On-Screen digitizing tutorial

- ✓ SiteWorx/OS calculates cut and fill volumes for site excavation from a variety of file formats. You'll digitize items on-screen from the file(s) using the mouse with SiteWorx/OS.

- ✓ Please become familiar with SiteWorx/OS by completing this tutorial with the included TIF files before starting your first job.

- ✓ This tutorial will walk through the takeoff of the included TIF files. The existing site is found on the ***Top of Curb Existing.tif*** file and the proposed elevations are found on the ***Top of Curb Proposed.tif*** file. Under Windows Vista and later, these files are found at C:\Users\Public\Public Documents\Vertigraph\SiteWorxOS\Drawing Files. Under Windows XP, these files are located at C:\Documents and Settings\All Users\Shared Documents\Vertigraph\SiteWorxOS\Drawing Files.

Table of Contents

1. Install the SiteWorx/OS Software

The SiteWorx/OS software is downloadable from http://www.vertigraph.com/demoreq.shtml or obtained from Vertigraph.

Vertigraph, Inc.
Takeoff and Estimating Software
12959 Jupiter Rd, Ste 252
Dallas, TX 75238
800-989-4243 (U.S. & Canada)
214-340-9436
214-340-9437 fax
www.vertigraph.com
support@vertigraph.com

- After downloading, install the software by double clicking on the **SiteWorxOS_Setup.exe** file.

- The SiteWorxOS program group is added to the Programs list. To open, click on **SiteWorxOS** from this SiteWorxOS program group and select **New Project** from the startup dialog box.

- When working with PDF files we highly recommend having Adobe Acrobat Version 7 (or later) installed. Vertigraph offers Adobe Acrobat at reduced pricing. Please contact Vertigraph for further details about Adobe Acrobat.

- After installing, make sure you have the latest version of SiteWorx/OS installed by clicking on the **Help | Check for Updates** menu. To check for and receive updates you must be connected to the internet. When connected, a notification that "there is an upgrade available" may appear. Click yes and follow the prompts to install. You'll be notified to close SiteWorx/OS during the installation of any upgrades. In order to receive those update notifications automatically, check the **Options | Automatic Update Check** menu command.

- This tutorial is located at C:\ Program Files\Vertigraph\SiteWorxOS\PDF Files and may be viewed by clicking on the tutorial at the SiteWorxOS program group found on the All Programs list. Again, please complete this tutorial before starting your first project.

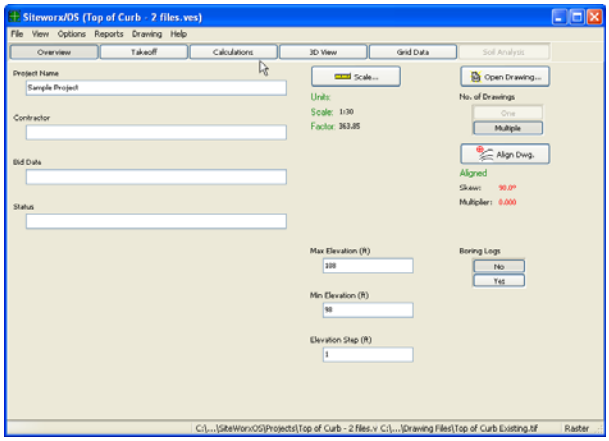
- Drawing files used with this tutorial are found at C:\Users\Public\Public Documents\Vertigraph\SiteWorxOS\Drawing Files under Windows Vista, Windows 7 and later.

  Under Windows XP these drawing files are located at C:\Documents and Settings\All Users\Documents\Vertigraph\SiteWorxOS\Drawing Files.

2. Open the Existing Drawing and Complete the Overview Tab

After opening SiteWorx/OS and selecting **New Project** from the startup dialog you'll be placed at the **Overview** tab. The **Overview** tab is where you name the project, open the drawing file(s) and set the scale. If using multiple drawings, you will align the drawings to each other here.

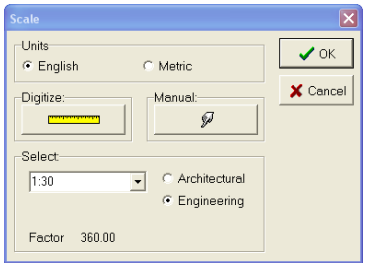
This tutorial does not address boring logs. However if you have boring logs and seek cut volumes by soil type, the soil types pertaining to the boring logs are defined here at the **Overview** tab. See item 13 for further information regarding boring logs.



- To begin, instruct SiteWorx/OS that this project uses multiple drawings by selecting "**Multiple**" under No. of Drawings and then click the "**Open Drawing**" button. Here, you'll search for the ***Top of Curb Existing.tif*** file located at C:\Users\Public\Public Documents\Vertigraph\SiteWorxOS\Drawing Files under Windows Vista or later. Open the file after the drawing image displays on the right side of the Open Drawing window.

- When using multiple files each file must be aligned to all of the other drawing files by clicking on two points that are common and can be easily identified on all drawings. Since this tutorial uses more than one drawing file, click the **Align Drawing** button. The drawing will appear. The two alignment points are marked as "A" and "B" on the drawings. Using the mouse, click on the "**A**" corner at the top left corner of the drawing and the "**B**" corner in the lower right corner. After clicking the B alignment point, click the **OK** button at the top of the screen.

- When the drawing is displayed, move around the drawing (i.e. pan) and zoom in and out by using the menu, toolbar or keyboard keys. Zoom using the scroll wheel on your mouse or hold down the SHIFT key on the keyboard while you left or right click the mouse. To pan, hold down the CTRL key on the keyboard while you drag the mouse. The mouse pointer changes to a magnifying glass when in zoom mode, to a hand when in pan mode and to a cursor pointer when in digitizing mode.



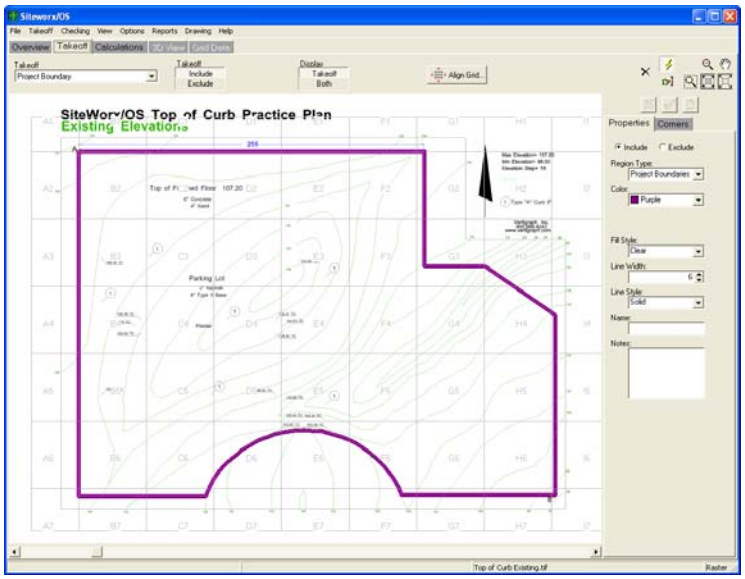
- Set the Scale by clicking on the **Scale** button. Here we'll select **English, Engineering** and then click on the **Digitize** button. The drawing will appear. Using the mouse, digitize the beginning and ending points of the 255' blue line at the top of the drawing. After digitizing the second, end point on the blue line, enter the distance in feet of **255** at the top of the screen followed by **OK**. **T**he scale factor should be approximately 360. Note: the factor for English scales is the reciprocal of the scale times twelve. A 1/30" scale's factor is 360.

