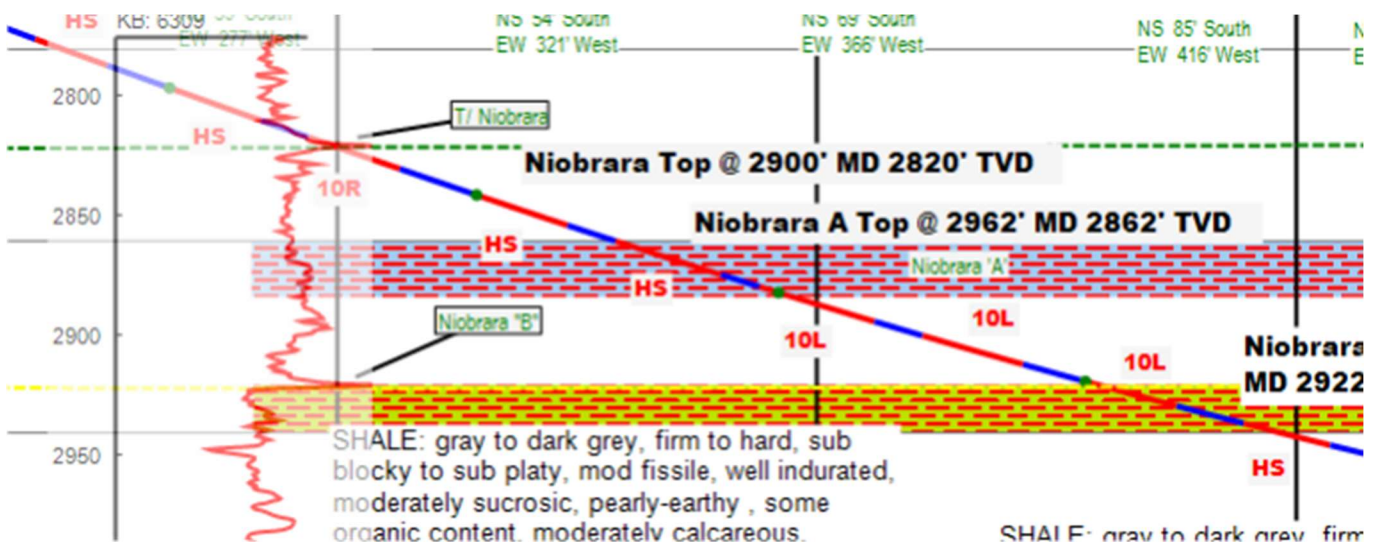The Horizontal XSection software was created, designed, and coded by a well-site geologist[i], for geologists, engineers and technicians who are looking for more comprehensive software on their horizontal projects. This manual has been updated in 2016 to reflect a new improved geosteering tool.

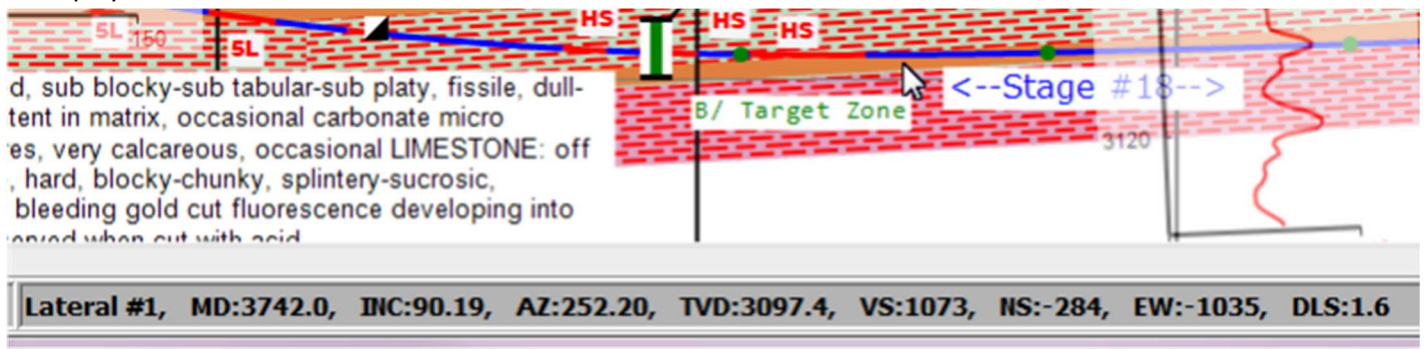## Survey Data – The Heart of the Program

