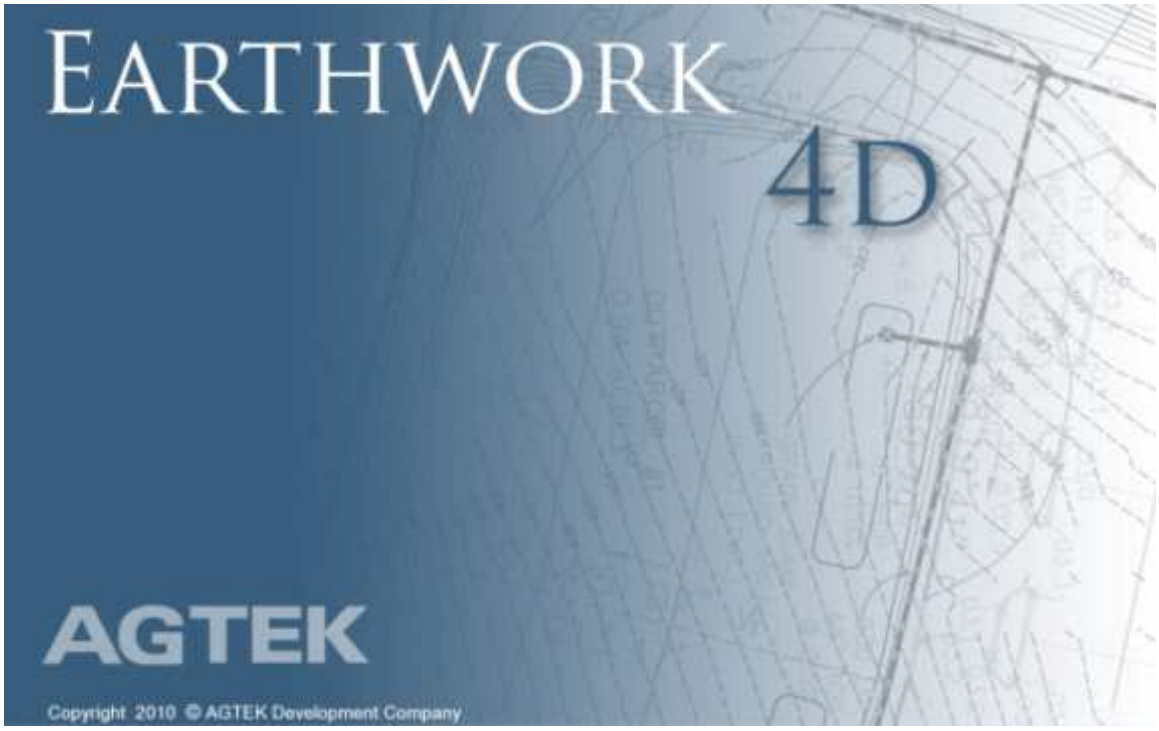

Sitework 4D

AGTEK
EARTHWORK SOFTWARE

Rev. 12/30/2016

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Installation

PDF Takeoff Tutorial

CAD Tutorial

Google Export Tutorial

Field Use Tutorial

Digitizer Support

Vector PDF

Reference

Appendix

Section 1

Installation

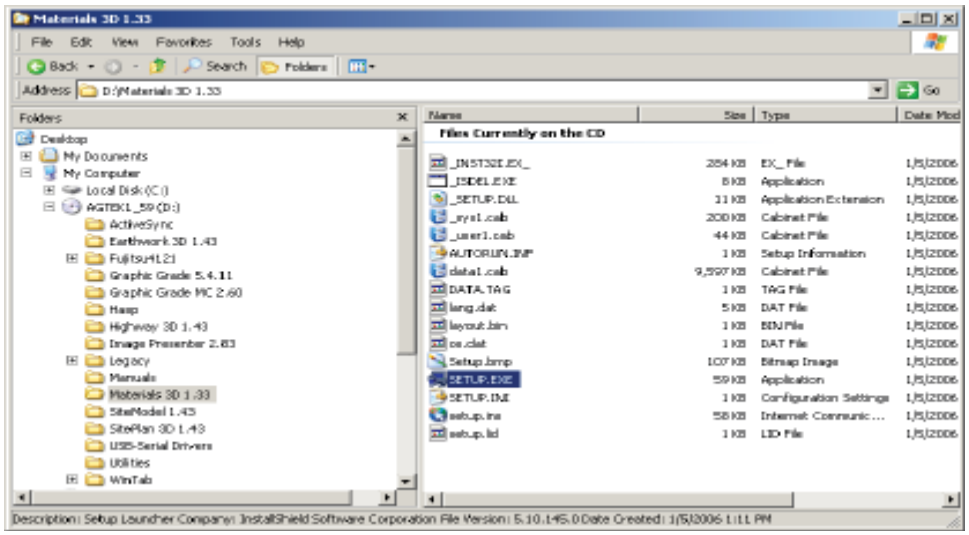
Software Installation Sequence

There are two parts to installing Materials 4D; the program software installation, setting up the digitizer, and software protection key installation. Installation must be performed in the following order to ensure proper functioning of the software:

1. Materials 4D Software Installation
2. USB/Internet Key Installation

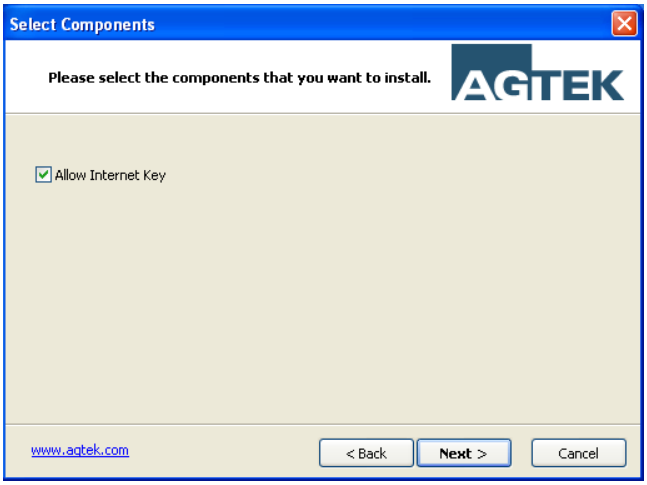
Materials 4D Software Installation

1. Launch your internet browser, most likely Internet Explorer, and go to www.agtek.com/software.asp.
2. Click the link on the left hand side of the screen for Materials 4D.
3. Enter your AGTEK UserID/Login and Password, then click **Login**.
4. Click the **Download** link, and choose **Save**.
5. Save the download somewhere easy to find, such as your desktop.



Installation from an Internet Download

1. Find the downloaded installation file and double-click the icon.
2. Click **Next** in the Welcome Dialog.
3. Click **Next** in the Choose Destination Location dialog box.



4. Select the **Allow Internet Key** check box, then click **Next** and the Setup Complete box is displayed.
5. Click **Finish** to complete the installation.

Internet Key Setup - Users

An Internet Key allows multiple users access to a common Materials 4D license. Users are added by the Internet Key's administrator. To use Materials 4D with an Internet Key, you must be entered as a user by the key administrator. To check out an Internet Key, you need the email address and password associated with your user name. The first time you open the software, you will be asked to enter a password and then confirm it. This will become your permanent password.

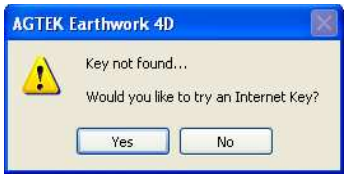
Using an Internet Key

- Obtain and Install the Current Version of the Materials 4D software
- Launch the Software Using an Internet Key

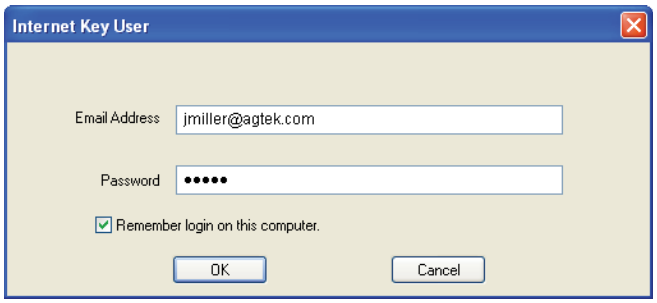
Launching the Program

For instructions on obtaining and installing a current version of the software, see page 1-1.

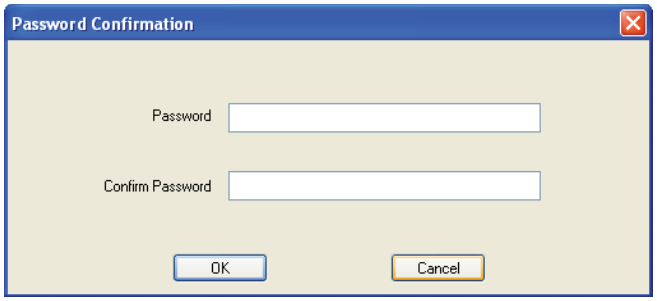
1. Double-click the **Materials 4D** icon on your desktop.
2. If no USB key is found in the system, the Internet Key box is displayed. Click **Yes**.



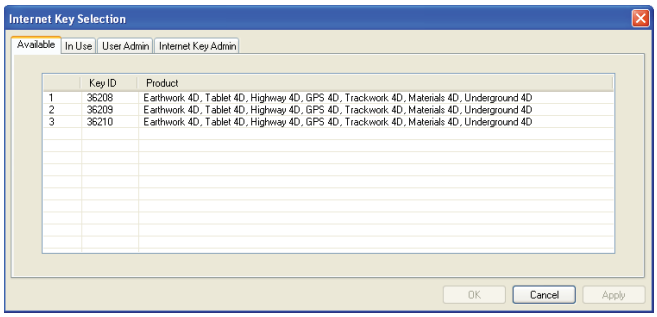
3. Enter you E-mail address and password..If this is your first time using the software, Create a password that can be easlly remembered, and click **OK**.



4. The first time you use the software, you will also be asked to confirm your password. Enter your password again and click **OK.**



5. Choose an available Internet Key from the list and click **OK**. If no Internet Key is available you will be unable to use the program until one becomes available.



6. When closing Materials 4D, the Internet Key dialog box displays and asks if you want to release the Internet Key. If you choose not to release the Internet Key, it automatically releases after the time period set by your key administrator has expired.

Internet Key Administration

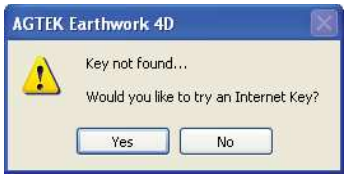
An Internet Key allows multiple users access to a common Earthwork 4D software license. Users are created by the Internet Key's administrator. As an Internet Key administrator you have the ability to add and/or delete users, assign different users to each key, and set the number of days an Internet Key can remain checked out. As the administrator, a user name is created for you when your software order is processed by AGTEK. You need the email address associated with your user name to launch the AGTEK Software, and to manage users. The password used to login for the first time is your permanent password.

Using a Internet Key

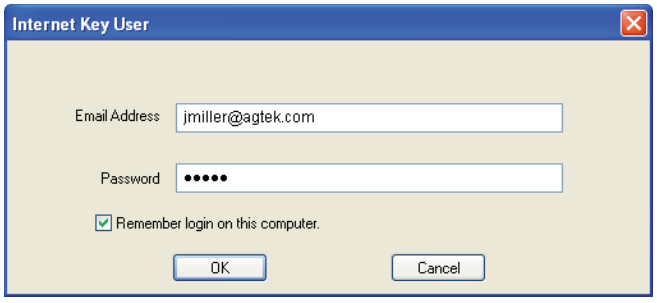
- Launch Software Using an Internet Key
- Manage user accounts

Launch Software Using an Internet Key

1. Double-click the **Earthwork 4D** Software icon on your desktop.
2. If no USB key is found in the system, the Internet Key box is displayed. Click **Yes**



3. Enter the email address and password associated with your user name, and click **OK**.

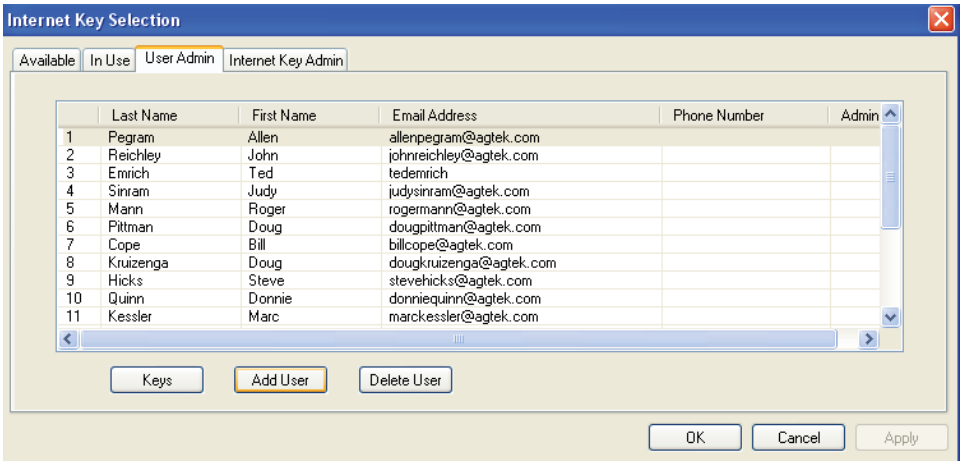


Manage Users

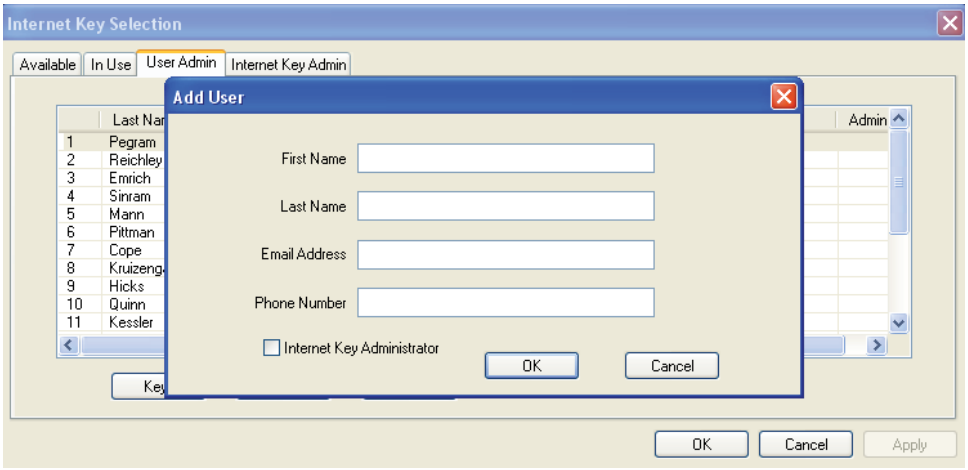
As Internet Key administrator you have the ability to create, modify, delete users and set the offline check-out period. To create a user you need the following information for each user: first and last name, email address and phone number. You also have the ability to allow administrator access for other users.

Creating a User

1. Follow steps 1 through 3 in the Launching Software section and the Internet Key Selection dialog box is displayed.
2. Select the **User Admin** tab and click the **Add User** button.

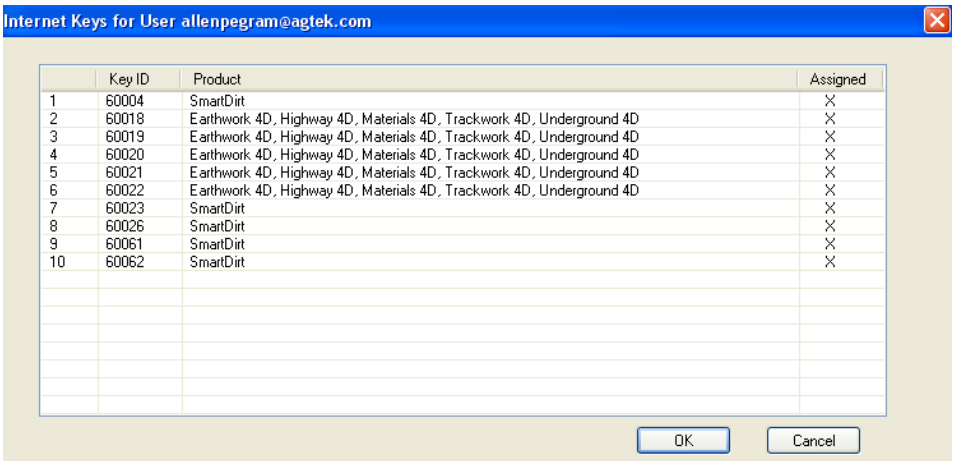


3. The **Add User** dialog box displays.



4. Enter the requested information. If the user is to be an Internet Key administrator, select the Internet Key Administrator check box.

5. Click **OK** and the list of all company keys will display



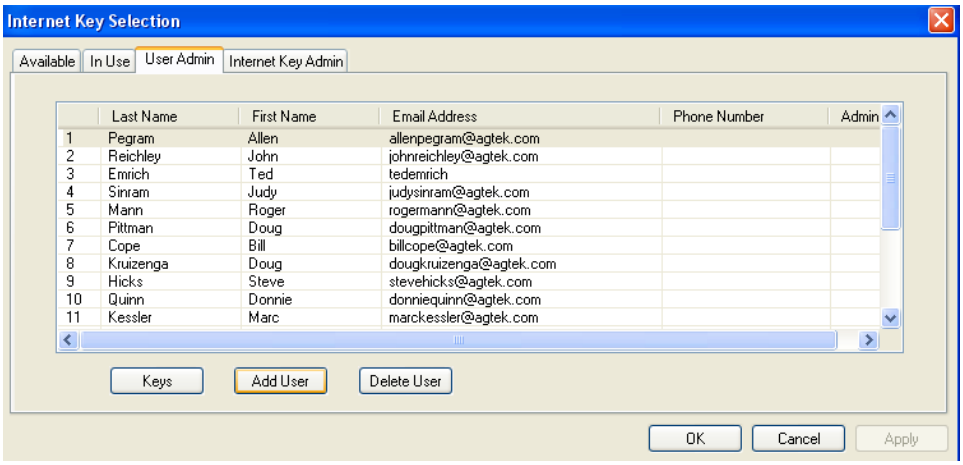
6. Select the programs you wish to assign to the new user. They may be assigned to multiple keys.

7. When the new user logs into the program for the first time they will set their own password.

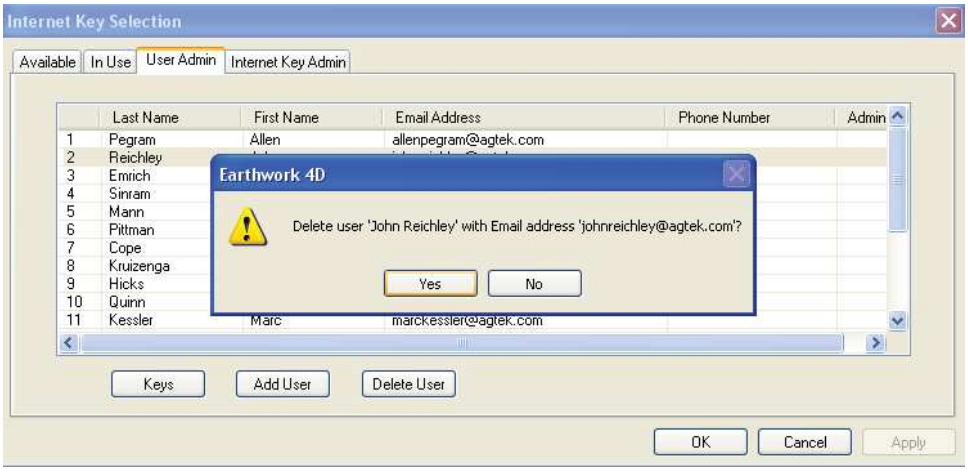
Deleting a User

1. Follow steps 1 through 3 in the Launching Software section and the Internet Key Selection dialog box is displayed.

2. Select the **User Admin** tab and select the user you wish to remove.



3. Click **Delete User** and then **Yes** to permanently remove the user, or **No** to cancel the operation.



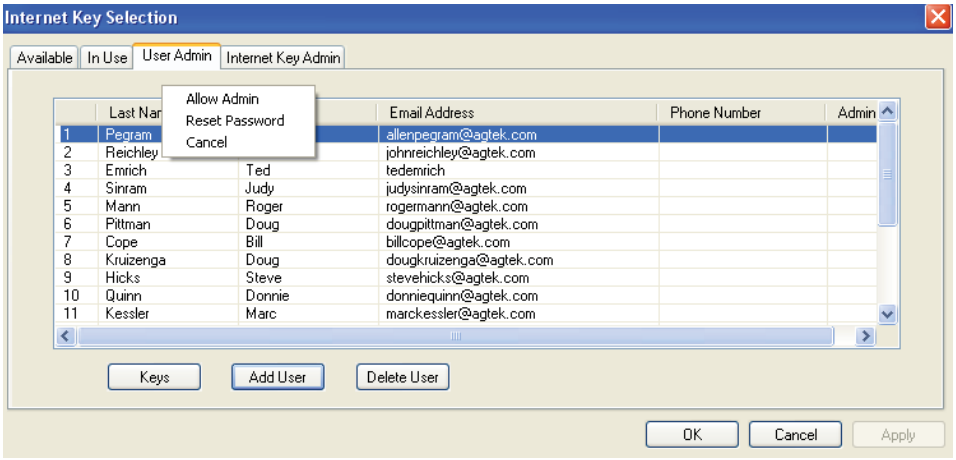
Right-click Menus

Under the **User Admin tab** of the Internet Key Selection dialog box you can perform the following operations by right-clicking on a user: Allow or Remove Admin, Reset Password, Cancel.

Allow or Remove Admin: Changes the Administrator status of a user.

Reset Password: Allows the user's password to be reset by a Internet Key administraton.

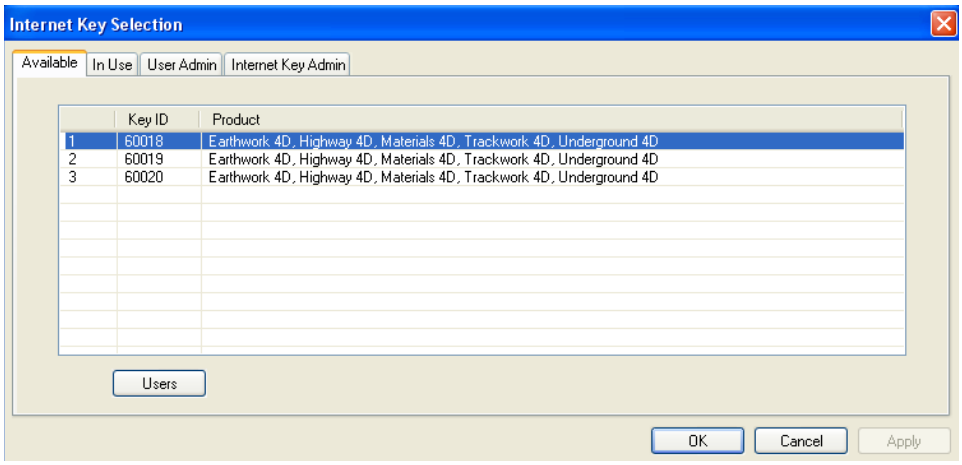
Cancel Cancels the operation.



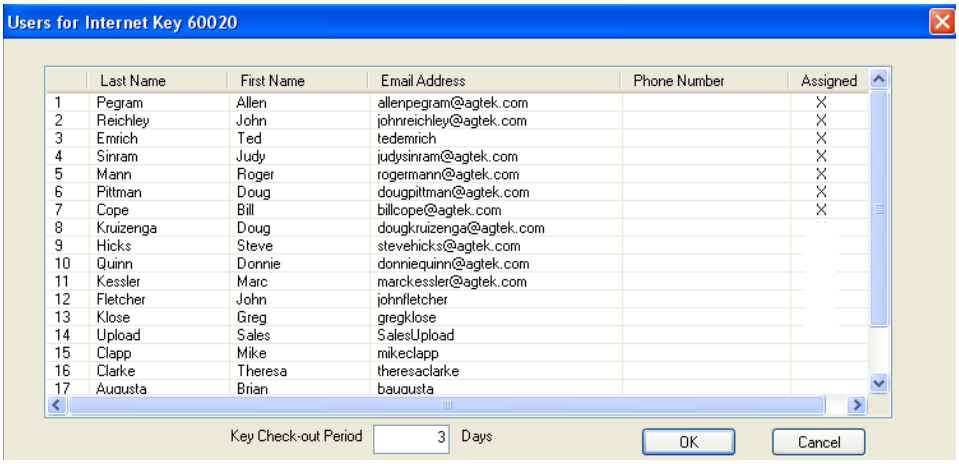
Assigning Users to a Key

As an Admistrator, you may assign different users to each key purchased by your company. There are two ways to assign users to a key

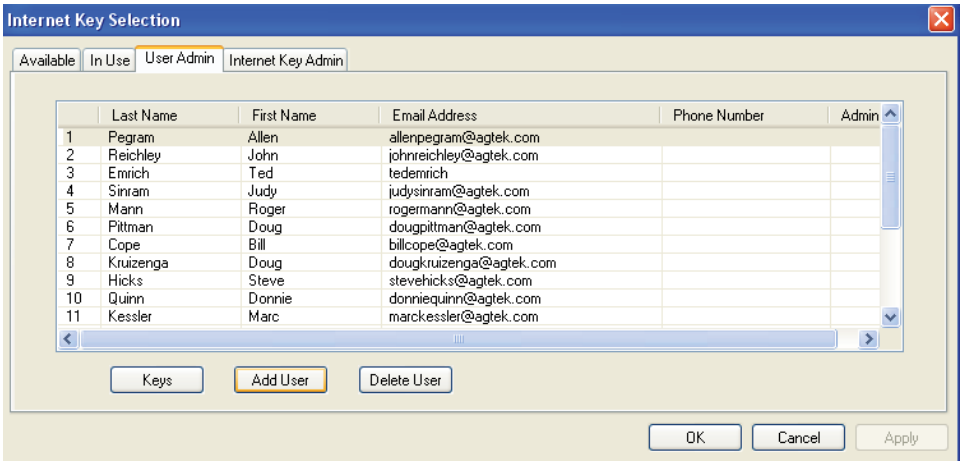
1. Follow steps 1 through 3 in the Launching Software section and the Internet Key Selection dialog box is displayed.
2. Select the key you wish to assign to the user.
3. Click the **Users** button at the bottom.



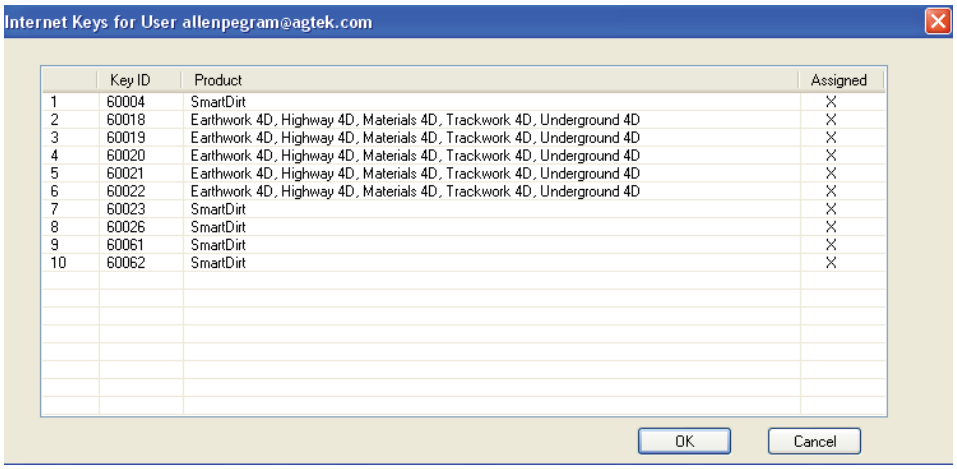
4. Click in the Assigned field to toggle the user on and off. There may be up to 10 users per key.



5. You may also assign users from the **User Admin** window.
6. Select the user from the list and click the **Keys** button at the bottom.



7. Click the Assigned field for the keys you wish to assign to this user.
8. Click **OK**.

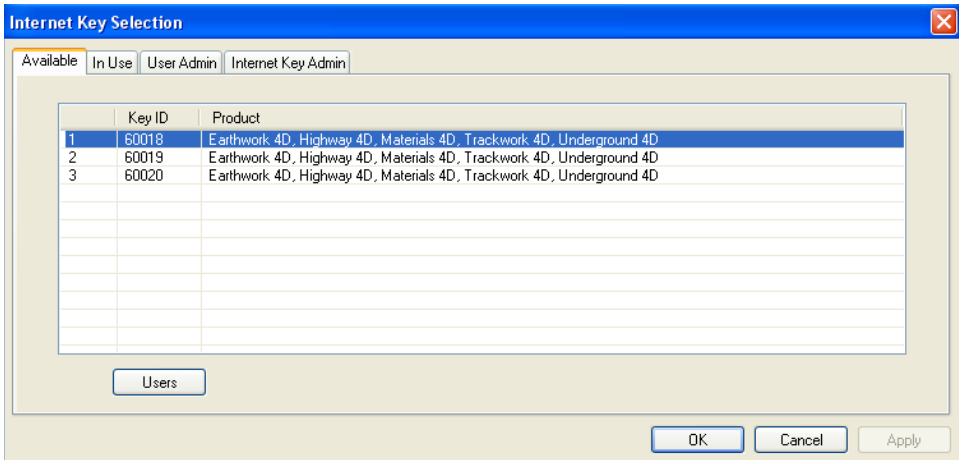


Setting Offline Check-out Period

The Offline Check-out Period defines the number of days a user can keep a key checked out. Once this time period has expired, the key is be checked in automatically. The default check-out period is three days. There are two ways to set the offline Check-out period.

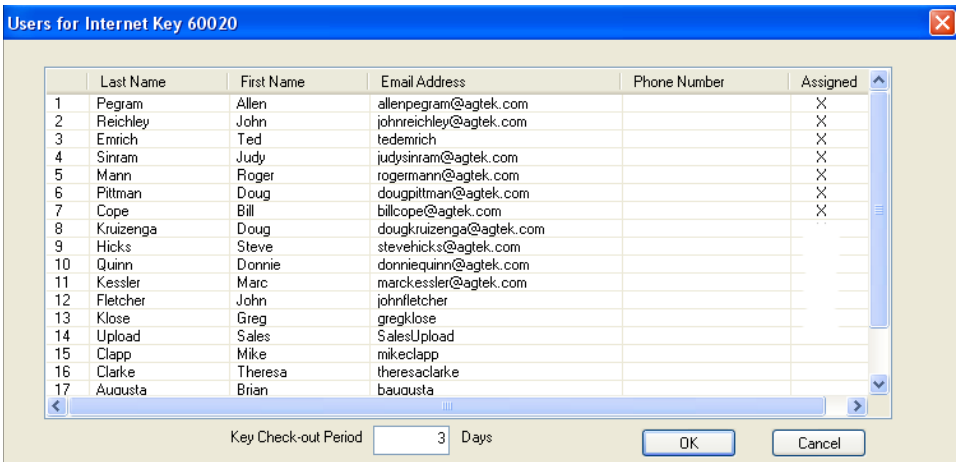
1. Follow steps 1 through 3 in the Launching Software section and the Internet Key Selection dialog box is displayed.

2. Select the desired key and click the **Users** button.

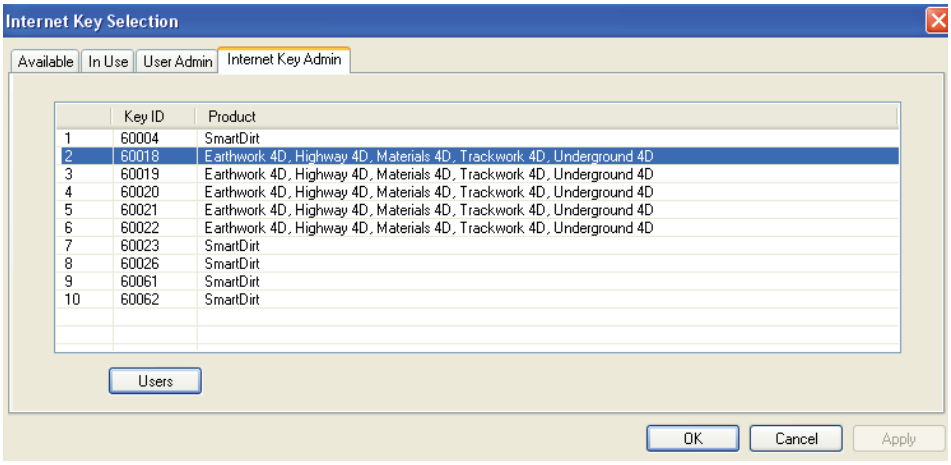


3. Enter the number of days you wish to allow a user to check out a key.

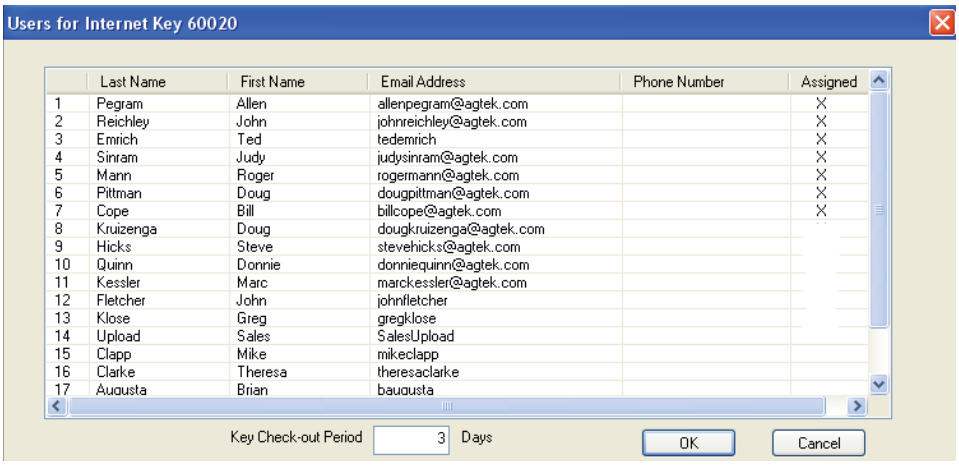
4. Click **OK**.



5. You may also set the Offline Check-out time from the **Internet Key Admin** window.



6. Select the desired key from the list.
7. Click the **Users** button.

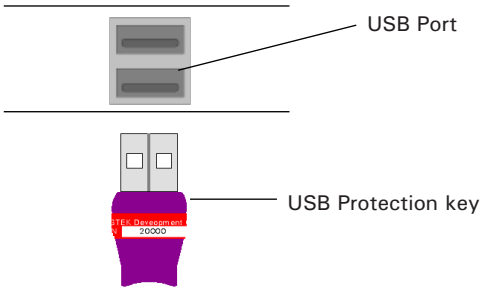


8. Enter the number of days you wish to allow a user to check out a key.
9. Click **OK**.

USB Protection Key Installation

Materials 4D uses either an Internet Key or a USB protection key and will not run if a key is not available. If using a USB key, install Materials 4D first, then use the diagram below to install the USB key before starting AGTEK software .

Do not force the key into a port. If it does not fit, make sure it is right side up and try again. Only one USB key should be installed on a computer.



Section 2

PDF Takeoff Tutorial

Document Conventions

This tutorial 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 - Press a specified button a 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.

Zoom In/Out - Use the Page Up/Page Down Keys to increase/decrease the area of the job in view. If your system is equipped with a roller-wheel mouse, you can use the roller-wheel to zoom in/out.

Pan - Select the Pan tool, then click and drag to change the view of the job. If your system is equipped with a roller-wheel mouse, you can push down on the roller wheel and drag to pan.

Lesson Examples

Samples files for all tutorials are found in the **C:\AGTEK\Data** directory.

Saving Your Work

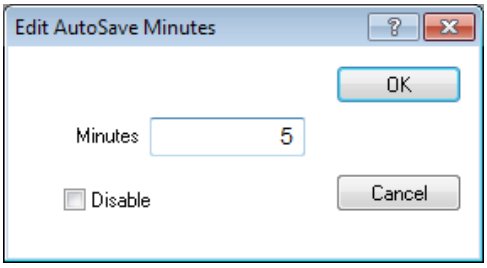
You should save your work often to avoid losing data in the event of an accidental closure or system crash. To Save your work:

- Select **File > Save**, name your job (if you are saving for the first time), then click the **Save** button.

AutoSave

AutoSave is a function of Sitework 4D that automatically backs-up your work in progress at a user-specified interval. With AutoSave enabled, Sitework 4D automatically asks you if you wish to open the most recent backup of the last open job file in the event of accidental closure or the computer crashes. An AutoSave will not occur unless at least one manual save has been completed. Even though the AutoSave function automatically saves the job, it is good practice to frequently save the job manually. To edit the AutoSave interval:

- Select **Options > AutoSave,** then set the interval in the Edit Autosave Minutes dialog box. A check next to the command on the menu indicates that it is enabled.



AutoSave allows you to set the interval between saves from 5 and 60 minutes. By default, the program sets the save interval to 5 minutes. It is recommended that this feature not be disabled. However, if you wish to turn off the Auto Save function, select the Disable check box, and click **OK**.

The Autosave.esw File

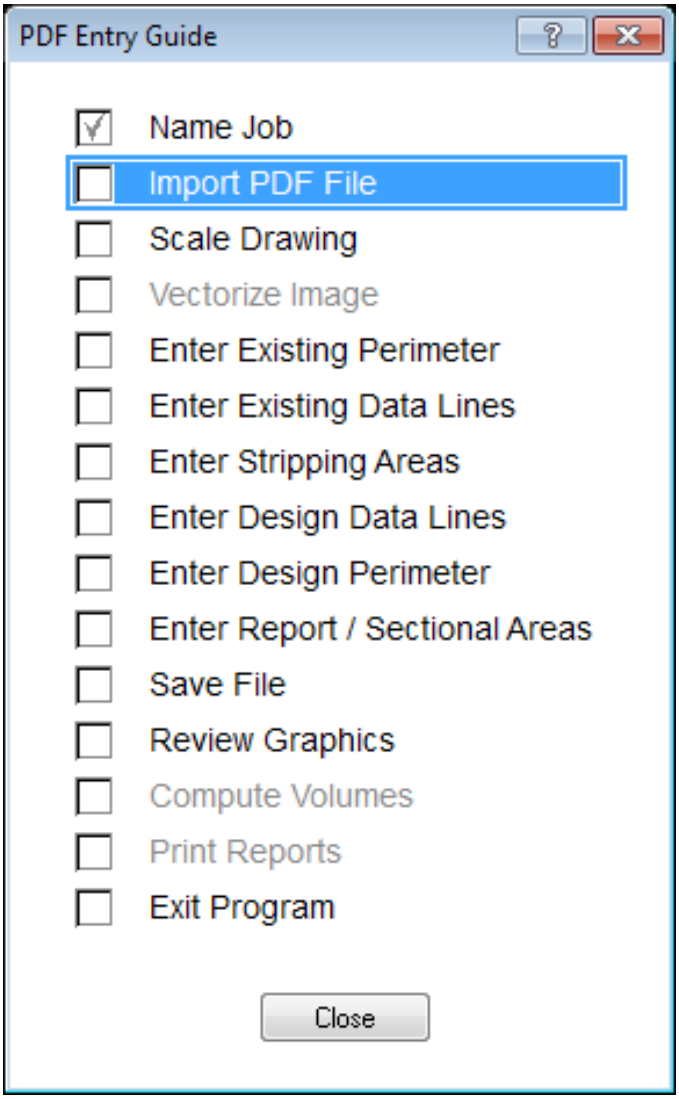
Autosave automatically saves to a file named Autosave.esw. The Autosave.esw file is located in the current working directory. This file is only created when the amount of time passed is greater than both the AutoSave interval and the amount of time since the last Save command was executed. If Earthwork 3D is closed using the Exit command from the file menu, any autosave file is deleted. If an autosave file is opened, be sure to save the file and either change the name of the file or choose the previous version of that file and overwrite it.

PDF Entry Overview

Sitework 4D can be used for dirt takeoff purposes when there is no CAD file available. This tutorial illustrates how to digitize a job using the images found in PDF, and TIF files, as a virtual plansheet. TIF files are treated the same as PDF files that contain no vector information.

PDF Guide

In the Guide menu, Sitework 4D contains guides for PDF, CAD, Tablet, and Haul Plan entry. This tutorial focuses on PDF entry. The PDF Guide can be accessed by selecting **Guide > PDF** or by pressing the **G** key. When a procedure is selected from the Guide, Sitework 4D will change to the proper mode, surface, and layer necessary for that procedure. The Guide displays a check mark in the corresponding box when an operation has been completed.



Data Entry Sequence

The following is the suggested data entry sequence when entering a takeoff using a PDF file.

Import and Scale PDF File

- Start a New Job
- Import the PDF
- Scale the Image and Verify Accuracy

Enter Existing Data

- Enter Existing Perimeter
- Enter Existing Data Lines
- Enter Stripping Areas

Enter Design Data

- Enter Design Data Lines
- Create Offset Lines
- Enter Design Perimeter
- Enter Report/Sectional Areas

Review Graphics

- Confirm Accuracy with 3D Mode

Compute Volumes

- A and V buttons
- Understanding the Report

Print Reports

- Send Report to Print Page
- Printing PDF
- Send Other Views to Print Page
- Send Images to Print Page

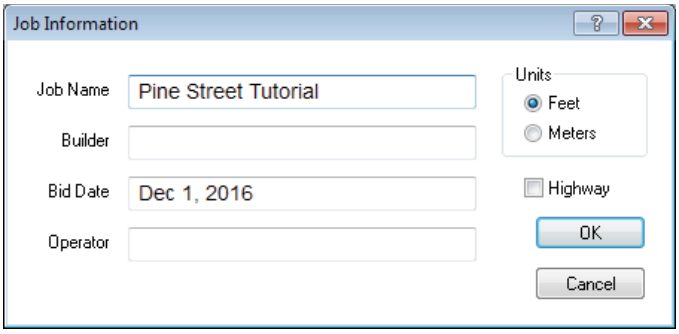
Lesson 1 - Importing and Scaling PDF File

This lesson will demonstrate how to import the Pine Street.pdf file, scale the file and review the accuracy of that scale. Training videos discussing PDF takeoffs can be found at http://www.agtek.com/trainingvideos.asp. It is recomended to watch the training videos before begining the tutorial.

Start a New Job

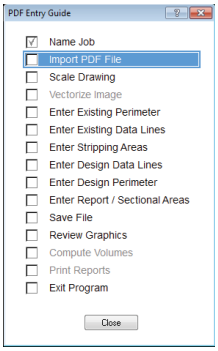
1. Double-click the Sitework 4D shortcut on the desktop or select **Start > All Programs > AGTEK > Sitework 4D,** and the Open dialog box is displayed.

2. Click **New** to start a new job and the Job Information dialog box is displayed.

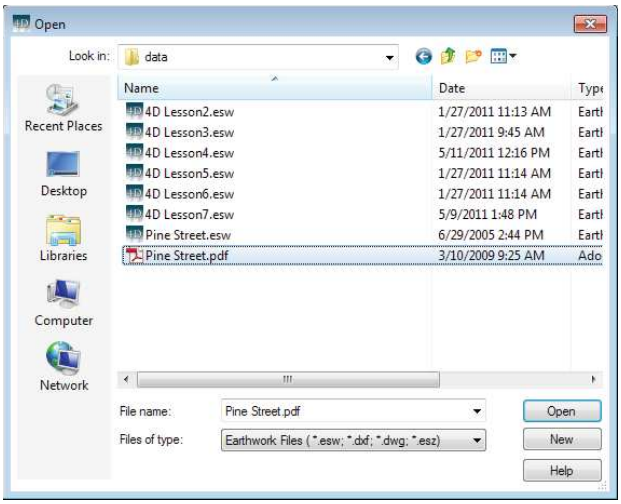


3. Enter a Job Name, Builder, Bid Date and Operator. Set the Units to Feet and click **OK**. Sitework 4D opens in the Entry Mode with a black screen.

Import the PDF



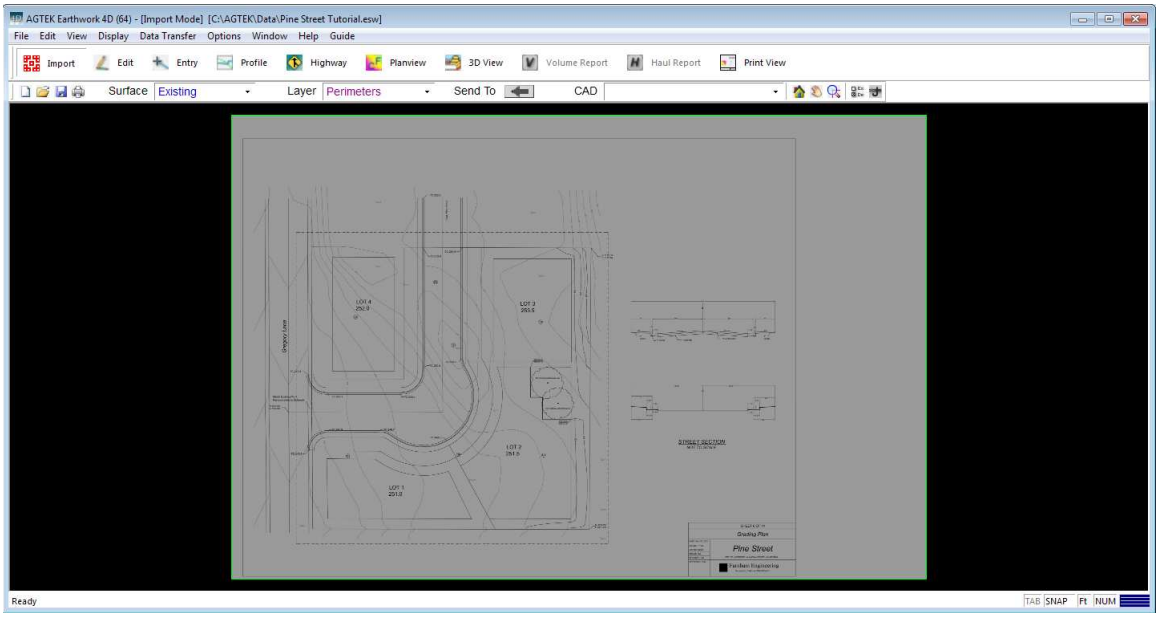
1. Select **File > Import**, or press the **G** key and select **Import PDF File** from the PDF Entry Guide, and the Import dialog box is displayed.



When opening an existing file, the PDF used to create the file may be re-imported by positioning the arrow inside the sheet annotation border and pressing the **Insert** key on the keybboard or by selecting the annotation sheet border, right-clicking, and selecting **Import File**.

2. Select “Pine Street.pdf” from the C:/AGTEK directory, and click **Open**. The PDF image is displayed in the CAD Transfer Mode.

3. The L key rotates the image counter-clockwise while the R key rotates the image clockwise. Press the **L** key twice to properly align the drawing on the screen. It should appear similar to the illustration below.

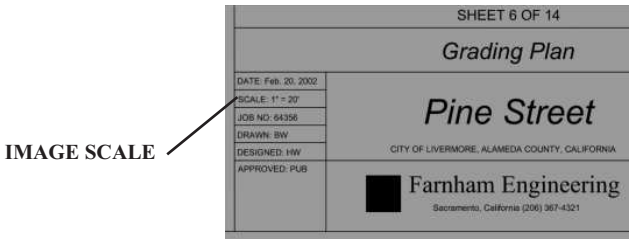


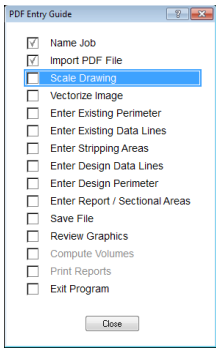
(Optional) Vectorize Image

When a PDF is imported it has either a green or red border. A red border indicates the file is a raster PDF and has no line work data available. A green border indicates a vector PDF and contains the information necessary to vectorize the file and create line work. That line work can then be transferred and turned into 3D data as though it were a CAD file. For information on transferring data and converting it to 3D, please see page 3-2 for the Modeling Tutorial

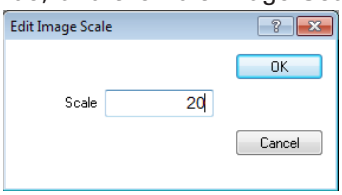
Scale the Image and Verify Accuracy

1. Most PDF's contain the scale of the image. Zoom into the lower-right side of this job and you can see that we are using a 20 scale.



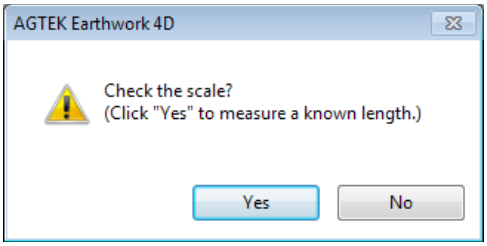


2. Select **Data Transfer > Image Scale**, or press the **G** key and select **Scale Drawing** from the PDF Entry Guide, and the Edit Image Scale box displays.

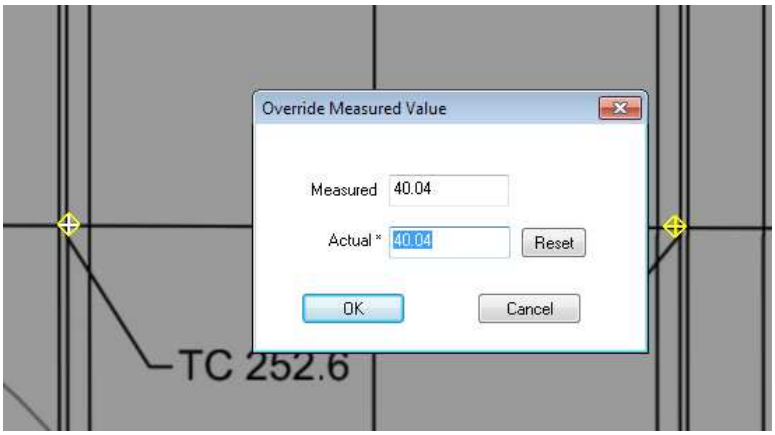


3. Enter “20”, and click **OK**.

4. A dialog box displays advising you to verify the scale of the drawing using a known distance. Click **Yes** to check the scale



5. From the typical section, we can see the width of the road from back of curb to back of curb should be 40 feet. Enter two points on the plan on the back of curb lines on both sides of the street.

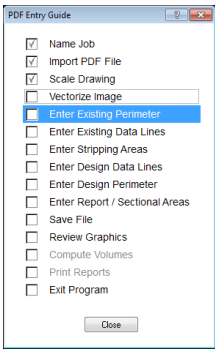


Lesson 2 - Enter Existing Data

This lesson demonstrates entering the existing conditions of the job site, as well as the site limits and stripping areas.

Enter Existing Perimeter

The existing perimeter represents the limits of the job site. It also gives the computer a place to stop calculating, which will speed up volume calculations.



1. Press the **E** key to switch to Entry Mode and set the Surface to Existing and the Layer to Perimeter, or press the **G** key to open the Guide, and select **Enter Existing Perimeter** from PDF Entry Guide.

2. Zoom in to the lower, left portion of the job site.

3. Find the dashed line that surrounds the entire job site. Click on the lower-left corner of the dash line.

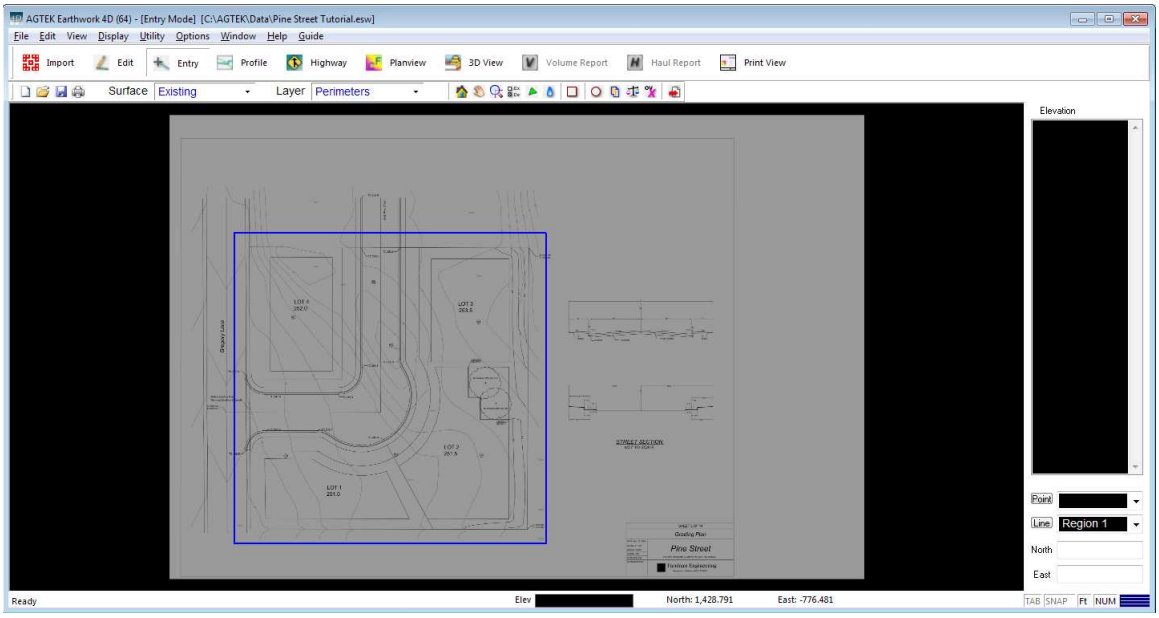
4. Pan to the right and click on the lower-right corner of the dashed line.

5. Click on the remaining two corners of the same dashed line.

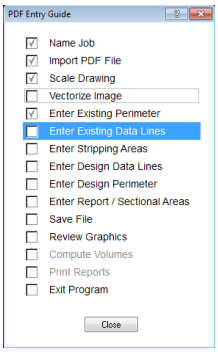
6. Right-click to end the entry. Sitework 4D will automatically snap the Existing Perimeter closed.

7. Press the **Home** key on the keyboard to Zoom out and center the job. Right-click to get your arrow back.

8. The screen should like like the illustration below.



Enter Existing Data Lines



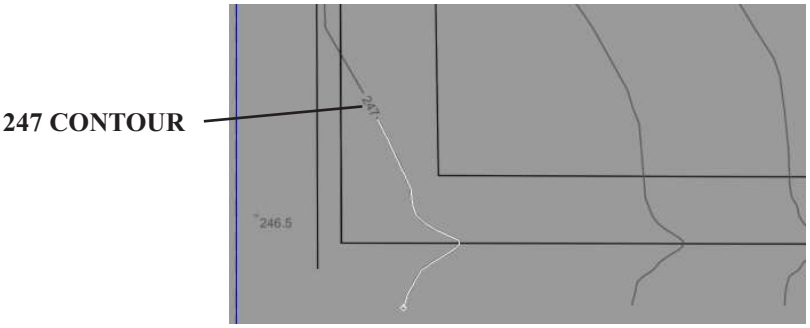
Existing data lines create a 3D representation of the ground prior to work being done.

Contour Lines

1. Confirm the Surface is set to Existing and change the Layer to Data Lines, or press the **G** key to open the Guide, and select **Enter Existing Data Lines** from the PDF Entry Guide.

2. Zoom into the lower left-hand portion of the job site and locate the contour with a 247 elevation. Enter the "247" using the keyboard.

3. Begin the 247 contour by clicking at the end of the contour line.

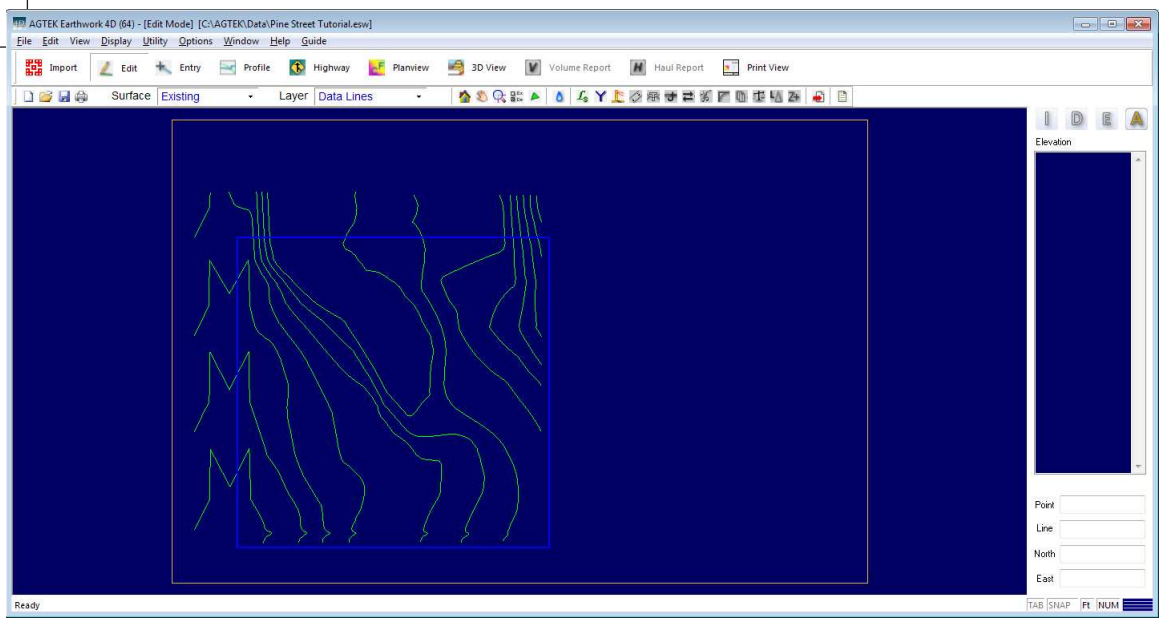


If you make a mistake entering a contour, press Backspace to delete the last point entered.

4. Move along the contour line, clicking your mouse to enter points as you go, and right-click when the contour is completed.

Placing points only at the sharp angles of the M shaped contours results in straighter lines.

5. Repeat steps 3 and 4 to enter the remaining contour lines. For now, leave the closed contours in the middle of the job alone. After the entering the second consecutive contour, the program will enter Auto-icrement mode and jump to the next elevation for automatically i.e.: 248 will auto-icrement to 249. Right-click to get your arrow back, then press the **T** key and your screen should look similar to the illustration below.

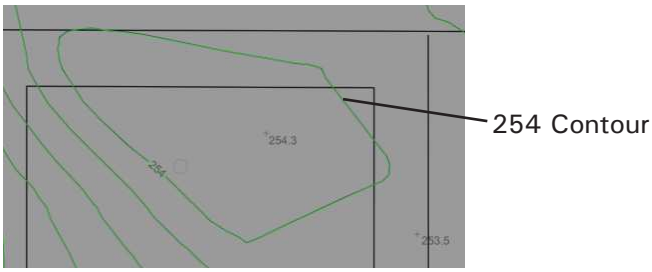


6. Press the **T** key twice to bring the PDF back.

7. Click the **Save** button to save your work.

Closed Contours

1. Begin with the closed, 254 contour in the top-left portion of the job.



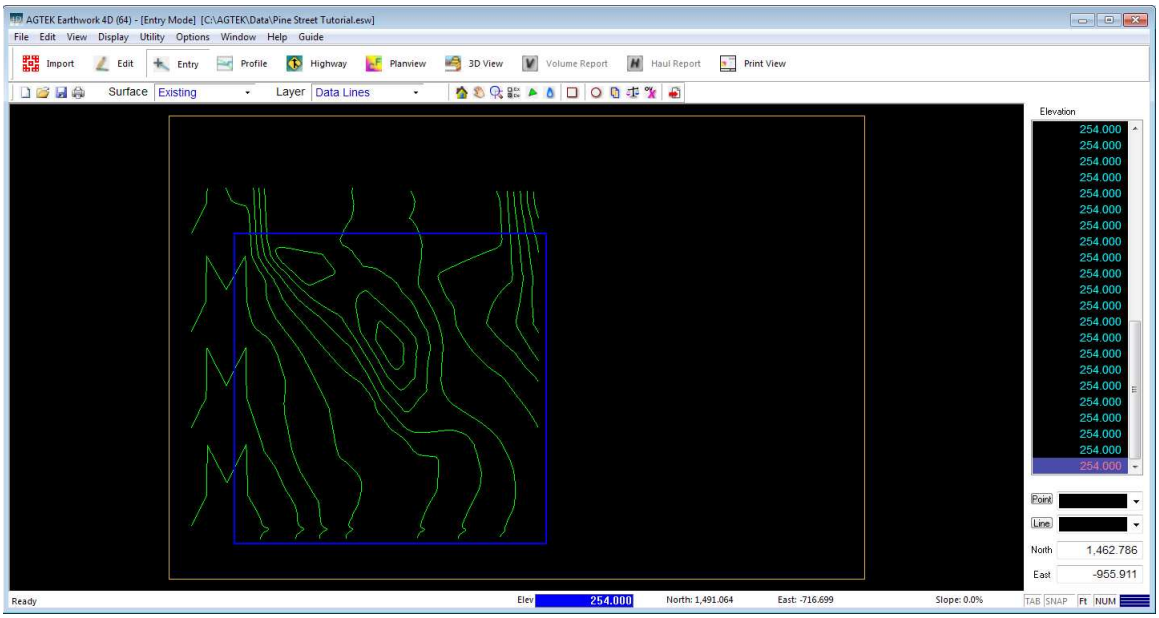
2. Enter “254” on the keyboard. Click along the line to enter points.

3. When nearing the start point of the data line, move the cursor over the starting point of the line and press the **F8** key to snap the contour closed.

4. A red 254 appears in the point list on the right if you have snapped the line closed correctly.

5. Right-click to end the entry.

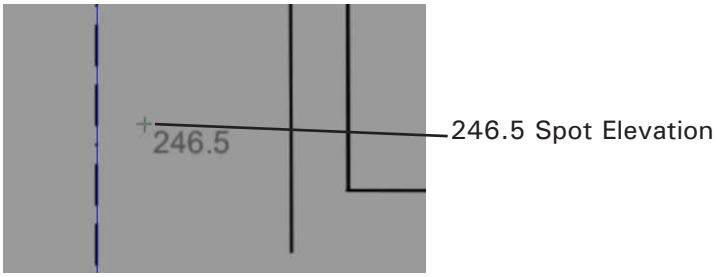
6. Repeat the above process for the remaining closed contours. Right-click to get your arrow back, then press the **T** key and your screen should look similar to the illustration below.



7. Press the **T** key twice to bring the PDF back.

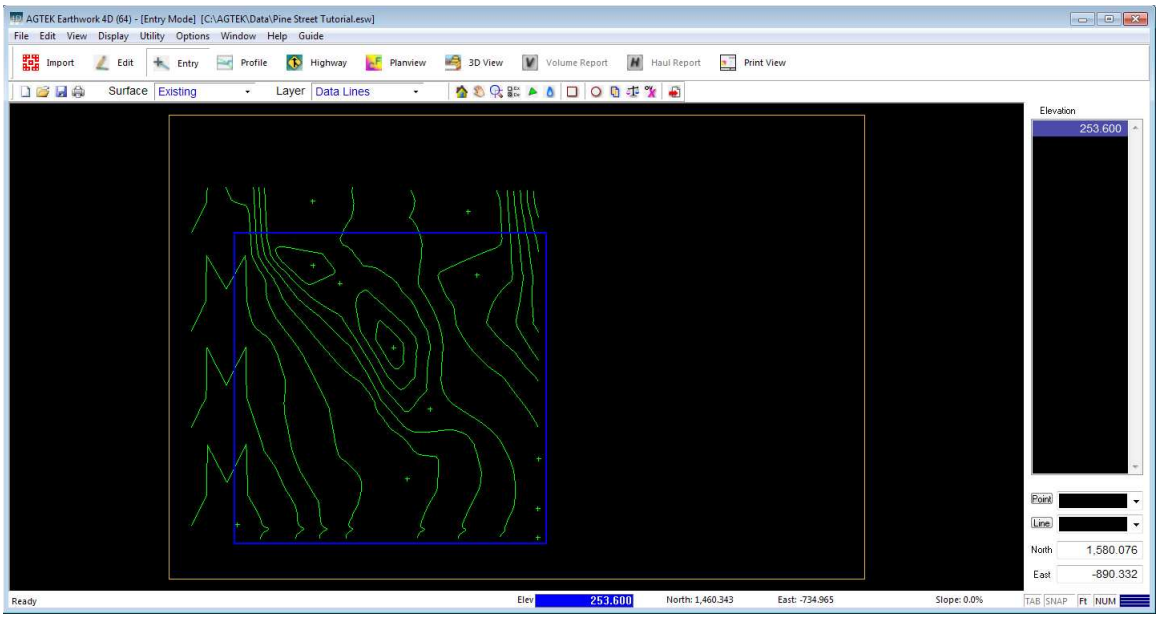
Spot Elevations

1. Locate the 246.5 spot elevation in the lower-left portion of the job site.



2. Enter “246.5” on the keyboard.
3. Click on the 246.5 spot elevation.
4. Right-click to end the entry.

5. Repeat this process to enter the remaining spot elevations. Right-click to get your arrow back, press the **Home** key, then press the **T** key and your screen should look similar to the illustration below.



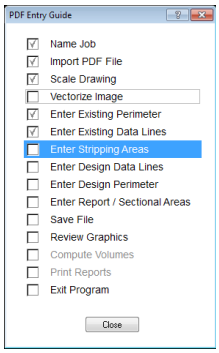
7. Press the **T** key twice to bring the PDF back.

6. Click the **Save** button to save your work.

Enter Stripping Areas

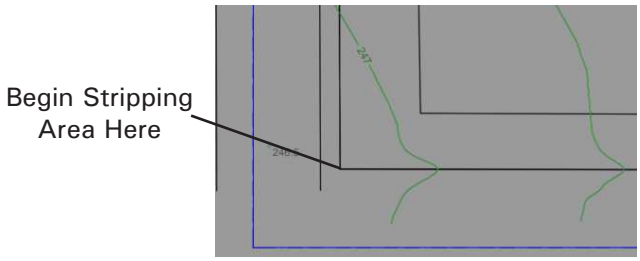
The stripping area removes a uniform depth from the existing ground surface.

1. Verify that Surface is still set to Existing and change the Layer to Stripping Areas. Click the Add Regions button, or press the **G** key to open the Guide and select **Enter Stripping Areas** on the PDF Entry Guide. The Stripping Areas dialog box displays.



2. Enter “Stripping 1” for the Area Name and “.5” for the Stripping Depth.

3. Click where the side walk for Gregory Lane intersects with the property line behind Lot 1.

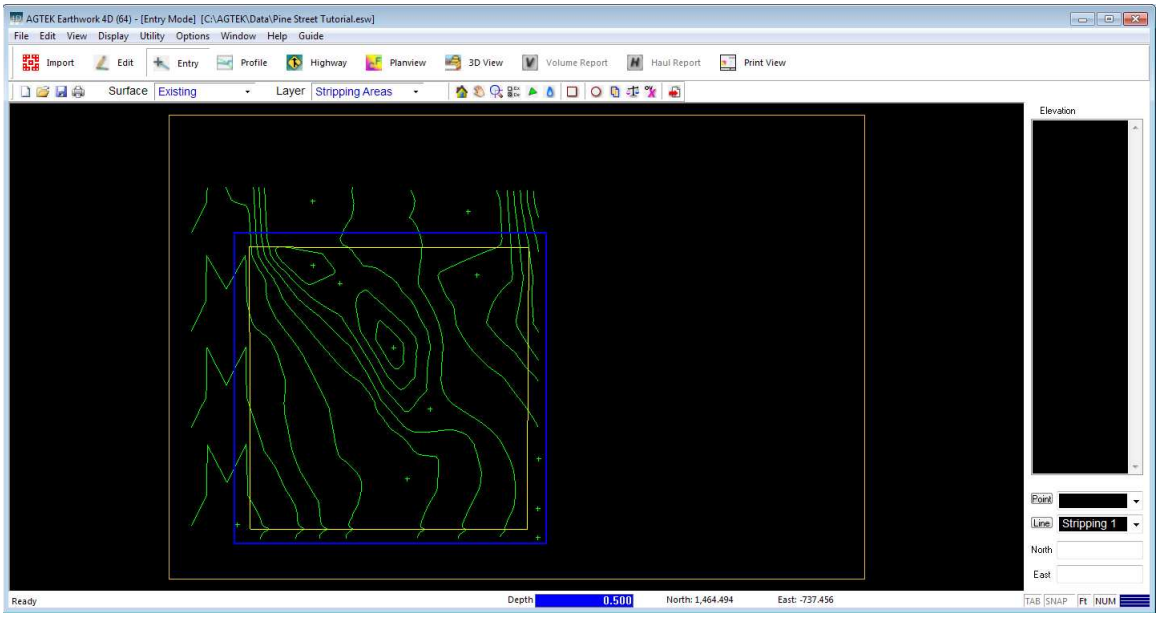


4. Pan up to, and click, where the same sidewalk intersects with the property line behind Lot 4.

5. Pan to the right, and click on the point labeled with a Northing/Easting at the far right of the job.

6. Continue down, and click on the point labeled with a Northing/Easting at the bottom-right of the job.

7. Right-click to end the entry. Sitework 4D will snap the Stripping Area closed for you. Right-click to get your arrow back, press the **Home** key, then press the **T** key and your screen should look similar to the illustration below.



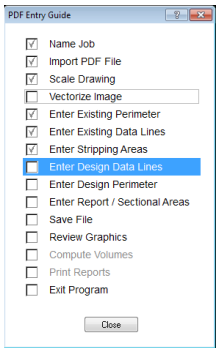
8. Press the **T** key twice to bring the PDF back.
9. Click the **Save** button to save your work.

Lesson 3 - Enter Design Data

This lesson demonstrates entering data for the intended design including subgrade and the limits of construction.

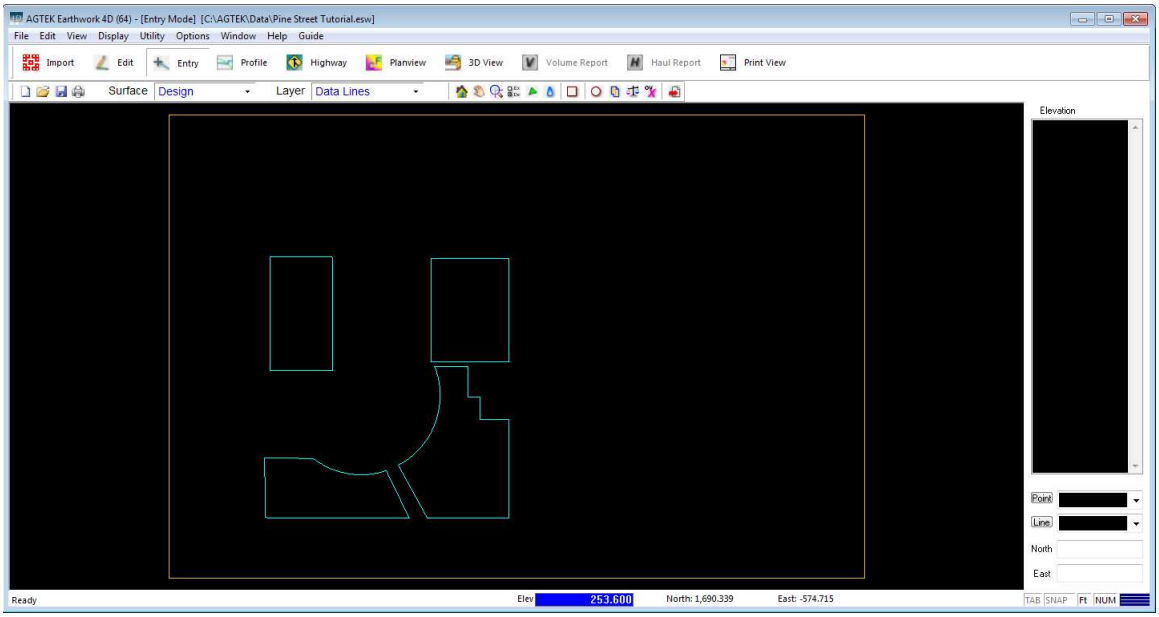
Enter Design Data Lines

Enter Building Pads



1. Change the Surface to Design and the Layer to Data Lines, or press the **G** key and select **Enter Design Data Lines** from the PDF Entry Guide.
2. Find Lot 1 in the lower-left portion of the job and enter the “251” elevation using the keyboard.
3. Click on the bottom-left corner of Lot 1.
4. Continue tracing the line for Lot 1, clicking on the corners and using multiple points to create the curve on the top right. Before completing the lot, put the cursor over the start point of the lot line and press **F8** to snap the line closed.
5. Right-click to end the entry.
6. Repeat the above process for the remaining lots. The more points you use tracing the curves, the smoother your curves will be. Be sure to snap all pads closed using the **F8** key.

7. When finished, press the **Home** key to zoom out and center the job. Right-click to get your arrow back, then press the **T** key and your screen should look similar to the illustration below.



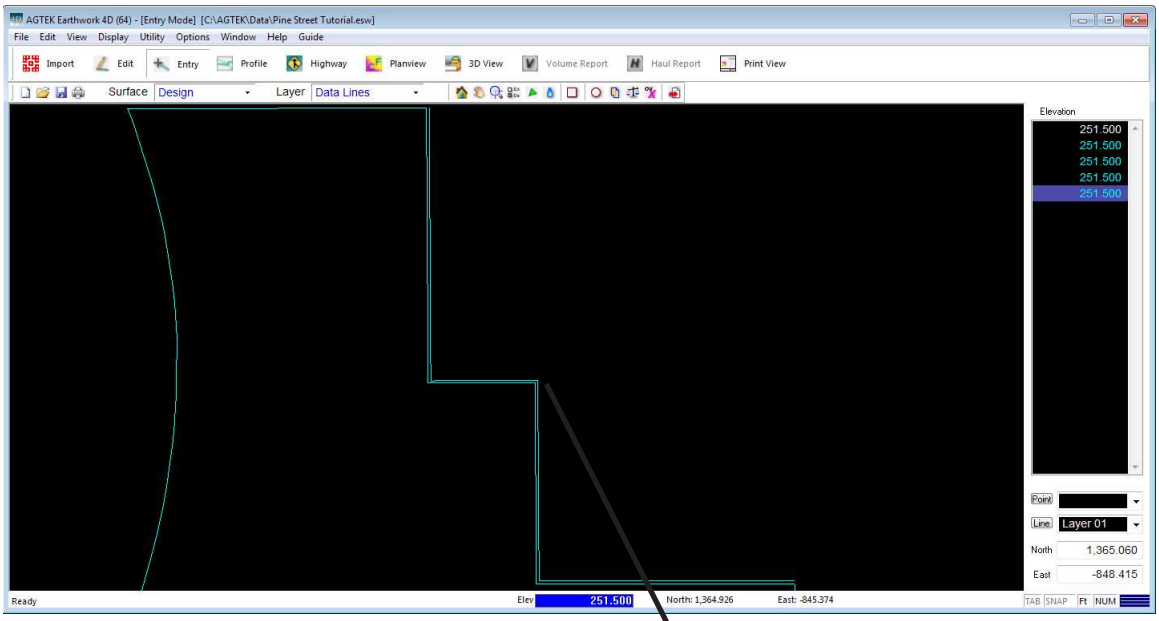
8. Press the **T** key twice to bring the PDF back.

9. Click the **Save** button to save your work.

Enter Retaining Wall

1. Zoom in to the retaining wall behind Lot 2.
2. Enter the top of wall elevation of “253.5”.
3. Beginning at the top, click on the corners of the retaining wall. Be sure that you do not cross the data line representing Lot 2.

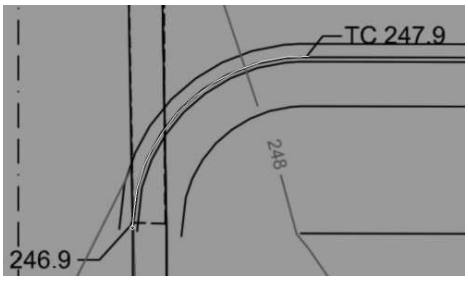
4. Right-click to end the entry.



Enter Curb Lines

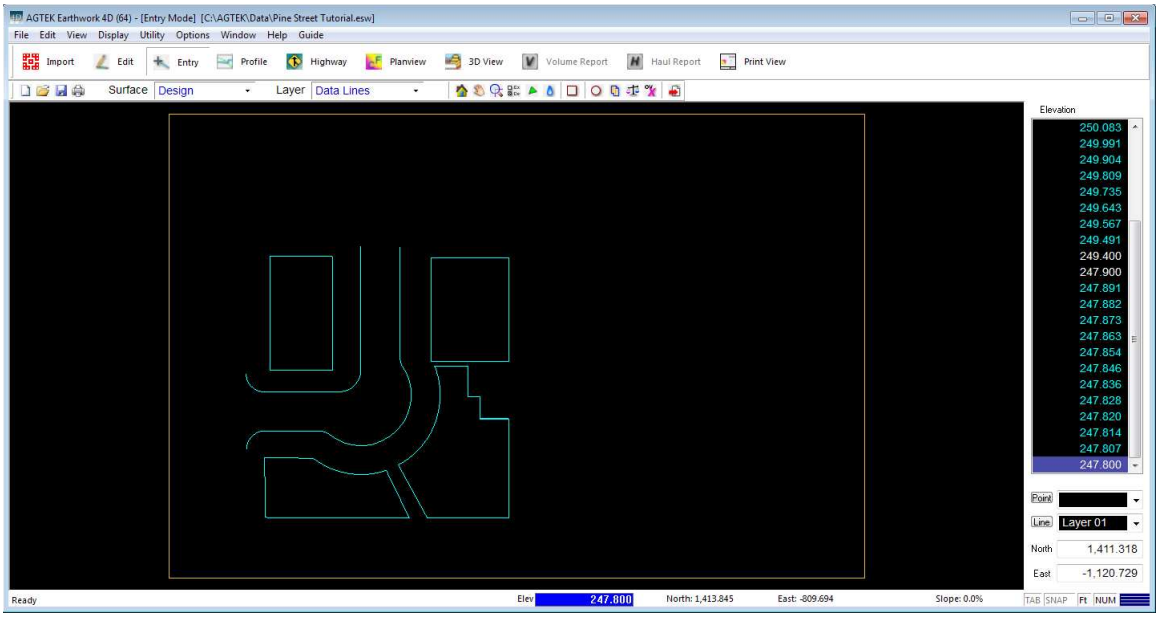
This exercise enters data lines with varying elevations.

1. Zoom into the left, center portion of the job and locate the top of curb line labeled 246.9.



2. Enter “246.9” using the keyboard and click on the beginning of the curb line.
3. Continue to follow the curb line, clicking to enter points as you go.
4. When you come to the first elevation change, enter “247.9” using the keyboard.
5. Move the cursor to the next elevation change, enter “248.7” on the keyboard and click on the elevation change. This keeps the line between the two elevations straight.
6. Continue the same process, entering elevation changes as you come to them, until you reach the 252.6 elevation at the top of the job.
7. After entering the 252.6 elevation, right-click to end the entry and move directly across the street.

8. Beginning with the 252.6 elevation, enter the second top of curb line using the process outlined above. When finished, right-click to get your arrow back, press the **Home** key, then press the **T** key and your screen should look similar to the illustration below.

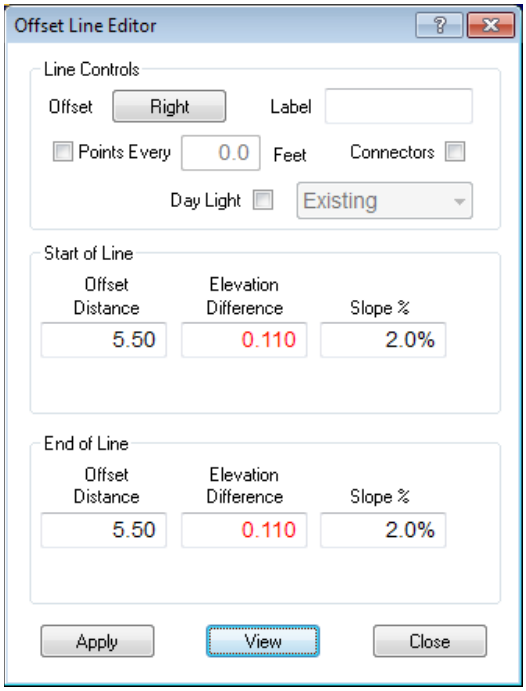


9. Press the **T** key twice to bring the PDF back.

10. Click the **Save** button to save your work.

Offset Line Editor

This exercise uses the Offset Line Editor to create the street by offsetting the top of curb line. Offset lines are created by choosing distance and elevation or slope differences from a chosen reference line. The features of the Offset Line Editor are explained below. For more information regarding offset lines, see page 8-92.

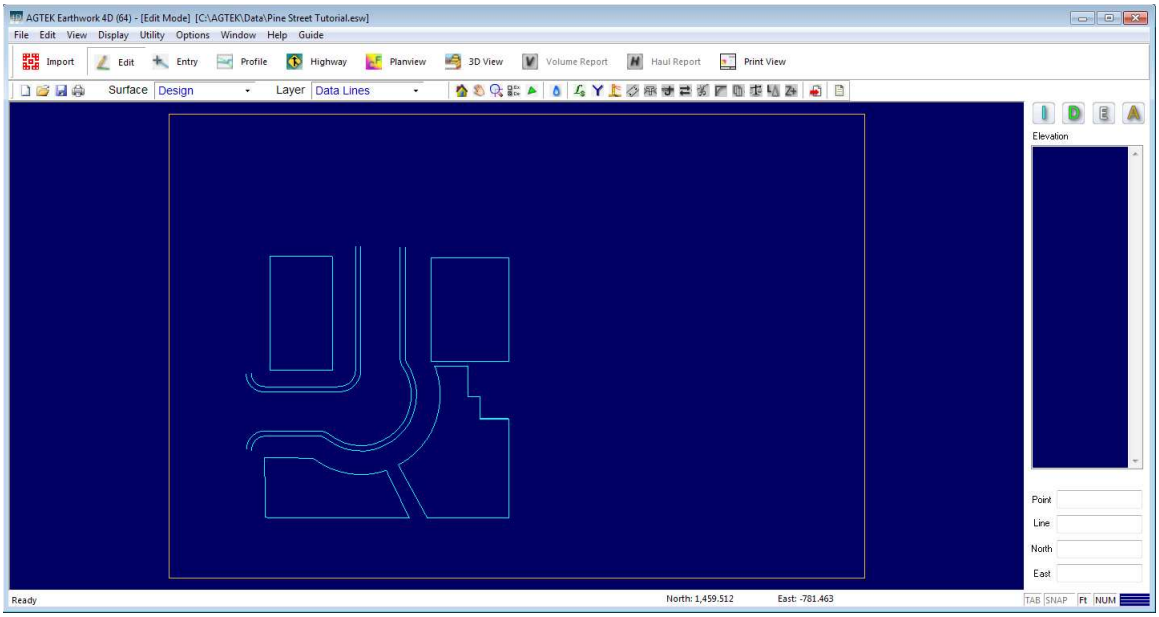


Creating Offset Lines

1. Press the **E** key to switch to the Edit Mode, and click on the top of curb line nearest Lot 4.
2. Shift + Click the remaining top of curb line.
3. Click the **Offset Line Editor** button, and the Offset Line Editor box, as seen on previous page, displays.
4. To create the back of sidewalk lines set the Offset Direction to Right.
5. Be sure Connectors, Points Every, and Daylight are unchecked.
6. Enter “5.5” for the Offset Distance and “2” for the slope.

7. Click the **View** button for a preview of the offset lines.

8. Click **Apply,** and then **Close** to enter the offset lines and close the Offset Line Editor box. When finished, press the **T** key and your screen should look similar to the illustration below.



9. Press the **T** key twice to bring the PDF back.

Enter Design Contour Lines

1. Press the **E** key, or click the Entry Mode button, to switch to Entry Mode.

2. Zoom into the bottom-right portion of the job and locate the 252 design contour.

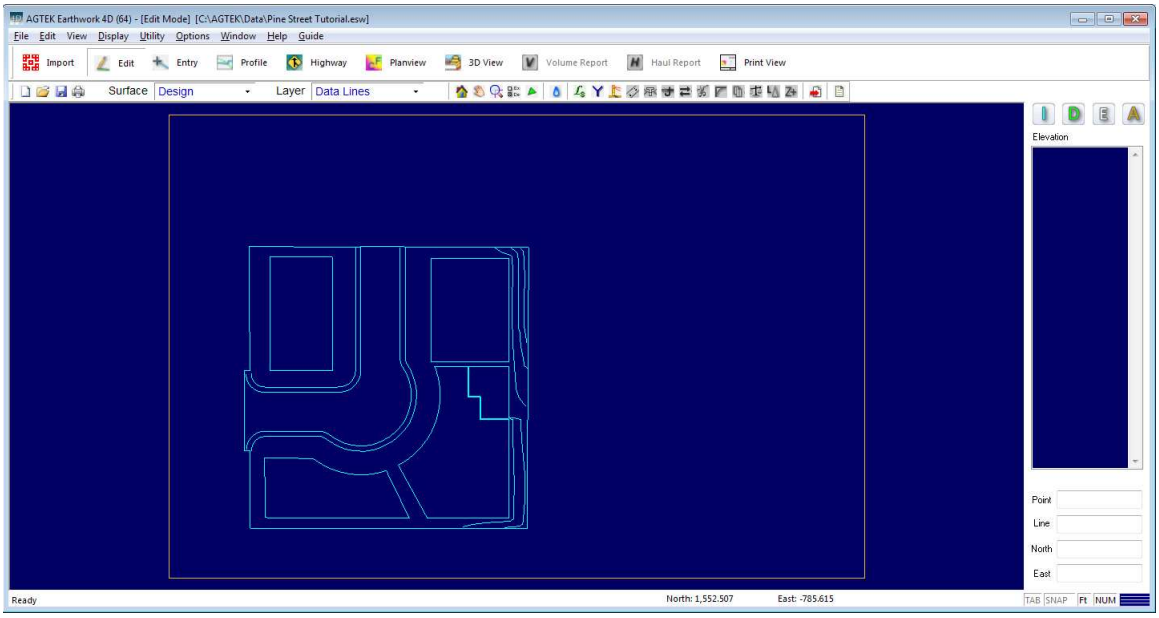
3 Enter “252” using the keyboard.

5. Enter the design contour lines by tracing the line with the mouse, clicking as you go.

6. Right-click to end the entry.

7. Repeat the above process for the four remaining contour lines. When finished, Right-click to get your arrow back.

8. Switch to the Edit Mode and press the **T** key. Your screen should look similar to the illustration below.

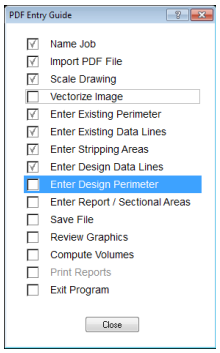


9. Press the **T** key twice to bring the PDF back.

10. Click the **Save** button to save your work.

Enter Design Perimeter

The Design Perimeter represents the limits of construction of your job. The Design Perimeter also tells the computer where to limit it's volume calculations. The Design Perimeter overrides all regions, sections, and areas, i.e. all dirt within the Design Perimeter will be counted, while all dirt outside of the Design Perimeter will be excluded from calculations. When the Design Perimeter is entered, you are asked to drape a Daylight line, at existing elevations, under the Design Perimeter. This will provide a smooth transition from the design to the surrounding conditions of the job site.



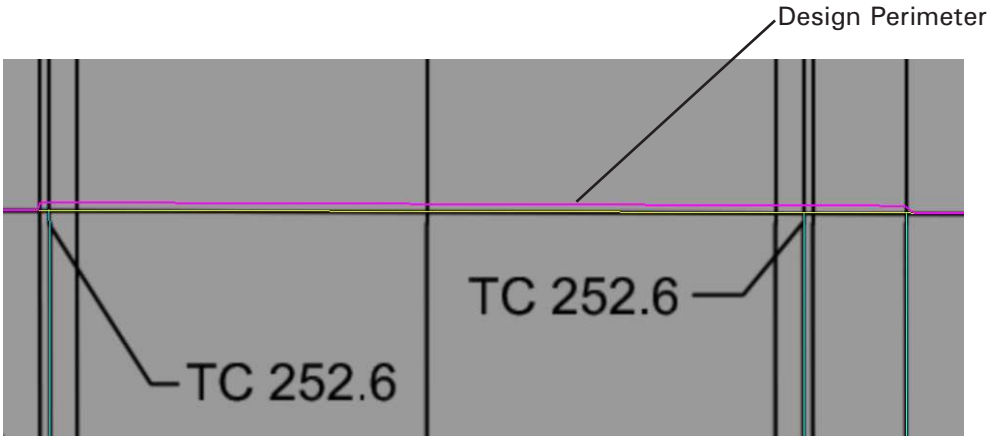
1. Press the **E** key to switch to the Entry Mode and set the Surface to Design and Layer to Perimeters, or press the **G** key, select **Enter Design Perimeter** from the PDF Entry Guide.

2. Right-click anywhere on the job and select **Display > Stripping Areas**.

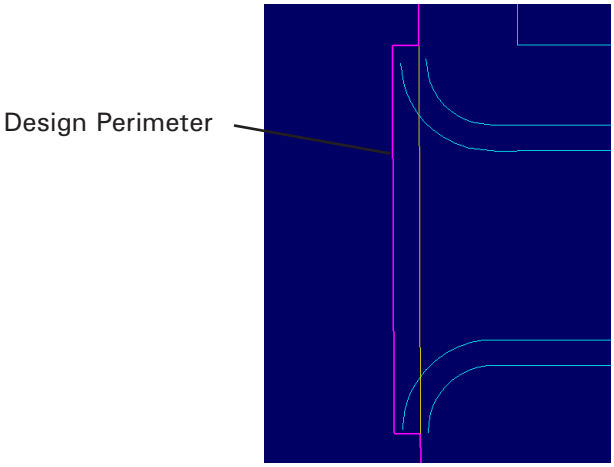
3. Snap to the lower left corner of the Stripping Area using the **F8** key.

4. Continue to the right and then up, snapping to the corners of the Stripping Area as you encounter them.

5. Continue to left, across the top of the Stripping Area. When you come to the street, extend the perimeter beyond the street. Use the **F6** key to snap to the stripping line.



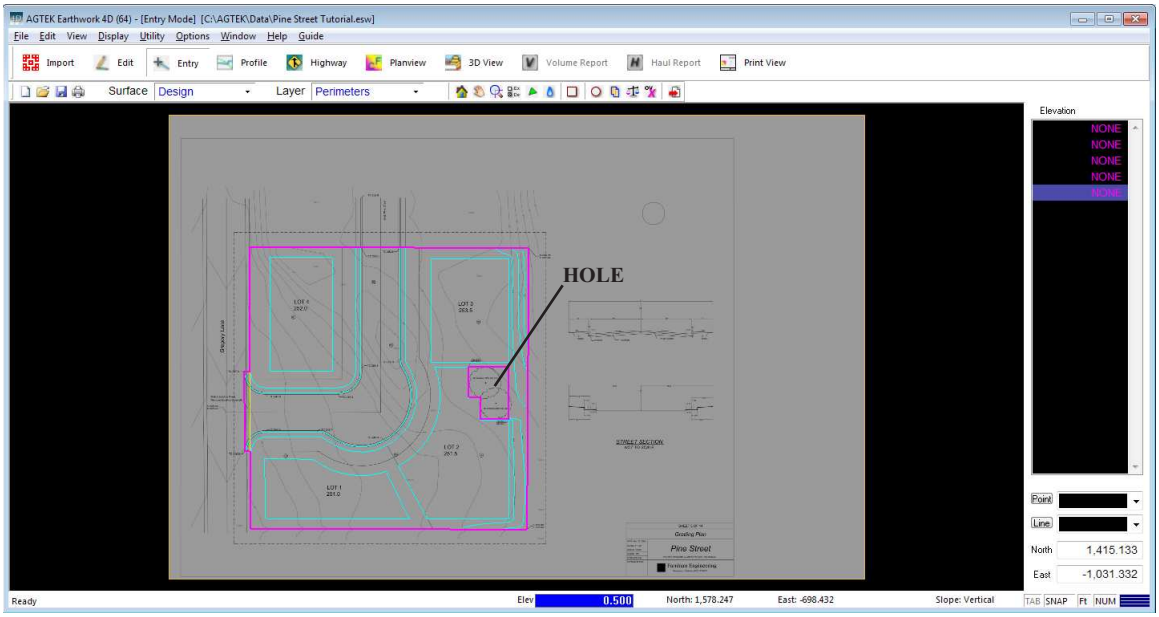
6. Continue to the left, and click on the top-left corner of the Stripping Area.
7. Continue down, extending the perimeter beyond the street.



Entering a perimeter withing a perimeter creates a hole in the job. Dirt quantities are not calculated withing this second perimeter.

8. Before returning to the starting point of the Design Perimeter, right-click to snap the perimeter closed.
9. Zoom in on the area behind the retaining wall at Lot 2 labeled “No Grading within Drip Line.”
10. Enter a second Perimeter around the area behind the retaining wall by clicking at each of the corners. Be sure the Design Perimeter does not intersect with any design data lines.
11. Right-click to close the second perimeter and create a hole in the job. The contents of this hole will be removed from the calculations.

12. Right-click a second time and the Apply Drape Line dialog box is displayed. Click **Yes**. Right-click to get your arrow back, then press the **T** key, and your screen should look similar to the illustration below.

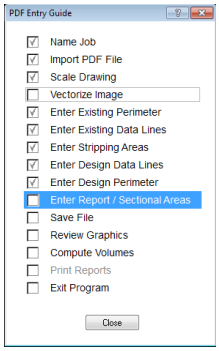


13. Press the **T** key twice to bring the PDF back.

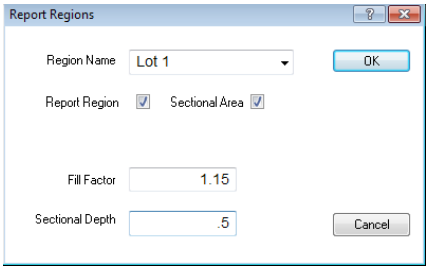
Enter Report/Sectional Areas

Report Regions are used to break a job up into individual areas for calculation on the volume reports. Sectional Areas are used to modify the design surface by subtracting their depth from the design surface and then listing the area individually on the volume report.

Break Out the Building Pad Areas



1. Switch to the Entry Mode. Click the Add Regions button, or press the **G** key, and select **Enter Report/Sectional Areas** from the PDF Entry Guide, and the Report Regions dialog box is displayed.



For the auto-increment to function, the region name must be entered with a space between the name and the number as in the example.

2. Enter "Lot 1" for the Region Name and ".5" (six inches) for the sectional depth (On a metric job .5 equals half a meter, or 500mm). You may also enter a Fill Factor to account for compaction. Enter 1.15 for 15 percent compaction. **Click OK**.
3. Move the cursor over the corner of Lot 1 and Line Snap (press the **F8** key twice in rapid succession) to the entire building pad.
4. Right-click to end the entry.
5. Repeat step 3 for the remaining building pads. Sitework 4D auto-increments the pad names (Lot 1, Lot 2, Lot 3...). Right-click to get your arrow back.

Enter Street Area

1. Click the Add Regions button, or press the **G** key and select **Enter Report/Sectional Areas** from the PDF Entry Guide, and the Report Regions dialog box displays.
2. Enter "Street" for the Name and "1.33" for Sectional Depth.
3. Zoom into where the street meets Gregory Lane. Move your cursor over the Southern TOC line and Line Snap (press **F8** twice in rapid succession on the same point) to the top of curb line.
4. Move the cursor to the top of the job, above the selected top of curb line, and press the **F8** key once. The snapped line will attach itself to the cursor.
5. Move directly across the street and Line Snap (press **F8** twice in rapid succession) to the other top of curb line.
6. Move back to where the street meets Gregory Lane, move the cursor above the end of the top of curb line and press **F8** once.
7. Right-click to snap the region closed, and end the Entry. Right-click again to get your arrow back.

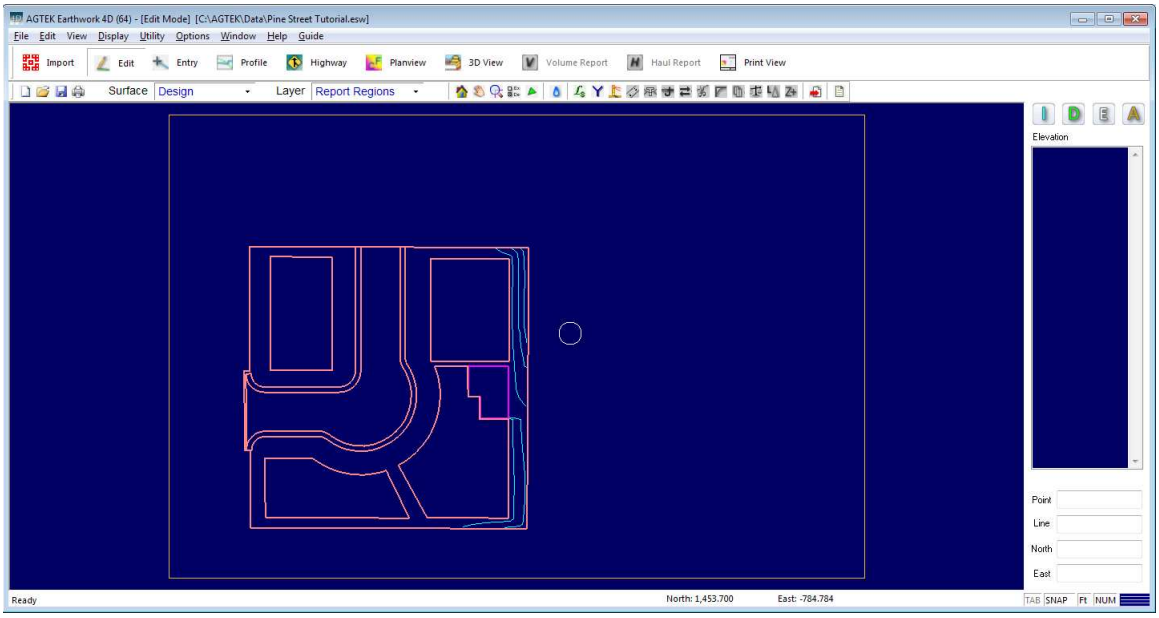
You may enter the Sidewalks in a similar manner using a sectional depth of .33

Enter A Final Report/Sectional Area

Entering a final Report/Sectional Area will make sure that all dirt is included in a Report Region. Any dirt left outside of a Report Region will be listed as Unspecified on the report.

"Landscape" is used for this example because it will primarily in clude the landscape/ grass areas around the building pads.

1. Click the Add Regions button, or press the **G** key and select **Enter Report/Sectional Areas** from the PDF Guide, and the Report Regions dialog box will display.
2. Enter "Landscape" for the Name and "0" for Sectional Depth and click **OK**.
3. Move the cursor over a corner of the Design Perimeter, and Line Snap (press **F8** twice in rapid succession on the same point) to snap to the Design Perimeter.
4. Right-click to end the entry. Right-click to get your arrow back, then press the **T** key and your screen should look similar to the illustration below.



