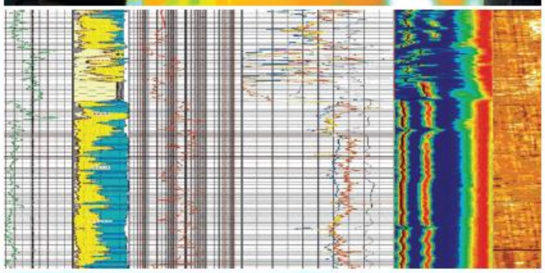
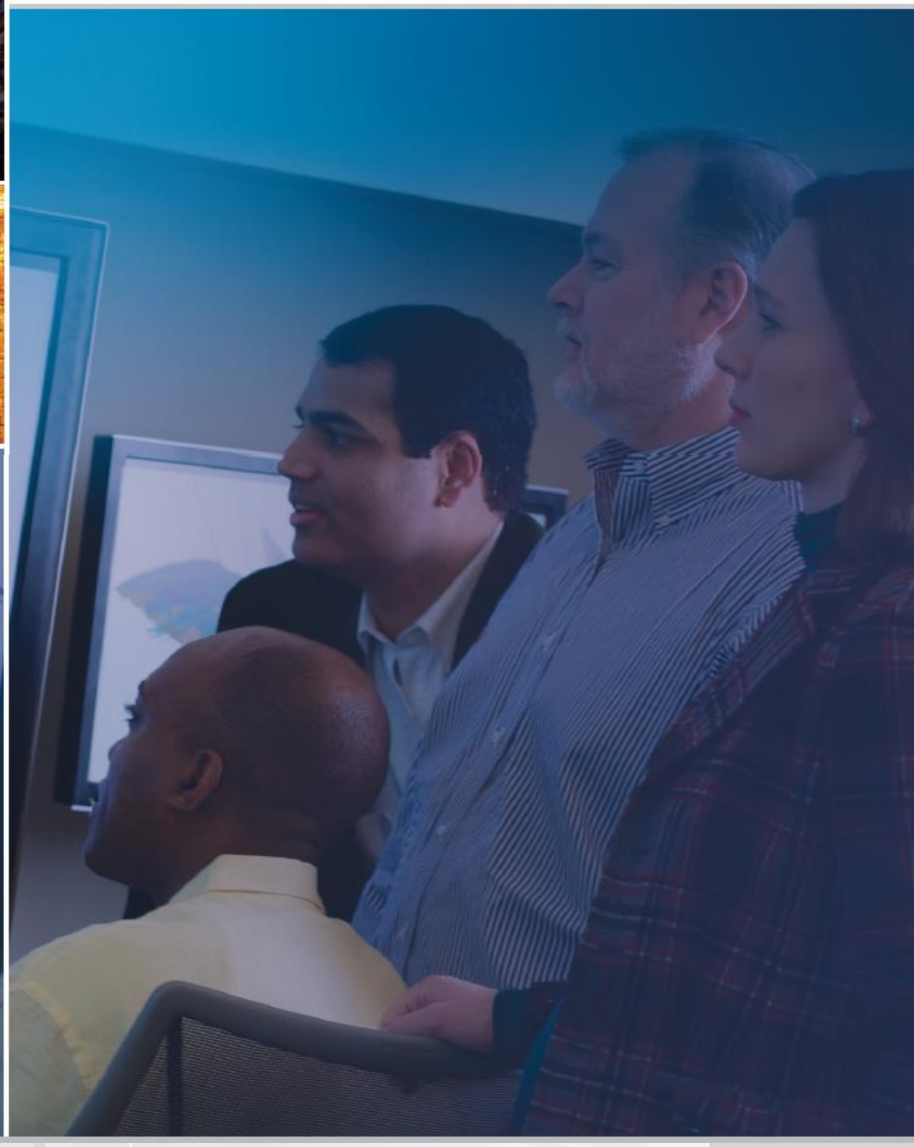


PetroTechnical Services



Company	Shell Gulf of Mexico, Inc
Well	OCS-Y 02321 001 ST00BP00
Section:	8.5”
Field:	Posey 6912
Area	Chukchi Sea
Country:	U.S.A.
Report by:	WL: R Morrissey, P. Trofimoff PTS: A Shende
Reviewed by :	H Dumont
Logging Date:	23-Sept-2015
Report Date:	5-Oct-2015
Run:	R1D2

Modular Formation Dynamics Tester Data Evaluation Report

PROPRIETARY

Schlumberger

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1 Executive Summary

This report presents the evaluation and interpretation of the MDT pretest & sampling data from the well OCS-Y 02321 001 ST00BP00, for the Runs 1 and 2 in the 8.5" section. A LFA was used for downhole fluid analysis (DFA) and an Extra Large Diameter probe was used for sampling.

As part of the acquisition program, 20 pretest stations were attempted resulting in 11 good, 4 medium and 3 low quality pressures as well as 1 tight and 1 dry test. 3 DFA stations were attempted and 4 non compensated (450 cc MPSR) samples were collected.

Pressure gradient analysis and sampling stations indicated that both the sands in this well are water bearing. A water gradient of 1.004 g/cc(0.435 psi/ft) could be obtained in the top zone, indicating the two lobes in this zone, might be connected to each other. Along with pressures, 3 DFA stations gave water samples and confirmed that the formation is water bearing.

Thus, the MDT program resulted in acquisition of 18 valid pressures and 4 downhole water samples and confirmed reservoir had water bearing sands.

2 Interpretation Summary

2.1 Introduction

20 stations were attempted resulting in 11 good, 4 medium and 3 low quality formation pressures. 1 tight and 1 dry test were also seen. 3 Downhole fluid analysis stations were completed and 4 MPSR bottles were filled.

2.2 Comments

MDT Runs 1 and 2 were performed on 23-Sept-2015 in the 8.5" section, drilled with 12 lbm/gal SOBM mud. A LFA was used for downhole fluid analysis. One Large Diameter and one Extra-Large Diameter probe with CQG gauges were used to take 20 pressure and 3 sampling stations. The sampling modules MRMS1 and MRMS2 were used to attempt 4 MPSR samples.

MDT Stations were processed with InSitu Pro to get the best pressure and mobility for each station.

TVD depths calculated from directional survey dated 23-Sept-2015.

2.3 Interpretation Comments

Zones were created based on pressures and petrophysical log data. They are for interpretation purposes only.

Zone 1 5867 ft TVD

15 pretest stations were attempted in this 100 ft zone, resulting in 10 good, 2 medium and 2 low quality pressures as well as 1 tight test. Pressures ranged between 3150.63- 3187.02 psia and mobilities were between 0.3-33.8 mD/cP . A water gradient of 1.004 g/cc(0.435 psi/ft) could be obtained from 7 good pressures. This was confirmed when water was sampled at the two DFA/ sampling stations in the zone. The gradient indicates the two lobes in this sand, might be connected to each other. Pressures taken in the low mobility streak between the two lobes, seem supercharged. There is a possibility of sanding in these stations, since water is seen earlier in the AFA, which is below the LFA

2 sampling stations (Files 1 and 2) were acquired at 5922.09 ft MD (5919.3 ft TVD) and 5882.39 ft MD (5879.67 ft TVD) respectively and LFA indicated water in both of them. 1 MPSR (450 cc) sample was successfully collected from the bottom lobe of the sand in File 1 with an Extra-Large diameter probe

Zone 2 6449 ft TVD

5 pretest stations were attempted in this 60 ft interval resulting in 1 good, 2 medium and 1 low quality pressures as well as 1 dry test. Pressures ranged between 3380.88-3391.19 psia and mobilities were between 0.61-3.57 mD/cP.

A sampling station (File 15) was attempted at 6478.93 ft MD (6475.04 ft TVD) and 3 MPSR (450 cc) water samples were successfully collected with an Extra-Large diameter probe, confirming the presence of water.

2.4 Formation Table

Zone	Color	Top MD	Top TVD	Bottom MD	Bottom TVD	Station Count
		ft	ft	ft	ft	
Zone 1		5870.37	5867.67	5968.47	5965.59	15
Zone 2		6452.99	6449.15	6514.88	6510.89	5

2.5 Conclusion

Thus, the MDT program resulted in acquisition of 18 valid pressures and 4 downhole water samples and confirmed reservoir had water bearing sands.

2.6 Contact Details

Please contact Aniket Shende for any further information or queries relating to this report.
Email:ashende@slb.com
Phone: 281-285-1503

For more details refer to:
Section 3 – Fluid and sampling summary
Section 4 – Fluid gradient
Section 5 – Test Point Table
Section 6 – Pressure vs Depth View
Section 7 – Downhole fluid analysis

Pressure vs Time plots are provided in a separate appendix.

3 Fluid and Sampling Summary

3.1 Sampling and Fluids Profiling Summary Table

Run No.	File No.	MD (ft)	TVD (ft)	Type	Bottle Module	Bottle Serial No.	Bottle Type	Bottle Volume (L)	Closing Pressure (psi)	Formation Pressure (psi)	Flowline Temperature (degF)	Maximum Drawdown Pressure (psi)	Pump Time (min)	Pump Volume (L)	Color
2	1	5922.09	5919.30	Sampling	MS_1 B4	30002	MPSR 450 cc	0.45000	9039.15	3168.01	146.91	112.45	50.87	6.15552	Water
2	2	5882.39	5879.67	Profiling						3154.95	146.83	430.35	61.17	5.01726	Water
2	15	6478.93	6475.04	Sampling	MS_1 B5	1370	MPSR 450 cc	0.45000	8288.74	3380.88	158.63	1493.90	43.40	6.33725	Water
2	15	6478.93	6475.04	Sampling	MS_1 B6	1399	MPSR 450 cc	0.45000	8046.45	3380.88	159.32	1560.28	70.57	11.26890	Water
2	15	6478.93	6475.04	Sampling	MS_1 B3	4360	MPSR 450 cc	0.45000	8521.92	3380.88	159.35	1608.16	78.34	12.55571	Water

***All pressures reported in this report are absolute pressures (psia)**

3.2 Fluids Analysis Results Table

No.	Run No.	File No.	MD (ft)	TVD (ft)	TVDss (ft)	Water Frac.	Color
1	2	1	5922.09	5919.30	-5843.30	1.00	Water
2	2	2	5882.39	5879.67	-5803.67	1.00	Water
3	2	15	6478.93	6475.04	-6399.04	1.00	Water

4 Gradient Table

Formation Gradient Summary

Zone Name	Gradient	Top TVD	Bottom TVD	Top TVDSS	Bottom TVDSS	Density	Color	Gradient Comments	Density Statistical Error	Density Theoretical Error	R2	STD
	psi/ft	ft	ft	ft	ft	g/cm3			g/cm3	g/cm3		psi
1	0.435	5876.53	5947	-5800.53	-5871	1.004		Water gradient from 11 good pressures Files 1-10 in Run 2	0.025	0.056	0.99939	0.25

Mud Before Formation Gradient Summary

Zone Name	Gradient	Top TVD	Bottom TVD	Top TVDSS	Bottom TVDSS	Density	Color	Gradient Comments	Gradient Statistical Error	Gradient Theoretical Error	R2	Chi2 Probability	STD
	psi/ft	ft	ft	ft	ft	lbm/gal			psi/ft	psi/ft			psi
All Zones	0.632	5844.17	6541.78	-5768.17	-6465.78	12.179		Mud Before	0.003	0.002	0.99993	0	1.35

Mud After Formation Gradient Summary

Zone Name	Gradient	Top TVD	Bottom TVD	Top TVDSS	Bottom TVDSS	Density	Color	Gradient Comments	Gradient Statistical Error	Gradient Theoretical Error	R2	Chi2 Probability	STD
	psi/ft	ft	ft	ft	ft	lbm/gal			psi/ft	psi/ft			psi
All Zones	0.633	5844.17	6541.78	-5768.17	-6465.78	12.1815		Mud After	0.003	0.002	0.99994	0	1.3

Fluids Type Definition

Density From (lbm/gal)	Density To (lbm/gal)	Gradient From (psi/ft)	Gradient To (psi/ft)	Color	Probable Fluid Type
Less	0.0000	Less	0.0000		Negative Gradient
0.0000	4.8145	0.0000	0.2500		Gas
4.8145	7.9924	0.2500	0.4150		Oil
7.9924	9.7833	0.4150	0.5080		Water
9.7833	15.5575	0.5080	0.8078		Mud
15.5575	Higher	0.8078	Higher		Invalid

5 Test Point Table

Test point table Summary

Burger J Posey 6912 OCS-Y-2321 001 ST00BP00		Total	Zone 1	Zone 2
Zone Top TVD(ft)			5867.67	6449.15
Zone BottomTVD(ft)			5965.59	6510.89
Pretest Type				
Volumetric Drawdown Pretest		5	5	0
Volumetric Pretest		15	10	5
Pretest Status				
Valid Test		18	14	4
Tight Test		1	1	0
Dry Test		1	0	1
Gauge				
PQQP1		18	14	4
BQP1		2	1	1
Runs	**Color**			
1 (23-Sep-2015)		5	3	2
2 (23-Sep-2015)		15	12	3
Formation Pressure Quality	**Color**			
NA		2	1	1
High		11	10	1
Medium		4	2	2
Low		3	2	1
Drawdown Mobility Quality	**Color**			
NA		2	1	1
High		11	10	1
Medium		4	2	2
Low		3	2	1

