Cimarex Energy Company
Ozley 25 Fed Com #1

Completion Profiler

Company	*Cimarex Energy Company*
Well Name	*Ozley 25 Fed Com #1*
Field	*White City Penn*
Location	*Eddy County, New Mexico*
Customer Name	*Steven Runyan*
Date of Survey	*December 6, 2017*
Date of Analysis	*January 18, 2018*
Logging Engineer	*Paulo Rios*
Analyst	*Derrick George*

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Survey Objectives

- Identify gas producing intervals.
- Identify oil producing intervals.
- Identify the source of water production.
- Quantitative production profile.

Logging Procedures

Date	Time	Comment
12/06	07:00	Arrive on location
12/06	09:00	Gauge run start
12/06	11:50	Gauge run stop
12/06	11:51	Program Completion Profile String
12/06	12:00	Start GIH pass
12/06	13:12	Stop GIH pass
12/06	13:18	Start logging passes
12/06	15:30	Stop logging passes
12/06	15:32	Start out of well pass
12/06	16:35	Stop out of well pass
12/06	16:45	Start download
12/06	17:30	Stop download
12/06	18:00	Rig down

Interval Logged: [From 8,409 to 9,977 ft.]
60 ft/min
90 ft/min
120 ft/min

Well Information

Casing: 5.500" 17.0 lb/ft surface to 12,245 ft PBTD: 10,350 ft

Tubing: 2.375" 4.6 lb/ft surface to 8,392 ft

Perforations:

Perforation Data																							
Stage 6 - Wolfcamp																							
8,440	to	8,441	8,452	to	8,453	8,460	to	8,461	8,469	to	8,470	8,477	to	8,478									
8,485	to	8,486	8,492	to	8,493	8,502	to	8,503	8,512	to	8,513	8,522	to	8,523									
8,533	to	8,534	8,542	to	8,543	8,552	to	8,553	8,564	to	8,565	8,575	to	8,576									
8,587	to	8,588	8,597	to	8,598	8,610	to	8,612	8,624	to	8,626	8,630	to	8,633									
Stage 5 - Wolfcamp																							
9,012	to	9,013	9,025	to	9,026	9,041	to	9,042	9,050	to	9,051	9,064	to	9,065									
9,072	to	9,073	9,087	to	9,088	9,118	to	9,119	9,154	to	9,155	9,162	to	9,163									
9,176	to	9,177	9,188	to	9,189	9,197	to	9,198	9,210	to	9,211	9,226	to	9,227									
9,231	to	9,232	9,240	to	9,241	9,247	to	9,248	9,256	to	9,258	9,262	to	9,265									
Stage 4 - Wolfcamp																							
9,298	to	9,299	9,311	to	9,312	9,317	to	9,318	9,326	to	9,327	9,338	to	9,339									
9,351	to	9,352	9,361	to	9,362	9,370	to	9,371	9,376	to	9,377	9,382	to	9,383									
9,388	to	9,389	9,400	to	9,401	9,409	to	9,410	9,418	to	9,419	9,427	to	9,428									
9,442	to	9,443	9,454	to	9,455	9,478	to	9,479	9,488	to	9,490	9,498	to	9,501									
Stage 3 - Wolfcamp																							
9,660	to	9,661	9,670	to	9,671	9,678	to	9,679	9,689	to	9,690	9,700	to	9,701									
9,705	to	9,706	9,710	to	9,711	9,724	to	9,725	9,734	to	9,735	9,743	to	9,744									
9,757	to	9,758	9,766	to	9,767	9,776	to	9,777	9,784	to	9,785	9,796	to	9,797									
9,812	to	9,813	9,828	to	9,829	9,842	to	9,843	9,859	to	9,861	9,875	to	9,878									
Stage 2 - Cisco Canyon																							
9,900	to	9,901	9,909	to	9,910	9,918	to	9,919	9,927	to	9,928	9,935	to	9,936									
9,941	to	9,942	9,948	to	9,949	9,957	to	9,958	9,964	to	9,965	9,972	to	9,973									
9,985	to	9,986	9,991	to	9,992	10,000	to	10,001	10,006	to	10,007	10,012	to	10,013									
10,021	to	10,022	10,034	to	10,035	10,044	to	10,045	10,058	to	10,060	10,068	to	10,071									
Stage 1 - Cisco Canyon																							
10,094	to	10,095	10,112	to	10,113	10,122	to	10,123	10,132	to	10,133	10,142	to	10,143									
10,158	to	10,159	10,171	to	10,172	10,182	to	10,183	10,190	to	10,191	10,200	to	10,201									
10,210	to	10,211	10,223	to	10,224	10,242	to	10,243	10,256	to	10,257	10,266	to	10,267									
10,285	to	10,286	10,290	to	10,291	10,304	to	10,305	10,312	to	10,314	10,318	to	10,321									

Tool String

The 1.700" Completion Profiler string comprised the following sensors:

Battery housing; RS-232/CCL; Memory/CPU; Gamma Ray; Pressure/Temperature Combo; Centralizer; Induction Collar Locator; Fluid Density; Fluid Dielectric; Centralizer; Spinner Flowmeter.

Results

The following table summarizes the production from each frac stage.

MEASURED SURFACE RATES Flow Rates Reported at STP				
	Tubing	Gas	Oil	Water
	Psi	MCFD	BFPD	BFPD
Avg	200 psi	1015 Mcf/d	20 bpd	270 bpd
Min		572 Mcf/d		
Max		1353 Mcf/d		

GAS / OIL / WATER PRODUCTION PROFILE Flow Rates Reported at STP										
Zone Intervals feet	Q-Gas MCFD	Qp-Gas MCFD	Percent of Total	Q-Oil BFPD	Qp-Oil BFPD	Percent of Total	Q-Water BFPD	Qp-Water BFPD	Percent of Total
Surface to 8440	1054.9 Mcf/d		100.00 %	20.47 bpd		100.00 %	267.52 bpd		100.00 %
Stage 6 - Wolfcamp			18.57 %			18.57 %			47.22 %
8440 to 8633	1054.9 Mcf/d	195.9 Mcf/d		20.47 bpd	3.80 bpd		267.52 bpd	126.33 bpd	
Stage 5 - Wolfcamp			12.56 %			12.56 %			22.13 %
9012 to 9265	859.0 Mcf/d	132.5 Mcf/d		16.67 bpd	2.57 bpd		141.19 bpd	59.20 bpd	
Stage 4 - Wolfcamp			8.75 %			8.75 %			12.83 %
9298 to 9501	726.6 Mcf/d	92.3 Mcf/d		14.10 bpd	1.79 bpd		81.99 bpd	34.32 bpd	
Stage 3 - Wolfcamp			28.07 %			28.07 %			12.44 %
9660 to 9878	634.2 Mcf/d	296.1 Mcf/d		12.31 bpd	5.74 bpd		47.67 bpd	33.28 bpd	
Stage 2 - Cisco Canyon			22.70 %			22.70 %			5.13 %
9900 to 9973	338.2 Mcf/d	239.4 Mcf/d		6.56 bpd	4.65 bpd		14.40 bpd	13.71 bpd	
Flow Contribution from Below Log Depth			9.36 %			9.36 %			0.26 %
9977 to Below	98.8 Mcf/d		9.36 %	1.92 bpd		9.36 %	0.68 bpd		0.26 %

The following table summarizes the production from each producing interval.

