

Getting the Most out of Raster Imagery in Autodesk Civil 3D

Autodesk® Raster Design is *the* solution for working with nonvector information within the Autodesk® product family. Raster Design is a complete suite of tools for working with scanned maps, aerial photographs, and other digital raster images. Use Raster Design tools to quickly and easily insert, edit, correlate, convert, and manage your images, regardless of the source.

For many companies, Autodesk® Civil 3D® software is the solution of choice for civil engineering design and documentation. Raster Design can be installed on top of Civil 3D to create a powerful combination of site analysis and development tools. This paper looks at several cases in which Raster Design can be used to enhance the design process.

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Introduction

Almost every civil engineering firm faces challenges brought on by working with information that does not fall within the traditional CAD arena. Such challenges include working with satellite imagery, using multiple aerial photographs to cover large regions, touching up scanned color maps, and incorporating as-built information into a new or revised design. This paper describes four examples of how Raster Design tools can be used to enhance the design process, as well as to create powerful presentation pieces.

- Working with digital elevation model (DEM) data
- Incorporating aerial and satellite photography
- Editing scanned color maps
- Converting raster to vector

Traditionally, these tasks would require the use of multiple software packages. Raster Design provides these capabilities without users ever having to leave the Civil 3D design environment.

Working with DEM Data

With the proliferation of data formats such as satellite images, multispectral imagery, and DEM data, you now have many more choices for what types of information you can use to perform initial site suitability analysis. For most regions, DEM data is now available and can be incorporated into your Civil 3D drawings through Autodesk Raster Design.

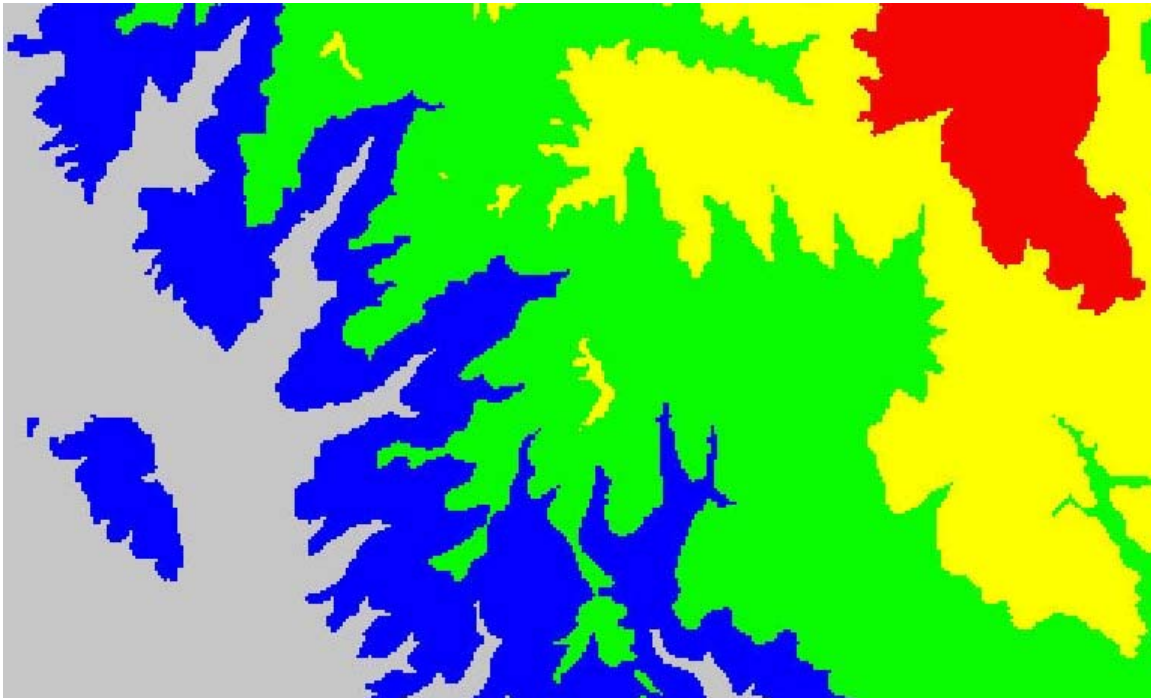


Figure 1: Insert DEM data into your Civil 3D drawings.

