TLog Instruction Manual (ver 1.4)

Updated- 08/14/17

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Introduction

This manual has instructions explaining how to install and use TLog software to generate vertical and horizontal mudlogs and striplogs in digital formats.

TLog is a graphical based application used to generate vertical and horizontal mudlogs and striplogs for use by geologists and mudloggers. It is written in Java and as a result can be used with various operating systems, such as 32- and 64-bit versions of Windows XP, Windows Vista, Windows 7, and Mac OS version 10.6+.

TLog makes it simple to create new mudlog and striplog templates that can be tailored to a geologist's or mud logger's specific requirements. It allows importing of data in various LAS, TXT, CSV and image file formats and then the data can be displayed in various curve, lithology, histogram or image tracks, depending on the geologists or loggers preferences. The logs can then be exported in various image formats, such as PDF, TIFF, or PNG, or exported in file formats such as LAS or ASCII. Lithology descriptions can be exported in a TXT file for use in a geology report.

There are two versions of TLog, the standard licensed edition allows users to view AND edit data on the log, while the Viewer (read-only) version allows users to view and print the data, but not edit the data. The read only version of TLog is sent to operators, in order to view and print TLog logs sent to them from the field.

Minimum System Requirements

- 1 GHz Processor
- Microsoft Windows XP, Windows Vista, Windows 7 (32- or 64-bit) or Mac OS version 10.6 or later
- Java client version 6 – (32- or 64-bit) Update 30 or later for Windows (Java version 1.60 or later for Mac OS)
- 2 GB of RAM (4GB recommended)
- 25MB of free hard disk space
- 1024 x 768 display

Installing TLog

Prior to installing TLog, first install the most current version of Java. For all Windows users, go to www.java.com and select *FREE JAVA DOWNLOAD*, then follow the instructions. To determine your current version of Java on a Windows PC, select *START → CONTROL PANEL → JAVA*. Then select *ABOUT* in the *GENERAL* tab in the Java Control Panel to see the current Java version. For Mac users, the most current version of Java is installed automatically via *SOFTWARE UPDATE* within the Mac OS. To determine your current version of Java on a Mac, open the *TERMINAL*, then type "*java –version*" at the command line.

In order to install TLog, you first need to obtain a license key from a Terra SLS' employee. Please call 970-243-3044 or send a request for a license to operations@terrasls.com. Once the MSI employee verifies your credentials, you will receive an automated email from MSI with your license key and link to download TLog onto your PC. The link to download TLog is http://www.terrasls.com/TLog.jnlp. Once TLog is installed, it will create a shortcut on your Desktop.

Configuring Templates and Tracks in TLog

When you open TLog for the first time and select *VERTICAL*, you will see a screen similar to that below in **Figure 1**.   The TLog screen contains an upper **Title Bar**, which displays the path and file name, with a **Menu Bar** directly below it, which includes *FILE, EDIT, HEADERS, LAYOUT, VIEW, EXTRANET, REAL-TIME DATA, HELP and DEBUG* functions.
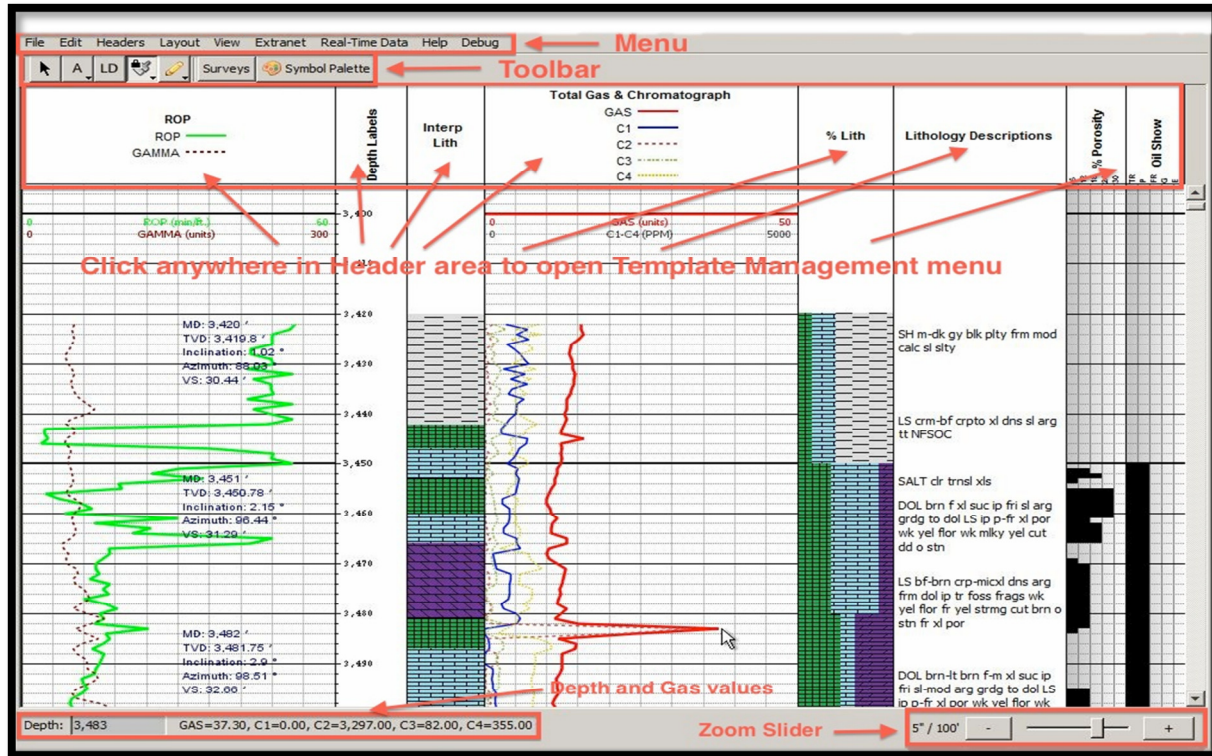

Figure 1 – TLog Screen – Vertical Mode

A **Tool Bar** is located directly below the **Menu Bar** with four tools: an <u>arrow</u> tool for selecting and moving notes and sample descriptions, an <u>A</u> tool for inserting notes and lithology descriptions, a <u>paintbrush</u> tool for drawing in lithology and accessories and a <u>pencil</u> tool for editing curve data directly. The <u>LD</u> tool is used to add descriptions to the <u>L</u>ithology <u>D</u>escriptions track.

Keyboard shortcuts are available to move between the four various Toolbar elements. You can also sequentially <u>tab</u> from one toolbar element to the next, and the <u>spacebar</u> can be used to toggle between the last two tools selected.

> **1 → to select the arrow tool (<u>m</u>ove)**
>
> **2 → to select the Note tool (<u>t</u>ext)**
>
> **3 → to select the <u>L</u>ithology Description tool**
>
> **4 → to select the <u>D</u>rawing tool**

The floating Symbol Palette, (**Figure 2** below) displayed in **HORIZONTAL Mode**, can be enabled by selecting the *SYMBOL PALLETE* button on the upper right of the Tool Bar. It is a convenient tool that can be used for inserting lithology, as well as various lithology accessories (minerals and fossils), oil show/porosity types and engineering symbols onto the log.

Also notice the feature at the bottom left side on the gray TLog border in **Figure 1** and **Figure 2** that displays the current curve values for a particular depth in a particular track. In **Figure 1** the mouse pointer was located in the Total Gas & Chromatograph track, so the Total Gas and Chromatograph values for a particular depth are displayed. In **Figure 2**, the mouse pointer was placed in the ROP track, so the ROP and GR values are displayed for a particular depth.

