SiteWorx/OS

Version 10

Tutorial and User Guide

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A. Overview

SiteWorx/OS models the existing and proposed surfaces from elevations and areas recorded from the grading plan. The differences in the surface models provide the location and quantities of soil movement.

The program features available depend on the file type. SiteWorx/OS works with both raster and vector type drawing files. This tutorial will demonstrate a takeoff using a multipage PDF vector file. Information about trenches, bore logs and importing elevations from a DWG file are also covered in this tutorial.

We highly recommend working through this tutorial step by step. Press the **F1** keyboard key for context sensitive help or click the small blue circle with the question mark in the far top right-hand corner of the window and then click the mouse when over a command for help. If you have any questions or problems whatsoever, please contact us at 800-989-4243, 214-340-9436 or support@vertigraph.com.

Wishing you the best of everything. Good luck.

B. About the SiteWorx/OS Window

1. *Help*

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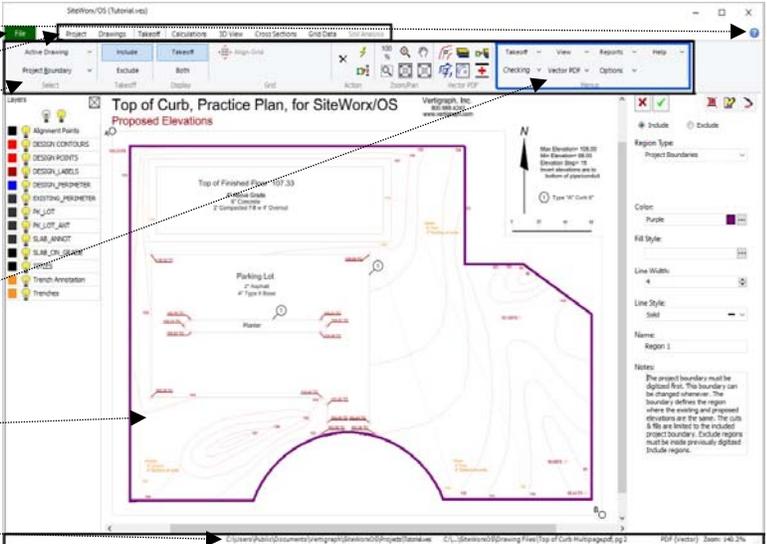
1. **Help**
   The question mark in the top right corner of the window provides context sensitive help. Click the question mark and then click a menu or toolbar command for explanation. The **F1** keyboard key also provides help.

2. **File Menu/Icon**
   To open, save or start a new project, click on the file menu/icon found on the top left-hand corner of the window.

3. **Tabs**
   The tabs at the top of the window are named **Project**, **Drawings**, **Takeoff**, **Calculations**, **3D View**, **Cross Sections**, **Grid Data** and **Soil Analysis**. Work from left to right along the tabs. Start at the **Project** tab, where the project is named. At the **Drawings** tab, files are opened and the scale is set. The **Takeoff** tab is where elevations and areas are recorded from the drawing file(s). Much of the work is done at the **Takeoff** tab. Each tab is covered in this tutorial.

4. **Toolbar**
   The toolbar ribbon underneath the tabs contain the program commands. Each tab will have a unique toolbar. The toolbar is divided into sections; the various section names are noted at the bottom of the toolbar.

5. **Menu Section of the toolbar**
   The right side of the toolbar contains the SiteWorx/OS menus. To learn more about the commands on the menus, click the help question mark in the top right-hand corner of the window, move the question mark pointer over the menu and click; or press the **F1** keyboard key.

6. **Work Area**
   The work area is the portion of the SiteWorx/OS window between the toolbar at the top and the status bar at the bottom. Data is entered, edited and results are analyzed in the work area.

7. **Status Bar**
   The status bar is at the very bottom of the window. The status bar displays from left to right: **i)** Instructions and status messages pertaining to the current activity **ii)** Project file name **iii)** Drawing file name and **iv**) Notation that identifies how the image is rendered – RASTER, PDF, Vector PDF or CAD.

C. File Types - Raster, Vector and PDF Files

SiteWorx/OS works with both raster and vector drawings. Knowing about these file types is important in understanding how SiteWorx/OS works and what features are available.

<u>**Raster File Images**</u>

What is a raster image? A raster image is a grid of tiny pixels. A pixel is defined as a point of color. More pixels per inch means higher resolution. Raster files are similar to a printed document where the image is created by a collection of tiny ink dots. Digital photos and scanned blueprints are always raster images. Raster files have the following file extensions: .TIF, .BMP, .JPG, .PNG and sometimes .PDF. When viewing a drawing with SiteWorx/OS, the status bar at the bottom of the window displays, on the right side, how the file is displayed or rendered. All raster files with be noted as either **Raster** or **PDF** on the SiteWorx/OS status bar. When taking off items from raster drawings, the estimator clicks on the tiny pixel dots on-screen to set apart the contours, points and areas.

Vector File Drawings

Vector drawings are very different than raster images; and a vector drawing is not rendered by using points of color (i.e. pixels) organized in a tiny grid like raster images.

Computer Aided Design Programs, such as AutoCAD, create vector drawings that are rendered by displaying objects, that are also known as "entities". The various entities are organized by logical layers. These entities are created by a list of points. Various attributes are assigned to these layers, entities and points through the CAD software. Generally, the layer attributes define the color, line style and line width. The entity attributes include the type of entity – which may be a point, line, polyline, polygon or text. And the point attributes provide the x,y,z positioning of the point. When taking off items (i.e. entities) from vector files with SiteWorx/OS, the user isolates the desired layer and then selects the entity or snaps to a point within the entity.

PDF Files

There are two types of PDF files, raster or vector, and the type of PDF file depends on how the PDF file was created. When a PDF file is created through the CAD program, the PDF drawing maintains the layers, entities and points defined in the CAD file. Some, but not all, attributes may also be recorded to this PDF file. Whenever a PDF file is created from the CAD drawing and there is more than one layer, the PDF file will be rendered as a vector type PDF file which contains layers and objects (aka entities). When the PDF file is created from raster images or scanned from blueprints, the PDF file will be a raster type PDF file rendered with points of color (i.e. pixels).

Vector files are noted in SiteWorx/OS as **PDF Vector** or **CAD** on the lower right corner of the status bar found at the bottom of the window. Vector type PDF files will have a **Vector PDF** section added to the Takeoff toolbar ribbon. An AutoCAD file, which are always a vector drawing, will have a **CAD** section added to the SiteWorx/OS toolbar. When digitizing items from vector files, you're able to isolate design layers and eliminate non-relevant information found on the image. When taking off contour lines, using the select entity command takes off the entire contour line with a single click.

If the vector file, such as AutoCAD DWG or vector PDF are available, we highly recommend that you use these vector files instead of raster files. In general, your takeoff will be faster and more accurate with vector files.

When opening a file with SiteWorx/OS, how the file is rendered or displayed is disclosed on the bottom right corner on the status bar. The file will be rendered as one of the following:

- **PDF** for raster type PDF files
- **Raster** for non-PDF raster files such as TIFF, JPEG, BMP, PNG and others
- **PDF (Vector)** for vector type PDF files
- **CAD** for DWG, DXF and other Computer Aided Design files which are always vector files

This tutorial demonstrates a complete takeoff using a multipage PDF (Vector) file. Towards the end of the tutorial, importing objects from an AutoCAD.DWG drawing file is also covered.

Now let's get started …

D. Project Tab

Start the takeoff at the **Project** tab. All you need to do here is name the project as "**Tutorial Project**" or whatever in the Project field. Information entered here appears on the reports. The Boring Logs and Trench settings noted on the right-side of this window, are job specific settings and are changed only when needed. Working with bore logs is covered in the Boring Logs section of this tutorial; and trenches are covered in the Trenches chapter.
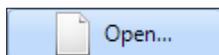
E. Drawings Tab

After naming the project at the **Project** tab, the **Drawings** tab is where files and/or pages are opened.

After clicking on the **Drawings** tab, the user may be asked to save changes to the current project. Answer **Yes** and name the file as "**Tutorial**" and click the **Save** button. Please note that all SiteWorx/OS file names end with a .ves extension.

This tutorial walks through a project using the installed **Top of Curb Multipage.pdf** drawing file which is a vector type PDF file.

Step 1 - Open the drawing files

Click the **Open…** button on the left side of the **Drawings** tab toolbar to find and open page 1 of the **Top of Curb Multipage.pdf** file.
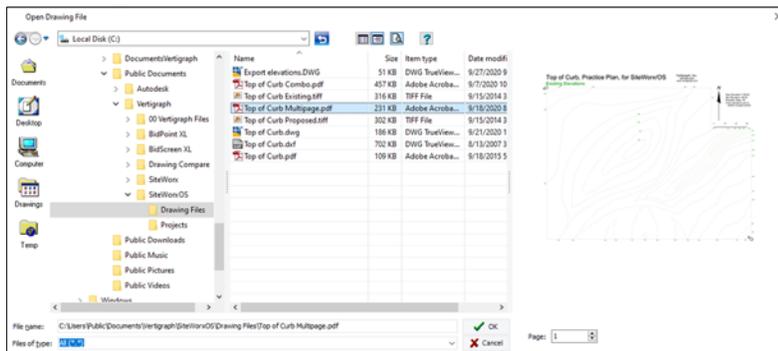
The tutorial drawing file named **Top of Curb Multipage.pdf** is found at **C:\Users\Public\Public Documents\Vertigraph\SiteWorxOS\Drawing Files**. Clicking the **Drawings** icon at the far-left side of the **Open Drawing File** window displays the files in this **Drawings** folder. After finding the **Top of Curb Multipage.pdf** file, click on the file name to display the preview image on the right side. **Please Note:** If the preview does not display, click the **Show Preview** tool on the top-right side of the **Open Drawing File** window.

When working with files that contain multiple pages, the first page of the file will display with the page number found underneath the preview at the bottom-right side of the window . Simply navigate through the pages using the up and down arrows to preview the desired page. This tutorial project uses one file with multiple pages. As a result, after the page 1 preview displays, click the **OK** button at the bottom to open and display page 1 of the drawing file.

The active drawing name and location are shown on the status bar at the bottom right-hand side of the window. How the file is rendered (i.e. either as a PDF, Raster, PDF (Vector) or CAD) is also shown on the status bar. This multiple page file is a vector type PDF file and as a result, will display **PDF (Vector)** on the bottom-right corner of the status bar.

Projects may contain a single drawing file or multiple drawing files or pages. In this tutorial, the existing elevations are found on page 1 and the proposed elevations are on page 2. As a result, page 2 of the file must also be opened and this tutorial project will use **Multiple** drawings. To open page 2 of the file, click the **Open…** command on the **Drawing** section of the toolbar, select the same file and change to page 2 at the bottom-right. After page 2 is displayed, click **OK** to add page 2 to the **Active Drawing** list.

The list of pages and/or drawings opened and available are displayed by clicking the **Active Drawing** command on the top-left side of the **Drawings** toolbar. Page 1 and page 2 should now show on the **Active Drawing** list. Once the desired drawings or pages are opened and properly displayed on the **Active Drawing** list, **DO NOT** change the **Page** number since changing the page number will change the drawings found on the **Active Drawing** list. To change the desired page displayed, simply select the desired page or file from the **Active Drawing** list.

Step 2 - Review the drawing files before starting

After the drawings are opened, review the drawings by selecting the file or page from the **Active Drawing** list to obtain a basic understanding of the project. To review a page that is not on the active drawing list, **right click** overtop the drawing displayed at the **Drawings** tab and select **Duplicate Drawing** from the popup menu and change the desired **Page** number on the **Page** section of the toolbar.

IMPORTANT – Zooming and moving around (i.e. panning) the drawing quickly and easily is critical. Zooming in and out is done through the scroll wheel on the mouse. When zooming with the scroll wheel, the drawing will center on the screen wherever the mouse pointer is placed. The **Zoom to Selection** tool at the **Zoom/Pan** section of the toolbar is also a quick way to zoom. When zoomed in, move (i.e. pan) around the drawing by holding down the **Ctrl** keyboard key while dragging the mouse with the left mouse button depressed. Holding down the scroll wheel also pans the drawing.

When reviewing the file(s) or page(s), determine the area of interest or project boundary where cuts or fills will occur. Where are the existing and proposed elevations different? Are there excluded areas? If there is more than one file or page, are there two common alignment points displayed on each drawing that can be used to align the first drawing opened to the other drawings? Is there anything that needs to be demolished and removed? Is there topsoil strip and respread required? Are project dimensions in meters or feet? Are there bore logs that need to be entered? Is there a known dimension available for auto-scaling? Are the areas flat or not flat? What subgrade material layers need to be placed under each area? Does the grading information come from one file page or does the data come from multiple file pages? If multiple files – are there match lines or common alignment points? In summary, gain a basic understanding of the project by reviewing the drawing(s) before starting.

