

Section 8

Reference

Document Conventions

This document uses standard software documentation conventions to explain how the software works. These conventions are described below.

Click/click on - Press the left mouse button (assuming the buttons are set to the default settings).

Double-click - Press the left mouse button twice in rapid succession.

Right-click - Press the right mouse button.

Click and hold - Press and hold down the left mouse button.

Shift/Ctrl + click - Press and hold down the Shift/Ctrl key then press the left mouse button.

Click and drag - Press and hold the left mouse button, then move the mouse.

Ctrl + (Key) - Press the Ctrl key then press the keyboard key noted in the step.

Press - Push a specified key on the keyboard.

Select - Use the mouse to pick an item on the screen or menu command.

Menu Commands - When documenting a menu command, the command is described using the following format: **Menu > Command**. If there is more than one level to the menu, it appears as a Submenu. For example, **Options > Sound Preference > Sound Card**.

Data Entry/File Names - If a file is specified in a procedure, or if specific text needs to be entered into a field as part of a procedure, it will appear inside double quote marks.

User Interface

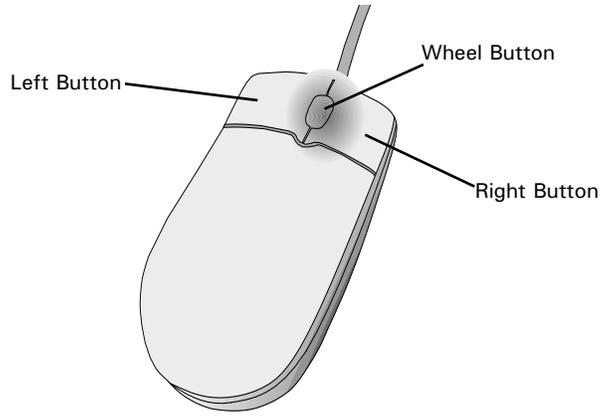
Earthwork 4D relies on the keyboard for alphanumeric entry and keyboard shortcut, and the mouse for non-digitized editing and entry.

The Keyboard

Most tasks are available on menus and the toolbar at the top of the screen, but the tasks can also be accessed through keyboard shortcuts shown next to the command in the menus.

The Mouse

Earthwork 4D makes extensive use of the mouse throughout the program. A wheel-style center button mouse is highly recommended. The mouse is used for data entry and editing.



The **Left** button is used to select objects and choose menu items.

The **Right** button is used to display the Right-Mouse menu. This menu displays quick access to specific commands.

The **Wheel Button** allows the user to zoom in or out over the location of the arrow (or a segment if selected) by rolling the wheel Up or Down respectively. Holding the button down and moving the mouse allows the user to pan the view on the screen.

Pull Down Menus

Menu commands can be selected from pulldown menus by clicking on the menu then clicking the command. A submenu is noted by an arrow pointing to the right after the command name. Click on the command with the submenu to view the available commands and click on the command in the submenu to select it. Menus and commands displayed in gray are not available.

Buttons



A button is selected by placing the cursor over the button and clicking it.

Check Boxes and Radio Buttons



Check Boxes and Radio Buttons are used to display whether an option is enabled or disabled. When filled, the option is on.

Checks



Checks indicate that a certain command option is enabled. These appear in menus and submenus in Earthwork 4D.

The Arrow



The arrow is used for selecting items only.

The Crosshair



The crosshair means the program is in Entry Mode.

Selecting

Selecting is done by placing the arrow over the object and clicking it. Multiple items can be selected by pressing and holding the Shift key while selecting the items.

Text Boxes

Text Boxes are used to input values. Select the text box to add or modify the data. The text cursor can be moved with the TAB key or by selecting a new text box.

Screen Modes

Earthwork 4D operates in several modes, each with a different purpose and a different set of menus and commands to perform specific tasks associated with that mode. Below is a description of each of the modes.

CAD Transfer Mode



CAD Transfer Mode is used to transfer the layers of a CAD file into the job file. Different layers can be chosen and sent either the Design or Existing Surface. The data can be further defined by transferring the lines to a specific layer within each surface.

Edit Mode



Edit Mode is used to edit job data and data lines once data has been entered or transferred.

Entry Mode



Entry Mode is used to enter job data and supporting data lines.

Profile View Mode



Profile View Mode is used to create two-dimension profile views across the 2D Plan View. Profile Lines can also be used to generate stations.

Plan View Mode



Plan View Mode is a colorized, two-dimensional cut-fill shaded plan view of the data. Plan View labels and the cut-fill shade table can also be displayed in Plan View Mode.

3D View Mode



3D View Mode is used to review the job using a three-dimensional model. A virtual drive-through can be done to inspect the job and volume quantities can be calculated in 3D View Mode. Results of adding additional job data can be seen instantly by the 3D View terrain once the data has been added.

Volume Report Mode



Volumes Report Mode displays the calculated volumes within the defined report regions.

Haul Report Mode



Haul Report Mode displays the calculated balance regions.

Print Preview Mode



Print Preview Mode displays the print page and allows the user to arrange the print page. Both 2D views and 3D views can be sent to the print page, along with reports. Titles, images and additional text can also be added.

Keyboard Shortcuts

Earthwork 4D contains many commands that can be accessed by both the menus and by keyboard shortcuts. Below is a list of these commands, their keyboard shortcut and a brief description of the command along with the mode in which the command is used.

Changing Mode

-  Switches to Edit Mode from any other mode. Toggles between Edit and Entry Modes.
-  Switches to 3D View Mode from any other mode.
-  Switches to Print Preview Mode from any other mode.
-  Switches to CAD Transfer Mode from any other mode.
-  Switches to Plan View Mode from any other mode.
-  Switches to Highway Mode. Toggles between Highway Mode and Haul Report Mode.
-  Switches to Profile View Mode from any other mode.

CAD Transfer Mode

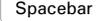
-  Deselects any selected line.
-  Zooms out to the extents of the job and restores the default viewing parameter.
-   Moves the cursor in the direction of the arrow selected.
-  
-  (select) Pressing the Shift key selects additional lines without deselecting other line.
-  (select) Pressing the Ctrl key selects additional lines without deselecting other lines.
-  Zooms in or out over cursor location.
-  -  Rotates displayed PDF right and left respectively in 45 degree increments.
-  and  Zoom in and out.
-  Deletes the currently selected line(s).
-  Sends the currently selected CAD Line(s)/Layer(s) to the selected Surface and Layer
-  "Sticky Zoom" toggle, allows zooming to a selected point.
-  Toggles on or off the display of Plus Marks on data line.
-   Hides the currently selected line(s)
-   Displays all hidden data.
-   Undo the last edit up to the last eight edits.
-   Redo previously undone edits.

Edit and Entry Modes

-  Zooms out and centers the 2D Plan View to view the entire file.
-   When the cursor is placed over the 2D Plan View, the Arrow keys move in the direction the Arrow key is pointing. When the cursor is placed over the Elevation List, the Up/Right and Down/Left arrows move up and down the list.
-  
-  -  In Entry Mode, the Number keys and the Period key are used to enter elevations, which appear in the Current Elevation Entry box at the bottom of the screen. In Edit Mode, these keys are used only when a line is selected. Typing a number displays the Point Editor dialog box, with changes made affecting the value in the Elevation box.
-  (select) Pressing the Shift key selects additional lines without deselecting other lines.
-  -  Zoom in and out.
-  Deletes currently selected line(s).
-  Deletes the previously entered point one at a time (Entry Mode only).
-  -  Rotates the terrain view right and left respectively in 45 degree increments while in Edit mode.
-  In Entry mode, displays the Edit Point/Line Labels dialog box.
-  -  With the terrain displayed, increases and decreases the view angle.
-  -  With the terrain displayed, increases and decreases the elevation magnification.
-  Displays the length and area for a selected line (Edit Mode only).
-  Toggles the display of the 3D terrain, PDF and a blank background.
-  Toggles on or off the display of the 2D Plan View (overlay).
-  Toggles on or off the location and display of the compass.
-  Displays the most recently selected Guide
-  Toggles the displayed PDF between low and high contrast.
-  Toggle on or off the Snap function.
-  "Sticky Zoom" toggle, allows zooming to a selected point.
-  With the terrain displayed, toggles between land view and sky view.
-  With the terrain displayed, moves the view above the vehicle.
-  With the terrain displayed, moves the view down to ground level.
-  View from inside vehicle.
-  View from 50 feet behind vehicle.
-  View from 50 feet left side of vehicle.
-  View from 50 feet right side of vehicle.
-  Breaks a line at a point nearest to the cursor (Edit Mode only).
-  In Edit Mode, inserts a point on the currently selected line. In Entry mode, snaps the point being entered to the nearest line and interpolates the elevation.

- F8** In Edit Mode, assigns ascending or descending elevations to points based on previous point selections. In Entry mode, snaps to the nearest point for point entry.
- F9** In Edit Mode, assigns the elevation from the nearest point to the selected line(s). In Entry Mode, puts the elevation from the nearest point in the Current Elevation box.
- F11** With the terrain displayed, rotates the 3D View 180 degrees.
- F12** Used to temporarily place the coordinate system into that of the selected line. Press the Q key to revert back to the original coordinate system (Entry Mode on).
- Alt A** Selects all data lines in the currently active layer (Edit Mode on).
- Alt B** Displays the Layer Selection window.
- Alt H** Hides the currently selected line.
- Alt U** With the terrain displayed, moves the view angle up.
- Alt D** With the terrain displayed, moves the view angle down.
- Alt R** With the terrain displayed, moves the view to the right.
- Alt L** With the terrain displayed, moves the view to the left.
- Alt I** With the terrain displayed, zooms in over the location of the vehicle.
- Alt O** With the terrain displayed, zooms out over the location of the vehicle.
- Alt P** Sends the currently displayed view to the Print Preview Page.
- Alt S** Displays all hidden data.
- Alt V** Displays only the active layer for editing/entry.
- Alt F** Toggles on or off the display of Hatch regions.
- Ctrl A** Toggles an elevation point/line to an annotation line and vice versa (Edit Mode on).
- Ctrl C** Copies the currently selected data to temporary memory (Edit Mode on).
- Ctrl V** Pastes the currently stored data to the current Surface and Layer.
- Ctrl J** Joins (Bridge Gap) selected lines at their endpoints if the distance is smaller than the bridge gap distance. Closes the line if only one line is selected (Edit Mode on).
- Ctrl L** Selects all lines with the same label as the currently selected line. If no line is selected, displays the Label Selection dialog box to select a label (Edit Mode on).
- Ctrl O** Displays the Offset Line Editor for the currently selected line(s) (Edit Mode on).
- Ctrl X** Breaks the currently selected line at the currently selected point (Edit Mode on).
- Ctrl Z** Undo the last edit up to the last eight edits.
- Ctrl Y** Redo previously undone edits (Edit Mode only).

3D View Mode

-  Zooms out and centers the 2D Plan View to view the entire job.
-   Moves the vehicle on the job site. The Up/Down arrows move the vehicle forward or backward. The Left/Right arrows rotate the vehicle left or right.
-  
-  Cancels in-progress volume calculations.
-  and  Rotates the 3D View right and left respectively in 45 degree increments.
-  and  Increases and decreases the view angle.
-  and  Increases and decreases the elevation magnification.
-  and  With the 2D Plan View displayed, increases and decreases the Plan View Scale.
-  Pauses/resumes the volume calculation.
-  Displays incremental cross sections during the paused volume calculation.
-  Toggles on or off the display of the 3D View overlay.
-  Toggles on or off the display of the 2D Plan View.
-  Toggles on or off the location and display of the compass.
-  Displays the most recently selected Guide
-  Toggles the displayed PDF between low and high contrast.
-  Toggles between land view and sky view.
-  Moves the view above the vehicle.
-  Moves the view down to ground level.
-  View from inside vehicle.
-  View from 50 feet behind vehicle.
-  View from 50 feet left of vehicle.
-  View from 50 feet right of vehicle.
-  Rotates the 3D View 180 degrees.
-  Enters a Volume Area around the entered data.
-  Calculates the volumes.
-  Displays the Layer Selection dialog box.
-  Moves the view angle up.
-  Moves the view angle down.
-  Moves the view to the right.
-  Moves the view to the left.
-  Zooms in over the location of the vehicle.
-  Zooms out over the location of the vehicle.
-  Sends the currently displayed view to the Print Preview Page.

Volume Report Mode

  Sends the currently displayed view to the Print Page.

Print Preview Mode

 Cycles between items on the page.

 Deletes the currently selected item

 and  Increase/decrease the scale of the currently selected item.

 Inserts text at the current cursor position.

 
  Moves the currently selected item in the direction indicated.

Tool Bars

Earthwork 4D uses the tool bars for quick and easy access to many commands. In addition to the standard tool bar, there are two other types: Mode Selection and Utility. Click on the button to activate the command. Below is a list of the commands on the tool bars. Buttons that are gray are not accessible.

	New	Starts a new job file. The same command as selecting New from the File menu.
	Open	Opens an ESW file. The same command as selecting Open from the File menu.
	Save	Saves the current job. The same command as selecting Save from the File menu.
	Print	Prints the data that is currently displayed on the screen. The same command as selecting Print from the File menu.

Mode Selection

The Mode Selection Tool Bar is used for switching between the different Modes.

	Transfer AutoCAD	Switches to CAD Transfer Mode.
	Edit Mode	Switches to the Edit Mode.
	Entry Mode	Switches to Entry Mode.
	Profile View Mode	Switches to Profile View Mode.
	Plan View Mode	Switches to Plan View Mode.
	3D View Mode	Switches to 3D View Mode.
	Volume Report Mode	Displays the Volume Report.
	Haul Report Mode	Displays the Haul Report.
	Print Preview Mode	Displays the Print Page.

Utility Tool Bar Buttons

The Utility Tool Bar displays different options depending on the Mode.

	Home	Centers the overlay and sizes it to fill the screen.
	Pan	Enables the Pan tool to move the overlay. Click the Pan button, then click and hold to move the overlay. Release to stop moving.
	Area Zoom	Defines the view by dragging a box around the information desired. Click and drag the box to define the zoom area. Click again to zoom in.
	Layer Selection	Controls the display of layers. Clicking a layer's check box toggles on or off the view of that layer. Gray layers cannot be displayed.
	Show Trimesh	Displays the Triangular Mesh over the Plan View.
	Water Flow	Displays shaded lines on the overlay indicating the direction water will flow on the surface.
	Send to Print Page	Sends the current screen image to the Print Page.

Transfer Auto CAD Data Mode Only

The following command is found only in the Transfer AutoCAD Data Mode Utility Tool Bar.

	Blocks	Displays AutoCAD blocks in the CAD file.
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Edit Mode Only

The following commands are found only in the Edit Mode Utility Tool Bar.

	Label Selection	Selects all lines with the same label as the currently selected line. If no line is selected, displays the Label Selection dialog box to select a label.
	Add Benchmark	Adds a benchmark to a selected point or user-defined coordinates. After a point is entered, the Edit Point dialog box is displayed allowing you to adjust the point location or assign a label.
	Add Stake Point	Adds a stake point to either a selected point, at defined intervals along a selected line, or at user-defined coordinates.
	Apply Template	Creates a template which can then be apply to a selected reference line.
	Offset Line	Displays the Offset Line Editor.
	Join (Bridge Gap)	Joins selected lines at their endpoints if the distance is smaller than the bridge gap distance. Closes the line if only one line is selected.
	Swap Ends	Switches the start and end points of a selected line. Allows the user to change the direction the line was entered.
	Trim Line	Breaks all lines that cross the selected trim line.
	Fillet Line	Fillets the intersection of line segments and joins them at the selected point.



Edit Report Region Edits existing report regions and sectional area.



Length/Area Displays the length, plane, and slope area of a selected line, or total length of the selected line(s).

Entry Mode Only

The following commands are found only in the Entry Mode Utility Tool Bar.



Rectangle Tool Draws a rectangle. Click and drag the box to draw the rectangle. Click again to end. After the rectangle is added, the Add Rectangle dialog box is displayed allowing you to make adjustments to the width and height.



Circle Tool Draws a circle. Click to indicate the center of the circle, then drag the circle to draw it. Click again to end. After the circle is added, the Edit Circle Radius window appears allowing you to adjust the radius of the circle.



Report Regions Creates report regions and sectional areas.



Balance Regions Enters a balance region using a paint brush effect.



Stage Over-Ex Displays the Over-Ex Guide menu for staging over-excavation data.

Profile View Mode Only

The following commands are found only in the Profile View Mode Utility Tool Bar.



Profile Entry Starts the Profile Entry command allowing the user to enter profile lines across the overlay while viewing the profile in real time at the bottom of the screen.



Swap Ends Switches the start and end of the selected profile line.



Station Offsets Displays the Edit Station/Offset window to enter the station name and the horizontal offset distance.



Station Generator Displays the Station Generation window to enter the station name, station interval, and left/right offset.



Attach Profile Assigns elevations to a selected line from profile data entered with a tablet.

Plan View Mode Only

The following commands are found only in the Plan View Mode Utility Tool bar.

	Balance Regions	Enters a balance region using the cursor.
	Volume Area	Creates a report region around all design perimeters (including islands) for total volume calculation.
	Calc Volume	Begins the volume calculation.
	Calc Balance Areas	Begins the volume calculation of the balance regions.
	Apply Haul Plan	Analyzes cut and fill areas within a balance region and moves the dirt from highest cut area elevation to lowest fill area elevation.
	Draw Haul Path	Draws a typical haul path for the balance region for use in haul planning and calculation.
	Stage Haul Plan	Stages the planned haul into the design ground.

3D View Mode Only

The following commands are found only in the 3D View Mode Utility Tool bar.

	Record	Records a driving simulation path.
	Play	Plays the recorded driving simulation path.
	Pause	Toggles the playback of the driving simulation.
	Stop	Stops the driving simulation.
	Volume Area	Creates a report region around all design perimeters (including islands) for total volume calculation.
	Calc Volume	Begins the volume calculation.
	Enable Autonomous GPS	Enables GPS for field data collection.
	Reverse Vehicle Direction	Rotates the vehicle 180 degrees in the 3D View.
	Survey Volume	Calculates the volume of survey data in the Current surface.3D View Mode Only

Menus

The Menu bar lists the available menus and commands. Many of the menus and commands are common, though some Modes have specific menus and specific commands. Below is a description of all of the available commands from each menu. If a menu or command is grayed out it is not available in that Mode.

Note: The illustration below shows all Menus, though not all menus will appear on the screen, depending on the mode.



File Menu

The File Menu is used to access files, import files, save job files, set up the printer and exit the program. The File menu for each Mode is different and specific to tasks in that Mode. Below is a list of the commands in the File Menu in all Modes.

