Section 6

Digitizer Support

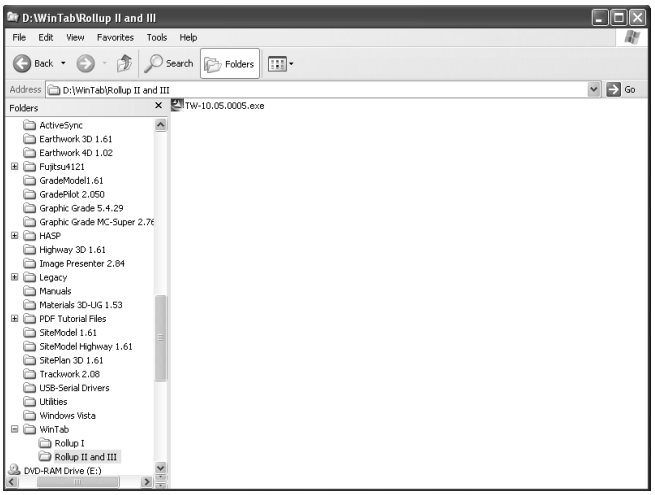
Digitizer Support Setup

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.

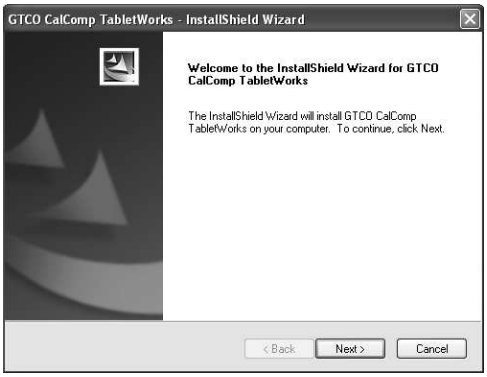
Lesson 1 - TabletWorks Driver Installation

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.

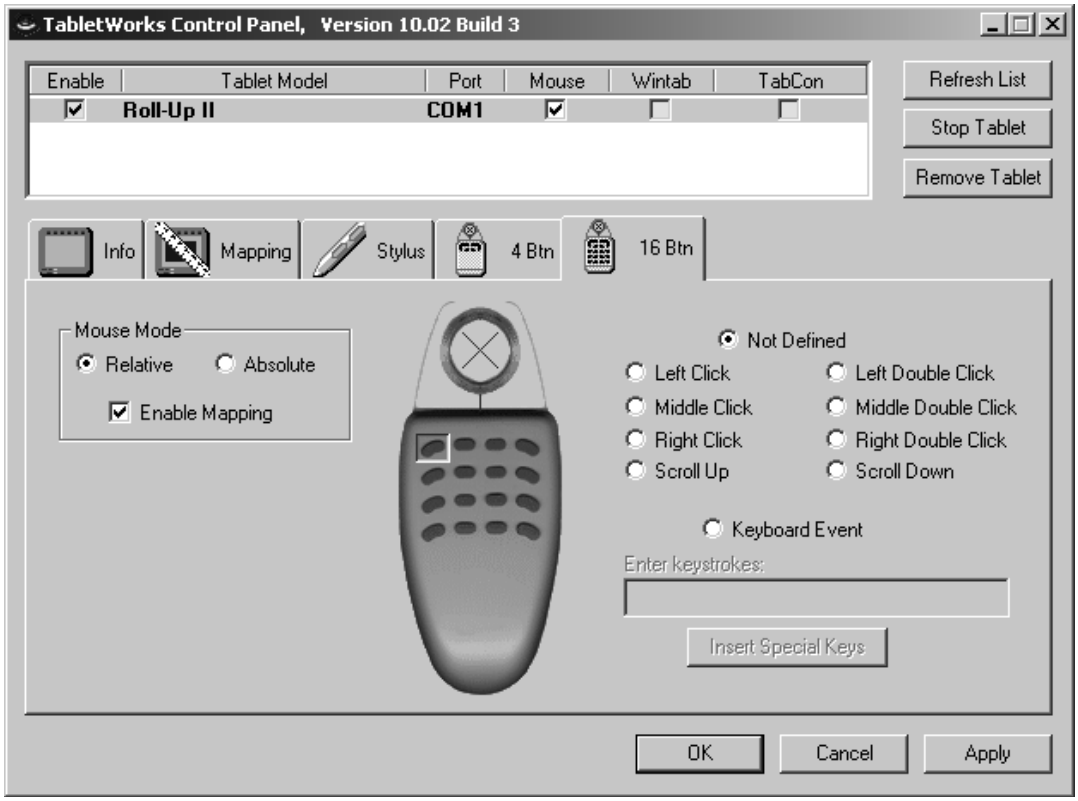


5. Click **yes** to accept the license agreement.
6. Select **Complete,** and click **Next**.
7. Click **Next** in the Welcome to Found New Hardware Wizard dialog box.
8. Click **Finish** to continue.

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

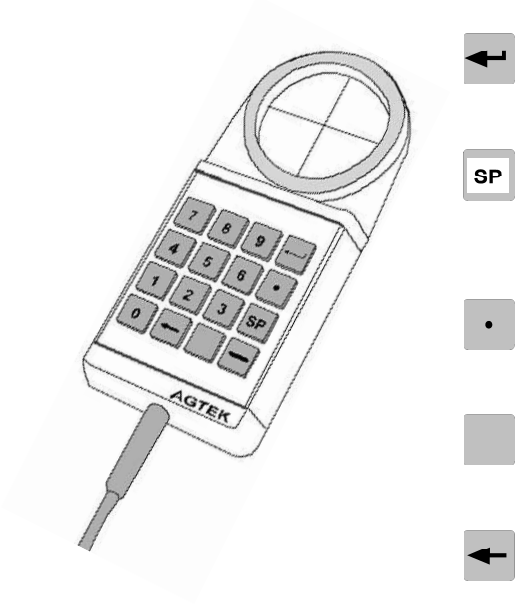
5. Click **OK** to apply the changes.

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.

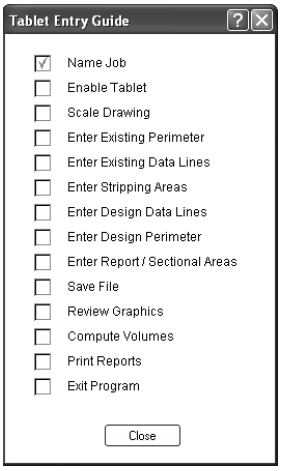
The **Backspace** key is used to delete the last point entered while digitizing.

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

0 to 9

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.

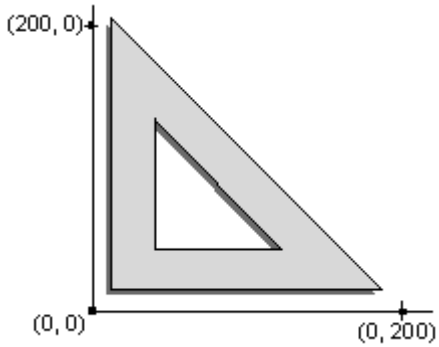


Scaling

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

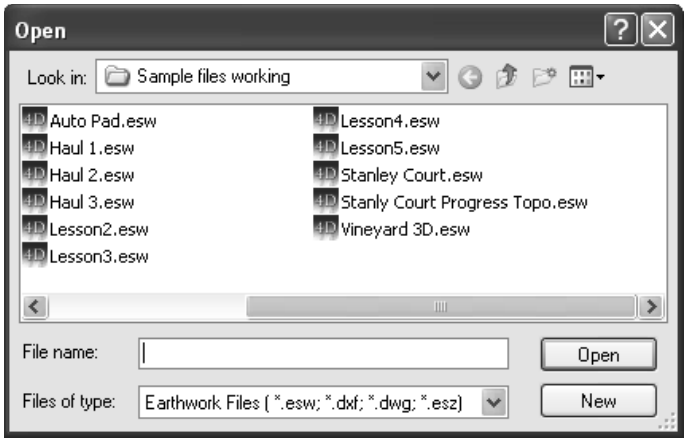
Lesson 1 – Enter Existing Data Lines

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.

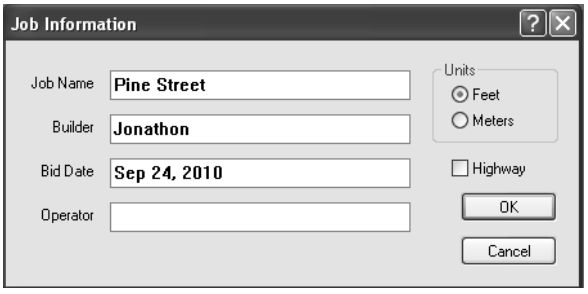
Start a New Job (Job Setup)

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.



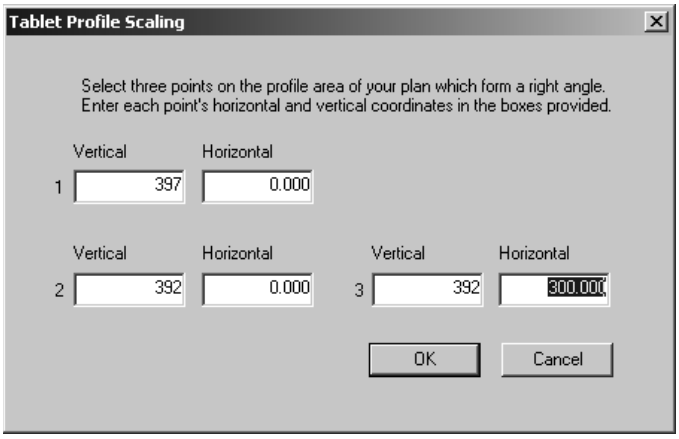
3. Enter a Job Name, Builder, Bid Date, and Operator. Select the units of measure (feet for this job) and click **OK**. Sitework 4D opens in Entry Mode with a blank screen ready for data entry.



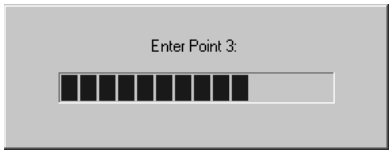
Enter the Plan Scale

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.

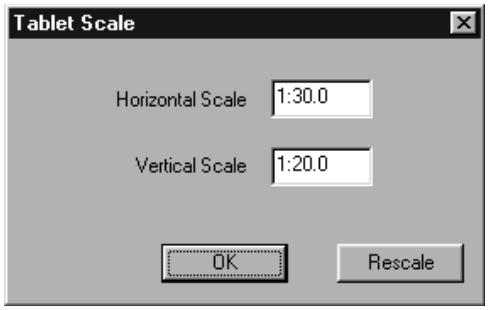
1. Select **Guide > Tablet,** then click **Enable Tablet** in the Tablet Entry Guide dialog box. The Tablet Scaling dialog box is displayed.



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.

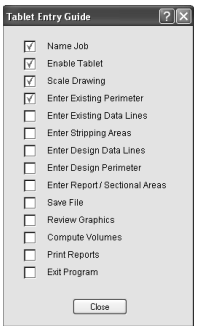


4. The scale for this job should be about a 1:20. Click OK to accept, or Rescale to re-enter the scaling coordinates again. After you have accepted the scale, the program switches to Entry Mode, and defaults to the Existing Surface and Perimeter Layer.

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.