Step 3 - Set the scale

When working with multiple pages or files, the scale is set only on the first drawing opened which is the first drawing listed on the **Active Drawing** list. As a result, insure the first, Page 1, drawing is selected on the **Active Drawing** list.

This first drawing on the **Active Drawing** list is known as the **Base Drawing**. To change which page or file is the first, base drawing for scaling, select any drawing except the first from the **Active Drawing** list, **right click** the mouse over the desired drawing and select **Make Base Drawing** from the popup menu.

To set the scale, select the first drawing on the **Active Drawing** list (i.e. the Base Drawing) and then click the **Scale** button on the **Scale** section of the toolbar.
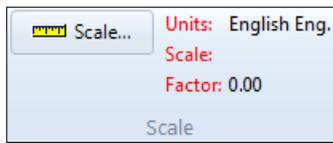
After clicking, a message will recommend autoscaling. To ensure accuracy, Autoscale should be used on all drawings.
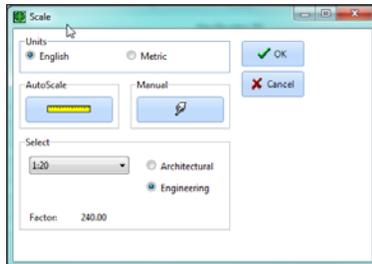
The scale units are defined as either **English** or **Metric** units. When **Metric** is selected, volumes are calculated as cubic meters rather than cubic yards, areas are reported as square meters instead of square feet and lengths are in meters instead of feet.

To set the scale for this tutorial, select **English** and **Engineering** and click the yellow ruler, **AutoScale** button, and the drawing appears. Single click (do not trace) the beginning and end points of the 0 to 60 scale legend located on the right side of the drawing under the direction arrow. After clicking the second point, enter the length of the line as **60** in the distance box on the toolbar and then click the green checkmark **OK** button on the **Scale** section of the toolbar. English auto-scale scale lengths are entered in decimal feet. For example, 25 feet, 6 inches is entered as 25.5 feet.

After entering the distance and clicking **OK**, the scale factor displays. For general information, when English scales are selected, the true scale factor is equal to the reciprocal of the scale times 12. A true 1:10 scale will have a factor of 120, a true quarter inch scale will have a 48 factor. Rarely does the scale factor created using **AutoScale** calculate the true, actual scale. For example, if the factor shows 479.87 after auto-scaling and the scale on the drawing shows 1:40, selecting the 1:40 scale from the drop-down list will change the factor to an even 480 which is the true and proper factor for a drawing with a true 1:40 scale. It is recommended that the calculated scale factor be compared to the factor that is generated by selecting the scale noted on the drawing. If the calculated scale factor is close to that factor, select the scale from the drop-down list. Otherwise use the calibrated scale factor. Since this autoscale factor is not close to any of the typical scales, click **OK** to accept the factor as calculated.

Step 4 - Align the drawings when multiple pages or files are opened

Aligning the drawings is only required when the project contains more than one file or page. Many projects consist of a single PDF or DWG drawing file or page. A single file or page does not need to be aligned. Since this tutorial uses two (i.e. multiple) pages where the existing elevations are displayed on page 1 and the proposed elevations are on page 2, these pages must be aligned to each other by clicking the **Align Dwg.** command.

To define the alignment points, first select the first drawing opened, which is known as the base drawing, and click the **Align Dwg** command on the **Alignment** section of the toolbar at the **Drawings** tab**.** When the drawing appears, click on two common alignment points. For this tutorial, move to the top left corner of the drawing and single click the corner inside the conveniently placed **A** circle. Next, move to the bottom right corner and click inside the **B** circle. After clicking the two alignment points, move to the **Align** section of the toolbar and click the green checkmark **OK** button. The alignment points are displayed overtop of the drawing at the **Drawings** tab. The red mark reveals the first alignment point, the blue mark shows the second alignment point. After page 1 is aligned, change to

page 2 by clicking **Active Drawing** on the **Drawing** section of the toolbar, click **Align Dwg**. and align page 2 to page 1 by clicking on the same two alignment points in the same manner.

Alignment points should generally be the top left and bottom right of an identifiable object. In this tutorial, the alignment points are conveniently noted as **A** and **B**. Sometimes alignment points are not as obvious as this tutorial. For other projects, the top left and bottom right corners of a slab, parking area or property limits may be ideal alignment points. The alignment points must be common on all of the drawing files or pages. Each project has unique alignment point locations that must be digitized whenever a project uses multiple files or pages.

Alignment points are required when there are multiple drawings with the same footprint. Sometimes multiple files/pages will display a match line with different footprints. For drawings with match lines, there are as many commercially available software products that stich together multiple pages along the match lines to create one large stitched together file.

Step 5 – Defining Control Points for Importing or Exporting Elevations

Setting control points are not required and will not be input for this tutorial. However, if two control points are recorded to the drawing file at the **Import/Export** section of the **Drawing** toolbar, GPS information can be imported or exported for machine control. Control points are used to link the drawing file to real world GPS coordinates when exporting surface model points for machine control, exporting the takeoff as a DWG file or importing GPS points from a CSV file.

Preferably, two control points are defined. The points define the scaling and rotation information necessary for the export/import. If only one control point is available, the North/South direction must be defined. For each control point, the northing and easting distances from the origination point are entered. Negative northing and easting values indicate a position due south and west of the origin, respectively.

Step 6 – Save the File

When done scaling and aligning the drawings at the **Drawings** tab, save the file by clicking the **File** | **Save Project** command. Please note that changes to the project file are not automatically recorded. Like Excel, data is initially stored in memory until the changes are saved to the drive or cloud. As a result, it is a good idea to save the project file frequently.

Please note that a backup file is created when saving the project. This backup file will be located in the same folder as the original project file. The original SiteWorx/OS project file has a **.ves** extension. The backup file will have the same name with a **.~ves** extension. When using the Windows File Explorer application (access File Explorer by right clicking on the Windows Start button) ensure that **File name extensions** checkbox is checked under the **View** menu. To use the backup, you'll need to rename the backup file. To rename the backup file, right click on the file in File Explorer, select **Rename** where you'll modify the file name and delete the "~" character in the file extension. After renaming the backup file, you can then open this backup file in SiteWorx/OS if needed.

F.   Takeoff Tab

The **Takeoff tab** is where the data from the drawing files are input into SiteWorx/OS. When building the project file, the majority of time is spent at this **Takeoff** tab.

Step 7 – Understand the Takeoff Tab Toolbar
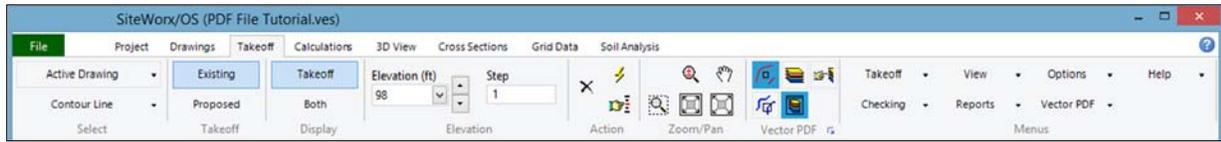
Understanding how the takeoff toolbar works is critical. The sections of the toolbar are discussed moving from left to right. The various section names: **Select**, **Takeoff**, **Display**, **Elevation**, **Action**, **Zoom/Pan**, **Vector PDF**, and **Menus** are noted at the very bottom of the toolbar.

Select

The left side of the toolbar is where you change and select the **Active Drawing** from the list when using more than one file or page.

The button underneath the **Active Drawing** button with the drop-down arrow displays a list of takeoffs available for selection. Initially, **Project Boundary** displays since the boundary is always taken off first.
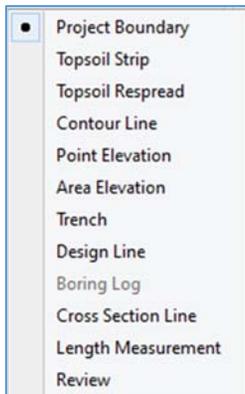
The takeoff process involves selecting the item to takeoff from the list and then recording the relevant data from the drawing file pertaining to the selection.

Takeoff

After selecting the object from the list, move to the right along the toolbar and select the **Takeoff** type. The takeoff type will be **Include** or **Exclude** for regions (a region is a project boundary, topsoil strip or topsoil respread area). The **Takeoff** for all other objects will be either **Existing** or **Proposed**.

Display

Whatever is selected as the **Takeoff** to the left, the **Display** section of the toolbar provides the option to display only the selected takeoff type noted to the left or both takeoff types. When **Both** are selected for elevation items, the screen will display the existing and proposed elevations for the object at the same time. If a region object is selected (i.e. topsoil strip, topsoil respread or project boundary), **Both** displays the included and excluded regions. The **Project Boundary** is always displayed for all selections.

Elevation

When digitizing contour lines, the elevation must be input on the toolbar whenever the **Options** menu | **Show Properties/Elevation Dialog** command is turned off. Normally the **Options** menu | **Show Properties/Elevation Dialog** command is turned on (i.e. checked) for everything except contour lines. If the **Show Properties/Elevation Dialog** is turned off for contour lines, please make sure this command under the **Options** menu is turned back on when digitizing areas, points or anything else.

Next to the elevation box, a step value is entered and usually has a value of 1. Instead of typing in the elevation for each contour line, it is quicker to increase and decrease the elevation by the step value.

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When clicking the increase or decrease elevation command from the right mouse popup menu or by using the keyboard shortcut keys (**F11** keyboard key is set to decrease elevation by the step value and the **F12** keyboard key increases the elevation by the step value), the contour line ends and the elevation changes by the value in the step box.

Action

Action tools on the toolbar are important.

Start Takeoff must be clicked to digitize items. The mouse will change from a typical mouse pointer to one of the following:

This mouse pointer is used to digitize pixels on screen and is the typical method to record items from a raster file. This mouse pointer displays when working with raster files and both **Auto Trace** and **Easy Trace** are turned off. When working with Vector or CAD files, this cross-hair displays when the **Select Entity** and **Snap to Entity Point** commands are off.

When working with vector files, the mouse pointer changes to a small selection box when **Snap to Entity Point** or **Select Entity** is turned on at the **Vector PDF** or **CAD** section of the **Takeoff** tab toolbar.

The mouse pointer changes to this shape when **Auto Trace** is turned on under the **Raster/PDF** menu. **Auto Trace** is available only for raster type files and is not available with vector type files. Prior to using **Auto Trace**, the background color must be defined by clicking on the drawing background after selecting the **Raster/PDF** | **Background Color** command. Auto Trace may be useful when recording contour lines from raster type files. Auto Trace draws the line by clicking on three points along the contour line (start of line point, direction indicator point along the line which is around 1" from the start of the line point and end of line point). Auto trace may not work when there are many intersecting lines along the contour line however. If it works, great. If not, don't use it.

The mouse pointer changes to this shape when **Easy Trace** under the **Raster/PDF** menu is turned on. **Easy Trace** is a simplified way of tracing lines from raster files. When approaching an intersecting line using **Easy Trace**, simply click over the line. To use **Easy Trace**, the background color must be defined by clicking on the drawing background after selecting the **Raster/PDF** | **Background Color** command.

Stop Takeoff. When the **Start Takeoff** action is on, this button stops the takeoff and returns the pointer to mouse mode. The project can't be saved if **Start Takeoff** is activated. As a result, click this **Stop Takeoff** command to save the file.

Delete last point. If a mistake is made when digitizing, this button deletes one point with each click. Clicking this button ten times in a row deletes the last ten points. Pressing the **Alt** + **Backspace** keys on the keyboard also deletes the last point.

**Select an Object.** To select an object for modification or deletion, click **Select an Object** from the **Action** section of the toolbar and move the square mouse pointer over an actual point in the object. The object changes color whenever the square mouse pointer is over a point. When the object changes color, **left click** on the point to select the object. For lines, a point is always found at the beginning and

end of the line. There may be no points in the middle of the line, the ends of the line always contain a point. For areas or regions, a point is always found on a corner. This command can also be activated by clicking the right mouse button.

After selecting, the chosen item's properties are deleted or changed on the far-right side of the window. After editing a selection on the right side of the window, click the green checkmark ☑ on the top right side of the window to record the changes. Clicking the second red X ✖, located to the immediate right of the green checkmark, deletes the object. **Important:** The far-right side of the SiteWorx/OS Takeoff window is only used to delete or change the selected object.

