

CALGARY COPY

Canada Oil and Gas Lands Administration Administration du pétrole et du gaz des terres du Canada
APR 9 1985
To: _____
File # _____

PETRO CANADA INC.
TWEED LAKE M-47
TWEED LAKE
85FEB18 - 85FEB20

CANADA OIL AND GAS LANDS ADMINISTRATION ADMINISTRATION DU PÉTROLE ET DU GAZ DES TERRES DU CANADA
APR 10 1985
ENGINEERING AND CONTROL TECHNIQUE ET DE CONTRÔLE

TEST OBJECTIVE: Perform a D.S.T. of 8 Hours through test equipment on the formation Mt. Clark (Lower) in the Tweed Lake Area for the well (Tweed Lake M-47). Monitor surface tubing, tubing temperatures, and gas flow rates. Methanol was injected to stop hydrating problems in the flow line and choke. Hydrates were indicated by the increasing well head pressure with decreasing flow rates. A small amount of water was produced and dumped into a barrel. Measurement of barrel indicated 13.4 inches. This amount of water is approximately .083 M3. High pressure gas samples were taken and sent to Core Lab in Calgary for analysis.

The following cumulatives were produced through the separator only:

Gas:	16,896.9 M3
Water:	.083 M3
Oil / Condensate:	0.00 M3

Later 170 Meters of drill string was recovered with 71 Degree API condensate in it.



OTIS ENGINEERING Co. LTD.

PRESSURE CONTROL SERVICE EQUIPMENT
PRODUCTION TESTING

TELEPHONE 403 - 275-1300 - TLX 038-22642
7211 - 8th STREET N.E., CALGARY, ALBERTA T2E 8A2

MAILING ADDRESS:
BOX 3037, STN. B, CALGARY, ALBERTA T2M 4L6 •

March 26, 1985

Petro Canada Ltd.
150 - 5th Ave. S.W.
Calgary, Alberta

Attention: Ron Boocock

Re: Tweed Lake M-47 Well Test Report

Dear Mr. Boocock;

As you requested I have provided the information required on the following items: 1) Well test report conversion factors, 2) Average flow rate flowing through the separator, 3) Absence of surface recovery of condensate found in the bottom of the test string.

1) Well Test Report Conversion Factors

These are the factors used in all Otis well test reports, standard and ODAS:

1 psi = 6.894757 Kpa
1 Bbl = 0.1589873 M³
1 MSCFD = 28.32784881 M³
1/64 Inch = 0.3969 mm

2) Average Flow Rate

@ 1.75" orifice - 21:52 - 22:55 Hrs. Feb. 19/85
- Separator cumulative gas = 3777.75 M³
(133.358 MSCF)

@ 1.50" orifice - 22:55 - 03:04 Hrs. Feb. 19-20/85
- Separator cumulative gas = 13,119.11 M³
(463.117 MSCF)

- Average separator rate = 77,985.51 M³/D
(2.753 MMSCF/D)

...../2

3) Absence of Condensate in Separator After Recovering Condensate in Tool String

Usually this is the result of gas flow rate being insufficient to overcome the friction factors inherent in continuous removal of liquids from the wellbore. Here at Otis we base our minimum clean-up flow rate calculations on the work done by Turner, Hubbard and Dukler, found in JPT, November 1969. The calculations, using Tweed M-47 fluid data, is as follows:

$$Q_g \text{ (MMSCF/D)} = \frac{3.06 P V_g A}{T_z}$$

$$V_g \text{ (water)} = \frac{5.62 (67 - 0.0039 P/Z)^{0.25}}{(0.0039 P/Z)^{0.5}}, \text{ ft/sec.}$$

$$V_g \text{ (condensate)} = \frac{4.02 (43.6 - 0.0039 P/Z)^{0.25}}{(0.0039 P/Z)^{0.5}}, \text{ ft/sec.}$$

Where: A = flow area of conduit, ft²

P = wellhead pressure, Psia

Q_g = minimum gas flow rate required, MMSCF/D

T = wellhead temperature, °R

Z = gas deviation-factor evaluated at wellhead conditions.

Naturally, various assumptions were made in deriving the equations for simplification. Among them are gas gravity = 0.698, condensate gravity = 71° API, fluid properties remain constant throughout the test string and friction factors of the flow conduit are equal throughout the string and the same as standard API tubing. Using the equations above I ran through a number of cases involving the flowing data from the Tweed Lake M-47 well test to see if the flow rates were sufficiently high enough to remove liquids. The results are on the attached computer print out. What they show is that the actual flow rates were slightly higher than the minimum required. No average internal flow I.D. was given so a 3.826" I.D. for 4.5" drill pipe was used in the calculations. A higher average flow I.D. than was used would necessitate a larger minimum flow rate for cleanup. Likewise using drill pipe with a larger friction factor than was used by Turner et al in coming up with their simplified equations would necessitate a larger minimum flow rate.

So it is entirely possible the flow rates achieved were just too small and prevented liquids from being lifted to surface even though the sample runs shown here indicate some liquid should have been lifted to surface during the early part of the test.

It must be emphasized that the work done by Turnal et al is based on the average observations of field data from a series of wells. For most wells the theory can work quite well but in some cases a significant amount of error could be involved. The only way one could ensure that the least amount of error was involved in the calculation for minimum gas flowrate would be to use a wellbore simulator. This method allows one to study multiphase flow behavior with a minimum amount of assumptions being made.

If you have any further questions please do not hesitate to contact me.

Yours truly,

OTIS ENGINEERING CO. LTD.

A handwritten signature in black ink, appearing to read "Mark Juskiw". The signature is stylized, with a large "M" and a long, sweeping underline that extends to the right.

Mark Juskiw
Field Engineer

MJ:jpf



CALCULATION FOR MINIMUM FLOW RATE TO REMOVE LIQUIDS FROM WELLBORE

REF: TURNER, HUBBARD, DUKLER - JPT NOV., 1969

SURFACE FLOWING PRESSURE = 515 PSIA
SURFACE FLOWING TEMPERATURE = 19 DEG F
SURFACE GAS GRAVITY = .698
Z-FACTOR AT SURFACE = .85
AVERAGE TUBING I.D. = 3.826 INCHES
ASSUMED CONDENSATE GRAVITY = 71.0 DEG API

MINIMUM GAS RATE TO REMOVE LIQUID = 2.04786253058 MMSCF/DAY

SURFACE FLOWING PRESSURE = 540 PSIA
SURFACE FLOWING TEMPERATURE = 19 DEG F
SURFACE GAS GRAVITY = .698
Z-FACTOR AT SURFACE = .845
AVERAGE TUBING I.D. = 3.826 INCHES
ASSUMED CONDENSATE GRAVITY = 71.0 DEG API

MINIMUM GAS RATE TO REMOVE LIQUID = 2.10152241872 MMSCF/DAY

SURFACE FLOWING PRESSURE = 560 PSIA
SURFACE FLOWING TEMPERATURE = 23 DEG F
SURFACE GAS GRAVITY = .698
Z-FACTOR AT SURFACE = .835
AVERAGE TUBING I.D. = 3.826 INCHES
ASSUMED CONDENSATE GRAVITY = 71.0 DEG API

MINIMUM GAS RATE TO REMOVE LIQUID = 2.13343106173 MMSCF/DAY

SURFACE FLOWING PRESSURE = 615 PSIA
SURFACE FLOWING TEMPERATURE = 23 DEG F
SURFACE GAS GRAVITY = .698
Z-FACTOR AT SURFACE = .82
AVERAGE TUBING I.D. = 3.826 INCHES
ASSUMED CONDENSATE GRAVITY = 71.0 DEG API

MINIMUM GAS RATE TO REMOVE LIQUID = 2.25183016418 MMSCF/DAY



CALCULATION FOR MINIMUM FLOW RATE TO REMOVE LIQUIDS FROM WELLBORE

REF: TURNER, HUBBARD, DUKLER - JPT NOV., 1969

SURFACE FLOWING PRESSURE	= 650 PSIA
SURFACE FLOWING TEMPERATURE	= 23 DEG F
SURFACE GAS GRAVITY	= .698
Z-FACTOR AT SURFACE	= .81
AVERAGE TUBING I.D.	= 3.826 INCHES
ASSUMED CONDENSATE GRAVITY	= 71.0 DEG API

MINIMUM GAS RATE TO REMOVE LIQUID = 2.32633135298 MMSCF/DAY

SURFACE FLOWING PRESSURE	= 690 PSIA
SURFACE FLOWING TEMPERATURE	= 23 DEG F
SURFACE GAS GRAVITY	= .698
Z-FACTOR AT SURFACE	= .8
AVERAGE TUBING I.D.	= 3.826 INCHES
ASSUMED CONDENSATE GRAVITY	= 71.0 DEG API

MINIMUM GAS RATE TO REMOVE LIQUID = 2.40828031955 MMSCF/DAY

SURFACE FLOWING PRESSURE	= 725 PSIA
SURFACE FLOWING TEMPERATURE	= 23 DEG F
SURFACE GAS GRAVITY	= .698
Z-FACTOR AT SURFACE	= .79
AVERAGE TUBING I.D.	= 3.826 INCHES
ASSUMED CONDENSATE GRAVITY	= 71.0 DEG API

MINIMUM GAS RATE TO REMOVE LIQUID = 2.48084849555 MMSCF/DAY

SURFACE FLOWING PRESSURE	= 760 PSIA
SURFACE FLOWING TEMPERATURE	= 23 DEG F
SURFACE GAS GRAVITY	= .698
Z-FACTOR AT SURFACE	= .78
AVERAGE TUBING I.D.	= 3.826 INCHES
ASSUMED CONDENSATE GRAVITY	= 71.0 DEG API

MINIMUM GAS RATE TO REMOVE LIQUID = 2.5527211292 MMSCF/DAY



SEQUENCE OF OPERATIONS

OEC-972-B

CUSTOMER

PEIRO CANADA INC.

CUSTOMER REPRESENTED BY

TIM GORMAN

TEST NUMBER

ONE

WELL NAME OR NUMBER

TWEED LAKE M-47

RIG NAME

ATCO # 76

FIELD

TWEED LAKE

OTIS TEST SUPERVISOR

ED SWETMAN

PAGE

1

OF

2

DATE

TIME

OPERATIONS

85FEB18

1300

ARRIVE ON LOCATION

85FEB19

1726

TOOL OPEN FOR PRE FLOW D.S.T. #4

1731

CLOSED TOOL FOR INITIAL SHUT-IN

1952

DOWN HOLE SHUT-IN PRESS. = 12,757 KPA / OPEN TOOL FOR FINAL FLOW

1953

GAS TO SURFACE / RIG FLOWS WELL TO PIT

2152

SWITCH RIG MANIFOLD TO FLOW THROUGH TEST EQUIPMENT

2230

LYNES 2 IN. CHOKE OPEN / CONTROL FLOW THROUGH 1 IN. HEATER CHOKE

2245

INJECT METHANOL DOWN TUBING

2255

CHANGE ORIFICE PLATE TO 1.5 IN.

2345

METER FROZE / BLOW DOWN LINES

2400

H.P. GAS SAMPLE TAKEN # 6230

0138

ROCK CHOKE / SUSPECT HYDRATES IN FLOW LINE OR AT CHOKE

0152

ZERO METER AND ROCK CHOKE

0200

H.P. GAS SAMPLE TAKEN # 6206

0208

PUT STEAM ON CHOKE / SUSPECT HYDRATES

0212

ZERO METER AND ROCK CHOKE

0253

ZERO METER AND ROCK CHOKE

0255

H.P. GAS SAMPLE TAKEN # 1435



SEQUENCE OF OPERATIONS

OEC-972-B

CUSTOMER		TEST NUMBER		RIG NAME		PAGE OF	
PETRO CANADA INC.		ONE		ATCO # 76		2 2	
CUSTOMER REPRESENTED BY		WELL NAME OR NUMBER		FIELD		AREA	
TIM GORMAN		TWEED LAKE M-47		TWEED LAKE			
OTIS TEST SUPERVISOR				ED SWETMAN			
DATE		TIME		OPERATIONS			
1	85FEB20	0256		RIG CREW SHUT-IN WELL / END OF TEST			
2		1854		RELEASED PACKER / REVERSE CIRCULATE			
3		1854		EQUIPMENT			
4				P.T. #3 = SWEET SERVICE 2 PHASE VERTICLE 1440 PSI W/P			
5				9 MMCFD- 250 BPD TOTAL LIQUID C/W 3 IN. METER RUN			
6				C/W 2 IN. SCH 80 FLOW LINE / 2 IN. SCH 40 FLARE LINE / 1 IN. PROD.			
7				1 MILLION BTU HEATER AUXILIARY HEATER 3000 PSI W.P. C/W 1 IN. THORN			
8				HILL CRAVER CHOKE			
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							



TEST RESULTS

OEC-885-1-B

CUSTOMER

PETRO CANADA INC.

TEST NUMBER		WELL NAME OR NUMBER		AREA		RATE/BUILD-UP NUMBER DATE (DAY MO YR)		PAGE OF							
1		TWEED LAKE M-47		---		1 19FEB85		1 2							
OIL GRAVITY @ 60° F (° API)		GAS SPECIFIC GRAVITY (AIR = 1)		INTERVAL TESTED ()		STANDARD CONDITIONS									
0.0		0.0000		4006-4055		Ft 14.65 PRESS.PSI 60 TEMP F									
DAY	TIME (24 HR CLOCK)	FLOW OR SHUT-IN TIME (HOURS)	WELL HEAD PRESSURE	WELL HEAD TEMP.	CHOKER SIZE	SEPARATOR PRESSURE	BOTTOM HOLE PRESSURE @	BOTTOM HOLE TEMP. @	CORRECTED GAS FLOW RATE Q _g	CORRECTED OIL FLOW RATE Q _o	WATER FLOW RATE	MSCF	WOR	WOR	WOR
19	1953	0.0	0	0	0.0	psig	Ft psig	Ft F	mscf/d	bb1/d	bb1/d	bb1	bb1	bb1	mscf
19	2152	2.0	0	0	0.0			GAS TO SURFACE / RIG FLOWING WELL TO PIT							
19	2152	0.0	0	0	0.0			SWITCH RIG MANIFOLD TO FLOW WELL THRU EQUIP.							
19	2230	.6	500	23	38.0	440			3023.43	0.00	0.00	0.000	0.00	0.00	0.00
19	2245	.9	525	23	38.0	440			INJECT METHANOL DOWN TUBING						
19	2255	1.0	525	23	38.0				3085.83	0.00	0.00	0.000	0.00	0.00	0.00
19	2300	1.1	508	23	38.0	420			CHANGE ORIFICE PLATE TO 1.50 INCHES						
19	2315	1.4	513	23	38.0	435			2835.98	0.00	0.00	0.000	0.00	0.00	0.00
19	2330	1.6	500	23	38.0	435			2807.12	0.00	0.00	0.000	0.00	0.00	0.00
19	2345	1.9	503	23	38.0	435			2850.76	0.00	0.00	0.000	0.00	0.00	0.00
19	2400	2.1	548	19	38.0	480			METER FROZE / BLOW DOWN DOWN LINES						
20	0030	2.6	545	19	38.0	480			2836.29	0.00	0.00	0.000	0.00	0.00	0.00
20	0100	3.1	549	19	38.0	475			H.P. GAS SAMPLES TAKEN #6230						
20	0130	3.6	603	19	38.0	470			2779.31	0.00	0.00	0.000	0.00	0.00	0.00
20	0138	3.8	603	19	38.0				DUMP WATER FROM SEP. INTO BAR. / 13 4in = .083 M3						
20	0152	4.0	603	19	38.0				2770.45	0.00	0.00	0.000	0.00	0.00	0.00
									2697.62	0.00	0.00	0.000	0.00	0.00	0.00
									2659.04	0.00	0.00	0.000	0.00	0.00	0.00
									ROCK CHOKER / SUSPECT FREEZING IN FLOW LINE						
									ZERO METER AND ROCK CHOKER						

TOTAL WELL EFFLUENTS PRODUCED

FLOW TIME		FLOW TIME		FLOW TIME/END		NUMBER	
FROM	TO	FOR RATE	FOR TEST UP TO	OF	NUMBER		
GAS ()	OIL ()	WATER ()	GAS ()	OIL ()	WATER ()		



TEST RESULTS

OEC-865-1-B

CUSTOMER

PETRO CANADA INC.

TEST NUMBER 1		WELL NAME OR NUMBER TWEED LAKE M-47		AREA ---		RATE/BUILD-UP NUMBER 1		DATE (DAY MO YR) 20FEB85		PAGE OF 2 2	
OIL GRAVITY @60°F ("API) 0.0		GAS SPECIFIC GRAVITY (AIR = 1) .6980		INTERVAL TESTED () 4006-4055		STANDARD CONDITIONS Ft 14.65 PRESS.psi 60 TEMP F					
FLOW ON SHUT-IN TIME	WELL HEAD PRESSURE	WELL HEAD TEMP.	CHOKER SIZE	SEPARATOR PRESSURE	BOTTOM HOLE PRESSURE @	BOTTOM HOLE TEMP. @	CORRECTED GAS FLOW RATE Q _g	CORRECTED OIL FLOW RATE Q _o	WATER FLOW RATE	WGR	
(HOURS)	psig	F	64th	psig	Ft	F	mscf/d	bb1/d	bb1/d	bb1) mmscf	
TIME (24 HR CLOCK)											
1 20											
2 20											
3 20											
4 20											
5 20											
6 20											
7 20											
8 20											
9											
10											
11											
12											
13											
14											
15											
16											

TOTAL WELL EFFLUENTS PRODUCED

FLOW TIME		FLOW TIME		FLOW TIME/END		NUMBER	
FROM	TO	FOR RATE	FOR TEST UP TO	OF	NUMBER		
GAS ()	OIL ()	WATER ()	GAS ()	OIL ()	WATER ()		



DEC-865-1-B

TEST RESULTS

0110
oils

OEC-965-1-B

TEST NUMBER	WELL NAME OR NUMBER	AREA	RATE/BUILD-UP NUMBER	DATE (DAY MO YR)	PAGE	OF
1	TWEED LAKE M-47	-	1	19FEB85	1	2
CUSTOMER						
PETRO CANADA INC.						
DAY	FLOW OR SHUT-IN TIME	WELL HEAD PRESSURE	WELL HEAD TEMP.	CHOKER SIZE	SEPARATOR PRESSURE	
TIME (24 HR CLOCK)	(HOURS)	kpag	C	MM	kpag	
1953	0.0	0	0	0.0		1
1953	0.0	0	0	0.0		2
2152	2.0	0	0	0.0		3
2152	0.0	0	0	0.0		4
2152	0.0	0	0	0.0		5
2230	0.6	3447	-5	15.1	3034	6
2245	0.9	3620	-5	15.1	3034	7
2255	1.0	3620	-5	15.1		8
2300	1.1	3503	-5	15.1	2896	9
2315	1.4	3537	-5	15.1	2999	10
2330	1.6	3447	-5	15.1	2999	11
2345	1.9	3468	-5	15.1	2999	12
2400	2.1	3778	-7	15.1	3309	13
0030	2.6	3758	-7	15.1	3309	14
0100	3.1	3785	-7	15.1	3275	15
0130	3.6	4158	-7	15.1	3241	16
0138	3.8	4158	-7	15.1		17
0152	4.0	4158	-7	15.1		18
TOTAL WELL EFFLUENTS PRODUCED						
FLOW TIME		NUMBER		FLOW TIME/END		
FROM	TO	FOR RATE	FOR TEST UP TO	OF		
GAS ()	OIL ()	WATER ()	GAS ()	OIL ()	WATER ()	

TEST RESULTS



OEC-865-1-B

TEST NUMBER		WELL NAME OR NUMBER		AREA		RATE/BUILD-UP NUMBER		DATE (DAY MO YR)		PAGE OF			
1		TWEED LAKE M-47		---		1		20 FEB 85		2 2			
OIL GRAVITY @ 60°F (°API)		GAS SPECIFIC GRAVITY (AIR = 1)		INTERVAL TESTED ()		STANDARD CONDITIONS							
0.0		.6980		1221-1236		M 101.01 PRESS. kPa		16		TEMP C			
DAY	TIME (24 HR CLOCK)	FLOW OR SHUT-IN TIME (HOURS)	WELL HEAD PRESSURE kPag	WELL HEAD TEMP. C	CHOKE SIZE MM	SEPARATOR PRESSURE kPag	BOTTOM HOLE PRESSURE @ M kPag	BOTTOM HOLE TEMP. °C	CORRECTED GAS FLOW RATE Q _g M3/d	CORRECTED OIL FLOW RATE Q _o M3/d	WATER FLOW RATE M3/d	WGR (M3) (M3)	WSR (M3) (M3)
1	20						M C		0	M3/d	M3/d	(M3)	(M3)
0200		4.1	4654	-7	15.1		H.P. GAS SAMPLES TAKEN #6206						
2	20						PUT STEAM ON CHOKE / POSSIBLE HYDRATES						
0208		4.3	4654	-7	15.1								
3	20						ZERO METER AND ROCK CHOKE						
0220		4.5	4654	-7	15.1								
4	20												
0230		4.6	5102	-7	15.1	3172			72911	0.00	0.00	0.00	0.00
5	20						WATER ACCUMULATED REMAINED THE SAME AT .083 M3						
0300		5.1	5116	-7	15.1	3241			73486	0.00	0.00	0.00	0.00
6	20						ZERO METER AND ROCK CHOKE						
0301		5.1	0	0	0.0								
7	20						H.P. GAS SAMPLE TAKEN #1435						
0303		5.2	0	0	0.0								
8	20						RIG CREW SHUT-IN WELL / END OF TEST						
0304		5.2	0	0	0.0								
9													
10													
11													
12													
13													
14													
15													
16													

TOTAL WELL EFFLUENTS PRODUCED

FLOW TIME		FLOW TIME		FLOW TIME/END		NUMBER	
FROM	TO	FOR RATE	FOR TEST UP TO	OF	NUMBER	OF	NUMBER
GAS ()	OIL ()	WATER ()	GAS ()	OIL ()	WATER ()		



FIELD READINGS

Single Stage Unit

OEC - 905-1

TEST NO. 1		RATE NO. 1		WELL NAME OR NUMBER TWEED LAKE M-47		INTERVAL TESTED (FT.) 4006-4055		DATE (DAY MO. YR.) 19FEB85		PAGE 1 OF 2	
CUSTOMER PETRO CANADA INC.		FIELD TWEED LAKE		FORMATION MT. CLARK (LOWER)		COND./OIL METER SIZE (INS) 3.068		METER/DIFF. RANGE (BBL/S) (INS. H ₂ O)			
TEST UNIT DESCRIPTION (#, SIZE, ETC.)		GAS PRODUCED TO GAS MEASURED WITH		PIPELINE 4"		GAS METER RUN SIZE (INS) 3.068		DIFF. RANGE (INS. H ₂ O) 0-200		STATIC PRESSURE TAKEN UPSTREAM DOWNSTREAM	
P.T. #3		FLOW CONTROL		GAS METERING		OIL OR CONDENSATE METERING		WATER METERING			
TIME		WELLHEAD DATA		FLOW CONTROL		GAS METERING		OIL OR CONDENSATE METERING		WATER METERING	
DAY		TUBING TEMP.		CASING PRESSURE		MANIFOLD CHOKES SIZE		HEATER CHOKES SIZE		ORIFICE SIZE	
24 HR. CLOCK		(PSIG)		(PSIG)		(PSIG)		(PSIG)		(PSIG)	
1 19		GAS TO SURFACE / RIG FLOWING WELL TO PIT		GAS TO SURFACE / RIG FLOWING WELL TO PIT		GAS TO SURFACE / RIG FLOWING WELL TO PIT		GAS TO SURFACE / RIG FLOWING WELL TO PIT		GAS TO SURFACE / RIG FLOWING WELL TO PIT	
1953		0.0		0.0		0.0		0.0		0.0	
2 19		SWITCH RIG MANIFOLD TO FLOW WELL THRU EQUIP.		SWITCH RIG MANIFOLD TO FLOW WELL THRU EQUIP.		SWITCH RIG MANIFOLD TO FLOW WELL THRU EQUIP.		SWITCH RIG MANIFOLD TO FLOW WELL THRU EQUIP.		SWITCH RIG MANIFOLD TO FLOW WELL THRU EQUIP.	
2152		2.0		0.0		0.0		0.0		0.0	
3 19		OPENING GAUGE = 0		OPENING GAUGE = 0		OPENING GAUGE = 0		OPENING GAUGE = 0		OPENING GAUGE = 0	
2152		0.0		0.0		0.0		0.0		0.0	
4 19		6		500		23		0		38	
2230		1.6		500		23		0		38	
5 19		INJECT METHANOL DOWN TUBING		INJECT METHANOL DOWN TUBING		INJECT METHANOL DOWN TUBING		INJECT METHANOL DOWN TUBING		INJECT METHANOL DOWN TUBING	
2245		9		525		23		0		38	
6 19		CHANGE ORIFICE PLATE TO 1.50 INCHES		CHANGE ORIFICE PLATE TO 1.50 INCHES		CHANGE ORIFICE PLATE TO 1.50 INCHES		CHANGE ORIFICE PLATE TO 1.50 INCHES		CHANGE ORIFICE PLATE TO 1.50 INCHES	
2255		1.0		525		23		0		38	
7 19		1.1		508		23		0		38	
2300		1.4		513		23		0		38	
8 19		1.6		500		23		0		38	
2330		1.9		503		23		0		38	
9 19		METER FROZE / BLOW DOWN DOWN LINES		METER FROZE / BLOW DOWN DOWN LINES		METER FROZE / BLOW DOWN DOWN LINES		METER FROZE / BLOW DOWN DOWN LINES		METER FROZE / BLOW DOWN DOWN LINES	
2345		1.9		503		23		0		38	
10 19		H.P. GAS SAMPLES TAKEN #6230		H.P. GAS SAMPLES TAKEN #6230		H.P. GAS SAMPLES TAKEN #6230		H.P. GAS SAMPLES TAKEN #6230		H.P. GAS SAMPLES TAKEN #6230	
2400		2.1		548		19		0		38	
11 19		DUMP WATER FROM SEP. INTO BAR. / 13.410		DUMP WATER FROM SEP. INTO BAR. / 13.410		DUMP WATER FROM SEP. INTO BAR. / 13.410		DUMP WATER FROM SEP. INTO BAR. / 13.410		DUMP WATER FROM SEP. INTO BAR. / 13.410	
20030		2.6		545		19		0		38	
12 20		3.1		549		19		0		38	
0100		3.6		603		19		0		38	
13 20		ROCK CHOKES / SUSPECT FREEZING IN FLOW LINE		ROCK CHOKES / SUSPECT FREEZING IN FLOW LINE		ROCK CHOKES / SUSPECT FREEZING IN FLOW LINE		ROCK CHOKES / SUSPECT FREEZING IN FLOW LINE		ROCK CHOKES / SUSPECT FREEZING IN FLOW LINE	
0130		3.8		603		19		0		38	
14 20		ZERO METER AND ROCK CHOKES		ZERO METER AND ROCK CHOKES		ZERO METER AND ROCK CHOKES		ZERO METER AND ROCK CHOKES		ZERO METER AND ROCK CHOKES	
0138		4.0		603		19		0		38	
15 20		H.P. GAS SAMPLES TAKEN #6206		H.P. GAS SAMPLES TAKEN #6206		H.P. GAS SAMPLES TAKEN #6206		H.P. GAS SAMPLES TAKEN #6206		H.P. GAS SAMPLES TAKEN #6206	
0152		4.1		675		19		0		38	
16 20											
0200											

GAS FLOW RATE CALCULATIONS

OEC-882-1-B		HIGH STAGE		TEST NUMBER 1	RATE NUMBER 1	AREA ...	WELL NAME OR NUMBER TWEED LAKE M-47	DATE (DAY, MO, YR) 19FEB85	PAGE OF 1 2
CUSTOMER PETRO CANADA INC.		STANDARD CONDITIONS 14.73 psi 60°F		OTHER 14.7psi, 60F		T _C =		MEAS. ☐ EST. ☐	
METER TYPE DANIELS		METER RUN SIZE (INCHES) 3.0680 in BARTON		FLOW RECORDER TYPE 14.73 psi 60°F		H ₂ O RANGE (INCHES WATER) 0-200		F ₀ TABLE PREV. PAGE 24.1311	
DAY TIME (24 HR CLOCK)		FLOW TIME (HOURS)		STATIC PRESSURE (PSI)		C ₂ = F _b X F _d X F _{pv} X Y ₂		CORRECTED GAS FLOW RATE	
1 19 2230		.6		455		F _b F _d F _{pv} Y ₂		C (C=C ₁ X C ₂) Q _g = C √(h _w P _f / d)	
2 19 2245		.9		455		663.42 1.0373 1.0007		18948 3023.43	
3						663.42 1.0420 1.0007		19339 3085.83	
4									
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CORE LABORATORIES - CANADA, LTD.

