoints are visible from this point.
- **Orange** = 0-50% of the route's viewpoints are visible from this point.
- **Red** = 0% of the route's viewpoints are visible from this point.

To create a 3D viewshed on route – query:

1. On the **Analysis** tab, in the **Line of Sight** group, click the arrow next to **Viewshed on Route**, and then click **3D Viewshed on Route – Query**. The 3D Viewshed on Route property sheet is displayed.



Viewshed on Route – Query Dialog

2. In the **Viewshed on Route** dialog, set the required parameters:

Property	Description
Viewshed Interval	The distance between terrain samples for the measurement along each ray. A smaller sample size is more accurate but slower to calculate.

Viewer Height	Altitude of your viewpoints.
Viewshed Distance	Distance of the 3D viewshed (in meters).
Spherical Viewshed	Select **Yes** to create a full 360 degree sphere.
Quality	Accuracy level of the viewshed calculation.
Min Altitude	Defines the altitude above ground level of the closest point to the ground.
Max Altitude	Defines the maximum altitude above ground level. If the Max Altitude is higher than the Min Altitude, the 3D Viewshed Query tool generates a matrix of points according to the Spacing value.
Spacing	Determines the horizontal and vertical spacing (in meters) between query points in the area for which the viewshed query is being calculated. The spacing property also defines the scale of the output points.
Clipboard	Viewpoints are created at all clipboard objects.

3. Once you have set the necessary parameters, click in the **3D Window** to define the first waypoint on your route. Drag and click the mouse to define the route's other waypoints. Right-click to finish. The output of the analysis is exported to a point feature layer that graphically represents the visibility of the different points.
4. In the **3D Window**, click any of the route's **Indicator**  icons to toggle display of the viewshed from that individual point.

Creating a 2D Viewshed on Route

The 2D Viewshed on Route calculates the terrain that is visible as a dynamic object progresses along a defined route.

There are three options for displaying the calculated route viewshed:

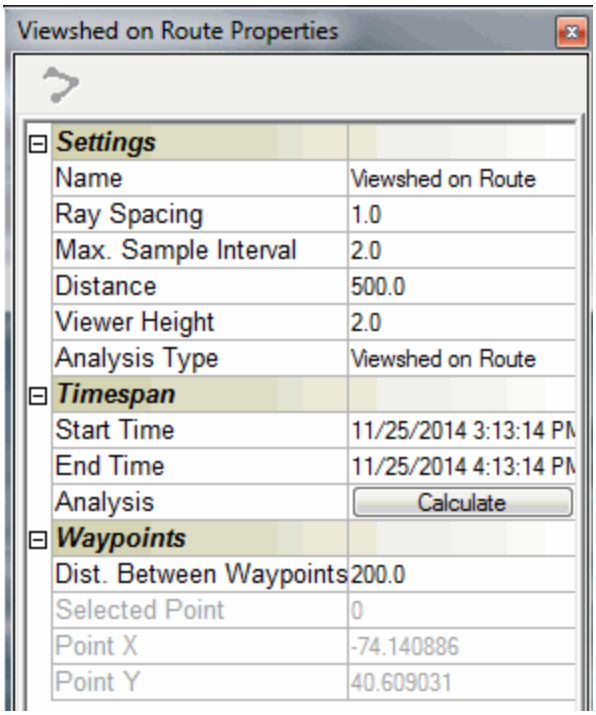
- Individual viewshed results for each selected point along the route
- A series of individual viewshed results that display according to a set timespan
- A single composite viewshed showing visible area from any of the route's waypoints

Note: When calculating the viewshed from a route, the field of view is automatically set to 360°.

To create a viewshed from a route:

1. On the **Analysis** tab, in the **Line of Sight** group, click the arrow next to **Viewshed on Route**, and then click **2D Viewshed on Route**:

The Viewshed on Route property sheet is displayed.



Viewshed on Route Property Sheet

2. In the **Viewshed Analysis property sheet**, set the required parameters:

Property	Description
Name	Type the description or name of the viewshed. This text appears in the Project Tree as the name of the object.
Ray Spacing	Determines the horizontal and vertical spacing (in meters) between each ray (in degrees). The smaller the ray spacing, the more accurate the measurement, but the longer it takes to calculate.
Max. Sample Interval	The distance between terrain samples for the measurement along each ray. A smaller sample size is more accurate but slower to calculate.
Distance	Length of the 3D viewshed from the viewer (in meters).
Viewer Height	Altitude of your viewpoints.
Analysis Type	Select one of the options for displaying the viewshed: ▪ **Viewshed on Route**: Individual viewshed results for each selected point along the route. Each circle has a radius equal to the Distance of Sight. ▪ **Timespan Viewshed on Route**: A series of individual viewshed results that display according to a set timespan ▪ **Cumulative Viewshed on Route**: A single composite viewshed showing visible area from any of the route's waypoints

Start Time	The time the dynamic object begins moving along the defined route. The date and time slider automatically adjusts to correspond to the timespan defined by the Start Time and End Time.
End Time	The time the dynamic object reaches the end of the defined route.
Dist. Between Waypoints	Distance between sample route waypoints.

3. Once you have set the necessary parameters, click in the **3D Window** to define the first waypoint on your route. Drag and click the mouse to define the route's other waypoints. Right-click to finish.

   Note: While creating the route, the Dist. Between Waypoints property is still editable.
4. Click **Calculate**. The created Viewshed on Route locked group appears in the Project Tree.
5. Once you establish the endpoint, all the parameters become read-only. At this point, TerraExplorer Pro begins to calculate the viewshed measurement. This process can take some time if the route has a considerable number of waypoints.

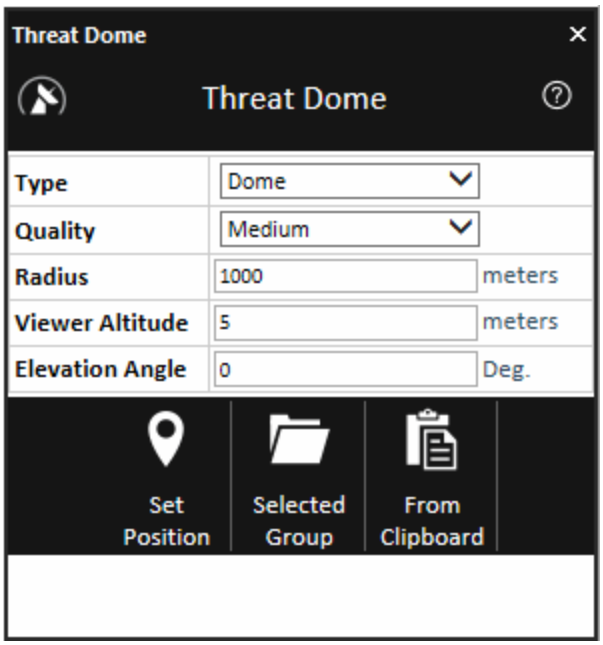
Threat Dome Tool

The threat dome tool analyzes and displays the area that is visible from a given point on the terrain within a 360° horizontal field of view. Several display options for the threat dome are available so that the particular information required can be easily visualized. The threat dome can be generated as a dome that defines the outer boundaries of the volume that is visible from the viewpoint, as a dome base that divides between visible and non-visible areas, or alternatively as a skyline that highlights obstructions to the field of view. After generating the threat dome, results can be further analyzed by creating a profile graph.

Using the Threat Dome Tool

To use the threat dome tool:

1. On the **Analysis** tab, in the **Terrain Analysis** group, click **Threat Dome.** The Threat Dome dialog is displayed.

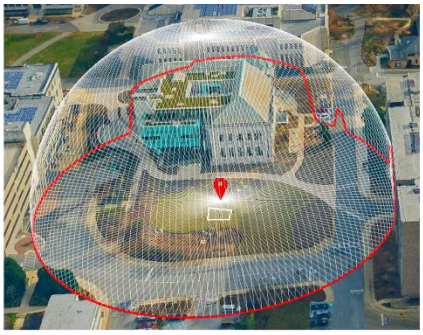


Threat Dome

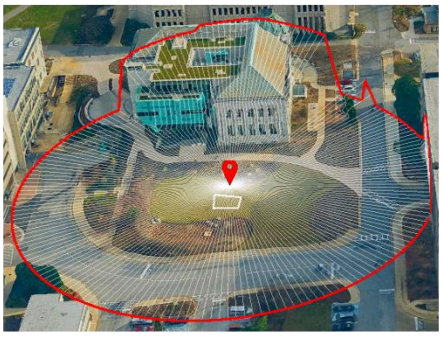
2. Set the Threat Dome properties**:**

Type	Output of the tool. Select one of the options for representing the visible area from the threat point. The threat dome is made up of a center point representing the viewer, a ring that circumscribes the area that can be seen, and in some a dome and/or base. ▪ **Dome** – A spherical dome is generated that encloses all points that can be viewed from the dome's viewpoint. ▪ **Dome base** – A circular surface is generated defining the area below which all points are not visible from the dome's viewpoint. ▪ **Skyline** – An outline of the visible terrain and objects is generated, highlighting any objects (e.g., buildings or mountains) that block the viewpoint's field of view. ▪ **Skyline base** – An outline of the visible terrain and objects is generated, with lines extending from the viewer to the ring.
Quality	Determines the distance between sample points by which the threat dome is being calculated. High Quality will yield a more accurate result, but take longer to calculate.
Radius	Radius of the threat dome.
Viewer Altitude	Altitude above the ground for the viewer location.
Elevation Angle	Enter the angle, from the ground, below which the viewpoint cannot see. For example, an elevation angle of zero creates a complete half sphere (or base of a half sphere if Type is set to Dome base), whereas an angle of 30 degrees creates an

	inverted cone, topped by a section of a sphere (or just an inverted cone if Type is set to Dome base). **Note**: This field is not available if **Type** is set to **Skyline**.



Dome



Dome Base



Skyline



Skyline Base

3. Select one of the following methods of designating the area for which the threat dome should be calculated. If the input group contains multiple points, then individual threat domes are generated for each of the points

   - **Set Position** – Click in the desired location for the threat dome query. A marker is created at the drawn point.
   - **Selected Group** - Query points are created at all point elements (point features or point objects) in the selected group. Select the required group from the Project Tree, and then click **Selected Group**. A separate threat dome is created for each of the point elements, with the center of each threat dome indicated by a different color marker.
   - **From Clipboard** - Query points are created for all point elements in the clipboard. Copy the required elements to the clipboard, and click **From Clipboard**.

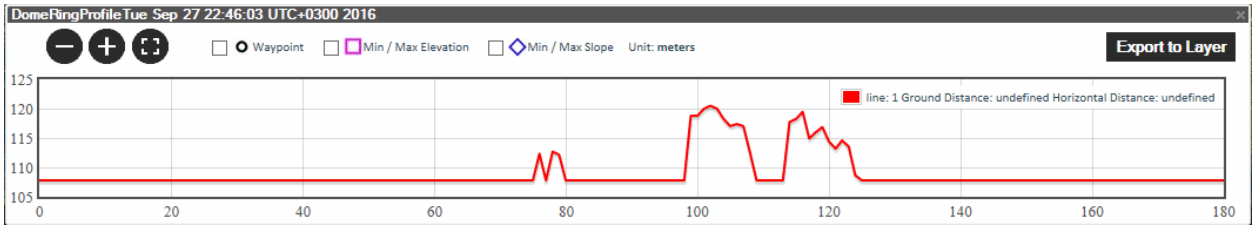
     The created Threat Dome group appears in the Threat Dome group in the Project Tree. The created group includes a Dome polygon object, a Viewer image label representing the viewpoint, and a Ring polyline representing the perimeter of the volume that is visible from the viewpoint. You can open any of their property sheets to further control the way the threat dome object is displayed. **See** "Polygon Property Sheet Parameters", "Polyline Property Sheet Parameters", and "Image Label Property Sheet Parameters" in the "Objects and Labels" chapter for more information.

4. If you want to display a graph of the threat dome profile for the last created threat dome, click **Show Profile**. Note that if the input group contains multiple points, the color of each profile line on the Dome

Ring Profile graph matches the color of the corresponding threat dome's query point marker in the 3D Window.

Note: The Show Profile button is only displayed after a threat dome is created.

A threat dome profile graph opens, displaying the terrain elevation profile.



Threat Dome Profile Graph

5. Use the Zoom in , Zoom out , and Zoom to full extent of data buttons to adjust the zoom as required.
6. Determine what information is indicated on the graph by selecting any of the following display options:

Waypoint	Select the check box to mark the waypoints on the graph with a .
Min/Max Elevation	Select the check box to mark the maximum and minimum points with a .
Min/Max Slope	Select the check box to mark the maximum and minimum slope with a .

7. If you want to export the threat dome profile to a shapefile layer, click **Export to Layer**.

   Note: When a threat dome profile is exported to a layer, the line color on the graph corresponds to the color of the points that make up the line in the layer.
8. Point to any point on the graph to display the following values. If you want to display the values and also jump to the point on the terrain, then click instead of pointing.

X	X-coordinate of the selected point.
Y	Y-coordinate of the selected point.
Elevation	Elevation value of the point above the terrain database vertical datum base ellipsoid.
Slope	Slope of the curve at the selected point

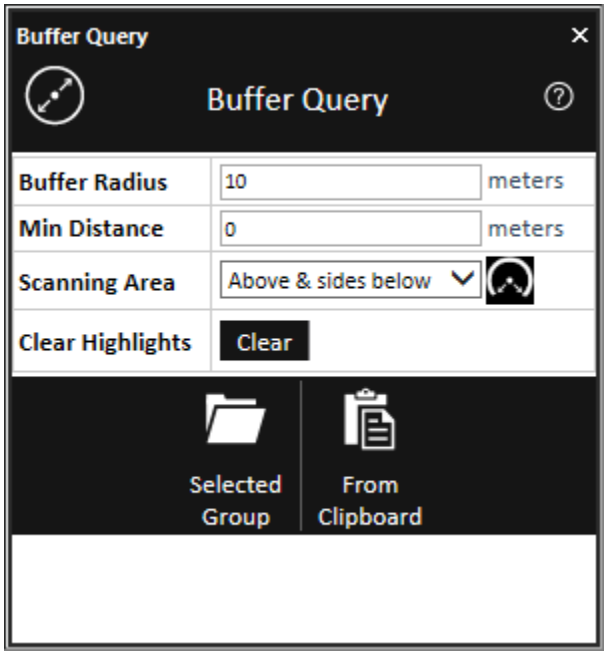
Buffer Query Tool

The Buffer Query tool detects all penetrations by 3D elements (e.g., 3D object or 3DML) to a set buffer zone of a selected polyline. This can be used, for example, in implementing safety requirements related to safe distances from a power line. The tool scans the buffer zone of each of the polyline's query points, and colors in red all query points with breached buffer zones. Clicking this query point highlights in red the 3D element that was found.

The output of the analysis is a point feature layer that graphically represents the locations along the line where a penetration to the buffer zone was found.

To use the Buffer Query tool:

1. On the **Analysis** tab, in the **Line of Sight** group, click **Buffer Query.** The Buffer Query dialog is displayed.



Buffer Query

2. Set the scan properties:

Buffer Radius	Radius of the buffer zone (in meters) from each of the polyline's query points
Min Distance	Minimum distance (in meters) from the polyline for inclusion in the buffer zone.
Scanning Area	The area to be scanned. Select **Above query point (180°)** to limit the scan to the FOV above the query point. Select **Above & sides below (270°)** to skip only the FOV directly below the query point.

3. Select one of the following methods for selecting the polylines for the buffer query. If the input group contains multiple polylines, each one is scanned, and the results collected in a in a single result layer
   - **Selected Group** - Buffer scans are performed for all polylines in the selected group or layer. The required Project Tree group must be selected before selecting this option.
   - **From Clipboard** - Buffer scans are performed for all polylines on the clipboard. The polylines must be on the clipboard before selecting this option.
4. Review the buffer query results. All query points in whose buffer zone one or more 3D elements were found are colored in red. Click a red query point to highlight in red the 3D elements that were found. Click the point again to toggle off that query point's highlighting. Click the **Clear** button to clear all highlighting from any query point.

5. The buffer query results are automatically exported to a point shapefile that is listed in the Project Tree and saved under the application AppData. You can find the full path to this shapefile in the layer's property sheet, in the **File Name** property under the **Layer** tab.

Shadow Tools

The following shadow tools are available:

- Global Shadow
- Selection Shadow
- Shadow Query

Global Shadow

You can display a shadow effect for an entire scene (including terrain and all 3D models, objects, and buildings), for a more realistic visualization that takes far less time to create than shadow generation per individual object. Using TerraExplorer Options, you can select the precise color of the shadow to more accurately simulate the actual lighting conditions. **See** "Graphics" in the "Using TerraExplorer Options" chapter for more information.

Shadows can be cast for all 3D objects in the 3D Window (whose ground object property is set to Yes) based on the sun's position. The sun is positioned according to the time, date and time zone you set using the Date and Time controls. The shadows dynamically update when the system date and time is changed.

Note: Project startup settings for shadows can be set in the **Date and Light** tab in the **Project Settings** dialog. **See** "Date and Light Effects" in the "Setting the Project" chapter for further information.

Note: The degree of shadow coverage in a specified area and period of time can be calculated using the Shadow Query tool. **See** "Shadow Query" in this chapter for further information.

Displaying a Shadow

To display a shadow:

1. In the **3D Window**, set the time, date and time zone using the Date and Time controls. **See** "Date and Time Slider" in this chapter for information.
2. On the **Analysis** tab, in the **Shadow** group, click **Shadow**.

   Note: If you want to cast a shadow only for currently selected buildings and 3D models, you can create a selection shadow. **See** "Selection Shadow" in this chapter.

Selection Shadow

In addition to the option to cast a global shadow for all 3D objects, shadows can also be cast only for selected objects. This enables you to visualize the shadow effect of a particular object on surrounding buildings and terrain.

You can cast a shadow from any 3D object whose ground object property is set to Yes, based on the sun's position. The sun is positioned according to the time, date and time zone you set using the Date and Time controls. The shadows dynamically update when the system date and time is changed.

To display a shadow for selected objects:

1. In the **3D Window**, set the time, date and time zone using the Date and Time controls. **See** "Date and Time Slider" in the "Basic Concepts" chapter for information.

2. Select the objects from which you want to cast a shadow.
3. On the **Analysis** tab, in the **Shadow** group, click **Selection Shadow**.

   Note: A selection shadow persists even after the object is deselected.
4. If you want to clear a selection shadow, on the **Analysis** tab, in the **Shadow** group, toggle off **Selection Shadow**.
5. If you want to recast the shadow from the previously selected object to a currently selected object, click the arrow next to **Selection Shadow**, and then click **Update Selection**.

Shadow Query

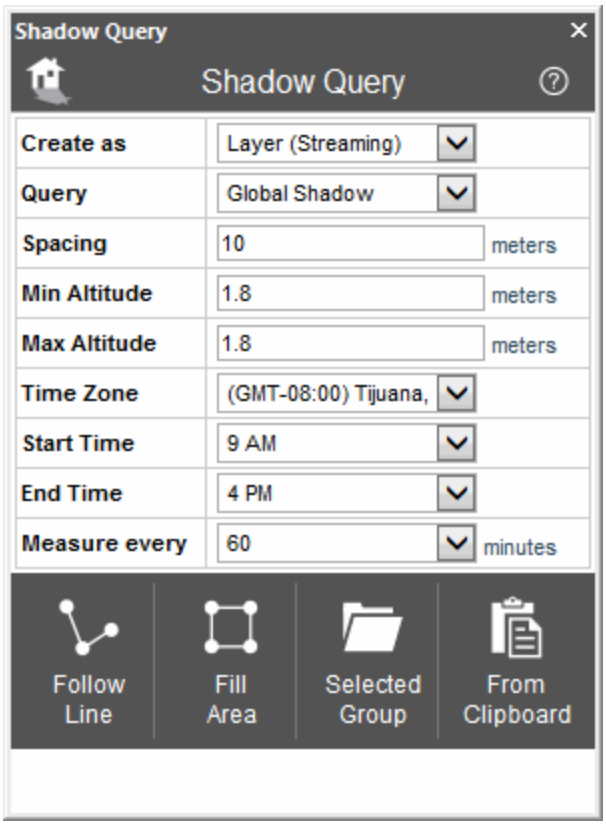
The Shadow Query tool calculates the sun-shadow ratio in a specified area, over a selected timespan. The area is defined by a drawn line or polygon, or by a selection of points, lines or polygons. Shadow analysis can be based on the shadow effect of selected objects (Selection Shadow) or of all the project's objects. **See** "Global Shadow" for information on viewing and creating global shadows. **See** "Selection Shadow" in this chapter for information on creating shadows for selected objects.

The output of the analysis is a point shapefile that graphically represents the sun-shadow ratio at different points in the specified area. Each point in the feature layer is color-coded according to its sun-shadow ratio:

- **Green** = Point receives 100% exposure to sunlight during the selected timespan
- **Yellow** = Point receives more than 65% exposure to sunlight during the selected timespan
- **Orange** = Point receives between 35-65% exposure to sunlight over the selected timespan
- **Red** = Point receives less than 35% exposure to sunlight over the selected timespan

To use the Shadow Query tool:

1. On the **Analysis** tab, in the **Shadow** group, click **Shadow Query**. The Shadow Query dialog is displayed.



Shadow Query

2. Select one of the **Create as** options:

Option	Description
Layer (Entire)	Create a feature layer under the application's AppData.
Layer (Streaming)	Create a streaming feature layer under the application's AppData.

3. Enter the following parameters:

Parameter	Description
Query	Defines which objects' shadows are taken into account in the shadow query: ▪ **Global Shadow** – Measure the sun-shadow ratio for each query point based on the shadow cast by all objects in the project. ▪ **Selection Shadow** – Measure the sun-shadow ratio for each query point based only on the objects selected in the Selection Shadow. **See** "Selection Shadow" in this chapter. ▪ **Selection Shadow supplement** - Measure the sun-shadow ratio for each query point based only on shadows cast **exclusively** by the objects selected in the Selection Shadow.
Spacing	Determines the horizontal and vertical spacing (in meters) between query points in the area for which the sun-shadow ratio is being calculated.

Min Altitude	Defines the altitude above ground level of the closest point to the ground. **Note**: When selecting points from a group, layer or the clipboard, the query points are created according to the altitude of the selected points and not according to the Min/Max altitude parameters.
Max Altitude	Defines the maximum altitude above ground level. If the Max Altitude is higher than the Min Altitude, the Shadow Query tool generates a matrix of points according to the Spacing value.
Time Zone	Time zone of the Start Time and End Time. The time zone should reflect the actual time zone in the query area. The tool tries to select the best match according to the camera's position when the tool is opened. If the user navigates to an area in another time zone, while the tool is open, the user may need to manually select the appropriate time zone. If the difference between the calculated time zone and the selected time zone is too large, an alert message is displayed.
Start Time	Start time on the day of the query. The date of the query (day, month and year) is based on the current TerraExplorer date (showing on the Time Slider or defined in the Date and Time Settings dialog).
End Time	End time on the day of the query. The date of the query (day, month and year) is based on the current TerraExplorer date (showing on the Time Slider or defined in the Date and Time Settings dialog).
Measure every	The interval (in minutes) between the Start Time and End Time. The smaller the interval, the more accurate the calculation, but the longer it takes to calculate.

4. Select one of the following methods of designating the area for which the sun-shadow ratio should be calculated:
   - **Follow Line –** Query points are created along the drawn line. In the **3D Window**, left-click to place the line waypoints, and right-click to complete the line.
   - **Fill Area –** Query points are created inside the drawn polygon.
   - **Selected Group –** Query points are created at all points, along all lines, or inside all polygons, in the selected feature layer. Select the required layer from the Project Tree, and then click **Selected Group**.
   - **From Clipboard** - Query points are created at all clipboard objects.

Comparison Tools

The following comparison tools are available:

- Swipe Layers
- Swipe Snapshots
- Elevation Comparison

Swipe Snapshots

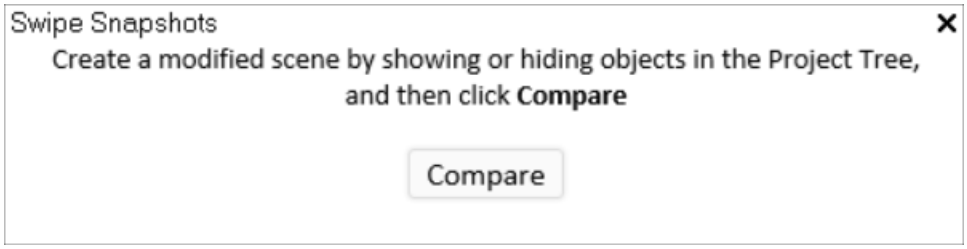
The Swipe Snapshots tool helps you create and compare snapshots showing different versions of the area in view in the 3D Window by showing or hiding objects in the Project Tree.



Swipe Snapshots Tool

To use the Swipe Snapshots tool:

1. In the **3D Window**, navigate to the required area, and then create the required scene by using the **Project Tree** to show or hide objects.
2. On the **Analysis** tab, in the **Comparison** group, click the arrow under **Swipe**, and select **Swipe Snapshots**. When snapshot generation is complete, a Swipe Snapshots dialog is displayed.



Create Modified Scene

3. Create a modified scene by showing or hiding objects in the **Project Tree**, and then click **Compare**.
4. When the snapshot is generated, use the following controls:
   - **Mode selection** – Selects the slider control mode. Choose between four clipping modes (right-left, left-right, top-bottom and bottom-top) and Transparency mode.
   - **Slider control** – Defines the clipping or transparency level extent. Slide the slider all the way to the left to completely show the first snapshot, and all the way to the right to completely show the second one. As the slider moves between these extremes, the first snapshot is gradually clipped or opacity decreased to reveal the second one.

Swipe Mesh, Point Cloud, and Imagery Layers

The Swipe Layers tool helps you detect the changes between two layers in the same location of any of the following types: mesh, point cloud, or imagery, or between one of these layer types and the base terrain. Using the tool, you can horizontally swipe between them, dynamically revealing and hiding parts of each layer.



Swipe Layers Tool

To use the Swipe Layers tool:

1. Zoom in on an area with two visible layers, or with a single layer that you want to compare to the base terrain.
2. On the **Analysis** tab, in the **Comparison** group, click the arrow under **Swipe**, and select **Swipe Layers**. The Swipe Layers controls are displayed.
3. Click any of the following: 3D Mesh, Point Cloud, and Imagery to filter the selection to the layer type(s) you want. If you want to refresh the dropdown layers, and automatically detect and select the layers in current view, click **Refresh & Auto-Select**.
4. Select the layers from the two dropdown lists, and click **Start**.

   Note: If the Swipe Layers tool is unable to detect the model, zoom out to view the base of the model.
5. If comparing mesh model layers, select the mesh model display style:
   - Texture
   - Texture + wireframe
   - Solid color
   - Solid color + wireframe
   - X-ray - Semi-transparent model, enabling you to see through all model walls
6. Slide the slider all the way to the right to completely show the first layer, and all the way to the left to completely show the second one. As the slider moves between these extremes, the first layer is gradually clipped to reveal the second one.
7. Click **Auto-Repeat** to automatically loop the slider value between 0-100% to dynamically change the top layer clipping. Click **Freeze** at any point to freeze the slider at a specific value.

Elevation Comparison

The Elevation Comparison tool analyzes the elevation difference between two layers of any of the following types: elevation, feature, point cloud or 3D mesh, or between a layer and base terrain in a defined polygonal area. This allows you to carefully compare before and after states, e.g., the state of an area before and after a landslide or volcano, or before and after mining restorative efforts.

The area for analysis is defined by a drawn polygon or by objects already on the clipboard. The output of the analysis is a text label with the analysis results and a point shapefile that stores the elevation difference information in its attribute fields and graphically represents the elevation difference at different points in the defined area. Only elevation differences that you consider significant for your analysis, i.e., that are above the Min Difference that you set, are marked:

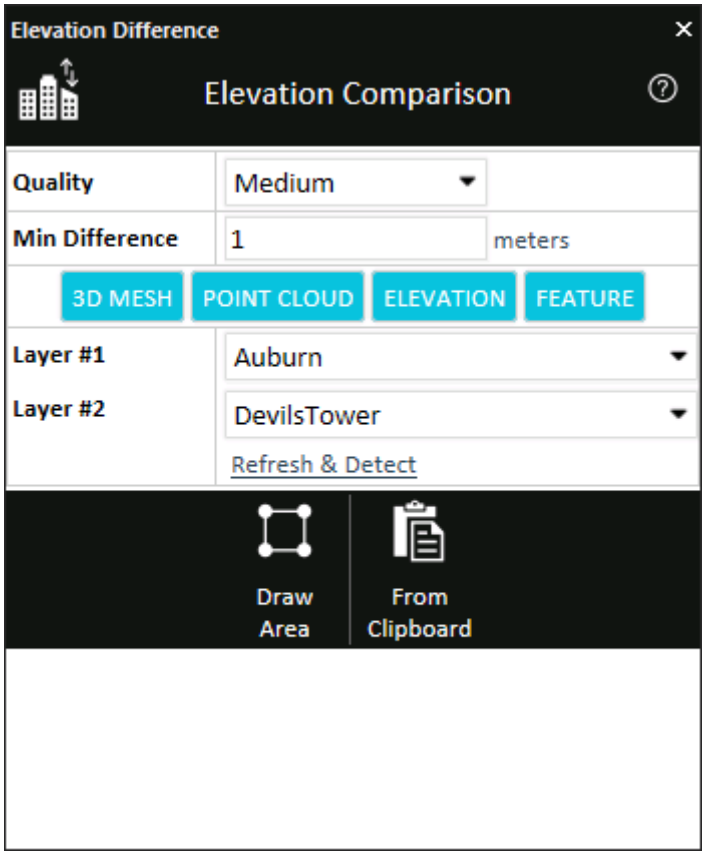
- Yellow – Layer 1 is higher than Layer 2
- Cyan (Blue-green) – Layer 2 is higher than Layer 1

A summary is also generated, with statistics on the percentage of points in which each layer was higher and the maximum elevation difference between the two.

Note: The visibility of layers or objects in the designated area that are not part of the comparison should be turned off, so that the comparison results are not affected.

To use the Elevation Comparison tool:

1. On the **Analysis** tab, in the **Comparison** group, click **Elevation**. The Elevation Comparison dialog is displayed.



Elevation Comparison

2. Click any of the following: **3D Mesh, Point Cloud, Elevation** or **Feature** to filter the selection to the layer type(s) you want. If you want to refresh the dropdown layers, and automatically detect and select the layers in current view, click **Refresh & Detect**. Only layers that are calculated as part of the

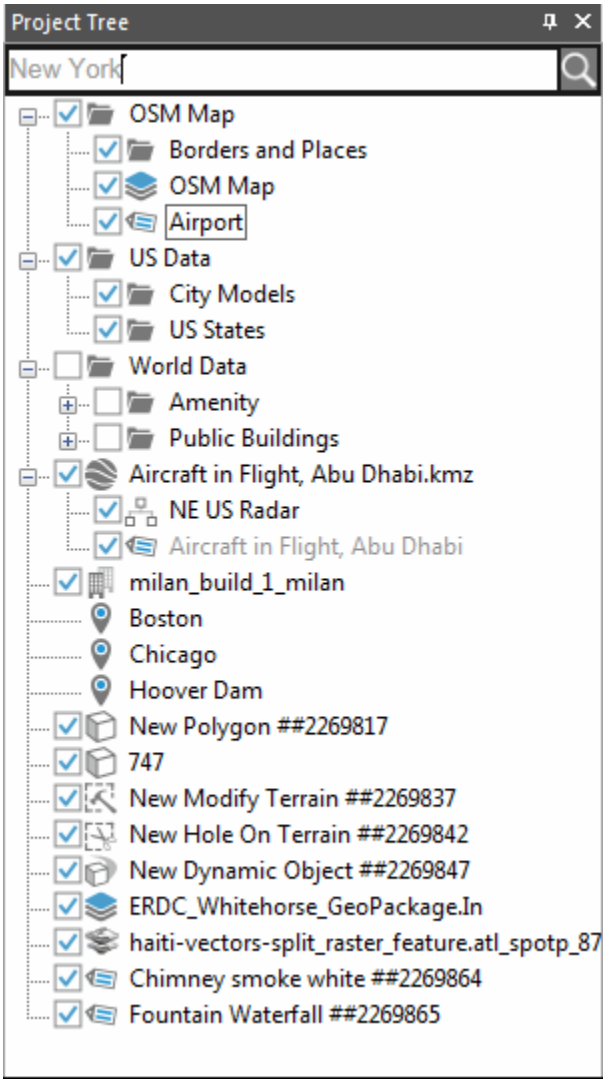
terrain's elevation (i.e., their "Ground Object" property is set to yes) are included in the dropdown lists.

3. Select two layers for comparison, or a layer and base terrain.
4. Select the **Quality** of the result layer. This determines the accuracy level by which the analysis is performed. Select one of the following options:
   - Low – Performs approximately 16K samples
   - Medium – Performs approximately 65K samples
   - High – Performs approximately 260K samples
5. In the **Min Difference** field, select the minimum elevation difference between the layers that should be marked.
6. Select either of the following methods to mark your area of interest:
   - **Draw Area –** The area is marked by drawing a polygon in the 3D Window. If this option is selected, left-click in the 3D Window to place the polygon waypoints, and right-click to complete.
   - **From Clipboard** – Analysis is performed in the locations of all polygon clipboard objects. The polygons must be on the clipboard before selecting this option.
7. After the analysis is complete, a results dialog is displayed. These results are saved in the Project Tree as a text label.
   - Number of sampled points for which the elevation difference between the layers was greater than the Min Difference set.
   - Number of sampled points above Min Difference in which Layer 1 was higher than Layer 2.
   - Number of sampled points above Min Difference in which Layer 2 was higher than Layer 1.
   - Maximum elevation difference in which Layer 1 was higher than Layer 2.
   - Maximum elevation difference in which Layer 2 was higher than Layer 1.
8. Review the elevation difference results, graphically represented by the generated point feature layer. Only elevation differences. that are above the Min Difference that you set, are marked:
   - Yellow – Layer 1 is higher than Layer 2
   - Cyan (Blue-green) – Layer 2 is higher than Layer 1
     Point to any point on the graph to display the elevation and volume difference at that point.
9. The elevation difference results are automatically exported to a point shapefile that is listed in the Project Tree and saved under the application AppData. You can find the full path to this shapefile in the layer's property sheet, in the **File Name** property under the **Layer** tab.

CHAPTER 9 USING THE PROJECT TREE

About the Project Tree

The Project Tree provides quick access to TerraExplorer Pro elements, enabling you to control the appearance of information in the 3D Window. Project Tree elements can be arranged in groups, according to function, type of information, or location.



The Project Tree

Note: Clicking once on a Project Tree item selects the item, whereas double-clicking performs its activation action.

The Project Tree contains the following elements:

Element	Icon	Description
Group		A folder containing a collection of objects. ▪ Double-click the group name or the

		Expand/Collapse icon ⊞ to show or hide the group's object in the Project Tree. **Note:** A locked group whose folder is always in collapse mode and cannot be opened by the TerraExplorer Basic viewer user has no **Expand/Collapse** icon ⊞
Feature Layer - Polygons		A polygon feature layer is a group containing visual representation of a geographic data using geographic polygon objects.
Feature Layer - Polylines		A polyline feature layer is a group containing visual representation of a geographic data using geographic polyline objects.
Feature Layer - Points		A point feature layer is a group containing visual representation of a geographic data using geographic points.
Location		Pre-defined location on the 3D Window. ▪ Double-click on the location icon to fly to the location or to perform a flight pattern around it.
Presentation		Recorded flight path and view of terrain. ▪ Click on the presentation icon to play the presentation.
Label		Text or image label. ▪ Double-click on the label icon to fly to the label, perform a flight pattern around it or view the label from a different direction.
Static Object		2D or 3D static object. ▪ Double-click on the object icon to fly to the object, perform a flight pattern around it or view the object from a different direction.
Imagery, Elevation Layers		Imagery or Elevation layer
Dynamic Object		2D or 3D dynamic object.
Message		Project Tree message.
Contour Map		Contour map of a selected area or the entire terrain. ▪ Double-click on the Contour Map icon to fly to it, perform a flight pattern around it or view it from a different direction.
Slope Map		Slope map of a selected area or the entire terrain.
Line of Sight		Line of Sight marker. ▪ Double-click on the Line of Sight icon to fly to the marker, perform a flight pattern around it or view it from a different direction.

Best Path		Best Path calculation object. ▪ Double-click on the Best Path icon to fly to the calculation object, perform a flight pattern around it or view it from a different direction.
Modify Terrain		Modify Terrain object. ▪ Click on the Modify Terrain icon to fly to it, perform a flight pattern around it or view it from a different direction.
Hole on Terrain		Hole on Terrain object. ▪ Double-click on the Hole on Terrain icon to fly to it, perform a flight pattern around it or view it from a different direction.
Video On Terrain		The Video On Terrain feature plays a video file onto any selected area of the terrain. ▪ Double-click on the video icon to fly to fly to it, perform a flight pattern around it or view it from a different direction.

Showing and Hiding Objects

Click the group's **show/hide** icon  to display or hide all of the group's children on the 3D Window.

The show/hide feature is also available for each child on the group. Groups with some children in show mode and others in hide mode display the following  icon.

The show/hide feature is relevant for labels, and static and dynamic objects. It has no effect on locations, presentations or Project Tree messages.

Showing Objects in the TerraExplorer Viewer Project Tree

All locations, presentations and Project Tree messages always appear in the Project Tree when a TerraExplorer Basic Viewer opens the .FLY project. Objects, by default, also display in the Project Tree when TerraExplorer Basic viewer opens a .FLY project, but their display settings can be changed using their "Show in Viewer" parameter.

To change display settings, do either of the following:

- Open the property sheet for a single object or group of objects and change the **Show in Viewer** parameter to **Yes** to display the objects in the TerraExplorer Viewer Project Tree or **No** to hide it.

  or

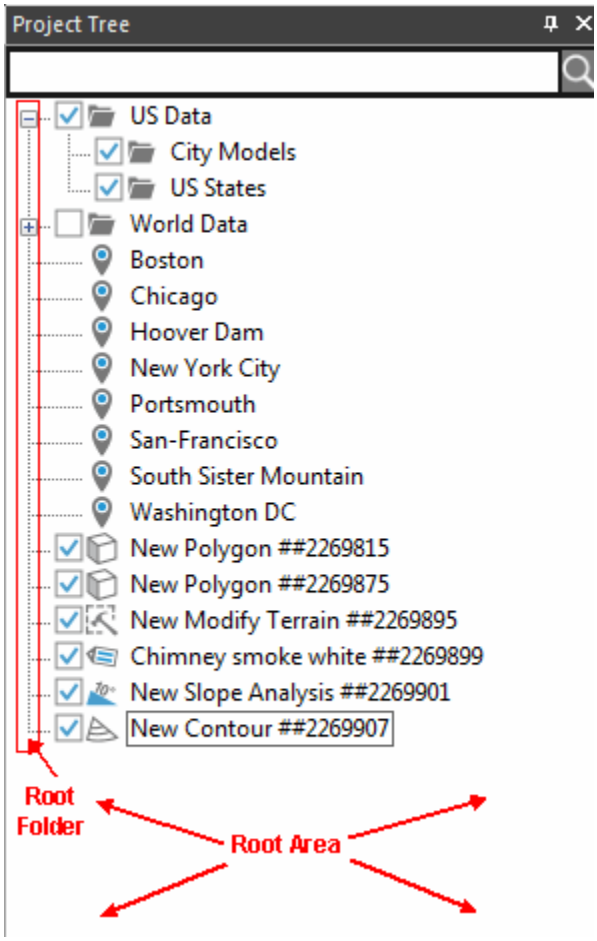
- In the Project Tree, right-click the required object, and then toggle the **Show in Viewer Project Tree** option on the shortcut menu.

Note: If all the children in a group are not shown on the Basic Viewer Project Tree, the group itself is removed.

The Root

The blank area of the Project Tree is called the "root area". The leftmost area on the side of the Project Tree is called the "root folder"

You can place elements or groups directly in the root (as described below), or as part of other groups.



Root

Search Tool

Using the TerraExplorer search tool located at the top of the Project Tree, you can search for any of the following:

- Items in your project tree, including locations, layers, groups and objects.
- Addresses and points of interest on your SkylineGlobe Server.
- Layers and projects on your SkylineGlobe Server, including feature, 3D Mesh Layer, raster, and point cloud.
- TerraExplorer ribbon commands, e.g., Publish, Viewshed, or Animation. (The search results will include all commands with the search term and the related tooltip).
- Feature attributes in a selected feature layer.
- Specific coordinates.

For more efficient and effective searches, search filters can be used to narrow the scope of your search, using the syntax ‘Filter: search term.

To search:

1. In the **Project Tree**, **Search here** field, type a search term.
2. If you want to filter your search, use the syntax *Filter*: *search term*. **See** "Search Filters" in this chapter for information about available filters.
3. If you want to search for feature attributes in a selected feature layer, do the following:
   a. In the **Project Tree**, right-click the feature layer and click "**Search**". The layer's name is inserted in the search bar.
   b. Add your search term after the colon that follows the layer name, i.e. [World Data\OSM Roads\OSM Roads Level 3]**:** *Search Term*.
4. When clicking on a search result, the operation that TE performs depends on the result type selected:
   - **Commands:** - Activates the command.
   - **Project:** - Selects the item on the project tree and flies to its location.
   - **Addresses:** - Flies to the address location.
   - **SkylineGlobe:** - Loads the layer.
   - **[Feature Layer]:** - Flies to the feature location.

To fly to a specific coordinate:

- In the **Project Tree**, **Search here** field, type the coordinates using the following syntax:
  - **Coord:** Lon, Lat or X, Y - Fly to coordinate.
  - **MGRS:** MGRS coordinate - Fly to MGRS coordinate

Search Filters

The following filters enable you to search for items from a specific source:

- **'project:'** (or '**p:**') *search term* - Searches only items in the project tree.
- **'command:'** (or '**c:**') *search term* - Searches only TerraExplorer ribbon commands.
- **'address:'** (or '**a:**') *search term* - Searches only addresses in your SkylineGlobe Server.
- **'skylineglobe:'** (or '**sg:**') *search term* - Searches only layers and projects in your SkylineGlobe Server

The following filters restrict the search results to items of a specific type:

- **'Group:'** *search term* - Searches the project tree only for groups
- **'Layer:'** *search term* - Searches only for feature/raster/3D mesh layer 3DML/point cloud layers
- **'3DML:'** *search term* - Searches only for 3D (3DML) layers
- **'Raster:'** *search term* - Searches only for imagery/elevation layers
- **'Imagery:'** *search term* - Searches only for imagery layers
- **'Elevation:'** *search term* - Searches only for elevation layers
- **'Feature:'** *search term* - Searches only for feature layers

- **'CPT:'** *search term* - Searches only for point cloud (cpt)

Selecting Items from the Project Tree

The Project Tree provides a set of tools for selecting single or multiple items from the tree. A new selection of single or multiple items deselects the previous selection on the tree.

Selecting a Single Item

To select a single item:

- In the **Project Tree**, click the required item.

  Note: If you double-click the item, you automatically perform the item's action.

Selecting Sequential Tree Items

You can select a set of sequential items from the tree. The items can be part of a single group or from several different groups.

To select sequential items:

1. In the **Project Tree**, click the required item.
2. Press and hold the SHIFT key.
3. Move the cursor to the last object you want to select and click it. All objects between the first and last objects are selected.

Note: If there is a group between the selected objects, the group, and all of its children (including other groups) are automatically selected. If a group name is selected, all its components are also selected, even though the components (children) are not highlighted on the tree.

Selecting Non-Sequential Tree Items

To select a set of items from the Project Tree that are not arranged sequentially:

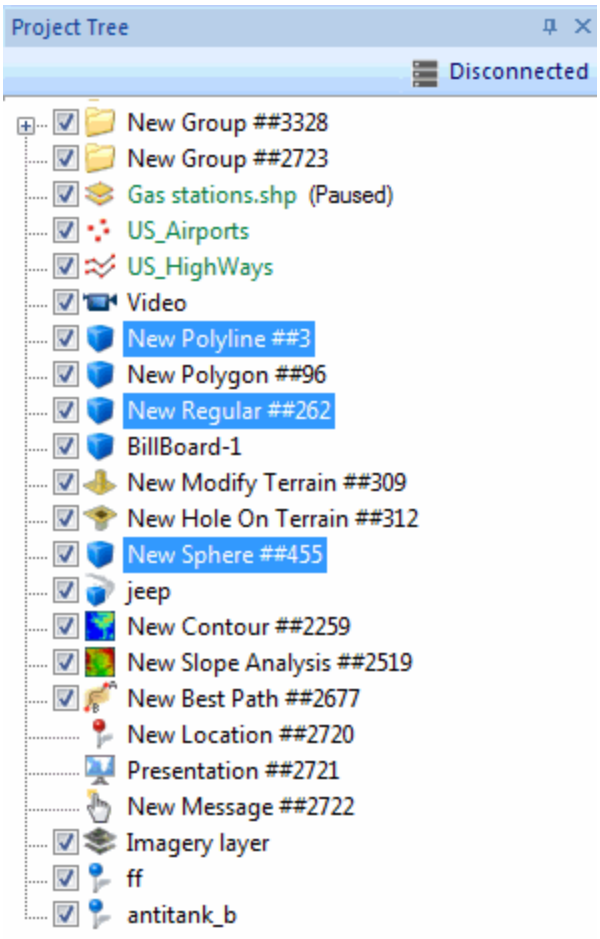
1. In the **Project Tree**, click the required item.
2. Press and hold the CTRL key.
3. Move the cursor to the next item you would like to select and click it.

You can repeat this operation as many times as you like, selecting multiple items from the same or different groups.

Note: If you want to deselect an item, click a previously selected item while the CTRL key is still pressed. The item becomes deselected in the same manner as it was selected.

You can combine sequential and non-sequential selections.

If you select a group, you automatically select all the children in that group. If you have selected a group, but then you wish to select only certain children from that group, first deselect the group, and then select the specific children that you require.



Multiple Non-Sequential Selections

Reordering Items in the Project Tree

You can reorder items in the Project Tree

To move an item to a new position in the Project Tree:

1. Click and drag the item to the required position on the Project Tree.

   Note: All groups, and feature and 3DML layers and 3DML always appear at the top of the Project Tree. Items such as objects and imagery layers cannot be placed above them.

2. If you want to move an item to the highest position in the Project Tree that it can be moved, drag it to the root folder, i.e., the leftmost area on the side of the Project Tree. When an item is dragged to the root folder, a blue line appears on the left side of the Project Tree.

Working with Groups

The Project Tree contains all project elements, organized in a hierarchy of groups. You can add any number of groups, either in the root area or folder, or under another group.

Creating New Groups

To create a new group under the root:

1. Right-click in the root area of the Project Tree, and then from the shortcut menu, select **Create Group**.

   or

   On the **Home** tab, in the **Add** group, click the arrow next to **Project Tree** and select **Create Group** from the dropdown menu.
2. Type the name of the new group and press **ENTER**.

To create a new group under an existing group:

1. Right-click the parent group, and then from the shortcut menu, select **Create Group**.
2. Type the name of the new group and press **ENTER**.

   or

1. Select the parent group.
2. On the **Home** tab, in the **Add** group, click **Project Tree**. From the dropdown menu, select **Create Group**.
3. Type the name of the new group and press **ENTER**.

Locking Groups

A locked group is a folder always shown in collapsed mode; it cannot be expanded by the TerraExplorer Basic Viewer user. This feature is used to combine a number of objects into one virtual entity.

To lock a group:

- Right-click the parent group, and then from the shortcut menu, select **Lock Group**.

To unlock a group:

- Right-click the parent group, and then from the shortcut menu, select **Unlock Group**.

Setting Group Properties

You can assign properties to a group, including the group's name, activation action, timespan, and location. Most of the properties apply only when the group is locked and determine the group's look and behavior. You can also set a Project Tree group as a radio group. All items in the group are then mutually exclusive, i.e., only one item can be selected at any time.

To set the group's properties:

1. Right-click the parent group, and then from the shortcut menu, select **Properties**. The Multi-Edit property sheet is displayed.
2. Click the **Group** tab and set the following parameters:

Parameter	Activity
General	
Name	Type the description or name of the group. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the locked group from the Project Tree.
Status	Select the group's status - locked or unlocked

Radio Group	Sets the Project Tree group as a radio group, whose items are mutually exclusive, i.e., only one item can be selected at any time. Select **Yes** to create a radio group.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information. The message property applies only when the group is locked.
Location	
Altitude Method	Sets the altitude method to be used for the specified location: ▪ Select **Relative to Terrain** to place the location point at a specified altitude above the ground. ▪ Select **Absolute** to place the location point at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	Enter the altitude above the ground for the specified location.
X	Enter the X-coordinate of the location of interest.
Y	Enter the Y-coordinate of the location of interest.
MGRS	The coordinates of the group in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Direction	Enter the horizontal angle of the camera when viewing the location.
Tilt	Enter the vertical angle of the camera when viewing the location.
Viewing Distance	Enter the distance between the camera and the specified location. This property also affects the radius of the flight patterns.
Set Viewpoint	Click this button to capture the current camera position and set as the camera parameters for this location.
Jump To Viewpoint	Click this button to make the 3D Window reflect the changes made to the location's fields.
Timespan	
Start Time	Click **Edit** and select the date and time when the group should first become visible.
End Time	Click **Edit** and select the date and time when the group should stop being visible.

Organizing Items in Groups

You can move items and groups in the Project Tree into new groups or out of groups into the root folder.

To reorganize the Project Tree:

1. Select a single or multiple items. **See** "Selecting Items from the Project Tree" in this chapter for information.
2. If you want to move an item into a new group, click and drag it onto the group folder.
3. If you wish to move an item out of a group, drag it to any part of the root folder. When an object is dragged to the root folder a blue line appears on the left side of the Project Tree.

Converting Groups to Layers

Groups can be saved to the following file formats:

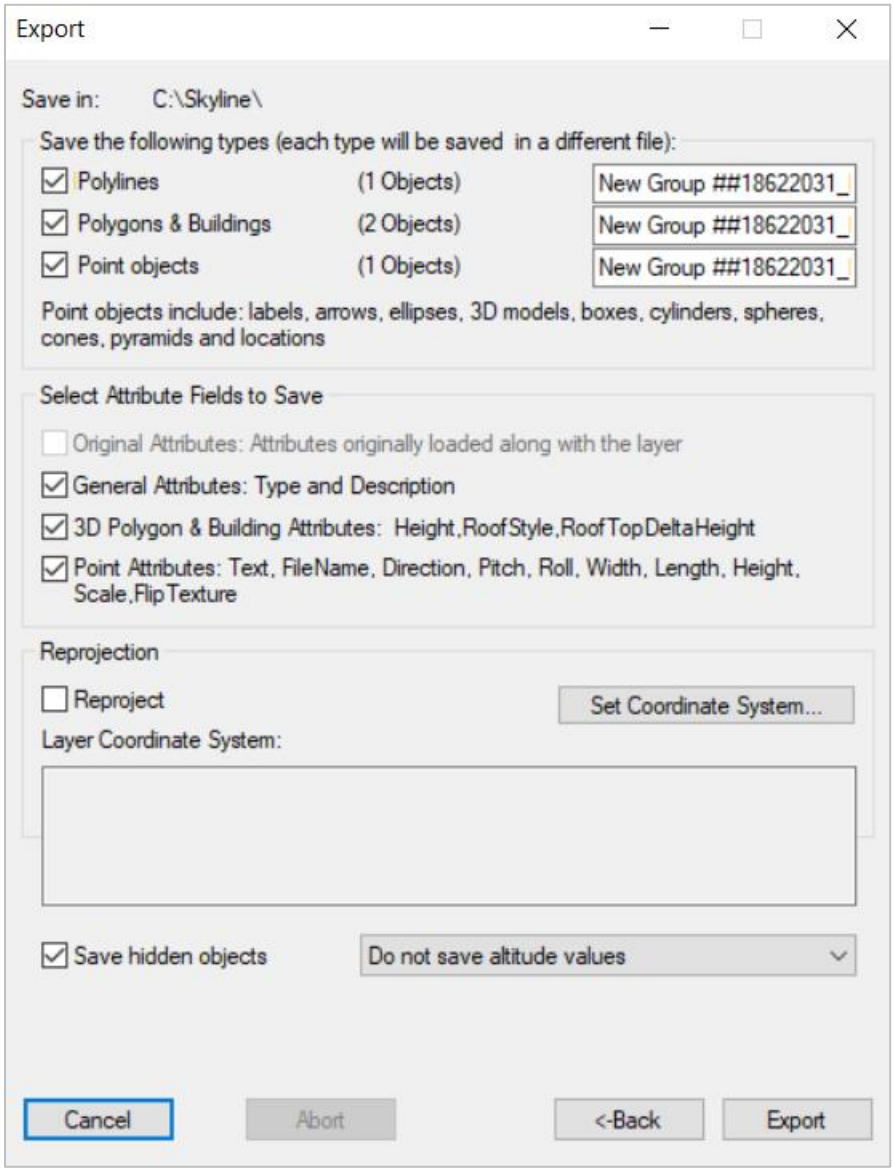
- TerraExplorer FLY project
- Esri shapefile
- OGC KML/KMZ file

To save a group as a layer:

1. In the **Project Tree,** right-click the required group and select **Save As Layer(s)** from the shortcut menu. The Save As dialog opens.
2. Browse to the required directory in which you want to save the layer file, and type a file name.
3. Click **Save**.

   Note: If you select this option from a group, you recursively save this group and all its sub-groups. If you select this option from the root, you save all the groups in the Project Tree.
4. If saving a group as a shapefile, the Export dialog is displayed. Enter the required parameters and click **Export**. **See** "Export to Shapefile Dialog" in this chapter for information.

Export to Shapefile Dialog



Export Dialog

To use the Export to Shapefile dialog:

1. Enter the required parameters:

Parameter	Description
Save in	Displays the path of the shapefile(s) to be saved.
Geometry Types	The elements are divided into three types: ▪ Polylines (including arcs) ▪ Polygons (including circles, rectangles, regular polygons and 3D polygons) and buildings.

	▪ Points objects: text and image labels, 2D and 3D arrows, ellipses, 3D models, boxes, cylinders, spheres, cones, pyramids and locations. Select the check box next each one of the types you want to save. **Note**: Even if you save more than one group, all elements of the same type are saved in one shapefile.
Select Attribute Fields to Save Add attributes fields information to the shapefile (*.dbf file).	
Original attributes	Save any attribute fields that were originally loaded with the layer.
General Attributes:	▪ **TE_TYPE**: The type of the element (Rectangle, Circle, Label, etc.) ▪ **TE_DESC**: The description in the Project Tree
3D Polygon & Building Attributes	▪ **TE_HEIGHT**: The height of the 3D Polygon. ▪ **TE_ROOF_ST**: The style of the roof. 0 for flat, 1 for angular. ▪ **TE_ROOF_DE**: The delta height between rooftop and roof base.
Point Attributes	▪ **TE_TEXT**: The text of a text label. ▪ **TE_FNAME**: The name of an image label file or a 3D model file. ▪ **TE_YAW**: The direction of the element. ▪ **TE_PITCH**: The pitch of the element. ▪ **TE_ROLL**: The roll of the element. ▪ **TE_WIDTH**: The width of the element. ▪ **TE_LENGTH**: The length of the element. ▪ **TE_HEIGHT**: The height of the element. ▪ **TE_SCALE**: The scale of the object, if applicable. ▪ **TE_FRAME**: The name of the image label frame file.
Reprojection	
Reproject	Select the **Reproject** check box to save the shapefile with a coordinate system different from the coordinate system of the terrain. Click the **Set Coordinate System** button to open the Coordinate System dialog and specify the coordinate system of the layer. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
Save Hidden Objects	Select the check box to save all the elements, hidden or not.
Saving the Elements Altitude	Select from one of the following options: ▪ **Save altitude values relative to terrain**: Save the elements in

	a 3D shapefile, altitude values are relative to terrain. ▪ **Save altitude values absolute**: Save the elements in a 3D shapefile, altitude values are absolute. ▪ **Do not save altitude values**: Save the elements in a 2D shapefile.

2. Click **Export**.

Adding Elements to the Project Tree

Any new element you add to the system is placed either in the root area or under one of the groups. You add elements in the following ways:

- **From the right-click menu** - To add locations, presentations, and messages.
- **From the Objects tab** -To add objects.
- **From the Home tab** (Add group) - To add locations, presentations, and messages.

Note: If you want to add an object to a specific group, make sure the group or one of its children is selected before you create the object.

If you want to add an element under the root, make sure to deselect the current element by selecting the root area. Then, create the new element.

To add an element to a specific group:

1. Right-click the group to which you want to add a new element.
2. Point to **New**, and select Location, Presentation, or Tree Message.

To add an element under the root area:

1. Right-click in the root area.
2. Point to **New**, and select Location, Presentation, or Tree Message.

Sorting the Project Tree

You can sort specific groups or elements in the Project Tree. The groups remain sorted when you add, remove or move objects.

There are three sort orders:

Order	Description
Alphabetically (A>Z)	Sorts the objects from left to right, character by character, in ascending order. The order of the characters is according to their ASCII value.
Alphabetically (Z>A)	Sorts the objects from left to right, character by character, in descending order. The order of the characters is according to their ASCII value.
By Type	Sort by TerraExplorer type. Objects of the same type are sorted alphabetically (A>Z).

Sorting the Entire Project Tree

When you sort the entire Project Tree, groups and feature and 3DML layers always appear first, arranged according to the selected type of sort, followed by the sorted root area items.

The elements of each group are also sorted using the same sort type.

To sort the Project Tree:

1. Right-click the root area.
2. In the shortcut menu, point to **Sort** and select the sort order.

Sorting a Particular Group

You can sort all the items in a specific group. If the group contains other groups, these sub-groups are rearranged according to the selected sort type, followed by the items in the sorted group.

The elements in each of the sub-groups are also sorted according to the same sort type.

To sort a particular group:

1. In the **Project Tree**, right-click the group name.
2. In the shortcut menu, point to **Sort** and select the sort order.

Stop Sorting

You can stop the objects in the Project Tree or a Group from maintaining a sorted order.

If other groups are contained within, these sub-groups stop rearranging according to the selected sort type.

To stop sorting:

1. In the **Project Tree**, right-click the root area or a specific group.
2. In the shortcut menu, point to **Sort** and toggle off the previously selected sort order.

Capturing the Tree State

When this option is selected, TerraExplorer Pro remembers the Project Tree folder configuration (i.e., which folders are open or closed and which object is shown in the 3D Window) and the show/hide status of each item. This information is saved the next time the .FLY file is saved.

Note: The information that is being saved describes the configuration at the moment you select the "Save Tree Configuration" option, and not the last tree configuration before you perform the save command.

To capture the tree state:

- On the **Home** tab, in the **Add** group, click **Project Tree**, and then select **Capture Tree State**.

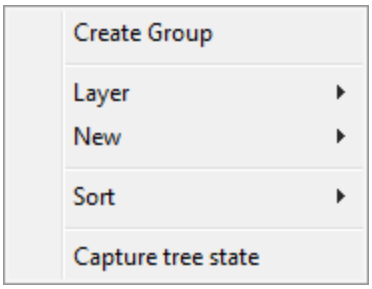
Shortcut Menus

In addition to the default operation of each Project Tree element, as described at the beginning of this chapter, each element type displays a unique menu of options when you right-click the element.

Root Area Menu

To open the Root Area’s shortcut menu:

- Right-click a blank area in the Project Tree:



Root Area Menu

The root area menu has the following options:

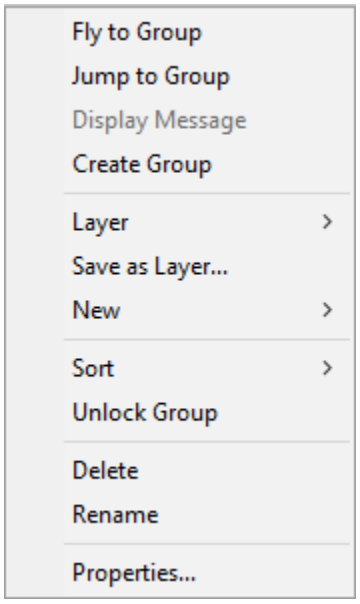
Option	Description
Create Group	Adds a new, empty group under the root area
Layer	Opens the **Layer** sub-menu with the following options: ▪ **Load Feature Layer:** Adds the loaded feature layers under the root area. **See** the "Feature Layers" chapter for further information. ▪ **Load Imagery Layer**: Adds the loaded imagery layers under the root area. **See** the "Imagery and Elevation Layers" chapter for further information. ▪ **Load Elevation Layer:** Adds the loaded elevation layers under the root area. **See** the "Imagery and Elevation Layers" chapter for further information. ▪ **Load KML/KMZ Layer**: Adds the loaded KML/KMZ files under the root area. **See** the "Complex Layers" chapter for further information. ▪ **Load 3D Mesh Layer**: Adds the 3DML file under the root area. **See** the "3D Mesh Layers" chapter for further information. ▪ **Load Point Cloud Model**: Adds a pre-processed point cloud model at any point in the 3D Terrain. **See** the "Point Cloud Layers" chapter for further information. ▪ **Create New Feature Layer**: Opens the Create Feature Layer dialog to create a new feature layer directly from TEP.
New	Opens the **New** sub-menu with the following options: ▪ **Location**: Adds a new location, at the current camera position in the 3D Window, under the root area. ▪ **Presentation**: Adds a new empty presentation under the root area. ▪ **Tree Message**: Adds a new message under the root area. This command opens the **Create Message** dialog.
Sort	Opens the **Sort** sub-menu.

	You can sort the tree objects in ascending or descending alphabetical order, or by object type.
Capture Tree State	When this option is selected, TerraExplorer Pro remembers the Project Tree folder configuration (i.e., which folders are open or closed and which object is shown in the 3D Window) and the show/hide status of each item. This information is saved the next time the .FLY file is saved. **Note**: The information that is being saved describes the configuration at the moment you select the "Save Tree Configuration" option, and not the last tree configuration before you perform the save command.

Group Menu

To open a **Group's** shortcut menu:

- In the **Project Tree**, right-click the required group.



Group Shortcut Menu

The Group menu has the following options:

Option	Description
Fly to Group	Flies from the current location directly to the location defined in the Group tab for the group. **Note**: This location is initialized from the first item included in the group, but can also be set using the Set Viewpoint option in the Group tab. **See** "Setting Group Properties" in this chapter for more information.
Jump to Group	Jumps directly to the location defined in the Group tab for the group.

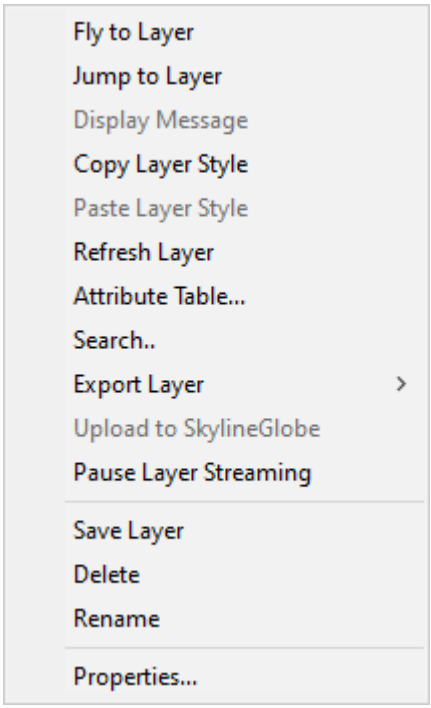
	Note: This location is initialized from the first item included in the group, but can also be set using the Set Viewpoint option in the Group tab. **See** "Setting Group Properties" in this chapter for more information.
Display Message	Displays the TerraExplorer message set for this group.
Create Group	Adds a new, empty group under the selected group.
Layer	Opens the Layer sub-menu with the following options: ▪ **Load Feature Layer -** Adds the loaded feature layers under the selected group. **See** the "Feature Layers" chapter for further information. ▪ **Load Imagery Layer -** Adds the loaded imagery layers under the selected group. **See** the "Imagery and Elevation Layers" chapter for further information. ▪ **Load Elevation Layer -** Adds the loaded elevation layers under the selected group. **See** the "Imagery and Elevation Layers" chapter for further information. ▪ **Load KML/KMZ Layer –** Adds the loaded OGC KML/KMZ layers under the selected group. **See** the "Complex Layers" chapter for further information. ▪ **Load 3D Mesh Layer** – Adds the loaded mesh layers under the selected group. **See** the "3D Mesh Layers" chapter for further information. ▪ **Load Point Cloud Model** - Adds the loaded point cloud models under the selected group. **See** the "Point Cloud Layers" chapter for further information. ▪ **Create New Feature Layer** - Opens the Create New Feature Layer dialog to create a new layer under the selected group. **See** "Creating New Layers" in the "Feature Layers" chapter for further information.
Save As Layer(s)	Opens the Save As dialog. You can save all the objects in the .FLY file to any available save type.
New	Opens the **New** sub-menu with the following options**:** ▪ **Location -** Adds a new location, at the current camera position in the 3D Window, under the selected group. ▪ **Presentation -** Adds a new empty presentation under the selected group. ▪ **Tree Message -** Adds a new message under the selected group. This command opens the Create Message dialog.
Sort	Opens the **Sort** sub-menu. You can sort the group's objects in ascending or descending alphabetical order, or sort by object type.

Lock/Unlock Group	Changes the mode of the group to Collapsed or Regular group. A Locked group is always in collapsed mode and cannot be opened by the TerraExplorer Basic Viewer user.
Delete	Deletes the selected group and all of its children.
Rename	Changes the name of the selected group. Enter the new name and press **ENTER**.
Properties	Opens the group's property sheet for editing.

Polygons, Polylines and Points Feature Layer Menu

To open a native feature layer's shortcut menu:

- In the **Project Tree**, right-click the required feature layer.



Feature Layer Menu

The native feature layer menu has the following options:

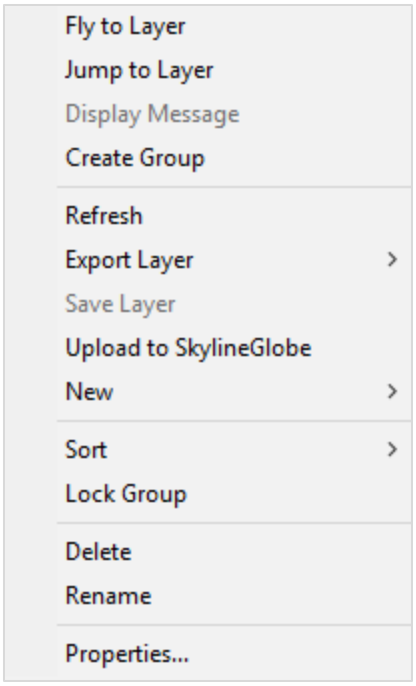
Option	Description
Fly to Layer	Flies from the current location directly to the selected layer.
Jump to Layer	Jumps directly to the selected layer.
Display Message	Displays the TerraExplorer message set for this feature layer. **See** "What is a TerraExplorer Message?" in the "Working with Objects" chapter for more information.
Copy Layer Style	Copies the layer style.
Paste Layer Style	Pastes the copied layer style to the selected layer.

Refresh Layer	Reloads the layer. **Note:** You can also reload a layer by clicking Refresh Layer on the Feature Layer tab.
Attribute Table…	Opens the Attribute Table for the selected layer.
Search	Searches the selected feature layer for feature attributes. **See** "Search Tool" in the "Using the Project Tree" for more information.
Export Layer	Opens a sub-menu with the following options: ▪ **Save As** - Opens the Save As dialog to save the layer to a new file. ▪ **Convert to Group** - Convert layer to group.
Upload to SkylineGlobe	Uploads layer to SkylineGlobe Server. **See** "Uploading Layers to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.
Pause Layer Streaming	Stop loading new objects for this layer (apply only for streaming layers).
Save Layer	Saves layer to data source.
Delete	Deletes the selected layer and all of its children
Rename	Changes the name of the selected layer. Enter the new name and press **ENTER**.
Properties	Opens the layer's property sheet for editing.

KML/KMZ Layer Menu

To open a KML/KMZ layer's shortcut menu:

- In the **Project Tree**, right-click the required layer.



KML/KMZ Layer Menu

The KML/KMZ layer menu has the following options:

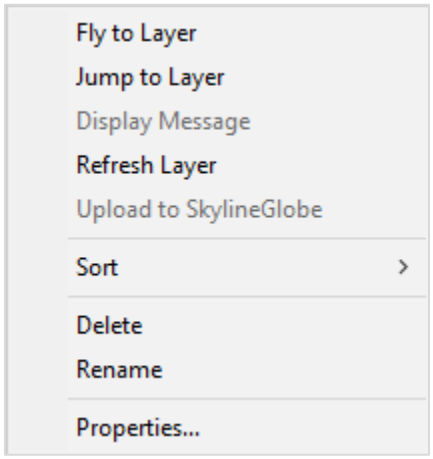
Option	Description
Fly to Layer	Flies from the current location directly to the selected layer.
Jump to Layer	Jumps directly to the selected layer.
Display Message	Displays the TerraExplorer message set for this layer. See "What is a TerraExplorer Message?" in the "Working with Objects" chapter for more information.
Create Group	Adds a new, empty group in the Project Tree.
Refresh	Reloads the layer.
Export Layer	Opens a sub-menu with the following options: ▪ **Save As** - Opens the Save As dialog to save the layer to a new file. ▪ **Convert to Group** - Convert layer to group.
Save Layer	Saves layer to data source. **Note:** The Save Layer command is only available for KML/KMZ files that were created by TerraExplorer (by exporting a layer or project to KML/KMZ).
Upload to SkylineGlobe	Uploads layer to SkylineGlobe Server. **See** "Uploading Layers to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.
New	Opens the **New** sub-menu with the following options: ▪ **Location**: Adds a new location, at the current camera position

	in the 3D Window, under the root area. ▪ **Presentation**: Adds a new empty presentation under the root area. ▪ **Tree Message**: Adds a new message under the root area. This command opens the **Create Message** dialog.
Sort	Opens the **Sort** sub-menu. You can sort the tree objects in ascending or descending alphabetical order, or by object type under the layer.
Lock Group	Changes the mode of the group to Collapsed or Regular group. A Locked group is always in collapsed mode and cannot be opened by the TerraExplorer Basic Viewer user.
Delete	Deletes the selected layer and all of its children
Rename	Changes the name of the selected layer. Enter the new name and press **ENTER**.
Properties	Opens the layer's property sheet for editing.

3DML Layer Menu

To open a 3DML layer's shortcut menu:

- In the **Project Tree**, right-click the required layer.



3DML Layer Menu

The 3DML layer menu has the following options:

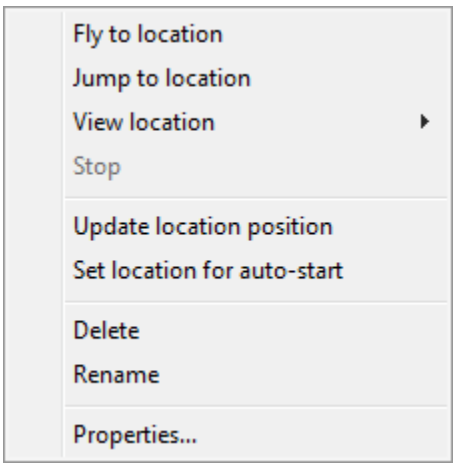
Option	Description
Fly to Layer	Flies from the current location directly to the selected layer.
Jump to Layer	Jumps directly to the selected layer.

Display Message	Displays the TerraExplorer message set for this layer. See "What is a TerraExplorer Message?" in the "Working with Objects" chapter for more information.
Refresh Layer	Reload the layer.
Upload to SkylineGlobe	Uploads layer to SkylineGlobe Server. **See** "Uploading Layers to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.
Sort	Opens the **Sort** sub-menu. You can sort the tree objects in ascending or descending alphabetical order, or by object type under the layer.
Delete	Deletes the selected layer and all of its children
Rename	Changes the name of the selected layer. Enter the new name and press **ENTER**.
Properties	Opens the layer's property sheet for editing.

Location Menu

To open a **Location's** shortcut menu:

- In the **Project Tree**, right-click the required Location.



Location Menu

The Location menu has the following options:

Option	Description
Fly to Location	Flies from the current location directly to the selected location.
Jump to Location	Jumps directly to the selected location.
View Location	This option's sub-menu contains a list of pre-defined flight patterns around the location. **See** "Flying to Locations" in the "Navigating in the 3D World" chapter for information.
Stop	Stops the flight.

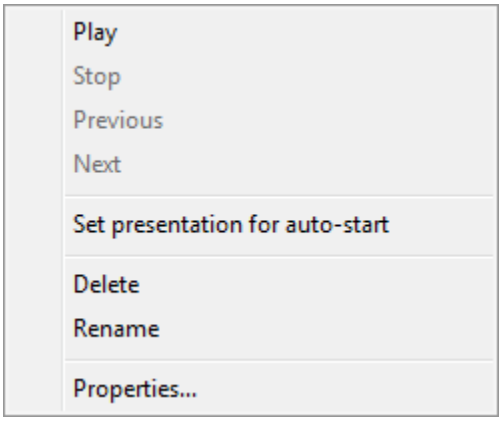
Update Location Position	Sets the current camera position as the location position.
Set Location for Auto-Start	Sets the selected location as the Auto-Start location for the current project. The project starts with this location.
Delete	Deletes the selected location.
Rename	Changes the name of the selected location. Enter the new name and press ENTER.
Properties	Opens the location's property sheet for editing.

See "Locations" in the "Navigating in the 3D World" chapter for further information.

Presentation Menu

To open a **Presentation's** shortcut menu:

- In the **Project Tree**, right-click the required Presentation.



Presentation Menu

The Presentation menu has the following options:

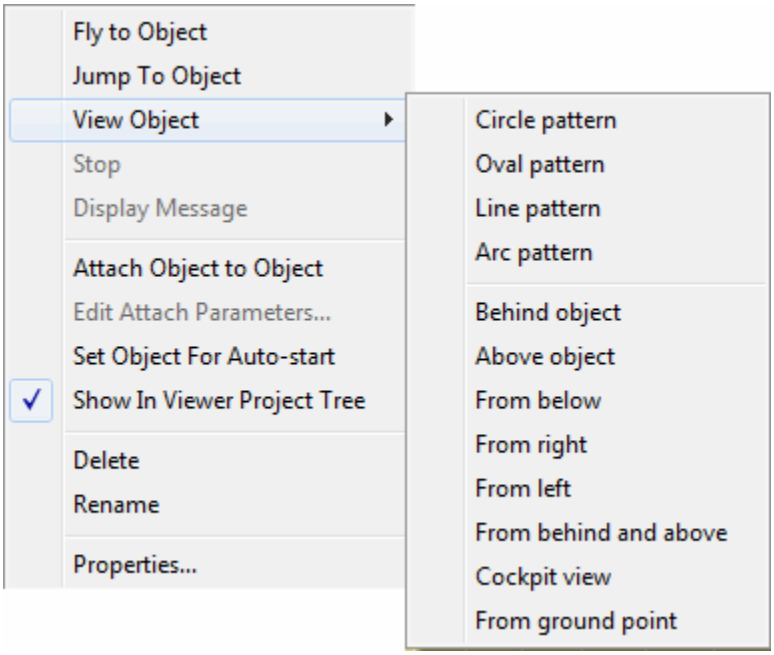
Option	Description
Play	Plays the presentation
Stop	Jumps directly to the selected location. This option is enabled when a presentation is currently playing.
Previous	Rewind to the previous step in the presentation. This option is enabled when a presentation is currently playing.
Next	Advance to the next step in the presentation. This option is enabled when a presentation is currently playing,
Set presentation for auto-start	Sets the selected presentation as the Auto-Start for the current project. The project starts with this presentation.
Delete	Deletes the selected presentation.
Rename	Changes the name of the selected presentation. Enter the new name and press ENTER.
Properties	Opens the presentation's property sheet for editing.

See the "Presentations" chapter for further information.

Object Menu

To open this shortcut menu:

- In the **Project Tree**, right-click any of the following: label, static or dynamic object, imagery or elevation layer, Video on Terrain, Best Path, Line of Sight, Threat Dome, Slope map, or Contour map.



Object Shortcut Menu

The **Object** menu has the following options:

Menu Option	Description	
Fly to Object	Flies from the current location directly to the selected object. The camera stops at the object's "Viewing Distance". ▪ For static objects, the camera flies directly to the object, by the shortest flight path, and stops. ▪ For dynamic objects, the camera continues to follow the object.	
Jump to Object	Jumps directly to the object. The camera stops at the object's "Viewing Distance".	
View Object	This option's sub-menu contains a list of pre-defined flight patterns that compass about the object. When you play a flight pattern, the default flight time of the camera for a one round trip around the point of interest is 15 seconds.	
	Circle Pattern	Performs a circle flight pattern around the object. The camera always faces the specified object.

	Oval Pattern	Performs an oval flight pattern around the object. The camera always faces the specified object. The first radius is set to the distance parameter and the second radius is set to one-half of the distance parameter.
	Line Pattern	Performs a tight oval flight pattern around the object/location. The camera always faces the specified object. The first radius is set to the distance parameter and the second radius is set to one-tenth of the distance parameter.
	Arc Pattern	Performs a vertical arc flight above the object/location. The camera always faces the specified object. The radius is set according to the distance parameter.
	For objects, the View submenu also contains a set of pre-defined view angles around the object. The camera stops at the object's "Viewing Distance" from the object's location. For dynamic objects, the camera continues to follow the object until the user stops it or performs another action.	
	Behind Object	To view the object from behind
	Above Object	To view the object from above
	From Below	To view the object from below
	From Right	To view the object from the right-hand side
	From Left	To view the object from the left-hand side
	From Behind and Above	To view the object from behind and above (45 degrees)
	Cockpit View	To view the world from the object's pivot point. The camera is set to the object's roll, tilt and direction angles. In this mode, the dynamic object is hidden.
	From Projector	Available for Video on Terrain objects only. This is for viewing the world from the video projector's position. The camera is set to the projector's roll, tilt and direction angles.
	From Ground Point	To view the object from the ground. After selecting this option, select a ground point on the terrain from which you want to view the object. **Note:** The "View From Ground Point" action cannot be defined as the activation action for the object because it requires a reference point on the terrain.
Stop	Stops the flight to the object, the flight pattern around the object or the attachment to the object.	
Display Message	Open the link to a website or file (unavailable if the object has no hot link).	
Attach Object to Object	Allows you to attach the selected object to another object from the Project Tree.	

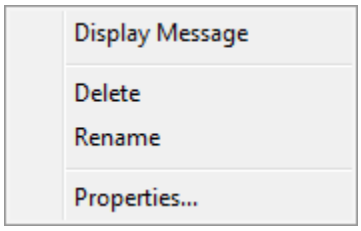
	Selects the target object by left-clicking on it or aborts the operation by right-clicking. If the object is already in attach mode, this entry displays "Detach from object" allowing you to remove the attachment.
Edit Attach Parameters	Opens the attachment editing dialog. This option is only available to attached objects.
Set Object for Auto-Start	Sets the selected object as the Auto-Start location for the current project. The project starts with viewing this object.
Show in Viewer Project Tree	Determine if the object appears in the Project Tree when the FLY file is opened with TerraExplorer Basic Viewer.
Delete	Deletes the selected object.
Rename	Changes the name of the selected object. Enter the new name and press ENTER.
Properties	Opens the object property sheet for editing
Start/Restart Route	For dynamic objects, starts/restarts the object's route.

See the "Working with Objects" chapter for further information.

Message Menu

To open a **Message** shortcut menu:

- In the **Project Tree**, right-click the required Message.



Message Menu

The Message menu has the following options:

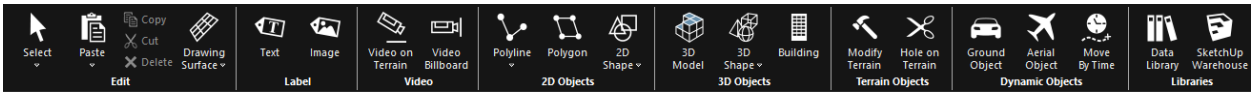
Option	Activity
Display Message	Displays the TerraExplorer message set. **See** "What is a TerraExplorer Message?" in the "Working with Objects" chapter for more information.
Delete	Deletes the selected message.
Rename	Changes the name of the selected message. Enter the new name and press ENTER.
Properties	Opens the message's property sheet for editing

See "Messages and Tooltips" in the "Working with Objects" chapter for further information about TerraExplorer messages.

CHAPTER 10 WORKING WITH OBJECTS

Creating New Objects

You can add 2D, 3D and dynamic objects to the project.



Objects Tab

To create a new object:

1. On the **Objects** tab, in the **2D Objects**, **3D Objects** and **Dynamic Objects** groups, click the object you want to create:

Icon	Activity
Label	
Text	Create a new text label in the 3D Window.
Image	Create a new text image in the 3D Window.
Video	
Video on Terrain	Play a video file onto any selected area of the terrain. You can also use a telemetry file to move the projected video based on recorded readings. Supported video file formats are determined by the codecs that are installed and registered on your computer. Most files that Windows Media Player can play (e.g., *.avi, *.mpg, etc.), including streaming Microsoft Media Server (MMS) content, can be draped on the terrain.
Video Billboard	Play a video file on a floating billboard.
2D Objects	
Polyline	Create a new polyline object in the 3D Window.
Polygon	Create a new polygon object in the 3D Window.
2D Shape	Click the arrow, and then click the required 2D shape to create in the 3D Window: rectangle, circle, ellipse, arrow, arc, or pentagon.
3D Objects	
3D Model	Click and then browse to the desired 3D model.
3D Shape	Click the arrow, and then click the required 3D shape to create in the 3D Window: cylinder, sphere, 3D arrow, 3D polygon, box, pyramid, cone.
Building	Create a new building object in the 3D Window.
Terrain Objects	
Modify Terrain	Modify the elevation values in an area of the terrain by drawing a polygon in the 3D Window and then setting the Modify Terrain

	object's properties in its property sheet. The surface of the terrain is raised or lowered according to the elevation values of the polygon's points. Different elevation behaviors allow replacing, cropping above or cropping below the original values of the terrain. The interior of the polygon can be flat or irregular in shape.
Hole on Terrain	Select this icon to cut a hole in the terrain based on a polygon that exposes the other side of the terrain through the opening.
Dynamic Objects	
Ground Object	Create a new ground vehicle object in the 3D Window and load its route from external file.
Aerial Object	Create a new air vehicle object in the 3D Window.
Move by Time	Create a dynamic object's route that begins and ends at specific times.
Libraries	
Data Library	Set of graphic elements you can add to your project. **See** "Loading Objects from the Data Library" in this chapter for information. The Data Library has both local and online objects. Note that online models require an Internet connection.
Sketchup Warehouse	An online repository of 3D models you can add to your project. **See** "Loading Objects from Sketchup Warehouse" in this chapter for information.

Selecting Objects for Editing

You can select a single object or multiple objects for editing from the Project Tree and the 3D Window.

Selecting a Single Object from the Project Tree

To select a single object from the Project Tree:

- In the **Project Tree**, right-click the object, and then from the object's shortcut menu, select **Properties.**

  The object's property sheet opens.

Selecting a Single Object from the 3D Window

To select a single object from the 3D Window:

1. On the **Home** tab, in the **Edit** group, click **Select**.
2. In the **3D Window**, select the object. A yellow frame surrounds the object and the object's property sheet opens.

To turn off the select mode:

- On the **Home** tab, in the **Edit** group, toggle off the **Select** command, or close the property sheet.

Selecting Multiple Objects from the Project Tree

To select multiple objects from the Project Tree:

1. In the **Project Tree**, select the required objects. **See** "Selecting Sequential Tree Items" and "Selecting Non-Sequential Tree Items" in the "Using the Project Tree" chapter for more information. If all the objects are in a group, click the group.
2. Right-click, and then from the shortcut menu, select **Properties**.

   The Multi-Edit property sheet opens.

Selecting Multiple Objects from the 3D Window

To select multiple objects from the 3D Window:

1. On the **Home** tab, in the **Edit** group, click **Select**.
2. Press and hold the CTRL key.
3. In the **3D Window**, select each of the objects you want. A yellow frame surrounds each of the selected objects.

   Note: If you want to deselect an object, click the previously selected object while the CTRL key is still pressed. The object becomes deselected in the same manner as it was selected.
4. Right-click and then from the shortcut menu, select **Properties**. The Multi-Edit property sheet opens including a top bar with mode buttons for moving the object in the XY plane and Z axis, and aligning the objects to the ground or a drawing surface.

Selecting All Objects in a Selected Area in the 3D Window

You can select an area in the 3D Window and edit all the objects within the area.

To select objects in a selected area in the 3D Window:

1. On the **Home** tab, in the **Edit** group, click the arrow under **Select** and then click **Area Selection**.
2. In the **3D Window**, select the area polygon points by clicking the mouse. You must select at least three points in the 3D Window.
3. Set the selection area by right-clicking. All objects within this selection area are marked with yellow selection frames.

   Note: The individual objects are only marked with the yellow selection frames once the selection process is complete.

   Note: Do not overlap the lines of the selection polygon with each other. This may result in an erroneous selection.

   Note: You can repeat steps 2 and 3 several times until you get the required selection.
4. Right-click on one of the selected objects, and then from the shortcut menu, select **Properties**.

   The Multi-Edit property sheet opens.

Note: The area selection tool does not affect the selection in the Project Tree.

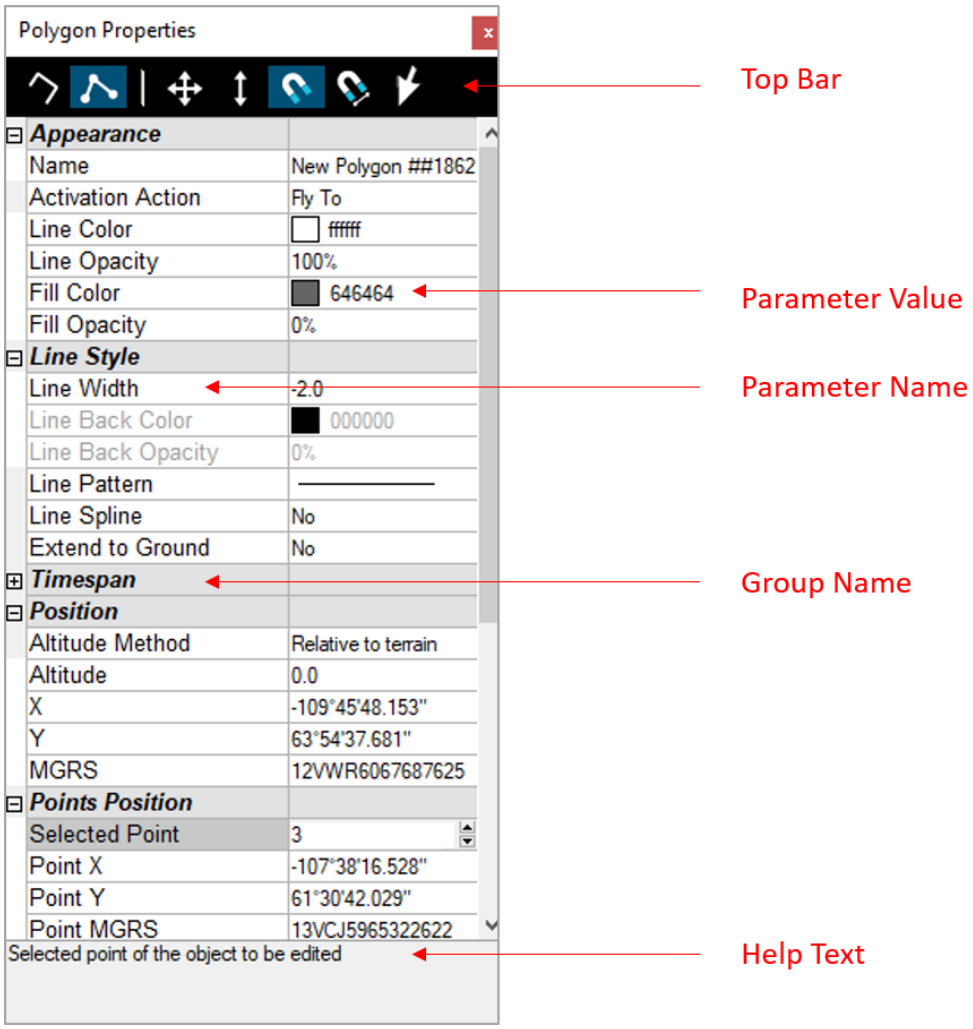
To turn off the Area Selection mode:

- On the **Home** tab, in the **Edit** group, click the arrow under **Select** and then toggle off the **Area Selection** command.

Working with the Property Sheet

The property sheet is the main editing tool for all TerraExplorer Pro objects. The property sheet displays all the parameters for the selected object and their values. The property sheet also determines the operation mode for editing the objects in the 3D Window. **See** "Editing Objects in the 3D Window" in this chapter for further information.

If a group of objects is selected for editing, the property sheet displays a set of common parameters. **See** "Multi-Editing" in this chapter for further information.

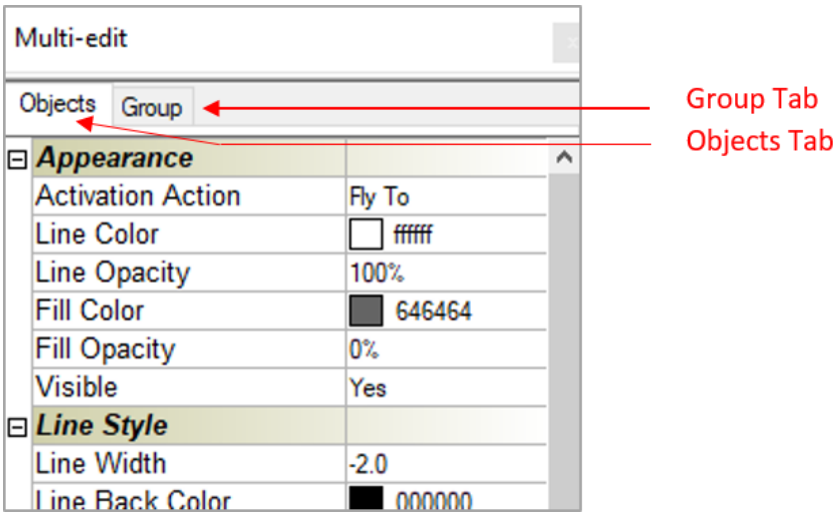


Property Sheet

The property sheet has the following fields:

Property Sheet Field	Description
Group	Contains a group of parameters
Parameter Name	Contains the name of each parameter
Parameter Value	Contains the current value of each parameter
Help Text	Displays the help text for the currently selected parameter

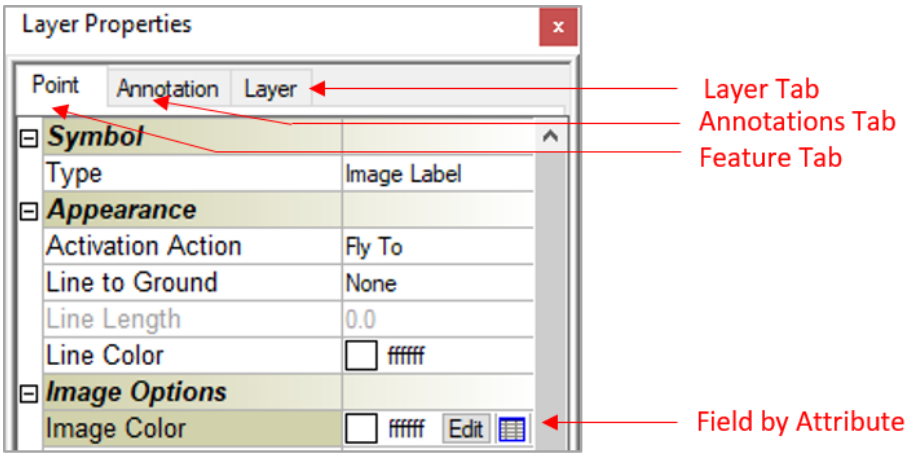
If a Group is selected for editing, the property sheet displays a tab for the group parameters and a tab for the object parameters.



Group Property Sheet

If a feature layer that includes an annotation symbol is selected for editing, the property sheet displays a tab for the layer's common parameters, a tab for the features parameters (point; polyline or polygon) and a tab for the annotations parameters. When loading feature layers, point annotation objects can be created in the center of each layer feature, which can be used to convey information, textually or graphically, relating to the feature.

Select the **Field by Attribute** button to define an expression that calculates the value of the field based on the attribute value of each object in the layer.



Feature Layer Property Sheet

Opening the Property Sheet

To open an object's property sheet:

- In the **Project Tree**, right-click the object, and then from the object's shortcut menu, select **Properties.** The property sheet opens.

Navigating in the Property Sheet

The properties in the property sheet are divided into groups according to their association.

To expand a group of properties:

- Click the **+** sign near the name of the group or double-click the group's name.

To collapse a group of properties:

- Click the **-** sign near the name of the group or double-click the group's name.

Editing Fields

To change the value of a property:

1. Click the property's name or value to set the focus on the property.

You can also set the focus by scrolling up and down between the properties using the arrow keys.

2. For each field type use the following method:

Field Type	Description
Text Field	Click again with the mouse on the value field to get an edit cursor and edit the current text string. You can start typing a new text without getting the edit cursor first. This entirely replaces the old text with the new text. Press the ENTER key or choose another parameter to accept the update or press ESC to cancel and restore the previous text. There are three types of unique text fields: ▪ **Text** property **for Text Label**: The **Text** property of the Text Label object uses the **Enter Label Text** dialog. When you start typing text, or click the **Edit** button, the dialog opens. You can then edit the multiple lines of text. Click **OK** to accept the new text or **Cancel** to restore the previous text. ▪ **Tooltip** property: The **Tooltip** property can accept multiline strings using the ENTER key. To accept the changes for this property you must choose another property in the **property sheet** or close the **property sheet** window. ▪ **Attributes parameter**: All the properties that were loaded from a native feature layer are placed in the Attributes group. The legal data type for each of the properties in this group is displayed in the **Help** text field. When you enter text in the value field, only valid input is updated and saved.
Number Field	Click again with the mouse on the value field to get an edit cursor and edit the current number. You can start typing a new number without getting the edit cursor first. This entirely replaces the old number with the new number. Press the ENTER key or choose another parameter to accept the update or press ESC to cancel and restore the previous number. You can also use the up and down buttons at the right side of the value field. Click and hold the buttons to change the value. The longer you hold the buttons the bigger the steps between the values are. Every value-change from the up and down buttons

	affects the object immediately and you cannot restore the old value.
Dropdown Lists	Click again with the mouse on the value field to open the dropdown list. Select the new value using the mouse or the arrow keys. Press the ENTER key or choose another property to accept the update or press ESC to cancel and restore the previous value.
Buttons	There are two types of buttons: ▪ **Button**: Click once to enable the operation, or click it again to disable. ▪ **Push Button** - Click once to perform the operation.
Special Text Fields	There are several custom-made value fields. You can edit these fields as regular text fields or select the open button, at the right side of the field, to open the special edit dialog. ▪ **Color Field**: Click to open the **Colors** dialog. ▪ **File Field**: Click to open the **Browse** dialog. ▪ **Message Field:** Click to open the **Message** dialog. **See** "Messages and Tooltips" in this chapter for further information.

Editing Fields by Attribute Value

After loading a native feature layer with attribute fields, you can apply different properties such as line color or cylinder height, based on the attribute field values of the objects.

See "About Basing Native Feature Layer Properties on Layer Attribute Fields" in the "Feature Layers" chapter for further information.

Undoing and Redoing Edits

You can undo or redo edit actions to objects. Changes to object properties can be undone or redone, even after the property sheet is closed, and then reopened. Changes to object geometry can only be undone or redone while the object is being created; once object creation is finished by right-clicking, undo/redo commands are unavailable.

Note: The undo and redo commands are supported for the following object types: text and image labels, video objects, polylines, polygons, 2D and 3D shapes (except for 3D polygons), and 3D models.

To undo an edit action:

- On the top of the object's property sheet, click **Undo** (CTRL+ z).

To redo an edit action:

- On the top of the object's property sheet, click **Redo** (CTRL+y).

Multi-Editing

The Multi-Edit property sheet includes a set of common parameters for the objects multi-selected from either the Project Tree or from the 3D Window). Some of the parameters only affect objects from a specific type (i.e., parameters that affect only text labels) whereas others affect all of the objects in the selection. Each change in one of the properties updates all the objects to which this property applies.

Only parameters that are relevant to at least one object in the selected group are displayed in the Multi-Edit property sheet. If all the selected objects have one or more parameters with the same values, these values are displayed.

To open the Multi-Edit property sheet, right-click one of the multi-selected objects, and then from the shortcut menu, select **Properties**.

The parameters in the Multi-Edit property sheet are divided into eight groups:

Parameter	Description
Appearance	Visible appearance parameters relevant to all objects.
Line Style	Line style parameters relevant to all objects.
Position	Allows you to change the location of the objects. Set the offset of the X, Y and Altitude from the current location of each object. **Note**: The delta values are relative to the object's locations at the time the Multi-Edit property sheet was opened. For example, if you set the delta X to 10 meters and afterward to 20 meters, all objects move 20 meters from their location at the time you opened the property sheet.
General	General parameters relevant to all objects.
Label Options	Label appearance parameters. This group is relevant to text and image labels.
Label Geometry	Label sizes and geometry parameters. This group is relevant to text and image labels.
Label Alignment	Label alignment parameters. This group is relevant to text and image labels.
3D Model	Parameters that are relevant to 3D model objects (static and dynamic).
Dynamic Objects	Parameters relevant to dynamic objects.
Texture	Parameters relevant to objects with textures.
Buildings	Parameters relevant to building objects.

Adjusting the Property Sheet Window Size

To change the size of the property sheet window:

1. Place the cursor over one of the four corners of the window.
2. When the cursor becomes a double-headed arrow, click and hold the mouse. Adjust the window to the desired size by dragging the cursor.

Note: The property sheet window is always placed on top of the TerraExplorer main window.

Editing Objects in the 3D Window

You can edit objects directly in the 3D Window. On the top bar of the property sheet appear the mode buttons. These buttons determine how the objects in the 3D Window are manipulated.

You can move the object in the XY plane and on the Z Axis. For some objects, you can edit either the entire object or specific nodes. Other objects, like buildings, provide more complex features for 3D Window editing. Polygon/polyline orientation are easily controlled using drawing surfaces and the align to ground command.

Changing the Position of an Object

Any of the following node operations can be performed to change the position of an object in the 3D Window:

Note: You can switch between the different move modes by pressing and holding down the shortcut keys indicated below.

- Move the object in the XY plane
- Move the object in the Z plane
- Move the object in the XY and Z planes based on where the mouse is pointing in the 3D Window

Moving an Object in the XY Plane

To move an object in the XY plane:

1. Select a single object for editing. **See** the "Selecting Objects for Editing" section in this chapter for further information.
2. On the top bar of the object's property sheet, click **Edit Object** and **XY Plane** (Shortcut key: 1).
3. In the **3D Window**, place the cursor over the object or the selection frame. The cursor changes to **Move** mode .
4. Click the object, and drag it to the required location in the XY Plane. Release the left mouse button to set the object at the current location.

Moving an Object in the Z Plane

To move an object in the Z plane:

1. Select a single object for editing. **See** the "Selecting Objects for Editing" section in this chapter for further information.
2. On the top bar of the object's property sheet, click **Edit Object** and **Z Axis** (Shortcut key: 2).
3. In the **3D Window**, place the cursor over the object. The cursor changes to a vertical arrow .
4. Click the object and drag the cursor up and down to change the object's altitude. Release the mouse button to set the object at the current altitude.

Moving an Object Based on Where the Mouse is Pointing in the 3D Window

This mode is recommended for positioning an object based on where the mouse is pointing in the 3D Window. This makes it easier to move an object above a 3DML layer or other terrain object. You can also snap the object to another object.

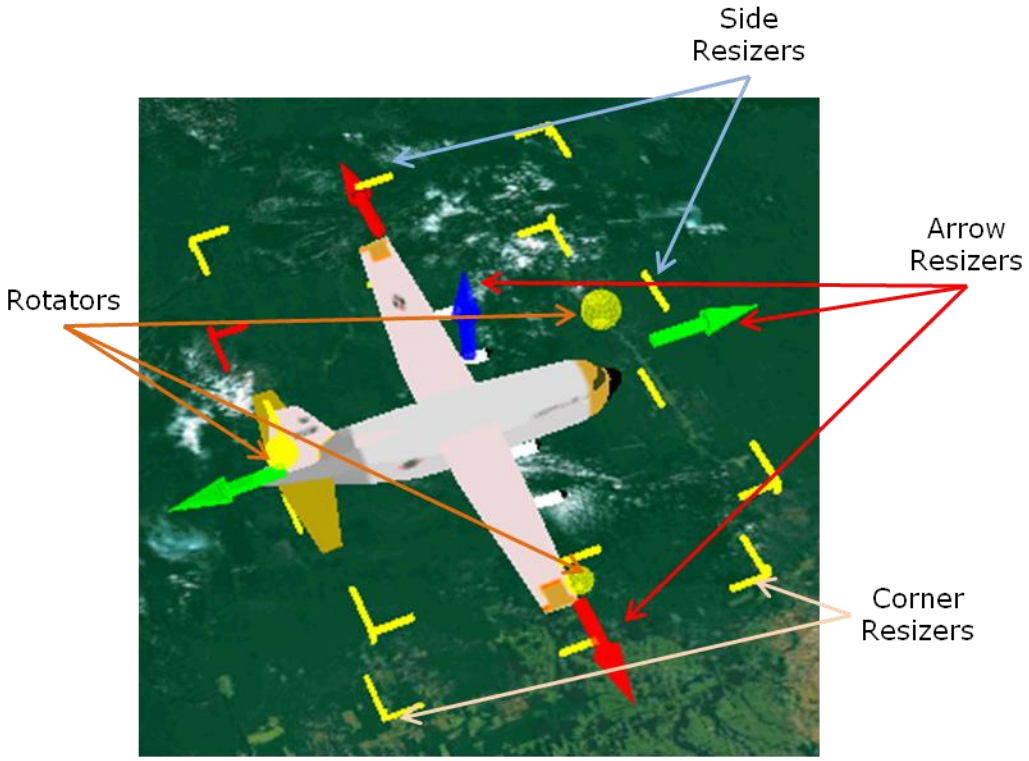
To move an object to where the mouse is pointing in the 3D Window:

1. Select a single object for editing. **See** the "Selecting Objects for Editing" section in this chapter for further information.
2. On the top bar of the object's property sheet, click **Edit Object** and then do either of the following:
   - If you want to set position based on mouse **and** snap the object to another object, click **Snap Based on Snapping Options** (Shortcut key: 4). **See** "Setting Snapping Options" in this chapter for more information.
   - If you don't want to snap the object to another object, click **Set Position Based on Mouse** (Shortcut key: 3).

   Note: This mode is available for objects with any **Altitude Method** other than On Terrain.
3. In the **3D Window**, place the cursor over the object or the selection frame. The cursor changes to XYZ Magnet mode .
4. Click the object, and drag it to the required location in the 3D Window. Release the left mouse button to set the object at the current location. If snapping to an object, move and snap the object to an edge or vertex of any existing polyline, polygon, or 2D shape.

Editing a 2D or 3D Object Using Object Handles

You can use the object handles for resizing, repositioning, and rotating an object.



(3D Model) Object Handles

The following 2D objects can be modified with object handles:

- Rectangle
- Regular Polygon
- Arrow
- Circle
- Ellipse
- Arc

The following 3D objects can be modified with object handles:

- 3D Model
- Arrow
- Pyramid
- Cone
- Sphere
- Cylinder
- Box

To edit an object using object handles:

1. Select a single object for editing. **See** the "Selecting Objects for Editing" section in this chapter for further information.
2. On the property sheet's top bar, click **XY Plane** . The selection box around the object changes to the "modify selection box".
3. Use the object handles to edit the object:

Object Handle	Description
Corner Resizers	Drag the corner resizer inwards or outwards. This causes the other corners to shift in the same direction, thus changing the object's width, length, and height (for 3D objects) simultaneously, and maintaining the model's aspect ratio.
Side Resizers	Drag the side resizer inwards or outwards, to change either the object's length **or** width **or** height (for 3D objects) of the object. **Note:** In 3D models, the side resizer maintains the model's aspect ratio.
Arrow Resizers	**3D Objects** Drag the arrow resizers inwards or outwards to change the object height. Every 3D object has two arrow resizers, one at the object top and the other at the object base. **3D Models** Drag any of the control arrows in or out. Every 3D model has three arrow resizers, for each of the X, Y, and Z axes.

	▪ When Aspect ratio is set to Yes in the property sheet, all three arrow resizers are yellow. When any one of the arrow resizers is dragged in or out, the other dimensions of the model are changed simultaneously, to maintain the original proportional relationship between the width, length, and height. ▪ When Aspect ratio is set to No in the model's property sheet, each of the three arrow resizers is a different color (blue – z axis, green – y axis, red- x axis), indicating that each dimension of the model can be resized independently of the other dimensions.
Rotators	Use the rotators to rotate the object. Every 3D object has three rotators to rotate the object around the yaw, the pitch and the roll axis. Hover on the rotator to display the rotation axis and perimeter.

Modifying Object Nodes

Any of the following node operations can be performed:

- Moving a Node in the XY Plane
- Moving a Node in the Z Plane
- Moving a Node Based on Where the Mouse is Pointing
- Adding a Node to an Object
- Deleting a Node from an Object
- Setting Snapping Options

Moving a Node in the XY Plane

To move a node in the XY plane in the 3D Window:

1. Select a single object for editing. **See** the "Selecting Objects for Editing" section in this chapter for further information.
2. On the top bar of the object's property sheet, click both **Edit Nodes** and **XY Plane**.
3. In the **3D Window**, place the cursor over one of the object's nodes. The node turns blue, and the cursor changes to **Move** mode .
4. Click the node and drag it to the required location in the XY Plane. Release the mouse button to set the node at the current location.

Moving a Node in the Z Plane

To move a node in the Z plane in the 3D Window:

1. Select a single object for editing. **See** the "Selecting Objects for Editing" section in this chapter for further information.
2. On the top bar of the object's property sheet, click both **Edit Nodes** and **Z Axis**.

3. In the **3D Window**, place the cursor over one of the object's nodes. The node turns blue, and the cursor changes to **Move** mode .
4. Click the node and drag it up and down to change the node's altitude. Release the mouse button to set the node at the current altitude.

Moving a Node Based on Where the Mouse is Pointing

This mode is recommended for moving nodes of an object that are above a 3DML layer or other terrain object.

To move a node based on where the mouse is pointing:

1. Select a single object for editing. **See** the "Selecting Objects for Editing" section in this chapter for further information.
2. On the top bar of the object's property sheet, click **Edit Nodes**  and then do either of the following:
   - If you want to set position based on mouse **and** snap the node to another object, click **Snap Based on Snapping Options** . **See** "Setting Snapping Options" in this chapter for information.
   - If you don't want to snap the object to another object, click **Set Position Based on Mouse** .

   Note: This mode is available for objects with any **Altitude Method** other than On Terrain.
3. In the **3D Window**, place the cursor over one of the object's nodes. The node turns blue, and the cursor changes to XYZ Magnet mode .
4. Click the node and drag it to the required location in the 3D Window. Release the mouse button to set the node at the current location. If snapping to an object, move and snap the node to an edge (green dot) or vertex (blue dot) of any existing polyline, polygon, or 2D shape.

Adding a Node to an Object

You can add a node to an object that is built from a few nodes (e.g., Polyline, 2D and 3D Polygon).

To add a node:

1. Select a single object for editing. **See** the "Selecting Objects for Editing" section in this chapter for further information.
2. On the top bar of the object's property sheet, click **Edit Nodes** . A red dot appears wherever a node can be added to the object.
3. If you want to add a node, in the **3D Window**, place the cursor over a red dot (it immediately turns light blue and the cursor changes to **Move** mode ), and then drag it to the required location.

Deleting a Node from an Object

You can delete an existing node from an object that is built from a few nodes (e.g., Polyline, 2D and 3D Polygon).

To delete a node:

1. Select a single object for editing. **See** the "Selecting Objects for Editing" section in this chapter for further information.
2. On the top bar of the object's property sheet, click **Edit Nodes** .

3. In the **3D Window**, place the cursor over the object's node you want to delete. The node turns blue, and the cursor changes to **Move** mode .
4. Right-click and select **Delete Node** on the shortcut menu.

Setting Snapping Options

You can set how a node or object snaps to other objects.

To set snapping options:

1. Select a single object for editing. **See** the "Selecting Objects for Editing" section in this chapter for further information.
2. On the top bar of the object's property sheet, click **Set Snapping Options** .
3. Toggle on any of the following options:
   - **Node Snapping** (5) – Snap object or node to nodes of other objects or features.
   - **Line Segment Snapping** (6)– Snap object or node to line segments of other objects or features.
   - **3D Snapping** (7)– Smart snap object or node to dynamically-identified edges and corners of any element in the 3D World.
   - **Directional Snapping** (8) – Constrain the object line segments currently being drawn to pre-defined angle increments. The angle constraint can be relative either to the previous line segment drawn in the same object or to a line segment in another object.
   - **Segment Distance on Edit** (9) – Show segment lengths while editing a polygon/polyline.

   Note: Snapping options can be combined, with priority based on their order in the Snapping options list.

Aligning Objects to the Ground

Polylines and polygons can be aligned to the ground (mesh ground, terrain, or any ground object) at each of their vertices.

To align a polyline and/or polygon object to the ground:

1. Select the object for editing.

   Note: You can also multi-select objects from the 3D Window. **See** "Selecting Multiple Objects from the 3D Window" or "Selecting All Objects in a Selected Area in the 3D Window" in this chapter for further information.
2. In the object's property sheet, set the **Altitude Method** to one of the following: Relative to Terrain, Absolute, or Relative to Pivot. If multiple objects were selected, set the altitude method in the multi-edit property sheet.
3. On the top bar of the property sheet, click **Align to Ground** **.**

Setting Object Orientation Using Drawing Surfaces

Drawing surfaces make it easy to draw objects on a particular plane. Drawing surfaces can be created in either of the following ways:

- Create a drawing surface with a particular orientation, for creation of objects with the same orientation. Then with **Set Position Based on Mouse**  mode on, create an object in the area of the surface. The drawn object will automatically be aligned to the surface.

- Create a drawing surface based on the orientation of a specific polyline or polygon – Draw a polyline/polygon so that its nodes are all lying in the same plane, and then create a drawing surface. The surface will automatically be aligned to the polyline/polygon. Additional objects then drawn on that surface, will be automatically aligned to it and to the original polyline/polygon.

The drawing surface commands can be accessed from the Objects tab or from the Feature Layer tab.

Creating a Drawing Surface

To create a surface with a particular orientation, do the following:

1. On the **Objects** tab, click the arrow next to **Drawing Surface** and select one of the following options:
   - **Auto-Aligned Surface** – Create a surface that is automatically aligned to the surface under the cursor.
   - **Horizontal Surface** – Create a horizontal drawing surface that is horizontally aligned to the surface under the cursor.
   - **Vertical Surface** – Create a vertical drawing surface that is vertically aligned to the surface under the cursor.
   - **Surface by 3 Points** – Create a drawing surface that is aligned to the three points you draw.
2. A surface is placed in the current location of the cursor, and the cursor changes to XYZ Magnet mode ., so you can drag the surface to the required location. Click the left mouse button to set the drawing surface in its place.

Aligning a Drawing Surface to a Polyline/Polygon

To align a drawing surface to a polyline/polygon:

1. Draw a polygon or polyline whose nodes are all lying in the same plane, or select an existing one. **See** also Creating a New Polyline" and "Creating a New Polygon" in the "Objects and Labels" chapter.
2. On the top bar of the polygon/polyline property sheet, click **Show/Align to Surface**  to create a surface aligned with the drawn polygon/polyline. When the property sheet is closed, the drawing surface is no longer displayed. To redisplay it, on the **Objects** tab, click the arrow next to **Drawing Surface** and select **Show Last Surface**. The last surface that was created is displayed.

Aligning Polylines/Polygons to a Drawing Surface

Drawing surfaces are used to control objects' orientation.

To align polylines/polygons to a drawing surface:

1. Create a surface with a particular orientation. **See** "Creating a Drawing Surface" in this chapter for information.
2. Select **Set Position Based on Mouse** **,** and then draw the polyline/polygon in the area of the created surface. **See** the "Objects and Labels" chapter for information.

   If you draw an object not directly on the drawing surface, the object's default alignment depends on the angle between the surface and the horizon:

   - If the drawing surface is vertical or nearly-vertical, the object's nodes are projected **perpendicularly** from where you clicked to add the node, onto the surface.
   - For other drawing surfaces, the object's nodes are projected **vertically** from where you clicked to add the node, onto the surface.

Note: You can override the default alignment using keyboard shortcut keys. For a near-vertical surface, type and hold down "v" to project the object vertically to the drawing surface. For other surfaces, type and hold down "n" to project the object perpendicularly.

3. If you draw a polygon or a polyline that is not aligned to surface or a polyline/polygon becomes misaligned with the surface as a result of editing in XY or Z mode, rather than in Set Position Based on Mouse mode, **Show/Align to Surface** becomes enabled. Click **Show/Align to Surface** to align any misaligned nodes. The node's alignment is represented by its color:
   - Black – aligned
   - White – misaligned

   Note: The selected node is yellow, regardless of alignment.
4. Other polylines or polygons in the area of the surface that were drawn before the surface was created, can also be aligned by selecting the polyline/polygon, and then clicking **Show/Align to Surface**.

Editing a Drawing Surface

To edit the drawing surface that is currently displayed:

1. On the **Objects** tab, click the arrow next to **Drawing Surface** and select **Edit Surface**. The surface property sheet is displayed.
2. Edit altitude, x, y, yaw, pitch, and roll properties in the property sheet as required, and use the toolbar, resizers, and rotators to edit the surface in the 3D Window. **See "**Editing a 2D or 3D Object Using Object Handles" and "Editing Objects in the 3D Window" in this chapter for information.

Selecting a Different Object

To select a different object from the one currently being edited:

- On the top bar of the object's property sheet, click **Select Mode** .

Messages and Tooltips

You can add a message and tooltip to any object in the project.

What is a TerraExplorer Message?

A message is a text string, HTML page, an image, a script code, multiple links or any other file you can display or run in one of the TerraExplorer Pro panels, a floating window or a floating pop-up window. The floating window is the default html browser defined in your system.

You can assign a message to any object, location, and Project Tree message element, and activate one as part of a presentation. You can also assign a message to be displayed at the beginning of the project. **See** "General" in the "Setting the Project" chapter for further information.

Message types:

Type of Message	Description
Text	A multiline text string. **Note:** A text message can also consist of HTML code, in which case it will display as an HTML page.

