

Borehole Log

Version 8.095



Log – Borehole Log – Version 8.095
User Guide

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LOG - TABLE OF CONTENTS

LIST OF FIGURES	iii
Log - Borehole Log	1
1. Launching the Log module	1
2. File, Edit, Insert, View, Window and Help menus	1
3. Tools menu	1
3.1. Options	2
3.1.1. Global parameters	2
3.1.2. Layout of the graphs in the pages	4
4. Data menu	6
5. Navigation	6
6. Organization of a graphic output	6
7. Overview of graphs	7
8. Layout of texts and indentation	9
9. Types of curves	10
9.1. Default Type	10
9.2. Text Type	11
9.3. Point Type	11
9.4. Histo Type	11
9.5. Step Type	12
9.6. Polyline Type	13
9.7. Polygon Type	13
9.8. Color Type	13
9.9. Pattern Type	14
10. Format of the numerical values	14
11. DEPTH graph	14
12. FEET, METERS, ELEVATION graphs	15
13. STRATIGRAPHY graphs	15
13.1. Definition of a STRATIGRAPHY graph and its curves	15
13.2. Layers and sub-layers	16
13.3. Display of the curves of the STRATIGRAPHY graphs	17
13.3.1. Display for the DEPTH_TOP field	17
13.3.2. Display for the DESCRIPTION field	18
13.3.3. Display for the CODE1 field	19
13.3.4. Display for the MATERIAL field	20
13.3.5. Display for a field other than DEPTH_TOP, DESCRIPTION, CODE1 or MATERIAL20	20
13.3.6. Display of the stratigraphic symbols	20
14. SAMPLE graphs	21
14.1. Display of the SAMPLE_NO curve	21

14.2.	Display of the STATE curve	21
14.3.	Display of the USCS curve	22
14.4.	Display of the MATERIAL curve	22
14.5.	Selection of the types of samples to present	23
15.	PIEZOMETER graph	23
15.1.	Display of the Seals curve	23
15.2.	Display of the Tube curve	23
15.3.	Display of the Tip curve	24
15.4.	Display of the Water_level curve	24
15.5.	Display of the Protection curve	25
15.6.	Display of the Cover curve	26
15.7.	Display of the Packer curve	26
15.8.	Display of the Chamber curve	26
15.9.	Display of the Caps curve	27
15.10.	Display of the Boring curve	27
16.	LIMITS graph	27
17.	CONSOLIDATION graph	28
18.	ROCK_JOINT graphs	28
19.	CPTU_ZONE graphs	29
20.	GEOCAMERA graphs	29
21.	Display of property values or of concentrations of contaminants	29
22.	Display of elevations and information associated to a depth curve	30
23.	Display of equivalences to values	31
24.	Legend graph	31
25.	Interactive editing	32

LIST OF FIGURES

Figure 1 - Display options: global parameters	3
Figure 2 - Display options: first page of the report	5
Figure 3 - Graph editing window	7
Figure 4 - Indentation format	9
Figure 5 - Predefined curves of the DESCRIPTION field from the STRATIGRAPHY graph	19
Figure 6 - Symbol of the bedrock as the end of boring	20
Figure 7 - Symbols representing the state of the samples	21
Figure 8 - Selection of a sample type in a SAMPLE graph	22
Figure 9 - Predefined curves of the PIEZOMETER graph	25
Figure 10 - Curves of the Legend graph	31
Figure 11 - Interactive menu	32

LOG - BOREHOLE LOG

The **Log** module is used to produce borehole logs.

Log uses a Graphical User Interface (i.e. with windowing) that is compatible with Microsoft Windows 7, 8 and 10. Log uses the Geo and X3D libraries created by Sobek Technologies Inc. for data editing, the definition of the presentation style, and viewing and editing graphic results. Please refer to the Geo and X3D guides for all details.

1. LAUNCHING THE LOG MODULE



Double-click on this icon to open the **Log** module.

The connection to the database can be done directly when calling Log by entering the following string as target. The string will be:

C:\Geotec80\Bin\Log.exe username/password@odbc:connection_alias

See paragraph 1 of chapter 2 of the X3D guide for all the details about the connection to a database. Once the connection to a database is done, the user can execute a data query to produce boring logs.

When **Log** is first launched, the following files are loaded from **C:\Geotec80\Style**:

- the markers file **geotec8.mrk**;
- the patterns file **geotec8.ptn**;
- the style file **log_borehole.sty** which is a classic boring log model.

The user can begin working with this initial presentation, or open another style file included with the software. He can modify the style file and save it in a new presentation. In subsequent loadings, Log opens the style, markers and patterns files that were in use when Log was closed.

2. FILE, EDIT, INSERT, VIEW, WINDOW AND HELP MENUS

None of the options of the **File**, **Edit**, **Insert**, **View**, **Window** and **Help** menu is specific to Log. The detailed description of each option of these menus is done in chapters 2, 3, 4, 5 and 8 of the X3D guide.

3. TOOLS MENU

The options of the **Tools** menu are used to define the utilisation parameters of Log and to edit the graphic components produced by Log: the characteristics of the graphic page, of the graphs, legends, axes, markers and patterns used. All these options are described in details in chapter 6 of the X3D guide.

Options is specific to Log. It is presented in paragraph 3.1.

3.1. Options

Generally, the first page of a boring log has a section presenting the company logo and general information about the boring. Another section shows a legend where all the symbols used in the various columns of the report are presented. The following pages of the report may not show these sections; the columns would then fill the full height of the pages.



The **Options** item of the **Tools** menu or this button opens the window of options for geotechnical properties display, illustrated in figure 1. The user can define the differences between the first and subsequent pages, the height of the columns headings in the report and the global display parameters. The options are saved in the style file.


The window of options for geotechnical properties display has three panels:

- The **Global** panel to define the global presentation criteria for the logs
- The **Page 1** panel to define the layout of the graphs in the first page of the log
- The **Page(s) 2..n** panel to define the layout of the graphs in the eventual other pages of the log.

3.1.1. Global parameters

The **Global** panel, shown in figure 1, is used to define the global layout parameters of the logs.

In the rectangle “**Reference for superimposed borings**”:

- The user can choose to display only the **current boring** or **all selected borings** at the same time.
- When **all selected borings** are displayed, one boring is taken as the reference boring. Its data will be displayed for the BORING table and all text information (ex: Text fields and numerical values in Text format). All numerical information in the property columns will be superimposed. By navigating among the records, the records from the current boring are displayed in red. It is possible to change the reference boring by selecting the number of the desired boring in the window opened by clicking on the  button in the navigation. It can also be done by creating groups of borings.
- If **all selected borings** are displayed, the user can use **distinctive colors and / or distinctive markers** for the different borings. Colors and markers are defined by default but can be modified for the 1st to nth boring in the legend and curves editing window for the **Legend** graph (#99), created automatically. See paragraph 24.
- A boring can be displayed **with its parent boring**, defined in the BORING table.
 - In “**current boring**” mode, the data from the boring and its parent boring will be displayed together, with the colors defined in the style file for the various columns. The data from the BORING table show the ones of the reference boring.
 - In “**all selected borings**” mode, the data from all borings and their parent borings will be superimposed. A reference boring is selected, and it is its data that will be displayed for the BORING table and all text information (ex: Text fields and numerical values in Text format).

If “**distinctive colors**” and / or “**distinctive markers**” is checked, the same color and / or same marker will be used for a boring and its parent boring.

- If **all selected borings** are displayed, the content of the columns of the boring log can be aligned with:
 - The **depth from the ground surface**
 - The **depth from the soil surface**
 - The **depth from the rock surface**
 - The **elevation**

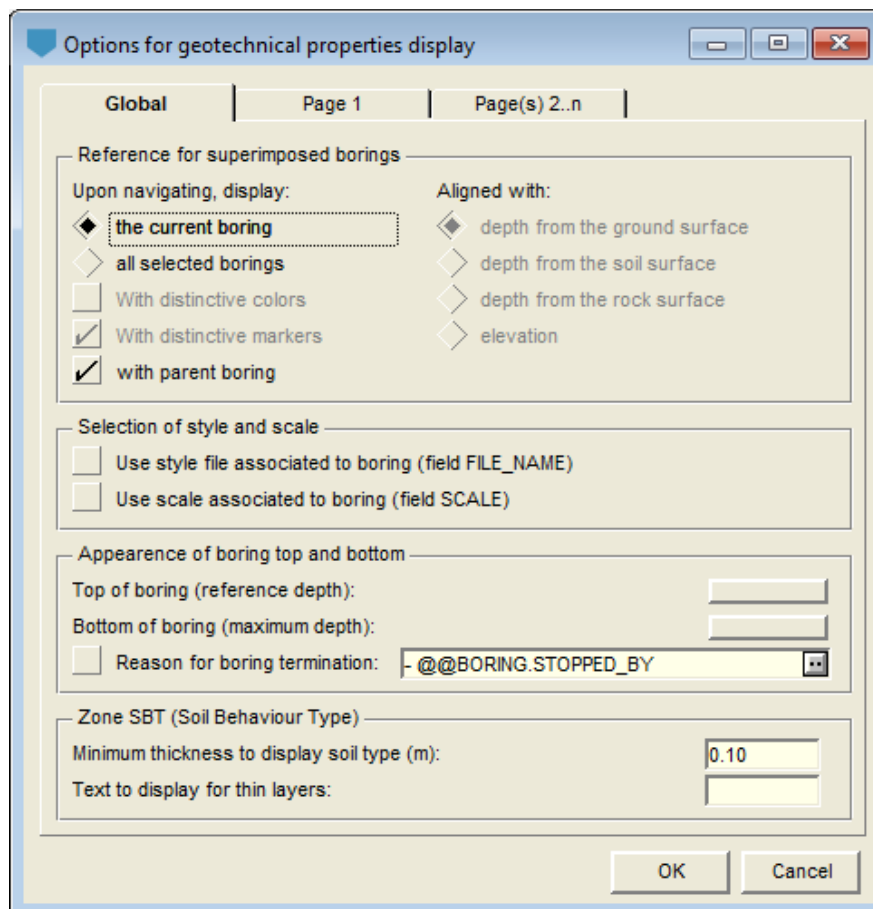


Figure 1 - Display options: global parameters

In the rectangle “**Selection of style and scale**”:

- If the box **Use style file associated to boring** is checked, **Log** will use the style file associated to the boring. Each boring with a style file name in the **FILE_NAME** field of the BORING table will be displayed with its style file. The style file must be located in the directory of the last style file used, or must include its complete path.