New

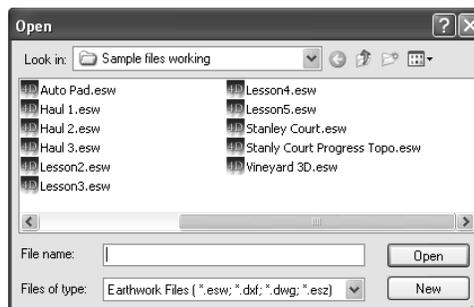
Used at the start a new job. When the command is selected, the Job Information dialog box is displayed.



Enter the Job Name, Builder, Bid Date, Operator and choose the Units of measure, either Feet or Meters. This is the only time the units of measure are determined for the job. Click OK to start the new job.

Open

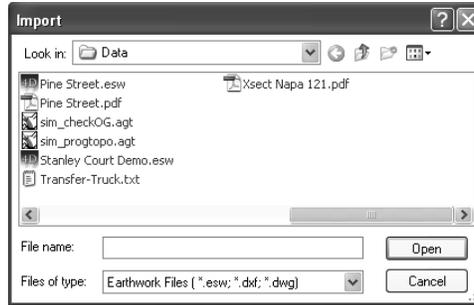
Used to open an existing job. When the command is selected, the Open dialog box is displayed.



Select the file from the list in the window. The name then displays in the File Name text box. Click Open to get the file. The following file types are opened in CAD Transfer Mode: .agt .dgn, .dxf, .dwg, and .ln3. AGTEK Highway Files (*.cgo, *.rds, *.rog) are opened in Highway Mode.

Import

Used to import files for use as a new job file, including CGO, RDS and ROG Highway files. When the command is selected, the Import dialog box is displayed.



Select the type of file from the Files of type pulldown, and the file from the list in the dialog box. The name then displays in the File Name text box. Click **Open** to get the file. Files are opened in CAD Transfer Mode.

PlanPilot Import

Used to import a GradePilot job file. You must have a PlanPilot connected to your computer for this command to work. When the command is selected, The Open dialog box is displayed, showing the files on the PlanPilot.

Select the file from the list in the dialog box and click Open. The file is opened in CAD Transfer Mode with Survey Data layer selected as the destination layer.

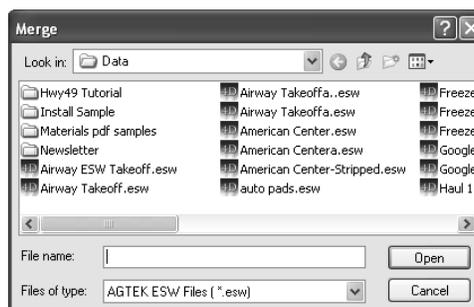
Import Recover Data

Used to import benchmarks and alignment data from an existing job file. When the command is selected, The Import Recover Data dialog box is displayed.

Select the file with the recover data in the dialog box and click Open. The benchmarks and alignment data from the selected file are imported in to the open job file.

Merge

Used to merge all layers from an .esw, .ttm, or .tn3 file into an existing job file. When the command is selected, the Merge dialog box is displayed.



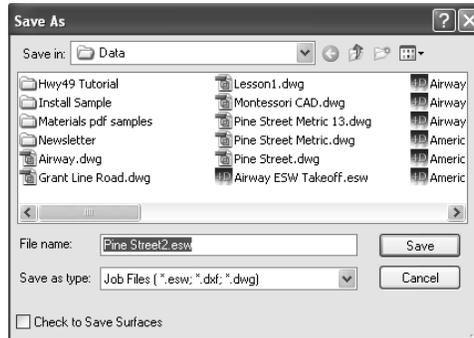
Select the file from the list in the window. The name then displays in the File Name text box. Click Open to merge the files.

Save

Saves the job with the current name. If the job has not yet been named, the Save As dialog box is displayed when the command is selected (see below).

Save As

Used to save a file as an AGT, ESW, DXF, DWG, LN3, TN3, or TTM file with an optional new file name. When the command is selected, the Save As dialog box is displayed.



Type the new name of the file in the text box and choose the appropriate file type from the Save as type pulldown, check the Check to Save Surfaces box (see below for information) and click Save.

Saving As DXF/DWG

When the DXF or DWG type is chosen, the Export CAD dialog box is displayed. Refer to “Export CAD” on page 9-17 for additional information.

Saving As AGT

When the AGT type is chosen, the surface in the Surface pulldown is saved and a 2-letter abbreviation for the surface is appended to the end of the current job name. Refer to “Creating AGT Files” in the Appendix for additional information.

Saving as Job File (ESW)

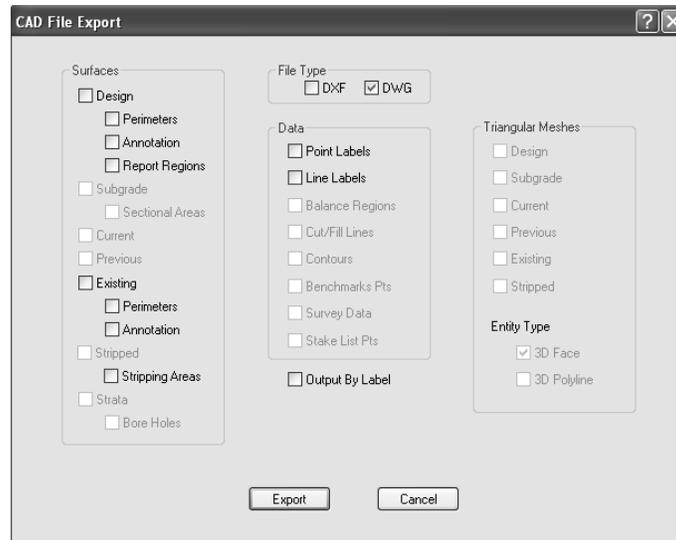
When the ESW type is chosen, the Check to Save Surfaces box is displayed in the Save As dialog box. Checking this box saves trimesh surface data in the ESW file. This is necessary if you are using the file with AGTEK Graphic Grade Machine Control or SitePilot to save time loading the file. If checked, the Surface Selection dialog box is displayed when you click Save.



Select the Reference and Difference surfaces to save and click **OK**.

Export CAD

Used to export a CAD file as either a DXF or DWG format. When the command is selected, the CAD File Export dialog box is displayed.



Check the boxes next to the Surface(s), File Type, Data, and Triangular Meshes to include. Click Export to create the file. The Save As dialog box is displayed prompting the user for the location and name of the file to be saved.

Type the new name of the file in the text box and click Save to save the file.

Export EMF

Used to save the color shaded grid map to an EMF (Enhanced Metafile) file. When the command is selected, the Save As dialog box is displayed.

Type the new name of the file in the text box and click Save to save the file.

PlanPilot Export

Used to create a file for use with AGTEK's GradePilot system. You must have a GradePilot connected to your computer for this command to work. When the command is selected, the Save As dialog box is displayed.

Type the new name of the file in the text box and click **Save**. The Surface Selection dialog box is displayed.



Select the Reference and Difference surfaces from the pulldowns and click **OK**.

Export VRML File

Used to save the 3D view as a VRML (Virtual Reality Modeling Language) file. When the command is selected, the Save As dialog box is displayed. Type the new name of the file in the text box and click Save to save the file.

Email

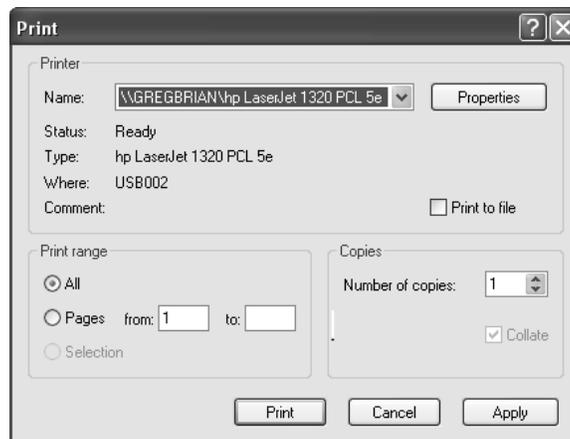
Opens your default email program and attaches an .esz (AGTEK zip format) file to the new email which contains the file open at the time of selection.

Export KMZ

Creates a .kmz (Google Earth zip format) for use in Google Earth. Automatically opens Google Earth, using the resulting .kmz, if Google Earth is installed on the your current computer.

Print

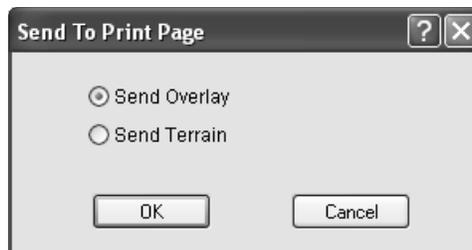
Used to print the data that is currently displayed on the screen. When the command is selected, the Print dialog box is displayed.



Choose the printer, change printer properties and print settings as needed. Click **OK** to print.

Send To Print Page

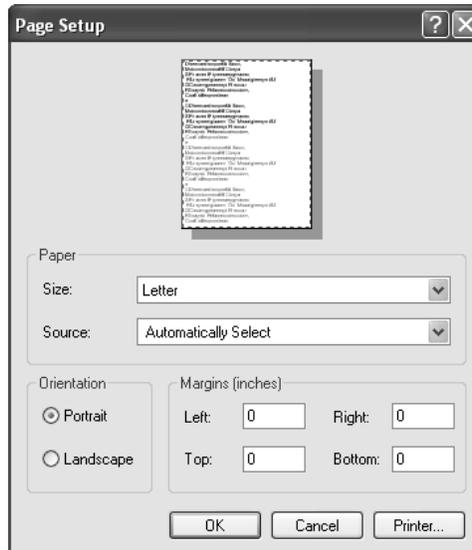
Sends the current view to the Print Page. If both the terrain and overlay are displayed, the Print Preview Send Options dialog box is displayed.



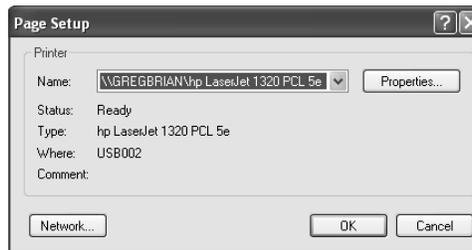
Select either Send Overlay or Send Terrain and click **OK** . The Print Page opens with the chosen view on the screen.

Page Setup

Used to change print options. When selected, the Page Setup dialog box is displayed.



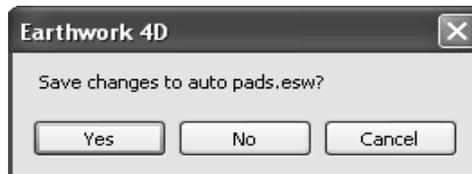
The user can change printer properties, such as paper size, orientation, margins, and which printer to use. Click the **Printer** button to change printers and the printer properties.



Click **OK** to return to the Page Setup window. Click **OK** to save the changes.

Exit

Quits Earthwork 4D. If changes have been made, a dialog box is displayed asking to save the file before quitting.



Click **Yes** to save, **No** to exit without saving or **Cancel** to abort saving and continue working on that file in Earthwork 4D.

Email PDF

Opens your default email program and attaches a PDF of the displayed print page.

Export PDF

Exports a PDF of the displayed print page.

Edit Menu

The Edit Menu is used to undo/redo commands, as well as select and edit data and data lines and change job file information and settings. The Edit menu for each Mode is different and specific to tasks in that Mode. Below is a list of the commands available from the Edit Menu in all Modes.

Undo

 Cancels the last edit(s) up to eight edits.

Redo

 Repeats the previously cancelled edit(s) using Undo, up to eight edits.

Copy

 Copies the currently selected data and stores it in temporary memory.

Paste

 Inserts the currently stored data from the Copy command into the currently active Surface and Layer.

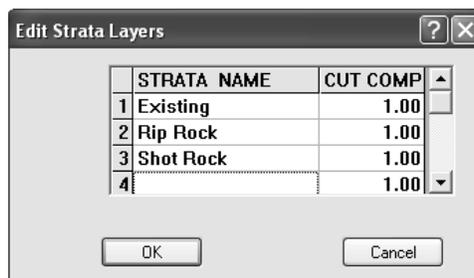


Delete

Removes any selected data. Multiple objects can be deleted by selecting each object using Shift + click before deleting them.

Strata Names

Used to enter and edit strata for the job. When selected, the Edit Strata Layers dialog box is displayed.



Enter the Strata Name and the Cut Comp value for the strata layers and click **OK**. Refer to "Strata" in the Appendix for additional information about strata layers.

Report Region

Used to edit the information of an existing Report Region. When selected, the Report Regions dialog box is displayed.

Note: A Report Region can also be edited by clicking on it in Edit Mode, then clicking the Edit Report Region button or by double-clicking on the Report Region.

Region Name Regions with the same name are totaled and regions with ascending names (i.e. Lot 1, Lot 2, etc.) are totaled individually and then subtotaled by the name "Lot".

Report Region This check box indicates that the region will be included as part of the job totals. Use this option when entering Report Regions.

Sectional Area This check box indicates that the sectional area will be included as part of the job totals. Use this option when entering Sectional Areas.

Fill Factor Represents the compaction percentage.

Sectional Depth The depth of the sectional taken from the surface of the design.

Balance Region

Used to edit the information of an existing Balance Region in Plan View Mode. When selected, the Balance Regions dialog box is displayed.

Region Name Regions with the same name are totaled and regions with ascending names (i.e. Balance 1, Balance 2, etc.) are totaled individually and then subtotaled by the name "Balance".

Fill Factor Represents the compaction percentage.

Break Line

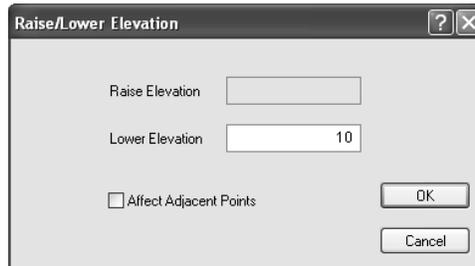
 Breaks a line at the selected point leaving one-half of the line selected.

Move Start

Moves the start point of a closed line to the currently selected point on the line.

Raise/Lower

Raise or Lower the elevation of selected lines, points, or Vertical COGO (in Highway Mode). When selected, the Raise/Lower Dialog box is displayed.



Affect Adjacent Points Causes any line snapped to the affected point(s) to be adjusted. This option is not available in Highway Mode.

Raise/Lower Elevation Enter in the amount to raise or lower the line/COGO by typing the elevation in the appropriate box.

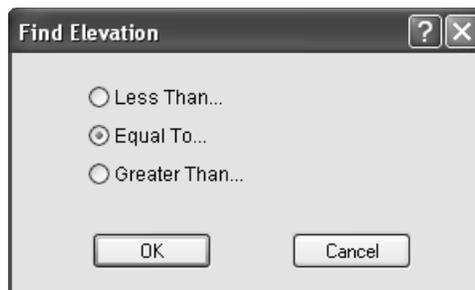
As soon as you start typing in either box, the other box grays out. Click **OK** to apply the elevation change.

Label Selection

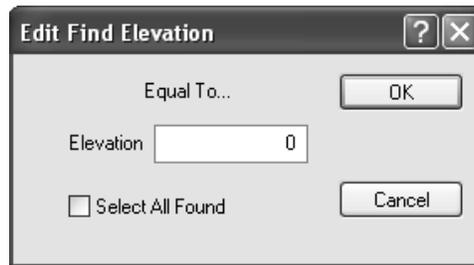
Selects all lines with the same label. If no line is selected, the Label Selection dialog box is displayed, allowing the user to select a label from a list of all labels in the current surface. An asterisk (“*”) can be used as a wildcard. For example, “curb*” would select all lines with a label that starts with curb.

Find Elevation

Selects data lines less than, equal to, or greater than a specified elevation. When selected, the Find Elevation dialog box is displayed.



Select which value to use and click **OK**. The Edit Find Elevation dialog box is displayed.



Enter the elevation in the box, check Select All Found to select all instances of the elevation, and click **OK**.

Area Select

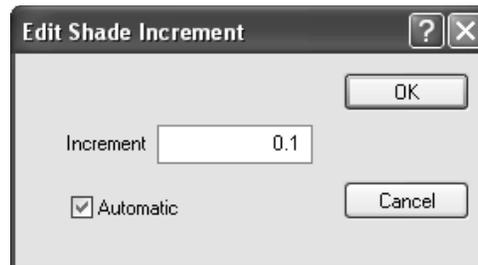
  Allows multiple items to be selected by dragging a box around the information desired. Click and drag the box to define the area to select. Click again to select the items.

Select All

Selects all visible data of the currently active surface layer.

Shade Increment

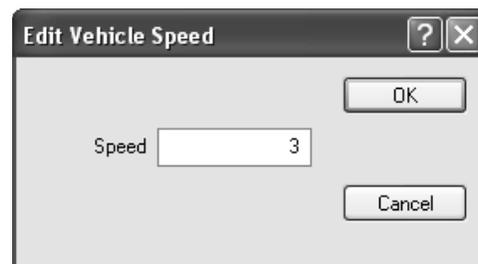
Adjusts the Cut-Fill Shade Increment in 3D View and Plan View Modes. When selected, the Edit Shade Increment dialog box is displayed.



Type in a new value or check Automatic. Click **OK** to apply the changes.

Vehicle Arrow Rate

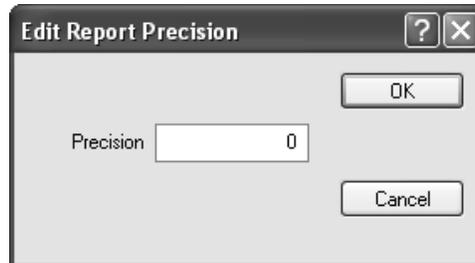
Changes the distance the vehicle travels on the screen using the Arrow keys on the keyboard or during drive simulation. When selected, the Edit Vehicle Speed dialog box is displayed.



Change the value in the Vehicle Speed box to change the speed. Click **OK** to apply the scale.

Decimal Precision

Used to change the number of decimal places the numbers display for reporting precision. When selected, the Edit Report Precision dialog box is displayed.



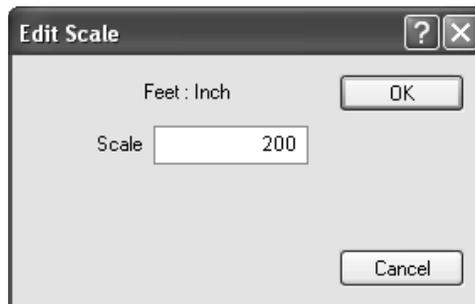
The default value is 0. Enter a value between “0” and “2”. Click **OK** to apply.

