COMPANY: **NORTHWEST NATURAL GAS**

WELL: **I.W. 24C-23-65**

FIELD: **CALVIN CREEK GAS STORAGE**

COUNTY: **COLUMBIA** **STATE:** **OREGON**

COUNTY: COLUMBIA
Field: CALVIN CREEK GAS STORAGE
Location: 985.3' N & 1258.4' E FROM THE
Well: I.W. 24C-23-65
Company: NORTHWEST NATURAL GAS

Schlumberger

ARRAY INDUCTION
BHC SONIC /SP/GR
SCALE: 5" = 100'

LOCATION

985.3' N & 1258.4' E FROM THE
FROM THE SW CORNER OF 23

Elev.: K.B. 917.5 ft
G.L. 905 ft
D.F. 917.3 ft

Permanent Datum: GROUND LEVEL
Elev.: 905 ft
Log Measured From: K.B
above Perm. Datum
Drilling Measured From: K.B

API Serial No.	SECTION	TOWNSHIP	RANGE
36-009-00350	23	6N	5W

Logging Date		7-MAY-2000			
Run Number		1			
Depth Driller		2591 ft			
Schlumberger Depth		2590 ft			
Bottom Log Interval		2581 ft			
Top Log Interval		1725 ft			
Casing Driller Size @ Depth		8.625 in	@ 1724 ft	@	
Casing Schlumberger		1725 ft			
Bit Size		7.875 in			
Type Fluid In Hole		DMA			
MUD Density	Viscosity	8.8 lbm/gal	38 s		
Fluid Loss	PH	6.6 cm3	10.5		
Source Of Sample		FLOWLINE			
RM @ Measured Temperature		0.914 ohm.m	@ 68 degF	@	
RMF @ Measured Temperature		1.250 ohm.m	@ 52 degF	@	
RMC @ Measured Temperature		1.325 ohm.m	@ 52 degF	@	
Source RMF	RMC	PRESS	PRESS		
RM @ MRT	RMF @ MRT	0.692 @ 92	0.744 @ 92	@	@
Maximum Recorded Temperatures		92 degF	92	92	
Circulation Stopped	Time	7-MAY-2000	0:30		
Logger On Bottom	Time	7-MAY-2000			
Unit Number	Location	3152	SACRAMENTO		
Recorded By		M.KHAN			
Witnessed By		JACK MEYER			

		Run 1	Run 2	Run 3	Run 4
Logging Date					
Run Number					
Depth Driller					
Schlumberger Depth					
Bottom Log Interval					
Top Log Interval					
Casing Driller Size @ Depth		@		@	
Casing Schlumberger					
Bit Size					
Type Fluid In Hole					
MUD Density	Viscosity				
Fluid Loss	PH				
Source Of Sample					
RM @ Measured Temperature		@		@	
RMF @ Measured Temperature		@		@	
RMC @ Measured Temperature		@		@	
Source RMF	RMC				
RM @ MRT	RMF @ MRT	@	@	@	@
Maximum Recorded Temperatures					
Circulation Stopped	Time				
Logger On Bottom	Time				
Unit Number	Location				
Recorded By					
Witnessed By					

DISCLAIMER

THE USE OF AND RELIANCE UPON THIS RECORDED-DATA BY THE HEREIN NAMED COMPANY (AND ANY OF ITS AFFILIATES, PARTNERS, REPRESENTATIVES, AGENTS, CONSULTANTS AND EMPLOYEES) IS SUBJECT TO THE TERMS AND CONDITIONS AGREED UPON BETWEEN SCHLUMBERGER AND THE COMPANY, INCLUDING: (a) RESTRICTIONS ON USE OF THE RECORDED-DATA; (b) DISCLAIMERS AND WAIVERS OF WARRANTIES AND REPRESENTATIONS REGARDING COMPANY'S USE OF AND RELIANCE UPON THE RECORDED-DATA; AND (c) CUSTOMER'S FULL AND SOLE RESPONSIBILITY FOR ANY INFERENCE DRAWN OR DECISION MADE IN CONNECTION WITH THE USE OF THIS RECORDED-DATA.

OTHER SERVICES1	OTHER SERVICES2
OS1: FMI GR	OS1:
OS2:	OS2:
OS3:	OS3:
OS4:	OS4:
OS5:	OS5:

REMARKS: RUN NUMBER 1	REMARKS: RUN NUMBER 2

RUN 1

SERVICE ORDER #:
PROGRAM VERSION: 9C1-303
FLUID LEVEL: 0 ft

LOGGED INTERVAL	START	STOP

RUN 2

SERVICE ORDER #:
PROGRAM VERSION:
FLUID LEVEL:

LOGGED INTERVAL	START	STOP

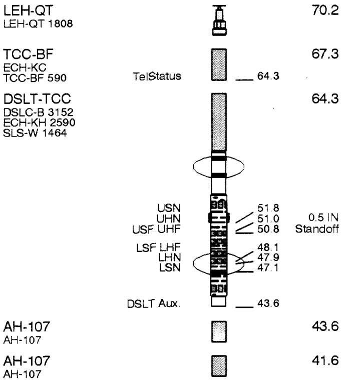
EQUIPMENT DESCRIPTION

RUN 1

SURFACE EQUIPMENT

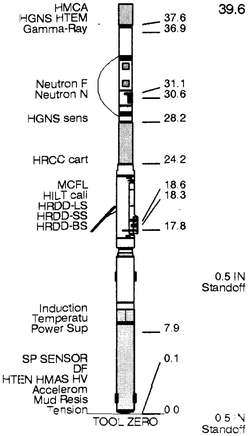
GSR-U/Y
NCT-B
CNB-AB
NCS-VB
WITM (CTS)-A

DOWNHOLE EQUIPMENT



RUN 2

HILTB-DTB
HTBCC
HMCA 756
HGNS-CAN-B
HGNS-H 828
NLS-KL
NSR-F
HACCZ
HCNT
HGR
HRCC-B 723
HRMS-B 723
HRGD 723
GLS-VJ 1924
MCFL Device
HILT Nucl. LS
HILT Nucl. SS
HILT Nucl. BS
AIT-H
AHIS-BA 112
AHRM-A
BOW-SPR
NPV-N