Petroleum Reservoir Engineering

CALGARY COPY

CORE ANALYSIS

PETRO-CANADA EXPLORATION INC.

FOOT LAKE TWEED LAKE M-47

TWEED LAKE, N.W.T.

66 55'47" N LAT. 125 54'09" W LONG.

85-02-09

CORE LABORATORIES - CANADA, LTD.

COMPANY PETRO-CANADA EXPLORATION INC.,
WELL POI ET AL TWEED LAKE N-47
FIELD TWEED LAKE, N.W.T.
LOCATION 66 55'47" N LAT, 125 54'09" W LONG.

FORMATION
CORING EQUIPMENT MOUNT CLARK
CORE DIAMETER (mm) DIAMOND
CORING FLUID 88
WATER BASE MUD

PAGE 1
FILE 7004-85-209C
DATE 85-02-09
ANALYSTS RP

CORE ANALYSIS RESULTS

Sample Number	Depth-Metres (m)	Rep.	Perm. Log Mtd.	Perm. M	Porosity	Residual Saturation	Grain Density	Visual Examination	
1	1217.00-17.23	0.23	0.24	0.055	0.149	0.034	0.095	0.339	2650 ss vf
2	1217.23-17.39	0.16	0.33	0.053	0.118	0.019	0.186	0.453	2640 ss vf shbk
3	1217.39-17.62	0.23	0.37	0.085	0.139	0.032	0.111	0.269	2650 ss vf shbk
4	1217.62-17.78	0.16	0.28	0.045	0.092	0.015	0.125	0.267	2650 ss vf shbk
5	1217.78-17.94	0.16	0.28	0.045	0.091	0.015	0.142	0.142	2640 ss vf shbk
6	1217.94-18.05	0.11	0.07	0.008	0.059	0.006	0.107	0.312	2640 ss vf
7	1218.05-18.22	0.17	0.17	0.029	0.065	0.011	0.093	0.585	2630 ss vf shbk 1sm
8	1218.22-18.35	0.13	0.28	0.036	0.092	0.012	0.164	0.481	2640 ss vf shbk 1sm
9	1218.35-18.58	0.23	0.10	0.023	0.050	0.012	0.295	0.328	2640 ss vf shbk
10	1218.58-18.88	0.30	0.19	0.057	0.115	0.035	0.161	0.407	2620 ss vf shbk 1sm
11	1218.88-19.04	0.16	0.16	0.026	0.115	0.018	0.204	0.579	2640 ss vf shbk 1sm
12	1219.04-19.18	0.14	0.20	0.028	0.110	0.015	0.171	0.462	2630 ss vf shbk 1sm
13	1219.18-19.48	0.30	-	-	-	-	-	-	sh shv sdy
13	1219.48-19.61	0.13	0.95	0.124	0.087	0.011	0.137	0.711	2630 ss vf shbk 1sm
14	1219.61-22.91	3.30	-	-	-	-	-	-	sh
14	1222.91-23.09	0.18	0.89	0.160	0.082	0.015	0.179	0.149	2630 ss vf f
15	1223.09-23.24	0.15	0.37	0.055	0.087	0.013	0.086	0.724	2660 ss vf f shbk 1sm
16	1223.24-23.51	0.27	0.25	0.067	0.089	0.029	0.065	0.740	2680 ss vf f shbk 1sm
-	1223.51-24.05	0.54	-	-	-	-	-	-	sh

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CORE LABORATORIES - CANADA, LTD.

WELL PCI ET AL TWEED LAKE M-47

PAGE 2

FORMATION MOUNT CLARK

SUMMARY INTERVAL 1217.00-1224.05

FILE 7004-83-209C

TOTAL 7.05

METRES ANALYZED 2.91

METRES NOT ANALYZED: TOTAL 4.14 DENSE 4.14 LOST 0.00 %G 0.00 DRILLED 0.00 RUBBLE 0.00

SUMMARY OF ANALYZED CORE:

	METRES	FRACTION OF ANALYZED CORE	WEIGHTED AVERAGE POROSITY	POROSITY METRES	WEIGHTED AV. HORIZONTAL PERMEABILITY	PERMEABILITY METRES	WEIGHTED AVERAGE RESID. OIL	WEIGHTED AVERAGE TOT. WATER
TOTAL	2.910	1.000	0.099	0.267	0.308	0.896	0.140	0.436
BY PERM RANGES								
LESS THAN 0.01 mD	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.01 0.09 mD	0.110	0.038	0.059	0.006	0.070	0.008	0.107	0.312
0.10 0.49 mD	2.490	0.856	0.102	0.254	0.243	0.605	0.139	0.444
0.50 0.99 mD	0.310	0.107	0.084	0.076	0.915	0.284	0.161	0.393
1.0 5.99 mD	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GREATER THAN 9.99 mD	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

*NOT ANALYZED BY REQUEST

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CORE LABORATORIES - CANADA, LTD.

CODE KEY - DESCRIPTIONS

anh	= Anhydrite	hal	= Halite (Salt)	scal	= removed for special core analysis
ast	= Appears similar to	i	= Interstratular	sdy	= Sands
brk	= Break	lam	= Laminar (Laminated)	sen	= Scanning electron microscope analysis
bldr	= Boulder	lmv	= Limb	sh	= Shale
c	= Coarse	ls	= Limestone	silt	= Siltstone
calc	= Calcite (arenous)	lv	= Large vug	silt	= Silt
carb	= Carbonaceous	m	= Medium	ss	= Sandstone
cbi	= Cobble	mi	= Mud invaded	sshs	= Slightly Shaly(<20%)
cec	= Cation exchange capacity	mic	= Micaceous	stb	= Stylolite (ic)
csi	= Conglomerate	msb	= Moderately shaly (20-40%)	sulf	= Sulphur
cht	= Chert	mv	= Medium vug	sv	= wet/dry sieve analysis
coai	= Coal/Coal Inclusion	na	= Not analysed by request	tr	= Trace
dol	= Dolomite	np	= No permeability measurement	ts	= Thin section
f	= Fine	ool	= Oolitic	uncons	= Unconsolidated
fest	= Ironstone	ob	= Overburden	vfrac	= Vertical fracture
foss	= Fossil (iferous)	f	= Preserved for future studies	vf	= Very fine
frac	= Fracture	fb1	= Febble	vob	= Vertical overburden sample
fri	= Friable	foa	= portion removed for oil analysis	vshs	= Very shaly (>40%)
glau	= Glauconite (ic)	pv	= Pervious vug	vug	= vuggy (olar)
grn1	= Gracule	psa	= Particle size analysis	*	= broken core
gyp	= Gypsum	pur	= Purite (ic)	**	= Permeability > 10240 mD
h fac	= Horizontal fracture	pybit	= Pyrobitumen		

CLEANING

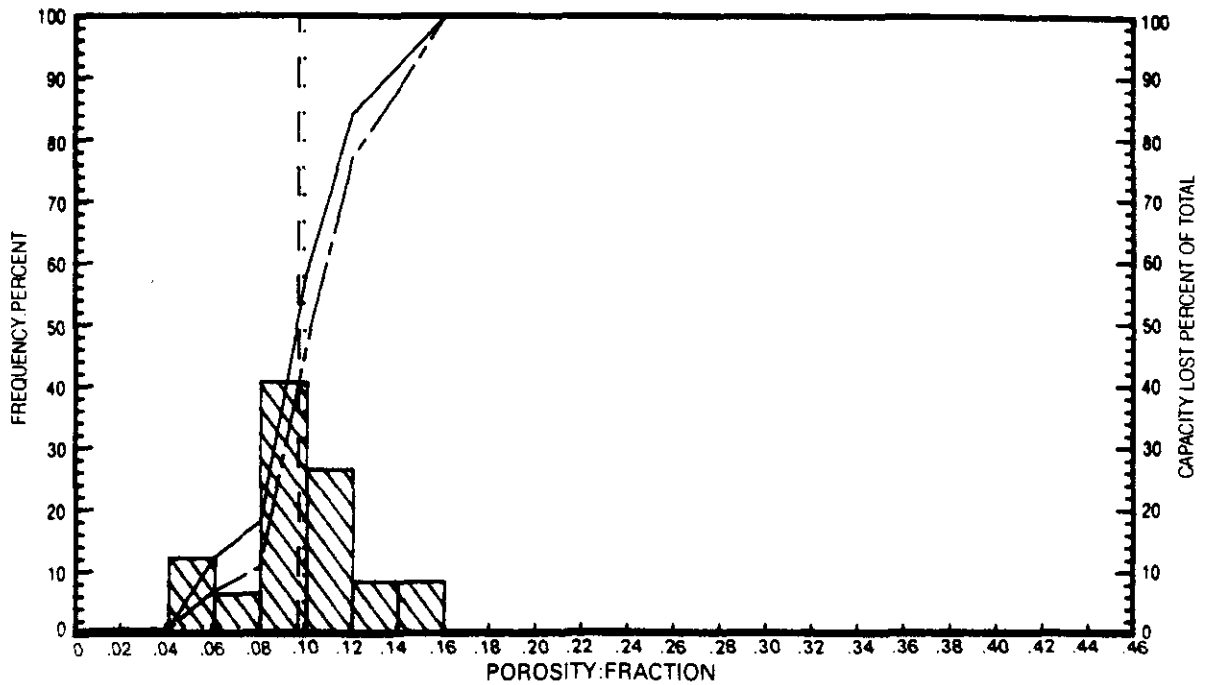
ANALYSIS

Solvent	TOLUENE	Core volume measured by Boyle's Law in a Hassler holder using He
Extraction Equipment	CENTRIFUGE/VAPOR	Grain vol werd by Boyle's Law in a modified U.S.R.H. porosimeter using He
Extraction Time	5 DAYS	X Grain volume measured by Boyle's Law in a matrix cup using He
Drying Equipment	GRAVITY OVEN	Bulk volume measured by calipering
Drying Time	48 HOURS	Bulk Volume by Archimedes Principle
Drying Temperature	132 DEG.C	Porosity determined by summation of fluids (retort)

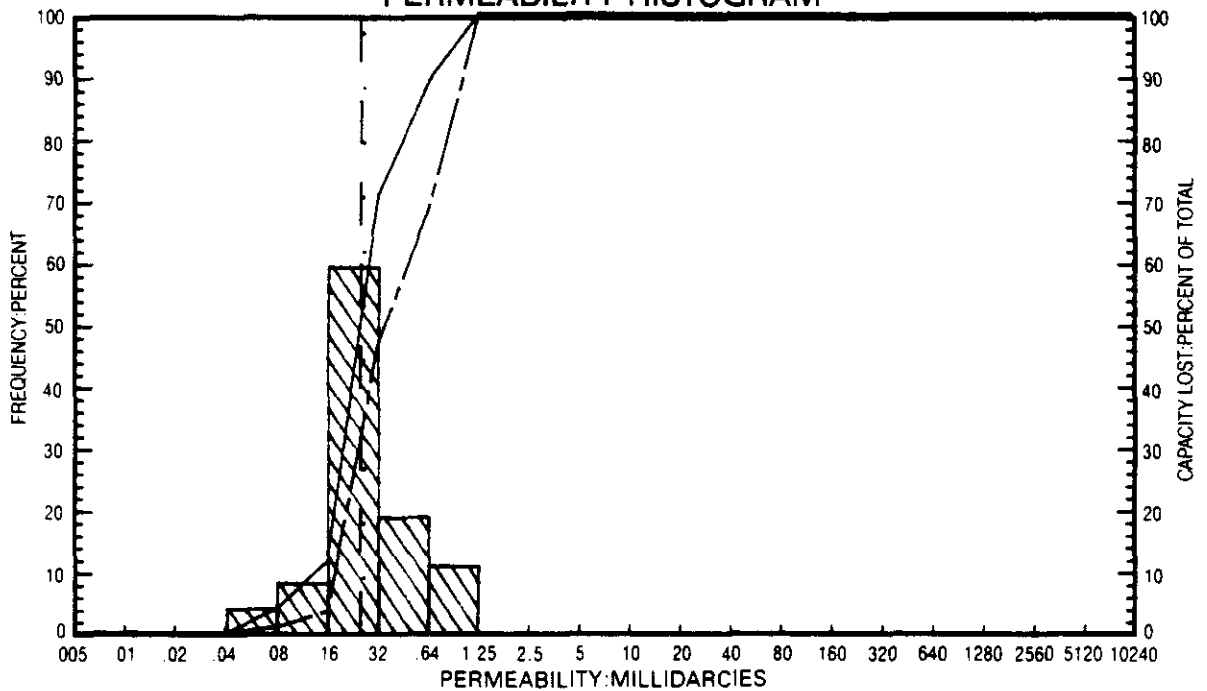
- X Fluid saturations by retort
- X Fluid saturations by retort on end pieces of full diameter samples
- X Water saturations by Dean-Stark
- Oil saturations by weight difference in Dean-Stark
- Permeabilities measured on 20mm cubes
- X Permeabilities measured on 25 mm diameter drilled plugs
- X Core Gamma Composite
- Core Gamma Spectral

REMARKS:

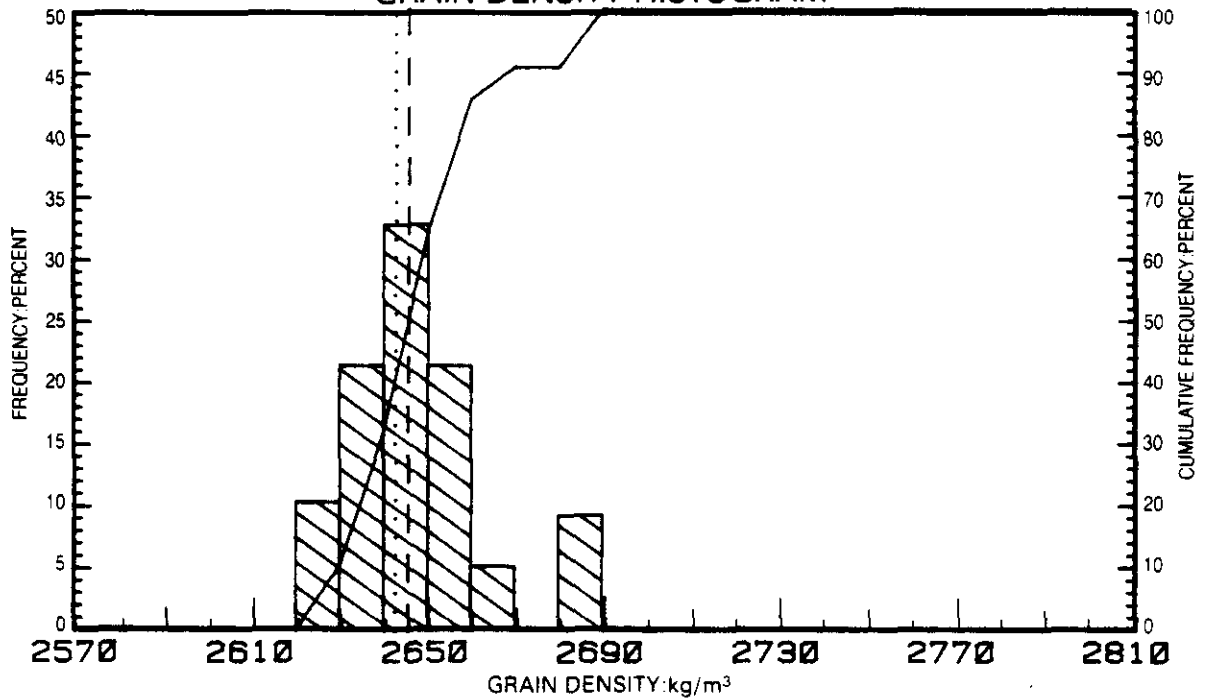
POROSITY HISTOGRAM



PERMEABILITY HISTOGRAM



GRAIN DENSITY HISTOGRAM



PETRO-CANADA EXPLORATION INC.
 PCI ET AL TWEED LAKE M-47
 TWEED LAKE
 N. W. T.
 1217.88-1224.85 FILE 7884-85-289C
 Kmax and Helium Porosity

LEGEND

MEDIAN VALUE ————
 CUMULATIVE FREQUENCY ————
 CUMULATIVE CAPACITY LOST ————
 ARITHMETIC MEAN POROSITY
 GEOMETRIC MEAN PERMEABILITY
 ARITHMETIC MEAN GRAIN DENSITY

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

PAGE 1
FILE 7004-85-209C

COMPANY: PETRO-CANADA EXPLORATION INC. WELL : FOI ET AL TWEED LAKE M-47
FIELD : TWEED LAKE PROVINCE: N.B.T.

AIR PERMEABILITY : MD. (MAXIMUM) RANGE USED 0.000 TO 10.
POROSITY : FRACTION (HELIUM) RANGE USED 0.000 TO .46

(PERMEABILITY UNCORRECTED FOR SLIPPAGE)

DEPTH LIMITS : 1217.00 - 1224.05 INTERVAL LENGTH : 7.05
METRES ANALYZED IN ZONE : 2.91 LITHOLOGY EXCLUDED : NONE

DATA SUMMARY

POROSITY AVERAGE	PERMEABILITY AVERAGES		
	ARITHMETIC	HARMONIC	GEOMETRIC
0.099	0.31	0.21	0.25

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STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PETRO-CANADA EXPLORATION INC. WELL : PCI ET AL TWEED LAKE M-47
FIELD : TWEED LAKE PROVINCE: N.W.T.

GROUPING BY PERMEABILITY RANGES

PERMEABILITY RANGE	METRES IN RANGE	AVERAGE PERM. (GEOM.)	AVERAGE PERM. (ARITH)	AVERAGE POROSITY	FREQUENCY (PERCENT)	CUMULATIVE FREQUENCY (%)
0.039 - 0.078	0.1	0.070	0.070	0.059	3.8	3.8
0.078 - 0.156	0.2	0.100	0.100	0.050	7.9	11.7
0.156 - 0.312	1.7	0.221	0.226	0.104	59.1	70.8
0.312 - 0.625	0.5	0.358	0.358	0.118	18.6	89.3
0.625 - 1.250	0.3	0.915	0.915	0.084	10.7	100.0

TOTAL NUMBER OF METRES : 2.91

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STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PETRO-CANADA EXPLORATION INC.
FIELD : TWEED LAKE
WELL : F01 ET AL TWEED LAKE M-47
PROVINCE: N.W.T.

POROSITY-METRES OF STORAGE CAPACITY LOST FOR SELECTED POROSITY CUT OFF

POROSITY	METRES	CAPACITY	METRES	CAPACITY	ARITH	MEDIAN
CUT OFF	LOST	LOST (%)	REMAINING	REMAINING (%)	MEAN	
0.000	0.0	0.0	2.9	100.0	0.099	0.096
0.020	0.0	0.0	2.9	100.0	0.099	0.096
0.040	0.0	0.0	2.9	100.0	0.099	0.096
0.060	0.3	6.3	2.6	93.7	0.105	0.099
0.080	0.5	10.1	2.4	89.9	0.107	0.101
0.100	1.7	46.5	1.2	53.5	0.126	
0.120	2.5	76.9	0.5	23.1	0.144	0.140
0.140	2.7	88.1	0.2	11.9	0.149	
0.160	2.9	100.0	0.0	0.0	0.000	

TOTAL STORAGE CAPACITY IN POROSITY-METRES = 0.287

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COMPANY: PETRO-CANADA EXPLORATION INC.

WELL: FCI ET AL TWEED LAKE M-47

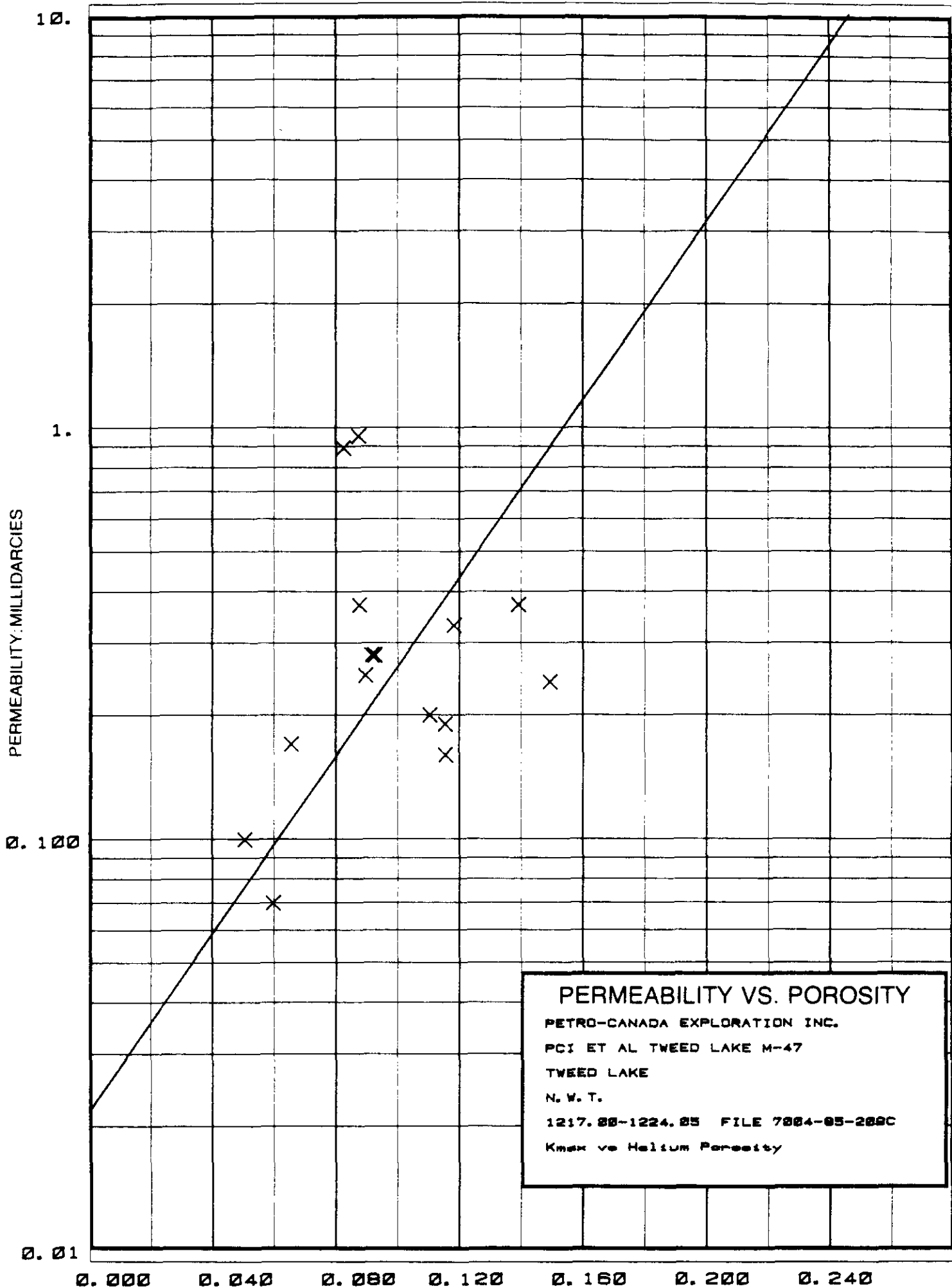
FIELD: TWEED LAKE

PROVINCE: N.W.T.

MILLIDARCY-METRES OF FLOW CAPACITY LOST FOR SELECTED PERMEABILITY CUT OFF							
PERMEABILITY CUT OFF	METRES LOST	CAPACITY LOST (%)	METRES REMAINING	CAPACITY REMAINING (%)		GEOM	
						MEAN	MEDIAN
0.005	0.0	0.0	2.9	100.0		0.25	0.24
0.010	0.0	0.0	2.9	100.0		0.25	0.24
0.020	0.0	0.0	2.9	100.0		0.25	0.24
0.039	0.0	0.0	2.9	100.0		0.25	0.24
0.078	0.1	0.9	2.8	99.1		0.27	0.25
0.156	0.3	3.4	2.6	96.6		0.29	
0.312	2.1	46.8	0.9	53.2		0.50	
0.625	2.6	68.3	0.3	31.7		0.91	
1.250	2.9	100.0	0.0	0.0		1.00	

TOTAL FLOW CAPACITY IN MILLIDARCY-METRES(ARITHMETIC) = 0.90

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EQUATION OF REDUCED LINE RELATING PERMEABILITY (K) TO POROSITY			
LOG (K) = (SLOPE)(POROSITY) + LOG OF INTERCEPT			
K = ANTILOG (SLOPE)(POROSITY) + LOG OF INTERCEPT			
RANGE	SYMBOL	EQUATION OF THE LINE	
1	X	PERM=ANTILOG (0.1873) (POROSITY)	-1.8548

COMPANY: PETRO-CANADA EXPLORATION INC.

WELL : PCI ET AL TWEED LAKE M-47

FIELD : TWEED LAKE

PROVINCE: N.W.T.