	You can display a text message in any one of the TerraExplorer Pro containers. You cannot display a text message in a floating window.
HTML/Image	A full path name or URL address of a web site, HTML page or image file. You can display the HTML page in any one of the TerraExplorer Pro containers, or in a floating html browser. Image files that are supported by the browser also open in a TerraExplorer panel. For feature layers, you can set different messages for different features using attribute values, e.g., http://www.skylineglobe.com/CitiesLayer/[type].png
File	A full path name or URL address of an image or any other file name. For security reasons, the file is opened in an HTML browser. If the browser supports this file type (i.e., BMP file), it appears in the selected container. If the browser does not support this file type or there are security restrictions, the browser displays the appropriate error or warning message. Image file types can be displayed in all the containers. Other file types must be assigned to the floating browser.
Script	A JavaScript code that uses the TerraExplorer API. The script can perform any API custom operation, including working with the object that was clicked using the "this" operator. **See** "Script Messages" in the section below for further information.
Links	A message with links to multiple categorized files and/or URL addresses. **See** "Messages Displaying Links to Multiple Files" in this chapter for further information.
Attributes	A message that displays selected attribute field values of an object. **Note**: This feature is enabled only for feature layers that have attribute fields information. **See** "Loading Layer Attribute Fields" in the "Feature Layers" chapter and "Attributes Messages" in this chapter for further information.

When Does the Message Appear?

Option	Description
Locations	The message appears when you double-click the location's name in the Project Tree.
Objects	The message appears when you double-click the object's name in the Project Tree or click the object in the 3D Window.
Groups (In locked state)	The message appears when you double-click the group's name in the Project Tree.
Layers	The message appears when you double-click the layer's name in the Project Tree.

Presentations	The message appears when the presentation is played at the step in the presentation at which it was set to be activated.
Project Tree Message	The message appears when you double-click the message's name in the Project Tree.
Start Message	The message appears upon opening of a project.

Adding Messages

- Add a Message to a Location, Object, or Group
- Create a Tree Message
- Cancel a Message

Adding a Message to a Location, Object, or Group

To assign a message to an object or group:

1. Open the location, object or group's property sheet.
2. Click on the Message parameter and then click the **Edit** button. The Create Message dialog opens.
3. Edit the message parameters and click **OK**. **See** "Using the Create Message Dialog" in this chapter. The number of the message appears in the Message's value field.

Creating a Tree Message

To create a Project Tree message:

1. On the **Home** tab, in the **Add** group, click **Project Tree** and then click **Create Tree Message**.

   The **Create Message** dialog opens.
2. Enter the required information. **See** "Using the Create Message Dialog" in this chapter for further information.

Cancelling a Message

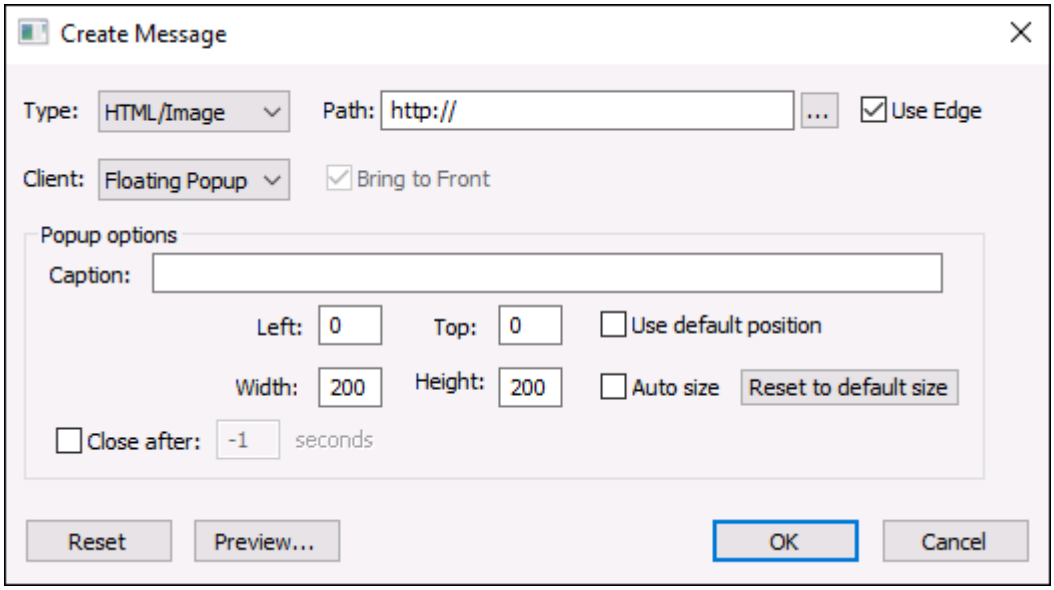
To cancel an existing message:

1. Open the **Create Message** dialog.
2. Click **Reset** and then click **OK**. The **-1** number appears in the Message's value field to indicate that there is no message associated with this object.

Using the Create Message Dialog

To create a message:

1. Open the Create Message dialog. **See** "Adding Messages" in this chapter for information.



Create Message Dialog

2. Enter values for the following parameters:

Parameter	Description
Type	Determines the type of message to be displayed. Select Text, HTML/Image, File, Script or Links from the dropdown list.
Path	Enter the path for a local HTML/Image file, remote URL address or any other file to be displayed. If you have selected the Text, Script or Links type, this field is unavailable.
Use Edge	Select the checkbox to open the message in Edge, rather than TerraExplorer. This option is available only when HTML/Image is selected as the Type. **Note:** Microsoft Edge is best suited for running simple, very limited scripts. Complex scripts that involve back-and-forth interactions with TerraExplorer using events may not function as intended or may experience performance issues. We are working to remove this limitation in future versions of TerraExplorer.
Client	Determines the panel in which the message is displayed. Select **Left Dock**, **Main View**, **Message Bar**, **Floating Browser** or **Floating Pop-up** from the dropdown list. If you select Floating Browser, the message is displayed in your default Internet browser. You cannot select floating Browser for Text messages.
Bring to Front	Select this check box so that the tab that contains this message is the active tab (if there is more than one tab). This option is available only when Left Dock or Main View was selected in the Client field.
Caption	This option is only available if Floating Popup is selected in the Client field.

	Type the caption text in the **Caption** field.
Left/Top	This option is only available if Floating Popup is selected in the Client field. Set the floating pop-up message initial display position. In the X and Y boxes, type the horizontal and vertical coordinates of the message box upper left corner respectively, relative to the top-left corner of the 3D Window.
Use default position	This option is only available if Floating Popup is selected in the Client field and the callout option is cleared. Select the **Use default Position** check box to return to the default message box position.
Width/Height	This option is only available if Floating Popup is selected in the Client field. Set the floating pop-up message initial size. Type the floating message box width and height in pixels.
Auto size	Select this check box to automatically set the message box size according to the size of the HTML page. **Note:** This option is not applicable for text messages (that do not contain HTML content). For optimal performance, it is recommended to use this setting when the web browser is set to Edge rather than TerraExplorer. See "Use Edge" setting above for more information.
Reset to Default Size	This option is only available if Floating Popup is selected in the Client field. Select the **Reset to Default Size** check box to set the height and width of the message box to its default size.
Close after	This option is only available if Floating Popup is selected in the Client field. Select the **Close after** check box to set the message display duration, and type the timeout duration in the **Seconds** box.
	This option is only available if Floating Popup is selected in the Client field. Select the geo-referencing check box to add a pointer from the message box to the object.
Text	Enter a multi-lined text string to be displayed in the selected client. This field is only available if you selected Text in the Type field.
Script	This option is only available if Script is selected in the Type field. Enter a JavaScript code to be executed using the TerraExplorer API. Unless you selected Script, this field is unavailable. **See** "Script Messages" in this chapter for further information.
Preview	Click **Preview** to see the selected HTML page or file in the default Windows application.
Reset	Click **Reset** to delete the message.

3. Click **OK**.

Script Messages

With Script messages, you can enter JavaScript code that uses the TerraExplorer API, into the Script area in the **Create Message** dialog. This script will be executed when the message is activated. For a complete description of the API, **see** the TerraExplorer Pro Programmer's Guide.

Note: Legacy VBScript has been deprecated and will not work in TerraExplorer Fusion.

You can use the following constants that do not need to be declared:

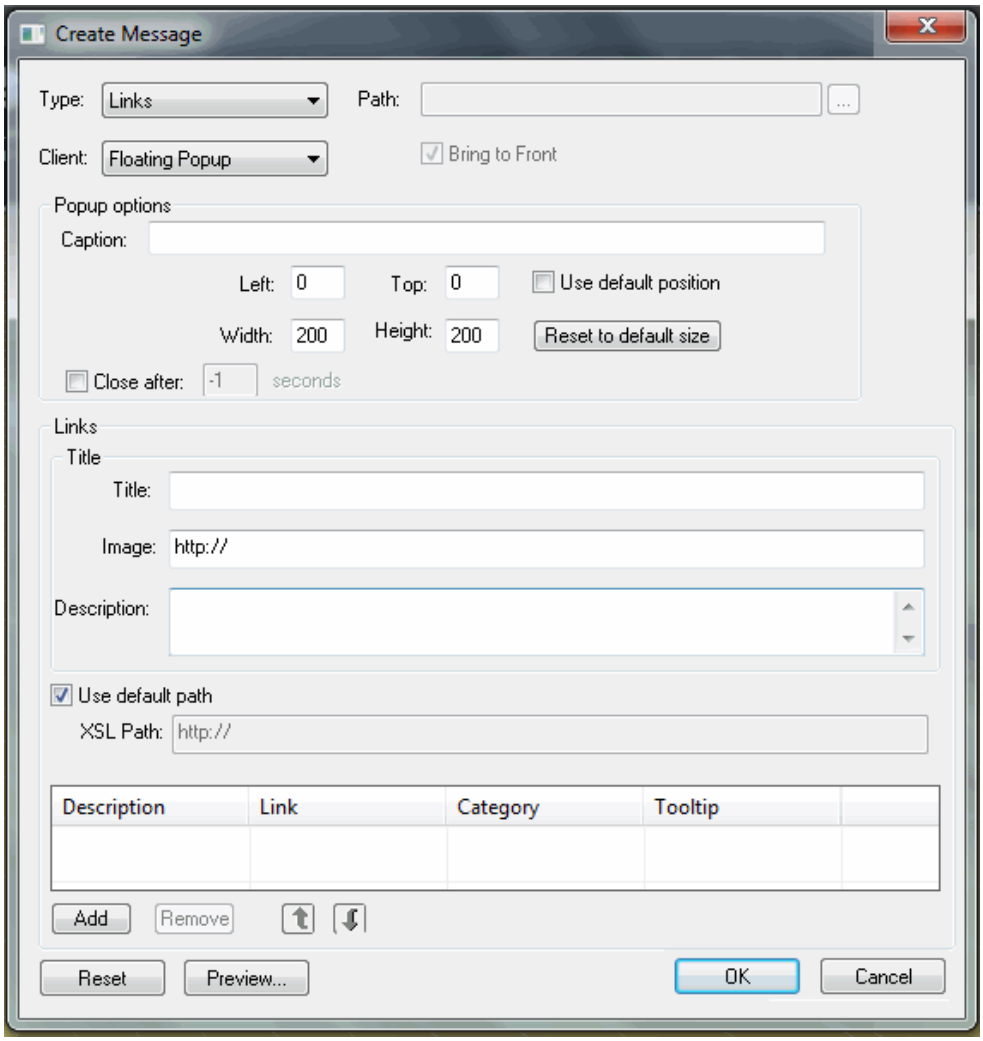
Constant	Description
ThisXXX	The "thisXXX" constant represents the ITerraExplorerObjectXXX derived object that the message is assigned to. For example, for a Text Label, you can enter the following script: *<script type = "javascript">* *alert("Text is: " + This80.Text);* *</script>* When the message is activated, a message box appears with the text content of the text label.
SGWorld80	Exposes the SGWorld interface. You can use all ISGWorld properties and methods. For example, this script: *<script type = "javascript">* *SGWorld80.Open ("c:\\project.fly");* *</script>* loads the specified fly file when the message is activated.

Note: Older interfaces, e.g., This74 & SGWorld74 are also supported, but using the latest versions is recommended.

Messages Displaying Links to Multiple Files

A **Links** message displays links to multiple documents or files. You can organize the hyperlinks into categories like pictures, videos and text.

You can activate a hyperlink to launch the appropriate file viewer based on file association. For example, a **.doc* hyperlink launches the Microsoft Word application (if installed) and displays the document's content. For security reasons, the file is opened in an HTML browser. If the browser supports this file type (i.e., BMP file), it appears in the selected panel. If the browser does not support this file type or there are security restrictions, the browser displays the appropriate error or warning message.



Create Message Dialog for Links Type

Use the following options to set the links parameters:

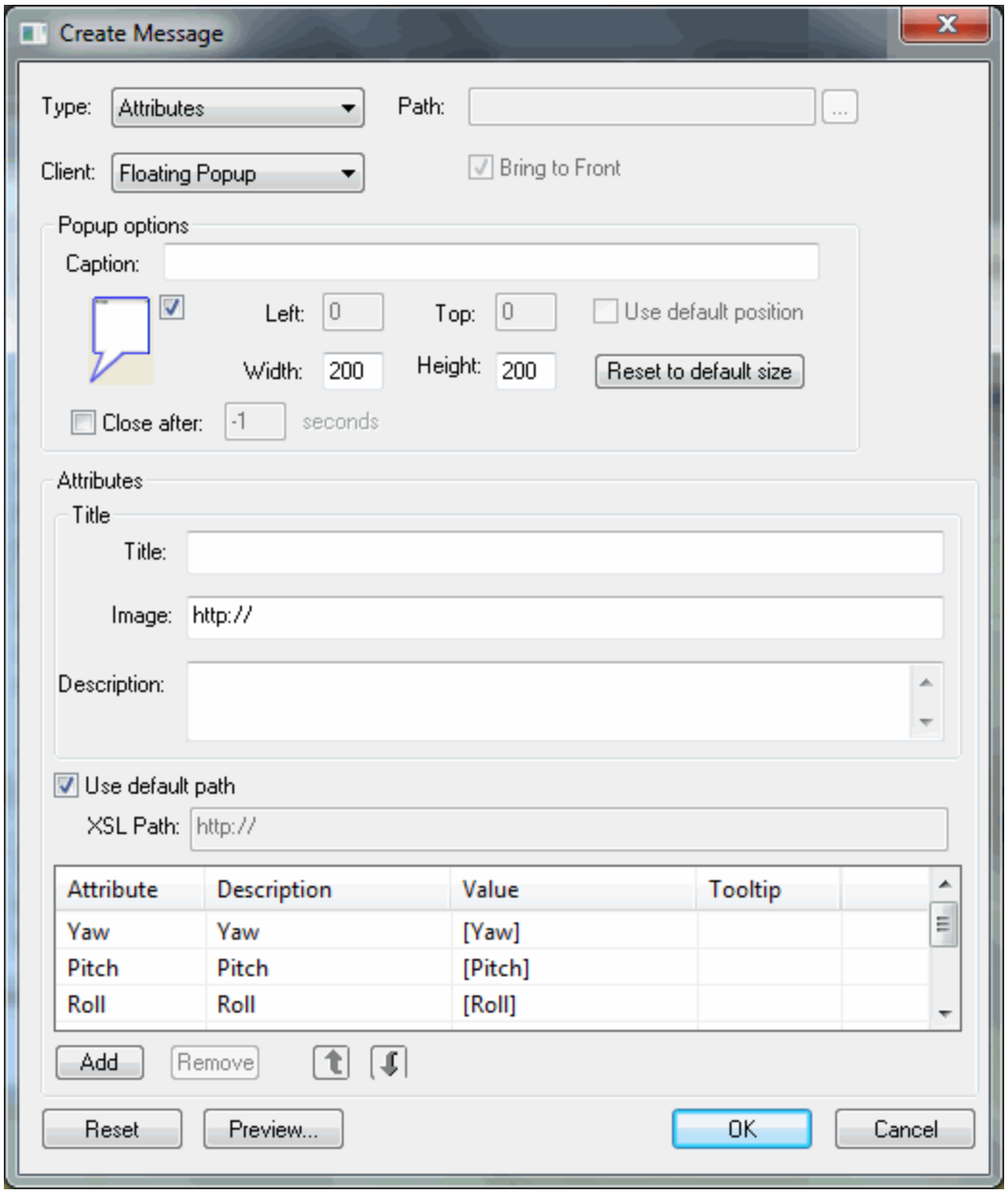
Option	Description
Title	Enter the title text. The text appears as the heading of the message.
Image	A full path name or URL address of an image file that is displayed in the message.
Description	Enter the text you want to appear in the message.
Use default path	Select the **Use default path** check box to style the links message using a default TerraExplorer XSL (Extensible Stylesheet Language) For more information see **XSL Path** below.
XSL Path	Enter the path for an XSL file to use to style the Links XML content. **See** "Styling Links and Attributes Messages with XSL" in this chapter for further information
Links table	▪ **Description**: a hyperlink text to the referenced document. The

	text is displayed under the **Description** column in the message. ▪ **Link**: A full path name or URL address of the document. ▪ **Category**: the category of the document that is displayed under the **Description** column. You can display links from all categories, or from a specific category. ▪ **Tool tip**: Tooltip text to appear when the mouse cursor is placed over the link.
Add	Click the **Add** button to add a link in the Links table.
Remove	Select a row from the Links table and click **Remove** to delete a link.
	Select a row from the Links table and use the **Move Up/Down** arrows to move it up or down.

Attributes Messages

You can create an Attributes message to display selected attribute field values of an object. This feature is enabled only for feature layers that have attribute fields information.

See "Using Attribute Fields" in the "Feature Layers" chapter for further information.



Create Message Dialog - Attributes

The Attributes message consists of the following parameters:

Item	Description
Title	Enter the title text. The text appears as the heading of the message.
Image	A full path name or URL address of an image file that is displayed in the message.
Description	Enter the text you want to appear in the message.

Use default path	Select the **Use default path** check box to style the links message using a default TerraExplorer XSL (Extensible Stylesheet Language) For more information see **XSL Path** below.
XSL Path	Enter the path for an XSL file to use to style the Links' XML content. **See** "Styling Links and Attributes Messages with XSL" in this chapter for further information.
Attribute	Select the field attribute to display from the dropdown list. The name of the attribute field is automatically filled in the Description column. The value column is filled with the attribute name in brackets.
Description	The textual description of the attribute.
Value	Use one of the following expression formats: ▪ **Attribute Value**: Attribute name in brackets, e.g., [ATTRIB], displays the values of the attribute field for the object. ▪ **Textual expression**: Attrib name in brackets with other text, e.g., Text Before [ATTRIB] Text After. ▪ **JavaScript expression**: Bounded by <>, e.g., <JS:LCase("[ATTRIB]") & "Text">.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the attribute in the Message.

Styling Links and Attributes Messages with XSL

Links and Attribute messages store content in an XML document. The content is then styled using an XSL (Extensible Stylesheet Language) file for display in the message. You can use the default XSL provided by TerraExplorer by selecting the **Use default path** check box or set a path to your XSL in the **XSL Path** field.

The examples below show dialog entries, and their respective resulting XML files and messages displayed with the TerraExplorer default XSL. The default XSL code is also provided for reference.

Links Messages

The following is an example showing how the content entered in the **Create Message** dialog for Links, is put into an XML. The XML is then formatted with the default TerraExplorer XSL and displayed in a message.

The following XML is automatically produced:

```
<DOCUMENT_LIST name="Links">
    <DOCTITLE>
        <TITLE>"My Title"</TITLE>
        <DESCRIPTION>"This is a sample Links Message"</DESCRIPTION>
        <IMAGE>"http://www.skylinesoft.com/logo.gif"</IMAGE>
    </DOCTITLE>

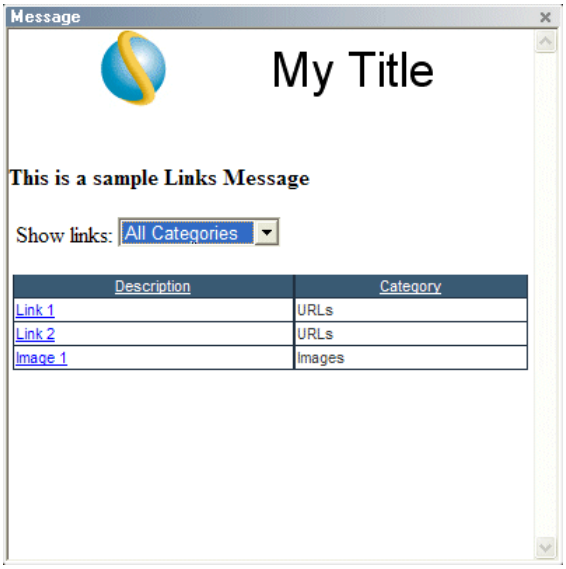
    <LIST_BODY>
        <COLUMNS>
```

```
        <COLUMN class="urlLinkDescription" urlColumnIdLink="2">
            <ID>0</ID>
            <NAME>Description</NAME>
            <WIDTH>150</WIDTH>
            <DEFAULT_VALUE>Link</DEFAULT_VALUE>
            <HIDE>0</HIDE>
        </COLUMN>
        <COLUMN class="urlLink">
            <ID>1</ID>
            <NAME>Link</NAME>
            <WIDTH>150</WIDTH>
            <DEFAULT_VALUE>http://</DEFAULT_VALUE>
            <HIDE>1</HIDE>
        </COLUMN>
        <COLUMN>
            <ID>3</ID>
            <NAME>Category</NAME>
            <WIDTH>150</WIDTH>
            <HIDE>0</HIDE>
        </COLUMN>
        <COLUMN class="ToolTip">
            <ID>2</ID>
            <NAME>Tooltip</NAME>
            <WIDTH>150</WIDTH>
            <HIDE>1</HIDE>
        </COLUMN>
</COLUMNS>

<ROWS>
        <ROW>
            <CELL>"Link 1"</CELL>
            <CELL>"http://www.link1.com"</CELL>
            <CELL>"URLs"</CELL>
            <CELL>"Tooltip1"</CELL>
        </ROW>
        <ROW>
            <CELL>"Link 2"</CELL>
            <CELL>"http://www.link2.com"</CELL>
            <CELL>"URLs"</CELL>
            <CELL>"Tooltip2"</CELL>
        </ROW>
        <ROW>
            <CELL>"Image 1"</CELL>
```

```
                    <CELL>"http://www.skylinesoft.com/image.gif"</CELL>
                    <CELL>"Images"</CELL>
                    <CELL>"Tooltip Image 1"</CELL>
                </ROW>
            </ROWS>
        </LIST_BODY>
</DOCUMENT_LIST>
```

The message is displayed as follows:



Multiple Files XSL Styled Message

The following is the default TerraExplorer XSL used when the **Use Default Path** check box is selected for a hyper-link multiple files message:

```
<?xml version='1.0'?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">
<xsl:template match="/">
<html>

<META http-equiv="Content-Type" content="text/html; charset=UTF-16"/>
<script language="jscript">
<![CDATA[
var allLinksTable;
function Sort(column_index)
{
        var linksTable = document.all('linksTable');
        for (i=1; i < linksTable.rows.length; i++)
        {
```

```
                var row =linksTable.rows(i);
                for (j=i+1; j < linksTable.rows.length; j++)
                {
                        var row1 = linksTable.rows(j);
                        var str1 = row.cells(column_index-1).innerText;
                        str1 = str1.toLowerCase();
                        var str2 = row1.cells(column_index-1).innerText;
                        str2 = str2.toLowerCase();
                        if( str1> str2)
                        {
                                linksTable.moveRow(j,i);
                                row =linksTable.rows(i)
                        }
                }
        }
}

function document_onload()
{
        var linksTable = document.all('linksTable');
        allLinksTable = linksTable.cloneNode(true);
        if(CatCombo.options.length>0)
                return;

        var Category = document.createElement("OPTION");
        Category.text="All Categories";
        Category.value=1;
        CatCombo.add(Category);
        for (i=1; i < linksTable.rows.length; i++)
        {
                var row =linksTable.rows(i);
                var catName = row.cells(1).innerText;

                var bFound=false;
                var arr = CatCombo.options;
                for(j=0;j<arr.length;j++)
                {
                        if(row.cells(1).innerText == arr[j].innerText)
                        {
                                bFound = true;
                                break;
                        }
                }
```

```
                if(bFound==false)
                {
                        var Category = document.createElement("OPTION");
                        Category.text=catName;
                        Category.value=i+1;
                        CatCombo.add(Category);

                }
        }
        CatCombo.selectedIndex=0;
        CatCombo.focus();
}

function CatCombo_onchange()
{
        var linksTable;
        if(CatCombo.selectedIndex==0)
                linksTable = allLinksTable;
        else
        {
                linksTable = allLinksTable.cloneNode(true);
                for(j=1;j<linksTable.rows.length;j++)
                {
                        var row = linksTable.rows(j);
                        if(row.cells(1).innerText!=CatCombo.options[CatCombo.selectedIndex].text )
                        {
                                row.removeNode();
                                j--;
                        }
                }

        }
        var oldlinksTable = document.all('linksTable');
        oldlinksTable.replaceNode(linksTable);
        Sort(1);
}

]]>
</script>
<head>
<style>
.s8 {font-family:  Arial, Helvetica; font-size: 11px; font-style: normal; font-weight: normal; color: #3B3B3B; text-
decoration: none;}
```

```
.s8w {font-family:  Arial, Helvetica; font-size: 11px; font-style: normal; font-weight: normal; color: #FFFFFF; text-decoration: underline;}
.s12 {font-family:  Arial, Helvetica; font-size: 34px; font-style: normal; font-weight: normal; color: #000000; text-decoration: none;}
TD {border:solid 1px #233141; border-top:solid 0px white;}
</style>
</head>

<body  bgcolor="#FFFFFF" leftmargin="0" topmargin="0" marginwidth="0" marginheight="0">

<script LANGUAGE="javascript" FOR="window" EVENT="onload">
 document_onload()
</script>

<table border="0" cellspacing="0" cellpadding="0" width="100%" class="s8">
<tr >
<xsl:if test= "string-length(//DOCUMENT_LIST/DOCTITLE/IMAGE/text())>7">
<td align="right" style="border:solid 0px white;filter:progid:DXImageTransform.Microsoft.Gradient(endColorstr='#FFFFFF', startColorstr='#3F5875', gradientType='0');">
<img src="{//DOCUMENT_LIST/DOCTITLE/IMAGE/text()}"/>
</td>
</xsl:if>
<td align='center' colspan='0' class="s12" style="border:solid 0px white;filter:progid:DXImageTransform.Microsoft.Gradient(endColorstr='#FFFFFF', startColorstr='#3F5875', gradientType='0');"><xsl:value-of  select="//DOCUMENT_LIST/DOCTITLE/TITLE"/></td>

        </tr>
</table>

<br /><span style="margin-left:5px"></span><b><xsl:copy-of select="//DOCUMENT_LIST/DOCTITLE/DESCRIPTION"/></b>
<br /><br />
<span style="margin-left:5px"></span> Show links:
<SELECT language="javascript"  id="CatCombo" style="LEFT: 12px; WIDTH: 117px; TOP: 16px"
            onchange="return CatCombo_onchange()" name="CatCombo">
</SELECT>
<br />
        <br />
        <table id="linksTable" cellspacing="0" cellpadding="1" align="center" class="s8" width="98%">
            <tr class="rowHeader" style="cursor:pointer;background-color:#3F5875">

                <xsl:call-template name="ShowColumnHeader">
                    <xsl:with-param name="showIndex" select="1"/>
                    <xsl:with-param name="index" select="1"/>
```

```
                    </xsl:call-template>

                </tr>

                <xsl:for-each select="//COLUMNS/COLUMN">
                    <xsl:if test = "@class='ToolTip'">
                        <xsl:apply-templates select="//ROWS/ROW">
                            <xsl:with-param name="tooltip_pos" select="position()"/>
                        </xsl:apply-templates>
                    </xsl:if>
                </xsl:for-each>
</table>

</body>
</html>

</xsl:template>


<xsl:template name="ShowColumnHeader">
    <xsl:param name="showIndex"/>
    <xsl:param name="index"/>
    <xsl:if test="//COLUMNS/COLUMN[$index]">
        <xsl:choose>
            <xsl:when test="//COLUMNS/COLUMN[$index]/HIDE=1">
                <xsl:call-template name="ShowColumnHeader">
                    <xsl:with-param name="showIndex" select="$showIndex"/>
                    <xsl:with-param name="index" select="$index+1"/>
                </xsl:call-template>
            </xsl:when>
            <xsl:otherwise>
                <td align='center' class='s8w' >

                    <xsl:attribute name="onclick">
                        <xsl:text>Sort(</xsl:text><xsl:value-of
select="$showIndex"/><xsl:text>)</xsl:text>
                    </xsl:attribute>
                    <xsl:value-of select="//COLUMNS/COLUMN[$index]/NAME"/>
                    <xsl:call-template name="ShowColumnHeader">
                        <xsl:with-param name="showIndex"
select="$showIndex+1"/>

                        <xsl:with-param name="index" select="$index+1"/>
                    </xsl:call-template>
                </td>
```

```
                    </xsl:otherwise>
                </xsl:choose>
        </xsl:if>

</xsl:template>



<xsl:template match="//ROWS/ROW">
<xsl:param name="tooltip_pos"/>
<tr>
<xsl:for-each select="child::*">
<xsl:variable name="cell_pos" select="position()"/>
                <xsl:choose>
                    <xsl:when test="//COLUMNS/COLUMN[$cell_pos]/@class='urlLinkDescription'">
                        <xsl:variable name="column_id"
select="//COLUMNS/COLUMN[$cell_pos]/@urlColumnIdLink"/>
                        <td><a href="{../CELL[position()=$column_id]/text()}"
title="{../CELL[$tooltip_pos]}" target="_blank"><xsl:value-of  select="."/></a></td>
                    </xsl:when>
                    <xsl:otherwise>
                        <xsl:choose>
                        <xsl:when test="//COLUMNS/COLUMN[$cell_pos]/HIDE=1">
                        </xsl:when>
                        <xsl:otherwise>
                            <td title="{../CELL[$tooltip_pos]}"><xsl:value-of select="text()"/></td>
                        </xsl:otherwise>
                        </xsl:choose>
                    </xsl:otherwise>
                </xsl:choose>
</xsl:for-each>
</tr>
</xsl:template>

</xsl:stylesheet>
```

Attributes Messages

The following is an example showing how the content entered in the **Create Message** dialog for Attributes, is put into an XML. The XML is then formatted with the default TerraExplorer XSL and displayed in a message.

The following XML is automatically produced:

```
<DOCUMENT_LIST name="Attributes">
        <DOCTITLE>
```

```
        <TITLE>"My Title"</TITLE>
        <DESCRIPTION>"This is a sample Attributes Message"</DESCRIPTION>
        <IMAGE>"http://www.skylinesoft.com/logo.gif"</IMAGE>
    </DOCTITLE>

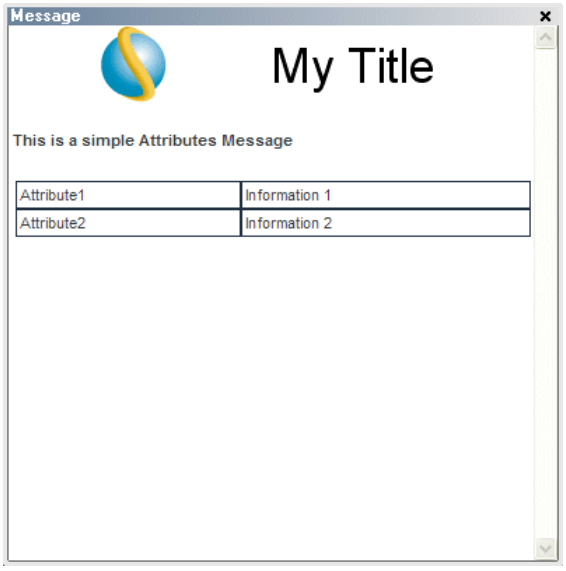
    <LIST_BODY>
        <COLUMNS>
            <COLUMN>
                <ID>0</ID>
                <NAME>Attribute</NAME>
                <WIDTH>100</WIDTH>

                <HIDE></HIDE>
            </COLUMN>
            <COLUMN>
                <ID>1</ID>
                <NAME>Description</NAME>
                <WIDTH>150</WIDTH>
            </COLUMN>
            <COLUMN>
                <ID>2</ID>
                <NAME>Value</NAME>
                <WIDTH>150</WIDTH>
            </COLUMN>
            <COLUMN class="ToolTip">
                <ID>3</ID>
                <NAME>Tooltip</NAME>
                <WIDTH>150</WIDTH>
            </COLUMN>
        </COLUMNS>

        <ROWS>
            <ROW>
                <CELL>"Attribute1"</CELL>
                <CELL>"Attribute1"</CELL>
                <CELL>"[Attribute1]"</CELL><!-- Automatically replaced by attribute value for
each object, e.g., "Information1"-->
                <CELL>"tooltip for attrib1"</CELL>
            </ROW>
            <ROW>
                <CELL>"Attribute2"</CELL>
                <CELL>"Attribute2"</CELL>
                <CELL>"[Attribute2]"</CELL><!-- Automatically replaced by attribute value for
each object, e.g., "Information2"-->
```

```
                    <CELL>"tooltip for attrib2"</CELL>
                </ROW>
            </ROWS>
        </LIST_BODY>
</DOCUMENT_LIST>
```

The message is displayed as follows:



Multiple Files XSL Style Message

The following is the default TerraExplorer XSL used when the **Use Default Path** check box is selected for an attributes message:

```
<?xml version='1.0' encoding='UTF-8'?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">
<xsl:template match="/">
<html>
<META http-equiv="Content-Type" content="text/html; charset=UTF-16"/>
<head>
<style>
.s8 {font-family:  Arial, Helvetica; font-size: 11px; font-style: normal; font-weight: normal; color: #3B3B3B; text-decoration: none;}
.s8w {font-family:  Arial, Helvetica; font-size: 11px; font-style: normal; font-weight: normal; color: #FFFFFF; text-decoration: underline;}
.s12 {font-family:  Arial, Helvetica; font-size: 34px; font-style: normal; font-weight: normal; color: #000000; text-decoration: none;}
TD {border:solid 1px #233141;}
</style>
</head>
```

```
<body  bgcolor="#FFFFFF" leftmargin="0" topmargin="0" marginwidth="0" marginheight="0">

<table border="0" cellspacing="0" cellpadding="0" width="100%" class="s8">
        <tr>
        <xsl:if test= "string-length(//DOCUMENT_LIST/DOCTITLE/IMAGE/text())>7">
                <td class="s12" align="right" style="border:solid 0px
white;filter:progid:DXImageTransform.Microsoft.Gradient(endColorstr='#FFFFFF', startColorstr='#3F5875',
gradientType='0');"><img src="{//DOCUMENT_LIST/DOCTITLE/IMAGE/text()}"/></td>
                </xsl:if>
                <td align='center' class="s12" colspan='0' style="border:solid 0px
white;filter:progid:DXImageTransform.Microsoft.Gradient(endColorstr='#FFFFFF', startColorstr='#3F5875',
gradientType='0');"><xsl:value-of  select="//DOCUMENT_LIST/DOCTITLE/TITLE"/></td>
                <style type="text/css">
                </style>
        </tr>
</table>

<table class="s8">
                <tr>
                <td style="border:solid 0px white;">
<span style="margin-left:5px"></span><b><xsl:copy-of select="//DOCUMENT_LIST/DOCTITLE/DESCRIPTION"/>
</b></td>
                </tr>
</table>

        <br></br>
        <table  cellspacing="0" cellpadding="2" width="98%" class="s8" style="margin-left:5px">

        <xsl:for-each select="//COLUMNS/COLUMN">
                <xsl:if test = "@class='ToolTip'">
                        <xsl:apply-templates select="//ROWS/ROW">
                                <xsl:with-param name="tooltip_pos" select="position()"/>
                        </xsl:apply-templates>
                </xsl:if>
        </xsl:for-each>

</table>
</body>
</html>

</xsl:template>


<xsl:template match="//ROWS/ROW">
```

```
<xsl:param name="tooltip_pos"/>
<tr>
<xsl:for-each select="child::*">
<xsl:variable name="cell_pos" select="position()"/>

                <xsl:if test="//COLUMNS/COLUMN[$cell_pos]/@class='ToolTip'">

                </xsl:if>

                <xsl:choose>
                <xsl:when test="//COLUMNS/COLUMN[$cell_pos]/@class or
//COLUMNS/COLUMN[$cell_pos]/HIDE">
                </xsl:when>
                <xsl:otherwise>
                        <td title="{../CELL[$tooltip_pos]}"><xsl:value-of select="text()"/></td>
                </xsl:otherwise>
                </xsl:choose>


</xsl:for-each>
</tr>
</xsl:template>

</xsl:stylesheet>
```

Adding a Tooltip

The object's tool tip is a text string that appears when you place the cursor, in the 3D Window, above the object for more than half a second.

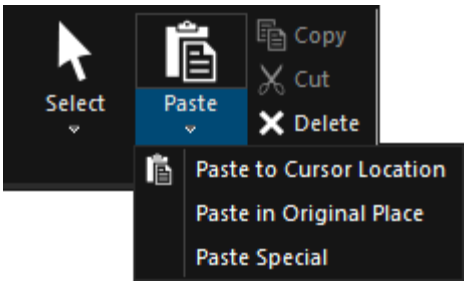
You can add the tool tip through the object's property sheet window. The tool tip string can include more than one line of text.

Cutting, Copying, and Pasting Objects

You can copy a single object or multiple objects in the 3D Window and paste them in another location. The new objects are added under the selected group in the Project Tree.

TerraExplorer Pro has a buffer for copied objects. Every time you perform a copy or cut function on objects in the 3D Window, the buffer is filled with the new set of objects. You can perform the paste function at any time until you close the project.

Using advanced clipboard mechanisms, you can generate any 2D or 3D object based on the geometry of objects in the clipboard (e.g., generate buildings according to properties of selected polygons). You can also use the geometry of objects in the clipboard as the input for advanced spatial queries or for Duplicate object operations.



Home Tab Edit Group

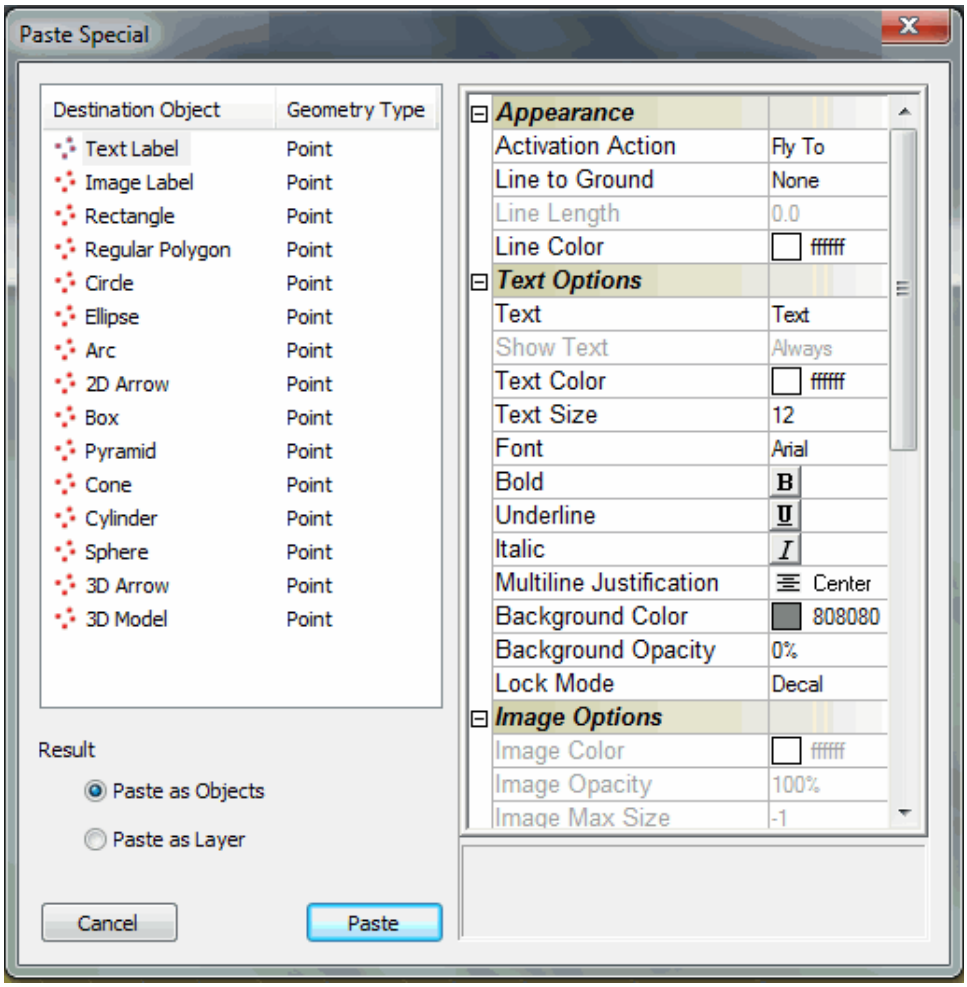
Copying and Pasting Objects

To copy and paste objects:

1. On the **Home** tab, in the **Edit** group, toggle on **Select**.
2. To copy: In the **3D Window**, place the cursor over the required object, and type CTRL + C.
3. To paste:
   - **To cursor location** – Type CTRL + V. A copy of the object is pasted in the current location of the cursor, and the cursor mode changes to the last positioning mode (i.e., XY, Z or XYZ Magnet) that you used, so you can drag the pasted object to the required location. Click the left mouse button to set the pasted object in its place. **See** "Changing the Position of an Object" in the "Working with Objects" chapter for information.
   - **In original place** – On the **Home** tab, in the **Edit** group, click the arrow below **Paste**, and then click **Paste in Original Place**.

   Note: You can also select the object, and use the ribbon commands on the Home or Objects tabs or the right-click menu to copy and paste.
4. If you want to generate a 2D or 3D object based on the geometry of the objects in the clipboard, do the following:

   a. On the **Home** tab, in the **Edit** group, click the arrow below **Paste**, and then click **Paste Special**. The Paste Special dialog is displayed.



Paste Special Dialog

b. Select the Destination Object that you want to generate, and then modify its properties as required in the Property sheet.

c. Select whether to paste the object as an object or layer:
   - Paste as Objects – Create a group that contains an object for each copied object.
   - Paste as Layer – Create a new feature layer that contains a feature for each copied object.

d. Click **Paste**.

Cutting and Deleting Objects

You can cut or delete a single object or multiple objects.

Note: When you "cut" an object in the 3D Window, the object is stored in the copy/cut buffer until a new copy or cut command is performed, so you can still restore it by performing the paste function. When you "delete" an object, however, you cannot restore it.

To **delete** an object or objects, do either of the following:

- In the **3D Window**, select the object or objects you want to delete, and then on the **Home** tab, in the **Edit** group, click **Delete**.

or

- In the **Project Tree**, select the object or objects you want to delete, and then right-click and select **Delete** from the shortcut menu.

To **cut** an object or objects:

- In the **3D Window**, select the object or objects you want to delete, and then on the **Home** tab, in the **Edit** group, click **Cut**.

  or

- In the **3D Window**, select the object or objects you want to delete, and then right-click, and select **Cut** from the shortcut menu.

See "Selecting Objects for Editing" in this chapter for more information on selecting objects from the 3D Window or Project Tree.

Moving Objects

You can select a single object or multiple objects in the 3D Window and move them to a new location. **See** "Selecting Objects for Editing" in this chapter for information.

Note: The Move function is most effective if you want to move an object to a close by location. If you need to move the object to a more distant location, it is easier to use the cut-paste commands.

Setting Objects for Auto-Start

You can assign any object for the Auto-Start procedure of the project. The last object you assign is used. You must save the project for this setting to take effect. You can assign static or dynamic objects with any activation action.

The camera performs a unique flight pattern according to the object settings.

See "Setting the Auto-Start Procedure" in the "Setting the Project" chapter for further information on how to set objects for the Auto-Start procedure.

Attaching Objects to Other Objects

You can attach an object to another object. If the second object is in motion, the attached object follows its movements.

You can set the distance between the two objects in all three axes. Use this feature to unite several TerraExplorer Pro objects to one virtual unit. You can also use this feature to add movement to 2D and 3D primitives that are not natively supported by the dynamic object, by creating an empty dynamic object and attaching the primitive to the object.

It is possible to attach more than one object to the same target object. It is also possible to attach an object, which has another object attached to it. It is illegal to attach an object to a target object that is attached to the first object (loop).

To attach an object to another object:

1. In the **Project Tree**, right-click the required object, and then from the shortcut menu select **Attach object to object**. If you are attaching a stationary object to a dynamic object to add movement to it, the object you right-click needs to be the stationary object.

2. With the "attachment" mode cursor , click the target object's name in the **Project Tree**. The Attachment property sheet opens.

   Note: You can right-click anywhere in the Project Tree to cancel the operation.

3. Edit the attachment properties and close the property sheet. **See** "Editing the Attached Parameters" in this chapter for more information.

Detaching an Object from another Object

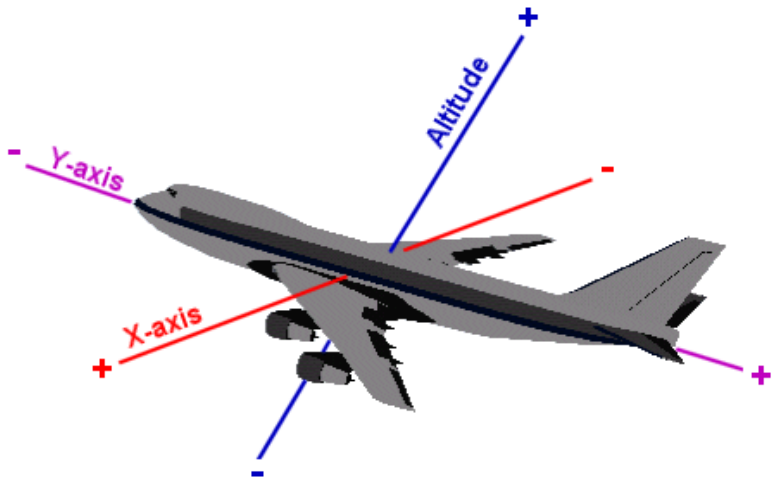
To detach an object from another object:

- In the **Project Tree**, right-click the required object, and then from the shortcut menu select **Detach from object**.

Editing the Attached Parameters

You can edit the attachment properties at the time you set the attachment or by right-clicking the attached object's name in the Project Tree and selecting the **Edit Attach Parameters** option.

The attachment properties allow you to set the offset between the attached object and the target object. All offsets are relative to the target object's axis. If the target object has pitch and roll angles, the attached object is positioned accordingly.



Offset Settings

In the **Attachment** property sheet, set the following parameters:

Parameter	Options and Activities
Attachment Offsets	▪ **X Offset**: Enter the distance between the two objects in the X-axis of the target object. Positive values place the object on the left side of the target object and negative values on the right side. ▪ **Y Offset:** Enter the distance between the two objects in the Y-axis of the target object. Positive values place the object on the left side of the target object and negative values on the right

	side. ▪ **Altitude Offset**: Enter the distance between the two objects in the Altitude-axis of the target object. Positive values place the object above the target object and negative values below it. ▪ **Yaw Offset**: Enter the angular difference between the two objects in the yaw axis of the target object. Positive values place the object on the left side of the target object and negative values on the right side. ▪ **Pitch Offset**: Enter the angular difference between the two objects in the pitch axis of the target object. Positive values place the object on the left side of the target object and negative values on the right side. ▪ **Roll Offset**: Enter the angular difference between the two objects in the roll axis of the target object. Positive values place the object on the left side of the target object and negative values on the right side.
Attachments Objects	▪ **Attached Object**: Shows the name of the attached object. This field is for information only; you cannot enter a new name. ▪ **Attached To**: Shows the name of the target object to which the selected object is attached. This field is for information only; you cannot enter a new name.

Loading Objects from the Data Library

The Data Library has four primary sets of graphic elements (icons, 3D models, lights, and line animation) that you can add to your project. In addition to the local data objects, the Data Library also includes online models that can be accessed if there is an Internet connection.

Note: Building texture files can be loaded from the Buildings-Textures folder located under the TE application files (.\Program Files\Skyline\TerraExplorer Pro\Tools\Data-Library\Buildings-Textures) and old projects using these textures will be supported.

Graphic Source	Description
Icons	Contains 2D images that you can use with image labels or as a background image for text labels. The images are stored in a BMP or GIF format. This group has three sub-groups: ▪ **Map Signs**: A set of commonly used map signs and letters and numbers. ▪ **Trees**: A set of tree icons you can use to cover small areas with trees. Although the trees are not real 3D models, they give a sufficient tree display in many cases. ▪ **Flags**: A set of flags from nations around the world.

3D Models	Contains local and online 3D models that you can add to your project. The models are stored in .x, .xpc, .flt, .fpc or .dae file formats.
Lights	Contains light effect models that you can add to your project. These objects are not true light sources that display light on the surrounding terrain, but rather image labels with the Blend Mode option turned on that simulate local light effects.
Line Animation Textures	Contains textures that you can use to create lines with scrolling textures.

Note: The feature layers in the Data Library are set to work with projects using Globe terrain models with Lat-Long projections. You can load the feature layers to local projection terrain only if the project contains the projection of the terrain. **See** "Terrain Database" in the "Setting the Project" chapter for further information.

To load an object from the Data Library:

1. On the **Objects** tab, in the **Libraries** group, click **Data Library**. The Data Library dialog is displayed.



Data Library Tool

2. Click the required tab: **Icons**, **3D Models**, **Lights**, or **Line Animation**.
3. To add a dynamic 3D model, do the following:
   a. On the **3D Models** tab, select the **Dynamic object - Draw Mode.**
   b. Select the graphic item you want to add.
   c. With the cursor in the **3D Window**, click the mouse to define the first waypoint of the vehicle's route. Use additional mouse clicks to add waypoints to the path. Right-click to finish.
4. To add an icon, static 3D model, or light effect, do the following:
   a. Select the graphic item you want to add.
      Note: To add a static 3D model, on the **3D Models** tab, select the **Static object - Draw Mode**.
   b. Click on the terrain to add an instance of the selected item or click **Esc** to cancel the operation.

Note: You can edit the added items using TerraExplorer Pro editing tools. **See** "Editing Objects in the 3D Window" in this chapter for information.

5. To add a line animation, do the following:
   a. Select the graphic item you want to add.
   b. With the cursor in the **3D Window**, click the mouse to define the first waypoint of the line animation. Use additional mouse clicks to add waypoints to the path. Right-click to finish.

Loading Objects from Sketchup Warehouse

Sketchup 3D Warehouse is an online repository of 3D models.

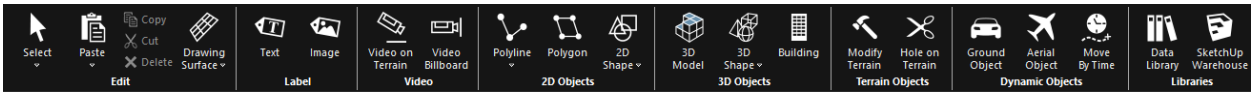
To use Sketchup Warehouse:

1. On the **Objects** tab, in the **Libraries** group, click **Sketchup Warehouse**. The Sketchup Warehouse dialog is displayed.
2. Enter the model to search for and click **Search**. The Sketchup 3D Warehouse Search is displayed with a collection of relevant thumbnail images.
3. Click the thumbnail image of the model you want to download and click **Download**.
4. From the dropdown list of formats, select either: KMZ from Sketchup or COLLADA (.zip).
5. Save the model to your local or network drive.
6. If you downloaded a model in KMZ format, load the model into your project by using TerraExplorer's Load KML/KMZ command.
7. If you downloaded a COLLADA (DAE) model, open the .zip file, and extract its contents to a folder. Then load the .dae file into your project by using TerraExplorer's Load 3D Model command.

CHAPTER 11 OBJECTS AND LABELS

About Objects and Labels

From the Objects tab, you can create text or image labels, 2D or 3D primitives, dynamic objects, and terrain objects and then place them in the 3D World.



Objects Tab

Text and Image Labels

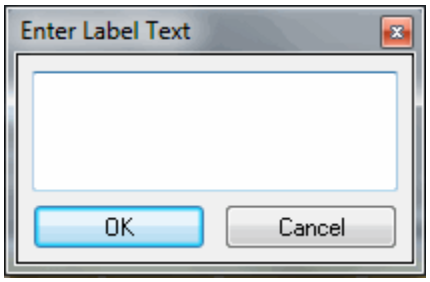
You can do any of the following:

- Create a new text label
- Create a new image label
- Create a graphic frame to surround a text or image label

Creating a New Text Label

To create a new text label:

1. On the **Objects** tab, in the **Label** group, click **Text**. The **Enter Label Text** dialog is displayed.



Enter Label Text Dialog

2. Type the text in the **Enter Label Text** dialog. You must enter a text and click **OK** before you can place the object in the 3D World.
3. The Text Label property sheet opens. Set the other parameters of the object. **See** "Text Label Property Sheet Parameters" in this chapter for more information.
4. If you want to position the label based on where the mouse is pointing in the 3D Window, on the top bar of the label's property sheet, click **Set Position Based on Mouse** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" in the "Working with Objects" chapter for more information.
5. If you want to position the label based on where the mouse is pointing in the 3D Window **and** snap it to another object, on the top bar of the label's property sheet, click **Snap Based on Snapping**

Options . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" and "Setting Snapping Options" in the "Working with Objects" chapter for more information.

6. If you want to position the label in the XY plane, on the top bar of the object's property sheet, click **XY Plane** . **See** "Moving an Object in the XY Plane" in the "Working with Objects" chapter for more information.
7. If you want to position the label in the Z plane, on the top bar of the object's property sheet, click **Z Plane** . **See** "Moving an Object in the Z Plane" in the "Working with Objects" chapter for more information.
8. Place the label in the **3D Window** by clicking in the desired location.
9. Continue to edit the label's parameters or close the property sheet to finish the operation.



Example of a Text Label with a Frame

Text Label Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the label. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the object from the Project Tree. **See** "Navigating to Objects" in the "Navigating in the 3D World" chapter for information.
Line to Ground	Adds a line from the label's pivot point either to the ground or to a custom length towards the ground. **Note**: A line to ground is displayed while the label is being edited (i.e., as long as its property sheet is open), regardless of this property value. This property only determines whether a line to ground will continue to display even **after** the label's property sheet is closed.
Line Length	Determines the length of the line to the ground. This property is available only when the "Line to Ground" parameter is set to "Custom Length".
Line Color	Sets the color of the label's line to ground. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff). This property is available only when the "Line to Ground" option is set to "To Ground" or "Custom Length".
Text Options	
Text	Edit the text for the label. This is the text that appears in the 3D Window.

Show Text	▪ Select **Always** to always display the label's text. ▪ Select **On Hover** to display the label's text only when the mouse points to the label's icon. **Note:** This field is enabled only if an image file was selected in the Image File field of the property sheet's Image Options group.
Text Color	Sets the foreground color of the text Click the **Edit** button to open the **Color** dialog, or type the color code in the hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Text Size	Select the font size, in pixels, from the dropdown list.
Font	Select the font type from the dropdown list.
Bold	Select for Bold font style.
Underline	Select for Underline font style.
Italic	Select for Italic font style.
Multiline Justification	If there is more than one line of text, this option determines the justification of the text. Select Left Justify, Center Justify or Right Justify.
Background Color	Sets the background color of the label. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Background Opacity	Enter the opacity value for the label's background. The background covers the area of the label that is not covered by the text or by the image file. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent. When the opacity is set to 0%, the characters are surrounded by a solid background color outline to highlight the text.
Frame File	Add a graphic frame to the label. Type the name of the frame file or click the **Edit** button to open the **Open** dialog. **See** "Label's Frame File Format" section in this chapter for further information on how to create frame files.
Frame Index	Select the index of the frame in the frame file. This field is only available if a frame file is selected. **See** "Label's Frame File Format" for further information on how to create frame files.
Lock Mode	Set which text label position parameters are adjusted automatically to face the camera and which are locked to the Position group field values (**See** Position group below). ▪ **Decal**: The text label position and reading direction are adjusted automatically to face the camera. ▪ **Axis**: All text label position parameters are locked to the Position group field values.

	▪ **Axis Text Up**: The text label reading direction is adjusted automatically to face the camera whereas the text label position is set to the Position group field values (**see** below). ▪ **Axis (Auto Pitch)**: The text label pitch angle is adjusted automatically to face the camera whereas the other position parameters are set to the Position group field values. ▪ **Axis (Auto Pitch Text Up)**: The text label reading direction and pitch angle are adjusted automatically to face the camera. The other position parameters are set to the Position group field values.
Image Options	
Image Color	Sets the color of the image. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Image Opacity	Enter the opacity value for the image. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Image Max Size	Enter a maximum size in pixels for the image.
Blend Mode	Determines how the label's image blends with the background terrain or model layer: ▪ On – Adds the image color to the background, e.g., if the terrain is green (RGB: 0, 255, 0), and a red label is drawn on it (RGB: 255, 0, 0), its RGB value is added to the background, to produce a yellow blend (RGB: 255, 255, 0). ▪ Off – Uses normal blending based on the opacity set for the image.
Image File	Add an image as a background to the text. Type the name of the image file or click the **Edit** button to open the **Open** dialog. BMP, JPEG, GIF, PNG and ICO formats are supported. To use a label that contains only an image (without text), select the Image Label option on the **Objects** tab.
Position	
Altitude Method	Sets the altitude method to be used by the label: ▪ Select **Relative to Terrain** to place the label's pivot point at a specified altitude above the ground. ▪ Select **Absolute** to place the label's pivot point at a specified altitude above the terrain database vertical datum base ellipsoid. ▪ Select **Relative to 3DML** to place the label's pivot point at a specified altitude above the 3DML layer.
Altitude	Enter the altitude, as defined in Altitude Method, for the text label's pivot point.

X	Enter the X-coordinate for the text label's pivot point.
Y	Enter the Y-coordinate for the text label's pivot point.
MGRS	The coordinates of the text label's pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Yaw	Determines the direction angle of the text label along the vertical axis relative to north.
Pitch	Determines the tilt angle of the text label along its lateral axis relative to the horizon.
Roll	Determines the roll angle of the text label along its longitudinal (front-to-back) axis.
Pivot Alignment	Determines the alignment of the label relative to its pivot point. Select Top, Left; Top, Center; Top, Right; Center, Left; Center, Center; Center, Right; Bottom, Left; Bottom, Center; Bottom, Right.
Geometry	
Scale	Determines the dimensions, in meters per pixel, of the label. The maximum character height is the Text Size times the Scale value.
Limit Growth	If this property is set to **Yes**, the label keeps its original size in pixels (Text Size). It does not grow as you fly closer.
Min. Viewing Height	Determines the minimum viewing height at which the label is visible. The label disappears when flying lower than the "Min Viewing Height".
Smallest Visible Size	Determines the minimum font height, in pixels, at which the label disappears as you fly away from it. The label can grow to a maximum of the Text Size times the Scale parameters. After that, the label starts to scale down until it reaches the Smallest Visible Size. At this point, it disappears.
Text & Image Alignment	
Text Relative to Image	Select **Text on Image** to display the text on the background image. Select **Text Around Image** to display the text next to the background image.
Text Alignment	Horizontal and Vertical justification of the text with respect to the background image. Select Top, Left; Top, Center; Top, Right; Center, Left; Center, Center; Center, Right; Bottom, Left; Bottom, Center; Bottom, Right.
Timespan	
Start Time	Click **Edit** and enter the date and time the label should first become visible.
End Time	Click **Edit** and enter the date and time the label should stop being visible.

Visibility	
Min. Viewing Height	Determines the minimum viewing height at which the label is visible. The label disappears when flying lower than the "Min Viewing Height".
Smallest Visible Size	Determines the minimum size in pixels, below which the label disappears as you fly away from it.
Max. Show-Through Dist.	Sets the maximum distance of label's pivot from camera, in meters, beyond which it will not show through terrain, mesh layers, or objects that are hiding it. Set to -1 to enable show-through at any distance when editing the label. When an object is showing through terrain, mesh or objects, it can be selected, edited, and snapped to other objects.
Default Viewing Distance	Determines the viewing distance of the camera from the label. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the label based on its size.
Visibility	This property is only displayed for point features in a feature layer. Sets the visibility of features based on their attribute values. Type a search expression comprised of one or more conditions, or click the **Field by Attribute** button  to create the search expression using the Attribute Table. **See** "Searching and Performing Operations by Attribute (Attribute Table Tool)" in the "Feature Layers" chapter for more information.
General	
Show in Viewer	Determines if the text label appears in the 3D Window when the file is viewed with the TerraExplorer Basic Viewer.
Message	The message associated with the text label. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the text label in the 3D Window.

Creating a New Image Label

To create a new image label:

1. On the **Objects** tab, in the **Label** group, click **Image**. The **Browse for Image** dialog is displayed.
2. Type or browse a path to a BMP, JPEG, GIF, PNG or ICO file to load as an image. You must set an image file before you can place the object in the 3D World.

   Note: Only standard 32 x 32 pixels, 256 colors, ICO files are supported.
3. Set the object's other parameters. **See** "Image Label Property Sheet Parameters" in this chapter for more information.

4. Place the label in the 3D World by clicking in the desired location.
5. Continue to edit the label's parameters or close the property sheet to finish the operation.



Example of an Image Label

Image Label Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the label. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the object from the Project Tree.
Line to Ground	Adds a line from the label's pivot point either to the ground or to a custom length toward the ground. **Note**: A line to ground is displayed while the label is being edited (i.e., as long as its property sheet is open), regardless of this property value. This property only determines whether a line to ground will continue to display even **after** the label's property sheet is closed.
Line Length	Determines the length of the line to the ground. This property is available only when the **Line to Ground** parameter is set to "Custom Length."
Line Color	Sets the color of the label's line to ground. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff). This property is available only when the **Line to Ground** option is set to **To Ground** or **Custom Length**.
Image Options	
Image Color	Sets the color of the image. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Image Opacity	Enter the opacity value for the image. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Image Max Size	Enter a maximum size in pixels for the image. **Note:** A negative value for this property is defined as no scaling of the image, so the actual image size is used.
Blend Mode	Determines how the label's image blends with the background terrain or model layer:

	▪ On - Adds the image color to the background, e.g., if the terrain is green (RGB: 0, 255, 0), and a red label is drawn on it (RGB: 255, 0, 0), its RGB value is added to the background, to produce a yellow blend (RGB: 255, 255, 0). ▪ Off – Uses normal blending based on the opacity set for the image. .
Image File	Type or browse a path to a BMP, JPEG, GIF, PNG or ICO file to load as the image.
Frame File	Add a graphic frame to the label. Type the name of the frame file or click the Edit button to open the Browse dialog. **See** "Label's Frame File Format" section in this chapter for further information on how to create frame files.
Frame Index	Select the index of the frame in the Frame File. This field is only available if a Frame File is selected. **See** "Label's Frame File Format" for further information on how to create frame files.
Lock Mode	Set which image label position parameters are adjusted automatically to face the camera and which are locked to the Position group fields values (**See** Position group below). ▪ **Decal**: The image label position and reading direction are adjusted automatically to face the camera. ▪ **Axis**: All image label position parameters are locked to the Position group field values. ▪ **Axis Text Up**: The image label reading direction is adjusted automatically to face the camera whereas the image label position is set to the Position group field values (**see** below). ▪ **Axis (Auto Pitch)**: The image label Pitch angle is adjusted automatically to face the camera whereas the other position parameters are set to the Position group field values. ▪ **Axis (Auto Pitch Text Up)**: The image label reading direction and Pitch angle are adjusted automatically to face the camera. The other position parameters are set to the Position group field values.
Geometry	
Scale	Determines the dimensions, in meters per pixel, of the label. The maximum label size is the image size in pixels times the Scale value.
Limit Growth	If this property is set to **Yes** the label keeps its size in pixels and does not grow as you fly closer.
Min Viewing Height	Determines the minimum viewing height for which the label is visible. The label disappears when flying lower than the "Min Viewing Height".

Smallest Visible Size	Determines the minimum image size, as a percentage of its original size, at which the label disappears as you fly away from it. The label can grow to a maximum of the image size times the Scale parameters. After that, the label starts to scale down until it reaches the smallest visible size. At this point, it disappears.
Position	
Altitude Method	Sets the altitude method to be used by the image label: ▪ Select **Relative to Terrain** to place the image label's pivot point at a specified altitude above the ground. ▪ Select **Absolute** to place the image label's pivot point at a specified altitude above the terrain database vertical datum base ellipsoid. ▪ Select **Relative to 3DML** to place the image label's pivot point at a specified altitude above the 3DML layer.
Altitude	Enter the altitude, as defined in Altitude Method, for the image label's pivot point.
X	Enter the X coordinate for the image label's pivot point.
Y	Enter the Y coordinate for the image label's pivot point.
Yaw	Determines the direction angle of the image label along the vertical axis relative to north.
Pitch	Determines the tilt angle of the image label along its lateral axis relative to the horizon.
Roll	Determines the roll angle of the image label along its longitudinal (front-to-back) axis.
Pivot Alignment	Determines the alignment of the label relative to its pivot point. Select Top, Left; Top, Center; Top, Right; Center, Left; Center, Center; Center, Right; Bottom, Left; Bottom, Center; Bottom, Right.
Timespan	
Start Time	Click **Edit** and select the date and time when the label should first become visible.
End Time	Click **Edit** and select the date and time when the label should stop being visible.
Visibility	
Min. Viewing Height	Determines the minimum viewing height at which the label is visible. The label disappears when flying lower than the "Min Viewing Height".
Smallest Visible Size	Determines the minimum size in pixels, below which the label disappears as you fly away from it.
Max. Show-Through Dist.	Sets the maximum distance of label's pivot from camera, in meters, beyond which it will not show through terrain, mesh layers, or objects that are hiding it. Set to -1 to enable show-through at any distance when editing the label.

	When an object is showing through terrain, mesh or objects, it can be selected, edited, and snapped to other objects.
Default Viewing Distance	Determines the viewing distance of the camera from the label. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the label based on its size.
Visibility	This property is only displayed for point features in a feature layer. Sets the visibility of features based on their attribute values. Type a search expression comprised of one or more conditions, or click the **Field by Attribute** button  to create the search expression using the Attribute Table. **See** "Searching and Performing Operations by Attribute (Attribute Table Tool)" in the "Feature Layers" chapter for more information.
General	
Show in Viewer	Determines if the image label appears in the 3D Window when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the image label. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the image label in the 3D Window.

Label Frame File Format

Text and Image labels can include a graphic frame surrounding the text or the image. The file that contains the frame patterns can be either a BMP or a GIF file. A single file can hold several frame patterns.

To select a frame for a label:

- Choose the frame file name and the index of the frame within the file. You can use one of the pre-prepared frame files included in the Data Library, or you can create a custom-made frame file.

Preparing a Frame Pattern

1. Draw a small pattern of a frame. You can draw it in any size and number of colors. The actual size of the frame is adjusted for each label.



Frame

2. Mark the corners of the frame by drawing 3 pixels per corner, as shown below. Use the same color for marking all the pixels.



Marked Frame

Note: When a pattern is used to create a frame for a label, the size of the corners is not changed. Rather, the edges are either stretched or repeated to fit the label.

3. By default, the edge is repeated to fit the label. If you want the edge to be stretched, draw another pixel attached to the edge.
   - For the top and bottom edges, the pixel should be attached to the left corners.
   - For the left and right edges, it should be attached to the top corners.
   - Each edge, within one pattern, can have a different width and can be either stretched or repeated.

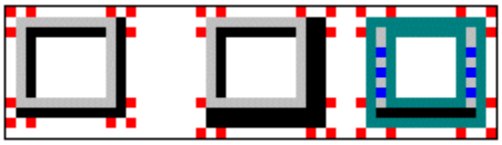


Example of frame with Stretched Top and Bottom Edges



Example of Frame with Stretched Left and Right Edges

4. To combine several frames to one file, align all the frame images (with their marking-pixels) to the top of the image file, and align the first (left) pattern (with its marking-pixels) to the left side of the image file.



Example of an Image File Containing Three Frame Patterns

Note: There must be a space of at least one pixel between any two patterns. The space can be of more than one pixel.

2D Objects

You can do any of the following:

- Create a polyline
- Create a polygon

- Create a 2D shape

Creating a New Polyline

You can create a polyline either by placing polyline vertices to create connected polyline segments or by drawing freehand.

Drawing a Polyline

To draw a polyline:

1. On the **Objects** tab, in the **2D Objects** group, click **Polyline**. The Polyline property sheet opens.
2. Set the parameters of the polyline. **See** "Polyline Property Sheet Parameters" in this chapter for information.
3. If you want to position the polyline based on where the mouse is pointing in the 3D Window, on the top bar of the label's property sheet, click **Set Position Based on Mouse** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" in the "Working with Objects" chapter for more information.
4. If you want to position the polyline based on where the mouse is pointing in the 3D Window **and** snap it to another object, on the top bar of the polyline's property sheet, click **Snap Based on Snapping Options** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" and "Setting Snapping Options" in the "Working with Objects" chapter for more information.
5. If you want to position the polyline in the XY plane, on the top bar of the object's property sheet, click **XY Plane** . **See** "Moving an Object in the XY Plane" in the "Working with Objects" chapter for more information.
6. If you want to position the polyline in the Z plane, on the top bar of the object's property sheet, click **Z Plane** . **See** "Moving an Object in the Z Plane" in the "Working with Objects" chapter for more information.
7. Place the polyline points in the 3D Window by clicking in the desired locations. You must place at least two points.
8. Finish the polyline insertion by right-clicking.

   Note: If you want to display the length of each polyline segment while creating and editing the polyline, select the "Show segments distance while editing a polygon/polyline" check box in the Options dialog. **See** "View" in the "Options" chapter for more information.
9. Continue to edit the polyline's parameters, or close the property sheet to finish the operation.

Drawing a Freehand Line

You can draw freeform lines that follow the movement of your pointer. This is useful for drawing curves.

To draw a freehand line:

1. On the **Objects** tab, in the **2D Objects** group, click the arrow below **Polyline**, and then click **Freehand Drawing**. The cursor changes to a brush icon.
2. Drag the brush in the 3D Window in the shape you want while holding down the mouse button. Release the mouse button when the freehand line is complete. The Polyline property sheet opens.
3. Edit the polyline's parameters or close the property sheet to finish the operation.



Example of a Polyline Object

Polyline Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the polyline. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the object from the Project Tree.
Line Color	Sets the color of the polyline. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Opacity	Enter the opacity for the object's lines. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Fill Color	Select the fill color for the object created by the Extend Polyline. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff). **Note:** This field is only enabled when the polyline's **Extend to Ground** field is set to **Yes** in the property sheet.
Fill Opacity	Enter the opacity for the object's fill. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent. **Note:** This field is only enabled when the polyline's **Extend to Ground** field is set to **Yes** in the property sheet.
Line Style	
Line Width	Enter the polyline width. Use positive values to indicate the width in meters, and negative values to indicate the value in pixels (width>-6). This field is not enabled when the polyline's **Extend to Ground** field is set to **Yes** in the property sheet.
Line Back Color	Sets the polyline back color. This field is only available when Altitude Method is set to On Terrain. The line back color is visible when the Line Pattern property field is set to non-solid pattern values, or when the Line Width property field is set to a value that is larger than 1. The Line Back Color property is only enabled when the Altitude Method property in the Position group (**See** Position Group below) is set to On Terrain value. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).

Line Back Opacity	Enter the opacity of the polyline back. This field is only available when Altitude Method is set to On Terrain. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Line Pattern	Select the line pattern for the polyline, e.g., solid, dashed, dotted or a combination of those patterns.
Line Spline	Determines if the polyline is drawn as a curve based on its nodes.
Extend to Ground	Extend the polyline vertically to the ground (to create a partition such as a fence). Select **Yes** from the dropdown list to extend the selected polygon. **Note:** The Extend to Ground parameter is not enabled if the "On Terrain" Altitude method was selected.
Timespan	
Start Time	Click **Edit** and select the date and time when the polyline should first become visible.
End Time	Click **Edit** and select the date and time when the polyline should stop being visible.
Position	
Altitude Method	Sets the altitude method to be used by the polyline: ▪ Select **Relative to Terrain** to place each point of the polyline at a specified altitude above the ground, defined by its **Point Altitude**. ▪ Select **Absolute** to place each point at a specified altitude above the terrain database vertical datum base ellipsoid. You can use this feature to create polylines with known absolute altitude values that are not dependent on the terrain elevation values. ▪ Select **Relative to Pivot** to place each point of the polyline at a specified altitude above the pivot point altitude, defined by its **Point Altitude**. The pivot is located at the center of the polyline. You can use this feature to create horizontal polylines in mountainous terrain. ▪ Select **On Terrain** to create the polyline on the terrain itself. This selection also changes the drawing method of the polyline. Instead of straight lines between the polyline's points, it paints the terrain in the selected color. It is recommended to use this feature to improve performance.
Altitude	Enter the altitude, as defined in Altitude Method, for the pivot point. The pivot's altitude is the average altitude of all the points. This value is used as the initial altitude of the points when you create a new polyline. Changing the pivot altitude to an existing polyline adjusts all the points according to the offset from the previous value.
X	Enter the X-coordinate for the polyline's pivot point.

	The pivot is located at the center of the polyline. Change this value to move the entire polyline.
Y	Enter the Y-coordinate for the polyline's pivot point. The pivot is located at the center of the polyline. Change this value to move the entire polyline.
MGRS	The coordinates of the polyline's pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Points Position	
The parameters in this group are enabled only when **Edit Nodes**  on the top bar of the property sheet is selected.	
Selected Point	Select the point you wish to edit. The selected point is highlighted on the 3D Window.
Point X	Enter the X-coordinate for the selected point.
Point Y	Enter the Y-coordinate for the selected point.
Point MGRS	The coordinates of the selected point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Point Altitude	Enter the altitude above ground (when the Altitude Method is set to **Relative to Terrain**), above the pivot altitude (when Altitude Method is set to **Relative to Pivot**), or absolute altitude (when the Altitude Method is set to **Absolute**) for the selected point.
Segment Yaw	Enter the direction from the selected point to the following point.
Segment Pitch	Enter the slope angle from the selected point to the following point.
Segment Length	Enter the distance between the selected point and the following point.
Texture	
The parameters in this group are enabled only when Terrain Method is set to Relative to Terrain, Absolute, or Relative to Pivot.	
Texture File	Type the full path of the file, or use the **Edit** button, for a BMP, GIF or JPEG texture file to provide the texture for the object. **Note**: You can set a transparent color for GIF and BMP files. Pixels with this color appear as holes in the texture. With GIF files, you can assign any color as the transparent color by using the GIF transparent color feature. With BMP files, the total-black color (RGB = 0, 0, 0) is used as the transparent color. **Note:** You can load textures from the Data Library(.\Program Files\Skyline\TerraExplorer Pro\Tools\Data-Library).
Tiling Method	Determines how the texture image file is applied to the polygon (extended polyline). The options are:

	▪ **Tiles per axis** – Designate a set number of tiles (repeats of the texture file) for the x and y axes of the polygon. The image file will be sized to enable the set number of tiles per axis. ▪ **Meters per tile** – Designate a size in meters for each tile.
Scale X	Determines the scaling for the texture according to the Tiling Method setting: ▪ If **Tiling Method** is **Tiles per axis**: Determines the number of repeats of the image file in the X-axis. ▪ If **Tiling Method** is **Meters per Tile:** Determines the size, in meters, of each tile in the X-axis.
Scale Y	Determines the scaling for the texture according to the Tiling Method setting: ▪ If **Tiling Method** is **Tiles per axis**: Determines the number of repeats of the image file in the Y-axis. ▪ If **Tiling Method** is **Meters per Tile:** Determines the size, in meters, of each tile in the Y-axis.
Rotate	Determines the angular rotation of the image used for the texture.
Texture X Scroll Rate	Number of times per second, texture scrolls completely on its x axis. If a negative value is entered, the texture scrolls in the reverse direction.
Texture Y Scroll Rate	Number of times per second, texture scrolls completely on its y axis. If a negative value is entered, the texture scrolls in the reverse direction.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the polyline. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the polyline based on its size.
Max. Visibility Distance	Sets the maximal distance from the camera above which the polyline disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the polyline disappears.
Max. Show-Through Dist.	Sets the maximum distance of object's pivot from camera, in meters, beyond which it will not show through terrain, mesh layers, or objects that are hiding it. Set to -1 to enable show-through at any distance when editing the object. The polyline's outline and fill will both show through. When an object is showing through terrain, mesh or objects, it can be selected, edited, and snapped to other objects.
Visibility	This property is only displayed for polyline features in a polyline feature layer.

	Set the visibility of features based on their attribute values, by entering a search expression. Type a search expression comprised of one or more conditions, or click the **Field by Attribute** button to create the search expression using the Attribute Table. **See** "Using Attribute Fields" in the "Feature Layers" chapter for more information. **Note:** You can also set visibility based on attribute values directly from the Attribute Table. **See** "Searching and Performing Operations by Attribute" in the "Feature Layers" chapter for information.
General	
Show in Viewer	Determines if the polyline appears in the 3D Window when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the polyline. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the polyline in the 3D Window.
Ground Object	Determines if the polyline is calculated as part of the terrain's elevation.
Order	Determines the order of objects with On Terrain altitude method, from back to front. Objects with higher values are displayed on top of objects with lower values.

Creating a New Polygon

To create a new polygon:

1. On the **Objects** tab, in the **2D Objects** group, click **Polygon**. The Polygon property sheet opens.
2. Set the parameters of the polygon. **See** "Polygon Property Sheet Parameters" in this chapter for information.
3. If you want to position the polygon based on where the mouse is pointing in the 3D Window, on the top bar of the label's property sheet, click **Set Position Based on Mouse**. **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" in the "Working with Objects" chapter for more information.
4. If you want to position the polygon based on where the mouse is pointing in the 3D Window **and** snap it to another object, on the top bar of the polygon's property sheet, click **Snap Based on Snapping Options**. **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" and "Setting Snapping Options" in the "Working with Objects" chapter for more information.
5. If you want to position the polygon in the XY plane, on the top bar of the object's property sheet, click **XY Plane**. **See** "Moving an Object in the XY Plane" in the "Working with Objects" chapter for more information.

6. If you want to position the polygon in the Z plane, on the top bar of the object's property sheet, click **Z Plane** . **See** "Moving an Object in the Z Plane" in the "Working with Objects" chapter for more information.
7. Place the polygon points in the 3D Window by clicking in the desired locations. You must place at least three points.

   Note: When creating a filled polygon, the lines of the polygon should not overlap each other. This may result in an irregular fill pattern.
8. Finish the polygon creation by right-clicking.

   Note: If you want to display the length of each polygon segment while creating and editing the polygon, select the "Show segments distance while editing a polygon/polyline" check box in the Options dialog. See "View" in the "Options" chapter for more information.
9. Edit the polygon's parameters in the 3D Window or using the property sheet. **See** "Editing Objects in the 3D Window" in the "Working with Objects" chapter for information. Close the property sheet to finish the operation.



Example of a Polygon Object

Polygon Property Sheet Parameters

Object Parameter	Activity
Symbol	
Type	Select the symbol type to use when rendering the features in a polygon feature layer: 2D polygon, 3D polygon, or building. The properties listed in the property sheet are based on the type selected. This property is only displayed for polygon feature layers. **See** "Building Property Sheet Parameters" in this chapter for a description of the properties listed if building is selected as the symbol type.
Appearance	
Name	Type the description or name of the polygon. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the object from the Project Tree.
Line Color	Select the outline color for the polygon. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Opacity	Enter the opacity for the object's lines. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Fill Color	Select the fill color for the polygon.

	Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Fill Opacity	Enter the opacity for the object's fill. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Line Style	
All the properties in this group except for Line Pattern are not available if Classification Mode is set to 3D polygon or colorize.	
Line Width	Enter the polygon's line width. The width is measured in meters.
Line Back Color	Sets the polygon back color. The line back color is visible when the **Line Pattern** property field is set to non-solid pattern values, or when the Line Width property field is set to a value that is larger than 1. The Line Back Color property is only enabled when the Altitude Method property in the Position group (**See** Position Group below) is set to On Terrain value. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Back Opacity	Enter the polygon line back opacity, visible when Line Pattern is set to non-solid patterns such as a dotted pattern. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent. The Line Back Opacity property is only enabled when the Altitude Method property in the Position group (**See** Position Group below) is set to On Terrain value.
Line Pattern	Select the polygon line pattern, e.g., solid, dashed, dotted or a combination thereof.
Line Spline	Determines if the polygon is drawn as a curve based on its nodes. This property is only enabled if Volume Classification is set to No.
Extend to Ground	Extend the edges of the polygon vertically to the ground (to create a partition such as a wall). Select **Yes** from the dropdown list to extend the selected polygon. **Note:** The Extend to Ground parameter is not available if the "On Terrain" Altitude method was selected.
Timespan	
Start Time	Click **Edit** and select the date and time when the polygon should first become visible.
End Time	Click **Edit** and select the date and time when the polygon should stop being visible.
Position	
Altitude Method	Sets the altitude method to be used by the polygon: ▪ Select **Relative to Terrain** to place each point of the polygon

	at a specified altitude above the ground, defined by its "Point Altitude." ▪ Select **Absolute** to place each point at a specified altitude above the terrain database vertical datum base ellipsoid. You can use this feature to create polygons of known absolute altitude values that are not dependent on the terrain elevation values. ▪ Select **Relative to Pivot** to place each point of the polygon at a specified altitude above the pivot point altitude, defined by its "Point Altitude." The pivot is located at the center of the polygon. You can use this feature to create horizontal polygons in mountainous terrain. ▪ Select **On Terrain** to create the polygon on the terrain itself. This selection also changes the drawing method of the polygon. Instead of straight lines between the polygon's points, it paints the terrain in the selected color. It is recommended to use this feature to improve performance.
Altitude	Enter the altitude, as defined in Altitude Method, for the pivot point. The pivot's altitude is the average altitude of all the points. This value is used as the initial altitude of the points when you create a new polygon. Changing the pivot altitude to an existing polygon adjusts all the points according to the offset from the previous value.
X	Enter the X-coordinate for the polygon's pivot point. The pivot is located at the center of the polygon. Change this value to move the entire polyline.
Y	Enter the Y-coordinate for the polygon's pivot point. The pivot is located at the center of the polygon. Change this value to move the entire polygon.
MGRS	The coordinates of the polygon's pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.

Volume Classification

The volume classification properties are applied when a polygon is used as a classification polygon for a different layer, e.g., mesh. Classification enables you to visually distinguish different areas of the layer and perform spatial and attribute queries on the polygon objects classifying the mesh layer. The classification can be displayed either by colorizing the intersecting layers and objects or by displaying a 3D polygon based on an extrusion of the polygon. **See** "Classifying Layers and Objects Using Feature Layers" in the "Feature Layers" chapter for more information on classification using polygon feature layers.

The properties in this group are enabled only if Extend to Ground is set to No.

Classification Mode	Determines whether to use the polygon as a classification polygon, and if it is used, how to display it: Classify by colorizing all objects and layers contained within the extruded polygon or Classify by displaying a 3D polygon (based on the extruded polygon).

Extrude Up / Front	Length to extrude the polygon upwards or frontwards in the direction of its normal. If a polygon's elevation angle to the ground is less than 20 degrees, the polygon is extruded vertically. If the polygon points were created in a clockwise orientation, then the front is the side facing the user. This option is only available if Classification Mode is set to 3D polygon or colorize.
Extrude Down / Back	Length to extrude the polygon downwards or backwards in the direction of its normal. If a polygon's elevation angle to the ground is less than 20 degrees, the polygon is extruded vertically. If the polygon points were created in a clockwise orientation, then the back is the side opposite the side facing the user. This option is only available if Classification Mode is set to 3D polygon or colorize.
2D Buffer	Distance of the buffer around the extruded polygon (in meters). This option is only available if Classification Mode is set to 3D polygon or colorize.
Points Position	
The parameters in this group are enabled only when **Edit Nodes**  on the top bar of the property sheet is selected.	
Selected Point	Select the point you wish to edit. The selected point is highlighted on the 3D Window.
Point X	Enter the X-coordinate for the selected point.
Point Y	Enter the Y-coordinate for the selected point.
Point MGRS	The coordinates of the selected point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Point Altitude	Enter the altitude above ground (when Altitude Method is set to "Relative to Terrain"), above the pivot altitude (when Altitude Method is set to "Relative to Pivot"), or absolute altitude (when the Altitude Method is set to "Absolute") for the selected point.
Segment Yaw	Enter the direction from the selected point to the following point.
Segment Pitch	Enter the slope angle from the selected point to the following point.
Segment Length	Enter the distance between the selected point and the following point.
Geometry	
Height	Enter the height of the polygon. This property is only available if 3D Polygon was selected as the Type.
Texture The properties in this group are enabled only if Volume Classification is set to No or 3D Polygon.	
Texture File	Type the full path of the file, or use the **Edit** button, for a BMP, GIF or JPEG texture file to provide the texture for the object. If the polygon was extended to the ground, the texture will be applied to all sides of the 3D polygon created.

	Note: You can set a transparent color for GIF and BMP files. Pixels with this color appear as holes in the texture. With GIF files, you can assign any color as the transparent color by using the GIF transparent color feature. With BMP files, the total-black color (RGB = 0, 0, 0) is used as the transparent color. **Note:** You can load textures from the Data Library (.\Program Files\Skyline\TerraExplorer Pro\Tools\Data-Library).
Tiling Method	Determines how the texture image file is applied to the polygon. The options are: ▪ **Tiles per axis** – Designate a set number of tiles (repeats of the texture file) for the x and y axes of the polygon. The image file will be sized to enable the set number of tiles per axis. ▪ **Meters per tile** – Designate a size in meters for each tile.
Scale X	Determines the scaling for the texture according to the setting for Tiling Method: ▪ If **Tiling Method** is **Tiles per axis**: Determines the number of repeats of the image file in the X-axis. ▪ If **Tiling Method** is **Meters per Tile:** Determines the size, in meters, of each tile in the X-axis.
Scale Y	Determines the scaling for the texture according to the setting for Tiling Method: ▪ If **Tiling Method** is **Tiles per axis**: Determines the number of repeats of the image file in the Y-axis. ▪ If **Tiling Method** is **Meters per Tile:** Determines the size, in meters, of each tile in the Y-axis.
Rotate	Determines the angular rotation of the image used for the texture.
Texture X Scroll Rate	Number of times per second, texture scrolls completely on its x axis. If a negative value is entered, the texture scrolls in the reverse direction. This property is enabled only when Terrain Method is set to Relative to Terrain, Absolute, or Relative to Pivot.
Texture Y Scroll Rate	Number of times per second, texture scrolls completely on its y axis. If a negative value is entered, the texture scrolls in the reverse direction. This property is enabled only when Terrain Method is set to Relative to Terrain, Absolute, or Relative to Pivot.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the polygon. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the polygon from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the polygon based on its size.
Max. Visibility Distance	Sets the distance from the camera at which the polygon disappears.

Min. Visibility Distance	Sets the minimal distance from the camera below which the polygon disappears.
Max. Show-Through Dist.	Sets the maximum distance of object's pivot from camera, in meters, beyond which it will not show through terrain, mesh layer, or objects that are hiding it. Set to -1 to enable show-through at any distance when editing the object. The object's outline and fill will both show through. When an object is showing through terrain, mesh or objects, it can be selected, edited, and snapped to other objects.
Visibility Filter	This property is only displayed for polygon features in a polygon feature layer. Sets the visibility of features based on their attribute values. Type a search expression comprised of one or more conditions, or click the **Field by Attribute** button  to create the search expression using the Attribute Table. **See** "Searching and Performing Operations by Attribute (Attribute Table Tool)" in the "Feature Layers" chapter for more information.
General	
Show in Viewer	Determines if the polygon appears in the 3D Window when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the polygon in the 3D Window.
Ground Object	Determines if the object is calculated as part of the terrain's elevation.
Order	Determines the order of objects with On Terrain altitude method, from back to front. Objects with higher values are displayed on top of objects with lower values.

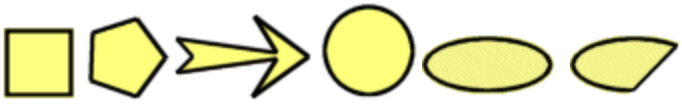
Creating a 2D Shape

To create a 2D shape:

1. On the **Objects** tab, in the **2D Objects** group, click **2D Shape**, and then click the required shape. The shape's property sheet opens.
2. Set the parameters of the 2D shape. **See** "2D Shape Property Sheet Parameters" in this chapter for information.
3. If you want to position the 2D shape based on where the mouse is pointing in the 3D Window, on the top bar of the label's property sheet, click **Set Position Based on Mouse** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" in the "Working with Objects" chapter for more information.
4. If you want to position the 2D shape based on where the mouse is pointing in the 3D Window **and** snap it to another object, on the top bar of the 2D shape's property sheet, click **Snap Based on**

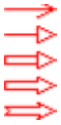
Snapping Options . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" and "Setting Snapping Options" in the "Working with Objects" chapter for more information.

5. If you want to position the 2D shape in the XY plane, on the top bar of the object's property sheet, click **XY Plane** . **See** "Moving an Object in the XY Plane" in the "Working with Objects" chapter for more information.
6. If you want to position the 2D shape in the Z plane, on the top bar of the object's property sheet, click **Z Plane** . **See** "Moving an Object in the Z Plane" in the "Working with Objects" chapter for more information.
7. Place the shape's points in the 3D Window:
   - **Rectangle** - Click to add the first corner, and then click a second time to add the opposite corner and complete the rectangle.
   - Regular Polygon  -
     i. Click to define the center (pivot point) of the regular polygon.
     ii. Drag the mouse to set its radius.
     iii. Click a second time to set the regular polygon.
   - Circle  -
     i. Click to define the center of the circle.
     ii. Drag the mouse to set the radius of the circle.
     iii. Click again to set the radius and complete the circle.
   - Ellipse 
     i. Click to define the center of the ellipse.
     ii. Drag the mouse in the X direction to define the first radius. Drag the mouse in the Y direction to define the second radius.
     iii. Click again to complete the ellipse.
   - Arc 
     i. Click to define the center of the ellipse from which the arc is formed.
     ii. Drag the mouse in the X direction to define the first radius. Drag the mouse in the Y direction to define the second radius.
     iii. Click again to complete the arc.
   - 2D Arrow 
     i. Click to define the pivot point of the 2D arrow.
     ii. Drag the mouse to set its size and direction.
     iii. Click a second time to set the 2D arrow.
8. Edit the shape's parameters in the open property sheet or in the 3D Window. **See** "Editing Objects in the 3D Window" in the "Working with Objects" chapter for information. Close the property sheet to finish the operation.



Examples of 2D Shapes

2D Shape Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the shape. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the shape from the Project Tree.
Line Color	Select the outline color for the shape. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Opacity	Enter the opacity for the shape's lines. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Fill Opacity	Enter the opacity for the shape's fill. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Fill Color	Select the fill color for the object. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Style	This property appears in the property sheet only for the arrow 2D Shape. Select the style of the 2D arrow that you want to use: 
Line Style	
Line Width	Enter the shape's line width. The width is measured in meters.
Line Back Color	Sets the shape's line-back color. The line back color is visible when the Line Pattern property field is set to non-solid pattern values, or when the Line Width property field is set to a value that is larger than 1. The Line Back Color field parameter is only enabled when the Altitude Method property in the Position group (**See** Position Group below) is set to On Terrain value.

	Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Back Opacity	The Line Back Opacity parameter is only enabled when the Altitude Method property in the Position group (**See** Position Group below) is set to On Terrain value. Enter the shape's line back opacity. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Line Pattern	Select the shape's line pattern, e.g., solid, dashed, dotted or a combination thereof.
Timespan	
Start Time	Click **Edit** and select the date and time when the shape should first become visible.
End Time	Click **Edit** and select the date and time when the shape should stop being visible.
Position	
Altitude Method	Select the drawing style of the shape: ▪ **Relative to Terrain** - Places each point of the shape at a specified altitude above the ground. ▪ **Absolute** - Places each point of the shape in the altitude above the terrain database vertical datum base ellipsoid. You can use this feature to create shapes of known absolute altitude values that are not dependent on the terrain elevation values. ▪ **Relative to Pivot** - Places each point of the shape at a specified altitude above the pivot point. The pivot is located at the center of the shape. You can use this feature to create horizontal shapes in mountainous terrain. ▪ **On Terrain**- Draws the shape on the terrain itself. This selection also changes the drawing method of the shape. Instead of straight lines between the shape's points, it paints the terrain in the selected color. It is recommended to use this feature to improve performance.
Altitude	Enter the altitude, as defined in Altitude Method, for the shape's pivot point.
X	Enter the X-coordinate for the shape's pivot point. This property is not displayed for the arrow 2D shape. The pivot is located at the center of the shape. Change this value to move the entire shape.
Y	Enter the Y-coordinate for the shape's pivot point. Change this value to move the entire shape. This property is not displayed for the arrow 2D shape.
MGRS	The coordinates of the shape's pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog.

	See "View" in the "Using TerraExplorer Options" chapter for more information.
Yaw	Determines the angle of rotation of the shape, about its pivot point. Change this value to rotate the entire shape by a specified angle. **Note**: The object's direction is initially set as the direction of the camera view, when the first point of the object is set in the 3D Window. To change the direction of the object after the object is created, you can adjust the Yaw parameter.
Geometry	
Length	This property appears in the property sheet only for the rectangle and arrow 2D shapes. Determines the length of the shape.
Width	This property appears in the property sheet only for the rectangle shape. Determines the width of the shape.
Radius	This property appears in the property sheet only for the regular polygon, arc, ellipse, and circle 2D shapes. For circle and regular polygon: ▪ **Radius X** - Determines the radius of the shape. This property defines the shape's size. For arc and ellipse: ▪ **Radius X**- Determines the radius of the arc in the X-axis. This axis is vertical with respect to the object's yaw direction. ▪ **Radius Y**- Determines the radius of the arc in the Y-axis. This axis is parallel with respect to the object's yaw direction. These two radius measurements define the size of the arc.
Number of Sides	This property appears in the property sheet only for the circle, regular polygon, arc, and ellipse 2D shapes. For circles, arcs, and ellipses - the greater the number of sides; the smoother the shape.
Start Angle	This property appears in the property sheet only for the arc 2D shape. Determines the angle at which the arc begins (default is 0). By changing the start and end angles, you can change the shape of the arc.
End Angle	This property appears in the property sheet only for the arc 2D shape. Determines the angle at which the arc ends (default is 180).
Texture	
Texture File	Type the full path of the file, or use the **Edit** button, for a BMP, GIF or JPEG texture file to provide the texture for the shape. **Note**: You can set a transparent color for GIF and BMP files. Pixels with this color appear as holes in the texture. With GIF files, you can assign any color as the transparent color by using the GIF transparent color feature. With BMP files,

	the total-black color (RGB = 0, 0, 0) is used as the transparent color. **Note:** You can load textures from the Data Library(.\Program Files\Skyline\TerraExplorer Pro\Tools\Data-Library).
Tiling Method	Determines how the texture image file is applied to the shape. The options are: ▪ **Tiles per axis** – Designate a set number of tiles (repeats of the texture file) for the x and y axes of the shape. The image file will be sized to enable the set number of tiles per axis. ▪ **Meters per tile** – Designate a size in meters for each tile.
Scale X	Determines the scaling for the texture according to the setting for Tiling Method: ▪ If **Tiling Method** is **Tiles per axis**: Determines the number of repeats of the image file in the X-axis. ▪ If **Tiling Method** is **Meters per Tile:** Determines the size, in meters, of each tile in the X-axis.
Scale Y	Determines the scaling for the texture according to the setting for Tiling Method: ▪ If **Tiling Method** is **Tiles per axis**: Determines the number of repeats of the image file in the Y-axis. ▪ If **Tiling Method** is **Meters per Tile:** Determines the size, in meters, of each tile in the Y-axis.
Rotate	Determines the angular rotation of the image used for the texture.
Texture X Scroll Rate	Number of times per second, texture scrolls completely on its x axis. If a negative value is entered, the texture scrolls in the reverse direction. This property is enabled only when Terrain Method is set to Relative to Terrain, Absolute, or Relative to Pivot.
Texture Y Scroll Rate	Number of times per second, texture scrolls completely on its y axis. If a negative value is entered, the texture scrolls in the reverse direction. This property is enabled only when Terrain Method is set to Relative to Terrain, Absolute, or Relative to Pivot.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the shape. This distance is used as a stop mark for any "Fly-to" or "View object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the shape based on its size.
Min. Visibility Distance	Sets the minimal distance from the camera below which the shape disappears.
Max. Visibility Distance	Sets the maximal distance from the camera above which the shape disappears.
Max. Show-Through Dist.	Sets the maximum distance of object's pivot from camera, in meters, beyond which it will not show through terrain, mesh layer,

	or objects that are hiding it. Set to -1 to enable show-through at any distance when editing the object. The object's outline and fill will both show through. When an object is showing through terrain, mesh or objects, it can be selected, edited, and snapped to other objects.
Visibility	This property is only displayed for point features in a feature layer. Sets the visibility of features based on their attribute values. Type a search expression comprised of one or more conditions, or click the **Field by Attribute** button  to create the search expression using the Attribute Table. **See** "Searching and Performing Operations by Attribute (Attribute Table Tool)" in the "Feature Layers" chapter for more information.
General	
Show in Viewer	Determines if the shape appears in the 3D Window when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and clicking the **Edit** button. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to display when the mouse cursor is placed over the shape in the 3D Window.
Ground Object	Determines if the object is calculated as part of the terrain's elevation.
Order	Determines the order of objects with On Terrain altitude method, from back to front. Objects with higher values are displayed on top of objects with lower values.

3D Objects

You can do any of the following:

- Load a 3D model
- Create a new building
- Create a 3D shape

Loading a 3D Model

The 3D model feature allows you to place a pre-prepared 3D object at any point in the 3D terrain. These models can be created using external design tools. Models can be loaded in any of the following formats:

- **COLLADA** (DAE), e.g., DAE models created in PhotoMesh or Sketchup
- **OBJ** – Wavefront simple data-format for storing 3D model surface geometry, color and texture information.
- **Direct X** (X) and its compressed version (XPC)

- **3DS** – 3D studio format for exchanging 3D data models
- **OpenFlight** (FLT) – Multigen format for exchanging 3D data models and its compressed version (FPC)
- **XPL** and **XPL2**, which provide better performance for the Direct X model (A set of XPL files is created from a single X file where each file contains data for one Level of Detail (LOD) only)
- **GLB** – Binary file format representation of 3D mesh models saved in the GL Transmission Format (glTF).

All model formats support BMP, JPG, DDS, and PNG texture formats. FLT also supports Silicon Graphics popular texture formats (RGB, RGBA, INT, INTA, BW).

All loaded models can be optimized by conversion to XPL2, either by using the Convert Models to XPL tool or automatically during the publishing process.

Note: Model files are automatically converted to XPL2 during the loading process if the option is selected in Project Settings. **See** "General" in the "Setting the Project" chapter.

When a model file is converted to XPL, a set of XPL files is created from a single X file where each file contains data for one Level of Detail (LOD) only. TerraExplorer displays the best LOD file based on the viewer position in relation to the object. When downloaded from a web server, each file is also downloaded independently. This results in an improvement in overall model display performance as well as download rate.

Note: Generating Level of Detail is recommended for projects that have dense model layers, with non-optimized models (e.g., KML with DAE models). Although objects may take slightly longer to load the first time, memory usage will be optimized.

Note: XPL files were created by earlier versions of TerraExplorer Pro. Newer versions create only XPL2 files.

Note: The following limitations apply when loading 3DS files:

- When 3DS animation files are loaded, only the first frame is read.
- The alpha must be in the diffuse map and not in the mask map.

Note: The following limitations apply when loading OpenFlight (FLT) files:

- Only the best LOD is used.
- Animation is not supported.
- External referencing is not supported (One FLT file cannot link to another one).

Loading a New 3D Model

To load a new 3D model:

1. On the **Objects** tab, in the **3D Objects** group, click **3D Model**. The **Browse for 3D Model** dialog is displayed.
2. Browse to the required file to load, and click **Open**. The 3D model is displayed in the 3D Window and the Static 3D Model Property sheet is displayed.
3. If you want to add the 3D model based on where the mouse is pointing in the 3D Window, on the top bar of the label's property sheet, click **Set Position Based on Mouse** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" in the "Working with Objects" chapter for more information.

4. If you want to add the 3D model based on where the mouse is pointing in the 3D Window **and** snap it to another object, on the top bar of the 3D model's property sheet, click **Snap Based on Snapping Options** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" and "Setting Snapping Options" in the "Working with Objects" chapter for more information.
5. If you want to add the 3D model in the XY plane, on the top bar of the object's property sheet, click **XY Plane** . **See** "Moving an Object in the XY Plane"
6. With the cursor in the 3D Window, click the mouse to define the position of the 3D model's pivot point on the terrain.

   Note: The pivot point of a 3D model is set at the 0, 0, 0 point in the object's coordinate system. It is recommended to create the object with the pivot point located at the center of the bottom surface of the object. To change an object's pivot point, you should edit it with the original tool from which it was built.
7. You can adjust the model's position and size in the 3D Window or from the model's property sheet. **See** "Editing Objects in the 3D Window" in the "Working with Objects" chapter.
8. Using the **property sheet**, set the parameters of the 3D object. **See** "3D Model Property Sheet Parameters" in this chapter for information.



Example of a 3D Model Object

3D Model Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the 3D model. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the 3D model from the Project Tree.
Shadow	When set to Yes, a shadow is cast on the 3D model. The sun is positioned according to the time, date and time zone you set using the Date and Time controls. The shadow dynamically updates when the system date and time is changed.
Model	
File Name	Type or browse a path to an .x, .xpc, .flt, .fpc, .3ds or .dae file to load as the 3D model.
Model Type	Select **Animation** to play the object animation or **Still** to stop object animation at the first frame. This option is enabled only for Direct X animation models that comply with the DirectX specification.
Animation Speed Rate	Selects the animation speed rate.

Position	
Altitude Method	Sets the altitude method to be used by the 3D model: ▪ Select **Relative to Terrain** to place the 3D model's pivot point at a specified altitude above the ground. ▪ Select **Absolute** to place the 3D model's pivot point at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	Enter the altitude, as defined in Altitude Method, for the 3D model's pivot point. If the model has a Z value, this value is added to each Z-coordinate.
X	Enter the X-coordinate for the 3D model's pivot point.
Y	Enter the Y-coordinate for the 3D model's pivot point.
MGRS	The coordinates of the 3D model's pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Yaw	Determines the direction angle of the 3D model along the vertical axis relative to north.
Pitch	Determines the tilt angle of the 3D model along its lateral axis relative to the horizon.
Roll	Determines the roll angle of the 3D model along its longitudinal (front-to-back) axis.
Geometry	
Maintain Aspect Ratio	Maintain the model's proportional relationship between the width, length, and height. If **Yes** is selected, when the scale factor in one of the axis is modified, the scale factor in the other two axes is automatically adjusted to maintain the original width:length:height ratio. If **No** is selected, the scale factor in each axis can be modified independently of the other axis scale factors.
Scale X	Determines the length on the X axis of the 3D model. The actual X value of the model in the 3D World is the x value of the model in its internal coordinate system times the Scale X value. (i.e., if the model has an X value of 5 units and the Scale X is set to 10 meters per pixel, the X value of the object in the 3D World is 50 meters.)
Scale Y	Determines the length on the Y axis of the 3D model. The actual Y value of the model in the 3D World is the Y value of the model in its internal coordinate system times the Scale Y value. (i.e., if the model has a Y value of 10 units and the Scale Y is set to 10 meters per pixel, the Y value of the object in the 3D World is 100 meters.)
Scale Z	Determines the height (Z value) of the 3D model. The actual height of the model in the 3D World is the height of the model in its internal coordinate system times the Scale Z value.

	(i.e., if the model has a height of 5 units and the Scale Z is set to 10 meters per pixel, the height of the object in the 3D World is 50 meters.)
Best LOD Size	Enter the minimum size of the object, in pixels, at which the object is displayed in the best level of detail. When zooming out from the best LOD size the object is displayed using data retrieved from a lower Level of Detail file. For more information, **see** "Loading a New 3D Model" in this chapter. This size can be set automatically by clicking the **Capture** button in the Set Best LOD field.
Set Best LOD	Clicking the **Capture** button sets the current object size as the size where the best level of detail is used. When the object is zoomed out from the best-fit size, it is displayed using data retrieved from a lower Level of Detail file.
Timespan	
Start Time	Click **Edit** and select the date and time when the model should first become visible.
End Time	Click **Edit** and select the date and time when the model should stop being visible.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the 3D model. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the 3D model based on its size.
Max. Visibility Distance	Sets the maximal distance from the camera above which the model disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the model disappears.
General	
Show in Viewer	Determines if the 3D model appears in the 3D Window when the file is viewed with the TerraExplorer Basic Viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the 3D model in the 3D Window.
Ground Object	Determines if the object is calculated as part of the terrain's elevation.

Creating a New Building

The Building feature allows you to add 3D models to the project by manually defining the geometry of the building rooftop and stretching it above the basic terrain, or by loading the rooftop geometry from external feature layers.

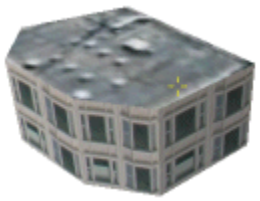
You can define the shape of the roof as a flat surface, or as an angular surface. After defining the building geometry, you can assign fill color and texture from external files or apply texture from the terrain to the roof and side walls.

To create a new building:

1. On the **Objects** tab, in the **3D Objects** group, click **Building**.
2. With the cursor in the **3D Window**, click the mouse to add the first point of the roof.
3. Click again to add additional points of the roof's polygon until you have marked the entire shape. You must place at least three points to define the roof.

   Note: When creating a building, the lines of the roof polygon should not overlap each other. This may result in an irregular object.

   Note: It is recommended to keep the number of roof points to the minimum required to define the shape. Adding unnecessary points may adversely affect performance.
4. Right-click to finish the roof polygon.
5. If there is a horizontal offset between the roof and the building base in the aerial/satellite imagery, use the mouse pointer to drag the base polygon (in green) to its place on the imagery and left click to finish the operation.
6. If there is no horizontal offset between the roof and the building base in the aerial/satellite imagery right-click again to finish the operation.
7. Enter the roof height of the building under **Geometry** in the **Building property sheet**.
8. Continue to edit the building's parameters and shape, or close the property sheet to finish the operation.



Example of a Building Object

Defining Roof and Wall Fill Types

For each of a building's sidewalls and its roof, you can assign a fill that is a single color, a texture from a file, or a texture from the terrain pattern. A different fill type can be assigned to each face of the building.

To change a building's fill type:

1. In the **Texture** section of the property sheet, in the **Selected Face** field, select the required surface.
2. In the **Face Fill Type** field, select the required fill type.

   Note: You can select the **Terrain Texture** option for sidewalls only if the building has an offset between the roof and the base frames.
3. For each surface for which you select **Terrain Texture** as the fill type, assign the **Face Terrain Texture** parameter. If a wall has an exposed texture on the satellite/aerial imagery, you should use its

own texture. If the wall's texture in not available, you can assign the texture from one of the other exposed walls.

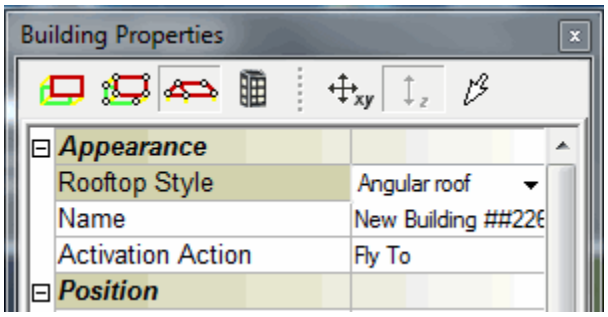
Note: It is recommended not to break an exposed wall into sub-walls. This allows you to use the entire wall texture for non-exposed walls.

4. For each surface for which you select **Single Color** as the fill type, select a **Face Color**.
5. For each surface for which you select **Image File Texture** as the fill type, browse to the required **Face Texture File**.

Modifying the Building Geometry and Position

After creating the building's initial geometry, you can still modify it by selecting one of the top bar tools and editing the building shape in the 3D Window.

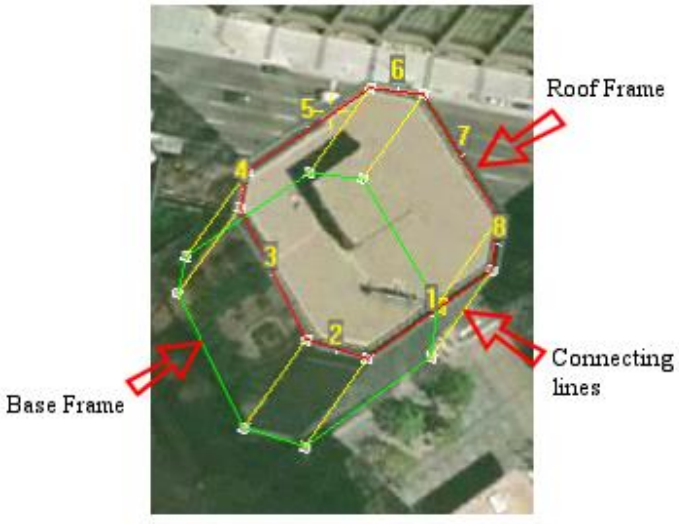
Mode	Description
2D View mode	While editing the building's base, roof and angular roof geometry, the building is displayed in 2D View mode. In this mode, you can view and edit the buildings outlines and nodes.
3D Window mode	This option displays the building as a complete 3D model. Use this option to edit the height of the building and view the result of your 2D editing.



Building Properties Window Top Bar

Icon	Function	Activity
	Edit roof/base position	Select this option to move the building's roof, base or the entire shape. ▪ Click and drag the **green** polygon to move the base frame. ▪ Click and drag the **red** polygon to move the roof frame. ▪ Click and drag the **yellow** line to move the entire building.
	Edit roof/base nodes	Select this option to move, add or delete nodes on the base or roof frames. ▪ Click and drag a node on the **green** polyline to move a node on the base frame.

		▪ Click and drag a node on the **red** polyline to move a node on the roof frame. ▪ Click and drag the **yellow** lines to move the base and roof nodes simultaneously. ▪ Select a segment between two nodes on the base or on the roof to add an additional corner to the building. ▪ Right-click on a base or roof node and select the **Delete Node** option to delete the corner of the building.
	Edit angular roof	Select this option to modify the angular roof geometry. This feature is enabled when the "Angular Roof" option is selected.
	3D Window mode	Select this option to view the building model in its final view. To move the building select "Move in the XY plane" mode and drag the building to a new position. You can also change the building height by selecting "Move in the Z axis" mode, clicking in the 3D Window and dragging the pointer up and down.
	Move in the XY plane	All movements are limited to the X and Y plane.
	Move in the Z axis	All movements are limited to the Z-axis. This option is only available when working in a 3D Window mode.



Building Geometry and Position

Creating Angular Roof

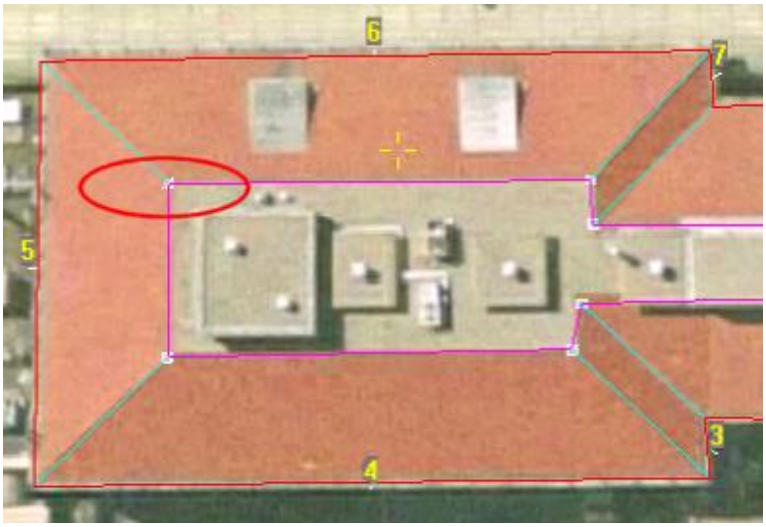
To create an angular roof:

1. After creating the building geometry in the **Appearance** section of the property sheet, in the **Rooftop Style** field, select **Angular Roof**.
2. On the top bar of the property sheet, click **Edit Angular Roof** .

3. In the 3D Window, select the angular roof points and drag them to the top-most position of the roof. The angular roof points are located between the connecting lines (cyan) and the rooftop frame (purple). The points of the angular roof shape should not overlap each other.

   Note: For adding additional angular roof points, you must switch to Edit Nodes mode, add additional roof point in the desired location and switch back to Edit Angular Roof mode.

4. In the **Geometry** section of the property sheet, set the rooftop delta height.



Angular Roof Geometry Setting

Working with the Building Lean Ratio Parameters

In many cases, the aerial imagery in large parts of a city has the same pitch angle. This means that all the buildings in this area have the same leaning ratio on the imagery. After manually setting one building, you can select all the buildings in this area and set the **Building Lean X Ratio** and **Building Lean Y Ratio** parameters according to the values of the building you have set manually.

TerraExplorer automatically calculates the roof and base locations according to the buildings' height and the leaning ratio you have set. The calculation is valid only when the rooftop frames are located in the correct geographic location and not according to the distorted imagery.

Note: This feature is mostly relevant when loading the rooftop geometry from an external feature layer.

Building Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the building. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the building from the Project Tree.
Rooftop Style	Determines whether the roof is flat or angular
Position	
Altitude Method	Sets the altitude method to be used by the building:

	▪ Select **Relative to Terrain** to set the building's altitude values at a specified altitude above the ground. ▪ Select **Absolute** to set the building's altitude values at a specified altitude above the terrain database vertical datum base ellipsoid.
Base Altitude	Enter the altitude, as defined in Altitude Method, for the base of the building.
Roof Altitude	Enter the altitude, as defined in Altitude Method, for the roof of the building.
X	Enter the X coordinate for the building's pivot point, the center of its base.
Y	Enter the Y coordinate for the building's pivot point, the center of its base.
Geometry	
Building Height	Determines the height of the building above its base. This is identical to the difference between the Roof Altitude and Base Altitude.
Rooftop Delta Height	Determines the height of the top of the angular roof above the building. This field is available only when Rooftop Style is set to Angular roof.
Texture **Note**: These fields are unavailable if you have selected the Stretch Terrain style.	
Selected Face	Select the face to modify. ▪ **Roof**: Select this option to change the roof color or texture. ▪ **All Walls**: Select this option to change the color or texture for all walls in the building. ▪ **Wall #**: Select a single wall to edit. **Note**: The walls are numbered according to the creation order. You can view the numbering labels above the center of the roof segment for each wall.



Face Fill Type	Select the fill type of the selected face. ▪ **Single Color**: The face gets a single color filling according to the **Face Color** field. ▪ **Image File Texture**: The face gets the texture from an external texture file according to the **Face Texture File** field. **Note**: Building texture files can be loaded from the Buildings-Textures folder located under the TE application files ((.\Program Files\Skyline\TerraExplorer Pro\Tools\Data-Library\Buildings-Textures) and old projects using these textures will be supported. ▪ **Terrain Texture**: The face gets the texture from the terrain imagery according to the **Face Terrain Texture** field.
Face Color	Select the color of the selected face. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Face Texture File	Type the full path of the file, or use the **Edit** button, for a BMP, GIF or JPEG texture file to provide the texture for the selected face. **Note**: The faces texture dimensions must be a power of 2 (i.e., 32 pixels by 64 pixels). **Note**: You can set a transparent color for GIF and BMP files. Pixels with this color appear as holes in the building. With GIF files, you can assign any color as the transparent color by using the GIF transparent color feature. With BMP files, the total-black color (RGB = 0, 0, 0) is used as the transparent color.
Face Terrain Texture	Assign a terrain texture to the selected face. The **Face Terrain Texture** dropdown list displays all the walls of the building with exposed texture.