MAXIMUM STRING DIAMETER 4.88 IN
MEASUREMENTS RELATIVE TO TOOL ZERO
ALL LENGTHS IN FEET

Input DLIS Files

DEFAULT	HILTB .005	FN:4	PRODUCER	07-May-2000 05:35	2598.0 FT	1616.0 FT

Output DLIS Files

DEFAULT	HILTB .009	FN:8	PRODUCER	07-May-2000 07:06	2602.0 FT	1620.0 FT

OP System Version: 9C1-303

MCM

HILTB-DTB	OP91-KP1a	DSLT-TCC	OP91-KP1a
TCC-BF	OP91-KP1a		

PIP SUMMARY

⊣ Integrated Transit Time Minor Pip Every 1 MS
⊣ Integrated Transit Time Major Pip Every 10 MS

■ Time Mark Every 60 S

AIT-H 60 Inch Investigation (AHT60)
0.2 (OHMM) 20

AIT-H 30 Inch Investigation (AHT30)
0.2 (OHMM) 20

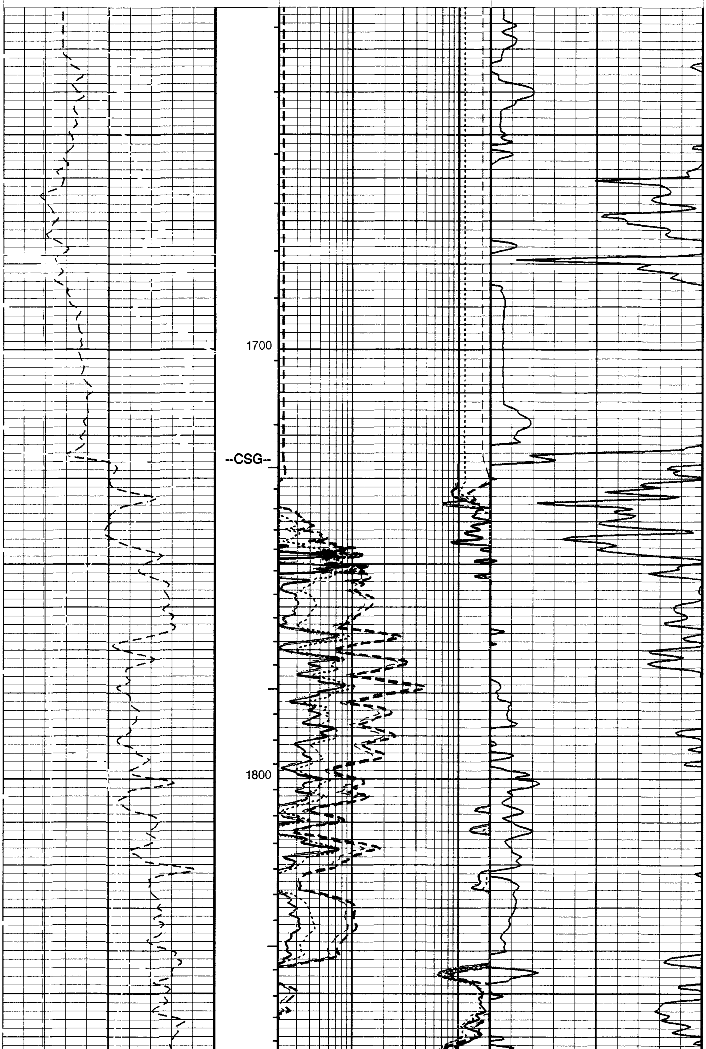
Gamma Ray (GR)
0 (GAPI) 150

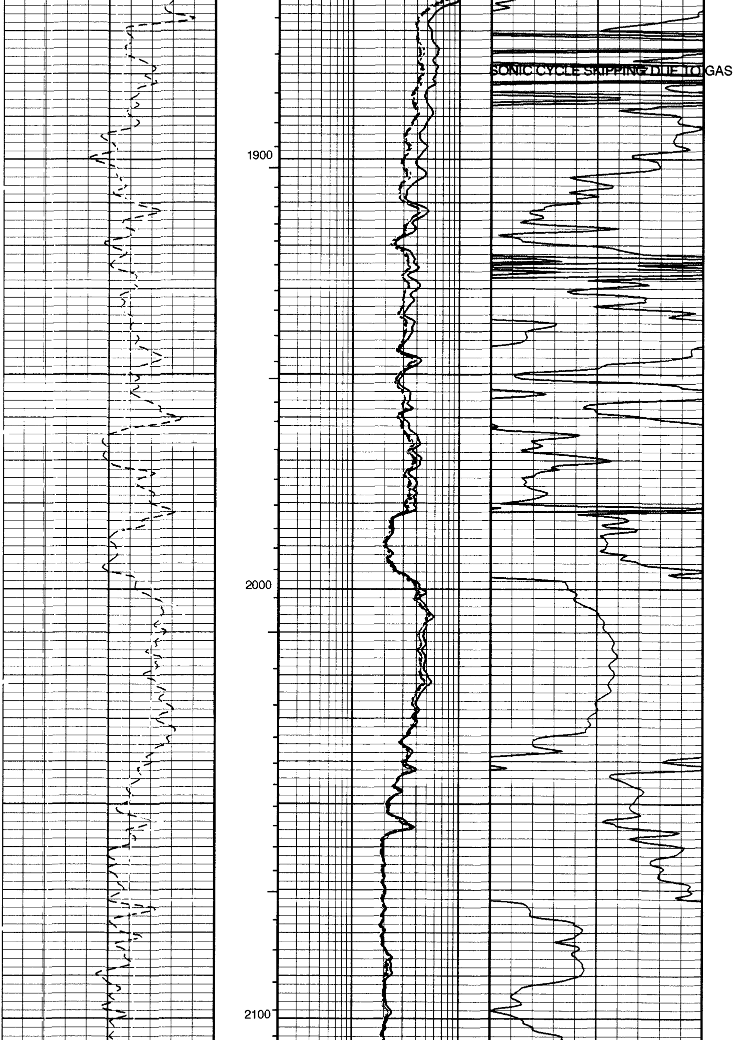
AIT-H 10 Inch Investigation (AHT10)
0.2 (OHMM) 20