FORMATION: MOUNT CLARK

AIR PERMEABILITY : MD - MAXIMUM

(UNCORRECTED FOR SLIPPAGE)

POROSITY : FRACTION

(HELIUM)

DEPTH INTERVAL	METERS ANALYZED	RANGE & SYMBOL	PERMEABILITY		POROSITY		PERMEABILITY AVERAGES			
			MINIMUM	MAXIMUM	MIN.	MAX.	AVERAGE	ARITHMETIC	HARMONIC GEOMETRIC	
1217.00 - 1224.05	2.91	1 (X)	0.000	10.0	0.000	0.460	0.099	0.31	0.21	0.25

EQUATION OF REDUCED LINE RELATING PERMEABILITY(K) TO POROSITY :

$$\text{LOG(K)} = (\text{SLOPE})(\text{POROSITY}) + \text{LOG OF INTERCEPT}$$

$$K = \text{ANTILOG}((\text{SLOPE})(\text{POROSITY}) + \text{LOG OF INTERCEPT})$$

RANGE

EQUATION OF THE LINE

1 FERM = ANTILOG(0.1073)(POROSITY) + -1.6540)

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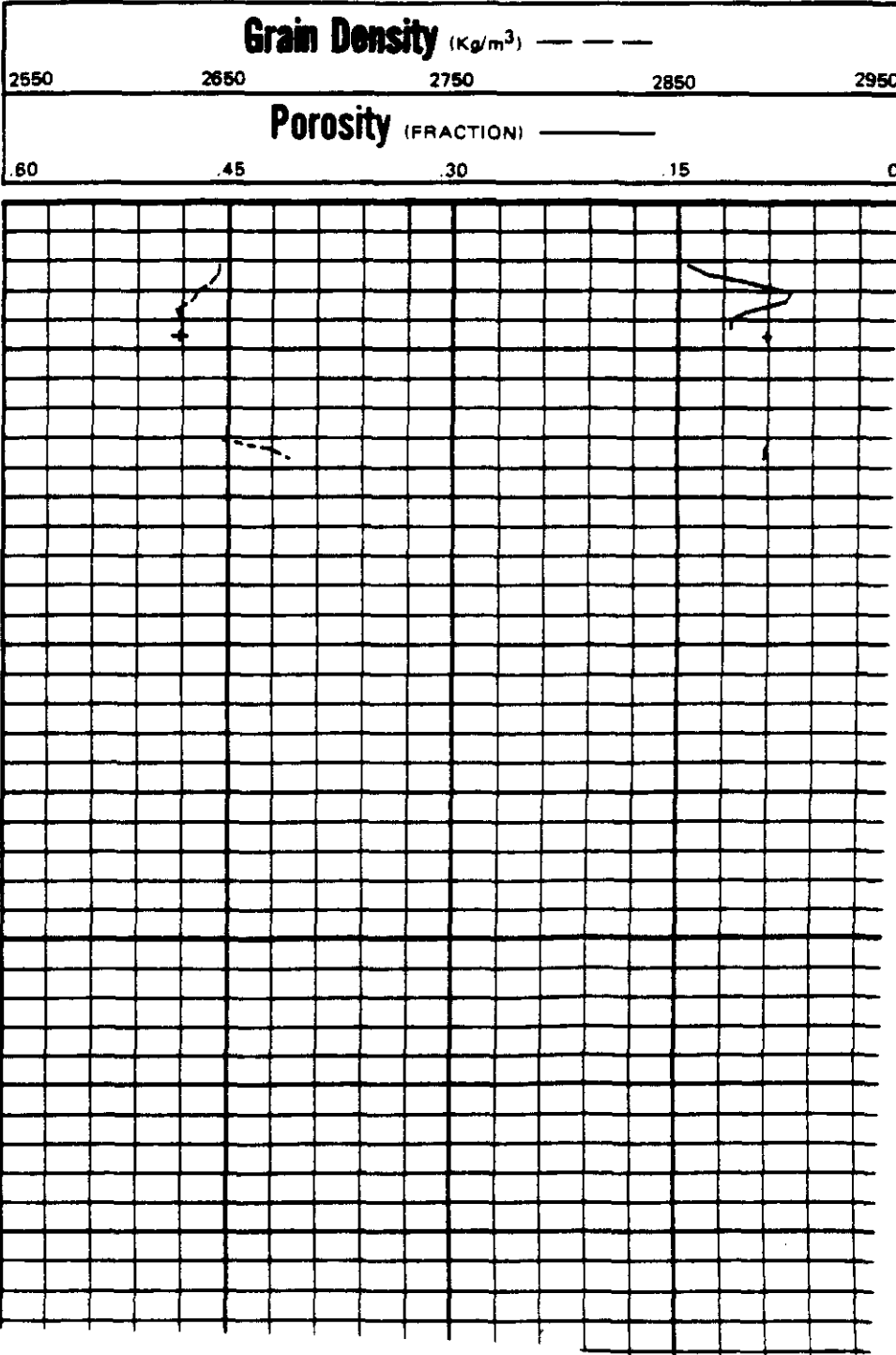
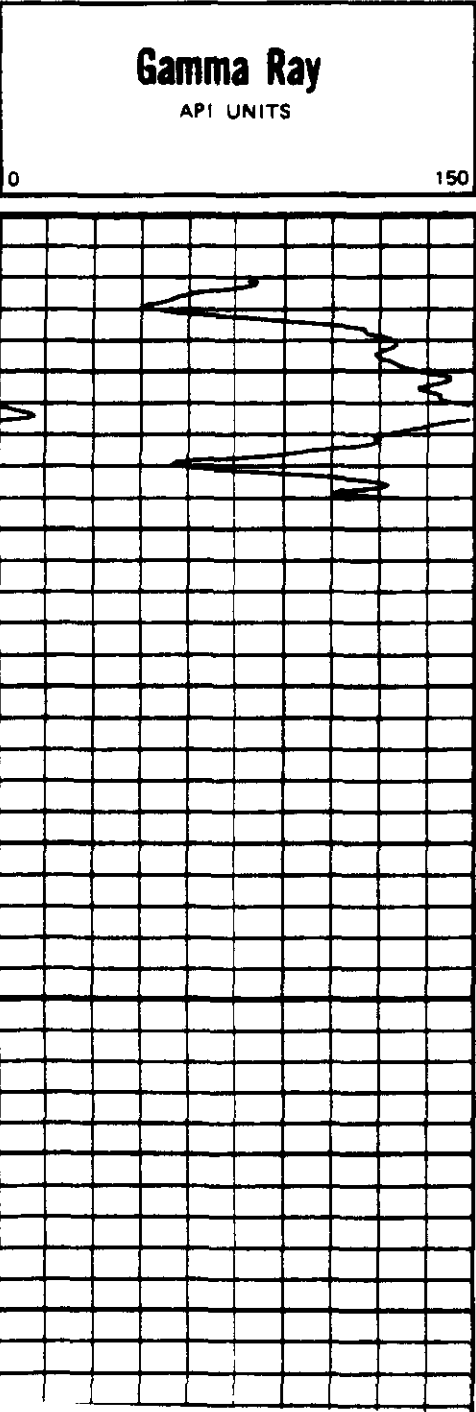


COMPANY PETRO-CANADA EXPLORATION INC. FILE NO. 7004-85-209C
WELL PCI ET AL TWEED LAKE N-47 DATE _____
FIELD TWEED LAKE FORMATION MOUNT CLARK ELEV. _____
PROVINCE N.W.T DRLG. FLD. WATER BASE MUD CORES 1
LOCATION 66°55'47" N LAT. 125°54'09" W LONG.

CORRELATION COREGRAPH

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VERTICAL SCALE: 10 cm = 24m



COMPANYPETRO-CANADA EXPLORATION INC.

FILE NO.7004-85-209

WELLPCI ET AL TWEED LAKE N-47

DATE

ELDTWEED LAKE

FORMATIONMOUNT CLARK

ELEV.

PROVINCE N.W.T.

DRLG. FLD. WATER BASE MUD

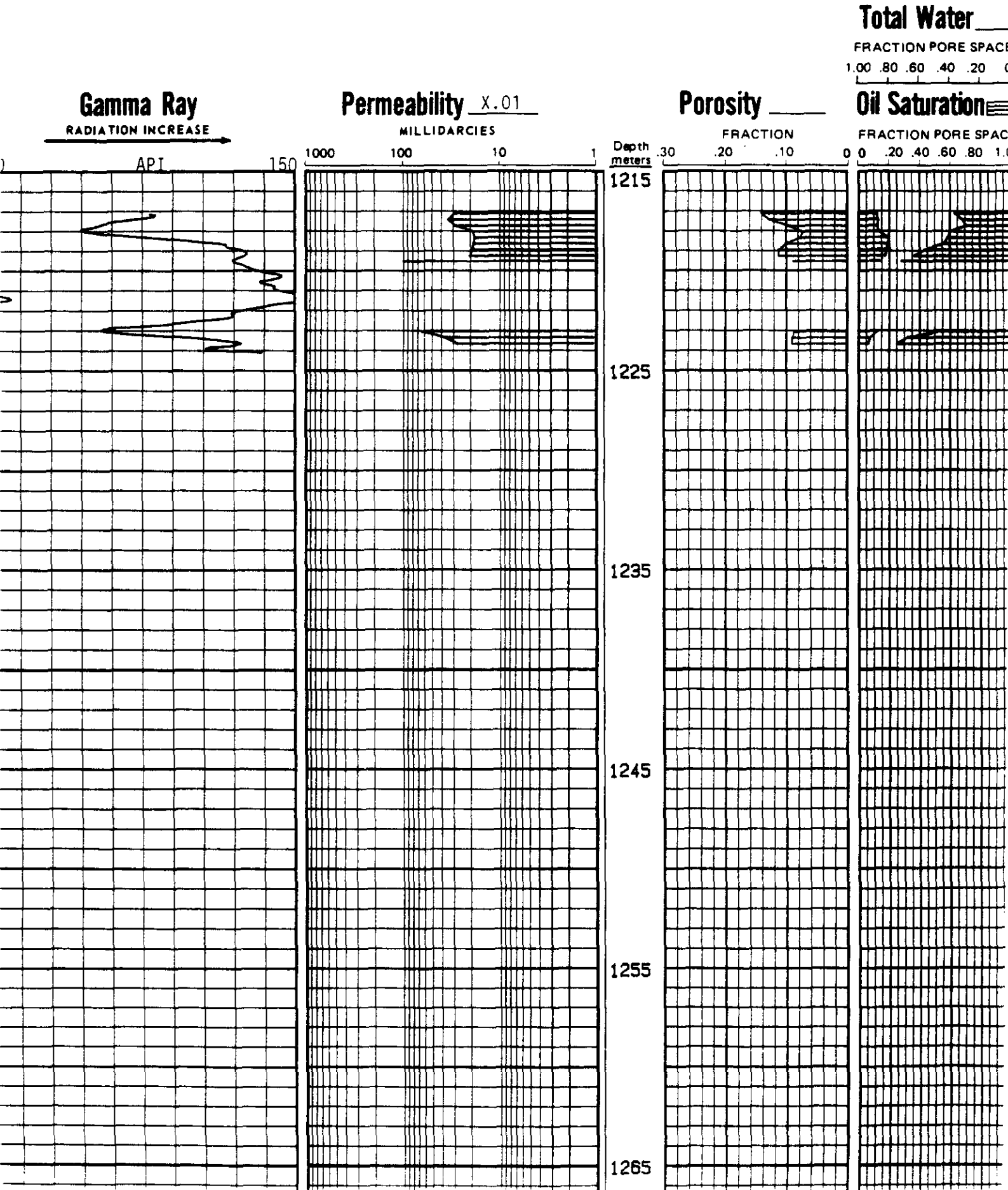
CORES1

LOCATION65°55'47" N LAT. 125°54'09" W LONG.

CORRELATION COREGRAPH

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VERTICAL SCALE: 10 cm = 24m



CORE LABORATORIES - CANADA, LTD.

Petroleum Reservoir Engineering

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CORE ANALYSIS

PETRO-CANADA EXPLORATION INC.

PCI ET AL TWEED LAKE M-47

TWEED LAKE, N.W.T.

66 55'47" N LAT, 125 54'09" W LONG.

85-02-09

CORE LABORATORIES - CANADA, LTD.

COMPANY PETRO-CANADA EXPLORATION INC.
WELL PCI ET AL TWEED LAKE W-47
FIELD TWEED LAKE, N.W.T.
LOCATION 66 53'47" N LAT, 125 54'09" W LONG.

FORMATION
CORING EQUIPMENT
CORE DIAMETER, (mm) 88
CORING FLUID WATER BASE MUD

PAGE 1
FILE 7004-85-209C
DATE 85-02-09
ANALYSTS RP

CORE ANALYSIS RESULTS

Sample Number	Depth-Metres (m)	Rep.	PERM. to Air Md.	PERM. x m	Porosity	Porosity x m	Residual Saturation	Fraction of Grain Density	(Pore Volume) Kg/(m ³)	Oil	Water	Visual Examination
1	1217.00-17.23	0.23	0.24	0.053	0.149	0.034	0.095	0.339	2650	ss	vf	shbk 1cm
2	1217.23-17.39	0.16	0.33	0.053	0.118	0.019	0.186	0.453	2640	ss	vf	shbk 1cm
3	1217.39-17.62	0.23	0.37	0.085	0.139	0.032	0.111	0.269	2650	ss	vf	shbk 1cm
4	1217.62-17.78	0.16	0.28	0.045	0.092	0.015	0.125	0.267	2650	ss	vf	shbk 1cm
5	1217.78-17.94	0.16	0.28	0.045	0.091	0.015	0.142	0.142	2640	ss	vf	shbk 1cm
6	1217.94-18.05	0.11	0.07	0.008	0.059	0.006	0.107	0.312	2640	ss	vf	shbk 1cm
7	1218.05-18.22	0.17	0.17	0.029	0.065	0.011	0.093	0.585	2630	ss	vf	shbk 1cm
8	1218.22-18.35	0.13	0.28	0.036	0.092	0.012	0.164	0.481	2640	ss	vf	shbk 1cm
9	1218.35-18.58	0.23	0.10	0.023	0.050	0.012	0.295	0.328	2640	ss	vf	shbk 1cm
10	1218.58-18.88	0.30	0.19	0.057	0.115	0.035	0.161	0.407	2620	ss	vf	shbk 1cm
11	1218.88-19.04	0.16	0.16	0.026	0.115	0.018	0.204	0.579	2640	ss	vf	shbk 1cm
12	1219.04-19.18	0.14	0.20	0.028	0.110	0.015	0.171	0.662	2630	ss	vf	shbk 1cm
13	1219.18-19.48	0.30	-	-	-	-	-	-	-	sh	shbk 1cm	shbk 1cm
13	1219.48-19.61	0.13	0.95	0.124	0.087	0.011	0.137	0.711	2630	ss	vf	shbk 1cm
14	1219.61-22.91	3.30	-	-	-	-	-	-	-	sh	-	-
14	1222.91-23.09	0.18	0.89	0.160	0.082	0.015	0.179	0.149	2630	ss	vf	f
15	1223.09-23.24	0.15	0.37	0.055	0.087	0.013	0.086	0.724	2660	ss	vf	f
16	1223.24-23.51	0.27	0.25	0.067	0.089	0.024	0.065	0.740	2680	ss	vf	f
-	1223.51-24.05	0.54	-	-	-	-	-	-	-	sh	-	-

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CORE LABORATORIES - CANADA, LTD.

WELL: FCI ET AL TWEED LAKE M-47 PAGE: 2

FORMATION: MOUNT CLARK

SUMMARY INTERVAL: 1217.00-1224.05 FILE: 7004-85-209C

TOTAL: 7.05

METRES ANALYZED: 2.91

METRES NOT ANALYZED: TOTAL: 4.14 DENSE: 4.14 LOST: 0.00 %NG: 0.00 DRILLED: 0.00 RUBBIF: 0.00

SUMMARY OF ANALYZED CORE:	METRES	FRACTION OF		WEIGHTED AVERAGE POROSITY	POROSITY METRES	WEIGHTED AV. HORIZONTAL PERMEABILITY	PERMEABILITY METRES	WEIGHTED AVERAGE RESID. OIL	WEIGHTED AVERAGE TOT. WATER
		ANALYZED	CORE						
TOTAL	2.910	1.000		0.099	0.287	0.308	0.896	0.140	0.436
BY									
PERM									
RANGES									
LESS THAN 0.01 mD	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
0.01 0.09 mD	0.110	0.038		0.059	0.006	0.070	0.008	0.107	0.312
0.10 0.49 mD	2.490	0.856		0.102	0.254	0.243	0.605	0.139	0.444
0.50 0.99 mD	0.310	0.107		0.084	0.026	0.915	0.284	0.161	0.393
1.0 9.99 mD	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
GREATER THAN 9.99 mD	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
*NOT ANALYZED BY REQUEST									

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CORE LABORATORIES - CANADA, L.T.D.

CODE KEY - DESCRIPTIONS

anhy	= Anhydrite	hal	= Halite (Salt)	scat	= removed for special core analysis
AST	= Appears similar to	l	= Intergranular	sdv	= Sands
bk	= Break	lam	= Laminar (Laminated)	SEM	= Scanning electron microscope analysis
blbr	= Boulder	lmw	= Limy	sh	= Shale
c	= Coarse	ls	= Limestone	silt	= Siltstone
calc	= Calcite (arenous)	lv	= Large vug	sily	= Silty
carb	= Carbonaceous	m	= Medium	ss	= Sandstone
chl	= Chert	mi	= Mud invaded	shy	= Slightly shaly (<20%)
CEC	= Cation exchange capacity	mic	= Micaceous	sty	= Stylolite (ic)
catl	= Conglomerate	msb	= Moderately shaly (20-40%)	sulf	= Sulphur
cht	= Chert	mv	= Medium vug	sv	= wet/dry sieve analysis
coal	= Coal/Coal Inclusion	NA	= Not analysed by request	tr	= Trace
dol	= Dolomite	NP	= No permeability measurement	TS	= Thin section
f	= Fine	ool	= Oolitic	uncons	= Unconsolidated
fest	= Ironstone	OB	= Overburden	vfrac	= Vertical fracture
foss	= Fossil (iferous)	P	= Preserved for future studies	vf	= Very fine
frac	= Fracture	Pbl	= Pebble	VOR	= Vertical overburden sample
fri	= Friable	POA	= Portion removed for oil analysis	vshs	= Very shaly (>40%)
glau	= Glauconite (ic)	PSV	= Pinpoint Vug	vug	= Vuggy (ular)
grnl	= Granule	PSA	= Particle size analysis	*	= broken core
gyp	= Gypsum	pyr	= Pyrite (ic)	**	= Permeability > 10240 mD
h frac	= Horizontal fracture	pyrbt	= Pyrobitumen		

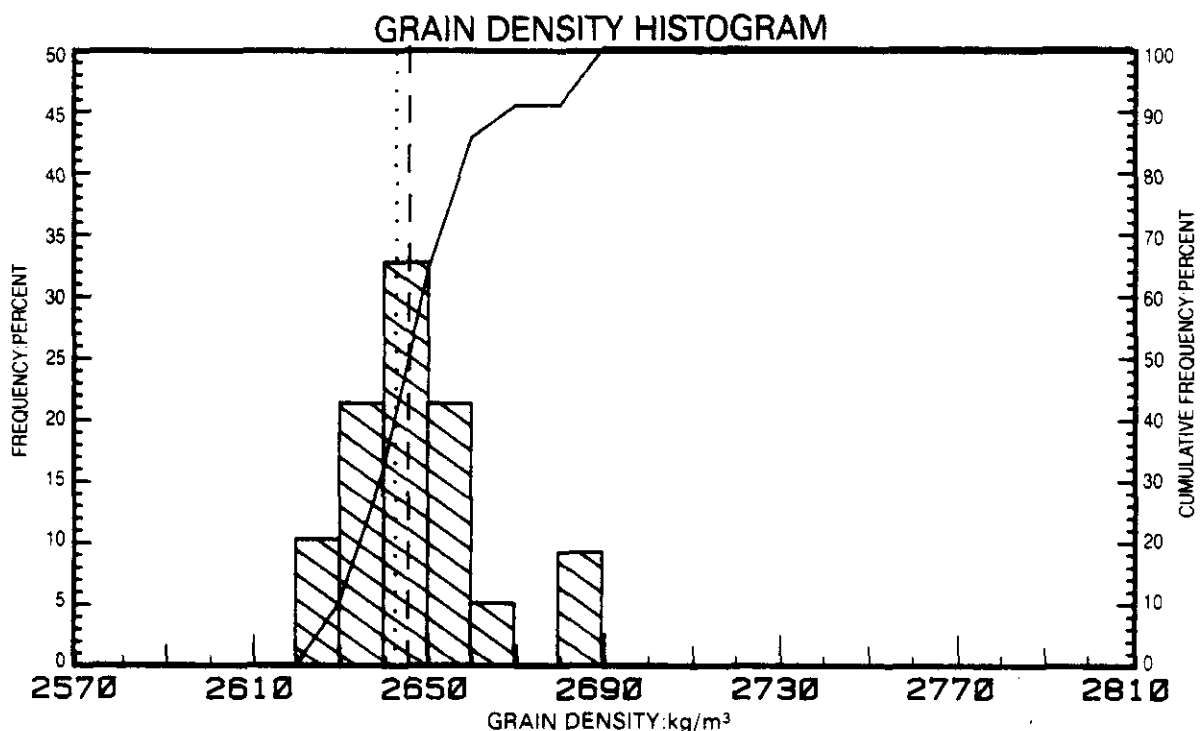
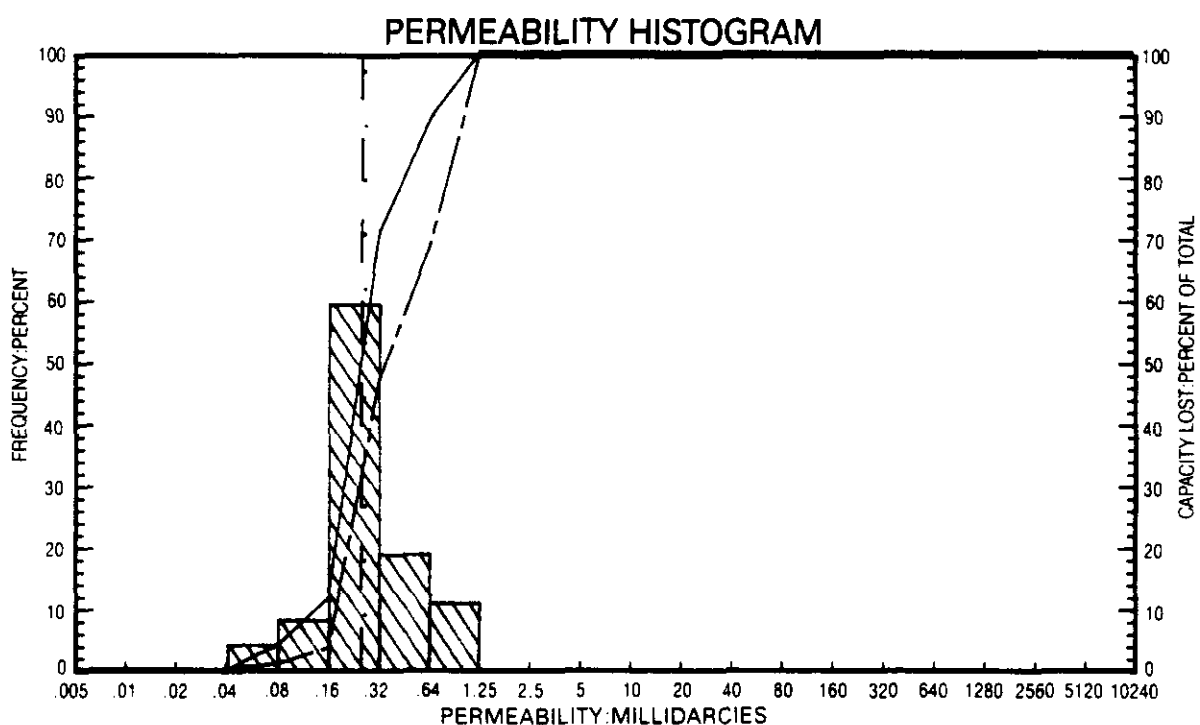
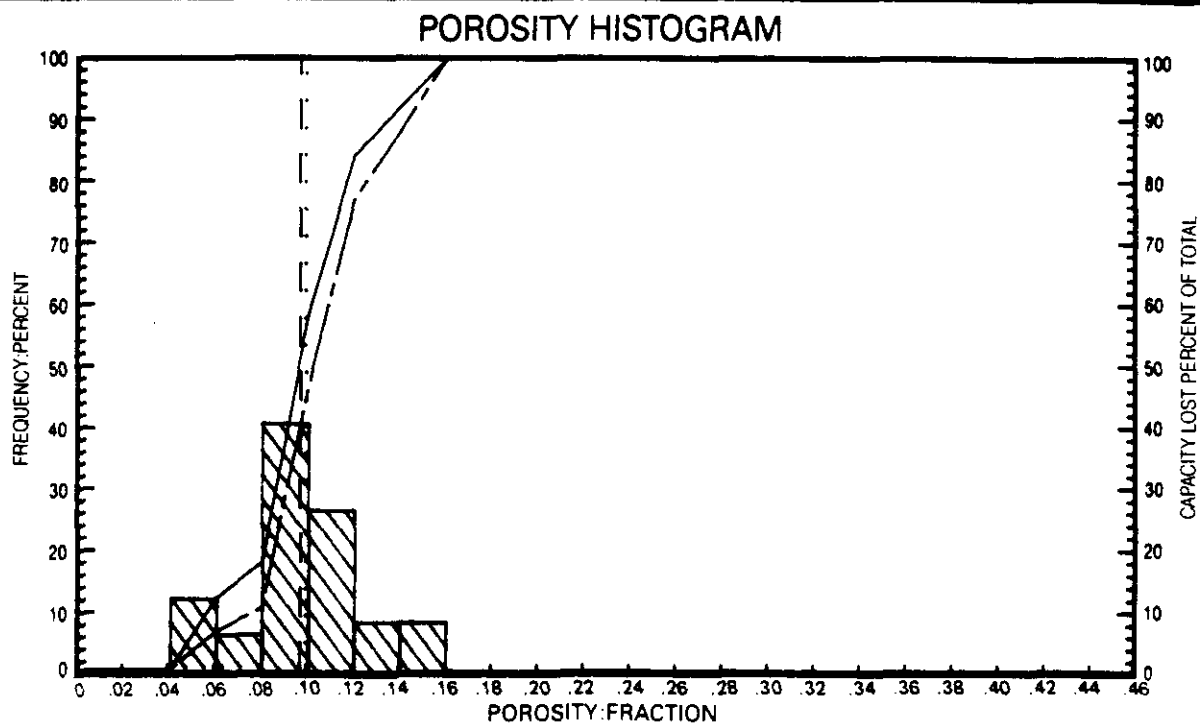
CLEANING

ANALYSIS

Solvent	TOLUENE		Core volume measured by Boyle's Law in a Hassler boulder using He
Extraction Equipment	CENTRAFLUGE/VAPOR		Grain vol used by Boyle's Law in a modified U.S.R.M. porosimeter using He
Extraction Time	5 DAYS		Core volume measured by Boyle's Law in a matrix cup using He
Drying Equipment	GRAVITY OVEN		Bulk volume measured by calipering
Drying Time	48 HOURS		Bulk Volume by Archimedes Principle
Drying Temperature	132 DEG.C		Porosity determined by summation of fluids (retort)

- X Fluid saturations by retort on end pieces of full diameter samples
- X Fluid saturations by retort
- X Water saturations by Dean-Stark
- X Oil saturations by weight difference in Dean-Stark
- X Permeabilities measured on 20mm cubes
- X Permeabilities measured on 25 mm diameter drilled plugs
- X Core Gamma Composite
- X Core Gamma Spectral

REMARKS:



PETRO-CANADA EXPLORATION INC.
 PCI ET AL TWEED LAKE M-47
 TWEED LAKE
 N. W. T.
 1217.00-1224.05 FILE 7004-05-200C
 Kmax and Helium Porosity

LEGEND
 MEDIAN VALUE ————
 CUMULATIVE FREQUENCY ————
 CUMULATIVE CAPACITY LOST
 ARITHMETIC MEAN POROSITY
 GEOMETRIC MEAN PERMEABILITY
 ARITHMETIC MEAN GRAIN DENSITY

COMPANY: PETRO-CANADA EXPLORATION INC.