Once you have imported DEM data into your drawing, you can take advantage of a wide range of formatting options. Use these options to display the DEM data as either elevation models or slope models. This flexibility enables you to easily determine which sites or which portions of the site are most suitable for development.

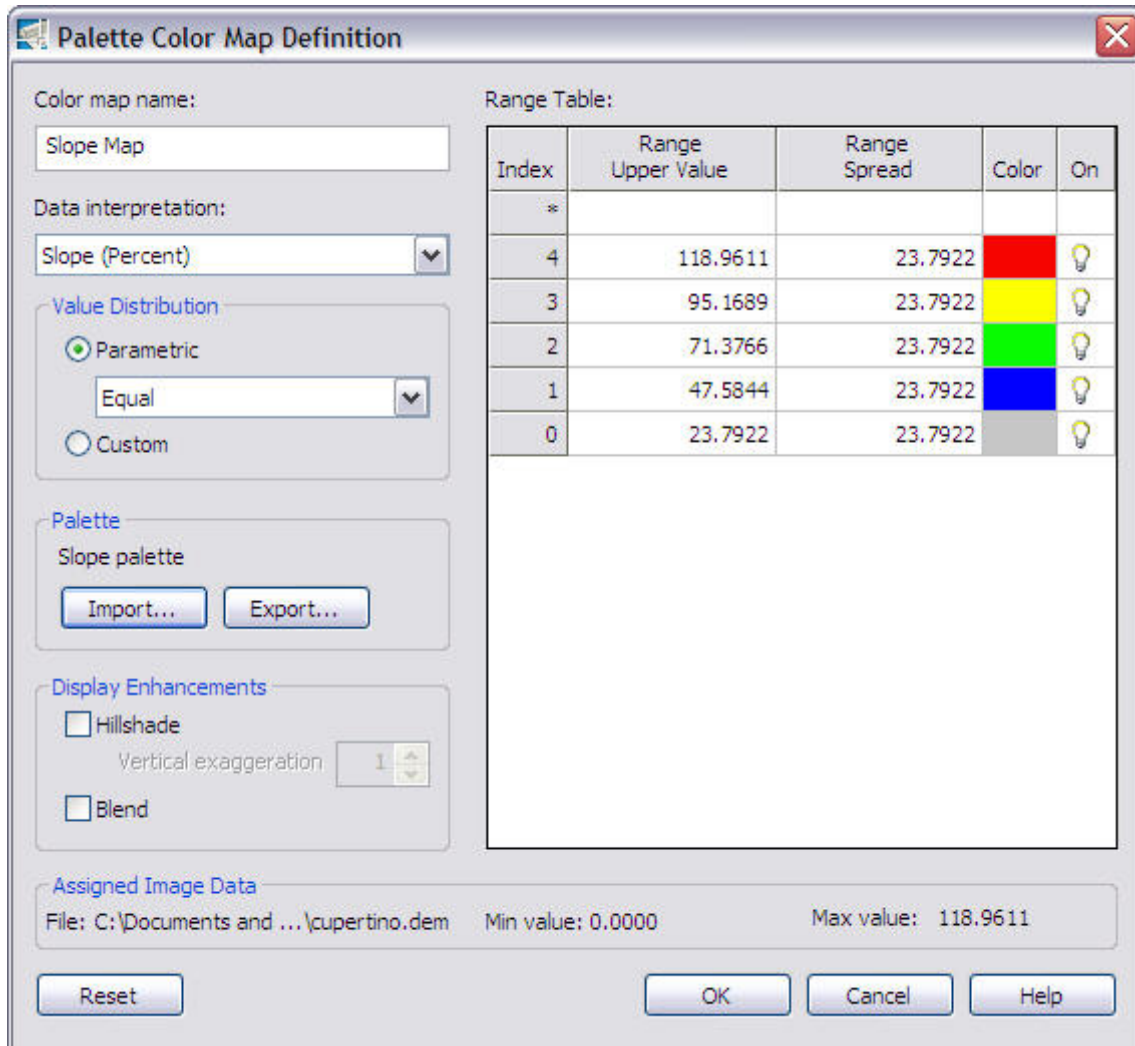


Figure 2: DEM data can be formatted in a variety of ways to extract the information you need.

The latest version of Autodesk Raster Design includes a new tool called Raster Data Query. This option enables you to select any point on the DEM and extract information about that point, such as the actual spot elevation.