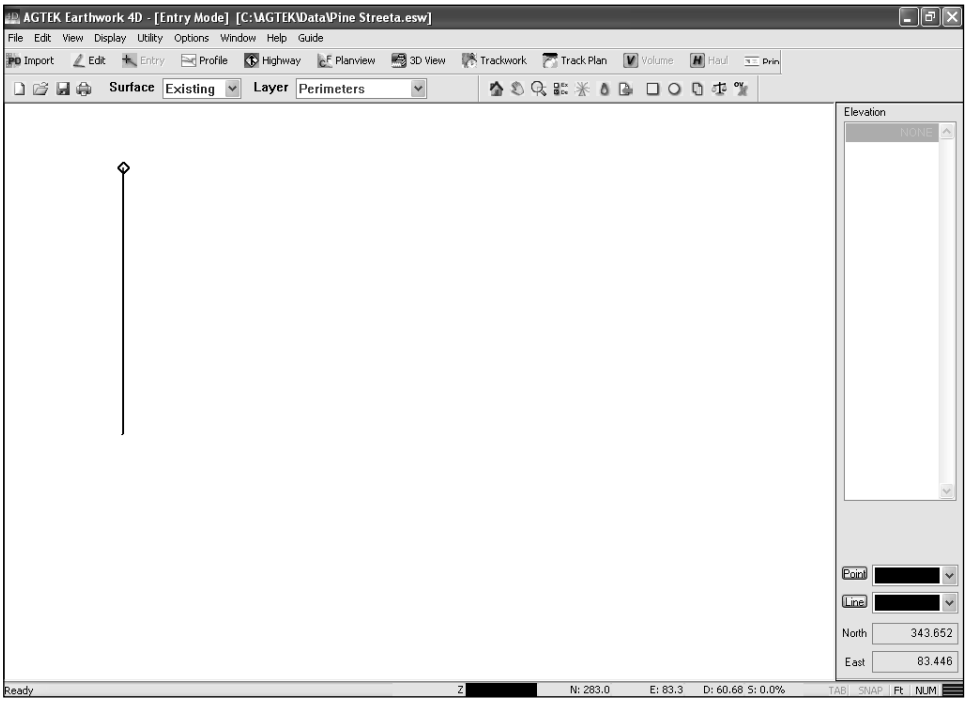
A site boundary is supplied on the Pine Street plan sheet (the dashed box with one side running down the center of Gregory Lane).



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.

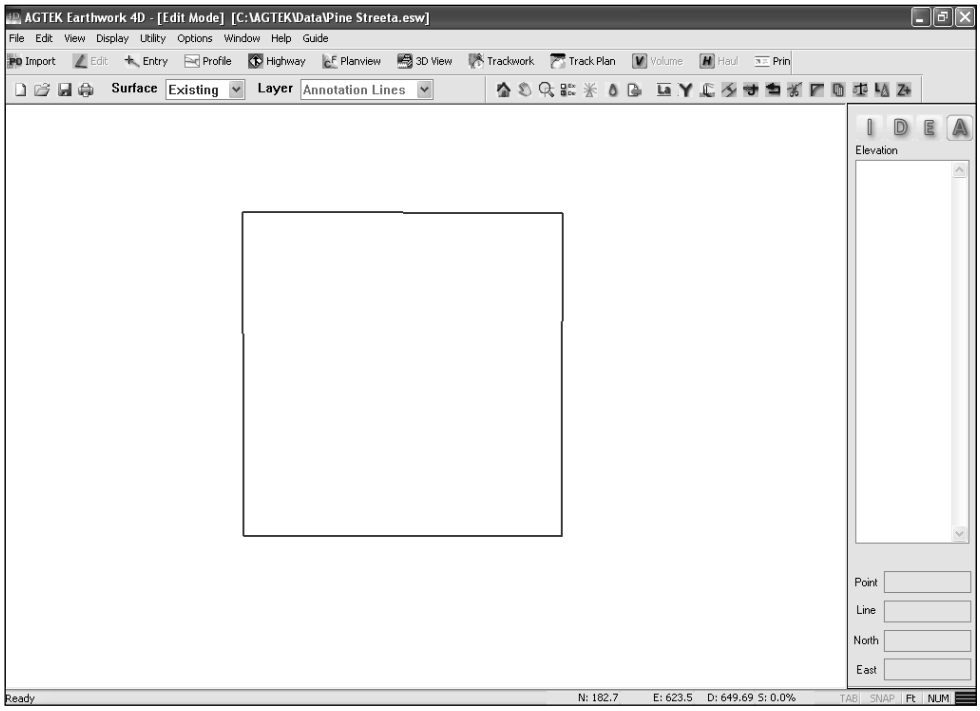
The Existing Perimeter is used to define the limits of 3D calculations and speed 3D rendering. Make sure necessary data is included in the Existing Perimeter.



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.

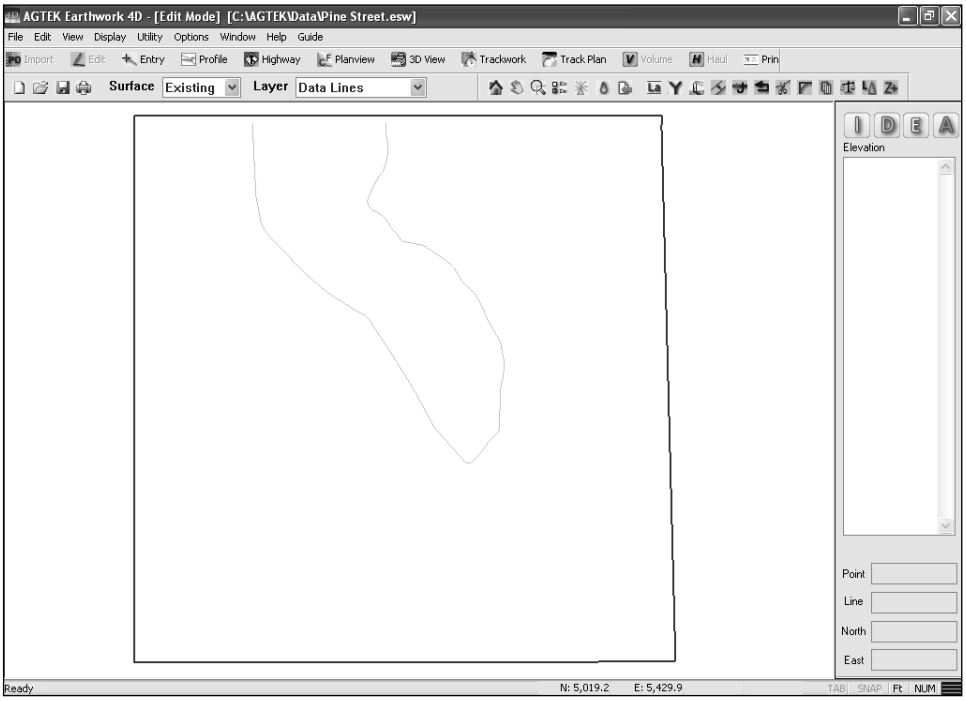
2. Type in "253" on the 16-button cursor then move the cursor crosshairs over the beginning of the contour, and press the **Enter** button. The status bar at the bottom of the screen displays the entered elevation and coordinates. The program creates the first point and connects the cursor to the point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

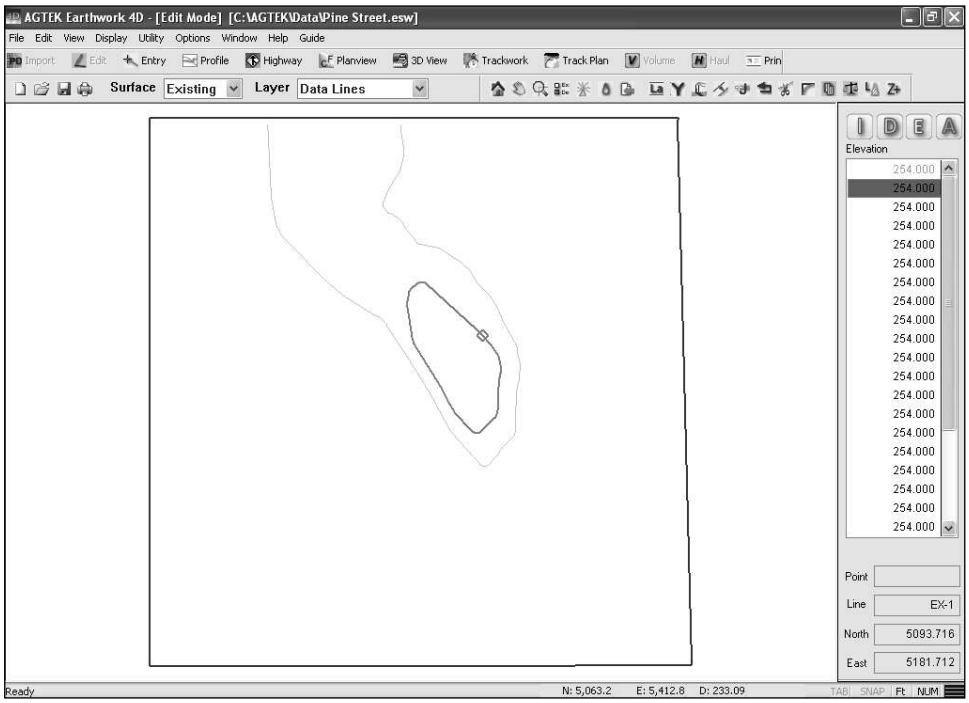


Enter Closed Contours

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

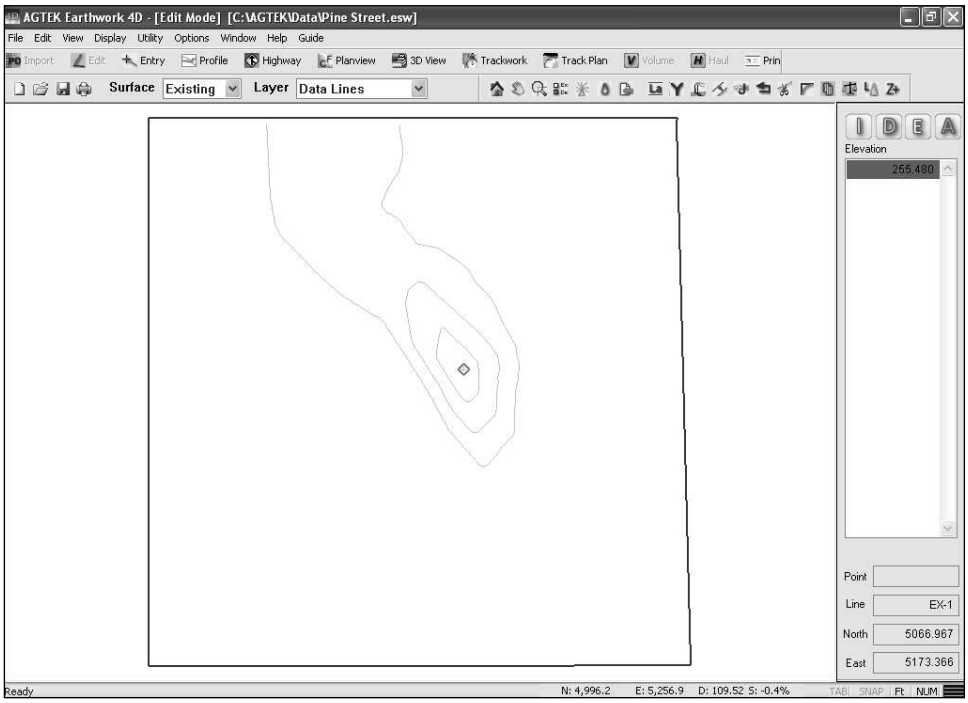
The auto increment function assists in entering elevations. As sequential elevations are entered, Sitework 4D anticipates the next elevation and fills it in automatically. As often as possible you should enter the contours sequentially by elevation to take advantage of this feature.

- 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.



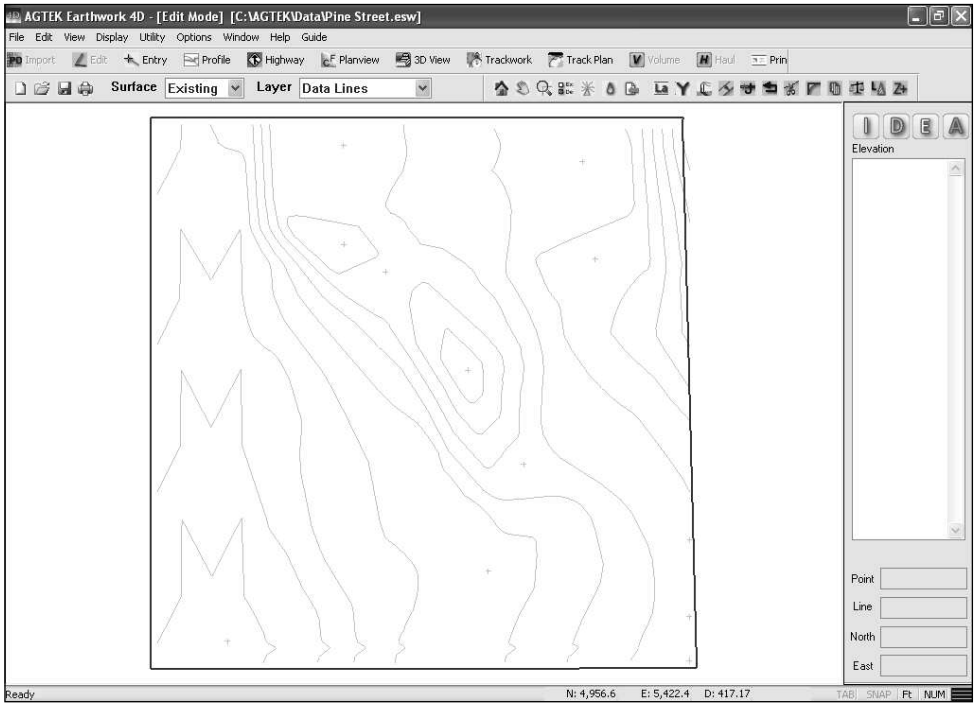
Enter Remaining Elevations

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.