WELL : FCI ET AL TWEED LAKE M-47

FIELD : TWEED LAKE

PROVINCE: N.W.T.

AIR PERMEABILITY : MD. (MAXIMUM) RANGE USED 0.000 TO 10.

POROSITY : FRACTION (HELIUM) RANGE USED 0.000 TO .46

(PERMEABILITY UNCORRECTED FOR SLIPPAGE)

DEPTH LIMITS : 1217.00 - 1224.05 INTERVAL LENGTH : 7.05

METRES ANALYZED IN ZONE : 2.91 LITHOLOGY EXCLUDED : NONE

DATA SUMMARY			
POROSITY AVERAGE	PERMEABILITY AVERAGES		
	ARITHMETIC	HARMONIC	GEOMETRIC
0.099	0.31	0.21	0.25

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STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

PAGE 2
FILE 7004-85-209C

COMPANY: PETRO-CANADA EXPLORATION INC.
FIELD : TWEED LAKE

WELL : FCI ET AL TWEED LAKE M-47
PROVINCE: N.W.T.

GROUPING BY POROSITY RANGES

POROSITY RANGE	METRES IN RANGE	AVERAGE POROSITY	AVERAGE PERM. (GEOM.)	(ARITH)	FREQUENCY (PERCENT)	CUMULATIVE FREQUENCY (%)
0.040 -0.060	0.3	0.053	0.089	0.090	11.7	11.7
0.060 -0.080	0.2	0.065	0.170	0.170	5.8	17.5
0.080 -0.100	1.2	0.088	0.386	0.451	40.5	58.1
0.100 -0.120	0.8	0.115	0.208	0.215	26.1	84.2
0.120 -0.140	0.2	0.139	0.370	0.370	7.9	92.1
0.140 -0.160	0.2	0.149	0.240	0.240	7.9	100.0
TOTAL NUMBER OF METRES :		2.91				

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FILE 7004-85-2090

WELL ; FBI ET AL TWEED LAKE M-47
PROVINCE; N.W.T,

[illegible]

0.039	-	0.078	0.1	0.070	0.070	0.059	3.6	3.8
0.078	-	0.156	0.2	0.100	0.100	0.050	7.9	11.7
0.156	-	0.312	1.7	0.221	0.226	0.104	59.1	70.8
0.312	-	0.625	0.5	0.356	0.356	0.116	16.6	89.3
0.625	-	1.250	0.3	0.915	0.915	0.084	10.7	100.0

TOTAL NUMBER OF METRES : 2,91

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FILE 7004-85-209C

WELL : POI ET AL TWEED LAKE M-47
PROVINCE: N.W.T.

	FOROSITY	METRES LOST	CAPACITY LOST (%)	METRES REMAINING	CAPACITY REMAINING (%)	ARITH. MEAN	MEDIAN
CUT OFF							

0.000	0.0	0.0	2.9	100.0	0.099	0.096
0.020	0.0	0.0	2.9	100.0	0.099	0.096
0.040	0.0	0.0	2.9	100.0	0.099	0.096
0.060	0.3	6.3	2.6	93.7	0.105	0.099
0.080	0.5	10.1	2.4	89.9	0.107	0.101
0.100	1.7	46.5	1.2	53.5	0.126	
0.120	2.5	76.9	0.5	23.1	0.144	0.140
0.140	2.7	66.1	0.2	11.9	0.149	
0.160	2.9	100.0	0.0	0.0	0.000	

0.337

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COMPANY: PETRO-CANADA EXPLORATION INC.

WELL: FCI ET AL TWEED LAKE M-47

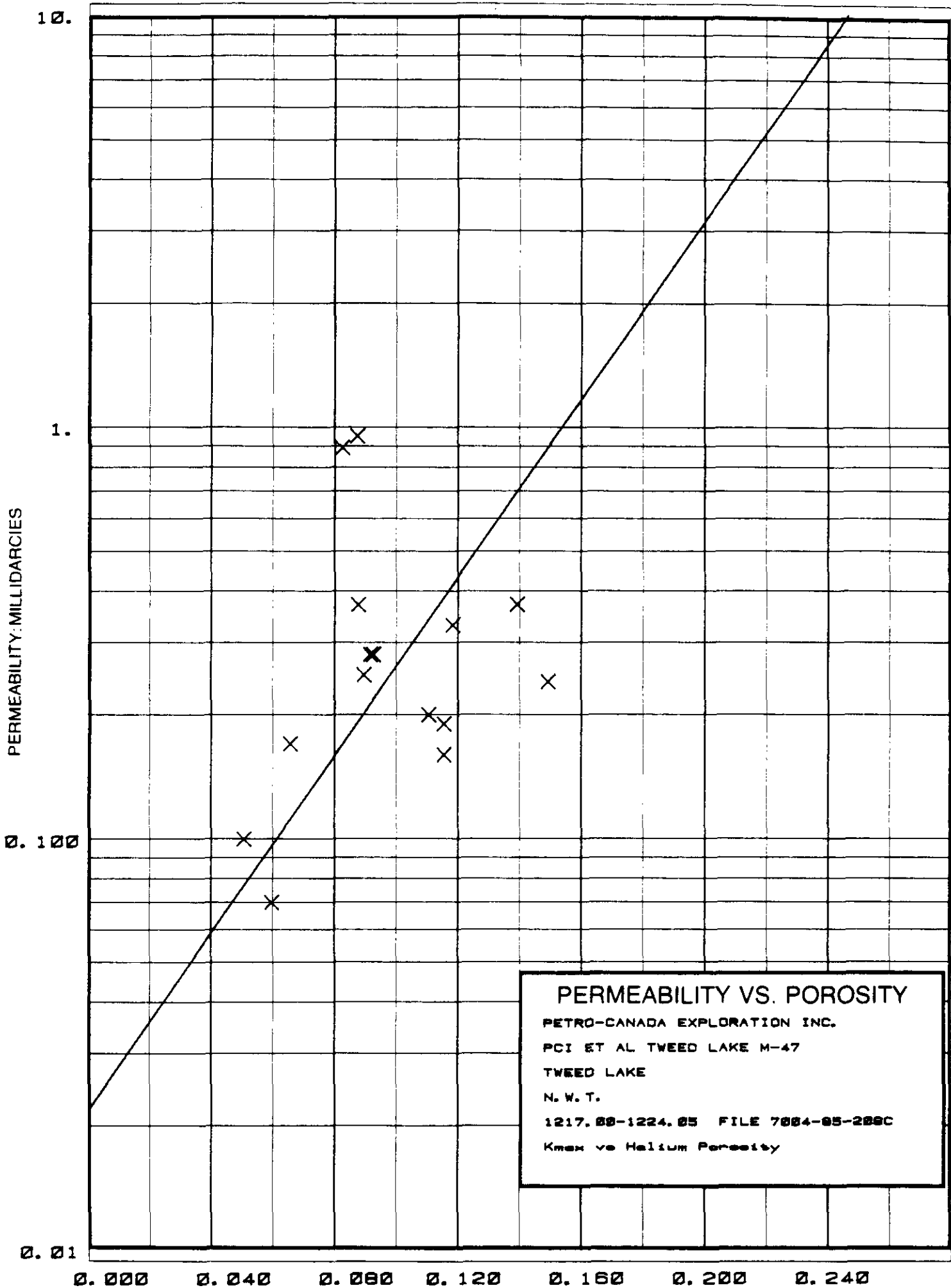
FIELD: TWEED LAKE

PROVINCE: N.W.T.

MILLIDARCY-METRES OF FLOW CAPACITY LOST FOR SELECTED PERMEABILITY CUT OFF										
PERMEABILITY CUT OFF	METRES		CAPACITY		METRES		CAPACITY		GEOM	
	LOST	LOST (%)	REMAINING	REMAINING (%)	MEAN	MEDIAN				
0.005	0.0	0.0	2.9	100.0	0.25	0.24				
0.010	0.0	0.0	2.9	100.0	0.25	0.24				
0.020	0.0	0.0	2.9	100.0	0.25	0.24				
0.039	0.0	0.0	2.9	100.0	0.25	0.24				
0.078	0.1	0.9	2.8	99.1	0.27	0.25				
0.156	0.3	3.4	2.6	96.6	0.29					
0.312	2.1	46.8	0.9	53.2	0.50					
0.625	2.6	68.3	0.3	31.7	0.91					
1.250	2.9	100.0	0.0	0.0	1.00					

TOTAL FLOW CAPACITY IN MILLIDARCY-METRES(ARITHMETIC) = 0.90

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PAGE 1
FILE: 7004-65-209C

WELL ; FCI ET AL. TUEDD LAKE M-47

PROVINCE: N. W. T.

AIR PERMEABILITY : MM - MAXIMUM	(UNCORRECTED FOR SLIPPAGE)
POROSITY : FRACTION	(HELIUM)

DEPTH INTERVAL	METERS ANALYZED	RANGE & SYMBOL	PERMEABILITY MINIMUM MAXIMUM	POROSITY MIN. MAX.	POROSITY AVERAGE	PERMEABILITY AVERAGES ARITHMETIC HARMONIC GEOMETRIC
1217.00 - 1234.05	2.91	1 (X)	0.000 10.0	0.000 0.460	0.099	0.31 0.21 0.25

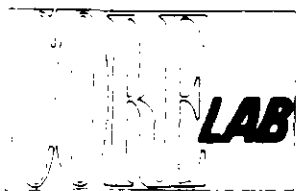
EQUATION OF REDUCED LINE FLATTING PERMEABILITY(K) TO POROSITY :

$$\text{LOG}(K) = (\text{SLOPE})(\text{FORCOST}) + \text{LOG OF INTERCEPT}$$
$$K = \text{ANTILOG}(\text{SLOPE}(\text{POROSITY}) + \text{LOG OF INTERCEPT})$$

RANGE EQUATION OF THE LINE

```
1  PERM = ANTILOG( ( 0.1073 ) ( POROSITY ) + -1.6540 )
```

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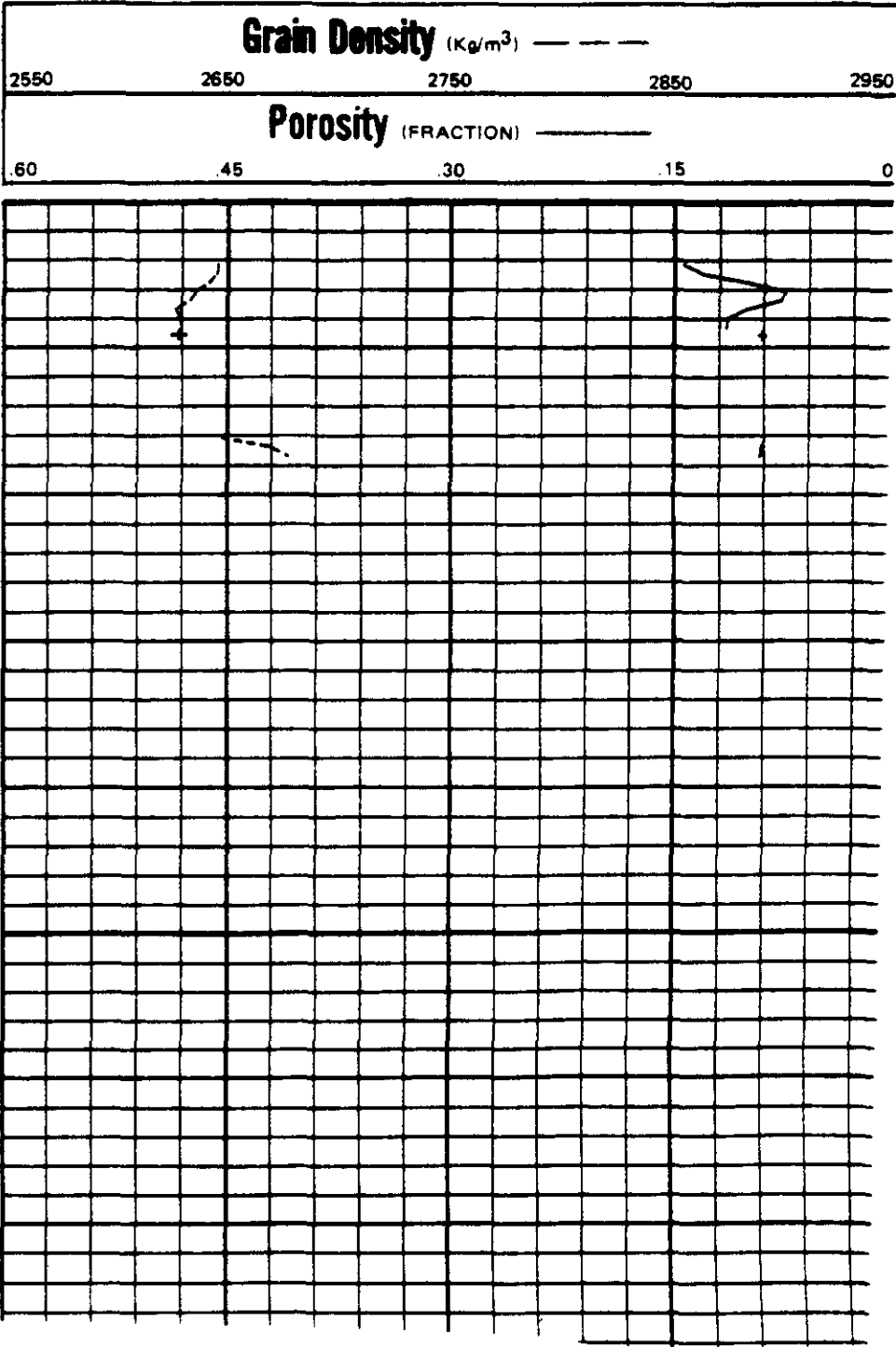
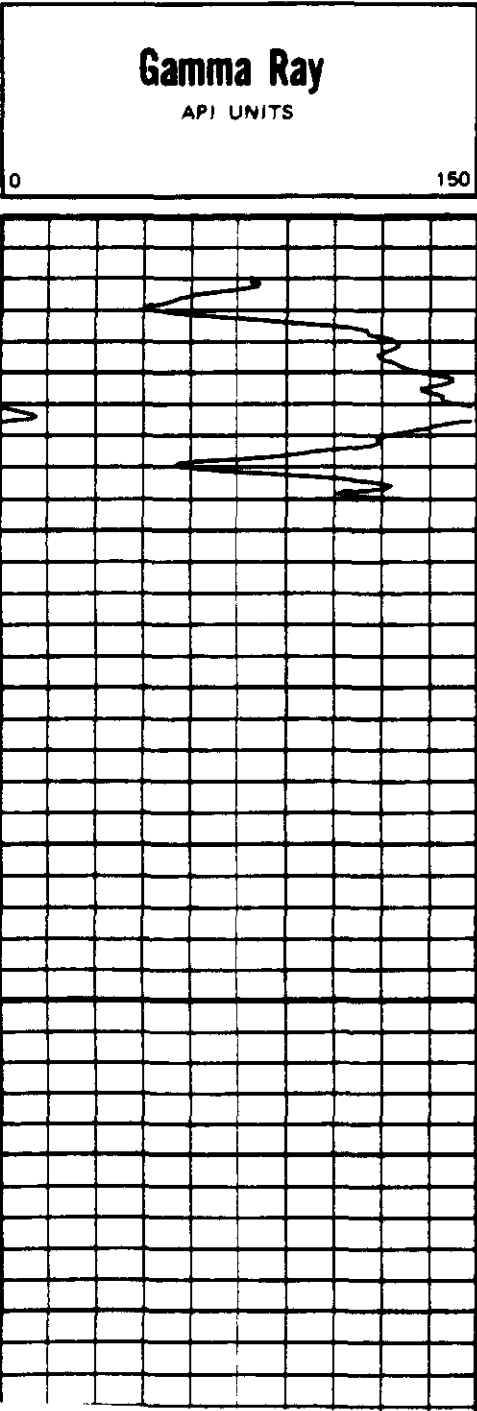


COMPANY PETRO-CANADA EXPLORATION INC. FILE NO. 7004-85-209C
WELL PCI ET AL TWEED LAKE N-47 DATE _____
FIELD TWEED LAKE FORMATION MOUNT CLARK ELEV. _____
PROVINCE N.W.T DRLG. FLD. WATER BASE MUD CORES 1
LOCATION 66°55'47" N LAT. 125°54'09" W LONG.

CORRELATION COREGRAPH

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories-Canada, Ltd., (all errors or omissions excepted); but Core Laboratories-Canada, Ltd., and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

VERTICAL SCALE: 10 cm = 24m





COMPANY PETRO-CANADA EXPLORATION INC.

FILE NO. 7004-85-209

WELL PCI ET AL TWEED LAKE N-47

DATE

ELD TWEED LAKE

FORMATION MOUNT CLARK

ELEV.

PROVINCE N.W.T.

DRLG. FLD. WATER BASE MUD

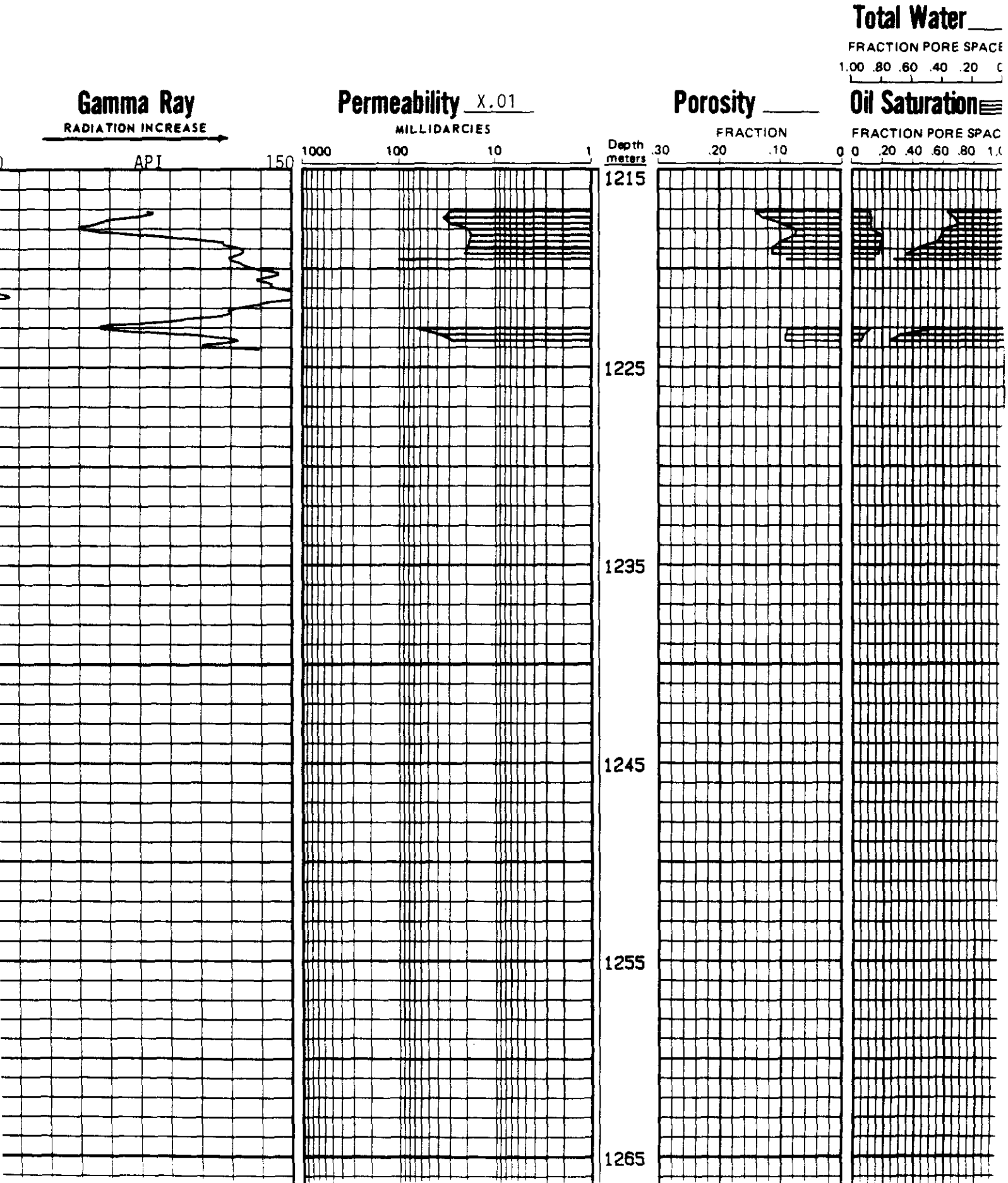
CORES 1

LOCATION 65°55'47" N LAT. 125°54'09" W LONG.

CORRELATION COREGRAPH

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VERTICAL SCALE: 10 cm = 24m



PCI ET AL TWEED LAKE M-47
400/ 66.564 / 125.540 /00
DST#01
1212.00m to 1227.00m
TIGHT HOLE

CALGARY COPY

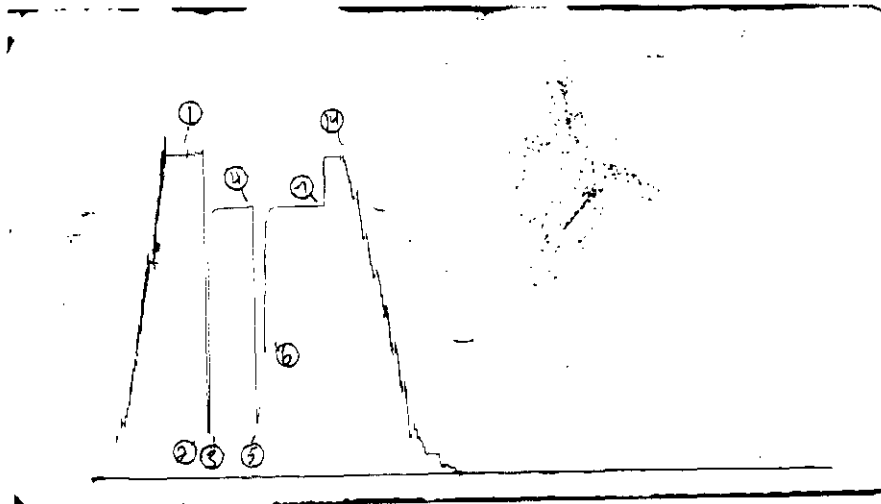
DEPTH: 1214.00m

PRESSURE
kPa(a)

- 1) Initial Hydro : 15186.
- 2) 1st Flow Start: 2327.
- 3) 1st Flow End : 1999.
- 4) END 1st Shutin: 12807.
- 5) 2nd Flow Start: 2689.
- 6) 2nd Flow End : 5619.
- 7) END 2nd Shutin: 12824.
- 14) Final Hydro. : 15117.

TEST TIMES (MIN)

- 1st FLOW : 2.
SHUTIN: 91.
2nd FLOW : 18.
SHUTIN: 118.



RECOVERY DATA

THIS TEST WAS RUN UNDER CLOSED CHAMBER CONDITIONS. TOTAL FLUID RECOVERY CONSISTED OF 65.00 M OF SLIGHTLY GAS CUT MUD.

REMARKS AND TEST SUMMARY

Test results indicate a mechanically successful test. Bottom hole pressures and the shape of the shut-in curves suggest RELATIVELY HIGH PERMEABILITY within the interval tested.

The initial shut-in stabilized in 30 minutes at 12 807.00 kPa and the final shut-in stabilized in 58 minutes at 12 824.00 kPa, therefore no extrapolations were performed.

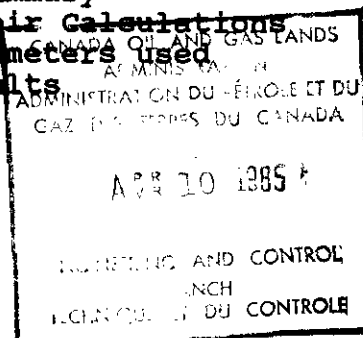
No pipe tally data available.

A Closed Chamber report is included.

TABLE OF CONTENTS

PAGE 1	PAGE 2	PAGE 3	PAGE 4
General Data	Tool Sequence	PRESSURE	Plot Summary
Blow Description	Recorder Summary	-TIME	Reservoir Calculations
Liquid Recovery	Mud and Hole Data	LISTING	-Parameters used
Gas Measurements			-Results

***** RECORDER PAGES & FIGURES *****



LYNES UNITED SERVICES LTD
DST#01 REPORT

p.1

Well name : PCI ET AL TWEED LAKE M-47
Location : 400/ 66.564 / 125.540 /00
Interval : 1212.00m to 1227.00m
Test Date : 85/02/08
Test Type : DUAL CONVENTIONAL BOTTOM HOLE
Formation : TIGHT HOLE

K.B.Elevation : 435.22m
Grd.Elevation : 429.10m
TD @ test Date: 1227.00m
Ticket Number : 66110
Unit Number :

Started in hole at : 1830 hrs
Tool opened at : 2200 hrs
Reverse circulated?: NO
Contractor & Rig No: ATCO #76
Lynes#1 : 1 of 1 on the same trip.

Operator: PETRO-CANADA INC.
ROOM 937 WEST
150 - 6TH AVE. S.W.
CALGARY ALBERTA
T2P3E3

Company Rep : HOPE Y
Testers : BABYAK R

5 REPORTS(S) TO: PAUL BAZINET
Company:

BLOW DESCRIPTION

Closed Chamber test run with Lynes United Services.

TOTAL LIQUID RECOVERY : 65.00m

For DST# 1 through DST# 1
3 Fluid Samples
Sent to: CORE LABS

Sample Salinity :120000.0g/m3

Btm. Hole Sampler #: 221
Sent to: CORE LABS

65.00m SLIGHTLY GAS CUT MUD.

