# AutoCAD<sup>®</sup> Civil 3D<sup>®</sup> 2014 for Surveyors





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# **Chapter 2**

# **Connecting to Geospatial Data**

In this chapter, you connect to existing geospatial data and create a surface from it to determine which data should be collected during the field survey.

This chapter contains the following topics:

- ✓Introduction to the Planning and Analysis Workspace
- ✓Coordinate Systems
- ✓Geospatial Data Connection
- ✓Create a Surface from GIS Data

# 2.1 Introduction to the Planning and Analysis Workspace

### Learning Objective



Identify where tools are found within the Planning and Analysis Workspace.

The Planning and Analysis Workspace in the AutoCAD<sup>®</sup> Civil 3D<sup>®</sup> software contains tools that are also found in the AutoCAD<sup>®</sup> Map 3D<sup>®</sup> software. They help you to attach and analyze GIS data for more efficient planning of projects before starting a design.

**Map Workflow** The following workflow is one of many workflows that can be used. It only covers a small portion of the AutoCAD Map 3D software capabilities.

- 1. Start a new drawing from a Civil 3D template that includes all of the necessary styles.
- 2. Assign a Coordinate System to the drawing file.
- 3. Attach Image and Digital Elevation Models (DEM) files using the **Data Connect** command.
- 4. Attach other source data using the **Data Connect** command.
- 5. Create AutoCAD Civil 3D surfaces from source data.
- 6. Style the layers for presentation or publication purposes.
- 7. Analyze the data.
- 8. Create labels and legends to annotate the drawing.

A typical workflow using the Planning and Analysis workspace includes setting up a drawing with the coordinates assigned, and then connecting to file-based data sources (.SHP or .SDF files) or to a database (Oracle or Microsoft SQL Server). Data can be queried as it is added to the drawing file to ensure that only the area of interest or items of interest are incorporated into the drawing file.

Once data is included in the drawing, it can be displayed using themes and symbols for proper representation of the entities. Analysis can be done on the entities to determine which entities are within a specific distance of another (buffer analysis) or which entities overlay another (overlay analysis). The *Map Setup* tab>Coordinate System panel is used to assign a coordinate system to the drawing file, as shown in Figure 2–1.



#### Figure 2–1

The *Home* tab>Data panel is used to connect to source data, such as images, file sources, and database sources, as shown in Figure 2–2.

Image: Search Connect       Image: Search Con	Paste
Data 🕶 😼 Draw 👻 Modify 🛨 AutoCAD Layers 👻 Properties 👻	Clipboard

Figure 2–2

Creating a surface from source data is done using the Civil 3D workspace in the *Home* tab>Create Ground Data panel, as shown in Figure 2–3.



# 2.2 Coordinate Systems

#### Learning Objective



Set the drawing coordinate system for a new drawing.

Coordinate systems are used in engineering and mapping to uniquely identify the position of geographical elements. Different systems project elements differently to accommodate the curvature of the earth's surface. Therefore, it is vitally important to set the coordinate system for the drawing in which you plan to work.

Coordinate systems communicate to the computer where the project is located in the world, along with mathematical equations used to account for the curvature of the earth. Once the drawing coordinate system has been set, any GIS or Survey data that is connected to the drawing automatically re-projects and lines up properly in the current drawing.

# How to: Set the Drawing Coordinate System in the Planning and Analysis Workspace

1. In the Quick Access Toolbar, change the workspace to **Planning and Analysis**, as shown in Figure 2–4.





2. In the Map Setup tab>Coordinate System panel, click

 $\bigcirc$  (Assign) to assign a coordinate system to the drawing file, as shown in Figure 2–5.



		6					
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CA83							
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	CA83-IIF	NAD83 California State Planes, Zone	P	NAD83	USA, California	2226	US Survey Foot
	CA83-III	NAD83 California State Planes, Zone	P	NAD83	USA, California	26943	Meter
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l õ	CA83-V	NAD83 California State Planes, Zone	P	AD83	USA, California	26945	Meter
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õ	CA83-VI	NAD83 California State Planes, Zone	P	NAD83	USA, California	26946	Meter
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2. In the *Settings* tab in the Toolspace, right-click on the drawing name and select **Edit Drawing Settings**, as shown in Figure 2–8.