	By default, every exposed wall gets its own texture and all other walls get the biggest exposed texture. You can override this setting by assigning any exposed texture to any wall of the building. **Note**: This field is available only if Terrain Texture option is selected.
Face Tiling Method	Determines the type of scaling for the texture. **Note**: The Face Tiling Method, Face Scale X, Face Scale Y and Face Rotation parameters are available only for faces with "Image File Texture" fill type.
Face Scale X	Determines the scaling for the texture according to the setting for Tiling Method: ▪ If the **Tiling Method** is **Tiles per face**: It determines the number of repeats, for the selected face, of the texture in the X-axis. ▪ If the **Tiling Method** is **Meters per Tile**: It determines the size of each texture tile in meters in the X-axis. If the texture is smaller than the face, it repeated until it fills the face.
Face Scale Y	Determines the scaling for the texture according to the setting for Tiling Method: ▪ If the **Tiling Method** is **Tiles per face**: It determines the number of repeats, for the selected face, of the texture in the Y-axis. ▪ If the **Tiling Method** is **Meters per Tile**: It determines the size of each texture tile in meters in the Y-axis. If the texture is smaller than the face, it repeated until it fills the face.
Face Rotation	Determines the angular rotation of the texture used for the selected face.
Building Lean X Ratio	The offset in the X-axis between the roof position, in the image, and the actual building position, divided by the building height.
Building Lean Y Ratio	The offset in the Y-axis between the roof position, in the image, and the actual building position, divided by the building height.
Timespan	
Start Time	Click **Edit** and select the date and time when the building should first become visible.
End Time	Click **Edit** and select the date and time when the building should stop being visible.
Visibility	
Default Viewing Distance	Determines the viewing distance of the building from the polyline. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the building based on its size.

Max. Visibility Distance	Sets the maximal distance from the camera above which the building disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the building disappears.
General	
Show in Viewer	Determines if the building appears in the Project Tree when the file is viewed with the TerraExplorer Basic Viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the building in the 3D Window.
Ground Object	Determines if the object is calculated as part of the terrain's elevation.

Creating a 3D Shape

To create a new 3D shape:

1. On the **Objects** tab, in the **3D Objects** group, click **3D Shape**, and then click the required shape. The 3D shape's property sheet opens.
2. In the shape's **property sheet**, set the object's parameters.
3. If you want to position the 3D shape based on where the mouse is pointing in the 3D Window, on the top bar of the label's property sheet, click **Set Position Based on Mouse** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" in the "Working with Objects" chapter for more information.
4. If you want to position the 3D shape based on where the mouse is pointing in the 3D Window **and** snap it to another object, on the top bar of the 3D shape's property sheet, click **Snap Based on Snapping Options** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" and "Setting Snapping Options" in the "Working with Objects" chapter for more information.
5. If you want to position the 3D shape in the XY plane, on the top bar of the object's property sheet, click **XY Plane** . **See** "Moving an Object in the XY Plane" in the "Working with Objects" chapter.
6. If you want to position the 3D shape in the Z plane, on the top bar of the object's property sheet, click **Z Plane** . **See** "Moving an Object in the Z Plane" in the "Working with Objects" chapter for more information.
7. With the cursor in the **3D Window**, draw the shape required as described in the sections below:
   - Box
   - Cylinder
   - Sphere
   - Cone
   - Pyramid

- 3D Arrow
- 3D Polygon

8. Edit the shape's parameters in the 3D Window or using the property sheet. **See** "Editing Objects in the 3D Window" in the "Working with Objects" chapter for information. Close the property sheet to finish the operation.

Box

To draw a box:

1. Click the mouse to define the first corner of the box.
2. Drag the cursor to set the base of the box.
3. Once the base is set, click again to complete it.
4. Move the mouse up or down to define the height of the box.
5. Once the height is set, click again to complete the box.

Cylinder

To draw a cylinder:

1. Click the mouse to define the center point of the cylinder's base.
2. Drag the cursor to set the base of the cylinder.
3. Once the base is set, click again to complete it.
4. Move the mouse up or down to define the height of the cylinder.
5. Once the height is set, click again to complete the cylinder.

Sphere

To draw a sphere:

Note: In the property sheet, you can choose to create a full sphere or just an upper or lower half of a sphere. When using half a sphere you can create it with or without a base.

1. Click the mouse to define the bottom center (pivot point) of the sphere.
2. Drag the cursor to define the radius of the sphere.
3. Once the radius is set, click again to complete the sphere.

Cone

To draw a cone:

1. Click the mouse to define the center point of the base circle.
2. Drag the cursor to define the radius of the base circle.
3. Once the base circle is set, click again to complete it.
4. Move the mouse up or down to define the height of the cone.
5. Once the height is set, click again to complete the cone.

Pyramid

To draw a pyramid:

1. Click the mouse to define the first base point.
2. Drag the cursor to set the base of the pyramid.
3. Once the base is set, click again to complete it.
4. Move the mouse up or down to define the height of the pyramid.

5. Once the height is set, click again to complete the pyramid.

3D Arrow

To draw a 3D arrow:

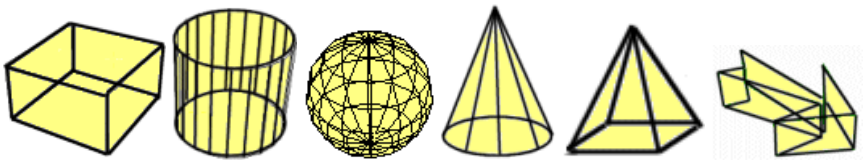
1. Click the mouse to define the pivot point of the 3D arrow.
2. Drag the cursor to set the length of the 3D arrow.
3. Once the base of the arrow is set, click again to complete it.
4. Move the mouse up or down to define the height of the arrow.
5. Once the height is set, click again to complete the 3D arrow.

3D Polygon

To draw a 3D polygon:

1. Click the mouse to define the first point of the 3D polygon.
2. Drag the cursor to the second point. Click again to set the second point.
3. Repeat the above step as many times as you like, until you have created your desired shape for the polygon. (The polygon still appears two-dimensional at this point.)

   Note: When creating a 3D Polygon, the lines of the base polygon should not overlap each other. This may result in an irregular object.
4. Once the shape is established, click the right mouse button to complete it.
5. Move the mouse up or down to define the height of the 3D polygon.
6. Once the height is set, click again to complete the 3D polygon.



Examples of 3D Shape Objects

3D Shape Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the shape. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the shape from the Project Tree.
Line Color	Select the outline color for the shape. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Opacity	Enter the opacity for the shape's lines.

	The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Fill Color	Select the fill color for the shape. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff). This option is enabled only when the Fill Opacity value is greater than zero.
Fill Opacity	Enter the opacity for the shape's fill. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Style	This property appears only for the 3D arrow shape. The style of the 3-dimensional arrow. Can be one of the following when looking at the arrow from a top-view: 0 -  1 - 
Sphere Style	This property appears in the property sheet only for the sphere 3D shape. Determines the style of the sphere. Select Normal, or select Half up, or Half down with or without base.
Segment Density	This property appears in the property sheet only for the sphere 3D shape. Determines a factor used to calculate the number of sides of the sphere. The higher the value of the segment density, the smoother the sphere.
Line Style	
Line Pattern	Select the line pattern for the shape. You can choose between different line patterns, e.g., solid, dashed, and dotted or a combination thereof.
Timespan	
Start Time	Click **Edit** and select the date and time when the shape should first become visible.
End Time	Click **Edit** and select the date and time when the shape should stop being visible.
Position	
Altitude Method	Sets the altitude method to be used by the shape: ▪ Select **Relative to Terrain** to place the shape's pivot point at a specified altitude above the ground. ▪ Select **Absolute** to place the shape's pivot point at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	Enter the altitude, as defined in Altitude Method, for the shape's pivot point, the center of its base.
X	This property does not appear in the property sheet for the arrow 3D shape.

	Enter the X-coordinate for the shape's pivot point, the center of its base.
Y	This property does not appear in the property sheet for the arrow 3D shape. Enter the Y-coordinate for the shape's pivot point, the center of its base.
MGRS	The coordinates of the shape's pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Yaw	Determines the direction angle of the shape along the vertical axis relative to north.
Pitch	Determines the tilt angle of the shape along its lateral axis relative to the horizon.
Roll	Determines the roll angle of the shape along its longitudinal (front-to-back) axis.
Points Position	
The parameters in this group appear in the property sheet only for 3D polygons. They are enabled only when **Edit Nodes**  is selected on the property sheet top bar.	
Selected Point	Select the point to edit. The selected point is highlighted on the 3D Window. When you edit this point, the corresponding point on the base or the top of the polygon changes accordingly.
Point X	Enter the X-coordinate for the selected point.
Point Y	Enter the Y-coordinate for the selected point.
Point MGRS	The coordinates of the selected point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Geometry	
Radius X	This property appears in the property sheet only for the sphere, cone, and cylinder 3D shapes. Determines the length of the radius.
Number of sides	This property appears in the property sheet only for the cone and cylinder 3D shapes. Determines the number of sides. The greater the number of sides; the smoother the shape.
Height	This property is displayed for all the 3D shapes except for sphere. Determines the height.
Length	This property appears in the property sheet only for the box, pyramid, and 3D arrow 3D shapes. Determines the length. For 3D arrow, the length also affects the width.

Width	This property appears in the property sheet only for the box and pyramid 3D shapes. Determines the width.
Texture	
Texture File	Type the full path of the file, or use the **Edit** button, for a BMP, GIF or JPEG texture file to provide the texture for the object. If the polygon was extended to the ground, the texture will be applied to all sides of the 3D polygon created. **Note**: You can set a transparent color for GIF and BMP files. Pixels with this color appear as holes in the texture. With GIF files, you can assign any color as the transparent color by using the GIF transparent color feature. With BMP files, the total-black color (RGB = 0, 0, 0) is used as the transparent color. **Note:** You can load textures from the Data Library(.\Program Files\Skyline\TerraExplorer Pro\Tools\Data-Library).
Tiling Method	Determines how the texture image file is applied to the shape. The options are: ▪ **Tiles per axis** – Designate a set number of tiles (repeats of the texture file) for the x and y axes of the shape. The image file will be sized to enable the set number of tiles per axis. ▪ **Meters per tile** – Designate a size in meters for each tile.
Scale X	Determines the scaling for the texture according to the setting for Tiling Method: ▪ If **Tiling Method** is **Tiles per axis**: Determines the number of repeats of the image file in the X-axis. ▪ If **Tiling Method** is **Meters per Tile:** Determines the size, in meters, of each tile in the X-axis.
Scale Y	Determines the scaling for the texture according to the setting for Tiling Method: ▪ If **Tiling Method** is **Tiles per axis**: Determines the number of repeats of the image file in the Y-axis. ▪ If **Tiling Method** is **Meters per Tile:** Determines the size, in meters, of each tile in the Y-axis.
Rotate	Determines the angular rotation of the image used for the texture.
Texture X Scroll Rate	Number of times per second, texture scrolls completely on its x axis. If a negative value is entered, the texture scrolls in the reverse direction. This property is enabled only when Terrain Method is set to Relative to Terrain, Absolute, or Relative to Pivot.
Texture Y Scroll Rate	Number of times per second, texture scrolls completely on its y axis. If a negative value is entered, the texture scrolls in the reverse direction. This property is enabled only when Terrain Method is set to Relative to Terrain, Absolute, or Relative to Pivot.
Visibility	

Default Viewing Distance	Determines the viewing distance of the camera from the shape. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the object based on its size.
Max. Visibility Distance	Sets the distance from the camera above which the shape disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the shape disappears.
Max. Show-Through Dist.	Sets the maximum distance of object's pivot from camera, in meters, beyond which it will not show through terrain, mesh layer, or objects that are hiding it. Set to -1 to enable show-through at any distance when editing the object. When an object is showing through terrain, mesh or objects, it can be selected, edited, and snapped to other objects.
Visibility	This property is only displayed for point features in a feature layer. Sets the visibility of features based on their attribute values. Type a search expression comprised of one or more conditions, or click the **Field by Attribute** button  to base visibility on attribute values using the Attribute Table. **See** "Searching and Performing Operations by Attribute (Attribute Table Tool)" in the "Feature Layers" chapter for more information.
General	
Show in Viewer	Determines if the shape appears in the Project Tree when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the shape. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the shape in the 3D Window.
Ground Object	Determines if the shape is calculated as part of the terrain's elevation.

Dynamic Objects

Dynamic objects provide an easy-to-use way to add movement to 3D objects as well as text and image labels. You can also create a virtual dynamic object that is a dynamic route with no object assigned to it. You can then attach any object to the virtual dynamic object, and it follows the route you have set for it.

You set the route of a dynamic object by manually placing waypoints in the 3D Window. The object's speed is set either by setting a specific speed for the object in the object's property sheet, or by setting the object to Move by Time and then defining a Start and End time. TerraExplorer Pro features a set of ground and air vehicles that you can add to your project.

Ground and Air Vehicles

Ground vehicles get pitch and roll angles according to the terrain surface under the object while it moves. Air vehicles get pitch and roll angles according to the altitude differences between the waypoints, regardless of the terrain surface.

Creating Dynamic Objects

To create a new dynamic object:

1. If you want to create a ground vehicle, on the **Objects** tab, in the **Dynamic Objects** group, click **Ground Object**. The **Dynamic Object** property sheet is displayed.
2. If you want to create an air vehicle, on the **Objects** tab, in the **Dynamic Objects** group, click **Aerial Object**. The **Dynamic Object** property sheet is displayed.
3. In the **Object Options** section of the **property sheet**, in the **Object Type** field, select one of the following:
   - 3D model
   - Image label
   - Text label
   - Virtual
4. In the **Object Options** section of the **property sheet**, in the **Motion Style** field, select one of the following:
   - Ground Vehicle
   - Airplane
   - Helicopter
   - Hover
5. If you selected a "3D Model" or "Image Label" type, in the **File Name** field, select the model or image file.
6. If you selected a "Text Label" type, in the **Text** field, enter the desired text string.
7. Using the property sheet, set the other parameters of the ground or aerial object. **See** "Creating Dynamic Objects that Move by Time" in this chapter.
8. If you want to position the dynamic object based on where the mouse is pointing in the 3D Window, on the top bar of the label's property sheet, click **Set Position Based on Mouse** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" in the "Working with Objects" chapter for more information.
9. If you want to position the dynamic object based on where the mouse is pointing in the 3D Window **and** snap it to another object, on the top bar of the dynamic object's property sheet, click **Snap Based on Snapping Options** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" and "Setting Snapping Options" in the "Working with Objects" chapter for more information.
10. If you want to position the dynamic object in the XY plane, on the top bar of the object's property sheet, click **XY Plane** . **See** "Moving an Object in the XY Plane" in the "Working with Objects" chapter.

11. If you want to position the dynamic object in the Z plane, on the top bar of the object's property sheet, click **Z Plane** . **See** "Moving an Object in the Z Plane" in the "Working with Objects" chapter for more information.
12. With the cursor in the **3D Window**, click the mouse to define the first waypoint of the vehicle's route.
13. Use additional mouse clicks to add waypoints to the path.
14. When you finish adding waypoints to the path, right-click to complete the route. When you close the property sheet, the vehicle starts moving along the route you have defined.

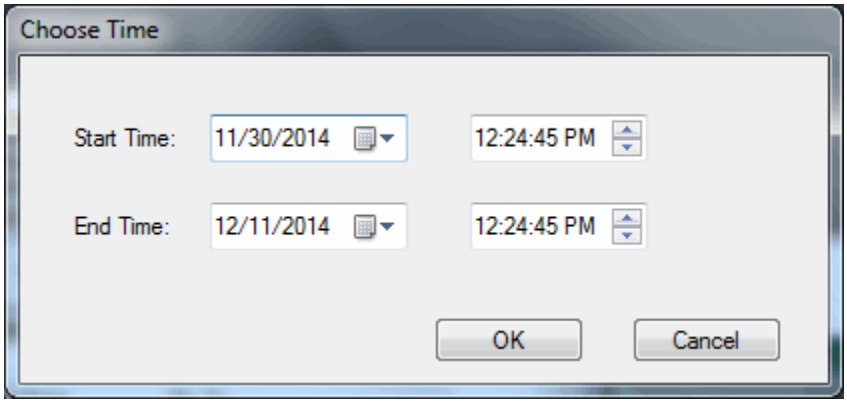
Note: After creation, you can change the parameters of the vehicle and the route using the property sheet. **See** "Working with the Property Sheet" in the "Working with Objects" chapter.

Creating Dynamic Objects that Move by Time

Instead of setting an object's speed and acceleration, a dynamic object's route can be set to begin and end at specific times. In this case, the object's acceleration is set to zero and its position is derived from the route distance, set timespan, and current TerraExplorer time.

To set a dynamic object's movement by time:

1. On the **Objects** tab, in the **Dynamic Objects** group, click **Move By Time**. The Choose Time dialog and Dynamic Object property sheet are displayed.



Choose Time Dialog

2. Enter a **Start Time** and **End Time** and click **OK**.
3. In the **Object Options** section of the **property sheet**, in the **Object Type** field, select one of the following:
   - 3D model
   - Image label
   - Text label
   - Virtual
4. In the **Object Options** section of the **property sheet**, in the **Motion Style** field, select one of the following:
   - Ground Vehicle
   - Airplane
   - Helicopter
   - Hover

5. If you selected a "3D Model" or "Image Label" type, in the **File Name** field, select the model or image file.
6. If you selected a "Text Label" type, in the **Text** field, enter the desired text string.
7. Using the property sheet, set the other parameters of the ground or aerial object. **See** "Dynamic Object Property Sheet Parameters" in this chapter.
8. If you want to position the dynamic object based on where the mouse is pointing in the 3D Window, on the top bar of the label's property sheet, click **Set Position Based on Mouse** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" in the "Working with Objects" chapter for more information.
9. If you want to position the dynamic object in the XY plane, on the top bar of the object's property sheet, click **XY Plane** . **See** "Moving an Object in the XY Plane" in the "Working with Objects" chapter.
10. With the cursor in the **3D Window**, click the mouse to define the first waypoint of the vehicle's route.
11. Use additional mouse clicks to add waypoints to the path.
12. When you finish adding waypoints to the path, right-click to complete the route. The vehicle will only be visible during the timespan you set.

Note: After creation, you can change the parameters of the vehicle and the route using the property sheet. The Speed parameter will be unavailable since when moving objects by time, object speed is determined by the speed required to travel the set route in the set timespan. **See** "Working with the Property Sheet" in the "Working with Objects" chapter.

Dynamic Object Property Sheet Parameters

Object Parameter	Activity
Appearance	
Activation Action	Select the action to perform when selecting the dynamic object from the Project Tree.
Name	Type the description or name of the dynamic object. This text appears in the Project Tree as the name of the object.
Object Options	
Motion Style	Determines the style of motion of the dynamic object. You can choose from Ground Vehicle, Airplane, Helicopter or Hover. ▪ **Ground Vehicle**: The object is a ground vehicle. ▪ **Airplane**: The object sets the pitch angles during the flight according to altitude differences between the waypoints. It also rolls while turning between the waypoints. ▪ **Helicopter**: The object leans forward with a fixed pitch angle of -15 degrees. It also rolls while turning between the waypoints. ▪ **Hover**: The object always keeps the pitch and roll angles set to zero. ▪ **Manual**: The object turns as fast as required to point to the next waypoint (same as value over 1000), ignoring the Turn Speed. An API user can further edit the waypoint orientation

	(yaw, pitch, and roll).
Object Type	Determines the type of object. Choose "3D Model" to add a loaded 3D model, "Image Label" to add an image label, "Text Label" to add a text label or "Virtual" to add a virtual object.
File Name	For 3D Model and Image types, select the associated file. In the **File Name** field, type, or browse, a path to an .x, .xpc, .flt, .fpc, .dae, .3ds, .obj, or .glb for 3D models, or .bmp, .jpg, jpeg, .gif, .png, or .ico for image labels.
Text	Determines the text to be used if the Object type is a Text Label.
Limit Growth	This option is only available if you selected Image Label or Text Label as the Object Type. If this property is set to **Yes**, the label keeps its original size in pixels (Text Size). It does not grow as you fly closer.
Font	Click on the **Edit** button to open the **Character Format** dialog. Select the required font type, size color and style. (This option is available only if the Text Label object type is selected.)
Background Color	Select the color for the vehicle's background. Click in the field to open the **Color** dialog. (This option is available only if the Text Label object type is selected.)
Background Opacity	Determines the type of background for the dynamic object. Select Transparent, Opaque or None. (This option is available only if the Text Label object type is selected.)
Scale	Determines the dimensions of the object. ▪ For 3D Model type, the actual size of the model in the 3D World is the size of the model in its internal coordinate system times the Scale value. (i.e., if the model has a width of 5 units and the scale is set to 10 meters per pixel, the width of the object in the 3D World is 50 meters.)
Route Options	
Move By Time	When set to Yes, the dynamic object's movement along the route is derived from its start and end times (as well as the route distance and current TerraExplorer time), rather than from its speed and acceleration. These start and end times are set in the Timespan group of the object's property sheet.
Altitude Method	For ground vehicles, this property is set to **Relative to terrain** and cannot be changed. For aerial vehicles, set the altitude method to be used for the waypoints: ▪ Select **Relative to Terrain** to place the waypoint at a specified altitude above the ground. ▪ Select **Absolute** to place the waypoint at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	During the creation of the route, this property determines the altitude above ground of the next waypoint. After you have finished

	placing all the waypoints on the terrain, you can use this property to set a new altitude for the entire route.
Speed	After you have finished placing all the waypoints on the terrain, you can use this property to set a new speed for the entire route. **Note:** This property is unavailable if Move by Time was set to Yes.
Acceleration	Determines the acceleration and deceleration speed of the object. The object tries to reach the defined speed at each waypoint by accelerating or decelerating according to this property. **Note:** This property is unavailable if the Move by Time property was set to Yes.
Turn Speed	Select the rate at which the object turns. **Note:** When set to a value of 1000 or higher, the object will turn as fast as required to point to the next waypoint ignoring the Turn Speed. **Note:** This property is unavailable if the Move by Time property was set to Yes.
Circular Route	Determines if the object restarts its route when it reaches the endpoint. Select one of the following options: ▪ **Stop at end** – The object stops at the end of the route. ▪ **Move to start** – The object drives/flies/walks back to the beginning of the route when it reaches the end. ▪ **Jump to start** – The object jumps to the beginning of the route when it reaches the end. **Note:** This property is unavailable if the Move by Time property was set to Yes.
Play Route on Startup	Determines if the dynamic object starts moving when a FLY project opens. Choose **Yes** to start the dynamic object automatically when a FLY file opens or **No** to instruct the object to wait for a start command.
Waypoints	
The parameters in this group are enabled only when **Edit Nodes**  on the top bar of the property sheet is selected.	
Selected Point	Select the point you wish to edit. The selected point is highlighted on the 3D Window.
Point X	Enter the X-coordinate for the selected waypoint.
Point Y	Enter the Y-coordinate for the selected waypoint.
Point MGRS	The coordinates of the selected waypoint in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Point Altitude	Enter the altitude above ground for the selected waypoint.

Point Speed	Enter the speed for the selected waypoint. The object tries to achieve this speed by the time it reaches the waypoint, under the limitation of the acceleration parameter.
Time	Click **Edit** and select the date and time when the object should reach the selected waypoint.
Timespan	
Start Time	Click **Edit** and select the date and time when the object should first become visible.
End Time	Click **Edit** and select the date and time when the object should stop being visible.
Track Style	
Show Track	Determines if a track line indicating the dynamic object's path is displayed in the 3D Window. **Note**: A track is displayed while the dynamic object is being edited (i.e., as long as its property sheet is open), regardless of this property value. This property only determines whether a track will continue to display even **after** the object's property sheet is closed.
Line Color	Select the color of the dynamic object's track line. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Opacity	Enter the opacity of the dynamic object's track line. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Line Width	Enter the line width for the dynamic object's track line. The width is measured in meters.
Line Pattern	Select the dynamic object's track line pattern. You can choose between different line patterns, e.g., solid, dashed, dotted or a combination thereof.
Line Spline	Determines if the track line is drawn as a curve based on its nodes.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the object. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the object based on its size.
Max. Visibility Distance	Sets the distance from the camera at which the object disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the object disappears.
General	
Show in Viewer	Determines if the object appears in the Project Tree when the file is viewed with the TerraExplorer Basic Viewer.

Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the object in the 3D Window.
Ground Object	Determines if the object is calculated as part of the terrain's elevation.

Attaching Objects to Virtual Dynamic Objects

You can add movement to any 2D or 3D primitive by attaching them to a dynamic object with a "Virtual" Object Type.

To add movement to any object, follow these steps:

1. Create a new dynamic object, and set its waypoints. **See** "Creating Dynamic Objects" in this chapter for more information.
2. In the **Dynamic Object property sheet**, in the **Object Options** section, select **Virtual** as the **Object Type**, and then close the property sheet.
3. Create the 2D or 3D primitives you want to use.
4. Attach the primitive to the virtual dynamic object. **See** "Attaching Objects to Other Objects" in the "Working with Objects" chapter for further information.

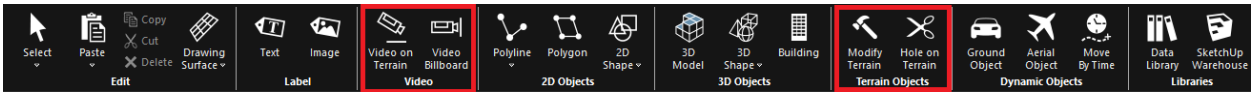
Editing Dynamic Objects

You can edit dynamic objects directly in the 3D Window. This is similar to editing other objects where changing the location of the object changes the location of the route, and changing the location of a node changes the location of a waypoint.

See "Editing Objects in the 3D Window" in the "Working with Objects" chapter for further information.

Terrain Objects

TerraExplorer provides a set of objects that affect the terrain. You can modify the terrain, create holes in the terrain and play a video file onto the terrain.



Objects Tab

Modifying the Terrain

Using the Modify Terrain tool, you can modify the elevation values in an area of the terrain by drawing a polygon in the 3D Window and then setting the Modify Terrain object's properties in its property sheet. The surface of the terrain is raised or lowered according to the elevation values of the polygon's points. Different elevation behaviors allow replacing, cropping above or cropping below the original values of the

terrain. The interior of the polygon can be flat or irregular in shape. You can modify the elevation values of a mesh layer by drawing a modify terrain object and applying it to the mesh layer.

To modify the terrain:

1. On the **Objects** tab, in the **Terrain Objects** group, click **Modify Terrain**. The Modify Terrain property sheet is displayed.
2. If you want to position the modify terrain object based on where the mouse is pointing in the 3D Window, on the top bar of the label's property sheet, click **Set Position Based on Mouse** . **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" in the "Working with Objects" chapter for more information.
3. If you want to position the modify terrain object in the Z plane, on the top bar of the object's property sheet, click **Z Plane** . **See** "Moving an Object in the Z Plane" in the "Working with Objects" chapter for more information.
4. With the cursor in the **3D Window**, click to add the first point of the polygon.
5. Click again to add additional points of the polygon until you have marked the entire shape. You must place at least three points to define the polygon.

   Note: When creating a Modify Terrain object, the lines of the polygon should not overlap each other.

   Note: It is recommended to keep the number of polygon points to the minimum required to define the shape. Adding unnecessary points may adversely affect performance.
6. Right-click to finish the object.
7. Continue to edit the object's parameters and shape or close the property sheet to finish the operation.

Modify Terrain Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the modified terrain. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the modified terrain from the Project Tree.
Modify Terrain	
Flat	If **Yes** is selected, sets all points of the modified terrain at the same altitude, creating a horizontal flat surface.
Elevation Behavior	Defines how the modified terrain elevation values affect the terrain's elevation: ▪ **Replace**: replaces the area defined by the modified terrain with the selected altitude value. ▪ **Crop Below**: replaces all elevation values that are lower than the selected elevation value with the selected altitude value. ▪ **Crop Above**: replaces all elevation values that are higher than the selected elevation value with the selected altitude value. ▪ **Offset:** offsets the area defined by the modified terrain with the selected altitude value.

Feather	Determines the distance along which the gradual fading of the edges of the modified terrain is applied. Applying a feather creates continuous diagonal surfaces. These surfaces start from the terrain database elevation value on the polygon to the modified terrain elevation value at its respective point on the feather polyline. Gradual fading of the edges is applied within the distance defined by the radius parameter. Type the required radius.
Apply To	Determines what surface the terrain modification object is applied to. If there is a 3DML in the area of the modify terrain object, click the arrow, and then select either of the following: ▪ **Terrain** – Changes the elevation values only of the terrain, without modification to the 3DML. ▪ **[name of the 3DML]** – Changes the elevation values of the specified 3DML. **Note:** A modify terrain object can also be applied to a 3DML from the 3D Mesh Layer tab. **See** "Modifying a 3D Mesh Layer" in the "3D Mesh Layers" chapter for information.
Timespan	
Start Time	Click **Edit** and enter the date and time the modified terrain should first become visible.
End Time	Click **Edit** and enter the date and time the modified terrain should stop being visible.
Position	
Altitude Method	Sets the altitude method to be used by the modified terrain. Always set to On Terrain.
Altitude	Enter the altitude, as defined in Altitude Method, for the modified terrain pivot point, the center of its base.
X	Enter the X-coordinate for the modified terrain's pivot point. The pivot is located at the center of the modified terrain. Change this value to move the entire object.
Y	Enter the Y-coordinate for the modified terrain's pivot point. The pivot is located at the center of the modified terrain. Change this value to move the entire object.
MGRS	The coordinates of the modified terrain's pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Points Position	
The parameters in this group are enabled only when **Edit Nodes** is selected on the property sheet top bar.	
Selected Point	Select the point to edit.

	The selected point is highlighted on the 3D Window. When you edit this point, the corresponding point on the modified terrain changes accordingly.
Point X	Enter the X-coordinate for the selected point.
Point Y	Enter the Y-coordinate for the selected point.
Point MGRS	The coordinates of the selected point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Point Altitude	Enter the altitude, as defined in Altitude Method, for the selected point.
General	
Show in Viewer	Determines if the modified terrain appears in the Project Tree when the file is viewed with the TerraExplorer Basic Viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the modified terrain in the 3D Window.
Order	Determines the order of objects with On Terrain altitude method, from back to front. Objects with higher values are displayed on top of objects with lower values.

Cutting a Hole on Terrain

Cutting a hole on the terrain removes the terrain texture while maintaining the original contours of the terrain. The objects or feature layers created on the terrain in the area of the hole are drawn on the original contours of the terrain.

To cut a hole on the terrain:

1. On the **Objects** tab, in the **Terrain Objects** group, click **Hole on Terrain**. The Hole on Terrain property sheet is displayed.
2. With the cursor in the **3D Window**, click to add the first point of the hole.
3. Click again to add additional points of the hole until you have marked the entire shape.
4. Right-click to finish the hole.

   Note: It is recommended to keep the number of hole points to the minimum required to define the shape. Adding unnecessary points may adversely affect performance.
5. Continue to edit the hole or close the property sheet to finish the operation.

Hole on Terrain Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the Hole on Terrain. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the Hole on Terrain from the Project Tree.
Line Color	Select the outline color for the Hole on Terrain. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Opacity	Enter the opacity for the Hole on Terrain outline. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Line Style	
Line Width	Enter the Hole on Terrain line width. The width is measured in meters.
Line Back Color	Sets the Hole on Terrain line back color. The Hole on Terrain line back color is visible when the line pattern is set to non-solid patterns such as a dotted pattern. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Back Opacity	Enter the Hole on Terrain line back opacity. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Line Pattern	Select the Hole on Terrain line pattern. You can choose between different line patterns, e.g., solid, dashed, dotted or a combination thereof.
Line Spline	Determines if the line around the Hole on Terrain is drawn as a curve based on its nodes.
Timespan	
Start Time	Click **Edit** and enter the date and time the hole on terrain should first become visible.
End Time	Click **Edit** and enter the date and time the hole on terrain should stop being visible.
Position	
Altitude Method	The altitude method used by the Hole on Terrain. Always set to On Terrain.
Altitude	The altitude of the Hole on Terrain is always set to zero, meaning on the surface of the terrain.
X	Enter the X-coordinate for the Hole on Terrain pivot point, the center of its base.

Y	Enter the Y-coordinate for the Hole on Terrain pivot point, the center of its base.
MGRS	The coordinates of the Hole on Terrain pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Points Position	
The parameters in this group are enabled only when **Edit Nodes** is selected on the property sheet top bar.	
Selected Point	Select the point to edit. The selected point is highlighted on the 3D Window. When you edit this point, the corresponding point on the hole changes accordingly.
Point X	Enter the X-coordinate for the selected point.
Point Y	Enter the Y-coordinate for the selected point.
Point MGRS	The coordinates of the selected point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Point Altitude	The altitude of all the points is always set to zero, meaning on the surface of the terrain.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the Hole on Terrain. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the Hole on Terrain based on its size.
Max. Visibility Distance	Sets the distance from the camera at which the Hole on Terrain disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the Hole on Terrain disappears.
General	
Show in Viewer	Determines if the terrain hole appears in the Project Tree when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.

Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the Hole on Terrain in the 3D Window.

Video on Terrain and Video Billboard

The Video on Terrain/Video Billboard commands play a video file either on a selected area of the terrain (Video on Terrain), or on a floating billboard (Video Billboard). Both these commands open the same property sheet and can be converted one to the other by changing the default properties. The primary difference between the two is the distance from the projector at which the video should be displayed (Maximum Projection Distance property set in the property sheet). When this distance is set to zero, the video is projected on the terrain.

The positioning of the projector and the projected video can also be determined using telemetry data that holds positioning information for the camera based on time stamps. The telemetry data can either be embedded in the video file or contained in a separate telemetry file.

Supported video file formats are determined by the codecs that are installed and registered on your computer. Most files that Windows Media Player can play (e.g., *.avi, *.mpg, .mov, etc.), including streaming Microsoft Media Server (MMS) content, can be draped on the terrain.

TerraExplorer supports the KLV (Key Length Value) format for videos with telemetry information (MISB 0601 standard). TerraExplorer can parse this data and place the video correctly on the terrain

Creating a Video on Terrain/Video Billboard

To create a video on terrain:

1. On the **Objects** tab, in the **Video** group, click **Video on Terrain/Video Billboard**. The Video property sheet is displayed.
2. If you want to use telemetry data, which is either embedded in the video file or contained in a separate telemetry file, do the following:
   a. In the **Use Telemetry File**, select **Yes**.
   b. In the **Video File** field, type or browse to a video file, whose format is supported, or type the URL (e.g., mms://mms.skylinesoft.com/) if you want to open streaming MMS content. For video files with telemetry information, TerraExplorer supports the KLV (Key Length Value) format (MISB 0601 standard).
   c. If your telemetry data is contained in a separate telemetry file, in the **Telemetry File Name** field in the property sheet, enter the Telemetry File Name.
3. If you want to set the object's location by defining a point in the 3D World, do the following:
   a. In the **Video File** field, type or browse to a video file, whose format is supported, or type the URL (e.g., mms://mms.skylinesoft.com/) if you want to open streaming MMS content.
   b. In the **Use Telemetry File**, select **No**. Then click the mouse in the **3D Window** to define the location of the projector.
4. After an object has been placed on the terrain, you can change its properties using the property sheet.

Playing, Pausing and Stopping the Video

To play, pause or stop the video, do either of the following:

- In the **Project Tree**, right-click a Video On Terrain/Video Billboard object and select the required option from the shortcut menu.

- In the **3D Window**, right-click a Video On Terrain/Video Billboard object and select the required option from the shortcut menu.

Using a Telemetry File

A telemetry file holds positioning information for the camera based on time stamps. This information is used to automatically determine the position of the video projector in the 3D Window. This allows the projected Video On Terrain to be draped over the same area that is captured in the video.

The file is a comma-delimited text file, with each line representing the location parameters for a certain time stamp. Each value should be a decimal number in double-precision floating-point range.

The following values should appear for each point:

Value	Description
Time	The time elapsed, in seconds, from the beginning of the recording. The first point should be set to zero. Following points can use any increasing value, including fractions (e.g., 0.3) to represent parts of a second.
X	The X-coordinate (Longitude) of the camera.
Y	The Y-coordinate (Latitude) of the camera.
Height	The height of the camera above the terrain database vertical datum base ellipsoid.
Roll	The Roll of the camera, in degrees.
Pitch	The Pitch of the camera, in degrees.
Yaw	The Yaw of the camera, in degrees. This is the direction in which the camera points.
Field of View	The horizontal field of view covered by the camera, in degrees.

Video on Terrain/Video Billboard Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the Video object. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the imagery layer from the Project Tree.
Video	
Video File	Type the full path of the file, or use the **Edit** button, for a supported media file. You can also type a URL for an MMS server. Supported video file formats are determined by the codecs that are installed and registered on your computer. Most files that Windows Media Player can play (e.g., *.avi, *.mpg, etc.), including streaming Microsoft Media Server (MMS) content, can be draped on the terrain. TerraExplorer can also use RTSP, or any custom protocol using "video:myprotocol://" for any custom protocol that is defined on your system: e.g., "video:custom1://".

Use Telemetry File	Determines how the position is defined. Choose **No** to set the object's route by placing the projector in the 3D World or **Yes** to link the object to an external set of files containing telemetry information.
Telemetry File Name	Type or browse a path to a .csv telemetry file.
Field Of View	Enter the horizontal field of view, in degrees, covered by the camera.
Calculate Hidden Surface	Calculate which surfaces are visible to the projector, and project video only onto these surfaces. **Note**: Selecting this option will slightly increase TerraExplorer's resource usage, but will result in a more realistic result.
Opacity	Enter the opacity for the Video object data. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Max. Projection Distance	Maximum distance from the projector at which the video should be displayed. Set to zero to project on the terrain.
Disable Soundtrack	Determines if the audio information in the video file is played. Choose **No** to play the soundtrack, or **Yes** to disable it.
Volume	Enter the audio volume level. The level is defined as percentage, where 100% is the maximum volume and 0% is the minimum.
Play Video on Startup	Determines if the video starts playing when a FLY project opens. Choose **Yes** to play the movie automatically when a FLY file opens or **No** to instruct the video to wait for a play command.
Projector	
TerraExplorer can display objects to mark the location of the video projector. A pyramid is used to show the position, orientation and field of view of the projector. Four lines originating from the projector's location to the ground mark the projector rays. This group defines the appearance of the projector objects in the 3D Window.	
Show Projector	Determines if the projector pyramid object is displayed in the 3D Window.
Projector Color	Select the color for the projector pyramid object. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format.
Projector Size	Enter the height, in meters, of the projector pyramid.
Show Projector Rays	Determines if the projector rays object is displayed in the 3D Window.
Projector Rays Color	Select the color for the projector rays object. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format.
Position	
Altitude Method	Sets the altitude method to be used by the Video object: ▪ Select **Relative to Terrain** to place the projector's position at a

	specified altitude above the ground. ▪ Select **Absolute** to place the projector's position at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	Enter the altitude, as defined in Altitude Method, of the video projector.
X	Enter the X-coordinate for the video projector.
Y	Enter the Y-coordinate for the video projector.
MGRS	The coordinates of the video projector in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Yaw	Determines the direction angle of the video projector along the vertical axis relative to north.
Pitch	Determines the tilt angle of the video projector along its lateral axis relative to the horizon.
Roll	Determines the roll angle of the video projector along its longitudinal (front-to-back) axis.
Timespan	
Start Time	Click **Edit** and enter the date and time the video should first become visible.
End Time	Click **Edit** and enter the date and time the video should stop being visible.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the video object. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the video object based on its size.
Max. Visibility Distance	Sets the distance from the camera at which the video object disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the video object disappears.
General	
Show in Viewer	Determines if the video on terrain appears in the Project Tree when the file is viewed with TerraExplorer Basic viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting

	Edit. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the video object in the 3D Window.

CHAPTER 12 EFFECTS

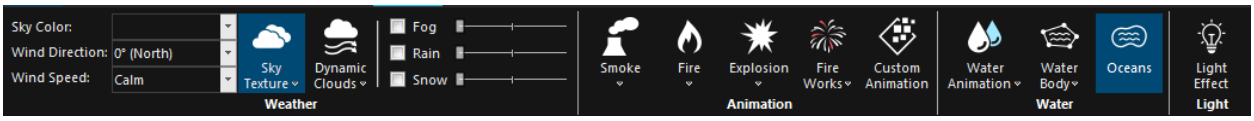
About Effects

TerraExplorer provides an array of visualization effects to enhance realism of the 3D visualization:

- **Weather Effects** – Simulation of meteorological phenomena such as clouds, wind, sky, sun, rain, snow, and fog.
- **Animation Effects** – Simulation of natural phenomena such as fire, smoke, and explosions, or fireworks, by modeling the underlying physical processes of these phenomena.
- **Water Effects** – Simulation of naturally or artificially flowing water such as rivers, oceans, waterfalls, and pools.
- **Light Effects** – Simulation of lighting effects. A range of different objects, rotations, and colors are available.

Animation and water effects are rendered in TerraExplorer using a powerful and robust particle system. Particle system effects are based on very small graphic objects that fade out quickly and are then re-emitted from the effect's source to simulate certain kinds of "fuzzy" phenomena, such as fire, explosions, smoke, moving water, fog, and snow. Each particle effect is composed of one or more emitters (each of which can use a distinct graphic object with distinct emitter properties).

When selecting an animation effect, you can use the default properties that are specific to the particular effect, or you can modify these properties using the Particle Editor. This editor gives you the ability to customize nearly all particle properties including: base image, color, size, rotation, speed, and lifetime. Changes made in the editor take effect immediately.



Effects Tab

Weather Effects

You can simulate different meteorological phenomena such as clouds, wind, sky, sun, rain, snow, and fog to enhance the realism of the 3D visualization.

Sky Color

To select a sky color:

1. On the **Effects** tab, in the **Weather** group, from the **Sky Color** dropdown list, select a color.
2. If you want to create your own sky color, select **Custom** from the dropdown list. The Settings dialog is displayed. **See** "Environment" in the "Setting the Project" chapter for more information.

Texture

To select a sky texture:

1. On the **Effects** tab, in the **Weather** group, from the **Sky Texture** dropdown list, select a sky texture.
2. If you want to create your own sky color, select **Custom** from the dropdown list. The Settings dialog is displayed. **See** "Environment" in the "Setting the Project" chapter for more information.

Dynamic Clouds

To select dynamic cloud covering:

1. On the **Effects** tab, in the **Weather** group, from the **Dynamic Clouds** dropdown list, select a cloud cover option.
2. If you want to create your own cloud cover, select **Custom** from the dropdown list. The Settings dialog is displayed. **See** "Environment" in the "Setting the Project" chapter for more information.

Wind Direction

To set a wind direction:

- On the **Effects** tab, in the **Weather** group, in the **Wind Direction** field, select a direction.

Wind Speed

To set a wind speed:

- On the **Effects** tab, in the **Weather** group, in the **Wind Speed** field, select a speed.

Fog

To set a fog covering:

- On the **Effects** tab, in the **Weather** group, select the Fog check box, and then drag the **Fog** slider to adjust the intensity of the fog cover.

Rain

To set a rain covering:

- On the **Effects** tab, in the **Weather** group, select the **Rain** check box, and then drag the **Rain** slider to adjust the intensity of the rainfall.

Snow

To set a snow covering:

- On the **Effects** tab, in the **Weather** group, select the **Snow** check box, and then drag the **Snow** slider to adjust the intensity of the snowfall.

Animation Effects

Using particle system animations, TerraExplorer simulates natural phenomena such as fire, smoke, and explosions, or fireworks, by modeling the underlying physical processes of these phenomena. TerraExplorer uses a versatile, powerful particle system that captures important elements of each effect with realistic colors and intensity to effectively simulate different phenomena.

When selecting an animation effect, you can use the default properties that are specific to the particular effect, or you can modify these properties using the Particle Editor. This editor gives you the ability to customize nearly all particle properties including: base image, color, size, rotation, speed, and lifetime. Changes made in the editor take effect immediately

Creating an Animation Effect Object

To create an animated effect object:

1. On the **Effects** tab, in the **Animation** group, click the required effect, and then from the dropdown menu, select the required shape. The Effect property sheet opens.
2. In the **Effect** property sheet, set the effect's parameters. If you want to modify particle properties such as base image, color, size, rotation, speed, and lifetime, then in the property sheet's **Effect Setting** field, click **Set**. The Particle Editor is displayed. **See** "Particle Editor Parameters" in this chapter for information.
3. Place the effect object in the **3D Window** by clicking in the desired location. The effect object is added to the Project Tree.
4. Continue to edit the effect's parameters, or close the property sheet to finish the operation.

Effect Property Sheet Parameters

Object Parameter	Activity
Appearance	
Name	Type the description or name of the effect. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the object from the Project Tree.
Line to Ground	Adds a line from the effect's pivot point either to the ground or to a custom length towards the ground. **Note**: A line to ground is displayed while the effect is being edited (i.e., as long as its property sheet is open), regardless of this property value. This property only determines whether a line to ground will continue to display even after the effect's property sheet is closed.
Line Length	Determines the length of the line to the ground. This property is available only when the "Line to Ground" parameter is set to "Custom Length".
Line Color	Sets the color of the effect object's line to ground. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff). This property is available only when the "Line to Ground" option is set to "To Ground" or "Custom Length".
Effect	
Effect Setting	Click **Set** to open the Particle Editor to modify particle parameters, such as base image, color, size, rotation, speed, and lifetime.
Timespan	
Start Time	Click **Edit** and select the date and time when the effect object should first become visible.
End Time	Click **Edit** and select the date and time when the effect object should stop being visible.
Position	

Altitude Method	Sets the altitude method to be used by the effect object: ▪ Select **Relative to Terrain** to place the effect object's pivot point at a specified altitude above the ground, defined by its "Point Altitude." ▪ Select **Absolute** to place the effect object's pivot point at a specified altitude above the terrain database vertical datum base ellipsoid. You can use this feature to create effect objects of known absolute altitude values that are not dependent on the terrain elevation values. ▪ Select **Relative to 3DML** to place the effect object's pivot point at a specified altitude above the 3DML layer.
Altitude	Enter the altitude, as defined in the Altitude Method, for the pivot point. The pivot's altitude is the average altitude of all the points. This value is used as the initial altitude of the points when you create a new effect object. Changing the pivot altitude to an existing effect adjusts all the points according to the offset from the previous value.
X	Enter the X-coordinate for the effect object's pivot point. The pivot is located at the center of the effect object. Change this value to move the entire effect object.
Y	Enter the Y-coordinate for the effect object's pivot point. The pivot is located at the center of the effect object. Change this value to move the entire effect object.
MGRS	The coordinates of the effect object's pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Yaw	Determines the direction angle of the effect object along the vertical axis relative to north.
Pitch	Determines the tilt angle of the effect object along its lateral axis relative to the horizon.
Roll	Determines the roll angle of the effect object along its longitudinal (front-to-back) axis.
Geometry	
Scale	Determines the dimensions, in meters per pixel, of the effect object.
Limit Growth	If this property is set to **Yes**, the effect object keeps its original size in pixels (Text Size). It does not grow as you fly closer.
Visibility	
Min. Viewing Height	Determines the minimum viewing height at which the effect object is visible. The effect object disappears when flying lower than the "Min Viewing Height".

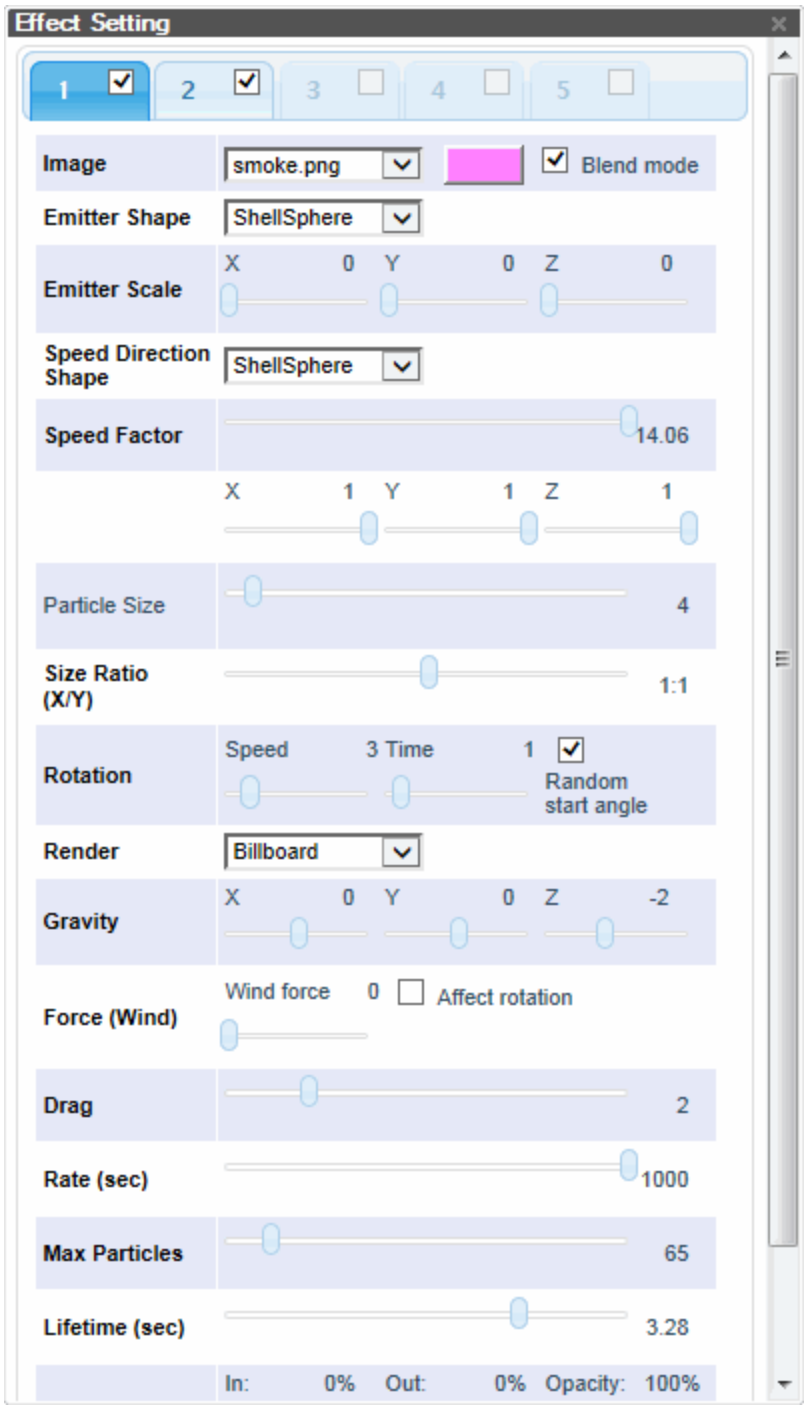
Smallest Visible Size	Determines the minimum size in pixels, below which the effect object disappears as you fly away from it.
Default Viewing Distance	Determines the viewing distance of the camera from the effect object. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the effect object based on its size.
General	
Show in Viewer	Determines if the effect object appears in the 3D Window when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the effect object in the 3D Window.

Particle Editor Parameters

To set particle parameters for each particle emitter:

- Select the tab of the emitter whose parameters you want to set, and then set the required parameters.

  Note: Selecting an emitter **check box** turns that emitter on while selecting the emitter's **tab** allows you to set its parameters.



Particle Editor

Effect Parameter	Activity
Image	Particle's base image.
Color	Particle's surface color.

Blend mode	Controls whether the particle blends the color designated in the Color parameter and the particle's image color. Clear this check box to ignore the color designated in the Color parameter.
Emitter Shape	Shape of the particle emitter. The choice of shape affects the region from which particles can be launched and the initial direction of the particles. For example, a sphere throws particles outward in all directions while, a cone produces a diverging stream of particles. Select one of the following: Cone, sphere, shellcone, shellsphere, ring, disc, cube, one.
Emitter Scale	Controls the size of the Emitter Shape. Drag the X, Y, and Z sliders (0-10) to adjust the scale factor in each dimension.
Speed Direction Shape	Shape of the volume that the particles are emitted into. Select one of the following: Cone, sphere, shellcone, shellsphere, ring, disc, cube, one.
Speed Factor	Controls the factor of the Speed Direction Shape. ▪ Drag the slider (0-14.06) to adjust the scale factor. ▪ Drag the X, Y, and Z sliders (-1 - 1) to adjust the ratio on each axis of the shape.
Particle Size	Size of the particle. The number entered is a factor of the size of the particle image. Enter 1 in this field to create a particle the same size as the image selected.
Size Ratio (X/Y)	Drag the slider (1:5-5:1) to set the particle's aspect ratio.
Rotation	▪ **Speed –** Drag the slider to set the maximum rotational speed in radians (0-20) ▪ **Time** – Drag the slider to set the duration in seconds of the particle rotation (0-10K). 10k will rotate infinitely. ▪ **Random start angle** – Select the check box to randomize the initial rotation of the particles. Otherwise, the angle is zero.
Render	How the rendered image is produced from the graphic image: ▪ **Billboard** - Particle always faces the camera ▪ **Horizontal** - Particle plane is parallel to the XZ "floor" plane ▪ **Vertical** - Particle is upright on the world Y axis but turns to face the camera
Gravity	Force of acceleration on particles after they are created. Drag the sliders (0-10) to set the X, Y, and Z gravity values.
Force(Wind)	▪ **Wind force –** Drag the slider (0-1) to set the degree in which the wind affects the particles. ▪ **Affect rotation** – Select this check box to have the wind's direction and speed affect the rotation of the particles.

	See "Wind Direction" and "Wind Speed" in this chapter for more information on wind settings.
Drag	Drag the slider (0-10) to set the amount of drag operating against a particle's motion.
Rate	Drag the slider (0-1000) to set the number of particles emitted per second.
Max Particles	Maximum number of particles that can exist at one time. A high number of particles may incur some performance penalty especially on low-end hardware configurations.
Lifetime	Amount of time, in seconds, that a particle exists before it disappears. Drag the slider (0-6.25) to control how long each individual particle is onscreen.
Fade	▪ Fade In % and Fade Out % define the amount of time spent fading in and fading out. For example, if Fade In is set to 50% and Fade Out is set to 0% then the particle will spend half its life fading in, the other half it will be fully visible, and then it will just disappear without fading out at all. ▪ Max Opacity – Maximum particle opacity that is reached once particle has fully faded in. Drag the Fade In and Fade Out sliders (0-100%) to adjust the fade in and fade out time. Drag the Max Opacity slider (0-100%) to adjust maximum particle opacity.

Water Effects

You can simulate naturally or artificially flowing water such as rivers, oceans, waterfalls, and pools.

Water Animation

To create a water object, such as a waterfall, fountain, or water pipe, which realistically simulates the particular object's water flow, color, and other attributes:

1. On the **Effects** tab, in the **Water** group, click **Water Animation**, and select the required effect. The Effect property sheet opens.
2. If you want to change the default water animation parameters, in the **Polygon** property sheet, set the required parameters. **See** "Effect Property Sheet Parameters" in this chapter for information.
3. If you want to modify particle properties such as base image, color, size, rotation, speed, and lifetime, then in the property sheet's **Effect Setting** field, click **Set**. The Particle Editor is displayed. **See** "Particle Editor Parameters" in this chapter for information.
4. Place the effect object in the **3D Window** by clicking in the desired location. The effect object is added to the Project Tree.
5. Continue to edit the effect's parameters, or close the property sheet to finish the operation.

Water Body

To simulate flowing water effect in a water body:

1. On the **Effects** tab, in the **Water** group, click **Water Body**, and select the required body of water. The Polygon property sheet opens.
2. If you want to change the default water body parameters, in the **Polygon** property sheet, set the required parameters. **See** "Polygon Property Sheet Parameters" in the "Objects and Labels" chapter for information.

   Note: The default water body parameters vary depending on the water body that was selected. The primary differences are in the values set for the Texture File.
3. If you want to modify particle properties such as water and reflection color and opacity or bump scale, then in the property sheet's **Water Setting** field, click **Set**. The Particle Editor is displayed. **See** "Water Particle Editor Parameters" in this chapter for information.
4. Place the polygon points in the **3D Window** by clicking in the desired locations. You must place at least three points.

   Note: When creating a filled polygon, the lines of the polygon should not overlap each other. This may result in an irregular fill pattern.
5. Finish the polygon creation by right-clicking.
6. Edit the polygon's parameters in the 3D Window or using the property sheet. **See** "Editing Objects in the 3D Window" in the "Working with Objects" chapter for information. Close the property sheet to finish the operation.

Water Particle Editor Parameters



Water Animation Particle Editor

Effect Parameter	Activity
Opacity	Controls the opacity of the water, where 100% is opaque and 0% is transparent. Drag the slider (0-100) to adjust the opacity.
Bump Scale	Controls how bumpy the water texture appears. Drag the slider (0-100) to adjust the scale.
Texture Repeat	Drag the slider to adjust the repeats of the texture file: ▪ X – Number of repeats of the water texture file in the X-axis (0-1024). ▪ Y - Number of repeats of the water texture file in the Y-axis (0-1024).
Bump Speed	▪ Speed - Drag the slider to adjust the speed (0-20).

	▪ Direction - Drag the slider to adjust the direction (0-360).
Fresnel	Bias and exponent values for Fresnel calculation.
HDR Multiplier	Multiply HDR values in background cube map.
Deep Color	Color of deep water.
Shallow Color	Color of shallow water.
Reflection Tint	Reflection color.
Kr	Strength of reflection.
KWater	Strength of water color.
Use Light	Display the sun's reflection on the water. The sun's position is based on the system's current date and time. The reflection dynamically updates when the system date and time is changed.

Oceans

You can display animated water on all sea and ocean terrain.

To toggle the display of the animated water on sea and ocean terrain:

- On the **Effects** tab, in the **Water** group, click **Oceans**.

Light Effects

Light effect objects can be added to enhance your 3D World. These objects are not true light sources that display light on the surrounding terrain, but rather image labels with the Blend Mode option turned on that simulate local light effects.

To add a light effect object:

1. On the **Effects** tab, in the **Light** group, click **Light Effect**. The Data Library dialog is displayed showing the Lights tab, with different lighting effect objects, rotations, and colors.
2. Select the required effect.
3. Place the effect object in the **3D Window** by clicking in the desired location. The effect object is added to the Project Tree. The light objects are stored in PNG format, and added to the project as image labels with the Blend Mode option turned on.

CHAPTER 13 FEATURE LAYERS

Working with Feature Layers

A feature layer is a visual representation of a geographic data set like roads, national parks, political boundaries, and rivers using geographic objects such as points, lines, and polygons (features). When a feature layer is loaded, a **layer object** containing all the layer's features is created in the Project Tree. This layer object enables you to perform layer level operations by using the property sheet page to set the appearance and behaviors of the features contained within the layer. All the features in a layer share the same properties (except for position), resulting in lighter files (since only limited property sheets are required for each individual feature. You can set the symbol type to use when rendering the individual features within a feature layer. TerraExplorer Pro can create at the center of each feature a corresponding annotation object, which can be used to convey information, textually or graphically, relating to the feature.

Most feature layer data sources include a homogenous set of features of the same geometry type. DGN and DXF may have more than one type of geometry.

TerraExplorer supports multi-part feature layers. Multi-polygon and Multi-line feature layers are loaded as-is, while multi-point feature layers are first converted to single-point feature layers with duplicated attributes.

If your feature layer is loaded with a set of attributes that contain object level data, you can display advanced layer information in the 3D Window. As an example, take a feature layer that overlays the terrain with country boundaries. In such a layer, we could use the layer's property sheet to represent the number of people living in a country by the line color of the country boundary. You can also use the Attribute Table Tool to display layer features that have a specific set of characteristics. For example, you can show in the 3D Window only countries that their GNP per capita surpasses $15,000. When a feature layer is loaded into TerraExplorer, the Feature Layer contextual tab is displayed. From this tab, you can perform various spatial operations on the layer's features, including merging features into a single feature, clipping one polygon from another, exploding a multi-part feature into its individual component features, and exporting selected features to a new file.

Using the Attribute Table Tool, you can search and filter the data in a map layer to obtain and display only the features and information you require. You can then display only the filtered data on the map or create a new layer that includes only this data. The original layer is not modified.

You can perform spatial queries on the layer, selecting features within a particular geographical area. If, for example, a chemical leak occurred in a particular location, and the wind is spreading the chemical odor across a 150 km radius, you can mark the area, and then determine which surrounding towns need to be evacuated.

TerraExplorer Pro enables you to load feature layers from remote or local databases. Various file formats are supported through a set of external plug-ins. Since you are always connected to the data source (local or remote), you can easily get the latest source updates by refreshing the layer. For shapefiles, GeoDatabase files, KML/KMZ files that were created by TerraExplorer (by exporting a layer or project to KML/KMZ), and WFS-T (A WFS service with read-write access by enabling transactions), all changes can be saved directly to the original source file.

TerraExplorer Pro handles differently layers that are loaded from FLY and KML files. TerraExplorer cannot read these layers as feature layers and is therefore not able to perform layer level operations on their features.

For FLY layers, geographic objects are read and put in the TerraExplorer Project Tree as a **Group**, whereas for KML files, a layer object containing the geographic objects is created in the Project Tree.

KML layers loaded into a project are always read directly from the local or remote data source, instead of being imported and stored in the FLY file.



Home Tab Add Group

Loading Feature Layers

TerraExplorer Pro constructs a feature layer as a layer object, which is then displayed in the Project Tree. A layer object enables you to perform layer level operations by using the property sheet page to set the appearance and behaviors of the geographic objects contained within the layer.

First, you load the layers from feature files or servers and then you set the layer appearance and parameters in the property sheet page and the Feature Layer tab on the Ribbon.

- To load native feature layers from files and servers, **see** "Loading Layers from Feature Files", "Loading Layers from SkylineGlobe Server" and "Loading Layers from Other Feature Servers" in this chapter for further information.
- To set the parameters of native feature layers, **see** "Setting and Editing Feature Layer Properties " in this chapter for further information.

Loading Layers from Feature Files

You can load layers from the following feature file types:

Feature File	Description
Esri Shapefile	A shapefile is a simple, non-topological file format used for storing the geographic location and attribute information of geographic features. This file format, developed by the Environmental Systems Research Institute (ESRI), was designed for the Esri GIS and mapping system and consists of the following files: ▪ **.shp**: The main file that stores records of shapes, geometry and vertices. ▪ **.dbf**: The dBASE file type that stores attributes data for each geographic object (points, lines and polygons). ▪ **.shx**: The index file that stores the offset of the related .shp file. ▪ **.qix**: A spatial index file created by TerraExplorer Pro when adding a shapefile as a streaming layer for the first time.
Excel File	A spreadsheet file that contains data for analysis and manipulation using tables and formulas. **Note:** Both *.xls and *.xlsx files are supported. TerraExplorer can read geographic location elements (points) from an Excel file, which is made possible by the user identifying the geographic fields.

	Excel Files Basic Rules: ▪ Each **sheet** in the file represents a single geographic **layer**. ▪ Each **row** in a sheet represents a single geographic **location**. ▪ Each row in the file should contain, at least: an X and Y coordinate (column). Coordinate columns should be in a **Number** Data Type and **Double** Field Size. **Note:** Opening *.xlsx files on computers running a 64-bit version of Windows requires either Office 32-bit or ACE 32.
Text File	A Text file is a free format file describing geographic locations of elements (points). Text files can be generated manually using a common text editor or loaded from other data forms (e.g., exported files from Microsoft Excel or from a Rational database). **Note:** Both *.txt and *.csv files are supported. Text Files Basic Rules: ▪ Each line in the file represents a single geographic location. ▪ Each line in the file contains, at least, an X and Y coordinate, and content data. ▪ Every line must have the same number of columns. Corresponding columns must have the same data types (although optional parameters are allowed). ▪ Optional parameters may be represented by empty spaces when using a TAB, comma or semi-colon as separators. For example, if the column format is "X, Y, H, P" where only "X" and "Y" are mandatory parameters, "X, Y" is sufficient to set the X and Y values only, but "X, Y, P" is required to set the P value. ▪ When using SPACE as a separator, the number of spaces in between columns is irrelevant. Therefore, empty parameters are not allowed in this type of file. ▪ It is mandatory that the chosen separator from the Select Text File dialog is exactly the same as the separator used in the file. For custom separators, it is required that the characters used are not in conflict with the data. For example, if the data contains a URL in the form "http://<URL>," using a colon as a custom separator, TerraExplorer distinguishes "http" as one column, and "//<URL>" as another.
Esri File Geodatabase (*.gdb)	A File Geodatabase stores as a folder of files that hold geographic data, attribute data, index files, lock files, and a signature file as well as other files. Each feature class or table in the geodatabase is stored in two or more files.
MapInfo file (Tab, Mif, Mid)	A MapInfo file is a two-dimensional format that stores both feature geometry and attribute information. This file format was developed and regulated by MapInfo. There are two types of MapInfo files:

	▪ TAB - MapInfo native format ▪ MIF/MID The TAB format consists of the following files: ▪ .**tab:** The ASCII file which is the link between all other files and holds information about the type of data file. ▪ .**dat:** Stores the attribute data. ▪ .**id:** Stores information linking graphic data to the database information. This file contains an index to the MAP file for each feature. ▪ .**map:** Stores the graphic and geographic information needed to display a map. ▪ .**ind:** Optional index files for tabular data. Which are present if any fields are indexed. These files must be kept together in the same directory. The MIF/MID format consists of the following files: ▪ .**mif:** Stores the geometric data. ▪ .**mid:** Stores the attribute data. These files must be kept together in the same directory.
Microstation DGN	Microstation DGN files can contain points, lines, areas, text, and other object types. Features all have the following generic attributes: ▪ **Type** - The integer type code as listed below in supported elements. ▪ **Level** - The DGN level number (0-63). ▪ **GraphicGroup** - The graphic group number. ▪ **ColorIndex** - The color index from the dgn palette. ▪ **Weight** - The drawing weight (thickness) for the element. ▪ **Style** - The style value for the element. **Note:** TerraExplorer supports v7 or lower of the DGN format.
AutoCAD DXF File	A Data Interchange File or *.dxf is an ASCII file format used to exchange vector-based graphics files. This format was developed, and is maintained, by Autodesk for the AutoCAD system. It is one of the most widely supported vector formats in PC-based CAD products. A DXF file is composed of graphic entities such as 2D primitives, 3D primitives and blocks (which are groups of entities). Feature layers based on DXF files are read-only. Layers can contain more than one type of geometry. TerraExplorer Pro supports the following graphical objects and features in DXF files: ▪ **Point**: An entity with single X, Y, Z coordinates. It can be represented by the "Points Layer Parameters" as listed later in this document. ▪ **Arc**: Any smooth curve joining two points.

	▪ **Circle**: A set of points equidistant from a given point. ▪ **Line**: A single line segment. ▪ **Polyline**: A connected sequence of line segments created as a single object. ▪ **3D Solid**: A solid object with free-form surface support. ▪ **3D Face**: 3D triangular or quadrilateral plane section. ▪ **Text**: A single line of alphanumeric characters. ▪ **Attrib**: An object containing text that links to a block. ▪ **Layers**: Any drawing entity can be assigned to any layer of the drawing, allowing separation of portions of the drawing.
SQLite (*.sqlite, *.db)	Spatial enabled SQLite databases stored in SQLite 3.x database files. **Note**: Although non-spatial tables are also supported, they are not recommended for optimal performance.
GDAL Virtual Datasource (VRT)	A VRT file is an XML file that transforms features read from other GDAL feature sources based on criteria specified in the file. The XML control file is essentially a metadata XML file describing various properties of the actual raster/vector file, like pixel dimensions, geolocation, etc. It is primarily used to derive spatial layers from flat tables with spatial information in attribute columns. It can also be used to associate coordinate system information with a data source, merge layers from different data sources into a single data source, or even just to provide an anchor file for access to non-file oriented data sources. **See** http://www.gdal.org/drv_vrt.html for more information.
GeoPackage	An Open Geospatial Consortium (OGC) standard that at its core, is simply an SQLite database schema. It provides the performance of a spatial database along with the convenience of a file-based data set.
Geospatial PDF	A set of geospatial extensions to the Portable Document Format (PDF) that relate a region in the document page to a region in physical space.
S-57	Vector interchange format used for maritime charts. Base files normally have the extension .000 while the update files have extensions like .001, .002 etc. The S-57 reader will normally read and apply all updates files to the in memory version of the base file on the fly. The feature data provided to the application therefore includes all the updates.
GeoJson	GeoJSON is a format for encoding a variety of geographic data structures. GeoJSON is an open standard format designed for representing simple geographical features, along with their non-spatial attributes, based on JavaScript Object Notation. The features include points, line strings, polygons, and multi-part collections of these types.
Autodesk DWG File	The native file format for Autodesk's AutoCAD® software. It is automatically converted to DXF before it is loaded into the project.

To load a feature file:

1. On the **Home** tab, in the **Add** group, click **Feature Layer**. The Browse for Feature Layer dialog is displayed.
2. Browse to the required file and click **Open**. The Select Layer dialog opens with the selected layer(s) listed in the Select a Layer section. **See** "Select Layer Dialog" in this chapter for information.

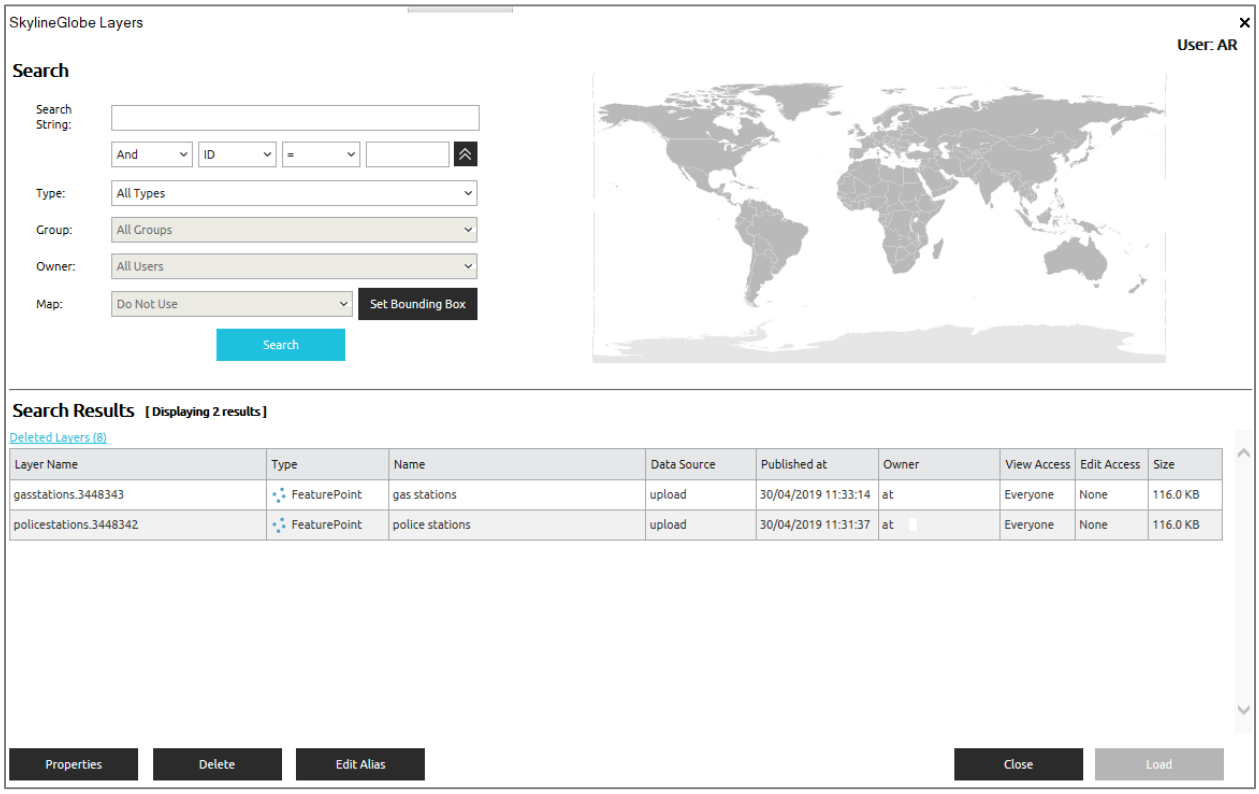
Note: For text files and Excel spreadsheets, select a layer and click **Next**. Then select the layer's Coordinate Fields in the Select Fields dialog and click **Next**. **See** "Select Fields Dialog" in this chapter for information.

3. Click **Import** to directly load with default settings or click **Next** to set the layer's general settings.
4. Set the layer's **General Settings** and click **Next**. **See** "Selecting General Layer Settings" in this chapter for more information. The Layer Settings dialog is displayed.
5. Select the attribute fields to load, set layer and layer object parameters, and apply different properties such as line color or cylinder height, based on the attribute field values of the objects. **See** "Loading Layer Attribute Fields", and "About Basing Native Feature Layer Properties on Layer Attribute Fields" in this chapter for information.

Loading Layers from SkylineGlobe Server (SGS)

SkylineGlobe Server is a private cloud solution that supports the client-server data delivery requirements of Skyline's 3D technology. TerraExplorer clients can load point cloud, KML, feature, elevation, imagery, 3DML, raster complex, TerraBuilder projects, and TerraExplorer projects loaded from SkylineGlobe Server. Feature layers can also be edited and changes saved to the data source. For more information on loading layers from SGS, see "Loading SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.

To add a layer from a SkylineGlobe server:



SkylineGlobe Layers Dialog

1. On the **Home** tab, in the **Add** group, click the arrow next to **3D Layer**, and select **SkylineGlobe Server**. The SkylineGlobe Layers dialog is displayed.

2. If you aren't already logged in to the required SkylineGlobe Server, log in to the server. **See** "Logging In to a SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.
3. Search for the required layer. **See** "Searching for SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.
4. Select the layer you want to load, and click **Load Layer**. The Select Layer dialog opens with the selected layer(s) listed in the Select a Layer section. **See** "Select Layer Dialog" in this chapter for information.
5. After the layer has been placed on the terrain, you can change its properties using its property sheet. **See** "Setting and Editing Feature Layer Properties" in this chapter for further information.

Loading Layers from Other Feature Servers

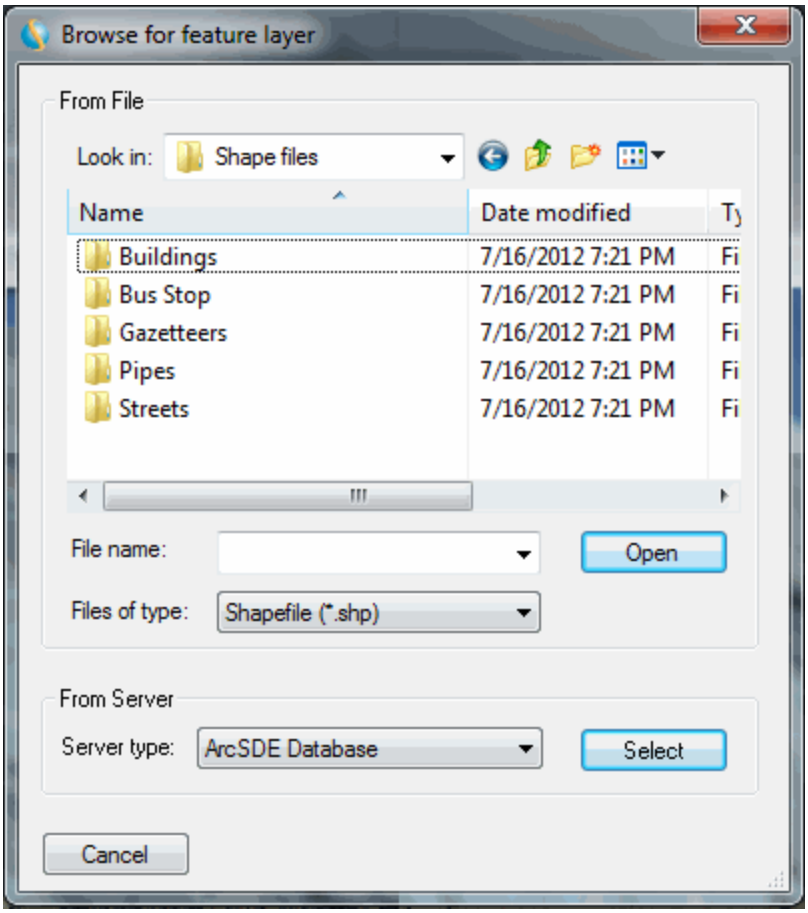
In addition to SkylineGlobe Server, you can also load feature layers from the following servers:

Server	Description
Web Feature Server (WFS, WFS-T)	WFS is a standard protocol published by the Open Geospatial Consortium (OGC) for serving geographical features over the Internet. TerraExplorer supports WFS 1.0.0, 1.1.0, 1.1.1, and 2.0.0. A WFS service with transactions (WFS-T) allows WFS clients to apply edits (inserts, deletes and updates) to the data in the source database through the WFS service.
TerraGate SFS (WFS)	Skyline's TerraGate SFS Server efficiently streams feature layers (Legacy support).
Esri ArcSDE	The Spatial Database Engine (SDE) is a client/server application that enables feature layers to be stored, managed and retrieved from database management systems like Oracle, Microsoft SQL Server, Sybase, IBM DB2 and Informix. Loading of layers from ArcSDE is only supported through ArcSDE 10.2 (Esri deprecated the application server connection method after this version). From ArcSDE 10.3 and above, layers can be loaded using the WFS/REST services.
Oracle Spatial	Oracle Spatial (formerly called SDO, and before that MultiDimension), provides a way to store and retrieve multi-dimensional data in Oracle. It is primarily used for Geographical Information Systems to implement geo-reference and solve queries such as how is something related to a specific location. **Note:** In order to load an Oracle Spatial layer you must have an Oracle Client installed on your computer.
SQL Spatial	Microsoft SQL Server Spatial Database provides support for access to spatial tables in Microsoft SQL Server 2008+ which contains the geometry and geography data types to represent the geometry columns.
PostgreSQL with PostGIS	Postgre SQL is an object-relational database management system (ORDBMS). It is released under an MIT-style license and is thus free and open-source software. It supports a large part of the SQL standard and offers many features: ▪ Complex queries ▪ Foreign keys

	▪ Triggers ▪ Views ▪ Transactional integrity ▪ Multiversion concurrency control PostGIS adds support for geographic objects to the PostgreSQL object-relational database. In effect, PostGIS "spatially enables" the PostgreSQL server, allowing it to be used as a backend spatial database for geographic information systems (GIS). PostGIS follows the OpenGIS "Simple Features Specification for SQL" and has been certified as compliant with the "Types and Functions" profile. **Note:** Transactions are not currently supported for layers loaded directly from a PostgreSQL database.
ArcGIS GeoServices REST Server	Esri's ArcGIS GeoServices REST (Representational State Transfer) Server relies on a stateless (generally HTTP), client-server, cacheable communications protocol. This allows fast performance, reliability, and the ability to grow, by re-using components that can be managed and updated without affecting the system as a whole, even while it is running.
MongoDB	MongoDB is a NoSQL document-oriented database that stores data in JSON-like documents with optional schemas.

To load a feature layer from a server:

1. On the **Home** tab, in the **Add** group, click **Feature Layer**. The Browse for Feature Layer dialog is displayed.



Browsing for the Feature Layer Dialog

2. In the **From Server** section, select the server type. A connection parameters dialog is displayed.
3. Enter the required connection parameters for the specific server or database, and click **Connect**. **See** "Connection Parameters" in this chapter for information.
4. Select a layer from the **Select Layer** dialog and click **Next**. **See** "Select Layer Dialog" in this chapter for information. For SkylineGlobe Server layers, **see** "Loading Layers from SkylineGlobe Server" in this chapter for information.

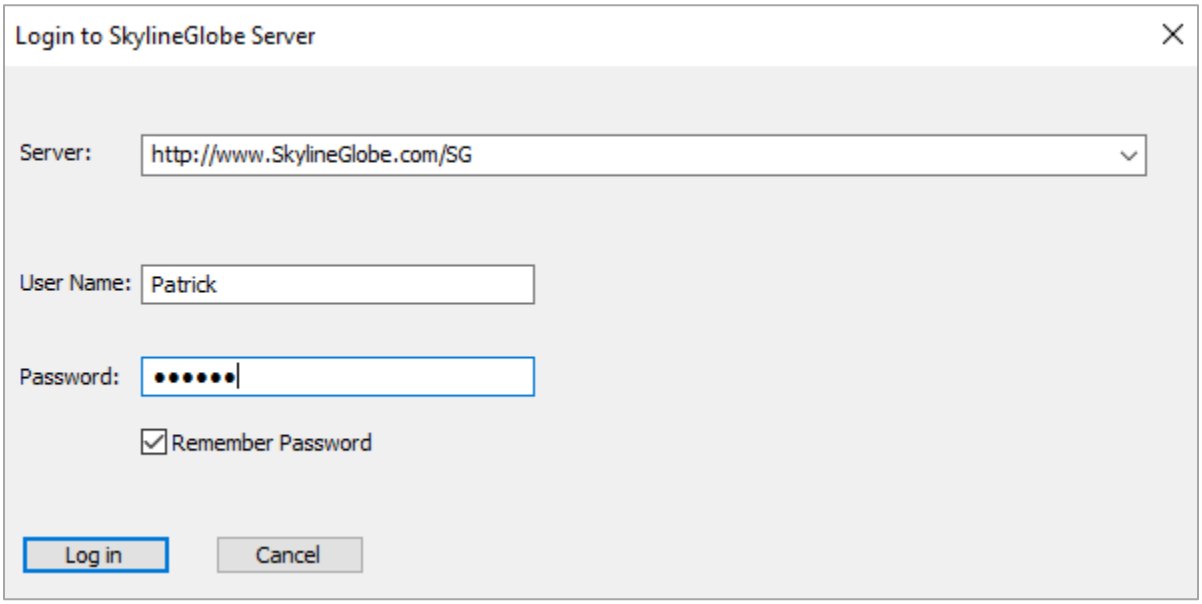
   Note: For ArcGIS GeoServices REST Server layers, the layers are selected directly in the connection parameters dialog, and loaded into the project.
5. Set the Layer's **General Settings** and click **Next**. **See** "Selecting General Layer Settings" in this chapter for more information. The Layer Settings dialog is displayed.
6. Select the attribute fields to load, set layer and layer object parameters, and apply different properties such as line color or cylinder height, based on the attribute field values of the objects. **See** "Loading Layer Attribute Fields", "About Basing Native Feature Layer Properties on Layer Attribute Fields", and "Setting and Editing Feature Layer Properties " in this chapter for information.

Connection Parameters

- Logging In to a SkylineGlobe Server
- Connecting to a Web Feature Server or a Skyline Feature Server

- Connecting to the ArcSDE Server
- Connecting to an Oracle Spatial Server
- Connecting to an SQL Spatial Server
- Connecting to a PostgreSQL Database
- Connecting to an ArcGIS GeoServices REST Server
- Connecting to a MongoDB Database

Logging In to a SkylineGlobe Server



Logging In to SkylineGlobe Server Dialog

To log in to a SkylineGlobe Server:

Note: If you are already logged in to a server and want to log in to a different one, first log out of the first server: on the top right of the application ribbon, click the arrow next to the User Name of the logged in user, and select **Log out**. Then log in to the required server with the required login information.

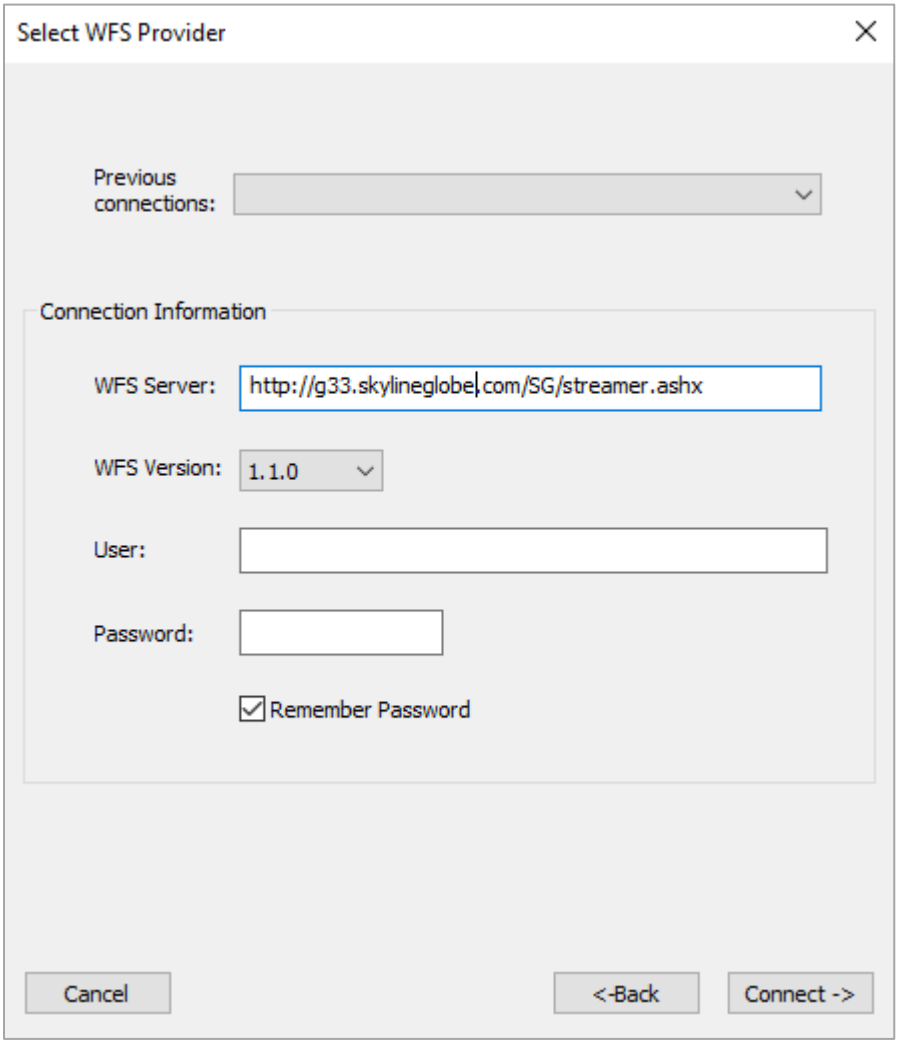
1. Enter the login information and click **Log In**:

Parameter	Activity
Server	The Server Host Name, which is the IP address of the server.
User Name	User name to access the server (mandatory).
Password	Enter the password.
Remember Password	Select this option to save the password. The password will be remembered and will be displayed in asterisks the next time the SkylineGlobe Server dialog is displayed.

The values that you enter for Server and User Name are saved. The next time you load this window, this information is automatically filled in.

2. If the connection to the server is successful, the SkylineGlobe Layers dialog opens from which you can load a layer into the project. **See** the "Working with SkylineGlobe Server" chapter for more information.

Connecting to a Web Feature Server or a Skyline Feature Server



Select WFS Provider Dialog

To connect to a Web Feature Service Server or a legacy TerraGate SFS Feature Server:

1. Enter the connection information:

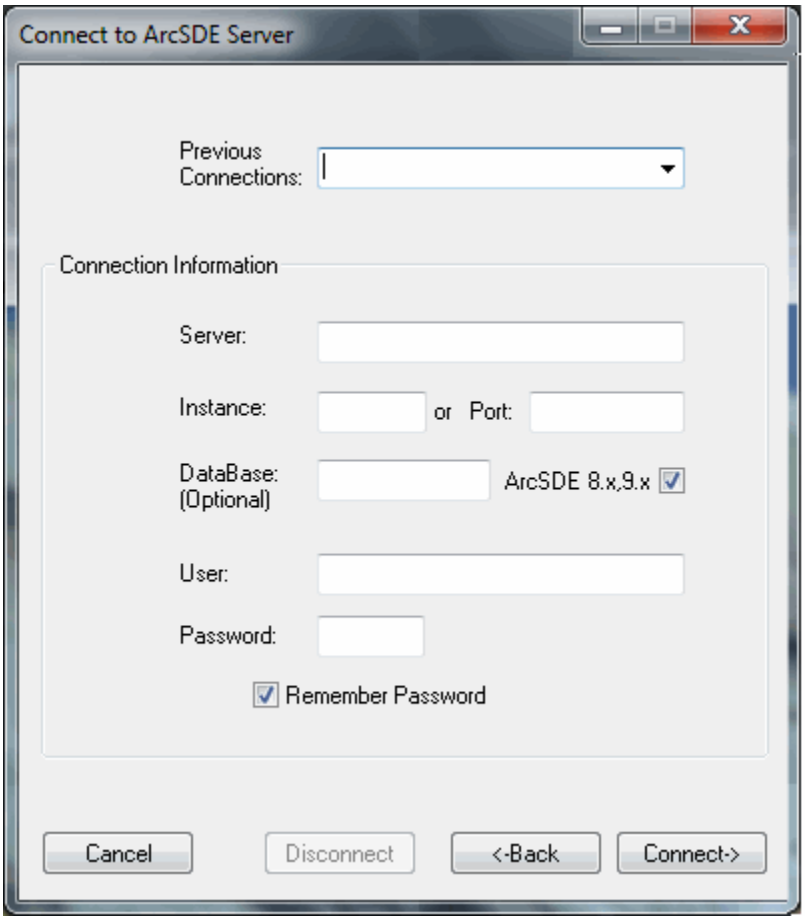
Connection Information	Description
Previous Connections	Displays information from any previous connection you made in the past.

WFS Server	Enter the current URL link if not provided in the Previous Connections field.
WFS Version	Select the WFS version. WFS 1.0.0, 1.1.0, 1.1.1, and 2.0.0 are the currently supported versions.
User	Enter your WFS Server user name.
Password	Enter your WFS Server password.
Remember Password	Select this option to save the password. The password will be remembered and will be displayed in asterisks the next time the Select WFS Provider dialog is displayed.

The values that you enter are saved. The next time you load this window, all the information is automatically filled in.

2. If the connection to the server is successful, click **Next**. The **Select Layer** dialog opens in which you set the layer properties and parameters. **See** "Select Layer Dialog" in this chapter for more information.

Connecting to the ArcSDE Server



Connect to ArcSDE Server Dialog

To access data from ArcSDE server, TerraExplorer requires access to specific ArcSDE components (dynamic link library files): sde.dll, pe.dll and sg.dll, of versions 10.0, 9.3 or 9.2. For versions 9.2 and 9.3, msvcr71.dll is also required. These files are installed with various Esri components, including ArcGIS Desktop and ArcSDE SDK, as well as the free viewers, ArcGIS Explorer Desktop and ArcReader. **See** http://www.esri.com/products/index.html#free_viewers_panel

To allow TerraExplorer to access these files, do any of the following:

- Make sure an ARCGISHOME or AGSDESKTOPJAVA environment variable is defined on your system and includes a reference to a folder under which a bin folder exists with the above-mentioned files.
- Make sure a PATH environment variable is defined on your system and includes a reference to a folder under which a bin folder exists with the above-mentioned files.
- Copy the DLL's to the main TerraExplorer folder.

To connect to an ArcSDE Server:

Note: If you are already connected to a server and want to connect to a different one, first click the Disconnect button, then fill in the new server connection information. You can now connect to the new server.

1. Enter the connection information:

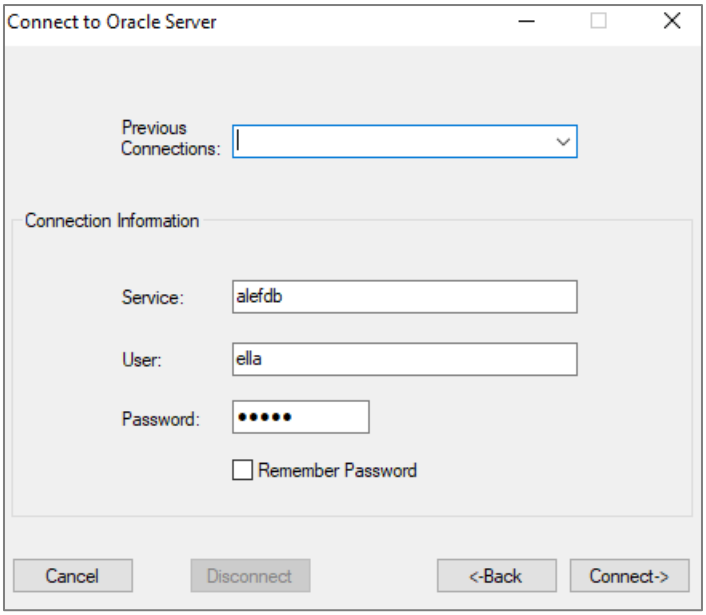
Connection Information	Description
Previous Connections	Displays information from any previous connection you made in the past.
Server	Server name (mandatory).
Instance	Instance name.
Port	Port number. You must fill in either the instance name or the port number.
Database	Database name (optional).
ArcSDE 8.x, 9.x	Select the ArcSDE 8.x check box to indicate connection to an ArcSDE 8 or an ArcSDE 9 database.
User	User name to access the server (mandatory).
Password	Enter the password.
Remember Password	Select this option to save the password. The password will be remembered and will be displayed in asterisks the next time the Connect to ArcSDE Server dialog is displayed.

The values that you enter are saved. The next time you load this window, all the information is automatically filled in.

2. If the connection to the server is successful, click **Next**. The **Select Layer** dialog opens in which you set the layer properties and parameters. **See** "Select Layer Dialog" in this chapter for more information.

   Note: After a connection with ArcSDE Server has been established the connection to the database remains open as long as you do not exit TerraExplorer, or click the **Disconnect** button.

Connecting to an Oracle Spatial Server



Connect to Oracle Spatial Server Dialog

To connect to an Oracle Spatial Server:

Note: If you are already connected to a server and want to connect to a different one, first click the **Disconnect** button, then fill in the new server connection information. You can now connect to the new server.

1. Enter the connection information:

Parameter	Activity
Previous Connections	Displays information from any previous connection you made in the past.
User	Enter the user name.
Password	Enter the password.
Remember Password	Select this option to save the password. The password is remembered and displayed in asterisks the next time the Oracle Spatial Server dialog is displayed.
Service	The Net Service name.

   The values that you enter are saved. The next time you load this window, all the information is automatically filled in.

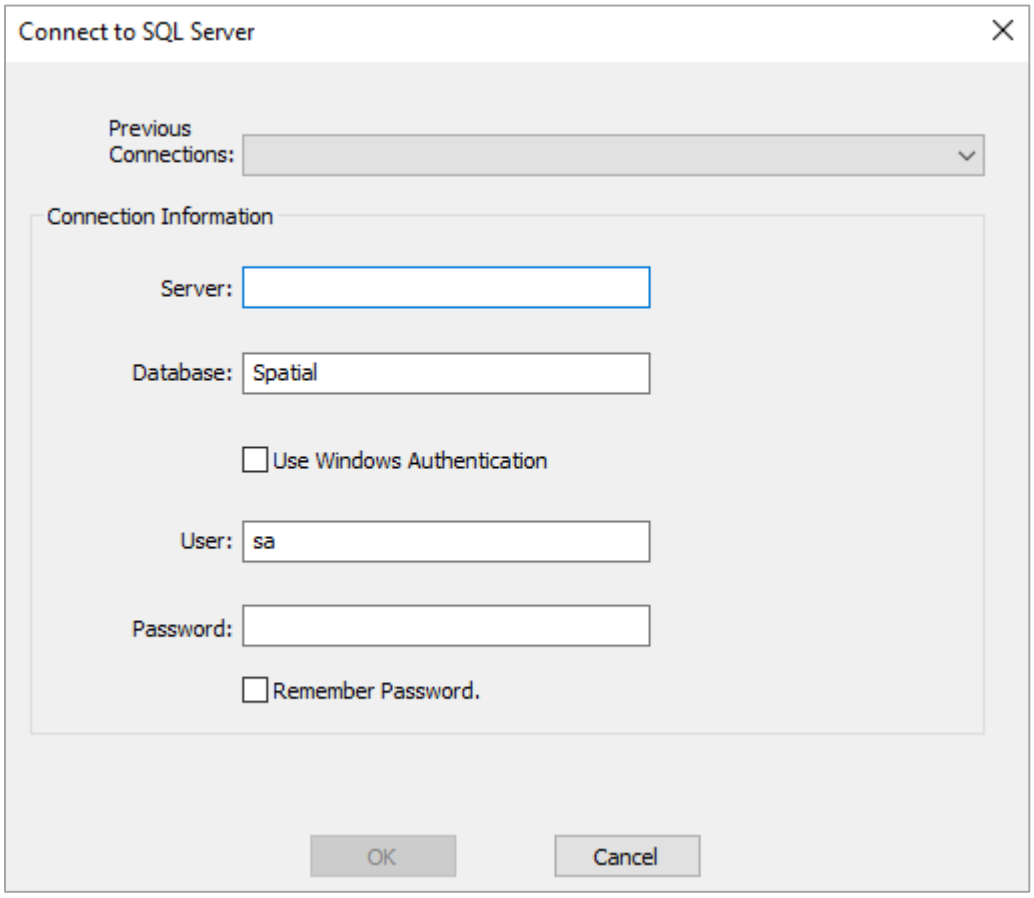
2. If the connection to the server is successful, click **Next**. The **Select Layer** dialog opens in which you set the layer properties and parameters. **See** "Select Layer Dialog" in this chapter for more information.

Note: After a connection with Oracle Spatial Server has been established, the connection to the database remains open as long as you do not exit TerraExplorer, or click the Disconnect button.

Local Naming: Local naming is a method used to resolve a simple name, a net service name, to a connect descriptor that the client uses to connect to a database or service. Local naming stores net

service names and their connect descriptors in a local tnsnames.ora file.
In order to connect to a Service it must be configured in the tnsnames.ora file.

Connecting to an SQL Spatial Server



Connect SQL Server Dialog

To connect to an SQL Spatial Server:

1. Enter the connection information:

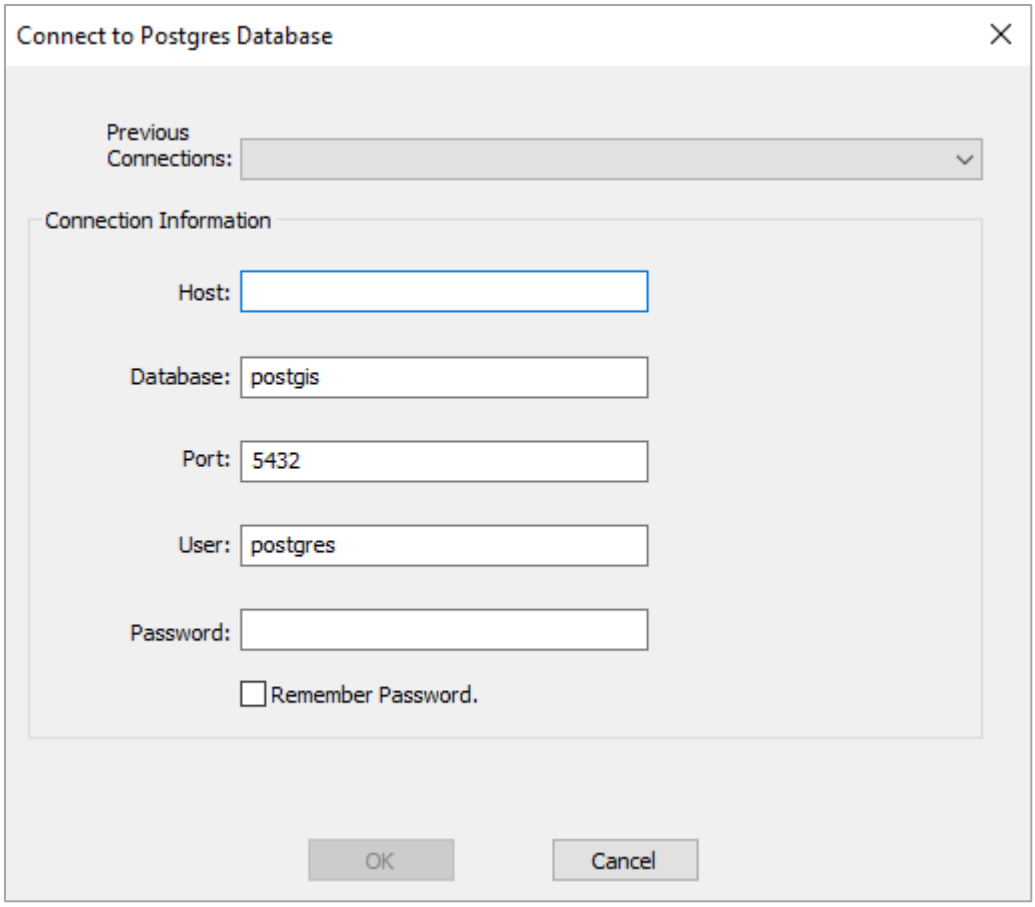
Parameter	Activity
Previous Connections	Displays information from any previous connection you made in the past.
Server	The Server Host Name, which is the IP address of the server.
Database	Database name (optional).
Use Windows Authentication	When the Use Windows Authentication check box is selected, the SQL Server OLE DB provider will request a secure (or trusted) connection to a SQL Server running on Microsoft platform. The SQL Server will use integrated login security to establish connections using this data source, regardless of the current login security mode at the server. Any login ID or password supplied is ignored. The SQL Server system

	administrator must associate your login with a SQL Server login ID. When cleared, the SQL Server will use standard login security to establish connections using this data source. You must specify a login ID and password for all connection requests.
User	User name to access the server. **Note:** If the Use Windows Authentication check box is selected, the User name field is unavailable
Password	Enter the password. **Note:** If the Use Windows Authentication check box is selected, the User name field is unavailable
Remember Password	Select this option to save the password. The password will be remembered and will be displayed in asterisks the next time the SQL Server dialog is displayed.

The values that you enter are saved. The next time you load this window, all the information is automatically filled in.

2. If the connection to the server is successful, click **OK**. The **Select Layer** dialog opens in which you set the layer properties and parameters. **See** "Select Layer Dialog" in this chapter for more information.

Connecting to a PostgreSQL Database



Connect to PostgreSQL Database Dialog

To connect to a PostgreSQL Server:

Note: If you are already connected to a server and want to connect to a different one, first click the **Disconnect** button, then fill in the new server connection information. You can now connect to the new server.

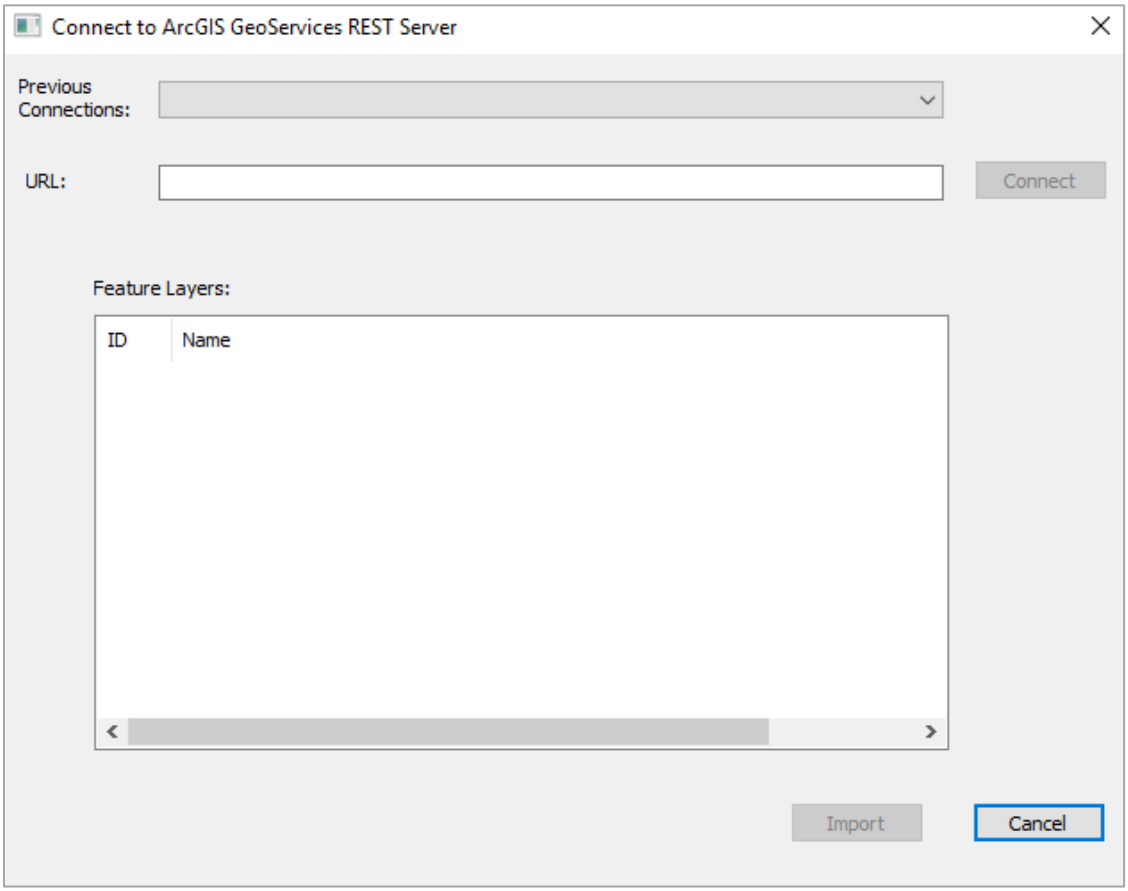
1. Enter the connection information:

Parameter	Activity
Previous Connections	Displays information from any previous connection you made in the past.
Host	The Server Host Name, which is the IP address of the server.
Database	Database name (optional).
Port	Port number.
User	User name to access the server (mandatory).
Password	Enter the password.

The values that you enter are saved. The next time you load this window, all the information is automatically filled in.

2. If the connection to the server is successful, click **Next**. The **Select Layer** dialog opens in which you set the layer properties and parameters. **See** "Select Layer Dialog" in this chapter for more information.

Connecting to an ArcGIS GeoServices REST Server

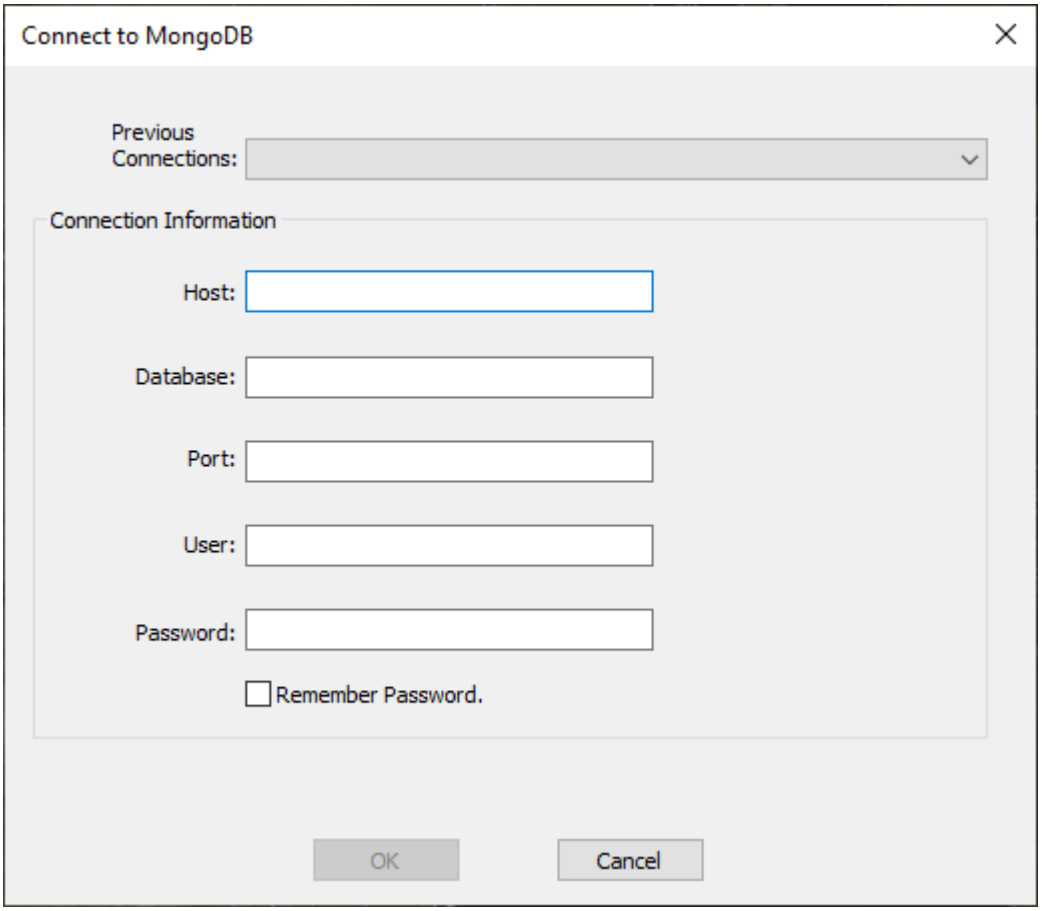


Connect to ArcGIS GeoServices REST Server Dialog

To connect to an ArcGIS GeoServices REST Server:

1. Enter the server's URL.
2. Click **Connect**.
3. Select a layer, and click **Import**.

Connecting to a MongoDB Database



Connect to MongoDB Dialog

To connect to a MongoDB database:

Note: TerraExplorer currently supports MongoDB v3.

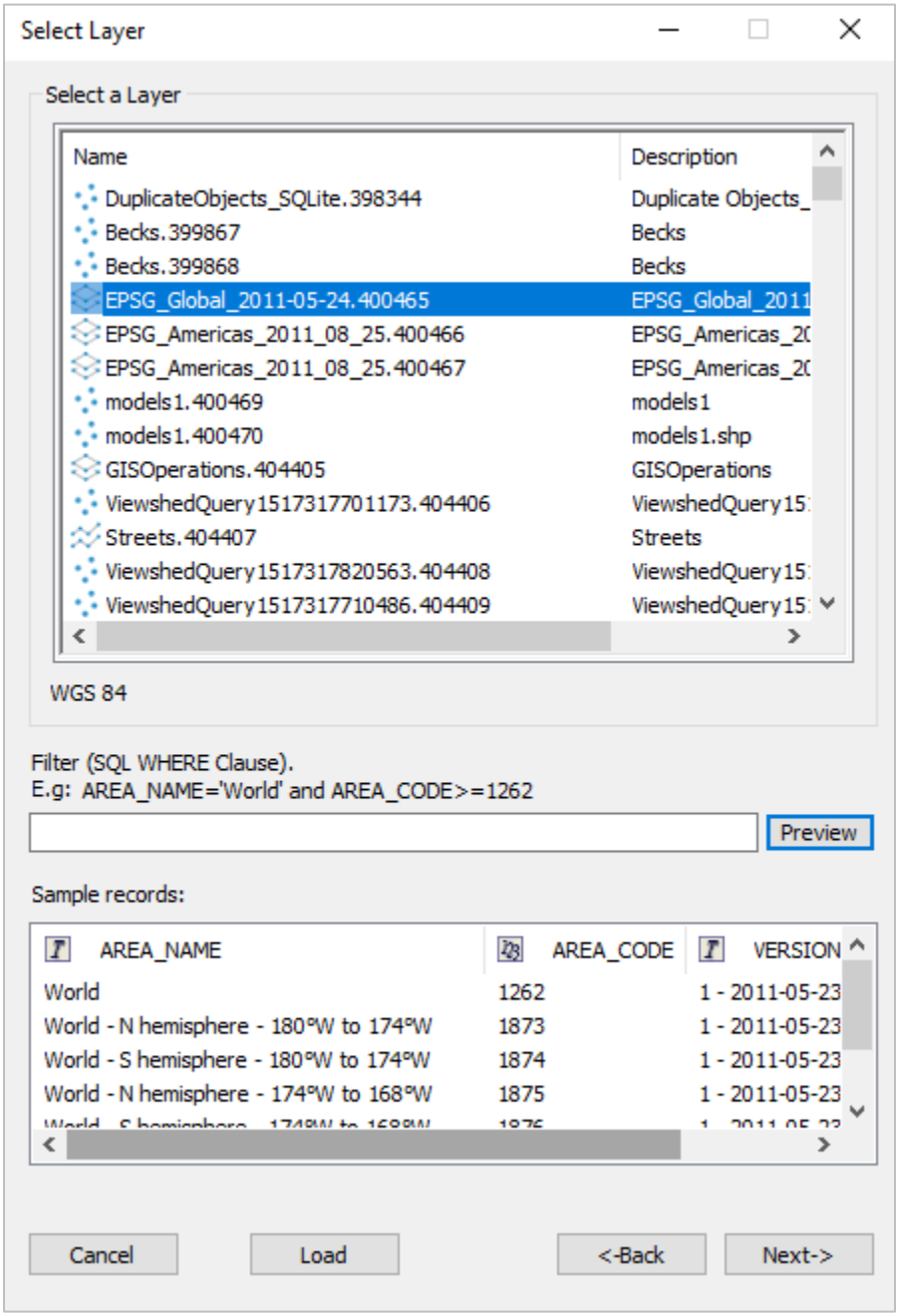
1. Enter the connection information:

Parameter	Activity
Previous Connections	Displays information from any previous connection you made in the past.
Host	The database host name, which is the IP address of the server holding the database.
Database	Database name (optional).
Port	Port number.
User	User name to access the server (mandatory).
Password	Enter the password.

The values that you enter are saved. The next time you load this window, all the information is automatically filled in.

2. If the connection to the server is successful, click **OK**. The **Select Layer** dialog opens in which you set the layer properties and parameters. **See** "Select Layer Dialog" in this chapter for more information.

Select Layer Dialog



Select Layer Dialog

To use the Select Layer dialog:

1. In the **Select a Layer** section, select the required layer. Use CTRL-click or SHIFT-click to multi-select layers.

Note: When multi-selecting layers, they are imported with default settings.

2. Define a filter for the layer; the filter is any valid SQL WHERE clause. Click the **Preview** button to display the filtered information.

   Note: The WHERE statement is an OGR SQL dialect. **See** http://www.gdal.org/ogr_sql.html for more information.

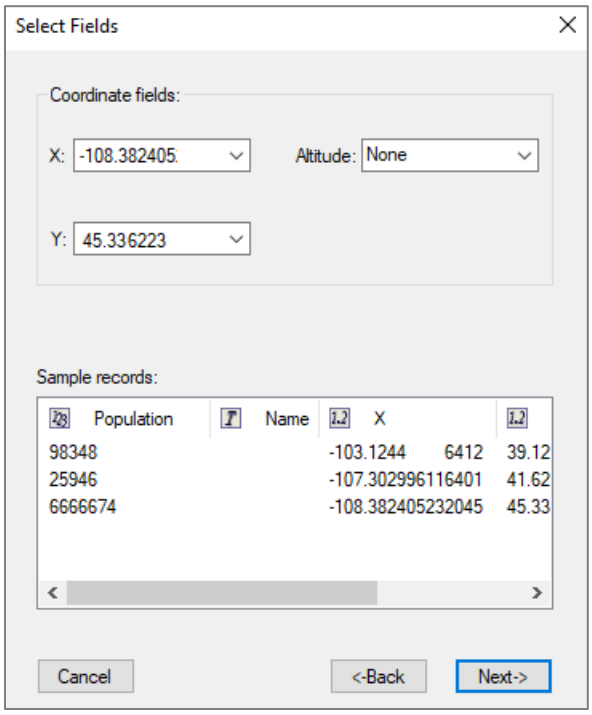
3. Select the **First row is column name header** check box if you want the first row of data shown in the **Sample Records** area to be the header.

