#1343
Copy 2 of 2

FLOW/BUILDUP TEST REPORT

HOME PIERSON 01-08-02-29W1
SPEARFISH (1030.5 - 1036.5 mKB)
TEST DATE: DECEMBER 20 - JANUARY 5, 2000

Prepared for:

ANDERSON EXPLORATION LTD.

Prepared by:

PETRO MANAGEMENT GROUP LTD.

January 2000

#401, 100 - 4th Avenue S.W.
Calgary, Alberta, Canada T2P 3N2
Email: pmg@petromgt.com
Bus: (403) 216-5100
Fax: (403) 216-5109
PMG

P M G

Petro Management Group Ltd.

January 20, 2000

ANDERSON EXPLORATION LTD.
1600, 324 - 8th Ave. S.W.
Calgary, Alta., T2P 2Z5

Attn.: Mr. Larry Sopko

HOME PIERSON 01-08-02-29W1
SPEARFISH (1030.5 - 1036.5 mKB)
FLOW/BUILDUP TEST
TEST DATE: DECEMBER 20 - JANUARY 5, 2000

As requested, a flow/buildup test analysis was performed on the subject well. A summary of the test data and the analysis results is attached. The report marked ORIGINAL contains the test data on a diskette. Three copies of the report are attached.

Should you have any questions, please feel free to contact me at (403) 216-5101.

Yours truly,
Petro Management Group Ltd.

COPY (Original Signed) **S. IBRAHIM**

Saad Ibrahim, P. Eng.
Principal Engineer

#401, 100 - 4th Avenue S.W.
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Summary of Test Data and Results

Case Name : Finite Conductivity Fracture #1

Home Pierson 01-08-02-29W1

Spearfish (1030.5 - 1036.5 mKB)

Flow/Buildup Test

Test Date: Dec. 20 - Jan. 5, 2000

Model Parameters

Oil Permeability (k_o)	10.496 mD	Fracture Half Length (x_f)	21.29 m
Gas Permeability (k_g)	0.016 mD	Fracture Flow Capacity (k_fw)	858.402 mD.m
Water Permeability (k_w)	0.005 mD	Fracture Face Skin (sf)	0.068
Total Mobility ($[k/\mu]_t$)	2.67 mD/mPa.s	Skin Equivalent to Xf	-4.442
Total Transmisivity ($[kh/\mu]_t$)	9.88 mDm/mPa.s	Exterior Radius (r_e)	1949.01 m
Wellbore Storage Constant Dim. (C_D)	91.41		

Formation Parameters

Net Pay (h)	3.70 m
Total Porosity (ϕ_t)	17.00 %
Oil Saturation (S_o)	60.00 %
Gas Saturation (S_g)	0.00 %
Water Saturation (S_w)	40.00 %
Wellbore Radius (r_w)	0.091 m
Formation Temperature (T)	42.0 °C
Formation Compressibility (c_f)	5.658e-7 kPa^{-1}
Total Compressibility (c_t)	1.094e-4 kPa^{-1}

Production and Pressure

Q_tB_t	6.995 m^3/d
Final Oil Rate	3.100 m^3/d
Final Gas Rate	0.110 $10^3m^3/d$
Final Water Rate	0.020 m^3/d
Final Flowing Pressure (p_{wfo})	543.00 kPa
Final Measured Pressure	2206.07 kPa
Initial Pressure (p_i)	2317.96 kPa

Fluid Properties

Oil Compressibility (c_o)	1.81094e-4 kPa^{-1}
Gas Compressibility (c_g)	4.52917e-4 kPa^{-1}
Water Compressibility (c_w)	4.56386e-7 kPa^{-1}
Oil Formation Volume Factor (B_o)	1.061
Gas Formation Volume Factor (B_g)	0.045628 m^3/m^3
Water Formation Volume Factor (B_w)	1.006
Oil Viscosity (μ_o)	8.363 mPa.s
Gas Viscosity (μ_g)	11.388 µPa.s
Water Viscosity (μ_w)	0.627 mPa.s
Solution Gas Ratio (R_s)	9 m^3/m^3
Oil Gravity (γ_o)	0.876
Gas Gravity (G)	0.650
PVT Reference Pressure (p_{PVT})	2317.96 kPa
Bubble Point Pressure (P_{bp})	2317.96 kPa

Synthesis Results

Average Error	0.03 %
Synthetic Initial Pressure (p_i)	3972.55 kPa
Extrapolated Pressure at Specified Time	3560.17 kPa
Pressure Drop Due To Skin (Δp_s)	138.77 kPa
Flow Efficiency (FE)	0.964
Damage Ratio (DR)	1.037

Forecasts

Specified Flowing Pressure (p_{wfs})	543.00 kPa
3 - Month Constant Rate	3.549 m^3/d
6 - Month Constant Rate	3.061 m^3/d
Specified Forecast Time	12.00 month
Forecast Constant Rate @ Current Skin	2.682 m^3/d
PI / II (Total Liquids - Actual)	1.02e-3 $m^3/d/kPa$
Forecast Constant Rate @ Skin=0	2.793 m^3/d
PI / II (Total Liquids - Ideal)	1.07e-3 $m^3/d/kPa$

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P M G

SUMMARY OF RESULTS

SUMMARY OF RESULTS

1. The average reservoir pressure (P_R) is 3 560 kPa.

2. The effective permeability to oil of the Spearfish formation is 10.5 mD.

3. The apparent skin factor of -4.4 and the fracture half length of 21.3 m confirm that the well was stimulated.

4. The IPR plot indicates a maximum theoretical stabilized oil rate (AOF) of 3.3 m^3/d.

5. The radius of investigation is 29 m.

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TEST ANALYSIS

DISCUSSION

1. Test Overview:

The well Home Pierson 01-08-02-29W1 is completed in the Spearfish formation at 1030.5 - 1036.5 mKB and is equipped with a 60.3 mm tubing.

The well produced at an oil rate of 3.1 m^3/d. Subsequently, the well ws shutin for a 384 hour buildup period. The producing GOR was reported at 35.5 m^3/m^3. The oil API gravity is 36 degrees. Oil physical properties were calculated using various standard correlations.

2. Data Validation:

During the flow/buildup test, tandem electronic pressure recorders were set at 1025.5 mCF & 1026.5 mCF. The pressure and temperature profiles of the two recorders tracked closely through out the test, as shown in the Raw Data plot (Figure 1), in the Section "Test Data Quality". The difference in pressures, measured by the two recorders, was fairly constant during the buildup period (Figure 2), indicating good quality of recorders and that either would produce the same results. The decline in the early pressure data, during the buildup period, is due to falling liquid level. Due to problems in running the pressure recorders, the first few hours of buildup could not be measured. The last FBHP was obtained from liquid level measurement prior to the test.

The primary pressure derivative (PPD) plot was constructed for the bottom pressure (Figure 3). The PPD showed major pressure anomalies and only data after 75 hours of shutin is considered valid. The PPD plot should be monotonically decreasing with time for valid buildup data.

Pressure data was reported in absolute. Depth correction was made to adjust the recorded pressures from the recorder run depth to the MPP using a liquid gradient of 7.7 kPa/m, as reported in the final static gradient survey.

TEST INTERPRETATION

1. Pressure Buildup Analysis:

Pressure buildup analysis was performed on the shut-in period. The reservoir parameters were provided by Anderson Exploration Ltd., as shown in the attached form of the test data and results summary. The final oil rate prior to shutting in the well was 3.1 m^3/d at a flowing sandface pressure of 543 kPa, as shown in Stip Chart Figure 4, in the section "Pressure Transient Analysis".

Both the Horner Plot and Derivative Analysis were used, as discussed below, and results were later fine tuned using the pressure history match techniques of the test pressure data.

Wellbore storage regime could not be identified since the early pressure data were not measured, as shown in the Diagnostic/Derivative plot (Figure 5), in the section "Pressure Transient Analysis". Radial flow regime, was identified by the flattening of the pressure derivative.

Radial flow analysis was performed to determine the reservoir parameters using the semi-log straight line, as shown in the Horner plot (Figure 6). The extrapolation of the last data points yielded a P^* of 3 961 kPa. The (P^*) was corrected for the shape, areal extent of the reservoir and the location of the well to determine the average reservoir pressure of 3 936 kPa. The results of the Horner plot and the pressure derivative analysis are summarized below:

	Horner	Derivative
Effective Permeability, mD	12.1	13.7
Ave. Reservoir Pressure, kPa	3 936	n/a
Apparent Skin Factor	-4.0	-3.8

2. Pressure History Match:

The preliminary results from the Horner plot and pressure derivative analysis were used as starting parameters for the pressure history match of the test data. The best match of the test data was obtained, using the Finite Conductivity Model. The overlay of simulated analysis results on the real test data is presented in the cartesian graph of the raw data, the semi-log graph of the Horner plot, and the log-log graph of the pressure derivative (Figures 7, 8 and 9), in the section "Pressure History Match". The parameters used to achieve the history match are as follows:

	History Match	
Ave. Reservoir Pressure, P_r	3 560	kPa
Effective Permeability, k	10.5	mD
Skin Factor, S	-4.4	
Fracture Half-Length, Xf	21.3	m
Fracture Flow Capacity, K_fw	858.4	mD.m

3. Inflow Performance Relationship (I.P.R)

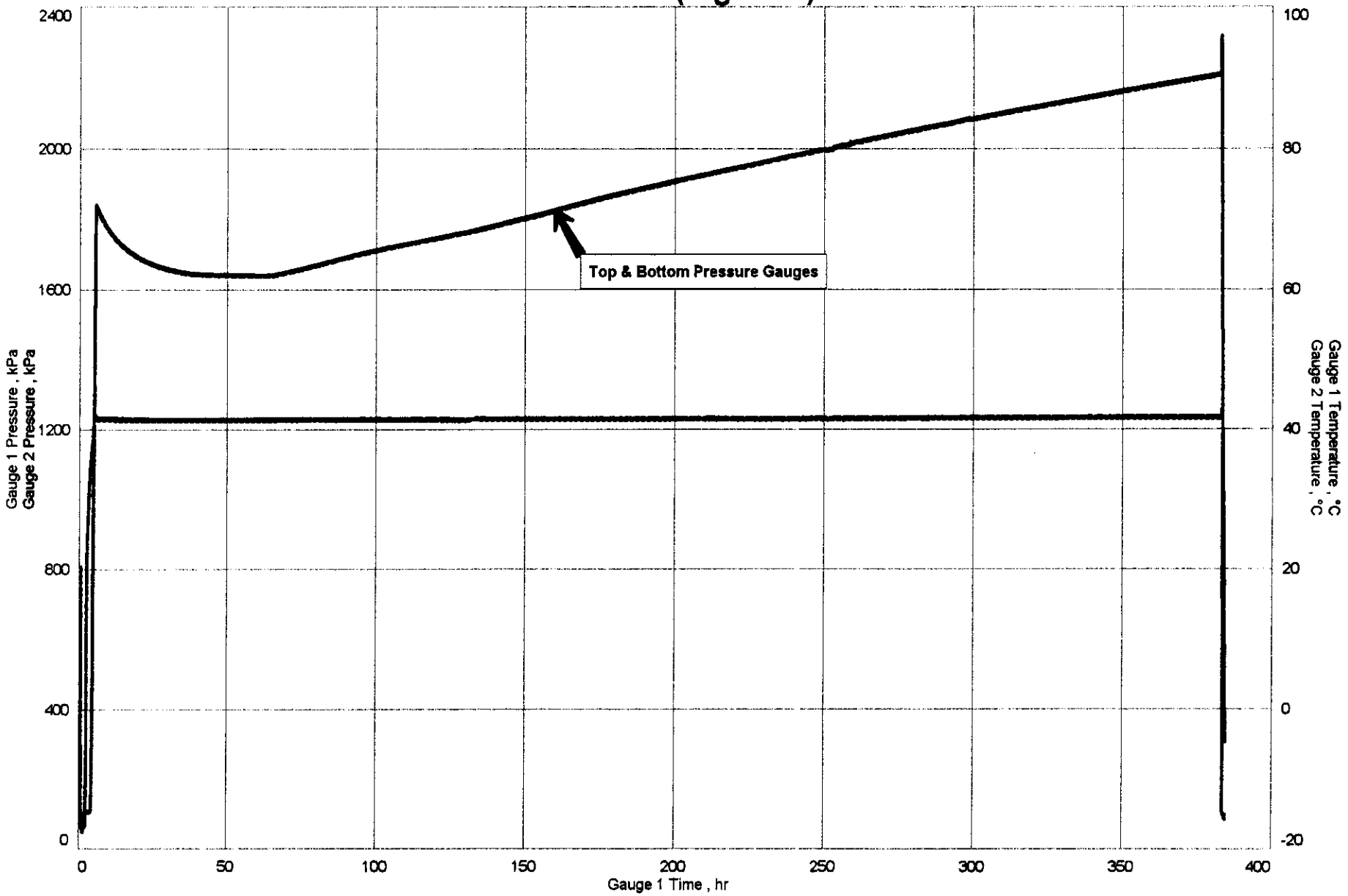
The Inflow Performance Relationship (I.P.R) was constructed using the Vogel equation, as shown in Figure 8, in the Section "I.P.R". The average reservoir pressure of 3 560 kPa and the test data were used to generate the I.P.R plot, at the current skin factor of -4.4 The well maximum theoretical oil rate is 3.3 m^3/d.

