

CORE LAB NORSK

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COAST CENTRE BASE ÅGOTNES BERGEN NORWAY Postboks 63-CCB

Statoil Damgårdsgt. 131 P O Box 1212 N-5001 Bergen Our Ref: NOR 830009

20 June 1983

Attention: Vidar Bergo Larsen

Gentlemen

Re: Conventional Core Analysis Well: 30/3-3

During the latter half of May 1983, Core Laboratories Norsk performed conventional core analysis on core from Statoil Well 30/3-3. The results of these measurements are presented herein and serve to confirm previous preliminary data:

Firstly, a surface core Gamma log was run and then a set of summation of fluid porosity results were obtained, one per meter. Core plugs of one inch diameter were drilled parallel to the bedding, three per meter, then cleaned in hot refluxing solvents before being dried thoroughly. Horizontal and vertical permeabilities were measured (and corrected for Klinkenberg effect) as well as Helium injection porosities and grain densities.

Should you have any questions, or if we can be of any further assistance, please do not hestiate to call us.

Yours faithfully

Stephen Erskine Laboratory Supervisor

Petroleum Reservair Fnainerring LONUUN · ADERVEEN



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Ŀ		DATE FORMATI DRLG• F LOCATIC		JUNE 1	983			FILE ND : NOR 830009 ANALYSTS : SE/TE/AF/TL ELEVATION:
			VERI	LICAL	PERMER	втілту		
DEPTH	PERMEAB KA	IL I T Y КL	POROS GEX	3ITY FLD	FLUID	SATS. WTR	GRAIN DEN	DESCRIFTION
CORF 1								
-								
2979.08	80.0	0.05	12.8	3,8	0.0	65+2	2+68	SS LT GY MOD IND CLY F GR W SRTD
2979.66	0,09		1.4.1				× 0 × 0	HA AA
2980.00	0.15	0.09	14.8 1	1, 1,	0.0	71.3	2.68 .68	AA (EXCL LAM)
2980.33				 •	1 1	- - -	1 - 1	PRESERVED SAMPLE
2980.60	0.06	0.03	10.7				2.70	SLST GY W IND CALC F GR W SRTD MI
2981.02	20.03	0.02	7,8 1	1.4	0.0	71.1	2.70	SLST DK GY W IND F GR W SRTD DNS
2981,30	0.01	0.01	9,8				2.69	SLT-SH DK-GY W IND SIL F GR W SRT
2981.65	0.16	0.10	13.8				2.67	SLST GY W IND SIL F GR W SRTD CAL
2982.02	0,05	20.03	10.5 1	6 • O	0.0	63.6	2.69	SS GY W IND SIL F GR W SRTD MICA
