

*Forward / pdc*  
19 December 1991

Manitoba Energy and Mines  
#555, 330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Attention: Mr. John Fox,  
Chief Petroleum Engineer

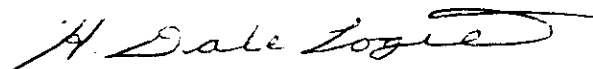
Dear Mr. Fox:

Subject: Pressure Surveys  
Waskada Unit No. 17 and No. 18

In reply to your letter of November 27, 1991, Enron Oil Canada Ltd. supplies the following information. Static bottom hole pressure surveys were run on the wells converted to water injection service on October 22, 1991 for Unit No. 17 and October 25, 1991 for Unit No. 18. The shut-in period between pressure survey measurement and service rig release date varied from approximately 5 to 20 days as presented in Table 1 attached. These pressure measurements were conducted to meet your requirements under Section 3 of the pressure maintenance approval. No detailed interpretation can be conducted on these single point static gradient pressure tests. Workover operations to change over to coated tubing made pressure build-up tests inappropriate. A more representative pressure regime within the Waskada Unit No. 17 and No. 18 waterflood project areas will be evident when pressure fall-off tests are conducted on these injection wells next summer. Average water injection rates from October 25 to December 9, 1991 are also presented in Table 1. All wells were able to meet target water injection rates at reasonable injection pressures and Enron is therefore pleased with initial waterflood operations.

Yours very truly,

ENRON OIL CANADA LTD.



H. Dale Logie, P.Eng.  
Chief Reservoir Engineer

HDL:pdc

**TABLE 1**  
**WASKADA UNIT NO. 16 AND NO. 17**  
**INITIAL INJECTOR DATA**

	<b>*Shut-in Pressure (kPag)</b>	<b>Shut-in Time (Days)</b>	<b>+ Water Injection (m<sup>3</sup>)</b>	<b>Injection Rate (m<sup>3</sup>/d)</b>	<b>Last Surface Injection Pressure (kPag)</b>
11-16-1-25	2 053	19.71	851.4	20.2	4 000
15-16-1-25	1 051	6.04	416.0	9.6	2 220
6-21-1-25	1 327	4.79	606.1	14.0	5 200
10-21-1-25	1 371	8.50	693.9	16.1	4 600
14-3-2-25	2 367	14.77	667.6	15.1	5 800
8-10-2-25	1 545	11.87	662.0	15.3	5 200
11-10-2-25	1 593	6.71	643.1	14.6	4 800
1-15-2-25	1 441	10.63	858.8	19.4	2 650
4-15-2-25	3 378	12.92	549.6	12.4	6 000
6-15-2-25	1 255	8.75	535.6	12.1	3 900
<p>* Shut-in pressure calculated @ MPP.</p> <p>+ Water injected from October 25 to December 9, 1991.</p>					

November 27, 1991

Mr. Dale Logie  
Enron Oil Canada Ltd.  
1300, 700-9th Avenue S.W.  
Calgary, Alberta  
T2P 3V4

Dear Sir:

**RE: Pressure Surveys - Waskada Unit No.'s 17 and 18**

The Petroleum Branch is in receipt of the results of the pressure surveys for Waskada Unit No.'s 17 and 18. The static gradients show very low reservoir pressures in both Units; 1250-3400 kPa in Unit No. 17 and 1050-2050 kPa in Unit No. 18.

It is impossible for the Branch to determine how representative the pressure survey results are without some indication of the shut-in period.

Please provide the Branch with your interpretation of the pressure surveys results and their impact on Enron's planned waterflood operations.