5. Press the **T** key twice to bring the PDF back.

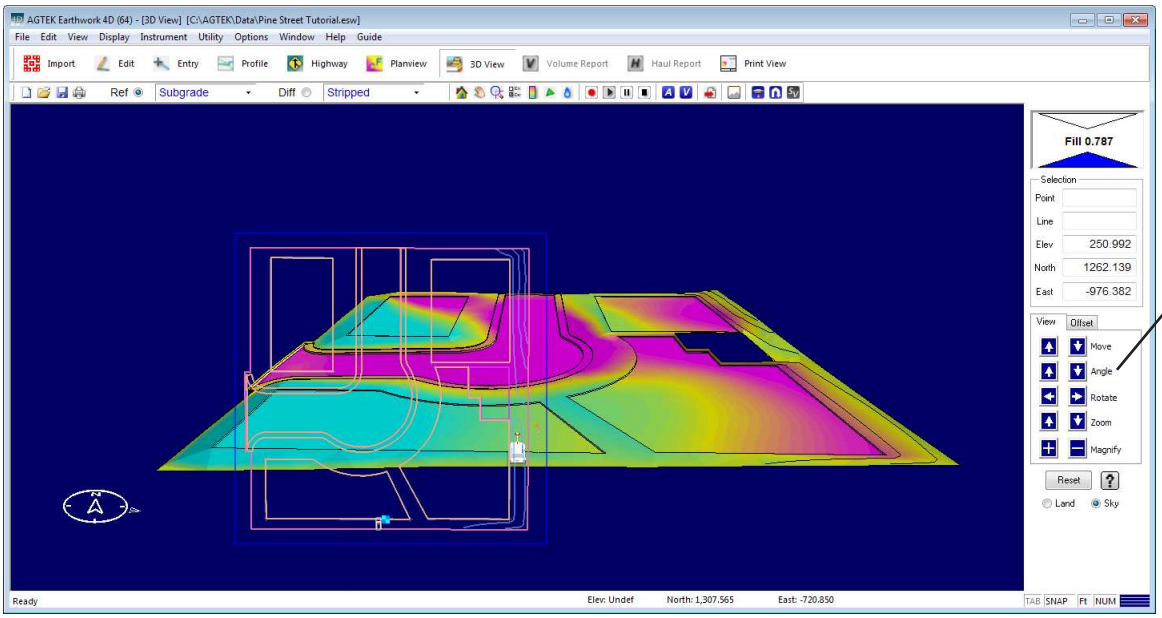
6. Click the **Save** button to save your work.

Lesson 4 - Review Graphics

The creation of 3D surfaces allows comparison of the surfaces for volumes. This lesson demonstrates how to verify the accuracy of the job with the 3D view, and specify the area to calculate and generate the volumes. The 3D Mode in Sitework 4D can be used to verify the accuracy of the job data. Using 3D controls to inspect the 3D surface and look for any errors which may have occurred during the data entry.

1. Switch to the 3D Mode, or select press the **G** key, and select Review Graphics from the PDF Guide. Make sure the Ref is set to Subgrade and the Dif is set to Stripped.
2. Use the controls described below to inspect the 3D surface for mistakes.

Be sure the finished surface (the surface you are calculating to) is on the left, and the begining surface (the one you are calculating from) is on the right.



Toolbar — Use the Toolbar to change the reference (Ref) and difference (Diff) surface to compare different surfaces in 3D View.

Overlay — The Overlay is the two-dimensional plan view of the job. Clicking on the Overlay moves the view to that position.

Terrain — The Terrain is the three-dimensional representation of the job. Use the Arrow keys to move around the Terrain View.

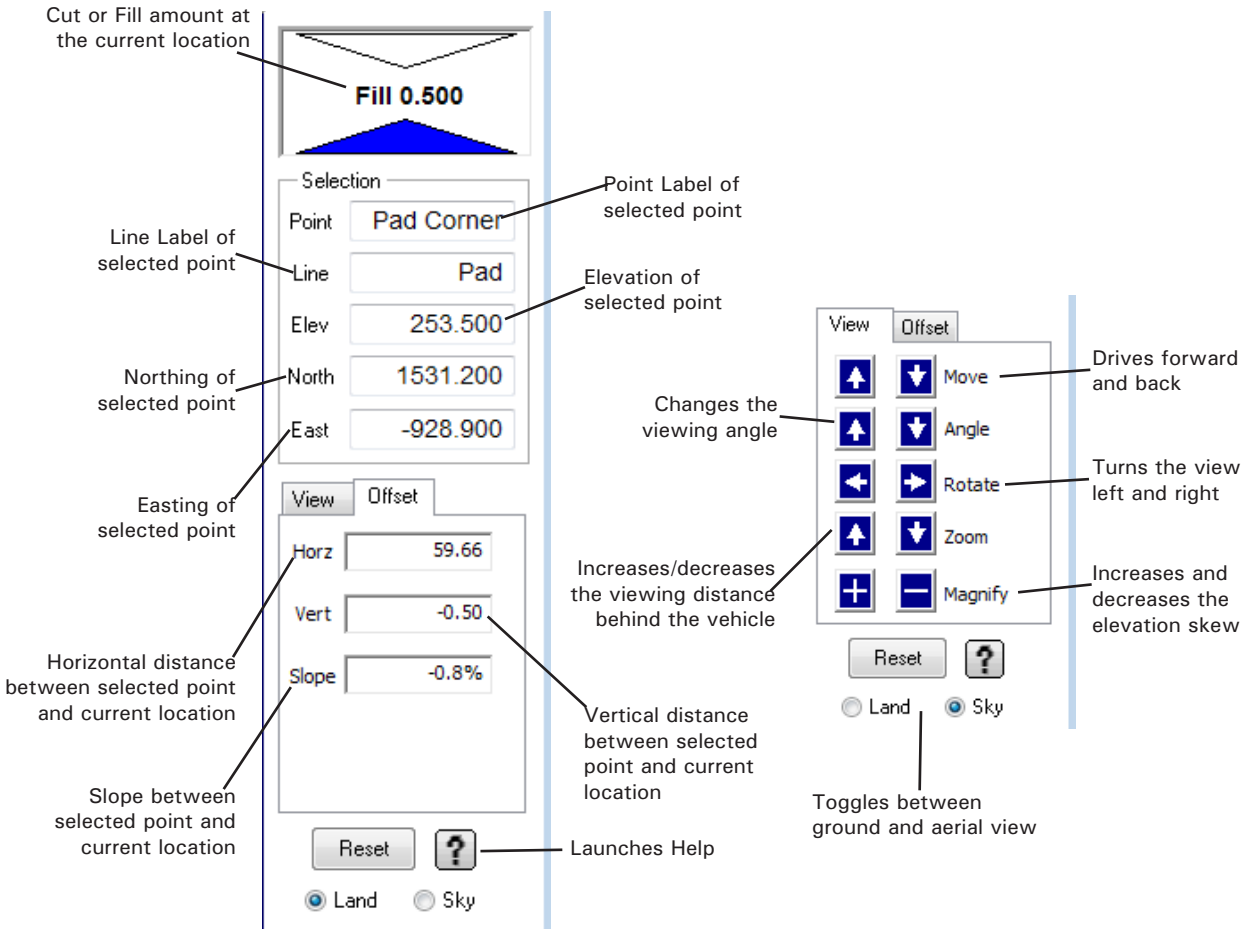
3D Controls — Use the 3D controls to inspect the terrain for any errors and to see how all of the data you have entered displays on the job.

Driving

Driving the 3D View is the easiest way to double check your work and the surface quality. It also can display the Subgrade and Stripping surfaces and calculate volumes.

Use the Arrow keys on the keyboard to drive through the site. The **Up** and **Down** arrows move forward and back. The **Right** and **Left** arrows turn. For additional clarity, you may want to turn the Overlay off by pressing the **O** key or by selecting **Display > Overlay**. The speed of the drive is based on the **Arrow Rate** setting, which is located on the **Edit** menu. Each arrow key press has a distance that the Arrow Rate controls. The speed of your computer and video adaptor can also affect screen speed.

Try using the 3D controls to change the views and get a feel for what they do. Also try changing the Reference and Difference surfaces to see the different views and comparisons.



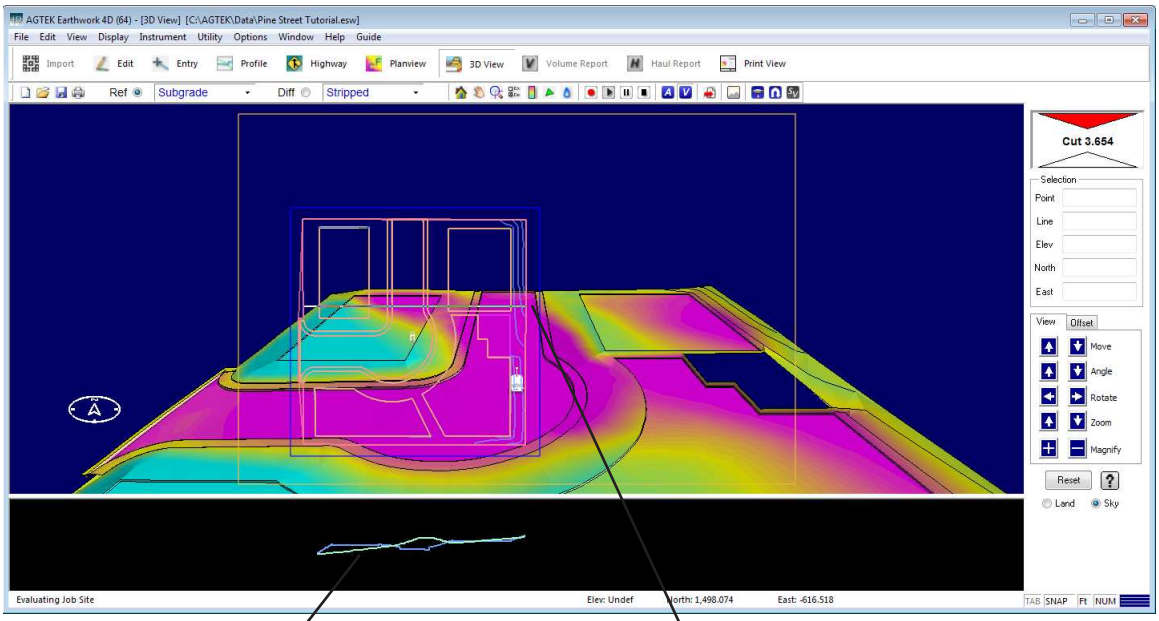
Lesson 5 - Calculating Volumes

Once the model has been verified, and any changes have been made, you can calculate volumes and compare surfaces.

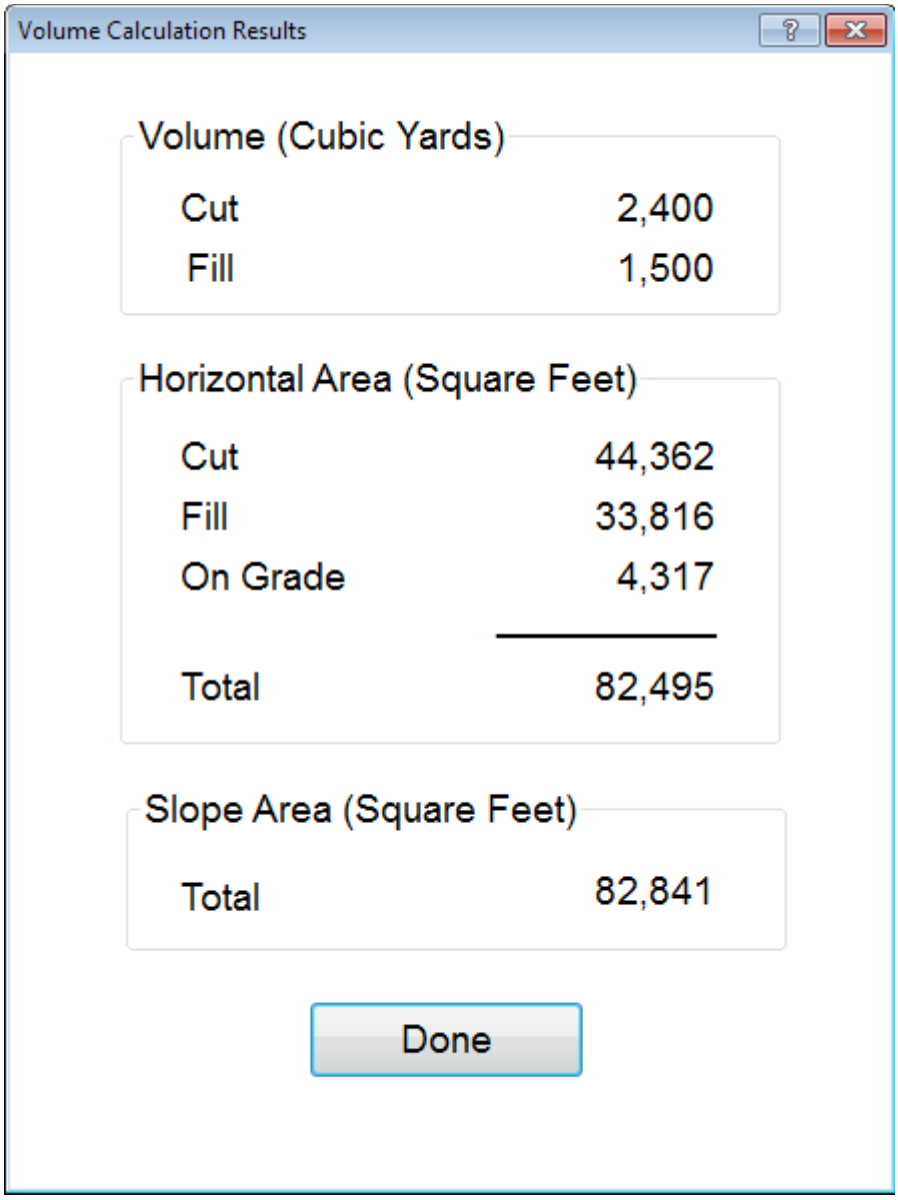
1. While still in 3D Mode, specify the Surfaces to be used. For our example, set the Reference surface to Subgrade and the Difference surface to Stripped.
2. Define the Volume Area. Click the **A button** on the Utility Tool Bar to create a bounding box (using the Design Perimeter) around the entire job. This determines the limits of the volume calculation.
3. Calculate the Volume. Click the **V button** on the Utility Tool Bar, or select **Utility > Calc Volume,** to begin volume calculations

During the volume calculation, cross sections display at the bottom of the screen with blue representing the Subgrade and green the Stripped surface. A line displays on the overlay showing the corresponding location of the cross section. The calculation can be paused by pressing the **Spacebar** or aborted by pressing **Esc**. When paused, the **I** key on the keyboard will move across the site incrementally. Pressing the **Spacebar** again will resume the volume calculation. When the calculation finishes, the Volume Calculation Results are displayed.

Be sure the finished surface (the surface you are calculating to) is on the left, and the begining surface (the one you are calculating from) is on the right.



These numbers represent uncompacted cut and fill between the two surfaces. The Horizontal Area represents plan view areas with no slope adjustment and is broken down into Cut, Fill, and On-grade square footage. Slope Area represents a slope adjusted square footage. It is the total surface area, excluding vertical surfaces like curb faces. Press **Done** to close the dialog box. These volume numbers can be recalled by clicking the Volume Report button on the tool bar.



The Volume Report

Once you click **Done** in the Volume Calculations Results dialog box, the Volume Report is displayed. You can also access the report after volumes have been calculated by selecting **Window > Volume Report,** or by clicking the Volume Report button.

The Volume Report displays area, volume, and depth for stripping and sectional areas. The total area, cut/fill, strata, and on grade area for each report region and sectional area are displayed, if created. The report also displays the Cut-Fill volumes, compaction ratios and their impact on the volumes, import/export data, and volume change per 0.1 foot of elevation change, which is useful for balancing the site. The data in the volume report should be similar to the illustration below.

■

Job: Pine Street Tutorial
Units: Ft-CY
Mon Dec 05, 2016 14:14:43 Page 1

Volume Report
Subgrade vs. Stripped

	Area				Volume		Comp/Ratio		Compact		Export	Change
	Total	Cut	Fill	OnGrade	Cut	Fill	Cut	Fill	Cut	Fill	-Import	Per .1 Ft
Landscape	29,726	9,432	17,764	2,530	322	665	1.00	1.15	322	765	-443	127
Lot 1	7,352	0	7,352	0	0	497	1.00	1.15	0	572	-572	31
Lot 2	11,643	7,801	2,908	934	289	50	1.00	1.15	289	57	232	50
Lot 3	8,627	7,051	1,111	465	250	16	1.00	1.15	250	18	232	37
Lot 4	7,582	2,664	4,678	240	143	272	1.00	1.15	143	313	-170	32
Lot Sub:	35,204	17,516	16,049	1,639	682	835			682	960	-278	150
Sidewalk 1	2,039	1,943	3	93	104	0	1.00	1.15	104	0	104	9
Sidewalk 2	1,440	1,386	0	54	47	0	1.00	1.15	47	0	47	6
Sidewalk Sub:	3,479	3,329	3	147	151	0			151	0	151	15
Street	14,086	14,086	0	0	1,246	0	1.00	1.15	1,246	0	1,246	60
Regions Total	82,495	44,363	33,816	4,316	2,401	1,500			2,401	1,725	676	352

Stripping Qtys	Plane Area	Slope Area	Depth	Volume
Stripping 1	82,006	82,095	0.500	1,520

Sectional Qtys	Plane Area	Slope Area	Depth	Volume
Lot 1	7,352	7,352	0.500	136
Lot 2	11,643	11,643	0.500	216
Lot 3	8,627	8,627	0.500	160
Lot 4	7,582	7,582	0.500	140
Lot Sub:	35,204	35,204		652
Sidewalk 1	2,039	2,040	0.330	25
Sidewalk 2	1,440	1,442	0.330	18
Sidewalk Sub:	3,479	3,482		43
Street	14,086	14,089	1.330	694
Sectional Total	52,769	52,775		1,389

Lesson 6 – Printing Reports

Sitework 4D can print the Overlay and Terrain graphics along with Volumes and Profiles. The Print Preview Window allows the user to import graphics and resize, move, and add text.

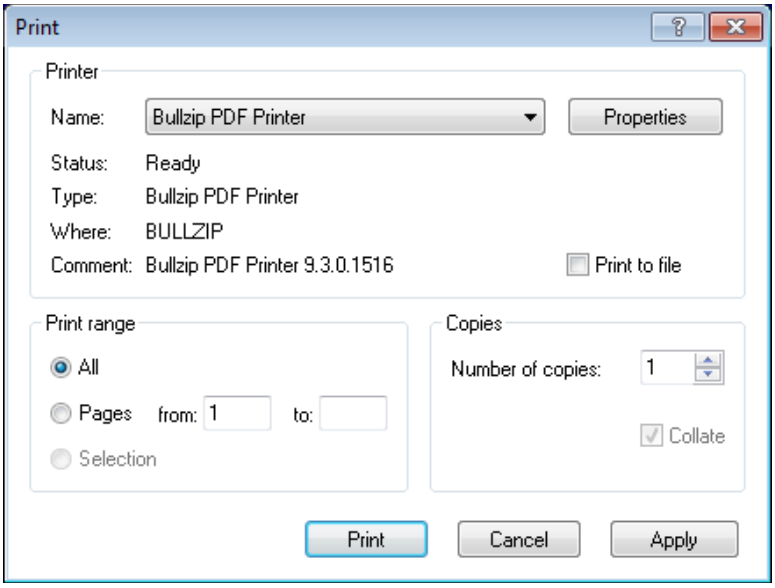
Set up the Printer

Before printing, the printer should be configured. Sitework 4D uses the printer specified to size the screen and margins.

1. Select **File > Open**, and choose Pine Street.esw. Click **Open**.

To configure a printer when using Windows XP, select **File > Print**, and click the **Printer** button

2. Select **File > Print** to configure the printer.



3. Verify your printer and its settings and click **Apply**.

Send Graphics to the Print Page

Selecting **File > Send to Print Page s**ends the current screen view to the Print Page.

1. Click the **3D View** button on the tool bar. The job is shown in 3D View mode.

2. Use the keyboard arrows and the 3D Controls to show a Terrain view you want to print, then select **File > Send to Print Page,** or click the **Send to Print Page** button.

3. If both the Overlay and Terrain are visible, the program asks which you want send. Select **Send Terrain,** and click **OK**.

The Print Page Window

The Print Page displays a representation of the page with the Terrain as an object on the page. The white area is the printable area on the page. The gray area represents the printer's margins.

Selecting Objects

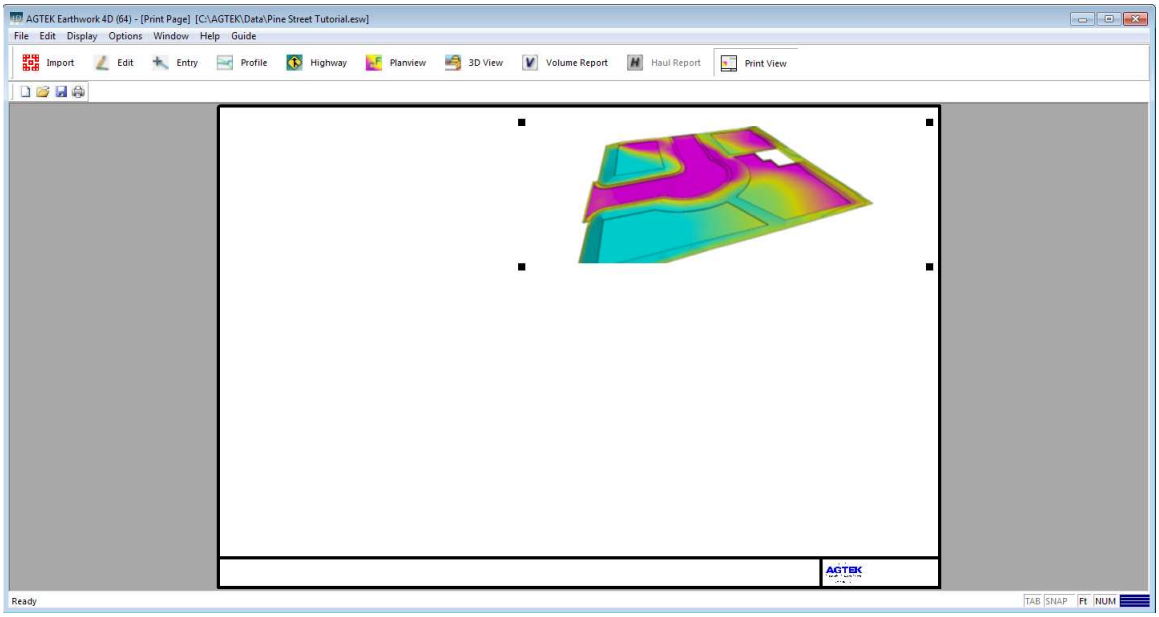
The Terrain object can be picked by clicking on it. A picked object displays four blocks around the object. In case of multiple overlapping objects, Shift + click cycles between objects.

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

- Select the Terrain object, drag it to the right side of the page, and increase the size to similar to the illustration below.



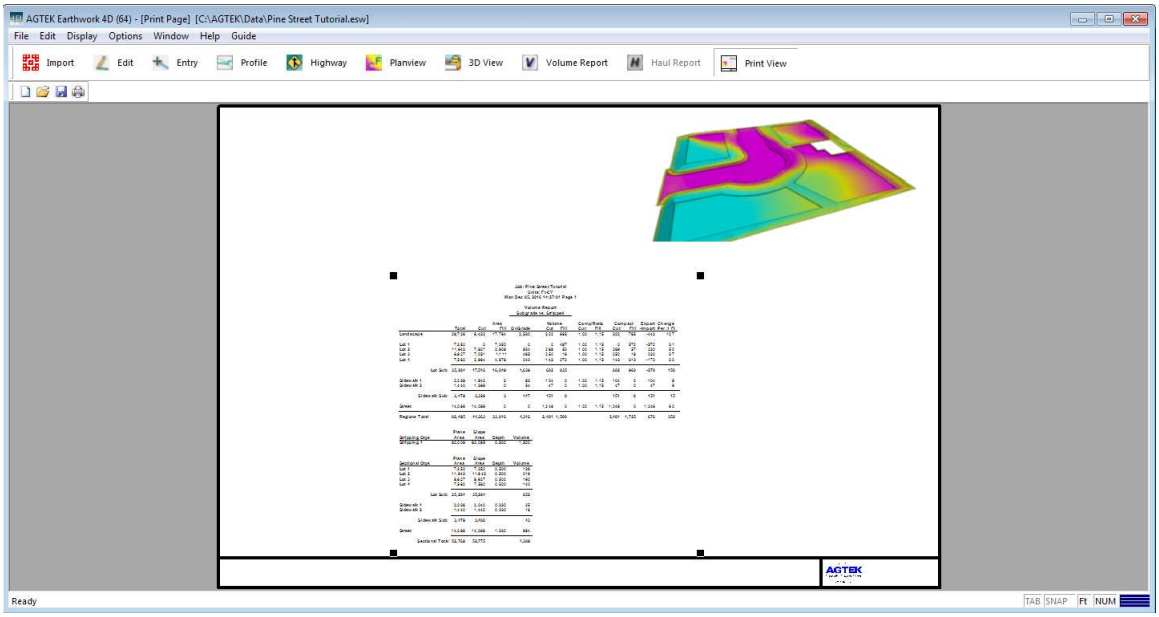
Adding Other Objects

The Print Preview window supports multiple objects. Next we'll add the Volumes Report to the page.

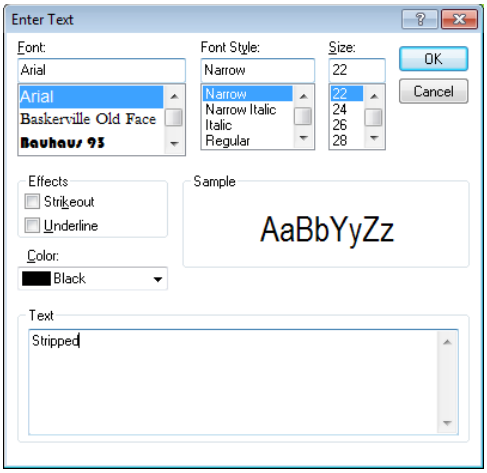
1. Click the **Volumes Report** button or select **Window > Volumes Report**. The Volumes Report shows the volumes and areas calculated earlier.

2. Select **File > Send to Print Page** and the report transfers to the Print Preview window.

The Volumes Report can be moved and resized using the same methods as the Terrain object. Move and size the report until the page looks similar to the illustration below.



3. To add text to the report, select the Edit menu and select **Add Text**.

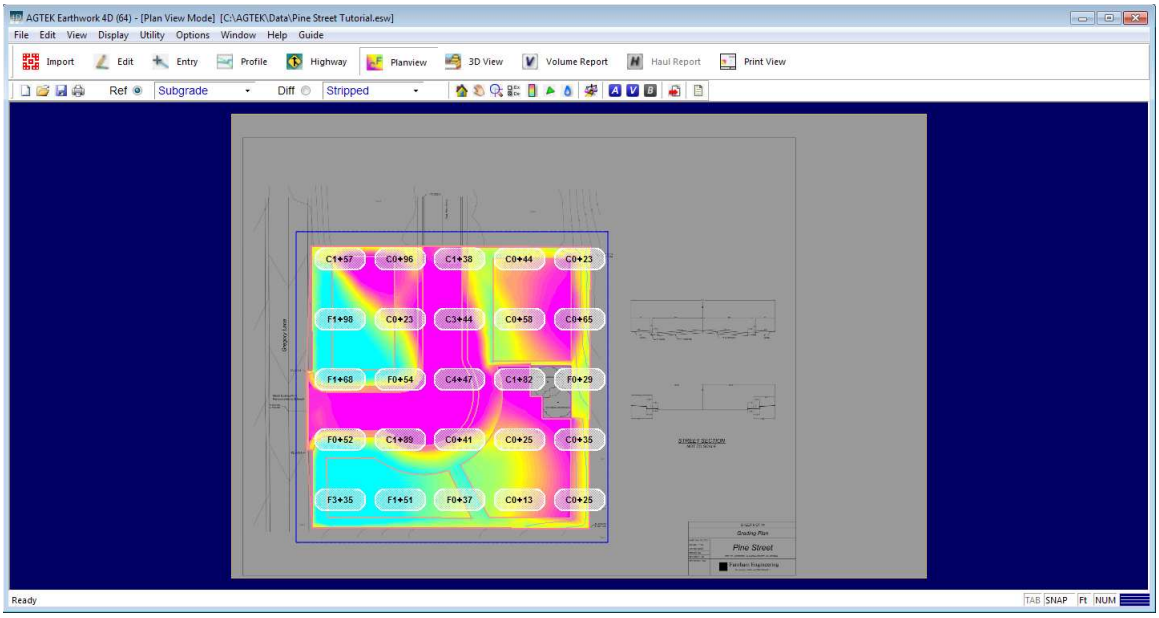


4. Enter the desired text and drag the object to the desired location.

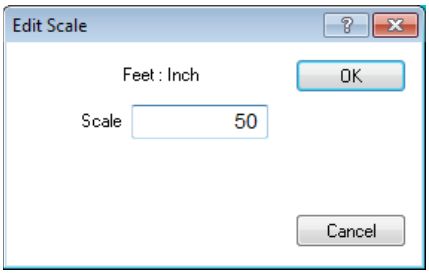
Printing the PDF

The PDF can also be sent to the print page, as it appears on screen.

1. Switch to the **Planview Mode**.
2. Press the **T** key twice to display the PDF behind the planview of the job.

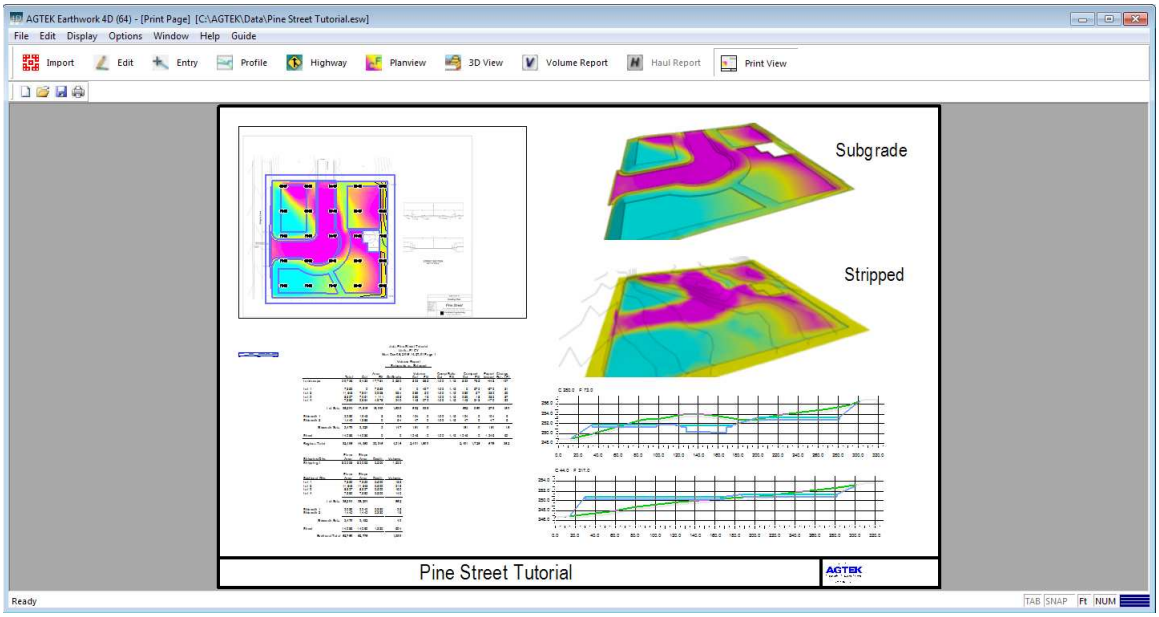


3. Click the **Send to Print Page** button and the Print Page displays.
4. The image can now be positioned and sized as desired on the Print Page.
5. To scale the plan, select the Edit menu and select Drawing Scale.



Print The Report

1. When you are satisfied with the results, click the **Print** button from the Selection Tool Bar or choose **File > Print**.



Section 3

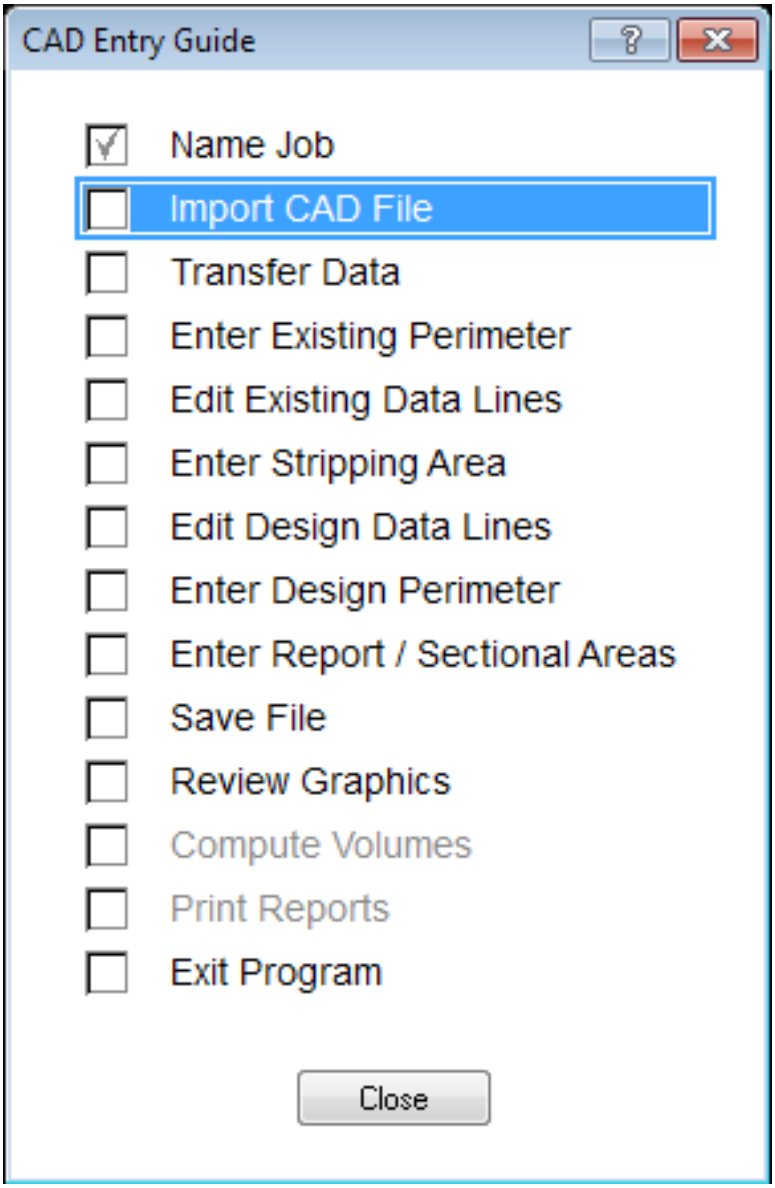
CAD Tutorial

3D Modeling Overview

Sitework 4D can be used to convert CAD files into takeoffs and accurate 3D models. This tutorial covers the steps to perform the conversion and creating the model.

CAD Entry Guide

In the Guide menu, Sitework 4D contains guides for PDF, CAD, Tablet and Haul Plan entry. These guides aid the entry of a complete job. This tutorial focuses on CAD entry. The CAD Entry Guide can be accessed by selecting **Guide > CAD** or by pressing the **G** key. When a procedure is selected from the Guide, Sitework 4D will change to the proper mode, surface, and layer necessary for that procedure. The Guide displays a check mark in the corresponding box when an operation has been completed.



Data Entry Sequence

Sitework 4D is used for data entry and editing to create 3D models from CAD data. Below is the suggested data entry sequence for the 3D modeling.

CAD Data Transfer

- Start a New Job
- Transfer CAD Data

Existing Ground Data

- Enter Existing Perimeter
- Edit Existing Ground
- Enter Stripping Areas

Design Ground

- Edit Design Data Lines
- Enter Design Perimeter
- Enter Sectional Areas

Calculate Volumes

- Visual Verification with the 3D Window
- Calculate Volumes
- Print Reports

Lesson 1 - CAD Data Transfer

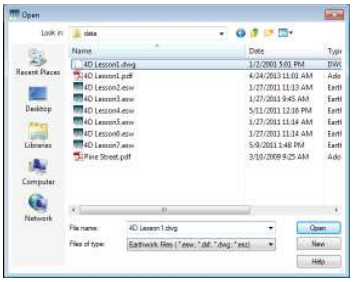
Sitework 4D is a tool for creating takeoffs from PDF files, digitized plan sheets, and CAD files. Both DWG and DXF files are read and can be quickly transformed into a precise 3D model suitable for use in the field.When a DXF or DWG file is selected, the data from that file is opened in CAD Transfer Mode displaying all layers in the file including frozen, or locked, layers. Training videos discussing CAD modeling are available at http://www.agtek.com/trainingvideos.asp. It recomended that you watch the training videos first.

Start a New Job (Job Setup)

This Open dialog box defaults to display three file types: ESW, DXF, and DWG. ESW is the native file type of Sitework 4D.

1. Double-click on the **Sitework 4D** shortcut, or select **Start > Programs > AGTEK > Sitework 4D.** The Open Dialog box is displays.

2. Select the “4D Lesson1.dwg” file, and click **Open**.



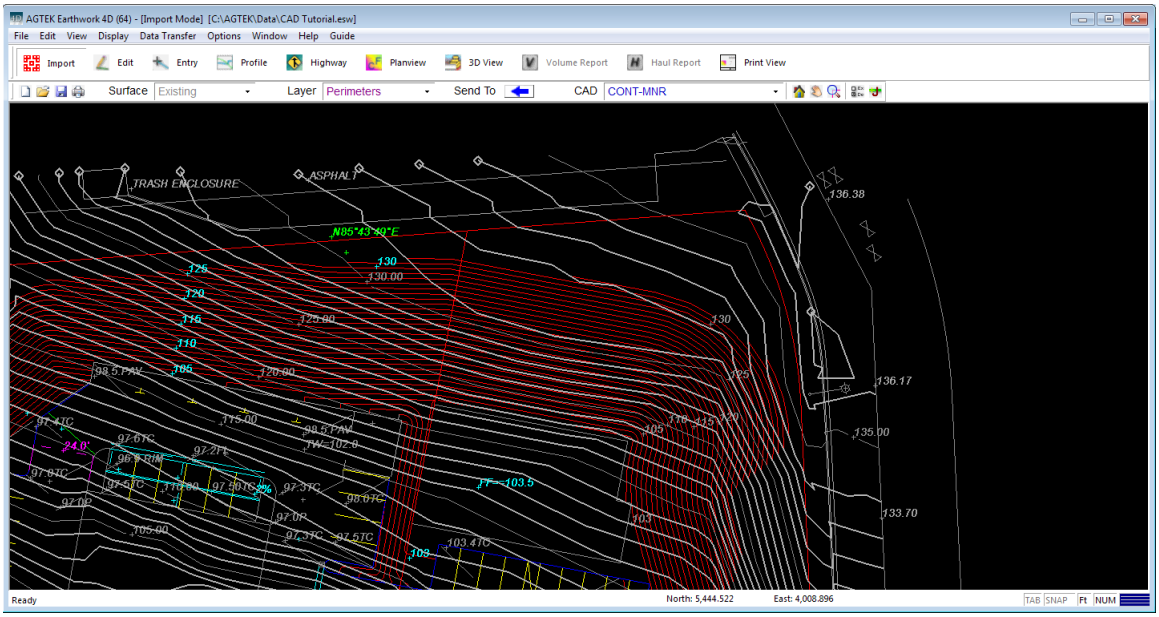
3. Select **Data Transfer > Crop Rectangle** to remove unnecessary data.
4. Click and draw a box around the relevant data, then click again to end.
5. Click **Yes** when asked to remove everything outside the rectangle.
6. Select **Data Transfer > Import Transfer Units,** and make sure Feet is selected as the units of measure, then click **OK**.

Import Transfer Units: The Import Transfer Units designate what unit of measurement the job is created in. It must be set to the same units as the CAD file being transfered: feet, metric, or architectural. User defined is used when the CAD file is created using a unique unit of measurement.

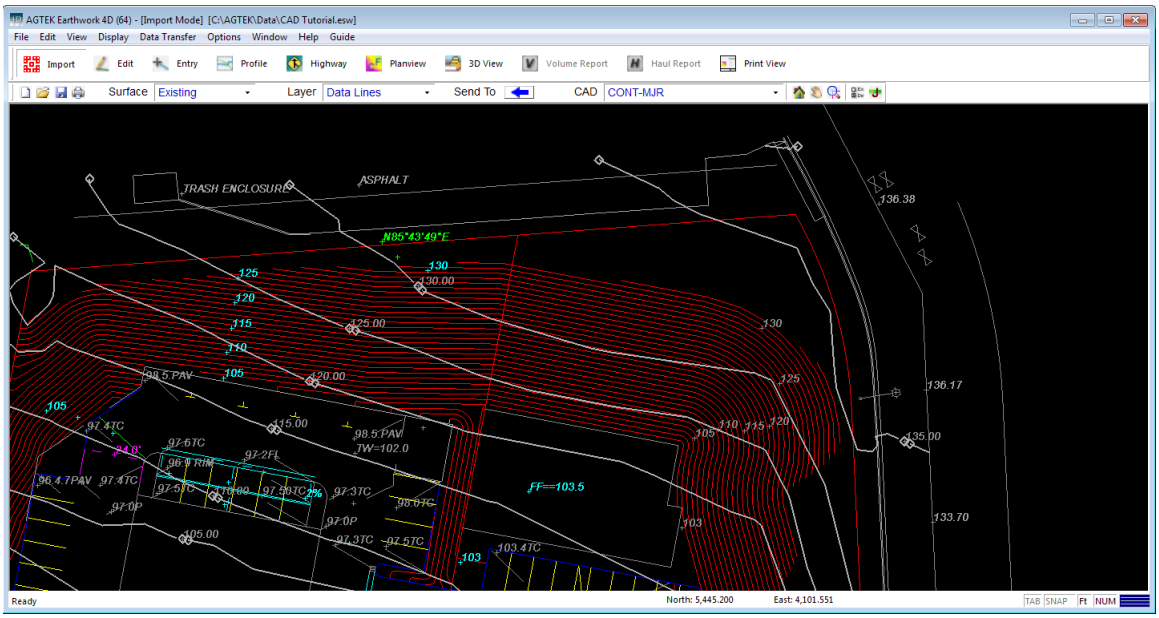
Transfer Existing Ground Data

When a line is selected in Import Mode, all lines in the same CAD layer are highlighted. The tool bar shows the name of selected layer along with the controls used to send that layer to a Sitework 4D surface. Transfer mode can also be found by pressing the **G** key, and choosing **Transfer Data.**

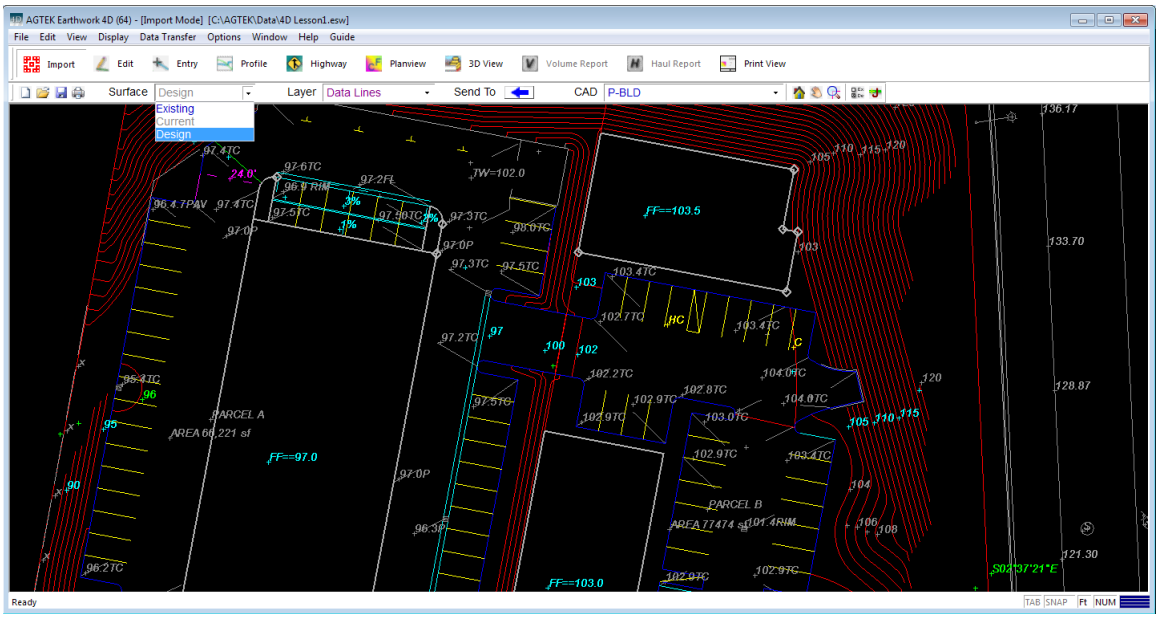
1. Change to the **Existing** Surface and **Data Line** Layer, then click the “CONT-MNR” layer, or use the toolbar to select it in the CAD pulldown, then click the **Send To** button to transfer the layer to the Existing surface.



2. Select the “CONT-MJR” layer with the mouse or by using the layer pulldown menu and send it to the Existing Surface and Data Lines Layer.



3. Change to the **Design** Surface and **Data Line** Layer, then select the “P-BLD” (building pad) layer and click the **Send To** button.



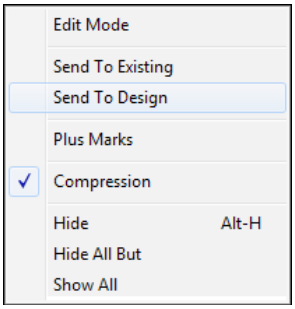
Other CAD Transfer Methods

In addition to the previous example, there are other methods of transferring CAD data.

Right-Click

Right-clicking a layer displays the Right-Mouse menu, which allows you to select the target surface.

- Select the “DSN-CNTR” layer, right-click, then select **Send to Design** to transfer the layer.

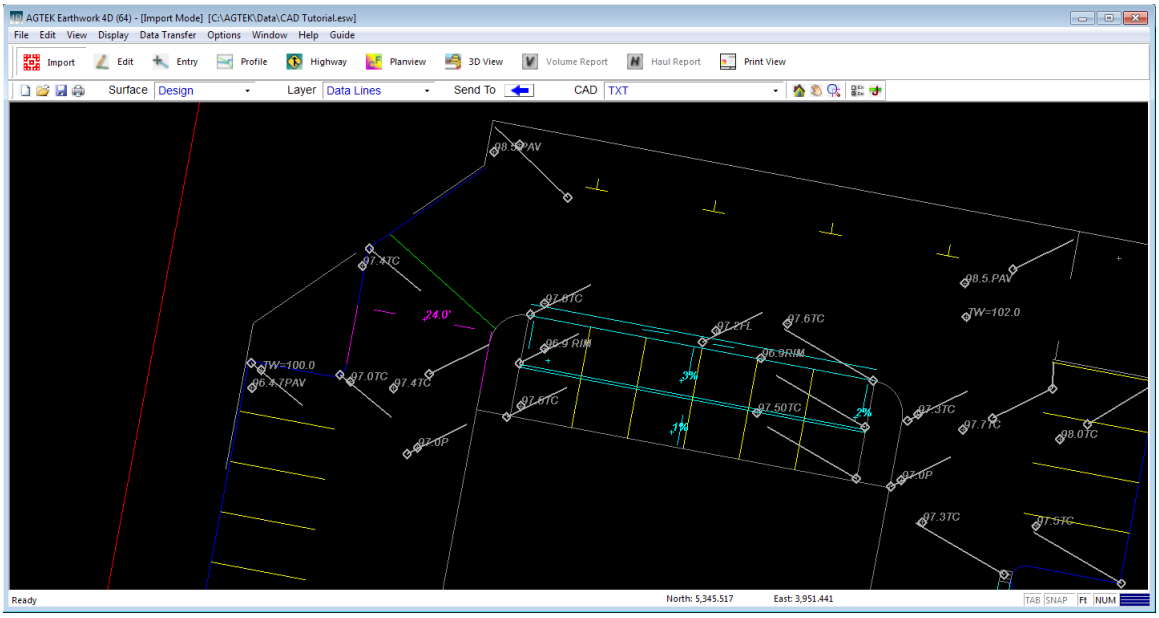


Transferring Multiple Layers

CAD Transfer also supports the transfer of multiple layers simultaneously.

1. Click on the top of curb “Des-TC” near the upper-left corner of the site.
2. Ctrl + click on the storm drain detail “1-SD”.
3. Ctrl + click on the grade text “TXT”.
4. Ctrl + click on the retaining wall “1-WALL”.

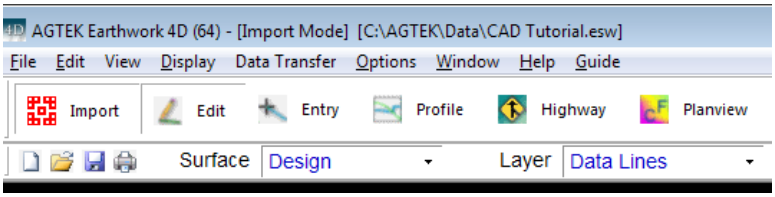
5. Right-click, then select **Send to Design** to move the layers to the Design surface.



Complete CAD Data Transfer

A few layers are left to transfer at this point. Use any of the transfer techniques to send the layers listed below to the Design surface.

- "Walk"
- "TEXT-GRADES"
- "1-DES-CURB"



When finished, click the **Edit Mode** button on the toolbar to leave CAD Transfer Mode.

Selecting **File > Save** will give you the opportunity to save a copy of your current file using a different name, leaving the original file unchanged.

6. Select **File > Save**, or click the **Save** button.

Other CAD Transfer Features

The CAD Transfer window has additional features that are not needed in this tutorial but are useful for future files.

Hide, Show All, and Delete

In some CAD files the amount of data displayed makes it difficult to identify the desired layers. The Hide command removes the selected data from the screen. It can be activated from the right-click menu, the Edit menu, or by pressing **Alt + H**.

The reverse of Hide is the Show All command. Show All is selected from the right-click menu or the View menu.

The **Delete** command removes the selected data from the screen permanently. Delete is activated by pressing the **Delete** key or through the Edit menu. It does not affect the original CAD file.

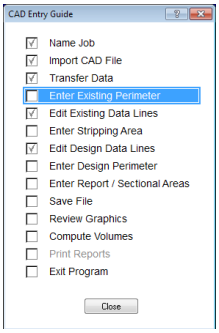
Undo and Redo

Sitework 4D supports up to eight levels of undo for those occasional mistakes that you wish you could start over. The Undo command is activated by pressing **CTRL-Z** or through the Edit menu. The Redo command is usually used when Undo was used one too many times. It also supports eight levels and is activated by pressing **CTRL-Y** or through the Edit menu.

Lesson 2 - Existing Ground

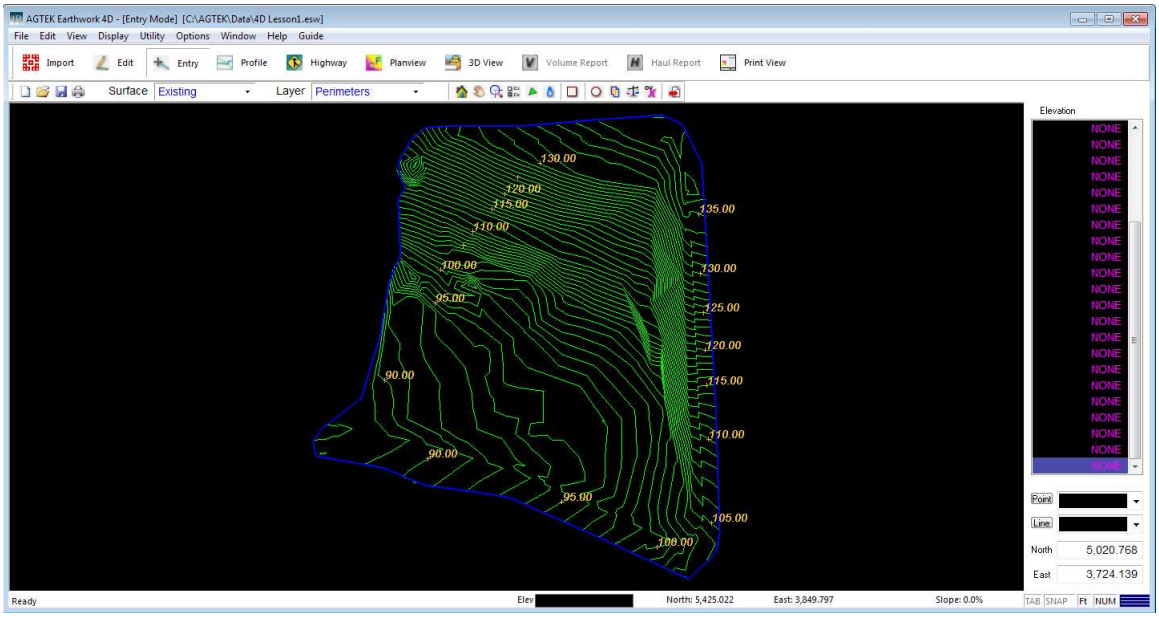
The Existing Ground represents the current conditions of the job site. In addition to the existing conditions, we add the Existing Perimeter and Stripping Areas so the existing surface can be used in volume calculations.

Enter the Existing Perimeter



The Existing Perimeter defines the job limits of your existing ground and is used to speed 3D rendering by ignoring information outside of the boundary. Use the following steps to enter the Existing Perimeter.

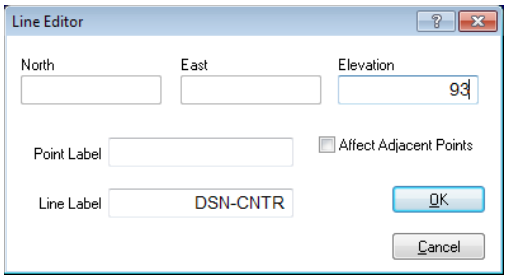
1. Select **File > Open** and open “4D Lesson2.esw”.
2. Switch to Entry mode, then select **Existing** from the Surface pulldown and **Perimeter** from the Layer pulldown, or press the **G** key, and choose **Enter Existing Perimeter** from the CAD Entry Guide.
3. Using the mouse, draw a perimeter around your site boundary. Right-click to close and end the site boundary entry. Right-click again to get your arrow back.



Edit Existing Data Lines

The 3D surface is created by converting the two-dimensional CAD data into a three-dimensional surface. Much of this work consists of cleaning up the data that has been transferred, including assigning elevations to points and contours, and joining lines. In this example all existing lines transfer with elevations already assigned to them. All techniques used to edit design data lines found in Lesson 3 of this tutorial can be used to edit existing data lines as well. To see what information is assigned to an individual existing data line:

1. Switch to the Edit mode by clicking the **Edit Mode** button and select **Data Lines** in the Layer drop down, or press the **G** key, and select **Edit Existing Data Lines** from the CAD Entry Guide.
2. Click on an existing data line to select it.
3. Right-click and choose **Line Editor** from the right-click menu. The Line Editor box is displays.



4. Click **Cancel** to close the Line Editor box.

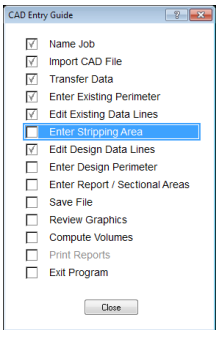
Enter Stripping Areas

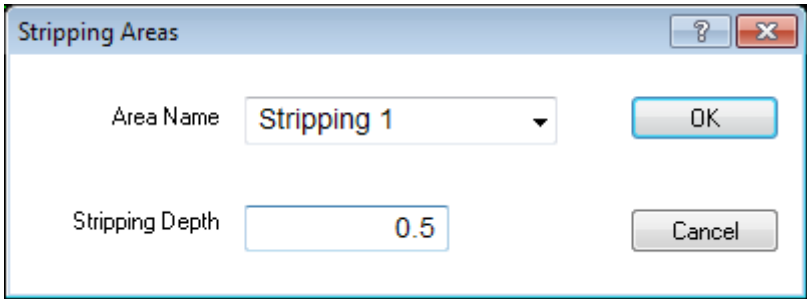
The depth specified for Stripping Areas is deducted from the Existing surface to create a Stripped surface. Stripping Areas are not additive, you may exclude areas from being stripped by entering a stripping area with a depth of "0".

In this sample we also display the design data lines and design annotation behind the existing data lines. This aids in the Stripping Area entry.

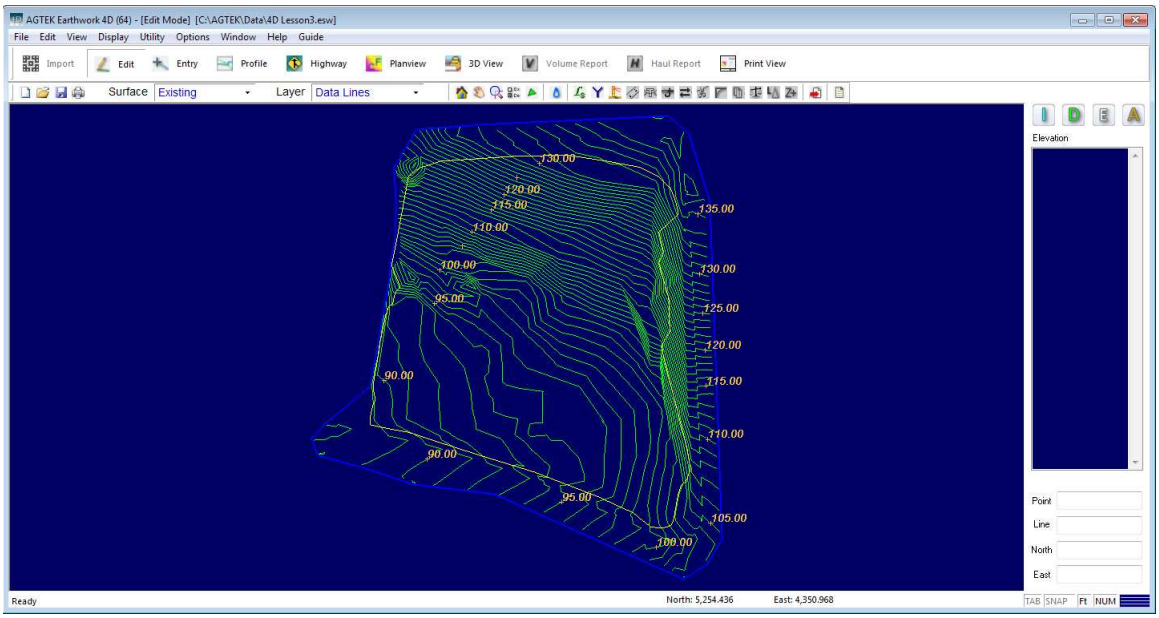
1. Switch to Entry mode, and select **Existing** from the Surface pulldown and **Stripping** Areas from the Layer pulldown, or press the **G** key and select **Enter Stripping Area** from the CAD Entry Guide.

2. If the Stripping Areas box is not displayed, click the **Add Regions** button.
3. Enter "Stripping 1" for the Area Name, "0.5" for the Stripping Depth, and click **OK**.





4. Right-click on the existing ground and select **Display > Design Layer**.
5. Right-click on the existing ground and select **Display > Design Annotation**.
6. Using your mouse, enter the Stripping Area around the area you plan to strip.
7. Right-click to close the Stripping area and end the entry. Be sure to keep the Stripping Area within the Existing Perimeter.
8. Right-click twice on the existing ground and select **Display > Design Layer** to turn the layer off.
9. Right-click on the existing ground and select **Display > Design Annotation** to turn the layer off.



10. Select **File > Save**, or click the **Save** button.

Lesson 3 - Design Data

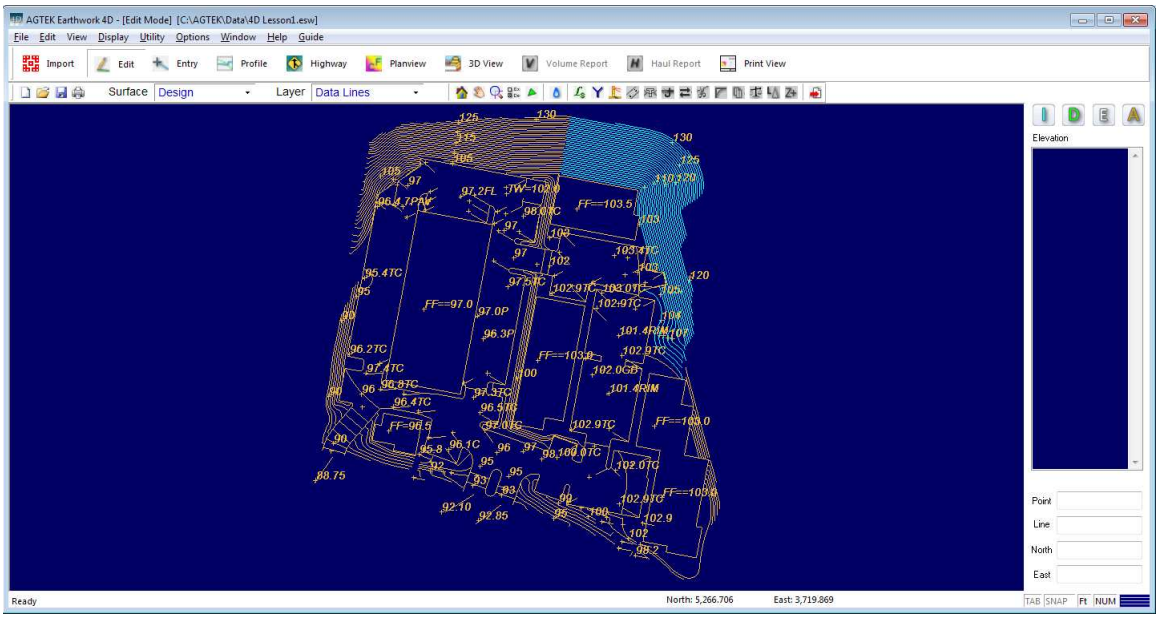
The Design Ground contains the design information for your job. In this lesson we will clean up the data transferred from a CAD file by joining lines, and assigning elevations, as well as creating offset lines, entering the Design Perimeter, grade breaks, Sectional Areas and control points.

Edit Design Lines

While editing Design lines we will clean up the transferred data by assigning elevations and joining lines. We will further refine the data by adding Sectional Areas, benchmarks, grade breaks, and a Design Perimeter.

The Edit Window

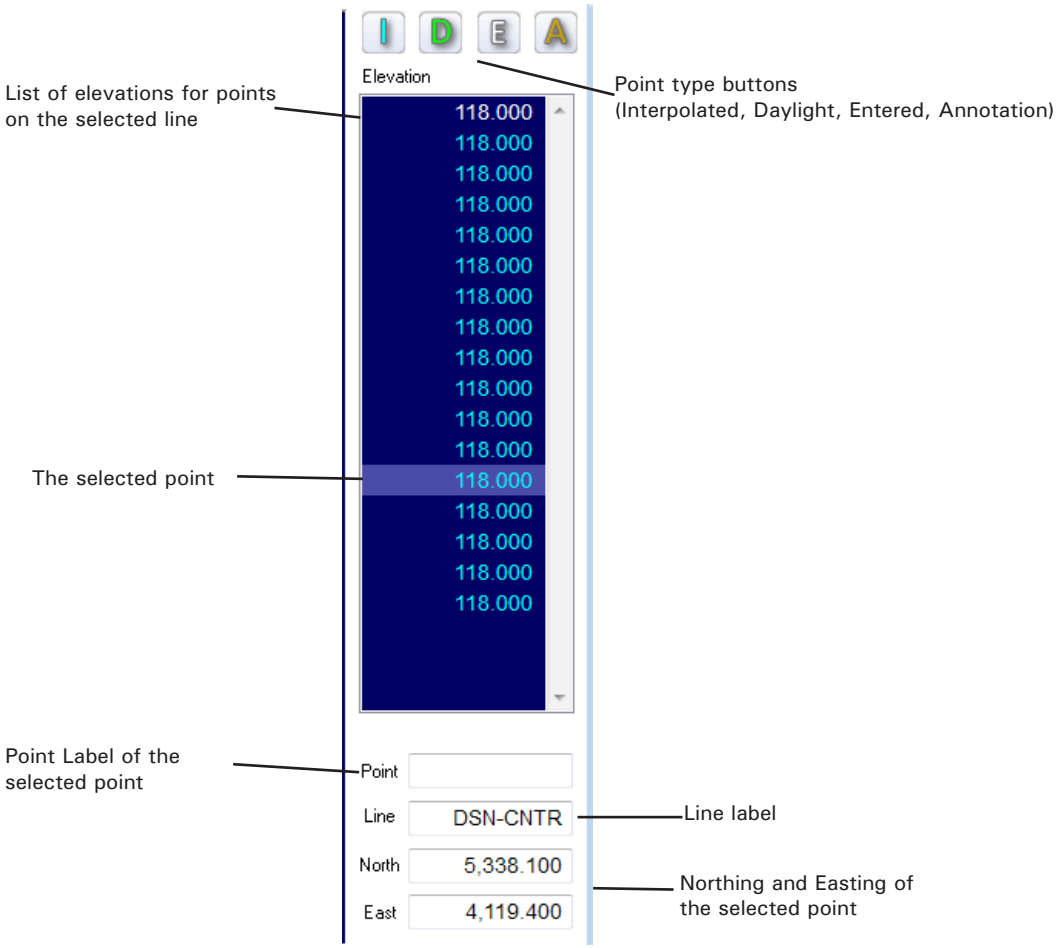
The initial view of the design data after transfer looks similar to the illustration below. Some lines transferred from the CAD file may have an elevation assigned to them already, while others may not. Lines with elevations are displayed in light blue. Lines without elevation are sent to the Annotation layer and are displayed in Brown.



Elevation List

The Elevation List shows information on the selected line (see the illustration below). Points listed in the elevation window are color-coded by type. Sitework 4D has five point types: Interpolated, Daylight, Entered, Snapped and Annotation.

- **Interpolated** points (light blue) derive their elevation from the slope between the Entered elevations that surround them. If the elevation of the points that are used for interpolation change, the interpolated point elevation is recalculated as well.
- **Daylight** points (green) are assigned elevation from the Existing surface.
- **Entered** points (white) are points where the user has assigned an elevation to by editing or entry. These points do not change elevation unless the user specifically changes them.
- **Snapped** points (red) are created when a point on a data line is snapped (F6 or F8) to another existing data line. These become Entered points after the job is saved and reopened.
- **Annotation** points (brown) are not used by the program to create the 3D surface. The presence of an Annotation point on a line changes all points on the line to Annotation. Lines transferred through the CAD transfer with an elevation of zero are automatically assigned as Annotation.

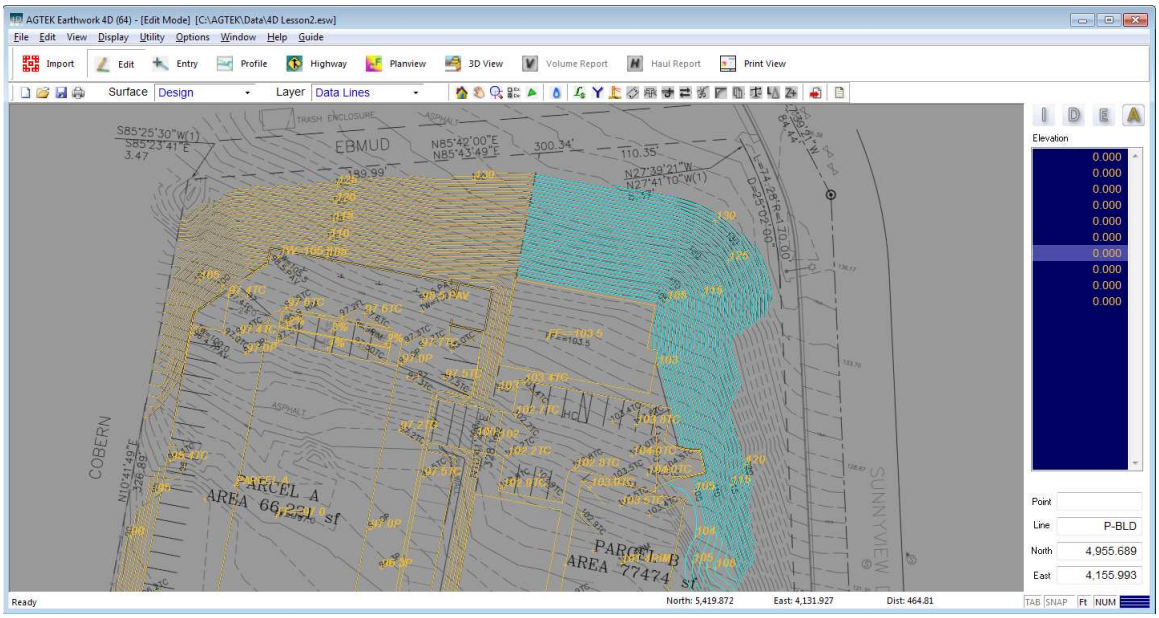


Assign Elevations

Annotation lines are lines with no elevation. Assigning elevations to annotation lines essentially converts them to data lines. Elevations can be assigned to these lines by using the Snap techniques described in this tutorial. We'll go over several different snap techniques in the exercises that follow.

Before you begin, switch to the Design Surface in Edit mode. Notice how the contour lines on the upper right side on the screen are blue, while the ones on the left are brown. The blue contours have elevations assigned. We need to assign the remaining elevations to the brown (annotation) contours.

It may be sesired to import and align the grading plan to enter the design data. The image may be toggled on and off by pressing the T key on the keyboard.



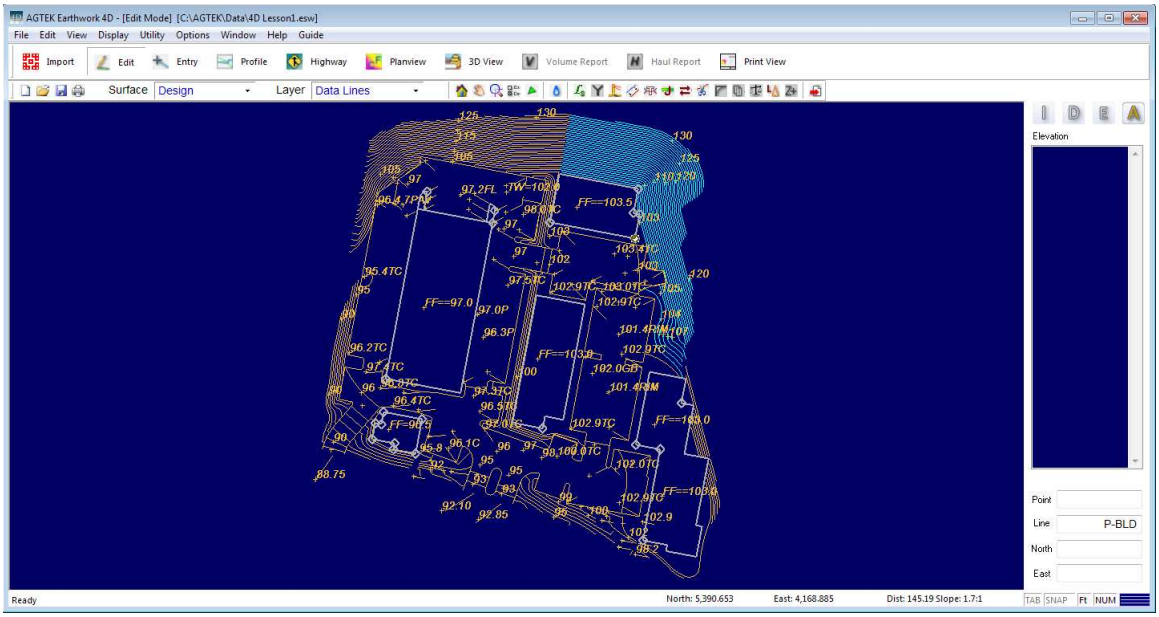
Join Lines/Assign Spot Elevations using Elevation Snap

CAD file lines are often “broken” and should be joined to ease elevation assignment. Before you can join lines, you should make sure to set your Bridge Gap Distance to the appropriate amount.

The Bridge Gap Distance indicates how far apart lines can be and still be joined. The space between the endpoints must be less than the Bridge Gap Distance for the lines to be joined.

Joining Lines

1. Select **File > Open** and open “4D Lesson3.esw”. Make the Surface is set to **Design** and the Layer is set to **Data Lines**, or select **Guide > CAD** and select **Edit Design Data Lines** from the CAD Entry Guide
2. Select one of the pad lines at the base of the slope.
3. Click the **Label Select** button. All the pad lines are selected.

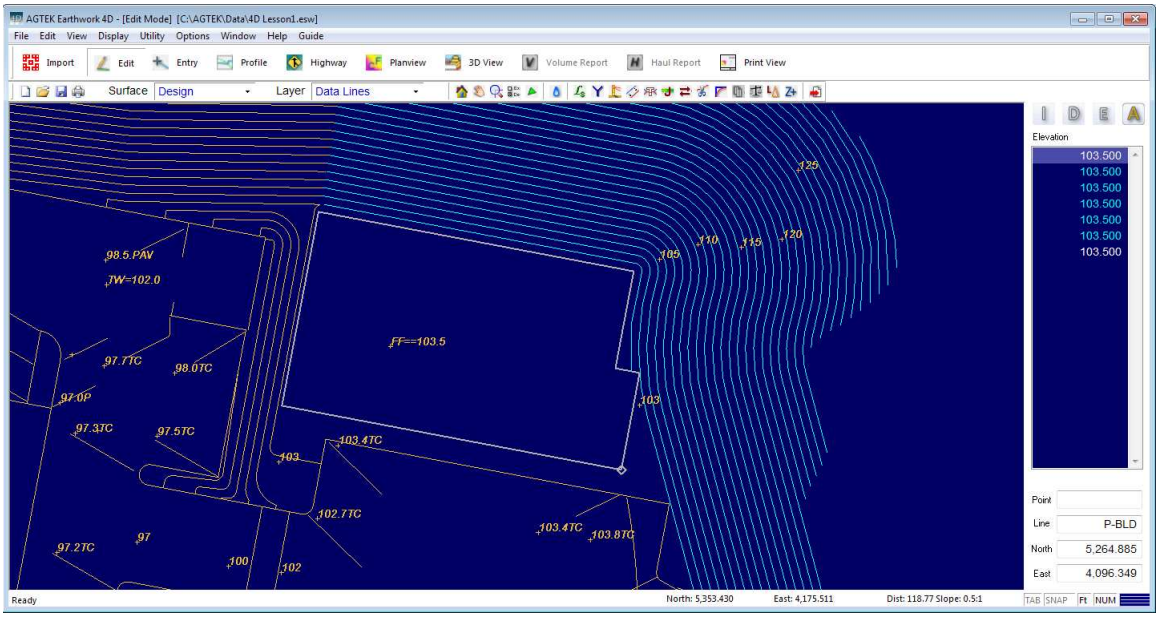


4. Select **Options > Bridge Gap Distance,** and enter the desired distance in the Edit Bridge Gap Distance dialog box. The distance is measured in feet. For this example, use the default distance of “0.1”.
5. Click **Join** button to join the lines. After the line is joined, it is selected.

Assign Elevations using Elevation Snap

Once the lines for the pad are joined, you can use Elevation Snap to assign an elevation to the line from a label.

1. Select the pad again and verify that it is now a single line.
2. Move the cursor over the text in the center (FF = 103.5) and press **F9** to assign that elevation to the pad.



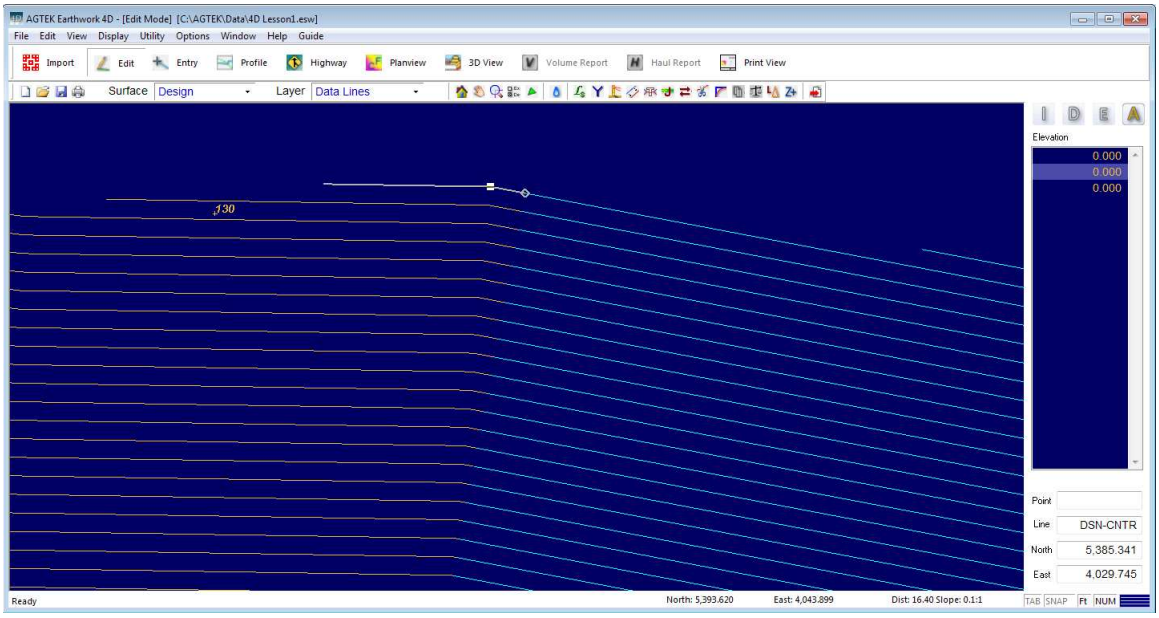
3. Continue using this technique to assign elevations to the remaining pads.

All of the snap techniques shown can be used for existing ground data as well as design data.

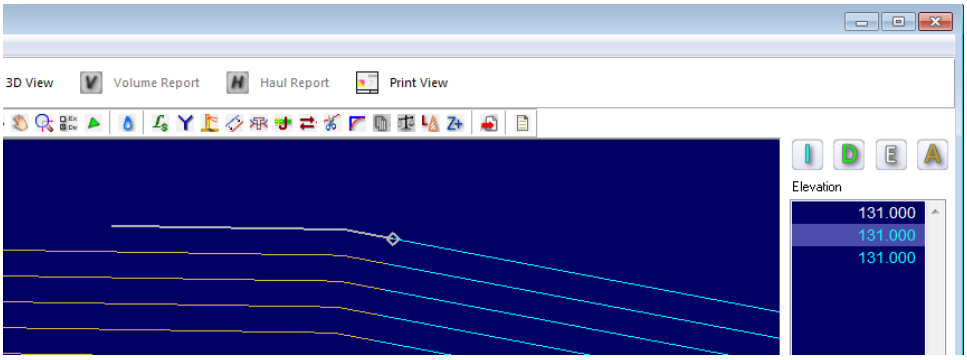
Elevation Snap (F9) grabs the elevation data from a label, or data line, and assigns it to a selected line.

4. Select **File > Open** and open "4D Lesson3.esw".

5. Zoom in to the contours at the top of the screen, and click on the first brown (annotation) contour on the left. Notice the elevation is 0.000 in the Elevation list.



3. Place the cursor over the light blue line to the right, and press the **F9** key. The elevation assigned to the line is displayed in the Elevation list.

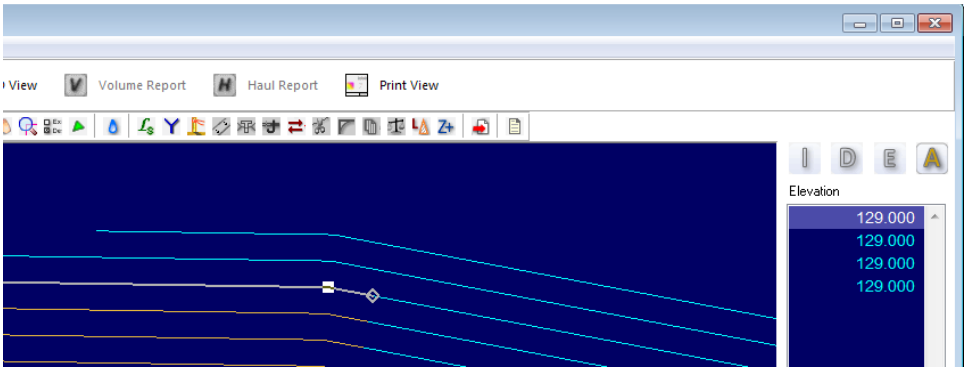


4. Repeat this process for the next contour to practice the technique. Use the Elevation list to verify that an elevation has been assigned.

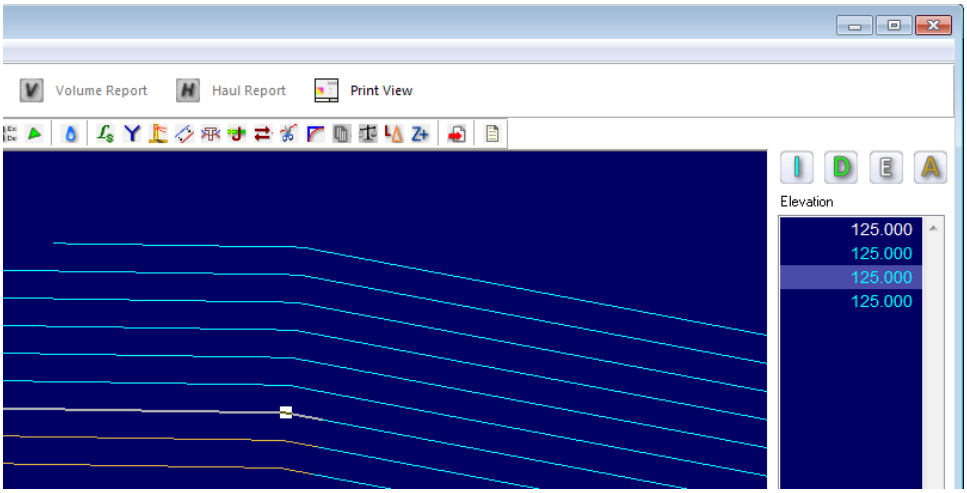
Assigning Elevation Using Increment Snap

Increment Snap creates an elevation increment and direction, then applies it to lines.

1. Press the **Esc** key to deselect any selected lines.
2. Place the cursor over the light blue contour with an elevation of 131, and press **F8**.
3. Move to the next contour below (130), and press **F8** again. The triple-beep indicates that the program is now in Increment Snap Mode.



4. Move to the next brown contour below, and press **F8** again. It automatically assigns the next incremental elevation, 127, to the line.

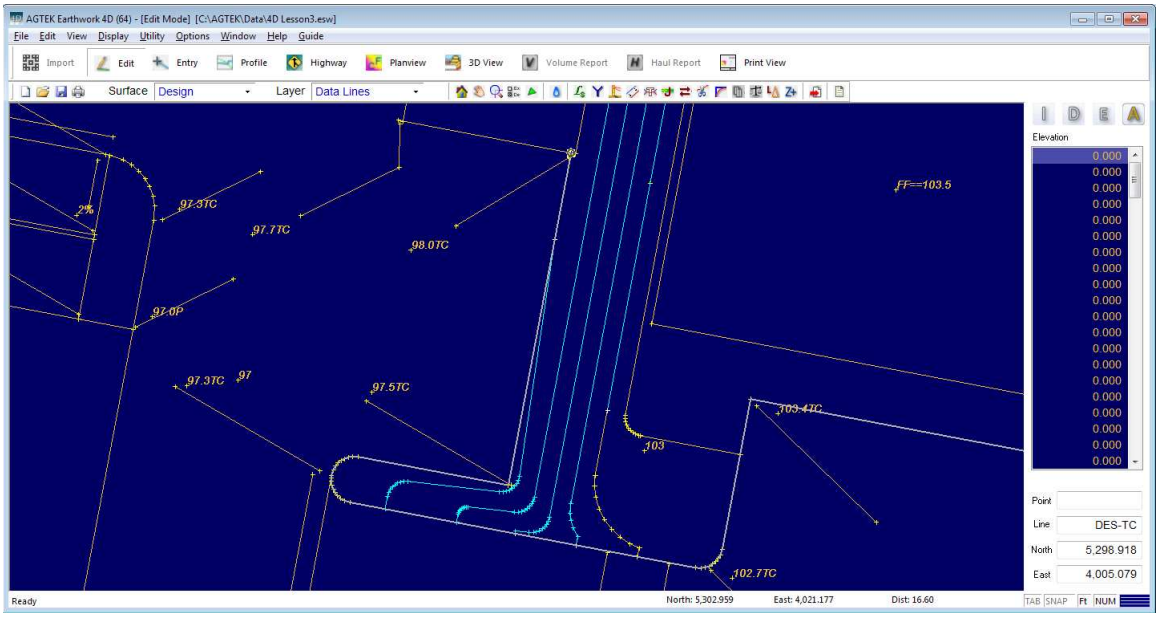


5. Repeat this process until you reach the bottom of the slope to practice the technique.

Assigning Varied Elevations to a Line

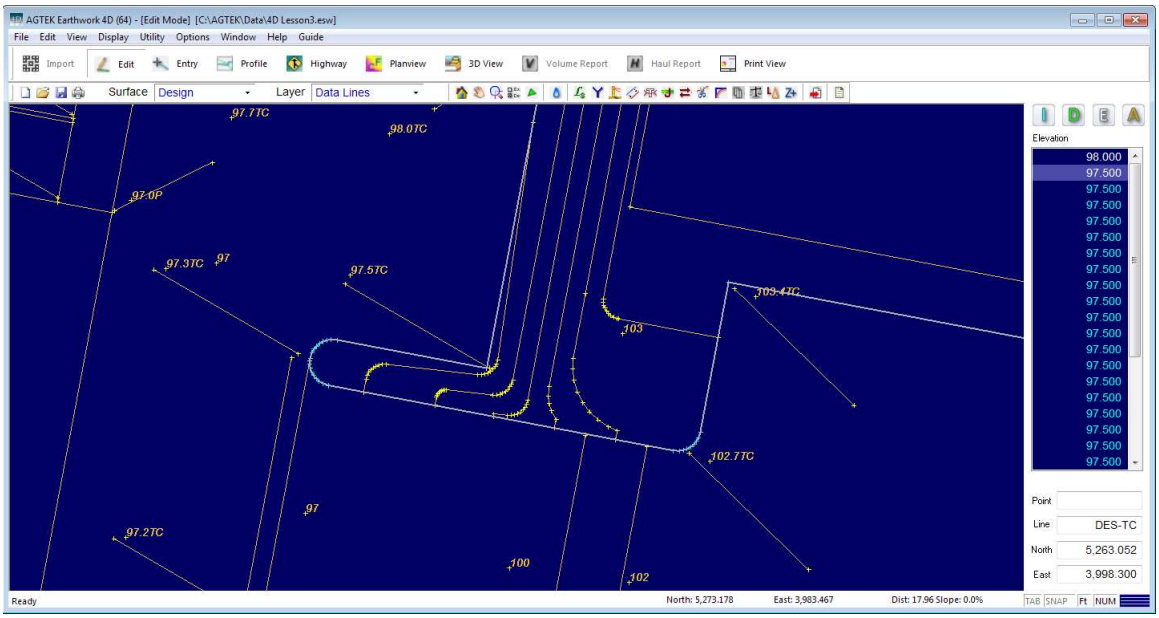
Up to this point we have snapped a single elevation to entire lines. However, you can also snap multiple elevations to a line. We will next assign elevations to the curb lines, which have varying elevations. It is recommended to Join the curb line using the same procedure as joining the Pads. Select one of the curb lines and click the Label Selection icon to select all the curb lines, then click the Join icon.

1. Click on the top of curb line on the top, right side of the job. Notice that the first point on the line is marked with a diamond.
2. Click on the diamond or select the first point in the Elevation list to Select the first point.



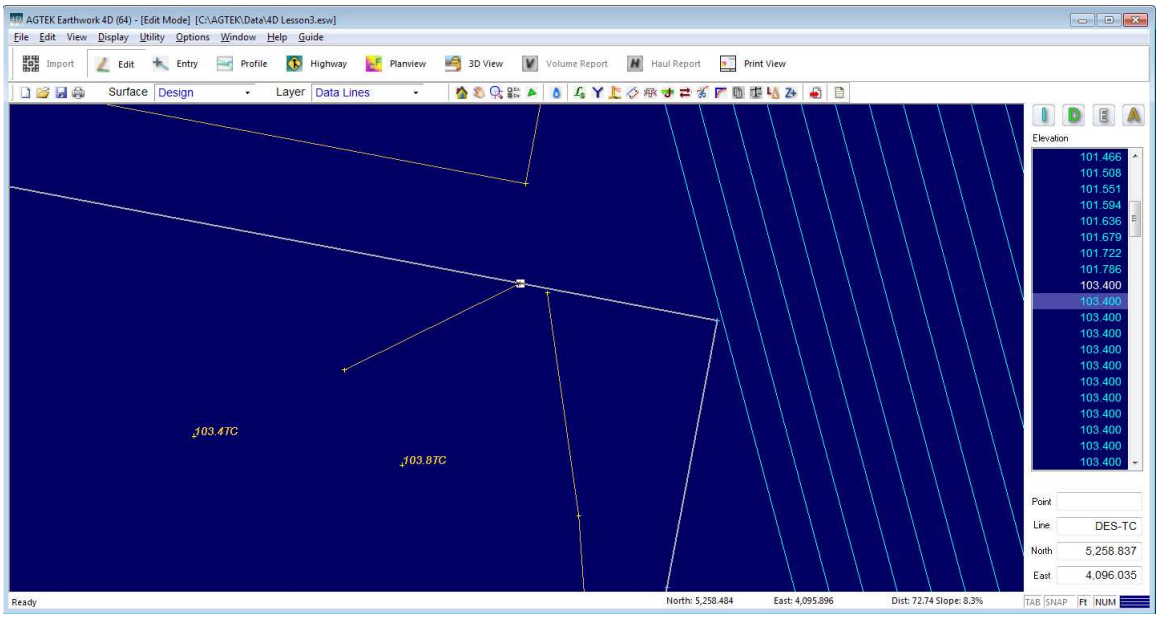
3. Move the cursor to the 98.0TC label, and press **F9** to assign that elevation to the curb.

4. Select the next point (corner point) on the line, and use **F9** to snap to the 97.5TC elevation label.

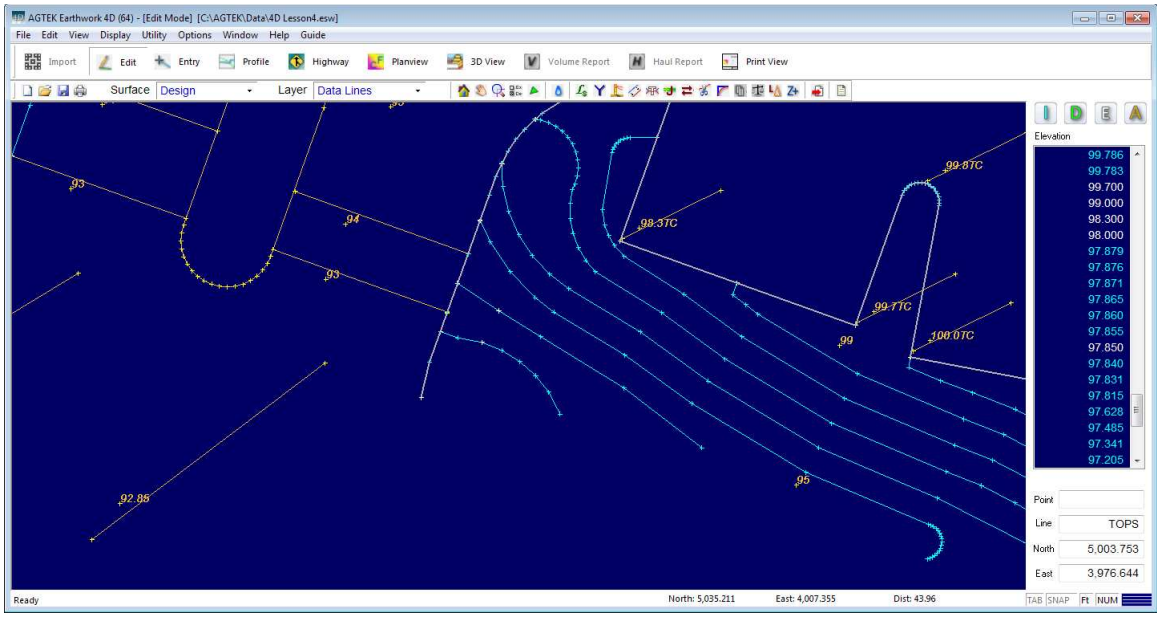


5. Continue selecting points at the leaders along the curb and assigning the elevations using F9.

6. Move the cursor to the intersection of the 103.4 leader line, and press **F6** to add a point on the curb line. The new point is automatically selected. Use **F9** to assign the 103.4 elevation.



7. Continue to the end of the curb line assigning grades as needed. Repeat the process for the remaining curb lines.

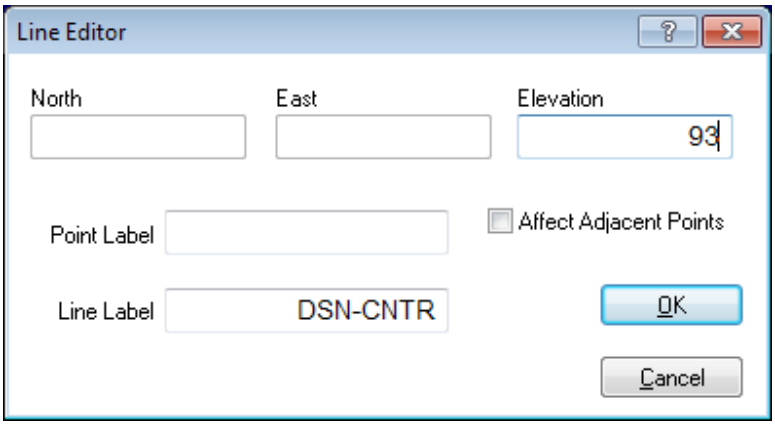


Assigning Elevations Using the Line Editor

The Line Editor can also be used to assign elevations to annotation lines or change existing elevations. To use the Line Editor:

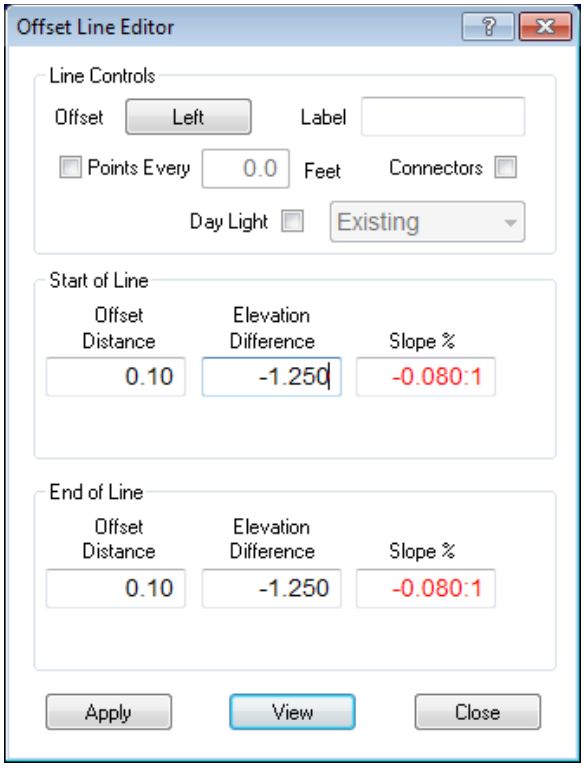
1. Click on a data line, then right-click to display the Right-Mouse menu and select **Line Editor**. The Line Editor dialog box is displayed.
2. Type in an elevation or label and click **OK**. The changes are displayed in the Elevation list.

For extra practice, you can continue to the assign elevations to the remaining annotation lines using the techniques previously discussed.



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. For more information regarding offset lines, see page 8-92.



Creating Offset Lines

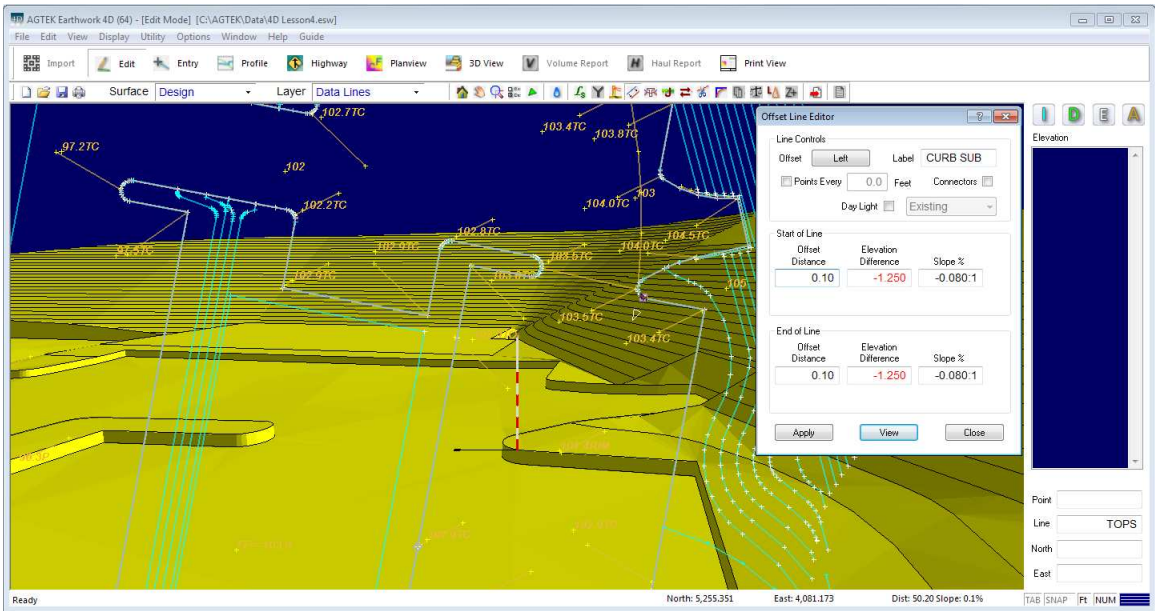
The job now has all of the top of curb, pad, and contour elevations assigned. To refine it further we need to create the bottom of curb lines.

In this example, to reach light duty pavement subgrade the new line needs to be offset down 1.25 feet (.5 for curb height, .75 paving materials). We'll use an offset distance of .1 because you should never create two lines exactly on top of each other with differing elevations.

1. Select **File > Open** and open the "4D Lesson4.esw" file.
2. Switch to Edit Mode, then select **Design** from the Surface pulldown and **Data Lines** from the Layer pulldown, or select **Guide > CAD**, and select **Edit Design Data Lines** from the CAD Entry Guide.

3. Press the **T** key to turn on the Terrain View.

4. Click on the top of curb line to which elevations were first assigned in the previous lesson (below the 103.5 pad), then select **Utility > Offset Line**. The Offset Line Editor is displayed.