2982,36	20.03	0.02	7.3				2,72	SLST GY W IND CLY F GR W'SRTD
2982,66	0,08	0.05	13,8				2,68	SS GY W IND SIL F GR W SRTD DNS(L
2983.00	0.19	0.12	13,1 1	7.1	0.0	66.7	2.67	SS LT-GY MOD IND SIL F GR W SRTD
2983,37	0.56	0,37	13.0				2,57	SS LT-GY MOD IND SIL F GR W SRTD(
2983,66	0.83	0.56	18.1	1	:		2.66	SS LT-GY MOD IND SIL F GR W SRTD(
2784.02	0+66	0.44	15.7 1	6•8	0.0	61+3	N•65	AA
2984.33								PRESERVED SAMPLE
2984.64	0.27	0.17	16.8				2+66	AA
2985.05	0.13	0,08	14.4 1	2.2	0.0	55.7	2.66	AA (WITH SOM MICA LAM)
2985.41	0.08	0,05	13.5				2.67	SS LT-GY MOD IND SIL+CLY F GR W S
2985.63	1.23	0.85	14.6				2.70	ትስትዮሃ
2986.00				6.4	0.0	56+3		SILTSTONE
2986.33								AA
2986.66								AA
2987.00								COAL
These analyses, opinions or interp	pretations are based on obser	rvations and mater	ials supplied by	the client to	whom, and fe	or whose evelusi	ive and confident	ial use, this report is made. The interpretations or opinions
expressed represent the best judg	ment of Core Laboratories L	J K Ltd. (all error	s and omissions	rveepted); bi	A Core Labor	atories U K Lt	d. and its officer	s and employees as unternor responsibility and make no warranty or
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STAT01L 30/3-3			DATE FORMATI	•• •• vo	JUNE	1983			FILE NO : NOR 830009 ANALYSTS : SE/TE/AF/TL
				VER	TICAL	PERMEA	RILITY		
SAMPLE NUMBER	DEPTH	PERMEAE KA 	31L.1TY	PORO GEX	SITY FLD	FLUID	SATS. WTR	GRAIN DEN	DESCRIPTION
9 4 8 4 6 4 6 6 7 6 4 6 6 7 6	2987.33 2987.64 2988.00 2988.36 2988.36	844 944 11	20 20 20 20 20 20 20 20 20 20 20 20 20 2	20+7 20+7 19+6	23 • 8	0.0	86 • 1	0000 0000 0000 0000	SILTSTONE Q-SS WH MOD IND SIL M GR W SRTD P AA (NOT PY) AA
- CL P M M M M M M M M M M M M M M M M M M	2989.00 2989.36 2989.64 2990.00 2990.33	10.1 80.0 0.08	500 00 00	1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4				2+86 2+86	SILTSTONE SILTSTONE SS GY W IND SIL+CLY F GR W SRTD P SS GY W IND SIL+CLY F GR W SRTD M SILTSTONE
9 M M M M 4 9 N B 6 0 H	2991.00 2991.00 2991.66 2992.00 2992.33	0.14	80.0	4 8	נט • N	0 • 0	76.0	2+73	CUAL NO RECOVERY NO RECOVERY SILTSTONE AA SLST GY W IND SIL+CLY F GR W SRTD

