New in UniPile 6.0

(2025.421.1.10)

1.0 Introduction

It has been more than 14 years since UniPile 5.0 was released and much has evolved since. UniPile 6.0 was redesigned from the ground up to give it a fresh look and to incorporate many of the comments we have received over the years.

UniPile 6.0 is not meant to replace or compete with powerful finite element analysis software such as Plaxis. It was designed to provide users with a simpler, faster, and far less expensive alternative.

This document does not replace the user manual. It was developed for experienced users of UniPile 5.0 to highlight new features and improvements. We recommend that first-time users consult the user manual.

2.0 Disclaimer

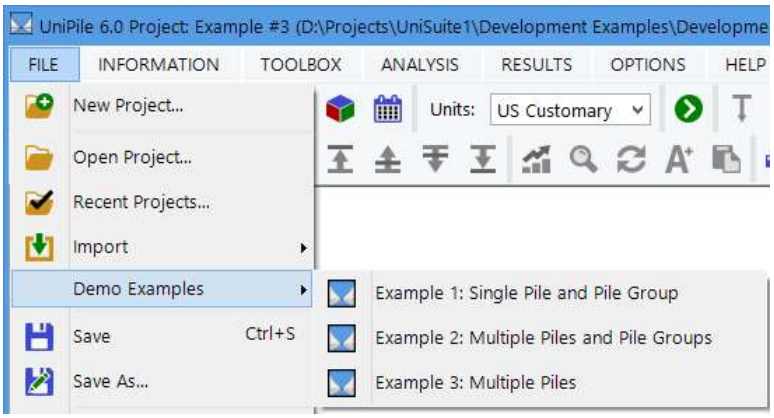
UniSoft Geotechnical Solutions Ltd does not endorse a specific theory or analysis method over another. The mathematical equations and methods used in this application were sourced from generally accepted technical papers and textbooks.

The analysis methods and equations used in UniPile 6.0 were obtained from ‘Basics of Foundation Design’ by Bengt H. Fellenius, Dr. Tech., P.Eng. This textbook is available within the main HELP menu. Settlement computation is based on Terzaghi's One-Dimensional Consolidation Theory as described in ‘An Introduction to Geotechnical Engineering’ by Robert D. Holtz and William D. Kovacs.

UniPile 6.0 is provided 'as is' without any warranties, express or implied. The developer and publisher assume no liability for any errors, damages, or losses arising from the use of this software. Users are solely responsible for verifying the accuracy of results and should consult with a qualified professional engineer before making any critical decisions based on the software results.

3.0 Example Files

UniPile 6.0 comes with three example files. These may be opened by visiting 'Demo Examples' located within the main FILE menu. The purpose of these examples is to showcase the many features of UniPile 6.0 and does not necessarily represent real site conditions. Most of the images presented in this document were produced from these example files.



Example 1: Single Pile and Pile Group

This example illustrates the analysis of a single 16" (610 mm) driven steel pipe pile (closed toe) and a pile group composed of 8 similar piles. It includes the CPT data used to create the soil profile applicable to this site and a set of SPT data that can be used to compute the pile resistance using other methods available in UniPile 6.0.

Example 2: Multiple Piles and Pile Groups

This example illustrates the analysis of two 450 mm square concrete precast piles and two pile groups composed of 8 piles. The piles are driven at the opposite ends of a site with two slightly different soil profiles. It includes the CPT data used to create the soil profiles applicable to this site and two sets of SPT data that can be used to compute the pile resistance using the other methods.

Example 3: Multiple Piles

This example illustrates the analysis of the many types of piles (21) and toe conditions available in UniPile 6.0. The piles are installed into a new 6 feet thick engineered fill to demonstrate the effect of negative skin friction on the long-term settlement of the piles. It includes the CPT data used to create the soil profile applicable to this site and a set of SPT data that can be used to compute the pile resistance using other methods available in UniPile 6.0.

Interestingly enough, many of the piles from Example 3 display plenty of resistance but large settlements induced by the soil settlement (downdrag).

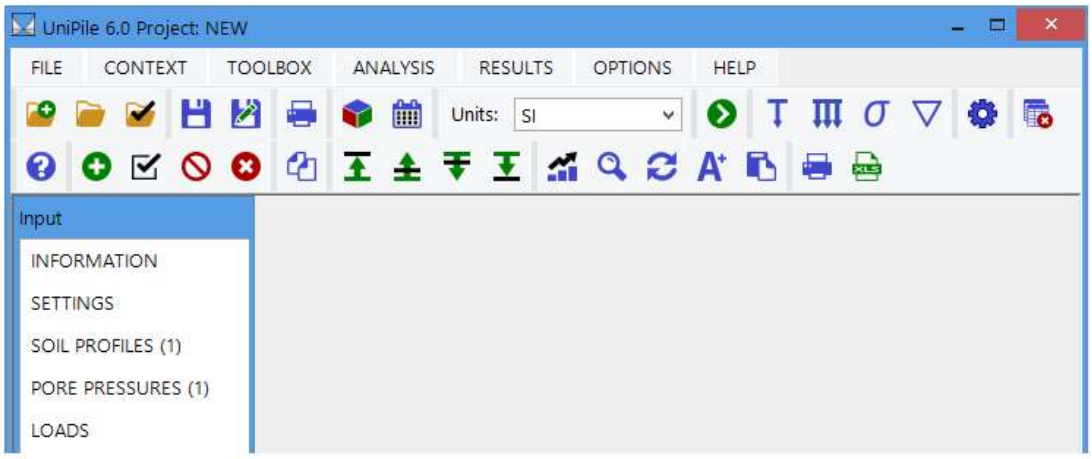
4.0 General Overview

Below is a partial list of the new features, which are discussed below.

- Redesigned interface and side menu
- Improved data entry
- Allow design notes throughout
- Improve the toolbox to include phase and compressibility relationships
- Specify multiple soil profiles
- Specify multiple piles and pile groups
- Specify multiple CPT and SPT datasets
- Perform CPT data interpretation including soil classification as per Robertson and Eslami-Fellenius
- Build soil profile from results of CPT data interpretation
- Improve charting of all data and results
- Display soil layers and color in charts
- Specify fills separately from loads
- Analyze various types of piles including CFA, tapered, step-tapered, and helical piles
- Analyze various pile toe conditions including expanded and tapered toe
- Compute pile resistance based on UWA (Lehane, 2021) and the updated LCPC (Bustamante-Gianselli, 2012) methods
- Compute pile settlement based on the Unified (t-z) method
- Compute pile settlement of layered soils as per Randolph-Wroth (1978)
- Produce pile Load-Distribution diagram
- Produce a 3D view of the project data
- Preview data and results within Microsoft Word
- Export results directly to Microsoft Word

5.0 Interface

Although this represents a major update, attempts were made to retain the same look and feel as UniPile 5.0. The main interface includes a main menu bar, two rows of toolbars, and a side menu listing of the application's various components.



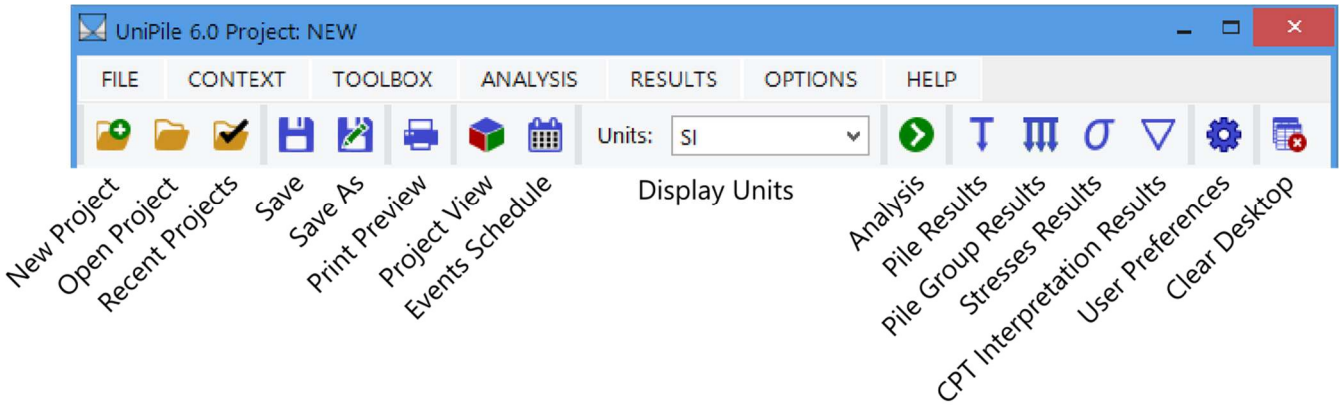
Context Sensitivity

As with UniPile 5.0, this update is context sensitive. This means that some features will only be available when the correct context is selected. For example, the option to add a new soil layer will only be available if an existing soil profile or an existing soil layer is selected.

The term 'context' refers to the current data or results visible on the screen. If multiple entry forms and results tables are displayed on the screen, the form or window with the focus is considered as the current context. The current context dictates if a specific feature will be enabled or disabled (greyed out).

6.0 Main Menu

The main menu is comprised of seven items: FILE, CONTEXT, TOOLBOX, ANALYSIS, RESULTS, OPTIONS, and HELP. The most popular menu and sub-menu items are accessible via the buttons located within the first row of the toolbars (primary). The buttons should be self-explanatory but hovering the cursor over the toolbar button for a second will provide a short description.



File Menu

The main FILE menu is divided into a series of sub-menus and is designed to be consistent with other Microsoft Windows applications. Use the FILE menu to create a new project file, open an existing project file, access a list of recent projects, import older project data, import datasets, open the demo examples distributed with the application, and save project data.

New in UniPile 6.0 is the ability to produce a 3D view of the project data and export all data, results, and charts to Microsoft Word for custom formatting and printing.

Context Menu

The main CONTEXT menu is dynamic and changes depending on the selected context. Understanding how the main CONTEXT menu works with the rest of the application is very important. Items related to this menu are discussed later in this document.

Toolbox Menu

The TOOLBOX menu is new in UniPile 6.0. It offers a list of practical tools designed to help and support data entry. Tools are discussed later in this document.

Analysis Menu

The ANALYSIS menu is where you go to perform an analysis. The type of analyses available in UniPile 6.0 are discussed later in this document.

Results Menu

One of the major changes in UniPile 6.0 is the manner in which results are accessed and presented. Rather than listing all available results within the main RESULTS menu, results are divided into groups. A group of results is subsequently subdivided into a drop-down list located within the first toolbar. For example, selecting 'Stresses…' from the main RESULTS menu provides the end user with the option to display stresses computed at piles locations. Results are discussed later in this document.

Options Menu

The main OPTIONS menu is designed to replace the main ADMINISTRATION menu found in UniPile 5.0. Use this menu to view and edit user's preferences, activate, and register your license, reset various interface settings, view the application.log file, and check for a new update.

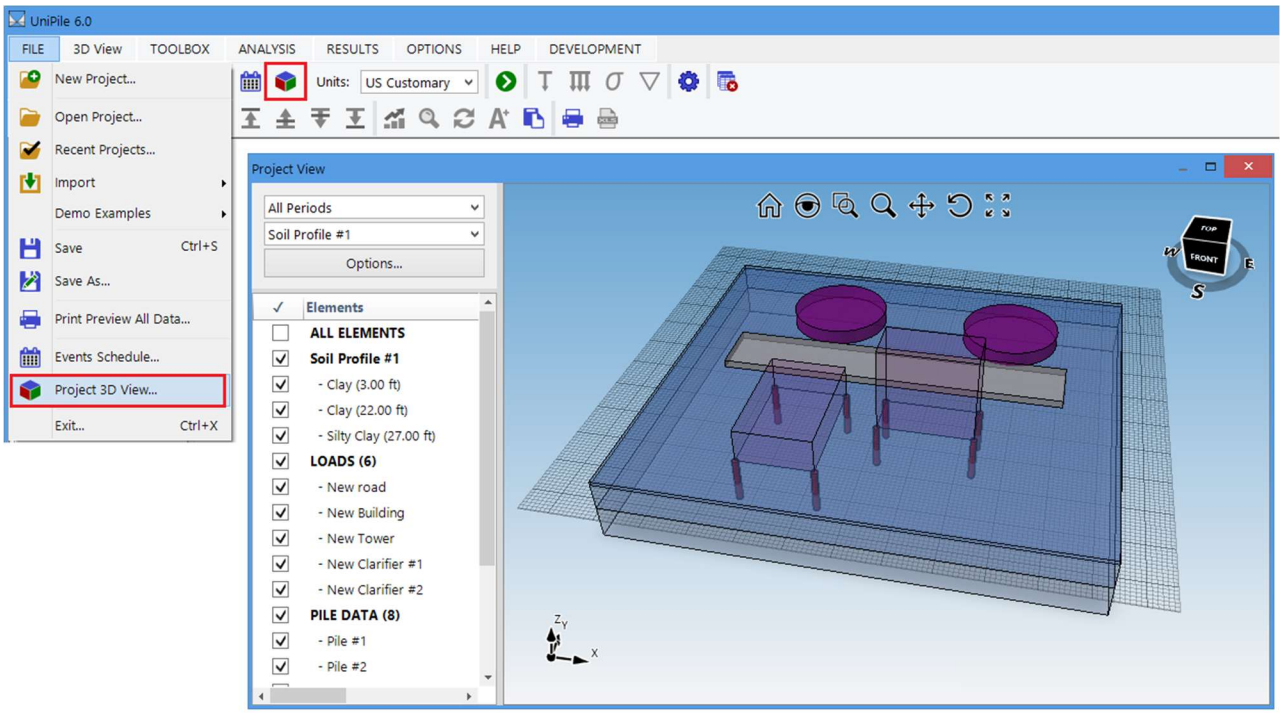
Help Menu

The main HELP menu is meant to access the About window, various documentation, our website, and the latest edition of 'Basics of Foundation Design' by Bengt H. Fellenius, Dr. Tech., P.Eng.

7.0 3D Project View

New in UniPile 6.0 is the ability to produce a 3D perspective view of the entire site with a single click.

The 3D perspective view produced by UniPile includes a list of all enabled elements defined in the project along with the ability to include or exclude them from the drawing; these can also be restricted based on their applicable periods.

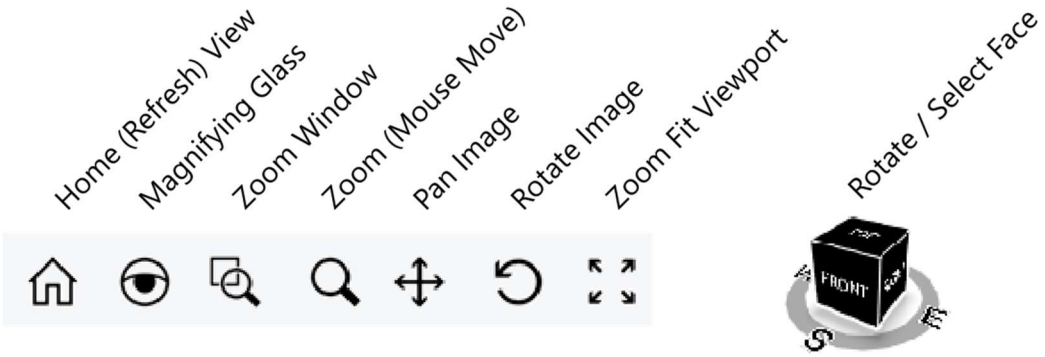


The list of the elements included in the project view includes soil layers, loads, fills, excavations, piles, and pile groups. Only one soil profile can be displayed at a time. Another soil profile, if specified, may be selected from the dropdown list.

