Rerum Naturalium Fragmenta

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QVOL
Quick Volumetrics for
Windows
User's Guide
Part II.

by

Tamas Jasko

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Rerum Naturalium Fragmenta
Tamas Jasko editor
tamas.jasko@jasko.eu
16 Melrose Place, Watford WD17 4LN, England

Chapter 4
STRUCTURE EDITING

The definition of a reservoir structure is given by a file storing its parameters. Before reservoir volumes can be calculated you have to edit the corresponding data file to contain the name(s) of the horizon(s) of the structure, the gas / oil / water contact depth and other calculation and plotting parameters.

Select Edit from the Structure menu to edit a structure file. Select the structure file to be edited from the list of files.

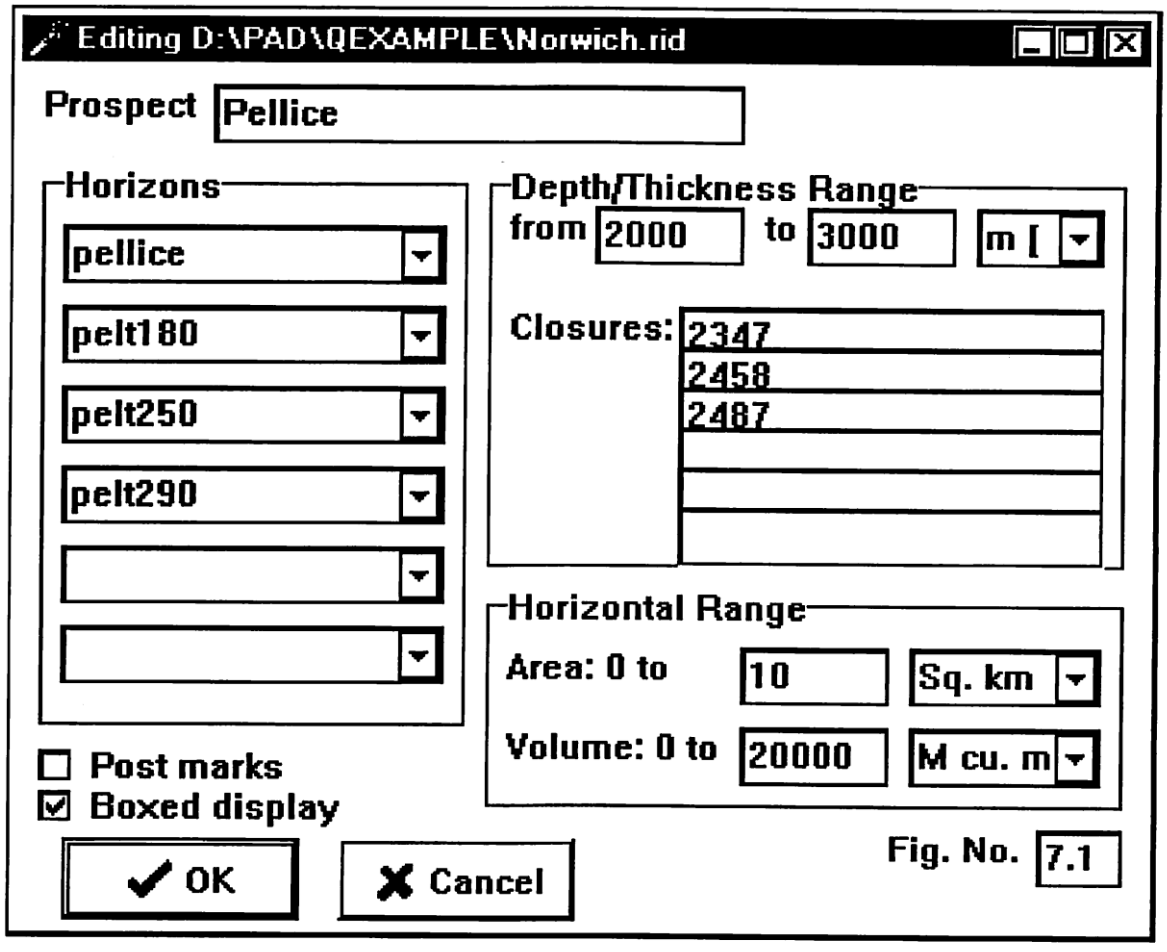

Figure 4.1: Structure editing

The selected dataset will be presented for editing in a window showing the editable data fields.

The editing functions can be used both to change the names of horizons to be used and the plotting parameters for Area/Depth and Volume/Closure plots.

Horizons

Select at least one, if required, more horizon files. Up to six horizons can be selected for plotting together but if you specify too many horizons the plots get crowded so it is better to split the data into smaller sets.

Depth Range

Minimum and maximum of depth (or thickness) for which volumes will be computed and displayed. Use round numbers to best effect.

Posted markers

If requested the program will post markers on Area/Depth curves showing which digitised contour values were used for interpolation.

Boxed display

If this item is checked, the plots will be displayed in the 'boxed' style.

Closures

Closures or phase contacts are defining the depth slices for which volumes are to be calculated. Also, at each closure specified a horizontal line will be drawn on the plots to the curve(s) displayed and the value of the depth is marked on the right end of the line.

Each closure is a depth value which can be followed by an optional annotation text. Examples: '4367', '2510.7', '2622 gas/oil contact'. If there is annotation, leave a space between the number and the annotation text.

