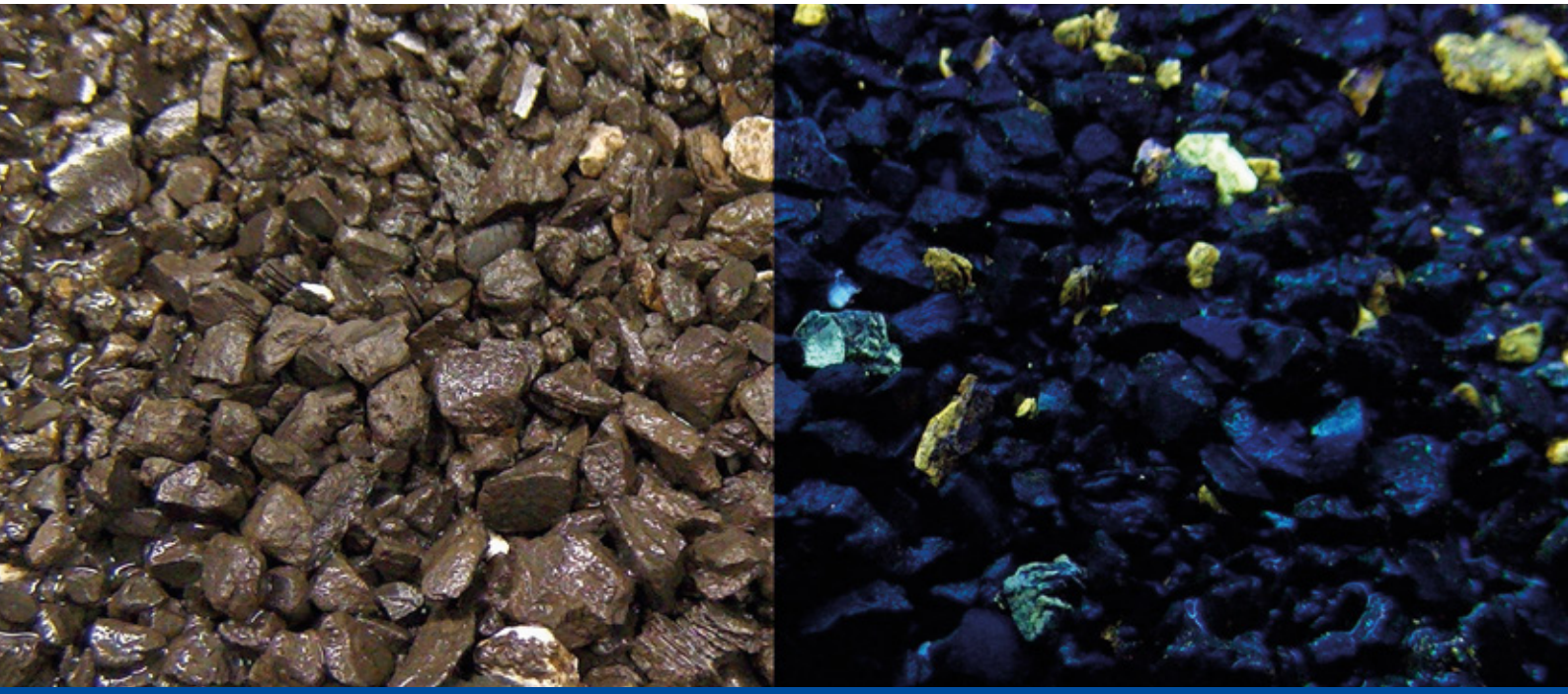
Digital Cuttings



Consistently measured digital data from drill cuttings:

Enhanced reservoir characterization
Regional sweet spot identification
Digitization of rock repositories

Benefits & Applications

Digital-Cuttings™ creates a permanent high-resolution digital record of the rock sample, generating a rich, analytics-ready dataset that can easily be upscaled into regional and reservoir scale subsurface models, accurately calibrate rock physics models, or assist in predicting near-wellbore completion performance, which is suitable for all cuttings or core samples, no matter the vintage.

