CER 24-18-64

HALLIBURTON LOGGING SERVICES, INC.

FINAL PRINT

SPECTRAL DENSITY DUAL SPACED NEUTRON LOG

5" = 100'

COMPANY ____ WELL ____ FIELD ____ COUNTY ____ ST __

COMPANY	ARCO OIL AND GAS COMPANY
WELL	LUNGREN CREEK NO. 24-18-64 CER
FIELD	MIST
COUNTY	COLUMBIA
STATE OR	
API NO.	N/A
LOCATION	NW B 1135.70 FEET NORTH AND 2181.19 FEET EAST FROM THE SOUTHWEST CORNER OF:
SEC. 18 TWP 6N RGE 4W	
OTHER SERVICES	DIG/AVL
PERMANENT DATUM	G.L. ELEV. 636.1
LOG MEASURED FROM	K.B 11.5FT. ABOVE PERM. DATUM
DRILLING MEASURED FROM	KELLY BUSHING
ELEV.: K.B.	647.6
D.F.	------
G.L.	636.1

DATE	09/19/89			
RUN NO.	ONE			
DEPTH-DRILLER	1810			
DEPTH-LOGGER	1808			
BTM. LOG INTER.	1805			
TOP LOG INTER.	456			
CASING-DRILLER	8 5/8@460	@	@	@
CASING-LOGGER	456			
BIT SIZE	6 1/4			
TYPE FLUID IN HOLE	POLYMER LS.ND			
DENS. : VISC	10.0 : 46	:	:	:
PH : FLUID LOSS	7.5 : 6.0	:	:	:
SOURCE OF SAMPLE	CIRCULATED			
RM @ MEAS. TEMP.	2.8 @75	@	@	@
RMF @ MEAS. TEMP.	2.9 @75	@	@	@
RMC @ MEAS. TEMP.	3.0 @64	@	@	@
SOURCE RMF : RMC	MEAS.: MEAS.	:	:	:
RM @ BHT	1.93 @112	@	@	@
TIME SINCE CIRC.	6.5 HOURS			
TIME ON BOTTOM	1:36 PM			
MAX. REC. TEMP.	112 @BHT	@	@	@
EQUIP. : LOCATION	2890 : WDLND	:	:	:
RECORDED BY	B.JOHNSON			
WITNESSED BY	JIM EASTES			

Fold Here

Service Ticket No.: 12306	API Serial No.: N/A	PGM Version: 1.31 PC

Change in Mud Type or Additional Samples		
Date/Sample No.	09/19/89 : ONE	/ / :
Depth-Driller		
Type Fluid in Hole		
Dens. : Visc.	:	:
pH. : Fluid Loss	:	:
Source of Sample		
Rm @ Meas.Temp.	@	@
Rmf @ Meas.Temp.	@	@
Rmc @ Meas.Temp.	@	@
Source: Rmf : Rmc	:	:
Rm @ BHT	1.93 @112	@
Rmf @ BHT	2.00 @112	@
Rmc @ BHT	1.79 @112	@

RESISTIVITY SCALE CHANGES

Type Log	Depth	Scale Up Hole	Scale Down Hole

RESISTIVITY EQUIPMENT DATA

Run No	Tool Type & No	Pad Type	Tool Pos.	Other
ONE	DUAL W109432	N/A	1.5"S.O.	M412
ONE	SGRD W108932	N/A	1.5"S.O.	M416

EQUIPMENT DATA

GAMMA		ACOUSTIC		DENSITY		NEUTRON	
Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE
Serial No.	W108581	Serial No.	W112458	Serial No.	W109740	Serial No.	W108749
Model No.	432	Model No.	305	Model No.	465	Model No.	434
Diameter	3 5/8	No.of Cent.	FOUR	Diameter	4 1/2	Diameter	3 5/8
Detector Model No.	N/A	Spacing	1 FOOT	Log Type	GAMMA	Log Type	NEUTRON
Type	SCINT.			Source Type	CS137	Source Type	AM241BE
Length	4 IN.	LSA	Y	Serial No.	118	Serial No.	66
Distance To Source	N/A	FWDA	N	Strength	1.5 CU.	Strength	19.5 CU

LOGGING DATA

GENERAL				GAMMA		ACOUSTIC			DENSITY			NEUTRON		
Run No.	Depth From	Depth To	Speed Ft/Min	Scale L	Scale R	Scale L	R	Matrix	Scale L	R	Matrix	Scale L	R	Matrix
ONE	1808	456	30.	0	50	150	50	57 US/FT	1.65	2.65	2.65 G/CC	60PU	0PU	SAND

Remarks: REPEAT RUN OVER INTERVAL FROM 1400 TO 1200 AT REQUEST OF COMPANY MAN.