A scale slider bar is on the lower right side of the TLog screen in both the Vertical and Horizontal modes. This tool can be used to increase or decrease the scale from a minimum of 1" = 100' (1:1200) all the way up to 20" = 100' (1:60), by selecting the "-" or "+" buttons on either side of the slider bar, or grabbing the slider bar with a cursor and sliding it. The scale can also be set from the *LAYOUT – LOG SCALE* menu as well.
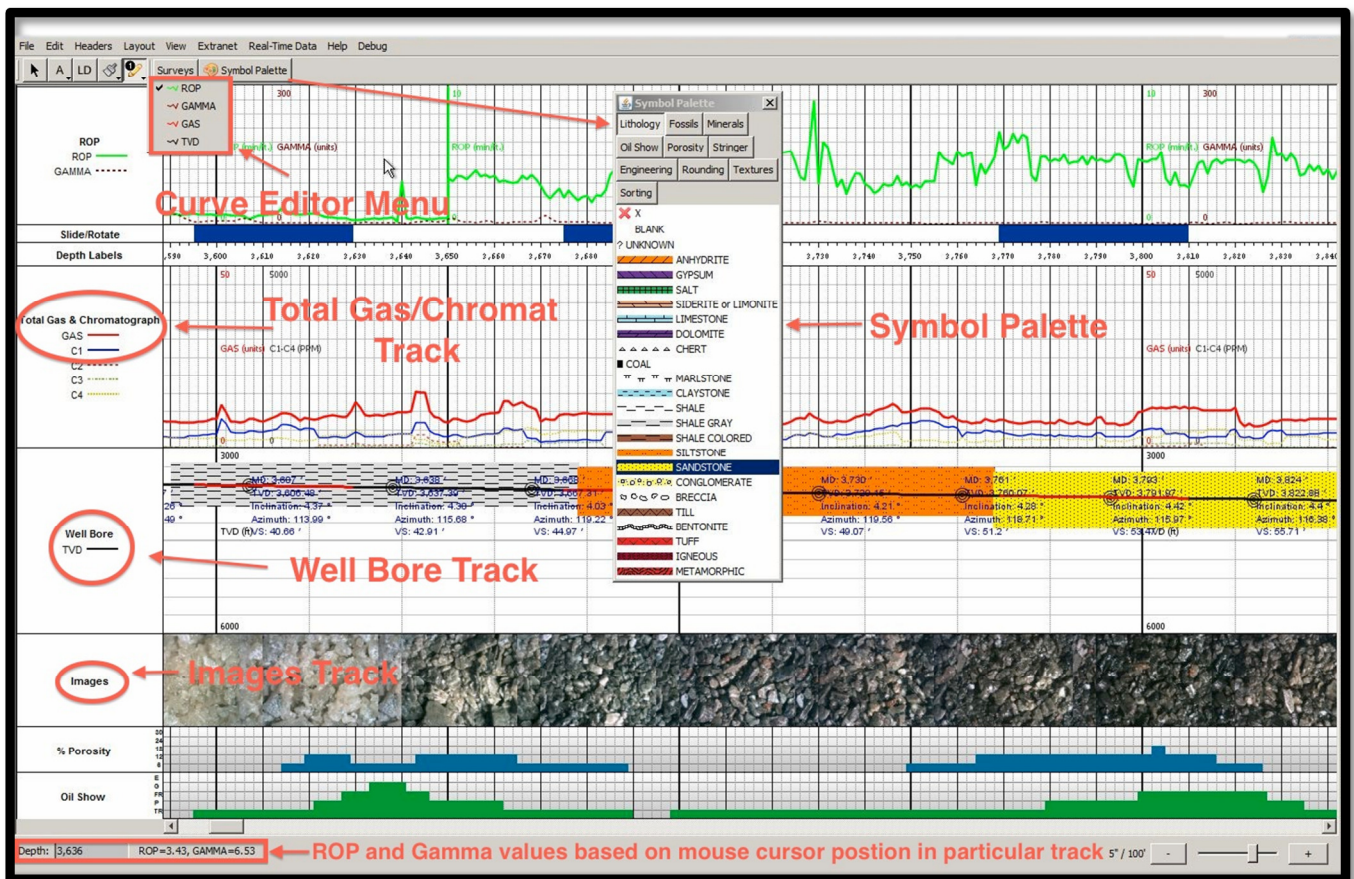
Figure 2 –TLog Screen – Horizontal Mode

Setting up Templates in TLog

When TLog is first opened, it uses a default template like the one shown above in **Figure 1.** However it is easy to modify this template by following the steps below. Open TLog and select *LAYOUT* in the Menu Bar. Then select *TEMPLATE MANAGEMENT.* You will see the *TEMPLATE MANAGEMENT* menu below in **Figure 3**. Left clicking anywhere in the track header area will open the TEMPLATE MANAGEMENT menu. The track header area appears at the TOP of Vertical logs and on the far LEFT side of Horizontal logs.

A new template can be, it can be exported to create a standardized template. Items that can be customized to be included with the template include the arrangement and width of tracks, types of

tracks, curves in tracks, company logos in the header, *Symbol Library (i.e. Lithology, Engineering Symbols, etc.) Note Templates* and *Lithology Abbreviations* (longhand and shorthand.)

Deleting Tracks

In order to DELETE any tracks, such as % Porosity, Interpretive Lithology, etc. that you do not need, just select the track with your cursor and make sure it's highlighted, then select *DELETE TRACK*.
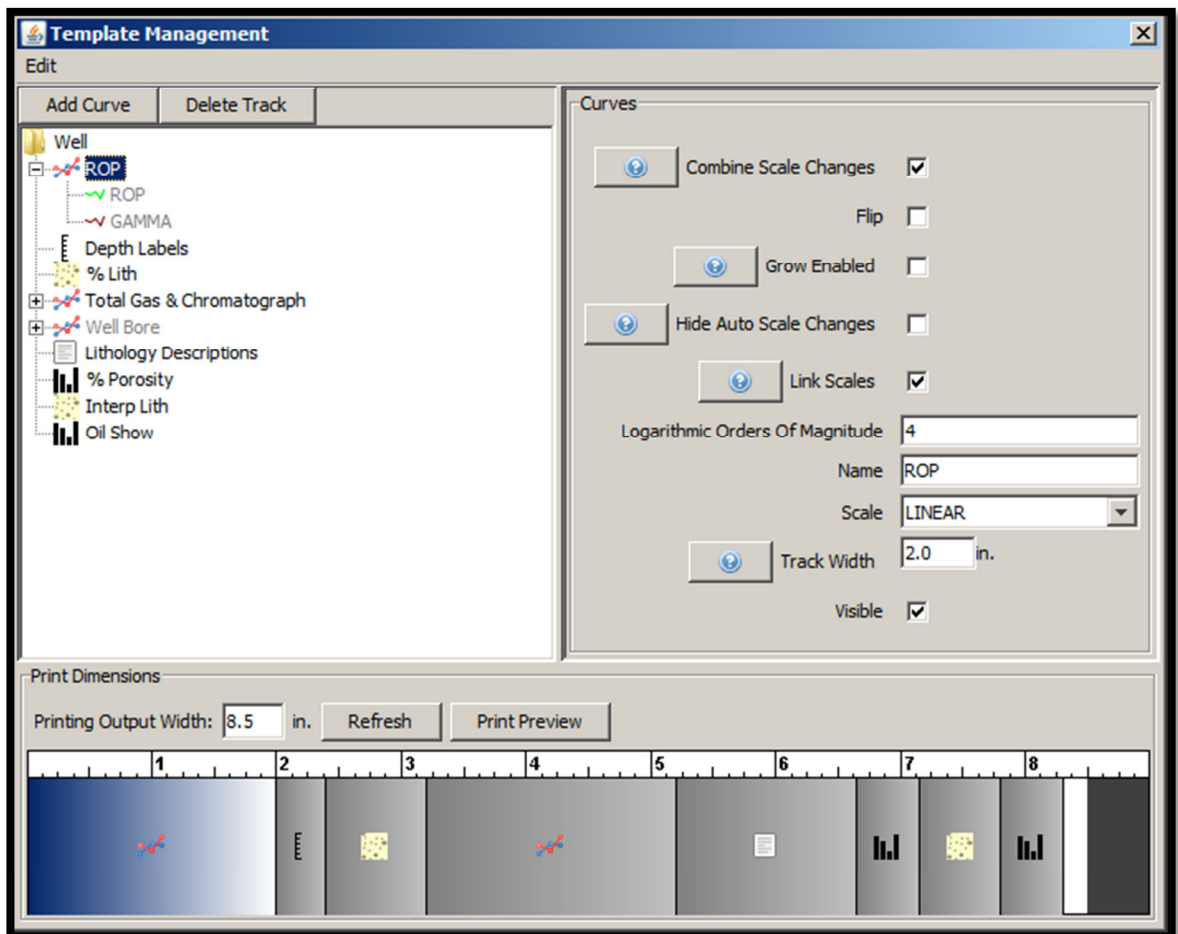
Figure 3 – Template Management menu

Moving Tracks

In order to MOVE a track to a different location, just select the track to be moved and hold down the LEFT mouse button, then just drag the track to where you need it.

Adding Tracks

In order to ADD a new track, make sure that you highlight the WELL NAME (in the case of **Figure 3**, *Well)* first, then select *NEW TRACK* to bring up a list of new tracks that can be added, and just select the track to be added from the drop down menu.

Some of the tracks that can be added include *Images* (for sample lithology pictures), *Oil Show Type*, *Slide/Rotate, Oil Show Type, Porosity Type* and *Blank* (for displaying notes such as mud data, drilling parameters, bit information, etc.)

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Changing Appearance of Tracks

In order to change the appearance of a specific track, just select the track and a menu will appear for changing parameters specifically for that track. The buttons with the blue question marks to the left of the options describe the action each item performs on the log. Each type of track (Curves, Histograms, Depth Labels, etc.) has a menu specific to it for modifying the particular characteristics of that track.

Unselecting *DETAILED TRACK HEADERS* from the *VIEW* menu will disable track headers. Detailed track headers are displayed by default.

Unlinking the Total Gas and Chromatograph Scales

By default, the Total Gas and Chromatograph scales are linked, so that the Chromatograph scale (in PPM) is 100x whatever the Total Gas scale is set to. In order to set the Chromatograph scale INDEPENDENTLY of the Total Gas scale, just uncheck the *LINK SCALES* box in the menu that appears when the *TOTAL GAS & CHROMATOGRAPH* is selected in *TEMPLATE MANAGEMENT*. (See **Figure 3** above.) As a result, separate C1 thru C5 scale labels will appear on the log. Each C1 thru C5 scale can then be set individually and independently of Total Gas.

Changing the Color, Stroke Pattern, Width and Unit of Measure of Curves within Tracks

In order to change the appearance of a particular CURVE within a track, just select the particular curve within the CURVE track, by expanding the CURVE TRACK folder and then select each particular curve to modify the color, stroke pattern and stroke width individually. (In the menu in **Figure 4**, for the ROP curve, Block Rendering, rather than Point-to-Point was selected, the Line Color was changed to blue, the Name field was changed to *Rate of Penetration* from ROP and the Unit of Measure was changed to f*t/hr* from *min/ft*.)