Active Drawing Settings View	Toolspace	
Active Drawing Settings View		
	Active Drawing	Settings View 💌
		Edit Drawing Settings Edit Label Style Defaults Edit LandXML Settings Table Tag Numbering Refresh

3. In the Drawing Setting dialog box, in the *Units and Zone* tab, select the category and coordinate system for the drawing, as

shown in Figure 2–9. Click

Units and Zone Transformation	Object Layers Abbreviations	Ambient Settin	gs		
Drawing units:	Imperial to Metric conversion:			Scale:	
Feet	US Survey Foot(39.37 Inche	s per Meter)	<u></u>	1" = 40'	<u> </u>
Angular units:	Scale objects inserted from	n other drawings		Custom scale:	
Degrees 💌	Set AutoCAD variables to	match		40	
Zone					
Categories:	C	USA, California			•
Available coordinate systems:					
NAD83 California State Plane	es, Zone VI, US Foot				-
Selected coordinate system co	de: CA83-VIF				
Description:					
NAD83 California State Plane	es, Zone VI, US Foot				
Projection:					
LM					
Datum:					
NAD83					
,					
			_		
		OK	Cancel	Apply	Help

Figure 2–9

# **Practice 2a**

Estimated time for completion: 5 minutes

# **Start a New Project**

## Learning Objective



Display the current conditions by connecting to GIS data.

In this practice, you will create a new drawing and assign a coordinate system to the drawing.

## Task 1 - Start a new file.

- \_....[
- 1. Click (Application Menu) and select **New** to start an new drawing file.
- 2. Select **\_AutoCAD Civil 3D (Imperial) NCS.dwt**, which ships with the software, as shown in Figure 2–10.





3. Click (Application Menu) and select **SaveAs**. Type **BaseMap** for the filename, browse to *C*:\*Civil 3D Projects*\

Civil3D-Training, and click

Task 2 - Set the drawing coordinates.

- 1. Continue working with the drawing from the previous task or open **GEO-A2-GIS.dwg**.
- 2. In the Quick Access Toolbar, change the workspace to **Planning and Analysis**, as shown in Figure 2–11.







# **2.3 Geospatial Data Connection**

### Learning Objective



Display the current conditions by connecting to GIS data.

Geospatial data is collected and maintained by a large number of organizations using a variety of different software. The AutoCAD Civil 3D software can connect to many of these data sources using the Feature Data Object (FDO) connection in *Display Manager* tab>AutoCAD Map 3D Task pane or the *Home* tab in the Planning and Analysis workspace. The types of data that can be connected include: ArcSDE, Enterprise Industry Models, MySQL, ODBC, Oracle, PostgreSQL, Raster Image or Surface Connection, Spatial Data Files, ESRI Shape files, SQL Server Spatial, SQLite, WFS, WMS.

## Connect to GIS Data

The process of connecting to GIS data is similar among data types. First you select the type of data to which to connect, and then you select the number of files that are going to connect at the same time. You can connect to one file at a time or to an entire directory of files at the same time. If a database connection is selected (such as Oracle or ArcSDE) you might need to input your login credentials, as shown in Figure 2–14.

Data Connections by Provider	? Data Connect help
Add ArcSDE Connection	OSGeo FDO Provider for ArcSDE
Add Enterprise Industry Model Co	Add a New Connection
Add MySQL Connection	Read/write access to an ESRI ArcSDE-based data store, using Oracle and SQL Server.
Add Oracle Connection	Connection name:
Add Raster Image or Surface Con	ArcSDE_1
Add SDF Connection	Server name:
Add SAP Connection	
Add SQLite Connection	Instance name:
Add WFS Connection	
ा Add WMS Connection	Login
	Data store:
	<b>_</b>
	Version:
	<b>•</b>
	Connect
•	



	Finally, you need to ensure that the coordinate system of the source file registers as you connect to it. If the coordinate system for the source file is listed as <unknown> (as shown in Figure 2–15), it did not register properly. Therefore, you need to assign the source coordinate system manually so that it re-projects automatically in the drawing and displays in the correct location.</unknown>
	Add Data to Map Available sources in this connection. Select Items to add to the map as layers.  Edit Coordinate Systems Schema Coordinate System V Cordinate System Combine into one layer:  Map Coordinate System CA83-VIF NADB3 Colifornia State Planes, Zone VI, US Foot Foot
	Figure 2–15
Home Insert Annotate Feature Edit Creat	<ul> <li>There are multiple locations in which you can access the Data Connection palette. The first is the <i>Home</i> tab in the Planning and Analysis workspace, the second is in the Map Task pane.</li> <li>1. In the <i>Home</i> tab&gt;Data panel in the Planning and Analysis workspace, click in the Planning and Analysis (Connect), as shown in Figure 2–16.</li> </ul>
Connect Search The Data and Connect Search	Image: Second with the second sec
Data ♥	Figure 2–16
	Alternatively, you can do the following:
	<ol> <li>In the Home tab&gt;expanded Palettes panel in the Civil 3D workspace, click (Map Task Pane), as shown in Figure 2–17.</li> </ol>
	Home Home Figure 2–17