Horizontal range

This gives the volume and/or area range displayed. Use round figures to get good axis labels.

Figure number

This field is optional. If you want the plots used in reports specify the Fig. no. to be displayed.

Chapter 5
AREA/DEPTH CURVE

Select Area-Depth from the Structure menu to access the area/depth curve function.

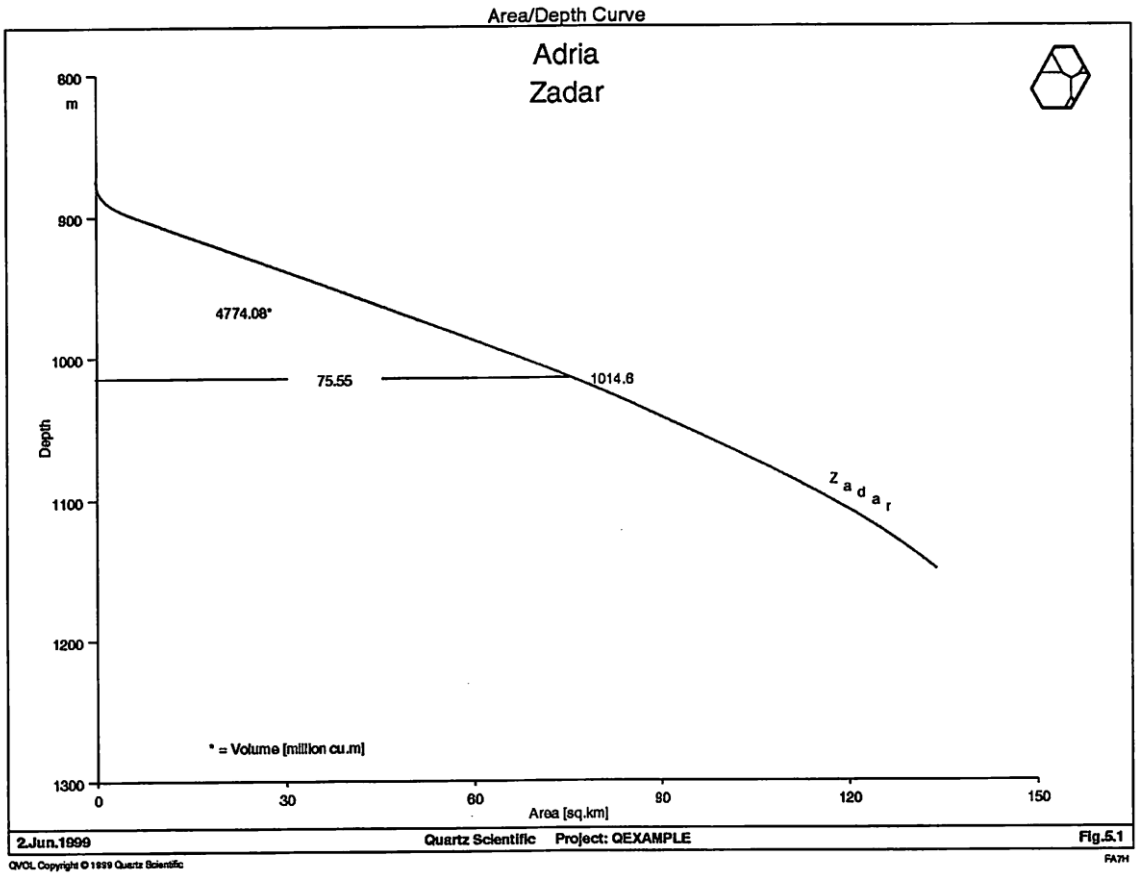

Figure 5.1: Area/Depth curve

Interpolation

The curve is generated by double precision Akima interpolation. This method honours the planimetered areas of the contours and connects them with a smooth line.

In most cases the resulting interpolation is quite satisfactory but there may be cases where the shape of the curve as fitted by

the program may look contrived in the absence of control points.

In such cases it is advisable to enter further control values of contour areas either by planimetry (if it is possible to draw intermediate contours) or by educated guess. The interpolated values are displayed in graphic form on the screen and may also be plotted on a laser printer. To distinguish the digitised and the interpolated values, you can use the 'Postmark' option to post markers at the digitised values.