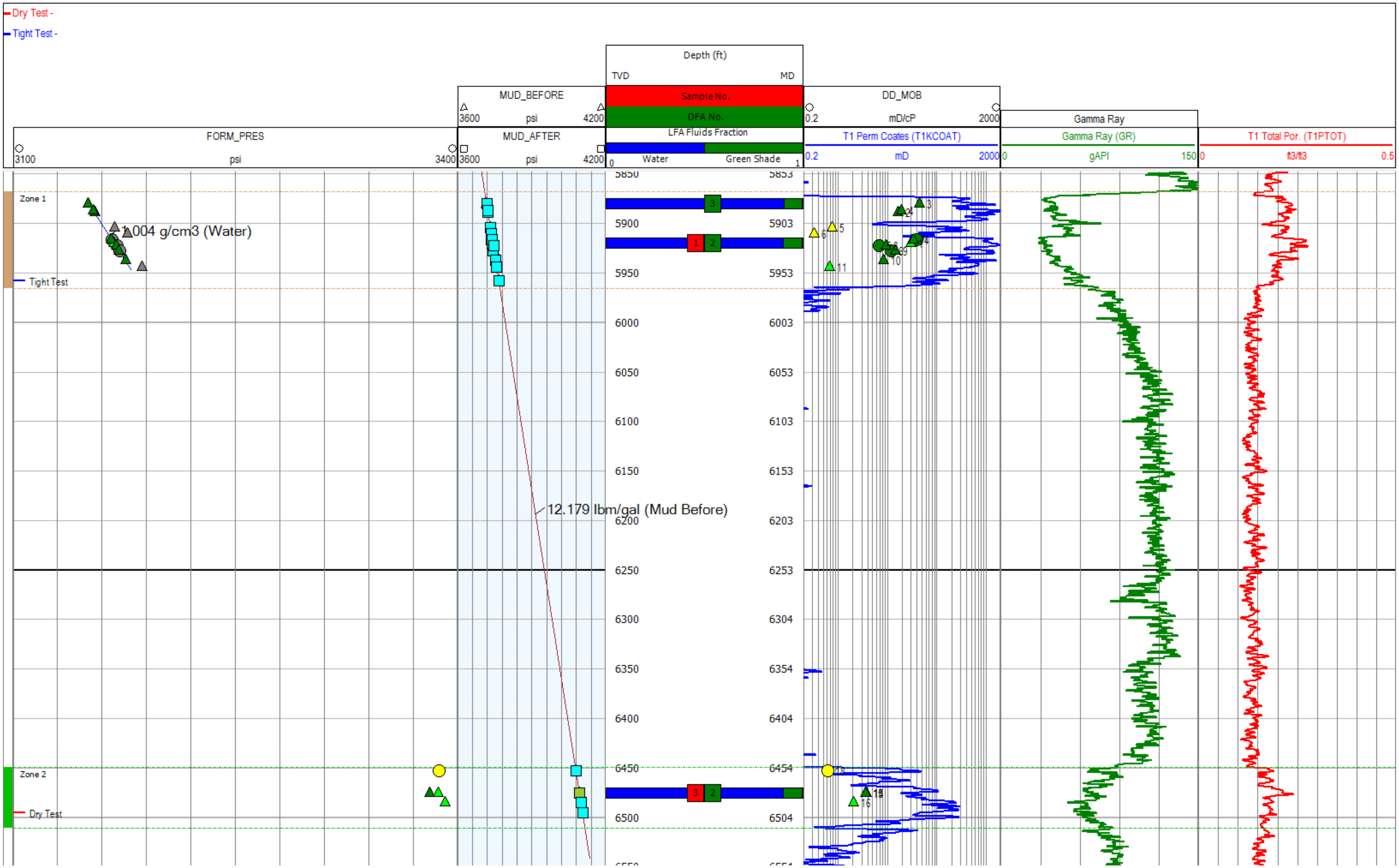
Test Point Table

File No.	Test No.	Probe MD	Probe TVD	TVD Subsea	Pretest Status	Comments	Formation Pres.		Last BU Pres.	Equiv. Formation Densit	DD Mobility		Pres. Variance	60 Sec Slope
		ft	ft	ft			psi		psi	lb/gal	mD/cP		psi	psi/mi
4	8	5919.1	5916.3	-5840.3	Valid Tes	Two pretests built up and stabilized	3166.7		3166.7	10.265	39.28		0	0.018
5	12	5925.2	5922.4	-5846.4	Valid Tes	Four pretests built up and stabilized	3170		3170	10.265	6.81		0.01	0.001
6	17	5930.2	5927.4	-5851.4	Valid Tes	Three pretests built up and stabilized	3171.8		3171.8	10.263	11.85		0.02	0.003
2	8	5891.4	5888.6	-5812.6	Valid Tes	Pretest before PO, buit up and stabilized	3155		3155	10.275	16.43		0.01	0
3	13	5882.3	5879.6	-5803.6	Valid Tes	Last pretest built down and stabilized	3150.6		3150.6	10.277	44.46		0	-0.001
4	18	5889.5	5886.7	-5810.7	Valid Tes	Last pretest built down and stabilized	3154		3154	10.275	19.37		0.02	-0.003
5	21	5906.9	5904.1	-5828.1	Valid Tes	Last pretest building up, . supercharged	3168.6		3168.6	10.293	0.77		0.03	0.001
6	24	5912.7	5910	-5834	Valid Tes	Last pretest building up. supercharged	3177		3177	10.31	0.32		0.12	-0.331
7	27	5918.9	5916.2	-5840.2	Valid Tes	Last three pretests built up and stabilized	3166.3		3166.3	10.264	33.86		0	-0.002
8	32	5925.2	5922.4	-5846.4	Valid Tes	Last two pretests built up and stabilized	3169.8		3169.8	10.265	9.28		0.01	-0.008
9	36	5930	5927.2	-5851.2	Valid Tes	Last pretest built up and stabilized	3171.6		3171.6	10.262	14.29		0.01	0.013
10	45	5939.8	5937	-5861	Valid Tes	builtup and stabilized	3175.7		3175.7	10.259	8.23		0.01	0.011
11	47	5946.5	5943.6	-5867.6	Supercha	Last pretest built up, but not stablized	3187		3187	10.284	0.67		0.43	-1.831
12	49	5960.6	5957.7	-5881.7	Tight Tes	Tight Test			3215.3				0.04	7.182
14	55	6478.9	6475	-6399	Valid Tes	Last pretest built up, but not stablized	3386.9		3386.9	10.035	3.72		0.01	0.044
15	59	6478.9	6475	-6399	Valid Tes	Last pretest builtup ans tabilized	3380.9		3380.9	10.017	3.57		0.01	0.229
16	64	6488.6	6484.7	-6408.7	Valid Tes	Last pretest built up, but not stablized	3391.2		3391.2	10.033	2.03		0.03	0.012
17	66	6499.6	6495.6	-6419.6	Dry Test	Dry Test			1776.3				0.84	1322.9
18	70	6456.7	6452.9	-6376.9	Valid Tes	Last two pretests building up, but not stable	3387.2		3387.2	10.07	0.61		0.06	-0.01

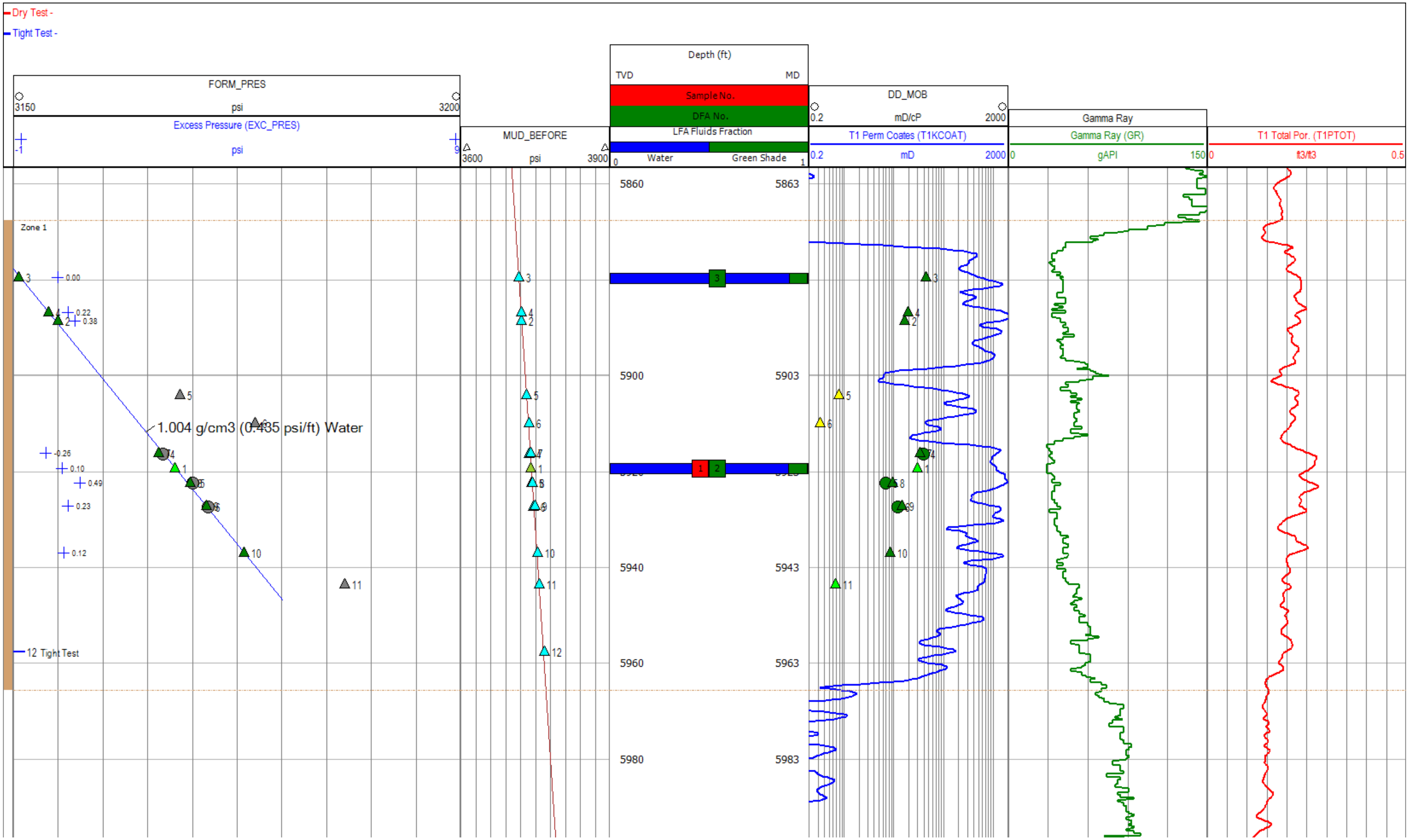
File No.	Test No.	Run No.	Mud Pres. Before	Equiv. Mud Density	Mud Pres. After	Pretest Volume	Pretest Duration	Pretest Flowrate	Pretest Type	Gauge Type	Packer/Probe Type	Date Time	Formation Zone	Temp. After	Well Deviation
			psi	lbm/gal	psi	cm3	min	cm3/s						degF	deg
4	8	1A	3736.71	12.122	3736.94	9.58	0.31	0.52	Volumetric Drawdown	PQQP1	Large-Diameter	9/23/2015 7:16	Zone 1	146.03	3.46
5	12	1A	3740.94	12.123	3741.51	9.73	0.32	0.51	Volumetric Drawdown	PQQP1	Large-Diameter	9/23/2015 7:35	Zone 1	146.36	3.46
6	17	1A	3744.51	12.124	3744.13	5.01	0.09	0.93	Volumetric Drawdown	PQQP1	Large-Diameter	9/23/2015 8:08	Zone 1	147.05	3.45
1	2	2	3739.6	12.125	3740.38	9.9	0.22	0.75	Volumetric Drawdown	BQP1	XLarge-Diameter	9/23/2015 8:54	Zone 1	147.36	3.45
2	8	2	3721.71	12.129	3721.95	9.74	0.17	0.98	Volumetric Drawdown	PQQP1	Large-Diameter	9/23/2015 10:57	Zone 1	147.53	3.48
3	13	2	3716.58	12.131	3716.88	4.05	0.12	0.56	Volumetric	PQQP1	Large-Diameter	9/23/2015 13:20	Zone 1	146.96	3.48
4	18	2	3721.05	12.131	3721.73	5.03	0.09	0.93	Volumetric	PQQP1	Large-Diameter	9/23/2015 13:45	Zone 1	147.29	3.48
5	21	2	3732.25	12.132	3732.82	9.51	0.32	0.5	Volumetric	PQQP1	Large-Diameter	9/23/2015 14:10	Zone 1	147.84	3.47
6	24	2	3736.34	12.133	3736.21	4.92	0.17	0.5	Volumetric	PQQP1	Large-Diameter	9/23/2015 14:30	Zone 1	148.22	3.46
7	27	2	3740.29	12.134	3740.07	4.39	0.08	0.91	Volumetric	PQQP1	Large-Diameter	9/23/2015 14:51	Zone 1	148.26	3.46
8	32	2	3744.33	12.134	3744.67	5.07	0.09	0.94	Volumetric	PQQP1	Large-Diameter	9/23/2015 15:30	Zone 1	148.46	3.46
9	36	2	3748.02	12.136		9.77	0.17	0.96	Volumetric	PQQP1	Large-Diameter	9/23/2015 15:40	Zone 1		3.45
10	45	2	3753.88	12.135	3753.93	3.7	0.06	1.03	Volumetric	PQQP1	Large-Diameter	9/23/2015 16:06	Zone 1	149.09	3.45
11	47	2	3757.87	12.134	3758.28	4.64	0.16	0.47	Volumetric	PQQP1	Large-Diameter	9/23/2015 16:40	Zone 1	149.24	3.44
12	49	2	3767.22	12.136	3767.42	4.82	0.18	0.46	Volumetric	PQQP1	Large-Diameter	9/23/2015 16:54	Zone 1	149.38	3.43
14	55	2	4092.25	12.134	4092.42	4.57	0.15	0.51	Volumetric	PQQP1	Large-Diameter	9/23/2015 17:44	Zone 2	155.79	3.98
15	59	2	4092.46	12.134	4092.96	9.72	0.38	0.43	Volumetric	BQP1	XLarge-Diameter	9/23/2015 18:01	Zone 2	158.51	3.98
16	64	2	4099.21	12.136	4099.47	4.81	0.15	0.52	Volumetric	PQQP1	Large-Diameter	9/23/2015 20:00	Zone 2	158.51	3.98
17	66	1A	4105.66	12.135	4106.14	6.09	0.19	0.52	Volumetric	PQQP1	Large-Diameter	9/23/2015 20:25	Zone 2	158.89	3.97
18	70	1A	4079.61	12.137	4079.15	4.73	0.16	0.48	Volumetric	PQQP1	Large-Diameter	9/23/2015 20:36	Zone 2	158.6	3.99

