## Tech Limit Toolbox

Release Notes 2023.4

17<sup>th</sup> October 2023

for further information

# Tech Limit Toolbox

### Release Notes

2023.4

#### Contents

Data IO	2
Data Editors	4
Image Logs	5
Well Viewer	9
Crossplot	11
Machine Learning	13
Depth Conversions	14
Miscellaneous	16

#### Data IO

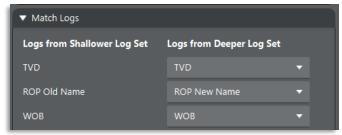
LAS files are now written with a STEP of 0 in the case where the depths are not regularly sampled, as per the LAS 2.0 specification.

```
~Version
VERS. 2.0 : CWLS log ASCII Standard -VERSION 2.0
WRAP. NO : One line per depth step
DLM . SPACE : Column Data Section Delimiter
~Well
STRT.m 1990.97254 : START DEPTH
STOP.m 2390.179 : STOP DEPTH
STEP.m 0 : STEP
NULL -9999.25 : NULL VALUE
COMP. Tech Limit Toolbox : COMPANY
```

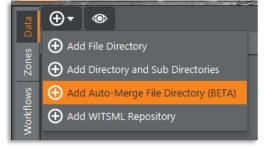
The software reads log/curve descriptions from WITSML and LAS files and displays the information in the mouse hover text on the data tree and in the Log Editor.



The **Append New Log Data** tool now uses the log name in the data file in addition to log's display name to match logs, which removes the need for manual selection.



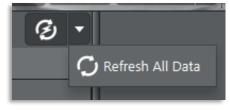
There is now a new option to add an **Auto-Merge File Directory** to the study, which will automatically merge all files in the folder. This option is used primarily for real-time monitoring projects where log data is split across multiple files.



Link to Data Tre	e									
☆ Favourite										
▼ Log Properti	es									
Name in File		lame		Log Type	Log Units	Sub Type	Line V	Vidth	Line Style	
ROTATION HRS										
MW_OUT							0.5			
FLOW_IN_PUMPS							0.5			
ROP_AVG							0.5			
TORQUE_AVG							0.5			
							0.5			
REVS							0.5			
SPM_TOTAL							0.5			
RACLX							0.5			
RPM_TOT							0.5			
							0.5			
							0.5			
							0.5			

There is a data editor for Auto-Merge repositories to set the properties of the merged logs.

When there is a WITSML repository in a study there is now a new **Quick Refresh Data** button above the Data tree in addition to the **Refresh All Data** button. The quick refresh will load in the latest log data from WITSML but will not refresh wells or reload previously loaded data. The new option is the default. For file-based repositories there is no difference between the two refresh options.



#### Data Editors

The **Log Editor** now displays the log name from the original file in brackets where the name has been changed in the software. It also shows the units string from the original file (or WITSML server) where appropriate so it can be referenced when specifying file <u>units</u>.

Log Name:	ROP Modified Name		(ROP)	From LAS
Unit Type in File:	Unitless	✓ (ft/h)		

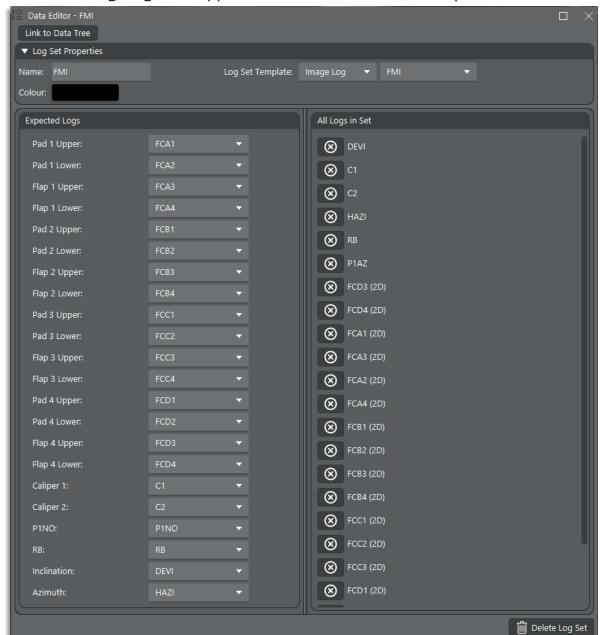
The **File Editor** now has an option to show additional columns in the Log Properties table to set the display properties of all logs in the file.