Apply Survey

Applies collected survey data to the current job file. Refer to “Updating a 3D Model with Survey Data” on page 9-81 for additional information about applying survey data.

Drawing Scale

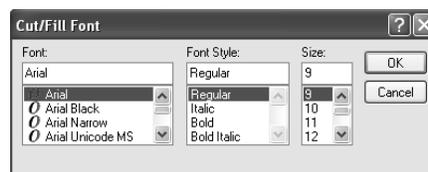
Used to scale the 2D Plan View and Profiles on the Print Page. First select an item then select the command. The Edit Plan Scale dialog box is displayed.



If you are scaling a profile, both vertical and horizontal scale appear. Type in the new scale in the text box and click **OK**.

Cut-Fill Font Size

Used to select the type, style, and size of the fonts that appear as part of the labels on the cut-fill shade map. When selected, the Cut-Fill Font dialog box is displayed.



Select the font type, style, and size and click **OK** to apply the changes. The program default (Arial, Regular, 9) is reset after each session.

Cut-Fill Label Style

Used to change the label displayed on the cut-fill shade map. When selected the Cut-Fill Label Style dialog box is displayed.



No Text Background

Displays black text with no label background over the shade map.

Transparent Background

Displays black text with a transparent background over the shade map.

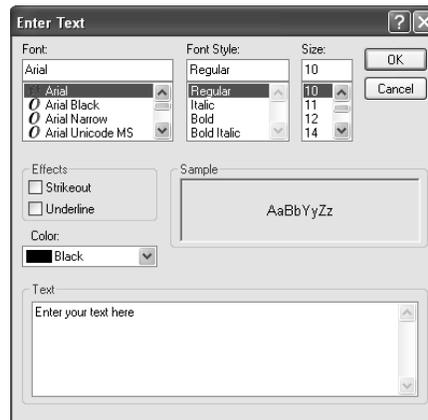
Solid White Background

Displays black text with a white background over the shade map.

Add Text



Adds text to the screen. When selected, the Enter Text dialog box is displayed.



Choose the font type, style, size and color. Type in the text to display on the screen in the box at the bottom of the window. Click **OK** to add the text to the screen.

Tablet Scale

Displays the Tablet Scale box and allows you to rescale the job.

View Menu

The View Menu is used to adjust the display of visible data on the screen. The View Menu is not available in Volume Report or Print Preview Modes. Below is a list of the commands available from the View Menu for all other Modes.

Hide

 Hides all selected data from view. Multiple data lines can be hidden by selecting them, then selecting the command.

Hide All But

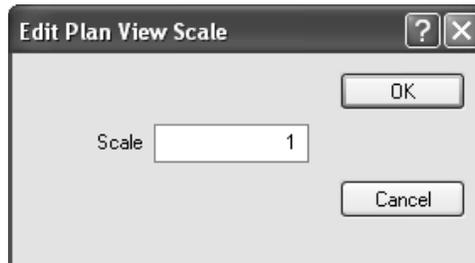
Hides everything except selected data. Multiple data lines can remain visible by selecting them then selecting the command.

Show All

 Displays all hidden data on the screen.

Plan View Scale

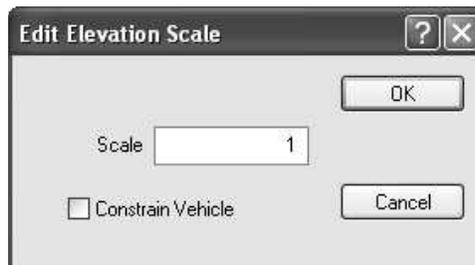
Used to increase/decrease the size of the displayed overlay. When selected, the Edit Planview Scale dialog box is displayed.



Type in a value in the text box to change the Plan View Scale. Click **OK** to apply the scale.

Elevation Scale

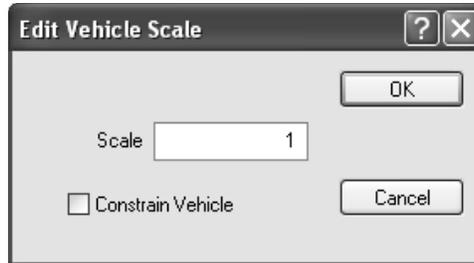
 Used to increase/decrease the elevation perspective to show increased relief of the terrain. When selected, the Edit Elevation Scale dialog box is displayed.



Change the value in the text box to change the Elevation Scale. Select the Constrain Vehicle check box to keep the Jeep and blade vertical scale unchanged during elevation scale magnification. Click **OK** to apply the scale.

Vehicle Scale

Used to change the size of the vehicle in relation to the 3D View. When selected, the Edit Vehicle Scale dialog box is displayed.

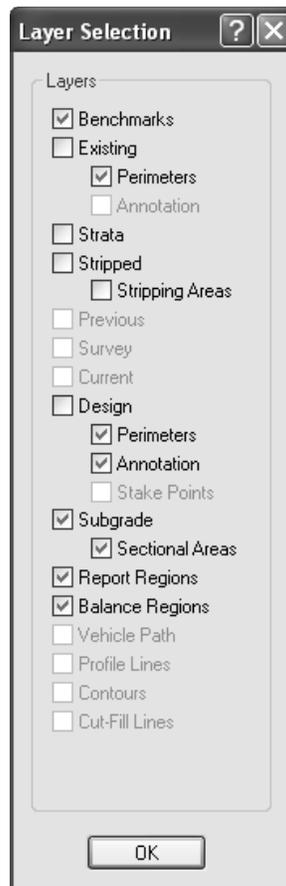


Change the value in the text box to change the Vehicle Scale. Select the Constrain Vehicle check box to keep the Jeep and blade vertical scale unchanged during elevation scale magnification. Click **OK** to apply the scale.

Layer Selection



Used show/hide layers not normally associated with the current surface. Data not in the currently active surface displays in the background and can be snapped to. When selected, the Layer Selection dialog box is displayed.



Check the boxes next to the layer(s) and click **OK**.

Region Selection

  Used to show which areas are contained within another and to show the location in the main window. Select an area from the layer, then select the command. The Region Selection dialog box is displayed.



Click on a region to highlight it on the screen. Click the **Close** button to close the dialog box. This command only works for report regions, perimeters, stripping, and sectional areas.

Plus Marks

Toggles on or off the display of plus (+) marks for points along data lines in CAD Transfer Mode.

Cut-Fill Values

Toggles on or off the display of the Cut-Fill Labels.

Cut-Fill Elevations

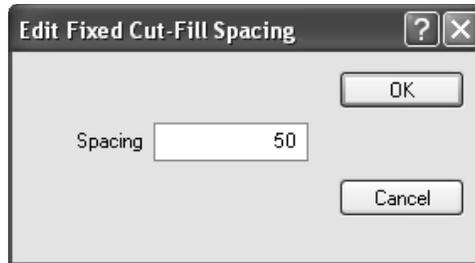
Toggles on or off the display of the Cut-Fill elevations on the Labels.

Default Cut-Fill Spacing

Spaces the cut-fill locations optimally on the screen.

Fixed Cut-Fill Spacing

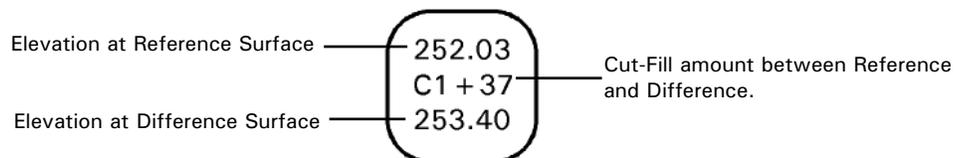
Allows the user to define the distance between the cut-fill spacing. When selected, the Edit Fixed Cut-Fill dialog box is displayed.



Enter a value between "10" and "1000" and click **OK**.

User Cut-Fill Locations

Used to enter locations manually for specific cut-fill locations to display in Plan View Mode. User locations are entered in Entry Mode in the Cut-Fill Layer. Below is an example of a Cut-Fill Label found in Plan View Mode.



Gray Hidden Lines

Any hidden lines are displayed in gray.

Display Menu

The Display Menu is used to adjust how screen data is displayed. A check next to the command indicates that it is enabled. The Display Menu is not available in Volume Report Mode. Below is a list of the commands available from the Display Menu for all other Modes.

Overlay



Toggles on or off the display of the 2D plan view overlay.

Terrain



Toggles on or off the display of the 3D terrain view.

Bitmap



Toggles on or off the display of an imported background image.

Black Background

Displays the screen background as black in CAD Transfer Mode.

White Background

Displays the screen background as white in CAD Transfer Mode.

Color Shades

Used to adjust the cut-fill coloring displayed in 3D View, and Plan View Modes and for printing. When selected, the Color Shades dialog box is displayed.



Select from a set of predefined color maps by selecting one from the Color Map pulldown or create a custom map by clicking on a cut-fill color, selecting a custom color, then clicking the Add button and naming the custom Color Map.

Shade Table

Toggles on or off the cut-fill shade table.

Plus Marks

Toggles on or off the display of plus (+) marks for points along all data lines. Plus marks automatically toggle off while zooming.

Grid Display

Toggles on or off the display of a grid over the 3D terra.

Hatch Regions

  Toggles on or off the display of hatch regions (fill patterns) over layers made up of areas.

Edit Layer Only

  Used to display only the selected layer.

Line Labels

Toggles on or off the display of line labels.

Material Labels

Toggles on or off the display of point and line labels simultaneously.

Station Numbers

Displays the station labels in Horizontal and Vertical COGO Modes.

Point Numbers

Toggles on or off the display of point numbers.

Point Labels

Toggles on or off the display of point labels.

Time Stamps

Toggles on or off the display of time stamp labels.

Elevations/Elevation Labels

Toggles on or off the display of elevation labels.

Frame

Adds a thick border around the edge of the Print Page.

Title Block

Adds a title block across the bottom of the Print Page. A title block can only be added if a frame has been added first.

Add Row

Adds a row of page(s) below the original print page(s) to the Print page.

Add Column

Adds a column of page(s) to the right of the original page(s) to the Print page.

Delete Row

Deletes a row of pages from the bottom of the Print page.

Delete Column

Deletes a row of pages from the right of the Print page.

Scrollable

Increases the display size of the Print page and allows the user to scroll through multiple sheets.

Data Transfer Menu

The Data Transfer Menu is used to transfer data from a CAD file to a Earthwork 4D job file. Data can be sent to either the Existing or Design surface and a specific layer within each surface. The Data Transfer Menu is only available in CAD Data Transfer Mode. Below is a list of the commands available from the Data Transfer Menu.

Send to Layer

Sends selected data to Surface and Layer displayed in the pulldown menus.



Send To Existing

Sends selected data to the Existing Surface and Layer displayed in the pulldown.

Send To Design

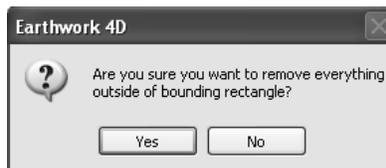
Sends selected data to the Design Surface and Layer displayed in the pulldown.

Compression

Compresses the data, removing extra points and detail during data transfer. Refer to "Compression Delta" on page 8-46 for information about setting the compression amount.

Crop Rectangle

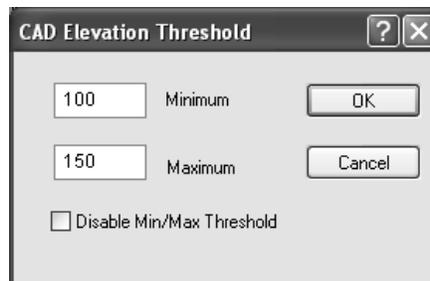
Used to delete all the data outside a specified area (Crop Rectangle). When selected, the arrow changes to the crosshair. Click and drag the box around the data to keep, then click again. A warning dialog displays.



Click **Yes** to remove all data outside of the box.

Transfer Min/Max

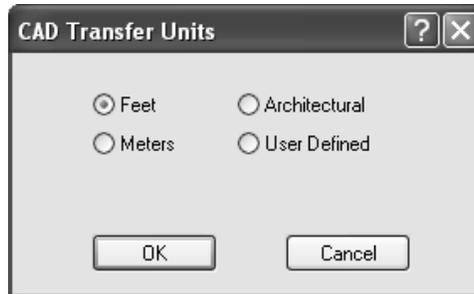
Used to set the minimum and maximum elevations to transfer. Elevations not within the minimum/maximum range are transferred as annotation data. When selected, the CAD Elevation Threshold dialog box displays.



Make any changes to the Minimum and Maximum text boxes. The Disable Min/Max check box allows you to turn off the elevation threshold settings. Click **OK** to apply.

CAD Transfer Units

Sets the unit of measure used to create the CAD file for proper scaling. When selected, the CAD Transfer Units dialog box is displayed.



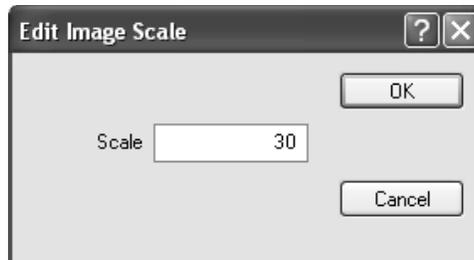
Select the appropriate unit of measure, enter the Units per Feet if using the User Defined option, and click **OK**. Layers that have been transferred are changed as well.

Image Rotate L/R

Rotates the displayed image clockwise in ninety degree increments.

Image Scale

Sets the scale for an imported image for proper scaling during vectorization. When selected the Edit Image scale dialog box is displayed.



Enter the scale for the imported image and click **OK**.

Image Thicken

Makes the lines on an imported image thicker to facilitate viewing and vectorization of lines that are not well defined. Images can be thickened multiple times.

Reset Image

Reverts an imported image to its original state.

Vectorize

Creates annotation lines from an image and separates the lines into layers based on line type and thickness. Once vectorized, lines can be sent to specific Surfaces and Layers like any other CAD data.

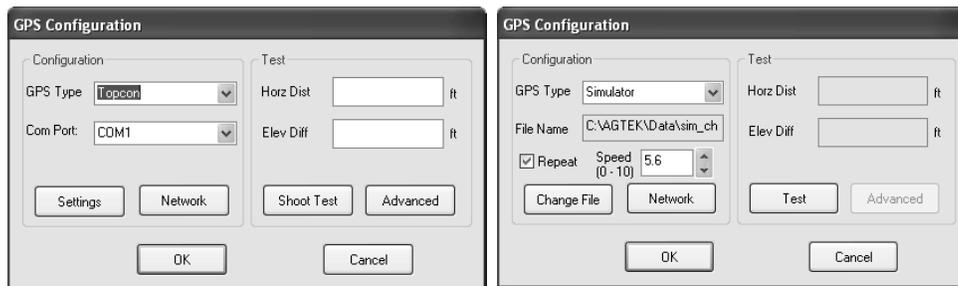
Instrument Menu

The Instrument Menu is used to enable and configure GPS instrument use with Earthwork 4D, and is only available in 3D View Mode. In addition, the Instrument Menu is only available if you have purchased GPS functionality. Below is a list of the commands available from the Instrument Menu.

GPS

Enable Enables GPS for field data collection and displays the rod.

Configure Displays the GPS Configuration dialog box.



GPS Type Used to select the GPS brand/model.

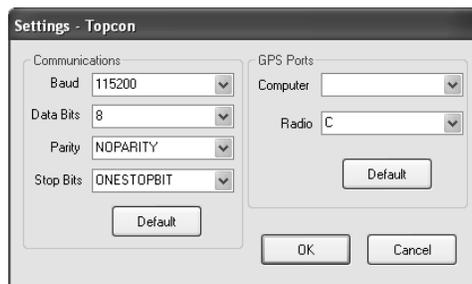
Com Port Specifies to which port the GPS is connected.

Horiz Dist Displays the horizontal distance from the rover GPS to the base GPS, when the Test/Shoot test button is clicked.

Elev Diff Displays the elevation difference between the rover and base GPS, when the Test/Shoot test button is clicked.

Test/Shoot Test Takes a shot to verify GPS data is being received.

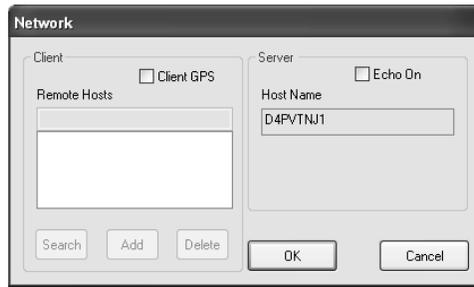
Settings Displays the Settings dialog box.



Communications Sets communication settings for the GPS model. Default values are displayed based on the GPS model selected in the GPS Configuration dialog box.

GPS Ports Specifies the serial port the GPS uses for communication (typically with Trimble units only).

Network Used to search for and add devices for use in Listen Mode.



Client Adds client devices (devices to listen to) for use in listen mode. To add a device check "Client GPS", type the name of the device in the Remote Host box, then click Add.

Server Adds server devices (used to relay data from devices being listened to) for use in Listen Mode.

Rod Height

Used to edit the rod height if it has been changed since alignment.

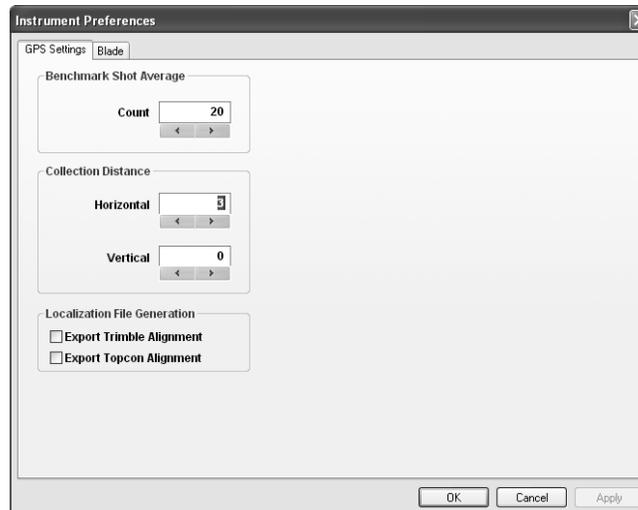
Create Benchmark

Used to shoot a new benchmark.

Preferences

Used to set Instrument preferences. When the command is selected, the Instrument Preferences dialog box is displayed showing the GPS Settings tab and the Blade tab.

