# AutoCAD Land Desktop Tutorial

Welcome to the AutoCAD Land Desktop tutorial.

This tutorial has 20 lessons about projects, points, labels, object tables, surfaces, volumes, and alignments.

You can work through these lessons sequentially, or you can do one lesson at a time. However, after you begin a lesson, you should complete the exercises in the order presented, as the first exercises provide you with the information you need for the later exercises in that lesson.

Every lesson, except for the first one, has a tutorial drawing and an accompanying dataset.

Click <u>Lesson 1</u> in the Contents tab to move to the next task.

#### New or updated lessons:

**Lesson11:** Creating Tag Labels and Object Tables - *Featuring the new Point Table and Table Object features* 

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# Tips for Using this Tutorial

- You will use the Land Desktop menus when working with all of these lessons. To display the Land Desktop menus, select Land from the Workspaces toolbar. If the Workspaces toolbar is not displayed, click Projects • Workspaces.
- You can close the Map Workspace (dockable window on the left of the AutoCAD screen) because it is not used in the tutorial.
- The tutorial window stays on top as you work with AutoCAD Land Desktop.
  If you do not want the tutorial window to stay on top, from the Help window's menu bar, select Options > Keep Help on Top > Not On Top.
- Working through these lessons will result in alteration of the Tutorial project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

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# **LESSON 1: Working with Projects**

One of the first requirements of working with AutoCAD Land Desktop is that your drafting and designing environment (your drawing file) must be linked to a project. A project is simply a storage area for a drawing's associated data, which can include points, surfaces, alignments, pipes, parcels, and survey observations.

Project data is not stored in the drawing, but in separate folders on your system.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

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# Creating a New Drawing and Project

In this exercise, you will start a new drawing and create a new project to store associated data.

- 1. On the File menu, click **New** to display the New Drawing: Project Based dialog box.
- 2. Enter **Lesson\_1** for the Name.
- 3. In the Project and Drawing Location section, verify that Project Path list displays \Land Projects <Version Number>\, and then click **Create Project** to display the Project Details dialog box.
- 4. In the Initial Settings for New Drawings section, from the Prototype list, select **Default (Meters).**
- 5. In the Project Information section, enter **Project\_1** for the Name.
- 6. Enter **Project for Exploring Land Desktop Startup** for the Description and **Training** for the Keywords.
- 7. In the Drawing Path for this Project section, verify that **Project "DWG" Folder** is selected.
- 8. Click **OK** to return to the New Drawing: Project Based dialog box.
- 9. In the Select Drawing Template section, click **Browse** and browse to the Template folder under the location of the Land Desktop <Version Number> installation (by default c:\Program Files\AutoCAD Land Desktop <Version Number>\Template), and from the Template list, select **aec\_m.dwt**.
- 10. In the Project and Drawing Location section, verify that the Project Name list displays Project\_1 and the Drawing Path list displays \Land Projects <\Version Number>\ Project\_1\dwg\.
- 11. Click **OK** to create the new drawing and project.

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On the File menu, click **New** to display the New Drawing: Project Based dialog box.

Enter **Lesson\_1** for the Name.

In the Project and Drawing Location section, verify that Project Path list displays \Land Projects <Version Number>\, and then click **Create Project** to display the Project Details dialog box.

In the Initial Settings for New Drawings section, from the Prototype list, select **Default (Meters).** 

In the Project Information section, enter **Project\_1** for the Name.

Enter **Project for Exploring Land Desktop Startup** for the Description and **Training** for the Keywords.

In the Drawing Path for this Project section, verify that **Project "DWG" Folder** is selected.

Click **OK** to return to the New Drawing: Project Based dialog box.

In the Select Drawing Template section, click **Browse** and browse to the Template folder under the location of the Land Desktop <Version Number> installation (by default c:\Program Files\AutoCAD Land Desktop <Version Number>\Template), and from the Template list, select **aec\_m.dwt**.

In the Project and Drawing Location section, verify that the Project Name list displays Project\_1 and the Drawing Path list displays \Land Projects <Version Number>\ Project\_1\dwg\.

Click **OK** to create the new drawing and project.

# Setting Up the New Drawing

In this exercise, you will specify the parameters for the new drawing.

- 1. As the Load Settings dialog box is displayed, verify that the Path is C:\Documents and Settings\All Users\Application Data\AutoCAD Land Desktop <Version Number>\<Release Number>\Data\setup\.
- 2. In the Load a Drawing Setup Profile section, from the Profile Name list, select **m500.set (Metric, 1:500)**, and then click **View** to display the View Drawing Setup Profile dialog box.

The coordinate zone, text style, and drawing border listed need to be changed for this drawing, so in the following steps you will make the appropriate edits to the drawing setup.

- 3. Click **OK** to return to the Load Settings dialog box, and then click **Load** to load the **m500** setup profile.
- 4. Click **Next** to display the Units dialog box and verify the units settings.
- 5. Click **Next** to display the Scale dialog box and verify the scale settings.

The horizontal drawing scale affects block insertion and the size of text that is automatically created. The vertical drawing scale controls only the default vertical exaggeration of profiles and cross sections created by the civil engineering tools.

- 6. Click **Next** to display the Zone dialog box.
- From the Categories list, select UTM, NAD 83 Datum, and then from the Available Coordinate Systems list select UTM with NAD 83 Datum, Zone 11, Meter; Central Meridian 117d W.
- 8. Click **Next** to display the Orientation dialog box and verify the orientation settings.
- 9. Click **Next** to display the Text Style dialog box, from the Style Set Name list, select **mleroy.stp**, and then click **Load** to load the mleroy text style.
- 10. From the Select Current Style list, select **L100**.
- 11. Click **Next** to display the Border dialog box.

- 12. In the Border Selection section, select **Scaled Block**, and then in the Custom Block section, click **Browse** to display the Select a Custom Block dialog box.
- 13. From the list select **pm\_841x594.dwg**, and then click **Open** to return to the Border dialog box.
- 14. Click **Next** to display the Save Settings dialog box.

If this is a drawing setup that you would like to use on a regular basis, enter a profile name and save the setup.

- 15. Click **Finish** to complete the drawing setup process.
- 16. As the Finish window is displayed, verify your final drawing settings, and then click **OK**.

Your drawing is now set up with the correct parameters.

## Setting Up the Point Database

In this exercise, you will specify the parameters for formatting the point database.

1. As the Create Point Database dialog box is displayed, verify that the Point Description Field Size is **32** characters.

There is an additional field in the point database for point names, which stores alphanumeric point numbers or unique point names that may be used interchangeably with point numbers in many point commands. The point number field for the point database is still the primary field by which points are sorted and grouped.

- 2. Select the **Use Point Names** check box, and then verify that the Point Name Field Size is **16** characters.
- 3. Click **OK** to continue.

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Select the **Use Point Names** check box, and then verify that the Point Name Field Size is **16** characters.

Click **OK** to continue.

# **Reviewing the Project Directory Structure**

In this exercise, you will look at the project directory structure with Windows Explorer.

- 1. Open Windows Explorer and navigate to the Land Projects folder.
- 2. Expand the **Land Projects 2007** folder to view the separate project folders.
- 3. Expand the **Project\_1** folder to view the separate folders that store different types of project data.

All point data is contained in the **cogo** folder, including Microsoftâ database (.mdb) files for point groups, description keys, and user-defined external data references.

The **dwg** folder contains the drawing files associated with the project and the .dfm files (which are ASCII text files that contain default drawing settings).

The **survey** folder is where raw files downloaded from data collectors are stored, as well as field book, observation database, and traverse adjustment files. This folder is empty until you use the surveying tools to populate the folder with these files.

Additional folders are automatically created when you use AutoCAD Land Desktop to work with surfaces (dtm), alignments (align), parcels (lots), and volumes (er).

Additional folders are automatically created when you use the civil engineering tools to work with pipes (pipewks), hydrology (hd), and sheet manager (cd).

This concludes the project creation lesson. In the next lesson, you'll learn about changing the project settings.

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# **LESSON 2: Changing Project Settings**

Copy projects to use project data with other drawings. Change drawing settings to specify new annotation, object creation, and calculation defaults.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

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lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

# Copying a Project and Re-associating the Current Drawing

A portion of the Lesson-2 tutorial drawing must be worked on as a separate project. Since some of the important data is not stored in the drawing but is stored in the project files, a copy of the project is required.

You can not copy an active, current project. To copy a project, start a new session of AutoCAD Land Desktop and, before starting a named drawing or associating it with a project, open the Project Management dialog box and use the Copy option.

- 1. From the Projects menu, click **Project Manager** to display the Project Management dialog box.
- 2. In the Project section, from the Name list, select **Tutorial1**, and then click **Copy** to display the Copy dialog box.
- 3. In the Copy Project To section, enter **TutorialC** for the Name.
- 4. Enter **Building site Northwest corner** for the Description, and then click **OK**.

The copied project has the same directory structure as the original project, with the same files populating each folder.

- 5. As an AutoCAD message dialog box is displayed, click **Yes** to change the project association and to return to the Project Management dialog box.
- 6. Click **Close** to close the Project Management dialog box.

Use the following steps to open the Lesson-2 tutorial drawing.

- 7. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.
- 8. From the Project Name list, select **TutorialC**, from the Select Project Drawing List, select **Lesson-2.dwg**, and then click **OK**.

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From the Projects menu, click **Project Manager** to display the Project Management dialog box.

In the Project section, from the Name list, select **Tutorial1**, and then click **Copy** to display the Copy dialog box.

In the Copy Project To section, enter **TutorialC** for the Name.

Enter **Building site - Northwest corner** for the Description, and then click **OK**.

The copied project has the same directory structure as the original project, with the same files populating each folder.

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Click **Close** to close the Project Management dialog box.

Use the following steps to open the Lesson-2 tutorial drawing.

On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

From the Project Name list, select **TutorialC**, from the Select Project Drawing List, select **Lesson-2.dwg**, and then click **OK**.

# **Changing Drawing Setup Parameters**

In this exercise, you will change the horizontal drawing scale and see how text height is affected. At the current horizontal scale of 1:500, the 2MM text style is 1 drawing unit high. The plot scale for a 1:500 scale drawing is 2 with plotting units in millimeters. This results in 2MM text style being plotted with a 2 mm height.

- 1. On the command line enter **ST** to display the Text Style dialog box.
- 2. From the Style Name list, select **2MM**, in the Font section, enter **1** for the Height, click **Apply**, and then click **Close** to continue.

Use the following steps to change the horizontal drawing scale to 1:1000.

- 3. On the Projects menu, click **Drawing Setup** to display the Drawing Setup dialog box.
- 4. Click the **Scale** tab, in the Drawing Scale section, from the Horizontal list, select **1:1000**, and then click **OK**.
- 5. On the command line, enter **ST** to display the Text Style dialog box.
- 6. Verify that the height of the 2MM text style is **2**, and then click **Cancel** to continue.

The plot scale for a 1:1000 scale drawing is 1 with plotting units in millimeters. Again, this results in 2MM text style being plotted with a 2 mm height. The appropriate scaling of text styles occurs with all text styles that you use when working with AutoCAD Land Desktop.

Use the following steps to change the precision of elevation values to 1.

- 7. On the Projects menu, click **Drawing Setup** to display the Drawing Setup dialog box.
- 8. Click the **Units** tab. In the Display Precision section, from the Elevation list, select **1**, and then in the Samples section verify the change to the sample elevation value.

This change affects all future elevation values in this drawing, including point marker elevation text.

Use the following steps to change the drawing base point and north rotation angle.

- 9. Click the **Orientation** tab. In the Base Point section, click **Pick**, and then use a Node Osnap to select point number **10** for the Base point.
- 10. As the Drawing Setup dialog box is displayed again, in the Northing and Easting section, enter **5000** for the Northing and **5000** for the Easting.
- 11. In the North Rotation section, enter **13.2450** for the Angle, and then click **OK**.

In AutoCAD Land Desktop, north rotation angles are represented in degrees, minutes, and seconds. The value, 13.2450, represents 13 degrees, 24 minutes, and 50 seconds, not a decimal degree value.

12. As an AutoCAD message dialog box is displayed, click **OK** to continue.

Use the following steps to insert a north arrow to show the north rotation.

- 13. On the Utilities menu, click **Symbol Manager** to display the Symbol Manager dialog box.
- 14. Verify that **COGO Symbols** is displayed in the Symbol Set list. From the Palette list select **Details**, select **North Arrow**, and then click **OK**.
- 15. Specify an insertion point for the north arrow, the press **ENTER** to accept the default, Magnetic, for the description.

<u>Click here</u> to see an illustration of the north arrow.

# Editing Drawing Settings

In this exercise, you will edit settings for the current drawing, and then save them to a prototype so these settings can be reused.

- 1. On the Projects menu, click **Edit Drawing Settings** to display the Edit Settings dialog box.
- 2. Verify that the Program list displays **AutoCAD Land Desktop**.
- 3. From the Settings list, select **Geodetic Labels**, and then click **Edit Settings** to display the Geodetic Annotation Settings dialog box.
- 4. In the Line Annotation section, in the Az column, clear the **Grid** and **Ground** check boxes.
- 5. In the Suffix column, enter **m** for the Grid, Ground, and Geodetic suffixes.
- 6. In the Distance Unit column, select **METERS** from the Grid, Ground, and Geodetic lists.
- 7. Click **OK** to return to the Edit Settings dialog box.

These settings only apply to the current drawing. Save these settings to a prototype so that future projects can use these settings.

- 8. In the Selected Item section, click **Save to Prototype** to display the Select Prototype dialog box.
- 9. From the Select Prototype list, select **DEFAULT (METERS)**, click **OK** to return to the Edit Settings dialog box, and then click **Close**.

You now have a prototype drawing setup that you can use for subsequent projects.

This concludes the project settings lesson. In the next lesson, you'll learn about point objects.

## liting Drawing Settings

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On the Projects menu, click **Edit Drawing Settings** to display the Edit Settings dialog box.

Verify that the Program list displays **AutoCAD Land Desktop**.

From the Settings list, select **Geodetic Labels**, and then click **Edit Settings** to display the Geodetic Annotation Settings dialog box.

In the Line Annotation section, in the Az column, clear the **Grid** and **Ground** check boxes.

In the Suffix column, enter **m** for the Grid, Ground, and Geodetic suffixes.

In the Distance Unit column, select **METERS** from the Grid, Ground, and Geodetic lists.

Click **OK** to return to the Edit Settings dialog box.

These settings only apply to the current drawing. Save these settings to a prototype so that future projects can use these settings.

In the Selected Item section, click **Save to Prototype** to display the Select Prototype dialog box.

From the Select Prototype list, select **DEFAULT (METERS)**, click **OK** to return to the Edit Settings dialog box, and then click **Close**.

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# **LESSON 3: Working with Point Objects**

Points objects represent existing or proposed points in Land Desktop. Their appearance in the drawing and their interaction with AutoCAD commands can be controlled by point settings.

Point objects have the following characteristics:

- Points can appear at their actual elevation or at a fixed elevation.
- Points are saved to an external database.
- Points have markers and text; both have styles that can be modified.
  Points can also be labeled using a label style.
- Markers and text can have either relative or absolute sizes controlling their appearance in the drawing.
- Point text can be separated from its associated point marker by grip editing, with a leader automatically generated to graphically link the marker and text.
- Point descriptions can be either raw (point database) or full (as specified by the description key).
- Point text appears on the same layer as the point marker, but the visibility of the text is controlled by individual settings.
- Point coordinate display in dialog boxes can be specified as Northing/Easting, Easting/Northing, x,y, or y,x.
- The AutoCAD UNDO command works with point objects.
- Point objects align with the World UCS.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead,

specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-3.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces**. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

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# Listing Point Objects

Two points are displayed in the drawing, 247 and 758. Use the AutoCAD LIST command to list information about the point number 247.

- 1. Enter **LIST**, and then select point number 247 and press **ENTER**.
- 2. Close the text window.

The point is an AECC\_POINT object. The point object appears in the drawing at its actual elevation. The point coordinates, description, point number, and point name are stored in the point database.

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Close the text window.

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## Inserting Points from the Point Database

You can erase points from the drawing, but they still exist in the points database. Erase point number 247 and 758, and then reinsert them.

- 1. On the command line, enter **ERASE**, select the two points, and then press **ENTER**.
- 2. On the Points menu, click **Point Utilities Joom to Extents**.

The Zoom to Extents command zooms to the extents of the minimum and maximum coordinates of the points in the database, not the extents of all of the entities in the drawing.

3. On the Points menu, click **Point Utilities** • **Quick View**.

Xs appear at all point locations, including the erased ones.

<u>Click here</u> to see an illustration of the quick view point locations.

Use the following steps to list all of the points in the database.

- 4. On the Points menu, click **List Points** to display the List Points dialog box.
- 5. Select the **List All Points** option.
- 6. Scroll down the list to view points 247 and 758.

Point number 247 is listed as 247L, which means it is locked. Locked points cannot be edited until they are unlocked.

- 7. Click **OK** to continue.
- 8. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **1**, click **Set Current**, and then click **OK**.

Use the following step to retrieve the two erased points from the points database and reinsert them in the drawing.

9. On the Points menu, click **Insert Points to Drawing**, enter **W** for the Window option, and then window in the area of the two missing points. (The two points are located in the right half of the screen in the current view.)

The two points now reappear in the drawing.

<u>Click here</u> to see an illustration of the reinserted points.

# **Changing Point Elevations**

In this exercise, you will change the actual elevation to a fixed elevation for inserted points.

- 1. On the Points menu, click **Point Settings** to display the Point Settings dialog box.
- 2. Click the Insert tab. In the Insertion Elevation section, select **Fixed elevation**, verify that the Fixed elevation is 0 (zero) m.
- 3. Click the Text tab. Select the **Automatic Leaders** check box and then click **OK**.

Use the following step to list information about the existing point elevation.

4. Enter LIST, and then select point number 758 and press ENTER.

The Marker Location still lists the elevation as 245.51 m. The point setting just made does not alter existing points in the drawing. You must reinsert or edit the point to implement the elevation change.

5. Close the text window.

Use the following steps to reinsert the points in this area back into the drawing.

- 6. On the Points menu, click **Insert Points to Drawing**, and then press **ENTER** to accept the default, Window, and window in the two points.
- 7. As the Point in Drawing dialog box is displayed, click **Replace All**.
- 8. Enter **LIST**, and then select point number 758 and press **ENTER**.

The Marker Location lists the elevation as 0 m.

9. Close the text window.

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Click the Text tab. Select the **Automatic Leaders** check box and then click **OK**.

Use the following step to list information about the existing point elevation.

Enter **LIST**, and then select point number 758 and press **ENTER**.

The Marker Location still lists the elevation as 245.51 m. The point setting just made does not alter existing points in the drawing. You must reinsert or edit the point to implement the elevation change.

Close the text window.

Use the following steps to reinsert the points in this area back into the drawing.

On the Points menu, click **Insert Points to Drawing**, and then press **ENTER** to accept the default, Window, and window in the two points.

As the Point in Drawing dialog box is displayed, click **Replace All**.

Enter LIST, and then select point number 758 and press ENTER.

The Marker Location lists the elevation as 0 m.

Close the text window.

# **Changing Point Display Properties**

In this exercise, you will look at some of the point display properties.

- 1. Select point number 758, right-click and click **Display Properties** to display the Point Display Properties dialog box.
- 2. Click the Reset tab. In the Point Elevation section, select the **Reset Point Elevation in Drawing** check box, select **Actual Elevation**, and then click **OK**.
- 3. Enter **LIST**, and then select both points and press **ENTER**.

For point number 758, observe that the Marker Location lists the elevation as 245.51 m. For point number 247, the Marker Location lists the elevation as 0 m. Changes made in the Display Properties dialog box take immediate effect, without having to reinsert the points in the drawing.

4. Close the text window.

## nanging Point Display Properties

exercise, you will look at some of the point display properties.

Select point number 758, right-click and click **Display Properties** to display the Point Display Properties dialog box.

Click the Reset tab. In the Point Elevation section, select the **Reset Point Elevation in Drawing** check box, select **Actual Elevation**, and then click **OK**.

Enter LIST, and then select both points and press ENTER.

For point number 758, observe that the Marker Location lists the elevation as 245.51 m. For point number 247, the Marker Location lists the elevation as 0 m. Changes made in the Display Properties dialog box take immediate effect, without having to reinsert the points in the drawing.

Close the text window.

## **Changing Point Markers and Text**

You can use either custom markers or AutoCAD points to designate point nodes. If you choose to use AutoCAD points as markers, the marker style can be adjusted with the DDPTYPE command.

In this exercise, you will select a new custom marker and superimposed symbol, and then size the marker in absolute units.

- 1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **3**, click **Set Current**, and then click **OK**.
- 2. Select point number 758, right-click and click **Display Properties** to display the Point Display Properties dialog box.
- 3. On the Marker tab, in the Custom Marker Symbol section, select the fourth marker symbol, and then in the Superimposed section, select the circle symbol.
- 4. In the Custom Marker Size section, select **Size in Absolute Units**, and then enter **2** for the Size.

You can change the visibility and color of number, elevation, and description text.

Use the following steps to turn off the visibility of the elevation text, change the color of the description text, and size the text in absolute units.

- 5. Click the Text tab, and then in the Color and Visibility section, clear the **(Elevation) Visible** check box.
- 6. Click the Description color box to display the Select a Color dialog box. From the Standard Colors palette select **cyan** (light blue), and then click **OK** to return to the Point Display Properties dialog box.
- 7. In the Style and Size section, select **Absolute Units**, enter **2** for the Text Size, and then click **OK**.

For point number 758, the point marker and text now appear smaller, and the number and description text strings are centered on the marker. The appearance of point 247 remains unchanged since its text size is still relative to the view area of the screen.

<u>Click here</u> to see an illustration of the new point 758 display parameters.

As you zoom in and out of the drawing, points with markers and text sized relative to the view area of the screen are resized each time that the points are regenerated.

- 8. On the Points menu, click **Point Settings** to display the Point Settings dialog box.
- 9. Click the Preferences tab. In the Point Display section, clear the **Always Regenerate Point Display After Zoom** check box, and then click **OK**.
- 10. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **1**, click **Set Current**, and then click **OK**.
- 11. On the command line enter **REGEN** to regenerate the drawing.

Point number 247 is resized proportionally, while point number 758 maintains its absolute size. If all of the points in the drawing have their markers and text set to absolute size, it is recommended that you turn off the Always Regenerate Point Display After Zoom check box to improve display performance.

Use the following steps to reposition point text relative to the point marker.

- 12. Select point number 247 to display its grips.
- 13. Select the grip and drag down to the right, and then click to fix the point text in its new position.

A leader is automatically drawn between the text and marker.

<u>Click here</u> to see an illustration of the point leader.

# Controlling Point Display by Layer

In this exercise, you will change the point layer, and then turn that layer off so the point is not visible in the drawing.

- 1. Select point number 247, right-click and click **Edit Object Display** to display the Object Display dialog box.
- 2. Click **Layer** to display the Select Layer dialog box.
- 3. From the Layer list, select **TEXTM**, click **OK** to return to the Object Display dialog box, and then click **OK**.
- 4. Click the Layers icon in the toolbar to display the Layer Properties Manager. Turn off the display of the **TEXTM** layer, and click **OK** to close the Layer Properties Manager.

The point is no longer displayed in the drawing.

This concludes the point object lesson. In the next lesson, you'll learn about creating points.

## ontrolling Point Display by Layer

exercise, you will change the point layer, and then turn that layer off so int is not visible in the drawing.

Select point number 247, right-click and click **Edit Object Display** to display the Object Display dialog box.

Click **Layer** to display the Select Layer dialog box.

From the Layer list, select **TEXTM**, click **OK** to return to the Object Display dialog box, and then click **OK**.

Click the Layers icon in the toolbar to display the Layer Properties Manager. Turn off the display of the **TEXTM** layer, and click **OK** to close the Layer Properties Manager.

The point is no longer displayed in the drawing.

s concludes the point object lesson. In the next lesson, you'll learn about g points.

## **LESSON 4: Creating Points**

Create points manually by northing and easting coordinates, along an alignment, or based on surface features. Use commands to edit and lock points, and check for discrepancies between points in the drawing and the points database.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-4**.dwg, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects </Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

#### **ESSON 4: Creating Points**

points manually by northing and easting coordinates, along an alignment, ed on surface features. Use commands to edit and lock points, and check crepancies between points in the drawing and the points database.

#### rk through this lesson follow these steps

Start AutoCAD Land Desktop if you have not already done so.

On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-4**.dwg, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

ng through these lessons will result in alteration of the project files. p copies of these project files can be found in the c:\Program AutoCAD Land Desktop <Version Number>\Landtut folder.

lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

## **Creating Points Manually**

In this exercise, you will change the point settings by specifying a new starting point number and manual elevations.

- 1. On the View menu, click **Named Views** to display the View dialog box, under Name, select **1**, click **Set Current**, and then click **OK**.
- 2. On the Points menu, click **Point Settings** to display the Point Settings dialog box.
- 3. On the Create tab, in the Numbering section, enter **10** for the Current number.
- 4. In the Elevations section, select **Manual**, and then click **OK**.

Use the following steps to place a point at the lower- right building corner at an elevation of 249 m.

- 5. On the Points menu, click **Create Points Manual**.
- 6. Use an Endpoint Osnap to select the lower-right building corner.
- 7. Enter **249** m for the Elevation, and then press ENTER to end the command.

Use the following steps to change the point settings so you can specify point descriptions manually.

- 8. On the Points menu, click **Point Settings** to display the Point Settings dialog box.
- 9. In the Descriptions section, select **Manual**, and then click **OK**.

Use the following steps to place a point at the upper-right building corner at an elevation of 249 m and with a description of BLDG.

- 10. On the Points menu, click **Create Points Manual**.
- 11. Use an Endpoint Osnap to select the upper-right building corner.
- 12. Enter **BLDG** for the Description, accept the default, **249** m, for the Elevation, and then press ENTER.

<u>Click here</u> to see an illustration of the first and second points.

# Specifying Automatic Elevations and Descriptions

In this exercise, you will continue placing points with automatic elevations and descriptions.

- 1. On the Points menu, click **Point Settings** to display the Point Settings dialog box.
- 2. On the Create tab, in the Elevations section, select **Automatic**.
- 3. In the Descriptions section, select Automatic, and then click OK.

