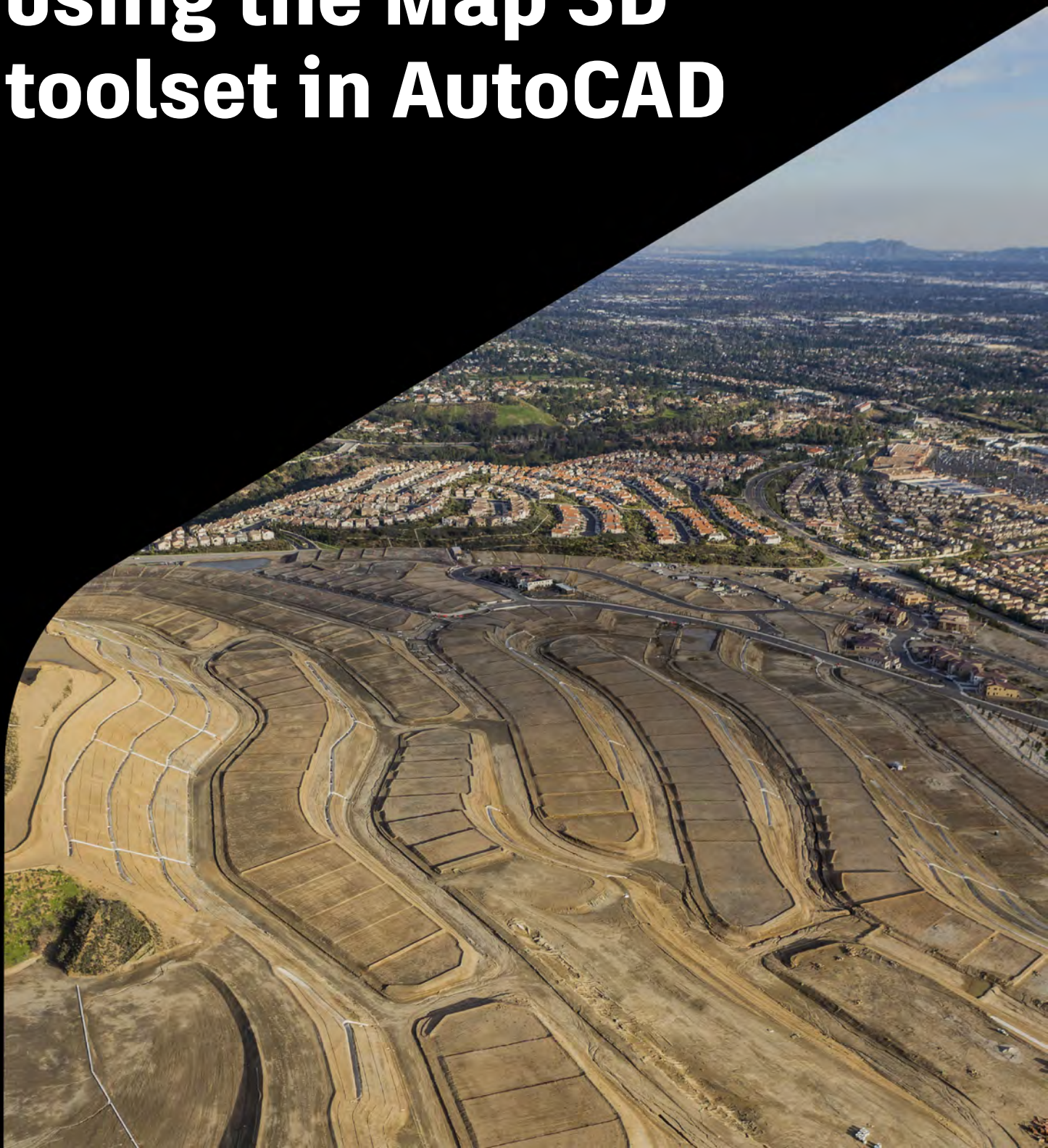# AUTODESK

The benefits of using the Map 3D toolset in AutoCAD

Introduction

The Map 3D toolset (previously referred to as AutoCAD® Map 3D), now included with AutoCAD as a specialized toolset, is built specifically to create and modify software-based design and documentation productivity for users working with Geographical Information Systems (GIS). Purpose-built data management and mapping tools minimize errors and provide accurate information to the user, allowing more time for mapping geographical data. This study details the productivity gains that users may experience when using AutoCAD with the Map 3D toolset rather than basic AutoCAD when working with maps and survey data.*

Executive summary

Designed by Autodesk and commissioned to an outside consultant, this study explores mapping design challenges when preparing construction documents in basic AutoCAD and the subsequent productivity gains by using the Map 3D toolset. A set of design documents will be recreated using both basic AutoCAD and AutoCAD with the Map 3D toolset, with tasks ranging from working with object data, stylizing, working with point clouds, and plotting maps. The Map 3D toolset provided a **60% productivity gain** over the time taken to accomplish each task in basic AutoCAD (depending on user expertise level with the Map 3D toolset and based on experience and training).

Key findings

Using the Map 3D toolset:

Faster

Creation of a mapping/GIS workspace is **83%** faster.

Reduced

The time taken to import and export specific GIS filetypes was reduced by **79%**.

The time taken stylizing FDO features in a mapping and GIS environment was reduced by **77%**.

Gained

There was an overall productivity gain of **60%** using the Map 3D toolset.

The study

This study explores eight common design challenges and shows direct comparisons of the time and effort required to accomplish each specific task in basic AutoCAD versus with the Map 3D toolset.*

The same tasks were completed up to 60% faster using AutoCAD with the Map 3D toolset.*

The performance results in this paper were achieved by one user, with expert-level experience, using both basic AutoCAD and AutoCAD with the Map 3D toolset, conducting comparative tests on various mapping and GIS-related tasks. The tasks are comprehensive in nature. The total time it took to complete each task using both basic AutoCAD and the Map 3D toolset is documented in each case.