6 Pressure vs Depth Displays

6.1 Overview Formation Pressure

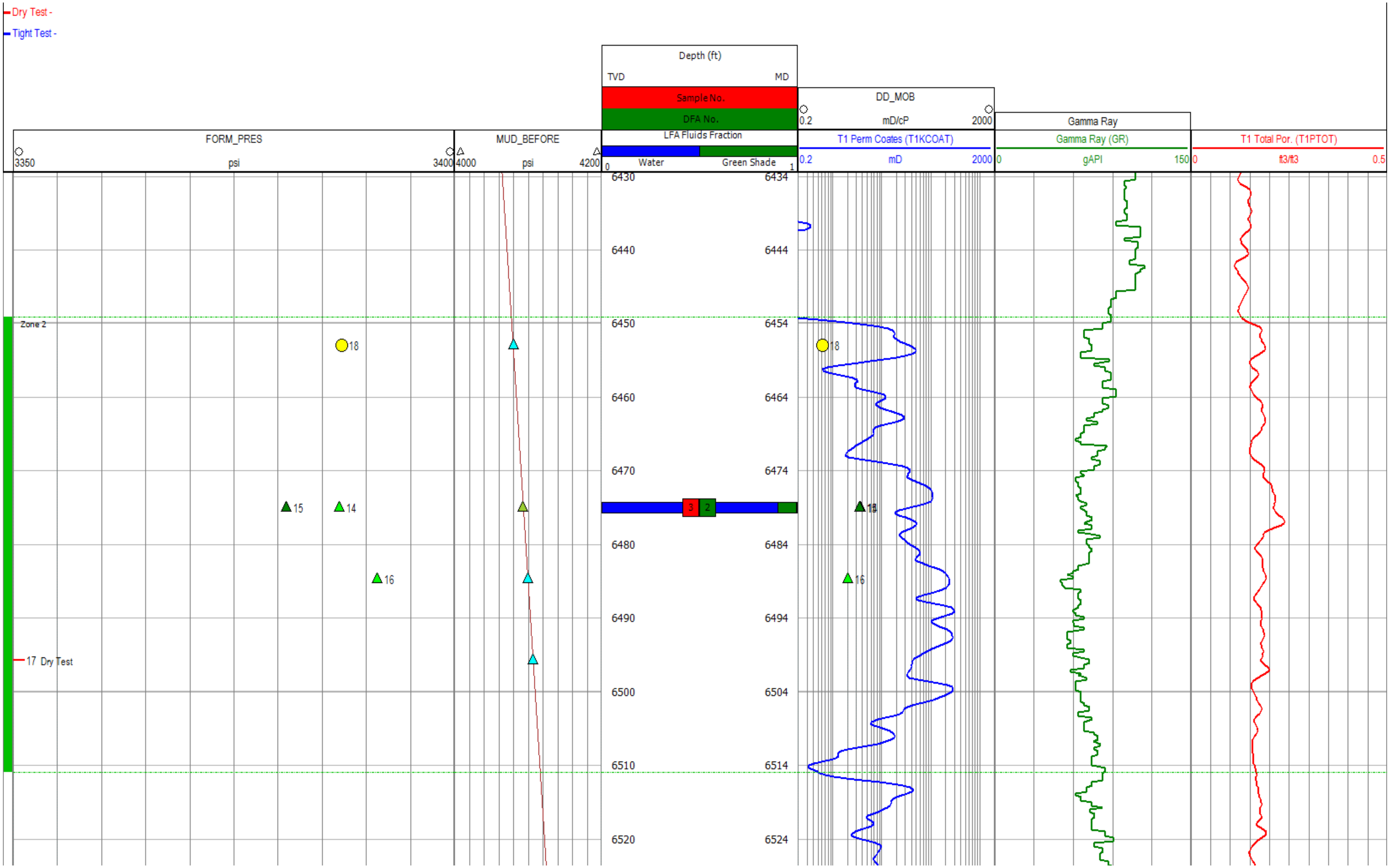


6.2 Zone 1



Dry Test -
Tight Test -
FORM_PRES
3150 psi 3200
Excess Pressure (EXC_PRES)
-1 psi 9
MUD_BEFORE
3600 psi 3900
Depth (ft)
TVD MD
Sample No.
DFA No.
LFA Fluids Fraction
0 Water Green Shade 1
DD_MOB
0.2 mD/cP 2000
T1 Perm Coates (T1KCOAT)
0.2 mD 2000
Gamma Ray
Gamma Ray (GR)
0 gAPI 150
T1 Total Por. (T1PTOT)
0 ft3/ft3 0.5
Zone 1
1.004 g/cm3 (0.435 psi/ft) Water
12 Tight Test
5860 5863
5900 5903
5940 5943
5960 5963
5980 5983

6.3 Zone 2


Dry Test -
Tight Test -
Depth (ft)
TVD
MD
Sample No.
DFA No.
LFA Fluids Fraction
Water
Green Shade
DD_MOB
mD/cP
0.2
2000
T1 Perm Coates (T1KCOAT)
mD
Gamma Ray
Gamma Ray (GR)
gAPI
0
150
T1 Total Por. (T1PTOT)
ft3/ft3
0.5
FORM_PRES
psi
3350
3400
MUD_BEFORE
psi
4000
4200
Zone 2
18
15
14
16
17 Dry Test
6430
6434
6440
6444
6450
6454
6460
6464
6470
6474
6480
6484
6490
6494
6500
6504
6510
6514
6520
6524

Downhole Fluid Analysis Displays

File 1

5922.09 ft MD, 5919.3 ft TVD

LFA indicated Water

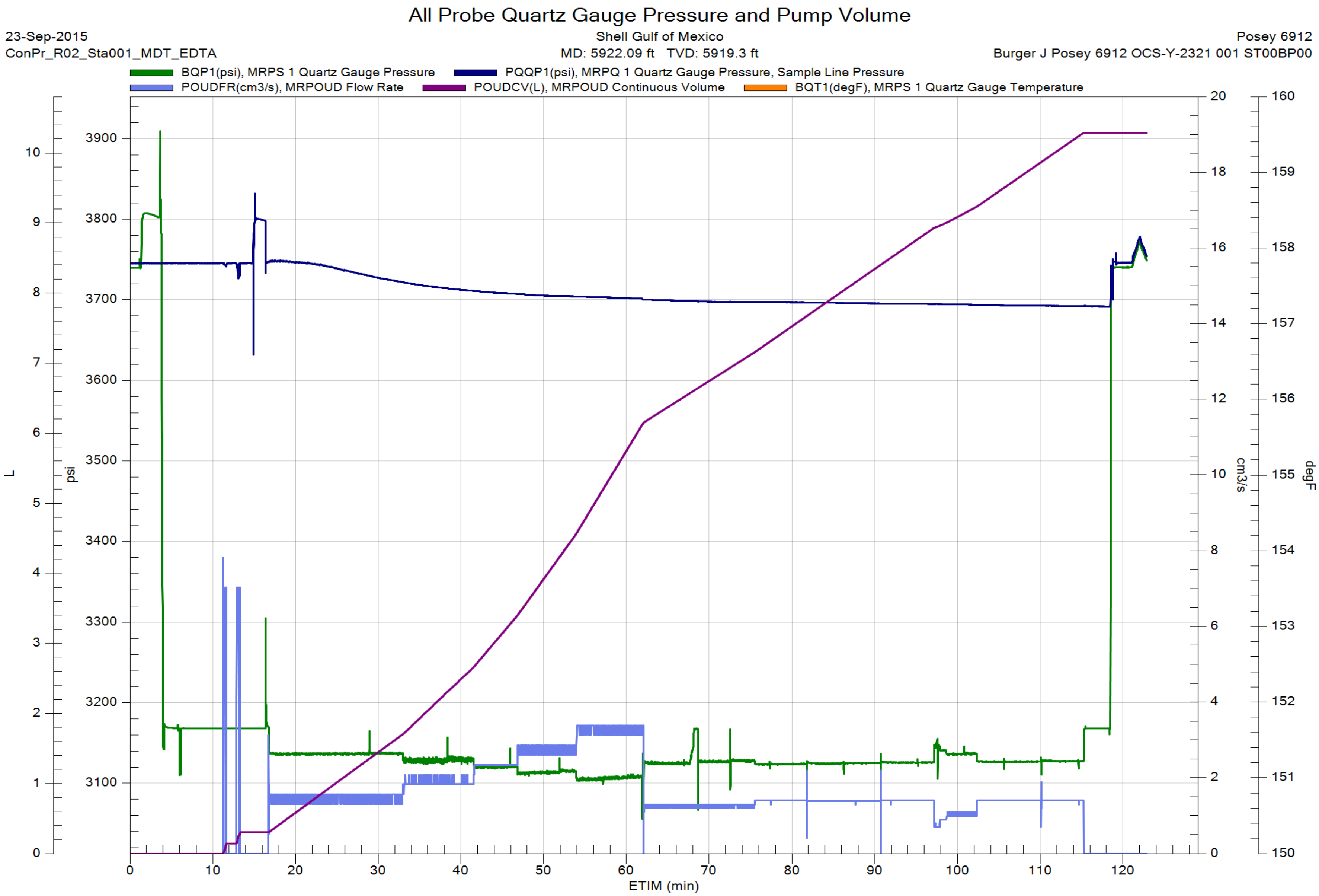
Sampling with X-Large diameter probe

1 MPSR (450cc) bottle was collected

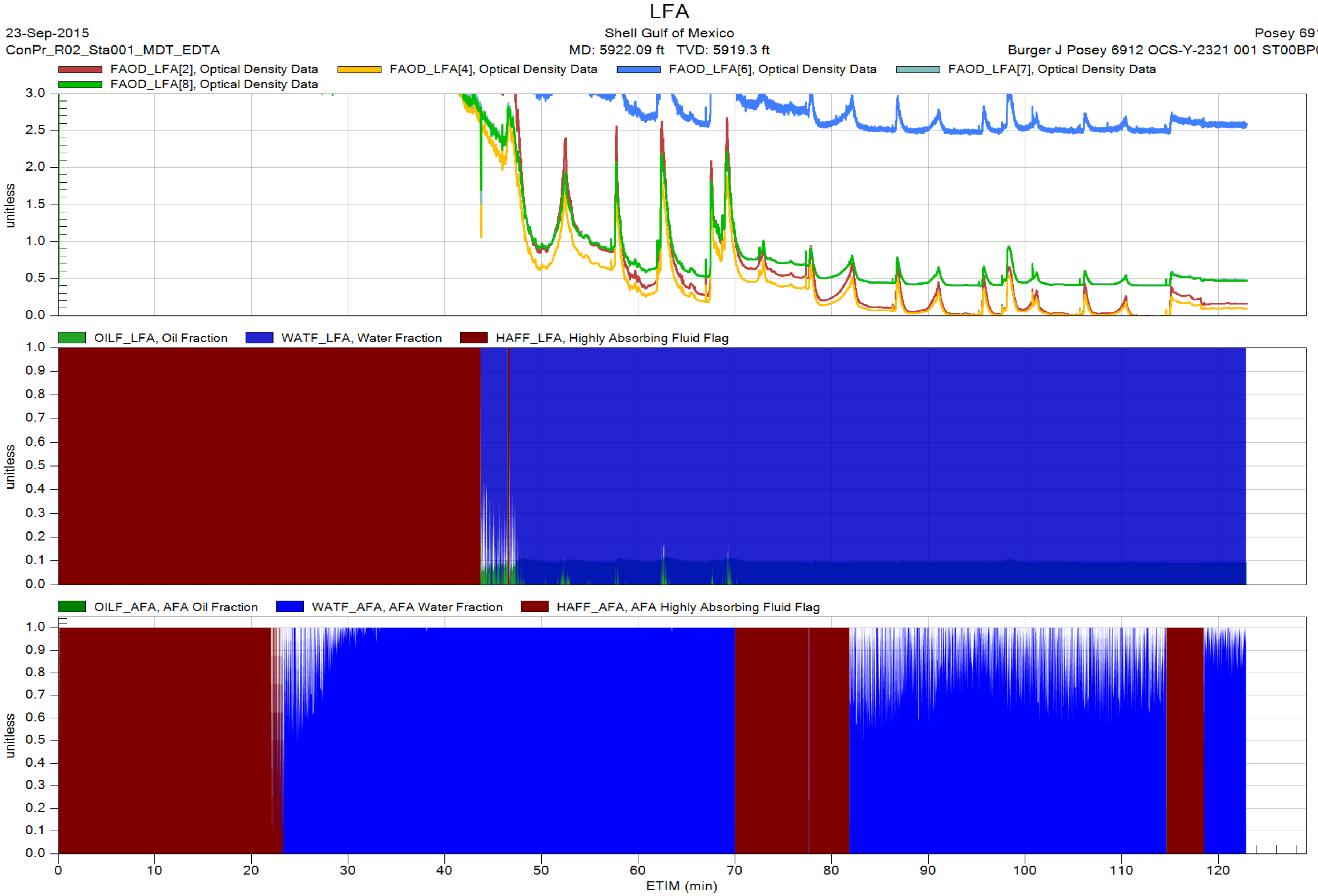
7 Downhole Fluid Analysis

7.1 MDT_IFA_R2Sta1

7.1.1 Standard Cross Plot



7.1.2 LFA Composition and Resistivity Optical Density Plot



Water is seen in the AFA (bottom track) before LFA (top track). Since AFA is situated below pump, this could indicate sanding in the sampling