   Note: This check box is only displayed when an Excel file is loaded.

4. Click **Load** to use the default general layer settings.
5. If you want to set non-default general layer settings, click **Next**. If you are loading a layer from a text file or Excel file, the Select Fields dialog opens. Otherwise, the General Settings dialog opens.

   Note: When multi-selecting layers, they can only be imported with default settings, so the Next button is not available.

Select Fields Dialog

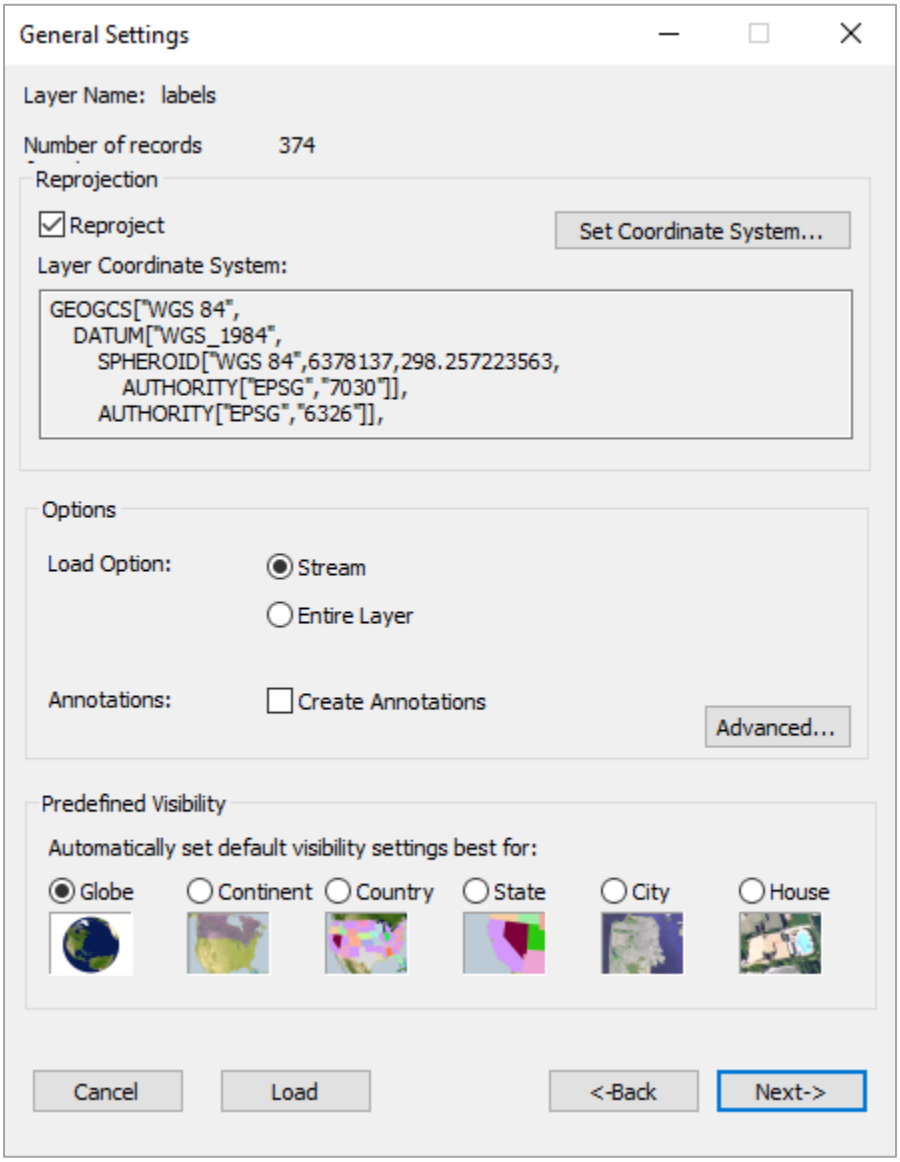


Select Fields Dialog

To use the Select Fields dialog:

1. Select the Layer's **X**, **Y** and **Altitude** coordinate fields.
2. Click **Next**. The **General Settings** dialog opens.

Selecting General Layer Settings



General Settings Dialog

Setting General Layer Settings

To set general layer settings:

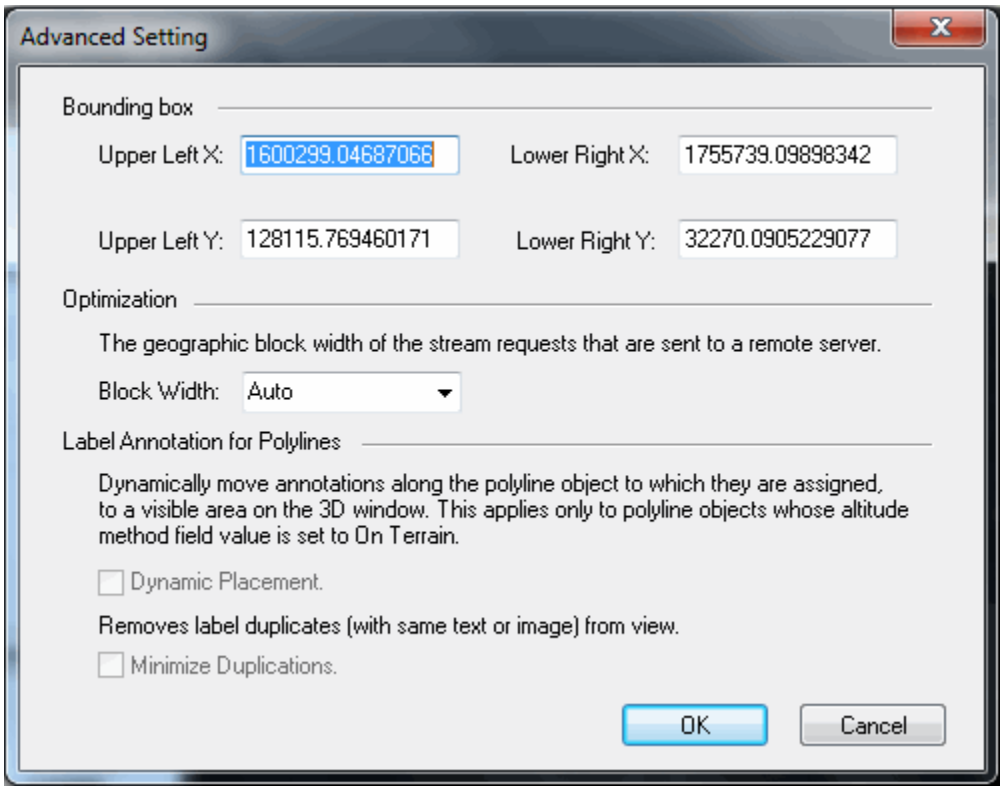
1. In the **General Settings** dialog, define the following parameters:

Parameter	Description
Reprojection	
Reproject	If the coordinate system of the layer is different from the coordinate system of the terrain, do the following: 1. Select the **Reproject** check box. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.

	2. Click the Set **Coordinate System** button to open the **Coordinate System** dialog to specify the coordinate system of the layer. **Note:** If TerraExplorer automatically recognized the layer's coordinate system, the Reproject check box is automatically selected and the Layer Coordinate System section is populated.
Options	
Load Option	Select the required option: ▪ **Stream** - Information from the remote layer file is retrieved, added to the terrain, and then removed dynamically based on the camera's position. This option enables you to fly without waiting for the entire layer to load. ▪ **Entire Layer** - The entire layer is loaded from the server when the FLY file opens.
Create Annotations	Select the **Create Annotations** check box to automatically add a point annotation object in the center of each layer feature, which can be used to convey information, textually or graphically, relating to the feature. The center point is determined according to the type of feature layer: ▪ **Point** – Same point. ▪ **Polygon** – Center of polygon (center of gravity, normally inside). ▪ **Polyline** – Center along the line.
Advanced	Click to set advanced streaming parameters. **See** "Setting Advanced Streaming Parameters" in this chapter for further information.
Predefined Visibility	
Globe/ Continent/ Country/ State/ City/ House	Select the viewer altitude from which visibility distance and scale is set to optimum.

3. Click **Next** to define layer settings. **See** "Loading Layer Attribute Fields" in this chapter for further information. If you don't want to define any layer settings, click **Load** to load the layer directly.

Setting Advanced Streaming Parameters



Advanced Streaming Setting Dialog

To set Advanced Streaming settings:

1. In the Advanced Setting dialog, define the following parameters:

Advanced Streaming Property	Description
Bounding Box	The loaded feature layer area is bounded within the coordinates of a fixed rectangular area. These coordinates are retrieved from the source file or the source server. You can change the coordinates of the layer bounding box only if the Load Layer parameters are set to Streaming. The coordinates parameters are as follows: ▪ **Upper Left X and Upper Left Y**: The coordinates of the upper left corner of the required bounding box. ▪ **Lower Right X and Lower Right Y**: The coordinates of the lower right corner of the required bounding box.
Optimization This option is available only for streaming layers.	
Block Width	You can change the geographic block width of the stream requests that are sent from TerraExplorer to the remote server.

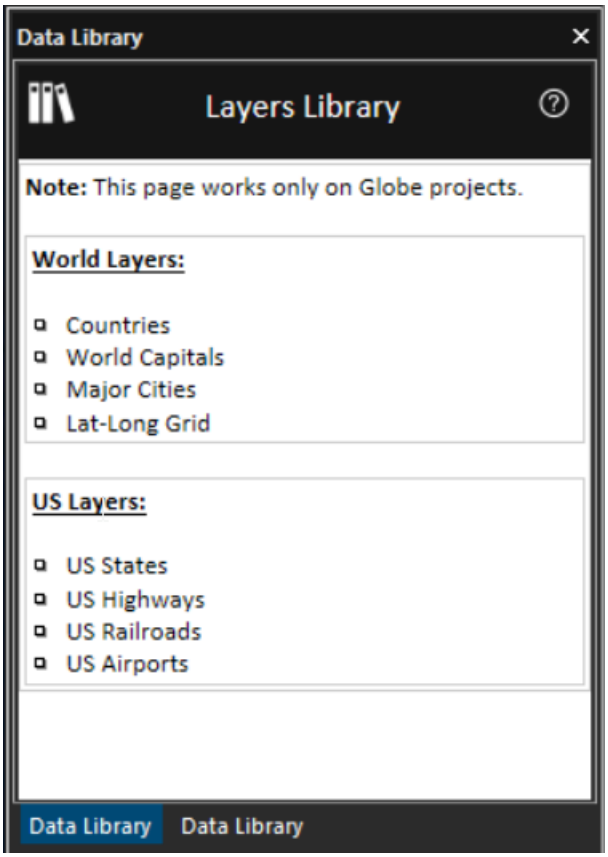
	Changing the block width can improve performance, For example, a block width that is about double the average line feature size, or covers about 50 point features, can improve streaming behavior. This field is enabled when the **Load** option in the Options section of the General Settings dialog is set to Streaming. Select one of the following options: ▪ **Auto**: TerraExplorer Pro calculates dynamically the request block width according to performance related criteria. ▪ **Predefined Set of Block Width Suggestions**: Select the block width in meters or kilometers.
Label Annotation for Polylines This option is available only for streaming layers, when you are creating a polyline and an annotation symbol.	
Dynamic Placement	When the **Dynamic Placement** option is selected, annotations are dynamically moved along the polyline object to which they are assigned, to a visible area in the 3D Window. This applies only to polyline objects whose altitude method field value is set to **On Terrain**.
Minimize Duplications	When the **Minimize Duplications** option is selected, repeating labels, with the same text or image, are removed from the view.

Loading Layers from the Data Library

You can load layers from the SkylineGlobe Data Library.

To load a feature layer from the Data Library:

1. On the **Layers** tab, in the **Feature** group, click **Data Library**. The Data Library dialog is displayed.



Load Layer from Data Library

2. Click the layer you want to add, and it is automatically added to the project and displayed in the Project Tree.

Loading SGS Base Layers

You can load base layers into the project from the SkylineGlobe Server TerraExplorer is currently connected to.

To load an SGS base layer:

1. If you aren't already logged in to the required SkylineGlobe Server, log in to the server. **See** "Logging In to a SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.
2. On the **Layers** tab, in the **Feature** group, click the arrow next to **SGS Base Layers**, and select one of the feature layer types (Borders and Places, Points of Interest, Streets and Roads, Buildings). The layer is added to the project and displayed in the Project Tree.

Setting and Editing Feature Layer Properties

The Layer property sheet includes up to three tabs for standard layers:

- The **Feature** tab (Polygon, Polyline, or Point)
- The **Annotation** tab
- The **Layer** tab

Note: Most data sources include a homogenous set of features of the same geometry type, so they have one feature tab that corresponds to the layer's geometry type. Other types (e.g., DGN, DXF) are of the "feature collection" type, which supports multiple geometry types within one layer. Their property sheets have tabs for each of the geometry types: polygon, polyline, and point.

The **Feature** and **Layer** tabs are always included in the property sheet. For standard layers, the inclusion of the **Annotation** tab depends on your selection in the **Options** section in the General Settings dialog at the time of loading. **See** "Selecting General Layer Settings" in this chapter to learn about the Create Annotations check box.

Layer properties can be set when a feature layer is loaded. If properties were not set or you want to modify properties, you can open the layer's property sheet and do so.

To set layer properties when loading a feature layer:

1. In the **Layer Settings** dialog, in the property sheet, select the required tab and set the parameter values.
2. If you want to undo/redo any property change, on the top of the layer's property sheet, click **Undo** / **Redo**. Changes can be undone or redone, even after the property sheet is closed, and then reopened.

Tab	Description
Features (Polygons or Polyline or Points) tab	This tab contains the properties related to the objects (the features) contained within the layer. **Note**: Most data sources include a homogenous set of features of the same geometry type, so they have one feature tab that corresponds to the layer's geometry type. Other types are added as feature collections (e.g., DGN, DXF), which can have more than one type of geometry, and will therefore have multiple feature tabs, one for each geometry type. Depending on the type of features that the layer contains, the Feature tab displays one of the following: ▪ **Points**: The Points properties displayed in the property sheet depend on the symbol type selected in the Symbol field located at the top of the Points tab. Symbol types can be Text Label, Image Label, Shape, Regular polygon, Circle, Ellipse, Arc, 2D Arrow, Box, Pyramid, Cone, Cylinder, Sphere, 3D Arrow, or 3D Model. See the relevant properties specification for each type of symbol in the guide section dedicated for it. ▪ **Polylines - See** "Creating a New Polyline" in the "Objects and Labels" chapter for more information. ▪ **Polygons**: The Polygon properties displayed in the property sheet depend on the symbol type selected in the Symbol field located at the top of the Polygon tab. Polygon symbol types can be Polygon, 3D Polygon or Building. See the relevant properties specification for each type of symbol in the guide section dedicated for it. See the relevant properties specification for each type of symbol in the guide section dedicated for it.

	Note: You can copy a layer style and paste it on to another layer with features of the same geometry type. All feature and annotation properties, i.e., properties included on the Feature (Polygon, Polyline or Point) and Annotation tabs are copied and pasted. **See** "Copying and Pasting Layer Styles" in this chapter for more information.
Annotations tab	The Annotation properties displayed in the property sheet depend on the symbol type selected in the Symbol field located at the top of the Annotation tab. Annotation symbol types can be Text Label, Image Label, Rectangle, Regular Polygon, Circle, Ellipse, Arc, 2D Arrow, Box, Pyramid, Cone, Cylinder, Sphere, 3D Arrow or 3DModel. See the relevant properties specification for each type of symbol in the guide section dedicated for it.
Layer tab	This tab contains the properties related to the layer as a whole, e.g., loading mode and coordinate system. **See** "Layer Tab" in this chapter for further information.

Layer Tab

The layer tab includes the following groups and fields:

Field	Activity
General	
Name	Type the description or name of the layer. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the locked layer from the Project Tree. The action is also applied on the annotation symbols group and the features group, if the groups are included in the layer.
Message	The message associated with the layer. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Location Defines the initial location of the camera when a locked layer is selected from the Project Tree. The location parameters also apply to the Features group, and to the Annotations Group if it was created.	
Altitude Method	Sets the altitude method to be used for the specified location: ▪ Select **Relative to Terrain** to place the location point at a specified altitude above the ground. ▪ Select **Absolute** to place the location point at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	Enter the altitude above the ground for the specified location.

X	Enter the X-coordinate of the location of interest.
Y	Enter the Y-coordinate of the location of interest.
MGRS	The coordinates of the location of interest in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Direction	Enter the horizontal angle of the camera when viewing the location.
Tilt	Enter the vertical angle of the camera when viewing the location.
Viewing Distance	Enter the distance between the camera and the specified location. This property also affects the radius of the flight patterns.
Set Viewpoint	Click **Capture** to capture the current camera position and set as the camera parameters for this location.
Jump To Viewpoint	Click **Jump** to make the 3D Window reflect the changes made to the location's fields.
Visibility Conditions	
Minimum Streaming Altitude	As you zoom in on a layer, information may become too coarse. You can set the minimum streaming altitude below which the layer objects and annotations in the layer stop streaming in. When flying lower than the "Minimum Streaming Altitude" the objects disappear and the streaming of layer data pauses (If the Load Option was set to "Streaming" on the General Settings page, **see** "Selecting General Layer Settings" in this chapter for further information).
Maximum Streaming Altitude	As you zoom out, it may be difficult to see more detailed information. You can set the maximum streaming altitude above which the layer objects and annotations in the layer are no longer visible. When flying higher than the "Maximum Streaming Altitude", the objects disappear and the streaming of layer data pauses (If the Load Option was set to "Streaming" on the General Settings page, **see** "Selecting General Layer Settings" in this chapter for further information).
Connection The Connection section displays layer connection parameters based on the layer file sources. If the layer source is a local file, the file name is displayed in the From File field, **see** "Loading Layers from Feature Files" in this chapter for further information. If the layer source is a remote server, **see** "Loading Layers from SkylineGlobe Server" and "Loading Layers from Other Feature Servers" in this chapter for further information.	
Layer Name	The name of the layer selected from the server (Read-only).
File Name	The name of the layer file (Read-only).
Load Layer The load layer section enables you to select the load mode and specify which areas to load within the layer.	

Load Option	Select one of the following load modes: ▪ **Streaming**: the layer features are streamed from the server according to the plane location during the flight. ▪ **All Features**: all layer features are loaded at once.
Filter	Define a filter for the layer; the filter is any valid SQL WHERE clause. Click the **Preview** button to display the filtered information. **Note:** The WHERE statement is an OGR SQL dialect. **See** http://www.gdal.org/ogr_sql.html for more information.
Suggested Block Width	Sets the block width of the stream requests sent from TerraExplorer to the remote server. Changing the block width can improve performance. For example, a block width that is about double the average line feature size, or covers about 50 point features, can improve streaming behavior. This field is enabled when the Load option field of the Load Layer section is set to Streaming. Select one of the following block width setting methods: ▪ **Auto**: TerraExplorer Pro calculates dynamically the request block width according to performance related criteria. ▪ **Predefined block width suggestions**: Select the block width in kilometers.
Ignore Geometry Z Value	Select whether to ignore the layer's z-coordinate value. This field is only displayed for data sources that support Z values.
Z Value Units	Select the desired units of measurement for z-coordinates: meters, feet, centimeters, decimeters, inches or yards. This field is only displayed for data sources that support Z values.
Refresh Layer	Click the **Apply** button to reload the layer from a server or file according to your load settings. Any changes made to specific objects are overwritten. Changes that were applied to the entire group using the Layer Properties, are applied again to the reloaded layer.
Projection	
Reproject Source	Determines if the layer's geographic information is reprojected from the source coordinate system to the terrain coordinate system.
Reproject Elevation	Select the check box to reproject the layer's elevation values to the terrain's coordinate system. This option only applies when Altitude Method is set to Absolute. Geocentric layers are always reprojected.
Layer Coord Sys	Displays the layer's coordinate system.
Coordinate System	Click **Set** to open the Coordinate System dialog.

Import Attribute Fields

The Import Attribute section enables you to select which attribute fields to load with the layer. You can add attributes that were not selected for loading when the layer was initially added to the terrain, (**See** "Selecting Layer Attributes Fields" in this chapter for further information) or you can clear field attributes that were initially selected.

Note: Field attributes on which property field values were based (**See** "About Basing Native Feature Layer Properties on Layer Attribute Fields" in this chapter for further information.) cannot be cleared and their check boxes are unavailable.	
Layer Bounding Box The loaded feature layer area is bounded within the coordinates of a fixed rectangular area. These coordinates are retrieved from the source file or the source server. You can change the coordinates of the layer bounding box only if the Load Layer parameters are set to Streaming.	
Reset	Click to reset the coordinate information to its original values.
Upper Left X	Click to modify the X coordinate of the upper left corner of the layer.
Upper Left Y	Click to modify the Y coordinate of the upper left corner of the layer.
Lower Right X	Click to modify the X coordinate of the lower right corner of the layer.
Lower Right Y	Click to modify the Y coordinate of the lower right corner of the layer.

Copying and Pasting Layer Styles

Layers are easily styled by copying the styles from one layer and pasting them onto another layer with features of the same geometry type. All feature and annotation properties, i.e., properties included on the Feature (Polygon, Polyline or Point) and Annotation tabs are copied and pasted.

Note: Layer styles cannot be pasted if the source of the layer being copied was deleted.

To copy and paste a layer's styles:

1. In the **Project Tree**, right-click the layer whose style you want to copy, and select **Copy Layer Style**.
2. In the **Project Tree**, right-click the layer to which you want to apply the copied layer style, and select **Paste Layer Style**. If you want to paste the style to multiple feature layers, use CTRL-click or SHIFT-click to multi-select the layers, and then select **Paste Layer Style**.

Using Attribute Fields

Most feature layers can store attribute field values for each of their features. This information can be used to:

- Display attribute field information in the Information Query Tool results. **See "**Information Query Tool" in the "Analysis Tools" chapter for further information.
- Control the appearance and behavior of layer features based on field attribute values. For example, you can represent the number of people living in a country attribute by the line color of the country's boundary. **See** "About Basing Native Feature Layer Properties on Layer Attribute Fields" in this chapter for further information.
- Perform actions on sets of layer features matching a specific set of attribute field values. For example, you can show in the 3D Window or export to a new layer only countries whose GNP per capita surpasses $15,000. This capability is enabled by the Attribute Table Tool. **See** "Searching and Performing Operations by Attribute (Attribute Table Tool)" in this chapter for further information.

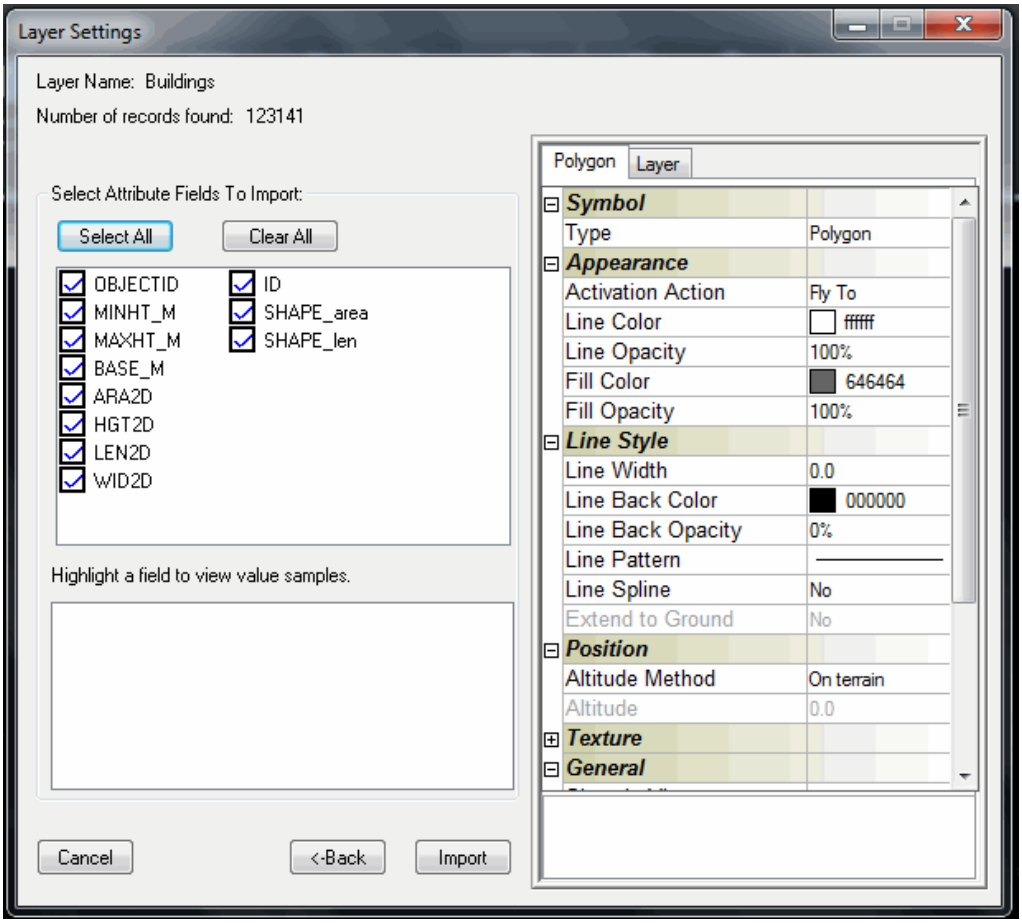
Loading Layer Attribute Fields

Feature layers can be loaded with their attribute fields and values. If attribute fields were not loaded with a layer or you want to modify which fields are loaded, you can select or clear field attributes in the layer's property sheet. However, if you base a property sheet field on an attribute field, the attribute field's check box is automatically selected and disabled.

To select attribute fields to load when loading a layer:

1. In the **Layer Settings** dialog, in the **Select Attribute Fields to Load** section, select the check boxes of the attributes you want to load. Attributes are listed here only if the chosen layer has attribute field information.

   Note: If you want to load all the attribute fields, click **Select All**. If you want to load no attribute fields, click **Clear All**.



Layer Settings Dialog

2. If you want to view samples of an attribute field, highlight it in the **Select Attribute Fields to Load** section. A sample is displayed in the Highlight a field to view value samples section.
3. In the **Layer Settings** dialog, in the property sheet panel, set layer and layer object parameters. **See** "Setting and Editing Feature Layer Properties " in this chapter for further information.

To load attribute fields after a layer was loaded.

1. On the **Layer** tab of the layer's **property sheet**, in the **Load Attribute Fields** section, select the check boxes of the attribute fields you want to load, and clear the check boxes of the attribute fields you want unloaded.

   Note: Attribute fields that were already loaded display with their check boxes selected.

2. A dialog is displayed reminding you that you need to refresh (reload) the layer before the new attribute fields are loaded. Click **OK**, and continue selecting or clearing check boxes as required.
3. When you close the property sheet, a dialog is displayed asking if you want to refresh the layer. Click **OK** to refresh.

Modifying Layer Attribute Data

After loading a native feature layer with attribute fields, you can view and edit the attribute field values of the objects.

The attribute values appear in the Attributes group in the object's property sheet. Any change you make to the attribute fields values is saved in the FLY file.

To edit layer attribute data:

1. Select a single object for editing.
2. On the **Feature Layer** tab, in the **Selection** group, click **Select Feature**.
3. In the **3D Window**, select the object. A yellow frame surrounds the feature object and the feature's property sheet opens.
4. In the layer's property sheet, in the **Attributes** section, click the parameter name to edit. The **Help** text at the bottom of the property sheet displays the field's data type (e.g., "String. Character Length:13", "Double", etc.).

   Note: Each attribute field that was loaded from the feature layer has a Parameter Name in the Attributes group. The value in the parameter's value is the appropriate value for the selected object.

5. Click the parameter value field and enter the new value.

   Note: Only valid inputs according to the field's data type are updated and saved.

About Basing Native Feature Layer Properties on Layer Attribute Fields

After loading a feature layer with attribute fields, you can apply different properties such as line color or cylinder height, based on the attribute field values of the objects.

Let's take as an example a polygon's layer that covers the terrain with country boundaries. With the help of this feature, it is possible for TerraExplorer to color in red only the boundaries of countries with a population of more than 10 million people.

Note that you can base properties on field attributes, only if the feature layers are loaded with attribute fields, such as "Country Population". If the layer does not contain attribute fields, or in the loading phase, you did not select any attribute field to load, you cannot take advantage of this feature.

See "Loading Layer Attribute Fields" in this chapter to learn how to add the attribute field information in the loading phase.

When basing a property field on an attribute field, you have to establish the property you want to set, and the attribute field on which to base your setting. In our example, the property is the country boundary's Line Color, and the attribute field is "Country Population".

Attribute Fields

Properties can be based on three types of attribute fields:

Description	Type of Storage /Example
Textual attribute field types	e.g., Country Name.
Integer attribute field types	Stores whole numbers without any decimals. e.g., State Population.
Double attribute field types	Stores real numbers having a double precision floating point. e.g., Average Income.

The field attribute type determines **how** the property is based on the value of the field attribute.

- When the attribute field is numeric - integer of double - it is possible to group attribute field values in ranges. For example, you can set the boundary line color to red for countries with a population between 1,000,000 and 2,000,000 and to green for countries with a population between 2,000,001 and 3,000,000.
- When a property is based on a numeric field attribute, it is also possible to use the >< =><= operators. For example, you can set the boundary line color to orange for all countries with a population larger (>) than 1,000,000.

Properties

There are four types of properties that can be set based on attribute fields:

- Color properties such as line color and fill color.

  See "Basing Color Properties on Attribute Fields" in this chapter for further information.
- Numeric properties such as cylinder height or text label altitude.

  See "Basing Numeric Style Properties on Attribute Fields" in this chapter for further information.
- The text content of text labels, tooltips and other text elements.

  See "Basing Text Content on Attribute Fields" in this chapter for further information.
- Dropdown lists properties such as font size or text underline.

  See "Basing Dropdown List Properties on Attribute Fields" in this chapter for further information.

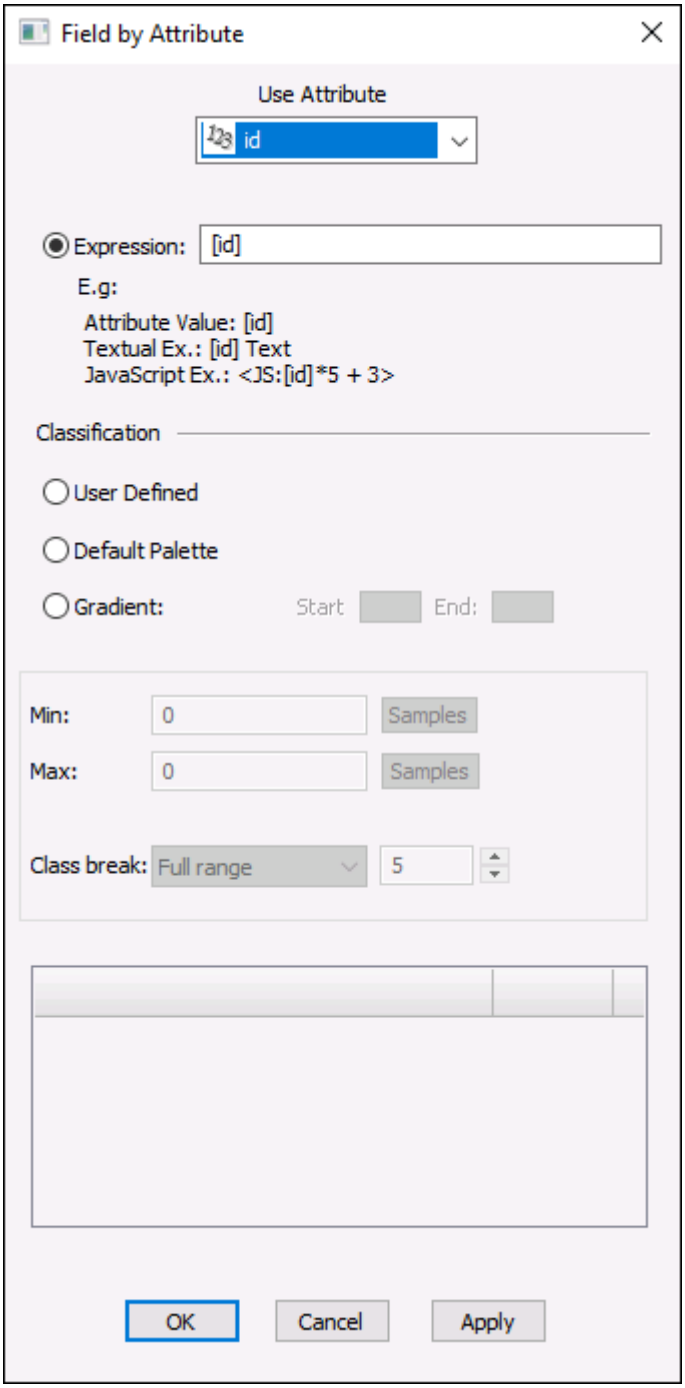
Basing Color Properties on Attribute Fields

To base color properties on attribute fields:

1. In the layer property sheet, click the color property box, and then click the **Field by Attribute** button .
2. From the **Use Attribute** dropdown list, select the field attribute on which to base the color property.
3. Select one of the following color property setting modes:
   - **Expression**: **See** "Applying the Color Expression Mode" in this chapter for further information.
   - **User Defined**: **See** "Applying the Color User Defined Mode" in this chapter for further information.
   - **Default Palette**: **See** "Applying the Color Default Palette Mode" in this chapter for further information.
   - **Gradient**: **See** "Applying the Color Gradient Mode" in this chapter for further information.

Applying the Color Expression Mode

The Expression mode lets you set the color property according to the values of the field attribute you selected in the Use Attribute dropdown list. The required color should be in decimal format. If the selected field contains the required decimal color, you can use it as is. Otherwise, you can use an expression whose end result is a color in decimal format, e.g., <[R]+[G]*255 + [B]*65536>.



Field by Attribute Dialog – Color Expression Mode

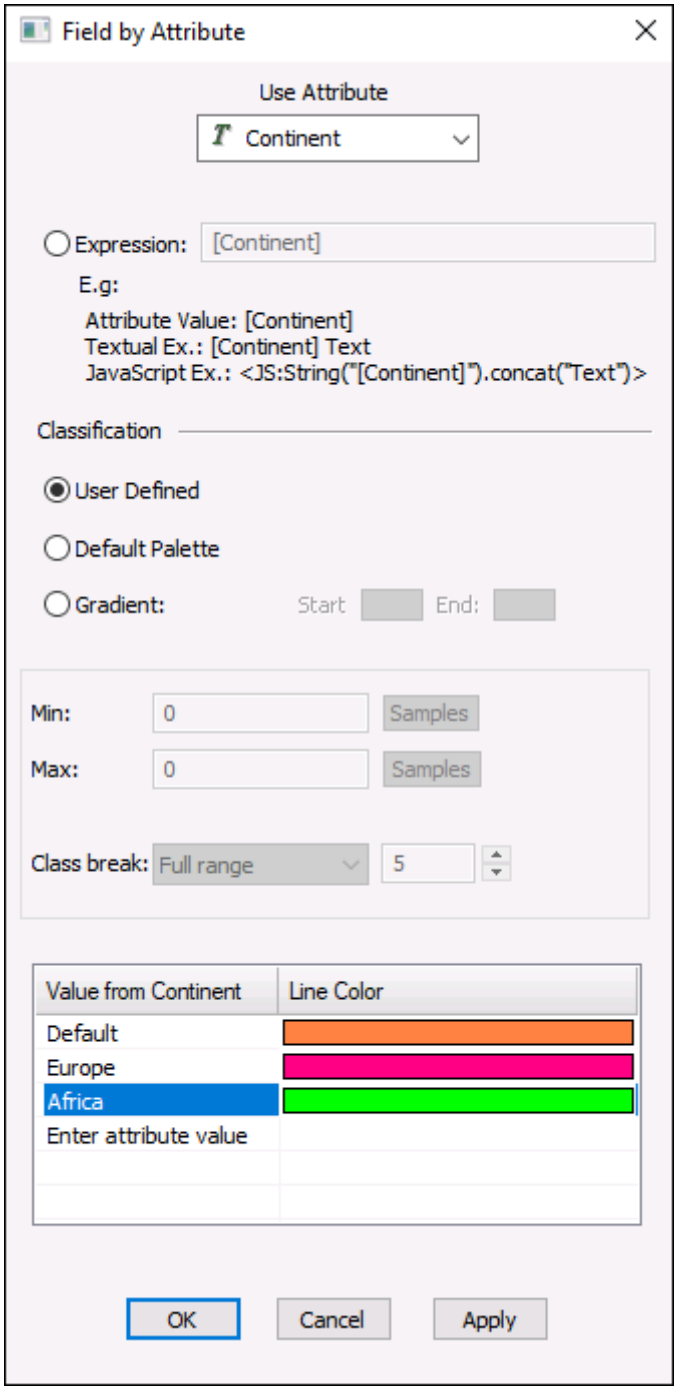
To apply the color Expression mode:

1. In the **Field by Attribute** dialog, select the **Expression** option.
2. In the **Expression** field, build an expression that contains the attribute as a variable.

   Note: Legacy VBScript has been deprecated and will not work in TerraExplorer Fusion.
3. Click **Apply**.

Applying the Color User Defined Mode

The User Defined mode enables you to assign a specific color to a specific attribute field value. In this field, for example, you can set the line color for all country boundaries in Europe to purple. You assign the purple color to the 'Europe' value, provided that you select the 'Continent' field attribute in the **Use Attribute** dropdown list.



Field by Attribute Dialog – Color User Defined Mode

To apply the User Defined mode:

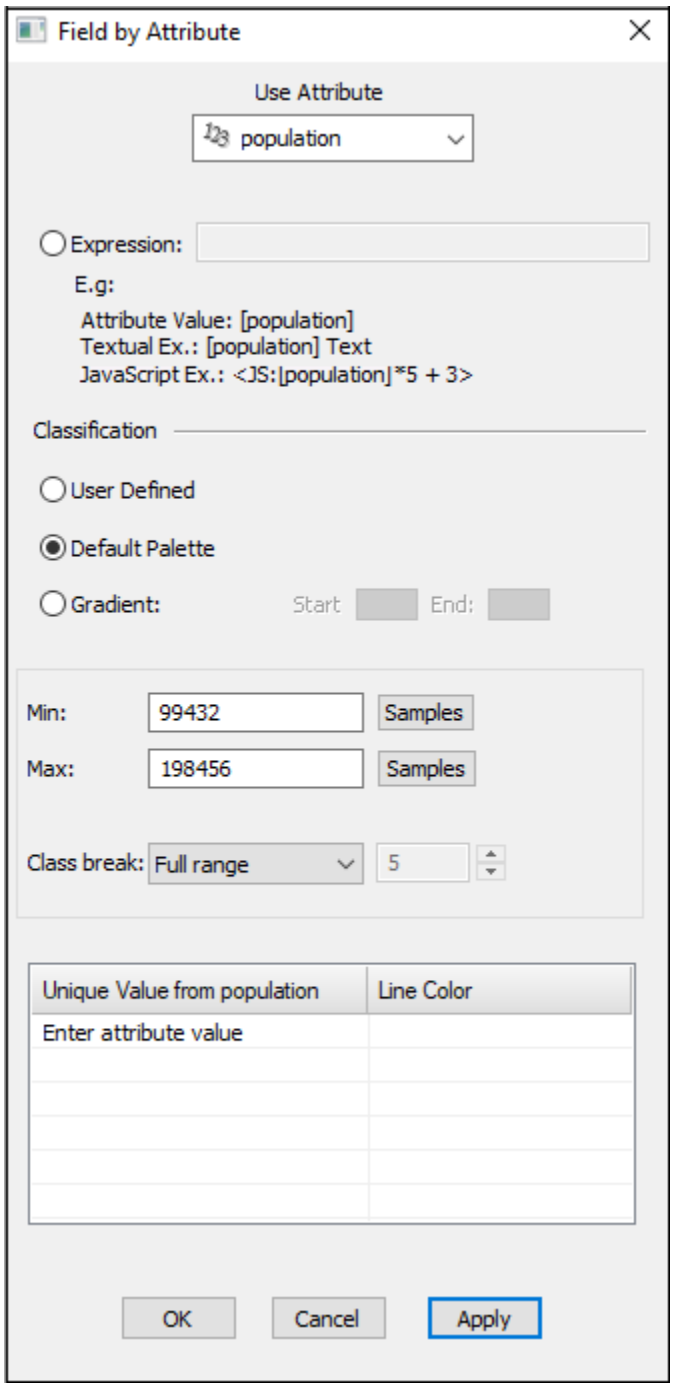
1. In the **Field by Attribute** dialog, select the **User Defined** option.
2. In the **Value from [Attribute]** section, in the first empty row of the left-hand side column, click and select a value from the **Choose Attribute Value** dialog.
3. If the attribute type is numeric, you can use the >< =><= operators.
4. Click the **Color** column in the same row, and select a color from the **Color** dialog.

5. Repeat steps 2-4 above to assign colors to additional field attribute values.
6. Click **Apply**.

Applying the Color Default Palette Mode

The default palette mode assigns automatically a different color to each unique attribute field value or to each range of numeric values.

Value	Activity
Unique	Assigning automatically a different color to each attribute field value. For example, you can use this mode to color country boundaries of the same continent with the same color. In this case, all unique values of the 'Continent' field attribute are assigned a different color automatically.
Class Breaks	Assigning automatically a different color to each range of numeric values. This option is only relevant for numeric attribute types. For example, you can use this mode to have all countries within a certain population range have the same color. In this case, the numeric values of the 'Country Population' field are divided into ranges (class breaks) where each range is assigned a different color automatically.



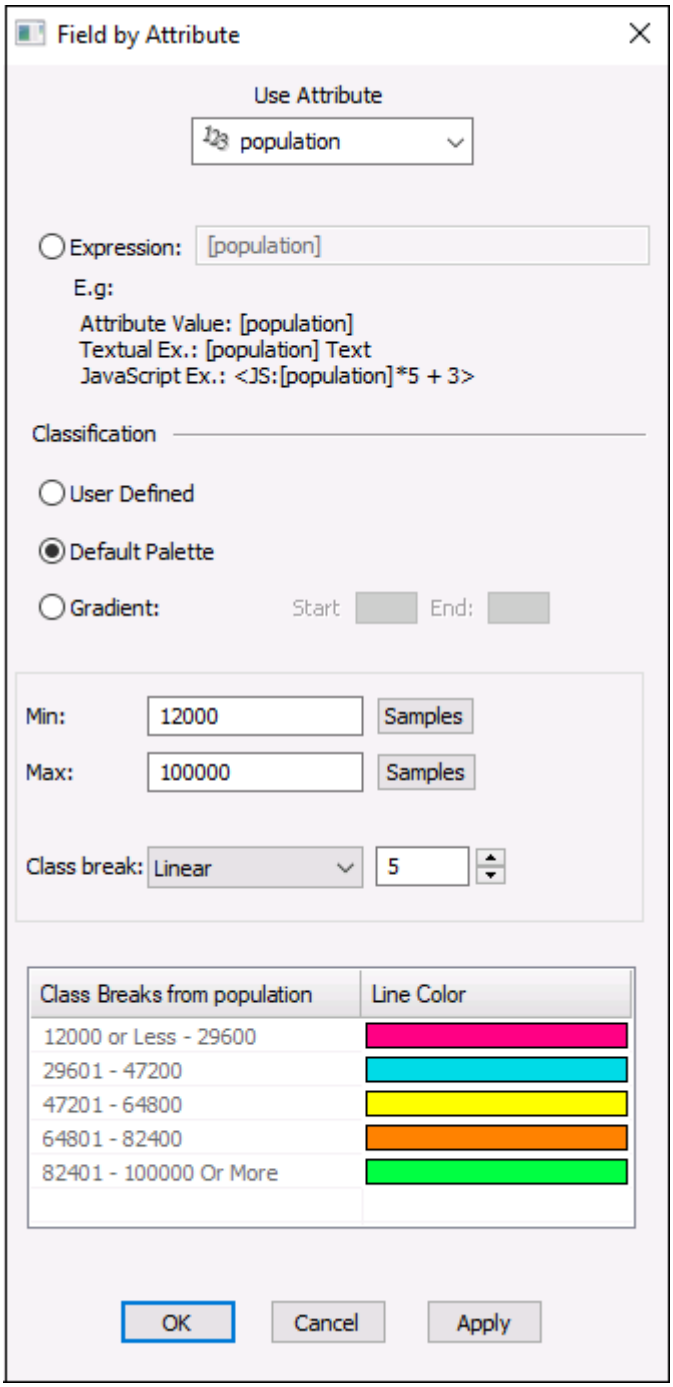
Field by Attribute Dialog – Default Palette Unique Value

To assign a unique color to each unique attribute field value:

1. In the **Field by Attribute** dialog, in the **Classification** section, select the **Default Palette** option.
2. From the **Class break** dropdown list, select **Full range**.

   Note: For textual attribute types, this option is automatically selected.
3. Click **Apply**. A unique color is applied in the 3D Window to each unique attribute field value for a max of 256 values.

Note: These values are not listed in the dialog. If you want to change the color assigned to a specific attribute field value, in the **Value from [Attribute]** section, in the left column, click ..., enter that attribute value and select the required color from the **Color** dialog.



Field by Attribute Dialog – Default Palette with Class Breaks

To assign a unique color to each class break:

1. In the **Field by Attribute** dialog, select the **Default Palette** option.
2. From the **Class break** dropdown list, select the required division mode of the attribute field values range**:**
   - **Linear**: The range of the attribute field values is divided equally between the classes.
   - **Logarithmic**: The range of the attribute field values is divided in a logarithmic way between the classes.
3. In the **Classes** field, enter the number of class breaks.
4. In the **Min** box, type the minimal attribute field value of the first class in the range.
5. In the **Max** box, type the maximal attribute field value of the last class in the range.
6. Click **Apply**.

Note: If you want to change the color assigned to a specific class break, click the color you want to change and select a different color from the **Color** dialog.

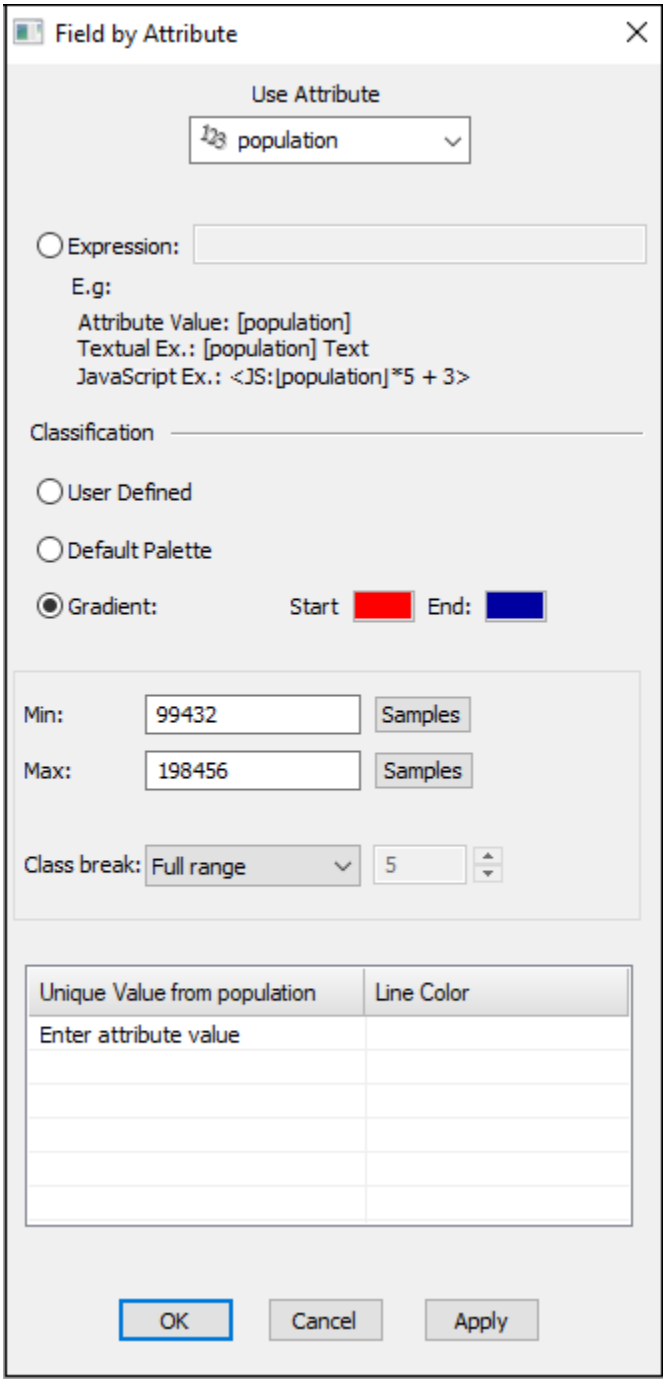
Applying the Color Gradient Mode

The Gradient Mode assigns automatically a different color from a predefined color spectrum to each unique value of the attribute field or to each range of numeric values.

The colors are assigned according to their location in the color spectrum. Adjacent values or ranges of values in the field attribute database column are assigned to adjacent colors in the color spectrum.

The gradient mode is applicable in two ways:

Value	Activity
Unique	Assigning automatically a different color from a predefined color spectrum to each unique value of the attribute field. For example, you can use this mode to have all country boundaries of the same continent to have the same color. In this case, all unique values of the 'Continent' field attribute are assigned different adjacent colors from a predefined color spectrum.
Class Breaks	Assigning automatically a different color from a predefined color spectrum to each range of numeric values. This option is only relevant for numeric attribute types. For example, you can use this mode to have all countries within a certain population range have the same color. The numeric values of the 'Country Population' field are divided into ranges (class breaks) where each range is assigned a different adjacent color from a predefined color spectrum.



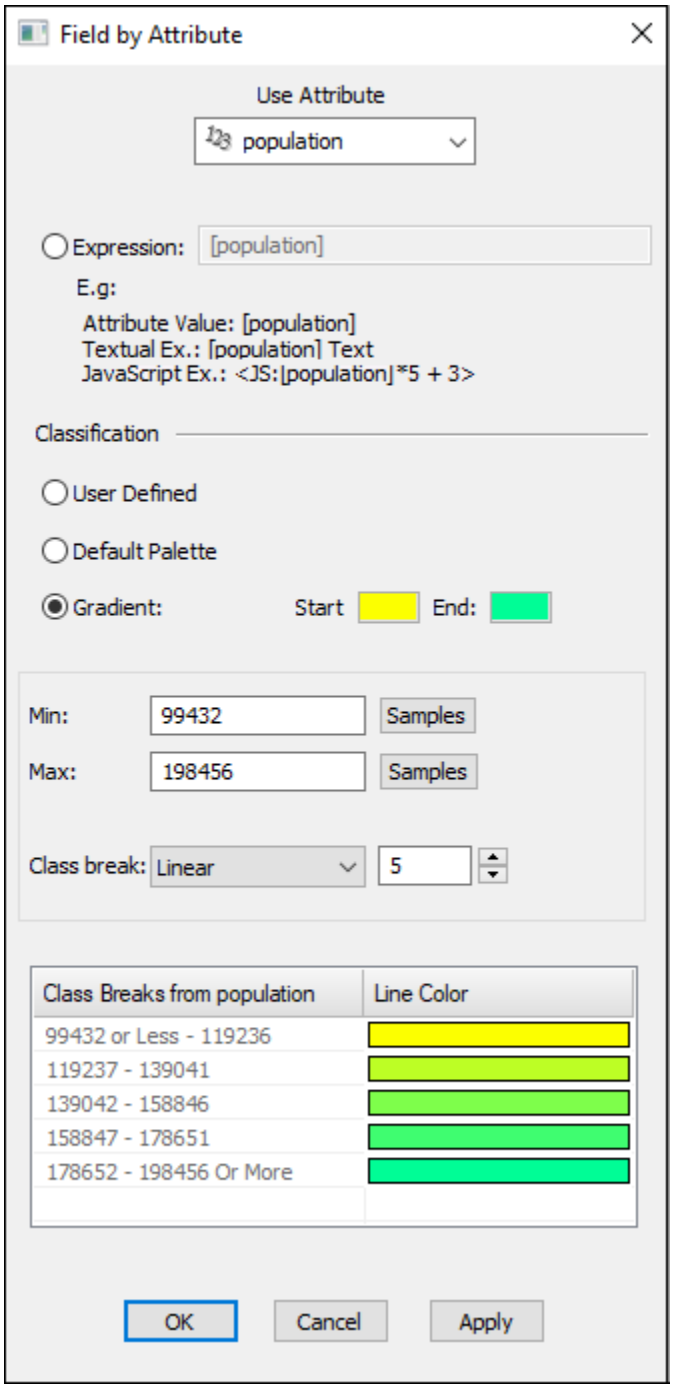
Field by Attribute Dialog – Gradient Unique Value

To apply a unique gradient color to each attribute field value:

1. In the **Field by Attribute** dialog, select the **Gradient** option.
2. Click the **Start** button, and select from the **Color** dialog the first color of the color spectrum range.
3. Click the **End** button, and select from the **Color** dialog the last color of the color spectrum range.
4. From the **Class break** dropdown list, select **Full range**.

   Note: For textual attribute types, this option is automatically selected.

5. Click **Apply**. A unique gradient color is applied in the 3D Window to each unique attribute field value for a max of 256 values.



Field by Attribute Dialog – Gradient Class Break

To apply a unique gradient color to each class break:

1. In the **Field by Attribute** dialog, select the **Gradient** option.

2. Click the **Start** button, and select from the **Color Palette** dialog the first color of the color spectrum range.
3. Click the **End** button, and select from the **Color Palette** dialog the last color of the color spectrum range.
4. From the **Class break** dropdown list, select the required division mode of the attribute field values range**:**
   - **Linear**: The range of the attribute field values is divided equally between the classes.
   - **Logarithmic**: The range of the attribute field values is divided in a logarithmic way between the classes.
5. In the **Classes** field, enter the number of class breaks.
6. In the **Min** box, type the minimal attribute field value of the first class in the range.
7. In the **Max** box, type the maximal attribute field value of the last class in the range.
8. Click **Apply**.

Note: If you want to change the color assigned to a specific class break, click the color you want to change and select a different color from the **Color** dialog.

Basing Numeric Style Properties on Attribute Fields

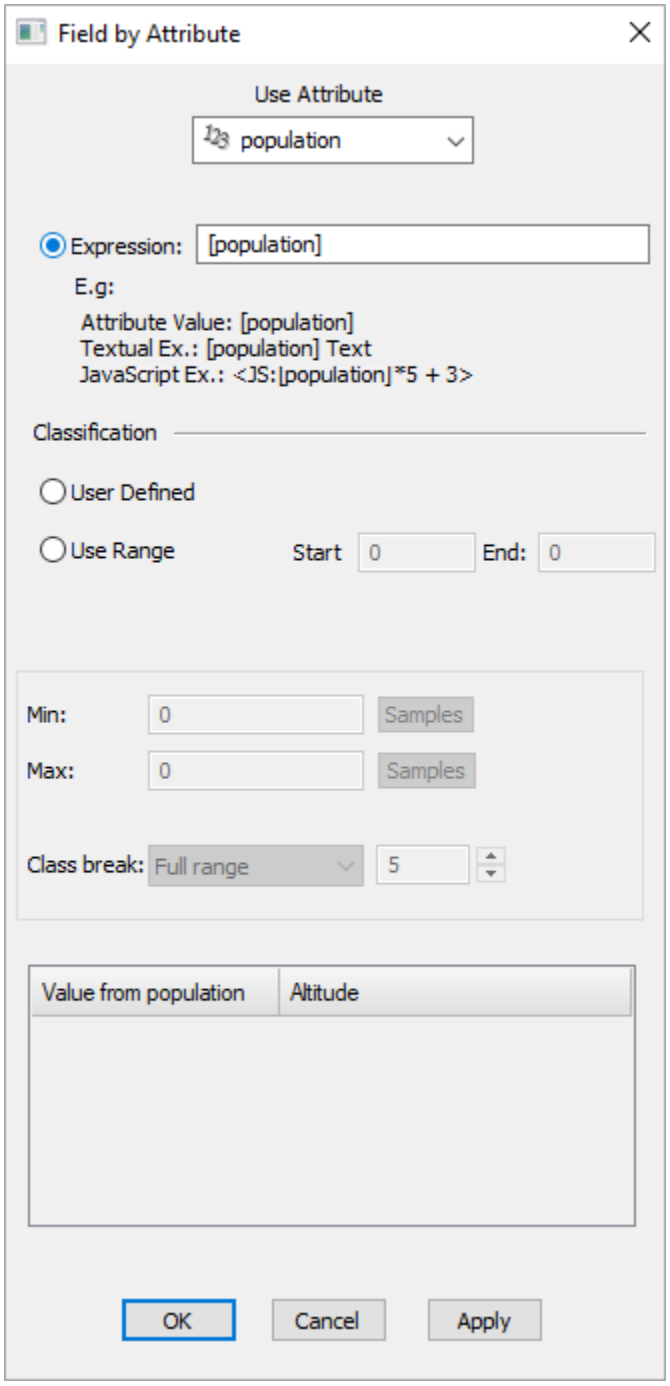
To base numeric style properties on attribute fields:

1. In the layer property sheet, click the numeric property box, and then click the **Field by Attribute** button .
2. In the **Use Attribute** dropdown list, select the field attribute on which to base the numeric property.
3. Select one of the following numeric property setting modes:
   - **Expression mode**: **See** "Applying the Numeric Expression Mode" in this chapter for further information.
   - **User Defined mode**: **See** "Applying the Numeric User Defined Mode" in this chapter for further information.
   - **Use Range mode**: **See** "Applying the Numeric Use Range Mode" in this chapter for further information.

Applying the Numeric Expression Mode

The Expression mode sets the numeric property to the numeric value contained in the selected field attribute. Using this option, for example, you can represent the population size of all countries by the height of their annotation cylinder or box. The numeric property, in this case is the cylinder height, which is determined by the numeric value of the Country Population attribute field.

You can also set the numeric property to an expression based on a field attribute numeric value.



Field by Attribute Dialog – Expression Mode

To apply the numeric Expression mode:

1. In the **Field by Attribute** dialog, select the **Expression** option.
2. In the **Expression** field, build an expression that contains the attribute as a variable.
   - **Attribute Value**: Attribute name in brackets e.g., *[ATTRIB]*
   - **Textual expression**: Attrib name in brackets with other text, e.g., *Text Before [ATTRIB] Text After*.

- **JavaScript expression**: Bounded by <> e.g., *<JS:[ATTRIB]*5 + 3>.*

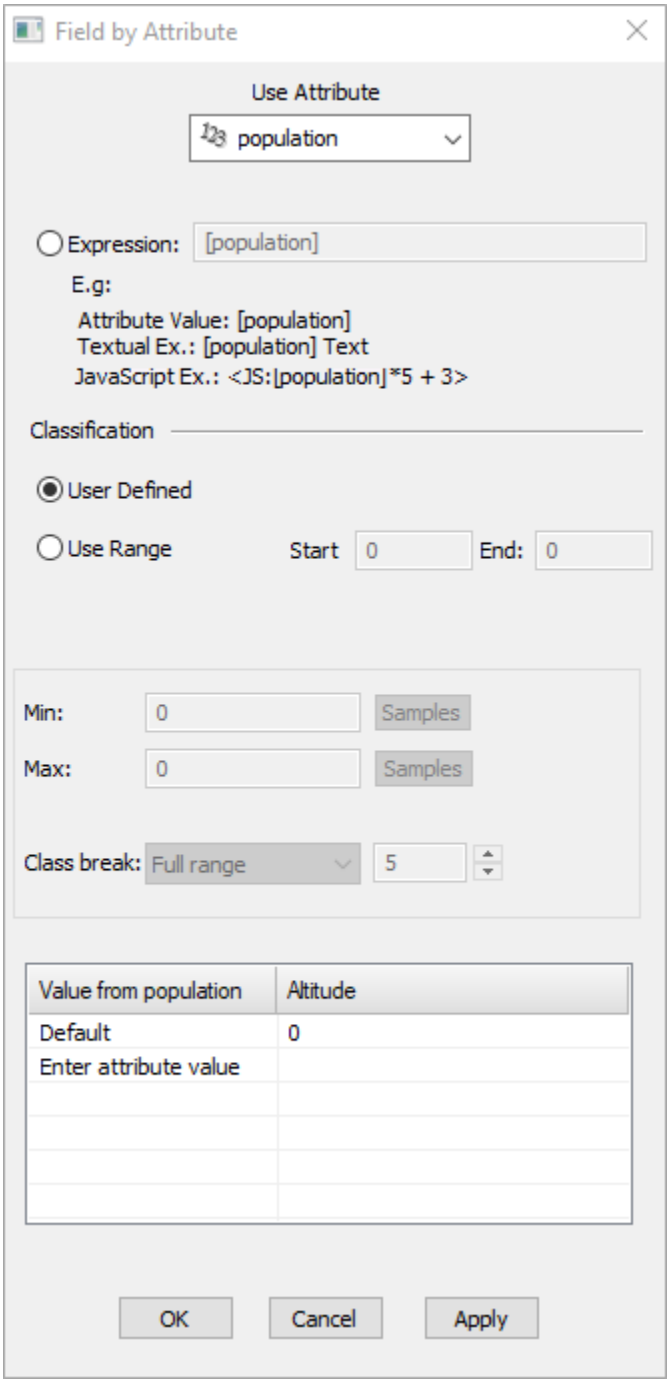
  Note: Legacy VBScript has been deprecated and will not work in TerraExplorer Fusion.

3. Click **Apply**.

Applying the Numeric User Defined Mode

The User Defined mode enables you to assign a numeric value to a specific value of an attribute field.

In this mode, for example, you can set the cylinder height of all countries with a population larger the 2,000,000 people to a specific numeric value, and then set the cylinder height for all other countries to zero. First, however, you have to select the 'Country Population' field attribute in the Use Attribute dropdown list.



Field by Attribute Dialog – User Defined

To apply the User Defined mode:

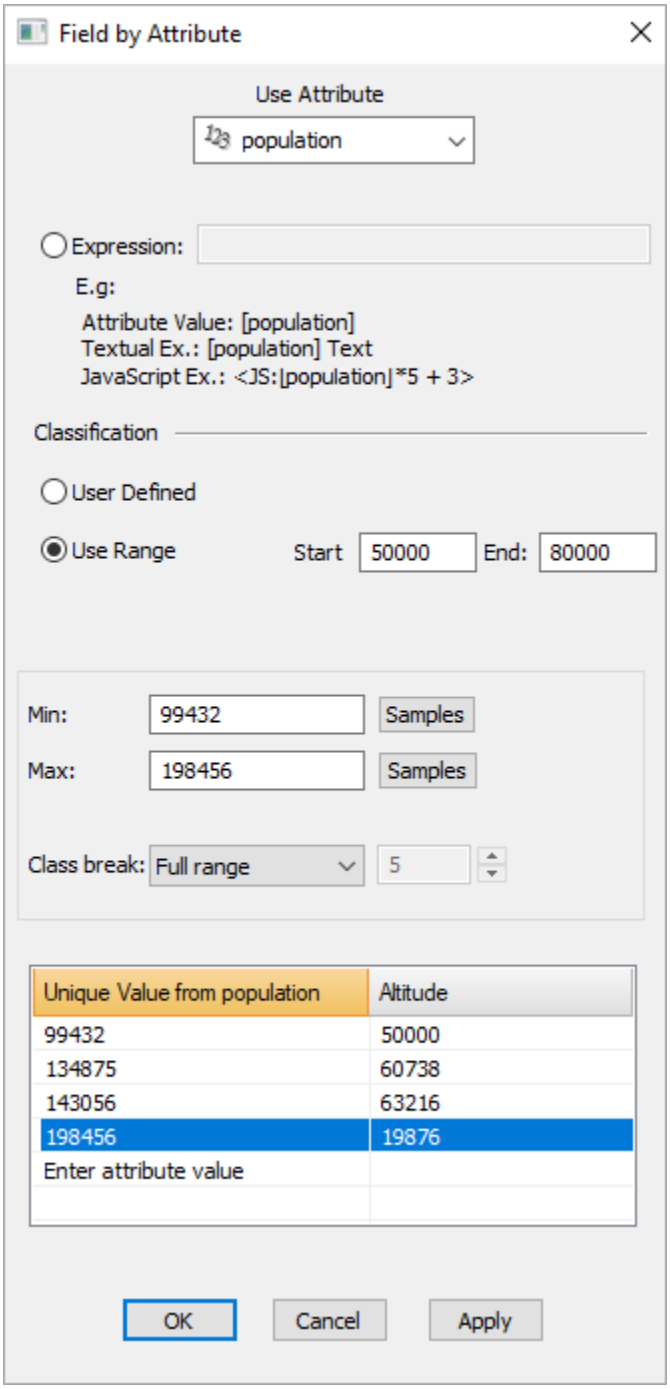
1. In the **Field by Attribute** dialog, select the **User Defined** option.
2. In the **Value from [Attribute]** section, in the first empty row of the left-hand side column, click and select a value from the **Choose Attribute Value** dialog.
3. If the attribute type is numeric, you can use the >< =><= operators.
4. Click the right column in the same row, and type the value of the numeric property.

5. Repeat steps 2-4 above to assign numeric values to additional field attribute values.
6. Click **Apply**.

Applying the Numeric Use Range Mode

The Use Range mode is applicable in two ways:

Value	Application
Unique Values	A different numeric property value is automatically assigned to each attribute field value. For example, you can set different cylinder heights for each value of the Country Population attribute field.
Class Breaks	Divides the range of attribute field values to a number of classes, with a different numeric property value assigned to each class. For example, you can set a certain cylinder height to all countries in the 1,000,000 to 2,000,000 population range and a different cylinder height to all countries in the 2,000,001 to 3,000,000 population range.

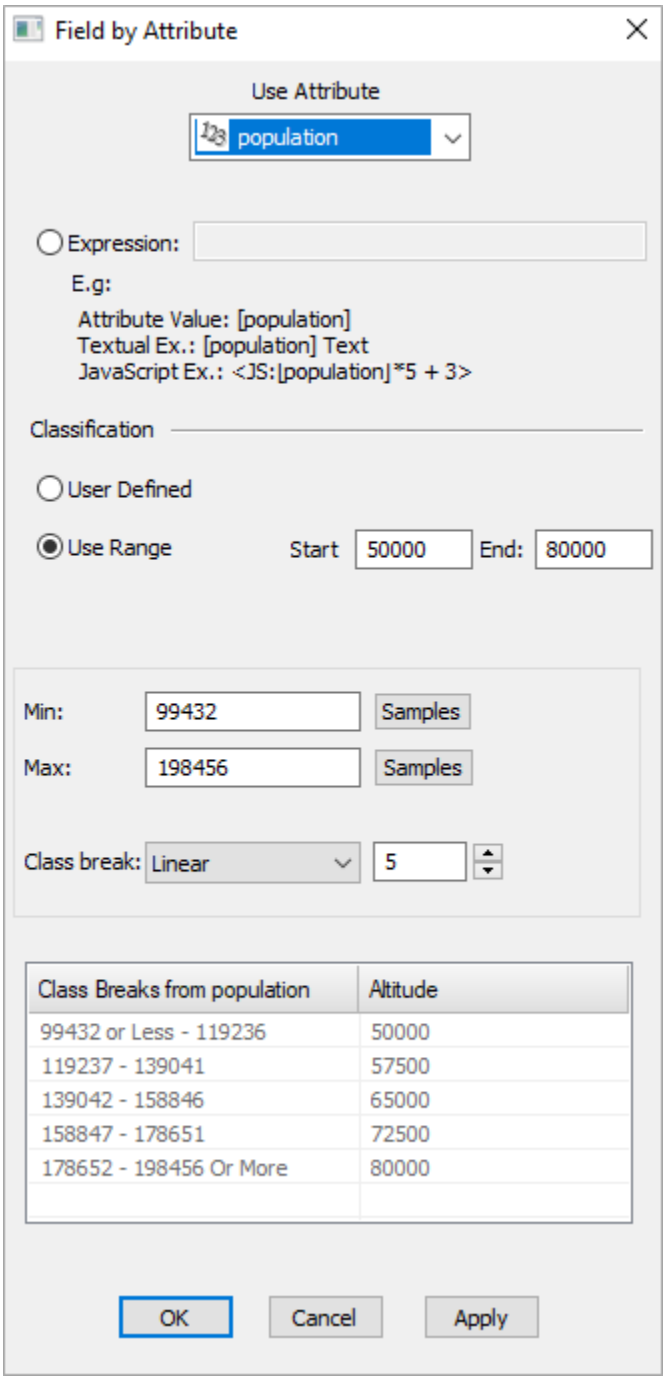


Field by Attribute Dialog – Numeric Use Range Mode Unique Value

To apply the unique numeric values option:

1. In the **Field by Attribute** dialog, select the **Use Range** option.
2. In the **Start** field, type the minimal numeric property value to be assigned to a field attribute.
3. In the **End** field, type the maximal numeric property value to be assigned to a field attribute.
4. From the **Class break** dropdown list, select **Full range**.
5. Click **Apply**. A unique numeric value is applied in the 3D Window to each unique attribute field value.

Note: These values are not listed in the dialog. If you want to change the numeric value assigned to a specific attribute field value, in the **Unique Value from [Attribute]** section, in the left column, click ..., enter that attribute value and enter the required numeric value.



Field by Attribute Dialog – Use Range Mode with Class Breaks

To apply the **Class Break** option:

1. In the **Field by Attribute** dialog, select the **Use Range** option.
2. In the **Start** field, type the minimal numeric property value to be assigned to a field attribute.

3. In the **End** field, type the maximal numeric property value to be assigned to a field attribute.
4. In the **Min** box, type the minimal attribute field value of the first class in the range.
5. In the **Max** box, type the maximal attribute field value of the last class in the range.
6. From the **Class break** dropdown list, select the required division mode of the attribute field values range**:**
   - **Linear**: The range of the attribute field values is divided equally between the classes.
   - **Logarithmic**: The range of the attribute field values is divided in a logarithmic way between the classes.
7. In the **Classes** field, enter the number of class breaks.
8. Click **Apply**.

Note: You can change a specific numeric property value assigned to a specific attribute field value. Click the value you want to change, and substitute it with another value.

Basing Text Content on Attribute Fields

To base text label content on attribute fields:

1. In the layer property sheet, click on the **Text** property box, and then click the **Field by Attribute** button 
2. In the **Use Attribute** dropdown, select the field attribute on which to base the text label content.
3. Select one of the following text label content setting modes:
   - **Expression mode**: **See** "Applying the Text Expression Mode" in this chapter for further information.
   - **User Defined mode**: **See** "Applying the Text User Defined Mode" in this chapter for further information.

Applying the Text Expression Mode

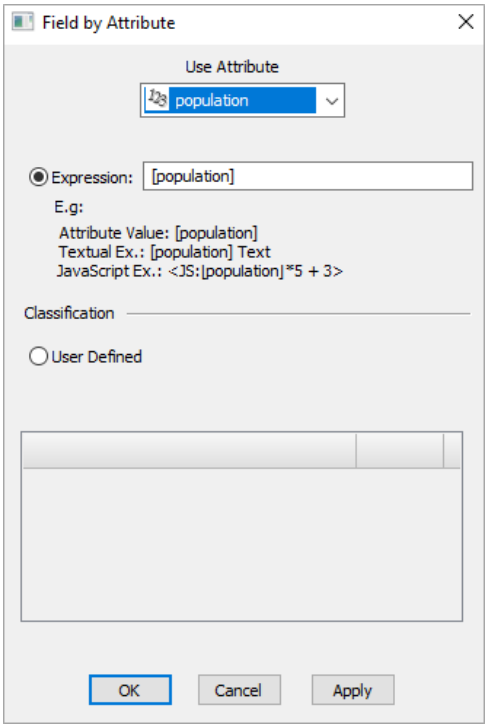
The Expression mode sets the text label content to the values of the attribute field you selected in the **Use Attribute** dropdown list. Use this mode only when the attribute field contains text values.

You can also set the text property to an expression based on a field attribute textual value.

To set the text property to an expression based on a field attribute textual value:

- Build an expression that contains the text field attribute as a variable.

Using this option, for example, you can append the text values of the attribute field by a fixed text. For example, you can add an "St." to each street name.



Field by Attribute Dialog – Text Expression Mode

To apply the Expression mode:

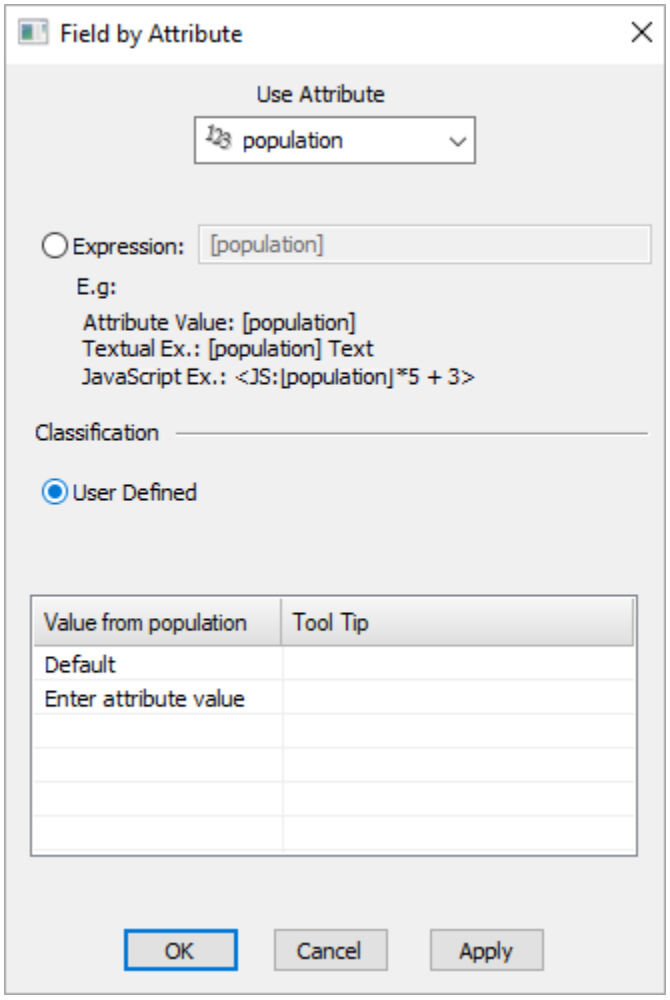
1. In the **Field by Attribute** dialog, select the **Expression** option.
2. In the **Expression** field, build an expression that contains the attribute as a variable.
   - **Attribute Value**: Attribute name in brackets, e.g., *[ATTRIB]*
   - **Textual expression**: Attrib name in brackets with other text, e.g., *Text Before [ATTRIB] Text After*
   - **JavaScript expression**: Bounded by <>, e.g., *<JS:LCase("[ATTRIB]") & "Text">.*

     Note: Legacy VBScript has been deprecated and will not work in TerraExplorer Fusion.
3. Click **Apply**.

Applying the Text User Defined Mode

The User Defined mode enables you to substitute specific text with a specific attribute field text value.

In this option, you can substitute text derived from a specific field attribute value with your typed text content.



Field by Attribute Dialog – Text User Defined Mode

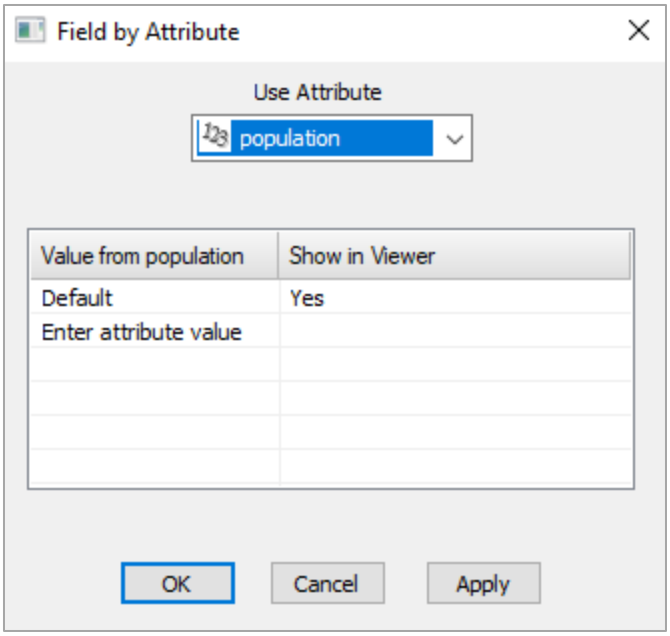
To apply the User Defined mode:

1. In the **Field by Attribute** dialog, select the **User Defined** option.
2. In the **Value from [Attribute]** section, in the first empty row of the left-hand side column, click and select a value from the **Choose Attribute Value** dialog.
3. Click the **Text** column in the same row, and type the text you want displayed instead **of** the field attribute text.
4. Repeat steps 2-3 above to substitute other field attribute values.
5. Click **Apply**.

Basing Dropdown List Properties on Attribute Fields

Some properties are determined by a selection from a dropdown list. For example, Font Size is a property that accepts only predefined set of values, such as 8, 12 and 14 points. Another example is the **Bold** style property that accepts only Yes or No values.

To base such properties on attribute fields, follow the steps below.



Field by Attribute Dialog

To base properties with fixed values on attribute fields:

1. In the layer property sheet, click on the fixed values property box, and then click on the **Field by Attribute** button .
2. In the **Use Attribute** dropdown list, select the field attribute on which to base the property.
3. In the **Value from [Attribute]** section, in the first empty row of the left-hand side column, click and select a value from the **Choose Attribute Value** dialog.
4. Click the right column in the same row, and select the fixed value from the dropdown list.
5. Repeat steps 3-5 above to assign another field attribute value with a property value.
6. Click **Apply**.

Working with Features

To work with features, you select the required feature/features by:

- Selecting Features from the 3D Window
- Spatial Queries
- Searching and Performing Operations by Attribute (Attribute Table Tool)

You can then edit feature attributes or perform feature layer operations.

Selecting Features from the 3D Window

To select a feature:

1. On the **Feature Layer** tab, in the **Selection** group, click **Select Feature.**
2. In the **3D Window**, select the required feature. The feature's property sheet opens.

Note: If you want to select multiple features, press and hold the CTRL key, while you select each of the required features.

Note: If you want to deselect an item, place the cursor over or click a previously selected item while the CTRL key is still pressed. The item becomes deselected in the same manner as it was selected.

Spatial Queries

You can select features based on their spatial relationship with a polygon, line or point that you draw, or with an existing object. You choose whether to include only features that entirely overlap with your selected or drawn geometry, or whether to include also those that partially intersect. You also can define a buffer zone to include features within a certain radius of the selection. So if, for example, a chemical leak occurred in a particular location, and the wind is spreading the chemical odor across a 150 km radius, you can perform a spatial query to determine which surrounding towns need to be evacuated by drawing a polygon around the contaminated area, and then setting a buffer of 150 km. Alternatively, if, for example, you want to find all schools that intersect with a specific road, you can select the road as the object selection, and perform a spatial query based on it, without needing to draw a selection area.

To perform a spatial query💻

1. On the **Feature Layer** tab, in the **Selection** group, click **Spatial Query** and then select one of the following from the dropdown list:
   - **Area**– Select all features that are spatially related to the polygon that will be drawn.
   - **Line** - Select all features that are spatially related to the line that will be drawn.
   - **Point**– Select all features that are spatially related to the point that will be drawn.
   - **Object selection** – Select all features that are spatially related to the object that will be selected.
   - **From clipboard** - Select all features that are spatially related to the objects in the clipboard.

   Note: This option allows you to perform a spatial query using another feature or object, thus eliminating the need to manually draw the selection area.

   Note: The selection of any objects that are defined around a point, (e.g., all 2D Shapes, but not Polyline or Polygon) selects an individual point and not the entire object.

   Note: The precise spatial relationship is defined in the next step.
2. On the **Feature Layer** tab, in the **Selection** group, define the spatial relationship to the drawn geometry:

Parameter	Description
Buffer	If you want to include features within a certain radius outside the selection, select the required distance.
Units	Select the desired units of measurement: meters, feet, kilometers, or miles.
Intersect/Completely Within	▪ Select **Intersect** if you want to select all features whose geometry intersect at any point with the selection geometry. ▪ Select **Completely Within** if you want to select only features whose entire geometry fall within or overlap the selection geometry.

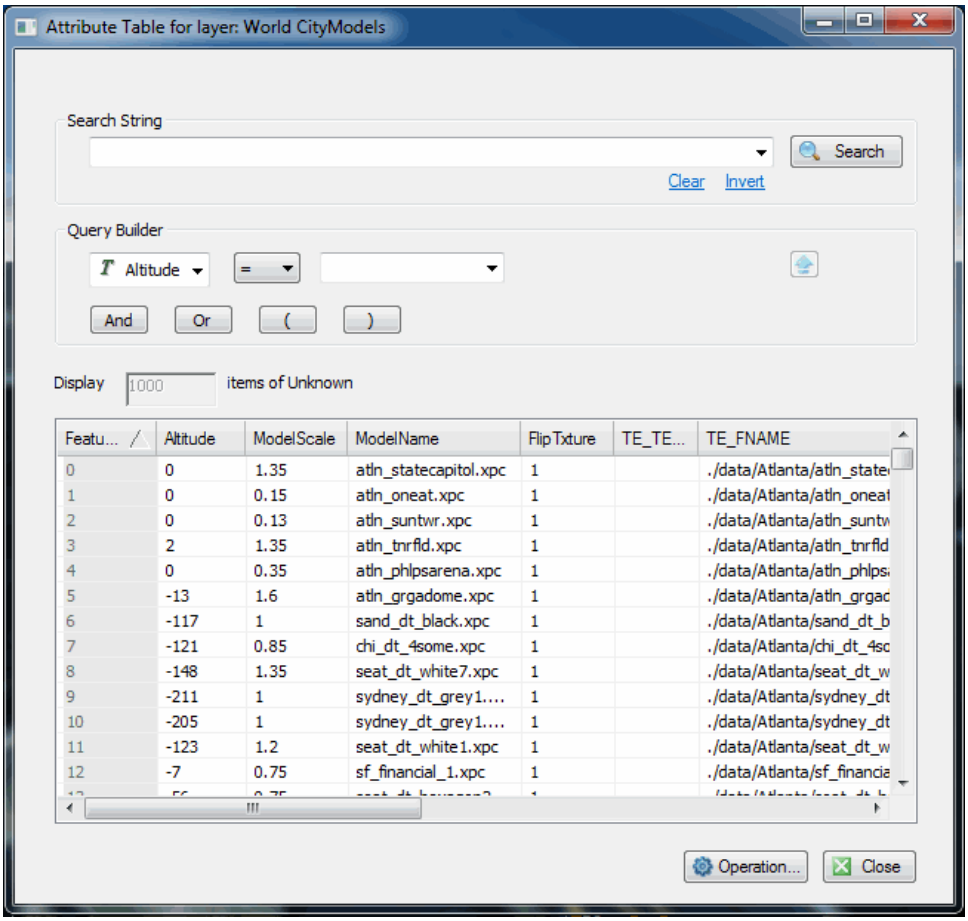
3. In the **3D Window**, do one of the following depending on the type of spatial query:

- **Area selection** – Place the polygon points in the 3D Window by clicking in the desired locations. You must place at least three points. Finish the polygon creation by right-clicking.
- **Line selection** - Place the line points in the 3D Window by clicking in the desired locations. You must place at least two points. Finish the line insertion by right-clicking.
- **Point selection** – Place a single point in the 3D Window by clicking in the desired location.
- **Feature selection** – Select any object by clicking it.

The selection area (including the buffer if there is one) is framed with a red border. All layer features within the selection area are marked with yellow selection frames.

Note: If you want to turn off the Select Area mode, on the **Feature Layer** tab, in the **Selection** group, toggle off the **Spatial Query** command.

Searching and Performing Operations by Attribute (Attribute Table Tool)



Attribute Table

The Attribute Table enables you to search the layer attribute database files and display the results in the 3D Window. You can use this table to fine-tune the information that is displayed on the terrain or to create a new project layer or file based on the filtered layer. For example, you can display all towns in Western Europe, which have a population of 20,000.

Using the Attribute Table, you can easily edit the attribute values of multiple features without opening separate property sheets for each feature.

Search expressions are comprised of one or more conditions. A condition consists of an attribute, an operator and an attribute value.

There are three types of attributes:

- String
- Integer
- Double

Each attribute type has its corresponding operators.

A search expression can consist of more than one condition. In this case, you need to insert a connector between the conditions to specify their relations. In addition to AND, you can use the OR, NOT and [] connectors to define the relations between conditions.

To search and perform operations by attribute:

1. In the **Project Tree**, select the required layer.
2. On the **Feature Layer** tab, in the **Attributes** group, click **Attribute Table**.
3. If you want to search for a previously-searched-for search expression, select one from the **Search String** dropdown list, and skip to step 6.
4. In the **Query builder** section, enter an attribute, condition, and value and click **Insert String** . The search expression is displayed in the Search String field.

   Note: All attribute values are listed in the value dropdown list.

   Note: If you want to clear the Search String field, click **Clear.**
5. If you want to include additional strings in your search expression, click one of the connector buttons: 

and repeat step 4 for the next condition.
6. Click **Search**. Your search results are displayed in the search results list at the bottom of the page.
7. For each attribute value that you want to modify, double-click and type the required value.
8. Do any of the following:
   - To select a feature: in the **Feature ID** column, select the required Feature ID. Use CTRL-click or SHIFT-click to multi-select. This feature will remain selected even when the Attribute Table is closed.
   - To fly to a feature, right-click the feature's row in the attribute table, and select **Fly to selected item**.
   - To edit a feature's other attribute values and XY coordinates, right-click the feature's row in the attribute table, and select **Edit item**. The feature's property sheet is displayed.
   - To delete a feature, right-click the feature's row in the attribute table, and select **Remove items from layer**.
   - To create a new layer composed only of the features which matched the search criteria: click the **Operation** button and select **Add as New Layer Entry**. The new layer is added to the Project Tree
   - To modify attribute properties: double-click the attribute value and modify as required. In the 3D Window, the plane flies from the current location directly to the selected feature.
   - To set the visibility of features based on their attribute values using the search expression entered in steps 3-5: click the **Operation** button and select **Set Visibility by Attribute**. The

features matching the search criteria and their annotations are displayed on the terrain, and the Visibility property is saved in the project. If you want to redisplay all features, click the **Operation** button and select **Clear Visibility by Attribute**.

Note: All visibility by attribute settings are saved to Visibility property in the layer's property sheet under both the Annotation and Feature tabs. You can also set visibility by attribute directly from the layer's property sheet. **See** the Visibility property in "Polyline Property Sheet Parameters" and "Polygon Property Sheet Parameters" in the "Objects and Labels" chapter.

- To save the filtered layer to a file: do the following:
  i. Click the **Operation** button and select **Save As**.
  ii. In the **Save As** dialog that is displayed, select the file type (.sqlite, gpkg, .shp, or .pdf).
  iii. Browse to the required file directory, and type a file name.
  iv. If you are saving the layer as an .sqlite, .gpkg, or .pdf file, type a **Layer name**.
  v. Click **Save**.

Editing Features

You can edit feature attributes or position on the terrain.

Editing an Individual Feature in the 3D Window

To edit a feature:

1. Select the feature. **See** "Selecting Features from the 3D Window" in this chapter for information.
2. In the feature's property sheet, set its properties (X, Y, and MGRS) and feature attributes.

   Note: Features have field attributes, only if the feature layers are loaded with attribute fields, such as "Country Population". If the layer does not contain attribute fields, or in the loading phase, you did not select any attribute field to load, no field attributes are listed in the property sheet.
3. Edit the polyline, polygon or point object. **See** "Editing Objects in the 3D Window" in the "Working with Objects" chapter.
4. If you want to undo/redo any edit action, on the top of the layer's property sheet, click **Undo** / **Redo** . Changes can be undone or redone, even after the property sheet is closed, and then reopened.

Editing Multiple Features' Attributes

To edit selected features' attributes:

1. Select the required features either by selecting them in the **3D Window** or by spatial query. **See** "Selecting Features from the 3D Window" and "Spatial Queries" in this chapter for information.
2. On the **Feature Layer** tab, in the **Edit** group, click **Editing** and select **Attributes**. The Attribute Table for the selected layer opens with the selected features and their attributes displayed in the Search Results section.

   Note: You can also click **Attribute Table** on the Feature Layer tab.
3. For each attribute value that you want to modify, double-click and type the required value.

Feature Layer Operations

The following feature layer operations are available:

- Exporting Selected Features to a New File
- Adding a Feature to a Layer
- Deleting Selected Features
- Merging Features
- Clipping Features
- Intersecting Features
- Exploding Features
- Moving Features from the 3D Window
- Cutting, Copying, and Pasting Features

Exporting Selected Features to a New File

To export selected features to a new layer:

1. Select the required features either by selecting them in the **3D Window** or by spatial query. **See** "Selecting Features from the 3D Window" and "Spatial Queries" in this chapter for information.
2. On the **Feature Layer** tab, in the **Load and Save** group, click the arrow next to **Save Layer** and select **Save Selected Features As**. The Save As dialog is displayed.
3. Type a **File name**.
4. Select a file **type** (.sqlite, .gpkg, .shp, or .pdf).
5. If you are saving the layer as an .sqlite, .gpkg, or .pdf file, type a **Layer name**.
6. Browse to the required Save location and click **Save**.

Adding a Feature to a Layer

To add a feature to a layer:

1. Select the layer.
2. On the **Feature Layer** tab, in the **Edit** group, click **Add [Polyline, Point, or Polygon]**. The [Polyline, Point or Text Label] property sheet opens. The geographic features that can be added depend on the type of feature layer.
3. Set the parameters of the geographic feature [polyline, point, or polygon].
4. In the **3D Window**, place the object's points by clicking in the desired location. You must place at least two points for a polyline and three points for a polygon. **See** "Editing Objects in the 3D Window" for information on editing feature objects.
5. Finish the object insertion by right-clicking.
6. Continue to edit the object's parameters, and set the feature's attribute values, or close the property sheet to finish the operation.

Deleting Selected Features

To delete selected features:

1. Select the required features either by selecting them in the **3D Window,** by spatial query, or by using the Attribute table. **See** "Selecting Features from the 3D Window", "Spatial Queries", and "Using the Attribute Table Tool" in this chapter for information.
2. On the **Feature Layer** tab, in the **Edit** group, click **Editing** and select **Delete**.

Merging Features

The Merge command combines features lying on the same plane from a single polyline or polygon layer into one feature. When merging overlapping polygons, a single part feature is created that is the union of the merged features. When non-overlapping polygons or polylines are merged, a multipart feature is created with one set of attributes.

To merge selected features:

1. Select the required features either by selecting them in the **3D Window** or by spatial query. **See** "Selecting Features from the 3D Window" and "Spatial Queries" in this chapter for information.

   Note: Only polylines and polygons can be merged.
2. On the **Feature Layer** tab, in the **Edit** group, click **Editing** and select **Merge**.
3. In the **3D Window**, select the feature whose attributes should be used for the merged object by clicking it.

Clipping Features

The Clip command creates a new feature by clipping away from a specified polygon or polygons the area that overlaps with the clip polygon. The polygons must all be from a single layer and lie on the same plane.

To clip a polygon:

1. Select the required polygons either by selecting them in the **3D Window** or by spatial query. **See** "Selecting Features from the 3D Window" and "Spatial Queries" in this chapter for information.
2. On the **Feature Layer** tab, in the **Edit** group, click **Editing** and select **Clip**.
3. In the **3D Window**, select the polygon to clip from the other polygons by clicking it.

Intersecting Features

The Intersect command creates a new feature from the common areas of any two polygons. You choose which feature's attributes will be preserved during the operation. The polygons must all be from a single layer and lie on the same plane.

To create a polygon from the intersection of other polygons:

1. Select the required polygons either by selecting them in the **3D Window** or by spatial query. **See** "Selecting Features from the 3D Window" and "Spatial Queries" in this chapter for information.
2. On the **Feature Layer** tab, in the **Edit** group, click **Editing** and select **Intersect**.
3. In the **3D Window**, select the polygon that determines the attributes by clicking it.

Exploding Features

A selected multi-part feature can be separated into its individual, component features using the Explode command.

To explode a multi-part feature:

1. Select the required multi-part feature. **See** "Selecting Features from the 3D Window" in this chapter for information.
2. If you want to separate all the features, on the **Feature Layer** tab, in the **Edit** group, click **Editing** and select **Explode All**.
3. If you want to separate out only specific features, do the following:
   a. On the **Feature Layer** tab, in the **Edit** group, click **Editing** and select **Explode**.
   b. In the **3D Window**, select a feature from within the selected area that you want to separate out.
   c. Repeat steps a and b for each object you want to separate.

Moving Features from the 3D Window

A single feature or multiple features can be moved in the 3D Window.

To move a feature(s):

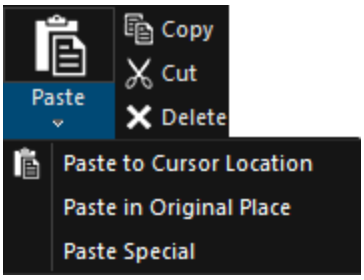
1. Select the required features either by selecting them in the **3D Window** or by spatial query. **See** "Selecting Features from the 3D Window" and "Spatial Queries" in this chapter for information.
2. If you selected a single feature, on the top bar of the object's property sheet, click **XY Plane** .
3. If you selected multiple features, right-click and select **Move** from the shortcut menu. The multi-edit property sheet opens.
4. In the **3D Window**, place the cursor over the feature or the selection frame. The cursor changes to **Move** mode .
5. Click the feature(s), and drag it to the required location in the XY Plane. Release the left mouse button to set the feature(s) at the current location.

   Note: You can also move the feature(s) by modifying the coordinate information in the property sheet.

Cutting, Copying, and Pasting Objects

You can copy or cut one or more objects in the 3D Window and paste them in another location. All cut/copied objects are placed in a buffer for future pasting, until new objects are copied/cut. Objects pasted from the Feature Layer Clipboard are pasted as new features in the selected layer. If you want to generate new objects, rather than features, you can instead paste the objects from the Home tab Clipboard.

Using advanced clipboard mechanisms, you can generate any 2D or 3D object based on the geometry of the objects in the clipboard (e.g., generate buildings according to properties of selected polygons). These objects can be saved either as a TerraExplorer group of objects or as a new feature layer (shapefile).



Copy Paste Ribbon Commands

Copying and Pasting Features

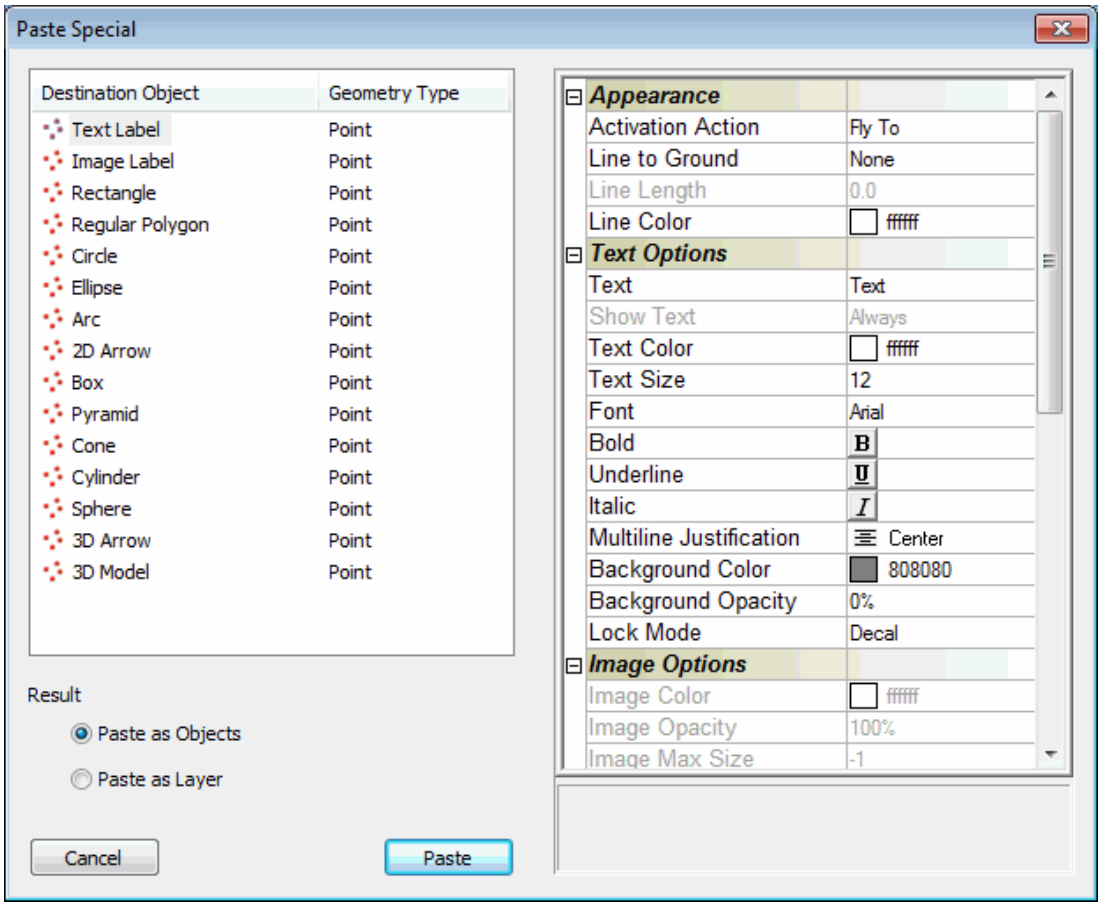
To copy and paste features:

1. On the **Feature Layer** tab, in the **Selection** group, toggle on **Select Feature**.
2. To copy: In the **3D Window**, place the cursor over the required feature, and type CTRL + C.

   Note: You can also select the feature, and use the ribbon commands on the Feature Layer tab or the right-click menu to copy and paste.
3. To paste:
   - **To cursor location** – Type CTRL + V. A copy of the feature is pasted in the current location of the cursor, and the cursor mode changes to the last positioning mode (i.e., XY, Z or XYZ Magnet) that you used, so you can drag the pasted feature to the required location. Click the left mouse button to set the pasted feature in its place. **See** "Changing the Position of an Object" in the "Working with Objects" chapter for information.
   - **In original place** – On the **Home** tab, in the **Edit** group, click the arrow below **Paste**, and then click **Paste in Original Place**.

   Note: The copy paste function produces different results when the clipboard is accessed from the Home tab rather than the Feature Layer tab. **See** "Cutting, Copying, and Pasting Objects" in the "Working with Objects" chapter for more information about copying and pasting objects from the Home tab. Note that copying can be performed from one tab and pasting from the other, but that certain information will not be retained in the process, e.g., if you copy objects using the Home tab clipboard and paste them from the Feature Layer tab as features into a layer, only the geometry of the objects will be applied. Likewise, if you copy features from the Feature Layer tab and then paste them from the Home tab clipboard, they will be pasted as standard TerraExplorer objects that are not part of the copied layer and therefore do not include layer and attribute data.
4. If you want to generate a 2D or 3D object based on the geometry of the features in the clipboard, do the following:

   a. Click the bottom half of the **Paste** button, and then click **Paste Special**. The Paste Special dialog is displayed.



Paste Special Dialog

b. Select the Destination Object that you want to generate, and then modify its properties as required in the Property sheet.

c. Select whether to paste the object as an object or layer:

- Paste as Objects – Create a group that contains an object for each copied feature object.
- Paste as Layer – Create a new feature layer that contains a feature for each copied object.

d. Click **Paste**.

Cutting and Deleting Features

You can cut or delete one or more features.

Note: When you "cut" a feature in the 3D Window, the object is stored in the copy/cut buffer until a new copy or cut command is performed, so you can still restore it by performing the paste function. When you "delete" a feature, however, you cannot restore it.

To **delete** a feature object or objects:

1. Select the required feature/s either by selecting them in the 3D Window or by spatial query. A yellow frame surrounds each feature object. **See** "Selecting Features from the 3D Window" and "Spatial Queries" in this chapter for information.
2. On the **Feature Layer** tab, in the **Clipboard** group, click **Delete**.

   OR

On the **Feature Layer** tab, in the **Edit** group, click **Editing** and select **Delete**.

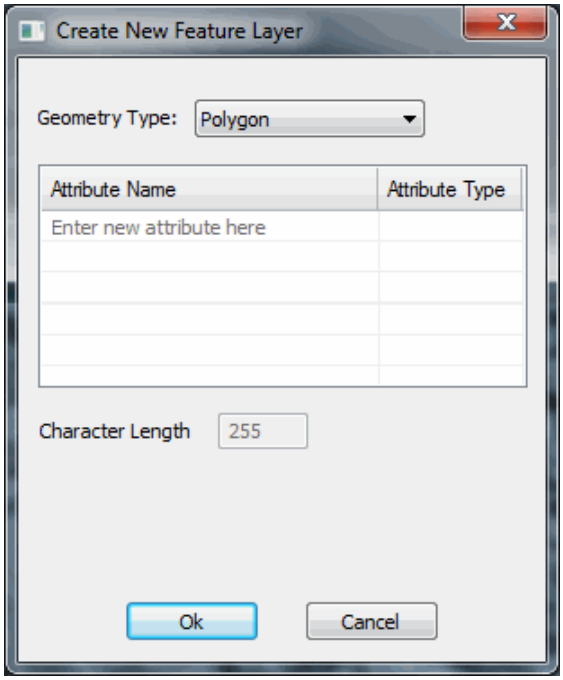
To **cut** a feature:

1. Select the required feature/s either by selecting them in the 3D Window or by spatial query. A yellow frame surrounds each feature object. **See** "Selecting Features from the 3D Window" and "Spatial Queries" in this chapter for information.
2. On the **Feature Layer** tab, in the **Clipboard** group, click **Cut**.

Creating New Layers

To create a new layer:

1. On the **Layers** tab, in the **Feature** group, click **New Layer**.
2. Browse to the required save location, and type a **File** name.
3. If you are saving the layer as an .sqlite or .gpkg file, type a **Layer name**.
4. In the **Save as** type field, select a file **type** (.sqlite, .gpkg, or .shp).
5. Click **Save**. The Create New Feature Layer dialog opens.



Create New Feature Layer Dialog

6. Select a **Geometry Type**: Polygon, Polyline, or Point.
7. For each attribute, enter the following information:
   - Attribute Name
   - Attribute Type (text, integer, double)
   - Character Length

   Note: When the "double" Attribute Type is selected, the "Decimal Places" field is displayed enabling you to set the precision level.

8. Click **OK**. After the layer is created, you can add features to the layer. **See** "Adding a Feature to a Layer" in the "Feature Layers" chapter for information.

Streaming 3D Models Using Feature Layers

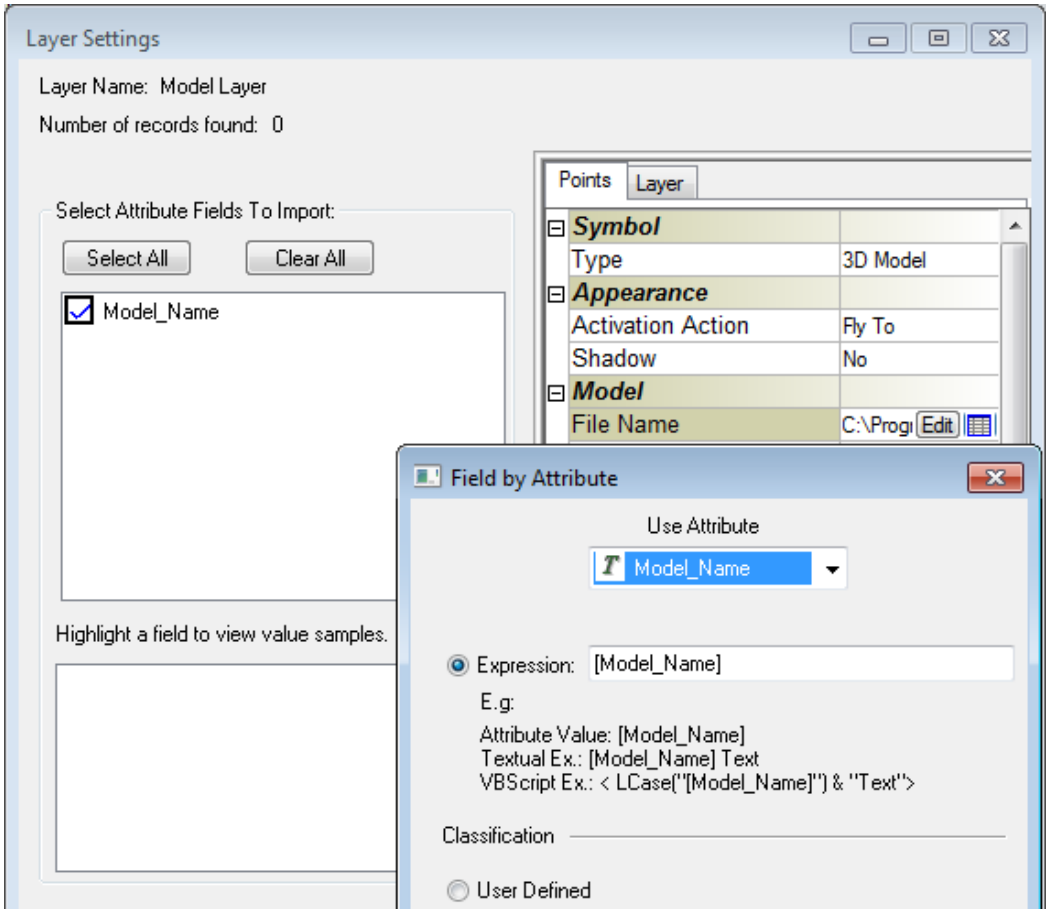
The way to load many 3D models, e.g., a city, is by streaming a point feature layer with a model file attribute field, where each point represents a model's pivot and the feature attribute designates which model to place at each point.

For layers that load many different models (e.g., different houses in an area), model streaming can be optimized by converting the models point feature layer to a unified 3D Mesh Layer (3DML). **See** "Converting Models to 3DML" in the "3D Mesh Layers" chapter for more information.

For layers that reference only a **few** models or models that are subject to frequent updates or modifications, model streaming can instead be optimized by converting the models to XPL format using the Convert Models to XPL tool. **See** "Converting Models to XPL" in this chapter. If these model layers are published to SkylineGlobe Server for use in TerraExplorer Fusion and Mobile, they should be in GLB format, the binary representation of the GL Transmission Format (glTF) format.

To stream a 3D model using a point feature layer:

1. Create a point feature layer where each point represents a model's pivot. The layer should contain the model's name as an attribute.
2. Load the point layer as a streaming layer. **See** "Loading Feature Layers" in this chapter.
3. In the property sheet panel, click the **Point** tab. Then from the **Symbol Type** dropdown list, select **3D Model**.
4. In the **Model** section of the property sheet, in the **File Name** field, use the **Field by Attribute** dialog to set the model's path followed by the model name from the attribute value, e.g., c:\mymodels\[MODEL_NAME].
5. If using XPL2 models, set an appropriate LOD size. If possible, you should set the LOD for each model separately, using Field by Attribute.



Loading Models Using a Feature Layer

Converting Models to XPL

The Convert Models to XPL tool converts 3D model files to the Skyline proprietary XPL2 file format, creating a set of XPL files where each file contains data for one Level of Detail (LOD). When displaying an XPL model, TerraExplorer dynamically selects and displays the best LOD file based on the viewer position in relation to the object. When downloaded from a web server, each file is also downloaded independently. This results in an improvement in overall model display performance as well as download rate.

The Convert Models to XPL tool offers the option to accelerate loading speed and consume less memory by using multi-resolution geometries in addition to multi-resolution textures. Performance can be further enhanced by combining models into streaming optimized groups and/or by using unified textures to dramatically reduce computer and graphic resource usage.

XPL files are optimized for TerraExplorer and Internet environments.



Geometry Level 1



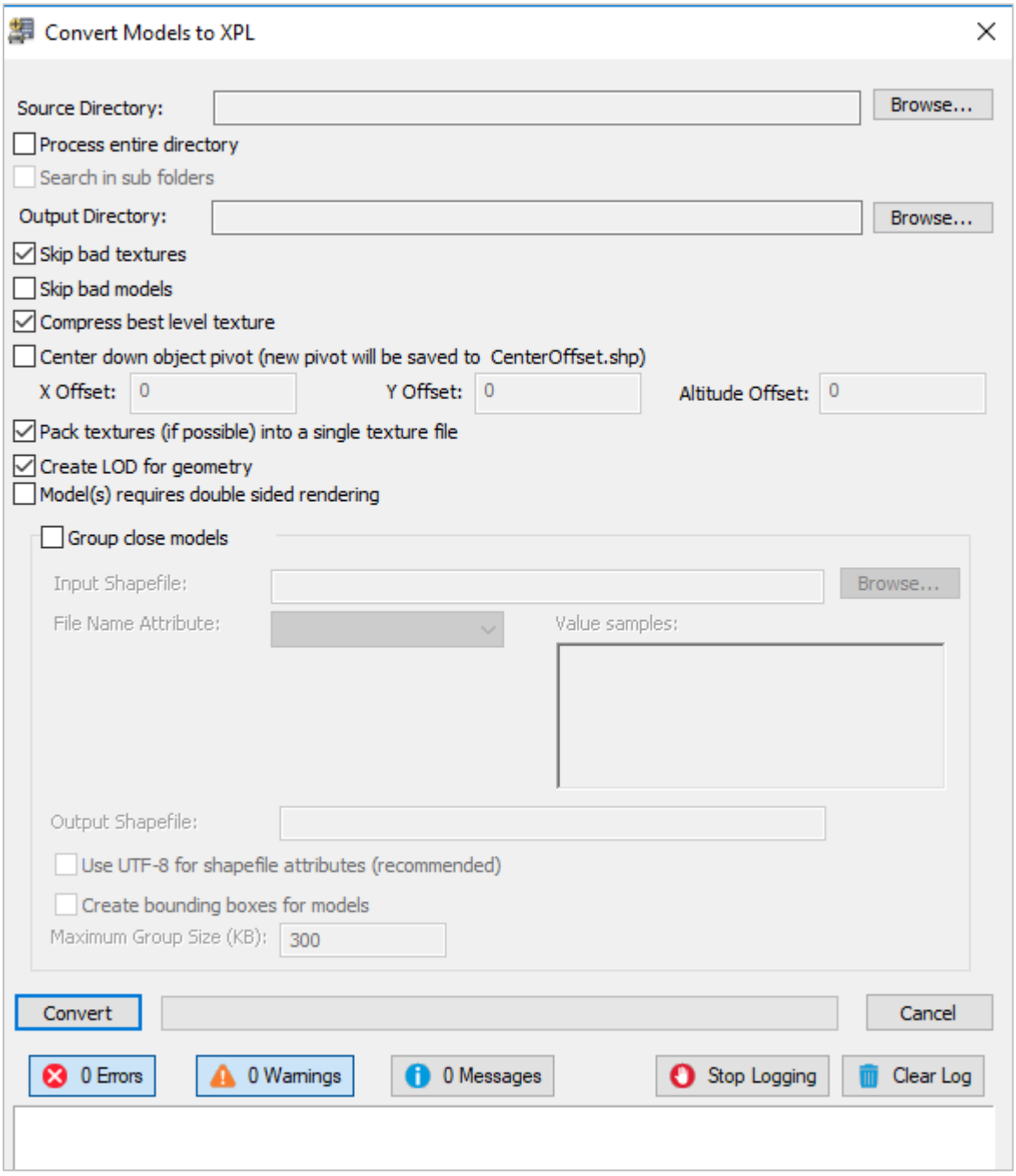
Geometry Level 2



Geometry Level 3

The Convert Models to XPL tool supports the following formats:

- COLLADA (DAE)
- Direct X (X) and its compressed version (XPC)
- XPL – old format
- 3DS - 3D studio format for exchanging 3D data models
- OpenFlight (FLT) – Multigen format for exchanging 3D data models and its compressed version (FPC)



Models to XPL Tool

To use the Models to XPL tool:

1. On the **Layers** tab, in the **3D Mesh** group, click **Models to XPL**. The Convert Models to XPL dialog is displayed.
2. If you want to process a single file, browse to the required **Source** directory and select the required file.
3. If you want to process an entire source directory, select the **Process entire directory** check box. Then browse to the required **Source** directory and click **OK**.

- Select the **Search in subfolders**, if you also want to search in the directory's subfolders.

4. Browse to the required **Output directory.** All created XPL2 files will be saved to this directory.
5. Select or clear the check boxes of the following options:

Option	Description
Skip bad textures	If selected, Convert Models to XPL ignores any texture files that cannot be converted (e.g., unsupported formats). If this check box is cleared, the Convert Models to XPL process will abort processing if a bad texture is encountered.
Skip bad models	If selected, Convert Models to XPL ignores any models that cannot be converted (e.g., unsupported formats). If this check box is cleared, the Convert Models to XPL process aborts processing if a bad model is encountered.
Compress best level texture	Compression reduces storage space and improves performance.
Center down object pivot	If all the models share the same pivot and also need to be centered down, select the check box and type the real geographic coordinates of the shared pivot point in the X, Y, and Altitude offset fields.
Pack textures to a single texture file	Merge texture information into a single file. The sub-textures are rendered by modifying the texture coordinates of the object's UV map, essentially telling it which part of the image its texture is in. When textures are packed in a single file, they are treated as a single unit by the graphics hardware, resulting in faster model rendering.
Create LOD for geometry	When this option is selected, multi-resolution geometries will also be created (in addition to multi-resolution textures). Using multi-resolution geometries will generally accelerate loading speed and consume less memory.

6. A single XPL file can be created for the lower resolution levels of multiple models that are in close proximity. This is particularly useful for small models. If you want to **Group close models** of XPL model files, select the check box, and enter the following information:

Field	Description
Input shapefile	Browse to the file that contains the models' positioning information.
File name attribute	Select the shapefile attribute that contains the model file name for each feature. (The symbol for each shapefile point feature is based on this attribute, so that each model is positioned in the correct position on the terrain.)
Output shapefile	Type the path of a shapefile that will store the models' modified referencing and grouping information.
Use UTF-8 for shape attributes	Use UTF-8 for international language support. UTF-8 is a variable-length character encoding for Unicode that is able to represent any universal character in the Unicode standard.
Create bounding boxes for models	If selected, Convert Models to XPL creates a simple bounding box element around each model object. The color of the

	bounding box is based on the dominant color among the model's textures. The bounding boxes are included in the modified shapefile attribute and can display a general outline of the model while the model is being rendered in the 3D Window.
Maximum group size	TerraExplorer will group together XPL files of models that are located in the same area without exceeding the designated grouped model size. When the maximum group size is reached, a new group is created from remaining elements in the same area.

7. Click **Go**.

Classifying Layers and Objects Using Feature Layers

Layers and objects, e.g., mesh layers, can be classified using classification polygons containing attribute data relevant to the mesh layer. Classification enables you to visually distinguish different areas of the layer and perform spatial and attribute queries on the feature layer that is classifying the mesh layer. The classification polygons are generally features in a feature layer, but individual polygon objects can also be used. The classification can be displayed either by colorizing or by displaying a 3D polygon around the intersecting layers and objects.