2. In the Display Manager tab in the Map Task Pane, click E (Data) and select Connect to Data, as shown in Figure 2–18. Task Pane Display Map: Default ٠ \* Connect to Data New Group 🔏 New <u>T</u>ext Layer... 🖞 New Co<u>n</u>tour Layer.. 🕰 Load Layer... Bulk Copy... Explorer Add Drawing Data • Man ۲ Add Point Cloud Data Remove Selected Item(s) Figure 2–18 3. In the Data Connect palette, select the proper connect type. 4. Type a name for the connection and click 🔳 (Browse for source file) or 🛄 (Browse for source folder), as shown in Figure 2–19. x ? Data Connect help Data Connections by Provider ю Add ArcSDE Connection Autodesk FDO Provider for Raster н Add Enterprise Industry Model Con Add a New Cor 💂 Add MySQL Connection Read access to various raster-based file formats. Supports georeferenced file-based raster images and 3D grid surfaces. Add ODBC Connection 🙀 Add Oracle Connection 🙀 Add PostgreSQL Connection Connection name: Add Raster Image or Surface Conn Aerial Image Add SDF Connection Source file or folder Add SHP Connection 🙀 Add SQL Server Spatial Connection Add SQLite Connection Add WFS Connection Add WMS Connection Figure 2–19 Open 5. Select the file or folder and click Connect 6. In the Data Connect palette, click 7. In the Coordinate System column, double-click on <unknown> to edit the coordinate system that is registered with the source file, as shown in Figure 2–20.

		Add Data to Mar Available source Edit Coordina Schema V JPG C:\Civi I Combine int Map Coordinat CA83-VIF NAPS3 Californ Foot 8. In the Edit Spa and click	s in this connecti te Systems   I 3D Projects \Civ o one layer: [ e System nia State Planes, i tial Con Edit	on. Select Items t II3D-Training\Ima Zone VI, US Foot Figure 2 Itexts dia , as sh	to add to the map as laye ges\Main Site Imperial.jp 2–20 alog box, se Iown in Figu	ers.	known>
		Spatial Contexts:           Name         0           Default	Coordinate System unknown >		Override		Edit Remove OK
							Cancel
				Figure	2–21		
		9. Select the requ	uired co	ordinate	system from	m the list	of codes,
Currently & Code: Descriptio Show — Status: U	Assigned	as shown in Fi	gure 2–	22. Click	Select	. Click	ОК
CA83							
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0	CA83-IF	NAD83 California State Planes, Zone	P	NAD83	USA, California	2225	US Survey Foot
0	CA83-II	NAD83 California State Planes, Zone	P	NAD83	USA, California	26942	Meter
0	CA83-IIF	NAD83 California State Planes, Zone	P	NAD83	USA, California	2226	US Survey Foot
0	CA83-III	NAD83 California State Planes, Zone	P	NAD83	USA, California	26943	Meter
	CA83IIIF	NAD83 California State Planes, Zone	P	NAD83	USA, California	2227	US Survey Foot
	CA83-IV	NAD83 California State Planes, Zone	P		USA, California	26944	Meter
	CA83-IVF	NAD83 California State Planes, Zone	P		USA, California	2228	US SURVEY FOOT
	CA83-VF	NADOS California State Planes, Zone	P	NAD83	USA, California	20343	US Survey Foot
	CA83-VT	NAD83 California State Planes, Zone	P	AD83	USA, California	26946	Meter
Č	CA83-VIF	NAD83 California State Planes, Zone	P	NAD83	USA, California	2230	US Survey Foot
		10. In the Data Co 11. Continue addir	nnect pa ng data	Figure : alette, cl sources	2–22 lick <sup>∠</sup> Add to as required	Map 🔻	



The available styles for a GIS layer depend on the type of GIS data being displayed. Point features (such as points of interest within a city) can use block symbols as the point style while linear features (such as roads) use linetypes and linewidths to communicate differences between feature types. If an area feature (such as a city boundary or parcel) is used, both hatch patterns and linetypes/linewidths are used to communicate differences between feature types, as shown in Figure 2–23.



Figure 2–23

## How to: Modify an Area Style

 In the View tab>Palettes panel, click (Map Task Pane) as shown in Figure 2–24.

Analyze Vi	ew	Fools	Output	Map	Setup	Autodesk 360	Add-ins	Raster T	ools Geo	technics	Feat	ured Apps	Express	Tools
	2	<b>1</b>	ор	-	寶 Vi	ewport Configurat	ions List 🔻	📑 New			<b>P</b>		<b>-</b>	
	12	. 1 <u>2</u> s	how UCS Ic	on 🔻	📑 Re	ectangular 🔹		🖬 Clip	Map	Data	Tool	Properties	£	Guit
년년년	2	UCS I	con Properti	ies	🔡 Na	amed		💾 Join	Task Pane	Table	Palettes	rioperaco	e	Windo
	Coor	dinates		ы		Viewp	orts				Palettes	•		



- 2. In the Task Pane, in the *Display Manager* tab, double-click on the area layer.
- 3. In the Style Editor palette, in the *Style* column, click