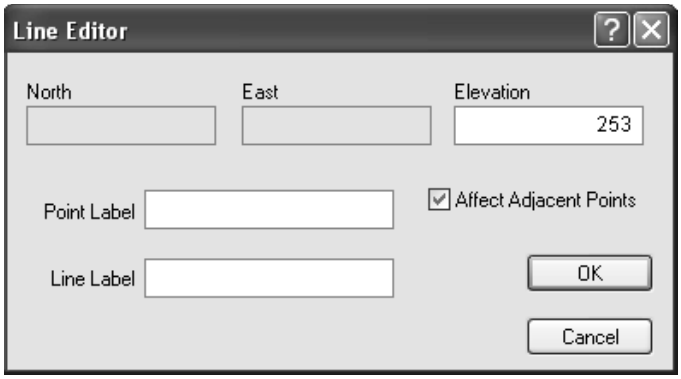
Undo

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.

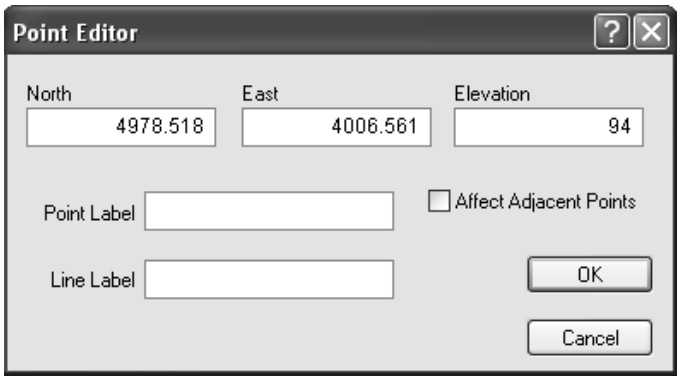
Editing a Point

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.

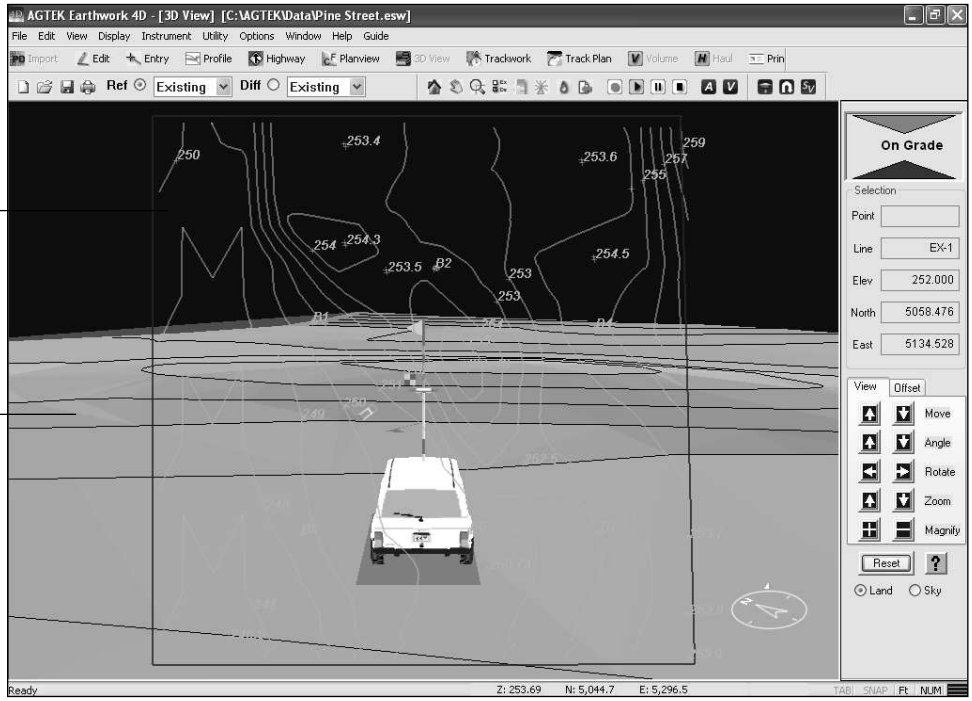


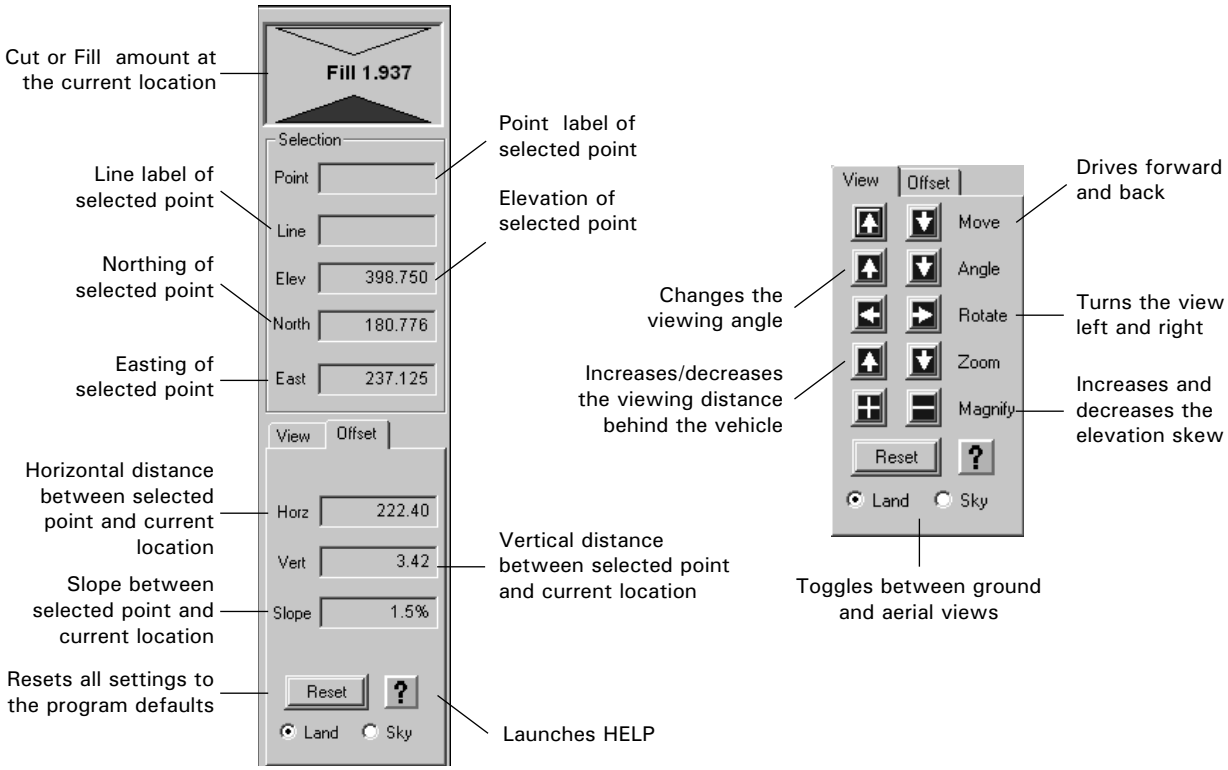
North	The northing coordinate for the point.
East	The Easting coordinate for the point.
Elevation	Changes the selected point's elevation.
Point Label	Assigns the point label to the selected point.
Line	Assigns a label to the line the point is part of. This label is independent of any point labels already 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

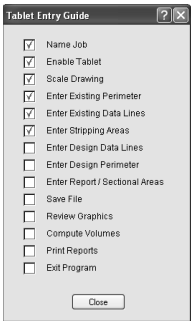
Use the Arrow keys or the 3D Controls on the right side of the window to move the vehicle around the site while looking for bad elevations. A bad elevation usually appears as a spike up or down on the 3D terrain. To fix a bad elevation:

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.

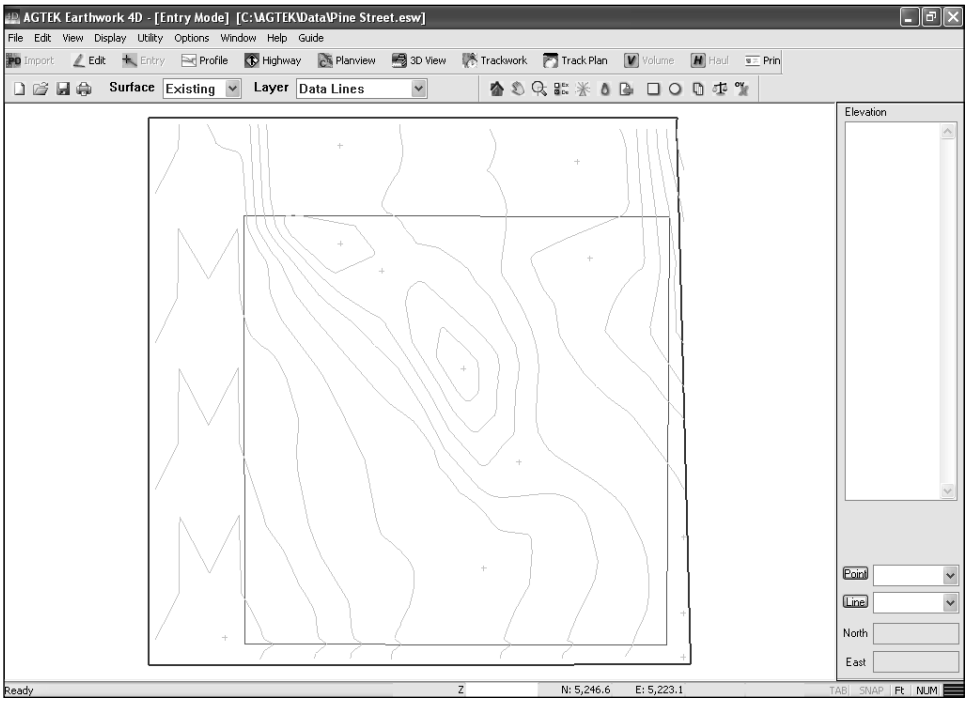


1. Switch to Entry mode and select Existing from the Surface pulldown and Stripping Areas from the Layer pulldown, or Select **Guide > Tablet** and choose **Enter Stripping Areas**, and the Stripping Areas dialog box displays.