The new classification is dynamic and reflects any changes to the classifying polygon features or classified layers and objects. It does not pre-process the classification layers with any particular mesh, which means that multiple feature layers can classify a single mesh and multiple meshes can be classified by any particular classification feature layer. The appearance (e.g., fill color or altitude) of each of your classification polygons can be controlled by basing the polygon properties on layer attribute fields. See "About Basing Native Feature Layer Properties on Layer Attribute Fields" in the "Feature Layers" chapter for more information.

Skyline continues to provide legacy support for classification layers created in older versions of TerraExplorer Pro or in CityBuilder.

Using a Feature Layer as a Classification Layer

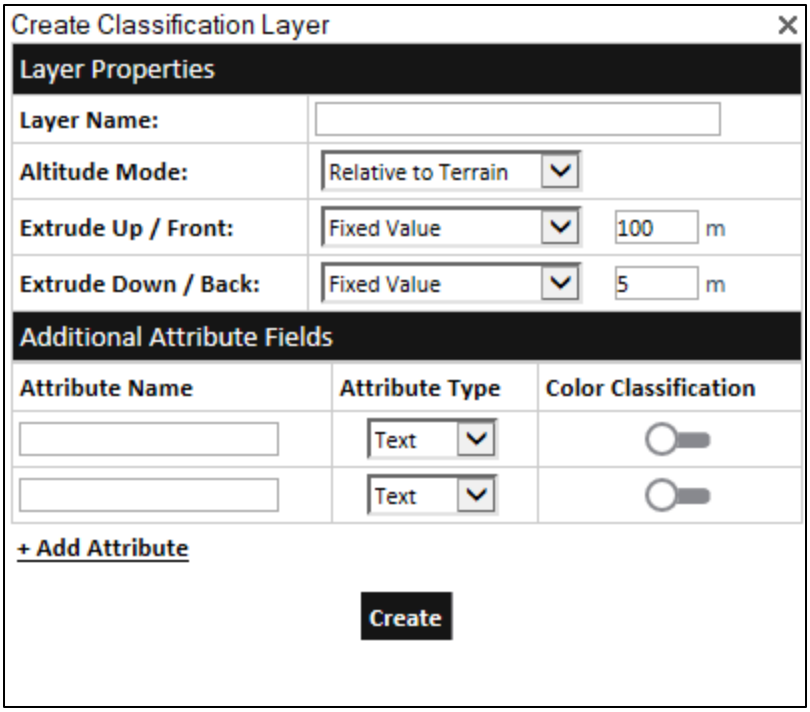
To use a feature layer as a classification layer:

1. Load the required feature layer. **See** "Loading Feature Layers" in the "Layers" chapter for information.
2. In the layer's property sheet, set the Altitude Method to Relative to Terrain or Absolute, and set the Classification Mode. **See** the Volume Classification section in "Polygon Property Sheet Parameters" in the "Objects and Labels" chapter.
3. Set the appearance, e.g., fill color, altitude, or visibility, of your classification polygons. **See** "Setting and Editing Feature Layer Properties" in the "Feature Layers" chapter for information. Polygon properties can be based on layer attribute fields. **See** "About Basing Native Feature Layer Properties on Layer Attribute Fields" in the "Feature Layers" chapter for more information.

Creating a New Classification Layer

To create a new classification layer:

1. On the **3D Mesh Layer** tab, in the **Volume Classification** group, click **Create Layer**. The Create Classification Layer dialog is displayed.



Create Classification Layer

2. Enter the following information:

Note: When creating a classification layer for buildings, generally the layer's Altitude Method should be set to Relative to Terrain and Extrude Up / Front and Down / Back should be set to fixed values that correspond to the height of the tallest building. When creating a classification layer for other building elements, e.g., floors, windows, and doors, the layer's Altitude Method should generally be set to Absolute and Extrude Up / Front and Down / Back should be set to By Attribute. Each individual polygon's altitude and extrude values should then be set according to the element being classified.

Property	Description
Layer Name	Name of the feature layer.
Altitude Mode	Sets the altitude method to be used by the layer's polygons: ▪ Select **Relative to Terrain** to place the pivot point of each of the layer's polygons at a specified altitude above the ground. ▪ Select **Absolute** to place the pivot point of each of the layer's polygons at a specified altitude above the terrain database vertical datum base ellipsoid.
Extrude Up / Front	Length to extrude the layer's polygons upwards or frontwards in the direction of each polygon's normal. If a polygon's elevation angle to the ground is less than 20 degrees, the polygon is extruded vertically. If the polygon points were created in a

	clockwise orientation, then the front is the side facing the user. Select either: ▪ Fixed Value – Fixed value in meters for all layer polygons. ▪ By Attribute – The extrusion value for each of the layer's polygons is taken from the value set for the polygon's "Front" attribute. If Extrude Up / Front is set to By Attribute, this attribute is added to each polygon feature in the layer. **See** "Adding a Feature to a Layer" and "Modifying Layer Attribute Data" in this chapter for information.
Extrude Down / Back	Length to extrude the layer's polygons downwards or backwards in the direction of each polygon's normal. If a polygon's elevation angle to the ground is less than 20 degrees, the polygon is extruded vertically. If the polygon points were created in a clockwise orientation, then the back is the side opposite the side facing the user. Select either: ▪ Fixed Value – Fixed value in meters for all layer polygons. ▪ By Attribute – The extrusion value for each of the layer's polygons is taken from the value set for the polygon's "Back" attribute. If Extrude Down / Back is set to By Attribute, this attribute is added to each polygon feature in the layer. **See** "Adding a Feature to a Layer" and "Modifying Layer Attribute Data" in this chapter for information.
Attribute Name	Add as many attributes as required. For each attribute, type a name and enter the attribute type. If you want to colorize the layer based on one of the attribute's values, switch **Color Classification** on for that attribute.

3. Click **Create**.
4. In the **Project Tree**, select the created classification layer, and set additional properties if required. In the Volume Classification section of the property sheet, you can set the Classification Mode: 3D polygon or Colorize objects and layers and a 2D Buffer for the classification polygons. **See** "Polygon Property Sheet Parameters" in the "Objects and Labels" chapter for information.
5. Add the required classification polygons. **See** "Adding a Feature to a Layer" in the "Feature Layers" chapter for information. If Extrude Up / Front and Down / Back were set to "By Attribute", enter values for the front and back attributes added to each polygon.

   Note: Selecting **Set Position Based on Mouse**  or **Snap Based on Snapping Options**  in the polygon property sheet before drawing makes it easier to draw the polygons above a

3DML layer. **See** "Moving an Object Based on Where the Mouse is Pointing in the 3D Window" in the "Working with Objects" chapter for information.

6. You can base the appearance, e.g., fill color or altitude, of the classification polygons on layer attribute fields. See "About Basing Native Feature Layer Properties on Layer Attribute Fields" in the "Feature Layers" chapter for more information.

Saving Feature Layers

Changes made to groups and layers can be saved in the following file formats:

- Esri shapefile
- TerraExplorer project file (*.fly)

  Note: When saving to a FLY, the files used by the FLY are not collected (as they are when publishing a TerraExplorer project), and the paths remain the same as the original FLY. Use this option if you intend to use the exported FLY in the same location as the current FLY file you are using.

- KML/KMZ file

Modifications to a layer can be made to the original source file or to a new file.

Saving Layer Changes to the Original Data Source

To save layer changes to the original source file:

Note: These commands are only available for shapefiles, GeoDatabase files, KML/KMZ files that were created by TerraExplorer (by exporting a layer or project to KML/KMZ), and WFS-T. A WFS service with transactions (WFS-T) allows WFS clients to apply edits (inserts, deletes and updates) to the data in the source database through the WFS service. **See** "Export to KML/KMZ" in the "Basic Concepts" chapter for more information on exporting to KML/KMZ.

- In the **Project Tree,** right-click the required layer and select **Save Layer** from the shortcut menu.

  or

- On the **Feature Layer** tab, in the **Load and Save** group, click **Save Layer**.

  A warning dialog is displayed cautioning you that you are about to modify the original source file. Click **Yes** to continue or **No** to cancel.

Saving Layer Changes to a New File

You can save a layer to a new local file. This can be particularly useful if a layer is located on a slow accessed remote server; by saving to a local file, you speed up access.

Note: A layer can be saved to a new file when the Entire Layer was loaded (fully or partially), as well as when a layer was streamed.

You can save to the following file formats:

- SQLite (.sqlite)
- GeoPackage (.gpkg)
- Shapefile (.shp)
- AutoCAD DXF (.dxf)

- Geospatial PDF (.pdf)
- Microsoft Excel (.xlsx)

Note: Only point layers can be saved to Microsoft Excel.

Note: Layers saved as Geospatial PDF or Microsoft Excel files are read-only when loaded back into TerraExplorer (i.e., their Save command is unavailable).

Note: Layers saved as AutoCAD DXF have an Entities layer  with each of the geometry types included in the layer. **See** "AutoCAD DXF File" in the "Feature Layers" chapter for more information.

To save a layer to a new file:

1. Do either of the following:
   - In the **Project Tree,** right-click the required layer, point to **Export Layer**, and select the **Save as** option from the shortcut menu.
   - On the **Feature Layer** tab, in the **Load and Save** group, click the arrow next to **Save Layer**, and select **Save as**.

     The Save As dialog is displayed.
2. Browse to the required Save location and in the **File name** field, enter the file name.
3. From the **Save as type** dropdown list, select a file **type** (.sqlite, .gpkg, .shp, .dxf, .pdf, or .xlsx).
4. If you are saving the layer as an .sqlite, .gpkg, or .pdf file, type a **Layer name**.
5. Click **Save**.

Converting Layers to Groups

Layers can only be converted to a group if the Load Option was set to All Features. **See "**Setting General Layer Settings" in the "Feature Layers" chapter for information.

To convert a native feature layer to a group:

- In the **Project Tree**, right-click the required layer, point to **Export Layer**, and select **Convert to Group** from the shortcut menu.

Uploading Feature Layers to SkylineGlobe Server

You can upload your layers to SkylineGlobe Server.

To upload a layer:

- In the **Project Tree**, right-click the required layer, and select **Upload to SkylineGlobe** from the shortcut menu. **See** "Uploading Layers to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.

CHAPTER 14 COMPLEX LAYERS

About Complex Layers

In addition to feature layer data sources which are composed entirely of homogeneous or heterogeneous geometries (points, lines, and polygons) representing geographic features, TerraExplorer Pro also supports the loading of several types of complex feature layers, which combine different data types in one layer. These include:

- **FLY** – Skyline's proprietary compressed binary file that includes pointers to feature and raster data, objects, and models.
- **OGC KML/KMZ** – OGC standard, publicly defined layer, which can be composed of feature and raster elements. For more information, **see** http://www.opengeospatial.org/standards/kml.

Loading FLY and KML/KMZ Files

When loading an OGC KML/KMZ file, TerraExplorer preserves KML object properties as accurately as possible by translating KML objects to their equivalent TerraExplorer geometries. If there is no TerraExplorer element that precisely represents a KML object, TerraExplorer uses the closest match. **See** "Export to KML/KMZ" in the "Basic Concepts" chapter for a list of the TerraExplorer – KML translations.

If a KML with a tour element is loaded into a TerraExplorer project, it will open as a TerraExplorer presentation that can be edited (modify the route, add captions and operations, etc.) and played just like any natively-created one. **See** "Loading a KML with a Tour Element" in the "Presentations" chapter for more information and a list of the supported KML Tour tags.

To load FLY or KML/KMZ layers from file:

- On the **Layers** tab, in the **Complex Layer** group, click the required layer type. Then in the **Browse for feature layer** dialog that is displayed, browse to the required file and click **Open**.

  Note: When a KML with a tour element is loaded into a TerraExplorer project, it opens as a TerraExplorer presentation that can be edited and played just like any natively-created one. **See** "Loading a KML with a Tour Element" in the "Presentations" chapter for information.

Loading FLY and KML Layers from SkylineGlobe Server

SkylineGlobe Server is a private cloud solution that supports the client-server data delivery requirements of Skyline's 3D technology. TerraExplorer can read streamed point cloud, KML, feature, elevation, imagery, 3DML, raster complex, TerraBuilder projects, and TerraExplorer projects. For more information on loading layers from SGS, see "Loading SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.

To load a FLY or KML layer from a SkylineGlobe Server:

1. On the **Home** tab, in the **Add** group, click the arrow next to **3D Layer**, and select **SkylineGlobe Server**. The SkylineGlobe Layers dialog is displayed.
2. If you aren't already logged in to the required SkylineGlobe Server, log in to the server. **See** "Logging In to a SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.
3. Search for the required layer. **See** "Searching for SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.
4. Select the layer you want to load, and click **Load Layer**.

5. After the layer has been placed on the terrain, you can change its properties using its property sheet. **See** "Setting and Editing Complex Layer Properties" in this chapter for further information.

Setting and Editing Complex Layer Properties

Basic layer and feature properties can be modified from the layer's property sheet.

See "Multi-Editing" in the "Working with Objects" chapter and "Setting Group Properties" in the "Using the Project Tree" chapter for information on the layer's property sheet.

If a KML/KMZ file with refresh tags is added, the layer's property sheet includes a special Network Link tab instead of the Group tab that includes two additional properties: Auto-Refresh Interval and After-Stop Interval.

Note: KML's with network links can only be saved to a new file. They cannot be saved to the original source file or uploaded to SkylineGlobe Server. **See** "Saving FLY and KML/KMZ Layers" in the "Complex Layers" chapter for more information.

Network Link Tab

The Network Link tab includes the following groups and fields:

Field	Activity
General	
Name	Type the description or name of the layer. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the layer from the Project Tree.
Status	
Location Defines the initial location of the camera when a layer is selected from the Project Tree.	
Altitude Method	Sets the altitude method to be used for the specified location: ▪ Select **Relative to Terrain** to place the location point at a specified altitude above the ground. ▪ Select **Absolute** to place the location point at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	Enter the altitude above the ground for the specified location.
X	Enter the X-coordinate of the location of interest.
Y	Enter the Y-coordinate of the location of interest.
MGRS	The coordinates of the location's pivot point converted to Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Direction	Enter the horizontal angle of the camera when viewing the location.
Tilt	Enter the vertical angle of the camera when viewing the location.
Viewing Distance	Enter the distance between the camera and the specified location.

	This property also affects the radius of the flight patterns.
Set Viewpoint	Click **Capture** to capture the current camera position and set as the camera parameters for this location.
Jump To Viewpoint	Click **Jump** to make the 3D Window reflect the changes made to the location's fields.
Timespan	
Start Time	Click **Edit** and select the date and time when the layer should first become visible.
End Time	Click **Edit** and select the date and time when the layer should stop being visible.
Refresh Conditions	
Auto Refresh Interval	The length of the interval in seconds between auto-refreshing of the layer. This value is based on the layer's refreshInterval tag.
After Stop Interval	The length of the interval in seconds after stopping the flight until the layer is refreshed. This value is based on the layer's viewRefreshTime tag.

Saving FLY and KML/KMZ Layers

FLY files are loaded as groups and like all other groups can be saved to a shapefile, FLY, or KML/KMZ file. **See** "Converting Groups to Layers" in the "Using the Project Tree" chapter.

KML/KMZ files can be saved to these same formats, i.e., shapefile, FLY, or KML/KMZ or converted to a group.

To save layer changes to the original source file:

Note: Only KML/KMZ files that were created by TerraExplorer (by exporting a layer or project to KML/KMZ) can be saved to the original file.

- In the **Project Tree,** right-click the required layer and select the **Save Layer** from the shortcut menu.

To save a KML/KMZ layer to a new file:

1. In the **Project Tree,** right-click the required group or layer, point to **Export Layer** and select **Save as** from the shortcut menu. The Save As dialog is displayed.
2. Browse to the required Save location and in the **File name** field, enter the file name.
3. From the **Save as type** dropdown list, select the file type.
4. Click **Save**.
5. If saving to a shapefile, the Export dialog is displayed. Enter the required parameters and click **Export**. **See** "Export to Shapefile Dialog" in the "Using the Project Tree" chapter for information.

To convert a KML/KMZ layer to a group:

1. In the **Project Tree,** right-click the required group or layer, point to **Export Layer** and select **Convert to Group** from the shortcut menu. A dialog is displayed warning that all layer settings will be lost if the layer is converted to a group.
2. Click **Yes** to convert the layer to a group, or **No** to cancel.

Uploading KML Layers to SkylineGlobe Server

You can upload KML layers to SkylineGlobe Server.

Note: Only KML/KMZ files that don't have network links can be uploaded to SGS.

To upload a layer:

- In the **Project Tree**, right-click the required layer, and select **Upload to SkylineGlobe** from the shortcut menu. **See** "Uploading Layers to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.

CHAPTER 15 POINT CLOUD LAYERS

Loading a Point Cloud Model

Point cloud models are created from a list of points in a 3D area that are collected by various sources including 3D scanners. The load point cloud feature supports Skyline's proprietary Point Cloud files (CPT).

Converting Point Cloud Data to CPT

The Convert Point Cloud to CPT tool converts point cloud data from various formats to a unified, visualization and stream-optimized Skyline-proprietary Point Cloud file (CPT) format. Supported input formats include all of the following:

- LAS files containing LiDAR point cloud data and their compressed version (LAZ)
- PTS text files
- Point cloud text files (.txt, .xyz)
- E57 files

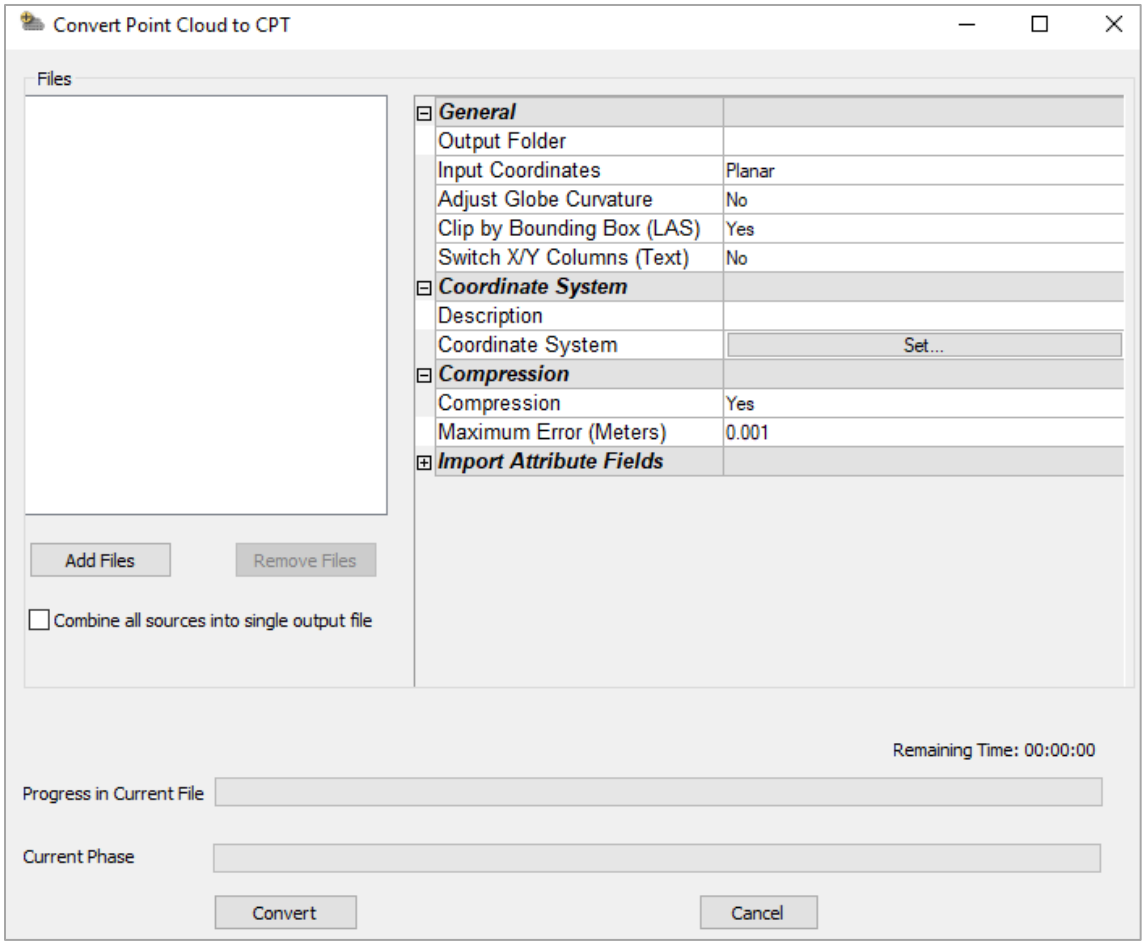
Text point cloud files must be in space delimited format and in the order X Y Z R G B I or X Y Z I, where X, Y, and Z are coordinate data, R, G, and B are color values between 0 and 255, and I is the intensity value between 0 and 255.

The following is an example of XYZ RGBI formatted data:

1.0 1.0 1.0 0 0 255 0

2.0 2.0 2.0 0 255 0 100

3.0 3.0 3.0 255 0 0 255



Convert Point Cloud to CPT Tool

To use the Convert Point Cloud to CPT tool:

1. On the **Layers** tab, in the **Point Cloud** group, click the arrow under Point Cloud and select **Convert Point Cloud**. The Convert Point Cloud to CPT dialog is displayed.
2. To add source files to be converted, click **Add Files**, and browse to the required source files.
3. To remove a source file from the output, in the **Files** list, select the source, and click **Remove Files**.
4. Select **Combine all sources into single output file** to generate all the source data as one CPT model.
5. In the property sheet, set the parameters for all of the sources:

Parameter	Description
General	
Output Folder	Set the folder for the generated file. **Note:** The output file name will be set to the same as the input file with a CPT extension. When the option to **Combine all sources to single output file** is selected, the combined file name is the same as the first input.

Input Coordinates	Select the type of coordinate system: Planar, Local Lat-Long or Global Lat-Long based on the coordinate system of your data. For Lat-Long data, it is generally preferable to use Local Lat-Long except when the project covers a large geographic area (e.g., an entire US state).
Adjust Globe Curvature	Select **Yes** to increase accuracy for Lat-Long CPT that will only be used with Globe terrain databases.
Clip by Bounding Box (LAS)	Select **Yes** to clip the CPT by the bounding box (BBox) information included in the LAS file. This property only applies to LAS files.
Switch X/Y Columns (Text Files)	Transpose the X Y columns. This property only applies to text files. **Note**: Text point cloud files need to be in space delimited format and in the order X Y Z R G B I or X Y Z I.
Coordinate System (for LAS Files)	
Description	Free text describing the coordinate system.
Coordinate System	Click **Set** to open the **Coordinate System** dialog, and set the required coordinate system. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
Compression	
Use Compression	Select Yes or No.
Maximum Error (Meters)	Maximum allowed error.
Import Attribute Fields Select the check boxes of the attribute fields you want to load with the layer.	

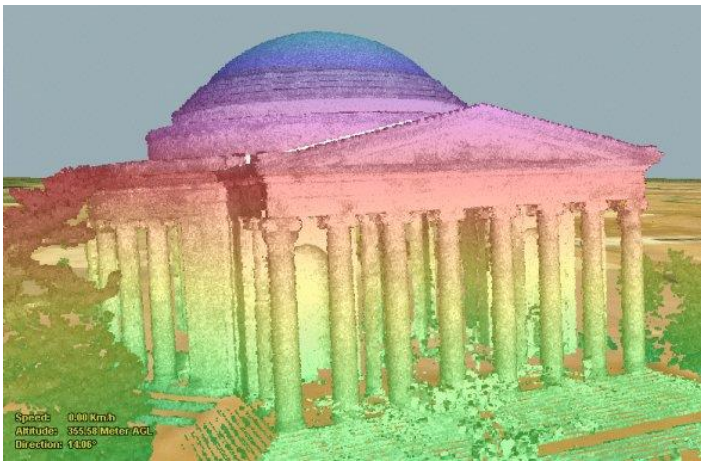
6. Click **Convert** to convert the files to a CPT model. When conversion is complete, you can load the converted CPT using the CPT from File command. **See** "Loading a Point Cloud Model from File" in this chapter for information.

Loading a Point Cloud Model from File

To load a point cloud model from file:

1. On the **Layers** tab, in the **Point Cloud** group, click the arrow next to **Point Cloud**, and select **CPT from file**. The Browse for Point Cloud Model dialog is displayed.
2. Browse to the required .cpt file to load as the point cloud model. The point cloud model is displayed in the 3D Window and its property sheet is opened.
3. If the point cloud model is geo-referenced, it is located accordingly on the terrain. Otherwise, it is placed at the center of the 3D Window. You can then manually edit its position, or reproject it. With the cursor in the **3D Window**, click the mouse to define the position of the point cloud model's center point on the terrain.

   Note: The center point of a point cloud model is automatically calculated as the center of the bounding box holding all the points in the file.
4. Using the property sheet, set the parameters of the point cloud object. **See** "Setting and Editing Point Cloud Properties" in this chapter for information.



Example of a Point Cloud Model Object

Loading a Point Cloud Model from SkylineGlobe Server

SkylineGlobe Server is a private cloud solution that supports the client-server data delivery requirements of Skyline's 3D technology. TerraExplorer can read streamed point cloud, KML, feature, elevation, imagery, 3DML, raster complex, TerraBuilder projects, and TerraExplorer projects. For more information on loading layers from SGS, see "Loading SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.

To load a point cloud model from a SkylineGlobe Server:

1. On the **Layers** tab, in the **Point Cloud** group, click the arrow next to **Point Cloud**, and select **SkylineGlobe Server**. The SkylineGlobe Layers dialog is displayed.
2. If you aren't already logged in to the required SkylineGlobe Server, the Login to SkylineGlobe Server dialog is first displayed so you can log in to the server. **See** "Logging In to a SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.
3. Search for the required layer. **See** "Searching for SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.
4. Select the layer you want to load, and click **Load Layer**.
5. After the layer has been placed on the terrain, you can change its properties using its property sheet. **See** "Setting and Editing Point Cloud Properties" in this chapter for further information.

Setting and Editing Point Cloud Properties

Point cloud properties can be modified from the layer's property sheet.

Note: You can apply a point cloud layer's properties (e.g., point size, point color, intensity blend) to another point cloud by copying and pasting the layer's styles. **See** "Copying and Pasting Layer Styles" in this chapter for information.

Note: If you want to undo/redo any edit action, on the top of the layer's property sheet, click **Undo** / **Redo** . Changes can be undone or redone, even after the property sheet is closed, and then reopened.

Object Parameter	Activity
Appearance	

Name	Type the description or name of the point cloud model. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the point cloud model from the Project Tree.
Style	
Point Size	Size, in pixels, of each of the point cloud's points. If you want to base the point size on attribute fields, click the **Field by Attribute** button . **See** "Basing Numeric Style Properties on Attribute Fields" in the "Feature Layers" chapter for more information.
Point Color	Color of the point cloud points. This can be set to any of the following: ▪ [RGB] – To color each point of the point cloud according to the CPT's RGB values. ▪ [Intensity] - To color each point of the point cloud according to the CPT's intensity values. ▪ A set color value for all the points. To select a color, click **Edit** and select a color. ▪ Attribute field - To base each point of the point cloud's color on a specific attribute field's value, click the **Field by Attribute** button . **See** "Basing Color Properties on Attribute Fields" in the "Feature Layers" chapter for more information.
Point Visibility	Determines if the point cloud's points are visible. To set the visibility of points based on their attribute values, click the **Field by Attribute** button . In the Field by Attribute dialog that opens, select the attribute on which to base visibility. Then for each attribute value, type the value and the corresponding visibility setting.
Intensity Blend	Determines how much the point cloud's intensity value is factored in colorizing the point cloud, where 0% colorizes the point cloud model by point color only, and 100% colorizes by intensity only.
Oversampling	The point cloud's Level of Detail (LOD). When set to Normal, TerraExplorer determines the optimal quality to performance balance based on the current view. The "High" and "Best" settings will load more points but are also more resource-intensive.
Flatten Underlying Terrain	Determines if the terrain under the model is leveled to the model's elevation value. This option is enabled only if the Altitude Method property in the point cloud property sheet is set to Absolute.
Hide Underlying Terrain	Hides the terrain texture under the point cloud model (the terrain appears as a black image).
Model	
File Name	Type or browse a path to a .cpt file to load as the point cloud model.

Position	
Altitude Method	Sets the altitude method to be used by the point cloud model: ▪ Select **Relative to Terrain** to place the point cloud model's pivot point at a specified altitude above the ground. ▪ Select **Absolute** to place the point cloud model's pivot point at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	Enter the altitude, as defined in Altitude Method, for the point cloud model's pivot point.
X	Enter the X-coordinate for the point cloud model's pivot point.
Y	Enter the Y-coordinate for the point cloud model's pivot point.
MGRS	The coordinates of the point cloud model's center point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Yaw	Determines the direction angle of the point cloud model along the vertical axis relative to north.
Pitch	Determines the tilt angle of the point cloud model along its lateral axis relative to the horizon.
Roll	Determines the roll angle of the point cloud model along its longitudinal (front-to-back) axis.
Default Location	Brings you to the default location of the object. This option is active only if an object was assigned a default location during its configuration stage.
Geometry	
Scale	Determines the dimensions, of the point cloud model. The actual size of the model in the 3D World is the size of the model in its internal coordinate system times the Scale value, (i.e., if the model has a width of 5 units and the scale is set to 10, the width of the object in the 3D World is 50 meters.)
Data Slice	Click on the Data Slice button to open the Data Slice Control dialog.
Timespan	
Start Time	Click **Edit** and select the date and time when the point cloud model should first become visible.
End Time	Click **Edit** and select the date and time when the point cloud model should stop being visible.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the point cloud model. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the object from the Project Tree.

	When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the model based on its size.
Max. Visibility Distance	Sets the distance from the camera above which the point cloud model disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the point cloud model disappears.
General	
Show in Viewer	Determines if the point cloud model appears in the Project Tree when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a tooltip text to appear when the mouse cursor is placed over the point cloud model in the 3D Window.
Ground Object	Determines if the object is calculated as part of the terrain's elevation.

Copying and Pasting Layer Styles

Point cloud layers are easily styled by copying and pasting styles from one point cloud to another. When the Copy/Paste layer style functions are performed, all layer properties are copied and pasted except for Name and the properties listed in the Model and Position sections of the point cloud property sheet.

Note: Layer styles cannot be pasted if the source of the layer being copied was deleted.

To copy and paste a point cloud's styles:

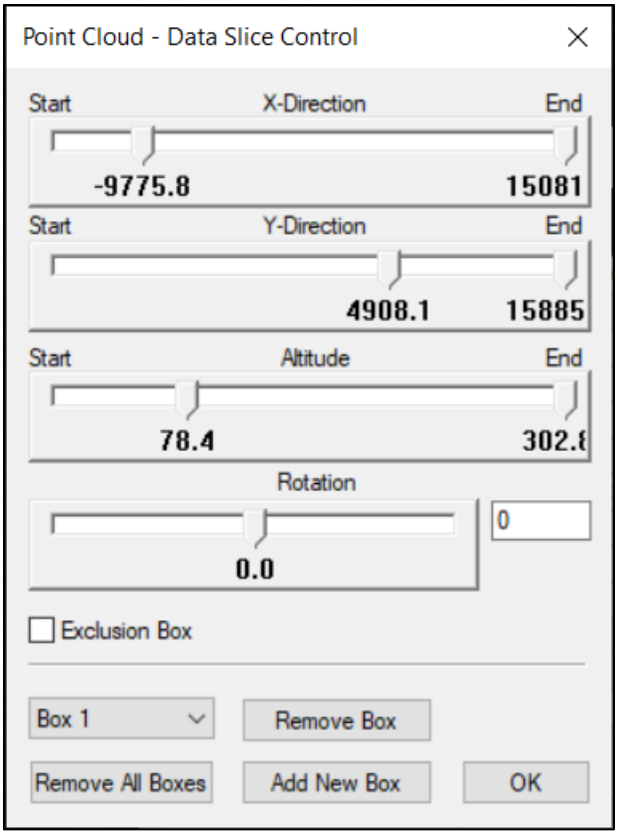
1. In the **Project Tree**, right-click the point cloud whose style you want to copy, and select **Copy Layer Style**.
2. In the **Project Tree**, right-click the point cloud to which you want to apply the copied layer style, and select **Paste Layer Style**. If you want to paste the style to multiple point cloud layers, use CTRL-click or SHIFT-click to multi-select the layers, and then select **Paste Layer Style**.

Using the Data Slice Control

After creating a point cloud model, you can designate which section(s) of it to include using the Data Slice Control. This control enables you to define either exclusion or inclusion bounding boxes.

- **Inclusion box** – Only points inside the box are displayed.
- **Exclusion box -** Only points outside the box are displayed.

When the point cloud model is selected for editing, a yellow frame and a red frame surround it. The yellow frame represents the total area of the point cloud model. The red frame represents the area that will be displayed. When you use the sliders on the Data Slice Control, the red frame is updated to show the selected area.



Point Cloud - Data Slice Control Settings

To define a bounding exclusion or inclusion box:

1. In the **point cloud** property sheet, in the **Data Slice** field, click **Set**. The Point Cloud – Data Slice Control is displayed.
2. For the **X-Direction**, **Y-Direction**, and **Altitude** controls, adjust the **Start** and **End** sliders to designate the limits of the bounding box. The values displayed are the distance in meters from the center point of the point cloud model.
3. Enter the rotation of the bounding box on the horizontal plane by adjusting the **Rotation** slider or typing the rotation value in the text box. The rotation value is converted to an equivalent value between -180º and 180º.
4. If you want the bounding box to function as an exclusion box, select the **Exclusion Box** check box.
5. If you want to create multiple bounding boxes, select **Add New Box**, and repeat steps 2-4.

   Note: You can use multiple Exclusion boxes but only one Inclusion box.
6. If you want to remove a box, select the required box in the **Box** dropdown list 

, and select **Remove Box**.
7. If you want to remove all boxes, select **Remove All Boxes**.
8. Click **OK**.

Uploading Point Cloud Layers to SkylineGlobe Server

You can upload your layers to SkylineGlobe Server.

To upload a layer:

- In the **Project Tree**, right-click the required layer, and select **Upload to SkylineGlobe** from the shortcut menu. **See** "Uploading Layers to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.

CHAPTER 16 3D MESH LAYERS

Working with 3D Mesh Layers

Mesh layers are multi-resolution, textured mesh models that may include classification layers, as well as polygons from BIM datasets. They are created through automatic reconstruction methods, manual modeling, or building information modeling (BIM). Mesh layers can be loaded into TerraExplorer from files or from SkylineGlobe or 3D Tile servers, and displayed on the terrain, as well as measured and analyzed. Mesh layers can be classified using polygons (generally from a feature layer) that enable you to visually distinguish different areas of the mesh layer, access the attribute data of the classification features and perform spatial and attribute queries. The classification is dynamic, reflecting any changes to the polygon features, and requires no pre-processing.

Mesh layers created from point feature layers with individually referenced 3D model files, imported BIM layers, and mesh layers classified using the legacy Classify Mesh Layer tools include associated feature layers that are pre-processed with their respective mesh layers. These mesh layers support many of the editing, analysis, and querying capabilities available for standard feature layers, e.g., spatial and attribute queries.

The following mesh layers are supported in TerraExplorer. Most mesh layers are converted to Skyline's proprietary, stream-optimized 3DML format, upon import.

- **Mesh models** – Automatically generated from standard 2D photographs in **PhotoMesh**.
- **Mesh + Classification** – Mesh layers classified in older versions of **TerraExplorer**, by associating and pre-processing polygon feature layers with the mesh (legacy support).

  Note: TerraExplorer's new mesh classification method is dynamic and does not pre-process the classification layers with any particular mesh. **See** "Classifying Layers and Objects Using Feature Layers" in the "Feature Layers" chapter for information.
- **Models** (Point feature layers that reference individual models) – Model layers are converted to 3DML in **TerraExplorer** using the Models to 3DML tool.
- **DAE (LODTreeExport.xml)** – DAE (LODTreeExport.xml) layers are converted to 3DML upon import to **TerraExplorer** using the Import and Convert tools.
- **OSGB** – OSGB layers are converted to 3DML upon import to TerraExplorer using the Import and Convert tools.
- **3D Tiles (tileset.json)** – 3D Tiles layers are converted to 3DML upon import to TerraExplorer using the Import and Convert tools.
- **Building Information Modeling** (**BIM)** – BIM layers are converted to 3DML upon import to TerraExplorer using the Import BIM tool.
- **Mesh + Classification + Models** – These are merged in the legacy CityBuilder application into a 3DML.

When a mesh layer is loaded into TerraExplorer, the 3D Mesh Layer contextual tab is displayed, from which you can perform mesh layer operations. Most of the mesh layer operations are available only for mesh layers in 3DML format.

The following mesh layer operations are supported:

- Set Display Style – Select a mesh model display style, e.g., texture, wireframe, or x-ray.
- Classify – Create a feature layer with classification polygons containing attribute data relevant to the mesh layer. Classification enables you to visually distinguish different areas of the mesh layer and perform spatial and attribute queries on the feature layer that is classifying the mesh layer.
- Modify – Modify the elevation values in a designated area of a 3DML using a modify mesh layer object.
- Mark for Retouch – Edit mesh imperfections, such as bumps, irregular surfaces, or floating artifacts.
- Scale and Rotate – Correct inaccuracies in mesh layers' scale, rotation and positioning.
- Export to Models – Export polygonal areas of a 3DML, e.g., buildings, to individual OBJ models.
- Export to Mesh – Export 3DML to 3D Tiles (tileset.json) or I3S/SLPK formats.

Some operations are only available for mesh layers with associated feature layers (i.e., mesh created from point feature layers with individually referenced 3D model files, imported BIM layers, or mesh layers classified using the legacy Classify Mesh Layer tools):

- Spatial Queries - Select features based on their spatial relationship with a polygon, line or point that you draw, or with an existing object.
- Search by Attribute - Search the layer attribute database files to easily edit the attribute values of multiple features and to create a new shapefile based on the filtered data.
- Display by Attribute - Display only selected areas of the mesh model that match a specific attribute value.
- Colorize by Attribute - Colorize the mesh model based on attribute value, with a different color assigned to each attribute value.

See "Working with 3DML's Feature Layers" in this chapter for more information.

Loading 3D Mesh Layers

TerraExplorer Pro loads a 3D mesh layer as a layer object, which is then displayed in the Project Tree. After loading the layer from file or server, you can set its appearance and parameters in the layer's property sheet.

You can load 3D mesh layers in 3DML, Open3DML or OGC 3D Tiles formats:

- 3DML or Open3DML from File
- 3DML from SkylineGlobe Server
- 3DML from TerraGate SFS (Legacy support)
- OGC 3D Tiles from SGS
- OGC 3D Tiles from Cesium Ion

You can also import the following formats and convert to 3DML:

- DAE (LODTreeExport.xml)
- OpenScene Graph (OSGB)
- 3D Tiles (tileset.json)
- Building Information Modeling (BIM)

Loading 3D Mesh Layers from File

You can load 3D mesh layers in 3DML and Open3DML (.o3DML) formats from a file.

To load a 3DML mesh layer from a file:

1. On the **Home** tab, in the **Add** group, click the arrow next to **3D Layer**, and select **3D Mesh Layer from File**. The Load 3D Mesh Layer (3DML) dialog is displayed.
2. Browse to the required file, and click **Open**.
3. After the layer has been placed on the terrain, you can change its properties using the property sheet. **See** "Setting and Editing 3D Mesh Layer Properties" in this chapter for further information.

Loading 3D Mesh Layers from SkylineGlobe Server

SkylineGlobe Server is a private cloud solution that supports the client-server data delivery requirements of Skyline's 3D technology. TerraExplorer can read streamed point cloud, KML, feature, elevation, imagery, 3DML, raster complex, TerraBuilder projects, and TerraExplorer projects. For more information on loading layers from SGS, see "Loading SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.

Note: For legacy support, TerraExplorer also offers the option to load 3DML layers from TerraGate SFS.

To load a 3DML from a SkylineGlobe Server:

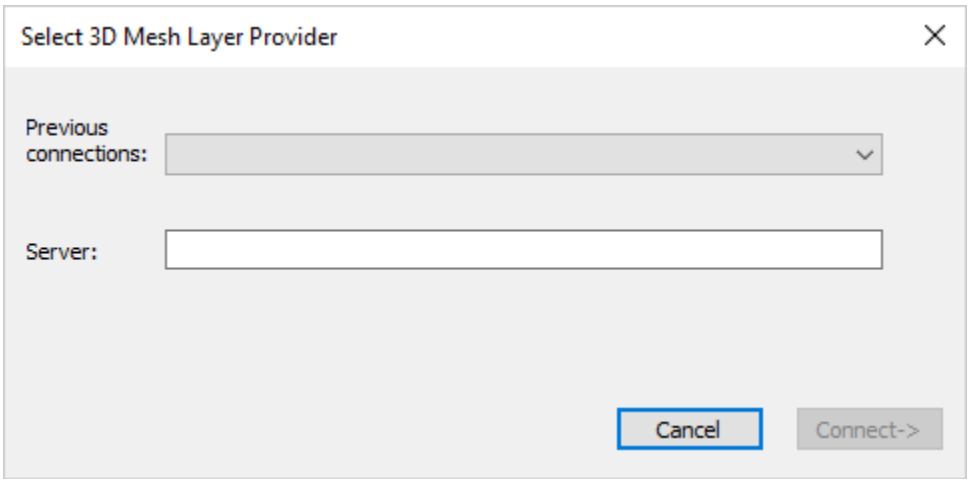
1. On the **Home** tab, in the **Add** group, click the arrow next to **3D Layer**, and select **SkylineGlobe Server**. The SkylineGlobe Layers dialog is displayed.
2. If you aren't already logged in to the required SkylineGlobe Server, log in to the server. **See** "Logging In to a SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.
3. Search for the required layer. **See** "Searching for SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.
4. Select the layer you want to load, and click **Load Layer**.
5. After the layer has been placed on the terrain, you can change its properties using its property sheet. **See** "3D Mesh Layer Parameters" in this chapter for further information.

Loading 3D Mesh Layers from TerraGate SFS

For legacy support, TerraExplorer supports loading of 3D mesh layers in 3DML format from TerraGate SFS.

To load a 3DML from SFS:

1. On the **Layers** tab, in the **3D Mesh** group, click the arrow next to **Load 3D Mesh**, and select **TerraGate/SFS v6**. The Select 3D Mesh Layer Provider dialog is displayed.



Select 3D Mesh Layer Provider Dialog

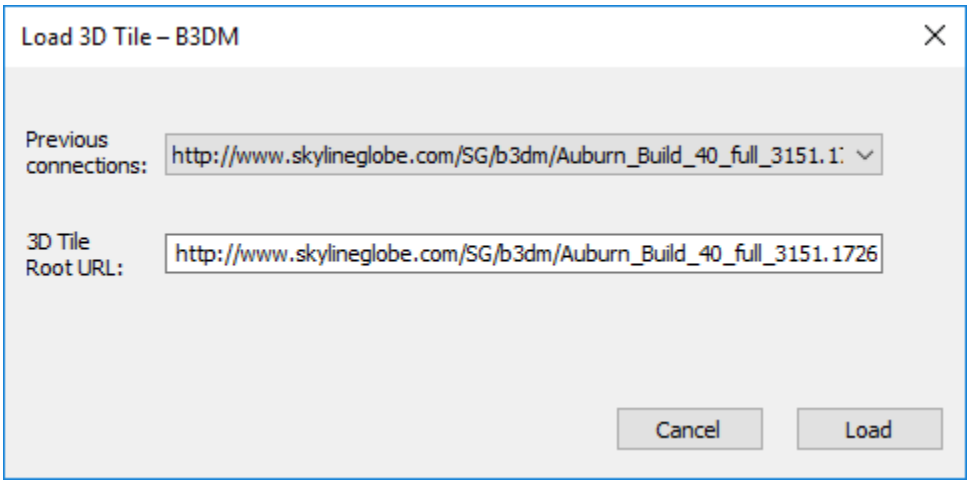
2. Select a **Previous connection** or type the server's URL, e.g., http://www.skylineglobe.com/sfs/streamer.ashx.
3. Click **Connect**. The 3D Mesh Layer List is displayed.
4. Select the layer you want to load, and click **Load**.
5. After the layer has been placed on the terrain, you can change its properties using its property sheet. **See** "Setting and Editing 3D Mesh Layer Properties" in this chapter for further information.

Loading OGC 3D Tiles from a Server

TerraExplorer can also load mesh layers in OGC 3D Tiles (B3DM) format from a server.

To load 3D mesh layers in OGC 3D Tiles format:

1. On the **Home** tab, in the **Add** group, click the arrow next to **3D Layer**, and select **3D Tile from URL**. The Load 3D Tile – B3DM dialog is displayed.



Load 3D Tile – B3DM Dialog

2. Select a **Previous connection** or type the URL to the 3D Tile's root file, e.g., http://www.skylineglobe.com/SG/b3dm/Auburn_4TEDF/tileset.json.

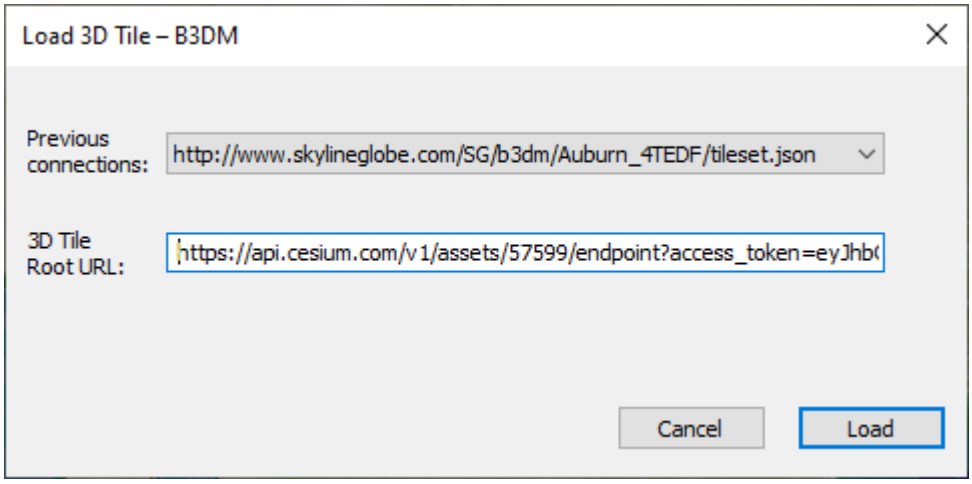
3. Click **Load**. The 3D Tile is loaded into the project and listed in the Project Tree.

Loading 3D Tiles from Cesium Ion and Google Earth

TerraExplorer can load mesh layers in 3D Tiles format from Cesium ion and Google Earth.

To load a Cesium ion asset:

1. On the **Home** tab, in the **Add** group, click the arrow next to **3D Layer**, and select **3D Tiles from URL**. The Load 3D Tile – B3DM dialog is displayed.



Load 3D Tile – B3DM Dialog

2. In the 3D Tile Root URL field, paste the following string:
   - For Cesium -
     https://api.cesium.com/v1/assets/[ASSETID]/endpoint?access_token=[TOKEN]

     Where:
     ASSETID = The Cesium ion asset ID
     TOKEN = The Cesium ion token
     E.g.,
     https://api.cesium.com/v1/assets/57599/endpoint?access_token=eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJqdGkiOiIxMjQ2YTVmMykjsdfY3LTQ2YjAtYTc2Zi1mYzEyMTAkMjFiMGJiLCJpZCI6MTQ4MTMsInNjb3BlcyI6VnJhc3IiLCJnYyJdLCJpYXQiOjE1NjYzODU5ODB9.fs_IBExCAiesNTn1OlsTPbm7ykJciiTWvHbYFqjfcns
   - For Google Earth -
     https://tile.googleapis.com/v1/3dtiles/root.json?key=[KEY
     Where KEY = The API key that you used to access 3D Tiles service.
3. Click **Load**. The 3D Tile is loaded into the project and listed in the Project Tree.

Importing and Converting 3D Mesh Layers

The following formats can be imported and converted to 3DML:

- DAE (LODTreeExport.xml)

- OpenScene Graph (OSGB)
- OGC 3D Tiles (tileset.json)
- BIM

In addition to the import methods supported from TerraExplorer user interface, additional import options can be performed from the SLMeshConverter command line tool. **See** "Importing and Exporting Using the Command Line" in this chapter for information.

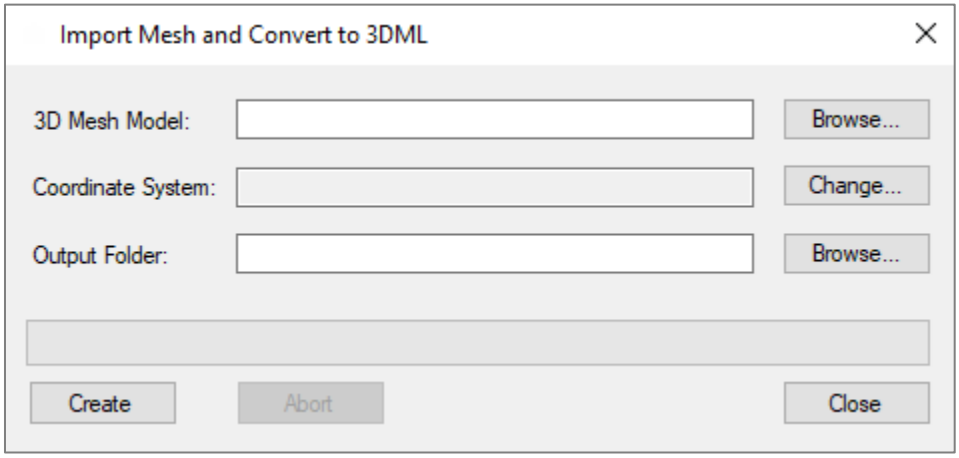
Importing and Converting DAE Mesh Layers

You can import a mesh layer in DAE (LODTreeExport.xml) format from older versions of PhotoMesh and other software, merge it with classification layers, and convert it to a stream-optimized 3DML.

To import and convert a DAE mesh layer:

1. On the **Layers** tab, in the **3D Mesh** group, click the arrow next to **Load 3D Mesh**, and select **Import DAE Layer**.

   The Import Mesh and Convert to 3DML dialog is displayed.



Import DAE Mesh and Convert to 3DML

2. Browse to the **3D Mesh Model** you want to import, and click **Open**. The dialog shows a list of the polygon feature layers that were loaded into the project.
3. The mesh model's coordinate system is automatically read from the imported file. If you want to change the model's coordinate system, click **Change**. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
4. Browse to the required **Output Folder**. The converted mesh model will be saved to this folder.
5. Click **Create**. The created 3DML is added to the project and displayed in the Project Tree.

Importing and Converting OpenScene Graph (OSGB) Layers

OSGB mesh layers are the native format of the open-source – OpenSceneGraph library http://www.openscenegraph.org/. OSGB layers created in an external application can be imported and converted to the stream optimized, 3DML mesh layer format. **See** "Uploading Layers to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter.

The *.filelist.txt file format is supported for the import and conversion of multiple OSGB tiles into a single 3DML. To use this format, a [FileName].filelist.txt text file should be created that references each of the OSGB tiles to be included in the 3DML. This file must adhere to the following rules:

- One tile should be referenced per line with the relative path to that tile's root file in the folder, e.g., ./Tile_485_494/georef/georef.osgb
- The path is relative to the filelist.txt file

For example, if you have four OSGB tile folders:

- Tile_485_494
- Tile_485_495
- Tile_486_494
- Tile_486_495

All of these folders should be placed in a directory next to the *.filelist.txt file, and then referenced as follows in the Example.filelist.txt file:

./Tile_485_494/georef/georef.osgb

./Tile_485_495/georef/georef.osgb

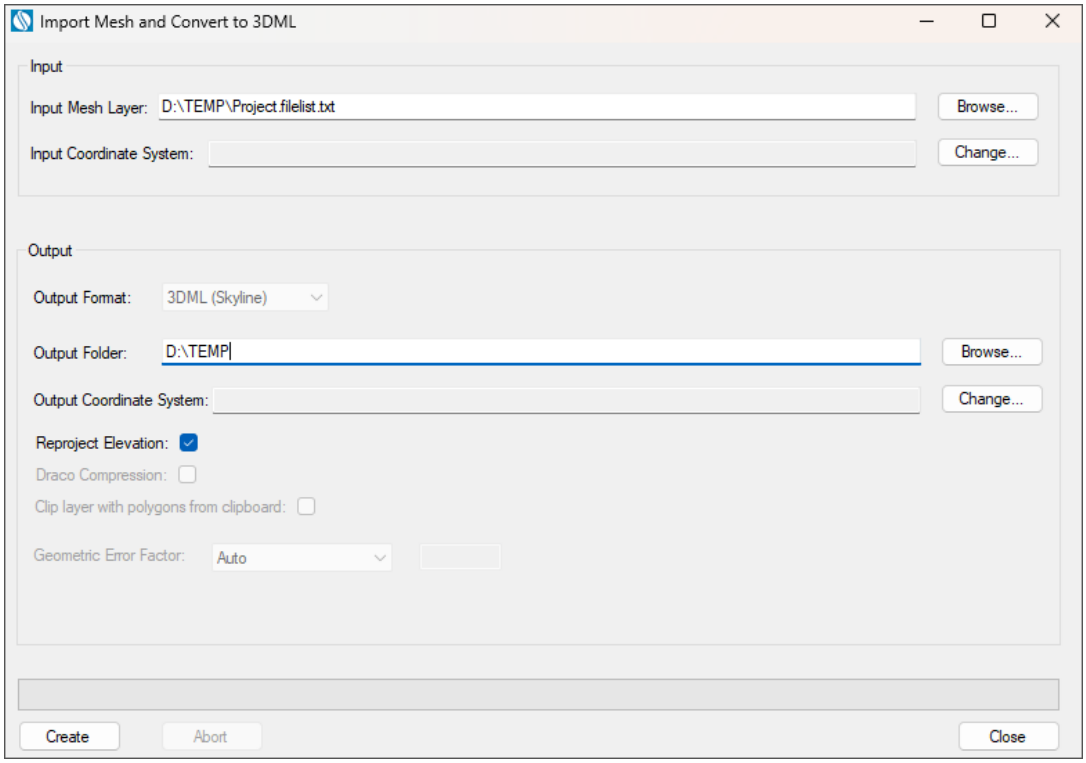
./Tile_486_494/georef/georef.osgb

./Tile_486_495/georef/georef.osgb

To import and convert an OSGB mesh layer:

1. On the **Layers** tab, in the **3D Mesh** group, click the arrow next to **Load 3D Mesh**, and select **Import OpenScene Graph Layer**.

   The Import Mesh and Convert to 3DML dialog is displayed.
2. Browse to the OSGB layer you want to import, and click **Open.** The Import Mesh and Convert to 3DML dialog is displayed.



Import Mesh and Convert to 3DML

3. The **Input Mesh Layer** is automatically populated based on the OSGB layer selected in the previous step.
4. The mesh model's coordinate system is automatically read from the imported file. If you want to change the model's coordinate system, in the **Input Coordinate System** field, click **Change**. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.

   Note: For models in lat-long coordinate system, the coordinate system and model center information can be read from a metadata.xml file that is placed next to the *.filelist.txt file. The metadata.xml can be obtained or generated from PhotoMesh or manually generated.
5. Browse to the required **Output Folder**. The converted mesh model will be saved to this folder.
6. In the **Output Coordinate System**, set the output mesh model's coordinate system. This is by default set to the project's terrain coordinate system. If you want to change the model's coordinate system, in the Output CS field, click **Change**. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
7. If you want to reproject the input layer's elevation values to the output coordinate system, select the **Reproject Elevation** check box.
8. If you want to import sections of the mesh layer using clip polygons on the clipboard, select the **Clip layer with polygons from clipboard** check box.

   Note: Only objects with a polygon geometry, i.e., created via 2D Objects > **Polygon** (on the Home or Objects tab) or polygons in a feature layer are supported.
9. A correction factor sometimes must be applied to a layer's geometric error value so that the 3DML will display properly in TerraExplorer. Geometric error together with other properties allow the viewer to determine the optimal balance between quality and performance so that the best Level of Detail

(LOD) for the current view can be used. In the **Geometric Error Factor** field, select **Auto** to automatically calculate the factor for optimal display in TerraExplorer.

10. Click **Create**. The created 3DML is added to the project and displayed in the Project Tree.

Importing and Converting OGC 3D Tiles (tileset.json) Layers

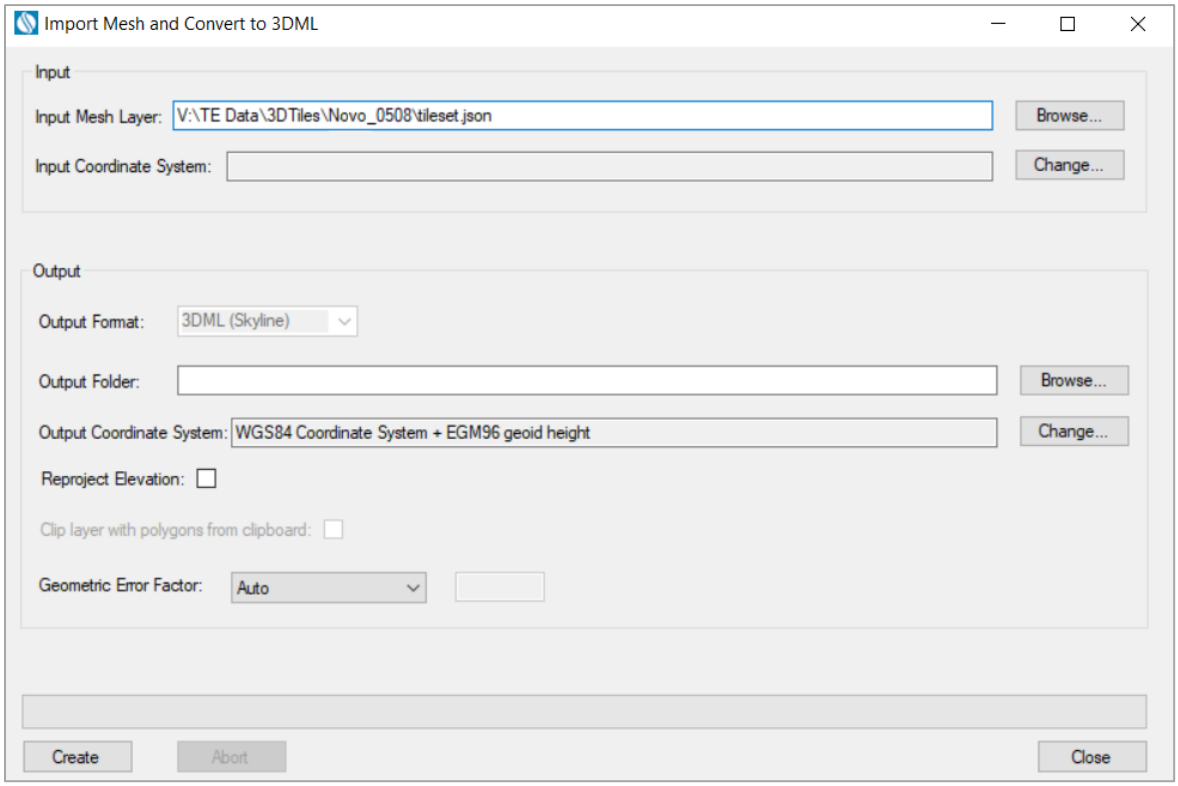
3D Tiles mesh layers can be imported and converted to the stream optimized, 3DML mesh layer format. **See** "Uploading Layers to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter.

To import and convert a 3D Tiles mesh layer:

1. On the **Layers** tab, in the **3D Mesh** group, click the arrow next to **Load 3D Mesh**, and select **Import 3D Tiles Layer**.

   The Import Mesh and Convert to 3DML dialog is displayed.

2. Browse to the 3D Tiles layer you want to import, and click **Open.** The Import Mesh and Convert to 3DML dialog is displayed.



Import Mesh and Convert to 3DML

3. The **Input Mesh Layer** is populated based on the 3D Tiles layer selected in the previous step and the mesh model's Input and Output Coordinate Systems are automatically set to ECEF.
4. Browse to the required **Output Folder**. The converted mesh model will be saved to this folder.
5. If you want to reproject the input layer's elevation values to the output coordinate system, select the **Reproject Elevation** check box. Most 3D Tiles use ellipsoid elevation as required by the Cesium 3D Tiles standard, so it is recommended to reproject them to the vertical coordinate system of the terrain.

   Note: Some 3D Tiles are created by reprojecting geoid elevation values declared as ellipsoid, into Earth-Centered, Earth-Fixed (ECEF). These 3D Tiles do not adhere to the 3D Tiles

standard of the ellipsoidal WGS 84 ECEF reference frame (EPSG 4978) coordinate system and will only match other resources, e.g., data from terrain providers that use such ellipsoid-declared geoid values. To convert such 3D Tiles to ellipsoid-declared 3DML with **correct** geoid values, select WGS84 Lat-Long ellipsoid (4326) as the output, and select the Reproject Elevation check box. After the import process is complete, open these 3DML's property sheets and clear their Reproject Elevation check boxes, so their geoid values are not reprojected.
After completing the import process, you can further convert the 3DML to geoid-**declared** mesh layers (with geoid values): by exporting the 3DML to 3DML format using the Export to Mesh tool. Set both the Input and Output Coordinate Systems to WGS84 Coordinate System + EGM96 geoid height, and select Reproject Elevation, to override the elevation coordinate system that was previously declared incorrectly.

6. If you want to import sections of the mesh layer using clip polygons on the clipboard, select the **Clip layer with polygons from clipboard** check box.

   Note: Only objects with a polygon geometry, i.e., created via 2D Objects > **Polygon** (on the Home or Objects tab) or polygons in a feature layer are supported.

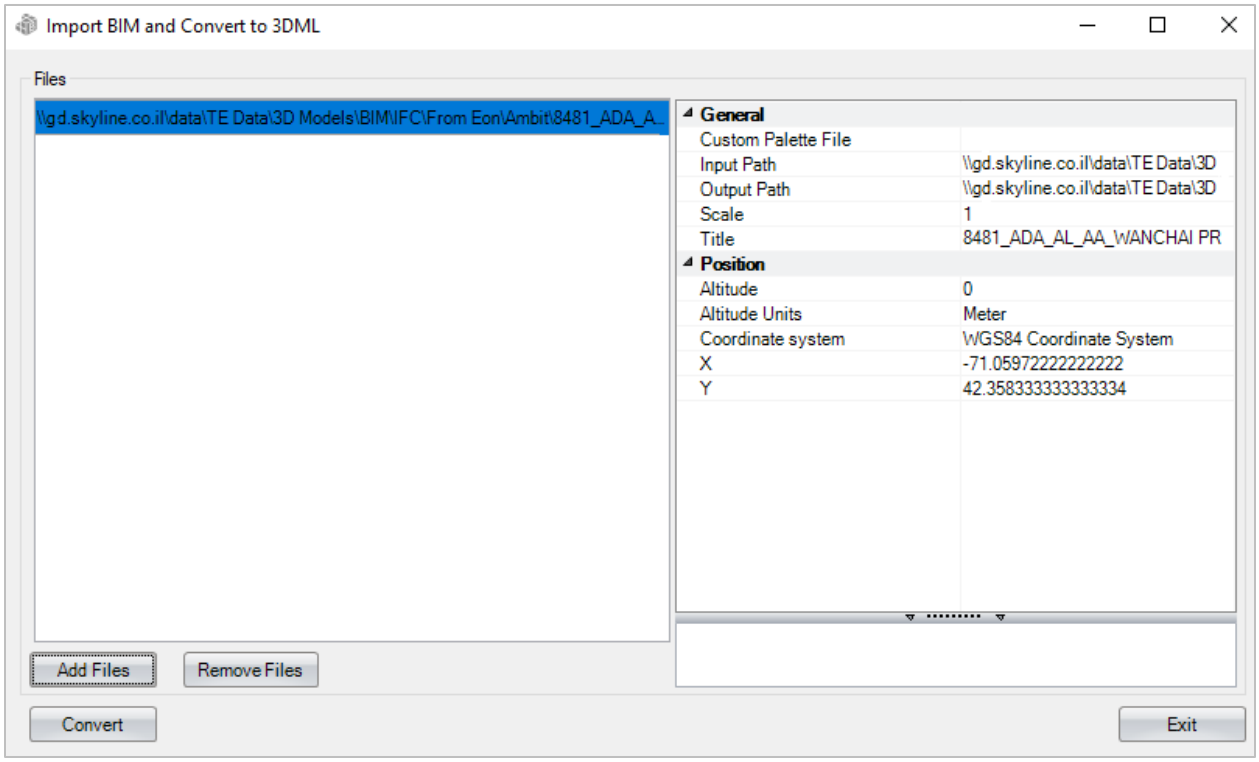
7. A correction factor sometimes must be applied to a layer's geometric error value so that the 3DML will display properly in TerraExplorer. Geometric error together with other properties allow the viewer to determine the optimal balance between quality and performance so that the best Level of Detail (LOD) for the current view can be used. Select **Auto** to automatically calculate the factor for optimal display in TerraExplorer.
8. Click **Create**. The created 3DML is added to the project and displayed in the Project Tree.

Importing and Converting BIM Layers

Building Information Modeling (BIM) layers store the geographic location and attribute data of models. When these files are imported into TerraExplorer, they are automatically converted to high-resolution, textured, 3DML models that have been compressed and stream-optimized to accelerate loading speed and efficiently handle memory. Currently, TerraExplorer supports IFC 2x3, 4, 4x1, 4x2, and 4x3 (rc1,rc2) and Autodesk Revit FBX versions 7.5, 7.4, 7.3, 7.2, 7.1, 7.0, 6.1, and 6.0 BIM files. IFC (Industry Foundation Classes) is an openly documented standard for the exchange of data. It is a platform neutral, open file format specification that is not controlled by a single vendor or group of vendors. FBX is an Autodesk proprietary format designed for interoperability between 3D content creation applications.

To import BIM layers:

1. On the **Layers** tab, in the **3D Mesh** group, click **BIM**. The Import BIM and Convert to 3DML dialog is displayed.



Import BIM and Convert to 3DML Dialog

2. Click **Add Files**. The Open dialog is displayed.
3. Browse to the required files, and click **Open**. All files added to the project are listed in the File section of the dialog.

   Note: Only IFC 2x3, 4, 4x1, 4x2, and 4x3 (rc1,rc2) and Autodesk Revit FBX versions 7.5, 7.4, 7.3, 7.2, 7.1, 7.0, 6.1, and 6.0 files are supported. The loading process can take some time since the files are analyzed before they are loaded.
4. From the File section of the dialog, select the file whose properties you want to modify. Use CTRL-click or SHIFT-click to multi-select. Using the property sheet, set the BIM layer properties as required. **See** "Setting and Editing BIM Layer Properties" in this chapter for information.
5. Click **Import**. If any of the selected files were already converted to 3DML, a dialog is displayed asking if you want to rebuild models for the files. Click **Yes** to rebuild. The tool converts the IFC or FBX file to a 3DML. When conversion is complete, a dialog is displayed informing you of the successful conversion, and the 3DML model is added to the Project Tree.

BIM Import Settings

General	
Custom Palette File	An XML file that assigns different colors to different materials. To modify these color assignments, use the BimAttributes.xml file located under the TE application files (.\Program Files\Skyline\TerraExplorer Pro\Resources) as your template and edit as required. This field is

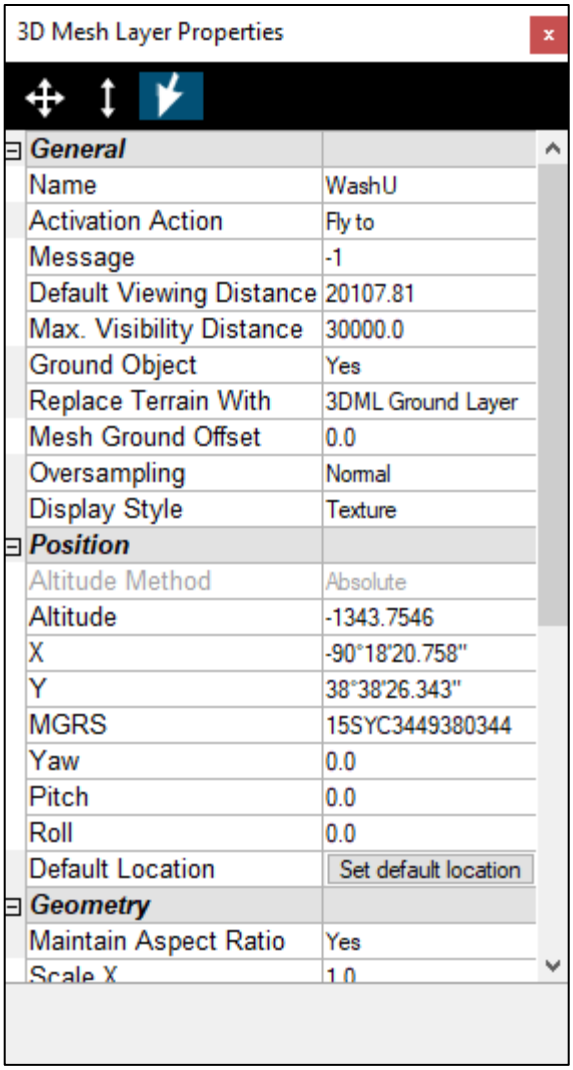
	unavailable for IFC models, which already include color representation information.
Input Path	Full path of the BIM file.
Output Path	Full path of the model file that will be created when the BIM is converted to 3DML.
Scale	Scale of the model. This property is usually used to scale a model to the metric units used in TerraExplorer, if the model uses a different measurement system or units. If you select the units of your model, the suggested scale is automatically displayed.
Title	3DML layer name as it will appear in the Project Tree.
Position	
Altitude	Absolute altitude of the BIM model.
Altitude Units	The z-coordinate units of measurement in which the model was created.
Coordinate System	Determines the coordinate system of the X and Y coordinates. Click **Set** to open the Coordinate System dialog.
X	X-coordinate of the pivot of the BIM model.
Y	Y-coordinate of the pivot of the BIM model.
MGRS	The coordinates of the pivot of the BIM model in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.

Setting and Editing 3D Mesh Layer Properties

Layer properties can be set when a mesh layer is loaded. If properties were not set or you want to modify properties, you can open the layer's property sheet and do so.

To edit 3D mesh layer properties:

1. In the **Project Tree**, select the required mesh layer.
2. On the **3D Mesh Layer** tab, in the **General** group, click **3DML Properties**. The 3D Mesh Layer property sheet is displayed.



3D Mesh Layer Properties

Parameter	Activity
General	
Name	Type the description or name of the layer. This text appears in the Project Tree as the name of the layer.
Activation Action	Select the action to perform when selecting the layer from the Project Tree.
Message	The message associated with the layer. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.

Ground Object	Determines if the layer is calculated as part of the terrain's elevation.
Replace Terrain With	Determines whether terrain imagery and elevation in the mesh area is replaced with the 3DML's ground layer (created in 3DML from PhotoMesh) or with the mesh's lower resolution data (Simplified Mesh), or not replaced at all.
Mesh Ground Offset	Offset from the mesh ground for drawing and placement of "on terrain" and "relative to terrain" objects.
Oversampling	The mesh layer's Level of Detail (LOD). When set to Normal, TerraExplorer determines the optimal quality to performance balance based on the current view. The "High" and "Best" settings will load higher quality blocks but are also more resource-intensive.
Display Style	Select a mesh model display style. The mesh model can include a wireframe and be textured, solid color, or semi-transparent (x-ray). ▪ Texture ▪ Texture + wireframe ▪ Solid color ▪ Solid color + wireframe ▪ X-ray – Semi-transparent model, enabling you to see through all model walls **Note:** The Display Style can also be selected from the 3D Mesh Layer contextual tab.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the layer. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the layer from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the layer based on its size.
Max. Visibility Distance	Sets the maximal distance from the camera above which the layer disappears.
Position	
Altitude Method	The altitude method used by the 3DML. For 3DML's, this property is read-only, always set to **Absolute**. **Absolute** places the 3DML's pivot point at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	The altitude, as defined in Altitude Method, for the 3DML's pivot point.
X	The X-coordinate for the 3DML pivot point.
Y	The Y-coordinate for the 3DML pivot point.
MGRS	The coordinates for the 3DML pivot point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See**

	"View" in the "Using TerraExplorer Options" chapter for more information.
Yaw	The direction angle of the 3DML along the vertical axis relative to north.
Pitch	The tilt angle of the 3D model along its lateral axis relative to the horizon.
Roll	The roll angle of the 3DML along its longitudinal (front-to-back) axis.
Default Location	Repositions the 3DML in its default location (according to the file's geo-referencing information).
Geometry	
Maintain Aspect Ratio	Maintain the 3DML's proportional relationship between the width, length, and height. If **Yes** is selected, when the scale factor in one axis is modified, the scale factor in the other two axes is automatically adjusted to maintain the original width:length:height ratio. If **No** is selected, the scale factor in each axis can be modified independently of the other axis scale factors.
Scale X	Determines the length on the X axis of the 3DML. The actual X value of the 3DML in the 3D World is the x value of the 3DML in its internal coordinate system times the Scale X value. (i.e., if the 3DML has an X value of 5 units and the Scale X is set to 10 meters per pixel, the X value of the 3DML in the 3D World is 50 meters.)
Scale Y	Determines the length on the Y axis of the 3DML. The actual Y value of the 3DML in the 3D World is the Y value of the 3DML in its internal coordinate system times the Scale Y value. (i.e., if the 3DML has a Y value of 10 units and the Scale Y is set to 10 meters per pixel, the Y value of the 3DML in the 3D World is 100 meters.)
Scale Z	Determines the height (Z value) of the 3DML. The actual height of the 3DML in the 3D World is the height of the 3DML in its internal coordinate system times the Scale Z value. (i.e., if the 3DML has a height of 5 units and the Scale Z is set to 10 meters per pixel, the height of the 3DML in the 3D World is 50 meters.)
Connection	
File Name	Path to the 3DML file.
Mesh Layer Name	Name of the 3DML file (Read-only).
Projection	
Reproject Elevation	Select the check box to reproject the layer's elevation values to the terrain's coordinate system. This option only applies when Altitude Method is set to Absolute. Geocentric layers are always reprojected.
Layer Coord Sys	The layer's coordinate system (Read-only).
Layer Bounding Box	

Upper Left X	The X coordinate of the upper left corner of the layer (Read-only).
Upper Left Y	The Y coordinate of the upper left corner of the layer (Read-only).
Upper Left MGRS	The coordinates for the upper left corner of the layer in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information (read-only).
Lower Right X	The X coordinate of the lower right corner of the layer (Read-only).
Lower Right Y	The Y coordinate of the lower right corner of the layer (Read-only).
Lower Right MGRS	The coordinates for the lower right corner of the layer in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information (Read-only).

Working with 3DML's Feature Layers

Mesh layers created from point feature layers with individually referenced 3D model files, imported BIM layers, and mesh layers classified using the legacy Classify Mesh Layer tools include associated feature layers that are pre-processed with their respective mesh layers. These feature layers support many of the editing, analysis, and querying capabilities available for standard feature layers, including:

- Spatial queries to select features within a particular geographical area.
- Use of the attribute information included in a 3DML's feature layers to display only selected areas of the mesh model that match a specific attribute value.
- Basing of feature properties such as tint and tooltip on the feature's attribute values.
- Data searches using the Attribute Table Tool to easily edit the attribute values of multiple features or create a new shapefile based on the filtered data.
- Modification of basic layer and feature properties (a limited subset of a standard feature layer's properties) from the layer's property sheet.

Selecting Features from the 3D Window

To select a feature:

1. In the Project Tree, select a mesh layer's associated feature layer. Then on the **3D Mesh Layer** tab, in the **Selection** group, click **Select Feature.**
2. In the **3D Window**, select the required feature. The feature's property sheet opens.

   Note: If you want to select multiple features, press and hold the CTRL key, while you select each of the required features.

   Note: If you want to deselect an item, place the cursor over or click a previously selected item while the CTRL key is still pressed. The item becomes deselected in the same manner as it was selected.

Spatial Queries

You can select features based on their spatial relationship with a polygon, line or point that you draw, or with an existing object. You choose whether to include only features that entirely overlap with your

selected or drawn geometry, or whether to include also those that partially intersect. You also can define a buffer zone to include features within a certain radius of the selection.

To perform a spatial query💻

1. In the Project Tree, select a mesh layer's associated feature layer. Then on the **3D Mesh Layer** tab, in the **Selection** group, click **Spatial Query** and then select one of the following from the dropdown list:
   - **Area**– Select all features spatially related to the polygon that will be drawn.
   - **Line** – Select all features spatially related to the line that will be drawn.
   - **Point**– Select all features spatially related to the point that will be drawn.
   - **Object selection** – Select all features that are spatially related to the object that will be selected.
   - **From clipboard** – Select all features that are spatially related to the objects in the clipboard.

   Note: This option allows you to perform a spatial query using another feature or object, thus eliminating the need to manually draw the selection area.

   Note: The selection of any objects that are defined around a point, (e.g., all 2D Shapes, but not Polyline or Polygon) selects an individual point and not the entire object.

   Note: The precise spatial relationship is defined in the next step.
2. On the **3D Mesh Layer** tab, in the **Selection** group, define the spatial relationship to the drawn geometry:

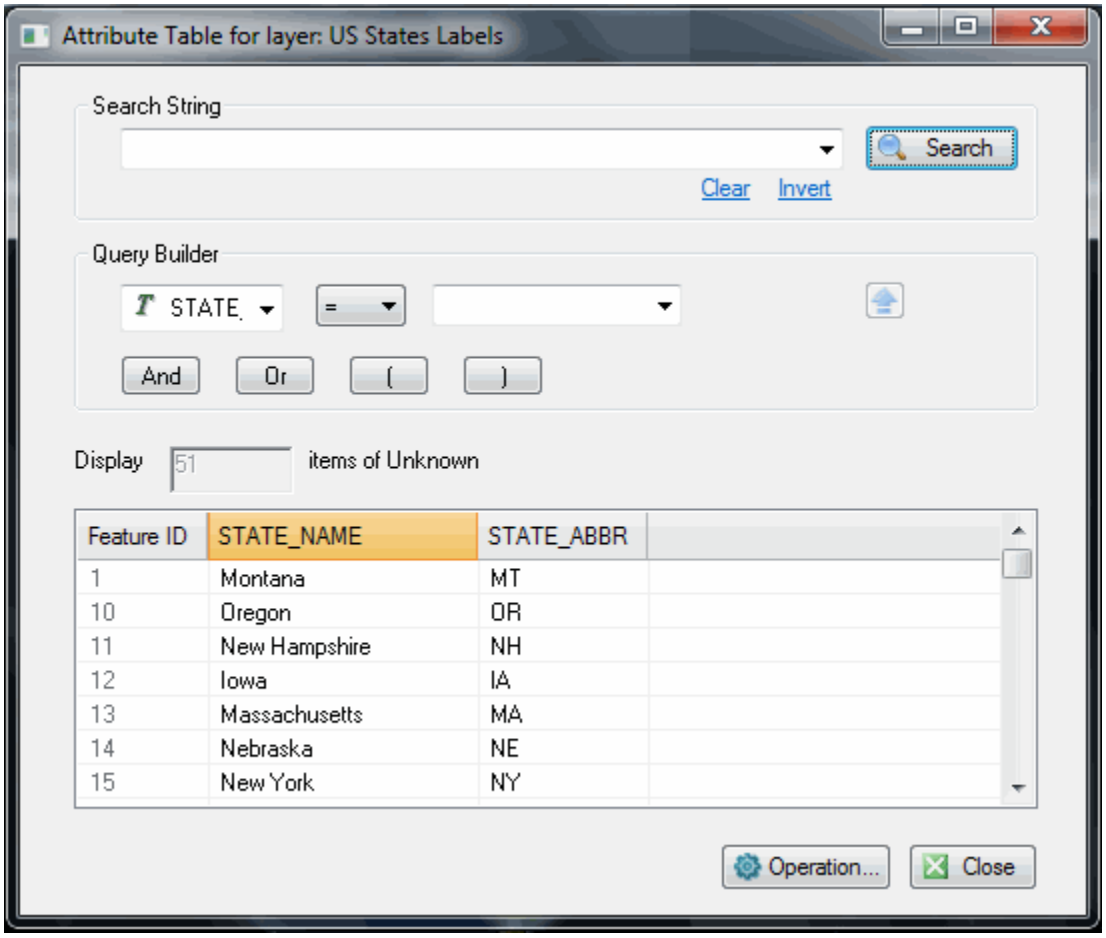
Parameter	Description
Buffer	If you want to include features within a certain radius outside the selection, select the required distance.
Units	Select the desired units of measurement: meters, feet, kilometers, or miles.
Intersect/Completely Within	▪ Select **Intersect** if you want to select all features whose geometry intersect at any point with the selection geometry. ▪ Select **Completely Within** if you want to select only features whose entire geometry fall within or overlap the selection geometry.

3. In the **3D Window**, do one of the following depending on the type of spatial query:
   - **Area selection** – Place the polygon points in the 3D Window by clicking in the desired locations. You must place at least three points. Finish the polygon creation by right-clicking.
   - **Line selection** – Place the line points in the 3D Window by clicking in the desired locations. You must place at least two points. Finish the line insertion by right-clicking.
   - **Point selection** – Place a single point in the 3D Window by clicking in the desired location.
   - **Feature selection** – Select any object by clicking it.

   The selection area (including the buffer if there is one) is framed with a red border. All layer features within the selection area are marked with yellow selection frames.

Note: If you want to turn off the Select Area mode, on the **3D Mesh Layer** tab, in the **Selection** group, toggle off the **Spatial Query** command.

Searching and Performing Operations by Attribute (Attribute Table Tool)



Attribute Table

The Attribute Table enables you to search the layer attribute database files and set visibility in the 3D Window based on attribute value. You can also search the layer attribute database files to easily edit the attribute values of multiple features and to create a new shapefile based on the filtered data.

Search expressions are comprised of one or more conditions. A condition consists of an attribute, an operator and an attribute value.

There are three types of attributes:

- String
- Integer
- Double

Each Attribute type has its corresponding operators.

A search expression can consist of more the one condition. In this case, you need to insert a connector between the conditions to specify their relations. In addition to AND, you can use the OR, NOT and [] connectors to define the relations between conditions.

To search and perform operations by attribute:

1. In the Project Tree, select a mesh layer's associated feature layer. Then on the **3D Mesh Layer** tab, in the **Attributes** group, click **Attribute Table**.
2. If you want to search for a previously-searched-for search expression, select one from the **Search String** dropdown list, and skip to step 6.
3. In the **Query builder** section, enter an attribute, condition, and value and click **Insert String** . The search expression is displayed in the Search String field.

   Note: All attribute values are listed in the value dropdown list.

   Note: If you want to clear the Search String field, click **Clear.**
4. If you want to include additional strings in your search expression, click one of the connector buttons: 

and repeat step 4 for the next condition.
5. Click **Search**. Your search results are displayed in the search results list at the bottom of the page.
6. To fly to a feature, right-click the feature's row in the attribute table, and select **Fly to selected item**.
7. For each attribute value that you want to modify, double-click and type the required value.
8. Do any of the following:
   - To select a feature: in the **Feature ID** column, select the required Feature ID. Use CTRL-click or SHIFT-click to multi-select. This feature will remain selected even when the Attribute Table is closed.
   - To fly to a feature, right-click the feature's row in the attribute table, and select **Fly to selected item**.
   - To modify attribute properties: double-click the attribute value and modify as required. In the 3D Window, the plane flies from the current location directly to the selected feature.
   - To set the visibility of features based on their attribute values using the search expression entered in steps 3-5: click the **Operation** button and select **Set Visibility by Attribute**. The features matching the search criteria and their annotations are displayed on the terrain, and the Visibility property is saved in the project. If you want to redisplay all features, click the **Operation** button and select **Clear Visibility by Attribute**.

     Note: All visibility by attribute settings are saved to Visibility property in the layer's property sheet under both the Annotation and Feature tabs. You can also set visibility by attribute directly from the layer's property sheet. **See** the Visibility property in "Polyline Property Sheet Parameters" and "Polygon Property Sheet Parameters" in the "Objects and Labels" chapter.
9. If you want to save the filtered layer to a file, do the following:
   a. Click the **Operation** button and select **Save As**.
   b. In the **Save As** dialog that is displayed, select the file type (.fly or .shp).
   c. Browse to the required file directory, and type a file name.
   d. Click **Save**.

Editing Feature Attributes

To edit selected features' attributes:

1. Select the required features by selecting them in the **3D Window** or by spatial query. **See** "Selecting Features from the 3D Window" and "Spatial Queries" in this chapter for information.

2. On the **3D Mesh Layer** tab, in the **Attributes** group, select **Attribute Table**. The Attribute Table for the selected layer opens with the selected features and their attributes displayed in the Search Results section.
3. For each attribute value that you want to modify, double-click and type the required value.

Editing Feature Layer Properties

Layer and feature properties can be modified from the layer's property sheet. If a 3DML was loaded with feature layers (see "About 3D Mesh Layers" in this chapter) with attribute fields, you can apply different properties based on the attribute field values of the feature layers. **See** "About Basing Native Feature Layer Properties on Layer Attribute Fields" in the "Feature Layers" chapter for information.

Layer Tab

The layer tab includes the following groups and fields:

Field	Activity
General	
Name	Type the description or name of the layer. This text appears in the Project Tree as the name of the object.
Activation Action	Select the action to perform when selecting the layer from the Project Tree.
Location Defines the initial location of the camera when a layer is selected from the Project Tree.	
Altitude Method	Sets the altitude method to be used for the specified location: ▪ Select **Relative to Terrain** to place the location point at a specified altitude above the ground. ▪ Select **Absolute** to place the location point at a specified altitude above the terrain database vertical datum base ellipsoid.
Altitude	Enter the altitude above the ground for the specified location.
X	Enter the X-coordinate of the location of interest.
Y	Enter the Y-coordinate of the location of interest.
Direction	Enter the horizontal angle of the camera when viewing the location.
Tilt	Enter the vertical angle of the camera when viewing the location.
Viewing Distance	Enter the distance between the camera and the specified location. This property also affects the radius of the flight patterns.
Set Viewpoint	Click **Capture** to capture the current camera position and set as the camera parameters for this location.
Jump To Viewpoint	Click **Jump** to make the 3D Window reflect the changes made to the location's fields.
Layer Bounding Box The loaded feature layer area is bounded within the coordinates of a fixed rectangular area. These coordinates are retrieved from the source file or the source server.	

Upper Left X	Read-only.
Upper Left Y	Read-only.
Lower Right X	Read-only.
Lower Right Y	Read-only.

Feature Tab

The feature tab includes the following groups and fields:

Note: You can apply different properties such as tint color or visibility, based on the attribute field values of the features. **See** "Using Attribute Fields" in the "Feature Layers" chapter for more information.

Field	Activity
Appearance	
Tint Color	The color used to tint each feature.
Tint Opacity	The opacity of the tint color. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
General	
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a Tooltip text to appear when the mouse cursor is placed over the layer in the 3D Window.

Modifying Layer Attribute Data

You can view and edit the attribute field values of the feature objects in the 3DML feature layers.

The attribute values appear in the Attributes group in the object's property sheet. Any change you make to the attribute fields values is saved in the FLY file.

To edit layer attribute data:

1. Select a single object for editing.
2. On the **Feature Layer** tab, in the **Selection** group, click **Select Feature**.
3. In the **3D Window**, select the object. A yellow frame surrounds the feature object and the feature's property sheet opens.
4. In the layer's property sheet, in the **Attributes** section, click the parameter name to edit. The **Help** text at the bottom of the property sheet displays the field's data type (e.g., "String. Character Length:13", "Double", etc.).

Note: Each attribute field that was loaded from the feature layer has a Parameter Name in the Attributes group. The value in the parameter's value is the appropriate value for the selected object.

5. Click the parameter value field and enter the new value.

Note: Only valid inputs according to the field's data type are updated and saved.

Using Attribute Fields

Most feature layers can store attribute field values for each of their features. This information can be used to:

- Display attribute field information in the Information Query Tool results. **See "**Information Query Tool" in the "Analysis Tools" chapter for further information.
- Control the appearance and behavior of layer features based on field attribute values. **See** "About Basing Native Feature Layer Properties on Layer Attribute Fields" in the "Feature Layers" chapter and "Attributes Messages" in the "Working with Objects" chapter for further information.

Saving Feature Layers

Layer changes can be saved in the following ways:

- Save Layer Changes to the Original Data Source
- Save Layer Changes to a New File
- Export Selected Features to a New File

Saving Layer Changes to the Original Data Source

Modifications to a 3DML feature layer can be made to the original source file.

To save 3DML feature layer changes to the original source file:

1. In the **Project Tree**, select the 3DML feature layer.
2. On the **3D Mesh Layer** tab, in the **Classification Layer** group, click the arrow next to **Save Layer**, and select **Save**.

Saving Layer Changes to a New File

You can save a 3DML feature layer to a new local file. This can be particularly useful if a layer is located on a slow accessed remote server; by saving to a local file, you speed up access.

Note: A layer can be saved to a new file when the Entire Layer was loaded (fully or partially), as well as when a layer was streamed.

You can save to the following file formats:

- SQLite (.sqlite)
- GeoPackage (.gpkg)
- Shapefile (.shp)
- Geospatial PDF (.pdf)

Note: Layers saved as Geospatial PDF are read-only when loaded back into TerraExplorer (i.e., their Save command is unavailable).

To save a layer to a new file:

1. In the **Project Tree**, select the layer.
2. On the **3D Mesh Layer** tab, in the **Classification Layer** group, click the arrow next to **Save Layer**, and select **Save as**. The Save As dialog is displayed.
3. Browse to the required Save location and in the **File name** field, enter the file name.
4. From the **Save as type** dropdown list, select a file **type** (.sqlite, gpkg, .shp, or .pdf).
5. If you are saving the layer as an .sqlite, .gpkg, or .pdf file, type a **Layer name**.
6. Click **Save**.

Exporting Selected Features to a New File

To export selected features to a new layer:

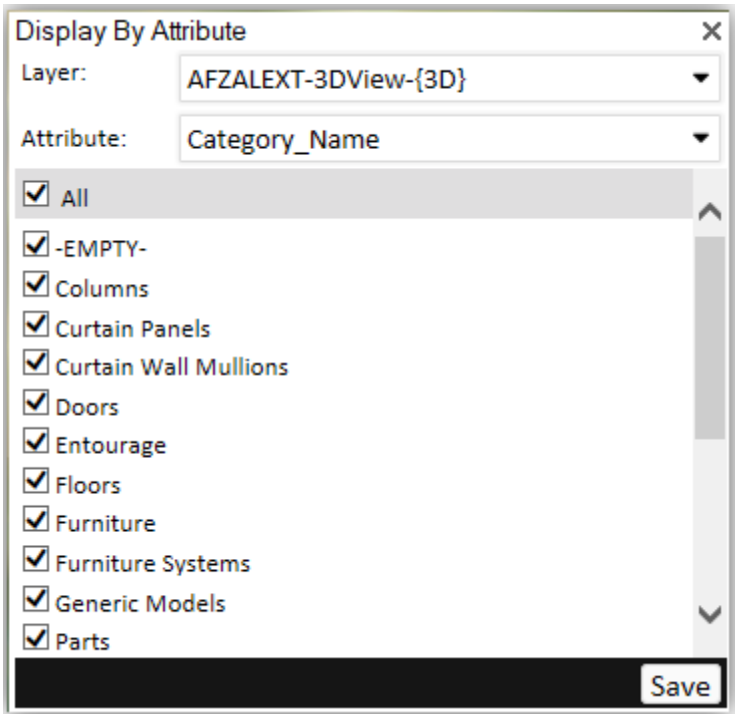
1. Select the required features either by selecting them in the **3D Window** or by spatial query. **See** "Selecting Features from the 3D Window" and "Spatial Queries" in this chapter for information.
2. On the **3D Mesh Layer** tab, in the **Classification Layer** group, click the arrow next to **Save Layer** and select **Save Selected Features As**. The Save As dialog is displayed.
3. Type a **File name**.
4. Select a file **type** (.sqlite, .gpkg, .shp, or .pdf).
5. If you are saving the layer as an .sqlite, .gpkg, or .pdf file, type a **Layer name**.
6. Browse to the required Save location and click **Save**.

Displaying by Attribute

If a 3DML's feature layers include attribute data, this information can be used to display only selected areas of the mesh model that match a specific attribute value. The tool scans all feature layers under the 3DML, and for each layer all attribute fields.

To display by attribute:

1. In the **Project Tree**, select the required layer.
2. On the **3D Mesh Layer** tab, in the **General** group, click the arrow next to **Display Tools**, and select **Display by Attribute**. The Display by Attribute dialog is displayed.



Display by Attribute Dialog

3. Select the attribute according to whose values you want to determine what parts of the mesh layer are displayed. If the number of unique values for this attribute exceeds 200, a warning message is displayed asking you to select a different attribute. Then select the check boxes of the values you want to display. If you want to display all, select **All**.
4. If you want the mesh layer to continue to display by attribute value after closing the dialog, and save the attribute display setting in the mesh layer's classification layer, click **Save**. If after closing the dialog you want to remove the display by attribute setting, reopen the dialog and select **All.** You can also open the property sheet of the mesh layer's classification layer, and under the [feature] tab, delete the value from the **Visibility** property.

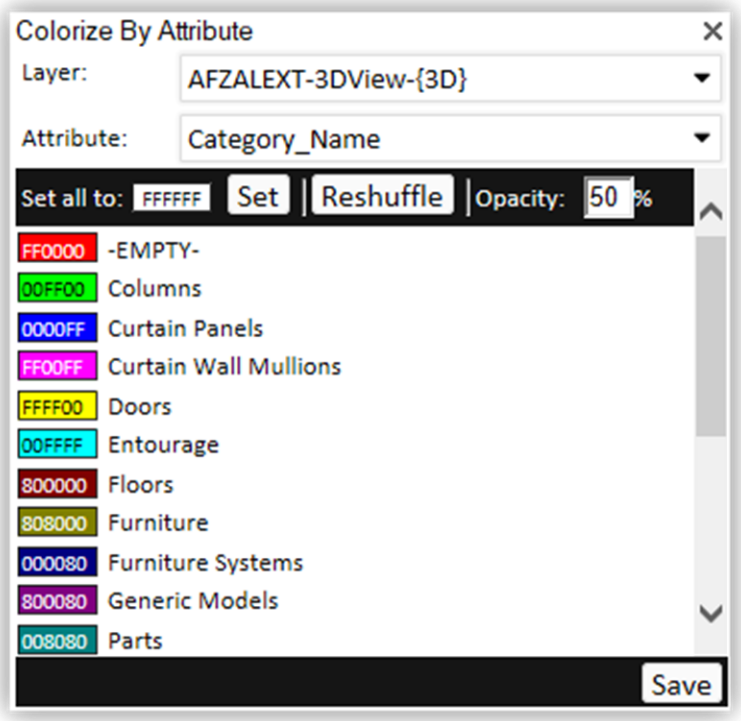
   Note: All visibility by attribute settings are saved to the Visibility property in the layer's property sheet under the Feature tab. You can also set visibility by attribute directly from the layer's property sheet. **See** the Visibility property in "Polyline Property Sheet Parameters" and "Polygon Property Sheet Parameters" in the "Objects and Labels" chapter.
5. Click **X** at the top right of the dialog to close the dialog.

Colorizing by Attribute

If a 3DML's feature layers include attribute data, this information can be used to colorize the mesh model based on attribute value, with a different color assigned to each attribute value. The tool scans all feature layers under the 3DML, and for each layer all attribute fields.

To colorize by attribute:

1. In the **Project Tree**, select the required layer.
2. On the **3D Mesh Layer** tab, in the **General** group, click the arrow next to **Display Tools**, and select **Colorize by Attribute**. The Colorize by Attribute dialog is displayed.



Colorize by Attribute Dialog

3. Select the attribute according to whose values you want to colorize the mesh layer. If the number of unique values for this attribute exceeds 200, a warning message is displayed asking you to select a different attribute.
4. Set the opacity of the colorization.
5. If you want to change the color of an attribute value, click the color and then select a color from the color palette.
6. If you want to set all attribute values to the same color, click **Set all to**, select a color from the color palette, and then click **Set**.
7. If you want to assign different random colors, click **Reshuffle**. You can repeatedly reshuffle until you get the desired color combination.
8. If you want the colorization to display after closing the dialog, and save the attribute colorization setting in the mesh layer's classification layer, click **Save**. If after closing the dialog you want to remove the attribute colorization, open the property sheet of the mesh layer's classification layer, and under the [feature] tab, delete the value from the **Tint Color** property.
9. Click **X** at the top right of the dialog to close the dialog.

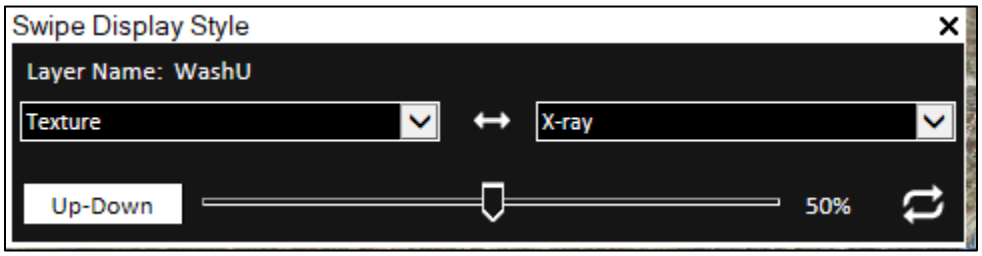
Swiping Display Style

The Swipe Display Style tool enables you to dynamically swipe between a 3DML's styles to view the interior of buildings or expose obscured sections of the 3D View.

To swipe between a mesh model's display styles:

1. In the **Project Tree**, select the required layer.

2. On the **3D Mesh Layer** tab, in the **General** group, click the arrow next to **Display Tools**, and select **Swipe Display Style**. The Swipe Display Style controls are displayed.



Swipe Display Style Dialog

3. Select the two display styles you want to swipe between.
4. Toggle between Up-Down and Sides to swipe horizontally and vertically.
5. Slide the slider all the way to the right to completely show the layer in the display style selected from the left display style list, and all the way to the left to completely show the layer in the display style selected from the right display style list. As the slider moves between these extremes, the first display style is gradually clipped to reveal the second one.
6. Click **Auto-Repeat** to automatically loop the slider value between 0-100%.

Classifying a 3D Mesh Layer

Mesh layers are classified using polygons that enable you to visually distinguish different areas of the mesh layer, access the attribute data of the classification features and perform spatial and attribute queries on the feature layer that is classifying the mesh layer. The classification is dynamic, reflecting any changes to the polygon features, and requires no pre-processing. **See** "Classifying Layers and Objects Using Feature Layers" in the "Feature Layers" chapter for information.

Skyline continues to also provide legacy support for pre-processed, classified mesh layers created in older versions of TerraExplorer Pro or in CityBuilder, that have **associated** feature layers. These mesh layers support many of the editing, analysis, and querying capabilities available for standard feature layers, including spatial and attribute queries. **See** "Working with 3DML's Feature Layers" in this chapter for information.

Uploading 3D Mesh Layers to SkylineGlobe Server

You can upload 3D mesh layers in 3DML format to SkylineGlobe Server.

To upload a layer:

- In the **Project Tree**, right-click the required layer, and select **Upload to SkylineGlobe** from the shortcut menu. **See** "Uploading Layers to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.

Modifying a 3D Mesh Layer

Elevation values in an area of a 3DML are modified using a modify mesh object. The surface of the 3DML is raised or lowered according to the elevation values of the modify mesh polygon's points. Different elevation behaviors allow replacing, cropping above or cropping below the original values of the terrain. The interior of the polygon can be flat or irregular in shape.

Note: Modify mesh objects are supported for all mesh layers except imported OGC 3D Tiles.

To modify a 3D mesh layer:

1. In the **Project Tree**, select the required layer.
2. On the **3D Mesh Layer** tab, in the **General** group, click **Modify Mesh Layer**. The Modify Terrain property sheet is displayed.
3. In the **3D Window**, left-click to place the modify mesh polygon's waypoints, and right-click to complete.
4. In the property sheet, set the modify mesh polygon's properties. **See** "Modifying the Terrain" in the "Objects and Labels" chapter for more information.

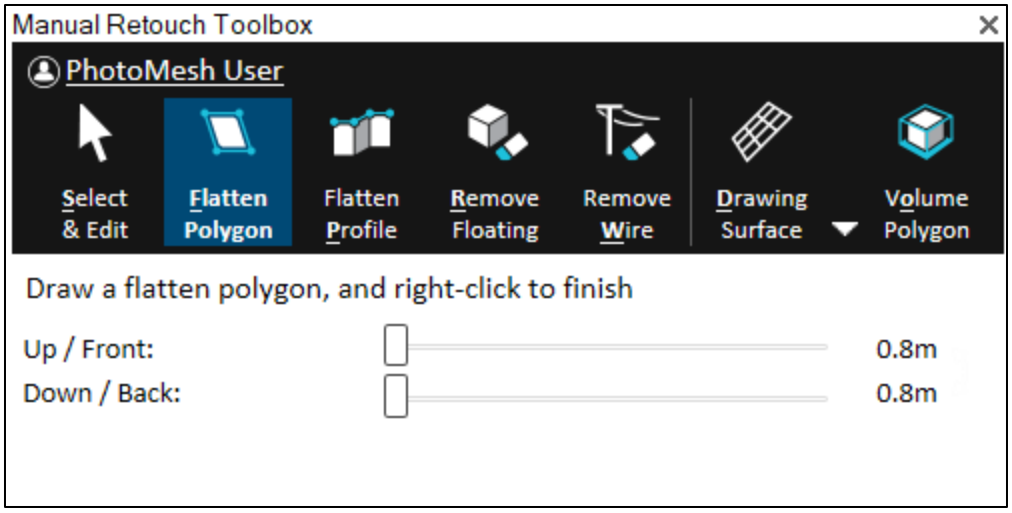
Marking a Mesh Layer for Retouching

Mesh imperfections, such as bumps, irregular surfaces, or floating artifacts, can be edited in TerraExplorer using manual retouch layers, in which you mark surfaces for flattening and floating artifacts for removal. The implementation is then performed in PhotoMesh. The output of the Manual Retouch tool is a polygonal feature "retouch layer" with attribute information that defines what retouch action should be performed in each area: clean, flatten, and retexture. This "retouch layer" must then be reimported to PhotoMesh. When rebuilding the project, PhotoMesh uses the manual retouch layer to add a set of constraints to the reconstruction algorithms. Most of the constraints defined apply to the mesh **model**, and the modified model is then retextured using the project's photos. There is also an option in the Manual Retouch tool to set a specific file texture, e.g., water or grass, for a marked area, instead of basing texturing on the project's photos.

To mark a mesh layer for retouch:

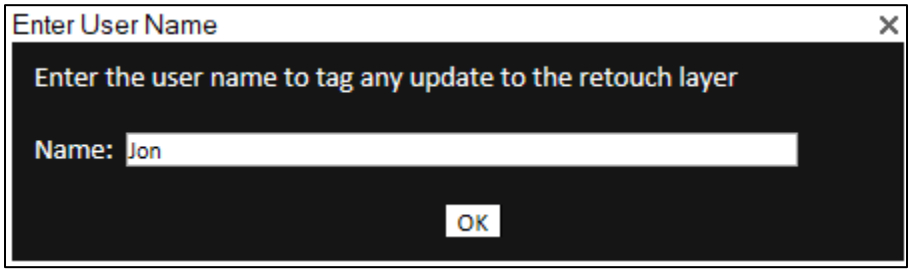
1. Load the mesh layer on which you want to mark the retouches. The 3DML outputs produced in PhotoMesh are found in the build's *outputBuild* folder. **See** "Accessing the Build Outputs" in the PhotoMesh User Guide for more information.

   Note: If the loaded 3DML's vertical coordinate system is different from the terrain's, the elevation values must be reprojected. **See** "Setting and Editing 3D Mesh Layer Properties" in the "Mesh Layers" chapter for more information.
2. Load an SQLite retouch layer that was exported from PhotoMesh. **See** the PhotoMesh User Guide for information. **See "**Loading Feature Layers" in the "Feature Layers" chapter for more information on loading the retouch layer.
3. In the **Project Tree**, select the loaded retouch layer, and then on the **Tools** tab, in the **PhotoMesh** group, click **Manual Retouch**. The Manual Retouch dialog is displayed.



Manual Retouch

4. If this is the first time you are opening the retouch layer in this TerraExplorer project, the Enter User Name dialog is displayed so you can tag your edits with your name. To open this dialog at a different time, click the user name link in the Manual Retouch toolbox. The user name entered here is saved in the layer's username attribute. When multiple users work on the same retouch layer, this attribute enables you to identify the particular user that worked on each retouch polygon.



Enter User Name Dialog

5. If you want to create a surface on which to draw your retouch polygon or polyline, e.g., for a model that is not flat or missing corners, click the arrow next to **Drawing Surface** (Shortcut key: d) and select one of the options. **See** "Using Drawing Surfaces" in the "Working with Objects" chapter for information.
6. Perform one of the following retouch operations:
   - **Flatten polygon** (Shortcut key: f) – Remove all elements inside a defined volume, and add a flat surface in the area of the 2D polygon.
     i. Click Flatten Polygon.
     ii. Draw a polygon around the area for flattening. Right-click to complete.
   - **Flatten profile** (Shortcut key: p) – Create multiple flatten polygons by defining a profile line (usually on a roof top) and the base elevation. A flatten polygon is created for each segment of the profile line (from the line to the base elevation). This method is useful for creating retouch polygons in hard to access places, e.g., between buildings.

iii. Click Flatten Profile.

iv. Draw the profile line, and then right-click to complete.

v. Use the property sheet's mini toolbar to edit the polygon. See "Editing Objects in the 3D Window" in the "Working with Objects" chapter for information. Close the mini toolbar when finished editing.

vi. Place the "X" on the model to define the base elevation.

- **Remove floating** (Shortcut key: r) – Remove all elements inside a defined volume. This option is generally used to remove floating elements that aren't connected to the ground.
  i. Click **Remove Floating**.
  ii. Click any point on the floating artifact. PhotoMesh automatically creates a polygon that includes the selected point.
- Remove wire (Shortcut key: w) – Remove thin elements such as power lines by drawing a polyline that marks the wire to be removed. A separate floating polygon is created for each segment of the polyline.
  i. Click **Remove Wire**.
  ii. Draw a polyline along the wire to remove, and then right-click to complete.

7. To select the polygon for editing after it is drawn, click **Select and Edit**, and then select the retouch object for editing. Use the property sheet's mini toolbar to edit the polygon. **See** "Editing Objects in the 3D Window" in the "Working with Objects" chapter for information.
8. To adjust the length to extrude the retouch polygon upwards or frontwards and downwards or backwards in the direction of the polygon's normal, select the polygon and in the **Manual Retouch Toolbox**, slide the **Front buffer** and **Back buffer** sliders. If a polygon's elevation angle to the ground is less than 20 degrees, the polygon is extruded vertically. If the polygon points were created in a clockwise orientation, then the front is the side facing the user.
9. If you want to add water or grass texture to your flatten polygon (created via "Flatten Polygon" or "Flatten Profile"), select the polygon, and then in the **Manual Retouch Toolbox**, select a **Texture file**. Enter a value for the texture tile size. If you want to remove the added texture, select the first entry which is blank in the **Texture file** list.
10. To select how to display the drawn polygon, click the **Volume** icon (Shortcut key: o) to switch between the following options:
    - **Volume Colorize** – Mark the area for retouching by colorizing all parts of the mesh contained within the extruded polygon.
    - **Volume Polygon** – Mark the area for retouching by displaying 3D polygons based on the extruded polygon.
    - **Volume No –** Mark the area for retouching only with a 2D polygon.
11. All changes to the Retouch layer are automatically saved, so no export of the retouch layer is required. When finished, import the SQLite retouch layer back into PhotoMesh.

Scaling and Rotating 3D Mesh Layers

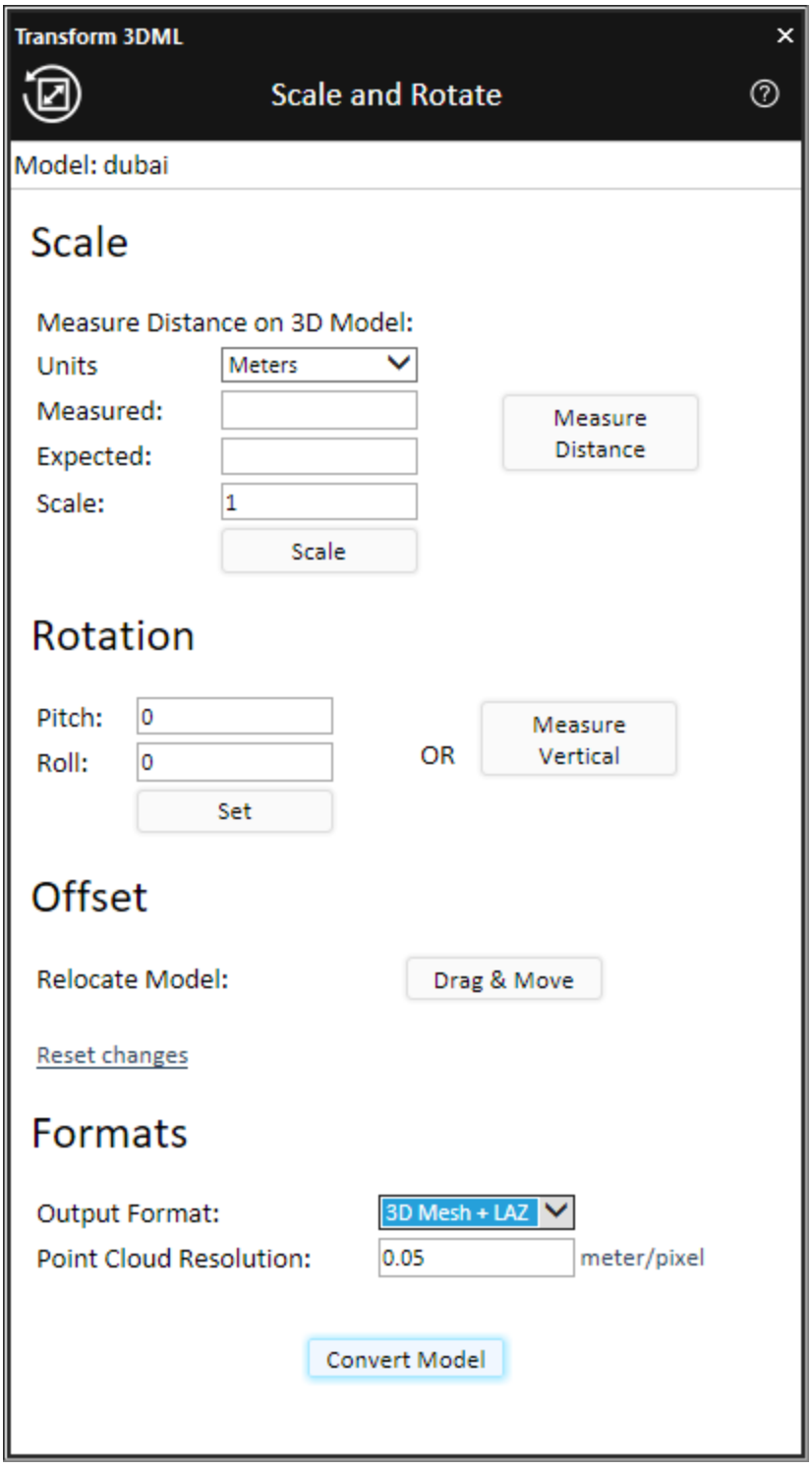
Inaccuracies in mesh layers' scale, rotation and positioning can be corrected using the Scale and Rotate tool and saved in the mesh layer file. These inaccuracies generally stem from inaccurate positioning hardware.

Note: Scale, rotation, and positioning values can also be modified in the mesh layer's property sheet. **See** "Setting and Editing 3D Mesh Layer Properties" in this chapter for more information. When properties are only modified in the property sheet, the mesh layer is only changed in the specific project's **Fly** file. Changes are saved to the mesh layer itself only if they are made using the Scale and Rotate tool.

To scale, rotate, and reposition a mesh layer:

1. In the **Project Tree**, select the required layer.
2. On the **3D Mesh Layer** tab, in the **Mesh Layer** group, click **Scale and Rotate**. The Scale and Rotate dialog box is displayed. with the 3DML already selected in the 3D Mesh Model field.

   Note: If you want to change the layer after the tool is open, select the required layer in the **Project Tree**, and in the tool dialog box, click **Capture**.



Scale and Rotate Dialog Box

3. **Set the required scale**: If you know the required scale value, enter it in the **Scale** field and click **Scale**. Otherwise, you can set the scale by measuring a specific, generally, easily distinguishable section of the model and calculating the ratio of the expected measurement (based on the real world measurement) to the actual measurement. Do the following:

a. The Units value is automatically populated with the units set for Altitude and Distance in the Options dialog **See** "View" in "Using TerraExplorer Options" for more information. If you want to use different units, select the required **Units**.

b. Click **Measure on 3D**.

c. In the **3D Window**, mark the two endpoints of the section of the model that you want to measure, and right click to set the distance value in the **Measured** field. **See** "Distance Tool" in the "Analysis Tools" chapter for more information.

d. In the **Expected** field, enter the actual, real world measurement of this section of the model.

e. Click **Calculate** to calculate the scale factor and resize the model**.** The scale factor is calculated based on the ratio between the Expected and Measured values and entered in the Scale field.

4. **Set the required rotation**: The Pitch and Roll values are populated automatically based on the model's property sheet. If you know the required Rotation values, enter them. Alternatively, if you have two points on the model that you know **should** be vertically aligned, e.g., the base and top of a flag pole, you can mark these points, and TerraExplorer can use this information to adjust the pitch and roll so that these points will actually be vertically aligned. Do the following:

   a. Click **Measure Vertical**.

   b. On the model, click a point on the bottom and then click a point towards the top that should be directly above the first point. The model's new pitch and roll are calculated and entered in their respective fields.

   c. Click **Set** to set the model's rotation according to the new values.

5. **Change the model's position:** In the **Offset** section, do the following:

   a. Click **Drag & Move**. The model's property sheet is displayed.

   b. Modify the layer's properties in the property sheet or click **Move in XY Plane**  to drag the model to the required position in the 3D Window. **See** "Setting and Editing 3D Mesh Layer Properties" in this chapter for more information.

6. If you want to reset the dimensions, rotation, or position of the model to the original value, click **Reset changes**.

7. Select one of the **Output Format** options:
   - 3D Mesh
   - 3D Mesh and LAS
   - 3D Mesh and LAZ

8. If you selected an output format option including point cloud, set the **Point Cloud Resolution** in meters/pixel.

9. Click **Convert Model**. The tool opens the SLMesh Converter command line tool to generate a new mesh layer file with the corrected scale, rotation and location. The new model is created in the same folder as the original model.