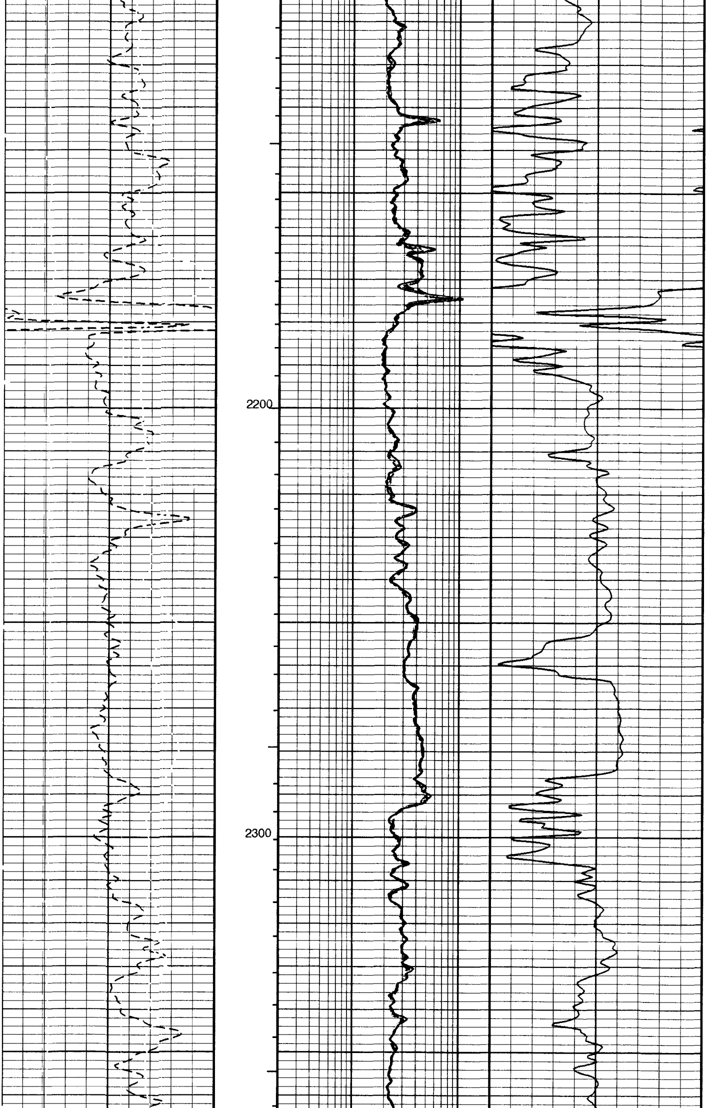
AIT-H 90 Inch Investigation (AHT90)
0.2 (OHMM) 20

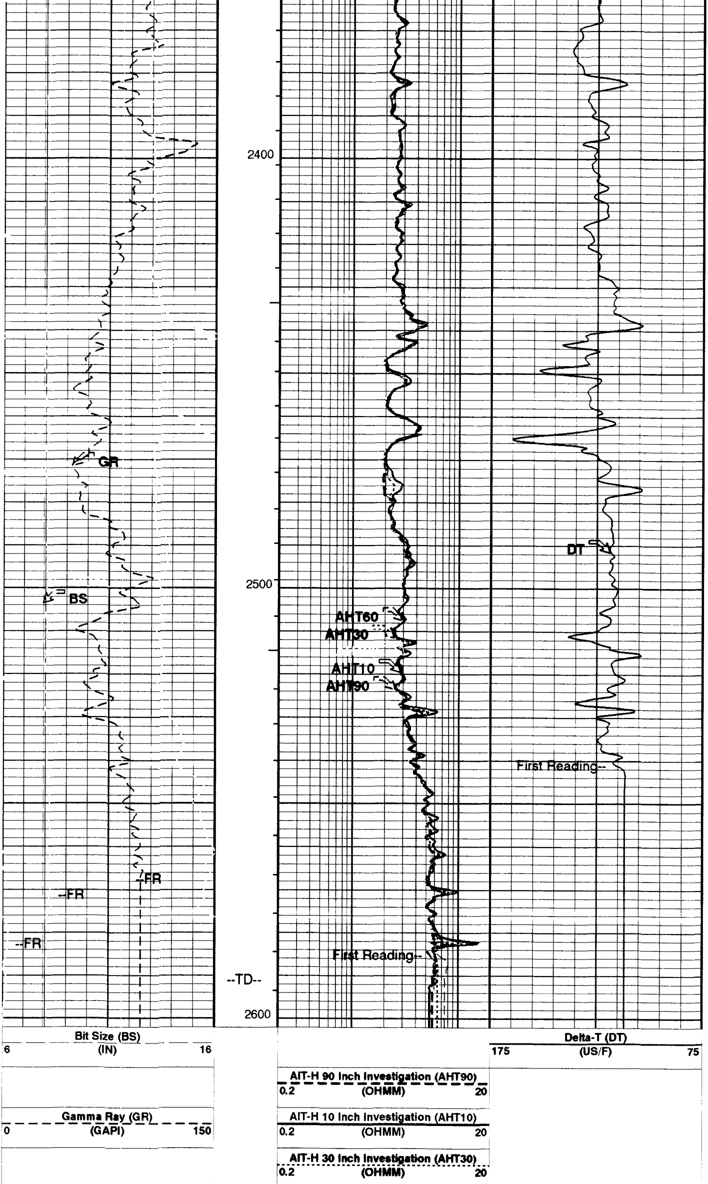
Bit Size (BS)
6 (IN) 16

Delta-T (DT)
175 (US/F) 75









AIT-H 60 Inch Investigation (AHT60)

0.2 (OHMM) 20

PIP SUMMARY

⊣ Integrated Transit Time Minor Pip Every 1 MS

⊣ Integrated Transit Time Major Pip Every 10 MS

▶ Time Mark Every 60 S

Parameters

DLIS Name	Description	Value	
AHBHM	Array Induction Borehole Correction Mode	2_ComputeStandoff	
AHBHV	Array Induction Borehole Correction Code Version Number	870	
AHBLM	Array Induction Basic Logs Mode	6_One_Two_and_Four	
AHBLV	Array Induction Basic Logs Code Version Number	973	
AHBPO	Array Induction Basic Logs Processing Option	Standard_Processing	
AHCDE	Array Induction Casing Detection Enable	Yes	
AHCEN	Array Induction Tool Centering Flag (in Borehole)	Eccentered	
AHCSED	Array Induction Casing Shoe Estimated Depth	-50000	FT
AHFRSV	Array Induction Response Set Version for Four ft Resolution	30.66.23.11	
AHMRF	Array Induction Mud Resistivity Factor	1	
AHORSV	Array Induction Response Set Version for One ft Resolution	30.66.23.11	
AHRFV	Array Induction Radial Profiling Code Version Number	700	
AHRPV	Array Induction Radial Parametrization Code Version Number	710	
AHSTA	Array Induction Tool Standoff	1.5	IN
AHTRSV	Array Induction Response Set Version for Two ft Resolution	30.66.23.11	
BHT	Bottom Hole Temperature (used in calculations)	92	DEGF
BS	Bit Size	7.875	IN
DFD	Drilling Fluid Density	8.80	LB/G
DO	Depth Offset for Logical Unit 1	4.0	FT
DORL	Depth Offset Repeat Analysis	5.0	FT
DTCM	Delta-T Computation Mode	FULL	
FEXP	Form Factor Exponent	2	
FNUM	Form Factor Numerator	1	
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	35	DEG
GGRD	Geothermal Gradient	0.01	DF/F
GRSE	Generalized Mud Resistivity Selection	AITH_RESIST	
GTSE	Generalized Temperature Selection	LINEAR_ESTIMATE	
HSCM	HILT Speed Correction Mode	NO_SC	
HSTI	STI Uses HILT Acceleration	YES	
MODE	Sonic Firing Mode	BHC	
PP	Playback Processing	NORMAL	
SHT	Surface Hole Temperature	68	DEGF
SPNV	SP Next Value	0	MV
TD	Total Depth	2591	FT