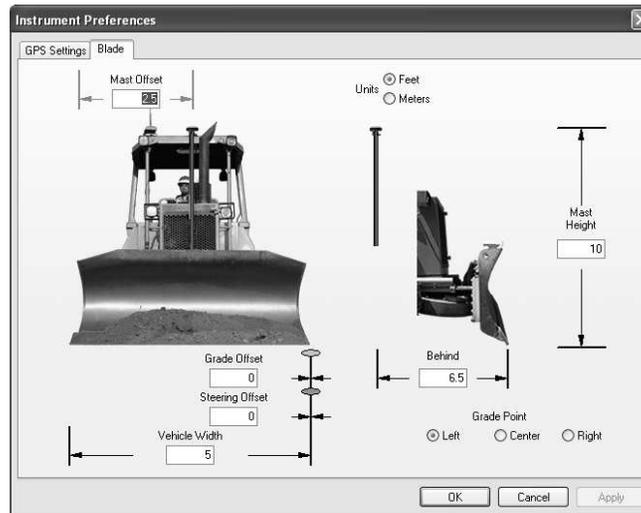
GPS Settings Tab



Benchmark Shot Average The number of shots taken when doing alignment or when creating a benchmark.

Collection Distance Sets the minimum horizontal and vertical distance (in feet) needed to move before the next shot is taken.

Blade Tab



Rod Position Position of the rod relative to the Blade.

Steering Position Position of the driver's view relative to the rod.

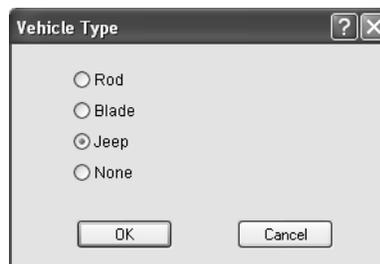
Blade Width Width of the blade (in feet).

Rod Point Offset of the rod (in feet) from the left edge, right edge, or center of the blade.

Grade Point Offset from the rod (in feet) to set the grading edge.

Vehicle

Used to select the vehicle type shown in the 3D View. When selected, the Vehicle Type dialog box is displayed.



Select the type of vehicle and click **OK**.

Mode

Cut-Fill Displays the vehicle/rod rising and falling on a cut-fill bar, which shows the vertical distance from the reference surface.

Stake Displays the vehicle on the reference surface with no vertical distance indicator.

Utility Menu

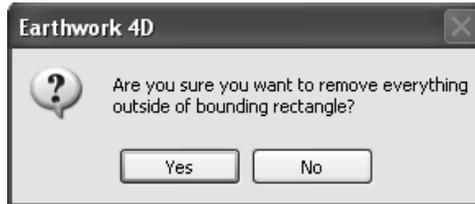
The Utility Menu is used to change the properties of data and profile lines, determine volume calculation areas and calculate those volumes, set the on-grade limits and transfer the subgrade to the design surface, and create and edit stations and offsets. The Utility Menu is available in Edit, Profile View, Plan View, and 3D View Modes. Below is a list of the commands available from the Utility Menu in those Modes.

Transform Job

Contains several commands used to move job coordinates, align data, and change the job scale. Refer to Page 9-75 for more information about using these commands.

Crop Rectangle

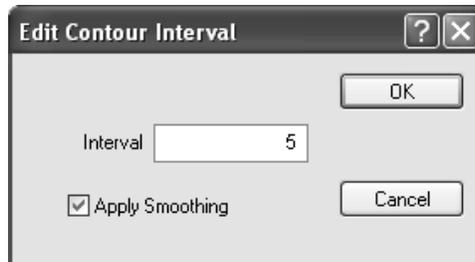
Used to delete all the data outside a specified area (Crop Rectangle). When selected, the arrow changes to the crosshair. Click and drag the box around the data to keep, then click again. A warning dialog displays.



Click **Yes** to remove all data outside of the box.

Contour Surface

Used to generate contours along the currently selected surface at a user specified interval. The resulting contours are put in the Design Contour layer. When selected, the Edit Contour Interval dialog box is displayed.



Enter a contour interval and click **OK**.

Auto-Pad

Uses text labels or elevation inside enclosed areas to automatically assign elevations. Refer to "Assigning Elevations using Auto-Pad" on page A-13 in the Appendix for more information about using Auto-Pad.

Offset Line

Ctrl **O** Used to create an offset line(s) adjacent to the selected line(s). When selected, the Offset Line Editor displays.

Set the values for distance, elevation and slope. Click the View button to see the lines applied in real-time. Click the Apply button to add the line. If you close the Editor before clicking Apply, the offset line is not created.

Bridge Gap (Join)

Ctrl **J** Used to join multiple line segments. Select the lines then select the command. Only lines of the same type may be joined. The lines must also be at a distance that is equal to or less than the Bridge Gap distances. Single lines are closed regardless of Bridge Gap distance when the Join command is selected.

Swap Ends

Ctrl **S** Switches the start and end points of a selected line(s). Allows the user to change the direction the line was entered.

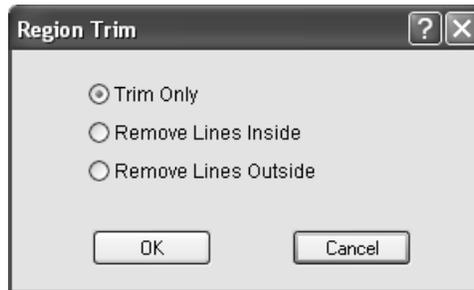
Fillet Line

Ctrl **F** Used to generate a radius between two line segments. It can also be used to fillet an existing angle. For more information, refer to "Adding Arcs/Fillets" on page A-7 in the Appendix.

Trim Line



Used to break all lines that intersect with a selected line or closed area. A trim line can be an existing data line, perimeter/region, or an annotation line. Select a line to use as the trim line then select the command. All lines crossing the trim line are broken at the trim line. If you select a closed line as the trim line, the Region Trim dialog box is displayed.



Trim Only

Trims all lines that cross the closed line.

Remove Lines Inside

Trims all lines that cross the region and removed all lines inside the closed line.

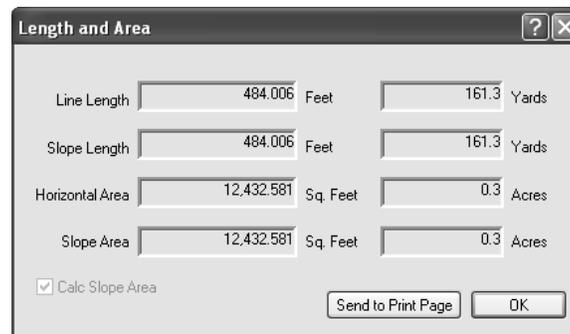
Remove Lines Outside

Trims all lines that cross the region and removes all lines outside the closed line.

Length/Area Info

Displays the length, plane and slope area of a line. When selected, the Length and Area dialog box is displayed.

The Line Length is displayed in both Feet and Yards. Areas are displayed as square feet and acres. Metric jobs displays meters and hectares. Below is a list of display rules for various line types.



- Slope Area is automatically displayed for closed lines in the Data Lines Layer.
- The Line Length and Horizontal Area only are displayed for all closed lines that are not in the Data Lines Layer.
- If the Calc Slope Area box is checked, the Slope Area of a closed line that is not in the Data Lines is calculated.
- Only the Line Length is displayed for open lines.
- Only the total Line Length is displayed for multiple selected lines (open or closed).

Compress Selected

Compresses the selected line(s) by removing extra points according to the Compression Delta. Refer to "Compression Delta" on page 9-48 for information about setting the compression amount.

Convert Daylights

Converts Daylight points to entered points on a selected line so the points no longer tie into the original surface they were daylighted to. Multiple lines can be selected. Interpolated points are not converted.

Conform Annotate

Drapes the currently selected annotation line and converts it to a data line.

To Design Lines Converts an annotation line to a data line with elevations based on the data line(s) it crosses.

To Current Surface Converts an annotation line to a data line with elevations based on the trimesh of the current surface.

Profile Entry

Switches to Profile View Mode and allows you to enter profile lines. Click to begin a line and right-click to end.

Swap Ends

Swaps the starting point and ending point of the selected line.

Volume Area



The Volume Area controls the limits of the volume calculation. When selected, the program automatically places a report region around the Design Perimeters. If no perimeter is present, a region is added surrounding the union of all Report Regions and Design Data.

Calc Volume



In all other modes it calculates the volume from the area defined using the Volume Area command. When complete, a report similar to the illustration below is displayed.

Volume (Cubic Yards)	
Cut	2,083.5
Fill	1,951.2

Horizontal Area (Square Feet)	
Cut	42,193.7
Fill	40,317.0
On Grade	0.0
Total	82,510.7

Slope Area (Square Feet)	
Total	82,919.1

Done

The volume and area totals display. Click the Done button to close this window.

Calc Balance

Calculates the volume of balance regions. When selected, the Haul report is displayed.

Calc Horiz. Slices

Calculates the volume per lift for user defined lifts. When selected, the Edit Slice Interval dialog box is displayed.

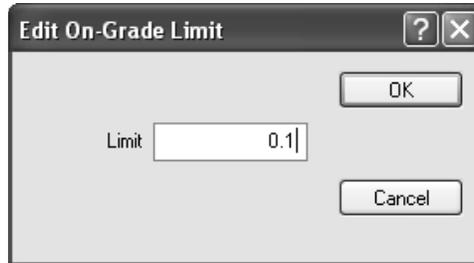
Interval

OK
Cancel

Enter the elevation interval and click OK. The Horizontal Slice report is displayed, showing the cut-fill volumes for each elevation slice.

On-Grade Limit

Sets the tolerance for the On-Grade Limit. When selected, the Edit On-Grade Limit dialog box is displayed.



Enter the On-Grade Limit in the box and click **OK** to apply the limit. A higher number allows for more variation within the tolerance to be considered on grade. A lower limit allows for less tolerance.

Transfer Subgrade/Design

Stages the subgrade sectional areas into the design or existing surface and deletes the sectional areas. All finished grade elevations in the design are changed to subgrade elevations. When selected, the Transfer Design/Subgrade dialog box is displayed.



Apply Survey

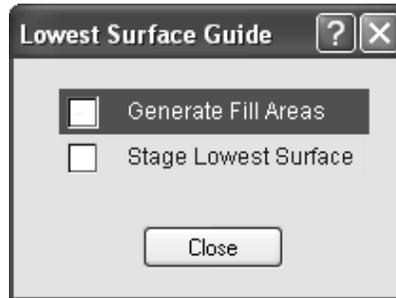
Used to copy data from the Survey layer to the Data Lines layer of the Current surface. When selected, the command creates a boundary around the survey data, displays the data and stages it. Refer to “Updating a 3D Model with Survey Data” on page 9-92 for additional information.

Cut-Fill Lines

Displays the transition between cut-fill and on-grade as contour lines in Plan View Mode.

Lowest Surface

Creates a new surface in the Current layer called Lowest based on the lowest elevations of the Existing and Design Surfaces. All regions must be closed prior to selecting the command. When the command is selected, the Lowest Surface Guide dialog box is displayed.



If there are cut-fill lines that are not closed, the Generate Fill Areas is displayed in red and you must close them before proceeding.

Click Close. The “Lowest” surface is created with the design lines.

Apply Haul Plan

Applies a haul plan by analyzing the cut and fill areas within a balance region and moving the dirt, from highest cut area elevation to lowest fill area elevation until the one with the smallest volume runs out. Refer to “Apply Haul Plan” on page 9-5 for additional information.

Draw Haul Path

Allows you to draw a haul path for the haul plan. When selected the cursor changes to a crosshair and connects to the end of the center mass of cut/fill for the balance region. When finished the Cycle Worksheet dialog box is displayed.

Note: A typical haul path starts in the cut, moves through the haul to the fill, then back to the cut by way of the return.

Edit Haul Cycle

Used to edit the Cycle Worksheet. This command is only available if you have applied a haul plan and drawn a haul path.

Haul Plan Template

Used to edit the Haul Plan Template. This command is only available if you have entered/edited information in the Cycle Worksheet.

Stage Haul Plan

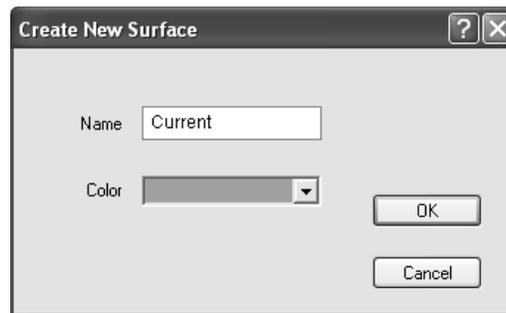
Update the job file to reflect current conditions after a haul plan has been done.

Send to Highway

Sends the currently selected line(s) to Highway as a new highway alignment.

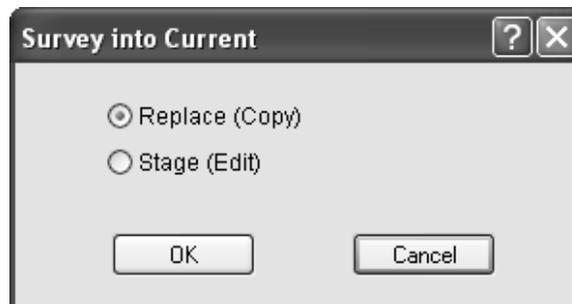
New Surface

Displays the Create New Surface Dialog box. Entering a name, choosing a surface color, and clicking **OK** creates a new surface with the entered name.



Apply Surface

Displays the Survey Into Current dialog box.



Replace Creates a new surface with the survey included and leaves the Design surface untouched.

Stage Stages the survey data into the Design ground.

Stage Over-ex

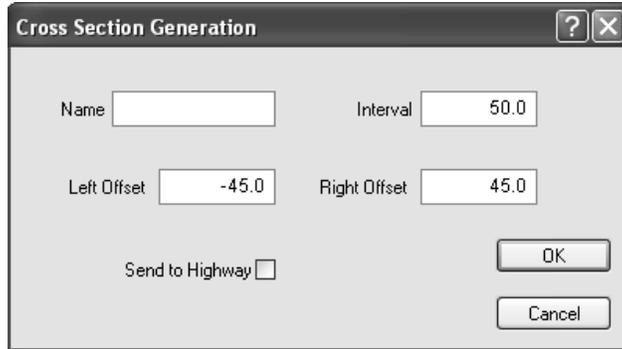
Displays the Over-ex Guide. For more information regarding the Over-ex guide, please see page A-15.

Edit Station/Offsets

Allow the Station Name and Horizontal Offset to be edited. When selected, the Edit Station/offset dialog box is displayed.

Station Generator

Allows the generation of stations along a selected profile line. When selected, the Profile Generation dialog box is displayed.



Enter or change the Station Name, Station Interval, Left and Right Offsets. Click to apply the changes.

Conform Profile Line

Adds points to a selected profile line everywhere it intersects a data line. You can then cycle through the points on the selected profile line, which are represented by pointers at the top and bottom of the profile view.

Clip Strata

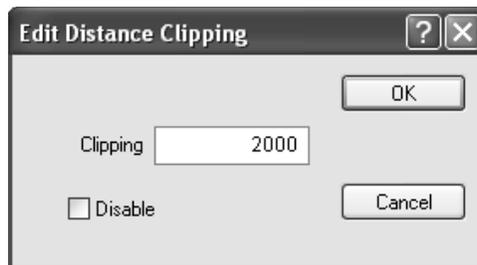
In the Profile View, displays the removal of strata in the selected surface.

Options Menu

The Options Menu is used to set certain preferences in Earthwork 4D to change or enable the several features like Auto Save and Snap Size. Below is a list of commands available from the Options Menu in all Modes.

Distance Culling

Sets the threshold for the amount of surface to be rendered in 3D View mode to speed up viewing the Terrain view on larger files. When selected, the Edit Distance Clipping dialog box is displayed.



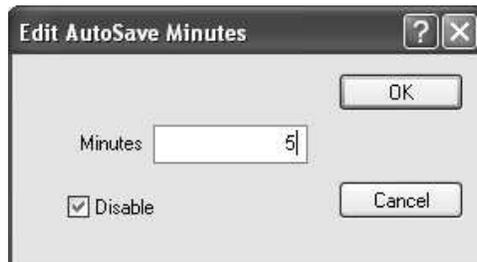
Type in a new distance in the text box and click **OK**. Checking the Disable box allows the terrain for the entire job to be rendered.

Staged Design

Enables the design to be staged to the Existing Surface for viewing. This allows the user to see where and how the design meets the existing ground at the boundary between the design data lines and the existing ground data lines.

AutoSave

Allows the user to enable/disable the Auto Save feature and change the interval between saves, which provides a point to resume work on the job file in the event of a program failure. When selected, the Auto Save Interval dialog box is displayed.



The interval is displayed in minutes between saves. Type in a number to change it. The default is 5 minutes. Check the Disable box to turn off this function. When finished, click **OK** to save these changes. When enabled, the file is saved as "Autosave.esw" in the current working directory. The file is deleted on normal program exit.

Sound Preference

Allows the user to choose sound options. A check next to the option indicates which one is active.

- Sound Card** Allow the use of external speakers.
- PC Speaker** Uses the internal PC speaker.
- No Sound** Disables all sounds

Strata Tracks OG

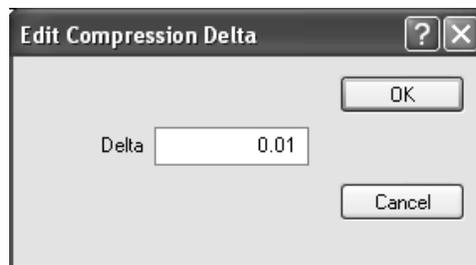
Allows the strata layers to follow the slope of the existing ground surface. If not selected, the strata layers slope straight from one boring to the next.

Freeze Strata Layers

Freezes strata to track the current Existing Surface. Future changes to the Existing Surface will not change the Strata Layer.

Compression Delta

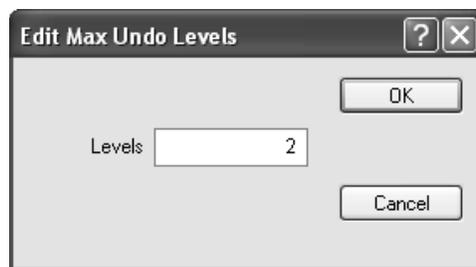
Sets the distance (using specified CAD Transfer Units) used to determine if a point will be removed during CAD Transfer to reduce file size. Points farther apart than the Delta will not be removed. When the command is selected, the Edit Compression Delta dialog box is displayed.



Enter the desired Delta distance and click **OK**.

Max Undo Levels

Determines how many levels of the Undo command can be performed. When selected, the Edit Max Undo Levels dialog box is displayed.



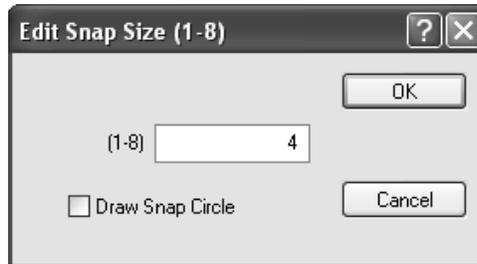
Enter in a value between "0" and "8". A value of 0 turns off the feature. Click **OK** to save and close the window.