Zoom/Pan
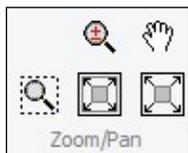
Zoom to selection zooms and enlarges the selected area. After clicking, hold down the left mouse button to zoom over a selected rectangle.

This command activates the zoom commands. After clicking this command, left click the mouse to zoom in, **right click** the mouse to zoom out. Click this tool again to turn off zooming. Zooming is quicker using the scroll wheel on the mouse or by holding down the **Shift** key on the keyboard while clicking.

Pan enables movement around the drawing. The mouse pointer will change to a hand after selecting this tool. Once this tool is activated, click it again to turn off panning. Panning is faster by holding down the **Ctrl** key on the keyboard while dragging and dropping the mouse with the left mouse button depressed. Holding down the scroll wheel on the mouse also pans the drawing.

Fit Project in Window will resize the drawing so that the **Project Boundary** fits inside the window. A **Project Boundary** must be defined for this command to work.

Fit Drawing in Window will fit the entire drawing inside the window.

Vector PDF Section of Takeoff Toolbar

The **Vector PDF** section of the toolbar displays whenever a vector PDF file is open. This **Vector PDF** toolbar section will not display when working with any other file type that is not a vector PDF. Remember, not all PDF files are vector, some PDF files are raster drawings. A menu with similar commands, entitled **Vector PDF**, is also added to the **Menus** section of the toolbar.

The buttons found on the **Vector PDF** toolbar section include:

Display the Layer List button shows the vector file layers on the left side of the screen.

Display Layer Dialog presents a pop-up window of the layers. This dialog is not needed when the **Layer List** is displayed.

Select Layers is used to identify and isolate a layer from the PDF file. After clicking on the **Select Layers** button move the red, square selection box over an object/entity point and once the entity is highlighted, click the right mouse button to display the popup menu.
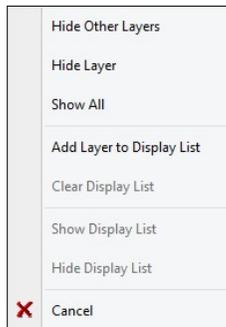
Here you can **Hide Other Layers** except the selected layer. Layers may be added to a display list that contains several layers. Layers can also be isolated from the layer list presented on the left side of the screen when the **Display Layer List** command is depressed on the toolbar. **Please note -** that after using the select layer command, you must turn off this **Select Layers** command on the toolbar before digitizing.

When working with vector PDF files, the user has three options in how the items are taken off from vector PDF files: 1) digitize pixels on screen like a raster file by turning off **Select Entity** and **Snap to Entity Point** 2) **Select Entity** or 3) **Snap to Entity Point**.

Select Entity should be turned on when working with contour lines. When clicking on the line, the entire polyline will be selected when **Select Entity** is depressed.

Snap to Entity Point snaps to a single point within the entity/object. **Snap to Entity Point** is ideal for digitizing areas or dashed contour lines that contain many segmented lines. When **Select Entity** and **Snap to Entity Point** are both turned off, the items on the screen are digitized just like any other raster file.

Enable/Disable PDF Append is useful when digitizing dashed contour lines that consist of individual lines instead of a polyline. After selecting this command with **Select Entity** or **Snap to Entity Point** turned on, click along the dashed contour line to append the many dashed lines as a single contour line

CAD Section of Takeoff Toolbar when CAD, Vector files are opened

The **CAD** section of the toolbar displays whenever a Computer Aided Design (CAD), vector type file is opened. CAD file extensions include DWG, DWF and DXF. With AutoCAD files, a **CAD** menu is also added to the **Menus** section of the toolbar.

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The commands found on the CAD section of the toolbar are similar to the Vector PDF toolbar commands noted above except an additional command is found on the CAD toolbar that imports the select layer information into the takeoff. This **import from drawing into takeoff** command is extremely valuable when working with AutoCAD DWG files and is covered in the chapter entitled "Importing objects and elevations from DWG files".

Raster/PDF Section of Takeoff Toolbar when raster files are opened


Three commands are found on the Raster/PDF toolbar: 1) **Enable Auto Trace** 2) **Enable Easy Trace** and 3) **Select Background Color**. These commands may be useful, or not, when taking off contour lines from raster type files. With auto trace and easy trace, SiteWorx/OS looks for the contrast between the line color and the background color. As a result, the background color must be defined before using Auto Trace or Easy Trace. Once the background color is defined by clicking on the background of the drawing, **Auto Trace** takes off the whole line with three clicks: 1) start of the line 2) an inch away along the line to define the initial direction of the line and 3) end of line.

Easy Trace, on the other hand, matches the digitized line to the plan by dragging the mouse near the line with the left mouse button held down.

Menus

Seven menus are available on the right-side **Menus** section of the **Takeoff** tab toolbar: **Takeoff**, **View**, **Reports, Help, Checking** and **Options**. Additionally, one of three file type menus will be added. A **Vector PDF** menu is added when a vector PDF file is opened. A **CAD** menu is added and available whenever a vector, type computer aided design file is opened such as AutoCAD DWG. And finally, a **Raster/PDF** menu is available when the file opened is a PDF type raster file or another type of raster file. As noted previously, click the **F1** keyboard key or click the Help button 🔘 in the top right-hand corner of the window and then click on the menu with the question mark mouse pointer to learn about the various sub-menus.

Step 8 - Digitize the Project Boundary
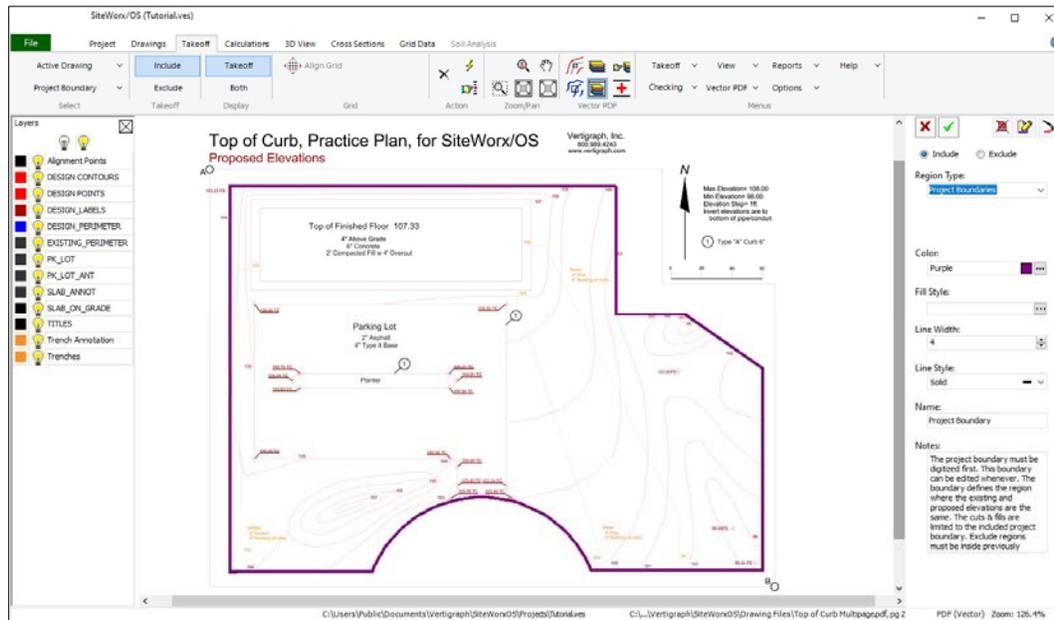
The project boundary must be digitized before anything else. Please note:

☐ Ensure that Page 2, which displays the proposed elevations, is the **Active Drawing** in the **Select** section of the toolbar. **Note:** the project boundary should always be digitized from the drawing file that shows the proposed contour lines. **Project Boundary** should be chosen from the **Select** list box found underneath the **Active Drawing** button. Next, click on **Include** at the **Takeoff** section of the toolbar which is to the immediate right of the **Project Boundary** selection. The cut and fill volumes are limited to the Include region.

Please note: although there are no excluded project boundaries in this tutorial, SiteWorx/OS can exclude certain regions from the included project boundary by selecting **Exclude** and then digitizing the excluded region inside a previously digitized **Included** Project Boundary. Excluded regions must be contained within included regions and must be digitized after the included Project Boundary is recorded.

☐ The Project Boundary is where the cuts and fills are calculated. Inside the project boundary existing elevations should be different from the proposed elevations. Again, no cuts and fills are calculated outside the included project boundary. When digitizing the project boundary that is not defined with clear boundary lines, click on the end of each proposed contour line which should be where the proposed contour meets up with the existing contour line.

☐ The included project boundary is the region where the proposed elevations are different than the existing elevations. Again, the project boundary is normally defined on the file or page that contains the proposed elevations (i.e. page 2 in this tutorial).

☐ To digitize the project boundary, click the lightning bolt **Start Takeoff** button located at the **Action** section of the toolbar. The mouse pointer will change to a cursor crosshair when **Select Entity** and **Snap to Entity Point** are not depressed on the **Vector PDF** section of the toolbar. When digitizing the project boundary, do not depress **Select Entity** or **Snap to Entity Point**.

☐ In this example, click on any corner of the blue project boundary line. A **Region Properties** dialog box will display after clicking the first point where information about the project boundary is entered. At the dialog box, change the line width to 3 and click the **OK** button. Please note, this dialog box displays only when **Show Properties/Elevations dialog** is checked under the **Options** menu on the toolbar. After clicking the first corner, click on each change of direction (i.e. corners) while moving

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around the project boundary either clockwise or counterclockwise. Do not trace the boundary line.

☐ To digitize around a curve, simply click in small increments around the curve or, better yet, press the right mouse button and select the **Arc** command followed by a click along the curve and another click at the end of the curved line. The Arc command is also quickly activated by the keyboard shortcut of **Alt+A**. In summary, after digitizing one point, activate the Arc command by the keyboard shortcut keys **Alt+A**, and then click on two points around the curve to draw a curved line.

☐ When done digitizing the last corner of the project boundary, press the right mouse button **Stop Takeoff** command. This boundary will close back to the first point digitized and the mouse pointer will change to a typical mouse pointer.

☐ After stopping the takeoff, information about the project boundary is found on the right side of the screen.

☐ After digitizing the project boundary, it is a good idea to verify that the project boundary is properly placed over all the drawing files to make sure your alignment points were properly recorded per Step 4 above. Change the drawing by clicking on the **Active Drawing** selection on the toolbar to verify that the boundary is properly located on each file or page.

☐ The **Align Grid** button at the **Grid** section of the toolbar is not used with this tutorial. Information about this command is available clicking **F1 Help**. However, for future knowledge and use, the **Align Grid** button aligns the grid to a side of the project boundary or to a selected point. The **Align Grid** command is only available for the first drawing opened (i.e. the base drawing). Aligning the grid may be required when exporting stake or GPS data. If the grid is not shown overtop the drawing, click on the **View** menu | **Takeoff Grid** to display. The grid size spacing is set at the **Calculations** tab. After clicking the **Align Grid** button, the project boundary can be aligned with the grid lines or to a selected point, such as a slab corner. If aligning the grid to a point, make sure the desired point has been recorded as a **Point Elevation** at the **Select** section of the **Takeoff** tab toolbar. Then at the **Point Elevation** window select the desired point using the **Select an Object** tool from the toolbar. After selecting the point, select the **Project Boundary** and press the **Align Grid** button to align the grid to this selected point.

Step 9 - Digitize Contour Lines

After digitizing the Project Boundary on page 2, change the active drawing to page 1, select **Contour Line** from the **Select** drop down list. The existing contour lines on page 1 and the project boundary should now display.

Before digitizing contour lines, click on the **Options** menu and make sure the **Show Properties/Elevation dialog** is unchecked and turned off (this command should be turned on for everything but contour lines). Next, select **Existing** as the **Takeoff** and type in **98** in the **Elevation** box with a **Step** value of **1**. The Display section of the toolbar should be set to **Takeoff**, not **Both**.

When working with a vector file, the contour lines can be taken off in three different ways:

1) Click along the line with the mouse by clicking on the change in direction inflection points. **Select Entity** and **Snap to Entity Point** must be disabled on the **Vector PDF** section of the toolbar.

2) Use the **Select Entity** tool where the contour line from a vector file is taken off with a single click. The Enable **PDF Append** command is also useful with **Select Entity**

when taking off dashed contour lines.