If the definition of a boring does not contain a style file name, if it is not found, or if the box is not checked, the boring log will be displayed with the last style file used by Log.

Warning: this option is not used during batch printing. The current style file will be used for all the style files.

- If the box **Use scale associated to boring** is checked, the scale used by **Log** to represent a boring will be the one entered in the **SCALE** field of the BORING table for the boring.

If the definition of a boring does not contain a scale value or if the box is not checked, Log will use the scales entered in the layout of pages 1 and 2 to n.

- These two options are saved in the computer's registry.

In the rectangle "**Appearance of boring top and bottom**":

- Two attributes buttons are used to define how the **top (reference depth)** and **bottom (maximum depth)** lines of the boring will be drawn.

These lines, if attributes are defined, will go across all the report columns except the DEPTH, FEET, METERS and ELEVATION columns, for clarity reason.

The drawing attributes for the top line are shown only if the start depth of the boring is negative; otherwise, the reference line (line for the top of the boring) is hidden by the X-axes or is above the columns in page 1 of the report.

- If the box **Reason for boring termination** is checked, the content of the field to the right will be added to the expression written at the bottom of the boring log, originating from the stratigraphy record of type "E" or from the title of the **End_of_borehole** curve from the graph of stratigraphic descriptions (see paragraphs 13.2 and 13.3.2).

The text added can be a free expression or a value from the database. As shown in figure 1, the expression "- @@BORING.STOPPED_BY" means that the text added will be a "-" followed by the expression entered in the EQUIVALENCE table equivalent to the content of the STOPPED_BY field of the BORING table.

In the rectangle "**Zone SBT (Soil Behaviour Type)**":

- Both parameters affect only the textual presentation of the SBT zones calculated from piezocone readings. These parameters apply only to a column showing the **SBT** field of the **CPTU_ZONE** table, with @@ in the **Series** cell of the legend and curve editing window if the user wants to display the equivalences as text.

Normally, a report displaying the results of piezocone tests has two columns showing the range of calculated SBT zones as histograms and text. Even if the numerous SBT measurements are grouped by range, some of them may be very small. By entering a value in the field **Minimal thickness to display soil type (m)**, the description of the ranges whose thickness is less than the value entered will be replaced by the string entered in the field **Text to display for thin layers**. If this field is empty, no description is displayed for thin layers. As histograms, all zones are displayed, no matter its thickness is.

3.1.2. Layout of the graphs in the pages

In the **Page 1** and **Page(s) 2..n** panels of the options window, the user can define the vertical layout of the primary graphs defined in the style file used and their presence on the pages of the report. He can also define the height of the columns headings.

To define the layout of the graphs in page 1, click on the Page 1 tab. To define the layout of the graphs in the other pages, click on the **Page(s) 2..n** tab. Figure 2 shows the **Page 1** panel.

The preview area of the options window shows the graphic page and the surface that the primary graphs (**#P** of **0**) occupy according to their dimensions defined in the graph editing window. The DEPTH graph, however, occupies the surface filled by all the columns associated to it and therefore sharing its Y axis.

In the **Page 1** and **Page(s) 2..n** panels, the user can define the layout of the primary graphs by clicking on the surface representing them in the preview area. The name of the current graph is then displayed in the top field.

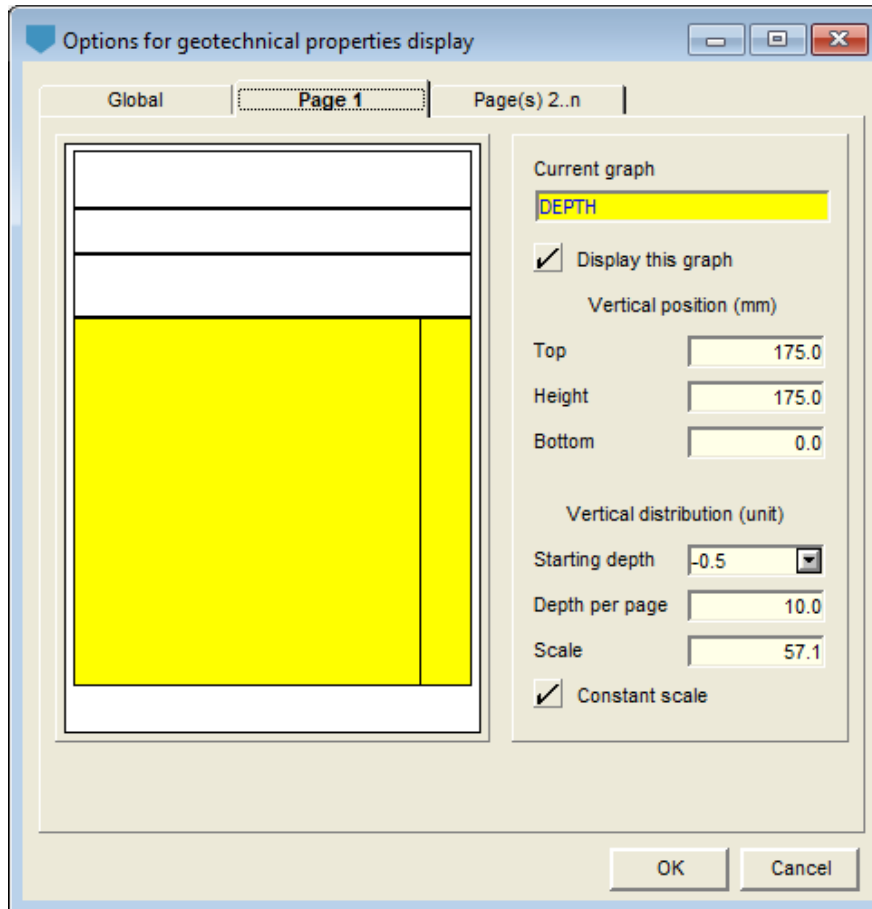


Figure 2 - Display options: first page of the report

In addition to the areas occupied by the primary graphs, the preview area shows the COLUMNS_HEADING surface above the DEPTH graph. The only characteristic that can be modified is the height of the headings. The height of the headings applies for all pages.

- If the box **Display this graph** is checked, the current graph is displayed in yellow. Otherwise, the surface is displayed with a white background in the preview area and the graph is not displayed in the boring log. It is not possible not to display the COLUMNS_HEADING and DEPTH graphs.
- The **Top**, **Height** and **Bottom** fields are used to define the vertical position and dimension of the graphs.
- The **Starting depth**, **Depth per page** and **Scale** fields can be edited when DEPTH is the current graph.

Starting depth is used to define the depth at which the boring log should start. A negative value will display a part above the ground surface level. A positive value allows the omission of part of the log. It is possible to start the boring logs at the soil or at the rock, by





entering "soil" or "rock" as the **starting depth**, respectively. The soil depth or the rock depth entered in the BORING table is used, and rounded up according to the primary step defined for the DEPTH graph.

Depth per page is used to define the length of the boring that will be represented in the page(s) of the current panel. This depth value and the height of the DEPTH graph determine the scale entered in the **Scale** field. The depth per page is adjusted when the scale is modified.

If the box **Constant scale** is checked, the scale entered or calculated in the current panel is entered in the other panel; the depth per page is adjusted if necessary. If the box **Constant scale** is not checked, it is possible to define a different scale in page 1 and the other pages.

4. DATA MENU

The options of the **Data** menu are detailed in chapter 7 of the X3D guide. The options are mainly used to retrieve data in the tables of the **Geotec** database. In Log, the default retrieval (**simple query**) is done on the **Boring** table.

In Log, the data entry options available in the **Data** menu (**Entry** option) and with the buttons of the application toolbar (   ) are those of **Site**, **Boring**, **Stratigraphy**, **Sample**. The user first inserts the sites, followed by the borings related to the sites, then the layers and samples from the borings.

5. NAVIGATION

The <<, <, #, >, >> elements in the menu bar are used by Log to navigate in the boring logs that have several pages. Keyboard keys have the same role. They do the following:

<<	or	[Home]	displays the first page of the report;
<	or	[Page Up]	displays the previous page of the report;
#			displays a window to enter the page number to display;
>	or	[Page Down]	displays the next page of the report;
>>	or	[End]	displays the last page of the report.

6. ORGANIZATION OF A GRAPHIC OUTPUT



The definition of graphs is established and updated in the graph editing window opened by selecting the **Graphs...** option of the **Tools** menu or by clicking the button shown on the left. More details about the graph editing are available in paragraph 3 of chapter 6 of the X3D guide. Figure 3 shows the graph editing window in Log.

The table in this window contains all the graphs defined in the style file used. Each graph is identified by a unique number in the **#** column. The first graph is always **Page** with **# 0**. This graph represents the graphic page and cannot be deleted.

Among the graphs, there are the **primary graphs** whose **#P cell is 0** and the **secondary graphs** whose **#P cell is a positive value**. In the example, all the secondary graphs have **4** as

their **#P** which is the number (#) of the **DEPTH** graph. These secondary graphs define columns of the boring log aligned on the depth column **DEPTH**, described in paragraph 11.

