Working with Attachments in PLS-CADD

PLS-CADD gives users the ability to import images or drawings to better understand the unique details of their project. Using attachments to create points, overlay ground imagery in the plan view and import proposed earthwork contours are just a few of the ways that attachments can be used to make sure that a **PLS-CADD** model includes all relevant information. There are several file formats that are compatible with **PLS-CADD**, which are listed below:

Table 1: Attachment File Types

Attachment Type	Format	File Extension
Vector Drawings	Drawing Exchange Format (ASCII)	.dxf
	Shapefile	.shp
Raster Images	Windows Bitmap	.bmp
	Tagged Image File Format	.tiff (.tif)
	Joint Photographic Experts Group	.jpg
	JPEG 2000	.jp2
	Enhanced Compressed Wavelet	.ecw
	Portable Network Graphics	.png

Managing Attachments

To manage attachments in **PLS-CADD**, use the Attachment Manager dialog box found at **Drafting/ Attachments (Raster and Vector)/ Attachment Manager**. The Attachment Manager shows the attachment name, file type, and which view the attachment is displayed in. From this the user can perform a variety of functions such as attaching files, adjusting files, and importing imagery through Web Mapping Service (WMS).

Attachment Manager Commands

Attaching/Detaching/Selecting Attachments

Attaching and detaching attachments to the **PLS-CADD** model can both be done multiple ways. To attach a file, the user can either use the "Attach" button or they can drag and drop an attachment into the Attachment Manage dialog box. Be careful, however, when using the drag and drop method. Dropping an
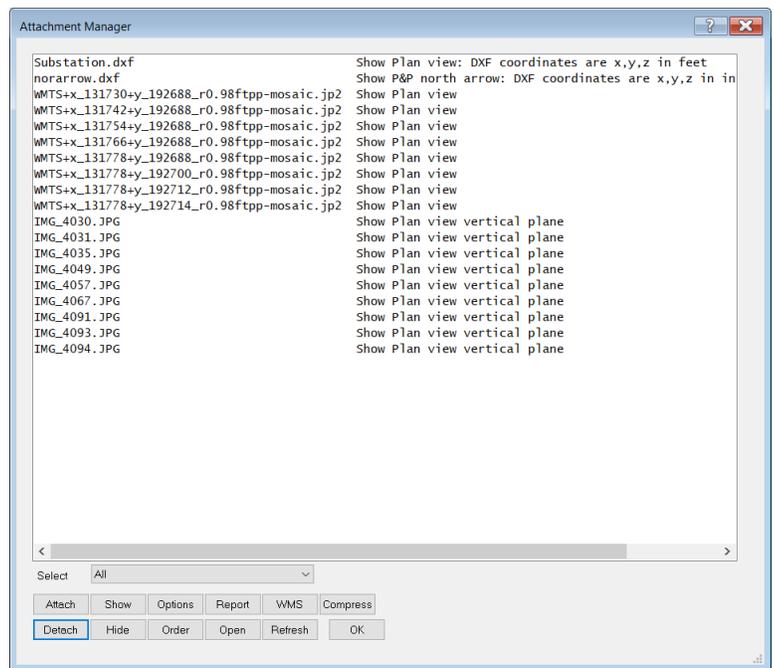

Figure 1: Attachment Manager Window

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attachment in the model space instead of the Attachment Manager dialog will indicate that you are trying to open that file and will try to close your model out. To detach a file, either select the file and click the "Detach" button or right click on the file and choose "Detach" from the menu that appears. Detached files are not included in backups so if there is information that is beneficial to include in the model, make sure it's attached.

Show/Hide

Users may want to toggle which attachments are shown in the model. An example of this is aerial imagery. This may not be an attachment that is always needed, and can slow a model down when being drawn. Instead of detaching and attaching this file, users can click the "Show" and "Hide" buttons in the Attachment Manager. This keeps files attached and settings preserved without the attachment being drawn. If several attachments need to be manipulated the Attachment Manager allows users to click and drag to select multiple attachments. As with Attaching/Detaching, Showing and Hiding can also be done by right clicking on the file.