3) The **Snap to Entity Point** tool may be used with the **Enable PDF Append** command to connect multiple lines contained in a dashed contour line. In this tutorial, this command will not be used since the contour lines are polylines. not segmented lines.

This tutorial will demonstrate all of the methods noted above. Item 1) above is how items are digitized from raster files. When performing the takeoff, you'll determine which method is best for the specific drawing file. The **Select Entity** and **Snap to Entity Point** commands are only available if the drawing is a vector type. On many projects, using more than one method is common.

Method 1 – Click on the change of direction on the contour line

First, using method 1 noted above, please ensure that the **Select Entity** and **Snap to Entity Point** buttons are not on or depressed at the **Vector PDF** section of the toolbar. Also, the **Elevation** should be at **98**, **Step** should be **1** at the **Elevation** section of the toolbar and the first command under the **Options** menu should be unchecked or turned off. Next click the ⚡ **Start Takeoff** button on the **Action** section of the toolbar to begin digitizing on the end of the contour line.

Since the contour lines are changing in foot increments, it is quicker to change the elevations by using the step value defined on the toolbar rather than typing the elevation for each line. Click on the change of direction along the 98-foot contour located at the bottom right corner of the drawing and when done digitizing along the 98 line, increase the elevation value by pressing the **F12** keyboard shortcut key. Elevations are decreased by the step value by pressing the **F11** keyboard shortcut key. Whenever the elevation is changed the line will end. Next, click on the beginning of the 99-elevation contour line and click along the line and repeat the above same steps.

Practice digitizing the contour lines using method 1 from the bottom right corner up to the 102-elevation line while using the right mouse button or **F12** and **F11** keyboard keys to increase and decrease the elevations by the step value.
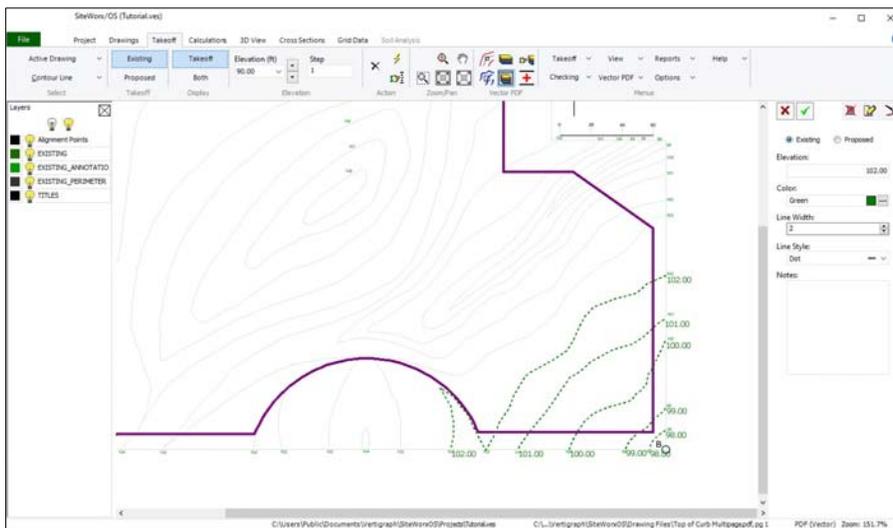
Please remember, zooming is best done using the scroll wheel on the mouse and moving around the drawing (i.e. panning) is performed by holding the keyboard **Ctrl** key while dragging the mouse. Practice moving around, panning, changing elevations and recording contour lines.

If you digitize incorrect points, click the **Delete last point** button on the **Action** section of the toolbar or press the **Alt+Backspace** keyboard shortcut keys. To end one line and start a new line with the same elevation, **right click** the mouse and select **New Object** from the popup menu. After digitizing the 102-contour line, **right click** the mouse and select **Stop Takeoff** or click the red X ❌ in the

Action section of the toolbar.

The properties for the last item digitized are shown on the right side of the window. Here the elevation and/or other properties can be changed or the entire line can be deleted. To record any changes made on the right side of the window, click the green checkmark on the top right side of the window ☑ to record the change(s). To select a contour line for modification or deletion, click on the **Select Object** tool 🖼 from the **Action** section of the toolbar and move the square selection box over a point within the line (please note that points are always found at the beginning and end of every contour line) and when the line is highlighted, left click to select that line. To delete the selected line that is now displayed on the right side of the window, click the red X button 🗙 located to the right of the green checkmark on right side of the window.

Method 2 – Select Entity

The remainder of the existing contour lines will be digitized using the **Select Entity** feature as noted in method 2) listed previously. Now that some of the existing contour lines have been recorded using the raster file takeoff method, the remaining contour lines will use the select entity, vector file method.
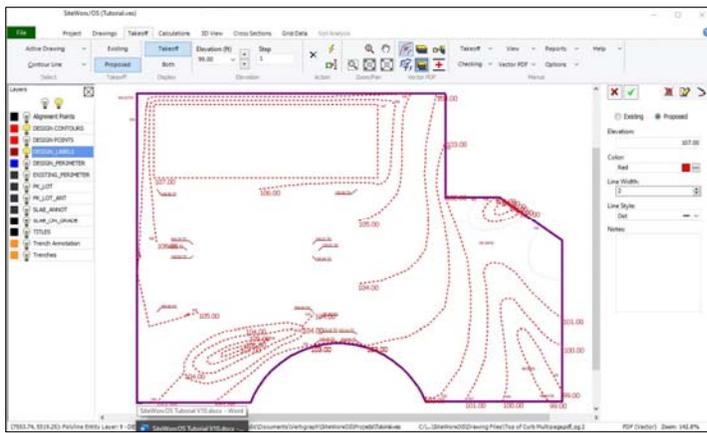
To digitize the proposed contour lines with the **Select Entity** setting, insure **Select Entity** 🔳 is clicked on the **Vector PDF** section of the toolbar. Finally, change the elevation at the **Elevation** section of the toolbar to 103 and make sure the **Step** value is set to **1**. Now click **Start Takeoff** on the **Action** section of the toolbar to begin.

The mouse pointer will display a box when **Select Entity** is turned on. Move the selection box over a point in the 103' contour line and left click on the line to takeoff the entire line. When done, use the **F11** keyboard key to decrease the elevation by the step value to 102'. Click the 102' contour line to takeoff the entire line. Continue to increase or decrease the elevations using the **F12** and **F11** keyboard shortcut keys or the right mouse button popup menu and then click on the line. Using **Select Entity** for contour lines from vector PDF files demonstrates the superiority of vector files over raster files when performing the takeoff.

When done with all of the existing contour lines, click **Stop Takeoff** from the right mouse button popup menu or from the **Action** section of the toolbar and then change the Active Drawing to Page 2 to digitize the proposed contours. Remember the **Takeoff** should be changed to **Proposed** on the toolbar ribbon before digitizing the proposed contours.

Before digitizing the proposed contours, lets isolate the proposed contour lines and elevations layers from the page 2 vector PDF file by performing the following:

a) Make sure the layer list is displayed on the left side of the window 🗎. If not, depress the **Display Layer List** command at the **Vector PDF** section of the toolbar.
b) Next, click the **Select Layers** command from the **Vector PDF** section of the toolbar 🖼.
c) Move the square selection box over the end of a red proposed contour line.
d) When the contour line is highlighted, right click the mouse and select **Hide Other Layers**.
e) Display the proposed elevations by moving over to the layer list on the left side of the window and click the light bulb to display the **DESIGN_LABELS** layer.
f) Turn off this select layers command by clicking on the **Select layers** command again before digitizing.

Like the existing contour lines, simply set the elevation and then click on a point in the proposed contour line to takeoff the entire line. When done with the contour lines, turn on all layers by clicking the yellow lightbulb at the very top of the layers list on the left side of the window.

Method 3 – Snap to Entity Point

When taking off contour lines from vector files, **Select Entity** is usually the preferred method. Sometimes however, the drawing has a collection of lines along the contour line rather than a single polyline. If you come upon a contour line that contains many small lines or entities, change from **Select Entity** to **Snap to Entity Point** on the **Vector PDF** section of the toolbar. Additionally, the **PDF Append Mode** should be turned on when digitizing contour line segments.

Snap to Entity Point is also the preferred method to takeoff areas from vector files. This **Snap to Entity Point** takeoff method will be demonstrated when recording the proposed areas.

Step 10 – Digitize Point Elevations

Page 2 on the Active Drawing contains point elevations. After digitizing the proposed contour lines, select **Point Elevation** from the **Select** section of the **Takeoff tab toolbar**. Click **Proposed** as the **Takeoff** type. Turn off **Select Entity** and **Snap to Entity Point** on the **Vector PDF** section of the toolbar. When taking off points, turn on at the **Options** menu | **Show Properties/Elevation Dialog**. Finally, 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 circle. Simply click on the point and then enter the elevation followed by the **Enter** key on the keyboard. Using the number keyboard, rather than the mouse, to record elevations into the Properties/Elevation Dialog will increase your data entry speed. Digitize the top of curb elevation points around the parking lot. When done digitizing all of the point elevations, click the **right mouse** button **Stop Takeoff** command to return to mouse mode.

Step 11 - Record Sloping Design Lines

A design line is a sloping line where the end points will have different elevations. Between the end points, a series of increasing or decreasing elevation points are created along the design line. Points found in contour lines and point elevations that are closest to the design line will connect to the points created along the design line.

On many projects, design lines are not needed since the contour lines and point elevations will properly model the surface. Users should determine if design lines are needed in certain locations only after looking at the 3D model noted at the 3D View tab.

In this tutorial, after looking at the **3D View**, design lines are used to define the slope of the parking lot. When recording a **Design Line**, the **Show Properties/Elevation Dialog** under the **Options** menu should be turned on. After selecting **Design Line** and **Proposed** Takeoff from the **Takeoff** tab toolbar, click the **Start Takeoff** button and after clicking on the end point of the line, type in the elevation and press the **Enter** key on the keyboard. Click on the other end point of the line and enter a different elevation followed by the **Enter** keyboard key. All points generated along the design line will have different elevations that will slope. Design lines should not cross.
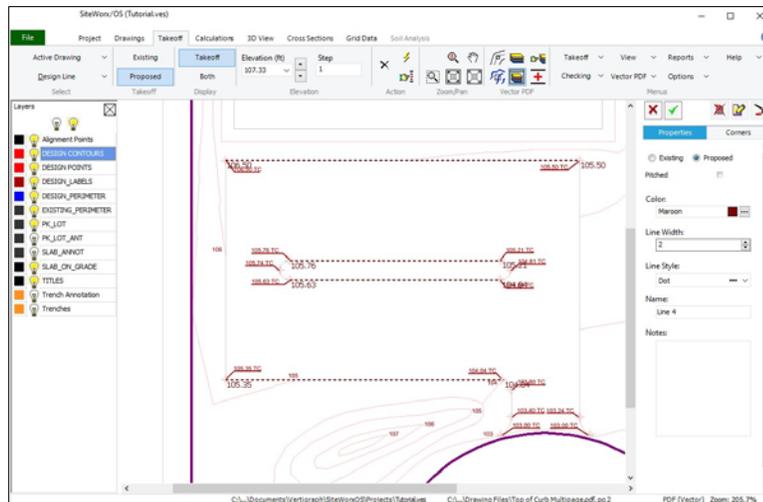
When recording design lines with the **Options | Show Properties/Elevation Dialog** checked, the elevation of the points contained in a design line may be calculated based on a slope by checking the **Pitched** check box. After clicking the **Pitched** check box, enter either a rise and run value or a percentage. For lines the slope downwards, the slope % or rise value will be negative. This tool is helpful in determining the end point elevations of a line with a constant slope.

After entering points from contour lines, point elevations and sloping design lines, the points connect to each other in all directions to create a 3D surface model. Proposed points do not extend outside the project boundary. If there is only one proposed point, the entire proposed site will be flat at the elevation of that one point.

Step 12 – Record Areas

With SiteWorx/OS, the existing and proposed surface models are initially created by connecting the individual points to each other in all directions. Any point located in a contour line, design line or point elevation will connect to the next closest point in all directions. The surface model is initially created by connecting elevation points. After the 3D surface model is created by connecting points, the areas are then placed overtop of the surface model as a geometric plane.

Please note there are four area types: **Surface**, **Basement**, **Subgrade Only** and **Other**. Before digitizing an area from the plan, please determine the area type.

1. A **Surface** area, such as a building slab, is for flat areas that are near grade at a specified elevation.

2. A **Basement** area type is for flat areas below grade. **Surface** and **Basement** areas are the same except that a contour line is drawn around the perimeter of a **Surface** area where the elevation points from the contour line will slope to the closest elevation points outside of the **Surface** area. A **Basement** area, on the other hand, will be dropped down to the specified elevation, and the walls will be straight up. The perimeter of a **Basement** does not slope or connect to the closest elevation points like a **Surface** area.