TEST DATA
QUALITY

100/01-08-002-29W1/0

Home Pierson
Formation: Spearfish

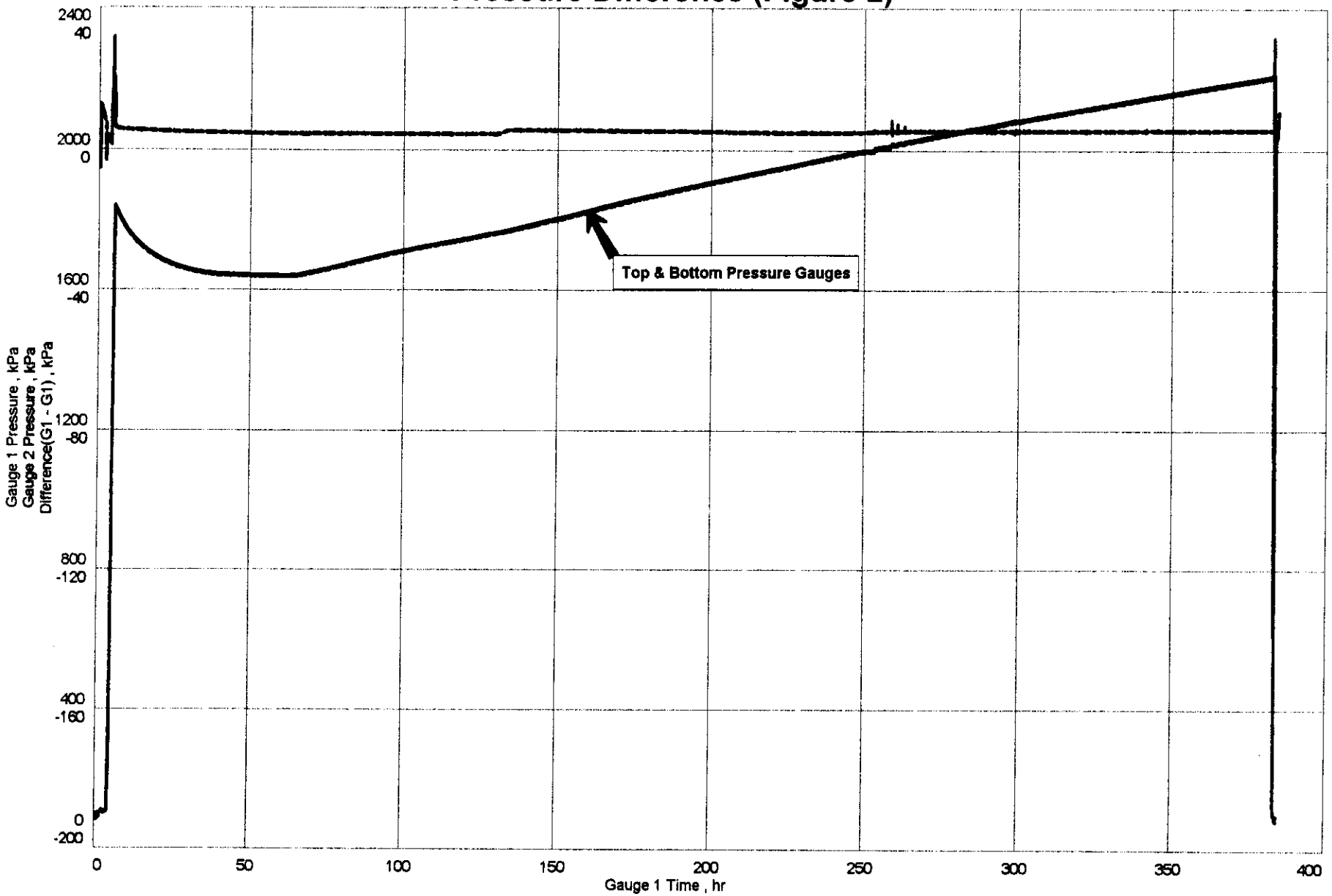
Raw Data (Figure 1)



100/01-08-002-29W1/0

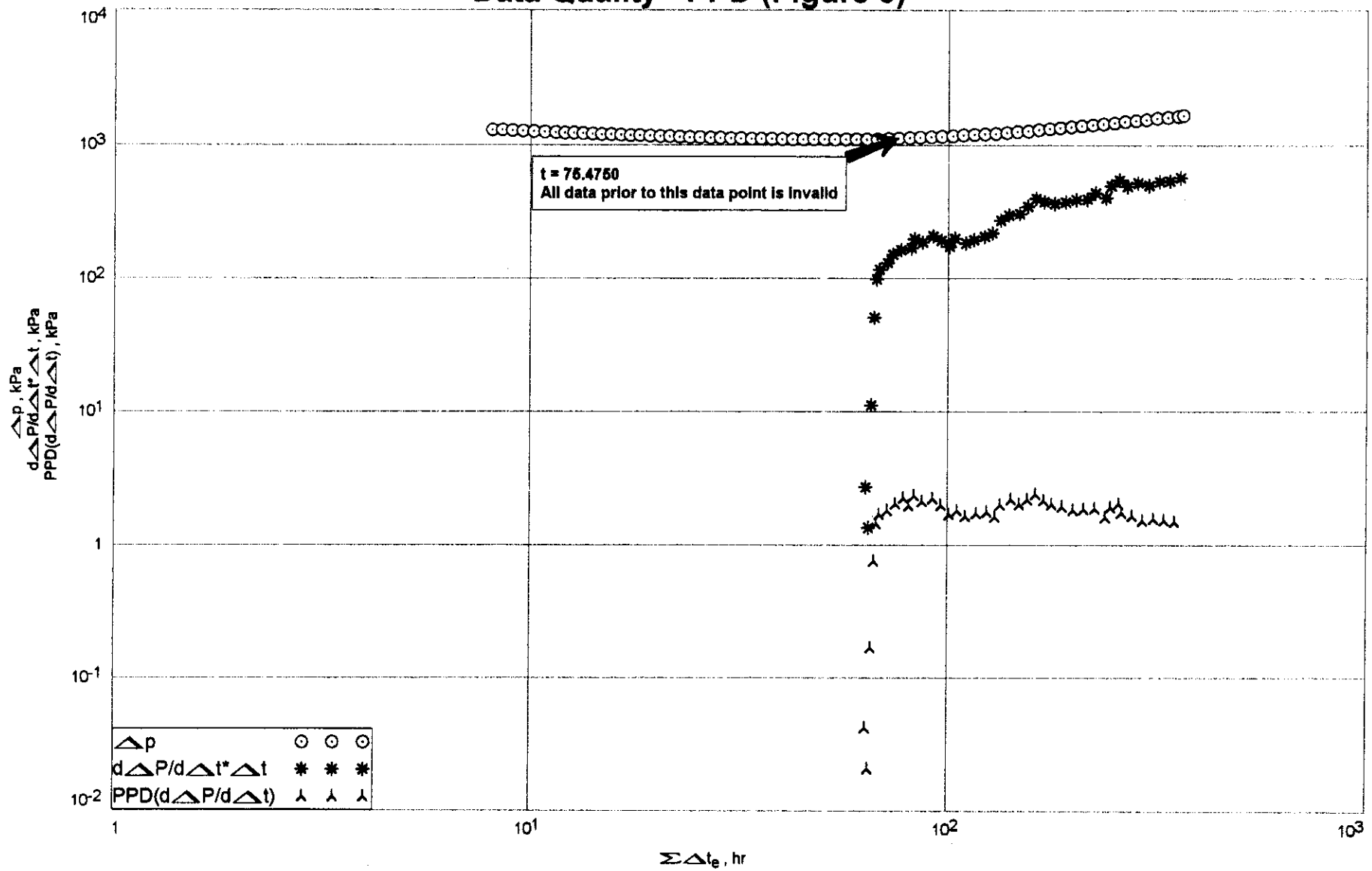
Home Pierson
Formation: Spearfish

Pressure Difference (Figure 2)



Home Pierson 01-08-02-29W1
Spearfish (1030.5 - 1036.5 mKB)
Flow/Buildup Test
Test Date: Dec. 20 - Jan. 5, 2000

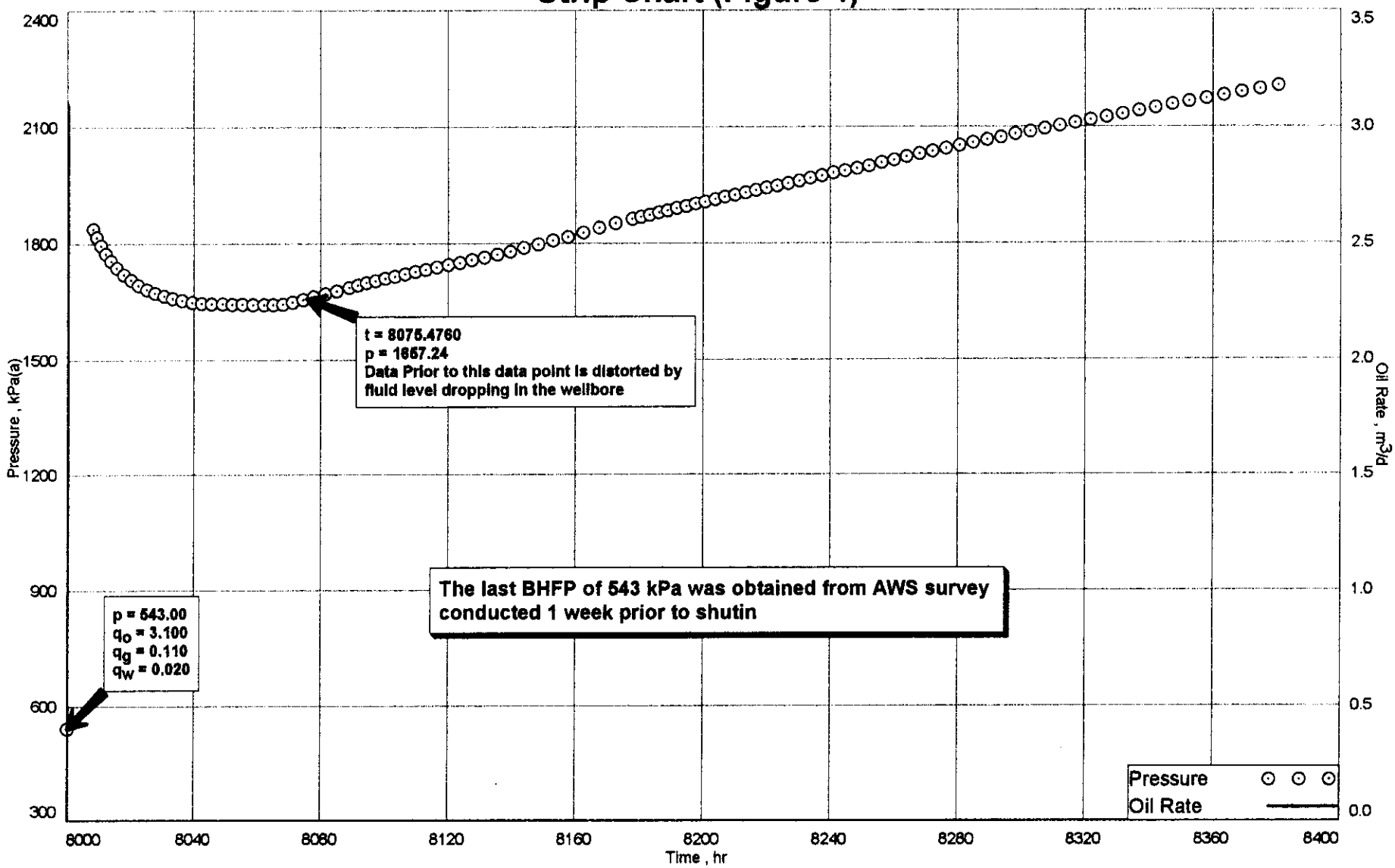
Data Quality - PPD (Figure 3)



PRESSURE TRANSIENT ANALYSIS

Home Pierson 01-08-02-29W1
Spearfish (1030.5 - 1036.5 mKB)
Flow/Buildup Test
Test Date: Dec. 20 - Jan. 5, 2000

Strip Chart (Figure 4)



