

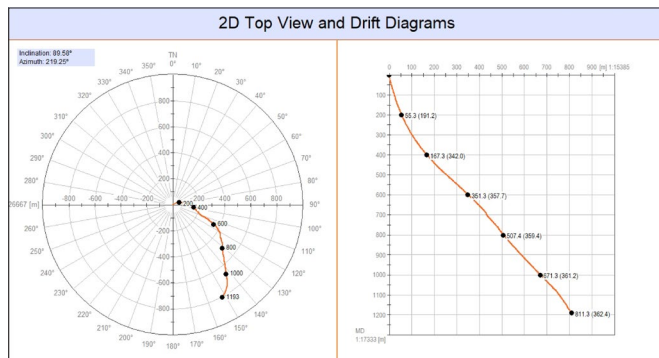
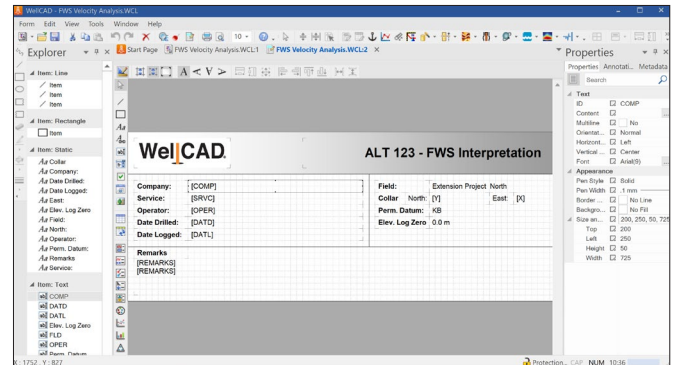


## Enhanced Header Design

HeadCAD has been integrated into the WellCAD header editor and enhanced with new features. Creating a new header form or editing an existing header (attached to a borehole document) can now be done directly within the WellCAD application. The functionality of the existing header editor (Figure 3) has been improved, and a design mode has been added to streamline the process. The standalone HeadCAD application is no longer available in WellCAD 5.8.

As part of the header editor update, several new header objects have been introduced. Diagrams from the Polar & Rose log, Chart log, Deviation module and Chart tool can now be added and displayed (Figure 4).

Figure 3 - New Header Editor in WellCAD.



These diagrams are dynamically linked to logs in the borehole document, ensuring that the display refreshes automatically when the data source changes.

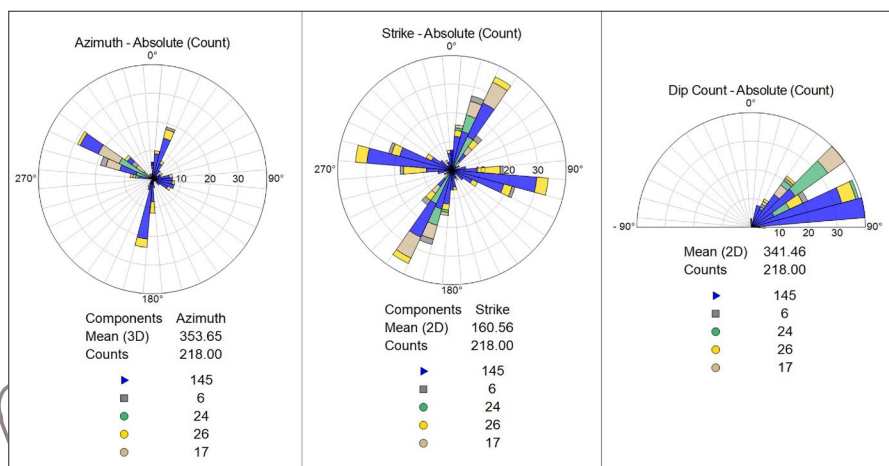
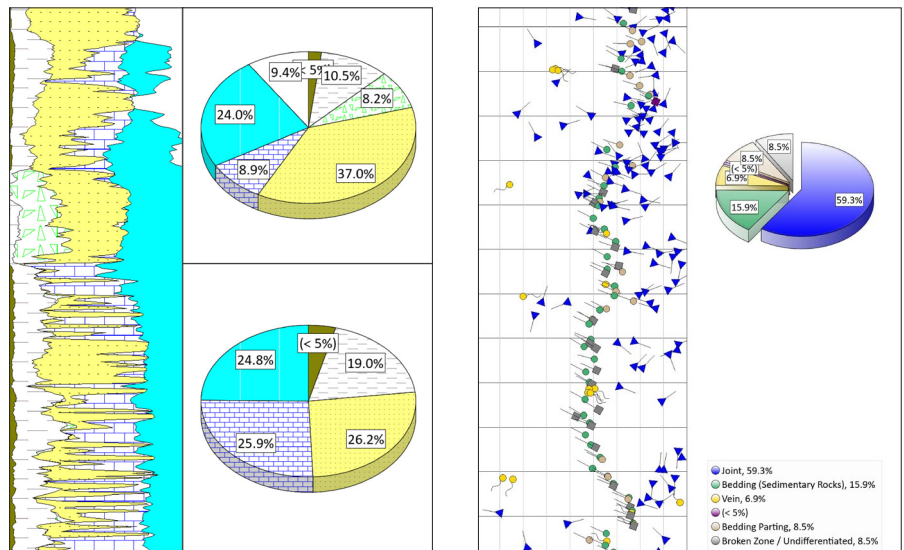
Furthermore, hyperlinks can now be added to the header form, allowing external media (e.g. URL links) to be accessed directly from a borehole document header.