Use the following steps to place a point at the upper-left building corner at an elevation of 249 m and with a description of BLDG.

- 4. On the Points menu, click **Create Points Manual**.
- 5. Use an Endpoint Osnap to select the upper-left building corner, and then press ENTER.

The point is placed at an elevation of 249 m and with a description of BLDG automatically.

<u>Click here</u> to see an illustration of the third point.

#### becifying Automatic Elevations and Descriptions

exercise, you will continue placing points with automatic elevations and ptions.

On the Points menu, click **Point Settings** to display the Point Settings dialog box.

On the Create tab, in the Elevations section, select **Automatic**.

In the Descriptions section, select **Automatic**, and then click **OK**.

Use the following steps to place a point at the upper-left building corner at an elevation of 249 m and with a description of BLDG.

On the Points menu, click **Create Points** • **Manual**.

Use an Endpoint Osnap to select the upper-left building corner, and then press ENTER.

int is placed at an elevation of 249 m and with a description of BLDG atically.

<u>nere</u> to see an illustration of the third point.

#### Creating Points in the Points Database

In this exercise, you will change the Point Settings so points are no longer inserted into the drawing, and then create another point.

- 1. On the Points menu, click **Point Settings** to display the Point Settings dialog box.
- 2. On the Create tab, in the Numbering section, clear the **Insert to Drawing as Created** check box, and then click **OK**.

Use the following steps to place a point at the next building corner.

- 3. On the Points menu, click **Create Points Manual**.
- 4. Use an Endpoint Osnap to select the next building corner, and then press ENTER.

The new point does not appear in the drawing. Use the following steps to restore the setting so subsequent points are inserted into the drawing, and insert the point you just created into the drawing.

- 5. On the Points menu, click **Point Settings** to display the Point Settings dialog box.
- 6. On the Create tab, in the Numbering section, select the **Insert to Drawing as Created** check box, and then click **OK**.
- 7. On the Points menu, click **Insert Points to Drawing**, enter **N** for the Numbers option, and then enter **13** for the Point number.

Point number 13 now appears in the drawing.

<u>Click here</u> to see an illustration of the fourth point.

#### eating Points in the Points Database

exercise, you will change the Point Settings so points are no longer d into the drawing, and then create another point.

On the Points menu, click **Point Settings** to display the Point Settings dialog box.

On the Create tab, in the Numbering section, clear the **Insert to Drawing as Created** check box, and then click **OK**.

Use the following steps to place a point at the next building corner.

On the Points menu, click **Create Points** • **Manual**.

Use an Endpoint Osnap to select the next building corner, and then press ENTER.

The new point does not appear in the drawing. Use the following steps to restore the setting so subsequent points are inserted into the drawing, and insert the point you just created into the drawing.

On the Points menu, click **Point Settings** to display the Point Settings dialog box.

On the Create tab, in the Numbering section, select the **Insert to Drawing as Created** check box, and then click **OK**.

On the Points menu, click **Insert Points to Drawing**, enter **N** for the Numbers option, and then enter **13** for the Point number.

number 13 now appears in the drawing.

<u>nere</u> to see an illustration of the fourth point.

# Placing Points on an Object

In this exercise, you will place points at the remaining two building corners.

- 1. On the Points menu, click **Create Points Automatic**.
- 2. Select the short vertical building line segment on the bottom of the building, and then press **ENTER**.

Two points are set at the endpoints of the selected line segment.

<u>Click here</u> to see an illustration of the fifth and sixth points.

## acing Points on an Object

exercise, you will place points at the remaining two building corners.

On the Points menu, click **Create Points** • Automatic.

Select the short vertical building line segment on the bottom of the building, and then press **ENTER**.

pints are set at the endpoints of the selected line segment.

<u>nere</u> to see an illustration of the fifth and sixth points.

# Placing Points Along an Alignment

In this exercise, you will place points along an alignment between specified stations at an offset. First, change the view and set the current alignment.

- 1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.
- 2. On the Alignments menu, click **Set Current Alignment**, and then press **ENTER** to display the Alignment Librarian dialog box.
- 3. From the Selection list, select **P3\_HWY69**, and then click **OK**.
- 4. On the Points menu, click **Create Points Alignments Measure Alignment**.
- 5. Enter **15500** for the Beginning station, and then enter **16000** for the Ending station.
- 6. Enter **15** m for the Offset, enter **50** m for the Station interval, and then enter **25** for the Current point number.

Eleven points are set along the alignment.

<u>Click here</u> to see an illustration of the points set along the alignment.

#### acing Points Along an Alignment

exercise, you will place points along an alignment between specified s at an offset. First, change the view and set the current alignment.

On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.

On the Alignments menu, click **Set Current Alignment**, and then press **ENTER** to display the Alignment Librarian dialog box.

From the Selection list, select **P3\_HWY69**, and then click **OK**.

On the Points menu, click **Create Points - Alignments - Measure Alignment**.

Enter **15500** for the Beginning station, and then enter **16000** for the Ending station.

Enter **15** m for the Offset, enter **50** m for the Station interval, and then enter **25** for the Current point number.

points are set along the alignment.

<u>nere</u> to see an illustration of the points set along the alignment.

## Placing Points on a Surface

In this exercise, you will place points on the existing ground surface in a grid pattern.

1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **3**, click **Set Current**, and then click **OK**.

Use the following steps to set EG as the current surface.

- 2. On the Terrain menu, click **Set Current Surface** to display the Select Surface dialog box.
- 3. From the Select surface to open list, select **EG**, and then click **OK**.
- 4. On the Points menu, click **Create Points Surface On Grid**.
- 5. Press **ENTER** to accept the default, 0 (zero) degrees, for the Grid rotation angle.
- 6. Use an Intersection Osnap to select the lower-left corner of the grid rectangle.
- 7. Enter **50** m for the Grid X Spacing, and then press **ENTER** to accept the default, 50 m, for the Grid Y spacing.
- 8. Use an Intersection Osnap to select the upper-right corner of the grid rectangle.
- 9. Press **ENTER** to accept the default, No, to accept the size or rotation of the grid/grid squares.

Points are set at specified grid nodes with elevations extracted from the current surface.

<u>Click here</u> to see an illustration of the points set on the surface.

This concludes the point creation lesson. In the next lesson, you'll learn about editing points.

## **LESSON 5: Editing Points**

Use the point editing commands to modify existing point numbers, coordinates, and descriptions.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-5.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

## **ESSON 5: Editing Points**

e point editing commands to modify existing point numbers, coordinates, scriptions.

#### rk through this lesson follow these steps

Start AutoCAD Land Desktop if you have not already done so.

On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-5.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

ng through these lessons will result in alteration of the project files. p copies of these project files can be found in the c:\Program AutoCAD Land Desktop <Version Number>\Landtut folder.

lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

# Selecting Points to Edit

In this exercise, you will specify points to edit by selecting them in the drawing.

- 1. On the View menu, click **Named Views** to display the View dialog box, under Name, select **1**, click **Set Current**, and then click **OK**.
- 2. On the Points menu, click **Edit Points Edit Points** to display the Edit Points dialog box.
- 3. Select the **Enable Filtering** option.
- 4. Click the **Include** tab.
- 5. Select the **With Number Matching** check box, and then click the **Selection Set in Drawing** button.
- 6. Enter **W** for the Window option and window in points 247, 248, and 758, and then press **ENTER**.
- 7. As the Edit Points dialog box is displayed again, verify that the three points now appear in the With Number Matching box.
- 8. Click the **Build List** button to build the list of points to edit.
- 9. Click the Edit tab.

Point number 247 is locked and cannot be edited, but the other two points are unlocked and can be edited. Before you edit the points, you'll exit the Edit Points dialog box and unlock point 247.

10. Click **OK** to continue.

#### electing Points to Edit

exercise, you will specify points to edit by selecting them in the drawing.

On the View menu, click **Named Views** to display the View dialog box, under Name, select **1**, click **Set Current**, and then click **OK**.

On the Points menu, click **Edit Points** • **Edit Points** to display the Edit Points dialog box.

Select the **Enable Filtering** option.

Click the **Include** tab.

Select the **With Number Matching** check box, and then click the **Selection Set in Drawing** button.

Enter **W** for the Window option and window in points 247, 248, and 758, and then press **ENTER**.

As the Edit Points dialog box is displayed again, verify that the three points now appear in the With Number Matching box.

Click the **Build List** button to build the list of points to edit.

Click the Edit tab.

Point number 247 is locked and cannot be edited, but the other two points are unlocked and can be edited. Before you edit the points, you'll exit the Edit Points dialog box and unlock point 247.

Click **OK** to continue.

# **Unlocking Points**

In this exercise, you will unlock point number 247 and then change its description and easting value.

- 1. On the Points menu, click Lock/Unlock Points Unlock Points.
- 2. Enter **S** for the Selection option, select point number 247, and then press **ENTER**.

Point number 247 is now unlocked. You can now edit the description and easting value.

3. On the Points menu, click **Edit Points** • **Edit Points** to display Edit Points dialog box.

The previous list of points is automatically displayed. Change the description and easting value for point 247.

- 4. On the **Edit** tab, click on the point number 247 line in the Raw Desc column and enter **MON**.
- 5. Click on the point number 247 line in the Easting column and enter **274101.6448**.
- 6. Click **OK** to continue.

Point number 247 now has a new description and is located 20 m to the left.

<u>Click here</u> to see an illustration of moved point number 247.

# nlocking Points

exercise, you will unlock point number 247 and then change its ption and easting value.

On the Points menu, click Lock/Unlock Points • Unlock Points.

Enter **S** for the Selection option, select point number 247, and then press **ENTER**.

Point number 247 is now unlocked. You can now edit the description and easting value.

On the Points menu, click **Edit Points** • **Edit Points** to display Edit Points dialog box.

The previous list of points is automatically displayed. Change the description and easting value for point 247.

On the **Edit** tab, click on the point number 247 line in the Raw Desc column and enter **MON**.

Click on the point number 247 line in the Easting column and enter **274101.6448**.

Click **OK** to continue.

number 247 now has a new description and is located 20 m to the left.

<u>here</u> to see an illustration of moved point number 247.

## **Editing Point Datum**

In this exercise, you will change the elevation of points in elevation range from 100 m to 200 m, and then move all of the points in the selection set up 100 m.

- 1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.
- 2. On the Points menu, click **Edit Points Datum**.
- 3. Enter **100** for the Change in elevation.
- 4. Enter **D** for the Dialog option to display the Points dialog box.
- 5. Verify that the **Enable Filtering** option is selected.
- 6. Click the **Reset** button near the bottom-left of the dialog box to clear the previous selection.
- 7. Click the **Point Groups** tab.
- 8. From the list of point groups, select **DAY2**, and then click the **Build List** button at the top of the dialog box.

You want to use only the points in the DAY2 point group that are between 100 and 200 meters. In the next steps, use the Exclude tab to exclude all other points outside of this elevation range.

9. Click the **Exclude** tab, select the **With Elevation Matching** check box, and then type **<100,>200**.

This syntax excludes points below 100 meters and above 200 meters.

- 10. Click **Build List** to exclude the points from the list.
- 11. Click **OK** to continue.

All of the points in the specified elevation range have now been moved up 100 m.

## Editing Points with AutoCAD Commands

You cannot use AutoCAD commands to edit points, with the exception of MOVE, ROTATE, and ALIGN. These AutoCAD commands only work if you enable their use in the Point Settings dialog box.

In this exercise, you will move an alignment and alignment points using the MOVE command. First enable the use of this command in the Point Settings dialog box.

- 1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **3**, click **Set Current**, and then click **OK**.
- 2. On the Points menu, click **Point Settings** to display Point Settings dialog box.
- 3. Click the Update tab, and in the AutoCAD MOVE command section, select the **Allow Points to be MOVE'd in Drawing** and **Update Point Database After MOVE Command** check boxes, and then click **OK**.

Use the following steps to move the alignment and associated points. The other layers in the drawing are locked, making it easy to use a window selection set.

- 4. On the command line, enter **MOVE**, use a window selection set to select the rust-colored alignment and alignment points, and then press **ENTER**.
- 5. Use a Node Osnap to select point 101 for the Base point, and then use a Node Osnap to select point 102 for the Second point of displacement.
- 6. As an AutoCAD message dialog box is displayed, click **Yes** to update the points in the project.

The alignment and points are moved, with the new position of each relocated point updated in the point database.

<u>Click here</u> to see an illustration of the moved alignment and alignment points.

#### liting Points with AutoCAD Commands

Innot use AutoCAD commands to edit points, with the exception of E, ROTATE, and ALIGN. These AutoCAD commands only work if you their use in the Point Settings dialog box.

exercise, you will move an alignment and alignment points using the E command. First enable the use of this command in the Point Settings box.

On the View menu, click **Named Views** to display the View dialog box. Under Name, select **3**, click **Set Current**, and then click **OK**.

On the Points menu, click **Point Settings** to display Point Settings dialog box.

Click the Update tab, and in the AutoCAD MOVE command section, select the **Allow Points to be MOVE'd in Drawing** and **Update Point Database After MOVE Command** check boxes, and then click **OK**.

Use the following steps to move the alignment and associated points. The other layers in the drawing are locked, making it easy to use a window selection set.

On the command line, enter **MOVE**, use a window selection set to select the rust-colored alignment and alignment points, and then press **ENTER**.

Use a Node Osnap to select point 101 for the Base point, and then use a Node Osnap to select point 102 for the Second point of displacement.

As an AutoCAD message dialog box is displayed, click **Yes** to update the points in the project.

ignment and points are moved, with the new position of each relocated updated in the point database.

<u>nere</u> to see an illustration of the moved alignment and alignment points.

# Using Check Points

In this exercise, you will use the AutoCAD UNDO command to move the alignment and points back to their original position. However, this will not update the point database, so use the Check Points command to resolve the discrepancy between the position of the points in the drawing and the point database.

- 1. On the command line, enter **UNDO**, press **ENTER**, and then press **ENTER** again to restore the alignment and points to their original position.
- 2. On the Points menu, click **Check Points Modify Project** to display the Modify Project Database Points from Drawing dialog box.
- 3. In the Scan Drawing for section, verify that **COGO Point Objects** is selected.
- 4. In the Modify Project Database section, verify that the **Change points in project database** check box is selected, and then click **OK**.

Point update information is displayed on the command line.

This concludes the point editing lesson. In the next lesson, you'll learn about point groups.

exercise, you will use the AutoCAD UNDO command to move the ent and points back to their original position. However, this will not the point database, so use the Check Points command to resolve the bancy between the position of the points in the drawing and the point se.

On the command line, enter **UNDO**, press **ENTER**, and then press **ENTER** again to restore the alignment and points to their original position.

On the Points menu, click **Check Points** • **Modify Project** to display the Modify Project Database Points from Drawing dialog box.

In the Scan Drawing for section, verify that **COGO Point Objects** is selected.

In the Modify Project Database section, verify that the **Change points in project database** check box is selected, and then click **OK**.

plate information is displayed on the command line.

s concludes the point editing lesson. In the next lesson, you'll learn about groups.

# **LESSON 6: Working with Point Groups**

Use the Point Group Manager to create point groups for use in building surfaces or other specific tasks.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-6.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

## **ESSON 6: Working with Point Groups**

e Point Group Manager to create point groups for use in building surfaces er specific tasks.

#### rk through this lesson follow these steps

Start AutoCAD Land Desktop if you have not already done so.

On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-6.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

ng through these lessons will result in alteration of the project files. p copies of these project files can be found in the c:\Program AutoCAD Land Desktop <Version Number>\Landtut folder.

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# Creating a Point Group

In this exercise, you will create a group of points to be used in building a surface that includes points from the day-two survey, but excludes points such as benchmarks and temporary turning points.

1. On the Points menu, click **Point Management** • **Point Group Manager** to display the Point Group Manager dialog box.

Some existing point groups are displayed in the left-hand pane of the Point Group Manager dialog box.

You will now create a new point group by copying an existing point group and then excluding selected points.

- 2. Right-click the point group named DAY2 and select **Copy Point Group** to display the Create Point Group dialog box.
- 3. Enter **DAY2-DTM** for the Group Name and then click the **Exclude** tab.
- 4. Select the **With Raw Desc Matching** check box.
- 5. Enter **92,93,94,95,96** for the Description.
- 6. Click **Apply** to exclude the specified points from the point group.

The Point List is updated to reflect the excluded points.

7. Click **OK** to return to the Point Group Manager dialog box.

The new point group is displayed with the existing point groups and the point list information is displayed in the right pane of the Point Group Manager dialog box.

#### ceating a Point Group

exercise, you will create a group of points to be used in building a surface cludes points from the day-two survey, but excludes points such as narks and temporary turning points.

On the Points menu, click **Point Management** • **Point Group Manager** to display the Point Group Manager dialog box.

Some existing point groups are displayed in the left-hand pane of the Point Group Manager dialog box.

You will now create a new point group by copying an existing point group and then excluding selected points.

Right-click the point group named DAY2 and select **Copy Point Group** to display the Create Point Group dialog box.

Enter **DAY2-DTM** for the Group Name and then click the **Exclude** tab.

Select the **With Raw Desc Matching** check box.

Enter **92,93,94,95,96** for the Description.

Click **Apply** to exclude the specified points from the point group.

The Point List is updated to reflect the excluded points.

Click **OK** to return to the Point Group Manager dialog box.

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# Creating a Point Group Using the Raw Desc Matching Tab

The Create Point Group dialog box has a Raw Desc Matching tab which you can use to quickly select points by their raw descriptions. The list on the Raw Desc Matching tab is based on the defined description key codes in the project.

**Note** Be sure to check the point list that is created when you select options on the Raw Desc Matching tab, especially when selecting raw descriptions that contain wildcards.

In this exercise, you will create a point group of borehole points which use the raw description "12."

- 1. From the Point Group Manager, click the **Create Point Group** icon (the left-most icon) to display the Create Point Group dialog box.
- 2. In the Group Name box, type **Borehole**.
- 3. On the **Raw Desc Matching** tab, select the "12" check box.
- 4. Click **Apply** to update the Point List.
- 5. Click **OK** to return to the Point Group Manager.

Now you will lock the Borehole point group to prevent it from being edited.

6. Right-click the Borehole point group and select **Lock Point Group Properties**.

A lock icon is added to the point group to indicate that it is locked.

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From the Point Group Manager, click the **Create Point Group** icon (the left-most icon) to display the Create Point Group dialog box.

In the Group Name box, type **Borehole**.

On the **Raw Desc Matching** tab, select the "12" check box.

Click **Apply** to update the Point List.

Click **OK** to return to the Point Group Manager.

Now you will lock the Borehole point group to prevent it from being edited.

Right-click the Borehole point group and select **Lock Point Group Properties**.

icon is added to the point group to indicate that it is locked.

# Applying Overrides to Point Groups

In this exercise, you will apply overrides to an existing point group to specify uniform descriptions for all of the points.

- 1. Right-click the **Control** point group and click **Properties** to display the Point Group Properties dialog box.
- 2. Click the **Overrides** tab.
- 3. Select the **Description** check box, and then click in the field to the right of the Description check box.
- 4. Enter **Control Point** for the Description override.
- 5. Click **OK** to return to the Point Group Manager dialog box.

Control Point is now the description for all of the points in the current point group.

- 6. Exit the Point Group Manager dialog box.
- 7. On the View menu, click **Named Views** to display the View dialog box.
- 8. Under Name, select **2**, click **Set Current**, and then click **OK**.

Now you will insert the points from the Control point group in the drawing.

- 9. On the Points menu, click **Point Settings** to display the Point Settings dialog box.
- 10. Click the Insert tab. In the Point Labeling Section, clear the **Use the Current Point Label Style When Inserting Points** check box, and then click **OK** to continue.
- 11. On the Points menu, click **Insert Points to Drawing**. Enter **G** for the Group option.
- 12. From the Selection list, select **Control**, and then click **OK**.
- 13. As the Point in Drawing dialog box is displayed, click **Replace ALL**.

The points now have the description Control Point assigned as the override to

the point group.

<u>Click here</u> to see an illustration of the points with the Control Point override.

Points inserted in the drawing from other point groups would not display this override description.

# **Updating Point Groups**

In this exercise, you will delete a point that is referenced in several point groups. Then you will use the Show Changes to All Point Groups feature to check the point groups for changes and update the point groups to remove the deleted point.

- 1. On the Points menu, click **Point Settings**, then click the **Preferences** tab.
- 2. Under **Point Group Manager**, verify that the **Check Status on Startup** check box is selected.

This setting detects and reports changes to point groups if the project point database is altered.

- 3. Click OK.
- 4. On the Points menu, click Edit Points Erase.
- 5. Type **N** to select the Numbers option.
- 6. Type **1020** and press **ENTER** to erase point number 1020.
- 7. On the Points menu, click **Point Management Point Group Manager**.

Notice that three of the four point groups, Borehole, Day2, and Day2-DTM are now marked with different icons to indicate that they are outof-date. In this case, the point groups are considered to be out-of-date because their point lists reference a point that no longer exists in the project.

8. Click the **Show Changes to All Point Groups** icon (the third icon from the left).

The Point Group Manager checks for changes to the point groups and then displays the Changed Point Groups dialog box.

The Add/Remove column indicates what type of action is required in order to update the point group. In this case, the column contains "Remove" because the point 1020 no longer exists in the project and should be removed from the point groups.

9. Click the **Update Point Group(s)** icon.

The point groups are updated and the Point Group Manager is redisplayed.

Notice that the Day2 and Day2-DTM point groups no longer have the out-of-date icon associated with them, but the Borehole group still does. This is because you locked the Borehole group so it cannot be updated.

Use the following steps to unlock the Borehole point group and update it.

10. Right-click the Borehole group and click **Unlock Point Group Properties**.

The lock symbol is removed from the Borehole point group.

- 11. Right-click the Borehole group again and click **Update**.
- 12. Close the Point Group Manager.

This concludes the point group lesson. In the next lesson, you'll learn about description keys.

# **LESSON 7: Organizing Points by Descriptions**

Use description keys to translate raw descriptions stored in the point database to a full description, to associate symbols with points, and to control point and symbol layers.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-7.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

#### **ESSON 7: Organizing Points by Descriptions**

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On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-7.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

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lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

# Creating a Description Key File

In this exercise, you will create a description key file. First, verify the symbol path for blocks to be inserted with points as specified by description keys.

- 1. On the Points menu, click **Point Settings** to display the Point Settings dialog box.
- 2. Click the Insert tab, in the Search Path for Symbol Block Drawing Files section, click **Browse** to display the Browse for Folder dialog box.
- 3. From the Select a Path list, select C:\Documents and Settings\All Users\Application Data\Autodesk\AutoCAD Land Desktop <Version Number>\<Release Number>\Data\Symbol Manager\Cogo\_metric, and then click OK to return to the Point Settings dialog box.
- 4. In the Point Labeling section, verify that the **Use the Current Point Label Style When Inserting Points** check box is selected.
- 5. Click the Description Keys tab. In the Matching Options section, verify that the **Match on Description Parameters (\$1, \$2, etc.)** check box is selected, and then click **OK**.
- 6. On the Points menu, click **Point Management Description Key Manager** to display the Description Key Manager dialog box.
- 7. Click the **Create DescKey File** icon (the left-most icon) to display the Create Description Key File dialog box.
- 8. Enter **CREW-B** for the File name, and then click **OK** to return to the Description Key Manager dialog box.

### eating a Description Key File

exercise, you will create a description key file. First, verify the symbol or blocks to be inserted with points as specified by description keys.

On the Points menu, click **Point Settings** to display the Point Settings dialog box.

Click the Insert tab, in the Search Path for Symbol Block Drawing Files section, click **Browse** to display the Browse for Folder dialog box.

From the Select a Path list, select **C:\Documents and Settings\All Users\Application Data\Autodesk\AutoCAD Land Desktop <Version Number>\<Release Number>\Data\Symbol Manager\Cogo\_metric**, and then click **OK** to return to the Point Settings dialog box.

In the Point Labeling section, verify that the **Use the Current Point Label Style When Inserting Points** check box is selected.

Click the Description Keys tab. In the Matching Options section, verify that the **Match on Description Parameters (\$1, \$2, etc.)** check box is selected, and then click **OK**.

On the Points menu, click **Point Management** • **Description Key Manager** to display the Description Key Manager dialog box.

Click the **Create DescKey File** icon (the left-most icon) to display the Create Description Key File dialog box.

Enter **CREW-B** for the File name, and then click **OK** to return to the Description Key Manager dialog box.

# **Creating Description Keys**

In this exercise, you will create description keys for observations of edges of pavement, iron bars, and trees for the new description key file. Note that description keys codes are case-sensitive; a "TREE" description key is different from a "Tree" description key.

First, create an edge of pavement description key.

- 1. Select **CREW-B**, and then click the **Create DescKey** icon (the second icon from the left) to display the Create Description Key dialog box.
- 2. Enter **EP** for the DescKey Code, and then on the General tab, enter **EP** for the Description Format and **PNT\_EP** for the Point Layer.
- 3. In the Symbol Insertion section, verify that the Symbol Block Name list displays <none>, and then click **OK** to return to the Description Key Manager dialog box.

Use the following steps to create an iron bar description key.

- 4. Click the **Create DescKey** icon to display the Create Description Key dialog box.
- 5. Enter **IB** for the DescKey Code, and then on the General tab, enter **IB** for the Description Format and **PNT\_IB** for the Point Layer.
- 6. In the Symbol Insertion section, from the Symbol Block Name list, select **bound**, and then enter **MONUMENT** for the Symbol Layer.
- 7. Click the Scale/Rotate Symbol tab. In the Scale Symbol By section, verify that the **Current Drawing Scale: 1:1000** check box is selected.
- 8. In the Apply Scale To section, verify that the **X-Y Dimensions** check box is selected, and then click **OK** to return to the Description Key Manager dialog box.

Use the following steps to create a tree description key that has a diameter-specific symbol.

- 9. Click the **Create DescKey** icon to display the Create Description Key dialog box.
- 10. Enter **Tree** for the DescKey Code, and then on the General tab, enter

**\$2mm \$1 Tree** for the Description Format and **PNT\_TREE** for the Point Layer.

**Note** The \$2mm \$1 Tree Description Format uses description parameters. Description parameters maintain but reorder the description text that you enter. In later steps, you'll create some points that represent trees. By entering "Tree Maple 120" for a point description, you'll create a point labeled "120 mm Maple Tree."