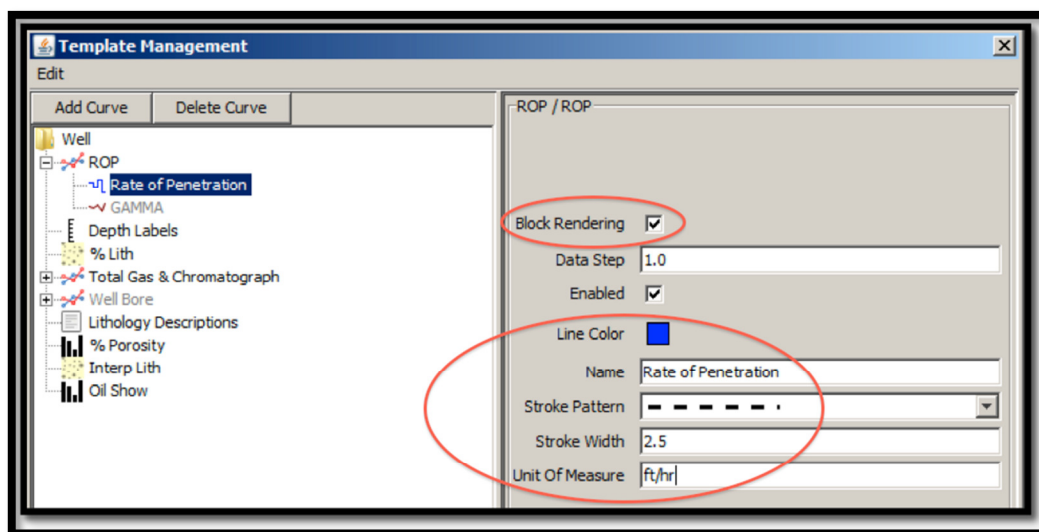Figure 4 – Modified Rate of Penetration curve parameters

Changing the Appearance of Histogram Tracks

A Histogram track, such as *% Porosity, Oil Show* and *Fluorescence* can also be modified. For instance in **Figure 5** below, the Oil Show track has been modified to reflect Flare Size, by changing the *Header Axis Labels* to the flare length and the Name of the track to *Flare Size. RANGE LINES* allows the

number of quantifiable parameters to be changed to allow more or less categories. The *RANGE LINES* correspond directly to the number of *HEADER AXIS LABELS*.

Selecting *FLIP*, in ANY Histogram menu such as *% Porosity, Oil Show, Fluorescence,* or custom Histogram*,* will cause the entire Histogram values to reverse from left to right in Vertical mode, or from top to bottom in Horizontal mode. The *Histogram Header Axis* Labels will ALSO reverse, along with the Histogram itself, when *FLIP* is selected. (Refer to **Figure 5** below.)
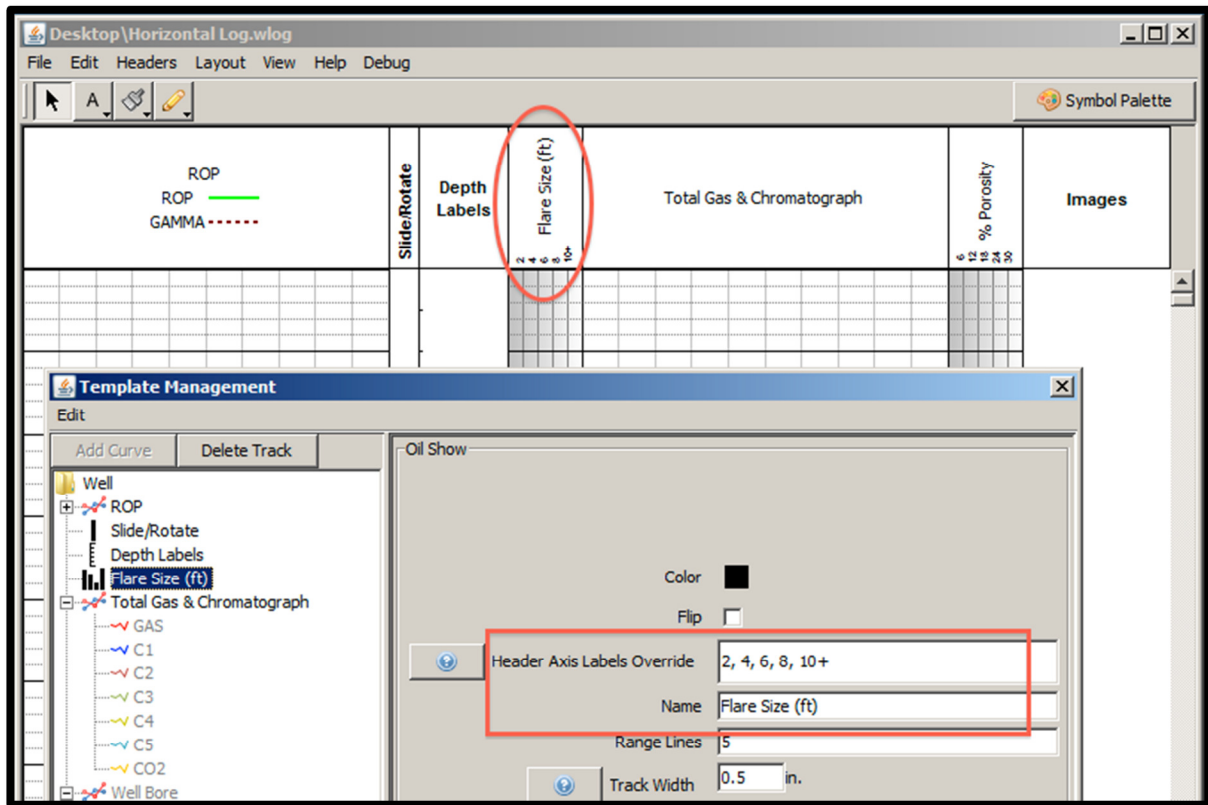

Figure 5 – Modified Histogram Track parameters

Importing Data into TLog

Various types of data files can be imported into TLog including LAS (version 2.0 and 3.0) files, CSV (comma separated value) files, TXT (ASCII Text Tab Delimited) files, and images in the form of JPEG files (**Figure 6**).

Importing Curve Data

In general, curve data includes readings taken on a continuous basis, represented in a depth-based format, such as ROP, Gamma Ray, Resistivity, WOB, Hook Load, Temperature In/Out and lagged Total Gas, CO_2, and Chromatography readings. Basically, any EDR WITS or E-Log data can be imported and displayed in TLog when the data is indexed in a depth-based format.
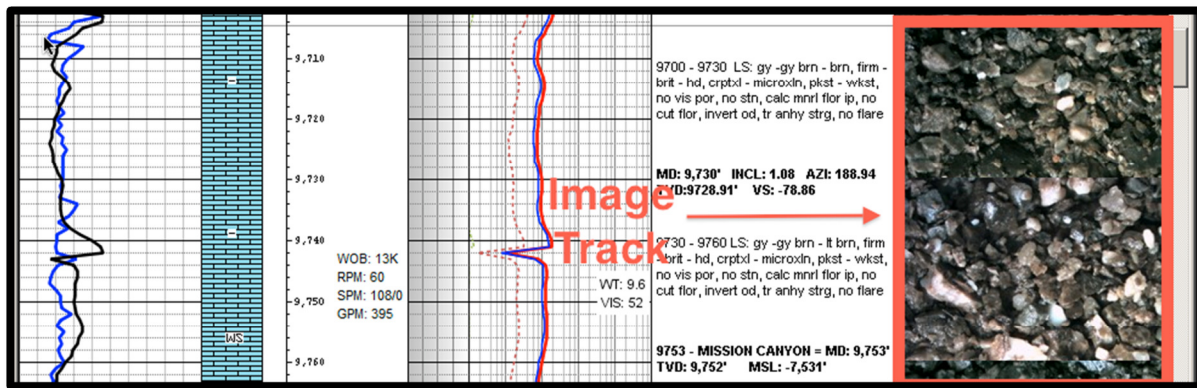
Figure 6 - TLog Log w/ Image track

Importing Curve Data from LAS files

In order to import an LAS file with curve data into TLog, open TLog and select either *VERTICAL* or *HORIZONTAL*, and then select *FILE → IMPORT → CURVE DATA*. Then just browse to the location of the desired LAS file. A menu will appear similar to the one below in **Figure 7**.

The *Data Import* menu indicates the file name and depth range of values within the file. The menu also displays the name of the various fields within the header of the LAS file. It gives the option of importing all of the data, just recent data, or importing a depth range. The *Data Preview* window allows a preview of the data in the LAS file, before importing it.