5. Enter “CURB SUB” in the Label box. AGTEK recommends that you label lines whenever possible. Labels are helpful for making changes to the model later if needed; such as raising the elevation of all lines with a common label.

6. Type “.1” in the Start of Line Offset Distance box, and “-1.25” in the Elevation Difference box. The Slope calculates automatically. Make sure the Offset button shows “Left” (click the button to change it if necessary).

   Click **Apply** and notice that the bottom of curb line is showing and the curb face has been created using the two lines. Click **Close.**

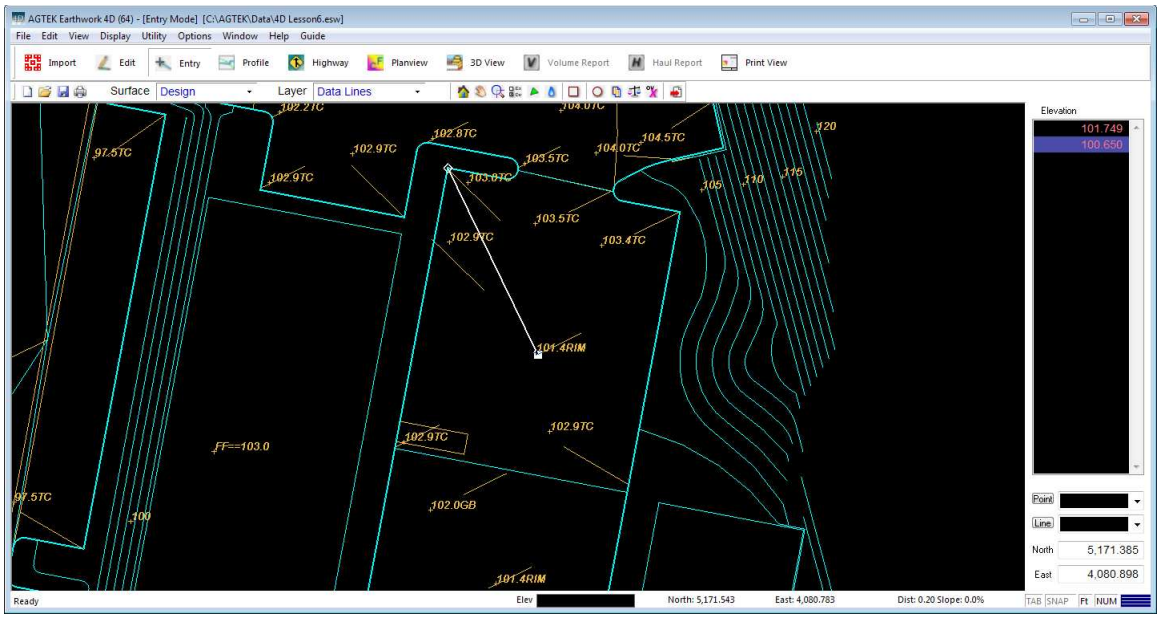
At this point you can select and offset the remaining top of curb lines on the job. The Offset Line Editor remembers the last settings used so the only changes you should need to make is changing the direction of the offset using the Swap Ends button.

Add Grade Breaks

Grade breaks are another method to refine the model for accurate takeoffs and volume calculations. This section uses the “4D Lesson5.esw” file, which has all of the bottom of curb (BC) lines offset.

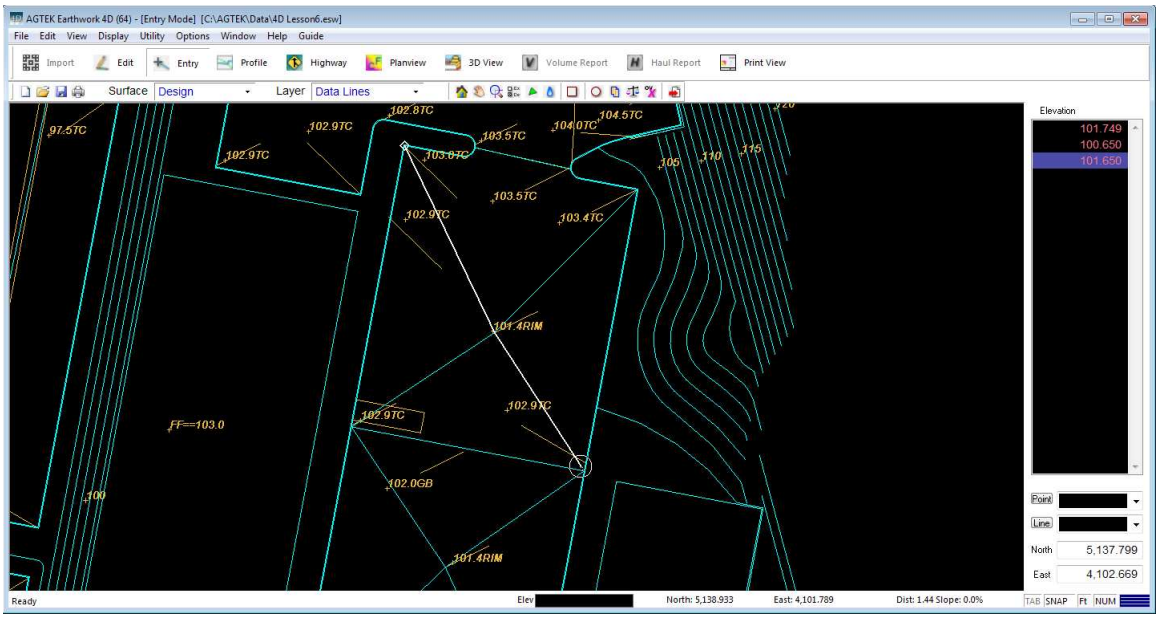
The parking areas include grade breaks and rim elevations for drainage. To refine it further we’ll enter the grade breaks including the drains for the parking lot on the right (between the 103 pads).

1. Select **File > Open** and open the “4D Lesson5.esw” file.
2. Switch to Entry Mode, select **Design** from the Surface pulldown and **Data Lines** from the Layer pulldown, then zoom in to the parking lot on the right side of the job.
3. Move the cursor to the bottom left curb at grade break and press **F8**. The first point is entered at the curb and a tether line connects it to the cursor.
4. Move the cursor near the drain point in the center of the lot (101.4RIM), and press **F9** to grab the elevation. Postion the cursor at the end of the leader line and press **F8** to snap.



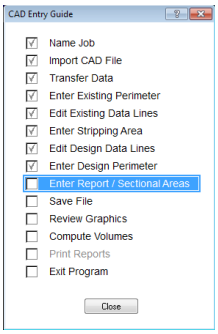
5. Continue diagonally to opposite corner, and press **F8** to snap to the bottom of curb.
6. Right-click to end the line, and move the crosshair across to the opposite corner.

7. Press **F8** to snap the top left corner, snap again to the point you previously entered near the drain rim, and finish the line in the opposite corner.



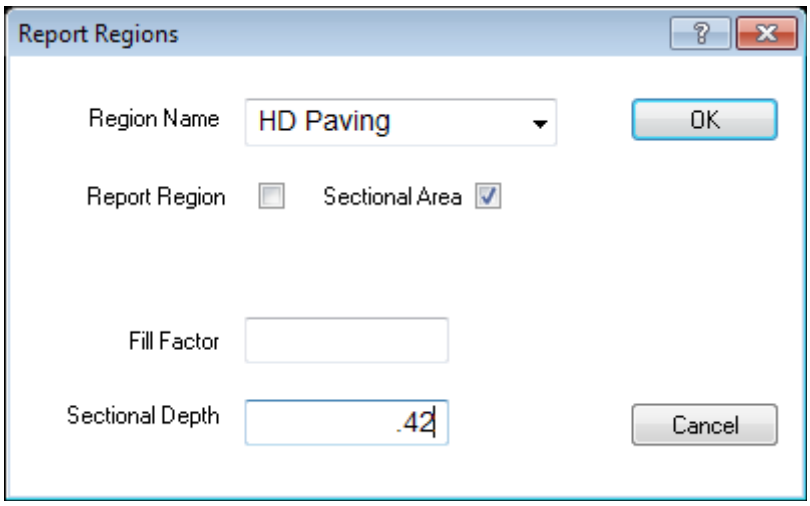
8. Enter the remaining grade breaks on the job.

Enter Sectional Areas



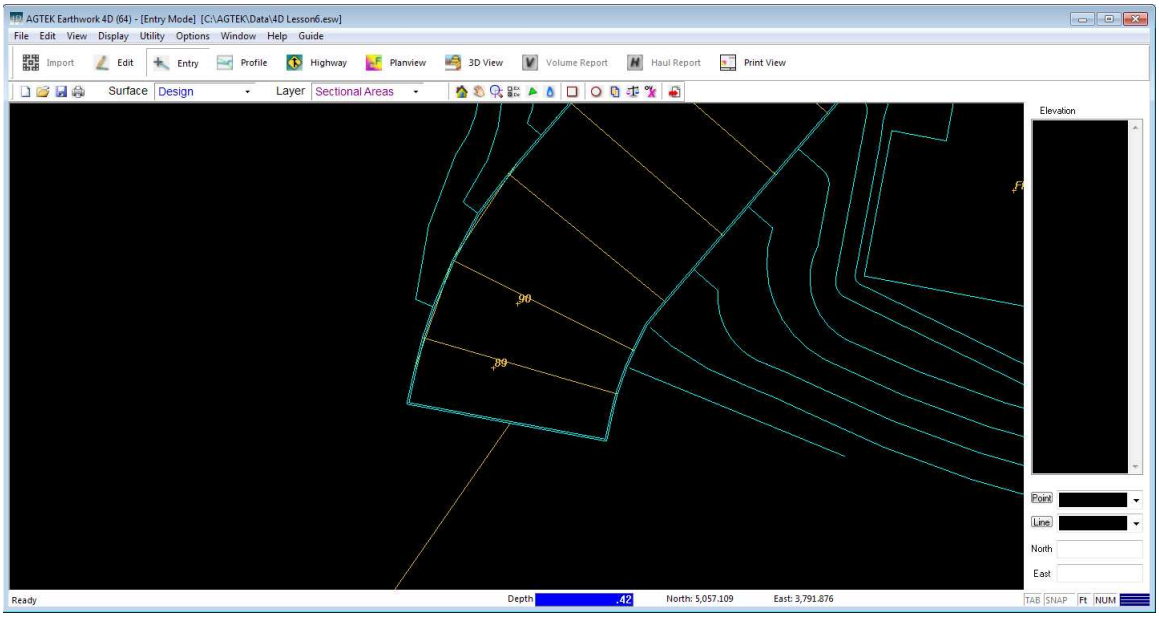
Sectional Areas are closed areas that modify the Design Surface by their specified depth. When we used the Offset Editor to create the bottom of the curb, we subtracted both the curb height and the light duty pavement section. This means that the only area needing a section is the heavy duty paving and the pads. The first sectional we'll enter is the heavy duty paving area. This section starts with all data lines entered and uses "4D Lesson6.esw".

1. Select **File > Open** and open the "4D Lesson6.esw" file.
2. Switch to Entry Mode, select **Design** from the Surface pulldown and **Sectional Areas** from the Layer pulldown, or Press the **G** key and select **Report/Sectional Areas**. Then, zoom to the driveway in the lower-left of the design.



Once a Sectional Area has been entered, it can also be used as a report region by selecting the area in Edit Mode, selecting **Edit > Report Region,** and naming the region.

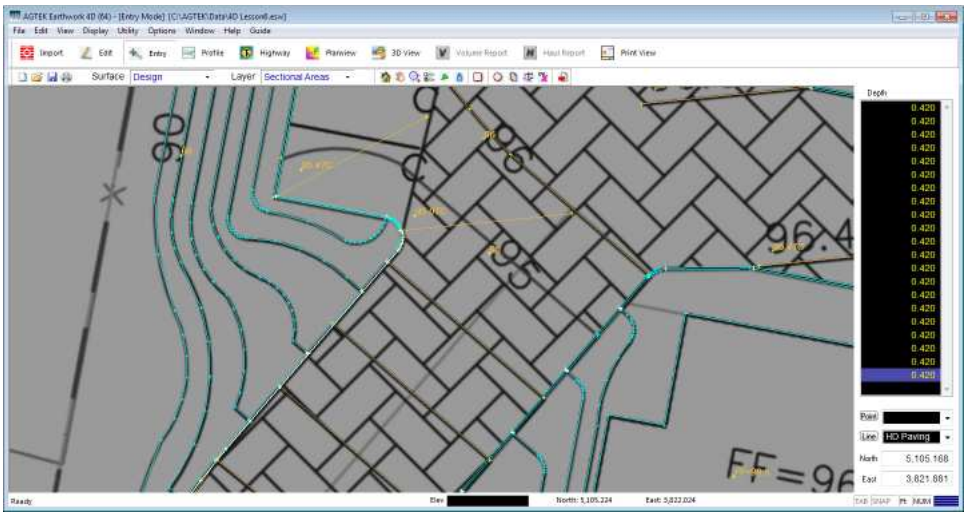
3. Enter "HD Paving" as the Region Name, ".42" (5 inches) as the Sectional Depth (this is the difference between the heavy duty and light duty section). Clear the Report Region checkbox and click **Enter.**



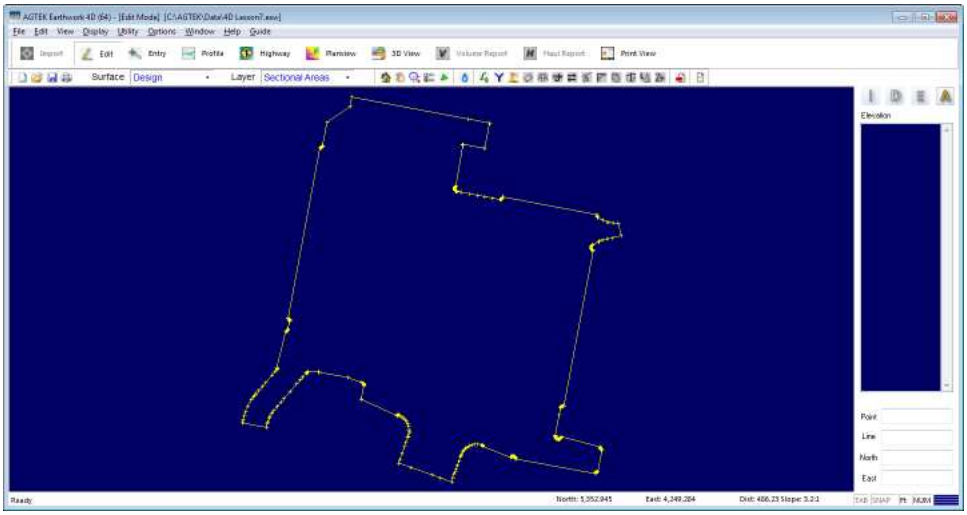
On a metric job the same ".42" would represent .42m , or 420mm.

4. Move the cross hair down to the lower-left edge of the driveway, and press **F8** to snap to the bottom of the curb line.
5. Move the crosshair to the next point up the driveway and press **F8** twice (Line Snap). The entire line is selected and changes the cursor to the line snap cursor.
6. Press the **Spacebar** to display the entire job. The selected line goes all the way to the retaining wall at the top of the parking lot. We want to follow only the portion of the line that borders the heavy duty paving area.

It may be sesired to import and align the paving plan to enter the sectional areas.



7. Move the cursor to the top of the driveway where the parking stalls start and press the Spacebar again to toggle back to the zoomed view, then press **F8** to limit the amount of line entered to just that section.
8. Move the cursor across the end of parking stalls, and press **F8** twice to snap to the end of the peninsula and then line snap around the tip.
9. Continue down the end of the parking stalls to the retaining wall using snap and line snap as necessary.
10. Trace around the outer edges of the parking while avoiding the light duty areas until you reach the starting point (see the illustration below).

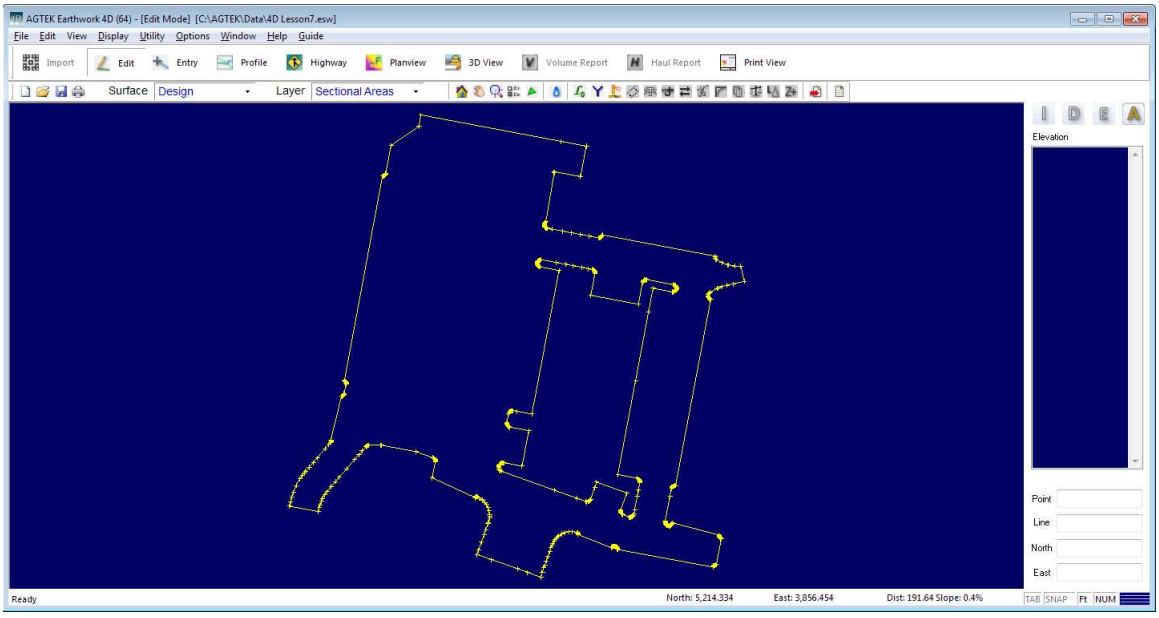


11. At the starting point (marked with a diamond) right-click to end and close the area.

Sectional Areas within Sectional Areas

The sectional area entered would drop the entire area within it by .42 feet. Since we want this to affect the heavy duty parking lot only, new sectional areas need to be entered within the first to represent different depths. Sectional Areas within other sections are not additive. We can specify a 0 depth and remove the portions from the surrounding section.

1. Switch to Entry Mode, select **Design** from the Surface pulldown and **Sectional Areas** from the Layer pulldown.
2. Type "0" to set the new depth to no sectional.
3. Move the crosshair to the center pad and surrounding curb (shown in the illustration below).
4. Use the **F8** key to snap and line snap around the CURB SUB line, and light parking areas (see the illustration below).

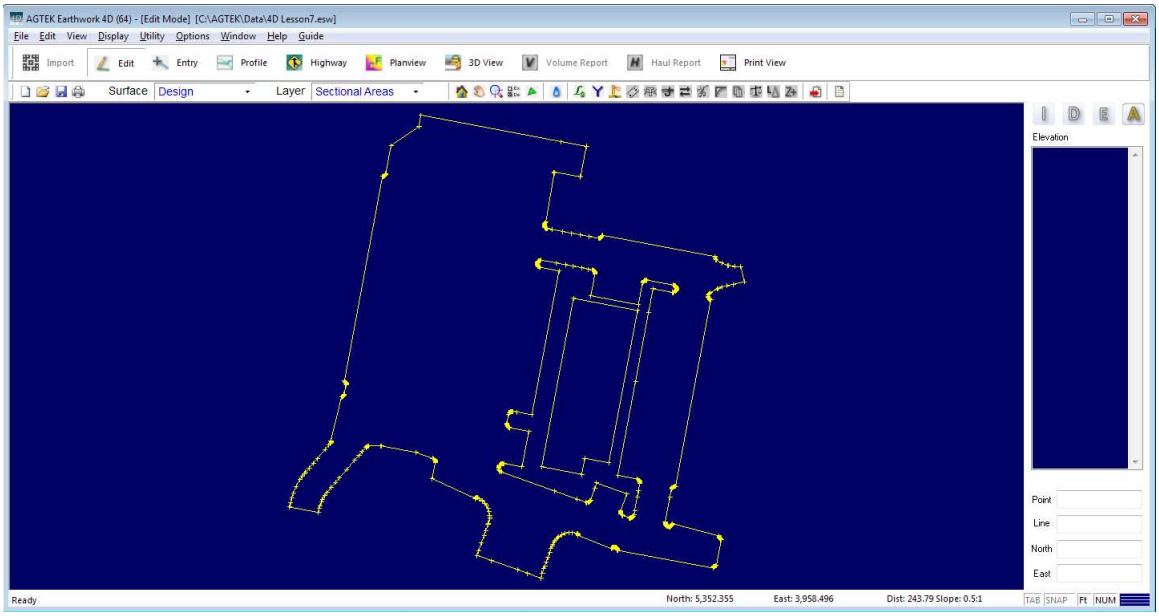


5. Right-click to finish and close the area.

The pad in the center of the 0 section has a .67 section. We need to add another sectional area to represent this.

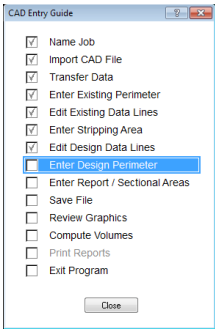
1. Type ".67" for the section and move the crosshair over one of the pad corners, then press **F8** twice to change to line snap mode. The entire pad line highlights.

2. Right-click to snap to the entire area. This is a variation of Line Snap, called Area Snap, which assigns the elevation to the entire enclosed area.



3. Continue the process to enter the rest of the sectional areas.

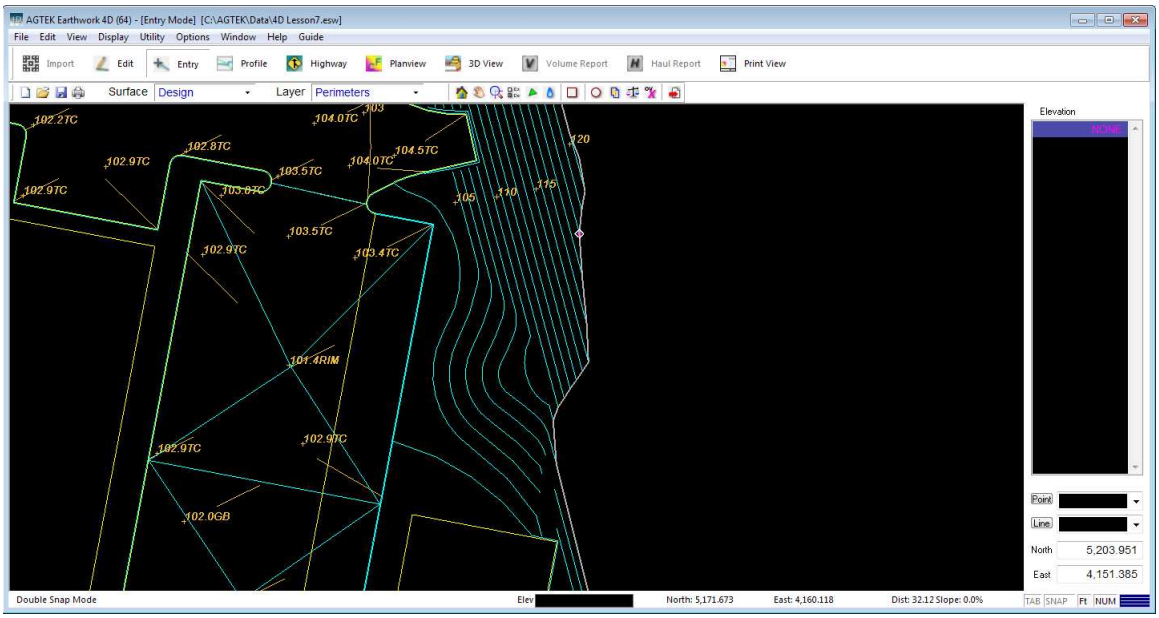
Enter Design Perimeter



Design Perimeters define where the Design stops and the Existing surface begins. They are also useful as a ready-made boundary when defining the volume calculation area.

Our goal with the perimeter is to trace around the edges of the design where it meets the existing ground. The Design Perimeter does not need any elevations to be entered because it automatically daylights to the Existing surface after exiting Entry mode.

1. Switch to Entry Mode and select **Design** from the Surface pulldown and **Perimeters** from the Layer pulldown, or select **Guide > PDF** and then select **Enter Design Perimeter** from the CAD Entry Guide.
2. Right-click, select **Display > Stripping Areas**.



3. Position the cursor over the Stripping Areas line and press the **F8** twice to line snap to the Stripping Areas line.
4. Right-click to end then entry. Right-click again and the Apply Drape Line dialog box displays. Click **Yes**.

5. Right-click to return to an arrow. Return to Edit Mode.

The program calculates the daylight elevations of the perimeter and creates a data line in the Design surface. If the 3D Terrain is turned on and the **Options > Staged Design** is checked, you'll see the Existing Ground shown outside of the Perimeter.

Lesson 4 – Verify the 3D Model

The creation of 3D surfaces allows comparison of the surfaces for volumes. This lesson shows how to verify the job with the 3D view and specify the area to calculate and generate the volumes. This lesson uses “4D Lesson7.esw”, which is the finished model.

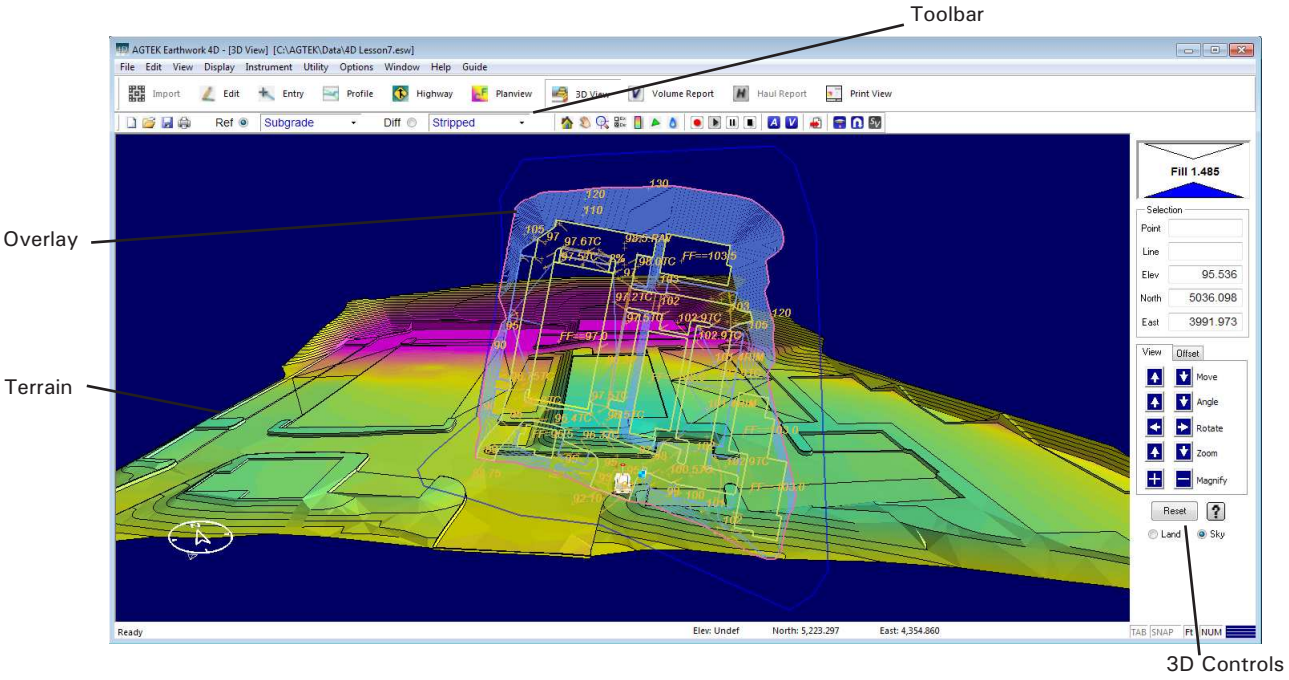
Visual Verification with the 3D View Window

Sitework 4D can display the 3D terrain as it is entered in the Edit window. The 3D View Window adds greater flexibility to viewing and verifying the 3D surfaces.

While we were editing, the 3D terrain showed how the program interpreted the data lines to form the surfaces. The 3D Window is a much more flexible version of the 3D terrain which allows greater control over the view.

1. Select **File > Open** and open the “4D Lesson7.esw” file.

2. Click the 3D View button on the tool bar or choose **Window > 3D View.** The 3D window calculates the cut-fill colors and surfaces before displaying.



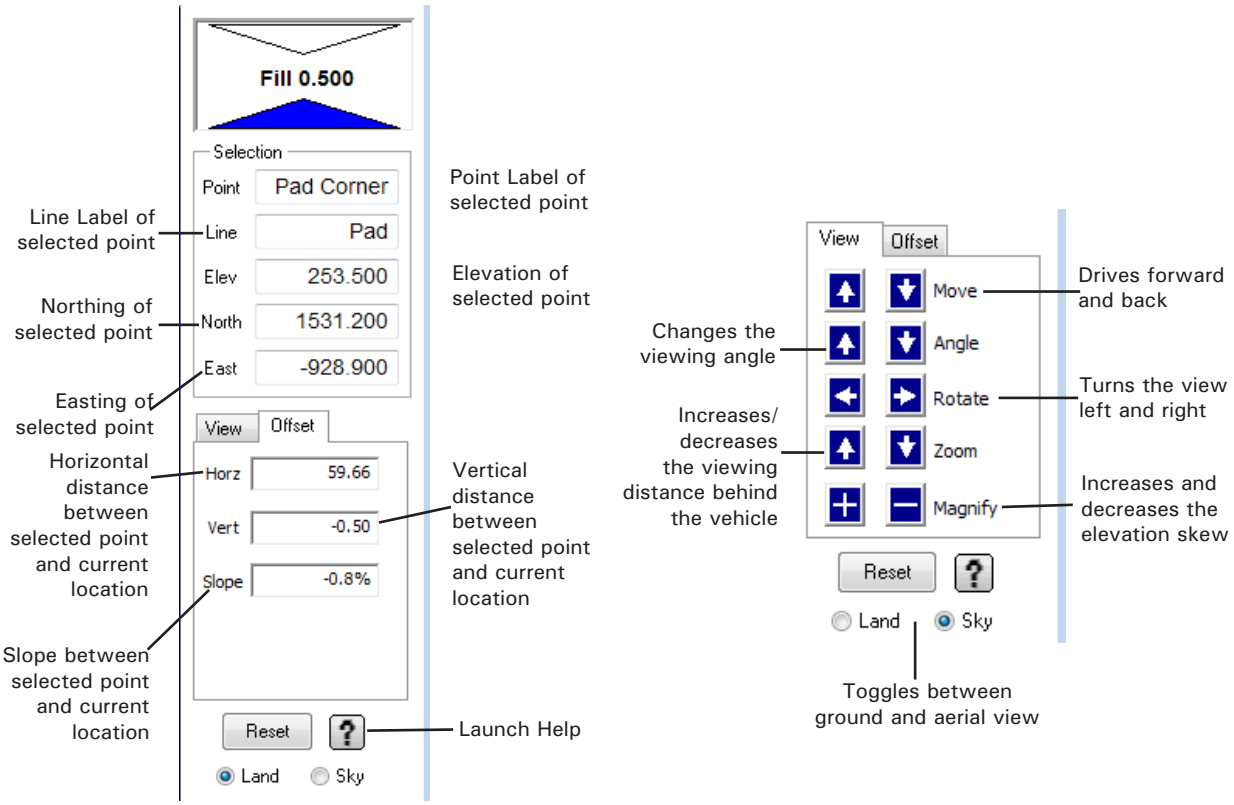
Toolbar	Use the Toolbar to change the reference (Ref) and difference (Diff) surface to compare different surfaces in 3D View.
Overlay	The Overlay is the two-dimensional plan view of the job. Clicking on the Overlay moves the view to that position.
Terrain	The Terrain is the three-dimensional representation of the job. Use the Arrow keys to move around the Terrain View.
3D Controls	Use the 3D controls to inspect the terrain for any errors and to see how all of the data we have entered displays on the job.

Driving

Driving the 3D View is the easiest way to double check your work and the surface quality. It also can display the Subgrade and Stripping surfaces and calculate volumes.

Use the Arrow keys on the keyboard to drive through the site. The **Up** and **Down** arrows move forward and back. The **Right** and **Left** arrows turn. For additional clarity, you may want to turn the Overlay off by pressing the **O** key or by selecting **Display > Overlay**. The speed of the drive is based on the Arrow Rate setting, which is located on the **Edit** menu. Each arrow key press has a distance that the Arrow Rate controls. The speed of your computer and video adaptor can also affect screen speed.

Try using the 3D controls to change the views and get a feel for what they do. Also try changing the Reference and Difference surfaces to see the different views and comparisons.



Lesson 5 - Calculating Volumes

Once the model has been verified, and any changes have been made, you can calculate volumes and compare surfaces. This lesson uses the file “4D Lesson7.esw”, which is the finished model.

1. Select **File > Open** and open the “4D Lesson7.esw” file.
2. Click the 3D View button on the tool bar or choose **Window > 3D View.** The 3D window calculates the cut-fill colors and surfaces before displaying.

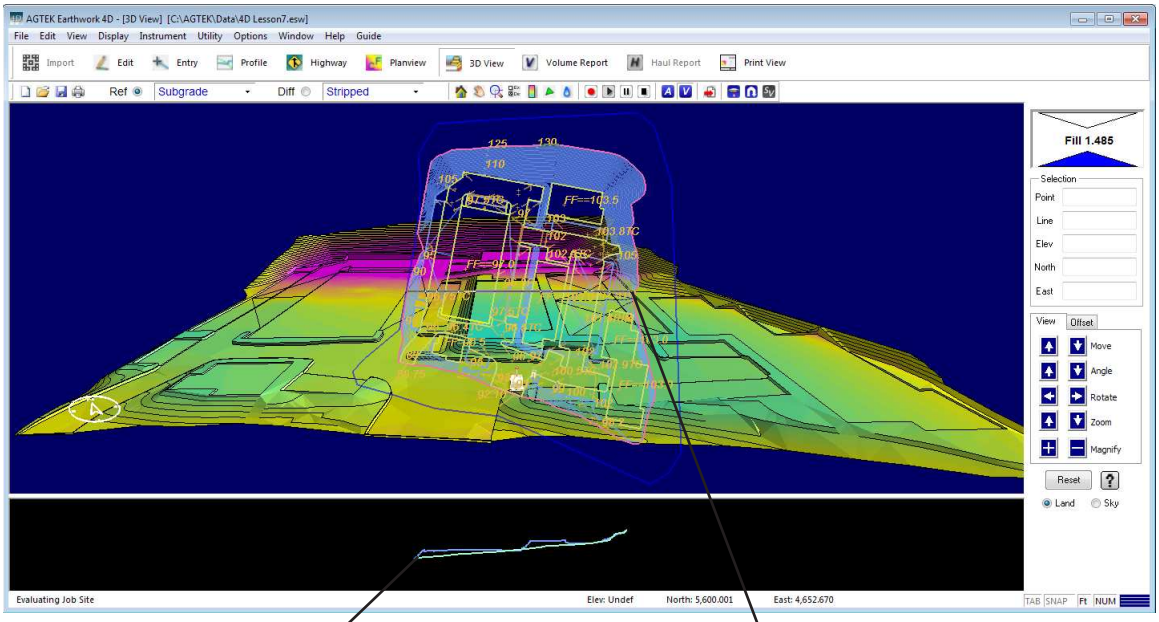
3. Define the Volume Area. Click the **A** button on the Utility Tool Bar to create a bounding box (using the Design Perimeter) around the entire job. This determines the limits of the volume calculation.
4. Specify the Surfaces. Before calculating the volumes, verify that the correct surfaces are selected. For our example, set the Reference surface to Subgrade and the Difference surface to Stripped.

5. Calculate the Volume. The Volume Calculation is started by clicking the Calc Volume button on the tool bar or by selecting **Utility > Calc Volume.**

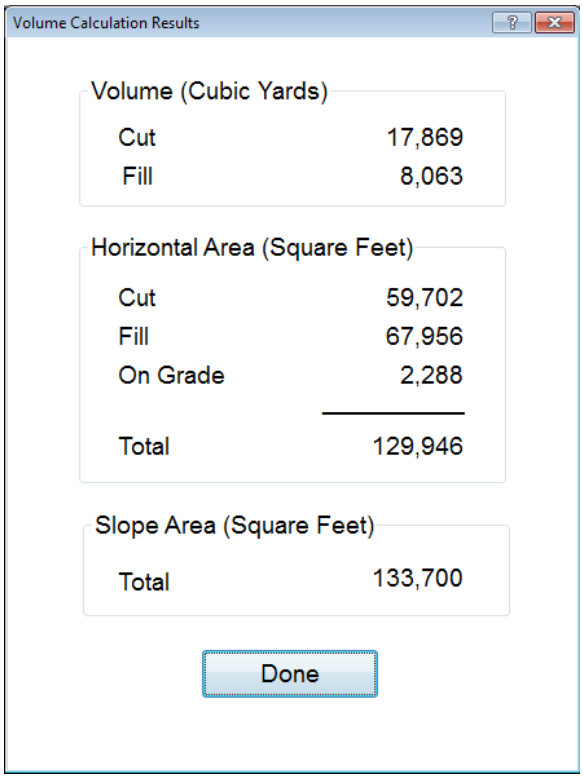
During the volume calculation the cross sections display at the bottom of the screen with blue representing the Reference and Green the Difference. A line displays on the overlay showing the corresponding location of the cross section. The calculation can be paused by pressing the Spacebar or aborted by pressing **Esc**. When paused, the **I** key on the keyboard will move across the site incrementally. Pressing the **Spacebar** again will resume the volume calculation.

When the calculation finishes, the Volume Calculation Results are displayed.

Be sure the finished surface (the surface you are calculating to) is on the left, and the begining surface (the one you are calculating from) is on the right.



These numbers represent uncompacted cut and fill between the two surfaces. The Horizontal Area represents plan view areas with no slope adjustment and is broken down into Cut, Fill, and On-grade square footage. Slope Area represents a slope adjusted square footage. It is the total surface area, excluding vertical surfaces like curb faces. Click **Done** to close the dialog box. These volume numbers can be recalled by clicking the Volume Report button on the tool bar.



The Volume Report

Once you click **Done** in the Volume Calculations Results dialog box, the Volume Report displays. You can also access the report after volumes have been calculated by selecting **Window > Volume Report** or by clicking the Volume Report button.

The Volume Report displays area, volume, and depth for stripping and sectional areas. The total area, cut/fill, strata, and on grade area for each report region and sectional area are displayed, if created. The report also displays the Cut-Fill volumes, compaction ratios and their impact on the volumes, import/export data, and volume change per 0.1 foot of elevation change, which is useful for balancing the site. The data in the volume report should be similar to the illustration below.

Job: 4D Lesson7
Units: Ft-CY
Tue Dec 06, 2016 13:49:55 Page 1

Volume Report
Subgrade vs. Stripped

	Area				Volume		Comp/Ratio		Compact		Export	Change
	Total	Cut	Fill	OnGrade	Cut	Fill	Cut	Fill	Cut	Fill	-Import	Per .1 Ft
Job Site	129,946	59,702	67,956	2,288	17,869	8,063	1.00	1.00	17,869	8,063	9,806	481

Stripping Qtys	Plane Area	Slope Area	Depth	Volume
Stripping 1	129,946	131,546	0.500	2,436

Sectional Qtys	Plane Area	Slope Area	Depth	Volume
HD Paving	39,686	39,753	0.420	618
Landscape	509	511	0.000	0
Landscape	108	108	0.000	0
Landscape	108	108	0.000	0
Landscape	5,800	6,096	0.000	0
Landscape Sub:	**6,525**	**6,823**		**0**
Pad	5,832	5,832	0.670	145
Pad	1,292	1,292	0.670	32
Pad	7,812	7,812	0.670	194
Pad	3,888	3,888	0.670	96
Pad	12,384	12,384	0.670	307
Pad Sub:	**31,208**	**31,208**		**774**
Sectional Total	**77,419**	**77,784**		**1,392**

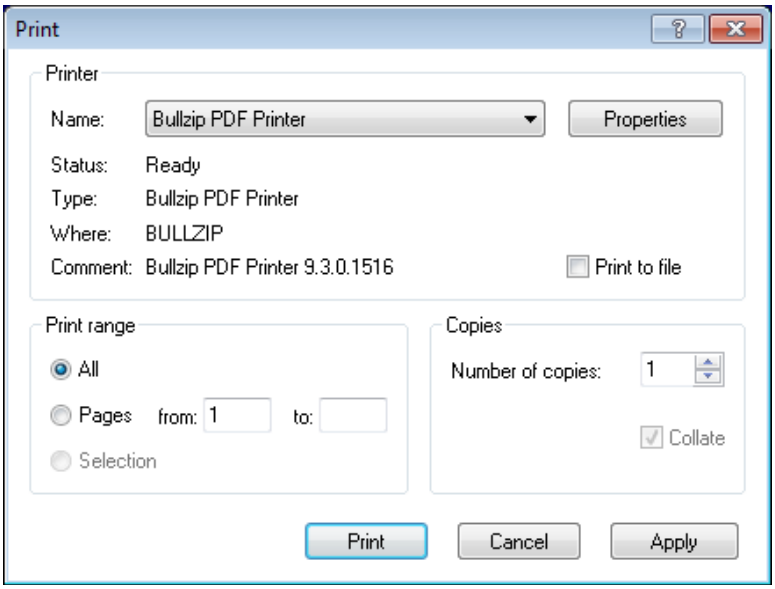
Lesson 6 – Printing Reports

Sitework 4D can print the Overlay and Terrain graphics along with Volumes and Profiles. The Print Preview Window allows the user to import graphics and resize, move, and add text. The lesson continues to use the file “4D Lesson7.esw”

Set up the Printer

Before printing, the printer should be configured. Sitework 4D uses the printer specified to size the screen and margins.

1. Select **File > Print Setup** to configure the printer.



2. Verify your printer and its settings and click **OK**.

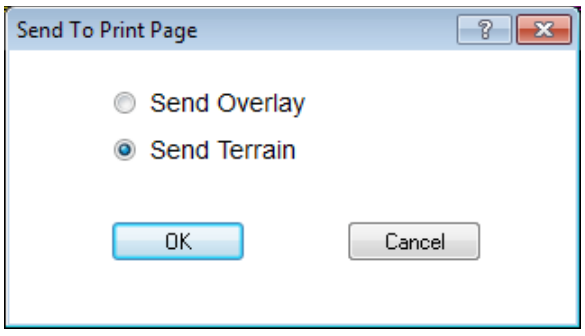
Send Graphics to the Print Page

Selecting **File > Send to Print Page** sends the current screen view to the Print Page.

1. Click the **3D View** button on the tool bar. The job is shown in 3D View mode.

2. Use the keyboard arrows and the 3D Controls to show a Terrain view you want to print, then select **File > Send to Print Page,** or click the **Send to Print Page** button.

3. If both the Overlay and Terrain are visible, the program asks which you want send. Select Send Terrain and click **OK**.



The Print Preview Window

The Print Preview window displays a representation of the page with the Terrain as an object on the page. The white area is the printable area on the page. The gray area represents the printer's margins.

Selecting Objects

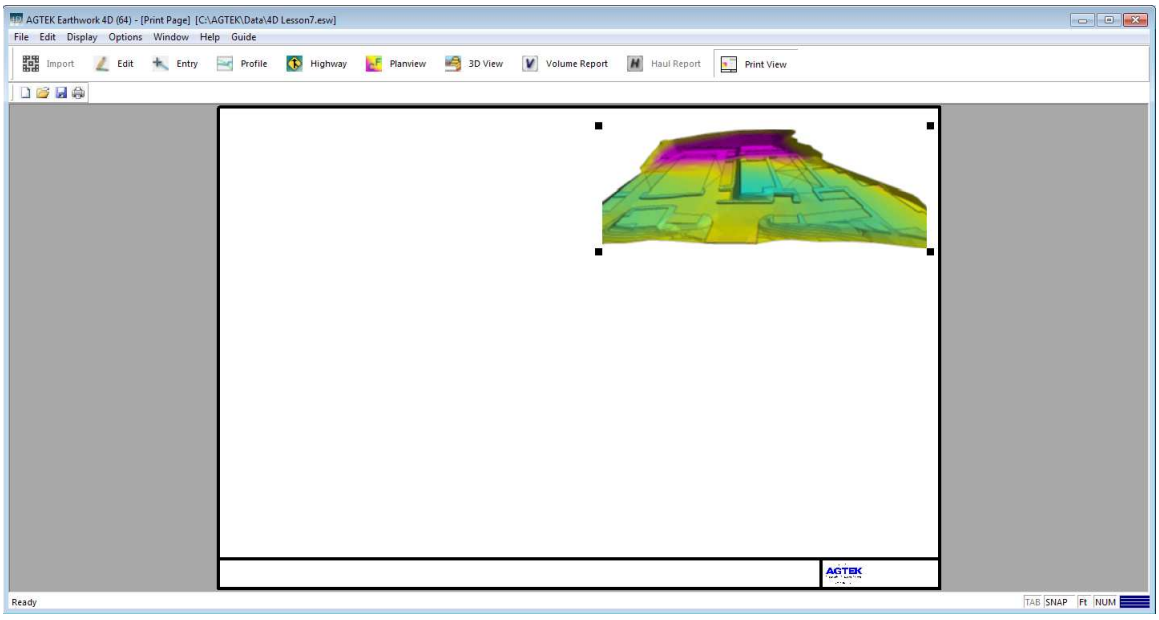
The Terrain object can be picked by clicking on it. A picked object displays four blocks around the object. In case of multiple overlapping objects, Shift + click cycles between objects.

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

- Select the Terrain object, drag it to the left side of the page, and increase the size to similar to the illustration below.



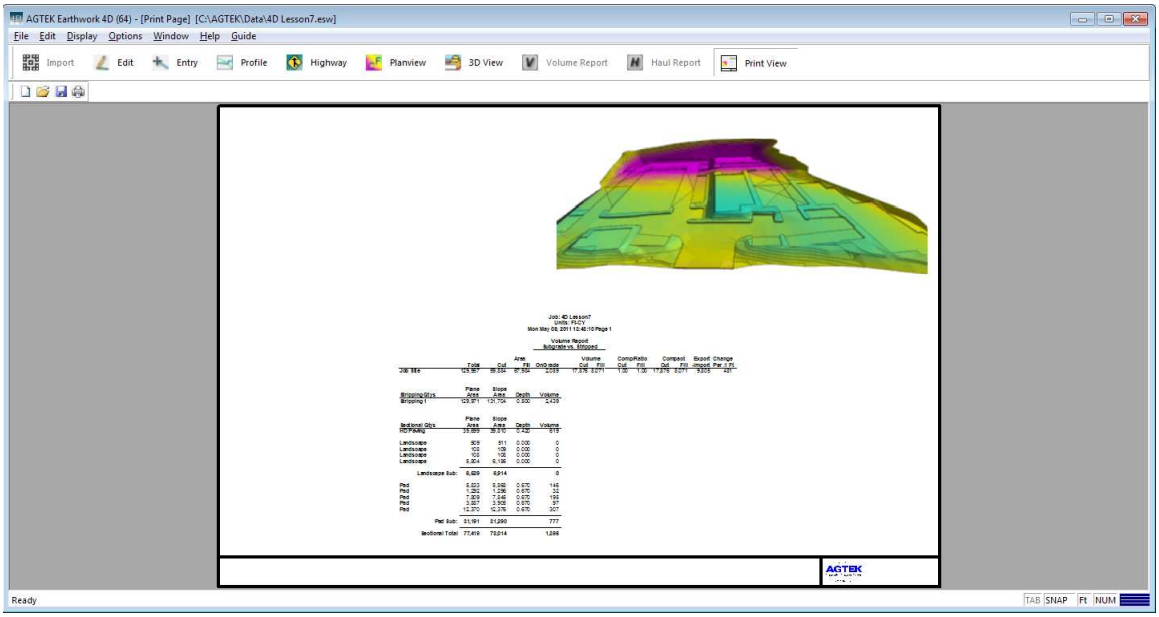
Adding Other Objects

The Print Preview window supports multiple objects. Next we'll add the Volumes Report to the page.

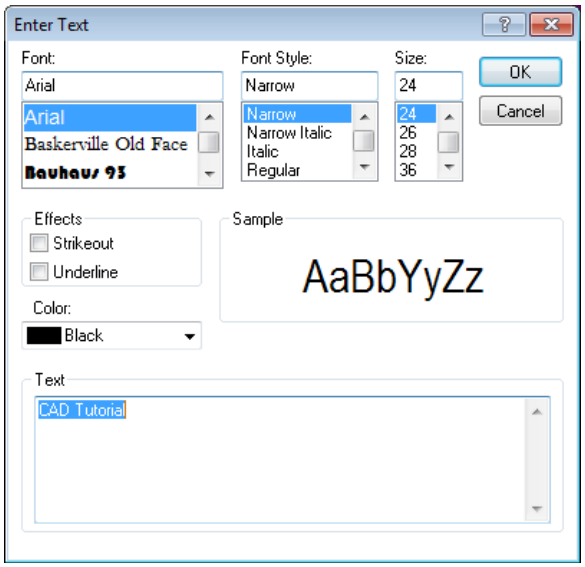
1. Click the Volumes Report button on the tool bar or select **Window > Volumes Report**. The Volumes Report shows the volumes and areas calculated earlier.

2. Select **File > Send to Print Page** and the report transfers to the Print Preview window.

The Volumes Report can be moved and resized using the same methods as the Terrain object. Move and size the report until the page looks similar to the illustration below.

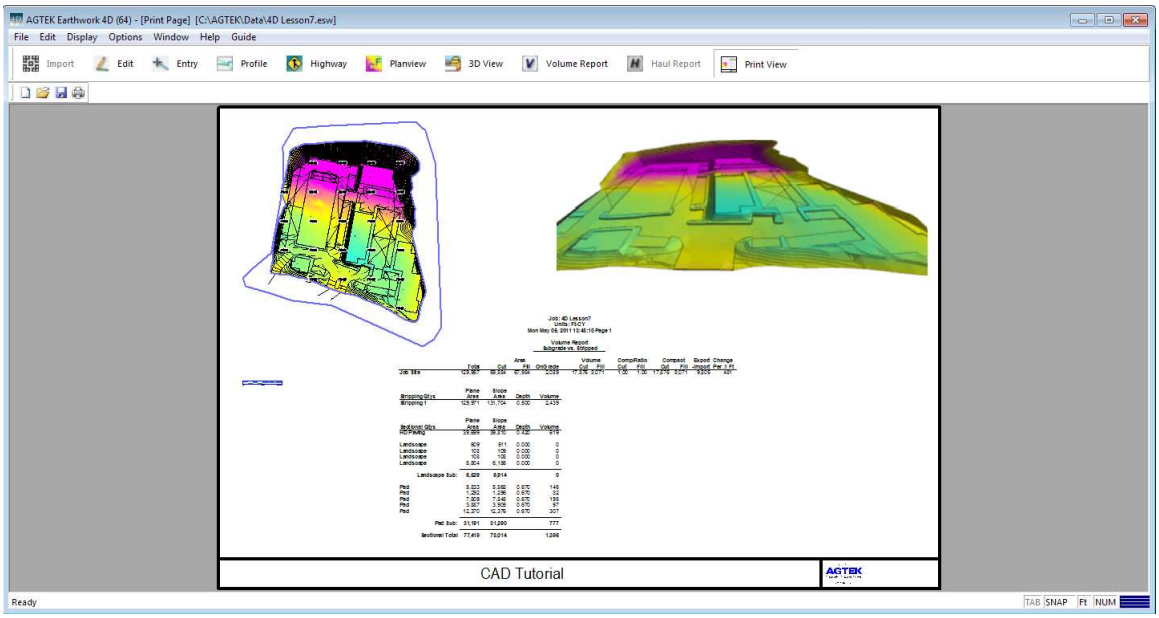


3. To add text to the report, select the Edit menu and select **Add Text**. Enter the desired text and po



Print The Report

1. Click the **Plan View** button on the tool bar or select **Window > Plan View**.
2. Send the image to the Print Page and switch back to the Print Page to resize and view the results. Your Print Page should look similar to the illustration below.
3. When you are satisfied with the results, click the Print button from the Selection Tool Bar or choose **File > Print**.



Section 4

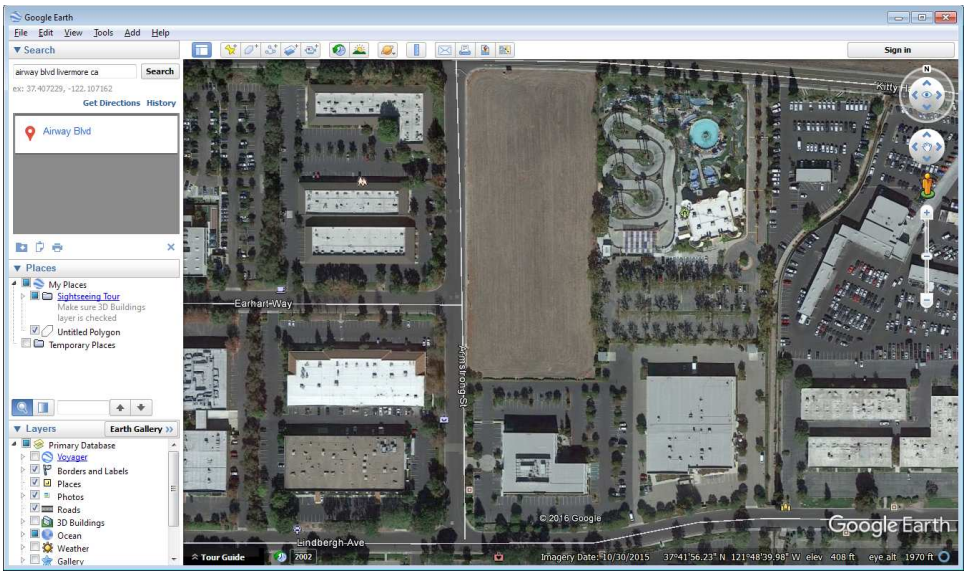
Google Export Tutorial

Earthwork 4D Geo-Referencing Files

To view your job site on Google Earth, or use the file in the field with SmartPlan, you must first geo-reference your job file by adding two benchmarks with approximate latitude and longitude information in Sitework 4D. You may use Google Earth® to locate these points. This procedure is the same for files containing plan sheets only for a pre-bid walk-thru, or a complete takeoff to be used for job planning and project management.

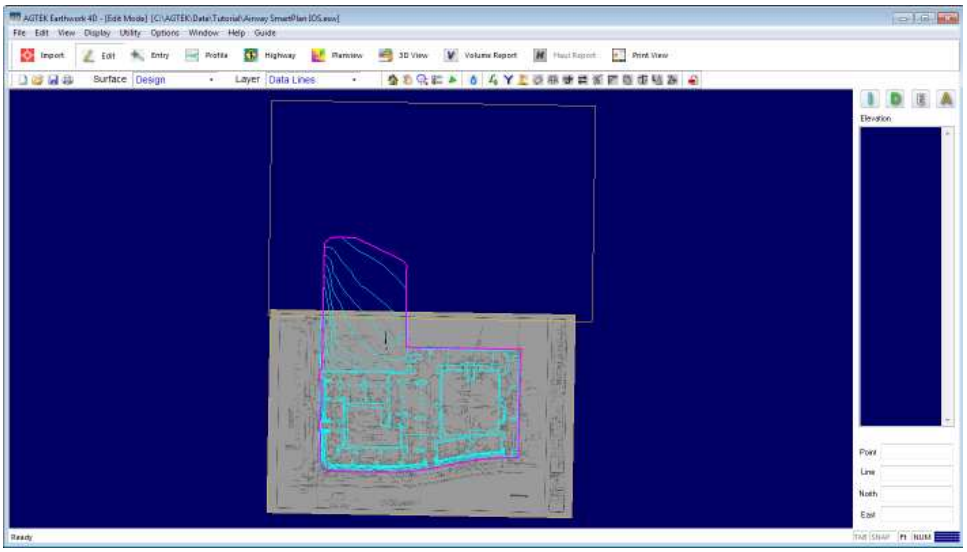
Enter Benchmarks and Locate Lat/Long information

To locate benchmark coordinates, and assign those coordinates in Sitework 4D, it is best to have both Sitework 4D and Google Earth® open simultaneously.

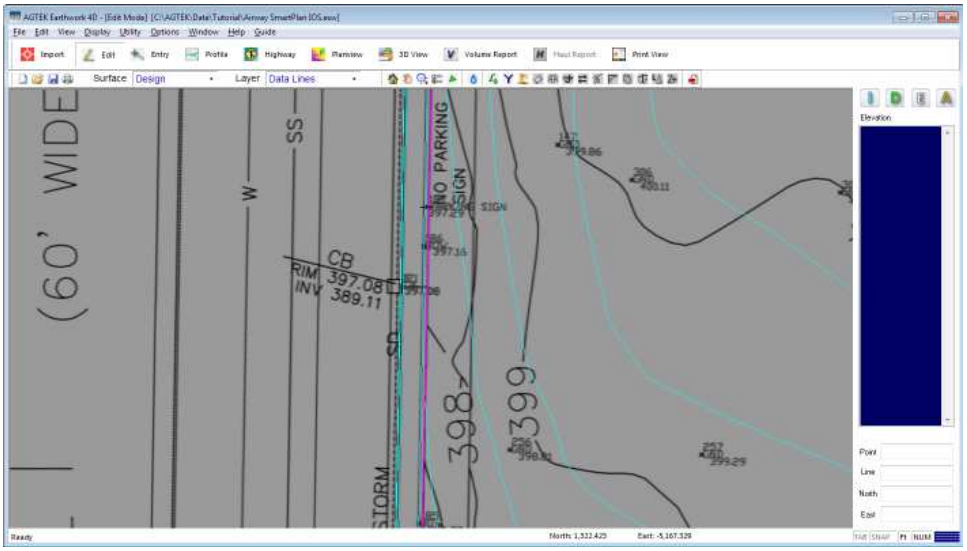


2. Identify some existing features that can be found on the plan sheets. Existing buildings, catch basins, or street intersections are good examples.

3. Open the job file in Earthwork 4D.
4. Import the plan sheet containing the existing features located on Google Earth.



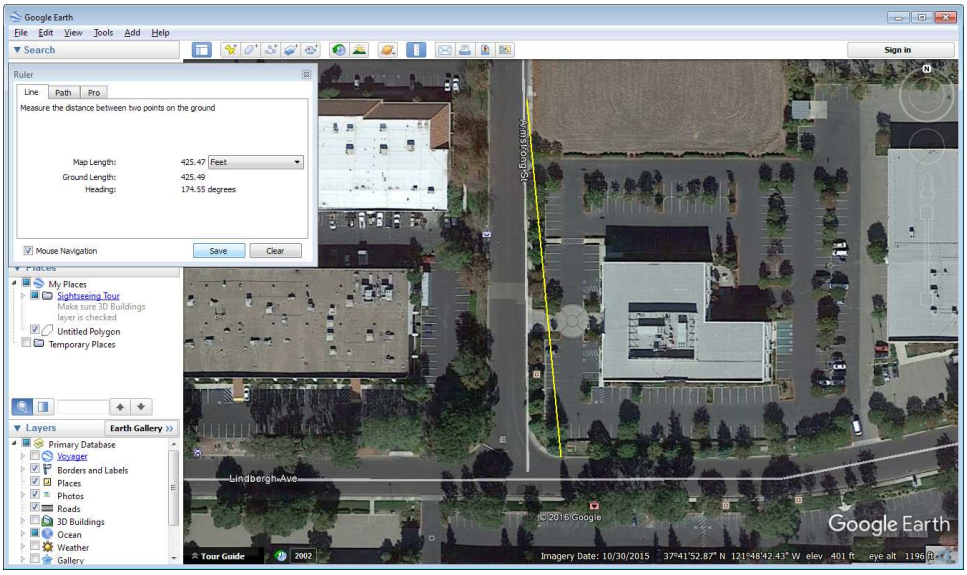
5. Locate the two common features found on Google Earth.



6. Minimize Earthwork 4D and return to Google Earth.

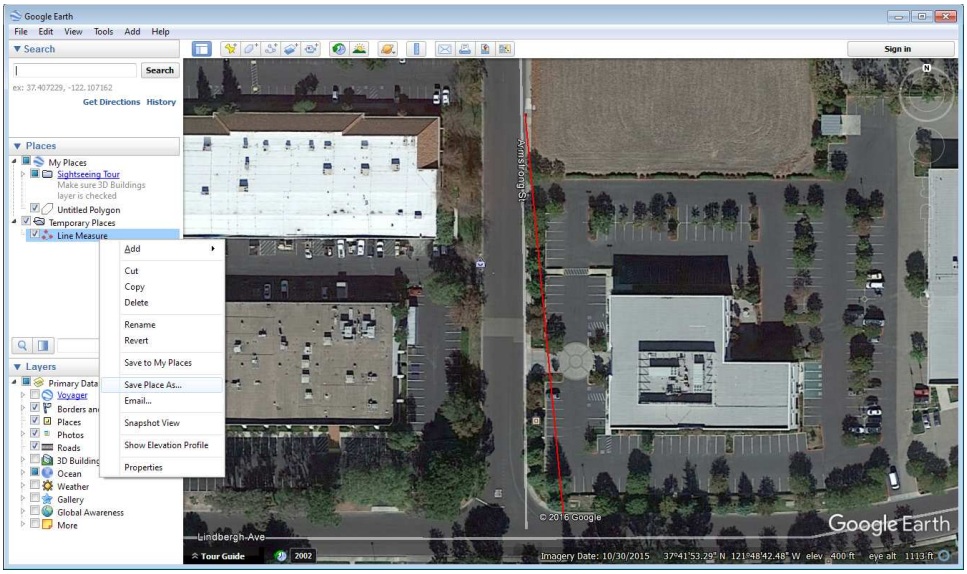
7. In Google Earth, select the **Show Ruler** icon, or select the **Tools** menu and select **Ruler**.

8. Draw a line connecting the two points. Click the **Save** button.



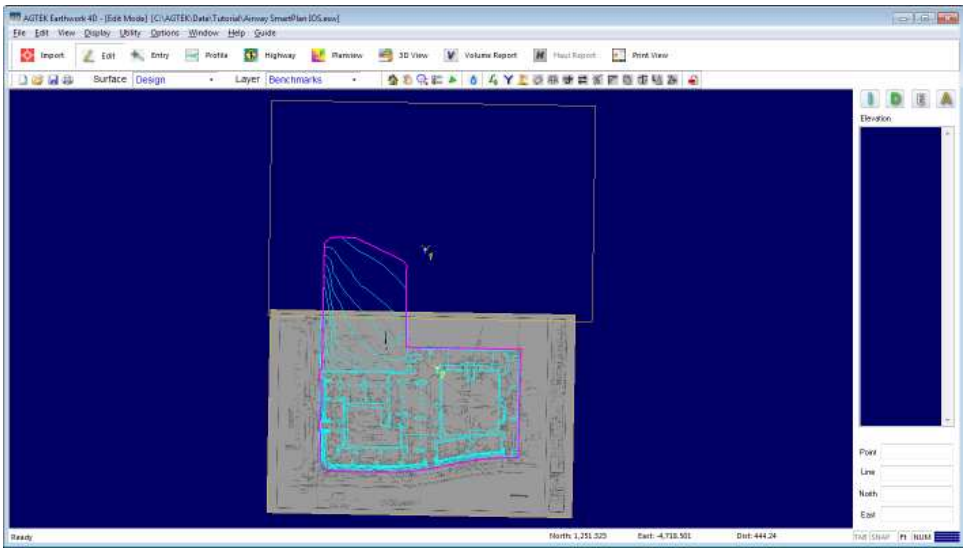
9. Keep the name Line Measure and click **OK**.

10. Right click on Line Measure under Temporary Places and select **Save Place As**.

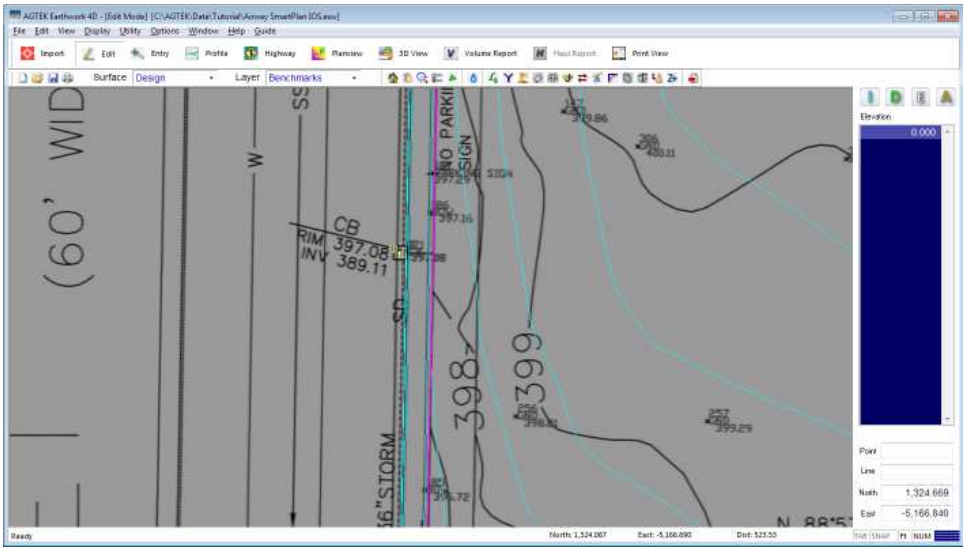


11. Save the file to the same file folder containing the Earthwork 4D job file.

12. In Earthwork 4D, right click and select **Import File**.
13. Select the Line Measure.KMZ file and click **Import**.



14. The Benchmarks will be inserted, however they will not be in the correct location.
15. Change the layer to **Benchmarks**.
16. Select one of the benchmarks. Position the tip of the arrow on the corresponding location on the plan sheet and press the **F7** key to move the benchmark to the new location.

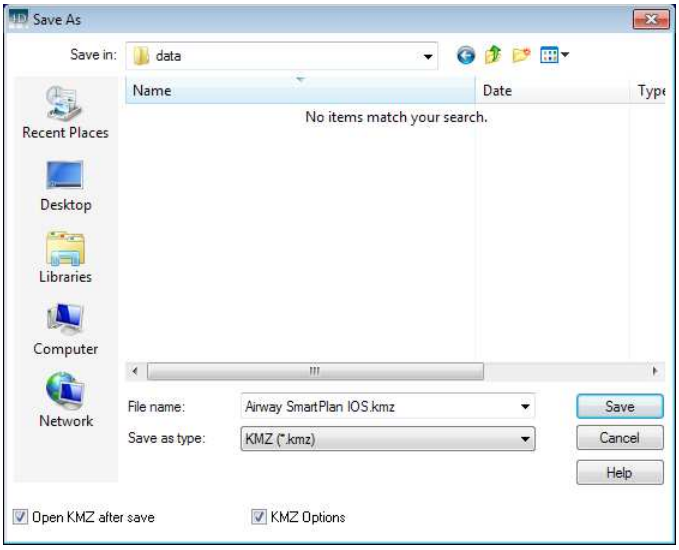


13. Repeat this process for the second benchmark.
14. The KMZ file may now be exported.

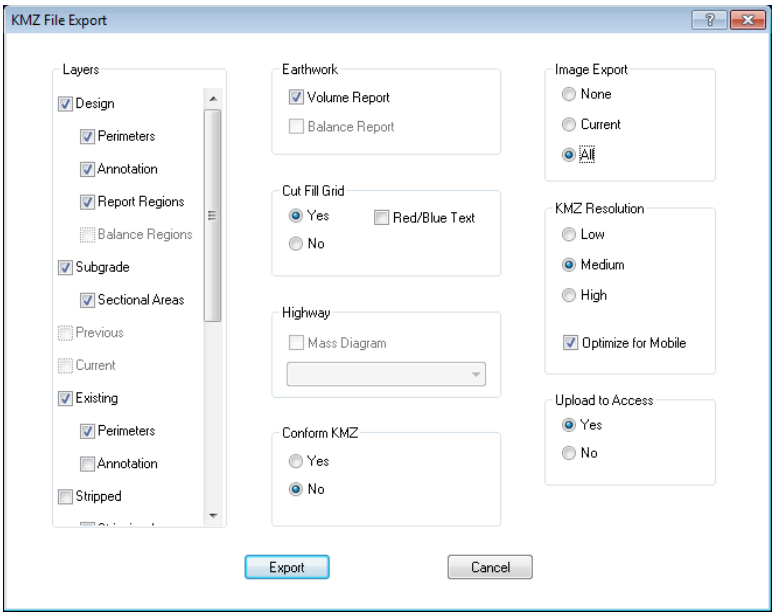
Save KMZ File

SmartPlan will read a KMZ file containing the plan sheet images, plan view data, color cut/fill map and volume reports. To export the KMZ file, select the Plan View mode icon on the toolbar.

1. Select **File > Export KMZ File.** The Save As dialog box displays.

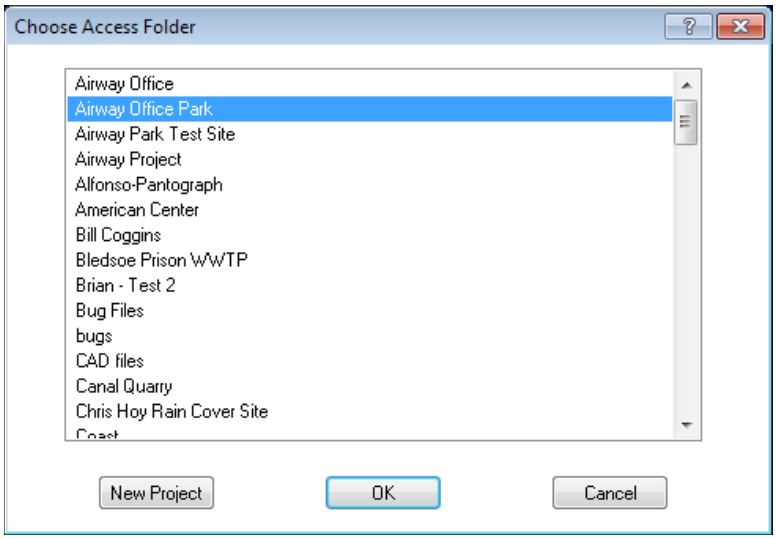


2. Enter a name for the KMZ file and click **Save**.
3. The KMZ File Export dialog will display.



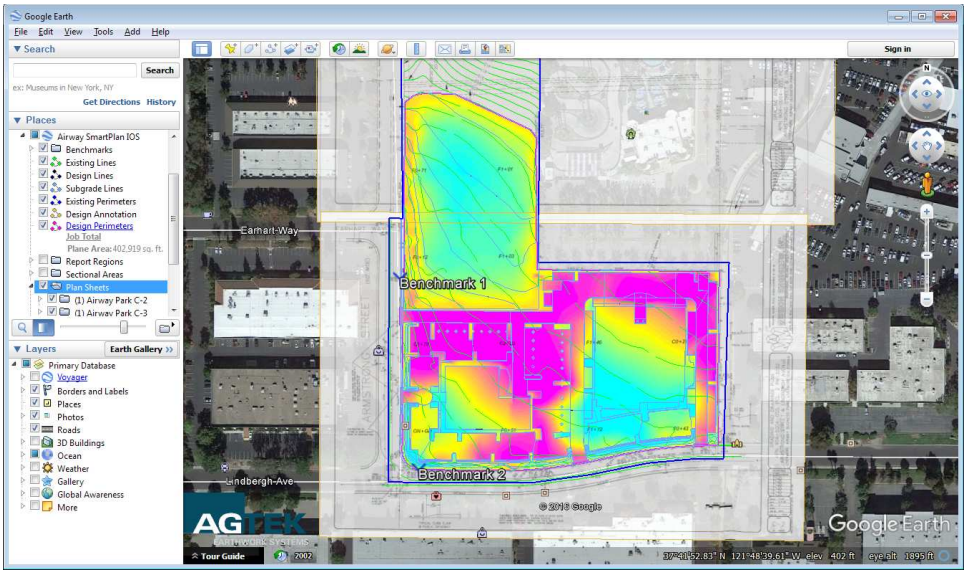
4. Select the desired layers to be saved to the KMZ file.
5. Check the desired additional options, such as the **Volume Report** or **Image Export**.
6. Check **Optimize for Mobile** when exporting the file to be used with SmartPlan.
7. Check Yes to Upload the file to AGTEK Access for use with SmartPlan. Click **Export**.

7. The Choose Access Folder dialog will display.



8. Select the desired Project folder. If no projects exist click New Project. Enter a name for the new project and click **OK**.

9. The file will be uploaded to AGTEK Access. The KMZ file will open in Google Earth. It is recommended you view the KMZ file on Google Earth to verify the accuracy of the alignment to the job site.

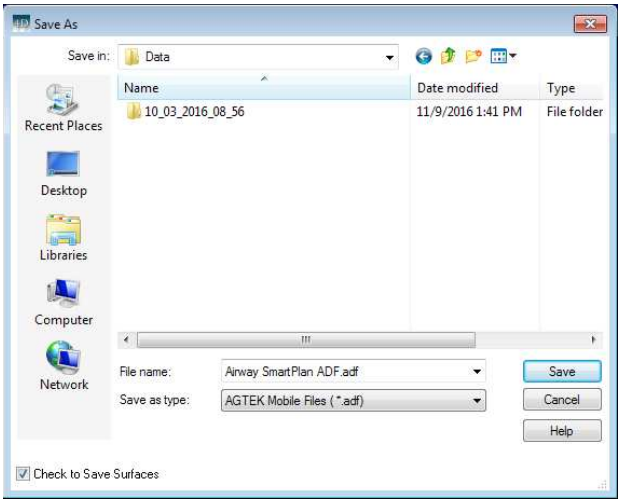


10. If the KMZ file is properly aligned, you are now ready to use SmartPlan in the field on the actual job site.

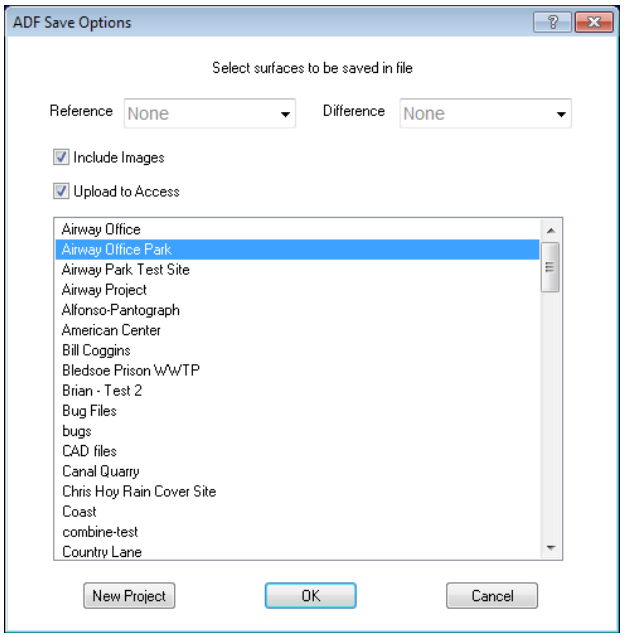
Save ADF File

SmartPlan will read an ADF file containing the plan sheet images. It is recommended to use the ADF file when using plan sheets only for a higher resolution of the images.

1. In Sitework 4D, select the **File > Save As**. The Save As dialog box displays.



2. Click the **Save as Type** pulldown and select AGTEK Mobile Files (*.adf).
3. Enter a name for the ADF file and click **Save**.
4. The ADF Save Options dialog will display.



5. If the file contains no takeoff data the Reference and Difference surfaces will show None.
6. Select the desired project folder. If no project folder exists, create a new project.
7. Check the boxes to Include Images and Upload to Access. Click **OK**.
8. The file will be uploaded to the project folder for use with SmartPlan.

Section 5

Field Use Tutorial

Field Use Overview

RTK GPS support is an additional feature in Sitework 4D, which must be purchased separately. In addition to creating takeoffs from grading plans, Sitework 4D can be used to capture field data using GPS to manage, update, and correct the 3D model in the office.

Data Collection Tutorials

Sitework 4D is used for GPS data entry/collection on a job site. The following are the tasks and applications for using Sitework 4D in the field.

Instrument Setup

- GPS Base Setup
- Aligning the Site/Rover Setup

Checking Existing Ground

Progress Topoing

Lesson Examples

This part of the tutorial uses lesson files located in the **C:\AGTEK\Data** directory.

Lesson 1 – Instrument Setup

Before you begin collecting GPS data on a job site, you must perform GPS Base Setup to localize the Base on the job site. In addition, each time you use Sitework 4D to collect GPS data at a job site, you must align to the site using the Rover, or recover the alignment.

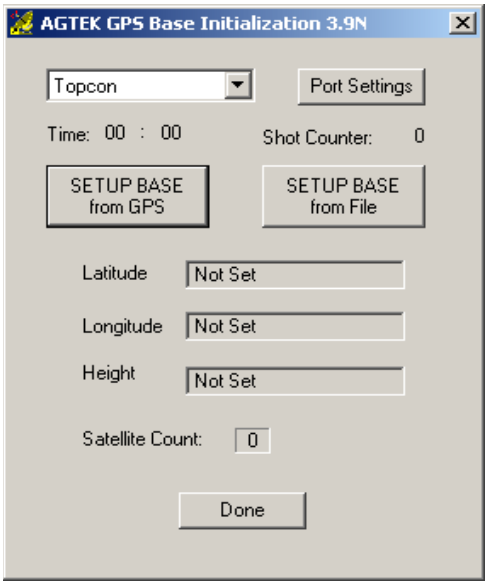
GPS Base Setup

Once the Bluetooth connections are established between the computer and the Base, you must setup the Base to verify it is receiving GPS data and localize it to the job site. Make sure the job site location for the Base has the following:

- A clear view of the horizon
- No nearby obstructions (buildings, trees, etc.)
- A secure and protected location
- Within 1000 feet of benchmark #1
- Within radio range of benchmark #2
- Away from sources of radio interference (cell, microwave towers, etc.)

To setup the Base:

1. Position the Base on the job site location.
2. Double-click the **GPS Base Setup** Icon on your desktop or select **Start > All Programs > AGTEK > GPS Base Setup.** The AGTEK GPS Base Initialization dialog box is displayed.



3. Select the type of GPS receiver you are using (Topcon, Trimble) from the pulldown menu.

4. Click the **Port Settings** button to verify that the Port is set to the COM port you selected for the Base during Bluetooth setup (typically COM8).
5. Click the **SETUP BASE** from GPS button. The Base takes shots for 5 minutes to ensure an accurate reading.
6. Save the position file for future use on the job site.
7. Click **Done** to complete Base setup.

To use the position file in the future, the Base must be in the same location with the same rod height as when the file was saved.

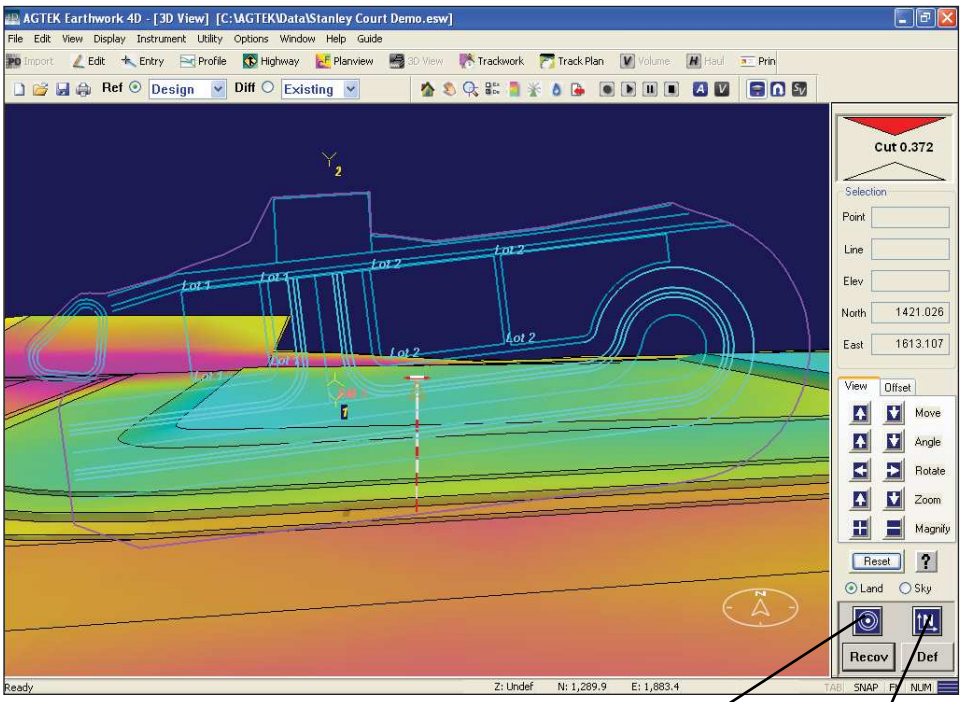
Aligning to the Site/Rover Setup

The Rover is the GPS receiver that moves around the job site. Rovers can be pole, backpack, or vehicle mounted. Before you can collect data for the job site, you must align to the site using the Rover.

1. Double-click the Sitework 4D icon or select **Start > Programs > AGTEK > Sitework 4D.** The Open dialog box is displays.

2. Select the model file, and click **Open**. The job site is opened in Edit Mode.

3. Switch to 3D View Mode, then select **Instrument > GPS > Enable.** Your screen should appear similar to the following illustration.



If you have already aligned to the job site, you can click the **Recovery** button to use the previous alignment data.

4. Select the benchmark on the screen you plan on shooting first, move to the point, level the Rover over the point, then click the Bullseye button. Benchmark 1 is shot.
5. Select the benchmark on the screen you plan on shooting second, move to the point, level the Rover over the point, then click the North Arrow button. Benchmark 2 is shot and the RTK Deviation Confirmation displays the deviation between the theoretical distance of the Benchmarks and the actual measured distance.

6. Click **Accept** to complete the alignment, or Retry to reshoot the second benchmark.

Lesson 2 – Checking Job Site Data

Once you have run a GPS Base Setup and aligned to the site, you can use Sitework 4D to manage your 3D model with actual job site data, including checking and correcting existing ground, progress topoing, and grade checking.

Although Sitework 4D can be used to gather job site data, most of the functions associated with data capture (topoing, staking, grading, area/stockpile measurement, etc.) are performed using a GradePilot RTK unit. Refer to your *GradePilot* manual for information about using the GradePilot RTK unit.

Checking Existing Ground (Simulation)

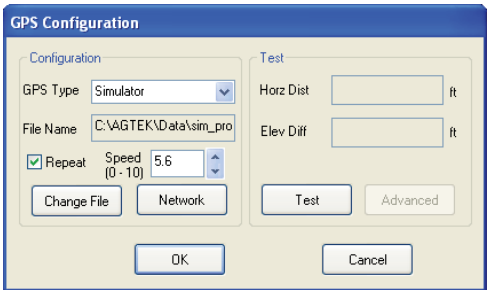
In this example the grades on the site begin to deviate substantially from the ground model and there appears to be a mound on the surface near the base of the slope. These deviations must be shot and recorded in order to update our current surface.

1. Double-click the Sitework 4D icon or select **Start > Programs > AGTEK > Sitework 4D.** The Open dialog box is displayed.

Earthwork 4D

2. Select the “Stanley Court Demo.esw” file, and click **Open.**

3. Switch to 3D Mode, then select **Instrument > GPS > Configure**. The GPS Configuration dialog box is displayed.

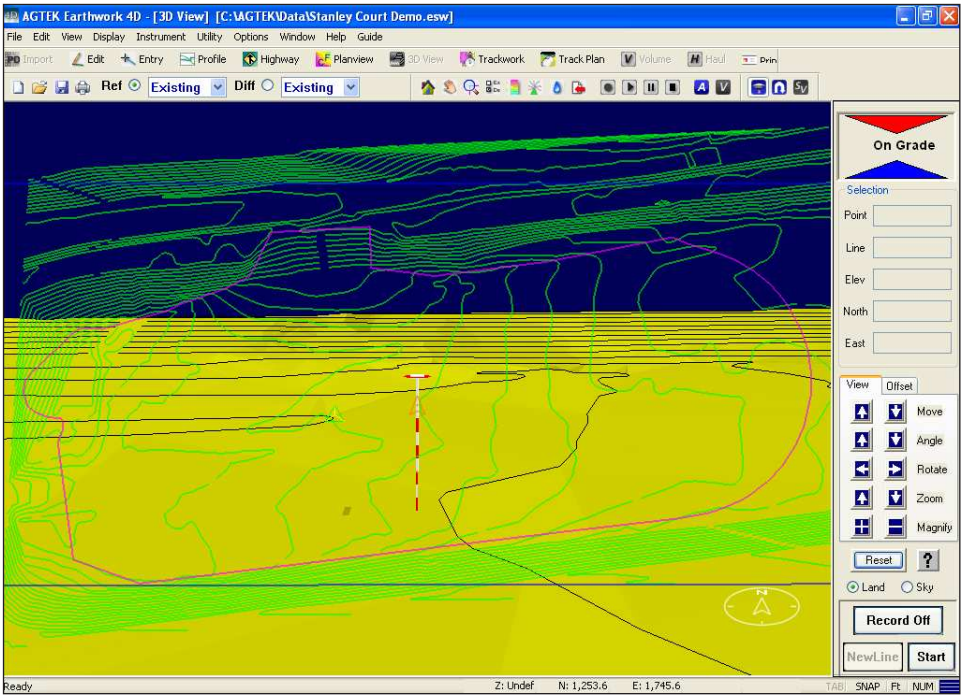


4. Select **Simulator** from the GPS Type pulldown menu, and click the **Change File** button. The Open dialog box is displayed.

5. Select the “sim_checkOG.agt” file, click **OK**, clear the repeat checkbox, then click **OK** in the GPS Configuration dialog box

6. Click the **Enable GPS** button, or select **Instrument > GPS > Enable.** In the field, once you select the Enable command you must align the model to the site with the Rover to begin receiving actual GPS data from the Rover. In simulate mode Alignment is not necessary.

7. Select “Existing” from the Ref pulldown menu to check actual topo data against the data currently in the model. Your screen should look similar to the illustration below.

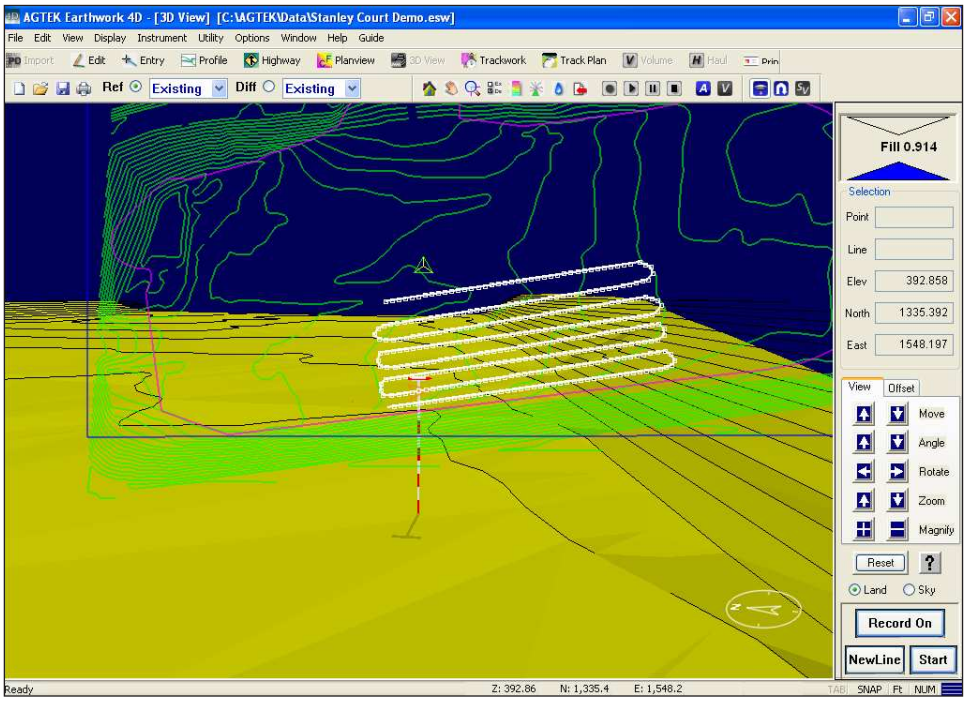


In the field you would move the Rover to an area outside the deviations before clicking the Record Off button instead of using simulated shots.

8. Click the **Record Off** button so that it reads Record On, then click the **Start** button to begin checking the topo. Notice that the shots detailing the area go out until they closely match the Ref surface. This makes sure that survey data ties into the existing topo and reflects any volume on the edges.

Notice that the 3D Controls window reports the cut/fill value between the actual (survey) and theoretical (reference) as shots are being taken. The Elev box displays the elevation or the Reference (Ref) surface at the Rover position. The Northing and Easting boxes show the Northing and Easting coordinates for the location using GPS data. Also notice that the survey elevation is displayed as the "Z" value at the bottom of the screen.

9. After all of the shots are taken, click the **Stop** button. When the simulation stops, the check is complete and we can view and quantify the difference between the shots and the existing topo. Your screen should look similar to the following illustration.



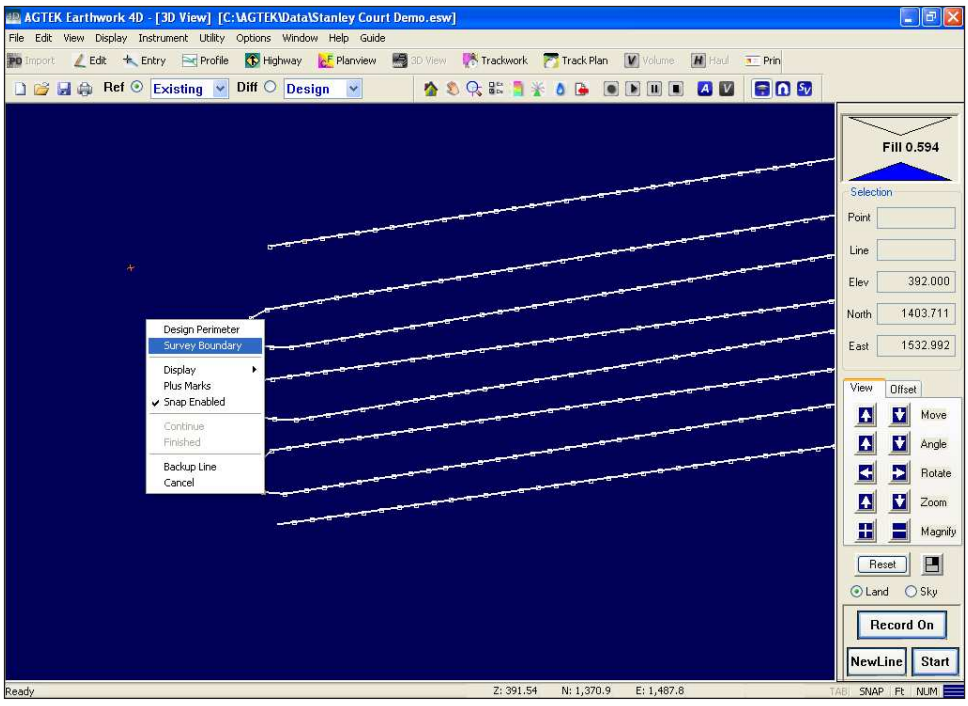
Correcting the Topo

Once you've collected the new survey data, you can use it to update the model so it contains accurate data based on job site data.

1. Select **Utility > Apply Survey**. The Survey Into Current dialog box is displayed.

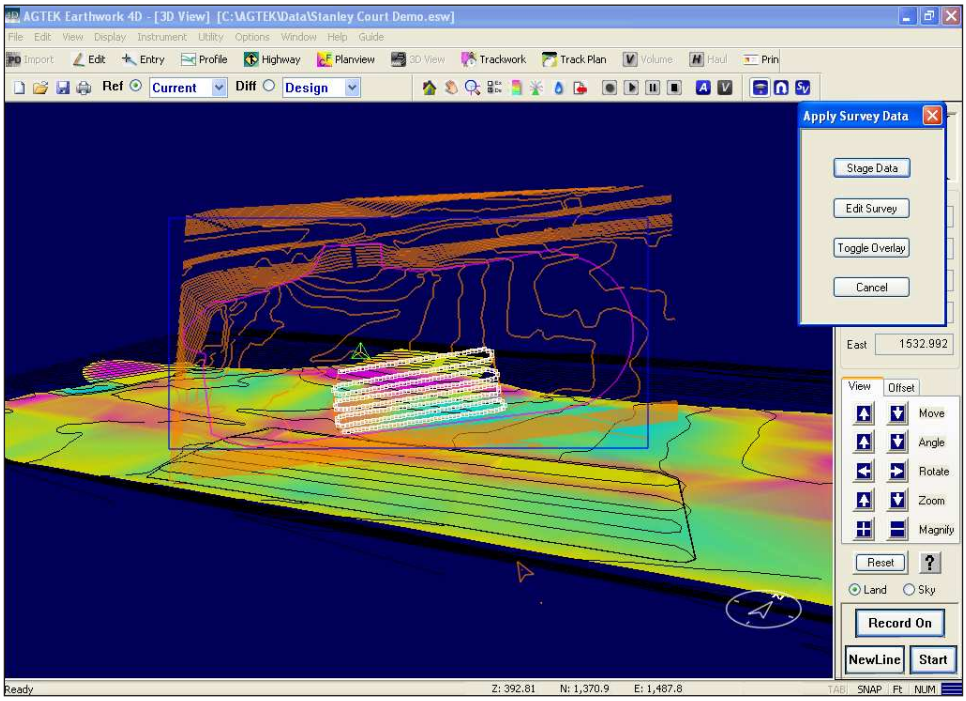
2. Select Stage, then click **OK**. The Current Layers Background dialog box is displayed.

3. Select **Existing,** and click **OK** to create the Current Surface with the survey data staged into the Existing Surface. The survey data is shown on the screen.



4. Right-click, then select **Survey Boundary** to draw a boundary around the survey data.

   The Current Surface is displayed with the existing ground and survey data and the Apply Survey Data dialog box is displayed.

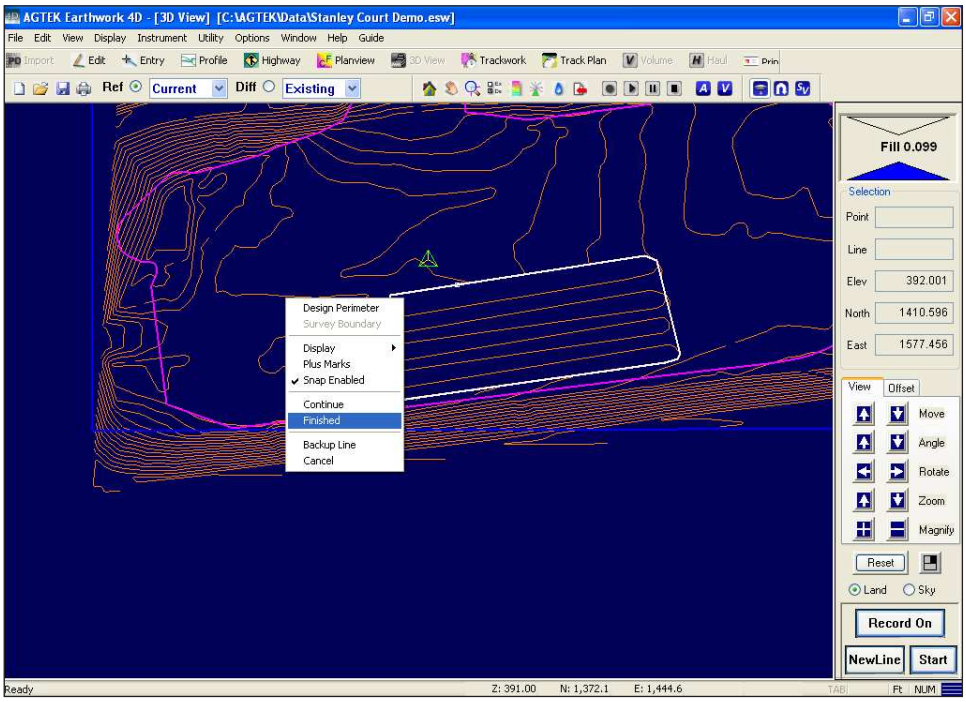


5. Click the **Stage Data** button. The Current surface now contains the Existing surface data plus the new survey data.

Calculating the Survey Volume

Once you've created the Current surface, you can compare it to the Existing surface to calculate the survey volume difference.

1. Click the **Survey Volume Calc** button. The survey data is shown on the screen.



2. Right-click, then select **Finished** to use the existing survey boundary. After calculation, the Volume Calculation Results dialog box is displayed.

3. Click the **Done** button and the Survey Volume Report is displayed.

Typically you would save the file at this point. Since this is a sample file that will be used in other examples, do not save the file.

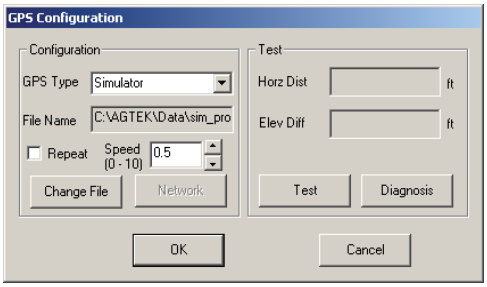
Progress Topoing

In this example, the street and top two pads will be surveyed to check the work progress in those areas.

1. Double-click the Sitework 4D icon or select **Start > Programs > AGTEK > Sitework 4D.** The Open dialog box is displayed.

2. Select the "Stanley Court Demo.esw" file, and click Open.
3. Select **File > Save As**. The Save As dialog box displays. Add today's date to the file name (i.e. "Stanley Court DemoJune062010.esw"), and click the Save button.

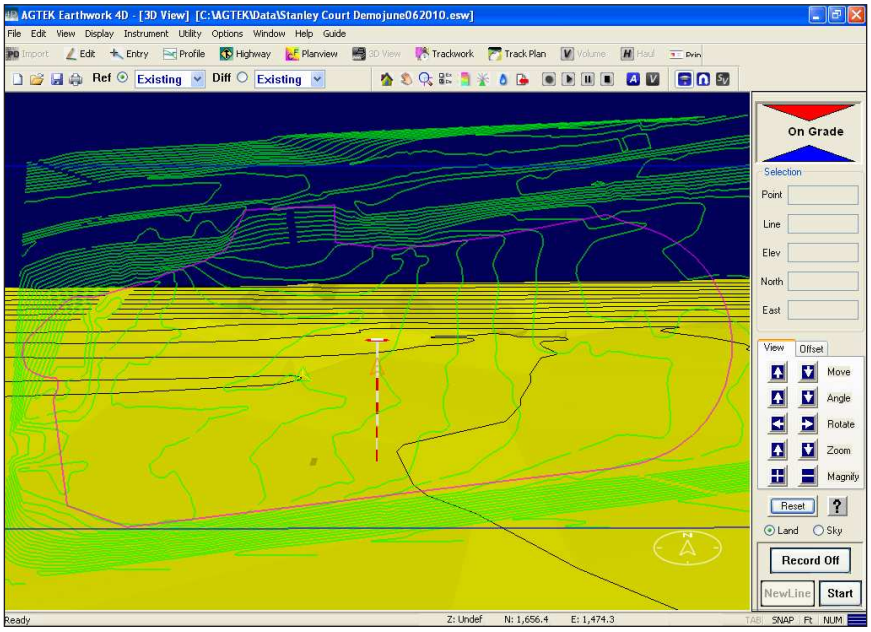
4. Switch to 3D Mode, then select **Instrument > GPS > Configure**. The GPS Configuration Dialog box is displayed.