- 11. In the Symbol Insertion section, from the Symbol Block Name list, select **tree**, and then enter **TREE** for the Symbol Layer.
- 12. Click the Scale/Rotate Symbol tab, in the Scale Symbol By section, select the **Description Parameter** check box, select **2** from the **\$** list, and then clear the **Current Drawing Scale: 1:1000** check box.
- 13. Click **OK** to return to the Description Key Manager dialog box, and then close the Description Key Manager dialog box.

You now have three new description keys.

## Creating a Label Style

In this exercise, you will create a new label style to enable the use of description keys without having to assign additional labels to points.

- 1. On the Labels menu, click **Edit Label Styles** to display the Edit Label Styles dialog box.
- 2. Click the Point Label Styles tab, and from the Name list, select **active desckeys only** (by selecting this style, the Text section of the dialog box is cleared). Verify that the Text section of the dialog box is blank.
- 3. Enter **DescKey Only Crew-B** for the Name.
- 4. In the Description Keys section, verify that the **DescKey Matching On** check box is selected, and then from the DescKey file list, select **CREW-B**.
- 5. Verify that the **Substitute DescKey Description** and **Insert DescKey Symbol** check boxes are selected.
- 6. Click **Save**, and then click **OK**.

### eating a Label Style

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On the Labels menu, click **Edit Label Styles** to display the Edit Label Styles dialog box.

Click the Point Label Styles tab, and from the Name list, select **active desckeys only** (by selecting this style, the Text section of the dialog box is cleared). Verify that the Text section of the dialog box is blank.

Enter **DescKey Only - Crew-B** for the Name.

In the Description Keys section, verify that the **DescKey Matching On** check box is selected, and then from the DescKey file list, select **CREW-B**.

Verify that the **Substitute DescKey Description** and **Insert DescKey Symbol** check boxes are selected.

Click **Save**, and then click **OK**.

## Inserting Points with Description Keys

Create new points with description keys activated. First, set the current label style to DescKey Only- Crew-B.

- 1. On the Labels menu, click Settings to display the Label Settings dialog box.
- 2. Click the Point Labels tab. From the Current Label Style list, select **DescKey Only Crew-B**, and then click **OK**.

Create four points manually in the drawing to test the description keys that have been created. Their location and elevation are not critical.

- 3. On the View menu, click **Named Views** to display the View dialog box, under Name, select **2**, click **Set Current**, and then click **OK**.
- 4. On the Points menu, click Create Points Manual.
- 5. Specify a point in the drawing for the first point, and then enter **EP** for the Description.
- 6. Specify a point in the drawing for the second point, and then enter **IB** for the Description.
- 7. Specify a point in the drawing for the third point, and then enter **Tree Maple 120** for the Description.
- 8. Specify a point in the drawing for the fourth point, enter **Tree Oak 300** for the Description, and then press **ENTER**.

Land Desktop creates new layers automatically if they do not exist to accommodate description key definitions.

<u>Click here</u> to see an illustration of the four new points set by description keys.

This concludes the description key lesson. In the next lesson, you'll learn about importing points.

### serting Points with Description Keys

new points with description keys activated. First, set the current label > DescKey Only- Crew-B.

On the Labels menu, click Settings to display the Label Settings dialog box.

Click the Point Labels tab. From the Current Label Style list, select **DescKey Only - Crew-B**, and then click **OK**.

Create four points manually in the drawing to test the description keys that have been created. Their location and elevation are not critical.

On the View menu, click **Named Views** to display the View dialog box, under Name, select **2**, click **Set Current**, and then click **OK**.

On the Points menu, click Create Points Manual.

Specify a point in the drawing for the first point, and then enter **EP** for the Description.

Specify a point in the drawing for the second point, and then enter **IB** for the Description.

Specify a point in the drawing for the third point, and then enter **Tree Maple 120** for the Description.

Specify a point in the drawing for the fourth point, enter **Tree Oak 300** for the Description, and then press **ENTER**.

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# **LESSON 8: Importing Points from an ASCII Text File**

There are many existing point file formats available for use when importing points into the project point database. You can also create custom file formats to match other file formats. In this lesson, you'll create a file format for an ASCII text file, and then import the points into the drawing.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.
- 3. The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.
- 4. From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-8.dwg**, and then click **OK**.
- 5. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

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## **ESSON 8: Importing Points from an ASCII Text File**

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Start AutoCAD Land Desktop if you have not already done so.

On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-8.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

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lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

## Creating a Point File Format

In this exercise, you will create a point file format to match the format of the point file provided, which in this case is northing, easting, elevation, and description.

- 1. On the Points menu, click **Import/Export Points Format Manager** to display the Format Manager dialog box.
- 2. Click **Add** to display the Format Manager Select Format Type dialog box.
- 3. From the list, select **User Point File**, and then click **OK** to display the Point File Format dialog box.
- 4. Enter **Tutorial** for the Format Name, from the Default Extension list, select **.txt**, and then enter **!** (exclamation point) for the Comment Tag.

The default extension list may be left blank to allow for a generic file extension search.

5. Select **Delimited By**, and then verify that the box to the right of the Delimited By label is blank.

This means that the file format is space delimited. You could specify a comma-delimited file, or use any other form of punctuation as a delimiter.

6. Click **Load** to display the Select Source File dialog box, navigate to the \Land Projects <Version Number>\Tutorial2\Survey folder, select **Topo\_pnt.txt**, and then click **Open**.

The first few lines of the topo\_pnt.txt file are displayed at the bottom of the dialog box.

Use the following steps to specify the data type for each column to match this file format.

- Click the first <unused> column heading on the left to display the Format Manager - Select Column Name dialog box.
- 8. From the list, select **Northing**, and then click **OK** to return to the Point File Format dialog box.

- 9. Click the next <unused> column heading to display the Format ManagerSelect Column Name dialog box.
- 10. From the list, select **Easting**, and then click **OK** to return to the Point File Format dialog box.
- 11. Click the next <unused> column heading to display the Format ManagerSelect Column Name dialog box.
- 12. From the list, select **Elevation**, and then click **OK** to return to the Point File Format dialog box.
- 13. Click the next <unused> column heading to display the Format ManagerSelect Column Name dialog box.
- 14. From the list, select **Description**, and then click **OK** to return to the Point File Format dialog box.
- 15. Click **Parse** to display the ASCII text point file data under the new column headings.
- 16. Scroll down and verify that the format you just created matches the loaded file.
- 17. Click **OK** to return to the Format Manager, verify that the new Tutorial file is displayed at the bottom of the list, and then click **Close**.

This completes the process of creating a new point file format for importing points.

## Importing an ASCII Text Point File

In this exercise, you will import the ASCII text point file into the point database and the drawing.

- 1. On the Points menu, click **Import/Export Points Import Options** to display the COGO Database Import Options dialog box.
- 2. For What to do when point numbers need to be asssigned to the points, verify that **Use next point number** is selected, and then click **OK** to continue.
- 3. On the Points menu, click **Import/Export Points Import Points** to display the Format Manager Import Points dialog box.
- 4. From the Format list, select **Tutorial**, and then verify that the Source File is \Land Projects <Version Number>\Tutorial2\Survey\Topo\_pnt.txt.
- 5. Select the **Add Points to Point Group** check box, and then click the **Create New Point Group** icon to display the Format Manager Create Group dialog box.
- 6. Enter **Topo\_Area1** for the Name, click **OK** to return to the Format Manager Import Points dialog box, and then click **OK** to display the COGO Database Import Options dialog box.
- 7. Click **OK** to close the COGO Database Import Options dialog box and begin processing points.

The points are processed and read into the points database and the drawing.

8. On the View menu, click **Named Views** to display the View dialog box, under Name, select **2**, click **Set Current**, and then click **OK**.

<u>Click here</u> to see an illustration of the inserted point file points.

Take a look at the points in the points database.

- On the Points menu, click **List Points** to display the List Points dialog box.
- Verify that the **Enable Filtering** option is selected.
- Click the **Reset** button to clear the previous selection.

• Click the Point Groups tab, select the **Topo\_Area1** point group from the list, and then click the **List** tab.

• When you have finished reviewing the point group data, click **OK**.

This concludes the point import lesson. In the next lesson, you'll learn about labeling lines, curves, spirals, and points.

# LESSON 9: Labeling Lines, Curves, Spirals, and Points

Use line, curve, spiral, and point labels to annotate your drawings with information such as direction, distance, and radius.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click Open to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-9.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

## ESSON 9: Labeling Lines, Curves, Spirals, and Points

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Start AutoCAD Land Desktop if you have not already done so.

On the File menu, click Open to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-9.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

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lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

# Changing Label Settings

In this exercise, you will specify label settings for lines, curves, and points.

- 1. On the Labels menu, click **Settings** to display the Label Settings dialog box.
- 2. Verify that the **Update Labels When Objects Change** check box is selected.

When the Update Labels When Objects Change check box is selected, dynamic labels will change to reflect changes made to their associated objects.

- 3. Click the Line Labels tab, and then from the Current Label Style list, select **direction above, distance below**.
- 4. From the Forced Bearings list, select **North**.
- 5. Click the Curve Labels tab, and then from the Current Label Style list, select **stacked above radius, length, tan, delta**.
- 6. Click the Point Labels tab, from the Current Label Style list, select **all point data**, and then click **OK**.

### nanging Label Settings

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Verify that the **Update Labels When Objects Change** check box is selected.

When the Update Labels When Objects Change check box is selected, dynamic labels will change to reflect changes made to their associated objects.

Click the Line Labels tab, and then from the Current Label Style list, select **direction above, distance below**.

From the Forced Bearings list, select **North**.

Click the Curve Labels tab, and then from the Current Label Style list, select **stacked above - radius, length, tan, delta**.

Click the Point Labels tab, from the Current Label Style list, select **all point data**, and then click **OK**.

## Labeling Lines and Points

In this exercise, you will isolate the Boundary and Pnt\_control layers and label the boundary polyline and control points first.

- 1. On the command line, enter **LAI**, then select a point on the blue polyline boundary and a control point (any one of the six points displayed in the drawing), press **ENTER** to display the Layer(s) to isolate dialog box, and then click **OK**.
- 2. Click the Layers toolbar icon to display the Layer Properties Manager. Turn on the **Boundary\_label** layer, set it as the current layer, and click **OK**.
- 3. On the Labels menu, click **Add Static Labels**, use a window selection set to select the boundary polylines and control points, and then press **ENTER**.
- 4. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.

<u>Click here</u> to see an illustration of the static line labels.

If you label a polyline with static labels, exploding the polyline will result in the labels remaining in the drawing. If you label a polyline with dynamic labels, exploding the polyline will result in the disappearance of the labels.

Distances are annotated with a foot (') symbol, even though the drawings units are set to meters. This is due to the current label style definition. You can edit the label style to reflect the correct units. Also, the boundary and control point labels were created on the Boundary\_label layer, since the label styles specified label creation on the current layer.

5. Enter **LOA** to turn all of the layers in the drawing back on.

Use the following steps to isolate the Lots layer and label the lot lines.

- 6. Enter **LAI**, select a point on a lot line, press **ENTER** to display the Layer(s) to isolate dialog box. LOT\_LINES should be selected. Click **OK**.
- 7. Click the Layers toolbar icon to display the Layer Properties Manager. Turn on the **Lot\_label** layer, set it as the current layer, and click **OK**.

Use the following steps to change the current label style.

- 8. On the Labels menu, click **Show Dialog Bar** to display the Style Properties dialog bar.
- 9. Click the Curve tab, and then from the Current Label Style list, select **length above, radius below**.
- 10. On the View menu, click **Named Views** to display the View dialog box, under Name, select **3**, click **Set Current**, and then click **OK**.
- 11. On the Labels menu, click **Add Dynamic Labels**, and then select all of the lot lines in the current view.

The lot lines are labeled. Some manipulation of the labels may be required to avoid overlapping text.

<u>Click here</u> to see an illustration of the dynamic labels.

## Working with Static and Dynamic Labels

Static labels will not update if the object from which the data is taken is changed, but dynamic labels will. In this exercise, you will change a dynamic label to a static label by changing the label's properties.

- 1. Select the yellow lot line to display its grips.
- 2. Select the top grip, drag it to a new position along the back lot line, and then use a Near Osnap to fix it in position.

<u>Click here</u> to see an illustration of the updated dynamic label.

- 3. Undo the last command.
- 4. Select the label text of the yellow lot line, and then right-click and select **Edit Label Properties**.
- 5. Clear the **Dynamically Update Label Text** check box and then click **OK**.
- 6. Select the yellow lot line to display its grips.
- 7. Select the top grip, drag it to a new position along the back lot line, and then use a Near Osnap to fix it in position.

<u>Click here</u> to see an illustration of the non-updated, static, label.

- 8. Press ESC to clear the lot line grips.
- 9. Select the label text, and then right-click and click **Edit Label Properties**.
- 10. Select the **Dynamically Update Label Text** check box, and then click **OK**.

The lot line label is automatically updated.

- 11. Undo the last two commands.
- 12. Select the yellow lot line, and then right-click and click **Dis-Associate Labels**.
- 13. Select the yellow lot line to display its grips.

- 14. Select the top grip, drag it to a new position along the back lot line, and then use a Near Osnap to fix it in position.
- 15. Select the yellow lot line, and then right-click and click **Update Labels**.

Because the label is disassociated, it does not update.

<u>Click here</u> to see an illustration of the disassociated label.

# Changing a Label Attached to an Object

In this exercise, you will change labels by swapping text from one side of an object to another and by modifying the label style.

1. On the Labels menu, click **Swap Label Text**, select one of the upper-left lot label lines in the current view, and then press **ENTER**.

<u>Click here</u> to see an illustration of swapped label text.

Change the line label style for a lot line.

- 2. On the Style Properties dialog bar, click the Line tab, and then from the Current Label Style list, select **stacked below direction, distance**.
- 3. Select the same lot line, and then right-click and click **Delete Labels**.

The Delete Labels command deletes all labels associated with the object on any layer.

4. On the Labels menu, click **Add Dynamic Labels,** select the same lot line, and then press **ENTER**.

<u>Click here</u> to see an illustration of the new dynamic label style.

This concludes the object labeling lesson. In the next lesson, you'll learn about creating label styles.

### nanging a Label Attached to an Object

exercise, you will change labels by swapping text from one side of an to another and by modifying the label style.

On the Labels menu, click **Swap Label Text**, select one of the upper-left lot label lines in the current view, and then press **ENTER**.

<u>Click here</u> to see an illustration of swapped label text.

Change the line label style for a lot line.

On the Style Properties dialog bar, click the Line tab, and then from the Current Label Style list, select **stacked below - direction, distance**.

Select the same lot line, and then right-click and click **Delete Labels**.

The Delete Labels command deletes all labels associated with the object on any layer.

On the Labels menu, click **Add Dynamic Labels**, select the same lot line, and then press **ENTER**.

<u>nere</u> to see an illustration of the new dynamic label style.

s concludes the object labeling lesson. In the next lesson, you'll learn about <u>g</u> label styles.

# LESSON 10: Creating Label Styles for Lines and Point

In this lesson, you will create your own label styles for lines, curves, spirals, and points to suit your needs.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-10.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

## ESSON 10: Creating Label Styles for Lines and Points

lesson, you will create your own label styles for lines, curves, spirals, and to suit your needs.

#### rk through this lesson follow these steps

Start AutoCAD Land Desktop if you have not already done so.

On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-10.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

ng through these lessons will result in alteration of the project files. p copies of these project files can be found in the c:\Program AutoCAD Land Desktop <Version Number>\Landtut folder.

lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

## Creating a New Line Label Style

In this exercise, you will create a new line label style by modifying an existing line label style. Incorporate metric and imperial distance units above the line by employing a mathematical operation to show an imperial measurement conversion. Below the line, show starting and ending northing and easting values.

- 1. On the Labels menu, click **Edit Label Styles** to display the Edit Label Styles dialog box.
- 2. On the Line Label Styles tab, from the Name list, select **distance above**, **direction below**.
- 3. Enter **Lot Plan for XYZ Co** for the Name.
- 4. In the Text Above section, delete the foot mark (') after {Length}, and then add a space and enter **m**.
- 5. Press ENTER and enter {Length\*3.28084}'.

Avoid extra carriage returns when entering text above or text below data. This will result in extra blank lines appearing between the label and the line itself when you label the line.

- 6. In the Text Below section, delete **{Direction}**.
- 7. In the Text Below section, enter **N** and a space, from the Data list, select **Start Northing**, and then click **>> Text Below**.
- 8. On the same line, add a space, enter **E** and a space, from the Data list, select **Start Easting**, and then click **>> Text Below**.

Use the following steps to add another line of data.

- 9. Place your cursor after the {Start Easting} text, and then press **ENTER**.
- 10. Enter **N** and a space, from the Data list, select **End Northing**, and then click **>> Text Below**.
- 11. On the same line, add a space, enter **E** and a space, from the Data list, select **End Easting**, and then click **>> Text Below**.
- 12. In the Text Properties section, enter **0.5** for the Offset, from the Style list,

select **L100**, and then enter **Lot\_label** for the Layer.

- 13. In the Units section, click **Linear** to display the Linear Units dialog box.
- 14. Enter **3** for the Linear precision value and **4** for the Coordinates precision value, and then click **OK** to return to the Edit Label Styles dialog box.
- 15. Click **Save**, and then click **OK** to continue.

This completes the creation of the new line label style.

# Labeling a Line

In this exercise, you will label an existing line with the new label style.

- 1. On the View menu, click **Named Views** to display the View dialog box, under Name, select **2**, click **Set Current**, and then click **OK**.
- 2. On the Labels menu, click **Show Dialog Bar** to display the Style Properties dialog bar.
- 3. On the Line tab, from the Current Label Style list, select **Lot Plan for XYZ Co**.
- 4. On the Labels menu, click **Add Dynamic Labels**, and then select the line segment, and press **ENTER**.

The new line segment is labeled with the new line label style. The length of the line is displayed, in meters and feet above the line, and the starting and ending northing and easting coordinates are displayed below the line.

<u>Click here</u> to see an illustration of the Lot plan for XYZ Co style line label.

New curve and spiral label styles are created in the same manner as new line label styles.

## abeling a Line

exercise, you will label an existing line with the new label style.

On the View menu, click **Named Views** to display the View dialog box, under Name, select **2**, click **Set Current**, and then click **OK**.

On the Labels menu, click **Show Dialog Bar** to display the Style Properties dialog bar.

On the Line tab, from the Current Label Style list, select **Lot Plan for XYZ Co**.

On the Labels menu, click **Add Dynamic Labels**, and then select the line segment, and press **ENTER**.

w line segment is labeled with the new line label style. The length of the displayed, in meters and feet above the line, and the starting and ending 1g and easting coordinates are displayed below the line.

<u>nere</u> to see an illustration of the Lot plan for XYZ Co style line label.

urve and spiral label styles are created in the same manner as new line tyles.

## Creating a New Point Label Style

In this exercise, you will create a new point label style to label lot corner elevations only.

- 1. On the Labels menu, click **Edit Label Styles** to display the Edit Label Styles dialog box.
- 2. Click the Point Label Styles tab, enter **Lot Corner Elevations** for the Name.
- 3. From the Data list, select **Elevation**, and click >> **Text**.
- 4. Place your cursor after the {Elevation} text, and then press **ENTER**.
- 5. From the Data list, select **Northing**, and then click **>> Text**.
- 6. Place your cursor after the {Northing} text, and then press **ENTER**.
- 7. From the Data list, select **Easting**, and then click **>> Text**.
- 8. In the Text Properties section, enter **1** for the Offset, and then select the lower-right radio button for the Justification.
- 9. From the Style list, select **L80**, and then enter **Lot\_elevation\_label** for the Layer.
- 10. Click **Save**, and then click **OK**.

This completes the creation of the new point label style.

## eating a New Point Label Style

exercise, you will create a new point label style to label lot corner ons only.

On the Labels menu, click **Edit Label Styles** to display the Edit Label Styles dialog box.

Click the Point Label Styles tab, enter **Lot Corner Elevations** for the Name.

From the Data list, select **Elevation**, and click >> **Text**.

Place your cursor after the {Elevation} text, and then press **ENTER**.

From the Data list, select **Northing**, and then click **>> Text**.

Place your cursor after the {Northing} text, and then press **ENTER**.

From the Data list, select **Easting**, and then click **>> Text**.

In the Text Properties section, enter **1** for the Offset, and then select the lower-right radio button for the Justification.

From the Style list, select **L80**, and then enter **Lot\_elevation\_label** for the Layer.

Click **Save**, and then click **OK**.

ompletes the creation of the new point label style.

# Labeling a Point

In this exercise, you will label a point with the new label style and then turn off the point marker text.

- 1. On the View menu, click **Named Views** to display the View dialog box, under Name, select **3** click **Set Current**, and then click **OK**.
- 2. On the Style Properties dialog bar, click the Point tab, and then from the Current label Style list, select **Lot Corner Elevations**.
- 3. Select the point 46 marker, and then right-click and click **Add Dynamic Labels**.

The lot corner point is labeled with the new point label style.

- 4. Select the point 46 marker text, and then right-click and click **Display Properties** to display the Point Display Properties dialog box.
- 5. Click the Text tab, clear the **Number, Elevation, and Description Visible** check boxes, and then click **OK** to continue.

<u>Click here</u> to see an illustration of the Lot Corner Elevation style point label.

This concludes the label style lesson. In the next lesson, you'll learn about creating line tables.

## abeling a Point

exercise, you will label a point with the new label style and then turn off int marker text.

On the View menu, click **Named Views** to display the View dialog box, under Name, select **3** click **Set Current**, and then click **OK**.

On the Style Properties dialog bar, click the Point tab, and then from the Current label Style list, select **Lot Corner Elevations**.

Select the point 46 marker, and then right-click and click **Add Dynamic Labels**.

The lot corner point is labeled with the new point label style.

Select the point 46 marker text, and then right-click and click **Display Properties** to display the Point Display Properties dialog box.

Click the Text tab, clear the **Number, Elevation, and Description Visible** check boxes, and then click **OK** to continue.

<u>nere</u> to see an illustration of the Lot Corner Elevation style point label.

s concludes the label style lesson. In the next lesson, you'll learn about g line tables.

# LESSON 11: Creating Tag Labels and Object Tables

You must add tag labels to line, curve, and spiral objects before you can create tables from these objects. Once tag labels have been assigned to the objects, you can generate tables that display object data (object tables).

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **Tutorial1**, from the Select Project Drawing list, select **Lesson-11.dwg**, then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the Tutorial project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

## **ESSON 11: Creating Tag Labels and Object Tables**

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#### rk through this lesson follow these steps

Start AutoCAD Land Desktop if you have not already done so.

On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **Tutorial1**, from the Select Project Drawing list, select **Lesson-11.dwg**, then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

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lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

# Creating a New Tag Style

In this exercise, you will create a new tag style by specifying tag parameters for lines and curves.

- 1. On the Labels menu, click **Edit Tag Styles** to display the Edit Tag Label Styles dialog box.
- 2. On the Line Label Styles tab, enter **Boundary Tags for XYZ Co** for the Name.
- 3. In the Text Properties section, from the Style list, select **L200**, then enter **Boundary\_tags** for the Layer.
- Click the Curve Label Styles tab, then enter Boundary Tags for XYZ Co for the Name.
- 5. In the Text Properties section, from the Style list, select **L200**, then enter **Boundary\_tags** for the Layer.
- 6. Click **Save**, then click **OK** to continue.

This completes the creation of a new tag style.

#### ceating a New Tag Style

exercise, you will create a new tag style by specifying tag parameters for nd curves.

On the Labels menu, click **Edit Tag Styles** to display the Edit Tag Label Styles dialog box.

On the Line Label Styles tab, enter **Boundary Tags for XYZ Co** for the Name.

In the Text Properties section, from the Style list, select **L200**, then enter **Boundary\_tags** for the Layer.

Click the Curve Label Styles tab, then enter **Boundary Tags for XYZ Co** for the Name.

In the Text Properties section, from the Style list, select **L200**, then enter **Boundary\_tags** for the Layer.

Click **Save**, then click **OK** to continue.

ompletes the creation of a new tag style.

# Labeling Objects with Tags

In this exercise, you will isolate the Boundary layer and label the boundary polyline with the new tag style.

- 1. On the command line, enter **LAI**, select a point on one of the blue boundary polylines, press **ENTER** to display the Layer(s) to isolate dialog box, then click **OK**.
- 2. On the Labels menu, click **Show Dialog Bar** to display the Style Properties dialog bar.
- 3. Click the Label icon to toggle to the Tag icon, then on the Line tab, from the Current Tag Style list, select **Boundary Tags for XYZ Co**.
- 4. Click the Curve tab, and from the Current Tag Style list, select **Boundary Tags for XYZ Co**.
- 5. On the Labels menu, click **Add Tag Labels**, select both of the blue boundary polylines, then press **ENTER**.
- 6. On the View menu, click **Named Views** to display the View dialog box, under Name, select **2**, click **Set Current**, then click **OK**.

<u>Click here</u> to see an illustration of boundary line tags.

The boundary is labeled with tags for each segment of the polyline.

### abeling Objects with Tags

exercise, you will isolate the Boundary layer and label the boundary ie with the new tag style.

On the command line, enter **LAI**, select a point on one of the blue boundary polylines, press **ENTER** to display the Layer(s) to isolate dialog box, then click **OK**.

On the Labels menu, click **Show Dialog Bar** to display the Style Properties dialog bar.

Click the Label icon to toggle to the Tag icon, then on the Line tab, from the Current Tag Style list, select **Boundary Tags for XYZ Co**.

Click the Curve tab, and from the Current Tag Style list, select **Boundary Tags for XYZ Co**.

On the Labels menu, click **Add Tag Labels**, select both of the blue boundary polylines, then press **ENTER**.

On the View menu, click **Named Views** to display the View dialog box, under Name, select **2**, click **Set Current**, then click **OK**.

<u>nere</u> to see an illustration of boundary line tags.

undary is labeled with tags for each segment of the polyline.

### Creating a Line Table

In this exercise, you will create a line table from lines that already have tag labels added to them. When creating the table, add two more columns of data (start northing and start easting data) to the default line table.