How to:	Change the Draw Order of GIS Layers
	<ol> <li>In the Task Pane, in the <i>Display Manager</i> tab, select <b>Draw</b> Order and drag the layers above or below the others to ensure that they all display, as shown in Figure 2–27.</li> </ol>
	Image: Task Pane         Display Map:         Default         Image: Defaul
	<ol> <li>Figure 2–27</li> <li>In the Draw Order dialog box that opens, select Continue action and allow Draw Order to control layer position from now on.</li> </ol>

## **Practice 2b**

Estimated time for completion: 10 minutes **Connect to GIS Data** 

### Learning Objective



Connect to an aerial image file using AutoCAD Map 3D tools.

In this practice, you will create a new drawing and assign a coordinate system to the drawing.

## Task 1 - Connect to an image file.

- 1. Continue working with the drawing from the previous practice or open GEO-B1-GIS.dwg.
- 2. In the *Home* tab>Data panel, click 🖳 (Connect), as shown in Figure 2–28.

<b>Figure 2–28 Some time to be a serie of the second transformed to be a second to be </b>	lome Insert	Annotate Feature Edit Create Analyze	e View Tools Output Map Setup Autodesk 360 Add-ins Raster To
<ul> <li>Figure 2–28</li> <li>S. In the Data Connect palette, select Add Raster Image or Surface Connection, for Connection name, type Aerial Image, and click is (browse for image file), as shown in Figure 2–29.</li> <li>Image is connection by Provide in the Connection Provide for Reader of the Add Provide of Reader of the Add Provide of Reader of the Add ODEC Connection Image as and D grid surfaces. Add ODEC Connection Image of Surface Connection Image of Surface Connection Image as and D grid surfaces. The add Connection Image of Surface Connection Image</li></ul>	Filter	Attach	+ +       +
<ul> <li>3. In the Data Connect palette, select Add Raster Image or Surface Connection, for Connection name, type Aerial Image, and click is (browse for image file), as shown in Figure 2–29.</li> <li> The Connections by Provider (Pata Connect help) Add ArCDE Connection Add SOPE Connection Add ArCDE Connection Add ArCDE Connection Add ArCDE Connection Add ArCDE Connection Add SOPE Connection Add ArCDE Connection Add ArCDE Connection Add SOPE Connection Connection Add SOPE Connection Connection Connection Connection Connection Connection Connection <p< td=""><td></td><td></td><td>Figure 2–28</td></p<></li></ul>			Figure 2–28
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<ul> <li>Add SDF Connection</li> <li>Add SDF Connection</li> <li>Add SQL Server Spatial Connection</li> <li>Add SQL Server Spatial Connection</li> <li>Add WFS Connection</li> <li>Add WFS Connection</li> <li>Add WFS Connection</li> </ul> Figure 2–29 4. Select the Main Site Imperial.jpg in C:\Civil 3D Projects\ Civil3D-Training\Images\. Click Open 5. In the Data Connect palette, click Connect		Add Oracle Connection	Connection name:
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<ul> <li>Figure 2–29</li> <li>4. Select the Main Site Imperial.jpg in C:\Civil 3D Projects\ Civil3D-Training\Images\. Click Open</li> <li>5. In the Data Connect palette, click Connect</li> </ul>		Add SQL Server Spatial Connection Add SQL Server Spatial Connection Add WFS Connection Add WFS Connection	Connect
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		7. In the Ed	it Spatial Co	ntexts di	alog box, se	elect <b><u< b="">r</u<></b>	nknown>
		and click	Edit	, as sl	nown in Fig	ure 2–30	
		Spatial Contexts:					_
		Name Default	Coordinate Syste < unknown >	em	Override		- Edit
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		8. In the Se	<i>arch</i> field, ty	pe <b>CA8</b> 3	<b>3</b> , and in the	e list of co	ode, select
		CA83-VI	F, as shown	in Figure	e 2–31. Clic	k	. Click
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		9. In the Da Data Cor	ta Connect planect planect palette	Figure palette, c , and sav	2–31 click Add to ve the draw	o <sup>Map</sup> ▼, c ing.	close the
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	2.	In the <i>Home</i> tab>Data panel, click 🖳 (Connect), as shown in Figure 2–32.
Connect	Filter Filter Search Table Data	Anthotate       Peature Eait       Create       Analyze       View       Tools       Output       Map Setup       Autocask 300       Add-ns       Raster Tools         Attach       Polyline       Image: Coop of the
		Figure 2–32
	3.	In the Data Connect palette, select <b>Add SHP Connection</b> . For the <i>Connection name</i> , type <b>Parcels</b> , and click
		(Browse for shp file), as shown in Figure 2–33.
× + E	ta Connection Add ArcSL Add ArcSL Add McSL Add Most Add Orado Add Orado Add Orado Add SDF C Add SDF C	Ins by Provider
		Figure 2–33
	4.	Select the <b>Properties.shp</b> in C:\Civil 3D Projects\
		Civil3D-Training\Geospatial\. Click
	5.	In the Data Connect palette, click
	6.	In the Data Connect palette, click Add to Map . Close the Data Connect palette and save the drawing.
	7.	If the Map Task Pane is not displayed, click [1] (Map Task Pane) in the <i>View</i> tab>Palettes panel, as shown in Figure 2–34.
Analyze	View	Tools Output Map Setup Autodesk 360 Add-ins Raster Tools Geotechnics Featured Apps Express Tools
		Image: Construction of the sector of the
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		i iguie 2-34