GAS / OIL / WATER PRODUCTION PROFILE Flow Rates Reported at STP										
Zone Intervals feet	Q-Gas MCFD	Qp-Gas MCFD	Percent of Total	Q-Oil BFPD	Qp-Oil BFPD	Percent of Total	Q-Water BFPD	Qp-Water BFPD	Percent of Total
Surface to 8440	1054.9 Mcf/d		100.00 %	20.47 bpd		100.00 %	267.52 bpd		100.00 %
Stage 6 - Wolfcamp			18.57 %			18.57 %			47.22 %
8440 to 8441	1054.9 Mcf/d	29.9 Mcf/d	2.84 %	20.47 bpd	0.58 bpd	2.84 %	267.52 bpd	18.95 bpd	7.08 %
8452 to 8453	1025.0 Mcf/d	64.4 Mcf/d	6.10 %	19.89 bpd	1.25 bpd	6.10 %	248.57 bpd	0.72 bpd	0.27 %
8460 to 8461	960.6 Mcf/d	1.5 Mcf/d	0.15 %	18.64 bpd	0.03 bpd	0.15 %	247.86 bpd	26.67 bpd	9.97 %
8469 to 8470	959.1 Mcf/d	1.9 Mcf/d	0.18 %	18.61 bpd	0.04 bpd	0.18 %	221.19 bpd	12.63 bpd	4.72 %
8477 to 8478	957.2 Mcf/d	1.9 Mcf/d	0.18 %	18.57 bpd	0.04 bpd	0.18 %	208.56 bpd	10.64 bpd	3.98 %
8485 to 8486	955.3 Mcf/d	1.7 Mcf/d	0.16 %	18.54 bpd	0.03 bpd	0.16 %	197.92 bpd	8.10 bpd	3.03 %
8492 to 8493	953.6 Mcf/d	2.0 Mcf/d	0.19 %	18.50 bpd	0.04 bpd	0.19 %	189.82 bpd	4.05 bpd	1.52 %
8502 to 8503	951.6 Mcf/d	4.9 Mcf/d	0.47 %	18.46 bpd	0.10 bpd	0.47 %	185.77 bpd	4.05 bpd	1.52 %
8512 to 8513	946.7 Mcf/d	7.0 Mcf/d	0.66 %	18.37 bpd	0.14 bpd	0.66 %	181.71 bpd	5.53 bpd	2.07 %
8522 to 8523	939.7 Mcf/d	4.5 Mcf/d	0.43 %	18.23 bpd	0.09 bpd	0.43 %	176.19 bpd	7.95 bpd	2.97 %
8533 to 8534	935.2 Mcf/d	9.6 Mcf/d	0.91 %	18.14 bpd	0.19 bpd	0.91 %	168.23 bpd	2.58 bpd	0.96 %
8542 to 8543	925.6 Mcf/d	8.9 Mcf/d	0.85 %	17.96 bpd	0.17 bpd	0.85 %	165.66 bpd	3.86 bpd	1.44 %
8552 to 8553	916.6 Mcf/d	9.7 Mcf/d	0.92 %	17.79 bpd	0.19 bpd	0.92 %	161.80 bpd	4.68 bpd	1.75 %
8564 to 8565	907.0 Mcf/d	9.2 Mcf/d	0.87 %	17.60 bpd	0.18 bpd	0.87 %	157.11 bpd	5.97 bpd	2.23 %
8575 to 8576	897.8 Mcf/d	1.0 Mcf/d	0.10 %	17.42 bpd	0.02 bpd	0.10 %	151.14 bpd	1.88 bpd	0.70 %
8587 to 8588	896.7 Mcf/d	0.9 Mcf/d	0.09 %	17.40 bpd	0.02 bpd	0.09 %	149.26 bpd	1.03 bpd	0.39 %
8597 to 8598	895.8 Mcf/d	1.1 Mcf/d	0.10 %	17.38 bpd	0.02 bpd	0.10 %	148.23 bpd	0.98 bpd	0.37 %
8610 to 8612	894.8 Mcf/d	9.0 Mcf/d	0.85 %	17.36 bpd	0.17 bpd	0.85 %	147.24 bpd	2.38 bpd	0.89 %
8624 to 8626	885.8 Mcf/d	6.0 Mcf/d	0.57 %	17.19 bpd	0.12 bpd	0.57 %	144.86 bpd	0.77 bpd	0.29 %
8630 to 8633	879.8 Mcf/d	20.8 Mcf/d	1.97 %	17.07 bpd	0.40 bpd	1.97 %	144.09 bpd	2.90 bpd	1.08 %
Stage 5 - Wolfcamp			12.56 %			12.56 %			22.13 %
9012 to 9013	859.0 Mcf/d	24.1 Mcf/d	2.28 %	16.67 bpd	0.47 bpd	2.28 %	141.19 bpd	1.02 bpd	0.38 %
9025 to 9026	835.0 Mcf/d	3.5 Mcf/d	0.33 %	16.20 bpd	0.07 bpd	0.33 %	140.17 bpd	1.89 bpd	0.71 %
9041 to 9042	831.5 Mcf/d	2.5 Mcf/d	0.23 %	16.13 bpd	0.05 bpd	0.23 %	138.29 bpd	2.33 bpd	0.87 %
9050 to 9051	829.0 Mcf/d	2.2 Mcf/d	0.21 %	16.08 bpd	0.04 bpd	0.21 %	135.96 bpd	1.31 bpd	0.49 %
9064 to 9065	826.8 Mcf/d	1.7 Mcf/d	0.16 %	16.04 bpd	0.03 bpd	0.16 %	134.65 bpd	2.04 bpd	0.76 %
9072 to 9073	825.2 Mcf/d	2.2 Mcf/d	0.21 %	16.01 bpd	0.04 bpd	0.21 %	132.61 bpd	1.16 bpd	0.43 %
9087 to 9088	823.0 Mcf/d	40.4 Mcf/d	3.83 %	15.97 bpd	0.78 bpd	3.83 %	131.45 bpd	2.19 bpd	0.82 %
9118 to 9119	782.6 Mcf/d	1.1 Mcf/d	0.11 %	15.18 bpd	0.02 bpd	0.11 %	129.27 bpd	4.51 bpd	1.69 %
9154 to 9155	781.5 Mcf/d	1.3 Mcf/d	0.12 %	15.16 bpd	0.03 bpd	0.12 %	124.76 bpd	5.23 bpd	1.96 %
9162 to 9163	780.2 Mcf/d	1.2 Mcf/d	0.11 %	15.14 bpd	0.02 bpd	0.11 %	119.53 bpd	1.16 bpd	0.43 %
9176 to 9177	779.0 Mcf/d	1.2 Mcf/d	0.11 %	15.11 bpd	0.02 bpd	0.11 %	118.37 bpd	2.04 bpd	0.76 %
9188 to 9189	777.8 Mcf/d	1.6 Mcf/d	0.15 %	15.09 bpd	0.03 bpd	0.15 %	116.33 bpd	1.75 bpd	0.66 %
9197 to 9198	776.2 Mcf/d	1.1 Mcf/d	0.10 %	15.06 bpd	0.02 bpd	0.10 %	114.58 bpd	1.30 bpd	0.49 %
9210 to 9211	775.2 Mcf/d	1.1 Mcf/d	0.11 %	15.04 bpd	0.02 bpd	0.11 %	113.28 bpd	1.89 bpd	0.71 %
9226 to 9227	774.1 Mcf/d	7.5 Mcf/d	0.71 %	15.02 bpd	0.15 bpd	0.71 %	111.38 bpd	2.33 bpd	0.87 %
9231 to 9232	766.6 Mcf/d	10.3 Mcf/d	0.98 %	14.87 bpd	0.20 bpd	0.98 %	109.05 bpd	1.71 bpd	0.64 %
9240 to 9241	756.3 Mcf/d	5.6 Mcf/d	0.53 %	14.67 bpd	0.11 bpd	0.53 %	107.35 bpd	1.31 bpd	0.49 %
9247 to 9248	750.6 Mcf/d	8.7 Mcf/d	0.83 %	14.56 bpd	0.17 bpd	0.83 %	106.04 bpd	1.02 bpd	0.38 %
9256 to 9258	741.9 Mcf/d	10.3 Mcf/d	0.98 %	14.40 bpd	0.20 bpd	0.98 %	105.02 bpd	10.26 bpd	3.84 %
9262 to 9265	731.6 Mcf/d	5.1 Mcf/d	0.48 %	14.20 bpd	0.10 bpd	0.48 %	94.76 bpd	12.77 bpd	4.77 %