IMPORTANT, PLEASE NOTE: When working with multiple drawing files, you'll set the scale only on the first drawing opened. The scales on any subsequently loaded drawings are determined and adjusted automatically when that drawing is aligned to the first drawing.

Congratulations, you have just loaded the drawing and properly set the alignment points for the first of the two drawing files. The scale has also been set for all drawing files. You are now ready to digitize areas and elevations.

3. Digitize and Copy the Project Boundary at the Takeoff Tab

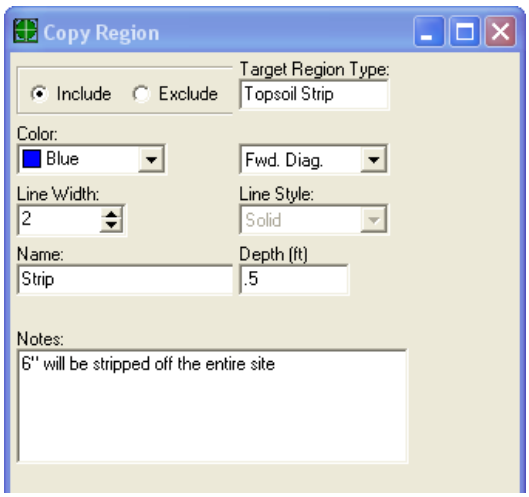
Once you're done at the **Overview** tab, save the file at **File | Save Project** and then click on the **Takeoff** tab. The **Takeoff** tab is where you'll digitize items from the drawing file into the computer using the computer mouse.



- The Project Boundary is the area that contains cuts and/or fills. Outside the perimeter of the Project Boundary is where the existing and proposed elevations are the same resulting in no cut and fill volumes. The Project Boundary is the area of interest.
- To begin digitizing the project boundary, click on the **Takeoff** tab and select **Project Boundary** from the **Takeoff** list box at the top, left hand side of the screen.
- Next, select **Include** as the **Takeoff** type at the top of the window. The cuts and fills will be calculated within the included project boundary. Although not used here, on future projects you're able to exclude certain areas from the included area.
- To begin digitizing the project boundary, click the lightning bolt, **Start Takeoff** button which is located in the top right hand corner. The mouse pointer will change to a cursor cross.
- Begin by clicking on any corner of the project boundary with the mouse and then click on each change of direction (i.e. corners) as you move around the project boundary either clockwise or

counterclockwise. To digitize around a curve, click in small increments around the curve or press the right mouse button (or use the keyboard shortcut keys) and select the Arc command followed by one click at the apex of the arc and a second click at the end of the curved arc line. After clicking the last arc point, the curved arc line will be drawn.

- When done digitizing the project boundary, press the right mouse button, select the **Stop Takeoff** command and the lightning bolt, **Start Takeoff** tool will no longer be depressed.
- After stopping the takeoff, the information regarding the digitized item is found on the right hand side of the screen under the Properties tab. Only change information on the right side of the window if you want to modify any of the attributes of a previously digitized and selected item.
- After digitizing the project boundary, you'll save some time by copying the project boundary as a topsoil strip and topsoil re-spread area rather than digitizing these topsoil areas. After pressing the **Stop Takeoff** command from the right mouse menu, click the right mouse button again, when the mouse pointer is inside the project boundary and select **Copy as Topsoil Strip.** The **Copy Region dialog** appears.



- The above dialog allows us to copy the entire project boundary as a topsoil strip area. Enter a **Depth** in decimal feet (**.5** for 6 inches) and a **Fwd Diag**. fill pattern. When done filling out the dialog box, press the **OK** button.
- Next, copy this same project boundary area as a topsoil re-spread area by pressing the right mouse button and selecting the **Copy As Topsoil Respread** command. Enter a depth of **.5** and click the **OK** button.
- These copied topsoil areas will not be displayed at the Project Boundary window. Please select **Topsoil Strip** or **Topsoil Respread** from the drop down list box at the top of the Takeoff window to view and edit these copied topsoil areas.
- The **Align Grid** button at the top of the Project Boundary window may be used at any time after the project boundary is digitized. The active drawing must be the initial file opened at the **Drawing | Active** menu when using this **Align Grid** button. Align Grid allows you to align the grid to specified sides of the project boundary. If the grid is not displayed, click on the **View | Takeoff Grid** command to display. The size of the grid is set at the Calculations tab. The **Align Grid** button is only useful, and should only be used, when exporting stakeout data. As a result, we will not be concerned with the Align Grid command at this time.

4. Load and Align the Proposed File

For those projects that contain multiple files, such as this tutorial, we highly recommend that you load the initial file, set the scale and two alignment points and then digitize the project boundary. After digitizing the project boundary on the initial file, load the other files before digitizing any elevations. After loading the multiple files, please verify that the project boundary is properly placed on each and every file before digitizing elevations.

- As a result of the preceding comments, load the second file at the **Overview** tab by clicking **Open Drawing** to browse for the ***Top of Curb Proposed.tif*** file located at C:\Users\Public\Public Documents\Vertigraph\SiteWorxOS\Drawing Files under Windows Vista or later.

- After opening the file, click the **Align Drawing** button and then click on the **A** corner at the top left corner of the drawing and the **B** corner in the southeast corner. After clicking the B alignment point, click the **OK** button at the top of the screen to align this proposed drawing to the first drawing file. To determine which alignment points were used on the first drawing, click on the Takeoff Tab when the first drawing is active and select Project Boundary from the drop down list box at the top. The first alignment point is shown as a red cross and the second alignment point is a blue cross.

- Once you have more than one drawing loaded and aligned, you can toggle between the various drawings by clicking on the **Drawing | Active** menu. The active drawing file is shown on the information bar at the bottom of the window.

- After loading the proposed file, click on the Takeoff tab and insure that the project boundary is properly located on the proposed drawing.

- After determining that the project boundary is properly placed on the proposed drawing, click on the **Drawing | Active** menu to change back to the Top of Curb Existing file.

- After digitizing the project boundary from the existing elevations, we'll next digitize the existing contour lines as noted in the next section; we will then change to the proposed drawing at the **Drawing | Active** menu. As noted in later chapters we will digitize the following from the *Top of Curb Proposed.tif* file:

    1. Excluded topsoil respread regions for areas where topsoil will not be respread (i.e. the slab and parking lot)
    2. Proposed contour lines
    3. Proposed spot elevations
    4. Proposed Surface Areas that are flat and contain elevations (i.e. concrete slab)
    5. Proposed Subgrade Only Areas that are sloping that do not have perimeter elevations (i.e. parking lot)
    6. Drainage Trench

5. Important Items about Digitizing at the Takeoff tab

- The Start takeoff button, located in the top right hand corner of the window, must be depressed in order to digitize areas and elevations.