8. In the	the Task Pane, in the Properties layer.	e Display Manag	artah daubla click on	
9 In				
0	the Style Editor pale	tte, in the <i>Style</i>	column, click	
<u></u>	(Browse) as shown	i in Figure 2–35.		
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		Figure 2–35	_	
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	Unit: Symbol and style Add Fill Add E Select symbol: Fill 0 Use Default Theme Colors	Inches Border SOLID SOLID Line J.937 Lock as 0	▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼	
	Unit: Symbol and style Add Fill Add E Select symbol: Fill 0 Use Default Theme Colors Standard Colors No Color	Inches Border SOLID SOLID SOLID Line Line Lock as 0 Close		
	Unit: Symbol and style Add Fill Add E Select symbol: Fill 0 Use Default Theme Colors Standard Colors No Color Selected Color	Inches Border SOLID Une June	Pect ratio	
	Unit: Symbol and style Add Fill Add E Select symbol: Fill 0 Use Default Theme Colors Standard Colors No Color Selected Color	Inches Border Border SOLID Une June	Pect ratio	
	Unit: Symbol and style Add Fill Add E Select symbol: Fill 0 Use Default Theme Colors Standard Colors No Color Selected Color	Inches Border Border SOLID June	Pect ratio	

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# 2.4 Create a Surface from GIS Data

### Learning Objective



Create a surface from a shape file containing elevation data.

An AutoCAD Civil 3D surface can be created from GIS data. Once created, the surface can be used to create surface profiles and act as a target for corridor models and grading groups. It is recommended that you request any available metadata when obtaining GIS layers that could be used for creating a 3D surface model. The metadata should indicate how accurate the data is and whether it can be used in detailed design drawings. GIS surfaces are not often used for detailed design because they are typically mapping grade rather than survey grade, but that is changing rapidly. Having a surface from GIS data can be useful in the project planning phase of a project, even if it is not survey grade. Data source types that can be used to create a surface include: ArcSDE, Oracle, and ESRI Shape Files

## How to: Create an AutoCAD Civil 3D Surface from SHP files

- 1. In the Quick Access Toolbar, select **Civil 3D** for the workspace.
- 2. In the Home tab>Create Ground Data panel, expand the

Surfaces drop-down list and click  $\overset{W}{\sim}$  (Create Surface from GIS Data), as shown in Figure 2–38.



3. In the Object Options page, for the *Civil 3D object type*, select **Surface**. Type a name and select the required styles for displaying the surface, as shown in Figure 2–39. Click

Next >	
Object Options	Civil 3D object type:
Connect to Data	Surface
<u>Schema and</u> <u>Coordinates</u>	Name: GIS Data
Geospatial Query	Description:
Data Mapping	Style: Contours 2' and 10' (Background)
	Layer: C-TOPO
	Render material:

Figure 2–39

4. In the Connect to Data page, for the Data source type, select

**SHP**, click .... (Browse for file) and select a shape file that includes vector data for the contours and elevation data in the database file, as shown in Figure 2–40. Click

Object Options       Data source type         Connect to Data <ul> <li>ArcSDE</li> <li>Oracle</li> <li>Schema and</li> <li>Cornection parameters</li> </ul> Geospatial Query       SHP         Data Mapping              C:Ctvil 3D Projects\Ctvil3D-Training\Geospatial\Contours.shp          Instance:           User name:           Password:           Datastore list:	
Figure 2–40	

5. In the So feature of	chema and Coordinates page, select the <b>Contours</b> class and ensure that the <i>Contours Coordinate</i>
system i	s set, as shown in Figure 2–41. Click Next >
Object Options Connect to Data	Schema: Default  Feature class Coordinate system Contours NAD83 California State Planes, Zone VI, US Foot
6. In the Ge interest to create Next >	Figure 2–41 eospatial Query page, clear the <b>Define area of</b> option so that the entire Contours shape file is used a surface, as shown in Figure 2–42. Click
Object Options Connect to Data Schema and Coordinates Geospatial Query Data Mapping	
<ol> <li>In the Da select th shown ir</li> </ol>	<b>Figure 2–42</b> ata Mapping page, expand the drop-down list and e field that holds the surface elevation values, as n Figure 2–43. Click Finish.
Object Options Connect to Data Schema and Coordinates Geospatial Query	Map GIS data to Civil3D properties: GIS Field Civil3D Property Default:Contours Elev Elevation Geometry
Contour dat often survey contour poly used from o interprets th	Figure 2–43 a is available from many sources. Large sites are yed using aerial photogrammetry, which provides /lines and spot elevations. When contour data is ther GIS data types, the AutoCAD Civil 3D software ie imported linework as polylines with elevations.