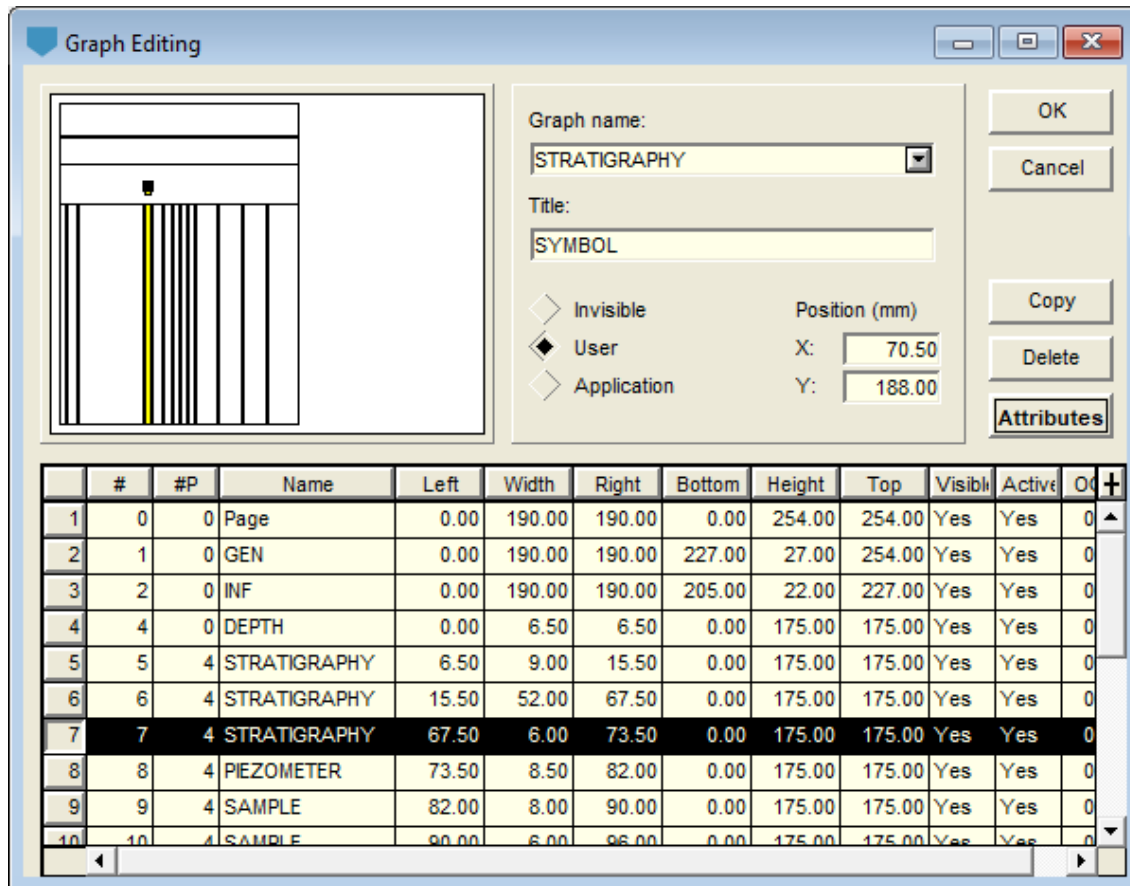


Figure 3 - Graph editing window

The **Left**, **Width**, **Right**, **Bottom**, **Height** and **Top** fields define the position and dimension of the graphs. For the secondary graphs, the vertical position and the height of the graphs are aligned on the **DEPTH** graph, even if the values in **Bottom**, **Height** and **Top** are modified. For the primary graphs, these values can also be defined via the options window, described at paragraph 3.1.2.

7. OVERVIEW OF GRAPHS

Log associates to some graphs a display that is completely or partially predefined. These graphs are in the following table. The predefined curves have numbers greater or equal to **100**. Log manages the display of these curves, but the user can still modify some of the drawing attributes of the curves. Paragraph 4 of chapter 6 of the X3D guide explains how to modify the display attributes of a curve.

Graph	Characteristics
DEPTH	<ul style="list-style-type: none"> • Is required; the other columns are aligned with it. • Displays the tick marks and labels of the depths. • Has no associated curve. • The characteristics of its Y axis: the total depth in the BORING table and the depth per page or the scale defined in the options window determine its display, which influences the display of the other graphs in columns.
FEET	<ul style="list-style-type: none"> • Displays the tick marks and labels of the depths, expressed in feet. The display is based on the DEPTH column which is considered to display the depths using the metric system, in meters. • Its #P must be the # of the DEPTH graph. • Has no associated curve.
METERS	<ul style="list-style-type: none"> • Displays the tick marks and labels of the depths expressed in meters. The display is based on the DEPTH column which is considered to display the depths using the imperial system, in feet. • Its #P must be the # of the DEPTH graph. • Has no associated curve.
ELEVATION	<ul style="list-style-type: none"> • Displays the tick marks and labels of the elevations. The display is based on the DEPTH column and expressed in the same unit system. • Its #P must be the # of the DEPTH graph. • Has no associated curve.
STRATIGRAPHY	<ul style="list-style-type: none"> • Typically, four STRATIGRAPHY graphs can be defined to display: <ul style="list-style-type: none"> ○ the elevations and depths of the stratigraphic horizons (DEPTH_TOP field); ○ the stratigraphic descriptions (DESCRIPTION field); ○ the symbols of the stratigraphic horizons (CODE1 field); ○ the color of the materials of the stratigraphic horizons (MATERIAL field). • The STRATIGRAPHY sub-graph has predefined curves if the field displayed is CODE1, DEPTH_TOP or DESCRIPTION.
SAMPLE	<ul style="list-style-type: none"> • SAMPLE graphs are often defined to display: <ul style="list-style-type: none"> ○ the type and number of the samples (TYPE and SAMPLE_NO fields); ○ their state (STATE field); ○ their recovery percentage (RECOVERY field); ○ their N and their RQD; ○ their USCS classification (USCS field); ○ their constituting material (MATERIAL field). • Special displays exist for the numbers and the state symbols of the samples.
PIEZOMETER	<ul style="list-style-type: none"> • Displays the installations of the piezometers, of the observation and supply wells and the measurements of the last piezometric levels. • Displays the contents of the PIEZOMETER, PIEZOMETER_SEAL and PIEZOMETRIC_LEVEL tables. • Only has predefined curves.

Graph	Characteristics
LIMITS	<ul style="list-style-type: none"> Displays the measurements of the Atterberg limits. A predefined curve displays the plastic and liquid limits using their typical representation (vertical dashes joined by a horizontal line) and the water content represented by a circle.
CONSOLIDATION	<ul style="list-style-type: none"> Displays the results of consolidation tests. A predefined curve displays the minimum and maximum preconsolidation stresses using their typical representation (vertical dashes joined by a horizontal line) and the probable preconsolidation stress represented by a down arrow.
ROCK_JOINT	<ul style="list-style-type: none"> A special display exists to represent jointly the type, angle and azimuth of the joints. A special display exists to represent the angle of the joints.
CPTU_ZONE	<ul style="list-style-type: none"> Displays the ranges of SBT zones if curve #1 is SBT. 9 predefined curves in the Page allow the user to define the colors of the 9 different ranges.
GEOCAMERA	<ul style="list-style-type: none"> Displays the optical, acoustic and 3D images and the photos of the geocamera from the FILE_NAME field.
Legend	<ul style="list-style-type: none"> Created automatically when displaying « all selected borings » Defines the colors and markers of the superimposed borings

8. LAYOUT OF TEXTS AND INDENTATION

The user can control the left, right, top and bottom margins of the texts in the columns of a boring log, except for the **DEPTH**, **FEET**, **METERS** and **ELEVATION** columns. The vertical layout of the texts is explained in the paragraphs presenting the different graphs.

The left and right margins of the texts of a column are defined in the **Margin** field of the legend and curve editing window for the desired column. This field is valid for the entire column; its value applies to the texts representing all the curves of the graph. Even with a margin of 0, the text is not on the border of the column; an offset equal to 1.5 times the height of the character used for the first curve of the column is kept to allow a possible indentation of the limit(s).

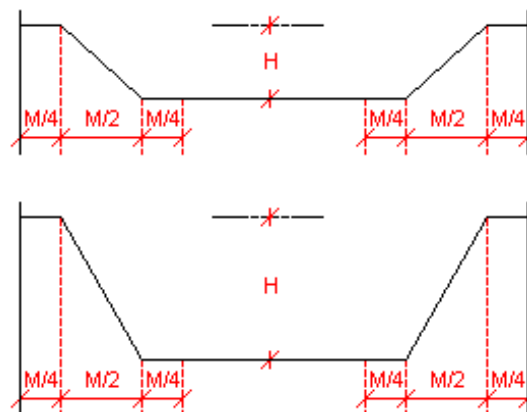


Figure 4 - Indentation format

Often, the height of the text displayed is greater than the height of the entity to which it applies, such as the thickness of the layer or the length of the sample. In this case, the lower limit or the two limits of the zone are indented to enlarge the display height in order to include the entire text. The indentation format is defined by the width of the margin using the concept shown in the diagram presented in figure 4 where **M** is the margin and **H** is the height of the indentation that depends on the amount of text to fit in.

The horizontal alignment, left, center or right, can be edited with the alignment button in the drawing attributes window, no matter if the curve is of Default or Text type.

The line spacing of the text is valid only for one curve. The line spacing is defined in the drawing attributes window for the curve in the **Line Spacing** field.

Vertically, the texts of a curve are offset from the upper and lower limits by a distance of at least half a line space. In addition, a top or bottom margin can be defined. This margin is also only valid for the curve. The top or bottom margin is defined in the drawing attributes window for the curve in the **Offset distance** field.

- If the alignment is from the top, the value entered is considered the top margin;
- If the alignment is from the bottom, the value entered is considered the bottom margin;
- If the alignment is centered vertically, the value entered is not applied;
- If no alignment is defined, the texts are aligned from the top in a **STRATIGRAPHY** column, and are centered in the other columns associated with samples or depths.

9. TYPES OF CURVES

9.1. Default Type

The **Default** type presents the values associated to the current curve according to the typical display in geotechnics for the type of information involved.

In some cases, the default display is the only possible display, especially for most of the curves with predefined display. In this situation, replacing the **Default** type with another type has no effect.

The user can modify some drawing attributes for the curves, accordingly.

If the curve represents values of a field beginning with "**DEPTH**" or "**ELEVATION**", the drawing attributes that the user can modify are:

- The text; the content of the **Title** cell for the curve in the curve and legend editing window will be displayed at the depth of each measurement (see paragraph 22);
- The line; a line is drawn at the depth of each measurement;
- The marker; it will have the same alignment as the text.

If the curve represents values of a field not beginning with "**DEPTH**" or "**ELEVATION**", the drawing attributes that the user can modify are:

- The text; the values will be displayed at the depth of the measurement or at its average depth if it is taken between a top and bottom depth or on a sample;
- The line, if the values of the curve are taken from a table containing a sample number or top and bottom depths; in this case, the lower and upper limits of the sample on which the measurement was taken, or the minimum and maximum depths of the measurement are displayed with the line parameters.

9.2. Text Type

Except the curves with predefined display, the **Text** type applies to all curves. The information is then presented in textual format.

When the curve is of **Text** type, the drawing attributes that the user can modify are:

- The text; the values will be displayed at the depth of the measurement or at its average depth if it is taken between a top and bottom depth or on a sample;
- The line, if the values of the curve are taken from a table containing a sample number or top and bottom depths; in this case, the lower and upper limits of the sample on which the measurement was taken, or the minimum and maximum depths of the measurement are displayed with the line parameters.

9.3. Point Type

The **Point** type will have an effect only on a curve containing numerical values, which will be represented by markers. The values will be represented at the depth of the measurements or at their average depth if they are taken between a top and bottom depth or on a sample.