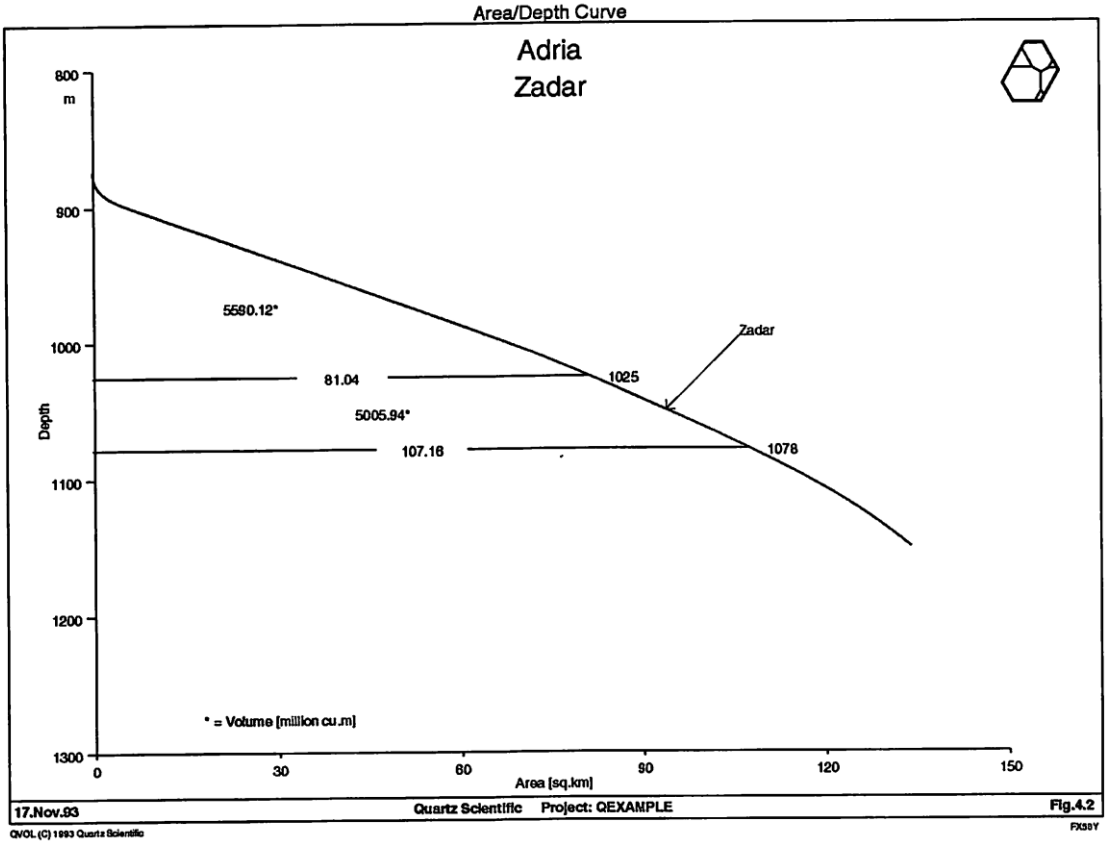

Figure 5.2: Area/Depth curve with several contacts

Closures

At each closure depth requested a horizontal line will be drawn to the curve(s) displayed and the value of the depth is marked on the right end of the line.

Area/Depth curves can be displayed either in 'boxed' or 'balloon' style.

In the balloon style the area of the formation will be shown by numbers placed on the horizontal segments. The volume of each formation between the indicated contacts is shown by the numbers in the polygonal areas. If the space is not sufficient then the numbers will be shown in the form of balloon captions.

In the boxed style areas and volumes are shown as tables inserted in the top right and bottom left corner of the plot.

If there are two or more surfaces shown then the figures will show the area and volume of the formation between the surfaces. If there is only one surface displayed then the values show the interpolated areas/volumes under that surface alone.

Posted markers

If requested the program will post markers on Area/Depth curves showing which digitised contour values were used for interpolation.

Plotting

Every time. the program produces screen graphics it records the plot data in a file. Select Print from the main menu to produce an A4 size paper plot. If you want to change printer parameters use the Printer Setup in the File menu.

The plot data are recorded in the temporary plot clipboard which is reused by the next program drawing on the screen. To keep a plot, use the Save Graphics Plot option of the main menu. Plots saved in named permanent files can be used to transfer them to another PC for printing on a particular printer. To print a named plot file use the option Plot from File.