The Show/Hide feature, and several other commands, are also available outside of the project manager. By using the **Drafting/ Attachments (Raster and Vector)/ Image Info** command users are given several options to manipulate raster images. After this command is selected the user can hover the mouse over an image, which will be outlined in green. Available actions are shown in the status bar at the bottom of the screen.

Options

Using the "Options" button in the Attachment Manager dialog box, right clicking the file, or double clicking on the file will all provide users with the ability to manage the options for a given file type. Options for three attachment types exist: DXF, Shapefile, and Raster Image. Options for each of these attachment types will be covered in a later section. Options that are set for an attachment only stay with the attachment while it is in the model. Detaching a file will remove the user specified options for that attachment.

Order

It may be preferred to group file types together or to order them alphabetically to make locating individual files easier. No matter what is preferred, users can order attachments in whatever order works best for them. The exception to this is that vector attachments will always be listed first. This is due to the fact that there are typically very few vector attachments compared to raster attachments for aerial imagery. When attachments are attached they appear at the bottom of the attachment list. Vector attachments, when added, will appear at the end of the vector attachment group. To order attachments alphabetically, click and drag to select the desired attachment(s), or use the "Select" dropdown to choose the attachment(s). Clicking "Order" will bring up a dialog box with three options. Click "Yes" to order alphabetically. If you would just like a single attachment moved to the top of the list, click on that attachment, click the "Order" button and select "No" in the dialog box that appears. Users can also right-click on an attachment and drag to the preferred order.
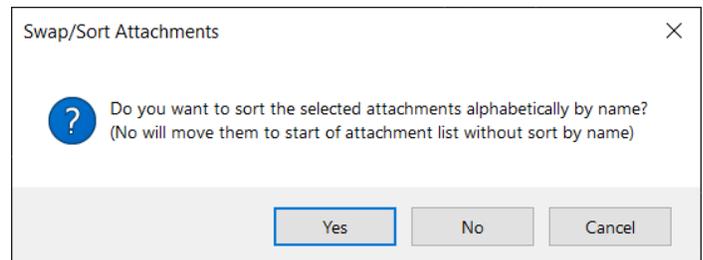

Figure 2: Sort Attachments

Compress

TIF and BMP files are uncompressed and can take up a large amount of disk space. Using the "Compress" button will compress selected attachments to decrease the amount of disk space required. Files can be compressed to either ECW or JPEG2000 format.

WMS

WMS, short for Web Mapping Services is an easy to use tool for importing aerial imagery for a project. When the "WMS" button is selected another dialog box appears to select the imagery server, and the extents for which imagery is to be imported. This imagery is automatically attached to the model with the file format being selected by the user from those available on the server (typically PNG or JPG) or automatically converted to one of the high compression formats supported by PLS-CADD (JPEG2000 or ECW). The WMS feature includes 12 standard servers to make importing of data possible for most situations all over the world. Users can also use their own custom server if available.

When importing imagery, users will specify the resolution, and the extents to import imagery for. The default resolution will be sufficient for most users and purposes. Import extents, however, will vary based on what the user is looking for. If the user is curious about the maximum imagery resolution, that information is only available from the WMS data host.

Wherever intersect project – Imagery is imported in a rectangle that includes the entire project. Using the "Init" button (or pressing the F3 key) in plan view will show the entire project extents. If points are included that are far outside of the main project area imagery will be included for the entire area. Some DXF

Figure 3: WMS Dialog Box

files may have a point at (0,0,0) which would cause extremely large extents. Both situations can result in large amounts of data being imported.

Within – Users can specify a distance from the alignment centerline to import data. Data is imported in rectangular tiles, so the imagery will not perfectly follow the alignment, but the imagery imported will never be less than the specified distance.

Current Plan View Extents – Import imagery for the area that is currently shown in the plan view window. This is a good option for easily importing imagery at a specified area such as a substation, where imagery for the entire project is not desired.

Inside Rectangle – Longitude and Latitude degree inputs allow the user to specify the lower left and upper right corner of a rectangle. Imagery is imported into this area regardless or project extents and current plan view.