The only drawing attributes that the user can modify are those of the marker.

9.4. Histo Type

The **Histo** type (histogram) will have an effect only on a curve containing numerical values taken from a table containing a sample number or top and bottom depths.

Each measurement will be represented by a rectangle limited:

- At the top and bottom by the limits of the sample or its top and bottom depths;
- Left and right by the edge of the column and the values of the measurements in X;
 - The user can edit the X axis to obtain the best possible representation for the measurements; the 0 origin of the axes is normally on the left; if the user asks the **inversion of the X axis**, the histogram will be resting on the right of the column.
 - To present the **inverted histogram**, i.e. the left border is the measurement value and the right border is the right border of the column (maximum value on the X axis), the user enters an **alignment value of 3** for the curve in the legend and curve editing window.

The **value of the period** for the curve in the legend and curve editing window is used to indicate which **lines of the histogram** will be displayed.

- A **period of 0** will display all 4 borders of the histogram. No marker is displayed. If a filling and/or pattern is defined, the histogram is always filled, without any marker, no matter the period entered.

- A **period of 1** will display the top and bottom lines and the vertical line corresponding to the value in X, if the filling and pattern are removed. A marker can also be displayed at the ends of each line.
- A **period of 2** will display only the top and bottom lines of the histogram, if the filling and pattern are removed. A marker can also be displayed at the ends of each line.
- A **period of 3** will display only the vertical line corresponding to the value in X, if the filling and pattern are removed. A marker can also be displayed at the ends of each line.
- A **negative period** will display the histogram from the X value, going towards the origin. For example, a period of -1 gives a histogram with a width of 1 unit (in X) towards the origin and starting from the X value; a period of -5 gives a histogram with a width of 5 units (in X) towards the origin and starting from the X value, etc.

The drawing attributes that the user can successfully modify are:

- The line; the border of each range will be displayed with the line attributes;
- The marker; a marker will be displayed at the corners of the ranges or the ends of the lines forming the histograms, if applicable;
- The filling; the background of each range will have the chosen filling;
- The pattern; the chosen pattern will fill the ranges by overlaying the filling.

9.5. Step Type

The **Step** type will have an effect only on a curve containing numerical values, which will be represented in relation to the measurement depth or to the top depth if the measurements were taken between two depths or on a sample.

Each measurement will be represented by a rectangle limited:

- Left and right by the edge of the column and the values of the measurements in X;
 - The user can edit the X axis to obtain the best possible representation for the measurements; the 0 origin of the axes is normally on the left; if the user asks the **inversion of the X axis**, the histogram will be resting on the right of the column.
 - To present the **inverted histogram**, i.e. the left border is the measurement value and the right border is the right border of the column (maximum value on the X axis), the user enters an **alignment value of 3** for the curve in the legend and curve editing window.
- By the measurement depth or the top depth if the measurement was taken between two depths; the period and dimension are used to customize the vertical limits of the steps.
 - The **value of the period** for the curve in the legend and curve editing window is used to **align the step** in relation to the measurement depth.
 - A **period of 1** forces an alignment by the top. The top of each step will be at the measurement depth or at the top depth if the measurement is taken between two depths.
 - A **period of 2** forces a centered alignment. The step is centered on the measurement depth or on the top depth if the measurement is taken between two depths. It is the default alignment if a period other than 1, 2 or 3 is entered.

- A **period of 3** forces an alignment by the bottom. The bottom of each step will be at the measurement depth or at the top depth if the measurement is taken between two depths.
- The **dimension value** for the curve in the legend and curve editing window defines the height of each step, in depth units, up to the next step maximum. When the depth scale is modified, the step height also changes.

The drawing attributes that the user can successfully modify are:

- The line; the border of each range will be displayed with the line attributes;
- The filling; the background of each range will have the chosen filling;
- The pattern; the chosen pattern will fill the ranges by overlaying the filling.

9.6. Polyline Type

The **Polyline** type will have an effect only on a curve containing numerical values, which will be represented by the summits of the polyline and possibly by markers. The values will be represented at the depth of the measurements or at their average depth if they are taken between a top and bottom depth or on a sample.

The drawing attributes that the user can modify are:

- The line; the polyline connecting the position of each measurement will have the line attributes;
- The marker; the position of each measurement will be accentuated by the chosen marker.

9.7. Polygon Type

The **Polygon** type will have an effect only on a curve containing numerical values. The polygon is limited on the:

- Left, by the left limit of the column;
- Right, by the polyline connecting the position of each measurement;
- Top, by the projection of the shallowest measurement on the left border of the column;
- Bottom, by the projection of the deepest measurement on the left border of the column.

If the X axis is inverted, the polyline takes into account the inversion of the axis, but the polygon remains resting on the left side of the column.

The drawing attributes that the user can modify are:

- The line; the border of the polygon will have the line attributes;
- The filling; the background of the polygon will have the chosen filling;
- The pattern; the chosen pattern will fill the polygon by overlaying the background.

9.8. Color Type

The **Color** type is used to present a value, numerical or textual, with a corresponding color. The values must be from a table containing a sample number or top and bottom depths.

The colors for the different list values are defined the LIST_ENG or LIST_FRE tables (whether the lists are used in English or French). Colors can also be defined for numerical values, even though no list of values is displayed in the entry forms for numerical fields. See paragraph 25 of chapter 2 of the Geo guide for all details about the lists.

The drawing attributes that the user can modify are:

- The filling; if a value doesn't have a corresponding color, the default filling color will be used.
- The line; the upper and lower limits of depths and the left and right borders of the columns are displayed with the line parameters.

9.9. Pattern Type

The **Pattern** type is used to present a value, numerical or textual, with a corresponding pattern. The values must be from a table containing a sample number or top and bottom depths.

The patterns for the different list values are defined the LIST_ENG or LIST_FRE tables (whether the lists are used in English or French). Patterns can also be defined for numerical values, even though no list of values is displayed in the entry forms for numerical fields. See paragraph 25 of chapter 2 of the Geo guide for all details about the lists.

The drawing attributes that the user can modify are:

- The pattern; if a value does not have a corresponding pattern, the default pattern will be used.
- The line; the upper and lower limits of depths and the left and right borders of the columns are displayed with the line parameters.

10. FORMAT OF THE NUMERICAL VALUES

The user can define the desired format for the display of numerical values in the **Format** field of the drawing attributes window for each curve; for example, "9.999" to have 3 decimals.

No format is predefined for texts placed as graphic objects representing numerical values from the database. The user can define a format right after the value string in the object's property window. For example, to display with 3 decimal numbers the natural ground elevation in the boring log heading, the user will define a graphic object of **Text** type with the value **&&BORING.GROUND_ELEV"9.999"**.

11. DEPTH GRAPH

The **DEPTH** graph is the only **required** graph (in addition to the page) in a boring log. No curve is associated to the DEPTH graph. This graph shows the tick marks for the depths. The other graphs are aligned on it.

The length of the boring displayed in the first page of a report, entered in the options window (see paragraph 3.1.2), is reflected in the limits of the Y axis of the DEPTH graph. The limits of the Y axis are “**Exact**” and cannot be modified.

The depths indicated in the DEPTH graph are the labels of the Y axis. The following example demonstrates how to define the drawing attributes for the DEPTH graph shown in figure 3.

With a width of 6.5 mm, this graph is aligned on the left side of the page. The tick marks are on the left inside the graph. The depth labels are also inside the column and are centered on the tick marks and aligned to the right, their alignment point is 6 mm from the left side of the graph.



To define these display parameters, open the axes editing window for the Y axis of the DEPTH graph and:

- check the **Inside** box of the primary and secondary tick marks;
- check the **Left** box for the position of the labels to set the labels along the left side of the DEPTH column;
- click on the button "**12.3**" below **Labels** to define drawing attributes:
 - enter an **offset in X** of -6 mm (negative value = inside the graph) and an **offset in Y** of 0 mm;
 - set the **alignment point** centered vertically and to the right;

12. FEET, METERS, ELEVATION GRAPHS

The **FEET** graph displays tick marks and labels of depths expressed in feet. When defined, this graph shows the equivalence in feet of the depths expressed in meters in the **DEPTH** column.

The **METERS** graph has the same role as the **FEET** graph but it displays the equivalence in meters of the depths expressed in feet in the **DEPTH** column.

The **ELEVATION** graph displays the tick marks and labels of the elevations parallel to the **DEPTH** column and in the same unit system.

The number of their parent graph (**#P**) must be the number (**#**) of the **DEPTH** graph in the graph editing window. They do not have curves associated.

The indications of depths or elevations displayed in these graphs are the labels of their Y axis. The tick marks and labels of these graphs are displayed the same way as the **DEPTH** graph (see paragraph 11).

13. STRATIGRAPHY GRAPHS

13.1. Definition of a STRATIGRAPHY graph and its curves

The stratigraphy of a boring is read in the **STRATIGRAPHY** table.

- In the graph editing window, select the STRATIGRAPHY table from the scrolling list in the **Name** column of the bottom table and click OK;

- In the legend and curve editing window, for the STRATIGRAPHY table, insert a curve and select the name of the desired field from the scrolling list in the **Name** column of the bottom table, such as:
 - **DEPTH_TOP** to display the depth of the upper limits of the stratigraphic horizons;
 - **DESCRIPTION** to display the stratigraphic descriptions;
 - **CODE1** to display the symbol representing the materials of the stratigraphic horizons;
 - **MATERIAL** to display the color of the materials constituting the layers;
 - Any other field from the STRATIGRAPHY table.
- If the curve is associated to the field **DEPTH_TOP**, **DESCRIPTION** or **CODE1**, four predefined curves are automatically created when the user clicks OK:
 - Elevation
 - Layers
 - Sub-layers
 - End_of_borehole

To view and edit these predefined curves, re-open the legend and curve editing window. Figure 5 shows the predefined curves associated to the fields DEPTH_TOP, DESCRIPTION and CODE1 from STRATIGRAPHY.

13.2. Layers and sub-layers

The layers and sub-layers are strata, which are records in the **STRATIGRAPHY** table.