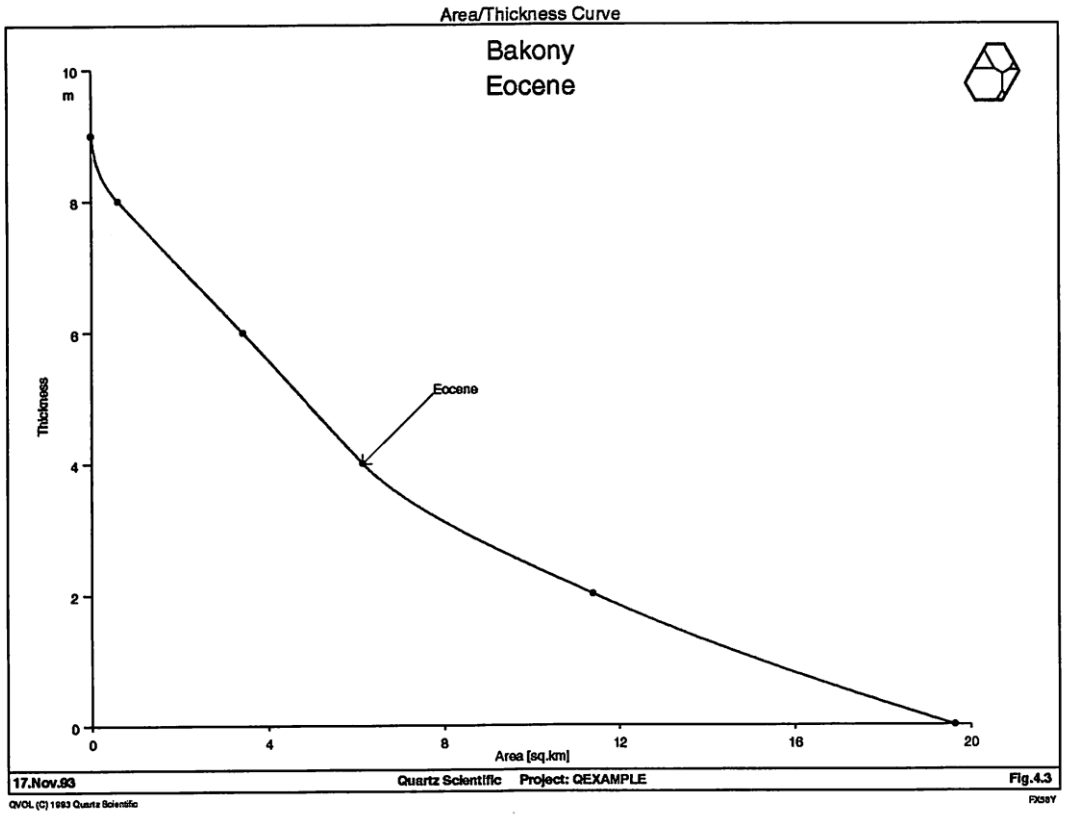

Figure 5.3: Area/thickness curve

Chapter 6
VOLUME/CLOSURE CURVE

Select Volume/Closure from the Structure menu to generate volume/closure curves. Select the structure file listing the horizons (sets of contour data). A smooth curve is fitted to the contour areas using Akima interpolation as for the area/depth curve. Same considerations apply for the shape of the curve. For correct closures at the top of a structure it is best to enter the top as a contour of zero area.

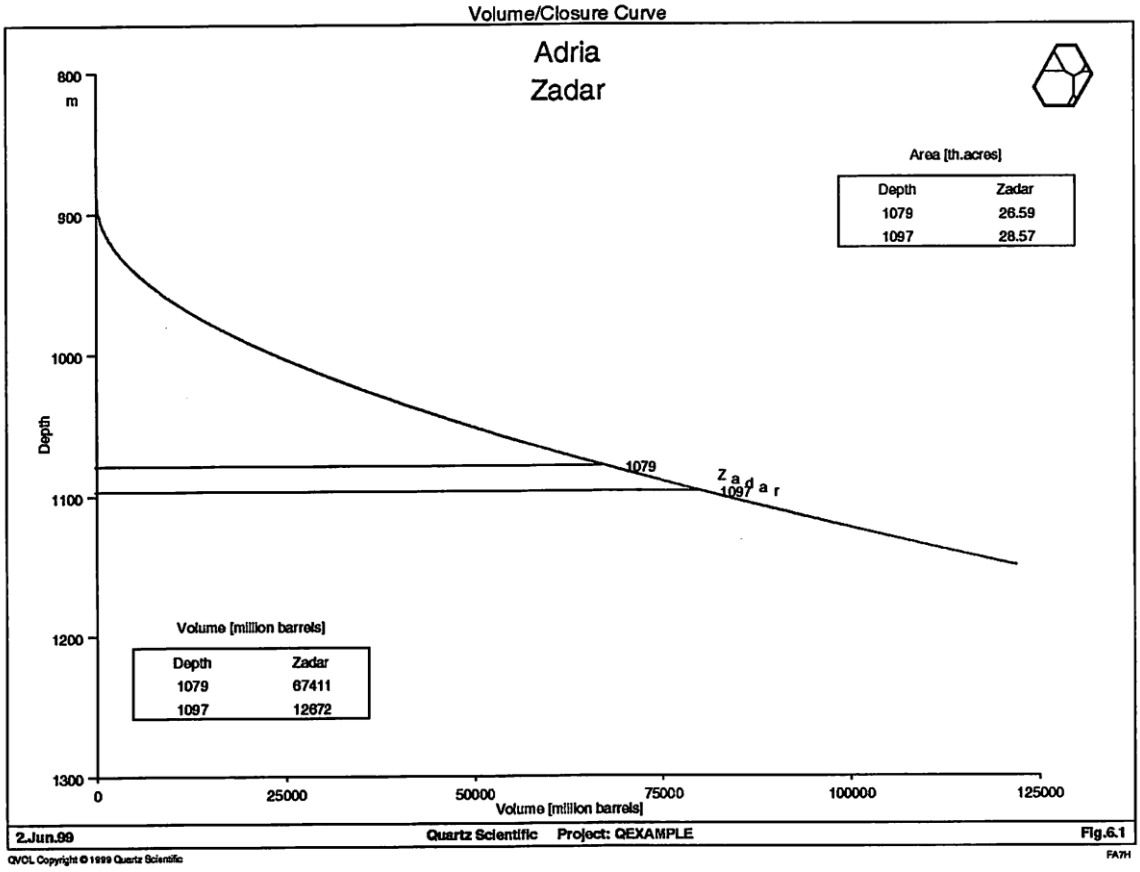

Figure 6.1: Volume/Closure curve

Integration

The interpolated data are then integrated by the trapezoidal rule to compute volumes and the integral curve is displayed in

graphic form on the screen. The curve can also be plotted on a laser printer.

Whenever a depth is marked, a horizontal line will be drawn from the depth axis through the curve(s) displayed and the value of the depth is marked at the right end of the line. Computed areas and volumes are displayed in small tables in the top right and bottom left corners.