There are also options to import only particular curve tracks from an LAS or TXT file. For instance in **Figure 7**, the C5 values are NOT selected, and as a result the C5 values appear greyed out in the *Data*
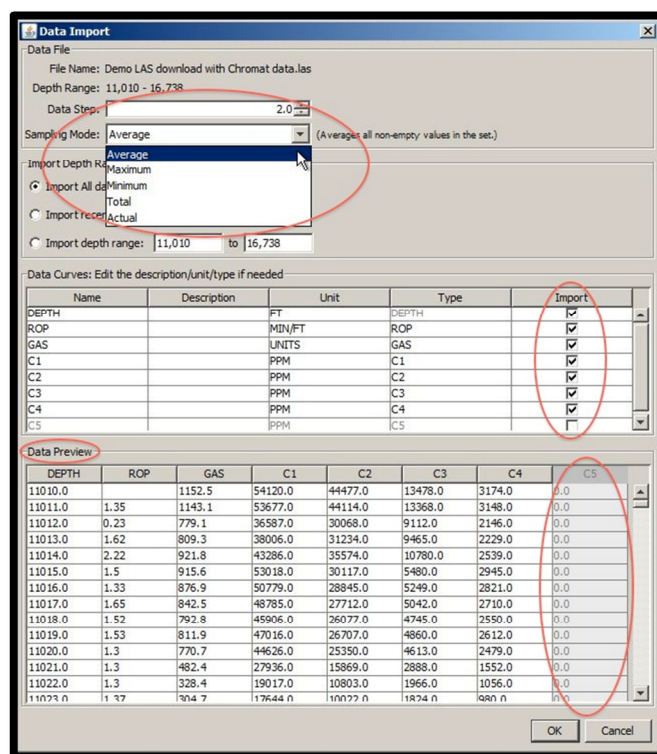

Figure 7 – Data Import menu (2' Average Data Step and Sampling Mode selected)

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Preview window.

When curve data is imported using the *Data Import* menu, it is also possible to select both a *Data Step* (such as 1', 2', etc.) and a *Sampling Mode*, such as *AVERAGE, MAXIMUM, MINIMUM, TOTAL* and *ACTUAL* (*the default*.) In **Figure 7**, a 2' Average *Data Step* and *Sampling Mode* are selected.   As a result, the ROP, Total Gas and Chromatograph values will all be averaged and plotted every 2' on the log. The averaged values for ROP, Total Gas and Chromatography will appear in the *Curve Data Editor* as well.

Once the appropriate depth range and fields are selected, just select *OK* to import the data. The main TLog window will appear with the newly imported curve data, and a message will appear indicating the number of rows that were imported from the LAS file.

In order to move a particular curve from one track to another, simply LEFT click and highlight the curve to be moved, hold down the left mouse button and drag the curve to the appropriate track.

Importing Curve Data from ASCII (TXT) files

When importing curve data from ASCII (TXT) files, it may be necessary to select the TYPE of data being imported for a particular column. For instance in **Figure 8** below, the SURVEY column is not associated with a particular data type, so selecting the TYPE cell across from SURVEY allows the user to select a predefined or CUSTOM type. In this case, the predefined TYPE of DEPTH was selected.
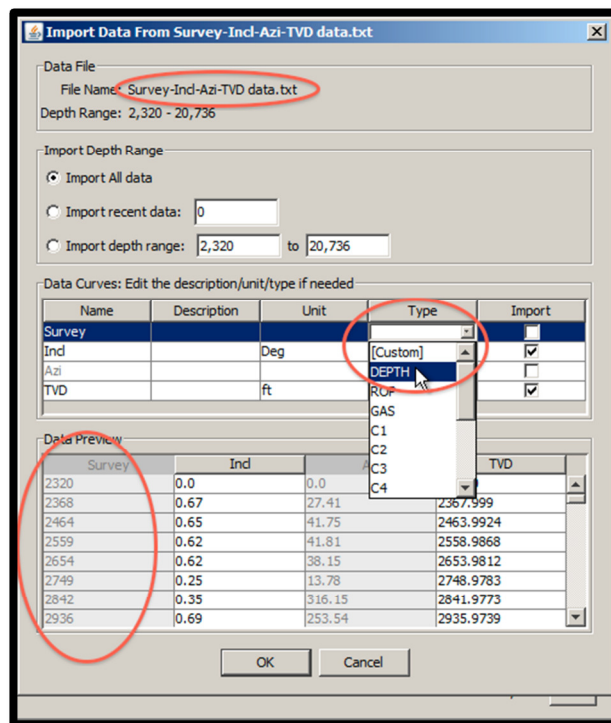

Figure 8 - Import TXT Data menu

The IMPORT box will automatically be selected when the TYPE (or field) is selected for a particular column, so that particular column will be imported from the TXT file. If a CUSTOM type is selected, the user will be prompted to add the TYPE for that data column, depending on the data represented

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in the column, such as temperature, resistivity, density, etc. The user can also type in a description and units for the data.

Importing Survey Data from LAS or TXT files

Survey Data can either be imported from an LAS, TXT or CSV files, or entered manually into TLog. The imported survey data can be used to create a separate True Vertical Depth (TVD) Log from deviated well data for correlating Gamma Ray curves to a true vertical offset log. The survey data can also be used to generate a Horizontal Well Log with a *Well Bore* track to display the actual borehole graphed as Measured Depth (X-axis) versus True Vertical Depth (Y-axis). The Well Bore track displays actual survey data, interpretive lithology and sample descriptions.

In order to import survey data from a file, simply select *FILE → IMPORT → SURVEYS*, and then browse to the survey file. Once the file containing the survey data is opened, a menu will appear similar to **Figure 9** below.

The TXT file in **Figure 9** included Measured Depth, TVD, Inclination, Azimuth, Northings, Eastings and Vertical Section survey data. Once the appropriate columns are selected, just select *OK* to import and display the Horizontal Log. Then just adjust the TVD scale (Y-axis) in order to keep the Well Bore curve in the Well Bore track. Just right-click in the Well Bore track to bring up the menu to adjust the TVD scale.

In order to plot a Well Bore track curve, only Measured Depth and TVD data is necessary. The other survey data can be used to generate a Survey Plan and Survey Elevation plot of the well later, to be printed just below the Well Header information if desired.

Figure 9 - Survey Data Import menu (from TXT file)

Modifying Curve Data

Once the curve data has been imported in TLog, it can easily be edited if necessary, using either a spreadsheet style *Curve Data Editor*, where actual values can be entered manually, or using the curve editing tool to draw over the questionable curve data.

Changing Scales in Curve Tracks

When data is first imported into TLog, the curve scale is automatically set for the largest value in the data set via auto-scaling. In order to change the default scale, just right-click in the track that you wish to change the scale and select *ADJUST SCALE* from the menu, for the particular curve scale you would like to modify. A separate scale can be set for each curve in the track.

In order to DELETE a particular scale change you've made, just double-click on the scale change and then select DELETE from the menu that appears.

By default, TLog displays auto-scales every 200' on the log, if you would like to disable this feature in order to just display manually entered scale changes; just select *HIDE AUTO SCALE CHANGES* in *TEMPLATE MANAGEMENT*. *(Remember, you can access TEMPLATE MANAGEMENT by just left-clicking on a header in the log.)*

The total gas and chromatograph curves are linked by default. The chromatograph values for C_1 thru C_4 in PPM, are automatically assigned values 100x the total gas values in Units. In order to disable this feature, from within *TEMPLATE MANGEMENT*, unselect the box labeled *LINK SCALES*. This causes the chromatograph values to auto-scale to the largest value in each curve. Also, when *LINK SCALES* is disabled, each chromatograph curve can be edited independently from each other and the total gas curve.

Changing the Current Displayed Depth

In order to display a specific depth on the log, either use the scroll bar located on the far right side of the TLog window, or select *GOTO DEPTH* (*CTRL-G*) from the *VIEW* menu, and type in the desired depth to view.

Changing Curve Values using the Curve Data Editor

The *Curve Data Editor* tool (**Figure 10** below) can be accessed by selecting *EDIT → CURVE DATA TABLE*, from the menu bar. Once the menu appears, just double-click on the item to change and type in the appropriate curve data value(s). When curve values are edited in this manner, other curve values, such as chromatograph curves, are not affected. You may also change the order of the columns by dragging and dropping the column headers.

If there are duplicate records (i.e. duplicate measured depth records), they can be deleted by first highlighting the duplicate record(s) and then selecting *EDIT → DELETE SELECTED ROW(S).* You may also repair any depth based data by selecting *DEBUG → DATA → REPAIR DEPTH-BASED DATA.*

Figure 10 - Curve Data Editor

Changing Curves using the Curve Editor Drawing Tool

The Curve Editor Drawing tool can be accessed by either selecting the pencil icon from the Toolbar (**Figure 11** below), or right clicking in the appropriate track and selecting *EDIT CURVE DATA* from the menu and then selecting appropriate curve from the drop-down menu.

Once the pencil appears in place of the mouse cursor, just place it over the questionable curve data to modify and hold down the left mouse button and edit the curve. In order to UNDO the new curve data just edited, just select *CTRL-Z* with your keyboard. The original curve data is always displayed as lighter lines, however these lines will **not** appear on the final hard copy or digital copy of the log.

Also, the lighter lines representing the original data are **not** displayed on the viewer only versions of TLog and do **not** appear on hard copies, digital images of the log, such as PDFs, TIFFs or PNGs, or the LAS exports of the log data.
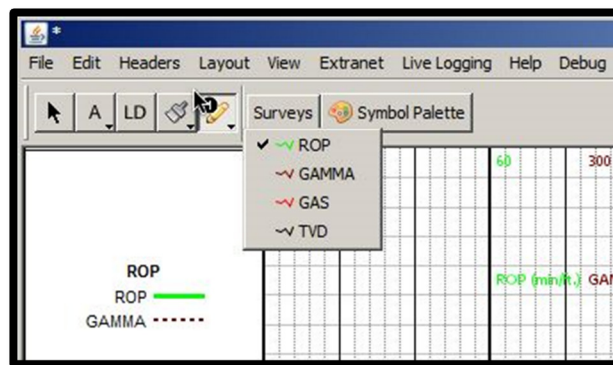

Figure 11 - Curve Editor Drawing Tool

In order to edit more than one section of curve data at a time, just click on the pencil icon twice until a lock shows up above the pencil to indicate that curve-editing feature can be used for editing

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multiple sections of curve data. In order to exit the curve-editing feature, just select a different tool on the toolbar.