Yours truly,

ORIGINAL SIGNED BY  
**JOHN N. FOX**

John N. Fox, P. Eng.  
Chief Petroleum Engineer

**ENRON**  
**Oil Canada Ltd.**

**TRANSMITTAL**

Date: November 7, 1991

FCC  
WASKADA UNIT NO. 18  
PRESSURE SURVEYS

**Attn.: Mr. John Fox**  
Manitoba Energy & Mines  
#555, 330 Graham Avenue  
Winnipeg, Manitoba R3C 4E3

**RE: A11-16-01-25 WPM**  
**15-16-01-25 WPM**  
**06-21-01-25 WPM**  
**10-21-01-25 WPM**

Enclosed please find the following data pertaining to the subject well:

- Static Gradient Tests  
Waskada/Spearfish Survey  
October 25, 1991

C. Squires,  
Drilling Secretary

:CS  
Encl.(s)

## Waskada/Spearfish

Pressure = kPa  
Depth = Meters

[illegible]

**MOOSE MOUNTAIN  
WELL SERVICES LTD.**

COMPANY: ENRON OIL CANADA LTD.

ADDRESS: CALGARY ALBERTA

FIELD-POOL: WASKADA/SPEARFISH

TYPE OF TEST: STATIC GRADIENT

PERF/OH INTERVAL: 902-912 KB

ELEVATIONS: (GL) 470.32 (KB) 474.57

POOL DATUM:

WELL NAME: WASKADA

LOCATION: A11-16-1-25-WPM

WELL STATUS: OIL

DATE OF TEST: 91OCT25

PRODUCING THROUGH: TUBING

MP PROD. INTER: 902.75 GL

DATUM DEPTH: (CF)

SHUT IN:

DWG PRESS: (KPA) T=250 C=425

RUN DEPTH TEMP: (C) 44

ON/OFF BTM: 1242-1257

	TOP RECORDER	BOTTOM RECORDER
ELEMENT SERIAL NO:	45299	45301
RUN DEPTH: (MCF)	901.2	903
RUN DEPTH PRESS: (KPA)	2026	2062
GRADIENT-RUN DEPTH: (KPA/M)	9.553	9.671
PRESSURE AT MMP: (KPA)	2041	2064
DATUM DEPTH PRESS: (KPA)		

REMARKS:

Company: ENRON OIL CANADA LTD.

Location: A11-16-1-15-WPM

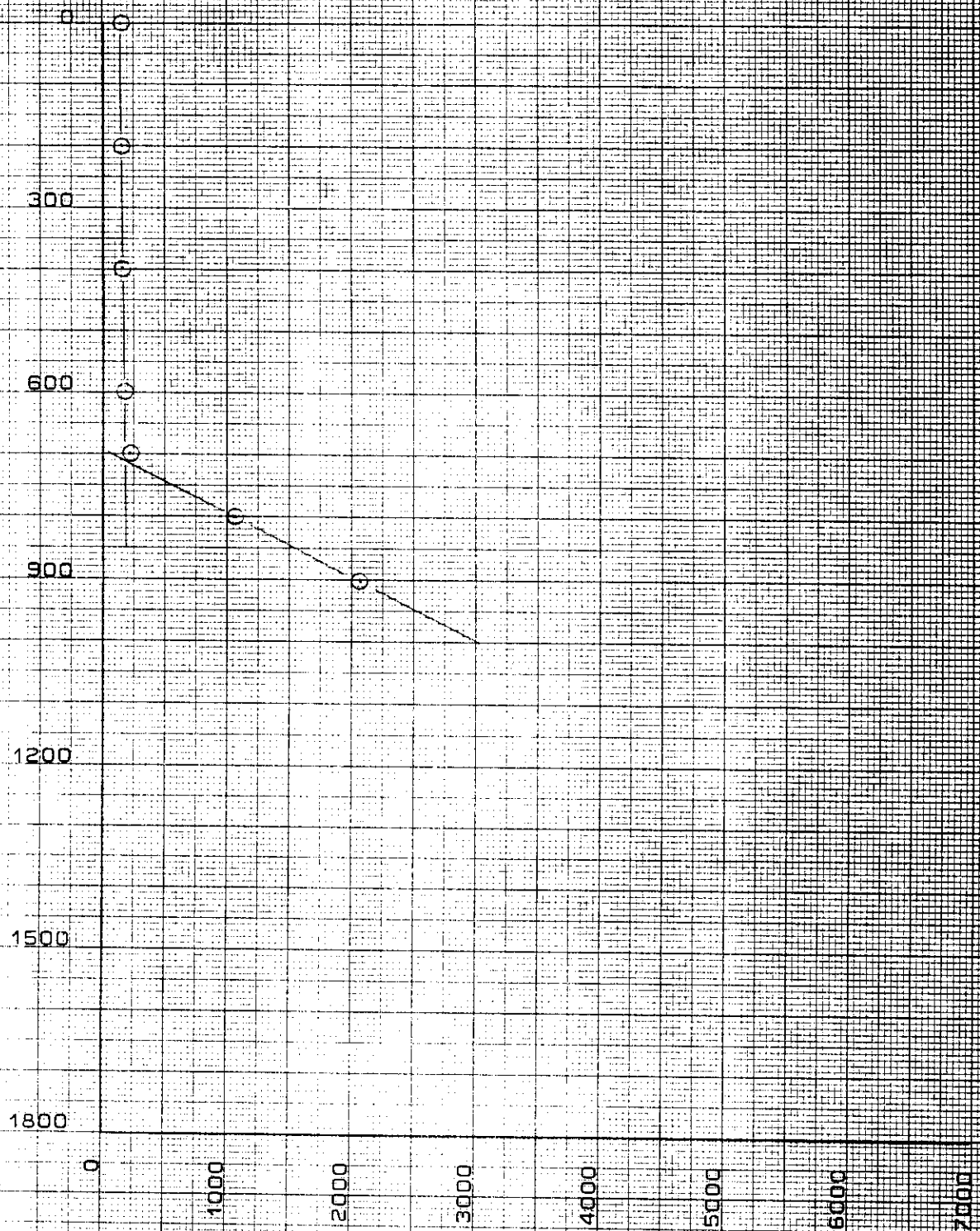
Element #: 45299      Range(kPa): 13790      IN#: 15282      3 hr Clock #: 2440  
Run Date: 91OCT25      Calib. Equation: 276.03 -30.76      Calib. Date: 91OCT11