10. To view the new model, delete the old version of the model from the Project Tree, and load the new one.

Exporting 3D Mesh Layers to Models, Point Cloud, and ATAK

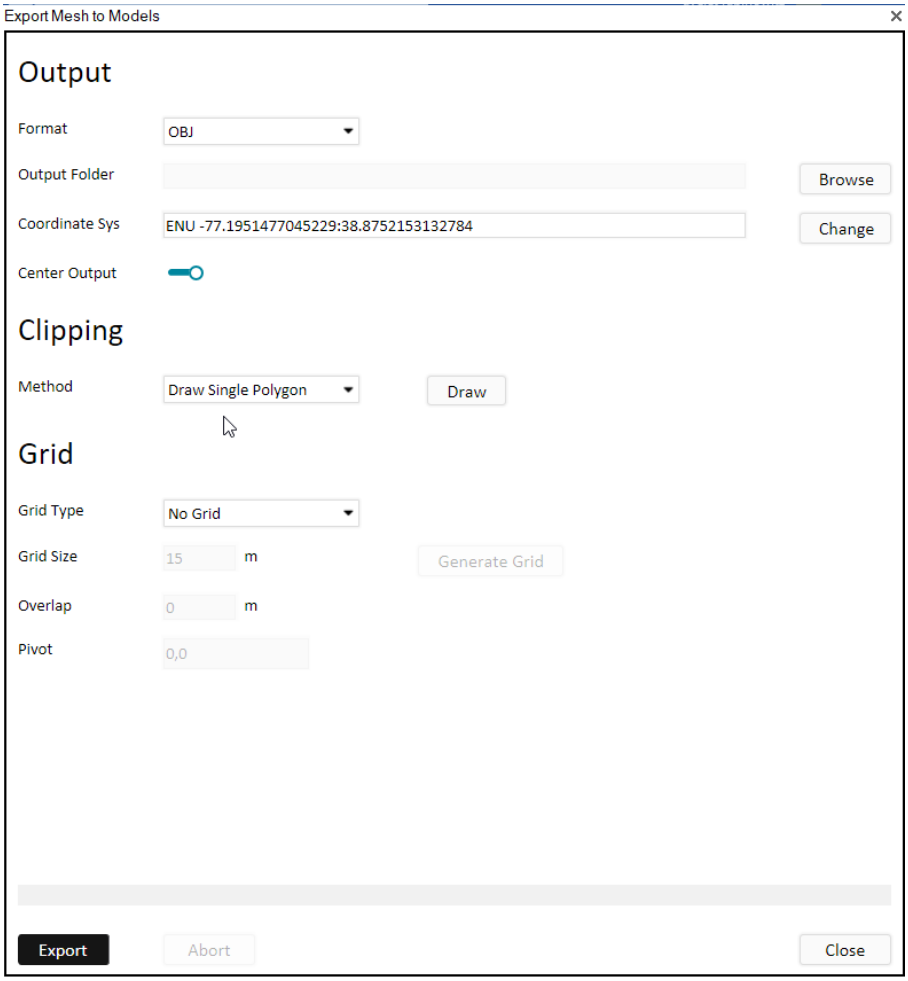
Mesh layers or sections of layers, e.g., subset areas or buildings, can be exported to any of the following data types: individual 3D models, LAS point cloud layers, or ATAK (for use with the ATAK mobile application). Export is supported for all mesh layers except for imported 3D Tiles and BIM, 3DML created from models feature layers, and 3DML from SGS that do not have edit permission.

The areas for export can be defined in any of the following ways:

- By selecting a feature layer
- Using polygons from the clipboard
- Drawing a polygon

The number of files created for each polygon depends on the grid size setting that you select. You have the option to split the extracted area into either 3D boxes or a 2D grid.

In addition to the export methods supported from TerraExplorer user interface, additional export options can be performed from the SLMeshConverter command line tool. **See** "Importing and Exporting Using the Command Line" in this chapter for information.



To export a mesh layer to individual models/ LAS point cloud / ATAK:

1. Select the mesh layer, and then on the **3D Mesh Layer** tab, in the **Mesh Layer** group, click the arrow next to **Export to Models** and select the required option. The Export dialog is displayed.
2. Set the properties as required:

Format	Select the output format. The options available depend on the export option selected: ▪ **Export to Models** - OBJ, DAE, GLB, FBX ▪ **Export to Point Cloud** – LAS, LAZ ▪ **Export to ATAK** – ATAK OBJ
Sample Resolution	Set the sample resolution in meters. This field is only displayed for LAS/LAZ point cloud output.
Output Folder	Browse to the folder where you want to save the outputted files.
Coordinate System	The coordinate system is automatically set to the mesh's coordinate system. If you want to change it, click **Change** and set the required coordinate system. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
Center Output	Re-center the coordinate system so that the origin (or reference point) is at the bottom-left corner of the mesh. This ensures that the coordinates are much smaller numbers, relative to the large original coordinates, making them easier to manage.
Clipping Method	Select your method of clipping the mesh area that you want to export: ▪ **Entire Mesh** - Export the entire 3D mesh layer. ▪ **Draw Single Polygon** – Mark a specific mesh section for export by drawing a polygon around it. Then click **Draw** to draw the polygon. ▪ **Feature Layer** - Export the areas, e.g., buildings or subset areas, defined by a feature layer. Then drag and drop a feature layer from the Project Tree into the dialog. ▪ **Polygons from the Clipboard** – Select the areas for export based on the clipboard polygons. Then click **Copy from Clipboard**.
Grid Type	Select the Grid Type: No grid, 2D, or 3D boxes. This determines how the selected mesh section is partitioned. ▪ **No Grid** – No grid is used to divide the mesh area. Instead, a single file is produced for each clipping polygon, unless the clipping polygon is very large. The maximum texture size per file is approximately 1024 x 1024 pixels. ▪ **2D Grid** – The mesh area is divided only along x and y axes into uniform squares. Each square captures all data from the base to the top in that particular grid area, extending from the lowest to the highest points. ▪ **3D Boxes** – The mesh area is divided along the x, y and z axes, axes, allowing for complex three-dimensional data such as tall buildings or utility poles to be split into multiple files.
Grid Size	Set the size in meters for each square or box. A smaller grid size will result in smaller exported models. If the grid size is too large, multiple files will be created for a single square or box.

Grid Overlap	Specify the amount of overlap, in meters, between adjacent squares or boxes.
Pivot	Set the coordinates of the grid pivot.

3. Click **Generate Grid** to generate the grid.
4. Click **Export**.

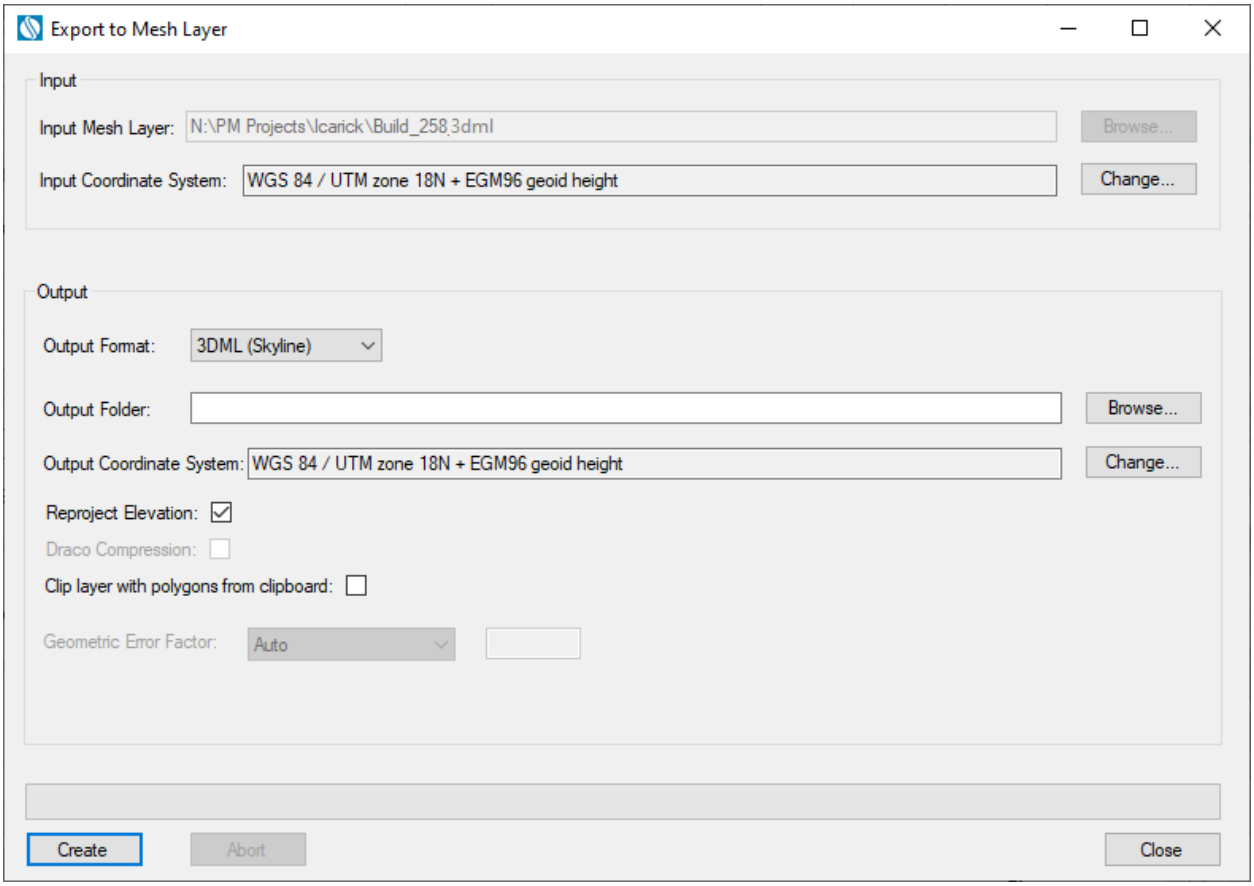
Exporting 3D Mesh Layers to Other Formats

3DML can be exported to Cesium 3D Tiles, I3S/SLPK, 3MX, and 3DML formats. You can also export sections of a mesh layer using clip polygons on the clipboard. Export is supported for all mesh layers except for imported OGC 3D Tiles and 3DML created from models feature layers. The export's output folder should be located on a fast local drive. When exporting to Cesium 3D Tiles, the tileset.json is exported to version 1.0 and the models (b3dm) to version 2.0.

In addition to the export methods supported from TerraExplorer user interface, additional export options can be performed from the SLMeshConverter command line tool. **See** "Importing and Exporting Using the Command Line" in this chapter for information.

To export a mesh layer to other formats:

1. Select the mesh layer, and then on the **3D Mesh Layer** tab, in the **Mesh Layer** group, select **Export to Mesh.** The Export to Mesh Layer dialog is displayed.



Export to Mesh Layer

2. The **Input Mesh Layer** is automatically populated based on the layer selected in the previous step.
3. The mesh layer's coordinate system is automatically read from the layer. If you want to change the model's coordinate system, in the **Input Coordinate System** field, click **Change**. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
4. Select an **Output Format**: Skyline 3DML, Cesium 3D Tiles, Esri I3S-SLPK, or Bentley 3MX.
5. Browse to the required **Output Folder**. The exported mesh layer will be saved to this folder.
6. In the **Output Coordinate System**, set the output mesh model's coordinate system. This is by default set to the project's terrain coordinate system. If you want to change the model's coordinate system, in the Output CS field, click **Change**. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information. 3D Tiles output is always produced in ECEF coordinate system.
7. If you want to reproject the input layer's elevation values to the output coordinate system, select the **Reproject Elevation** check box. When exporting to 3D Tiles, it is recommended to select the Reproject Elevation option in order to reproject the elevation values to ellipsoid, and then to ECEF as required by the Cesium 3D Tiles standard for compatibility with other standard Cesium resources, e.g., data from terrain providers, that use ellipsoid elevation.

   Note: Some Cesium resources, e.g., data from terrain providers, use geoid elevation value that were declared as ellipsoid. This data does not adhere to the Cesium standard of the ellipsoidal WGS 84 Earth-Centered, Earth-Fixed (ECEF) reference frame (EPSG 4978) coordinate system and would only match other resources, e.g., 3D Tiles, that also use such ellipsoid-declared geoid values. To export a mesh layer that is compatible with these resources, the elevation values should not be reprojected to ellipsoid, so the check box should be cleared.
8. For 3D Tiles and I3S-SLPK mesh formats, if you want to compress the mesh in Draco format for reduced size and better streaming, select **Draco Compression**.
9. If you want to export sections of the mesh layer using clip polygons on the clipboard, select the **Clip layer with polygons from clipboard** check box.

   Note: Only objects with a polygon geometry, i.e., created via 2D Objects > **Polygon** (on the Home or Objects tab) or polygons in a feature layer are supported.
10. Click **Create**. The created 3DML is added to the project and displayed in the Project Tree.

Importing and Exporting Using the Command Line

In addition to the format conversions supported from TerraExplorer user interface, additional conversions can be performed from the SLMeshConverter command line tool:

- 3D Tiles to: 3D Tiles, I3S/SLPK, 3MX, and o3DML
- OSGB to: 3D Tiles, I3S/SLPK, 3MX, and o3DML
- o3DML to o3DML
- 3DML to o3DML
- 3DML to LAS/LAZ

To convert, construct a single command line that includes all the following:

1. Run SLMeshConverter

```
"c:\program files\Skyline\TerraExplorer Pro\SLMeshConverter.exe" -cmd convert
```

2. Define the input layer:
   - For 3DML/o3DML – Full path to the file
   - For 3D Tiles – Full path to the tileset.json
   - For OSGB – Full path to the root OSGB file

   ```
   -in "FullPathToFile"
   ```

3. -Define the output format:
   - For 3D Tiles

     ```
     -f "b3dm"
     ```
   - For o3DML

     ```
     -f "o3dml"
     ```
   - For 3DML

     ```
     -f "3dml"
     ```
   - For I3S/SLPK

     ```
     -f "i3s"
     ```
   - For 3MX

     ```
     -f "3mxb"
     ```
   - For LAS/LAZ

     ```
     -f "las"
     ```

     Note: The LAS/LAZ distinction is determined by the -out file name extension.

     Note: Point cloud density in meters is defined by the -las_res argument. E.g., -las_res 0.4
4. Set the output WKT by defining the path to a file containing the WKT in a single line. If this parameter is not provided, the output will be in the same coordinate system as the input layer. For specific formats such as 3D Tiles, it is advisable to omit this parameter. Specify the output WKT file path, which should contain the WKT in a single line. If this parameter isn't provided, the output will maintain the same coordinate system as the input layer. For specific formats such as 3D Tiles, it's advisable to omit this parameter.

   ```
   -wktout "C:\WKTFiles\4326.wkt"
   ```
5. Define the output file/folder:
   - For 3MX/3D Tiles – Full path to the output folder

     ```
     -out "C:\ConvertedLayers"
     ```
   - For 3DML/o3DML – Full path to the output file

     ```
     -out "C:\ConvertedLayers\outputfile.3dml"
     ```
   - For I3S/SLPK – Full path to the output file

     ```
     -out "C:\ConvertedLayers\outputfile.slpk"
     ```
   - For OSGB – Full path to the root OSGB file

     ```
     -out "C:\ConvertedLayers\Tile_000106_000090.osgb"
     ```
   - For LAS – Full path to the output file

     ```
     -out "C:\ ConvertedLayers\outputfile.las"
     ```
   - For LAZ – Full path to the output file

```
-out "C:\ ConvertedLayers\outputfile.laz"
```

Examples:

Convert 3D Tiles to SLPK

```
"C:\Program Files\Skyline\TerraExplorer Pro\SLMeshConverter.exe" -cmd convert -in
"C:\LayersToConvert\tileset.json" -out "N:\Output Files\OutputFile.slpk" -f i3s
```

Convert OSGB to o3DML

```
"C:\Program Files\Skyline\TerraExplorer Pro\SLMeshConverter.exe" -cmd convert -in
"C:\LayersToConvert\Tile_000106_000090.osgb" -out
"C:\ConvertedFiles\ConvertedFile.o3dml" -f o3dml
```

Convert 3DML to LAZ

```
"C:\Program Files\Skyline\TerraExplorer Pro\SLMeshConverter.exe" -cmd convert -in
"C:\LayersToConvert\inputfile.3DML" -out "N:\Output Files\OutputFile.laz" -f las -
las_res 0.4
```

Conversion Methods

- GUI - Direct conversion via GUI
- Command Line - Direct conversion (via SLMeshConverter command line tool)
- Indirect – Indirect conversion – first convert to 3DML and from 3DML to the required format

		Output Formats						
		3DML	**3D Tiles**	**Esri I3S/SLPK**	**Bentley's 3MX**	**OBJ (models)**	**o3DML**	**LAS/LAZ**
Input Formats	**3DML**	User Interface	User Interface	User Interface	User Interface	User Interface	Command Line	User Interface
	3D Tiles	User Interface	Command Line	Command Line	Command Line	Indirect	Command Line	Indirect
	OSGB	User Interface	Command Line	Command Line	Command Line	Indirect	Command Line	Indirect
	o3DML	User Interface	Indirect	Indirect	Indirect	Indirect	Command Line	Indirect
	DAE LODTreeExport	User Interface	Indirect	Indirect	Indirect	Indirect	Indirect	Indirect
	BIM FBX	User Interface	Indirect	Indirect	Indirect	Indirect	Indirect	Indirect
	BIM IFC	User Interface	Indirect	Indirect	Indirect	Indirect	Indirect	Indirect
	Point layer with models (DAE, OBJ...)	User Interface	Indirect	Indirect	Indirect	Indirect	Indirect	Indirect

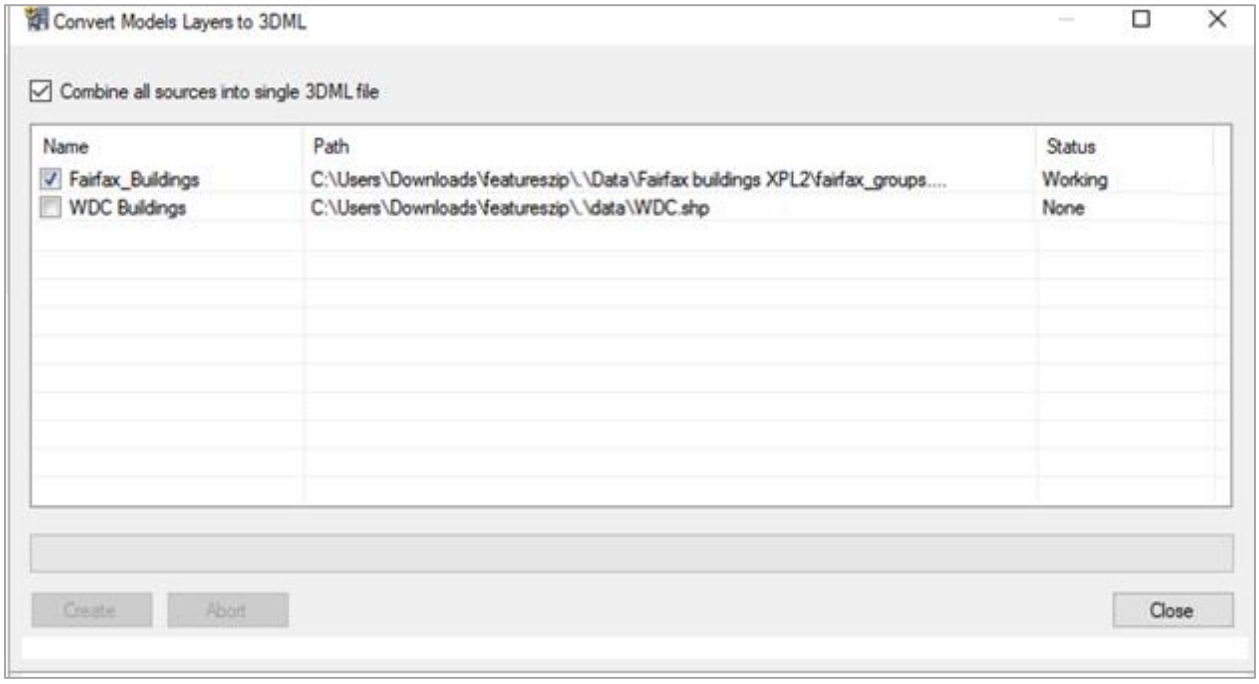
Converting Models to 3DML

The Convert Models to 3DML tool enables you to create a unified, stream optimized 3D Mesh Layer (3DML) database from a point feature layer with individually referenced 3D model files. This tool is only recommended for converting layers with many **small** models (each model should not exceed 100 MB), e.g., a city with individually modeled buildings. For larger model files, it is recommended to export the mesh models in a format that supported by TerraExplorer, and then to import them. **See** "Streaming 3D Models Using Feature Layers" in the "Feature Layers" chapter and "Working with 3D Mesh Layers" and "Importing and Converting 3D Mesh Layers" in the "3D Mesh Layers" chapter for information. Conversion to 3DML improves performance and provides better support for web and mobile devices, especially for large layers that reference many different models. If your point feature layer references multiple instances of only a few models, conversion to 3DML is not recommended.

To create a 3DML dataset:

1. On the **Layers** tab, in the **3D Mesh** group, click **Models to 3DML**. The Convert Models Layer to 3DML dialog is displayed, showing a list of all shapefile, sqlite, and GeoPackage point feature layers in the project with individually referenced 3D model files.

   Note: It may take a short while for the list of layers to be displayed.



Convert Models Layer to 3DML

2. Select the files for which you want to create 3DML layers, and click **Create**.

   Note: You can click **Abort** at any point to cancel 3DML creation.

3. If you want to combine all sources into a single 3DML, select the check box.
4. When the 3DML layers have been created, a dialog is displayed informing you that the 3DML layers will now be loaded into the project, and asking you if you want to remove the corresponding feature layers that they were based on. Click **Yes** to remove them, or click **No** to leave them in the project.

CHAPTER 17 IMAGERY AND ELEVATION LAYERS

About Raster Layers

Raster data is made up of pixels, each of which has its own value. TerraExplorer supports two types of raster data: geo-referenced, satellite or aerial images that overlay the terrain imagery and geo-referenced elevation raster that replaces the elevation data of the terrain database.

All raster layers are displayed in the coordinate system of the terrain database. If a layer is in a different coordinate system, TerraExplorer can automatically reproject the layer on the fly to the terrain's coordinate system. If a source does not include coordinate system information, you should supply the coordinate system information so that TerraExplorer can reproject the layer.

A file can be of better resolution than the area on which it is placed. Automatic morphing between the terrain imagery and the imagery layer is performed on computers with Microsoft DirectX version 9.0 installed.

Loading Raster Layers

You can create imagery and elevation layers by referencing imagery and elevation data from:

- Files on your own computer or on your local network.
- A database that is served over a network by one of the supported servers. **See** "Loading Raster Layers from Raster Servers" in this chapter for information.

Loading Raster Layers from File

The following file formats are supported:

- Windows Bitmap (*.bmp)
- ER-Mapper (*.ecw)
- ER-Mapper Jpeg2000 (*.jp2, *.j2k, *.jpc))
- ER-Mapper Server (*.ecwp)
- GDAL (*.gif, *.ntf, *.jpg, *.jp2, *.j2k, *.jpc, *.tif, *.img, *.gpkg, *.webp, *.*, *.vrt, *.pdf, *.wcs)
- HTC Raster file (*.htc)
- Web Map server (*.wms)
- Erdas Imagine (*.img)
- Mip Terrain (*.mpt)
- SkylineGlobe Server (*.tglobe)
- Image MPU (*.li.mpu)
- NGA formats (CIB, CADRG, ADRG)
- No Stream formats (Bitmap, Jpeg, Gif)
- ArcSDE Raster Server (*.sde)

- MrSid (*.sid)
- Tiff Format (*.tif, *.itiff)
- Tile Text File (*.tlt)
- Triangle elevation as color (*.tri)
- Projection Text File (*.prj)

To add a raster source from file to a project:

1. On the **Home** tab, in the **Add** group, click the arrow next to **Raster Layer**, and select the required format or "More Formats and Servers"/ "Other Elevation Formats". The Load Imagery/Elevation Layer dialog is displayed.
2. Browse to the required file, and click **Open**.

   Note: If you inserted a RAW, IMG (Erdas Imagine), or NGA format files, a dialog is displayed in which you can define properties for the relevant file type. If you inserted a GeoPackage format file, a dialog is displayed in which you can select the required layer.

   Note: If you want to restrict your Browse list to files of a specific format, in the **Files of type** field, select the required format.

If the source file is geo-referenced it is located accordingly on the terrain. Otherwise, it is placed at the center of the 3D Window. You can then manually edit its position, or reproject it.

3. If the source file does not include coordinate system information or TerraExplorer cannot read it from the file, the Coordinate System dialog opens. Specify the coordinate system of the layer. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
4. After the layer has been placed on the terrain, you can change its properties using the property sheet. **See** "Imagery and Elevation Layer Parameters" in this chapter for further information.

Loading Raster Layers from Raster Servers

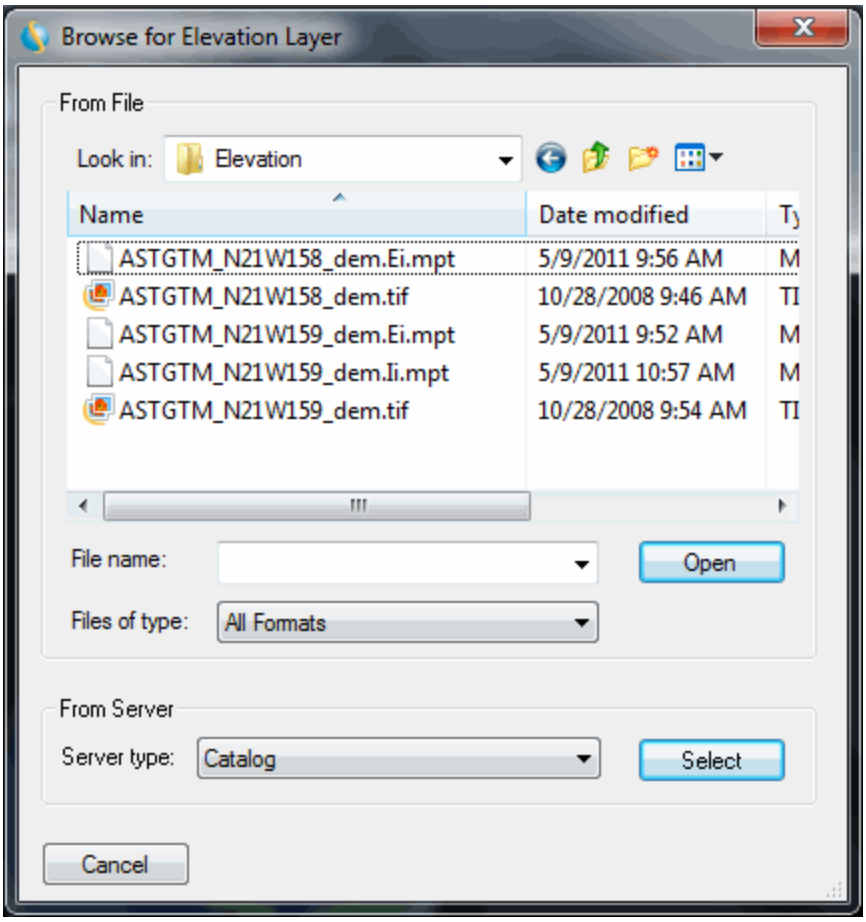
You can load raster layers from the following servers:

Server	Description
SkylineGlobe Server	SkylineGlobe Server is a private cloud solution that supports the client-server data delivery requirements of Skyline's 3D technology. TerraExplorer can read streamed imagery and elevation layers (Imagery, Elevation, RasterComplex) and TBP projects. For more information on loading layers from SGS, see "Loading SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.
Web Map Server / Web Map Tile Service	WMS/WMTS are standard protocols published by the Open Geospatial Consortium (OGC) for serving georeferenced map images and pre-rendered georeferenced map tiles over the Internet. TerraExplorer supports WMS 1.1.1 and 1.3.0 and WMTS 1.0.0.
Web Coverage Service (WCS)	WCS is a standard protocol published by the Open Geospatial Consortium (OGC) for serving geospatial information, in forms that can be used as input for analysis and modeling. TerraExplorer allows use of coverage in a WCS server as a raster dataset and supports version 1.0.0

TerraGate Server	Skyline's TerraGate Server efficiently streams Skyline terrain databases (MPT files) created by TerraBuilder and TerraBuilder projects (TBP) (Legacy support).
Oracle Spatial Database	Oracle Spatial (formerly called SDO, and before that MultiDimension), provides a way to store and retrieve multi-dimensional data in Oracle. It is primarily used for Geographical Information Systems to implement, geo-reference and solve queries such as how is something related to a specific location. **Note:** In order to load an Oracle Spatial layer you must have an Oracle Client installed on your computer.
ECW Image Web Server	ECW Image Web Server serves over the Internet large images (greater than a Terabyte in size) with fine alternating contrast while retaining their visual quality.
Esri ArcSDE Raster Server	The Spatial Database Engine (SDE) is a client/server application that enables spatial data to be stored, managed and retrieved from database management systems like Oracle, Microsoft SQL Server, Sybase, IBM DB2 and Informix. Loading of layers from ArcSDE is only supported through ArcSDE 10.2 (Esri deprecated the application server connection method after this version). From ArcSDE 10.3 and above, layers can be loaded using the WMS/REST services.
Google Earth Enterprise (GEE) Server	Allows opening imagery from Google Earth Enterprise Server. GEE Server provides a way of hosting private versions of Google Earth and Google Maps.

To load a raster layer from a server:

1. On the **Home** tab, in the **Add** group, click the arrow next to **Raster Layer**, and select the required server. The Browse for Imagery Layer/Elevation Layer dialog opens.



Browse for Imagery Layer Dialog

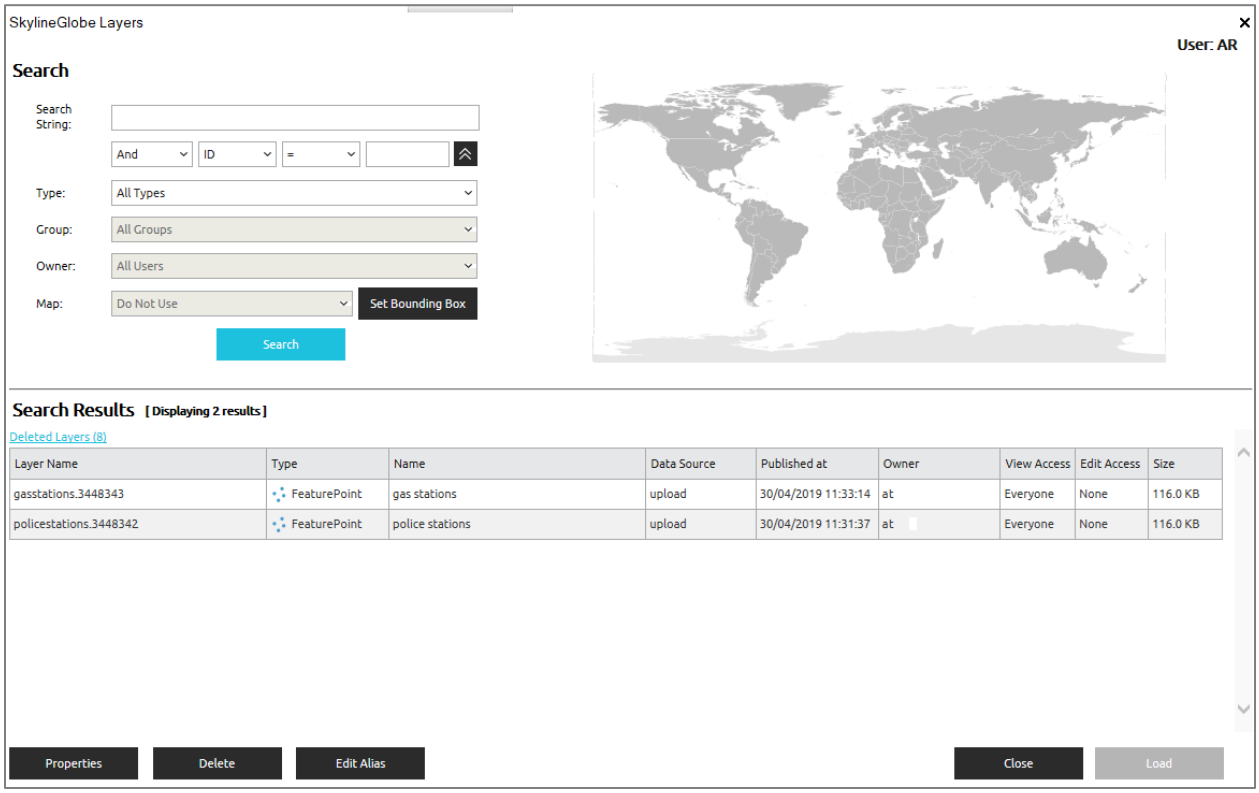
2. In the **Browse for Imagery Layer** or **Browse for Elevation Layer** dialog, in the **From Server** section, select the server type. A dialog is displayed corresponding to the server selected.
3. Enter the information required for the selected server:
   - SkylineGlobe Server
   - Web Map Service (WMS)
   - Web Map Tile Service (WMTS)
   - Oracle Spatial Database
   - ECW Image Web Server
   - TerraGate Server
   - ArcSDE Raster Server
   - Google Earth Enterprise Server

SkylineGlobe Server

SkylineGlobe Server (SGS) is a private cloud solution that provides a comprehensive set of web services for publishing, storing, managing and streaming 3D spatial data. SkylineGlobe Server provides streaming services for all your spatial data types including terrain (MPT/TBP), map (raster-WMS/WMTS), feature (WFS/WFS-T), 3D Mesh (3DML, OGC 3D Tiles, I3S/SLPK), and point cloud (CPT, OGC 3D Tiles). SkylineGlobe Server includes the Maps Service that streams most TerraExplorer supported raster layer

formats to remote TerraExplorer clients and any application that reads the standard OGC WMS/WMTS protocol. The layers are streamed as WMS/WMTS tiles in JPEG and PNG formats.

To add a layer from a SkylineGlobe server:



SkylineGlobe Layers Dialog

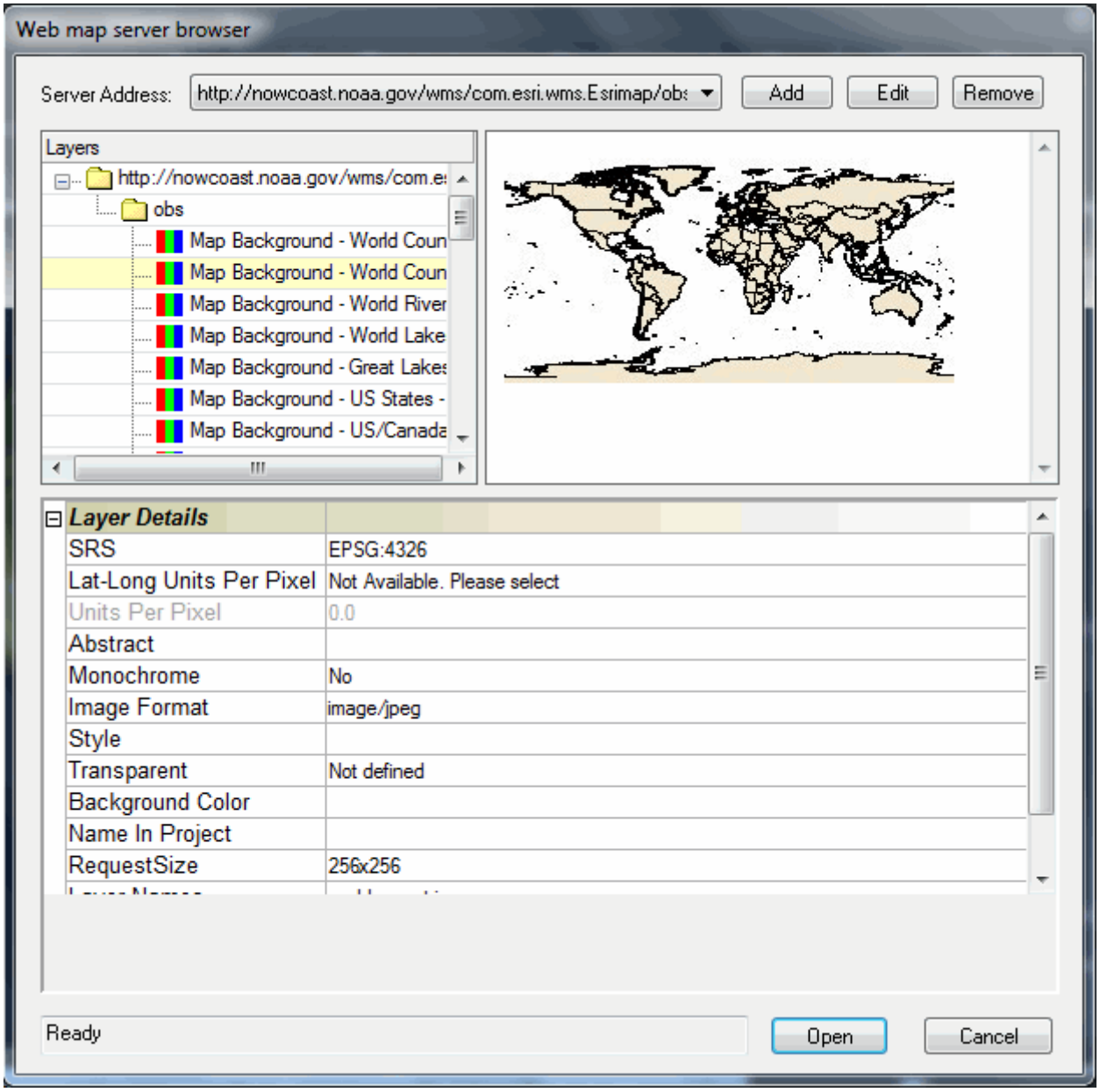
1. If you aren't already logged in to the required SkylineGlobe Server, log in to the server. **See** "Logging In to a SkylineGlobe Server" in the "Feature Layers" chapter for information.
2. Search for the required layer. **See** "Searching for SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.
3. Select the layer you want to load, and click **Load Layer**.

Web Map Service/Web Map Tile Service

To load a layer from a Web Map server (WMS/WMTS):

Note: TerraExplorer supports WMS versions 1.1.1 and 1.3.0, and WMTS 1.0.0.

Note: The following is the copyright information for server address: "http://maps.opengeo.org/geowebcache/service/wms?" that is pre-configured in the server addresses list: "Map data © OpenStreetMap contributors, CC-BY-SA".



Web Map Server Browser Dialog

1. If you want to modify the Server Address list, do any of the following:
   a. If you want to add a new address, click **Add**. The Add Web Map Server dialog opens.
      i. Add a new address.
      ii. If you want to add extra parameters (e.g., Token information) to the GetMap request, append the parameter at the end of the address using the following format:
      SLGetMapExtraParam={"<extra_param>"}
      where <extra_param> is the extra parameter for the GetMap request.
      e.g.,
      http://www.skylineglobe.com/SFS/streamer.ashx?service=WMS&SLGetMapExtraParam={"key=1

2345"}
This will add key=12345 to the GetMap request.

iii. Select the required service type.

iv. If you want to use RESTful request encoding, select **Use RESTful requests for WMTS**.

Note: Some servers may require the **ArcGIS compatibility** check box to be selected.

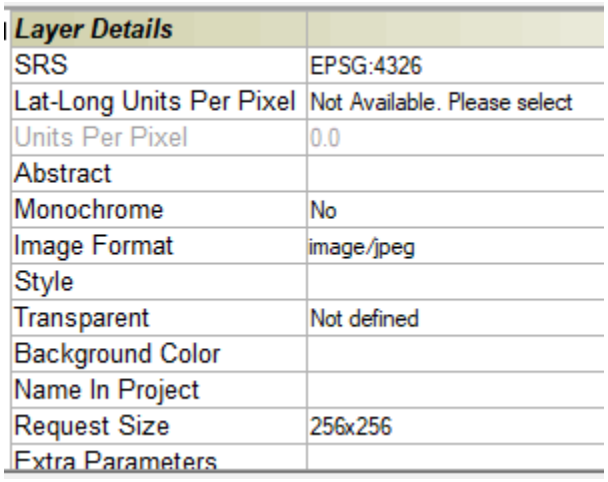
Note: Some servers may require the **NASG** (National Administration of Surveying, Mapping and Geoinformation of China) **compatibility** check box to be selected (e.g., used by Tianditu).

v. Click **OK**.

b. If you want to edit an address, select the address from the dropdown list, and click **Edit**. The Edit Web Map Server dialog opens. Edit the address and click **OK**.

c. If you want to remove an address, click **Remove**. A message is displayed asking you to confirm the deletion. Click **Yes** to delete.

2. From the **Server Address** list, select a server address.
3. In the **Layers** box, browse to the required data. The window on the right shows a preview of the data (when available).
4. In the **Layer Details Sheet**, set the properties according to the data supplier's stipulations.



Layer Details	
SRS	EPSG:4326
Lat-Long Units Per Pixel	Not Available. Please select
Units Per Pixel	0.0
Abstract	
Monochrome	No
Image Format	image/jpeg
Style	
Transparent	Not defined
Background Color	
Name In Project	
Request Size	256x256
Extra Parameters	

Property Sheet

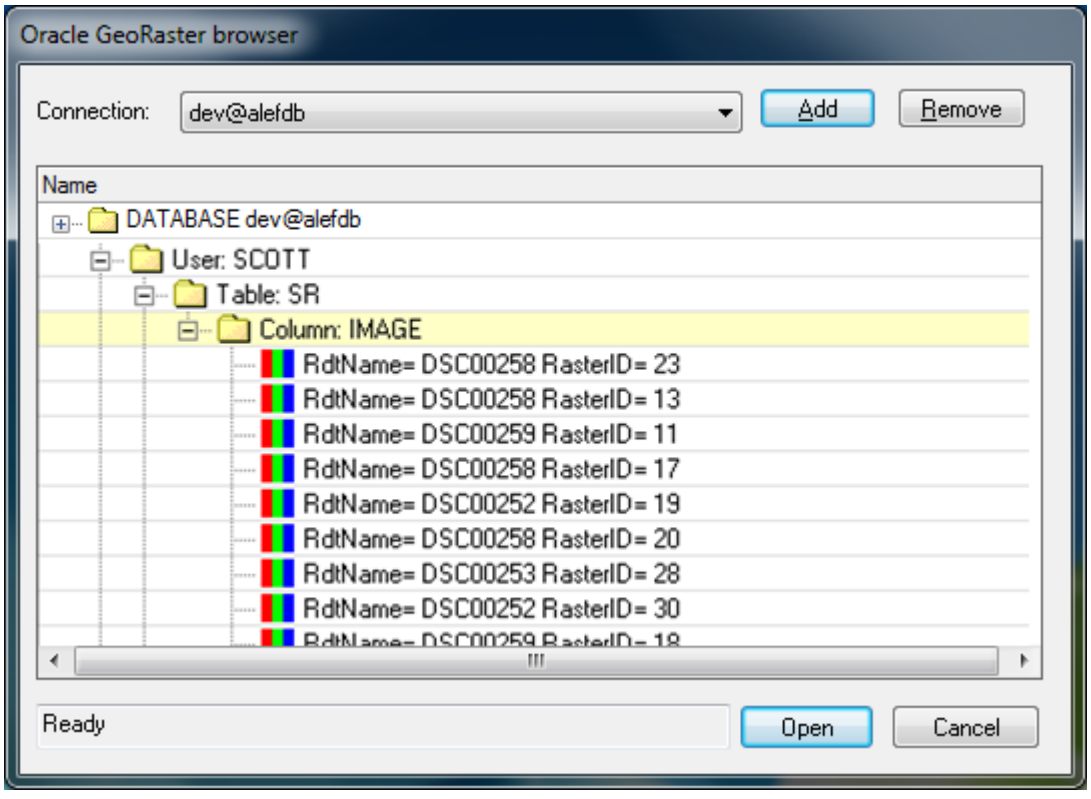
Property	Description
SRS	Spatial Reference System - Select the EPSG projection code indicating the projection in which the WMS/WMTS server is able to serve data.
Lat-Long Units Per Pixel	The best resolution level in degrees per pixel that is requested from the server. This field is only available when requesting a layer in SRS 4326 - geographic Lat-Long WGS84.
Units Per Pixel	The units per pixel (UPP) of the layer.
Abstract	A description of the layer (Read-only).

Monochrome	Add the layer as a black and white source.
Image Format	The format of the loaded layer –e.g., png or gif.
Style	Some layers can be displayed in more than one style (e.g., Points, Contours or Points and Contours)
Transparent	Select True to use WMS/WMTS layer as an overlay or False to use the WMS/WMTS layer as a base image.
Background Color	The layer's background color.
Name in Project	The layer's name in the Project Tree.
Request Size	The image size in pixels.
Extra Parameters	Extra parameters that are appended to any GetMap request, (e.g., Token information for requests to a token-secured WMS service).
Layer Names	The names of the selected WMS/WMTS layers (Read-only).
Style Names	Select the required style from the list of styles (if available) (Read-only).

5. Click **Open.** The selected layer is added to the project and displayed in the Project Tree.

Oracle Spatial Database

To load a layer from an Oracle Spatial database:



Oracle GeoRaster Browser

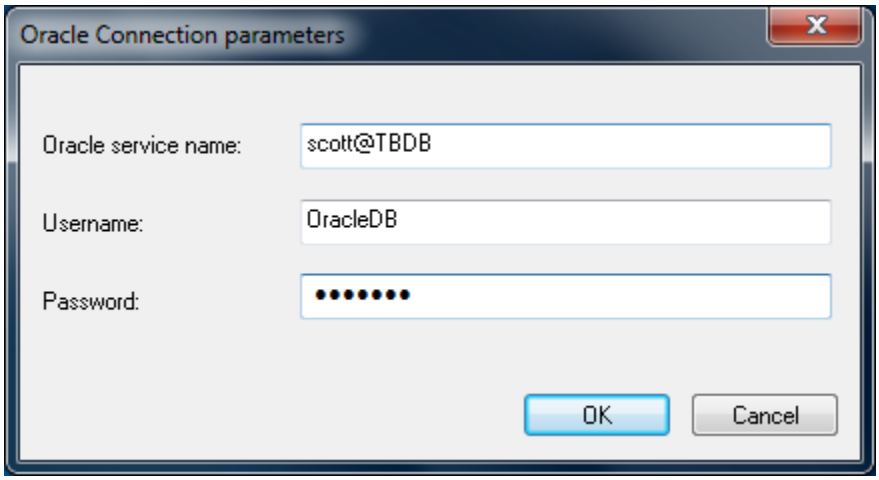
1. From the **Connection** list, select a connection.

   Note: You can remove a connection from the list by selecting it and clicking **Remove**.
2. If you want to add a connection, click **Add**, and enter the parameters in the Oracle Connection Parameters dialog. **See** "Adding an Oracle Connection" in this chapter for more information.
3. Select the required layer file in the files hierarchy tree. The selected layer is added to the project and displayed in the Project Tree.

Adding an Oracle Connection

To add an Oracle Server connection:

1. In the **Oracle GeoRaster Browser** dialog, click **Add**. The Oracle Connection Parameters dialog is displayed.



Oracle Connection Parameters Dialog

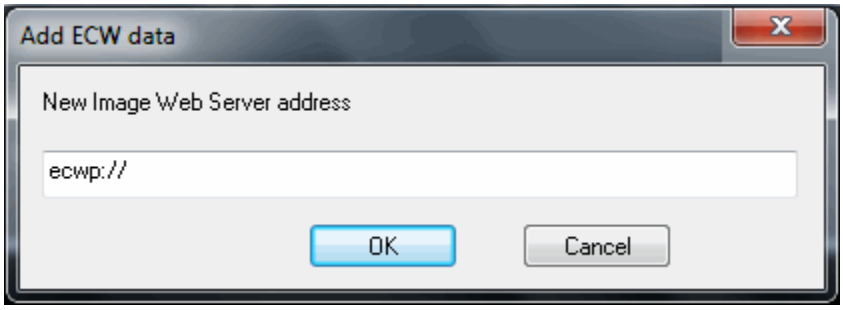
2. Define the following parameters:

Field	Description
Oracle service name	The Net Service name
User Name	User name to access the server (mandatory)
Password	Enter the password

3. Click **OK**. The new connection is added to the list.

ECW Image Web Server

To add a layer from ECW Image Web Server:



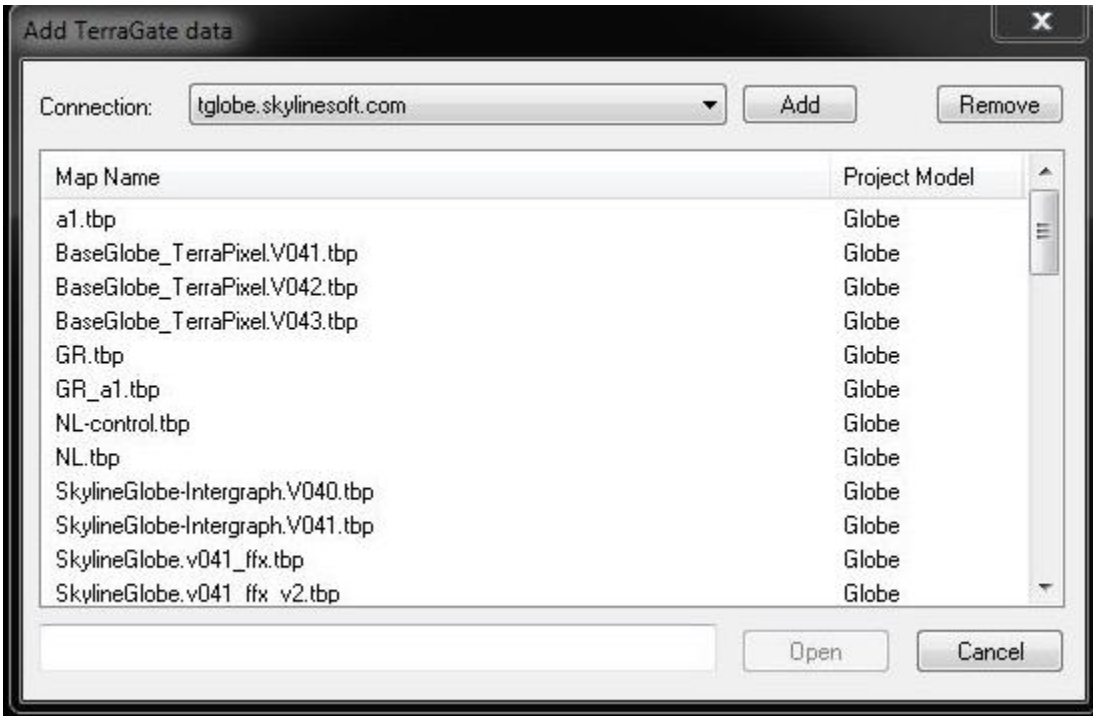
Add ECW Data Dialog

- Enter the New Image Web Server address and click **OK**. The selected layer is added to the project and displayed in the Project Tree.

TerraGate Server

Skyline offers legacy support for TerraGate.

To add a layer from a TerraGate server:



Add TerraGate Data Dialog

1. If you want to add a TerraGate connection, click **Add**, and enter the parameters in the Database Connection dialog. **See** "Adding a TerraGate Connection" in this chapter for more information.
2. From the **Map Name** list, select a connection.

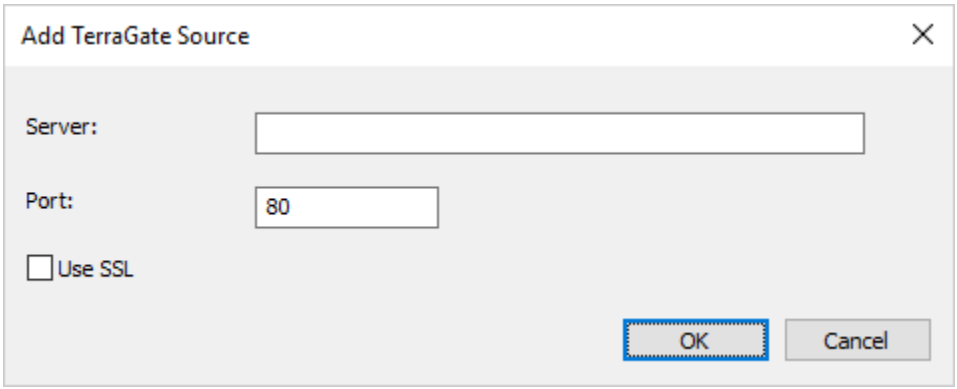
   Note: You can remove a connection from the list by selecting it and clicking **Remove**.

3. Select one of the layer options and click **Open**. The selected layer is added to the project and displayed in the Project Tree.

Adding a TerraGate Connection

To add a TerraGate connection:

1. In the **Add TerraGate data** dialog, click **Add**. The Add TerraGate Source dialog opens.



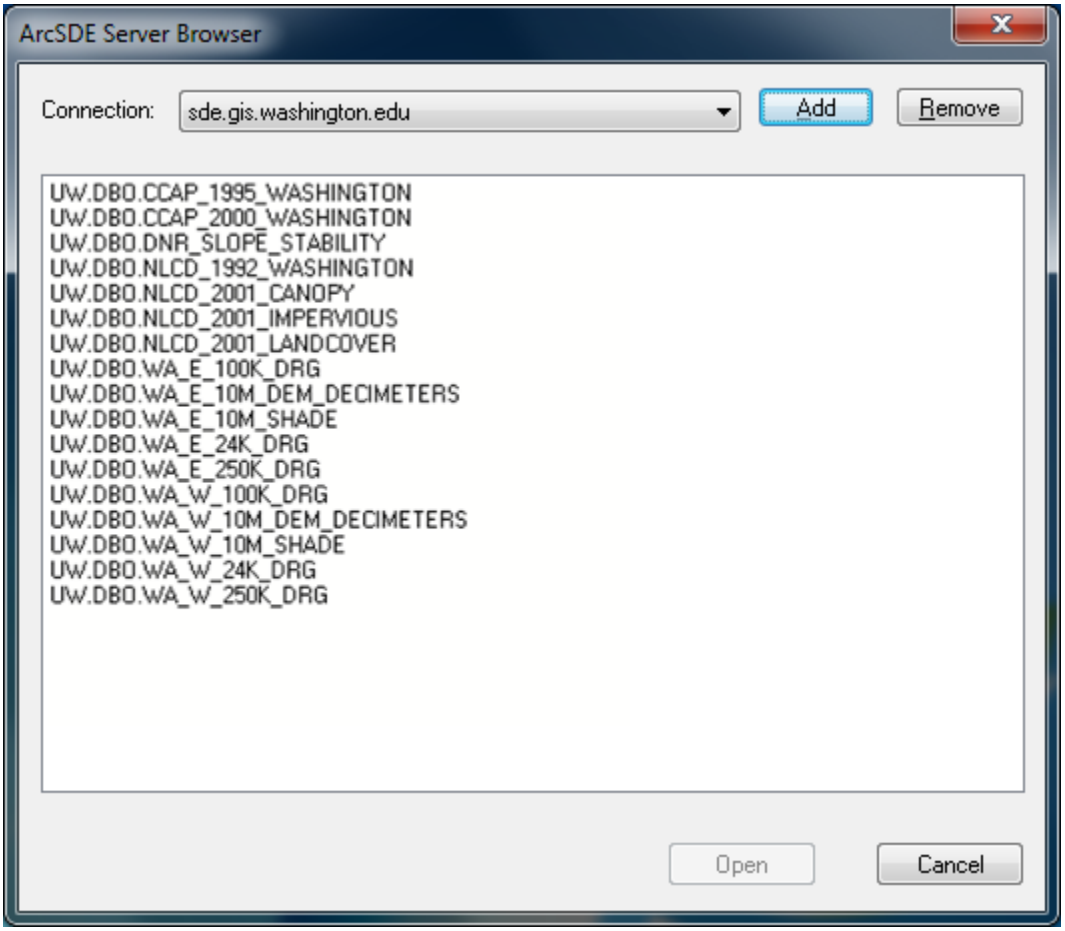
Add TerraGate Source Dialog

2. Enter the map name of the TerraGate Server (i.e., **<map name>.tbp** (or .mpt)@<**name of the TerraGate server or IP address**.
3. If a port other than the default of 80 is used, enter the **Port Number**.
4. If you want to open a file from TerraGate over a secure connection (SSL), select the **Use SSL** check box.

The selected layer is added to the project and displayed in the Project Tree.

ArcSDE Raster Server

To add a layer from an ArcSDE Raster Server:



ArcSDE Server Browser Dialog

1. If you want to add an ArcSDE Server connection, click **Add**, and enter the parameters in the Database Connection dialog. **See** "Adding an ArcSDE Server Connection" in this chapter for more information.
2. From the **Connection** list, select a connection.

   Note: You can remove a connection from the list by selecting it and clicking **Remove**.
3. Select one of the layer options and click **Open**. The selected layer is added to the project and displayed in the Project Tree.

Adding an ArcSDE Server Connection

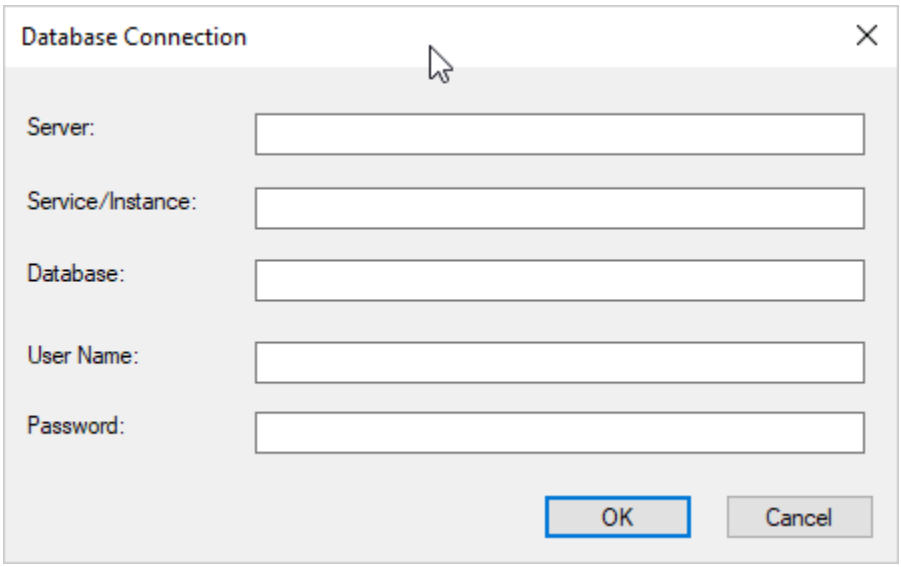
To access data from ArcSDE server, TerraExplorer requires access to specific ArcSDE components (dynamic link library files): sde.dll, pe.dll and sg.dll, of versions 10.0, 9.3 or 9.2. For versions 9.2 and 9.3, msvcr71.dll is also required. These files are installed with various Esri components, including ArcGIS Desktop and ArcSDE SDK, as well as the free viewers, ArcGIS Explorer Desktop and ArcReader. **See** http://www.esri.com/products/index.html#free_viewers_panel

To allow TerraExplorer to access these files, do any of the following:

- Make sure an ARCGISHOME or AGSDESKTOPJAVA environment variable is defined on your system and includes a reference to a folder under which a bin folder exists with the above-mentioned files.
- Make sure a PATH environment variable is defined on your system and includes a reference to a folder under which a bin folder exists with the above-mentioned files.
- Copy the DLL's to the main TerraExplorer folder.

To add an ArcSDE Server connection:

1. In the **ArcSDE Server Browser** dialog, click **Add**. The **Database Connection** dialog is displayed.



Database Connection Dialog

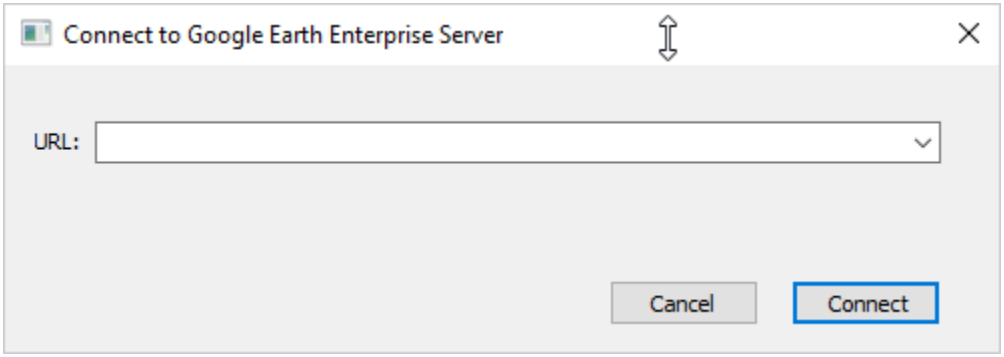
2. Define the following parameters:

Field	Description
Server	Server name (mandatory)
Service/Instance	Service or Instance name
Database	Database name
User Name	User name to access the server (mandatory)
Password	Enter the password

3. Click **OK** to connect to the server.

Google Earth Enterprise Server

To load a layer from Google Earth Enterprise Server:



Connect to Google Earth Enterprise Server Dialog

- Enter the server's URL and click **Connect**.

SGS Base Layers

You can load any of the SGS base layers configured for the SkylineGlobe Server that TerraExplorer is currently connected to.

To load:

1. If you aren't already logged in to the required SkylineGlobe Server, log in to the server. **See** "Logging In to a SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.
2. On the **Layers** tab, in the **Raster** group, click **SGS Base Layer** and select any of the available layers.

Moving and Clipping a Layer

An imagery or elevation layer is located on the terrain based on the geographic information it has, whether contained in the file, a reprojected value, or a manual input. You can modify the geographical location of a layer as well as clip a particular section of the layer, to display a subset of the image.

To change the geographical location of a layer:

- After creating the imagery or elevation Layer, in the layer's **property sheet**, in the "Imagery" or "Elevation" section respectively, update the Upper Left X, Upper Left Y, Lower Right X, and Lower Right Y values as required. **See** "Imagery and Elevation Layer Parameters" in this chapter for information.

To clip a layer:

- If you want to draw a polygon around the required subsection of the raster, do the following:
  a. In the layer's **property sheet**, in the **Imagery** section click **Draw**.
  b. In the **3D Window**, place the polygon points by clicking in the desired location. You must place at least three points.
  c. Finish the polygon creation by right-clicking.

  Note: When creating a filled polygon, the lines of the polygon should not overlap each other. This may result in an irregular fill pattern.
- If you want to load a shapefile which contains the clip polygon you want to use, do the following:

a. In the layer's **property sheet**, in the **Imagery** section click **Load**.

b. Browse to the required shapefile, and click **Open**.

Note: If you want to undo the clip or draw polygon action and restore the original raster, click **Restore**.

Imagery and Elevation Layer Parameters

Imagery and elevation layer properties can be modified from the layer's property sheet.

Note: If you want to undo/redo any edit action, on the top of the layer's property sheet, click **Undo** / **Redo**. Changes can be undone or redone, even after the property sheet is closed, and then reopened.

Parameter	Activity
Appearance	
Name	Type the description or name of the layer. This text appears in the Project Tree as the name of the layer.
Activation Action	Select the action to perform when selecting the layer from the Project Tree.
Line Color	Select the outline color for the layer. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Opacity	Enter the opacity for the layer's outline. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Fill Opacity	Enter the opacity for the layer data. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Line Style	
Line Width	Enter the layer's line width. The width is measured in meters.
Line Back Color	Sets the layer's line back color. This field is only available when Altitude Method is set to On Terrain. The layer's line back color is visible when the line pattern is set to non-solid patterns such as a dotted pattern. Click the **Edit** button to open the **Color** dialog, or type the color code in hexadecimal BBGGRR format (B = Blue channel 00-ff, G = Green channel 00-ff, R = Red channel 00-ff).
Line Back Opacity	Enter the layer's line back opacity. This field is only available when Altitude Method is set to On Terrain. The opacity is defined as a percentage, where 100% is opaque and 0% is transparent.
Line Pattern	Select the layer's line pattern. You can choose between different line patterns, e.g., solid, dashed, dotted or a combination thereof.
Timespan	

Start Time	Click **Edit** and select the date and time when the layer should first become visible.
End Time	Click **Edit** and select the date and time when the layer should stop being visible.
Points Position	
The parameters in this group are enabled only when **Edit Nodes** , on the top bar of the property sheet, is selected.	
Selected Point	Select the point to edit. The selected point is highlighted in the 3D Window. When you edit this point, the corresponding point on the base or the top of the polygon changes accordingly.
Point X	Enter the X-coordinate for the selected point.
Point Y	Enter the Y-coordinate for the selected point.
Point MGRS	The coordinates of the selected point in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Imagery/Elevation	
Imagery/Elevation File	Type the full path of the file, or use the **Edit** button to browse to a supported imagery/elevation file or to open the Web map server browser dialog if loading a layer from a Web Map Server (WMS).
Upper Left X	Enter the X-coordinate of the layer top-left corner.
Upper Left Y	Enter the Y-coordinate of the layer top-left corner.
Upper Left MGRS	The coordinates of the layer top-left corner in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Lower Right X	Enter the X-coordinate of the layer bottom-right corner.
Lower Right Y	Enter the Y-coordinate of the layer bottom-right corner.
Lower Right MGRS	The coordinates of the layer bottom-right corner in Military Grid Reference System (MGRS) coordinates. This field is only available if **Show MGRS Coordinates** was selected in the Options dialog. **See** "View" in the "Using TerraExplorer Options" chapter for more information.
Auto Refresh Interval	The time interval, in seconds, for auto-refreshing the layer. The minimum interval is 10 seconds.
Elevation Scale	Change the elevation data to a new value. This feature enables you to adjust several elevation sources that are defined with reference to different baselines, such as different sea levels. The elevation data in the source file is changed to a new value where: New Value = Old Value * Scale Factor + Offset Value
Elevation Offset	Change the elevation data to a new value.

	This feature enables you to adjust several elevation sources that are defined with reference to different baselines, such as different sea levels. The elevation data in the source file is changed to a new value where: New Value = Old Value * Scale Factor + Offset Value
Remove Null Value	Select **Yes** to display the color or elevation data whose value is nullified. Select **No** to keep the selected value nullified.
Null Value	Nullify a color value in an imagery layer or an elevation value in an elevation layer: ▪ Imagery Layer - Nullify a color value to make the underlying terrain visible in places that are colored with the nullified color value. ▪ Elevation Layer - Nullify an elevation value to cancel the value's elevation effect.
Null Tolerance	Enter the permissible deviation from the specified Null value when the color value is irregular.
Draw Polygon	Click the **Draw** button to clip a subsection of the raster. Place the polygon points in the 3D Window by clicking in the desired location. You must place at least three points. Finish the polygon creation by right-clicking. **Note**: When creating a filled polygon, the lines of the polygon should not overlap each other. This may result in an irregular fill pattern.
Reset Polygon	Click to restore the original raster.
Import Polygon	Click to import a shapefile which contains the clip polygon you want to use.
Projection	
Reproject Source	If you want to reproject the source's geographic information from the source coordinate system to the terrain coordinate system, select **Yes**.
Reproject Elevation	Select the check box to reproject the layer's elevation values to the terrain's coordinate system. This option only applies when Altitude Method is set to Absolute. Geocentric layers are always reprojected.
Description	Free text describing the coordinate system.
Coordinate System	Click **Set** to open the **Coordinate System** dialog, and set the required coordinate system. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
Visibility	
Default Viewing Distance	Determines the viewing distance of the camera from the layer. This distance is used as a stop mark for any "Fly-to" or "View Object" operation. It is also used when selecting to edit the layer from the Project Tree. When this value is set to the default of -1, TerraExplorer calculates and sets the ideal viewing distance for the layer based on its size.

Max. Visibility Distance	Sets the distance from the camera at which the layer disappears.
Min. Visibility Distance	Sets the minimal distance from the camera below which the layer disappears.
General	
Show in Viewer	Determines if the layer appears in the Project Tree when the file is viewed with the TerraExplorer Basic viewer.
Message	The message associated with the object. The number displayed is the number of the message. To create a new message, or update an existing message, open the **Create Message** dialog by clicking in this field and selecting **Edit**. **See** "Using the Create Message Dialog" in the "Working with Objects" chapter for more information.
Tooltip	Type a Tooltip text to appear when the mouse cursor is placed over the layer in the 3D Window.
Order	Determines the order of objects with On Terrain altitude method, from back to front. Objects with higher values are displayed on top of objects with lower values.

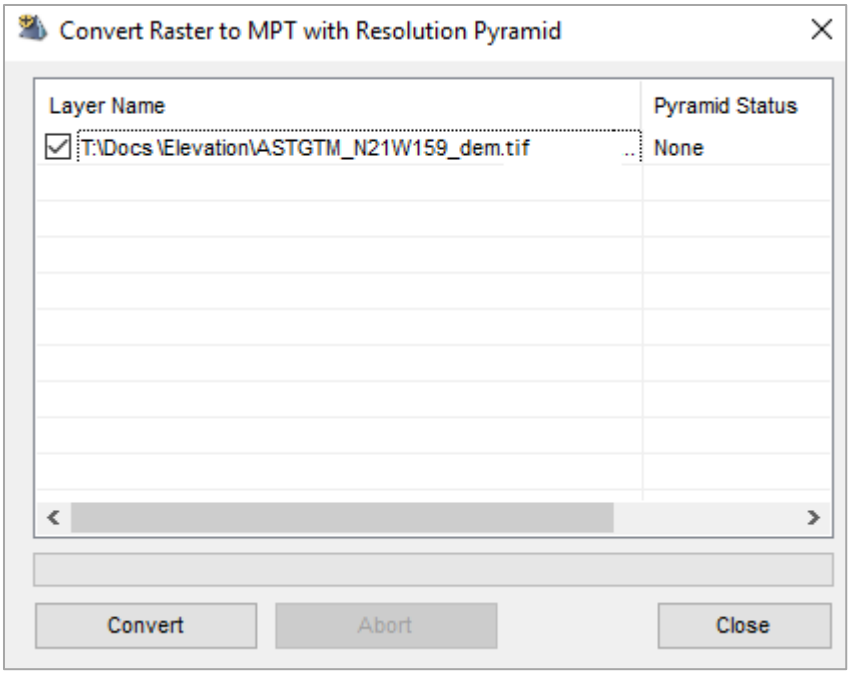
Converting Raster to MPT with Resolution Pyramid

Convert selected raster files, which do not include resolution levels or have an insufficient number of them, to stream-optimized MPT files with resolution pyramids.

To display a layer in different altitudes, TerraExplorer Pro requires a number of resolution levels per layer, which are also known as a resolution pyramid or a multi-resolution file. Without a resolution pyramid, the layer will not be displayed when attempting to zoom out from the original resolution level.

A layer source file may or may not include resolution levels or may have an insufficient number of them. In that case, TerraExplorer can generate a resolution pyramid for such sources. The resulting MPT file replaces the original layer source file and does not point to it.

Note: It is good practice to convert all layers in the project to MPT with a resolution pyramid.



Convert Raster to MPT with Resolution Pyramid Dialog

To convert a raster layer to an MPT with a resolution pyramid:

1. In the **Project Tree**, select the layers that require a resolution pyramid.
2. On the **Layers** tab, in the **Raster** group, click **Raster to MPT**. The Convert Raster to MPT with Resolution Pyramid dialog is displayed.
3. Select the check boxes of the layers for which to create a resolution pyramid.
4. Click **Convert**. When the creation process is finished, the Pyramid Status column changes to "Done".

   Note: If you want to cancel the resolution pyramid creation in the middle of the process, click **Abort**.

Uploading Raster Layers to SkylineGlobe Server

Raster layers can be uploaded to SkylineGlobe Server either by publishing the entire TerraExplorer project in which they are included (see "Publishing a Project to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter) or by uploading individual layers.

To upload a layer:

- In the **Project Tree**, right-click the required layer, and select **Upload to SkylineGlobe** from the shortcut menu. **See** "Uploading Layers to SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information.

CHAPTER 18 WORKING WITH TOOLS

About the Tools

TerraExplorer Pro Tools are a set of external tools that communicate with TerraExplorer Pro using the TerraExplorer API and provide an extended set of features to the user.

The following tools are available from the Tools tab.

Tool	Description
Snapshot Tool	Takes a snapshot of the current 3D Window: ▪ Opens the snapshot in a new window. ▪ Saves the snapshot to a file.
Collaboration Tool	Allows the user to share an interactive Fly session over the network.
Extract to MPT	Extracts and creates a subset of a local or remote terrain database on the user's local computer.
Extract to VRML	Extracts and creates a VRML model from a local or remote terrain database that can be displayed in VRML viewers, 3D printing etc.
Extract to Zebra	Extracts and creates a Zebra Imaging model from a local or remote terrain database, which you can use for producing 3D hologram images.
Urban Design	Creates simple and/or customized objects including markers, freehand lines, Mil-Std-2525b symbols, and urban designs.
Duplicate Objects	Creates multiple instances of the same object along a line or inside an area.
Power Lines	Creates a power line by placing power poles along a user-defined path and connecting them with power lines.
Pipelines	Creates a pipeline along a user defined path.
Fence and Wall	Creates fences and walls in the precise dimensions, shape and texture you require. The output can be saved as a TerraExplorer group of objects or as a feature layer (shapefile).
Timespan Tags	Assign timespan tags to groups. Determine whether objects within each subgroup display successively, each for a fraction of the total timespan, or whether all objects in each subgroup should hide and display simultaneously.
Block Width	Determine an appropriate layer block width for efficient streaming of layers.
Photo Inspector	Display the photos used to generate a 3D PhotoMesh model so you can view and inspect any section of your model (tower, bridge, construction site, etc.) without distortions or filters. Photo Inspector makes it easy to navigate within the model and between the model and its associated photos, providing real world coordinates for each photo pixel, so you can find the best photos for each area of the model.

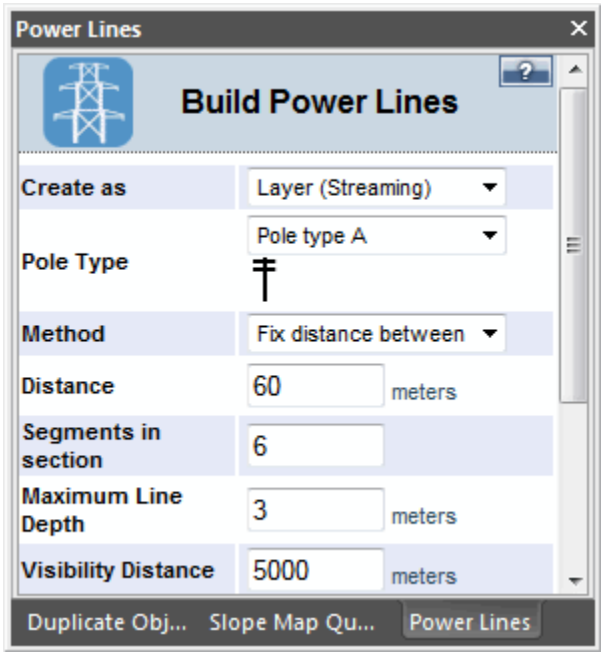
	The Photo Inspector also provides a set of drawing and measurement tools to mark areas and locations on the model and generate a detailed report with all inspection details.
HoloLens Extension	Display the TerraExplorer 3D view as a lifelike 3D hologram that can be viewed in the HoloLens 2 immersive headsets. The hologram is displayed on a virtual table whose dimensions can be customized and whose location is determined simply by the placement of a QR code.
TEZ Creator	Package custom tools, licenses, start pages, ribbon configurations, options settings, and data libraries into a TEZ zip file for easy distribution to TerraExplorer users.

Using Tools

To use a tool:

- On the **Tools** tab, click the required tool. The tool opens in a new window. When more than one tool is open, use the tabs at the bottom of the tool window to switch between tools.

  Note: All TerraExplorer tools initially open in the same location - at the bottom, left side of the screen. When multiple tools are opened simultaneously, a tab displays for each tool on the bottom of the tool window.



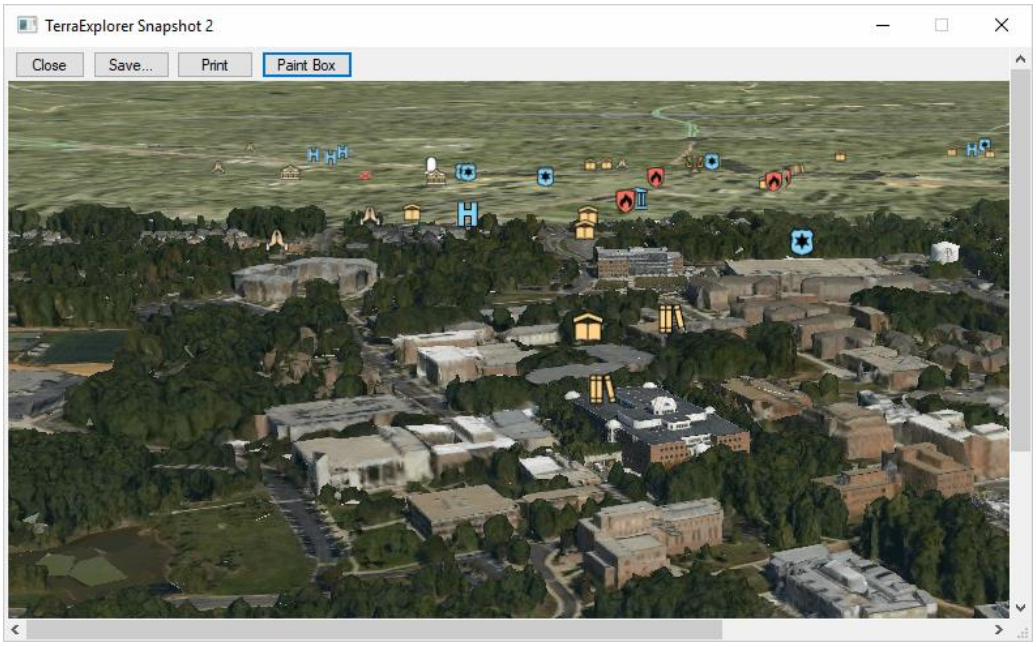
Tool Tabs

To close a tool:

- On the **Tools** tab, click the currently selected tool, or click the **Close** link in the upper-right corner of the tool's window.

Snapshot Tool

The Snapshot Tool copies the current 3D Window to a floating window so you can edit it in a Paint program before saving to an image file.



Snapshot Tool

To use the Snapshot tool:

1. On the **Tools** tab, in the **Snapshot** group, set the dimensions of the screen capture:
   - If you want to set a specific size for the screen capture, select the **Custom Size** check box, and enter the **Width** and **Height** measurements.
   - If you want to base the dimensions of the screen capture on those of the current screen, clear the **Custom Size** check box.
2. If you want to "paint" the screen capture before saving it to a file, click the arrow below **Snapshot**, and then click **Snapshot to New Window**.
3. If you want to save the screen capture, click the arrow below **Snapshot**, and then click **Snapshot to File**. In the Save As dialog, browse to where you want to save the screen capture, type a **File Name**, and click **Save**.

Collaboration Tool

This tool connects TerraExplorer users on one collaborative network. Connecting over the internet/intranet, users can chat, annotate the terrain with text labels and freehand drawing, point using a virtual cursor and synchronize their flight.

One user serves as the manager of the session, while the rest connect to the session as clients. The collaboration server can also reside on a SkylineGlobe server to enable better management and control and to solve security problems when accessing end-user computers behind firewalls.

About the Collaboration Server

The collaboration server is a communication program responsible for managing collaboration sessions, and delivering all contents, via TCP/IP networks, to all members.

The collaboration server can run on a local computer of one of the session members, or as part of an existing TerraGate server. When a collaboration server is activated, using the Start Local Session request, it serves the current session on a local machine and after the termination of the session the server shuts down. When the collaboration server is set up as part of the TerraGate server it is always up and running and can server several sessions.

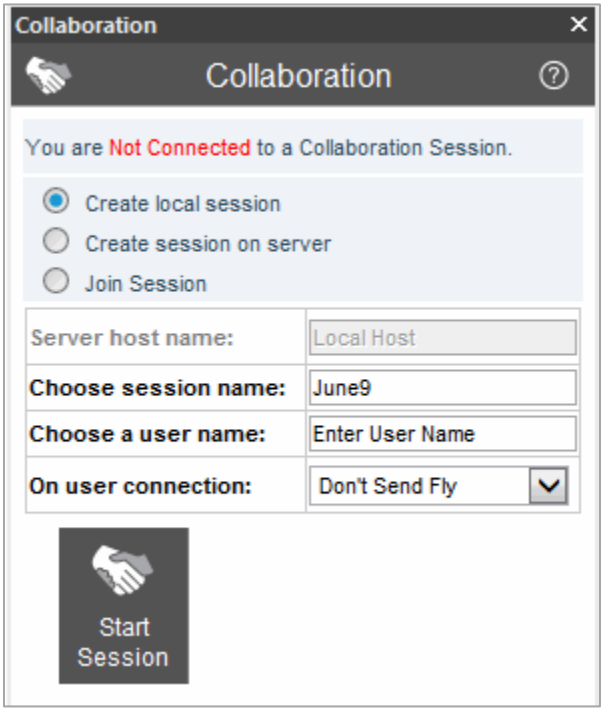
Note: The collaboration server is only available until TerraGate server 6.6.1. If collaboration services are required, contact Support@Skylinesoft.com for information about a standalone installation.

Note: For further information on setting and controlling a collaboration service on a TerraGate server, see the TerraGate User Manual.

Joining or Opening a Session

To join or open a Collaboration session:

1. On the **Tools** tab, in the **Collaboration** group, click **Collaboration**. The Collaboration toolbox opens.



Collaboration Tool – Before a Session

2. Select the connection type:

Create Local Session	To start a communication server on your local computer, open a session and become the Manager and the Leader of the session.
Create Session on Server	To create a new session on a TerraGate server running the communication service and become the manager and the leader of the session

Join Session	To join an ongoing session opened by another user on its local computer or on a TerraGate server.

Note: The Manager of the session is the only participant that has permission to give the leadership of the session to another user. The Leader of the session is the user that sets the location of the camera by navigating freely in the 3D World and all other users can attach to this point of view.

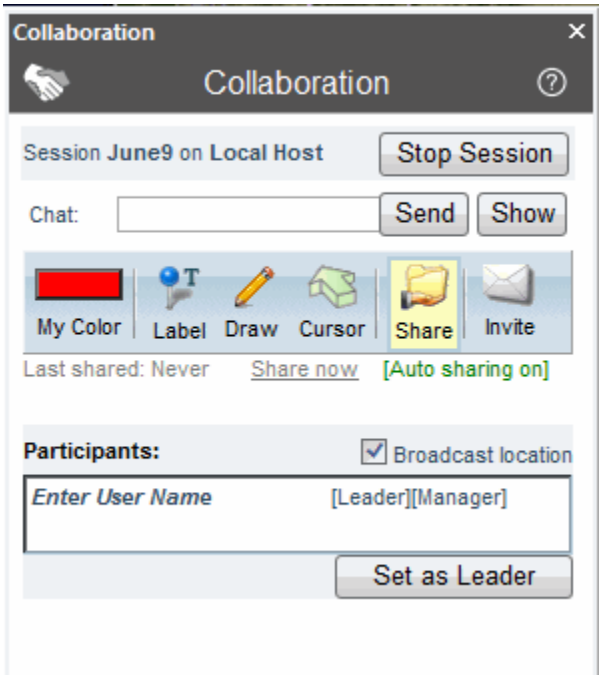
3. Enter the **Server Host Name**, which is the IP address of the communication server:
   - If you want to join an ongoing session, type the name or address of the Manager's local computer or the TerraGate server.
   - If you want to create a new session on a TerraGate server, type the name or address of the server.
4. In the **Choose Session Name** field, type the session's name:
   - If you create a new session on a TerraGate server, type a unique session name. If you create a local session, the session name serves as an additional protection from unwanted guests.
   - If you join an ongoing session, type the session name that was given by the manager.
5. In the **Choose User Name** field, type a user name. Each member of the session must have a unique user name. The user name is shown in the Participants list and will be attached to the chat messages.
6. If you started a local or a server session, from the **On User Connection** dropdown list, select one of the following options:

Don't Send Fly	When other users join the session, they do not receive any FLY project. They have to manually open a valid project before joining the collaboration session.
Send Fly Link	When other users join the session, the current FLY project name is sent to them and their local TerraExplorer opens this project before connecting to the session.
Send Fly File	When other users join the session, the FLY project is sent to them. The collaboration server sends the content of the FLY project, but not the additional resources.

Note: Use the Send Fly Link option only when the FLY project and all additional resources in the FLY project (e.g., MPT database, 3D models or icons) reside on a local or remote network storage that is shared and accessible to all participants in the session. It is recommended to use this option when you use an Internet kit created using the "Create TerraExplorer Kit" option. Use Send FLY File only when the MPT database is on a TerraGate server or on a shared storage and there are no additional resources or all resources reside on a shared storage.

7. Click the **Start Session** button to create the session or **Join Session** to join an ongoing session. A second Collaboration dialog opens.
8. If you want to close a session you created, click **Stop Session**. If you want to disconnect from a session you joined, click **Disconnect**.

Managing the Session



Collaboration Tool

To manage a session:

- The **Participants** list displays all connected users to the session. If you want to appoint another participant leader, select the required name in the list, and click **Set as Leader**.

Controlling the Camera

- If you created a local or a server session, select the **Broadcast location** check box to send your camera position to all other participants in the session.
- If you joined a session, select the **Follow leader** check box to attach your 3D Window (camera) to the session leader view. Clear this option to navigate freely on the terrain, and select it again to get re-attached to the session view.

Inviting Participants to the Session

If you started a local or a server session, you can invite other users to the session by e-mail.

To invite participants to the session:

1. In the **Collaboration** dialog, click the **Invite** button. The Enter Email(s) field is displayed in the lower half of the dialog.
2. In the **Enter Email(s)** field, type the required e-mail address. If you want to send the message to multiple recipients, separate their addresses by commas.
3. Click the **Invite** button. Your default mail client opens with a new e-mail message.
4. Follow the instructions in the message body and send the mail. Recipients of the message can connect to the session by simply opening the mail attachment.

Chatting with Other Participants

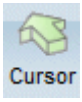
To type a chat message:

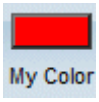
1. In the **Collaboration** dialog, in the **Chat** field, type the message text.
2. Click **Send** to send this chat message to all other participants in the session. The text appears in the Chat box preceded by the name of the sender.
3. If the message box is not displayed, click the **Show** button to display it.

Using the Virtual Cursor

You can use a virtual cursor to point to an area on the 3D Window. The cursor, which is available in different colors, is visible to all the participants in the session.

To use the virtual cursor:

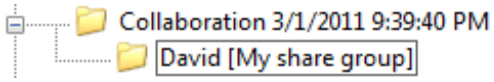
1. In the **Collaboration** toolbox, click the **Virtual Cursor** 

button.
2. Click the **Color** 

button to set the virtual cursor's color and select a color from the color palette.
3. Click and hold the mouse button to display the Virtual Cursor.
4. Right-click to finish the operation.

Sharing Your Content

The collaboration tool allows you to share new content you create in the 3D World with other participants. All content located under your sharing group can be shared with session participants.



To share content:

1. Turn on the automatic sharing option 

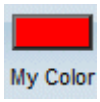
or click the **Share Now** link. The collaboration tool will send all content located under your sharing group to the session participants.
2. Use the Text label or Freehand drawing tools to add content directly to the sharing group
3. You can create any TerraExplorer object or layer using the TerraExplorer standard tools and drag the object or the group to your sharing group.

Note: The collaboration sharing tool sends the objects and layers under the sharing group but **does not send resources** used by these objects or layers. Make sure you use resources accessible by all other participants in the session.

Adding a Text Label

To add a text label:

1. In the **Collaboration** toolbox, click the **Add Text Label** 

button. The Text Label field is displayed in the lower half of the dialog.
2. In the **Text Label** field, type a text string.
3. Click the **My Color** 

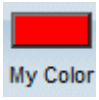
button to set the color of the text, and select a color from the color palette.
4. In the **3D Window**, click the terrain location where you want to insert the text label. The label is displayed in the 3D Window at the same location, for all other participants of the session.

Using the Freehand Drawing Tool

You can draw freehand in the 3D Window. Your drawings are visible to all participants in the session.

To draw freehand:

1. In the **Collaboration** toolbox, click the **Draw** 

button.
2. Click the **Color** 

button to set the drawing tool's color and select a color from the color palette.
3. Click and hold the mouse button to draw.
4. Right-click to finish the operation.

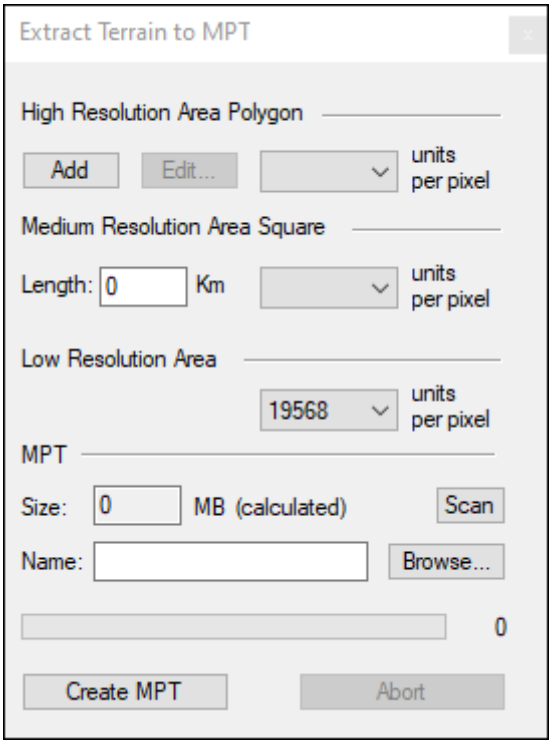
Extracting Terrain to MPT

The Extract Terrain tool extracts and creates a subset of a local or remote terrain database.

Using the Extract Terrain tool, you can create a terrain database for distribution using an external storage device or even create a local MPT from a DirectConnect project.

The extracted terrain is built from a high-resolution polygon, a medium resolution rectangle surrounding the high-resolution area and a low-resolution area that always covers the entire terrain. You can control the size of the high- and medium-resolution areas and control the quality of all three areas.

Note: Because the low-resolution area always covers the entire source terrain database, although it can be set for a very poor quality to save storage space, the original FLY project always runs on the new terrain database and all locations and objects have valid coordinates in the extracted terrain.



Extract Terrain to MPT Tool

Using the Extract Terrain to MPT Tool

To extract terrain to MPT:

1. On the **Tools** tab, in the **Extract Terrain** group, click **Extract to MPT**. The Extract Terrain to MPT tool opens.
2. Create a high resolution area polygon by doing the following:
   a. Click **Add**.
   b. In the **3D Window**, click in the required locations to place the polygon points. You must place at least three points.
   c. Right-click to finish the polygon creation.
   d. Perform any of the following editing operations if required:
      - **Move a node** – Click Edit. Then in the 3D Window, place the cursor over one of the polygon's nodes. The node turns blue, and the cursor changes to Move mode . Click the node and drag it to the required location in the XY Plane. Release the mouse button to set the node at the current location.
      - **Add a node** – Click Edit. Then in the 3D Window, place the cursor over one of the polygon's lines. Where a node can be added, a red node appears on the line and the cursor changes to Add Node mode . Click to add a node, and then drag it to the required location.

- **Delete a node** – Click Edit. Then in the 3D Window, place the cursor over the node you want to delete. The node turns blue, and the cursor changes to Move mode . Right-click, and select Delete Node from the shortcut menu.

Note: If you want to remove the polygon and create a new one, click **Remove** and repeat steps a-d.

e. Set the quality of the high-resolution area by selecting a **Unit Per Pixel** value from the dropdown list.

Note: The Unit Per Pixel list of values is created from the terrain database (MPT file) pyramid of resolutions.

3. Type the **Length** of and resolution of the **Medium Resolution Area Square**. The medium resolution area square always surrounds the high-resolution polygon. Type **0** to remove the square. The **Unit per Pixel** value must be higher (lower resolution) than the value set in the High-resolution polygon.
4. Select the **Low Resolution Area** Unit Per Pixel value.

   The Low Resolution Area always covers the entire MPT database to ensure that the current project will run.

   Note: It is recommended to set a medium resolution area around the High-resolution polygon to get a smooth transition between the high-quality terrain and the very low-resolution background. It is recommended that the medium resolution be four levels higher than the selected high-resolution. The Low Resolution Area can be set to the worst resolution to reduce the size of the extracted MPT.
5. Click **Scan** to get a better estimation of the size of the new MPT. If you want to stop the scanning process, click **Abort**.

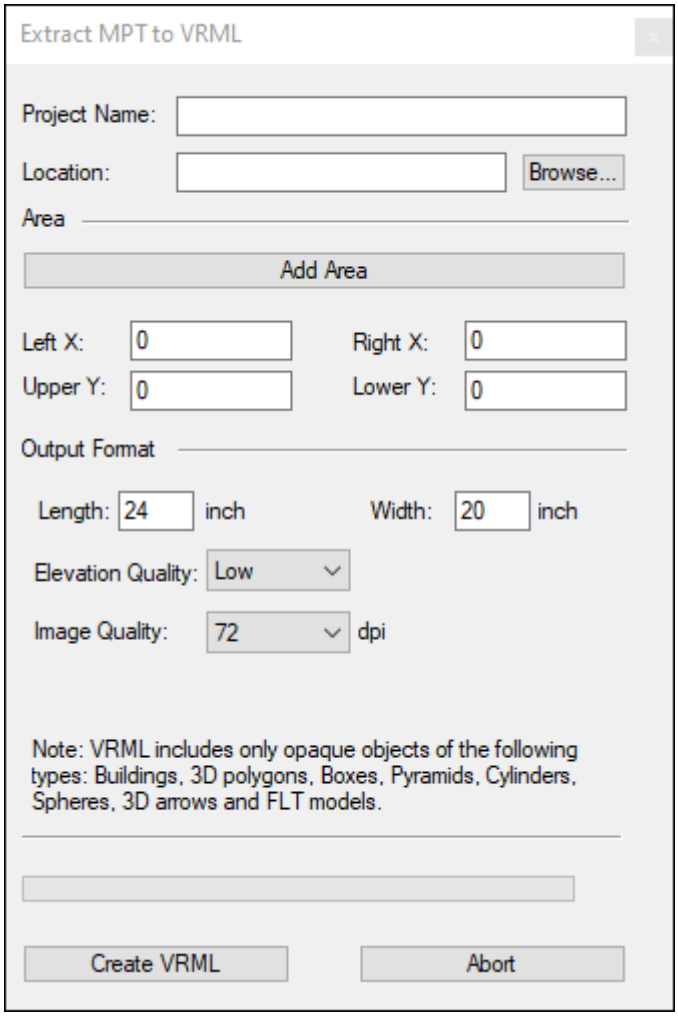
   Note: While setting the size and resolutions of the different areas, the Extract Terrain tool displays an estimated size of the new MPT file based on a calculation (multiplication of the areas and the selected resolutions). After clicking the Scan option, the Extract Terrain tool scans the three areas and calculates the size based on the actual resolution of the terrain in these areas. The final size of the new MPT file can be distinctly different from the calculated and scan sizes if the original MPT file has many areas with different resolutions.
6. Select the name of the extracted MPT file by typing a valid file name, or click the **Browse** button and select an existing directory and file name on your system.
7. Click **Create MPT** to start downloading and creating the new MPT file.
8. Click **Abort** to stop the creation process, or **Pause** and **Resume** to temporarily halt the process and resume it from the same location.

Extracting Terrain to VRML

The Extract Terrain tool creates a VRML model from a local or remote MPT database to your local machine. Using the Extract Terrain tool, you can create a VRML model for display in VRML viewers, 3D printing etc.

The extracted terrain includes the elevation and imagery information from the terrain database, and buildings created by TerraExplorer Pro.

Building textures are currently not supported. You can control the size of the VRML model by defining the export area, and the image and elevation quality.



Extract MPT to VRML Tool

Using the Extract Terrain to VRML Tool

To extract terrain to VRML:

1. On the **Tools** tab, in the **Extract Terrain** group, click **Extract to VRML**, and select Extract to VRML. The Extract MPT to VRML dialog is displayed.
2. Type the **Project Name**. A folder by this name is created in the **Location** path together with a VRML model.
3. In the **Location** field, browse to the directory in which to create the project.
4. Click **Add Area**, and then click on the terrain to mark one corner of the rectangle, and click once again to mark the opposite corner and finish the operation.

   Note: If you want to remove the rectangle and create a new one, click **Remove Area** and repeat step 3.
5. If you want to modify the dimensions of the rectangle, edit the **Left** and **Right X** and **Upper** and **Lower Y** values.
6. Enter the model's **Length** and **Width** values, in inches. The selected area is scaled to this size for printing.

7. Select the **Elevation Quality** value.
8. Select the **Image Quality** in dpi.
9. Click **Create VRML** to start creating the VRML model. If you want to stop the creation process, click **Abort**.

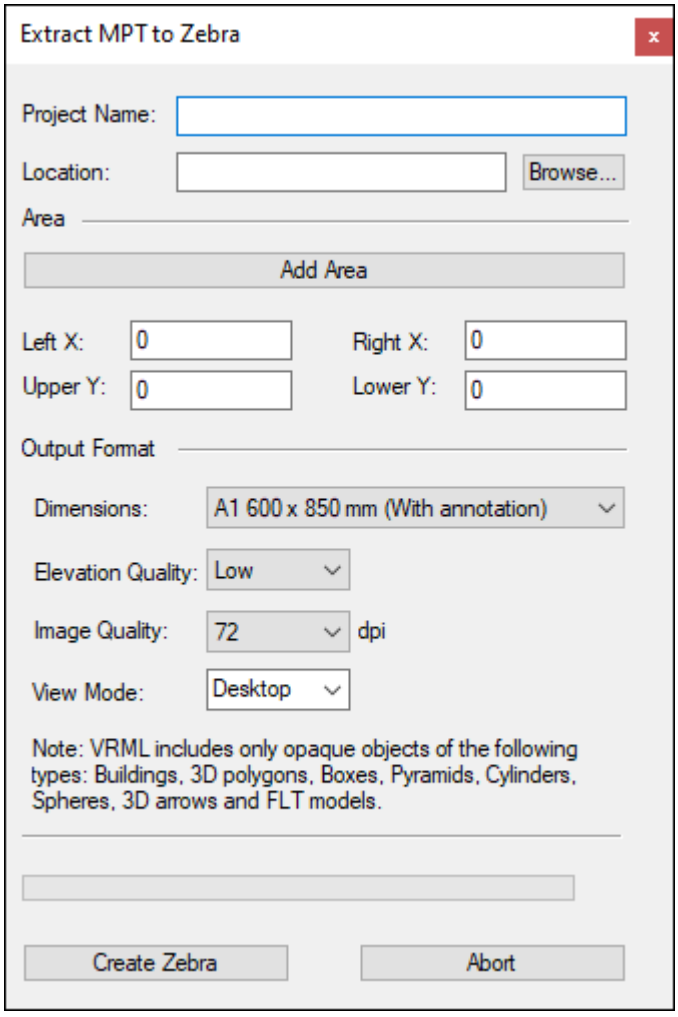
Note: The size of the image generated depends on the width, length and image quality. An image size less than 20.000 dots on each axis is recommended.

Extracting Terrain to Zebra

The Extract Terrain to Zebra tool creates a Zebra Imaging model from a local or remote MPT database to your local machine. Using the Extract Terrain to Zebra tool, you can create a Zebra model for producing 3D hologram images. For more information on Zebra Imaging, see http://www.zebraimaging.com/.

The extracted model includes the elevation and imagery information from the terrain database and buildings created by TerraExplorer Pro.

Building textures are currently not supported. You can control the size of the Zebra model by defining the export area, dimensions, and the image and elevation quality.



Extract MPT to Zebra Tool

Using the Extract Terrain to Zebra Tool

To extract a zebra model:

1. On the **Tools** tab, in the **Extract Terrain** group, click **Extract to VRML**, and select Extract to Zebra. The Export MPT to Zebra dialog is displayed.
2. Type the **Project Name**. A zip file by this name is created in the **Location** path.
3. In the **Location** field, browse to the directory in which to create the project.
4. Click **Add Area**, and then click on the terrain to mark one corner of the rectangle, and click once again to mark the opposite corner and finish the operation.

   Note: If you want to remove the rectangle and create a new one, click **Remove Area** and repeat step 3.
5. If you want to modify the dimensions of the rectangle, edit the **Left** and **Right X** and **Upper** and **Lower Y** values.
6. Select the **Elevation Quality** value.
7. Select the **Image Quality** in dpi.
8. Set the final hologram **View Mode**. Select **Wall** if the image is intended to be displayed on a wall or **Desktop** if it is intended to be displayed on a desktop.
9. Click the **Create Zebra** button to start creating the Zebra model. If you want to stop the creation process, click the **Abort**.

Note: The size of the image generated depends on the Dimensions, Elevation and Image Quality. We recommend that the image size be less than 20.000 dots on each axis.

Drawing Tools

Terra Explorer Pro's drawing tools allow you to:

- Create an urban scenario with its own roads, junctions and traffic lights (Urban design).
- Create multiple instances of the same object along a broken line, or within a closed polygon shape area.
- Create power lines along a user-defined path.
- Create pipelines along a user-defined path.
- Create fences and walls along a user-defined path.

Urban Design

The Urban Design tool enables you to create an urban scenario with its own roads, junctions and traffic lights.

To add urban design objects:

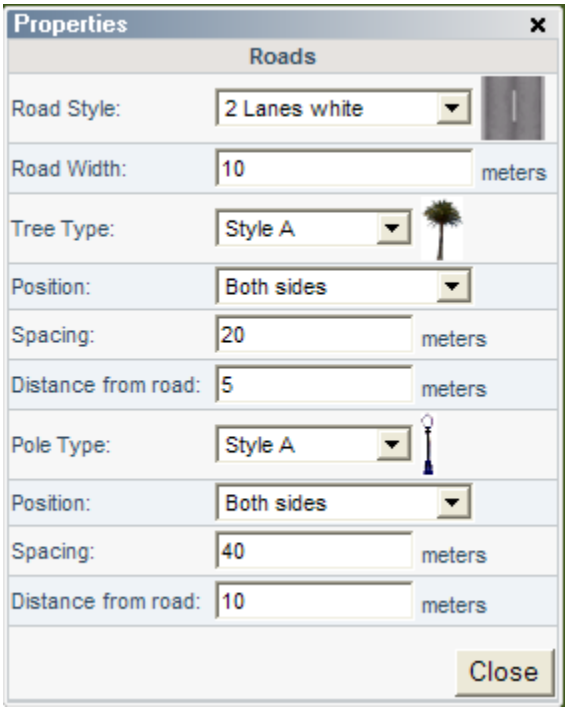
1. On the **Tools** tab, in the **Draw Tool** group, click **Urban Design**. The Urban Design toolbar is displayed.



Urban Design Draw Tool

2. On the **Urban Design** toolbar, select the required drawing object.
   - Road
   - Junction
   - Traffic Light
3. In the property sheet, set the object parameters.
4. In the **3D Window**, use the mouse to create the object.

Roads Object Parameters

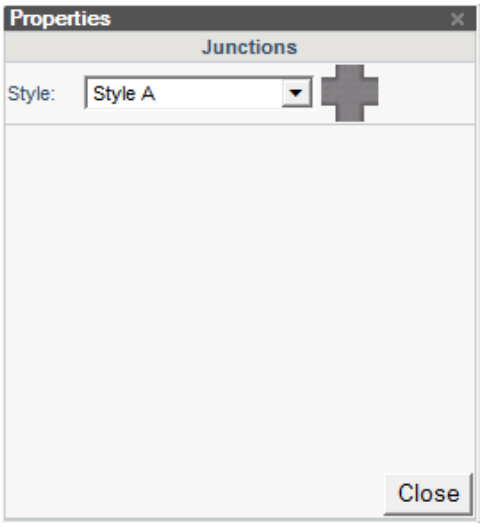


Urban Design - Build Roads Tool Property Sheet

Parameter	Activity
Road Style	Select one of the available road styles from the dropdown list.
Road Width	Set the road's width in meters.
Tree Type	You can add trees by the road from the types of trees available: **None**, **Style A** - **F** or **Random**.

Position	Set the trees' position to be on **Both Sides**, **Right**, **Left** or **Center**.
Spacing	Set the spacing between the road and the trees in meters.
Distance from Road	Set the tree's distance from the road in meters.
Pole Type	Add a pole by the road from 4 different types of poles available: **Style A - D**
Position	Set the pole's position to be on **Both Sides**, **Right** or **Left Side**.
Spacing	Set the spacing of the pole(s) from the road in meters.
Distance from Road	Set the distance of the poles(s) from the road in meters.

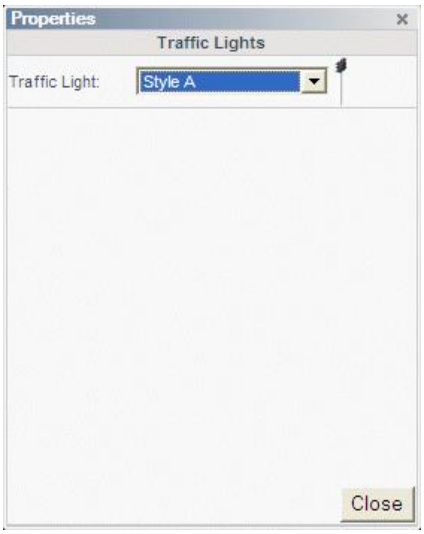
Junctions Object Parameters



Draw Tool - Urban Design

Parameter	Activity
Style	Select from one of the junction types.

Traffic Lights Object Parameters



Draw Tool - Urban Design

Parameter	Activity
Traffic Light	Select from one of the traffic light types.

Deleting Urban Design Objects

To delete an urban design object from the 3D Window:

1. On the **Urban Design** toolbar, click **Delete** .
2. In the **3D Window**, click the object you want to delete.

Editing Urban Design Objects

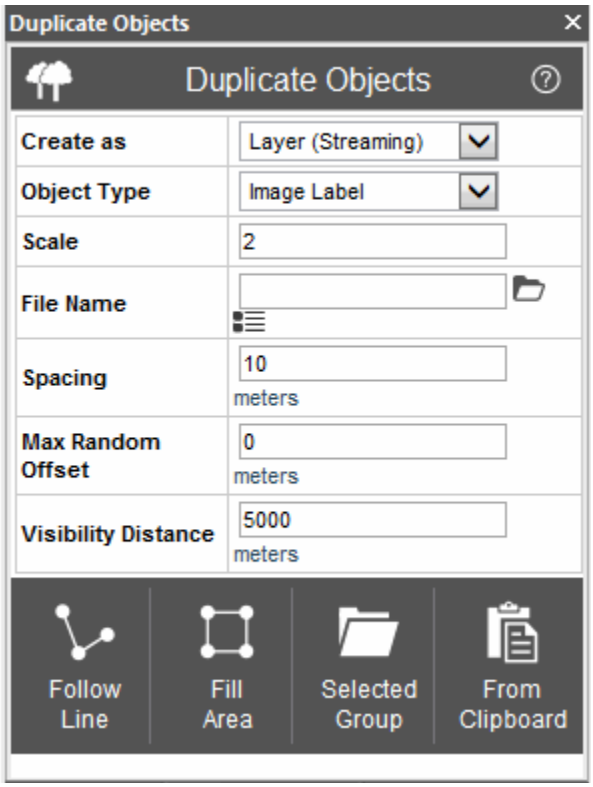
To edit an urban design object:

1. On the **Urban Design** toolbar, click **Edit** .
2. In the **3D Window**, click the object you want to edit. The object's property sheet is displayed.
3. Modify the object's parameters as required.

Duplicate Objects

The Duplicate Objects tool creates multiple instances of the same object along a broken line, or within a closed polygon shape area. For example, you may need to place street lights, phone booths, or bus stops along a section of a road, or place trees in a forest or park. The tool allows the user to set the basic graphic representation of the object and the spacing between the instances.

The output of a Duplicate Object operation is either a group of TerraExplorer objects or a Points layer that can be saved to a local data source (Shapefile format) and loaded as a Streaming or Entire layer.



Duplicate Objects Tool

To use the Duplicate Objects tool:

1. On the **Tools** tab, in the **Draw Tool** group, click **Duplicate Objects**. The Duplicate Objects dialog is displayed.
2. Select the **Create as** option:

Option	Description
Group	Create a group with objects.
Layer (Entire)	Create feature layer under the application AppData.
Layer (Streaming)	Create streaming feature layer under the application AppData.

3. Select the required **Object Type**, and then enter the other parameter values:

Parameter	Description
Object Type	Type of object: Text/Image Label, 3D Model, Regular Polygon, or one of the 2D or 3D Shapes
Scale	Determines the dimensions of the object.
File Name	This property is only displayed when the Image Label or 3D Model object type is selected. Browse to the required file.
Text	This property is only displayed when the Text Label object type is selected.

	Type the required label text.
Segments	This property is only displayed when the Regular Polygon object type is selected. Type the number of sides required.
Second Radius	This property is only displayed when the Ellipse object type is selected. Type the required value.
Height	This property is only displayed when the Box Cone, Pyramid, Arrow, or Cylinder object type is selected. Type the required height.
Spacing	Type the required distance between every two objects.
Max Random Offset	If this property is larger than 0, the objects are placed at random distances from the required location up to the maximum parameter.
Visibility Distance	Set the visibility distance of the objects.

4. Select one of the following methods of designating the placement of the duplicated objects:

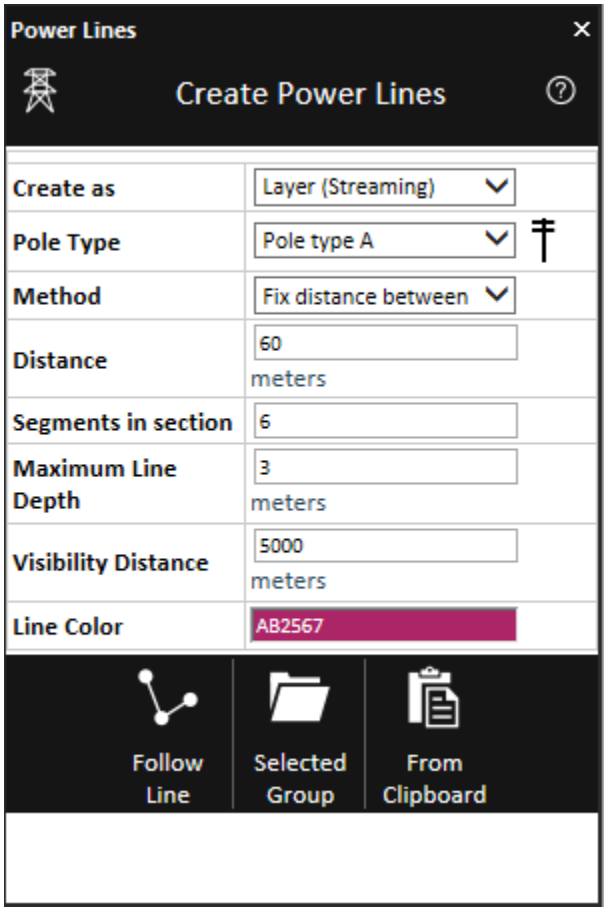
Method	Description
Follow Line	Duplicate the object along a line. Click **Follow Line**. Then in the **3D Window**, left-click to place the line waypoints, and right-click to complete the line.
Fill Area	Duplicate the selected object inside the drawn polygon. Click **Fill Area**. Then in the **3D Window**, left-click to set the line or polygon waypoint, and right-click to complete it.
Selected Group	Duplicate the object along all polylines or polygons in a selected group or layer. Select the required group or layer from the Project Tree and then click **Selected Group**. **Note:** Only first level polygons and polylines in an existing group are included.
From Clipboard	Duplicate the selected object based on a polyline or polygon clipboard object: ▪ **Polyline clipboard object** - Object is duplicated along the line. ▪ **Polygon clipboard object** - Object is duplicated inside the polygon. Click **From Clipboard**.

5. In the **3D Window**, left-click to place the line or polygon waypoints, and then right-click to complete the line or polygon.
6. If you want to modify additional parameters, in the **Project Tree Window**, right-click the duplication group and select **Properties**

Create Power Lines

This tool creates a power line by placing power poles along a user-defined path and connecting them with power lines.

The output of a create power line operation is either a group of TerraExplorer objects or a Point layer that can be saved to a local data source (Shapefile format) and loaded as a Streaming or Entire layer.



Power Lines Dialog

To use the Create Power Lines tool:

1. On the **Tools** tab, in the **Draw Tool** group, click **Power Lines**. The Create Power Lines dialog is displayed.
2. Select the **Create as** option:

Option	Description
Group	Create a group with objects.
Layer (Entire)	Create feature layer under the application AppData.
Layer (Streaming)	Create streaming feature layer under the application AppData.

3. Enter the following parameters:

Parameter	Description
Method	Select the required creation method: ▪ **Pole every waypoint** – To add a single pole on every left-click on the terrain. ▪ **Fixed distance between poles** – To add several poles between clicks with a fixed distance between each pole.
Pole Type	▪ **Pole Type A** creates a power line with two connecting wires. ▪ **Pole Type B** and **Pole Type C** create a power line with three connecting wires.
Distance between poles	This field is enabled when the Fixed distance between poles method is selected.
Segments in sections	The number of segments for connected power lines between two poles.
Maximum Line Depth	The height difference of the connected power lines between the highest and lowest points.
Visibility Distance	Set the visibility distance of the objects.
Line Color	The color of the drawn power line.

4. Select one of the following methods of designating the power lines to be created:

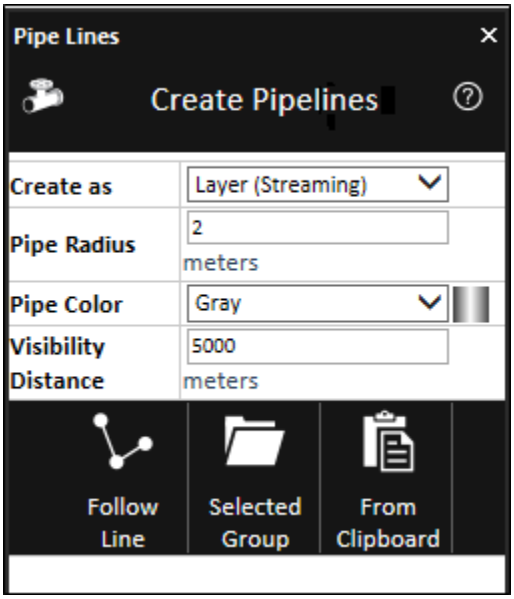
Method	Description
Follow Line	Create power lines along a line. Click **Follow Line**. Then in the **3D Window**, left-click to place the line waypoints, and right-click to complete the line
Selected Group	Create power lines along all polylines in a selected group or layer. Select the required group or layer from the Project Tree and then click **Selected Group**. **Note:** Only first level polylines in an existing group are included.
From Clipboard	Create power lines along a clipboard object. **Note:** Power lines are only created for polyline clipboard objects. Click **From Clipboard**.

5. If you want to edit additional parameters, right-click the Power Line group/layer in the Project Tree and select **Properties**.

Create Pipelines

This tool creates 3D pipelines long a user-defined path. The output of a create pipeline operation is either a group or a point feature layer, with pipe and connector objects. Both outputs can be saved to local data sources (Shapefile format) and loaded as Streaming or Entire layers.

Note: The pipelines tool does not support multipart features.