	Log Unit	s	Sub Type 🕂 🕬	EP.m0.0 LL. MP. Te LL.
•	deg	•	Azimuth Show additional colum	
•	deg	•	Dip	ov.
•	Unitless	•		ΤΥ. ΔΤ

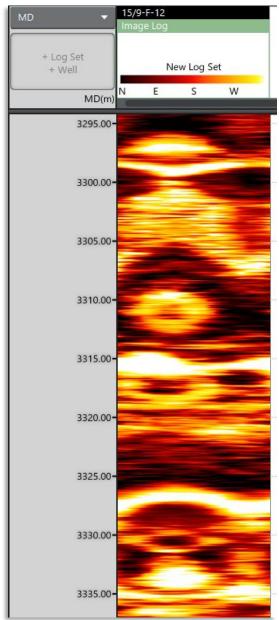
Sub Type	Color	Line V	Vidth	Line Style		_
Azimuth 🔫		0.5	•		•	
Dip 🔻		0.5	•		•	
-		0.5	•		•	
-		0.5	•		•	
-		0.5	•		•	
-		0.5	•		•	
-		0.5	•		•	
-		0.5	-		•	
•		0.5	•		•	

#### Image Logs

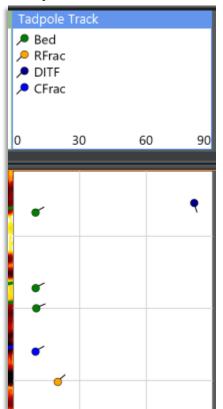
A new **Log Set Template** has been added for defining image logs from data loaded from DLIS files. There is initial support for simple 2D images and FMI tools. Additional image log tool support can be added via shared repositories.



An **Image Log Track** has been added to display image logs, together with surfaces, breakouts and DITFs.



A **Tadpole Track** has been added to display surfaces and DITFs



There is a new **Image Log Picking** tool for manually picking surfaces, breakouts and DITFs on image logs.

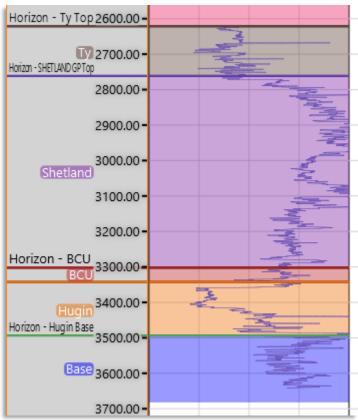
📚 Image Log Picking	g				-		_	_	_			
🔁 Inputs 🗦 P	Parameters 🖸 Outputs		🖉 Notes 🛛 🔻	≳ Controls		Image Log			Tadp	ole Track		
Picking Mode: Surfa	aces 🔻 Surface Type	Scheme: Basic Structural II	nterpretations		+ Log Set	\/ DITF ∕v CFrac			,● DI ,● CF	TF		
Surfaces Breakou	uts DITFs				+ Well	O Breakou	ıt <sup>-</sup> MI Dynar	nic				
MD (m)	True Dip	True Dip Direction	Surfac	е Туре		N E	S	w	0	30	60	90
1108.471	9.975	63.030	Bed		MD(m)							
1108.499	10.254	67.572	Bed						<b>.</b> .			
1108.367	9.918	61.101	Bed		1108.40-			618-	• AT2			
1108.559	9.918	61.101	CFrac				nin					
					1108.50	A (1).	110		<b>1</b> .			
					1100.50		4 -					
									1 🔨			
					1108.60-							
							Barr					

**Surface Type Schemes** have been added, which define the surface types available for selection when picking surfaces on an image log. These can also be used to interpret a 'surface type' column when importing surface data from other applications. A number of default Surface Type Schemes are defined, and others can be added manually.