Stage 4 - Wolfcamp				**8.75 %**			**8.75 %**			**12.83 %**
9298	to **9299**	726.6 Mcf/d	4.8 Mcf/d	**0.46 %**	14.10 bpd	0.09 bpd	**0.46 %**	81.99 bpd	1.02 bpd	**0.38 %**
9311	to **9312**	721.7 Mcf/d	5.2 Mcf/d	**0.49 %**	14.00 bpd	0.10 bpd	**0.49 %**	80.97 bpd	1.89 bpd	**0.71 %**
9317	to **9318**	716.5 Mcf/d	4.5 Mcf/d	**0.43 %**	13.90 bpd	0.09 bpd	**0.43 %**	79.07 bpd	1.85 bpd	**0.69 %**
9326	to **9327**	712.1 Mcf/d	5.4 Mcf/d	**0.51 %**	13.82 bpd	0.10 bpd	**0.51 %**	77.22 bpd	1.31 bpd	**0.49 %**
9338	to **9339**	706.7 Mcf/d	7.5 Mcf/d	**0.71 %**	13.71 bpd	0.15 bpd	**0.71 %**	75.91 bpd	1.74 bpd	**0.65 %**
9351	to **9352**	699.2 Mcf/d	2.5 Mcf/d	**0.24 %**	13.57 bpd	0.05 bpd	**0.24 %**	74.17 bpd	1.89 bpd	**0.71 %**
9361	to **9362**	696.7 Mcf/d	2.5 Mcf/d	**0.24 %**	13.52 bpd	0.05 bpd	**0.24 %**	72.28 bpd	1.45 bpd	**0.54 %**
9370	to **9371**	694.2 Mcf/d	2.5 Mcf/d	**0.24 %**	13.47 bpd	0.05 bpd	**0.24 %**	70.82 bpd	1.31 bpd	**0.49 %**
9376	to **9377**	691.7 Mcf/d	0.6 Mcf/d	**0.06 %**	13.42 bpd	0.01 bpd	**0.06 %**	69.51 bpd	1.85 bpd	**0.69 %**
9382	to **9383**	691.1 Mcf/d	1.1 Mcf/d	**0.10 %**	13.41 bpd	0.02 bpd	**0.10 %**	67.67 bpd	1.86 bpd	**0.69 %**
9388	to **9389**	690.0 Mcf/d	0.8 Mcf/d	**0.08 %**	13.39 bpd	0.02 bpd	**0.08 %**	65.81 bpd	1.85 bpd	**0.69 %**
9400	to **9401**	689.2 Mcf/d	5.5 Mcf/d	**0.52 %**	13.37 bpd	0.11 bpd	**0.52 %**	63.96 bpd	1.74 bpd	**0.65 %**
9409	to **9410**	683.7 Mcf/d	4.5 Mcf/d	**0.42 %**	13.27 bpd	0.09 bpd	**0.42 %**	62.22 bpd	1.31 bpd	**0.49 %**
9418	to **9419**	679.2 Mcf/d	5.0 Mcf/d	**0.47 %**	13.18 bpd	0.10 bpd	**0.47 %**	60.91 bpd	1.31 bpd	**0.49 %**
9427	to **9428**	674.2 Mcf/d	20.0 Mcf/d	**1.90 %**	13.08 bpd	0.39 bpd	**1.90 %**	59.60 bpd	1.31 bpd	**0.49 %**
9442	to **9443**	654.2 Mcf/d	1.3 Mcf/d	**0.12 %**	12.69 bpd	0.03 bpd	**0.12 %**	58.29 bpd	2.18 bpd	**0.82 %**
9454	to **9455**	652.9 Mcf/d	1.2 Mcf/d	**0.11 %**	12.67 bpd	0.02 bpd	**0.11 %**	56.11 bpd	1.74 bpd	**0.65 %**
9478	to **9479**	651.7 Mcf/d	12.5 Mcf/d	**1.18 %**	12.65 bpd	0.24 bpd	**1.18 %**	54.36 bpd	3.49 bpd	**1.31 %**
9488	to **9490**	639.2 Mcf/d	2.5 Mcf/d	**0.23 %**	12.40 bpd	0.05 bpd	**0.23 %**	50.87 bpd	1.60 bpd	**0.60 %**
9498	to **9501**	636.8 Mcf/d	2.5 Mcf/d	**0.24 %**	12.36 bpd	0.05 bpd	**0.24 %**	49.27 bpd	1.60 bpd	**0.60 %**
Stage 3 - Wolfcamp				**28.07 %**			**28.07 %**			**12.44 %**
9660	to **9661**	634.2 Mcf/d	45.6 Mcf/d	**4.32 %**	12.31 bpd	0.88 bpd	**4.32 %**	47.67 bpd	1.72 bpd	**0.65 %**
9670	to **9671**	588.6 Mcf/d	5.5 Mcf/d	**0.52 %**	11.42 bpd	0.11 bpd	**0.52 %**	45.95 bpd	1.45 bpd	**0.54 %**
9678	to **9679**	583.2 Mcf/d	4.5 Mcf/d	**0.43 %**	11.32 bpd	0.09 bpd	**0.43 %**	44.50 bpd	1.16 bpd	**0.44 %**
9689	to **9690**	578.6 Mcf/d	4.9 Mcf/d	**0.46 %**	11.23 bpd	0.10 bpd	**0.46 %**	43.33 bpd	1.60 bpd	**0.60 %**
9700	to **9701**	573.7 Mcf/d	6.1 Mcf/d	**0.58 %**	11.13 bpd	0.12 bpd	**0.58 %**	41.73 bpd	1.60 bpd	**0.60 %**
9705	to **9706**	567.6 Mcf/d	2.9 Mcf/d	**0.28 %**	11.01 bpd	0.06 bpd	**0.28 %**	40.13 bpd	0.73 bpd	**0.27 %**
9710	to **9711**	564.7 Mcf/d	3.4 Mcf/d	**0.32 %**	10.96 bpd	0.07 bpd	**0.32 %**	39.41 bpd	0.73 bpd	**0.27 %**
9724	to **9725**	561.3 Mcf/d	0.1 Mcf/d	**0.01 %**	10.89 bpd	0.00 bpd	**0.01 %**	38.68 bpd	2.04 bpd	**0.76 %**
9734	to **9735**	561.1 Mcf/d	1.4 Mcf/d	**0.13 %**	10.89 bpd	0.03 bpd	**0.13 %**	36.64 bpd	1.45 bpd	**0.54 %**
9743	to **9744**	559.7 Mcf/d	20.4 Mcf/d	**1.93 %**	10.86 bpd	0.40 bpd	**1.93 %**	35.19 bpd	1.31 bpd	**0.49 %**
9757	to **9758**	539.4 Mcf/d	1.9 Mcf/d	**0.18 %**	10.47 bpd	0.04 bpd	**0.18 %**	33.88 bpd	2.04 bpd	**0.76 %**
9766	to **9767**	537.5 Mcf/d	2.1 Mcf/d	**0.20 %**	10.43 bpd	0.04 bpd	**0.20 %**	31.84 bpd	1.31 bpd	**0.49 %**
9776	to **9777**	535.4 Mcf/d	1.8 Mcf/d	**0.18 %**	10.39 bpd	0.04 bpd	**0.18 %**	30.54 bpd	1.45 bpd	**0.54 %**
9784	to **9785**	533.5 Mcf/d	2.2 Mcf/d	**0.20 %**	10.35 bpd	0.04 bpd	**0.20 %**	29.08 bpd	1.16 bpd	**0.44 %**
9796	to **9797**	531.4 Mcf/d	2.3 Mcf/d	**0.21 %**	10.31 bpd	0.04 bpd	**0.21 %**	27.92 bpd	1.74 bpd	**0.65 %**
9812	to **9813**	529.1 Mcf/d	1.8 Mcf/d	**0.17 %**	10.27 bpd	0.04 bpd	**0.17 %**	26.17 bpd	2.33 bpd	**0.87 %**
9828	to **9829**	527.3 Mcf/d	4.5 Mcf/d	**0.43 %**	10.23 bpd	0.09 bpd	**0.43 %**	23.85 bpd	2.33 bpd	**0.87 %**
9842	to **9843**	522.8 Mcf/d	4.5 Mcf/d	**0.43 %**	10.14 bpd	0.09 bpd	**0.43 %**	21.52 bpd	2.04 bpd	**0.76 %**
9859	to **9861**	518.3 Mcf/d	128.3 Mcf/d	**12.16 %**	10.06 bpd	2.49 bpd	**12.16 %**	19.49 bpd	2.62 bpd	**0.98 %**
9875	to **9878**	390.0 Mcf/d	51.8 Mcf/d	**4.91 %**	7.57 bpd	1.00 bpd	**4.91 %**	16.87 bpd	2.47 bpd	**0.92 %**