Downhole Fluid Analysis Displays

File 2

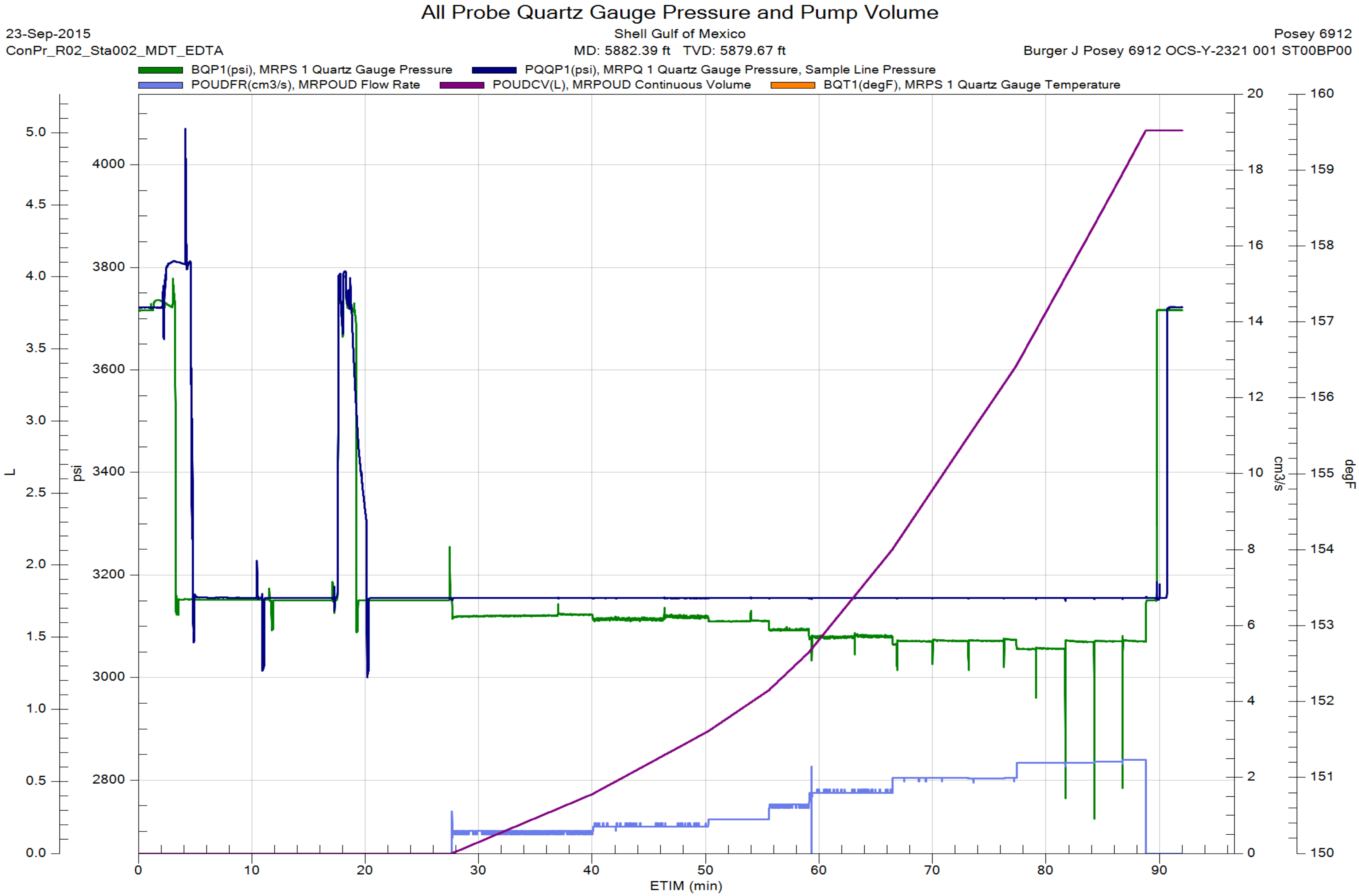
5882.39 ft MD, 5879.67 ft TVD

LFA indicated Water

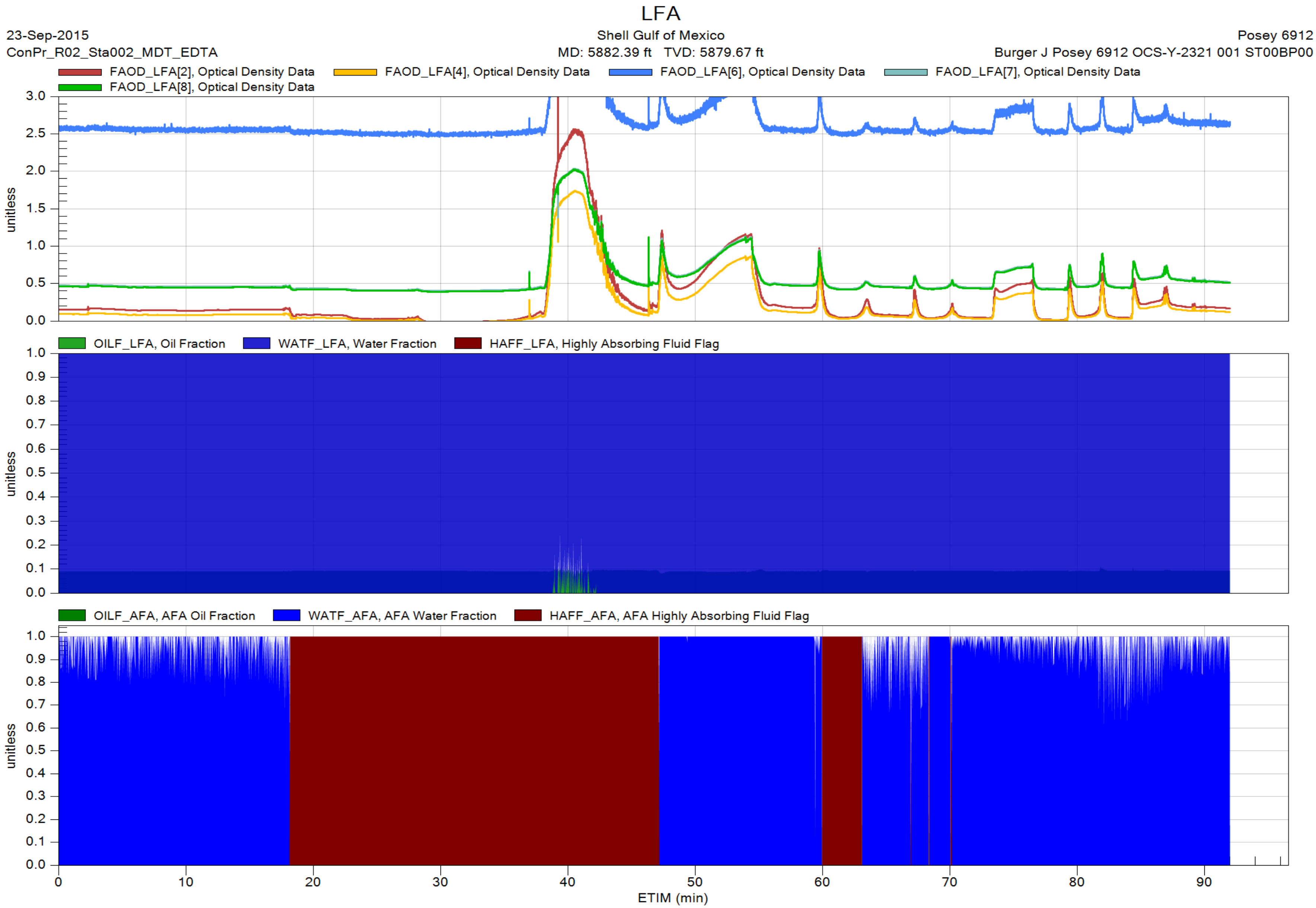
Only DFA/ fluid scanning, no samples taken

7.2 MDT_IFA_R2Sta2

7.2.1 Standard Cross Plot



7.2.2 LFA2 Composition and Resistivity Optical Density Plot



Downhole Fluid Analysis Displays

File 15

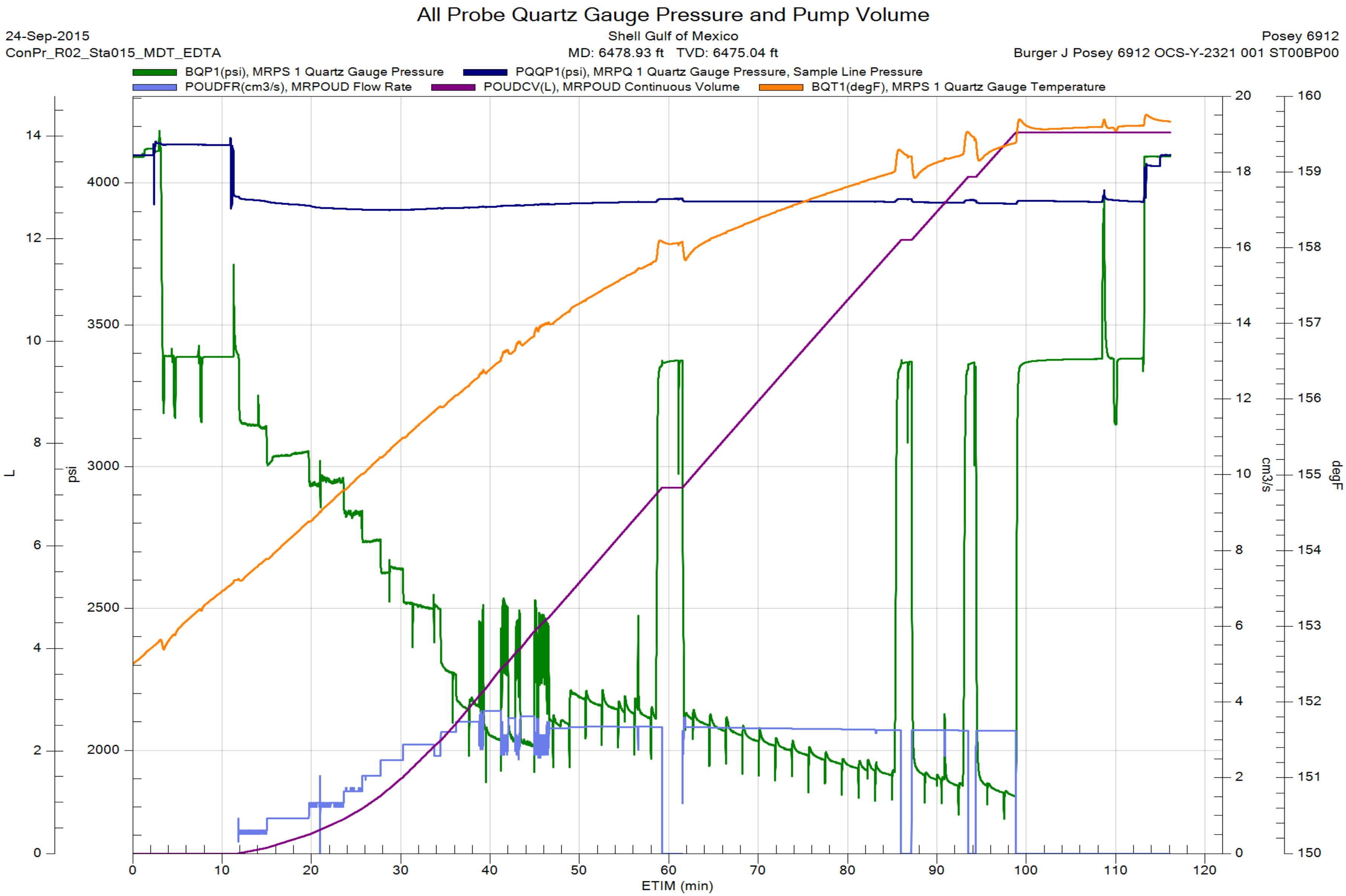
6478.93 ft MD, 6475.04 ft TVD

Sampling was done with X-Large diameter probe

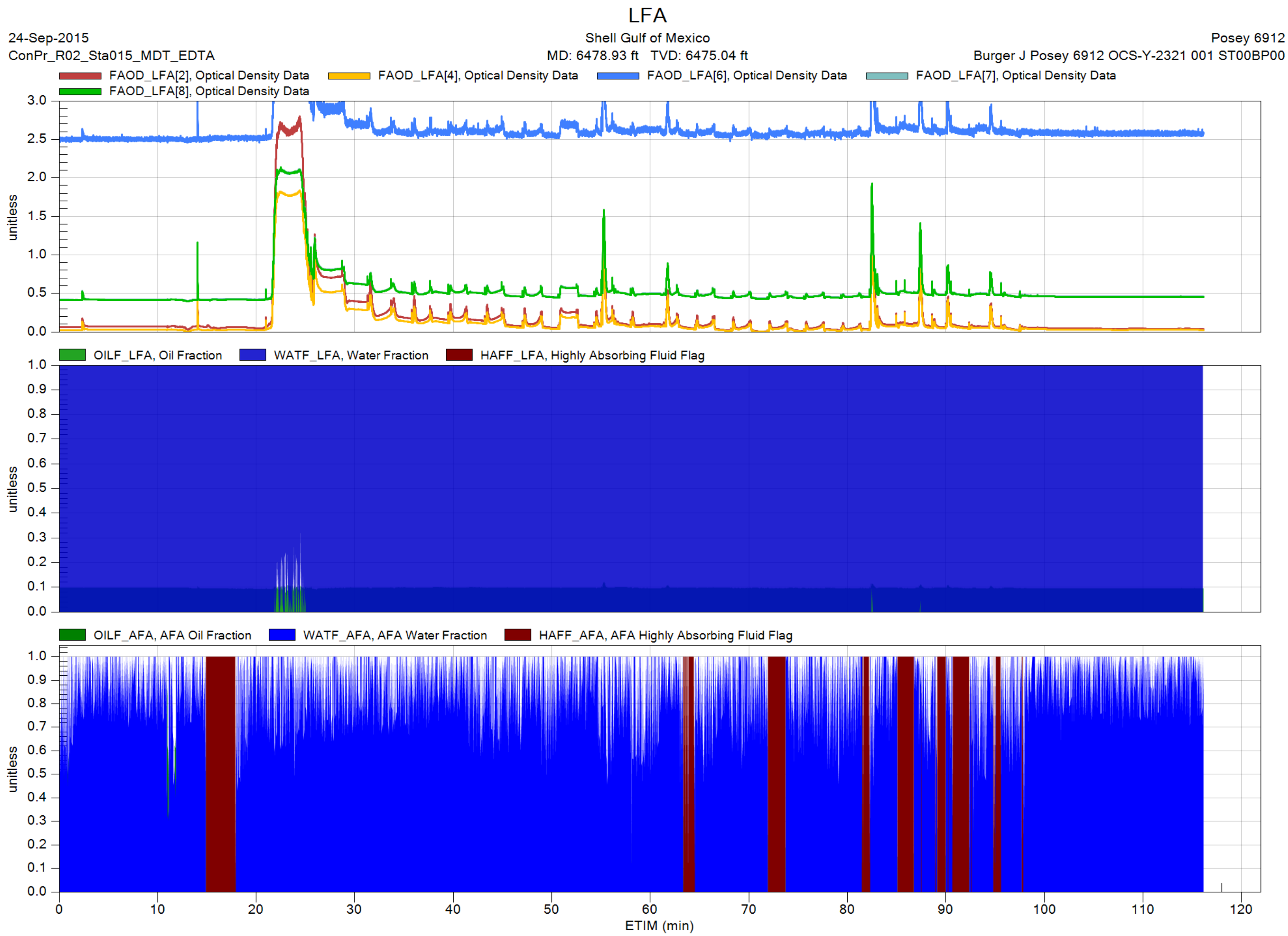
3 MPSR (450cc) bottles were collected

7.3 MDT_IFA_R2Sta15

7.3.1 Standard Cross Plot



7.3.2 LFA Composition and Resistivity Optical Density Plot



8 Well and Job Data

8.1 Well Header

Schlumberger

Company: Shell Gulf of Mexico

Well: Burger J Posey 6912 OCS-Y-2321 001 ST00BP00

Field: Posey 6912

Waters: Chukchi Sea State: Alaska

Waters: Chukchi Sea
Field: Posey 6912
Location: X=555036m, Y=7897424m
Well: Burger J Posey 6912 OCS-Y-2321 001 ST00BP00
Company: Shell Gulf of Mexico

Pressures and Samples

GR-MDT

PROPRIETARY

Location: X=555036m, Y=7897424m

Elev.:	K.B.		
	G.L.	-144.00 ft	
	D.F.	76.00 ft	

Permanent Datum:	Mean Sea Level	Elev.:	0.00 ft
Log Measured From:	Drill Floor	76.00 ft	above Perm.Datum
Drilling Measured From:	Drill Floor		

API Serial No.	Rig:	Longitude:	Latitude:
5535-20000400	Polar Pioneer	163° 28' 18.522" W	71° 10' 24.029" N