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Digital Cuttings

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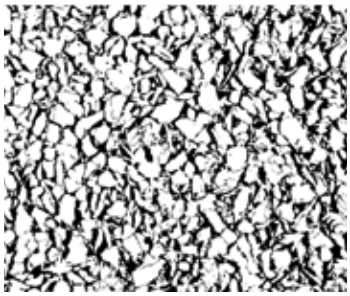
At GEOLOG we are "Passionate about cuttings". Cuttings are an invaluable source of quality data that can be consistently measured and converted into a digital record, stored in a cloud-based platform and easily accessed when required. GEOLOG's patented Digital-Cuttings™ workflow offers a seamless and consistent approach to generating quality, measured rock and fluids data thus providing reliable quantitative subsurface data and valuable interpretations such as lithology, Litho-Brite™ (Lithofacies) and hydrocarbon fluids when combined with GEOLOG's G9+ technology.

If the DIGITALIZATION of subsurface data is important, then GEOLOG's DIGITAL-CUTTINGS™ service is for you.

At the sample scale, the Digital-Cuttings™ workflow offers:

Digital white light image

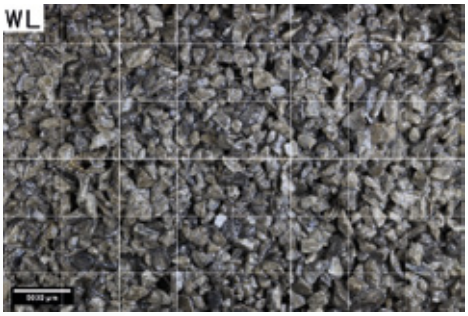


Particle segmentation image

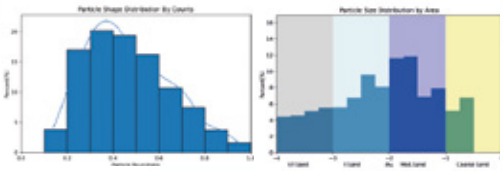
- High-resolution digital images in white light and UV light
- Particle segmentation for particle size & shape data
- Quantitative color extraction data
- Quantitative XRF major & minor elemental data
- Seamless addition of other analytical data e.g., XRD, TOC, GeoPyrolysis or G9+
- Lithology interpretation
- Litho-Brite™ (lithofacies) interpretation