It was assumed during the study that all symbols and title blocks needed in basic AutoCAD for the design process were local to the document. Searching time is subjective and the methodologies allowed for the quick placement of required blocks in the shortest amount of time possible.

A detailed description of the study follows.
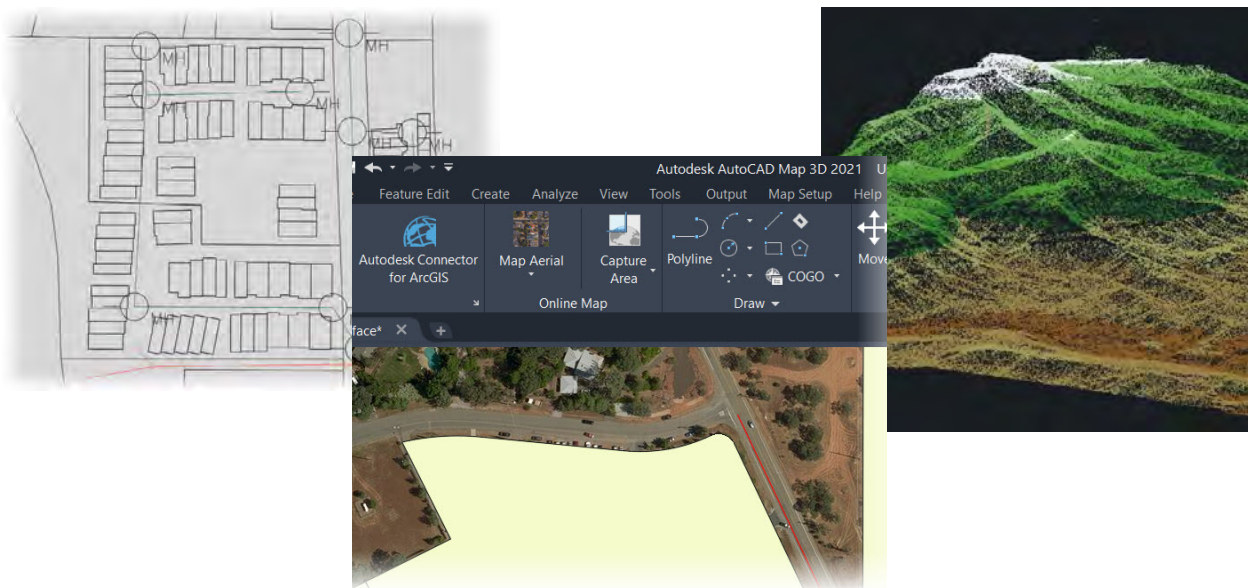
Design task 1

Interface and workspaces

When working with basic AutoCAD, the user interface (UI) is standard, with 2D & 3D workspaces provided. Setting up a mapping/GIS workspace for a suitable UI would take up valuable time, and knowledge of the Customize User Interface (CUI) dialog box would be required to create a suitable workspace. The Map 3D toolset lets you select a specific mapping/GIS workspace during installation, and sets you up with Online Map Data via your Autodesk Account, providing you are signed in. This task is to show how much time is saved using the Map 3D UI set up tools when installing the software, against having to develop a suitable UI in basic AutoCAD.

Steps

1. Create a suitable mapping/GIS workspace
2. Connect to Online Map Data to display maps in AutoCAD
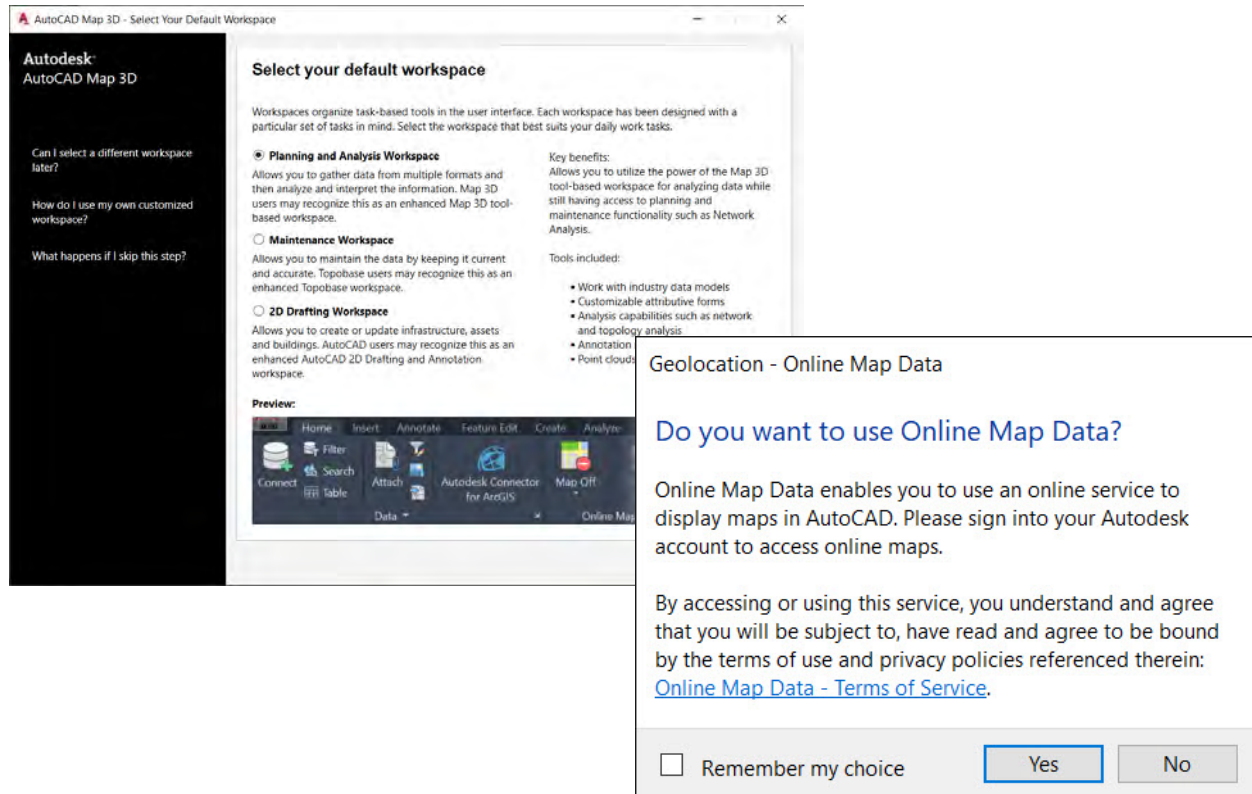
Interface and workspaces	AutoCAD	Map 3D toolset
Create a mapping/GIS workspace	45:00	5:00
Connect to Online Map Data	3:00	3:00
Total time to complete task	48:00	8:00
Time savings with Map 3D toolset		**83%**