GAS MEASUREMENTS

Bomb#: 7255
Sent to: CORE LABS

No Gas Measurements

TOOL SEQUENCE

RECORDER SUMMARY

SUB

LENGTH
(m)

- 1) NUMBER : 001749 ELECTRONIC GAUGE.
TYPE : DMRB PRESSURES AND
LOCATION: OUTSIDE TEMPERATURE.
RANGE: 68900.00kPa(a)
DEPTH : 1214.00m
- 2) NUMBER : 008887 ABOVE HYDRAULIC
TYPE : K-3 TOOL RECORDER.
LOCATION: INSIDE
RANGE: 20000.00kPa
DEPTH : 1203.00m
- 3) NUMBER : 013480
TYPE : K-3
LOCATION: OUTSIDE
RANGE: 20000.00kPa
DEPTH : 1214.00m
- 4) NUMBER : 014103 ABOVE INTERVAL
TYPE : K-3 RECORDER.
LOCATION: INSIDE
RANGE: 20000.00kPa
DEPTH : 1205.00m
- 5) NUMBER : 017737
TYPE : K-3
LOCATION: OUTSIDE
RANGE: 21000.00kPa
DEPTH : 1214.00m

***** TOOL TOTAL

DRILL COLLARS

ID= 72.0mm: 917.05
ID= :

DRILL PIPE

OD=114.3mm:
OD= :

COLLAR-PIPE TOTAL 917.05

STICK UP ABOVE TABLE :
TOOL ABOVE INTERVAL :
TOTAL INTERVAL :
BOTTOM CHOKE SIZE: 12.70 mm

MUD AND HOLE DATA

Calipered Hole Size @ Test Depth: Water Loss : 14.0cc/s
Hole Condition at Test Time : Filter Cake: 1.5 mm
Hole Conditioned Prior to Test? : YES
Mud Weight : 1275.0 kg/m3 Main Hole Size: 216.00mm
Mud Type : SALT GEL
Viscosity : 41.0s/l Temperature @1214.00m = 11.6C

Location: 400/ 66.564 / 125.540 /00 Recorder Number: 001749
Test Type: DUAL CONVENTIONAL BOTTOM HOLE Recorder Depth: 1214.00 m
Formation: TIGHT HOLE Subsea Depth: -778.78 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE(T+dt)/dt kPa(a) ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6	
1	INITIAL HYDROSTATIC			15186		
2	START OF 1st FLOW	0.0		2327		
		1.		2086		
3	END OF 1st FLOW	2.		1999		
	1st SHUTIN PERIOD	0.0		1999		
		2.	6291	8291	2.0000	68.7397
		4.	9739	11738	1.5000	137.7877
		7.	10532	12531	1.2857	157.0310
		9.	10635	12635	1.2222	159.6331
		11.	10687	12686	1.1818	160.9423
		14.	10721	12721	1.1429	161.8188
		16.	10739	12738	1.1250	162.2567
		18.	10756	12755	1.1111	162.6977
		20.	10773	12773	1.1000	163.1368
		23.	10773	12773	1.0870	163.1368
		25.	10790	12790	1.0800	163.5764
		27.	10790	12790	1.0741	163.5764
		30.	10808	12807	1.0667	164.0193
		32.	10808	12807	1.0625	164.0193
		34.	10808	12807	1.0588	164.0193
		36.	10808	12807	1.0556	164.0193
		39.	10808	12807	1.0513	164.0193
		41.	10808	12807	1.0488	164.0193
		43.	10808	12807	1.0465	164.0193
		46.	10808	12807	1.0435	164.0193
		48.	10808	12807	1.0417	164.0193
		50.	10808	12807	1.0400	164.0193
		52.	10808	12807	1.0385	164.0193
		55.	10808	12807	1.0364	164.0193
		57.	10808	12807	1.0351	164.0193
		59.	10808	12807	1.0339	164.0193
		62.	10808	12807	1.0323	164.0193

* VALUES USED FOR EXTRAPOLATIONS

Location: 400/ 66.564 / 125.540 /00
Test Type: DUAL CONVENTIONAL BOTTOM HOLE
Formation: TIGHT HOLE

Recorder Number: 001749
Recorder Depth: 1214.00 m
Subsea Depth: -778.78 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE(T+dt)/dt kPa(a)	ABSCISSA	PRESSURE SQUARED kPa(a) ^2/10^6
		64.	10808	12807	1.0313	164.0193
		66.	10808	12807	1.0303	164.0193
		68.	10808	12807	1.0294	164.0193
		71.	10808	12807	1.0282	164.0193
		73.	10808	12807	1.0274	164.0193
		75.	10808	12807	1.0267	164.0193
		78.	10808	12807	1.0256	164.0193
		80.	10808	12807	1.0250	164.0193
		82.	10808	12807	1.0244	164.0193
		84.	10808	12807	1.0238	164.0193
		87.	10808	12807	1.0230	164.0193
		89.	10808	12807	1.0225	164.0193
4	END OF 1st SHUTIN	91.	10808	12807	1.0220	164.0193
5	START OF 2nd FLOW	0.0		2689		
		2.		2758		
		3.		2982		
		4.		3172		
		5.		3378		
		6.		3585		
		7.		3775		
		8.		3947		
		10.		4326		
		11.		4516		
		12.		4706		
		13.		4861		
		14.		5016		
		15.		5171		
		16.		5326		
6	END OF 2nd FLOW	18.		5619		
	2nd SHUTIN PERIOD	0.0		5619		
		3.	5602	11221	7.6667	125.9153
		6.	6843	12462	4.3333	155.3064

* VALUES USED FOR EXTRAPOLATIONS

DST#01
PCI ET AL TWEED LAKE M-47
1212.00 m to 1227.00 m

p.3b

Location: 400/ 66.564 / 125.540 /00
Test Type: DUAL CONVENTIONAL BOTTOM HOLE
Formation: TIGHT HOLE

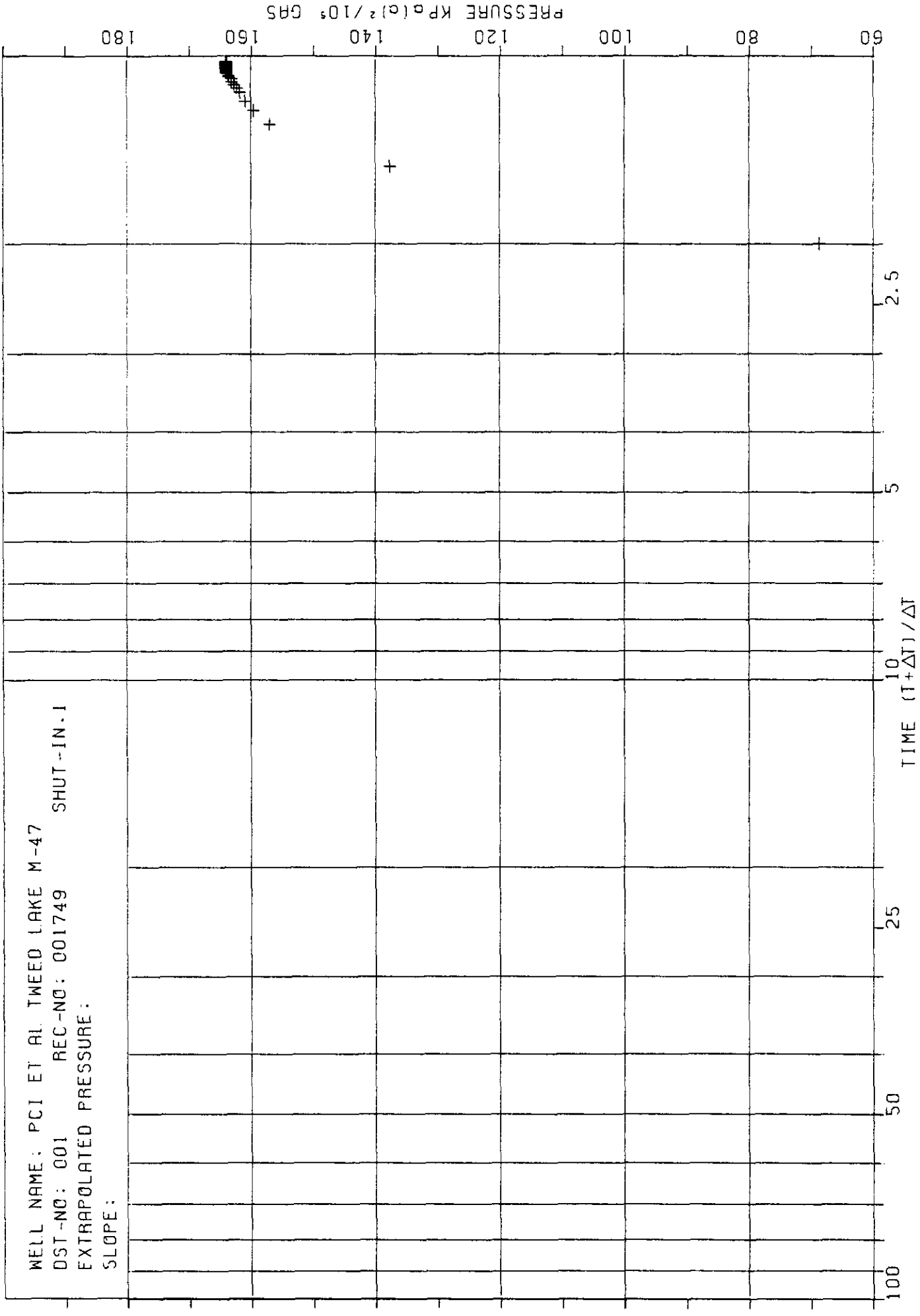
Recorder Number: 001749
Recorder Depth: 1214.00 m
Subsea Depth: -778.78 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE(T+dt)/dt kPa(a)	ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
		10.	7050	12669	3.0000	160.5061
		13.	7119	12738	2.5385	162.2567
		17.	7153	12773	2.1765	163.1368
		20.	7153	12773	2.0000	163.1368
		24.	7188	12807	1.8333	164.0193
		27.	7188	12807	1.7407	164.0193
		30.	7188	12807	1.6667	164.0193
		34.	7188	12807	1.5882	164.0193
		37.	7188	12807	1.5405	164.0193
		41.	7188	12807	1.4878	164.0193
		44.	7188	12807	1.4545	164.0193
		48.	7205	12824	1.4167	164.4601
		51.	7188	12807	1.3922	164.0193
		54.	7188	12807	1.3704	164.0193
		58.	7205	12824	1.3448	164.4601
		61.	7205	12824	1.3279	164.4601
		65.	7205	12824	1.3077	164.4601
		68.	7205	12824	1.2941	164.4601
		72.	7205	12824	1.2778	164.4601
		75.	7205	12824	1.2667	164.4601
		78.	7205	12824	1.2564	164.4601
		82.	7205	12824	1.2439	164.4601
		85.	7205	12824	1.2353	164.4601
		89.	7205	12824	1.2247	164.4601
		92.	7205	12824	1.2174	164.4601
		96.	7205	12824	1.2083	164.4601
		99.	7205	12824	1.2020	164.4601
		102.	7205	12824	1.1961	164.4601
		106.	7205	12824	1.1887	164.4601
		109.	7205	12824	1.1835	164.4601
		113.	7205	12824	1.1770	164.4601
		116.	7205	12824	1.1724	164.4601
7	END OF 2nd SHUTIN	118.	7205	12824	1.1695	164.4601
14	FINAL HYDROSTATIC			15117		

* VALUES USED FOR EXTRAPOLATIONS

WELL NAME: PCI ET AL. TWEED LAKE M-47
DST-NO: 001 REC-NO: 001749 SHUT-IN-I
EXTRAPOLATED PRESSURE:
SLOPE:



WELL NAME: PCI E1 AL. TWEED LAKE M-47
DST-NO: 001 REC-NO: 001749 SHUT-IN: 2
EXTRAPOLATED PRESSURE:
SLOPE:

PRESSURE $KPa (10^2) / 10^5$ GAS

TIME $(T+\Delta T) / \Delta T$

2.5

5

10

25

50

100

180

170

160

150

140

130

120

PCI ET AL TWEED LAKE M-47
66.564 / 125.540

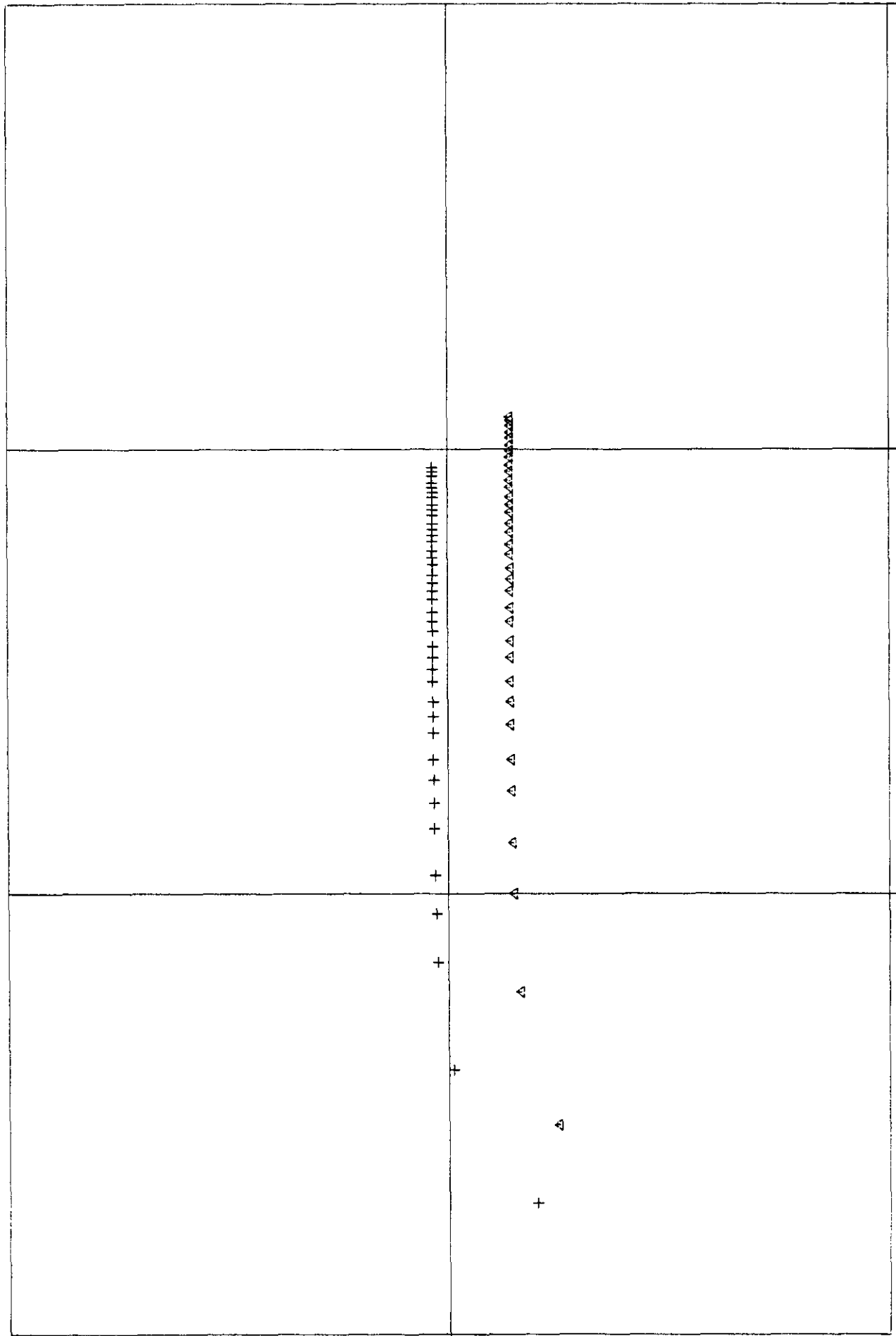
REC#001749
DST#001

SHUTIN # 1 +
2 Δ

100000

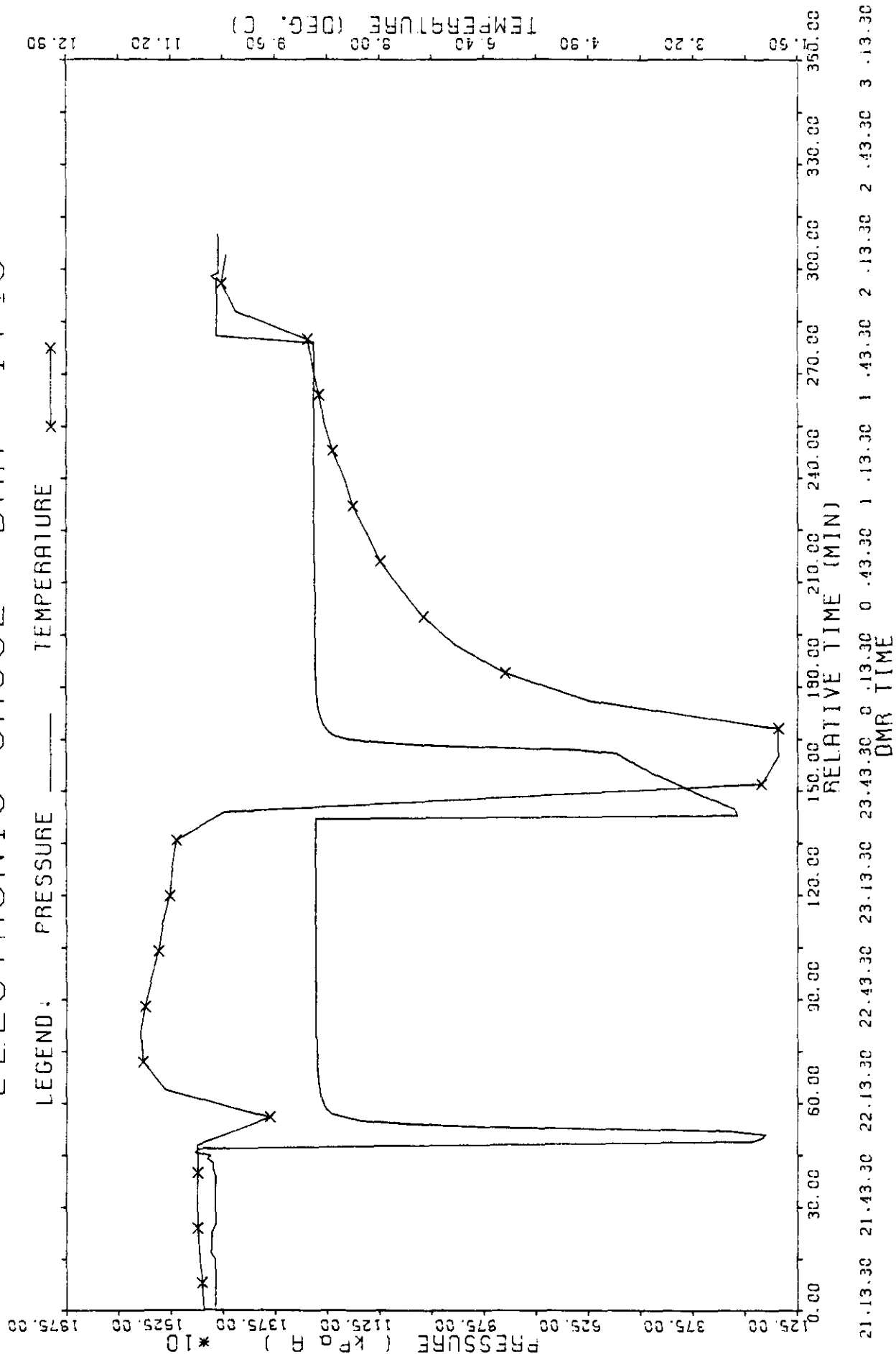
10000

DELTA KPa.



10 100 1000

PCI ET AL TWEED LAKE M-47 66.564 - 125.540 DST #1 ELECTRONIC GAUGE DMR #1749



DST#01
PCI ET AL TWEED LAKE M-47
1212.00m to 1227.00m

PRESSURE RECORDER NUMBER : 001749

DEPTH : 1214.00m LOCATION : OUTSIDE
TYPE : DMRB CAPACITY : 68900.00kPa(a)

PRESSURE
kPa(a)

***** TEMPERATURE AT RECORDER DEPTH = 11.6 C

- 1) Initial Hydro : 15186.
- 2) 1st Flow Start: 2327.
- 3) 1st Flow End : 1999.
- 4) END 1st Shutin: 12807.
- 5) 2nd Flow Start: 2689.
- 6) 2nd Flow End : 5619.
- 7) END 2nd Shutin: 12824.
- 14) Final Hydro. : 15117.

ELECTRONIC GAUGE.
PRESSURES AND
TEMPERATURE.

TEST TIMES(MIN)

- 1st FLOW : 2.
SHUTIN: 91.
2nd FLOW : 18.
SHUTIN: 118.

PRESSURE RECORDER NUMBER : 008887

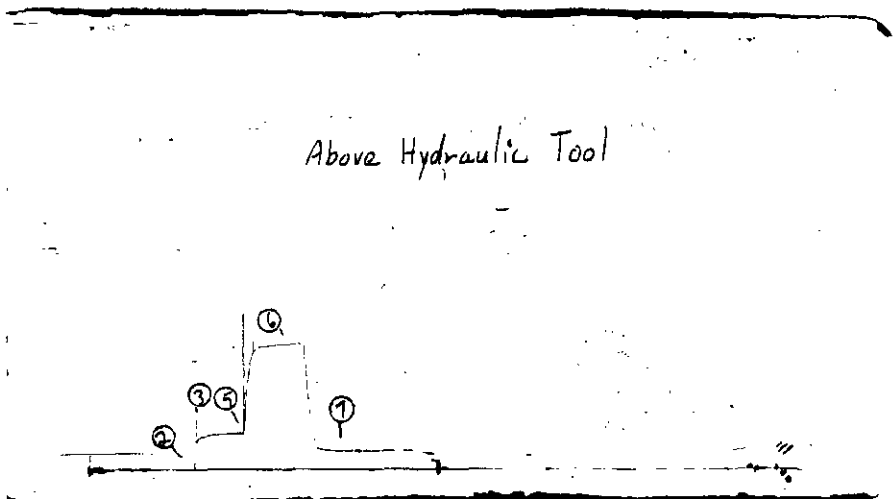
DEPTH : 1203.00m LOCATION : INSIDE
TYPE : K-3 CAPACITY : 20000.00 kPa

PRESSURE
kPa

- 1) Initial Hydro :
- 2) 1st Flow Start: 26.
- 3) 1st Flow End : 1570.
- 4) END 1st Shutin:
- 5) 2nd Flow Start: 1766.
- 6) 2nd Flow End : 5949.
- 7) END 2nd Shutin: 905.
- 14) Final Hydro. :

Above Hydraulic Tool

ABOVE HYDRAULIC
TOOL RECORDER.



DST#01
PCI ET AL TWEED LAKE M-47
1212.00m to 1227.00m

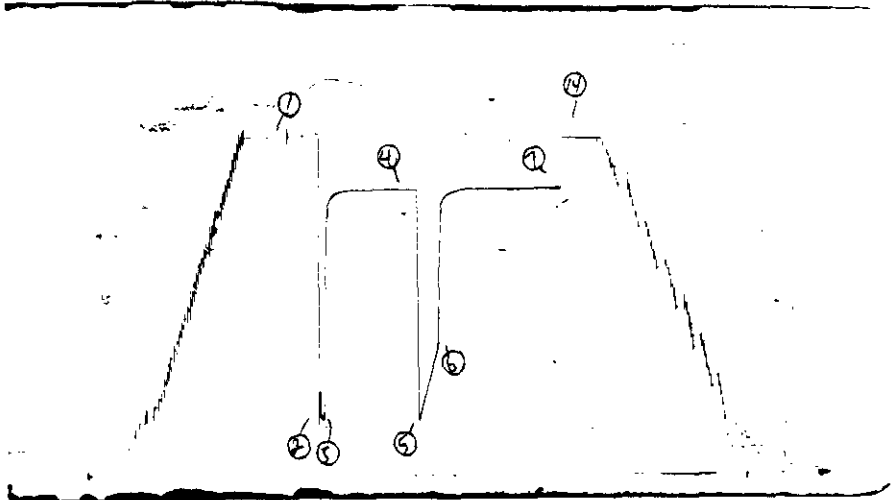
PRESSURE RECORDER NUMBER : 013480

DEPTH : 1214.00m
TYPE : K-3

LOCATION : OUTSIDE
CAPACITY : 20000.00 kPa

PRESSURE
kPa

- 1) Initial Hydro : 15179.
- 2) 1st Flow Start: 1987.
- 3) 1st Flow End : 1921.
- 4) END 1st Shutin: 12723.
- 5) 2nd Flow Start: 2384.
- 6) 2nd Flow End : 5421.
- 7) END 2nd Shutin: 12723.
- 14) Final Hydro. : 15130.



TEST TIMES (MIN)
1st FLOW : 2.
SHUTIN: 91.
2nd FLOW : 18.
SHUTIN: 118.

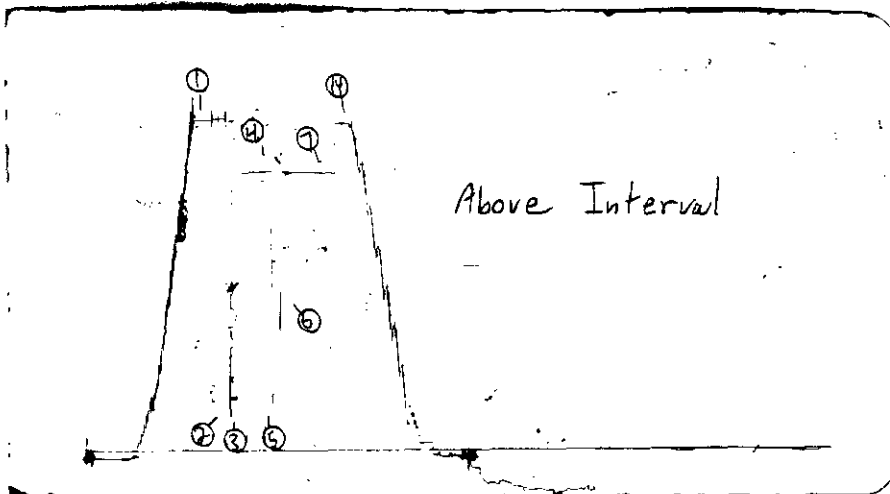
PRESSURE RECORDER NUMBER : 014103

DEPTH : 1205.00m
TYPE : K-3

LOCATION : INSIDE
CAPACITY : 20000.00 kPa

PRESSURE
kPa

- 1) Initial Hydro : 15000.
- 2) 1st Flow Start: 1875.
- 3) 1st Flow End : 1875.
- 4) END 1st Shutin: 12695.
- 5) 2nd Flow Start: 2401.
- 6) 2nd Flow End : 5429.
- 7) END 2nd Shutin: 12614.
- 14) Final Hydro. : 14853.



ABOVE INTERVAL
RECORDER.