A raster image of the project view may be previewed in Word or exported to Windows memory (clipboard). Printing and exporting are discussed later in this document.

Elements are presented to scale. However, when loads are involved, the height of each load is assessed based on a stress/height ratio of 25 kPa/m (~0.16 ksf/ft) by default. A 50 kPa load, for example, will be displayed with a height of 2.0 m (a 1 ksf load will have a height of 6.25 ft). Alternatively, this display height can be override using the Stress/Height Ratio input for any specific load.

The 3D view can be zoomed, panned, and rotated in any direction using the icons appearing at the top of the window. The perspective cube located at the top right of the window may also be used to rotate the image in any direction around any three axes.



The default view is set to an orthographic projection of the top view (site plan). The default projection mode and the view type (and others) can be edited within the 'User preferences…" located under the main OPTIONS menu.

The colors used to display the soil layers and the various elements (loads, fills, excavations, etc.) can be edited and customized individually at the source. The defaults colors can also be edited within the 'User preferences…" located under the main OPTIONS menu.

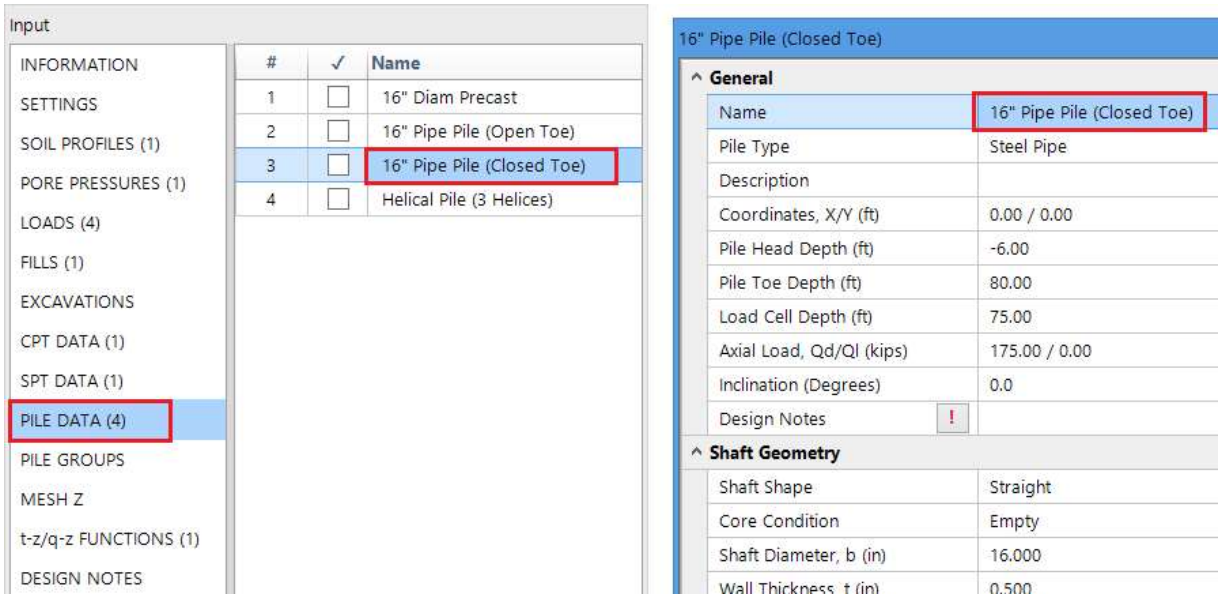
The soil layers and elements color are defined using the ARGB system, where A represents the level of transparency and RGB represents the red, green, and blue components of the color. An Alpha value of 255 represents a totally opaque color whereas an Alpha value of 0 represents a totally transparent color. Most of the default colors are set with an Alpha transparency of 100 to produce some level of transparency when drawing overlapping elements.

The current release of UniPile 6.0 does not display elements labels and coordinates as part of the 3D View. We hope to have this feature available in a future release.

8.0 Side Menu

As with UniPile 5.0, the interface displays a side menu listing the various components available to the project. If the component selected involves a single-entry form, such as INFORMATION, SETTINGS, or DESIGN NOTES, the side menu is comprised of a single panel. If the selected component is designed to hold multiple elements (i.e. Fills, Loads, Excavations, Piles, etc.), they will be listed in an adjacent panel.

The number in brackets next to each component represents the total number of elements associated with a specific component. PILE DATA (4) for example indicates that four piles have been specified.



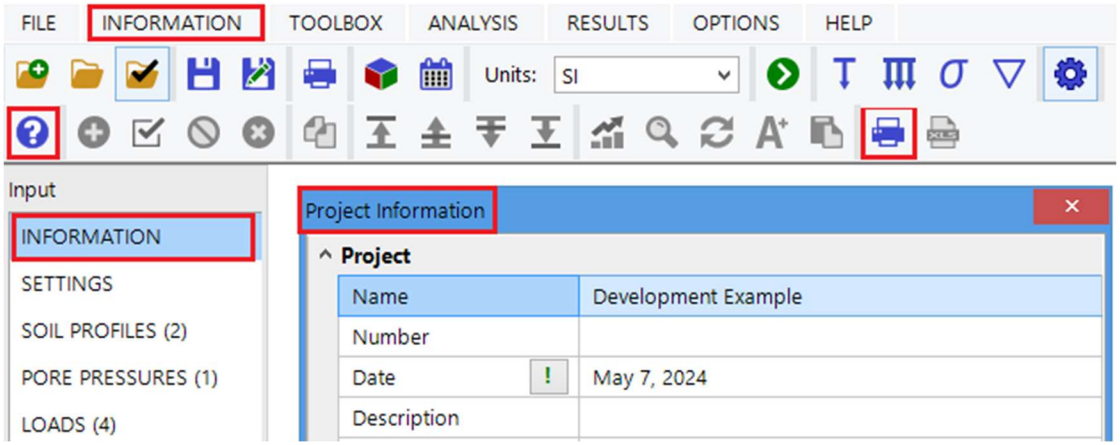
With a few exceptions, all data entry forms are accessible from the side menu. For example, selecting PILE DATA (4) from the first panel and '16" Pipe Pile (Closed Toe)' from the second panel will display the entry form for this specific pile.

The components listed in the first panel of the side menu are fixed. However, the list of elements found in the second panel may be updated using the Add and Delete features located within the context menu (secondary toolbar).

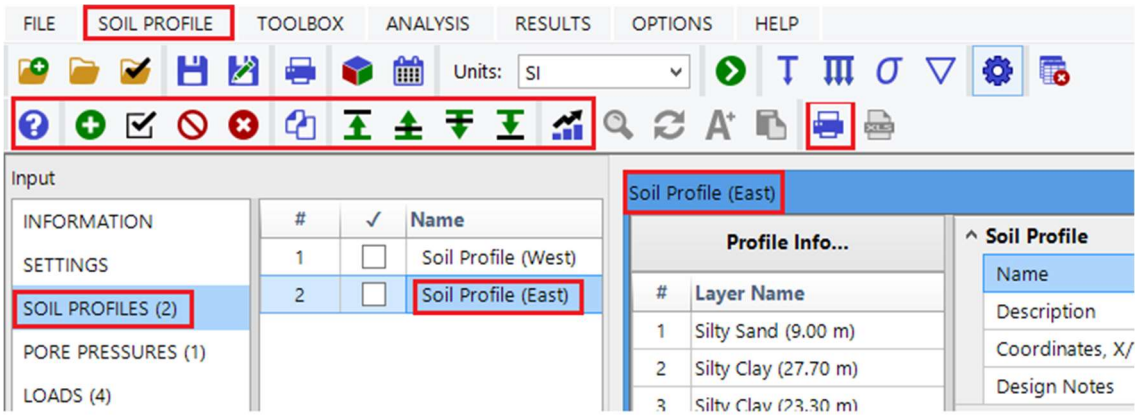
9.0 Context Menu

The main CONTEXT menu is dynamic and changes depending on the context that is currently selected. It works in concert with the content presented on the screen. The items listed within the main CONTEXT menu are also accessible from the secondary toolbar.

The availability of the options displayed within the CONTEXT menu depends on the context. If the focus is on the Project Information entry form, for example, the CONTEXT menu will read INFORMATION and most of the sub-menu items will be grayed out except for the Help and Print buttons indicating the only two options available for this component.



If the focus is on a specific Soil Profile entry form, for example, the CONTEXT menu will read SOIL PROFILE and options such as Add, Delete, Duplicate, etc. will be enabled.



The CONTEXT menu is comprised of 17 items. Their purpose is described below.

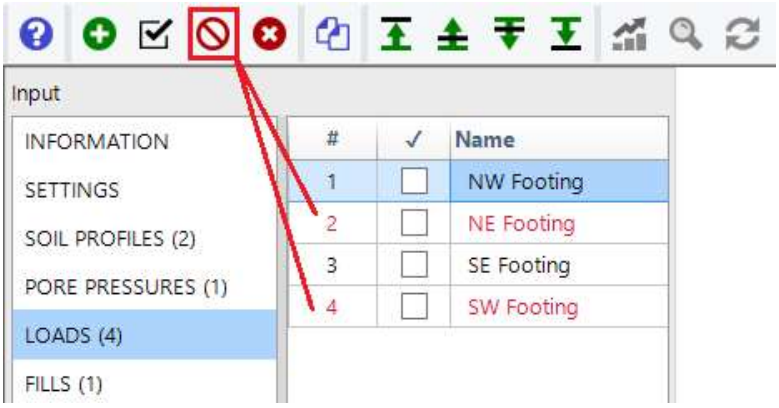
Help
To display help content related to the context on the screen.

Add
Use this option to add additional elements to the project. Elements can be anything from a soil profile, a soil layer, pore pressure, load, fill, excavations, pile, pile group, etc. When a new element is added to the project, it will be listed in the adjacent panel of the side menu.

Select/Deselect
This allows the user to select or deselect the entire list of elements. Functions such as Enable/Disable or Delete will only apply to the list of selected elements. If no element is selected, functions such as Enable/Disable or Delete will only apply to the highlighted element.

Enable/Disable
Use this feature to disable or enable elements from the list. When disabled, elements within the list will appear in red and will not be included in the analysis.

The image below shows a list of four loads, where Loads #2 and #4 were disabled. They will not be used during the analysis.



Delete
This allows the user to delete elements from the list. When deleted, all traces of these elements within the list will be removed from the project entirely. Deleted elements cannot be recovered.

Duplicate
Use this feature to duplicate a specific element from the list. When duplicating an element, a copy will be made and added to the bottom of the list automatically. New elements can be moved up or down the list using the four Move buttons.

Move buttons (4)
Depending on the number of items in the list of elements, these four buttons may be used to move and set the order of elements within the list.

View Chart
When available, use this option to produce a chart representation of the current data or results. UniPile 6.0 automatically produces more than 50 charts. Charts and their features are discussed later in this document.

Chart Zooming (On/Off)
Use this feature to turn a chart's zooming axes On or Off. Zooming and other features related to charts are discussed later in this document.

Refresh Chart
This feature serves to redraw the chart to its full view after zooming.

Chart Font Size
The font size used to draw text on a chart will look different depending on the user's screen resolution. A 12pt font size on a high-resolution screen may look smaller than a 10pt font size on a lower-resolution screen. The appearance of images created from charts will also look different depending on how they are

resized once they have been exported. Use this feature to switch between small, regular, medium, large, or extra-large font sizes on the fly. The font size selected should be based on output requirements.

Copy Chart Image to Clipboard
Use this feature to copy a chart produced by UniPile 6.0 into the Microsoft Windows clipboard (memory). Once in the computer memory, content can be pasted into most Microsoft Windows-compatible applications including Word and Excel.

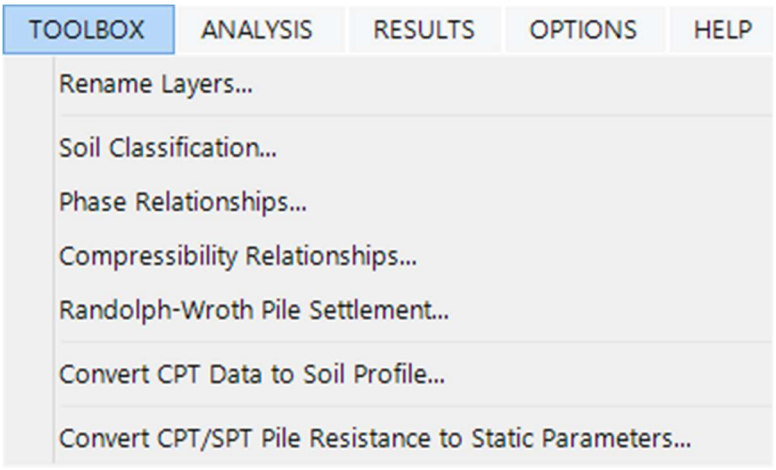
Preview in Word
Use this feature to produce a rich text format file (.rtf) version of the data, results, or chart currently on the screen and preview the content in Microsoft Word automatically. Once in Word, the content can be edited, saved, or sent to the device of your choice.

Note that this feature is a simpler version of the 'Print Preview All Data…' located within the main FILE menu. Printing all data, charts, and results is discussed later in this document.

Preview in Excel
This feature is only available after an analysis has been performed and a set of results is displayed on the screen. It produces a higher-precision, comma-separated format file (.csv) version of the results and previews the content in Microsoft Excel automatically. Once in Excel, the content can be edited, saved, or sent to the device of your choice.

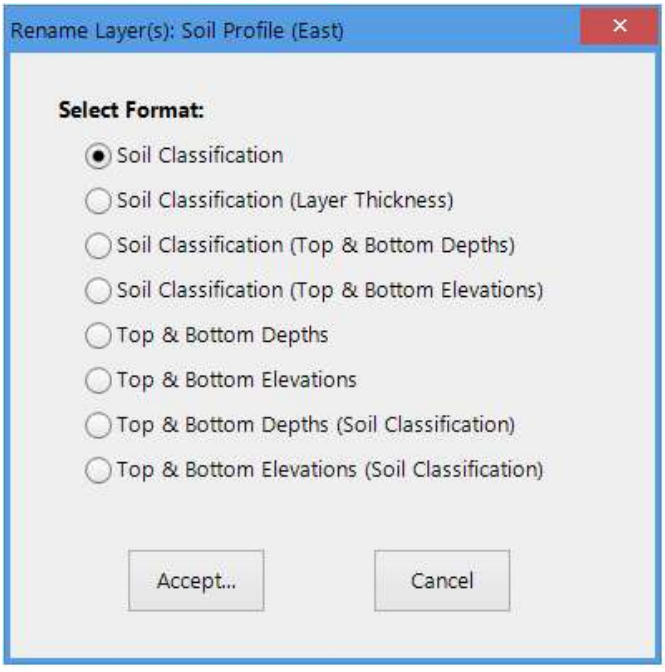
10.0 Toolbox Menu

This menu offers a list of tools designed to help with many data entries and to convert data based on various mathematical relationships. Many of the tools listed within this menu may also be accessed by using the ! button located next to a specific data entry. Below is a short description of these tools and how they can be used. The ! button is discussed later in this document.