Format: AITSON   Vertical Scale: 5" per 100'   Graphics File Created: 07-May-2000 07:06

OP System Version: 9C1-303

MCM

HILTB-DTB	OP91-KP1a	DSLT-TCC	OP91-KP1a
TCC-BF	OP91-KP1a		

Input DLIS Files

DEFAULT	HILTB .005	FN:4	PRODUCER	07-May-2000 05:35	2598.0 FT	1616.0 FT

Output DLIS Files

DEFAULT	HILTB .009	FN:8	PRODUCER	07-May-2000 07:06

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REPEAT SECTION

MAXIS 500 Field Log

Input DLIS Files

DEFAULT	HILTB .005	FN:4	PRODUCER	07-May-2000 05:35	2598.0 FT	1616.0 FT
DEFAULT	HILTB .006	FN:5	PRODUCER	07-May-2000 06:05	2100.0 FT	1614.5 FT

Output DLIS Files

DEFAULT	HILTB .009	FN:8	PRODUCER	07-May-2000 07:06	2602.0 FT	1620.0 FT

OP System Version: 9C1-303

MCM

HILTB-DTB	OP91-KP1a	DSLT-TCC	OP91-KP1a
TCC-BF	OP91-KP1a		

PIP SUMMARY

┤ Integrated Transit Time Minor Pip Every 1 MS
─┤ Integrated Transit Time Major Pip Every 10 MS

■ Time Mark Every 60 S

AHT60_REP Curve (AHT60_REP)
0.2 (OHMM) 20

RWA_REP Curve (RWA_REP)
0 (OHMM) 3

AHT30_REP Curve (AHT30_REP)
0.2 (OHMM) 20

REPEAT ANALYSIS

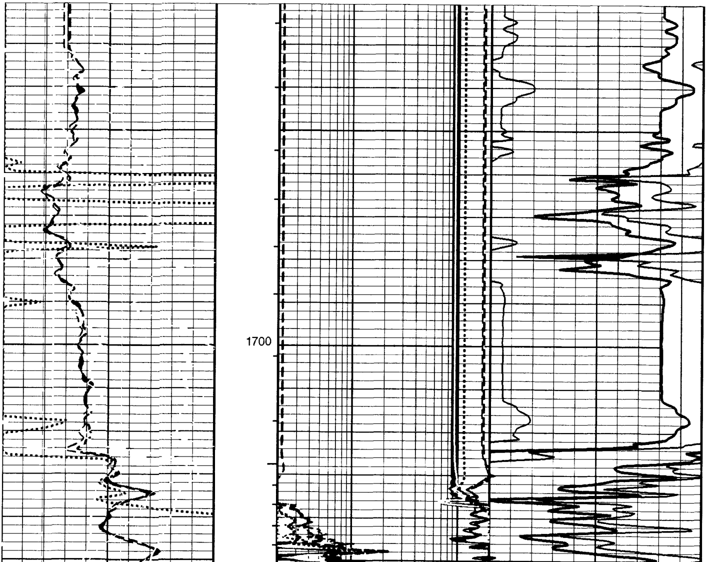
GR_REP Curve (GR_REP)
0 (GAPI) 150

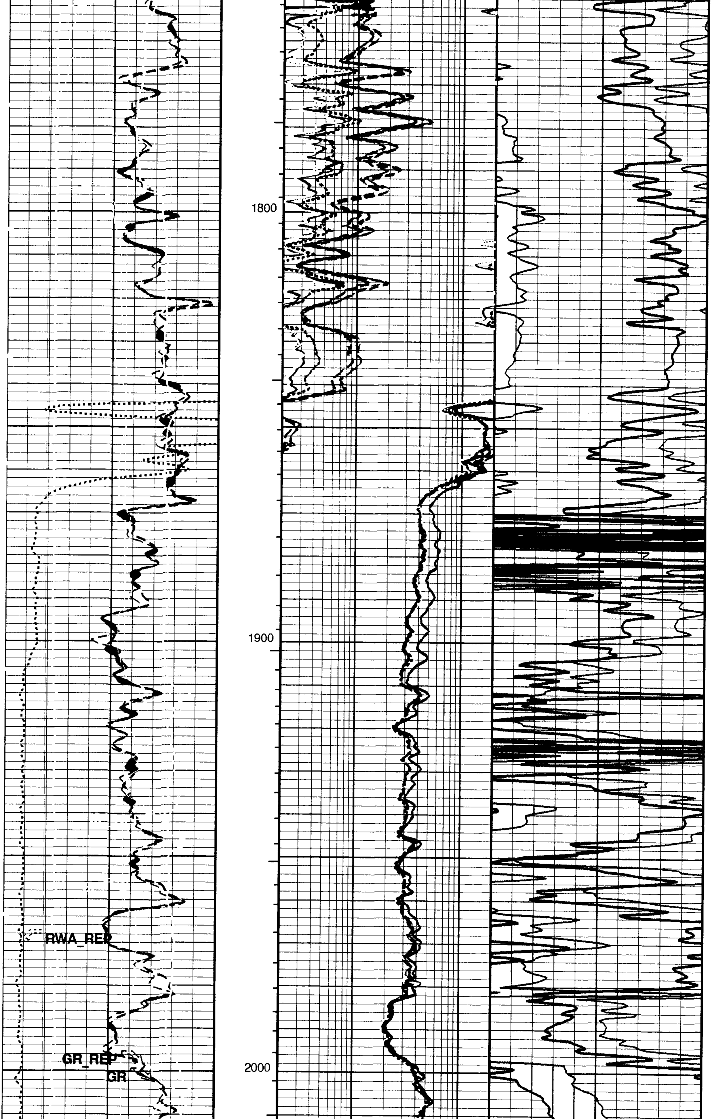
AHT10_REP Curve (AHT10_REP)
0.2 (OHMM) 20