Figure 4 - Deviation chart header object.

## New Charts

WellCAD 5.8 expands the visualisation capabilities with newly added chart objects (Pie Charts, enhanced Rose diagram display, etc). As a powerful visualisation tool, pie charts are introduced as a new diagram type within the Chart log functionality and as a Header Chart object. They can be used to illustrate the percentages of parts and categories in relation to a borehole, such as lithology or structure type distributions (Figure 5).

Figure 5 - Left-hand side image shows a lithology composition pie chart whereas the right-hand side image shows a structure type chart.



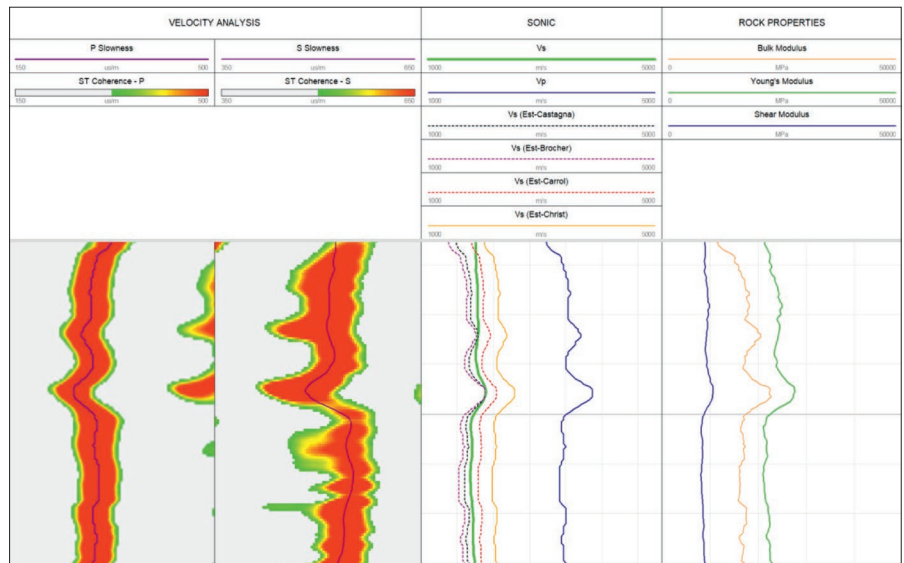
Rose diagrams in Polar & Rose logs, Dip workspace and Header forms can now display wedges segmented by the proportions of the different structure types (Figure 6). The colours of the wedges correspond to the specific structure types being represented.

Figure 6 - Azimuth, strike and dip rose diagrams.

## Improved S-Wave Picking and Empirical Processes

An innovative picking system has been added for determining the first arrival wave using an algorithm based on kurtosis changes in the FWS signal.