3. A **Subgrade Only** area is used for non-flat areas, such as parking lots and sidewalks. The elevations over a **Subgrade Only** area will be reduced by the subgrade layer depths that are entered. The elevations of a **Subgrade Only** area, before being reduced by the layer depths, are initially determined by the elevation points (i.e. contour lines, point elevations or design lines) previously entered.

4. An **Other** area type is used to calculate areas, perimeters and layer volumes. Other areas have **NO** effect on the 3D model or the cut and fill volumes. **Other** is used for measuring only.

Again, before digitizing the area, determine the type of area being taken off. Is it a **Surface Area** or a **Subgrade Only** area? Again, flat slab areas are **Surface** areas, flat areas below grade are **Basement** areas and non-flat areas are usually **Subgrade Only** areas. When digitizing areas, the **Show Properties/Elevation Dialog** should always be checked under the **Options** menu.

Digitizing a Flat Surface Area

Select Page 2 as the **Active Drawing** on the **Select** section of the **Takeoff** tab toolbar to display the proposed elevations drawing file.

Isolating design layers from vector files eliminates drawing information that is not needed or relevant to the current takeoff. Again, isolating drawing layers is a key advantage of vector files. To isolate a vector layer (e.g. the slab on grade) please insure that **Display the Layer List** is turned on at the **Vector PDF** toolbar. The width of the layer list on the left side of the window is adjusted by moving the mouse pointer to the edge of the list and once the pointer changes to a double headed arrow, drag the edge of the layer list window to resize.

Click the **Select layers** button on the **Vector PDF** toolbar and then move the red square mouse pointer over a corner of the building slab. When the perimeter line is highlighted, **right click** the mouse to obtain a popup menu of layer commands.

Hide Other Layers
Hide Layer
Show All
Add Layer to Display List
Show Display List
Clear Display List
Cancel
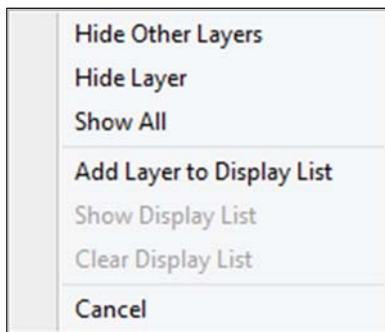
To display the selected layer only, select the **Hide Other Layers** command from the popup menu.

Please note that several layers could be added to a display list by clicking on the **Add Layer to Display List** command. After the desired layers have been added to the Display List, click **Show Display List** to show this collection of layers. The created display list is used when you want to show two or more layers at the same time. For example, a display list could be created for the proposed slab, parking lot and annotations.

After the building slab displays, move to the layer list on the left side of the window and turn on, by clicking, the light bulb for **Slab Annotation**, **Pkg lot** and **parking Lot Annotation** layers. Four layers should now be displayed. Please note, the yellow light bulb on the top of the left side layer list displays all of the layers. The white light bulb at the top, turns off all layers.

Important - When done selecting the desired layers, turn off the **Select Layers** command on the **Vector PDF** section of the toolbar and click on the **Snap to Entity Point** command. This area takeoff will demonstrate how the **Snap to Entity Point** method works with a vector file.

To digitize areas, select **Area Elevation** from the **Select** section of the toolbar at the **Takeoff** tab. Next, select **Proposed** as the **Takeoff**. Click **Start Takeoff** on the **Action** section of the toolbar and then click the first corner of the slab to display the **Area Elevation Dialog**.

At the **Area Elevation Dialog** type in **107.33** as the proposed finish floor elevation, click **proposed** and select **Surface** as the **Area Type**, enter **4** as the **Overcut** length in feet, enter **.33** as the **Above Grade** value, change the color and fill pattern, and finally, **Name** the area as "**Slab on Grade FFE 107.33**" and then click **OK**.
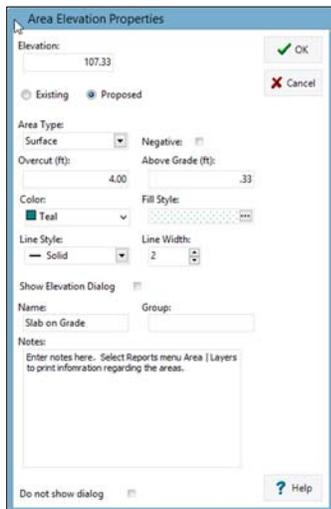
To digitize the building area, click on four corners, which will snap to the corner point, either clockwise or counter clockwise around the slab, and then press the right mouse button and select **Stop Takeoff** to complete. There is no need to digitize back to the first point. When stopping the area takeoff, the area will automatically close to the first point.
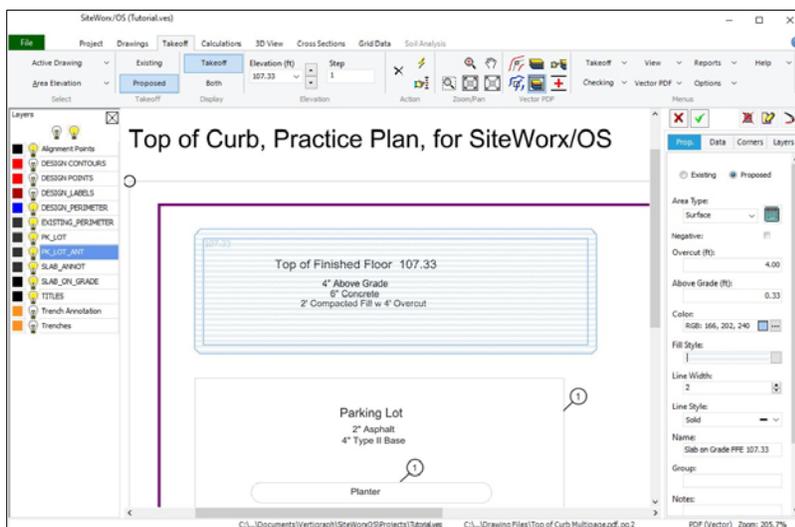

Any of the information improperly recorded at the **Area Elevation** dialog may be changed on the right side after the area is completed. To save any changes made on the right side, click the green checkmark ✓ found on the top right-hand side of the window. The entire area can be deleted by clicking the 🗙 to the right of the green checkmark.

The material subgrade layers under the slab are input by clicking the **Layers** tab on the right side of the window.

Click the **Layers** tab and create two layers: Concrete and Select Fill should be typed in the Material boxes. The depth of the concrete should be .5 and the depth of the select fill should be 2 feet. The select

fill should also be applied to the overcut area by checking the **Include Overcut** box by scrolling to the right side of the layers list.
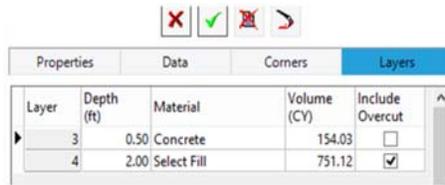

Please note the following regarding the **Layers** tab:

☐ The width of window is changed by moving the mouse pointer to the left edge of the window near the up and down scroll bar. Once the pointer changes to a double headed arrow, drag and drop the window width.

☐ To add, delete and record layers, use the buttons at the bottom. Moving, up or down, off the layer record also records any changes.

☐ If the layers are spelled consistently, the layers for all of the areas will be totaled under the **Reports** | **Material Volumes …** menu.

☐ If an area has on overcut value greater than 0 at the **Properties** window, the material layer can be applied to the larger overcut area by checking the **Include Overcut** checkbox. When **Include Overcut** is checked, the volume of backfill is also calculated.

☐ The layer and backfill volumes are not included in the fill volumes shown at the **Calculations** tab.

☐ The **Reports | Area | Layers** report discloses the layer volumes that need to be added to the site.

☐ Layer details may be copied from the last area digitized by clicking on the **Options** menu | **Copy Area Layer Info | Always**.

Digitizing a Non-Flat Subgrade Only Parking Area

To digitize a non-flat area, such as the parking lot or sidewalk, select **Area Elevation** from the drop-down list box at the top of the **Takeoff** window. Next, select **Proposed** as the **Takeoff**, click the **Start Takeoff** command from the **Action** section of the toolbar, and click the first corner of the parking lot to display the **Area Elevation Properties** dialog box. If SiteWorx/OS asks about copying the layers from the last area, click **No**.

When recording non-flat areas like parking lots or sidewalks, the elevation of the digitized area will be reduced by the subgrade layers depth. As a result, elevations are not needed or used for **Subgrade Only** areas. At the **Area Elevation Properties** dialog box ignore the elevation box and change the proposed **Area Type** to **Subgrade Only**, change the color, fill pattern and name the area as "**Parking Lot**".

Simply click on the change in direction as you move clockwise or counterclockwise around the parking lot. Click in small increments around the curve at the bottom of the parking lot or input the curved line using the **Arc** command. To activate the **Arc** command, **right click** the mouse and select **Arc** or press **Alt+A** shortcut keyboard keys. After activating the **Arc** command, click anywhere along the curve followed by a click on the end of the curve. To correct a mistake, click the delete last point command from the **Actions** section of the toolbar or press the keyboard **Alt+Backspace** keys (twice for arcs). When done digitizing the parking lot, click the **Stop Takeoff** command to complete.
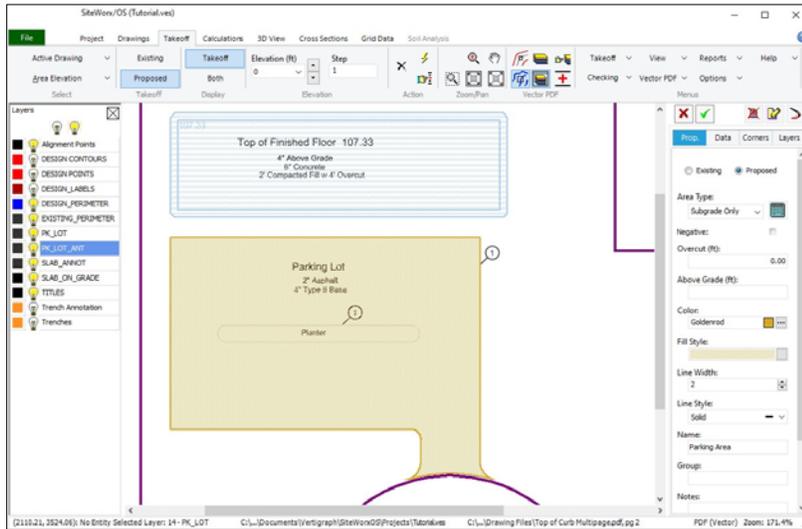
Please note the following about Subgrade Only areas:

- If changes need to be made, select the area and change any of the information on the right side. After changing information on the right side click the green checkmark at the top right ☑ to record the changes.

- Click the **Layers** tab on the far right to enter the layers. Since the elevation points inside this area were recorded at the top of curb elevations, a layer is required for the height of the curb of .5 feet to bring the elevations down to the top of pavement. Another layer will be added for the 2" Asphalt (.17 depth in feet) and a third layer of .33 depth in feet for the 4" Type II base. When done with the layers, click the checkmark at the bottom of the layers window to record the changes. With three layers that are a total of 1 foot deep, the proposed subgrade elevations previously digitized will be reduced by 1 foot over this area.

- Any negative areas (e.g. the planter island) must also be digitized. After clicking **Start Takeoff**, digitize a point on the excluded area and SiteWorx/OS will ask if you want to copy the layers from the parking area. Answer **yes**, and the properties dialog box displays. Here, check the **Negative** box on the **Area Elevation Properties** dialog, ensure **Subgrade Only** is the area type and click around the planter island area. When done, **right click** the mouse and select **Stop Takeoff**. Again, if anything was not entered properly at the **Area Elevation Properties** dialog, move to the right side after the area is completed and change the properties. For this negative area, click on the Layers tab on the right and make sure the layers were copied from the parking lot area (i.e. .5 height of curb, .17 Asphalt and .33 Type II Base). The layer volumes disclosed for this negative area will be subtracted from the parking lot's layer volumes.

- There is no demolition and removal on this project. If you encounter a job with demolition, removing a parking lot or sidewalk from an existing site for example, the area should be taken off as an **Existing Subgrade Only** area and a layer called "**remove or demo payment**" must be added at the **Layer** tab on the right with the depth of the material to be removed. The volume of the parking lot to be removed will be disclosed under the **Reports menu** | **Are**a | **Layers**. The cuts and fills shown on the **Calculations** tab are the volumes after the existing parking lot was removed.