For any of the import extents options, the user must be careful to limit the import extents to what is needed. If the import extents are too large, even if by accident, the WMS provider may revoke the user's ability to use their server. **PLS-CADD** has implemented several warnings to notify the user that the amount of information being
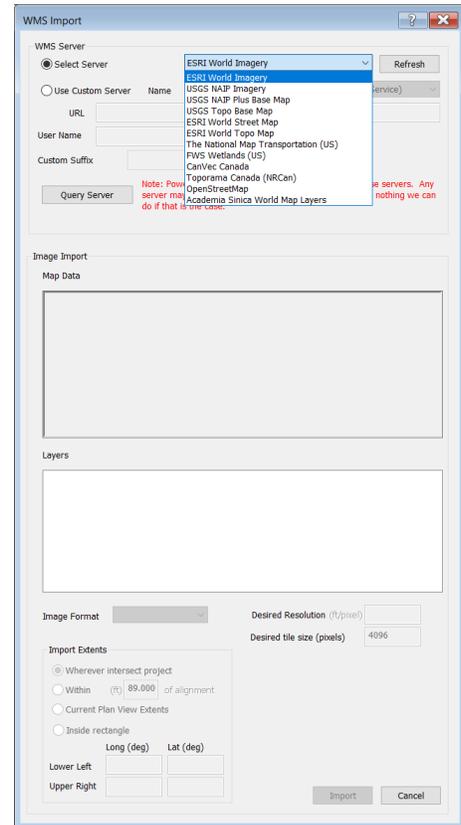
downloaded is exceptionally large. The user should consider this warning carefully prior to moving forward with their download.

Options by File Type

The options window for the file type being attached will appear at the time of attachment. These options can also be accessed at any point to change display options or make adjustments to the attachments. This can be helpful if an attachment is not displaying as previously expected or if adjustments need to be made to prevent clashing details.

DXF

An ASCII based DXF file can be displayed in Plan, Profile, Sheets and Inset views. The user can also specify whether the display is in Imperial or S.I. units. If a DXF is displayed in either Plan or Profile views it will also be displayed in the sheets view. This may be useful for some attachments, like proposed road work lines, but attachments like borders or the north arrow should be attached to only sheets views. As mentioned above, some DXF files will have a starting point of (0,0,0) which can make the project seem to disappear when the "Init" button is clicked.

Check boxes on the left side of the window will allow the user to chose between DXF display settings that come with the DXF, or making display changes in **PLS-CADD**. Toggling DXF layers on or off and changing colors is possible using the table at the bottom of the window. The "Use DXF file colors" check box will need to be unchecked for this option. If a DXF is set up correctly, users will have a great amount of flexibility in DXF layer display allowing for specific DXF files to respresent a variety of information. This becomes usefull for projects like road moves where proposed roadway DXFs are very busy, and color coding or hiding layers helps clarify the plans. If users choose to use the DXF text style when displaying the DXF, be aware that only TrueText fonts are supported. Using non-TrueText fonts will not appear correctly, which will require that the graphic font is used instead.

If the DXF does not line up where you expect it to, or the size is incorrect, checking the "Apply additional scale factors…" box will allow the user to make adjustments to the location, rotation, and scale of the DXF. This table will appear after clicking "OK" or "Apply" buttons on the DXF Overlay Options dialog box. These should only be changed if there is an obvious reason to, such as a DXF border not aligning with the page edge. Changing these values from their default could cause issues if used for structure spotting. In addition to scaling changes DXF files can have a specific coordinate system defined. The coordinate system specified on import must match the coordinate system that the DXF was created in. If no coordinate system is specified, **PLS-CADD** will assumed that the coordinate system is the same as the current model.
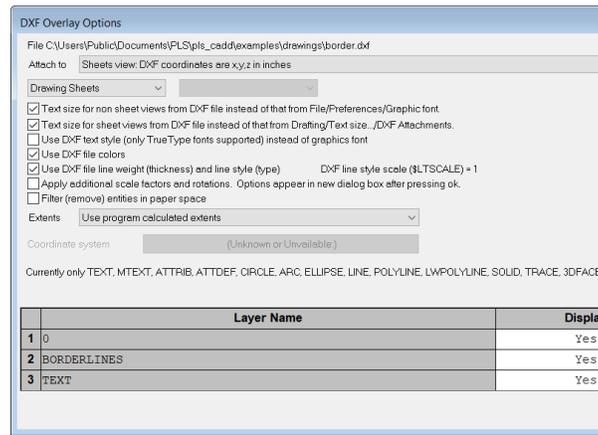
Figure 4: DXF Overlay Options

Raster Images

Images have a number of uses including aerial imagery, structure photos, and colorizing the TIN to give a real-world look to the 3D view. Like DXFs, Raster images can be attached to different views. If chosing sheets view, a single sheet, a range of sheets, or a particular sheet type can be specified to show the image. Like other attachments, users will need to specify a coordinate system for raster images to correctly locate the image. Users can also adjust X and Y coordiantes to move the image.