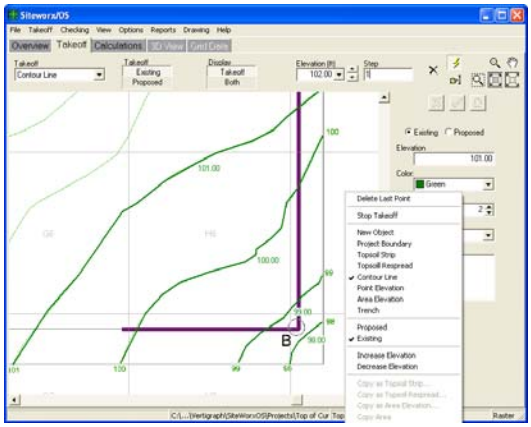
- Zoom by using the scroll wheel on the mouse. You may also zoom in or out of the drawing by holding down the **Shift** key on the keyboard. While the Shift key is held down, click the left mouse button to zoom in. Click the right mouse button with the **Shift** key held down to zoom out of the drawing.

- Once you are zoomed into a drawing, move (i.e. pan) around the drawing by holding down the **Ctrl** key on the keyboard as you drag and drop the mouse over the plan. You can also pan with the scroll bars. Additional zoom and pan commands are available from the toolbar and SiteWorx/OS menu bar.

- The properties on the right side of the window relate to the selected object. Normally this is the last object digitized. To change the selected object, click the **Select Object** button, located on the right hand side under the lightning bolt. When clicking the **Select Object** tool, the mouse pointer on the screen, is changed to a square. Select the object by placing the square selection box over a digitized point in the object. To properly select an object, place the selection box on an area corner or end point of a line to insure you're over a digitized point. Once the mouse is over the object point, the color of the object changes. Click on the object with the left mouse button to select and then change any of the properties on the right side and click the **Save Changes**, green checkmark button. If you are unable to edit an item or copy the project boundary, please select the item or project boundary first before copying or editing.

- As you digitize objects, each object is numbered. To scroll through the numbered objects, click on the **Checking | Examine** menu at the **Takeoff** tab. A number with scroll arrows is placed on the top right hand side of the Properties display. Simply scroll through the numbers and the selected item will be highlighted. When the item is selected, properties such as elevations, line color, thickness and fill style of the selected object can be changed or deleted. Changes are made by clicking on the buttons above the properties. If you can't edit the properties using the Examine command, use the select object command to initially select the item. When done scrolling through the digitized items, turn off the **Checking | Examine** feature.

6. Digitize the Existing Contour Lines



- Insure the Top of Curb Existing Drawing file is active by clicking on the **Drawing** | **Active** menu.

- Select **Contour Line** from the drop down list box at the top of the Takeoff window. Next, select **Existing** as the Takeoff and type in **98** as the elevation with a step of **1**. Click the lightning bolt **Start Takeoff** button to begin digitizing.

- The 98 foot elevation line is located in the bottom right hand corner of the drawing. Simply click along the line (i.e. click wherever there is a change in direction and do not trace) and when done, press the right mouse button and select the **Increase** elevation command. Selecting the increase elevation command, will terminate the current contour line and increase the elevation by the step value of 1 to 99 feet. Also, you can increase and decrease the elevations by using the keyboard keys (F11 to increase). Please note that the lists of short cut keys are defined at the **Options | Keyboard Shortcuts** command. If the increase elevation command does not increase the elevation, please verify that Step is set to 1.

- If you make a mistake while digitizing, delete the last point(s) digitized with the keyboard by holding down the Alt key on the keyboard as you depress the Backspace key on the keyboard or click the right mouse button and select the Delete Last point command.

- After increasing the elevation, digitize the 99 foot line and again press the right mouse button to increase the elevation to 100. Continue digitizing all of the lines to gain speed and experience.

- The **New Object** command from the right mouse button menu allows you to stop one line and start a new line with the same elevation.

- When done digitizing all of the existing contour lines, press the **Stop Takeoff** command from the right mouse button popup menu. The existing site takeoff is now complete. Change to the proposed file by clicking on **Drawing | Active** before continuing.

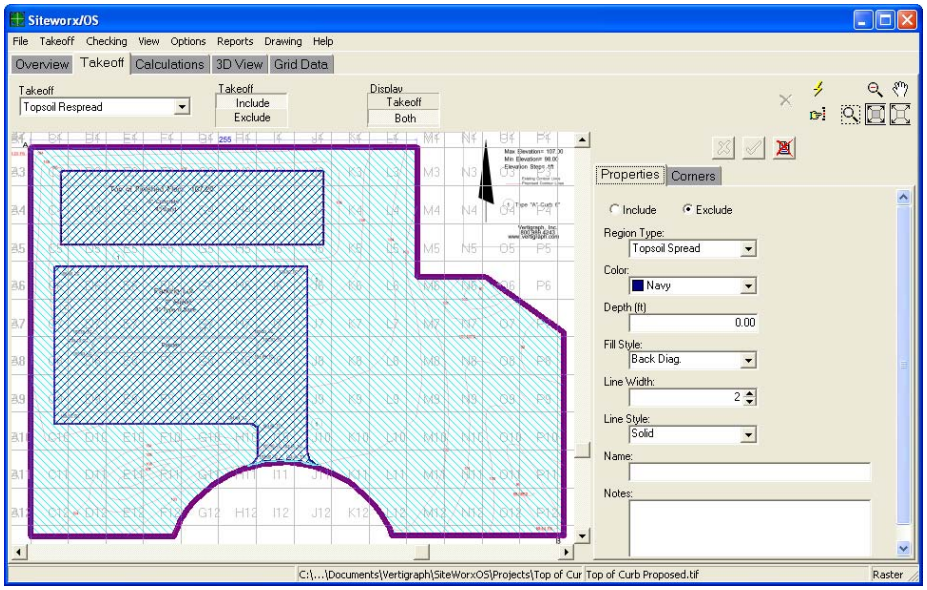
7. Exclude Topsoil Respread Regions

After selecting the Top of Curb Proposed from the **Drawing | Active** menu, we will be viewing the proposed elevation plan file. In item 3 above, the project boundary was copied as a topsoil re-spread area. We are now going to exclude certain areas from this previously copied area.

- At the **Takeoff** tab, select **Topsoil Respread** from the list box at top of the window.

- To the right, select **Exclude** and you may display **both** the included and excluded areas or just display the **Excluded** Takeoff.

- Click the **Start Takeoff** button and digitize around the excluded slab. When you arrive back to the starting point, press the right mouse button and select **New Object**.



- Digitize around the parking lot. When you are done digitizing around the perimeter of the parking lot, press the right mouse button and select **Stop Digitizing**.

8. Digitize Proposed Contour Lines

- Select **Contour Line** from the drop down list box at the top of the Takeoff window. Next, select **Proposed** as the Takeoff and type in **99** as the elevation with a step of **1**. Click the **Start Takeoff** button to begin digitizing the 99 foot elevation line located in the bottom right corner.