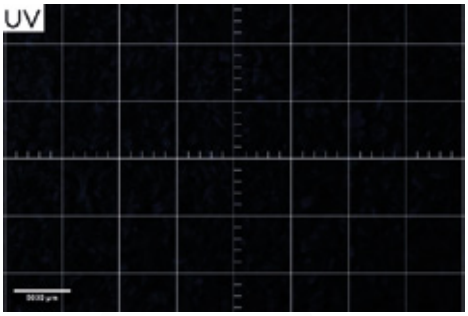
	MAIN ELEMENTS (%)										TRACE ELEMENTS (ppm)																							
DEPTH	SiO2	Al2O3	Fe2O3	K2O	CaO	MgO	S	P2O5	TiO2	MnO	Cl	As	Cu	Ni	V	Mo	Sr	Pb	Zn	Zr	Rb	Th	U	Cr	Co	Nb	Nd	Cs	Ga	Gd	La	Ba	CGR
2047	55.372	10.162	4.66	1.791	3.523	1.337	0.584	0.171	0.609	0.099		15.1	29.7	40.1	111.2	10.5	111.6	25.4	91	190.5	65.3	10.1	3.2	101.7	32.3	8.4	26.9	48.2	12	6.3		690.9	90
2277	57.358	15.126	5.053	1.902	0.451	0.794	0.202	0.096	0.888	0.063		9.5	38.7	59	158.6	7	94.4	23.9	143	210.4	79.8	11.1	2.9	149.5	42.5	12	9.7	44	17.6	7.1		733.3	93
2360	54.482	15.347	6.978	2.43	1.906	1.517	0.229	0.201	0.887	0.112		12.8	44.2	66.9	178.7	7.1	126.3	34	149.3	185.3	105.2	13.5	3.9	121.6	41.2	13.4	39.5	42.1	20.2	8.9		683.6	117
2435	52.737	14.812	8.377	2.231	2.906	1.618	0.883	0.176	0.849	0.11		25.6	35.7	63.5	174.5	5.6	134.1	40.8	140.6	183.2	99.1	9.7	3.9	115.3	41.7	11.2	26.7	45.9	20.1	9.8		852.7	100
2465	64.585	8.932	5.357	1.175	2.355		0.375	0.162	0.498	0.069	180.2	12.9	28.9	39	110	14.4	82.1	23.3	81.1	105.9	46.7	7.6	2.4	145.6	36.6	7.3	24.6	41.6	10.9	7.5		909.6	65
2475	61.3	11.489	5.824	1.544	1.829	0.687	0.307	0.165	0.553	0.074		15	32.6	47.7	113	11.5	102.7	28.1	91.3	129.8	67.3	10.6	2.8	113.2	36.9	8.9	27	28.8	12.8	8.1		667.8	85
2505	52.505	13.817	8.708	2.01	1.59	1.298	0.358	0.232	0.89	0.111		10.7	41.2	52.4	172.3	5.6	110.6	34	129.8	196.3	91	9.5	2.8	146.5	40.2	12.7	47.6	50.8	19.9	10.8		846.5	87
2555	51.929	11.185	9.175	1.853	1.634	1.798	0.71	0.224	0.747	0.147		17.5	25.4	54.4	153	6	108.5	29.5	114.4	165.8	78	9	1.8	130.3	40.7	10.5	40.1	34.4	17.8	11.7		680.9	91
2595	41.899	10.757	8.699	1.731	10.387	2.621	0.309	0.282	0.661	0.113		18.7	31.3	46.2	132.6	5.6	177.9	25.7	102.4	153.6	73.2	7	2.7	81	35.5	10	4.7	60.1	14.5	9.3		853	73
2625	52.799	10.707	4.877	1.6	10.117	2.889	0.169	0.247	0.67	0.074		9.7	38.1	42.4	121	5.4	192	12.4	83.9	180.3	59	7.5	2.7	83.7	26.8	9.6	15.9	68.1	12.8	5.7		502.5	73
2730	51.838	15.205	6.724	2.498	1.423	1.463	0.208	0.198	0.909	0.052		14.9	38.2	52.4	176.2	2.2	135.1	28.5	126.9	206.2	107.9	10.4	4.6	107.9	40.2	13.5	35.8	58.6	20	8.7		701.5	112
2860	53.83	12.47	6.067	2.029	1.75	1.49	0.471	0.171	0.726	0.061	167.4	9.3	37.5	52	157.5	3.5	103.2	22.5	212.9	150.6	81.9	8.4	3.9	126.1	37.2	10.6	37.9	45	17.1	7.9		697.5	92
2870	48.161	9.626	5.87	1.458	9.719	3.778	0.209	0.206	0.63	0.061		5.1	27.7	49	108.4	1.6	212.1	15.4	78.1	188.4	58.7	6.2	1.2	118.2	29.5	9.4	21.5	66.2	12.5	6.8		728.6	30
2880	71.598	7.919	2.842	0.996	0.668		0.154	0.124	0.41	0.025	163.8	46.3	36.4	34.8	111.9	19.3	62.6	96.4	53.5	86	32.3	5.6	3	169.7	25.9	6.2	3.8	26.4	6.9	5		576.6	60
2890	67.133	9.234	4.89	1.003	1.388	0.828	0.264	0.132	0.473	0.036	292.6	4.2	26	34.6	104.3	16.3	88.9	17	53.6	127.3	34.9	7.3	3.4	242.9	33.3	6.4	22.1	39.1	10	7.2		462.1	72
2900	68.676	11.141	3.91	1.582	1.153	1.196	0.202	0.152	0.565	0.041		5.2	36.8	39	86.9	2.5	127.7	16.5	77.8	155.8	61	7.7	2.8	185.6	30.1	8.3	28.3	27.4	11.2	5.8		668.1	74