(Figures shown in minutes and seconds)

Advantages

The Map 3D toolset provides the ability to set a mapping/GIS workspace during installation. The user can select one of three workspaces: Planning and Analysis Workspace, Maintenance Workspace, or 2D Drafting Workspace. The last of the three workspaces allows the user to work in a traditional 2D AutoCAD environment for standard drawing editing. When using basic AutoCAD, valuable time would be used up creating a specific mapping/GIS workspace. The Map 3D toolset has these workspaces built into the software.
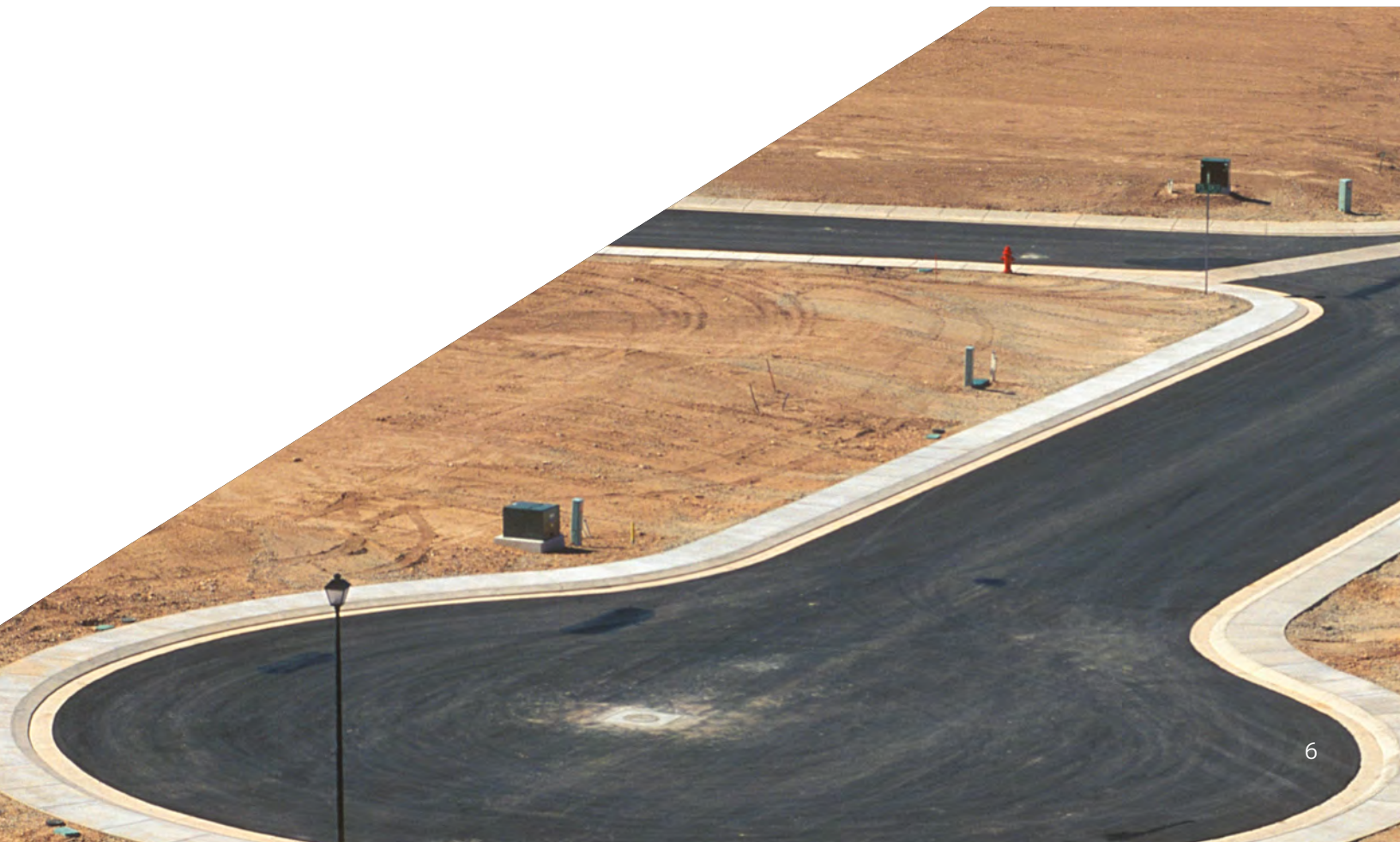
Design task 2

Creating and editing coordinate geometry

The task was to create and edit coordinate geometry in a drawing to be used for mapping and GIS purposes. Coordinate geometry (known as COGO) in the Map 3D toolset is much more specific than in basic AutoCAD. Basic AutoCAD provides Surveyors Units, but that is all. The Map 3D toolset provides coordinate geometry commands that can use bearings, azimuth, and deflection, combined with distances, to create geometry and parcels in your mapping/GIS drawings.