DST#01
PCI ET AL TWEED LAKE M-47
1212.00m to 1227.00m

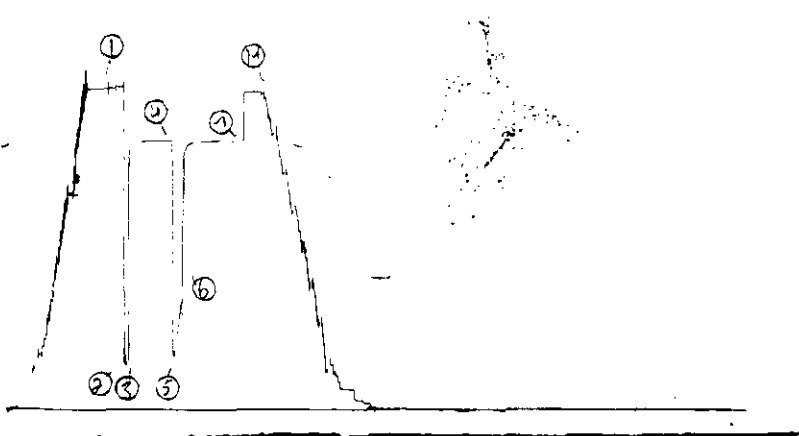
PRESSURE RECORDER NUMBER : 017737

DEPTH : 1214.00m
TYPE : K-3

LOCATION : OUTSIDE
CAPACITY : 21000.00 kPa

PRESSURE
kPa

1) Initial Hydro : 15230.
2) 1st Flow Start: 2075.
3) 1st Flow End : 2041.
4) END 1st Shutin: 12752.
5) 2nd Flow Start: 2518.
6) 2nd Flow End : 5325.
7) END 2nd Shutin: 12752.
14) Final Hydro. : 15115.



TEST TIMES (MIN)
1st FLOW : 2.
SHUTIN: 91.
2nd FLOW : 18.
SHUTIN: 118.

LYNES UNITED SERVICES

1144 29th AVE. N.E., CALGARY

ALBERTA, T2E 7P1

CLOSED CHAMBER DST REPORT

Well name: PCI ET AL TWEED LAKE M-47

Location: 66.564 - 125.540

DST No.: 1

Interval: 1212-1227 m

Date: 85/02/08

LYNES UNITED SERVICES, CALGARY, ALBERTA

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1. GENERAL INFORMATION

Company: PETRO-CANADA INC. Date: 85/02/08
 Well name: PCI ET AL TWEED LAKE M-47 Tester: BABYAK R
 Well no: 66.564 - 125.540 CC Tester: MACQUARRIE D
 DST #: 1 Ticket #: 66110
 Interval: 1212-1227 m Hole size: 216 mm
 Formation: TIGHT HOLE
 Type of test: CONV BTM HOLE
 Primary objective of closed chamber:
 Cushion: 0.000 m Volume: 0.000 m³
 Gas cushion: 0.000 kPa Volume: 0.000 Sm³
 Chamber volume: 8.239 m³ Sump volume: .395 m³

RECORDER DATA

DSR #: 124 DMR #: 1749 Depth: 1214 m
 Above shut-in recorder #: 8887 Depth: 1203 m
 Surface probe #: 1528

CONSTANTS AND FORMATION PARAMETERS

Bottom hole choke size(d): 12.7 mm No. run: 1 Coeff(FP): 17.5
 Est. form pressure: 12800 kPa Est. form temp: 284.75 deg K
 Gas spec. gravity: .6 (z): .732
 Estimated gas-water ratio(R): 1.5 Surface pressure: 101.514 kPa

PRETEST CALCULATION RESULTS

	Max rate m ³ /d	Max dp/dt kPa/min	Conversion m ³ /d/kPa/min
Gas:	340442.463	2870.388	118.605
Gas saturated water:	1292.826	18.835	68.638
Gas free water:	861.884	7.935	108.617

2.1 Test Report Summary

A drill stem test was conducted on
PCI ET AL TWEED LAKE M-47
66.564 - 125.540 under closed chamber conditions according
to LYNES STANDARD CLOSED CHAMBER TESTING PROCEDURE.

The surface pressure was monitored throughout the
entire test. All measured data is presented both graph-
ically and in tabular form in segments 3 and 4 of this
report along with the calculated rates.

2.2 Results determined from the test data

1) PREFLOW

Flow time = 5 minutes
Surface pressure - start = 101.514 kPa
Surface pressure - end = 945.027

Indicated fluid = gas

Initial gas rate = 45 m3/d
Maximum gas rate = 34671 m3/d
Last gas rate = 29834 m3/d
Average gas rate = 21101 m3/d
Average gas rate = 28892 m3/d **

The closed chamber and DST preflow times do not agree.
Firstly, the DMR was sensing a temperature when the tool
was opened which resulted in it missing the first preflow
pressure. Secondly, the closed chamber surface pressures
indicate that the tool was slow in fully opening. The
average gas rate with the ** was calculated by ignoring
the first 6 calculated gas rates.

2) INITIAL SHUT-IN

Shut-in time = 91 minutes

The surface pressure during the initial shut-in was
essentially stable indicating virtually pure gas flow.

3) FINAL FLOW

Flow time = 19 minutes
Surface pressure - start = 996.944 kPa
Surface pressure - end = 4602.230 kPa

Initial gas rate = 29591 m3/d
Maximum gas rate = 109878 m3/d

Last gas rate = 17166 m³/d
Average gas rate = 23733 m³/d

As with the preflow, the DMR was sensing a temperature when the tool was opened for the final flow. This caused the difference in times between the DST and the closed chamber results.

The gas rate calculations show two large gas rates at 0.75 minutes and at 4 minutes. These values may not be accurate due to a problem with the time print out of the DSR. However, this does not affect the validity of the remainder of the results.

4) FINAL SHUT-IN

Shut-in time = 118 minutes
The surface pressure was monitored for 133 minutes.

The surface pressure was decreasing slightly for most of the shut-in. This could indicate a small leak in the surface equipment.

The surface pressure was vented 100 minutes into the shut-in.

2.3 Comments on the test

With the exception of a minor timing problem for the DSR, the closed chamber results indicate a successful test.

The reported fluid recovery was 65 meters of slightly gas cut mud. This amount appears to be the sump volume.

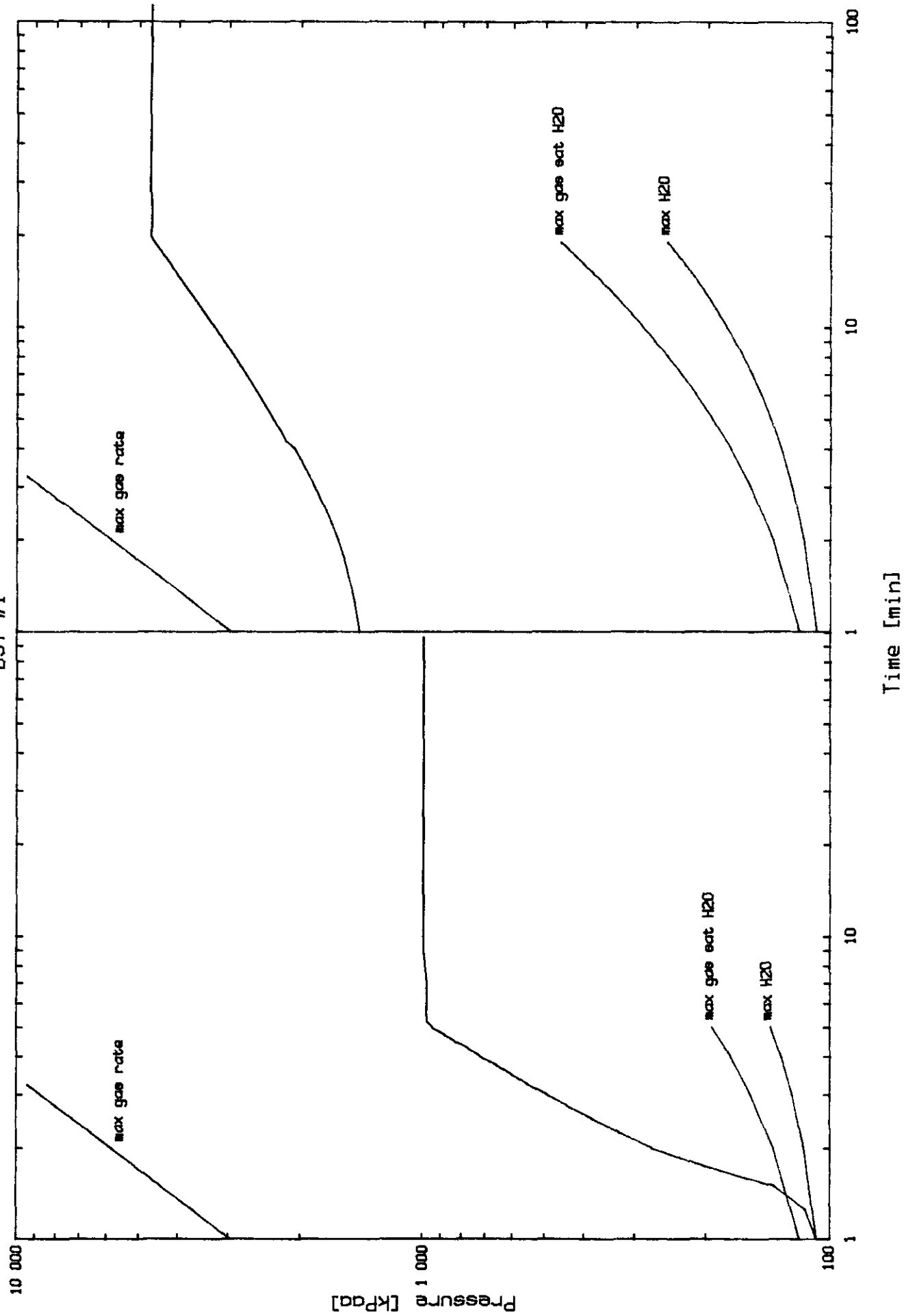
2.4 Conclusion

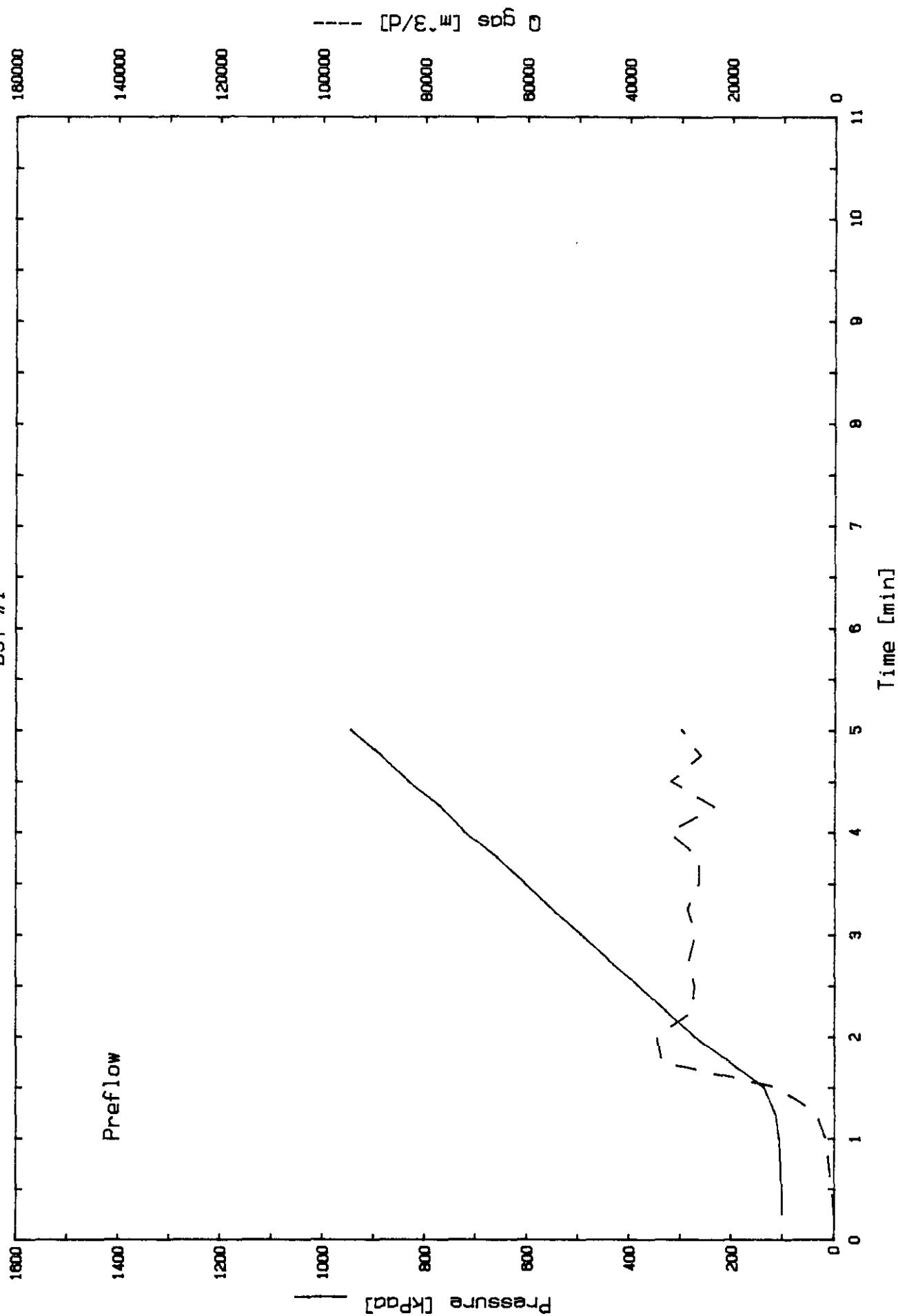
The closed chamber and DST results indicate a zone of relatively high permeability within the interval tested.

LYNES UNITED SERVICES

PCI ET AL TWEED LAKE M-47
66.564 - 125.540
DST #1

Fig. 3-1

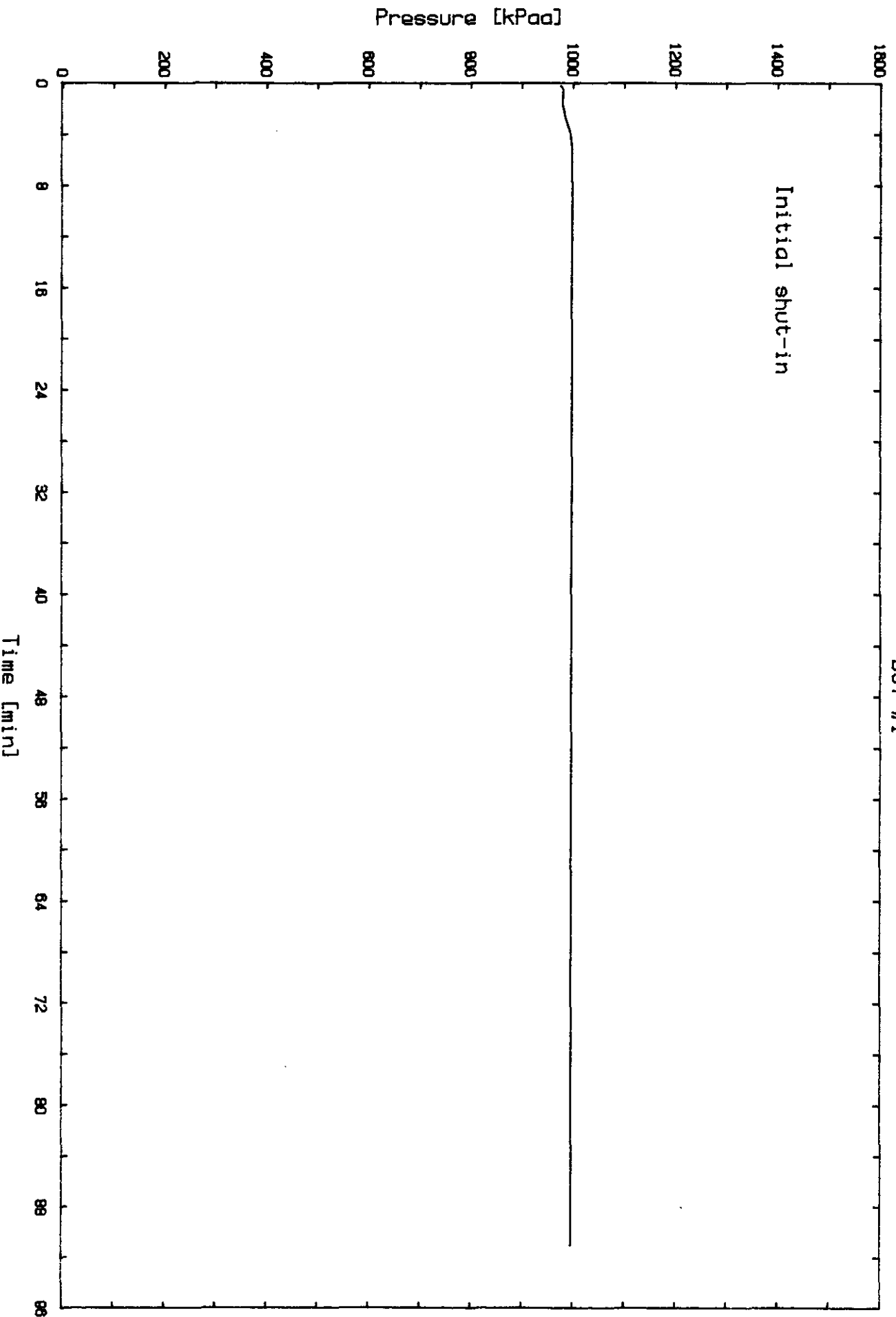




LYNES UNITED SERVICES

PCI ET AL. TWEED LAKE M-47
66.564 - 125.540
DST #1

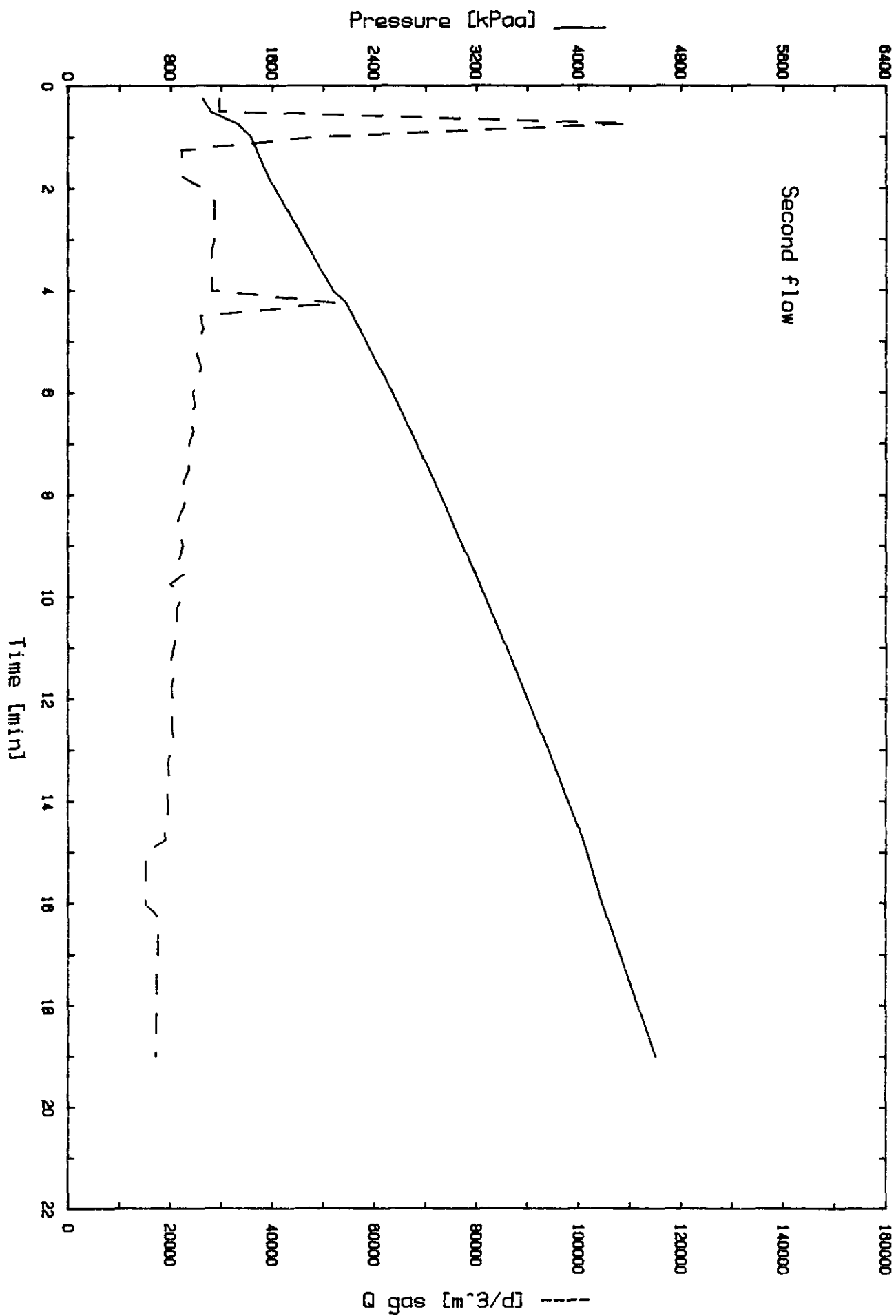
Fig. 3-3

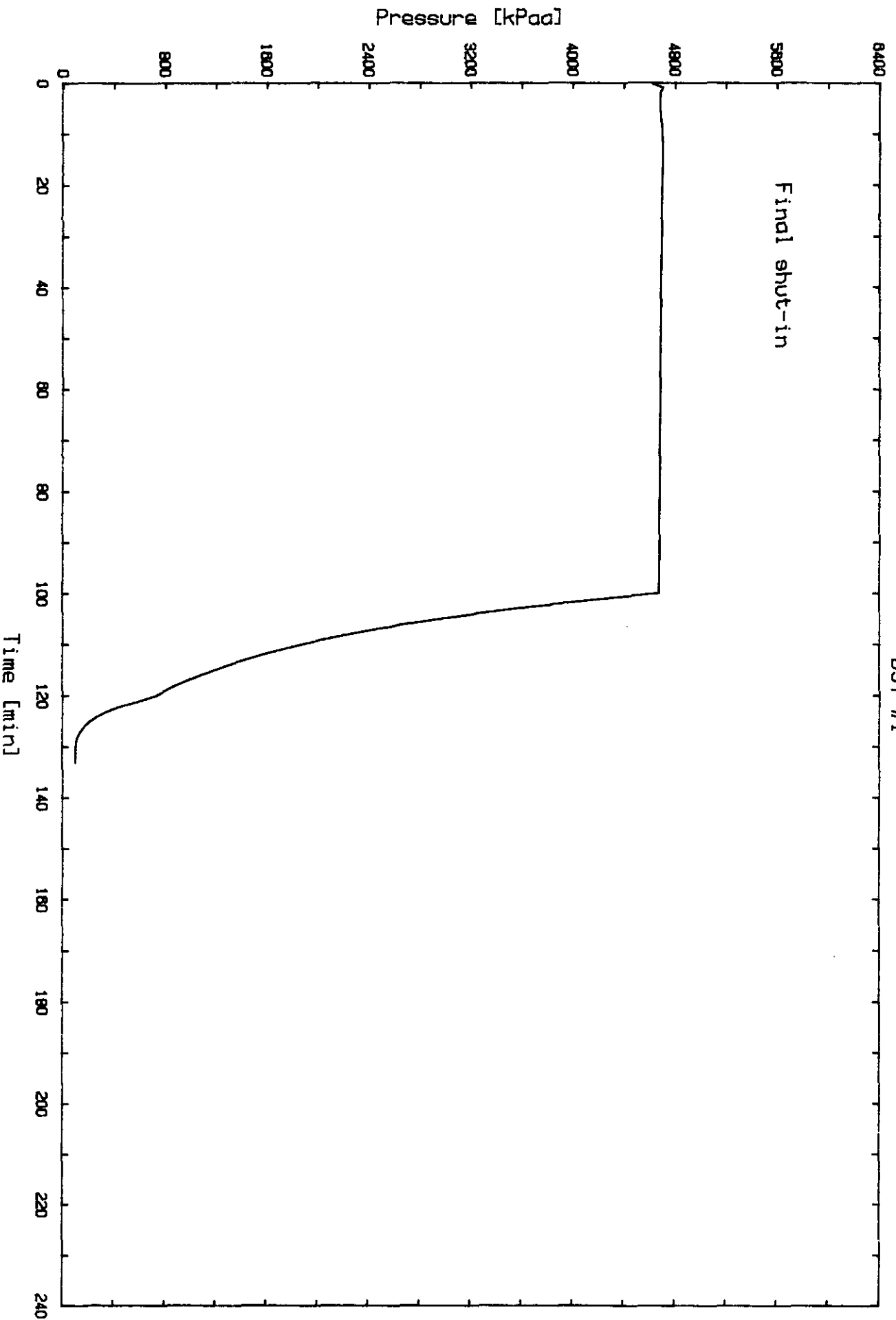


LYNES UNITED SERVICES

PCI ET AL. TWEED LAKE M-47
86.584 - 125.540
DST #1

Fig. 3-4





4. DATA LISTINGS

First flow (surface valve closed, downhole valve open)

Elapsed time min	Press kPaA	dp/dt kPa/min	Qg m ³ /d
.25	101.603	.356	44.527
.50	102.600	3.988	498.808
.75	104.564	7.856	982.607
1.00	107.847	13.132	1642.514
1.25	115.003	28.624	3580.210
1.50	136.577	86.296	10793.663
1.75	203.979	269.608	33721.818
2.00	273.278	277.196	34670.904
2.25	328.692	221.656	27724.115
2.50	383.422	218.920	27381.904
2.75	440.020	226.392	28316.481
3.00	494.307	217.148	27160.267
3.25	551.652	229.380	28690.212
3.50	604.542	211.560	26461.336
3.75	657.648	212.424	26569.402
4.00	722.096	257.792	32243.905
4.25	769.141	188.180	23537.030
4.50	832.979	255.352	31938.717
4.75	885.394	209.660	26223.689
5.00	945.027	238.532	29834.918

First shut-in (surface valve closed, downhole valve closed)

Elapsed time min	Press kPaA	dp/dt kPa/min
1.00	981.330	36.303
2.00	982.399	1.069
3.00	988.479	6.080
4.00	996.788	8.309
5.00	999.715	2.927
6.00	999.503	-.212
7.00	999.430	-.073
8.00	999.444	.014
9.00	999.444	0.000
10.00	999.331	-.113
11.00	999.398	.067
12.00	999.465	.067
13.00	999.345	-.120
14.00	999.365	.020
15.00	999.312	-.053
16.00	999.265	-.047
17.00	999.118	-.147
18.00	999.186	.068
19.00	999.132	-.054
20.00	999.060	-.072
21.00	999.007	-.053
22.00	998.987	-.020
23.00	998.987	0.000
24.00	998.833	-.154
25.00	998.814	-.019
26.00	998.814	0.000
27.00	998.808	-.006
28.00	998.781	-.027
29.00	998.754	-.027
30.00	998.723	-.031
31.00	998.691	-.031
32.00	998.660	-.031
33.00	998.629	-.031
34.00	998.598	-.031
35.00	998.566	-.031
36.00	998.535	-.031
37.00	998.504	-.031
38.00	998.472	-.031
39.00	998.441	-.031
40.00	998.404	-.037
41.00	998.367	-.037
42.00	998.331	-.037
43.00	998.294	-.037
44.00	998.257	-.037
45.00	998.220	-.037
46.00	998.183	-.037
47.00	998.147	-.037
48.00	998.110	-.037