Rename Layers

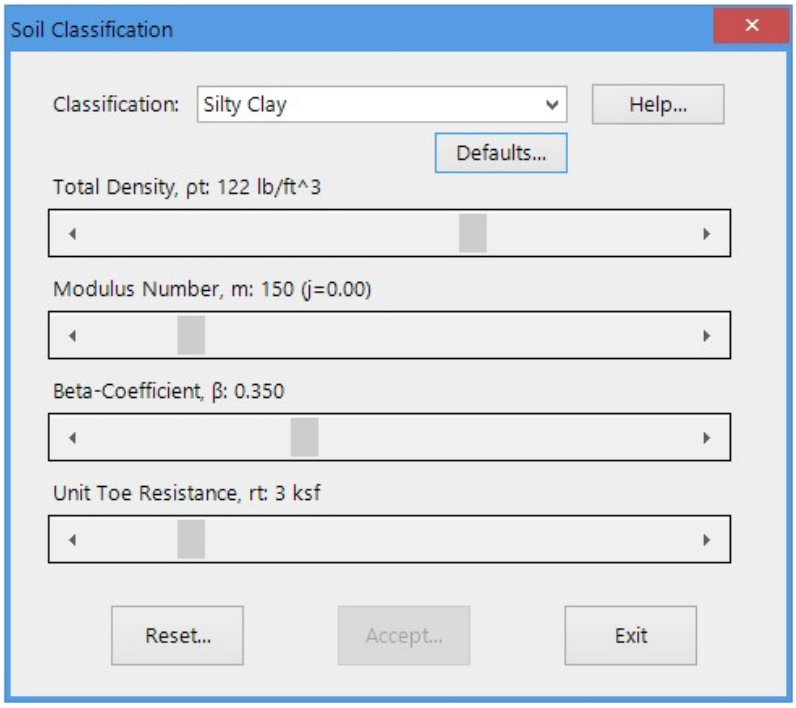
This tool renames all soil layers of a specific soil profile based on a set of pre-defined formats. This tool is only accessible (i.e., available) when the data related to a soil profile, or a soil layer are present on screen. All of the soil layers presented in the demo examples have been renamed using this tool.



The name of individual soil layers does not affect the analysis itself. However, if named with consistency, this can make a project much easier to understand. Technically the name of a soil layer can be any alpha-numeric value up to 50 characters in length.

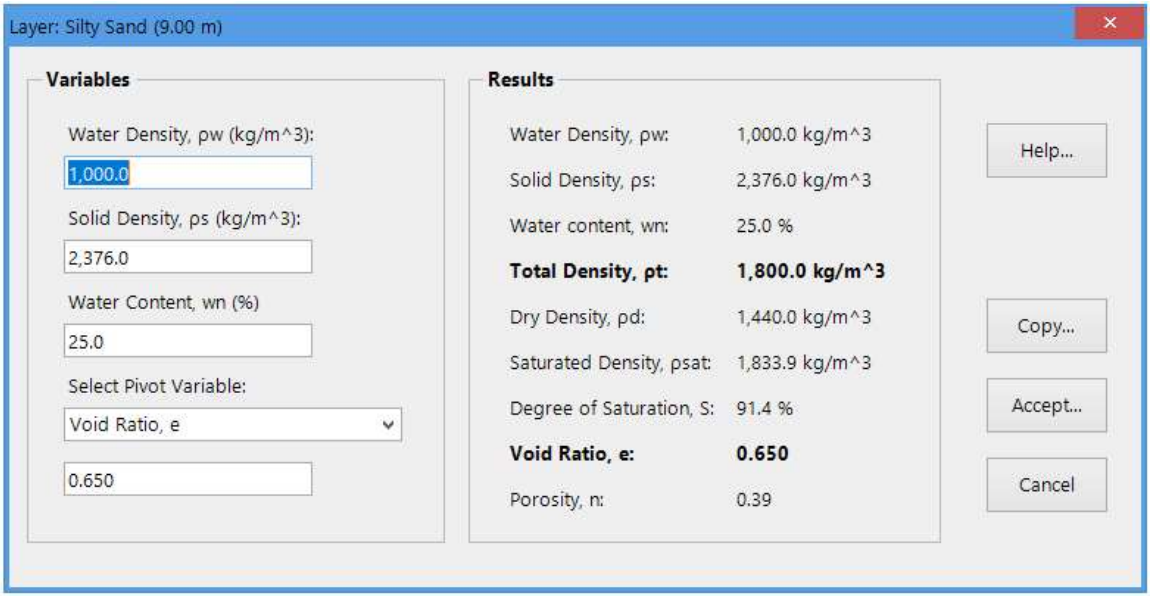
Important:
The name of individual soil layers is used throughout the many tables and charts. The colors used to display soil layers in the charts and the 3D View can be edited at the source. The default colors can be edited within the 'Users Preferences…' located under the main OPTIONS menu.

Soil Classification
The purpose of this tool is to provide an alternative way to specify certain data entries specific to a soil layer. It is only accessible (i.e., available) when the data related to a soil layer is present on screen.



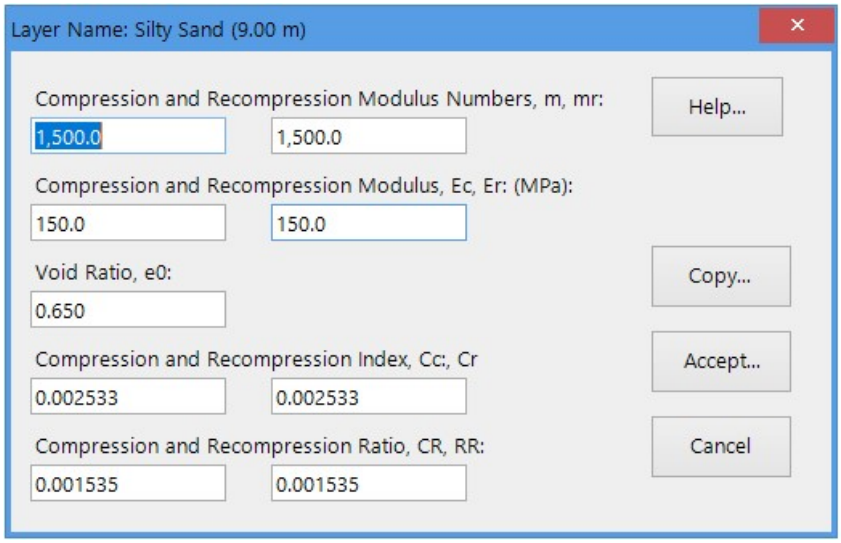
Phase Relationships

This tool computes phase relationships of soil between air, water, and solid. It can be used to compute the total density of the soil from other known values.



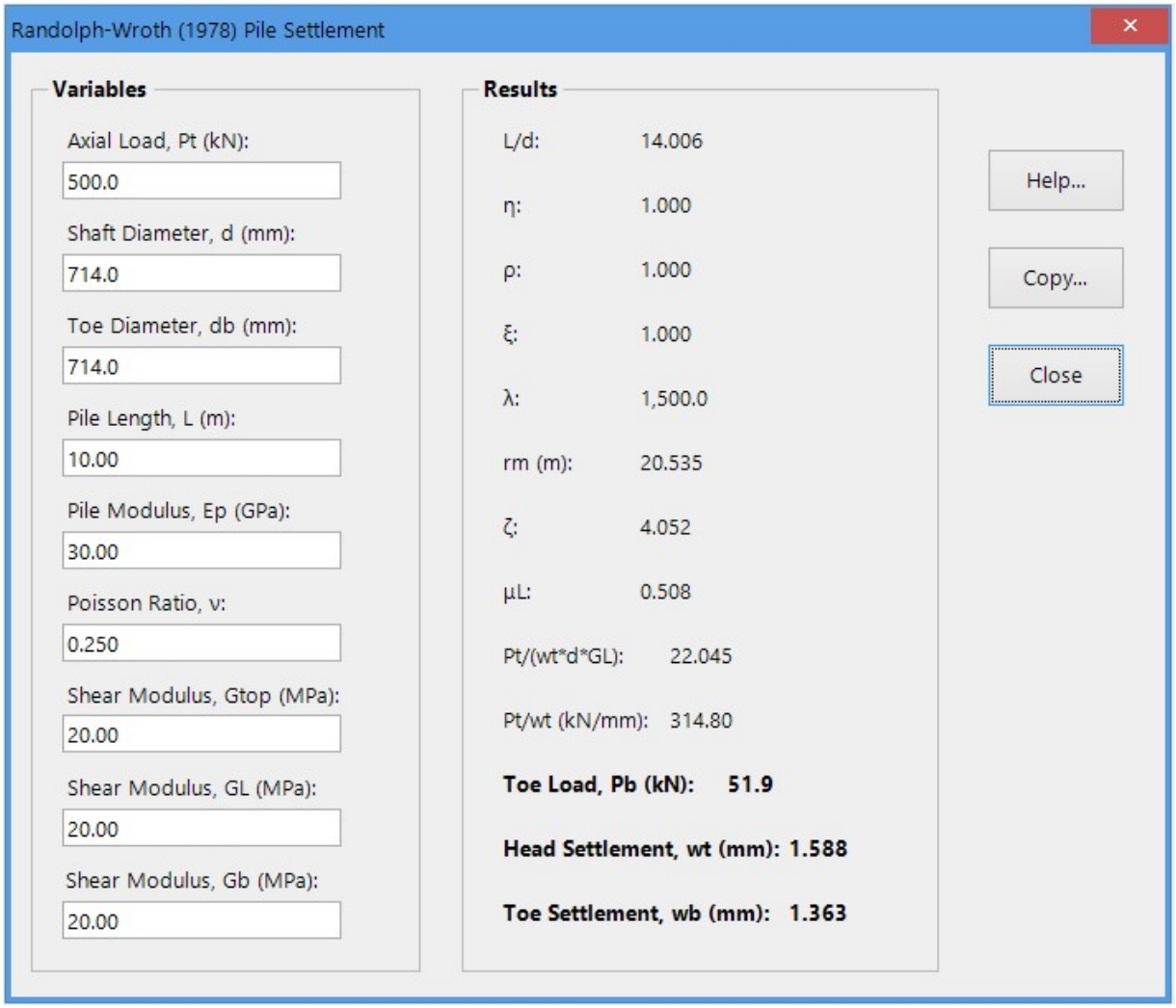
Compressibility Relationships

This tool computes the compressibility relationship between the Modulus Number, Young's Modulus, the Compression Index, and the Compression Ratio.



Randolph-Wroth Pile Settlement

This tool can be used to compute the pile settlement within a single soil layer.



Convert CPT Data to Soil Profile

This tool may be used to convert the results obtained from a CPT data interpretation to a soil profile compatible with UniPile 6.0. CPT data interpretation is discussed later in this document.

Convert CPT/SPT Pile Resistance to Static Parameters

Use this tool to automatically convert the pile resistance obtained from one of the CPT/SPT analysis methods to soil properties that can be used to perform a Static (e.g. Fellenius, 2024) analysis. Pile analysis is discussed later in this document.

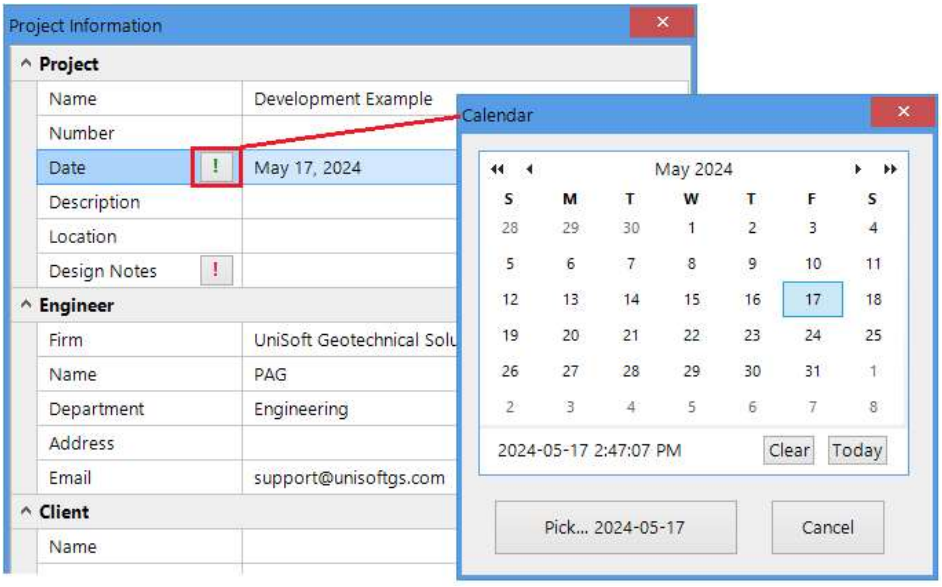
11.0 Data Entry

Most data entry forms are designed to look like Microsoft Excel rows and columns. In most cases, data are entered by typing within the cell itself. Pressing the 'Enter' key or moving the cursor to another cell will record the new value. In other cases, a value may be selected from a drop-down list that becomes available when the cell is accessed.

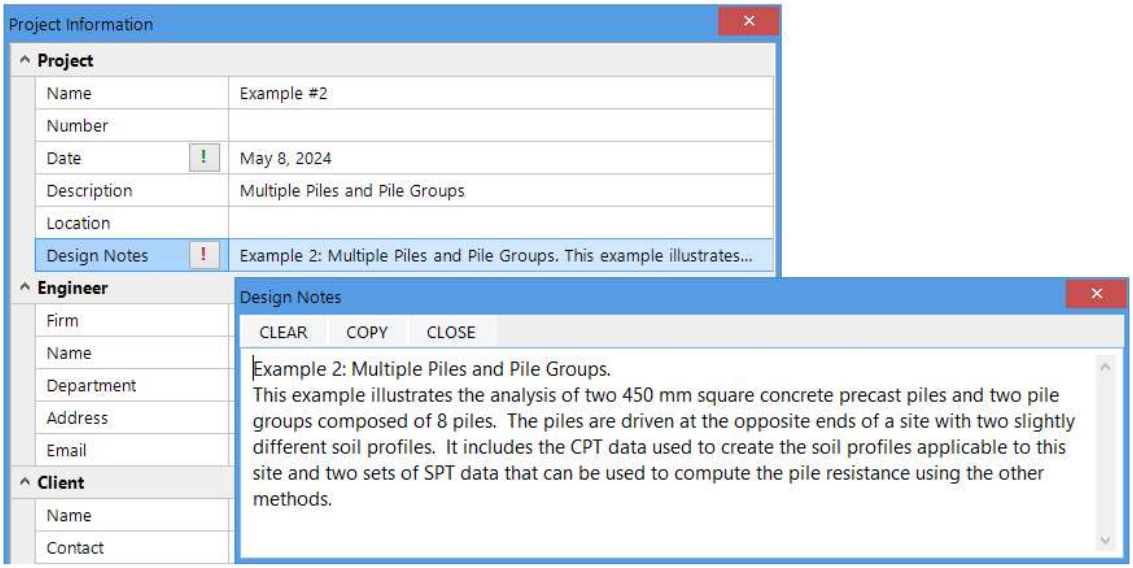
! Button

New in UniPile 6.0 is a type of entry that can be accessed via a separate cell button. When available, this button will open a secondary entry form providing further options and input. This button comes in two colors (Red and Green). The green button represents an optional selection, meaning that the content of the cell may be specified without having to use the **!** button. The red one represents a mandatory entry, meaning that it must be clicked to enter and/or edit the content of the cell.