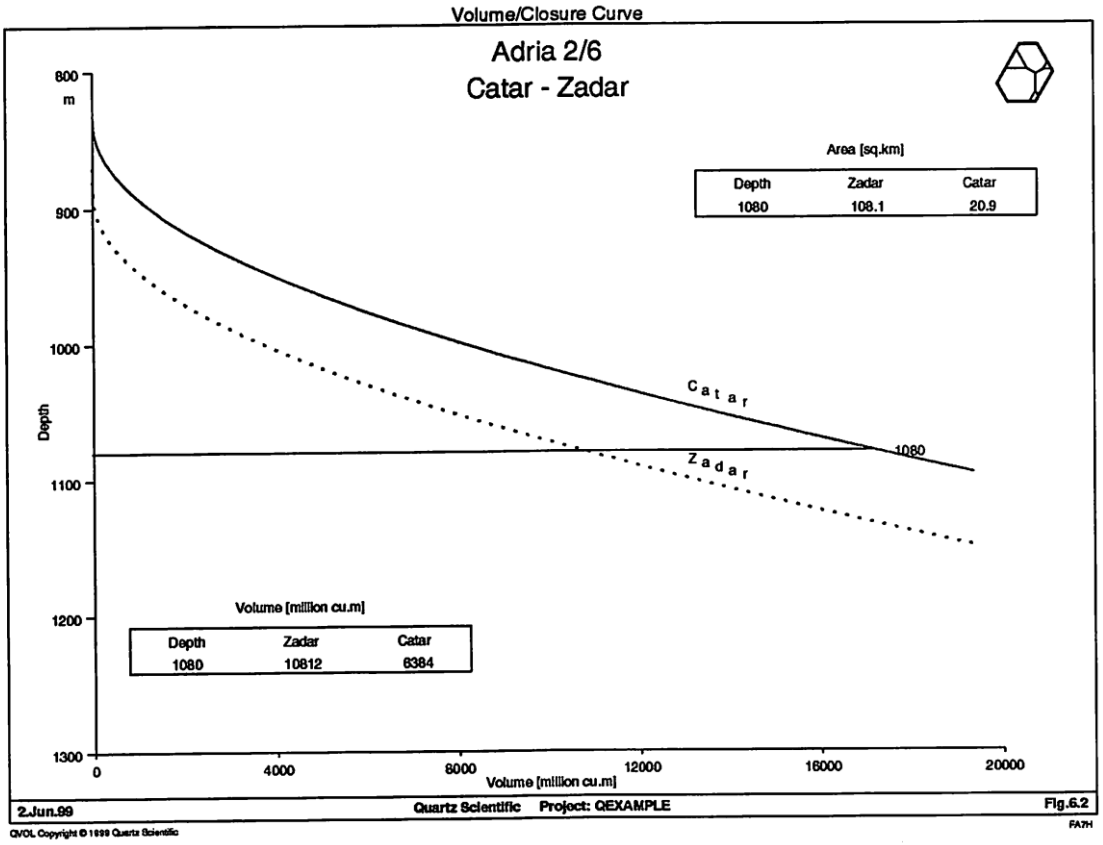

Figure 6.2: Volume/closure curve of a formation

If there are two or more surfaces shown then the markers and computed values show the difference between neighbouring surfaces. If there is only one surface displayed then the marker is drawn to the vertical axis and volumes are related to the closure of that surface alone.

Paper plots are produced by the same way as for Area/Depth curves, by selecting Print from the main menu.

Chapter 7
VOLUME ESTIMATES WITH UNCERTAINTY

Often we have to estimate volumes with uncertainty. As an example, consider a case where both the thickness of the reservoir and the closure are subject to uncertainty. Each is characterised by 3 numbers, which represent minimum, most likely and maximum values.