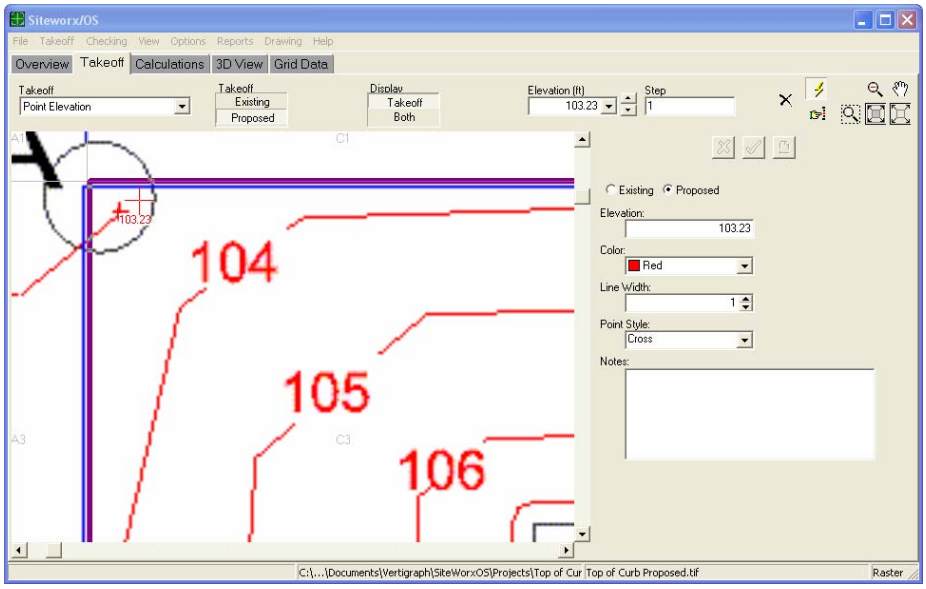
- Just like the existing contour lines, simply click along the line and then press the right mouse button to increase or decrease the elevation, or use the keyboard commands, to increase the elevations by the step value displayed at the top of the window. When you're done digitizing all of the proposed contour lines, click the right mouse button and select **Stop Takeoff** from the popup menu.

- **Remember; use the scroll wheel to zoom. You can also zoom by holding down the shift key while left clicking to zoom in, and right clicking to zoom out. Hold down the ctrl key while dragging the mouse to pan (i.e. move) around the drawing.**

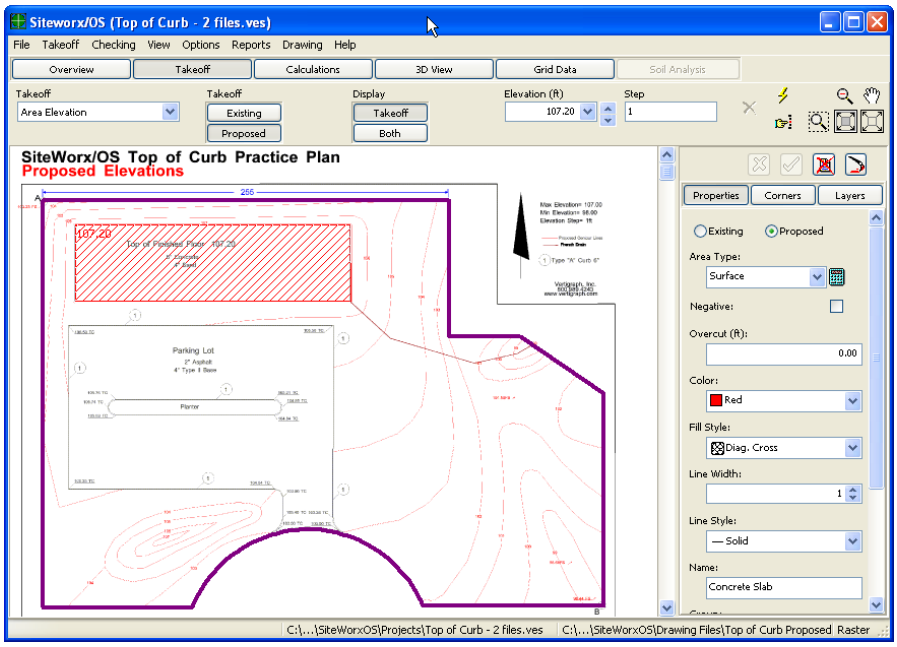
9. Digitize Proposed Point Elevations

- Select **Point Elevation** from the drop down list box at the top of the **Takeoff** window. Next, select **Proposed** as the Takeoff and type in an elevation of **103.23**. Next, click the **Start Takeoff** button to begin digitizing.

- The 103.23 point elevation is located in the top left corner of the window below the A alignment point. Simply click on this point and then zoom and/or scroll around the drawing to find the next proposed elevation point. Change the elevation to 98.44 before clicking on the 98.44 elevation point located in the bottom right hand corner of the drawing. Above the 98.44 point, there are two more point elevations that need to be digitized: 98.66 and 101.50. Simply change the elevation at the top of the window before clicking on the appropriate point. Digitize the elevation points around the parking lot. When complete, press the right mouse button **Stop Takeoff** command to return to mouse mode.



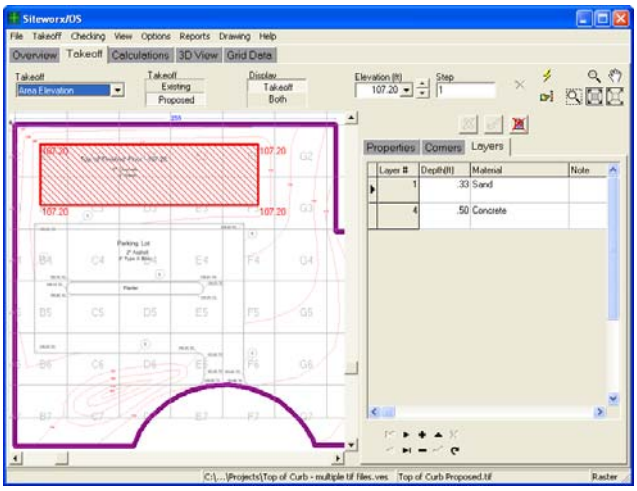
10. Digitized Proposed Area Elevations



- Select **Area Elevation** from the drop down list box at the top of the **Takeoff** window. Next, select **Proposed** as the Takeoff and type in **107.20** as the elevation.

- Once the data in the top of the window is defined, click the **Start Takeoff** button tool to begin digitizing the107.20 slab elevation displayed at the top of the drawing. To digitize the area, click on three corners either clockwise or counter clockwise around the slab and then press the right mouse button and select **Stop Takeoff** to complete.

- After digitizing the area, the subgrade material layers are defined at the **Layers** tab.



- The layer information is created by clicking on the Layers tab on the right hand side of the window. Please note that the width of the properties and layers window is expanded and contracted by pointing the mouse to the left edge of the properties tab and dragging the mouse. The layers are edited and posted by pressing the buttons at the bottom of the **Layers** tab. The concrete slab has two layers: “sand” and “concrete”. Type in the layer name and then enter the depth of the layer in decimal feet (i.e. .5 for 6 inches). When complete, press the checkmark at the bottom to save the slab layers.

- Next, digitize the parking lot. When done with the parking lot, click the **Stop Takeoff** command from the right mouse button menu. After digitizing the parking lot, change the Area Type on the right side to “Subgrade Only" and press the Green Checkmark button to save this change. Then click the Layers tab and enter the layers.