Steps

1. Create mapping/GIS geometry
2. Edit mapping GIS geometry
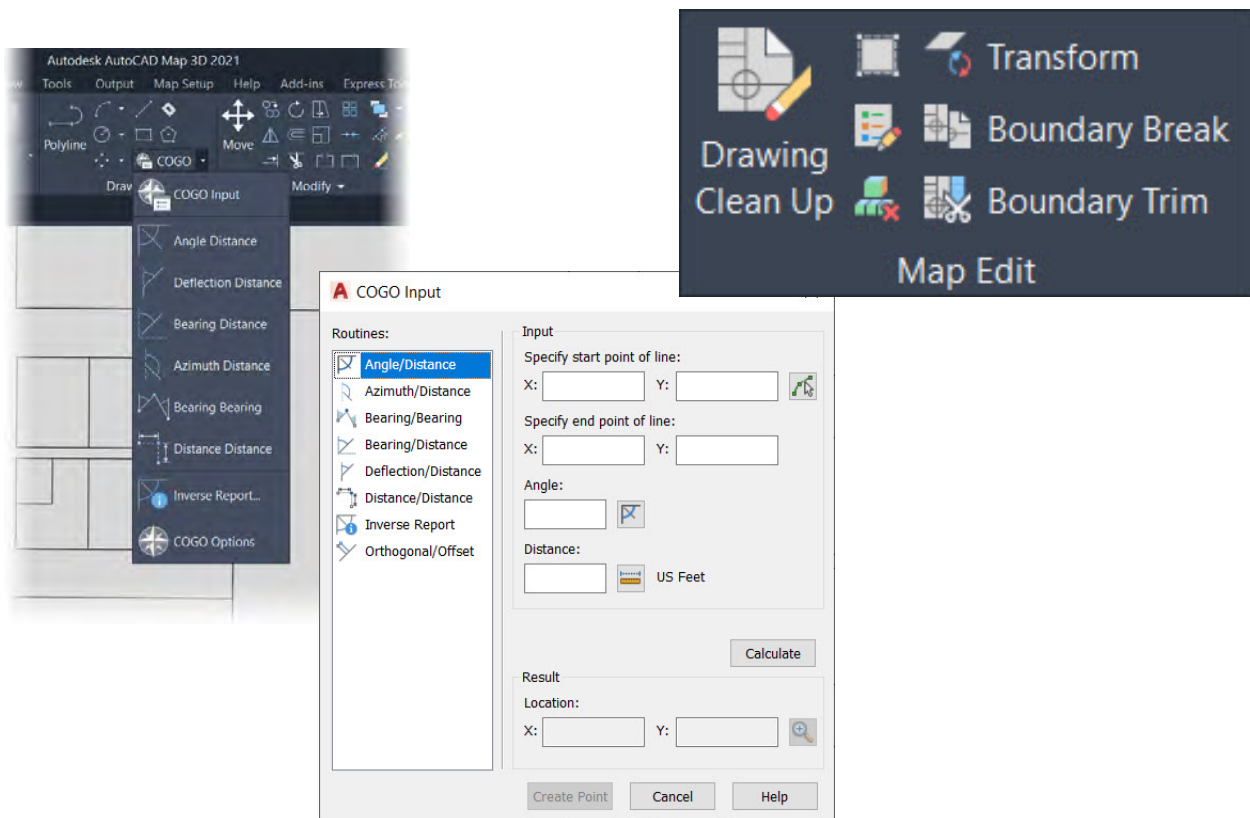
Creating and editing coordinate geometry	AutoCAD	Map 3D toolset
Creating a geometry for mapping/GIS drawings	35:00	10:00
Editing geometry for mapping/GIS drawings	30:00	15:00
Total time to complete task	65:00	25:00
Time savings with Map 3D toolset		**62%**

(Figures shown in minutes and seconds)

Advantages

AutoCAD with the Map 3D toolset can save notable amounts of tedious coordinate geometry creation and editing time that would be required in basic AutoCAD. During this task, it was obvious that the Map 3D toolset provided tools that functioned well in context, whereas basic AutoCAD required that the user convert geometry coordinates manually to their required format. This, in turn, could lead to conversion inaccuracies and, potentially, create mapping/GIS drawings with built-in errors.

Design task 3
Object data

The task was to generate links to an object database (an MDB file) in a mapping/GIS drawing. The Map 3D toolset provides specific data mapping functions for this type of work, whereas basic AutoCAD does not. The requirement to link database data to block attributes in a mapping/GIS environment is paramount, especially on government drawings where utilities and services need to be displayed with correct, up-to-date information. In this task, it was necessary to link fire hydrant data from a database to hydrant blocks with attributes in the drawing.