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

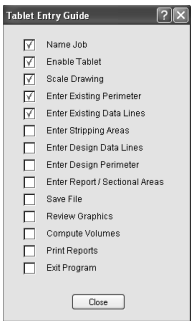
Editing the stripping area is just like editing any line or point on a line. To edit the entire area, use the Line Editor. To edit points on the stripping area, including moving the point to modify the shape of the area, use the Point Editor. See “Edit Existing Ground” on page 7-14 and “Editing a Point”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

Lesson 2 – Enter The Proposed Design

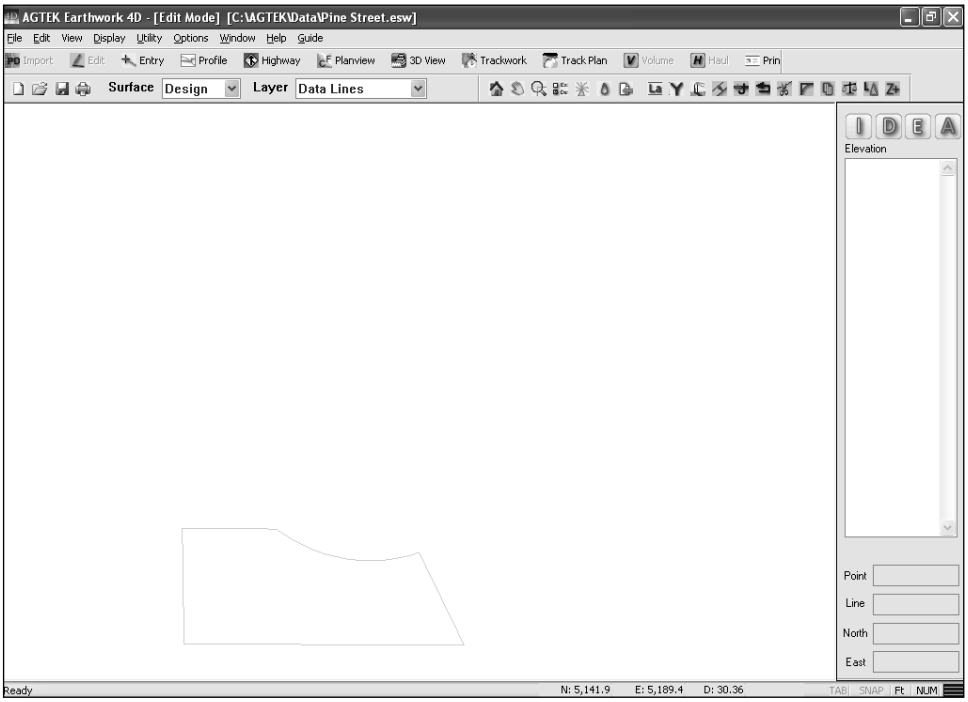
The next step is to enter the proposed design lines. All proposed design lines are entered in the Design surface. Like the previous sections, this section demonstrates how to enter lots, streets, retaining walls, and curbs, but does not cover entering all data from the plan sheet.

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.

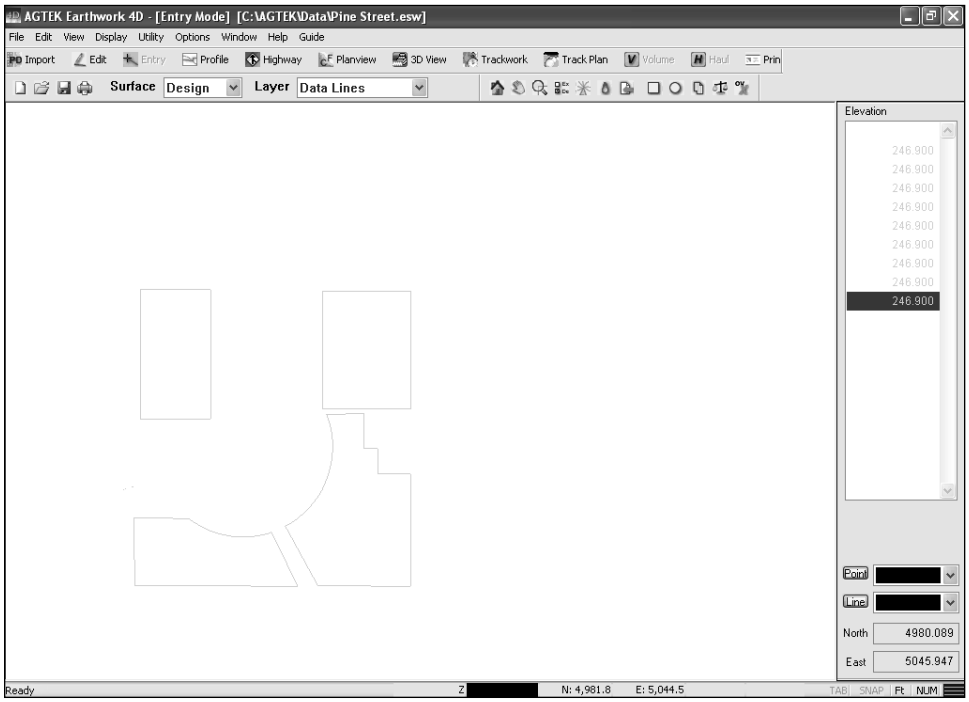


6. Enter the remaining lots to practice the technique.

Enter the Street

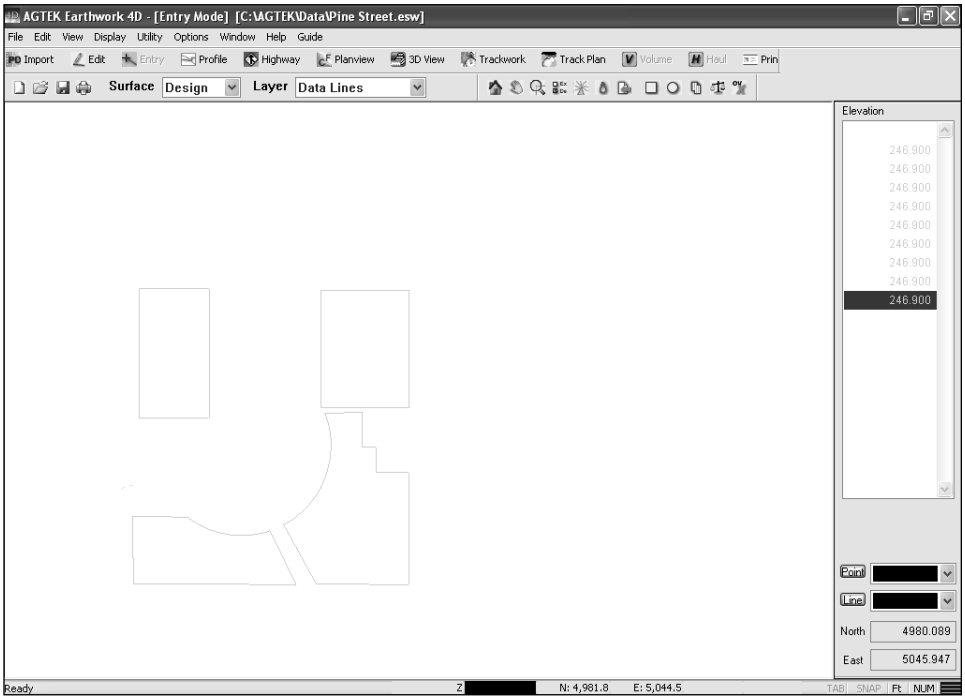
The street will be built to subgrade, and the street, curb/gutter, and sidewalk will be built using offset lines. To do that, we must digitize a reference line with elevations to use for offset line creation. The reference line we will use is the top of curb line.

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.

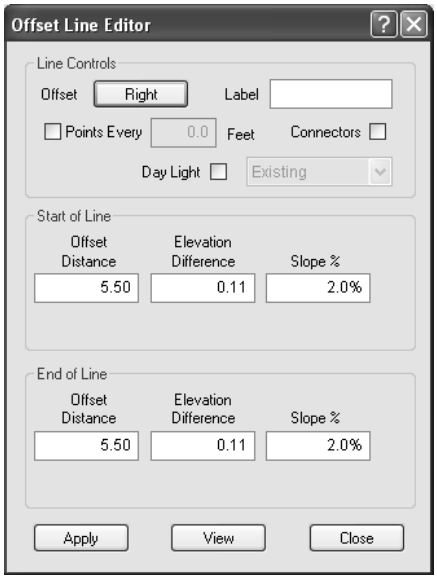


Create the Sidewalk using Offset Lines

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.

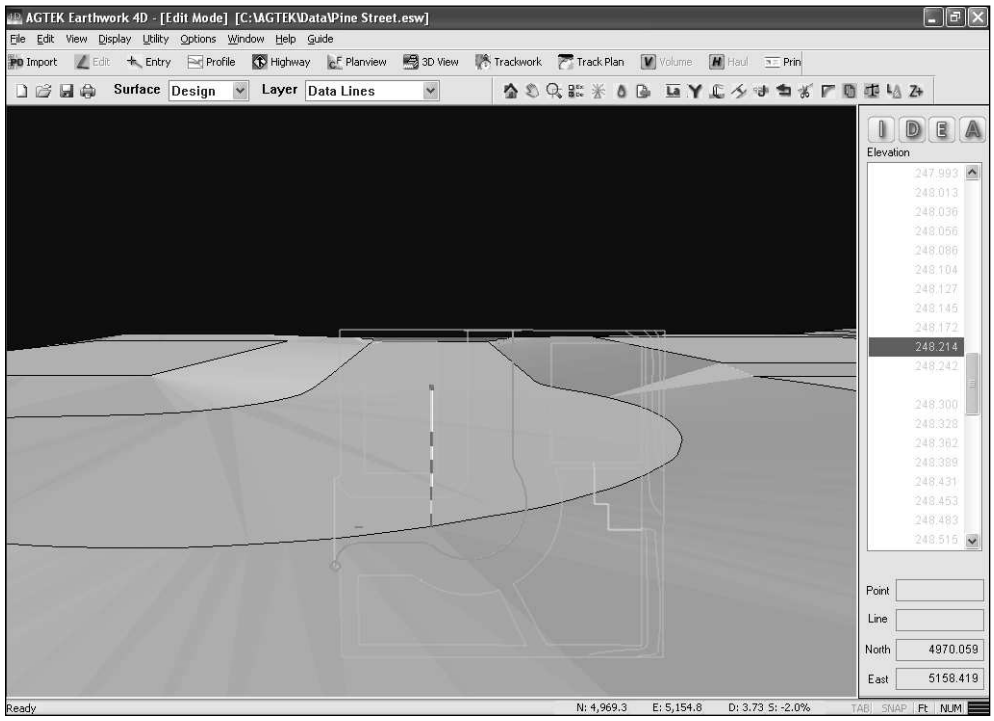
Other Offset Features

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.

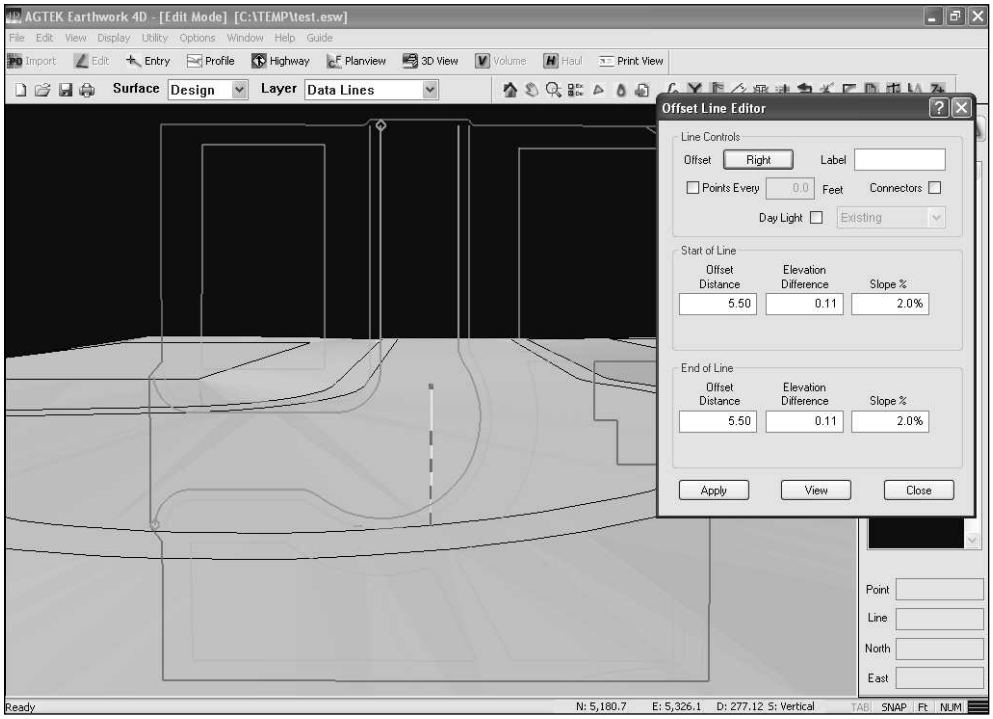
1. Switch to Edit mode, and click on the top of curb reference line nearest Lot 4.

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.