Stage 2 - Cisco Canyon				**22.70 %**			**22.70 %**			**5.12 %**
9900 to **9901**	338.2 Mcf/d	31.4 Mcf/d	**2.98 %**	6.56 bpd	0.61 bpd	**2.98 %**	14.40 bpd	3.34 bpd	**1.25 %**
9909 to **9910**	306.8 Mcf/d	34.4 Mcf/d	**3.26 %**	5.95 bpd	0.67 bpd	**3.26 %**	11.05 bpd	1.31 bpd	**0.49 %**
9918 to **9919**	272.3 Mcf/d	7.5 Mcf/d	**0.71 %**	5.28 bpd	0.15 bpd	**0.71 %**	9.74 bpd	1.31 bpd	**0.49 %**
9927 to **9928**	264.9 Mcf/d	5.6 Mcf/d	**0.53 %**	5.14 bpd	0.11 bpd	**0.53 %**	8.43 bpd	1.31 bpd	**0.49 %**
9935 to **9936**	259.2 Mcf/d	6.3 Mcf/d	**0.60 %**	5.03 bpd	0.12 bpd	**0.60 %**	7.13 bpd	1.16 bpd	**0.44 %**
9941 to **9942**	252.9 Mcf/d	18.0 Mcf/d	**1.70 %**	4.91 bpd	0.35 bpd	**1.70 %**	5.96 bpd	0.87 bpd	**0.33 %**
9948 to **9949**	234.9 Mcf/d	52.4 Mcf/d	**4.97 %**	4.56 bpd	1.02 bpd	**4.97 %**	5.09 bpd	1.02 bpd	**0.38 %**
9957 to **9958**	182.6 Mcf/d	41.9 Mcf/d	**3.97 %**	3.54 bpd	0.81 bpd	**3.97 %**	4.07 bpd	1.31 bpd	**0.49 %**
9964 to **9965**	140.7 Mcf/d	29.9 Mcf/d	**2.84 %**	2.73 bpd	0.58 bpd	**2.84 %**	2.76 bpd	1.02 bpd	**0.38 %**
9972 to **9973**	110.7 Mcf/d	12.0 Mcf/d	**1.14 %**	2.15 bpd	0.23 bpd	**1.14 %**	1.74 bpd	1.06 bpd	**0.40 %**
Flow Contribution from Below Log Depth			**9.36 %**			**9.36 %**			**0.26 %**
9977 to **Below**	98.8 Mcf/d		**9.36 %**	1.92 bpd		**9.36 %**	0.68 bpd		**0.26 %**

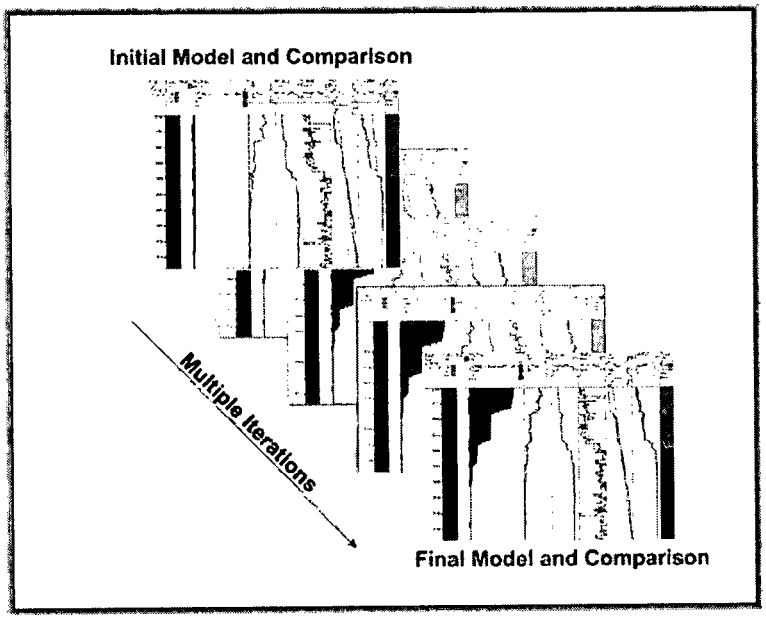
Analysis Summary

1. The analysis was conducted as 3-phase. The oil production of 20 BOPD is too low to accurately quantify. The downhole oil rate, at 100% flow, accounts for ~2 % of the total mass flow and ~1 % of the total volumetric rate, assuming free gas entry and solution gas breaking out downhole. The GOR is assumed to be even across all zones.

2. The perforations below 9,977 feet were not logged due to wellbore restrictions. Total production from these intervals was calculated based on the data below the 9,972 – 9,973 feet perforations.

Brief Description of Process

The analysis is performed using a global stochastic optimization technique.
In this technique an initial flow model is estimated. Then from this model the theoretical log responses are derived. The theoretical responses are compared to all available data and the model is adjusted until the best possible match of the theoretical and actual data is obtained.



A comparison between the model responses and the recorded data is shown in this report. Good correlation between the theoretical and log data curves indicates that the flow model is in agreement with the log data and the actual well production profile. Discrepancies between the theoretical and raw data curves can be due to tool deficiencies, conflicts between the parameters or conditions that make the underlying empirical models (such as flow regimes) less applicable.

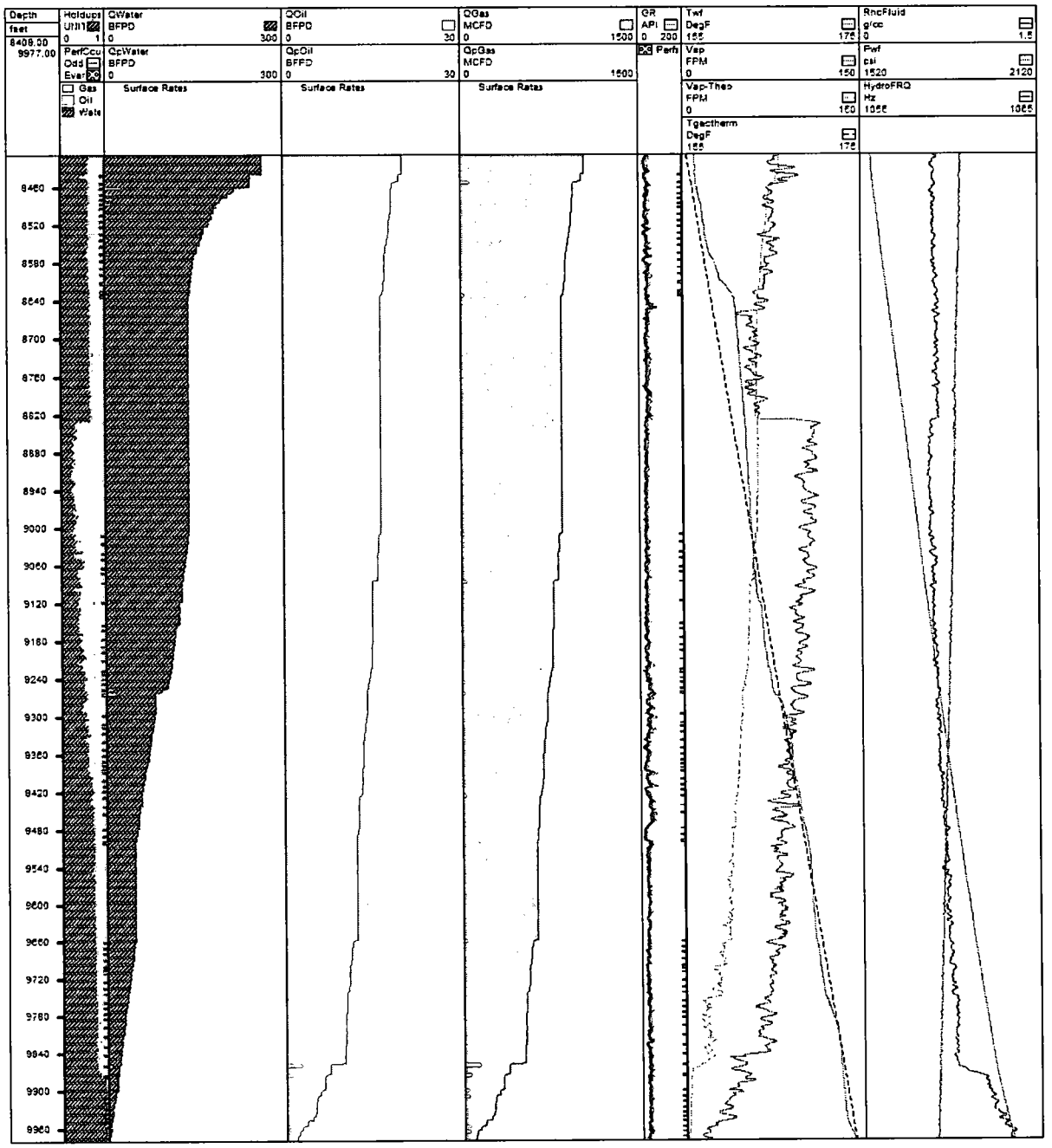
- The flow regimes were determined, directly from the flow rates and holdups, according to the Taitel-Dukler analytic model.
- The profile factors, to calculate the average effective fluid velocity from the apparent velocity, were based on the Reynolds number, calculated from the phase velocities and phase properties.
- Where gas was present the density, heat capacity and Joule-Thompson coefficients were derived from the Lee Kesler Pitzer equation of states.
- Solution gas in oil was derived from the Vasquez and Beggs or Oistein Glaso correlation.