	In the AutoCAD Civil 3D software, polylines with elevation are useful as custom contour objects. Whether using polylines or other GIS contour objects, the AutoCAD Civil 3D software builds a surface by triangulating between contours. The end of each triangle side connects to a vertex of two different contours.
Contour Issues	Note the following issues when working with contour data: bays and peninsulas within the contours and the lack of high and low point elevations. These issues affect triangulation and the quality of a surface.
	Bays and peninsulas within contours represent gullies or isolated high points on a surface. As long as there is data to work with, the AutoCAD Civil 3D software builds a surface by triangulating between contours of different elevations. When the software cannot triangulate between different contours, the triangulation switches to connecting vertices on the same contour.
	The <b>Minimize Flat Faces</b> command helps mitigate this situation by forcing the triangulation to target different contours, as shown in Figure 2–44. However, this method, similar to the edge swap method, does not correct every problem on a contour surface.
	To launch the Minimize Flat Faces command, right-click on the Edits heading in the Definition collection of a surface and select the command.
	Figure 2-44

The second issue with contour data regards the loss of high and low points. Contours represent an elevation interval (120, 122, 123, etc.). However, the top of a hill could be 123.04 or 136.92 and the only contours present are for the elevations of 123 or 136. Spot elevations are needed in the surface data to help correctly resolve the high and low spots of a surface.

Flat spots and the loss of high and low points affect the calculation of volumes for earthworks, as shown in Figure 2–45.





Minimizing Flat Triangle Strategies

By default, the **Minimize flat areas by:** options shown in Figure 2–46 are selected in the Add Contour Data dialog box.

Minimize flat areas by:	
🗹 Filling gaps in contour data	
Swapping edges	

- Adding points to flat triangle edges
- Adding points to flat edges



	Together, these three methods attempt to detect and resolve peninsulas, bays, and other issues by adding additional points and filling in gaps based on surface trends. Generally, these provide the most expected results. The <b>Swapping edges</b> option is provided as a way of emulating how other terrain modeling software (such as AutoCAD Land Desktop) traditionally approached minimizing flat areas. The AutoCAD Civil 3D software automatically applies three of the four Minimize flat area options as it creates the surface from GIS data.
Draping Images On a Surface	Images and other 2D linework can be draped on a surface. Draping a 2D image on a surface gives it the appearance of being 3D and provides a better visualization of what is happening on the project site.
How to:	Drape an Image on an AutoCAD Civil 3D Surface
	1. In Model Space, select the GIS Data surface. In the
	contextual Surface tab>Surface Tools panel, click $$ (Drape Image), as shown in Figure 2–47.
	2 In the Drane Image dialog her, ensure that the Main Site
	Imperial image is selected and that the GIS Data surface is
	selected, as shown in Figure 2–48. Click
	Image: Main Ste Imperial_11584 Surface: Render Material Name: GIS Data_Main Site Imperial_11584_Rende OK Cancel Help Figure 2-48

# **Practice 2c**

*Estimated time for completion: 5 minutes* 

# Create a Surface from a Shape File

## Learning Objective



Create a surface from a shape file containing elevation data.

In this practice, you will create a new drawing and assign a coordinate system to the drawing.

## Task 1 - Create a surface from a Shape file.

- 1. Continue working with the drawing from the previous practice or open **GEO-C1-GIS.dwg**.
- In the Quick Access Toolbar, for the workspace, select Civil 3D.
- 3. In the Home tab>Create Ground Data panel, expand the

Surfaces drop-down list and click  $\overset{\text{W}}{\sim}$  (Create Surface from GIS Data), as shown in Figure 2–49.