Depth Below cfm	Time	Deflection mm	P-PC kPa	Pressure kPa	Gradient kPa/m
-1.80	1211-1216	0.580	+29	158	0.000
198.20	1217-1222	0.605	+29	165	0.034
398.20	1222-1227	0.630	+29	172	0.034
598.20	1227-1232	0.665	+28	181	0.048
698.20	1232-1237	0.750	+28	204	0.232
798.20	1237-1242	3.825	+17	1043	8.381
901.20	1242-1257	7.435	+5	2026	9.553

Element #: 45301      Range(kPa): 13790      IN#: 36585      3 hr Clock #: 2492  
Run Date: 91OCT25      Calib. Equation: 279.84 -23.59      Calib. Date: 91OCT11

Depth Below cfm	Time	Deflection mm	P-PC kPa	Pressure kPa	Gradient kPa/m
0.00	1211-1216	0.530	+22	147	0.000
200.00	1217-1222	0.555	+22	154	0.035
400.00	1222-1227	0.595	+22	165	0.055
600.00	1227-1232	0.650	+22	180	0.076
700.00	1232-1237	0.780	+22	216	0.361
800.00	1237-1242	3.840	+14	1065	8.490
903.00	1242-1257	7.430	+6	2062	9.671

Waskada  
A11-16-1-25-WPM  
October 25, 1991



46 1510



**MOOSE MOUNTAIN  
WELL SERVICES LTD.**

COMPANY:ENRON OIL CANADA LTD.	WELL NAME: WASKADA
ADDRESS: CALGARY ALBERTA	LOCATION: 15-16-1-25-WPM
FIELD-POOL: WASKADA/SPEARFISH	WELL STATUS: OIL
TYPE OF TEST: STATIC GRADIENT	DATE OF TEST: 91OCT25
PERF/DH INTERVAL: 901.0-911.0 KB	PRODUCING THROUGH: TUBING
ELEVATIONS: (GL)469.8 (KB) 473.7	MP PROD. INTER: 902.1 GL
POOL DATUM:	DATUM DEPTH: (CF)