5. Select Simulator from the GPS Type pulldown menu, and click the **Change File** button. The Open dialog box is displayed.
6. Select the "sim_progtopo.agt" file, click **OK**, clear the repeat box, then click **OK** in the GPS Configuration dialog box.

7. Click the **Enable GPS** button or select **Instrument > GPS > Enable.** In the field, once you select the Enable command you must align the model to the site with the Rover to begin receiving actual GPS data from the Rover. In simulate mode Alignment is not necessary.

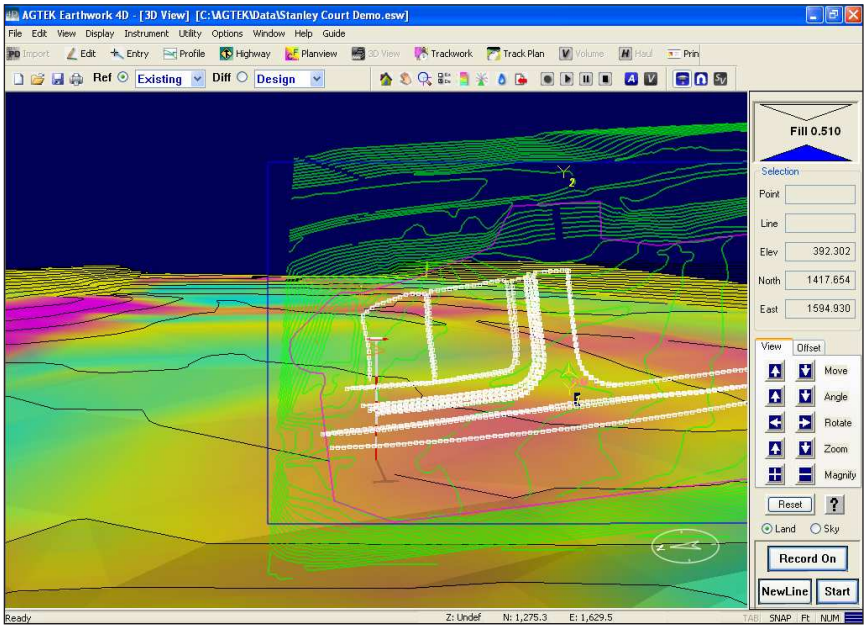
8. Select Existing from the Ref pulldown menu to check actual topo data against the data currently in the model. Your screen should look similar to the illustration below.



In the field you would move the Rover to the area to topo before clicking the Record Off button.

9. Click the **Record Off** buttons so that it reads Record On, then click the **Start** button to begin the progress check. Notice that the cut/fill differences are small at the edge of the work area and get larger as the simulation reaches the street and the pads.

10. After all of the shots are taken, click the **Stop** button. When the simulation stops, the check is complete and we can view and quantify the difference between the survey and the existing topo. Your screen should look similar to the following illustration.



Saving the Progress Topo Data

Once you've collected the new survey data, you can save it for comparison to the master file for the job site.

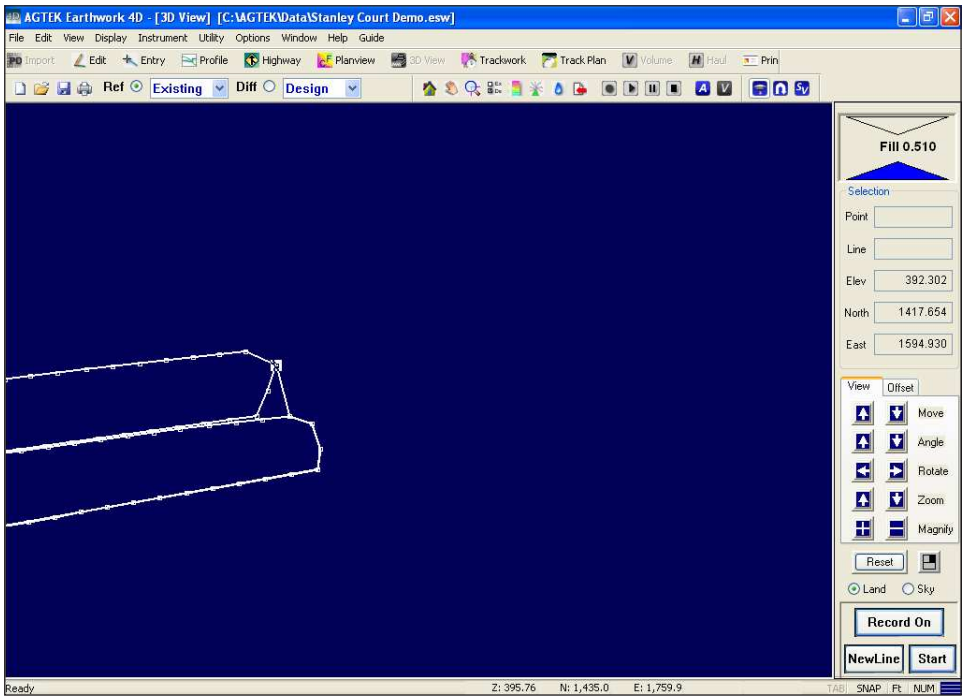
Because this is an irregular shaped survey and you want to get an accurate volume calculation, you need to snap a boundary around data rather than using the Survey Boundary command.

1. Select **Utility > Apply Survey.** The Survey Into Current dialog box is displayed.

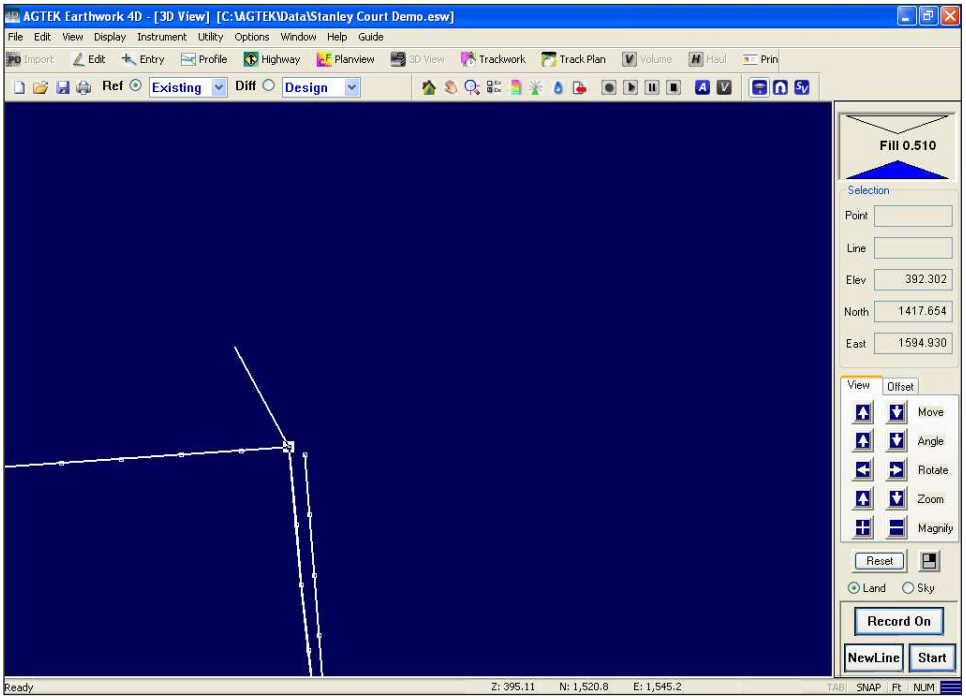
2. Select Stage, then click **OK**. The Current Layers background dialog box is displayed.

3. Select Existing, and click **OK** to create the Current Surface with the Existing Surface as the background and the survey data staged into it. The survey data is shown on the screen.
4. Make sure Snap is enabled (press the **S** key to turn snap on if it is not already), then zoom in, and double-click the first point of the survey near the street on the left side of the job.
5. Move to the right end of the survey data, and click the point at the top of the curve.

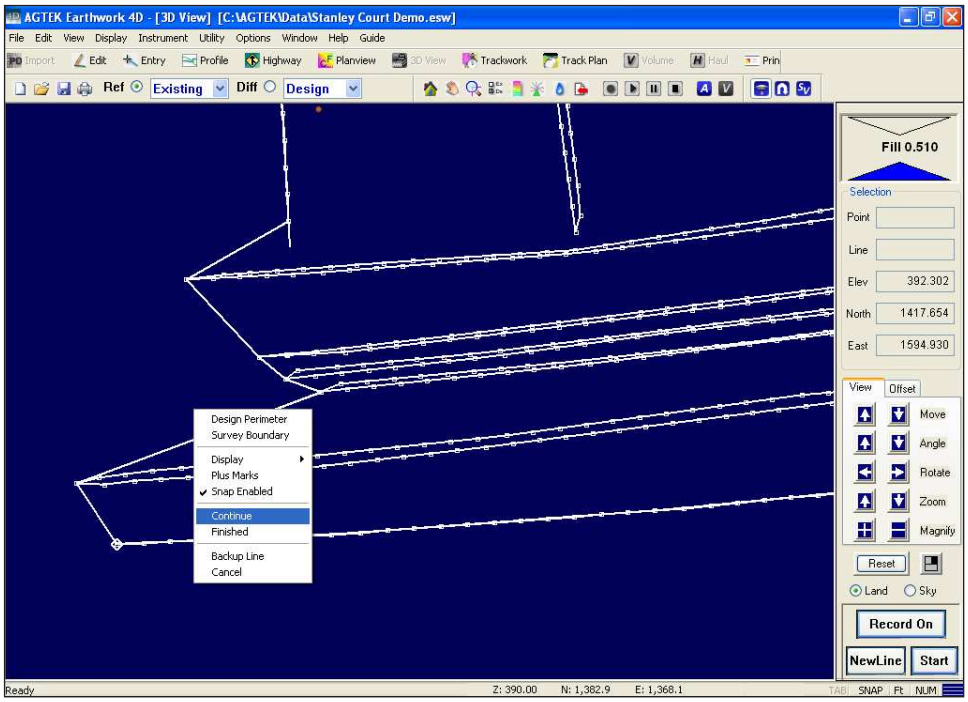
6. Double-click the end point of the next curve above. Your screen should look similar to the illustration below.



7. Click on the corner point at the top left of the street.

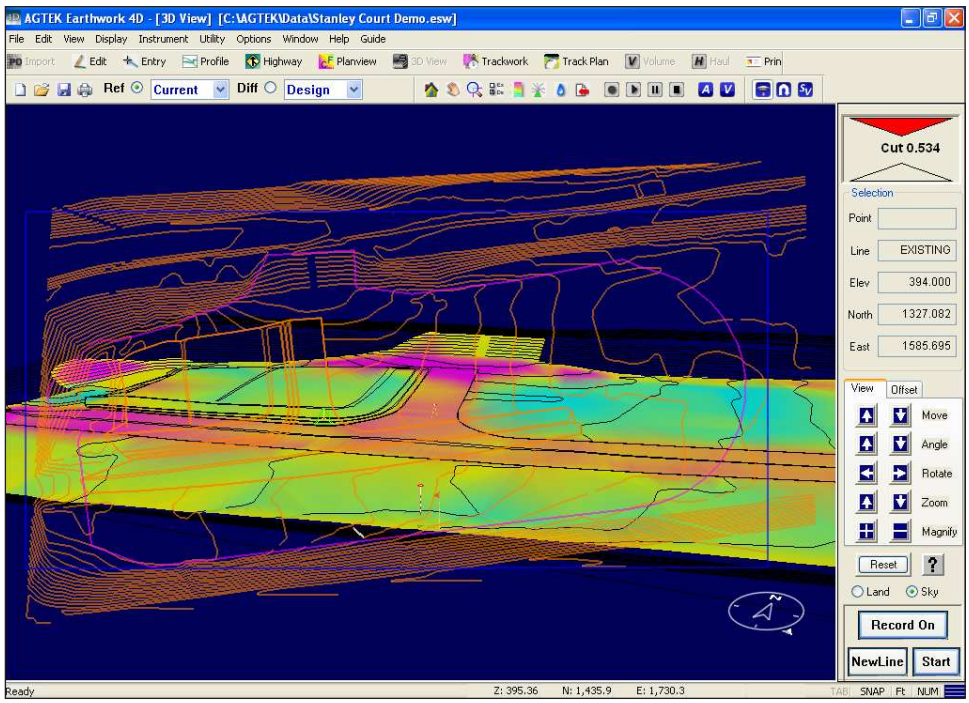


8. Continue clicking and double-clicking until the outside edge of the survey has been selected. Your screen should look similar to the illustration below.



9. Right-click, and select **Finished**. The survey data is shown with the Apply Survey Data dialog box.

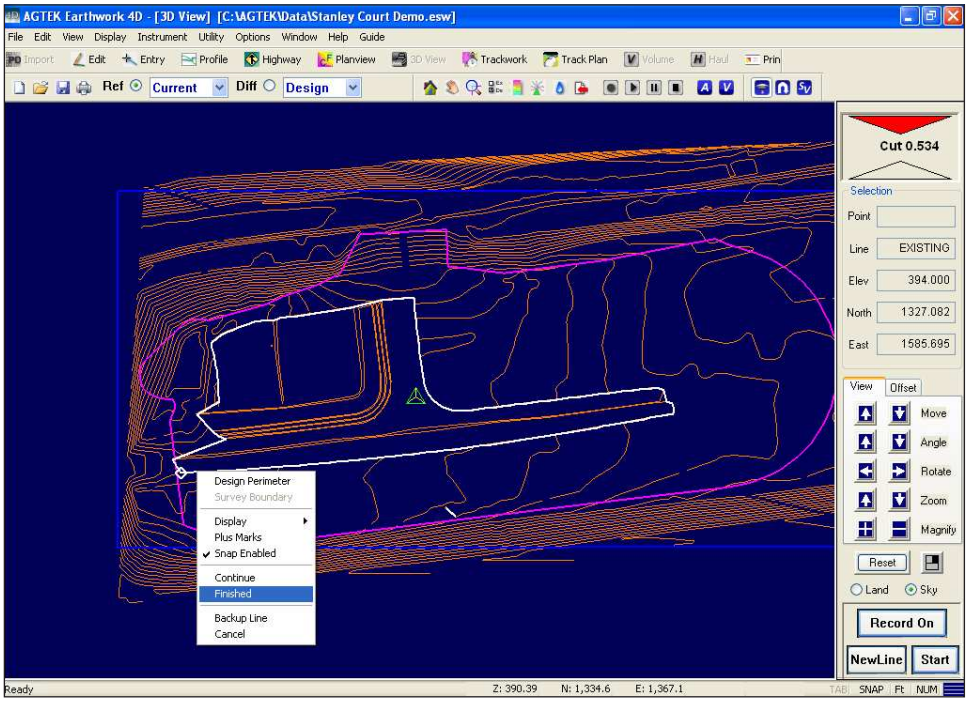
10. Click the **Stage Data** button. The Current surface now contains the Existing surface data plus the new survey data. Click the **Home** button to see the entire job site.



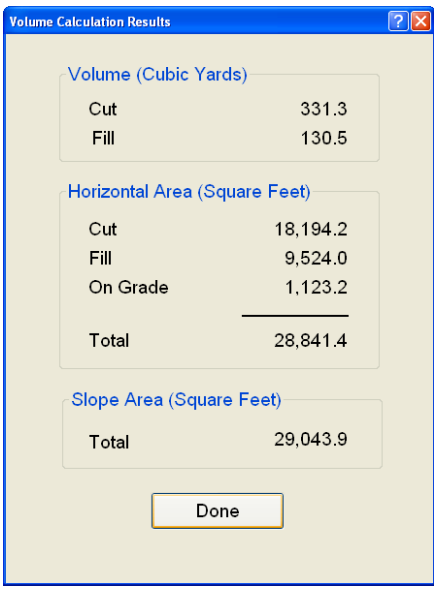
Calculating the Survey Volume

Once you've created the Current surface, you can compare it to the Existing surface to calculate the survey volume difference.

1. Click the **Survey Volume Calc** button. The survey data is shown on the screen.



2. Right-click, then select **Finished** to use the existing survey boundary. After calculation, the Volume Calculation Results dialog box displays.



3. Click the **Done** button and the Survey Volume Report is displays.
4. Save the file.

Lesson 3 – Field Supervision

If you use Sitework 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.

Apply the Survey Data

1. Open the master file in Sitework 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 **Edit > Apply Survey.** The Survey Into Current dialog box is displayed
6. Select Stage (Edit), then click **OK**. The Current Layers Background dialog box is displayed.

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

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.
8. Enter a survey boundary around the updated topo data. Right-click at the start of the boundary, then select Finished to complete the boundary.
9. 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.
10. Select Current from the Ref pulldown and Existing from the Diff pulldown. This compares the Existing surface with the Current surface to calculate the volume difference between the two surface.

11. Click the Survey Volume Calc button. After calculation, the Volume Calculation Results dialog box is displayed.
12. Click the **Done** button, and the Volume Report displays.

Applying Survey Data Collected in GradePilot RTK

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

Apply the Survey Data

1. Open the master file in Sitework 4D.
2. Connect the GradePilot to the computer via a USB port, then select **File > PlanPilot Import**. The Open dialog box is displayed.
3. Select the file that was used to collect the data, and click **Open**. The Survey data is opened in CAD Transfer mode.
4. 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 (Edit), then click **OK**. The Current Layers Background dialog box is displayed.

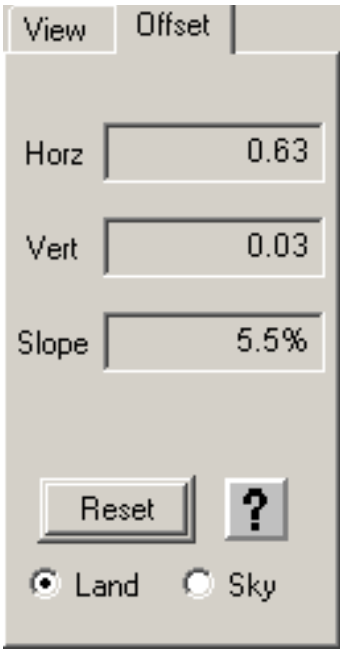
If the topo data is symmetrical, right-click and select **Survey Boundary** to auto-create the boundary, then right-click and select **Finished.**

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.
8. Enter a survey boundary around the updated topo data. Right-click at the start of the boundary, then select **Finished** to complete the boundary.
9. 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.
10. Select Current from the Ref pulldown and Existing from the Diff pulldown. This compares the Current surface with the Existing surface to calculate the volume difference between the two surfaces.
11.  Click the **Survey Volume** Calc button. After calculation, the Volume Calculation Results dialog box is displayed.
12. Click the **Done** button, and the Volume Report is displayed.

Stake Checking

Make sure you have setup Bluetooth connections and run GPS Base Setup before stake checking. Refer to “GPS Base Setup” in “Lesson 1 - Instrument Setup” on page 6-2 for 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 6-3 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 Sitework 4D matches the cut/fill and elevation data on the stake at the job site.

Section 6

Digitizer Support

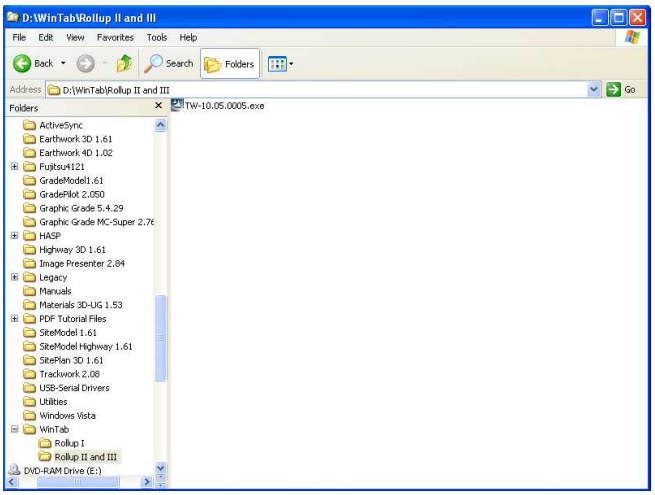
Digitizer Support Setup

Digitizer support is an additional feature in Sitework 4D, which must be purchased separately. This tutorial demonstrates how to install the tablet drivers and set up your tablet for use with Sitework 4D, as well as using the tablet enter a takeoff using a paper plansheet. Be sure to install the Sitework 4D software before installing tablet drivers. For information regarding Sitework 4D installation please refer to the “Installation” section of this manual, beginning on page 1-1.

Lesson 1 - TabletWorks Driver Installation

TabletWorks is the software driver used to control the digitizer. This program can be downloaded from the GTCO website at http://www.gtco.com/supportgtcocalcompsoftware.htm.

1. Open you internet browser and go to http://www.gtco.com/supportgtcocalcompsoftware.htm.
2. Click on the link to download the Tabletworks version 10.09 software and save it somewhere easy to find.
3. Double-click the saved installation file.



4. Click **Next** in the GTCO CalComp TabletWorks Install Wizard dialog box.

5. Click **yes** to accept the license agreement.
6. Select **Complete,** and click **Next**.
7. Click **Next** in the Welcome to Found New Hardware Wizard dialog box.
8. Click **Finish** to continue.

Lesson 2 AGTEK 16-button Cursor Configuration

After Tabletworks has been installed, you must configure the AGTEK 16-button cursor.

1. Select **Start > All Programs > Tablet Works > Tablet Works**.
2. Click the **16 Btn** tab. The button configuration dialog box is displayed.

3. Select **Relative** in Mouse Mode, and make sure the Enable Mapping box is checked.
4. Click on the buttons on the cursor image to set their function. The buttons on the screen correspond to the actual buttons on your cursor (the top right button is the "7" button). Set the buttons to the following:

7 - None	8 - None	9 - None	Enter - Left Click
4 - None	5 - None	6 - None	Period - Right Click
1 - None	2 - None	3 - None	SP - None
0 - None	Backspace - None	Blank - Right Click	Minus - None

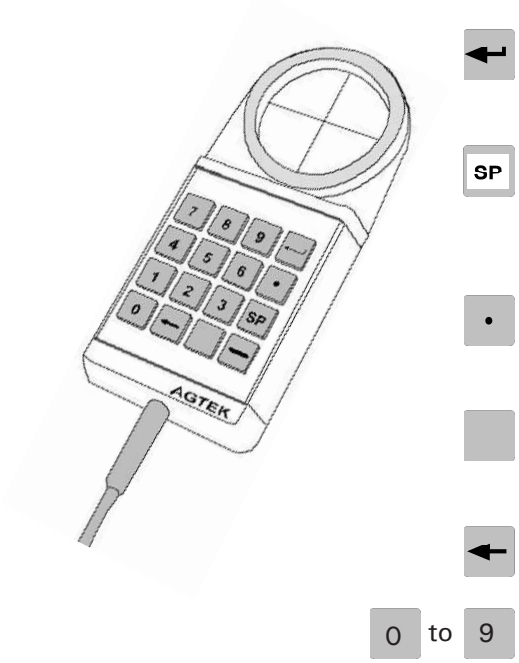
5. Click **OK** to apply the changes.

Plansheet Takeoff Overview

Sitework 4D can be used for dirt takeoff purposes when there is no electronic data available using a traditional paper plansheet. In these situations Sitework 4D relies on digitized input using a digitizer, and AGTEK 16-button Cursor.

The Cursor

The AGTEK-formatted 16-button cursor is used to enter digitized data from plan sheets. Below is an example of the cursor and a brief explanation of the buttons.



The **Enter** key is used for selecting and entering data. Holding down the Enter key allows tracing of data lines with AGTEK's intelligent stream mode.

The **SP** key is used to "snap" a point to the nearest data point. Pressing the SP key twice on the same point selects the entire line, and allows the user to determine the distance desired with a third SP entry.

The **Period** key is used to display the Right-Mouse menu, for entering daylight points, and as a decimal point.

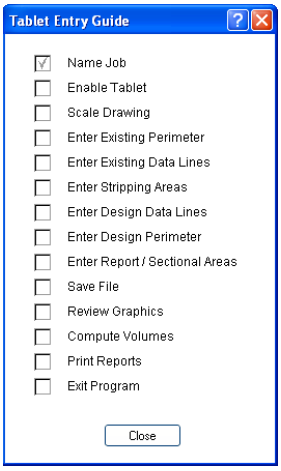
The **Blank** or **End** key is used to end a line or stop data entry. It is also used to display the Right-Mouse Menu when not in data entry mode.

The **Backspace** key is used to delete the last point entered while digitizing.

The **Number** keys are used to type in values in designated text boxes.

Tablet Entry Guide

In the Guide menu, Sitework 4D contains guide for PDF, CAD, Tablet, and Haul Plan entry. This tutorial focuses on Tablet entry. The Tablet Entry Guide can be accessed by selecting **Guide > Tablet**, and later by pressing the **G** key. The Guide display a check mark in the corresponding box when an operation has been completed.

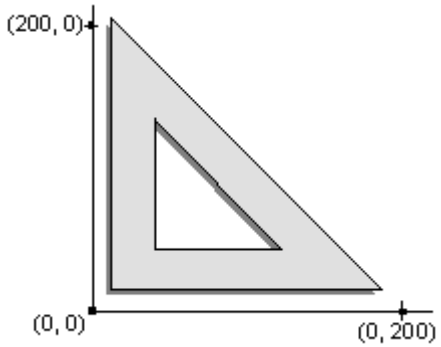


Scaling

Before any data can be digitized, the plan sheet must be scaled. Scaling aligns the plan sheet with the digitizer, creates a coordinate system for the job, and establishes the scale of the plan sheet. There are three methods of scaling and the one you choose should reflect the needs of the job.

Right Angle

The simplest method is to draw a right angle on the plan. Place the right angle near the center of the plan sheet. Measure out about 10" along each axis with the appropriate plan scale (20' = 1" in this case) and mark the coordinates based upon these measurements (see the example below). You can use this method if you don't need to align the takeoff to a CAD file, survey, or a matching sheet. It also does not adjust for any plan shrinkage from duplication.



Known Distance

Another method is to find some known distances on the plan both horizontally and vertically and use those to create the coordinate system. Property Line measurements and road stationing often provide known distances. The chief advantage of this method over the former is the adjustment for any plan shrinkage.

Northings and Eastings

The best method is to use Northings and Eastings marked on the plan sheet. There are two advantages to this method. First, alignment to CAD files, surveys, and other sheets is greatly simplified. Second, this method adjusts for plan shrinkage.

Data Entry Sequence

Below is the suggested data entry sequences for plansheet takeoff.

Enter Existing Ground

- Start a new Job
- Scale Drawing
- Enter Existing Perimeter
- Enter Existing Data Lines
- Enter Stripping Area

Enter Proposed Design

- Enter Design Data Lines
- Enter the Design Perimeter
- Enter Report/Sectional Areas

Calculate Volumes

- Visual Verification with the 3D Window
- Calculate Volumes

Print Reports

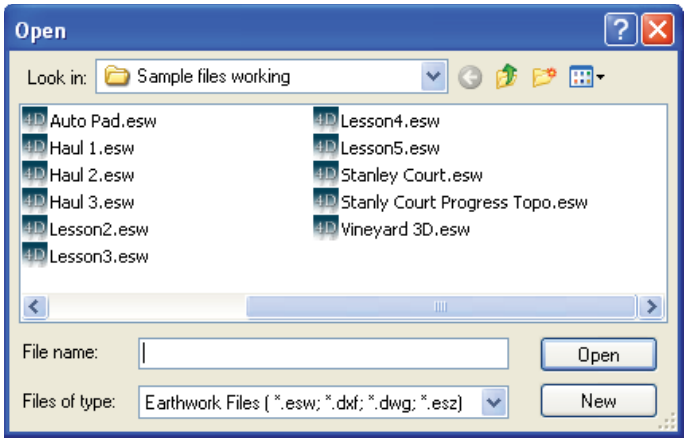
Lesson 1 – Enter Existing Data Lines

Prior to beginning, tape the Pine Street grading plan to your digitizer. Be sure you have access to a right angle and an engineers scale. The following lesson demonstrates how to enter the existing ground.

Start a New Job (Job Setup)

1. Double-click on the Sitework 4D shortcut or select **Start** > **Programs** > **AGTEK** > **Sitework 4D.** The Open dialog box displays.

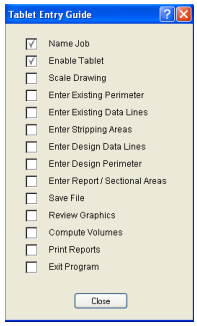
2. Click **New** to start a new job. The Job Information dialog box displays.



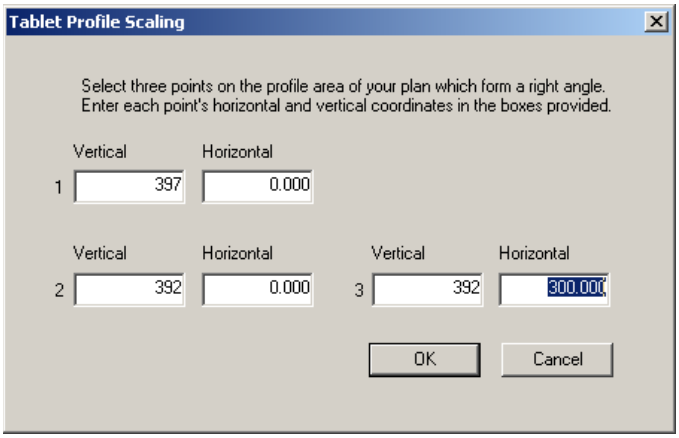
3. Enter a Job Name, Builder, Bid Date, and Operator. Select the units of measure (feet for this job) and click **OK**. Sitework 4D opens in Entry Mode with a blank screen ready for data entry.

Enter the Plan Scale

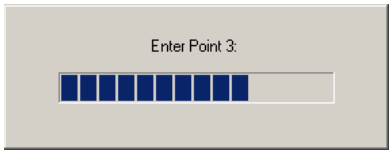
To scale the tablet to the Pine Street plan sheet, use the Northings and Eastings marked on the eastern property corners and on a monument in the center of Gregory Lane.



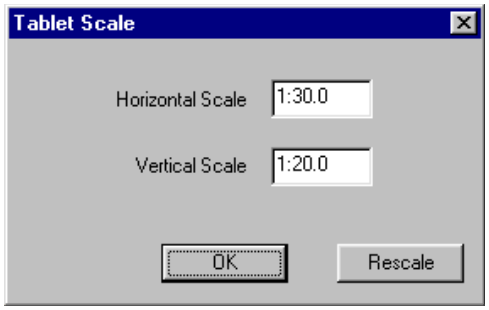
1. Select **Guide > Tablet,** then click **Enable Tablet** in the Tablet Entry Guide dialog box. The Tablet Scaling dialog box is displayed.



2. Type the monument coordinates for the first point, the southeastern property corner for the second point, and the northeastern property corner for the third point. Make sure the North Always Up box is checked, and click OK to accept these values. A dialog box prompts you to digitize the first point.



3. Place the 16-button cursor over the first point, and press the **Enter** button. Move to the second and third scaling points and press the **Enter** button over each point. A confirmation window displays the vertical and horizontal scales.

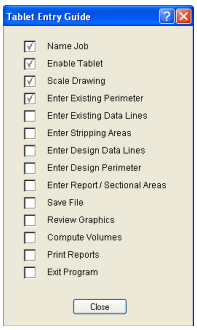


4. The scale for this job should be about a 1:20. Click OK to accept, or Rescale to re-enter the scaling coordinates again. After you have accepted the scale, the program switches to Entry Mode, and defaults to the Existing Surface and Perimeter Layer.

Enter the Existing Perimeter

Once the job has been scaled to the plans, you can begin entering jobsite data, including the site boundary, original topo information, and stripping areas.

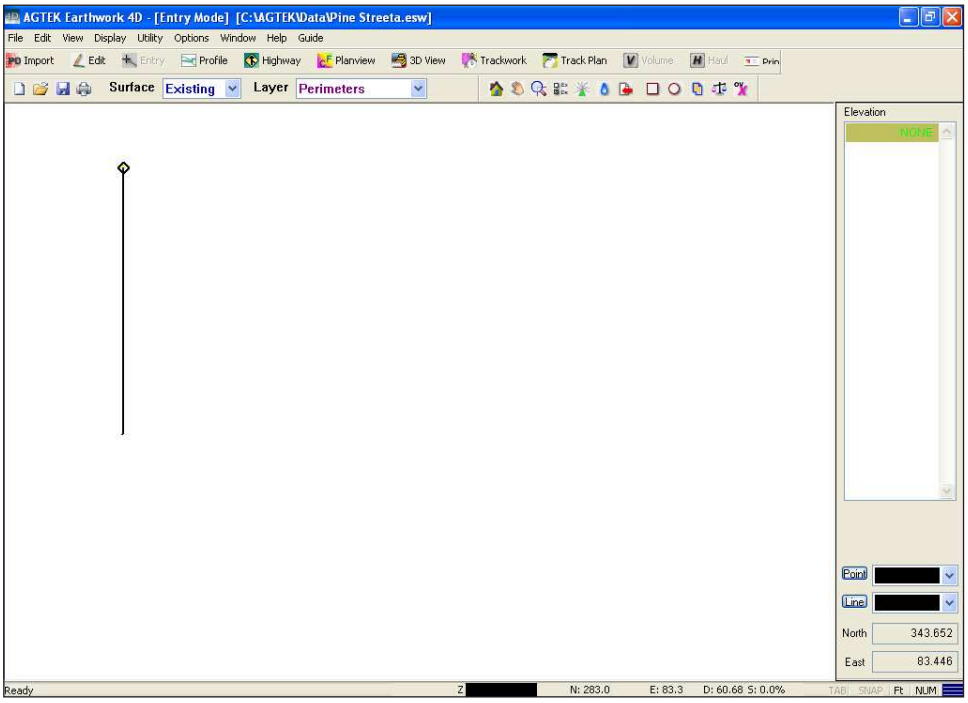
A site boundary is supplied on the Pine Street plan sheet (the dashed box with one side running down the center of Gregory Lane).



1. Switch to the Entry mode and select Existing from the surface pulldown and Perimeters from the Layer pulldown, or select **Guide > Tablet,** and select **Enter Existing Perimeter** from the Tablet Entry Guide.

2. Place the 16-button cursor over one corner of the marked site boundary and press the Enter button. The crosshair is connected to the first point by “rubber band“ line.

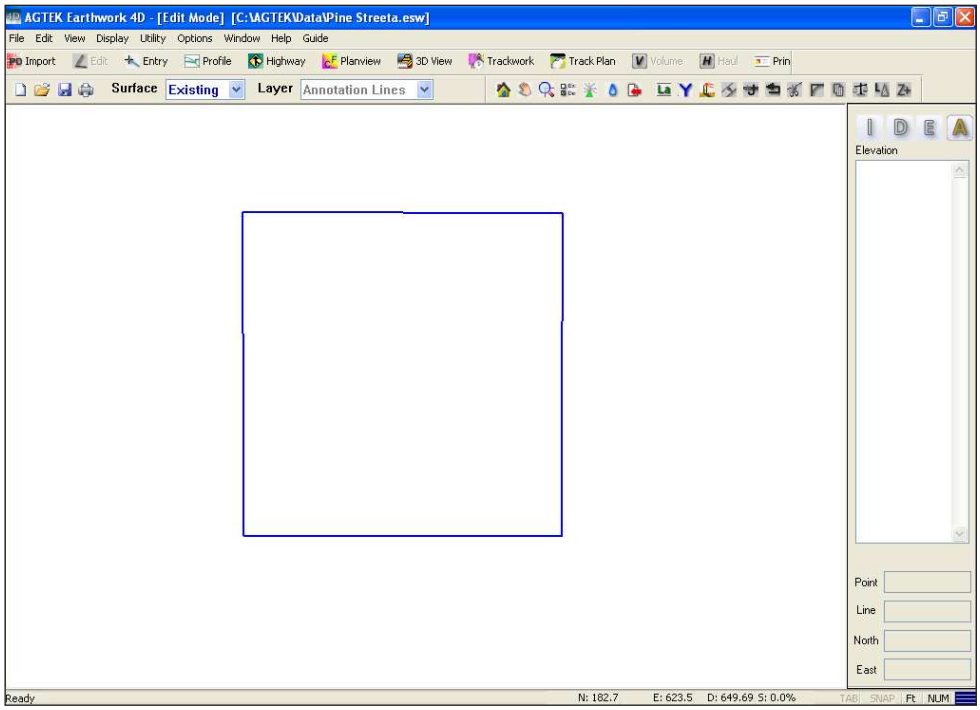
The Existing Perimeter is used to define the limits of 3D calculations and speed 3D rendering. Make sure necessary data is included in the Existing Perimeter.



3. Move the cursor to the next corner and press the Enter button. Continue entering the other corners of the perimeter. If you make a mistake, press the **Backspace** key to remove the last point entered.

4. Press the **Blank** key to finish boundary entry.

4. Click the **Home** button, or press the **Home** key on the keyboard to zoom out and view the boundary.

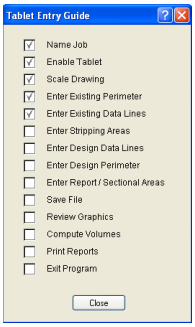


Enter Existing Data

With the site boundary entered, the next step is enter the existing ground information. All of the topo information is entered into the Data Lines layer. This section demonstrates how to enter a contour, spot elevation, closed areas, ridge, and swale lines, but does not cover entering all data from the plan sheet.

Enter Contours

Contours can be entered in any order but we'll use the 253 contour in the upper middle part of the plan sheet.



1. Select Existing from the Surface pulldown, and Data Lines from the Layer pulldown, or press the **G** key, and select **Enter Existing Datalines** from the Tablet Entry Guide.

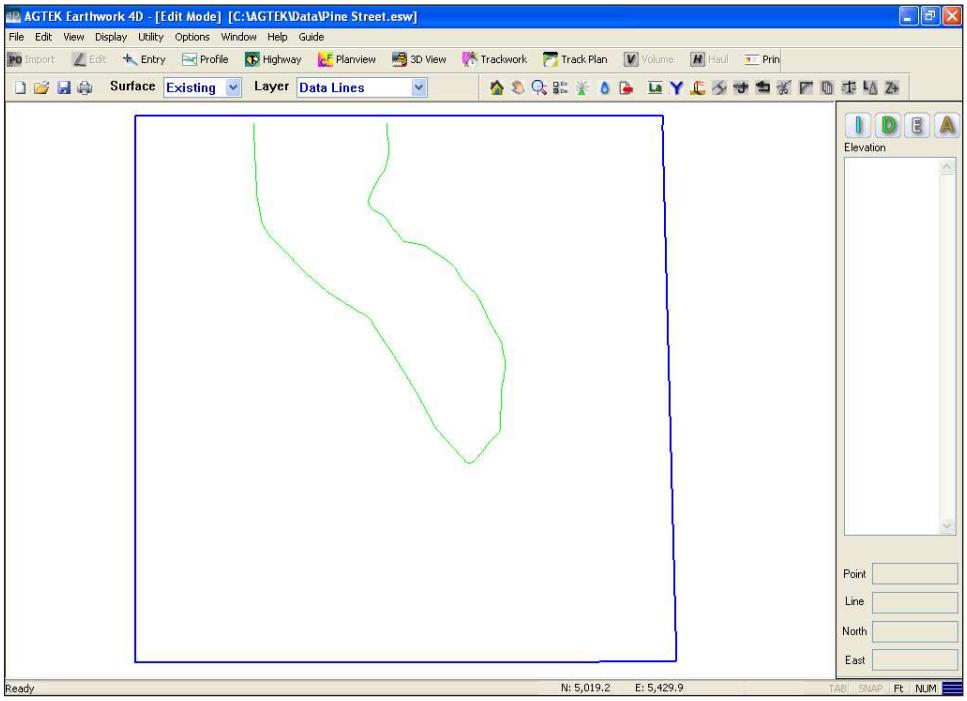
2. Type in "253" on the 16-button cursor then move the cursor crosshairs over the beginning of the contour, and press the **Enter** button. The status bar at the bottom of the screen displays the entered elevation and coordinates. The program creates the first point and connects the cursor to the point by a rubber band line.

3. Move the cursor along the contour, and press the **Enter** button at the end of each straight section.

The more points you enter while digitzing a curve, the smoother and more accurate the data will be.

4 Press the **Enter** button several times while moving the cursor around the radius of curves.

5. Press the **Blank** button to end the line at the end of the contour. Your screen should look similar to the illustration below.

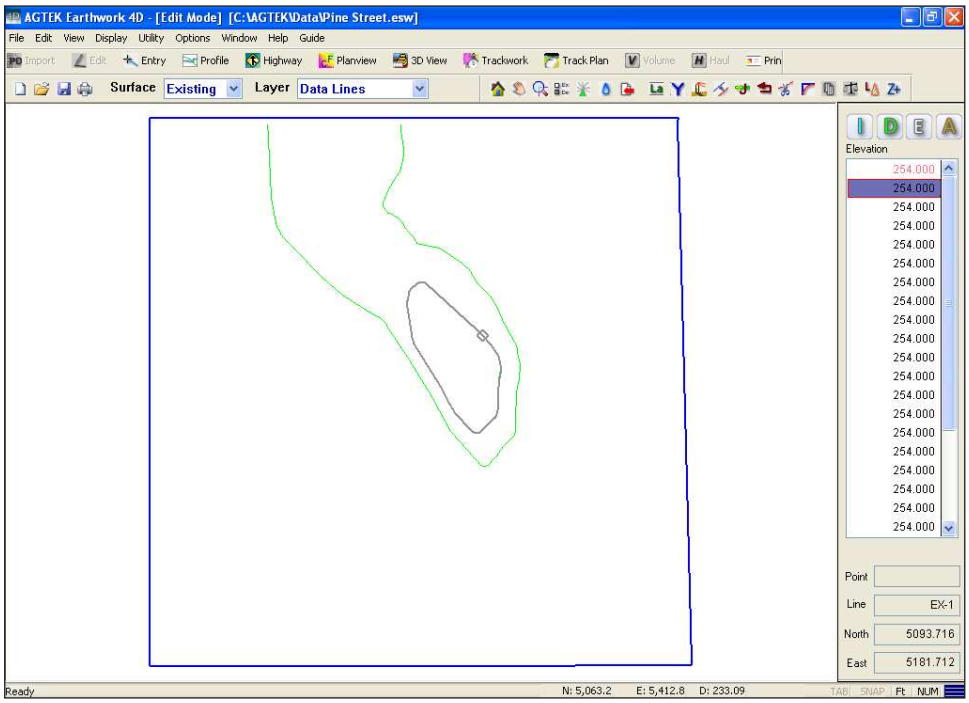


Enter Closed Contours

Closed contours are entered differently than typical contours. We'll use the 254 closed area inside the contour just digitized in this example.

1. Type in "254" on the 16-button cursor, and then move the crosshairs over the contour and press the **Enter** button.

2. Digitize the contour, pressing the **Enter** button at the end of each straight section, and pressing the **Enter** button several times while moving the cursor around the radius of curves. Your screen should look similar to the illustration below.



3. Move the crosshair close to the starting point, and press the **SP** button to snap to that point and close the contour.

4. Press the **Blank** button to end the line.

Auto Increment Elevation Entry

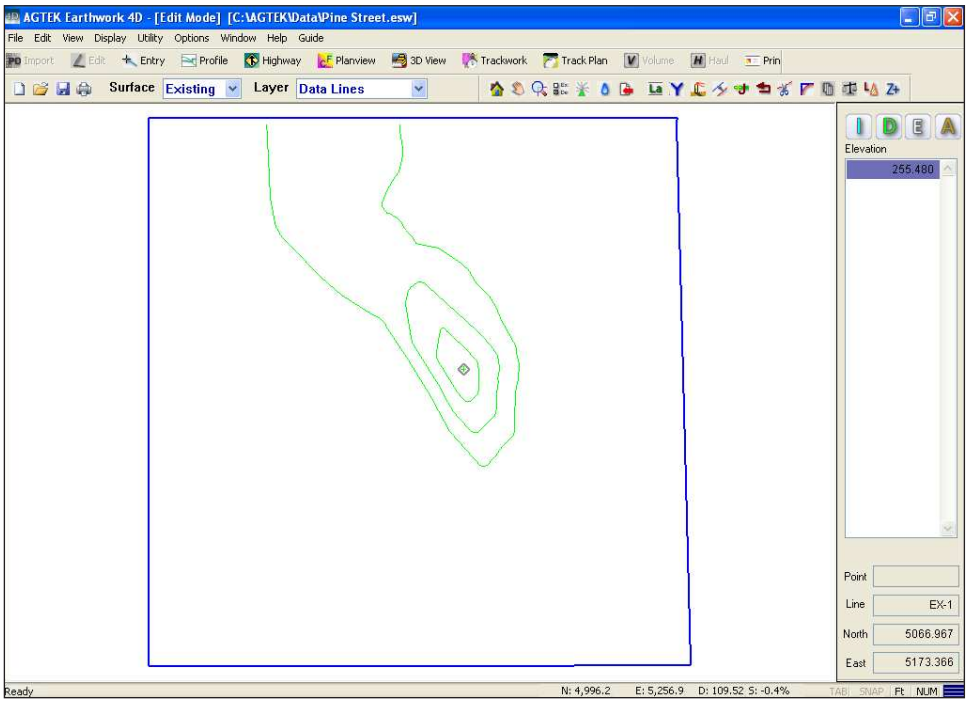
The auto increment function assists in entering elevations. As sequential elevations are entered, Sitework 4D anticipates the next elevation and fills it in automatically. As often as possible you should enter the contours sequentially by elevation to take advantage of this feature.

- Enter the 255 closed contour inside the 254 elevation using the auto increment function, and steps 2 through 4 above.

Enter Spot Elevations

There are several spot elevations in the existing ground. We'll use one inside the 255 contour just digitized in this example.

1. Type in "255.48" on the cursor then move the cursor crosshairs over the elevation inside the contour and press the **Enter** button.
2. Press the **Blank** button to end the spot elevation entry. Your screen should look similar to the illustration below.



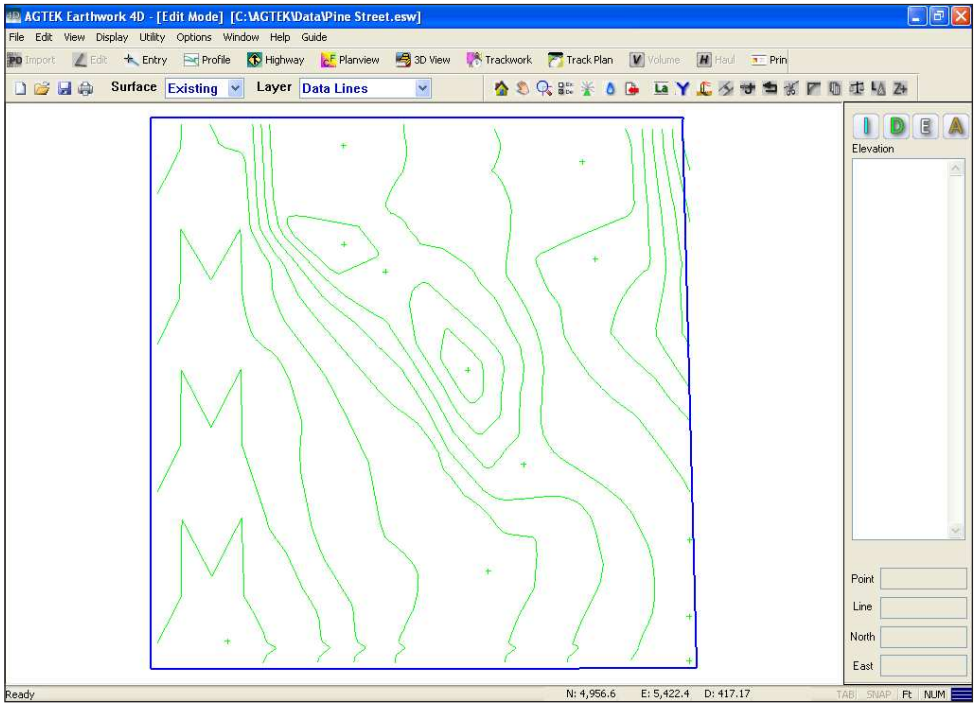
Enter Remaining Elevations

Use the previous techniques to enter the remaining existing elevations from the Pine Street plan sheet.

Enter Ridges and Swales

Ridges and swales can be entered to increase the accuracy of the ground model. This grading plan includes an existing street (Gregory Lane) represented as contours on the left side of the plan sheet. The chevron pattern of the contours do not model the curb line very well and leaves out the sharp edge of curb and crown slope. To optimize the 3D model we should snap elevation lines at the crown and sides of the existing street. This improves the model of the original ground.

1. Switch to Entry mode, and place the 16-button cursor near the center crown tip of the 247 street contour, then press the **SP** button to snap to this point.
2. Move the crosshairs to the 248 street contour crown, and press the **SP** button again.
3. Continue up the street snapping to the other center-line points on the contours.
4. Press the **Blank** button to close the line.
5. Snap a few other lines along the curb on either side of the existing street. This should give it more definition for a better ground model.
6. Press the **Blank** button to display the Right Mouse menu, and select Edit Mode to end line entry. Your screen should look similar to the illustration below.



Edit Existing Ground

After you've entered the existing ground, you should take some time to edit the data to ensure it is as accurate as possible. Essentially, all of the existing ground is made up of lines or points. This section shows how to edit lines and points. Editing is typically done in Edit mode with the mouse instead of the 16-button cursor.

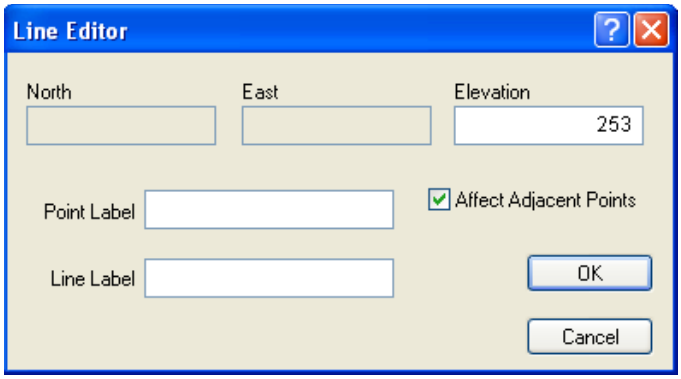
Undo

If at any time you make a mistake, Sitework 4D has the added feature of Undo. To access this command, press **Ctrl + Z** or select **Edit > Undo**. Up to the last 8 commands can be reversed. Undo works in both Edit and Entry mode.

Editing a Line

The Line Editor is used to make changes that affect every point on the line. The Line Editor allows you to change the Elevation, Point Labels, and the Line Label for the selected line. A description of the fields is below.

- To open the Line Editor, double-click on a line, or select a line, right-click to display the Right-Mouse menu, and select **Line Editor**.



Elevation	Changes all points on the selected line to one constant elevation.
Point Label	Assigns all the points on the selected line the same point label.
Line	Assigns a label to the line. This label is independent of any point labels already assigned.
Affect Adjacent Points	This causes any line attached to the currently selected line to also be modified at the point where they connect.

Deleting a Line

To delete a line, select it then select **Edit > Delete** or press the **Delete** key. Multiple lines can be deleted by selecting each line using Shift + click before deleting them.

Breaking a Line

Sometimes only part of a line needs to be edited. To do this you first have to break the line, then edit the new line as needed. To break a line:

- Click on a point on a line and press **Ctrl + X** or select **Edit > Break Line.**

or

- Place the cursor over the point at which you want to break the line and press the **F5** key. The line breaks at the location of the cursor and a point is inserted at the break points on each line segment.

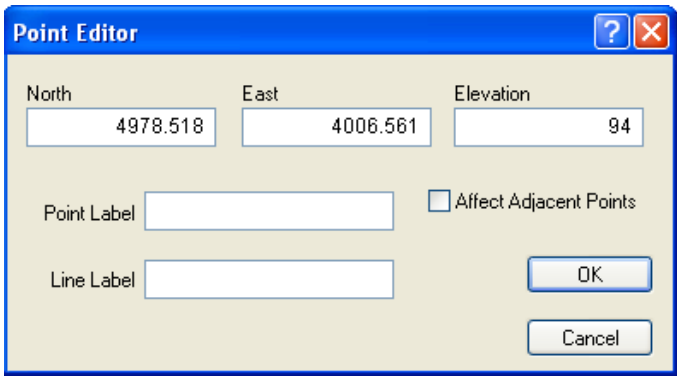
Editing a Point

Individual points are edited using the Point Editor. The Point Editor allows you to change the North, East, and Elevation of the point as well as the Point Label and Line Label for the selected point. Sitework 4D has five point types, color-coded by type. The point types are:

- **Interpolated** points (light blue) derive their elevation from the slope between the Entered elevations that surround them. If the elevation of the points that are used for interpolation are edited, the interpolated point elevation is recalculated as well.
- **Daylight** points (green) are assigned elevation from the Existing surface.
- **Entered** points (white) are points with user-assigned elevations, through editing or entry. These points do not change elevation unless the user specifically changes them.
- **Snapped** points (red) are created when a point on a data line is snapped (F6 or F8) to another existing data line. These become Entered points after the job is saved and reopened.
- **Annotation** points (brown) are not used by the program to create the 3D surface. The presence of an Annotation point on a line changes all points on the line to Annotation. Lines transferred through the CAD transfer with an elevation of zero are automatically assigned as Annotation.

To open the Point Editor:

- Select a point, then right-click and select **Point Editor** from the Right Mouse Menu.

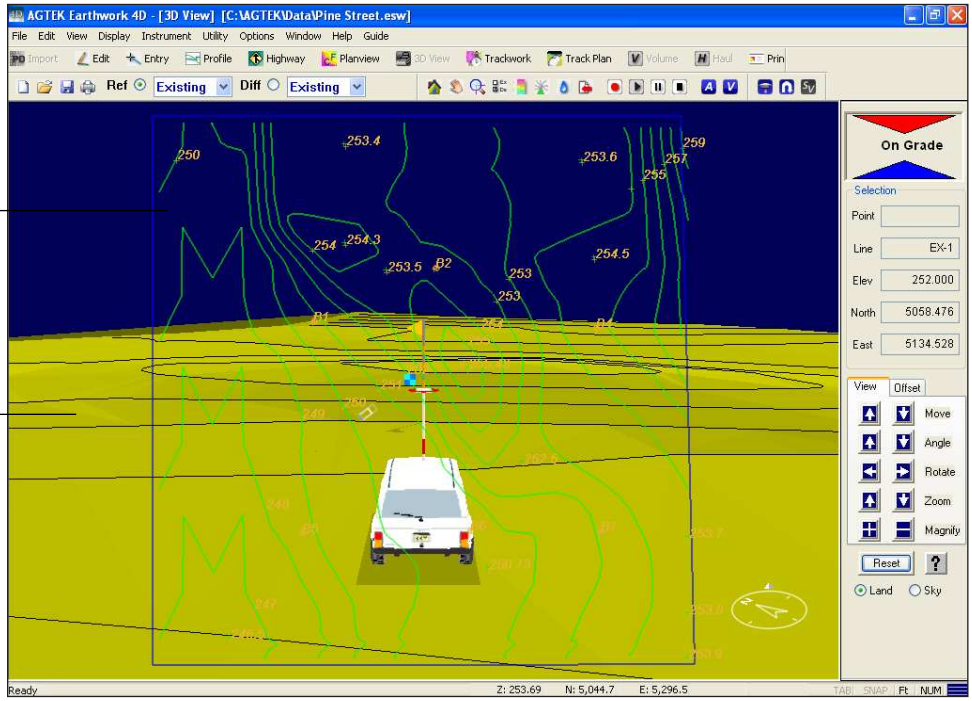


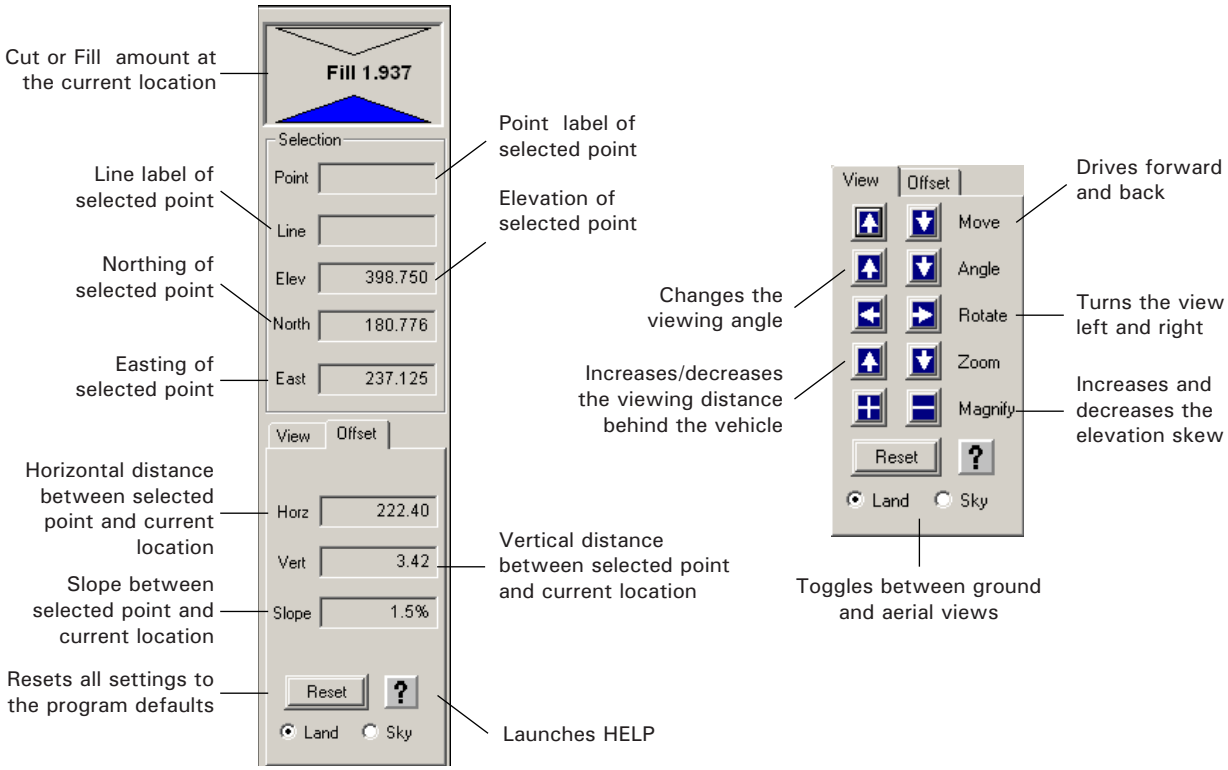
North	The northing coordinate for the point.
East	The Easting coordinate for the point.
Elevation	Changes the selected point's elevation.
Point Label	Assigns the point label to the selected point.
Line	Assigns a label to the line the point is part of. This label is independent of any point labels already assigned.
Affect Adjacent Points	This causes any line attached to the currently selected point to also be modified at the point where they connect.

Inspect the Existing Ground

Now that all the existing ground data has been digitized and edited, you can visually inspect the site in 3D. To view the existing ground in 3D:

- Press the **V** key, or click the 3D View button on the tool bar. If the 3D view does not appear, press **T** key to toggle the display of the terrain.





Fix Bad Elevations

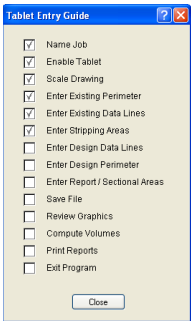
Use the Arrow keys or the 3D Controls on the right side of the window to move the vehicle around the site while looking for bad elevations. A bad elevation usually appears as a spike up or down on the 3D terrain. To fix a bad elevation:

1. Select the bad elevation in the 2D Overlay or move the vehicle to the location.
2. Switch to Edit Mode, and press the **T** key to turn on the terrain to see the bad elevation in 3D.
3. Select the bad elevation (if not selected). The elevation is highlighted in the Elevation list on the right side of the window.
4. Double-click the elevation in the list to open the Point Editor, and make necessary modifications.
5. Switch back to 3D View mode to find and fix other bad elevations.

Having the terrain visible allows you to see how any changes affect the 3D model instantly.

Enter Stripping Areas

Stripping areas are used to remove a constant depth from the existing ground to reflect vegetation and topsoil removal. Stripping areas are entered in the Existing surface in the Stripping Areas layer. On this site we'll strip .5 feet from the back of the existing sidewalk over the remainder of the site. Stripping areas are not cumulative, so putting a stripping area within an existing stripping area does not add the depths together.

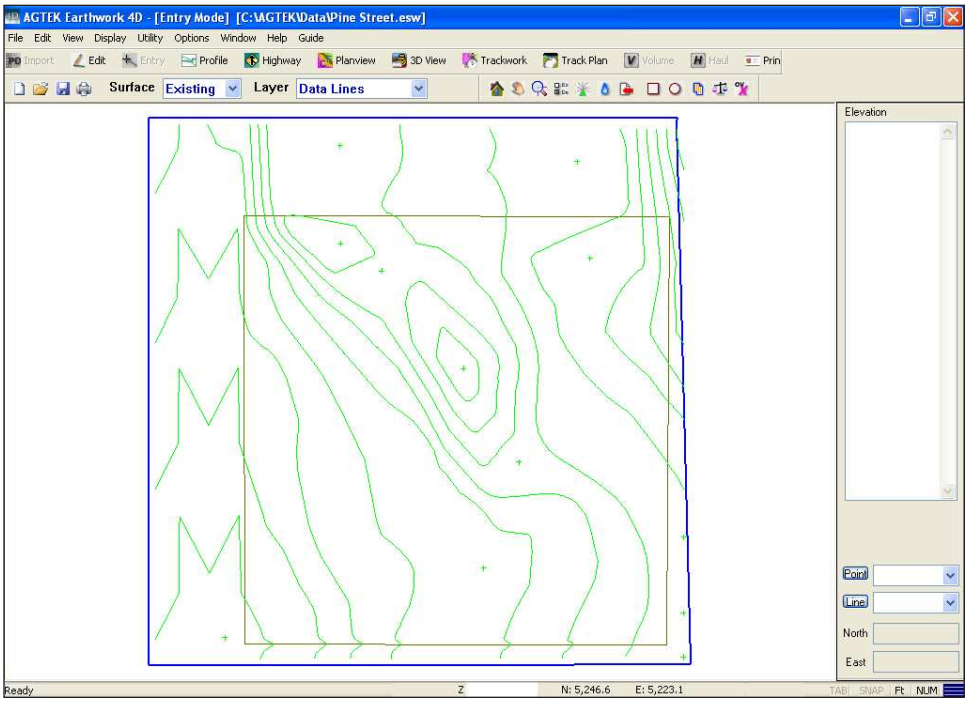


1. Switch to Entry mode and select Existing from the Surface pulldown and Stripping Areas from the Layer pulldown, or Select **Guide > Tablet** and choose **Enter Stripping Areas**, and the Stripping Areas dialog box displays.

2. Enter "Stripping 1" for the Area Name and ".5" for the stripping depth. Click **OK**.
3. Move you cursor to where the sidewalk for Gregory Lane intersects with the property line behind Lot 1.
4. Move the cursor up to where the sidewalk for Gregory Lane intersects with the property line behind Lot 4 and push the **Enter** button.

5. Continue to the right and push the **Enter** button at the point labeled with a Northing and Easting at the top-right of the job.

6. Continue down to the next point labeled with a Northing and Easting, and push the **Enter** button.



6. Press the **Blank** key to end the entry and snap the Stripping Area closed.

Editing Stripping Areas

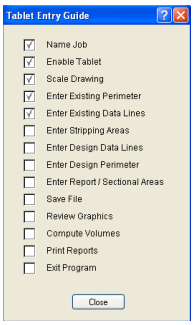
Editing the stripping area is just like editing any line or point on a line. To edit the entire area, use the Line Editor. To edit points on the stripping area, including moving the point to modify the shape of the area, use the Point Editor. See “Edit Existing Ground” on page 7-14 and “Editing a Point” on page 7-15 for more information.

Lesson 2 – Enter The Proposed Design

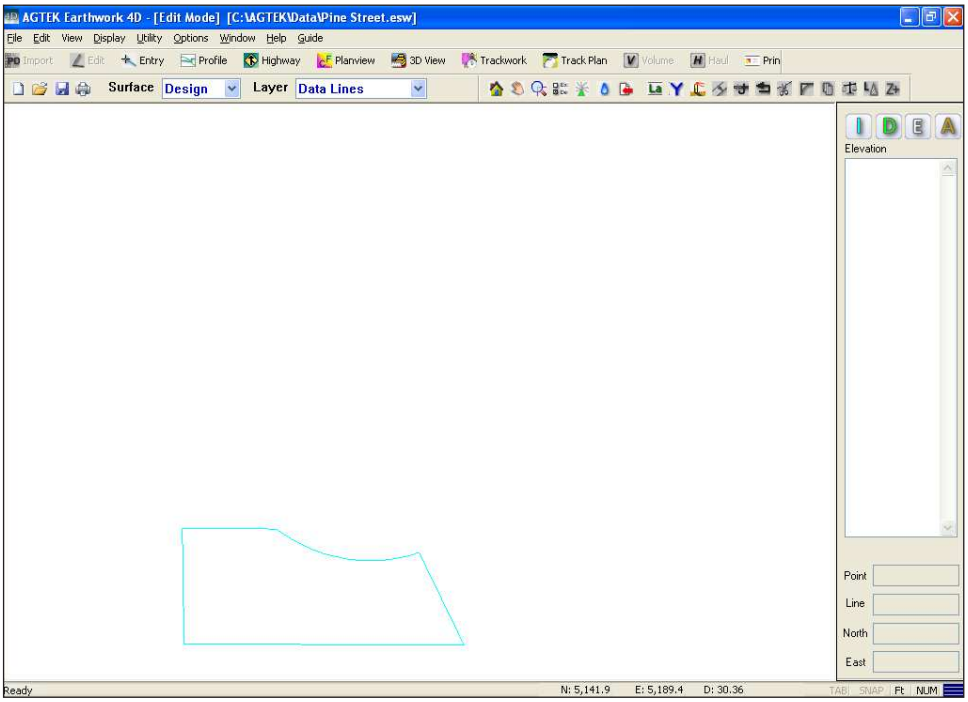
The next step is to enter the proposed design lines. All proposed design lines are entered in the Design surface. Like the previous sections, this section demonstrates how to enter lots, streets, retaining walls, and curbs, but does not cover entering all data from the plan sheet.

Enter Lots

There are four lots on Pine Street, but we'll enter lot on the bottom left as a demonstration.



1. Switch to Entry Mode and select Design from the Surface pulldown and Data Lines from the Layer pulldown, or press the **G** key and select **Enter Design Data Lines** from the Tablet Entry Guide.
2. Type in "251.0" on the 16-button cursor, then move the crosshairs over the lower left corner of lot 1 and press the **Enter** button. The status bar at the bottom of the screen displays the entered elevation and coordinates. The program creates the first point and connects the cursor to the point by a rubber band line.
3. Move the cursor along the lot and press the **Enter** button at the end of each straight section.
4. Press the **Enter** button several times while moving the cursor around the radius of curves.
5. Press the **SP** button to snap to the first point and close the lot. Press the **Blank** button to end the line.

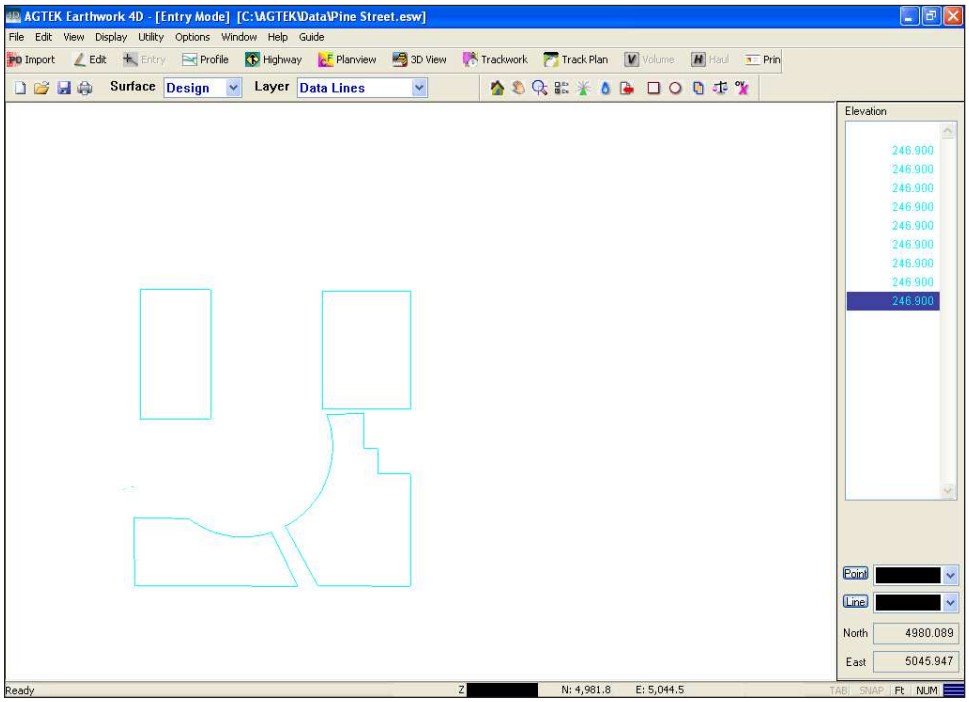


6. Enter the remaining lots to practice the technique.

Enter the Street

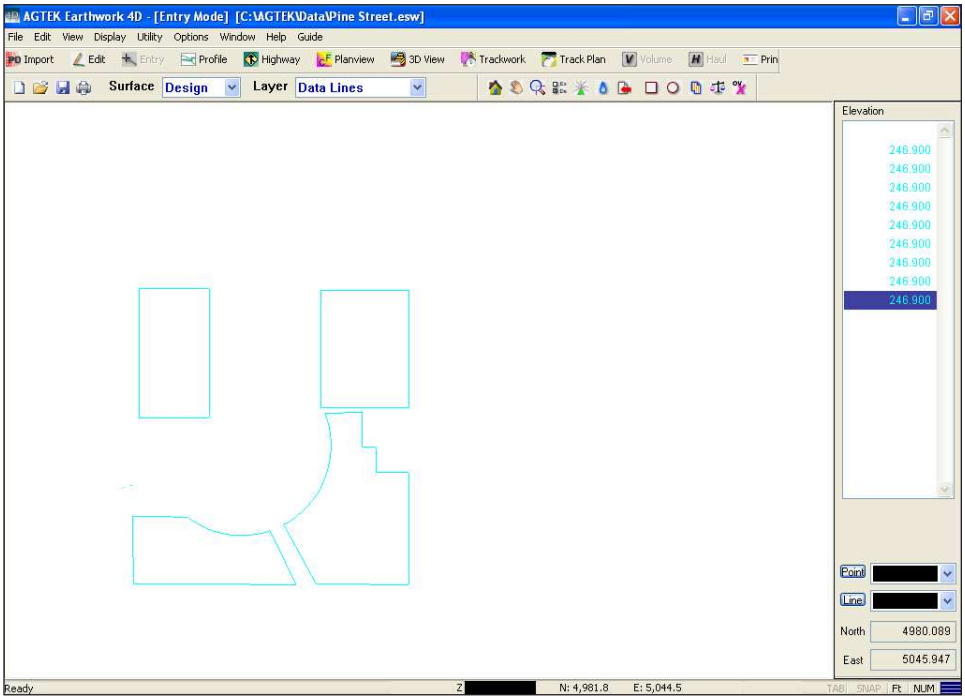
The street will be built to subgrade, and the street, curb/gutter, and sidewalk will be built using offset lines. To do that, we must digitize a reference line with elevations to use for offset line creation. The reference line we will use is the top of curb line.

1. Type in "246.9" on the 16 button cursor, then move the crosshairs to the left of Lot 1 where the proposed street meets Gregory Lane, and press the **Enter** button.
2. Press the **Enter** button several times while moving the cursor around the radius of the curve until you reach the next assigned elevation.



3. Type in "247.9" on the cursor then press the **Enter** button to enter that point.
4. Continue typing in elevations and pressing the **Enter** button along the length of the curb to enter points.
5. Press the **Blank** button to end the line.
6. Type in "247.8" on the cursor, then move the cursor crosshairs to the other side of the street at Gregory Lane, and press the **Enter** button.
7. Continue typing in elevations, and pressing the **Enter** button along the length of the curb to enter points.

8. Press the **Blank** button to end the line. Your screen should look similar to the illustration below.

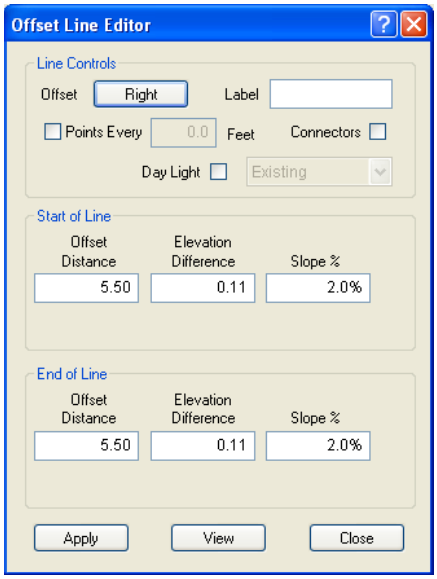


Create the Sidewalk using Offset Lines

The sidewalk needs to be entered. The top of curb line will be used as the reference for creating this line using the Offset Line Editor.

Offset Line Editor

The Offset Line Editor is a powerful tool for creating lines based on numeric distances from a reference line. The following page has explanations of the features of the Offset Line Editor.



Line Controls

Offset The Offset button 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 daylight. Checking this option adds Cut and Fill slope text boxes to the Start and End of line areas.

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 specified as a percentage.

Confirmation Controls

Apply Creates an offset line based upon 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 end of the line indicating the first point when the line was drawn. 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.

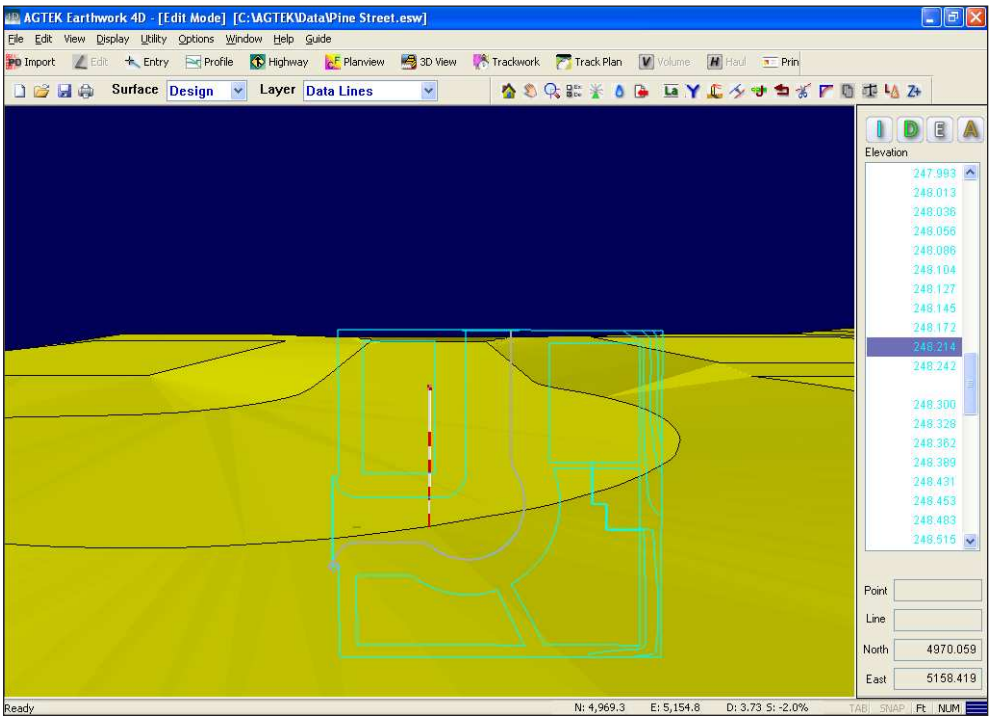
Other Offset Features

The Offset Editor can offset multiple selected lines. This relies on the line direction being constant between the lines. The **Utility > Swap Ends** command changes line direction.

Because we started the lines at Gregory Lane when we digitized the top of curb lines, both start on the left side of the job. For this example, we need to change the direction of one of the lines so that we can enter the offsets for both lines simultaneously.

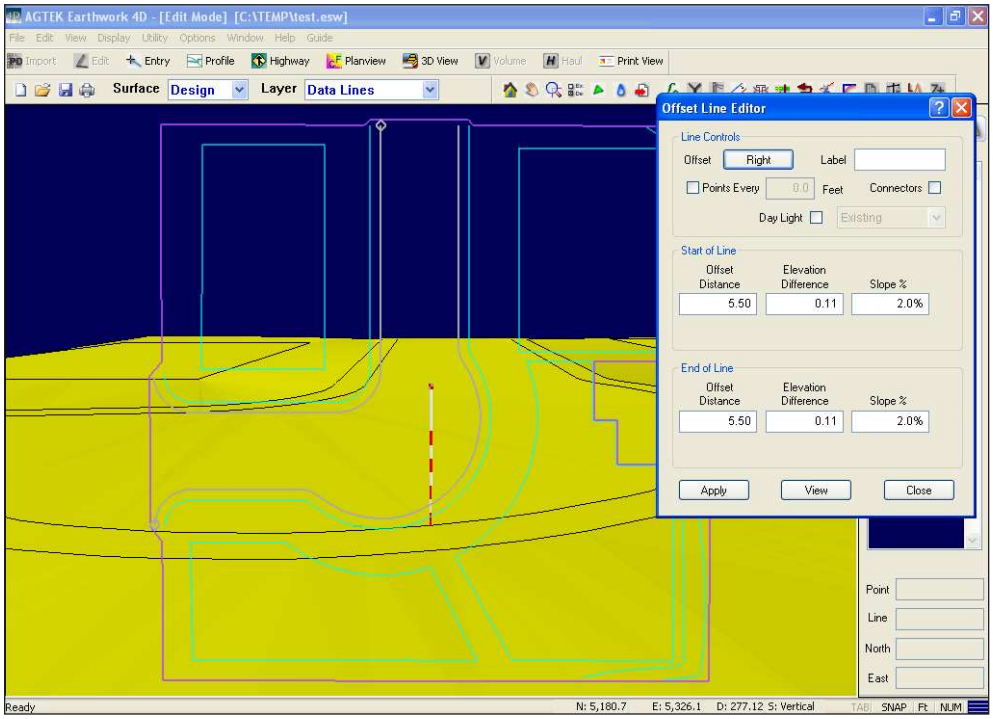
1. Switch to Edit mode, and click on the top of curb reference line nearest Lot 4.

2. Click the **Swap Ends** button to change the direction of the line. The diamond should now be at the opposite end of the line.
3. Shift + click on the other top of curb reference line so that both lines are selected.
4. Press the **T** key to toggle on the terrain display. Your screen should look similar to the illustration below.



5. Click the Offset Line button or select **Utility > Offset Line** to open the Offset Line Editor.

6. Set the offset to Right, type “5.5” as the Offset Distance and “2” as the Slope, then click the **View** button to see the line displayed. If it looks to be in the right place, click **Apply** to add the line. After applied, your screen should look like the illustration below.



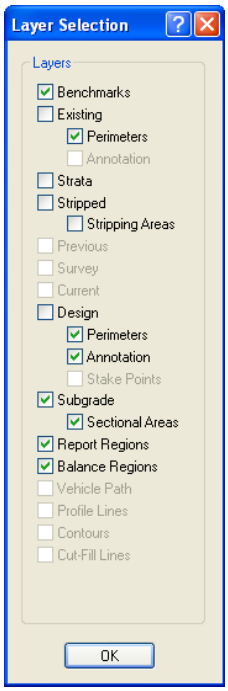
7. Click the **Close** button to close the Offset Line Editor.

Adding the Design Contours and a Retaining Wall

The only proposed ground left to enter is the retaining wall and the design contours at the back of lots 2 and 3. Most of the contours tie into the existing ground so it is helpful to see the existing ground during design entry.

1. Click the **Layer Selection** button. The Layer Selection window is displayed. In this case, we want to make the existing contour lines visible so we can tie the design contours into them.

2. Select the Existing box, and click **OK**. The existing contour lines now display with the design lines.



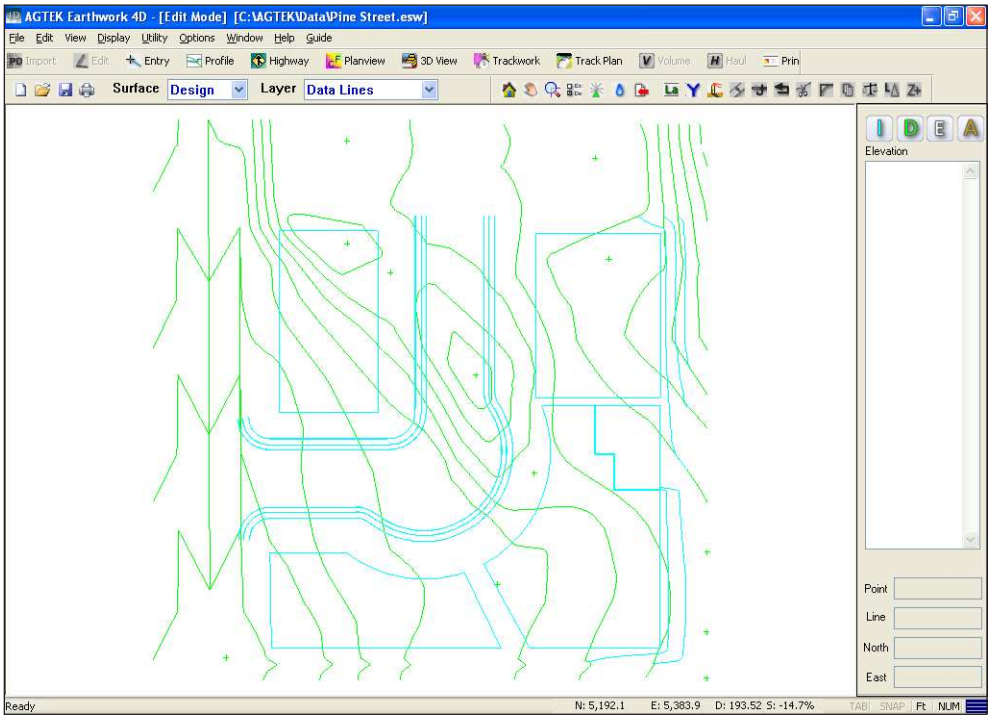
3. Switch to Entry Mode.

4. Place the 16-button cursor over the 252 design contour behind Lot 2 where it connects to the existing contour, and press the **F6** key. This inserts a point on the existing contour, and snaps to that location. Move to the 253 existing contour and press **F6** to insert a point, and snap to that contour.

5. Continue digitizing the contour, pressing the **F6** key only to snap to a place on a line where there is no point. If there is a point on the line available, use the **F8** key to snap to the existing point.

6. Enter the remaining design contours behind Lots 2 and 3 using the method above. When complete, your job site should look similar to the illustration on the next page.

7. Zoom in to the location of the retaining wall. Type in “253.5” for the top of the wall, and enter points along the wall’s length. Make sure you zoom in far enough that you don’t overlap the retaining wall line with the design line for Lot 2.



For this example, we do not put in the bottom of the retaining wall, because the bottom of the retaining wall is at the same elevation as the building pad. It is not necessary to enter the bottom of the wall in this example. For future retaining walls, use an offset line set at 0.1 to the down-sloping side of the wall.

8. Press the **Blank** button to end data entry.

Editing Design Data Lines

Editing design lines is the same as editing the existing ground. See “Editing Existing Ground” on page 7-14 for additional information.

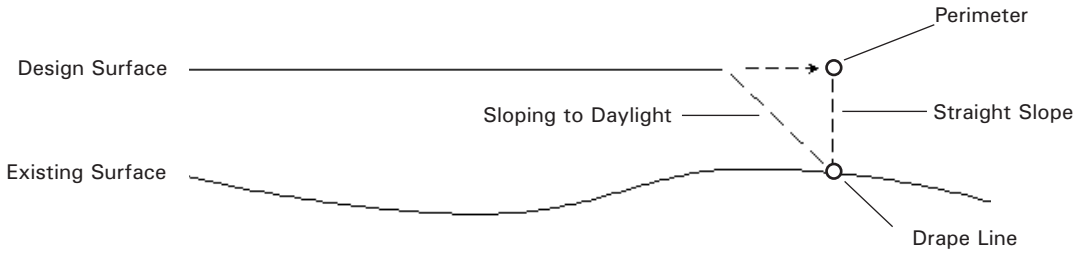
Enter the Design Perimeter

The Design Perimeter controls the limits of excavation. Any data outside of the Design Perimeter area is not calculated and is not included as part of the total volume. Any area that does not have a Report Region assigned to it will be a part of the Perimeter Proposed on the volumes report. The Design Perimeter is entered in the Design Perimeter layer.

The Design Perimeter has no elevation when entered but calculates the elevation of the Existing Ground along its length. The Design Perimeter conforms to the Existing Ground and adds a data line, known as a Drape Line, to the Proposed Design at daylight.

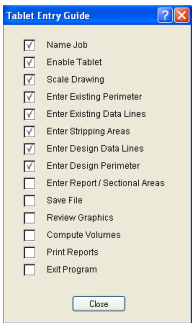
Drape Lines

For most situations the Design Perimeter should be entered with a Drape Line. A Drape Line ties the edges of the job to daylight at the perimeter of the job. For example, you may not want a drape line if you are doing a takeoff from multiple sheets with perimeters around each sheet to calculate volumes but not needed to slope to daylight.

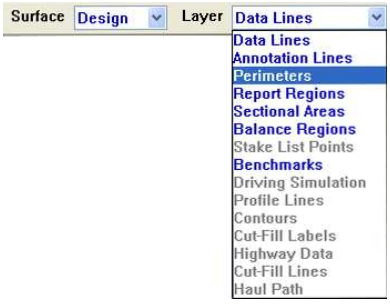


In the illustration above, you can see how the design data slopes differently when there is a drape line. With a drape line, the design slopes to daylight at the design perimeter. When there is no drape line, the design continues its current slope until it reaches the perimeter and then slopes straight to daylight.

Enter the Design Perimeter



1. Switch to Entry Mode and select **Design** from the Surface pulldown and **Perimeters** from the Layer pulldown, or press the **G** key and select **Enter Design Perimeter** from the Tablet Entry guide.

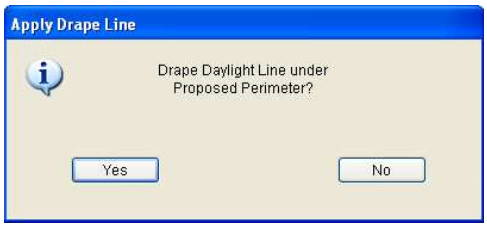


2. Place the 16-button cursor at the lower right corner of the plan sheet and press the **SP** button twice to snap to the Stripping Area that should be displayed on the screen. If it is not displayed, select **View > Show All** and make sure that Stripping Areas is checked in the Layer Selection dialog box.

3. Snap to the remaining corners of the Stripping Area. You may want to extend the perimeter beyond the street so that the associated daylight line does not cause the street to slope to daylight.

4. Press the **Blank** button to close the region. Press the **Blank** button again to end data entry. The Apply Drape Line dialog box is displayed.

5. Click **Yes** to apply a drape line.



Entering a Hole in the Design Perimeter

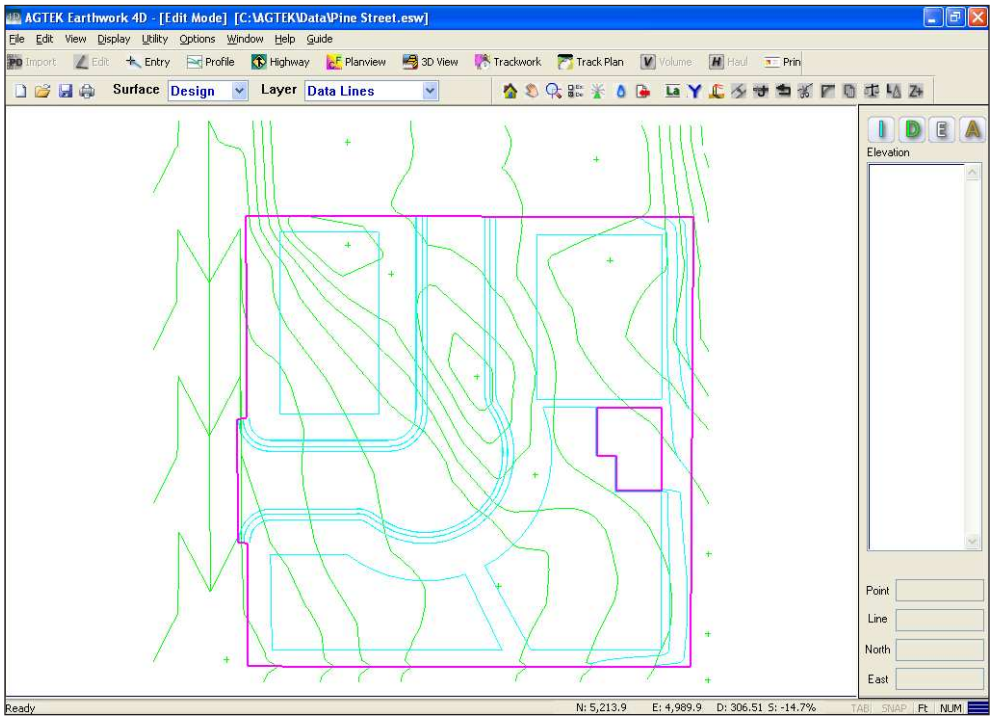
A hole in the Design Perimeter is entered as a perimeter within the Design Perimeter and is excluded from volume calculation. A hole in the design perimeter also places holes in the stripping areas, report regions and sectional areas. The opposite is true for a perimeter entered outside the Design Perimeter. This acts as an island and becomes a part of the volume calculation of the Design Perimeter. The undisturbed area behind Lot 2 will be entered as a hole in the Design Perimeter.

1. Make sure that the Design Surface and Perimeters Layer are selected from the pulldown menus, and zoom into the area behind Lot 2.

2. Press the **Enter** button at each of the corners of the hole to create the hole.

3. Press the **Blank** button twice to close the area, and end data entry. The Apply Drape Line dialog box is displayed.

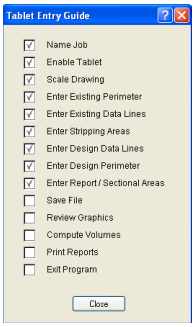
4. Click **Yes** to apply a drape line. Your screen should look like the illustration below.



Create Report Regions/Deduct Sectional Areas

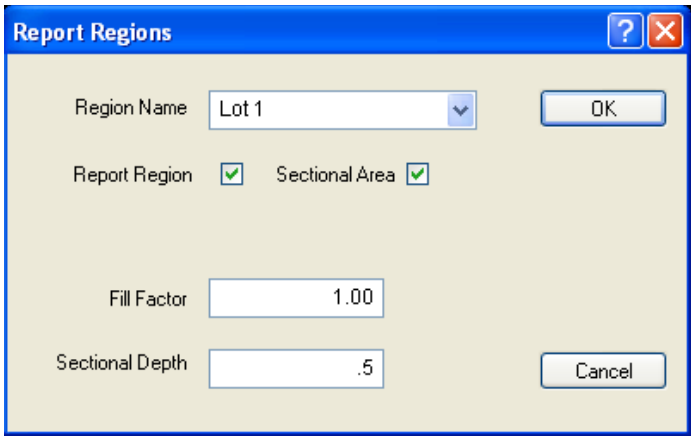
Sitework 4D uses Report Regions to break up areas for individual calculation on the volume report. These are created by entering a Report Region around the area. Sectional areas are regions that subtract their depth from the design grade elevations, as well as being broken up for individual calculation on the volume report.

1. Switch to Entry Mode.



2. Click the **Add Report Regions** button, or press the **G** key and select **Enter Report/Sectional Areas** from the Tablet Entry Guide. The Report Regions dialog box is displayed.

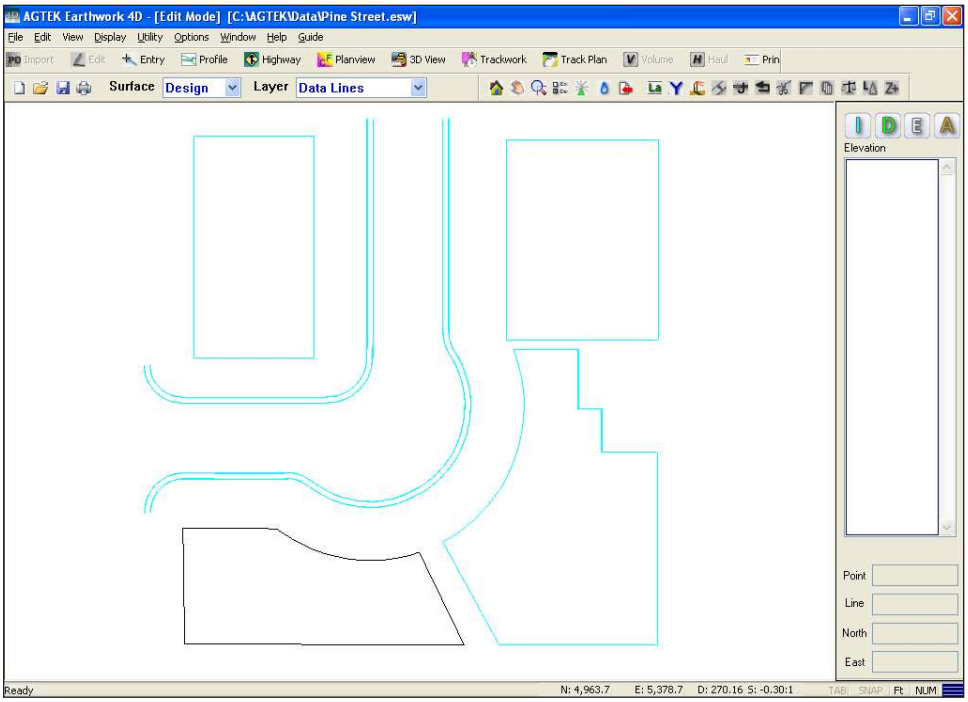
3. Type "Lot 1" in the Region Name. Check the Report Region box and uncheck the Sectional Area box. Type ".5" as the Sectional Depth. Click **OK**.



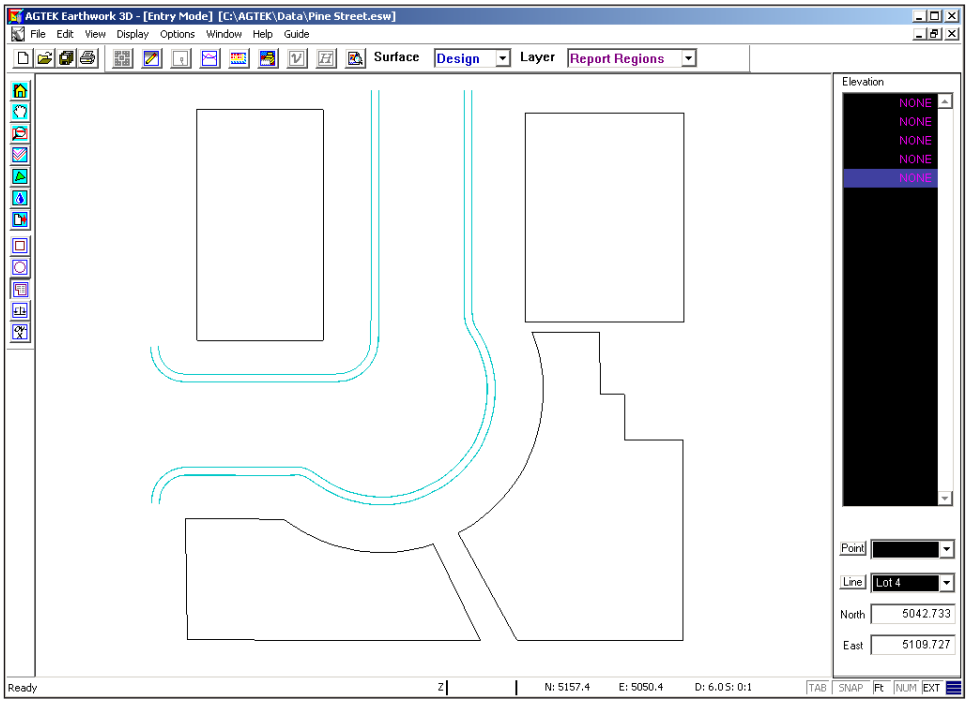
Sitework 4D auto-increments Report Region names when the name is followed by a space and a number, i.e., "Lot 1".

4. Place the cursor over the top left corner of Lot 1, and press the **F8** key twice then the Blank key to snap a report region around Lot 1.

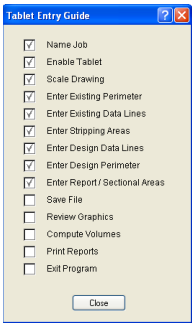
5. Repeat step 4 for lots 2-4 to digitize a region around each lot.



6. Press the **Blank** button again to end Report Region entry.



Entering the Street Sectional Area

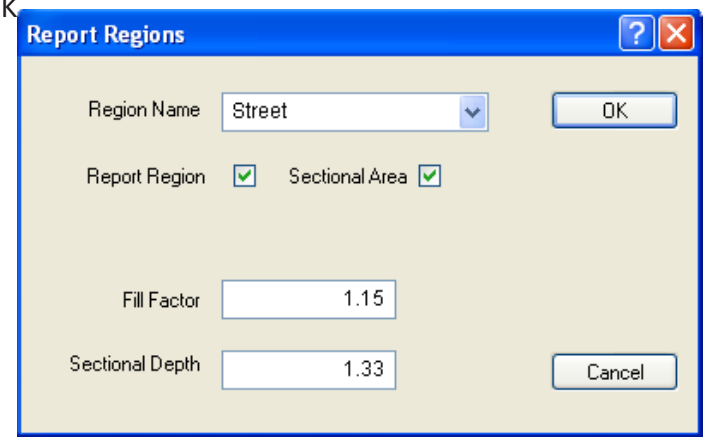


To drop the street to subgrade, we need to create a sectional depth.