Snap

 Toggles on or off the Snap function.

Snap Size

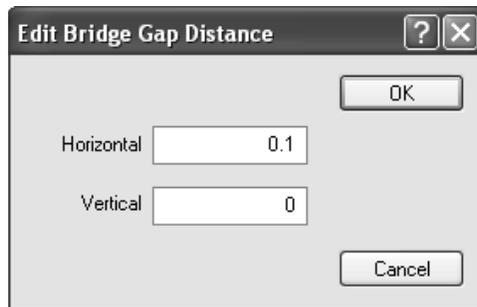
Allows the user to change the radius of the snap circle, an invisible perimeter surrounding the mouse pointer. Points outside the perimeter can not be snapped to. When selected, the Edit Snap Size dialog box is displayed.



Type in the a new Snap Size in the text box. Snap sizes can be from “1” to “8”. Click **OK** to apply the changes.

Bridge Gap Distance

Allows the user to edit the horizontal and vertical distance the Bridge Gap (Join) command will span. When selected, the Edit Bridge Gap dialog box is displayed.



Type in a new distance for the Horizontal and Vertical distance in the text box and click **OK**.

Automatic Join

Connects a snapped line to an existing data line and joins them as one line when snapping to it.

Sticky Zoom

 Enables the zoom function to zoom on a selected point.

Status Bar Display



Sets the program to one of four status bar display modes. Ctrl + Q cycles between these modes. The Q button resets the display to the default Distance/Slope.

Distance/Slope	Displays distance/slope of the line in the lower right of the status bar.
Distance/OG Elevation	Displays distance and Original Ground elevation (when Original Ground data exists in the file.)
Discrete Distance/Slope	Calculates a discrete distance, which varies with zoom factor, and derives the slope from it, so that when a second elevation is entered in the Elevation entry box and the cursor is moved, the resulting slope is displayed. The distance values are at even stops of 10 when zoomed out, 1 when zoomed in, and 5 in between.
Discrete Distance/Angle	Calculates a distance, which varies with zoom factor, and an angle, which initially uses single degree increments, then uses 45 degree increments as data is entered after the second point entry. To orient the coordinate system for this use in Entry Mode, the user either presses the F12 key to select which line segment to align to or enters the first two point. The Q key resets the drawing coordinate system so that zero degrees is up. Snap should be disabled when using this.

Auto Panning

Allows the cursor to pan the screen when you click on the outer frame drawn on the main window.

Auto Plus Marks

Automatically displays or hides plus marks depending on zoom level. If the **Display > Plus Marks** command is selected Auto Plus Marks is disabled. Select the Auto Plus Marks command to re-enable the command.

Rotated Text

Toggles on or of the rotation of text to the same angle as the nearest line.

Report Title

Toggles the display of the Job Name, Units of Measure and Date at the top of the report on or off in the Mass Haul Diagram.

Report Stripping

Toggles the display of stripping areas on or off in the Mass Haul Diagram.

Report Sectionals

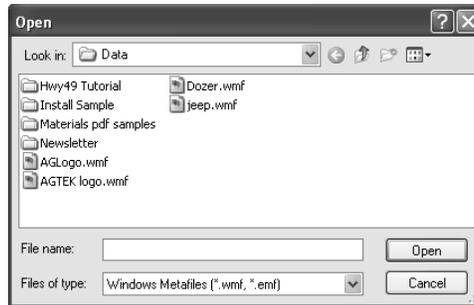
Toggles the display of sectional areas on or off in the Mass Haul Diagram.

Sub-Totals

Toggles the display on or off of only report region subtotals in the Mass Haul Diagram.

Title Block Logo

Inserts a logo to display in the Title Block across the bottom of the Print Page. Only files with the ".wmf" extension can be inserted in this manner. When the command is selected, the Open dialog box is displayed.



Select the logo file to use from the window and click Open to insert the image.

Label Font Size

Modifies the size of the font used for text labels on the Print page. Check Small, Medium, or Large and click OK.

Tablet Entry

Displays the Tablet Scaling dialog box and allows you to rescales the tablet to the drawing.

Window Menu

The Window Menu is used to switch to a different mode and set some window view preferences. Available Modes are displayed in black text while unavailable ones are in gray. Below is a list of commands available from the Window Menu.

High/Low Contrast

Toggles between windows default colors and high contrast colors for viewing outdoors.

Hide/Show Dialog

Toggles the display of the Elevation/Station List on the right side of the screen.

Area Zoom

Displays the crosshair and begins area zoom mode.

CAD Transfer

Switches to the CAD Transfer Mode.

Edit Mode

Switches to Edit Mode.

Entry Mode

Switches to Entry Mode.

Highway Mode

Switches to Highway Mode.

Profile View

Switches to Profile View Mode.

Plan View Mode

Switches to the color-shaded Plan View Mode.

3D View

Switches to 3D View Mode.

Volume Report

Switches to the Volume Report Mode.

Haul Report

Switches to the Mass Haul Report (only available if the job was started in Earthwork 4D).

Print Preview

Switches to the Print Preview Mode.

Help Menu

The Help Menu is used to allow the user to access Earthwork 4D Help, information about the version of the software, any recent changes, file name and information regarding elevations and coordinates. There is also a link to AGTEK's Home Page on the internet. Below is a description of these commands.

Earthwork 4D Help

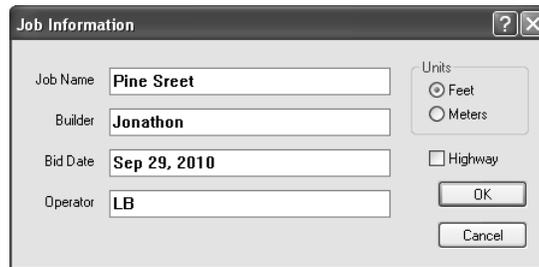
Starts the Help program ,which allows the user to search through various topics about Earthwork 4D.

Hot Key Help

Opens the Help program with links to keyboard shortcuts for the different Modes.

Job Info

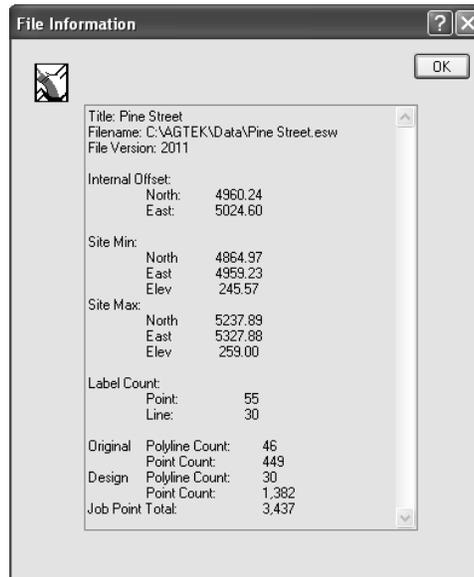
Displays the Job Information dialog box.



This is the same window that displays when a new job is started, except the option to choose the units of measure is unavailable. Make any changes and click **OK**.

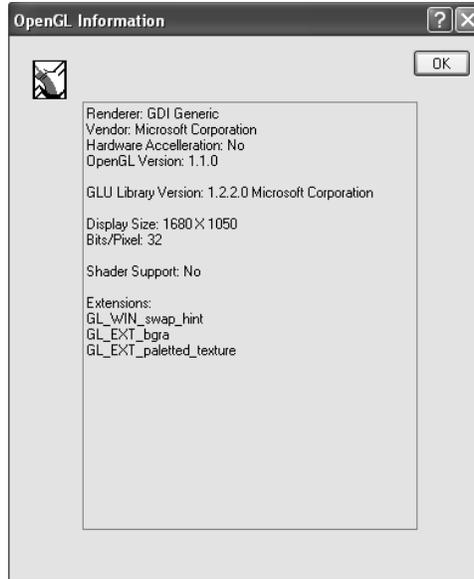
File Info

Displays the File Name and Site Min/Max Northing, Easting, Elevation, and Point/Line Labels and Counts.



OpenGL Info

Displays OpenGL information about you computer.

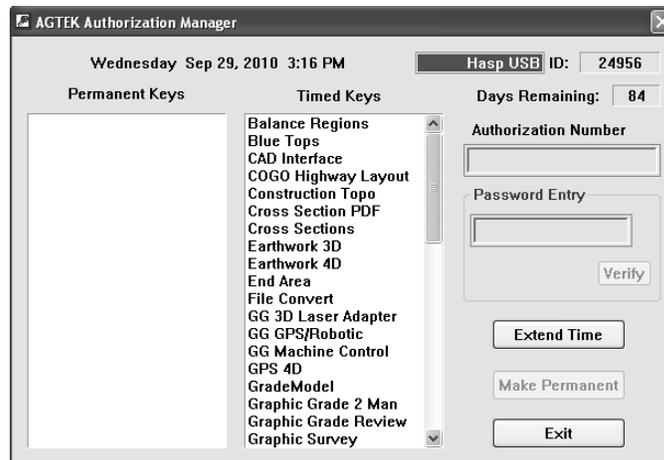


Visit AGTEK Online

Launches a web browser and opens the AGTEK Development Company Home Page.

Authorization Manager

Opens the Authorization Manager program, which displays information about current AGTEK software programs and is used to update the AGTEK Protection Key.



About Earthwork 4D

Displays the Earthwork 4D version, days remaining on Time-out Key and copyright information.



Revision History

Opens a file with the revision history of Earthwork 4D, including the latest changes to the software.

Printer Info

Display the name of the currently selected printer.

Point Types in Earthwork 4D

Earthwork 4D uses different types of points along lines to generate the 3D terrain. When a point is selected in Edit Mode or when a line is being added in Entry Mode, the points are listed in the Elevation list on the right side of the screen. Points are color-coded by type. Earthwork 4D has five point types, Interpolated, Daylight, Entered, Annotation and Snapped.

Interpolated

Interpolated points (light blue) derive their elevation from the slope between the entered elevations that surround them.

Daylight

Daylight points (green) are assigned elevation from the Existing surface. Daylight lines in the Design Layer automatically update to reflect changes made to the existing ground whenever the trimesh is recalculated. The trimesh recalculates any time the terrain view is enabled. Entered data points can be changed to daylight using the D button at the top of the Elevation list.

Entered

Entered points (white) are points that the user has assigned an elevation to by editing a point or typing in an elevation during Entry Mode.

Annotation

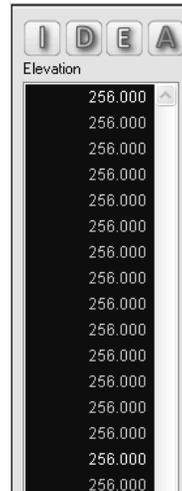
Annotation points (brown) are not used by the program to create the 3D surface. Lines transferred through the CAD transfer with an elevation of zero or with elevations that are outside of the Transfer Min/Max range are automatically assigned as Annotation.

Snapped

Snapped points (red) are created when a point on a data line is snapped (F6 or F8) to existing data line. A snapped point will automatically adjust its elevation when any adjoining point is edited.

Elevation List

The Elevation list appears on the right side of the screen in both Edit and Entry modes. It displays the elevations of points of the currently selected line, the type of points by a color coded system, and allows the user to edit the selected points. If multiple lines are selected, no points or elevation are shown in the Elevation list.



Selecting Multiple Points

To select a range of points, click and drag up or down in the Elevation list.

You can also click on a point, then Shift + click another point. All points between these points will be selected.

To select the entire line, click on the line in the main window or right-click over a point in the Elevation list, then select **Select All**.

Right-Click Menu

With a line selected, place the cursor over the Elevation list and right-click. The Right-Mouse menu is displayed with a list of available commands.

Entry Mode	
Point Editor	
Line Editor	
Import File	
Align	
Copy	Ctrl+C
Paste	Ctrl+V
Display	▶
Plus Marks	
Snap Enabled	
Undo	Ctrl+Z
Delete Line	
Cancel	

Entry/Edit Mode

Switch to either Entry or Edit mode.

Send to Existing

Send selected CAD layer to the Existing surface.

Send to Design

Send the selected CAD layer to the Design surface.

Plus Marks

Displays plus mark when checked.

Compression

Compresses the transferred data, removing extra points and detail during data transfer. Refer to "Compression Delta" on page 9-49 for information about setting the amount of compression.

Hide

Hides the selected point or line.

Hide All But

Hides all lines except for the selected points or lines.

Show All

Displays all points and lines in the job.

Point Editor

Displays the Point Editor dialog box. Allows you to edit the properties of the selected point.

Line Editor

Displays the Line Editor dialog box. Allow you to edit the properties of the selected line.

Import File

Imports the PDF associated with the selected outline. If no outline is selected, or the selected outlines references a PDF not in the same folder as the file you are using, the Import dialog box is displayed.

Align

Displays the Transform Selection dialog box. Form more information on aligning PDF's see page 9-76.

Copy

Copies the selected information.

Paste

Inserts the copied information into the displayed surface.

Display

Any checked layer is displayed, regardless of selected surface.

Snap Enabled

When checked, snap is turned on. Every time you click on the file the program will snap to the nearest point.

Undo

Cancels the last edit(s), up to the last eight edits.

Delete Line

Deletes the selected line.

Cancel

Deselects all selected lines and quits and operation in progress.

Continue

Allows you to proceed entering the most recently ended line.

Station Offset

Displays the Edit Station/Offset dialog box, allowing you to change the station name and the horizontal offset of the selected station.

Select All

Selects all the points of the current line in the Elevation list.

Clear Selection

Clears all points selected in the Elevation list.

Scale Object

Displays the Edit Scale dialog box, allowing you to change the scale of the selected object on the Print Page

Delete Object

Deletes the selected object on the Print Page.

Add Text

Displays the Add Text dialog box, allowing to enter and format text which is then inserted into the Print Page.

Insert Point

Allows a point to be added to the selected line at the highlighted position. By default, the point is added as an Entered point using the elevation of the currently selected point. The new point is added above the selected point. When Insert Point is selected, the Point Editor dialog box displays. Change the North, East and Elevation as needed and assign any labels. Checking the Affect Adjacent Point box causes any other lines that share that point to be modified as well. Click OK to apply the changes.

Note: When a new point is inserted, it is important that the new point not have the same Northing and Easting coordinates as the currently selected point. This can cause problems when the volumes are calculated.

Remove Selected

Deletes the currently selected point(s) and then rejoins the line.

Edit Selected

Allows the selected point(s) to be edited. When selected, the Point Editor dialog box displays. Change the North, East and Elevation as needed and assign any labels. Checking the Affect Adjacent Point box causes any other lines which share that point to be modified as well. Click OK to apply these changes and close the window.

Earthwork 4D Surfaces and Layers

A surface is a 3D representation of the ground created by data lines. These data lines can be contours, spot elevations or lines with varying elevations. All data entry is done within two distinct surfaces, Existing and Design. Four additional surfaces, Stripped, Previous, Current, and Subgrade, appear in the 3D View Mode.

Each Surface has several layers associated with it. The different layers are only visible in Entry and Edit Mode. The Current Surface and Current Layer are indicated in the tool bar at the top of the screen



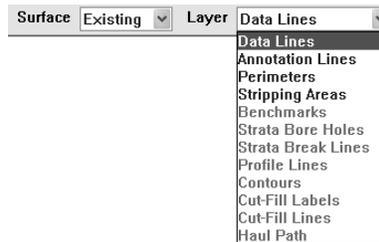
Changing the Current Surface is done by clicking on the pulldown menu and selecting the surface. The Current Layer is changed by clicking on the pulldown menu and selecting the layer. Below is an explanation of these surfaces and layers.

Existing Surface

The Existing Surface contains all the data pertaining to the Existing/Original Ground prior to any excavation. Existing contour lines, points and labels are contained within this layer. This layer also contains any pre-design excavating such as stripping areas.

Existing Surface Layers

The Existing Surface is composed of several layers. The example below shows the available Existing Surface Layers. A brief explanation of the layers is found below.



Data Lines

Contains all the contour lines, points, and labels relevant to the existing ground. Data contained within this layer is used to generate the Existing 3D surface and are modified by any stripping areas and the Existing perimeter.

Annotation Lines

This is a reference layer not used as part of the 3D surface. Data with no elevation is automatically moved to this layer during transfer.

Perimeters

Used to define the bounding edge of the existing ground data.

Stripping Areas

A modifying layer used to lower the existing surface to reflect stripped material.

Benchmarks

Special points used to mark control points. These points are often used when scaling to CAD file coordinates and preparing files for use in field and Machine Control systems such as AGTEK's SitePilot and Graphic Grade Machine Control programs.

Profile Lines

Lines generated for the Profile View Mode. These lines are used to locate profiles and generate cross sections from the current surface.

Contours

Contains contours that are created when using the Contour Surface command.

Cut-Fill Labels

Used to enter locations for cut-fill labels to appear in Plan View Mode.

Cut-Fill Lines

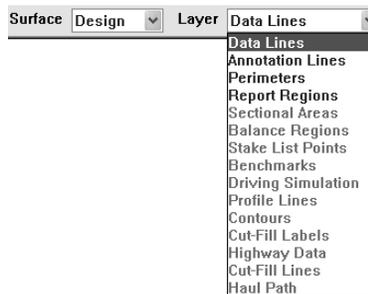
Lines generated in Plan View Mode to define the cut to fill transitions.

Design Surface

The Design Surface contains all the data pertaining to the design. Design lines, points, and labels are contained within this surface.

Design Surface Layers

The Design Surface is composed of several layers. The example below shows the available Design Surface Layers. A brief explanation of the layers is found below.



Data Lines

Contains all the contour lines, points, and labels relevant to the design. Data contained within this layer is used to generate the Design 3D surface, and are modified by any sectional areas and the Design Perimeter.

Annotation Lines

This is a reference layer not used as part of the 3D surface. Data with no elevation is automatically moved to this layer during transfer.

Perimeters

Creates a bounding limit for grading and defines the bounding edge of the design. When Staged Design is enabled, the Design Perimeter determines where the Existing Surface ties into the Design Surface.

Holes

Holes are perimeters within the design perimeter that are excluded from grading. A Hole is created by entering a perimeter within another perimeter.

Islands

Islands are perimeters entered outside the main perimeter that are included in grading. Enter a perimeter completely around any islands to include them in the volume calculations.

Report Regions

Used to define areas for volume calculations that are sub totaled on the Volume Report.

Sectional Areas

A modifying layer used to lower finish grade to subgrade in areas with a structural section.

Balance Regions

Used to define areas of cut-fill that are normally intended to be balanced to plan dirt hauls and cost estimation for a job.