Elapsed time min	Press kPaA	dp/dt kPa/min
49.00	998.073	-.037
50.00	998.041	-.033
51.00	998.008	-.033
52.00	997.976	-.033
53.00	997.943	-.033
54.00	997.911	-.033
55.00	997.878	-.033
56.00	997.846	-.033
57.00	997.813	-.033
58.00	997.781	-.033
59.00	997.748	-.033
60.00	997.681	-.067
61.00	997.614	-.067
62.00	997.547	-.067
63.00	997.480	-.067
64.00	997.413	-.067
65.00	997.346	-.067
66.00	997.279	-.067
67.00	997.212	-.067
68.00	997.145	-.067
69.00	997.078	-.067
70.00	997.011	-.067
71.00	997.055	.044
72.00	997.098	.044
73.00	997.011	-.087
74.00	997.008	-.003
75.00	997.004	-.003
76.00	997.001	-.003
77.00	996.997	-.003
78.00	996.994	-.003
79.00	996.991	-.003
80.00	996.987	-.003
81.00	996.984	-.003
82.00	996.980	-.003
83.00	996.977	-.003
84.00	996.973	-.003
85.00	996.970	-.003
86.00	996.990	.020
87.00	996.929	-.061
88.00	996.970	.041
89.00	996.970	0.000
90.00	996.903	-.067
91.00	996.944	.041

Second flow (surface valve closed, downhole valve open)

Elapsed time min	Press kPaA	dp/dt kPa/min	Qg m ³ /d
.25	1056.090	236.584	29591.268
.50	1115.240	236.600	29593.269
.75	1334.860	878.480	109877.832
1.00	1434.530	398.680	49865.784
1.25	1479.127	178.387	22312.107
1.50	1523.723	178.387	22312.107
1.75	1568.320	178.387	22312.107
2.00	1620.840	210.080	26276.221
2.25	1678.138	229.190	28666.447
2.50	1735.435	229.190	28666.447
2.75	1792.733	229.190	28666.447
3.00	1850.030	229.190	28666.447
3.25	1906.338	225.230	28171.141
3.50	1962.645	225.230	28171.141
3.75	2018.953	225.230	28171.141
4.00	2075.260	225.230	28171.141
4.25	2180.360	420.400	52582.461
4.50	2232.370	208.040	26021.064
4.75	2285.290	211.680	26476.345
5.00	2336.730	205.760	25735.888
5.25	2387.260	202.120	25280.607
5.50	2439.420	208.640	26096.110
5.75	2489.890	201.880	25250.588
6.00	2538.750	195.440	24445.091
6.25	2588.370	198.480	24825.326
6.50	2635.660	189.160	23659.606
6.75	2684.820	196.640	24595.184
7.00	2732.280	189.840	23744.658
7.25	2779.450	188.680	23599.569
7.50	2826.600	188.600	23589.563
7.75	2871.630	180.120	22528.908
8.00	2918.100	185.880	23249.353
8.25	2963.210	180.440	22568.933
8.50	3006.270	172.240	21543.299
8.75	3050.130	175.440	21943.547
9.00	3095.180	180.200	22538.914
9.25	3138.620	173.760	21733.417
9.50	3185.150	186.120	23279.371
9.75	3225.210	160.240	20042.373
10.00	3269.720	178.040	22268.747
10.25	3312.140	169.680	21223.102
10.50	3354.790	170.600	21338.173
10.75	3397.100	169.240	21168.068
11.00	3438.340	164.960	20632.737
11.25	3478.440	160.400	20062.385
11.50	3520.110	166.680	20847.870
11.75	3560.640	162.120	20277.518
12.00	3601.600	163.840	20492.651

Elapsed time min	Press kPaA	dp/dt kPa/min	Qg m ³ /d
12.25	3642.430	163.320	20427.611
12.50	3683.080	162.600	20337.555
12.75	3724.260	164.720	20602.719
13.00	3764.380	160.480	20072.391
13.25	3803.390	156.040	19517.049
13.50	3842.700	157.240	19667.141
13.75	3881.350	154.600	19336.937
14.00	3920.500	156.600	19587.092
14.25	3959.490	155.960	19507.042
14.50	3996.820	149.320	18676.530
14.75	4034.750	151.720	18976.715
15.00	4065.078	121.312	15173.367
15.25	4095.406	121.312	15173.367
15.50	4125.734	121.312	15173.367
15.75	4156.062	121.312	15173.367
16.00	4186.390	121.312	15173.367
16.25	4221.425	140.140	17528.321
16.50	4256.460	140.140	17528.321
16.75	4291.495	140.140	17528.321
17.00	4326.530	140.140	17528.321
17.25	4361.145	138.460	17318.191
17.50	4395.760	138.460	17318.191
17.75	4430.375	138.460	17318.191
18.00	4464.990	138.460	17318.191
18.25	4499.300	137.240	17165.597
18.50	4533.610	137.240	17165.597
18.75	4567.920	137.240	17165.597
19.00	4602.230	137.240	17165.597

Second shut-in (surface valve closed, downhole valve closed)

Elapsed time min	Press kPaA	dp/dt kPa/min
1.00	4706.200	103.970
2.00	4690.700	-15.500
3.00	4687.430	-3.270
4.00	4687.320	-.110
5.00	4689.500	2.180
6.00	4691.990	2.490
7.00	4695.220	3.230
8.00	4699.820	4.600
9.00	4704.310	4.490
10.00	4707.300	2.990
11.00	4708.240	.940
12.00	4707.740	-.500
13.00	4706.900	-.840
14.00	4706.230	-.670
15.00	4705.655	-.575
16.00	4705.080	-.575
17.00	4704.635	-.445
18.00	4704.190	-.445
19.00	4703.610	-.580
20.00	4703.030	-.580
21.00	4702.580	-.450
22.00	4702.130	-.450
23.00	4701.695	-.435
24.00	4701.260	-.435
25.00	4700.800	-.460
26.00	4700.340	-.460
27.00	4699.930	-.410
28.00	4699.520	-.410
29.00	4699.115	-.405
30.00	4698.710	-.405
31.00	4698.375	-.335
32.00	4698.040	-.335
33.00	4697.660	-.380
34.00	4697.280	-.380
35.00	4696.900	-.380
36.00	4696.520	-.380
37.00	4696.100	-.420
38.00	4695.680	-.420
39.00	4695.340	-.340
40.00	4695.000	-.340
41.00	4694.665	-.335
42.00	4694.330	-.335
43.00	4694.040	-.290
44.00	4693.750	-.290
45.00	4693.425	-.325
46.00	4693.100	-.325
47.00	4692.780	-.320
48.00	4692.460	-.320

Elapsed time min	Press kPaA	dp/dt kPa/min
49.00	4692.160	-.300
50.00	4691.860	-.300
51.00	4691.480	-.380
52.00	4691.100	-.380
53.00	4690.865	-.235
54.00	4690.630	-.235
55.00	4690.305	-.325
56.00	4689.980	-.325
57.00	4689.690	-.290
58.00	4689.400	-.290
59.00	4689.065	-.335
60.00	4688.730	-.335
61.00	4688.465	-.265
62.00	4688.200	-.265
63.00	4687.940	-.260
64.00	4687.680	-.260
65.00	4687.370	-.310
66.00	4687.060	-.310
67.00	4686.800	-.260
68.00	4686.540	-.260
69.00	4686.180	-.360
70.00	4685.820	-.360
71.00	4685.575	-.245
72.00	4685.330	-.245
73.00	4685.105	-.225
74.00	4684.880	-.225
75.00	4684.540	-.340
76.00	4684.200	-.340
77.00	4683.965	-.235
78.00	4683.730	-.235
79.00	4683.450	-.280
80.00	4683.170	-.280
81.00	4682.910	-.260
82.00	4682.650	-.260
83.00	4682.320	-.330
84.00	4681.990	-.330
85.00	4681.830	-.160
86.00	4681.670	-.160
87.00	4681.410	-.260
88.00	4681.150	-.260
89.00	4680.820	-.330
90.00	4680.490	-.330
91.00	4680.285	-.205
92.00	4680.080	-.205
93.00	4679.830	-.250
94.00	4679.580	-.250
95.00	4679.330	-.250
96.00	4679.080	-.250
97.00	4678.885	-.195
98.00	4678.690	-.195
99.00	4678.370	-.320
100.00	4678.050	-.320

Elapsed time min	Press kPaA	dp/dt kPa/min
101.00	4293.000	-385.050
102.00	3929.145	-363.855
103.00	3565.290	-363.855
104.00	3253.620	-311.670
105.00	2966.610	-287.010
106.00	2704.150	-262.460
107.00	2464.790	-239.360
108.00	2249.070	-215.720
109.00	2054.070	-195.000
110.00	1877.350	-176.720
111.00	1715.930	-161.420
112.00	1567.950	-147.980
113.00	1431.460	-136.490
114.00	1304.450	-127.010
115.00	1190.320	-114.130
116.00	1082.430	-107.890
117.00	982.331	-100.099
118.00	890.212	-92.119
119.00	806.109	-84.103
120.00	729.399	-76.710
121.00	599.480	-129.919
122.00	459.545	-139.935
123.00	352.607	-106.938
124.00	271.973	-80.634
125.00	211.911	-60.062
126.00	168.084	-43.827
127.00	137.277	-30.807
128.00	117.129	-20.148
129.00	105.784	-11.345
130.00	102.117	-3.667
131.00	102.069	-.048
132.00	102.020	-.049
133.00	102.025	.005

PCI ET AL TWEED LAKE M-47

66.564 - 125.540
DST #1**APPENDIX A****A.1 PRETEST PLANNING PARAMETERS AND CALCULATIONS**

1 Surface temperature	283.150 deg K	measured
2 Average chamber temperature	283.950 deg K	(est. form temp + surf temp)/2
3 Chamber deviation factor(z)	.950	given
4 Sump volume	.395 m ³	calculated
5 Top packer depth	1212.000 mKB	given
6 Bottom packer depth	1227.000 mKB	given
7 Test valve depth	1205.000 mKB	given
8 Stick up above KB	5.000 mKB	given
9 Total chamber length	1202.050 m	given
10 Lower drill collar length	197.050 m	given
11 Lower drill collar ID	72.000 mm	given
12 Lower drill collar capacity	.00407 m ³ /m	calculated
13 Lower drill collar volume	.802 m ³	calculated
14 Upper drill collar length	0.000 m	given
15 Upper drill collar ID	0.000 mm	given
16 Upper drill collar capacity	0.00000 m ³ /m	calculated
17 Upper drill collar volume	0.000 m ³	calculated
18 Lower drill pipe length	1005.000 m	given
19 Lower drill pipe capacity	.00740 m ³ /m	given
20 Lower drill pipe volume	7.437 m ³	calculated
21 Upper drill pipe length	0.000 m	given
22 Upper drill pipe capacity	0.00000 m ³ /m	given
23 Upper drill pipe volume	0.000 m ³	calculated
24 Total chamber volume	8.239 m ³	total of tubular volumes
25 Water cushion length	0.000 m	measured
26 Water cushion volume	0.000 m ³	calculated
27 Net air/gas volume	8.239 m ³	calculated
28 Minimum time to produce sump volume	.660 min	calculated
29 Corresponding surface pressure increase	5.500 kPa	calculated

A.2 MAXIMUM POSSIBLE RATES OF dp/dt AND FLOW:

27 Gas	2870.388 kPa/min	340442.463 m ³ /d
28 Gas saturated water	18.835 kPa/min	1292.826 m ³ /d
29 Gas free water	7.935 kPa/min	861.884 m ³ /d

A.3 PRETEST PLANNING SUMMARY

From the above parameters it is clear that a surface pressure change greater than 2870.388 kPa/min would not occur during this test. Surface pressure changes greater than 18.835 kPa/min indicate hydrocarbon influx, and pressure changes less than 7.935 kPa/min may indicate liquid or low rate gas.

If gas is produced, a surface pressure increase of 1 kPa/min corresponds to 118.605 m³/d of gas influx to the chamber.

CALGARY COPY

GEOLOGICAL WELLSITE REPORT

FOR

P.C.I. CANTERRA

TWEED LAKE M-47

Prepared For

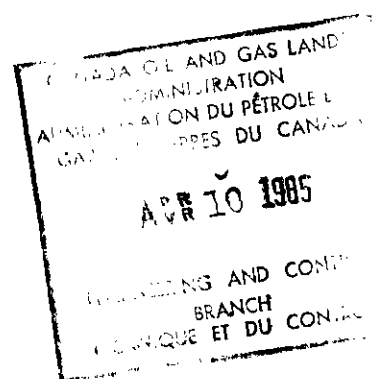
PETRO CANADA INCORPORATED

By

T. Vader

PRO GEO CONSULTANTS

February, 1985



PRO
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WELL SUMMARY

WELL NAME: P.C.I. Canterra Tweed Lake M-47

COORDINATES: N. Lat 66° 56' 47.11"; W. Long. 125° 54' 09.42"

LOCATION: Unit M, Section 47, Grid Area 67° 00' N; 125° 45' W

ELEVATIONS: Ground: 429.1m
KB: 435.22m

OPERATOR: Petro Canada Incorporated

DRILLING CONTRACTOR: Atco/Equitak #76

WELLSITE SUPERVISION: Toolpusher: D. Kennedy/D. Lauck
Engineer: M. Prichuk/Y. Hope
Geologist: T. Vader

WELL SPUDDED: 1300 hours 11/01/85

DRILLING COMPLETED: 14/02/85

BIT SIZES: Surface: 311mm
Downhole: 216mm

CASING SIZES: Surface: 244mm
Production: 178mm

TOTAL DEPTH: Driller: 1420m
Logger: 1420m

BOTTOM HOLE FORMATION: Proterozoic

CORES CUT: Core #1 1217 - 1224m; #2 1400 - 1409m; 34 sidewall

LOGS RUN: (1420 - 760m) DLL-MSFL, BHCS, CNL-LDT, NGT-AMS, SHDT, CST, WST; (760 - 64m) DIL-GR, LDT-GR-CAL; BHSC LSS-GR

DRILL STEM TESTS: DST #1 1212 - 1227 (Mt. Clarke)
DST #2 1188 - 1199 (Mt. Cap)
DST #3 1155 - 1170 (Mt. Cap)
DST #4 1221 - 1236 (Mt. Clarke)
DST #5 1209 - 1216.5 (Mt. Cap/Clarke)

RIG RELEASED: 1600 hours 24/02/85

WELL STATUS: Mt. Clarke Gaswell

DAILY SUMMARY

11/01/85 Prepare to spud
 Spud at 1300 hours
 Drill 311mm pilot hole to 15m with Bit #1A (HWX3A)

12/01/85 Drill 311mm pilot hole to 24m
 Pull out of hole
 Pick up 610mm hole opener
 Open hole to 610mm

13/01/85 Open hole to 610mm to 23m KB
 Pull out of hole
 Run 508mm conductor pipe
 Circulate conductor pipe
 Wait on cement

14/01/85 Wait on cement
 Drill out cement & shoe

15/01/85 Drill 445mm conductor hole to 47m with bit #2B
 (HW OSC 1GJ) (very rough drilling)
 Work on cellar pump and lines
 Pull out of hole for bit
 Run in hole with bit #3B (HW OW VJ) and drilling jars
 Drill ahead to 51m

16/01/85 Drill 445 mm hole to 64m (very rough drilling)
 Run wiper trip
 Circulate
 Pull out of hole to run conductor casing
 Run conductor casing
 Cement casing
 Wait on cement

17/01/85 Wait on cement
 Head up diverter system
 Re-drill mouse hole

18/01/85 Head up diverter system
 Pressure test hydril
 Drill out top plug
 Pull out of hole for plugged jets
 Drill cement, bottom plug and shoe
 Drill 311mm hole to 79m with Bit #4C (HW JD7)

19/01/85 Drill 311mm hole ahead to 145m
 Pull out of hole for bit
 Jars separated (left 3 drill collars and lower section of jars in hole)

20/01/85 Fish for collars and jars
Retrieve fish (7 hours fishing)
Run in hole with bit #5 (HWJD7)
Drill 311mm hole ahead to 215m

21/01/85 Drill 311mm hole ahead to 231m
Trip for bit
Run in hole with Bit #6C HW JD7
Drill ahead to 265m

22/02/85 Drill 311mm hole to 273m
Trip for bit and lost circulation
Run in hole with bit #7C (HW J-33)
Rig up air drilling equipment
Drill ahead with foam to 321m

23/01/85 Drill with stable foam to 428m

24/01/85 Repair air drilling equipment
Drill ahead to 467m
Thaw kelly and air drilling equipment
Drill ahead with stable foam to 494m

25/01/85 Drill ahead to 515m
Hoist for bit
Run in hole with bit #8C (HWJ-22)
Drill ahead to 544m

26/01/85 Drill ahead to 614m
Suspend drilling while levelling rig
Drill ahead to 620m

27/01/85 Drill ahead to 624m
Hoist for bit
Run in hole with bit #9C (HWJ-33)
Drill ahead to 671m

28/01/85 Drill ahead to 736m
Run 5 stand wiper trip
Drill ahead to 758m

29/01/85 Drill ahead to 760m
Blow hole clean
Run 5 stand wiper trip
Pull out of hole to log
Rig up loggers
Logging with Schlumberger
(DIL-GR; LDT-GR-CAL; BHCS LSS-GR)
Run in hole
Blow hole clean
Pull out of hole to run casing

30/01/85	Ran 61 joints surface casing Circulate casing Cement casing Wait on cement Rig out diverter system
31/01/85	Weld on casing bowl Head up BOP's Pressure test BOP's
01/02/85	Pressure test BOP's Run in hole Drill out DV Tool Plug Drill out cement from 204m - 334m with BIT #10D 216mm (HW J3)
02/02/85	Drill out cement to 760 Drill ahead to 763m Run Pressure Integrity Test Run Cement Bond Log
03/02/85	Run gyro survey Run in hole with drilling assembly & bit #11D (HW J-22) 216mm Displace hole to mud Drill ahead to 795m
04/02/85	Drill ahead to 997m
05/02/85	Drill ahead to 1118m
06/02/85	Drill ahead to 1159m Circulate sample Drill ahead to 1170m Circulate sample Drill ahead to 1172m Circulate sample Drill ahead to 1198m Circulate sample Drill ahead to 1204m
07/02/85	Drill ahead to 1217m Circulate sample Run 10 stand wiper trip Circulate bottoms up Hoist to pick up core barrel Run in hole with core barrel Core 171mm hole with CB #1 C201 to 1224m Hoist Core #1

08/02/85 Recover Core #1
Run in hole with Bit #13D (HW J07) 216mm
Repair high drum clutch
Ream rathole
Drill 216mm hole to 1227m
Circulate sample
Pull out of hole
Make up test tool
Run in hole with test tool
Run DST #1 1212 - 1217m

09/02/85 Run DST #1
Pull out of hole with test tool
Recover 65m SGCDM
Run in hole with Bit #14D (HW J-33) 216mm
Drill ahead to 1254m

10/02/85 Drill ahead to 1313m

11/02/85 Drill ahead to 1371m

12/02/85 Drill ahead to 1400m
Circulate sample
Run in hole with Bit 15D (RR) HW JD7 (216m) and junk sub

13/02/85 Circulate and condition mud and hole
Hoist to cut core #2
Run in hole with core barrel and bit #16D C201 diamond (171mm)
Cut core #2 1400 - 1409m
Pull out of hole
Recover Core #2
Run in hole with bit #17D (HW J-22) 216mm
Ream rathole

14/02/85 Ream rathole
Drill ahead to 1420m
Circulate bottoms up
Run 10 stand wiper trip
Circulate and condition hole
Pull out of hole to log
Logging with Schlumberger

15/02/85 Logging with Schlumberger

16/02/85 Logging with Schlumberger (velocity survey)
 Circulate and condition mud and hole
 Wait on orders
 Run in hole for DST #2
 Run DST #2 (1188 - 1199m)
 Recover DST #2

18/02/85 Make up test tool for DST #3 (1155 - 1170m)
 Run in hole with test tool
 Run DST #3
 Recover DST #3
 Wait on separator

19/02/85 Wait on separator?

20/02/85 Make up test tool and rig up surface testing equip-
 ment
 Run in hole for DST #4
 Run DST #4 (1221m - 1236m)

21/02/85 Run DST #4
 Recover DST #4
 Make up test tools and equipment for DST #5
 Run in hole for DST #5
 Run DST #5 (1209 - 1216.5m)

22/02/85 Run DST #5
 Recover DST #5
 Run in hole
 Circulate and condition hole and mud prior to running
 casing

23/02/85 Circulate and condition hole
 Pull out of hole and lay down drill pipe and collars
 Rig up and run casing
 Cement casing
 Wait on cement
 Nipple down BOP's

24/02/85 Rig out BOP's and install wellhead
 Release rig at 1600 hours

CASING SUMMARY

Surface Casing

Ran 61 joints 244mm, L80, 60kg/m surface casing. Cemented by Dowell with 68 tonnes Class "G" Oilwell cement plus 2% CaCl_2 in stage 2. Landed at 760.00m. Plug down at 30/01/85 1233 and 1334 hours. Good cement returns to surface.

2 stage cement job. DV tool at 45m KB.

Cement top on first stage at 371m K.B.

Cement top on second state at surface.

Production Casing

Ran 109 joints 178mm, 43 kg/m, 500-95, 8RD, LTC, Rge 3 production casing. Cemented by Dowell with 46.0 tonnes Class "G" followed by 7 tonnes Class "G" + 2.5% CaCl_2 . Landed at 1418.0m. Plug down at 2223 hours 23/02.85. Good cement returns to surface.



DRILL STEM TEST REPORT

Date: 85 (Yr) 02 (Mo) 08 (d)

Well Name : P.C.I. CANTERRA Location : TWEED LAKE M-47
DST No. : 1 Formation : MT. CAP or MT. CLARKE
Test Intv. (KB) : 1212 m to 1227 m Testing Co. : LYNES UNITED
KB elevation : 435.22 m Water cushion : NONE m

Preflow: 85 (min) ISI: 90 (min) VO: 20 (min) FSI: 120 (min) Nature of Blow: STRONG BLOW

Recovery Details: 65 m of column, DRILLING FLUID (SLIGHTLY GAS CUT)

CLOSED CHAMBER.

Time/(min)	Q/(m ³ or dam ³)	Time/(min)	Q/(m ³ or dam ³)	NaCl salinity/(mg/l)
<u>0</u>	<u>0</u>	<u>12</u>	<u>21,913</u>	top : <u>120,000</u>
<u>2</u>	<u>24,830</u>	<u>14</u>	<u>21,049</u>	middle : <u>120,000</u>
<u>4</u>	<u>30,179</u>	<u>16</u>	<u>12,725</u>	bottom : <u>120,000</u>
<u>6</u>	<u>27,415</u>	<u>18</u>	<u>18,777</u>	
<u>8</u>	<u>25,031</u>	<u>20</u>	<u>18,389</u>	
<u>10</u>	<u>12,459</u>			

Pressures in kPa; reported from gauge No.:

IHP: 15236 FHP: 15155 IPFP: 1987 FFPF: 1987 Did the FSIP level? YES
IFP: 2401 FFP: 5528 ISIP: 12765 FSIP: 12765 BHT: 11 °C

Straddle Test: Does bottom gauge show that bottom packer held? Yes/No

Mud type: SALT SAT GEL/CHEM K.B. - GL. : 632 m Dr.P. OD : 114 mm
visc.: 41 s/L Main H D : 216 mm Dr.P. ID : 97 mm
W. Loss: 14.0 cm³ Rat H D : - mm Top.H.Ch : 6.35 mm
density : 1275 kg/m³ Csg I D : 224 mm Bot.H.Ch : 12.70 mm
filtr. sal: - mg/L Surface Csg. landed at : 760 m KB

Drill Collars: Total length above tool: 197.05 m, Dr.C. ID : 72 mm

DST type : BTTN HOLE CONVENTIONAL Did the mud drop in the annulus? Yes ☒ No
Time record : Start in 18:30 On bottom 21:50 Open 1st preflow 22:00
(24h clock) Close for ISI 22:05 Start 2nd fl(VO) 23:35 Close for FSI 23:55
Pull Loose 01:55 Out of Hole 06:00

Were samples of recovery caught? YES Sent to? CORE LABSTest mechanically satisfactory: YESRemarks: CLOSED CHAMBER TEST

Geologist: T. VADER Engineer: Y. HOPE

DRILL STEM TEST #2

1188 - 1199m Formation - Mt. Cap Type: Inflate Straddle

TIMES: PF: 5 minutes
 ISI: 86 minutes
 FF: 212 minutes
 Closed Chamber: 139 minutes
 Flow to surface: 63 minutes
 FSI: 600 minutes

PREFLOW: closed chamber
VO: closed chamber
RECOVERY: 35m gas cut mud
HP: 15018 / 15018 kPa
SIP: 12549 / 12725 kPa
FP: 347 / 434 kPa

Of the final flow period, 139 minutes was a closed chamber test. The final 63 minutes was open to surface. When the tool was opened to surface the flow rapidly dropped to TSTM.