Incorporating Aerial and Satellite Photography

When you are working on projects that cover extremely large areas, aerial or satellite photographs can be used to aid preliminary design review, as well as create public presentation pieces. In Civil 3D alone, you can import, but not edit, a photograph. When

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you install Raster Design on top of Civil 3D, you inherit a host of editing and correlation tools.



Figure 3: Aerial photographs can be scanned and inserted into a Civil 3D drawing.

Modern image capture techniques such as satellite imagery and scanned aerial photographs often use a global coordinate system, such as the Universal Transverse Mercator (UTM) projection, to identify locations on a worldwide basis. These are known as georeferenced images. When working on local maps, GIS project managers and civil engineers often use projections other than the UTM. Raster Design combined with Civil 3D provides powerful transformation tools to match raster data to the coordinate system being used in the CAD maps.

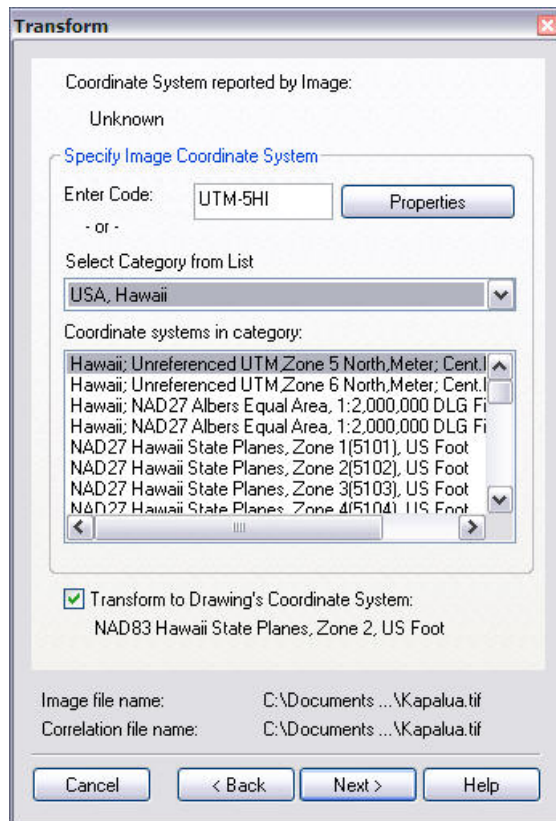


Figure 4: Raster Design can use the full power of Civil 3D, transforming images to match the current drawing's coordinate system.

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When using certain types of satellite imagery, you can insert multiple images representing different color bands as a multispectral image.