- 1. On the View menu, click **Named Views** to display the View dialog box, under Name, select **3**, click **Set Current**, then click **OK**.
- 2. On the Labels menu, click **Add Tables** Line Table to display the Line Table Definition dialog box.
- 3. In the Table Title section, from the Text Style list, select **L200**.
- 4. In the Column Definition section, double-click in the fourth column under the No Column heading to display the Column #4 Definition dialog box.
- 5. In the Column Header Information section, enter **START NORTHING** for the Header.
- 6. In the Display Value Information section, select **Start Northing**, click **Add Value**, then verify that {Start Northing} is displayed in the Text section.
- 7. In the Units section, click **Linear** to display the Linear Units dialog box.
- 8. From the Coordinate list, select **4**, then click **OK** to return to the Column #4 Definition dialog box.
- 9. Click **OK** to return to the Line Table Definition dialog box.
- 10. In the Column Definition section, double-click in the fifth column under the No Column heading to display the Column #5 - Definition dialog box.
- 11. In the Column Header Information section, enter **START EASTING** for the Header.
- 12. In the Display Value Information section, select **Start Easting**, click **Add Value**, then verify that {Start Easting} is displayed in the Text section.
- 13. Click **OK** to return to the Line Table Definition dialog box.

- 14. Click **OK** on the Line Table Definition dialog box.
- 15. Click on the location in the drawing where you want the table placed. The upper-left corner of the table is inserted where you clicked.
- 16. You may need to zoom in to see the line table.

<u>Click here</u> to see an illustration of the line table.

## Creating a Point Table

In this exercise, you will create a point table by selecting drawing points that are included in an existing point group.

- 1. Open the **Lesson-3.dwg** file from the **Tutorial2** project.
- 2. On the Labels menu, click **Add Tables Point Table** to display the Points dialog box.
- 3. Click the **Point Groups** tab and check on (select) the **Control** point group.
- 4. Click the **List** tab to view the points included in this point group.
- 5. Click the **Summary** tab to view the total number of points included in this point group.
- 6. Click **OK** on the Points dialog box to display the Point Table Definition dialog box.
- 7. In the Table Title section, type MY POINT TABLE into the Text box.
- 8. In the Column Definition section, double-click in the fourth column under the No Column heading to display the Column #4 Definition dialog box.
- 9. In the Column Header Information section, enter **NORTHING** for the Header.
- 10. In the Display Value Information section, select **Northing**, click **Add Value**, then verify that **{Northing}** is displayed in the Text section.
- 11. Click **OK** to return to the Point Table Definition dialog box.
- 12. In the Column Definition section, double-click in the fifth column under the No Column heading to display the Column #5 - Definition dialog box.
- 13. In the Column Header Information section, enter **EASTING** for the Header.
- 14. In the Display Value Information section, select **Easting**, click **Add Value**, then verify that **{Easting}** is displayed in the Text section.

- 15. Click **OK** to return to the Point Table Definition dialog box.
- 16. Click **OK** on the Point Table Definition dialog box.
- 17. Click on the location in the drawing where you want the table placed. The upper-left corner of the table is inserted where you clicked.
- 18. You may need to zoom in to see the table.

Points 247 and 758 display in the table because they exist in the drawing. Points that exist in the points database but not in the drawing do not display in the table.

# Updating (Re-drawing) an Object Table

The Re-Draw Table command lets you automatically update the information displayed in a line, curve, or spiral object table. For example, if you created a line table that displayed information on 20 line objects, and then you deleted some of those lines from your drawing, the information in the object table would not change. However, you can use the Re-Draw Table command to automatically update the table so that it displays current object data.

- 1. Close the current drawing and project then open the **Tutorial1** project and the **Lesson-11.dwg** file.
- 2. In a previous lesson, you created a line table. <u>Click here</u> to see an illustration of that line table. If you do not have a line table on the current drawing, create one using the steps in the Creating a Line Table lesson.
- 3. In the drawing, select any three lines from the drawing and delete them. Notice that the line table still displays information on the lines that you just deleted from the drawing.
- 4. From the Labels menu, select **Edit Tables Re-Draw Table**.
- 5. Click on any text in the line table, then press **ENTER**. Notice that the table automatically updates, removing the rows of data for lines that no longer exist in the drawing.

The Re-Draw Table command updates all object information displayed in the table. For example, if northing and easting data changed for objects displayed in the table, Re-Draw automatically updates the information displayed in the table.

# pdating (Re-drawing) an Object Table

e-Draw Table command lets you automatically update the information red in a line, curve, or spiral object table. For example, if you created a ole that displayed information on 20 line objects, and then you deleted of those lines from your drawing, the information in the object table would ange. However, you can use the Re-Draw Table command to automatically the table so that it displays current object data.

Close the current drawing and project then open the **Tutorial1** project and the **Lesson-11.dwg** file.

In a previous lesson, you created a line table. <u>Click here</u> to see an illustration of that line table. If you do not have a line table on the current drawing, create one using the steps in the Creating a Line Table lesson.

In the drawing, select any three lines from the drawing and delete them. Notice that the line table still displays information on the lines that you just deleted from the drawing.

From the Labels menu, select **Edit Tables** • **Re-Draw Table**.

Click on any text in the line table, then press **ENTER**. Notice that the table automatically updates, removing the rows of data for lines that no longer exist in the drawing.

e-Draw Table command updates all object information displayed in the For example, if northing and easting data changed for objects displayed in le, Re-Draw automatically updates the information displayed in the table.

# **Understanding Table Objects**

This exercise illustrates differences between object tables that have the Create Table Object option on the Table Definition dialog selected, and object tables that do not have this option selected.

- 1. Open the **Tutorial1** project and the **Lesson-11.dwg** file.
- 2. Create a new line table, making sure the Create Table Object option on the Line Table Definition dialog box is not selected, and typing NOT TABLE OBJECT into the Table Title Text box. Insert this line table onto your drawing.
- 3. Create another line table, this time selecting the Create Table Object option on the Line Table Definition dialog box, and typing IS TABLE OBJECT into the Table Title Text box.
- 4. Insert this table next to the first one, so they are either side-by-side, or one above the other.
- 5. In the NOT TABLE OBJECT table, select any grid line in the table. Note that only the line you clicked on is selected, not the entire table. If you move this line, only that lines moves.
- 6. In the IS TABLE OBJECT table, select any grid line in the table. Note that the entire table is selected, not just the line you clicked on. If you move the selected line, the table does not move.
- 7. In the IS TABLE OBJECT table, click the upper left corner handle. The entire table is selected. To move this type of table, click on the upper left corner handle and drag the table to a new location.
- 8. In the NOT TABLE OBJECT table, select the entire table using a window or crossing selection. To move this type of table, click on any part of the table, while the entire table is selected, and move it to a new location.

This concludes the object table lesson. In the next lesson, you'll learn about the Terrain Model Explorer.

# LESSON 12: Working with the Terrain Model Explorer

Use the Terrain Model Explorer to create digital terrain models (DTMs) from any combination of point, contour, breakline, and surface boundary data.

#### To work through this lesson follow these steps

- 1. 1Start AutoCAD Land Desktop if you have not already done so.
- 2. 2On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. 3From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-12.dwg**, and then click **OK**.
- 4. 4On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

### ESSON 12: Working with the Terrain Model Explorer

e Terrain Model Explorer to create digital terrain models (DTMs) from mbination of point, contour, breakline, and surface boundary data.

#### rk through this lesson follow these steps

1Start AutoCAD Land Desktop if you have not already done so.

2On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

3From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-12.dwg**, and then click **OK**.

4On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

ng through these lessons will result in alteration of the project files. p copies of these project files can be found in the c:\Program AutoCAD Land Desktop <Version Number>\Landtut folder.

lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

# Creating a New Surface Folder

In this exercise, you will create a new surface folder for a new surface, Area1.

- 1. On the Terrain menu, click **Terrain Model Explorer** to display the Terrain Model Explorer.
- 2. Select **Terrain**, and then right-click and click **Create New Surface**.

The new surface is automatically assigned the name Surface1 and a new folder is created below the Terrain folder.

- 3. Click on the Surface1 folder and display information regarding the surface in the right pane.
- 4. Expand the Surface1 folder to view the TIN data folders.
- 5. Select **Surface1**, and then right-click and click **Rename** to display the Rename Surface dialog box.
- 6. Enter **Area1** for the New surface name, and then click **OK**.

Now you are ready to specify the data for creating the new surface.

#### eating a New Surface Folder

exercise, you will create a new surface folder for a new surface, Area1.

On the Terrain menu, click **Terrain Model Explorer** to display the Terrain Model Explorer.

Select **Terrain**, and then right-click and click **Create New Surface**.

The new surface is automatically assigned the name Surface1 and a new folder is created below the Terrain folder.

Click on the Surface1 folder and display information regarding the surface in the right pane.

Expand the Surface1 folder to view the TIN data folders.

Select **Surface1**, and then right-click and click **Rename** to display the Rename Surface dialog box.

Enter Area1 for the New surface name, and then click OK.

ou are ready to specify the data for creating the new surface.

# Adding Point Data

In this exercise, you willadd point data from a predefined point group.

- 1. Expand the Area1 folder to view the TIN data folders.
- 2. Select **Point Groups**, and then right-click and click **Add Point Group** to display the Add Point Group dialog box.
- 3. From the Point group name list, select **Area1**, and then click **OK** to return to the Terrain Model Explorer.

The point group name is displayed in the right pane of the Terrain Model Explorer.

# dding Point Data

exercise, you willadd point data from a predefined point group.

Expand the Area1 folder to view the TIN data folders.

Select **Point Groups**, and then right-click and click **Add Point Group** to display the Add Point Group dialog box.

From the Point group name list, select **Area1**, and then click **OK** to return to the Terrain Model Explorer.

int group name is displayed in the right pane of the Terrain Model er.

# Adding Contour Data

In this exercise, you will add contour data from existing contours in the drawing.

- 1. In the Terrain Model Explorer, select **Contours**, and then right-click and click **Add Contour Data** to display the Contour Weeding dialog box.
- 2. Accept the defaults for Weeding and Supplementing factors by clicking **OK**.
- 3. Press **ENTER** to accept the default, Layer, for contour selection, and then select a contour line in the drawing.
- 4. Press **ENTER** to continue, and then press **ENTER** to process the contour data.

The contour data is displayed in the right pane of the Terrain Model Explorer.

# dding Contour Data

exercise, you will add contour data from existing contours in the drawing.

In the Terrain Model Explorer, select **Contours**, and then right-click and click **Add Contour Data** to display the Contour Weeding dialog box.

Accept the defaults for Weeding and Supplementing factors by clicking **OK**.

Press **ENTER** to accept the default, Layer, for contour selection, and then select a contour line in the drawing.

Press **ENTER** to continue, and then press **ENTER** to process the contour data.

ntour data is displayed in the right pane of the Terrain Model Explorer.

# Adding Breakline Data from Points

In this exercise, you will add breakline data from existing points and 2D and 3D polylines in the drawing. First create a breakline from points to define the streambed centerline.

- 1. Move the Terrain Model Explorer to the side of your screen.
- 2. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.
- 3. Enter **LAI**, select one of the streambed points (the cyan Xs identified with the description Strm Bed), and then press **ENTER** to display the Layer(s) to isolate dialog box.
- 4. Verify the layer STREAM\_PNTS is displayed in the Item box, and click **OK** to isolate the streambed layer.
- 5. On the Terrain Model Explorer select **Breaklines**, and then right-click and click **Define by Point**.
- 6. Select the bottom streambed point, and select the remaining streambed points sequentially from bottom to top, and then press **ENTER** when you have finished selecting the points.
- 7. Enter **Streambed** for the Description.
- 8. Press **ENTER** to display the Terrain Breaklines dialog box, and then click **No** to continue and process the breakline data.

The breakline is generated with each streambed point as a vertex.

<u>Click here</u> to see an illustration of the streambed breakline.

The breakline point data is displayed in the right pane of the Terrain Model Explorer.

### dding Breakline Data from Points

exercise, you will add breakline data from existing points and 2D and 3D ies in the drawing. First create a breakline from points to define the bed centerline.

Move the Terrain Model Explorer to the side of your screen.

On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.

Enter **LAI**, select one of the streambed points (the cyan Xs identified with the description Strm Bed), and then press **ENTER** to display the Layer(s) to isolate dialog box.

Verify the layer STREAM\_PNTS is displayed in the Item box, and click **OK** to isolate the streambed layer.

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Select the bottom streambed point, and select the remaining streambed points sequentially from bottom to top, and then press **ENTER** when you have finished selecting the points.

Enter **Streambed** for the Description.

Press **ENTER** to display the Terrain Breaklines dialog box, and then click **No** to continue and process the breakline data.

eakline is generated with each streambed point as a vertex.

<u>nere</u> to see an illustration of the streambed breakline.

eakline point data is displayed in the right pane of the Terrain Model 'er.

# Adding Breakline Data from 3D Polylines

In this exercise, you will define breaklines from existing 3D polylines that represent existing roadway edge of pavement.

- 1. On the command line, enter **LOA** to turn all of the layers in the drawing back on.
- 2. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **3**, click **Set Current**, and then click **OK**.
- 3. Enter **LAI**, select one of the red existing roadway EOP 3D polylines, and then press **ENTER** to display the Layer(s) to isolate dialog box.
- 4. Verify that the EOP\_3D layer is selected and click **OK** to isolate the existing roadway EOP layer.
- 5. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **1**, click **Set Current**, and then click **OK**.
- 6. On the Terrain Model Explorer select **Breaklines**, and then right-click and click **Define by Polyline**.
- 7. Enter **Existing\_Road\_EOP** for the Description, and then use a crossing box to select the existing roadway EOP 3D polylines. Make sure you select all of the polylines.
- 8. Press **ENTER** to display the Terrain Breaklines dialog box, click **No** to continue and process the breakline data.

The 3D polyline breakline data is displayed in the right pane of the Terrain Model Explorer.

# dding Breakline Data from 3D Polylines

exercise, you will define breaklines from existing 3D polylines that ent existing roadway edge of pavement.

On the command line, enter **LOA** to turn all of the layers in the drawing back on.

On the View menu, click **Named Views** to display the View dialog box. Under Name, select **3**, click **Set Current**, and then click **OK**.

Enter **LAI**, select one of the red existing roadway EOP 3D polylines, and then press **ENTER** to display the Layer(s) to isolate dialog box.

Verify that the EOP\_3D layer is selected and click **OK** to isolate the existing roadway EOP layer.

On the View menu, click **Named Views** to display the View dialog box. Under Name, select **1**, click **Set Current**, and then click **OK**.

On the Terrain Model Explorer select **Breaklines**, and then right-click and click **Define by Polyline**.

Enter **Existing\_Road\_EOP** for the Description, and then use a crossing box to select the existing roadway EOP 3D polylines. Make sure you select all of the polylines.

Press **ENTER** to display the Terrain Breaklines dialog box, click **No** to continue and process the breakline data.

) polyline breakline data is displayed in the right pane of the Terrain Explorer.

# Adding Breakline Data from 2D Polylines

In this exercise, you will define breaklines from existing 2D polylines that have been drawn between existing roadway edge of pavement, ditch, and railway bed points.

- 1. On the command line, enter **LOA** to turn all of the layers in the drawing back on.
- 2. Enter **LAI**, and then press **ENTER** twice to display the Layer(s) to isolate dialog box.
- 3. From the Layers list, select **2D\_Breaklines**, and then click **OK** to isolate the existing road 2D polylines.
- 4. On the Terrain Model Explorer, select **Breaklines**, and then right-click and click **Proximity by Polylines**.
- 5. Enter **Misc\_Topo** for the Description, and then use a crossing box to select the existing 2D polylines.
- 6. Press **ENTER** to display the Terrain Breaklines dialog box, and then click **No** to continue.
- 7. As additional message dialog boxes are displayed, click **Yes** to continue and process the breakline data.

The 2D polyline breakline data is displayed in the right pane of the Terrain Model Explorer.

## dding Breakline Data from 2D Polylines

exercise, you will define breaklines from existing 2D polylines that have rawn between existing roadway edge of pavement, ditch, and railway bed

On the command line, enter **LOA** to turn all of the layers in the drawing back on.

Enter **LAI**, and then press **ENTER** twice to display the Layer(s) to isolate dialog box.

From the Layers list, select **2D\_Breaklines**, and then click **OK** to isolate the existing road 2D polylines.

On the Terrain Model Explorer, select **Breaklines**, and then right-click and click **Proximity by Polylines**.

Enter **Misc\_Topo** for the Description, and then use a crossing box to select the existing 2D polylines.

Press **ENTER** to display the Terrain Breaklines dialog box, and then click **No** to continue.

As additional message dialog boxes are displayed, click **Yes** to continue and process the breakline data.

**)** polyline breakline data is displayed in the right pane of the Terrain Explorer.

# Adding Surface Boundary Data

In this exercise, you will add surface boundary data from an existing surface boundary in the drawing.

- 1. On the command line, enter **LOA** to turn all of the layers in the drawing back on.
- 2. On the Terrain Model Explorer, select **Boundaries**, and then right-click and click **Add Boundary Definition**.
- 3. Select the white surface boundary polyline, and then enter **Area1** for the Boundary name.
- 4. Press **ENTER** to accept the default boundary type, Outer.

The Outer option limits the extents of the surface to the area inside the selected surface boundary polyline.

5. Enter **No** for making breaklines along edges, and then press **ENTER** to end the command.

When breaklines are not made along the edge, only data inside inside of the polyline boundary is considered when creating the surface.

The surface boundary data is displayed in the right pane of the Terrain Model Explorer.

# dding Surface Boundary Data

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On the command line, enter **LOA** to turn all of the layers in the drawing back on.

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When breaklines are not made along the edge, only data inside inside of the polyline boundary is considered when creating the surface.

rface boundary data is displayed in the right pane of the Terrain Model er.

# Building a Surface

In this exercise, you will build the surface using point, contour, breakline, and surface boundary data.

- 1. On the Terrain Model Explorer, in the left pane, select **Area1**, and then right-click and click **Build** to display the Build Area1 dialog box.
- 2. Enter **Area1** for the Description.
- 3. In the Surface Data Options section, clear the **Use point file data** check box and select the **Minimize flat triangles resulting from contour data** check box.
- 4. Click **OK** to process all of the surface data and build the surface.
- 5. As the Build Progress dialog box is displayed, click **OK** to end the command.

The surface data for surface Area1 is displayed in the right pane of the Terrain Model Explorer. You now have a surface model generated from point, contour, and breakline data representing actual terrain conditions.

6. When you have finshed reviewing the data in the Terrain Model Explorer, close it.

This concludes the Terrain Model Explorer lesson. In the next lesson, you'll learn about editing surfaces.

# ilding a Surface

exercise, you will build the surface using point, contour, breakline, and boundary data.

On the Terrain Model Explorer, in the left pane, select **Area1**, and then right-click and click **Build** to display the Build Area1 dialog box.

Enter **Area1** for the Description.

In the Surface Data Options section, clear the **Use point file data** check box and select the **Minimize flat triangles resulting from contour data** check box.

Click **OK** to process all of the surface data and build the surface.

As the Build Progress dialog box is displayed, click **OK** to end the command.

The surface data for surface Area1 is displayed in the right pane of the Terrain Model Explorer. You now have a surface model generated from point, contour, and breakline data representing actual terrain conditions.

When you have finshed reviewing the data in the Terrain Model Explorer, close it.

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# **LESSON 13: Editing Surfaces**

A surface model created by the triangulation process is only as accurate as the data used to build it. Sparse elevational data and lack of breakline control yields ambiguous results at best. Even with extensive elevational data in the surface file, it is important to verify that the surface model is an accurate representation of the site conditions.

In this lesson, a few areas are pinpointed for surface editing. However, the entire surface requires additional editing that is not covered in this lesson.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-13.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

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lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

# **Identifying Triangulation Problems**

First-hand knowledge of the site is indispensable for identifying problems with the surface model, and comparing your drawing to site photographs is useful even if you have access to the site.

One way to identify triangulation problems is to look at contours and see where features such as ridgelines or streambeds are improperly represented. Unnecessarily jagged contours can also be indicative of triangulation problems. A second way to identify triangulation problems is to look at sections cut through critical areas to verify expected surface behavior.

- 1. On the View menu, click **Named Views** to display the View dialog box, under Name, select **2**, click **Set Current**, and then click **OK**.
- 2. On the Terrain menu, click **Set Current Surface** to display the Select Surface dialog box, from the Selection list, select **Area1b**, and then click **OK**.

To see the triangulation pattern that causes problems without adding any objects to the drawing, generate a Quick View.

3. On the Terrain menu, click **Surface Display** • **Quick View**.

Quick View entities are drawn with temporary vectors and cannot be edited.

In the circled area, the TIN lines triangulate between contours at the same elevation, thus creating a flat area. In most cases, flat surfaces like this are minimized. Occasionally, manual editing is necessary to correct these situations when they occur. Also, in the accompanying existing ground cross section, the slope to the left is flat, and then drops off steeply. This does not reflect the actual slope condition.

4On the command line, enter **REDRAW** to erase the Quick View temporary vectors.

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e command line, enter **REDRAW** to erase the Quick View temporary 3.

# Adding Points to the Surface

Point objects can be added to the original data used to build the surface and the surface can be rebuilt at any time with this information. However, to avoid having to rebuild the surface, surface points can be added.

First, import the surface triangulation lines as 3D lines.

- 1. On the Terrain menu, click **Edit Surface Import 3D Lines**.
- 2. Press **ENTER** to accept the default, Yes, to erase the old surface view.

Since the contour lines in the specific area are at an elevation of 122 m, add a surface point midway between the contour lines (the center point of circle 1) at an elevation of 121.5 m.

- 3. On the Terrain menu, click **Edit Surface Add Point**.
- 4. Use a Center Osnap to select the center of the small reference circle1, enter **121.5** m for the Elevation, and then press **ENTER**.

The surface point was added, with the triangulation adjusted automatically, but some flat triangles remain.

<u>Click here</u> to see an illustration of how the area within the circle was retriangulated.

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Press **ENTER** to accept the default, Yes, to erase the old surface view.

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On the Terrain menu, click **Edit Surface** • **Add Point**.

Use a Center Osnap to select the center of the small reference circle1, enter **121.5** m for the Elevation, and then press **ENTER**.

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<u>here</u> to see an illustration of how the area within the circle was gulated.

# Adding and Deleting TIN Lines

In this exercise, you will add two lines to correct the flat triangulation. Add the first between points 1 and 2.

- 1. On the Terrain menu, click **Edit Surface Add Line**.
- 2. Use Endpoint Osnaps to select the TIN vertex point inside circle 1 for the From point and the TIN vertex point inside circle 2 for the To point, and then press **ENTER**.

The line is added between points 1 and 2 and that triangulation lines crossed by the new line are automatically deleted.

<u>Click here</u> to see an illustration of the added TIN Line.

Extraneous TIN lines, often long slivers that appear on the outside edges of surfaces should be deleted. Delete the sliver to the left of point 2.

- 3. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2B**, click **Set Current**, and then click **OK**.
- 4. On the Terrain menu, click **Edit Surface Delete Line**.
- 5. 5Select the sliver TIN line, and then press **ENTER**.

The sliver TIN line is deleted.

## dding and Deleting TIN Lines

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On the Terrain menu, click **Edit Surface** Add Line.

Use Endpoint Osnaps to select the TIN vertex point inside circle 1 for the From point and the TIN vertex point inside circle 2 for the To point, and then press **ENTER**.

The line is added between points 1 and 2 and that triangulation lines crossed by the new line are automatically deleted.

<u>Click here</u> to see an illustration of the added TIN Line.

Extraneous TIN lines, often long slivers that appear on the outside edges of surfaces should be deleted. Delete the sliver to the left of point 2.

On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2B**, click **Set Current**, and then click **OK**.

On the Terrain menu, click **Edit Surface** • **Delete Line**.

5Select the sliver TIN line, and then press **ENTER**.

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# Flipping TIN Faces

Flipping TIN faces is another way to correct triangulation problems.

1. On the View menu, click **Named Views** to display the View dialog box, under Name, select **3**, click **Set Current**, and then click **OK**.

The cyan contour lines that occur roughly between points 3 and 4 are jagged. Correct this situation by flipping the TIN face between points 3 and 4.

- 2. On the Terrain menu, click **Edit Surface** Flip Face.
- 3. Select the TIN line that is located between points 3 and 4, and then press **ENTER**.

<u>Click here</u> to see an illustration of the flipped TIN line.

Recreate the contours to view the triangulation change.

- 4. On the Terrain menu, click **Create Contours** to display the Create Contours dialog box.
- 5. Accept the default values displayed in this dialog box by clicking **OK**.
- 6. Press **ENTER** to accept the default, Yes, to erase old contours.

The contours are recreated based on the correct triangulation, with a smoother appearance rather than a jagged appearance.

<u>Click here</u> to see an illustration of recreated contours.

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The cyan contour lines that occur roughly between points 3 and 4 are jagged. Correct this situation by flipping the TIN face between points 3 and 4.

On the Terrain menu, click **Edit Surface** • **Flip Face**.

Select the TIN line that is located between points 3 and 4, and then press **ENTER** .

<u>Click here</u> to see an illustration of the flipped TIN line.

Recreate the contours to view the triangulation change.

On the Terrain menu, click **Create Contours** to display the Create Contours dialog box.

Accept the default values displayed in this dialog box by clicking **OK**.

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# Applying Surface Edit History

After the surface has been built and edited, further review of the surface sometimes identifies the need for additional breaklines. Incorporating additional surface data like breaklines, requires that you rebuild the surface. This is true regarding any additional surface data not added or altered by the Surface Editing commands.

Surface edit history can be recorded and added to a file, and then reapplied to a surface when it is rebuilt. Rebuilding a surface with the Edit History option toggled on will return it to its original state, before editing occurred.

- 1. On the Terrain menu, click **Terrain Model Explorer** to display the Terrain Model Explorer.
- 2. Select **Area1b**, and then right-click and click **Build** to display the Surface Modified dialog box.
- 3. Click **Yes** to acknowledge the Surface Modified dialog box and display the Build Area1b dialog box.
- 4. Enter **Area1b** for the Description, and then in the Surface Data Options section, verify that the **Use point group data**, **Use breakline data**, and **Use contour data** check boxes are selected.
- 5. Select the **Minimize flat triangles resulting from contour data** and **Apply Edit History** check boxes, and then click **OK**.

The surface data is reprocessed and the surface is rebuilt.

- 6. As a message dialog box is displayed, click **OK** to continue, and then close the Terrain Model Explorer.
- 7. On the Terrain menu, click **Surface Display Quick View**.