Steps

1. Add blocks with attributes to the drawing
2. Define a link template
3. Add database link to block attributes in the drawing
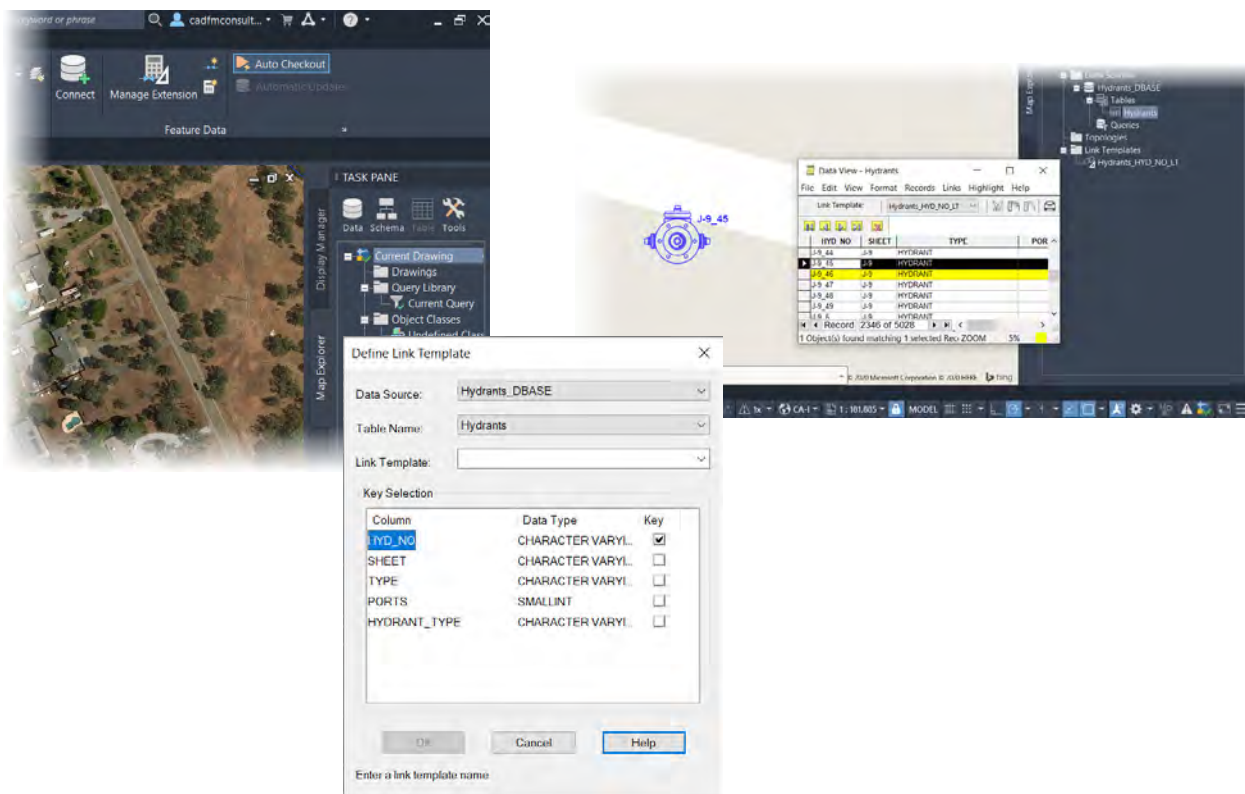
Object data	AutoCAD	Map 3D toolset
Add blocks with attributes to the drawing	45:00	45:00
Define a link template	25:00	10:00
Add database link to block attributes	25:00	5:00
Total time to complete task	95:00	60:00
Time savings with Map 3D toolset		**37%**

(Figures shown in minutes and seconds)

Advantages

The Map 3D toolset provides the following advantages:

- Specific tools are provided to link database data to block attributes in the Map 3D toolset. A degree of programming knowledge is needed to do this in basic AutoCAD.
- Creating a link template is quick and easy with the Map 3D toolset finding the appropriate block attributes to link
- The Map Explorer tab in the Task Pane of the Map 3D toolset provides a full visual breakdown of the database and the tables linked to the drawing, including the link templates

Design task 4

Importing and exporting

Importing essential graphical GIS information into your mapping/GIS drawings is a fundamental requirement. To do this in basic AutoCAD can be incredibly time-consuming, especially if the file format is not supported in basic AutoCAD. The Map 3D toolset supports numerous GIS file formats such as the ESRI® ArcView™ ShapeFile format. Exporting this data built into your drawing is often a necessary requirement as well.

In this task, the valve data and locations on a drainage system are to be found in an ESRI ShapeFile and need to be imported into your mapping/GIS drawing. Using the MAPIMPORT command in the Map 3D toolset, many hours of work may be saved by being able to use the ESRI ShapeFile in its native format.

Steps

1. Importing the ESRI ShapeFile
2. Point mapping the ESRI data into the current drawing
3. Exporting out the current drawing, including the ESRI ShapeFile data
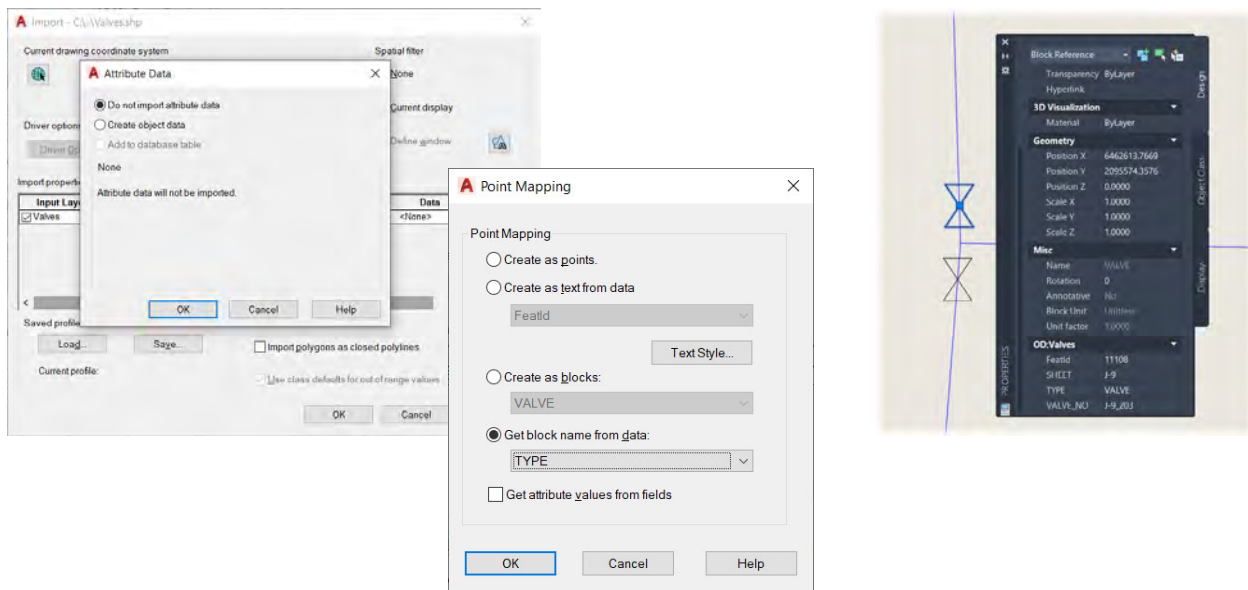
Importing and exporting	AutoCAD	Map 3D toolset
Importing an ESRI file into the current Map 3D drawing	25:00	5:00
Point mapping ESRI file data into current drawing	30:00	5:00
Exporting out the current drawing to an Autodesk SDF file	15:00	5:00
Total time to complete task	70:00	15:00
Time savings with Map 3D toolset		**79%**