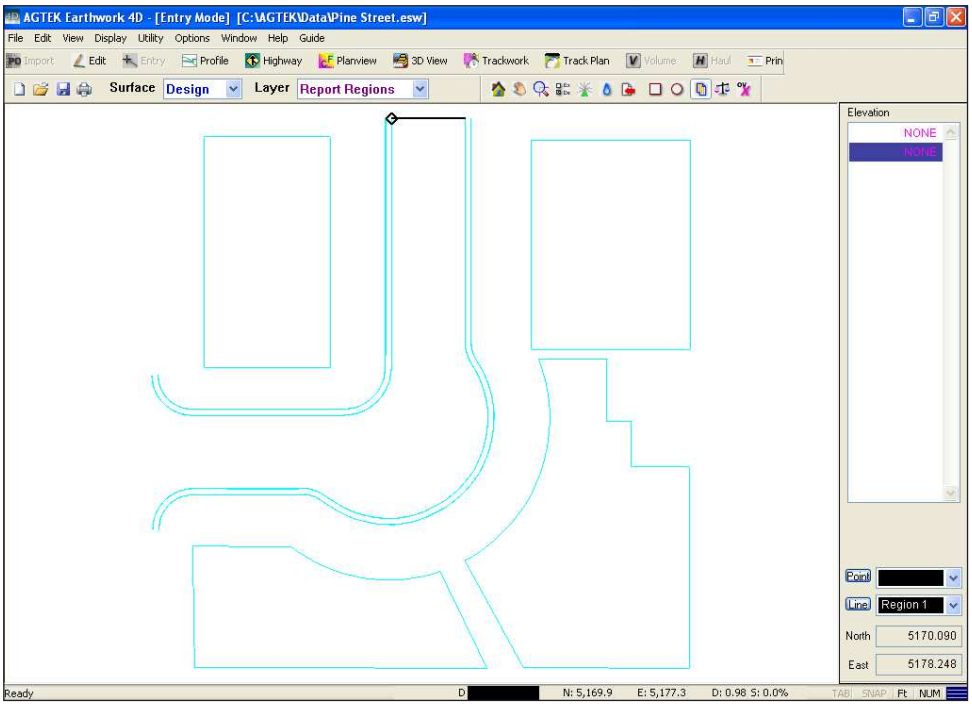
1. Switch to Entry Mode.

2. Click the **Add Report Regions** button, or press the **G** key, and select **Enter Report Regions/Sectional Areas** from the Tablet Entry Guide. The Report Regions dialog box is displayed.

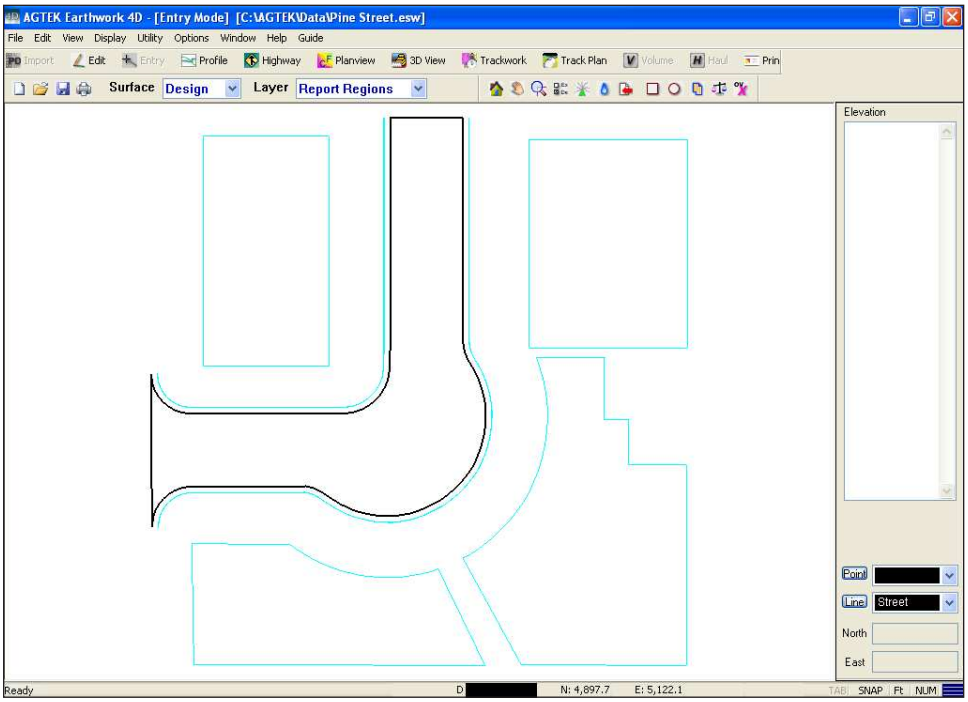
3. Type “Street” in the Region Name. Check the Report Region box and the Sectional Area box. Enter “1.15” in the Fill Factor box and “1.33” in the Sectional Depth box. Click OK.



4. Place the cursor over the beginning of the top of curb line near Lot 4.



5. Using the **F8** key and line snap, digitize a region around the street. Use the other top of curb line for the other side of the street and connect the lines at the openings.

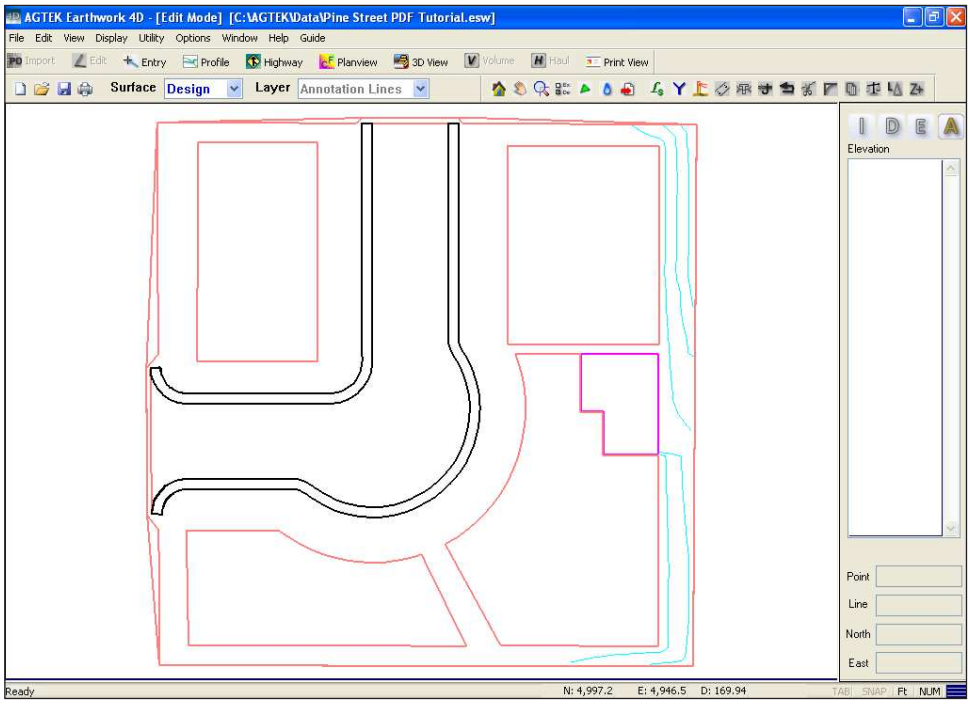


6. Press the **Blank** button to end the entry and close the Sectional.

Entering the Sidewalk Sectional Areas

To drop the sidewalks to subgrade, we need to create a sectional similar to he street section created previously.

1. Click the **Add Report Regions** button, or press the **G** key, and select **Enter Report Regions/Sectional Areas** from the Tablet Entry Guide. The Report Regions dialog box is displayed
2. Type “Sidewalk 1” in the Region Name box. Check the Report Region box and the Sectional Area box. Enter “1.15” in the fill factor box and “0.330” in the Section Depth box.
3. Place the cursor over the beginning of the top back or walk line near Lot 4.
4. Using the **F8** key and line snap, digitize a region around the left sidewalk between the back of walk line and the top of curb line.
5. Press the **Blank** button to end the entry and close the sectional.
6. Repeat the above process for the sidewalk on the other side of the street, using “Sidewalk 2” for the name.



Lesson 3 – Calculating Volumes

The creation of 3D surfaces allows comparison of the surfaces for volumes. This lesson shows how to verify the job with the 3D view and specify the area to calculate and generate the volumes.

Visual Verification with the 3D View Window

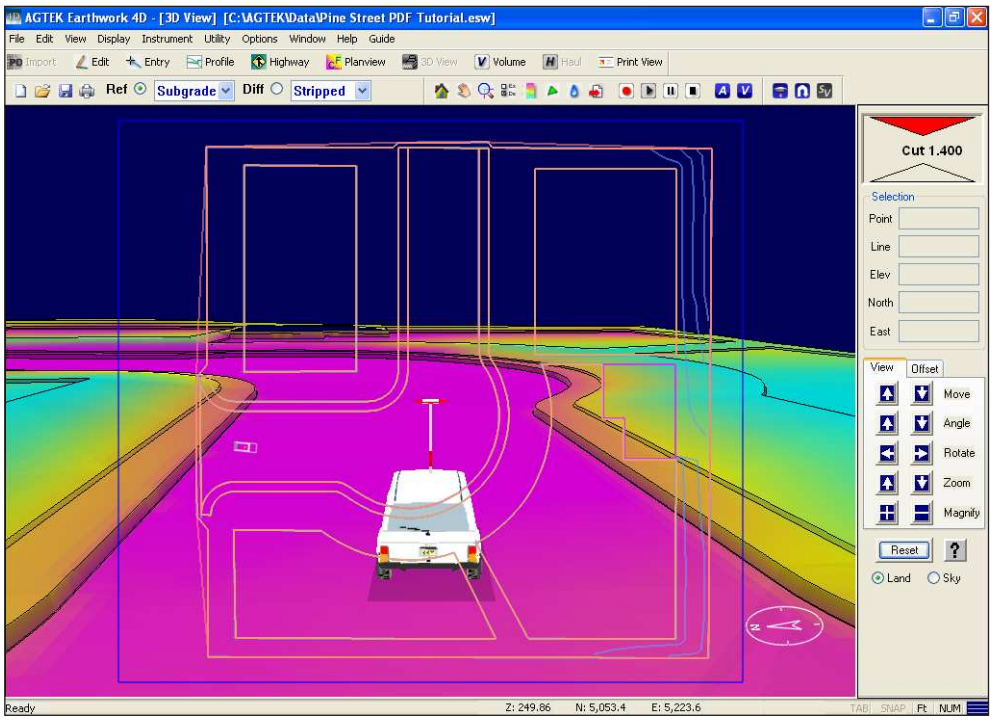
Sitework 4D can display the 3D terrain as it is entered in the Edit window. The 3D View Window adds greater flexibility to viewing and verifying the 3D surfaces.

While we were editing, the 3D Terrain showed how the program interpreted the data lines to form the surfaces. The 3D Window is a much more flexible version of the 3D Terrain which allows greater control over the view.

Press the 3D View icon on the tool bar or choose **Window > 3D View**. The 3D window calculates the cut/fill colors and surfaces before displaying.

Use the 3D controls to inspect the terrain for any errors and to see how the data we have entered displays on the job. Refer to “Inspect the Existing Ground” on page 7-17 for a description of this window and the 3D Controls. Note that the Ref and Diff surfaces can be changed to compare different surfaces on the 3D View.

Be sure the finished surface (the surface you are calculating to) is on the left, and the begining surface (the one you are calculating from) is on the right.



Driving

Driving the 3D View is the easiest way to double check your work and the surface quality. It also can display the Subgrade and Stripping surfaces and calculate volumes.

Use the Arrow keys on the keyboard to drive through the site. The Up and Down arrows move forward and back. The Right and Left arrows turn. For additional clarity you may want to turn the Overlay off by pressing the **O** key or by selecting **Display > Overlay**. The speed of the drive is based on the Arrow Rate setting which is located on the **Edit** menu. Each arrow key press has a distance that the Arrow Rate controls. The speed of your computer and video adaptor can also affect screen speed.

Try using the 3D controls to change the views and get a feel for what they do. Also try changing the Reference and Difference surfaces to see the different views and comparisons.

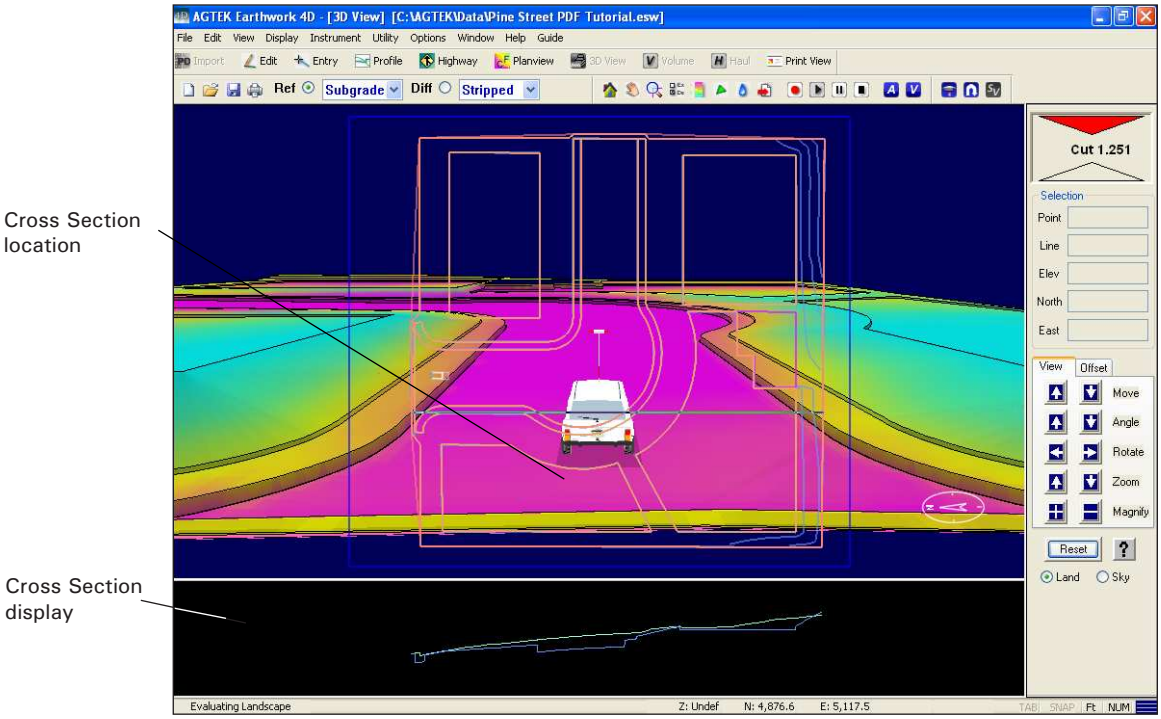
Calculate Volumes

1. Define the Volume Area. Click the **A** button on the Utility Tool Bar to create a bounding box around the entire job. This determines the limits of the volume calculation.

2. Specify the Surfaces. Before calculating the volumes verify that the correct surfaces are selected. For our example, set the Reference surface to Design and the Difference surface to Stripped.

3. Calculate the Volume. The Volume Calculation is started by clicking the Calc Volume button on the tool bar or by selecting **Utility > Calc Volume.**

During the 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** or aborted by pressing **Esc.** When paused, the **I** key on the keyboard will move across the site incrementally. Pressing the Spacebar again will resume the volume calculation.



When the calculation finishes, the Volume Calculation Results are displayed.

These numbers represent uncompacted cut and fill between the two surfaces. The Horizontal Area represents plan view areas with no slope adjustment and is broken down into Cut, Fill, and On-grade square footage. Slope Area represents a slope adjusted square footage. It is the total surface area, excluding vertical surfaces like the curb face. Press Done to close the dialog box. These volume numbers can be recalled by clicking the Volume Report button on the tool bar.

The Volume Report

Select **Window > Volume Report** or click on the Volume Report button to switch to the Volume Report.

The Volume Report displays area, volume, and depth for stripping and sectional areas. The total area, cut/fill, strata, and on grade volume for each report region and sectional area are displayed, if created. The report also displays the Cut-Fill volumes, compaction ratios and their impact on the volumes, import/export data, and volume change per 0.1 foot of elevation change, which is useful for balancing the site. The data in the volume report should be similar to the illustration below.

Job: Pine Street PDF Tutorial
Units: Ft-CY
Mon Mar 07, 2011 09:16:47 Page 1

Volume Report
Subgrade vs. Stripped

	Total	Area Cut	Area Fill	OnGrade	Volume Cut	Volume Fill	Comp/Ratio Cut	Comp/Ratio Fill	Compact Cut	Compact Fill	Export -Import	Change Per .1 Ft
Landscape	29,881	9,511	17,821	2,549	319	672	1.00	1.00	319	672	-353	111
Lot 1	7,358	0	7,358	0	0	498	1.00	1.00	0	498	-498	27
Lot 2	11,666	7,864	2,955	847	290	50	1.00	1.00	290	50	240	43
Lot 3	8,645	7,103	1,120	422	251	17	1.00	1.00	251	17	234	32
Lot 4	7,580	2,654	4,703	223	143	274	1.00	1.00	143	274	-131	28
Lot Sub:	**35,249**	**17,621**	**16,136**	**1,492**	**684**	**839**			**684**	**839**	**-155**	**130**
Sidewalk 1	2,038	1,946	0	92	105	0	1.00	1.00	105	0	105	8
Sidewalk 2	1,441	1,391	0	50	47	0	1.00	1.00	47	0	47	5
Sidewalk Sub:	**3,479**	**3,337**	**0**	**142**	**152**	**0**			**152**	**0**	**152**	**13**
Street	14,113	14,113	0	0	1,254	0	1.00	1.00	1,254	0	1,254	52
Regions Total	**82,722**	**44,582**	**33,957**	**4,183**	**2,409**	**1,511**			**2,409**	**1,511**	**898**	**306**

Stripping Qtys	Plane Area	Slope Area	Depth	Volume
Stripping	81,992	82,195	0.500	1,522

Sectional Qtys	Plane Area	Slope Area	Depth	Volume
Landscape	29,881	30,572	0.000	0
Lot 1	7,358	7,388	0.500	137
Lot 2	11,666	11,698	0.500	217
Lot 3	8,645	8,674	0.500	161
Lot 4	7,580	7,605	0.500	141
Lot Sub:	**35,249**	**35,365**		**656**
Sidewalk 1	2,038	2,057	0.330	25
Sidewalk 2	1,441	1,455	0.330	18
Sidewalk Sub:	**3,479**	**3,512**		**43**
Street	14,113	14,118	1.330	695
Sectional Total	**82,722**	**83,567**		**1,394**

Section 7

Vector PDF

Vector PDF Entry Overview

This tutorial illustrates how to digitize a job using the information found in a vector PDF. A vector PDF is one that contains line data from a CAD, or similar, file. A vector PDF can be identified by the color of the border when the image is imported into Sitework 4D; a green outline represents a vector PDF, while a red outline represents a standard raster PDF. Remember: green for go, red for no.

Data Entry Sequence

The following is the suggested data entry sequence when entering a takeoff using a PDF file.

Import and Scale PDF File

- Start a New Job
- Import the PDF
- Scale the Image
- Verify the Scale

Vectorizing and Transferring Data

- Vectorize PDF
- Transfer Existing Lines
- Transfer Design Lines

Assigning Elevations

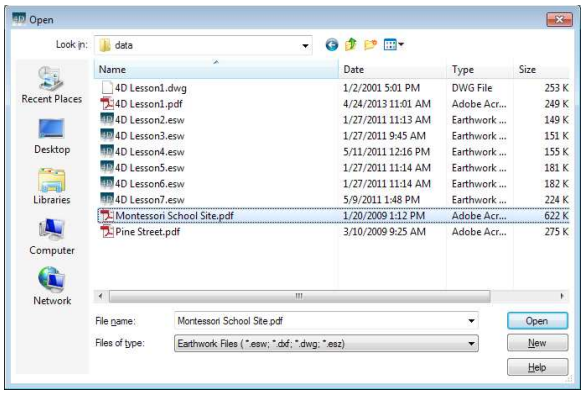
- Line Editor
- Increment Snap
- Elevation Snap

Lesson 1 - Importing and Scaling

This lesson covers the importing and scaling of a vector PDF. Training videos discussing vector PDFs can be found at http://www.agtek.com/trainingvideos.html. It is recommended to watch the training videos before beginning the tutorial.

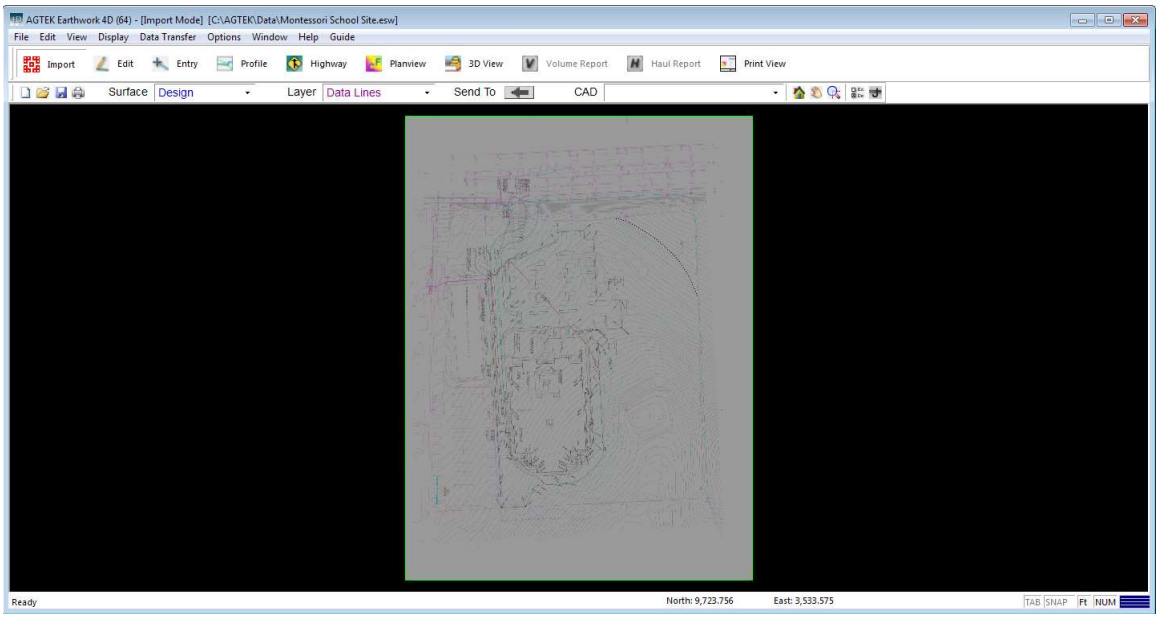
Start a New Job.

1. Double click the Sitework 4D shortcut on the desktop. The open dialog displays.

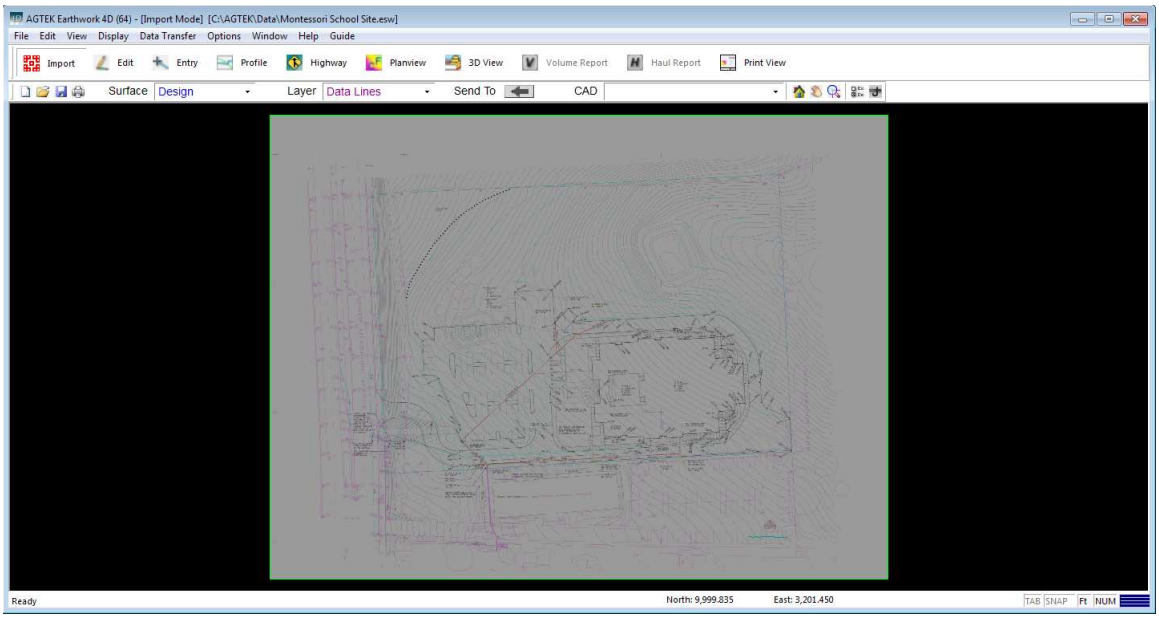


2. Select the “Montessori School Site.pdf” file and click **Open**.

3. The PDF is imported into the Data Transfer Mode with a green outline, signifying a vector PDF. A vector PDF contains the information necessary for the program to vectorize the data, and create line work similar to a CAD file. The information is divided into layers based on line color and thickness. A red outline signifies a raster PDF which can not be vectorized and must be entered manually.

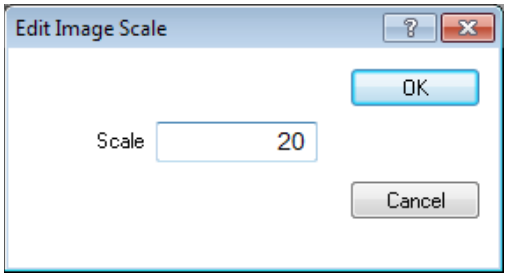


4. Rotate the image pressing the **L** key twice to rotate the image counter-clockwise into the proper alignment. The **R** key will rotate the image clock-wise. Your screen should appear similar to the illustration below.

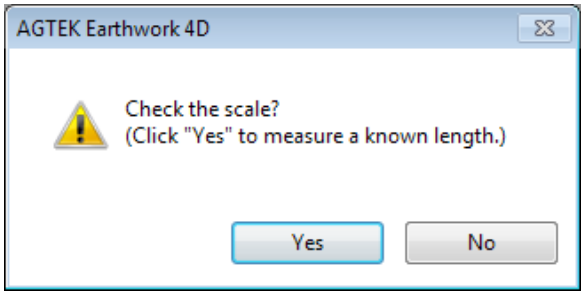


Scaling the PDF

1. Zoom in to the lower-right section of the PDF and locate the scale bar. In this example the scale is 1:20 feet.
2. Select **Data Transfer > Image Scale** and the Edit Image Scale dialog box is displayed.



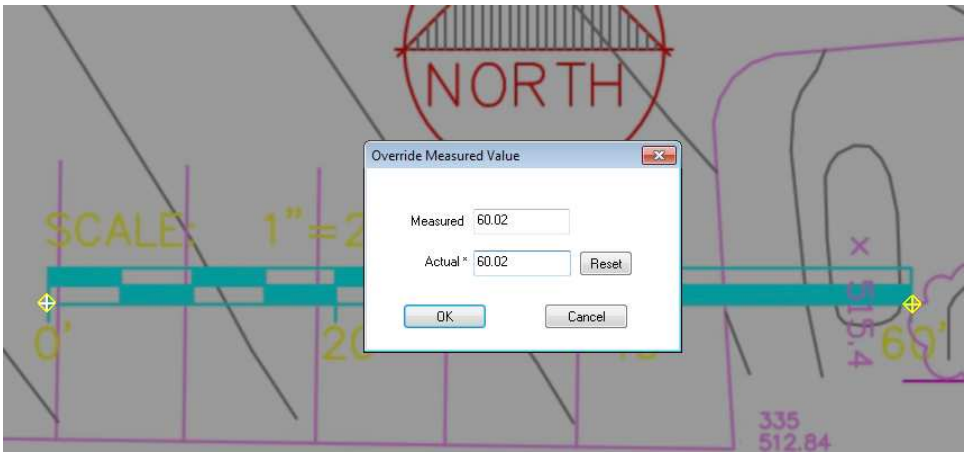
3. Enter "20" for the scale and click **OK**.



4. A dialog box is displayed advising you to verify the scale of a drawing by measuring a known distance. Click **Yes** to verify the scale.

5. Zoom into the scalebar at the bottom right side of the drawing and enter two points at each ond of the toolbar. Confirm the measured distance is correct. Click **OK**.

If the measure distance is incorrect, enter the correct distance in the **Actual** field and click **OK**..

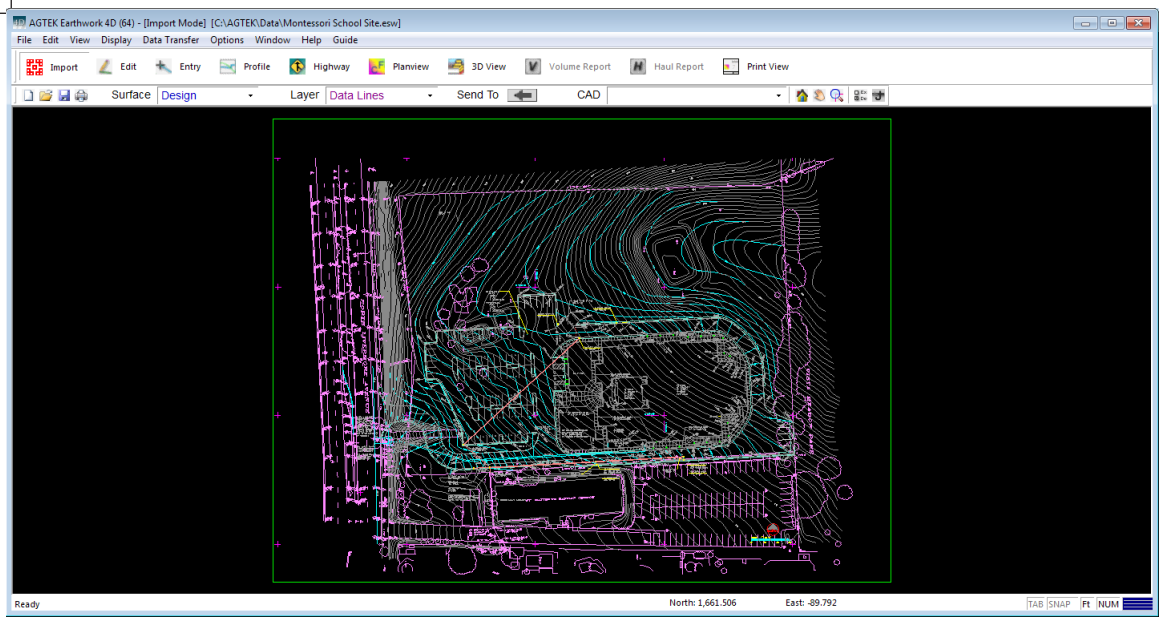


Lesson 2 - Vectorizing and Transferring Data

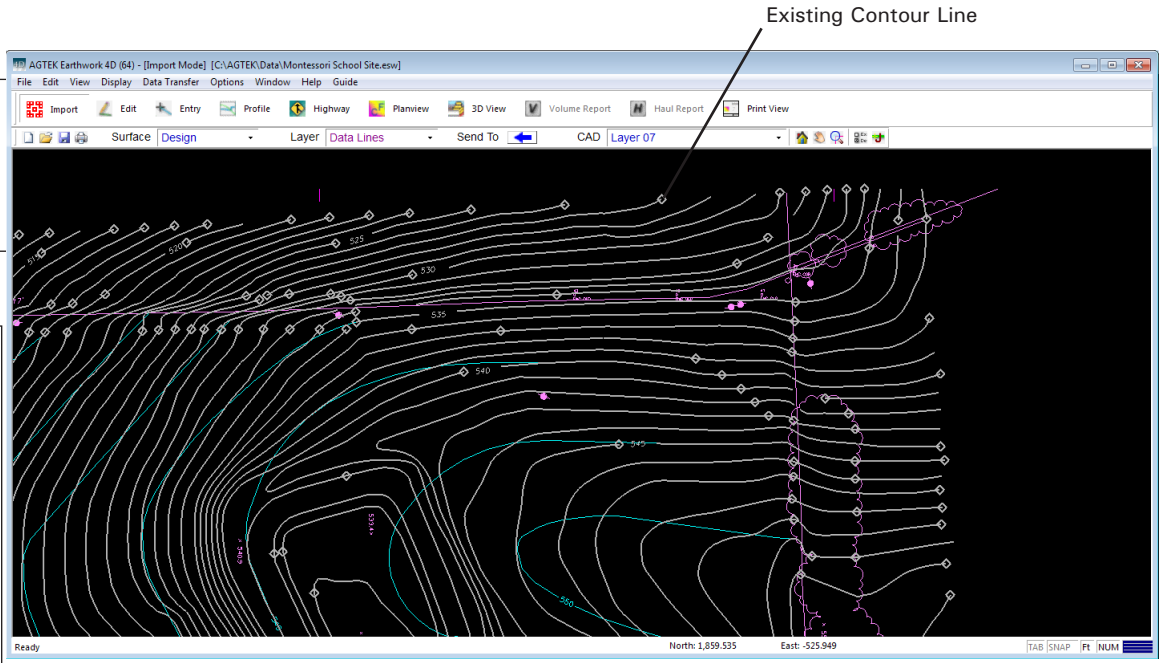
When you vectorize a file using AGTEK software, annotation lines are created and separated into layers depending line weight and color of the original file i.e.; red, black, and blue lines would all be in different layers (Layer 1, Layer 2, etc...).

Some files vectorize better than others. You may want to transfer data that vectorizes well, and trace the data that doesn't manually.

1. Since this is a vector PDF, which has line data from a CAD file, we can vectorize the data by selecting **Data Transfer > Vectorize.**
2. When complete, vecotrized lines are laid over the image. To turn off the background image, select **Display > Bitmap**, or by pressing the **T** key. Your screen should appear similar to the illustration below.



3. Zoom into the drawing and select one of the gray Existing contour lines.



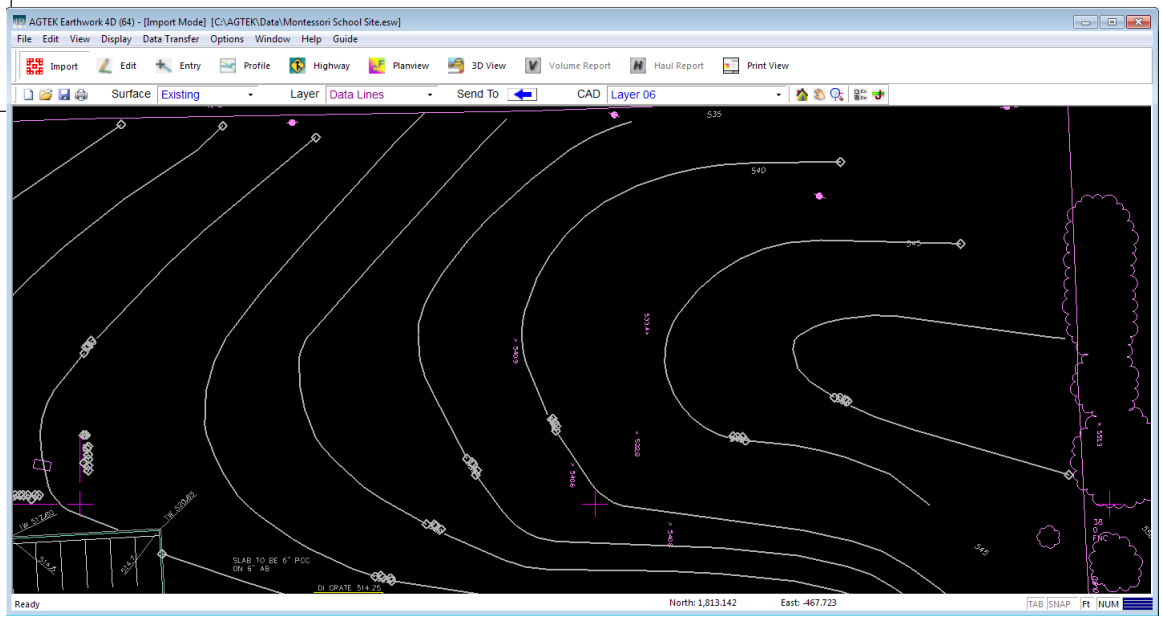
This screen shot has been zoomed into the upper-left side of the job.

When existing contours are dashed, and can be separated into their own layer (same weight, color, etc...) Sitework 4D will automatically join them, eliminating the gaps.

4. Right-click and select **Send to Existing**. Since there are no elevations assigned, all lines are sent to the annotation layer.

5. Select a Design line. Right-click and select **Send to Design**. Continue sending data to the Design layer until all useful information is transferred.

This screen shot has been zoomed into the upper-left side of the job.

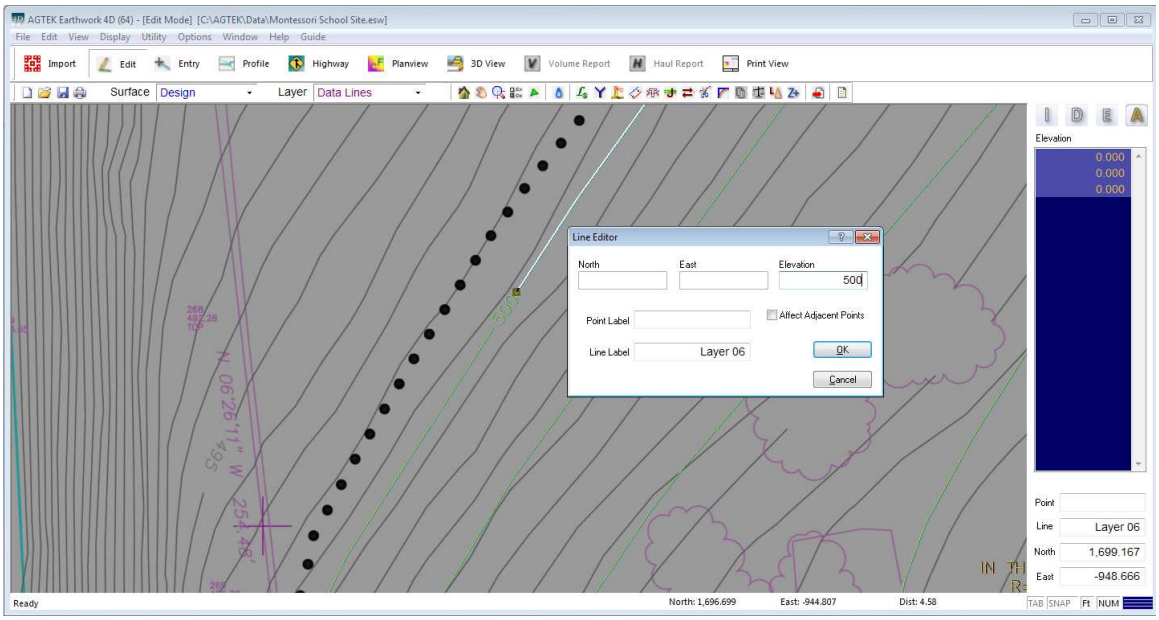


Lesson 3 - Assigning Elevations

1. Turn off the PDF by pressing the **T** key. This will make the annotation lines easier to read.

2. Zoom into the top-left portion of the job and select the 500 contour line. Enter “500” using the keyboard and the Line Editor dialog will display. Click **OK**.

Vectorized design lines are sometimes segmented. They can be joined to create a single line. For information on joining lines, see page 3-13.

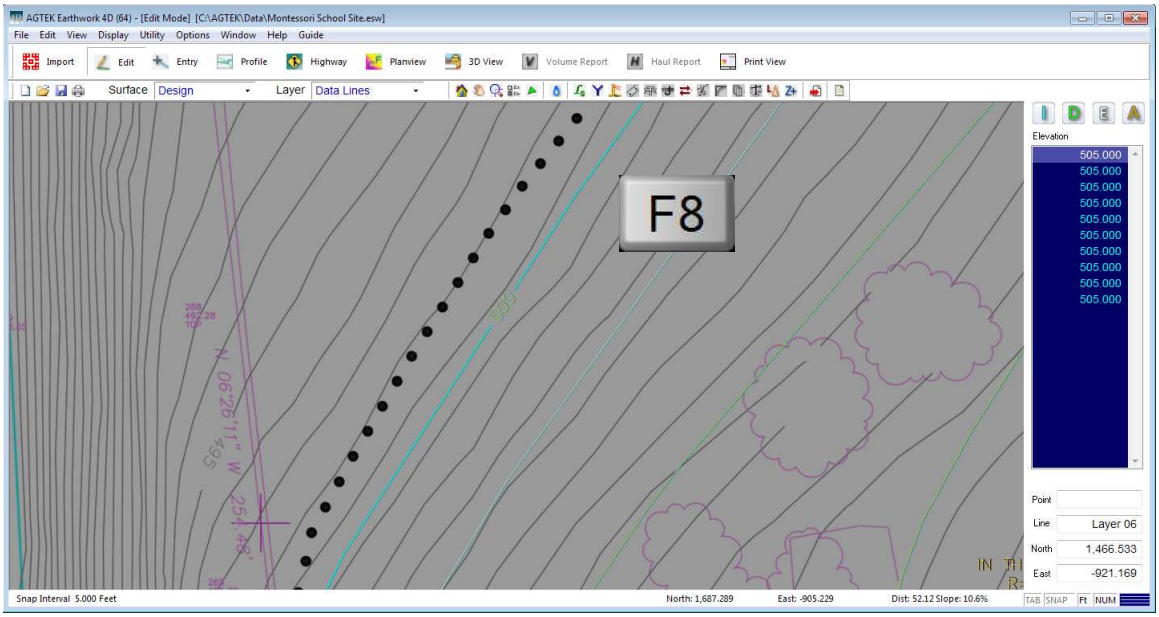


3. Select the 505 contour and enter “505” using the keyboard and the Line Editor dialog will display. Click **OK**.

4. Press the **ESC** key to clear all selections.

5. Position your arrow over the “500” contour, BUT DO NOT CLICK. Press the **F8** key.

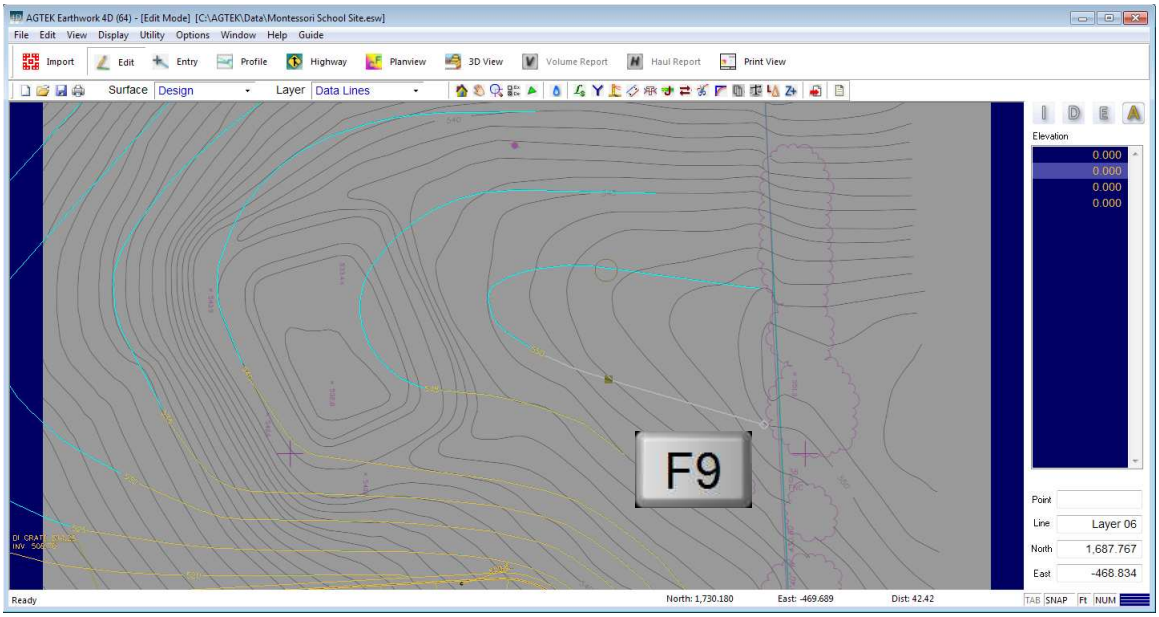
Increment snap increases/ decreases the elevation of the last line and assigns that elevation to the current line. It will continue until you press ESC or select something by clicking the mouse.



6. Position your arrow over the “505” contour, BUT DO NOT CLICK. Press the **F8** key. This will enable Increment Snap. The current interval can be seen at the bottom left of the program window.

7. Continue using the Increment Snap to assign the rest of the elevations at the top of the slope. The increment, in this case 5 feet, and direction, up or down - this case up, is determined by the first two lines selected. In the case the first two lines selected were 500 and 505, so following lines will be assigned ascending elevations in 5 foot increments.

8. When complete, select annotated portion of the 550 contour line on the right side of the job. Position your arrow over the blue portion of the “550” contour line (data line) BUT DO NOT CLICK. Press the **F9** key. The elevation from the selected 550 data line will be assigned to the indicated annotation line.



9. Continue using the same technique to assign the rest of the Design contour lines. The Existing contour lines can also be entered using the same techniques.

It is not uncommon for jobs to be spread across multiple PDFs. In this case, you will need to align PDFs to data that has already been entered. For information on aligning multiple PDFs please see page A-70 in the appendix.

For more information on completing the job; adding Sectional Areas/Report Regions, Perimeters, Stripping, etc., please see the CAD Tutorial beginning on page 3-1. There area also training videos available at http://www.agtek.com/trainingvideos.asp. It is advised that you watch the corresponding training videos before completing the tutorials.

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

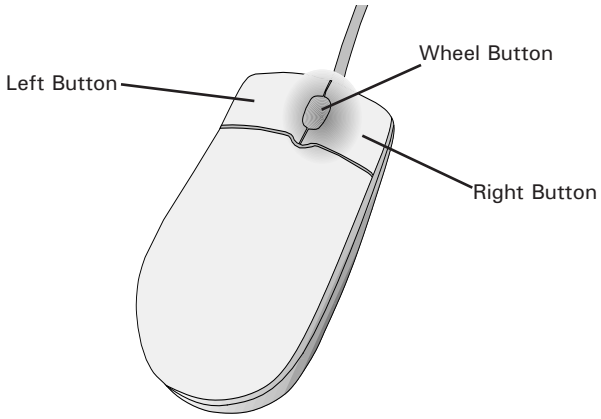
Earthwork 4D relies on the keyboard for alphanumeric entry and keyboard shortcut, and the mouse for non-digitized editing and entry.

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.

Import 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

E — Switches to Edit Mode from any other mode. Toggles between Edit and Entry Modes.

V — Switches to 3D View Mode from any other mode.

P — Switches to Print Preview Mode from any other mode.

A — Switches to CAD Transfer Mode from any other mode.

W — Switches to Plan View Mode from any other mode.

H — Switches to Highway Mode. Toggles between Highway Mode and Haul Report Mode.

F — Switches to Profile View Mode from any other mode.

CAD Transfer Mode

Esc — Deselects any selected line.

Home — Zooms out to the extents of the job and restores the default viewing parameter.

↑ ↓ ← → — Moves the cursor in the direction of the arrow selected.

Shift (select) Pressing the Shift key selects additional lines without deselecting other line.

Ctrl (select) Pressing the Ctrl key selects additional lines without deselecting other lines.

Spacebar — Zooms in or out over cursor location.

R - L Rotates displayed PDF right and left respectively in 45 degree increments.

Page Up and Page Down Zoom in and out.

Delete — Deletes the currently selected line(s).

S — Sends the currently selected CAD Line(s)/Layer(s) to the selected Surface and Layer

Z — “Sticky Zoom” toggle, allows zooming to a selected point.

F2 — Toggles on or off the display of Plus Marks on data line.

Alt H Hides the currently selected line(s)

Alt S Displays all hidden data.

Ctrl Z Undo the last edit up to the last eight edits.

Ctrl Y Redo previously undone edits.

Edit and Entry Modes

Home — 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.

0 - 9 — 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.

Shift (select) — Pressing the Shift key selects additional lines without deselecting other lines.

Page Up - Page Down — Zoom in and out.

Delete — Deletes currently selected line(s).

Backspace — Deletes the previously entered point one at a time (Entry Mode only).

R - L — Rotates the terrain view right and left respectively in 45 degree increments while in Edit mode.

L — In Entry mode, dipsplays the Edit Point/Line Labels dialog box.

U - D — With the terrain displayed, increases and decreases the view angle.

+ - - — With the terrain displayed, increases and decreases the elevation magnification.

I — Displays the length and area for a selected line (Edit Mode only).

T — Toggles the display of the 3D terrain, PDF and a blank background.

O — Toggles on or off the display of the 2D Plan View (overlay).

C — Toggles on or off the location and display of the compass.

G — Displays the most recently selected Guide

M — Toggles the displayed PDF between low and high contrast.

S — Toggle on or off the Snap function.

Z — “Sticky Zoom” toggle, allows zooming to a selected point.

B — With the terrain displayed, toggles between land view and sky view.

U — With the terrain displayed, moves the view above the vehicle.

D — With the terrain displayed, moves the view down to ground level.

F1 — View from inside vehicle.

F2 — View from 50 feet behind vehicle.

F3 — View from 50 feet left side of vehicle.

F4 — View from 50 feet right side of vehicle.

F5 — Breaks a line at a point nearest to the cursor (Edit Mode only).

F6 — 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.

F7 In Edit Mode, moves the selected point to the position of the tip of the arrow.

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

Home — 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.

Esc — Cancels in-progress volume calculations.

R and L — Rotates the 3D View right and left respectively in 45 degree increments.

U and D — Increases and decreases the view angle.

+ and - — Increases and decreases the elevation magnification.

Page Up and Page Down — With the 2D Plan View displayed, increases and decreases the Plan View Scale.

Spacebar — Pauses/resumes the volume calculation.

I — Displays incremental cross sections during the paused volume calculation.

T — Toggles on or off the display of the 3D View overlay.

O — Toggles on or off the display of the 2D Plan View.

C — Toggles on or off the location and display of the compass.

G — Displays the most recently selected Guide

M — Toggles the displayed PDF between low and high contrast.

B — Toggles between land view and sky view.

U — Moves the view above the vehicle.

D — Moves the view down to ground level.

F1 — View from inside vehicle.

F2 — View from 50 feet behind vehicle.

F3 — View from 50 feet left of vehicle.

F4 — View from 50 feet right of vehicle.

F11 — Rotates the 3D View 180 degrees.

Ctrl A — Enters a Volume Area around the entered data.

Ctrl V — Calculates the volumes.

Alt B — Displays the Layer Selection dialog box.

Alt U — Moves the view angle up.

Alt D — Moves the view angle down.

Alt R — Moves the view to the right.

Alt L — Moves the view to the left.

Alt I — Zooms in over the location of the vehicle.

Alt O — Zooms out over the location of the vehicle.

Alt P — Sends the currently displayed view to the Print Preview Page.

Volume Report Mode

Alt + P Sends the currently displayed view to the Print Page.

Print Preview Mode

Tab Cycles between items on the page.

Delete Deletes the currently selected item

Page Up and Page Down Increase/decrease the scale of the currently selected item.

T 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.

Import Mode Switches to Import 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.

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

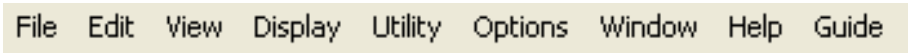
The following commands are found only in the 3D View Mode Utility Tool bar.

	**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.

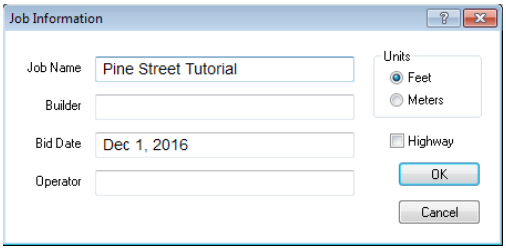


File Menu

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

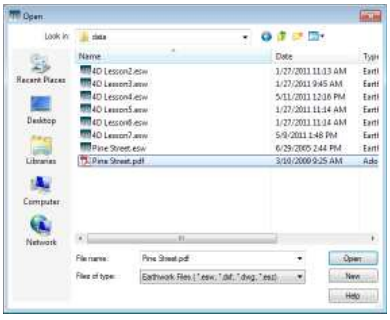
Used at the start a new job. When the command is selected, the Job Information dialog box is displayed.



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

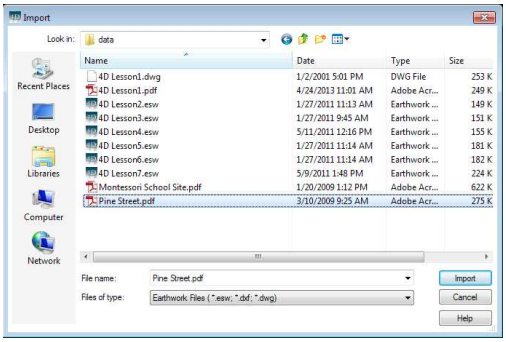
Used to open an existing job. When the command is selected, the Open dialog box is displayed.



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.

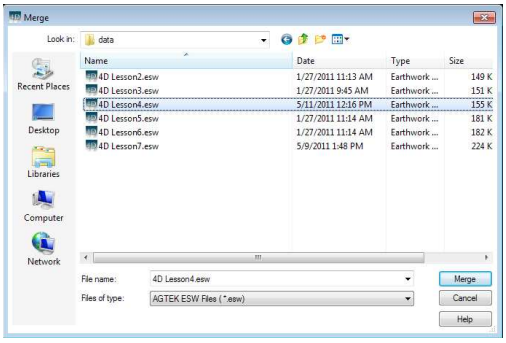
Import Recover Data

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.



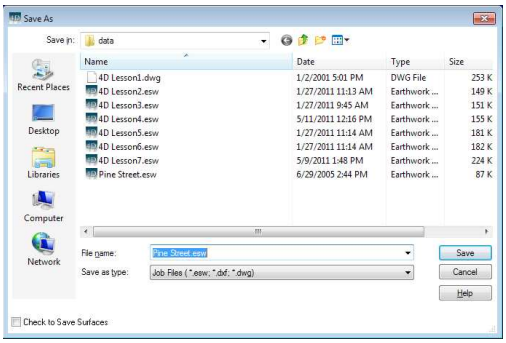
Select the file from the list in the window. The name then displays in the File Name text box. Click Open to merge the files.

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

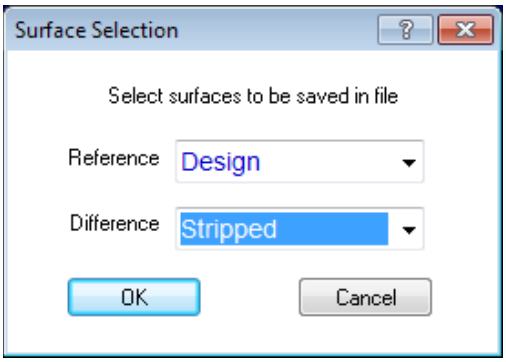
When the DXF or DWG type is chosen, the Export CAD dialog box is displayed. Refer to “Export CAD” on page 9-17 for additional information.

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)

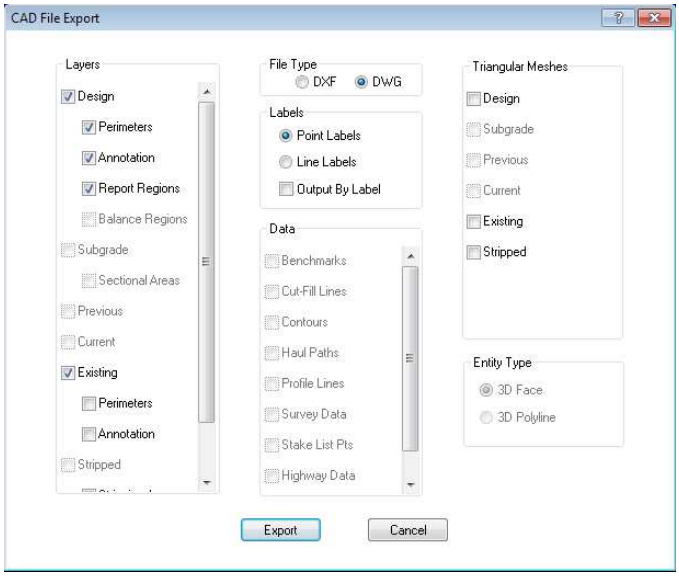
When the ESW type is chosen, the Check to Save Surfaces box is displayed in the Save As dialog box. Checking this box saves trimesh surface data in the ESW file. This is necessary if you are using the file with AGTEK Graphic Grade Machine Control or SitePilot to save time loading the file. If checked,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

Export VRML File

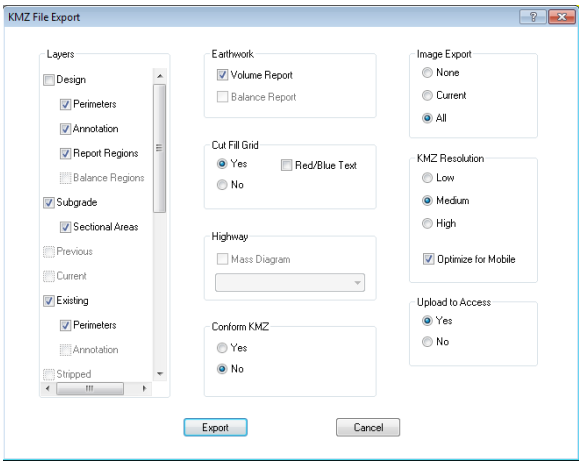
Used to save the 3D view as a VRML (Virtual Reality Modeling Language) file. When the command is selected, the Save As dialog box is displayed. Type the new name of the file in the text box

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.

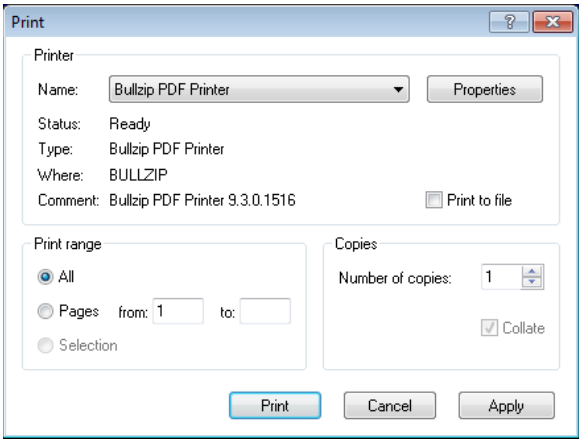
Export KMZ

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



Print

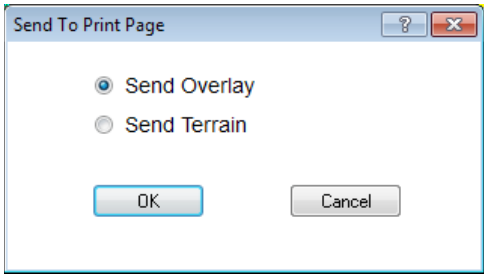
Used to print the data that is currently displayed on the screen. When the command is selected, the Print dialog box is displayed.



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

Send To Print Page

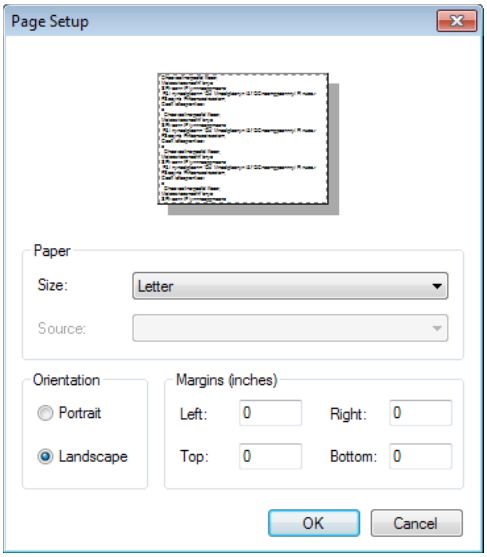
Sends the current view to the Print Page. If both the terrain and overlay are displayed, the Print Preview Send Options dialog box is displayed.



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

Page Setup

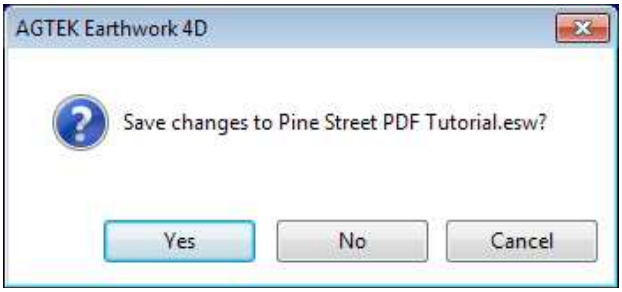
Used to change print options. When selected, the Page Setup dialog box is displayed.



The user can change printer properties, such as paper size, orientation, margins, and which printer to use.

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

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

Redo

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

Copy

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

Paste

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

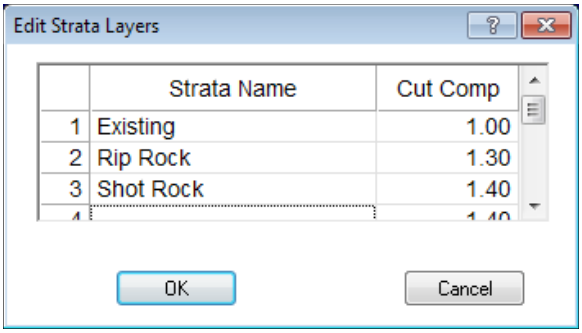
Delete

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.

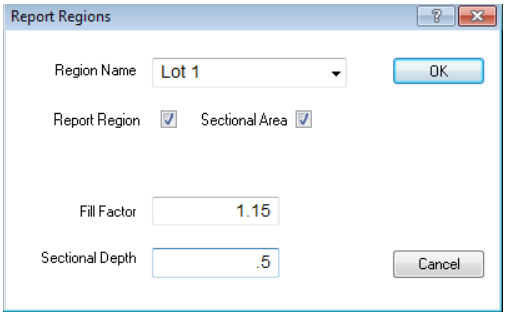


Enter the Strata Name and the Cut Comp value for the strata layers and click **OK**. Refer to "Strata" in the Appendix for additional information about strata layers.

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.

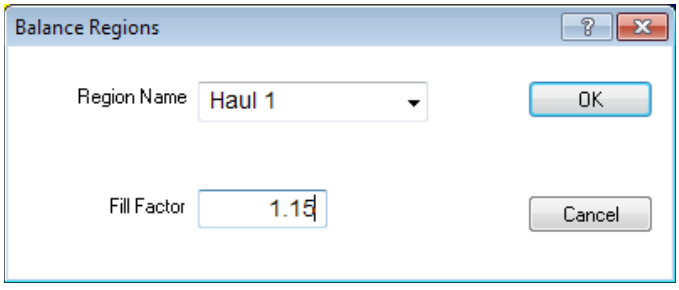
Sectional Area This check box indicates that the sectional area will be included as part of the job totals. Use this option when entering Sectional Areas.

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

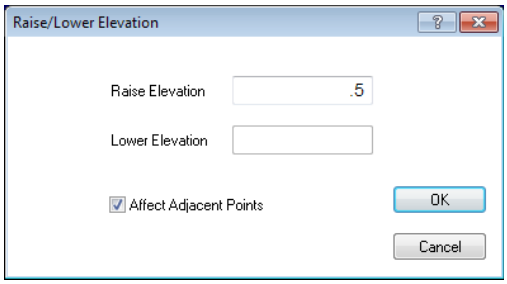
Ctrl X Breaks a line at the selected point leaving one-half of the line selected.

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.

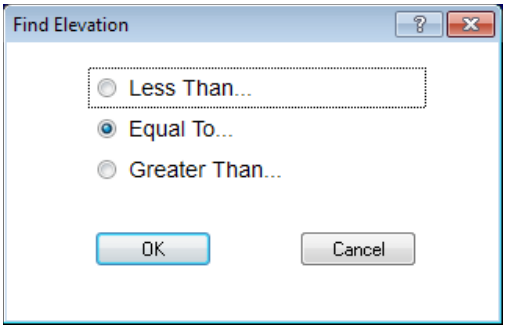
As soon as you start typing in either box, the other box grays out. Click **OK** to apply the elevation change.

Label Selection

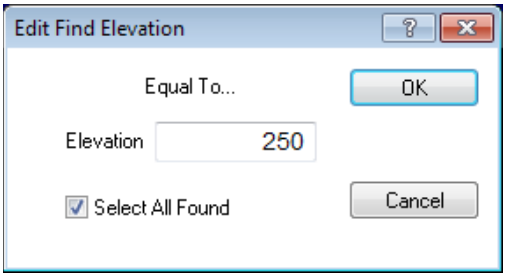
Selects all lines with the same label. If no line is selected, the Label Selection dialog box is displayed, allowing the user to select a label from a list of all labels in the current surface. An asterisk ("*") can be used as a wildcard. For example, "curb*" would select all lines with a label that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

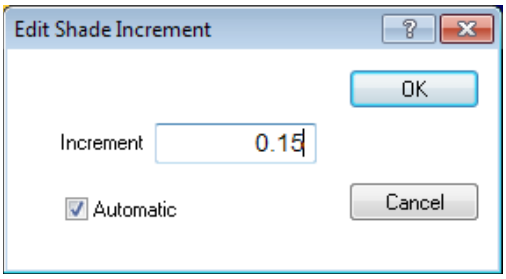
Alt A Allows multiple items to be selected by dragging a box around the information desired. Click and drag the box to define the area to select. Click again to select the items.

Select All

Selects all visible data of the currently active surface layer.

Shade Increment

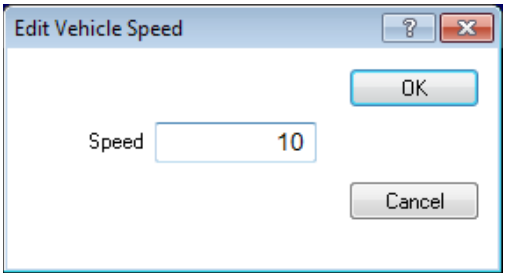
Adjusts the Cut-Fill Shade Increment in 3D View and Plan View Modes. When selected, the Edit Shade Increment dialog box is displayed.



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

Vehicle Arrow Rate

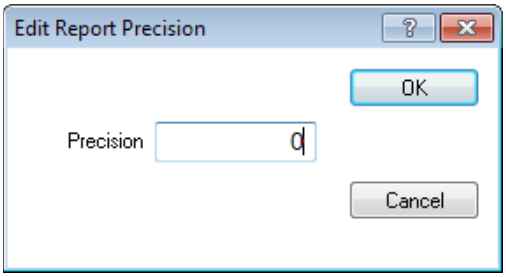
Changes the distance the vehicle travels on the screen using the Arrow keys on the keyboard or during drive simulation. When selected, the Edit Vehicle Speed dialog box is displayed.



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.



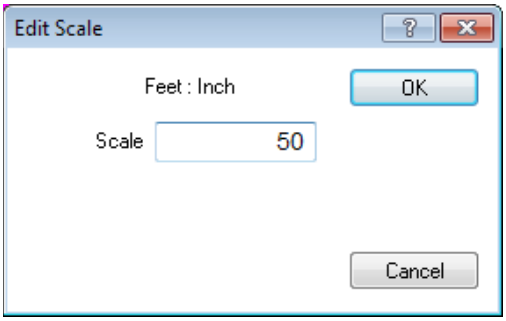
The default value is 0. Enter a value between “0” and “2”. Click **OK** to apply.

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

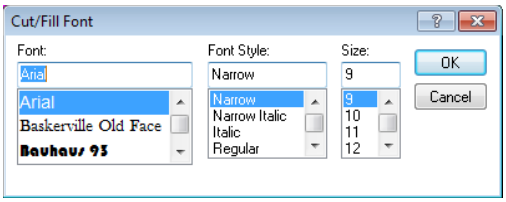
Used to scale the 2D Plan View and Profiles on the Print Page. First select an item then select the command. The Edit Plan Scale dialog box is displayed.



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

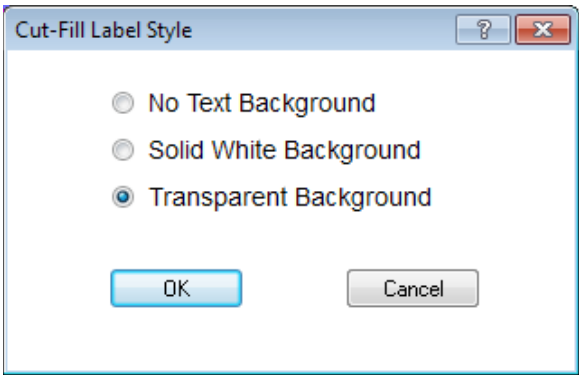
Used to select the type, style, and size of the fonts that appear as part of the labels on the cut-fill shade map. When selected, the Cut-Fill Font dialog box is displayed.



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.



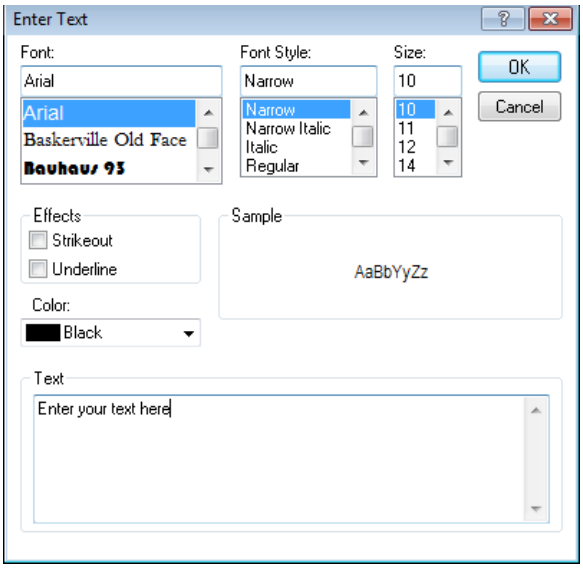
No Text Background — Displays black text with no label background over the shade map.

Solid White Background — Displays black text with a transparent background over the shade map.

Transparent 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

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

Hide All But

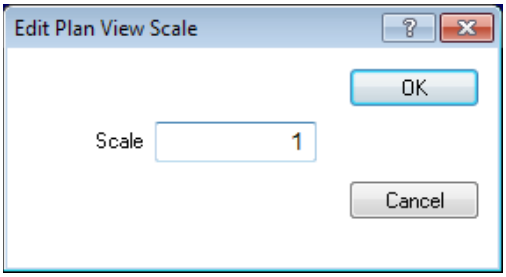
Hides everything except selected data. Multiple data lines can remain visible by selecting them then selecting the command.

Show All

Alt S Displays all hidden data on the screen.

Plan View Scale

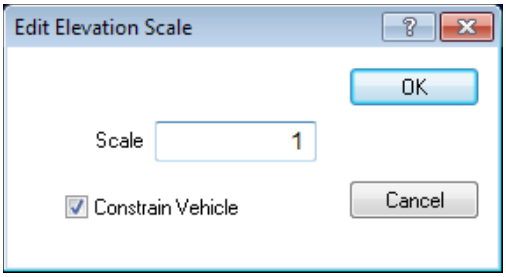
Used to increase/decrease the size of the displayed overlay. When selected, the Edit Planview Scale dialog box is displayed.



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

Elevation Scale

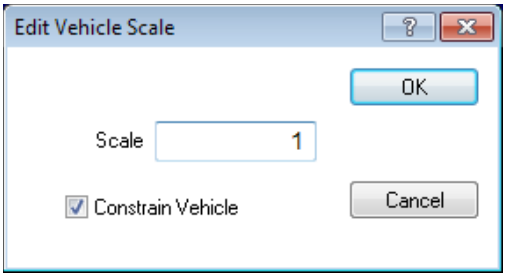
+ - Used to increase/decrease the elevation perspective to show increased relief of the terrain. When selected, the Edit Elevation Scale dialog box is displayed.



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.

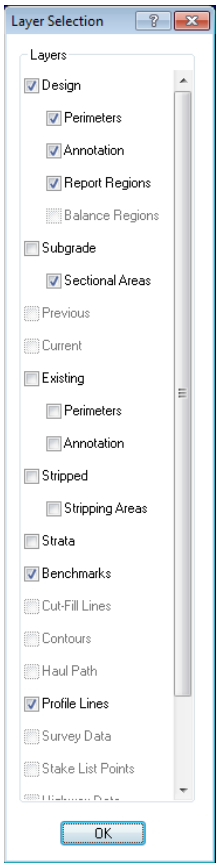


Change the value in the text box to change the Vehicle Scale. Select the Constrain Vehicle check box to keep the Jeep and blade vertical scale unchanged during elevation scale magnification. Click **OK** to apply the scale.

Layer Selection

Alt B

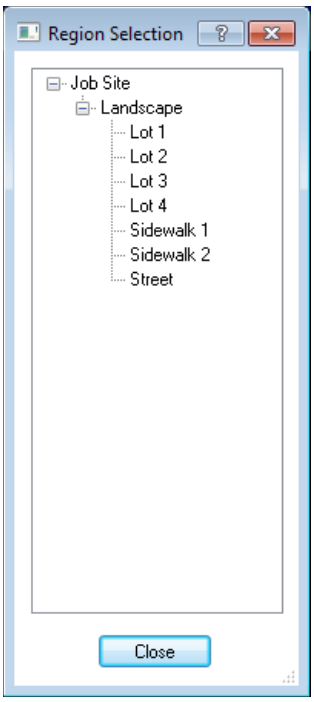
Used show/hide layers not normally associated with the current surface. Data not in the currently active surface displays in the background and can be snapped to. When selected, the Layer Selection dialog box is displayed.



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

Region Selection

Alt X 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

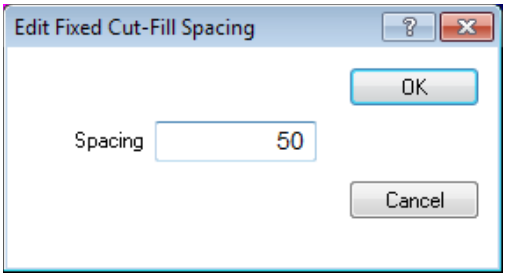
Toggles on or off the display of the Cut-Fill elevations on the Labels.

Default Cut-Fill Spacing

Spaces the cut-fill locations optimally on the screen.

Fixed Cut-Fill Spacing

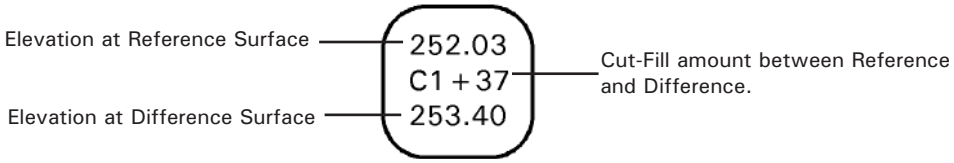
Allows the user to define the distance between the cut-fill spacing. When selected, the Edit Fixed Cut-Fill dialog box is displayed.



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

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

Terrain

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

Bitmap

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

Black Background

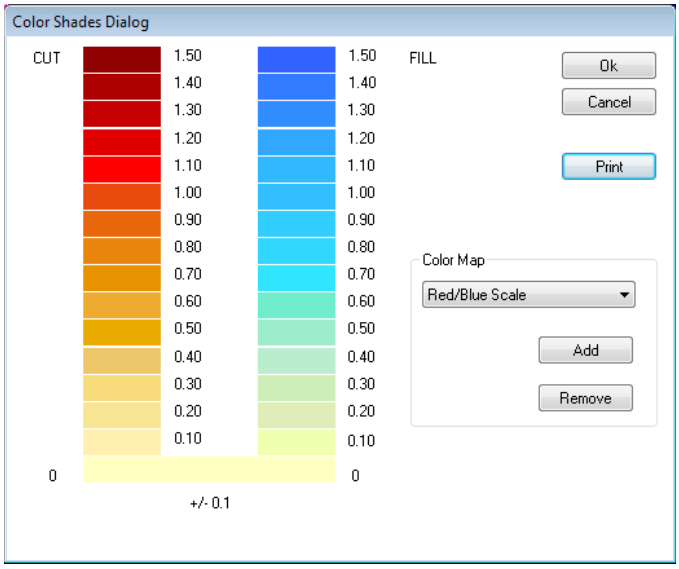
Displays the screen background as black in CAD Transfer Mode.

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

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

Edit Layer Only

Alt V 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

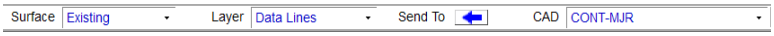
Increases the display size of the Print page and allows the user to scroll through multiple sheets.

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

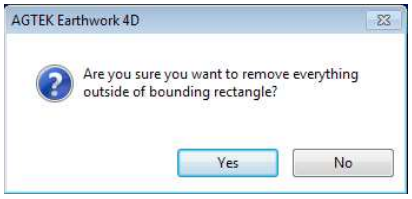
Sends selected data to the Design Surface and Layer displayed in the pulldown.

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

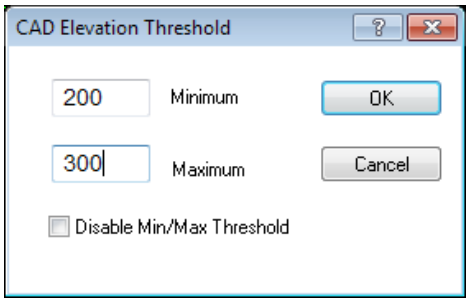
Used to delete all the data outside a specified area (Crop Rectangle). When selected, the arrow changes to the crosshair. Click and drag the box around the data to keep, then click again. A warning dialog displays.



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

Transfer Min/Max

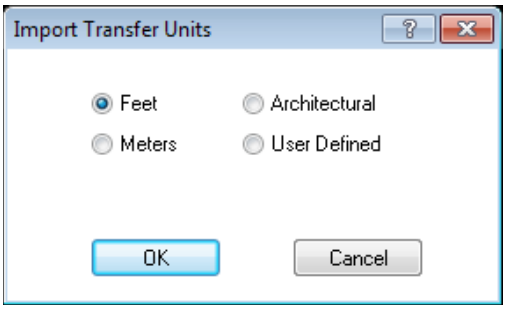
Used to set the minimum and maximum elevations to transfer. Elevations not within the minimum/maximum range are transferred as annotation data. When selected, the CAD Elevation Threshold dialog box displays.



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.



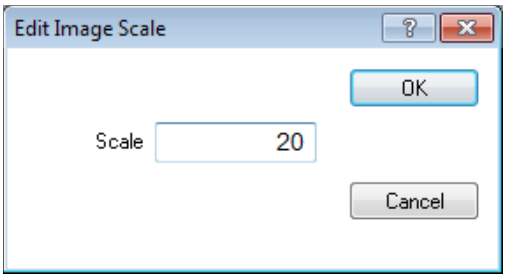
Select the appropriate unit of measure, enter the Units per Feet if using the User Defined option, and click **OK**. Layers that have been transferred are changed as well.

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.

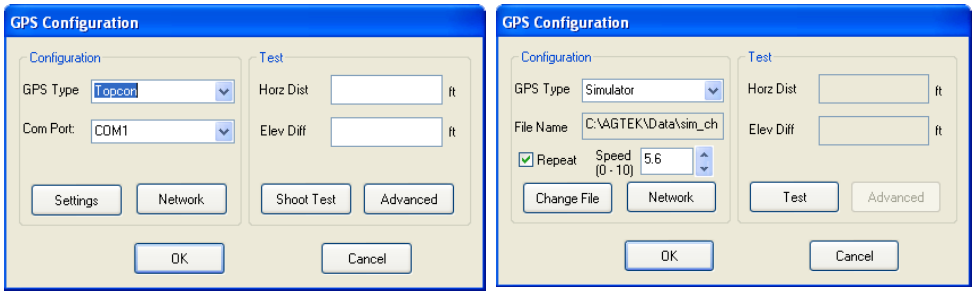
Instrument Menu

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.

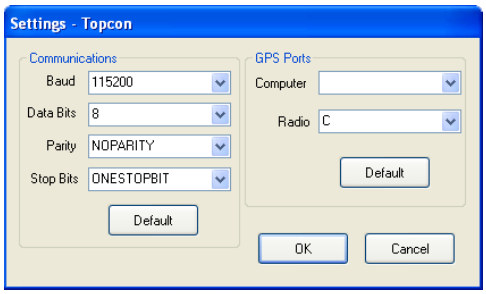
Com Port Specifies to which port the GPS is connected.

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.

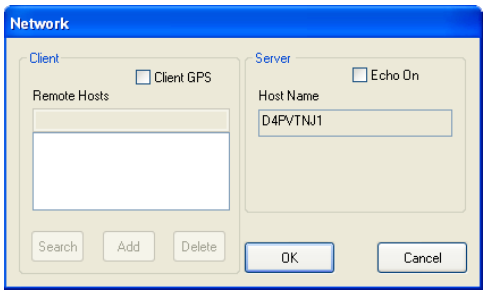
Settings Displays the Settings dialog box.



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.

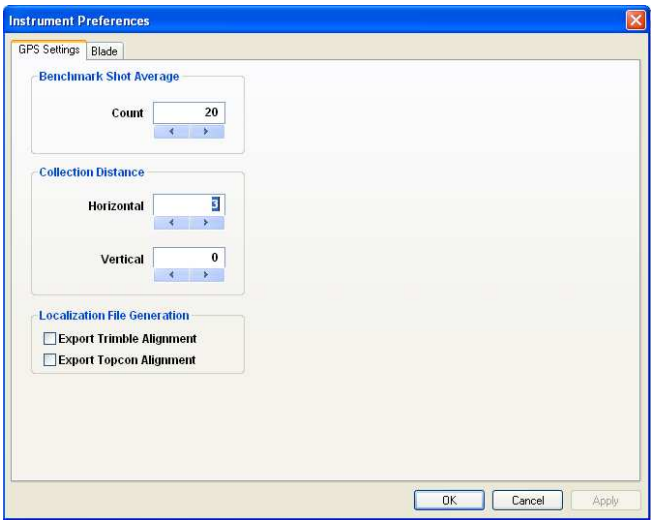
Create Benchmark

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.

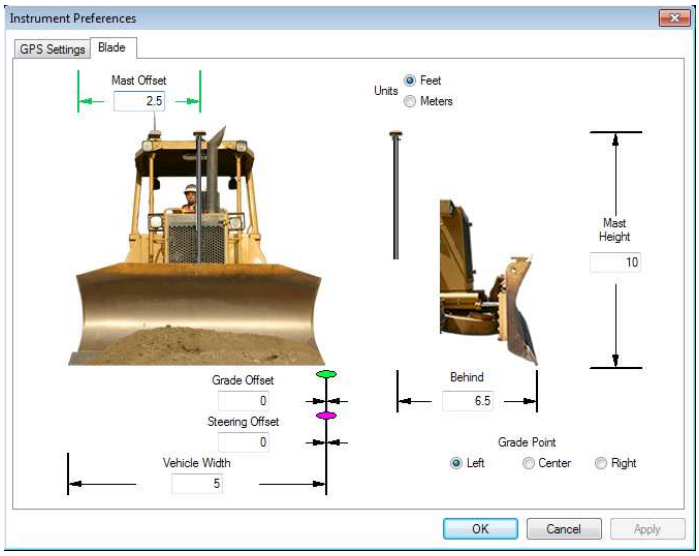
GPS Settings Tab



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.

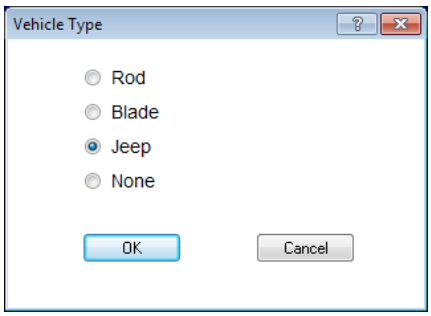
Blade Width Width of the blade (in feet).

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

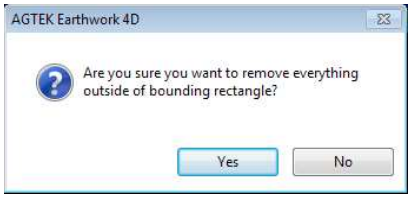
The Utility Menu is used to change the properties of data and profile lines, determine volume calculation areas and calculate those volumes, set the on-grade limits and transfer the subgrade to the design surface, and create and edit stations and offsets. The Utility Menu is available in Edit, Profile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

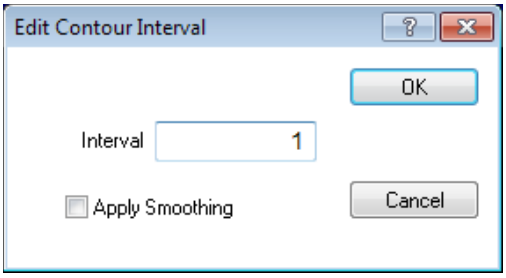
Used to delete all the data outside a specified area (Crop Rectangle). When selected, the arrow changes to the crosshair. Click and drag the box around the data to keep, then click again. A warning dialog displays.



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.



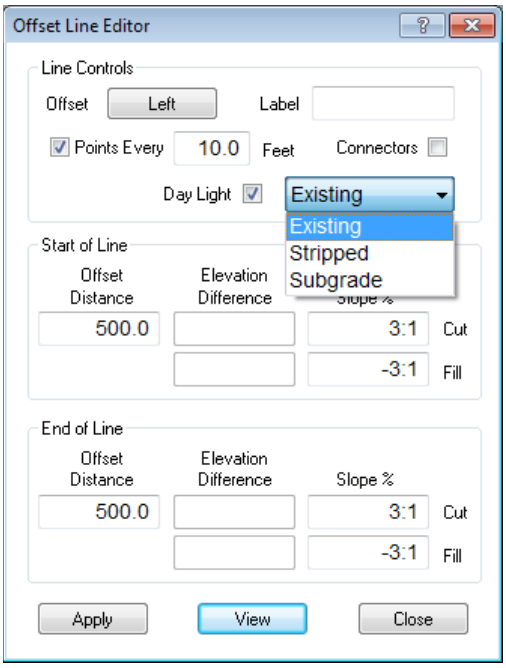
Enter a contour interval and click **OK**.

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.

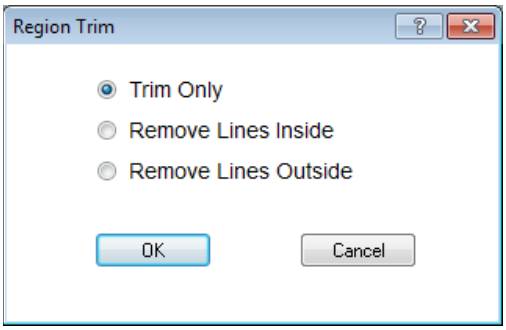
Fillet Line

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

Ctrl T

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.

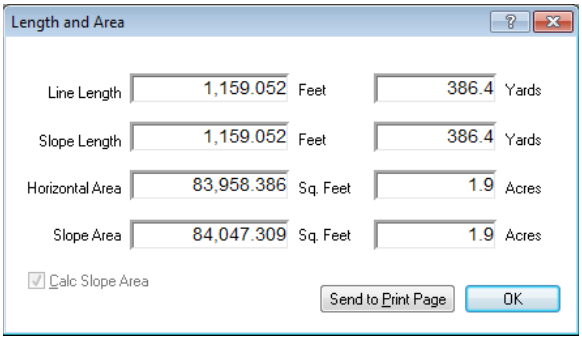
Remove Lines Inside Trims all lines that cross the region and removed all lines inside the closed line.

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.

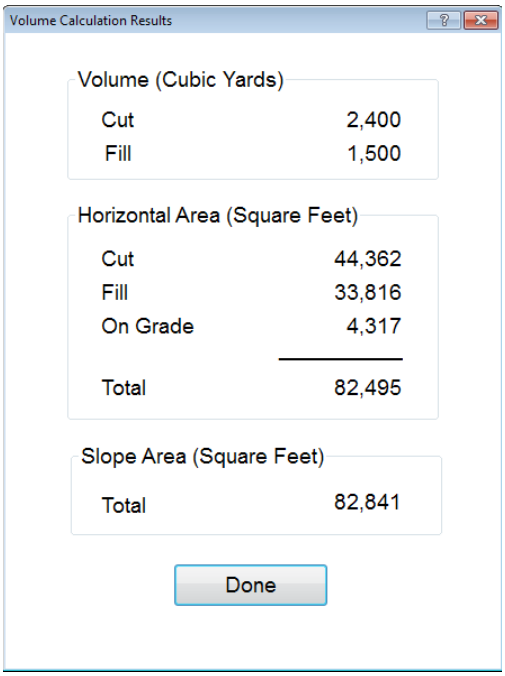
Volume Area

Ctrl A

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

Ctrl V 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.



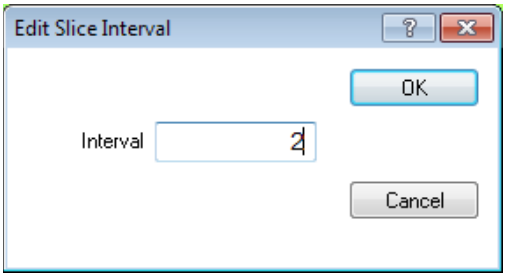
The volume and area totals display. Click the Done button to close this window.

Calc Balance

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

Calc Horiz. Slices

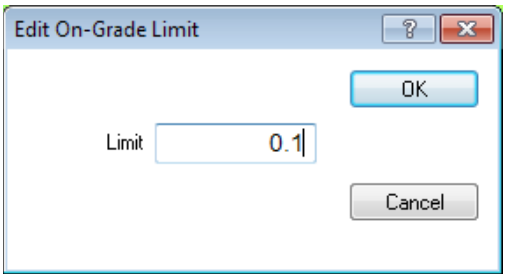
Calculates the volume per lift for user defined lifts. When selected, the Edit Slice Interval dialog box is displayed.



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

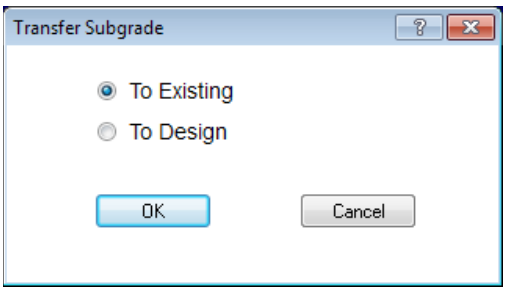
Sets the tolerance for the On-Grade Limit. When selected, the Edit On-Grade Limit dialog box is displayed.



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

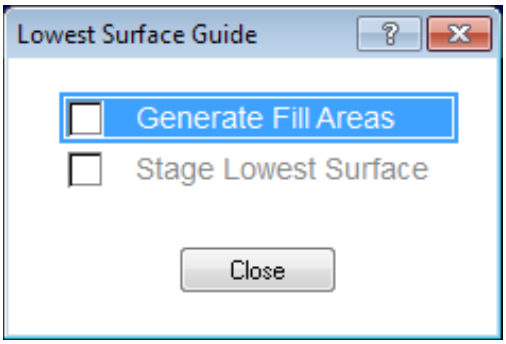
Used to copy data from the Survey layer to the Data Lines layer of the Current surface. When selected, the command creates a boundary around the survey data, displays the data and stages it. Refer to “Updating a 3D Model with Survey Data” on page 9-92 for additional information.

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.

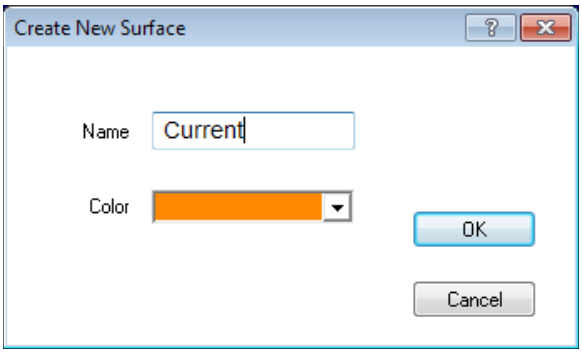
Click Close. The “Lowest” surface is created with the design lines.

Send to Highway

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

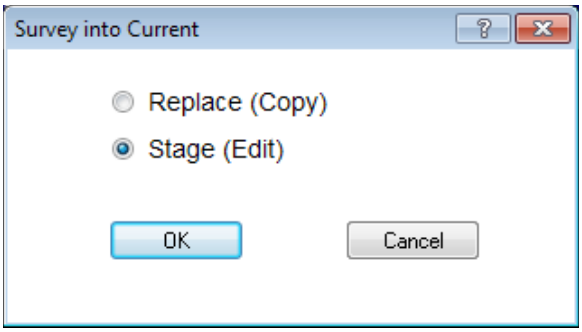
New Surface

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. You may have no more than 8 total surfaces in the file.



Apply Survey

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

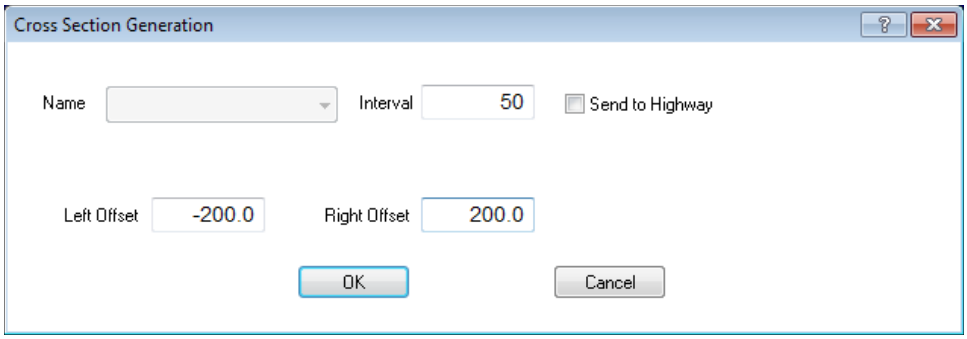
Displays the Over-ex Guide. For more information regarding the Over-ex guide, please see page A-15.

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

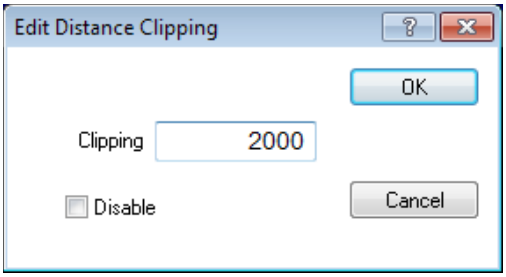
In the Profile View, displays the removal of strata in the selected surface.

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.



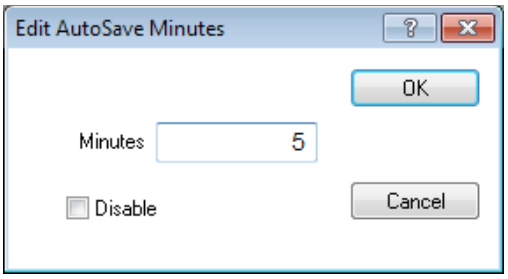
Type in a new distance in the text box and click **OK**. Checking the Disable box allows the terrain for the entire job to be rendered.

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

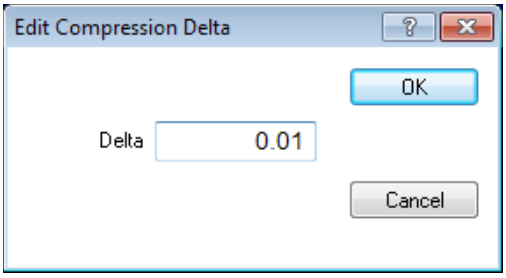
Allows the strata layers to follow the slope of the existing ground surface. If not selected, the strata layers slope straight from one boring to the next.

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

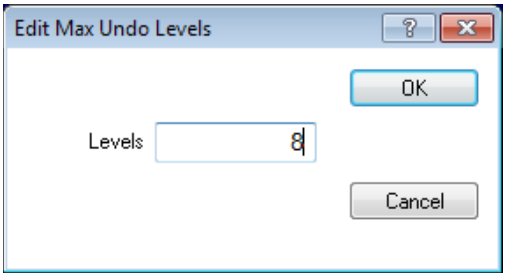
Sets the distance (using specified CAD Transfer Units) used to determine if a point will be removed during CAD Transfer to reduce file size. Points farther apart than the Delta will not be removed. When the command is selected, the Edit Compression Delta dialog box is displayed.



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.



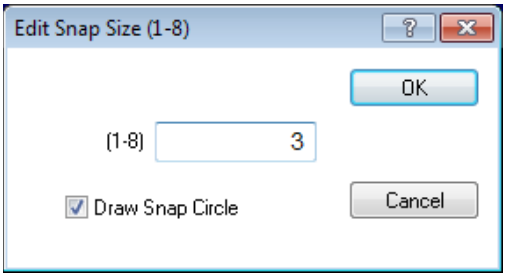
Enter in a value between “0” and “8”. A value of 0 turns off the feature. Click **OK** to save and close the window.

Snap

S Toggles on or off the Snap function.

Snap Size

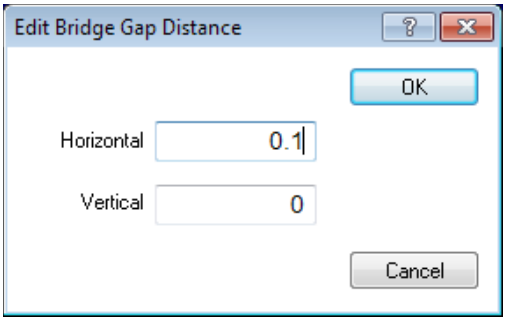
Allows the user to change the radius of the snap circle, an invisible perimeter surrounding the mouse pointer. Points outside the perimeter can not be snapped to. When selected, the Edit Snap Size dialog box is displayed.



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

Z Enables the zoom function to zoom on a selected point.

Status Bar Display

Ctrl Q 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 in crements 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

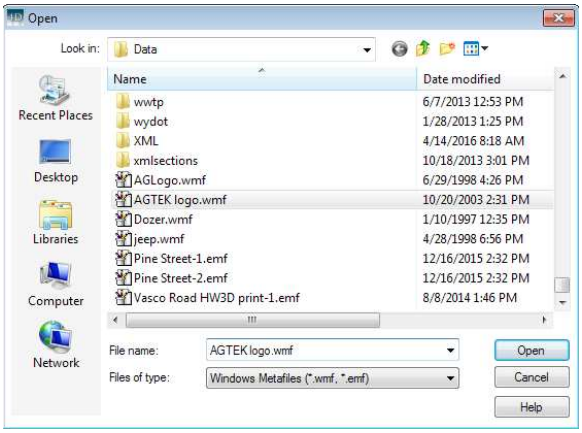
Toggles the display of sectional areas on or off in the Mass Haul Diagram.

Sub-Totals

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

Title Block Logo

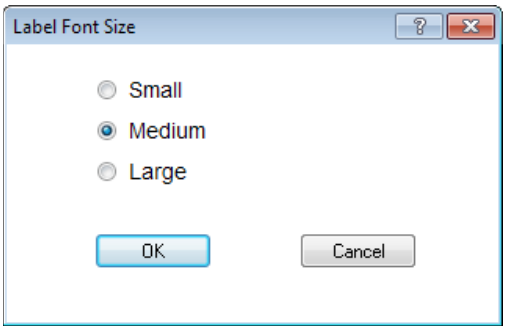
Inserts a logo to display in the Title Block across the bottom of the Print Page. Only files with the ".wmf" extension can be inserted in this manner. When the command is selected, the Open dialog box is displayed.



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.