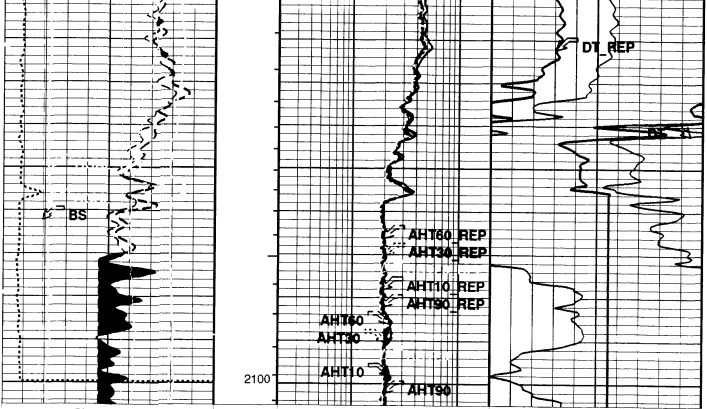
Bit Size (BS)
6 (IN) 16

AHT90_REP Curve (AHT90_REP)
0.2 (OHMM) 20

DT_REP Curve (DT_REP)
150 (US/F) 50







Bit Size (BS)
6 (IN) 16

AHT90_REP Curve (AHT90_REP)
0.2 (OHMM) 20

DT_REP Curve (DT_REP)
150 (US/F) 50

AHT10_REP Curve (AHT10_REP)
0.2 (OHMM) 20

GR_REP Curve (GR_REP)
0 (GAPI) 150

RWA_REP Curve (RWA_REP)
0 (OHMM) 3

AHT30_REP Curve (AHT30_REP)
0.2 (OHMM) 20

AHT60_REP Curve (AHT60_REP)
0.2 (OHMM) 20

REPEAT ANALYSIS

PIP SUMMARY

⊣ Integrated Transit Time Minor Pip Every 1 MS
⊣ Integrated Transit Time Major Pip Every 10 MS

Time Mark Every 60 S

Parameters

DLIS Name	Description	Value	
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AHBHV	Array Induction Borehole Correction Code Version Number	870	
AHBLM	Array Induction Basic Logs Mode	6_One_Two_and_Four	
AHBLV	Array Induction Basic Logs Code Version Number	973	
AHBPO	Array Induction Basic Logs Processing Option	Standard_Processing	
AHCDE	Array Induction Casing Detection Enable	Yes	
AHCEN	Array Induction Tool Centering Flag (in Borehole)	Eccentered	
AHCSED	Array Induction Casing Shoe Estimated Depth	-50000	FT
AHFRSV	Array Induction Response Set Version for Four ft Resolution	30.66.23.11	
AHMRF	Array Induction Mud Resistivity Factor	1	
AHORSV	Array Induction Response Set Version for One ft Resolution	30.66.23.11	
AHRFV	Array Induction Radial Profiling Code Version Number	700	
AHRPV	Array Induction Radial Parametrization Code Version Number	710	
AHSTA	Array Induction Tool Standoff	1.5	IN
AHTRSV	Array Induction Response Set Version for Two ft Resolution	30.66.23.11	
BHT	Bottom Hole Temperature (used in calculations)	92	DEGF
BS	Bit Size	7.875	IN
DFD	Drilling Fluid Density	8.80	LB/G
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DORL	Depth Offset Repeat Analysis	5.0	FT
DTCM	Delta-T Computation Mode	FULL	
FEXP	Form Factor Exponent	2	
FNUM	Form Factor Numerator	1	
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	35	DEG
GGRD	Geothermal Gradient	0.01	DF/F
GRSE	Generalized Mud Resistivity Selection	AITH_RESIST	
GTSE	Generalized Temperature Selection	LINEAR_ESTIMATE	
HSCM	HILT Speed Correction Mode	NO_SC	
HSTI	STI Uses HILT Acceleration	YES	
MODE	Sonic Firing Mode	BHC	
PP	Playback Processing	NORMAL	
SHT	Surface Hole Temperature	68	DEGF
SPNV	SP Next Value	0	MV
TD	Total Depth	2591	FT

Format: AITSON_REP Vertical Scale: 5" per 100' Graphics File Created: 07-May-2000 07:06

OP System Version: 9C1-303
MCM

HILTB-DTB	**OP91-KP1a**	**DSLT-TCC**	**OP91-KP1a**
TCC-BF	**OP91-KP1a**		

Input DLIS Files

DEFAULT	**HILTB .005**	**FN:4**	**PRODUCER**	**07-May-2000 05:35**	**2598.0 FT**	**1616.0 FT**
DEFAULT	**HILTB .006**	**FN:5**	**PRODUCER**	**07-May-2000 06:05**	**2100.0 FT**	**1614.5 FT**