SHUT IN:	RUN DEPTH TEMP: (C) 44
DWG PRESS: (KPA) T=320 C=1500	ON/OFF BTM: 1130-1145

	TOP RECORDER	BOTTOM RECORDER
ELEMENT SERIAL NO:	45299	45301
RUN DEPTH: (MCF)	900.2	902
RUN DEPTH PRESS: (KPA)	1015	1072
GRADIENT-RUN DEPTH: (KPA/M)	7.375	7.603
PRESSURE AT MMP: (KPA)	1029	1073
DATUM DEPTH PRESS: (KPA)		

REMARKS:

Company: ENRON OIL CANADA LTD.

Location: 15-16-1-25-WFM

Element #: 45299      Range(kPa): 13790      IHH: 15282      3 hr Clock #: 2440  
Run Date: 91OCT25      Calib. Equation: 276.03 -30.76      Calib. Date: 91OCT11

Depth Below cfs	Time	Deflection mm	P-PC kPa	Pressure kPa	Gradient kPa/m
-1.80	1059-1104	0.830	+28	226	0.000
198.20	1105-1110	0.860	+28	234	0.041
398.20	1110-1115	0.885	+28	241	0.034
598.20	1115-1120	0.910	+28	248	0.034
698.20	1120-1125	0.940	+27	256	0.082
798.20	1125-1130	0.965	+27	263	0.068
900.20	1130-1145	3.725	+18	1015	7.375

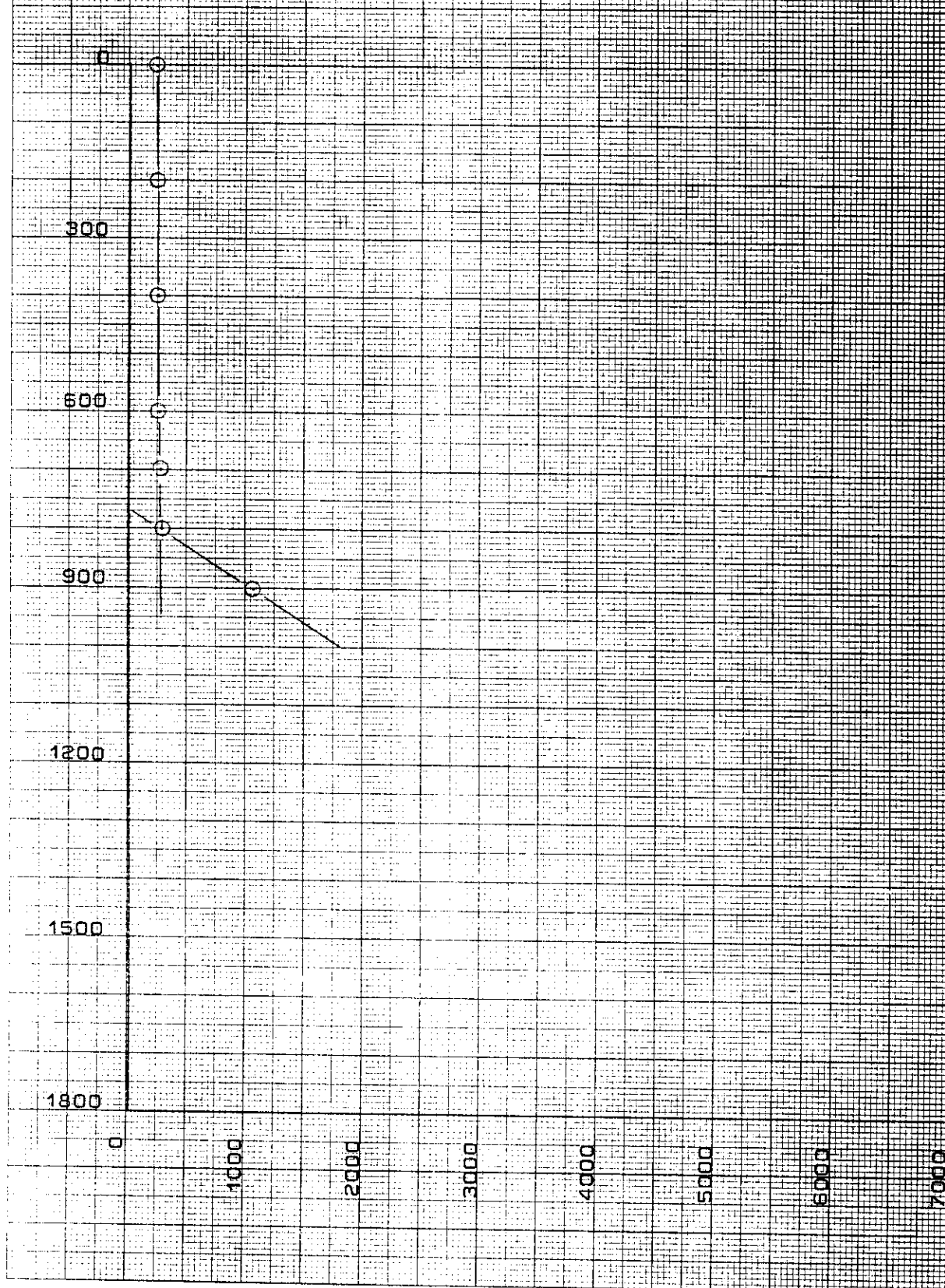
Element #: 45301      Range(kPa): 13790      IHH: 36585      3 hr Clock #: 2492  
Run Date: 91OCT25      Calib. Equation: 279.84 -23.59      Calib. Date: 91OCT11