(Figures shown in minutes and seconds)

Advantages

The Map 3D toolset may enable notable time savings here because:

- Specific GIS file types can be imported as their native format, which cannot be done in basic AutoCAD
- Point mapping can be taken from the imported GIS files
- The Map 3D toolset can be imported out as an Autodesk geospatial SDF file

Design task 5
Enhanced data exchange

There is often the need to take your mapping/GIS drawings back to a standard DWG file format, as other stakeholders in a project do not have access to the Map 3D toolset. Stakeholders with just basic AutoCAD will still need to see the objects in the drawing displayed with the FDO features stylization engine.

In this task, the Map to DWG command is used, enabling the sharing of data without losing the cartographic style of the Map 3D toolset. In basic AutoCAD, this would use up valuable time, ensuring that all regular AutoCAD objects are displayed correctly and have the appropriate object data.

Steps

1. Create a suitable mapping/GIS drawing with FDO features
2. Check that all mapping/GIS features have their appropriate appearance and object data
3. Convert the mapping/GIS drawing to the appropriate DWG file format
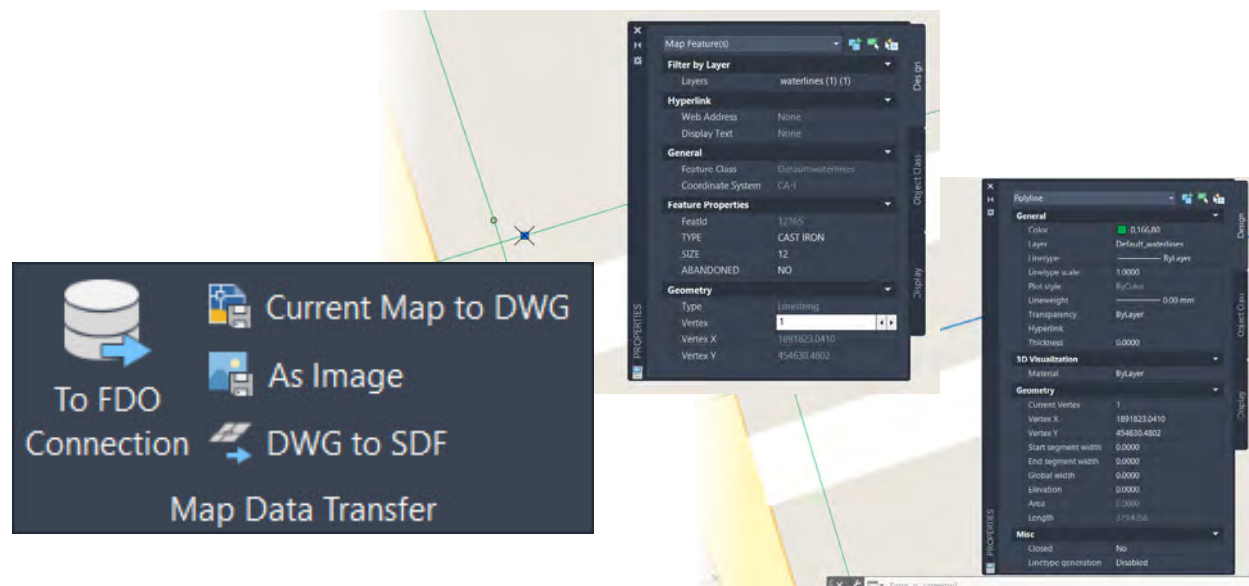
Enhanced data exchange	AutoCAD	Map 3D toolset
Create mapping/GIS drawing with FDO features	70:00	45:00
Confirm appropriate appearance and object data	5:00	5:00
Convert mapping/GIS drawing to DWG	25:00	5:00
Total time to complete task	100:00	55:00
Time savings with Map 3D toolset		**45%**

(Figures shown in minutes and seconds)

Advantages

The advantages of the Map 3D toolset:

- Any mapping/GIS drawings include objects created with the FDO features stylization engine. Basic AutoCAD does not have this feature.
- The Map 3D toolset allows for easy checking of any FDO objects
- The Map 3D toolset converts to DWG file format with FDO features stylization

Design task 6

Source drawings and coordinate systems

Mapping systems often contain large amounts of data and geometry. Source drawings and coordinate systems are drawings that are attached to the current drawing but are not loaded into memory until a request is made through queries. Map 3D has the data technology to do this, whereas in basic AutoCAD, this would normally be done via external reference files (XREFs).

The task was to map a drive alias and then add source drawings to a mapping/ GIS drawing. In the case of basic AutoCAD, this was done using XREFs.