Layer Material or Name	Depth
Height of Curb (Air)	.5 for 6” curb height
Type II Base	.3333
Asphalt	.1667

- After digitizing the parking lot, the final item to digitize is the negative planter island in the center of the parking lot. Simply click the **Start Takeoff**, lightening bolt button and digitize around the planter island. When done, click the right mouse button and select **Stop Takeoff**. Next, move to the right side and make sure the **Area Type** is defined as “Subgrade Only” and the Negative checkbox is checked. If you enter the same layers as you entered for the parking lot, the layer volumes disclosed will be negative and subtracted from the parking lot’s layer volumes.

- **PLEASE NOTE:** There are 3 Area Types noted under the properties tab. 1) **Surface** areas require elevations and are often flat areas. 2) **Subgrade Only** areas do not require elevations and are usually sloping areas. 3) **Other** area type is used to calculate the square footage, square meters and volumes of an area along with its perimeter with no effect on the cut and fill volumes. Other area types are used simply for measuring, With **Subgrade Only** areas, all point and contour line elevations digitized inside the Subgrade Only area will be reduced by the layer depths when calculating cut and fill volumes. The layer depths for each area are defined at the **Layers** tab. **Subgrade Only** areas are used for sloping areas such as parking lots. Whenever you digitize an area, the area type defaults to a **Surface** Area Type. If you are digitizing a subgrade area, a parking lot for example, after digitizing you’ll need to change the area type on the right side by changing the **Area Type** from **Surface** to **Subgrade Only**.

- Again, all areas are initially digitized as flat Surface Area types with elevations. If you desire a subgrade only area, you’ll need to change the Area Type from Surface to Subgrade Only.

- In this tutorial, the concrete slab will be a surface area whereas the parking lot is considered a subgrade only. Again, please note that surface areas require elevations and are usually flat areas. Subgrade only areas, on the other hand, are used for non-level areas such as parking lots.

- Elevations are located at the corners tab. Change elevations by simply overwriting the current value. Press the black checkmark at the bottom of the tab to save the changes. To delete an elevation point from the list hold down the Ctrl key on the keyboard as you press the delete key. Once a corner is deleted, it cannot be replaced.

11. Other Important Items to know regarding the Takeoff

- The design line command is used to smooth out different elevations. For example, if after calculating and viewing the 3-D model, portions of your 3-D model looks spiky, the design line can be used to smooth out those spikes. The design line is a sloping line with different elevations at the beginning and end of the line.

- When performing a takeoff, only the current takeoff objects are displayed. For example, point elevations, contours or topsoil strip. When Review is selected from the takeoff drop down at the top of the Takeoff tab, you are able to select which takeoff objects are displayed. Select all, clear or select combinations of takeoff objects that have been digitized. This feature is helpful if miscalculations occur or your 3D model does not appear as it should.

- Each item taken off is given a unique identifier. To view the item number identifiers, click the **Checking | Examine** command. Under the Checking menu, the Examine command will display the identifier for the selected Takeoff type. (i.e., project boundary, contour line, area elevation). Each item that has been digitized is identified with a number. You can scroll through the identifying numbers found under the Properties tab on the right hand side when **Checking | Examine** is turned on. When scrolling through the identifying numbers on the right hand side of the screen, the selected item will change color on the takeoff display. The selected item's properties, such as line color, thickness, are available for review and editing.

- Both the Examine command and Review feature can be used to review miscalculations. However, the review option does not allow the user to change the Takeoff Object's properties, such as line thickness, elevation or color.

- Once the lightning bolt is depressed, right click and a number of commands are available. These commands are also available by using keyboard shortcuts. The keyboard commands configured at the **Options | Keyboard Shortcuts** menu are available when the lightening bolt is depressed.

- Please remember to use your mouse and keyboard when zooming and panning. Zoom using the scroll wheel on the mouse or zoom in by holding down the Shift key and left click the mouse. Zoom out by holding down the Shift key while right clicking the mouse. When zoomed in, pan around the drawing by holding the Ctrl key down as you drag and drop the mouse.

12. Trenches

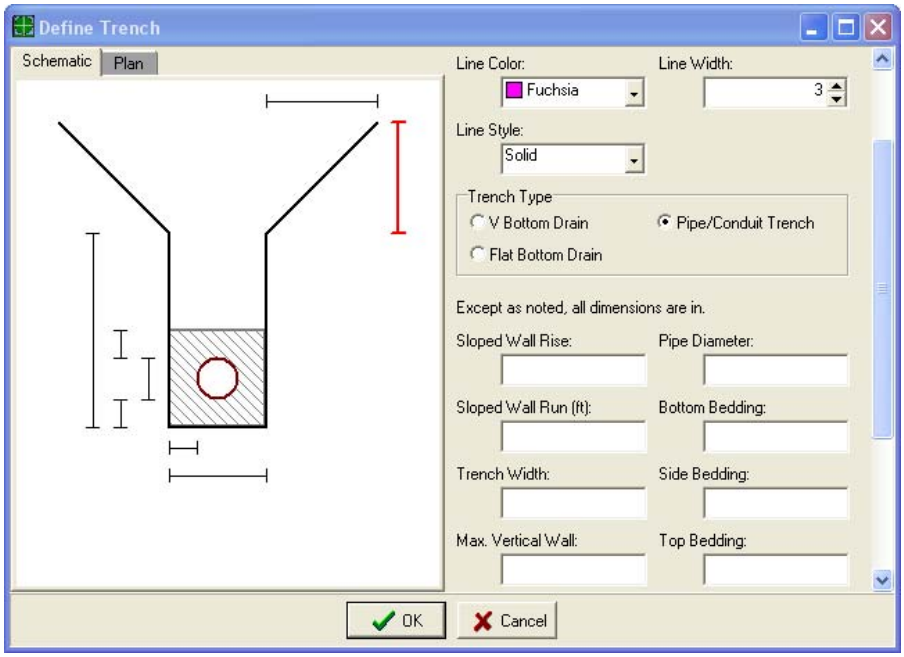
- SiteWorx/OS enables you to calculate trench volumes. The cut and backfill volumes from trenches are reported separately and are not included in the cut and fill volumes displayed at the Calculations tab. To view the trench information and volumes, select **Trench** and **Trench definition** from the **Reports** menu.

- SiteWorx/OS develops a model of the proposed site based on the proposed elevations digitized. The trenches are then dug from the proposed elevations to arrive at the trench volumes.

- To digitize a trench, select Trench, at the top of the window from the Takeoff list at the Takeoff tab

- Next, at the top of the screen, enter the invert elevation for the beginning of the trench. The invert elevation is the trench elevation at the bottom of the trench.

- Click the Start takeoff, lightening bolt button and the Define Trench dialog box will appear.



- Simply define the line colors, width and type of trench. SiteWorx/OS handles three types of trenches: V Bottom Drain, Flat bottom Drain and Pipe Conduit trenches. After selecting the trench type, simple click on the dimension boxes and enter the various dimensions.

- When clicked on a dimension box, the measurement required will be displayed in red under the Schematic tab.

- After all dimensions have been entered at the Schematic tab, the cross section of the trench based on the dimensions entered will be displayed at the Plan tab. Once the trench has been defined, press the OK button. You'll return to the image where you'll digitize the beginning of the trench elevation.

- Simply change the elevation to the end of trench invert elevation and click on the end of the trench.