Screenshot of a typical XRF data sheet showing 10 major elements and 22 minor elements



Bag Depth	Shifted Depth
10880-10910 ft MD	10880-10910 ft MD





XRF Major Elemental Oxides (%)									
Si	Al	Fe	K	Ca	Mg	S	P	Ti	Mn
64.46	7.19	1.57	2.07	6.67	1.07	0.54	0.14	0.49	0.03

Calculated Gamma Ray
XRF-CAPI
67.49

XRD Bulk Lithology				
Tot. Carb.	Tot. Silic.	Tot. Access.	Tot. Evap.	Tot. Clays
15.60	72.30	NQ	NQ	12.10

XRF Trace Elements (ppm)																					
Cl	As	Cu	Ni	V	Mo	Sr	Pb	Zn	Zr	Rb	Th	U	Cr	Co	Nb	Nd	Cs	Ga	Gd	La	Ba
7900.00	NQ	34.90	36.80	52.70	4.60	210.80	1.10	36.80	216.10	62.90	6.10	2.50	51.80	NQ	8.20	8.20	20.70	8.10	3.50	NQ	793.00

RGB Color Extraction				YUV Color Extraction			Brightness
Average Red	Average Green	Average Blue	Normalized Red	Average Y	Average U	Average V	
92.19	90.88	89.85	2.34	92.19	90.88	89.85	91.53

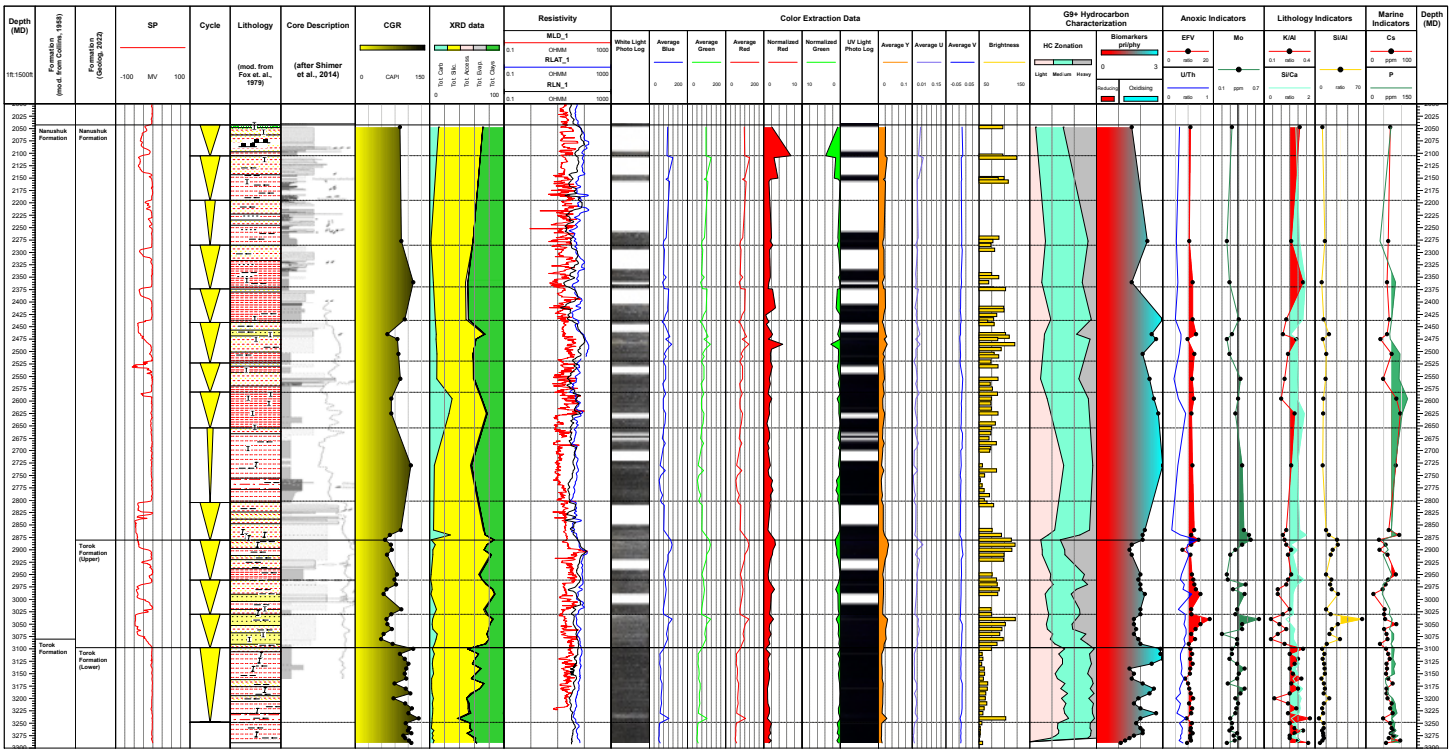
Litho-Brite™ code:	B_ch_ax
Lithofacies Description: Average Brightness = 94.61. Confined stacked channel sands, clean, high energy with little evidence of anoxia.	