The analysis was performed in five steps:

- The data preparation to filter the data, compute gradients and error estimates.
- The flow meter analysis to compute the apparent velocity.
- The profile determination to identify the potential producing and/or injecting zones.
- The computation of the flow rates (model) by global optimization.
- The computation of surface production rates and reporting

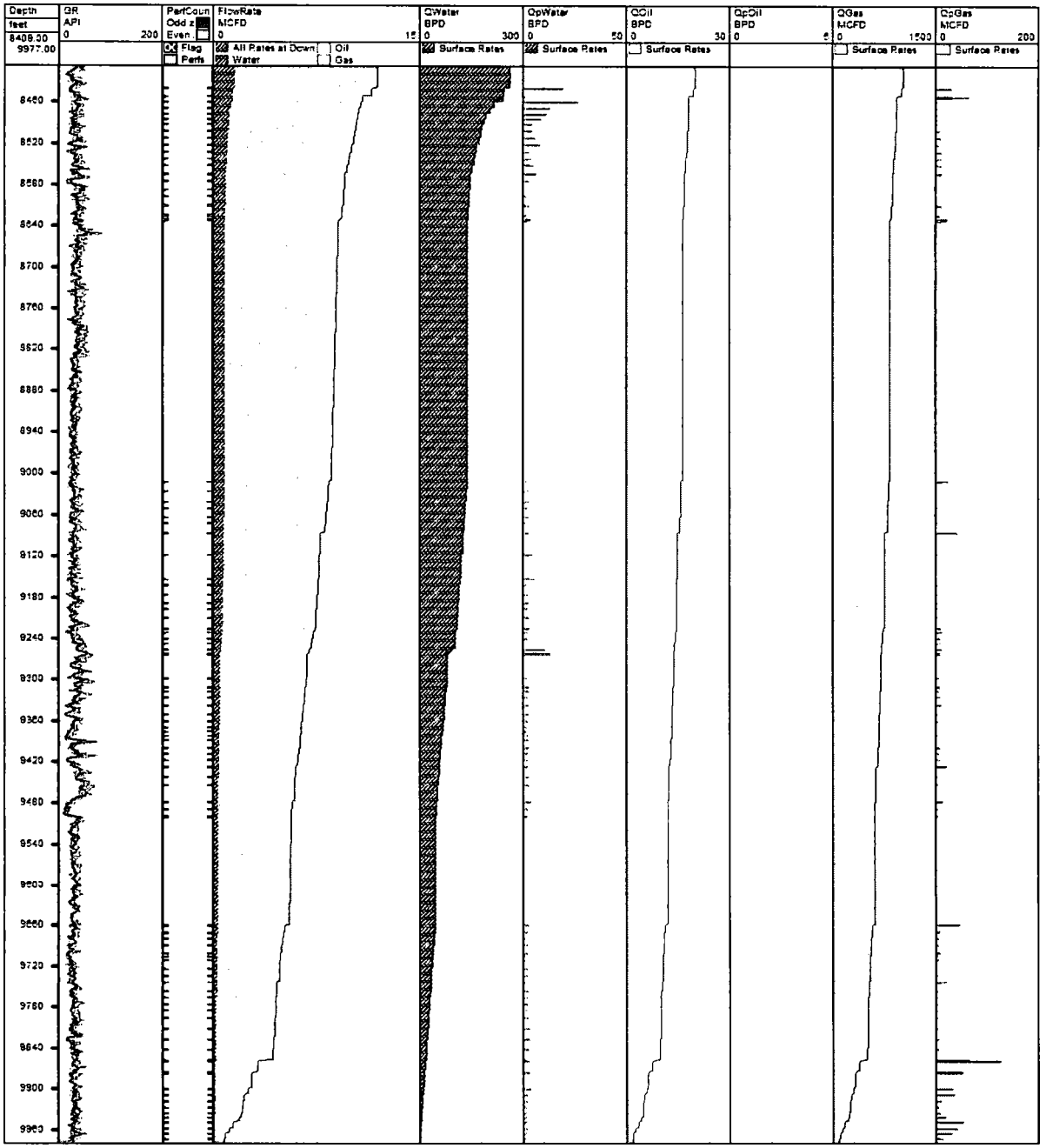
Completion Profile Analysis

Model Results With Recorded Data



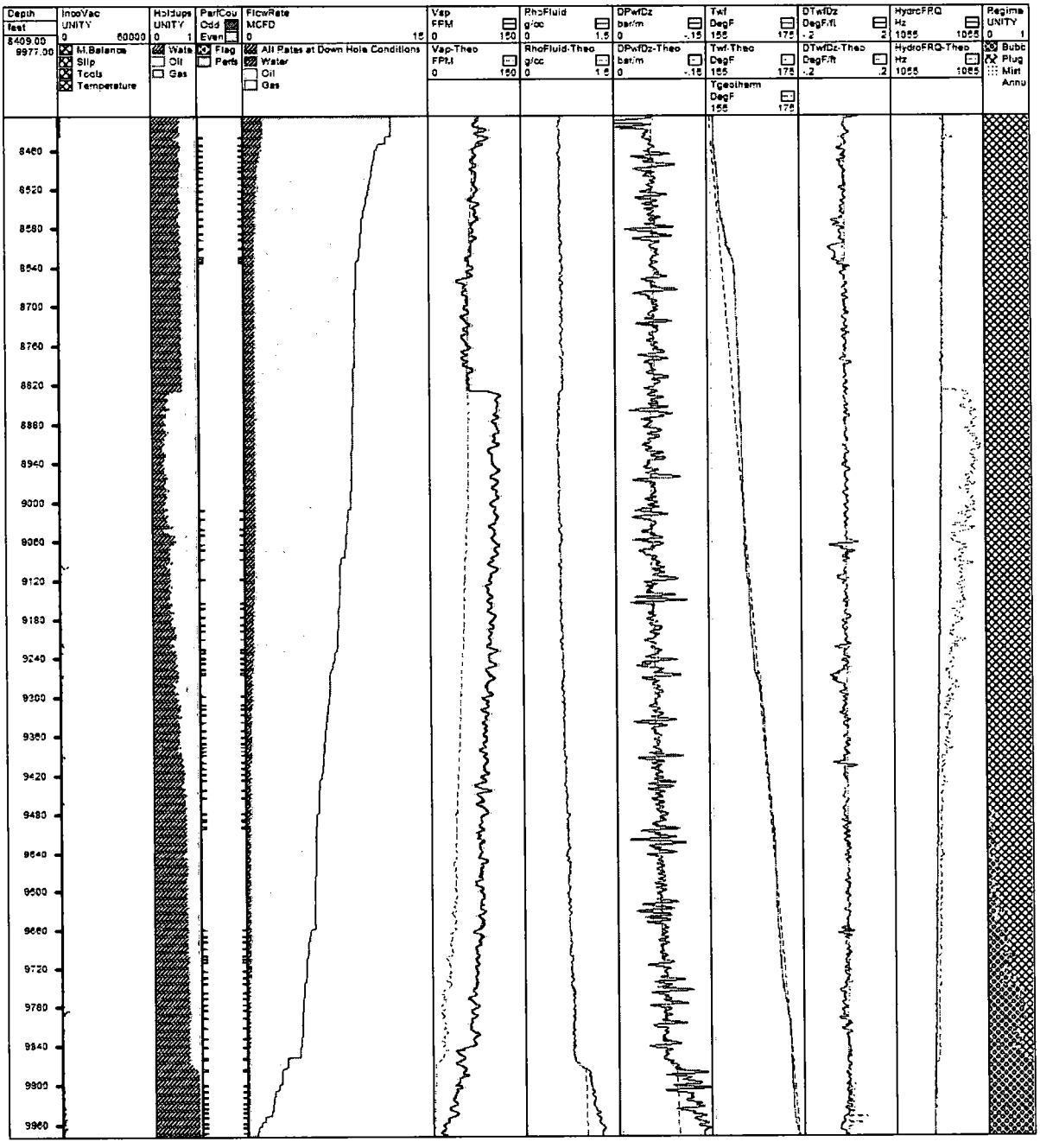
Completion Profile Analysis

Production Rates At Surface Conditions



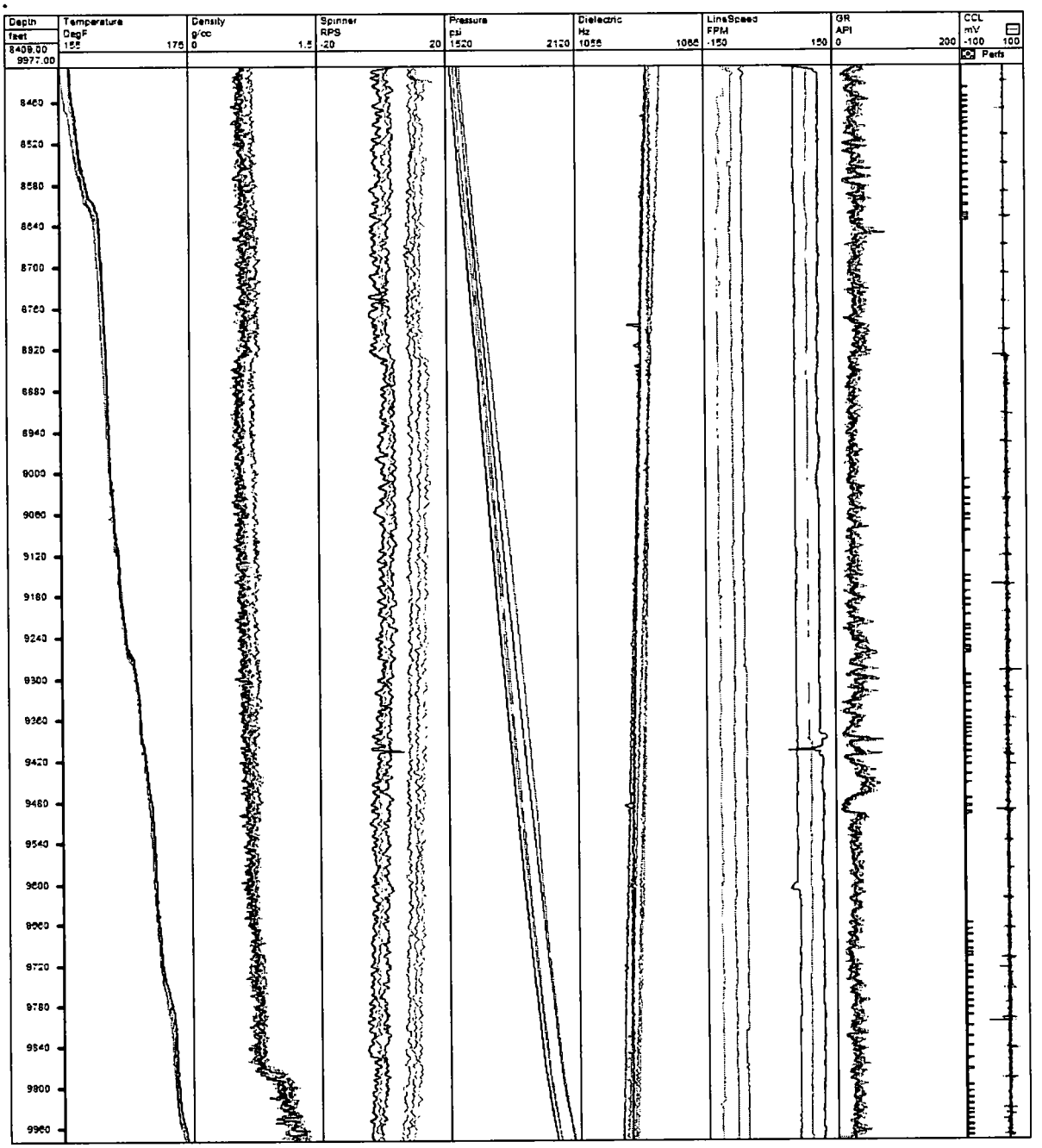
Completion Profile Analysis

Flow Model at Downhole Conditions With Comparison of Theoretical Response to Recorded Data