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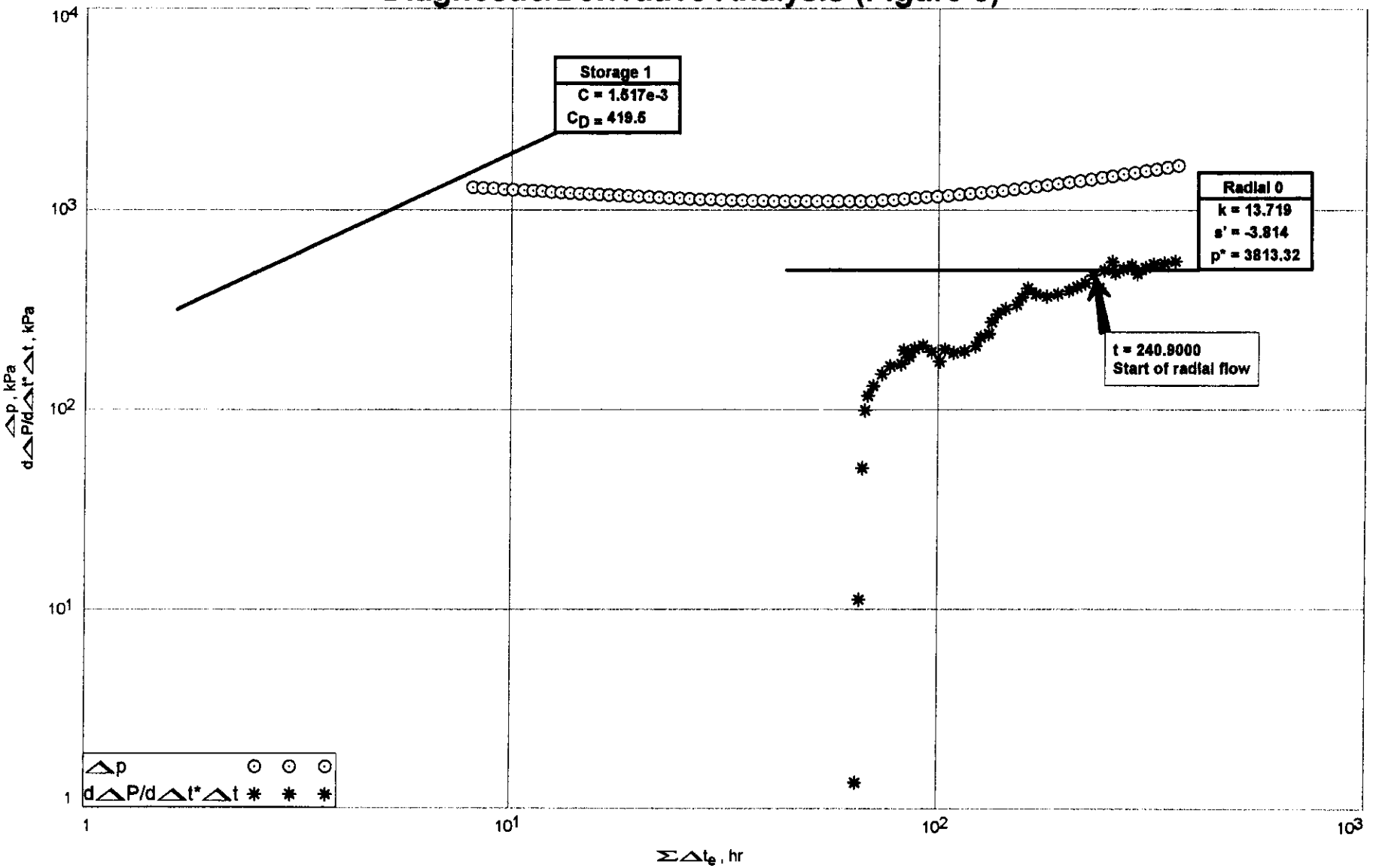
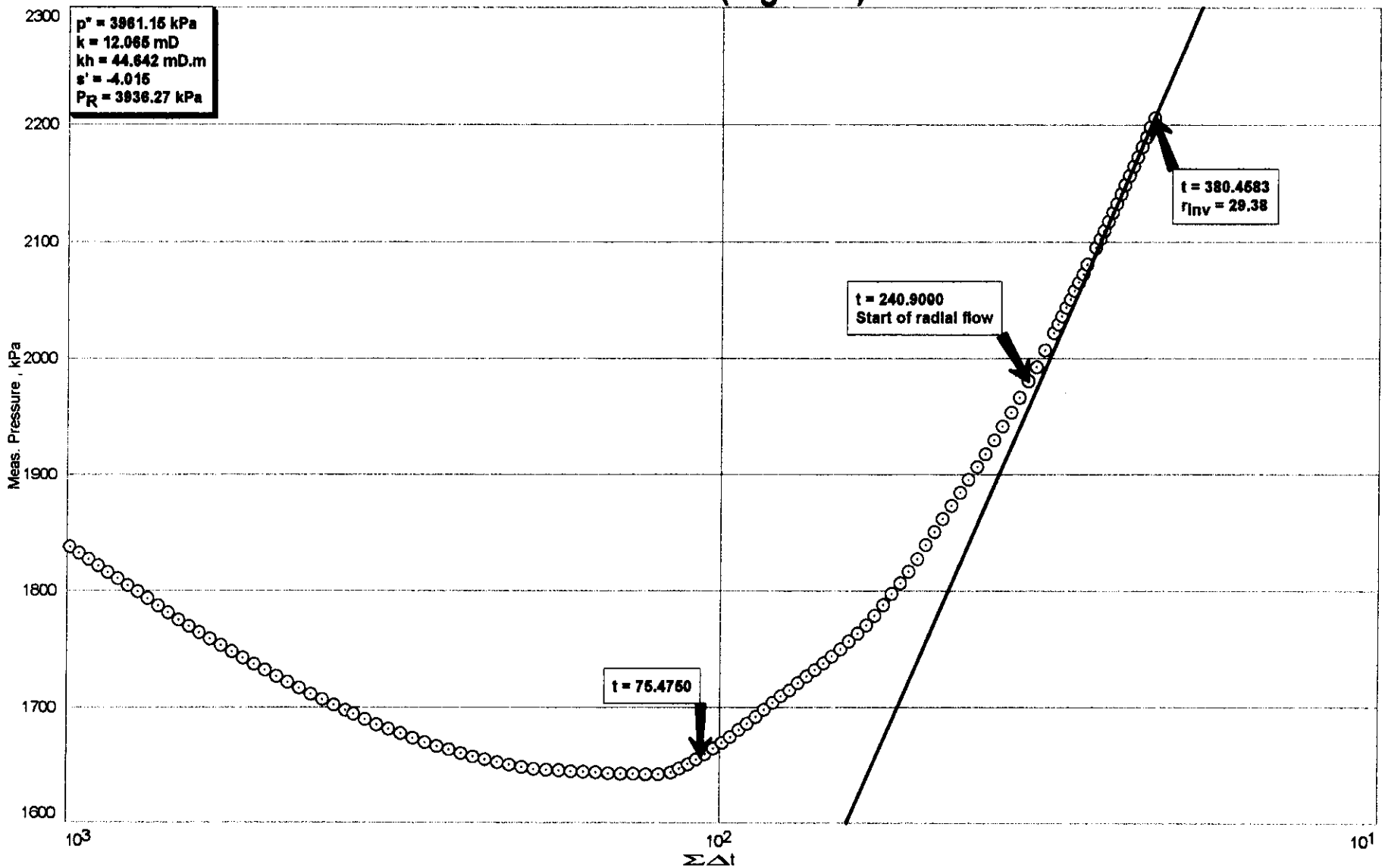
Home Pierson 01-08-02-29W1
Spearfish (1030.5 - 1036.5 mKB)
Flow/Buildup Test
Test Date: Dec. 20 - Jan. 5, 2000

Diagnostic/Derivative Analysis (Figure 5)



Home Pierson 01-08-02-29W1
Spearfish (1030.5 - 1036.5 mKB)
Flow/Buildup Test
Test Date: Dec. 20 - Jan. 5, 2000

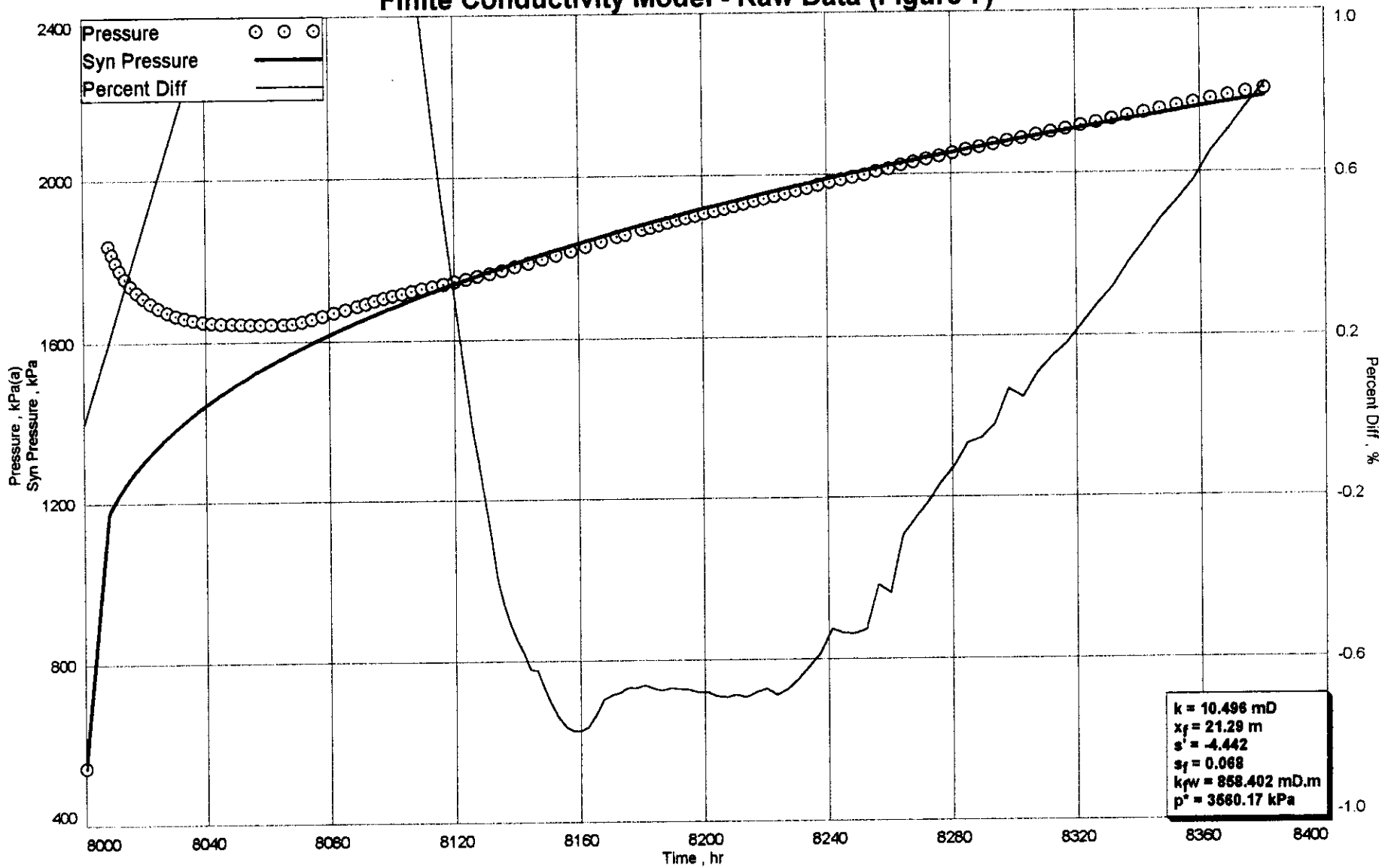
Horner Plot (Figure 6)



PRESSURE
HISTORY
MATCHING

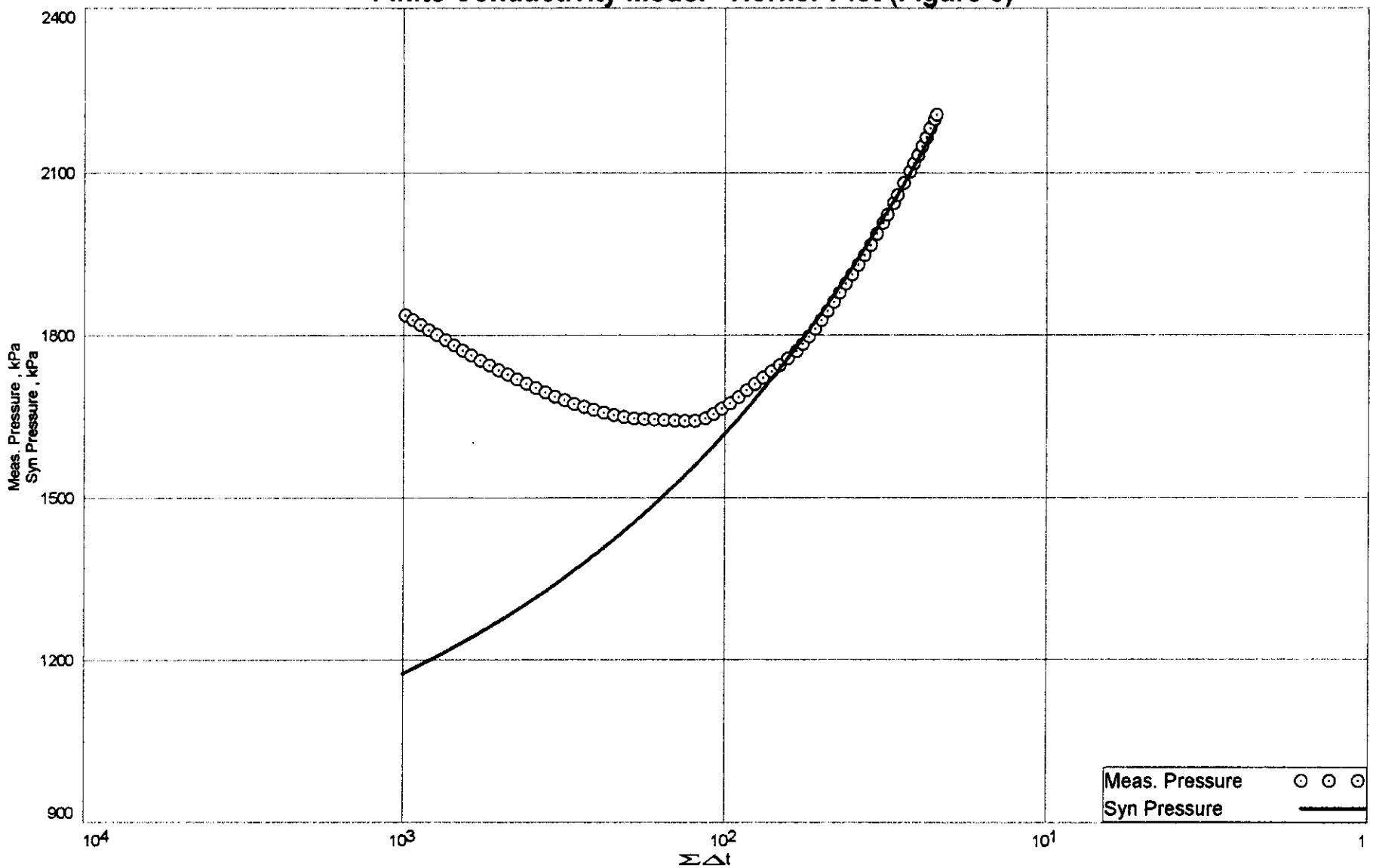
Home Pierson 01-08-02-29W1
Spearfish (1030.5 - 1036.5 mKB)
Flow/Buildup Test
Test Date: Dec. 20 - Jan. 5, 2000

Finite Conductivity Model - Raw Data (Figure 7)



Home Pierson 01-08-02-29W1
Spearfish (1030.5 - 1036.5 mKB)
Flow/Buildup Test
Test Date: Dec. 20 - Jan. 5, 2000

Finite Conductivity Model - Horner Plot (Figure 8)