Example sample card display as part of a downhole digital sample catalogue

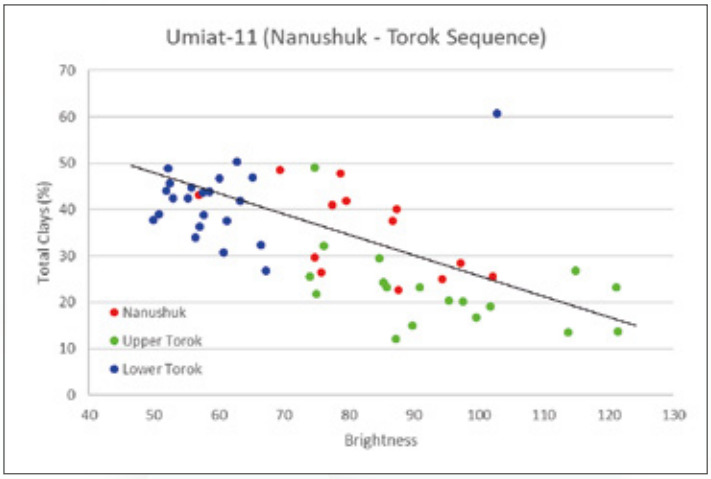
Example 1:

Digitalization of a major Cuttings Repository: example North Slope, Alaska

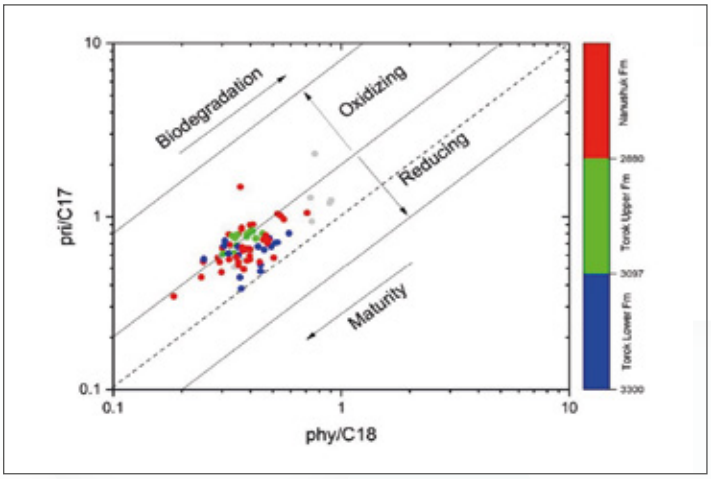
- 100's of wells & 1000's of cuttings samples.
- Different vintages of cuttings from the 1940s to the recent.
- Analytical consistency.
- Full digital record of every sample image, color extraction, elemental & liquid hydrocarbon quantification.