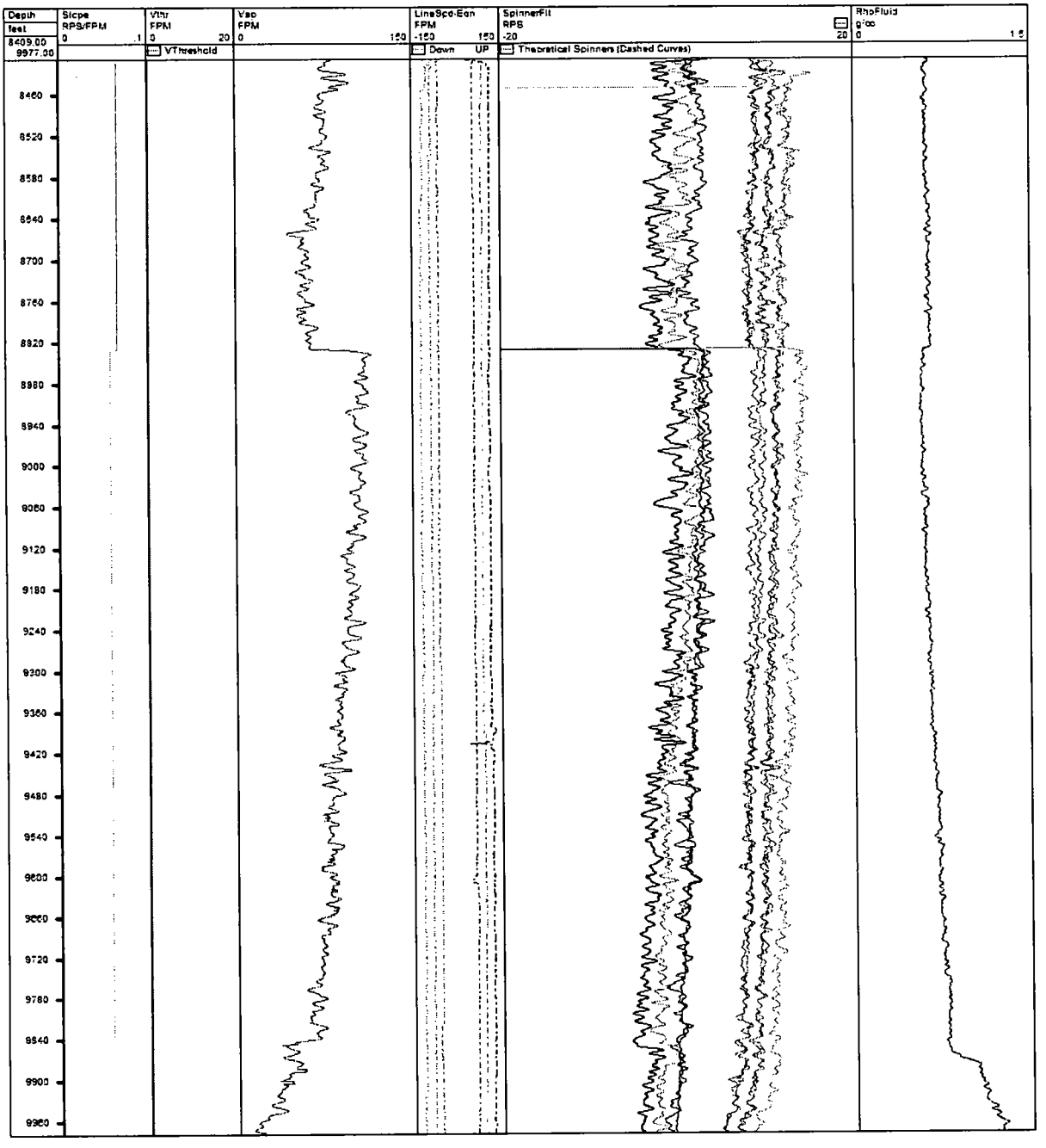


Completion Profile Analysis

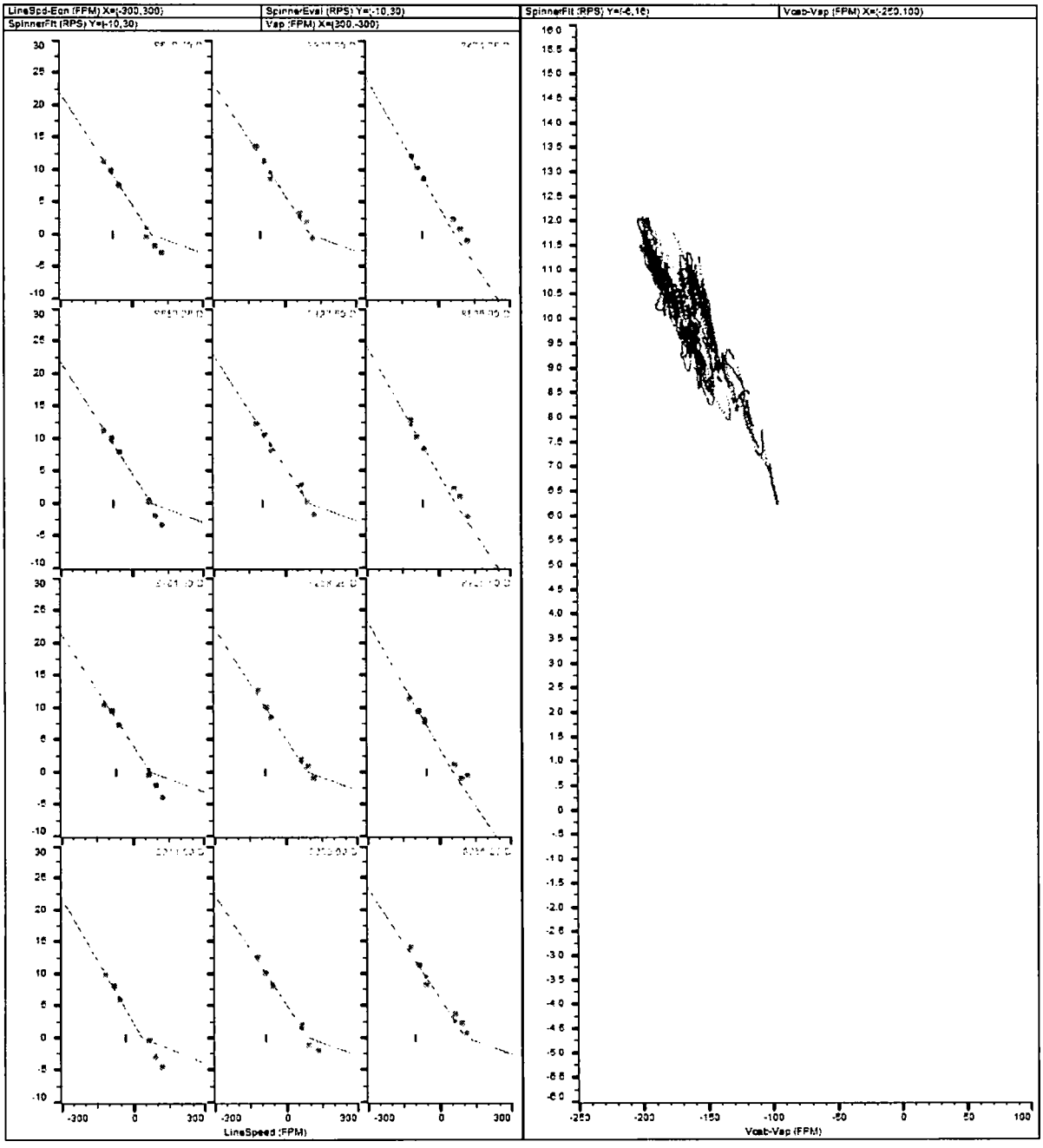
Overlay of all Log Data



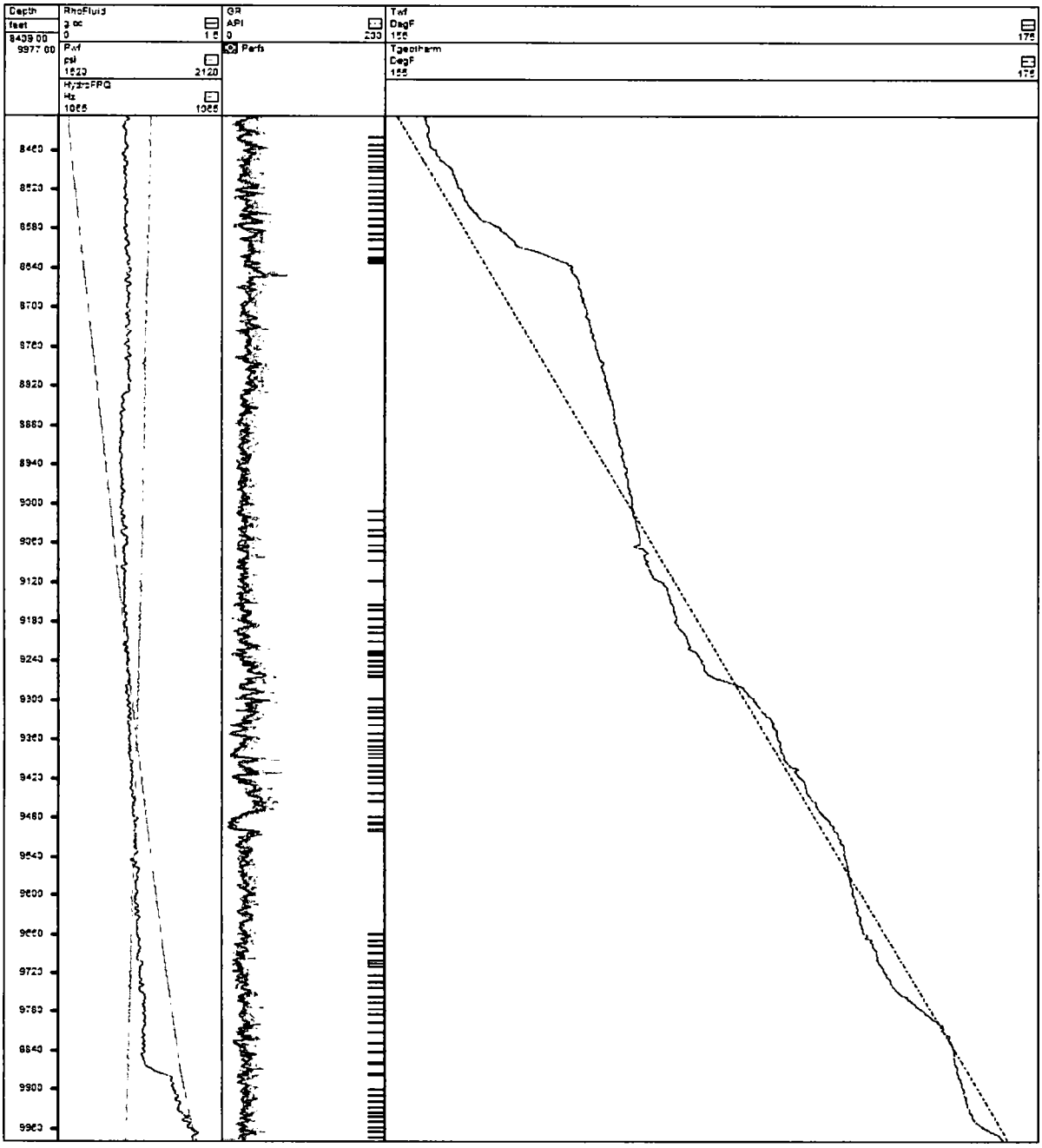
Apparent Fluid Velocity Derived from Spinner



Spinner Calibration Plots
Relationship between R.P.S. and Fluid Velocity (fpm)



Geothermal Gradient



Completion Profile Analysis

Well Information
Parameters used for Analysis

SPGG	UNITY	.682
APIOil	UNITY	52.3
DPipe	in	4.90
PipeAngle	DegAng	0
Geotherm	°F/ft	.0120
TgeoRef	°F	174
DgeoRef	ft	9977

Downhole Measured and Computed Parameters

Depth	Pwf	Twf	ρ_{gas}	ρ_{oil}	ρ_{water}	RhoFluid	B_{gas}	Vap
feet	psi	DegF	g/cc	g/cc	g/cc	g/cc	UNITY	FPM
8409.00	1552	156	.0840	.738	1.00	.617	.00993	81.5
8521.00	1577	157	.0853	.738	1.00	.604	.00978	78.3
8633.00	1608	161	.0863	.737	1.00	.627	.00967	63.2
8745.00	1639	161	.0879	.737	1.00	.627	.00949	55.2
8857.00	1670	162	.0896	.736	1.00	.603	.00932	109
8969.00	1700	162	.0911	.736	1.00	.587	.00916	111
9081.00	1728	163	.0926	.736	1.00	.601	.00901	110
9193.00	1759	164	.0941	.736	1.00	.626	.00887	103
9305.00	1791	166	.0953	.735	1.00	.657	.00875	87.3
9417.00	1823	168	.0968	.734	1.00	.680	.00862	91.6
9529.00	1858	169	.0984	.734	1.00	.714	.00848	77.0
9641.00	1892	170	.100	.734	1.00	.716	.00834	75.3
9753.00	1929	171	.102	.733	1.00	.788	.00820	67.3
9865.00	1968	173	.103	.733	1.00	.812	.00807	40.1
9977.00	2027	174	.106	.732	1.00	1.24	.00785	23.0