The **!** button next to the 'Date' field, for example, will open a calendar that can be used to select a specific date.



The **!** button next to 'Design Notes', for example, is required to add and/or edit design notes related to the current project.



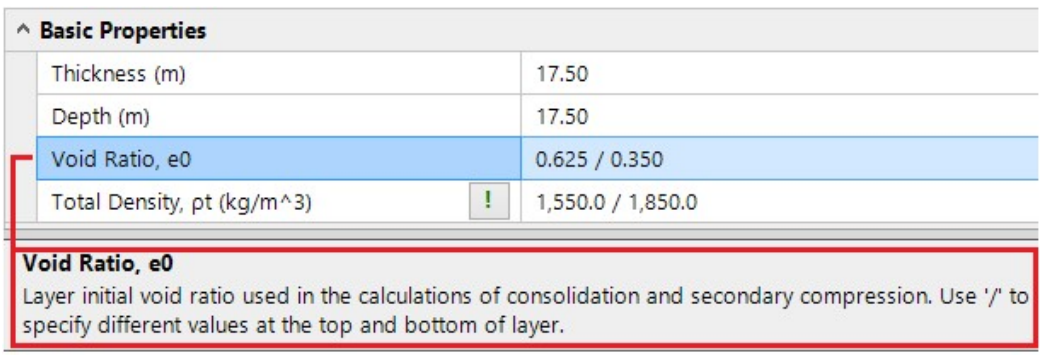
The ! button next to the 'Total Density' field, for example, will open the 'Phase Relationships' edit tool from the main TOOLBOX menu.

Combined Entries with "/"

Also new in UniPile 6.0 is the ability of some cells to accept two values by separating them with a forward slash, "/". The purpose of combining two entries in the same cell is to save time and screen space. For example, Cartesian coordinates are now specified in this manner.

Coordinates, X/Y (m)	-25.00 / 34.50

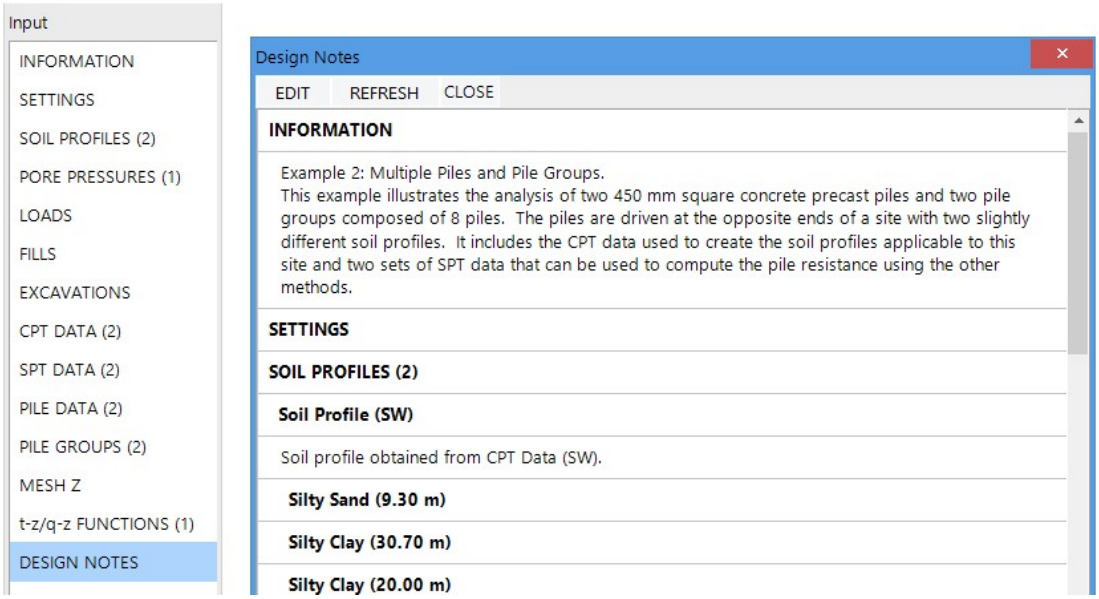
In some cases, the need to provide a second value is optional. For example, the soil density for a soil layer may be constant throughout, thus requiring a single entry. Alternatively, you may specify a soil density varying with depth by specifying the density at the top and the bottom of the cell. The image below shows the void ratio and total density of a 17.5 m thick soil layer varying from top to bottom.



The option to specify a second value within a cell is also noted with the definition of the cell located at the bottom of all entry forms.

Design Notes

Extensive design notes may be included as part of the project file. Every data entry form now includes a 'Design Notes' cell that can be accessed via the **!** button. Design notes can be up to 30,000 characters in length. A summary of all the design notes for the entire project is available at the bottom of the side menu. The example files distributed with the application make use of the design notes throughout.



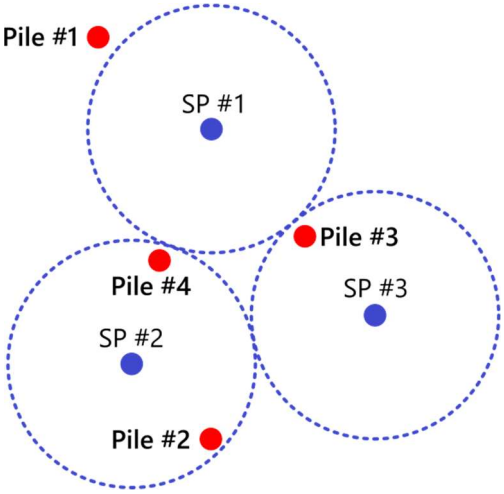
Ground Elevation

New in UniPile 6.0 is the ability to specify the project's ground (or datum) elevation within the 'Project Settings' entry form. The ground elevation is used throughout the results to display the elevation scale next to the depth scale. Where appropriate, charts may also be set to show elevations rather than depth.

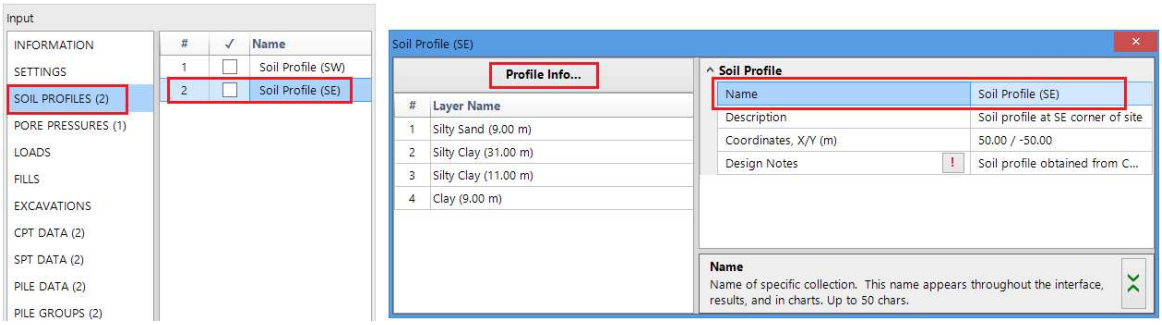
Soil Profiles

UniPile 6.0 is able to handle multiple soil profiles within the same project or site. Each soil profile must be associated with a unique set of cartesian coordinates. If more than one soil profile is defined and enabled, the soil properties closest to the pile under analysis will be used. Soil properties and parameters used during an analysis are never interpolated. In case of equidistance, the soil properties of the first listed soil profile will be used.

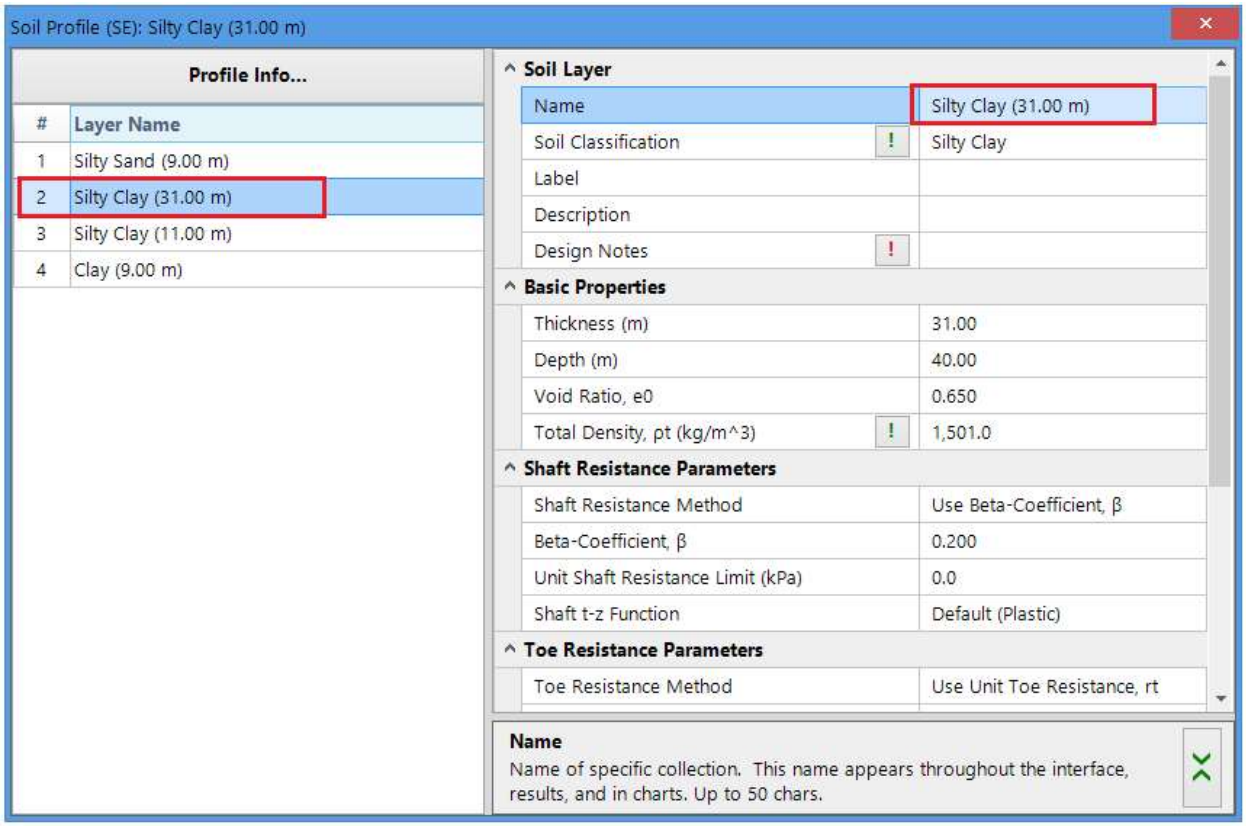
In the image below, for example, the Soil Profile SP#1 will be used to analyze Pile #1. Soil Profile SP#2 will be used to analyze Pile #2 and #4. Soil Profile SP#3 will be used to analyze Pile #3.



The soil profile entry form is divided into two sections. One lists the layers available to a specific soil profile, the other is to enter data specific to the soil profile itself or individual soil layers within the profile. The image below displays the soil profile information for a soil profile consisting of 4 soil layers.



Within the 'Soil Profile' entry form, parameters related to an individual soil layer may be accessed by selecting it from the list. The entries relating to the soil profile in general may be accessed once again via the 'Profile Info…' button located at the top left of the form.



Unlike soil profiles, soil layers cannot be disabled from the analysis.

Also new in UniPile 6.0 is how the top and bottom properties and parameters of soil layers are specified. In UniPile 5.0, the only way to provide variable soil parameters within the same layer was to set the 'Layer Interpolation' value to 'Interpolate between top and bottom'. This is no longer the case. Where available, top and bottom property values may be defined by separating both values with "/". The first image below indicates a constant soil total density of 1,850 kg/m^3 used throughout the layer. The second image describes a soil layer of varying soil density between 1,800 kg/m^3 (at the top) and 1,950 kg/m^3 (at the bottom).

Loads
New in UniPile 6.0 is the ability to specify dead and live loads separately. Separating live from dead load is necessary when UniPile is updated to include LFRD design in the near future. Live loads, however, are never included in the computation of pile and pile group settlement.

Fills
New in UniPile 6.0 is the ability to handle fills as separate entities rather than as separate loads. Fills are assumed to be engineered and will not report compression. However, the shaft resistance of piles installed into fills is included during a Static analysis.

The ability to define ring and cone-type loads is also included. The entries used to define embankment-type loads are improved and offer much flexibility.

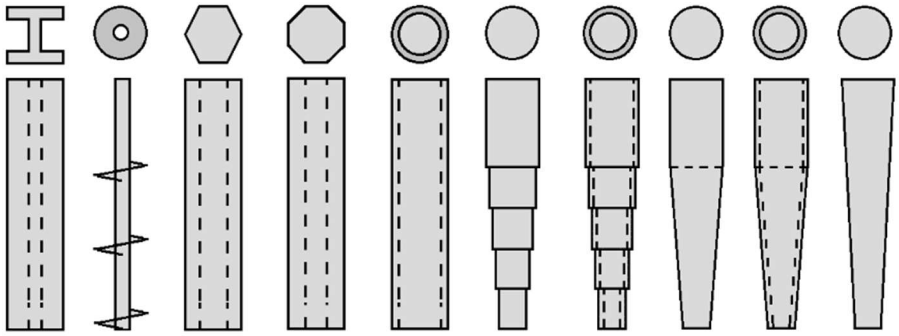
Excavations
The ability to specify trench-type excavations has been added. Although UniPile 6.0 can handle multiple excavations, the application will check and inform users if excavations are overlapping in space or time.

CPT Data
New in UniPile 6.0 is the ability to import multiple sets of CPT data for analysis and charting. Soil profiles based on the CPT data interpretation can be produced. CPT data interpretation is discussed later in this document.

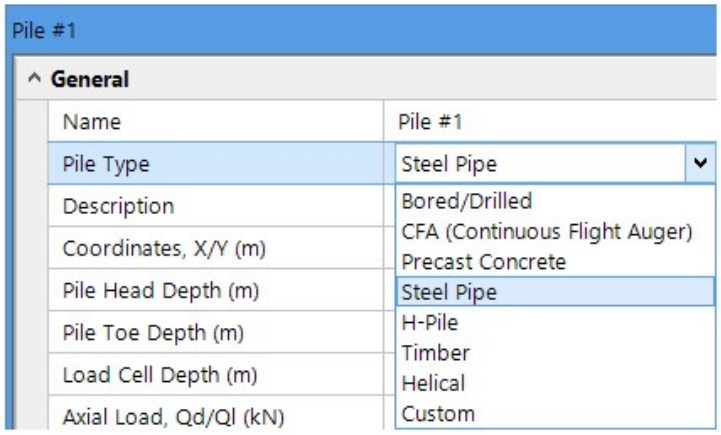
SPT Data
New in UniPile 6.0 is the ability to import multiple sets of SPT data used for pile analysis.

Mesh Z
The depths at which the analysis is performed are dictated by the precision level noted in the 'Project Settings' entry form. However, Mesh Z may be used to include additional depth. Precision Level is discussed later in this document.