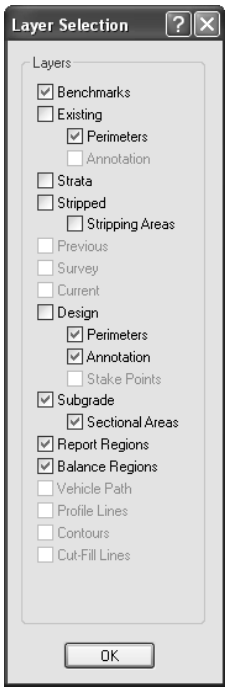


7. Click the **Close** button to close the Offset Line Editor.

Adding the Design Contours and a Retaining Wall

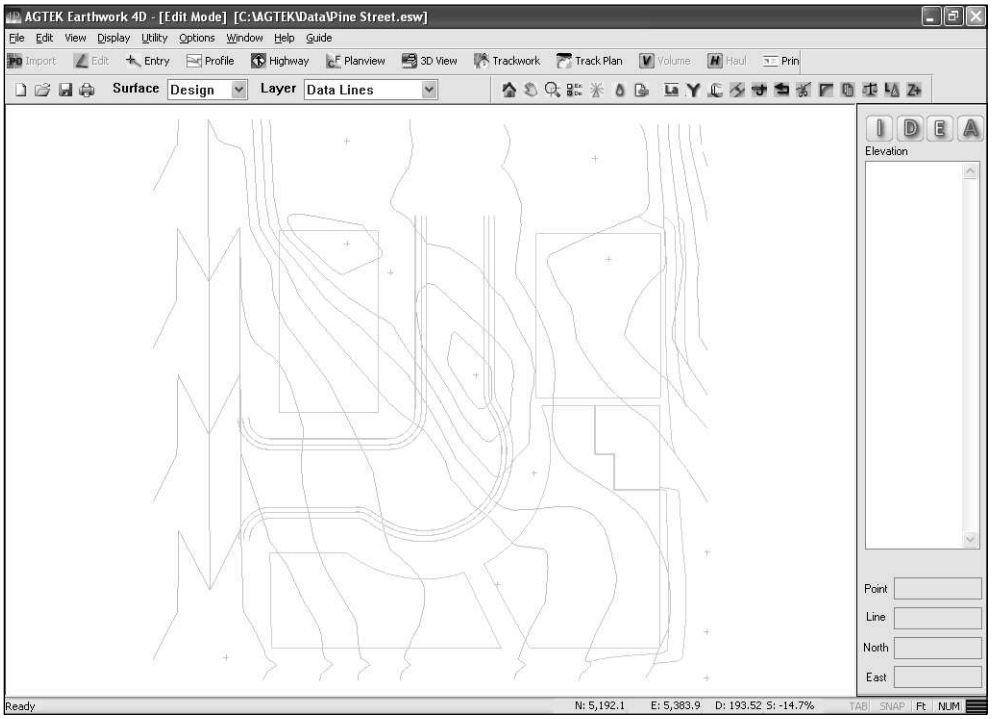
The only proposed ground left to enter is the retaining wall and the design contours at the back of lots 2 and 3. Most of the contours tie into the existing ground so it is helpful to see the existing ground during design entry.

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.

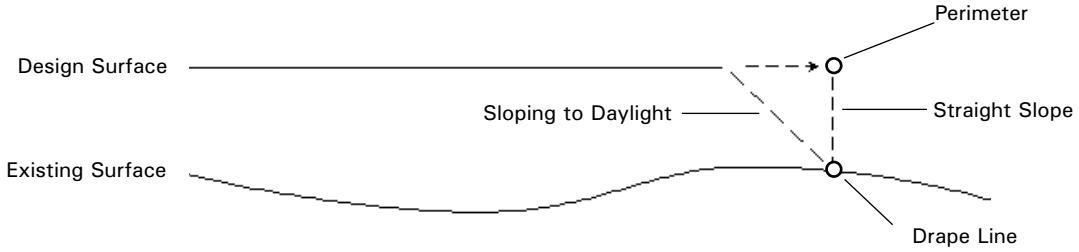
Enter the Design Perimeter

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

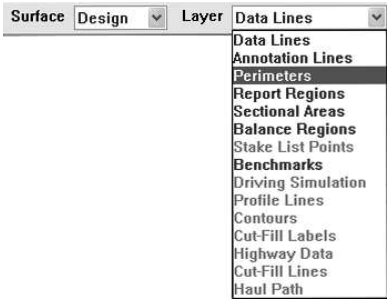
For most situations the Design Perimeter should be entered with a Drape Line. A Drape Line ties the edges of the job to daylight at the perimeter of the job. For example, you may not want a drape line if you are doing a takeoff from multiple sheets with perimeters around each sheet to calculate volumes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

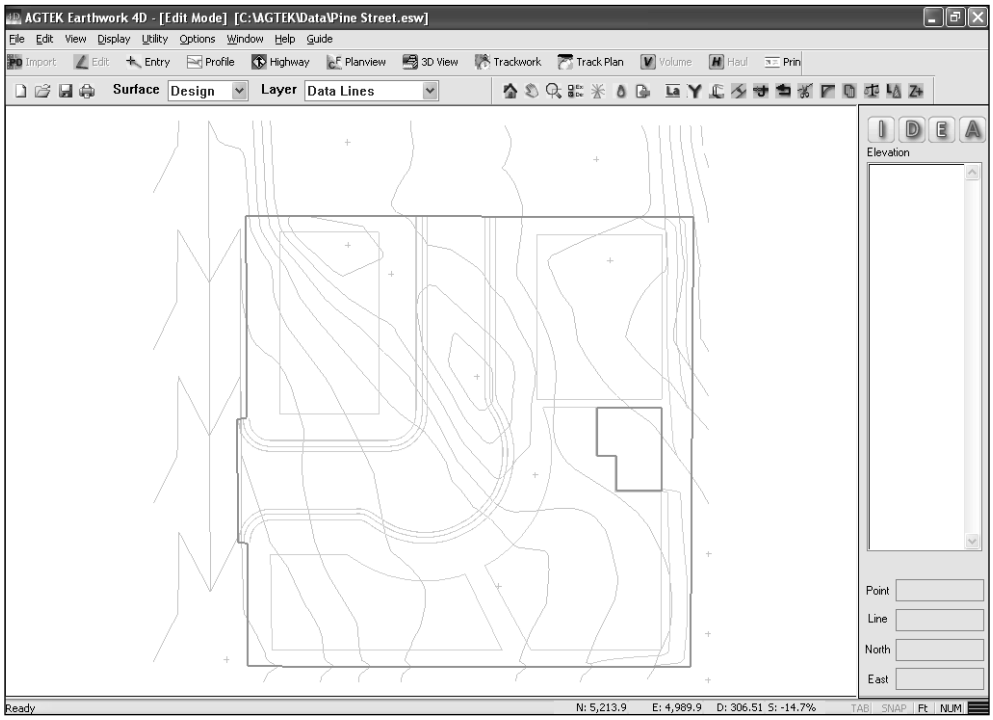
A hole in the Design Perimeter is entered as a perimeter within the Design Perimeter and is excluded from volume calculation. A hole in the design perimeter also places holes in the stripping areas, report regions and sectional areas. The opposite is true for a perimeter entered outside the Design Perimeter. 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.



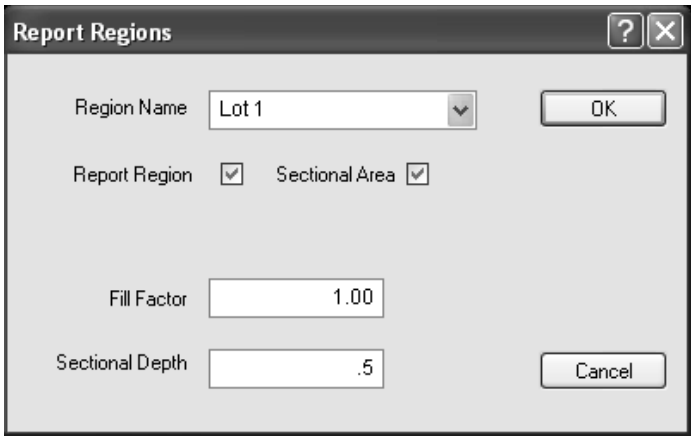
Create Report Regions/Deduct Sectional Areas

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.

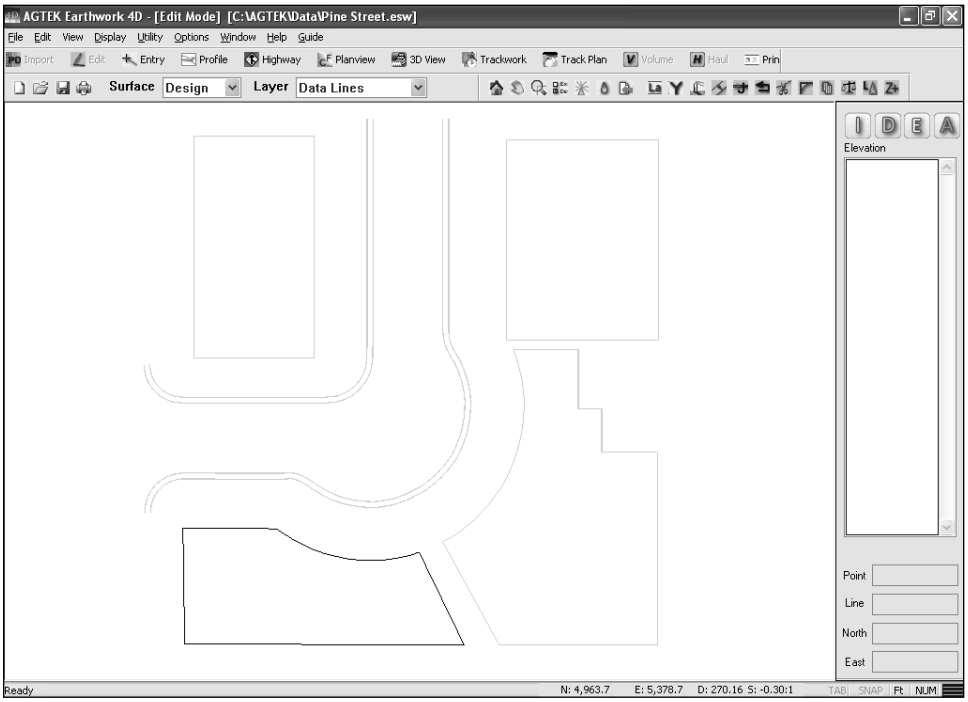
3. Type “Lot 1” in the Region Name. Check the Report Region box and uncheck the Sectional Area box. Type “.5” as the Sectional Depth. Click **OK**.



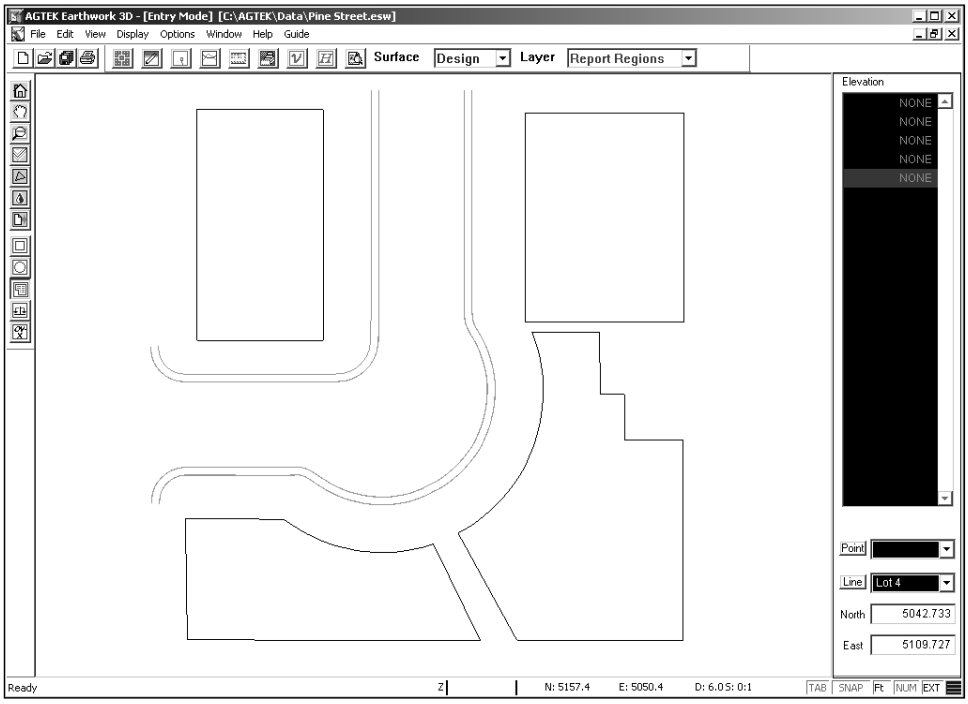
Sitework 4D auto-increments Report Region names when the name is followed by a space and a number, i.e., “Lot 1”.