Object Options	Civil 3D object type:	
Connect to Data	Surface	
Schema and Coordinates	Name: GIS Data	
Geospatial Query	Description:	
Data Mapping	Style:	
	Contours 2' and 10' (Background)	
	C-TOPO	
	Render material:	
	Figure 2–50	
5. In the Conne	ect to Data page, for the <i>Data source type</i> , select	
	(Browse for file) and select <b>Contours shn</b> in	
C:\Civil 3D P	Projects/Civil3D-Training/Geospatial/, as shown	
01101111 02 1		
in Figure 2–5	51. Click Open . Then click	
Login		
Object Options	Data source tune	
Connect to Data	C ArcSDE	
Schema and	C Oracle	
Coordinates	Connection parameters	
<u>Geospatial Query</u>	SHP path: C:\Civil 3D Projects\Civil3D-Training\Geospatial\Contours shp	
<u>Data Mapping</u>	Instance:	
	liser name:	
	Password:	
	Login	
	Datastore list:	
	Y	
	Connect to datastore	
Figure 2–51		
6 On the Sche	ma and Coordinates name, select the <b>Contours</b>	
feature class	and ensure that the Contours Coordinate	
system is set	t to NAD83 California State Planes, Zone VI,	
	Nexts	
US Foot, as	shown in Figure 2–52. Click	
Object Options Schen	na:	
Connect to Data	at 👤	
Schema and	eature class Coordinate system	
	NAD83 Calfornia State Planes, Zone VI, US Foot	
Figure 2–52		

Next >         Object Options Connect to Data Coordinates Schema and Coordinates       Ferce Circle         Sesseatial Ouery Data Maxima       Ferce Circle         Sesseatial Ouery Data Maxima       Ferce Circle         May of S data to OutSD properties Connect to Data Schema and Coordinates       Finish         Object Options Schema and Coordinates       May of S data to OutSD properties Connect to Data Schema and Coordinates         Object Options Schema and Coordinates       May of S data to OutSD properties Connect to Data Schema and Coordinates         Sesseatial Ouery Data Maxima       May of S data to OutSD properties Connect to Data Schema and Coordinates         Sesseatial Ouery Data Maxima       Sesseatial Ouery Data Maxima         Save the drawing.       Figure         9. Save the drawing.       Figure         1. Continue working with the dra open GEO-C2-GIS.dwg.       Contextual Surface tab>Surfac Image), as shown in Figure 2			
Object Options       Image: Polygon         Schema and       Schema and         Coordinates       Image: Polygon         Data Maopina       Finish         Steet Options       Image: Polygon         Schema and       Image: Polygon </th <th></th> <th></th> <th></th>			
Figure         8. In the Data Mapping page, e         Image: Content Elevation, as shown         Image: Content to Data         Schema and         Continue working with the dr         open GEO-C2-GIS.dwg.         2. In Model Space, select the O         Contextual Surface tab>Surfac         Image), as shown in Figure 2			
<ul> <li>8. In the Data Mapping page, e and select Elevation, as sho</li> <li>Finish</li> <li>Object Options</li> <li>Gild data to Cwi3D properties:</li> <li>Geospatal Ouery</li> <li>Data Mapoing</li> <li>Figure</li> <li>9. Save the drawing.</li> <li>7ask 2 - Drape an image on the open GEO-C2-GIS.dwg.</li> <li>2. In Model Space, select the Geotometry of the drage), as shown in Figure 2</li> </ul>	2–53		
Finish         Object Options Connect to Data         Schema and Coordinates         Schema and Coordinates       Coordinates         Scordinates       Coordinates         Coordinates       Coordinates         Save the drawing.       Figure 4         1.       Continue working with the drawing         1.       Continue Surface tab>Surface         Contextual Surface tab>Surface         Contextual Surface tab>Surface         Coordinates       Coordinates	pand the	Elev dro	op-down lis
<ul> <li>Connect to Data Schema and Coordinates</li> <li>Gesspatal Query Data Mapoing</li> <li>Figure</li> <li>Save the drawing.</li> <li>Task 2 - Drape an image on the open GEO-C2-GIS.dwg.</li> <li>In Model Space, select the G contextual Surface tab&gt;Surfa Image), as shown in Figure 2</li> </ul>	vir in rigu	10 2-04	. Olick
Object Options       Map GIS data to CWI3D properties:         Schema and       Coordinates         Geospatial Query       Teld Image on the Geometry         Data Mapping       Figure         9. Save the drawing.       Figure         1. Continue working with the dr open GEO-C2-GIS.dwg.       Contextual Surface tab>Surfa Image), as shown in Figure 2         Contextual Surface tab>Surfa Image), as shown in Figure 2			
<ul> <li>Sorema and Coordinates</li> <li>Geospatial Query</li> <li>Geospatial Query</li> <li>Figure</li> <li>9. Save the drawing.</li> <li>9. Save the drawing.</li> <li>Task 2 - Drape an image on the drawing with the drawing open GEO-C2-GIS.dwg.</li> <li>1. Continue working with the drawing open GEO-C2-GIS.dwg.</li> <li>2. In Model Space, select the G contextual Surface tab&gt;Surfatimage), as shown in Figure 2</li> </ul>	Property		
<ul> <li>Figure</li> <li>9. Save the drawing.</li> <li><b>Task 2 - Drape an image on th</b></li> <li>1. Continue working with the dropen GEO-C2-GIS.dwg.</li> <li>2. In Model Space, select the Ge contextual <i>Surface</i> tab&gt;Surfatimage), as shown in Figure 2</li> </ul>	n		
<ul> <li>Figure</li> <li>9. Save the drawing.</li> <li>Task 2 - Drape an image on the</li> <li>1. Continue working with the dropen GEO-C2-GIS.dwg.</li> <li>2. In Model Space, select the Geotextual Surface tab&gt;Surface tab&gt;S</li></ul>			
<ul> <li>9. Save the drawing.</li> <li>Task 2 - Drape an image on the drawing with the drawing with the drawing open GEO-C2-GIS.dwg.</li> <li>2. In Model Space, select the Gradient contextual Surface tab&gt;Surface tab&gt;Surfac</li></ul>	2–54		
<ul> <li>Task 2 - Drape an image on the dropen GEO-C2-GIS.dwg.</li> <li>In Model Space, select the Grontextual Surface tab&gt;Surfatimage), as shown in Figure 2</li> </ul>			
<ol> <li>Continue working with the dr open GEO-C2-GIS.dwg.</li> <li>In Model Space, select the G contextual <i>Surface</i> tab&gt;Surfa Image), as shown in Figure 2</li> </ol>	surface		
<ol> <li>Continue working with the dr open GEO-C2-GIS.dwg.</li> <li>In Model Space, select the G contextual <i>Surface</i> tab&gt;Surfa Image), as shown in Figure 2</li> </ol>			
<ul> <li>In Model Space, select the G contextual Surface tab&gt;Surface tabb&gt;Surface tab&gt;Surface tab&gt;Surface tab&gt;Surface tab&gt;Surface tab&gt;</li></ul>	wing from	1 the pre	vious task
contextual <i>Surface</i> tab>Surfa Image), as shown in Figure 2	<b>S Data</b> ຣເ	urface. I	n the
	ce Tools p –55.	anel, cli	ick 齡 (Dra
Add Data Edit Surface Water Drop Resolve Crossing @ Ca Breaklines		Export to DEM Drape Image	Quick Profile
Modify Analyze 🔻	ity Check +	Extract Objects	
Figure	ity Check •	Extract Objects rface Tools 👻	Launch Pad