Definitions

Curve Name	Description
Holdup	Holdups
PerfCount	Perforations
QGas	Total Gas Production at surface conditions
QpGas	Incremental Gas Production at surface conditions
QOil	Total Oil Production (if present downhole) at surface conditions
QpOil	Incremental Oil Production (if present downhole) at surface conditions
QWater	Total Water Production at surface conditions
QpWater	Incremental Water Production at surface conditions
GR	Gamma Ray/SpectraScan
Twf	Average Temperature
Vap	Apparent Velocity
Vap-Theo	Theoretical Apparent Velocity
Tgeotherm	Geothermal Gradient
RhoFluid	Average Fluid Density
Pwf	Average Pressure
HydroFrq	Average Fluid Dielectric
Flowrate	Total Flowrate at downhole conditions
Vap	Apparent Velocity
Vap-Theo	Theoretical Apparent Velocity
RhoFluid	Average Fluid Density
RhoFluid-Theo	Theoretical Average Fluid Density
DPwfDz	Differential Pressure
DPwfDz-Theo	Theoretical Differential Pressure
Twf	Average Temperature
Twf-Theo	Theoretical Average Temperature
Tgeotherm	Geothermal Gradient
DTwfDz	Differential Temperature
DTwfDz-Theo	Theoretical Differential Temperature
Regime	Flow Regimes
Temperature	Temperature Passes
Density	Fluid Density Passes
Spinner	Spinner Passes
Pressure	Pressure Passes
Linespeed	Linespeed Passes
Slope	Spinner Slope
Vthr	Spinner Threshold
SpinnerFlt	Spinner
DPipe	Inside diameter of the casing/tubing across logged interval
PipeAngle	Average pipe angle across logged interval
APIOil	Degree API of the oil
SPGG	Specific Gravity of the gas
TgeoRef	Reference Temperature for Geothermal Gradient calculations
DgeoRef	Reference Depth for Geothermal Gradient calculations
Goetherm	Geothermal Gradient across logged interval

Completion Profile Analysis

Tool Specifications

O.D.	1-11/16 in. (42.86 mm)
Length	11.9 ft.(3.63 m) in combination 23.28 ft. (7.1 m) stand alone
Pressure Rating	15,000 psi (103421.4 Kpa)
Temperature Rating	350°F (177°C)

Flow Measurement

Measurement of fluid velocity is made using the *Spinner Flowmeter*. This is calibrated by making logging passes at different line speeds to establish the relationship between instrument velocity in feet/minute and the spinner response in revolutions/second (RPS). With this relationship the measured RPS can be converted to fluid velocity in ft/minute. With a known pipe I. D. this can be used to calculate the flow rate in BPD.

$Q_{BPD} = ft/min \times 1.4 \times I.D.^2$

Mass flow rate can be computed using the *Temperature* data. This is based on an enthalpy model, taking into consideration; kinetic energy, frictional and Joule-Thompson heating as well as conduction and convection into the formation.

In gas wells the volumetric fraction of liquids (water) can be very small. Therefore water production may not be quantifiable by velocity measurement alone. Because of water's high mass relative to gas, mass flowrate computed from the *Temperature* data can be better at quantifying the water production.

Holdup Measurement

Holdup (γ) - The fraction of each phase in the wellbore (Water, Oil, Gas fraction) This should not be confused with Cut. i.e. 100% water holdup exists in the static rathole but does not flow.

The *Fluid Density* instrument uses a small gamma ray source and a gamma ray detector to measure the density of the wellbore fluid mixture. The mixture density is used to calculate the holdup fraction.

$\gamma_{water} \quad (\rho_{mixture} - \rho_{gas}) / (\rho_{water} - \rho_{gas})$

[For two-phase gas-water production]

ρ: density (gm/cc)

The *Fluid Dielectric* instrument works like an electric capacitor. The capacitor plates are exposed to the wellbore fluids and are a fixed size and distance apart. The value of the capacitance will change as the dielectric of the fluids between the plates change. The instrument response is then used to calculate the hydrocarbon and water fractions. This is possible because of the unique dielectric constant of water, oil and gas.
Water = 78, Oil = 4 and Gas = 1

The *Pressure* data can also be used to corroborate the fluid holdup measurements. This is done by measuring the pressure gradient or the derivative of the pressure curve with respect to depth. The resulting curve in psi/ft can be used to determine the water and gas fractions.

Note:
In three phase flow both fluid density and dielectric measurements are necessary. The dielectric is used to determine the water holdup then the density is used to calculate the remaining gas and oil holdups.

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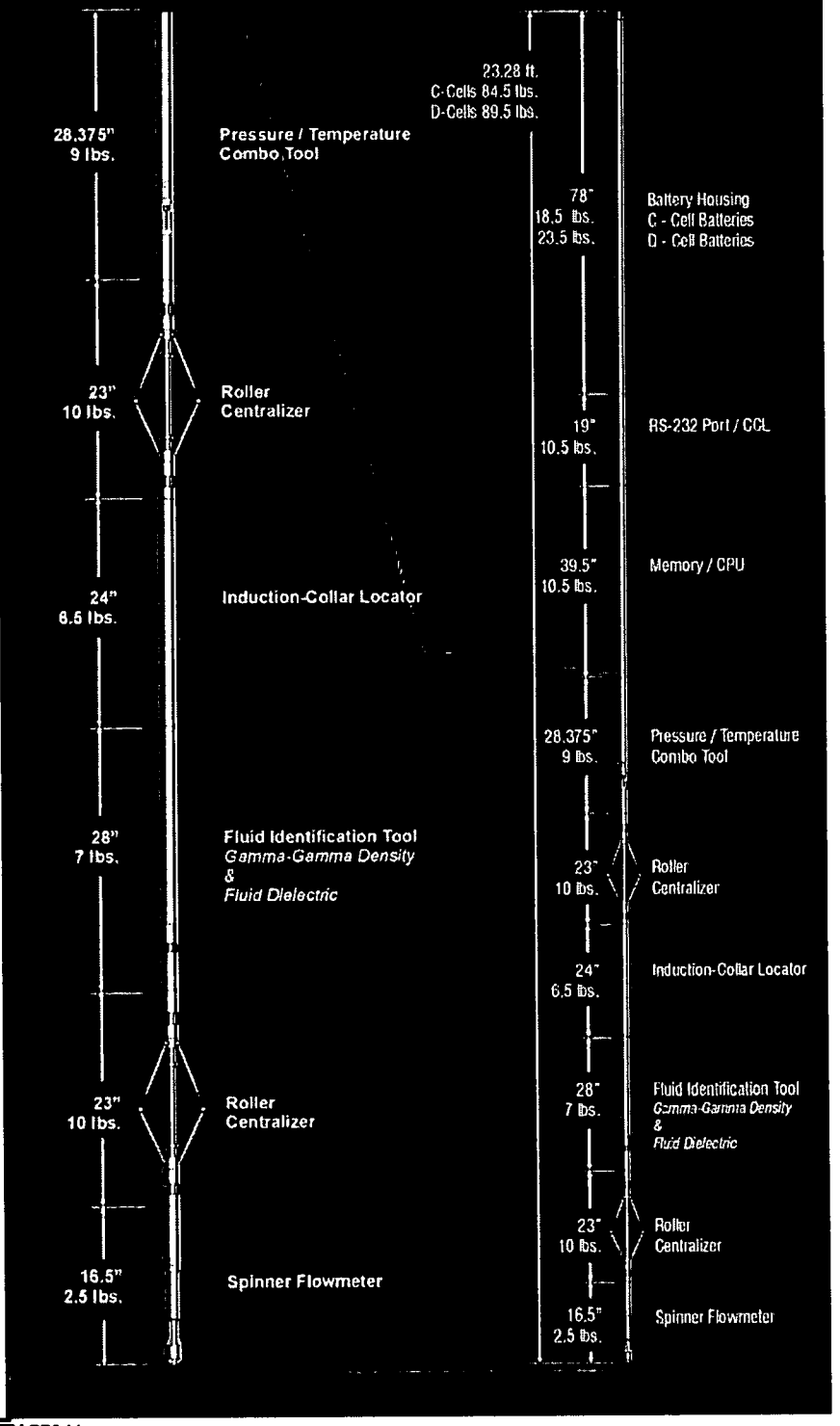
Completion Profiler ™



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