When the total gas curve is edited and the chromatograph scales are linked, the chromatograph data will retain their original proportions throughout the edited section of curve data (**Figure 12** below). The original total gas and chromatograph curve values appear much lighter than the newly edited curves.
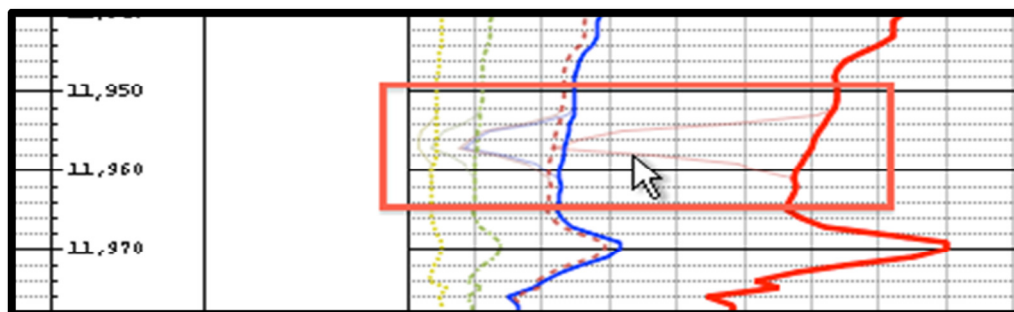
Drawing Lithology and Symbols on the Log

Users can enter various lithologies, geology and engineering symbols into a log simply and efficiently, using different methods.

Entering % Lithology Symbols using *Depth Range*

In order to enter larger ranges of lithological symbols into a log, first position the mouse cursor in the *Depth Labels* track and hold down the left mouse button while moving the cursor down. A shaded area will appear indicating the depth range you have selected in the *DEPTH LABELS* track. Then right click in the % Lith track and then select *INSERT RANGE* in the menu. In the *INSERT PERCENT LITHOLOGY RANGE* menu, then select the appropriate lithologies. Once the lithologies appear in window on the left, you may also modify the percentages by selecting and dragging the borders between the lithology types to increase or decrease the percentage of each lithology. (Refer to the circled double-arrow between limestone and dolomite in **Figure 14**.) The percentage values for each lithology appear above each lithology selected. (Refer to the circled %'s above each lithology in **Figure 14**). Select *OK* to enter the particular depth range of % Liths into the track once the appropriate percentages of each lithology have been selected.

Another method to add lithology to the % Lith track is to simply right-click in the % Lith track and then select *INSERT RANGE* from the menu. Just type in the appropriate depths in the *DEPTH FROM* and *DEPTH TO* boxes. (Refer to the top of **Figure 13**.) Once the depths have been entered, then just select the appropriate lithologies from the right column. Then select *SAVE AND ADD* to automatically add another % LITH range, or select *SAVE AND CLOSE* to return to the log. Selecting *SAVE AND ADD* will <u>automatically</u> increment the *Depth From* and *Depth To* to the next Depth Range, based on the previously entered depth range. Several hundred to several thousand feet of % lithologies can easily be added using this method.
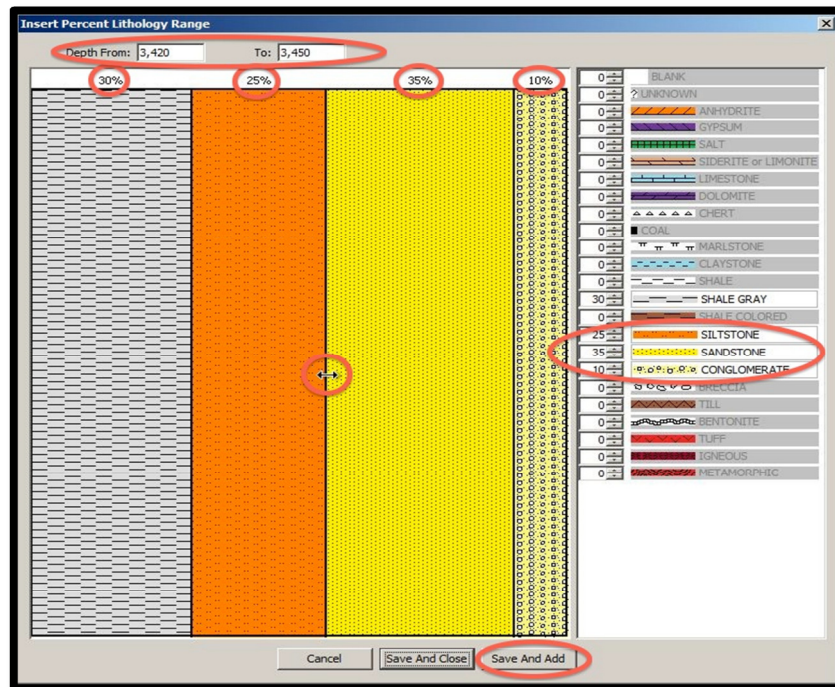
Figure 13 - Insert Percent Lithology Range menu

Entering % Lithology and Interpretive Lithology Symbols using the Drawing Tool

Another method to insert either % Lith or Interpretive Lithology symbols in their respective tracks is to select the drawing tool from the toolbar that looks like a paintbrush. (Click on this symbol TWICE to lock it in order to use it more than once.) Then right click in the % Lith track or the Interpretive Lith track and then select the appropriate lithology symbol from the menu that appears. Place the paintbrush at the appropriate depth and just hold the left mouse key down while moving the paintbrush down in the track. In the case of the % Lith track, a yellow popup box will appear indicating the relative % of lithology that is selected in the track. In the case of the % Lith track, repeat this procedure for each lithology.

In order to UNDO a recently drawn symbol, or most tasks, just select *CTRL-Z.*

Using *Depth Line On Cursor* as a Visual Aid for Inserting Lithologies/Histograms

Selecting *VIEW → DEPTH LINE ON CURSOR (CTRL-T)* displays a horizontal line on the tip of the cursor that extends across the width of the TLog window, which may be used as a visual aid for aligning lithology and histograms with increases/decreases in ROP or Total Gas curves.

Entering Symbols on the Log

In order to enter lithology or engineering symbols in the log, FIRST select the paintbrush-drawing tool (click on it TWICE to lock it), then right click in any track other than the Lithology Descriptions, Image or a Histogram track.

Then select the appropriate symbol type from the menu that appears, such as fossil, minerals, stringers, textures or engineering and select the appropriate symbol that appears on the top of the menu, for that particular symbol type. Just left click on the log to insert the appropriate symbol (if

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the paintbrush tool is locked, you can insert several symbols at once.) The Lithology Descriptions, Images and all Histogram tracks do NOT support symbols.

Inserting Notes on the Log

Notes can be inserted on the log by either double-clicking in a track, or just right clicking in any track (except Histogram and Image tracks) and then selecting *ADD NOTE* from the menu (**Figure 14**.) Various options are available for the note, such as bold, italics, underline, font size/type, color, and borders. The note background can be blanked out completely by selecting *OPAQUE*, or the background can appear through the note by default.
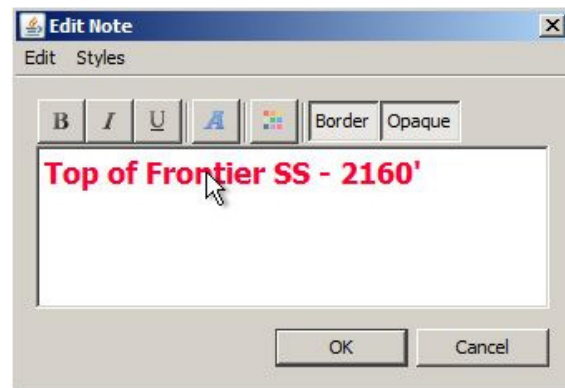
Figure 14 - ADD NOTE menu

Another method to add a note is to first select the "**A**" from the TLog toolbar (click on it TWICE to lock it in order to add more than one note) and then click on the log where the note should be inserted and type in the note. Finally select *OK* to add the note to the log.

In order to delete a note, first select it and then select *DELETE* from your keyboard to remove it, or left click right on the note to highlight it and right click and select CUT from the popup menu.

To cut or copy a note, select it first, then right click on it and select *CUT* or *COPY* from the menu. Then select where to place the new note, right click and select *PASTE* from the menu. Keyboard shortcuts are also available for cut, copy and paste:

Cut	→	**CTRL + X**
Copy	→	**CTRL + C**
Paste	→	**CTRL + V**

An easy way to COPY a NOTE is to select the arrow in the Toolbar, then select the NOTE to copy with the cursor, hold down the CTRL key and just drag the NOTE to where it should be copied.

To move a note, select it first using the arrow on the Toolbar, and hold down the left mouse button and drag the note to a new position on the log.

Note shapes can be changed by first highlighting the note and then grabbing the right side of the note box border and moving it left or right to lengthen or shorten the note.

The user can either add a TXT note, or create a note from a predefined or custom note template. Predefined templates include Bit Data and Survey Data.