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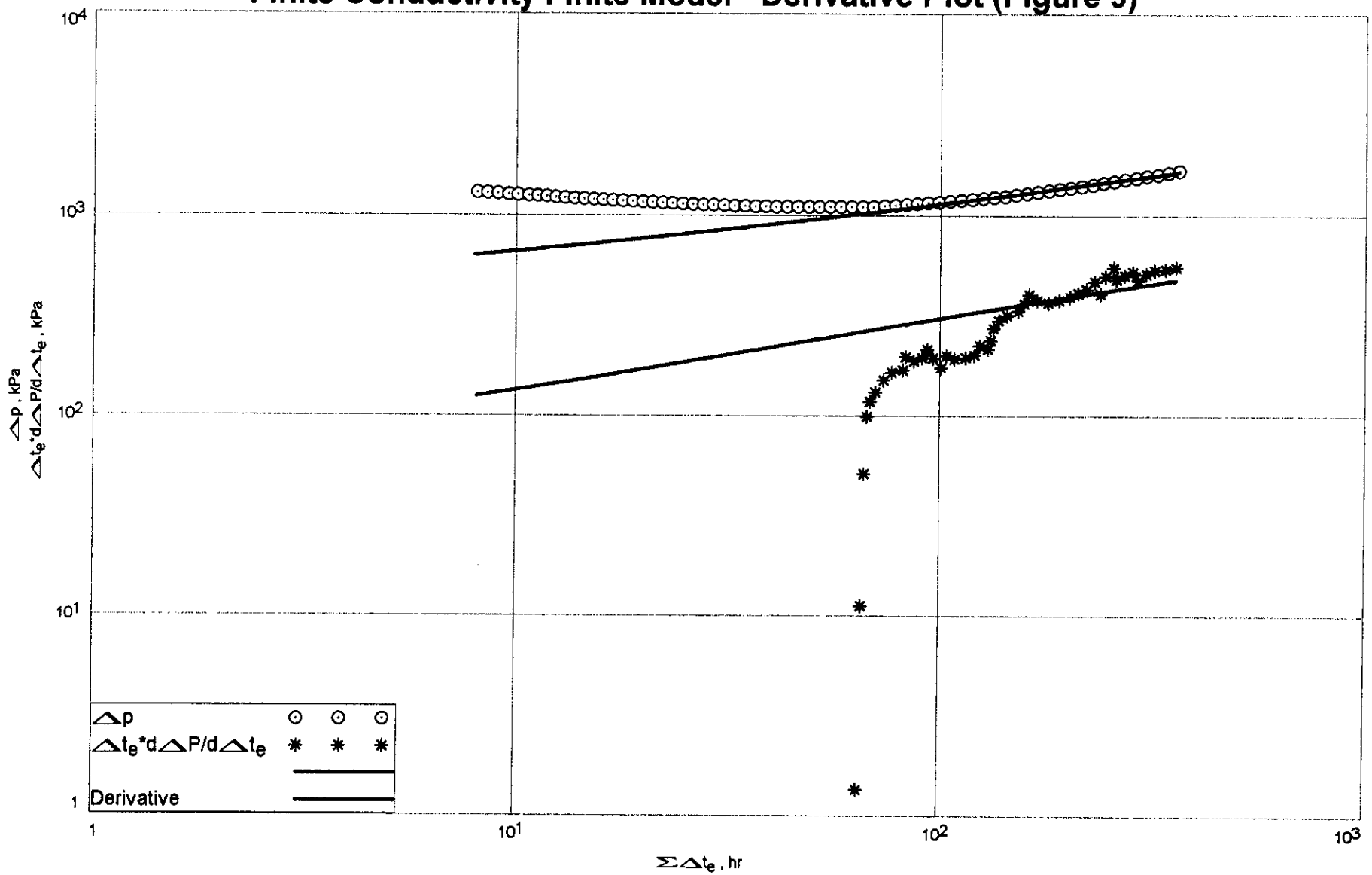
Home Pierson 01-08-02-29W1
Spearfish (1030.5 - 1036.5 mKB)
Flow/Buildup Test
Test Date: Dec. 20 - Jan. 5, 2000

Finite Conductivity Finite Model - Derivative Plot (Figure 9)



I.P.R.

Inflow Performance Relationship
(I.P.R.)

Home Pierson 01-08-02-29W1
Spearfish (1030.5 - 1036.5 mKB)

Flow/Buildup Test
Test Date: Dec. 20 - Jan. 5, 2000

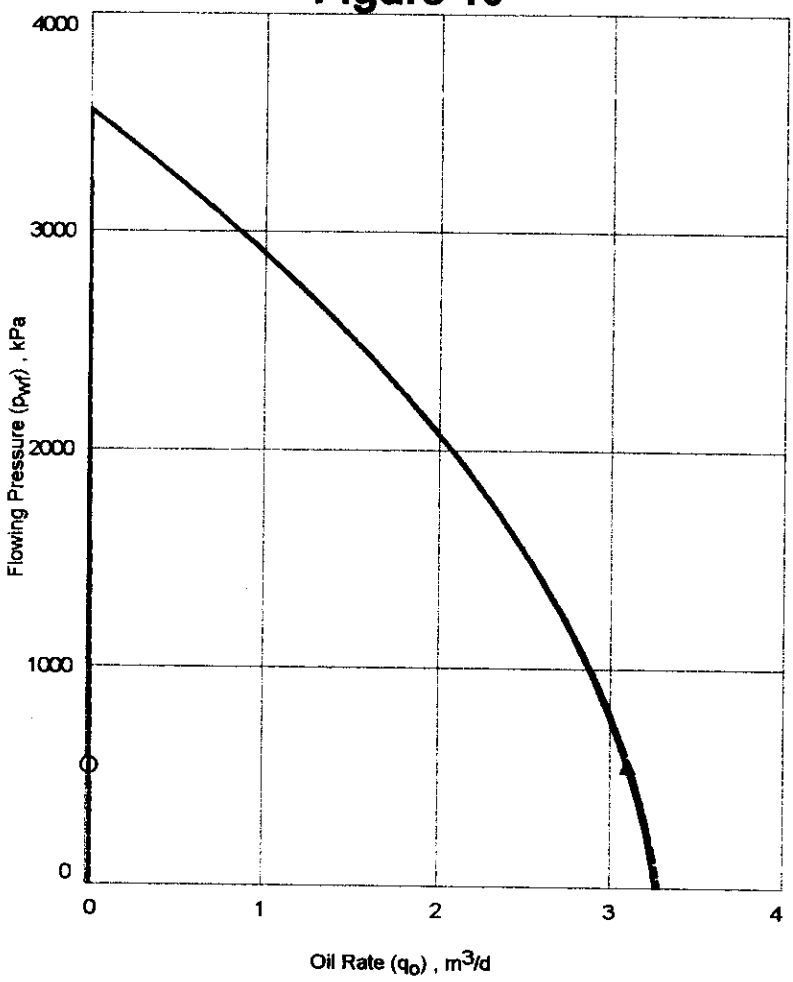
Test Data

Reservoir Pressure (p_R)	3560.20	kPa
Bubble Point Pressure (p_{bp})		kPa
Test Pressure (p_{wf})	543.00	kPa
Oil Test Rate (q_o)	3.100	m^3/d
Water Test Rate (q_w)	0.020	m^3/d

Results

Maximum Oil Rate	3.260	m^3/d
Maximum Water Rate	0.024	m^3/d
Maximum Total Rate	3.284	m^3/d

Figure 10



Flowing Pressure	Oil Rate	Water Rate	Total Rate
kPa	m^3/d	m^3/d	m^3/d
0.00	3.260	0.024	3.284
300.00	3.187	0.022	3.208
543.00*	3.100	0.020	3.120
600.00	3.076	0.020	3.096
900.00	2.929	0.018	2.946
1200.00	2.744	0.016	2.760
1500.00	2.522	0.014	2.536
1800.00	2.264	0.012	2.275
2100.00	1.968	0.010	1.978
2400.00	1.635	0.008	1.643
2700.00	1.266	0.006	1.271
3000.00	0.859	0.004	0.863
3300.00	0.415	0.002	0.417
3560.20	0.000	0.000	0.000

Note : * Test Point
** Bubble Point
Oil IPR based on Vogel's Equation.
(Quadratic Curve Factor=0.2)

SUBSURFACE
PRESSURES

Well Provers Corp.

A Division of Select Energy Systems Inc.

TRANSMITTAL

Customer	**Anderson Exploration Ltd.**	Date:	**January 6, 2000**
Address:	**#1600, 324 – 8 Avenue, SW Calgary, Alberta T2P 2Z5**	Job No.:	**99-0196**
Attention:	**Mr. Gord Peters**		
Subject:	**Home S Pierson Unit #1 100/01-08-002-29-W1/00**		
Shipped Via:	☐ Mail ☑ Hand Delivered ☐ Courier ☐ Fax:		

Quantity	Description
One (1)	**Flow & Build Up Report**
One (1)	**Static Gradient Report**
One (1)	**Site Report**
One (1)	**Diskette (ASCII format only)**

Notes: .PAS FILES NOT REQUIRED AS TEST PERFORMED IN MANITOBA.

INVOICE TO FOLLOW VIA MAIL.

Should you have any question or require further information, please contact me at the telephone number below.

K Sands.

Kellie D. Sands
Accounts Executive

Copies To:

402 – 53rd Avenue, SE • Calgary, Alberta • T2H 0N4
Telephone: (403) 243-7542 • Fax: (403) 287-1424

Well Provers Corp.

A Division of Select Energy Systems Inc.

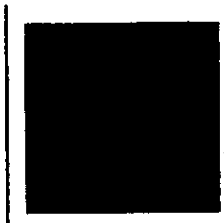
SITE REPORT

Customer:	Anderson Exploration	Date:	Jan. 4/00
Location:	01-08-002-29W1	Job No.:	99-0196
Site/Office Contact:	Scott Dalziel Brad Smith	Tel. No.:	485-7711 485-7712
Formation:	Spearfish	Technician:	Toly Bondarev
Program:	Build Up and Static Gradient		

	Serial No.	Start Date	Start Time	End Date	End Time
Top Gauge	5023	Dec 20/99	12:20	Jan. 5/00	1150
Bottom Gauge	5014	Dec 20/99	12:20	Jan. 5/00	1150

Tubing Pressure (kPa):	**waxed**	**Casing Pressure (kPa):**	**482.65**
MPP in mKB =	**1033.0**	**Time Pressured Up:**	
KB =	**477.95**	**Time On Bottom:**	**10:15**
Ground =	**473.75**	**Time Off Bottom:**	**10:20**
Difference (KB-Gl) =	**4.2**	**Time at Surface:**	**11:27**
Tubing or Casing Flowing:			
Well Shut in Date & Time:	**December 21, 1999**		

Time (hours):	Summary
December 20, 1999	
1215	Arrived on location.
1220	Gauges turned on.
1315	Rigged up.
1430	At surface.
1435	Run in hole.
1740	Landed at 1033.0 mKB MPP.
1800	Off location.
January 5, 2000	
0943	Arriving on the location.
1010	Rig up.
1015	Stop 1 - 1043 mKB (-10m)
1024	Stop 2 - 1003 mKB (30m) tension 300 lbs
1031	Stop 3 - 973 mKB (60m) tension 240 lbs
1039	Stop 4 – 943 mKB (90m)
1053	Stop 5 – 693 mKB (340m) 760m heavy amounts of oil on line
1107	Stop 6 - 443 mKB (590m) 600m dead oil on line
1118	Stop 7 - 193 mKB (840) tension 175lbs @ full speed
1127	At Surface
1150	Rig Down
	Top # Samples=103/46367
	Bot # Samples=95/46400
1205	Off location



Well
Provers Corp.

A Division of Select Energy Systems Inc.

Anderson Exploration Ltd.

Home S Pierson Unit #1
100/01-08-002-29-W1/00

Static Gradient

January 5, 2000

Release Date: January 6, 2000

402 – 53rd Avenue, SE • Calgary, Alberta • T2H 0N4
Telephone: (403) 243-7542 • Fax: (403) 287-1424
Email: wpc@telusplanet.net

GENERAL INFORMATION

Client Information:

Company: Anderson Exploration Ltd.

Contact: Gord Peters

Phone: (403) 232-5027 Fax: (403) 232-7102 e-mail: petersg@axl.ca

Site Information:

Contact: Scott Dalziel / Brad Smith

Phone: (306) 485-7711 Fax: e-mail:

Well Information:

Name: Home S Pierson Unit #1

Operator: Anderson Exploration Ltd.

Location-Downhole: 100/01-08-002-29W1/0

Location-Surface: 1-8-2-29-W1

Test Information:

Company:	Well Provers Corp.		
Representative:	Sherman Reeder		
Supervisor:	A. Bondarev / F. Tadgell		
Test Type:	Static Gradient	Job Number:	99-0196
Test Unit:	WP-02		
Start Date:	2000/01/05	Start Time:	10:15:00
End Date:	2000/01/05	End Time:	11:40:00
Report Date:	2000/01/06	Prepared By:	Kellie Sands
Remarks:		Qualified By:	Sherman Reeder

CLIENT INFORMATION

Company: Anderson Exploration Ltd.
Contact: Gord Peters

Street 1: Suite #1600
Street 2: 324 - 8 Avenue, SW
City: Calgary Prov./State: Alberta
Country: Canada Postal Code: T2P 2Z5

Phone: (403) 232-5027 Fax: (403) 232-7102
e-mail: petersg@axl.ca

SITE INFORMATION

Contact: Scott Dalziel / Brad Smith
Phone: (306) 485-7711 Fax:
e-mail:

Remarks

WELL INFORMATION

Well Name : Home S Pierson Unit #1

Well Operator : Anderson Exploration Ltd.

Well Location : 100/01-08-002-29W1/0

Location-Surface : 1-8-2-29-W1

Field : Pierson **Well Type : Vertical**

Pool :

Formation : Spearfish

Perforation Type :			Producing Through : Tubing	Size	73.00 mm
Pool Datum	m	CF	Elevation Referenced Fro	477.95 m	KB
Datum Depth	m	CF	Elevation Referenced To	473.75 m	CF
			Offset	4.20 m	

Production Intervals

Production Interval & MPP Reference To : KB MPP Pressure Reference : None

	From - m	To - m	Depth - m	Pressure - kPa
1.	1030.00	1036.00	1.	
2.			2.	
3.			3.	
4.			4.	
5.			5.	
6.			6.	
7.			7.	
8.			8.	
9.			9.	
10.			10.	
11.			11.	
12.			12.	