- the strata can be classified as three **types**: **R** (rock classification), **S** (simplified classification) or **U** (unified classification);
 - for an **R** type stratum, only one material can be defined; its code is entered in **code 1**;
 - for an **S** type stratum, up to six materials can be defined; their codes (one character each) are entered in **code 1**;

the relative proportions of the materials are entered in the **proportion** field; the main material has a proportion of 1, a material with traces has a proportion of 4; the proportions must be entered in the same order as the materials in code 1; more than one material can have the same proportion;

code 2 is used to indicate grain size or plasticity characteristics, it does not have an impact on the display;

the **line** can be used to force the display of the top horizon limit using a specific format; the type of line requested will prevail over the one used for the lines belonging to the curve; the types of line that can be imposed are:

 - **L0** blank line;
 - **L1** continuous line;
 - **L2** dotted line;
 - **L3** dashed line;

the values of L0 to L3 entered in **code3** in the previous versions of Geotec will be used if there are no values in Line.

- for a **U** type horizon, two materials can be defined in **code 1** from the scrolling list; they are separated by a dash;

- each layer is limited by top and bottom depths and can have a text description.

In addition to the layers:

- descriptions can be added at specific depths along the boring; these records of type **T** (text) have a top depth but no bottom depth;
if a record of type **T** has a negative depth, its description is displayed above the top line of the log, generally the ground surface;
if there is no record of type **T** at a negative depth, Log automatically displays, at the top of the log, the title of the **Elevation** curve of the **STRATIGRAPHY** graph associated to the **DESCRIPTION** field;
- a description can be associated to the bottom of the boring; this record of type **E** has a top depth but no bottom depth;
if there is no record of type **E**, Log automatically displays at the bottom of the log the title of the curve **End_of_borehole** of the **STRATIGRAPHY** graph associated to the **DESCRIPTION** field;

A stratum is a **layer** if its classification type, its code 1 **or** its proportions (for the S type) is different than the preceding stratum. A horizon is a **sub-layer** if its classification type, its code 1 **and** its proportions are the same as those from the preceding stratum. The **Layers** and **Sub-layers** curves affect the stratigraphic layers and sub-layers.

13.3. Display of the curves of the STRATIGRAPHY graphs

Depending on the field specified as the non-predefined curve of the **STRATIGRAPHY** graph, the display associated to the curves varies and depends on Log.

13.3.1. Display for the DEPTH_TOP field

The **DEPTH_TOP** curve shows the depth of the top of the layers and sub-layers, as well as the depth of the end of boring.

- Choose the **Default** type for the **DEPTH_TOP** curve to have a conventional display in this column. The type of the predefined curves is irrelevant.
- The user can edit the font, height, color, style, format, etc. of the depths in the drawing attributes window associated to the curve. By default, the format for the depths is defined at two decimals.
- The vertical alignment of the depths, i.e. their position relative to the lines separating the layers and the sub-layers, depends on the vertical alignment of the elevations presented by the **Elevation** curve. If the **Elevation** curve is hidden, the vertical alignment of the depths can be adjusted with the alignment button.
- The horizontal alignment of the depths, i.e. their position relative to the column borders, is adjusted with the alignment button. By default, the depths are centered horizontally.
- If the **DEPTH_TOP** curve is hidden, no information is displayed in the column.
- To hide the depths but still display the predefined curves, open the drawing attributes window for the **DEPTH_TOP** curve and set its text height at **0** or remove its text by selecting the **Text** button and clicking on the "-" button.

The **Elevation** curve shows the elevation of the layers, sub-layers and end of the boring. It also shows the ground surface elevation; this text is always positioned above the line of the top of the boring.

- The user can edit the font, height, color, style, format, etc. of the elevations in the drawing attributes window associated to the curve. By default, the format for the elevations is defined at two decimals.
- The vertical alignment of the elevations, i.e. their position relative to the lines separating the layers and sub-layers, has priority on the vertical alignment of the depths presented by the **DEPTH_TOP** curve.
 - If the vertical alignment of the **Elevation** curve is centered, the elevations will be centered on the lines separating the strata (which are automatically broken) and the depths will not be displayed.
 - If the vertical alignment of the **Elevation** curve is by the bottom, the elevations will be displayed above the lines separating the strata and the depths will be displayed below these lines; the display of the depths takes into consideration the eventual offset distance between the depths and the lines.
 - If the vertical alignment of the **Elevation** curve is by the top, the elevations will be displayed below the lines separating the strata and the depths will be displayed above these lines.
- The horizontal alignment of the elevations, i.e. their position relative to the column borders, is adjusted with the alignment button. By default, the elevations are centered horizontally.
- To hide the elevations, the user can hide the **Elevation** curve, define a text height of **0** a text with no color ("- " button). The **Elevation** curve then has no vertical alignment priority.

The **Layers** curve displays the top line of the layers. The line characteristics can be edited.

The **Sub-layers** curve displays the top line of the sub-layers. The line attributes can be edited.

The **End_of_borehole** curve displays the line at the end of the boring. The line characteristics can be edited.

13.3.2. Display for the **DESCRIPTION** field

The **DESCRIPTION** curve displays the records of type **T** (text). The **DESCRIPTION** curve must be of **Default** type for the particular display to be used. The type of the predefined curves is irrelevant. The display characteristics of the text can be edited.

The title of the **Elevation** curve is displayed above the top line of the log, generally the ground surface, unless the stratigraphy of the boring has a **T** type record with a negative depth, in which case, it is the description of this record that is displayed at the top of the log.

The **Layers** curve displays the upper limit and the description of the layers (**DESCRIPTION** field of the **STRATIGRAPHY** table).

The **Sub-layers** curve displays the upper limit and the description of the sub-layers.

The **End_of_borehole** curve displays the limit of the end of boring. The title of this curve is displayed at the bottom of the log unless the stratigraphy of the boring has an **E** type record, in which case it is the description of this record that is displayed at the bottom of the log.

The horizontal alignment of the texts of this column can be edited. The vertical alignment can be edited for the **Layers** and **Sub-layers** curves.

The descriptions of the strata are generally entered in the database with 255 characters. If the user wants to enter longer descriptions (up to 1023 characters), he will open the database and change the type of the DESCRIPTION field of the STRATIGRAPHY table from Text to Memo.

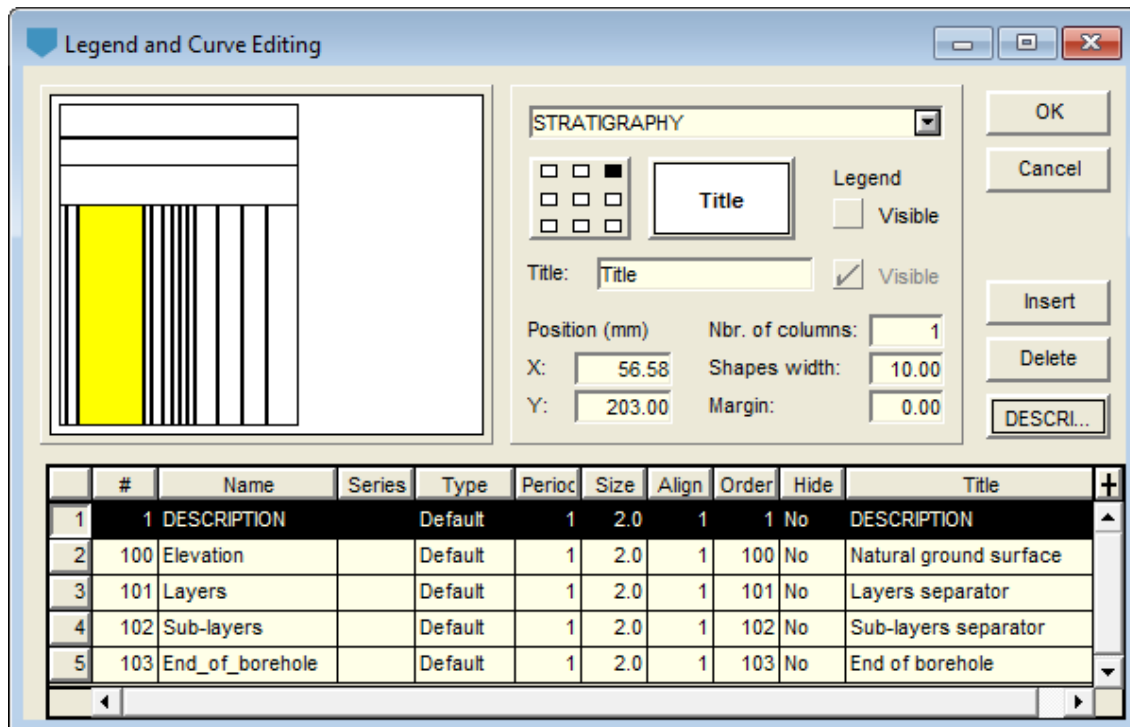


Figure 5 - Predefined curves of the DESCRIPTION field from the STRATIGRAPHY graph

13.3.3. Display for the CODE1 field

If the **CODE1** curve is of **Default** type:

- The column shows the stratigraphic symbols in graphic format if they are defined in the current **.ptn** pattern file, otherwise using a text format (see paragraph 13.3.6 about the display of stratigraphic symbols).
- The **Elevation** curve displays nothing.
- The **Layers** curve displays the upper limit of the layers.
- The **Sub-layers** curve displays the upper limit of the sub-layers.
- The **End_of_borehole** curve displays the end of boring limit and, if the record of type **E** has a **code 1** of **R**, the bedrock symbol (illustrated in figure 6) indicating the refusal (or stop) of the boring on the bedrock, is drawn with the drawing attributes of the curve.

If the **CODE1** curve is of **Text** type, the columns displays the stratigraphic symbols using a text format and the predefined curves are not considered. The attributes of the limits of the layers and sub-layers and of the textual stratigraphic symbols are those defined for the **CODE1** curve.

If the **CODE1** curve is of a type other than **Default** or **Text**, nothing is displayed in the column. The types of the predefined curves are irrelevant.



Figure 6 - Symbol of the bedrock as the end of boring

13.3.4. Display for the MATERIAL field

If the **MATERIAL** curve is of **Default** type, the column shows the background colors for the materials making up the layers. The colors are the ones associated to the materials of code **S** defined in the **MATERIAL** table for the **SPEC** site.

If the **MATERIAL** curve is of **Text** type, the column shows the codes of the materials in text format. The attributes of the textual materials and of the limits between the layers are defined by the **MATERIAL** curve.

If the **MATERIAL** curve is of a type other than **Default** or **Text**, nothing is displayed in the column.

13.3.5. Display for a field other than DEPTH_TOP, DESCRIPTION, CODE1 or MATERIAL

A curve representing a field other than **DEPTH_TOP**, **DESCRIPTION**, **CODE1** or **MATERIAL** displays the values of this field. The predefined curves, if they are still present, have no effect. They can be deleted.