- Whenever you have entered two invert elevations, SiteWorx/OS can calculate the elevations subsequently digitized by applying the calculated slope to all future points. This is accomplished by checking the Cal Inv Elev. (Calculate Invert Elevation) checkbox found to the right of the elevation at the top of the window.

- After digitizing the elevations of the trench, press the right mouse button and select Stop Takeoff to complete.

13. Boring Logs and Area Overcuts – New with Version 4

SiteWorx/OS Version 4 has the following enhancements:

- Boring Logs with the Soil Analysis Tab
- Area Overcuts
- Optional Startup Dialog
- Revised Calculation Summary
- Enhanced Grid Export

Boring Logs

Overview

SiteWorx/OS can use the data from boring logs to model the soil layers (strata) found on the site. The data entry process involves locating (taking off) the boring on the site and entering the data for the soil types found in the boring log. By locating the borings and entering the soil strata depths for each boring, a cut report by soil type will be available. The Soil Analysis tab shows the soils cross sections at each boring log.

If using boring logs, topsoil strip volumes can only be calculated by defining a topsoil boring soil type and checking the Strip Site of Topsoil checkbox at the boring log setup window on the Overview page. You're unable to digitize topsoil strip areas if boring logs are used.

To use boring logs with SiteWorx/OS, select **Yes** for Boring Logs at the Overview tab.

Boring Log Data

SiteWorx/OS maintains a list of the soil types. The listing is found by selecting **Yes** for Boring logs, click **Setup** and then click on the Soil Types tab. The commands to enter soil types are found at the bottom of the window. That list contains the following information for each soil type:

- Soil Type - a short description
- Swell Factor
- Topsoil - check if this strata is topsoil. There can be only one topsoil strata, and, if present, it must be the top strata in each log.
- Use for Fill - check if this soil type can be used for fill
- Display properties (Color, Fill and Line Width) for the Soil Analysis Tab
- Notes - record any relevant particulars for the soil type

Each Boring Log is entered at the Takeoff tab and contains:

- Boring ID - This displays on the takeoff to identify the log. Not required.
- Surface Elevation
- Display properties (Color, Point Style and Line Width) for the takeoff
- Notes - record any relevant particulars for the log
- Information for each layer or strata:
- Soil Type - one of the soil types from the list above
- Top Elevation - elevation of the top of the strata is automatically generated. For the top strata, this is the surface elevation. For subsequent layers, it is the Bottom Elevation of the preceding strata.

- Bottom Elevation - elevation of the bottom of the strata. Can be entered or generated.*
- Depth below Surface - depth of the bottom of the strata. Can be entered or generated.*
- Style - graphical display of the style properties associated with the soil type.

Boring Log Data Entry

Entering Boring logs is a three step process.

- Look at the logs and set up the log information at the Overview tab. If there is no surface elevation given for the borings the Set Surface Elevation to 0 should be checked. The strata information is entered by entering either the bottom of the strata elevation or the depth of the strata below surface. Please look at the boring logs to determine if the Bottom of the Strata Elevation or the Depth Below Surface elevations are going to be entered.

- Go through the boring logs and enter the different soil types at the Overview tab.

- Go through the boring logs and enter the strata for each boring at the Takeoff tab

SiteWorx/OS provides the flexibility to reverse the last two steps. Just enter the soil types into the boring logs. If the soil type is not in the list of soil types, it will be added. After entering the logs, the soil types can be edited to add swell factor, display style, etc.

Notes about Borings

Using borings changes a few other aspects of SiteWorx/OS:

- Topsoil Strip Areas are not used. Check the Strip Topsoil box in Boring Log Setup to strip the site of the topsoil layer.
- Subsoil Swell Factor on the Calculations tab is not used.
- Site balancing is not available.

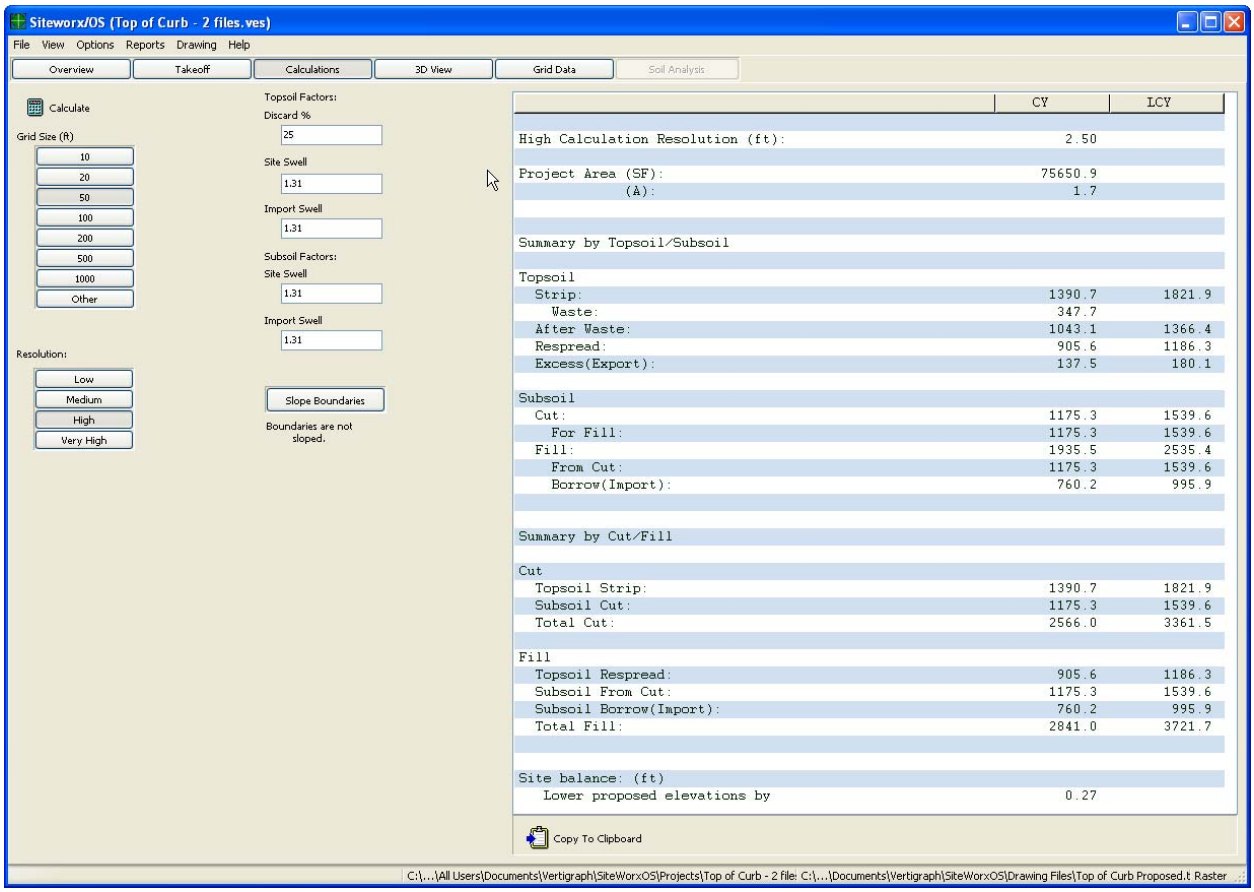
Area Overcuts

For any area digitized under Area Elevations at the Takeoff tab and overcut length may be applied to the digitized area. On the right side of the Area Elevation window under the Properties tab enter the overcut length and click the green checkmark to record the change. The area will be enlarged by the length of the overcut. The dimension is in feet or meters. The overcut surrounds the entire area.