Image transparency is also adjustable. An opaque image is useful in most cases, but users may want to vary the level of transparency to see through an image, perhaps to a background image or to prevent covering up details behind the photo. Using the radio buttons in the Transparency Options section and setting the transparency level will allow users to customize the image's view.

A unique display option for raster images is the ability to make photos visible in 3D view. Using the Attach to dropdown and selecting Plan view vertical plane will present the option to set an azimuth from where the photo can be viewed. This is especially

Figure 5: Raster Image Options

useful for situations like structure photos from a walkdown. Photos taken with a smart phone will have georeferencing built in, which takes some of the guesswork out of importing the photo as the location and direction that the photo were taken will be included into the photo information. Figures 11 and 12 show these photos being used in a PLS-CADD model.
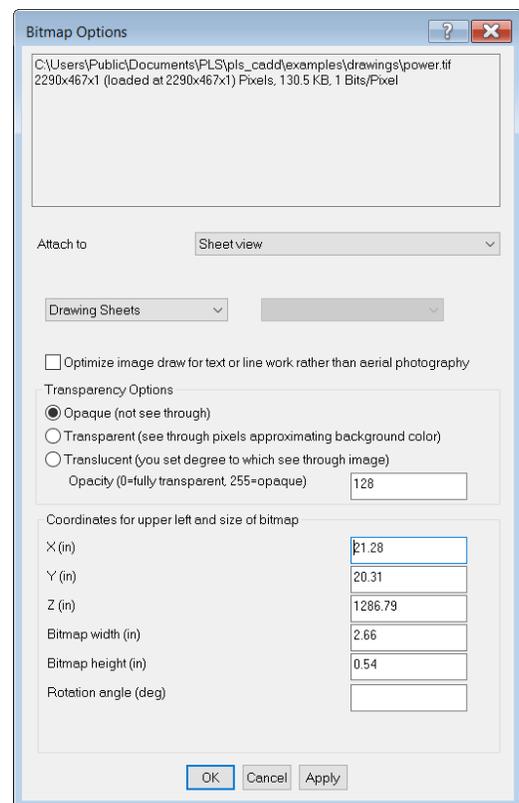
Shape Files (.SHP)

Shape Files typically come from a mapping or GIS application. Use of land data can aid in alignment and structure spotting decisions by delineating areas such as sensitive wetland areas or land owners. Attaching Shape Files is similar to a DXF. Shape Files can be attached to different views with specific units of measurement and come with layers that can be displayed or turned off. Shape Files require the coordinate system they were exported from to be correctly located. It is important to point out that Shape Files also require a dBase database file and a Shape Index file in order to properly attach to a model. These file extensions are .dbf and .shx, respectively.
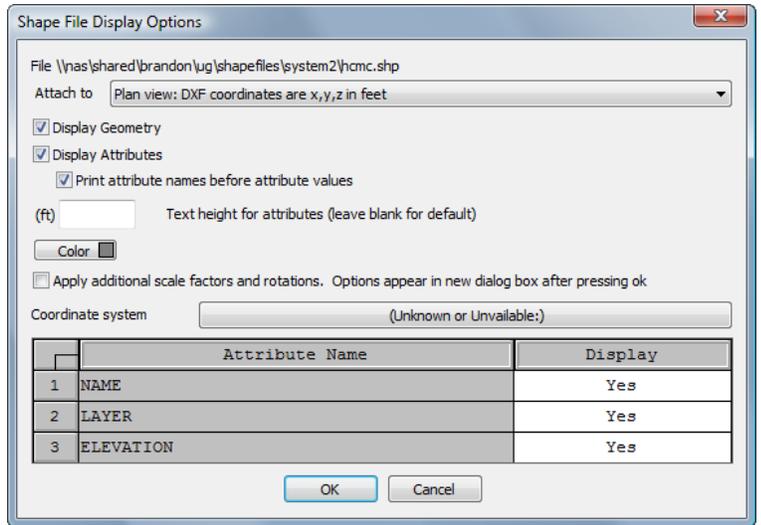
Figure 6: Shape File Display Options

