

**2/7-218 OPEN HOLE WIRELINE LOGGING SUMMARY**

LOG TYPE	RUN #	DATE	INTERVAL LOGGED (T)	INTERVAL LOGGED (B)	BIT SIZE	BHT (°F)	TIME ELAPSED S/CIRC (hrs)	MUD WEIGHT (ppg)	MUD TYPE	REMARKS
DIL/LSS/GR	1	9/7/89	3465	8279	17.5	176	10	13.8	WATER	(SOLTEX-ACTAFLO)
DIL/GR	2	2/8/89	8241	13365.5	12.25	245	9.1	14.6	WATER	(SOLTEX-ACTAFLO)
DLL/GR/MSFL/SLS	1	11/8/89	8241	13889	12.25	259	12.26	14.8	WATER	(SOLTEX-ACTAFLO)
LDL/CNL/NGL	1	11/8/89	10533	13818	12.25	267	20.54	14.8	WATER	EXPERIENCED REPEATED STICKING - HOLE RUGOSITY DID NOT REACH TOTAL DEPTH
DIL/LSS/GR	2	6/9/89	13855	14970	8.5	297	12.29	17.6	OIL	
LDL/CNL/NGL/BHC	2	6/9/89	13855	14971	8.5	305	18.27 WIPER TRIP	17.6	OIL	
OBDT/GR	1	7/9/89	13855	14955	8.5	295	9.15	17.7	OIL	
RFT/GR	1	7/9/89	14139	14912	8.5		20.16	17.7	OIL	
RFT/GR W/CHAMBER	2	8/9/89	N/A	N/A	8.5			17.7	OIL	SAMPLES AT 14182 & 14181 LOST DUE TO SEAL FAILURE
							WIPER TRIP			
RFT/GR W/CHAMBER	3	9/9/89	N/A	N/A	8.5			17.7	OIL	SAMPLE AT 14183
CST/GR	1	9/9/89	14366	14865	8.5	310	15.15	17.7	OIL	15 REC, 6 EMPTY, 9 MISSING
DIL/SDT/GR	3	7/11/89	14971	16542.5	5.875	332	10.5	17.4	OIL	SDT FAILED - NO LOG
LDL/CNL/NGL/BHC	3	7/11/89	14971	16547	5.875	337	16.37 WIPER TRIP	17.4	OIL	
RFT/GR	4	8/11/89	15000	16523	5.875			17.4	OIL	
							WIPER TRIP			
OBDT/GR	2	9/11/89	14971	16547	5.875	331	8.45	17.4	OIL	

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**SOUTH ELDFISK, 2/7 21S: EVENTS AND RESULTS SUMMARY**

**DST 1**

15017-15132 FT RKB

Gauge: HPR SN 9108

Sens. Depth: 14,865 ft RKB (14,012 ft-TVD RKB)

	DEPTH FT,RKB
gross 96 NET 70 PHI 11% SW 10%	14135
	14231
	14588
gross 237 NET 180  PHI 10% SW 30%	14825
	15017
gross 115 NET 44 PHI 8% SW 41%	15132

**REPRESENTATIVE INFORMATION**

from MAIN FLOW (=DD 2)

CHOKE INCH	RATE STBOD	BHP PSIA	WHP PSIG
0	0	12196	8050
14/64	600	7800	3320
BHT, degF		320	
GOR, SCF/STB		1600	
OIL SG		0.8 (45 deg API)	
GAS SG		0.78	
H2S, ppm		25	
CO2, mol%		5.5	

**TEST ANALYSIS RESULTS**

TYPE CURVE

HORNER

KH	K	S	KH	K	S
65.0	1.5	7.0	65.6	1.6	7.0

**MODEL**

HOMOGENEOUS, INFINITE ACTING

**NET  
41°  
FT,TVD**

\*avg. dev. through pay: 21.5 deg

DURATION OF EVENTS, decimal hours

1.83	7.05	21.08	9.5
DD 1	BU 1	DD 2	BU 2

39.46  
TOTAL

**SOUTH ELDFISK, 2/7 21S: EVENTS AND RESULTS SUMMARY**

**DST 2**

14588-14825 FT RKB

Gauge: SDP SN 86641

Sens. Depth: 13,948 ft RKB (13,158.7 ft TVD RKB)