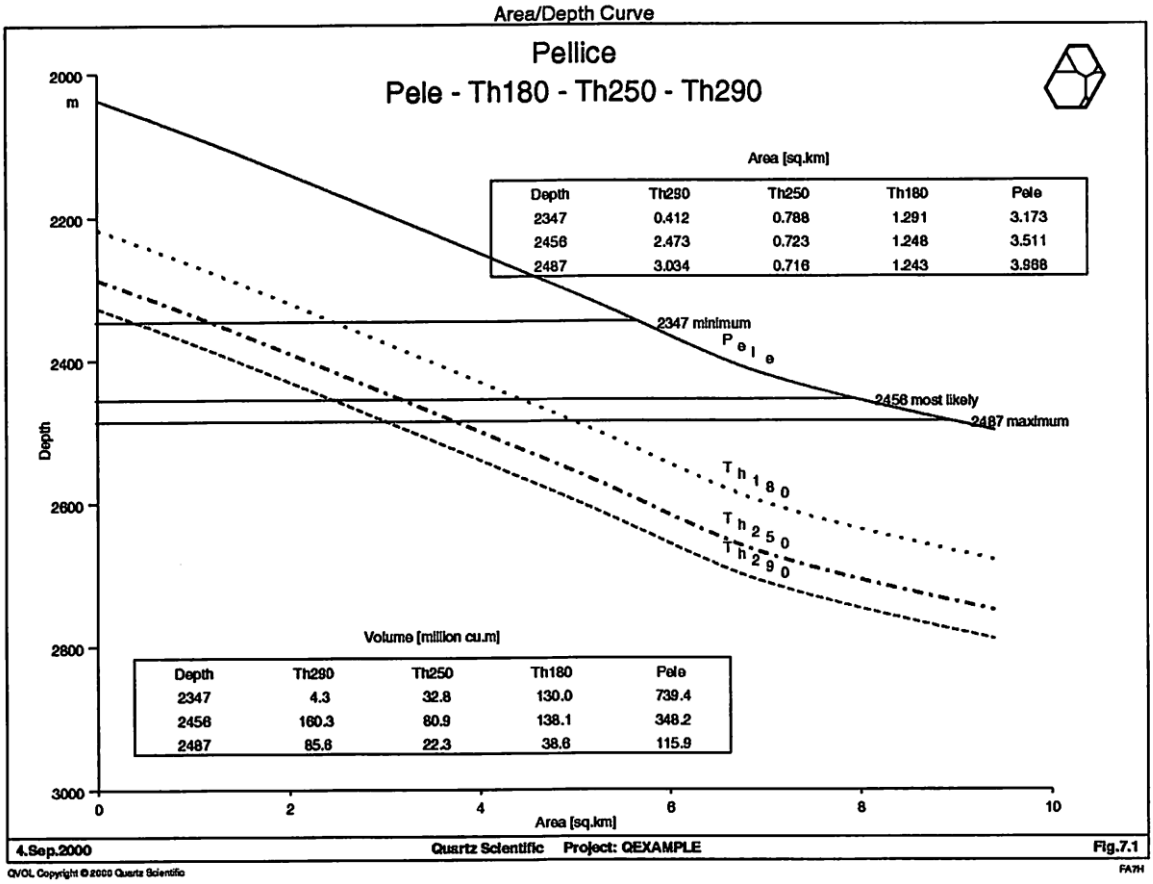

Figure 7.1: Area/Depth Curve with 3 thicknesses and closures

We wish to compute minimum, most likely and maximum values for the reservoir formation volume. Such a dataset is depicted by Fig. 7.1. There are 4 horizons and 3 closure depth values in this figure and 4 x 3 = 12 computed volumes (and an equal

number of computed areas). The tabulated results are somewhat confusing.

It is best, instead, to compute and display each case separately. Each case is entered as a separate structure file. First, enter, compute and display the minimum of gross rock volume using the minimum thickness (180 m) and the minimum closure (2437 m) as in Fig. 7.2. This figure, shown in the 'balloon' format, gives 739 million cubic meters as the minimum of rock volume.

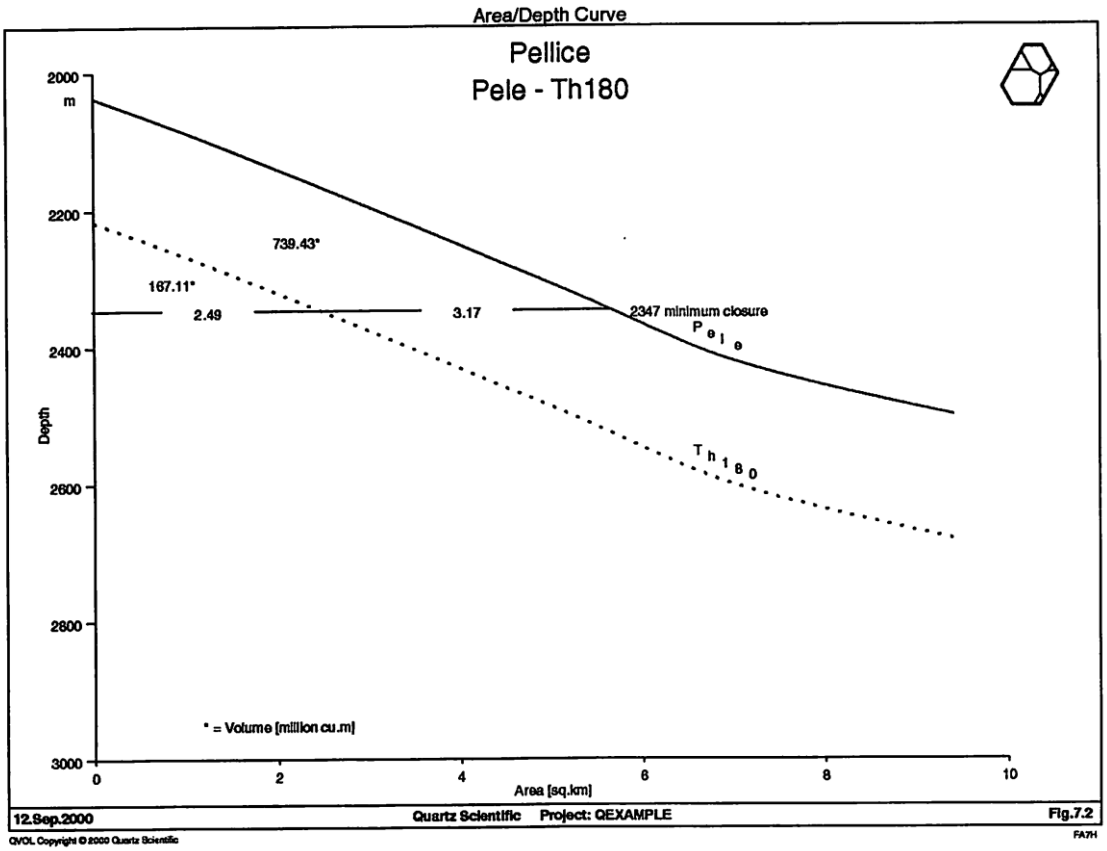

Figure 7.2: Minimum case

Next, enter, compute and display the most likely case separately, using 250 m thickness and 2456 m closure. The result is 1356 million cubic meters (Fig. 7.3).

Last, enter in a structure file, compute and display the maximum case, with thickness = 290 m, closure = 2487 m. Fig. 7.4 gives the maximum of gross rock volume as 1646 million cubic meters.