The surface edits previously performed have been reapplied to the surface.

This concludes the surface editing lesson. In the next lesson, you'll learn about creating contours.

## **LESSON 14: Creating Contours**

Contours can be created as either polylines or contour objects. Using contour objects results in a smaller drawing file size and allows for greater flexibility in labeling.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-14.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects </Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

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On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-14.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

ng through these lessons will result in alteration of the project files. p copies of these project files can be found in the c:\Program AutoCAD Land Desktop <Version Number>\Landtut folder.

lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

### **Creating Contours**

Create contours from a surface that exists in the project database and based on the current contour style, Standard, that is set as the default in the Contour Style Manager dialog box. Create major contours at 5 m intervals and minor contours at 1 m intervals.

- 1. On the Terrain menu, click **Set Current Surface** to display the Select Surface dialog box, from the Selection list, select **AREA1C**, and then click **OK**.
- 2. On the Terrain menu, click **Create Contours** to display the Create Contours dialog box.
- 3. In the Intervals section, select **Both Minor and Major**.
- 4. From the Minor Interval list, select **1** m, and then verify that **CONT-MNR** is the minor interval Layer.
- 5. From the Major Interval list, select **5** m, and then verify that **CONR-MJR** is the major interval Layer.
- 6. In the Properties section, verify that **Contour Objects** is selected, and then click **OK** to create the contours.
- 7. Press **ENTER** to accept the default, Yes, to erase old contours.

The contours are created at 1 m minor intervals and 5 m major intervals.

<u>Click here</u> to see an illustration of the countours for the surface Area1C.

### reating Contours

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On the Terrain menu, click **Set Current Surface** to display the Select Surface dialog box, from the Selection list, select **AREA1C**, and then click **OK**.

On the Terrain menu, click **Create Contours** to display the Create Contours dialog box.

In the Intervals section, select **Both Minor and Major**.

From the Minor Interval list, select **1** m, and then verify that **CONT-MNR** is the minor interval Layer.

From the Major Interval list, select **5** m, and then verify that **CONR-MJR** is the major interval Layer.

In the Properties section, verify that **Contour Objects** is selected, and then click **OK** to create the contours.

Press **ENTER** to accept the default, Yes, to erase old contours.

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<u>nere</u> to see an illustration of the countours for the surface Area1C.

## Creating a New Contour Style

In this exercise, you will change contours style properties in the Contour Style Manager dialog box. Edit the appearance of contours and how labels appear on the contours. Assign different contour style properties to either single contours or all of the contours in the drawing.

- 1. On the Terrain menu, click **Contour Style Manager** to display the Contour Style Manager dialog box.
- 2. Click the Manage Styles tab. In the Contour Styles in Drawing list, enter **SMOOTH**, and then click **Add**.

At this point, the new contour style can either be saved as a style accessible by all projects or just the current drawing.

- 3. Click the Contour Appearance tab and verify that the Current Style is SMOOTH.
- In the Contour Display section, select **Contours and Grips**, and then in the Smoothing Options section, select **Add Vertices** and set the slider to 8.
- 5. Click the Text Style tab and in the Text Properties section, from the Style list, select **2MM.** Set the Precision to 0.
- 6. Select the Color box to display the Select Color dialog box. From the Standard Colors bar select **cyan** (light blue), and then click **OK** to return to the Contour Style Manager dialog box.
- 7. From the Suffix list, select **m**.
- 8. Click the Label Position tab. In the Orientation section, verify that **On Contour** is selected and the **Break Contour For Label** check box is selected.
- 9. In the Readability section, select **Label Positive Slope** and in the Border Around Label section, select **Rectangular**, and then click **OK**.

You now have a new contour style to apply to contours in your drawing.

# Applying a New Contour Style

In this exercise, you will apply the new SMOOTH contour style to all of the contours in the drawing.

- 1. Click the Layers icon, make layer CONT-MJR the current layer, and freeze layer 0.
- 2. Select all of the contours in the drawing with a crossing selection box.
- 3. Right-click and click **Contour Properties** to display the Contour Style Manager dialog box.
- 4. Click the Manage Styles tab, from Contour Styles in Drawing list, select **SMOOTH**, and then click **OK**.

All of the contours in the drawing now appear with the new contour style, SMOOTH.

<u>Click here</u> to see an illustration of the contours with the new contour style applied.

## pplying a New Contour Style

exercise, you will apply the new SMOOTH contour style to all of the rs in the drawing.

Click the Layers icon, make layer CONT-MJR the current layer, and freeze layer 0.

Select all of the contours in the drawing with a crossing selection box.

Right-click and click **Contour Properties** to display the Contour Style Manager dialog box.

Click the Manage Styles tab, from Contour Styles in Drawing list, select **SMOOTH**, and then click **OK**.

the contours in the drawing now appear with the new contour style, )TH.

<u>here</u> to see an illustration of the contours with the new contour style 1.

## Labeling Contours

In this exercise, you will assign elevation labels to the contours based on the label style set in the Contour Style Manager dialog box.

- 1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **1**, click **Set Current**, and then click **OK**.
- 2. On the Terrain menu, click **Contour Labels Group Interior** to display the Contour Labels Increments dialog box.
- 3. Enter **2** m for the Elevation Increment, clear the **Add multiple interior labels along each contour** check box, and then click **OK**.

Drag a line across the contours to be labeled.

4. Select a point near the lower-left corner of the current view for the Start point, and then select a point near the upper-right corner for the End point. Press **ENTER** to end the command.

The contours are labeled every 2 m with a rectangular box border around the elevation text. The contour appears to be broken around the contour label box, but is actually still intact as a continuous contour line.

<u>Click here</u> to see an illustration of the contours labeled at 2 m increments.

Use the following steps to reposition a contour label.

- 5. Select a contour to display its grips, select the grip at the center of the contour label, and then slide the contour label along the contour.
- 6. Click to fix the contour label in its new position.

The contour label maintains its relative position on the contour.

Use the following steps to delete a contour label.

- 7. On the Terrain menu, click **Contour Labels**, and then click **Delete Labels**.
- 8. Select the contour label, select a point near the contour label, and then press **ENTER** twice.

The contour label has been deleted.

# **Converting Contour Objects**

It is sometimes necessary to provide contour data to other project team members who do not have Land Desktop, in which case contour objects may need to be converted to polylines. Use the AutoCAD EXPLODE command to do this.

Conversely, contours represented by polylines can be converted to contour objects.

In this exercise, you will convert a contour to a polyline, and then convert it back to a contour object.

- 1. On the command line, enter **EXPLODE**, select a contour, and then press **ENTER**.
- 2. Enter **LIST** and select the same contour.

The contour is now a lightweight polyline.

- 3. Press **ESC** and then close the text window.
- 4. On the Terrain menu, click **Contour Utilities**, click **Convert Polylines**, and then select the contour polyline and press **ENTER**.
- 5. Enter **LIST** and select the same contour.

The contour is now an AECC\_CONTOUR.

6. Close the text window.

Labeled contours exist as a series of separate segments, and as such, may not be exploded and converted back to continuous contour objects. Delete contour labels from contours before conversion to avoid this problem.

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On the Terrain menu, click **Contour Utilities**, click **Convert Polylines**, and then select the contour polyline and press **ENTER**.

Enter **LIST** and select the same contour.

The contour is now an AECC\_CONTOUR.

Close the text window.

d contours exist as a series of separate segments, and as such, may not be led and converted back to continuous contour objects. Delete contour from contours before conversion to avoid this problem.

# **Editing Contours**

Contours can be edited with AutoCAD TRIM, EXTEND, BREAK, and ERASE commands. If the contour style has grips enabled, contours can also be modified using standard grip editing commands.

In this exercise, you will trim and extend contours to keep them inside a fenced area. Use the white polyline on layer 0 (zero) as the boundary.

- 1. Click the Layers icon and thaw layer 0.
- 2. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.
- 3. Enter **TRIM**, select the boundary polyline, and then press **ENTER**.
- 4. Select the contours to trim and then press **ENTER**.
- 5. Enter **EXTEND**, select the boundary polyline, and then press **ENTER**.
- 6. Select the contours to extend, and then press **ENTER**.

<u>Click here</u> to see an illustration of the edited contours.

This concludes the contour creation lesson. In the next lesson, you'll learn about generating sections.

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Enter **TRIM**, select the boundary polyline, and then press **ENTER**.

Select the contours to trim and then press **ENTER**.

Enter **EXTEND**, select the boundary polyline, and then press **ENTER**.

Select the contours to extend, and then press **ENTER**.

<u>nere</u> to see an illustration of the edited contours.

s concludes the contour creation lesson. In the next lesson, you'll learn generating sections.

# **LESSON 15: Generating Sections**

Generate cross sections to show below-ground conditions for single or multiple surfaces.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-15.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

## **ESSON 15: Generating Sections**

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#### rk through this lesson follow these steps

Start AutoCAD Land Desktop if you have not already done so.

On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-15.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

ng through these lessons will result in alteration of the project files. p copies of these project files can be found in the c:\Program AutoCAD Land Desktop <Version Number>\Landtut folder.

lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

## Defining and Processing Sections From Single Surfaces

In this exercise, you will define two sections from an existing surface by referencing existing lines in the drawing to define as sections. First, specify EG as the current surface.

- 1. On the Terrain menu, select **Set Current Surface** to display the Select Surface dialog box.
- 2. From the Selection list, select **EG**, and then click **OK**.
- 3. From the Terrain menu, click **Sections Define Sections**.
- 4. Enter **W-E** for the Group Label and **AA** for the Section Label.

Use the following steps to specify line AA as the first section line.

5. Use an Endpoint Osnap to select the left end of line AA, and then use an Endpoint Osnap to select the right end of line AA.

Use the following steps to specify line BB as the second section line.

- 6. Enter **BB** for the Section Label, and using an Endpoint OSNAP select the left end of line BB, and then using an Endpoint OSNAP select the right end of line BB.
- 7. Press **ENTER** twice.

Next, process the sections.

8. From the Terrain menu, click **Sections** • **Process Sections**.

You now have two sections defined from a single surface.

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On the Terrain menu, select **Set Current Surface** to display the Select Surface dialog box.

From the Selection list, select **EG**, and then click **OK**.

From the Terrain menu, click **Sections** • **Define Sections**.

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Use the following steps to specify line AA as the first section line.

Use an Endpoint Osnap to select the left end of line AA, and then use an Endpoint Osnap to select the right end of line AA.

Use the following steps to specify line BB as the second section line.

Enter **BB** for the Section Label, and using an Endpoint OSNAP select the left end of line BB, and then using an Endpoint OSNAP select the right end of line BB.

Press **ENTER** twice.

Next, process the sections.

From the Terrain menu, click **Sections** • **Process Sections**.

w have two sections defined from a single surface.

# **Importing Sections From Single Surfaces**

In this exercise, you will import the two sections into the drawing.

- 1. From the Terrain menu, click **Sections Import Sections**.
- 2. Press **ENTER** to accept the default, Datum, for the Datum line layer.
- 3. Enter **2** for Vertical scale factor.
- 4. Select a point to the right side of the current view near section line AA for the insertion of section AA, and then press **ENTER** to accept the default value for the Datum elevation.
- 5. Select a point to the right side of the current view near section line BB for the insertion of section BB, and then press **ENTER** to accept the default value for the Datum elevation.
- 6. Zoom in on the imported imported single surface sections.

<u>Click here</u> to see an illustration of the imported single surface sections.

Use the following steps to add grids to the sections.

- 7. On the Terrain menu, click **Sections Grid for Sections**.
- 8. Press **ENTER** to accept the default, Grid, for the Section grid layer.
- 9. Select the section datum block text for section AA (the block at the lower-left corner of the section), and then enter **2** m for the Elevation increment and **5** m for the Offset increment.
- 10. Select the section datum block text for section BB, press **ENTER** to accept the default, **2** m, for the Elevation increment and press **ENTER** to accept the default, **5** m, for the Offset increment, and then press **ENTER** to end the command.

<u>Click here</u> to see an illustration of the imported single surface sections with grids.

## Creating and Processing Sections from Multiple Surface

In this exercise, you will create a third section using both the existing ground (EG) and finished ground (FG) surfaces.

- 1. Zoom to the previous view.
- 2. On the Terrain menu, click **Sections Multiple Surfaces On/Off** and verify that "Multiple surfaces are on" is displayed at the command line.
- 3. On the Terrain menu, click **Sections Define Multiple Surfaces** to display the Multiple Surface Selection dialog box.
- 4. From the Select from list, select **EG**, hold down the CTRL key, and then select **FG**.
- 5. Verify the EG and FG are displayed in the Current list, and then click **OK**.

Use the following steps to specify line CC as the third section line.

- 6. From the Terrain menu, click **Sections Define Sections**.
- 7. Enter **SE-NW** for the Group Label and **CC** for the Section Label.
- 8. Use an Endpoint Osnap to select the upper end of line CC, and then use an Endpoint Osnap to select the lower end of line CC.
- 9. Press **ENTER** twice.

Next, process the section.

- 10. From the Terrain menu, click **Sections Process Sections**.
- 11. Press **ENTER** to accept the default, Yes, to append to the end of the existing section file.
- 12. Enter **SE-NW** for the Group to retrieve, and then press **ENTER**.

### eating and Processing Sections from Multiple Surfaces

exercise, you will create a third section using both the existing ground nd finished ground (FG) surfaces.

Zoom to the previous view.

On the Terrain menu, click **Sections** • **Multiple Surfaces On/Off** and verify that "Multiple surfaces are on" is displayed at the command line.

On the Terrain menu, click **Sections** • **Define Multiple Surfaces** to display the Multiple Surface Selection dialog box.

From the Select from list, select **EG**, hold down the CTRL key, and then select **FG**.

Verify the EG and FG are displayed in the Current list, and then click **OK**.

Use the following steps to specify line CC as the third section line.

From the Terrain menu, click **Sections** • **Define Sections**.

Enter **SE-NW** for the Group Label and **CC** for the Section Label.

Use an Endpoint Osnap to select the upper end of line CC, and then use an Endpoint Osnap to select the lower end of line CC.

Press **ENTER** twice.

Next, process the section.

From the Terrain menu, click **Sections** • **Process Sections**.

Press **ENTER** to accept the default, Yes, to append to the end of the existing section file.

Enter **SE-NW** for the Group to retrieve, and then press **ENTER**.

# **Importing Sections From Multiple Surfaces**

In this exercise, you will import the multiple surface section into the drawing.

- 1. From the Terrain menu, click **Sections Import Sections**.
- 2. Press **ENTER** to accept the default, Datum, for the Datum line layer.
- 3. Enter **2** for Vertical scale factor.
- 4. Select a point near the top of the screen for the insertion of section CC, and then press **ENTER** to accept the default value for the Datum elevation.
- 5. Zoom in on the multiple surface section.

<u>Click here</u> to see an illustration of the multiple surface section.

## porting Sections From Multiple Surfaces

exercise, you will import the multiple surface section into the drawing.

From the Terrain menu, click **Sections** • **Import Sections**.

Press **ENTER** to accept the default, Datum, for the Datum line layer.

Enter **2** for Vertical scale factor.

Select a point near the top of the screen for the insertion of section CC, and then press **ENTER** to accept the default value for the Datum elevation.

Zoom in on the multiple surface section.

<u>nere</u> to see an illustration of the multiple surface section.

# Viewing Dynamic Sections

Use dynamic quick sections as a tool to quickly view the terrain in a particular area. Dynamic sections can be copied and pasted into any Windowsâ application, or imported into the drawing using the current drawing scale.

You can create quick sections from one or multiple surfaces. Multiple surfaces are currently turned on in the project, so the quick section you create in this task will be based on the surfaces EG and FG, the two surfaces you selected previously with the Define Multiple Surfaces command.

- 1. Zoom to the previous view.
- 2. From the Terrain menu, click **Sections View Quick Section**.
- 3. Select the section line C-C in the drawing, and then press **ENTER** to display the Section window.

The Section window can be moved and resized in the drawing. You can also change the section properties using the Section pull-down menu in the upper left corner of the Section window.

Use the following steps to change the vertical scale of the section.

- 4. From the Section menu in the Section window, select **View Properties** to display the Quick Section Properties dialog box.
- 5. On the Grid Settings tab enter **2** for Vertical factor, enter **10** for the Minimum Vertical Increment, and enter **50** for the Minimum Horizontal Increment.
- 6. Click the Surface Color Settings tab. Note that the color of EG is green and the color of FG is blue. You can change the colors of up to 8 surfaces when viewing quick sections for multiple surfaces.
- 7. Click **OK**.

You can grip edit the line from which you created the section, and the view in the Section window is updated dynamically.

8. Select section line C-C in the drawing to display its grips, and then select one of the grips and drag it to a new position.

Observe that the section view is automatically updated to reflect the new

position of the section line.

You can import a quick section into the drawing using the current drawing scale.

- 9. From the Utilities menu in the Section window, select **Import Quick Section**.
- 10. Type **tutorial1** as the layer name prefix for the surfaces.

When you import the quick section, the section line for each surface is placed on a unique layer. By using tutoral1 as the prefix, the section line for surface EG will be created on layer tutorial1-EG, for example.

- 11. Press ENTER to accept the default, **datum**, as the datum line layer.
- 12. Type **CC** as the description for the section.
- 13. Enter **2** for the Vertical scale factor.
- 14. Select an insertion point for the section below the section CC you imported earlier.
- 15. Press ENTER to accept the default datum elevation.

The quick section is imported into the drawing.

16. Close the section window so you can see the imported quick section.

This concludes the section creation lesson. In the next lesson, you'll learn about surface visualization tools.

## **LESSON 16: Visualizing Surfaces**

Use surface visualization features to show elevation banding and watershed delineation. Use the Object Viewer to generate different views of surfaces.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-16.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

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On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-16.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

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lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

# **Creating Elevation Banding**

In this exercise, you will create elevation banding with 3D faces.

- 1. On the **Terrain** menu, click **Set Current Surface** to display the Select Surface dialog box.
- 2. From the Selection list, select **Area1C**, and then click **OK**.
- 3. On the **Terrain** menu, click **Surface Display • Banding 3D Faces** to display the Surface Elevation Shading Settings dialog box.
- 4. Verify that the **Create Skirts** check box is clear, enter **2** for the Vertical factor and **6** for the Number of ranges, and then click **Auto-Range** to display the Terrain Range Views dialog box.
- 5. Accept the default values displayed in this dialog box by clicking **OK**, and then the Surface Range Definitions dialog box is displayed.
- 6. Click **OK** to return to the Surface Elevation Shading Settings dialog box, and then click **OK**.
- 7. Press **ENTER** to accept the default, Yes, to erase the old range view, and then the Range Statistics window is displayed.
- 8. When you have finished reviewing the range statistics information click **OK**.

The elevation banding is drawn with 3D faces.

<u>Click here</u> to see an illustration of the 3D face elevation banding.

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On the **Terrain** menu, click **Set Current Surface** to display the Select Surface dialog box.

From the Selection list, select **Area1C**, and then click **OK**.

On the **Terrain** menu, click **Surface Display • Banding - 3D Faces** to display the Surface Elevation Shading Settings dialog box.

Verify that the **Create Skirts** check box is clear, enter **2** for the Vertical factor and **6** for the Number of ranges, and then click **Auto-Range** to display the Terrain Range Views dialog box.

Accept the default values displayed in this dialog box by clicking **OK**, and then the Surface Range Definitions dialog box is displayed.

Click **OK** to return to the Surface Elevation Shading Settings dialog box, and then click **OK**.

Press **ENTER** to accept the default, Yes, to erase the old range view, and then the Range Statistics window is displayed.

When you have finished reviewing the range statistics information click **OK**.

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<u>nere</u> to see an illustration of the 3D face elevation banding.

# Viewing Surfaces in the Object Viewer

In this exercise, you will view the elevation banding in the Object Viewer.

- 1. On the **Utilities** menu, click **Object Viewer.**
- 2. Using a window selection set, select all of the elevation banding entities, and then press **ENTER** to continue.

The elevation banding is displayed in the Object Viewer.

Wireframe is the default display mode for the Object Viewer. The Object Viewer also has six standard orthogonal and four isometric views to choose from. The current view in the AutoCAD editor window is the default view in Object Viewer.

<u>Click here</u> to see an illustration of the elevation banding in the Object Viewer.

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<u>nere</u> to see an illustration of the elevation banding in the Object Viewer.

## Using Object Viewer Navigation Tools

In this exercise, you will use Object Viewer navigation tools to pan and zoom in and out of parallel views and move in and out of perspective views. The initial view in Object Viewer is parallel by default.

- 1. Click the **Zoom** icon (3rd icon from the right, top row) and then move your cursor to zoom in and out.
- 2. Click the **Pan** icon (4th icon from the right, top row) and then move your cursor to pan around.
- 3. Click the **Perspective** icon (2nd icon from the left, bottom row) and then move your cursor to move in and out.

Use additional zoom icons to specify zoom parameters in parallel view.

- 4. Click the **Orbit** icon (2nd icon from the right, top row) and then move your cursor to rotate the view in all three axes (X, Y, and Z) simultaneously.
- 5. When you have finished viewing the elevation banding, close the Object Viewer.
- 6. If needed, use the UNDO command to restore the drawing to its previous state.

Use the following steps to erase the range view layers.

- 7. On the **Terrain** menu, click **Terrain Layers Range Layers**.
- 8. Press **ENTER** to accept the default, Erase, to erase the range view layers.

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Click the **Zoom** icon (3rd icon from the right, top row) and then move your cursor to zoom in and out.

Click the **Pan** icon (4th icon from the right, top row) and then move your cursor to pan around.

Click the **Perspective** icon (2nd icon from the left, bottom row) and then move your cursor to move in and out.

Use additional zoom icons to specify zoom parameters in parallel view.

Click the **Orbit** icon (2nd icon from the right, top row) and then move your cursor to rotate the view in all three axes (X, Y, and Z) simultaneously.

When you have finished viewing the elevation banding, close the Object Viewer.

If needed, use the UNDO command to restore the drawing to its previous state.

Use the following steps to erase the range view layers.

On the Terrain menu, click Terrain Layers , Range Layers.

Press **ENTER** to accept the default, Erase, to erase the range view layers.

## **Delineating Watershed Areas**

In this exercise, you will divide the site up into catchment areas by building a watershed model and importing the watershed boundaries.

- 1. On the **Terrain** menu, click **Terrain Model Explorer** to display the Terrain Model Explorer dialog box.
- 2. Select **Area1c** and expand its TIN data tree. Select **Watershed**, and then right-click and click **Calculate Watershed** to display the Watershed Parameters dialog box.
- 3. Enter **1** m for the Minimum Depression Depth and **50** sq. m for the Minimum Depression Area, and then clear the **Must exceed both minimum area and minimum depth** check box.
- 4. Click **OK** to display the Calculate Watershed dialog box, and then click **OK** as the Done calculating watershed message is displayed.

Information regarding the watershed areas is displayed in the right pane of the Terrain Model Explorer.

Use the following steps to import the watershed boundaries into the drawing.

- 5. Select **Watershed**, and then right-click and click **Import Watershed Boundaries** to display the Watershed Display Settings dialog box.
- 6. Accept all of the default values that are displayed in this dialog box by clicking **OK**.
- 7. Close the Terrain Model Explorer and view the watershed boundaries.

<u>Click here</u> to see an illustration of the watershed boundaries.

8. Zoom in so you can see the watershed numbers that were inserted.

<u>Click here</u> to see an illustration of the watershed numbers.

This concludes the surface visualization lesson. In the next lesson, you'll learn about calculating volumes.

# **LESSON 17: Calculating Site Volumes**

Define a site and stratum for volume calculations, and then perform grid and composite surface volume calculations and section method volume calculations. Compare the results from all three methods.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-17.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

## **ESSON 17: Calculating Site Volumes**

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From the Project Name list, select **TUTORIAL1**, from the Select Project Drawing list, select **Lesson-17.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

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lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

### Defining a Stratum and a Site

In this exercise, you will define a stratum from surfaces EG and FG, and then define a site enclosing the area in which volumes will be calculated.

- 1. On the Terrain menu, click **Select Current Stratum** to display the Define Stratum dialog box.
- 2. Enter **Stratum1** for the Name and **EG and FG Surfaces** for the Description.
- 3. Click **Select** for Surface 1 to display the Select Surface dialog box, select **EG**, and then click **OK** to return to the Define Stratum dialog box.
- 4. Click **Select** for Surface 2 to display the Select Surface dialog box, select **FG**, and then click **OK** to return to the Define Stratum dialog box.
- 5. Verify that Surface 1 is eg and Surface 2 is fg, and then click **OK** to continue.

Use the following steps to change the volume site settings.

- 6. On the Terrain menu, click **Site Definition Site Settings** to display the Volume Site Settings dialog box.
- 7. In the Volume Labeling section enter **m3** for the Suffix, and then click **OK**.

Use the following steps to define the site with a 2 m by 2 m grid rotated 20 degrees.

- 8. On the Terrain menu, click **Site Definition Define Site**.
- 9. Enter **20** degrees for the Rotation angle.
- 10. Enter **.P** (dot P) to use the point filter, and then enter **1** for the Site Base Point.

Filters are available for your use when working with AutoCAD Land Desktop commands. Use the .P point filter to specify an existing point number, use the .G graphical filter to select objects in the drawing, or use the .N northing filter to specify northing and easting coordinates.

11. Enter **2** m for the Grid M size, and then press **ENTER** to accept the

default, 2 m, for the Grid N size.

- 12. Enter **.P** (dot P) again to disable the use of the point filter, and then use an Endpoint OSNAP to select the upper right corner of the site definition polyline.
- 13. Press **ENTER** to accept the default, No, to changing the size or rotation of the grid, and then enter **No** to erasing the old site outline.
- 14. Enter **Site1** for the Site name.

With a defined stratum and grid you have a relationship between two surfaces from which, by various methods, you can derive volumes.

# Calculating Grid Volumes

In this exercise, you will calculate volumes by the grid volumes method. The grid volumes method works by superimposing a grid on both surfaces in the stratum, extracting elevations at grid line intersections, and then compiling the difference in elevation at each concurrent grid line intersection.

- 1. On the Terrain menu, click **Grid Volumes Calculate Total Site Volume** to display the Site Librarian dialog box.
- 2. From the Select site list, select **Site1**, and then click **OK** to display the Grid Volume Settings dialog box.
- 3. Accept the default values in this dialog box by clicking **OK** and displaying the Volume Results Surface dialog box.
- 4. Enter **G1-Site1** for the New surface, and then click **OK**.