Remarks :

Anderson Exploration Ltd.
100/01-08-002-29W1/0
Start Test Date: 2000/01/05
Final Test Date: 2000/01/05

Home S Pierson Unit #1
Formation: Spearfish

Job Number: 99-0196

	Depth	Time	Duration	Pressure	Gradient	Spec. Grad.	LL Depth	LL Pres.	Temp.	Gradient
	m	hh:mm:ss	min	kPa	kPa/m	kPa/m	m	kPa	°C	°C/m
1	1033.00	09:03:30		2213.07					41.49	
2	1003.00	09:22:00	18.50	1919.68	9.760				41.76	-0.009
3	973.00	09:29:29	7.50	1686.08	7.787				41.53	0.008
4	943.00	09:37:00	7.50	1453.31	7.759	7.759	769.30	105.53	40.97	0.019
5	693.00	09:47:29	10.50	104.54	5.395				35.11	0.023
6	443.00	10:05:30	18.00	100.96	0.014	0.014			24.54	0.042
7	193.00	10:13:30	8.00	96.92	0.016				16.53	0.032
8	0.00	10:30:30	17.00	94.48	0.013				-0.79	0.090

Bottom Gauge Serial Number: Start Date: 2000/01/21 08:10:00 Run Depth:

Print Filter Off

Fast

Well Provers Corp.

A Division of Select Energy Systems Inc.

Anderson Exploration Ltd.

Home S Pierson Unit #1
100/01-08-002-29-W1/00

Flow & Build Up

December 20/99 – January 5/00

Release Date: January 6, 2000

402 – 53rd Avenue, SE • Calgary, Alberta • T2H 0N4
Telephone: (403) 243-7542 • Fax: (403) 287-1424
Email: wpc@telusplanet.net

WELL INFORMATION

Well Name : Home S Pierson Unit #1

Well Operator : Anderson Exploration Ltd.

Well Location : 100/01-08-002-29W1/0

Location-Surface : 1-8-2-29-W1

Field : Pierson **Well Type : Vertical**

Pool :

Formation : Spearfish

Perforation Type :			Producing Through : Tubing	Size	73.00 mm
Pool Datum	m	CF	Elevation Referenced Fro	477.95 m	KB
Datum Depth	m	CF	Elevation Referenced To	473.75 m	CF
			Offset	4.20 m	

Production Intervals

Production Interval & MPP Reference To : KB MPP Pressure Reference : None

	From - m	To - m	Depth - m	Pressure - kPa
1.	1030.00	1036.00	1.	
2.			2.	
3.			3.	
4.			4.	
5.			5.	
6.			6.	
7.			7.	
8.			8.	
9.			9.	
10.			10.	
11.			11.	
12.			12.	

Remarks :

CLIENT INFORMATION

Company: Anderson Exploration Ltd.
Contact: Gord Peters

Street 1: Suite #1600
Street 2: 324 - 8 Avenue, SW
City: Calgary Prov./State: Alberta
Country: Canada Postal Code: T2P 2Z5

Phone: (403) 232-5027 Fax: (403) 232-7102
e-mail: petersg@axl.ca

SITE INFORMATION

Contact: Scott Dalziel / Brad Smith
Phone: (306) 485-7711 Fax:
e-mail:

Remarks

GENERAL INFORMATION

Client Information:

Company: Anderson Exploration Ltd.

Contact: Gord Peters

Phone: (403) 232-5027 Fax: (403) 232-7102 e-mail: petersg@axl.ca

Site Information:

Contact: Scott Dalziel / Brad Smith

Phone: (306) 485-7711 Fax: e-mail:

Well Information:

Name: Home S Pierson Unit #1

Operator: Anderson Exploration Ltd.

Location-Downhole: 100/01-08-002-29W1/0

Location-Surface: 1-8-2-29-W1

Test Information:

Company:	Well Provers Corp.		
Representative:	Sherman Reeder		
Supervisor:	Toly Bondarev / Frank Tadgell		
Test Type:	Flow & Build Up	Job Number:	99-0196
Test Unit:	WP-03		
Start Date:	1999/12/20	Start Time:	12:20:00
End Date:	2000/01/05	End Time:	12:56:00
Report Date:	2000/01/06	Prepared By:	Kellie Sands
Remarks:		Qualified By:	Sherman Reeder

Anderson Exploration Ltd.
100/01-08-002-29W1/0
Start Test Date: 1999/12/20

Home S Pierson Unit #1
Formation: Spearfish

Job Number: 99-0196

	Bottom Gauge Date	Clock Time	Time	Bottom Gauge Pres.	Bottom Gauge Temp.	Top Gauge Pres.	Top Gauge Temp.
	yyyy/mm/dd	hh:mm:ss	hr	kPa(a)	°C	kPa(a)	°C
1	1999/12/20	12:20:00	0.0000	95.96	15.54	93.74	16.87
2	1999/12/20	13:20:29	1.0083	99.86	-17.40	88.32	-17.59
3	1999/12/20	16:21:00	4.0167	107.53	36.12	105.84	36.32
4	1999/12/20	19:21:30	7.0250	1810.20	41.30	1804.27	41.68
5	1999/12/20	22:21:59	10.0333	1767.17	41.29	1761.50	41.67
6	1999/12/21	01:22:30	13.0417	1737.29	41.25	1731.81	41.63
7	1999/12/21	04:23:00	16.0500	1714.70	41.22	1709.06	41.59
8	1999/12/21	07:23:29	19.0583	1697.08	41.19	1691.62	41.56
9	1999/12/21	10:24:00	22.0667	1683.03	41.17	1677.82	41.54
10	1999/12/21	13:24:29	25.0750	1672.42	41.16	1667.10	41.52
11	1999/12/21	16:24:59	28.0833	1664.06	41.15	1658.94	41.51
12	1999/12/21	19:25:30	31.0917	1657.42	41.15	1652.40	41.51
13	1999/12/21	22:26:00	34.1000	1652.35	41.15	1647.41	41.51
14	1999/12/22	01:26:29	37.1083	1648.46	41.15	1643.49	41.51
15	1999/12/22	04:27:00	40.1167	1646.33	41.16	1641.49	41.51
16	1999/12/22	07:27:30	43.1250	1645.17	41.15	1640.15	41.51
17	1999/12/22	10:27:59	46.1333	1644.34	41.15	1639.44	41.51
18	1999/12/22	13:28:30	49.1417	1643.63	41.16	1638.72	41.51
19	1999/12/22	16:29:00	52.1500	1642.84	41.15	1638.16	41.51
20	1999/12/22	19:29:29	55.1583	1642.34	41.15	1637.58	41.50
21	1999/12/22	22:30:00	58.1667	1642.04	41.17	1637.27	41.53
22	1999/12/23	01:30:29	61.1750	1641.82	41.20	1637.21	41.55
23	1999/12/23	04:30:59	64.1833	1642.11	41.20	1637.48	41.55
24	1999/12/23	07:31:30	67.1917	1646.33	41.21	1641.74	41.56
25	1999/12/23	10:32:00	70.2000	1651.87	41.21	1647.27	41.57
26	1999/12/23	13:32:29	73.2083	1657.87	41.24	1653.22	41.57
27	1999/12/23	16:33:00	76.2167	1663.84	41.25	1659.19	41.58
28	1999/12/23	19:33:29	79.2250	1670.19	41.27	1665.57	41.57
29	1999/12/23	22:33:59	82.2333	1676.93	41.24	1672.19	41.57
30	1999/12/24	01:34:30	85.2417	1683.37	41.23	1678.75	41.58
31	1999/12/24	04:35:00	88.2500	1689.98	41.22	1685.30	41.57
32	1999/12/24	07:35:29	91.2583	1696.38	41.22	1691.79	41.57
33	1999/12/24	10:36:00	94.2667	1703.02	41.22	1698.38	41.57
34	1999/12/24	13:36:30	97.2750	1709.01	41.22	1704.30	41.57
35	1999/12/24	16:36:59	100.2833	1714.35	41.22	1709.69	41.57
36	1999/12/24	19:37:30	103.2917	1719.75	41.22	1715.26	41.57
37	1999/12/24	22:38:00	106.3000	1725.21	41.22	1720.69	41.57

Bottom Gauge Serial Number: Start Date: 1999/12/20 12:20:00 Run Depth:
Top Gauge Serial Number: Start Date: 1999/12/20 12:20:00 Run Depth:

Print Filter Used: Nth Line = 361.000

	Bottom Gauge Date	Clock Time	Time	Bottom Gauge Pres.	Bottom Gauge Temp.	Top Gauge Pres.	Top Gauge Temp.
	yyyy/mm/dd	hh:mm:ss	hr	kPa(a)	°C	kPa(a)	°C
38	1999/12/25	01:38:29	109.3083	1730.30	41.22	1725.78	41.57
39	1999/12/25	04:39:00	112.3167	1735.31	41.22	1730.77	41.57
40	1999/12/25	07:39:29	115.3250	1740.29	41.22	1735.69	41.57
41	1999/12/25	10:39:59	118.3333	1745.35	41.22	1740.71	41.57
42	1999/12/25	13:40:30	121.3417	1750.36	41.21	1745.71	41.56
43	1999/12/25	16:41:00	124.3500	1755.59	41.20	1750.87	41.54
44	1999/12/25	19:41:29	127.3583	1760.79	41.19	1756.23	41.53
45	1999/12/25	22:42:00	130.3667	1765.53	41.19	1760.83	41.51
46	1999/12/26	01:42:30	133.3750	1771.30	41.36	1765.73	41.63
47	1999/12/26	04:42:59	136.3833	1777.48	41.32	1771.88	41.66
48	1999/12/26	07:43:30	139.3917	1784.00	41.33	1778.21	41.62
49	1999/12/26	10:44:00	142.4000	1790.08	41.31	1784.34	41.61
50	1999/12/26	13:44:29	145.4083	1796.71	41.31	1791.09	41.62
51	1999/12/26	16:45:00	148.4167	1802.83	41.32	1797.07	41.60
52	1999/12/26	19:45:30	151.4250	1808.82	41.31	1803.27	41.62
53	1999/12/26	22:45:59	154.4333	1815.15	41.31	1809.63	41.62
54	1999/12/27	01:46:30	157.4417	1822.05	41.32	1816.36	41.62
55	1999/12/27	04:47:00	160.4500	1828.90	41.32	1823.15	41.64
56	1999/12/27	07:47:29	163.4583	1836.12	41.32	1830.47	41.62
57	1999/12/27	10:48:00	166.4667	1842.96	41.34	1837.38	41.64
58	1999/12/27	13:48:30	169.4750	1849.42	41.35	1843.82	41.64
59	1999/12/27	16:48:59	172.4833	1855.96	41.33	1850.33	41.65
60	1999/12/27	19:49:30	175.4917	1862.16	41.34	1856.77	41.63
61	1999/12/27	22:50:00	178.5000	1868.39	41.34	1862.86	41.62
62	1999/12/28	01:50:29	181.5083	1874.17	41.33	1868.79	41.64
63	1999/12/28	04:51:00	184.5167	1880.19	41.33	1874.72	41.62
64	1999/12/28	07:51:30	187.5250	1886.18	41.34	1880.75	41.65
65	1999/12/28	10:51:59	190.5333	1892.08	41.32	1886.73	41.63
66	1999/12/28	13:52:30	193.5417	1897.71	41.33	1892.32	41.64
67	1999/12/28	16:53:00	196.5500	1903.44	41.33	1898.04	41.64
68	1999/12/28	19:53:29	199.5583	1909.07	41.33	1903.67	41.65
69	1999/12/28	22:54:00	202.5667	1914.65	41.35	1909.28	41.64
70	1999/12/29	01:54:29	205.5750	1920.12	41.35	1914.97	41.65
71	1999/12/29	04:54:59	208.5833	1925.56	41.35	1920.48	41.66
72	1999/12/29	07:55:30	211.5917	1930.99	41.33	1925.86	41.65
73	1999/12/29	10:56:00	214.6000	1936.56	41.35	1931.48	41.67
74	1999/12/29	13:56:29	217.6083	1942.20	41.35	1937.20	41.66

Bottom Gauge Serial Number: Start Date: 1999/12/20 12:20:00 Run Depth:
Top Gauge Serial Number: Start Date: 1999/12/20 12:20:00 Run Depth:
Print Filter Used: Nth Line = 361.000

Anderson Exploration Ltd.
100/01-08-002-29W1/0
Start Test Date: 1999/12/20

Home S Pierson Unit #1
Formation: Spearfish

Job Number: 99-0196

	Bottom Gauge Date	Clock Time	Time	Bottom Gauge Pres.	Bottom Gauge Temp.	Top Gauge Pres.	Top Gauge Temp.
	yyyy/mm/dd	hh:mm:ss	hr	kPa(a)	°C	kPa(a)	°C
75	1999/12/29	16:57:00	220.6167	1947.25	41.34	1942.21	41.62
76	1999/12/29	19:57:30	223.6250	1952.54	41.33	1947.65	41.61
77	1999/12/29	22:57:59	226.6333	1958.16	41.32	1953.14	41.63
78	1999/12/30	01:58:30	229.6417	1963.87	41.29	1958.84	41.62
79	1999/12/30	04:59:00	232.6500	1969.57	41.30	1964.48	41.64
80	1999/12/30	07:59:29	235.6583	1975.13	41.32	1970.20	41.64
81	1999/12/30	11:00:00	238.6667	1981.08	41.31	1976.12	41.66
82	1999/12/30	14:00:30	241.6750	1985.77	41.32	1980.85	41.65
83	1999/12/30	17:00:59	244.6833	1991.40	41.33	1986.30	41.66
84	1999/12/30	20:01:30	247.6917	1996.57	41.34	1991.45	41.67
85	1999/12/30	23:02:00	250.7000	1999.56	41.33	1994.50	41.66
86	1999/12/31	02:02:29	253.7083	2007.71	41.35	2002.44	41.69
87	1999/12/31	05:03:00	256.7167	2013.14	41.34	2007.64	41.69
88	1999/12/31	08:03:30	259.7250	2018.65	41.33	2013.18	41.67
89	1999/12/31	11:03:59	262.7333	2023.80	41.36	2018.37	41.69
90	1999/12/31	14:04:30	265.7417	2030.03	41.38	2024.56	41.71
91	1999/12/31	17:05:00	268.7500	2035.41	41.38	2029.82	41.72
92	1999/12/31	20:05:29	271.7583	2040.40	41.40	2034.96	41.73
93	1999/12/31	23:06:00	274.7667	2045.57	41.40	2040.10	41.73
94	2000/01/01	02:06:29	277.7750	2050.83	41.41	2045.26	41.75
95	2000/01/01	05:06:59	280.7833	2056.18	41.42	2050.50	41.75
96	2000/01/01	08:07:30	283.7917	2061.23	41.40	2055.76	41.73
97	2000/01/01	11:08:00	286.8000	2065.83	41.42	2060.27	41.75
98	2000/01/01	14:08:29	289.8083	2070.69	41.42	2065.06	41.75
99	2000/01/01	17:09:00	292.8167	2075.89	41.43	2070.39	41.76
100	2000/01/01	20:09:29	295.8250	2081.48	41.42	2076.12	41.76
101	2000/01/01	23:09:59	298.8333	2085.41	41.42	2079.92	41.75
102	2000/01/02	02:10:30	301.8417	2089.84	41.43	2084.33	41.77
103	2000/01/02	05:11:00	304.8500	2095.15	41.45	2089.58	41.77
104	2000/01/02	08:11:29	307.8583	2099.78	41.45	2094.20	41.78
105	2000/01/02	11:12:00	310.8667	2104.50	41.44	2098.97	41.78
106	2000/01/02	14:12:29	313.8750	2109.35	41.46	2103.73	41.78
107	2000/01/02	17:12:59	316.8833	2113.88	41.46	2108.31	41.78
108	2000/01/02	20:13:30	319.8917	2118.79	41.46	2113.08	41.78
109	2000/01/02	23:14:00	322.9000	2123.42	41.46	2117.72	41.78
110	2000/01/03	02:14:29	325.9083	2128.08	41.47	2122.28	41.79
111	2000/01/03	05:15:00	328.9167	2132.59	41.47	2126.96	41.79