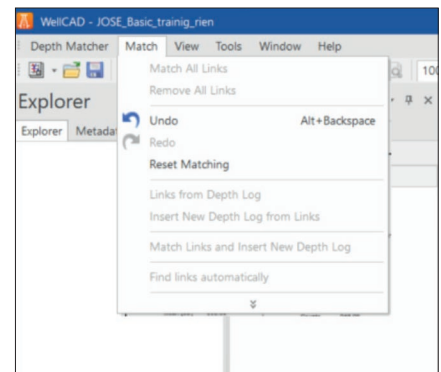
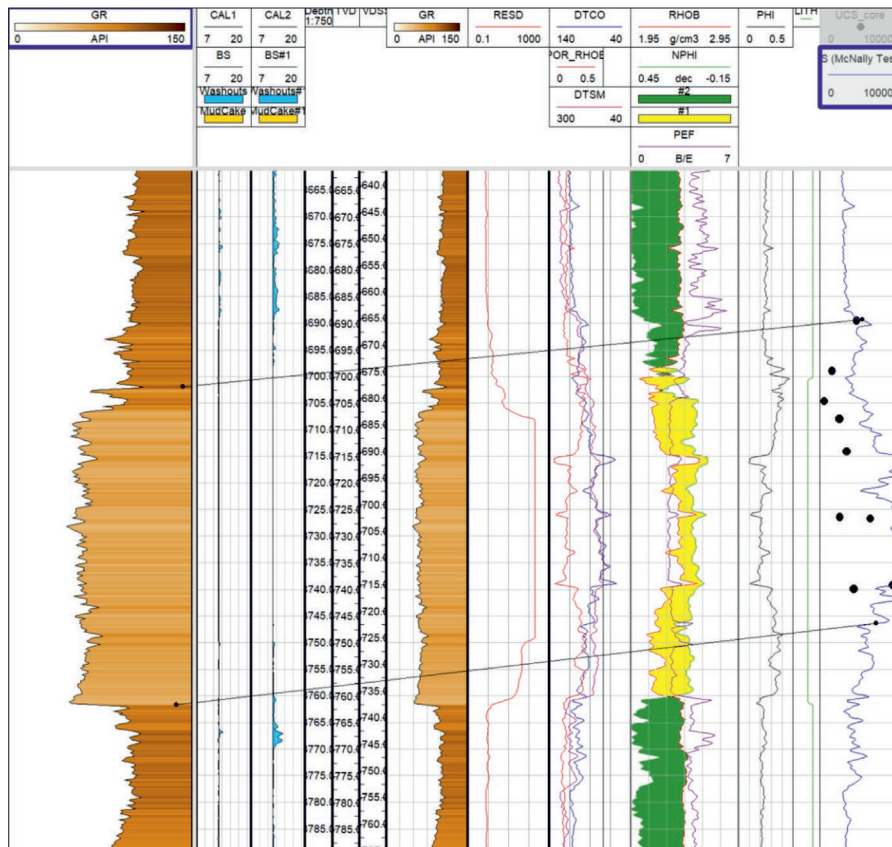
Also, in cases where data quality prevents clear detection of shear wave intercepts and empirical estimations from compressional wave velocities are necessary, WellCAD 5.8 introduces various shear wave velocity estimation processes including methods from Brocher, Castagna, Carroll, and Christensen (Figure 7).



**Figure 7** - Comparison of all "estimated" Vs curves using empirical equations using the Vp curve.

## Depth Matcher Enhancements

The Match tab has been improved to incorporate three new actions: 1) Undo, 2) Redo and 3) Reset Matching. These new functions will allow users to dynamically and efficiently interact with depth matching operations (Figure 8).



**Figure 8** - Logplot view showing a depth matcher example. Right-hand side image shows the new functionality "Undo", "Redo" and "Reset Matching".

# What's New Feature List

## Basic Module

### Header Editor

#### HeadCAD integration within the WellCAD Header Editor

The functionality of HeadCAD has been fully integrated into the WellCAD Header Editor, leading to the discontinuation of the stand-alone HeadCAD application.

#### New Header forms workflow

New header forms can now be created in WellCAD (File > New). Headers already attached to a borehole document can be edited in-place using the header editor (Tools > Header Editor).

#### Diagrams and chart Display

Polar & Rose diagrams, cross-plots, pie charts, histograms, Schmit plots, deviation diagrams, ternary plots, spinner flowmeter calibration charts, CBL charts and CBL calibration parameters can now be displayed in dedicated header objects, which are dynamically linked to logs in the borehole document.

### New Hyperlink Object

A new hyperlink object (e.g., URLs or links to media stored in the cloud) can be added to header forms.

#### Dynamic Table

A dynamic table object has been introduced to present the data from linked logs in a spreadsheet format.

#### Stacking Pattern Log

Legend objects have been updated to accommodate the Stacking Pattern log.

### Groundwater

#### Transmissivity Calculations

A process to compute the transmissivity of a formation has been added to the collection of groundwater processes.

### New Units

New units are available for the Hydraulic Conductivity process.

### Installer

#### Automatic Updates

WellCAD will automatically detect available updates and prompt the user before installation.

### Other Features

#### New Colour Display for Picker Dialog Boxes

New colour picker dialog boxes will offer an extended range of default colours.

#### New Colour Gradient Palettes

New default colour gradient palettes will be installed with the new version.

#### UI Changes

The document protection icon has been moved to the bottom of the WellCAD workspace, next to the time display.

### Pie Charts

The functionality of the Chart log has been extended and pie charts can now be displayed for Litho, Strata, Core Desc, Structure and other log types.