Umiat-11 well. Full, Digital-Cuttings™ Data Summary Chart of a 1,500ft 1940's vintage vertical well, North Slope Alaska. The data display includes: Tops, SP curve, Cycle interpretation, Lithology, CGR, XRD, Resistivity, Color Extract, Brightness, Hydrocarbon Fluid & Source Rock facies data (G9+) and elemental anoxic, lithology, and marine indicators.



Umiat-11 well, Alaska North Slope. Good correlation (-ve) between Brightness and Total Clays (%) suggesting brighter phases (e.g. upper Torok & Torok/Nanushuk boundary) are 'cleaner'.



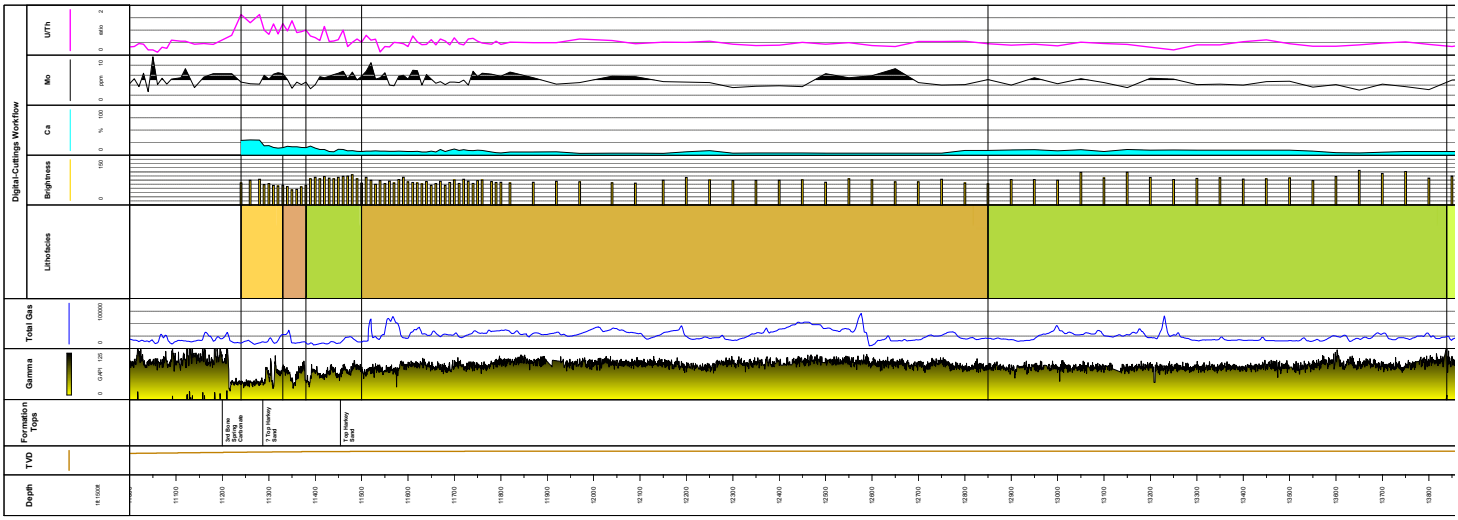
Pristane/Phytane biomarker data from G9+ analyses of cuttings samples as part of a Digital-Cuttings™ workflow, Umiat-11 well Alaska North Slope. Note that a more reducing source rock depositional environment is indicated from the results.