Step 13 – Record Topsoil Strip and Topsoil Respread regions

If the project requires topsoil to be stripped or respread, these topsoil regions must be recorded. If borings are used however, the topsoil strip volume is always calculated from the boring log data and

you can't digitize topsoil strip regions from the drawing.

There are three ways to enter topsoil regions: 1) digitize with the mouse the topsoil region and enter the depth at the displayed dialog window 2) select **Project Boundary** from the **Takeoff** tab, and copy the entire project boundary as a topsoil region or 3) record a topsoil layer when using borings.

In this tutorial, the project boundary will be copied as a topsoil strip and topsoil respread region. At the **Takeoff** tab **Project Boundary** selection, click a corner of the project boundary after clicking the **select an object** command 🖼 at the **Action** section of the toolbar; after selecting the project boundary, click the right mouse button when the mouse pointer is over the drawing and select **Copy as Topsoil Strip.** The **Copy Region dialog** appears.
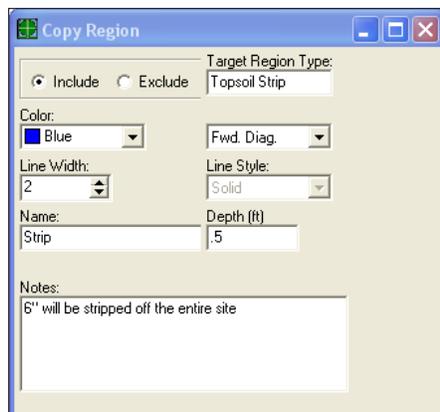
The above dialog will copy the entire project boundary as a topsoil strip area. Enter a **Depth** in decimal feet or meters (**. 5** for 6 inches) with a **Fwd Diag**. fill pattern. When done filling out the dialog box, press the **OK** button.

Then copy this same project boundary as a topsoil respread region by pressing the right mouse button again inside the project boundary and select **Copy as Topsoil Respread**. Enter a depth of **.5** and click the **OK** button.

The slab and parking lot previously digitized at the **Area Elevation** selection will be copied as Excluded Topsoil Respread regions as noted in Step 14 to arrive at the proper topsoil respread volumes.

These copied regions may be edited at any time by selecting **Topsoil Strip** or **Topsoil Respread** from the **Select** section of the **Takeoff** tab toolbar.

Step 14 - Copy Selected Areas as Excluded Topsoil Respread regions

Since topsoil is not re-spread over the building and parking lot, these areas will be copied as excluded topsoil re-spread regions by performing the following:

- ☐ At the **Takeoff** tab, select **Area Elevation**. Click the **Select an Object** tool 🖼 from the **Action** section of the toolbar, and left click on the corner of the slab to highlight and select.
- ☐ After the area is selected, **right click** the mouse, and select **Copy as Topsoil Respread**.
- ☐ A copy region dialog box is displayed. Change **Include** to **Exclude** on the dialog box, and click **OK**.
- ☐ When done with the slab, select the parking lot and perform the same steps to exclude the parking lot as a topsoil respread region.
- ☐ This excluded topsoil re-spread regions are displayed when **Topsoil Respread** is selected from the toolbar and the **Display** section of the toolbar is set to **Both**.

The takeoff for this limited tutorial is now complete. Calculating the results, reviewing the information and printing the reports will be done next. Once the review is completed, the user may need to return to the **Takeoff** tab to select certain items for modification. To record changes, select the takeoff from the toolbar (i.e. contour line, point elevation, etc.) then use the **Select an Object** tool from the **Action** section of the toolbar to select the individual item. Make changes on the right side of the window followed by the green checkmark to post the changes. You can also select items for editing by using the **Checking** | **Examine** menu from the Takeoff toolbar to scroll through all of the number objects by clicking on the arrows displayed on the top right side of the window.

To calculate the results, click on the **Calculations** tab…

G.   Calculations Tab

Step 15 - Calculate the results at the Calculations tab

Comments about the Calculations tab's toolbar:

☐ Click the **Calculate** button located at the top left of the **Calculation** tab toolbar to figure.

☐ The **TO Check** button on the toolbar checks the takeoff for errors or for elevations that are outside the **Min** and **Max Elevations** specified under the **Takeoff** tab **Checking** menu.

☐ At the very bottom of the calculated information, the site balancing adjustment is shown. If the proposed elevations are adjusted by this value, the site will balance where the subsoil cut volume will equal the fill volume and there will be little subsoil import or export. To balance the site which will change the proposed elevations, click the **Balance** button on the toolbar. **IMPORTANT** - save the project file as a different name prior to clicking the **Balance** button since the proposed elevations will change and will no longer agree to the proposed elevations noted on the drawing. For this tutorial, do not balance the site.

☐ The calculated information may be copied to the clipboard in order to paste this information into other programs such as Excel. To copy, click the **Copy to Clipboard** button on the toolbar. Many estimators use Microsoft Excel to apply costs to the quantities. Open Excel, click on a cell and then paste this information from the clipboard into Excel. An Excel file can also be created by clicking the **Save** as **XLS…** 🖫 Save As XLS... command on the toolbar.

Comments about the Calculations tab work area:

☐ The actual grid lines based on the grid size setting are displayed at the **Takeoff** tab when the menu **View | Takeoff Grid** is turned on. The cut and fill volumes for each grid box 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.

☐ Topsoil and subsoil expansion and compression factors are recorded at the **Calculations** tab. The **Site Swell** factor concerns soil expansion and the **Import Swell** factor and the related Import Compression % (i.e. **Imp. Comp. %**) affects soil compression. The **Site Swell** factor is multiplied by the bank or tight volumes to arrive at loose cubic yards (LCY). The **Import Swell** factor is divided into the loose volumes to arrive at compressed yards. Alternatively, the related **Imp. Comp. %** adjusts the import volumes to arrive at the tight volumes. The **Discard %** for topsoil is deemed to be waste. The percentage of topsoil recorded as waste may be green material that dies or topsoil that disappears from the topsoil strip volumes. If you desire no swell or compression simply set the factors to 1. For no topsoil waste, set the percentage to 0.

☐ Topsoil strip volumes are displayed at the **Calculations** tab only for jobs that do not use boring logs. If boring logs are setup at the **Project** tab, the topsoil strip volumes, as defined by the boring logs, are shown at the **Reports | Cut by Soil Type** menu.

☐ The Resolution setting affects the amount of calculations that are performed for each grid square. Each grid is further subdivided into smaller calculation grid squares based on the resolution setting. The higher the resolution results in more calculations per grid square. The number of sub-grid squares also increases when the resolution setting is increased. The following are the number of squares for each grid box for the resolution settings:

- **Low** – 100 calculation squares for each grid box (10 x 10)
- **Medium** - 625 squares for each grid box (25 x 25)
- **High** – 2,500 squares for grid box (50 x 50)
- **Very High** – 10,000 squares for each grid box (100 x 100)

The resolution setting truly affects the detail and number of calculations. As you can see, **Very High** resolution creates 100 times more detail and calculations than **Low** resolution.

For speed and ease of use, first calculate using the **Low** or **Medium Resolution** setting. After calculating, review the results and look at the **3D View** tab to verify the takeoff. If the **3D View** tab and numbers look reasonable, recalculate using **High** or **Very High** resolution for final results. The higher the resolution, the more calculations performed in SiteWorx/OS and the longer it takes. If you have 100 grid boxes over the site and you calculate at very high resolution, the project will use one million smaller calculation squares or sub-grids to calculate the volumes. If the grid size is too small or the resolution is too high, the calculation time may be excessive. To speed up the process, increase the grid size and/or reduce the resolution setting.

The Grid Size and Resolution interact to have an effect on the accuracy of the calculated volumes. Increasing Resolution decreases the size of each square calculated. With a 50' grid, Low Resolution calculates based on 5' X 5' squares. High Resolution calculates on 1' X 1' squares.

☐ Calculated results are shown to the right of the screen. Information is broken out by topsoil and subsoil volumes. The left column displays the tight, bank volumes before swell factors. The right column shows the loose volumes after applying the swell factors.

☐ Total Cut = Subsoil Cut + Topsoil Strip

☐ Total Fill = Subsoil Fill + Topsoil Respread

- [ ] **IMPORTANT PLEASE READ** – At least one existing and proposed elevation point must be entered in order to properly calculate the volumes. An elevation point is either a contour line (a contour line generates a series of equidistant points along the line with the same elevation) or a point elevation. SiteWorx/OS calculates volumes and develops a 3D model of the existing and proposed site based on the elevation points entered. The elevations points, created from the contour lines, point elevations or design lines, are connected to each other to develop the 3D model. Areas are then placed on top of this 3D model as a geometric plane at the very end. SiteWorx/OS develops an existing and proposed surface model from the items digitized. Again, at least one existing and proposed point must be input. And areas and design lines don't count.

- [ ] The total cut and fill volumes are calculated based on the differences between the existing and proposed surface models created by the data entered. If the proposed elevation is higher than existing for a sub-grid square, the volume for that square is calculated as a fill volume. Likewise, if the proposed elevation is lower than existing elevations for a resolution grid square, the volume for that square is defined as a cut volume.

After calculating, click on the **3D View** tab to review the models…

H.   3D View Tab

Step 16 – Review the models at the 3D View tab
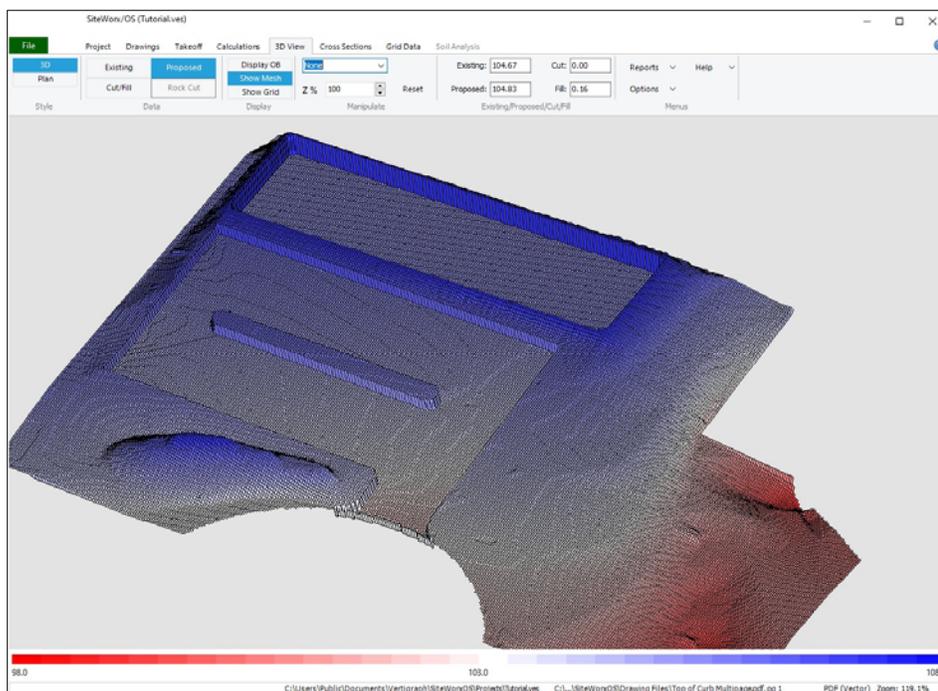
- [ ] The quality and resolution of the 3D view is determined by the grid size and resolution setting at the **Calculations** tab. A smaller grid size and a higher resolution setting increases the quality of the 3D view.

- [ ] When Manipulate section is set to none, moving the mouse pointer over the 3D model displays existing and proposed elevations at that location along with the cut or fill depth.

- [ ] The **3D** style is best for displaying the **Existing** and **Proposed** data. The **Plan** style is ideal for showing the **Cut/Fill** and **Rock Cut** data.

- [ ] **Display OB** will show the image outside the project boundary. Existing elevations can go outside the project boundary. Proposed elevations stop at the boundary line.

☐ **Show Mesh** displays the calculation square lines. When using a high-resolution setting, the image may be dark due to the many squares. To improve the view, increase the size of the image by zooming using the manipulate commands or turn off the **Show Mesh** setting.

☐ The drop-down list box in the **Manipulate** section of the toolbar allows the rotation and resizing of the 3D view. If the **Rotate and Zoom** manipulate option is selected, zoom the image by holding down the right mouse button while slowly dragging the mouse from the center. Rotate the image by holding down the left mouse button while slowly moving the mouse.