#### Updated Histogram View

A new type of histogram view for dip counts have been developed.

#### Polar Projection Enhancement

The Polar plots have been enhanced to allocate more visual and display objects.

## Other Features

### Log Slicing

The options for the log slicing process have been combined into a single dialog box improving usability.

### Depth Matcher

Three options have been added to aid depth match operations. These are "Undo", "Redo" and "Reset Matching".

### Geological Data Export to .LAS Files

Codes and descriptions for geological symbols will be exported into the optional header section of LAS version 3.0 files.

### Duplicate logs of the Same Dataset

The display of two sets of the same dataset/logs are now allowed. An example might be the display of Lithology as a background colour in a 'outcrop profile' and also as a separate lithology log.

## Image and Structure Interpretation (ISI) Module

### Fracture Topology

#### Structure Interval Statistics

The Structure Interval Statistics process has been expanded to include Pxy statistics, enabling the determination of fracture frequencies and intensities in one, two, and three dimensions.

- Calculation of fracture topology descriptors: Includes the distribution of node and branch proportions, line and branch connectivity, and the number of branches to the number of lines ratio.
- Pxy statistics to determine fracture frequency and intensity (density) in one, two and three dimensions.

#### Structure Log Display

The display of X-, Y- and I-nodes as introduced in fracture topology chapter can be enabled in the properties of a structure log (when the data is displayed in projection mode). Structure logs will show X-, Y- and I-nodes when the picks are displayed in projection mode.

#### Node and Branch Distribution

Node and branch distribution diagrams have been added to the Polar & Rose log, Chart objects and for Dips charts.

### Other Features

#### Interval Statistics for Fracture Spacing

The ability to determine the fracture spacing has been added to the structure interval statistics process.

#### New Display for Rose Diagram

Rose diagram wedges are displayed using the colours of the classification attributes. The vector diagram displaying dip/azimuth and other aspects related to aliasing has been also enhanced.

#### Updated Diagrams

The display for the Woodcock diagram has been updated.

#### Shortcut Key for Partial Picks

The shortcut key for partial picks can now be defined by the user.

#### Partial Picks Setup

The start and end points of a partial pick can be fine-tuned by holding down the shortcut key ("P") and dragging them to extend or reduce the visible part of the sinusoid.

#### Aperture Display

The aperture of structural features can now be displayed in 3D logs.

#### Caliper Resolution

The 3D log in the ISI workspace now automatically adjusts the resolution of the caliper component to match the one of the amplitude components to avoid a blocky appearance.

#### Pipe Deformation Detection

A new ellipse fitting process has been added to the Image Module enabling the detection and quantification of borehole or pipe deformations.

## Other Features

### Breakout Detection

A process to automatically detect breakouts from image logs containing radii, caliper of travel time data is now available.

### Core Cropper Templates

Layout templates for the Core Cropper workspace can now be saved and applied. This feature is also available in the CoreCAD module.

### Core Cropper “rotate left”

A button “rotate left” has been added to improve usability.

### Radius to/from Diameter Process

The Radius to / from Diameter process is no longer exclusive to the Casing Integrity Module and is now available in the ISI Module > Image Log menu as well.

### Metada Bar Icons

Header icons are added to substitute light-bulb icons when dealing with metadata display types.

### View Angle Value Updates

The view angle value is updated on the title while rotating the log.

## Full Waveform Sonic (FWS) Module

### Picking

#### New Picking System

A new first arrival picking algorithm based on kurtosis changes of the FWS signal has been added.

### Methods

#### New Empirical Shear Wave Velocity Methods

Shear wave velocities can now be estimated using popular empirical compressional waves relationships introduced by Brocher, Carroll, Castagna and Christensen.

## Automation Module

### Functions

#### New and Updated Automation Functions

New and updated automation functions are available supporting the following processes in WellCAD:

- Creation of linked logs (log cloning).
- Structure interval statistics has been updated to support fracture topology.
- Shear wave velocity estimation.
- Transmissivity determination.
- Automatic breakout picking.

## Bug Fixes

### v5.7 fixes

#### Fracture Height Calculation Process

The fracture height calculation process now takes partial picks correctly into account.

#### Partial Picks

Partial picks keep their feature depth after the apparent to true correction.

#### Snap Grid Sensitivity

Switching the units of the ruler bar to quantities different from the default defined in Tools > Options > Document Layout is now handled correctly.

#### WellCAD Links

Some links included in the Help Files are now fixed and content can be accessed.

#### Depth Shift Functions

Depth shifting operations are allowed for all type of integers.

#### TFD Imports in Automation

The automation function now correctly imports all channels based on the specified configuration file.