Example 2:

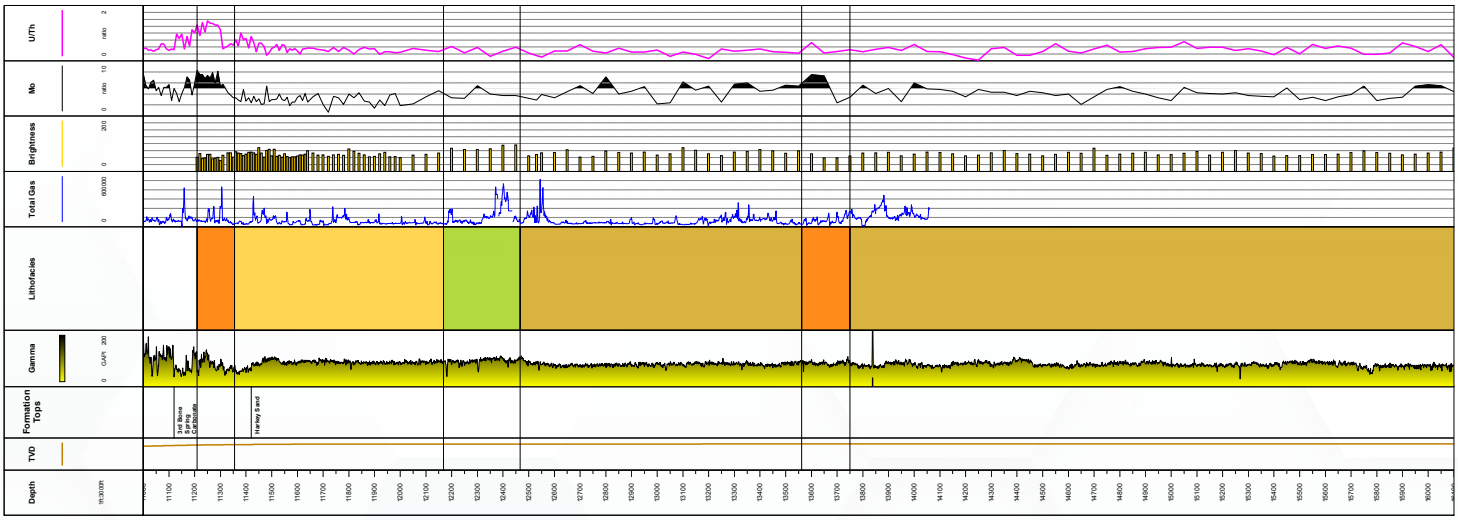
Using a Digital-Cuttings™ based approach to predict reservoir performance, Delaware Basin, New Mexico, USA

- 6 Lateral wells & >1,200 cuttings samples.
- 2 main reservoir benches.
- Litho-Brite™ framework leading to 'good rock vs bad rock' interpretation & facies architecture predictions.
- Strong correlation with quantitative mud-gas data.
- Lateral wells with > proportion of 'good rock' out-performing wells with < proportion of 'good rock' facies.

Lateral 1: 70% 'good rock' (green colors)



Lateral 2: <10% 'good rock' (green colors)