Steps

1. Create a new host mapping/GIS drawing
2. Create a drive alias for source drawings (or an XREF file location)
3. Add source drawings (or XREFs) and view them in the host drawing
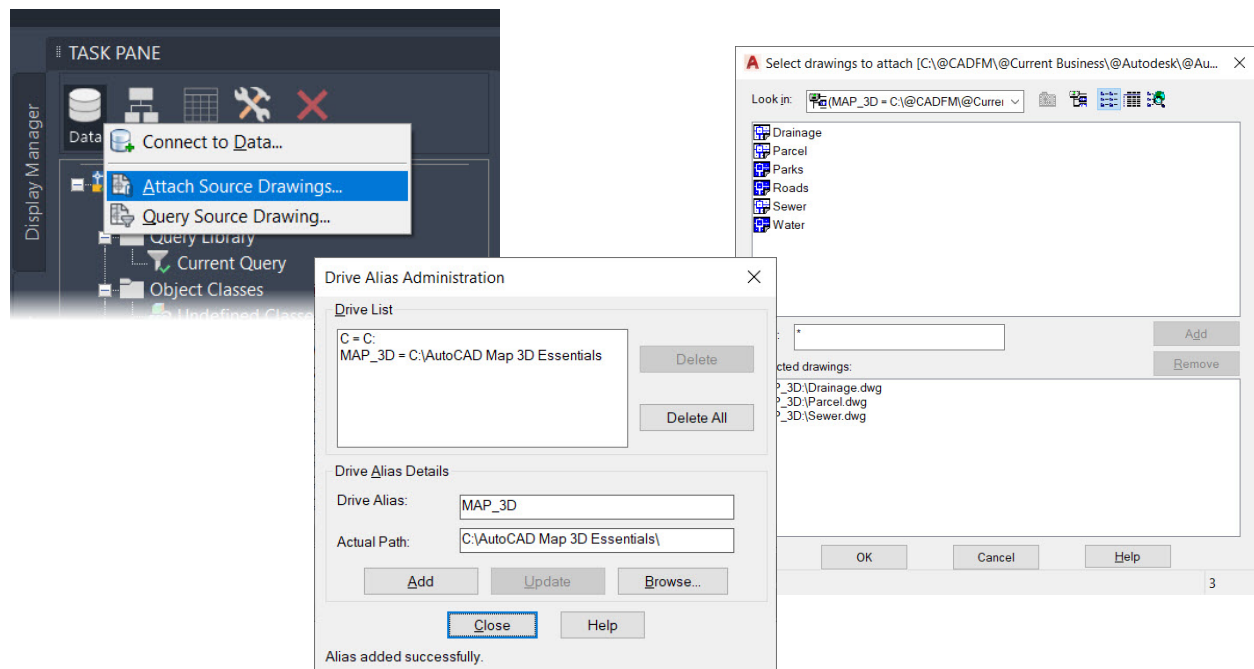
Source drawings and coordinate systems	AutoCAD	Map 3D toolset
Create a new host mapping/GIS drawing	5:00	5:00
Create a drive alias (or XREF file location)	10:00	10:00
Add source drawings (or XREFs) and view them	45:00	10:00
Total time to complete task	60:00	25:00
Time savings with Map 3D toolset		**58%**

(Figures shown in minutes and seconds)

Advantages

Adding source drawings with basic AutoCAD is a time-consuming task. Each XREF will need to be added individually to the host drawing, and file location and coordinate systems will need to be optimized also. The Map 3D toolset provides time savings, primarily due to the drive aliasing made available.

- Drive aliasing allows for direct server connection to know source drawing locations
- Quick View in the Map 3D toolset allows for queries to show the source drawings on demand

Design task 7

Stylizing FDO features

When working with FDO features in your mapping/GIS drawings, related features are often objects stored in other drawings. In order to stylize the features in the current drawing to match other features on those other drawings, the Map 3D toolset provides you with the ability to save and edit them and save any changes back to the original source as well. To do this in basic AutoCAD would require many hours of bring in both block references and XREFs.

The task in this case was to bring in features for hydrants, roads, and parcels from Autodesk SDF files, and edit the feature content and parameters to suit the requirements of the main mapping/GIS drawing.

Steps

1. Add the appropriate SDF files to the mapping/GIS drawing
2. Edit the FDO feature content and parameters to suit the current mapping/GIS drawing requirements
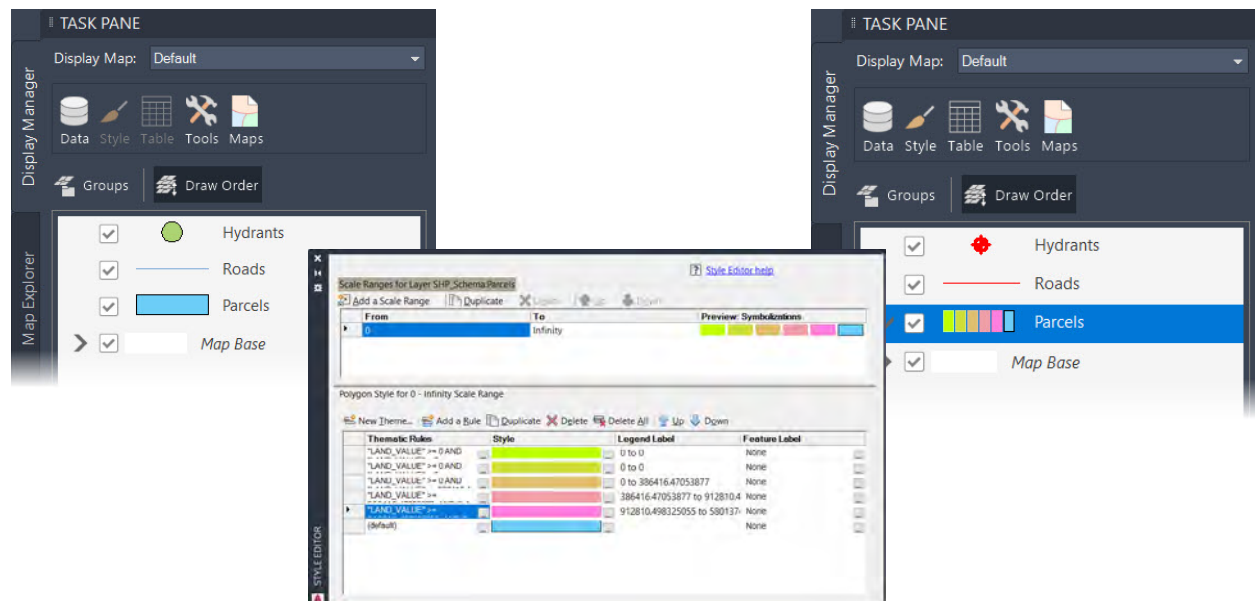
Stylizing FDO features	AutoCAD	Map 3D toolset
Add SDF files to current Mapping/GIS drawing	75:00	15:00
Edit FDO feature content and parameters	35:00	10:00
Total time to complete task	110:00	25:00
Time savings with Map 3D toolset		**77%**