CREW ON LOCATION: J.JOHNSON, R.JEFFERY
THANK YOU FOR USING HALLIBURTON LOGGING SERVICES!

Halliburton Logging Services, Inc. does not guarantee the accuracy of any interpretation of log data, conversion of log data to physical rock parameters or recommendations which may be given by HLS personnel or which may appear on the log or in any other form. Any user of such data, interpretations, conversions or recommendations agrees that HLS is not responsible except where due to gross negligence or wilful misconduct, for any loss, damages, or expenses resulting from the use thereof.

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GAMMA SHOP CALIBRATION SUMMARY
PERFORMED: 10:05:26 09/01/89 LAST SHOP CALIBRATION: 14:24:17 08/08/89
SERIAL NUMBER: 108594 PROGRAM VERSION: 1.31 PC
MODEL: #432 FIELD CALIBRATOR: #2141
PERFORMED BY: MCDANIEL

	MEASURED	CALIBRATED	UNITS
BACKGROUND	13	13	API-CPS
BACKGROUND+CALIBRATOR	269	271	API-CPS
CALIBRATOR	256	258	API-CPS

GAMMA BEFORE SURVEY FIELD CHECK SUMMARY
PERFORMED: 08:30:08 09/19/89 LAST SHOP CALIBRATION: 10:05:26 09/01/89
FIELD CALIBRATOR: #2141

	SHOP	FIELD	UNITS
BACKGROUND	13	27	API-CPS
BACKGROUND+CALIBRATOR	271	289	API-CPS
CALIBRATOR	258	262	API-CPS

GAMMA AFTER SURVEY FIELD CHECK SUMMARY
PERFORMED: 15:02:46 09/19/89 LAST SHOP CALIBRATION: 10:05:26 09/01/89

	BEFORE	AFTER	UNITS
BACKGROUND	27	52	API-CPS
BACKGROUND+CALIBRATOR	289	312	API-CPS
CALIBRATOR	262	260	API-CPS

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DUAL SPACE NEUTRON SHOP CALIBRATION SUMMARY
PERFORMED: 10:57:07 08/30/89 LAST SHOP CALIBRATION: 10:23:05 08/30/89
SERIAL NUMBER: 108749 PROGRAM VERSION: 1.31 PC
MODEL: #434 FIELD CALIBRATOR: #4916 SOURCE: #66
PERFORMED BY: MCDANIEL

PRIMARY CALIBRATOR

	MEASURED	CALIBRATED	UNITS
RATIO	6.458	6.371	
POROSITY	24.364	23.962	%

FIELD CHECK BLOCK

	MEASURED	DEFINED	UNITS
CHECK RATIO	7.116	7.020	
CHECK POROSITY	27.435	26.988	%

DUAL SPACE NEUTRON BEFORE SURVEY FIELD CHECK SUMMARY
PERFORMED: 12:30:55 09/19/89 LAST SHOP CALIBRATION: 10:57:07 08/30/89
FIELD CALIBRATOR: #4916 SOURCE: #66

	SHOP	FIELD	UNITS
CHECK RATIO	7.020	6.955	
CHECK POROSITY	26.988	26.683	%

DUAL SPACE NEUTRON AFTER SURVEY FIELD CHECK SUMMARY
PERFORMED: 15:09:13 09/19/89 LAST SHOP CALIBRATION: 10:57:07 08/30/89

	BEFORE	AFTER	UNITS
CHECK RATIO	6.955	7.008	
CHECK POROSITY	26.682	26.928	%

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SDL CALIPER SHOP CALIBRATION SUMMARY
PERFORMED: 12:06:51 08/30/89 LAST SHOP CALIBRATION: 14:08:10 08/08/89
SERIAL NUMBER: 63 PROGRAM VERSION: 1.31 PC
MODEL: #465
PERFORMED BY: MCDANIEL