Data Editor - Basic Structi ink to Data Tree				
<ul> <li>Surface Type Scheme P</li> </ul>	roperties			
ame: Basic Structural Int	erpretations			
Surface Types				
Add Surface Type: 🕀	Copy from e	existing Surface Type Scheme:		
Name	Interpretation	Colour	Integer Identifier	Text Identifier
Ondefined			0	
🛞 Bed	Bedding Surface		1	
CFrac	Conductive Natural Fracture		2	
RFrac	Resistive Natural Fracture		3	
OITF	Drilling Induced Tensile Fracture		4	
		Published schemes canno	4	
	💾 Save to New Surf			
~				
• 💫 Surface	Type Schemes	$\oplus$		
	Type Schemes Structural Interpretations	Ð		
Basic		( <del>)</del>		

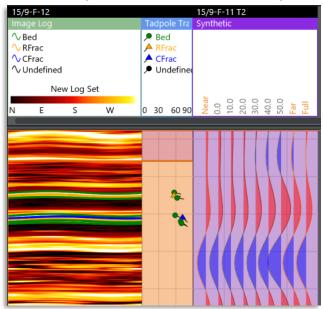
#### Well Viewer

Improved labelling of zones in the depth axis on the well viewer so that it's easier to match the zone to the label, and to make it less likely that labels draw on top of each other.



It is now possible to multi-select logs in the data tree (using shift/ctrl + click) and drag them all into a log track, log set or tool.

Dragging an image log, surface/DITF set or synthetic seismic into an empty track now converts the track to an Image Log, Tadpole or Synthetic track automatically. This means you don't have to manually add the correct type of track upfront.

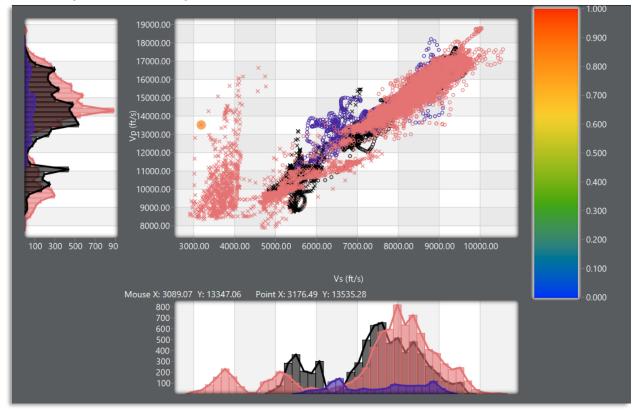


#### Crossplot

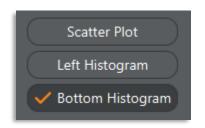
If the axis log types of a Crossplot have been selected you can now drag and drop a well onto the plot to add the well and plot the favourite logs.

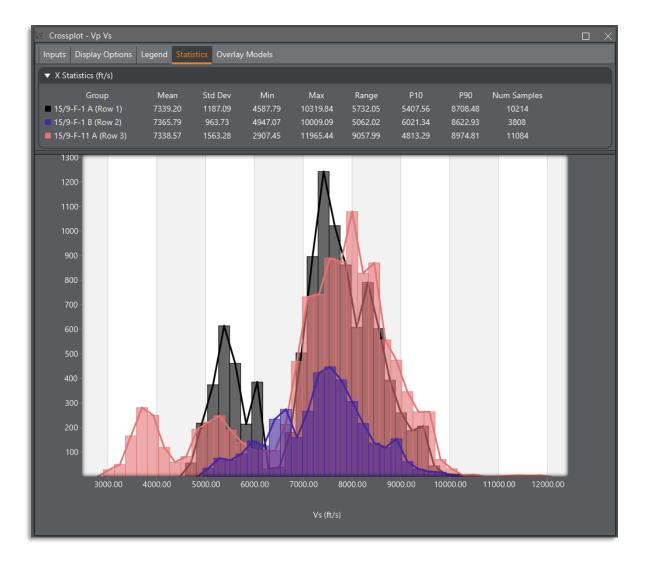
You can now mix discrete and continuous logs in the Crossplot. The continuous logs will be sampled at the depths of the discrete log.