Logging Date		23-Sep-2015		
Run Number		1A		
Depth Driller		6800.00 ft		
Schlumberger Depth		6800.00 ft		
Bottom Log Interval		6770.00 ft		
Top Log Interval		257.00 ft		
Casing Fluid Type		Polymer		
Salinity		138000 ppm		
Density		12 lbm/gal		
Fluid Level		8.00 ft		
BIT/CASING/TUBING STRING				
Bit Size		8.50 in		
From		5423.00 ft		
To		6800.00 ft		
Casing/Tubing Size		9.625 in		
Weight		53.5 lbm/ft		
Grade		L80		
From		2637.00 ft		
To		5408.00 ft		
Max Recorded Temperatures		158 degF 159 159		
Logger on Bottom	Time	23-Sep-2015	06:41:00	
Unit Number	Location:	7206	Anchorage	
Recorded By		R. Morrissey / P. Trofimoff		
Witnessed By		D. Reed / L. Villegas		

PROPRIETARY

8.2 Well Header Table

Borehole Size/Casing/Tubing Record						
Bit						
Bit Size (in)	8.5					
Bottom Driller (ft)	6800					
Bottom Logger (ft)	6800					
Casing						
Size (in)	9.625					
Weight (lbm/ft)	53.5					
Inner Diameter (in)	8.535					
Grade	L80					
Top Driller						
Top Logger (ft)	2637					
Bottom Driller (ft)	5408					
Bottom Logger (ft)	5408					
Comments						
Operational Run Summary						
Parameter (Unit)	**1**	**2**				
Date Log Started	23-Sep-2015	23-Sep-2015				
Time Log Started	17:45:36	17:45:36				
Date Log Finished	23-Sep-2015	23-Sep-2015				
Time Log Finished	09:47:15	09:47:15				
Top Log Interval (ft)	257					
Bottom Log Interval (ft)	6770					
Total Depth (ft)	6800	6800				
Max Hole Deviation (deg)	3.99	3.99				
Azimuth of Max Deviation (deg)	35.86	35.86				
Bit Size (in)	8.5	8.5				
Logging Unit Number	7206	7206				
Logging Unit Location	Anchorage	Anchorage				
Recorded By	R. Morrissey / P. Trofimoff					
Witnessed By	D. Reed / L. Villegas					
Service Order Number						
Comments						
Borehole Fluids						
Parameter (Unit)	**1**	**2**				
Type Fluid	Polymer	Calcium Chloride Brine				
Max Recorded Temperature (degF)	156	156				
Source of Sample	Active Tank	Active Tank				
Salinity (ppm)	138000	138000				
Density (lbm/gal)	12	12				

Viscosity (s)	0.93	0.93				
Fluid Loss (cm3)	2.3	2.3				
pH	9.1	9.1				
Date/Time Circulation Stopped	22-Sep-2015 13:55:00					
Date Logger on Bottom	23-Sep-2015	23-Sep-2015				
Time Logger on Bottom	09:47:15	09:47:15				
Source Rmf	Pressed	Pressed				
Source Rmc	Pressed	Pressed				
Rm@Meas Temp (ohm.m@degF)	0.05@59.2	0.05@59.2				
Rmf@Meas Temp (ohm.m@degF)	0.05@63.2	0.05@63.2				
Rmc@Meas Temp (ohm.m@degF)	0.18@65.4	0.18@65.4				
Rm @ BHT						
Rmf @ BHT						
Rmc @ BHT						
Comments						

Depth Summary

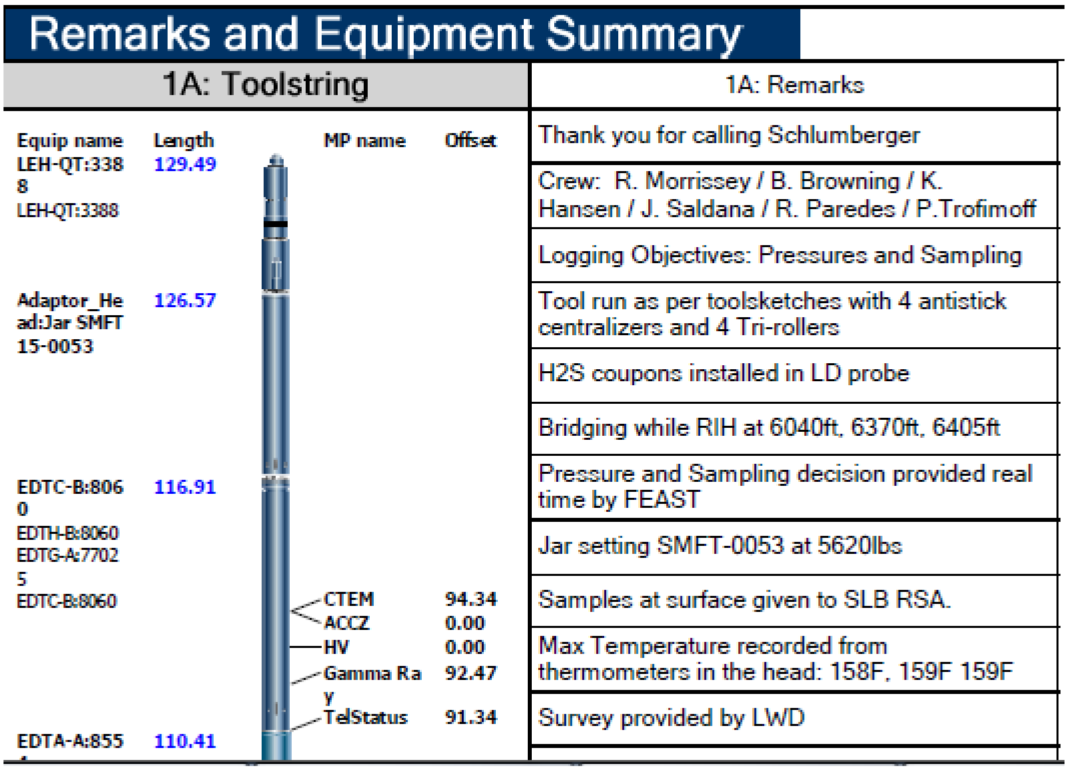
Depth Control Parameters	**1**	**2**				
Rig Type	Semi Submersible	Semi Submersible				
Depth Measured Device	**1**	**2**				
Type	IDW-JA	IDW-JA				
Serial Number						
Wheel Correction 1	-6	-6				
Wheel Correction 2	-4	-4				
Tension Device	**1**	**2**				
Type	TD-K	TD-K				
Serial Number						
Logging Cable	**1**	**2**				
Type	7-50KA-US-SSC	7-50KA-US-SSC				
Serial Number						
Logging Cable Length (ft)	20600	20600				
Comments						

Remarks

Run Name	**1**
Remark Line 1	Thank you for calling Schlumberger
Remark Line 2	Crew: R. Morrissey / B. Browning / K. Hansen / J. Saldana / R. Paredes / P.Trofimoff
Remark Line 3	
Remark Line 4	
Remark Line 5	
Remark Line 6	
Remark Line 7	
Remark Line 8	Logging Objectives: Pressures and Sampling
Remark Line 9	Tool run as per toolsketches with 4 antistick centralizers and 4 Tri-rollers
Remark Line 10	H2S coupons installed in LD probe
Remark Line 11	Bridging while RIH at 6040ft, 6370ft, 6405ft
Remark Line 12	Pressure and Sampling decision provided real time by FEAST

Remark Line 13	Jar setting SMFT-0053 at 5620lbs
Remark Line 14	Samples at surface given to SLB RSA.
Remark Line 15	
Remark Line 16	
Remark Line 17	
Comments	
Run Name	**2**
Remark Line 1	Thank you for calling Schlumberger
Remark Line 2	Crew: R. Morrissey / B. Browning / K. Hansen / J. Saldana / R. Paredes / P.Trofimoff
Remark Line 3	

8.3 Tool String



1A: Remarks
Thank you for calling Schlumberger
Crew: R. Morrissey / B. Browning / K. Hansen / J. Saldana / R. Paredes / P.Trofimoff
Logging Objectives: Pressures and Sampling
Tool run as per toolsketches with 4 antistick centralizers and 4 Tri-rollers
H2S coupons installed in LD probe
Bridging while RIH at 6040ft, 6370ft, 6405ft
Pressure and Sampling decision provided real time by FEAST
Jar setting SMFT-0053 at 5620lbs
Samples at surface given to SLB RSA.
Max Temperature recorded from thermometers in the head: 158F, 159F 159F
Survey provided by LWD

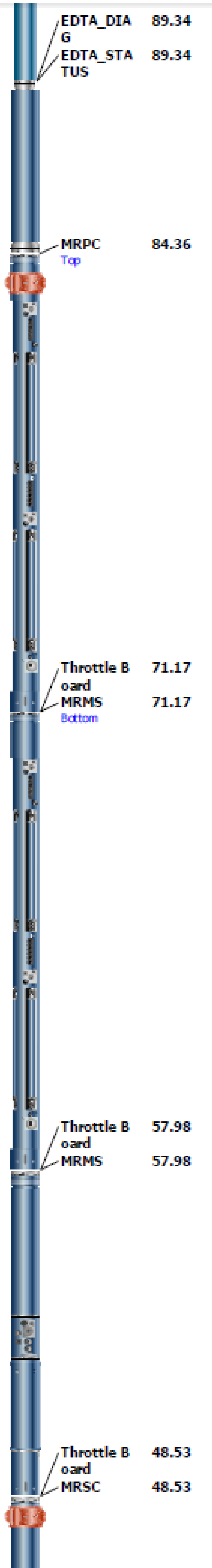
4
HECH-KA:854
3
EDTA-AA:855
4
MRPC-XD:90 108.41
4
MRCH-NL
MRPC-XD:904

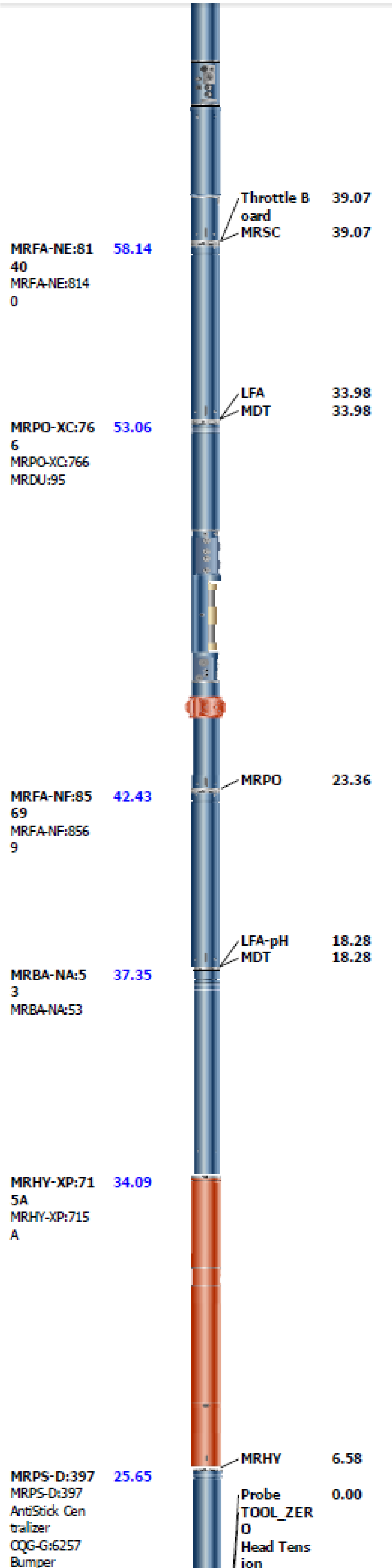
MRMS-XC[2 103.43
]:584
MRMS-XC:584
AntiStick Cen
tralizer
Bottle[6]:4909
[MPSR-BA]
Bottle[5]:4361
[MPSR-BA]
Bottle[4]:4915
[MPSR-BA]
Bottle[3]:4920
[MPSR-BA]
Bottle[2]:4930
[MPSR-BA]
Bottle[1]:4040
[MPSR-BA]
Throttle-Boar
d

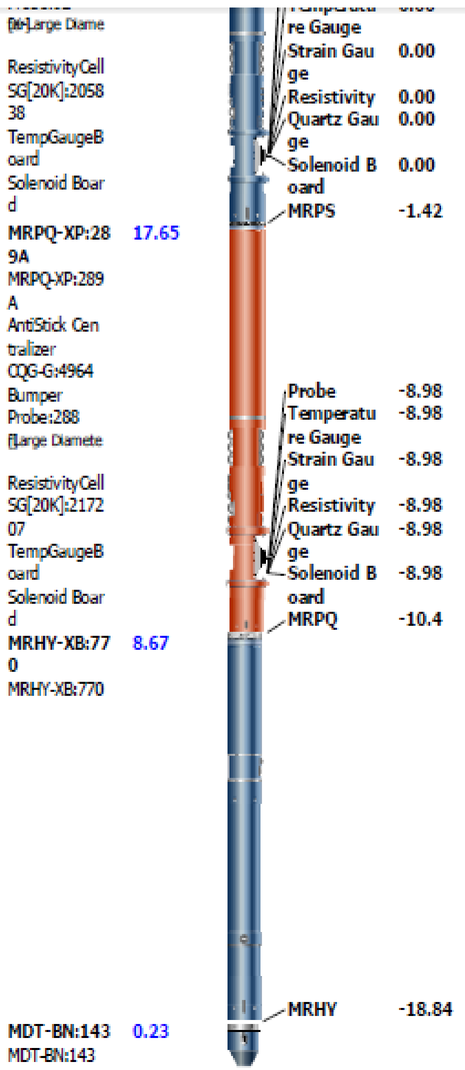
MRMS-XC[1 90.24
]:612
MRMS-XC:612
AntiStick Cen
tralizer
Bottle[6]:1399
[MPSR-BA]
Bottle[5]:1370
[MPSR-BA]
Bottle[4]:3000
2
[MPSR-BA]
Bottle[3]:4360
[MPSR-BA]
Bottle[2]:4120
[MPSR-BA]
Bottle[1]:4363
[MPSR-BA]
Throttle-Boar
d

MRSC-XJ[2] 77.06
:590
MRSC-XJ:590
Throttle-Boar
d

MRSC-XJ[1] 67.6
:533
MRSC-XJ:533
Throttle-Boar




Throttle B oard 39.07
MRSC 39.07
MRFA-NE:8140 58.14
MRFA-NE:8140
LFA 33.98
MDT 33.98
MRPO-XC:766 53.06
MRPO-XC:766
MRDU:95
MRPO 23.36
MRFA-NF:8569 42.43
MRFA-NF:8569
LFA-pH 18.28
MDT 18.28
MRBA-NA:53 37.35
MRBA-NA:53
MRHY-XP:715A 34.09
MRHY-XP:715A
MRHY 6.58
MRPS-D:397 25.65
MRPS-D:397
AntiStick Cen tralizer
CQG-G:6257
Bumper
Probe 0.00
TOOL_ZERO
Head Tens ion



Lengths are in ft
Maximum Outer Diameter = 7.250 in
Line: Sensor Location, Value: Gating Offset
All measurements are relative to TOOL_ZERO