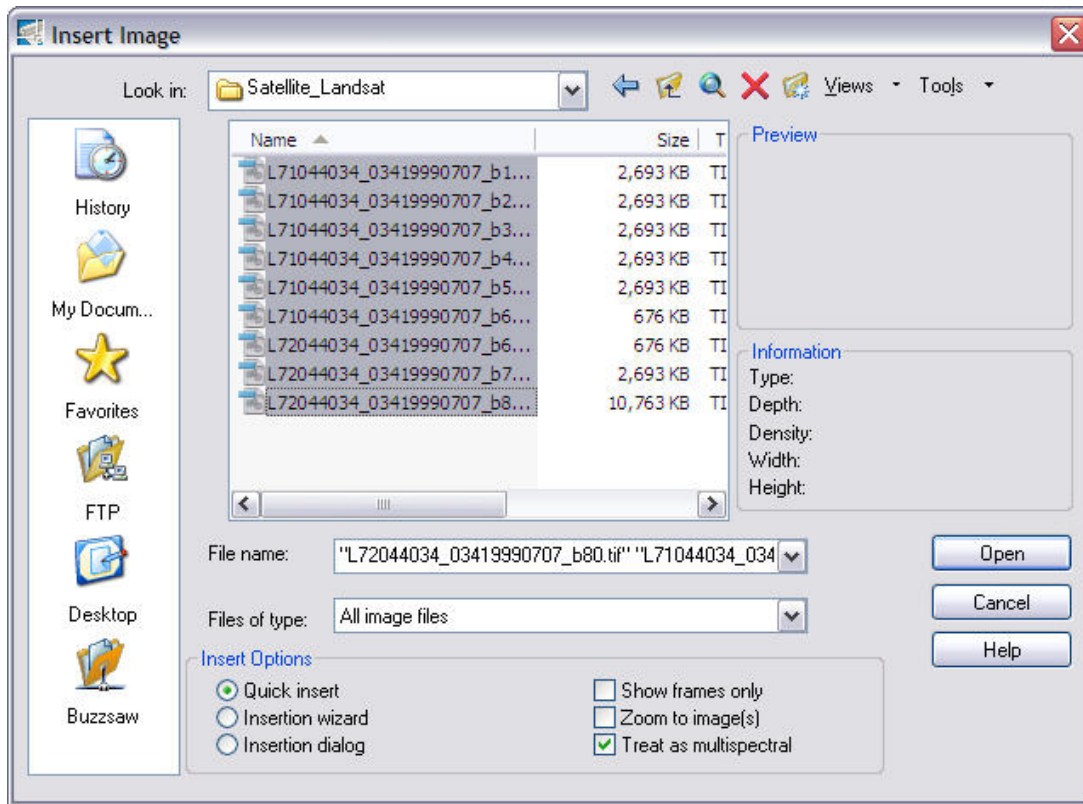


Figure 5: Insert several images taken in different color bands as a multispectral image.

What is multispectral imaging? In Raster Design, a multispectral image is a group or set of images representing the same area taken in different wavelengths. These images are known as bands. Each band of a multispectral image set is an image from a different segment of the full electromagnetic spectrum, of which the visible bands (red, green, and blue) are only a part. By channeling a specific combination of images to the red, green, and blue colors used to display a picture on the computer, you can see specific characteristics of the land.

Once a multispectral image has been inserted, you can change which color bands are displayed.

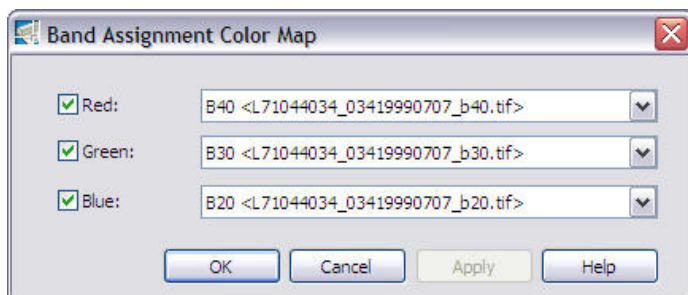


Figure 6: Edit the band assignment color map for a multispectral image.

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By analyzing different combinations of color bands, you can gather information about the site that may not otherwise be visible. For example, you can combine color bands for infrared and visible green and blue to create a false color image. Vegetation would be shown in the resulting image as shades of red, while the surrounding water is blue. The different shades of red represent various types and the health of vegetation in the area.



Figure 7: False color multispectral image showing vegetation types and density in infrared.

Editing Scanned Color Maps

Until recently, Autodesk products were known primarily for the power of their vector editing capabilities. To edit raster information, many companies turned to photoediting software programs. The main drawback was that employees would have to master several software applications to get their job done. With Raster Design, you can make sophisticated image edits directly in the AutoCAD® environment. This means that learning time is short and skill retention rate much higher than for other software platforms.

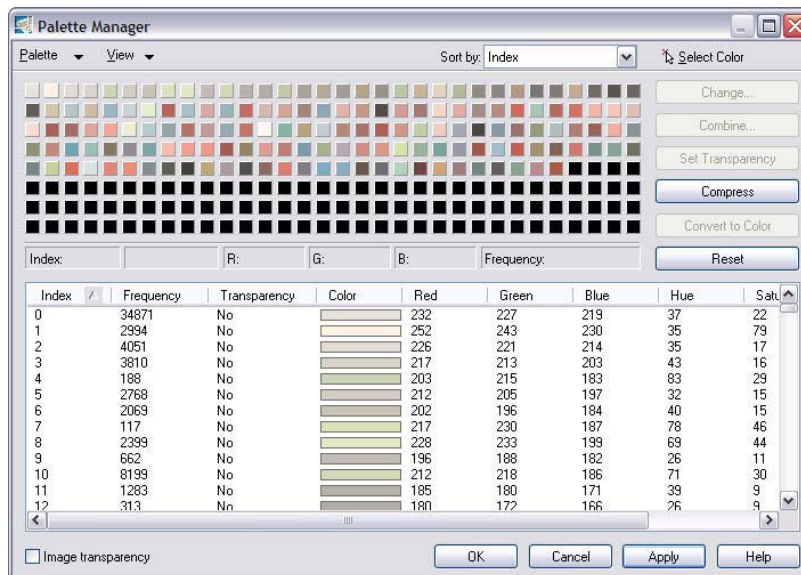


Figure 8: Complex editing tools are built into Raster Design, enabling you to make image edits directly in the AutoCAD environment.