Output DLIS Files

DEFAULT	**HILTB .009**	**FN:8**	**PRODUCER**	**07-May-2000 07:06**

Schlumberger

CALIBRATIONS

MAXIS 500 Field Log

Calibration and Check Summary

Measurement	Nominal	Master	Before	After	Change	Limit	Units
High resolution Integrated Logging Tool-CTS Wellsite Calibration - Electronics Calibration Check - Thru Cal Mag. & Phase Master: Calibration out of date 20-JAN-2000 11:39 Before: 7-MAY-2000 5:47							
Thru Cal Magnitude - 0	0	0.6214	0.6314	N/A	N/A	N/A	V
Thru Cal Magnitude - 1	0	1.274	1.294	N/A	N/A	N/A	V
Thru Cal Magnitude - 2	0	0.6329	0.6429	N/A	N/A	N/A	V
Thru Cal Magnitude - 3	0	0.7152	0.7270	N/A	N/A	N/A	V
Thru Cal Magnitude - 4	0	1.335	1.356	N/A	N/A	N/A	V
Thru Cal Magnitude - 5	0	1.943	1.975	N/A	N/A	N/A	V
Thru Cal Magnitude - 6	0	1.947	1.979	N/A	N/A	N/A	V
Thru Cal Magnitude - 7	0	1.371	1.399	N/A	N/A	N/A	V
Phase - 0	0	64.91	65.76	N/A	N/A	N/A	DEG
Phase - 1	0	63.80	64.66	N/A	N/A	N/A	DEG
Phase - 2	0	60.03	60.92	N/A	N/A	N/A	DEG
Phase - 3	0	59.25	60.14	N/A	N/A	N/A	DEG
Phase - 4	0	52.91	53.86	N/A	N/A	N/A	DEG
Phase - 5	0	50.96	51.96	N/A	N/A	N/A	DEG
Phase - 6	0	50.92	51.91	N/A	N/A	N/A	DEG
Phase - 7	0	47.08	48.43	N/A	N/A	N/A	DEG
High resolution Integrated Logging Tool-CTS Wellsite Calibration - Electronics Calibration Check - Auxilliary Master: Calibration out of date 20-JAN-2000 11:39 Before: 7-MAY-2000 5:47							
Array Induction SPA Plus	990.5	989.8	991.2	N/A	N/A	N/A	MV
Array Induction SPA Zero	0	0.1083	0.07563	N/A	N/A	N/A	MV
Array Induction Temperature Pl	0.9150	0.9169	0.9183	N/A	N/A	N/A	V
Array Induction Temperature Ze	0	0.0001095	0.00007744	N/A	N/A	N/A	V
High resolution Integrated Logging Tool-CTS Wellsite Calibration - Test Loop Gain Correction Master: Calibration out of date 20-JAN-2000 11:39							
Test Loop Gain Magnitude - 0	0	1.042	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude - 1	0	1.011	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude - 2	0	1.012	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude - 3	0	1.010	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude - 4	0	0.9940	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude - 5	0	0.9835	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude - 6	0	0.9934	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude - 7	0	0.9945	N/A	N/A	N/A	N/A	V
Phase - 0	0	0.3672	N/A	N/A	N/A	N/A	DEG
Phase - 1	0	-0.6191	N/A	N/A	N/A	N/A	DEG
Phase - 2	0	-0.01578	N/A	N/A	N/A	N/A	DEG
Phase - 3	0	0.1871	N/A	N/A	N/A	N/A	DEG
Phase - 4	0	0.1325	N/A	N/A	N/A	N/A	DEG
Phase - 5	0	-0.1680	N/A	N/A	N/A	N/A	DEG
Phase - 6	0	0.2889	N/A	N/A	N/A	N/A	DEG
Phase - 7	0	-0.2642	N/A	N/A	N/A	N/A	DEG
High resolution Integrated Logging Tool-CTS Wellsite Calibration - Sonde Error Correction Master: Calibration out of date 20-JAN-2000 11:39							
R Sonde Error Correction - 0	0	-121.4	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction - 1	0	149.7	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction - 2	0	113.9	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction - 3	0	58.40	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction - 4	0	24.16	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction - 5	0	11.87	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction - 6	0	7.431	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction - 7	0	-3.605	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction - 0	0	34.14	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction - 1	0	-240.4	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction - 2	0	67.33	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction - 3	0	81.72	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction - 4	0	-1.172	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction - 5	0	-10.09	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction - 6	0	10.78	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction - 7	0	0.3313	N/A	N/A	N/A	N/A	MM/M

High resolution Integrated Logging Tool-CTS Wellsite Calibration - Mud Gain Correction
Master: Calibration out of date 20-JAN-2000 11:39

Coarse - Mag, Real, Imag - 0	0	1.013	N/A	N/A	N/A	N/A
Coarse - Mag, Real, Imag - 1	0	1.013	N/A	N/A	N/A	N/A
Coarse - Mag, Real, Imag - 2	0	1.013	N/A	N/A	N/A	N/A
Fine - Mag, Real, Imag - 0	0	1.011	N/A	N/A	N/A	N/A
Fine - Mag, Real, Imag - 1	0	1.011	N/A	N/A	N/A	N/A
Fine - Mag, Real, Imag - 2	0	1.011	N/A	N/A	N/A	N/A

High resolution Integrated Logging Tool-CTS Wellsite Calibration - Stab Measurement Summary
Before: 7-MAY-2000 5:52

BS Window Ratio	1.033	N/A	1.022	N/A	N/A	N/A	
BS Window Sum	14310	N/A	14410	N/A	N/A	N/A	CPS
SS Window Ratio	0.5004	N/A	0.5048	N/A	N/A	N/A	
SS Window Sum	11490	N/A	11420	N/A	N/A	N/A	CPS
LS Window Ratio	0.2862	N/A	0.2864	N/A	N/A	N/A	
LS Window Sum	1163	N/A	1156	N/A	N/A	N/A	CPS

High resolution Integrated Logging Tool-CTS Wellsite Calibration - Photo-multiplier High Voltages Calibrations
Before: 7-MAY-2000 5:52

BS PM High Voltage (Command)	1614	N/A	1634	N/A	N/A	N/A	V
SS PM High Voltage (Command)	1916	N/A	1955	N/A	N/A	N/A	V
LS PM High Voltage (Command)	1966	N/A	1974	N/A	N/A	N/A	V

High resolution Integrated Logging Tool-CTS Wellsite Calibration - Crystal Quality Resolutions Calibration
Before: 7-MAY-2000 5:52

BS Crystal Resolution	12.26	N/A	12.52	N/A	N/A	N/A	%
SS Crystal Resolution	11.63	N/A	12.18	N/A	N/A	N/A	%
LS Crystal Resolution	10.59	N/A	10.66	N/A	N/A	N/A	%

High resolution Integrated Logging Tool-CTS Wellsite Calibration - MCFL Calibration
Before: Calibration not done

Raw B0 Resistivity	3875	N/A	N/A	N/A	N/A	N/A	OHMM
Raw B1 Resistivity	3830	N/A	N/A	N/A	N/A	N/A	OHMM
Raw B2 Resistivity	3830	N/A	N/A	N/A	N/A	N/A	OHMM

High resolution Integrated Logging Tool-CTS Wellsite Calibration - HILT Caliper Calibration
Before: 28-APR-2000 22:56

HILT Caliper Zero Measurement	8.000	N/A	7.316	N/A	N/A	N/A	IN
HILT Caliper Plus Measurement	16.00	N/A	15.86	N/A	N/A	N/A	IN

High resolution Integrated Logging Tool-CTS Wellsite Calibration - Detector Calibration
Before: 7-MAY-2000 5:47

Gamma Ray Background	30.00	N/A	23.06	N/A	N/A	N/A	GAPI
Gamma Ray (Jig - Bkg)	193.6	N/A	193.6	N/A	N/A	17.60	GAPI
Gamma Ray (Calibrated)	165.0	N/A	173.7	N/A	N/A	15.00	GAPI

High resolution Integrated Logging Tool-CTS Wellsite Calibration - Zero Measurement
Master: 6-APR-2000 5:31 Before: 7-MAY-2000 5:49

CNTC Background	27.31	27.31	26.03	N/A	N/A	4.096	CPS
CFTC Background	28.31	28.31	30.62	N/A	N/A	4.247	CPS

High resolution Integrated Logging Tool-CTS Wellsite Calibration - Accelerometer Calibration
Before: Calibration not done

Z-Axis Acceleration	32.19	N/A	32.19	N/A	N/A	N/A	F/S2

The GLS-VJ source activity is acceptable.