8.4 Well Survey Table

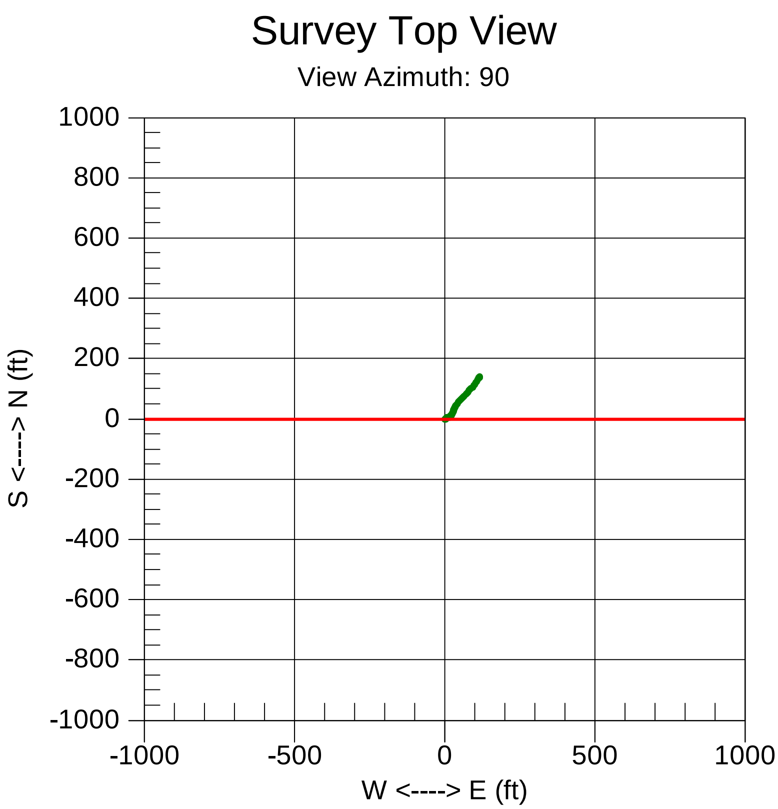


Figure 2 Survey Top View

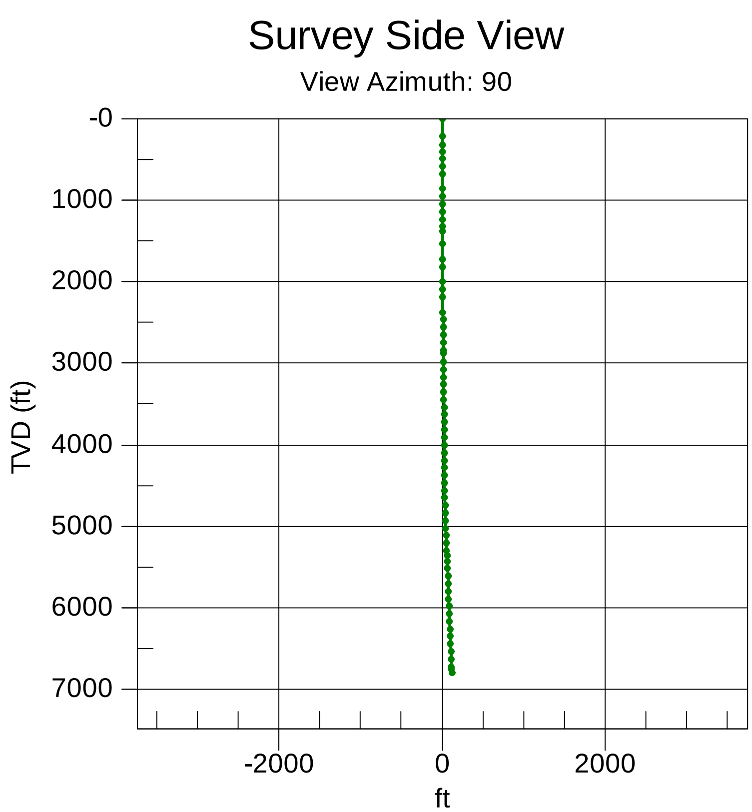


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Figure 3 Survey Side View

#	MD (ft)	Incl (deg)	Azim (deg)	TVD (ft)	North (ft)	East (ft)	Dep.Azim. (deg)	Dog Leg Sev. (deg/100ft)
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	220	0	0	220	0	0	0	0
4	320.88	0.51	129.6	320.88	-0.29	0.35	129.6	0.51
5	406.77	0.31	89.93	406.77	-0.53	0.87	121.25	0.39
6	495.25	0.99	122.22	495.24	-0.94	1.76	118.04	0.84
7	590.43	0.31	82.72	590.41	-1.34	2.71	116.36	0.82
8	684.05	0.64	327.24	684.03	-0.87	2.68	108.01	0.88
9	866.1	0.28	101.2	866.08	-0.1	2.56	92.28	0.47
10	957.99	0	269.46	957.97	-0.15	2.78	93	0.3
11	1051.65	0.14	176.72	1051.63	-0.26	2.79	95.32	0.15
12	1144.54	0.26	120.65	1144.52	-0.48	2.98	99.17	0.23
13	1235.66	0.41	134.11	1235.64	-0.81	3.39	103.48	0.18
14	1328.6	0.51	59.75	1328.57	-0.84	3.99	101.84	0.6
15	1378.5	0.25	111.62	1378.47	-0.76	4.28	100.13	0.81
16	1540.18	0.12	50.83	1540.15	-0.79	4.74	99.43	0.13
17	1723.74	0.39	34.99	1723.71	-0.15	5.25	91.68	0.15
18	1818.58	0.58	50.01	1818.55	0.42	5.8	85.87	0.24
19	2003.18	1.06	39.81	2003.13	2.33	7.61	72.97	0.27
20	2095.93	0.87	35.51	2095.86	3.56	8.57	67.42	0.22
21	2186.15	0.69	72.12	2186.08	4.29	9.48	65.67	0.58
22	2373.34	0.75	76.36	2373.25	4.92	11.74	67.26	0.04
23	2463.93	0.78	75.65	2463.83	5.21	12.92	68.02	0.03
24	2555.3	0.79	70.25	2555.2	5.58	14.11	68.42	0.08
25	2646.22	0.79	76.51	2646.11	5.94	15.31	68.8	0.09
26	2743.03	0.7	74.08	2742.91	6.26	16.53	69.27	0.1
27	2837.42	0.74	67.59	2837.29	6.65	17.65	69.36	0.1
28	2875.38	0.64	69.95	2875.25	6.81	18.07	69.34	0.27
29	2978.31	0.74	64.69	2978.17	7.3	19.22	69.21	0.11
30	3074.55	0.58	52.33	3074.4	7.86	20.16	68.7	0.22
31	3169.04	0.67	47.05	3168.89	8.53	20.95	67.85	0.11
32	3258.93	0.77	27.36	3258.77	9.42	21.61	66.44	0.3
33	3351.8	0.94	33.05	3351.63	10.62	22.31	64.56	0.2
34	3445.4	0.89	33.34	3445.22	11.87	23.13	62.84	0.05
35	3537.9	0.88	39.68	3537.71	13.01	23.98	61.51	0.11
36	3630.29	0.86	29.57	3630.09	14.16	24.77	60.24	0.17
37	3724.13	1.05	46.97	3723.91	15.36	25.75	59.18	0.37
38	3815.47	1.16	37.46	3815.24	16.67	26.92	58.24	0.23
39	3909.95	1.11	27.77	3909.7	18.23	27.93	56.86	0.21
40	4001.96	1.54	18.87	4001.68	20.19	28.75	54.91	0.52

41	4095.18	1.55	21.22	4094.87	22.55	29.61	52.7	0.07
42	4189.17	1.52	19.27	4188.83	24.92	30.48	50.73	0.06
43	4280.67	1.73	13.84	4280.29	27.4	31.21	48.72	0.28
44	4373.26	2.11	22.24	4372.83	30.34	32.19	46.7	0.51
45	4465.71	1.69	19.56	4465.23	33.2	33.29	45.08	0.46
46	4559.04	2.02	19.56	4558.51	36.04	34.3	43.58	0.35
47	4651.17	2.19	23.91	4650.58	39.18	35.56	42.22	0.25
48	4743.27	2.64	25.07	4742.59	42.71	37.17	41.03	0.49
49	4836.87	3.09	32.03	4836.08	46.8	39.42	40.11	0.61
50	4929.2	3.15	34.87	4928.27	51	42.19	39.6	0.18
51	5021.52	3.28	37.85	5020.45	55.16	45.26	39.37	0.23
52	5113.59	3.34	39.69	5112.36	59.31	48.59	39.33	0.13
53	5206.14	3.59	47.76	5204.74	63.33	52.46	39.64	0.59
54	5299.05	3.7	48.27	5297.46	67.28	56.85	40.2	0.12
55	5364.19	3.45	52.11	5362.48	69.88	59.96	40.63	0.53
56	5429.81	3.65	46.91	5427.97	72.52	63.05	41	0.58
57	5518.31	3.73	45.18	5516.29	76.47	67.15	41.28	0.15
58	5612.7	3.58	42.26	5610.49	80.82	71.31	41.42	0.25
59	5704.09	3.56	42.97	5701.7	85.01	75.16	41.48	0.05
60	5795.19	3.47	41.51	5792.63	89.14	78.91	41.52	0.14
61	5889.32	3.48	42.48	5886.59	93.38	82.73	41.54	0.06
62	5980.7	3.42	42.67	5977.8	97.43	86.45	41.58	0.07
63	6075.07	3.43	41.69	6072	101.61	90.24	41.61	0.06
64	6167.81	3.55	39.12	6164.57	105.91	93.89	41.56	0.21
65	6259.59	3.53	39.52	6256.17	110.29	97.48	41.47	0.03
66	6346.61	3.75	37.26	6343.02	114.62	100.91	41.36	0.3
67	6445.34	3.99	34.54	6441.52	120.02	104.81	41.13	0.31
68	6536.48	3.96	35.37	6532.44	125.2	108.43	40.9	0.07
69	6628.63	3.92	37.01	6624.38	130.31	112.17	40.72	0.13
70	6721.62	3.89	35.41	6717.15	135.42	115.91	40.56	0.12
71	6745.05	3.99	35.86	6740.53	136.73	116.85	40.52	0.45
72	6800	3.99	35.86	6795.34	139.83	119.09	40.42	0

Table 5 Survey Table

9 Literature

9.1 Excess Pressure

Excess Pressure is used in this report to show small changes in the pressure regime and to indicate a density or fluid change. The Excess pressure is generated by subtracting the expected pressure from the fluid weight from the total measured pressure and the remaining pressure is the difference. If the pressures are of high quality and the fluid in the pore space has not changed then the Excess Pressures should fall along a vertical line i.e. have the same excess pressure value. If the Excess Pressures deviates from the vertical line or from a consistent value this could indicate a pressure regime change, fluid density change, unstable pressures or supercharging.

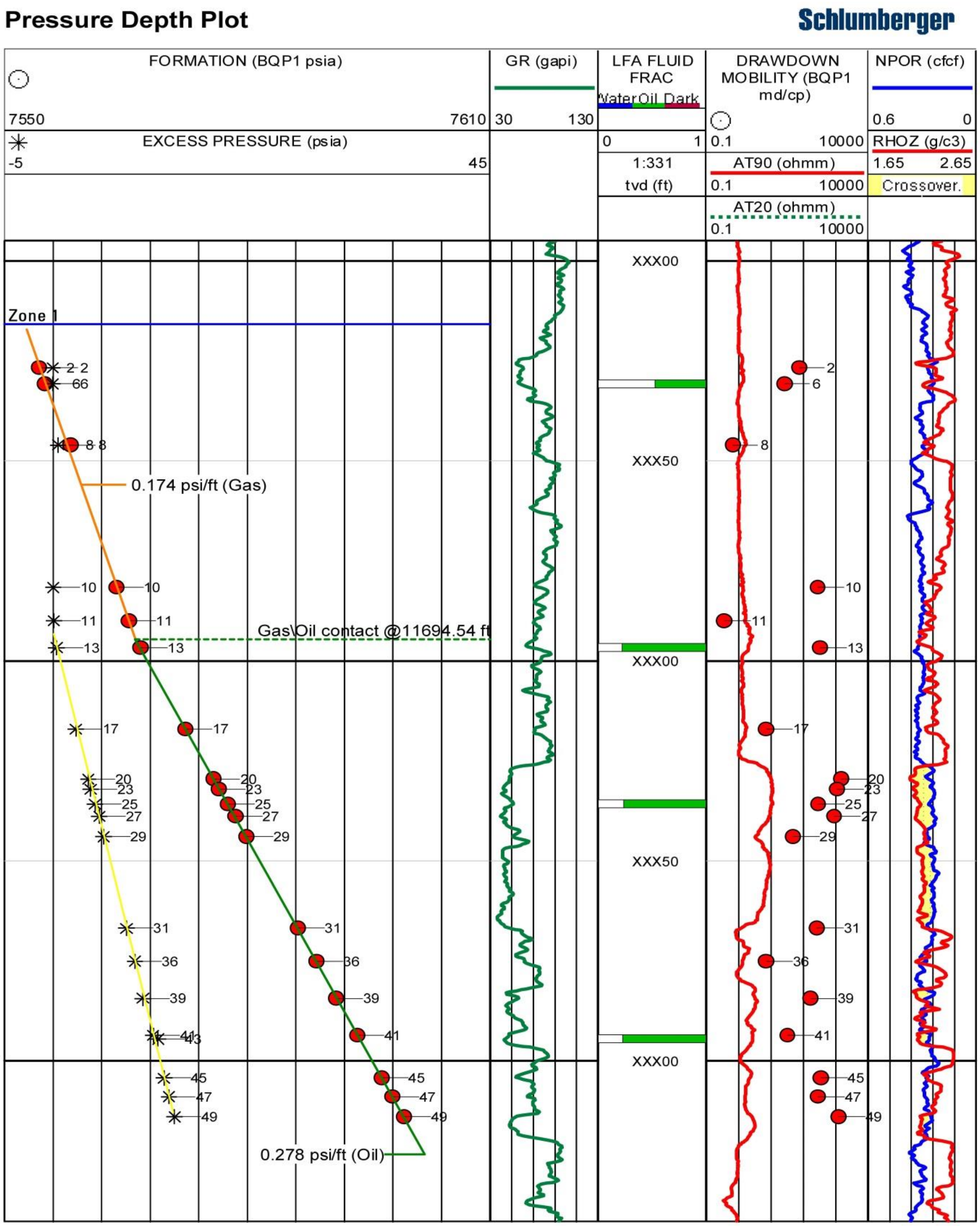
To get the Excess Pressure a high quality pressure is picked as the total pressure and the gradient is used to get a fluid density for computing the Excess Pressure. At the pressure datum the Excess Pressure will be 0. So when the Excess pressure is plotted any good pressures that don't have the same fluid density
will be shifted off the zero line.