13.3.6. Display of the stratigraphic symbols

To graphically display a stratigraphic symbol, an X3D pattern must be associated to the material code to be represented in the pattern file (**.ptn**) used (and the **CODE1** curve must be of **Default** type). Otherwise, the material will be represented textually.

- If a record is of type **R**, its code 1, for example **CAL**, will be represented graphically if there is a pattern named **R_CAL**, according to our example.
- If a record is of type **S**, the graphic representations of the materials specified in code **1** will be superimposed if a pattern exists for each of these codes, whose name begins with **S_** followed by the code to be represented and the proportion of the material;

for example, the **CMG** code with a proportion of **123** will be represented by three superimposed patterns if the patterns **S_C1**, **S_M2** and **S_G3** exist in the **.ptn** pattern file being used.

- If a record is of type **U**, if a pattern exists for the complete **code1**, for example **ML-MH**, and whose name is **U_ML-MH**, it will be used for the graphic representation.

The **geotec8.ptn** file provided with the installation contains patterns for most of the standard codes used. The user can refer to the X3D guide for information about how to look up, edit and create patterns.

14. SAMPLE GRAPHS

SAMPLE graphs are often presented to show the number, state, recovery, N or RQD, USCS classification and constituting material of the samples. However, all the fields from the **SAMPLE** table can be displayed in curves of a **SAMPLE** graph.

The curves **SAMPLE_NO**, **STATE**, **USCS** and **MATERIAL** have a special display.

14.1. Display of the **SAMPLE_NO** curve

If the **SAMPLE_NO** curve is of **Text** type, only the sample number is displayed.

If the **SAMPLE_NO** curve is of **Default** type, it shows the sample numbers concatenated to their type, for example SS-01; this layout cannot be modified.

The user can modify the attributes of the text and line showing the top and bottom depths of each sample.

14.2. Display of the **STATE** curve

If the **STATE** curve is of **Text** type, the sample states are represented by their textual code.

If the **STATE** curve is of **Default** type, a graphic symbol represents the state of the samples along their entire length. Four symbols, shown in figure 7, are generally used to represent the state of the samples.



Figure 7 - Symbols representing the state of the samples

To display these symbols, the drawing attributes of the **STATE** curve must be defined as follows:

- The **Line** is defined with the color, type and size desired; the line attributes apply to all states; the line is used as the symbol border and for the cross, for a remolded sample;
- The **Pattern** must contain an **X3D** pattern (usually a hatched pattern); this pattern applies only to **Intact** samples.
- The **Filling** applies to the **Lost** and **Core** samples; it must be defined in two steps:
 - It must be defined with the desired color;
 - It must be "erased" with the "-" button for the filling not to affect the intact samples.

The **remolded** samples are the only ones with a symbol set by the **Log** module; only the line attributes forming the cross can be modified.

The **lost percentage** of a sample can be graphically represented at the bottom of the sample with a height proportional to the lost percentage. To do this, indicate a **period of 2** for the STATE curve. The filling attributes will be used.

If a sample has a **recovery of 0%**, it is drawn as 'lost'.

14.3. Display of the USCS curve

If the **USCS** curve is of **Default** type with a **period of 1 or less**, the column shows the X3D patterns defined in the current **.ptn** patterns file, named "**U_USCS**", for example, U_GW.

If the **USCS** curve is of **Default** type with a **period greater than 1**, the column shows the colors associated to the materials of code **U** defined in the **MATERIAL** table for the **SPEC** site.

If the **USCS** curve is of **Text** type, the column shows the USCS classification in text format. The attributes of the text and of the limits between the samples are defined for the **USCS** curve.

If the **USCS** curve is of a type other than **Default** or **Text**, nothing is displayed in the column.

14.4. Display of the MATERIAL curve

If the **MATERIAL** curve is of **Default** type, the column shows the background colors for the materials constituting the samples (materials of the borrow pits). The colors are the ones associated to the materials of code **S** defined in the **MATERIAL** table for the **SPEC** site.

If the **MATERIAL** curve is of **Text** type, the column shows the codes of the materials in text format. The attributes of the textual materials and of the limits between the layers are defined by the **MATERIAL** curve.

If the **MATERIAL** curve is of a type other than **Default** or **Text**, nothing is displayed in the column.

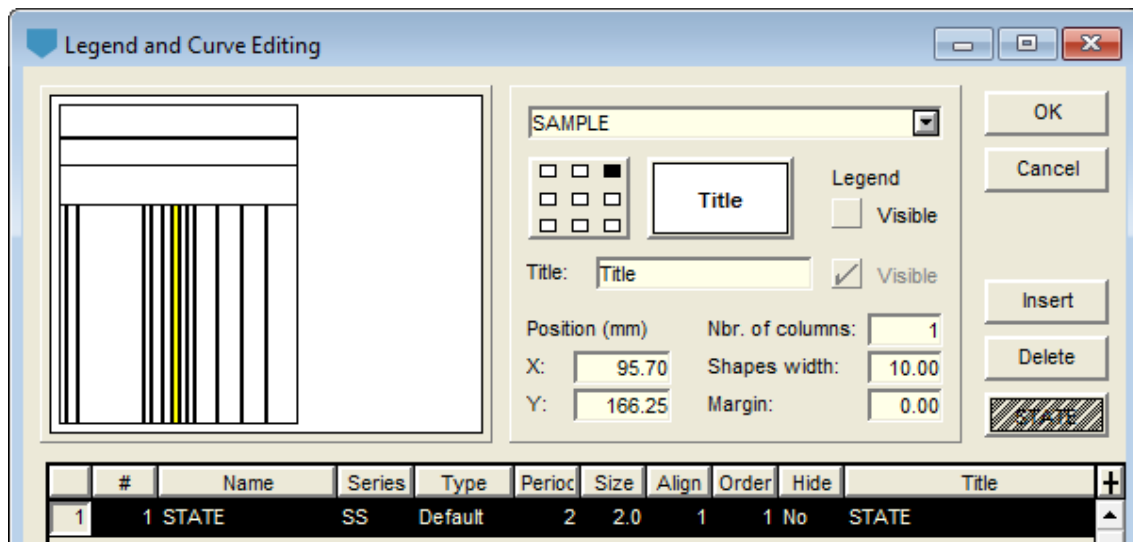


Figure 8 - Selection of a sample type in a SAMPLE graph

14.5. Selection of the types of samples to present

Log allows the user to restrict the display of the samples to just one type. To do this, indicate the type of samples to display in the **Series** column. In the example, "SS" requests the representation of the split spoons.

Each cell of the **Series** column has a scrolling list which displays all the types of samples inserted in the current database.

The user can select a different type for each curve of a SAMPLE graph. Only the values associated to the selected type will be displayed. If the cell of the **Series** column is empty or if it contains "@@", all the samples will be represented for this curve.

15. PIEZOMETER GRAPH

The installations of the piezometers, observation and supply wells as well as the seals, lanterns and piezometric levels are shown in the **PIEZOMETER** graph.

Log reads the information about the piezometers in the **PIEZOMETER** table, the information about the seals and lanterns in the **PIEZOMETER_SEAL** table and on the piezometric levels in the **PIEZOMETRIC_LEVEL** table.

The **PIEZOMETER** graph can only contain the predefined curves shown in figure 9, which are of Default type. The type of curves has no effect on the display.

15.1. Display of the Seals curve

The **Seals** curve (#100) represents the content of the **PIEZOMETER_SEAL** table. It displays:

- The limits of the seals and lanterns, as lines;
- The graphic symbols representing the materials of the seals and lanterns;

The symbols displayed are those associated to the material codes defined using the simplified classification with a proportion of 1 (see paragraph 13.3.6) in the current **.ptn** file.

The line and the pattern are the only components of the **Seals** curve that can be edited; as for the pattern, only its color can be defined, to display all the patterns of the column with the chosen color.

15.2. Display of the Tube curve

The **Tube** curve (#101) displays the piezometer tubes from the **PIEZOMETER** table.

The position of each tube in the graph depends on their number. If there is only one tube, it is displayed in the center; otherwise they are spread proportionally according to the width of the graph.

- If the code of the tube is anything **except P, E and V**, Log draws a tube whose width is defined by the **Height** attribute (in mm) of the characters of the **Tube** curve.
- If the code of the tube is **P, E or V**, a line will be drawn.

The tube or line is drawn from the top depth of the tube to the top of the tip. If no top depth of the tube is indicated, a depth of 0 is used by default.

The components of the **Tube** curve that can be edited are the line (for the contours of the tubes and the line of the tube), the pattern and filling (for inside the tubes) and the text (for the width of the tubes).

15.3. Display of the Tip curve

The **Tip** curve (#102) shows the tips of the piezometers, displayed in the extension of their tube. The information is read in the **PIEZOMETER** table. The tip is drawn from the bottom depth of the tip towards the top, over a length defined in the database.

- If the code for the tip is "**P**", it will be represented by a rectangle ending with a triangle at the bottom.
- If the code for the tip is "**C**", it will be represented by an empty rectangle.
- Otherwise, a rectangular tip will be drawn, filled with the pattern defined in the **.ptn** pattern file by the name **S_code**.

The tips are not drawn to scale; the **height** of the text (in mm) of this curve is used to define the width of the tips.

If the **Tip** curve has an **alignment of 2**, the piezometers will be displayed from shallowest to deepest, from left to right.

If the **Tip** curve has an **alignment other than 2**, the piezometers will be displayed in their alphabetic order, from left to right.

The components of the **Tip** curve that can be edited are the line (for the borders of the tips), the filling (for inside the tips), the text (for the width of the tips) and the alignment (for the order of the piezometers).

15.4. Display of the Water_level curve

The **Water_level** curve (#103) shows the most recent piezometric level read in the **PIEZOMETRIC_LEVEL** table for each piezometer displayed.

Each level is symbolized by default by the classic solid triangle with the tip pointing downwards. This symbol can be changed by editing the marker associated to the **Water_level** curve in its drawing attributes window.

The title of the **Water_level** curve is displayed vertically above the triangle. This title can contain a reference to fields of any database table. Typically, the values displayed are the last piezometric level and its reading date. To display them, the title must contain:

- `&&PIEZOMETRIC_LEVEL.PIEZO_LEVEL"9.99"`
- `&&PIEZOMETRIC_LEVEL.PIEZO_DATE"YYYY-MM-DD"`
- The "9.99" and "YYYY-MM-DD" expressions are optional and specify the display format.