These 3 numbers can now be used in the prospect evaluation calculation as the minimum, most likely and maximum values for 'Gross Rock Volume'.

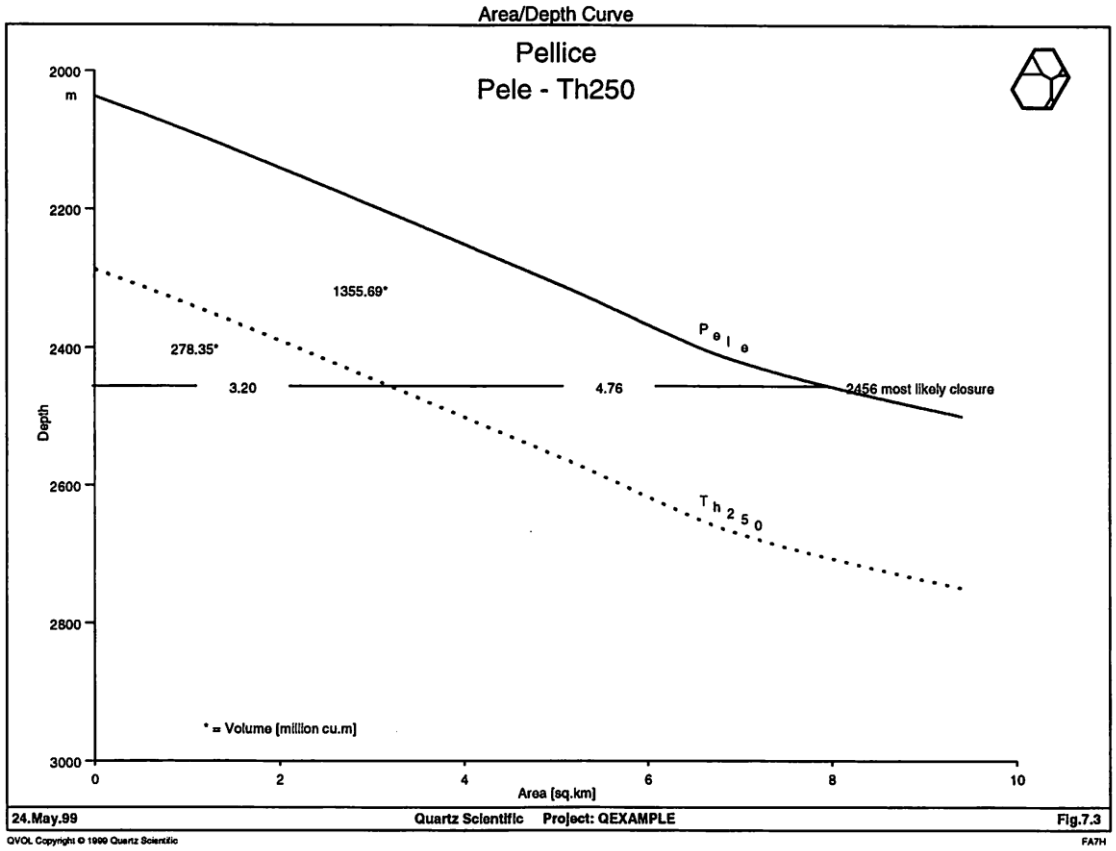

Figure 7.3: Most likely case

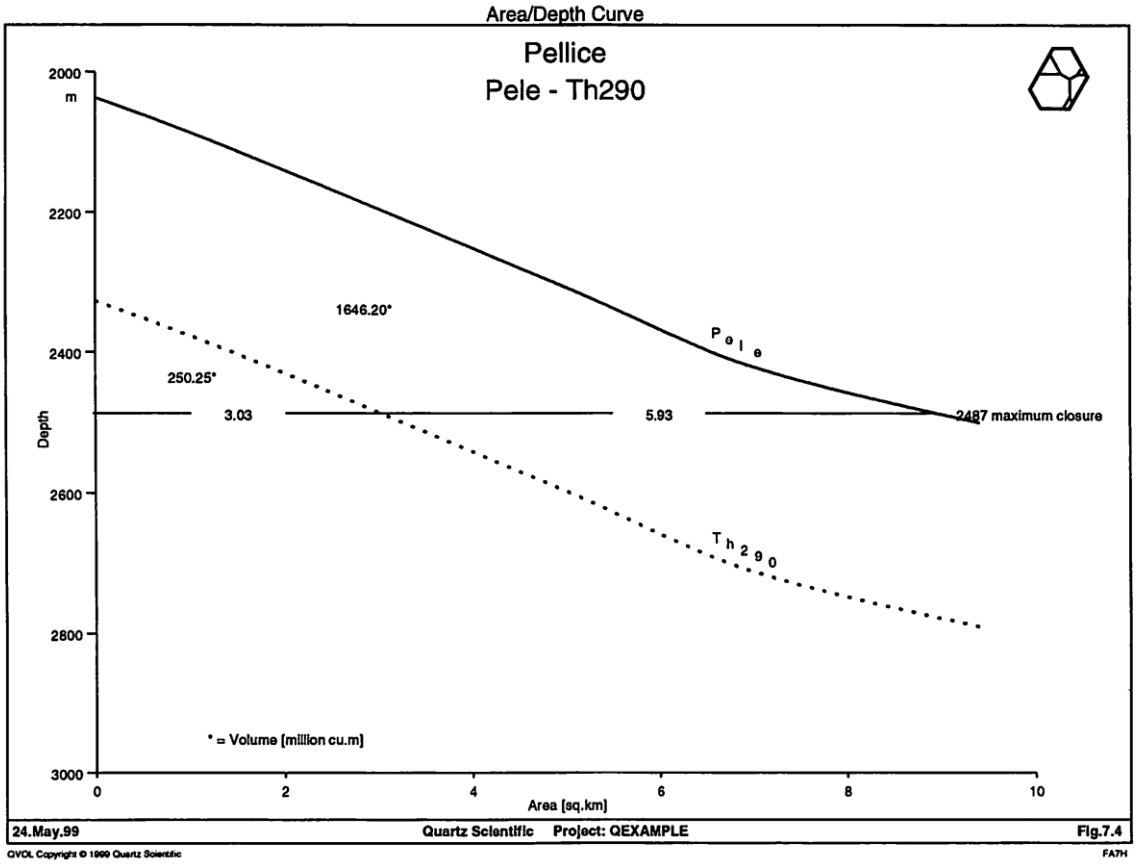

Figure 7.4: Maximum case

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PROGRAM SETUP & OPTIONS

Setup

Programs are distributed on 3.5 inch floppy diskettes or on CD-ROM, as required. To install the program on the hard disk, put the distribution disk in the floppy disk (or CD-ROM) drive. From the Windows start-up menu select Run, then enter a:setup (if the program disk is in drive A; for drive B, enter b:setup, and so on...).

The program will ask if you want to install the programs or the example data. Next it will ask for the disk drive and the directory where it should store the programs and the data files. Press OK to accept the defaults. To use a different disk drive or directory type a different name.