If you are working with several sites and strata it is helpful to develop a naming convention for the volume surfaces. This aids in correlating a surface to the volumes calculation method used to create it. You can also specify the site name as the surface description in the Terrain Model Explorer when creating surfaces.

The grid volumes method calculations are displayed on the command line, with a cut volume of 3,376 m3, and fill volume of 20,380 m3, and a net volume of 17,004 m3 of fill.

Use the following steps to turn on the boundary of the fg surface then generate a Quick View of the new volume surface.

- 5. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.
- 6. Click the Layers icon in the toolbar to display the Layer Properties Manager. Turn on the display of the **Fg-srf-bdr** layer to view the FG surface boundary polyline, and click **OK** to close the Layer Properties Manager.
- 7. On the **Terrain** menu, click **Set Current Surface** to display the Select Surface dialog box and select **Volume Surface**. Select **G1-Site1** from the list of surfaces and then click **OK**.
- 8. On the Terrain menu, click **Surface Display Quick View**.

<u>Click here</u> to see an illustration of the grid volumes surface quick view.

The area between the fg surface boundary and the extent of the grid volume surface is excluded from the volumes calculations.

Grid squares that fall partially outside of the finished ground surface are ignored when volumes are calculated. This may be avoided by using two surfaces with concurrent boundaries, or by pasting the proposed ground surface onto the existing ground surface. As an alternative, specifying a smaller M and N grid size results in minimizing the impact of grid squares occurring outside of the finished ground surface.

# Calculating Composite Volumes

In this exercise, you will calculate volumes by the composite volumes method.

- 1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **1**, click **Set Current**, and then click **OK**.
- 2. On the Terrain menu, click **Composite Volumes Calculate Total Site Volume** to display the Site Volume Librarian dialog box.
- 3. From the Select site list, select **Site1**, and then click **OK** to display the Composite Volume Settings dialog box.
- 4. Accept the default values in this dialog box by clicking **OK** and displaying the Volume Results Surface dialog box.
- 5. Enter **C1-Site1** for the New surface, and then click **OK**.

The composite volumes method calculations are displayed on the command line, with a cut volume of 3,475 m3, and fill volume of 20,940 m3, and a net volume of 17,465 m3 of fill.

Use the following steps to open the Terrain Model Explorer and view the C1-Site1 volume.

- 6. On the Terrain menu, click **Terrain Model Explorer** to display the Terrain Model Explorer.
- 7. Under the Volume folder select **C1-Site1**, right-click and click **Surface Display Quick View**.
- 8. Move the Terrain Model Explorer to see the quick view entities.

<u>Click here</u> to see an illustration of the composite volumes surface quick view.

9. Close the Terrain Model Explorer, and then on the command line, enter **REDRAW** to clear the quick view entities.

With the Composite Volumes method no clipping of grid squares occurs, and no unexpected surface triangulation line are generated, resulting in higher volume totals than with the Grid Volumes method. In this case, a net fill volume of 17,465 m3 was output using composite volumes, compared with a net volume of 17,004 m3 using grid volumes.

# **Calculating Section Method Volumes**

In this exercise, you will calculate volumes by the section volumes method. With the section volumes method the average of adjacent cross section areas is multiplied by the distance between them.

First, sample average end area sections for both surfaces.

- 1. On the Terrain menu, click **Section Volumes Sample Sections** to display the Site Volume Librarian dialog box.
- 2. From the Select site list, select **Site1**, and then click **OK** to display the Section Volume Settings dialog box.
- 3. In the Volume Calculation Type section verify that **Average end area** is selected, and then in the Direction section select **M** (**x**).
- 4. Accept the default Volume Corrections factors, and then click **OK** to sample sections for both surfaces.

Use the following steps to calculate average end area section volumes for the site.

- 5. On the Terrain menu, click **Section Volumes Calculate Volume Total** to display the Site Volume Librarian dialog.
- 6. From the Select site list, select **Site1**, and then click **OK** to display the Section Volume Settings dialog box.
- 7. Accept the default values in this dialog box by clicking **OK**, and then press **ENTER**.

The section volumes method calculations are displayed on the command line, with a cut volume of 3,478 m3, a fill volume of 21,012 m3, and a net volume of 17,534 m3 of fill.

### alculating Section Method Volumes

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ample average end area sections for both surfaces.

On the Terrain menu, click **Section Volumes** • **Sample Sections** to display the Site Volume Librarian dialog box.

From the Select site list, select **Site1**, and then click **OK** to display the Section Volume Settings dialog box.

In the Volume Calculation Type section verify that **Average end area** is selected, and then in the Direction section select **M** (**x**).

Accept the default Volume Corrections factors, and then click **OK** to sample sections for both surfaces.

Use the following steps to calculate average end area section volumes for the site.

On the Terrain menu, click **Section Volumes** • **Calculate Volume Total** to display the Site Volume Librarian dialog.

From the Select site list, select **Site1**, and then click **OK** to display the Section Volume Settings dialog box.

Accept the default values in this dialog box by clicking **OK**, and then press **ENTER**.

ction volumes method calculations are displayed on the command line, cut volume of 3,478 m3, a fill volume of 21,012 m3, and a net volume of  $\cdot$  m3 of fill.

## Viewing the Volume Report

In this exercise, you will look at the volumes results from all three volumes calculation methods.

- 1. On the Terrain menu, click **Volume Reports Site Reports** to display the Site Volume Corrections dialog box.
- 2. Accept the default values in this dialog box by clicking **OK** and display the Site Volumes window.

Observe that all three methods yield volumes that are quite close, with a 3.0% difference between the highest volumes value (section average end area method), 17,534 m3, and the lowest volumes value (grid method), 17,004 m3.

It is recommended that you use all three methods to calculate volumes for your particular site. Sound engineering judgment should then be used to select the proper value.

3. When you have finished reviewing the volumes results click **OK**.

### ewing the Volume Report

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On the Terrain menu, click **Volume Reports** • **Site Reports** to display the Site Volume Corrections dialog box.

Accept the default values in this dialog box by clicking **OK** and display the Site Volumes window.

Observe that all three methods yield volumes that are quite close, with a 3.0% difference between the highest volumes value (section average end area method), 17,534 m3, and the lowest volumes value (grid method), 17,004 m3.

It is recommended that you use all three methods to calculate volumes for your particular site. Sound engineering judgment should then be used to select the proper value.

When you have finished reviewing the volumes results click **OK**.

# **Calculating Parcel Volumes**

Sometimes it is necessary to calculate volumes for only a portion of the site. In some geographic regions the volume calculations for a subdivision are performed separately for lots and roads.

Use the Parcel Volumes method to calculate volumes for a parcel. First, define a parcel by selecting one of the existing parcel boundary polylines in the drawing.

- 1. Click the Layers icon in the toolbar to display the Layer Properties Manager. Turn on the display of the **Subsites** layer to view the parcel boundary polylines, and click **OK** to close the Layer Properties Manager.
- 2. On the Parcels menu, click **Define from Polylines** and select the yellow polyline around the hatched area, and then press **ENTER** to end the command.

Use the following steps to calculate grid volumes for parcel 1.

- 3. On the Terrain menu, click **Grid Volumes Calculate Parcel Volumes** to display the Site Volume Librarian dialog box.
- 4. From the Select site list, select **Site1**, and then click **OK** to display the Parcel Volume Librarian dialog box.
- 5. From the Select parcel list, select **1**, and then click **OK**.

The parcel volumes method calculations are displayed on the command line, with a cut volume of 2,058 m3, a fill volume of 3,356 m3, and a net fill volume of 1,298 m3.

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On the Parcels menu, click **Define from Polylines** and select the yellow polyline around the hatched area, and then press **ENTER** to end the command.

Use the following steps to calculate grid volumes for parcel 1.

On the Terrain menu, click **Grid Volumes** • **Calculate Parcel Volumes** to display the Site Volume Librarian dialog box.

From the Select site list, select **Site1**, and then click **OK** to display the Parcel Volume Librarian dialog box.

From the Select parcel list, select **1**, and then click **OK**.

rcel volumes method calculations are displayed on the command line, cut volume of 2,058 m3, a fill volume of 3,356 m3, and a net fill volume  $\theta$  m3.

# Generating Cut and Fill Contours

In this exercise, you will generate cut and fill contours for the site using the C1-Site1 volume surface.

- 1. Click the Layers icon in the toolbar to display the Layer Properties Manager. Turn off the display of the **Subsites** and **Fg-srf-bdr** layers, and click **OK** to close the Layer Properties Manager.
- 2. On the Terrain menu, click **Set Current Surface** to display the Select Surface dialog box.
- 3. Select **Volume Surface**, from the Select surface to open list, select **C1**-**Site1**, and then click **OK**.
- 4. On the Terrain menu, click **Create Contours** to display the Create Contours dialog box.
- 5. In the Intervals section select **Both Minor and Major**, enter **0.5** m for the Minor Interval and **2.5** m for the Major Interval.
- 6. Click **OK** to continue, and then press **ENTER** to accept the default, Yes, for erasing old contours.

The cut and fill contours are drawn to represent the depth of equal cut and fill across the site.

<u>Click here</u> to see an illustration of the cut and fill contours.

### enerating Cut and Fill Contours

exercise, you will generate cut and fill contours for the site using the C1olume surface.

Click the Layers icon in the toolbar to display the Layer Properties Manager. Turn off the display of the **Subsites** and **Fg-srf-bdr** layers, and click **OK** to close the Layer Properties Manager.

On the Terrain menu, click **Set Current Surface** to display the Select Surface dialog box.

Select **Volume Surface**, from the Select surface to open list, select **C1-Site1**, and then click **OK**.

On the Terrain menu, click **Create Contours** to display the Create Contours dialog box.

In the Intervals section select **Both Minor and Major**, enter **0.5** m for the Minor Interval and **2.5** m for the Major Interval.

Click **OK** to continue, and then press **ENTER** to accept the default, Yes, for erasing old contours.

t and fill contours are drawn to represent the depth of equal cut and fill the site.

<u>here</u> to see an illustration of the cut and fill contours.

## Generating Grid Ticks and Labels

In this exercise, you will generate grid ticks and labels to show cut and fill volume values at specified grid points.

- 1. On the Terrain menu, click **Grid Volumes Grid Volume Ticks** to display the Site Volume Librarian dialog box.
- 2. From the Select site list, select **Site1**, and then click **OK** to display the Grid Volume Ticks dialog box.
- 3. Enter **5** for the Tick interval and Label interval, and then enter **1** for the Label precision.
- 4. In the Label Position section select **Right**, and then click **OK**.
- 5. Enter **No** to not erase old ticks.

The grid ticks and labels are generated.

6. Zoom in on one of the grid ticks and labels.

<u>Click here</u> to see an illustration of grid ticks and labels.

This concludes the volume calculation lesson. In the next lesson, you'll learn about drawing lines, curves, and spirals.

### enerating Grid Ticks and Labels

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On the Terrain menu, click **Grid Volumes** • **Grid Volume Ticks** to display the Site Volume Librarian dialog box.

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Enter **5** for the Tick interval and Label interval, and then enter **1** for the Label precision.

In the Label Position section select **Right**, and then click **OK**.

Enter **No** to not erase old ticks.

The grid ticks and labels are generated.

Zoom in on one of the grid ticks and labels.

<u>nere</u> to see an illustration of grid ticks and labels.

; concludes the volume calculation lesson. In the next lesson, you'll learn drawing lines, curves, and spirals.

# LESSON 18: Drawing Tangents, Curves, and Spirals

Draw tangents, curves, and spirals to lay out alignment centerlines. Create new alignments and edit existing alignments by connecting tangent segments with circular curves and spirals. Use speed tables to draw curves and work with attaching multiple alignment objects.

#### To work through this lesson follow these steps:

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-18.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

## ESSON 18: Drawing Tangents, Curves, and Spirals

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From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-18.dwg**, and then click **OK**.

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## **Drawing Tangents**

In this exercise, you will draw tangent segments between two existing PIs, a point specified by northing/easting coordinates, and a station block to define a bridge abutment alignment crossing the main roadway alignment.

- 1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.
- 2. On the Lines/Curves menu, click **Line**, enter **.P** (dot P) to use the Point filter, and then enter **1** for the Point number of the starting point.
- 3. Enter **2** for the Point number of the next point.
- 4. Enter **.N** (dot N) to use the Northing/Easting filter, and then enter **5018657.3345** for the Northing value and **273727.9099** for the Easting value for the next point.
- 5. Enter **.N** to toggle off the Northing/Easting filter, and then use an Insertion Osnap to select the station block on the north side of the main road for the ending point.
- 6. Press **ENTER** twice.

You now have three tangent segments for the bridge abutment alignment.

<u>Click here</u> to see an illustration of the bridge abutment tangents.

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Enter **2** for the Point number of the next point.

Enter **.N** (dot N) to use the Northing/Easting filter, and then enter **5018657.3345** for the Northing value and **273727.9099** for the Easting value for the next point.

Enter **.N** to toggle off the Northing/Easting filter, and then use an Insertion Osnap to select the station block on the north side of the main road for the ending point.

Press **ENTER** twice.

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<u>nere</u> to see an illustration of the bridge abutment tangents.

# **Drawing Curves**

In this exercise, you will draw 700 m radius circular curves between each of the three tangent segments that you just drew.

- 1. On the Lines/Curves menu, click **Curve Between Two Lines**, select the first tangent line, and then select the second tangent line.
- 2. Press **ENTER** to accept the default, Radius, and then enter **700** m for the Radius.
- 3. Select the second tangent line, and then select the third tangent line.
- 4. Press **ENTER** to accept the default, Radius, enter **700** m for the Radius, and then press **ENTER**.

The three tangent segments are connected with circular curves to complete the bridge abutment alignment.

<u>Click here</u> to see an illustration of the bridge abutment alignment curves.

### rawing Curves

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ree tangent segments are connected with circular curves to complete the abutment alignment.

<u>nere</u> to see an illustration of the bridge abutment alignment curves.

# **Drawing Spirals**

In this exercise, you will draw a spiral-curve-spiral system to connect tangent segments on the main roadway alignment. First, verify that you will use a clothoid spiral.

- 1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **3**, click **Set Current**, and then click **OK**.
- 2. On the Lines/Curves menu, click **Create Spirals Spiral Type** to display the Spiral Type dialog box.
- 3. Verify that Clothoid is selected, and then click **OK**.
- 4. On the Lines/Curves menu, click **Create Spirals Fit Tangent-Tangent** to display the Fit Spirals Tangent to Tangent dialog box.
- 5. From the Description list, select **Spiral-Curve-Spiral**, and then click **OK**.
- 6. Select the left tangent, and then select the right tangent.
- 7. Enter **850** m for the Radius, and then enter **300** for the Spiral A in value.
- 8. Press **ENTER** to accept the default, 300, for the Spiral A out value, and then press **ENTER**.

The tangents are connected with spirals and an 850 m radius curve.

<u>Click here</u> to see an illustration of the main alignment spiral-curve-spiral system.

### rawing Spirals

exercise, you will draw a spiral-curve-spiral system to connect tangent nts on the main roadway alignment. First, verify that you will use a id spiral.

On the View menu, click **Named Views** to display the View dialog box. Under Name, select **3**, click **Set Current**, and then click **OK**.

On the Lines/Curves menu, click **Create Spirals** • **Spiral Type** to display the Spiral Type dialog box.

Verify that Clothoid is selected, and then click **OK**.

On the Lines/Curves menu, click **Create Spirals** • **Fit Tangent-Tangent** to display the Fit Spirals - Tangent to Tangent dialog box.

From the Description list, select **Spiral-Curve-Spiral**, and then click **OK**.

Select the left tangent, and then select the right tangent.

Enter **850** m for the Radius, and then enter **300** for the Spiral A in value.

Press **ENTER** to accept the default, 300, for the Spiral A out value, and then press **ENTER**.

ngents are connected with spirals and an 850 m radius curve.

<u>nere</u> to see an illustration of the main alignment spiral-curve-spiral system.

## Working with Speed Tables

In this exercise, you will use speed tables to draw a curve system for another part of the main roadway alignment. The design intent is to superelevate this roadway curve. Copy the Canada06 speed table to create a new speed table based on a design speed of 110 km/hr and 1000 m radius curve.

- 1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **4**, click **Set Current**, and then click **OK**.
- 2. On the Lines/Curves menu, click **Speed Tables Edit Speed Table** to display the Select Speed Table dialog box.
- 3. From the Speed Table list, select **canada06.sup**, and then click **OK** to display the Horizontal Speed Table dialog box.
- 4. From the Design Speed list, select **110** km/hr.
- 5. Click **Save As** to display the Save Horizontal Speed Table dialog box.
- 6. Enter **Tutorial** for the File name, and then click **Save** to return to the Horizontal Speed Table dialog box.
- 7. Click in the eighth row of the Speed Table (1000 m radius curve), and then click **Edit** to display the New/Edit Speed Table Item dialog box.
- 8. Enter **350** for the 4 Lane Spi A value, and then click **OK** to return to the Horizontal Speed Table dialog box.
- 9. Click **Save**, and then click **OK**.

Use the following steps to draw a new 4-lane curve system based on the Tutorial speed table for the main roadway alignment.

- 10. On the Lines/Curves menu, click **Speed Tables Create Curves**.
- 11. Select the left tangent, and then select the right tangent to display the Horizontal Speed Table dialog box.
- 12. Verify that **Tutorial.sup** is the current Speed table and 110 km/hr is the Design speed.
- 13. Click in the eighth row of the Speed Table column (1000 m radius), and then click **OK** to display the Select dialog box.

14. Click **Four Lanes** to create the spiral-curve-spiral system.

The tangents are connected with a curve system generated by the new speed table.

<u>Click here</u> to see an illustration of the speed table curve system.

## Attaching Multiple Alignment Objects

In this exercise, you will create an exit ramp alignment by attaching multiple alignment objects. First, offset the roadway centerline tangent 26 m south as the start of the ramp.

- 1. On the View menu, click **Named Views** to display the View dialog box, under Name, select **5**, click **Set Current**, and then click **OK**.
- 2. On the command line, enter **OFFSET**, enter **26** m for the Distance, and then select the left tangent on the left side of your screen.
- 3. Select a point below the tangent for the Side to offset, and then press **ENTER**.

Use the following steps to add a 1280 m radius curve to the right end of the ramp.

- 4. On the Lines/Curves menu, click Attach Multiple.
- 5. Select the right end of the new offset ramp tangent.
- 6. Enter **A** for the Arc option, and then press **ENTER** to accept the default, Radius.
- 7. Enter **1280** m for the Radius, press **ENTER** to accept the default, Length, and then enter **206.8** m for the Length.

Use the following steps to attach a compound spiral to the curve.

- 8. Enter **S** for the Spiral option, and then enter **C** for the Compound option.
- 9. Press **ENTER** to accept the default, 1280 m, for the Radius.
- 10. Enter **L** for the Length option, and then enter **54.397** m for the Length.
- 11. Enter **250** m for the Ending radius.

Use the following steps to attach another curve to the compound spiral.

- 12. Enter **A** for the Arc option, press **ENTER** to accept the default, Radius, and then press **ENTER** to accept the default, 250 m, for the Radius.
- 13. Press **ENTER** to accept the default, Length, and then enter **106.304** m

for the Length.

Use the following steps to attach a spiral to the curve.

- 14. Enter **S** for the Spiral option, and then enter **O** for the Outcurve option.
- 15. Press **ENTER** to accept the default, 250 m, for the Radius, enter **A** for the A factor option, and then enter **146.615** for the A factor.

Use the following steps to finish the ramp alignment by drawing a tangent segment.

- 16. Enter **T** for the Tangent option, and then enter **206.016** m for the Length.
- 17. Press **ENTER** to end the command.

The ramp alignment is represented by multiple alignment objects.

<u>Click here</u> to see an illustration of the ramp alignment.

Take a look at all of the alignment objects in the drawing.

18. On the View menu, click **Named Views** to display the View dialog box, under Name, select **1**, click **Set Current**, and then click **OK**.

This concludes the object drawing lesson. In the next lesson, you'll learn about defining and editing alignments.

# **LESSON 19: Defining and Editing Alignments**

Define alignments for roadway centerlines, curb lines, or other roadway features from polylines or individual entities. Edit alignments and generate alignment reports with the Horizontal Alignment Editor.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-19.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

# **ESSON 19: Defining and Editing Alignments**

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From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-19.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

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lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

# Defining an Alignment from a Polyline

In this exercise, you will define the first alignment from the red alignment polyline.

- 1. On the Alignments menu, click **Define from Polyline**.
- 2. Select a point on the polyline.

A red X appears at the starting point of the polyline.

- 3. Press **ENTER** to accept the starting point as the alignment reference point and to display the Define Alignment dialog box.
- 4. Enter **A1** for the Alignment name and **Alignment #1 Seguin Trail** for the Description.
- 5. Accept the Starting station of 0.000, and then click **OK** to continue.

The first alignment is defined from a polyline. Data for the new alignment is displayed on the command line including the alignment description, name, number, length, and starting and ending stations.

<u>Click here</u> to see an illustration of the A1 alignment.

If the alignment contains spirals it must be defined from entities, rather than defined from a polyline.

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Accept the Starting station of 0.000, and then click **OK** to continue.

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<u>nere</u> to see an illustration of the A1 alignment.

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# Defining an Alignment from Objects

In this exercise, you will define the second alignment from individual objects.

- 1. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.
- 2. From the Layer list, turn on the **CL-2** layer.

The yellow alignment on the CL-2 layer now appears in the drawing. This alignment is comprised of connected alignment objects. Define a second alignment from these objects, starting with the right end of the alignment.

- 3. On the Alignments menu, click **Define from Objects**.
- 4. Select the right end of the first tangent on the right end of the alignment.

A red X appears at the starting point of the alignment.

5. Use a window selection set to select the rest of the entities in the alignment, and then press **ENTER**.

Use the following steps to specify a reference point at the center of an existing circle positioned on the alignment, and then specify a reference station value.

- 6. At the Select Reference Point prompt on the command line, enter '- **VIEW** (apostrophe dash VIEW), **R** for the Restore option, and then **3** for the view to restore.
- 7. Use a Center Osnap to select the center of the circle as the reference point, and then enter **15778.63** for the Reference station value.
- 8. Press **ENTER** to display the Define Alignment dialog box.
- 9. Enter **A2** for the Alignment name and **Alignment #2 Highway 69** for the Description.
- 10. Accept the Starting station value of 15299.008, and then click **OK** to continue.
- 11. On the View menu, click **Named Views** to display the View dialog box. Under Name, select **2**, click **Set Current**, and then click **OK**.

The second alignment is defined from objects.

<u>Click here</u> to see an illustration of the A2 alignment.

## Viewing and Editing Alignment Data

In this exercise, you will use the Horizontal Alignment Editor to view and edit PI, curve, and spiral data for alignment A2.

1. On the Alignments menu, click **Edit** to display the Horizontal Alignment Editor.

Use the following steps to view data for the first curve in the alignment.

- 2. In the Edit section, click in the second row of the Station column, and then click **Edit Curve** to display the Curve Detail Window.
- 3. When you have finished reviewing the data for the first curve, click **Next** to view data for the second curve.
- 4. When you have finished reviewing the data for the second curve, click **OK** to return to the Horizontal Alignment Editor.

Use the following step to change the Northing value for the fourth PI point of the alignment to move it south 40 m.

5. Click in the fourth row of the Northing column, enter **5018525.433** as the new Northing value, and then press **ENTER**.

The station and direction values change for the adjacent tangent segment in the alignment.

### ewing and Editing Alignment Data

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When you have finished reviewing the data for the first curve, click **Next** to view data for the second curve.

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# Generating Alignment Reports

In this exercise, you will generate an alignment report file.

- 1. In the Horizontal Alignment Editor, in the Reports section, click **Settings** to display the Output Settings dialog box.
- 2. In the Output Options section, select the **File** check box.

Specify a name and location for the alignment report file.

- 3. Click **Output File Name** to display the Output File Name dialog box, specify a location for the alignment report file, and then enter **Report1.prn** for the Output file name.
- 4. Click **Save** to return to the Output Settings dialog box, and then click **OK** to return to the Horizontal Alignment editor.
- 5. Click **Station/Curve**, press **ENTER** to accept the default beginning station, and then press **ENTER** to accept the default ending station.
- 6. Press **ENTER** to accept the default Output file name, Report1.prn, and display the Horizontal Alignment Station and Curve Report dialog box.
- 7. When you have finished reviewing the data in this dialog box, click **OK** to return to the Horizontal Alignment Editor dialog box.
- 8. Click Save, and then click **OK**.

The alignment has moved in the drawing to reflect the changes made in the Horizontal Alignment Editor.

This concludes the alignment creation and editing lesson. In the next lesson, you'll learn about stationing and offsetting alignments.

### enerating Alignment Reports

exercise, you will generate an alignment report file.

In the Horizontal Alignment Editor, in the Reports section, click **Settings** to display the Output Settings dialog box.

In the Output Options section, select the **File** check box.

Specify a name and location for the alignment report file.

Click **Output File Name** to display the Output File Name dialog box, specify a location for the alignment report file, and then enter **Report1.prn** for the Output file name.

Click **Save** to return to the Output Settings dialog box, and then click **OK** to return to the Horizontal Alignment editor.

Click **Station/Curve**, press **ENTER** to accept the default beginning station, and then press **ENTER** to accept the default ending station.

Press **ENTER** to accept the default Output file name, Report1.prn, and display the Horizontal Alignment Station and Curve Report dialog box.

When you have finished reviewing the data in this dialog box, click **OK** to return to the Horizontal Alignment Editor dialog box.

Click Save, and then click **OK**.

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## LESSON 20: Creating Alignment Stationing and Offset

Station alignments to define even increments of alignment measurement. Create offsets to quickly generate roadway details such as edge of pavement, edge of shoulder, and so on.

#### To work through this lesson follow these steps

- 1. Start AutoCAD Land Desktop if you have not already done so.
- 2. On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

- 3. From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-20.dwg**, and then click **OK**.
- 4. On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

Working through these lessons will result in alteration of the project files. Backup copies of these project files can be found in the c:\Program Files\AutoCAD Land Desktop <Version Number>\Landtut folder.