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

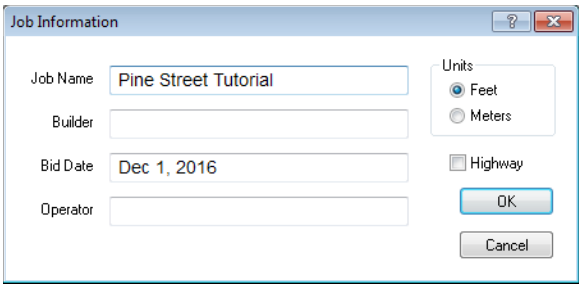
Starts the Help program ,which allows the user to search through various topics about Earthwork 4D.

Hot Key Help

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

Job Info

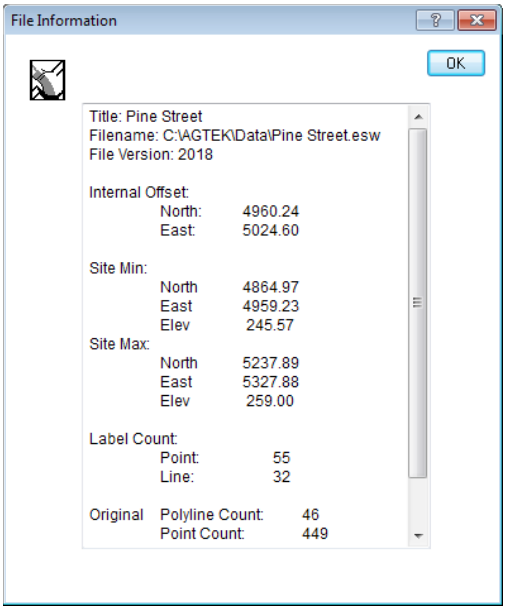
Displays the Job Information dialog box.



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**.

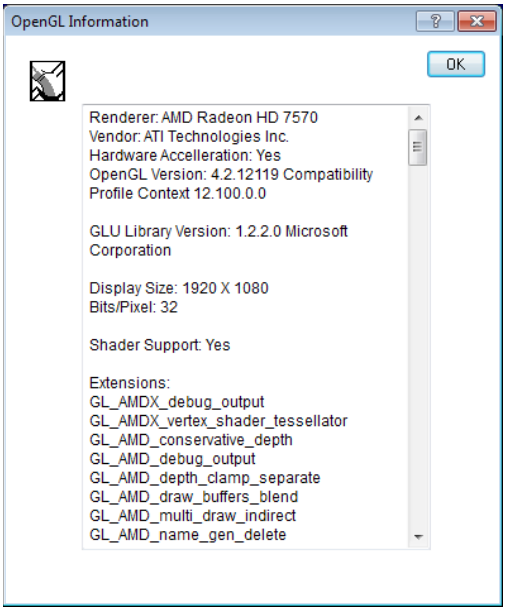
File Info

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.

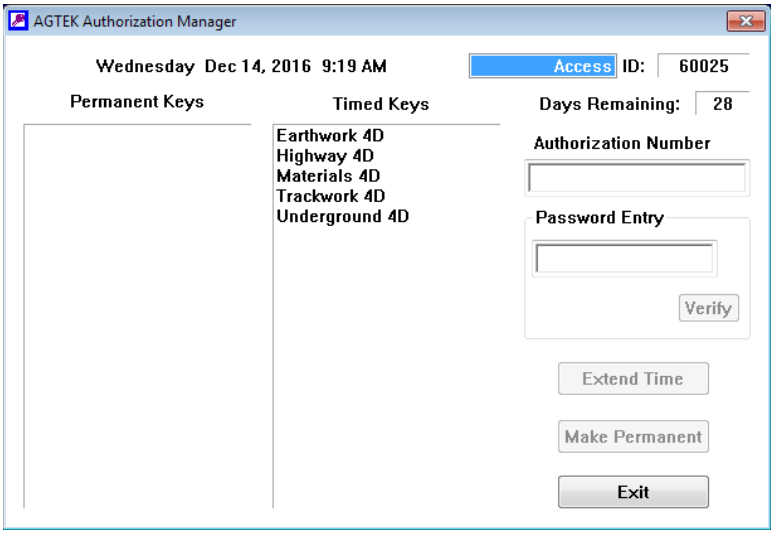


Visit AGTEK Online

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

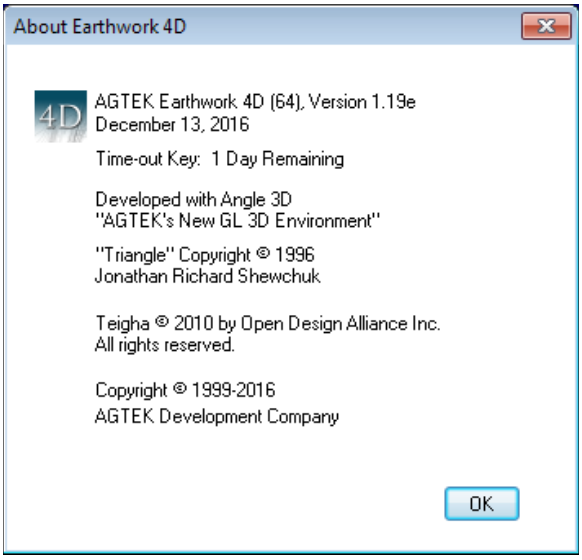
Authorization Manager

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

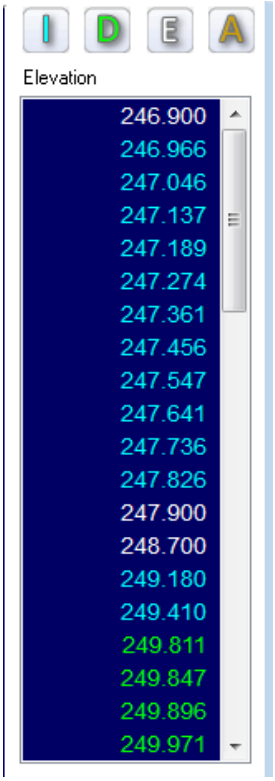
Annotation points (brown) are not used by the program to create the 3D surface. Lines transferred through the CAD transfer with an elevation of zero or with elevations that are outside of the Transfer Min/Max range are automatically assigned as Annotation.

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.

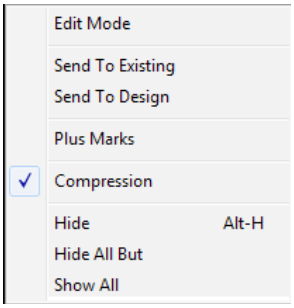
You can also click on a point, then Shift + click another point. All points between these points will be selected.

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**.

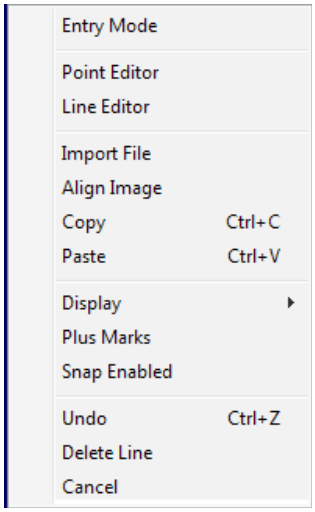
Right-Click Menu

With a line selected, right clicking the mouse provides several commonly used commands depending on the current mode.

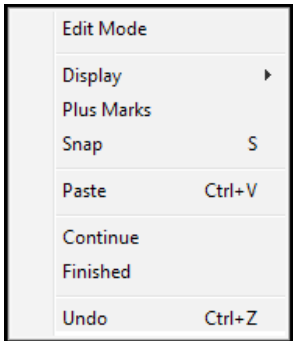
Import Mode



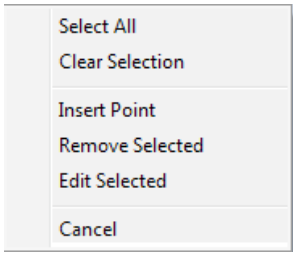
Edit Mode



Entry Mode



Point List



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 sleeted 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 Image

Used to align PDF/TIF files to a current file. 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

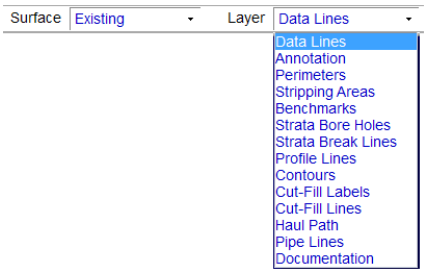
Changing the Current Surface is done by clicking on the pulldown menu and selecting the surface. The Current Layer is changed by clicking on the pulldown menu and selecting the layer. Below is an explanation of these surfaces and layers.

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

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 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

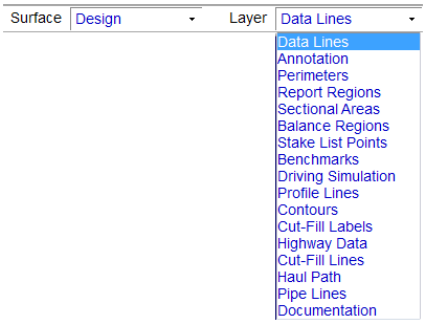
Lines generated in Plan View Mode to define the cut to fill transitions.

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

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. The Design Perimeters define the limits of the volume calclulations. Perimeters entered inside one another creates a hole.

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 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 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.

Pipe Lines

Pipe Lines may be entered to calculate underground trench excavation.

Documentation

The Documentation layer is used to add notes, 3D views or images to the file for viewing on Google Earth or in the field with SmartPlan. All photos, tracks, notes and measures may also be imported from SmartPlan.

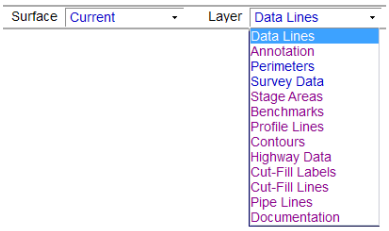
Current/Previous Surfaces

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 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.

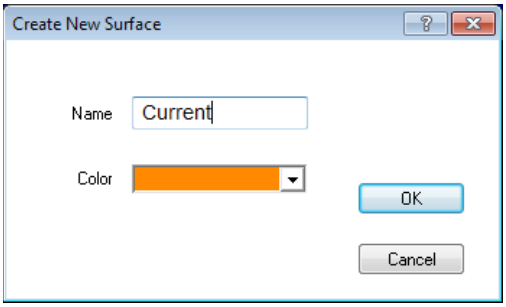
Subgrade Surface

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

S

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

F9

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

F8

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

F6

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 a 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.

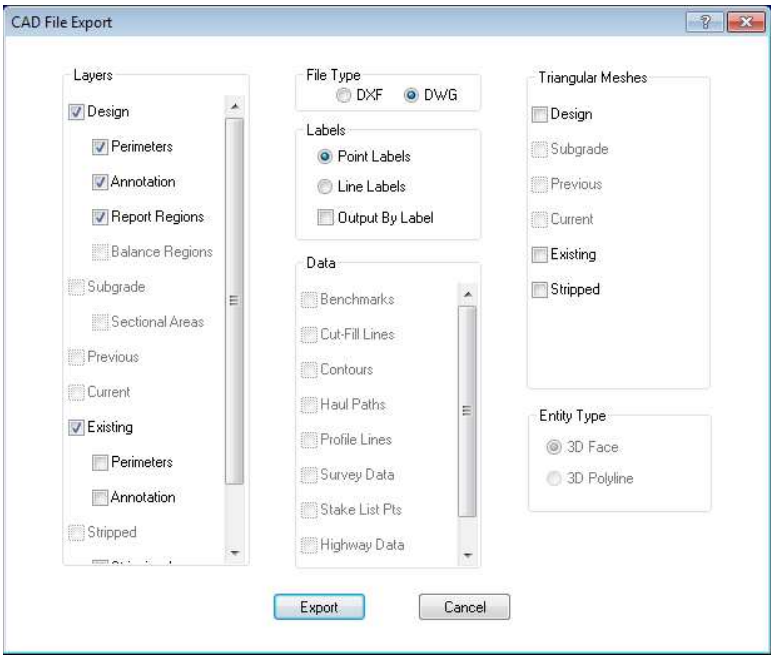
Edit text by selecting the text, then pressing the T key or selecting **Edit > Add Text**.

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:

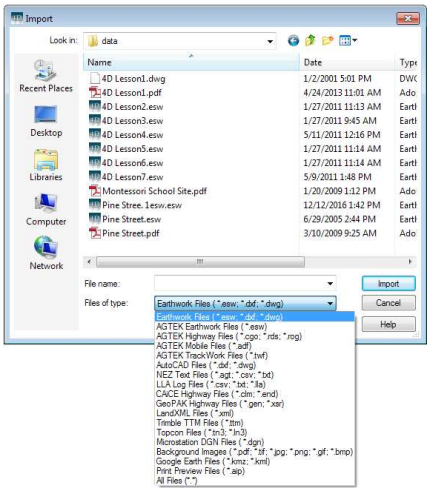
1. Select the line, then select a point closest to the location of the new point in the Elevation list.
2. Right-click and select **Insert Point**. The Point Editor dialog box is displayed.
3. Type in the North and East coordinates and Elevation for the new point and click OK.

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)
- LandXML Files (*.xml)
- 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, LandXML, PDF, and TIF Files (.dxf, .dwg, .agt, .csv, .txt, .ln3, .dgn, .xml, .pdf, .tif)

AutoCAD, NEZ, Topcon LN3, Microstation, LandXML, PDF, and TIF files all open using Import 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.

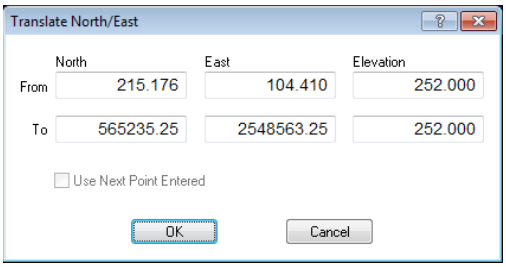
Note: There is no Undo for when using the "Whole Job" option. It is recommended that a backup of the job file be made prior to using any of these commands.

Translate North/East

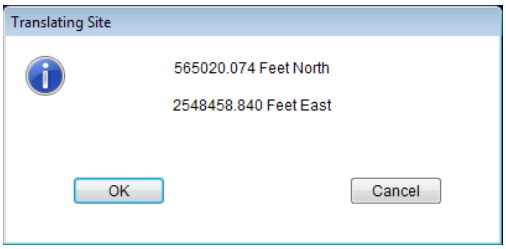
Used to move data to a different coordinate system. There are three methods to move data; all data, selected data, or the whole job. All data and selected data methods move only the data in the current Surface and Layer. Whole job moves all data in all Surfaces and Layers. For information on aligning 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.

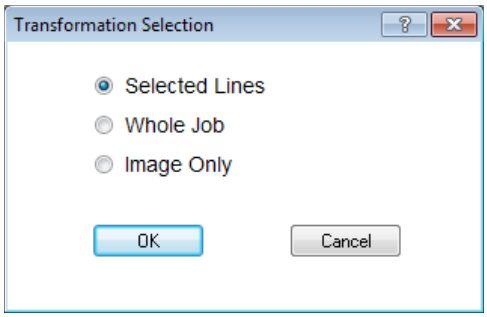


6. This dialog box displays the distance the data will be moved. Click OK to move the data or Cancel to abort the command.

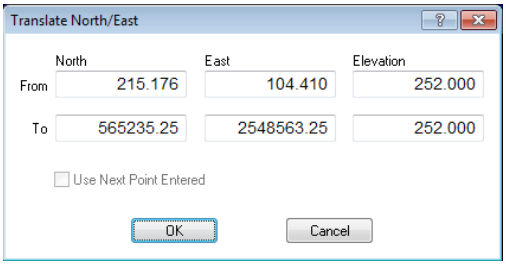
Selected Data/Whole Job

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.

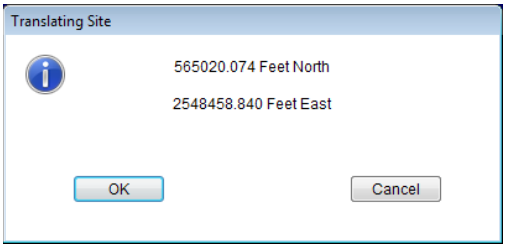
1. Select the data to move.
2. Select **Utility > Transform Job > Translate North/East**. The Select Area for Transformation dialog box displays.



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.



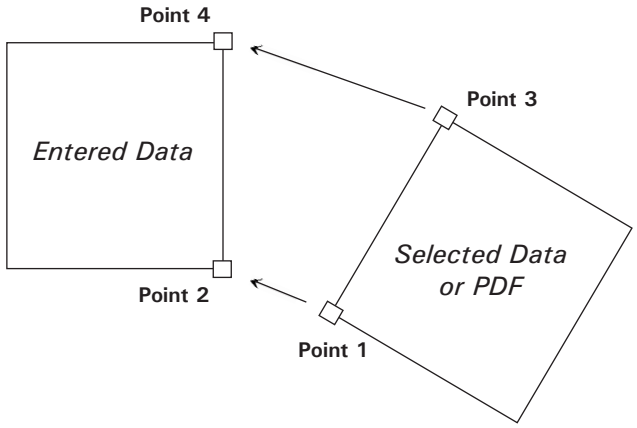
7. This dialog box displays the distance the data will be moved. Click OK to move the data or Cancel to abort the command.

Align Matching Edges

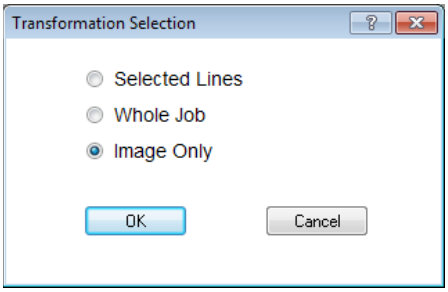
Used for matching data from separate grading sheets, rotating data into the correct field coordinates, moving data on different surfaces into the same coordinate system, or aligning digitized data with a PDF. Aligning matching edges requires two common points in both sets of data. Property corners or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

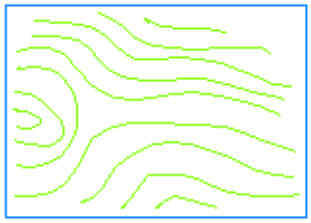
Rotating data is very similar to matching data to a common edge. The only difference is that point 1 and point 2 would be the same point when rotating data.

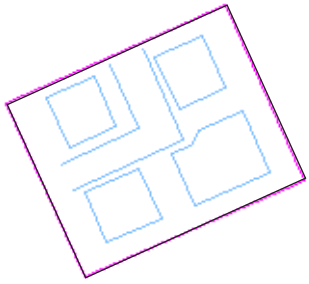
To rotate data, use the procedure for matching data to a common edge and select the same points for point 1 and point 2 in steps 4 and 5 in the procedure.

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.

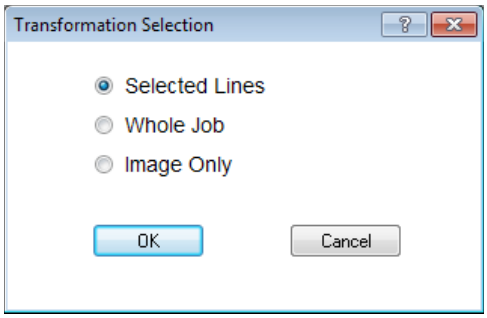
1. Press the ESC key to make sure nothing is selected.
2. Select **Utility > Transform Job > Align Matching Edges**.
3. Press Alt + B to display the Layer Selection window.
4. Select all required surfaces and layers. If moving design to match existing, make sure they are both selected.



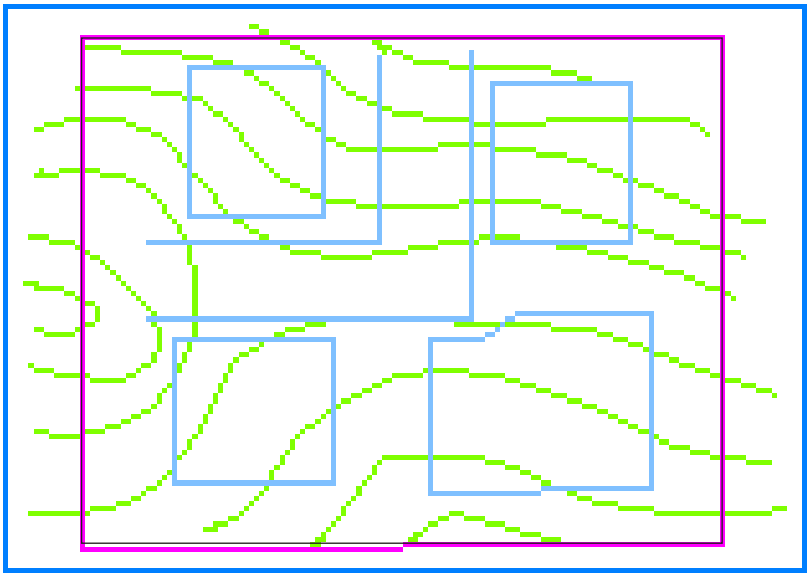


5. Select all the data in the layer you want to move.

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.

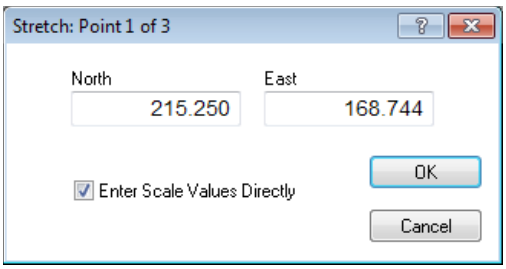


Stretch Site

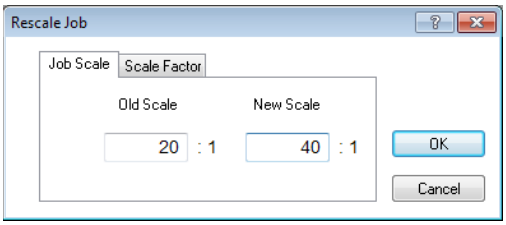
Adjusts the scale of selected data, or the whole job. The most common use is to correct data entered at the wrong scale.

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.



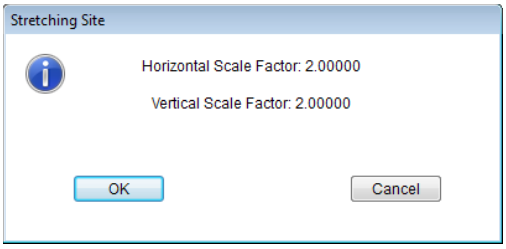
4. Check the Enter Scale Value Directly box. The Rescale Job dialog box is displays.



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.

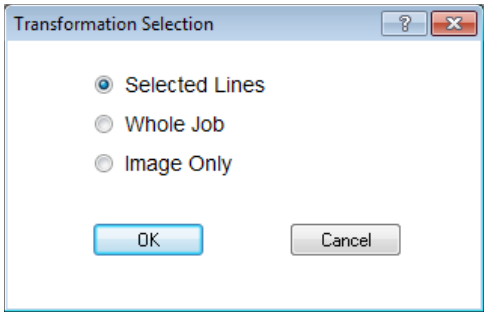
6. Click **OK**. The Stretching Site dialog box displays the vertical and horizontal factor by which the job was stretched.



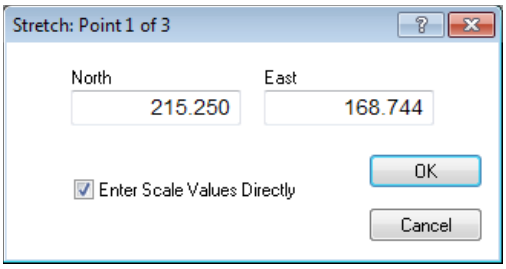
7. Click OK to finish and rescale the job.

Selected Lines Only

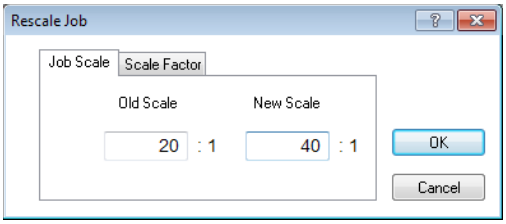
1. Select all the data to stretch on the screen.
2. Select **Utility > Transform Job > Stretch Site**. The Select Area for Transformation dialog box is displayed.



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.



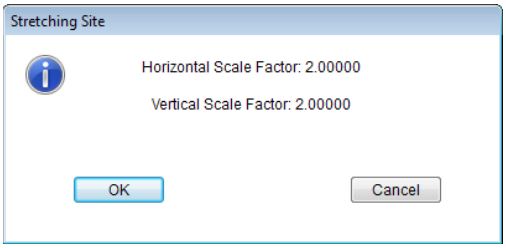
5. Check the Enter Scale Value Directly box. The Rescale Job dialog box displays.



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.

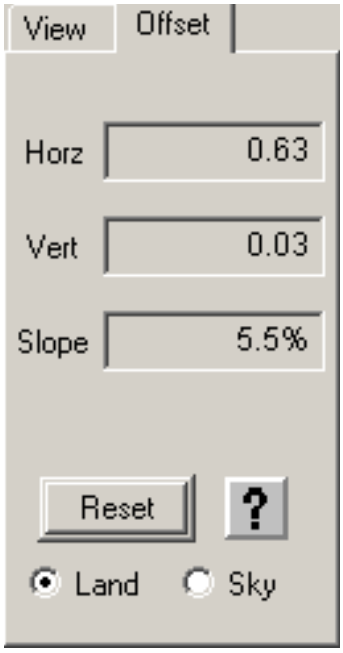


8. Click OK to finish and rescale the job.

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.

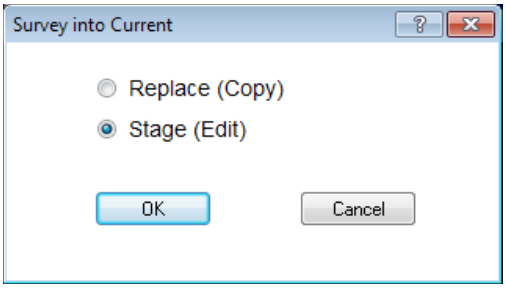
Make sure you have setup Bluetooth connections and run GPS Base Setup before checking existing ground. Refer to "Bluetooth Configuration" in the Appendix A-26 and "Lesson 1 - Instrument Setup" on page 6-2 for additional information.

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

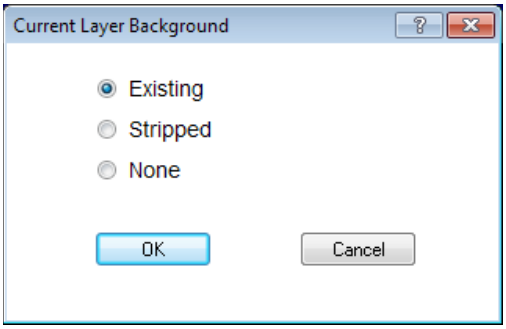
If the existing ground deviates substantially from the data in the job file, Earthwork 4D can use data collected from the Rover to document the difference and correct the original topo.

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).

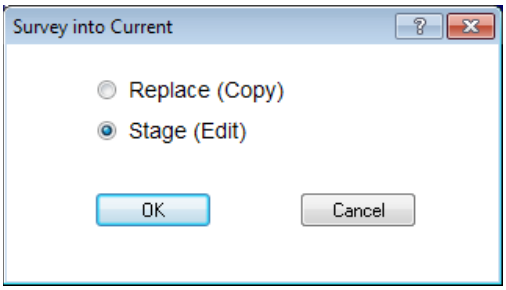
Progress Topoing

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.

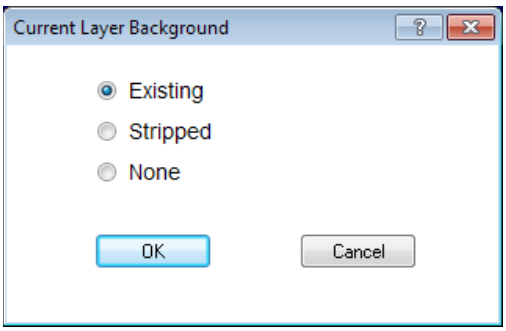
Make sure you have setup Bluetooth connections and run GPS Base Setup before stake checking. Refer to “Bluetooth Configuration” in the Appendix page A-26 and “Lesson 1 - Instrument Setup” on page 6-2 for additional information.

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 staring 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.

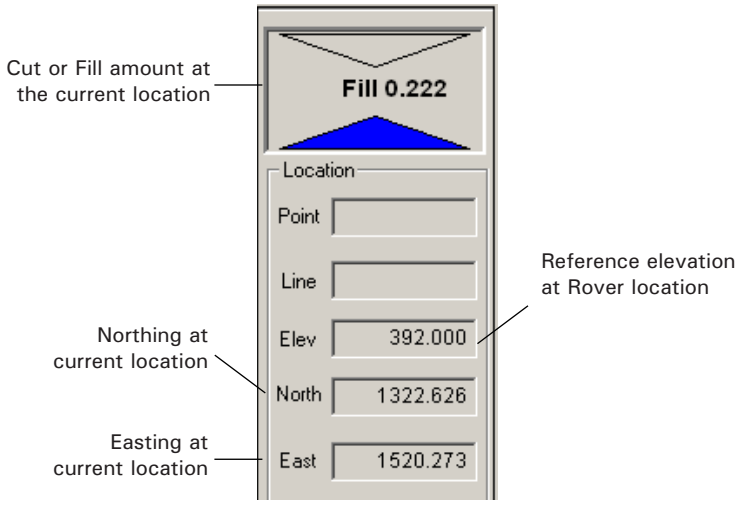
14. Click the Done button and the Survey Volume Report displays.

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.



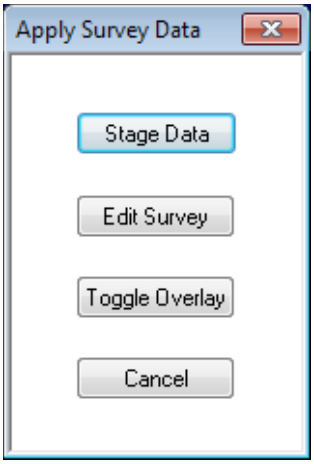
5. Repeat steps 3-4 for any other points to check.

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.

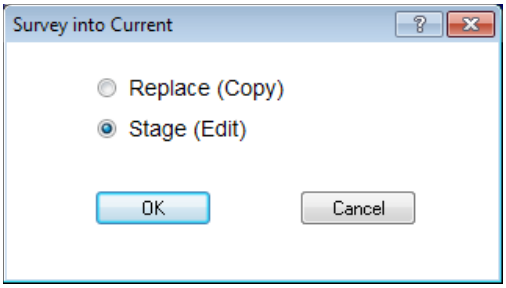
Collect the Data

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.

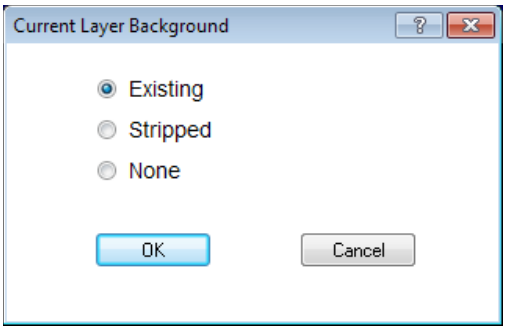
Stage the Data

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.

8. 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.

9. 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.
10. 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.
11. Click the Survey Volume Calc button. After calculation, the Volume Calculation Results dialog box is displayed.
12. 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.

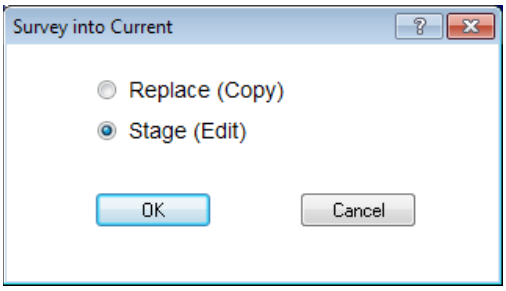
Collect the Data

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

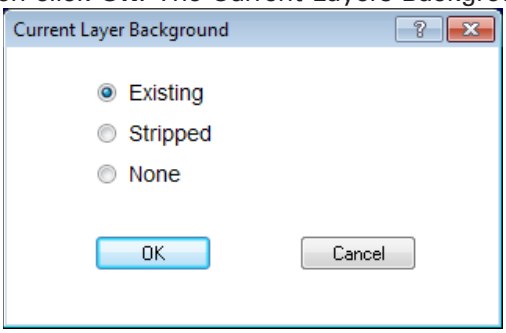
Stage the Data

1. Open the master file to apply the data to in Earthwork 4D.
2. Connect the SitePilot to your computer via a USB port, then select **File > PlanPilot Import.** The Open dialog box is displayed.
3. Select the file that was used to collect the data and click Open. The Survey data is opened in CAD Transfer mode.
4. 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 displays.



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.

8. 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.

9. 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.

10. 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.

11. Click the Survey Volume Calc button. After calculation, the Volume Calculation Results dialog box is displayed.

12. 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

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

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.

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.

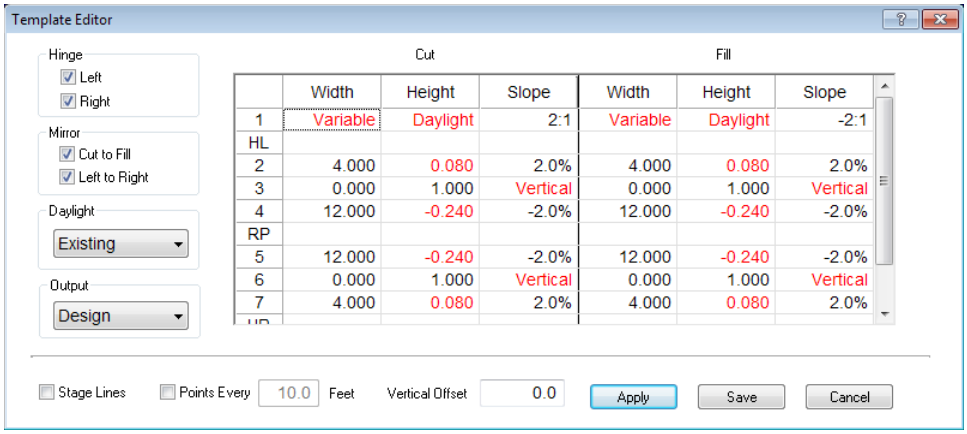
Sectional Area Hole

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.



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.

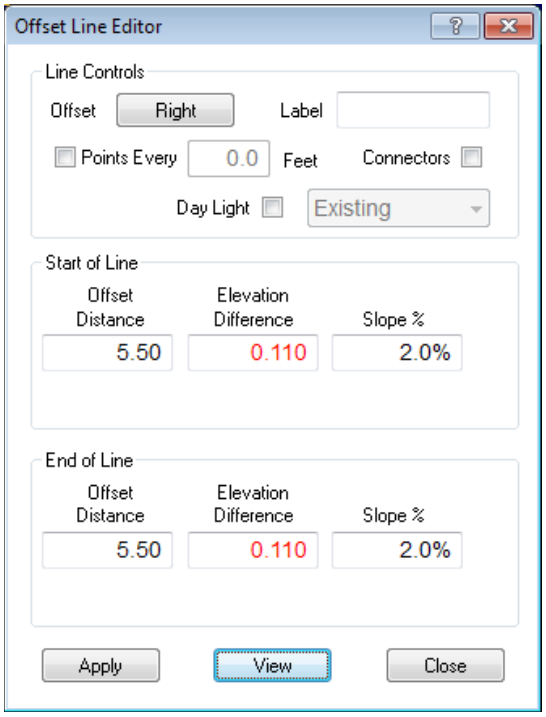
Height Segment elevation change.

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.

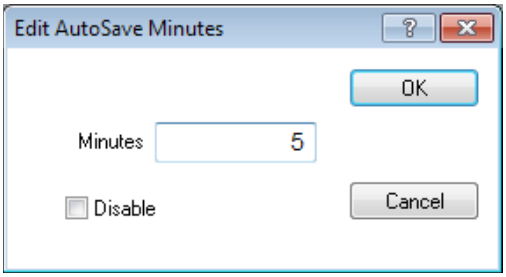
Multiple offset lines can also be created from a single reference line. For example, the base of curb could be created from the top of curb by clicking the **Apply** button and then a back of walk created by entering the new specifications and clicking **Apply**.

Section 9

Appendix

Using Auto Save

The Auto Save feature automatically saves your job to ensure data is not lost during an inadvertent termination of Sitework 4D. To edit the properties of this feature, select **Options > Auto Save**. A check next to the command on the menu indicates that it is enabled.



Auto Save allows you to set the interval between saves from 1 and 60 minutes. By default, the programs sets the save interval to 5 minutes. To turn off the Auto Save function, select Disable checkbox and click **OK**.

The Autosave.esw File

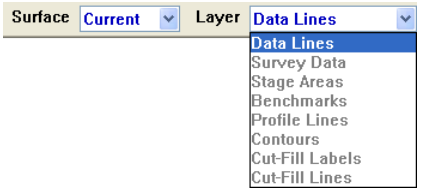
If Sitework 4D is not closed down properly, any data in the current job file that was entered after the previous Save is automatically saved to a file called “Autosave.esw”. The “Autosave.esw” file is located in the current working directory. This file is only created when the amount of time passed is greater than both the Auto Save interval and the amount of time since the last Save command was executed. If Sitework 4D is closed using the Exit command from the file menu, the autosave file is deleted.

Recovering the File

When an “Autosave.esw” file has been created and Sitework 4D has closed improperly, the Autosave.esw file is automatically opened the next time Sitework 4D is started. If an autosave file is opened, be sure to Save the file and either change the name of the file or choose the previous version of that file and overwrite it. Auto Save files that have not been recovered are deleted when you exit Sitework 4D.

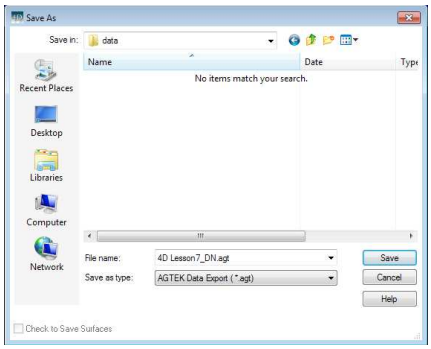
Creating AGT Files

Sitework 4D can create AGT files, which are ASCII line format files used to transfer data lines between programs. These files can then be imported into other programs, such as AGTEK's Graphic Grade 3D program. To create an AGT file



1. Select the Surface and Layer you want to save as an AGT file.

2. Use the Hide, Hide All But, and Show All commands or use the Layer Selection command to display the Layer data to be saved. Only the visible data lines of the active Surface and Layer are saved in the AGT file



3. Select **File > Save As**. The Save As dialog box is displayed.

4. Change the file type to AGTEK Text Export (*.agt) and click Save.

   Note: A 2-letter abbreviation for the currently active surface is appended to the end of the job name to distinguish it from other AGT files created from this job.

Importing AGT Files

When an AGT file is imported, Sitework 4D automatically switches to CAD Transfer mode and allows the file to be sent to a specific surface and layer from that window.

Exporting Machine Control Files

Sitework 4D saves surface information for use in Machine control units, including AGTEK, Topcon, Trimble, Leica units.

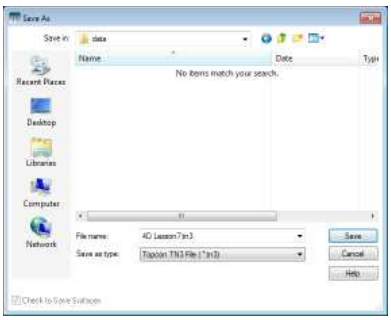
AGTEK Graphic Grade Machine Control

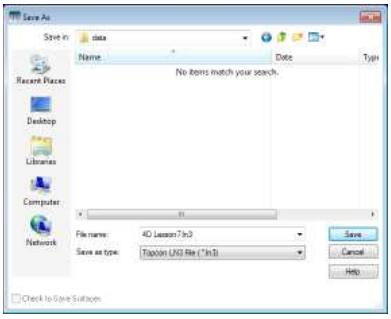
Sitework 4D saves machine control data in the .esw file when it is saved in Sitework 4D. To use the data, open the .esw file in Graphic Grade Machine Control. Refer to the AGTEK *Graphic Grade Machine Control* manual for additional information.

Topcon Machine Control

Sitework 4D can export TN3 files, which can be opened in Topcon applications to create a machine control file for use in Topcon units.

1. Open the file for use as the machine control file in Sitework 4D.
2. Select **File > Save As**. The Save As dialog box displays.
3. Select "Topcon TN3 File (*.tn3)" from the Save as type pulldown and click **Save**.



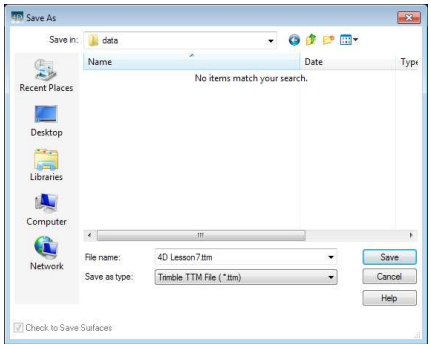


4. Select "Topcon LN3 File (*.ln3)" from the Save as type pulldown and click **Save**.
5. Open the files in Topcon and save a machine control file. Refer to the Topcon documentation for information about saving a machine control file.

Trimble Machine Control

Sitework 4D can export TTM files, which can be opened in Trimble applications to create a machine control file for use in Trimble units.

1. Open the file for use as the machine control file in Sitework 4D.
2. Select **File > Save As**. The Save As dialog box is displayed.



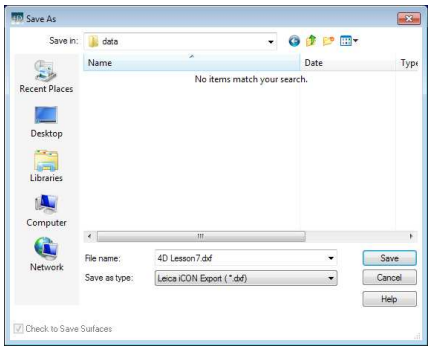
3. Select "Trimble TTM File (*.ttm)" from the Save as type pulldown and click **Save**.
4. Open the file in Trimble and save a machine control file. Refer to the Trimble documentation for information about saving a machine control file.

Leica Machine Control

Sitework 4D can export DWG files which are optimized for use with Leica applications and products.

1. Open the file for use as the machine control file in Sitework 4D.

2. Select **File > Save As**. The Save As dialog box is displayed.



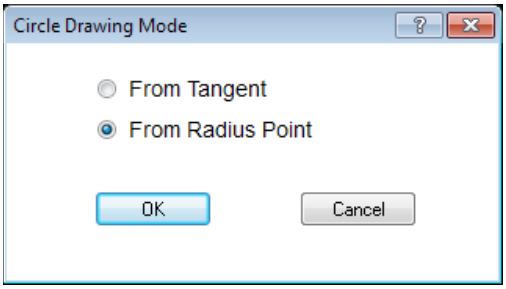
3. Select "Leica HMC3D (*.dwg, *.dxf)" from the Save as type pulldown and click **Save**.

4. Open the file in Leica and save a machine control file. Refer to the Leica documentation for information about saving a machine control file.

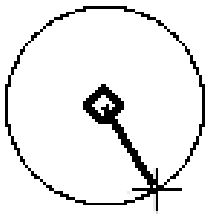
Adding Circles

The Circle Tool button is used to add a user-defined circle to a design. Circles are added using an existing center point or by creating a circle without a center point reference. Circles can only be added in Entry Mode. Follow the steps below to add a circle to your job.

1. Click the **Circle Tool** button from the Utility Tool Bar. The Circle Drawing Mode window will display. Choose the desired method.

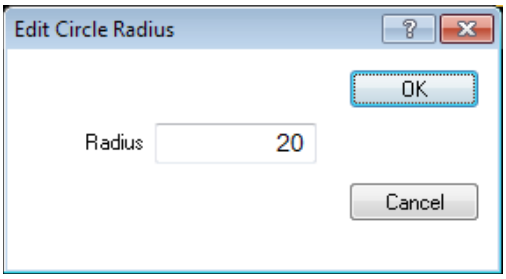


2. Move the crosshair over the location for the circle or the center point to use and press the **Enter** key. The crosshair snaps to the existing point if snap is turned on.



3. Move the crosshair away from the center point.

4. Press the **Enter** key again to add the circle. The Edit Circle Radius dialog box is displayed



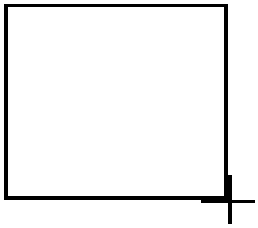
5. Make changes to the radius and click **OK** to finish entering the circle.

Adding Rectangles

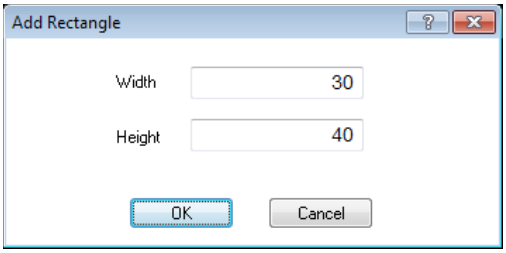
The Rectangle Tool button is used to add a user defined rectangle, such as a building pad, to a design. Rectangles can only be added in Entry Mode. Follow the steps below to add a rectangle to your job.

1. Click the **Rectangle Tool** button from the Utility Tool Bar. The cursor changes to a crosshair.

2. Move the crosshair over the location of one of the corners of the rectangle and press the **Enter** key.



3. Move the crosshair away from the starting point to draw the rectangle.



4. Press the **Enter** key again to add the rectangle. The Add Rectangle dialog box is displayed.

5. Make changes to the Width and Height and click **OK** to finish entering the rectangle.

Entering Rectangles Parallel to an Existing Line

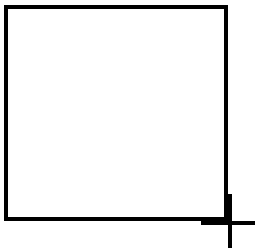
Often, the roads and pads of a job site do not run exactly North-South and East-West. Sitework 4D can enter data by temporarily changing the coordinate system based on a line segment that runs parallel to the data to be entered. Any rectangles drawn subsequently will follow this new coordinate system. Follow the steps below to add a rectangle parallel to an existing line to your job .

1. Move the cursor over a line parallel to the orientation of the proposed rectangle.

2. Press the F12 key . The line displays a yellow diamond at each end. The job is now set up to use these coordinates for data entry.

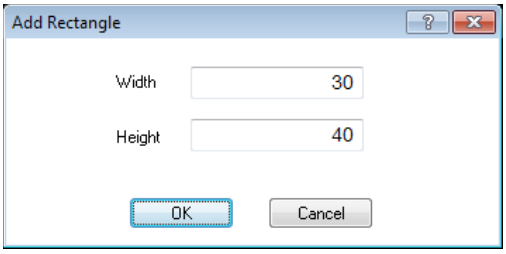
3. Click the **Rectangle Tool** button from the Utility Tool Bar. The cursor changes to a crosshair.

4. Move the crosshair over the location of one of the corners of the rectangle and press the **Enter** key.



5. Move the crosshair away from the starting point to draw the rectangle.

6. Press the **Enter** key again to add the rectangle. The Add Rectangle dialog box displays.



7. Make changes to the Width and Height and click **OK** to finish entering the rectangle.

8. Press the **X** key to return the original job coordinate system.

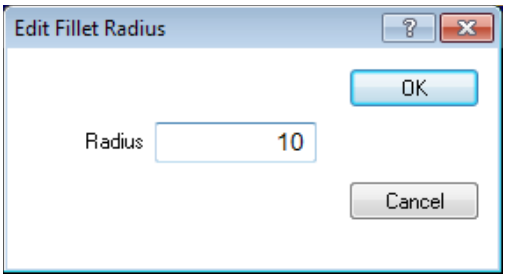
Adding Arcs/Fillets

The Fillet Line button is used to add an arc where two surfaces meet, forming a rounded corner. The fillet is entered with a user-defined radius added between adjoining line segments. Fillets can be added in Entry and Edit Mode. Follow the steps below to add a Fillet to your job.

Adding a Fillet in Edit Mode

In Edit Mode, the Fillet Tool button is used to add a fillet to the corner of two joined line segments. The corner must be on a joined or continuous line segment.

1. Switch to Edit Mode.
2. Click on the corner of the line where the fillet will be added
3.  Click the Fillet Tool button from the Utility Tool Bar. The Edit Fillet Radius dialog box displays.



4. Enter the desired radius and click **OK** to add the fillet.

Two annotation points are added, “CR1” and “PL1”. “CR1” represents the center of the radius that was created and “PL1” is the previous corner location.

Adding a Fillet in Entry Mode

In Entry Mode, the fillet command is accessed using the **R** key while entering points. The radius is applied to the line after the second point is entered.

1. Switch to Entry Mode.
2. Click on the first point.
3. Move the crosshairs to the location of the second point and click on the point
4.  Press the **R** key followed by a radius value and move the crosshair to preview the fillet.
5. Click again to add a point using the specified fillet radius.

   Note: Any subsequent fillet will use the previously used radius value until a different R-value is entered using the steps above.

Adding Benchmarks

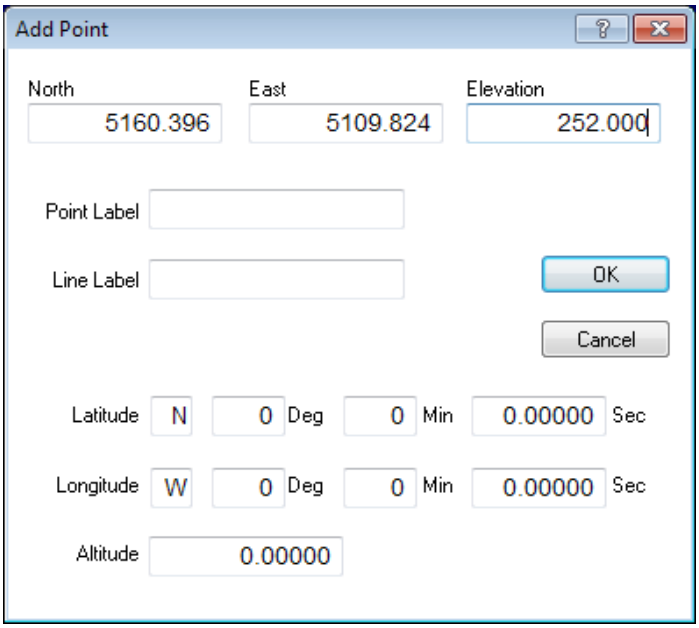
The Add Benchmarks button is used to add benchmarks to a job. Once added, Benchmarks can be used for scaling purposes or for future use in the field. Benchmarks can only be added in Edit Mode. There are two methods for adding a Benchmark, using a selected point and using user-defined Benchmarks. Follow the steps below to add a Benchmark to your job.

Using a Selected Point

An existing point can be used as a benchmark. The point may be alone or part of a data line.

1. Click on the point to be used as a benchmark.

2. Click the **Add Benchmarks** button. The add Point dialog box displays.



3. Add any desired Point or Line Labels and click OK. A benchmark point (displayed as a "Y") is created.

User-Defined Benchmarks

If no point exists at the Benchmark location, a user-defined Benchmark can be added at a specific location. Note that the current job must be scaled to field coordinates to add a Benchmark that can be used on the construction site.

1. Make sure nothing is selected by pressing the Esc key

2. Click the Add Benchmarks button. The cursor changes to a crosshair.

3. Move the crosshair to the location of the Benchmark and click. The Add Point dialog box is displayed.

4. Enter the coordinates for the Benchmark, add any desired Point or Line Labels and click **OK**. A benchmark point (displayed as a "Y") is created.

Enter Benchmarks with Lat/Long Info From Google Earth

To successfully export a .kmz file for use with Google Earth the file must be properly aligned using lats and longs. If this information is not available, approximate lat/long coordinates can be obtained using Google Earth. For information on exporting a .kmz file refer to page 5-4.

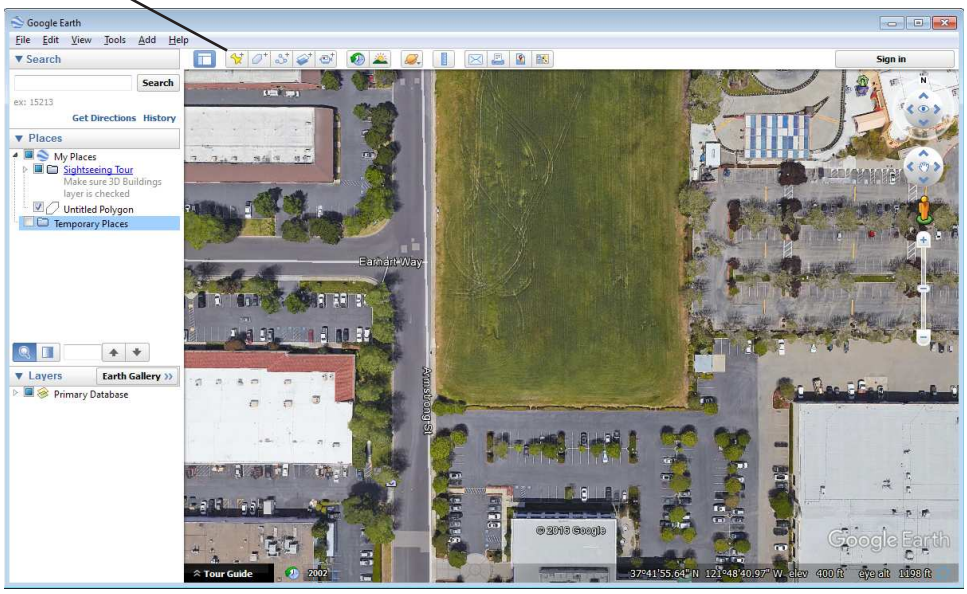
1. Open your file in Sitework 4D and launch Google Earth. If you do not have Google Earth installed it can be downloaded at http://earth.google.com/.

2. Using Google Earth, locate your job site.

3. Identify two points which can also be found in you job file.

4. Click the Add Placemark tool identified below. A dialog box displays giving you the latitude and longitude of the pushpin.

Add Placemark Tool



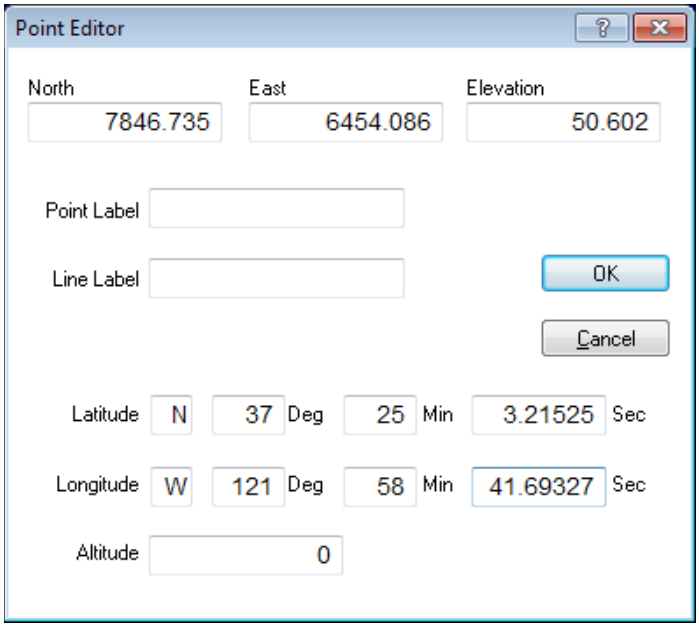
5. Place the tip of the pushpin on the first of the two points selected.

6. Click and drag over the lat coordinate to highlight it, right-click and select copy.

7. Switch to Sitework 4D.

8. Click the **Add Benchmarks** button. The cursor becomes to a crosshair.

9. Click the point on the job that matches the point located in Google Earth. The Add Point box displays.



10. Right-click in the degree box for the latitude coordinate and select paste.

11. Switch to Google Earth and repeat steps 6-10, this time for the longitude coordinate.

12. Repeat the process for the second point.

13. Click the **Save** button.

14. Your job is now ready to create a .kmz file.

Conforming Annotation Lines

Design lines are often imported from CAD files as annotation lines. These annotation lines can be converted into three-dimensional data lines by using the Conform Annotate command. This command can quickly change a large number of annotation lines by interpolating elevations and "conforming" them to current design data lines or to the current surface.

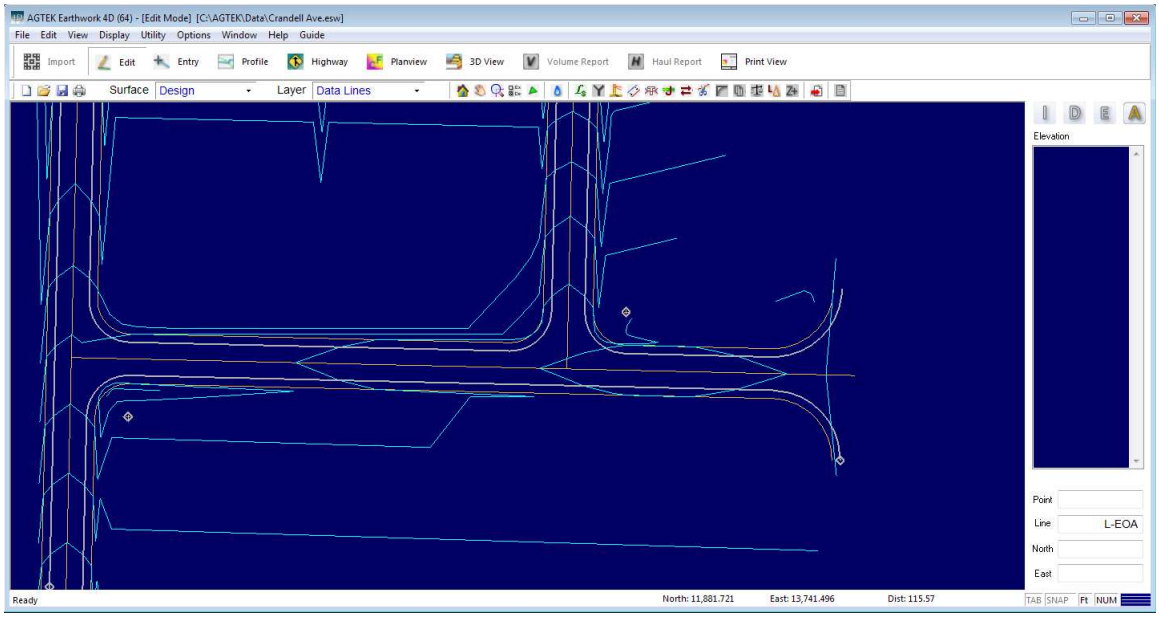
Conforming to Design Lines

This example uses a sample file called "Crandell Ave.esw", available in the **C:\AGTEK\Data** directory. This job is a subdivision with street lines that have been imported as annotation lines. We'll convert these lines to design lines using Conform Annotate instead of entering elevations individually or re-digitizing the lines.

1. Open the "Crandell Ave.esw" file.

2. Switch to Edit Mode, make sure the Design Surface and Annotation Lines Layer are selected, and zoom in to a section of the street.

3. Click the L-EOA line (the inside line defining the street), then click the Label Selection button



4. Select **Utility > Conform Annotate > to Design Lines.** The line changes to blue, and elevations are interpolated based on elevations near the line.

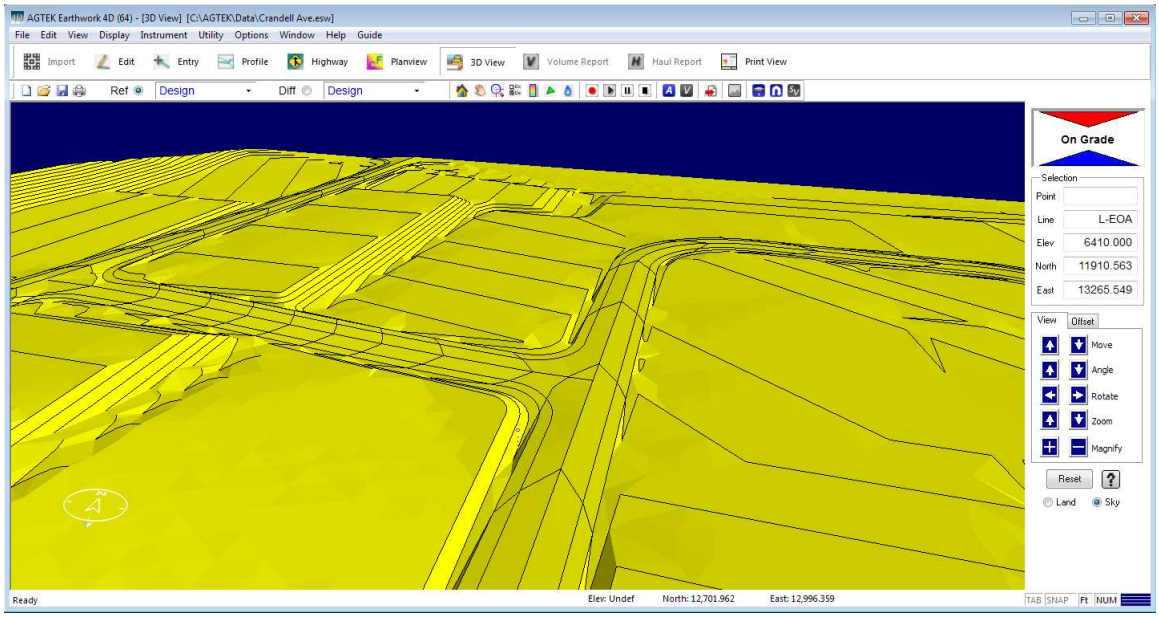
5. Click the L-SHLDR line (the outside line defining the street), then click the **Label Selection** button.

6. Select **Utility > Conform Annotate > to Design Lines**. Elevations are interpolated based on elevations near the line.

7. Click the Centerline line then Click the **Label Selection** button.

8. Select **Utility > Conform Annotate to Design Lines**. Elevations are interpolated based on elevations near the line and the road is now at Finished Grade.

9. Check the design in 3D view for elevation differences. Your screen should look similar to the illustration below



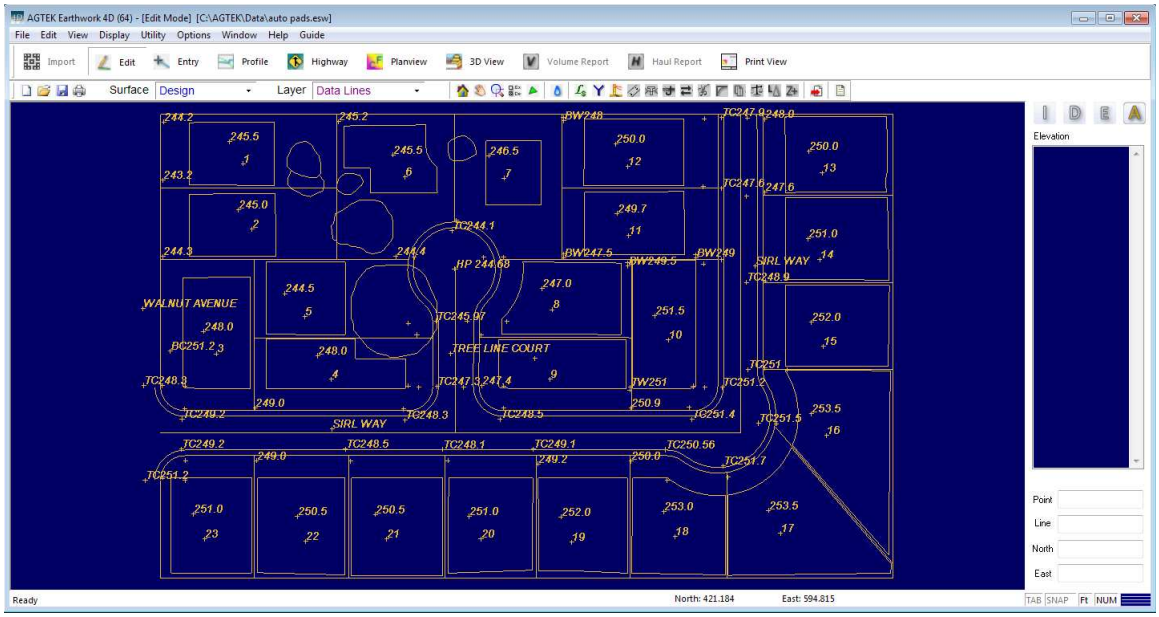
Assigning Elevations using Auto-Pad

Sitework 4D can quickly assign elevations to enclosed areas using the Auto-Pad function. This is especially useful for assigning elevations to files that have a large number of pads that are transferred as annotation lines.

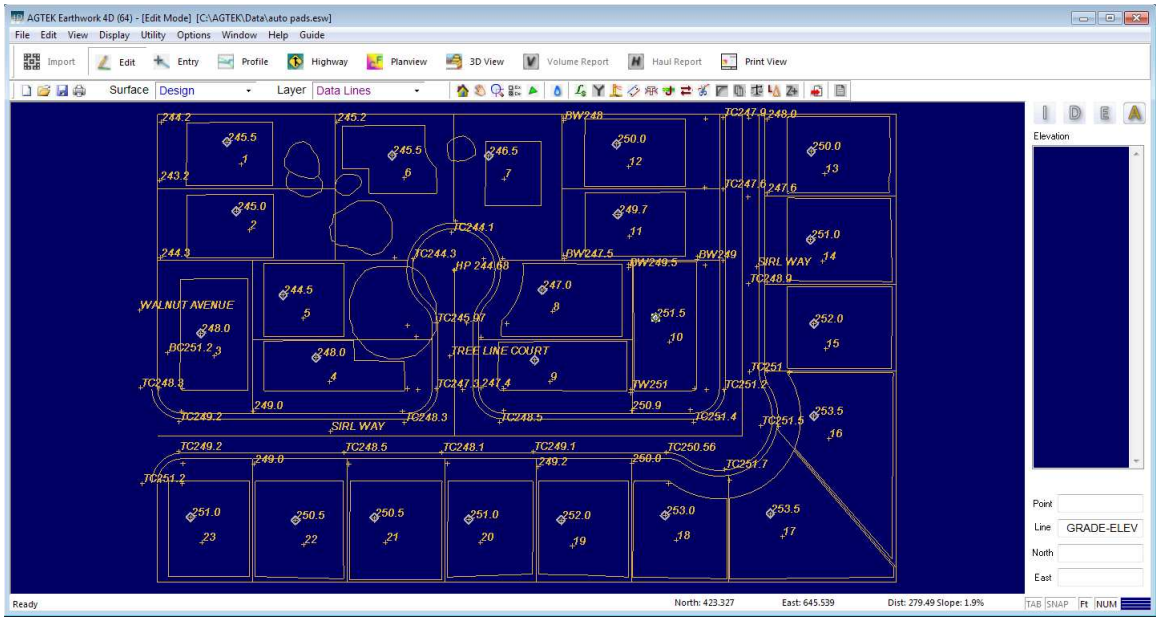
This example uses a sample file called “Auto Pad.esw”, available in the **C:\AGTEK\Data** directory. This is a CAD file that has been transferred with the pads as annotation lines.

1. Open the “Auto Pad.esw” file.

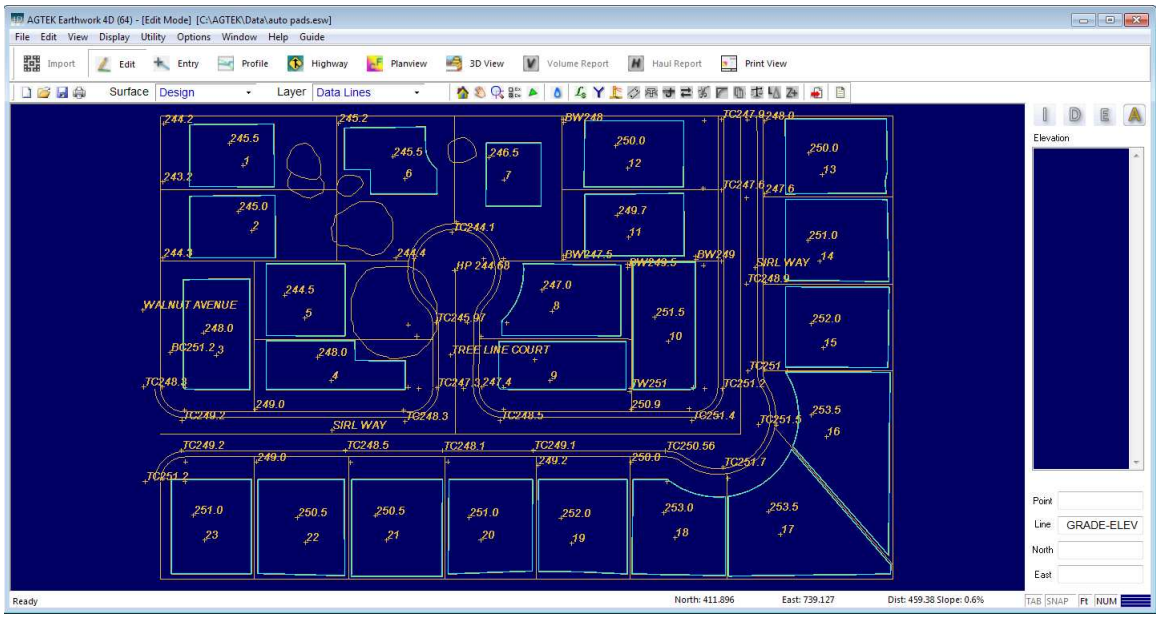
2. Switch to Edit Mode, make sure the Design Surface and Annotation Lines Layer are selected.



3. Click on an elevation then Shift + click on all of the remaining elevations in the pads. If the pad number is selected, it will be used for the elevation.



4. Select **Utility > Auto-Pad** to create pad elevations.

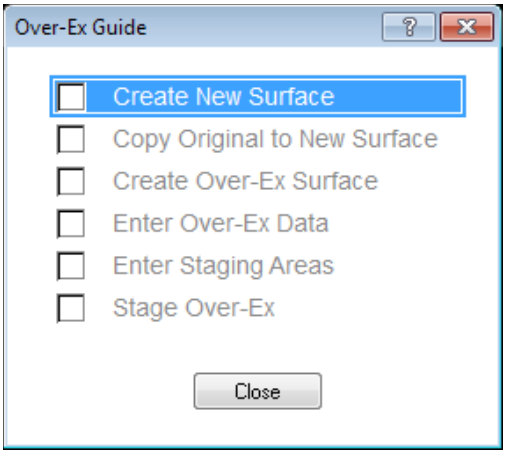


Over-Excavating

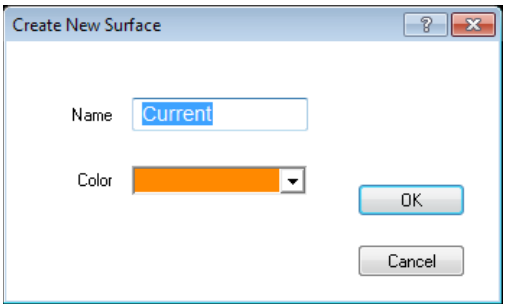
Over-Excavation and backfilling new material is often required on building sites before grading to subgrade. Sitework 4D allows the user to calculate the volumes of the over-excavation by creating a new surface at the over-ex grades and comparing it to the existing ground. The example below uses the "over-ex.esw" file, which can be found in the **C:\AGTEK\Data directory**.

1. Open the "Over-ex.esw" file.

2. Switch to Entry Mode and click the **Over-Ex** button on the Utility Tool Bar. The Over-Ex Guide dialog box is displayed.

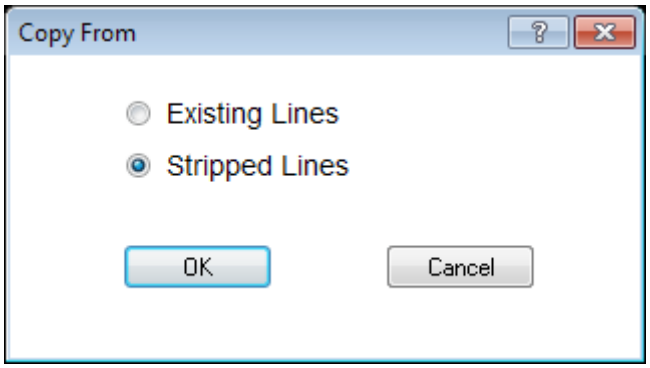


3. Select Create New Surface and click **OK**. The Create New Surface dialog box is displayed with Current as the default name.



4. Click **OK**. The Current Surface is displayed on the screen.

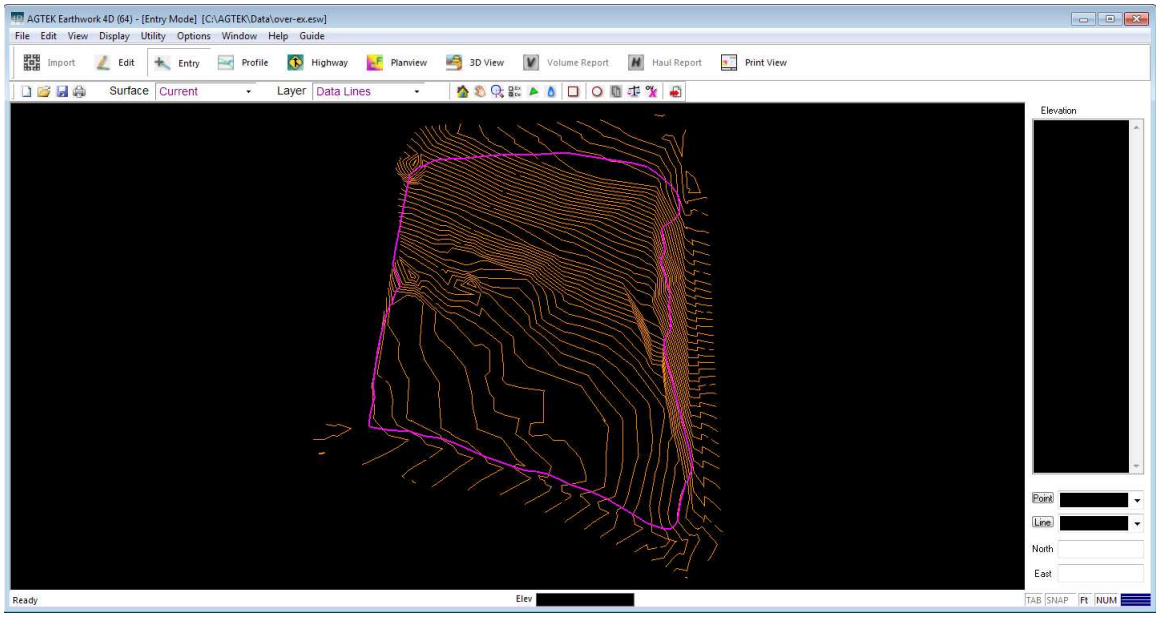
5. Click the **Over-Ex** button on the Utility Tool Bar and select Copy OG into New Surface. The Copy From window will display. Select either Existing or Stripped and click **OK**.



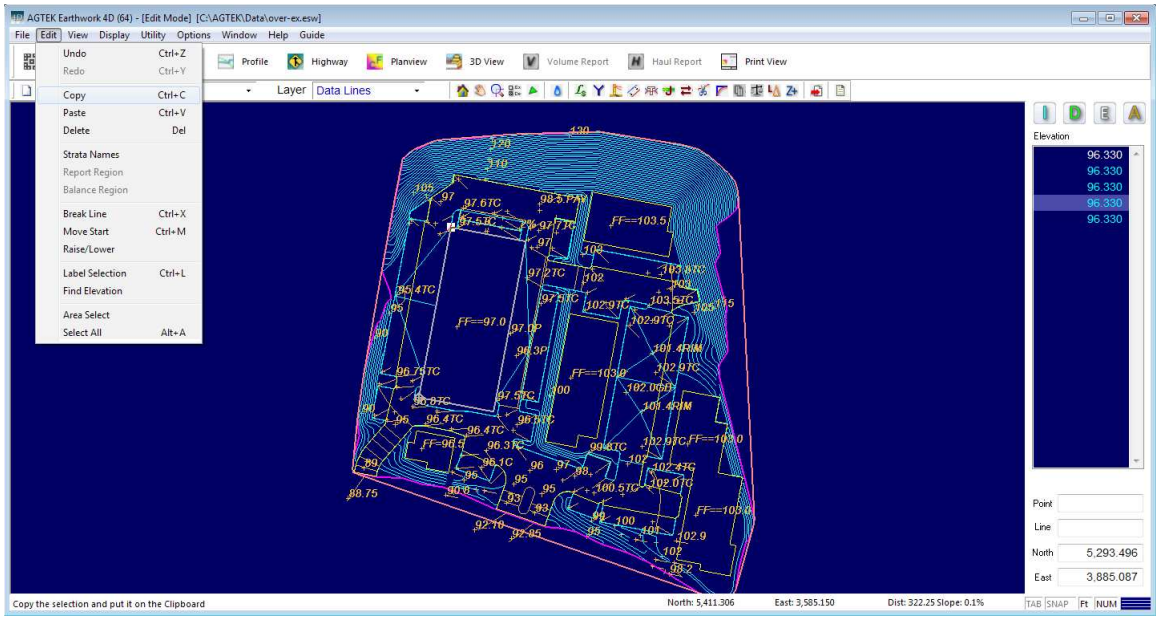
6. Click the **Over-Ex** button on the Utility Tool Bar and select Create Over-Ex Surface from the guide. The Over-Ex Surface is displayed on the screen with no data.

7. Click the **Over-Ex** button on the Utility Tool Bar and select Enter Over-Ex Data.

8. Switch to Edit Mode and select the Design Surface and Data Lines Layer.

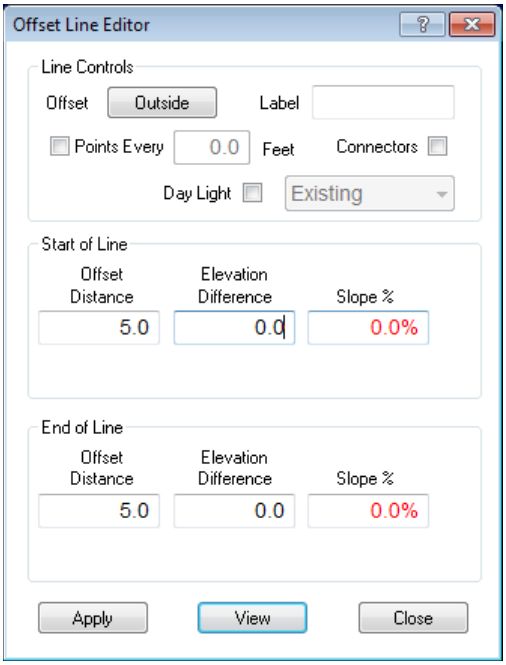


9. Click on the pad on the left side of the job and select **Edit > Copy**.



10. Select the Over-Ex Surface and select **Edit > Paste**. The pad is pasted in as a yellow line.

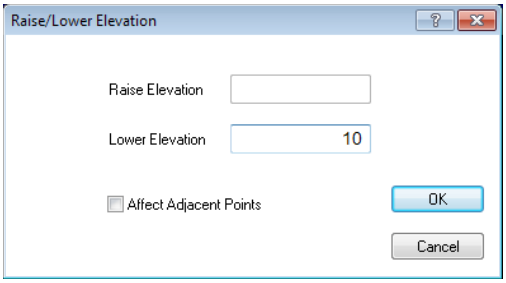
11. Click on the pad and the click the **Offset Line** button. The Offset Line Editor is displayed.



12. Run an Offset Line outside the pad with an Offset Distance of "5" and a Slope % of "0". Click **View** to view the line, **Apply** to add the line, and **Close** to close the Offset Line Editor.

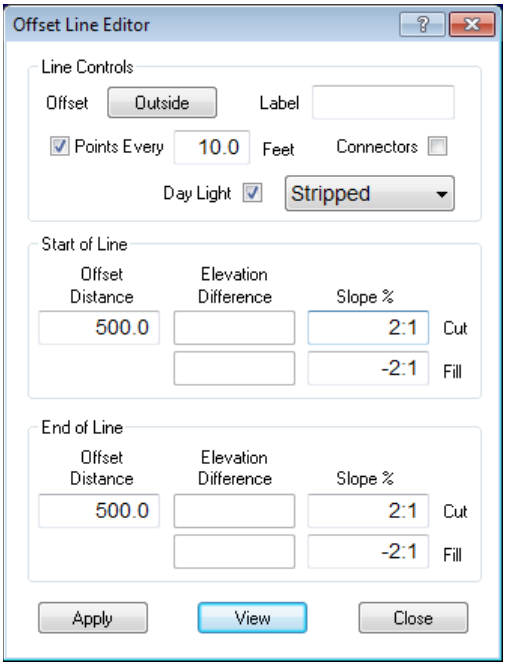
13. Press the **Delete** key to remove the pad from the Over-Ex Surface since we no longer need it.

14. Select the offset line just created and select **Edit > Raise/Lower** from the menu. The Raise/Lower Elevation dialog box is displayed.



15. Enter "10" in the Lower Elevation box and click **OK**. This lowers the offset line from the pad to the over-excavation level.

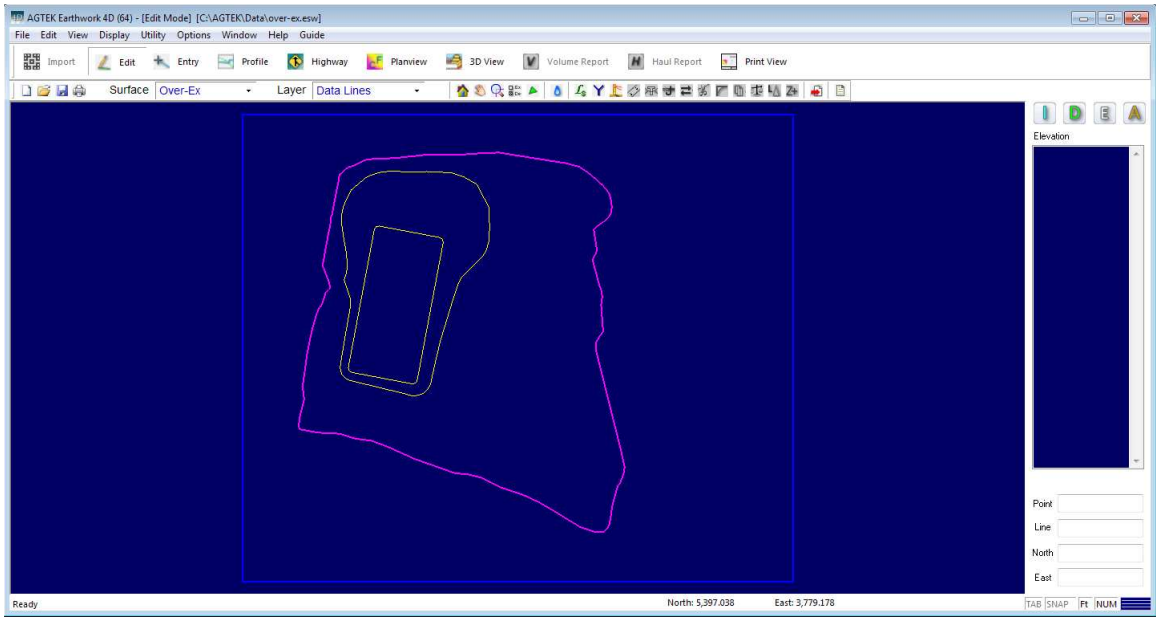
16. With the line selected, click the **Offset Line Editor** button. The Offset Line Editor displays.



17. Check the Day Light box, select Existing, and enter "2:1" in the Start of Line Slope % box. This creates an offset line to daylight at 2:1 slope.

18. Click **View** to view the line, **Apply** to add the line, and **Close** to close the Offset Line Editor. Your screen should look similar to the illustration on the following page.

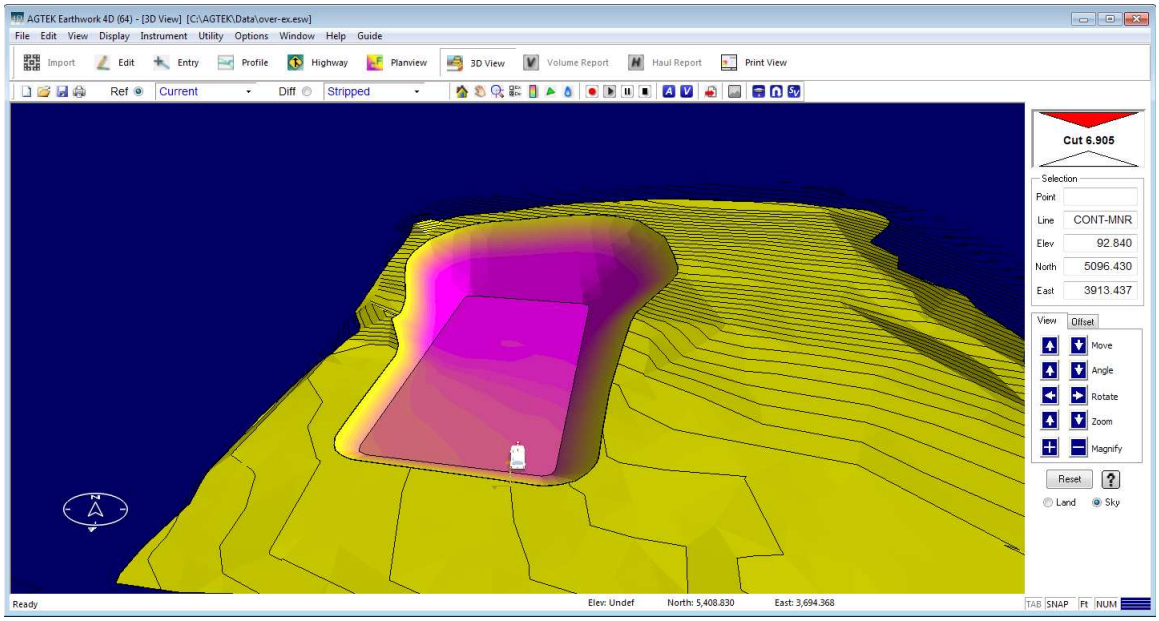
19. Switch to Entry Mode, click the **Over-Ex** button on the Utility Tool Bar and select Enter Staging Areas. The Stage Areas Layer is selected.



20. Press the F8 key twice over the offset line to area snap the stage area to the line. Right-click twice to end snap and data entry.

21. Press the **Over-Ex** button on the Utility Tool Bar and select Stage Over-Ex. The screen switches to 3D Edit Mode displaying the staged data in Terrain and Overlay view.

22. Switch to 3D View Mode and select Current as the Ref and Stripped as the Diff.



23. Click the **Calc Volume** button to calculate the volume of the over-excavation area. To view the full report, switch to the Volume Report Mode.

Stripped Current Surface vs. Stripped Existing Surface

To compare a stripped current surface to stripped existing surface in 3D View Mode, the stripped surface must be used instead of the existing surface in the current layer when creating the Over-Ex surface. When creating the current surface on the Over-Ex Guide, skip the step: Copy OG into New Surface. Follow the steps below to copy the stripped existing ground data into the Current Surface.

1. Switch to 3D View Mode, change the Ref to Stripped.

2. Type Ctrl-C to copy the stripped surface.

3. Switch back to Edit Mode. Change the Surface to Current and the Layer to Data Lines. Type Ctrl-V to paste the data into the Data Lines layer of the Current surface.

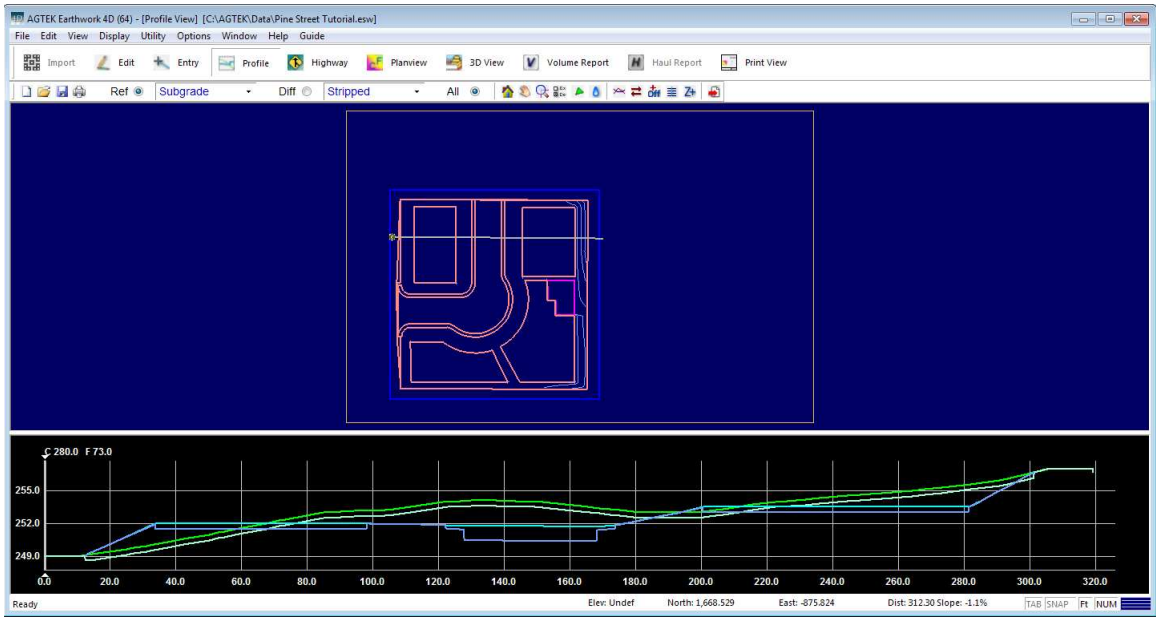
Press the **Over-Ex button** and continue from **Create Over-Ex Surface**.

Profile Views

Profiles are another way to check your work and can be viewed from any position on the site. Profiles are entered in the Profile View mode.

Entering a Profile

1. Switch to Profile View Mode and select Subgrade as the Ref (Reference) layer and Stripped as the Diff (Difference) Layer.
2. Select **Utility > Profile Entry** and click at the edge of Lot 4.
3. Move the cursor across Lot 3 to the back edge of the design contours and click again.
4. Right-click to end the line



As you drag the cursor over the site, you notice how the profile displays along the bottom of the screen showing design, existing ground and the strata layers. To display all layers in the file, select the **All** button on the tool bar.

5. Move the cursor to the center-line of the street between Lot 1 and Lot 4, then click and draw a line down the center of the street passing through Lot 2 and the retaining wall to the edge of the site.

6. Right-click to end the line

Notice how the street section displays as well as the retaining wall and hole in the proposed perimeter. Try entering in other profile lines. Profile lines don't have to be straight and may contain multiple line segments. Press the Enter button to add a point and change the direction of the line. These Profile lines can also be used to create stations along the length of the profile.

Zooming In/Out on a Profile

Zooming in on a selected profiles allows for a closer inspection of that profile. You can also pan across the profile to continue inspection.

1. Place the cursor over the selected profile in the profile view. Roll the mouse wheel up/down to zoom in/out.

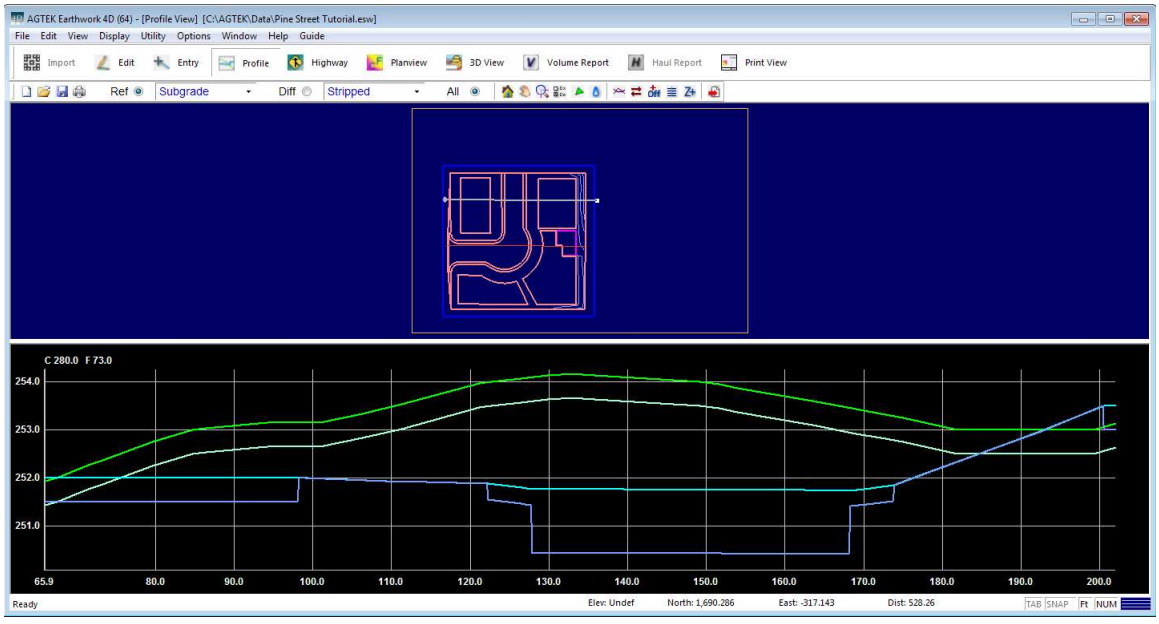
2. Push down on the mouse wheel and drag the cursor to pan the view of the selected profile.

Enlarging Profile Window

Enlarging the profile window allows you to adjust the amount of screen space dedicated to the profile view.

1. Place the cursor over the bar separating the plan view from the profile view.

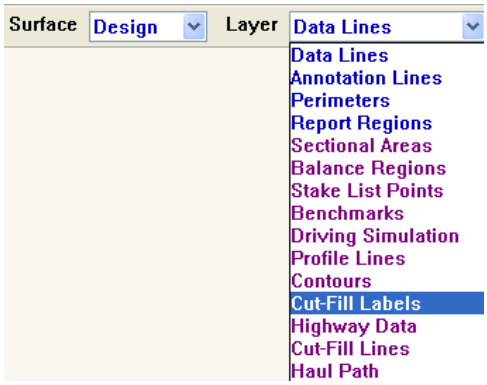
2. Left-click and drag the bar up or down to adjust the size of the profile view. Your profile view should appear similar to the illustration below.



User Cut-Fill Values

The User Cut Fill Values option allows the user to enter locations manually for specific cut/fill locations to display. To enter these specific locations.

1. Switch to Entry Mode



2. Select the Design Surface and Cut/Fill Labels Layer.
3. Click to enter Points where you wish cut-fill labels to display. Right-click to finish.
4. Switch to Plan View Mode.
5. Select **View > User Cut Fill Values**. The only cut-fill labels that appear should be the ones that you entered.

Modifying the View

The Plan View can be modified with the Zoom and Pan functions.

Zooming

Zoom allows you to change the scale of the Plan View and creates a more detailed display of cut-fill labels.

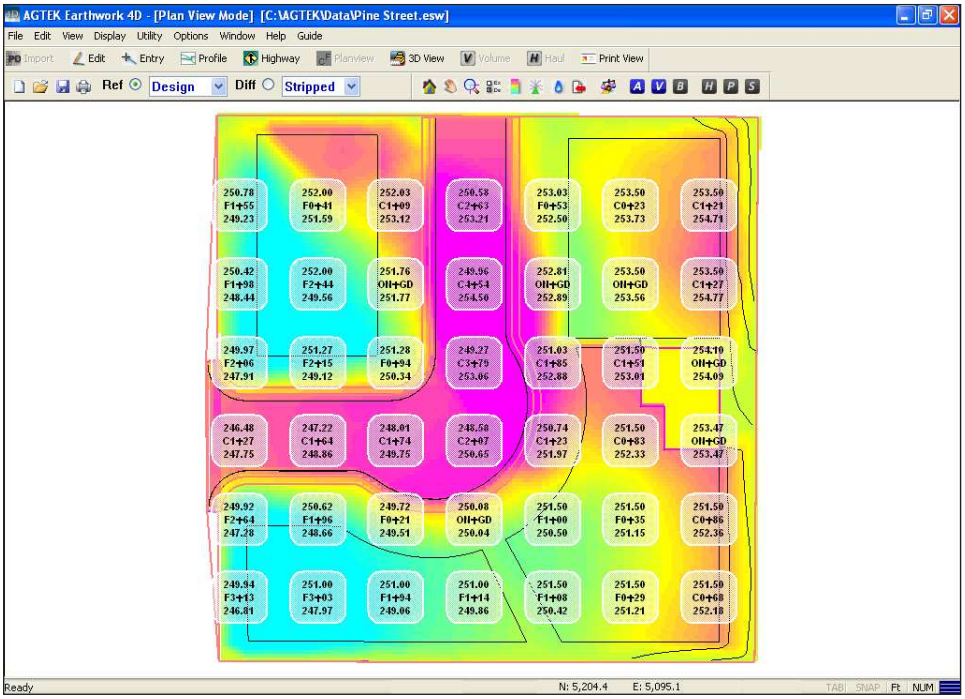
Panning

Panning allows you to move your position on the plan View while zoomed in. There are several ways to pan.

Plan View

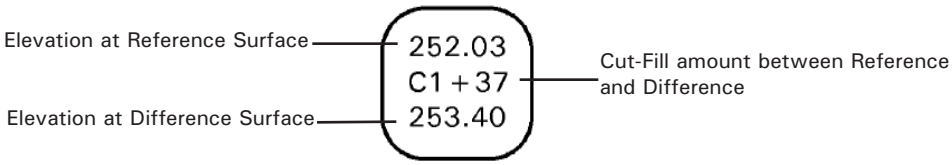
The Plan View is a view of the overlay showing cut-fill areas by color, with information regarding cut-fill, and elevations of the reference and difference layers at predetermined locations on the plan.

Switch to Plan View Mode to view your job in Plan View. The label information is explained below.

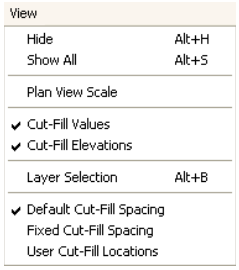


Plan View Labels

Below is an example of a Plan View label.



The information displayed in the label can be changed by selected the options located under the View Menu. Select the desired label option and see the results display on the screen.



Bluetooth Setup

RTK GPS support is an additional feature in Sitework 4D, which must be purchased separately.Before you can receive GPS data from the base and rover, you must setup a Bluetooth connection between the receivers and your computer. You only need to setup the Bluetooth connection once for each GPS receiver. This can be performed prior to arriving at the job site.

1. Turn on your base and rover GPS units.

2. Click **Start > Bluetooth Settings**. If no receivers have been setup, the Add New Connection Wizard is displayed. If connections exist, the Bluetooth Settings window displays.