3. In the Drape Image dialog box, ensure that the **Main Site Imperial** image is selected and that the GIS Data surface is

selected, as sho	wn in Figure 2–56	6. Click	OK
	Image:		

GIS Data\_Main Site Imperial\_11584\_Render

nder Material Name:

OK

Figure 2–56

Cancel

Help

4. In the *View* tab>Navigate 2D panel, click <sup>♣</sup> (Orbit). Orbit the drawing as shown in Figure 2–57. Press <Esc>.



Figure 2–57

5. Save the drawing.

The image might not look the same in the object view. Use **3D Orbit** to display the results of draping an image.

# **Chapter Review Questions**

- 1. In which workspace is the Coordinate System panel located?
  - a. Civil 3D
  - b. 2D Drafting and Annotation
  - c. 3D Modeling
  - d. Planning and Analysis
- 2. What type of data cannot be connected using the Data Connection palette?
  - a. ArcSDE
  - b. Oracle
  - c. Microstation DGN file
  - d. ESRI Shape File
- 3. You have to be in the Planning and Analysis workspace to access the Data Connect palette.
  - a. True
  - b. False
- 4. In which workspace is the **Create Surface from GIS Data** command located?
  - a. Civil 3D
  - b. 2D Drafting and Annotation
  - c. 3D Modeling
  - d. Planning and Analysis
- 5. What toolspace do you need to be in to drape an image on a surface?
  - a. Civil 3D
  - b. 3D Modeling
  - c. Planning and Analysis
  - d. It does not matter because the *Surface* contextual tab displays when you select a surface no matter which workspace you are using.

# **Command Summary**

Button	Command	Location
$\bigcirc$	Assign	Workspace: Planning and Analysis
		<ul> <li>Ribbon: Map Setup tab&gt;Coordinate System panel</li> </ul>
		Command Prompt: MAPCSASSIGN
<b>∑</b> ₁	Create Surface	Workspace: Civil 3D
	from GIS Data	<ul> <li>Ribbon: Home tab&gt;Create Ground Data panel</li> </ul>
		Command Prompt: CreateSurfaceFromGISData
	Data Connect	Workspace: Planning and Analysis
		Ribbon: Home tab>Data panel
		Command Prompt: MAPCONNECT
	Drape Image	<ul> <li>Ribbon: Contextual Surface tab&gt; Surface Tools panel</li> </ul>
	Map Task Pane	Workspace: Civil 3D
		<ul> <li>Ribbon: Home tab&gt;Expanded Palettes panel</li> </ul>
		Command Prompt: MapWSpace