☐ The **Z%** exaggerates the Z scale when increased. The **Z%** should be set to 100 or sometimes 10 to display the 3D view to scale. To display the elevations disproportionately, increase the **Z%** value.

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

☐ Elevation errors are clearly displayed at the **3D View** tab. **Important** - look at the legend at the bottom of the screen. Are there any spikes? Is the existing or proposed site all one color and is the range of elevations on the bottom legend reasonable? A 0 elevation on the left side of the legend indicates that an item was digitized without an elevation. At the **Takeoff** tab, click the **Checking** | **Examine** menu at the **Takeoff** tab to find incorrect elevations.

☐ The **Rock Cut** display is only available when boring logs are used and one of the soil strata layers is defined as a rock layer.

I.   Review and make adjustments

Occasionally incorrect elevations and data may be recorded. The **3D View** tab will clearly display problems. Does the **3D View** tab show spikes? Does the range of elevations on the legend at the bottom of the **3D View** window look correct? Does the existing, proposed and cut/fill models look reasonable? If any of the 3D models do not appear proper, something is wrong. If there is an error, try to determine if the error is due to an incorrect elevation point, contour line, area, or design line? The **Review** selection at the **Takeoff** tab displays the data in relationship to other selected objects.

To find and correct an error, perform the following:

i.   Go the **Takeoff** tab, select and display any of the takeoffs (i.e. Contour Line, Point Elevation, Area Elevation, etc.).

ii. If the error is obvious, click the select an object tool 🔲 on the **Action** section of the toolbar and click on a point within the object (end of contour line or corner of area) and then change the incorrect data on the right side followed by the green checkmark.

iii. If the item causing the error is not obvious, look at all of the digitized objects by clicking the **Checking** | **Examine** menu. All objects are assigned a number with SiteWorx/OS. When **Checking** | **Examine** is turned on, the object's number will be displayed on the top right side of the window. Browse through the numbered objects by clicking the arrow buttons to the immediate right of the number to find the takeoff object causing the problem.

iv. At the **Takeoff** tab, after clicking on **Checking** | **Examine**, click **Checking** | **Above Maximum** and **Below Minimum** to find items that are above or below the max and min elevation settings you define. The min and max settings are set at the **Checking** menu | **Min** or **Max Elevation**.

v.   After selecting the object, the right side of the window will display the properties of the selected object which may be changed and deleted. Again, click the ☑ green checkmark to save changes.

vi. To delete an object, click the ❌ **Delete selected object** tool located on the right side of the window and to the right of the ☑ green checkmark.

vii. The width of the properties window on the right side may be resized by holding down the left

mouse button while dragging the mouse once the mouse pointer changes to a double headed arrow.

viii. When reviewing the objects, please make sure the elevations are accurate, the takeoff type is correct (i.e. existing or proposed) and the areas are properly defined. Areas that are not flat are normally **Subgrade Only** areas; flat areas are either **Surface** or **Basement** areas. When looking at Surface and Basement **Area Elevation** objects, the actual elevations are shown at the **Corners** tab. Also, make sure the subgrade material depths are properly recorded at the **Layers** tab for each area.

After making the changes, save the file and look at the effects at the **3D View** tab.

J.   Cross Sections Tab
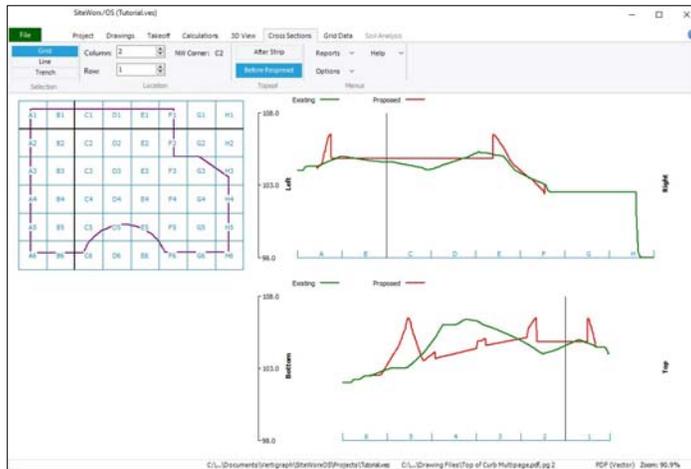
The project boundary with the grid lines are displayed on the left side of the **Cross Sections** tab. As noted previously, the grid spacing is set at the **Calculations** tab. The top left side of the Cross Sections toolbar, has three Selections: **Grid**, **Line** and **Trench**.

When **Grid** is selected, the horizontal and vertical cross sections are displayed along the grid lines by clicking anywhere inside the grid box. The top right image shows the location of the cross-section line running from left to right along the grid. The bottom right image displays the vertical cross-section line from bottom to top.

With Version 10 of SiteWorx/OS, users can now create and name cross section lines anywhere by creating the line at the **Cross Section Line** selection of the **Takeoff** tab. Once custom lines are created at the **Takeoff** tab, these custom cross sections will display by selecting **Line** from the Cross Sections **toolbar** and then selecting the previously digitized cross section line from the list.

Cross sections along the digitized trenches are now available with version 10. Whenever trenches are digitized at the **Takeoff** tab, the cross section of the trench displays when **Trench** is selected at the top left corner of the **Cross Sections** tab toolbar.

K.   Grid Data Tab

To the right of the **Cross Sections** tab is the **Grid Data** tab.

The cut and fill volumes for each grid are shown at the **Grid Data** tab. The actual grid is displayed overtop the drawing file at the **Takeoff** tab. If the grid does not display at the **Takeoff** tab, click on the **View | Takeoff Grid** menu to display. And remember, the grid size is set at the **Calculations** tab.

The **Cut/Fill** display is shown above. The Cut and Fill volumes consists of the topsoil volumes and the subsoil volumes. Like the calculations window, **Total Cut** equals **Topsoil Strip** plus **Subsoil Cut** and **Total Fill** equals **Topsoil Respread** plus **Subsoil Fill**. The stake height adjustments for each of the four corners of the grid may be before or after topsoil strip. The notation of **O. B**. indicates the corner is outside the project boundary.

The **Stake** report provides the coordinates of the northwest corner of each grid. At this stake point, the existing elevation, proposed elevation and the depth of the cut and/or fill are provided. As noted previously, the grid can be aligned to the project boundary or to a specific point. To align the grids with a certain coordinate, see Step 8 - Digitize the Project Boundary.

The data on the Grid Data tab may be exported to a number of formats by clicking the **Export…** button.

The **Export Surface** and **Export DWG** commands require control points at the **Import/Export** section of the **Drawings** tab. Surface points, aligned with a defined spacing setting, with elevations and locations are exported as a DWG or CSV file by clicking the **Export Surface** command. The **Export DWG** command, creates a DWG file of the contour lines, points and areas along with positioning coordinates and elevations. Both **Export Surface** and **Export DWG** create files used for developing machine control models.

L. Soil Analysis Tab

The Soil Analysis tab is active when borings logs are used. As a result, this **Soil Analysis** tab will be covered under the [Boring Logs](#) chapter.
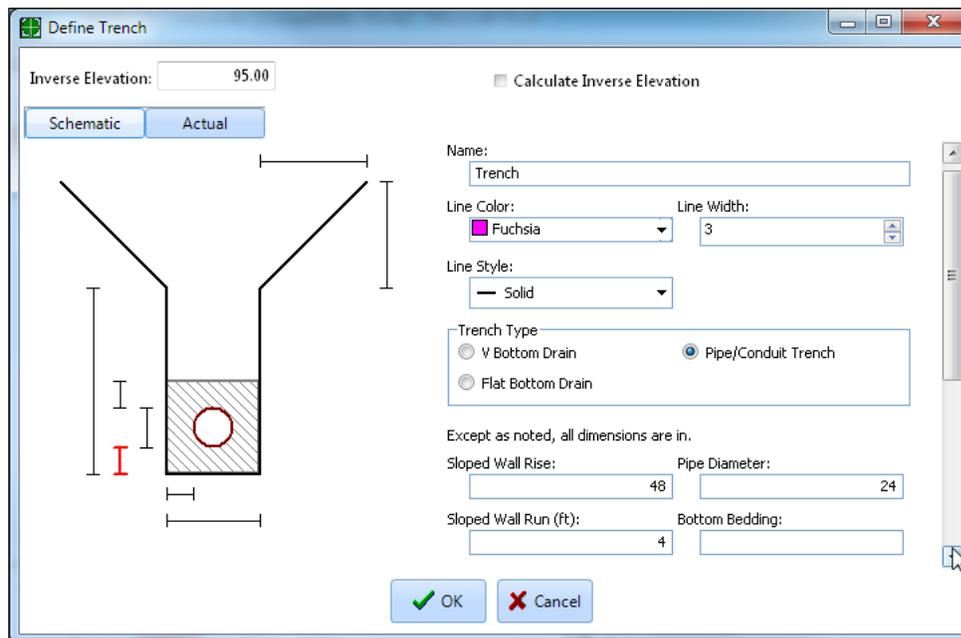
M. Trenches

SiteWorx/OS calculates 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. After digitizing the trenches, view the trench information and volumes, by selecting **Trench** and **Trench definition** from the **Reports** menu.

SiteWorx/OS provides four options for the existing surface elevation used when calculating Trench Cut and Fill for Pipe/Conduit trenches. These options are made at the **Project** tab and follow:

- **Proposed Elevation:** Use this option if trenches are excavated after site work is complete. (This is the elevation used in previous versions of the program.)
- **Proposed Elevation before Topsoil Respread**: Use this option if trenches are excavated after the site work is completed, but before topsoil is respread.
- **After Cut, Before Fill**: Uses the proposed elevation, before topsoil respread, where there is cut and the existing elevation, after topsoil strip, where there is fill. Use this option if trenches are excavated after site cuts are made, but before site fills are completed.
- **Existing Elevation after Topsoil Strip:** Use this option if trenches are excavated first from the existing site.

To digitize a trench, select **Trench** from the list of objects on the **Takeoff** tab toolbar and ensure the **Show Elevations/Property Dialog** and the **Show Trench Definition Dialog** are turned on under the **Options** menu. Next, at the top of the screen, enter the inverse elevation for the beginning of the trench. The invert elevation is the trench elevation at the bottom of the trench or bottom of the pipe depending on the setting defined at the **Project** tab. Click the Start takeoff, lightning bolt button and the Define Trench dialog box appears.

Please note:

- ☐ 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**. After selecting the trench type, click on the dimension boxes and enter the various dimensions.

☐ When clicked on a dimension box, the measurement required will be displayed in red on the left side under the **Schematic** tab.

☐ After all dimensions have been entered at the **Schematic** tab, the cross section of the trench based on the dimensions actually entered will be displayed at the **Actual** tab. Once the trench has been defined, press the **OK** button. Next, digitize the next point along the trench line.

☐ Whenever any two invert elevation points are recorded, SiteWorx/OS can calculate the invert elevations of the other points digitized by applying the calculated slope between those two points. A trench requires a minimum of two points with non-calculated invert elevations. The elevations of all other points can be calculated based on the slope between the two known points. This is accomplished by checking the **Calculate Invert Elevation** checkbox found on the elevation dialog box. In summary, enter the actual inverse elevation in the **Inverse Elevation** box or calculate the elevation by checking the **Calculate Inverse Elevation** checkbox. To use the **Calculate Invert Elevation** checkbox, the actual elevation must be entered in two places: at the start of the trench and anywhere else along the trench line. In this example, click the **Calculate Invert Elevation** check box on all trench line points except the first and last points on the trench line. At the end of the trench, the actual invert elevation will be entered and the calculate invert elevation checkbox will be unchecked.

☐ After digitizing or calculating the elevations of the trench, press the right mouse button and select **Stop Takeoff** to complete.

☐ Once complete, view and print the trench reports under the **Reports** menu. The location of the trench in relationship to the surface elevations for pipe trenches is available at the **Cross Sections** tab **Trench Selection**. Again, the trench volumes appear only on the **Reports** menu | **Trench …**. The trench volumes are not included in the site excavation cut and fill volumes displayed on the **Calculations** tab or on the other reports.

N. Summary and review the reports

In summary the takeoff process with SiteWorx/OS works as follows:

1. Complete the **Project** Tab
2. Open the Drawing(s), scale and align at the **Drawings** tab if more than one drawing.
3. Click on the **Takeoff** tab define the project boundary and digitize elevations and areas.
4. Click on the **Calculations** tab and set the grid size, resolution and then calculate.
5. Review the calculated results at the **3D View**, **Cross Sections**, **Grid Data** and **Soil Analysis** tabs.
6. If changes need to be made, select the object or use the **Checking | Examine** menu to edit the information on the right side of the **Takeoff** tab
7. Once the data appears reasonable, recalculate the project with **High** or **Very High** resolution.
8. Finally, print the desired reports found under the **Reports** menu on the toolbar.