If this lesson has been previously run, copy these unaltered project files to the \Land Projects <\Version Number> folder when starting a new tutorial session to ensure that the sequence outlined in each lesson can be followed properly.

### ESSON 20: Creating Alignment Stationing and Offsets

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On the File menu, click **Open** to display the Open Drawing: Project Based dialog box.

The default location folder for project files is c:\Land Projects <Version Number>. If you opted to install these files in another location instead, specify the appropriate project path.

From the Project Name list, select **TUTORIAL2**, from the Select Project Drawing list, select **Lesson-20.dwg**, and then click **OK**.

On the Projects menu, click **Workspaces** to display the Workspaces toolbar. In the list, select Land Desktop to display the Land Desktop menus.

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lesson has been previously run, copy these unaltered project files to the Projects <Version Number> folder when starting a new tutorial session to that the sequence outlined in each lesson can be followed properly.

### Changing Station Settings

In this exercise, you will change station settings by specifying the station base value, adding a layer prefix, and beginning of curve and curve/tangent intersect labels.

- 1. On the Alignments menu, click **Station Display Format** to display the Edit Station Format dialog box.
- 2. In the Station/Chainage Numeric Format section change the Station base value to **1000** by moving the slider to the right, and then click **OK**.
- 3. On the Alignments menu, click **Alignment Labels** to display the Alignment Labels Settings dialog box.
- 4. In the Layer Prefix section, enter \*- (asterisk hyphen) for the Layer prefix.

This will append the alignment name automatically to all of the layers that are automatically created when generating alignment stationing.

5. In the Label Text section, enter **BC** for the Beginning of curve and **EC** for the Curve/Tangent intersect, and then click **OK**.

Although stationing can be accomplished in a single operation, this lesson shows you how to create station labels with a specific text style and offset first, and then station point labels with a different text style and offset.

- 6. On the Alignments menu, click **Station Label Settings** to display the Alignment Station Label Settings dialog box.
- 7. Clear the **Station point labels** check box, enter **50** m for the Station label increment, **10** m for the Station tick increment, and **2** m for the Station label offset, and then click **OK**.
- 8. On the Utilities menu, click **Set Text Style** to display the Text Style dialog box.
- 9. From the Style Name list, select **2MM**, and then click **Close**.

You now have a new station label style.

### Generating Alignment Stationing

In this exercise, you will add station labels to the alignment. First, set alignment A1b as the current alignment.

- 1. On the Alignments menu, click **Set Current Alignment**, and then press **ENTER** to display the Alignment Librarian dialog box.
- 2. From the Selection list, select **A1b**, and then click **OK**.
- 3. On the Alignments menu, click **Create Station Labels**.
- 4. Accept the default beginning and ending station values, and then press **ENTER** to accept the default, Yes, to delete existing stationing layers.

The station labels are automatically generated.

<u>Click here</u> to see an illustration of the station labels.

Use the following steps to add station point labels to the alignment.

- 5. On the Alignments menu, click **Station Label Settings** to display the Alignment Stationing Settings dialog box.
- 6. Clear the **Station labels** check box, select the **Station point labels** check box, enter **25** m for the Station label offset, and then click **OK**.
- 7. On the Utilities menu, click **Set Text Style** to display the Text Style dialog box.
- 8. From the Style Name list, select **3MM**, and then click **Close**.

You now have a new station point label style.

- 9. On the Alignments menu, click **Create Station Labels**.
- 10. Accept the default beginning and ending station values, and then press **ENTER** to accept the default, Yes, to delete existing stationing layers.

The station point labels are automatically generated. When you are working with some smaller-radius curves the station point labels may need to be manually adjusted for clarity.

11. Zoom in on the alignment to view the station point labels.

<u>Click here</u> to see an illustration of the station point labels.

# **Creating Offsets**

In this exercise, you will add edge of pavement, shoulder, and right-of-way offsets to the alignment.

- 1. Zoom to the previous view.
- 2. On the Alignments menu, click **Create Offsets** to display the Alignment Offset Settings dialog box.
- 3. In the Outer offset section, enter **0** (zero) m for the Left offset and **25** m for the Right offset.
- 4. In the Second offset section, select the Second offset check box, and then enter **6.5** m for both the Left and Right offsets.
- 5. In the Inner offset section, verify that the Left and Right offset value is 4.25 m, and then click **OK**.

The alignment offsets are automatically generated.

<u>Click here</u> to see an illustration of the alignment offsets.

When working with the Alignment Offset Settings dialog box, you do not have the option of automatically erasing alignment offset objects. To avoid generating duplicate alignment offset objects click **Cancel** to exit the Alignment Offset Settings dialog box when you are only checking settings.

This concludes the AutoCAD Land Desktop tutorial.

For more information about the features of AutoCAD Land Desktop, see the online help.

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Zoom to the previous view.

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### **Civil Engineering Tutorials**

NOTE The Civil Engineering Tutorials described in this chapter are available when you install AutoCAD® Civil 3D® Land Desktop Companion 2008. The stand-alone installation of AutoCAD Land Desktop does not include these features.

Welcome to the Civil Engineering Tools tutorial.

This tutorial has 16 lessons about profiles, cross sections, templates, superelevation, transitioning, and grading.

You can work through these lessons sequentially, or you can do one lesson at a time. Every lesson has a tutorial drawing and an accompanying dataset.

Click Lesson 21 in the Contents tab to move to the next task..

### vil Engineering Tutorials

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<u>Lesson 21</u> in the Contents tab to move to the next task..

### Surveying Tutorials

NOTE The Surveying Tutorials described in this chapter are available when you install AutoCAD® Civil 3D® Land Desktop Companion 2008. The stand-alone installation of AutoCAD Land Desktop does not include these features.

Welcome to the surveying tools tutorial.

This tutorial has two lessons about working with survey data:

- Lesson 37: Using Survey Toolspace. This lesson provides exercises on adding, editing, and viewing survey data using the Survey Toolspace, which is a centralized interface for managing and editing survey control point data, survey setup data, survey observation data, and survey figure data.
- Lesson 38: Using Other Survey Features: This lesson provides exercises on other Survey features as well as alternative ways of inputting, adjusting, and viewing survey data.

The surveying tools contain a complete set of tools for the surveyor to download and process survey information, perform adjustments on network and traverse data, and import those survey points into an AutoCAD drawing.

The surveying tools also provide additional options for detailing points with figures and line work. Other options provide the capability of calculating directions based on Sun and Starshot information. For more information, see the Surveying Tools online Help.

**Note** Before using this tutorial, you should be familiar with AutoCAD Land Desktop. If you haven't had experience using the AutoCAD Land Desktop, review the AutoCAD Land Desktop Tutorial.

Click Lesson 37 in the Contents tab to move to the next task.

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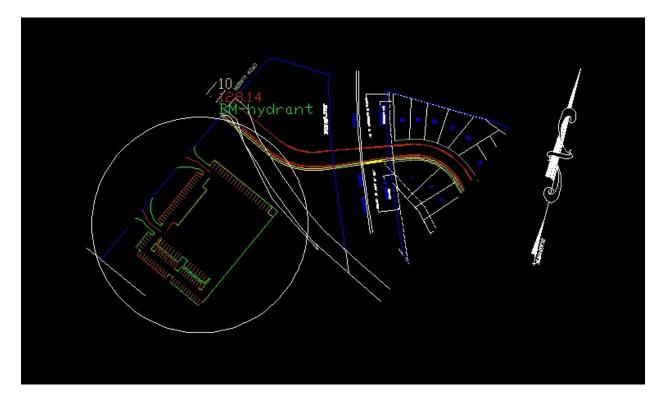
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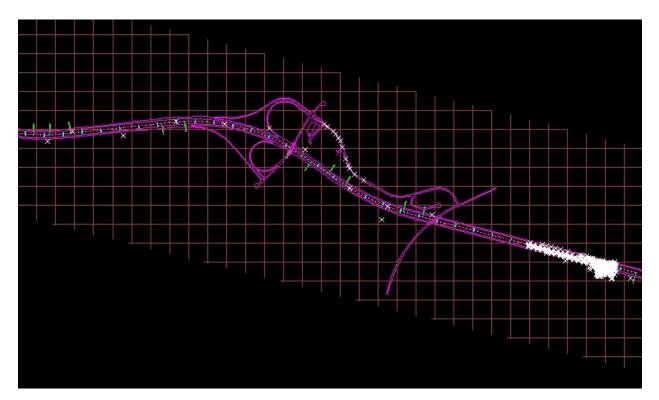
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<u>Lesson 37</u> in the Contents tab to move to the next task.

#### North Arrow



### **Quick View Points**



#### **Reinserted Points**



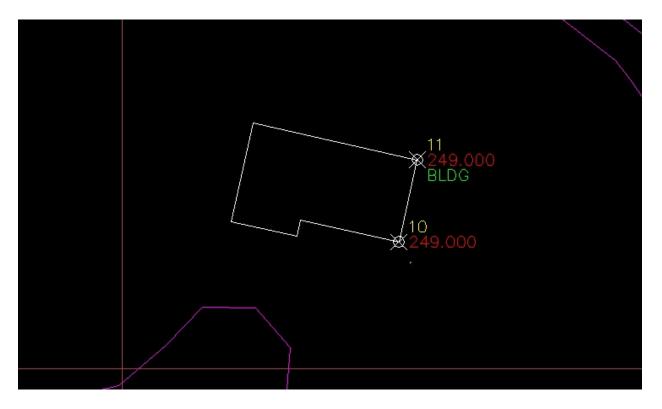
**Point 758 Display Parameters** 



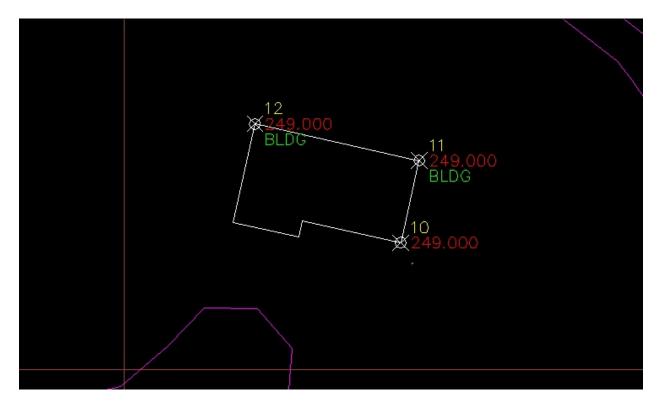
#### **Point Leader**



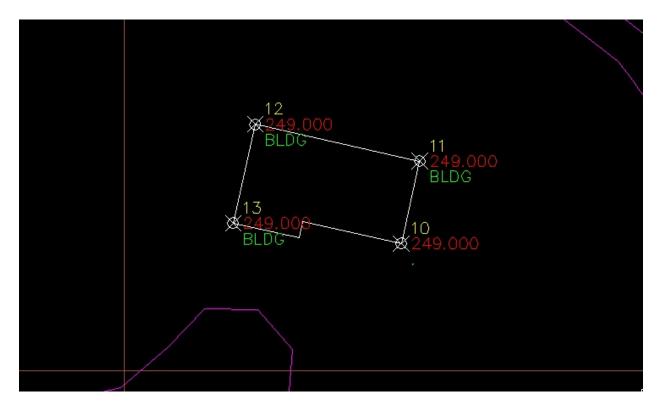
#### **First and Second Points**



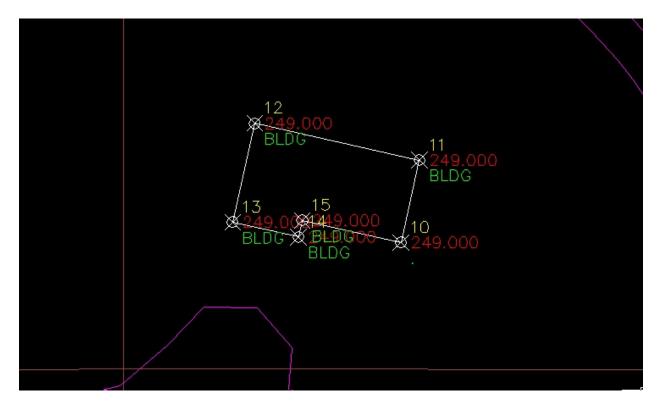
#### **Third Point**



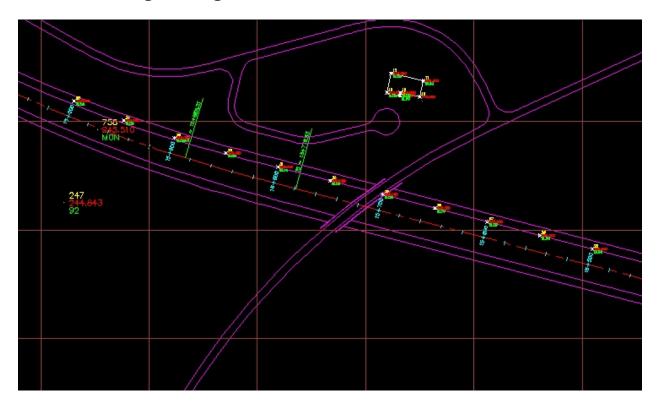
#### **Fourth Point**



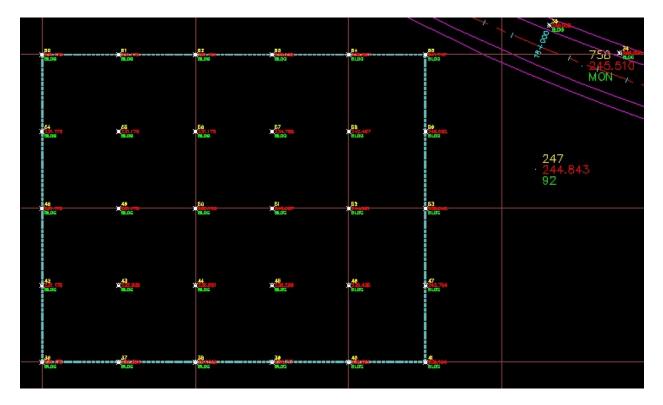
#### Fifth and Sixth Points



Points Set Along the Alignment



#### **Points Set On the Surface**



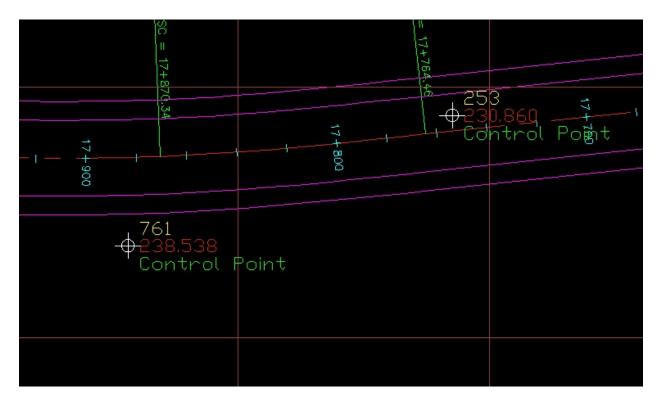
#### **Moved Point 247**



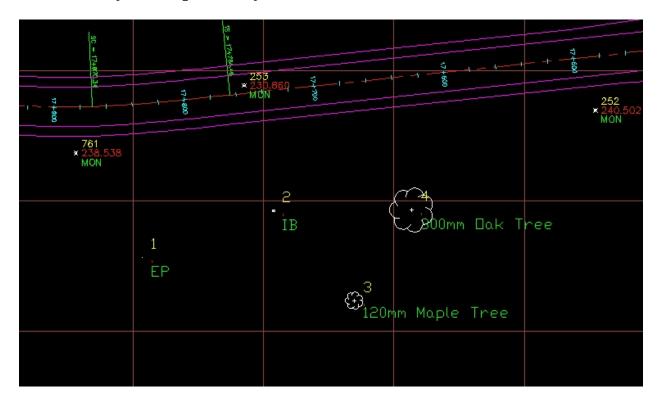


### Moved Alignment and Alignment Points

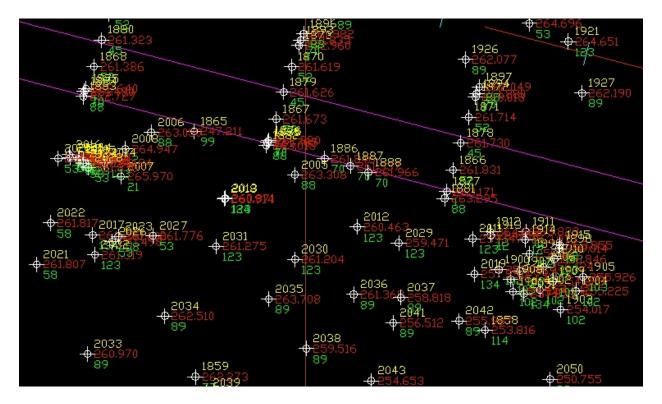
#### **Points with Control Point Override**



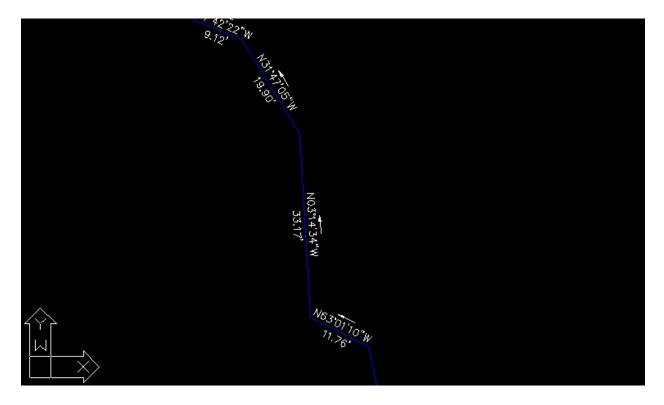
### Points Set by Description Keys



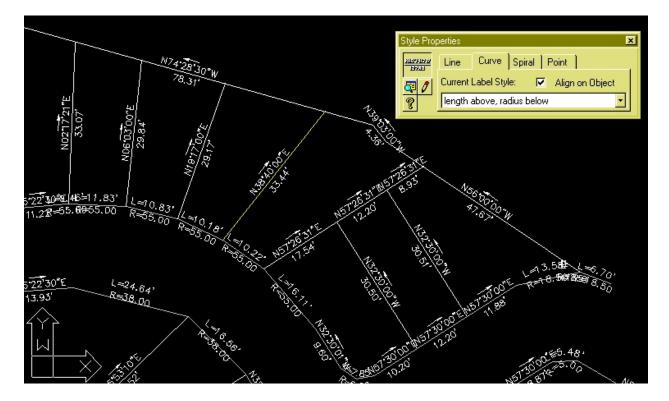
#### **Inserted Point File Points**



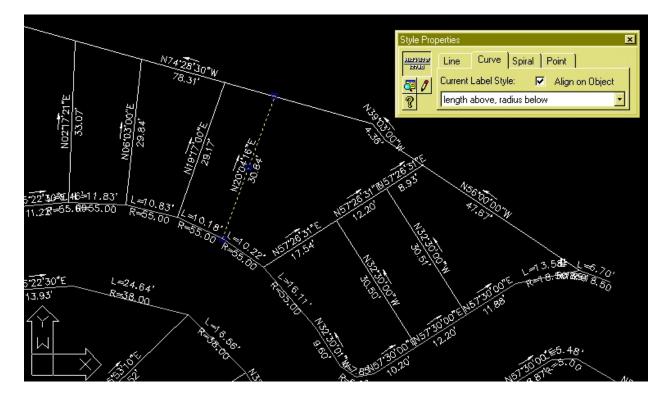
### Static Line Labels



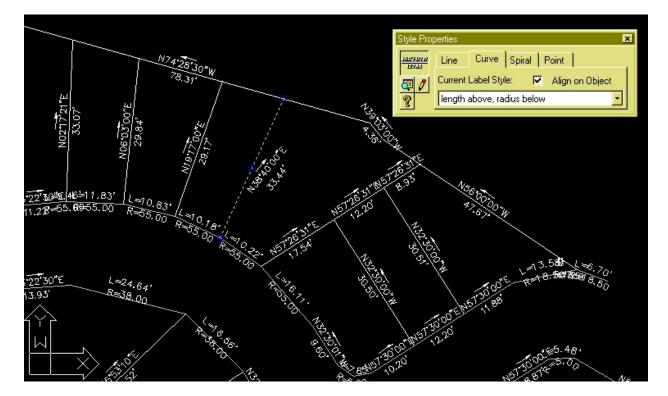
#### **Dynamic Line Labels**



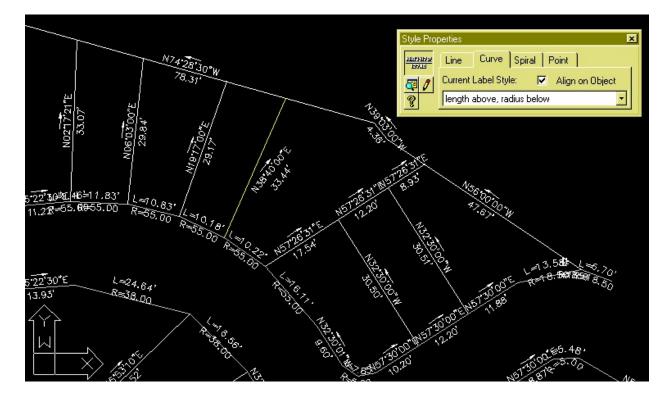
### **Updated Dynamic Label**



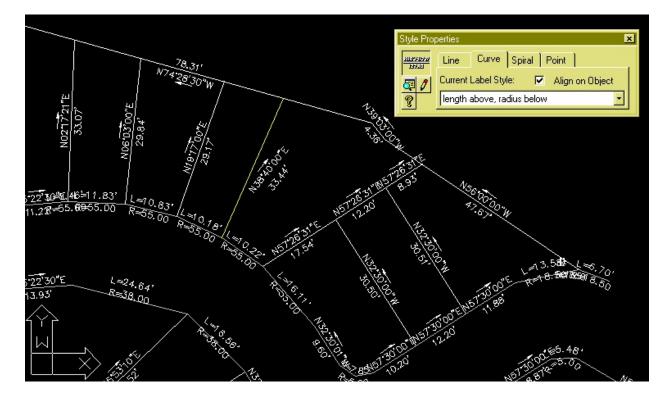
### Non-Updated Dynamic Label



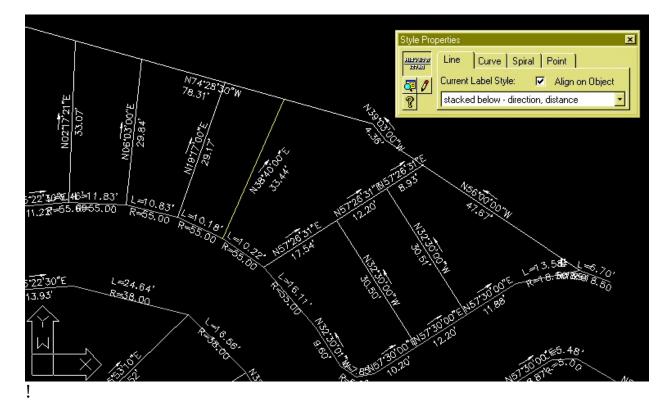
#### **Disassociated Label**



### Swapped Label Text



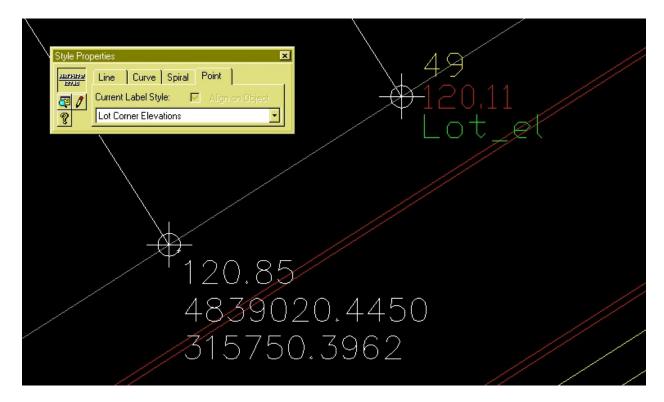
### New Dynamic Label Style



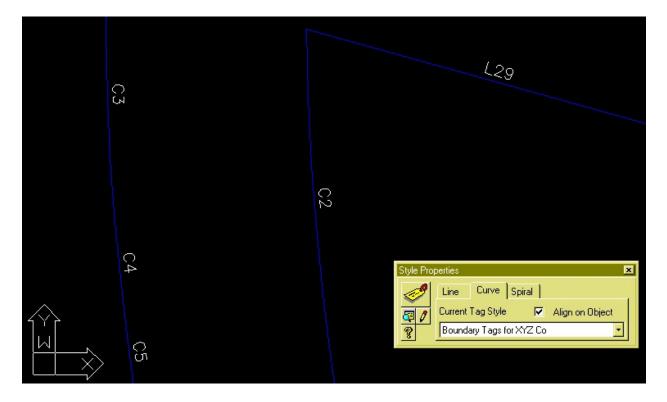
Lot Plan for XYZ Co Line Label

ALL CONTRACTOR	Current Label Style: Align on Object Cot plan for xyz co	Current Label Style: Align on Object Current Label Style: Align on Object Lot plan for xyz co	Current Label Style: Align on Object Current Label Style: Align on Object Lot plan for xyz co	Style Prop	perties	
Lot plan for xyz co	Lot plan for xyz co	Lot plan for xyz co	Lot plan for xyz co	SILPFINW ENLID	Line Curve S	piral Point
PLot plan for xyz co	PLot plan for xyz co	PLot plan for xyz co	PLot plan for xyz co		Current Label Style:	Align on Object
10-851 10 10-13/4 13-14 13-16 13-16	10-851 10-13-14 13-14 13-14 13-14 13-14 14-14 13-14 14-14 13-14 14	10-851 10-13-14 13-14 13-14 13-14 13-14 14-14 13-14 14-14 13-14 14	10-851 10-13-14 13-14 13-14 13-14 13-14 14-14 13-14 14-14 13-14 14	8	Lot plan for xyz co	•
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	AP-PART - AP-PAR					
P WE DE PART	* 400 m	H H H H H H H H H H H H H H H H H H H	H H H H H H H H H H H H H H H H H H H			