A custom note template can be created by selecting *EDIT* → *NOTE TEMPLATES,* then selecting *ADD NOTE TEMPLATE* from the menu. Type in a name for the note template, such as Mud Data (**Figure 15**.) Then select names for the fields within the note. In this case new fields for the Mud Data note include "WT, VIS, ph, WL, and FC". Just select ADD FIELD to add the name of the field, and select any trailing labels, such as "#/gal " and then select the type of value for the field, either text or number. (NOTE: Custom note templates are saved when customized TLog log templates are exported using FILE → EXPORT → TEMPLATE.)
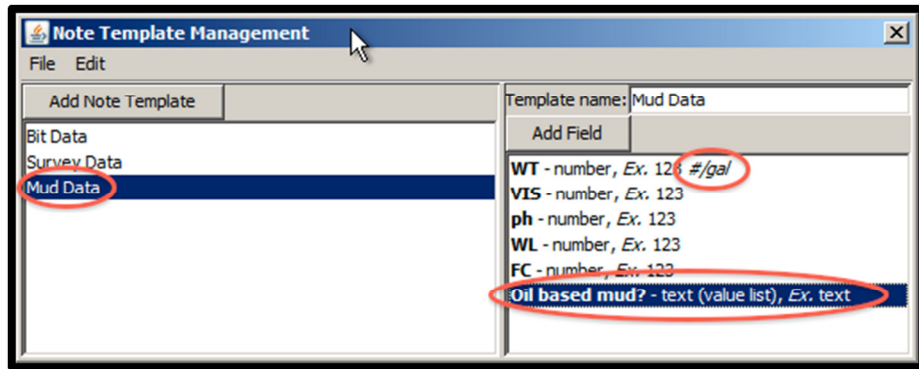
Figure 15 - Add new Note Template

A value list for a note can be added as an option, where a specific value can be selected from a drop down list for that particular field. In this case, "Oil based mud?" is the field name and the user populated the value list with "Yes", "No", and "Maybe" as drop down selections (**Figure 16.**) Once the appropriate values have been entered, just select **DONE** to return to the NOTE TEMPLATE MANAGEMENT menu.
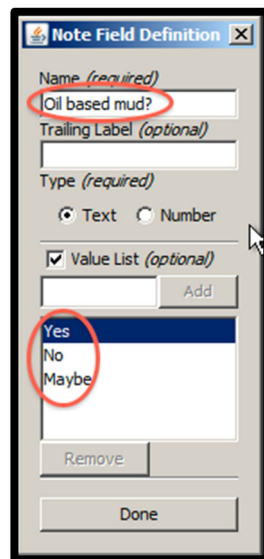
Figure 16 - Note Field - Value List (optional)

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Inserting Lithology Descriptions

To insert Lithology Descriptions double-click in the Lithology Description track to bring up the *Add Lithology Description* menu, type in the descriptions, and then select *SAVE AND CLOSE*.

In order to automatically add depth ranges to the descriptions, select *AUTO ADD DEPTH* in *TEMPLATE MANAGEMENT* for the LITHOLOGY DESCRIPTIONS track (just left click on the header to enter TEMPLATE MANAGEMENT). Click *SAVE AND ADD* to increment the depth in the description automatically, which will leave the Lithology Description menu open to insert the next description. Select *SAVE AND CLOSE* in order to save the description and close the menu.

An easy way to COPY a lithology description is to select the arrow in the Toolbar, then select the LITH DESCRIPTION to copy with the cursor, hold down the CTRL key and just drag the LITH DESCRIPTION to where it should be copied.

Another method to copy and paste text in the LITH DESCRIPTION menu is to first highlight the text to copy, then select *CTRL-C* to copy the text and select *CTRL-V* to paste the text back into the menu.

In order to move the lithology descriptions, just select the pointer from the menu bar in TLog, and then the description can be positioned up or down in the LITHOLOGY DESCRIPTION track.

Modifying the Depth Label Track

The Depth Label track can be modified to rotate depth labels either horizontally or vertically, change the font size for the depths labels and change the width of the Depth Label track (**Figure 17** below.) It can also be set to GROW ENABLED in order to the track to expand proportionately with other GROW ENABLED tracks if there is sufficient unused space when printed.

Entering Log Header Information

Log header information such as well name, operator, well location, etc. is entered by selecting *HEADERS* → *EDIT HEADERS.* (**Figure 18 belo**w) The first tab that appears includes well name, location and elevation information for the well. The *Banner* tab allows the user insert an operator's logo into the header using a JPEG, BMP or PNG image, by either dragging the appropriate image file or right-clicking and selecting *OPEN IMAGE FILE* to browse to the appropriate image file. The operator's name and address is entered in the *Operator* tab. The user may also insert their company logo and information in the *Geologist* tab. The other tabs are for *Core* and *Other* miscellaneous information, if so desired.
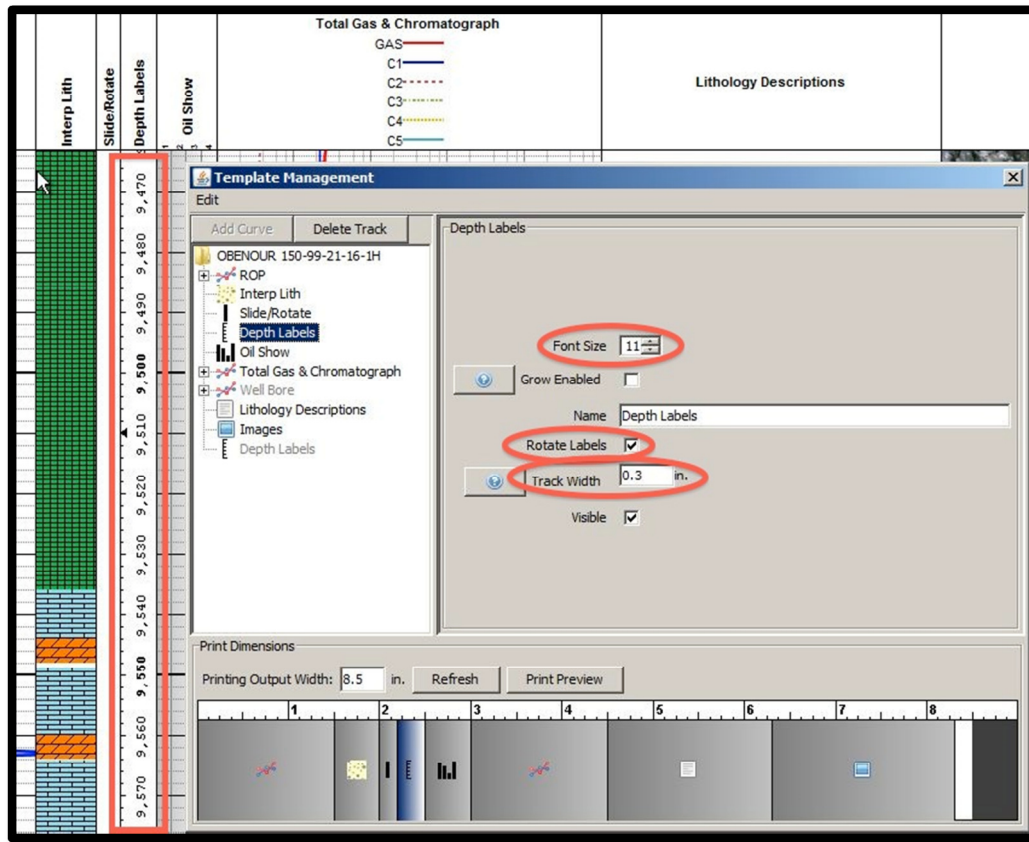
Figure 17 - Depth Label menu

Prior to printing the final log, the user can select exactly which Headers to include in the final log, by selecting *FILE → EXPORT → WELL DATA*, and select *CHOOSE HEADERS TO PRINT*… Headers that may be included or excluded are: *Logo and Well Info, Operator, Geologist, Other, Core Information, Rock Types, Accessories, Other Symbols, Survey Plan and Survey Elevation*.

Once the well's header information and logos are added, the appropriate headers are selected to print. *PRINT PREVIEW* from the *FILE* menu may be used as a quick way to view the entire header, prior to printing the log, to make sure the appropriate headers have been selected.

Figure 18 - TLog Header menu

Creating a TVD Log from a Measured Depth Log

TLog can create a True Vertical Depth (TVD) log when the necessary Measured Depth data such as ROP, Total Gas, survey data and Gamma Ray data are entered in an TLog vertical log first. The TVD log will create a true vertical representation of the Measured Depth log data, such as Gamma Ray and ROP, as if the deviated well at a true 90°. In order to calculate and create a TVD log, the minimum survey information must be entered for each survey: measured depth, inclination and azimuth.

Once all the necessary survey data, Gamma Ray data and Log Header information has been entered in TLog, select *FILE → EXPORT → TRUE VERTICAL DEPTH (TVD) LOG* from the menu. **Be sure to select a unique file name for the TVD Log so that it doesn't overwrite the Measured Depth log accidently.** TLog will generate a TVD log from the Measured Depth log and open it in TLog to review. The TVD log can then be printed or saved as an image file (TIFF, PNG or PDF), just like a Measured Depth log.

Printing TLog Logs

Hard copy logs can be printed from any printer that accepts continuous feed fanfold paper from TLog, either by printing directly to a printer or by first creating a PDF file and then printing the PDF to a printer.

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Printing Logs Directly to a Plotter

First, select *PRINTER SETUP* in the menu in order to set the paper size and paper source and select the appropriate margins. For instance, the minimum left and right margins that the iSys plotters support is 0.13 inches. (See **Figure 19** below.)