Histograms have been added to the Crossplot showing the distribution of values in the X and Y directions. Histograms can be drawn as bars or lines, and the bar width can be adjusted manually.



The Crossplot's Display Options tab contains controls to turn off the scatter plot and histogram plots. This can be used for instance to show a histogram on its own.





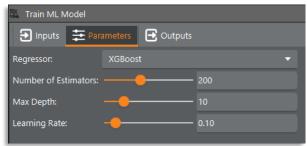
The Crossplot now contains a **Statistics** tab showing the distribution of values in each population. Hovering the mouse over the panel displays a Copy All button, which copies the values to the clipboard so that they can be pasted elsewhere (i.e. Excel)

Crossplot - Vp Vs									
Inputs Display Options Legend	Statistics	Overlay Models							
▼ X Statistics (ft/s)									
Group	Mean	Std Dev	Min	Max	Range	P10	P90	Num Samples	
× 15/9-F-1 A (Row 1) - Ty	5652.41	341.08	4831.68	7088.06	2256.38	5253.98	6046.78	1402	
C 15/9-F-1 A (Row 1) - Shetland	7877.32	726.26	5278.94	9640.94	4362.00	7059.59	8832.28	5407	
× 15/9-F-1 B (Row 2) - Ty									
© 15/9-F-1 B (Row 2) - Shetland	7563.88	1010.55	5515.46	9260.31	3744.84	6284.30	8902.24	1228	
× 15/9-F-11 A (Row 3) - Ty	4743.90	1102.13	2907.45	7604.56	4697.11	3514.99	6509.40	1694	
C 15/9-F-11 A (Row 3) - Shetland	8158.66	848.85	4605.79	10560.33	5954.54	7324.29	9213.87	6688	
▼ Y Statistics (ft/s)									
Group	Mean	Std Dev	Min	Max	Range	P10	P90	Num Samples	
× 15/9-F-1 A (Row 1) - Ty	10686.43	762.91	8766.20	15454.45	6688.24	9908.51	11239.13	1402	
🗅 15/9-F-1 A (Row 1) - Shetland	14564.85	1277.30	10085.03	17736.06	7651.04	13112.31	16369.56	5407	
🗙 15/9-F-1 B (Row 2) - Ty									
🛛 15/9-F-1 B (Row 2) - Shetland	14448.61	1411.31	11152.91	18205.55	7052.64	12601.62	16517.79	1228	
× 15/9-F-11 A (Row 3) - Ty	10264.36	5 1190.84	7884.76	16636.17	8751.41	8989.17	11495.18	1694	
C 15/9-F-11 A (Row 3) - Shetland	14896.52	1348.89	9242.57	18809.37	9566.80	13555.83	16598.06	6688	

#### Machine Learning

An indeterminate progress bar has been added to the **Train ML Model** tool to show that calculation is being performed.

The **Train ML Model** tool now contains Gradient Boosting and XGBoost (Extreme Gradient Boosting) regressor models in addition to Random Forest. XGBoost is the default option.



#### Depth Conversions

The **Section View** can now display data in either TVDss or TWT. There is a new Z Type selector on the Inputs tab to switch between the two. There have also been performance improvements made to the Section View, resulting in an increased frame rate when displaying logs along well paths.