Stake Point List

A list of stake points for use in the field with Graphic Grade 3D.

Benchmarks

Special points used to mark control points. These points are often used when scaling to CAD file coordinates and preparing files for use in field and Machine Control systems such as AGTEK's SitePilot and Graphic Grade Machine Control programs.

Driving Simulation

Allows entry of a path for the vehicle to follow during the driving simulation.

Profile Lines

Lines generated for the Profile View Mode. These lines are used to locate profiles and generate cross sections from the current surface.

Contours

Contains contours created using the Contour Surface command.

Cut-Fill Labels

Used to enter locations for cut-fill labels to appear in Plan View mode.

Cut-Fill Lines

Lines generated in Plan View Mode to define the cut to fill transitions.

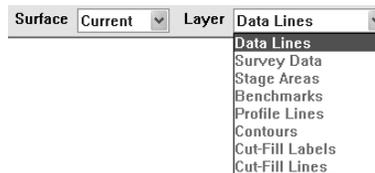
Current/Previous Surfaces

The Current Surface is an additional surface added in Entry Mode. Only two additional surfaces can exist at a time. Refer to “Adding a Surface” on page 9-61 for information about how to add a surface.

The data that makes up the new surface can come from any source. The data can be imported from a file and transferred directly to that surface. The data can also be copied from an existing surface layer in the job and pasted to the new surface, staged from survey data, or digitized into the new surface.

Current/Previous Surface Layers

Current/Previous Surfaces are composed of several layers. The example below shows the available Surface Layers. A brief explanation of the layers is found below.



Data Lines

Contains all the contour lines, points and labels relevant to the surface. Data contained within this layer is used to generate the 3D surface.

Survey Data

Data used to update the surface using Apply Survey and then staging the survey data to the Data Lines layer. The Survey Data layer is not available in the Previous Surface Layer menu.

Stage Areas

Data used to update the surface using Stage Over-Ex from the Over-Ex Guide. Once the data has been staged, the Stage Areas layer becomes empty.

Benchmarks

Special points used to mark control points. These points are often used when scaling to CAD file coordinates and preparing files for use in field and Machine Control systems such as AGTEK’s SitePilot and Graphic Grade Machine Control programs.

Profile Lines

Lines generated for the Profile View Mode. These lines are used to locate profiles and generate cross sections from the current surface.

Contours

Contains contours created from the Current surface using the Contour Surface command.

Cut-Fill Labels

Used to enter locations for cut-fill labels to appear in Plan View Mode.

Cut-Fill Lines

Lines generated in Plan View Mode to define the cut to fill transitions.

Stripped Surface

The Stripped surface is the Existing surface minus any Stripping Areas. The data lines for this surface are entered in the Existing Surface and Stripping Area Layer.

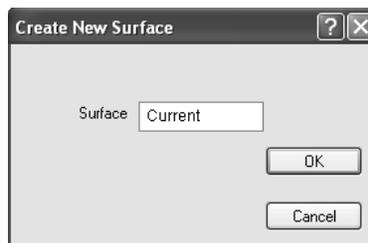
Subgrade Surface

The Subgrade surface is the Design surface minus any Sectional Areas. The data lines for this surface are entered in the Design Surface and Sectional Area Layer.

Adding a Surface

Earthwork 4D allows the creation of two additional surfaces. Each additional surface after the second causes the first surface to be copied to the second, called "Previous", and the second surface to be deleted. For example, if you add Surface-1 and Surface-2, then add Surface-3, Surface-1 will be removed and Surface-2 and Surface-3 will remain. To add a surface:

1. Switch to Edit Mode and select **Edit > New Surface**. The Create new Surface dialog box is displayed. The default name for the surface is "Current" but it can be changed by typing a new one.



2. Click **OK** to add the surface or **Cancel** to abort.

Snap Techniques

Snap is a powerful feature in Earthwork 4D. It allows for fast entry with greater precision than possible with freehand data entry. When used with CAD files, it allows quick conversion of data from annotation (two-dimensional) to data (three-dimensional) for use in the model.

Snapping in Edit Mode

Snap



With Snap enabled in Edit Mode, you can enter a point at an existing point/line closest to the cursor. Enable Snap Mode by pressing the S key on the keyboard or right-clicking and selecting **Snap Enabled**. The “Snap” indicator at the lower right corner of the window displays is black when enabled and gray when disabled.

Elevation Snap



Earthwork 4D can read elevations, including elevations stored as text (for example in a CAD file) and assign it to other points or lines by using Elevation Snap. Select the point or line to assign an elevation to, then move the cursor over a point or the plus (+) in front of the text with the desired elevation and press F9.

Auto-Increment Snap



The Auto-Increment Snap assigns incrementally increasing/decreasing elevations to points or lines. Follow the steps below to auto-increment snap:

1. Make sure that nothing is selected by pressing the Esc key.
2. Find two contours that have elevations in the increment you wish to assign. For example, to start assigning an auto-increment elevation at 250, going up in one-foot increments, you need a 248 and a 249 contour.
3. Snap by pressing the F8 key over each contour. The order that the contours are snapped determines whether the increment goes up or down.
4. Place the cursor on a contour with no elevation and press F8 to snap an elevation to it. Continue snapping to each annotation contour in the order to be assigned. For example, if the known contours were 248 and 249 and they were snapped in that order, the first elevation assigned to an annotation contour would be 250. Subsequent snaps would assign elevation 251, 252, 253, etc.

Point Snap



Additional points along a line can be entered by placing the arrow over the desired location on a line and pressing F6. If the new point is inserted between two points with different elevations, the elevation of that point is interpolated along a straight slope.

Snapping in Entry Mode

With Snap enabled in Entry Mode, you can connect to the point closest to the cursor for data entry. Enable Snap by pressing the **S** key on the keyboard or right-clicking and selecting **Snap**. The “Snap” indicator at the lower right corner of the window displays is black when enabled and gray when disabled.

If an elevation was typed in, the new point assumes that elevation. If no elevation is specified, the snapped point interpolates the elevation from the point to which it was snapped.

Line Snap



Line Snap (or double-snap) is a quick way to snap to multiple points on a line. Press the F8 key twice or double-click on a line at the point you want to start the new line. The entire line should highlight with a small diamond displayed on the first and last points of the selected line. The cursor changes to the Line Snap cursor (see example to the left). Move the cursor to the point on the highlighted line where you want to end, then press F8 a third time or click.

Area Snap



Area Snap is a variation of Line Snap and allows you to snap to multiple points on an enclosed line. Press F8 twice or double-click to highlight the entire area, then move the cursor to the point on the highlighted line where you want to end and press F8 a third time or click.

Intersection Snap



Intersection Snap enters a point on an existing line at the crosshairs, and interpolates the elevation. Press F6 at the point on a line to enter the point.

Elevation Snap



Earthwork 4D can read elevations, including elevations stored as text (for example in a CAD file) and enter it into the elevation window at the bottom of the screen for use in data entry. Place the cursor over the point or line with the desired elevation, press F9, then enter the data. The points use the elevation selected with F9 as their elevation.

Print Page Basics

Selecting Objects

Once there are many objects on the Print Page, it can be difficult to select the desired object to edit. If you select any object on the page, press the Tab key to cycle through the different objects on the page until you select the one you want.

Moving and Sizing Objects

To move an object, click and hold the object then drag it to the desired location.

To resize an object, click on it, then click and hold the lower right selection block. The arrow changes to a double-headed arrow. By moving the cursor toward or away from the object, you can resize it.

Scaling

A drawing object can be scaled by clicking on it then selecting **Edit > Drawing Scale**. Type in the new scale and click OK to apply the new scale.

Deleting

An unwanted object can be deleted by selecting the object then selecting **Edit > Delete** or pressing the Delete key.

Adding/Editing Text

Add text by pressing the T key or selecting **Edit > Add Text**, then typing the text and clicking OK.

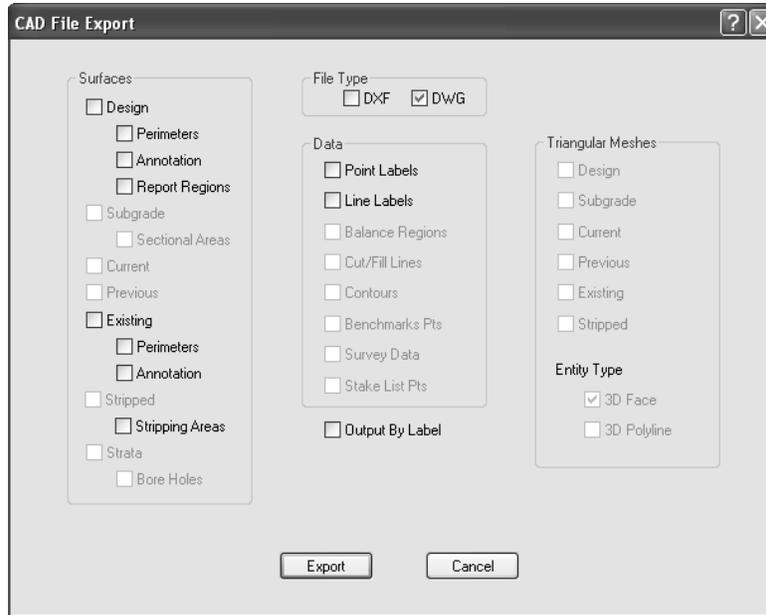
Edit text by selecting the text, then pressing the T key or selecting **Edit > Add Text**.

Changing Cut-Fill Labels

Both the text size and style of the Plan View cut-fill labels can be changed by selecting the **Edit > Cut-Fill Font Size**. The label background is changed selecting **Edit > Cut-Fill Label Style**.

Exporting CAD Files

Earthwork 4D can export DXF/DWG files with many options. When **File > Export CAD** is selected, the CAD File export dialog box is displayed



The export choices are broken down by Surface, File Type, Data, and Triangular Meshes. When exported, each checked option is created in the file as a separate layer.

Surfaces

Surface options are the data lines displayed as the overlay and create the three-dimensional views (annotation is an exception). Many of these are self-explanatory.

Design	The design surface data lines.
Perimeters	The proposed perimeter line.
Annotation	Annotation lines present in the design surface.
Report Regions	Report regions present in the design surface.
Subgrade	The design surface data lines lowered by the Sectional Area depth.
Sectional Areas	Sectional areas that were used to create the Subgrade Surface.
Existing	The existing ground surface data lines.
Perimeter	The existing ground perimeter line.
Annotation	Annotation lines present in the existing surface.
Stripped	The stripped surface data lines.
Stripping Areas	Stripping areas used to create the stripped surface.
Strata	The strata surface data lines.
Bore Holes	Location and depth of strata bore holes.

File Type

The File Type options allow you to select file format to which the CAD file will be exported.

DXF	Saves the file as a DXF (Data Exchange Format) file.
DWG	Saves the file as a DWG (AutoCAD) file.

Data

The Data options are additional data types you may want to include in the CAD export. Each option, when checked is written as a separate layer.

Point Labels	The text labels entered on points.
Line Labels	The text labels entered on lines.
Balance Regions	All balance regions entered in the file.
Cut-Fill Lines	All cut-fill lines generated in the file.
Contours	All contours generated in the file.
Benchmark Pts	Any Benchmarks in the file.
Survey Data	All survey data in the file.
Stake List Pts	All stake list data in the file.

Triangular Meshes

Triangular Meshes are three-dimensional triangles that Earthwork 4D creates based on the data lines of the different surfaces. The Entity Type allows the user to specify the way these meshes are written. The user should choose entity types based on what software the file is going to be read into and how it will be used.

Design	Design Surface Trimesh.
Subgrade	Subgrade Surface Trimesh.
Current	Current Surface Trimesh.
Previous	Previous Surface Trimesh.
Existing	Existing Surface Trimesh.
Stripped	Stripped Surface Trimesh.

Entity Type

3D Face	Exports the Trimesh as 3D faces.
3D Polyline	Exports the Trimesh as 3D polylines.

Adding a Point to a Line

Points can be added to a line using the F6 key or the Insert Point command from the Right Mouse menu in the Elevation list.

Using F6



To add a point using the F6 key:

- Select the line, place the cursor over the location for the new point, then press the F6 key.

The grade at that location is interpolated and an interpolated point is placed on the line.

Using the Elevation List

To add a point using the Right-Mouse menu in the Elevation list:

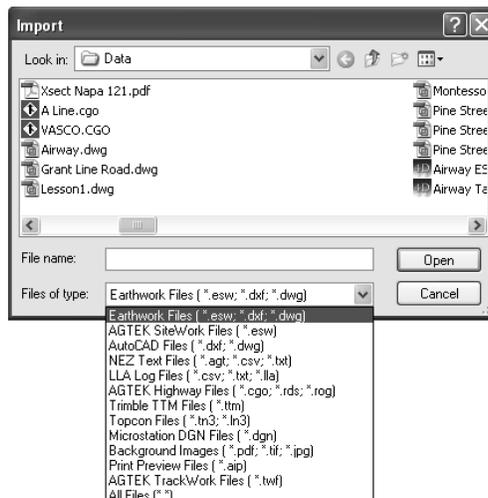
1. Select the line, then select a point closest to the location of the new point in the Elevation list.
2. Right-click and select **Insert Point**. The Point Editor dialog box is displayed.
3. Type in the North and East coordinates and Elevation for the new point and click OK.

Importing Files

Earthwork 4D can import a variety of file types. Importing a file is typically done to create a new job from an existing file. Below is a list of importable file types.

- Earthwork Files (*.esw, *.dxf, *.dwg)
- AGTEK SiteWork Files (*.esw)
- AutoCAD Files (*.dxf, *.dwg)
- NEZ Text Files (*.agt, *.csv, *.txt)
- Topcon LN3 Files (*.ln3)
- Microstation Files (*.dgn)
- PDF Files (*.pdf)
- TIF Files (*.tif)
- Print Preview Files (*.aip)
- AGTEK Sitework zip file (*.esz)

To import, select **File > Import** for an existing job, or **File > Open** for a new job. The Import dialog box displays



Use the pulldown menu to choose the desired file type, then select the file and Click Open.

AutoCAD, NEZ, Topcon LN3, Microstation, PDF, and TIF Files (.dxf, .dwg, .agt, .csv, .txt, .ln3, .dgn, .pdf, .tif)

AutoCAD, NEZ, Topcon LN3, Microstation, PDF, and TIF files all open using CAD Transfer Mode, allowing you to transfer the data to the appropriate surface.

Print Preview Files (.aip)

Importing an AIP file automatically switches the program to Print Preview Mode. Any reports or images on the Print Preview Page remain and the imported data is added to the page.

Transforming Jobs

Transforming jobs uses commands in the **Utility > Transform Job** in Edit Mode. These commands are: Translate North/East, Align Matching Edges, and Stretch Site. Each of these commands are described below.

Note: There is no Undo for when using the “Whole Job” option. It is recommended that a backup of the job file be made prior to using any of these commands.

Translate North/East

Used to move data to a different coordinate system. There are three methods to move data; all data, selected data, or the whole job. All data and selected data methods move only the data in the current Surface and Layer. Whole job moves all data in all Surfaces and Layers. For information on aligning multiple PDF files, see the examples starting on page A-68.

All Data

1. Press the ESC key to make sure no data is selected.
2. Select **Utility > Transform Job > Translate North/East**.
3. Pick the first point, indicating what data to move. The Translate North/East dialog box displays.

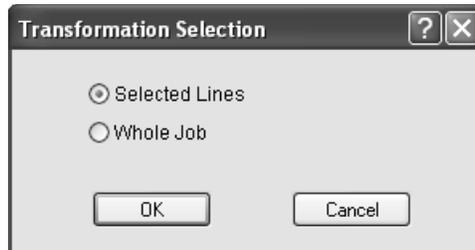
4. Either type in the To coordinates or check Use Next Point Entered and click OK. If you check Use Next Point Entered, select the second point, indicating where you want to move this data to. Once the second point is selected, Translate North/East dialog box is displayed again for verification of the second point.
5. Click OK to continue. The Translating Site dialog box is displayed.

6. This dialog box displays the distance the data will be moved. Click OK to move the data or Cancel to abort the command.

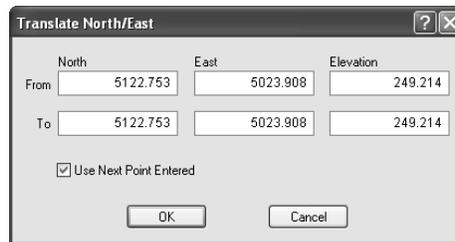
Selected Data/Whole Job

The procedure for Selected Data and Whole Job are identical, except that you would select Whole Job if you accidentally had data selected but wanted to move the whole job.

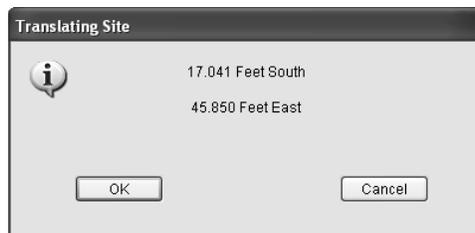
1. Select the data to move.
2. Select **Utility > Transform Job > Translate North/East**. The Select Area for Transformation dialog box displays.



3. Choose Selected Lines and click OK to continue.
4. Pick the first point, indicating what data to move. The Translate North/East dialog box is displayed.



5. Either type in the To coordinates or check Use Next Point Entered and click OK. If you check Use Next Point Entered, select the second point, indicating where you want to move this data. Once the second point is selected, Translate North/East dialog box is displayed again for verification of the second point.
6. Click OK to continue. The Translating Site dialog box is displayed.



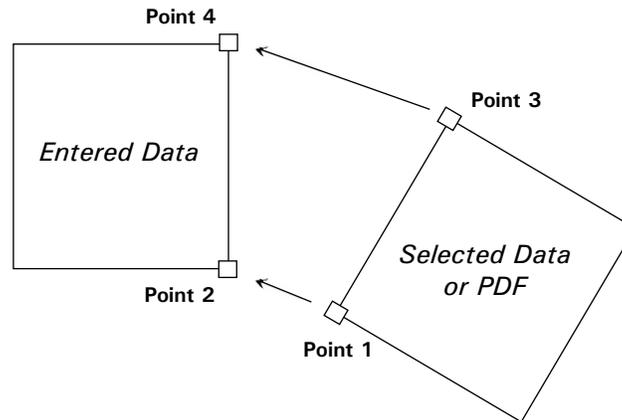
7. This dialog box displays the distance the data will be moved. Click OK to move the data or Cancel to abort the command.