Bottom Gauge Serial Number: Start Date: 1999/12/20 12:20:00 Run Depth:
Top Gauge Serial Number: Start Date: 1999/12/20 12:20:00 Run Depth:
Print Filter Used: Nth Line = 361.000

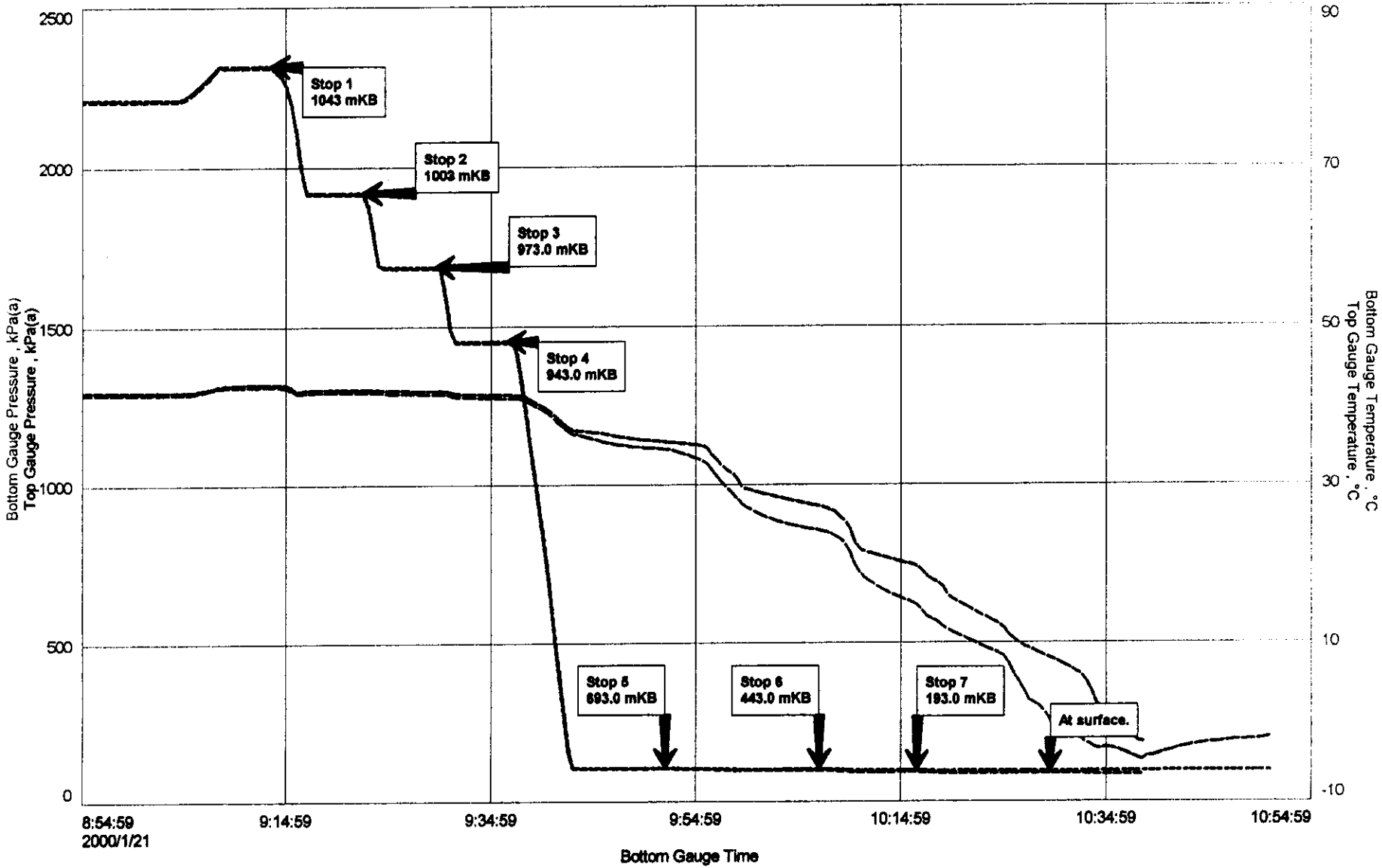
	Bottom Gauge Date	Clock Time	Time	Bottom Gauge Pres.	Bottom Gauge Temp.	Top Gauge Pres.	Top Gauge Temp.
	yyyy/mm/dd	hh:mm:ss	hr	kPa(a)	°C	kPa(a)	°C
112	2000/01/03	08:15:29	331.9250	2137.29	41.47	2131.70	41.79
113	2000/01/03	11:15:59	334.9333	2142.13	41.47	2136.57	41.80
114	2000/01/03	14:16:30	337.9417	2146.72	41.47	2141.08	41.79
115	2000/01/03	17:17:00	340.9500	2151.27	41.48	2145.75	41.80
116	2000/01/03	20:17:29	343.9583	2155.93	41.47	2150.16	41.80
117	2000/01/03	23:18:00	346.9667	2160.49	41.47	2154.79	41.80
118	2000/01/04	02:18:30	349.9750	2165.04	41.48	2159.32	41.81
119	2000/01/04	05:18:59	352.9833	2169.43	41.48	2163.86	41.80
120	2000/01/04	08:19:30	355.9917	2174.03	41.49	2168.29	41.81
121	2000/01/04	11:20:00	359.0000	2178.53	41.49	2172.96	41.81
122	2000/01/04	14:20:29	362.0083	2182.87	41.49	2177.28	41.81
123	2000/01/04	17:21:00	365.0167	2187.44	41.49	2181.75	41.81
124	2000/01/04	20:21:29	368.0250	2191.85	41.49	2185.97	41.82
125	2000/01/04	23:21:59	371.0333	2196.32	41.49	2190.33	41.81
126	2000/01/05	02:22:30	374.0417	2200.48	41.49	2194.71	41.81
127	2000/01/05	05:23:00	377.0500	2204.79	41.49	2199.03	41.82
128	2000/01/05	08:23:29	380.0583	2209.32	41.48	2203.49	41.81
129	2000/01/05	11:24:00	383.0667	1919.72	41.75	1915.60	42.11
130	2000/01/05	12:55:30	384.5917	97.16	-1.96		

Bottom Gauge Serial Number: Start Date: 1999/12/20 12:20:00 Run Depth:
Top Gauge Serial Number: Start Date: 1999/12/20 12:20:00 Run Depth:
Print Filter Used: Nth Line = 361.000

Anderson Exploration Ltd.
100/01-08-002-29W1/0
Start Test Date: 2000/01/05
Final Test Date: 2000/01/05

Home S Pierson Unit #1
Formation: Spearfish
Job Number: 99-0196

Static Gradient - Overall

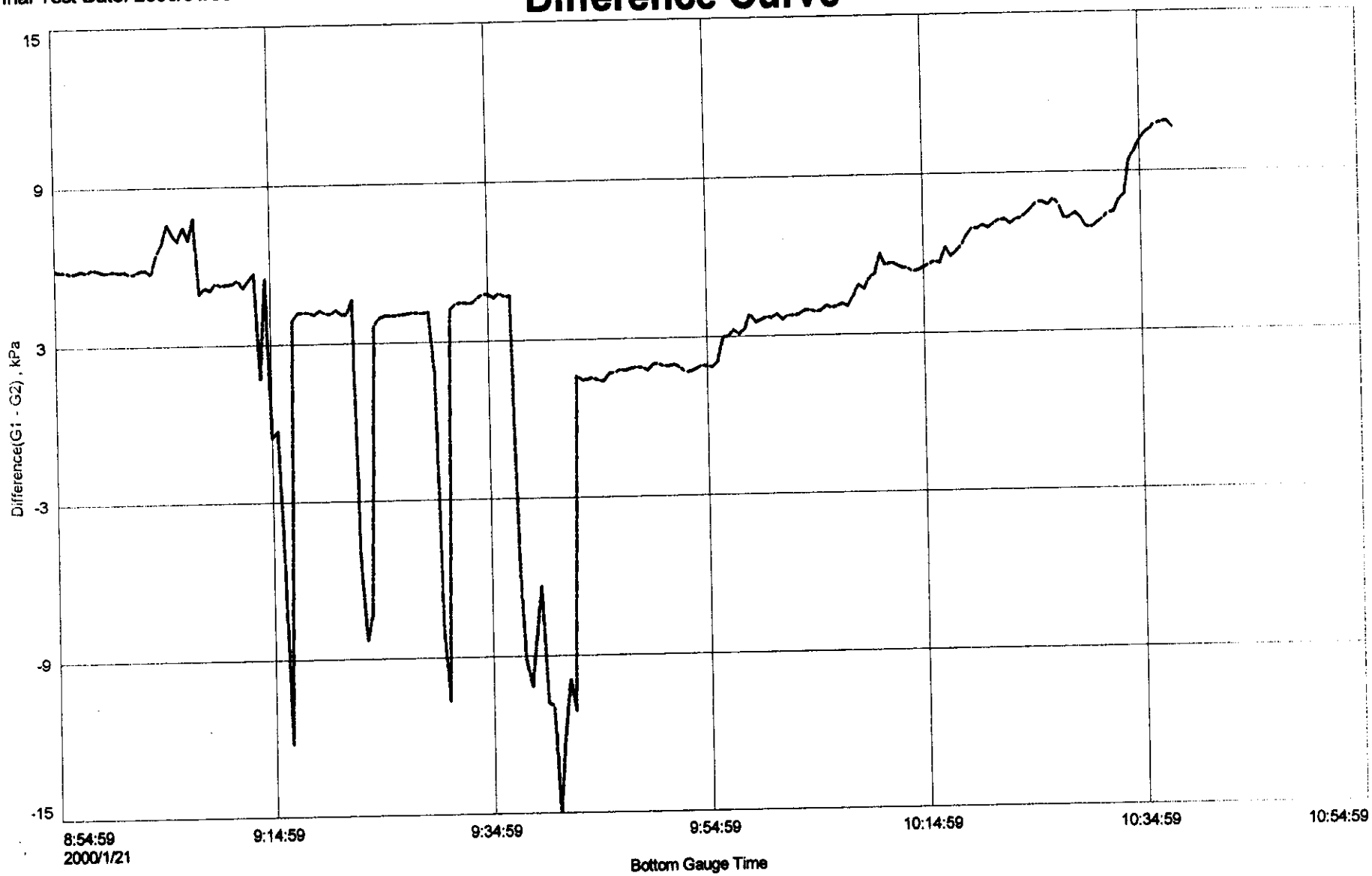


Fast

Anderson Exploration Ltd.
100/01-08-002-29W1/0
Start Test Date: 2000/01/05
Final Test Date: 2000/01/05