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One of the newest tools enables you to directly edit the color palette of certain types of scanned images. This capability is particularly useful when adding raster copies of USGS quad maps to a drawing. Color palettes can be edited, imported, or matched with other images.

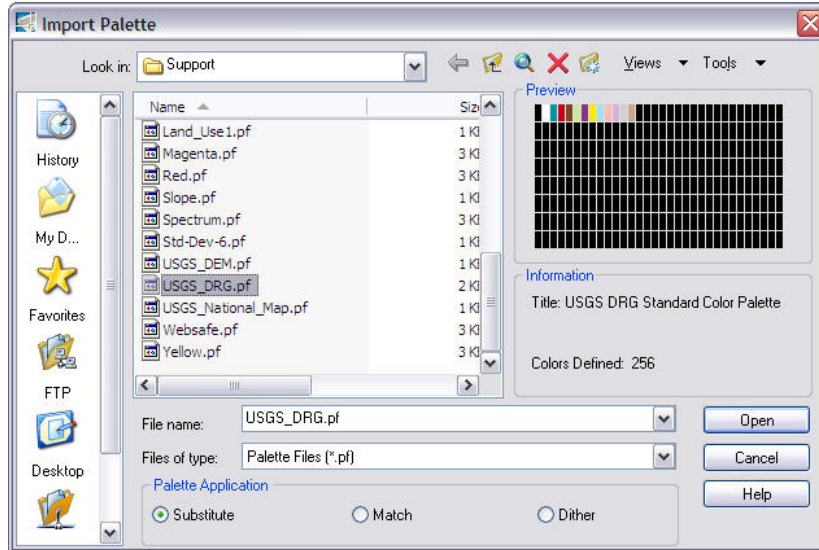


Figure 9: Import color palettes to enable color matching between images.

Converting Raster to Vector

Although Raster Entity Manipulation (REM) can be used to touch up existing plans, sometimes these drawings, or portions of these drawings, need to be converted to a full vector drawing. One place this is often done is with existing ground or as-built topography to bring the contour lines into Civil 3D for use as the basis of a surface model. This can be one of the most tedious tasks an office can face. Until now, a drafter would spend up to 30 hours per sheet digitizing the existing flow lines, assigning elevations to these features, and creating a terrain model.

Raster Design contains a full set of vectorization tools that can automate a great deal of this process, saving up to 80 percent of the time and labor costs involved in converting these maps. Since Raster Design integrates completely with Civil 3D, when converting from a scanned map, you can generate contour lines as polylines with true elevations.

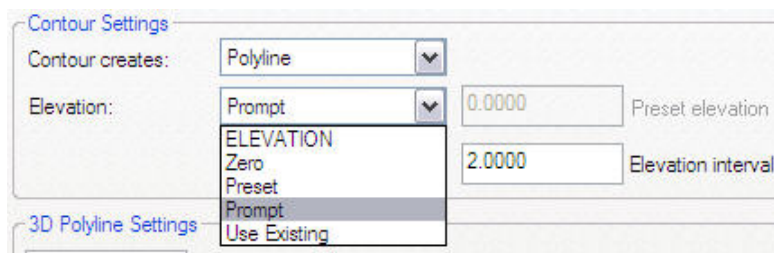


Figure 10: Use Raster Design to convert scanned topography into polylines with elevation.

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Raster Design also provides tools for accurately converting any type of scanned map into AutoCAD native vector objects such as lines, arcs, polylines, and text. These tools can save weeks when importing archived data such as parcel or soils maps. Since Raster Design was created to support the accuracy of Civil 3D, all vector objects can be verified for quality as they are converted.