The symbol and information defined in the title of the curve are displayed at the vertical position of the elevations from the **PIEZOMETRIC_LEVEL** table.

The components of the **Water_level** curve that can be edited are the marker and its diameter (for the symbol) and the text.

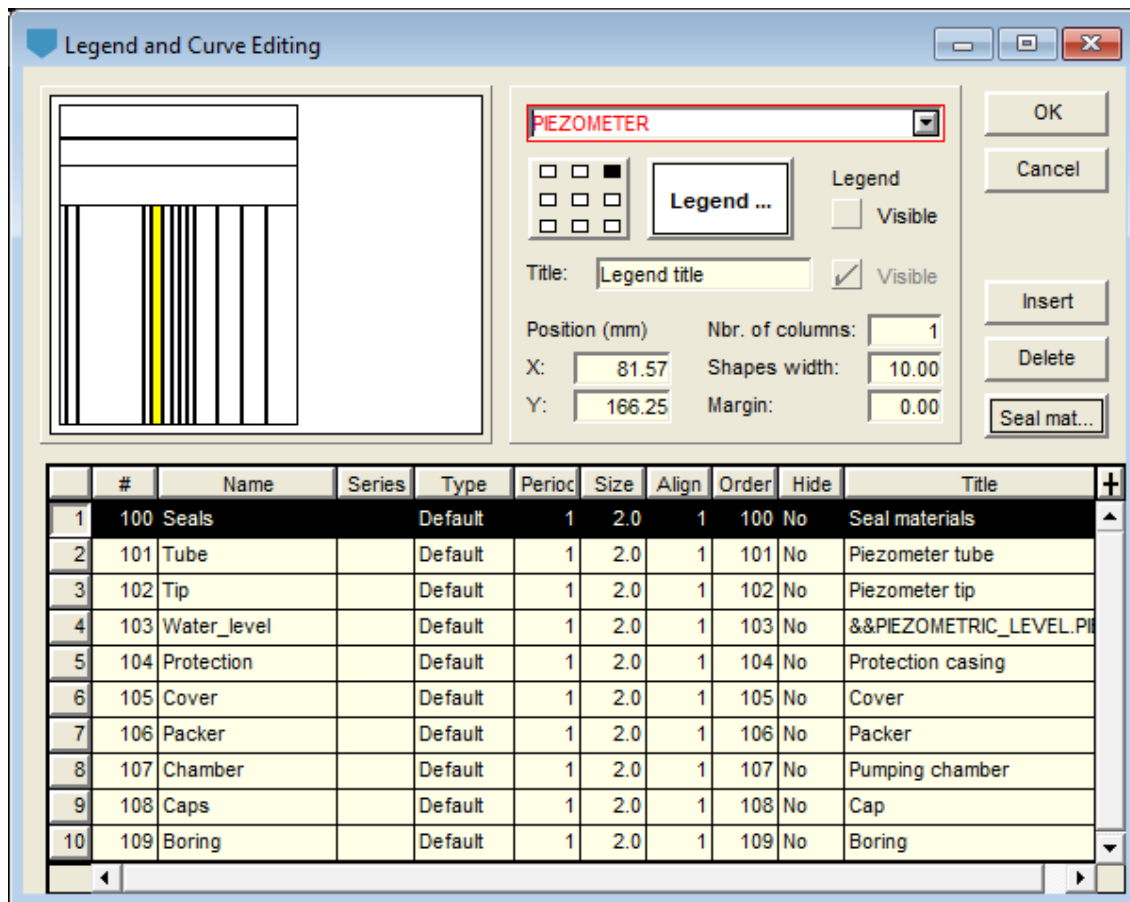


Figure 9 - Predefined curves of the PIEZOMETER graph

15.5. Display of the Protection curve

The **Protection** curve (#104) shows the protection casing read in the **PIEZOMETER** table. If several piezometers are installed in a boring, the user must define the protection with the definition of the first piezometer in the boring.

The protection is drawn from the top depth of the protector (or 0 if no value is entered), over the length defined in the database.

The protection can be drawn in 2 ways:

- An empty protection case
 - For the value of PROTECTOR_CODE equal to "B", or
 - For a character height of the "Protection" curve equal to 0 mm or a negative value. This text height (in mm) defines the width (in mm) around the protection case, on each side.
- A protective casing
 - For the value of PROTECTOR_CODE different than "B", or

- For a height of characters of the “Protection” curve equal to a positive value. This text height (in mm) defines the width of the casing (in mm) from the limit of the graph, on each side.

The components of the **Protection** curve that can be edited are the line (for the borders of the protections), the filling and/or pattern (for inside the protections) and the text (for the width of the protections).

15.6. Display of the Cover curve

The **Cover** curve (#105) shows the cover read in the **PIEZOMETER** table. If several piezometers are installed in a boring, the user must define the cover with the definition of the first piezometer in the boring.

When a COVER_TYPE is defined, it is drawn on the top depth of the protector (or 0 if no value is entered).

The covers are not drawn to scale; the **height** of the text (in mm) of this curve is used to define the height of the cover. The width of the cover is slightly larger than the piezometer graph.

The components of the **Cover** curve that can be edited are the line (for the borders of the covers), the filling and/or pattern (for inside the covers) and the text (for the height of covers).

15.7. Display of the Packer curve

The **Packer** curve (#106) shows the packers. This curve is displayed only if the code of the tube is **R** (O’ring), **S** (sleeve) or **M** (manchon, in French) in the **PIEZOMETER** table.

The packer is drawn from the top depth of the tube (or 0 if no value is entered).

The packers are not drawn to scale; the **height** of the text (in mm) of this curve is used to define the height of the packer. The width of the packer is the same as the piezometer graph.

The components of the **Packer** curve that can be edited are the line (for the borders of the packers), the filling and/or pattern (for inside the packers) and the text (for the height of the packers).

15.8. Display of the Chamber curve

The **Chamber** curve (#107) shows the pumping chamber. The information is read in the **PIEZOMETER** table.

The pumping chamber is drawn from the bottom depth of the tip, over the length defined in the database.

The pumping chambers are not drawn to scale; the **height** of the text (in mm) of this curve is used to define the width of the pumping chamber.

The components of the **Chamber** curve that can be edited are the line (for the borders of the pumping chamber), the filling and/or pattern (for inside the pumping chamber) and the text (for the width of the pumping chamber).

15.9. Display of the Caps curve

The **Caps** curve (#108) shows the upper and lower caps, if a type is defined for each in **PIEZOMETER** table.

If the code of the tube is **R** (O'ring), **S** (sleeve) or **M** (manchon, in French), an upper cap is not displayed even if defined (the packer is shown instead). If the code of the tube is **P** (pneumatic), **E** (electric) or **V** (vibrating chord), there is no upper cap either.

For all other tube codes, an upper cap is drawn from the top depth of the tube, downwards, and a lower cap is drawn from the lowest depth defined (tip or pumping chamber), upwards.

The caps are not drawn to scale; the **height** of the text (in mm) of this curve is used to define the height of the caps. The width of the caps is the same as the curve to which they apply (Tube for the upper cap, Tip or Chamber for the lower cap).

The components of the **Caps** curve that can be edited are the line (for the borders of the caps), the filling and/or pattern (for inside the caps) and the text (for the height of the caps).

15.10. Display of the Boring curve

The **Boring** curve (#109) shows the boring "hole". This curve is displayed when a piezometer is defined.

The boring hole is drawn from the top depth of the protector to the total depth of the boring (defined in the **BORING** table). The width of the boring hole is the same as the piezometer graph.

The components of the **Boring** curve that can be edited are the line (for the borders of the boring) and the filling and/or pattern (for inside the boring, usually white to represent the emptiness). If this curve is hidden, any graph superimposed behind the Piezometer graph (for example, the stratigraphy) will be shown.

16. LIMITS GRAPH

The **LIMITS** graph displays the results of the Atterberg limits measurements: the plastic limit, the liquid limit and the water content. Log reads the data in the **LIMITS** table.

When a **LIMITS** graph is created, the predefined curve **PL-LL** is created. This curve shows a typical display, i.e. two vertical dashes representing the plastic and liquid limits and joined by a horizontal line, as well as an empty circle representing the water content. The symbols are positioned at the depth corresponding to the center of the samples.

The user can open the drawing attributes window and modify the **marker**, which will then be the symbol for the water content. The **line** can be modified; it will have an effect on the horizontal line and the vertical dashes for PL and LL. The **text** is displayed by default, but can be modified or removed ("-" button) via the attributes window.

If the user does not want to display any marker, he will enter a size of 0 for the PL-LL curve. If he only wants the markers for the limits, he will enter a period of 0 in the attributes window for the curve.

It is also possible to add curves for the **W**, **LL** and **PL** fields to impose a specific display; for example, to connect all the plastic limits, the liquid limits and the water contents, select the Polyline type for these curves. Each polyline is defined by the **line** attribute. If the **W**, **LL** and **PL** curves are of **Point** type, only the markers will be displayed.

17. CONSOLIDATION GRAPH

The **CONSOLIDATION** graph displays the measurements of consolidation pressures read in the **CONSOLIDATION** table.

When a **CONSOLIDATION** graph is created, the predefined curve **PCMIN-PCMAX** is created. This curve shows a typical display, i.e. two vertical dashes representing the minimum and maximum preconsolidation stresses and joined by a horizontal line, as well as an empty down arrow representing the probable preconsolidation stress. The symbols are positioned at the depth corresponding to the center of the samples.

The user can open the drawing attributes window and modify the **marker**, which will then be the symbol for the probable PC. The **line** can be modified; it will have an effect on the horizontal line and the vertical dashes for the minimum and maximum preconsolidation stresses. The **text** is displayed by default, but can be modified or removed ("-") button) via the attributes window.

If the user does not want to display any marker, he will enter a size of 0 for the PCMIN-PCMAX curve. If he only wants the markers for the minimum and maximum stresses, he will enter a period of 0 in the attributes window for the curve.

It is also possible to add curves for the other fields of the table, the same way as for the curves of the LIMITS graph (see paragraph 16).

18. ROCK_JOINT GRAPHS

All the fields from the **ROCK_JOINT** table can be displayed in curves of a **ROCK_JOINT** graph.

The **ALPHA** (or **ANGLE** in the previous versions of Geotec), **DIP** and **TYPE** curves have a special display. These three curves cannot be displayed in the same sub-graph.