O.   Boring Logs

Boring logs must be setup and entered when cut volumes by soil type are needed. Boring logs are required for calculating rock volumes. SiteWorx/OS uses the data from boring logs to model the soil layers (strata) found on the site. The data entry process involves digitizing the boring location and entering the data for the soil types per the boring log.

Entering Borings for the Tutorial Project

To enter boring log data to the tutorial project recently completed, perform the following:

1. Save this tutorial project as a different name by clicking on **File** | **Save Project As….** and name this project new project **Tutorial w borings.ves** for example.
2. At the **Takeoff** tab, Select **Topsoil Strip** and delete the topsoil strip region since topsoil is defined by the boring logs. The delete object button is found on the right side of the window to the immediate right of the green checkmark.
3. At the **Drawings** tab, right click the mouse overtop the drawing displayed and select **Duplicate Drawing**. Change the page number on the toolbar to **3**. Next, select Page 1 from the **Active Drawing** list, change back to Page 3 and click the **Align Dwg.** button to align page 3 to pages 1 and 2.
4. Print or view on a second monitor the boring logs noted on the Appendix at the end of this tutorial.
5. At the **Project** tab, click on **Yes** at **Borings Logs** and then click **Setup**.
6. Setup the boring log data entry and soil types as noted on the **Sample Project Boring Logs** found at the end of this tutorial. Please note that if a soil stratum is a topsoil or rock layer, check the **Topsoil** or **Rock** box when setting up the **Soil** Types.
7. After setting up the borings and soil types at the **Project** tab, digitize the boring location and soil types by selecting **Boring Log** at the **Takeoff tab**.
8. When done entering the borings and soil depths, calculate the project and look at the **Soil Analysis tab** and **Reports | Cut by Soil Type** to review the results.

## *Entering Boring logs is a three-step process:*

1. Look at the logs and set up the data entry at the **Project** tab. Boring logs present the soil strata depths several ways. Sometimes the log shows no surface elevation. Sometimes the elevation at the bottom of the strata is shown. Other logs may show the depth of the strata below the surface. The choice of which depth or elevation to enter depends on the actual boring logs and is defined at the **Setup** tab shown below.

   At the **Project** tab **toolbar**, click **Yes** for boring logs and then click on **Setup…** to define the boring log information setup.

Again, before setting up the bore log data entry, look at the boring logs and see how the strata depths are shown on the logs. Defining how the strata data will be entered from the bore logs is important. How are the elevations displayed?

2. Go through the boring logs and enter the different soil types. Click the **Soil Types** tab to enter the soil types.
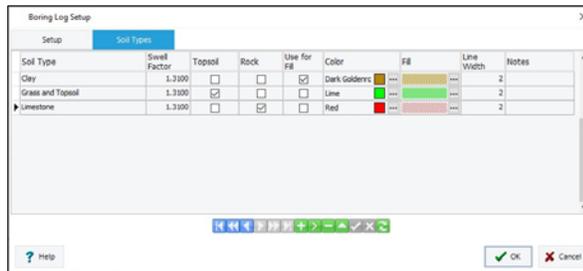
At the **Soil Types** tab, name the soil type and define its colors, fill patterns and swell factors. If a soil type must be exported and removed, do not check the **Use for Fill** checkbox. Only one layer, (i.e. the top layer) can be defined as the topsoil layer. If a layer is rock, check the **Rock** box when setting up the soil types. The colored buttons at the bottom of the window are for additions, deletions and recording this tabular information.

3. Go through the boring logs and enter the strata by clicking the **Takeoff** tab, **Boring Log** selection, and record the location of the bore holes along with the strata depths.
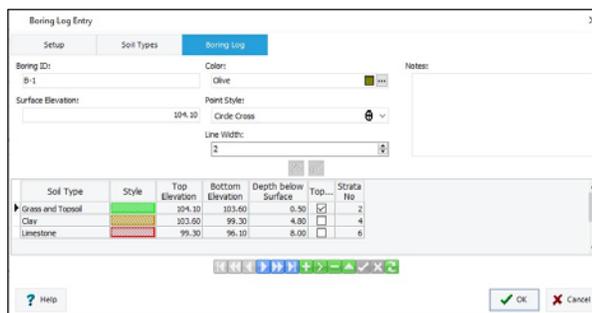
Like the Soil Type setup, the colored buttons at the bottom of the window are for additions, deletions and recording this tabular information.

Boring Log Results

When using boring logs, SiteWorx/OS calculates the cut volumes for each soil type. These results can be viewed at **Reports** menu | **Cut by Soil Type**. Additionally, a graphic presentation of the soil strata is shown on the **Soil Analysis** tab.

Notes about Boring Logs

Using Boring Logs changes some 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.
- Topsoil Swell Factor at the **Calculations** tab is not used.
- Site balancing is not available.
- Subsoil Report is not available.

P.   Importing objects and elevations from DWG files

SiteWorx/OS imports objects from AutoCAD DWG files. If you have a DWG file, much of the information can be imported directly from the file rather than using the mouse to digitize the objects. To import objects from a DWG file:

a) Click on the **File** menu/icon | **New Project**. At the **Project** tab, name this project **DWG File Import** or whatever. When clicking on the **Drawings** tab, you'll be asked to save changes to current project? Answer **Yes**, and then name this SiteWorx/OS project file as **DWG Import.ves**. At the **Drawings** tab, **Open… Top of Curb.dwg** file and select **foot** as the CAD drawing unit after clicking the **Scale** button. This **Top of Curb.dwg** file is located at C**:\Users\Public\Public Documents\Vertigraph\SiteWorxOS\Drawing Files**.

b) At the **Takeoff** tab, the Included Project Boundary must be digitized using the mouse before importing CAD objects. Before digitizing the Project Boundary, insure that **Select Entity** and **Snap to Entity Point** on the **CAD** section of **Takeoff** tab toolbar are turned off. After digitizing the perimeter of the project boundary, click the **Stop Takeoff** command.

c) Since contour lines will be imported from the DWG file, select **Contour Line** and then **Existing** as the Takeoff type from the **Takeoff** toolbar. Next, the exiting contour lines must be isolated. When working with CAD files such as AutoCAD DWG files, show the layers on the left side of the **Takeoff** tab window by turning on the **Display the Layer List** command from the **CAD** section of the toolbar. The width of the layer list is resized using the mouse. As noted previously, to isolate a layer, click the **Select Layers** button from the CAD section of the **Takeoff** toolbar, move the mouse pointer overtop an existing contour line, **right click** the mouse and click **Hide Other Layers** from the popup menu. Only the existing contour lines should display after hiding the other layers. After selecting the desired layer, turn **OFF** the select layers command at the CAD section of the toolbar.

d) SiteWorx/OS imports contour lines and points with elevations directly from DWG files. Before importing, make sure that the **CAD** menu | **Use Z axis for Elevation** is turned on (i.e. checked) so that the elevations associated with the entity will also be imported. Importing entities is a process where the appropriate object is selected at the **Takeoff** tab, the drawing layer pertaining to the object is displayed, and the data for the selected object is imported by clicking the **Import from drawing into takeoff** command on the **CAD** section of the **Takeoff** toolbar.

e) In this example we'll import the existing contour lines, then change to proposed and isolate the proposed contours lines and import the proposed. Next, we'll change the takeoff selection to **Point Elevation**, isolate the **DESIGN POINTS** layer and then press the **Import from drawing into takeoff** command from the CAD section of the toolbar ribbon. Also, please insure the **Select layers** command is turned off prior to clicking the **Import from drawing into takeoff** command.

f) To record Area Elevations, please note:
   - Sometimes areas are not properly closed to the first point by the creator of the DWG file. As a result, area elevations are often digitized from the DWG file using the **Snap to Entity Point** command from the **CAD** section of the toolbar rather than importing the area. Click the **Snap to Entity Point** command on the **CAD** section of toolbar to turn on this feature.
   - To digitize areas, make sure that **Options | Use Z Axis for Elevation** is not on and **Options | Show Properties/Elevation Dialog** is clicked on.
   - Use the **CAD | Layers List** menu to display the desired areas or isolate the layer from the drawing using the **Select Layers** command from the **CAD** section of the toolbar. Please display the **SLAB_ANNOT**, **SLAB_ON_GRADE**, **PK_LOT** and **PK_LOT_ANT** layers.

- Once the proper layers are displayed, click the **Start Takeoff** action and click a corner of the slab and the **Area Elevation Properties** dialog should display. In the dialog box, record a **Proposed Elevation** of **107. 33**, set the **Area Type** to **Surface**, enter a **4** for **Overcut**, **.33** for **Above Grade**, change the **Color**, select a **Fill Style** by clicking the three-dot lookup button, name that area **"SLAB"** and finally, click the **OK** button. Click on the next three corners and when completed, right click the mouse and select **Stop Takeoff**. On the right side of the window, click the **Layers** tab and input the material layers of concrete with a depth of .5 and Select fill with a depth of 2 which is applied to the overcut area by checking the Include Overcut checkbox. When completed, click the checkmark at the bottom of the window to record the changes to the material layer list.
- After digitizing the building, digitize the parking lot as a subgrade only area and record the layers of .5 for curb height and .5 for asphalt and base.

g) After importing the contour lines and points, and after digitizing the areas, verify that all elevations are properly recorded and within range by looking at the **3D View** tab. Sometimes, and depending on the how the file was created, some elevations will be recorded with a zero value. At the **Takeoff** tab, select the object (e.g., **Contour Line**) and then click **Checking | Examine** followed by **Checking | Below Minimum** to ascertain that all elevations are properly recorded. The **Max** and **Min Elevations** are defined under the **Checking** menu. After clicking the **Checking | Below Minimum** command, the initial item found that is below the minimum elevation will display on the right side of the window. Click on the **Delete selected object** button on the right side of the window to delete this incorrect elevation item and move to the next item. And remember, please make sure that the **Min** and **Max Elevation** are properly set under the Options menu.

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

Any questions, comments or suggestions, please contact us at any time. We wish you the best of everything.

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Q.   Appendix - Sample Boring Logs

At the Project tab, setup the following soil types when recording borings:

Listing of Soil Types (assume all soil types have a swell factor of 1.31):

Soil Type	Topsoil	Use for Fill	Rock
Grass and Topsoil	Yes	No	
Clay		Yes	
Limestone		No	Yes

List of Borings:

Boring ID: B-1   Surface elevation: 104.10

Soil Type Description	Elevation at top of strata	Depth in feet below surface
Grass and Topsoil	104.10	.50
Clay	103.60	4.80
Limestone	99.30	8.00

Boring ID: B-2   Surface elevation: 104.20

Soil Type Description	Elevation at top of strata	Depth in feet below surface
Grass and Topsoil	104.20	.50
Clay	103.70	2.50
Limestone	101.70	8.00

Boring ID: B-3   Surface elevation: 104.50

Soil Type Description	Elevation at top of strata	Depth in feet below surface
Grass and Topsoil	104.50	.50
Sandy Lean Clay II	104.00	3.50
Limestone	101.00	8.00

Boring ID: B-4   Surface elevation: 105.00

Soil Type Description	Elevation at top of strata	Depth in feet below surface
Grass and Topsoil	105.00	.50
Clay	104.50	4.00
Limestone	101.00	12.00

Boring ID: B-5   Surface elevation: 107.40

Soil Type Description	Elevation at top of strata	Depth in feet below surface
Grass and Topsoil	107.40	.50
Clay	106.90	3.00
Limestone	104.40	8.50

Boring ID: **B-6** Surface elevation: 101.00

Soil Type Description	Elevation at top of strata	Depth in feet below surface
Grass and Topsoil	101.00	.50
Clay	100.50	5.00
Limestone	96.00	8.00

Boring ID: **B-7** Surface elevation: 100.60

Soil Type Description	Elevation at top of strata	Depth in feet below surface
Grass and Topsoil	100.60	.75
Clay	99.85	4.00
Limestone	96.60	10.00

Boring ID: **B-8** Surface elevation: 99.20

Soil Type Description	Elevation at top of strata	Depth in feet below surface
Grass and Topsoil	99.20	.75
Clay	98.45	3.00
Limestone	96.20	15.50

Boring ID: **B-9** Surface elevation: 104.20

Soil Type Description	Elevation at top of strata	Depth in feet below surface
Grass and Topsoil	104.20	.50
Clay	103.70	9.80
Limestone	94.40	12.00