The most important visual component of the Horizontal XSection is the Cross-Section track, which is organized around the survey data. Horizontal XSection utilizes the "Minimum Curvature Method" to calculate the True Vertical Depth, as well as the other derived survey information (Vertical Section, NS or Northings, EW or Eastings, Doglegs - see "Chapter 5 - Survey Data" for more information). Moreover, the software interpolates the borehole azimuth and inclination for every foot between surveys, and calculates the related survey parameters (TVD, VS, Northings, etc.). The below figure shows a portion of a log showing the "build" section of a horizontal well; the red sections are slides while the blue is when they were rotating. The green dots are the surveys.

Besides calculating the survey data parameters, the Horizontal XSection Log software allows for easy access to the survey data. The calculated survey values are stored in the programs memory and are constantly displayed relative to the position of the mouse pointer. For example, in the below example, the mouse is at 3742.0' MD and displays all the relevant survey data in the status bar at the bottom of the window. If there are two or more laterals displayed at the same measured depth, for example, a well plan or a sidetrack, the software will determine which curve is closer to the mouse pointer, and display only that lateral's survey information. If you move the mouse directly over a survey point, the annotation in the status bar will indicate that this is a survey point. When there is no mention of a survey point (as in the below example), the status bar displays calculated (interpolated) survey parameters for measured depths that occur between survey points.

The other tracks consist of four graphs for the ROP, TG and or GC data, Gamma or other LWD data, a sample track to hold the sample components, and three histogram tracks that can be used for a variety of purposes like porosity, flare length, show quality, grain size, cleating, or any information that is best displayed by a histogram. Most of the editing of the log will occur in the cross-section track. The log is formatted using the formatting menus. Use the histogram tracks

to display information

Lateral #1, MD:3742.0, INC:90.19, AZ:252.20, TVD:3097.4, VS:1073, NS:-284, EW:-1035, DLS:1.6

To annotate the log, the user selects the appropriate log mode, for example "Text" mode to add text, "Lithology" mode to add lithology beds, "Line" mode to draw lines, "Image" mode to add images and pictures, "TVD Log" mode to add TVD log data to your cross-section. There is also a "Geo-Horizon" mode that allows the user to add geologic information that can be projected on to a "TVD versus Vertical Section" Cross-Section (See Chapter 11).

The following chapters delve into more detail the different features of this software program. Read the whole manual to learn about many of the software features, as well as shortcuts and tips.

Quick Reference (The Different Program Modes)

Lithology Mode (Cross-Section Track):
- Left-click mouse and hold to draw lithology bed.
- Left-click mouse once to draw lithology stringer.
- Hold ctrl-key down and left-click lithology bed to delete.
- Hold shift-key down and left-click lithology bed to MoveToBack.
- Move mouse over lithology bed and right-click mouse for editing menu.
- Move mouse over lithology beds while shift key depressed to group lithology beds together, then right-click mouse for editing menu. This will allow for multiple beds to be moved, resized and copy and pasted.

Text Mode (Cross-Section Track, Graph Tracks):
- Left-click mouse to open Text Editor (cross-section track, graph tracks).
- Left-click mouse over a text block (block should have an orange outline) to open the text editor with selected text pre-loaded.
- Hold shift-key down and left-mouse click mouse to open text editor with survey data in status bar loaded and formatted.
- Move mouse over text block and right-click mouse for editing menu.

Draw Line Mode (Cross-Section Track):
- Left click mouse and hold to draw line.
- Move mouse over the end of a line (orange-rectangle should appear), left-click mouse and hold to move selected line.
- Move mouse over end of line (either end) and right-click mouse for editing menu – including dip calculation.

Add Image Mode (Cross-Section Track):
- Left click mouse to add the 'selected' image.
- Select Image from the menu bar Mode->Add Image-> 'Select an Image'
- Move mouse over an image (orange bounding rectangle will appear) and right-click mouse to open the editing menu .

TVD Log Mode (Cross-Section Track)
The "TVD Log" mode is used to enter, move, change the opacity, and change the depths from TVD to Subsea, of logs in the cross-section track. There must be at least one TVD Log loaded into the TVD Menu for the user to enter "TVD Log" mode.