The HGNS Neutron Master Calibration was done with the following parameters :

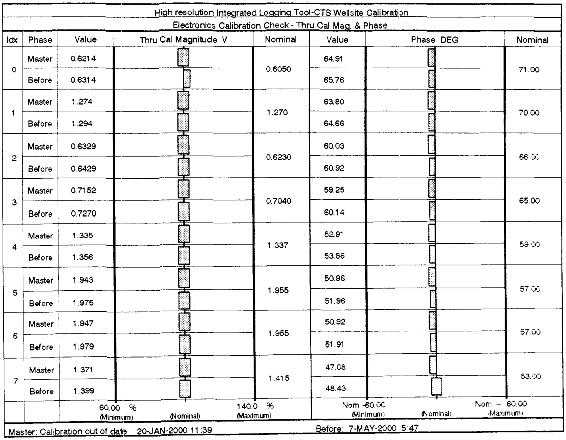
NCT-B Water Temperature 90.0 DEGF.
Thermal Housing Size 3.375 IN.

High resolution Integrated Logging Tool-CTS / Equipment Identification

Primary Equipment:

Array Induction Tool - H	AIT - H	
Rm/SP Bottom Nose	AHRM - A	
Array Induction Sonde	AHIS - BA	112
HILT high-Resolution Mechanical Sonde	HRMS - B	723
HILT Rxo Gamma-ray Device	HRGD -	723
HILT Nuclear Back-Scatter Detector	HILT -	
HILT Nuclear Short-Spacing Detector	HILT -	
HILT Nuclear Long-Spacing Detector	HILT -	

Auxiliary Equipment:

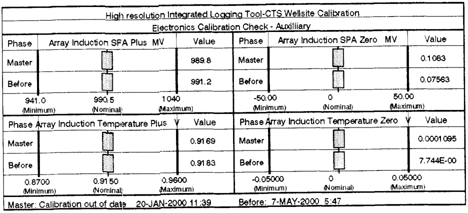


High resolution Integrated Logging Tool-CTS Wellsite Calibration

Electronics Calibration Check - Thru Cal Mag. & Phase

Idx	Phase	Value	Thru Cal Magnitude V	Nominal	Value	Phase DEG	Nominal
0	Master	0.6214		0.6050	64.91		71.00
	Before	0.6314			65.76		
1	Master	1.274		1.270	63.80		70.00
	Before	1.294			64.66		
2	Master	0.6329		0.6230	60.03		66.00
	Before	0.6429			60.92		
3	Master	0.7152		0.7040	59.25		65.00
	Before	0.7270			60.14		
4	Master	1.335		1.337	52.91		59.00
	Before	1.356			53.86		
5	Master	1.943		1.955	50.96		57.00
	Before	1.975			51.96		
6	Master	1.947		1.955	50.92		57.00
	Before	1.979			51.91		
7	Master	1.371		1.415	47.08		53.00
	Before	1.399			48.43		
		60.00 % (Minimum)	(Nominal)	140.0 % (Maximum)	Nom -60.00 (Minimum)	(Nominal)	Nom - 60.00 (Maximum)

Master: Calibration out of date 20-JAN-2000 11:39 Before: 7-MAY-2000 5:47



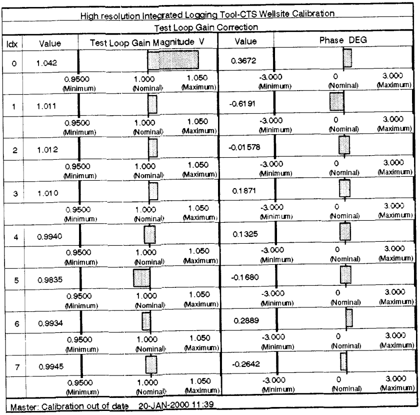
High resolution Integrated Logging Tool-CTS Wellsite Calibration

Electronics Calibration Check - Auxilliary

Phase	Array Induction SPA Plus MV	Value	Phase	Array Induction SPA Zero MV	Value
Master		989.8	Master		0.1083
Before		991.2	Before		0.07563
	941.0 (Minimum) 990.5 (Nominal) 1040 (Maximum)			-50.00 (Minimum) 0 (Nominal) 50.00 (Maximum)	

Phase	Array Induction Temperature Plus V	Value	Phase	Array Induction Temperature Zero V	Value
Master		0.9169	Master		0.0001095
Before		0.9183	Before		7.744E-00
	0.8700 (Minimum) 0.9150 (Nominal) 0.9600 (Maximum)			-0.05000 (Minimum) 0 (Nominal) 0.05000 (Maximum)	

Master: Calibration out of date 20-JAN-2000 11:39 Before: 7-MAY-2000 5:47



High resolution Integrated Logging Tool-CTS Wellsite Calibration

Test Loop Gain Correction

Idx	Value	Test Loop Gain Magnitude V	Value	Phase DEG
0	1.042		0.3672	
		0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)		-3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
1	1.011		-0.6191	
		0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)		-3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
2	1.012		-0.01578	
		0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)		-3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
3	1.010		0.1871	
		0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)		-3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
4	0.9940		0.1325	
		0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)		-3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
5	0.9835		-0.1680	
		0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)		-3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
6	0.9934		0.2889	
		0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)		-3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
7	0.9945		-0.2642	
		0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)		-3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)