Examples of Attachment Uses

Aerial Imagery with WMS

The **PLS-CADD** attachment manager comes with a built-in way to import aerial imagery for a project. Having relatively current aerial information is an easy way to avoid problem areas like roads, parking lots, and other obstructions that prevent structure spotting. While this information should always be verified through site walkdowns and survey information aerial imagery can be a great starting point when spotting a line.
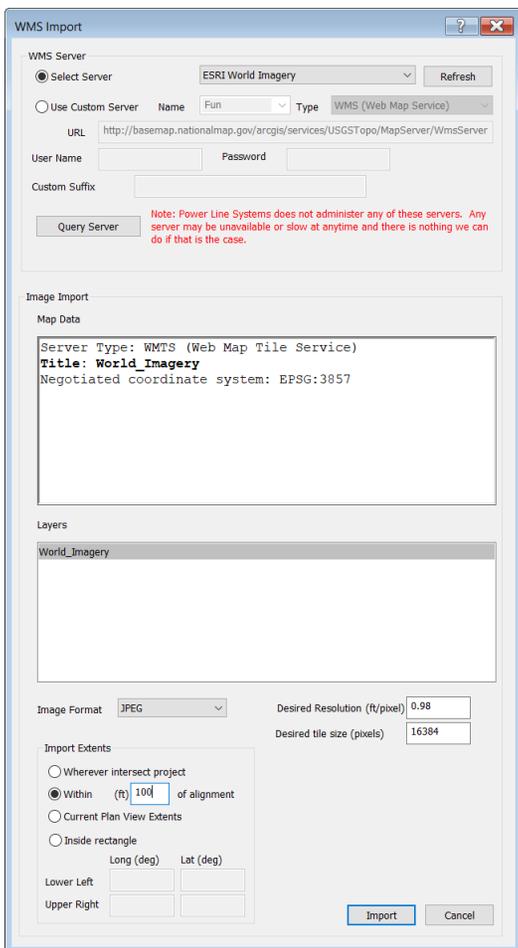

Figure 7: WMS Import Dialog

Figure 8: Imported Aerial Imagery

To obtain this view:

Open the WMS dialog directly with **Drafting/Attachments (Raster and Vector)/WMS**

In the WMS Import dialog box select the server to query. The "ESRI World Imagery" server was selected to import aerial imagery.

Click "Query Server" and then select the required Layer from the available list of that WMS Server.

Import Extents were specified to be within 100' of alignment. This imports necessary information for the line without downloading unnecessary images.

Images are imported along the alignment and appear in the attachment manager.