Depth Below cfs	Time	Deflection mm	P-PC kPa	Pressure kPa	Gradient kPa/m
0.00	1059-1104	0.890	+21	247	0.000
200.00	1105-1110	0.905	+21	251	0.021
400.00	1110-1115	0.945	+21	262	0.055
600.00	1115-1120	0.995	+21	276	0.069
700.00	1120-1125	1.030	+21	286	0.097
800.00	1125-1130	1.070	+21	297	0.111
902.00	1130-1145	3.865	+14	1072	7.603

461510

10 X 10 TO THE CENTIMETER 18 X 20 CM  
1 1/2 IN. 5 1/2 IN. 10 IN. 12 IN.

Waskada  
15-16-1-25-WPM  
October 25, 1991



MOOSE MOUNTAIN  
WELL SERVICES LTD.

COMPANY:ENRON OIL CANADA LTD.	WELL NAME: WASKADA
ADDRESS: CALGARY ALBERTA	LOCATION: 6-21-1-25-WPM
FIELD-POOL: WASKADA/SPEARFISH	WELL STATUS: OIL
TYPE OF TEST: STATIC GRADIENT	DATE OF TEST: 91OCT25
PERF/OH INTERVAL: 901.0-911.0 KB	PRODUCING THROUGH: TUBING
ELEVATIONS: (GL)470.6 (KB) 474.8	MF PROD. INTER: 901.8 GL
POOL DATUM:	DATUM DEPTH: (CF)

SHUT IN:	RUN DEPTH TEMP: (C) 44
DWG PRESS: (KPA) T=325 C=825	ON/OFF BTM: 1021-1036

	TOP RECORDER	BOTTOM RECORDER
ELEMENT SERIAL NO:	45299	45301
RUN DEPTH: (MCF)	900.2	902
RUN DEPTH PRESS: (KPA)	1289	1350
GRADIENT-RUN DEPTH: (KPA/M)	8.070	8.147
PRESSURE AT MMP: (KPA)	1301	1352
DATUM DEPTH PRESS: (KPA)		

REMARKS:

Company: ENRON OIL CANADA LTD.