The curve associated to the **ALPHA** (or **ANGLE**) field has a specific display if it is of **Default** type. It then displays the joints as lines inclined according to their angle relative to the core axis and centered on their average depth. The lines have a length of 80% of the column's width. The elements that can be edited for the **ALPHA** (or **ANGLE**) curve depend on the type of curve chosen.

The display is similar for the curve associated to the **DIP** field, except that the line is inclined relative to the horizontal, in counter-clockwise direction.

The curve associated to the **TYPE** field is used to display information relative to three fields: **TYPE** and of one of the following pairs depending on the reference taken for the measurement of the angles: **ALPHA** and **BETA**, or **DIP** and **DIRECTION**. If a marker named **J_type** is defined and an angle is entered in the database for the same depth, the marker representing the type

will be displayed at the location of the value between 0 and 90 on the X axis, and will be inclined according to the azimuth value (between 0 and 360). If no azimuth value is defined, a value of 0 (vertical) will be used. For this display, the **TYPE** curve must be of **Default** type. If the curve is of **Text** type, only the type values will be displayed textually.

19. CPTU_ZONE GRAPHS

It is possible to display the ranges of SBT zones calculated as histograms or as textual description for the results of piezocone tests. For this, the curve #1 of the CPTU_ZONE graph must be associated to the **SBT** field.

- If the **Series** cell of the SBT curve is empty, the column will display the ranges of SBT zones as histograms. The period for the curve must be 0 or a filling must be defined for the curve to show the different colors for the ranges.
- If the **Series** cell of the SBT curve contains "@@", the column will display the SBT ranges as descriptions. If the **EQUIVALENCE** table contains the description of the zones as equivalences to their value, this description is displayed; otherwise, the numbers of the zones are displayed. Paragraph 3.1.1 of this guide describes the display parameters for the descriptions of the SBT zones.

Nine predefined curves are automatically included in the **Page** graph when the SBT curve of CPTU_ZONE is displayed. These curves named "**Zone_1**" to "**Zone_9**" are used to define the colors of the various values of SBT zones. A series of colors commonly used is proposed by default. However, the user can modify these colors by editing the "**Zone_n**" curves.

20. GEOCAMERA GRAPHS

The columns associated to the **GEOCAMERA** table are used to display image files of optical, acoustic or 3D type or photos. The name of the image file (.bmp) is entered in the **FILE_NAME** field of the **GEOCAMERA** table. The image files must be located in the directory of the input files defined in the preference window.

Create a curve associated to the field **TYPE** of **Default** type. In the **Series** cell, the user enters:

- **AC** to display the acoustic images with AC as TYPE
- **OP** to display the optical images with OP as TYPE
- **3D** to display the 3D images with 3D as TYPE
- **PH** to display the photos with PH as TYPE

21. DISPLAY OF PROPERTY VALUES OR OF CONCENTRATIONS OF CONTAMINANTS

The **PROPERTY_VALUE** table contains the values of various properties according to depth; the properties are defined by the user. Also, the **CONCENTRATION** table contains the concentrations according to depth of various contaminants defined in the **CONTAMINANT** table.

To display the values of the **PROPERTY_VALUE** table for a specific property in a column, the user must:

- associate the **PROPERTY_VALUE** table to a secondary graph dependent on the **DEPTH** graph in the graph editing window;
- define at least one curve associated to a field of the table in the curve editing window; usually, it is usually the **CVALUE** field.
- in the **Series** column of the curve definition, enter the property for which values are to be represented;

The display in a column of values from the **CONCENTRATION** table for a contaminant is done the same way, with the name of the **contaminant** in the **Series** cell.

22. DISPLAY OF ELEVATIONS AND INFORMATION ASSOCIATED TO A DEPTH CURVE

In a graph other than the ones described above, we can define curves associated to a field starting with **DEPTH_** or finishing with **_DEPTH**. These curves must be of **Default** type. We can add information at each depth in the graph by entering the information to be displayed in the title of the **DEPTH_xxx** or **xxx_DEPTH** curve.

The information displayed can be any text. It can contain the value of a field from a **Geotec** table; the syntax is then **&&table_name.field_name"format"** to display the values, or **@@table_name.field_name"format"** to display the values or eventual equivalences (see paragraph 23). The format is not required.

For example, the user can create a column to display the initial and stabilized depths of the water table using a marker and the reading date. For this:

- the user associates the **BORING** table to a secondary graph dependent on the **DEPTH** graph in the graph editing window;
- the user defines two curves. The first curve is associated to the **WATER_DEPTH** field and has this expression in the **Title** cell: **&&BORING.WATER_DATE"yyyy-mm-dd"**. The second curve is associated to the **STABLE_WATER_DEPTH** field and has this expression in the **Title** cell: **&&BORING.STABLE_WATER_DATE"yyyy-mm-dd"**. A marker for the water level can be associated to each curve.

It is also possible to display the elevations corresponding to the depths presented. These elevations are displayed if the **ELEVATION** keyword is specified in the title of the curve. These keywords cannot be included in a string. The dip of the boring is taken in account to determine the value of the elevations.

If no title is provided for a **DEPTH_xxx** or **xxx_DEPTH** curve of **Default** type, the depth is then displayed.

If the user wants to display the depths and the elevations, two **DEPTH_xxx** or **xxx_DEPTH** curves of **Default** type must be created in the graph. One of the titles will remain empty, while the other will be **ELEVATION**. By aligning the characters of a curve by the top and the other by the bottom, both texts will not be superimposed in the graph.

23. DISPLAY OF EQUIVALENCES TO VALUES

It is possible to display equivalent expressions to some values in a curve if the following conditions are met:

- The curve does not belong to a graph with **predefined curves**;
- The curve does not belong to a graph representing the **CONCENTRATION** or **PROPERTY_VALUE** table.
- The curve does not represent a **DEPTH_xxx** or **xxx_DEPTH** field;
- Expressions equivalent to one or many values are defined in the **EQUIVALENCE** table or in the **LIST_ENG** table for the field represented by the curve;
- The @@ expression is entered in the **Series** column of the curve.

Regardless of whether the field values are numerical or textual, if their equivalent expressions are textual, they will only be displayed if the curve is of **Default** or **Text** type. If their equivalent expressions are numerical, they can be displayed regardless of the type of curve.

24. LEGEND GRAPH

When the option “upon navigating, display all selected borings” is checked in the options window (see paragraph 3.1.1), the **Legend** graph is automatically created.

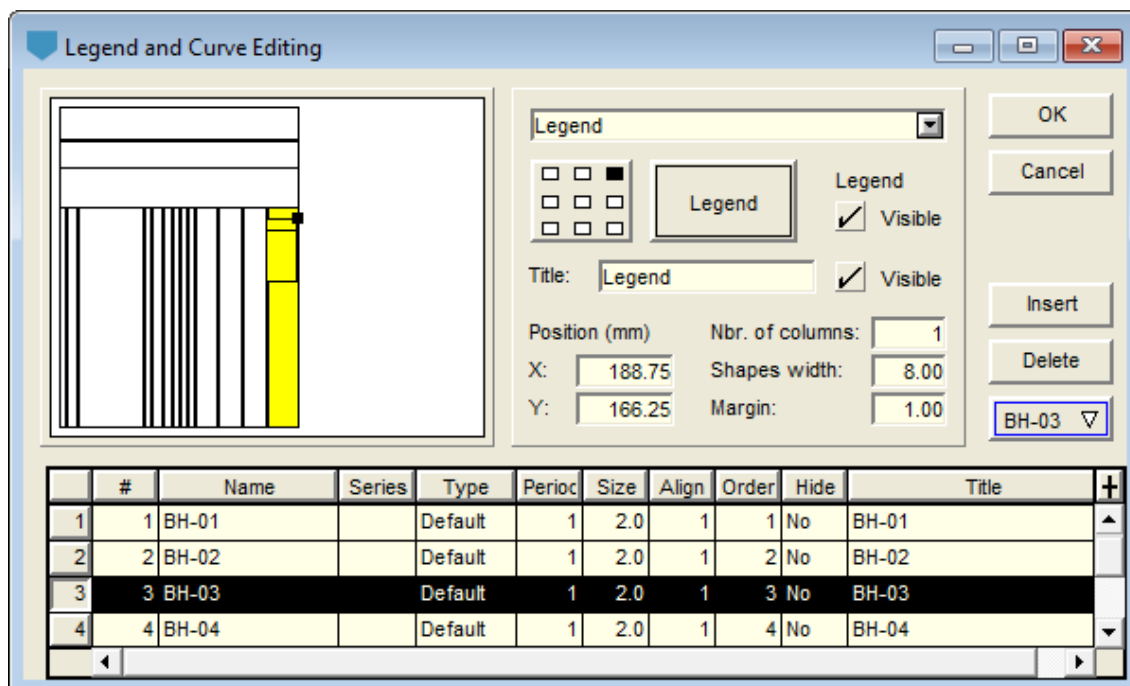


Figure 10 - Curves of the Legend graph

In the legend and curves editing window, the Legend graph shows one curve per boring returned by the query, with colors and markers defined automatically. These attributes can be

modified for each curve and are saved in the style file for future queries of superimposed borings.

25. INTERACTIVE EDITING

In the page and different columns of the boring log, the user can click with the right button of the mouse to display the contextual menu shown in figure 11.

The first item is used to **create** a new record in the table whose data are displayed in the column. The depth clicked will be displayed by default for the new record. For a sample, it will be its top depth. For a stratum, it will be its bottom depth, unless the user clicks in a stratum that is already defined, in which case it will be the depth of a text type record. For the other tables, it will be the top depth or average depth of the record. For a graph other than a table or view, **Create** is not active.

The **Information** option opens the correct entry form on the data of the record where the user clicked. Double-clicking on data has the same role. For a graph other than a table or view, **Information** is not active, but double-clicking will open the BORING table.

With the interactive menu, it is also possible to launch the modules of Geotec to show the various types of data that can be displayed for the current boring.

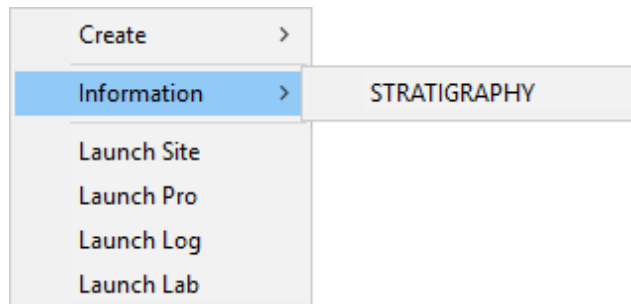


Figure 11 - Interactive menu