(Figures shown in minutes and seconds)

Advantages

The time savings provided by the Map 3D toolset are worthy
of noting:

- Necessary information for stylizing can be found using
  Autodesk SDF source files. Basic AutoCAD does not provide
  this, and many hours would be used to link both block
  references and XREFs
- The Map 3D toolset provides extensive FDO feature editing
  tools which are not available in basic AutoCAD
- The Map 3D toolset is used specifically for mapping and GIS,
  and basic AutoCAD is much more generic, thus using more
 hours to develop and mapping or GIS drawings

Design task 8

Plotting maps

There will always be a need to plot drawings, and mapping/GIS drawings are no exception. Basic AutoCAD provides suitable plotting tools via the layout tabs and the Page Setup Manager. But the Map 3D toolset provides more functionality in the Display Manager that allows for connections to source files (such as SDF files) for layers and functionality that provides itemized legends in the layout tab.

The task here was to generate a mapping/GIS drawing for plotting by adding a legend, north point, and a scale to communicate the appropriate mapping and GIS information in the drawing.

Steps

1. Set up layout tab through Page Setup Manager
2. Add a suitable viewport displaying the mapping/GIS information
3. Add a legend, north point, and a scale
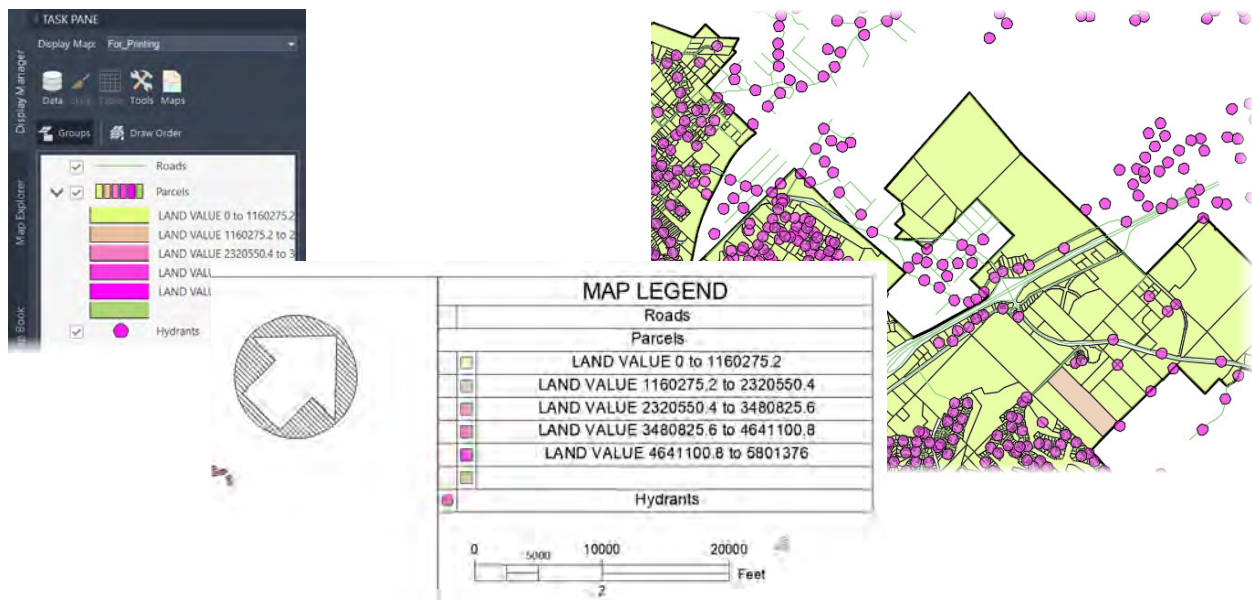
Plotting maps	AutoCAD	Map 3D toolset
Set up layout through Page Setup Manager	15:00	15:00
Add a viewport that displays the map/GIS information	5:00	5:00
Add legend, north point, and scale	25:00	5:00
Total time to complete task	45:00	25:00
Time savings with Map 3D toolset		**44%**

(Figures shown in minutes and seconds)

Advantages

As you can see, it takes three-quarters of an hour to create a suitable mapping/GIS plot via basic AutoCAD. This time is more than halved by using the features available in the Map 3D toolset. The ability to place a legend, north point, and a scale relative to your mapping and GIS information in the drawing make for a greater timesaving.

Conclusion

In this Map 3D toolset productivity study, the eight design tasks analyzed were just a few examples of how the Map 3D toolset can provide tools and workflows to make you more productive.

Project tasks	AutoCAD	Map 3D toolset	Time savings
1 Interface & workspaces	48:00	8:00	83%
2 Creating & editing coordinate geometry	65:00	25:00	62%
3 Object data	95:00	60:00	37%
4 Importing & exporting	70:00	15:00	79%
5 Enhanced data exchange	100:00	55:00	45%
6 Source drawings & coordinate systems	60:00	25:00	58%
7 Styling FDO features	110:00	25:00	77%
8 Plotting maps	45:00	25:00	44%
Total time	**593:00**	**238:00**	
Overall time savings with the Map 3D toolset			**60%**

(Figures shown in minutes and seconds)

With the Map 3D toolset, it is possible to save about **60%** of the 2D CAD working time when compared to basic AutoCAD.*

The advantages of the Map 3D toolset

Based on these eight selected tasks, the Map 3D toolset provides a level of productivity for mapping and GIS users that is not possible with basic AutoCAD. Because the Map 3D toolset is built specifically for mapping and GIS, you could possibly realize productivity benefits such as the ones discussed in this paper.

*As with all performance tests, results may vary based on machine, operating system, filters, and even source material. While every effort has been made to make the tests as fair and objective as possible, your results may differ. Product information and specifications are subject to change without notice. Autodesk provides this information "as is", without warranty of any kind, either express or implied.

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