**REPRESENTATIVE INFORMATION**

from MAIN FLOW (=DD 2)

	DEPTH FT, RKB
gross 96 NET 70 PHI 11% SW 10%	14135
	14231
	<b>14588</b>
gross 237 NET 180  PHI 10% SW 30%	
	<b>14825</b>
	<b>15017</b>
gross 115 NET 44 PHI 8% SW 41%	15132

**NET  
167\*  
FT, TVD**

CHOKE INCH	RATE STBOD	BHP PSIA	WHP PSIG
0	0	12025	8300
25/64	3370	11450	7520
30/64	5000	11210	6890

BHT, degF	309
GOR, SCF/STB	1900
OIL SG	0.816 (42 deg API)
GAS SG	0.8
H2S, ppm	40
CO2, mol%	5

**TEST ANALYSIS RESULTS**

	TYPE CURVE			HORNER		
	<u>KH</u>	<u>K</u>	<u>S</u>	<u>KH</u>	<u>K</u>	<u>S</u>
pre-cleanup	<b>5111</b>	30.6	6.8	<b>5108</b>	30.6	6.5
post-cleanup	<b>5043</b>	30.2	1.5	<b>5015</b>	30.0	1.3

**MODEL**

TWO INTERSECTING SEALING BOUNDARIES

DISTANCE 1, FT	140
DISTANCE 2, FT	240
ANGLE, deg	60

\*avg. dev. through pay: 21.5 deg

DURATION OF EVENTS, decimal hours

0.63	3.0	23.93	44.5	0.37	72.43
DD 1	BU 1	DD 2	BU 2	FLOW- after- FLOW	TOTAL

**SOUTH ELDFISK, 2/7 21S: EVENTS AND RESULTS SUMMARY**

**DST 3**

14135-14231, 14588-14825 FT RKB

Gauge: SDP1 SN 85396

Sens. Depth: 13,946.6 ft RKB (13,157.1 ft TVD RKB)

**REPRESENTATIVE INFORMATION**

from MAIN FLOW (=DD 2)

	DEPTH FT, RKB
gross 96 NET 70	14135
PHI 11% SW 10%	14231
	14588
gross 237 NET 180	14825
PHI 10% SW 30%	
	15017
gross 115 NET 44	15132
PHI 8% SW 41%	

NET  
65\*  
FT, TVD

CHOKE INCH	RATE STBOD	BHP PSIA	WHP PSIG
0	0	11985	8300
28/64	4770	10820	6600
48/64	8000	9830	3920 **

\*\* FLOW-after-FLOW

BHT, degF	309
GOR, SCF/STB	1850
OIL SG	.81 (43 deg API)
GAS SG	0.8
H2S, ppm	20-25
CO2, mol%	5

**TEST ANALYSIS RESULTS**

NET  
167\*  
FT, TVD

TYPE CURVE

HORNER

	KH	K	S	KH	K	S
pre-cleanup	2865	12.3	10	2867	12.4	10.1
post-cleanup	2921	12.6	6	2821	12.2	6.0

Sum=232 ft

**MODEL**

TWO INTERSECTING SEALING BOUNDARIES

DISTANCE 1, FT	100
DISTANCE 2, FT	270
ANGLE, deg	90

\*avg. dev. through pay: 21.5 deg

DURATION OF EVENTS, decimal hours

1.17	4.28	18.03	36.0	11.9	15.03	2.3	0.97	
DD 1	BU 1	DD 2	BU 2	F-a-F	BU 3	PLT	BU 4	
							TOTAL	89.68

**ADDENDUM: RESULTS FROM THE 2-LAYER ANALYSIS OF DST 3**

**SOUTH ELDFISK, 2/7 21S: EVENTS AND RESULTS SUMMARY**

**DST 3** 14135-14231, 14588-14825 FT RKB

Gauge: SDP1 SN 85396  
Sens. Depth: 13,946.6 ft RKB (13,157.1 ft TVD RKB)