#### **Lot Corner Elevation Point Label**



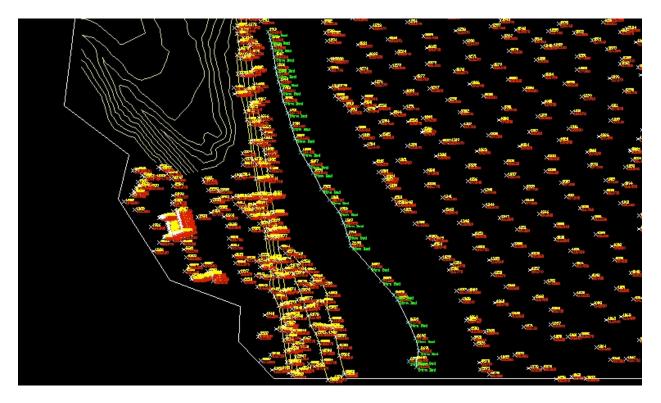
### **Boundary Line Tags**



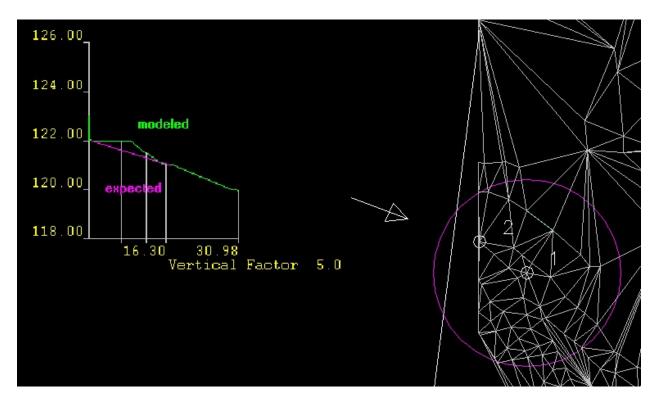
#### Line Table

LINE TABLE									
LINE	LENGTH	BEARING	START NORTHING	START EASTING					
L	1 83.24	S22°15′45″E	4838741,3335	315741,5921					
Lá	2 12.20	\$59*35′40 <b>*</b> E	4838664.2975	315773.1279					
L	3 41.15	N36*54/15*E	4838658,1244	315783.6474					
L	1 57.49	N41°47′55″E	4838691.0280	315808.3559					
L	5 2,96	N23*18/46*W	4839020,8289	315829,8754					
Lt	5 91,63	N63°12'10*W	4839023.5445	315828,7052					
L7	7 90.23	N74*28'30*W	4839064.8567	315746.9111					
L8	3 55.13	208°35′30″E	4839010.7247	315666.0541					
LS	9 15.42	\$36*19/55 <b>*</b> E	4838956.2094	315674.2906					
L10	9,12	S67°42′22*E	4838943,7879	315683,4258					
Li	1 19.90	\$31*47′05*E	4838940.3275	315691.8656					
L12	2 33.17	S03*14/34 <b>*</b> E	4838923,4119	315702,3475					
L13	3 11.76	S63*01/10 <b>*</b> E	4838890.2924	315704.2239					
L14	30,41	S12*11/24*E	4838884.9588	315714.7004					
L15	5 91,77	S22°34/51″E	4838855.2387	315721.1206					
L16	32.69	\$26*51/17*W	4838770.5004	315756.3604					
L17	7 1,28	N23°34′24*E	4838741.3335	315741.5921					
ή <u>Γ΄</u> L18	3 39.55	N39*45'30*E	4839083.1816	315538.2497					
L19	7,46	N75°18′41″E	4839113.5856	315563,5439					
	39.40	\$72°40′30″E	4839115.4772	315570.7601					
4	1 5.91	S76*37′45*E	4839103.7442	315608.3726					

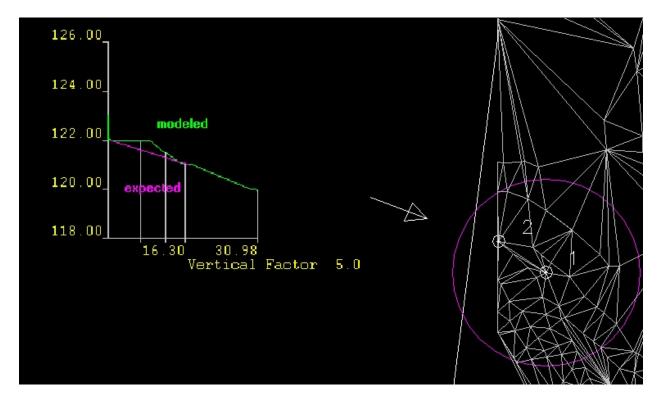
### Streambed Breakline



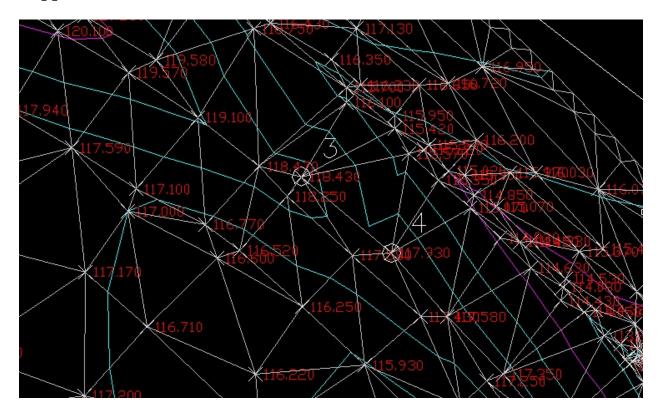
#### **Point Added to Surface**



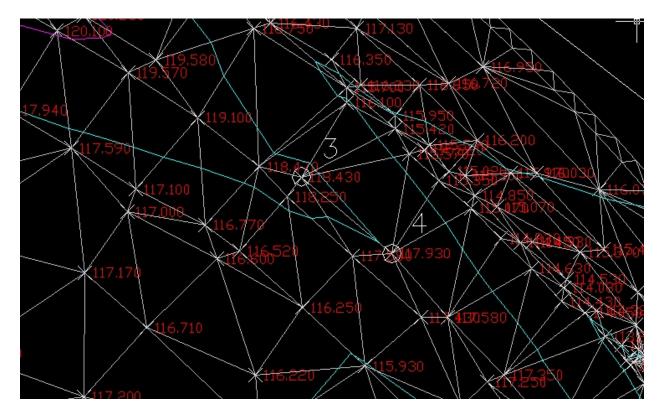
#### **Added TIN Line**



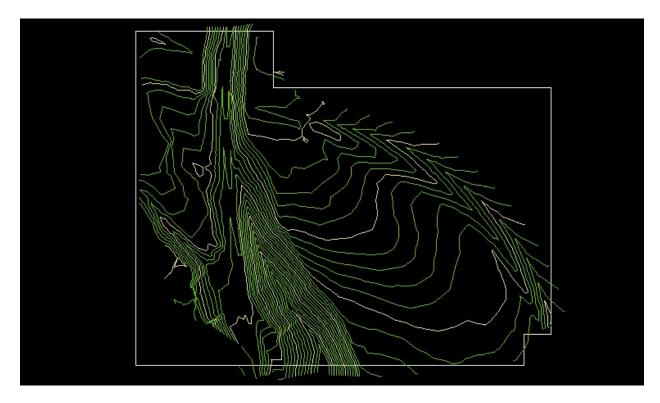
### Flipped TIN Line



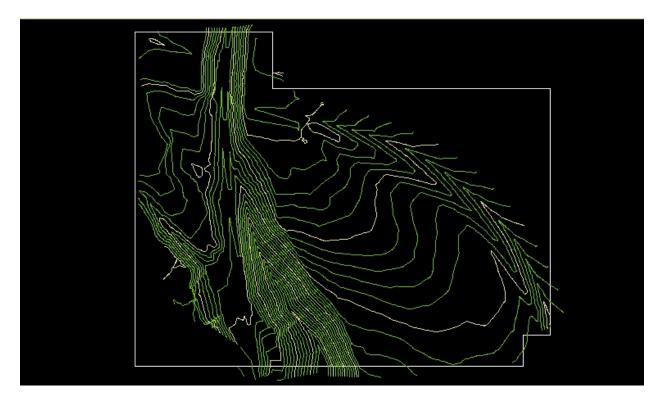
### **Recreated Contours**



#### Area1C Contours



Contours with New Style Applied



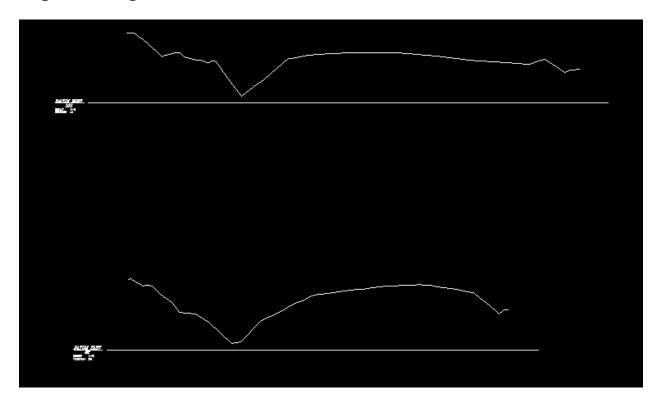
#### **Labeled Contours**



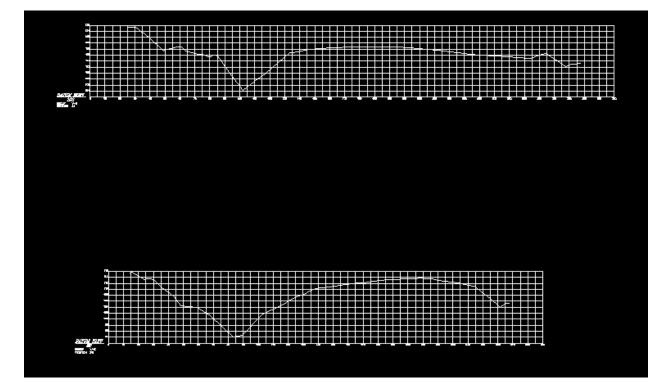
#### **Edited Contours**



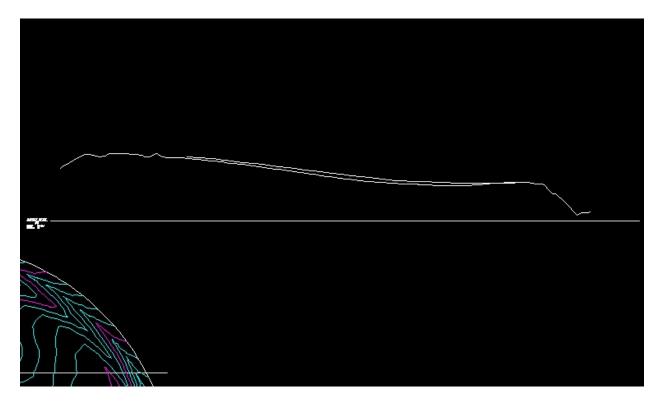
# Imported Single Surface Sections



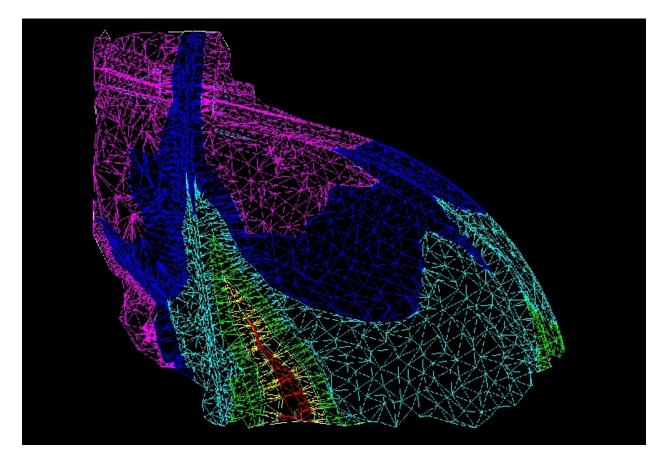
**Imported Single Surface Sections with Grid** 



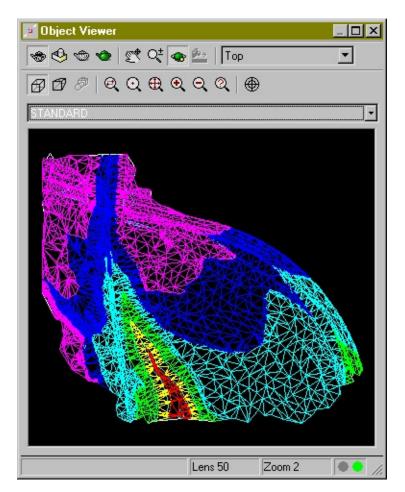
### Imported Multiple Surface Section



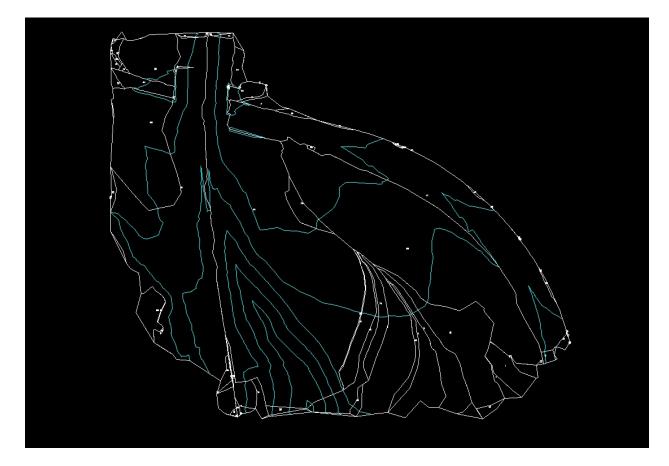
# **3D Face Elevation Banding**



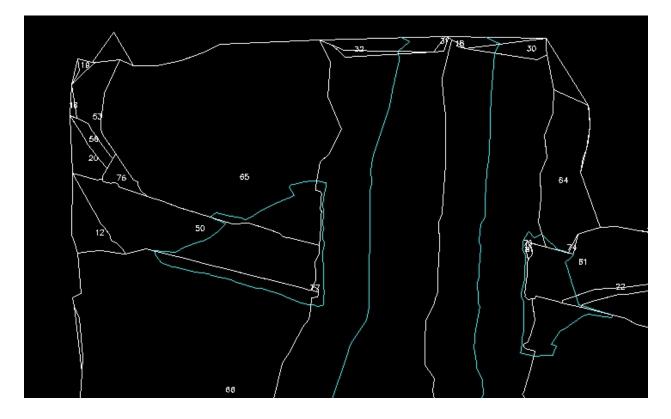
**Elevation Banding in the Object Viewer** 



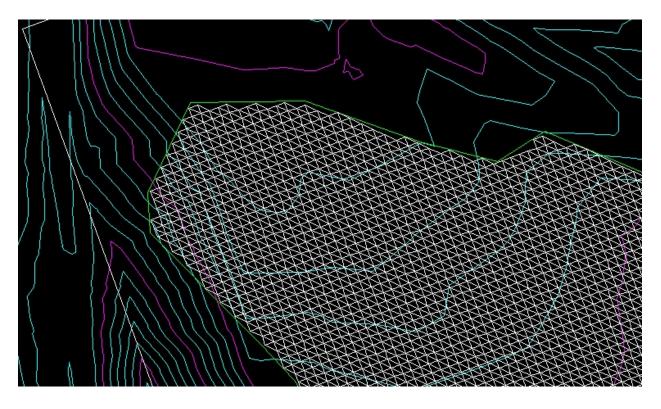
### Watershed Boundaries



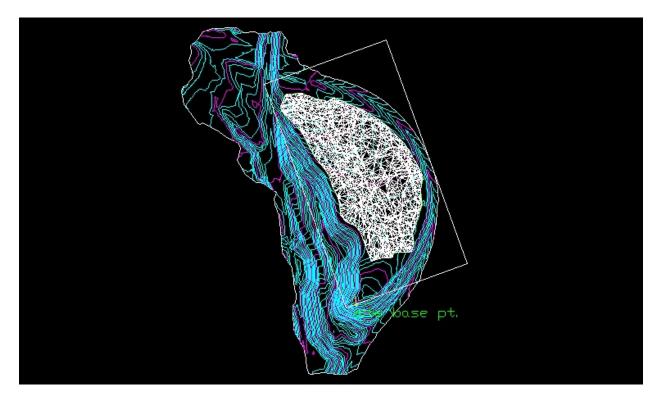
### Watershed Numbers



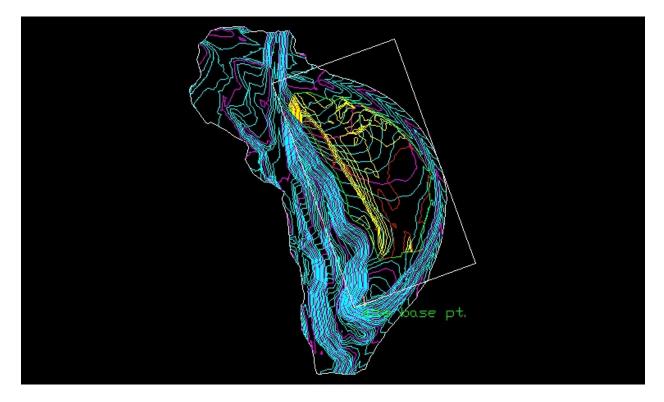
# Grid Volumes Surface Quick View



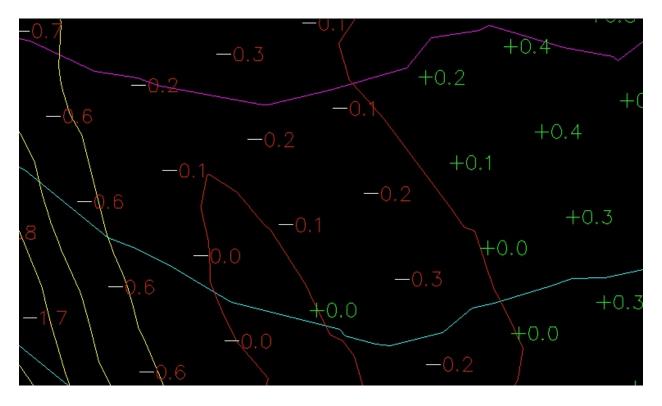
**Composite Volumes Surface Quick View** 



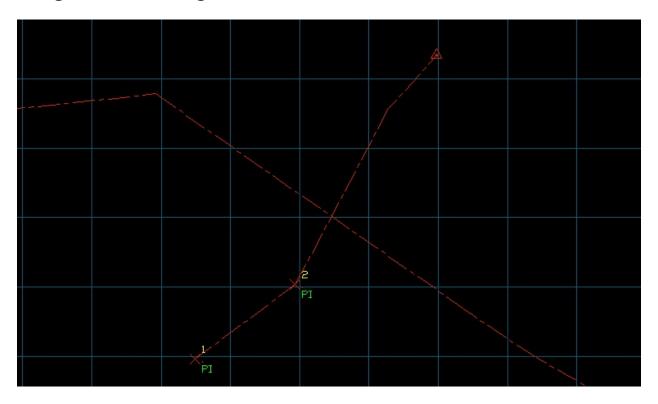
### **Cut and Fill Contours**

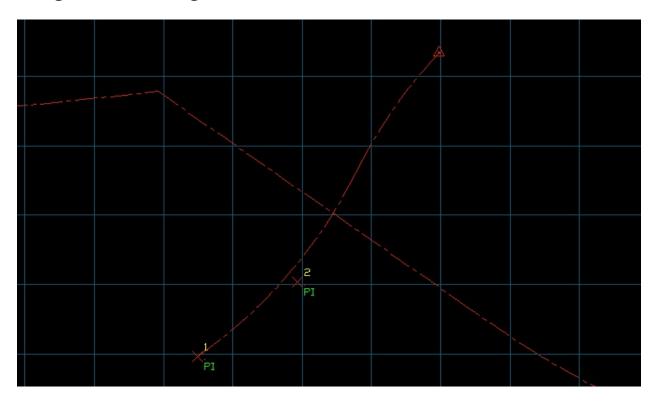


### **Grid Ticks and Labels**



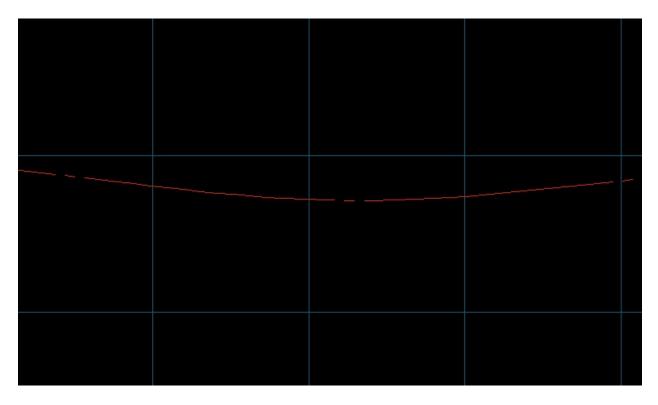
# Bridge Abutment Tangents



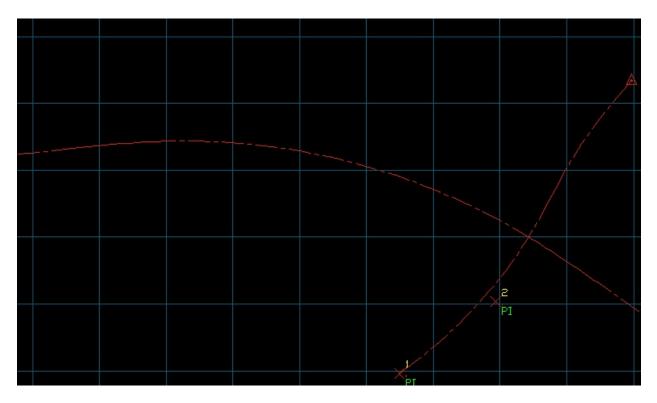


# Bridge Abutment Alignment Curves

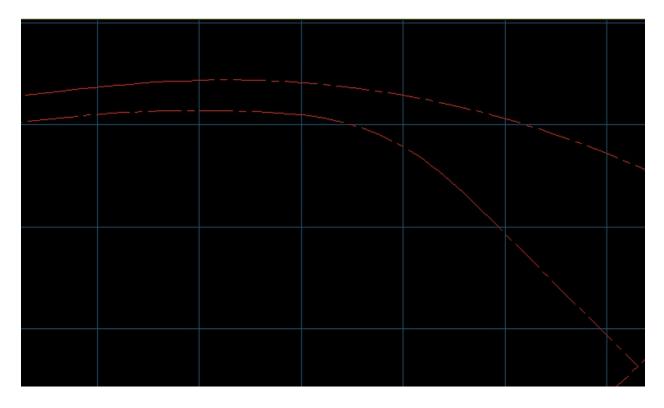
# Main Alignment Spiral-Curve-Spiral System



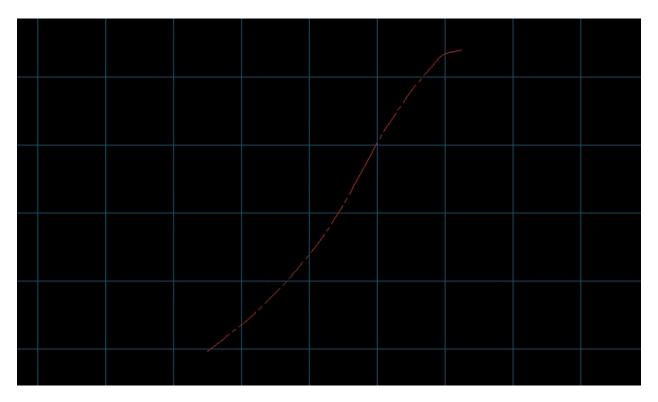
# Speed Table Curve System



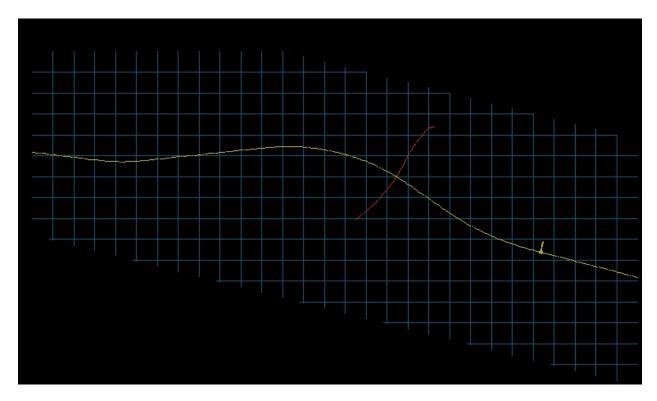
### Ramp Alignment



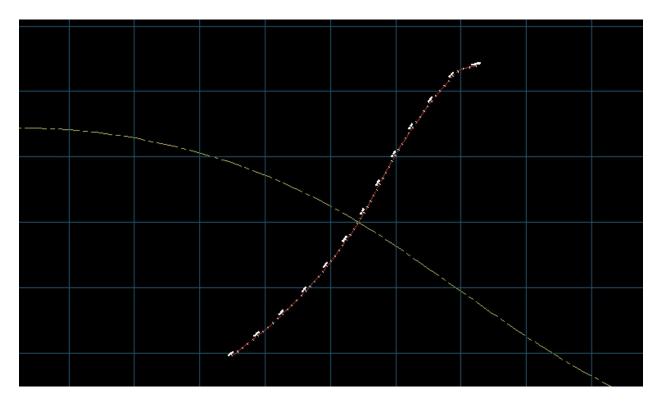
# A1 Alignment



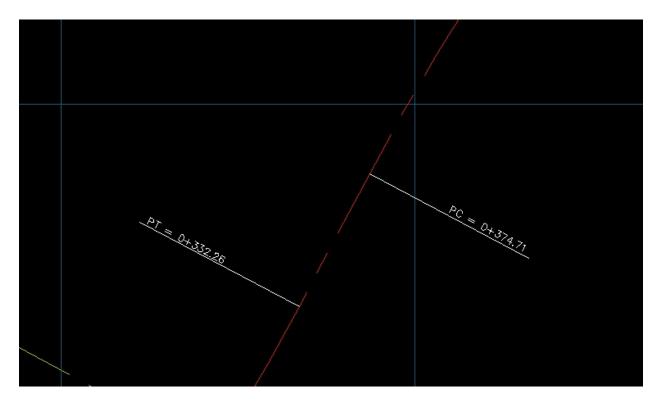
### A2 Alignment



#### **Station Labels**



#### **Station Point Labels**



# Alignment Offsets