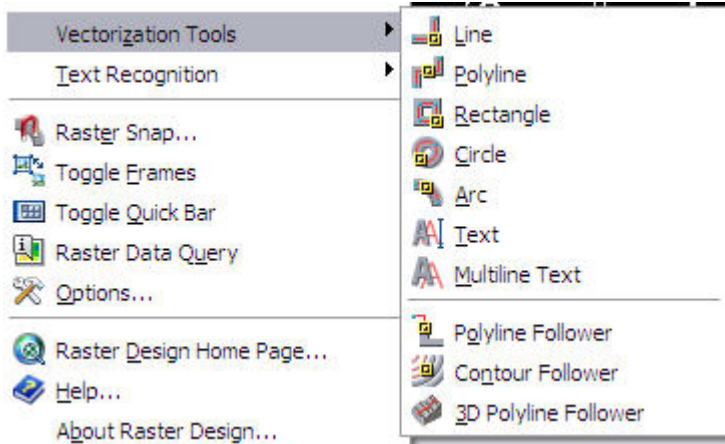


Figure 11: Conversion tools are available for all types of data.

One unique feature in Raster Design is the ability to export converted text to a word processing or spreadsheet program. These documents can then be used as the basis for reports and calculations, or formatted for importing back to AutoCAD multiline text or table objects.

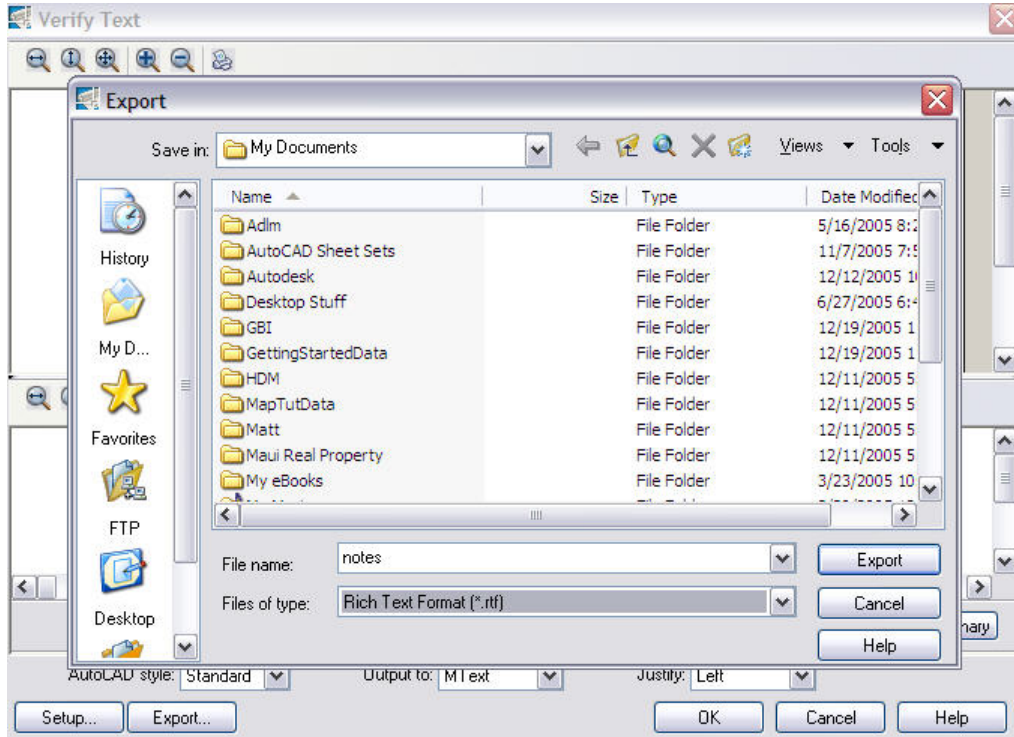


Figure 12: Convert scanned text to word processing or spreadsheet files.

Conclusion

No single software package can supply all the tools an engineer requires when analyzing an existing site and developing a new design. By combining the powerful raster editing and conversion tools in Autodesk Raster Design with the comprehensive suite of site design tools in Autodesk Civil 3D, you can incorporate just about any data type, visualize your solutions, and get the maximum use from your data in 3D.

About the Author

Felicia Provencal is an independent consultant based on Maui. She has more than 20 years of experience working with Autodesk products in the civil engineering, GIS, and construction industries. A popular Autodesk University instructor and Autodesk® Buzzsaw® consultant, she currently offers training and consulting for firms throughout the United States and Pacific Basin.

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