Location: 6-21-1-25-WPM

Element #: 45299      Range(kPa): 13790      IH#: 15282      3 hr Clock #: 2440  
Run Date: 91OCT25      Calib. Equation: 276.03 -30.76      Calib. Date: 91OCT11

Depth Below cfm	Time	Deflection mm	P-PC kPa	Pressure kPa	Gradient kPa/m
-1.80	947- 952	0.850	+28	232	0.000
198.20	954- 959	0.875	+28	238	0.034
398.20	1000-1005	0.900	+28	245	0.034
598.20	1006-1011	0.940	+27	256	0.055
698.20	1011-1016	0.970	+27	264	0.082
798.20	1016-1021	1.710	+25	466	2.017
900.20	1021-1036	4.730	+14	1289	8.070

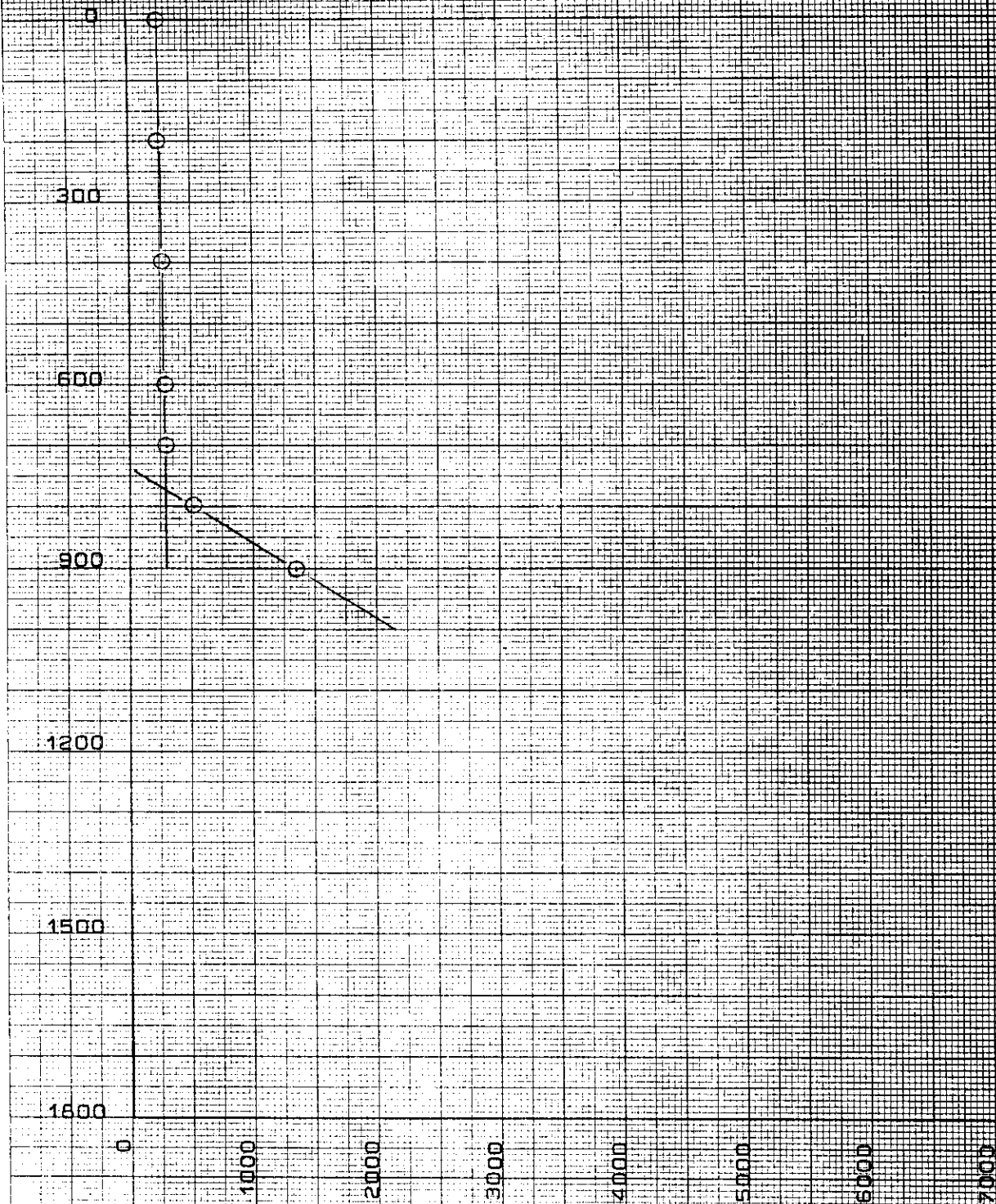
Element #: 45301      Range(kPa): 13790      IH#: 36585      3 hr Clock #: 2492  
Run Date: 91OCT25      Calib. Equation: 279.84 -23.59      Calib. Date: 91OCT11