The orientation for this particular plotter is set for *Portrait*, and the source in this case is configured for *Automatically Select*.   Once the settings are configured, select *OK* to save them.
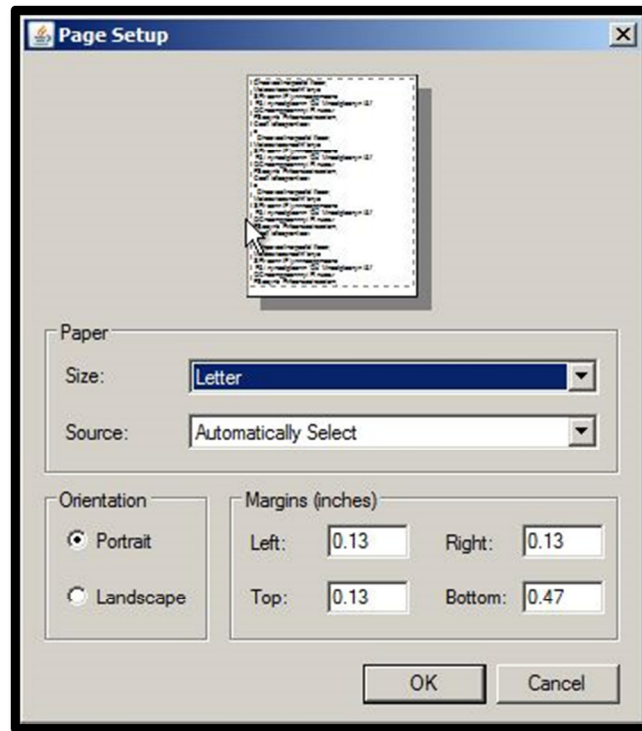
Figure 19- Page Setup menu

Select *FILE* → *PRINT* from the menu bar in TLog to print logs to a continuous feed plotter. Make sure the Zoom Level is set to the appropriate scale (i.e. 5" = 100') and select the *CHOOSE HEADERS TO PRINT* button to select the appropriate headers to include in the log. Make sure that *PRINTER* is selected and then select the Depth Range from the bottom of the same menu. The options are to *Print All Data, Print Recent Depth* and *Print Depth Range*. Then select *OK* to open the Print menu. Make sure that the default printer is set correctly, from the drop-down menu. Known continuous feed high quality plotters that are currently supported in native format are the iSys iTerra Elite and the iSys iTerra TL1290.

Select the PROPERTIES button from the PRINT menu to make sure the appropriate Paper Size, Paper Type and other printer parameters are set properly. The *Paper Size* would normally be set to indicate a continuous feed or fan-fold paper and the orientation for vertical logs should be set to Portrait. Once the printer parameters are configured properly, just select *OK* to print the output to the printer.

Printing PDF Files to a Plotter

If there are any problems printing to a particular printer, another option is to export the output to a PDF file and then use *Adobe Acrobat Reader* (http://get.adobe.com/reader/) to print the PDF file to the plotter.

To create a PDF file, just select *FILE → PRINT* and then select *PDF* from the menu, **Figure 20** below. Then select the appropriate *Zoom Level* and *Depth Range* to print from the menu. Select *SAVE PDF* and TLog will request a file name for the PDF image. Insert a file name and then select *SAVE*. TLog will then create a PDF image and then open it in *Adobe Acrobat Reader* to review it.
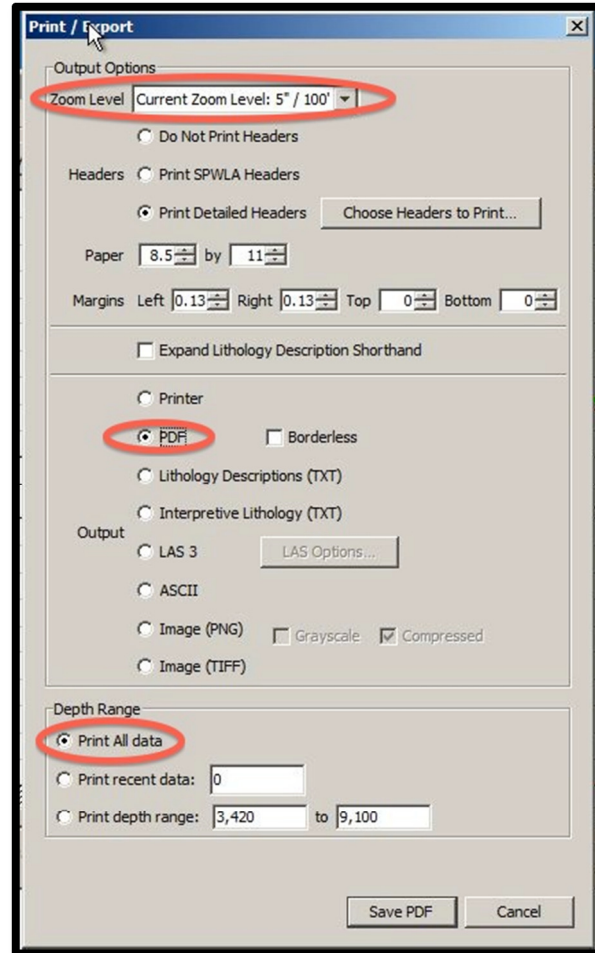
Figure 20 - Create a PDF to print

In order to print the PDF file from *Adobe Acrobat Reader* to a continuous feed printer, just select *FILE → PRINT* from the *Adobe Acrobat Reader* menu, then select the appropriate *Printer Name* from the drop down menu, and **be sure to change the *Page Scaling* to NONE** to eliminate page breaks in the printout.

Be sure to select the appropriate Printer Settings first, by selecting the PROPERTIES button next to the printer name. Settings in PROPERTIES will include paper size, which is usually set to 8.5" x 11" for standard log sizes. Also be sure to set the quality of the output, usually set to 600x600 dpi for many high quality printers.

For vertical logs, the Orientation should be set to *Portrait*, while horizontal logs should be set to *Landscape* mode. Once all of the appropriate printer setup choices have been designated, select *OK* to go back to the *Adobe Acrobat Print* menu and select *OK* to print

Creating TIFF and PNG Image Files

TLog can create both TIFF and PNG files, in addition to PDFs, for digital archival of mudlog data. In order to create a TIFF or PNG file, first be sure that all necessary header information for the well has been inserted into the header by selecting *HEADERS* → *EDIT HEADERS*.

Once all necessary header information has been populated, then select *FILE* → *EXPORT* → *WELL DATA* to bring up the *PRINT/EXPORT* menu. Then just select either *IMAGE (PNG)* or *IMAGE (TIFF)* in the OUTPUT section. Then select *GRAYSCALE* and/or *COMPRESSED* if desired. Then select the appropriate *DEPTH RANGE* to save and then select *EXPORT* to create the file. A menu will appear requesting the name of the file and a folder where to save the file to. Once this information is entered, then select *SAVE*.

Previewing Logs using *Print Preview*

PRINT PREVIEW may be used at any time to preview the current log before printing, which will include any headers, logos and horizontal well profiles, such as Survey Plan or Survey Elevation. Just select *NEXT* (or *PREVIOUS*) to view the entire well when the log appears in *PRINT PREVIEW*.

Enabling Real-Time Logging

The entire TLog log can be broadcast and displayed in real-time to operators and other interested and approved personnel while it is being created, while simultaneously acquiring real-time data from the MLogger, if so desired. In order to push data to clients remotely, a reliable Internet connection via cellular service or satellite should be available to allow Real-Time Broadcasting to continually update the data from the rig to the real-time log.

Just clicking on a link sent by the geologist/logger via a single email from the rig to the appropriate personnel will launch the real-time log. This link will automatically install the necessary TLog application on the PC, even if it was not previously installed, and then download all data and open the current vertical or horizontal log automatically.

Real-Time Logging consists of two parts, *Real-Time Broadcasting* – sending the TLog mudlog broadcasts in real-time to the operator for monitoring/quality review from the rig and *Real-Time Data Acquisition* – acquiring the drilling parameters, such as ROP, Total Gas and Chromatography, in real-time from the MLogger directly into TLog. *Real-Time Broadcasting* and *Real-Time Data Acquisition* can be enabled together or separately. Also, *Real-Time Broadcasting* and *Real-Time Data Acquisition* can be enabled or disabled at any time while building a log if so desired.

NOTE: Currently for *Real-Time Data Acquisition* to work properly it is absolutely necessary to connect to an MLogger with TLog immediately after nuking the MLogger and **BEFORE** connecting to the MLogger with TControl, in order to establish a UUID which is a unique identifier. If you connect to an MLogger with TControl, prior to connecting to it with TLog, then it will be necessary to nuke the MLogger, then connect to it with TLog.

Enabling Real-Time Broadcasting

A prerequisite to enabling *Real-Times Broadcasting* is to have an Extranet login with your credentials, which include your email address and a password. You can verify your Extranet credentials by going to www.terrasls.com/extranet and then attempt to log in there. If you do NOT have the proper credentials to log in, then either contact your company's Extranet administrator or call Terra SLS at 970-243-3044 to have someone create your Extranet credentials.

