Map 3D has two types of overlay analysis available, Drawing Object overlay and Feature overlay. Feature overlays are straightforward and do not require the construction of a topology, which is needed in a Drawing Object overlay. Feature overlays allow you to compare a base or source layer and an overlay layer. There are several types of Feature overlays, which we will look at in more detail in a minute. Regardless of the type of Feature overlay selected, the output will be sent to an SDF file and added as a layer to the current map.

Feature Overlays
Feature overlays allow us to compare the features on one layer, called the source layer, with features on a second layer, called the overlay layer. As you can see from the images below, the result can allow us to see how the features overlap or interact based on the type of analysis we use to analyze the overlay.

In the first image, we see a view of a number of parcels in a city.

This second image displays census blocks for the same city.

The overlay shows what areas of the city were covered by the census in relation to the parcels and what census block a particular parcel resides in.
This particular example uses an Identity type of overlay. This overlay will create a new feature in areas where the source and overlay features intersect. We end up with the polygons (features) from the source layer combined with data from the overlay layer. In the case of our example, the result will show the census block value for each of the parcels covered by the census, and a <Null> value where the parcels and census features do not intersect. In the following image, you see the result of the overlay visible in the map as a feature layer.

The data table shows the values for the census block from the overlay layer for each of the parcels in the source layer.

You can see that each of the parcel addresses shown fall within the 2001 census block.

Due to the nature of the data and its methods of collection and construction, there are a couple of things to keep in mind when doing Feature overlays. The first is the creation of long, thin polygons called slivers. These occur when the source and overlay feature polygons do not quite line up. There are a number of reasons this might occur, but often the cause is an uneven quality in the data sources. As you undertake the analysis, you can set a tolerance for the sliver area, from which the application will determine if the sliver should be merged with an adjacent polygon, or kept as a separate polygon. The second thing to watch out for are lines that have an excessive number of nodes along their length. These may be linear features or polygon sides. To overcome this, you can set an ordinate tolerance which specifies a minimum distance between nodes before each is determined to be distinct.

As in any computation, the simpler the data, the faster the computation will proceed. Setting the sliver and ordinate tolerances judiciously can affect the processing of the overlay dramatically.

**Overlay Types**

There are several types of feature overlays available, as you can see from the selection list in the dialog.
Let’s look at each one in more detail. In the example we looked at in the previous section, both the source and overlay layers contained polygons. Remember, though, that the feature layer could also be one containing just points or lines.

An **Intersect** overlay will create its result set on the basis that the geometry that overlaps is contained in both the source and overlap layers. Features that do not overlap are not included in the result set. This is, in effect, an elimination operation.

A **Union** overlay will look at the features that exist in both of the layers. The result set is made from new features created where the two source layer geometries intersect, so the result is the sum of the source and overlay layers.

An **Erase** overlay yields a result set that contains features from the source layer that do not intersect features from the overlay layer. Intersecting geometries are discarded. This is a useful analysis to determine areas that are not affected by the presence of a condition represented by the features on the overlay layer.

An **Identity** analysis (the type mentioned in the previous section) will create a result set that is comprised of new features where the geometries of the source and overlay layers intersect and which combines the geometry of the source layer with the data in the overlay layer. As we saw in the example, the result set contained the parcel polygon geometries (source) and the data in the census layer (overlay) and created a new feature source and display layer to show the results.

An **Clip** analysis works much the same as an intersect analysis, in that it creates a result set based on features that intersect on both layers. However, only attributes from the source layer are included in the result and the boundary is determined by the overlay layer. This is the type of analysis that would yield roads (source) that lie within a city limit (overlay).

A **Paste** analysis is pretty much as it sounds. It creates a result set of features by pasting all of the overlay features onto the source features regardless of the layer geometry intersection, with all the attributes and geometries of the features from both layers retained.

A **Symmetric Difference** analysis creates a result set that contains geometries from the source and overlay layers that do not overlap. In other words, the result set contains the features that are mutually exclusive. Unlike the Erase analysis, which creates a result containing only features from the source layer, a symmetric difference analysis contains features from both layers in the result. The data table will show attributes from both layers, but column values will be <Null> where required. To illustrate, look at the following images.

Here is a parcel for which there is no census block.

![Image of a parcel with no census block](image1)

Here’s the data. Note the parcel data versus the <Null> values for the census data.

![Image of census data with <Null> values](image2)
An Overlay Analysis Example

Let's take a look at a simple overlay analysis. We'll use our parcel and census data (in the form of SDF files) and establish FDO connections to each.

We'll do an Erase analysis to see what parcels have not been covered by any census block. First, we start the **Feature Overlay** command. It's found in the Feature panel of the Analyze tab of the ribbon, or you can type **MAPGISOVERLAY** as the command.

On the first screen of the Overlay Analysis wizard, we can select the source and overlay layers as well as the type of analysis. Note that once you select the analysis type, the application gives you some information about it and what to expect from different combinations of features.
Click the Next button. On the second screen of the wizard, you can set the sliver and ordinate tolerances, as well as the output location, layer name and output properties. The Output Properties field allows you to specify which properties are included in the result set layer from the source and (if applicable) overlay layers.

- **All** will add all the properties to the resulting layer.
- **Identifiers** will add just the primary keys or unique fields.
- **Non-Identifiers** will add attributes which are not primary keys or unique fields. If you choose this option, the application will create a primary identifier for the result set.

In our example, we'll select the “All” value.

Click the Finish button to close the wizard and run the command. Here’s a partial view of the result.
You can see the new layer (Parcels_Erase) has been created based on the SDF file created from the result set. The set contains only the features from the source layer (Parcels) that do not have any intersection with the overlay layer (CensusBlk2000).

Feature overlays are quick and straightforward to use. They allow us to look at data interactions and enhance our understanding of the data represented in a map.

**About the Author: Jeff Morrow**

Jeff, a senior civil and geospatial consultant with IMAGINiT, has over forty years’ experience in the mining and engineering sectors. He has been involved with AutoCAD and the Autodesk civil software applications since their earliest days, and has consulted on the development of standards and procedures, CAD management, database and technical applications, training and implementation, and project management. Jeff is recognized for his work in mineral exploration, minesite reclamation and environmental issues. He is a graduate of McGill University, and is an AutoCAD Civil 3D Implementation Certified Expert. You can reach him at jmorrow@rand.com.