Pile Data
UniPile 6.0 is now able to handle multiple piles of different shapes, sizes, and depths simultaneously. When multiple soil profiles, CPT, or SPT datasets are used to compute the pile resistance and settlement, the soil properties (or CPT, SPT data) closest to the pile under analysis are used.



Pile type and geometry are identified by selecting from a list of available pile types. Pile types include but are not limited to Bored, CFA, Precast, Steel Pipe, Tapered Tube, H-Pile, Timber, and Helical. Steel pipe piles can be emptied or filled with concrete. Different toe geometry can be defined with a few keystrokes.



Pile Groups

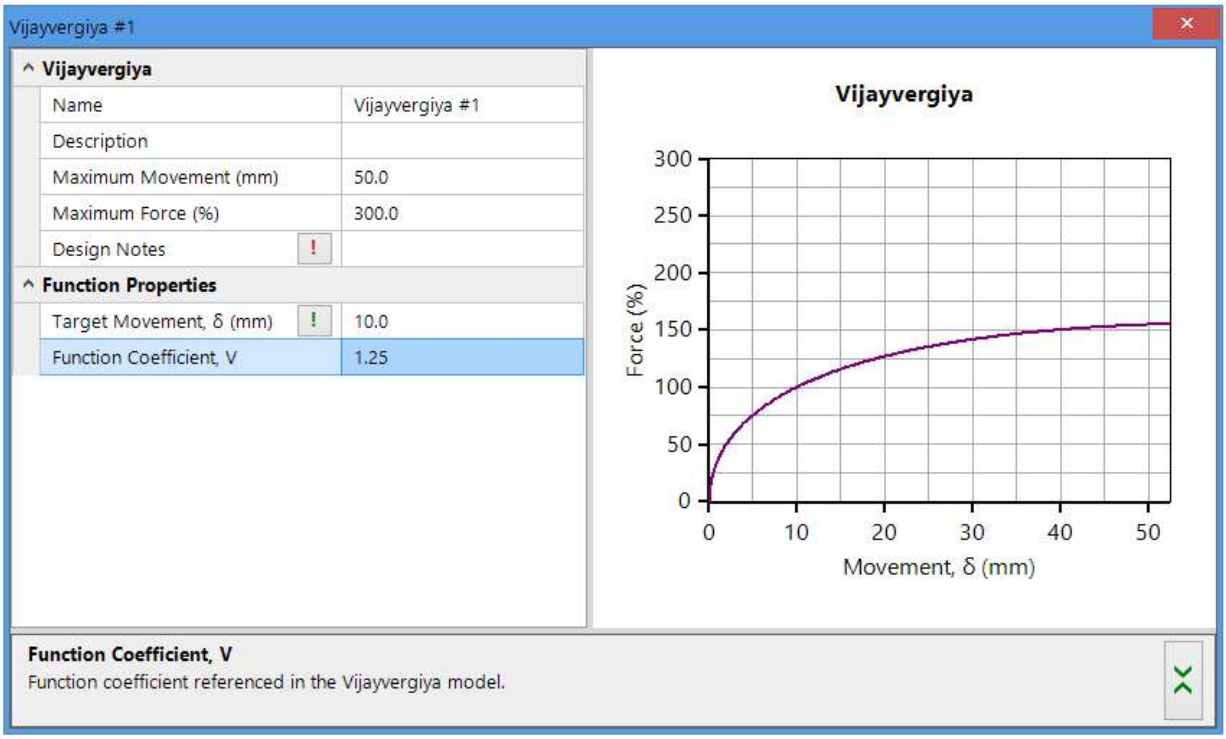
UniPile 6.0 is now able to handle multiple pile groups of different sizes and depths simultaneously. When multiple soil profiles, CPT, and SPT datasets are defined, the properties and parameters used during analysis will be based on proximity.

At this time, UniPile can only handle the settlement of smaller (rigid) pile groups, which assumes that all piles in the group will settle evenly. The settlement of perimeter and interior piles of larger groups or flexible rafts is not included in this release.

t-z/q-z Functions

Predefined t-z/q-z functions based on Vijayvergiya and Rahman methods were added to the list of available t-z/q-z functions. The list continues to include Gwizdala (Ratio), Chin-Kondner (Hyperbolic), Vander Veen (Exponential), Hansen 89%, Zhang, and Custom methods. Charts showing the graphical representation of the selected function can also be exported and/or previewed in Word using the 'View Chart...' and 'Preview in Word...' features.

The image below, for example, represents a t-z/q-z function based on the Vijayvergiya model.



12.0 Project Settings

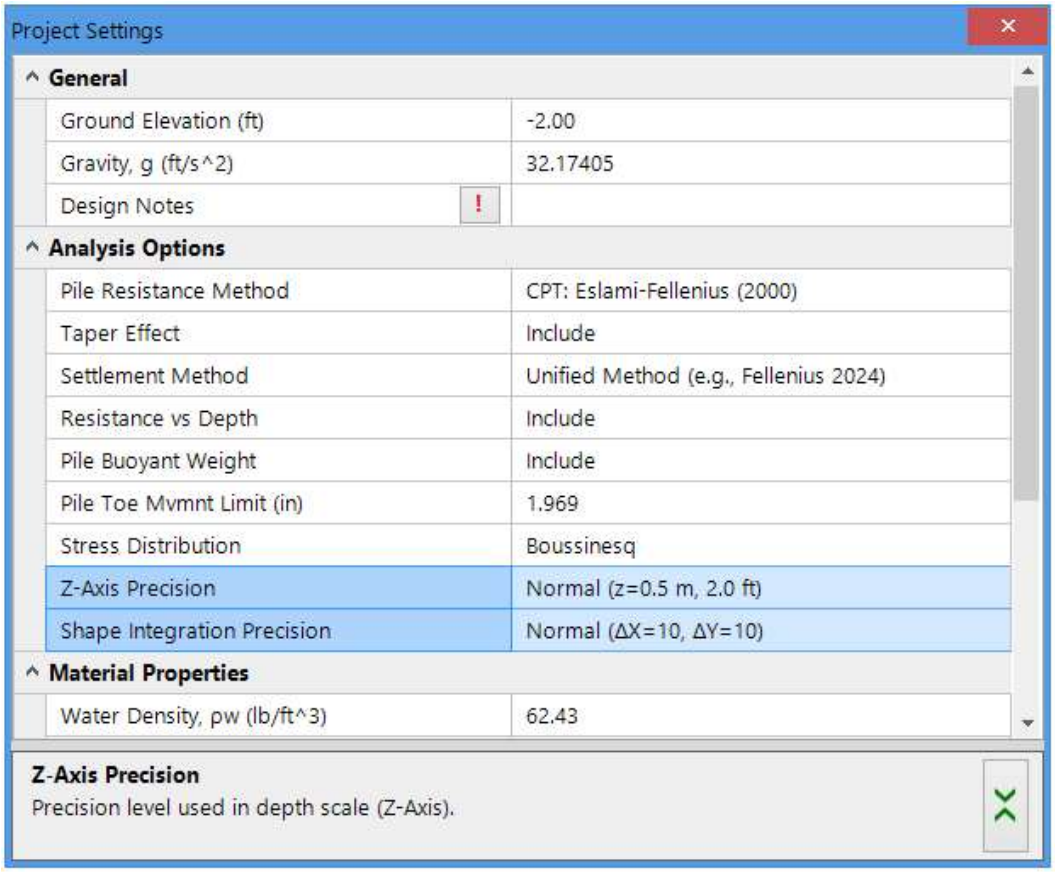
Stress Distribution

Stress distribution imposed by various loads can still be performed using Boussinesq, Westergaard, or 2H:1H Distribution.

Precision Level

In UniPile 5.0, the depth spacing used during the computations were set for every soil layer via the 'Z Steps' value. The precision used to perform the integration of shapes was defined for every load and/or excavation.

In UniPile 6.0, the precision used throughout the computations are defined in the Project Settings portion of the application. The depth spacing is defined using the 'Z-Axis Precision' value. The level of precision used during the integration of shapes is defined using the 'Shape Integration Precision' value.



The table below describes the precision values available for the Z-Axis Precision.

Z-Axis Precision	Z-Axis (Depth)
Lowest	1.5 m / 5.0 ft
Low	1.0 m / 3.0 ft
Normal	0.5 m / 2.0 ft
High	0.25 m / 1.0 ft
Higher	0.1 m / 0.5 ft
Highest	0.05 m / 0.25 ft
Custom	User Defined

The table below describes the precision values available for the Shape Integration Precision. ΔX and ΔY represents the number of strips used during integration.

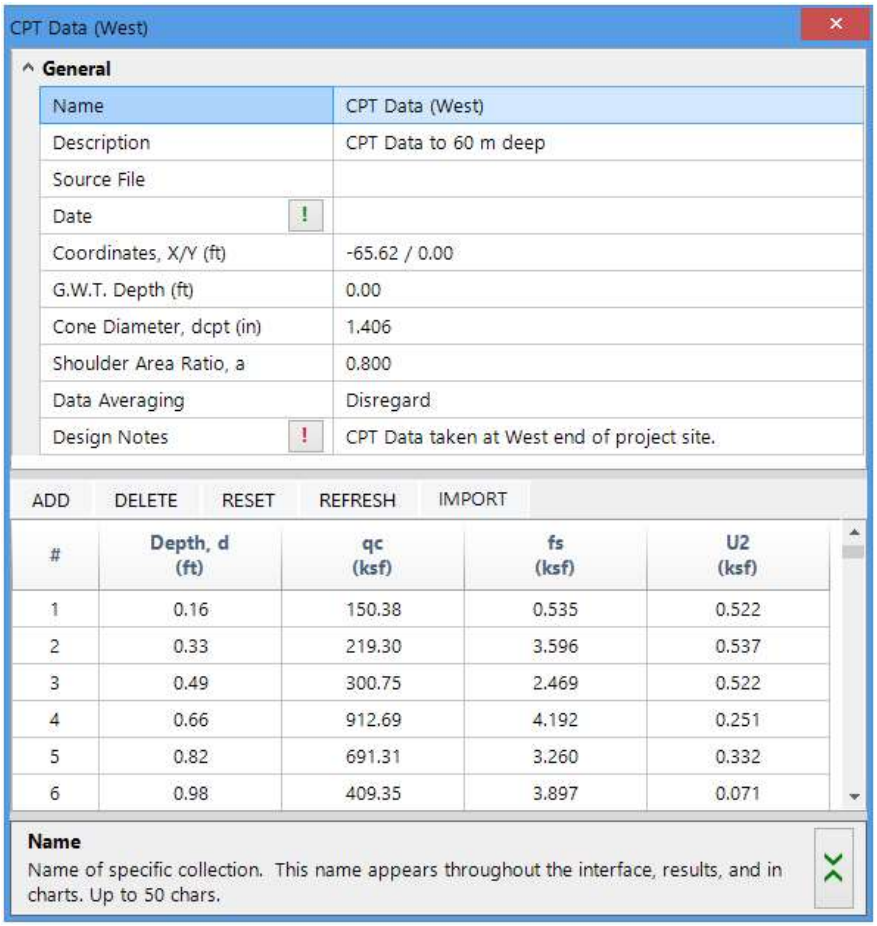
Shape Integration Precision	X-Axis	Y-Axis
Low	ΔX=5	ΔY=5
Normal	ΔX=10	ΔY=10
High	ΔX=25	ΔY=25
Highest	ΔX=50	ΔY=50
Custom	User Defined	User Defined

For example, selecting 'Normal' precision, will perform the computation at every 0.5 m depth (or 2.0 feet if using US customary units). Geometric shapes will be integrated by dividing the dimensions along both the X-axis and the Y-axis by a factor of 10. As an alternative, the precision level may be customized using the 'Custom' level.

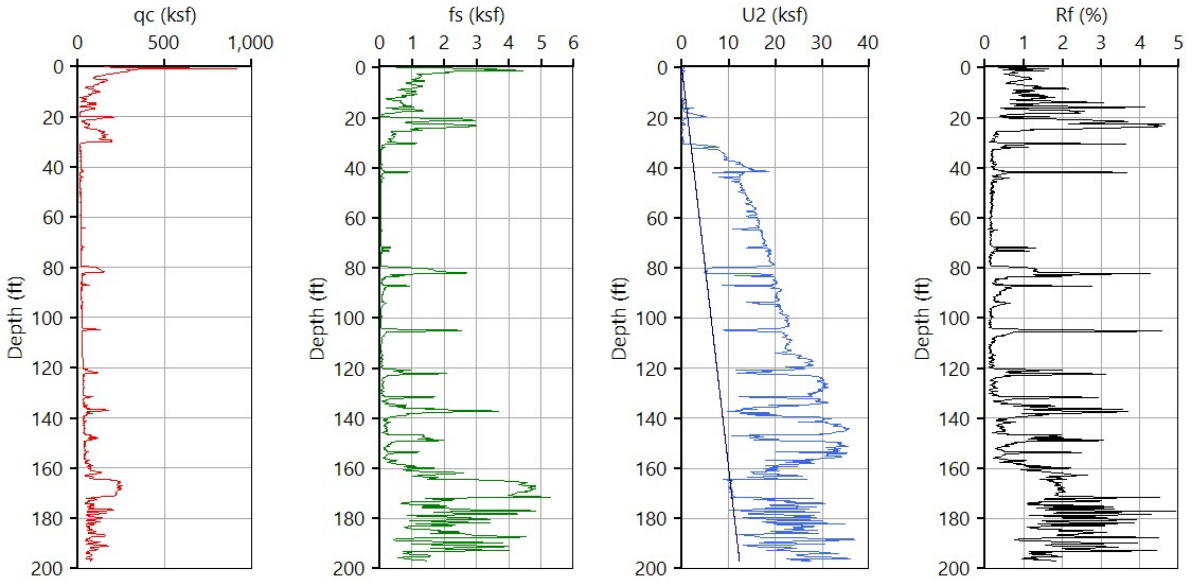
In most cases, selecting the ‘Normal’ level should produce a precision level well within the precision of the specified soil parameters. Obviously, the higher the precision, the longer it will take to perform an analysis.

13.0 CPT Data Interpretation

New in UniPile 6.0 is the ability to import multiple CPT datasets. CPT data may be charted and interpreted to produce a compatible soil profile. CPT data may be imported by visiting the 'Import' option located within the main FILE menu. CPT data may also be imported or appended to an existing set of CPT data.

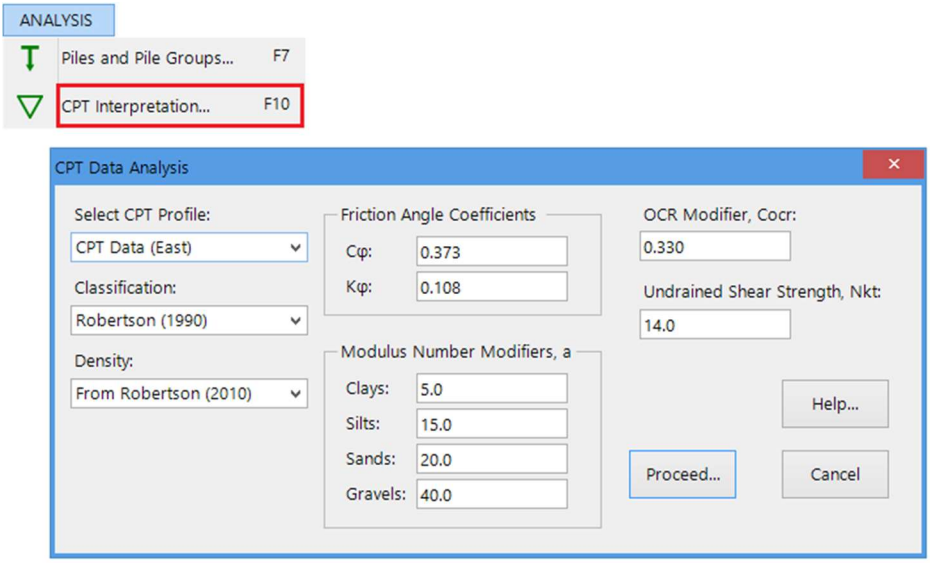


Once imported into UniPile 6.0, CPT data may be added, deleted, or edited manually. Raw data may also be charted using the 'View Chart…" feature. The image below represents a typical presentation of CPT data.