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.



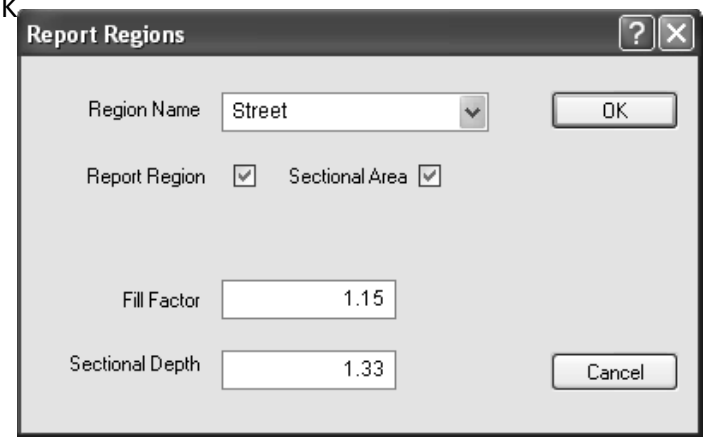
6. Press the **Blank** button again to end Report Region entry.



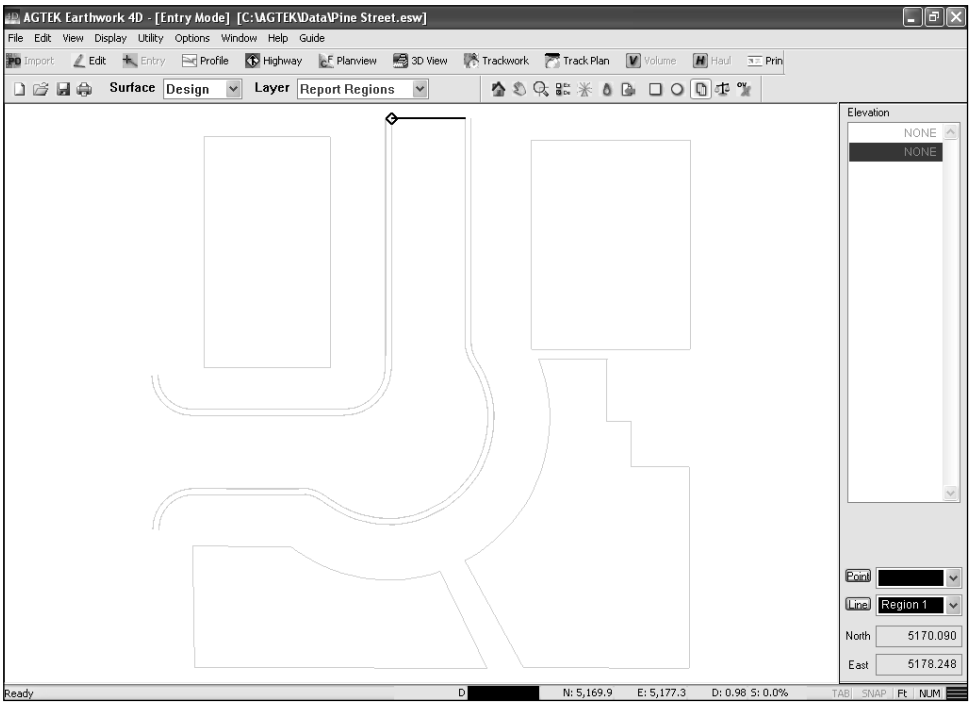
Entering the Street Sectional Area

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

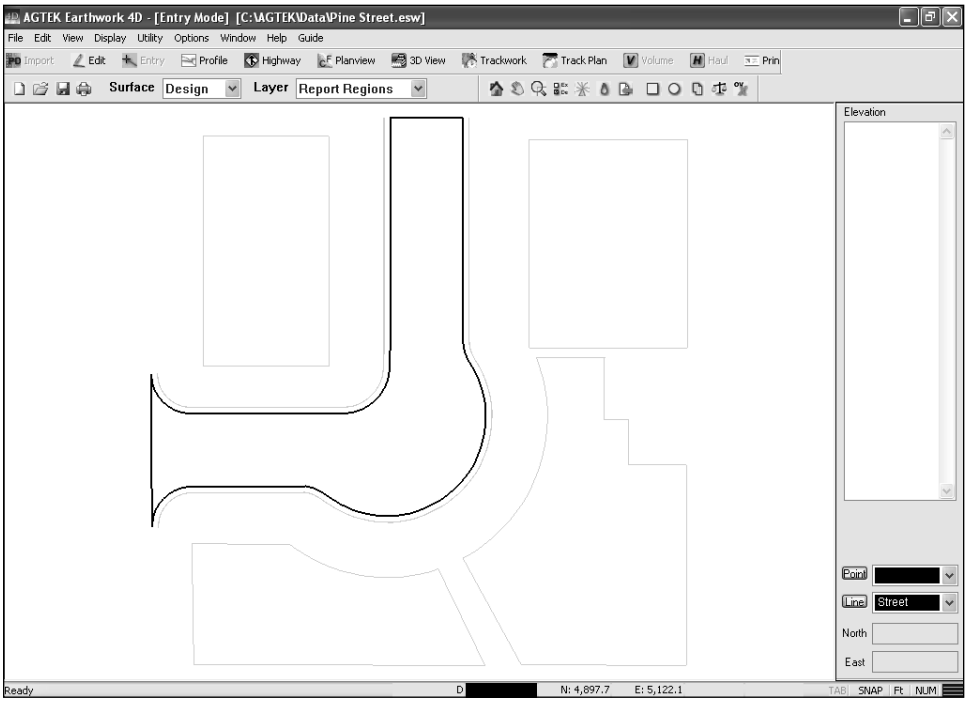
1. Switch to Entry Mode.
2. Click the **Add Report Regions** button, or press the **G** key, and select **Enter Report Regions/Sectional Areas** from the Tablet Entry Guide. The Report Regions dialog box is displayed.
3. Type “Street” in the Region Name. Check the Report Region box and the Sectional 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.

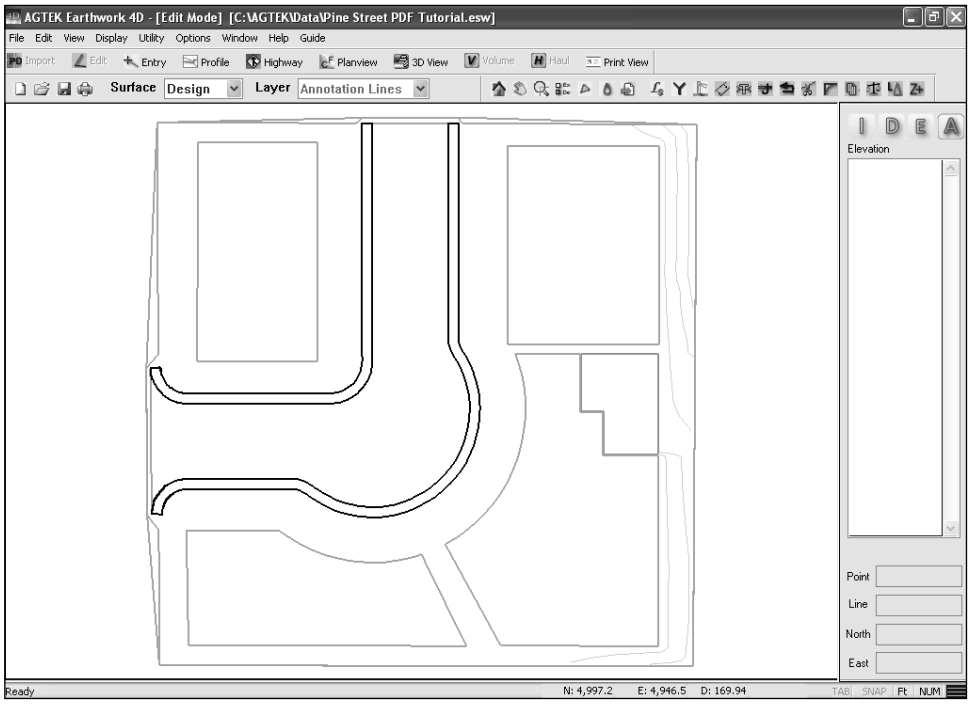


6. Press the **Blank** button to end the entry and close the Sectional.

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

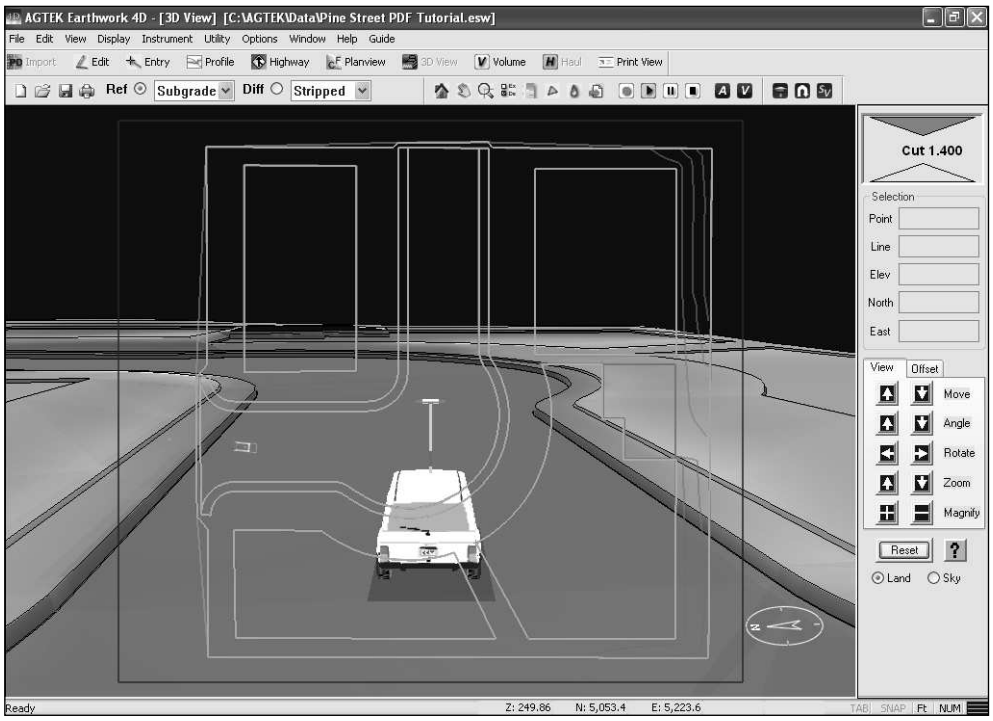
Sitework 4D can display the 3D terrain as it is entered in the Edit window. The 3D View Window adds greater flexibility to viewing and verifying the 3D surfaces.

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.