🗭 Sectio	on View - [	Default								
Inputs	Display C	Display Options								
Z Type:	TVDss	•	Section Line:	wells		-				
⊕ ⊗	TVDss									
	тwт		Well							
15/9-F-	·1 A				•					

There is a new **TVDss / TWT Conversion** tool to convert 3D volume data between TVDss and TWT (in either direction). The primary input to this tool is a calibrated velocity volume, but the tool can also use TVDss / TWT horizon pairs to guide the conversion.

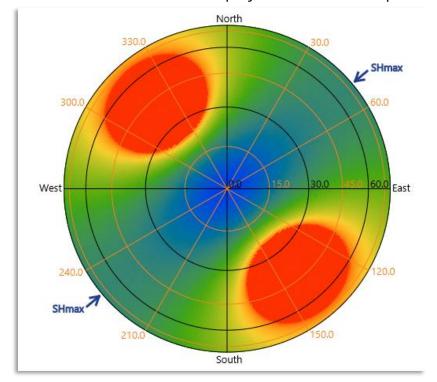
NT TVE	Oss / TWT Conversion							$\Box$ $\times$
Ð 1	nputs 🚊 Parameters 🖸 Outputs				Section Line: Inline		<b></b> 10161	Decimate Trace
Interva	I Velocity Volume: Velocities					K)		
Seismi	c Reference Datum (TVDss): 0.00		(m)		1 Depth			Seabed
▼ T\	/D / TWT Horizon Pairs (optional)							
⊕	Add Row				500:000	(Anthonyou)		
	TVDss Horizons		TWT Horizons					
$\otimes$								
$\otimes$	SHETLAND GP Top		SHETLAND		1000.000-			
$\otimes$	Hugin Top		Hugin Top			Start.	appending the	
$\otimes$								
⊗	BCU		BCU		1500.000- F			
<b>v</b> 0	utput Volume Geometry				/Dss (	-		
Z Typ	e: TVDss 🔻				÷	10000		
Geor	netry from: Volume 🔻 Time Sei				2000.000	man the se	more tank	
Inline	e Min: 9961 Max:		Step: 2					The second
Cros	sline Min: 1961 Max:	2680	Step: 1		Ty Top		- Carlo	
z	Top: 4.00 Bottom:	3400.00	Step: 4.00		GP Top			Ty Top SHETLA
Trace	Decimation on Depth Slice: 4				BCU			States and a state of the state
Z De	cimation on Depth Slice: 1				3000.000 - 10 BTRE			
<b>v</b> .c	alculate and Save				MA Base			Hugin i
	I Volume Set Name: TVDss / TWT Conversion						1 - Alaria	BCU
	Refresh Tempo		ual Volumes					
			Save Virtual Vol	ume Set	Maura TVDari 2222.1	4 Time Ceiemie 201	Distance Along Section (km) 10 CONVERTED: -0.39 Unitless	
a second second					Wouse TVDSS: 2555.1	4 m mile seismic 20	TO_CONVERTED0.39 Unitless	

The **Depth and Trajectory Logs** tool can now output TWT and Interval Velocity logs for wells that have a TVDss to TWT conversion defined.

🏹 Depth and Trajectory Logs							
🕣 Inputs 💽 Ou	tputs	🗾 Notes					
▼ 15/9-F-11 T2							
	MD						
	TVDss						
	TVDkb						
	TVDml						
	E/-W_Offset						
	N/-S_Offset						
	Inclination						
	Azimuth						
	тwт						
	Interval Velocities						

MD to TVD conversions on wells are now calculated at a higher resolution to better constrain the conversion in situations where there are only a handful of survey points (i.e. when the well is created via the Well Builder tool).