Align Matching Edges

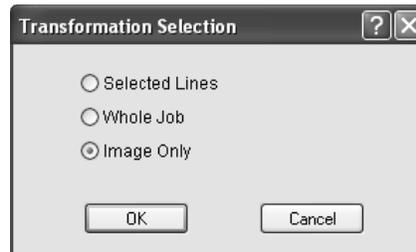
Used for matching data from separate grading sheets, rotating data into the correct field coordinates, moving data on different surfaces into the same coordinate system, or aligning digitized data with a PDF. Aligning matching edges requires two common points in both sets of data. Property corners or pad corners are often good points.

Matching Data to a Common Edge

When files are merged, or imported, often they are in different coordinates systems. Selected data, or a PDF, can be moved and edge matched to non-selected data. Point 1 is moved to match Point 2, and Point 3 is moved to match Point 4. See the example below.



1. Select the data to move.
2. Select **Utility > Transform Job > Align Matching Edges**. The Select Area for Transformation dialog box is displayed.



3. Choose Selected Lines or Image Only (for PDF) and click OK to continue.
4. Pick the first point (Point 1) indicating what data you want to align. The Alignment: Point 1 of 4 dialog box displays the coordinates of the first point. Click OK to continue.
5. Pick the second point (Point 2) indicating where the first point matches. The Alignment: Point 2 of 4 dialog box is displayed. Click OK to continue.
6. Pick the third point (Point 3) indicating what data you want to align. The Alignment: Point 3 of 4 dialog box is displayed. Click OK to continue.
7. Pick the fourth point (Point 4) indicating where the third point matches. The Alignment: Point 4 of 4 dialog box is displayed. Click OK to continue.
8. A warning dialog box may appear stating that the second pair of points may not match. This is common given the degree of error in digitized takeoffs. Alignment does not rescale the data. Click OK to continue.

Rotating Data

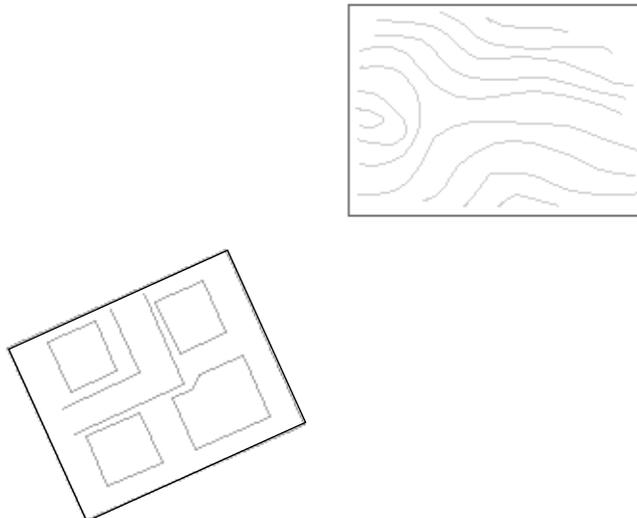
Rotating data is very similar to matching data to a common edge. The only difference is that point 1 and point 2 would be the same point when rotating data.

To rotate data, use the procedure for matching data to a common edge and select the same points for point 1 and point 2 in steps 4 and 5 in the procedure.

Moving Data

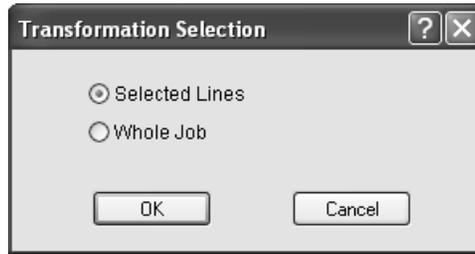
Layers can be moved in relation to each other to match the coordinate system. For example, moving the design layer data to match the existing ground. This is similar to edge matching, but the data is being aligned to data points on a different surface or layer. This is commonly used to move data imported from a CAD file to align with data from a take-off and you may need to add benchmarks before moving data.

1. Press the ESC key to make sure nothing is selected.
2. Select **Utility > Transform Job > Align Matching Edges**.
3. Press Alt + B to display the Layer Selection window.
4. Select all required surfaces and layers. If moving design to match existing, make sure they are both selected.

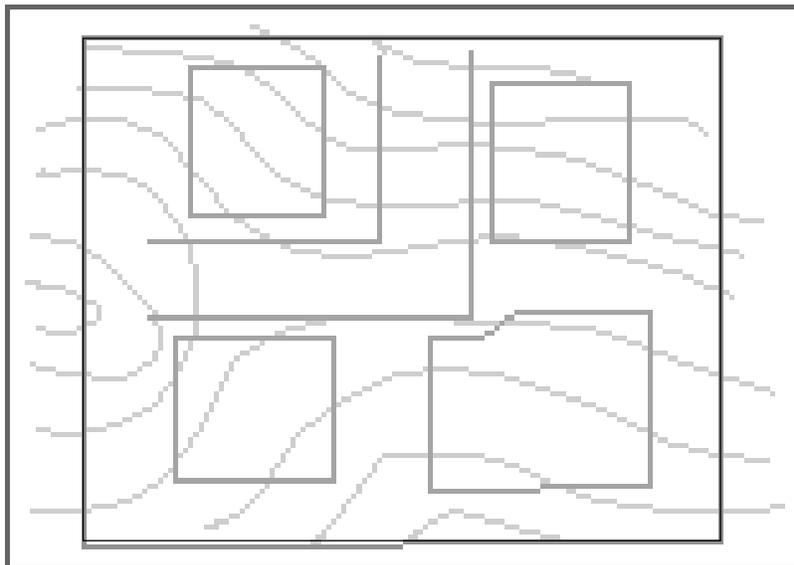


5. Select all the data in the layer you want to move.

6. Choose **Utility > Transform Job > Align Matching Edges**. The Select Area for Transformation dialog box is displayed.



7. Choose Selected Lines and click OK to continue.
8. Pick the first point, indicating what data you want to align. The Alignment: Point 1 of 4 dialog box displays the coordinates of the first point. Click OK to continue.
9. Pick the second point, indicating where the first point matches. The Alignment: Point 2 of 4 dialog box is displayed. Click OK to continue.
10. Pick the third point indicating what data you want to align. The Alignment: Point 3 of 4 dialog box is displayed. Click OK to continue.
11. Pick the fourth point indicating where the third point matches. The Alignment: Point 4 of 4 dialog box is displayed. Click OK to continue.
12. A warning window may appear stating that the second pair of points may not match each other. This is common given the degree of error in digitized takeoffs. Alignment does not rescale the data. Click OK to continue.

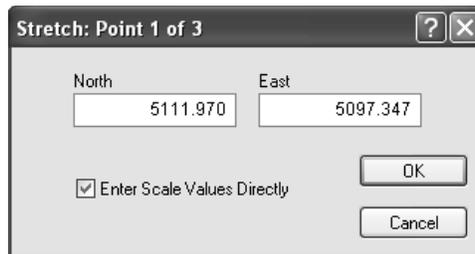


Stretch Site

Adjusts the scale of selected data, or the whole job. The most common use is to correct data entered at the wrong scale.

Whole Job

1. Press the ESC key to make sure nothing is selected.
2. Select **Utility > Transform Job > Stretch Site**.
3. Select an anchor Point, indicating from where you want to stretch the data in the lower left corner on the screen. The Stretch: Point 1 of 3 dialog box displays.



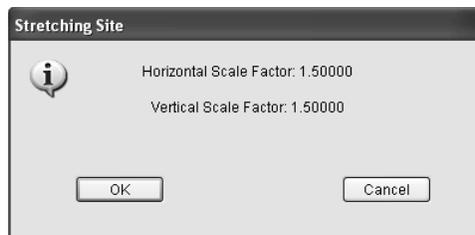
4. Check the Enter Scale Value Directly box. The Rescale Job dialog box is displays.



5. On the Job Scale tab, enter the scale used to digitize the plan sheet in the Old Scale box. Enter the new scale for the job (the correct scale) in the New Scale box.

Note: The Scale Factor tab can be used to adjust the job scale by a factor. For example, to scale a plan digitized at a 1:10 to 1:20, enter a scale factor of 2.

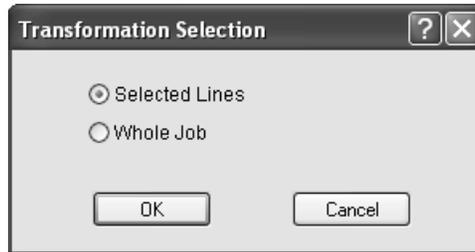
6. Click **OK**. The Stretching Site dialog box displays the vertical and horizontal factor by which the job was stretched.



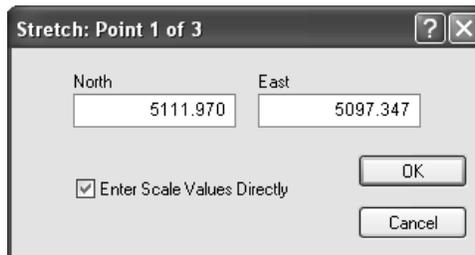
7. Click OK to finish and rescale the job.

Selected Lines Only

1. Select all the data to stretch on the screen.
2. Select **Utility > Transform Job > Stretch Site**. The Select Area for Transformation dialog box is displayed.



3. Check Selected Lines and click **OK** to continue.
4. Select an anchor Point, indicating from where you want to stretch the data in the lower left corner on the screen. The Stretch: Point 1 of 3 dialog box displays.



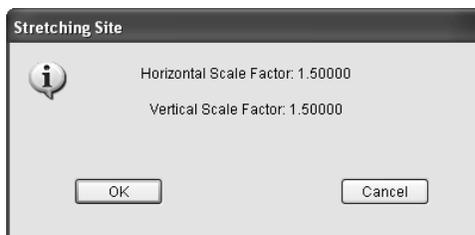
5. Check the Enter Scale Value Directly box. The Rescale Job dialog box displays.



6. On the Job Scale tab, enter the scale used to digitize the plan sheet in the Old Scale box. Enter the new scale for the job (the correct scale) in the New Scale box.

Note: The Scale Factor tab can be used to adjust the job scale by a factor. For example, to scale a plan digitized at a 1:10 to 1:20, enter a scale factor of 2.

7. Click **OK**. The Stretching Site dialog box displays the vertical and horizontal factor by which the job was stretched.

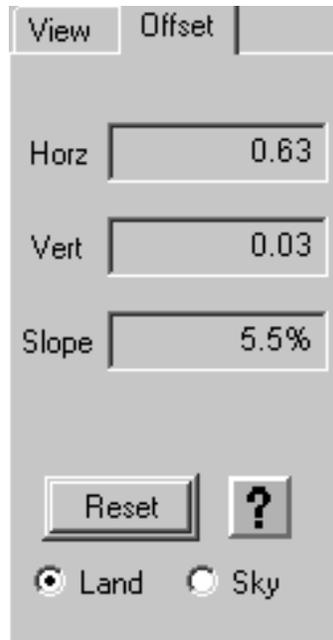


8. Click **OK** to finish and rescale the job.

Stake Checking

RTK GPS support is an additional feature in Sitework 4D, which must be purchased separately. Make sure you have setup Bluetooth connections and run GPS Base Setup before stake checking. Refer to “Bluetooth Setup” in the Appendix on page for additional information.

1. Open the model file that contains the stake data to check.
2. Align to the site using the Rover. Refer to “Aligning to the Site/Rover Setup” on page 7-3 for information.
3. Select a stake point to check in the job file.
4. Move the Rover to the point on the site and level the Rover. The Offset tab of the 3D Controls window displays the horizontal and vertical difference and the slope from the picked point to the Rover.



5. Verify the information displayed in Earthwork 4D matches the cut/fill and elevation data on the stake at the job site.

Checking Existing Ground

When checking existing ground, areas with high grass, brush, or trees should be given extra attention because errors can be common in those areas on aerial topos. Also look for obvious signs of earth-moving that may have occurred after the original topo was done. Finally, remember that there is a certain inherent inaccuracy to ground models represented by contours and grades within half a contour interval are usually considered within acceptable margins as long as they are not consistently high or low.

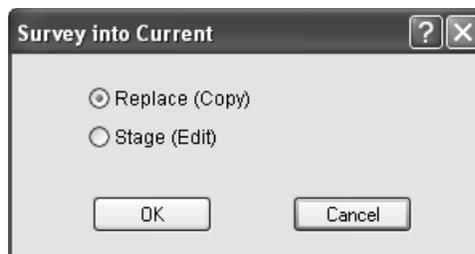
Make sure you have setup Bluetooth connections and run GPS Base Setup before checking existing ground. Refer to "Bluetooth Configuration" in the Appendix A-26 and "Lesson 1 - Instrument Setup" on page 6-2 for additional information.

1. Open the job file with the data in it to grade check.
2. Align to the site using the Rover. Refer to "Aligning to the Site/Rover Setup" on page 6-3 for information.
3. Change the Reference surface to Existing to display the existing ground by selecting Existing from the Ref pulldown menu.
4. Move the Rover around the area to check. The 3D Controls window reports the cut or fill value between the actual (survey) and theoretical (reference). The Elev box shows what elevation the program calculated that it should be based on the Reference (Ref) surface. The Northing and Easting boxes show the Northing and Easting coordinates for the location using GPS data. The survey elevation is displayed as the "Z" value at the bottom of the screen.
5. Click the Stop button when finished checking the area.

Correcting Existing Ground

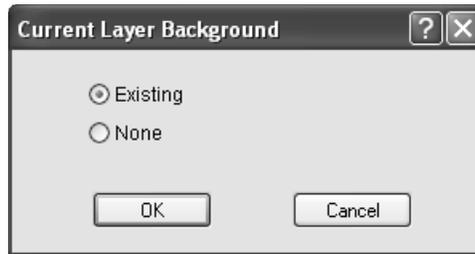
If the existing ground deviates substantially from the data in the job file, Earthwork 4D can use data collected from the Rover to document the difference and correct the original topo.

1. Switch to 3D view Mode, then move the Rover to a starting point for the topo area to correct.
2. Click the Record Off button so that it reads Record On and take shots in serpentine pattern to cover the topo area.
3. After completing the topo, click the Record On button so that it reads Record Off.
4. Select **Utility > Apply Survey**. The Survey into Current Dialog box is displayed.



5. Select Replace to copy the data into the current layer with no other data or Stage to copy the data into data from the model and click OK. If you select Replace, skip step 6.

6. In the Current Layer Background dialog box, select the layer to use as the data for the Current layer. The cursor changes to a crosshair.



7. Enter a survey boundary around the updated topo data. Right-click at the start of the boundary, then select **Finished** to complete the boundary.

Note: You can also right-click and select **Survey Boundary** if the topo data is a symmetrical shape to auto-create the boundary, then right-click and select **Finished** to complete the boundary.

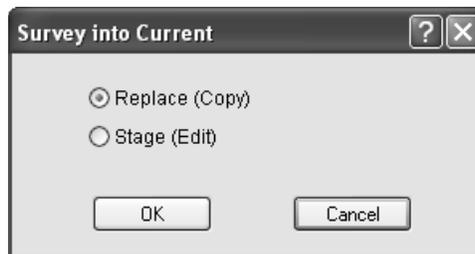
8. Click the Stage Data button in the Apply Survey Data dialog box. The Current layer now contains the new topo data plus the data from the layer you selected as the background (if any).

Progress Topoing

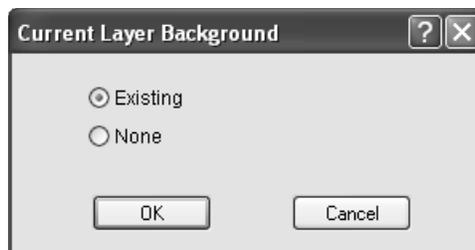
Progress topoing is a variation of checking existing ground. The difference is that you are creating a record of progress by creating multiple job site files with a progression of the Existing/Current changes for comparison.

Make sure you have setup Bluetooth connections and run GPS Base Setup before stake checking. Refer to "Bluetooth Configuration" in the Appendix page A-26 and "Lesson 1 - Instrument Setup" on page 6-2 for additional information.

1. Open the model to do progress topo.
2. Select **File > Save As** to save the job file under a different name.
Note: Progress topoing might be performed on a daily basis, so using a name such as the job file plus the date or the job file plus the phase would be helpful for future comparison of the files.
3. Align to the site using the Rover. Refer to "Aligning to the Site/Rover Setup" on page 6-3 for additional information.
4. Move the Rover to a starting point for the topo area to check.
5. Click the Record Off button so that it reads Record On and take shots in serpentine pattern to cover the topo area.
6. After completing the progress topo, click the Record On button so that it reads Record Off and save the job.
7. Select **Utility > Apply Survey**. The Survey into Current Dialog box is displayed



8. Select Replace to copy the data into the current layer with no other data or Stage to copy the data in with data from the model (see next step). If you select Replace, skip step 9.
9. In the Current Layer Background dialog box, select the layer to use as the data for the Current layer. The cursor changes to a crosshair.



10. Enter a survey boundary around the updated topo data. Right-click at the start of the boundary, then select **Finished** to complete the boundary.

Note: You can also right-click and select **Survey Boundary** if the topo data is a symmetrical shape to auto-create the boundary, then right-click and select **Finished** to complete the boundary.



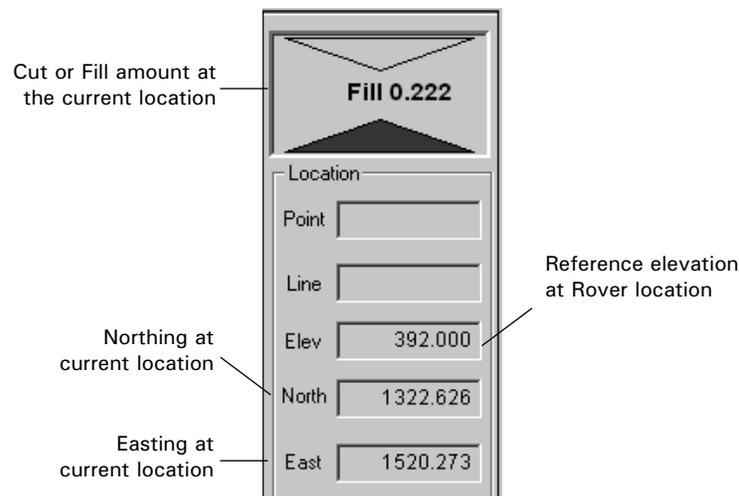
11. Click the Stage Data button in the Apply Survey Data dialog box. The Current layer now contains the new topo data plus the data from the layer you selected as the background (if any).
12. Click the Survey Volume Calc button. The survey data is shown on the screen.
13. Right-click, then select **Finished** to use the existing survey boundary. After calculation, the Volume Calculation Results dialog box displays.
14. Click the Done button and the Survey Volume Report displays.

Grade Checking

Earthwork 4D can be used for spot grade checking to determine if data for specific points in the model match the job site data.