Move the mouse over a log image (orange bounding rectangle will appear) and right-click for the editing menu.

See "Chapter 10 - TVD Logs in the Cross-Section", for more information.

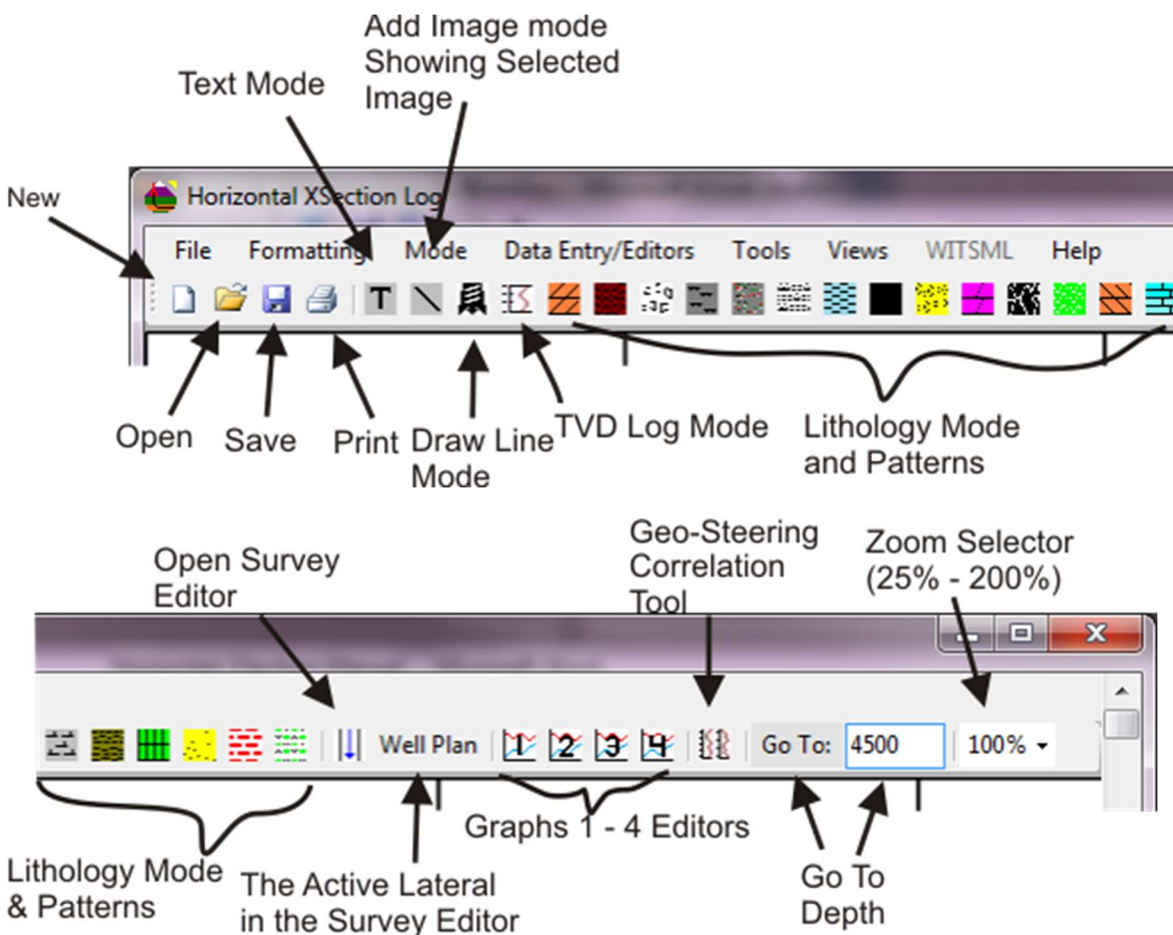### Geo-horizon Mode (Cross-Section Track)
Use this mode to draw geologic features onto the cross-section that can then be projected onto the "TVD vs. Vertical Section" View (See Chapter 11, which is about the Geo-horizon feature).

Save
Save often and backup files regularly and/or enable the AutoSave function. More on saving and backing up logs in the "Chapter 3 - The Formatting and File Menu".

The ToolBar Buttons
The toolbar allows for quick access to many of the features described in subsequent chapters. The below illustration explains what the different buttons on the toolbar do.

ⁱ That would be Peter D. Falk.