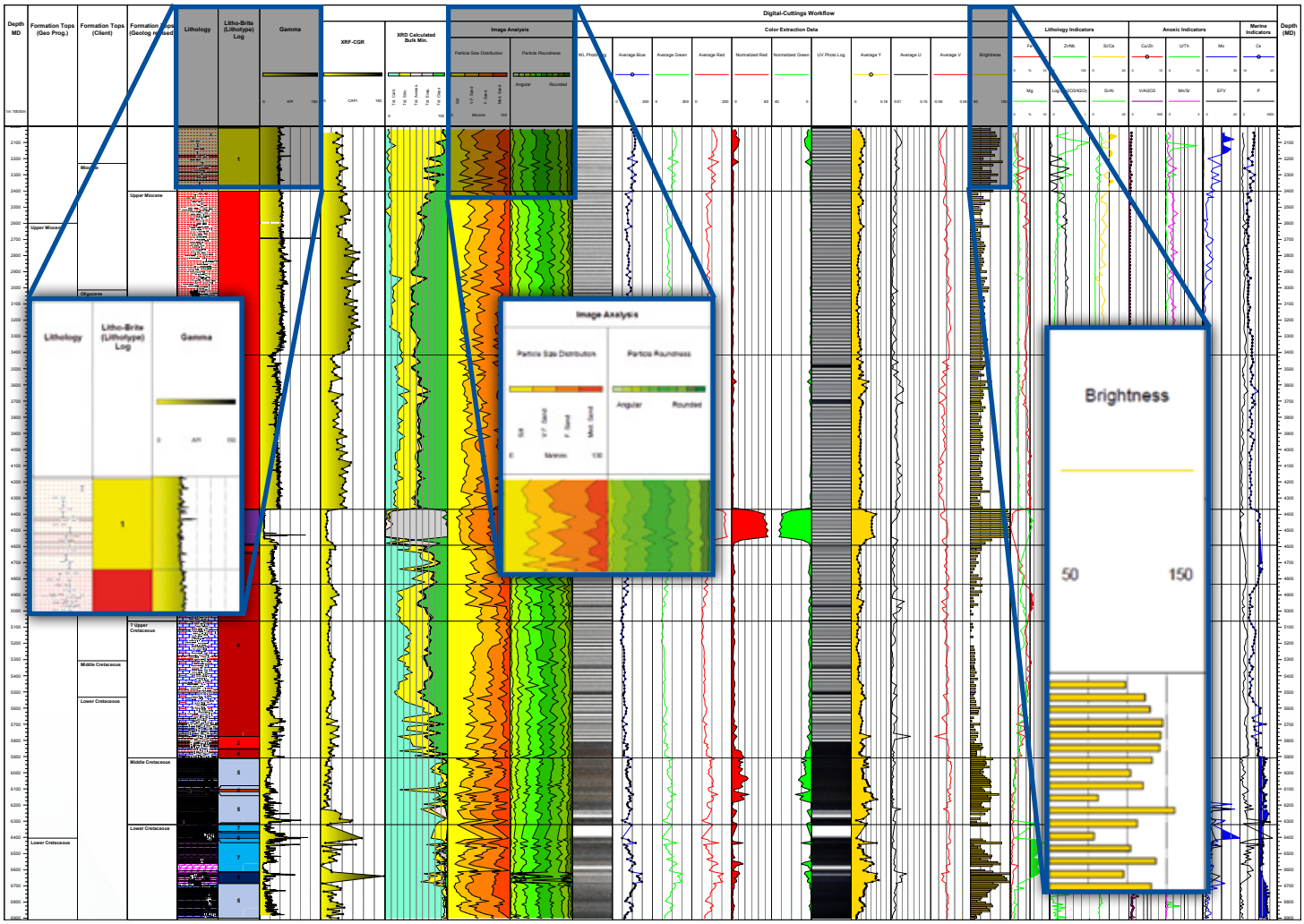


2 Lateral wells from the Harkey Mills Sand bench of the Bone Spring Formation, Northern Delaware Basin, New Mexico, USA. The black line is the top Harkey Mills Sand pick for each Lateral well. Each plot includes MD (ft), tops, GR, Litho-Brite™ (green to brown colored zones), Brightness & anoxia elemental indicators. Green zones indicate channel-fill sands and relate to 'good rock', while brown colors indicate overbank deposits and relate to 'bad rock'. When put on production Lateral 1 significantly outperformed Lateral 2, due to better completion stage performance in the higher proportion of 'good rock'. Each Lateral is approx. 5,000ft in length from the top Harkey Mills Sand pick.

Example 3:

NOC requires better near-wellbore rock definition in key exploration well

- 400+ cuttings samples
- Litho-Brite™ interpretation provided a better reservoir definition
- Image analysis revealed a change in particle shape & size through the reservoir interval.
- Good correlation with flow units



Full, Digital-Cuttings™ Data Summary Chart of a 5000m vertical well, offshore GOM. The data display includes:
Tops, Lithology, Litho-Brite™ GR, CGR, XRD, Image Analysis, Color Extract, Brightness and elemental lithology, anoxic and marine indicators.

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