The layers in the area can be either the size of the original area or the size of the expanded overcut area. To set a layer to the overcut size, check the Include Overcut field for the layer on the Layers Tab.

The amount of backfill required is found on the Area Summary report.

14. Calculate the Results



- Click on the **Calculation** tab and press the **Calculate** button located at the top left of the screen to calculate.

- The grid, based on the **Grid Size** set here, is displayed at the **Takeoff** tab if the menu **View | Takeoff Grid** is turned on. The cut and fill volumes for each grid are disclosed at the **Grid Data** tab. A smaller grid results in a more detailed calculation of volumes. Grid size also affects the resolution of the 3D image shown at the **3D View** tab. The smaller the grid size, the higher the resolution displayed at the **3D View** tab.

- Topsoil and subsoil expansion and compression factors are recorded on the calculations tab. The **Site Swell** factor relates to expansion and the **Import Swell** factor relates to compression. Normally these factors are greater than 1 and less than 2. The **Site Swell** factor is multiplied by the bank volumes to arrive at loose cubic yards (LCY). The **Import Swell** factor is divided into the loose volumes to arrive at compressed yards. The **Discard %** for topsoil is deemed to be waste and simply blows away and disappears from the job site. If you desire no swell or compression set the factors to 1.

- When boring logs are used, the site swell factor is determined by using the site swell factor of the various soil types established when setting up the borings at the Overview tab. Also, when using borings, the topsoil strip is calculated from the boring information and you will not be able to digitize topsoil strip areas at the Takeoff tab.

- The proposed elevations may be sloped to the project boundaries based on the information entered when pressing the **Slope Boundaries** button. A pitch or rise and a run may be entered for the slope. If this button is not pressed, the boundaries elevations are determined based on the closest elevation point digitized.

- The **Resolution** setting determines the sub-grid spacing used for calculating each grid's volumes. A higher resolution results in more sub-grids, is more accurate, but takes longer to calculate. We recommend that you initially calculate with **Medium** resolution, review the results and the 3D view. If the 3D view and results look reasonable, use a **High** or **Very High** resolution for final, most accurate bidding numbers. The following resolution settings are used when calculating each individual grid; the size of the grid is defined under **Grid Size**:

  Low is 25 squares (or sub-grids) per grid (5 X 5)
  Medium is100 squares per grid (10 X 10)
  High is 400 squares per grid (20 X 20)
  Very High is 2,500 squares per grid (50 X 50)

- Calculated results are shown to the right of the screen. Information is broken out by topsoil and subsoil volumes.

- Total Cut = Subsoil Cut + Topsoil Strip

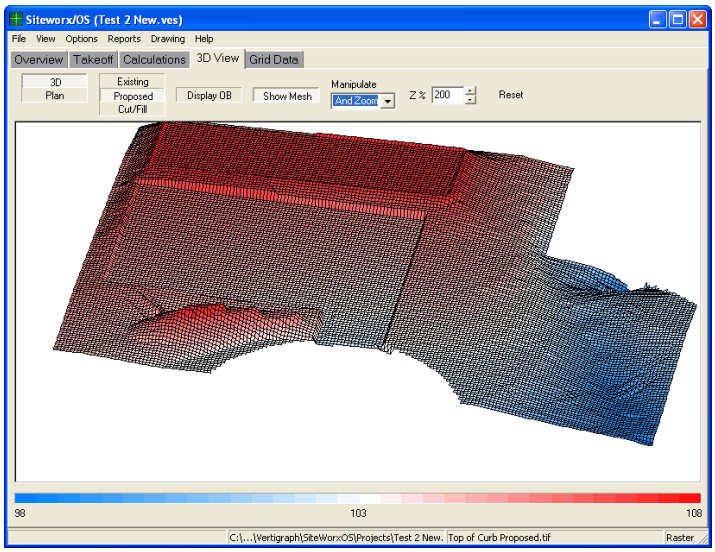
- Total Fill = Subsoil Fill + Topsoil Respread

- SiteWorx/OS develops a 3D model of the existing and proposed sites based on the elevations entered. The elevations points are connected to each other through an advanced algorithm to develop the 3D model. Areas are then placed on top of the 3D model as a plane. SiteWorx/OS develops an existing and proposed 3D model from the items digitized.

- The total cut and fill volumes are calculated based on the differences between the existing and proposed elevations. If the proposed elevation is higher than existing for a resolution grid area, the volume for that grid is calculated as a fill volume. Likewise, if the proposed elevation is lower than existing elevations for a resolution grid area, the volume for that resolution grid is defined as a cut volume. After calculating the total cut and fill volumes, the topsoil strip and topsoil re-spread volumes are subtracted to arrive at the Subsoil cut and fill volumes. Remember, Total Cut volume equals Subsoil Cut volume plus Topsoil Strip and the Topsoil fill volume equals Topsoil Re-spread plus Subsoil Fill volume.

- At the bottom of the window on the right side, SiteWorx/OS discloses how to adjust the proposed elevations to arrive at a balanced site where cut equals fill volume. The site balancing adjustment is not available if boring logs are used.

15. Display the 3D View



- The manipulate drop down list box allows you to move rotate and resize the 3D image. If the Rotate and Zoom option is selected; zoom the image by holding down the right mouse button as you drag the image from the center. Rotate the image by holding down the left mouse button.

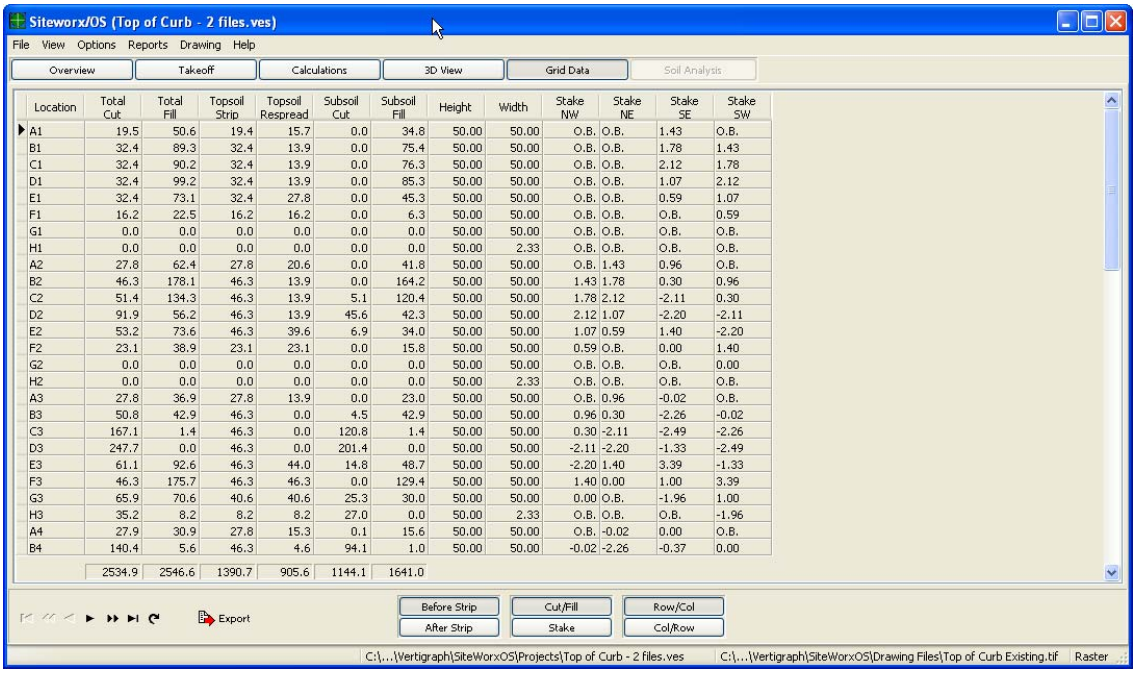
- The 3D view is ideal for displaying the existing and proposed site. The plan view is better for showing where the cut and fill areas are located.