Similar to soil profiles and other elements (loads, excavations, etc.) multiple CPT datasets may be imported into a single project file. To avoid potential conflicts, CPT data must have a unique set of cartesian (X, Y) coordinates.

Interpretation of CPT data is performed via the 'CPT Interpretation (F10)" option located within the main ANALYSIS menu (with F10 representing a shortcut).

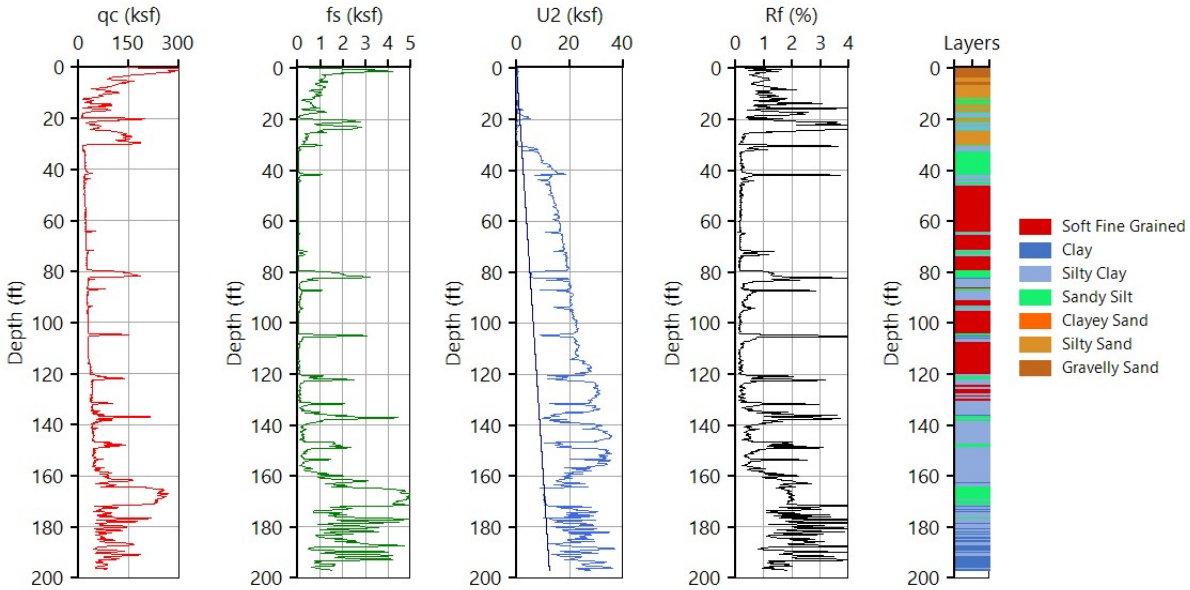


The main purpose of interpreting CPT data is to obtain a soil classification representing the dataset. UniPile 6.0 can analyze the data based on the three most popular soil classifications: Robertson (1986), Robertson (1990), and Eslami-Fellenius (1996). In addition to soil classification, the analysis will produce other useful

values such as soil behavior type (SBT) and indices (Isbt and Ic), friction angle (for sand), the modulus number, m, and much more.

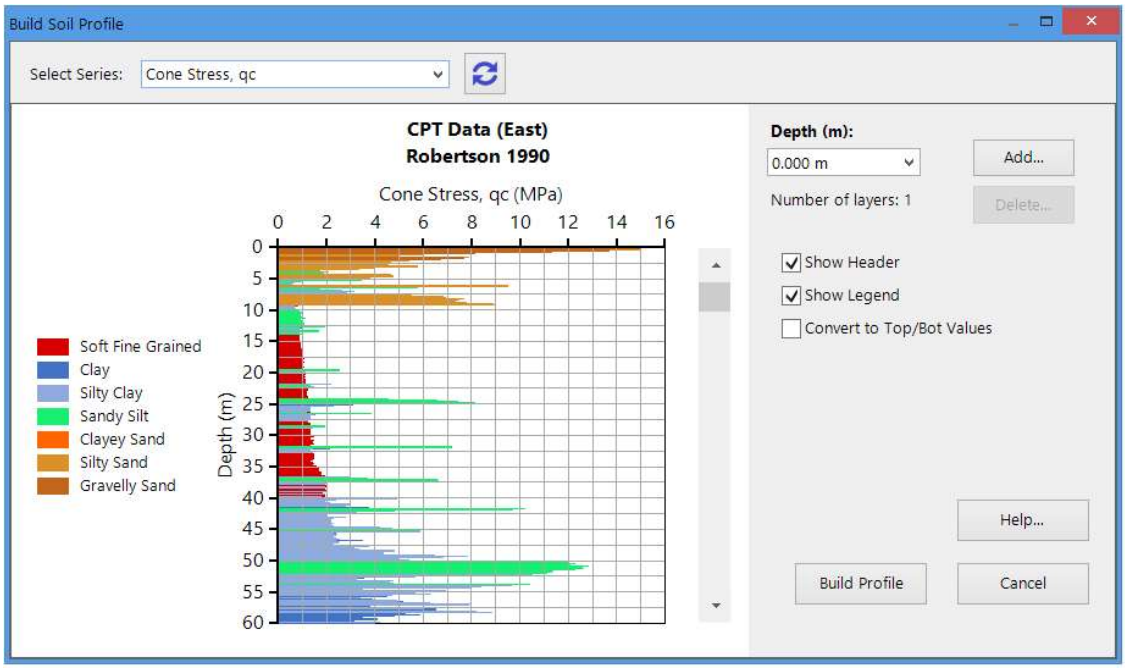
Important:
Do not confuse CPT data interpretation with the ability to compute the pile resistance using CPT data. The ability to compute pile resistance is discussed later in this document.

Once CPT data have been interpreted, UniPile 6.0 produces a series of tables and charts capable of displaying the soil strata based on classification.



Results obtained from the interpretation of the CPT data may also be used to build a soil profile compatible with both UniSettle 5.0 and UniPile 6.0. This feature can be accessed via the 'Convert CPT Data to Soil Profile…' located within the main TOOLBOX menu.

Building a soil profile compatible with UniPile 6.0 is simply a matter of moving the vertical scrollbar cursor located at the right of the chart to indicate a layer boundary and clicking 'Add...'. Additional layer boundaries may be added by repeating the process. Once all layer boundaries are defined, select 'Build Profile' to build the specific soil profile. The image below shows a set of CPT data defined with three boundaries (four layers).

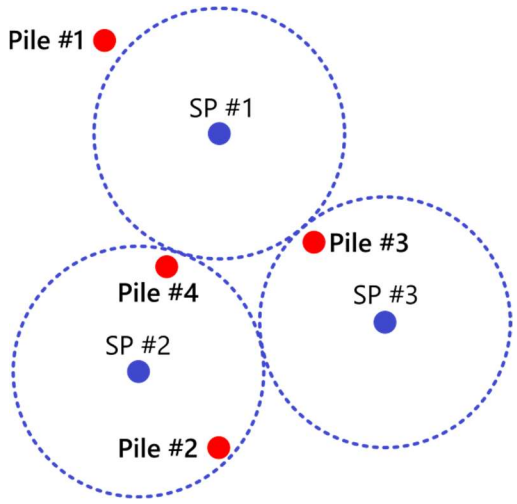


14.0 Pile Analysis

New in UniPile 6.0 is the ability to analyze multiple piles simultaneously while referencing multiple soil profiles, CPT data, or SPT data. This new feature makes comparing various designs much easier.

When an analysis includes multiple piles, soil profiles, CPT Data, and SPT Data, the interaction between the various elements will be based on proximity based on individual element cartesian coordinates.

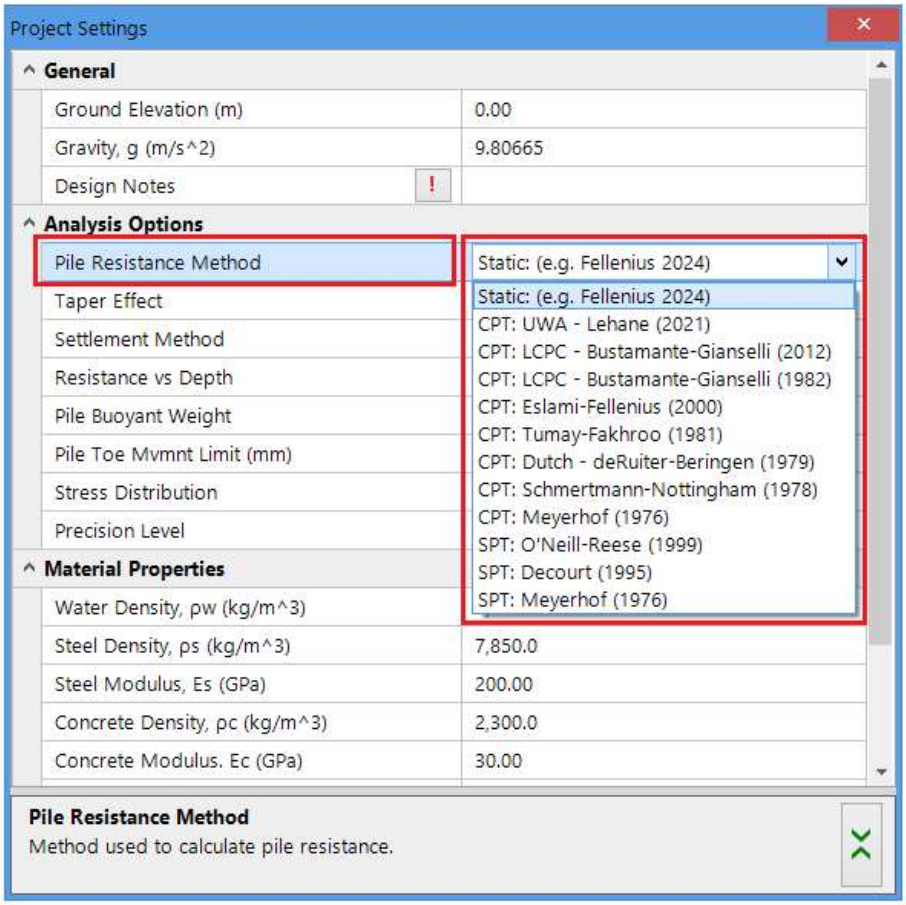
In the image below, for example, the Soil Profile SP#1 will be used to analyze Pile #1. Soil Profile SP#2 will be used to analyze Pile #2 and #4. Soil Profile SP#3 will be used to analyze Pile #3. If the pile resistance were to be computed based on one of the CPT or SPT set of data, the same concept would apply.



Pile Resistance Methods

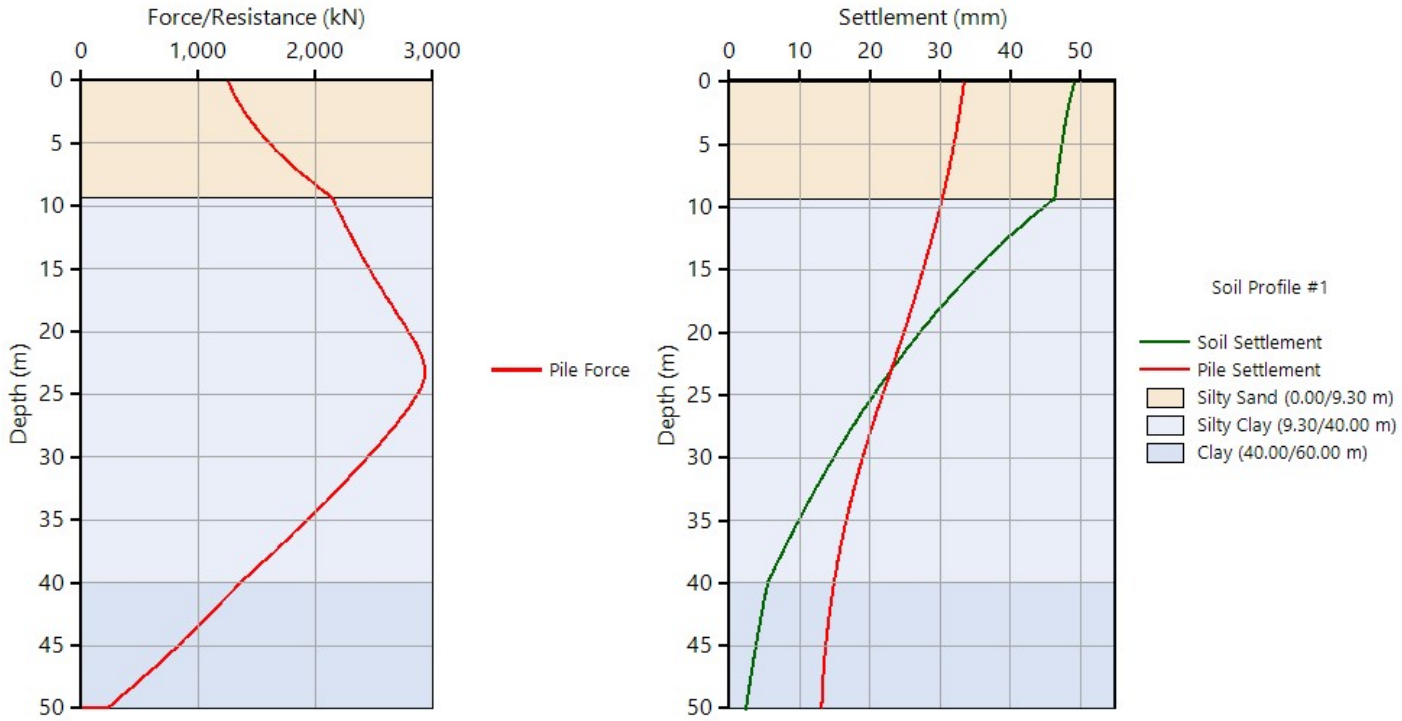
Pile resistance may be computed using the Static method (stress-dependent or independent) and various methods based on CPT and SPT data. New in UniPile 6.0 is the ability to compute the pile resistance based on the UWA (Lehane, 2021) and the updated LCPC (Bustamante-Gianselli, 2012) methods.

Methods available to compute the pile resistance are listed next to the 'Pile Resistance Method" entry within the 'Settings' entry form.