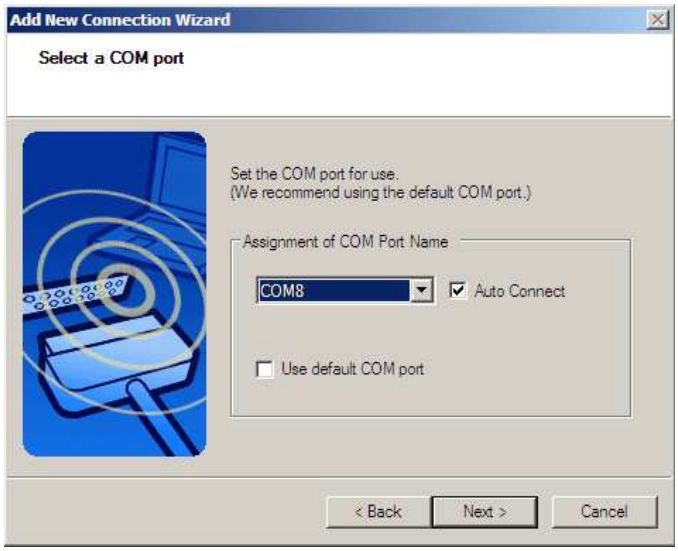
3. Click the **New Connection** button to display the Add New Connection Wizard.

4. Be sure to select Custom Mode and click **Next**.

5. Select the Base GPS from the list and click **Next**.

6. Select Serial Port as the Service and click **Next**.

7. Uncheck the Use default COM port option. Click **OK** when the warning dialog box is displayed.



8. Select COM8 from the pulldown menu and click **Next**.

9. Click **Next** on the COM port setting screen and on the Enter a name and select an Icon screen.

10. Click Finished to complete setup. An icon for the Base is displayed in the Bluetooth Settings window.

11. Repeat the steps above for the Rover, selecting the Rover GPS in step 4 and COM9 in step 7 for the port. The Bluetooth Settings window should look similar to the illustration below when finished.

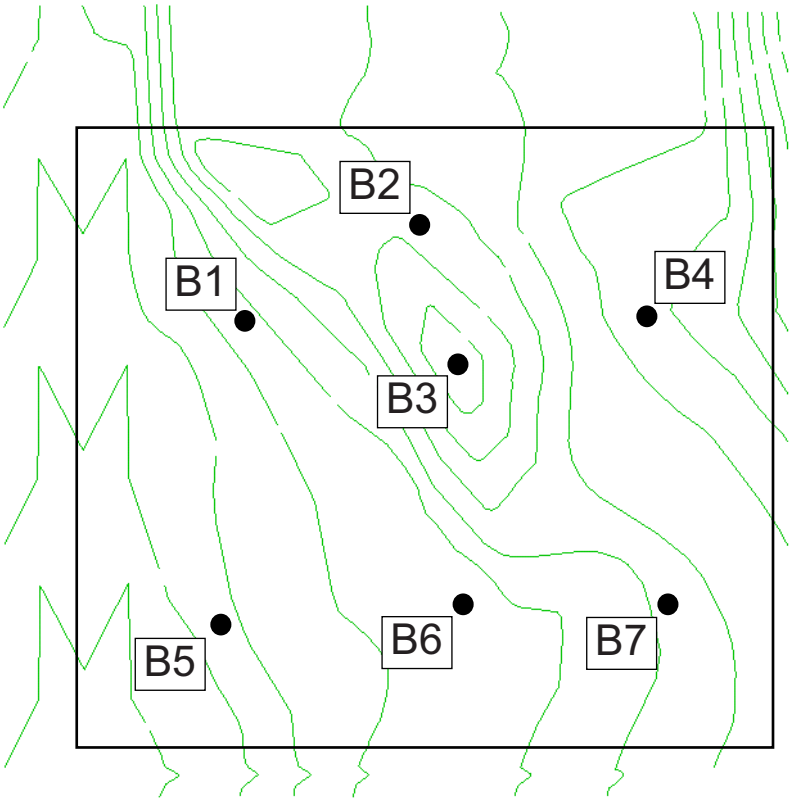
Strata

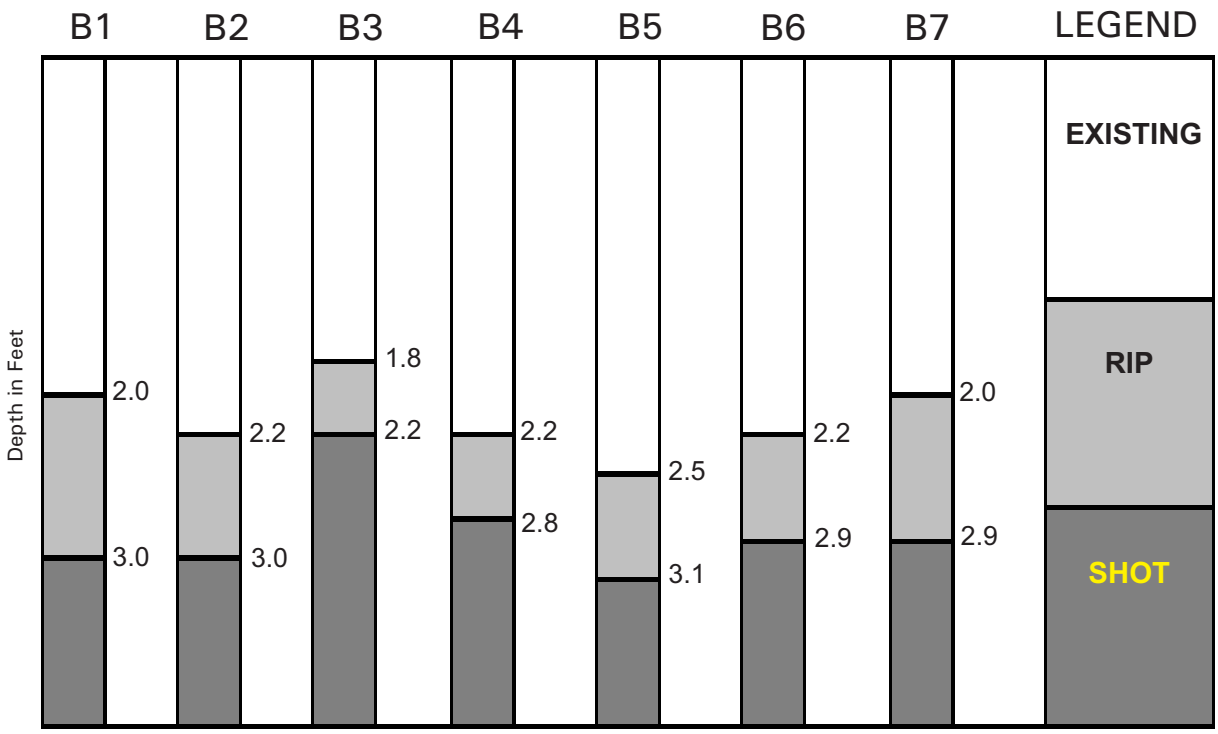
Strata are layers of different materials beneath the Existing Ground. Strata layers are described by borings as depths below the existing ground or by elevations that cannot exceed the existing ground. Only cut areas produce strata volumes. During volume calculations, each cut area volume is calculated for each strata layer.

Strata Bores

There are seven borings located on Pine Street. The illustration below shows their locations on the Pine Street plan sheet.

On the following page is a chart that explains the strata at each bore location. The existing ground starts at zero and increasing values are depths below the existing ground surface.

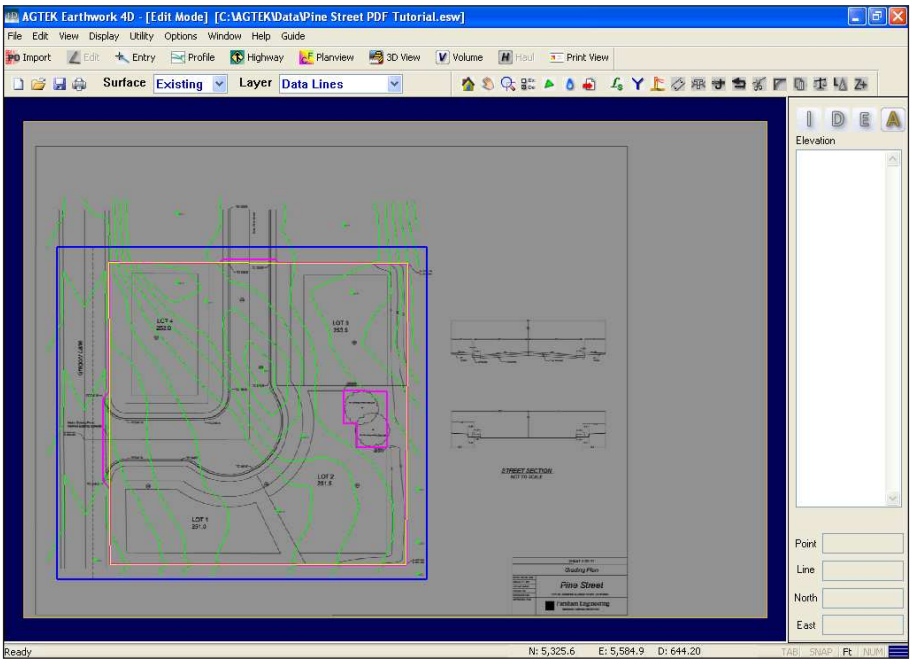




Entering Strata Bores

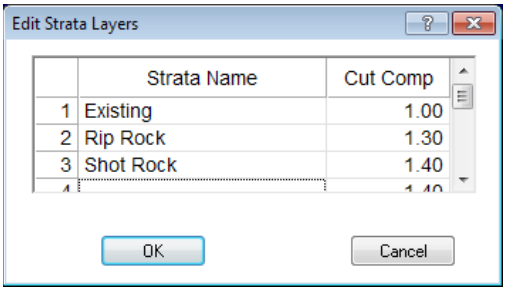
1. Open the "Pine Street PDF Tutorial.esw" file.

2. Select the annotation outline surrounding the job site. Right-click and select **Import File.** The PDF is displayed. There are seven bore holes visible on the PDF.



3. Switch to **Entry** mode, set the surface to **Existing** and set the layer to **Strata Bore Holes**.

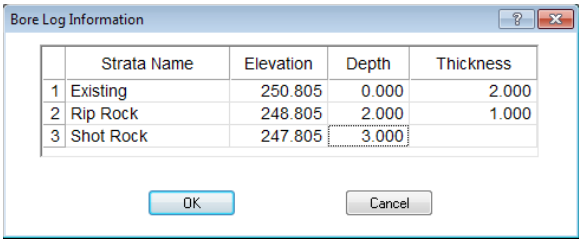
4. Left-click on bore location B1 at the center of Lot 4. The Edit Strata Layers dialog box displays. The Edit Strata Layers dialog box will only display the first time you enter a bore hole.



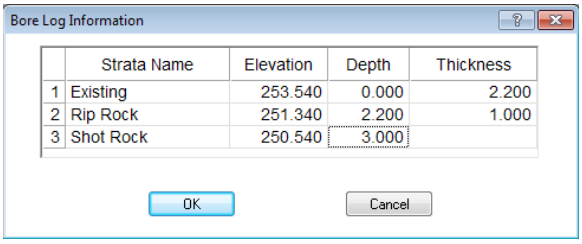
5. In the second row, type “Rip Rock” as the STRATA NAME and “1.30” as the CUT COMP value. In the third row, type “Shot Rock” as the STRATA NAME and “1.40” as the CUT COMP value. Click **OK**. The Bore Log Information dialog box is displayed.

6. Enter a Depth of “2.0” for the Rip Rock and “3.0” for the Shot Rock. These number represent the depth below the existing ground and can be found on the Bore Log on page A-30. Click **OK** to add the bore hole to the takeoff.

If a strata layer does not exist at a given location, enter the same depth as the layer below the nonexistent layer.



7. Left-click on bore hole at location B2. The Bore Log Information dialog box is displayed.



8. This bore has different strata depths and thickness than the previous bore. Enter a Depth “2.2” for the Rip Rock and a Depth of “3.0” for the Shot Rock. Click **OK** to add the bore hole to the takeoff.

9. Continue entering the remaining borings using the same steps. Press the right-click end bore hole entry.

Strata Tracking

The strata borings require a method used to determine how the strata slopes from one boring to another.

Strata Tracks OG

The **Options > Strata Tracks OG** command allows the program to use the existing ground and slope the strata layers following the sloping information from the existing ground topo. When there is a check next to this option, it is turned on and tracks the existing ground, or OG (Original Ground).

When this option is unchecked, the program uses the break lines to slope from one boring to the next.

Freeze Strata Layers

The **Options > Freeze Strata Layers** command freezes any entered strata data to the current Existing Surface. Any future changes to the Existing Surface will not change the Strata Layer.

When this option is unchecked, any changes to the Existing Surface will also affect the Strata data in the job file.

Editing Borings and Break Lines

Editing borings and break lines is similar to editing any other point or line. Switch to Edit mode and select the Existing Surface and either the Strata Bore Holes or Strata Break Lines Layer.

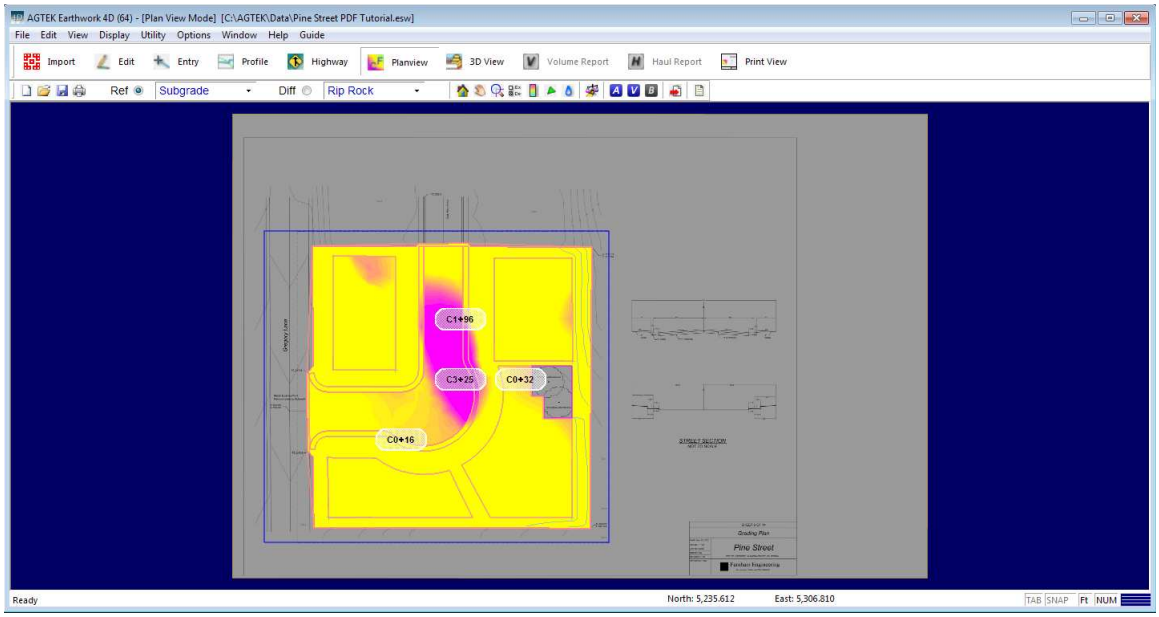
If the break lines were entered as one continuous line, then use the **Edit > Break Line** command to break the lines as selected points. The lines can then be deleted.

Editing break lines is slightly different. To edit the strata elevations, select a boring, then double click the point in the Elevation list. The Point Editor is displayed with a Depth box showing the depth of the first layer, instead of an Elevation box. Make any desired changes and click OK.

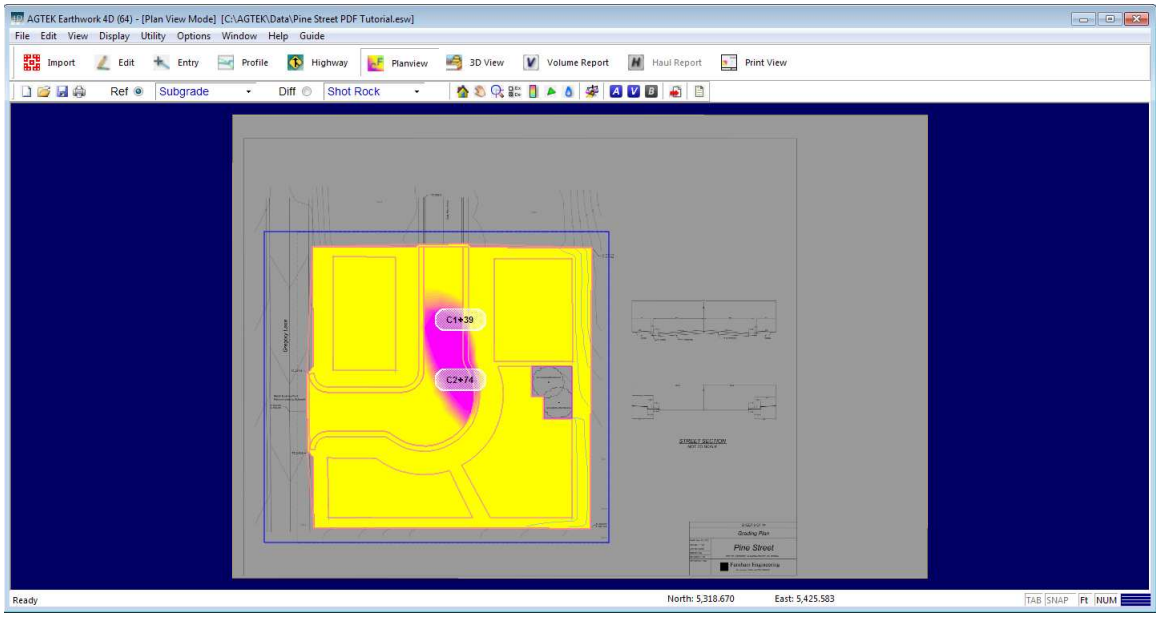
Reviewing Strata Information

1. Switch to the **Planview** Mode.

2. Set the Reference surface to **Subgrade** and the Difference surface to **Rip Rock**. You can now see the cut area where you will encounter Rip Rock.



3. Change the Difference layer to **Shot Rock** and you can see the cut areas where you will see the areas that will require blasting.



Calculating Volumes

1. Change the Difference Layer to **Stripped**.

2. Click the **V** button to calculate volumes and the Volume Calculation Results dialog box displays.

3. Click done and the Volume Report displays. The volume of the entered strata layers are displayed in red.

Job: Pine Street PDF Tutorial
Units: Ft-CY
Mon Dec 19, 2016 12:15:47 Page 1

Volume Report
Subgrade vs. Stripped

		Area			Volume		Comp/Ratio		Compact		Export	Change
	Total	Cut	Fill	OnGrade	Cut	Fill	Cut	Fill	Cut	Fill	-Import	Per .1 Ft
Landscape	29,869	9,541	17,692	2,636	289	663	1.00	1.00	289	663	-374	
Rip Rock	1,043				19		1.30		25		25	
Shot Rock	497				16		1.40		22		22	
			Landscape Total:		324	663			336	663	-327	111
Lot 1	7,360	0	7,360	0	0	499	1.00	1.00	0	499	-499	
Rip Rock	0				0		1.30		0		0	
Shot Rock	0				0		1.40		0		0	
			Lot 1 Total:		0	499			0	499	-499	27
Lot 2	11,664	7,814	2,905	945	278	50	1.00	1.00	278	50	228	
Rip Rock	1,171				12		1.30		16		16	
Shot Rock	0				0		1.40		0		0	
			Lot 2 Total:		290	50			294	50	244	43
Lot 3	8,644	7,067	1,133	444	247	17	1.00	1.00	247	17	230	
Rip Rock	383				4		1.30		5		5	
Shot Rock	0				0		1.40		0		0	
			Lot 3 Total:		251	17			252	17	235	32
Lot 4	7,581	2,658	4,684	239	120	273	1.00	1.00	120	273	-153	
Rip Rock	1,331				24		1.30		31		31	
Shot Rock	0				0		1.40		0		0	
			Lot 4 Total:		144	273			151	273	-122	28
Lot Sub:	35,249	17,539	16,082	1,628	645	839			645	839	-194	
Rip Rock	2,885				40				52		52	
Shot Rock	0				0				0		0	
			Total Lot:		685	839			697	839	-142	130
Sidewalk 1	2,038	1,942	3	93	66	0	1.00	1.00	66	0	66	
Rip Rock	682				12		1.30		16		16	
Shot Rock	568				24		1.40		34		34	
			Sidewalk 1 Total:		102	0			116	0	116	8
Sidewalk 2	1,441	1,392	0	49	42	0	1.00	1.00	42	0	42	
Rip Rock	289				5		1.30		7		7	
Shot Rock	49				0		1.40		0		0	
			Sidewalk 2 Total:		47	0			49	0	49	5
Sidewalk Sub:	3,479	3,334	3	142	108	0			108	0	108	
Rip Rock	971				17				23		23	
Shot Rock	617				24				34		34	
			Total Sidewalk:		149	0			165	0	165	13
Street	14,114	14,114	0	0	773	0	1.00	1.00	773	0	773	
Rip Rock	9,443				150		1.30		195		195	
Shot Rock	5,128				312		1.40		437		437	
			Street Total:		1,235	0			1,405	0	1,405	52
Regions Total	82,711	44,528	33,777	4,406	1,815	1,502			1,815	1,502	313	306
Rip Rock	14,342				226				295		295	
Shot Rock	6,242				352				493		493	
			Regions Total:		2,393	1,502			2,603	1,502	1,101	306

Stripping Qtys	Plane Area	Slope Area	Depth	Volume
Stripping	81,992	82,080	0.500	1,520

Sectional Qtys	Plane Area	Slope Area	Depth	Volume
Landscape	29,869	30,116	0.000	0
Lot 1	7,360	7,360	0.500	136
Lot 2	11,664	11,664	0.500	216
Lot 3	8,644	8,644	0.500	160
Lot 4	7,581	7,581	0.500	140
Lot Sub:	35,249	35,249		652
Sidewalk 1	2,038	2,038	0.330	25

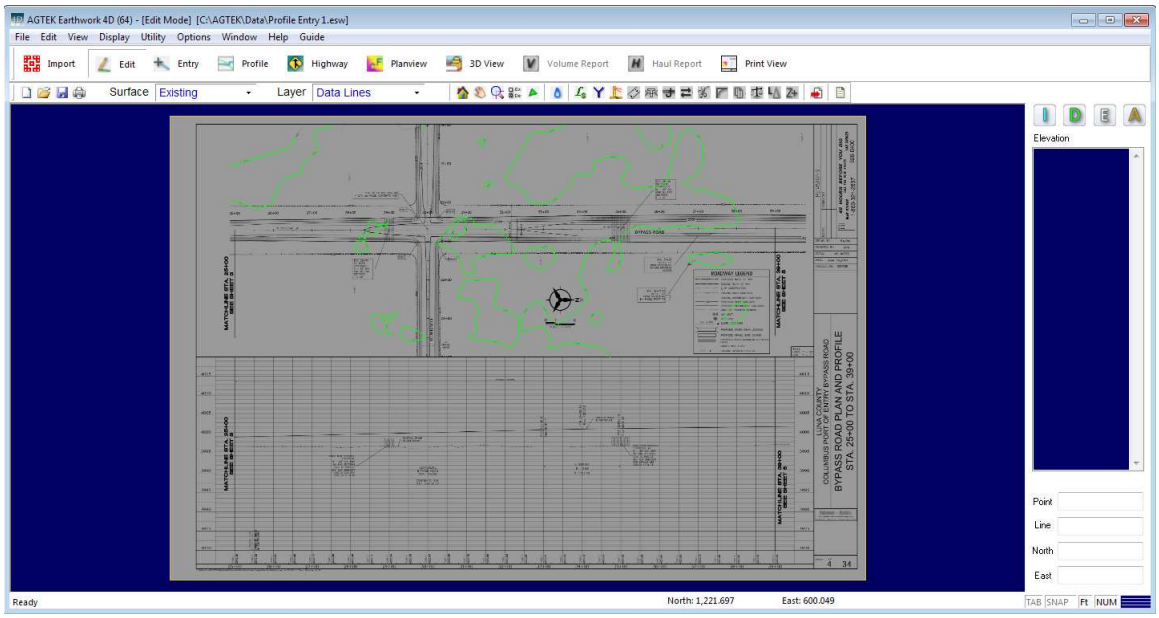
PDF Profile Entry

Sitework 4D can be used to enter elevations that are defined by a profile view. This is common on jobs such as county roads, streets or canals. Profiles may be attached to data lines, annotation line or profile lines. The following example uses a job which already has the existing plan view information entered.

Open Sample Files

1. Select **File > Open** and browse to C:\AGTEK\data. Select “Profile Entry1.esw” and click **Open**.

2. Select the brown annotation line surrounding the job site. Right-click and select **Import File.**



Entering Profile Reference Line

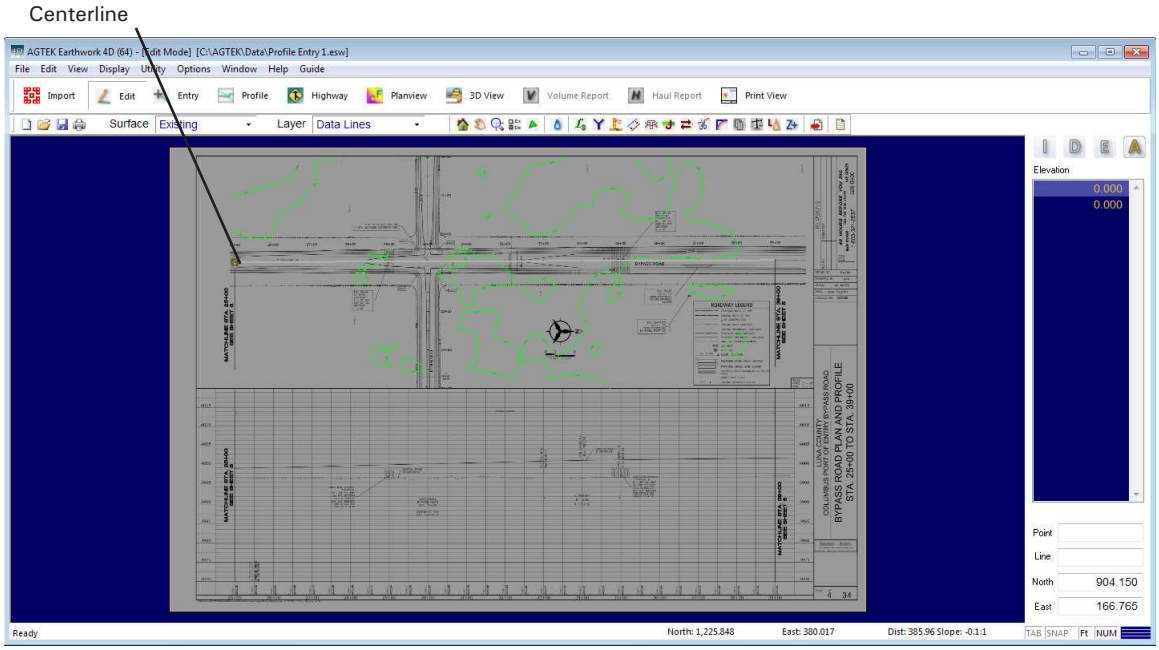
In this example we enter an annotation line to be used as a reference line for both the existing and design data.

1. Switch to the **Entry** Mode, and set the Layer to **Annotation Lines**.

2. Using the keyboard, enter “0” as the elevation, and trace the centerline of the road, left-clicking as you go to enter points. Begin tracing where the matchline intersects station 25 + 00 and stop tracing at the 39 + 00 station.

3. Right-click to end the entry, and right-click again to get your arrow back.

4. Right-click and select “Edit Mode”. Your screen should appears similar to the illustration below.



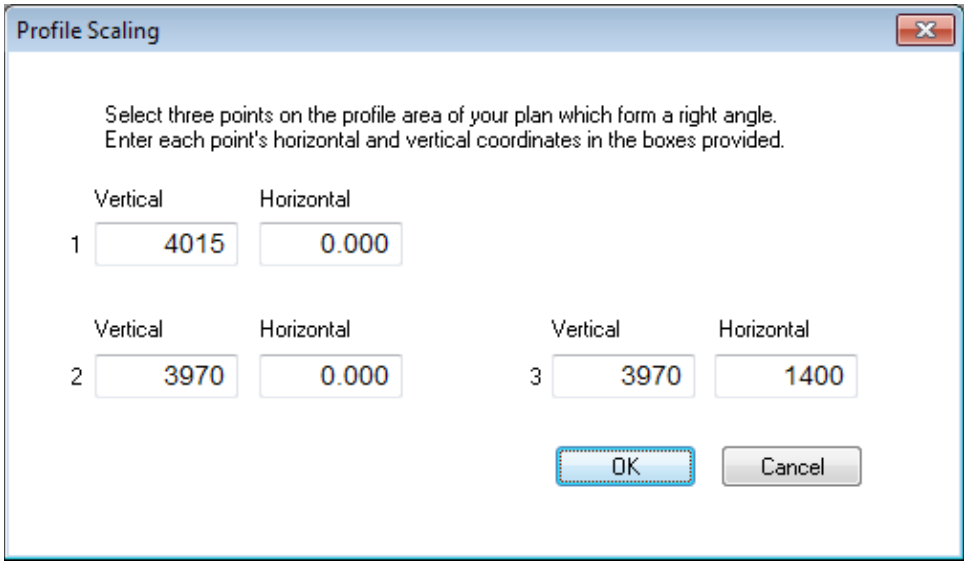
Scaling the Profile

When scaling the profile, it is important to use the elevations listed on the grid for vertical elevations and station numbers, or distance between stations, for horizontal distance.

1. Click on the annotation line you just entered to select it.

2. Click the **Attache Profile** button and the Profile Scaling dialog box displays.

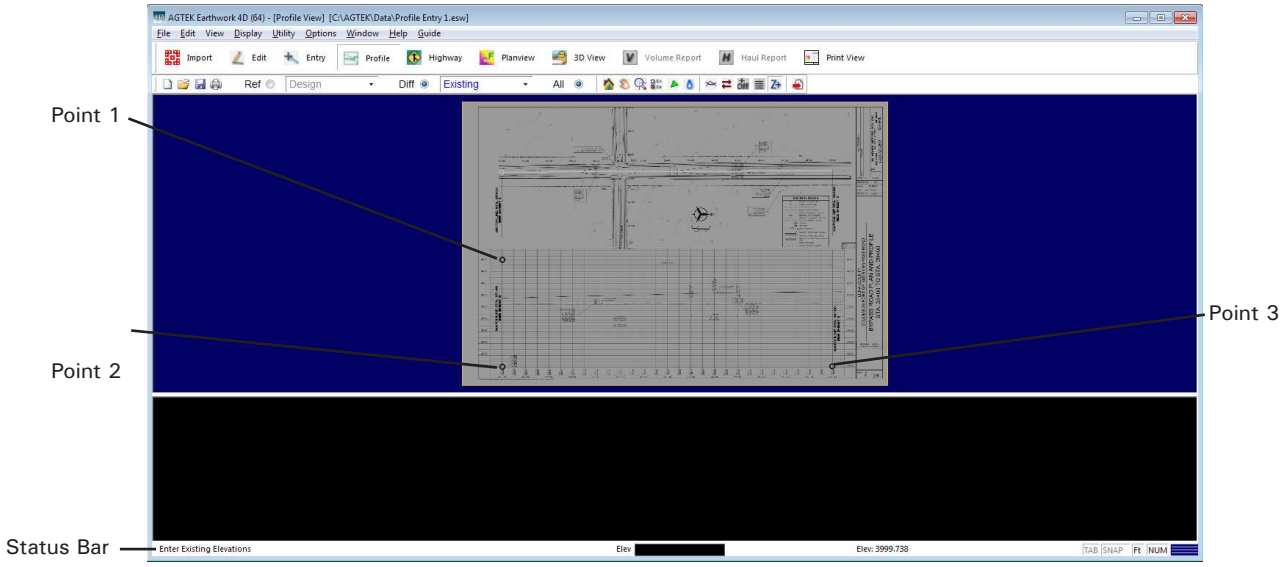
3. Enter “4015” for the vertical of point 1, “3970” for the vertical of point 2, “1400” for the horizontal of point 3, and click **OK**.



4. On the profile grid at the bottom of the PDF, position the crosshair at the intersection of station 25 + 00 and elevation 4015. Left-click to enter point 1.

5. Position the crosshair over the intersection of station 25 + 00 and elevation 3970. Left-click to enter point 2.

6. Position the crosshair over the intersection of station 39 + 00 and elevation 3970. Left-click to enter point 3. You are prompted by the status bar to enter the existing ground.



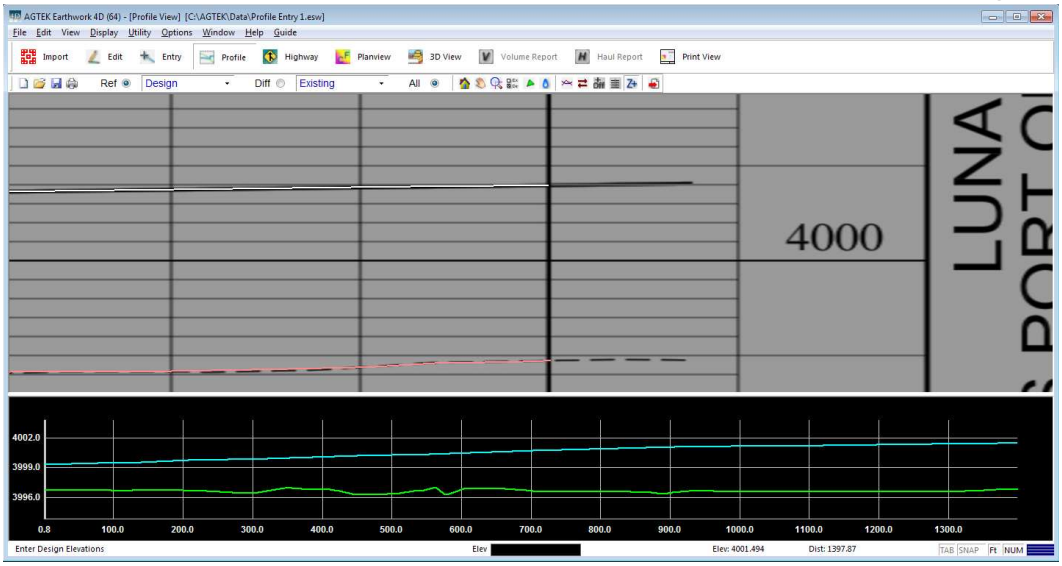
Entering Existing and Design Data

If there is no existing data to enter here, right-click to skip to the design entry

1. Beginning at station 25 + 00, trace the existing profile line, left-clicking to enter points as you go. Right-click to end the entry at the 39 + 00 station.

2. Beginning at station 25 + 00, trace the Design profile line, left-clicking to enter points as you go. Right-click to end the entry at the 39 + 00 station.

3. The elevations will be assigned to the selected profile line, which is displayed in the profile view at the bottom of the screen. The street can then be built using Template.



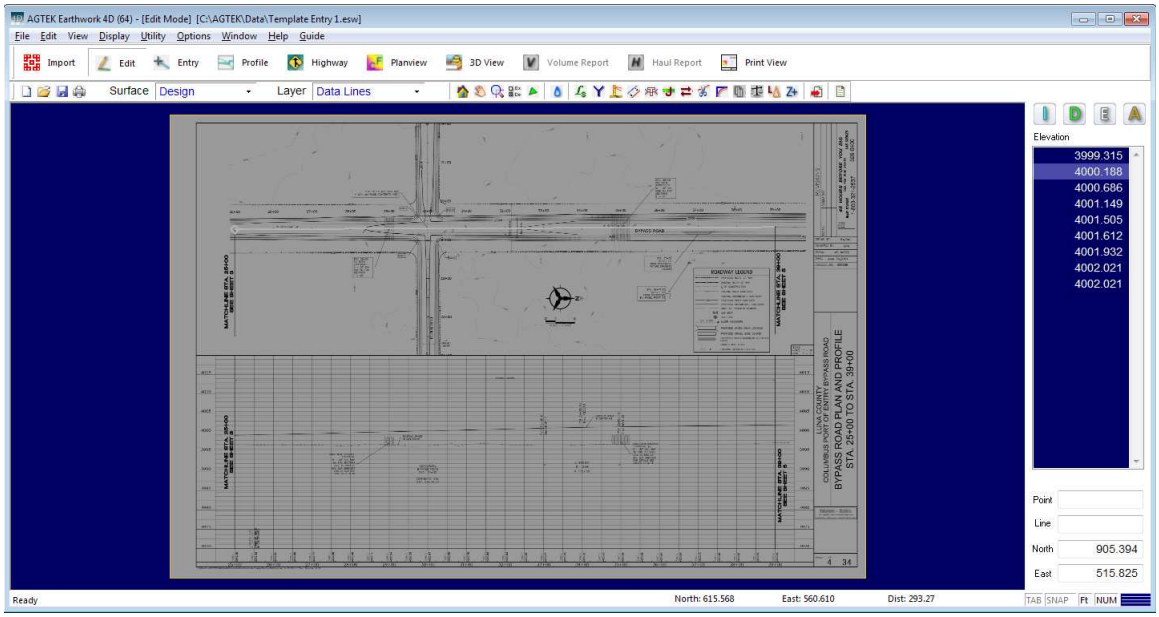
Templates

Jobs such as roads, canals and trenches are often based on structural details or typical cross sections. Sitework 4D can be used to create a template based a typical cross section and apply that template to a chosen reference line.

Basic Template Entry

1. Select **File > Open** and browse to C:\AGTEK\data. Select “Template Entry 1.esw” and click **Open**. Set the Surface to **Design**.

2. Select the brown annotation line surrounding the job site. Right-click and select **Import File**. The existing contours and design profile information have already been entered in this file.



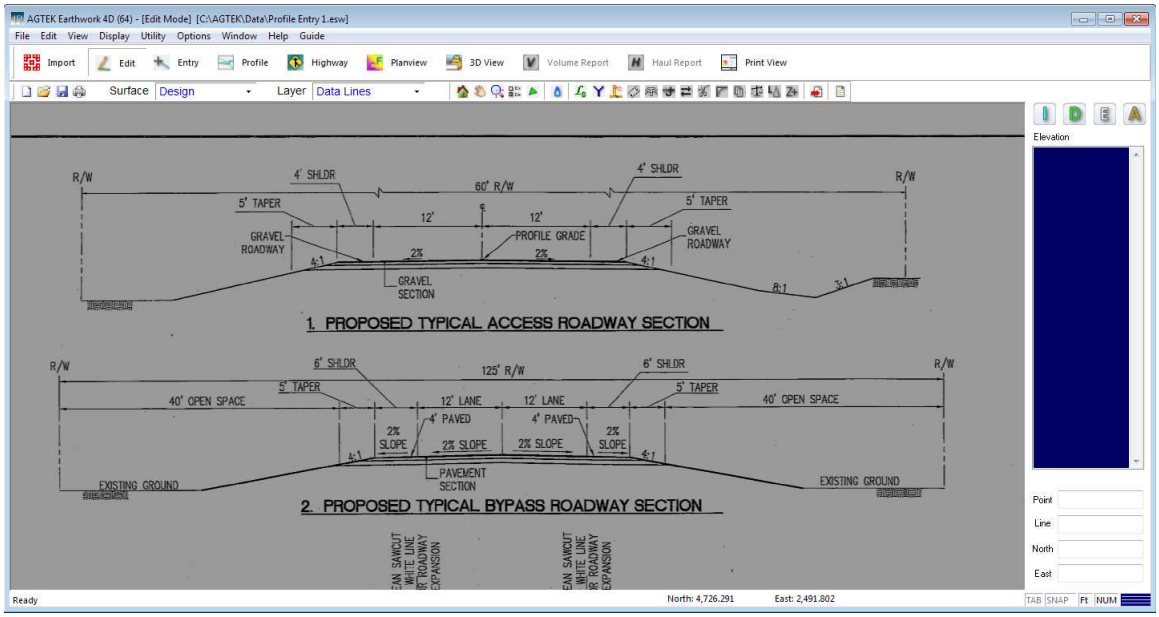
Import Typical Information

This section imports the PDF containing the information for the typical cross section. It is possible to skip the following steps and enter the typical cross section segments as demonstrated in the “Enter Template Information” section without importing the PDF in which they are contained, using the blank space outside of your job.

1. Press the **Esc** key to deselect the brown annotation border. Select **File > Import**, choose “Typicals.pdf” and click **Open**. The PDF opens in the CAD Transfer window.

2. Switch to the Edit Mode. The PDF imports larger than the previous one.

3. Zoom in to the typical section labeled “2. Proposed Typical Bypass Roadway Section”. Take note of the following information: 12’ travelway with a -2% slope, 6’ shoulder with a -2% slope, 5’ taper at a 4:1 slope, and a 4:1 slope to existing ground. Notice the typical cross section is symmetrical.



Enter Template Information

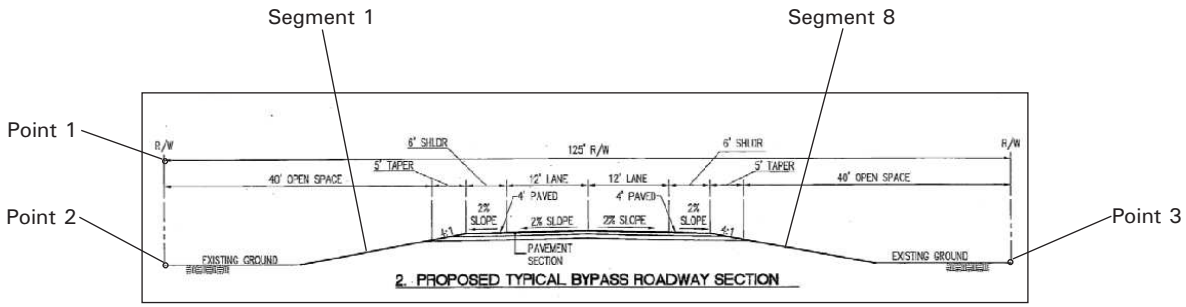
1. Zoom out and select the design center line.

2. Click the **Apply Template** button on the toolbar and the Open dialog box displays.

3. Click **New** and the Template Scaling dialog box displays. The typical section is not to scale, which is common, so we will use the default values provided.

4. Click **OK** and zoom in to the typical section labeled “2. Proposed Typical Bypass Roadway Section” and click on the top-left, bottom-left and bottom-right extremes of the typical section shown below to scale in. Remember, the scale is arbitrary.

5. Trace the typical cross section, entering points between each segment. Add a segment on each side to allow for a slope to daylight. There are eight segments in this example.



6. Right-click to end the entry and the Template Editor dialog box displays. The reference point is marked with a yellow diamond on the cross section at the bottom of the screen.

Typical information can also be entered freehand, without the PDF displayed. Be sure to include the appropriate number of segments.

7. Select both the **Cut to Fill** and the **Left to Right** check boxes.

8. For segment 5, enter “12” for the width and “-2” for the slope. For segment 6, enter “6” for the width and “-2” for the slope. For segment 7, enter “5” for the width and “-4:1” for the slope. Notice segments 2 through 4, and all values for fill, change to match entered values.

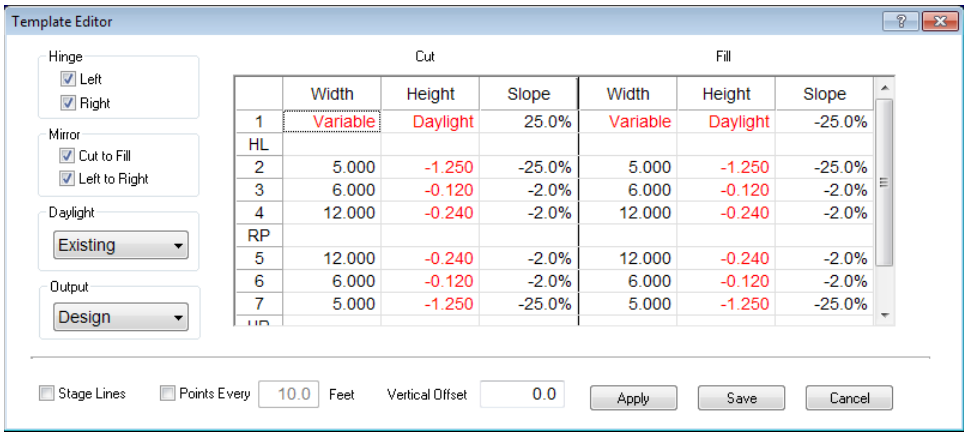
9. Select segment 2 and select the **Left** Hinge checkbox, the width changes to Variable and the height changes to Daylight.

10. Select segment 7 and select the **Right** Hinge checkbox, the width changes to Variable and the height changes to Daylight.

11. Enter “4:1” in the Slope column for segment 1.

12. Set the Daylight surface to **Existing** and the Output surface to **Design**.

13. Select the **Points Every** check box and enter “20” for the value.

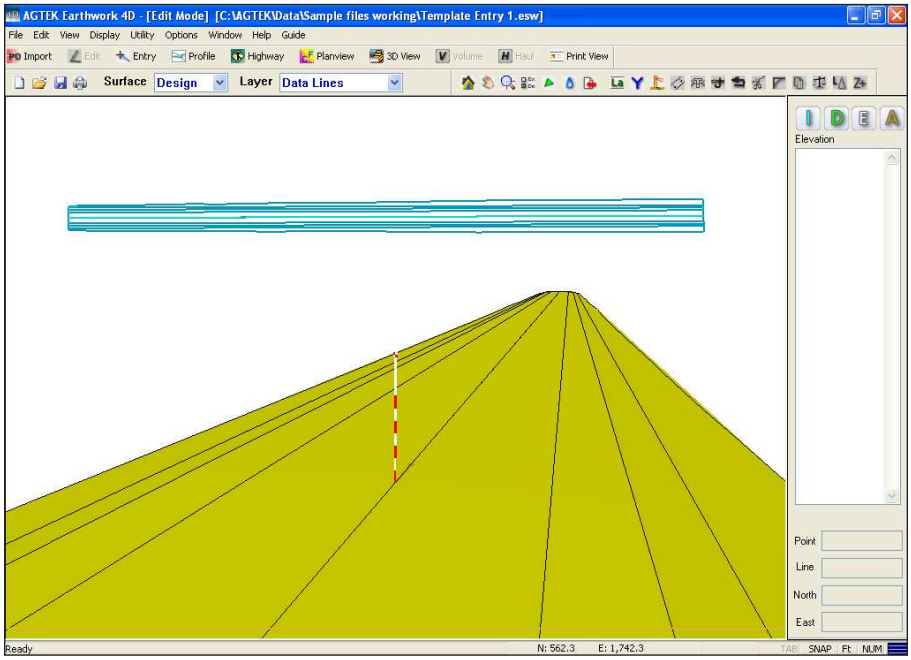


14. Click **Apply** and you are prompted to save the changes to the template. Click **Yes** and the Save As dialog box displays.

For more information on Reference Points (RP) and Hinge Points (HL and HR) see page 8-87.

15. Name the template “Bypass” and click **Save.** The template then sweeps down the reference line using the template information to create lines at the designated distance and slope from the chosen reference line.

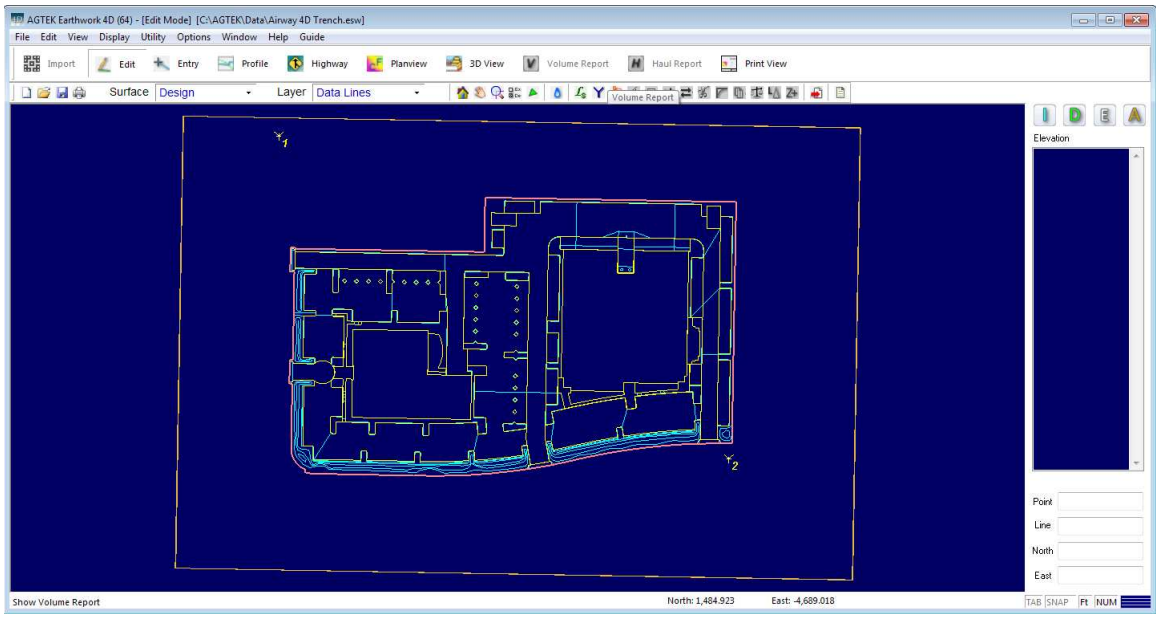
16. Switch to 3D Mode to view the changes made to the design surface by the applied template.



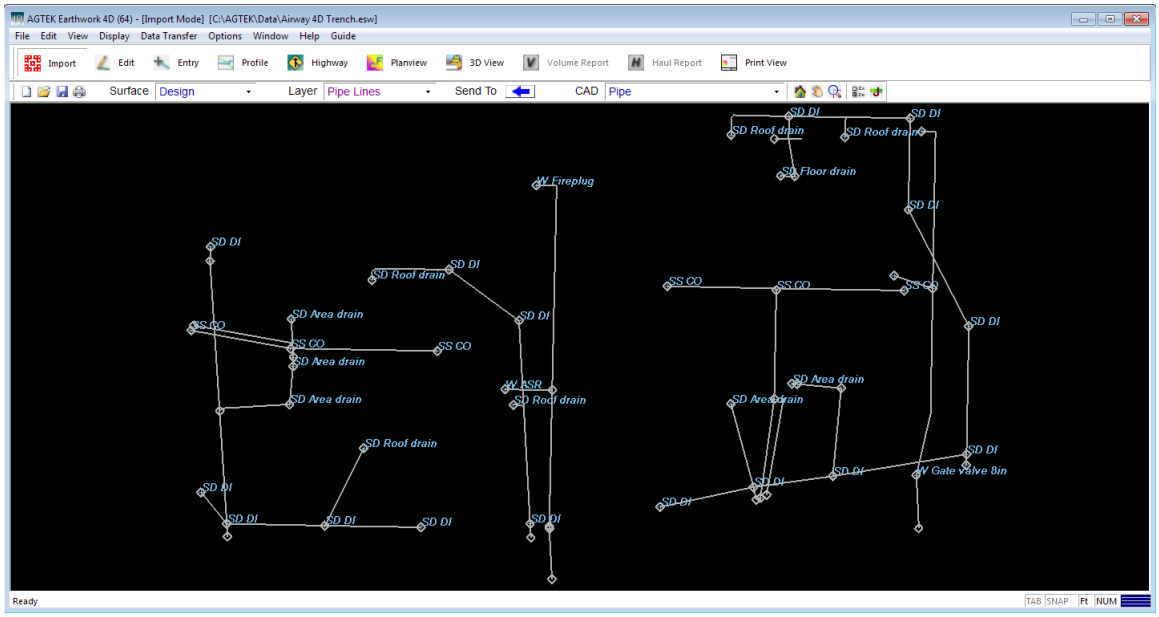
Templates - Building Trenches

For this example, we will import lines representing the pipe work on the job in the form of an .agt file. This .agt file was created using Materials 4D. The pipe data can be entered using the invert elevations.

1. Select **File > Open**, select “Airway 4D Trench.esw” from the C:/AGTEK/Data directory and click **Open**.



2. Select **File > Import** and choose “Pipe.agt” from the C:/AGTEK/Data directory and click **Open**. The .agt file opens in the Import mode.

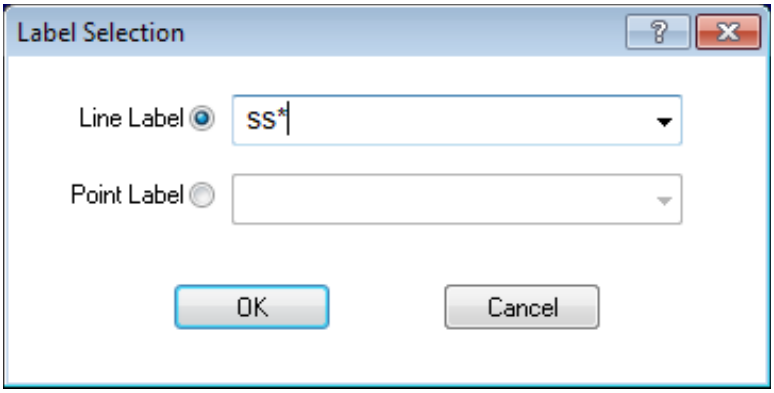


3. Select one of the lines in the CAD Transfer mode, set the Surface to **Design** and the Layer to **Pipe Lines**. Click the **Send To** button.

Applying Templates

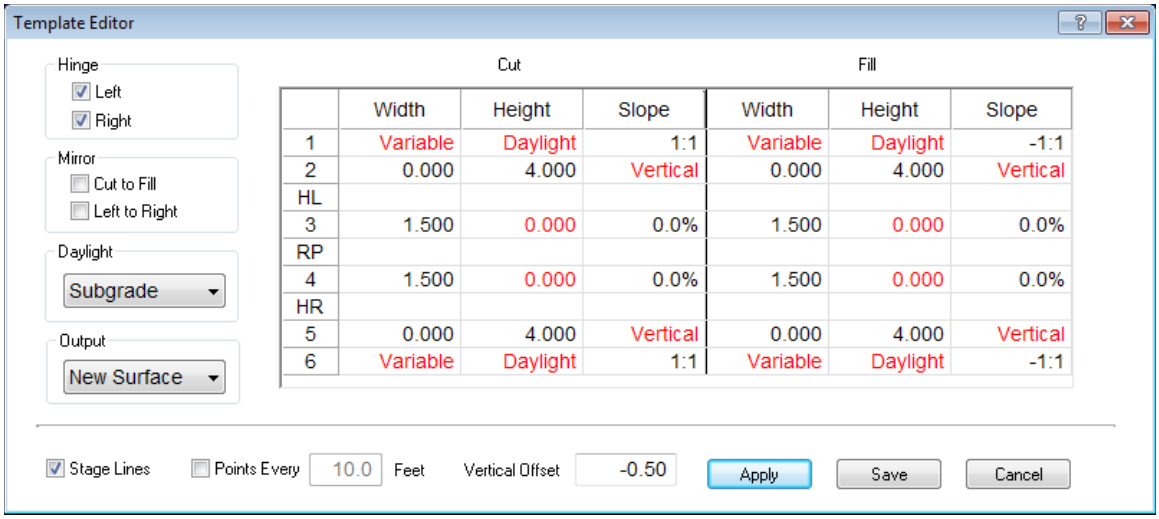
1. Be sure no lines are selected and click the **Label Select** button. The Label Selection dialog box is displayed.

The asterick is used a wild card. In this case all lines beginning with "ss" will be hilighted, regardless of the text following the "ss".



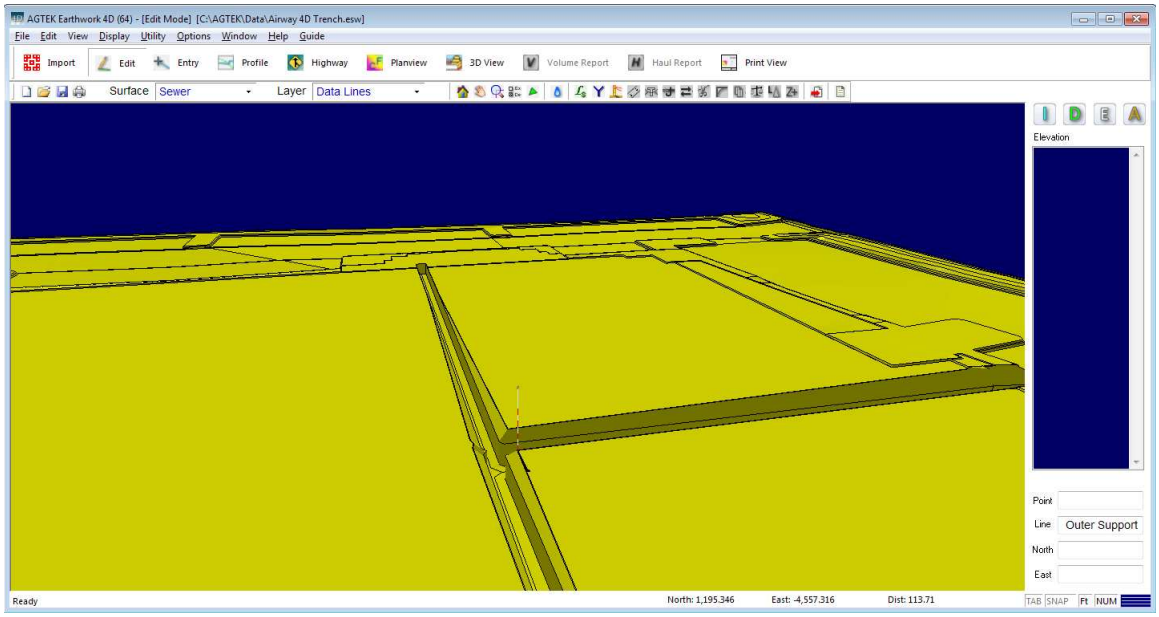
2. Select the **Line Label** option and enter "ss*" and click **OK**. All sanitary sewer lines are highlighted.

3. Click the **Apply Template** button and the Open dialog box displays. Select "3ftTrench.typ" from the C:/AGTEK/Data directory and click **Open**. The Template Editor dialog box is displayed. The 3ftTrench.typ is a saved template from a previous job.



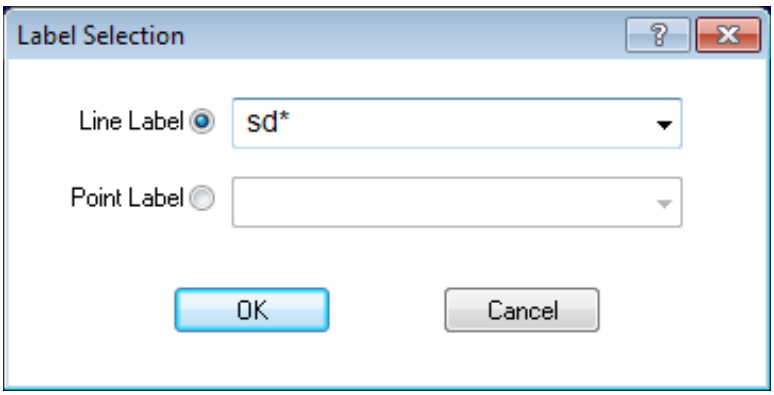
4. Set the Daylight Surface to **Subgrade** and the Output surface to **New Surface**. Stage Lines is selected by default. Select the Points Every box and enter “10”. Click **Apply**. The template sweeps down the selected lines.

5. When the template application is complete, the Create New Surface dialog box displays. Enter “Sewer” for the surface name. Click **OK** and your screen should appear similar to the illustration below.

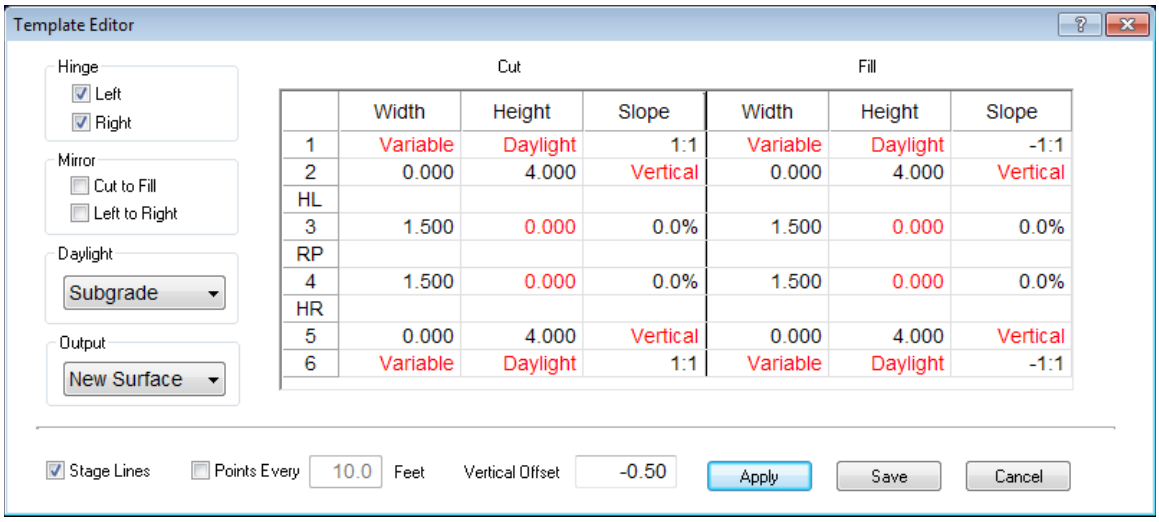


6. Change the Surface to **Design** and click the **Label Select** button. The Label Selection dialog box is displayed.

7. Select the **Line Label** option and enter “sd*” and click **OK**. All storm pipes should be highlighted.

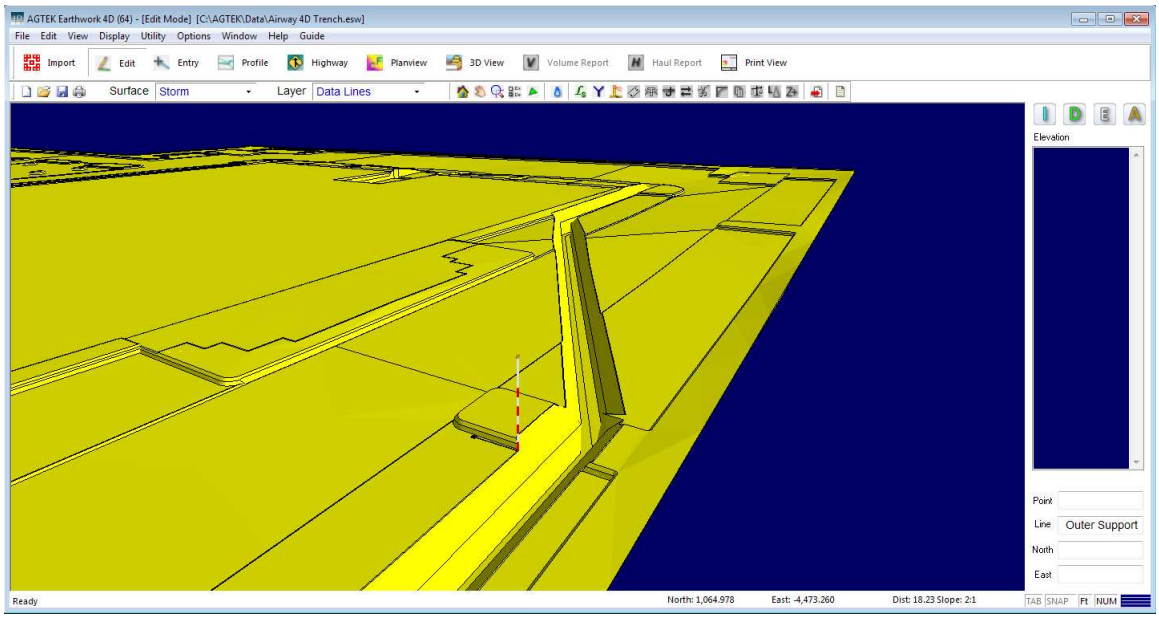


8. Click the **Apply Template** button and the Open dialog box displays. Select "3ftTrench.typ" from the C:/AGTEK/Data directory and click **Open**. The Template Editor dialog box is displayed.



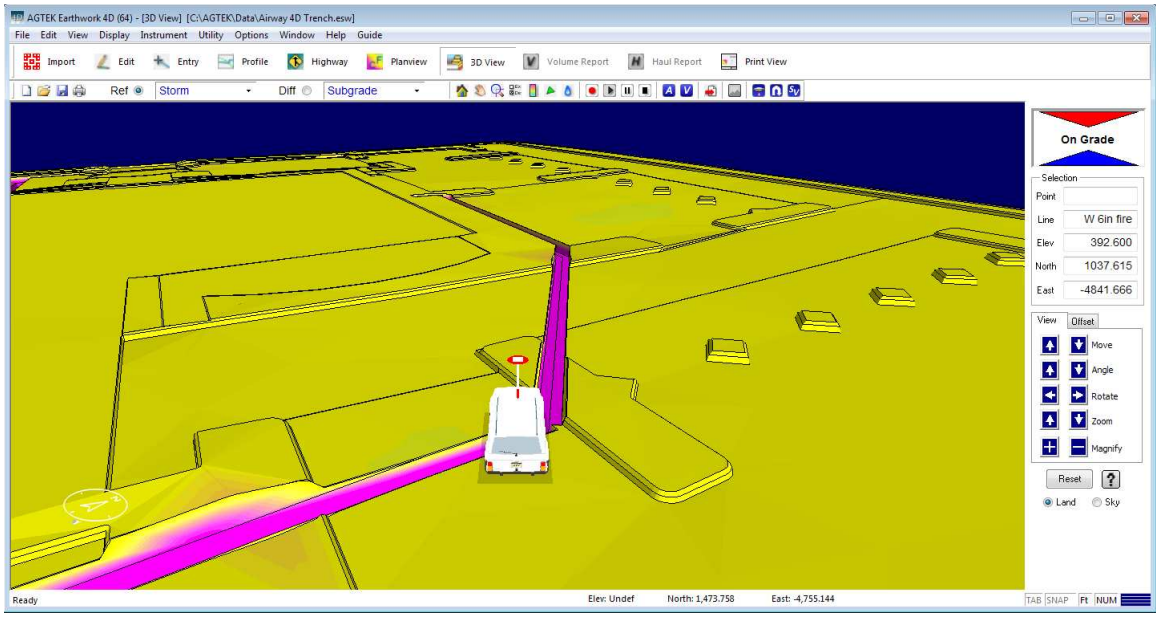
9. Set the Output surface to **New Surface**. Leave the rest of the information unchanged and click **Apply**. The template sweeps down the selected lines.

10. When the template application is complete, the Create New Surface dialog box displays. Enter "Storm" for the surface name and click **OK**. Two new surfaces should now be visible in the Surface pulldown: Sewer and Storm.



Calculating Volumes

1. Click the **3D View** button. Set the Ref surface to **Storm** and the Dif surface to **Subgrade**. The 3D view can be inspected using the 3D controls discussed on page2-23.



2. Click the **V** button to begin volume calculation. The Volume Calculations Results dialog box is displayed. Click **Done** to view the report. The process can be repeated for the Sewer surface as well.

Job: Airway 4D Trench
Units: Ft-CY
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Volume Report
Storm vs. Subgrade

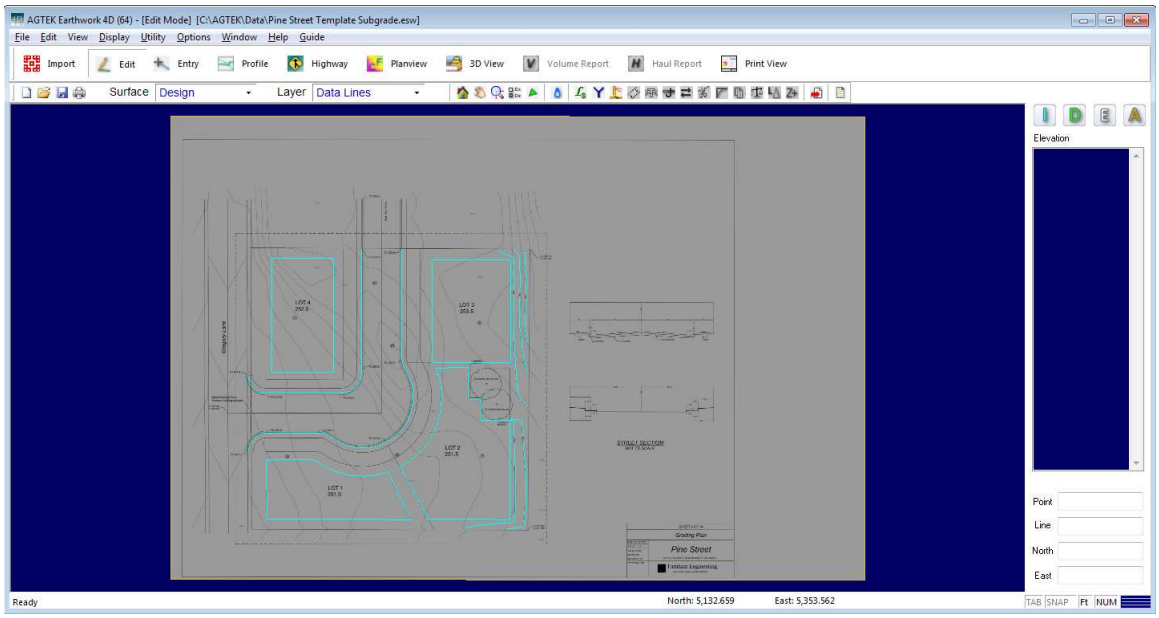
	Area				Volume		Comp/Ratio		Compact		Export	Change
	Total	Cut	Fill	OnGrade	Cut	Fill	Cut	Fill	Cut	Fill	-Import	Per .1 Ft
Job Site	271,447	12,354	940	258,153	1,497	22	1.00	1.00	1,497	22	1,475	1,005

Applying Templates to Subgrade

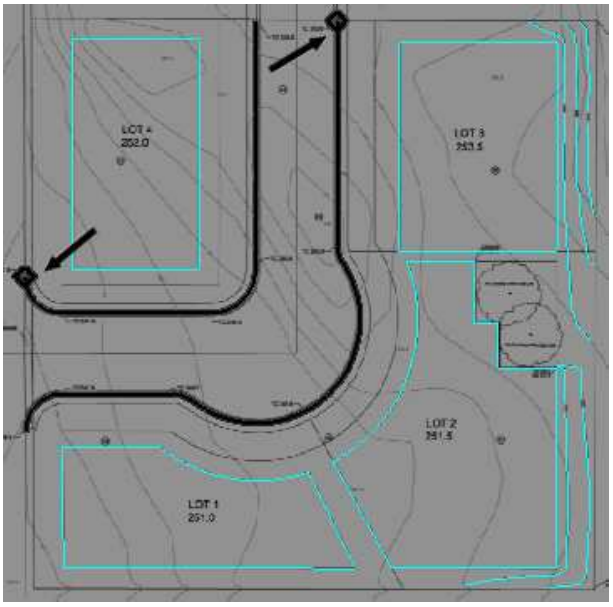
Templates can be used to create subgrade by running multiple offset lines simultaneously. In this example we will be using the top of curb lines to build the subgrade of the street.

1. Select **File > Open**, select "Pine Street Template Subgrade.esw" from the C:/AGTEK/ Data directory and click **Open.**

2. Select the annotated outline around the design data. Right-click and select **Import File.** You screen should appear similar to the illustration below.

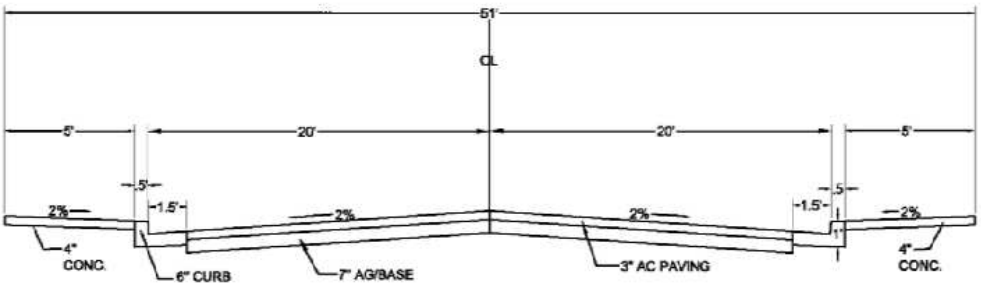


3. Select the two top of curb lines using Ctrl + Click. To apply templates to multiple lines, the lines must be entered in the same direction. In this case, the lines are entered in a clockwise direction, as seen by the location of the diamond shaped start points.



Enter Template Information

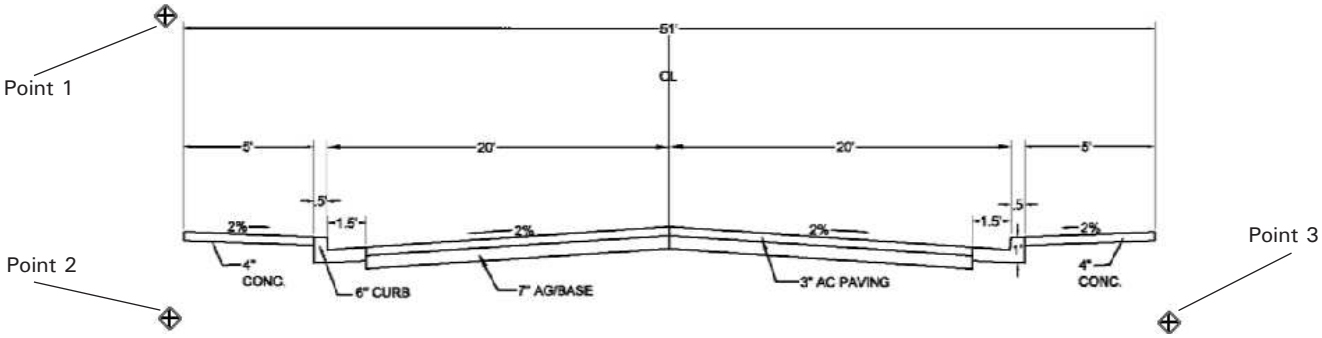
1. Zoom in to the drawing of the street typical on the right side of the PDF.



2. Click the **Apply Template** button and the Open dialog box displays. Click **New**.

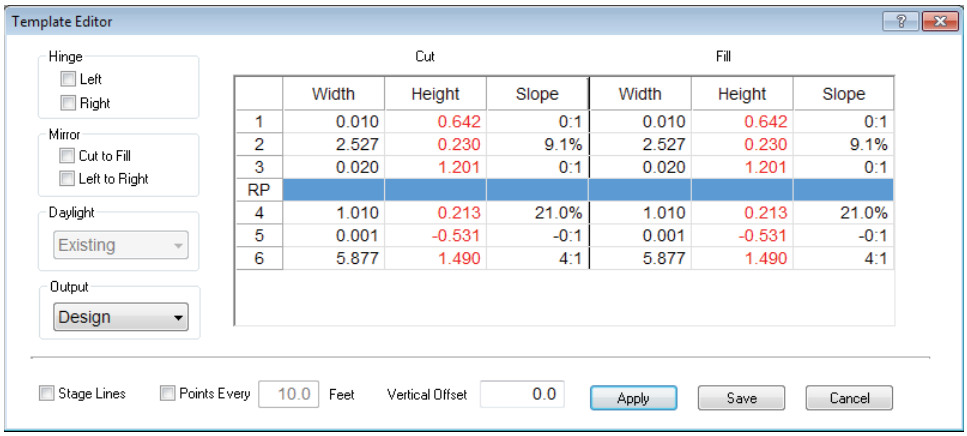
3. The Template Scaling dialog box displays. Click **OK**. The typical section is not to scale, so the scale point values are arbitrary.

4. Click on the three scaling points on the outside extremes of the typical as illustrated below.



5. Trace the subgrade on the left side of the typical section. The resulting line should appear similar to the example below.

6. Right-click to finish and the Template Editor dialog box is displayed.



The reference point is displayed as diamond on the template cross section at the bottom of the screen.

7. Click and drag the Reference Point (RP) up one position, between segment 2 and segment 3.

	Width
1	0.000
2	5.000
3	0.000
RP	
4	2.000

→

	Width
1	0.000
2	5.000
RP	
3	0.000
4	2.000

8. Select the Cut to Fill check box in the Mirror section of the Template Editor.

9. For segment 1, enter “0” for the Width and “0.330” for the Height. The Slope defaults to “Vertical”.

10. For segment 2, enter “5” for the Width and “2” for the Slope. The Height defaults to “1.100”.

11. For segment 3, enter “0” for the Width and “-0.670” for the Height. The Slope defaults to “Vertical”.

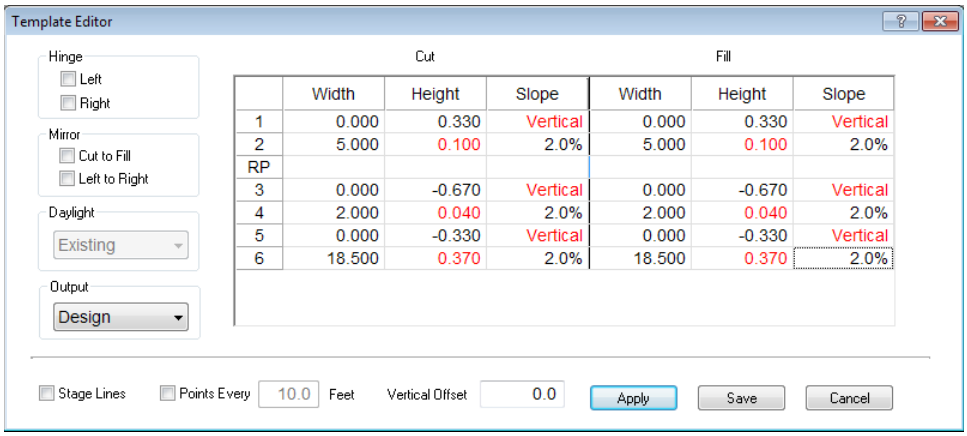
12. For segment 4, enter “2” for the Width and “2” for the Slope. The Height defaults to “0.040”.

13. For segment 5, enter “0” for the Width and “-0.330” for the Height. The Slope defaults to “Vertical”.

14. For segment 6, enter “18.500” for the Width and “2” for the Slope. The Height defaults to “0.370”

15. Select the Points Every check box and enter “20”

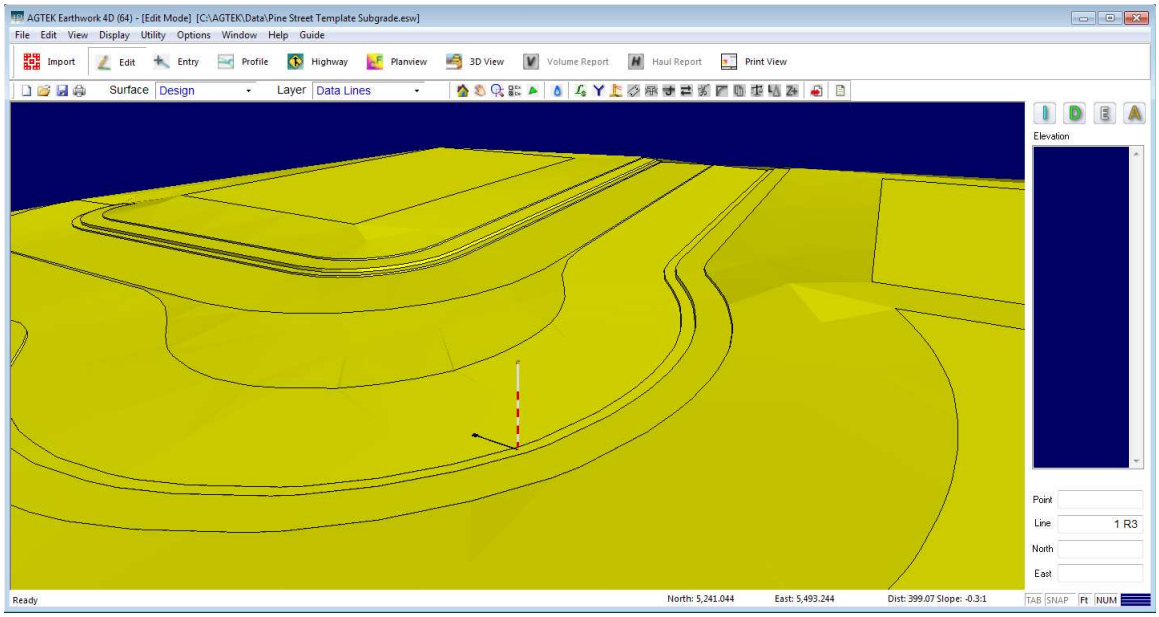
16. Enter “-.33” in the Vertical Offset box. When complete the Template Editor dialog box should appear similar to the illustration below.



17. Click **Apply** and the you are prompted to save the changes to the Template. Click **Yes** and the Save As dialog box is displayed.

18. Enter “C&G” for the name and click **Save**. The Template will now sweep down both lines in the direction they were entered.

19. When the Template is applied, the street section is completed and can be seen in the terrain by press the **T** key twice.



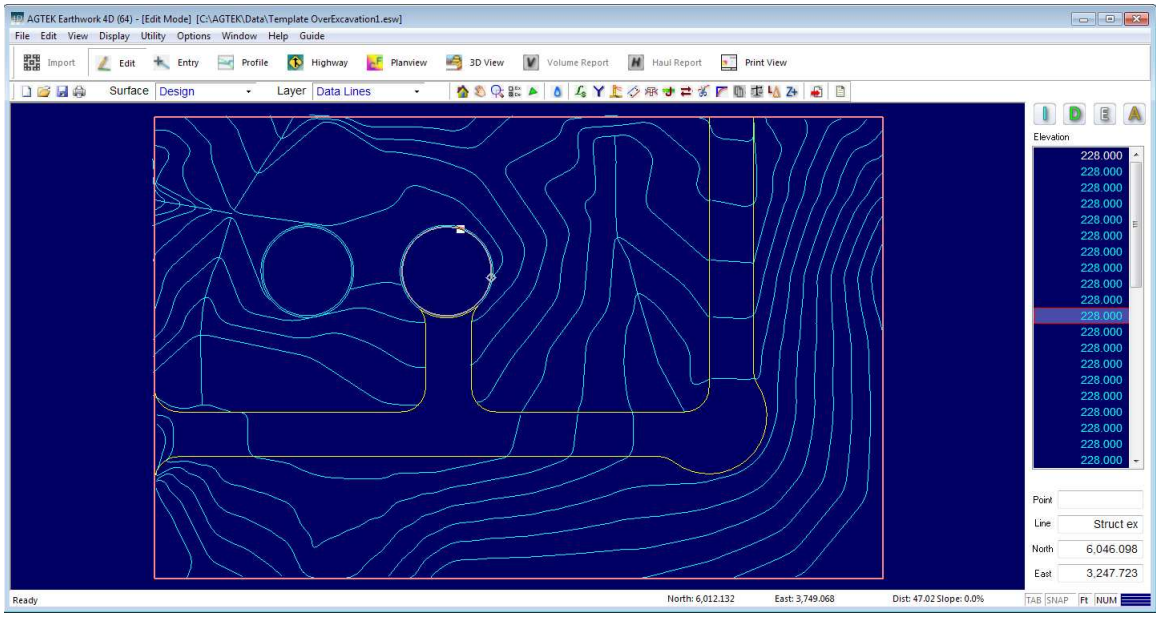
Applying Templates to Over Excavation

Templates can be used to create over excavation surfaces for structures such as basements and holding tanks. In the first example, the over excavation lines for the two tanks do not overlap and can entered at the same time.

Over Excavation - Example 1

1. Select **File > Open**, select "Template OverExcavation 1.esw" from the C:/AGTEK/Data directory and click **Open**.

2. Check to make sure both lines are entered in the same direction. Select one of the inner lines of the holding tanks. Select a point in the point list on the right side of the screen. Press the down arrow on your keyboard to scroll through the points. Note that the flashing box representing the selected point is moving conter-clockwise.

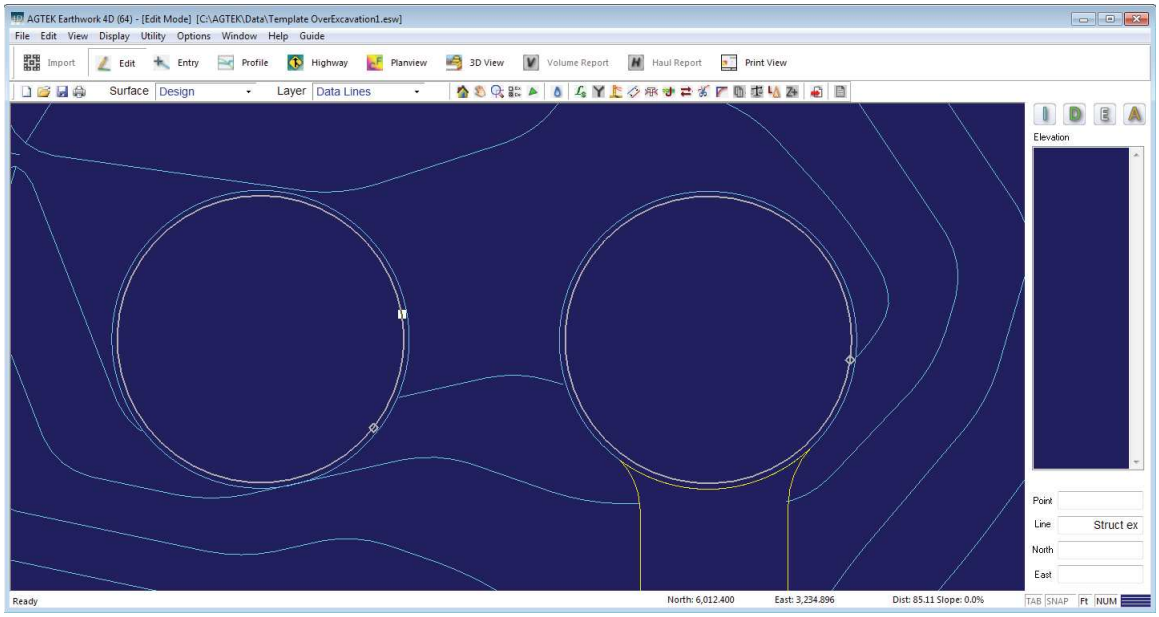


3. Repeat the process for the second holding tank.

Enter Template Information

1. Zoom into the pair of holding tanks as see below.

2. Select one of the bottom of tank lines (inner data lines). Shift + click the second bottom of tank line to select both lines.

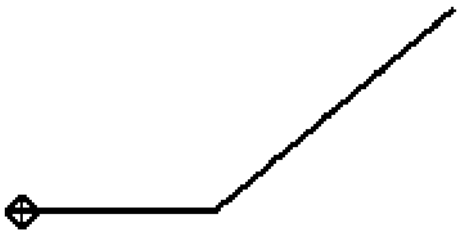


3. Click the **Apply Template** button on the toolbar and the Open dialog box displays. Click **New** and the Template Scaling dialog box displays.

4. Since we will be entering the Template free hand the scale is arbitrary. Keep the default values and click **OK**.

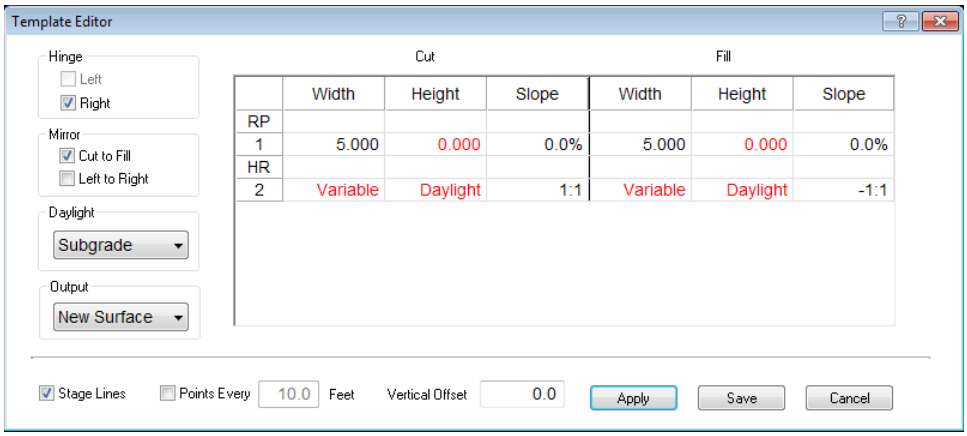
5. Zoom out and enter three scaling points outside of the data. Enter the points at a 90˚ angle, in the shape of a letter “L”, similar to the illustration below.

6. Enter three points to roughly define the five foot horizontal segment and a 1:1 slope to daylight. Use the illustration below as a guide. The template does not have to be perfect since we will adjust it in the Template Editor.



7. When complete, right-click to end and the Template Editor dialog box is displayed.

The reference point is displayed as diamond on the template cross section at the bottom of the screen.



8. Click and drag the reference point (RP) to segment 1, making the reference point the first entry on the list.

9. Select the **Cut to Fill** checkbox in the Mirror section.

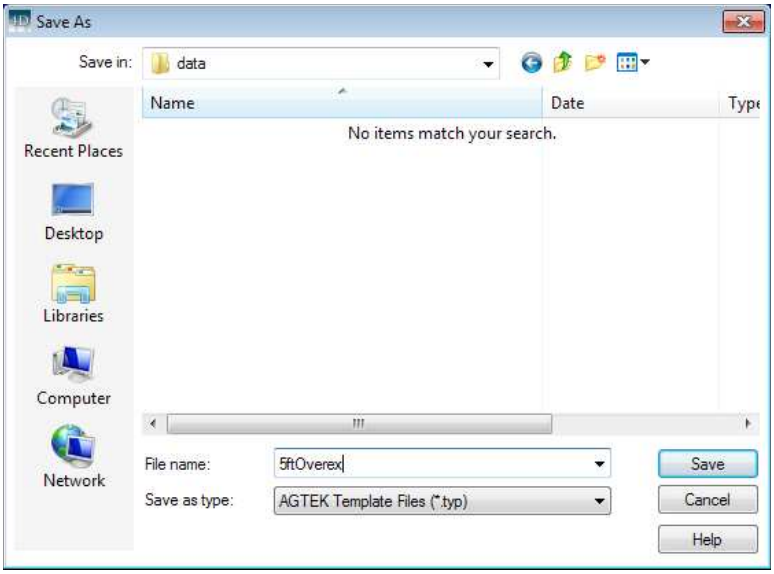
10. For segment 1, enter “5.000” for the Width and “0” for the Slope. The height defaults to “0”.

11. Select segment 1 and the select the **Right** checkbox in the Hinge section. For segment 2, the width defaults to “Variable” and the Height defaults to “Daylight”. Enter “1:1” for the Slope.

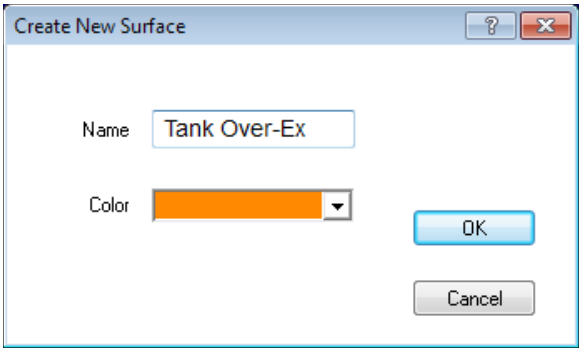
12. Select **Subgrade** for the Daylight surface and **New Surface** for the Output surface. The Stages Lines check box is selected by default.

13. Select the **Points Every** check box and enter “10”.

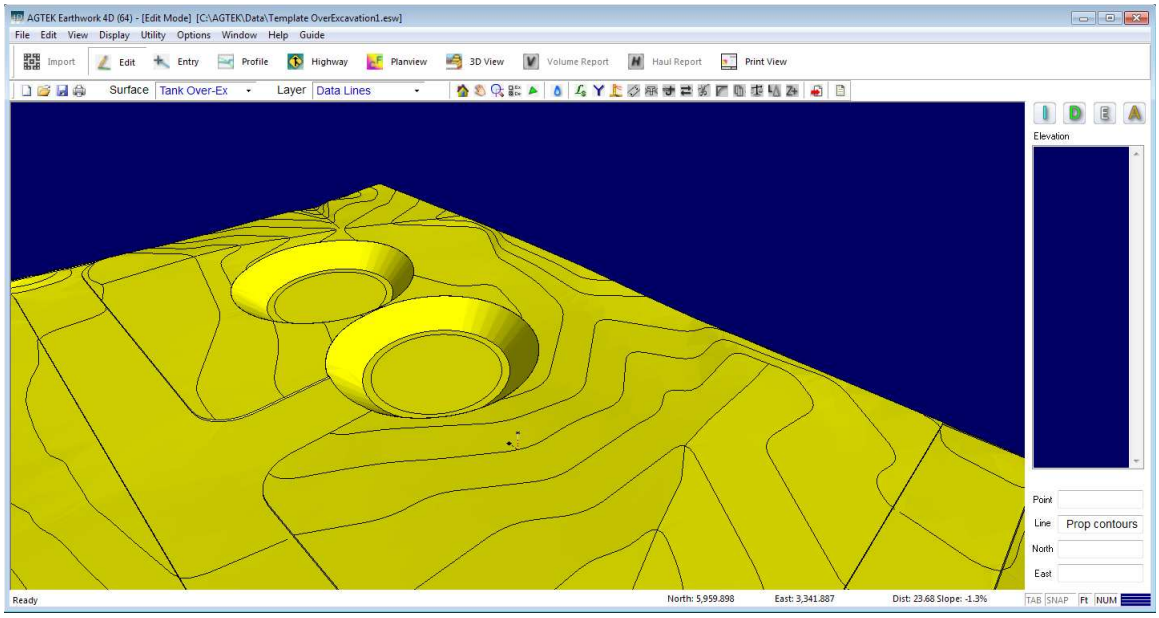
14. Click **Apply** and you are prompted to save the changes made to the Template. Click **Yes**. Enter “5ftOverex” for the name, click **Save** and the Template is applied.



15. When the Template is complete the Create New Surface dialog box is displayed. Enter “Tank Overex” for the Surface name and click **OK**.



16. The resulting surface can be viewed by pressing “T” key turn on the terrain. Press the “T” key again to turn off the terrain.



Calculating Volumes

1. Click the **3D View** button. Set the Reference Surface to **Tank Overex** and the Difference Surface to **Existing**. The 3D view can be inspected using the 3D controls discussed on page 2-23.

2. Click the **V** button to begin volume calculation. The Volume Calculations Results dialog box is displayed. Click **Done** to view the report. This volumes represents the total excavation for the entire site.

Job: Template OverExcavation 1
Units: Ft-CY
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Volume Report
Tank Over-Ex vs. Existing

	Total	Area Cut	Area Fill	Area OnGrade	Volume Cut	Volume Fill	Comp/Ratio Cut	Comp/Ratio Fill	Compact Cut	Compact Fill	Export -Import	Change Per .1 Ft
Job Site	269,689	156,284	93,931	19,474	17,418	4,958	1.00	1.00	17,418	4,958	12,460	999

3. Click the **3D View** button. Set the Reference Surface to **Subgrade** and the Difference Surface to **Tank Overex**. The 3D view can be inspected using the 3D controls discussed on page2-23

4. Click the **V** button to begin volume calculation. The Volume Calculations Results dialog box is displayed. Click **Done** to view the report. This volumes represents the backfill required.

Job: Template OverExcavation 1
Units: Ft-CY
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Volume Report
Subgrade vs. Tank Over-Ex

	Total	Area Cut	Area Fill	Area OnGrade	Volume Cut	Volume Fill	Comp/Ratio Cut	Comp/Ratio Fill	Compact Cut	Compact Fill	Export -Import	Change Per .1 Ft
Job Site	269,689	478	14,897	254,314	9	5,027	1.00	1.00	9	5,027	-5,018	999

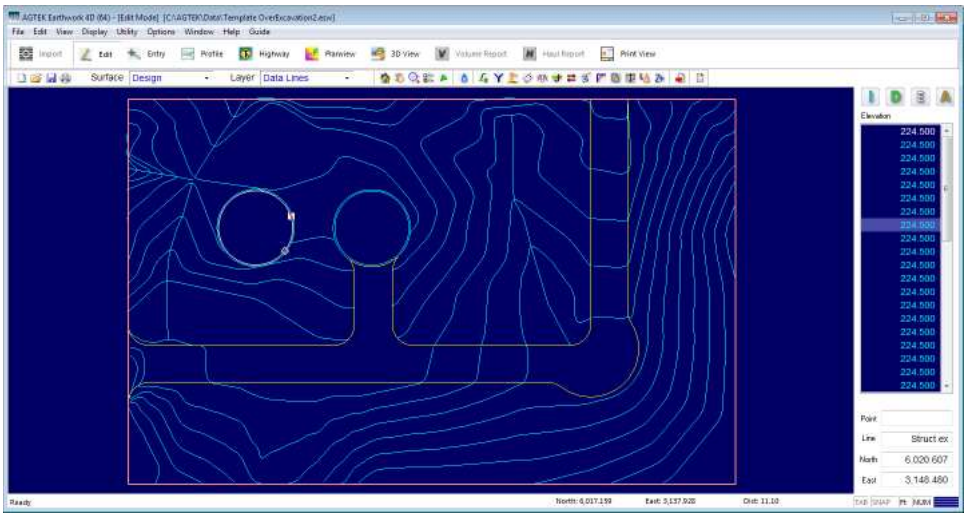
Over Excavation - Example 2

In the case, when the Template is applied to both lines, the areas overlap. The Template will need to be applied to one line at a time and then edited to clean up the model. Begin with the tank on the left.

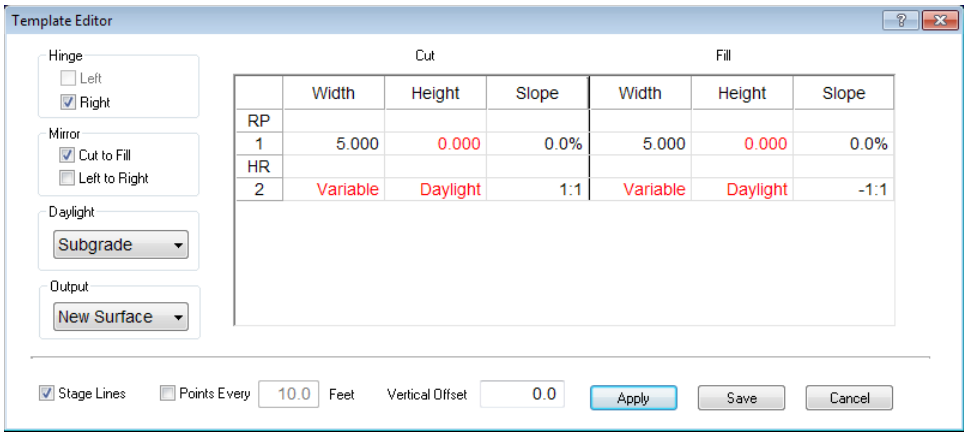
1. Select **File > Open**, select "Template OverExcavation2.esw" from the C:/AGTEK/Data directory and click **Open**.