Coloring TIN with a Bitmap

A very popular function that **PLS-CADD** performs is exporting the model to Google Earth. The shortcoming of this function is that there is no way to make adjustments or check the model, and each change must be saved as a .kmz to be opened and viewed in Google Earth. If a TIN has been created for a model and a coordinate system is defined the user can get a similar effect in the model 3D view by coloring the TIN.
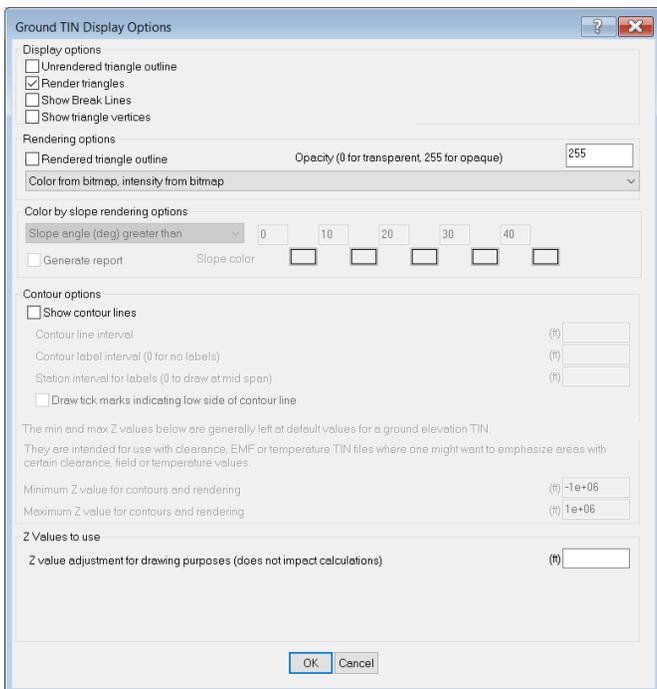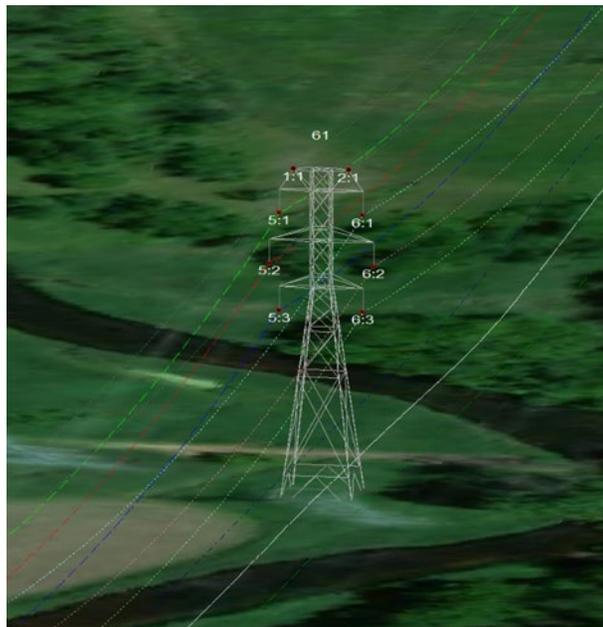

Figure 9: TIN Display Options

Figure 10: 3D View of TIN Colored w/ Imagery

To obtain this view:

Display the aerial imagery imported either through WMS or simply attached.

Bring up the TIN display dialog box found at **Terrain/ TIN/ Display Options.**

Check the "Render triangles" box. This will allow the user to use the "Rendering Options" dropdown.

From this dropdown choose the "Color from bitmap, intensity from bitmap" option. The "intensity from incidence" option could also be used to see shadowing.

Structure Photos

Structure photos taken during a walk-down can be displayed in 3D view next to the associated structure. This is especially convenient when modeling existing structures or making notes of the site conditions. Photos that are geotagged are easily imported to the location they were taken. Photo location can also be manually adjusted for user preference. Through the **Drafting/ Attachments (Raster and Vector)/ Associate Structure Photos** feature, users can quickly place photos next to the structure they are associated with.
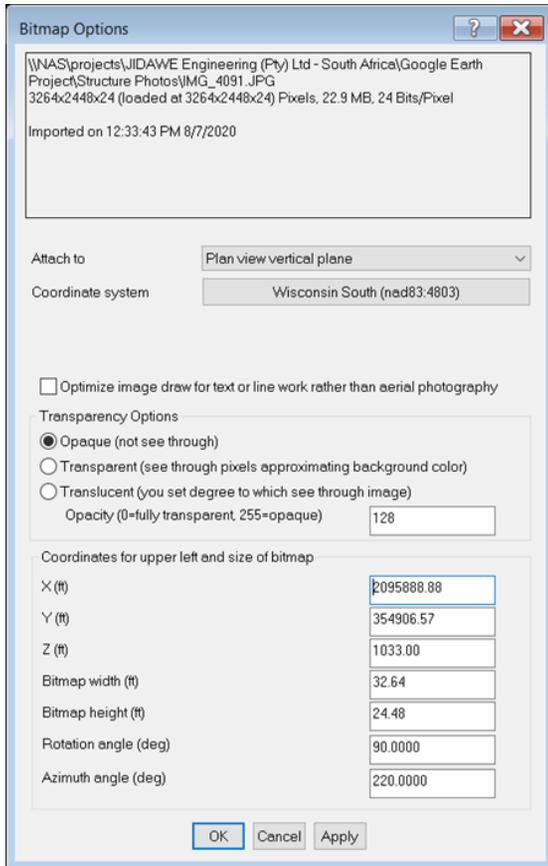