The following low resistivity example demonstrates the use of Excess Pressure. Here test 2 was used as the pressure datum and the Gas gradient of 0.174 psi/ft was used as the fluid density to compute Excess Pressure. Tests 2 through 11 line up well on zero and tests 13 through 19 make a new diagonal line off the zero line. In this case this shows the pressures are good values and there is a fluid change around 11694 ft. The LFA analysis and the standard pressure gradient also support the fluid change, or Gas Oil contact.

If the pressures were not stable or supercharged they would not of fit on a line and would of indicated poor quality pressures. A change in pressure regime due to a barrier would be indicated by a discrete excess pressure shift.

Reference: Alton Brown: "Improved interpretation of wireline pressure data" , AAPG Bulletin v. 87 no.2 (February 2003)

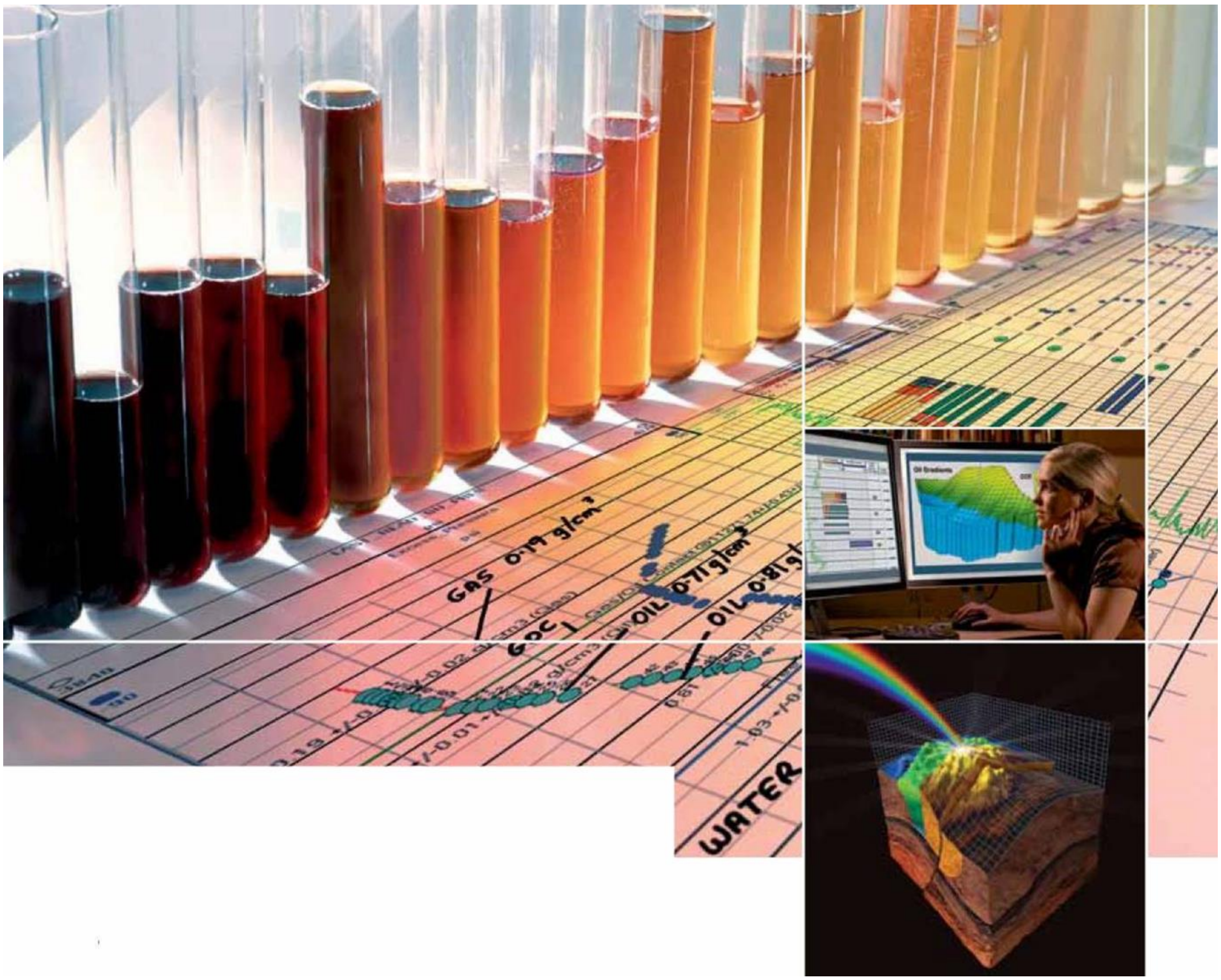
9.2 Excess Pressure Example



MDT Example Well 1

9.3 InSitu Fluid Analyzer

Quantitative fluid measurements at reservoir conditions, in real time



InSitu Fluid Analyzer

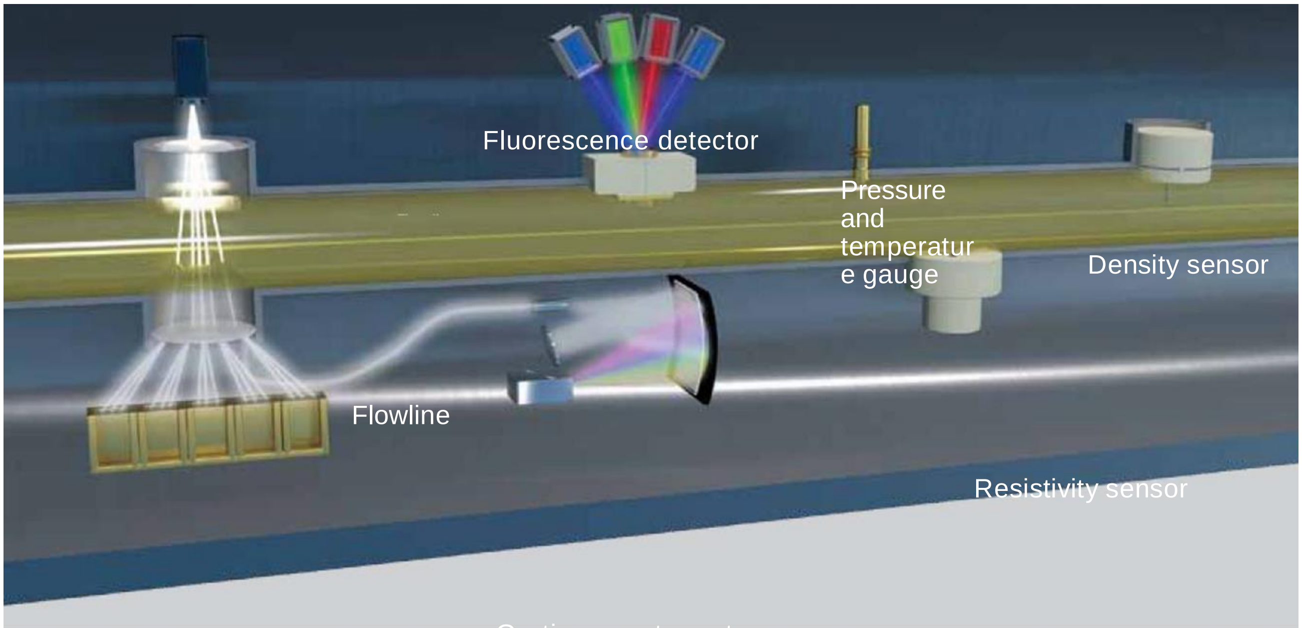
Quantitative fluid measurements
at reservoir conditions, in real time

Quantified fluid measurements that were previously unachievable from wireline logs or laboratory analysis are now possible downhole and in real time. By investigating fluids at their source, you gain a deeper insight to fluid composition and distribution, to improve your understanding of the reservoir.

Applications:

- Reservoir fluid characterization
- Identification of compartments and lateral sealing boundaries . Quantification of compositional grading
- Strategy development for corrosion and scale
- Sample assurance: single phase and purity . Reservoir simulation (EOS modeling)
- Improved-accuracy
- determination of pretest gradients and fluid contacts . Asphaltene gradient determination
- Differentiation of biogenic and thermogenic dry gas
- Identification of volatile oil and gas condensate
- Determination of gas/oil ratio (GOR) and condensate/gas ratio (CGR)

Module



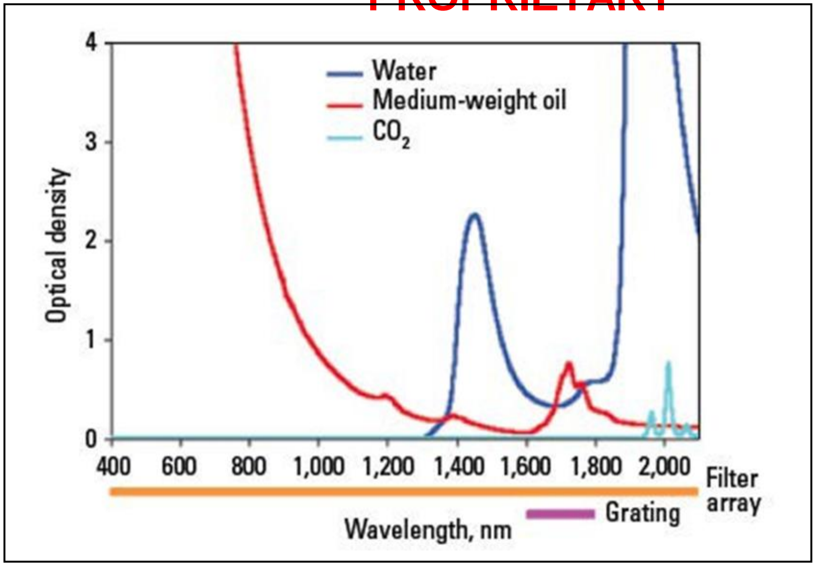
InSitu Fluid Analyzer service integrates multiple InSitu Family reservoir fluid measurements and sensors.

Fluid Profiling analysis of InSitu Family DFA measurements gives further insight to reservoir fluid distribution and variation. Characterization of the fluid system is extended from a single well to multiple-well (field-based) applications, such as quantifying compositional gradients and identifying zonal connectivity.

1. Dual Spectrometers for Enhanced Accuracy

The foundation of DFA is optical absorption spectroscopy. The InSitu Composition hydrocarbon fluid composition measurement introduces the first downhole deployment of a laboratory-grade “grating spectrometer” in addition to the conventional filter array spectrometer. This technical innovation expands the accuracy and detail of the compositional information, resulting in quantifiable fluid data. The filter array spectrometer measures wavelengths in the visible to near-infrared (Vis-NIR) range from 400 to 2,100 nm across 20 channels that indicate the color and molecular vibration absorptions of the reservoir fluid and also show the main absorption peaks of water and CO_2. The grating spectrometer has 16 channels focused on the 1,600- to 1,800-nm range, where reservoir fluid has characteristic absorptions that reflect molecular structure.

The dual-spectrometer measurements together with real-time calibration (performed downhole every 1 second) and improved compositional algorithms significantly improve the accuracy and repeatability of quantitative reservoir fluid analysis. It is this improved accuracy that enables Fluid Profiling comparison of fluid properties between wells, making field-wide DFA characterization a new critical tool for reservoir studies.



The wavelength ranges of the filter array and grating optical spectrometers are optimized for the detection and analysis of hydrocarbon and CO2 components in crude oil and natural gas, as well as for the determination of water content and pH. The measurement of optical density (OD) is simply the base-10 logarithm of the ratio of incident light to the transmitted light through a cross-section of reservoir fluid in the flowline. OD is presented as a dimensionless unit, whereby one OD absorbance unit implies a 10-fold reduction in light intensity. For example, OD = 0 means 100% of light is transmitted, OD = 1 indicates
10% light is transmitted, and OD = 2 means 1% light is transmitted. The measurements are conducted across the entire frequency spectrum of light in the Vis-NIR range.

2. InSitu Composition Measurement

The Vis-NIR spectrum measured by the two InSitu Composition spectrometers is used for the analysis of fluid hydrocarbon composition, GOR, CO2, water content, and mud filtrate contamination. In addition to the improved measurement capabilities of the dual spectrometers, the compositional analysis is refined with an algorithm developed from Beer-Lambert's law, which indicates that the optical absorption of a component is proportional to its concentration. Thus the spectrum of a live oil is a weighted sum of the absorptions of its individual components. The significant variation of the C6+ group in live oil is also accounted for in the algorithm. The C6+ group is the main component of stock-tank oil, and the detailed spectrum of the grating spectrometer in the 1,600- to 1,800-nm range was used to characterize stock-tank oil on the basis of wax and branched-alkane content. From this data, the fluid composition analysis corrects for spectrum variation. An independent determination of ethane (C2) is now possible for the first time owing to the increased resolution of the grating spectrometer together with advanced deconvolution. This extra detail in analyzing light-end hydrocarbon components is critical for productivity analysis and economic assessment. The ratio of C1/C2 can also help determine whether the hydrocarbon source is biogenic or thermogenic. From the composition, the gas/oil ratio (GOR) and condensate/gas ratio (CGR) are determined from the vaporizations of the hydrocarbon and CO2 components at standard conditions for flashing a live fluid.

3. InSitu GOR

From the enhanced composition measurement, the gas/oil ratio (GOR) and condensate/gas ratio (CGR) are determined from the vaporizations of the hydrocarbon and CO_2 components at standard conditions for flashing a live fluid. This new implementation provides greater range and increased accuracy over the measurement offered in previous generation tools (LFA live fluid analyzer and CFA compositional fluid analyzer). Results can now be entered into reservoir simulation models with confidence.

4. InSitu CO_2 Measurement

Carbon dioxide is present in the fluids of many reservoirs and must be accurately accounted for when developing hydrocarbon reserves. However, reliable quantification of CO_2 from reservoir fluid samples can be difficult, especially if there is water in the collected samples, because CO_2 easily reacts with water, whether from mud filtrate contamination or formation water. The measurement of CO_2 content by the InSitu Fluid Analyzer system is performed with the filter array spectrometer. A dedicated channel to the CO_2 absorption peak is complemented with dual baseline channels above and below that subtract out the overlapping spectrum of hydro-carbon and small amounts of water. The new channels and enhanced algorithm make it possible to plot the CO_2 content in real time, together with upper and lower accuracy tolerances on the measurement. This gives increased confidence in the measurement accuracy under different environments.

5. InSitu Color Measurement

With optical filters improved for high-temperature performance, the InSitu Color reservoir fluid color measurement uses the extended measurement range of the 20-channel filter array spectrometer to determine fluid color. The reliability of the measurement is supported by continuous real-time auto- calibration, application of a contamination algorithm that uses all the spectrometer channels, and a coated- window detection flag for enhanced QC. The color measurement supports fluid identification, determination of asphaltene gradients, and pH measurement.