#### Miscellaneous

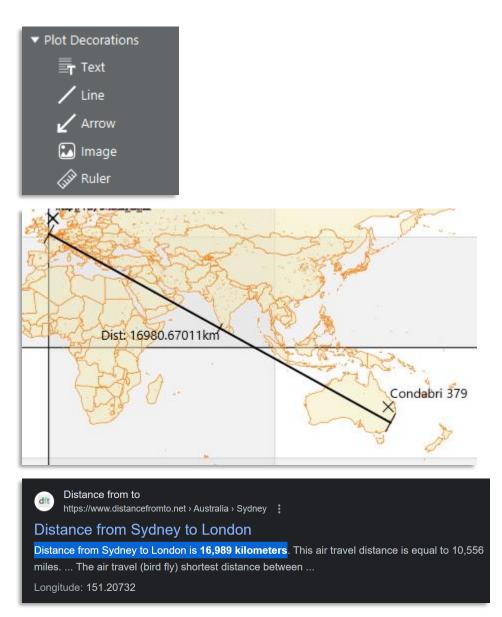


SHmax orientation is now displayed on **Stereonet** plots

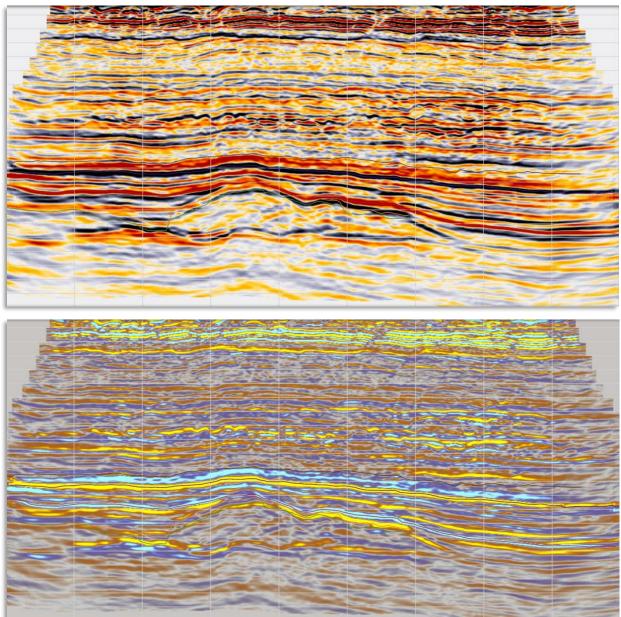
The **Pore Pressure Prediction** tool has a new option to apply constant pressure gradients in a zone from the zone below. This is useful for modelling hydrocarbon columns.



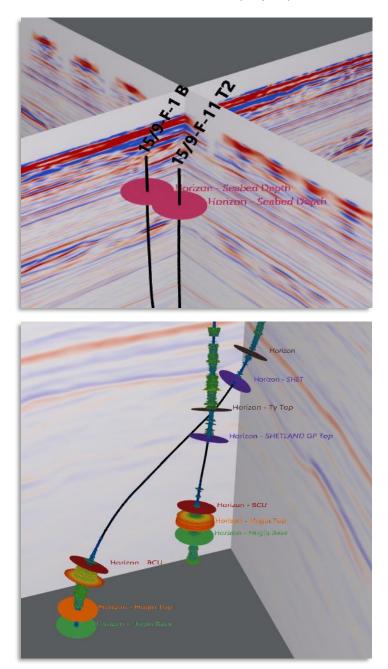
There is now an option to add a **Ruler** plot decoration to measure distances. Rulers can be added to all plots that support decorations (map, log track, crossplot, section view). The behaviour changes slightly depending on the plot, on a map it shows the straight line distance between the points, and includes support for measuring on lat/long views.



There are 2 new colourmaps included for displaying seismic amplitudes, named "Seismic" and "Seismic 2".



The **3D Viewer** displays well names, well tops and well top names. These can be turned on and off from the Display Options tab.



It's now possible to quickly select an item in any **Log Type** drop down selector by typing the first few letters of the required type.

Log Type:	Density 🔻
Unit Type in File:	Cohesion
<ul> <li>Display Properties</li> </ul>	Date Time
Colour: Line Width:	Density
Line Style:	Distance
Save Display Properties to .	Elapsed Time
	Fracture Pressure
	GR
	Hydrostatic Pressure
	Indicator