Petroleum Reservoir Engineering LC ON BE EEN . These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories U K. Ltd. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used on relevant.

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7 2981.02 0.12 0.16 /.8 11.4 0.0 /1.1 2.40 5.51 JN 8 2981.30 0.12 0.07 9.8 2.69 5L5T 5L5T 5H JK 9 2981.45 0.12 0.07 9.8 13.8 2.65 5L5T 6Y W 10 2982.02 0.84 0.57 10.5 12.9 0.0 63.6 2.65 55 GY W N 11 2982.02 0.02 0.01 7.3 12.9 0.0 63.6 2.65 55 GY W N 12 2982.06 0.44 0.33 13.1 17.1 0.0 66.7 2.67 55 LT-6Y M N 13 2983.00 0.51 0.33 13.1 17.1 0.0 66.7 2.67 55 LT-6Y M N	0.16 7.8 11.4 0.0 71.1 0.07 9.8 0.24 13.8 0.57 10.5 12.9 0.0 63.6 0.01 7.3 0.28 13.8 0.28 13.8 0.33 13.1 17.1 0.0 66.7 1.80 13.0 1.80 13.0	2.69 SLT-SH DK-GY W IND SIL F GR W SRT 2.67 SLST GY W IND SIL F GR W SRT 2.69 SS GY W IND SIL F GR W SRTD CAL 2.69 SS GY W IND SIL F GR W SRTD MICA
8 2981.30 0.12 0.07 9.8 2.65 5L1-5H JN- 9 2981.65 0.37 0.24 13.8 2.67 5L57 5L7 5L57 5L7	0.07 9.8 0.24 13.8 0.57 10.5 12.9 0.0 63.6 0.01 7.3 0.28 13.8 0.28 13.1 17.1 0.0 66.7 1.80 13.0 1.80 13.0	2.69 SLI-SH UN-GY W IND SIL F UK W SKI 2.67 SLST GY W IND SIL F GR W SRTD CAL 2.69 SS GY W IND SIL F GR W SRTD MICA
9 2981.65 0.37 0.24 13.8 2.69 55.67 55.67 55.67 55.67 55.67 55.67 55.67 55.67 55.67 55.67 55.67 10.15 12.72 51.67 10.15 12.72 55.67	0.24 13.8 0.57 10.5 12.9 0.0 63.6 0.01 7.3 0.28 13.8 0.33 13.1 17.1 0.0 66.7 1.80 13.0 1.80 13.0	2.69 SS GY W IND SILF GR W SRTD MICA
10 2782.02 0.844 0.01 7.3 2.72 5LST 67 W 11 2982.36 0.02 0.01 7.3 2.72 5LST 67 W 12 2982.66 0.44 0.28 13.8 2.68 55 67 W 10 13 2983.00 0.51 0.33 13.1 17.1 0.0 66.7 2.67 55 LT-67 W	0.28 13.8 0.28 13.8 0.33 13.1 17.1 0.0 66.7 1.80 13.0 0.97 18.5	
11 2782:36 0.02 0.01 0.3 12 2982:46 0.44 0.28 13.8 13 2983:00 0.51 0.33 13.1 13 2983:00 0.51 0.33 13.1 13 2983:00 0.51 0.33 13.1	0.28 13.8 0.28 13.8 0.33 13.1 17.1 0.0 66.7 1.80 13.0 0.97 18.5	
13 2983+00 0.51 0.33 13.1 17.1 0.0 66.7 2.67 SS LT-GY M	0.33 13.1 17.1 0.0 66.7 1.80 13.0 0.97 18.5	2.48 SS GY M TND STL F GR W SRTD DNS(L
	1.80 13.0 0.97 18.5	2.67 SS LT-GY MOD IND SIL F GR W SRTD
14 2483+3/ T+30 T+80 T0+0	0.97 18.5	2.57 SS LT-GY MOD IND SIL F GR W SRTD(
15 2983.66 1.40 0.97 18.5 2.66 SS LT-GY M		2.66 SS LT-GY MOD IND SIL F GR W SRTD(
16 2984.02 1.10 0.75 15.7 16.8 0.0 61.3 2.65 AA	0.75 15.7 16.8 0.0 61.3	2.65 AA
17 2984.33 PRESERVED		PRESERVED SAMPLE
18 2984.64 0.89 0.60 16.8 2.66 AA	0.60 16.8	2+66 AA
19 2985.05 0.66 0.44 14.4 12.2 0.0 55.7 2.66 AA (WITH S	0.44 14.4 12.2 0.0 55.7	2.66 AA (WITH SOM MICA LAM)
20 2985.41 0.19 0.12 13.5 2.67 SS LT-GY M	0.12 13.5	2.67 SS LT-GY MOD IND SIL+CLY F GR W S
21 2985+63 0+25 0+16 14+6 2+70 AA+PY	0.16 14.6	2.70 AA+PY
22 2986.00 SILTSTUNE 6.4 0.0 56.3 SILTSTUNE	6.4 0.0 56.3	SILISIUNE
23 2986+33 AA		AA
24 2986.66 AA		AA
25 2987.00 CDAL		CDAL