Create Pipelines Dialog

To create pipelines:

1. On the **Tools** tab, in the **Draw Tool** group, click **Pipelines**. The Create Pipelines dialog is displayed.
2. Select the **Create as** option:

Option	Description
Group	Create a group with objects.
Layer (Entire)	Create feature layer under the application AppData.
Layer (Streaming)	Create streaming feature layer under the application AppData.

3. Enter the following parameters:

Parameter	Description
Pipe Radius	Type the desired radius.
Pipe Color	Select the required color.
Visibility Distance	Set the visibility distance of the objects.

4. Select one of the following methods of designating the pipelines to be created:

Method	Description
Follow Line	Create pipelines along a line. Click **Follow Line**. Then in the **3D Window**, left-click to place the line waypoints, and right-click to complete the line
Selected Group	Create pipelines along all polylines in a selected group or layer. Select the required group or layer from the Project Tree and then click **Selected Group**.

	Note: Only first level polylines in an existing group are included. **Note**: The pipelines tool does not support multipart polylines.
From Clipboard	Create pipelines along a clipboard object. **Note:** Pipelines are only created for polyline clipboard objects. Click **From Clipboard**.

5. If you want to edit additional parameters, right-click the pipeline group/layer in the Project Tree and select **Properties**.

Create Fences and Walls Tool

The Create Fences and Walls tool enables you to easily create fences and walls in the precise dimensions, shape and texture you require. The output can be saved as a TerraExplorer group of objects or as a feature layer (shapefile).

A fence or wall can be created through the simple view (by clicking on the required fence/wall image) or through the advanced view that enables manual setting of relevant parameters.

To use the Create Fences and Walls tool:

1. On the **Tools** tab, in the **Draw Tool** group, click **Create Fences and Walls**. The Create Fences and Walls dialog is displayed.

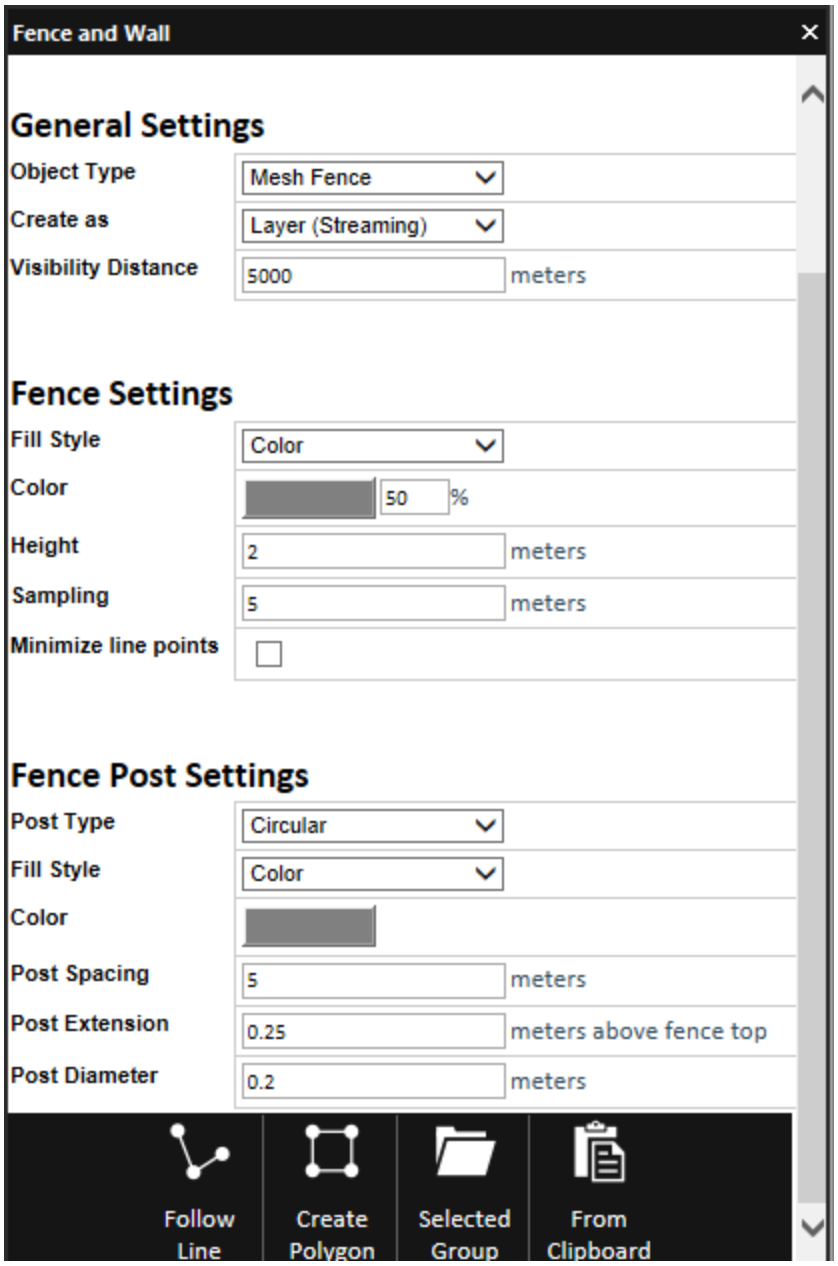


Fence and Wall Tool

2. If you want to create the fence or wall through the Simple view, select the required fence or wall style, by clicking a fence or wall image. This will automatically set the appropriate texture file as well as other parameters and create a Project Tree group that contains all the created fences/walls.

   Note: Once parameters are set in the Advanced mode (see below), these parameters are applied to all fences and walls created while the Fence and Wall tool remains open. Once the Fence and Wall tool is closed, the default parameters are restored.

3. If you want to use a different texture and/or manually set other parameters for the fence or wall, click **Advanced**. A Fence and Wall property sheet displays with fence/wall parameters.



Fence and Wall Parameters

4. In the **General Settings** section, enter the following parameters:

   Note: Once the Object Type is selected, the settings displayed below the General Settings section change to correspond to the selected type.

Parameter	Description
Object Type	Select one of the following: ▪ **Mesh Fence** – Fence with either a solid colored or textured surface. ▪ **Wall** – Object with measurable width.

	▪ **Wall with Fence Top** – Wall with a mesh fence (solid colored or textured) on top of it. ▪ **Wire Strand Fence** – Fence made of horizontal wires. **Note:** A wall differs from a fence in that it has measurable width.
Create as	Select one of the following: ▪ **Group** – Create a group with fence/wall objects. If the fences or walls are being created based on the polylines or polygons in a selected group or layer (**See** step 6 below), the new group will contain a fence/wall object for each polyline or polygon in the original group or layer. ▪ **Layer (Entire)** – Create a feature layer under the application AppData. If the fences or walls are being created based on the polylines or polygons in a selected group or layer (**See** step 6 below), the new layer will contain a feature for each polyline or polygon in the original group or layer. ▪ **Layer (Streaming)** – Create a streaming feature layer under the application AppData.
Visibility Distance	Sets the maximal distance from the camera above which the fence/wall disappears.

5. Enter the parameters that are relevant for the selected object type:

Parameter	Description
Wire Strand Settings (For Wire Strand Fence)	
# of Strands	Number of horizontal wires to be placed within the height of the fence.
Strand Color	Color of the wires.
Height	Height of the fence.
Sampling	Distance between points added to the fence, in meters. The smaller the spacing, the more accurately the fence follows the terrain, but the longer it takes to calculate.
Minimize line points	Simplifies the number of sampling points calculated for the fence.
Fence Post Settings (For Mesh Fence, Wire Strand Fence, and Wall with Fence Top)	
Post Type	Select one of the following types: ▪ **None** – No fence posts are rendered. ▪ **Circular** – Fence posts are rendered as cylindrical objects. ▪ **Square** – Fence posts are rendered as rectangular objects.
Fill Style	Select the fill type for the posts:

	▪ **Color** – The posts get a single-color filling according to the Color field. ▪ **Texture** – The posts get the texture from an external texture file according to the Texture field.
Color	Select the color of the posts and the % opacity of the post fill.
Texture	Browse to the GIF, JPEG, or PNG to provide the texture for the posts.
Post Spacing	Type the required distance between posts, in meters. The smaller the spacing, the more accurately the fence follows the terrain, but the longer it takes to calculate.
Post Extension	Height, in meters, that the posts extend above the fence.
Post Diameter	Diameter of the rendered circular posts or width of the rendered rectangular posts, in meters.
Wall Settings (For Wall and Wall with Fence Top)	
Fill Style	Select the fill type for the wall: ▪ **Color** – The wall gets a single-color filling according to the Color field. ▪ **Texture** – The wall gets the texture from an external texture file according to the Texture field.
Color	Select the color of the wall and the % opacity of the fill.
Texture	Browse to the GIF, JPEG, or PNG to provide the texture for the wall.
Height	Height of the wall in meters.
Wall Width	Width of the wall in meters.
Sampling	Distance between points added to the wall, in meters. The smaller the spacing, the more accurately the wall follows the terrain, but the longer it takes to calculate.
Minimize line points	Simplifies the number of sampling points calculated for the wall.
Wall Post Settings (For Wall and Wall with Fence Top)	
Post Type	Select one of the following types: ▪ **None** - No wall posts are rendered. ▪ **Circular** – Wall posts are rendered as cylindrical objects. ▪ **Square** – Wall posts are rendered as rectangular objects.
Fill Style	Select the fill type for the posts: ▪ **Color** – The posts get a single-color filling according to the Color field. ▪ **Texture** – The posts get the texture from an external

	texture file according to the Texture field.
Color	Select the color of the posts and the % opacity of the post fill.
Texture	Browse to the GIF, JPEG, or PNG to provide the texture for the posts.
Post Spacing	Type the required distance between posts, in meters. The smaller the spacing, the more accurately the wall follows the terrain, but the longer it takes to calculate.
Post Extension	Height, in meters, that the posts extend above the wall.
Post Diameter	Diameter of the rendered circular posts or width of the rendered rectangular posts, in meters.
Fence Settings (For Wall with Fence Top)	
Fill Style	Select the fill type for the fence top: ▪ **Color** – The fence gets a single-color filling according to the Color field. ▪ **Texture** – The fence gets the texture from an external texture file according to the Texture field.
Color	Select the color of the fence top and the % opacity of the fill.
Texture	Browse to the GIF, JPEG, or PNG to provide the texture for the fence top.
Height	Height of the fence top, in meters.

6. Select one of the following methods of designating the fences/walls to be created:

Method	Description
Follow Line	Build a fence or wall along a line. Click **Follow Line**. Then in the **3D Window**, left-click to place the line waypoints, and right-click to complete the line
Create Polygon	Build a fence or wall along a polygon's borders. Click **Create Polygon**. Then in the **3D Window**, left-click to place the polygon waypoints, and right-click to complete the polygon.
Selected Group	Build fences or walls along all polygons or polylines in a selected group or layer. Select the required group or layer from the Project Tree and then click **Selected Group**. **Note:** Only first level polygons and polylines in an existing group are included.
From Clipboard	Build a fence or wall along a polyline or polygon clipboard object. Click **From Clipboard**.

7. If you want to edit these or additional parameters, right-click the group/layer in the Project Tree and select **Properties**.

Timespan Tool

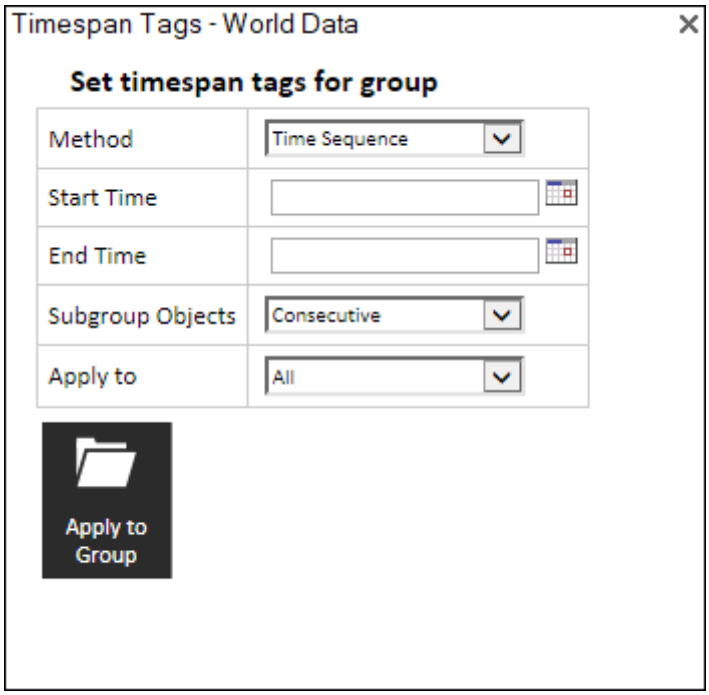
Timespan tags restrict the visibility of data to a specific period of time. Timespans are usually used for data sets that appear in multiple locations (e.g., Placemarks moving along a path). The data associated with a timespan is visible only when the time slider is showing the time interval defined in the timespan tag.

The timespan for an individual object can be set in its property sheet. Similarly, the timespan for a group can be set from the group property sheet, when you want all objects in the group and all subgroup objects to have the same timespan. The Timespan Tool is necessary when you want to evenly split a timespan, either between a group's subgroups or between all the objects in all of a group's subgroups.

Using the Timespan Tags Tool

To use the Timespan Tags tool:

1. In the **Project** Tree, select the group.
2. On the **Tools** tab, in the **Time** group, click **Timespan Tags**. The Timespan Tags dialog is displayed.



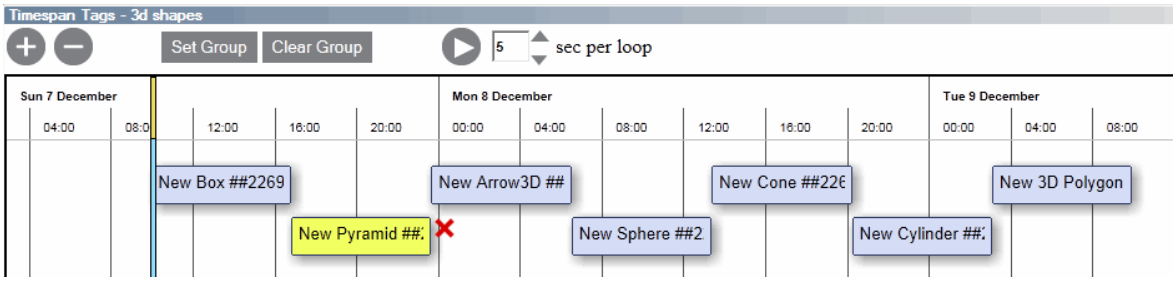
Timespan Tags

3. Select a **Method**:
   - **Time Sequence** – Split the timespan evenly between the group objects with each object displaying after the one that preceded it on the Project Tree, for an equal fraction of the total time.
   - **Full Time Range** – Set the entire timespan for each of the group objects (so that they all display for the entire timespan).
4. Click **Start Date and Time**, and enter a **Start Time.**
5. Click **End Date and Time**, and enter an **End Time**.
6. If the group contains subgroups, in the **Subgroup Objects** field, define how the objects within each subgroup should display:

Note: When the Method is set to Full Time Range, this field is not available.

- **Consecutive** - The objects within each subgroup display successively, each for an **equal** fraction of the total timespan.
- **Simultaneous** - Each subgroup should function like a unified object, with all the objects within each subgroup displaying simultaneously during the subgroup's segment of the total timespan.

7. In the **Apply to** field, select to apply the group timespan to either:
   - **All** – All objects in the group. Any timespan tags previously set for individual objects in the group are deleted and reset in accordance with the timespan set in this tool.
   - **Objects without time** – Only group objects that didn't already have a timespan tag. All objects with a previously set timespan tag will display according to that timespan tag.
8. Click **Apply to Group**. A timeline is displayed showing each object in the group and the date and time in which it will be visible.



Timespan Timeline

9. If you want to clear the timespan set for the group, click **Clear Group**.
10. If you want to modify an object's display, click the required object on the timeline and then do any of the following:
    - To remove the object from the timespan group - click the red x next to the object.
    - To modify the sequence in which an object displays, drag the object to the required position on the timeline.
    - To change the length of time for which the object displays, point to the edge of the required object until the cursor becomes a double-sided arrow. Then click and drag the mouse to resize the selected object.
11. If you want to automatically cycle through the group objects with each displaying in turn in the 3D Window during its segment of the group timespan, click **Play** **.** Set the time for each cycle in the **sec per loop** field.
12. Click **Zoom in/out** to zoom in and out of the timeline.

If you want to clear the timespan set for a particular group (after closing the group's timeline):

1. On the **Tools** tab, in the **Time** group, click **Timespan Tags**.
2. In the **Project Tree**, select the required group.
3. In the **Timespan Tags** table, click **Clear Group**.

Block Width Tool

An appropriate block width is one of the most critical parameters used to stream a layer efficiently. If the block width is too big, it will take time to request for the data from the data source and it could take a lot longer to render it. If the block width is too small, TerraExplorer "wastes" many requests transmitting data it could have easily transmitted in one request. This also results in "bothering" the data source with many small requests.

The Block Width tool calculates an appropriate block width for efficient layer streaming. In some cases, setting the best block width for a layer is an iterative process. Two major factors influence the selection of the block width for a layer:

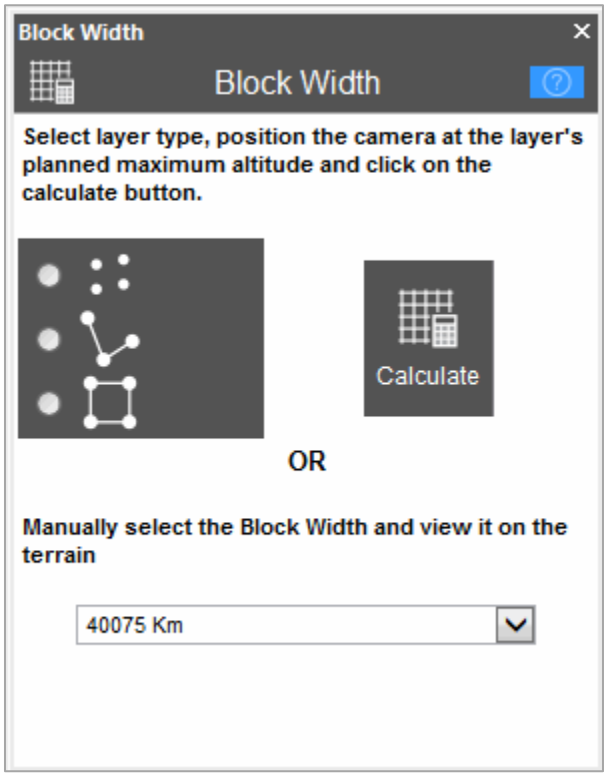
- **Layer's Maximum Visibility Distance** – The higher you want to view the data, the bigger the block width should be.
- **Density and Precision Level** - The denser and precise the data, i.e., the mean points or vertices per area, the smaller the block width should be.

Sometimes, although the data is very dense and precise, you might want to view it from a high visibility distance. In this situation, it is advised to simplify the layer.

Using the Block Width Tool

To use the Block Width tool:

1. On the **Tools** tab, in the **Calculate** group, click **Block Width**. The Block Width dialog is displayed.



Block Width Tool

2. Select the layer's type

3. Position the camera at the layer's planned maximum altitude
4. Click **Calculate**.

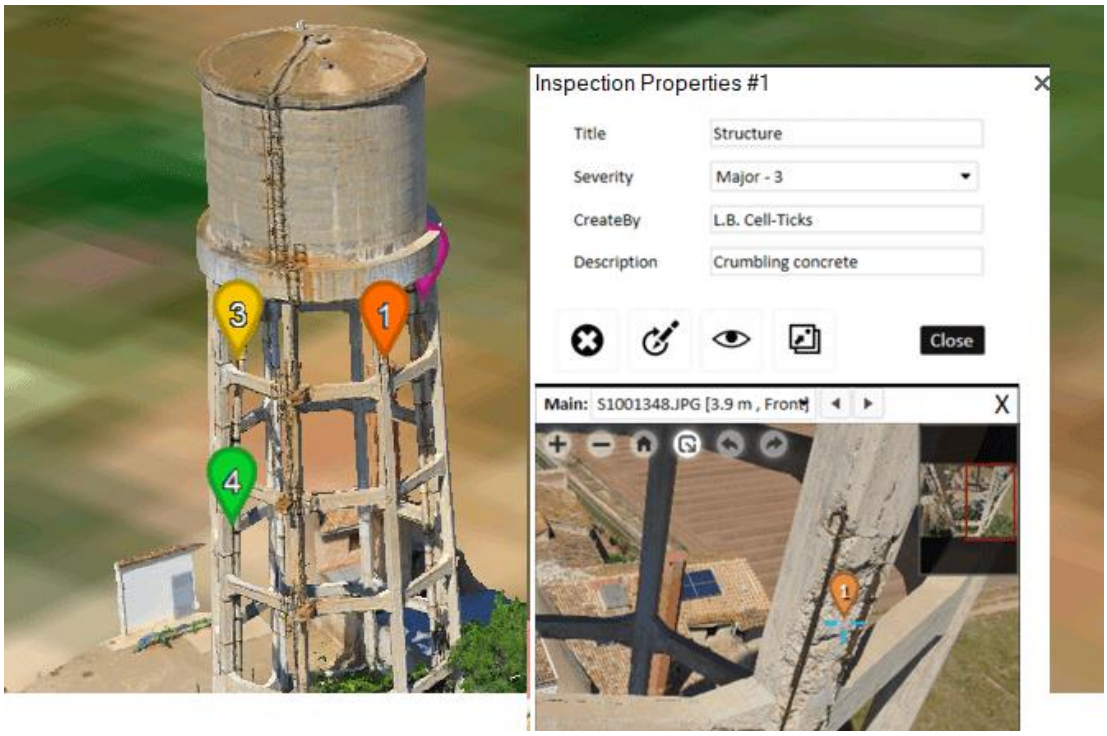
   OR

   From the dropdown list, manually select the Block Width dimensions and view it on the terrain.

Photo Inspector Tool

The Photo Inspector tool displays the photos used to generate a PhotoMesh 3D model so you can view and inspect any section of your model (tower, bridge, construction site, etc.) together with the source photos used to produce it. Photo Inspector makes it easy to navigate within the model and between the model and its associated photos, so you can find the best photos for each area of the model.

The Photo Inspector also provides a set of drawing and measurement tools to mark areas and locations on the model and generate a detailed report with all inspection details.

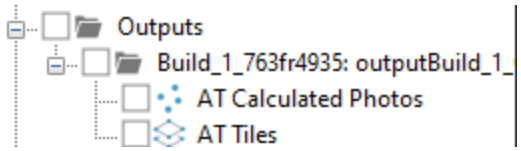


Starting the Photo Inspector Tool

To perform photo inspections, the Photo Inspector tool requires access to the PhotoMesh 3D model output (3DML) and the photos layer generated by PhotoMesh's aerotriangulation process. The tool also needs access to the folder or server containing the original photos used by PhotoMesh.

To start the Photo Inspector tool:

1. Load the output FLY file produced in a PhotoMesh project (*outputs.fly*) into your TerraExplorer project. To determine the location of this file, in **PhotoMesh**, open the project with your generated output. Then in the **Build Outputs** list, select **Open Project Folder,** or **Open in TerraExplorer** to open the output in TerraExplorer directly from PhotoMesh. **See** PhotoMesh User Guide for more information. When this file is loaded into the project, an Outputs group is created in the Project Tree that contains two shapefiles: *AT Calculated Photos* and *AT Tiles*. E.g.,



Note: It is recommended to save a copy of the PhotoMesh outputs.fly project to another location or publish it to SkylineGlobe Server. You can publish PhotoMesh projects with photos to SkylineGlobe Server from the Publish Project with Photos to SGS setting.

2. On the **Tools** tab, in the **PhotoMesh** group, click **Photo Inspector**. The Photo Inspector dialog is displayed.

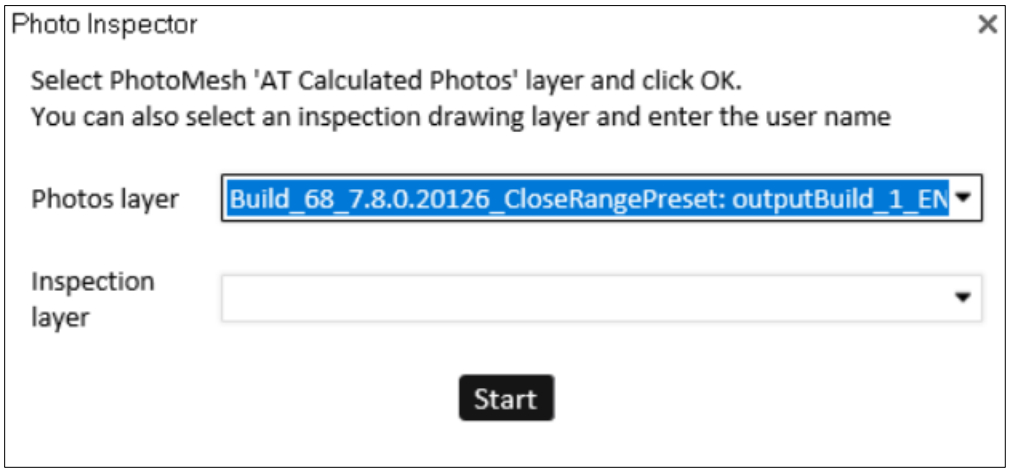


Photo Inspector

3. The Photos layer field is automatically populated with the AT Calculated Photos layer in the selected project. If there are multiple Calculated Photos layers, select the required layer from the dropdown list.
4. The Inspection layer field is automatically populated with all polyline and polygon feature layers in the project. **See** "Using Inspection Layers" in this chapter for more information.
5. Click **Start**. The Photo Inspector Quick Guide is displayed.

Setting an Inspection Point (Point of Interest)

To set an inspection point:

1. In the **Photo Inspector Quick Guide**, click **Zoom in** to view the inspection area.
2. Click **Set inspection point** (Shortcut key: "m") and then click on the model in the point of interest. The photos looking at the point are listed in the Photo Inspector lists under the main and secondary viewers. In the 3D Window, photo icons are displayed for each of the photos looking at the point.
3. If the photo viewers are displayed, you can select a new point of interest by clicking **Set inspection point**, and then clicking on one of the photos.
4. Use the **Reset** button on the toolbar to clear the inspection point, close the photo viewers and reset the visibility filter on the photo's layer in the 3D Window to view all photo icons.

Photo Inspector Lists

To be listed in the viewers' Photo Inspector lists, a photo must meet the following conditions:

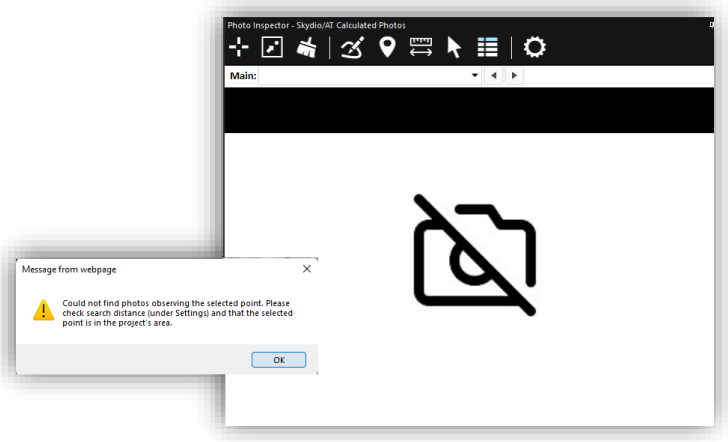
- Its location is within the Settings-Search distance value of the point of interest.
- It was calculated by PhotoMesh's aerotriangulation process.
- The point of interest was projected within the photo frame but not too close (> 50 pixels) to the edge of the photo.

The number of photos listed in the viewers is determined by the Max Results per Viewer setting. The photos are listed in order from most relevant to the point of interest to least relevant according to the following criteria:

- Distance between the photo and the selected point
- Angle of the camera to the selected point in comparison to the viewer angle

If the selected point is on a horizontal surface (road, roof), more weight is given to the distance factor. If the selected point is on a vertical surface, more weight is given to the angle.

If there are no photos that meet the filter criteria, the photo viewer displays a "no photo" image and a message that no photos were found.



Using the Photo Viewers (Main and Secondary)

After selecting a point of interest, the Photo Inspector selects the most relevant photo and zooms in to the selected point on the photo in the photo viewer. The selected point is marked by a blue crosshairs on the photo and on the 3D model. All the photos looking at the point that meet the criteria listed above, are listed in the Photo Inspector under the main and secondary viewers:

The Photo Inspector includes two viewers as described below. In Settings, you can set whether to show only a single viewer (main) or whether to show also a secondary viewer:

- **Main photo viewer** – If only one viewer is set, then the main viewer shows all photos. If two viewers are set, then the main viewer shows either only RGB photos or only photos looking at the point of interest from the front and above (depends on the secondary photo viewer settings).
- **Secondary photo viewer** – The secondary photo viewer is used to display alternative photos to the main viewer. There are two options for the secondary viewer:
  - **From Alternative Direction**: Photos looking at the point of interest from the left, right, and behind.

- **Non-RGB Photos**: If the project contains RGB and non-RGB collections, the secondary viewer can be used to view the non-RGB photos (e.g., NIR, thermal). In this case, the main viewer displays RGB photos from all angles and the secondary viewer displays non-RGB photos from all directions.

Switching Between Single and Multiple Viewers

To switch between single and multiple viewers:

- On the **Photo Inspector** toolbar, click  to toggle between a single viewer (main) and two viewers (main and secondary). You can also toggle on/off this option from the **Settings** dialog (Show secondary viewer)

Selecting the Photos to be Displayed

To set the photos to be displayed in the secondary viewer:

- In **Settings**, select either of the following:
  - **From alternative direction** - Photos looking at the point of interest from the left, right, and behind
  - **Non-RGB collections** - e.g., NIR, thermal

Attaching the Secondary Viewer to the Main Viewer

Attaching the secondary viewer to the main one links the two viewers so that the secondary viewer moves to focus on the same center point as in the main viewer, whenever you drag or zoom in the main viewer. If the center point doesn't exist in the photo shown in the secondary viewer, a black photo is displayed.

To attach the secondary photo viewer to the main viewer:

- In **Settings**, toggle on the **Attached to Main** option.

Viewing the Inspection Point in the Photos

After selecting a point of interest, the Photo Viewer's Photo Inspector lists show the most relevant photos according to the Max Results per Viewer setting.

To view the inspection point in the photos, do any of the following:

- Select a photo in the viewers' dropdown photo lists.
- Use the Next/Previous buttons or the keyboard shortcuts "<", ">" to browse through the photos.
- In the **3D Window**, click any camera icon to display the photo associated with it in the relevant viewer (main or secondary).
- Use the **Photo Inspector's on-screen controls** to inspect a photo in the viewer:



  -  and  to zoom in and out

-  and  to rotate left and right
-  zoom out to see entire photo

Note: The Toggle Full Page  command is disabled in this version.

- Hover over a photo in the main or secondary viewer to display a virtual cursor  on the 3D model in the 3D Window in the same location. This virtual cursor indicates the location of the hovered position on the photo.

Publishing a Project with Photos to SGS

When publishing the TerraExplorer project to SGS, all photos associated with the AT inspection layer can also be published.

Note: This capability is only available for SGS 7.3.1 or higher.

To publish:

- Click **Publish** to publish the photos linked to this layer when publishing to SGS. Then in the Publish to SGS dialog that is displayed, click **Publish**.

When opening the published project, the online photos layer has a new attribute field called "das_userfilename" that contains the online address of each photo. Photo Inspector automatically identifies this attribute value and works with the online resources.

Using Inspection Layers

Using the Photo Inspector tool, you can create inspection feature layers in which you mark and measure areas in your 3D model or on photos in the Photo Inspector. You can create a new layer for this purpose or designate any polyline or polygon feature layer created or loaded into the project as an inspection layer.

The model or photo can be marked with inspection points, polylines, or polygons. An HTML or PDF inspection report can then be generated with information about the project and all inspection markings and measurements.

Creating and Selecting Inspection Layers

Either select an inspection layer already loaded to your TerraExplorer project or create a new layer.

To select an inspection layer, do either of the following:

- Select the inspection layer from the initial **Photo Inspector** dialog.
- In **Settings**, select a layer from the **Inspection Layer** list. The Inspection layer field is automatically populated with all polyline and polygon feature layers in the project, whether created in the project or loaded into it.

To create a new inspection layer:

1. In the Photo Inspector **Settings**, **Create inspection layer** field, click **Create**. The New Inspection Layer dialog is displayed.
2. Type a name for the layer and define custom attributes, that can be used to characterize and categorize the inspection area polygons.

3. Click **Create.** The inspection layer with its lines and annotations is stored as a GeoPackage file.

Adding Markings and Measurements

To add markings and measurements to an inspection layer, do any of the following:

- **Add an inspection line or polygon**:

  On the **Photo Inspector** toolbar, click **Draw inspection line on model or photo** . The inspection line is drawn according to the Draw Mode style selected in the Photo Inspector settings. In all modes you can draw the lines on the 3D model or on the photos:

  - **Polyline** - Place the polyline points by clicking in the desired locations. Finish the polyline creation by right-clicking.
  - **Freehand Line** – Click and hold the left mouse button and draw the freehand line on the 3D model or on a Photo. Release the left mouse button to complete the drawing.
  - **Polygon** - Place the polygon points by clicking in the desired locations. Finish the polygon creation by right-clicking.

- **Add an inspection point**:

  On the Photo Inspector toolbar, click **Draw inspection point** on model or photo . Then click anywhere on the model or on a photo.

- **Measure distance**:

  On the **Photo Inspector** toolbar, click **Start distance measurement** . Click any point on the model or on a photo to define the start point of the measurement. A yellow line extends from the start point. Click again to add additional measurement points. Right-click to finish the measurement.

  Note: You can choose between U.S measurement units (feet and inches) and imperial unit (meters) by setting the Measurement Units in the **Settings** dialog.

Setting Inspection Layer Styling

The color of the inspection layer markings and annotations (e.g., ) is based on its severity setting (OK=green, Minor=yellow, Major = orange, Severe = red, Critical = purple). The inspection layer default styling can be modified in the layer's property sheet.

Note: The annotation number is a unique feature index. Markings may sometimes not be consecutively numbered (e.g., in the case of deleted markings or another user working on the same inspection layer).

To modify layer styling:

1. On the **Photo Inspector** toolbar, click **Settings** . The Settings dialog is displayed.
2. In the **Inspection Layer** section, click **Edit Style**. The inspection layer's property sheet is displayed.
3. Modify the properties as required (e.g., line color, annotation color).
4. To reset the inspection layer's properties to the default, in the **Settings** dialog, in the **Inspection Layer** section, click **Reset Style**.

Setting Inspection Attributes and Editing Inspection Markings

Using the Inspection Properties dialog, you can set and edit inspection marking attributes and perform several editing operations.

To set inspection attributes:

1. Open the **Inspection Properties** dialog. The Inspection Properties dialog is displayed after you add an inspection marking or measurement. The Inspection Properties dialog is also displayed when doing either of the following:
   - On the **Photo Inspector** toolbar, click **Select inspection drawing on model or photo** and select an inspection feature from the 3D Window. Note that you cannot select an inspection feature from a photo**.**
   - From the **Inspections List**, select the **Edit** option.
2. Enter/edit the inspection attributes:
   - **Title** – Free text describing the inspection marking subject. For distance measurements, the title includes the distance calculation
   - **Severity level** – Select the severity from the selection box (only for markings, not measurements).
   - **Author** – Author of the inspection. The name entered last is used as the default value for new inspection features.
   - Optional attributes (only for markings, not measurements).
3. Perform any of the following operations in the **Inspection Properties** dialog:
   - Click **Delete** to delete the inspection drawing.
   - Click **Redraw** to redraw the inspection drawing.
   - Click **Zoom in** to zoom in to the inspection drawing.
   - Click **Show Photos** to open the Photo Viewer and show photos looking at the area marked by your inspection feature.
   - Click **Select Attribute Values from BIM Model** to select a BIM element on the BIM model and open its sheet with its attribute values. If you want to include some of the BIM attribute information in your inspections list, you can copy attribute values from the property sheet to the inspection attributes. **See** "Viewing an Inspections List" in this chapter for more information.

Viewing an Inspections List

To view a list of markings and measurements to an inspection layer:

1. In **Photo Inspector** Settings, select an Inspection layer from the dropdown list.
2. On the **Photo Inspector** toolbar, click **Show list of inspection drawings.** The Inspections List is displayed, showing a table of all the inspections markings and measurements in the layer.
3. Do any of the following:
   - Click **View** to zoom in the model in the 3D Window to the selected inspection marking or measurement.
   - Click **Edit** to open the Inspection Properties dialog for the selected inspection marking or measurement. **See** "Adding Markings and Measurements" in this chapter for more information.
   - Click **View Photos** to open the Photo Viewer and show photos looking at the area marked by your inspection feature.
   - Click the column headers to **sort** the inspections.
   - Enter search keywords in the **Search** box to filter the Inspections List.

- Click **Generate Report** to generate an inspection report from the Inspections List.
- Click **Open Attribute Table** to open the TerraExplorer attribute table showing all the inspections markings and measurements in the layer.

Generating an Inspection Report

The inspection report is an HTML or PDF that shows information about the project and all inspection markings. Measurement features are not included in the report.

To generate an inspection report:

1. Open the **Inspections List** .
2. Click **Generate Report**.

The inspection report includes the following sections:

- **Project Information** – General information about the inspection project, including project name, description, company commissioning, and author (based on the Project Information fields in Settings).
- **Index Map** – List of all inspection markings and an overview snapshot of the 3D model with the inspection annotations.
- **Inspection Information** – Each of the inspection markings in the index links to a page with attribute information and a photo viewer showing the area of the model with the inspection marking. Pan and zoom in the photo viewer to find the best view before saving the report as a PDF.

To save the report to a PDF document:

1. On the top of the report, click **Save as PDF**.
2. In the browser's print dialog, select the **Save as PDF** and not the **Microsoft Print to PDF** option.

Photo Inspector Settings

Settings for your current inspection project can be viewed and edited from the Photo Inspector Settings dialog. These settings include general project information, viewer properties, photo filter settings, and inspection layer properties. The settings are saved separately for each photo layer and applied when closing the Settings dialog (either by clicking X or Close).

To view and modify photo inspector settings:

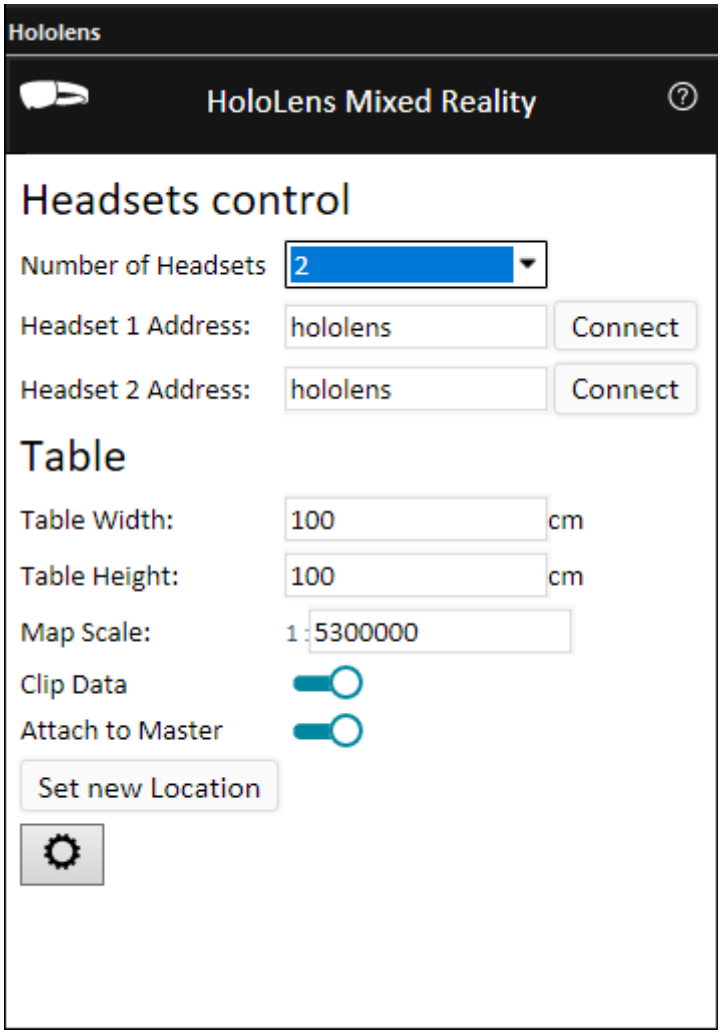
- On the **Photo Inspector** toolbar, click **Settings** , and view/modify the settings as required:

Parameter	Description
Settings	
Fix Photo Path URL	If the wrong URL is associated with a photo, click **Fix**. Then in the **Find** field, enter the current URL and in the **Replace with** field, enter the URL that you want to replace it with.
Camera Symbol Size	Enter the size of the camera symbols that should display for each photo.
Search Distance (m)	Search distance, in meters, for photos looking at the selected point. Enter a value that is suitable for the effective range of photos in your project.

Max Results Per Viewer	Number of photos that will be listed in the photo viewer photos list (for both the main viewer and secondary viewer).
Use PhotoMesh tiled photos format (smpt)	Turn on to stream only the required tiles of SMPT at the appropriate zoom level. This eliminates the need to load large JPEGs, improving. the performance of Photo Inspector.
Publish	
Publish Project with Photos to SGS	Click **Publish** to publish also the original photos used by PhotoMesh (referenced by the AT Calculated Photos layer) when publishing to SkylineGlobe Server. Then in the Publish to SkylineGlobe Server dialog that is displayed, click **Publish**. **Note**: This capability is only available for SkylineGlobe Server 7.3.1 or higher.
Extract and Publish Area as Offline Kit	Click **Publish** to publish also the original photos used by PhotoMesh (referenced by the AT Calculated Photos layer). Then in the Extract and Publish Area as Offline Kit dialog that is displayed, enter the required information, and click **Publish**. **See** "Extract and Publish Area as Offline Kit" in the "Publishing TerraExplorer Projects" chapter for information.
Secondary Viewer	
Show Secondary Viewer	In a single viewer mode, the main viewer shows photos from all directions. When a secondary viewer is shown, it displays alternative photos to the main viewer: either from alternative directions or non-RGB photos (depends on the Secondary viewer settings).
Attached to Main	Attaching the secondary viewer to the main one links the two viewers so that the secondary viewer moves to focus on the same center point as in the main viewer, whenever you drag or zoom in the main viewer.
Secondary Viewer	Select what to display in the secondary viewer: ▪ **From alternative direction** - Photos looking at the point of interest from the left, right, and behind ▪ **Non-RGB collections** - e.g., NIR, thermal
Inspection Layer	
Inspection Layer	Select the required inspection layer.
Layer Style	Click **Edit Style** to open the inspection layer's property sheet, and modify the properties as required (e.g., line color, annotation color). Click **Reset Style** to reset the inspection layer's properties to the default settings.
Create Inspection Layer	Click **Create** to create a new inspection layer. The New Inspection Layer dialog is displayed. Type a name for the layer and define custom attributes, that can be used to characterize and categorize the inspection area markings, and click **Create**.
Draw Mode	Select the drawing mode for the inspection markings: ▪ Polyline ▪ Freehand line ▪ Polygon

Line Width	Line width of the inspection markings.
Max Symbols per Photo	Maximum number of inspection markers and measurements to display on each photo viewer. A large number of drawings may affect the tool's speed.
Measurement Units	Select Metric or U.S. Imperial.
Mesh Model BIM Model	If you want to include information from an associated BIM model in your inspection report, select the required mesh model in the Project Tree, and click **Capture**. Then select the required BIM model in the Project Tree, and click **Capture**. Click **Reset** to remove the selection.
Project Information	
Project Name	Name of project.
Project Description	Free text describing the project.
Created for	Free text identifying the company commissioning the project.
Author	Name of inspector.

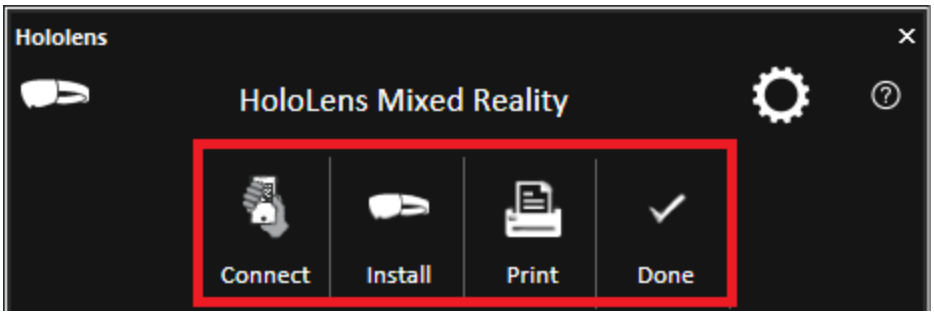
HoloLens Tool



The HoloLens plug-in (TEZ) displays the TerraExplorer 3D view as a lifelike 3D hologram that can be viewed in the HoloLens 2 immersive headsets. The hologram is displayed on a virtual table whose dimensions can be customized and whose location is determined simply by the placement of a QR code. From TerraExplorer's GUI, you connect TerraExplorer to your HoloLens headsets and manage various settings.

To install and set up (first time use):

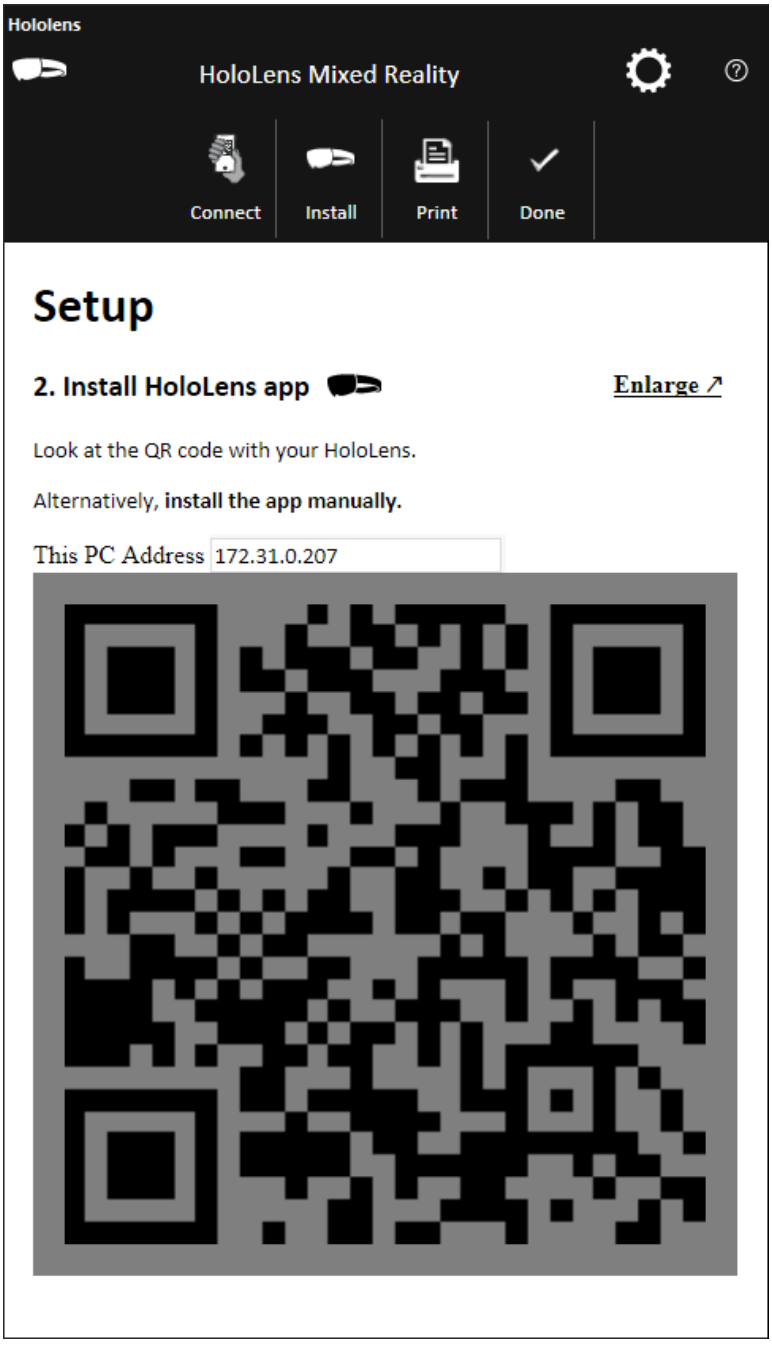
1. Double click the HoloLens.tez file received from Skyline.
2. Open TerraExplorer, and on the **Tools** tab, click **HoloLens**.
3. The HoloLens Mixed Reality dialog is displayed. If HoloLens was not yet set up, the HoloLens tool opens directly to a series of setup screens. You can navigate between these screens using the tabs at the top of the dialog: **Connect, Install, Print, Done.**



4. On the **Connect** tab, enter the IP address of the computer running TerraExplorer that will be used by the HoloLens headset and your handheld controller device to connect to TerraExplorer. The HoloLens tool automatically scans the network for available IP's and lists them under the **Suggested** section. Select one of the suggested IPs or type your own.



5. **Connect a handheld device:** The QR code in the dialog updates to the selected IP. Scan the QR code with the handheld device (e.g., phone) you intend to use as a controller for HoloLens to connect to the same network. Then click the **Install** tab at the top of the TerraExplorer Setup dialog on your computer.



6. **Install Skyline Remote Player on each of the HoloLens headsets:** Put on the HoloLens headset and look at the QR code on the setup page. Then do the following:

   a. On the HTML page that opens, click **Download Player** to download the Skyline Remote Player. The installation file will display in your browser's Downloads list.

b. When the download is complete, click on the file in the **Downloads** list. The installation page is displayed on the HoloLens headset.

c. Click **Install**. Enter the **Sign-in** pin of the HoloLens account, and again click **Install**.

7. **Run Skyline Remote Player on each of the HoloLens headsets:** After installation is complete, put on the headset and use the start gesture to launch the main menu. Then do the following:

a. Select the **Settings** tile to launch the **Skyline Remote Player** app in your environment.

b. Select **Update**.

c. Select **For developers**.

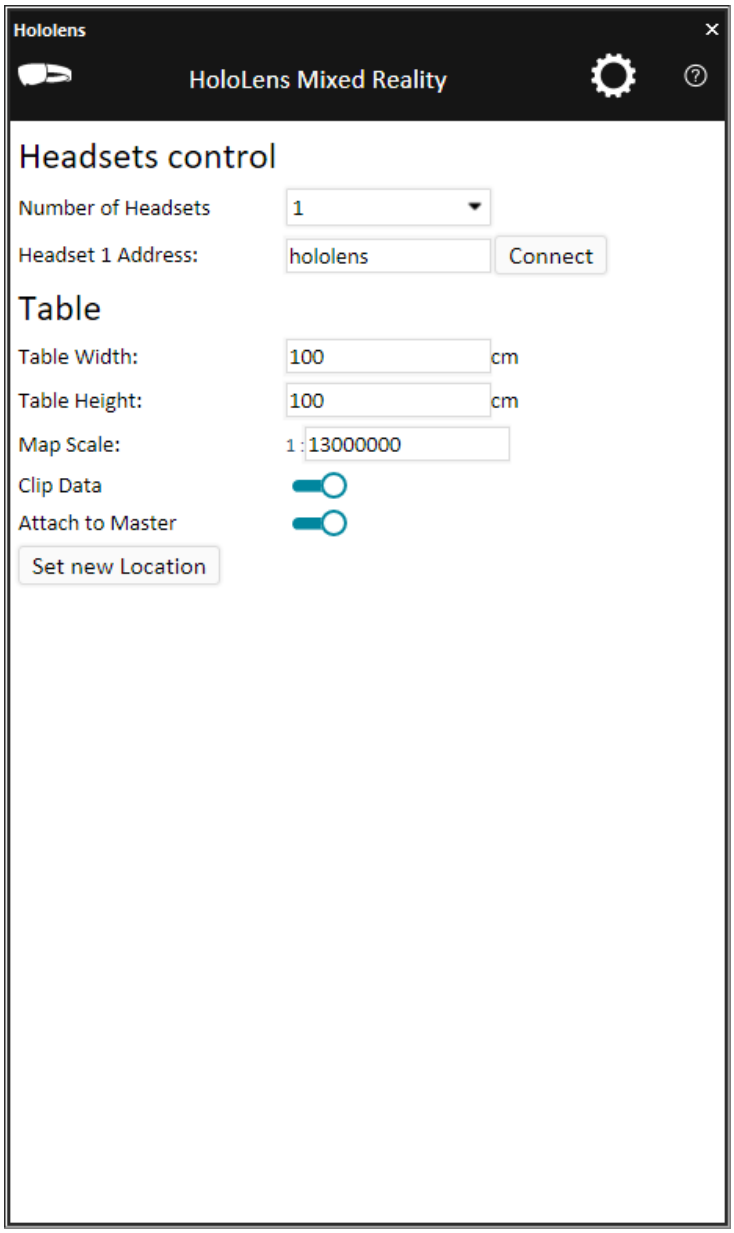
d. Enable **Use developer features** to deploy apps from Visual Studio to your HoloLens. If your device is running Windows Holographic version 21H1 or newer, also enable Device discovery.

e. The IP address of the headset will be displayed floating in front of the headset. Take note of this IP address, since it will be used in the "Using HoloLens" steps below. Then click the Setup dialog's **Print** tab.



8. **Print the QR code and place it in the room:** The location of the virtual table on which the hologram will be displayed is determined simply by where you place this printed QR code. Click **Print** to print a physical copy of the QR code. Then click the **Done** tab.
9. Note that you can always return to the Setup dialogs by clicking **Settings** .

To use HoloLens:



- **Set the headset address and virtual table details:** Set the properties in the HoloLens dialog. See property descriptions below.

Headsets Control

Number of Headsets	Number of headsets that will be connected to TerraExplorer. Up to 4 headsets are supported. Skyline Remote Player must first be installed on each of the headsets. See step 6 above.
Headset Address	IP address of the connecting headsets. After installation of Skyline Remote Player is complete (see step 6 above), the IP address of the headset device will be displayed floating in front of the headset. Enter this IP address here. Click **Connect** to connect between TerraExplorer and the HoloLens headset.
Table	
Table Width	The width of the virtual table on which the TerraExplorer hologram will be displayed. A virtual table is created wherever the QR code is placed.
Table Length	The length of the virtual table on which the TerraExplorer hologram will be displayed. A virtual table is created wherever the QR code is placed.
Map Scale	Automatically adjusts to the scale of the currently displayed view in the hologram.
Clip Data	Toggle on to limit the dimensions of the hologram to those set in table width and length.
Attach to Master	Connects the TerraExplorer GUI (Master) to the virtual hologram view. Any movements made in the Master interface will reflect in the hologram view.
Sync Location to Master	Updates the area displayed in the virtual hologram to the current location in the TerraExplorer GUI (Master). The area displayed in the virtual hologram is marked in the TerraExplorer GUI by a blue frame.

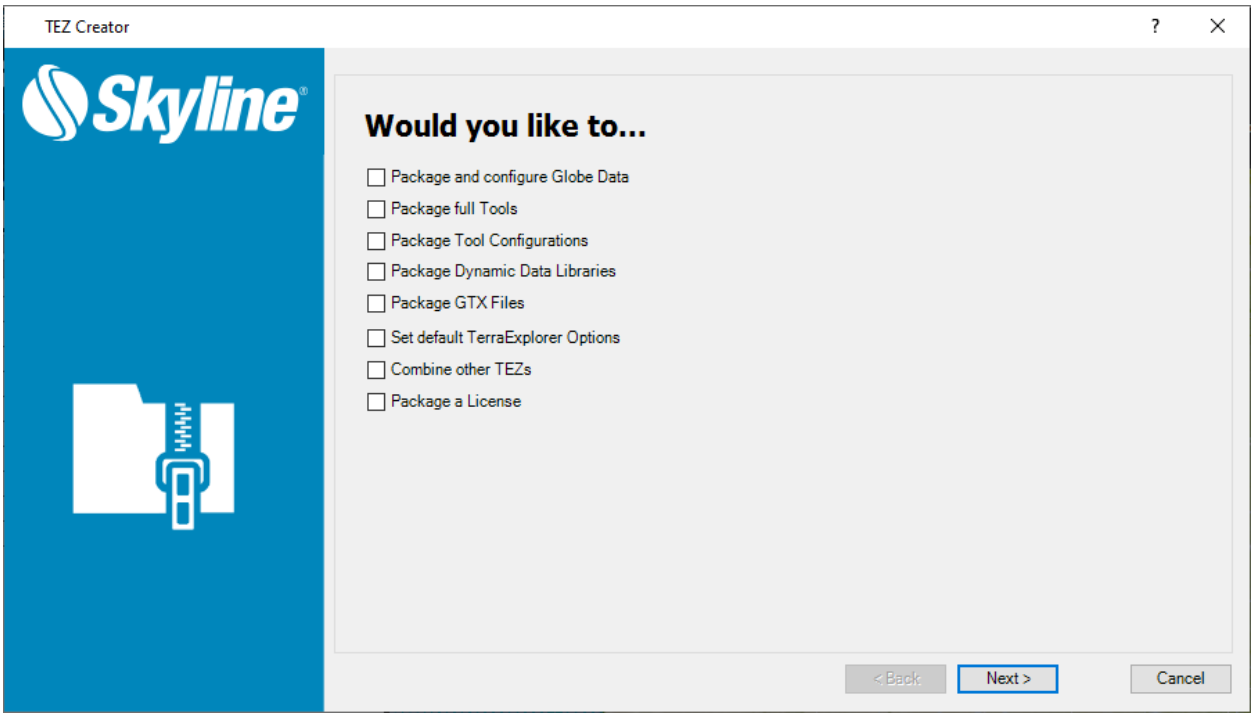
TEZ Creator Tool

The TEZ Creator simplifies the process of distributing and installing add-on TerraExplorer tools or grid shift files, customizing TerraExplorer's layout, packaging data for distribution, or automating post-install configurations to suit the needs of an install location. Using this tool, you can package custom tools, licenses, start pages, ribbon configurations, options settings, and data libraries into a TEZ zip file for easy distribution to TerraExplorer users. A straightforward wizard with a series of well-defined steps guides you through the process.

TEZ files can be manually installed on the user's computer, or auto-installed by placing the TEZ in the installation folder. **See** "Installing a TEZ File" in this chapter for more information.

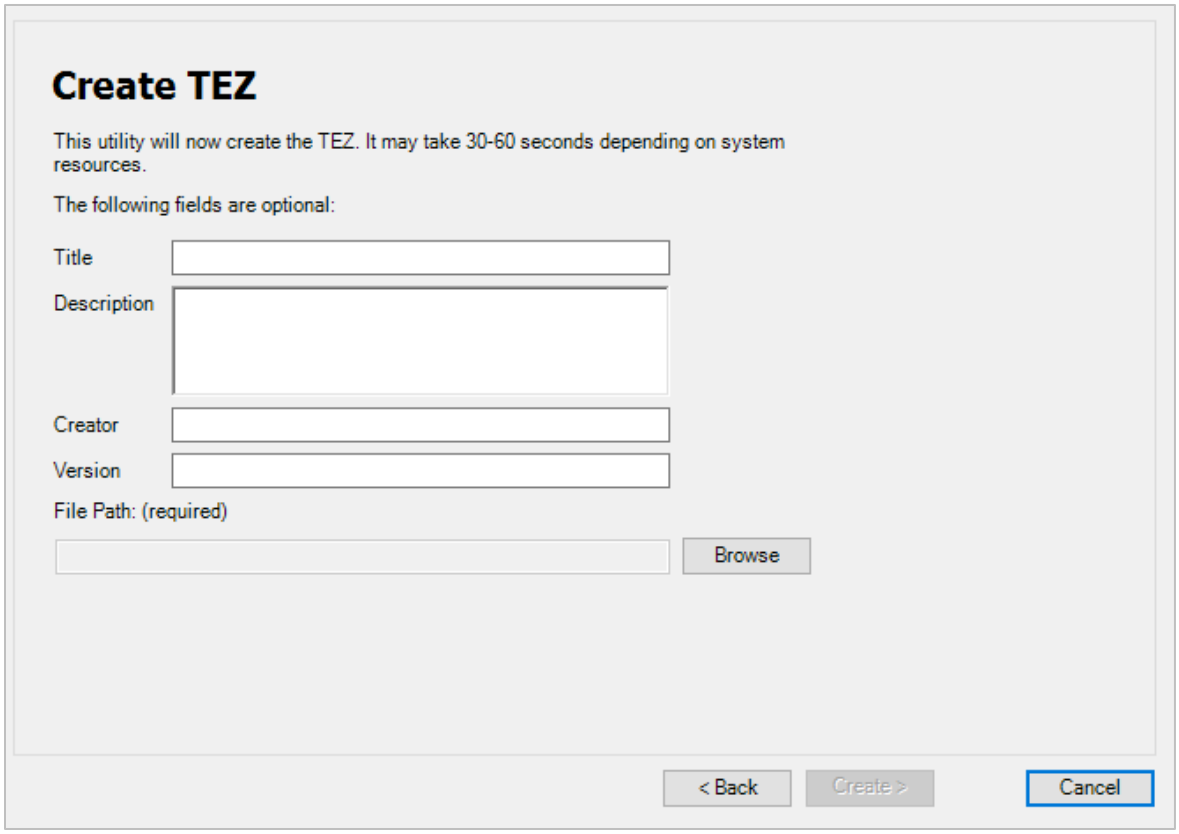
To use the Make TEZ tool:

1. On the **Tools** tab, in the **Create** group, click **Make TEZ**. The TEZ Creator dialog is displayed.



TEZ Creator

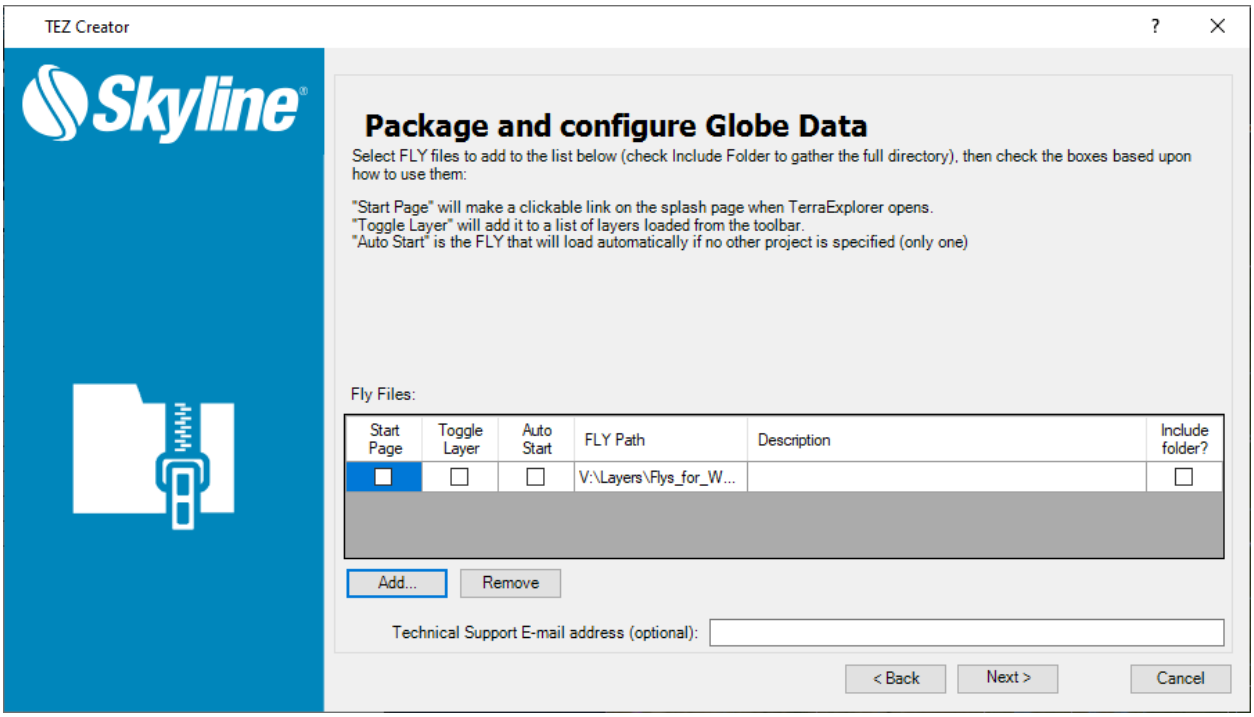
2. Select the elements to package into a TEZ file. Then click **Next**, and enter the required information in the respective dialoges that are displayed:
   - Package and Configure Globe Data – Package a FLY file that automatically opens when TerraExplorer is started or that is added as a link to the Start page or Project Tree.
   - Package Full Tools – Package custom tools. These tools will be added to the Tools tab of the TerraExplorer ribbon.
   - Package Tool Configurations – *Reserved*
   - Package Dynamic Data Libraries – *Reserved*
   - Package GTX (Grid Shift) Files – Package grid shift files (TIFF, GSB, GTX) to enable their installation without manually copying the files into a specific folder.
   - Set Default TerraExplorer Options – Select default options for screen overlay, units, cache size, etc.
   - Combine Other TEZs – Package multiple TEZs containing any of the components listed in the other options here into a master TEZ. When this master TEZ is launched, it will apply all the add-ons of each of the TEZs it contains.
   - Package a License – Package licenses to enable easy installation of TerraExplorer.
3. After entering the information for the various add-ons selected for inclusion in the TEZ, the Select Certificate for Signing dialog is displayed. Signing your TEZ enables files to be verified on installation, to ensure there was no tampering. This step is strongly recommended as a means of adding security. Select a certificate and then click **Next**. The certificate fields are automatically populated. The Create TEZ dialog is displayed.



4. In **the File Path** field, browse to the directory in which to create the TEZ file, and type a name for the file. You can also enter file information: title, description, creator, and version.
5. Click **Create**.

Package and Configure Globe Data

This option customizes the FLY file that automatically opens when TerraExplorer is started or that is added as a link to the Start page or Project Tree.



Do the following:

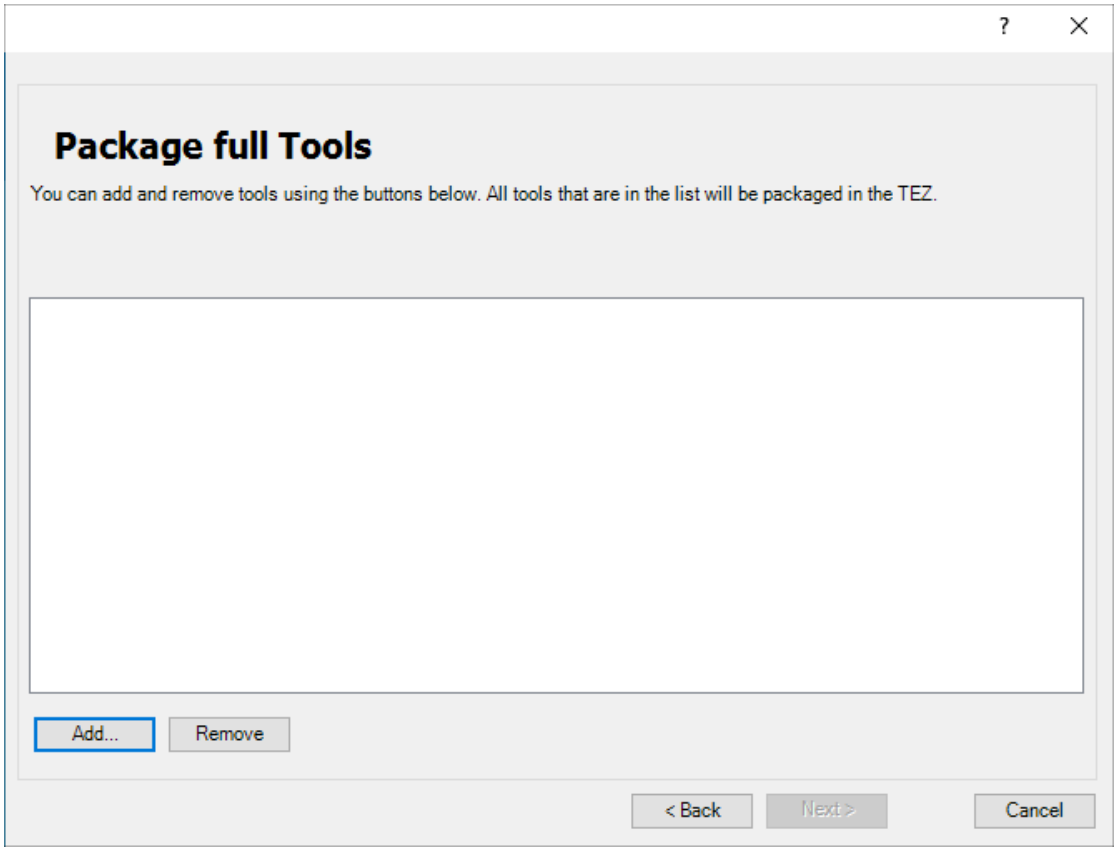
1. Click **Add**, and browse to the FLY file that you want to automatically open when TerraExplorer is started or that you want added to the TerraExplorer Start page or Project Tree.
2. Select any of the following:
   - **Start Page** – Adds the FLY file as a link to the Start page whenever TerraExplorer is opened.
   - **Toggle Layer** – Adds the FLY file to the Project Tree of any project opened in TerraExplorer.

     Note: Selecting both "Start Page" and "Toggle Layer" creates two distinct copies of the FLY file.
   - **Auto Start** – Sets TerraExplorer to open the FLY file you selected any time you start TerraExplorer.
   - **Include Folder** – Copies the full contents of the selected FLY's directory. This can be used to include all the data in a TerraExplorer published kit.

     Note: Selecting this option can significantly increase the size of the TEZ file.
3. If you want to include a **Technical Support E-mail address** on the Start page, enter an email address.

Package Full Tools

This option adds custom tools to TerraExplorer, which can be accessed from the TerraExplorer ribbon.

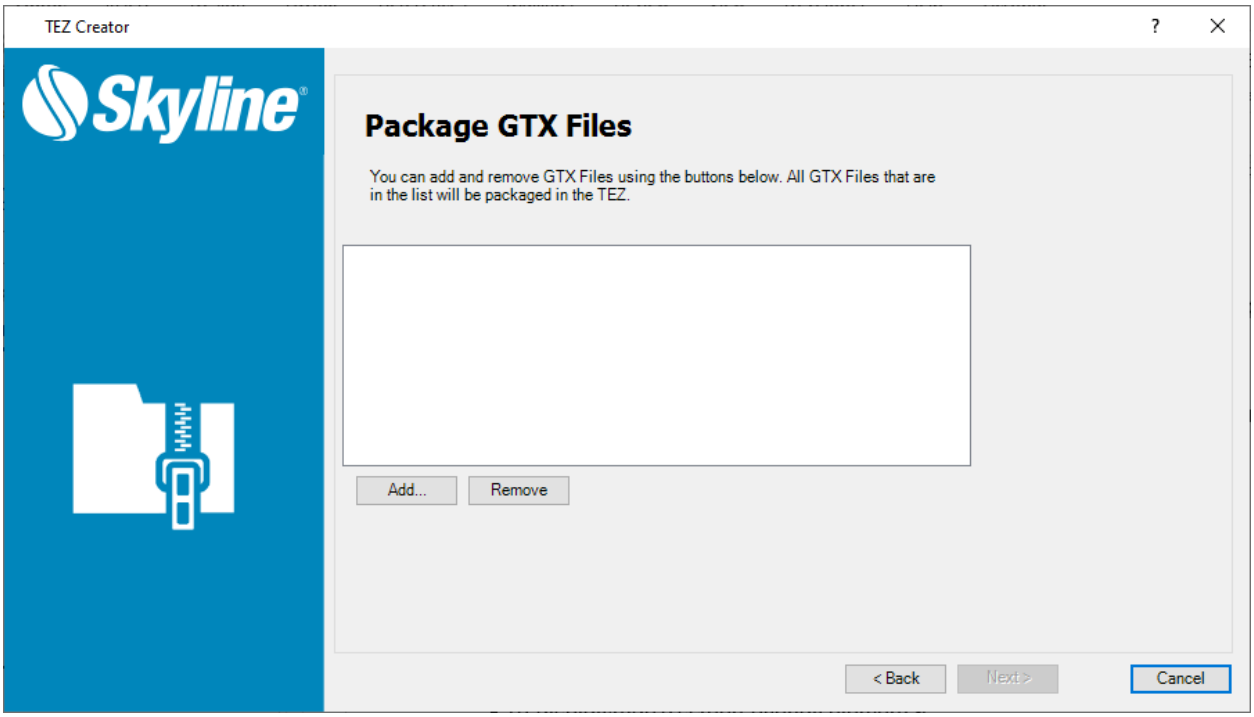


Do the following:

1. Click **Add** and browse to a tool's tool.xml file. Repeat for each of the tools you want to package.
2. Click **Next**.

Package GTX (Grid Shift) Files

Packaging grid shift (TIFF, GSB, GTX) files allows for their easy distribution and enables a grid shift file to be installed without manually copying the file into a specific folder. As with other TEZs, they can also be installed without administrator rights.



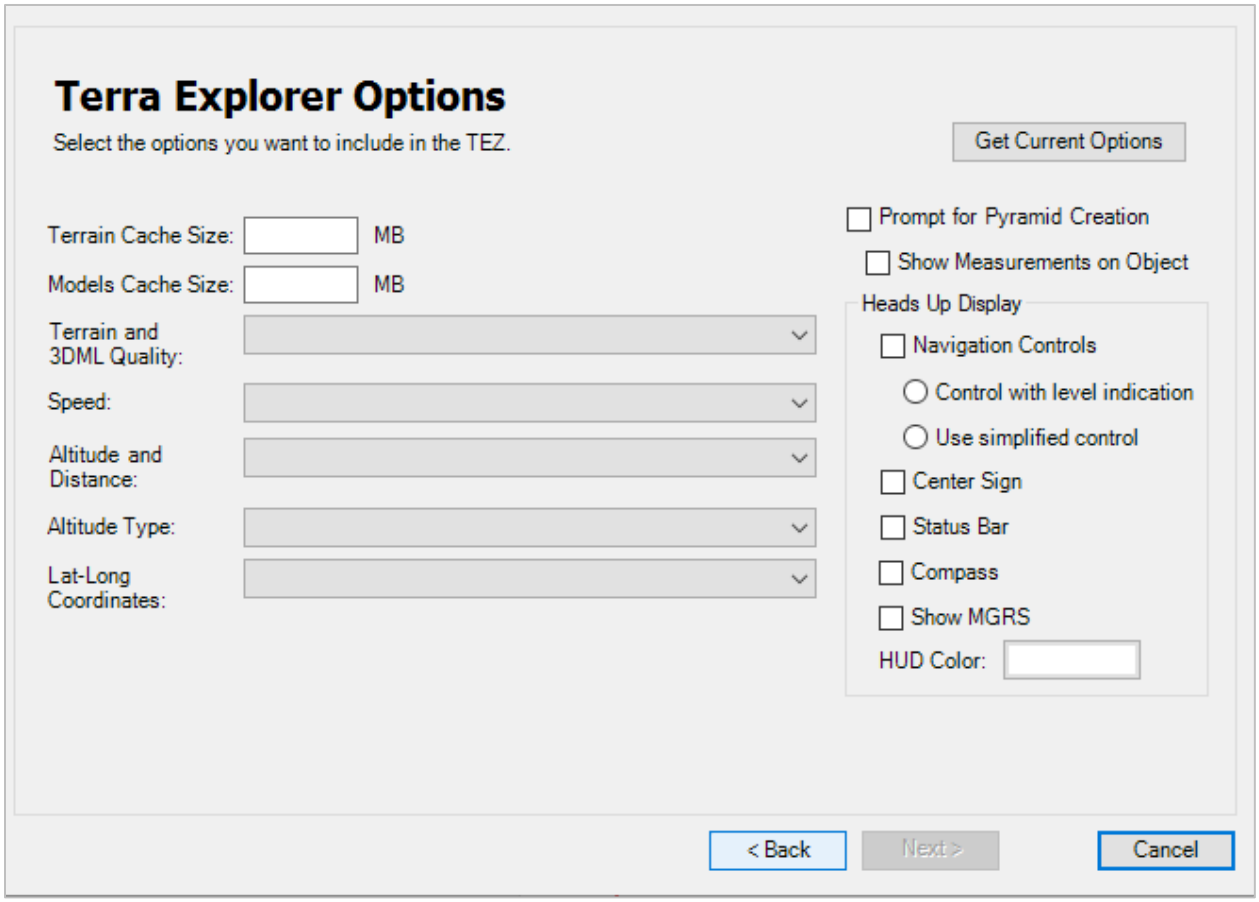
Package Grid Shift Files as TEZ

To package a grid shift file as a TEZ file:

1. Click **Add** and browse to one or more grid shift files. **See** "Adding Grid Shift Files" in the "Basic Concepts" chapter for more information about grid shift files.
2. Click **Next**. You can skip the installation wizard's next step: Select Certificate for Signing, and click **Next** again. The Create TEZ dialog is displayed.

Set Default TerraExplorer Options

Set default options for screen overlay, units, cache size, etc.

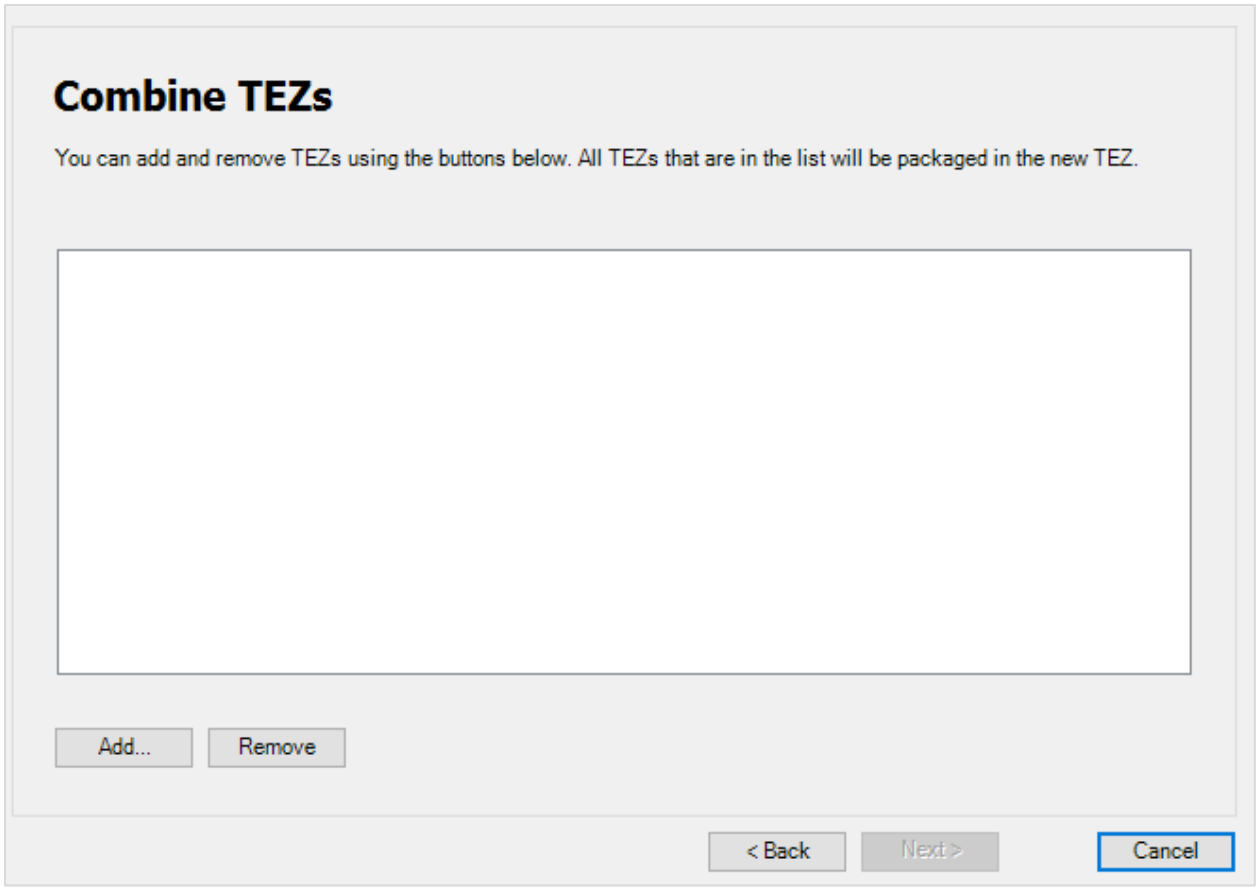


Do the following:

1. Set the default options/values that you want to set. **See** the "Using TerraExplorer Options" chapter for information about these options.
2. If you want to set the default values to the current project's values, click **Get Current Options**.
3. Click **Next**.

Combine Other TEZs

Package multiple TEZs containing any of the elements listed above into a master TEZ. When this master TEZ is installed, it installs all the individual TEZs that are packaged inside it.



Do the following:

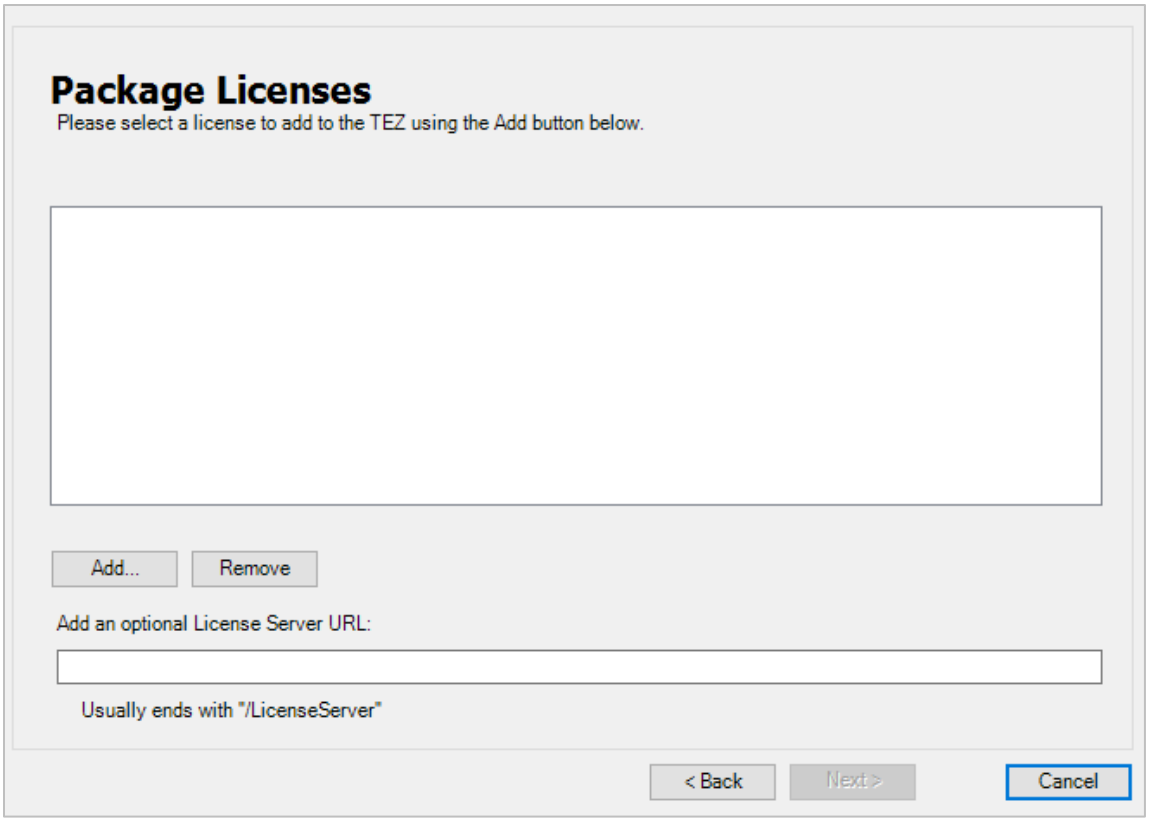
1. Click **Add** and browse to a TEZ file. Use CTRL-click or SHIFT-click to multi-select files. Repeat for each of the TEZs you want to package.

   Note: If you are packaging multiple TEZs containing different default FLY projects, the combined TEZ will have the settings and content of the **last** TEZ in the list.

2. Click **Next**.

Package Licenses

Packaging licenses allows for easy distribution of licenses and enables a license to be installed without manually loading it in the License Manager or copying the license file into the installation folder. **See "**Installing a TEZ File" in this chapter for more information. As with other TEZs, they can also be installed without administrator rights.



Do the following:

1. Click **Add** and browse to a license file. Repeat for each of the licenses you want to package.
2. If you are packaging a license that is on a Skyline Floating License Server, enter the server's URL. **See** "Skyline's Floating License Server" in the "Getting Started" chapter, and the SFLS User Guide for more information.
3. Click **Next**.
4. In the **Create TEZ** dialog, in **the File Path** field, browse to the directory in which to create the TEZ file, and type the following name for the file*: setup.tez*

Installing a TEZ File

After installing a TEZ file, all its add-ons/configurations are installed and applied to any TerraExplorer opened on the same device. A TEZ file can be manually or automatically installed.

Note: You can uninstall a TEZ file's add-ons from the Options menu. **See** "Add-ons" in the "Using TerraExplorer Options" chapter for information.

To auto-install a TEZ file:

1. Save your TEZ file with the name **setup.tez**.
2. Place the TEZ file next to the **setup.exe** file, before installing TerraExplorer.

To manually install a TEZ file:

Note: TerraExplorer should be closed when the TEZ file is being installed.

1. Double-click the TEZ file. The TEZ Installer is displayed.
2. Click **Yes**.

CHAPTER 19 PUBLISHING TERRAEXPLORER PROJECTS

About Publishing TerraExplorer Projects

Projects can be published either as TerraExplorer kits, i.e., directories that contain the project and all relevant files, or to SkylineGlobe Server, Skyline's private cloud solution.

TerraExplorer kits can be distributed to external users using any external storage device. The Publish TerraExplorer Kit process collects all the files that are used in the project and stores them in the target directory.

When a project is published to SkylineGlobe Server, the project is made available through a single publishing operation, to desktop, mobile and TerraExplorer Fusion clients, as well as standard geospatial clients such as WFS/WFS-T/WMS/WMTS/3D Tiles (Cesium). The SkylineGlobe Server provides a comprehensive set of web services for publishing, storing, managing and streaming your 3D spatial data.

The following options are available:

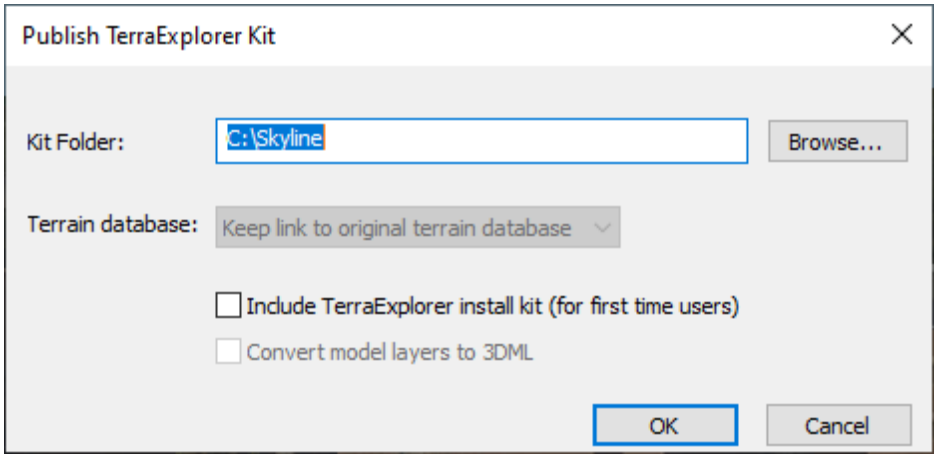
- Publish Project as Local Kit - Gather local files and objects to a kit folder, maintaining references to all network resources. When required, a TerraExplorer installation setup can be included in the kit.
- Extract and Publish Area as Offline Kit - Extract a geographic subset of the project and copy all of its local and network resources to local files, for use in a disconnected environment.
- Publish Project as KMZ - Export a TerraExplorer project to an OGC KML/KMZ file.
- Publish Project to SkylineGlobe Server - Publish an entire project and all its layers, resources, and styling to SkylineGlobe Server, Skyline's private cloud solution.

Publish Project as Local Kit

To publish a project as a local kit:

1. On the **Home** tab, in the **Project** group, click **Publish Offline**, and then click Publish Project as Local Kit. The Publish TerraExplorer Kit dialog is displayed.

   The Publish TerraExplorer Kit dialog is displayed.



Publish TerraExplorer Kit Dialog

2. In the **Kit Folder** field, enter or browse for the name of the folder that is to contain the files for the TerraExplorer Kit.
3. In the **Terrain database** field, select one of the following options:

Field	Activity
Do not copy terrain database to kit	Select this option to save time and disk space. You must copy the MPT file manually, directly to the external storage device (to the same location as the .FLY file).
Copy terrain database to kit	Select this option to copy the MPT file from its current location on your hard (disk) drive to the Kit folder. This feature is only valid for local MPTs and does not apply to remote files.
Keep link to original terrain database	This option enables creating and testing a TerraExplorer Kit without moving a large MPT file to the TerraExplorer Kit folder. However, when creating a TerraExplorer Kit as a final stage before saving to an external storage device, do not select this option (otherwise, the .FLY project is not able to find the MPT file).

4. If you want to prepare an external storage device for a first-time user who does not already have TerraExplorer installed, select the **Include TerraExplorer install kit** check box.
5. If you want to convert model layers to the optimized, fully textured 3DML format, select the check box. If the check box is not selected, the layers with the models will be copied to the kit folder.
6. Click **OK**. When you publish a project as a local kit, two files are created in the designated folder: Default.fly and DefaultMobile.fly. DefaultMobile.fly is a limited FLY file containing only layers (not objects), while Default.fly includes many more elements.

Uploading an Existing Kit to a Mobile Device

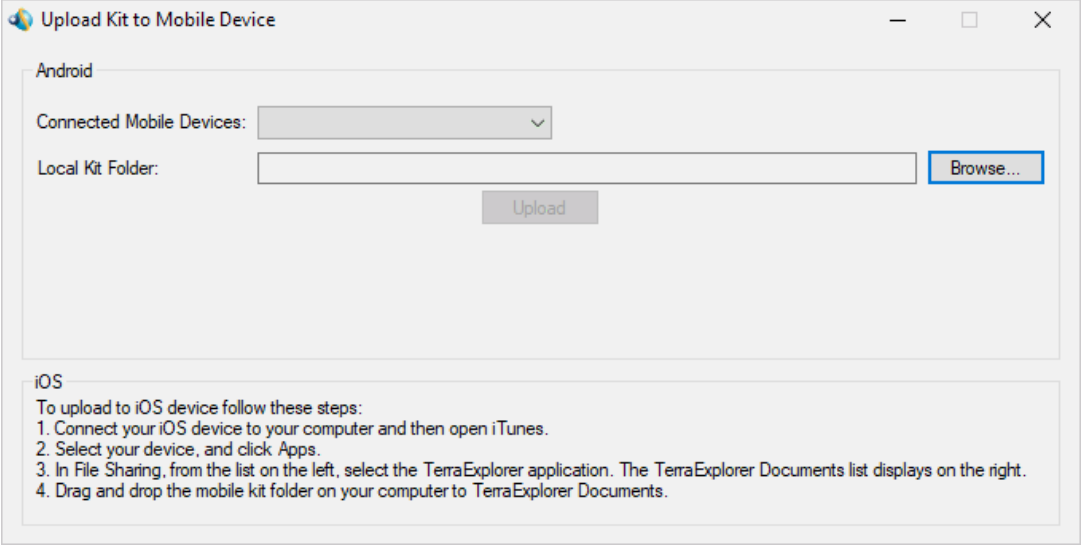
Uploading from TerraExplorer copies the project file (Default.fly) created when you publish a project as a local kit and all project layers and resources to an Android device, **for use in the TerraExplorer for Mobile (Native) app v7.0.1 or higher**. The native app (based on TerraExplorer Desktop native code) is only available to customers who need to work offline. Skyline's official version, available on Google Play Store and Apple App Store, is the TerraExplorer for Mobile (Web) v7.0.0 app (based on TerraExplorer for Web). When using the TerraExplorer for Mobile (Web) app, the project file is not uploaded or copied to your mobile device, but rather the TE Web URL generated when you publish a project to SkylineGlobe Server is used.

When the project is published, TerraExplorer Pro 7.4 also generates a more limited project file (DefaultMobile.fly) that can be used on Android devices in older versions of TerraExplorer for Mobile (Native). This project file can be found in the local kit folder and copied to a mobile device.

To upload a kit to an Android mobile device:

1. Connect your device to your computer.

   Note: Your device should be in "Media device (MTP)" mode.
2. On the **Home** tab, in the **Project** group, click **Publish Offline**, and then click Upload Existing Kit to Mobile Device. The Upload Kit to Mobile Device dialog is displayed.



Upload Kit to Mobile Device

3. In the **Connected mobile devices** field, select the device to which you want to upload the mobile kit.

   Note: If your device has an SD card, separate options will generally appear for the device and the SD card. In some devices and versions, the SD card is not recognized.

4. Browse to the location on your computer of the kit you are uploading, and click **Upload**. The kit is copied to a preconfigured TerraExplorer folder on your device**.**

TerraExplorer Objects Supported on Mobile Version

While most TerraExplorer Desktop objects and layers are supported in the **TerraExplorer for Mobile (Native) app v7.0.1**, there are some that either are not supported or do not display/operate as expected on older operating systems and devices. These include: video on terrain, CPT point clouds, elevation layers, KMZ, and PDF, and several analysis objects. Note that the Best Path analysis object should be removed from a project before publishing to a local kit, because its inclusion in the project will prevent the FLY file from opening. For editable feature layers, it is recommended to use GeoPackage or shapefile formats, to ensure proper support.

Extract and Publish Area as Offline Kit

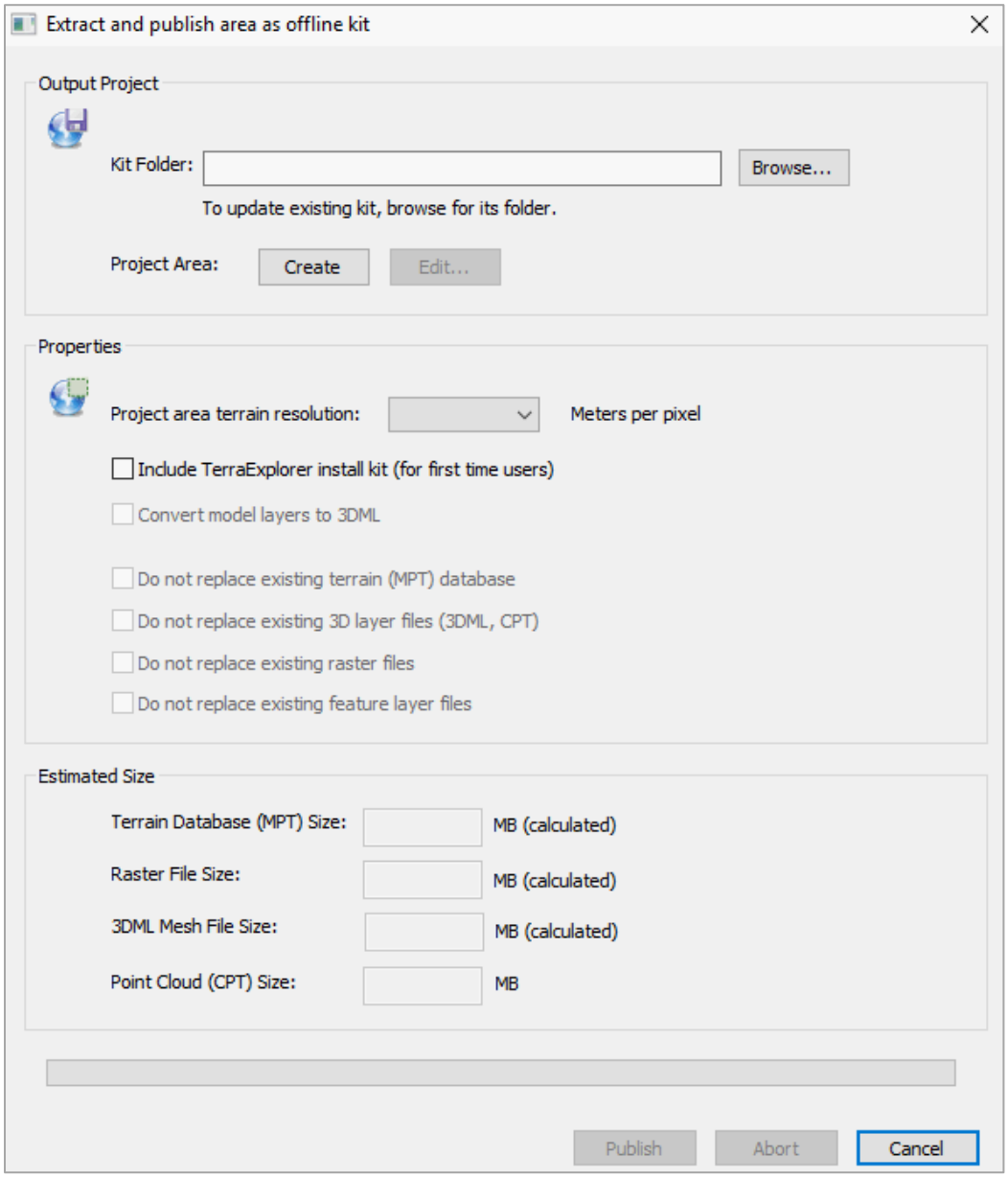
The Extract and Publish Area as Offline Kit process enables you to create a directory for offline use that contains the terrain, layers, objects, and resources of a selected subset of the TerraExplorer project.

After the user marks an area of interest by drawing a clip polygon in the 3D Window, TerraExplorer does all the following:

- Extracts the terrain in the selection area and saves it as an MPT in the kit folder.
- Saves the section of each imagery layer that intersects with the selected area as a local MPT file in the kit folder.
- Creates a subset feature layer (containing only the features that intersected with the selected area) for each feature layer that intersects with the selected area in the kit folder.
- Copies all objects that intersect with the selected area and any of their URL resources to the kit folder.

To extract an area and publish it as an offline kit:

1. On the **Home** tab, in the **Project** group, click **Publish Offline**, and then select **Extract and Publish Area as Offline Kit**. The Publish Project in Area to Offline Kit dialog is displayed.



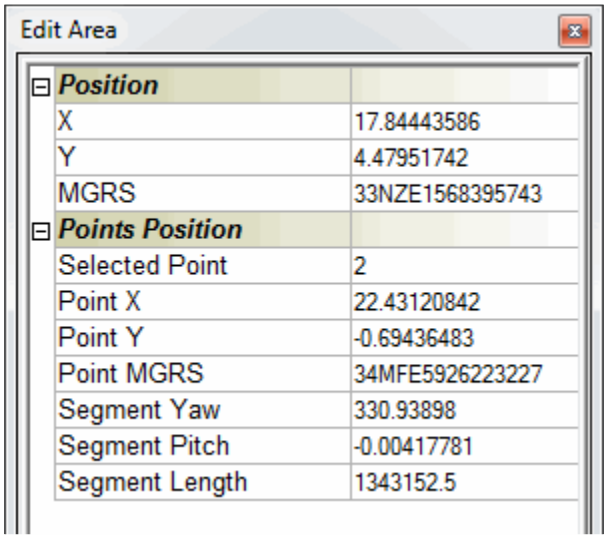
Extract and Publish Area as Offline Kit Dialog

2. In the **Kit Folder** field, enter or browse for the name of the folder that is to contain the files for the kit.
3. In the **Project Area** field, click **Create** and then in the **3D Window**, mark the area of interest by drawing a clip polygon.
   a. In the **3D Window**, click in the required locations to place the polygon points. You must place at least three points.
   b. Right-click to finish the polygon creation.

4. If you want to modify the polygon you drew, click **Edit**. Then do any of the following:
   - **Move a node** - In the **3D Window**, place the cursor over one of the polygon's nodes. The node turns blue, and the cursor changes to **Move** mode . Click the node and drag it to the required location in the XY Plane. Release the mouse button to set the node at the current location.
   - **Add a node** - In the **3D Window**, place the cursor over one of the red nodes and the cursor changes to **Move** mode . Click to add a node, and then drag it to the required location.
   - **Delete a node** - In the **3D Window**, place the cursor over the node you want to delete. The node turns blue, and the cursor changes to **Move** mode . Right-click, and select **Delete Node** from the shortcut menu.

   Note: If you want to remove the polygon and create a new one, click **Remove** and repeat steps 3-4.

   Note: You can also modify a polygon's properties in its property sheet.



Extract Area Polygon Properties

5. In the **Properties** section, set the resolution of the project area by selecting a **Meters per pixel** value from the dropdown list.

   Note: The Meters per pixel list of values is based on the current terrain database (MPT file) pyramid of resolutions.

6. If you want to prepare a TerraExplorer kit for a first-time user who does not already have TerraExplorer installed, select the **Include TerraExplorer install kit** check box.
7. If you want to convert model layers to the optimized, fully textured 3DML format, select the check box. If the check box is not selected, the layers with the models will be copied to the kit folder.
8. In the **Properties** section of the dialog, select a **Project area terrain resolution**.

9. If you are updating an existing kit, you can skip terrain and layer extraction for existing files to accelerate the process. In the **Properties** section of the dialog, select any of the following check boxes:
   - Do not replace existing terrain (MPT) database
   - Do not replace existing 3D layer files (3DML, CPT)
   - Do not replace existing raster files
   - Do not replace existing feature layer files
10. Click **Publish** to create the kit. The Estimate Size section of the dialog displays the size of the extracted MPT and raster files.

    Note: While setting the size and resolutions of the different areas, the Estimated Size section displays a rough approximation of the size of the extracted MPT file based on a calculation (multiplication of the areas and the selected resolution). The final size of the extracted MPT file can be distinctly different from the estimated size, e.g., if the original MPT file or raster files have many areas with different resolutions.
11. Click **Close** to close the dialog.

Publish Project as KMZ

To publish a project as KMZ:

1. On the **Home** tab, in the **Project** group, click **Publish Offline**, and then select Publish Project as KMZ.
2. In the **Save As** dialog type a file name and enter or browse to the folder that is to contain the KMZ file. **See** "Export to KML/KMZ" in the "Basic Concepts" chapter for more information. The published KMZ contains the KML project and all relevant project files.

Publishing a Project to SkylineGlobe Server

The Publish to SkylineGlobe Server process publishes the entire project and all its layers, resources, and styling to SkylineGlobe Server, Skyline's private cloud solution. Through a single publishing operation, the project is made available to desktop, mobile and TerraExplorer Fusion clients, as well as standard geospatial clients such as WFS/WFS-T/WMS/WMTS/3D Tiles (Cesium). The SkylineGlobe Server provides a comprehensive set of web services for publishing, storing, managing and streaming your 3D spatial data.

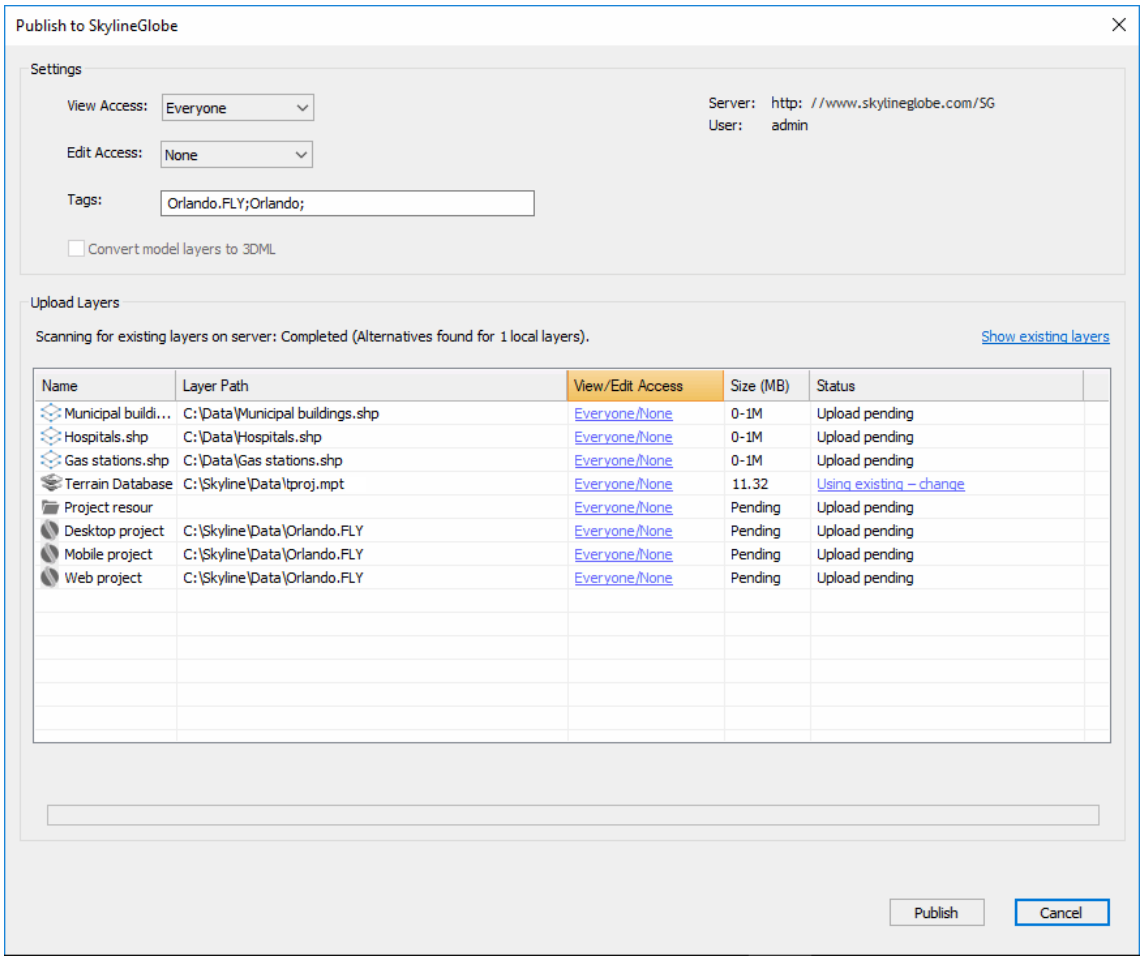
When publishing a project that was opened from SkylineGlobe Server, you can either publish it as a new FLY project or update the existing project on the server. If you choose to update the existing project, it will be published with the connection URL but as a separate version. This ensures that users automatically get the latest version of the project. In SGS Manager, you can select which version of a FLY layer should be served to TerraExplorer clients when loading the layer. By default, the latest version is served. **See** "Selecting a Layer Version" in the SGS User Manual for more information.

How to Publish a Project to SGS

To publish a project to SkylineGlobe Server:

1. On the **Home** tab, in the **Project** group, click **Publish to SG**.
2. If you aren't already logged in to a SkylineGlobe Server, the Login to SkylineGlobe Server dialog is first displayed to enable you to log in. **See** "Logging In to a SkylineGlobe Server" in the "Working with

SkylineGlobe Server" chapter for information. After logging in, the Publish to SkylineGlobe dialog is displayed.



Publish to SkylineGlobe Dialog

3. Set the **View Access** for the project:
   - **Only me** – Only for user publishing the project
   - **My group** – Everyone in the user's group
   - **Everyone** – Viewable by everyone

   Note: Users with View access can view and load the project from the Layers page.
4. Set the **Edit Access** for the project:
   - **None** – No Edit access is granted even to the user publishing the project
   - **Only me** – Only for user publishing the project
   - **My group** – Everyone in the user's group
   - **Everyone** – Editable by everyone

   Note: Users with Edit access can also load, edit and save changes to the project from TerraExplorer and the browser.

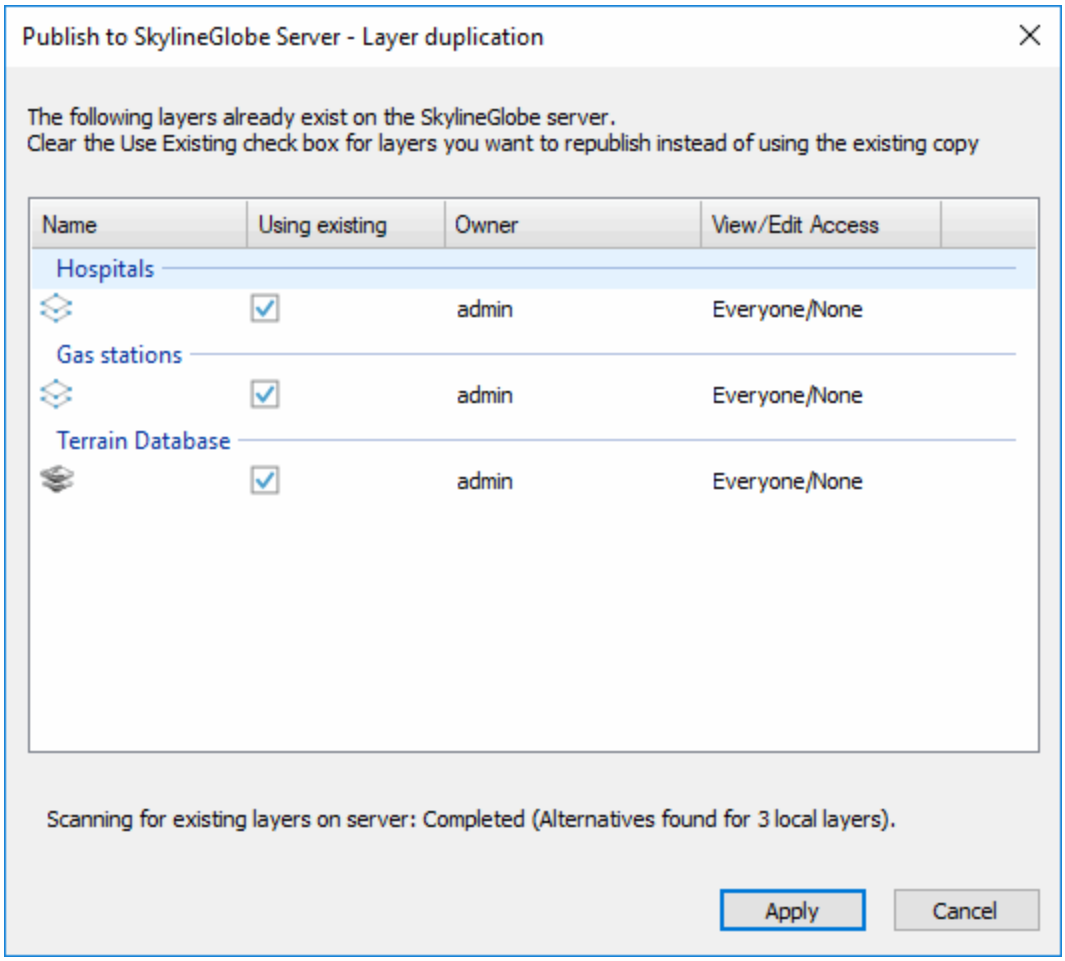
5. If you want to set unique permissions for specific project layers, click the **View / Edit Access** link for the required layer, and in the **Set Permissions** dialog, select the required permissions for that layer.
6. Set **Tags** (Key words or terms associated with the project file) for advanced searches. The default value for this field is the project name. If adding multiple tags, they should be semicolon delimited.
7. If you want to set a viewer token that can be used to grant view access to the project, generate a viewer access token in SkylineGlobe Server Manager, and then enter the token here in the **Viewer Token** field. The token is appended to the project URL (see step 11), e.g., http://skylineglobe.com/SG/projects/Default_Local_Terrain.35199954?token=0cad22c2h96e4f8fbb91c8a7a9gb7387, and enables a user to directly access SGS project layers that are non-public, without logging in to SGS. **See** the Access Token property in the "Adding Users and Setting User Properties" chapter of the SkylineGlobe Server User Guide for more information.
8. If you want to create a unified, stream optimized 3D Mesh Layer (3DML) database from a point feature layer with individually referenced 3D model files, select the **Convert model layers to 3DML** check box. To retain the individual models, clear the **Convert model layers to 3DML** check box. Conversion to 3DML will improve performance and provide better support for web and mobile devices, especially for large layers that reference many different models. **See** "Streaming 3D Models Using Feature Layers" in the "Feature Layers" chapter.
9. If the project you are currently publishing was opened from SkylineGlobe Server, and you want to update the existing project on the server, click the arrow next to **Publish**, and select **Update existing**. When a project is loaded from SGS, the most updated version is served, unless a different version was selected from SGS Manager. **See** the SGS User Guide for more information. If you want to create a new FLY project, select **Create new**.

   Note: You can only update a project that you are the owner of, e.g., you published the original project to SGS.
10. Before uploading a layer, TerraExplorer compares its file size, checksum, and metadata to all files currently on the server, to determine if a duplicate of this layer was already published to the server. If a duplicate is found, the existing copy can be used instead of expending resources on re-publishing this layer. TerraExplorer's default action depends on how close a match is found: When a perfect match is found, the default action is to use the existing layer; when no match or only a similar (but not perfect) match is found, the default action is to upload the new layer. If you want to perform the default action, click **Publish**.
11. If you want to view similar layers on the server for all project layers, click the **Show existing layers** link. The Publish to SkylineGlobe Server – Layer Duplication dialog is displayed, showing all the layers for which there is already a close or identical copy on the SkylineGlobe Server. If you want to view similar layers on the server for a specific layer for which a similar or perfect match was found, click the link in the layer's **Status** field. The Publish to SkylineGlobe Server – Layer Duplication dialog is displayed, showing all duplicates on the server for the specific layer. Do the following:

    a. If you want to republish layer(s) for which matches were found instead of using the existing layers on the server, clear the **Use Existing** checkbox for each of the layers, and click **Apply**.

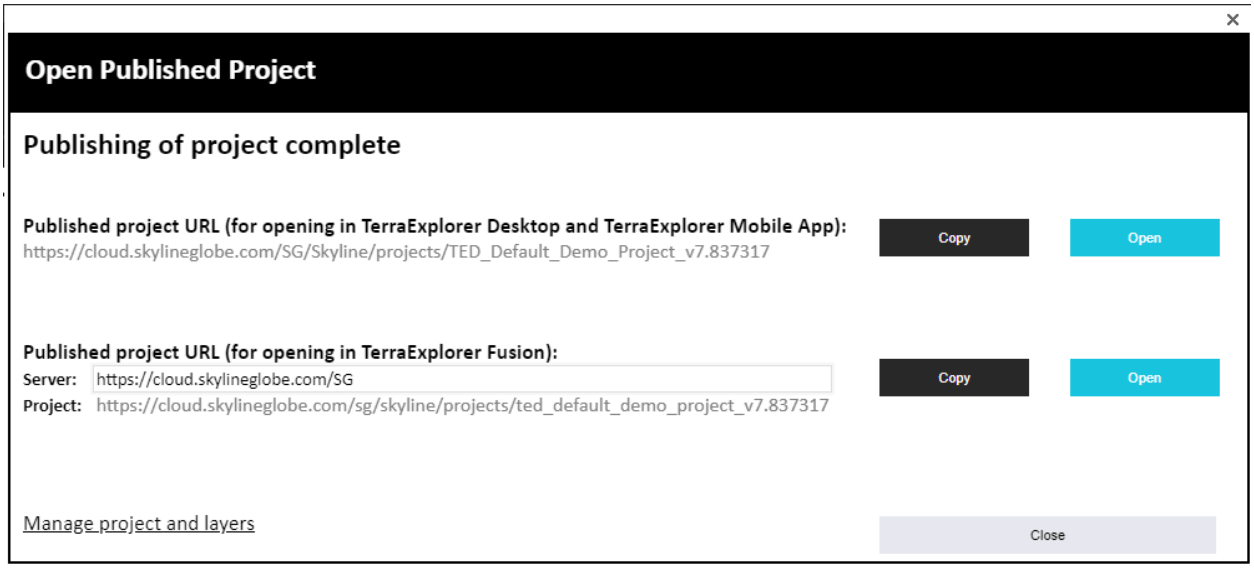
    b. If you want to use existing layers on the server for layers for which a similar but not exact match was found, select their check boxes, and click **Apply**.

    c. Click **Publish**.