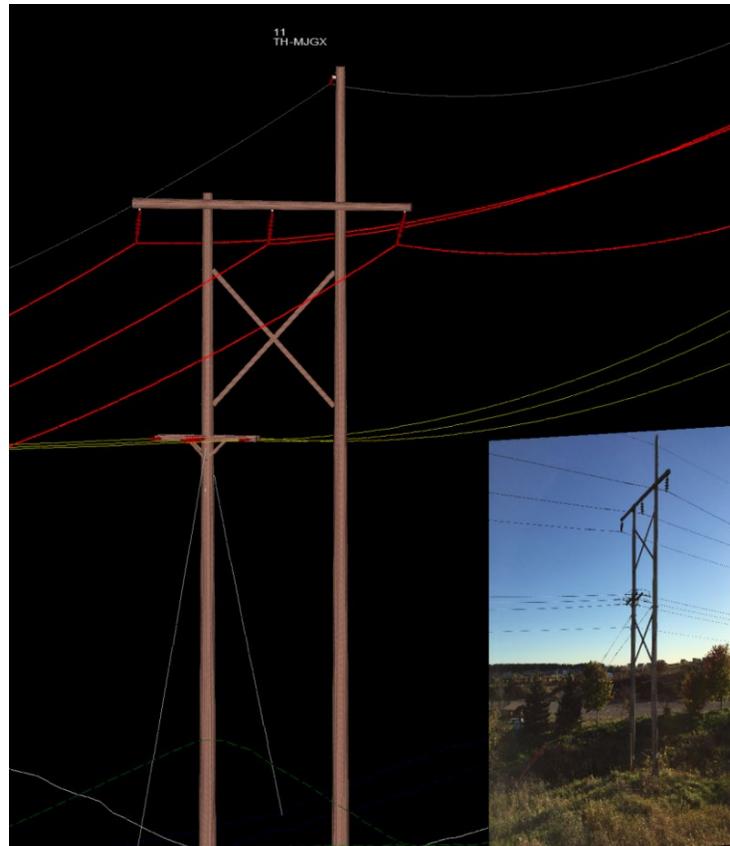**Figure 11: Plan View Vertical Plane Settings**

Figure 12: Structure Model and Photo

To obtain this view:

Select an image file in the Attachment Manager and navigate to "Options"

Change the Attach to dropdown to "Plan Vertical View" and choose the coordinate system that the photo was taken in.

Adjust the X, Y, and Z to locate the photo next to the desired structure.

The bitmap will come with a width and height. Adjust these to a preferred size while keeping the ratio between the to the same to prevent distortion.

Adjust the Rotation angle to turn the photo vertically. Adjust the Azimuth to change the direction from which the photo will be seen in 3D view. The photo will disappear when rotated away from this view.