2. Select the bottom of tank line (inner data line) of the left holding tank.

3. Click the **Apply Template** button on the toolbar and the **Open** dialog box is displayed.



4. Select “5ftOverex.typ” and click **Open**. The Template Editor dialog box is displayed.

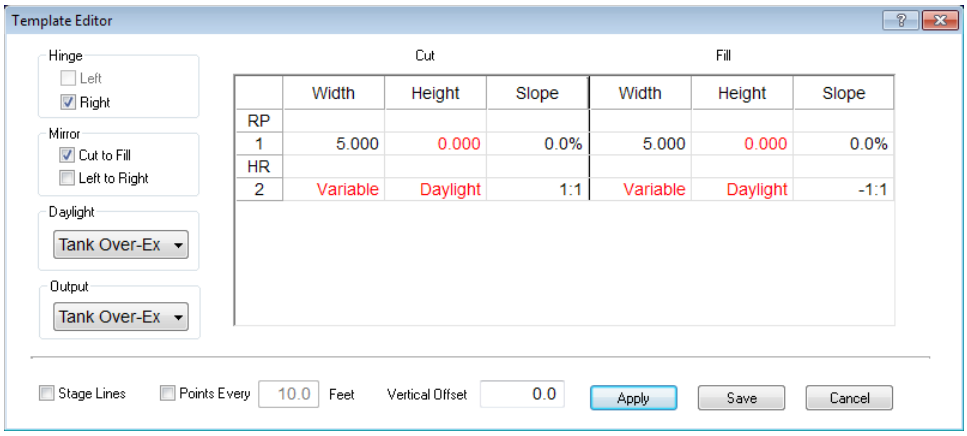


5. Set the Daylight surface to **Subgrade** and set the Output surface to **New Surface**, and click **Apply**. The Template sweeps around the first tank.

6. When complete the Create New Surface dialog box displays. Enter “Tank Overex” and click **OK**.

7. Select the bottom of tank line (inner data line) of the right holding tank.

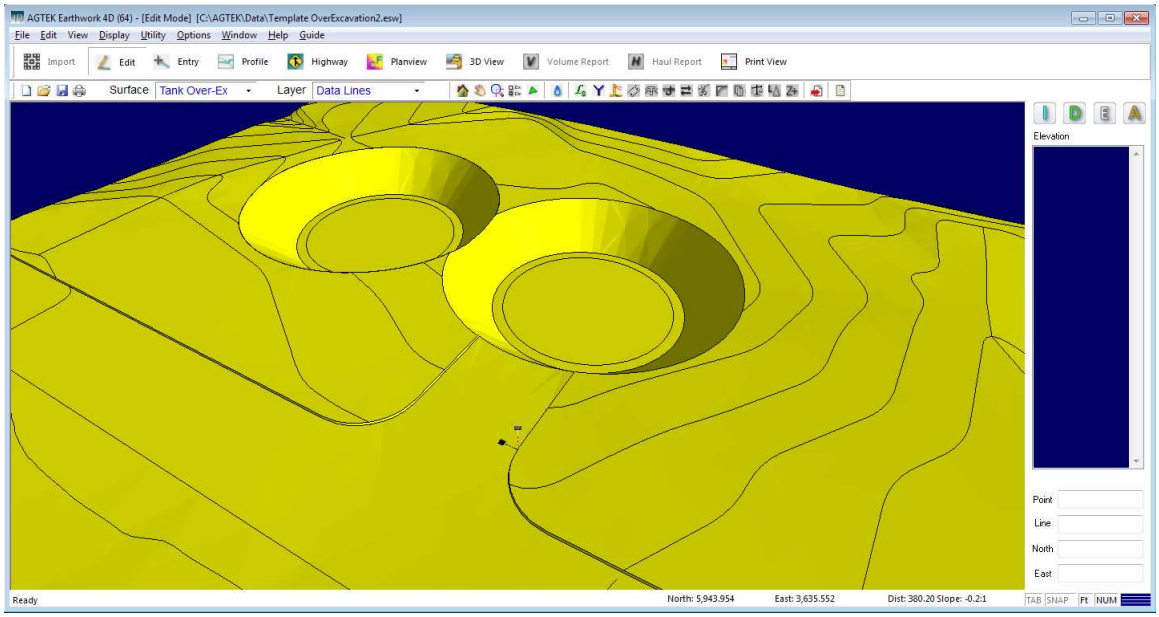
8. Click the **Apply Template** button on the toolbar and the Open dialog box displays.



9. Select “5ftOverex.typ” and click **Open**. The Template Editor dialog box displays.

10. Set the Daylight surface to **Tank Overex**, set the Output surface to **Tank Overex** and select the **Stage Lines** checkbox. The Template sweeps around the second tank.

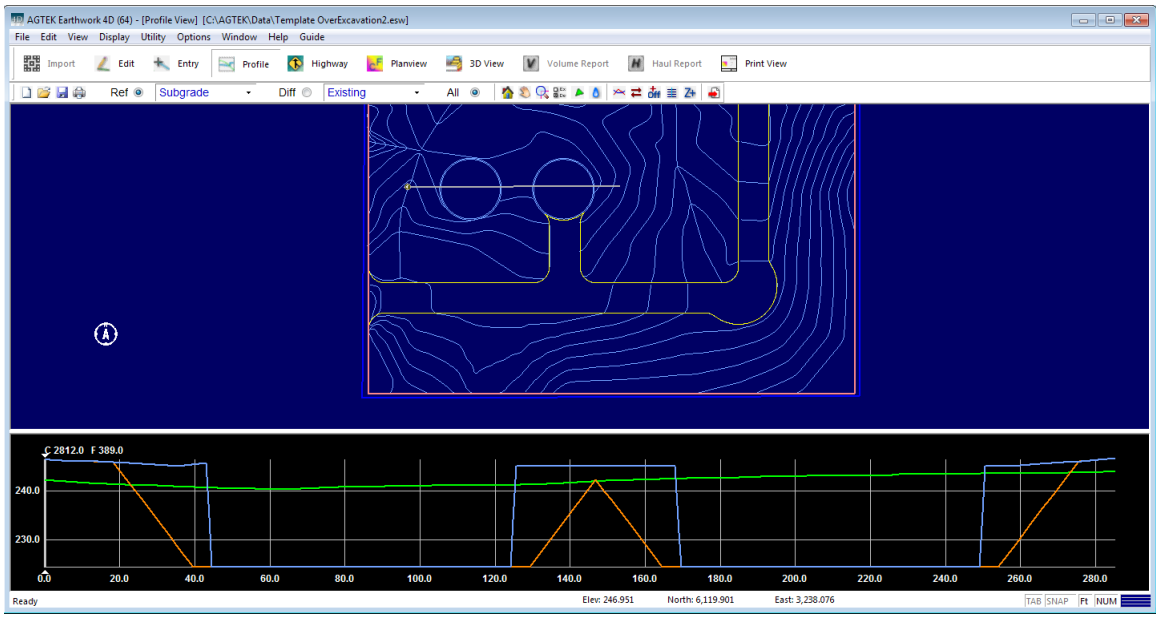
11. The resulting surface can be viewed by pressing “T” key turn on the terrain. Press the “T” key again to turn off the terrain.



12. The resulting over excavation surface may also be view as a profile. Click the **Profile View** button on the toolbar.

13. Click the **Profile Entry** button, and enter a profile line across both tanks, similar to the illustration below. Right-click to end the entry.

14. The profile of the two tanks is displayed at the bottom of the screen. Be sure the All button is selected to view all surfaces.



15. Volumes can be calculated as in the previous example.

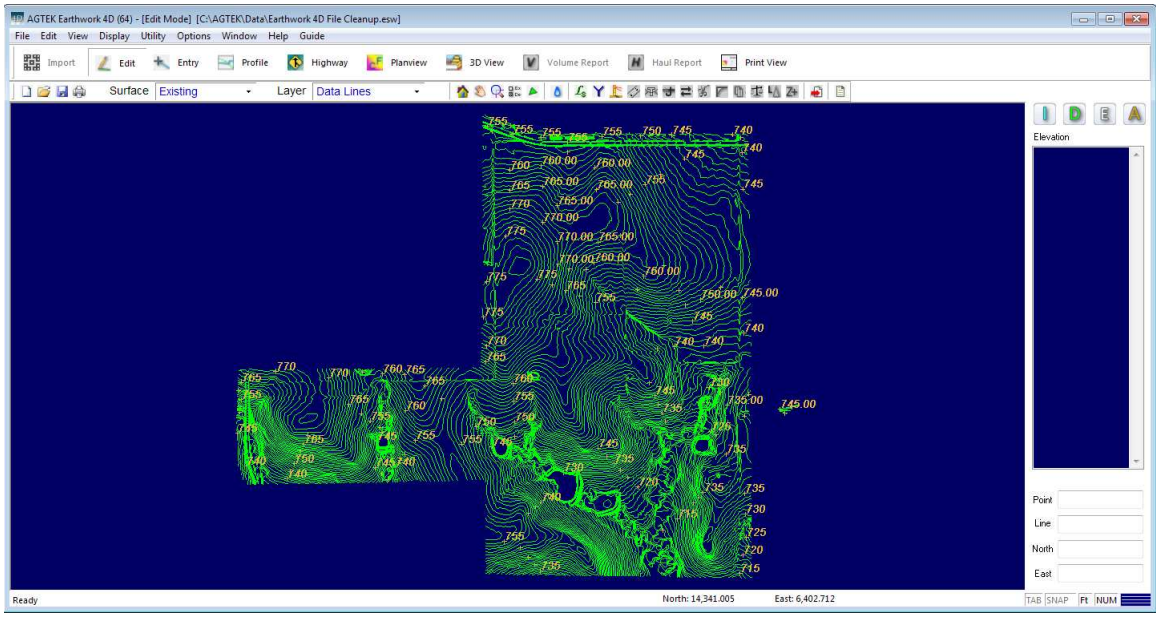
Cleaning up CAD Files

The following lesson demonstrates the use of the Join, Compress Selected, and Join functions to clean up CAD files before they are used for your Sitework 4D takeoff. The sample file used in the lesson below assumes that a CAD file has been imported, and the information has been transferred to Sitework 4D.

Open Sample Files

1. Select **File > Open** and browse to C:\AGTEK\data. Select “Earthwork 4D File Cleanup.esw”, and click **Open.**

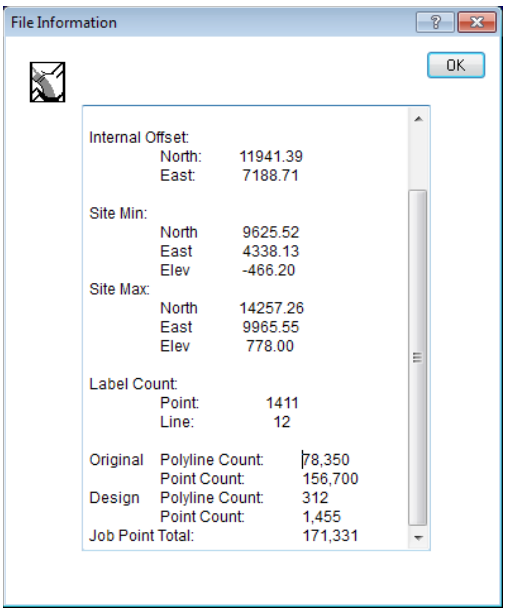
2. Set the Surface to **Existing** and the Layer to **Data Lines**, and press the **Home** key to zoom out and center the job.



Checking File Info

Checking the file info gives you and idea of just how large the file is. If there seems to be an excessive number of points or lines, the amount of information in the file may be reduced by joining and compressing the file data, and/or deleting unused data.

1. Select **Help > File Info** and the File Information window is displayed.



2. Scroll to the bottom of the window. Notice that there are half as many lines as there are points, which means that each line only contains two points. This is a good indication that the lines in the file need to be joined.

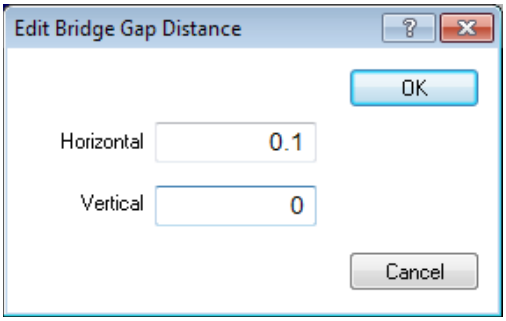
3. Click **OK** to close the File Information window.

Joining Lines.

1. Select any contour. Notice that all contours are in small sections.

2. Select **Edit > Select All** to select all data lines.

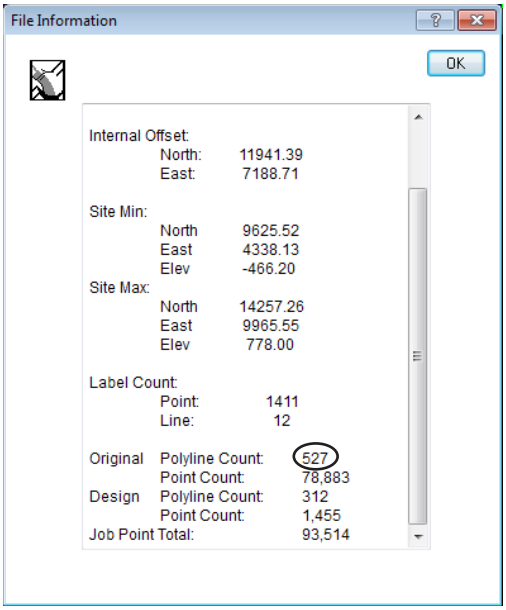
3. Click the **Join Lines** button and the Edit Bridge Gap dialog box displays.



Depending of the file size, the process can take a long time. You may need to join the lines in sections by selecting and joining smaller areas.

4. If not already set, enter "0.1" for the Horizontal and "0" for the vertical. Click **OK** and the Joining Line Process begins.

5. Select **Help > File** info and you can see the original Polyline and Point counts have been greatly reduced. Click **OK** to close the File Information window.

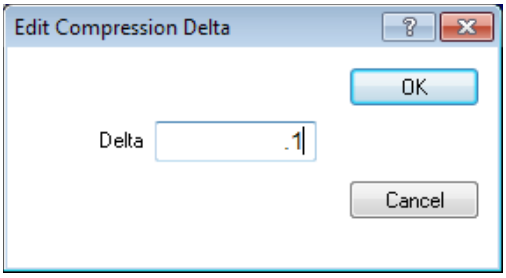


Compressing File Information

Compressing files removes points based on the Compression Delta. The higher the compression Delta, the more points that are removed. If the Compression Delta is to high, the resulting data lines will be too coarse.

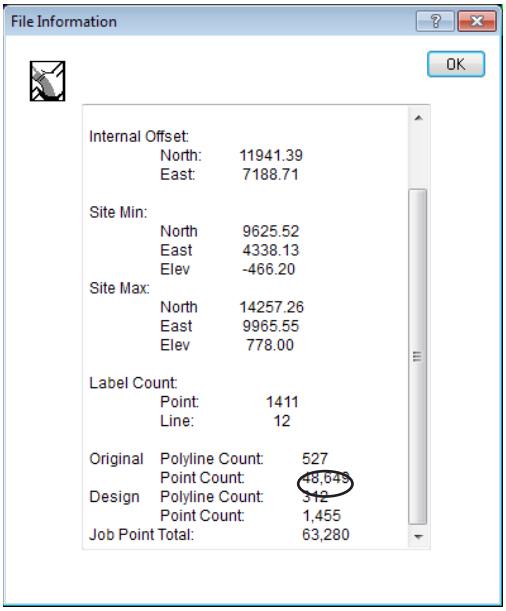
1. Select **Edit > Select All** and all data lines are selected.

2. Select **Utility > Compress Selected** and the Edit Compression Delete Dialog box displays.



3. Enter “0.1” for the Delta, click **OK**, and the lines are compressed.

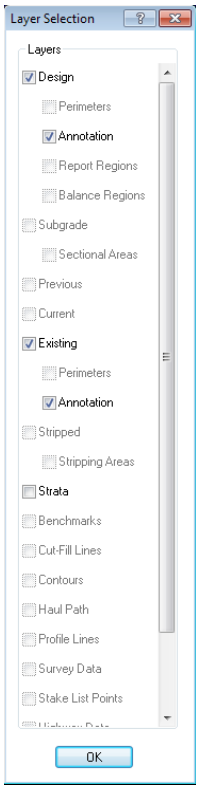
4. When complete, select **Help > File** Info and the File Information window is displayed. You can see that the Point Count in the file is reduced even further.



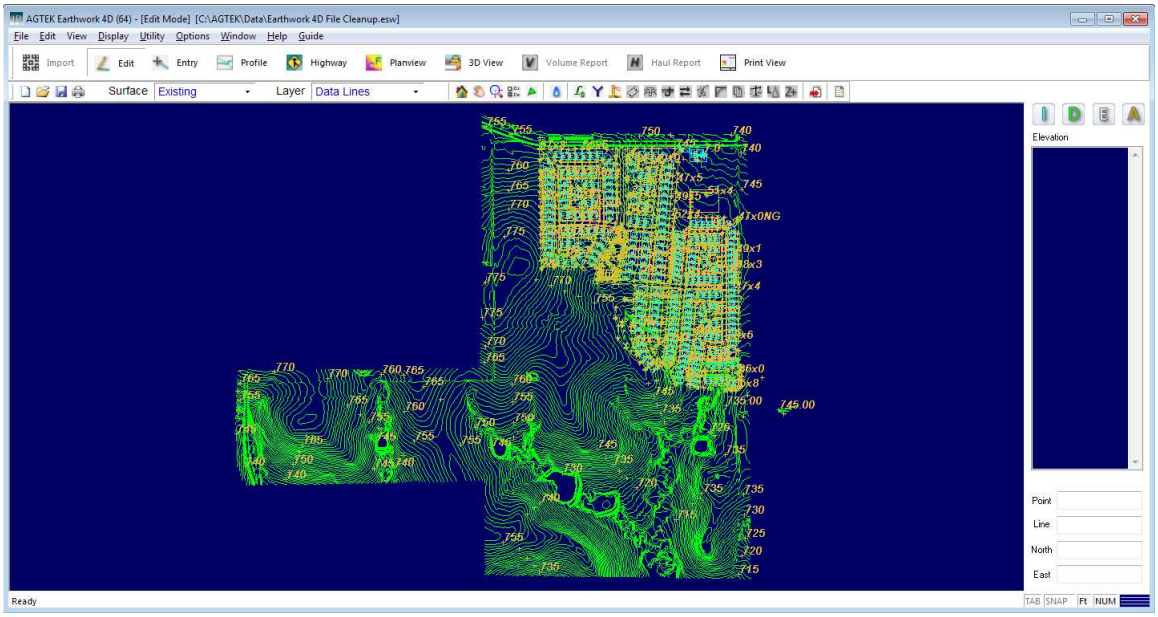
Trimming Lines

In some cases, the existing data may extend beyond the limits of excavation. This extra data can be removed, with the aid of the Trim Lines function, to further reduce the amount data in the file.

1. Click the **Layer Selection** button and the Layer Selection dialog box displays.



2. Select the **Design** checkbox and the **Annotation** checkbox directly below Design. The design data lines, and the design annotation lines are now visible. Click **OK**.

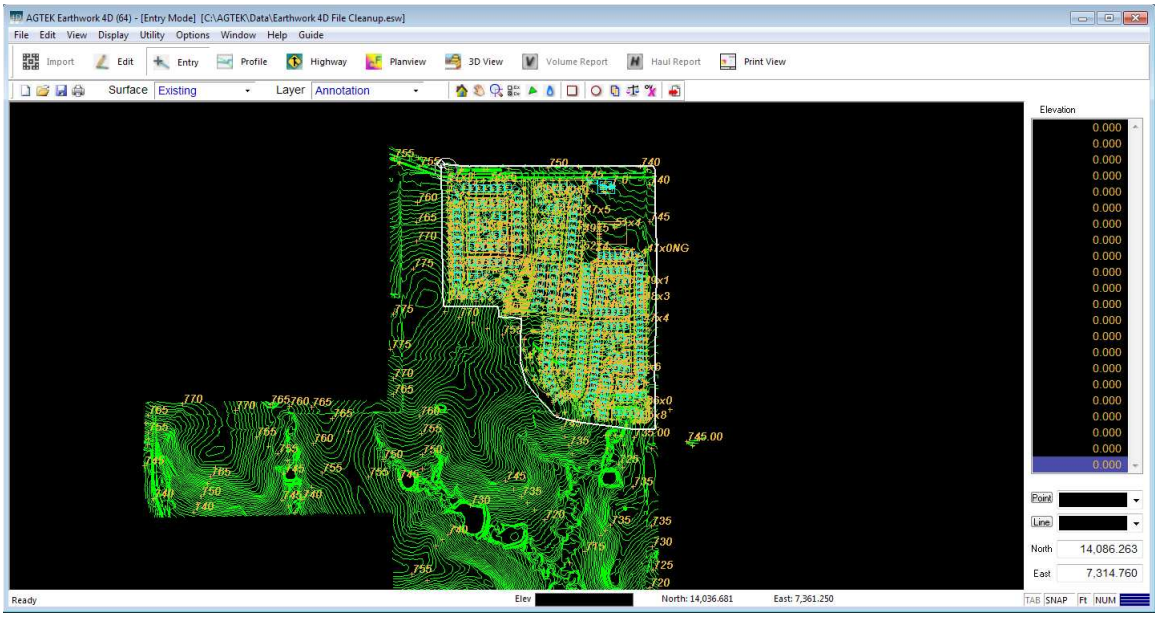


3. Click the **Entry Mode** button to switch to Entry Mode.

4. Change the Layer to **Annotation**.

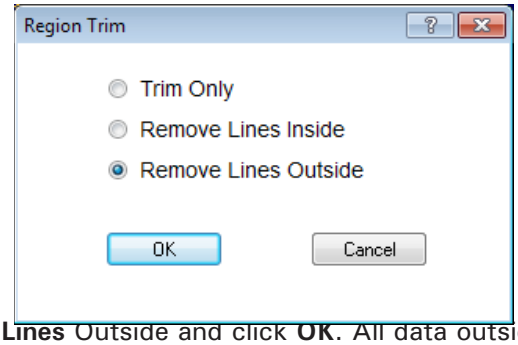
5. Type “0” on the keyboard to enter a 0 elevation.

6. Draw a line around the design data in the job, similar to the illustration below. Be sure to snap the line closed using the **F8** key. Right-click to end the entry.

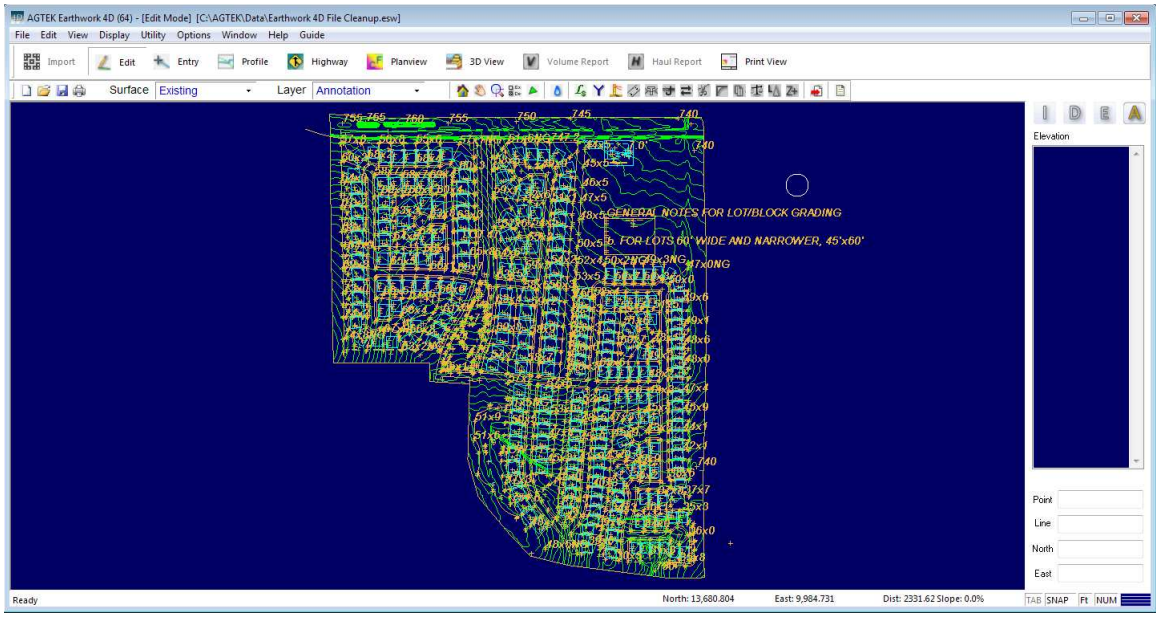


7. Right-click again to return to an arrow and click the **Edit Mode** button to switch to Edit Mode.

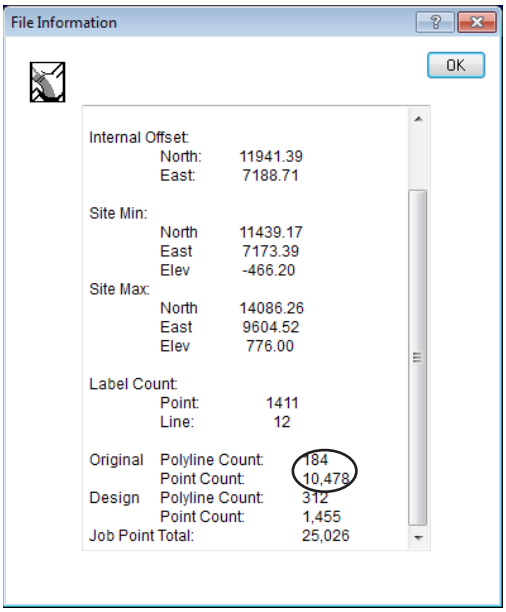
8. Select the annotation line you just entered, click the **Trim Line** button and the Trim Region dialog box displays.



9. Select **Remove Lines** Outside and click **OK**. All data outside of the selected trim line is removed.



10. Select **Help > File** Info and the File Info dialog box is displayed. You can see the Polyline and Point counts are even further reduced.



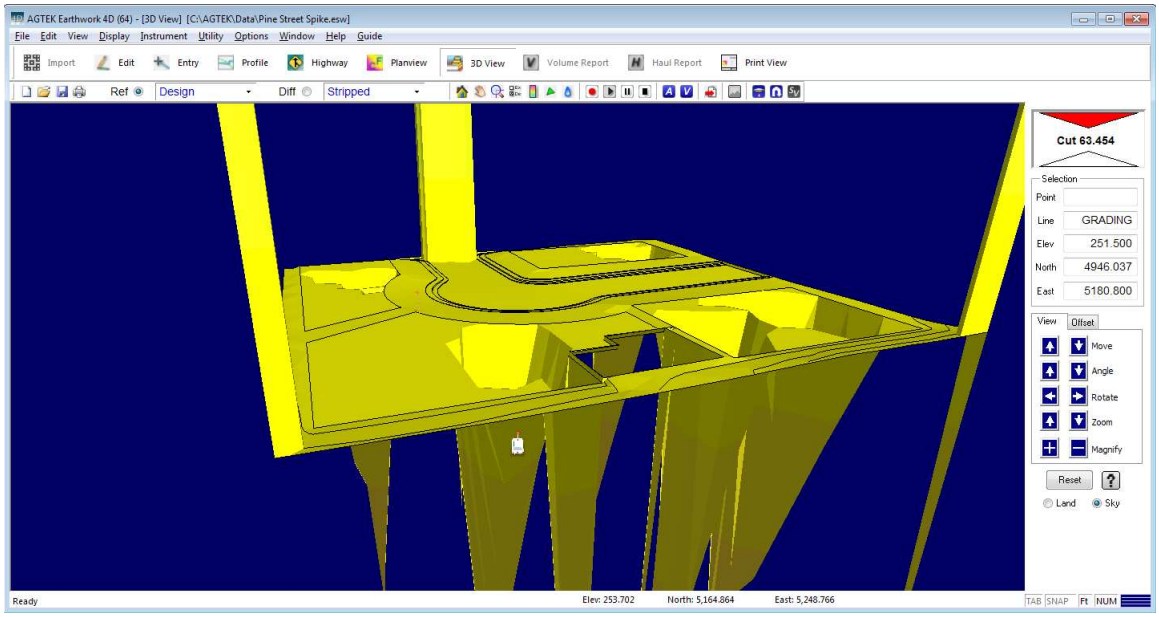
Finding Elevations

Finding elevations is a useful tool to diagnose problems seen in the 3D View, such as spikes. The Find Elevation tool allows you to isolate elevations in a specific range. In the sample file used below, there a several elevation spikes, which simulate elevation spikes which are sometimes seen when you transfer CAD data to Sitework 4D. Training videos on this subject can be found by going to AGTEK's website at www.agtek.com.

Open Sample Files

1. Select **File > Open** and browse to C:\AGTEK\data. Select "Pine Street Spike.esw", and click **Open.**

2. Click the 3D View button to switch to 3D View. Set the Ref surface to **Design** and the Dif surface to **Stripped**. You should be able to see the elevation spikes on the job, similar to the illustration below.



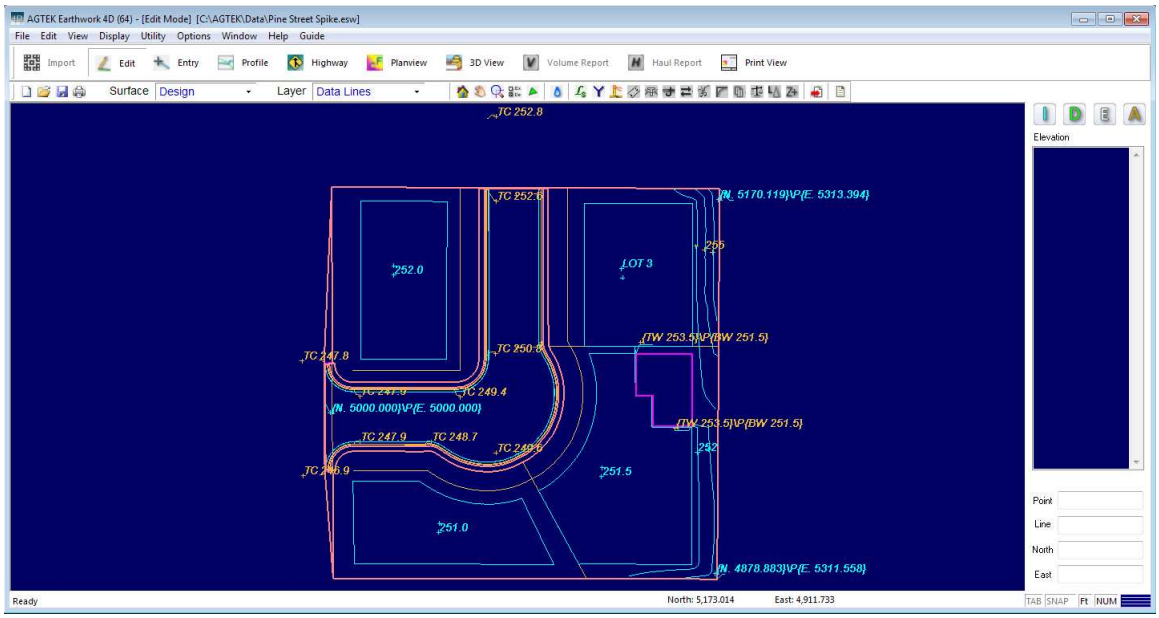
Correcting Elevation Spikes

In this example we know that we should have no elevation above 300ft, or below 200ft.

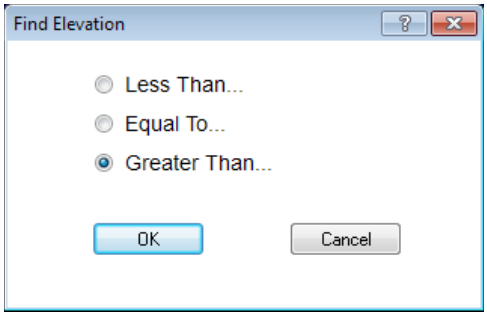
1. Switch to the **Edit Mode** and set the Surface to **Design** and the Layer to **Data Lines**.

2. Select **Display > Edit Layer Only** to hide everything but the data lines.

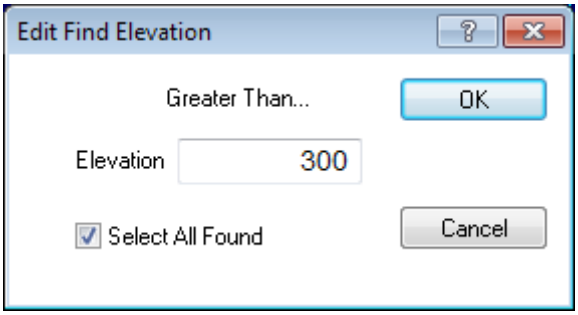
3. Press the **Esc** key to be sure that no points are selected, and your screen should appear similar to the illustration below.



4. Select **Edit > Find Elevation** and the Find Elevation dialog box is displayed.



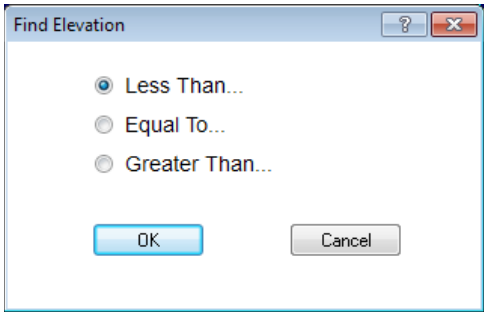
5. Select the **Greater Than** button and click **OK**. The Edit Find Elevation dialog box is displayed.



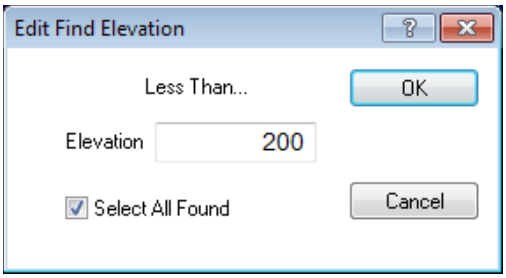
6. Enter “300” for the elevation and select the “Select All Found” check box.

7. Click **OK** and all data with and elevation of 300 or above is selected. The lines can be deleted, or you can click on the **A** button on the IDEA bar to change the data to annotation.

8. Select **Edit > Find Elevation** and the Find Elevation dialog box is displayed.



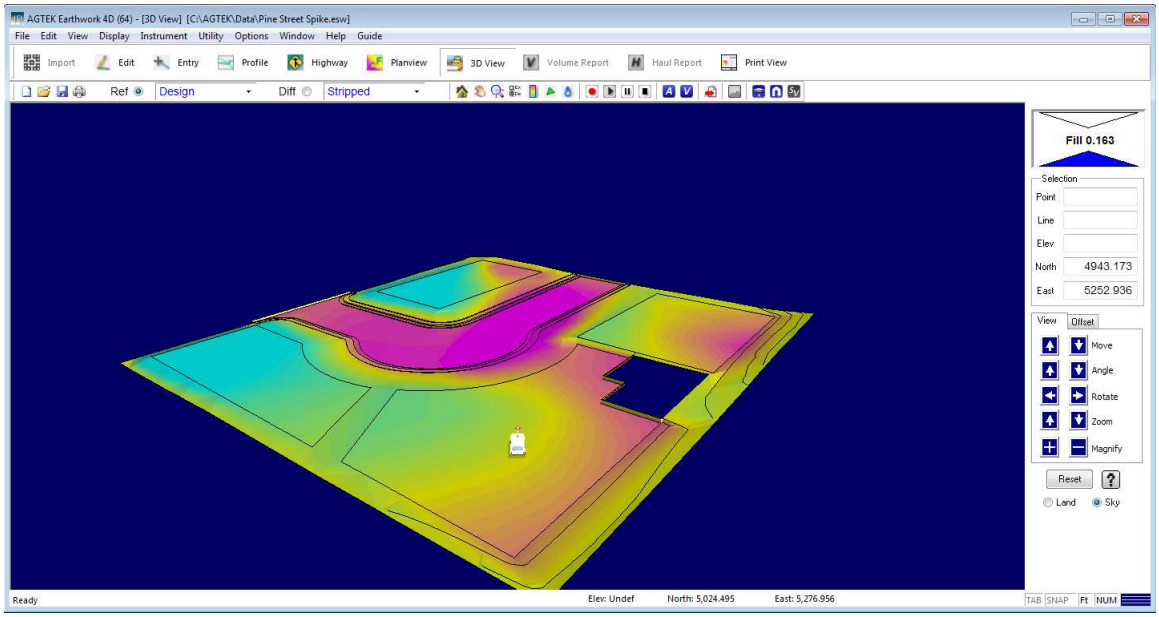
9. Select the **Less Than** button and click **OK**. The Edit Find Elevation dialog box is displayed.



10. Enter "200" for the elevation and select the "Select All Found" check box.

11. Click **OK** and all data with and elevation of 200 or less is selected. The lines can be deleted, or you can click on the **A** button on the IDEA bar to change the data to annotation.

12. Switch the **3D View** and you can see that the spikes have been corrected.



Aligning PDFs

This section discusses skills which are useful when working with PDF files. We will cover correcting a PDF scale, aligning PDFs, and working with vector PDFs. All sample files used can be found in the C:\AGTEK\Data directory. Training videos on this subject can be found by going to AGTEK's website at www.agtek.com.

Adjusting an incorrect PDF Scale

Depending on how the PDF file was created, it may have scale which does not match the scale printed on the drawings. When working with a PDF, it is always advisable to check the scale of the plansheet using a known distance.

Opening the Sample File

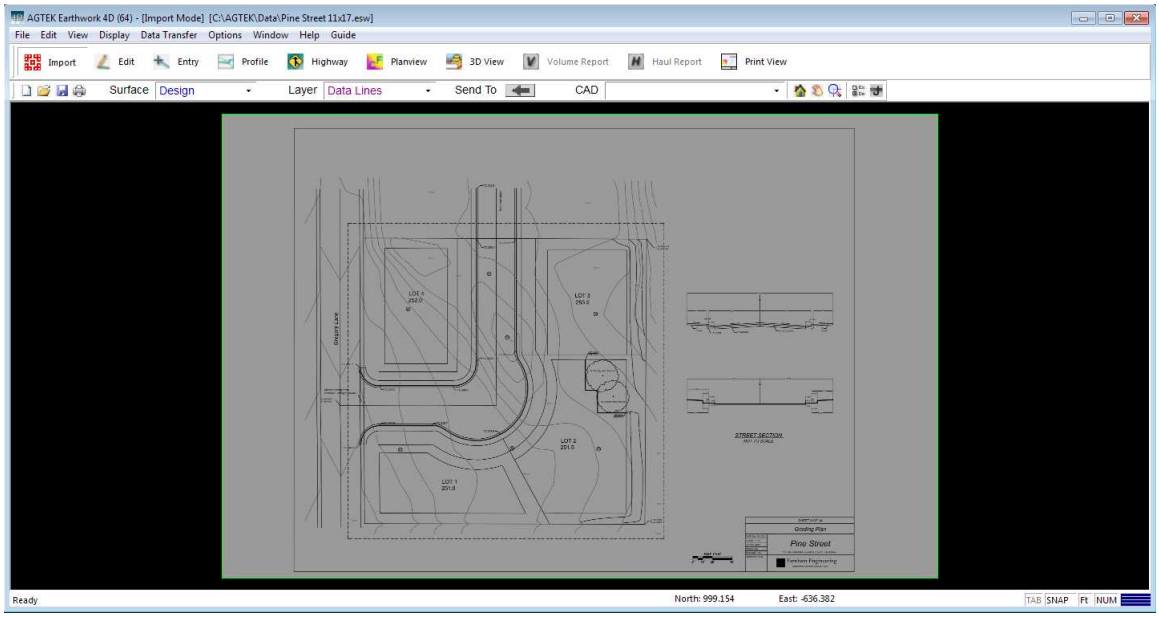
1. Double-click the **Sitework 4D** icon on the desktop to launch the program.

2. Select **File > New** and the Job Information dialog box is displayed. Enter "Pine Street 1" for the Job Name and click **OK**. The rest of the information is optional.

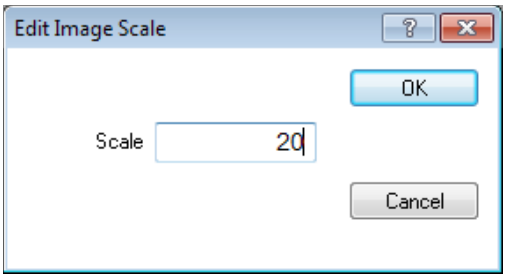
3. Select **File > Import** and select "Pine Street 11x17.pdf" from the C:\AGTEK\Data directory and click **Open**.

Checking the Scale

1. Press the "L" twice to rotate the PDF image. Locate and zoom in on the scale bar on the lower-right portion of the drawing. According the scale bar, the scale of the drawing should be 1 inch equals 20 feet.

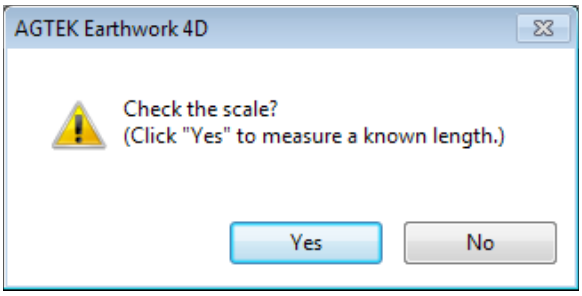


2 Select **Data Transfer > Image Scale** and the Edit Image Scale dialog box displays.



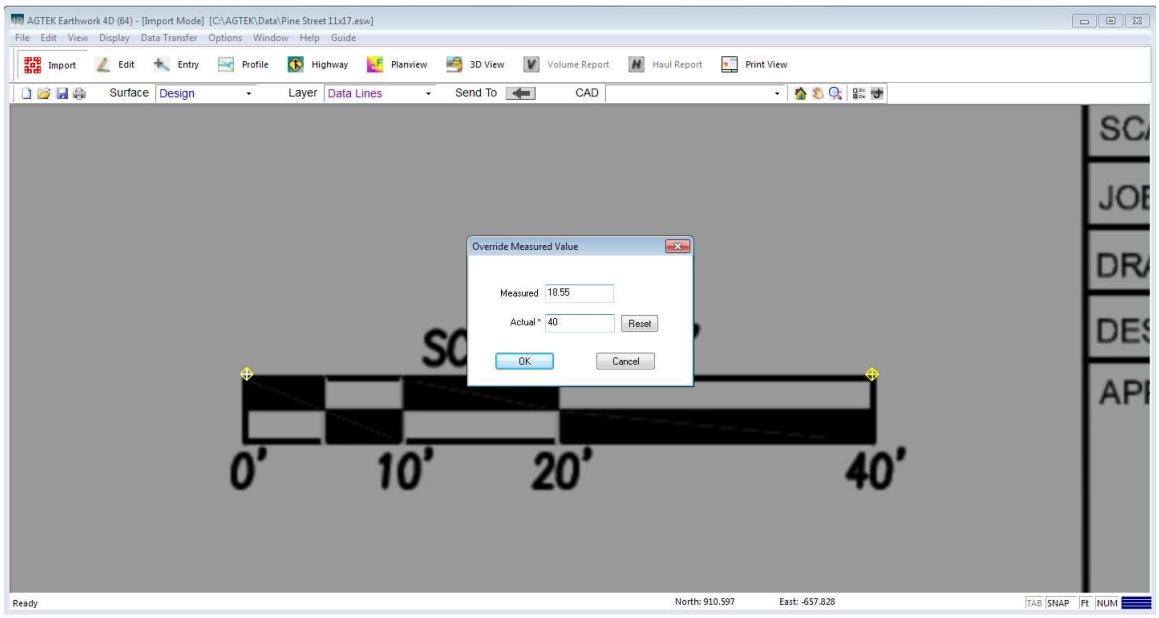
3. Enter “20” for the scale and click **OK**.

4 You are prompted to check a known distance on the plansheet. Click **Yes** to check the scale.



5. Zoom in to the scale bar.

6. Enter two points at each end of the scale bar. The **Measured** Distance will display.



7. Enter the correct distance in the **Actual** field and click **OK**. The scale is now correct.

Aligning Multiple PDFs

Most jobs will be drawn on multiple sheets. In this case, it is necessary to align multiple PDF sheets to complete your job.

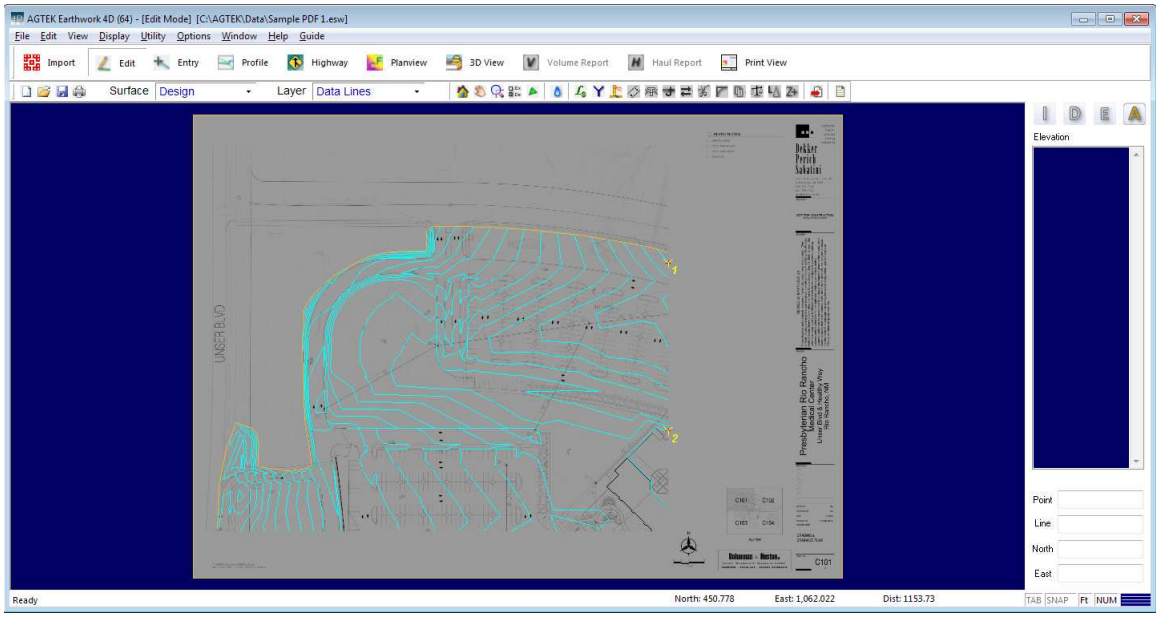
Example 1 - Open Sample Files

Benchmarks have been added to illustrate the points we will use to align the second PDF sheet. Benchmarks are not required.

1. Select **File > Open** and select “Sample PDF 1.esw” from the C:\ AGTEK\Data directory.

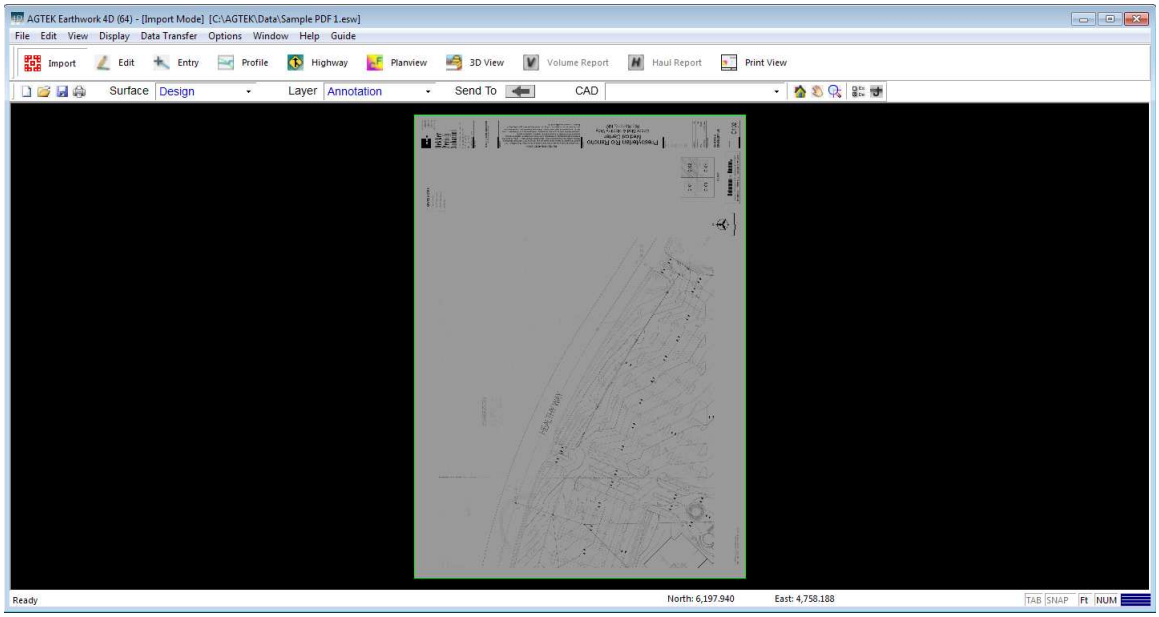
2. Set the Surface to **Design** and the Layer to **Data Lines**.

3. Select the annotation line surrounding the job. Right-click, select **Import File** and the PDF is displayed behind the data.



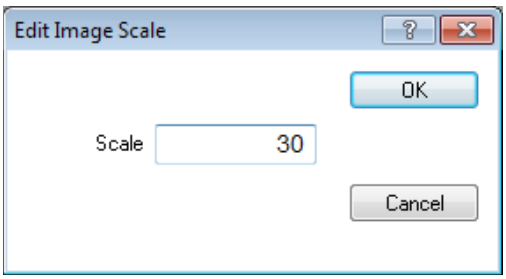
Align PDF to Entered Data

1. Press the **Esc** key to make sure no lines are selected. Select **File > Import** and select "Sample PDF 2.pdf" and click **Open**. The file opens in the Data Transfer mode.



2. Press the "**R**" key on your keyboard twice to rotate the image.

3. Select **Data Transfer > Image Scale** and the Edit Image Scale dialog box displays.

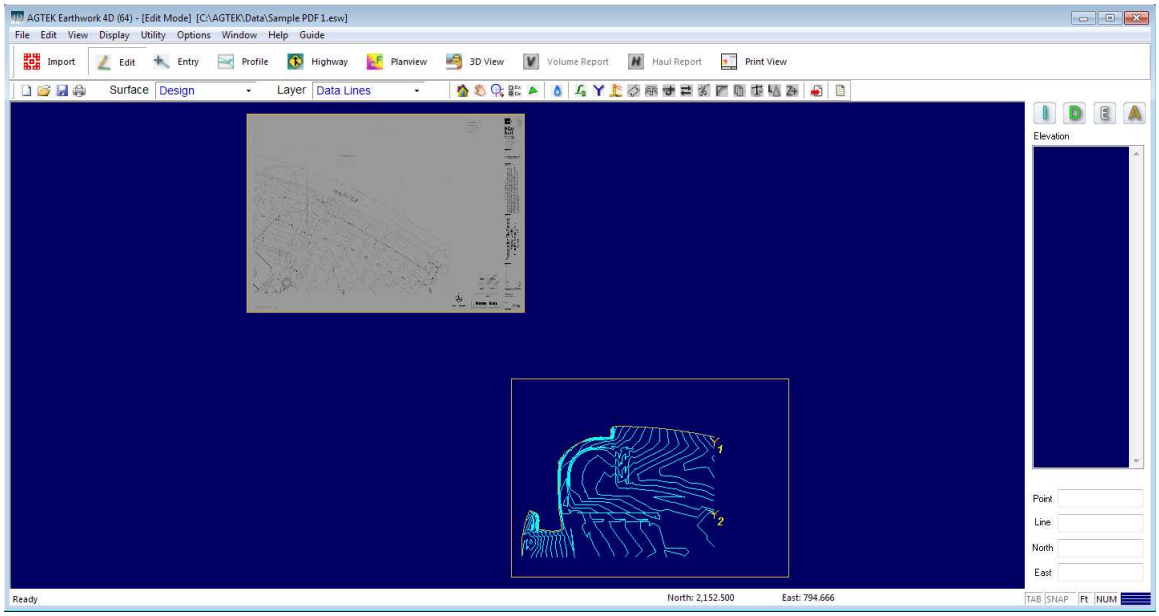


4. Enter "30" for the Image Scale and click **OK**. You will be prompted to check the scale using a known distance. Click **OK**.

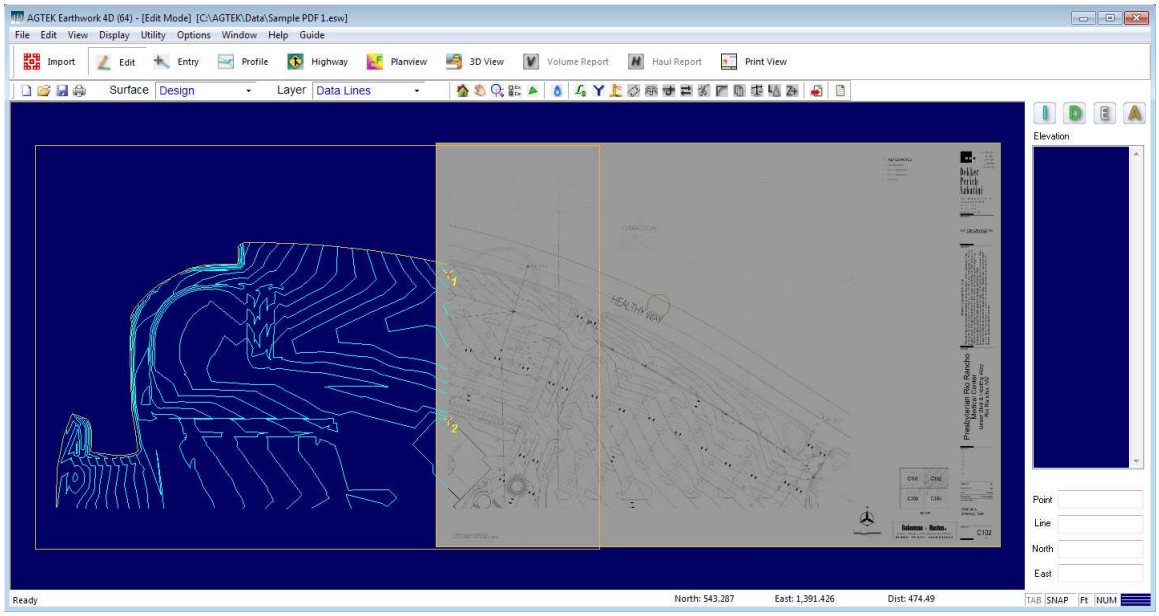
5. Switch to the **Edit** Mode.

6. The image will be inserted but it will not be in the correct location. We will need to move the new image to match the data from the first sheet. Right-click on the job and select **Align Image.**

7. Select the first point (Point 1) on the PDF sheet to be moved.



8. Select the benchmark that corresponds with the point selected in step 7 (Point 2). The image will be moved to the second point.



9. The points from sheet one should line up with the points from the entered data. Since both sheets are in the same rotation, the second alignment point is not needed. Right-click and select **Cancel**. The data on the second sheet can now be entered.

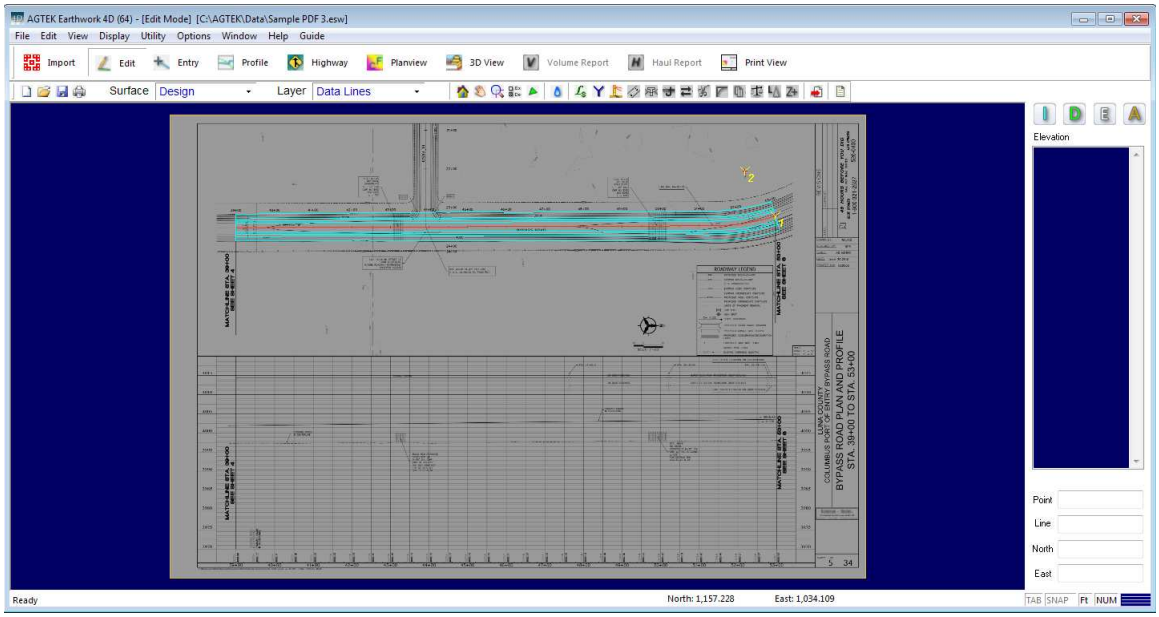
Example 2 - Opening Sample Files

The following example assumes the second PDF sheet has already been imported and scaled. This job also has benchmarks entered to aid in alignment. The benchmarks are not necessary.

1. Select **File > Open** and select “Sample PDF 3.esw” from the C:\ AGTEK\Data directory.

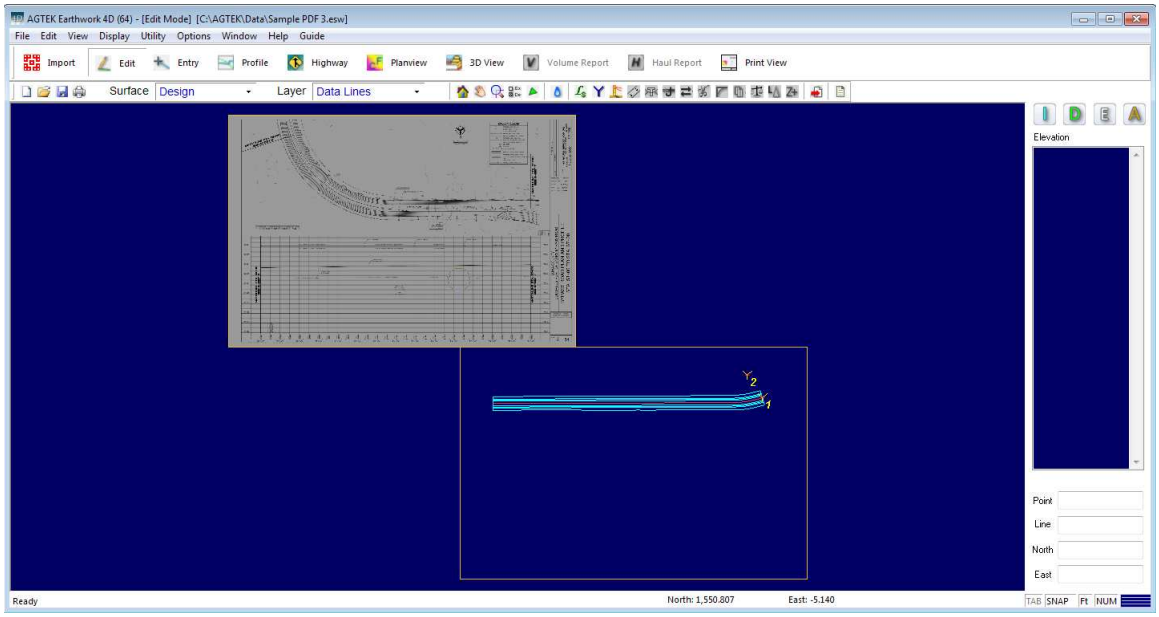
2. Set the Surface to **Design** and the Layer to **Data Lines**.

3. Select the annotation line surrounding the job. Right-click and select **Import File**.



Align PDF to Entered Data

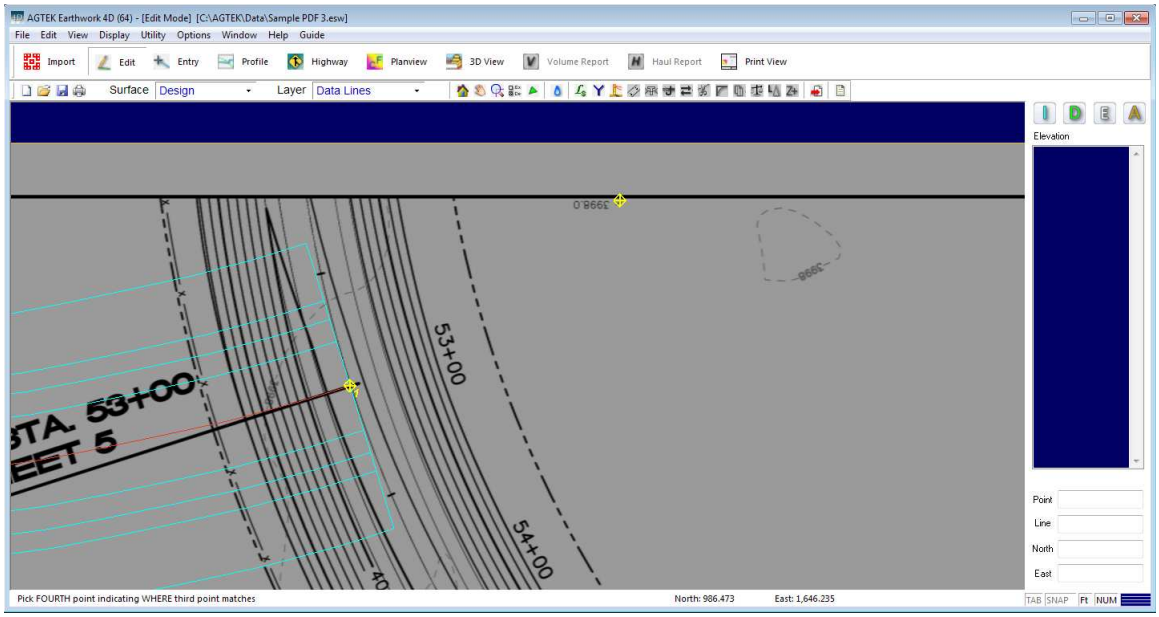
1. Right click and select **Import File**. Select the **Sample PDF 4.pdf** and click **Import**. The image will be inserted, however it will not be in the correct location.



2. Right-click on the job and select **Align Image**.

3. Select the intersection of the match line with the center line on the new sheet (Point 1).

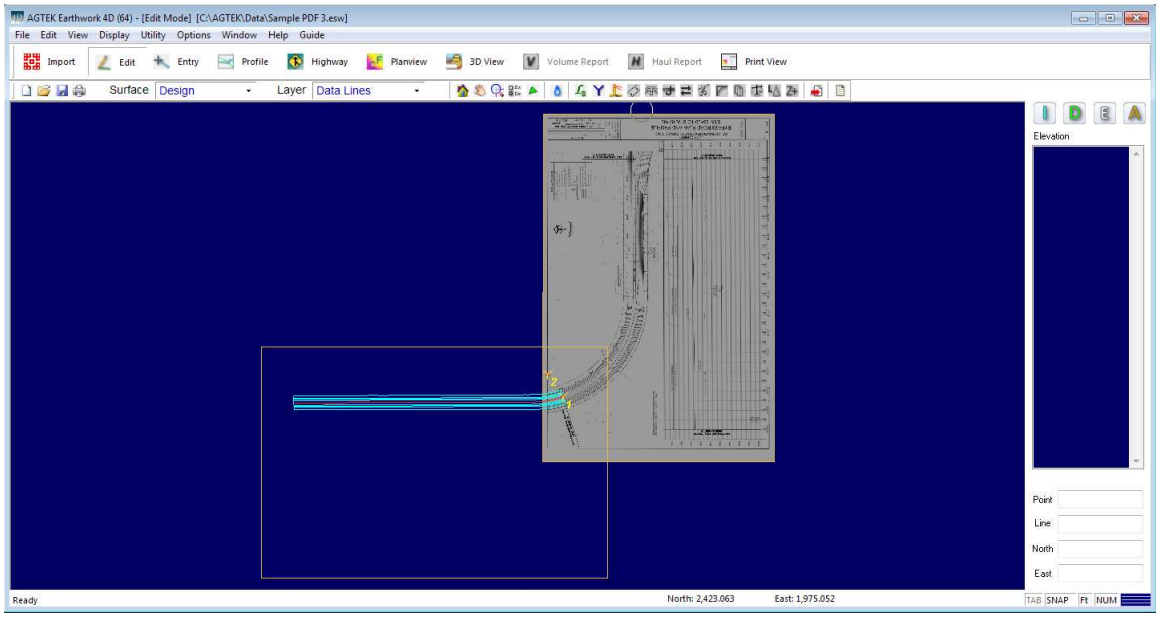
4. Select the end of the data line from the previous sheet (Point 2).



5. Select the spot elevation (3998.0) to the upper-right of the matchline (Point 3).

6. Select the spot elevation entered from the previous sheet (Point 4).

7. The Aligning Site dialog box displays providing information about the alignment. Click **OK**. The sheet should now be aligned and ready to continue entering information.



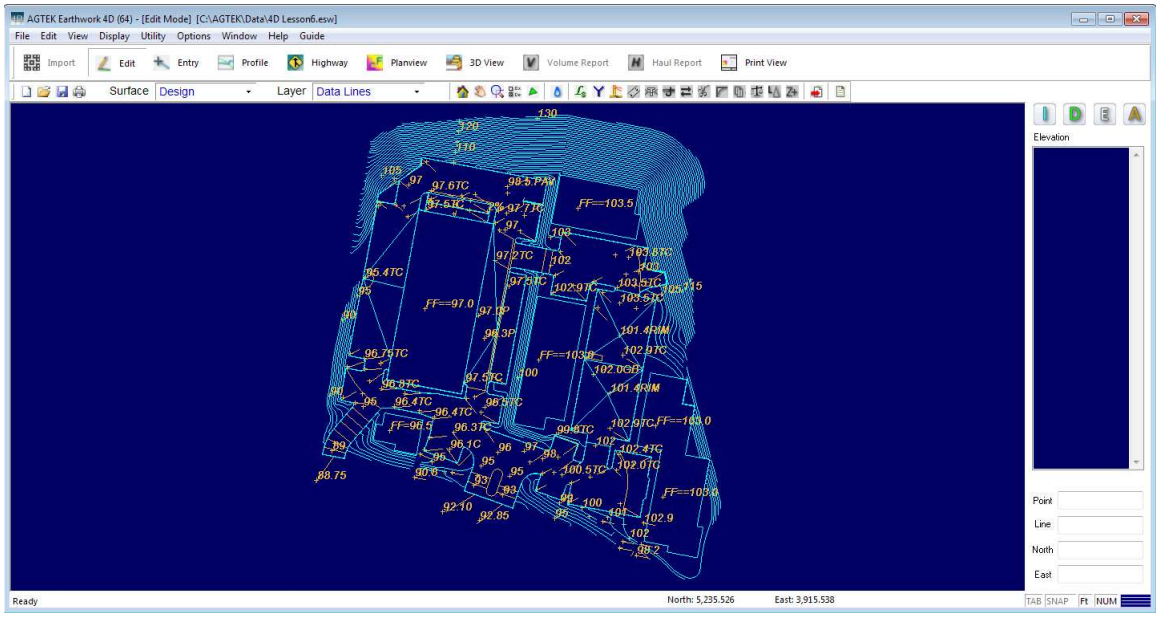
Aligning PDFs With CAD Files

On some jobs you may find it beneficial to align CAD data with a PDF image, such as when there is required information on the PDF which is not included in the CAD file. This example assumes that the existing and design data lines have already been transferred from the CAD file.

Opening Sample Files

1. Double-click the **Sitework 4D** icon on the desktop to launch the program.

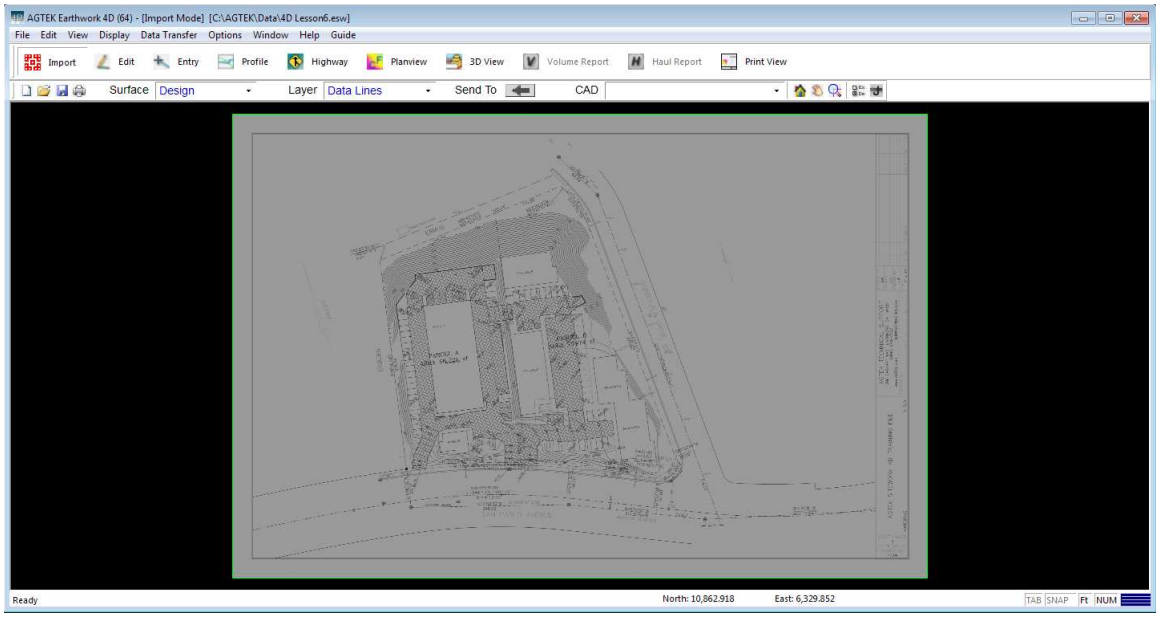
2. Select **File > Import** and select "4D Lesson6.esw" from the C:\AGTEK\Data directory and click **Open**.



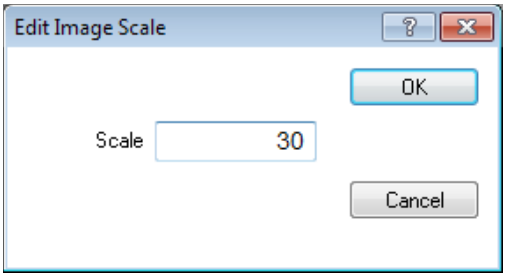
Aligning PDF image

1. Select **File > Import**. Select “Paving Plan.pdf” from the C:\AGTEK\Data directory and click **Open**. The file will open in the Data Transfer Mode.

2. Press the “**L**” key twice to rotate the image.



3. Select **Data Transfer > Image Scale** and the edit Image Scale dialog box is displayed.

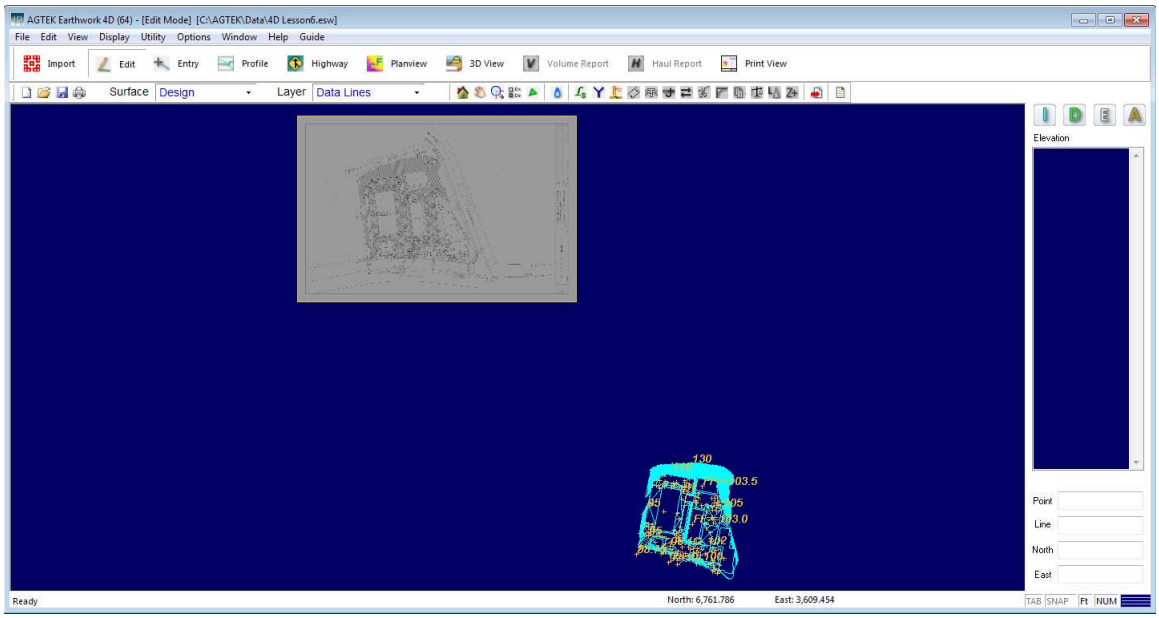


4. Enter “30” for the Scale and click **OK**.

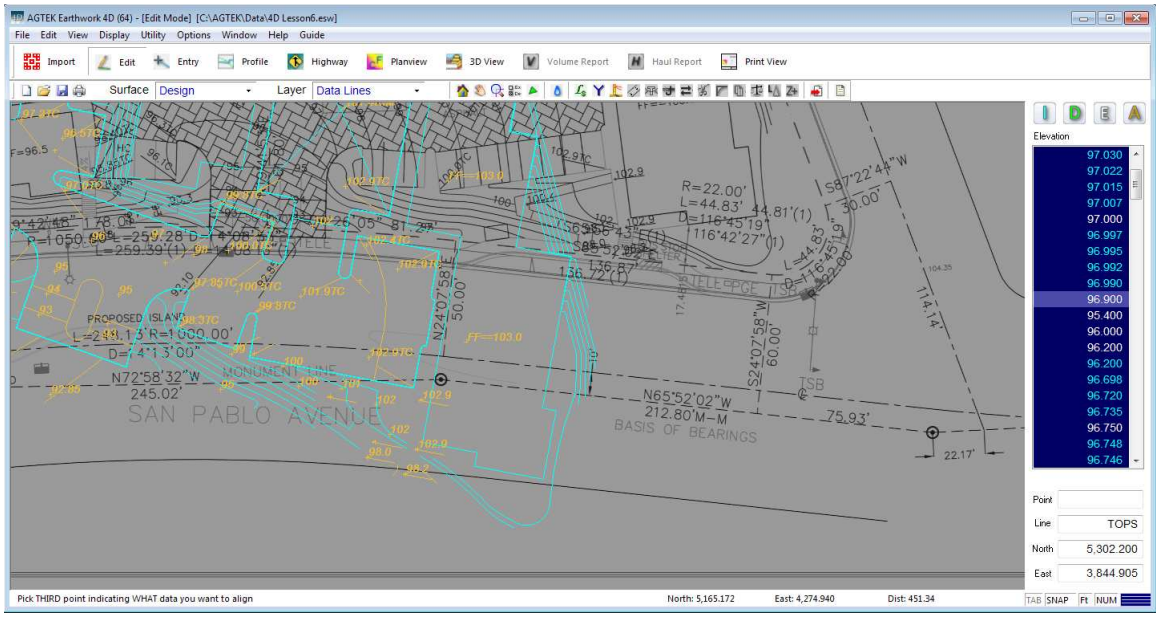
5. Switch to the **Edit** Mode.

6. Right-click on the job and select **Align Image**.

7. Select the corner of the curb line in the upper-left portion of the job site on the PDF image (Point 1).

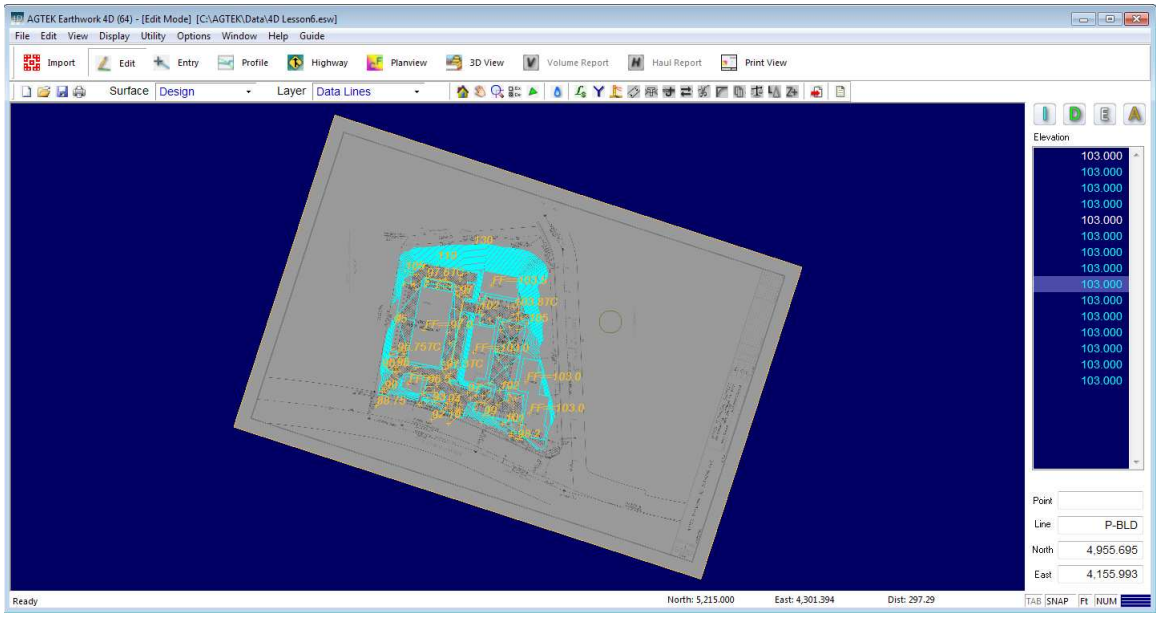


8. Select the corresponding corner in the upper-left portion of the design data (Point 2). The PDF image will change position, but will not be aligned properly.



9. Select the corner in the lower-right portion of the job site on the PDF image (Point 3) and the Alignment Point dialog box displays. Click **OK**.

10. Select the corner in the lower-right portion of the design data (Point 4) and the Alignment Point dialog box displays. Click **OK** and the Aligning Site dialog box will display. Click **OK**. The PDF image will should be aligned with the design data.



11. The PDF image can now be used to enter information not found in the CAD file, such as Sectional Areas.

Vector PDFs

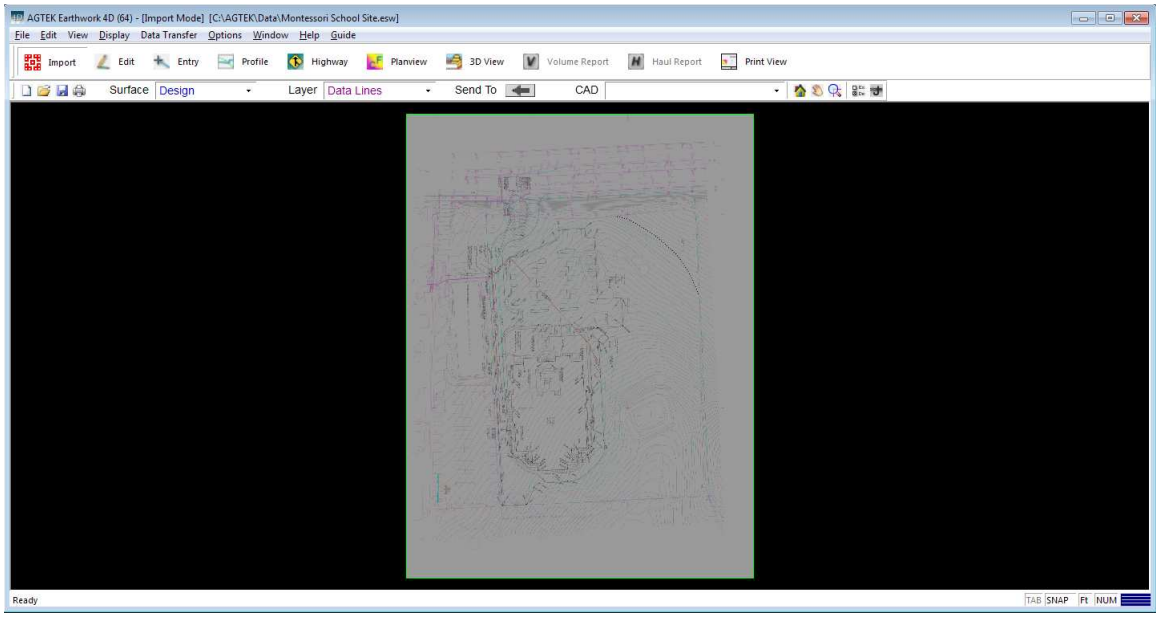
In the Data Transfer Mode: if the PDF is outlined in red it can not be vectorized, if it is outlined in green it can be vectorized.

There are two types of PDF files: raster and vector. Raster files are images or scans of drawings. Vector files contain the information necessary for Sitework 4D to create lines and arcs in different layers. You can then transfer that information from the Data Transfer Mode and edit as though you were working with a CAD file.

Opening Sample Files

1. Double-click the **Sitework 4D** shortcut on your desktop and the Open dialog box is displayed.

2. Select "Montessori School Site.pdf" from the C:\AGTEK\Data directory and click **Open**. The PDF will be displayed in the Data Transfer Mode.

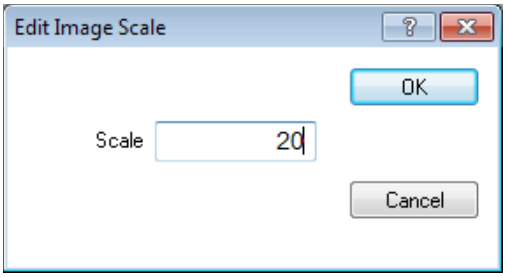


Scaling the Drawing

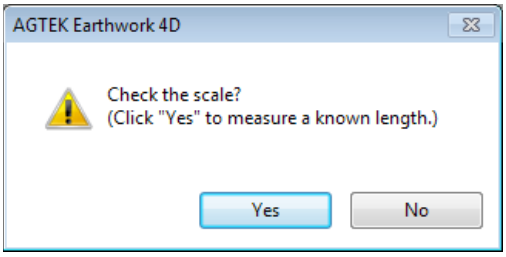
1. Press the "**L**" key twice to rotate the PDF.

2. To find the scale of the drawing, zoom into scalebar at the lower-right side of the drawing. You can see the scale is 1:20.

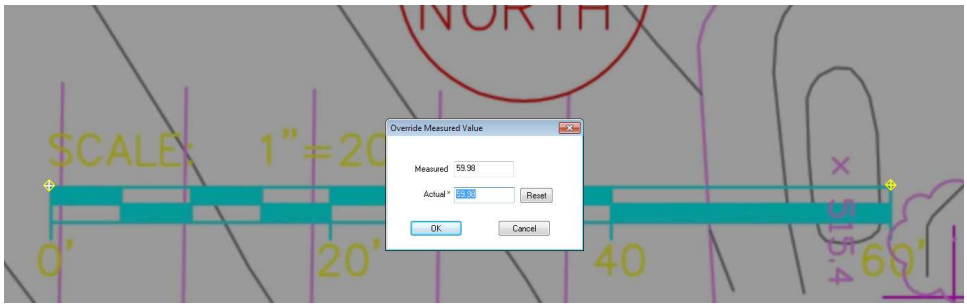
3. Select **Data Transfer > Image Scale** and the Edit Image Scale dialog box is displayed. Enter 20 for the scale and click **OK**.



4. You are prompted to check the resulting scale of the drawing, click **Yes** to check the scale.

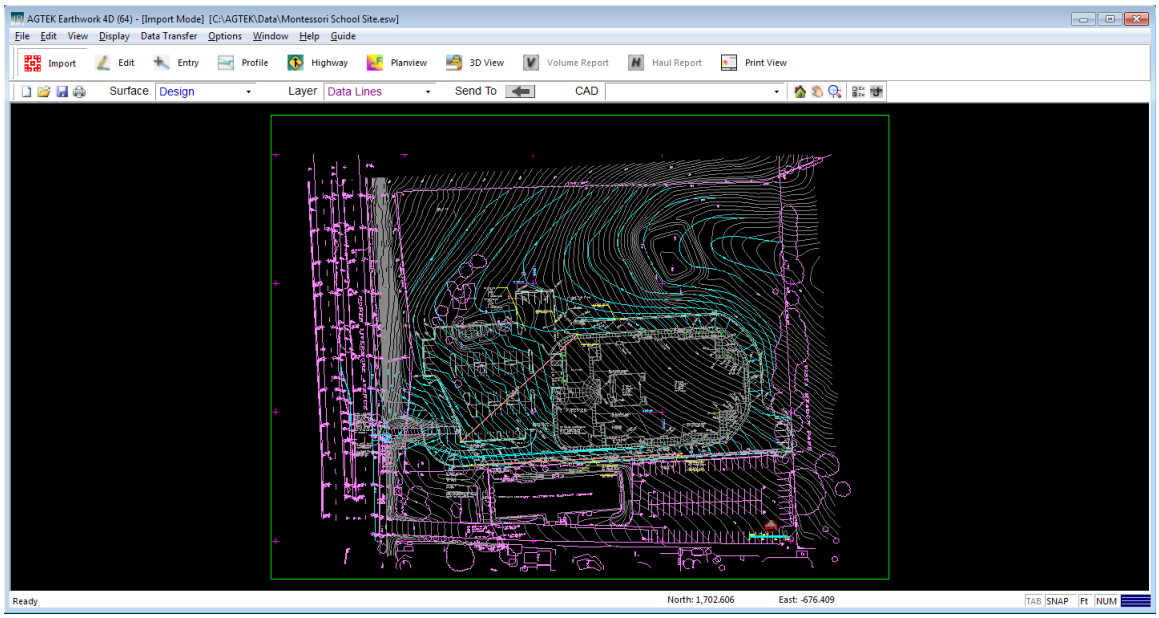


5. Enter two points at each end of the scale bar. The **Measured** distance will display. Verify the distance is correct and click **OK**.



Vectorize and Transfer Data

1. Select **Data Transfer > Vectorize** and lines are overlaid on the image.
2. To turn off the image, select **Display > Bitmap** (or press the "**T**" key on the keyboard).
3. Zoom into the drawing and select an existing contour line. The entire layer will be selected.

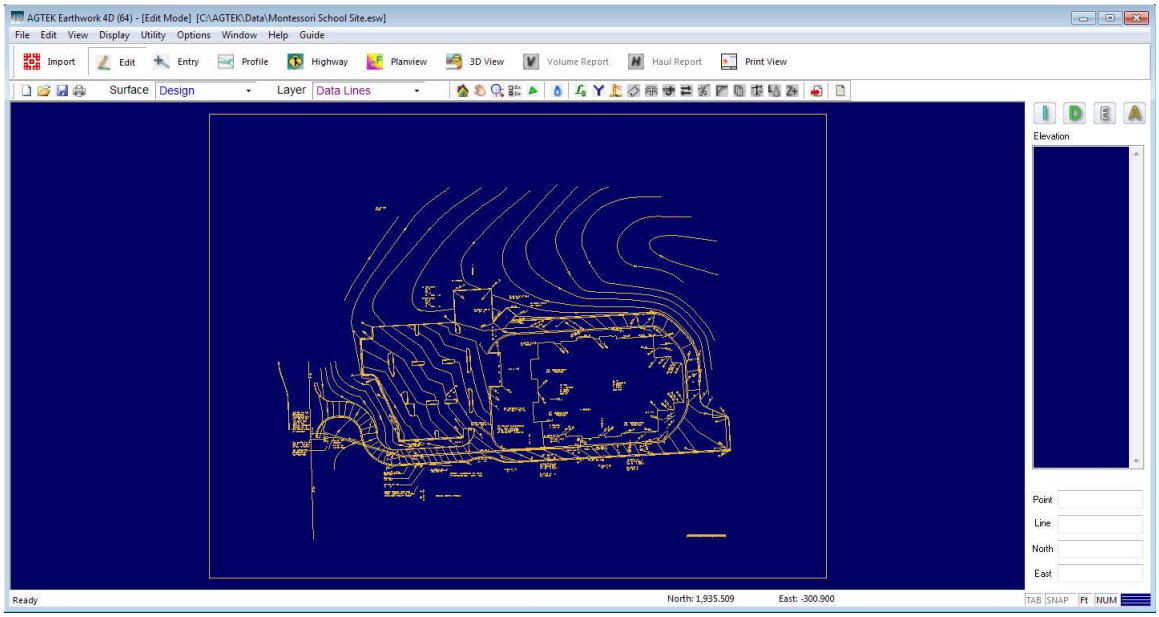


4. Right-click and select **Send to Existing**.

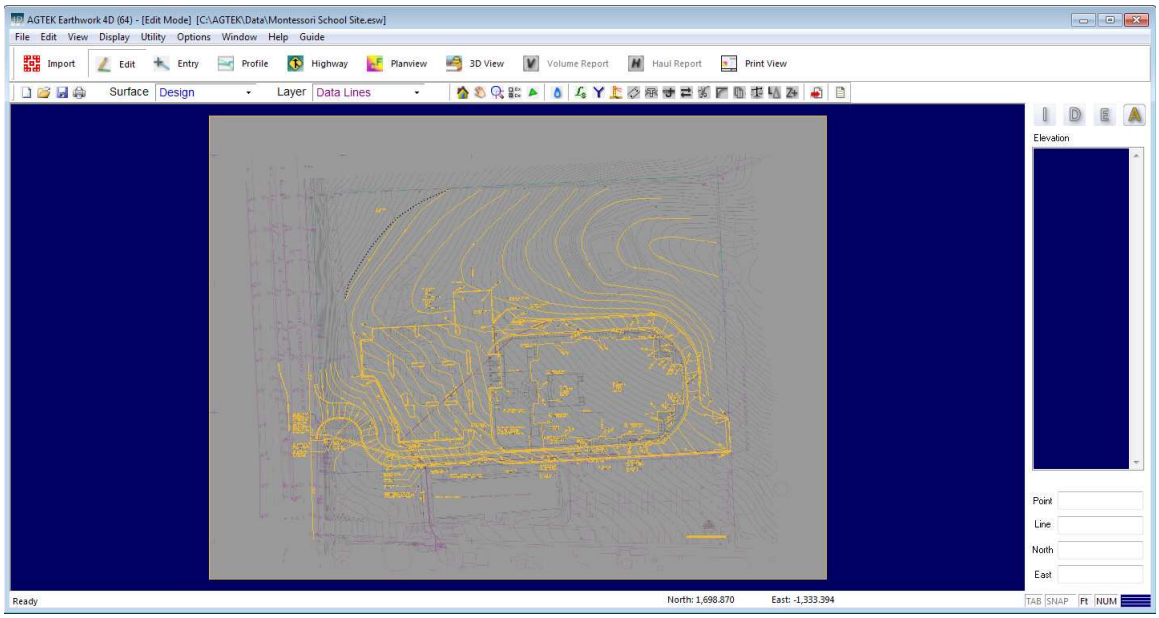
5. Select a design contour, the right-click and select **Send to Design.**

6. Continue sending data until all useful data has been transferred.

7. Switch to the **Edit** Mode and you can see the data that you have transferred.

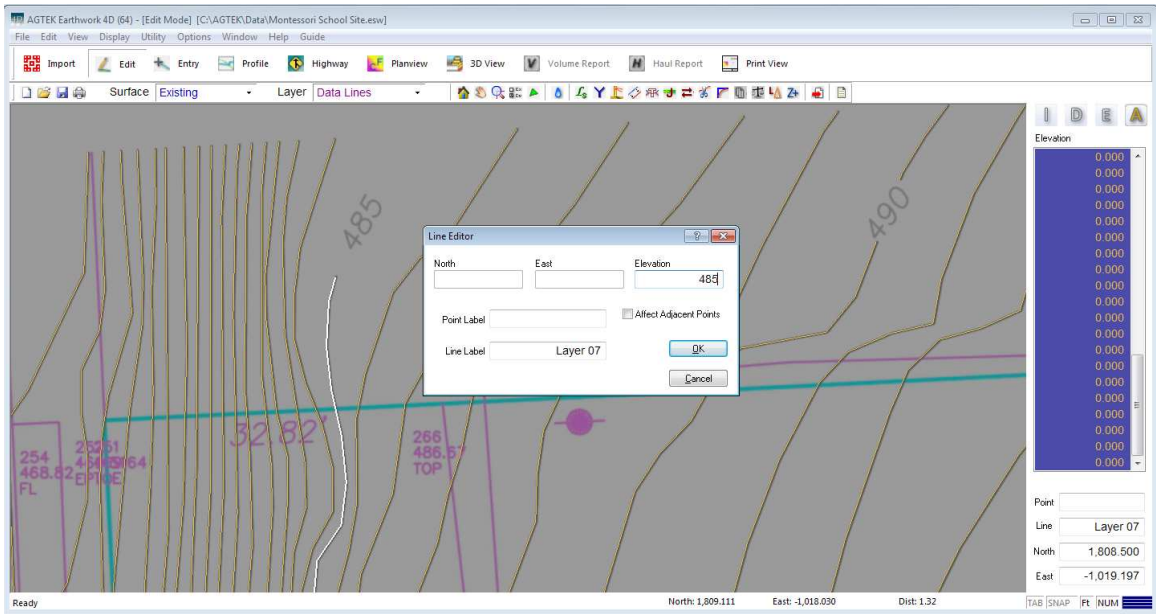


8. Press the “T” key on the keyboard to turn the PDF image on.



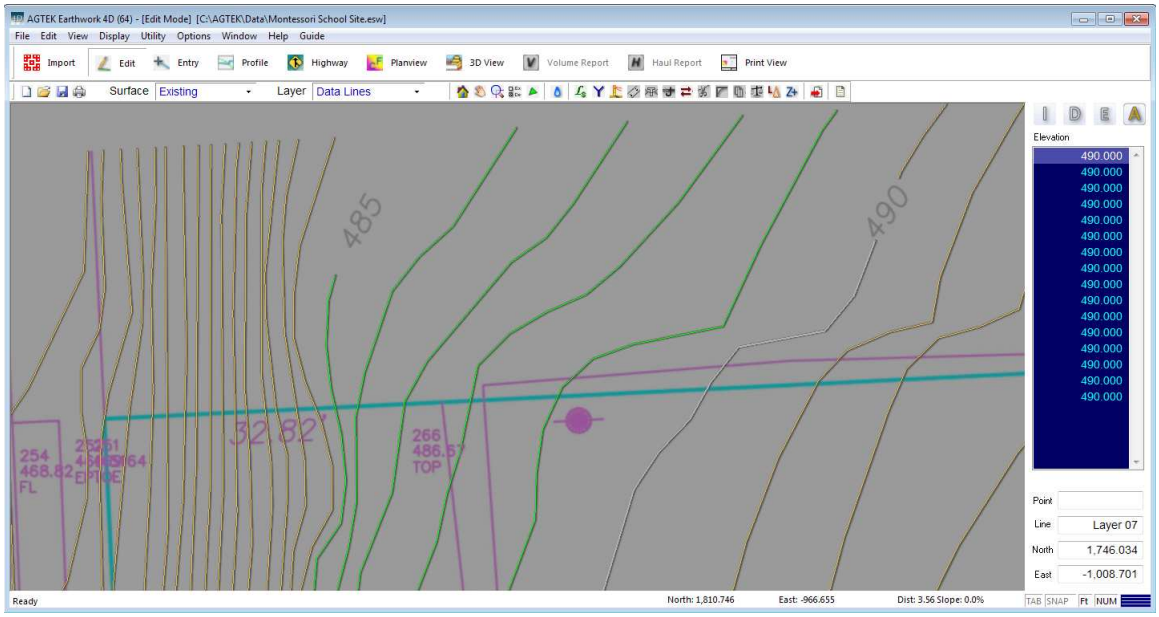
Assigning Elevations

1. Change the surface to Existing. Select an Annotation with a text elevation shown on the plan. Enter the elevation from the keyboard and the Line Editor will display. Click **OK**.

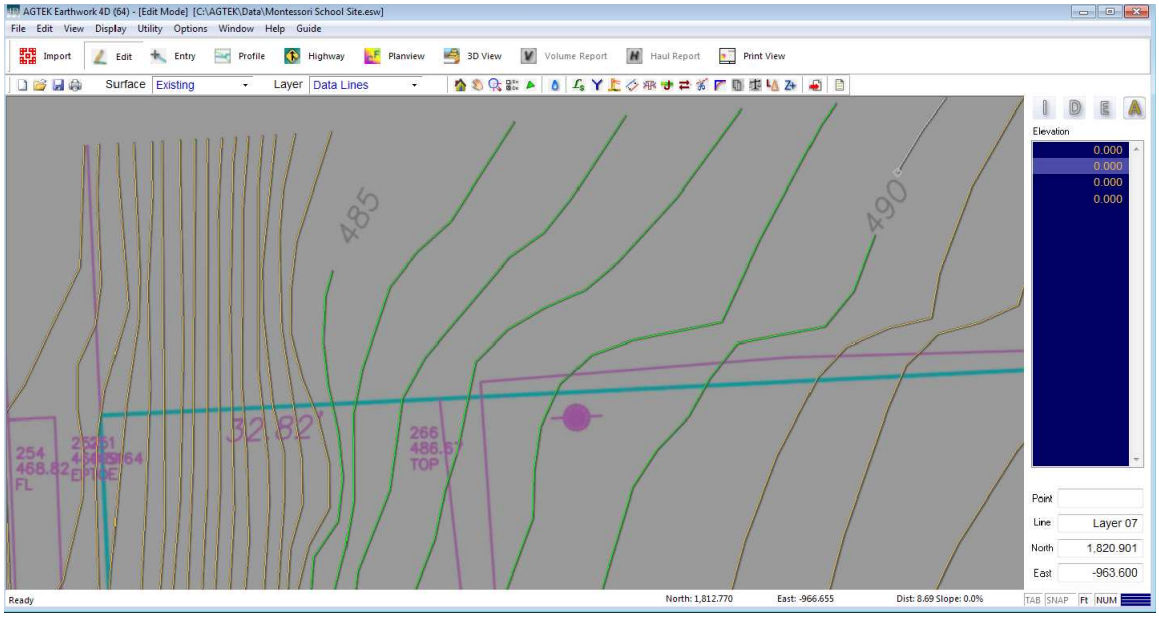


2. Enter an elevation from the keyboard for the next contour in sequence and click **OK**.

3. Press the **Escape** key to clear the point review list. Position the cursor over the first contour entered (Do not pick the line) and press the **F8** key on the keyboard. Move the cursor over the next contour in sequence and press the **F8** key again. This will start the Sequence Snap. Move the cursor to the next contour and press the **F8** key. Continue this process until you reach the top or bottom of the slope.



4. To assign elevations to an Annotation that has an data line with the correct elevation assigned, you may select the Annotation line and position the arrow over the elevated data line and press the **F9** key to assign the elevation to the Annotation. Continue assigning elevations using the desired method.



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