Publish Project to SkylineGlobe Server – Layer Duplication Dialog

12. After the publishing process is complete, a dialog box is displayed with the URLs for both Desktop/Mobile and TerraExplorer Fusion.



Open Published Project Dialog

13. To copy a URL, click **Copy** next to the required URL. If you want to open the project in TerraExplorer Fusion, click **Open** next to the Fusion link. If you want to open the published project in the open Desktop application, click **Open** next to the Desktop/Mobile link.
14. Click **Manage project and layers** to open the SkylineGlobe Layers dialog to manage your project and layers. The published project FLY is listed in the dialog as well as all project layers that are either:
    - Local layers.
    - Layers that you are both the owner of, i.e., you originally published the layer to SGS, and which were loaded into this project from the SkylineGlobe Server you are currently connected to.

    See "Managing Your Own SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter for more information.

CHAPTER 20 WORKING WITH SKYLINEGLOBE SERVER

About Working with SkylineGlobe Server

SkylineGlobe Server (SGS) is a private cloud solution that provides a comprehensive set of web services for publishing, storing, managing and streaming 3D spatial data. Remote TerraExplorer clients can access all spatial data types including terrain (MPT/TBP), map (raster-WMS/WMTS), feature (WFS/WFS-T), 3D Mesh (3DML, OGC 3D Tiles, I3S/SLPK), and point cloud (CPT, OGC 3D Tiles) using SkylineGlobe Server's streaming services. All data on your server is cataloged and referenced so you can easily find the specific published layer required.

Individual geospatial layers and complete projects can be directly uploaded and published to the cloud server from TerraExplorer or other Skyline client applications, thus streamlining your workflow and eliminating the need for any server-side login after initial installation. Through a single publishing operation, data is made ready for consumption by all TerraExplorer clients: Desktop, Mobile, and TerraExplorer Fusion, as well as standard geospatial applications. Server-side geospatial layers that are stored in existing data stores on the server can also be published by scanning their data stores and publishing selected layers.

SkylineGlobe Server is compliant with the following OpenGIS Implementation Specifications:

- OpenGIS® Web Feature Service (WFS) Implementation Specification
- OpenGIS® Web Feature Service Transactions (WFS-T) Implementation Specification
- OpenGIS® Web Map Service (WMS) Implementation Specification
- OpenGIS® Web Map Tiling Service (WMTS) Implementation Specification

For more information about SkylineGlobe Server, see the SkylineGlobe Server User Guide.

Logging In to a SkylineGlobe Server

To log in to a SkylineGlobe Server:

1. On the top right of the application ribbon, click **Log in**. The Login to SkylineGlobe Server dialog is displayed.

   Note: If you are already logged in to a server and want to log in to a different one, first log out of the first server: on the top right of the application ribbon, click the arrow next to the User Name of the logged in user, and select **Log out**. Then log in to the required server with the required login information.

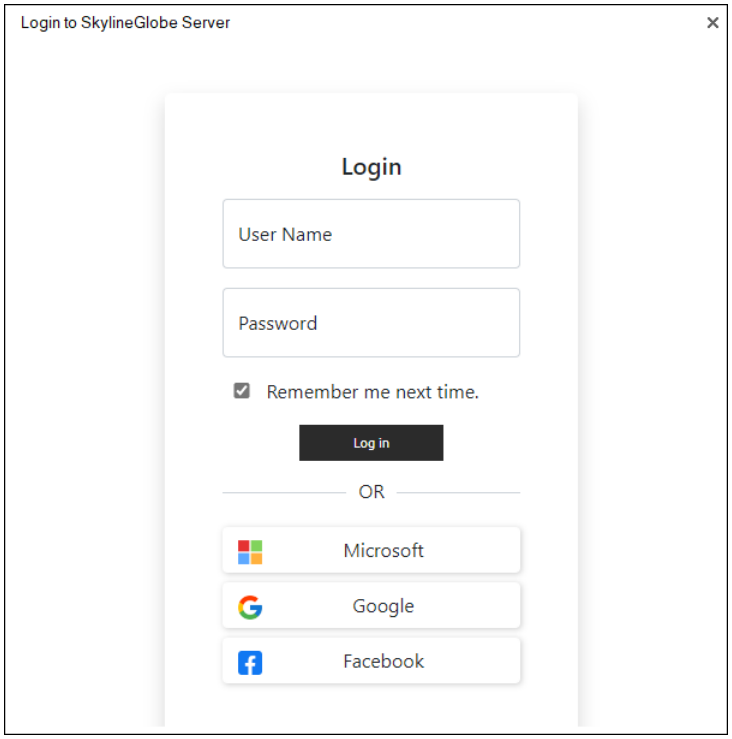


Login to SkylineGlobe Server Dialog

2. Enter the SkylineGlobe Server URL, and then click **Next**. The login dialog is displayed. SkylineGlobe Server 8.0 features integrated Single Sign-On (SSO) - OpenID user authentication, so users can now sign in using a commercial Identity Provider (IdP) like Google Workspace and Facebook or using an enterprise identity provider server, if these were set up for your server.

   Note: If you want to log in to a specific server site, use the following format: [server]/sg/[NameOfSite], e.g., http://www.skylineglobe.com/sg/SiteOne

   Note: If you have an access token, you can directly access SGS layers without entering a user name and password. An access token allows you to load and edit layers for which you have valid view/edit access, but not publish layers to SGS. The access token parameter should be appended to the end of your server URL, e.g., http://www.skylineglobe.com/SG?token=0cad22c2h96e4f8fbb91c8a7a9gb7387



SGS Login with SSO Authentication

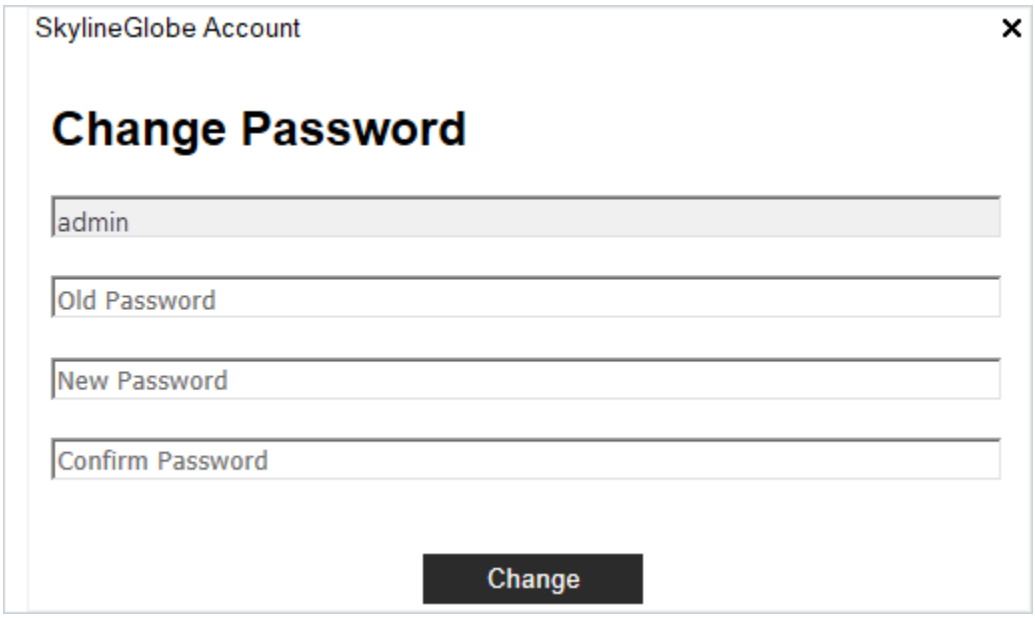
3. To log in, do either of the following on the Login page:
   - Type your **User Name** and **Password**. If you want your login details to be automatically completed the next time you log in, select **Remember me next time**. Then click **Log in**. The values that you enter for Server and User Name are saved. The next time you load this window, this information is automatically filled in.
   - Sign in using one of the available identity providers like Google or Facebook. This option is only available if identity provider authentication was integrated into your SGS. **See** "Integrating Identity Providers (IdP) in SGS" in the SGS User Manual for information.

Changing Your SkylineGlobe Account Password

You can change your SkylineGlobe account password directly from TerraExplorer. You must be logged in to a SkylineGlobe server to manage your account. If you logged in using an access token, you can load and edit layers for which have valid view/edit access, but you cannot access "My Account". **See** "Logging In to a SkylineGlobe Server" in this chapter for information.

To change your SkylineGlobe account password:

1. On the top right of the application ribbon, click the arrow next to the User Name of the logged in user, and select **My Account.** The SkylineGlobe Account dialog is displayed.



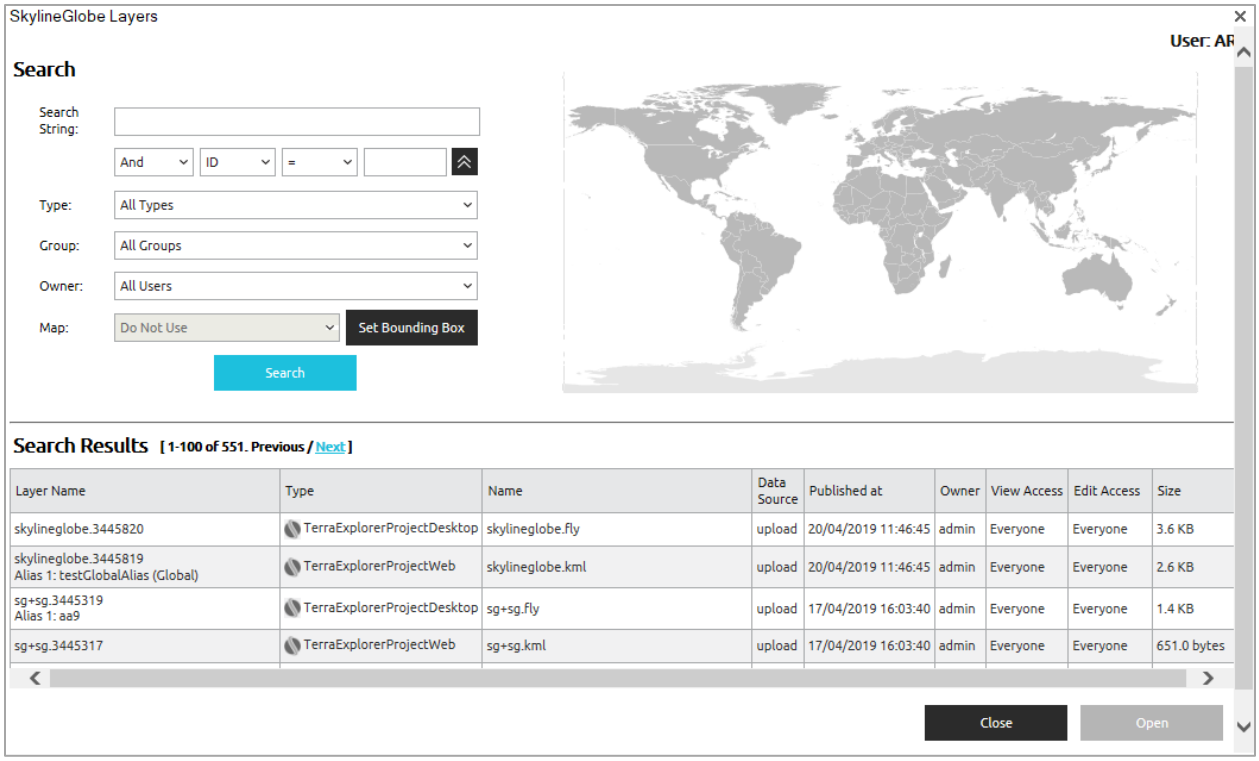
SkylineGlobe Account Dialog

2. Type your old password.
3. Type your new password and confirm it, and then click **Change**.

Loading a Project from SkylineGlobe Server

To load an existing project from SkylineGlobe Server:

1. From the **File** menu , point to **Open** and select **Open Project from SkylineGlobe**.
2. If you aren't already logged in to a SkylineGlobe Server, the Login to SkylineGlobe Server dialog is first displayed. Click **Log in** to log in to a server. **See** "Logging In to a SkylineGlobe Server" in this chapter for more information.
3. The **SkylineGlobe Layer** dialog is displayed showing all projects on your SkylineGlobe server.



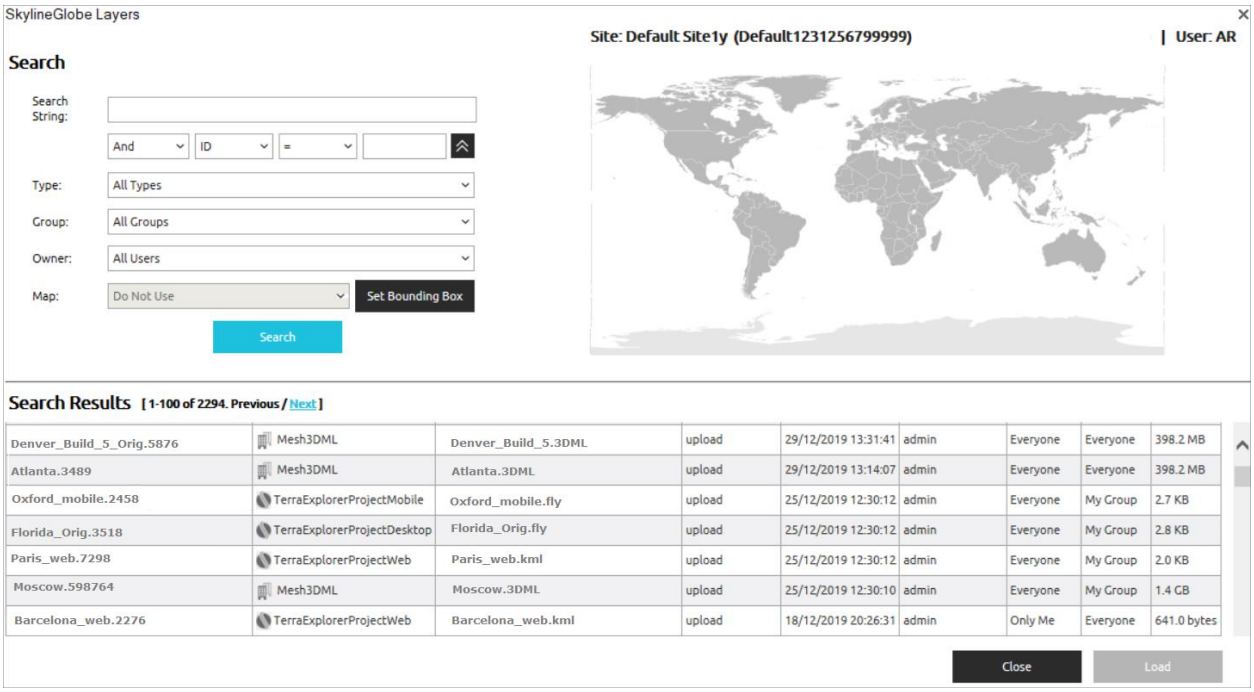
SkylineGlobe Layers Dialog

4. Search for the required project. **See** "Searching for SkylineGlobe Layers" in this chapter.
5. Select the required project and click **Open**.

Loading SkylineGlobe Layers

To add a layer from a SkylineGlobe server:

1. On the **Layers** tab, in the **SGS** group, click **Load SGS Layers**. The SkylineGlobe Layers dialog is displayed, showing all layer types.



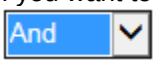
SkylineGlobe Layers Dialog

2. If you aren't already logged in to a SkylineGlobe Server, the Login to SkylineGlobe Server dialog is first displayed. Click **Log in** to log in to a server. **See** "Logging In to a SkylineGlobe Server" in this chapter for more information. After logging in, the SkylineGlobe Layers dialog is displayed showing all layer types.
3. Search for the required layer. **See** "Searching for SkylineGlobe Layers" in the "Working with SkylineGlobe Server" chapter.
4. Select the layer you want to load, and click **Load Layer**. Use CTRL-click or SHIFT-click to multi-select layers.

   Note: When loading a feature layer, the Select Layer dialog opens with the selected layer(s) listed in the Select a Layer section. **See** "Select Layer Dialog" in the "Feature Layers" chapter for information.

Searching for SkylineGlobe Layers

To search for a layer in the SkylineGlobe Layers dialog:

1. If you want to search for layers whose property information contains a specific string (e.g., ID, Name, Data Source), do the following:
   a. In the Search String field, type a search string or enter an attribute, condition, and value and click **Insert String** . The search expression is displayed in the Search string field.
   b. If you want to include additional strings in your search expression, select a connector: 

and OR, and repeat step a for the next condition.
2. If you want to search according to geographic location, do the following:

a. Click **Set Bounding Box**, and select the required region by drawing a rectangle on the map on the right side of the page around the area to which the search is confined

b. From the **Map** field, select one of the following:

- Do Not Use – To ignore the bounding box.
- Contained – If you want to search only for layers whose entire geometry fall within the bounding box.
- Intersect – If you want to search for all layers whose geometry intersect at any point with the bounding box.

c. If you want to clear the bounding box, click **Clear**.

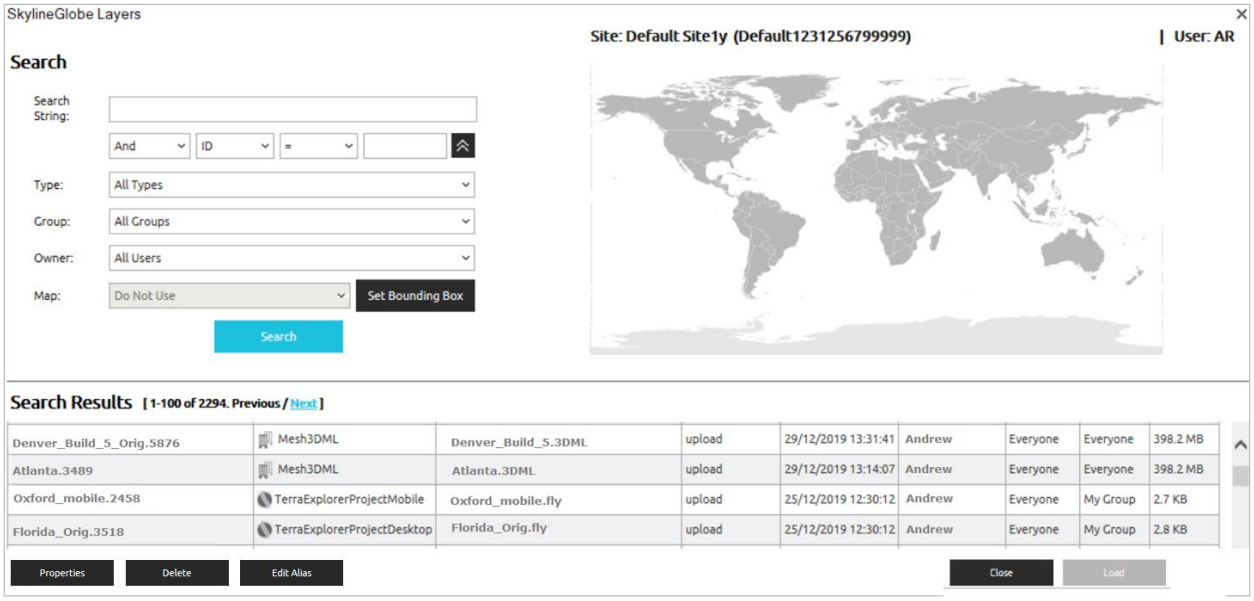
3. Click **Search**. Your search results are displayed in the search results list at the bottom of the page.

Managing Your Own SkylineGlobe Layers

To manage your own layers on a SkylineGlobe server:

1. On the top right of the application ribbon, click the arrow next to the User Name of the logged in user, and select **My Layers.** The SkylineGlobe Layers dialog is displayed, showing all layers of which you are the owner.

   Note: You must be logged in to a SkylineGlobe server to manage your layers. If you logged in using an access token, you can load and edit layers for which have valid view/edit access, but you cannot access "My Layers". **See** "Logging In to a SkylineGlobe Server" in this chapter for information.



SkylineGlobe Layers Dialog

2. If you aren't already logged in to a SkylineGlobe Server, the Login to SkylineGlobe Server dialog is first displayed. Click **Log in** to log in to a server. **See** "Logging In to a SkylineGlobe Server" in this chapter for more information. After logging in, the SkylineGlobe Layers dialog is displayed showing all layers for which you are the owner.
3. Search for the required layer. **See** "Searching for SkylineGlobe Layers" in this chapter.

4. If you want to view or modify layer properties, select the required layer and click **Properties**. The Layer Properties dialog is displayed.

   Note: The layers displayed vary depending on the type of layer selected.

5. Edit the properties as required:

Property	Description
General	
ID	Layer ID.
Name	Name of the layer.
Description	Additional text about the layer.
Tags	Key words or terms associated with the layer. If adding multiple tags, they should be semicolon delimited.
Type	Layer type (e.g., TerraExplorer Project Web, TerraExplorer Project Mobile, Feature Complex, Feature Polygon, Raster Complex).
Data Source	Name of the data source that defines connection information to the layer's data store, i.e., the physical place where the data is stored. Click **View** to view or modify the data source properties. **See** the SkylineGlobe Server usual manual for more information about editing data sources.
Layer Path	Location of the layer file (Read-only). The path is relative to the layer's data folder.
File Size	Size (Read-only).
Layer Published	Date and time (UTC +0) the layer was added to SkylineGlobe Server (Read-only).
Layer Modified	Date and time (UTC +0) the SGS layer was last modified (Read-only).
File Created	Date and time file was created.
File Modified	Date and time file was last modified
Coordinate Reference System	Layer coordinate system in WKT format. The equivalent EPSG code, if available, is shown below the WKT.
Bounding Box	The coordinates of a fixed rectangular area within which the loaded feature or imagery layer area is bounded. The coordinate parameters are as follows: ▪ **Top Left X and Top Left Y**: The coordinates of the top left corner of the required bounding box. ▪ **Bottom Right X and Bottom Right Y**: The coordinates of the bottom right corner of the required bounding box.
Recommended Block Width	Recommended geographic block width of the stream requests that are sent from TerraExplorer to SkylineGlobe Server. Select the block width in meters or kilometers. This field can have a large impact on the performance of both the clients and SkylineGlobe Server.

Maximum Block Width	The maximum size of a client request (larger requests will be rejected by SkylineGlobe Server). Setting this property appropriately prevents an excessively long wait for a client's request to complete.
Encrypt Data	Select the check box to encrypt saved cache files and blocks transmitted to the client. Only TerraExplorer can decipher this encryption, so no layers that are to be accessed by clients other than TerraExplorer should be encrypted.
Permissions	
Owner	Your user name. If you want to modify user properties, click **View**. Then modify the following properties as required, and click **Save**: **Note:** The Show User link is only available to administrator users. ▪ **User Name** – User name by which you log in to SkylineGlobe Server (Read-only). ▪ **Display Name** – The name to display in the SkylineGlobe Server user login. This is only the name displayed. To actually log in, the User Name must be entered ▪ **Active** – Select whether user should be active. ▪ **Expiration Date** – Expiration date for the user account (Read-only). ▪ **Role** – User role (Read-only): ▪ **Viewer** – Can list, load and edit, from the client side, all layers for which the user has valid view/edit access. ▪ **Publisher** – In addition to all Viewer permissions, a Publisher can also publish layers to SkylineGlobe Server and manage **these** layers from supporting clients, e.g., TerraExplorer Pro. ▪ **Site Administrator** – In addition to all Publisher permissions, a Site Administrator can also log in to SGS Manager of a specific site to perform SGS management and configuration activities. This includes management of **all** the site's services, data sources, layers, groups/users and some site settings. ▪ **Super Administrator** – A Super Administrator is the only user who can add, delete, and edit properties of server sites. In addition to all Site Administrator permissions, a Super Administrator can also log in to SGS Manager to any of the server's sites to perform SGS management and configuration activities. This includes management of **all** the server's data sources, layers, groups/users, and settings. ▪ **Site** – Server site for your user (Read-only). ▪ **Group** – User group. Users can view / edit layers published by other users in the same user group if the respective view / edit permission for the layer was set to

	"My Group" or "Everyone". ▪ **Password** – Type a new password, or click **Generate** to generate a random one. If you want the user to be required to change the password upon logging in to SkylineGlobe Server, select **Change Required**. ▪ **Storage Used** – Click **Calculate** to calculate the amount of data (in GB) you have already uploaded. ▪ **Max Storage** – Select the check box to set a limit on storage for your user, and then enter the storage limit in GB. ▪ **Max Active Sessions** – Select the check box to set a limit on the number of concurrent clients for your user, and then enter the number. ▪ **Allow Notifications** – Select the check box to display a notifications dialog when your user logs in to SGS Manager with information about entities (sites, groups, and users) that have already expired or will be expiring within the next five days. ▪ **SG Cloud User** – Reserved.
View Access	The view permission level for this layer, i.e., the users that have been granted view access (None, Only Me, My Group, or Everyone). Users with valid view access for a layer can list, view and load the layer (opened from TerraExplorer Pro, TerraExplorer Fusion and any WFS/WMS client).
Edit Access	The edit permission level for this layer, i.e., the users that have been granted edit access (None, Only Me, My Group, or Everyone). In addition to loading the layer, users with edit access can also perform layer transactions from TerraExplorer Pro and any WFS-T client. **Note**: Only the user that added the layer and the administrator can modify layer properties.
Cache **Note:** If you want to clear cache for a layer, click **Clear Cache.**	
No Cache	Select the check box to delete any existing cache file and to prevent any creation of a new cache file. Each request from TerraExplorer will stream data directly from the data source. **Note:** This property is only displayed for feature layers.
Cache Path	Location of the layer's hard disk cache (Read-only). **Note**: If No Cache was selected, this property is not displayed.
Cache Creation Date	Date cache was created (Read-only). **Note**: If No Cache was selected, this property is not displayed.
Meta Tags	

View Style	Metadata style format.
Upload	If you want to upload metatags, browse to the required file, and click **Upload**.

6. If you want to remove a layer from SkylineGlobe Server, select the layer, and click **Remove.**
7. If you want to add/edit an alias, select the layer, and click **Edit Alias**. The Edit Alias dialog is displayed.
   a. Type an Alias 1 and/or Alias 2.
   b. Click **OK**. The alias is displayed in the Layer Name field in the SkylineGlobe Layers dialog, and layers can be searched according to their aliases.

Uploading Layers to SkylineGlobe Server

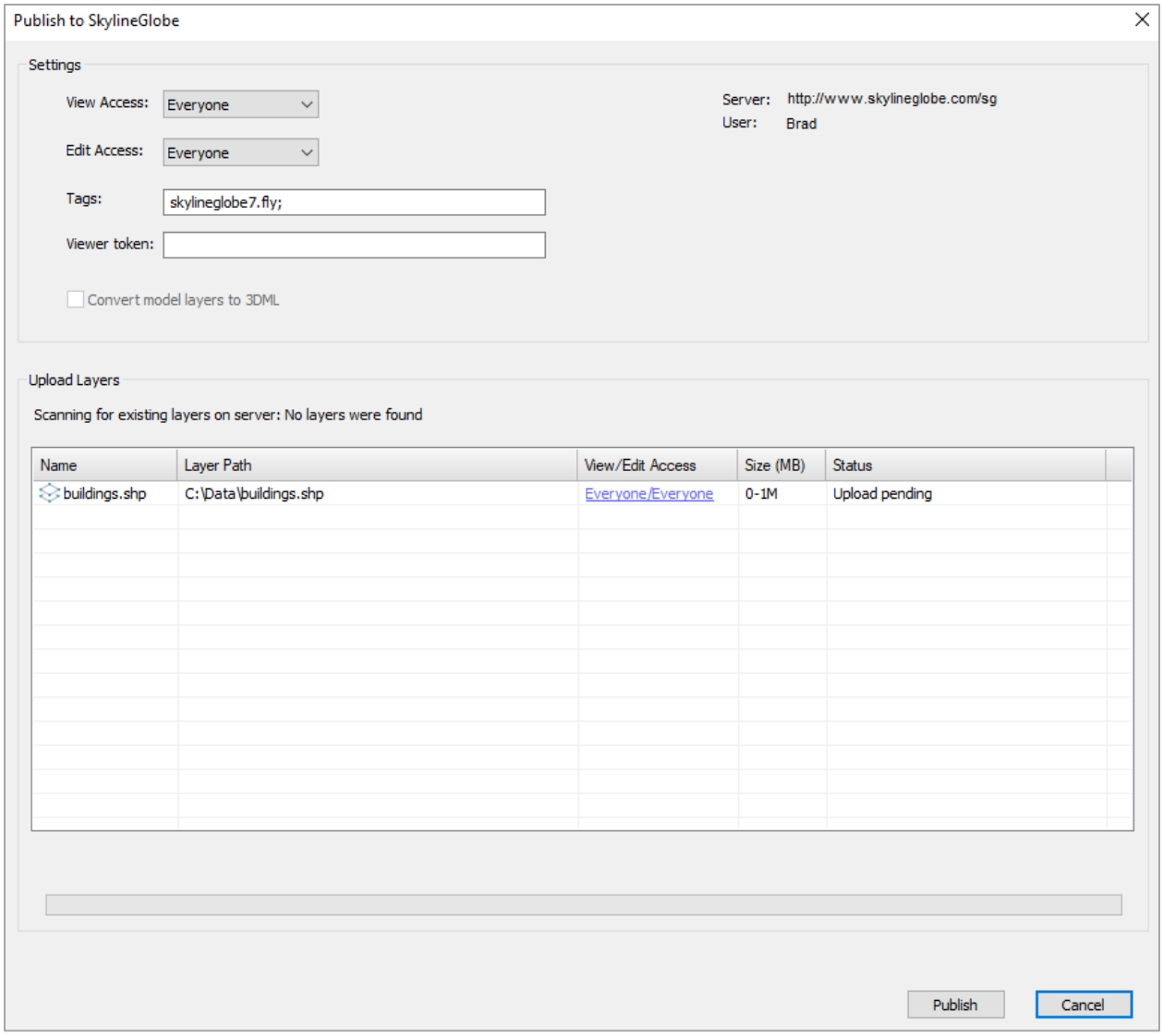
You can upload your layers to SkylineGlobe Server directly from TerraExplorer.

Note: TerraExplorer is the only client that can serve layers, which are missing their EPSG code indicating the projection in the data should be served.

Note: An entire project and all its layers, resources, and styling can also be published to SkylineGlobe Server. **See** "Publishing a Project to SkylineGlobe Server" in the "Publishing TerraExplorer Projects" chapter for information.

To upload a layer:

1. In the **Project Tree**, right-click the required layer, and select **Upload to SkylineGlobe** from the shortcut menu. Use CTRL-click or SHIFT-click to multi-select layers.
2. If you aren't already logged in to the required SkylineGlobe Server, the Login to SkylineGlobe Server dialog is first displayed to enable you to log in. **See** "Logging In to a SkylineGlobe Server" in this chapter for information.
   After logging in, the Publish to SkylineGlobe dialog is displayed.



Publish to SkylineGlobe Dialog

3. Set the **View Access** for the layer:
   - **Only me** – Only for user publishing the project
   - **My group** – Everyone in the user's group
   - **My site** – Everyone in the user's server site
   - **Everyone** – Viewable by everyone
4. Set the **Edit Access** for the layer:
   - **None** – No edit access is granted even to the user publishing the layer
   - **Only me** – Only for user publishing the layer
   - **My group** – Everyone in the user's group
   - **My site** – Everyone in the user's server site
   - **Everyone** – Editable by everyone

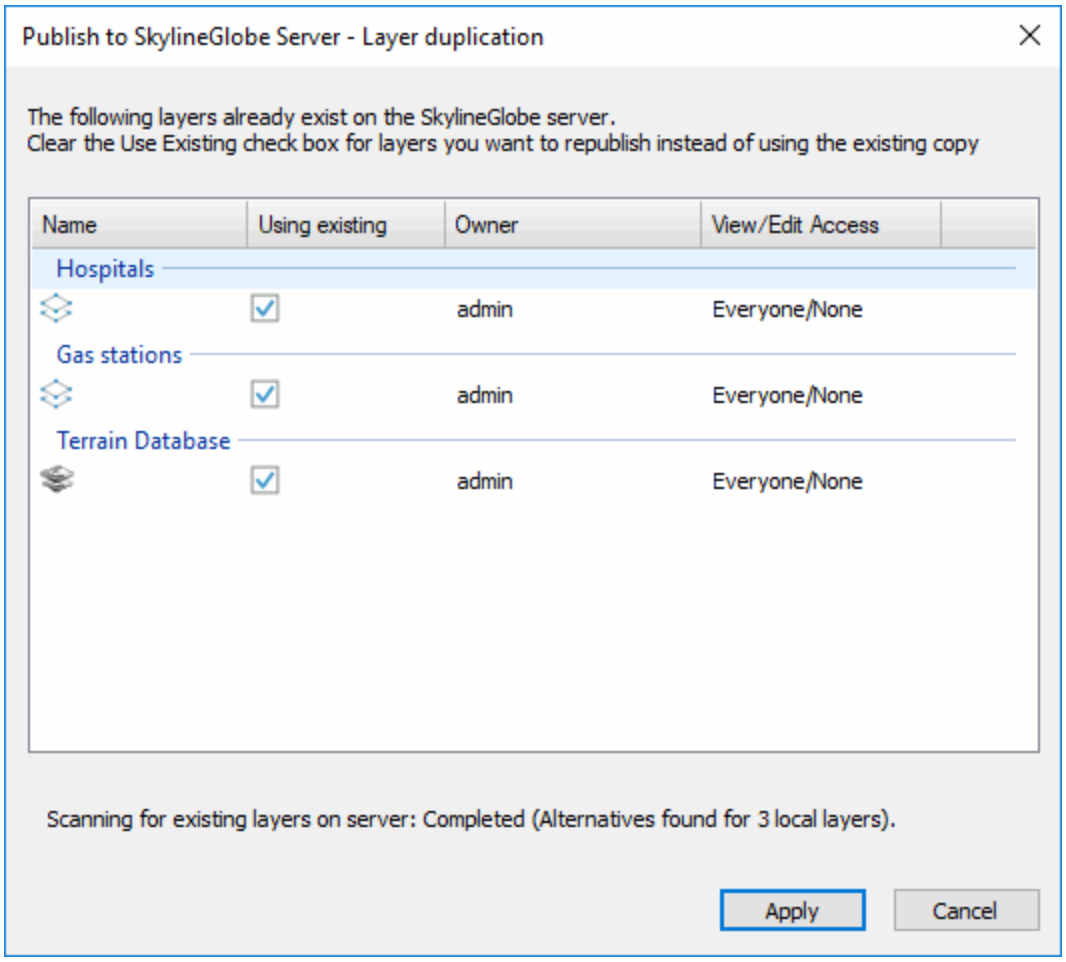
5. Set **Tags** for advanced searches. The default value for this field is the layer name. If adding multiple tags, they should be semicolon delimited.
6. If you want to set a viewer token that can be used to grant view access to the layer, enter a **Viewer Token**.
7. If you are uploading a point shapefile with individually referenced 3D model files and you want to convert it to a unified, stream optimized 3D Mesh Layer (3DML) database, select the **Convert model layers to 3DML** check box.

   Note: A feature layer that references GLB model files cannot be converted to 3DML.
8. Before uploading a layer, TerraExplorer compares its file size, checksum, and metadata to all files currently on the server, to determine if a duplicate of this layer was already published to the server. If a duplicate is found, the existing copy can be used instead of expending resources on re-publishing this layer. TerraExplorer's default action depends on how close a match is found: When a perfect match is found, the default action is to use the existing layer; when no match or only a similar (but not perfect) match is found, the default action is to upload the new layer. If you want to perform the default action, click **Publish**.
9. If you want to view similar layers on the server for all uploaded layers, click the **Show existing layers** link. The Publish to SkylineGlobe Server – Layer Duplication dialog is displayed, showing all the layers for which there is already a close or identical copy on the SkylineGlobe Server. If you want to view similar layers on the server for a specific layer for which a similar or perfect match was found, click the link in the layer's **Status** field. The Publish to SkylineGlobe Server – Layer Duplication dialog is displayed, showing all duplicates on the server for the specific layer. Do the following:

   a. If you want to republish layer(s) for which matches were found instead of using the existing layers on the server, clear the **Use Existing** checkbox for each of the layers, and click **Apply**.

   b. If you want to use existing layers on the server for layers for which a similar but not exact match was found, select their check boxes, and click **Apply**.

   c. Click **Publish**.



Publish Layer to SkylineGlobe Server – Layer Duplication Dialog

10. After the publishing process is complete, a dialog is displayed asking if you want to replace the local layer with the layer published to SkylineGlobe server. Click **Yes** to open the published layer.

    Note: In some cases, TerraExplorer may add Data Attribute Style (DAS) attributes to the published feature layers.

CHAPTER 21 SETTING THE PROJECT

About the Project Settings

Settings for your current .FLY file can be viewed and edited from the Project Settings dialog. These settings include general project and startup information, terrain database properties, application layout, and specifications for startup date/time and environment effects. The settings are saved in the .FLY file and applied each time this file is used.

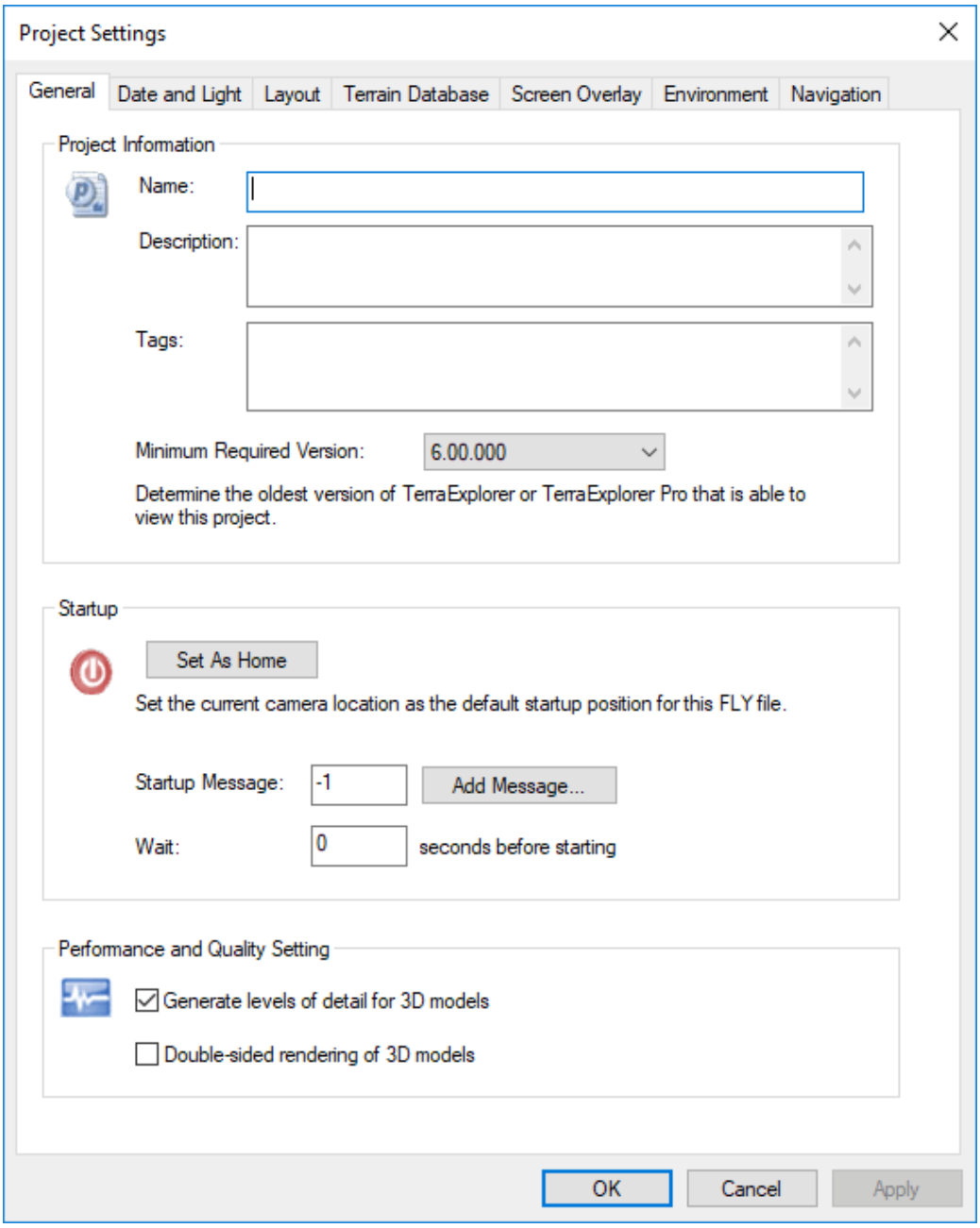
To open the **Project Settings** dialog:

- On the **Home** tab, in the **Project** group, click **Project Settings** (Shortcut – F8).

General

The General settings define basic properties of the .FLY file including: project information, minimum required version of TerraExplorer, and startup message parameters.

To implement any setting changes, you need to save, and then reopen the project.



Project Settings - General Tab

Parameter	Description
Project Information	
Name	Name of the project.
Description	Enter a text string.

Tags	Key words or terms associated with the project file. If adding multiple tags, they should be semicolon delimited.
Minimum Required Version	When TerraExplorer or TerraExplorer Pro opens a .FLY project, they compare this number to their own version number. If the minimum supported version is higher than the version of TerraExplorer currently trying to open the project, TerraExplorer forces an upgrade in order to open it.
Startup	
Set As Home	Click to set the current camera location as the default startup position for this .FLY file.
Startup Message	Determines the message to be shown when the project is opened. Click **Add Message** to open the Create Message dialog. **See** "Messages and Tooltips" in the "Working with Objects" chapter for further information on creating messages.
Wait	Set the number of seconds TerraExplorer waits at the beginning of the session before starting the Auto-Start procedure or allowing manual flight. It is recommended to use this feature for Internet applications where you want to freeze camera movement for several seconds at the beginning of the session. This freeze allows TerraExplorer to stream objects and features and sharpen the image before the session starts. The user can override the wait period by selecting elements from the Project Tree. **See** "Setting the Auto-Start Procedure" in this chapter for further information on assigning elements for Auto-Start.
Performance and Quality Setting	
Generate Levels of Detail for 3D Models	Automatically optimize all loaded models by conversion to XPL2 upon loading. When a model file is converted to XPL, a set of XPL files is created from a single model file where each file contains data for one Level of Detail (LOD) only. TerraExplorer displays the best LOD file based on the viewer position in relation to the object. This results in an improvement in overall model display performance. **Note:** Generating Level of Detail is recommended for projects that have dense model layers, with non-optimized models (e.g., KML with DAE models). While objects may take slightly longer to load the first time, memory usage will be optimized.
Double sided rendering of 3D models	Select this check box to render the faces of 3D models from two sides. You should only use this option if you have 3D models in the project with single-side faces or non-unified normal, and you want to display them as double-sided.

Setting the Auto-Start Procedure

You can assign only one element for the Auto-Start procedure. The last element you assign is used. You must save the project for this setting to take effect.

You can assign any of the following elements for Auto-Start:

- The camera’s current position.

- Any location, presentation, or object.

At the beginning of the project, the camera starts at a specific location or performs a unique flight pattern according to the selected Auto-Start element.

Auto-Start Element	Description
Start Position	The project starts with the camera in the Start Position coordinates.
Location	The auto-start procedure depends on the selected location's Activation Action: ▪ If the location's Activation Action parameter is set to "Fly To", the project begins with the camera viewing the selected location. ▪ If the location's Activation Action parameter is set to one of the pattern flights, the project begins by flying in the selected pattern around the selected location.
Presentation	The project starts by playing the selected presentation.
Object	The auto-start procedure depends on the type of object and its Activation Action: ▪ Static object with Activation Action parameter set to "Fly To" or one of the "View" actions - The project starts by flying from the Start Position to the selected object. If a specific "View" action is selected for the object, the camera stops at that view. ▪ Static object with Activation Action parameter set to one of the pattern flights - The project starts by playing the pattern around the selected object. ▪ Dynamic object with Activation Action parameter set to "Fly To" or one of the "View" actions - The project starts by flying from the Start Position to the selected object. If a specific "View" action was selected for the object, the camera stops at that view. If the "Fly To" action is selected, then the camera stops behind and above the object. After the camera reaches the object, it starts to follow it. ▪ Dynamic object with Activation Action parameter set to one of the pattern flights - The project starts by playing the pattern around the selected object, while the object is moving.

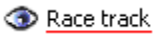
How to Assign an Element for Auto-Start

To set the camera's current position as the Start Position of the project (shortcut - F2):

1. On the **Home** tab, in the **Project** group, click **Project Settings**.
2. In the **General** tab, in the **Startup** section, click **Set As Home**.
3. If another location, object, or presentation had previously been set for Auto Start, a dialog displays confirming that you want to replace the previous element with the current location. Click **Yes** to replace it, or **No** to cancel.

To assign an element (location, presentation, or object) as the Start Position of the project:

- In the Project Tree, right-click the element and from the shortcut menu select: Set Location for Auto-Start, Set Presentation for Auto-Start or Set Object for Auto-Start.

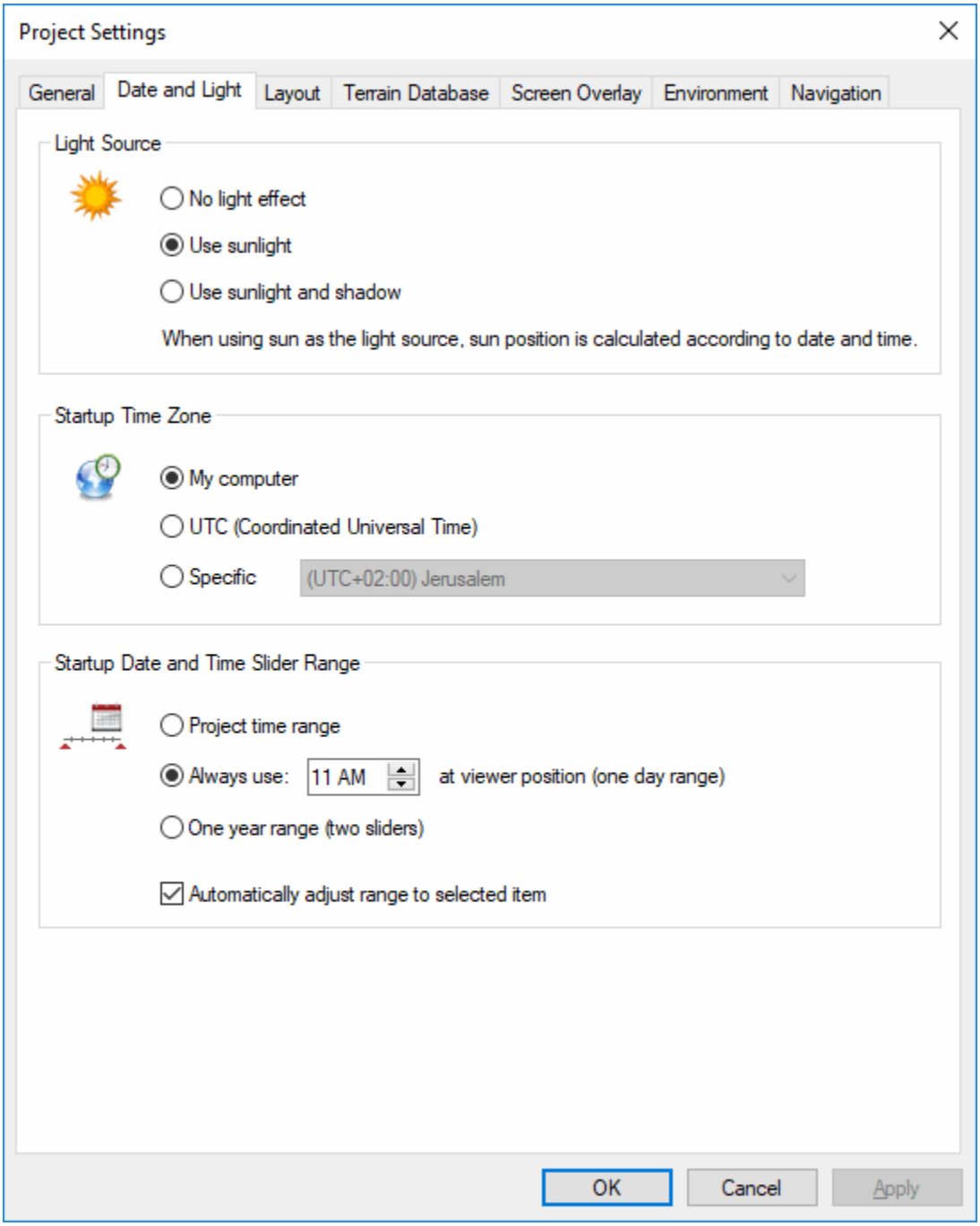
Note: The name of the Auto Start element in the Project Tree is underlined in red. For example, an "Auto-Start" location is marked: 

To set a waiting time at the beginning of the session before the system performs the Auto-Start procedure:

1. On the **Home** tab, in the **Project** group, click **Project Settings**.
2. In the **Startup** section, in the **Wait** field, type the number of seconds the system should wait before the Auto-Start.

Date and Light Effects

The Date and Light tab enables you to control the sun and shadow display and the range of the Date and Time slider.



Project Settings - Date and Light Tab

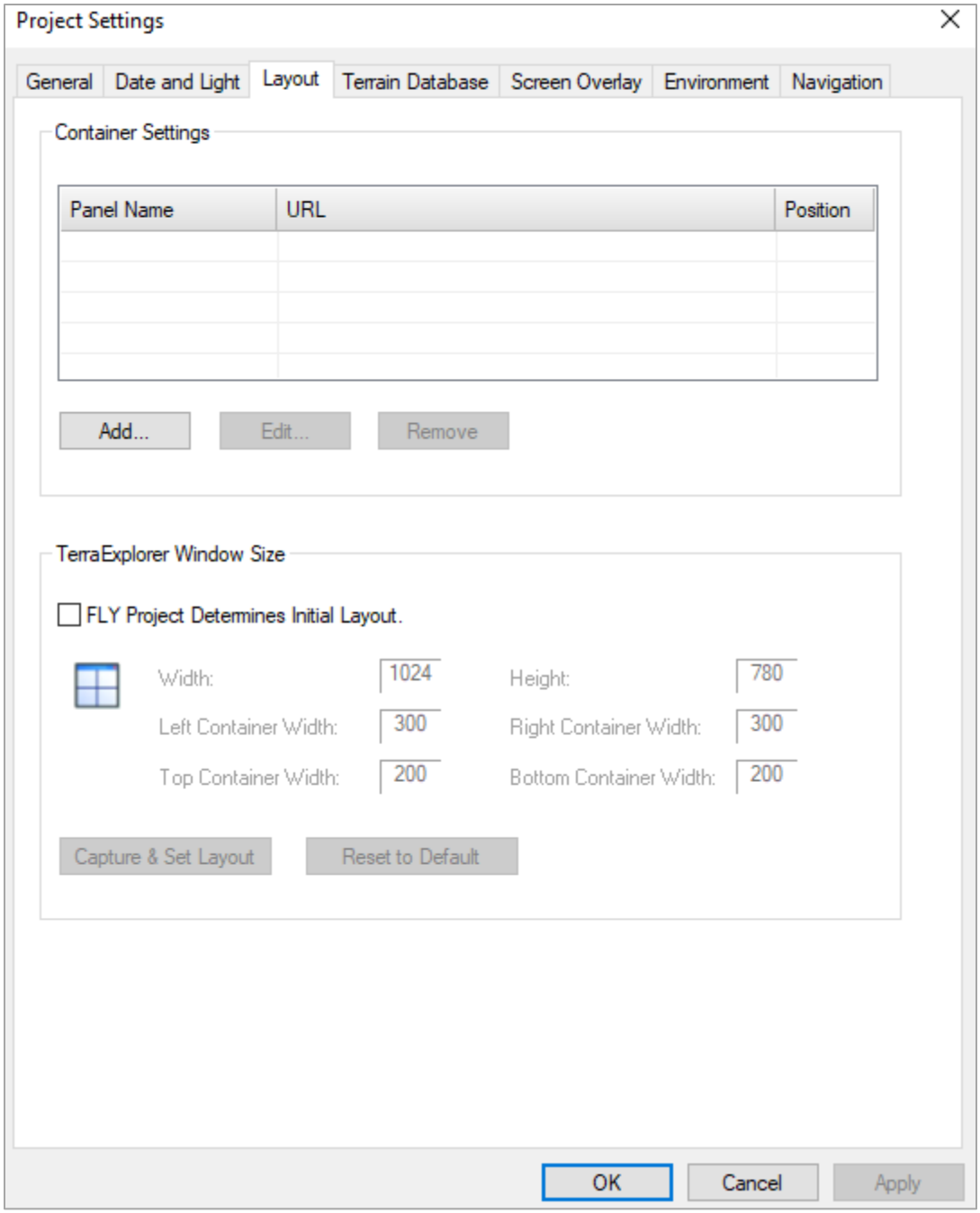
Parameter	Description
Light Source	

No light effect	Select this option to light all sides of the 3D Window evenly.
Use sunlight	Select this option if you want the sun to serve as the light source for the project. This results in parts of the 3D World being brighter than others based on the time, date and time zone set.
Use sunlight and shadow	Select this option if you want the sun to serve as the light source for the project and you want shadows cast for all buildings and 3D models in the 3D Window. The lighting and shadows dynamically update when the system date and time is changed.
Startup Time Zone	
My computer	Select this option to use your local time zone.
UTC (Coordinated Universal Time)	Select this option to use UTC time.
Specific	Select this option to use a specific time zone, and then select it from the dropdown list.
Startup Date and Time Slider Range	
Project time range	Select this option to display a time/date slider whose range corresponds to the project's range.
Always use <> at viewer position	Select this option to display a time slider with a 24-hour range, which is set at a specified time.
One year range (two sliders)	Select this option to display two sliders, a time slider whose range is 24 hours and a date slider whose range is one year.
Automatically adjust range to selected item	Select this option to display a time/date slider whose range varies depending on the range of the selected item. When no item is selected, the slider's date and time correspond to the date and time option selected above.

Layout

In the **Layout** tab, you can set:

- Window size and layout of the containers after TerraExplorer reopens the project.
- Contents for the left, right, top, bottom, and main view containers and floating window. Containers with more than one panel are given tabs to allow you to switch between the options.



Project Settings - Layout Tab

To establish a particular size and layout for the project:

1. Restore down the TerraExplorer Pro application and set it to the required size.
2. Reposition and resize the panels as required. **See** "Application Layout" in the "Basic Concepts" chapter for information.
3. In the **Project Settings** dialog, click the **Layout** tab.
4. Select the **Fly Project Determines Initial Layout** check box.
5. Click **Capture & Set Layout**. The project settings are set to the current sizes.

Note: You can click the **Reset to Default** button to reset the TerraExplorer default settings. Resetting will cancel your configured settings.

6. Click **OK**.

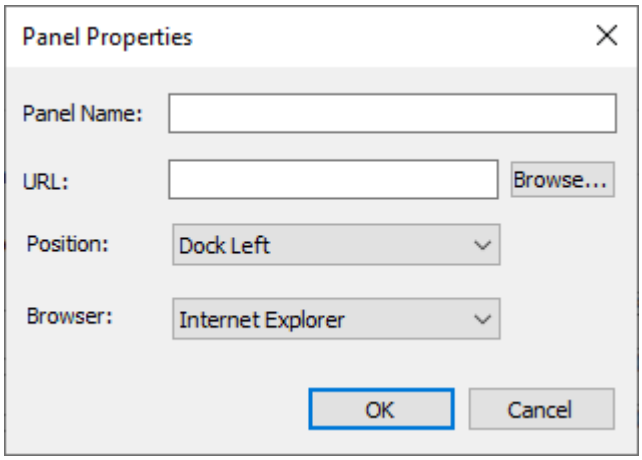
Note: If you do not want to establish any particular size and layout for this project, clear the **Fly Project Determines Initial Layout** check box, and save the .FLY project. Doing so restores standard TerraExplorer size and layout when the user reopens the project.

To create new panels:

1. In the **Layout** tab of the **Project Settings** dialog, in the **Container Settings** section, click **Add**.

   Note: If you already created a new panel and now want to modify its parameters, select the panel, and click **Edit**.

   The Panel Properties dialog is displayed.



Tab Properties Dialog

2. Do the following:

   a. In the **Panel Name** field, enter/modify the name you want to appear on the panel caption or on the tab.

   b. In the **URL** field, enter or browse to the required URL.

   c. In the **Position** field, select one of the following options from the dropdown list:

   - Dock Left
   - Dock Right
   - Dock Top
   - Dock bottom
   - Float
   - Main View

   d. In the **Browser** field, select a browser: Internet Explorer or Edge. This determines which web browser this URL will be opened in.

Note: Microsoft Edge is best suited for running simple, very limited scripts. Complex scripts that involve back-and-forth interactions with TerraExplorer using events may not function as intended or may experience performance issues. We are working to remove this limitation in future versions of TerraExplorer.

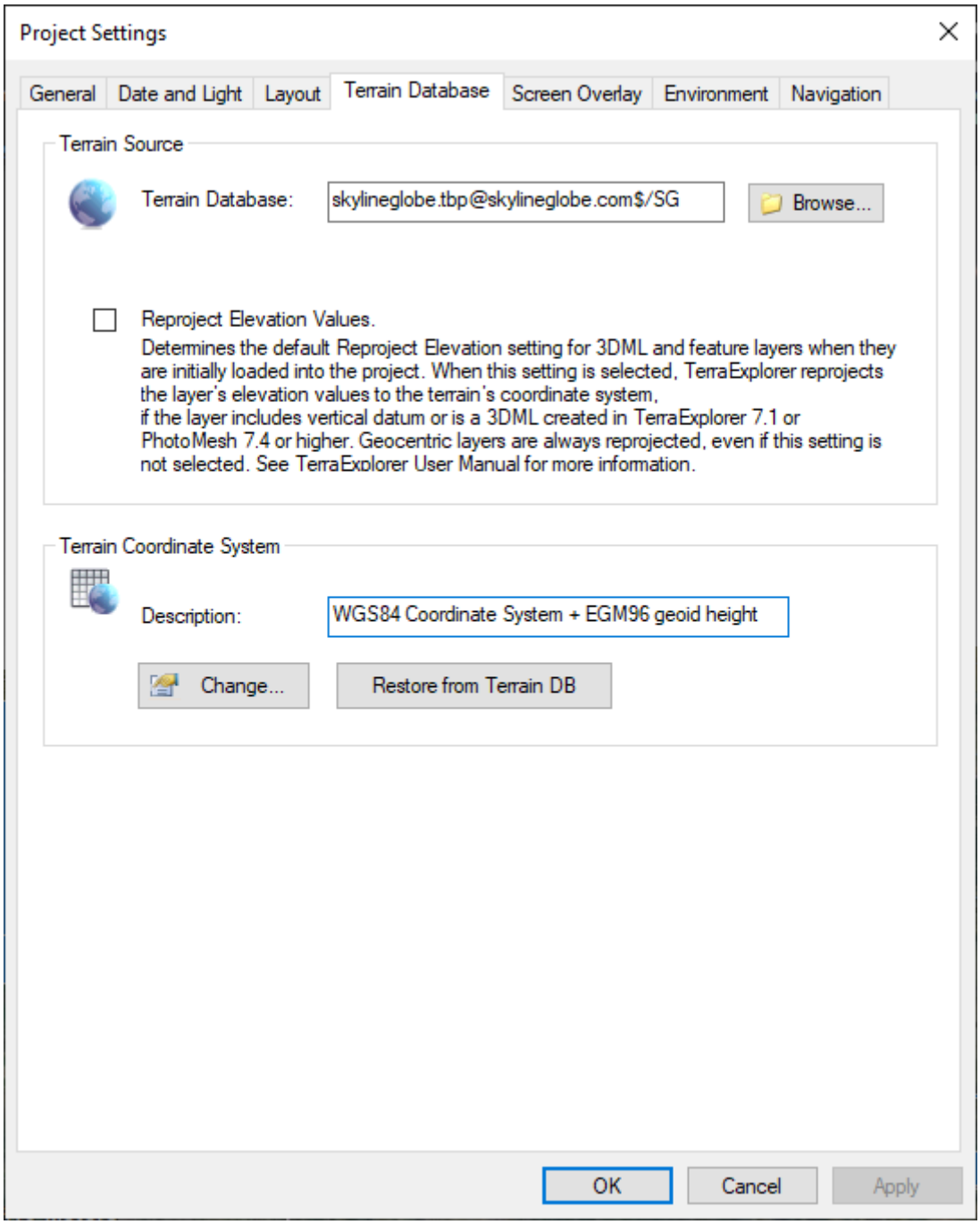
Note: If you want to remove a panel, in the **Container Settings** section, select it and click **Remove**.

Note: Only the position of new panels can be set in the Tab Properties dialog. TerraExplorer's standard panels are repositioned by dragging them to the required positions on the screen. You can reposition any panel on the screen except for the 3D Window.

Terrain Database

The **Terrain Database** tab determines the terrain source and settings and sets and restores the terrain coordinate system.

By default, the terrain coordinate system is read from the terrain database. However, in rare cases where you know the coordinate system does not exist in the terrain database, or is incorrect, you can define it manually.



Project Settings - Terrain Database Tab

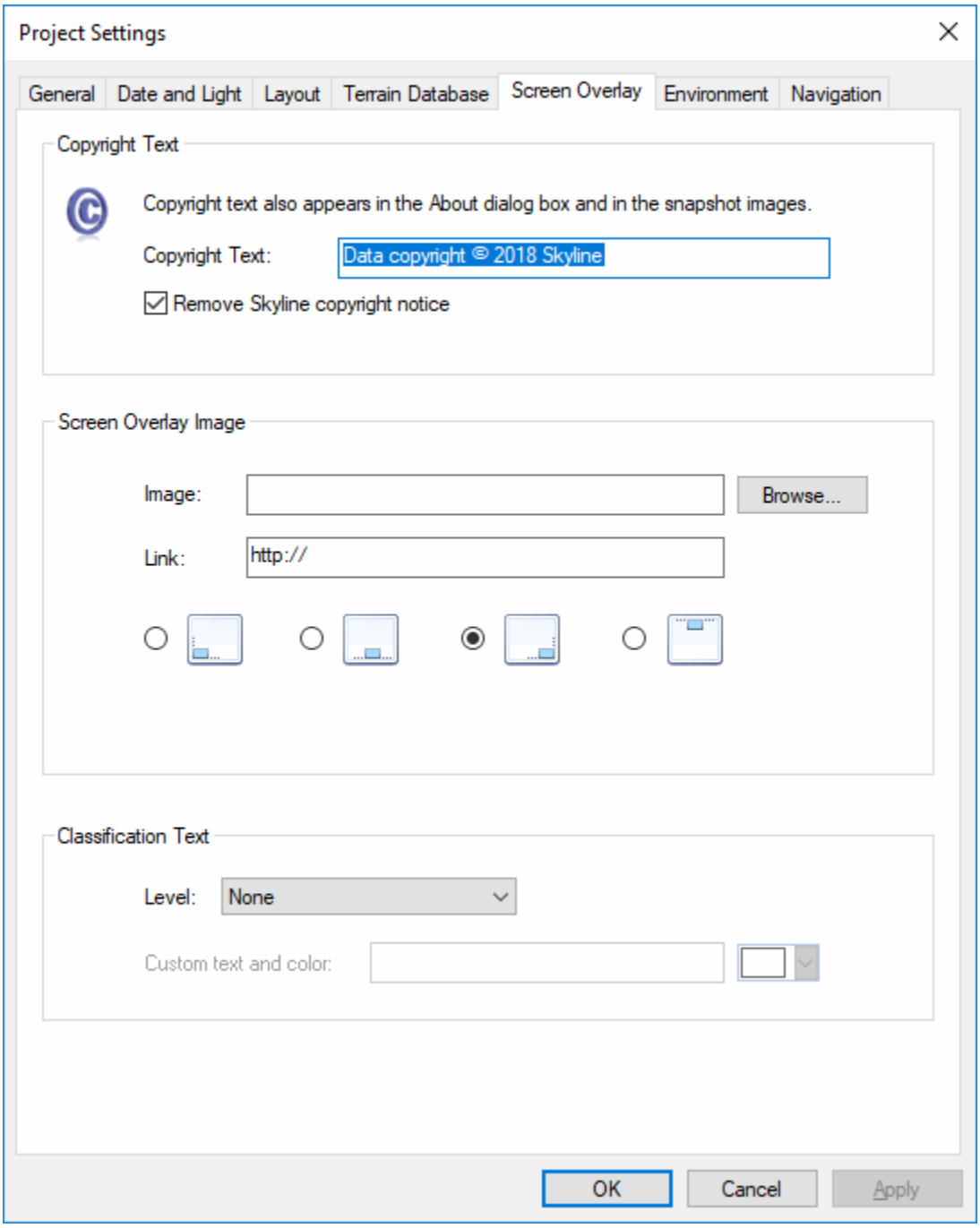
Enter the following information:

Parameter	Activity
Terrain Source	
Terrain Database	The name of the local or remote MPT database currently used by this project. To change the project's MPT database:

	▪ Click the **Browse** button and select a different MPT database. Make sure that the new MPT has the same coordinate system and covers the same area as the original MPT, or the content of the project will be unusable.
Reproject Elevation Values	Determines the default Reproject Elevation setting for 3DML, elevation, and feature layers when they are initially loaded into the project. When this setting is selected, TerraExplorer reprojects the layer's elevation values to the terrain's coordinate system, if the layer includes vertical datum or is a 3DML created in TerraExplorer 7.1 or PhotoMesh 7.4 or higher. Geocentric layers are always reprojected, even if this setting is not selected.
Terrain Coordinate System	
Description	Free text field (Read-only).
Change	Click to open the Coordinate System dialog. This high-level dialog allows you to select, view, edit and create a new coordinate system. **See** "Coordinate System Dialog" in the "Basic Concepts" chapter for information.
Restore from Terrain DB	Restores the coordinate system that is available from the MPT file.

Screen Overlay

The Screen Overlay settings allow you to set the copyright text and image that appear on the 3D Window.



Project Settings -Screen Overlay Tab

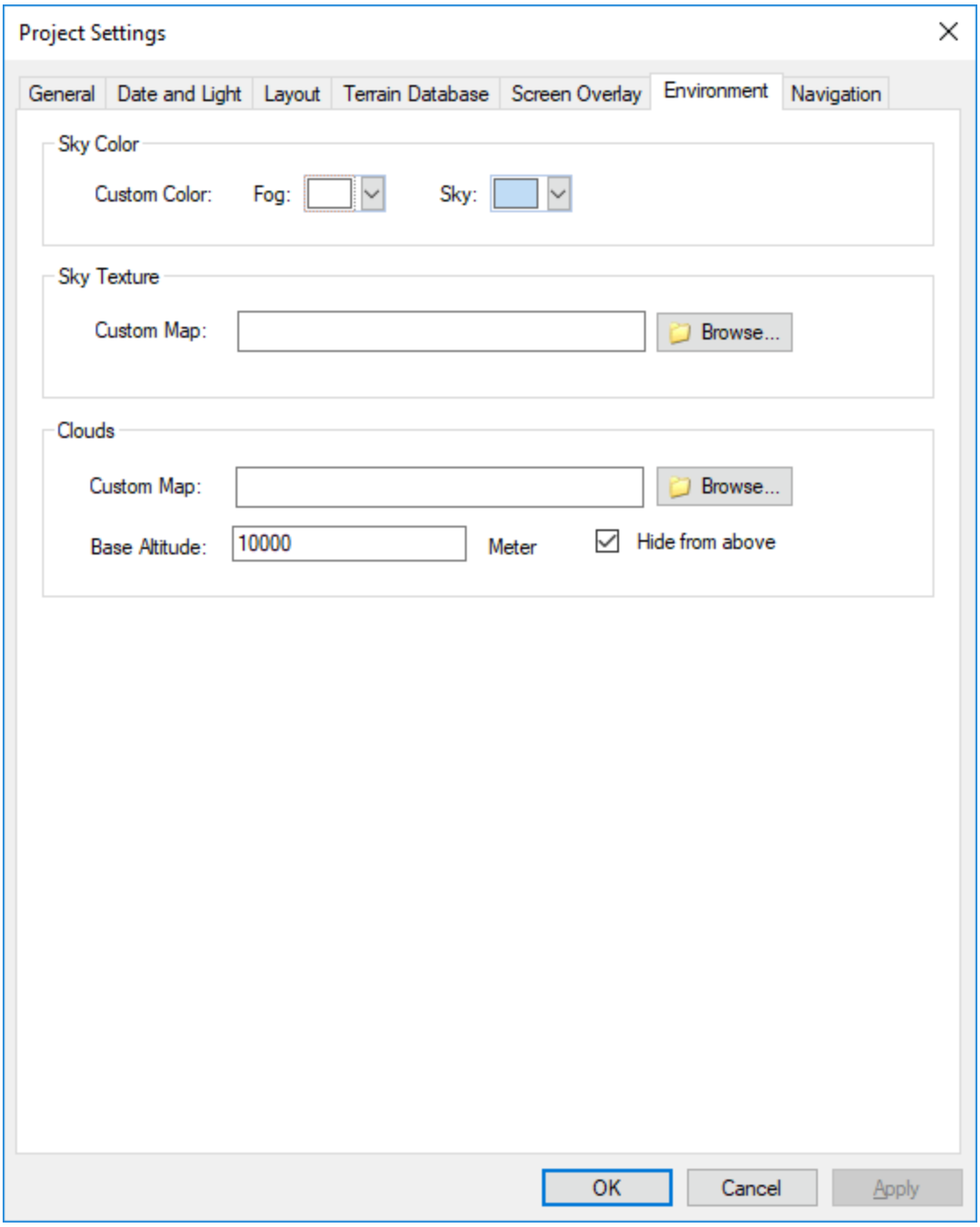
Enter the following information:

Parameter	Activity
Copyright Text	
Copyright Text	Enter an alphanumeric string for the owner of the copyright for the data. This information appears on the bottom of the 3D Window and on the About TerraExplorer screen accessed from the **Resources** menu.
Remove Skyline copyright notice	Check this option if you do not want to display the Skyline copyright notice.
Screen Overlay Image	
Image	Type or browse a path to a BMP, JPEG, or GIF to load as the overlay image. If no image is selected, no screen overlay image will be displayed. Animated GIF files are supported.
Link	Enter the link URL. If a link exists, TerraExplorer Pro launches an external web browser with the selected URL when the user clicks on the image.
Screen Alignment	Select the position on the screen for the screen overlay: ▪ Bottom left ▪ Bottom center ▪ Bottom right ▪ Top center
Classification Text	
Level	Select a project classification level: **Note:** The classification level selected for the project is displayed prominently in the 3D Window. ▪ None ▪ Unclassified (Green) ▪ Secret (Red) ▪ Top Secret (Yellow) If you want to set your own classification level text and color, select **Custom**.
Custom text and color	Type the text and color for the custom classification level.

Environment

From the Environment tab, you can set the appearance of the atmosphere in the 3D Window:

- Horizon distance, fog starting distance
- Sky and fog color
- Sky and cloud textures
- Water effect.

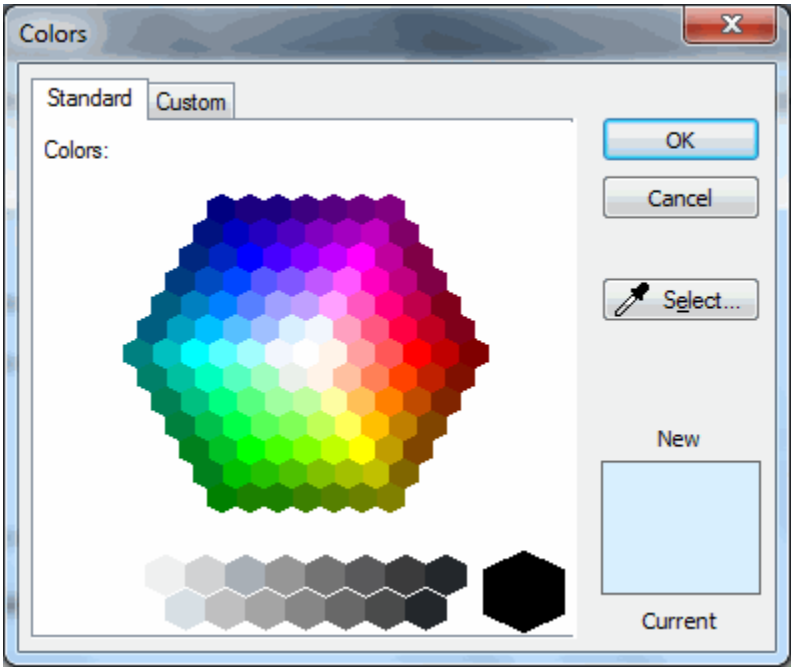


Project Settings - Environment Tab

Parameter	Activity
Sky Color	
Fog	Click this arrow and select the required fog color from the dropdown list of fill colors or click **Other**, and select the required color from the Colors dialog. **See** "Colors Dialog" in this chapter for

	information. The actual fog color is a gradient of colors from the Fog color at the horizon to the Sky color at the middle of the sky.
Sky	Click this arrow and select the required sky color from the dropdown list of fill colors or click **Other**, and select the required color from the Colors dialog. **See** "Colors Dialog" in this chapter for information.
Sky Texture	
Sky texture	If you want a sky texture to be displayed, select the check box, and select one of the texture options, or select **Custom**, and browse to the required texture file.
Clouds	
Custom map	If you want a cloud cover to be displayed, select the check box, and select the Cloud cover option, or select **Custom**, and browse to the required Cloud map file.
Base altitude	Enter a number between 10000 and 20000 as a base altitude for the cloud cover.

Colors Dialog



Colors Dialog

To select a color:

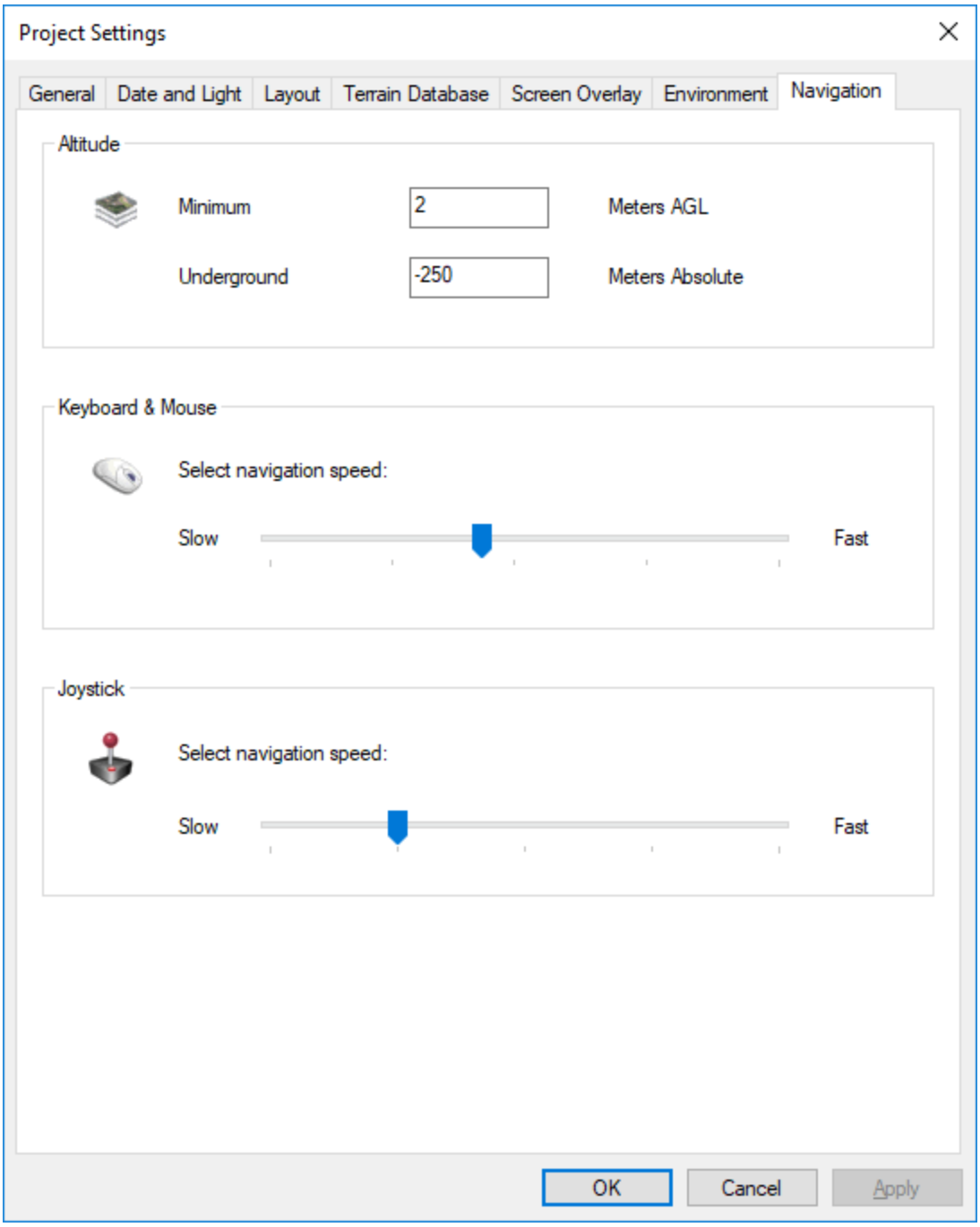
1. Use one of the following methods:
   - In the **Standard** tab, click one of the displayed Colors.
   - In the **Custom** tab, create Custom colors using the color matrix and luminosity slider or by typing exact parameters in the value-boxes. Click **OK**.
   - Click **Select**, drag the eye dropper to any area on the screen with the required color and click.

2. Click **OK**.

Navigation

The Navigation settings allow you to define the free flight envelope. Navigation settings determine the characteristics and limits of the free flight but do not affect pre-determined fly-through such as fly-to object or fly-to location. The free flight is controlled with one or more of the following methods:

- Mouse
- Keyboard
- Joystick
- Control panel.



Project Settings - Navigation Tab

Parameter	Activity
Altitude	
Minimum Altitude	Type the minimum altitude allowed for the plane in meters or feet above ground level.
Underground Surface	Type the altitude above the terrain database vertical datum base ellipsoid.

Keyboard & Mouse	
Navigation Speed	Slide the slider to set navigation speed when using the keyboard controls. **See** "Navigating Using the Keyboard" in the "Navigating in the 3D World" chapter for information about keyboard controls.
Joystick	
Navigation Speed	Slide the slider to set the joystick's speed.

CHAPTER 22 USING TERRAEXPLORER OPTIONS

About TerraExplorer Options

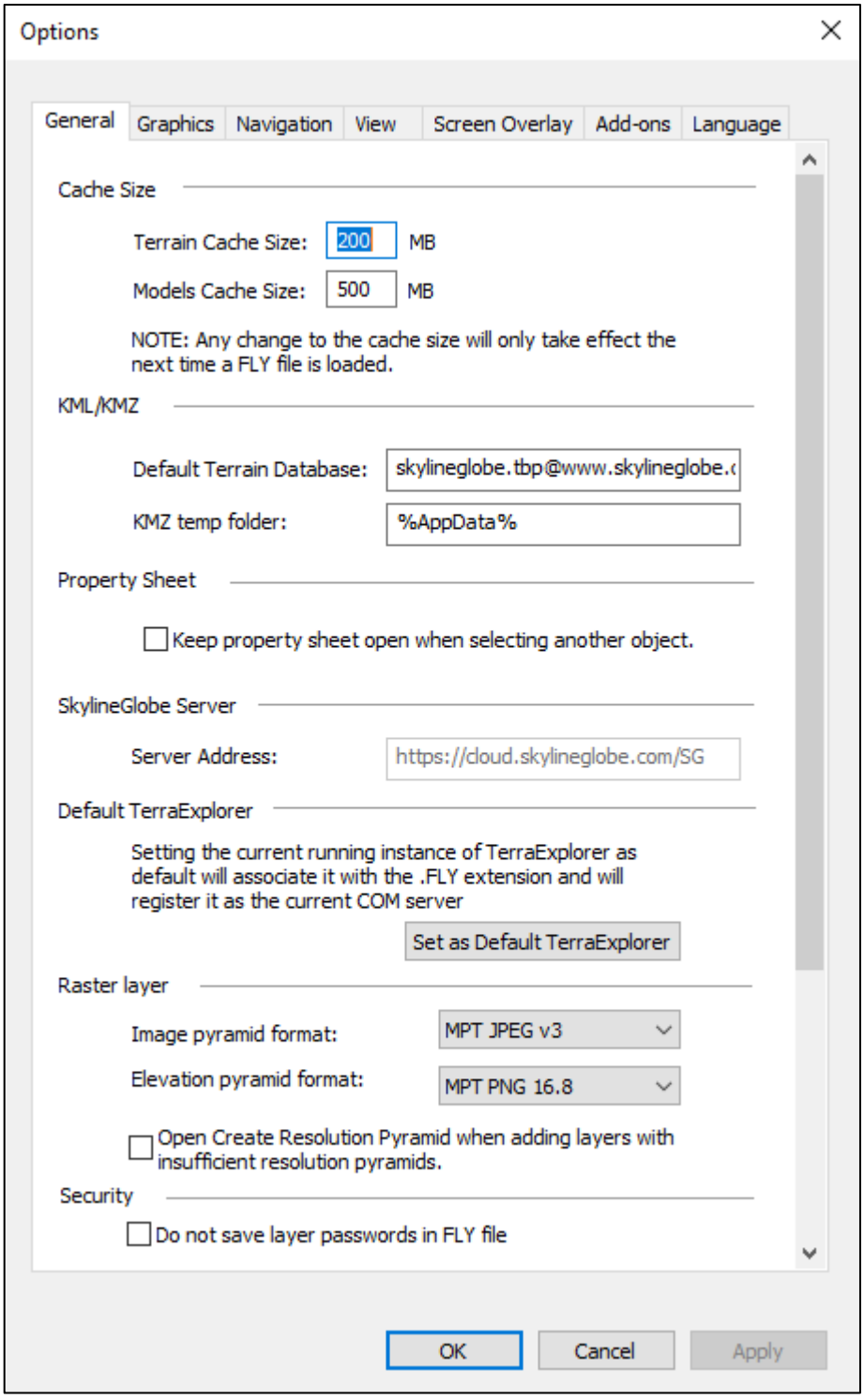
The TerraExplorer Options determine your working environment. Any changes in these options are saved and used in your future sessions. You can view and edit these options with the **Options** dialog.

To open the **Options** dialog:

1. On the **File** menu , click the **TerraExplorer Options** button **(F9)**.
2. Click the tabs and define TerraExplorer options as required:
   - General
   - Graphics
   - Navigation
   - View
   - Screen Overlay
   - Add-ons
   - Language

General

The General tab determines the basic parameters for your TerraExplorer. You can manage disc cache size, define KML/KMZ settings, select raster pyramid formats, and set the currently running TerraExplorer as the default TerraExplorer.



Options - General Tab

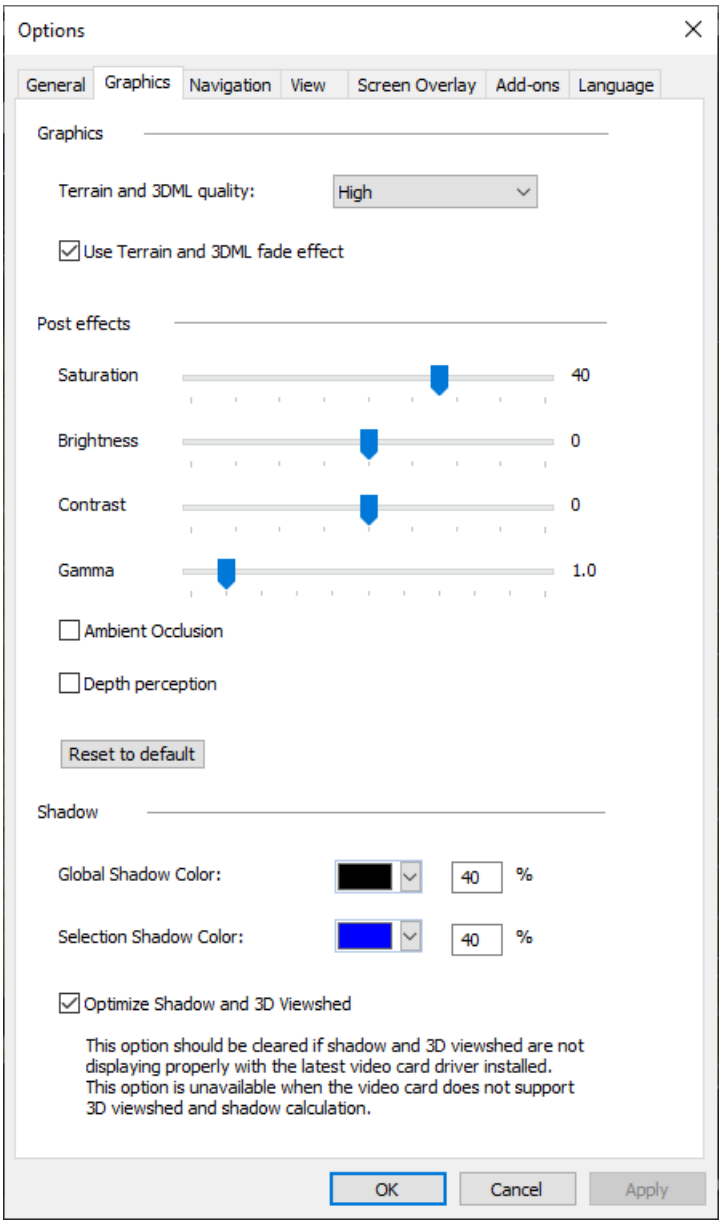
Parameter	Description
Cache Size	

Terrain Cache Size	Enter the size in MB to be allocated on your hard disk for terrain caching. When you use a terrain from a SkylineGlobe server, data for the area you fly is cached on your local disk. This allows you to fly around this area, without downloading it again. In addition, if you close TerraExplorer and later resume operation using the same internet terrain, information in the cache can be used.
Models Cache Size	Enter the size in MB to be allocated on your hard disk for 3D models' automatically generated levels of detail. This option only applies when the Generate levels of detail for 3D models option is selected in the Project Settings General tab. **See** "General" in the "Setting the Project" chapter for more information.
KML/KMZ	
Default Terrain Database	The default terrain database to use when directly opening a KML or KMZ file.
KMZ temp folder	A temporary folder used to extract compressed KMZ files.
Property Sheet	
Keep property sheet open when selecting another object	Select this checkbox ability to keep the properties sheet open when selecting other item from the project tree
SkylineGlobe Server	
Server Address	The SkylineGlobe Server that TerraExplorer is currently connected to, or the address of the last server that TerraExplorer was connected to, if you are logged out from the server. This server is used for all SkylineGlobe services including the publishing and reading of layers from server, search functionality and SGS base layers (Read-only). **Note**: **See** "Logging In to a SkylineGlobe Server" in the "Working with SkylineGlobe Server" chapter for information on logging in to a server.
Default TerraExplorer	
Set as Default TerraExplorer	Sets the currently running instance of TerraExplorer as the default that is associated with the .FLY extension and as the TE version to be used by external applications using TerraExplorer API. This setting can also fix some errors resulting from installation errors or use of other TE versions on the same computer.
Raster Layer	
Image pyramid format	Select the required format: ▪ **MPT JPEG v3** – For standard imagery. ▪ **MPT PNG 24** – For high quality images.
Elevation pyramid format	Select the required format: ▪ **MPT JPEG v3** – For standard resolution. ▪ **MPT PNG 16.8** – For high resolution data. ▪ **MPT PNG 16** – For very high resolution data. The precision is dynamic according to the range of elevation.

Open Create Resolution Pyramid when adding layers with insufficient resolution pyramids	Select the check box to automatically open a Create Resolution Pyramid dialog when loading an imagery layer with an insufficient resolution pyramid.
Security	
Do not save layer passwords in FLY file	Select this option to provide increased security, by omitting all password information for external sources (e.g., remote servers) from the FLY file. When this option is selected, users will be prompted for password information each time they open the FLY and access the data.
Projection Module	
Use reproject by GDAL starting from version 3	Use GDAL v3's coordinate system reprojection library. This is the recommended option especially when publishing projects to SkylineGlobe Server that will require grid shift files for shifting and transforming between coordinate systems, e.g., for use with TerraExplorer Fusion. Setting will only take effect after closing and reopening TerraExplorer.

Graphics

The Graphics tab enables you to select the quality of the terrain model and add visual effects.



Options – Graphics Tab

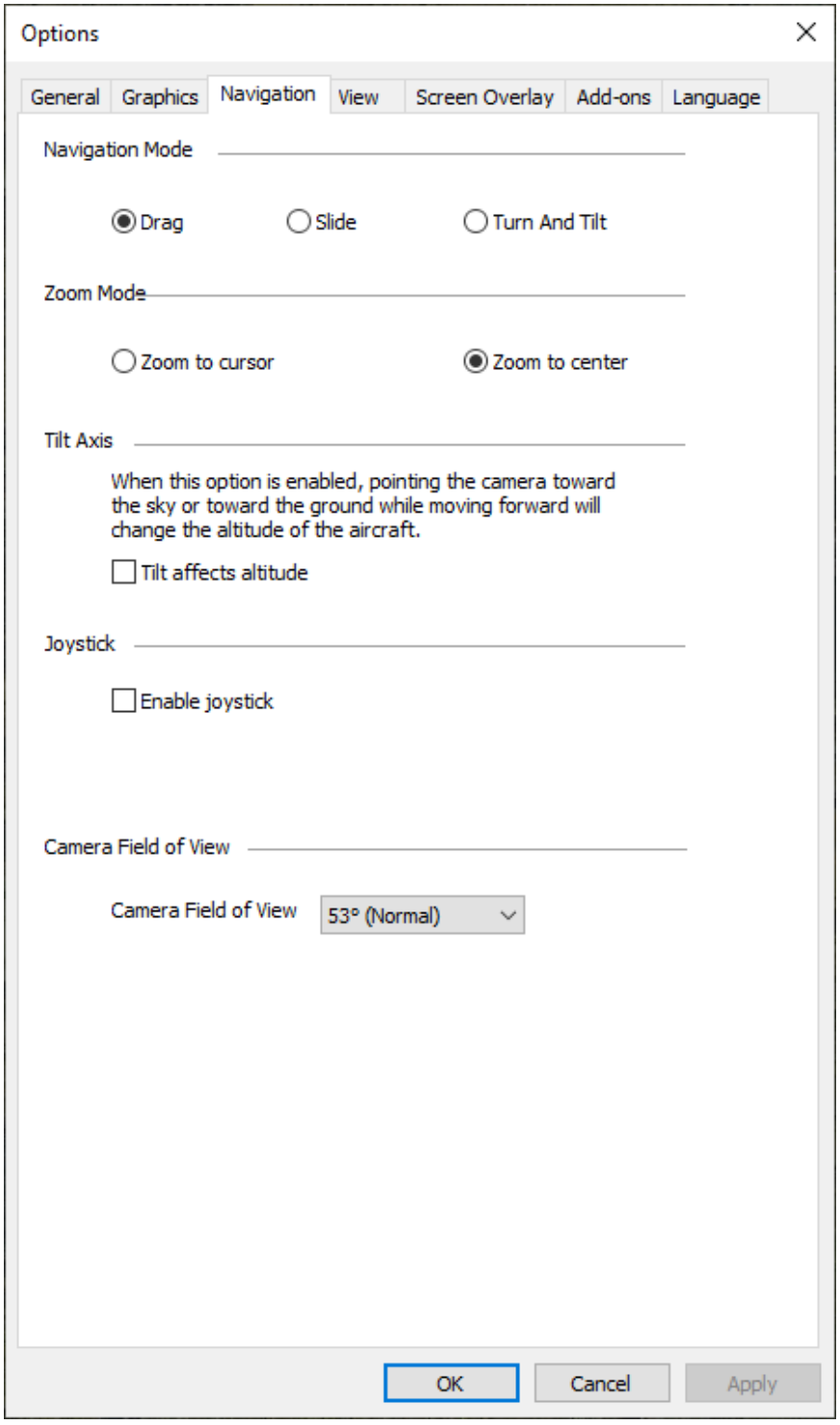
Parameter	Description
Graphics	
Terrain and 3DML Quality	Select the resolution of the polygonal terrain model and 3DML models. ▪ Select **Normal** for best performances. ▪ Select **High** to quadruple the number of polygons used to

	create the terrain model for the area close to the camera, and to display a higher Level of Detail (LOD) for 3DML. ▪ Select **Best** - **FHD** to quadruple the number of polygons that create the terrain model for the entire visible terrain, and to display the highest LOD for 3DML. This setting uses the most memory. ▪ Select **Best** - **4K** for Ultra High Definition (UHD) 4K quality, offering true 3840x2160 pixels render resolution. **Note:** This setting should only be applied with the Windows Display resolution set to 4K and the scale set to 100% (Windows Settings > System >Display).
Use Terrain and 3DML Fade Effect	Select **Use Terrain and 3DML Fade Effect** option to produce a smoother transition between terrain and 3DML imagery resolutions in Globe projects. When you open a Globe project, if this option is enabled, TerraExplorer activates a morphing effect that switches resolution. This effect is activated when zooming in or out. When terrain fade is disabled, a new block is displayed on the terrain instantaneously, with no fade.
Post Effects	
Saturation	Drag the slider to adjust the vibrancy of the colors of the entire 3D view. The color saturation enhancement affects the terrain and all 2D and 3D objects.
Brightness	Drag the slider to adjust the light intensity of the entire 3D view.
Contrast	Drag the slider to adjust the distinction between lighter and darker areas of the entire 3D view.
Gamma	Drag the slider to adjust the gamma of the entire 3D view.
Ambient Occlusion	Select this option to enable Screen Space Ambient Occlusion (SSAO). This adds realism to 3D elements by approximating the way light radiates in real life, especially off of surfaces that are normally considered non-reflective. It operates on all models, shapes, and the terrain. **Note:** Enabling this feature requires a DirectX 10 supporting graphics card. Some performance penalty may be noticed, especially on low-end hardware configurations.
Depth Perception	Select this option to highlight depth changes in the 3D model to make it easier to recognize the model's contours and shape. This can be especially useful for an untextured model or point cloud without colors.
Reset to Default	Click to restore the default Post Effects settings.
Shadows	
Global Shadow Color	Select the shadow color and opacity that should be applied when a shadow is created for all buildings and 3D models in the 3D Window. **See** "Global Shadow" in the "Analysis Tools" chapter for more information.

Selection Shadow Color	Select the shadow color and opacity that should be applied when creating a shadow for selected objects. **See** "Selection Shadow" in the "Analysis Tools" chapter for more information.
Optimize Shadow and 3D Viewshed	This option should be cleared if shadow and 3D viewshed are not displaying properly with the latest graphics card driver installed. This option is unavailable when the graphics card does not support 3D viewshed and shadow calculation.

Navigation

The navigation settings allow you to change the settings for navigating the camera on the 3D Window. **See** the "Navigating in the 3D World" chapter for more information on flying using the keyboard, joystick and navigation controls.



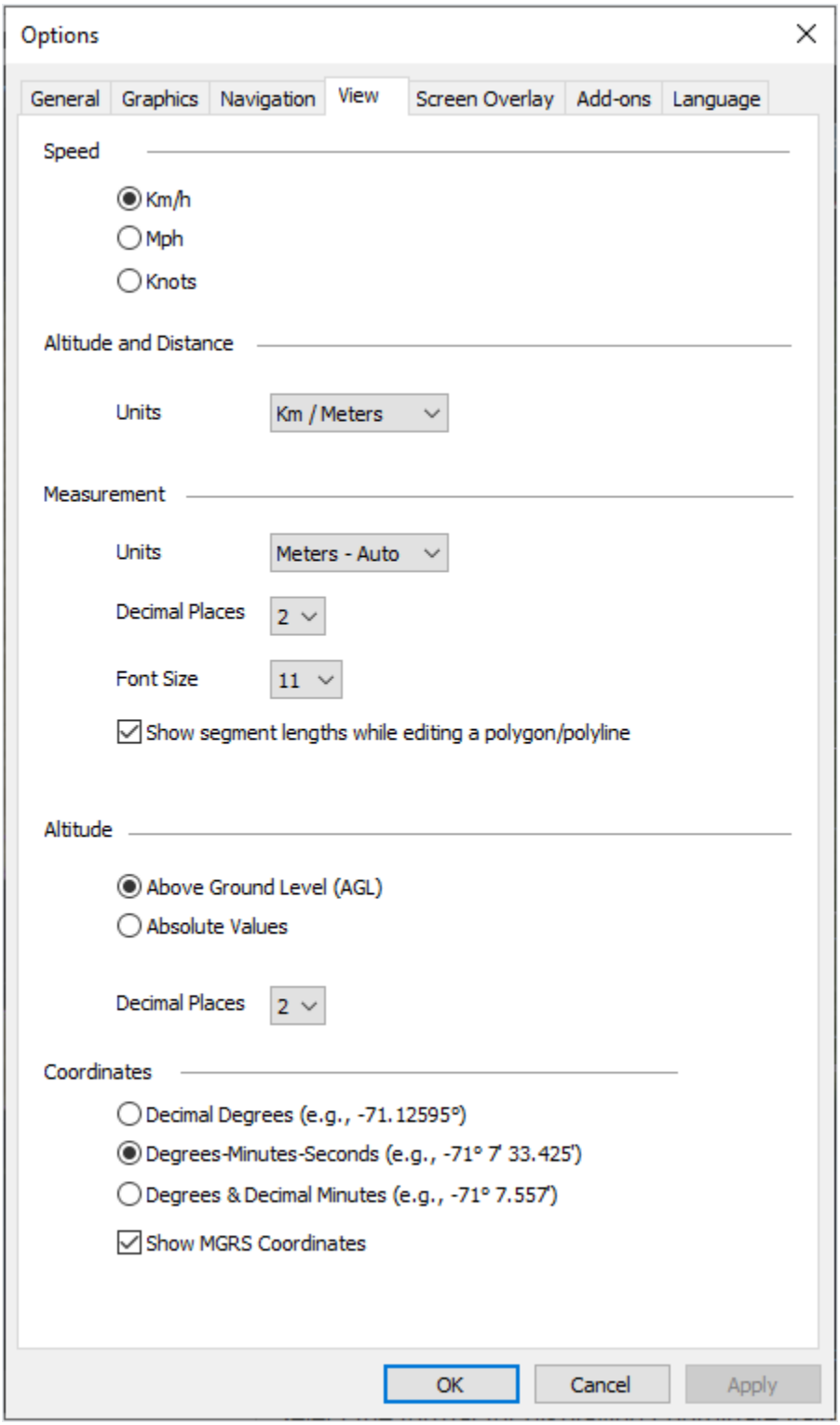
Options - Navigation Tab

Parameter	Description
Navigation Mode	
	Select the navigation mode:

	▪ Drag ▪ Slide ▪ Turn and Tilt **See** "Navigating Using the Mouse" in the "Navigating in the 3D World" chapter for further information.
Zoom Mode	
	Select the zoom mode when adjusting zoom using the mouse wheel: ▪ Zoom to cursor – Zoom to mouse cursor location. ▪ Zoom to center – Zoom to center of screen (regardless of location of cursor).
Tilt Axis	
Tilt Affects Altitude	When selected, the keyboard, mouse and Navigation Controls change the tilt of the plane. The camera points in the same direction as the plane. When not selected, the controls change the tilt of the camera, the plane's tilt is set to 0 degrees.
Joystick	
Enable Joystick	Enable use of external joystick for navigation.
Camera Field of View	
Camera Field of View	The field of view is the size of the camera's viewing angle, or the zoom level of the camera. TerraExplorer Pro's field of view ranges from 15 to 90 degrees, with 53 degrees set as the default. A wider field of view (larger angle) allows you to see more, with a decreased zoom level. A narrower field of view (smaller angle) allows you to see less, with an increased zoom level. In some cases, you also experience reduced performance of the TerraExplorer Pro application with a field of view less than 53 degrees. To set the camera's field of view: ▪ Select one of the available values.

View

You can define the units used throughout TerraExplorer Pro for elevation, speed, distance and more. Changing the units significantly affects TerraExplorer Pro's visual input and output.



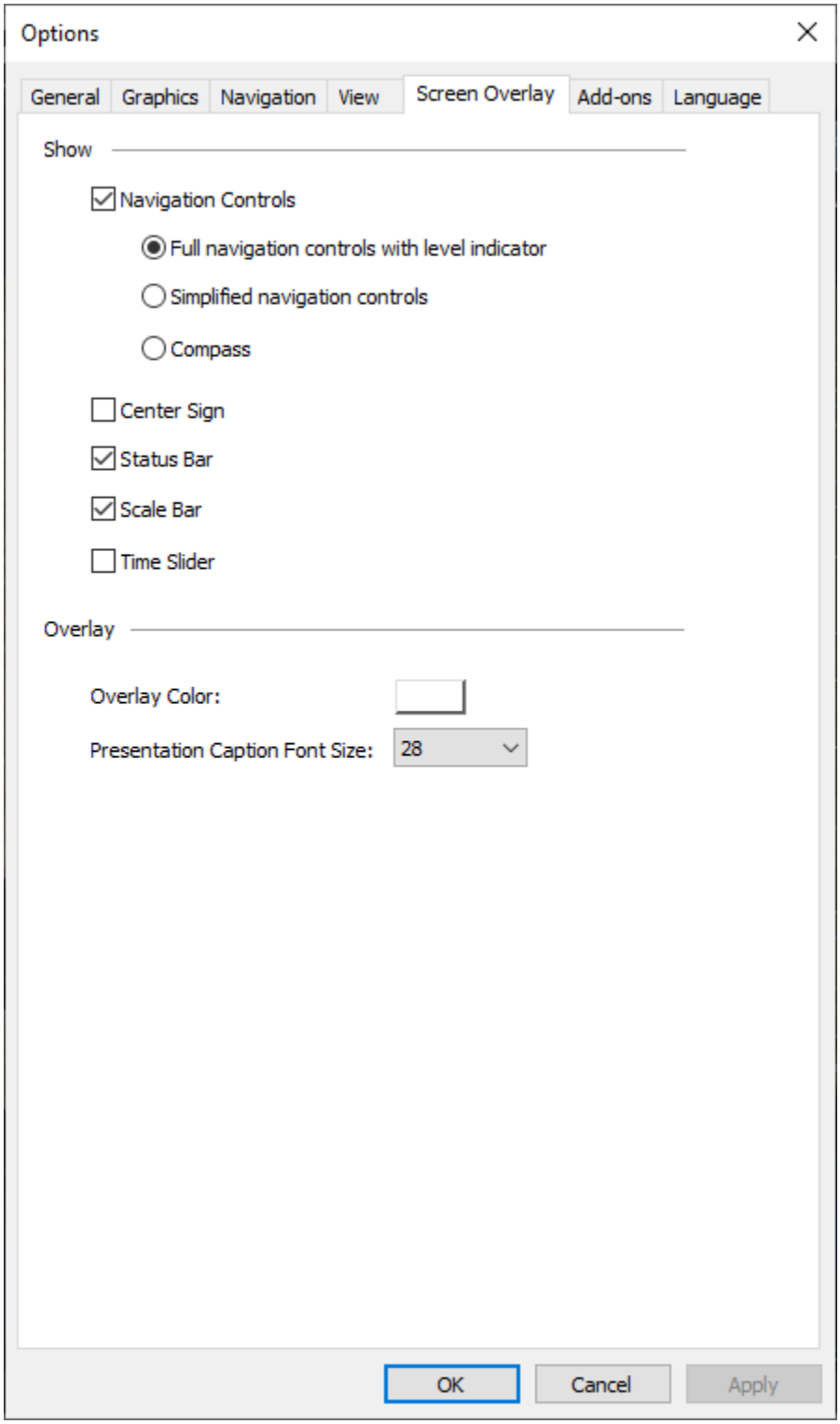
Options-View Tab

Parameter	Description
Speed	

Units	Select the display units for speed.
Altitude and Distance	
Units	Units system to use for display of all distance and altitude values: meters (metric) or feet (imperial).
Measurement	
Units	Sets the display units for distance and area measurements. Only Units options that are consistent with the Altitude and Distance Units (system) selected are displayed. If you want TerraExplorer to automatically use the most appropriate metric or imperial (feet) units for each measurement based on size, select the **Auto** option.
Decimal Places	Sets the number of decimal places for the display of distance and area measurements (0-6).
Font Size	Sets the font size for display of distance and area measurements in the 3D Window.
Show segment lengths while editing a polygon/polyline	Select the check box to display the length of each polygon/polyline segment while editing. The units, decimal places and font size settings are also applied to the segment lengths display.
Altitude Type	
Units	Select the display units for altitude.
Relative/Absolute	Select the altitude type: ▪ **Above Ground Level (AGL)** – Displays altitude values as meters or feet above the ground level in the selected coordinate. ▪ **Absolute Value** – Displays altitude values as meters or feet above the terrain database vertical datum base ellipsoid.
Decimal Places	Sets the number of decimal places for the display of altitude (0-6).
Coordinates	
Display Format	Select the format for displaying coordinate values: ▪ **Decimal Degrees** – e.g., -71.12595 ▪ **Degrees-Minutes-Seconds** – e.g., -71° 7’ 33.425" ▪ **Degrees and Decimal Minutes** – e.g., -71° 7.557’
Show MGRS Coordinates	Select the check box to display Military Grid Reference System (MGRS) coordinates in the status bar, all property sheets, and Information Query results.

Screen Overlay

The **Screen Overlay** is a graphic and textual display that projects flight and camera information onto the terrain view. This allows you to monitor the flight, without taking your eyes off the terrain.



Options - Screen Overlay Tab

Parameter	Description
Show	

Navigation Controls	Displays the navigation controls. Select any of the following: ▪ **Full navigation control with level indicator** – More extensive navigation controls provide a joystick for free flight, and control over plane tilt and direction, as well as zoom adjustment and turning North. ▪ **Simplified navigation control** – Optimized for touch screens, simplified navigation controls offer basic controls (zoom adjustment and turning North) while conserving screen real estate. ▪ **Compass** – Only display a small turn North control at the bottom of the 3D Window to maximize screen real estate. **See** "Navigating Using On-Screen Navigation Controls" in the "Navigating in the 3D World" chapter for further information**.**
Center Sign	Displays the 3D Window center point.
Status Bar	Displays the speed, altitude and direction as text lines on the bottom of the 3D Window.
Scale Bar	Displays the ratio of a distance in the virtual 3D World to the corresponding distance in the actual world.
Time Slider	Enables you to adjust current date and time.
Overlay	
Overlay Color	Click and select a color for the screen overlay.
Presentation Caption Font Size	Select the font size, in pixels, from the dropdown list for presentation captions.

Add-ons

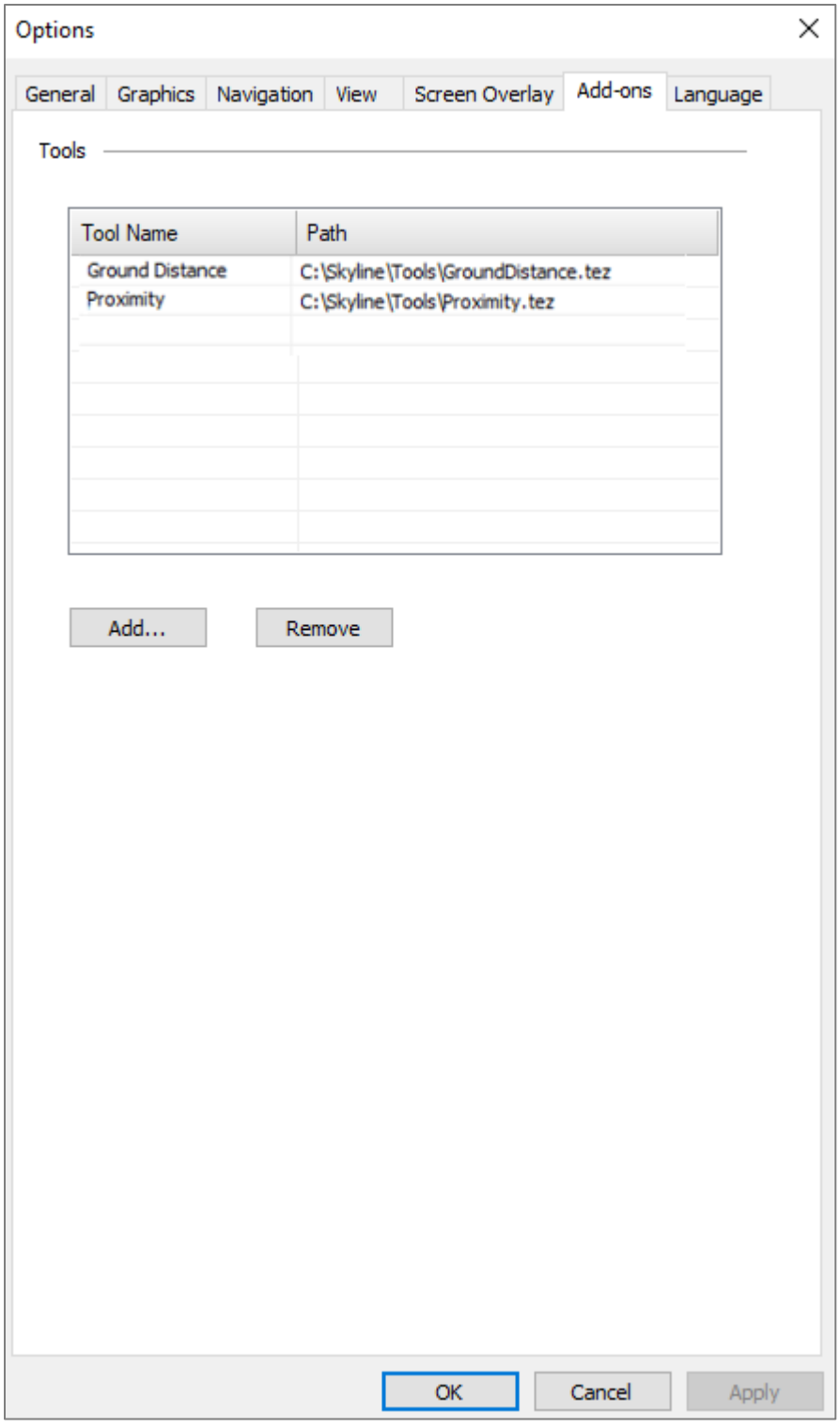
The Add-ons tab provides an easy means of managing your TerraExplorer extensions. TEZ zip files containing new tools or an alternative Start page can be installed from this tab, or alternatively removed from the application. **See** the "TEZ Creator Tool" chapter for more information on creating and installing TEZ files.

To add an add-on:

1. On the **Add-ons** tab, click **Add** and browse to the location of the tool or alternative Start page.
2. Click **OK**.

To remove an add-on:

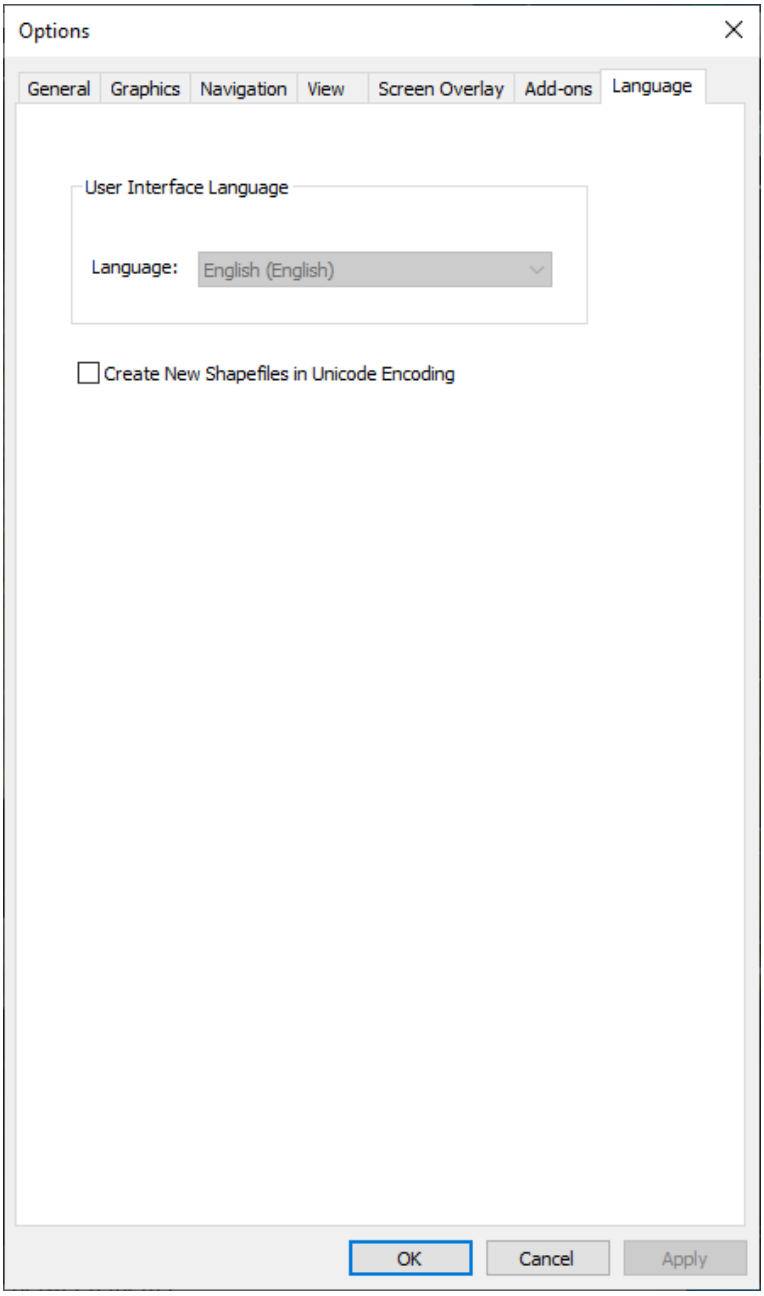
1. Select the required add-on, and click **Remove**.
2. Click **OK**.



Options-Add-ons Tab

Language

You can set the user interface language, and define Unicode settings.



Options - Language Tab

Parameter	Description
User Interface Language	
Language	Select a language from the dropdown list.
Create new shapefiles with Unicode encoding	Enables Unicode support in shapefiles.