PAGE

₽ÅGE 2	FILE ND : NOR 830009 ANALYSTS : SE/TE/AF/TL		DESCRIPTION		SILTSTONE Q-SS WH MOD IND SIL M GR W SRTD P	AA (NOT PY)	AA	AA +FY	SILTSTONE	SS GY W IND SIL+CLY F GR W SRTD P	SS GY W IND SIL+CLY F GR W SRTD M	SILTSTONE	AA	COAL	NO RECOVERY	NO RECOVERY	SILTSTONE	AA	SLST GY W IND SIL+CLY F GR W SRTD	
Surr		~	GRAIN DEN		2.67	2,66	2,66	2,68		2.75	2,86								2,73	
ungınee)EE		ABILIT	SATS. WTR			86.1												76.0		
AB	.983	. PERME	FLUID OIL			0.0												0.0		
10 X 858	JUNE 1	IZONTAL	SITY FLD			23,8												7,5		
<i>troteun</i> L	** ** 0	HORI	POR(GEX		25.4	20.7	19.6	14.1		9+9	6+0								4.8	
7 e	DATE FORMATI		ЗІГІТҮ КL	*** *** *** *** *** ***	• 02	82.	74.	0.14		0.07	0.10								0.04	
			PERMEAE Ka		36.	92.	•28	0.22		0.11	0.17								0.07	
			DEPTH		2987.33 2987.64	2988.00	2988,36	2988,59	2989.00	2989.36	2989.64	2990.00	2990.33	2990.66	2991.00	2991.33	2991.66	2992.00	2992,33	
	STAT01L 30/3-3		SAMPLE NUMBER		20	28	29	30	31	32	23	34	32	36	37	38	39	40	41	

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed to represent the best judgment of Core Laboratories U K. Ltd. (all errors, and omissions excipted); but Core Laboratories U K. Ltd. and its officers and employers, as turn no responsibility and make no warranty or top restored to representations, or profitableness of any oil, gas or other miner of source to with which such report is used upon.



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С С Ц			с с ВЕ	LITY AVERAG	0.17			The interpretations or opu responsibility and make n
		30/3-3	D FOR SLIPPA HELIUM	FERMEABI ARITHMETIC	7.4	POROSITY : VTERCEPT)	-3,0186)	tial use, this report is made. s and employees, astume no ort is used or relied upon.
۲۵۰۰ ۲۰۱۲ ۱۳۵۰ - ۱۹۲۱ ۱۳۵۸ - ۱۹۲۱ ۱۳۵۲ - ۱۹۲۱ ۱۳۵۲ - ۱۹۲۱ - ۱۹۲۱ ۱۳۵۲ - ۱۹۲۱ - ۱۹۲ ۱۳۵۲ - ۱۹۶۱ - ۱۹	ITY	L STATE:	<pre>correcte</pre>	POROSITY AVERAGE 	13,8	ILITY(K) TO DF INTERCEPT) + LOG OF II LINE		vhose exclusive and confiden ries U K Lud, and is officr nnection with which such rep
ОПА - АВЕНОВ	LTY VS POROS	COUL	HORIZONTAL VT	POROSITY MIN. MAX.	4.8 25.4	FING PERMEAB SITY) + LOG (PE)(POROSITY FION OF THE I	0.1926) (P0	the client to whom, and for v xeepted); but Core Lahorato r mineral well or sand in co
Prisoler LUNE	PERMEABILI		ITY : MD - H : PERCEN	EABILITY JM MAXIMUM	20 92.0	0 LINE RELAT SLOPE)(POROS VTILOG((SLOF EQUAT	ANTILOG((und materials supplied by t (all errors and omissions e ness of any oil, gas or uthe
			ЕКМЕАВІС] :ТҮ	PERME	0.02	r REDUCEI 3(K) = (5 = AN	PERM =	d on observations a ratories U K Ltd., tions, or profitable.
		STATOIL	AIR PE POROSI	RANGE & SYMBOL	1 (X)	NUATION OF LOC K RANGE	T T	erpretations are base dgment of Core Labo uctivity, proper opera
		COMPANY: FIELD :		DEPTH INTERVAL	2979.0 - 2992.5	U U		These analyses, opinions or int expressed represent the best ju- representations, as to the prod



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STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

STATOIL	
COMPANY: 5	FIELD :

WELL : 30/3-3 COUNTY, STATE:

MEABILITY : N	4D.	~.	HORIZONTAL	~ ~	RANGE	USED	0.005		10240.
••	-EKCENI	-	HELIUM	~	KHNUE	1100		2	10+0

(PERMEABILITY CORRECTED FOR SLIPPAGE)

13.5	NE
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	-
LENGTH	XCLUDEI
INTERVAL	LITHOLOGY E
2992.5	
2979.0 -	13.4
••	**
	ZONE
	IN
H LIMITS	ANALYZED
DEPTI	MTRS

DATA SUMMARY

IGES	GEOMETRIC	 0,38
LITY AVERA	HARMONIC	0.11
PERMEABI	ARITHMETIC	7.1
°OROSITY	AVERAGE	 13.6

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Petroleum Reservoir Engineering LO DN BE EN STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: STATOIL FIELD :

WELL : 30/3-3 COUNTY, STATE:

	CUMULATIVE FREQUENCY (2)	ни и и и и и и и и и и и и и и и и и и
	FREQUENCY (PERCENT)	H NN N4400444 O M H P 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
TY RANGES	FERM. (ARITH)	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0
BY POROSI	AVERAGE (GEOM.)	с м м м м м м м м м м м м м
GROUPING	AVERAGE FOROSITY 	й 4 4 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	MTRS IN RANGE	ан С пооииоооо П С пооииоооо П С пи 4 8 ин 4 8 4 4 т П
	POROSITY RANGE	4.0 - 6.0 6.0 - 8.0 8.0 - 10.0 10.0 - 12.0 14.0 - 14.0 16.0 - 18.0 18.0 - 20.0 24.0 - 22.0 24.0 - 26.0 7DTAL NUR

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Petroleum Reservoir Engineering «LO DN BE EN STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: STATOIL FIELD :

WELL : 30/3-3 COUNTY, STATE:

GROUPING BY PERMEABILITY RANGES

PERMEABILITY RANGE	MTRS IN RANGE	AVERAGE (GEOM.)	PERM. (ARITH)	AVERAGE POROSITY	FREQUENCY (PERCENT)	CUMULATIVE FREQUENCY (%)
	900 600 mm mm 600 mm 6mb mm mm			·		
0.010 - 0.020	5.0	0.011	0.011	2•3	л•л М	ິ. ເກ
0.039 - 0.078	1.2	0,057	0.058	. 8.7	14.3	17.9
0.078 - 0.156	1.0	0.121	0.122,	11.0	11.6	29.5
0.156 - 0.312	2.6	0.206	0.210.	13.3	20.7	60.2
0.312 - 0.625	1. • U	0.480	0.493	13.8	17.4	77.6
0.625 - 1.250	0.7	0.876	0,883	17.2	7.9	85.4
1.250 - 2.500	10 × 0	1,8	1.8	13.0	3.4	88.8
20 40.	0.4	31.	31.	25.4	4	93.1
40 80.	0 0	74.	74.	, 1.9.6	2+7	95.8
80 160.	0.4	•28	• 28	1.20.7	, 4 ()	100.0
					-	
TOTAL NUM	HBER OF MTRU	0 0 1 0				
			* *			
				· · ·		
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			1 '	•		

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories U K Ltd. and interpretations, as not not responsibility and make no warranty or representations, or profited or productive, or proper operations, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

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Reservoir Engineering DN ~BEL_LEN Petroleum •LO

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: STATOIL FIELD :

COUNTY, STATE:

POROSITY MTRS OF STORAGE CAPACITY LOST FOR SELECTED POROSITY CUT OFF

MEDIAN	13.6 13.6	13.6	14.2	14.8	19.5	20.4	22.0			
ARITH MEAN	13.6 13.6	13.6	14.9			21.2	23.0	0 0 0 0 4 4		
CAFACITY REMAINING (2)	100.0	100.0	0.0	82.1	0.05 10.05	24.1	14.45	2 · 2 · 2 · 2 · 2 · 2 · 2 · 2 · 2 · 2 ·	0.0	u =115.4
REMAINING	ហ ហ ៣ ៣ ៣ ៣	0 0 0 0			3.8	х . 	2 •0	0 0 0 4 4 0	0.0	POROSITY-MTR
CAPACITY LOST (%)	00 00	0		17.9	43.5 70.0	75.9	85.6		100.0	ACITY IN
MTRS LOST	0.0	000	4	- CI	4.7 6.8	2.0	7.8	000	0 •	RAGE CAP
POROSITY CUT OFF	0 0 0 0 0 0	4 0 • 4 0 • 4	0.0	10.0	14.0 16.0	18.0	20.0	22.0	26+0	TOTAL STO

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories U K. Ltd. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or profitablences of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

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Petroleum Keservui Lunginening LC ON BE EEP STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: STATOIL Field :

WELL : 30/3-3 COUNTY, STATE: MILLIDARCY-MTRS OF FLOW CAPACITY LOST FOR SELECTED PERMEABILITY CUT OFF

MEDIAN	67////6/10000000000000000000000000000000
GEOM MEAN	000000 000000 000000 000000 000000 000000
(%)	
CAPACITY REMAINING	11 11 1000 11 1000 1000 1000 1000 1000
MTRS REMAINING	00000400000040000000000000000000000000
CAPACITY LOST (%)	н 000000 00000 0000 0000 0000 0000 000
MTRS LOST	00040004000000000000000000000000000000
FERMEABILITY CUT OFF	0.005 0.010 0.020 0.037 0.156 0.156 0.156 0.156 0.037 0.312 0.037 0.037 0.156 0.156 0.037 0.156 0.156 0.005 0.005 0.156 0.010 0.010 0.010 0.010 0.005 00000000

60.61 TOTAL FLOW CAPACITY IN MILLIDARCY, MTRS(ARTHMETIC) = These malyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories U K Ltd. (all crors and omissions excepted); but Core Laboratories U K Ltd. and its officers and employees, assume no responsibility and make no warranty or representations, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.





PLOTS AND STATISTICS

(a) Core Graph

Gamma radiation, permeability (horizontal, vertical or both), helium or fluid summation porosity, oil saturation and water saturation are plotted versus depth on a 1:200 scale and other scales if required.

Permeability Versus Porosity Plot (b)

One statistical page accompanies this plot. Averages are for all data points within the depth interval shown, even if some data points are shown off the top or bottom of the graph grid. Both permeability and porosity scales can be optionally chosen. As standard, the permeability versus porosity plot will include all poro-perm pairs of data measured from the core submitted. Optionally, plots for specific depth intervals or for specific permeability ranges may be requested.

A best fit line is included in this plot.

(c) Histograms

Accompanying the histogram page are five pages of statistical data and a permeability versus porosity range plot. Helium porosity is used as standard.

Note that in the permeability histogram, 10240 millidarcies is the upper limit, and the subsequent permeability averages (page 1) will reflect this (however, there is no upper permeability limit when permeability averages are calculated from the permeability versus porosity plot, q.v.)

"Feet (or metres) analyzed in zone" (page 1) is the total length of the cores.

"Total number of feet (or metres) (page 2) is the total of the sample intervals for which a permeability/porosity pair of data was measured. Each sample interval to be from the whole foot mark (25 cm. mark for metric clients) to the next, irrespective of the exact point where the plug was drilled within that foot (25 cm.) interval.

The permeability versus porosity range plot is the one without the best-fit line.

Symbol "+" plots the arithmetic averages of the porosities in each porosity group (top histogram) versus the geometric average of the corresponding permeabilities of each sample in the porosity group. Symbol "X" plots the geometric average of the permeabilities in each permeability group (bottom histogram) versus the arithmetic average of the corresponding porosities of each sample in the permeability group. Again, permeability and porosity scales are optional.

Finally, multiple wells may be processed together in the above manner, using any depth intervals required from each well.

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