Home S Pierson Unit #1
Formation: Spearfish
Job Number: 99-0196

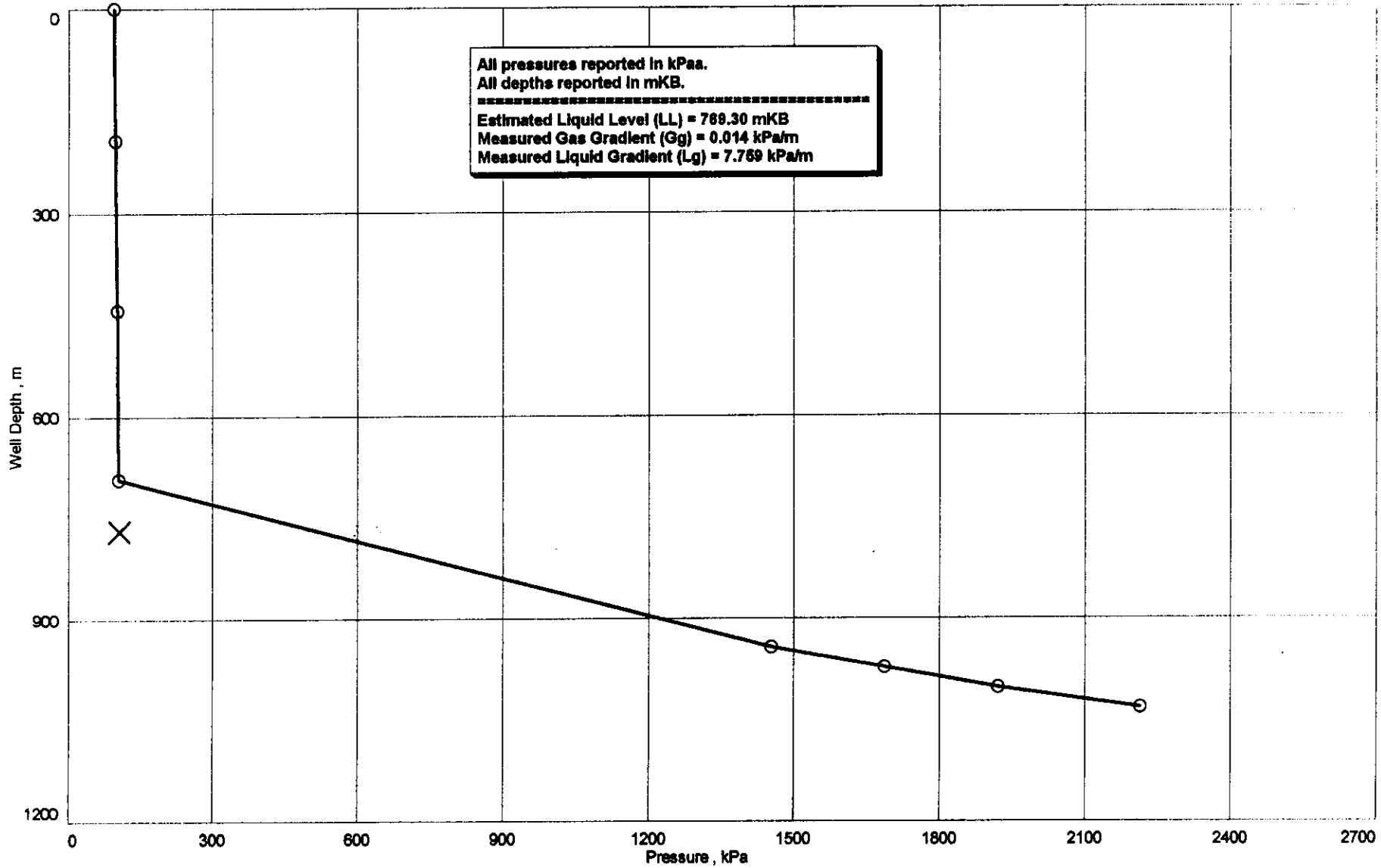
Difference Curve



Anderson Exploration Ltd.
100/01-08-002-29W1/0
Start Test Date: 2000/01/05
Final Test Date: 2000/01/05

Home S Pierson Unit #1
Formation: Spearfish
Job Number: 99-0196

Static Gradient

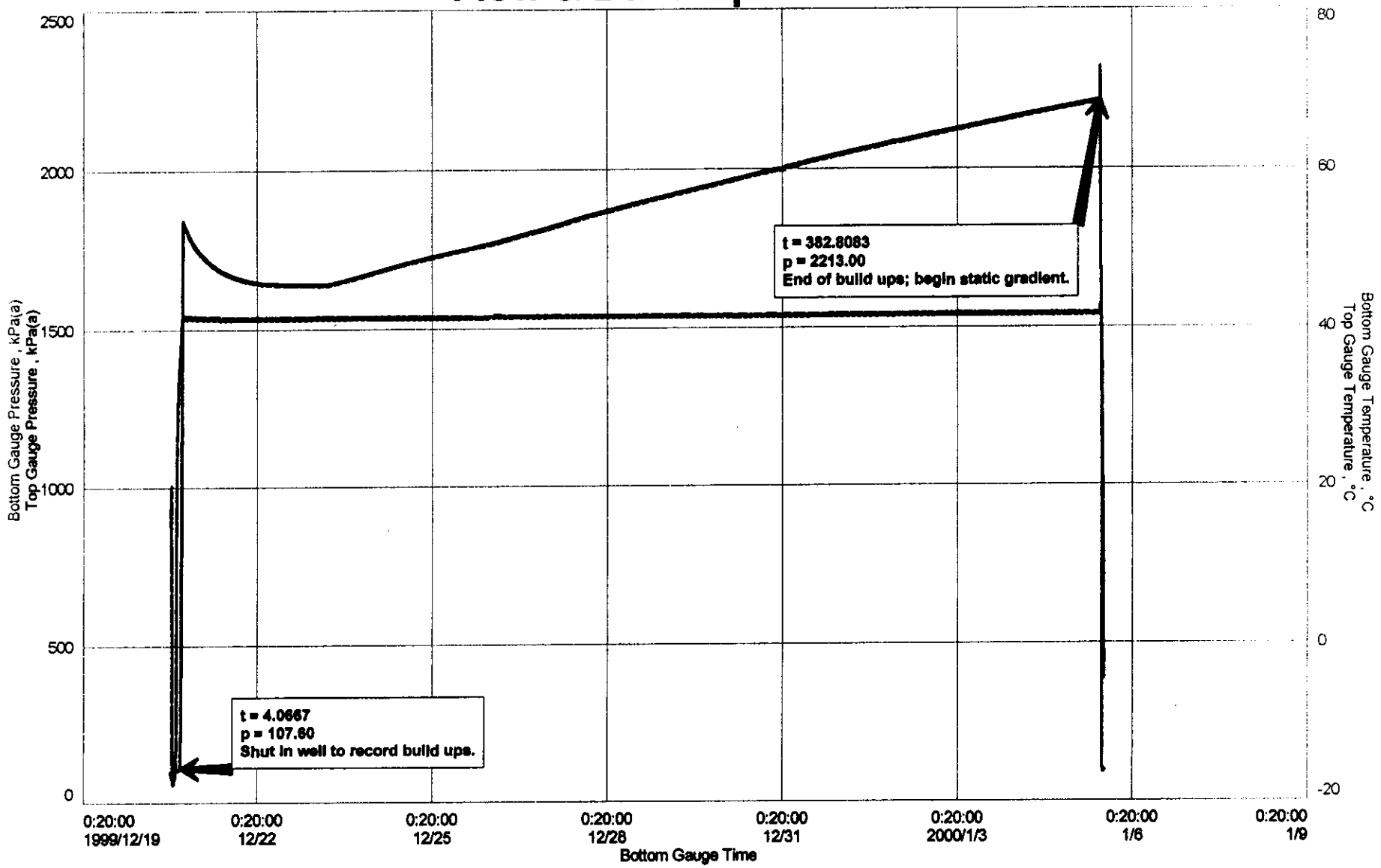


Fast

Anderson Exploration Ltd.
100/01-08-002-29W1/0
Start Test Date: 1999/12/20
Final Test Date: 2000/01/05

Home S Pierson Unit #1
Formation: Spearfish
Job Number: 99-0196

Flow & Build Up - Overall

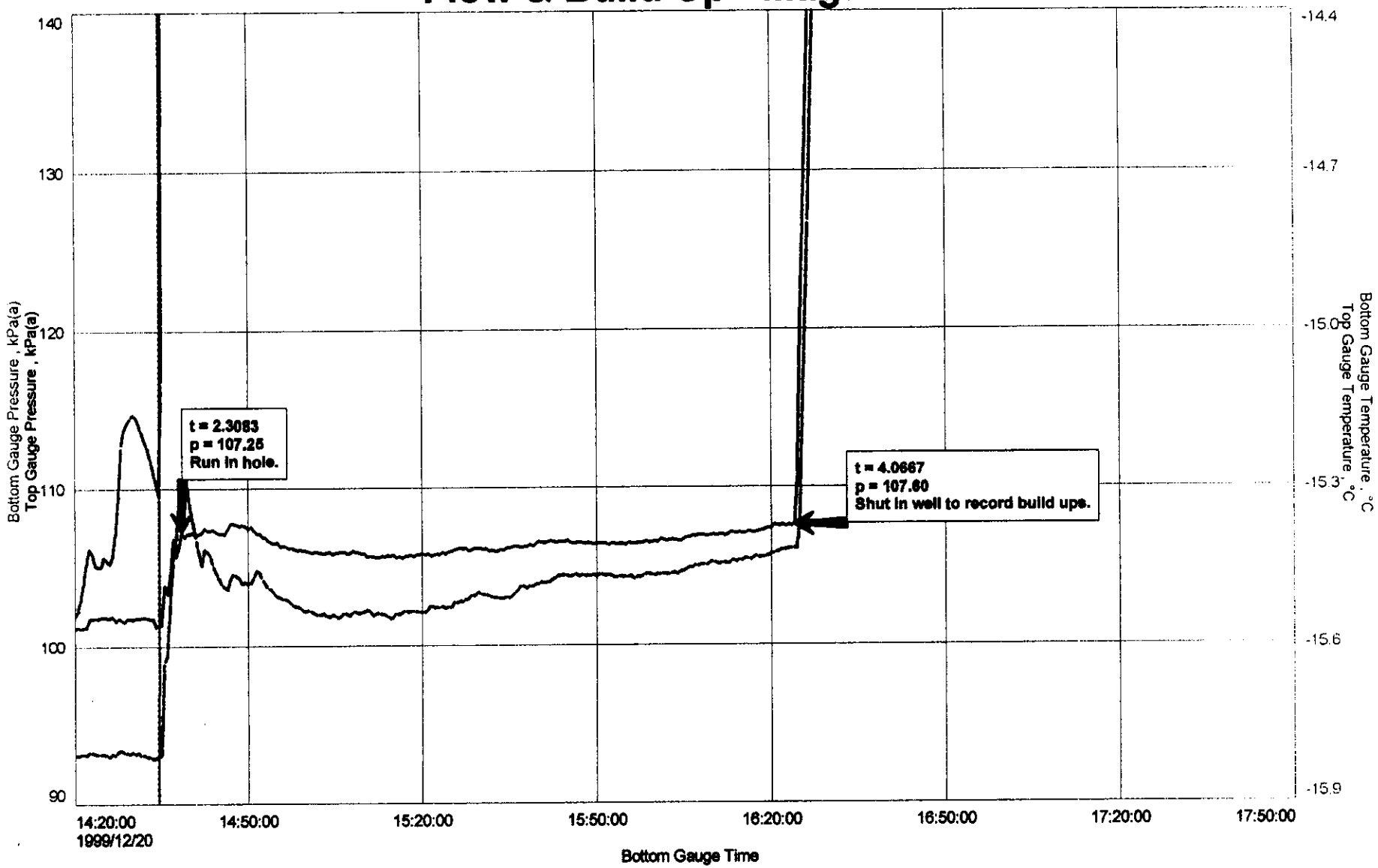


Fast

Anderson Exploration Ltd.
100/01-08-002-29W1/0
Start Test Date: 1999/12/20
Final Test Date: 2000/01/05

Home S Pierson Unit #1
Formation: Spearfish
Job Number: 99-0196

Flow & Build Up - Magnified



EQUATIONS

and

NOMENCLATURE

(METRIC UNITS)

PMG

BASIC TIME FUNCTIONS

Flow Time t

Shut-In Time Δt

Horner Time $\frac{t + \Delta t}{\Delta t}$

Superposition Time $t_n = \sum_{j=1}^{n} \frac{q_j - q_{j-1}}{q_n} \log(t - t_{j-1})$

$$\Delta t_n = \sum_{j=1}^{n} \frac{q_j}{q_n} \log \frac{t_n + \Delta t - t_{j-1}}{t_n + \Delta t - t_j}$$

Equivalent Time $\Delta t_e = \frac{t \cdot \Delta t}{t + \Delta t}$

Root Time $\sqrt{t}$

$\sqrt{\Delta t}$

Tandem Root Time $\sqrt{t + \Delta t} - \sqrt{\Delta t}$

PMG

BASIC TIME FUNCTIONS (cont'd)

Quad Root Time $\sqrt[4]{t}$

$\sqrt[4]{\Delta t}$

Tandem Quad Root Time $\sqrt[4]{t+\Delta t} - \sqrt[4]{\Delta t}$

TYPECURVES - DIMENSIONLESS VARIABLES

$$\Delta p_D = \frac{(kh/\mu)_t \, \Delta p}{141.2 \, q_t \, B_t}$$

$$t_D = \frac{2.637E{-}4(k/\mu)_t \, t}{\phi c r_w^2}$$

$$\frac{t_D}{C_D} = 0.000295 \, (\frac{kh}{\mu})_t \frac{t}{C}$$

$$C_D e^{2s} = \frac{0.8936 \, C \, e^{2s}}{\phi c h r_w^2}$$

$$t_{DA} = \frac{2.637E{-}4 \, (k/\mu)_t \, t}{\phi c A}$$

$$t_{Dxf} = \frac{2.637E{-}4 \, (k/\mu)_t \, t}{\phi c x_f^2}$$

$$(k_f w)_D = \frac{k_f w}{k x_f}$$

PMG

McKINLEY ANALYSIS

Wellbore Capacity

$$F = \left(\frac{\Delta p\ F}{qB}\right)\left(\frac{qB}{\Delta p}\right)$$

Alpha

$$\alpha = \frac{F}{5.615}$$

Note: Alpha is the same as C

Wellbore Storage Constant
Compressible Fluid

$$C = c_{ws} V_{ws}$$

Wellbore Storage Constant
Changing Liquid Level

$$C = \frac{cross\text{-}sectional\ area}{5.615\ liquid\ gradient}$$

Transmissivity

$$\frac{kh}{\mu} = \left(\frac{T}{F}\right) F$$

Pressure Drop Skin

$$\Delta p_s = \left[1 - \frac{kh_{(wellbore)}}{kh_{(formation)}}\right] \Delta p_{(departure)}$$

Flow Efficiency

$$FE = \frac{p^* - p_{wf} - \Delta p_s}{p^* - p_{wf}}$$

PMG

SEMILOG ANALYSIS

Transmissivity

$$\left(\frac{kh}{\mu}\right)_t = \frac{162.6\ q_t\ B_t}{m}$$

Permeability

$$k = \frac{162.6\ q_o\ B_o\ \mu_o}{mh}$$

Skin Factor

$$s' = 1.151\left[\frac{p_{ws} - p_{wfo}}{m} - \log\frac{t\Delta t}{t+\Delta t} - \log\left(\frac{(k/\mu)_t}{\phi_t c_t r_w^2}\right) + 3.23\right]$$

Pressure Drop due to Skin

$$\Delta p_s = 0.869\ ms'$$

Flow Efficiency

$$FE = \frac{\bar{p}_R - p_{wfo} - 0.869\ ms'}{\bar{p}_R - p_{wfo}}$$

Damage Ratio

$$DR = \frac{1}{FE}$$

Radius of Investigation

$$r_{inv} = \sqrt{\frac{(k/\mu_t)\ t}{948\phi_t c_t}}$$

Time to Stabilization

$$t_s = \frac{\phi\ c\ A}{2.637E{-}4\ (k/\mu)_t}(t_{DA})_{pss}$$

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SEMILOG ANALYSIS (cont"d)