- The Z% enables you to exaggerate the Z scale or elevations. The **Z%**, should be set to 100 to display the image to scale. To display the elevations disproportionately, increase the **Z%** value to a value over 100, 200 for example.

- The reset button resets the image to the default values.

- Elevation errors are clearly displayed at the 3D View window. Look at the legend at the bottom of the screen to check for reasonableness. Are there any spikes? Is the existing or proposed site all one color and does the range of elevations appear reasonable? A 0 elevation indicates that an item was digitized without an elevation. You can use the **Checking** | **Examine** menu at the **Takeoff** tab to find incorrect elevations.

16. View the Grid Data



Location	Total Cut	Total Fill	Topsoil Strip	Topsoil Respread	Subsoil Cut	Subsoil Fill	Height	Width	Stake NW	Stake NE	Stake SE	Stake SW
A1	19.5	50.6	19.4	15.7	0.0	34.8	50.00	50.00	O.B.	O.B.	1.43	O.B.
B1	32.4	89.3	32.4	13.9	0.0	75.4	50.00	50.00	O.B.	O.B.	1.78	1.43
C1	32.4	90.2	32.4	13.9	0.0	76.3	50.00	50.00	O.B.	O.B.	2.12	1.78
D1	32.4	99.2	32.4	13.9	0.0	85.3	50.00	50.00	O.B.	O.B.	1.07	2.12
E1	32.4	73.1	32.4	27.8	0.0	45.3	50.00	50.00	O.B.	O.B.	0.59	1.07
F1	16.2	22.5	16.2	16.2	0.0	6.3	50.00	50.00	O.B.	O.B.	O.B.	0.59
G1	0.0	0.0	0.0	0.0	0.0	0.0	50.00	50.00	O.B.	O.B.	O.B.	O.B.
H1	0.0	0.0	0.0	0.0	0.0	0.0	50.00	2.33	O.B.	O.B.	O.B.	O.B.
A2	27.8	62.4	27.8	20.6	0.0	41.8	50.00	50.00	O.B.	1.43	0.96	O.B.
B2	46.3	178.1	46.3	13.9	0.0	164.2	50.00	50.00	1.43	1.78	0.30	0.96
C2	51.4	134.3	46.3	13.9	5.1	120.4	50.00	50.00	1.78	2.12	-2.11	0.30
D2	91.9	56.2	46.3	13.9	45.6	42.3	50.00	50.00	2.12	1.07	-2.20	-2.11
E2	53.2	73.6	46.3	39.6	6.9	34.0	50.00	50.00	1.07	0.59	1.40	-2.20
F2	23.1	38.9	23.1	23.1	0.0	15.8	50.00	50.00	0.59	O.B.	0.00	1.40
G2	0.0	0.0	0.0	0.0	0.0	0.0	50.00	50.00	O.B.	O.B.	O.B.	0.00
H2	0.0	0.0	0.0	0.0	0.0	0.0	50.00	2.33	O.B.	O.B.	O.B.	O.B.
A3	27.8	36.9	27.8	13.9	0.0	23.0	50.00	50.00	O.B.	0.96	-0.02	O.B.
B3	50.8	42.9	46.3	0.0	4.5	42.9	50.00	50.00	0.96	0.30	-2.26	-0.02
C3	167.1	1.4	46.3	0.0	120.8	1.4	50.00	50.00	0.30	-2.11	-2.49	-2.26
D3	247.7	0.0	46.3	0.0	201.4	0.0	50.00	50.00	-2.11	-2.20	-1.33	-2.49
E3	61.1	92.6	46.3	44.0	14.8	48.7	50.00	50.00	-2.20	1.40	3.39	-1.33
F3	46.3	175.7	46.3	46.3	0.0	129.4	50.00	50.00	1.40	0.00	1.00	3.39
G3	65.9	70.6	40.6	40.6	25.3	30.0	50.00	50.00	0.00	O.B.	-1.96	1.00
H3	35.2	8.2	8.2	8.2	27.0	0.0	50.00	2.33	O.B.	O.B.	O.B.	-1.96
A4	27.9	30.9	27.8	15.3	0.1	15.6	50.00	50.00	O.B.	-0.02	0.00	O.B.
B4	140.4	5.6	46.3	4.6	94.1	1.0	50.00	50.00	-0.02	-2.26	-0.37	0.00
	2534.9	2546.6	1390.7	905.6	1144.1	1641.0						

- Two different reports are available, **Cut/Fill** and **Stake**.

- The stake height adjustments for each of the four corners of the grid may be before or after topsoil strip. To change the stake heights, click on **Before Strip** or **After Strip** at the bottom of the window. The notation of **O.B**. for an individual stake indicates the corner is outside the boundary.

- The actual grid location is displayed at the **Takeoff** tab if the **View | Takeoff Grid** menu command is turned on. The size of the grid spacing is set at the **Calculations** tab.

- Click the Export button at the bottom of the screen to export a variety of fields to several different file formats.

- The **Stake** report provides the coordinates of the northwest corner of each grid. For this point, the existing elevation, proposed elevation and the depth of the cut and/or fill is also provided. To align the grids with a certain coordinate, click on the **Align Grid** button at the top of the **Takeoff** tab window when **Project Boundary** is selected. Remember, you must be at the first drawing opened at **Drawing | Active** to align the grid. This Stake data may be exported to a number of different file formats for further import into total stations and other instruments.

17. Print the Reports and Summary

In summary the process works as follows:

1. Complete the **Overview** Tab
2. Click on the **Takeoff** tab and digitize all relevant items.
3. Click on the **Calculations** tab and set the grid size, resolution and then calculate.
4. Review the calculated results, **3D View** and **Grid Data**.
5. If changes need to be made based on the initial review, select the object and edit the information at the **Takeoff** tab
6. Once the data appears reasonable, recalculate the project with **High** or **Very High** resolution.

Finally, print the desired reports found under the **Reports** menu.

Congratulations, you're now ready for a real project.

If you have any questions, comments or would like Vertigraph to review a takeoff, please feel free to contact us at any time.

Vertigraph, Inc.
12959 Jupiter Road, Ste 252
Dallas, TX 75238
214-340-9436
800-989-4243
214-340-9437 Fax
support@vertigraph.com
www.vertigraph.com