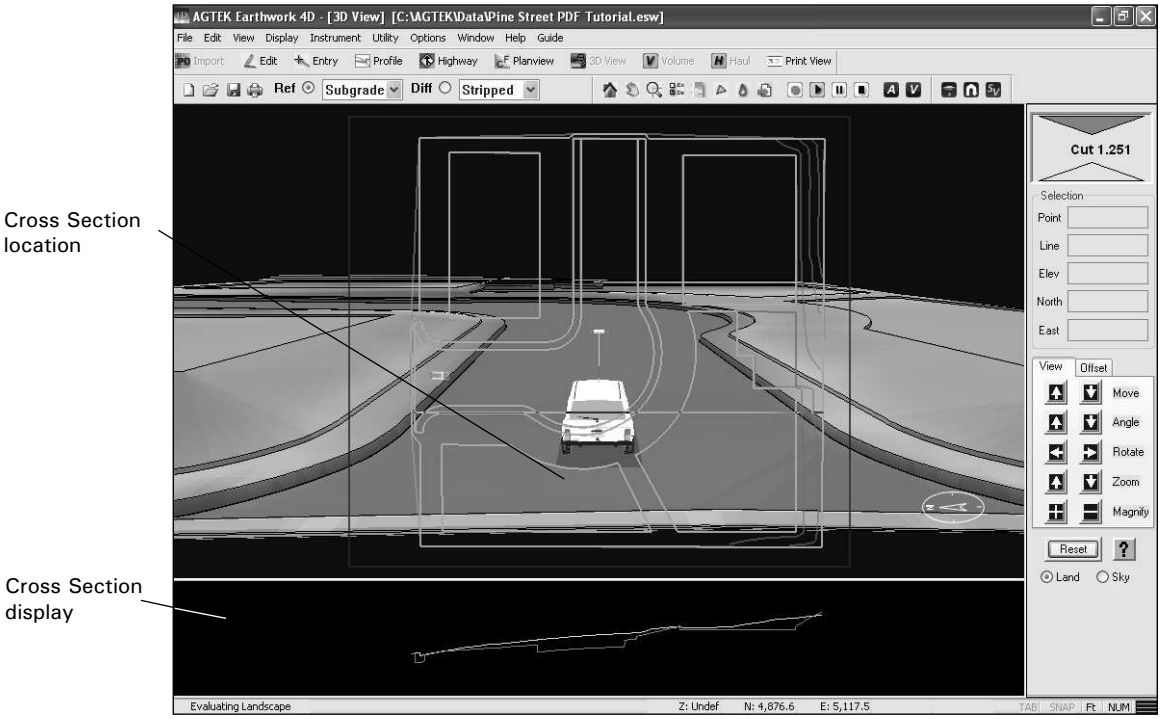
Calculate Volumes

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.

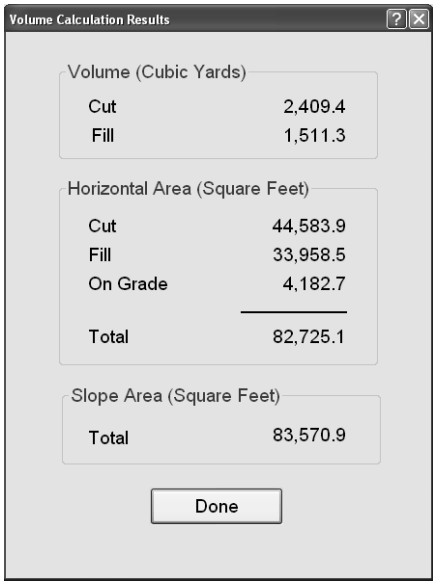
2. Specify the Surfaces. Before calculating the volumes verify that the correct surfaces are selected. For our example, set the Reference surface to Design and the Difference surface to Stripped.

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

		Area			Volume		Comp/Ratio		Compact		Export	Change
	Total	Cut	Fill	OnGrade	Cut	Fill	Cut	Fill	Cut	Fill	-Import	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

Vectorizing and Transferring Data

- Vectorize PDF
- Transfer Existing Lines
- Transfer Design Lines

Verifying the Scale

- Select known distance
- Length/Area to verify scale

Assigning Elevations

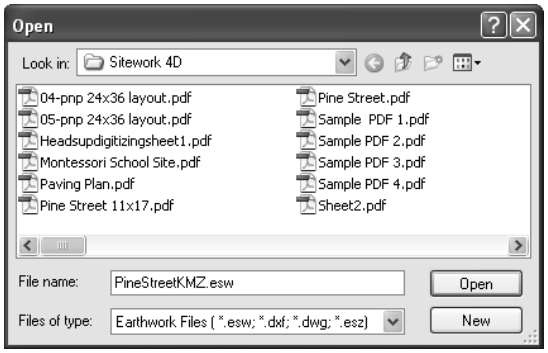
- Line Editor
- Increment Snap
- Elevation Snap

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.asp. It is recommended to watch the training videos before beginning the tutorial.

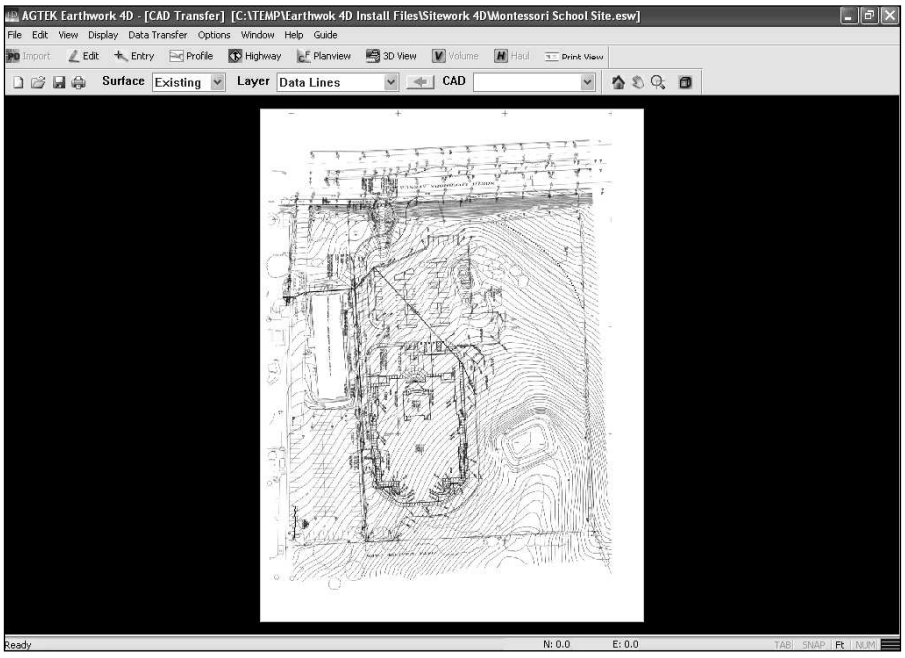
Start a New Job.

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

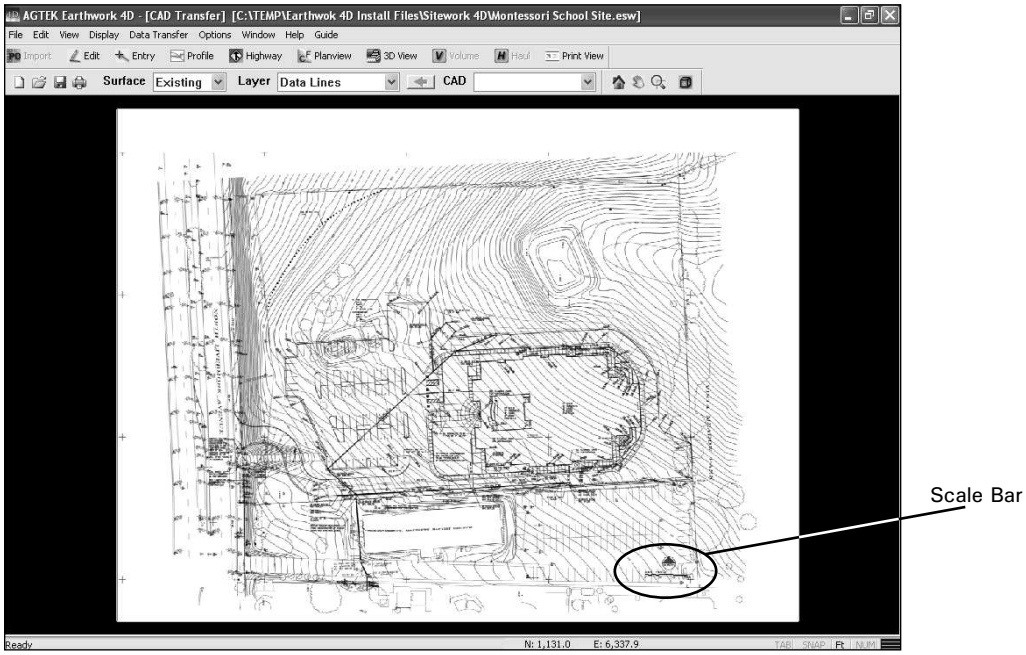


2. Select the “Montessori School Site.pdf” file and click **Open**.

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.

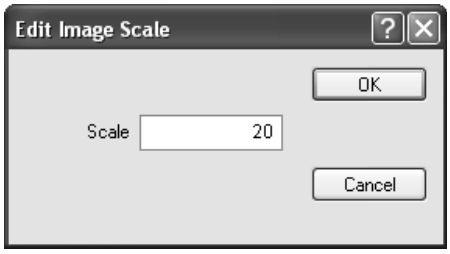


4. Rotate the image pressing the **L** key twice to rotate the image counter-clockwise into the proper alignment. The **R** key will rotate the image clock-wise. Your screen should appear similar to the illustration below.

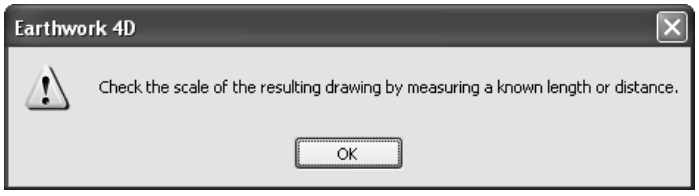


Scaling the PDF

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 **OK**.

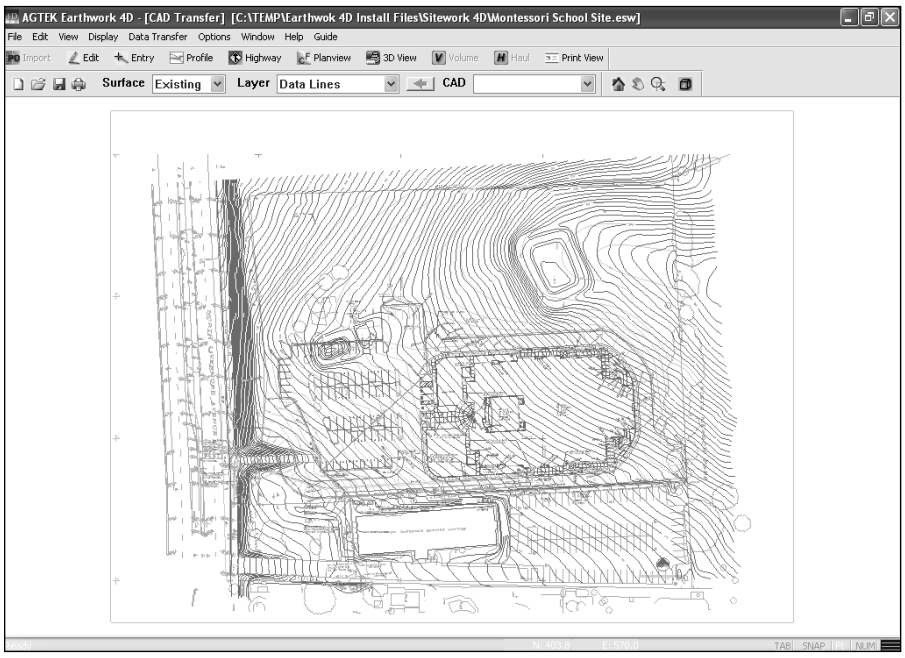
Lesson 2 - Vectorizing and Transferring Data

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...).

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.**

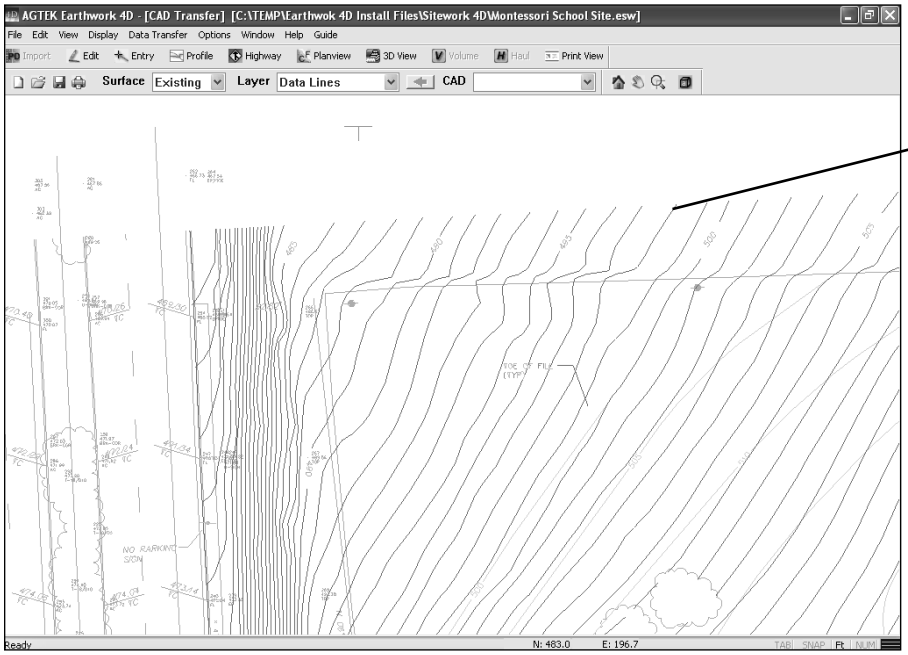
Some files vectorize better than others. You may want to transfer data that vectorizes well, and trace the data that doesn't manually.