In order to enable the *Real-Time Broadcasting* part of Real-Time Logging to update remote client mudlogs with real-time data, just select *EDIT → PREFERENCES → Enable Real-Time Broadcasting* from within TLog. Three new buttons will appear to the right of the Toolbar menu when *Real-Time Broadcasting* is enabled. They are a *Chat* button, a *MLogger* button and a *TLog Server* button. Clicking on the *TLog Server* button will bring up a menu indicating that status (online or offline), the last synch with server edit number, and the next broadcast edit number. There are also buttons that allow TLog to *Revert to Server*, which reverts to the TLog version stored on the server, and to *Restart the Network Workers* in case the connection goes down between TLog and the TLog Server. You can also *Stop TLog Server Communication (for 1 hour)*, in case the communication to the TLog Server becomes sporadic due to poor cellular or satellite signal on location.

Once you have an Extranet login that works, have *Real-Time Broadcasting* enabled and have a reliable Internet connection to the MLogger, then you need to select *EXTRANET → SEND TLOG LINK* to send a link to the well to either an operator to view or to a manager for monitoring or quality control. They will receive a link to the well in their email. When they click it, TLog will install a viewer if they don't have it installed already, and then download the data and then automatically open the log on their PC. The Viewer gives the user the ability to change scales, modify track and curve positions, but NOT change the log data.

Any and all updates made by the logger or geologist to the log in the field will be reflected in the log they have opened almost immediately. IF the person that received the link in an email has an Editor version of TLog, then any changes they make to the log will be sent and updated on the loggers/geologists mudlog. The Viewer version of TLog doesn't allow any edits to the data itself, remotely or locally.

Just type in the Recipient's first name in the appropriate field and select *ADD*. If the recipient is already in the Extranet, his or her name should appear in a list with other geologists with the same first name. Just click on the appropriate name and select OK to ADD it to the distribution list for the link. Do this for each person that needs a link to the well sent to them, type a brief message in the *MESSAGE* box and then select *SEND FILE*. If the Recipient doesn't already exist, then select YES from the message that appears to add a new recipient. You will need to supply their first and last name, email address and company name from the drop down list.

The *Chat* button can be used when *Real-Time Broadcasting* is enabled to enable a chat session with other users that have the log open. You will be able to determine who is online by virtue of their credentials and send chats back and forth. A number will appear on the *Chat* button to indicate the number of chats that have arrived since you last had *Chat* open.

Enabling Real-Time Data Acquisition

In order to enable Real-Time Data Acquisition from the MLogger, select the *MLogger* button that appears in the menu bar. Then select *DIRECT CONNECTION TO MLOGGER* if you are connected to the MLogger via a LAN cable or via WiFi link. This will allow the MLogger to automatically stream time-based data directly into TLog, rather than continually importing LAS files into TLog manually. As a result, curves such as ROP, Total Gas and Chromatography and any other WITS tags that are selected will be updated automatically in TLog.

There is also an option to connect to an MLogger via the *Extranet/Cloud* as a data source if so desired, AND if you have permission to access a particular MLogger remotely. In this case, a list of available MLoggers will appear that you have permission to access remotely. Just select the appropriate MLogger to connect to remotely for *Real-Time Data Acquisition*.

Advanced TLog Features

Creating New and Modifying Existing Lithology Symbols

It is possible to design different lithologies and other symbols (fossils, minerals, engineering, etc.) for TLog and save them to your TLog template for all loggers and geologists to use. In order to create a new symbol, you can either start with a completely NEW symbol, or edit an existing symbol from TLog.

In order to add a new symbol, first create a new symbol in an image editor such as *Windows Paint* and save it as a PNG or JPG file (approximately 58 x 8 pixels in size.) Then just select *EDIT → SYMBOL LIBRARIES*. Then select the appropriate Symbol Type to add, such as LITHOLOGY. Then select *ADD SYMBOL* in the SYMBOL MANAGEMENT menu and type a new lithology name into the NEW LITHOLOGY NAME box. Then select the new lithology name you just typed from the lithology list and right-click in the IMAGE box (with the question mark) that appears, then select *CHOOSE IMAGE FILE…* from the menu that appears (See **Figure 21** below) and just browse to the image file that contains your new lithology image file.

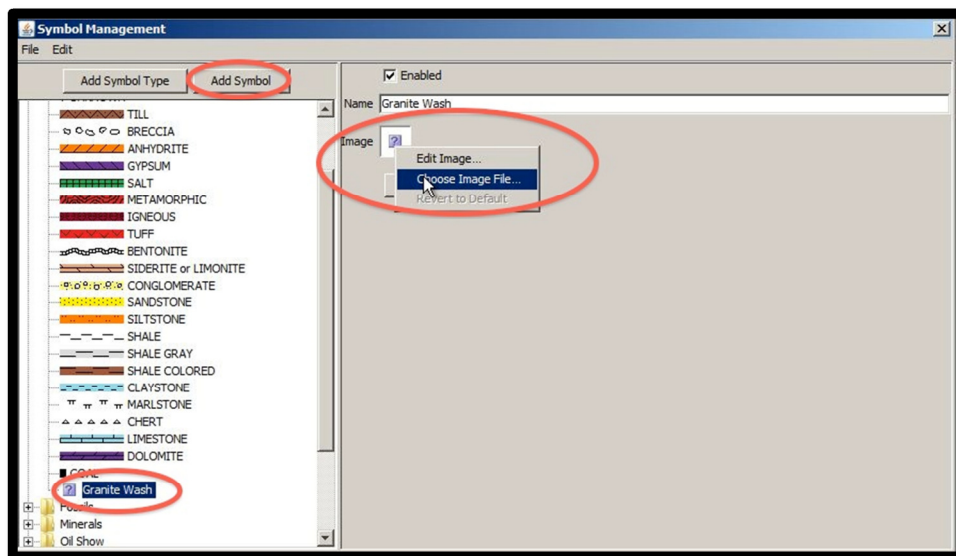<div align="center">Figure 21 – Symbol Management menu</div>

In order to modify an existing lithology image file to create a <u>new</u> lithology symbol, just select the appropriate lithology in the Symbol Management menu (see **Figure 23** above) and then right-click the lithology image that appears in the right column and select *EDIT IMAGE*. Then within *Windows Paint* that opens, select *FILE* → *SAVE AS* to save the selected lithology image file in the folder of your choice with a new file name. Then modify the image and save the newly modified lithology symbol using *Windows Paint* and then select *ADD SYMBOL* from the Symbol Management menu to add it to the list of existing lithology symbols.

Adjusting existing TLog lithology image files is also possible by just selecting the appropriate lithology image file to modify, then right-click on the image on the right side, then select *EDIT IMAGE*. By default, *Windows Paint* will open the image file. Once the necessary modifications are made to the image, then save it in *Windows Paint* and then select *OK* in the TLog message that appears to save the new image file as a modified lithology symbol in TLog.

Adding or Modifying Lithology Abbreviations

Lithology abbreviations can be added or modified by selecting *EDIT* → *LITHOLOGY ABBREVIATIONS*. Just scroll down to an existing lithology abbreviation and then click on the shorthand abbreviation or longhand word to modify it.

In order to add an abbreviation, just scroll down the list of abbreviations and click on the line just above where the new abbreviation will be inserted, then hit the ENTER key to add a new blank line and type in both the new abbreviation and word in the blank line. Then just select OK to accept the new abbreviation. (See **Figure 22** below.) The new abbreviations are included in the TLog template when it is created.
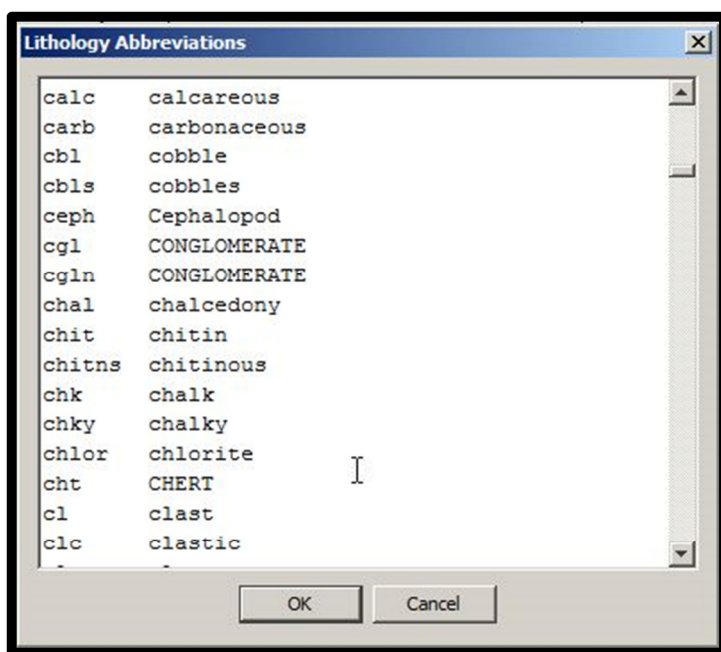

Figure 22 - Lithology Abbreviations

Adjusting TLog Log Depth due to Rig Depth Changes

Various TLog data curves can be adjusted either up or down while drilling based on changes of depth that the rig has made due to strap corrections. It is also possible to adjust curves such as ROP and Total Gas up or down at Total Depth to correlate to ELog data, such as the Gamma Ray curve.

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In order to adjust the log depth up or down to compensate for rig depth corrections, go to *EDIT* → *ADJUST DEPTH*. Then select the appropriate *Depth Range* in the top of the menu. Then select the data curves to adjust, such as ROP, total gas and chromatograph curves. After the curves have been selected, then enter the amount of depth to increase (+) or decrease (-) in the *Depth Adjust Amount* box.