**REPRESENTATIVE INFORMATION**

from MAIN FLOW (=DD 2)

gross 96  
**NET 70**  
PHI 11%  
SW 10%

DEPTH FT,RKB
<b>14135</b>
<b>14231</b>

**NET 65\***  
FT, TVD

CHOKE INCH	RATE STBOD	BHP PSIA	WHP PSIG
0	0	11965*	8300
28/64	4770	10820	6600
48/64	8000	9830	3920 **
			* estimated
			** FLOW-after-FLOW
BHT, degF	309		
GOR, SCF/STB	1850		
OIL SG	.81 (43 deg API)		
GAS SG	0.8		
H2S, ppm	20-25		
CO2, mol%	5		

gross 237  
**NET 180**

<b>14588</b>
<b>14825</b>

**NET 167\***  
FT, TVD

**TEST ANALYSIS RESULTS**

		KH	K	H	S
pre-cleanup	upper zone	<b>1950</b>	30	65	7.2
	lower zone	<b>4500</b>	30	150	45
Sum=232 ft post-cleanup	upper zone	<b>1950</b>	30	65	7.2
	lower zone	<b>4500</b>	30	150	42

gross 115  
**NET 44**  
PHI 8%  
SW 41%

15017
<b>15132</b>

**MODEL**

TWO INTERSECTING SEALING BOUNDARIES

	upper zone	lower zone
DISTANCE 1, FT	100	140
DISTANCE 2, FT	270	240
ANGLE, deg	90	60

\* avg. dev. through pay: 21.5 deg

DURATION OF EVENTS, decimal hours

1.17	4.28	18.03	36.0	11.9	15.03	2.3	0.97
DD 1	BU 1	DD 2	BU 2	F-a-F	BU 3	PLT	BU 4

TOTAL 89.68

**INTRO. 5 (added)**

2/7-218 RFT DATA, 8 1/2 in HOLE SECTION

Survey Date: September 7, 1989

Note: Mobilities are low because only one test chamber functions above 8000 psi. The software is written for a two-chamber test. RFT in top sand.

<u>Measured Depth</u>	<u>Vertical Depth</u>	<u>Form Pressure psig</u>	<u>Hydro Pressure</u>	<u>K/MU</u>	<u>Note</u>
14139	13337	12012.5	12254.0	0.53	Good Perm
14152	13350	0.0	12262.0		Seal Failure
14151	13349	0.0	12259.0		Seal Failure
14162	13359	12020.1	12267.8	1.48	V. Good Perm
14172	13368	12022.0	12273.9	3.87	V. Good Perm
14182	13378	12024.6	12281.7	29.17	V. Good Perm
14192	13388	12026.8	12290.0	0.30	Average Perm
14202	13398	12029.2	12296.7	6.34	V. Good Perm
14218	13411	12033.4	12311.0	0.92	Good Perm
14233	13425	12036.0	12324.1	0.08	Tight
14396	13577	12074.4	12478.1	3.46	V. Good Perm
14406	13586	12076.9	12485.1	13.22	V. Good Perm
14424	13603	12081.2	12499.5	1.71	Good Perm
14474	13650	0.0	12544.8		Tight
14520	13692	12109.5	12587.8	1.62	V. Good Perm (i)
14533	13790	0.0	12594.2		Tight
14596	13762	12133.5	12648.5	6.08	V. Good Perm
14626	13790	12124.1	12668.7	0.05	Tight
14620	13784	12139.1	12659.5	68.91	V. Good Perm
14646	13808	12145.4	12682.3	207.29	V. Good Perm
14682	13841	12153.5	12712.0	3.77	Good Perm
14693	13851	0.0	12720.1		Tight
14696	13854	12157.4	12721.0	12.73	Good Perm
14719	13875	12162.9	12740.4	2.08	Average Perm
14732	13887	12165.7	12749.0	0.91	Good Perm
14748	13902	12170.0	12764.1	11.40	Good Perm
14760	13913	12173.0	12774.7	3.05	Good Perm
14776	13928	12177.0	12789.6	2.11	Good Perm
14824	13972	0.0	12834.0		Tight
14826	13974	12190.6	12834.0	3.00	Good Perm
14840	13987	12193.5	12845.9	4.19	Good Perm
14852	13998	0.0	12857.1		Tight
14871	14015	12202.6	12873.1	0.39	Average
14873	14017	12203.4	12872.9	0.84	Good Perm
14922	14062	0.0	12919.0		Tight
14912	14053	12215.1	12907.1	0.11	Average Perm