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.



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

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

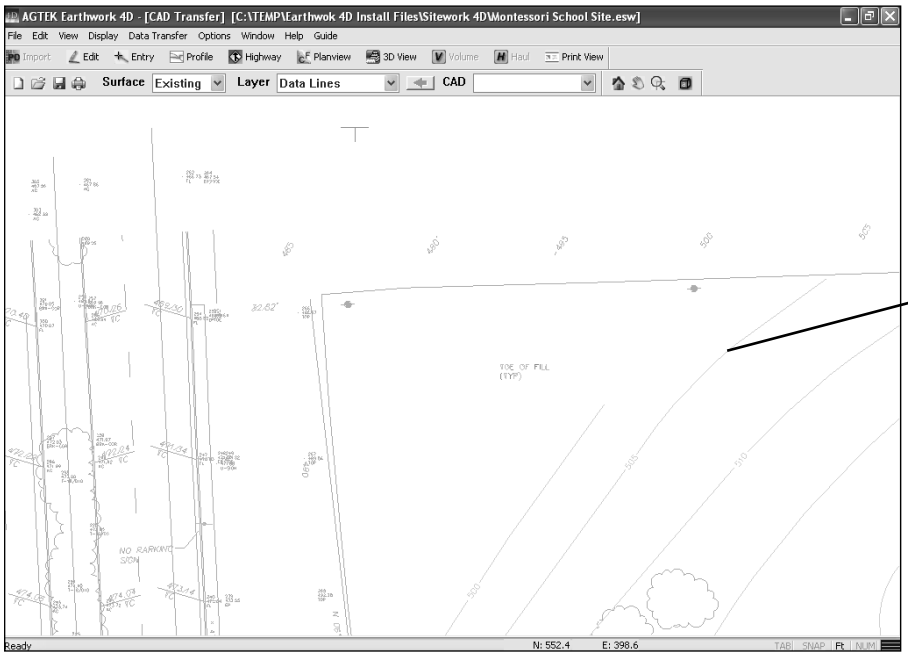


When existing contours are dashed, and can be separated into their own layer (same weight, color, etc...) Sitework 4D will automatically join them, eliminating the gaps.

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

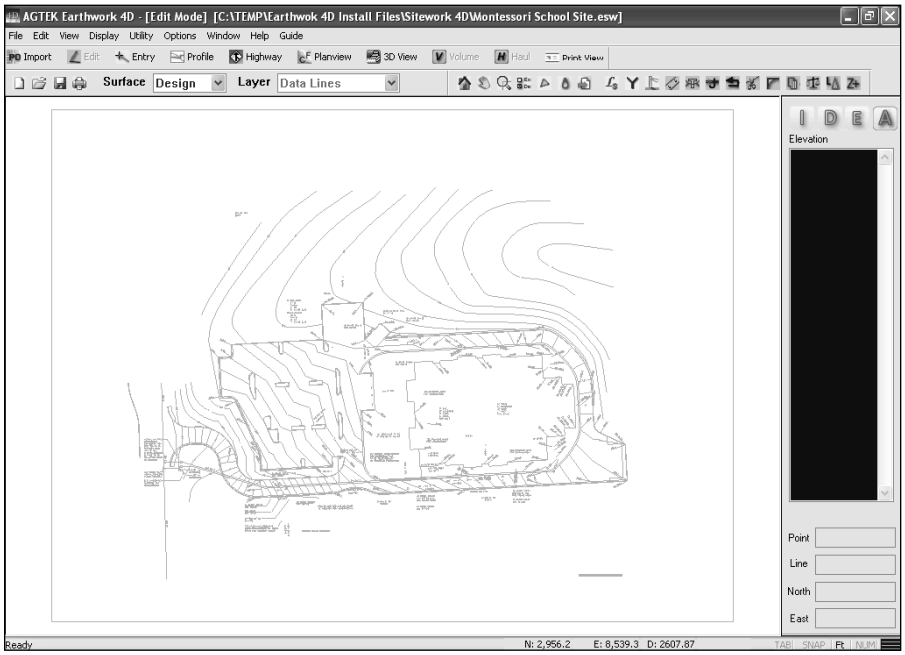
5. Select a Design line. Right-click and select **Send to Design**. Continue sending data to the Design layer until all useful information is transferred.

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

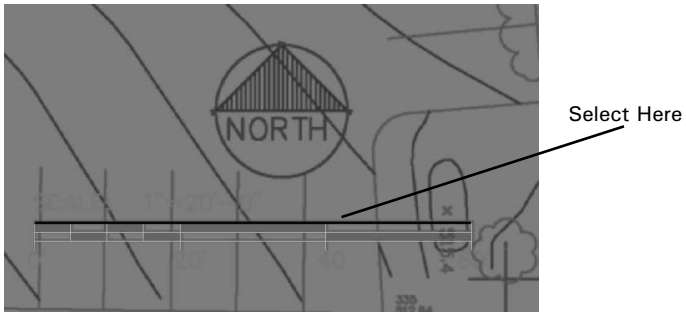


Lesson 3 - Verifying the Scale

1. Click the **Edit Mode** button to switch modes and press the **Home** key to zoom out and center the job. Your screen should appear similar to the illustration below.

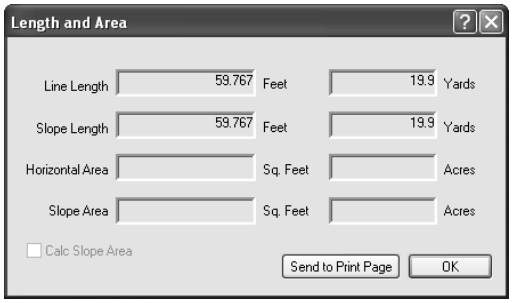


2. Press the **T** key to turn the PDF back on.
3. Zoom in to the lower-right portion of the job and locate the scale bar.
4. Select a line that runs the length of the scale bar.



5. Click the **Length/Area** button on the toolbar and the Length and Area dialog box displays. The Line Length should be approximately 60 feet, confirming that the scale is correct. Keep in mind PDF files are not as accurate as CAD files.

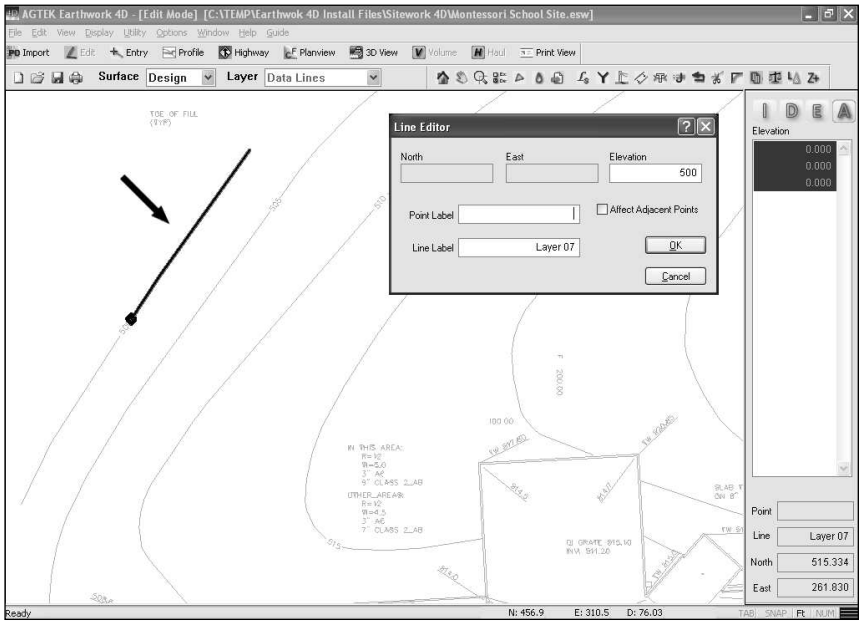
If the scale is incorrect, see page A-70 for directions on rescaling a PDF file.



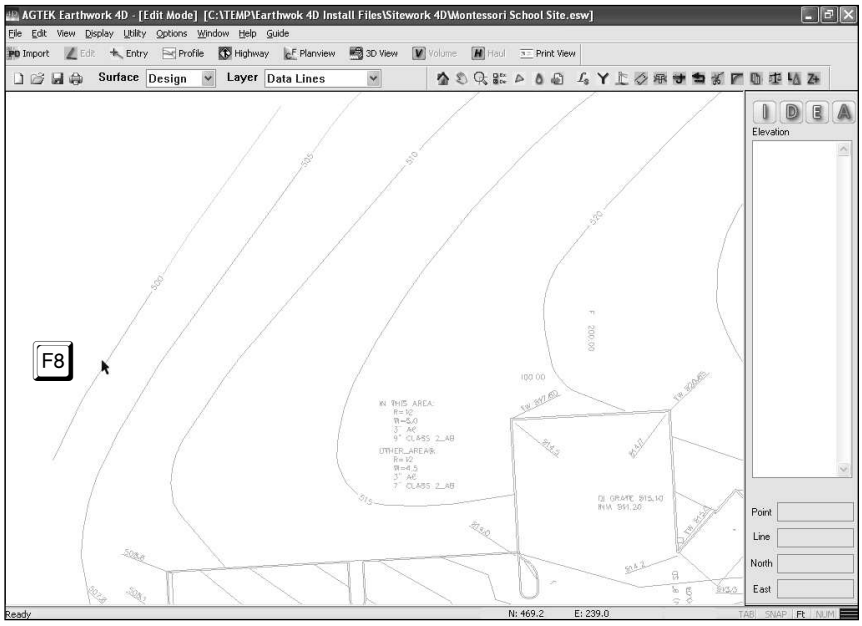
Lesson 4 - Assigning Elevations

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.



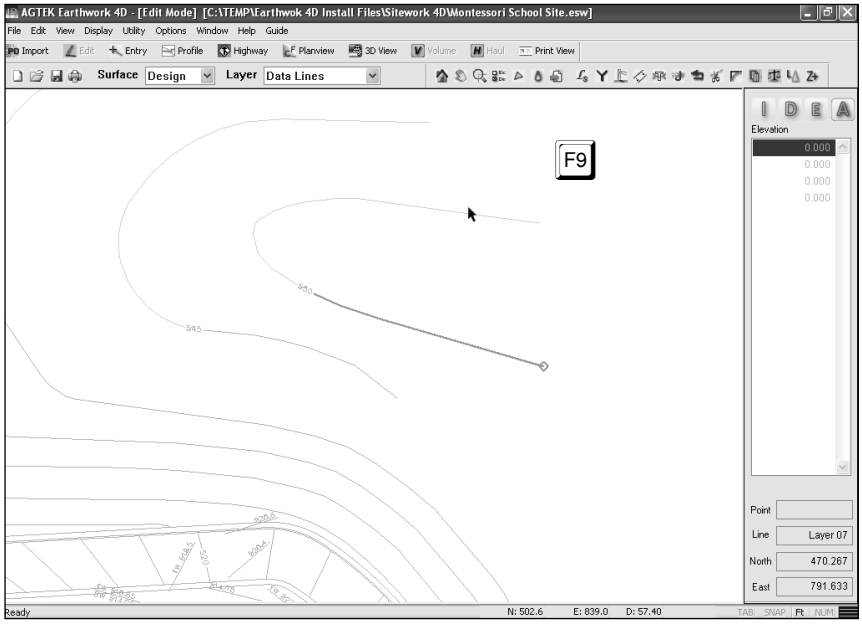
3. Select the 505 contour and enter “505” using the keyboard and the Line Editor dialog will display. Click **OK**.
4. Press the **ESC** key to clear all selections.
5. Position your arrow over the “500” contour, BUT DO NOT CLICK. Press the **F8** key.



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.