	MEASURED	CALIBRATED	UNITS
VALUE 1	7.879	8.000	INCHES
VALUE 2	15.973	16.000	INCHES

SDL CALIPER BEFORE SURVEY FIELD CHECK SUMMARY
PERFORMED: 12:23:55 09/19/89 LAST SHOP CALIBRATION: 12:06:51 08/30/89

	SHOP	FIELD	UNITS
VALUE 1	8.000	7.850	INCHES

SDL CALIPER AFTER SURVEY FIELD CHECK SUMMARY
PERFORMED: 15:04:28 09/19/89 LAST SHOP CALIBRATION: 12:06:51 08/30/89

	BEFORE	AFTER	UNITS
VALUE 1	7.850	8.001	INCHES

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SPECTRAL DENSITY SHOP CALIBRATION SUMMARY
PERFORMED: 11:54:31 08/30/89 LAST SHOP CALIBRATION: 13:43:07 08/08/89
SERIAL NUMBER: 109740 PROGRAM VERSION: 1.31 PC
MODEL: #465 FIELD CALIBRATOR: #AL SOURCE: #118
PERFORMED BY: MCDANIEL

PRIMARY CALIBRATOR

	MEASURED	CALIBRATED	UNITS
ALUMINUM BLOCK			
ALUMINUM DENSITY	2.595	2.595	gm/cc
ALUMINUM CORRECTION	.037	.039	gm/cc
ALUMINUM Pe SHORT	3.256	3.209	
AUMMINUM Pe LONG	3.221	3.179	
ALUMINUM BLOCK W/SLEEVE			
ALUMINUM DENSITY	2.595	2.594	gm/cc
ALUMINUM CORRECTION	-.054	-.054	gm/cc
ALUMINUM Pe SHORT	6.085	6.000	
AUMMINUM Pe LONG	6.193	6.169	
MAGNESIUM BLOCK			
MAGNESIUM DENSITY	1.670	1.672	gm/cc
MAGNESIUM CORRECTION	.006	.010	gm/cc
MAGNESIUM Pe SHORT	3.215	3.169	
MAGNESIUM Pe LONG	2.868	2.824	

FIELD CHECK BLOCK

	MEASURED	DEFINED	UNITS
ALUMINUM SLIDE			
ALUMINUM DENSITY	1.659	1.657	gm/cc
ALUMINUM CORRECTION	-.051	-.050	gm/cc
ALUMINUM Pe SHORT	4.606	4.541	
ALUMINUM Pe LONG	4.298	4.263	
ALUMINUM SLIDE IN			
ALUMINUM DENSITY	2.156	2.158	gm/cc
ALUMINUM CORRECTION	-.007	-.005	gm/cc
ALUMINUM Pe SHORT	4.755	4.688	
ALUMINUM Pe LONG	3.944	3.907	
BRASS SLIDE			
BRASS DENSITY	2.364	2.362	gm/cc
BRASS CORRECTION	-.372	-.376	gm/cc
BRASS Pe SHORT	5.881	5.798	
BRASS Pe LONG	3.692	3.653	

SPECTRAL DENSITY BEFORE SURVEY FIELD CHECK SUMMARY
PERFORMED: 12:33:08 09/19/89 LAST SHOP CALIBRATION: 11:54:31 08/30/89
FIELD CALIBRATOR: #AL SOURCE: #118

ALUMINUM SLIDE IN	SHOP	FIELD	UNITS
ALUMINUM DENSITY	2.158	2.161	gm/cc
ALUMINUM CORRECTION	-.005	-.002	gm/cc
ALUMINUM PE SHORT	4.688	4.828	
ALUMINUM PE LONG	3.907	4.082	

SPECTRAL DENSITY AFTER SURVEY FIELD CHECK SUMMARY
PERFORMED: 15:11:36 09/19/89 LAST SHOP CALIBRATION: 11:54:31 08/30/89

ALUMINUM SLIDE IN	BEFORE	AFTER	UNITS
ALUMINUM DENSITY	2.161	2.159	gm/cc
ALUMINUM CORRECTION	-.002	-.004	gm/cc
ALUMINUM PE SHORT	4.828	4.801	
ALUMINUM PE LONG	4.082	4.091	