FIG. 3.4.1

2/7-218 RFT DATA, 5 7/8 in HOLE SECTION

<u>Measured Depth</u>	<u>Vertical Depth</u>	<u>Form Presssure psig</u>	<u>Hydro Pressure</u>	<u>K/MU</u>	<u>Note</u>
15000			12368		Tight
15022	14157.8	12201.0	12650	92.0	Good Perm
15050	14168.9	12219.0	12662	32.0	Good Perm
15061			12675		Tight
15078	14209.8	12225.5	12679		Tight
15095			12693	2.25	Mod. Perm
15108			12711		Tight
15103			12720		Tight
15076			12708		Tight
15073		10791.0	12676		Tight
15025	14160.6	12219.0	12673	0.03	Still Building
15114			12625	3.95	Mod. Perm
15121			12732		Tight
15168			12734		Tight
15222			12782		Tight
			12833		Tight
15251			12859		Tight
15271			12874		Tight
15288			12885		Tight
15352			12947		Tight
15450			13025		Tight
15489			13054		Tight
15541			13098		Tight
15548		13162.0	13091		Questionable
15582			13117		Tight
15599			13131		Tight
16294			13642		Tight
16316			13658		Tight
16335			13670		Tight
16350			13679		Tight
16388			13710		Tight
16426			13737		Tight
16476			13773		Tight
16488			13776		Tight
16523			13802		Tight
15022 +/- 1		12218.0			Tool test

FIG. 3.4.2

**SOUTH ELDFISK: SUMMARY OF PVT RESULTS, 2/7-20 AND 2/7-21S**

Bottle Number	2/7-21S					2/7-20
	DST 1 TS-07-12	DST 2 TS-09-05	DST 2 TS-10-21	DST 3 TS-10-16	DST 3 TS-09-12	
Pb at 320 degF, psia	4597	4786	4779	4772	4786	4626
Compressibility at Pb, 1/psi	4.57E-05	4.35E-05	4.99E-05	4.95E-05	4.56E-05	4.14E-05
Viscosity at Pb, cp	0.131	0.127	0.126	0.125	0.128	0.118
Viscosity at 12000 psi, cp	0.183	0.171	0.170	0.173	0.176	0.181
<u>FROM SINGLE-STAGE FLASH:</u>						
GOR, SCF/STB	1898	2237	2095	2066	2124	2101
Bo at Pb, RB/STB	2.321	2.576	2.423	2.445	2.467	2.446
Oil Density at 59 degF, lbs/bbl	285.6	285.2	285.2	285.5	285.8	285
spec. grav	0.815	0.814	0.814	0.815	0.816	0.813
deg API	42.09	42.34	42.34	42.15	41.97	42.46
Oil Density at Pb, lb/bbl	176.9	167.2	173.5	170.9	171.7	175.6
<u>FROM THREE-STAGE FLASH:</u>						
Bobf (at Pb), RB/STB	2.172	2.265	2.300	2.288	2.257	2.239
Rs (sum of stages) SCF/STB	2191	2296	2377	2374	2366	2317
Oil Density, Stock Tank	281.7	282.8	281.7	281.5	281.9	280.7
spec. grav	0.804	0.807	0.804	0.803	0.805	0.801
deg API	44.50	43.81	44.50	44.62	44.37	45.12

FIG. 3.8.6