After copying the files to the hard disk the program will check that the main program directory is included in the directories listed as the 'program path'. The installation program will warn you if your program path needs modifying.

Install each distribution disk the same way.

Options

Select the Options from the main menu to customise the program to match your hardware and set preferences.

If the program is used by more than one person you may wish to record the name of the user (author) on each plot. Set the Author option to Yes. With this option in effect, every time you start a session the program will prompt for the user (author) name to be shown on the plots generated.

Another parameter in the Preferences screen allows setting the display format for the date on plots: you can specify whether you want the year to appear as a two digit or as a four digit number.

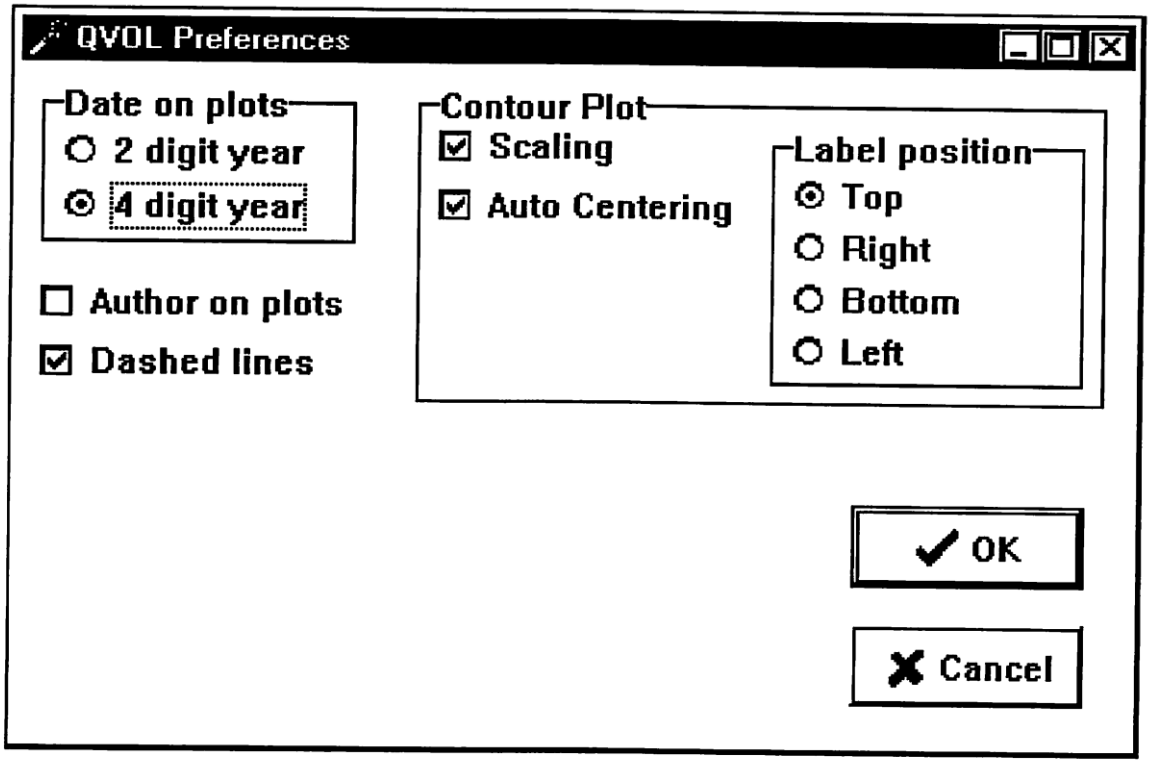

Figure 8.1: Preferences Screen

Other parameters in the Preferences window include setting the scaling, centring and label position on contour plots.
(Qvol for Windows User Guide, Quartz Scientific, Watford, 2000)