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TENSION SHOP CALIBRATION SUMMARY
PERFORMED: 08:15:29 09/19/89 LAST SHOP CALIBRATION: 20:19:50 09/12/89
SERIAL NUMBER: TOP PROGRAM VERSION: 1.31 PC

H L S CALIBRATION SUMMARY TABLE

SERVICE or SIGNAL	SHOP	BEFORE	AFTER	CHANGE	TOLERANCE
GAMMA	258	262	260	1	+/- 9.0
DSN POROSITY	26.988	26.682	26.928	-.245	+/-.90
CALIPER VALUE 1	8.000	7.850	8.001	-.150	+/- 0.50
BULK DENSITY	2.158	2.161	2.159	.002	+/-.015
DENSITY CORRECTION	-.005	-.002	-.004	.002	+/-.015
DENSITY PE SHORT	4.688	4.828	4.801	.026	+/-.30
DENSITY PE LONG	3.907	4.082	4.091	-.009	+/-.30

EVENTS

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 1 13: 3:14 00000 >DATE OF LOG: MMDD                        919
 2 13: 6: 1 01025 >PLS SOFTWARE REVISION                   1.31
 3 13: 6: 1 01025 >CURRENT REVISION UPDATE NUMBER PC
 4 13:11:50 01264 > SDL OPEN MANDREL.
 5 13:13:55 01646 >IS THIS A CASED HOLE? (Y/N)             N
 6 13:13:56 01646 >CASING SIZE O.D. (INCHES)               5.500+0
 7 13:13:56 01646 >CASING WEIGHT? (POUNDS/FT)              1.700+1
 8 13:13:57 01646 >CASING SIZE O.D. (INCHES)               5.500+0
 9 13:13:57 01646 >BIT SIZE? (INCHES)                      7.875+0
10 13:13:59 01646 >MATRIX DENSITY? (1.5<RHOM<4.5)          2.710+0
11 13:13:59 01646 >FLUID DENSITY (.10<RHOF<1.2)            1.000+0
12 13:13:59 01646 >MUD DENSITY (#/GAL)                     9.500+0
13 13:14: 0 01646 >ANY BARITE IN THE MUD? (Y/N)            Y
14 13:14: 0 01646 >UN-FILTERED PE DATA? (Y/N)              N
15 13:14: 1 01646 >DSN BAD HOLE CORRECTION? (Y/N)          Y
16 13:14: 1 01646 >DSN STANDOFF? (INCHES)                  0.000+0
17 13:14: 1 01646 >LITHOLOGY:L=1,S=2,D=3,LS=4,LD=5           1
18 13:14: 2 01646 >FOR "F": DSN=1, DEN=2, CROSS=3            2
19 13:14: 2 01646 >FOR "F" USE: (.5<A<2.5)                 1.000+0
20 13:14: 2 01646 >FOR "F" USE: (1.2<M<2.5)                2.000+0
21 13:14:14 01646 >>LOG PARAMETERS UPDATED HERE
22 13:16:38 01579 >MATRIX DENSITY? (1.5<RHOM<4.5)          2.650+0
23 13:16:43 01576 >MUD DENSITY (#/GAL)                     1.000+1
24 13:16:58 01569 >LITHOLOGY:L=1,S=2,D=3,LS=4,LD=5           2
25 13:17: 3 01566 >FOR "F" USE: (.5<A<2.5)                 8.100-1
26 13:17: 6 01565 >>LOG PARAMETERS UPDATED HERE
27 13:19:50 01503 > SDL CLOSE MANDREL.
28 13:20:25 01481 > SDL STOP MANDREL.
29 13:20:36 01478 > SDL OPEN MANDREL.
30 13:22:27 01400 >LOGGING SECTION NO.                        2
31 13:29:12 01195 >"HALTING" END OF SECTION
32 13:29:13 01195 >"HALTING" END OF SECTION
33 13:29:49 01176 > SDL CLOSE MANDREL.
34 13:31:16 01149 >BIT SIZE? (INCHES)                      6.250+0
35 13:31:42 01149 >>LOG PARAMETERS UPDATED HERE
36 13:35:51 01149 > SDL OPEN MANDREL.
37 13:36:54 01812 >LOGGING SECTION NO.                        3
38 14:20: 6 00441 >"HALTING" END OF SECTION
39 14:21:32 00395 > SDL CLOSE MANDREL.
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