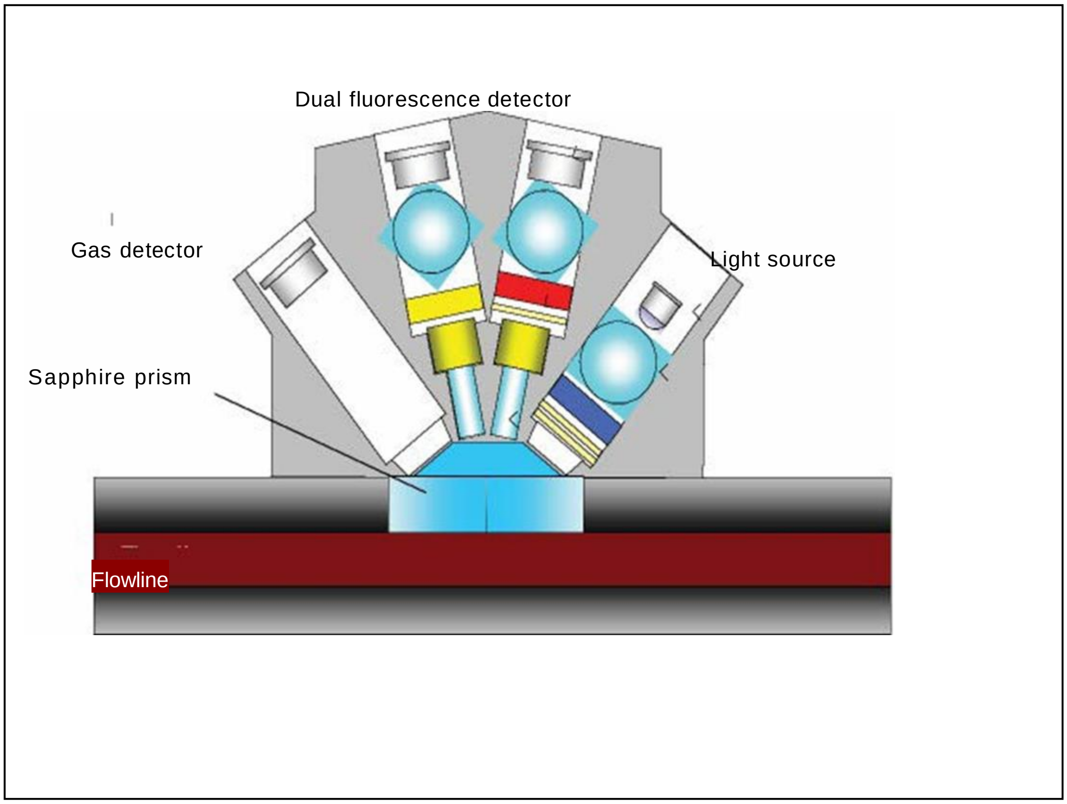
6. InSitu Density Measurement

Measuring density downhole at reservoir conditions provides numerous advantages over surface measurements, especially for determining pressure gradients in thin beds or carbonate transition zones. This real-time measurement directly yields the slope of the pressure gradient for the identification of fluid contacts. The InSitu Density reservoir fluid density measurement is based on the resonance characteristics of a vibrating sensor that oscillates in two perpendicular modes within the fluid. Simple physical models describe the resonance frequency and quality factor of the sensor in relation to the fluid density. Dual-mode oscillation is superior to other resonant techniques because it minimizes the effects of pressure and temperature on the sensor through common mode rejection, which further improves the accuracy of the measurement. The InSitu Density measurement is made under flowing conditions, and the resonator is resistive to corrosive fluids.

7. InSitu fluorescence Measurement

The InSitu Fluorescence reservoir fluid fluorescence measurement detects free gas bubbles and retrograde condensate liquid dropout for single-phase assurance while conducting DFA and sampling. Fluid type is also identified. The resulting fluid phase information is especially useful for defining the difference between retrograde condensates and volatile oils, which can have similar GORs and live-oil densities. Because the fluorescence measurement is also sensitive to liquid precipitation in a condensate gas when the flowing pressure falls below the dewpoint, it can be used to monitor phase separation in real time to ensure the collection of representative single-phase samples.

Schlumberger



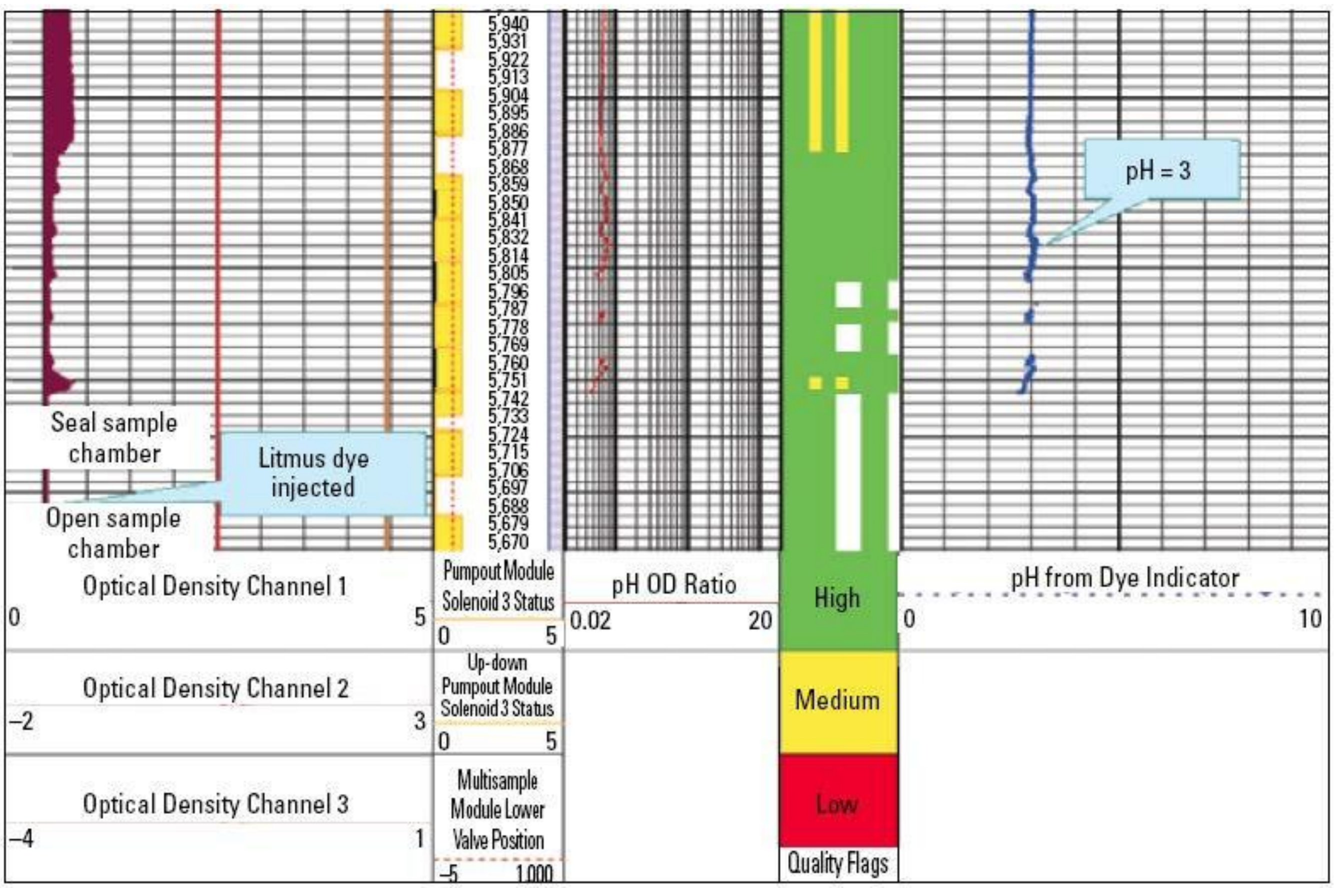
Downhole reflection and dual fluorescence measurements provide assurance that the reservoir fluid is in single phase before DFA and sampling.

8. InSitu pH Measurement

The formation water pH is a key parameter in water chemistry, used for calculating the corrosion and scaling potential of the water, under-standing reservoir connectivity and transition zones, determining the compatibility of injection water and formation water, and designating optimal salinity and pH windows for polymer and gel injections. Obtaining high-quality DFA and samples of formation water relies on tracking mud filtrate contamination by distinguishing between formation water and mud filtrate in real time.

Water pH is measured with the InSitu pH reservoir fluid pH measurement by injecting dye into the formation fluid being pumped through the InSitu Fluid Analyzer flowline. The pH is calculated with 0.1- unit accuracy from the relevant visible wavelengths of the dye signal measured by an optical fluid analyzer. Making the measurement at reservoir conditions avoids the irreversible pH changes that occur when samples are brought to the surface, as acid gases and salts come out of solution with reduced temperature and pressure and routine laboratory flashing of the sample.

InSitu pH sensor measures fluids across the entire flowline cross section, which makes it more robust than potentiometric methods of measurement, which are compromised when oil and mud foul electrode surfaces. Direct pH measurements with dye also avoid the limitations of resistivity measurement in monitoring contamination, which requires a sufficient resistivity contrast between the filtrate and formation water.



InSitu pH measurement of pH = 3 indicated high CO_2 that was missed in laboratory analysis conducted after the sample was flashed. With knowledge of the actual CO_2 content, the operator could minimize subsequent corrosion and scaling problems.

9. Flowline Resistivity Measurement

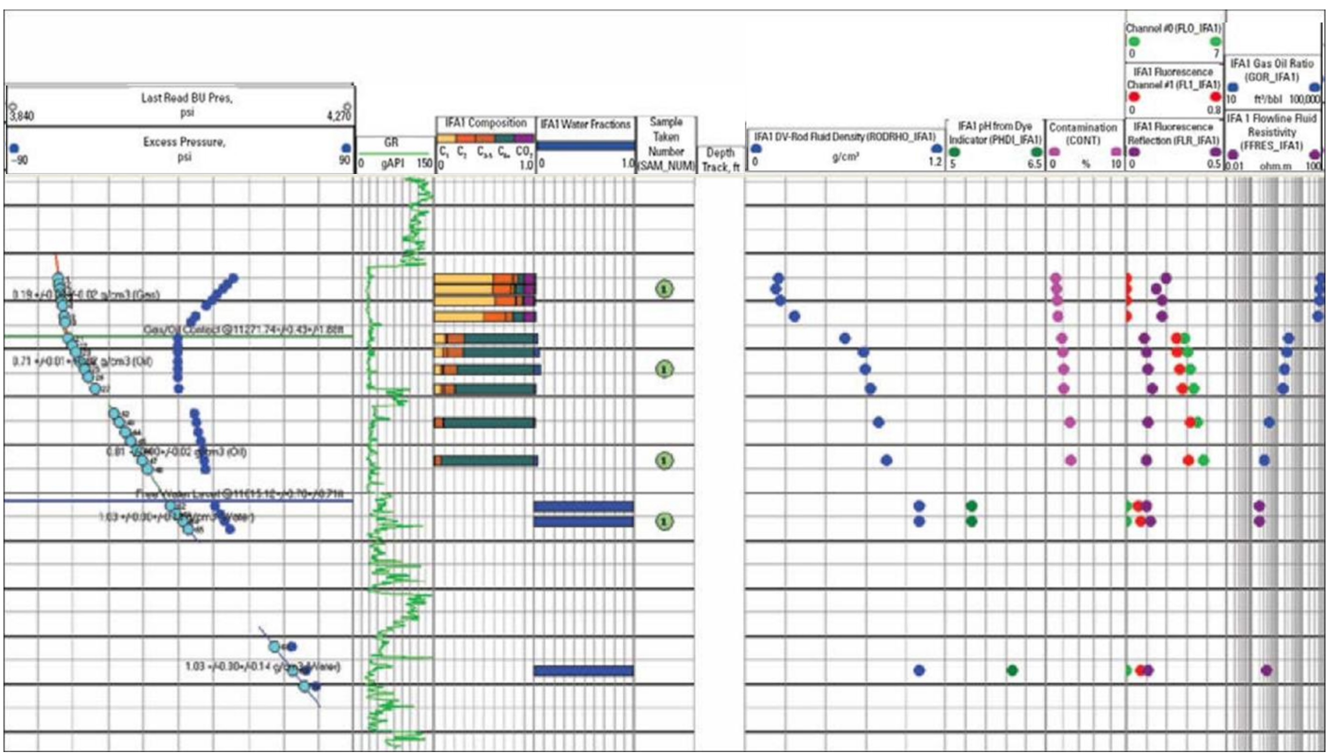
The flowline resistivity sensor uses the same proven technology employed in Schlumberger formation testing tools. With the resistivity sensor included in the DFA assembly, it is possible to monitor resistivity during dual-packer sampling operations in WBM.

10. Flowline Pressure and Temperature Measurements

The high-resolution pressure and temperature sensors used in Schlumberger formation testing tools are also incorporated in the InSitu Fluid Analyzer service. Direct measurement of pressure and temperature is essential to identify the position in the PVT envelope where the other fluid properties, such as density, are measured, especially when the sensors are placed downstream of the flowline pump. The DFA measurements within the flowline can then be accurately translated back to virginal reservoir conditions by employing well-known equation-of-state (EOS) algorithms.

11. Sampling Quality Control

With InSitu Family measurements, the reservoir fluid is analyzed before samples are collected, which substantially improves the quality of the fluid samples. The sampling process is optimized in terms of where and when to sample and how many samples to collect. In addition, the pressure sensor provides an accurate record of over pressuring the sample contents before the sampling chamber is closed.



The comprehensive InSitu Pro real-time quality control and interpretation software depth view combines the results of pressure and fluids analysis from multiple data sources.

12. Chain of Custody

DFA also provides a convenient technique for establishing a chain of custody for fluid samples. Differences between analytical data acquired downhole and that from corresponding samples in the laboratory are a strong indication that the laboratory sample may have been compromised.

13. Fluid Profiling

Fluid Profiling characterization provides the distribution of fluid properties across the reservoir, beyond what a traditional sampling program can achieve. The quantified accuracy of the InSitu Family measurements expands DFA application from a single well to multiple-well analysis, defining reservoir architecture across the entire field. Quantification of the variation of fluid properties at higher resolution than conventional sampling and analysis is key to identifying and differentiating compositional grading, fluid contacts, and reservoir compartments.

14. InSitu Fluid Analyzer Mechanical Specifications

Temperature rating, degF	350 [175]
Pressure rating, psi [MPa]	25,000 [170]
Diameter, in [cm]	5 [12.7]
Length, ft [m]	10.43 [3.18]
Weight, lbm [kg]	368 [167]

Thank You for Calling