Proposed Ground DXF/ Create Points

If a vector file contains elevation information, creating points from the DXF to check clearances is easy. Proposed earthwork at a structure site is a great example of this. Figure 13 below shows the DXF displayed. Figure 14 shows the points created from the DXF to represent the proposed ground profile.
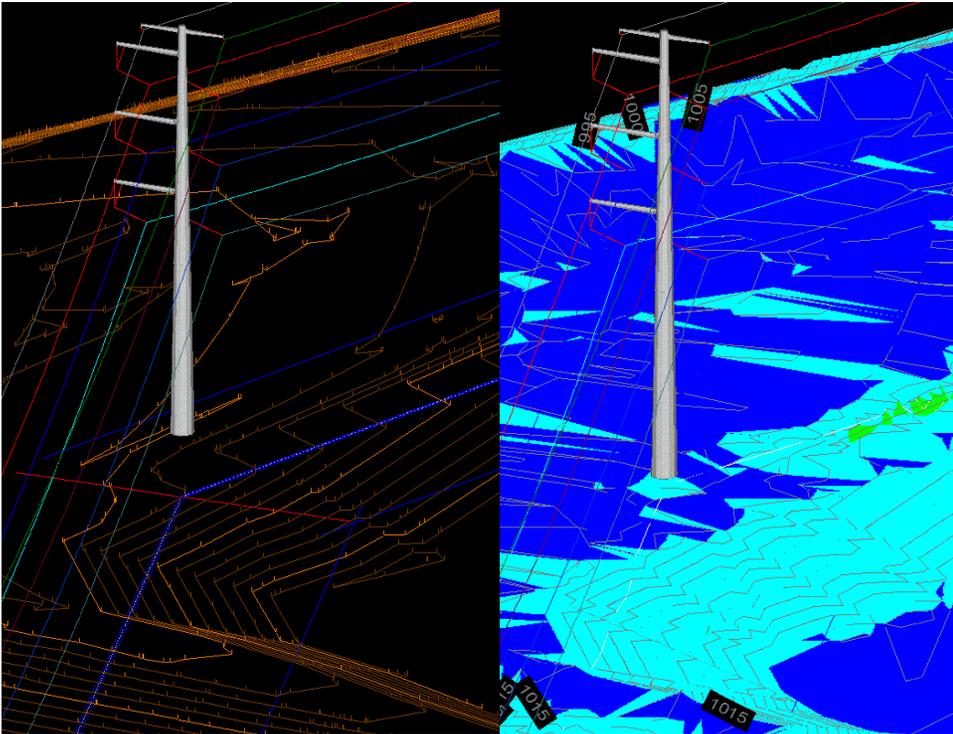

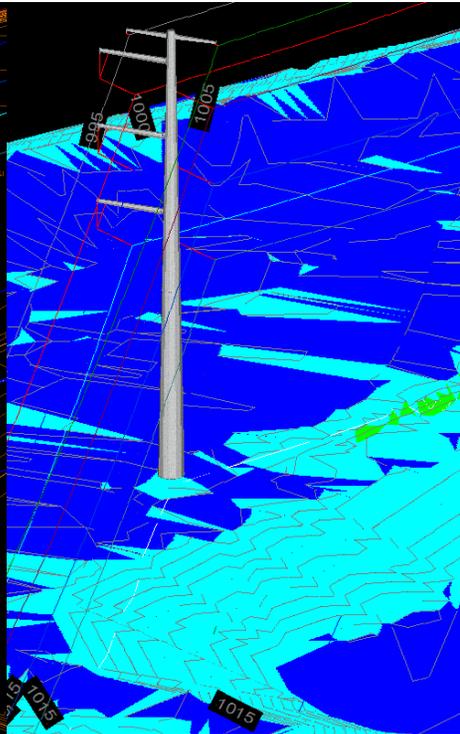**Figure 13: Proposed Ground DXF**

Figure 14: Proposed Ground Survey Points

To obtain this view:

Start by attaching a DXF that has elevation information.

Create points from a DXF file by using the **Terrain/ Edit/ Merge Points from External File/ Create XYZ or PFL Points from DXF or SHP Attachment** command.

Choose a feature code for the new points being created.

Select the criteria and interval for new points to be created. Decreasing the interval results in more points created along the DXF lines.

Select the attached dxf that will be referenced to create points.

Create a TIN using the newly created points using **Terrain/TIN/Create TIN.**

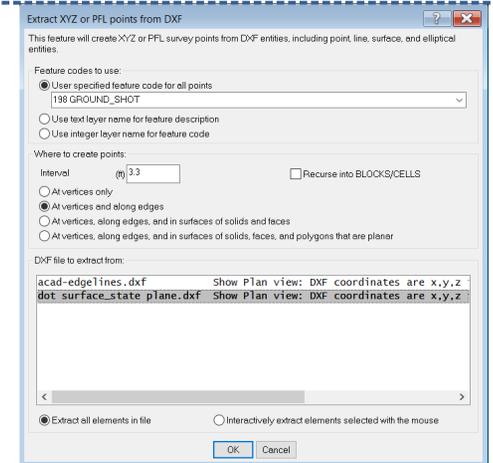Display the TIN according to slope in the dialog found at **Terrain/ TIN/ Display Options**

Figure 15: DXF Point Creating Settings