Depth Below cfm	Time	Deflection mm	P-PC kPa	Pressure kPa	Gradient kPa/m
0.00	947- 952	0.930	+21	258	0.000
200.00	954- 959	0.940	+21	261	0.014
400.00	1000-1005	0.985	+21	273	0.062
600.00	1006-1011	1.040	+21	289	0.076
700.00	1011-1016	1.080	+21	300	0.111
800.00	1016-1021	1.870	+19	519	2.192
902.00	1021-1036	4.865	+12	1350	8.147

Waskada  
6-21-1-25-WPM  
October 25, 1991

46 1510

K&E 10 X 10 TO THE CENTIMETER 15 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.



MOOSE MOUNTAIN  
WELL SERVICES LTD.

COMPANY:ENRON OIL CANADA LTD.	WELL NAME: WASKADA
ADDRESS: CALGARY ALBERTA	LOCATION: 10-21-1-25-WPM
FIELD-POOL: WASKADA/SPEARFISH	WELL STATUS: OIL
TYPE OF TEST: STATIC GRADIENT	DATE OF TEST: 91OCT25
PERF/OH INTERVAL: 891.0-907.0 KB	PRODUCING THROUGH: TUBING
ELEVATIONS: (GL)471.1 (KB) 475.3	MP PROD. INTER: 894.8 GL
POOL DATUM:	DATUM DEPTH: (CF)

SHUT IN:	RUN DEPTH TEMP: (C) 44
DWG PRESS: (KPA) T=225 C=0	ON/OFF BTM: 852-907

	TOP RECORDER	BOTTOM RECORDER
ELEMENT SERIAL NO:	45299	45301
RUN DEPTH: (MCF)	885.2	887
RUN DEPTH PRESS: (KPA)	1274	1325
GRADIENT-RUN DEPTH: (KPA/M)	8.208	8.340
PRESSURE AT MMP: (KPA)	1353	1390
DATUM DEPTH PRESS: (KPA)		

REMARKS:

Company: ENRON OIL CANADA LTD.

Location: 10-21-1-25-WPM

Element #: 45299      Range(kPa): 13790      IHH: 15282      3      hr Clock #: 2440  
 Run Date: 91OCT25      Calib. Equation: 276.03 -30.76      Calib. Date: 91OCT11