Master: Calibration out of date 20-JAN-2000 11:39

High resolution Integrated Logging Tool-CTS Wellsite Calibration

Sonde Error Correction

Idx	Value	R Sonde Error Correction MM/M			Value	X Sonde Error Correction MM/M		
		(Minimum)	(Nominal)	(Maximum)		(Minimum)	(Nominal)	(Maximum)
0	-121.4	-231.0	-56.00	119.0	34.14	-2250	0	2250
1	149.7	114.0	159.0	204.0	-240.4	-625.0	0	625.0
2	113.9	66.00	111.0	156.0	67.33	-350.0	0	350.0
3	58.40	39.00	64.00	89.00	81.72	-250.0	0	250.0
4	24.16	15.00	25.00	35.00	-1.172	-63.00	0	63.00
5	11.87	4.000	14.00	24.00	-10.09	-50.00	0	50.00
6	7.431	5.000	10.00	15.00	10.78	-30.00	0	30.00
7	-3.605	-5.000	0	5.000	0.3313	-30.00	0	30.00

Master: Calibration out of date 20-JAN-2000 11:39

High resolution Integrated Logging Tool-CTS Wellsite Calibration

Mud Gain Correction

Idx	Value	Coarse - Mag, Real, Imag			Value	Fine - Mag, Real, Imag		
		(Minimum)	(Nominal)	(Maximum)		(Minimum)	(Nominal)	(Maximum)
0	1.013	0.8000	1.000	1.200	1.011	0.8000	1.000	1.200
1	1.013	0.8000	1.000	1.200	1.011	0.8000	1.000	1.200
2	1.013	0.8000	1.000	1.200	1.011	0.8000	1.000	1.200

Master: Calibration out of date 20-JAN-2000 11:39

High resolution Integrated Logging Tool-CTS Wellsite Calibration

Stab Measurement Summary

Phase	BS Window Ratio			Value	Phase	SS Window Ratio			Value	Phase	LS Window Ratio			Value
	(Minimum)	(Nominal)	(Maximum)			(Minimum)	(Nominal)	(Maximum)			(Minimum)	(Nominal)	(Maximum)	
Before	0.9818	1.033	1.085	1.022	Before	0.4754	0.5004	0.5255	0.5048	Before	0.2719	0.2862	0.3005	0.2864

Phase	BS Window Sum CPS			Value	Phase	SS Window Sum CPS			Value	Phase	LS Window Sum CPS			Value
	(Minimum)	(Nominal)	(Maximum)			(Minimum)	(Nominal)	(Maximum)			(Minimum)	(Nominal)	(Maximum)	
Before	13590	14310	15020	14410	Before	10920	11490	12070	11420	Before	1105	1163	1221	1156

Before: 7-MAY-2000 5:52

High resolution Integrated Logging Tool-CTS Wellsite Calibration

Photo-multiplier High Voltages Calibrations

Phase	BS PM High Voltage (Command) V			Value	Phase	SS PM High Voltage (Command) V			Value	Phase	LS PM High Voltage (Command) V			Value
	(Minimum)	(Nominal)	(Maximum)			(Minimum)	(Nominal)	(Maximum)			(Minimum)	(Nominal)	(Maximum)	
Before	1514	1614	1714	1634	Before	1816	1916	2016	1955	Before	1866	1966	2066	1974

Before: 7-MAY-2000 5:52

High resolution Integrated Logging Tool-CTS Wellsite Calibration

Crystal Quality Resolutions Calibration

Phase	BS Crystal Resolution %			Value	Phase	SS Crystal Resolution %			Value	Phase	LS Crystal Resolution %			Value
	(Minimum)	(Nominal)	(Maximum)			(Minimum)	(Nominal)	(Maximum)			(Minimum)	(Nominal)	(Maximum)	
Before	11.26	12.26	13.26	12.52	Before	10.63	11.63	12.63	12.18	Before	9.591	10.59	11.59	10.66

Before: 7-MAY-2000 5:52

High resolution Integrated Logging Tool-CTS Wellsite Calibration

MCFL Calibration

Phase	Raw B0 Resistivity OHMM			Value	Phase	Raw B1 Resistivity OHMM			Value	Phase	Raw B2 Resistivity OHMM			Value
Before		NOT DONE		N/A	Before		NOT DONE		N/A	Before		NOT DONE		N/A
	3565 (Minimum)	3875 (Nominal)	4185 (Maximum)			3524 (Minimum)	3830 (Nominal)	4136 (Maximum)			3524 (Minimum)	3830 (Nominal)	4136 (Maximum)	

Before: Calibration not done

High resolution Integrated Logging Tool-CTS Wellsite Calibration

HILT Caliper Calibration

Phase	HILT Caliper Zero Measurement IN	Value	Phase	HILT Caliper Plus Measurement IN	Value
Before		7.316	Before		15.86
	6.000 (Minimum) 8.000 (Nominal) 10.00 (Maximum)			12.00 (Minimum) 16.00 (Nominal) 20.00 (Maximum)	

Before: 28-APR-2000 22:56

High resolution Integrated Logging Tool-CTS Wellsite Calibration

Detector Calibration

Phase	Gamma Ray Background GAPI	Value	Phase	Gamma Ray (Jig - Bkg) GAPI	Value	Phase	Gamma Ray (Calibrated) GAPI	Value
Before		23.06	Before		193.6	Before		173.7
	0 (Minimum) 30.00 (Nominal) 120.0 (Maximum)			176.0 (Minimum) 193.6 (Nominal) 211.2 (Maximum)			150.0 (Minimum) 165.0 (Nominal) 180.0 (Maximum)	

Before: 7-MAY-2000 5:47

High resolution Integrated Logging Tool-CTS Wellsite Calibration

Zero Measurement

Phase	CNTC Background CPS	Value	Phase	CFTC Background CPS	Value
Master		27.31	Master		28.31
Before		26.03	Before		30.62
	5.000 (Minimum) 27.31 (Nominal) 40.00 (Maximum)			5.000 (Minimum) 28.31 (Nominal) 40.00 (Maximum)	

Master: 6-APR-2000 5:31

Before: 7-MAY-2000 5:49

High resolution Integrated Logging Tool-CTS Wellsite Calibration

Accelerometer Calibration

Phase	Z-Axis Acceleration F/S2	Value
Before		32.19
	31.53 (Minimum) 32.19 (Nominal) 32.84 (Maximum)	

Before: Calibration not done

COMPANY: NORTHWEST NATURAL GAS

WELL: I.W. 24C-23-65

FIELD: CALVIN CREEK GAS STORAGE

COUNTY: COLUMBIA

STATE: OREGON

BOTTOM LOG INTERVAL	2581 ft
SCHLUMBERGER DEPTH	2590 ft
DEPTH DRILLER	2591 ft
KELLY BUSHING	917.5 ft
DRILL FLOOR	917.3 ft
GROUND LEVEL	905 ft

Schlumberger

ARRAY INDUCTION
BHC SONIC /SP/GR
SCALE: 5" = 100'