Project Settings
General
Ground Elevation (m)
0.00
Gravity, g (m/s^2)
9.80665
Design Notes
Analysis Options
Pile Resistance Method
Static: (e.g. Fellenius 2024)
Taper Effect
Settlement Method
Resistance vs Depth
Pile Buoyant Weight
Pile Toe Mvmnt Limit (mm)
Stress Distribution
Precision Level
Material Properties
Water Density, ρw (kg/m^3)
Steel Density, ρs (kg/m^3)
7,850.0
Steel Modulus, Es (GPa)
200.00
Concrete Density, ρc (kg/m^3)
2,300.0
Concrete Modulus. Ec (GPa)
30.00
Static: (e.g. Fellenius 2024)
CPT: UWA - Lehane (2021)
CPT: LCPC - Bustamante-Gianselli (2012)
CPT: LCPC - Bustamante-Gianselli (1982)
CPT: Eslami-Fellenius (2000)
CPT: Tumay-Fakhroo (1981)
CPT: Dutch - deRuiter-Beringen (1979)
CPT: Schmertmann-Nottingham (1978)
CPT: Meyerhof (1976)
SPT: O'Neill-Reese (1999)
SPT: Decourt (1995)
SPT: Meyerhof (1976)
Pile Resistance Method
Method used to calculate pile resistance.

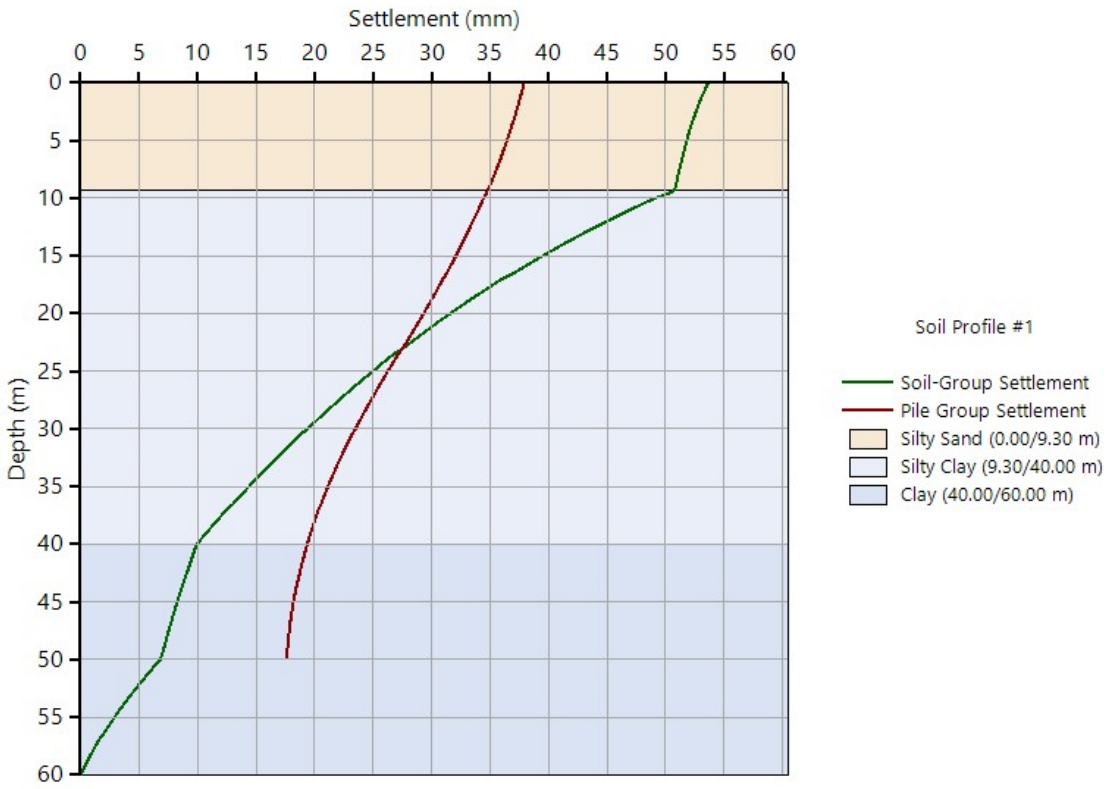
Pile Settlement

The settlement computation of a single pile has been improved to include the Fellenius Unified method (2024). This method of computing the pile settlement is unique as it includes the interaction of load transfer and soil settlement. Reduction of the force in the pile caused by the transition zone is also included. The Unified method is discussed in Chapter 7 of 'Basics of Foundation Design' by Bengt H. Fellenius, Dr. Tech., P.Eng, available within the main HELP menu.



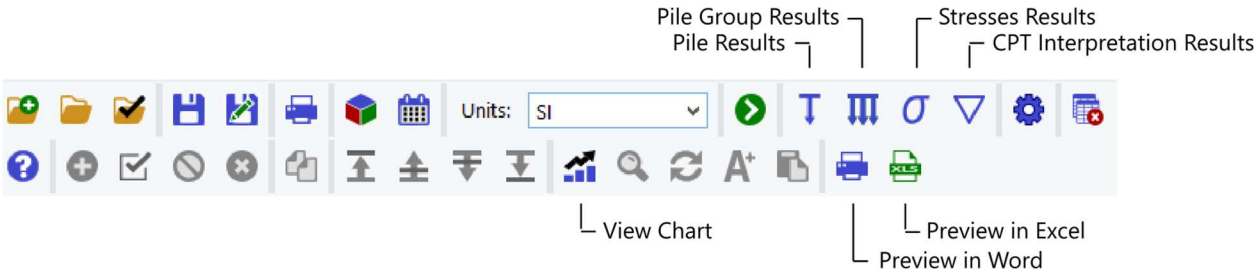
Pile Group Settlement

The settlement of small rigid pile groups has been improved to automatically include the distribution of the equivalent raft. Settlement of narrow rigid pile groups is discussed in Chapter 7 of 'Basics of Foundation Design' by Bengt H. Fellenius, Dr. Tech., P.Eng, available within the main HELP menu.



15.0 Results

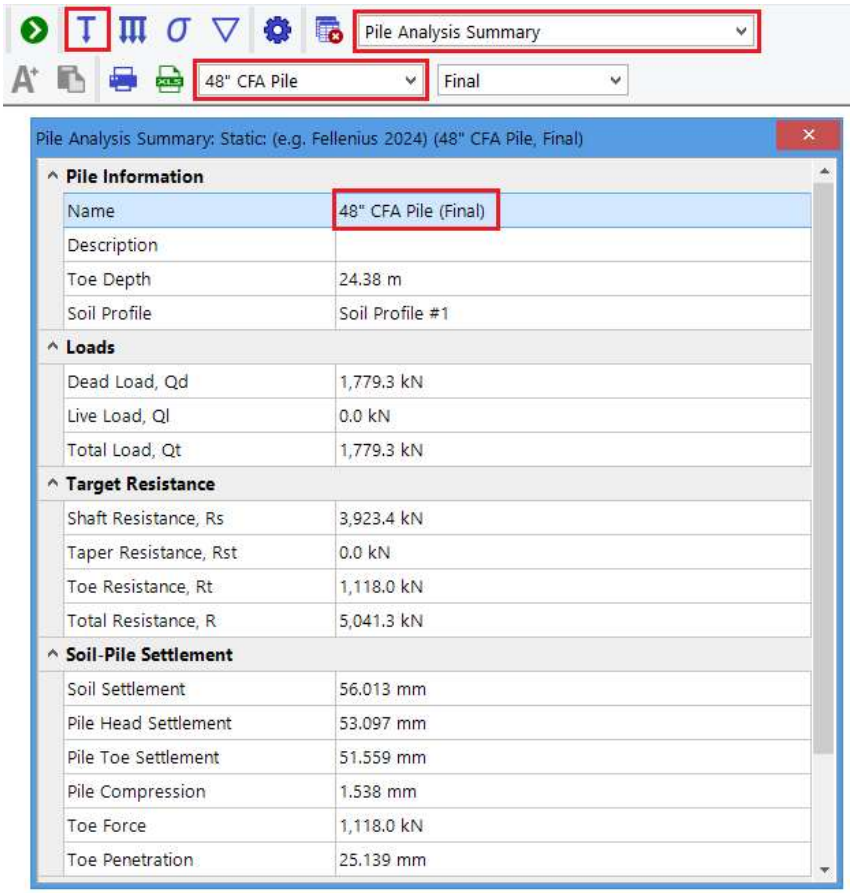
Upon completion of an analysis, the top menu and toolbars will be updated to show the various results that are available for review. The ability to review certain results depends on the type of analysis that was just performed.



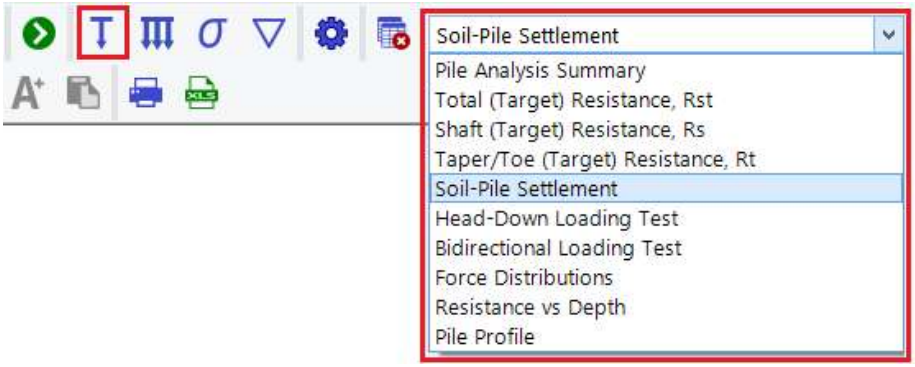
Results can be viewed in chart format. They can also be viewed in Microsoft Word and Excel for further manipulation.

Pile Results

Selecting 'Piles…' from the main RESULTS menu or the primary toolbar updates the interface and displays a list of the results related to pile analysis. The secondary toolbar is updated to include other options specific to the results presented on the screen. The image below shows an example of the dropdown settings to display the 'Pile Analysis Summary' of a 48" CFA Pile at 'Final' conditions.

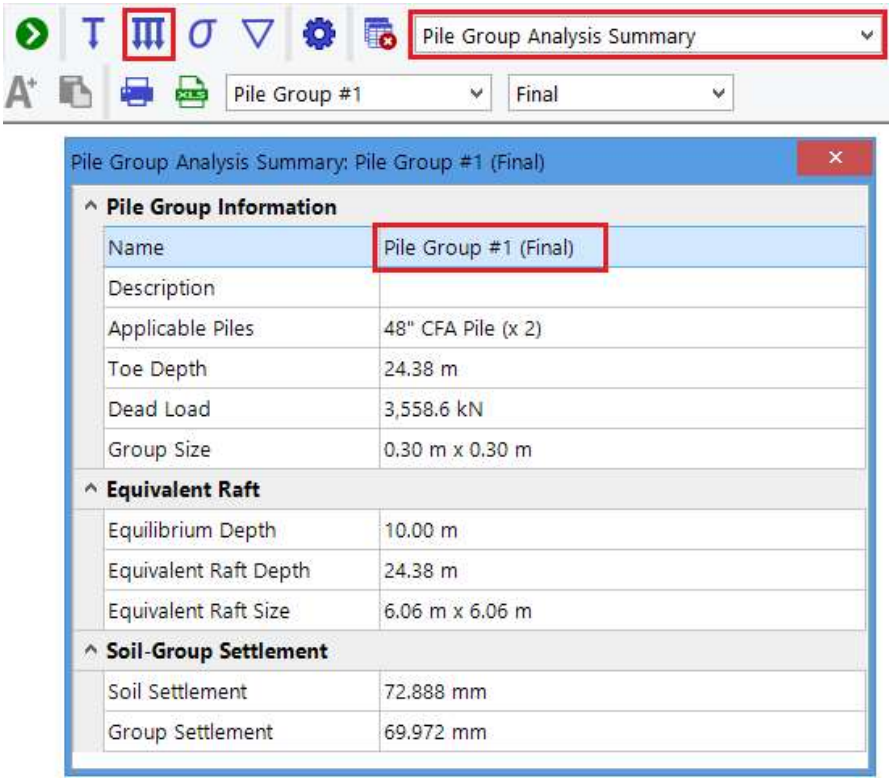


Depending on the extent of the analysis, UniPile 6.0 may produce up to 10 tables. Specific results are available inside the dropdown located within the primary toolbar.



Pile Group Results

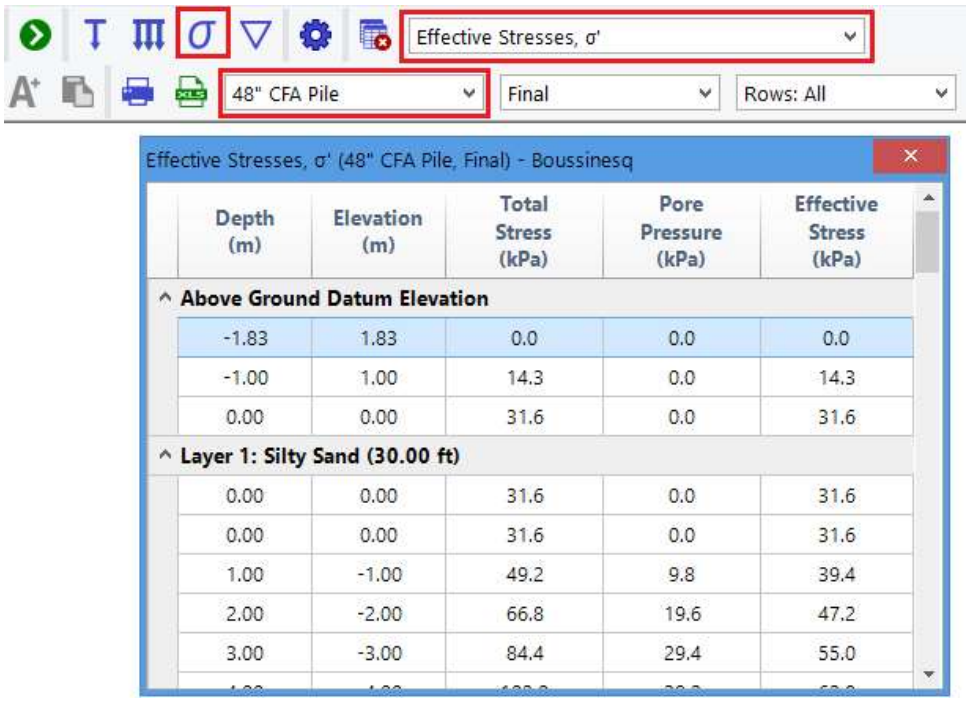
Selecting 'Pile Groups…' from the main RESULTS menu or the primary toolbar updates the interface and displays a list of the results related to pile groups. The secondary toolbar is updated to include other options specific to the results presented on the screen. The image below shows the dropdown settings to display the 'Pile Group Analysis Summary' related to Pile Group #1.



Depending on the analysis, UniPile 6.0 may produce up to two tables. The specific results are available inside the dropdown located within the primary toolbar.

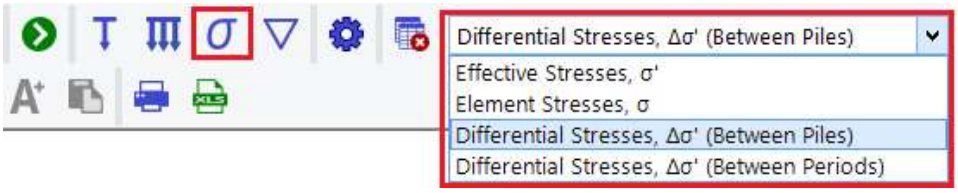
Stress Results

Selecting 'Stresses…' from the main RESULTS menu or the primary toolbar updates the interface and displays a list of the results related to stresses. The secondary toolbar is updated to include various options specific to the results presented on the screen. The image below shows the dropdown settings to display the 'Effective Stresses, σ', computed at the '48" CFA Pile'.