Make sure you have setup Bluetooth connections and run GPS Base Setup before stake checking. Refer to “Bluetooth Configuration” in the Appendix A-26 and “Lesson 1 - Instrument Setup” on page 6-2 for additional information.

1. Open the job file with the data in it to grade check.
2. Align to the site using the Rover. Refer to “Aligning to the Site/Rover Setup” on page 7-3 for additional information.
3. Change the Reference surface to Existing to display the existing ground by selecting Existing from the Ref pulldown menu.
4. Select the point to check in the model, move the Rover to it, then level the Rover on the point. The 3D Controls window reports the cut or fill value between the actual (survey) and theoretical (reference). The Elev box shows what the elevation should be based on data in the Reference (Ref) surface. The Northing and Easting boxes show the Northing and Easting coordinates for the location using GPS data.



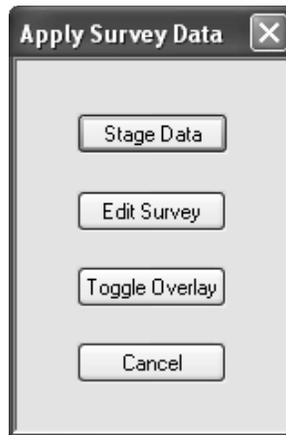
5. Repeat steps 3-4 for any other points to check.

Updating a 3D Model with Survey Data

In addition to updating job files in the field, you may have a file in the office that serves as the master file that you update with data collected in the field using a different file. This data is typically collected in the Survey Data Layer of the Current Surface. Updating a file with survey data is also called staging data.

Apply Survey Dialog box

The Apply Survey Data dialog box is displayed during the staging process. Below is a description of the dialog box.



Stage Data	Moves the survey data to the data line layer and updates the current surface.
Edit Survey	Switches back to Entry Mode to change the boundary of the survey data.
Toggle Overlay	Toggles on or off the display of the 2D Overlay.
Cancel	Aborts the Apply Survey Command.

Applying Survey Data Collected in Earthwork 4D

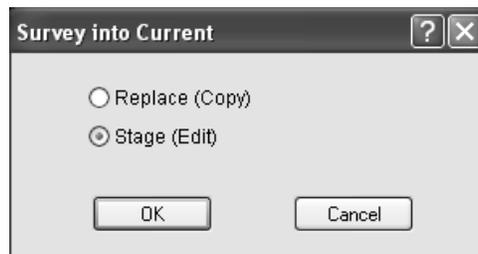
If you use Earthwork 4D in the field to collect data, you can export it from the field file, then import the survey data in to the master file.

Collect the Data

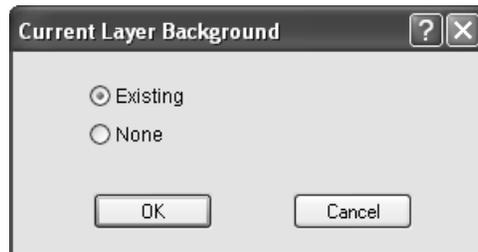
1. Open the job file that contains the reference surface or start a new file.
2. Switch to 3D View mode and collect data in the field.
3. Select **Utility > Apply Survey**. The Survey Into Current dialog box is displayed.
4. Select Replace (Copy) and click **OK**. The Current surface is created with the survey data.
5. Select **File > Save As**, and save the file as an AGT file.
6. (Optional) Save the file as an ESW file for reference. Make sure to change the name of the file so the original file is not overwritten if using an existing file.

Stage the Data

1. Open the master file to apply the data to in Earthwork 4D.
2. Select **File > Import**. The Import dialog box is displayed.
3. Select the AGT file that was created with the survey data in it and click Open. The Survey data is opened in CAD Transfer mode.
4.  Select the survey data, select "Current" from the Surface pulldown, "Survey Data" from the Layer pulldown, then click the Send To button. The data is transferred to the Current surface.
5. Switch to 3D Mode and select **Utility > Apply Survey**. The Survey Into Current dialog box is displayed.



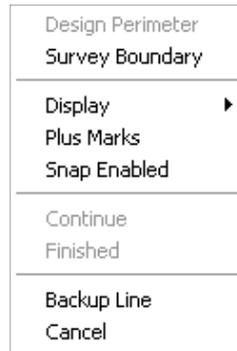
6. Select Stage, then click OK. The Current Layers Background dialog box is displayed.



7. Select Existing and click OK to create the Current Surface with the Existing Surface as the ground and the survey data staged into it. The survey data is shown on the screen.

- Enter a survey boundary around the updated topo data by clicking to add points around the data. Right-click at the start of the boundary, then select **Finished** to complete the boundary.

Note: If the topo data is symmetrical, you can right-click and select **Survey Boundary** to auto-create the boundary, then right-click and select **Finished** to complete the boundary.



- Click the Stage Data button in the Apply Survey Data dialog box. The Current layer now contains the Existing layer data plus the new topo data.
- Select Existing from the Ref pulldown and Current from the Diff pulldown. This compares the Existing surface with the Current surface to calculate the volume difference between the two surfaces.
- Click the Survey Volume Calc button. After calculation, the Volume Calculation Results dialog box is displayed.
- Click the Done button and the Volume Report is displayed.



Applying Survey Data Collected in SitePilot RTK

If you use a SitePilot RTK unit in the field to collect data, you can import the survey data directly from the unit in to the master file.

Collect the Data

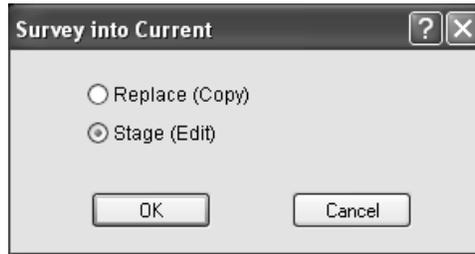
Refer to the SitePilot chapter of the PlanPilot manual for information about checking existing ground and starting a new survey using SitePilot RTK.

Stage the Data

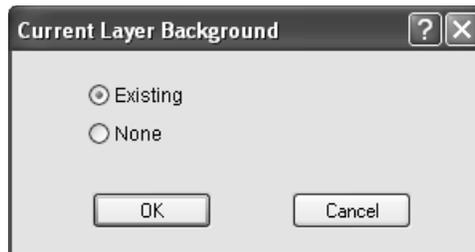
- Open the master file to apply the data to in Earthwork 4D.
- Connect the SitePilot to your computer via a USB port, then select **File > PlanPilot Import**. The Open dialog box is displayed.
- Select the file that was used to collect the data and click Open. The Survey data is opened in CAD Transfer mode.
- Click the Send To button. The data is transferred to the Current surface.



- Switch to 3D Mode and select **Utility > Apply Survey**. The Survey Into Current dialog box displays.

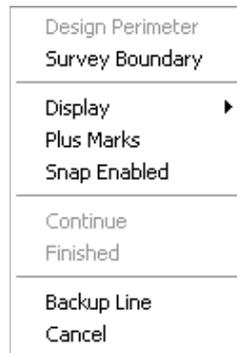


- Select Stage, then click **OK**. The Current Layers Background dialog box is displayed.



- Select Existing and click **OK** to create the Current Surface with the Existing Surface as the ground and the survey data staged into it. The survey data is shown on the screen.
- Enter a survey boundary around the updated topo data by clicking to add points around the data. Right-click at the start of the boundary, then select **Finished** to complete the boundary.

Note: If the topo data is symmetrical, you can right-click and select **Survey Boundary** to auto-create the boundary, then right-click and select **Finished** to complete the boundary.



- Click the Stage Data button in the Apply Survey Data dialog box. The Current layer now contains the Existing layer data plus the new topo data.
- Select Existing from the Ref pulldown and Current from the Diff pulldown. This compares the Existing surface with the Current surface to calculate the volume difference between the two surfaces.
- Click the Survey Volume Calc button. After calculation, the Volume Calculation Results dialog box is displayed.
- Click the Done button and the Volume Report displays.



Calculating Volumes

Earthwork 4D calculates volumes in 3D View Mode by comparing the Reference surface with the Difference surface within the Volume Area. Report Regions are used to control the extent of the volume calculation. In 3D View Mode, all design perimeters can be selected, and the undefined area included by using the Volume Area button.

Volume Area

- A** Click the Volume Area button on the tool bar or select **Utility > Volume Area**. The Volume Area controls the limits of the volume calculation. When selected, the program automatically places a report region around the Design Perimeters. If no perimeter is present, a region is added surrounding all the entered Report Regions, Design Data, or Existing Data accordingly.

Starting the Volume Calculation

- V** Before calculating the volumes verify that the correct surfaces are selected for comparison. Click the Calc Volume button on the Utility Tool Bar or select **Utility > Calc Volume** to begin volume calculation. During volume calculation, the cross sections display at the bottom of the screen with blue representing the Reference and Green the Difference. A line displays on the overlay showing the corresponding location of the cross section. The calculation can be paused by pressing the Spacebar. When paused, the I key will move across the site incrementally. Pressing the Spacebar again resumes the volume calculation. Volume calculation can also be aborted by pressing the Esc key. When the calculation completes, the Volume Calculation Results dialog box displays.

Volume (Cubic Yards)	
Cut	3.3
Fill	12.6

Horizontal Area (Square Feet)	
Cut	1,471.4
Fill	4,914.8
On Grade	10,623.0
Total	17,009.2

Slope Area (Square Feet)	
Total	17,021.1

Done

- V** Click Done to close this window and view the Volume Report. You can also switch to Volume Report Mode to view the Volume Report by clicking the Volume Report button.

Calculating Survey Volumes

Earthwork 4D can also calculate the volume of survey data in the Current surface if you have collected survey data.



Once you have staged survey data, you can click the Survey Volume button. Using the Survey boundary, the Volume Calculation Results dialog box displays the survey volume. Click OK to display the Survey Volume report.

Islands and Holes

Islands and holes are additions/subtraction to areas in the design.

Islands

An Island is a separate area outside of the main design perimeter but is part of volume calculation. A golf course may be a good example of this. The parent region is the first region entered and islands are entered afterwards using the same attributes as the parent. Any island that does not have a design perimeter or report region around its perimeter is not included in volume calculation.

Holes

A Hole is an area within another area that is not to be included as part of the parent region on the volume report. Entering a hole in the Design Perimeter essentially places a hole in all other regions. Entering a hole in other regions has other effects, described below.

Design Perimeter Hole

A hole in the design perimeter is created by entering a design perimeter within the parent perimeter. If a hole is placed in the design perimeter, it will also place a hole in the Report Region, Sectional Areas, and Stripping Areas. There is no need to enter additional holes in area that contain design perimeter holes.

Report Region Hole

A hole in a Report Region is entered by placing a report region with the name "Hole" within the parent region. The area of the hole is added to the Unspecified area and does not show up as "Hole" on the volume report.

Stripping Area Hole

A hole in a Stripping Area is entered by placing a stripping area within the parent area with a depth of "0". The hole can be any name. Individual stripping areas are totaled, and stripping areas with the same name are subtotaled.

Sectional Area Hole

A hole in a Sectional Area is entered by placing a sectional area with the name "Hole" and a depth of "0" within the parent area. Sectional Areas with the name "Hole" do not show up on the volume report. However, a sectional area with a different name and depth of "0" does show up.

Templates



Earthwork 4D can be used to create a template using typical cross section information. That template can then be applied to a chosen reference line, which can be used to build job such as roads, canals and trenches. Templates are entered by clicking on the **Apply Template** button on the toolbar.

When selected, you are prompted to scale the cross section. For instructions on using **Templates**, see page A-37.

	Cut			Fill		
	Width	Height	Slope	Width	Height	Slope
1	Variable	Daylight	25.0%	Variable	Daylight	-25.0%
HL						
2	6.000	-0.120	-2.0%	6.000	-0.120	-2.0%
3	12.000	-0.240	-2.0%	12.000	-0.240	-2.0%
RP						
4	12.000	-0.240	-2.0%	12.000	-0.240	-2.0%
5	6.000	-0.120	-2.0%	6.000	-0.120	-2.0%
HR						
6	Variable	Daylight	25.0%	Variable	Daylight	-25.0%

- Hinge** Adds a hinge point to the left or right side of the template to allow the ends to be sloped to daylight.
- Mirror** Creates a symmetrical template by entering default values to match either the Cut and Fill, or the Left and Right, depending on when checkboxes are selected.
- Daylight** Selects the surface to be referenced when daylighting the template.
- Output** Selects the surface to which the template is applied. Selecting "New Surface" copies the Daylight surface in a new surface, and stages the new template lines into the new surface.
- Stage Lines** Stages lines produced by the template into the output surface by trimming and deleting any intersecting lines within the template.
- Points Every** When selected, enters points at the designated interval.
- Vertical Offset** Distance, in feet, above or below the reference line.
- Apply** Applies the template to the chosen reference line.
- Save** Saves the template for use on future jobs.
- Cancel** Cancels the operation.
- Width** Segment width.
- Height** Segment elevation change.
- Slope** Segment slope.

Offset Line Editor

Offset Lines are a powerful method of creating lines based upon numeric distances and elevations from a specified reference line (such as creating the bottom of curb from the top of curb line). This tutorial uses the "4D Lesson 4.esw" file, with all of the CAD data converted.

The Offset Line Editor is used to create offset lines in Earthwork 4D. This page and the following page has explanations of the feature of the Offset Line Editor.

Line Controls

- Offset** Toggles the direction of the offset line compared to the selected reference line. The point order on the line determines right and left. An arrow displays on the overlay showing the offset direction.
- Points Every** This is a two-part control. When the Points Every box is checked, the program creates extra points on the offset line at the distance specified in the text box. When the box is unchecked, the program matches the points on the reference line and only adds points to correctly model corners.
- Connectors** This option creates lines between the reference point and its corresponding offset point. It is most often used when sloping to Daylight.
- Daylight** The Daylight check box allows creation of lines at a specified slope to a designated daylight surface. The default surface is existing. Selecting this option adds Cut and Fill slope text boxes to the Start and End of lines areas
- Line Label** Use this box to enter a line label for the offset line that will be created.

Start/End of Line

The Start/End of Line text boxes control the placement of the offset line. Specifying any two values for the Start or End calculates the other value and displays it in red. Varying the Start and End values allows creation of offset lines not parallel to the reference line.

Offset Distance The distance from the reference line to the offset line.

Elevation Difference The change in elevation between the reference and offset lines.

Slope The slope from the reference line to the offset line shown as a percentage.

Confirmation Controls

Apply Creates an offset line using the specifications in the Offset Editor.

View Displays changes made in the Offset Editor settings without actually creating the line.

Close Closes the Offset Editor.

Determining Line Direction



The line direction is indicated by a diamond at the starting point of the line. Imagine yourself standing on the first point of the line looking down the line. An offset line to the left and right would be the same as your left and right.

Other Offset Features

The Offset Editor can offset multiple selected lines, but requires the line direction for the lines be constant. The **Utility > Swap Ends** command changes line direction.

Multiple offset lines can also be created from a single reference line. For example, the base of curb could be created from the top of curb by clicking the **Apply** button and then a back of walk created by entering the new specifications and clicking **Apply**.

Cycle Worksheet

The cycle worksheet uses known data about equipment capabilities, combined with information for your Sitework 4D takeoff, to estimate: the total length of your cycle, the average speed of your equipment in feet per second, and the total time needed to complete a haul in seconds. A cycle is broken down into four portions: Load, Haul, Spread, and Return. The Cycle Worksheet can be sent to the print page to be printed, or included in reports.

	Length (ft)	Slope	Speed (ft/sec)	Time (sec)
Load	100	-1.5%	1.852	54
Haul	480	-0.2%	18	27
Spread	100	-0.1%	2.778	36
Return	537	0.5%	20	27
	1217		8.50	144

Buttons: Send to Print Page, OK

- Length** The distance, in feet or meters, needed to complete the referenced portion of the cycle (Load, Haul, Spread, Return). Keep in mind when estimating for trucks or excavators, the equipment does not move during the load and spread portions of the cycle and the resulting lengths will be "0". The final entry in the Length column is the total average length of a cycle. The total length is based on the haul path.
- Slope** The average slope of referenced portion of the cycle.
- Speed** The speed of the equipment, in feet or meters per second, during the referenced portion of the cycle. Keep in mind when estimating for trucks or excavators, the equipment does not move during the load and spread portions of the cycle and the resulting speeds will be "0". The final entry in the Speed column is the total average speed of a cycle.
Miles per hours can be converted to feet per second by multiplying by 1.467 (Mph X 1.467 = Ft/Sec)
Kilometers can be converted to meters per second by multiplying by 0.278 (Kph X 0.278 = M/Sec)
- Time** Amount of time, in seconds, needed to complete the referenced portion of the cycle. The final entry in the Time column is the total average time of a cycle.
- Load** The portion of a cycle where cut material is loaded on equipment.
- Haul** The portion of a cycle where where a load is transported to a fill area.
- Spread** The portion of a cycle where a load is removed from equipment.
- Return** The portion of a cycle where equipment returns to the cut area.
- Send To Print Page** Exports the Cycle Worksheet to the Print Page where it can be added to reports or printed on its own.
- OK** Closes the Cycle Worksheet

Haul Plan Template

The Haul Plan Template is used to estimate the total moving hours and cost hours of your haul. The numbers on the Haul Plan Template are estimating using the data from the Cycle Worksheet and the Balance Region used to define the haul.

Field	Plan	Track
Volume	5417.4 BCY	
Cycles	339	
Avg. Load	16 BCY	
Avg. Length	1217 Feet	
Avg. Time	144 Seconds	
Moving Hours	13.6	
Minutes / Hour	50	
Cost Hours	16.3	

Plan	Estimated data for the current haul based on the data provided on the Cycle Worksheet.
Track	Using the Trackwork module of Earthwork 4D, actually real world data from the job can be tracked using a GPS data logger and imported into this column to compare the actual data to the estimated data.
Volume	Total amount of dirt, in bank cubic yards or M ³ , that is moved to complete the haul.
Cycles	Total number of cycles needed to complete the haul.
Avg. Load	Average amount of dirt moved, in bank cubic yards or M ³ , per cycle (manually entered).
Avg. Length	Average length, in feet or meters, of a cycle.
Avg. Time	Average amount of time, in seconds, necessary to complete a haul.
Moving Hours	The total number of hours that equipment will be moving to complete the haul.
Minutes/Hour	Number of working minutes you expect to get out of every hour (manually entered).
Cost Hours	Total number of hours necessary to complete the haul.
Export to CSV	Exports the Haul Plan template to a CSV (comma separated value) file which can then be opened in a spreadsheet program.
Send to Print Page	Exports the Haul Plan Template to the Print Page where it can be added to reports or printed on its own.
OK	Closes the Haul Plan Template.