Stabilized Rate

$$q_s = \frac{p_i - p_{wfo}}{\frac{162.6\ B_o}{(k/\mu)_o\ h}\left[\log\left(\frac{4A}{1.781\ r_w^2 C_A}\right) + \frac{4\pi(t_{DA})_{pss}}{2.303} + \frac{2s'}{2.303}\right]}$$

Productivity Index

$$P\ I = \frac{q}{\bar{p}_R - p_{wfo}}$$

MBH Average Pressure

$$\bar{p}_R = p^* - \frac{m}{2.303}\ (MBH\ function)$$

DIETZ Average Pressure

$$(\Delta t)_{\bar{p}_R} = \frac{\phi\ c_t\ A}{2.637E{-}4\ C_A (k/\mu)_t}$$

LINEAR ANALYSIS

Fracture half-length

$$x_f = \frac{4.064\ q_t\ B_t}{mh(\phi ck/\mu)_t^{1/2}}$$

Channel width

$$W = \frac{8.128\ q_t\ B_t}{mh(\phi ck/\mu)_t^{1/2}}$$

Skin Factor

$$s = \ln \frac{2\ r_w}{x_f}$$

BI-LINEAR ANALYSIS

Fracture Conductivity

$$k_f w = \left[\frac{44.1\ qB\mu}{mh(\phi\mu ck)^{1/4}}\right]^2$$

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NOMENCLATURE

Symbol	Description	Metric (SI)	Field
a	LIT flow equation coefficient	-	-
A	drainage area	m^2	ft^2
AOF	absolute open flow potential (gas)	$10^3m^3/d$	MMcfd
b	LIT flow equation coefficient	-	-
B	formation volume factor	-	-
c	compressibility	kpa^{-1}	psi^{-1}
c_{ws}	compressibility of wellbore fluids	kpa^{-1}	psi^{-1}
C	wellbore storage/unloading constant	m^3/kPa	bbl/psi
C	simplified flow equation coefficient	-	-
C_A	shape factor	-	-
C_{aD}	apparent wellbore storage constant	-	-
C_D	dimensionless wellbore storage constant	-	-
C_{pD}	storage pressure parameter	-	-
DR	damage ratio	-	-
F	wellbore capacity (McKinley)	m^3/kPa	ft^3/psi
FE	flow efficiency	-	-
G	relative density (gas)	-	-
GOR	gas-oil ratio	m^3/m^3	ft^3/bbl
h	net pay	m	ft
k	permeability	mD	md
$k_{(x,y,z)}$	permeability in the x,y,z direction	mD	md
k_f	fracture permeability	mD	md
k_fw	fracture conductivity	mD.m	md.ft
kh	flow capacity	mD.m	md.ft
k/μ	mobility	-	-
kh/μ	transmissivity	-	-

Symbol	Description	Metric (SI)	Field
L	length of horizontal well	m	ft
L_e	effective length of horizontal well	m	ft
m	slope of transient plots	-	-
n	simplified flow equation coefficient	-	-
p	pressure	kPa	psia
p_{bp}	bubble point pressure	kPa	psia
p_c	gas pseudo-critical pressure	kPa	psia
p_i	initial pressure	kPa	psia
p_R	average reservoir pressure	kPa	psia
p_{tf}	flowing wellhead pressure	kPa	psia
p_{ts}	shut-in wellhead pressure	kPa	psia
p_{wf}	flowing sandface pressure	kPa	psia
P_{wfo}	final flowing pressure	kPa	psia
p_{ws}	shut-in sandface pressure	kPa	psia
p^*	extrapolated pressure	kPa	psia
Δp_D	dimensionless pressure	-	-
Δp	pressure drop	kPa	psi
PI	productivity index	$m^3/d/kPa$	bbl/d/psi
q	flow rate - gas - liquid	$10^3m^3/d$ m^3/d	MMcf/d bbl/d
q_j	j^{th} flow rate	m^3/d	bbl/d
q_n	n^{th} flow rate	m^3/d	bbl/d
q_s	stabilized rate - gas - liquid	$10^3m^3/d$ m^3/d	MMcf/d bbl/d
r_e	external radius	m	ft
r_{inv}	radius of investigation	m	ft
r_w	wellbore radius	m	ft
R_s	solution gas ratio	m^3/m^3	ft^3/bbl

Symbol	Description	Metric (SI)	Field
s	skin factor	-	-
s'	apparent skin factor	-	-
S	saturation (oil, gas, water)	-	-
t	time	hr	hr
t_D	dimensionless time	hr	hr
t_a	pseudo-time	hr	hr
t_{DA}	dimensionless time (based on drainage area)	hr	hr
t_{Dxf}	dimensionless time (based on fracture 1/2 length)	hr	hr
t_n	n^{th} flow period, or superposition time	-	-
Δt	shut-in time	hr	hr
Δt_a	shut-in pseudo-time	hr	hr
Δt_e	equivalent time	hr	hr
$(t_{DA})_{pss}$	dimensionless time at pseudo-steady state	-	-
t_s	time to stabilization	hr	hr
T	temperature	K	°R
T_c	gas pseudo-critical temperature	K	°R
V_{ws}	wellbore volume - gas - liquid	m^3 m^3	ft^3 bbl
W	channel width	m	ft
w	fracture width	m	ft
x_e	length of reservoir	m	ft
x_f	fracture half-length	m	ft
x_o	x -location of observation well	m	ft
x_w	x- location of centre of active well	m	ft
y_e	width of reservoir	m	ft
y_o	y- location of observation well	m	ft
y_w	y- location of centre of active well	m	ft
Z	gas compressibility factor	-	-
z_w	z-location of centre of active well	m	ft

Symbol	Description	Metric (SI)	Field
α	wellbore storage/unloading constant	m^3/kPa	bbl/psi
μ	viscosity - gas	μPa.s	cp
	- liquid	mPa.s	cp
λ	inter-porosity flow coefficient	-	-
T	transmissivity (McKinley)	mD.m/mPa.s	md.ft/cp
ϕ	porosity	-	-
Ψ	pseudo-pressure	$kPa^2/\mu Pa.s$	$psia^2/cp$
ω	storativity ratio	-	-

Subscripts

D	dimensionless
DA	dimensionless based on area
Dxf	dimensionless based on fracture half -length
f	formation or flowing
g	gas
i	initial
o	oil
R	reservoir
s	shut-in, skin, stabilized or storage
t	total, transient, or wellhead (tubing head)
w	water or wellbore (sandface)
ref	evaluated at reference pressure

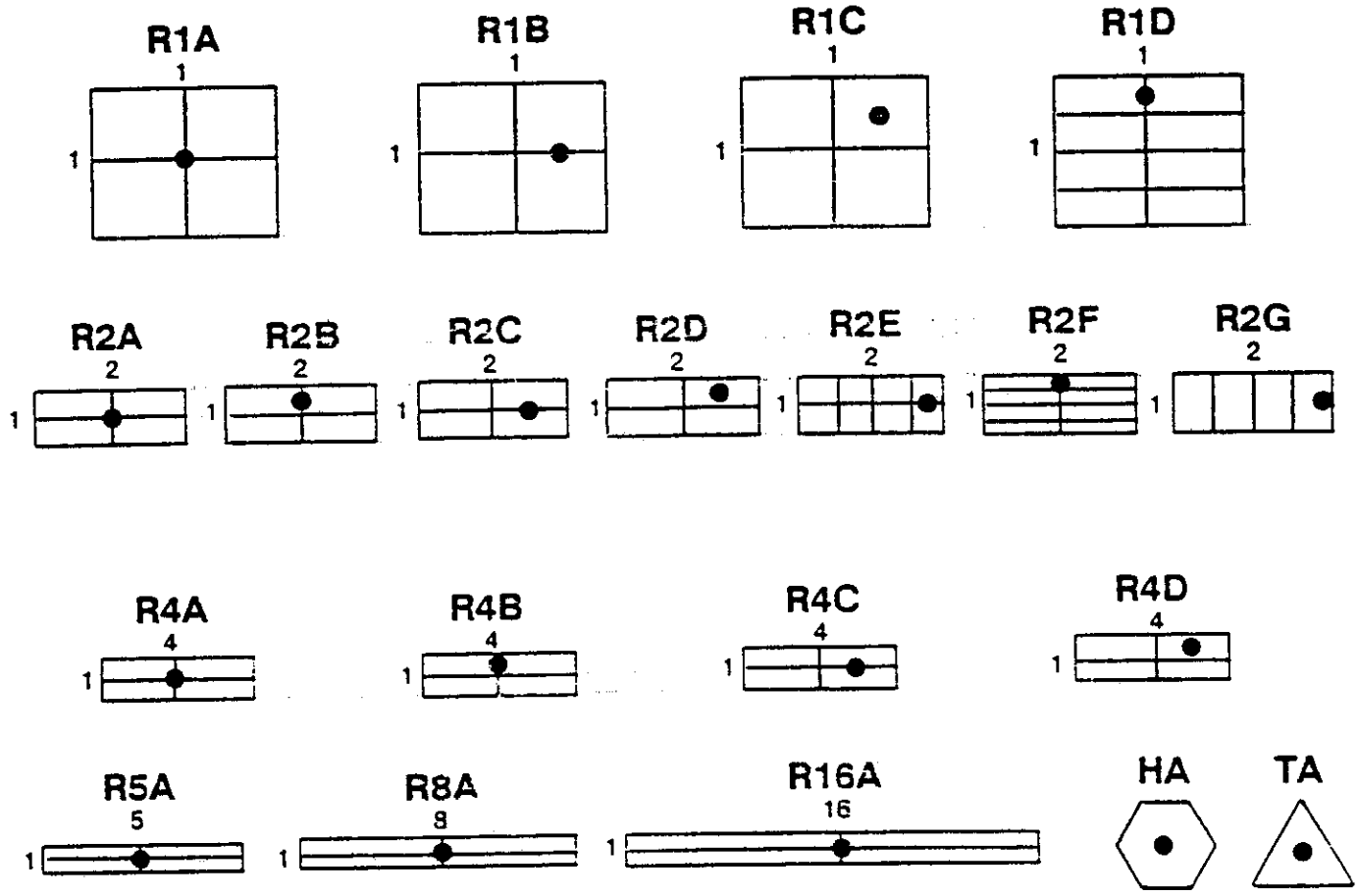
Superscripts

-	average

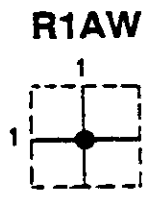
DIETZ SHAPE CODES

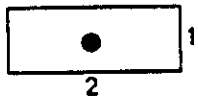
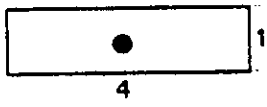
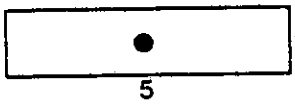
AVERAGE RESERVOIR PRESSURE - MBH CORRECTIONS

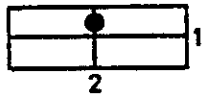
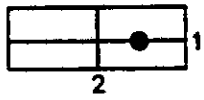
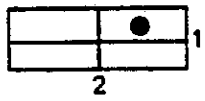
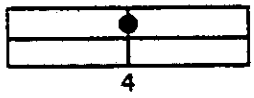
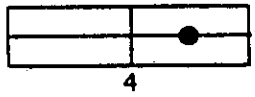
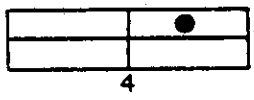
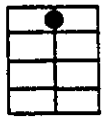
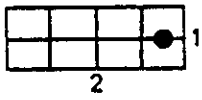
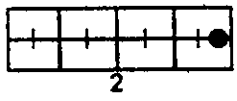
NO FLOW OUTER BOUNDARY



CONSTANT PRESSURE OUTER BOUNDARY



	$\ln C_A$	C_A	STABILIZED CONDITIONS FOR t_{DA} >
IN BOUNDED RESERVOIRS			
	3.45	31.6	0.1
	3.43	30.9	0.1
	3.45	31.6	0.1
	3.32	27.6	0.2
	3.30	27.1	0.2
	3.09	21.9	0.4
	3.12	22.6	0.2
	1.68	5.38	0.7
	0.86	2.36	0.7
	2.56	12.9	0.6
	1.52	4.57	0.5

	$\ln C_A$	C_A	STABILIZED CONDITIONS FOR t_{DA} >
	2.38	10.8	0.3
	1.58	4.86	1.0
	0.73	2.07	0.8
	1.00	2.72	0.8
	-1.46	0.232	2.5
	-2.16	0.115	3.0
	1.22	3.39	0.6
	1.14	3.13	0.3
	-0.50	0.607	1.0
	-2.20	0.111	1.2
	-2.32	0.098	0.9
IN WATER DRIVE RESERVOIRS			
	2.95	19.1	0.1
IN RESERVOIRS OF UNKNOWN PRODUCTION CHARACTER			
	3.22	25	0.1

PSEUDO-STEADY STATE SHAPE FACTORS FOR VARIOUS RESERVOIRS

FROM DIETZ (1965)

PMG

UNITS CONVERSION AND PREFIXES

METRIC (SI) UNIT	FIELD UNIT	DIVIDED BY
$10^3m^3/d$	MMcfd	2.817 399 E+01
kPa	psia	6.894 757 E+00
mD	md	9.869 233 E-01
mD.m	md.ft	3.008 142 E-01
m	ft	3.048 E-01
m^3	bbl (35 Imp gal) (42 US gal)	1.589 873 E-01
Pa.s	cp	1.0 E+03
°C	°F	(°F-32)5/9 E+00
K	°R	5/9 E+00
m^2	section (640 acres)	2.589 988 E+06
ha	section (640 acres)	2.589 988 E+02
m^3	gallon (Imp)	4.546 09 E-03
m^3	gallon (US)	3.785 412 E-03
$m^3/10^3m^3$	bbl/MMcf	5.643 052 E-03

Standard conditions: Metric (SI) 15°C, 101.325 kPa
Field 60°F, 14.65 psia

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