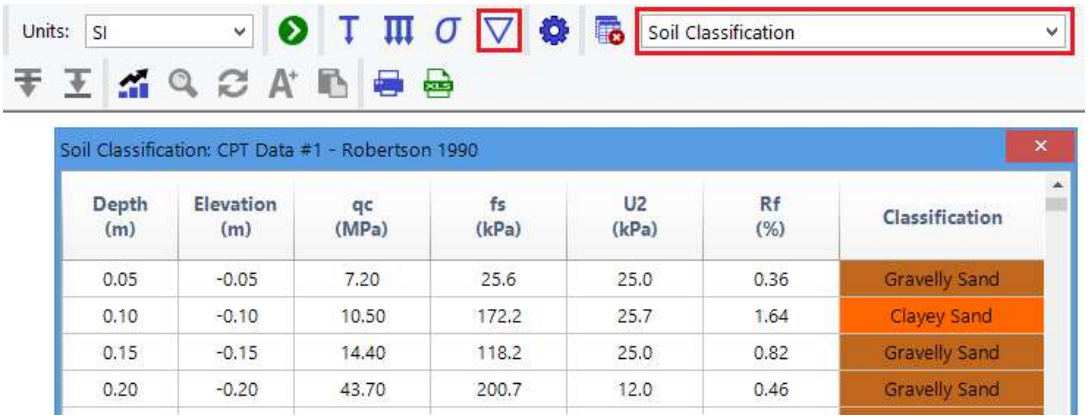
Depth (m)	Elevation (m)	Total Stress (kPa)	Pore Pressure (kPa)	Effective Stress (kPa)
Above Ground Datum Elevation				
-1.83	1.83	0.0	0.0	0.0
-1.00	1.00	14.3	0.0	14.3
0.00	0.00	31.6	0.0	31.6
Layer 1: Silty Sand (30.00 ft)				
0.00	0.00	31.6	0.0	31.6
0.00	0.00	31.6	0.0	31.6
1.00	-1.00	49.2	9.8	39.4
2.00	-2.00	66.8	19.6	47.2
3.00	-3.00	84.4	29.4	55.0

Stress results produced by UniPile 6.0 are divided into four separate tables. Specific results are available inside the dropdown located within the primary toolbar.



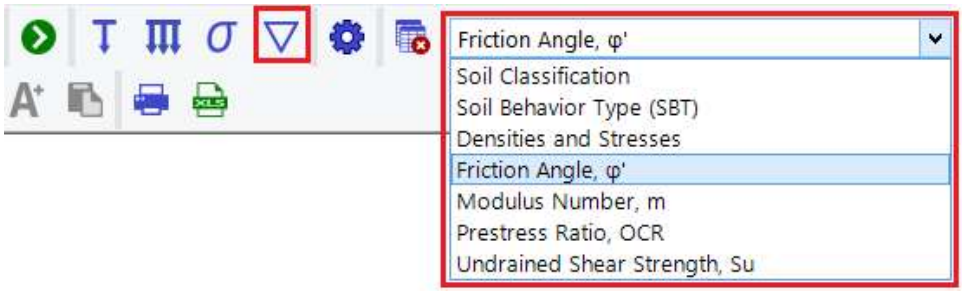
CPT Interpretation Results

Selecting 'CPT Interpretation...' from the main RESULTS menu or the primary toolbar updates the interface and displays a list of the results related to CPT data interpretation. The image below shows the dropdown settings to display the 'Soil Classification' obtained from a set of CPT data.



Depth (m)	Elevation (m)	qc (MPa)	fs (kPa)	U2 (kPa)	Rf (%)	Classification
0.05	-0.05	7.20	25.6	25.0	0.36	Gravelly Sand
0.10	-0.10	10.50	172.2	25.7	1.64	Clayey Sand
0.15	-0.15	14.40	118.2	25.0	0.82	Gravelly Sand
0.20	-0.20	43.70	200.7	12.0	0.46	Gravelly Sand

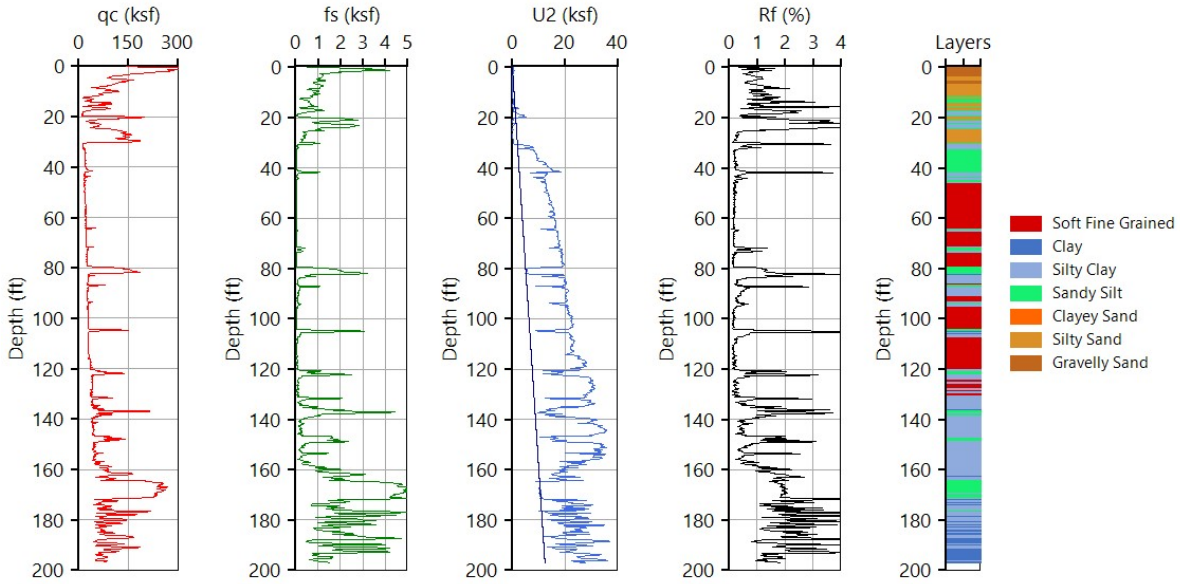
CPT data interpretation produces seven tables. Specific results are available inside the dropdown located within the primary toolbar.



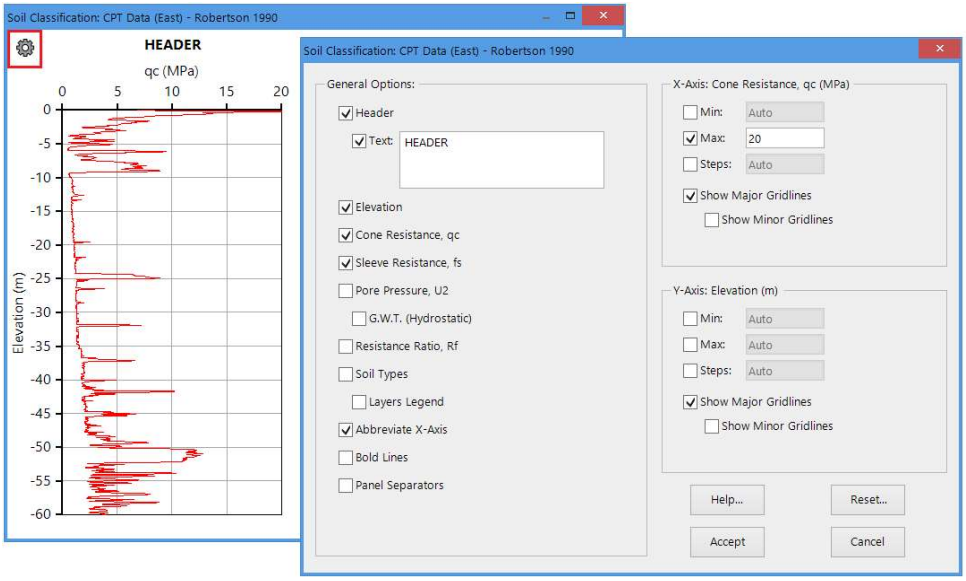
16.0 Charting Data and Results

Where available, data and results may be presented in graphical form by using the 'View Chart…' button located within the secondary toolbar or the main CONTEXT menu. Depending on the data and the type of analysis performed, more than 50 types of charts may be produced with a single click.

Also new in UniPile 6.0 is the ability to produce up to five side-by-side charts. The chart below was produced using the 'Soil Classification' feature of a CPT data interpretation.



The appearance of charts and series may be customized by selecting the 'Chart Settings…" button located at the top left corner of every chart.



Below is a list of the many options and features that may apply to a single or group of charts. The list varies depending on what the chart is meant to represent.

- The chart header may be edited or hidden
- When dealing with depth, the depth axis may be revised to display elevation
- When multiple charts appear side-by-side, they may be hidden
- Lines may be bold
- Symbols may be turned On/Off
- Soil profile with or without color may be turned On/Off
- Individual series may be turned On/Off
- Series legends may be turned On/Off
- X and Y axis settings may be set manually
- Major and minor gridlines may be turned On/Off

Manual zooming of a section of a chart may be performed by drawing a rectangle while holding your main (usually left) mouse button.

An image of the chart(s) as it appears on the screen may be viewed in Word using the “Preview in Word…” button located within the secondary toolbar. An image copy of the chart can also be copied to Windows memory (clipboard) and pasted into other applications capable of accepting Portable Network Graphic images (png). The size of the image being copied is based on its size on the screen and the screen resolution. The larger its appearance on the screen, the larger the image in memory will be. Depending on the intended purpose, you may use the ‘Chart Font Size…” feature located within the secondary toolbar to adjust the font size to suit your needs.

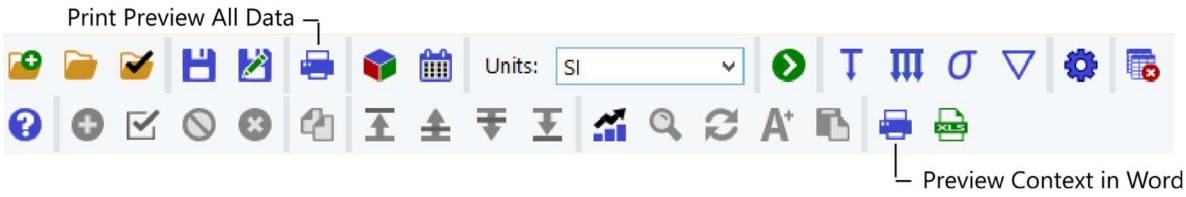
17.0 Printing Data, Results, and Charts

When selecting the Print command, a temporary Rich Text Format (.rtf) file is created and automatically previewed in Microsoft Word. Having Microsoft Word handle all printing means that the format and content can be edited by the end user without any limits. It also means that all outputs may be copied and pasted into engineering reports.

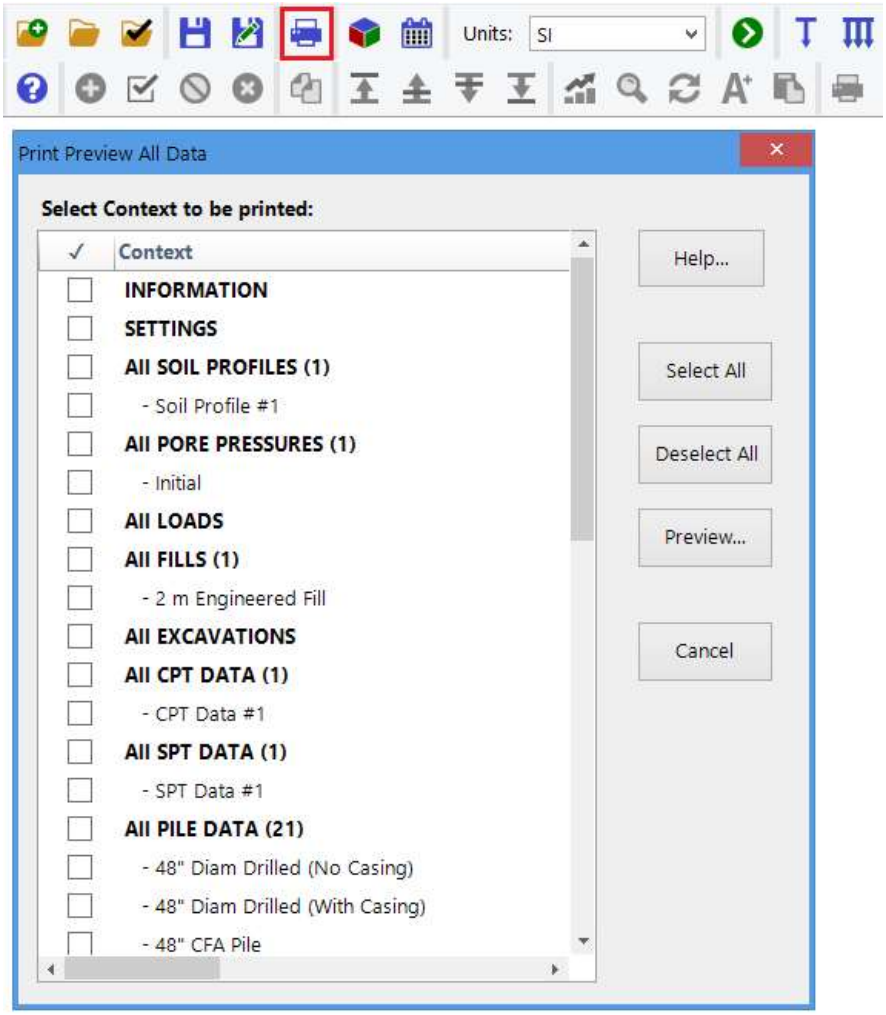
By default, all temporary files produced by UniPile 6.0 are recorded in the Users\AppData\Local\Temp\UniSoft GS\UniPile6 folder. This output folder may be changed by visiting the User Preferences located within the main OPTIONS menu.

Printing can be achieved in two ways:

- From the 'Print Preview All Data…' located within the main FILE menu (and primary toolbar)
- From the 'Preview in Word…' located within the main CONTEXT menu (and secondary toolbar)



The 'Print Preview All Data…' opens a window allowing the selection of one or multiple sets of input data. Depending on the size of the project, previewing all data may produce hundreds of pages and may take a few minutes. This is particularly the case when CPT datasets are included.



Using the 'Preview in Word…' option located within the secondary toolbar bypasses the above window and previews the data, results, or chart currently on the screen.

Important:
Due to the extremely large amount of results being produced by UniPile 6.0, it is not possible to print all available results using a single action. Only the results currently visible on the screen may be printed or exported.

18.0 Exporting Results

Individual results may be exported to a temporary comma-separated format file (.csv) and automatically previewed in Microsoft Excel using the 'Preview in Excel…' button located within the secondary toolbar. Having the ability to view the raw data within Microsoft Excel means that the format and content can be manipulated by the end user without any limits. It also means that custom charts and graphs can be produced.

By default, all temporary files produced by UniPile 6.0 are recorded in the Users\AppData\Local\Temp\UniSoft GS\UniPile6 folder. This output folder may be changed by visiting the User Preferences located within the main OPTIONS menu.