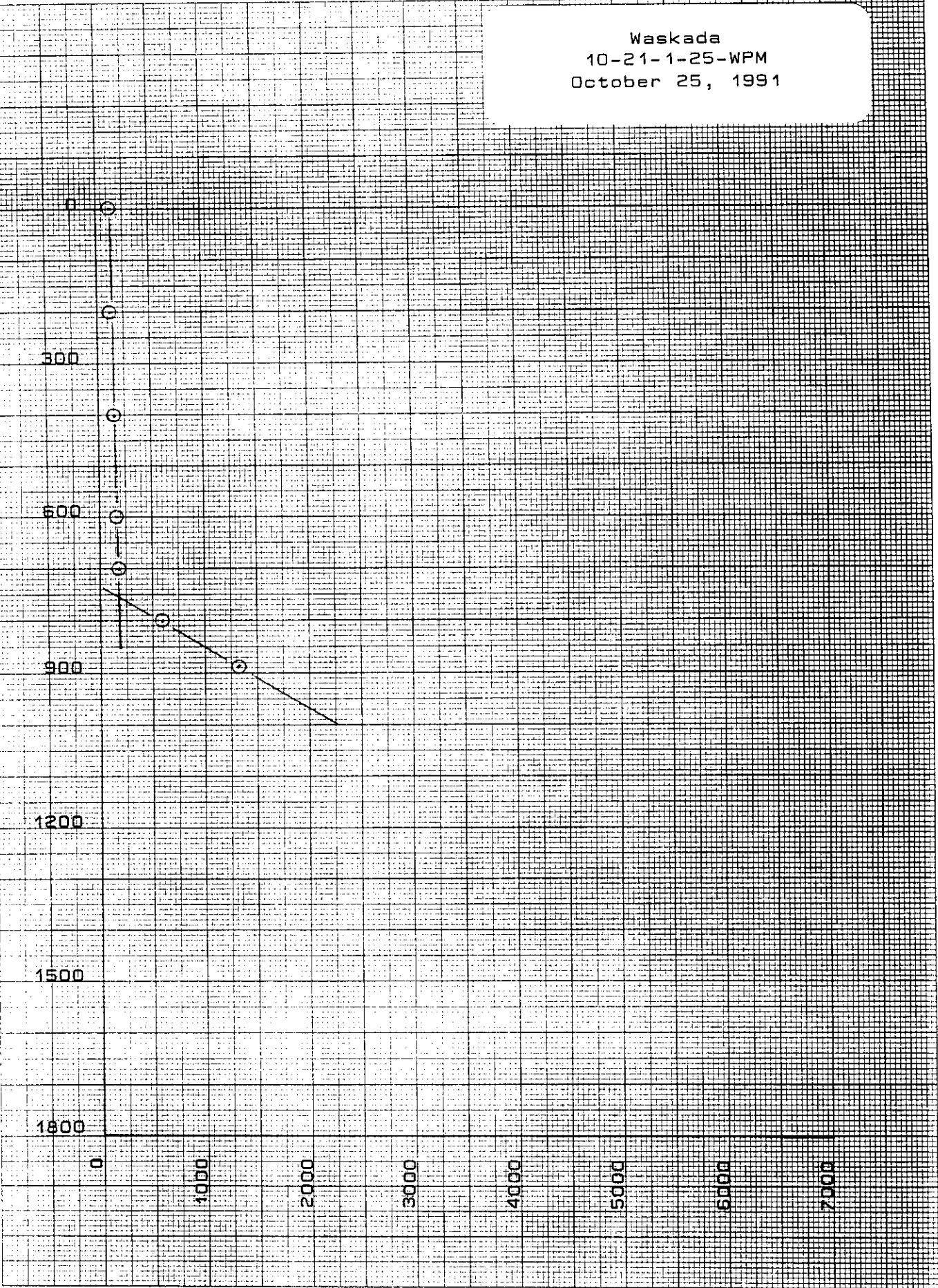
Depth Below cfm	Time	Deflection mm	P-PC kPa	Pressure kPa	Gradient kPa/m
-1.80	818- 823	0.495	+29	135	0.000
198.20	825- 830	0.525	+29	143	0.041
398.20	831- 836	0.535	+29	146	0.014
598.20	836- 841	0.570	+29	155	0.048
698.20	841- 846	0.600	+29	164	0.082
798.20	846- 851	2.055	+24	560	3.966
885.20	852- 907	4.675	+15	1274	8.208

Element #: 45301      Range(kPa): 13790      IHH: 36585      3      hr Clock #: 2492  
 Run Date: 91OCT25      Calib. Equation: 279.84 -23.59      Calib. Date: 91OCT11

Depth Below cfm	Time	Deflection mm	P-PC kPa	Pressure kPa	Gradient kPa/m
0.00	818- 823	0.490	+22	136	0.000
200.00	825- 830	0.520	+22	144	0.042
400.00	831- 836	0.560	+22	155	0.055
600.00	836- 841	0.600	+22	166	0.055
700.00	841- 846	0.645	+22	179	0.125
800.00	846- 851	2.160	+18	599	4.204
887.00	852- 907	4.775	+12	1325	8.340



Waskada  
10-21-1-25-WPM  
October 25, 1991



FROM 1/2 INCH TO THE CENTIMETER  
KNAUF & ESSER CO. MADE IN U.S.A.