Date 85 (Yr) 02 (Mo) 18 (d)

Well Name PLS. ET. AL. TWEED LN Location M. 47
 DST No. THREE Formation MT. CAP
 Test Intv. (KB) 1155 m to 1170 m Testing Co. LYNE'S UNITED
 KB elevation 435.22 m Water cushion NONE m

Preflow: 5 (min) ISI: 120 (min) VO: 60 (min) FSI: 180 (min) Nature of Blow: WEAK BUILDING

Recovery Details: 10 m of column, DRILLING MUD

Time/(min)	Q/(m ³ or dam ³)	Time/(min)	Q/(m ³ or dam ³)	NaCl salinity/(mg/l)
				top
				middle
				bottom

Pressures in kPa; reported from gauge No.: 13480

IHP: 14906 FHP: 14906 IFFP: 331 FFFP: 331 Did the FSIP level? NO
 IFP: 331 FFP: 497 ISIP: 911 FSIP: 993 BHT: 7 °C

Straddle Test: Does bottom gauge show that bottom packer held? Yes No

Mud type: SALT K.B. GL: 6.12 m Dr.P. OD: 114 mm
 visc.: 56 s/L Main H D: 216 mm Dr.P. ID: 97 mm
 W. Loss: 12.4 cm³ Rat H D: 216 mm Top.H.Ch: 6.35 mm
 density: 1265 kg/m³ Csg I D: 223 mm Bot.H.Ch: 25.4 mm
 filtr. sal: _____ mg/L Surface Csg. landed at: 760 m KB

Drill Collars: Total length above tool: 85.58 m, Dr C. ID: 72 mm

DST type: INFLATE STRADDLE Did the mud drop in the annulus? Yes NO

Time record: (24h clock) Start in 01:30 On bottom 06:00 Open 1st preflow 07:46
 Close for ISI 07:52 Start 2nd fl(VO) 10:05 Close for FSI 11:12
 Pull Loose 14:40 Out of Hole 17:00

Were samples of recovery caught? YES Sent to: CORE LAB
 Test mechanically satisfactory: YES

Remarks: _____

Geologist: _____ Engineer: Richard P. Smith



DRILL STEM TEST REPORT

Date: 85 (Yr) 02 (Mo) 21 (d)

Well Name : PC-1 ET AL TWEED LK Location : M-47
 DST No. : FOUR Formation : MT CLARK
 Test Intv. (KB) : 1221 m to 1236 m Testing Co. : LYNE'S UNITED
 KB elevation : 435.22 m Water cushion : NONE m

Preflow: 5 (min) ISI: 120 (min) VO: 420 (min) FSI: 960 (min) Nature of Blow: STRONG G.T.S 4 MIN

Recovery Details: 170 m of column, CONDENSATE

Time/(min)	Q/(m ³ or dam ³)	Time/(min)	Q/(m ³ or dam ³)	NaCl salinity/(mg/l)
				top : _____
				middle : _____
				bottom : _____

Pressures in kPa; reported from gauge No.: 13480

IHP: 15562 FHP: 15562 IFFP: 2730 FFFP: 2730 Did the FSI level? YES
 IFP: 3717 FFP: 9092 ISIP: 12765 FSIP: 12765 BHT: 5.8 °C

Straddle Test: Does bottom gauge show that bottom packer held? ☒ Yes ☐ No

Mud type: SALT K.B. - GL : 6.12 m Dr.P. Op : 114 mm
 visc.: 56 s/L Main H.D. : 216 mm Dr.P. ID : 97 mm
 W. Loss: 13 cm³ Rat H.D. : 216 mm Top.H.Ch : _____ mm
 density : 1270 kg/m³ Csg ID : 223 mm Bot.H.Ch : 25.4 mm
 filtr. sal: _____ mg/L Surface Csg landed at : 760 m KB

Drill Collars: Total length above tool: 85.58 m, Dr.C. ID : 72 mmDST type : WELATE STADDLE Did the mud drop in the annulus? Yes ☐ No ☒

Time record : Start in 14:25 On bottom 17:00 Open 1st preflow 17:31
 (24h clock) Close for ISI 17:36 Start 2nd fl(VO) 19:36 Close for FSI 02:36
 Pull Loose 18:36 Out of Hole 01:00

Were samples of recovery caught? YES Sent to? CORE LABTest mechanically satisfactory: YES

Remarks: _____

Geologist: _____ Engineer: Michael Rischke



DRILL STEM TEST REPORT

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Date: 8.5 (Yr) 02 (Mo) 22 (d)

Well Name: RET EX AL TWEED LK Location: M-417
DST No.: FIVE Formation: MT CLARK
Test Intv. (KB): 1209 m to 1216.5 m Testing Co.: LYNES UNITED
KB elevation: 435.22 m Water cushion: NONE m

Preflow: 5 (min) ISI: 120 (min) VO: 240 (min) FSI: 480 (min) Nature of Blow: WEAK BLOWING TO STRONG

Recovery Details: 35 m of column, GAS CUT DRILLING MUD

Time/(min)	Q/(m ³ or dam ³)	Time/(min)	Q/(m ³ or dam ³)	NaCl salinity/(mg/l)
				top
				middle
				bottom

Pressures in kPa: reported from gauge No.: 14103

IHP: 15625 FHP: 15446 IPFP: 535 FFPF: 535 Did the FSIP level? YES
IFP: 609 FFP: 724 ISIP: 12761 FSIP: 12785 BHT: _____ °C

Straddle Test: Does bottom gauge show that bottom packer held? Yes/No

Mud type: SALT K.B. - GL: 6.12 m Dr.P. OD: 114 mm
visc.: 57 s/L Main H D: 216 mm Dr.P. ID: 97 mm
W. Loss: 13 cm³ Rat H D: 216 mm Top.H.Ch: 9.25 - 3.175 mm
density: 1270 kg/m³ Csg I D: 223 mm Bot.H.Ch: 25.4 mm
filtr. sal: _____ mg/L Surface Csg. landed at: 760 m KB

Drill Collars: Total length above tool: 96.14 m, Dr.C. ID: 72 mm

DST type: INFLATE STRADDLE Did the mud drop in the annulus? Yes/No (No)

Time record: (24h clock) Start in 14:40 On bottom 17:05 Open 1st preflow 17:31

Close for ISI 17:36 Start 2nd fl(VO) 19:36 Close for FSI 23:36

Pull Loose 07:36 Out of Hole 13:00

Were samples of recovery caught? YES Sent to? CORE LAB

Test mechanically satisfactory: YES

Remarks: _____

Geologist: _____ Engineer: Michael Macdonald

GEOLOGICAL SUMMARY

P.C.I. Canterra Tweed Lake M-47 was drilled as an exploration hole to evaluate the Cambrian sands in the Colville Lake area, Northwest Territories. The main zone of interest was the Mount Clarke formation consisting primarily of sandstones with minor interbedded shales. The secondary zone of interest was the Mount Cap formation consisting of silts, shales, sands, and dolomites, all finely interbedded.

The upper half of this well was drilled in the Ronning Group which consists of porous and fractured cherty dolomite. Total lost circulation was encountered in this zone at 273 meters. Drilling with stable foam was then continued to 760 meters. While drilling with foam the well was producing fresh water to a drilled depth of 760m. The lower part of the Ronning Group consisted of a tight, medium to dark grey/brown argillaceous dolomite with occasional green shale partings and bands. The lower contact with the conformably underlying Saline River Formation is somewhat gradational.

The Saline River formation shows as interbedded green and red shales with occasional bands of argillaceous dolomite. Forty-five meters into the Saline River Formation massive salt beds occur. Penetration rates in the Saline River are quite fast so there is not a great change when the salt is penetrated. The drilling mud was not saturated when we drilled into the salt and the drilled salt immediately dissolved. A chlorides check of the drilling mud confirmed we were drilling in the salt. Interbedded within the salt are occasional bands and stringers of shale, dolomite and anhydrite.

The Mount Cap formation consists of interbedded shale, dolomite, and anhydrite near the top and some limestone bands in the upper to middle section of the formation. The lower part of the Mount Cap shows as interbedded shales, dolomites and occasional siltstones.

The shales and dolomites in the middle and lower sections of the formation are commonly bitumen engrained and occasionally grade to siltstones. Good gas shows were observed in thin siltstone banks in the lower Mount Cap. The siltstones were white to cream in color and grain sizes were from silt to very fine grained. The grains were cemented with silica and minor calcite and had a slightly argillaceous to very argillaceous matrix. Poor to occasionally fair effective porosity was observed in these sands. Minor shows of weak yellow fluorescence, traces of fast weak green massive cut and high total gas shows and gas detection equipment were all observed. The gas chromatograph showed the gasses to be mainly methane and ethane with only traces of heavier gases.

The Mount Clarke Formation was picked as the first distinct sandstone observed in samples. The uppermost Mount Clarke sandstone was cream to light/grey brown, very fine to fine grained, sub angular, well sorted and slightly argillaceous. The sand exhibited fair intergranular porosity, common live oil staining, common weak yellow fluorescence, and a fast pale green massive cut. Occasionally the sand was slightly plugged with minor amounts of bitumen. Good total gas shows were also observed on the hotwire and gas chromatograph. Porosity increased to good with depth in the sand as well as the intensity of the visual shows. A seven meter core was then cut. Coring was discontinued after seven meters due to slow penetration rates and an abnormally high standpipe pressure. After observing the core it was decided to drill ahead for 3 meters and then run a bottom hole conventional drill stem test. The test was run as a closed chamber test and gas production rates approaching 1 mmcf/day were experienced. It was then decided to return to drilling.

The main body of sand was then drilled up and showed in cuttings samples as a light grey, very fine to occasionally coarse grained quartz sand. Porosity was fair to good throughout the sand and live oil staining, weak yellow fluorescence and a slow weak yellow green massive cut were observed in samples. Moderate shows were also noted on the total gas detector and on the gas chromatograph.

Immediately below the main Mount Clarke sand the Proterozoic was encountered. The Proterozoic showed in samples as interbedded sands and shales predominantly reddish/brown in color with occasional partings, blebs and bands of dolomite. The sand appeared to be of a sub-greywacke nature with no effective intergranular porosity or hydrocarbon shows.

A core was cut near total depth to further study the Pre Cambrian environment and determine its effects on hydrocarbon potential for the area. No sand was observed in the nine meter core but occasionally vague sandstone textures and bedding features could be seen. No individual sand grains were observed in the zones with a sandy texture. The shale in the core was very hard and had been fractured vertically and horizontally with the fractures subsequently infilled by calcite or dolomite. Blebs of dolomite were also present throughout the core as well as blebs of a green/black mineral (possibly chlorite). The entire appearance of the core led me to believe that this section of the proterozoic had been exposed to some degree of high grade diagenesis.

Drilling was continued for another eleven meters and final total depth was established at 1420 meters.

After an extensive logging program a velocity survey and sidewall cores were run. An extensive testing program was then run with favorable results in gas production and some condensate production from the main Mount Clarke sand. Casing was then run on this well.

An interesting post script note on this well is that the maximum bottom hole temperature for this well only reached 16°C. This temperature is well below a normal temperature gradient for a total depth of 1420m.

FORMATION TOPS

<u>FORMATION</u>	<u>SAMPLE</u>		<u>LOG</u>	
	<u>Depth</u>	<u>Subsea</u>	<u>Depth</u>	<u>Subsea</u>
Bear Rock	-	-	-	-
Ronning Group	20m	415.22	-	-
Saline River	723	-287.78	718.00	-282.78
Salt Member	845	-409.78	763.00	-327.78
Mt. Cap	1003	-567.78	1001.00	-565.78
Mt. Clarke	1212	-776.78	1192.00	-756.78
Proterozoic				
(Clastic Sequence)	1235	-799.78	1235.00	-799.78
(Carbonate Sequence)	-	-	-	-
F.T.D.	1420	-984.78	1420.00	-984.78

SAMPLE DESCRIPTIONS

<u>Depth</u>	<u>Description</u>
25 - 37m	<u>Dolomite</u> ; cream to light brown, very fine crystalline, subhedral, slightly iron stained(?), common chert grains and fragments included, sucrosic texture poor to occasional fair intercrystalline porosity.
37 - 51m	<u>Dolomite</u> ; light grey, cryptocrystalline to occasionally very fine crystalline, dolomite cement anhedral to subhedral very poor intercrystalline porosity, common chert grains and bands included and common beds of: <u>Chert</u> : massive, white to light grey, translucent, occasional rounded grains.

- 51 - 64m Dolomite; white to light brown, cryptocrystalline to very fine crystalline, dolomite cement, sucro-sic texture in part, tight to very poor inter-crystalline porosity with comon beds of Chert; clear, white to light grey, angular frag-ments, translucent, abundant rounded quartz and chert grains, fine grained; clear - light grey, (possibly from sand stringers or from uphole due to conductor pipe washout).
- 64 - 84m Dolomite; white to light grey, microcrystalline to medium crystalline, occasionally coarse crys-talline, subhedral, dolomite cement, poor to fair intercrystalline and vuggy porosity; traces of Chert; silicified dolomite, white to light grey, translucent, angular fragments, hard, trace of pyrite.
- 84 - 97m Dolomite: white to light grey, cryptocrystalline to fine crystalline, occasionally medium crystal-line, subhedral, dolomite cement, poor to fair intercrystalline porosity, trace of vuggy porosi-ty, minor bands of Chert as above.
- 97 - 112m Dolomite; white to light grey, cryptocrystalline to micro-crystalline, commonly verky fine crystalline, dolomite cement, anhedral, very poor intercrystalline porosity, minor fracture porosity with minor Chert as above.
- 112 - 121m Dolomite; white to light grey, cryptocrystalline to microcrystalline, occasionally meidum crystalline, vitreous lustre, dolomite cement, tight to poor intercrystalline porosity, minor fracture porosity, common clear quartz and white chert veining associated with fractures, and minor bands of Chert; white to light grey, silicified dolo-mite/metasomatic, translucent, hard, angular fragments.
- 121 - 128m Dolomite; as above with common thin bands of Chert as above
- 128 - 136 Dolomite; white to light grey, cryptocrystalline to very fine crystalline, vitreous lustre, dolomite cement tight to poor intercrystalline porosity, trace of vuggy and fracture porosity, minor quartz and chert veining associated with fractures; and common bands of pockets of Chert; white to light grey, metasomatic, hard, angular fragments.

- 136 - 162m Dolomite: white to cream, occasionally light grey, microcrystalline to fine crystalline, occasionally medium crystalline, dolomite cement, silica cement, subhedral, poor to occasionally fair intercrystalline, fracture and vuggy porosity; with minor
Chert; white to cream, metasomatic, associated with fractures?, translucent to opaque, occasionally laminate, occasional quartz crystals and quartz rhombohedral pseudomorphs
- 162 - 182m Dolomite; cream to light grey, microcrystalline to fine crystalline, occasionally medium crystalline, dolomite cement, silica cement, subhedral, occasional rhombs, slightly argillaceous in part, poor to occasionally fair intercrystalline, fracture and vuggy porosity, trace of pyrite, with common bands of
Chert; white to cream, metasomatic, opaque, occasionally laminate, rare quartz crystals and rhombohedral pseudomorphs.
- 182 - 188m Dolomite; cream, occasionally light grey, very fine crystalline to fine crystalline, occasionally medium crystalline, subhedral, dolomite cement, silica cement, trace of anhydrite cement, slightly argillaceous in part, poor intergranular fracture and vuggy porosity, frequently lining fractures and vugs is
Chert; white to cream, light grey, metasomatic, translucent to opaque, occasionally laminated, occasional quartz crystals and pseudomorphs.
- 188 - 194m Dolomite; cream, light grey, white, fine crystalline to medium crystalline, subhedral, dolomite cement, silica cement, trace of anhydrite cement, slightly argillaceous in part, tight to poor fracture and vuggy porosity trace of interscler porosity; with veins of chert as above.
- 194 - 210m Dolomite; white, cream to light grey, microcrystalline to fine crystalline, occasionally medium crystalline, subhedral, dolomite cement, silica cement, trace of anhydrite cement, poor to occasionally fair intercrystalline fracture and buggly porosity with minor veins of metasomatic
Chert as above.

- 210 - 215m Dolomite; cream to light grey, very fine to medium crystalline, subhedral, dolomite cement, minor silica cement, slightly argillaceous in part, poor fracture, vuggy and intercrystalline porosity with minor veins of Chert; white to cream, light grey, metasomatic, translucent to opaque, occasionally laminated, occasional quartz crystals.
- 215 - 231m Dolomite; cream to tan, very fine to fine crystalline, sucrosic texture in part, dolomite cement, subhedral, poor intercrystalline, fracture and vuggy porosity, with a trace of chert as above.
- 231 - 236m Dolomite; cream to tan, very fine to medium crystalline, sucrosic texture in part, occasionally coarse crystalline dolomite rhombs, dolomite cement, trace of silica cement in fractures and vugs, subhedral, poor intercrystalline, fracture and vuggy porosity with a trace of chert and quartz crystals.
- 236 - 243m Dolomite; tan to light brown, microcrystalline, sucrosic, dolomite cement, subhedral, tight to poor intercrystalline porosity.
- 243 - 253m Dolomite; tan to light brown, light to medium grey in part, fine crystalline to medium crystalline, medium crystalline in part, subhedral, dolomite cement, tight to poor intercrystalline fracture and vuggy porosity.
- 252 - 262m Dolomite; cream to light brown, cryptocrystalline to microcrystalline, dolomite cement, vitreous lustre in part, dolomite cement, slightly argillaceous in part, tight to poor intercrystalline porosity, minor vuggy and fracture porosity.
- 262 - 268m Dolomite; cream to tan, light grey in part, very fine crystalline, sucrosic in part, dolomite cement, slightly argillaceous in part, tight to poor intercrystalline porosity.
- 268 - 276m Dolomite; as above, with minor microcrystalline dolomite and traces of grey green dolomitic shale, traces of orange iron stained dolomite, probable good fracture porosity (lost circulation at 273m - switched to foam drilling).

- 276 - 286m Dolomite; cream to tan, light grey/brown, crypto-crystalline to very fine crystalline, sucrosic in part, vitreous lustre in part, subhedral, dolomite cement, tight to poor intercrystalline porosity, probable fracture porosity.
- 286 - 304m Dolomite; tan, fine to medium crystalline occasionally coarse crystalline, subhedral, dolomite cement, trace of pyrite cement, vitreous lustre, poor to fair fracture, vuggy and intercrystalline porosity.
- 304 - 310m Dolomite; cream to tan, fine to medium crystalline, occasionally coarse crystalline, subhedral, dolomite cement, trace of pyrite cement, vitreous lustre, fair vug and fracture porosity, minor intercrystalline porosity, trace of grey green dolomitic shale, trace of grey/green argillaceous siltstone.
- 310 - 316m Dolomite; cream to tan, as above
- 316 - 322m Dolomite; tan to light grey/brown, microcrystalline to fine crystalline, occasionally medium crystalline, subhedral, dolomite cement, trace of pyrite cement, vitreous lustre poor to fair vuggy and fracture porosity, minor intercrystalline porosity, trace of siliceous oolites.
- 32 - 327m Dolomite; tan to light grey/brown, fine to medium crystalline, subhedral, dolomite cement, vitreous lustre, poor to fair intercrystalline porosity, minor vuggy and fracture porosity.
- 327 - 343m Dolomite; cream to tan, light grey/brown in part, microcrystalline to very fine crystalline, dolomite cement, vitreous lustre in part, sucrosic in part, poor to occasionally fair intercrystalline porosity, minor vuggy and fracture porosity.
- 343 - 360m Dolomite; cream to light brown, microcrystalline, dolomite cement, vitreous lustre in part, sucrosic in part, slightly argillaceous in part, dolomite cement, poor intercrystalline porosity, trace of vuggy and fracture porosity, trace of siliceous oolites.

- 360 - 374m Dolomite; cream to light brown, microcrystalline, occasionally fine to medium crystalline, dolomite cement, vitreous lustre in part, sucrosic texture in part, poor intercrystalline porosity, minor vuggy and fracture porosity, trace of chert, trace of light grey/green, light - medium grey shale partings.
- 374 - 392m Dolomite; tan to light brown, cryptocrystalline to microcrystalline, occasionally fine crystalline, vitreous lustre in part, sucrosic texture in part, dolomite cement, poor intercrystalline porosity, minor vuggy porosity; with common partings of
Shale; light grey/green, medium grey, blocky to sub fissile, slightly dolomitic.
- 392 - 404m Dolomite; cream to medium brown, microcrystalline to fine crystalline, vitreous lustre, dolomite cement, subhedral, slightly argillaceous in part, tight to poor intercrystalline porosity, trace of vuggy porosity; with common partings of
Shale; light to dark grey/green, medium grey/brown, blocky, dolomitic in part.
- 404 - 417m Dolomite; tan to light brown, cryptocrystalline to very fine crystalline, dolomite cement, subhedral, slightly argillaceous in part, tight to poor intercrystalline porosity, trace of vuggy porosity, with minor partings of;
Shale; as above, and traces of grey/green dolomitic siltstone.
- 417 - 429m Dolomite; cream to light brown, microcrystalline, occasionally fine crystalline, dolomite cement subhedral, vitreous lustre in part, micro-sucrosic in part, tight to very poor intercrystalline porosity, trace of vuggy and fracture porosity with rare veins of
Chert; white to clear, opaque to translucent, minor disseminated pyrite inclusions in part, traces of grey/green shale and siltstone.
- 429 - 446m Dolomite; white to cream, light to medium brown in part, cryptocrystalline to microcrystalline, occasionally fine to medium crystalline, subhedral, dolomite cement, trace of calcite cement, trace of pyrite cement, tight to poor intercrystalline porosity, trace of vuggy and fracture porosity with common partings of

- 429 - 446m
(cont'd) Shale; light to medium grey, grey/green, blocky, soft, slightly dolomitic, slightly silty in part, traces of metasomatic chert, traces of slightly dolomitic grey/green siltstone.
- 446 - 458m Dolomite; cream to light grey, light brown, microcrystalline, common fine to medium crystalline, subhedral to occasionally subhedral, dolomite cement, trace of calcite cement, trace of yrite cement, slightly argillaceous in part, tight to poor vuggy and fracture porosity, minor intercrystalline porosity with common partings of Shale; light grey/green, blocky, soft, minor disseminated pyrite, slightly silty, slightly dolomitic, with rare veins and pockets of metasomatic chert.
- 458 - 473m Dolomite; tan to medium grey/brown, cryptocrystalline, occasionally fine to medium crystalline, subhedral to occasionally euhedral, dolomite cement, trace of calcite cement, slightly argillaceous in part, tight to poor vuggy and fracture porosity, trace of intercrystalline porosity, with rare partings of grey/green, slightly dolomitic shale and rare veins or pockets of metasomatic chert.
- 473 - 477m Dolomite; cream to tan, fine to medium crystalline, subhedral, dolomite cement, trace of pyrite cement, poor vug and fracture porosity, minor intercrystalline porosity with common partings of Shale; bright green, soft, blocky, waxy lustre and Shale; light grey/green, blocky, soft, silty in part, slightly dolomitic and traces of metasomatic chert.
- 477 - 486m Dolomite; cream to light grey/brown, microcrystalline, occasionally fine to medium crystalline, subhedral, dolomite cement, trace of calcite cement, slightly argillaceous, slightly silty in part, tight to very poor vug and fracture porosity, trace of intercrystalline porosity with minor partings of Shale; light to medium grey/green, blocky, soft, silty in part, dolomitic in part, with rare veins or pockets of metasomatic chert within the dolomite.

- 486 - 507m Dolomite; cream to tan, microcrystalline to medium crystalline, subhedral, dolomite cement, trace of calcite cement, trace of pyrite cement, slightly silty in part, tight to poor vug and fracture porosity, trace of intercrystalline porosity, with occasional veins of Chert; white to light grey, clear, metasomatic, opaque to translucent, banded in part, and occasional partings of Shale; light to medium grey/green, blocky, waxy lustre in part, slightly silty in part, slightly dolomitic, trace of pyrite.
- 507 - 514m Dolomite; cream to light brown, cryptocrystalline to microcrystalline occasionally very fine to medium crystalline, subhedral, dolomite cement, trace of calcite cement, trace of pyrite cement, tight to poor fracture and vuggy porosity, with common bands of Shale; light grey, light to medium grey/green, blocky, soft, waxy in part, silty in part, slightly dolomitic in part, with occasional veins and/or pockets of chert.
- 514 - 520m Dolomite; tan to light grey/brown, cryptocrystalline, dolomitic cement, trace of calcite cement, slightly argillaceous, tight, trace of shale partings.
- 520 - 527m Dolomite; tan to medium brown, cryptocrystalline to very fine crystalline, dolomite cement, trace of calcite cement, slightly argillaceous, tight to poor vug and fracture porosity, trace of chert veining, trace of shale partings.
- 527 - 542m Dolomite; cream to medium brown, cryptocrystalline to medium crystalline, dolomite cement, trace of calcite cement, slightly argillaceous in part, tight to poor vuggy and fracture porosity, trace of intercrystalline porosity, traces of chert and grey/green silty dolomitic shale.
- 542 - 565m Dolomite; tan to medium brown, crykptocrystalline to microcrystalline, occasionally very fine crystalline, dolomite cement, trce of calcite cement, slightly argillaceous in part, tight, rare veins of metasomatic chert, and rare partings of grey/green, brown dolomitic shale.

- 565 - 585m Dolomite; tan to medium brown, cryptocrystalline to microcrystalline, occasionally very fine to fine crystalline, dolomite cement, trace of calcite cement, slightly argillaceous in part, tight, trace of shale partings.
- 585 - 592m Dolomite; cream to light brown, microcrystalline to medium crystalline, subhedral to euhedral in part, dolomite cement, trace of calcite cement, trace of pyrite cement, poor to occasionally fair vug and fracture porosity, minor intercrystalline porosity, trace of metasomatic chert veining and lining vugs with occasional siliceous oolites.
- 592 - 602m Dolomite; as above, with common bands and partings of Shale; light grey, light to medium grey/green, blocky, soft, silty in part, dolomitic.
- 602 - 615m Dolomite; cream to medium brown, cryptocrystalline to very fine crystalline, commonly fine to medium crystalline, subhedral, dolomite cement, trace of calcite cement, slightly argillaceous in part, poor to occasional fair vug and fracture porosity, trace of intercrystalline porosity, with common bands and partings of Shale light grey, light to medium grey/green, blocky, soft, silty in part, dolomitic in part, traces of disseminated pyrite, slightly bentonitic; with rare veins and vug linings of metasomatic chert with rare siliceous oolites.
- 615 - 624m Dolomite; cream to light grey, light grey/brown, cryptocrystalline to microcrystalline, occasionally to commonly very fine to fine crystalline, subhedral, dolomite cement, trace of calcite cement, slightly argillaceous in part, tight to occasional poor vuggy and fracture porosity, trace of intercrystalline porosity, with common bands and partings of Shale; light grey, light to medium grey/green, blocky, soft, silty in part, dolomitic in part; rare chert veining.
- 624 - 636m Dolomite; cream to light grey/brown, cryptocrystalline to fine crystalline, dolomite cement, trace of calcite cement, slightly argillaceous in part, tight to poor vug and fracture porosity with a trace of intercrystalline porosity; and common partings and thin bands of

- 624 - 636m
(cont'd) Shale; light grey, light to medium grey/green, green, blocky, soft, silty in part, dolomitic in part, with rare chert veining and lining vugs.
- 636 - 645m Dolomite; cream to light grey, light grey/brown, cryptocrystalline to microcrystalline, dolomite cement, common calcite cement, slightly argillaceous in part, tight with traces of shale and chert.
- 645 - 655m Dolomite; tan to medium brown, cryptocrystalline, occasionally very fine to fine crystalline, dolomite cement, trace of calcite cement, slightly argillaceous in part, tight to occasional poor vug and fracture porosity, trace of shale.
- 655 - 664m Dolomite; cream to medium brown, cryptocrystalline, commonly very fine to fine crystalline, rarely medium crystalline, dolomite cement, trace of calcite cement, slightly argillaceous in part, tight to occasional poor vug and fracture porosity, trace of intercrystalline porosity, common light grey, light grey/green dolomitic shale partings, trace of white to clear metasomatic chert.
- 664 - 671m Dolomite; light to medium brown, cryptocrystalline, dolomite cement, trace of calcite, slightly argillaceous to argillaceous, tight, trace of dark brown shale partings.
- 671 - 675m Dolomite; tan to medium brown, cryptocrystalline, occasionally fine crystalline, dolomite cement, calcite cement, slightly argillaceous, tight to occasionally poor vug and fracture porosity, common dark green shale partings trace of metasomatic chert.
- 675 - 688m Dolomite; light to medium grey/brown, cryptocrystalline to microcrystalline, dolomite cement, trace of calcite cement, slightly argillaceous to very argillaceous, grades to shale in part, tight, occasional medium grey/green dolomitic shale partings.

- 688 - 703m Dolomite; medium to dark grey/brown cryptocrystalline to occasionally microcrystalline, dolomite cement, trace of calcite cement, argillaceous to very argillaceous grades to dolomitic shale in part, tight, with common bands and partings of
Shale; medium to dark grey/green, blocky, moderately soft, slightly dolomitic.
- 703 - 718m Dolomite; medium to dark grey/brown, cryptocrystalline, dolomite cement, trace of calcite cement, argillaceous to very argillaceous, grades to dolomitic shale in part, tight, with common bands and partings of
Shale; medium to dark grey/green, blocky, moderately soft, slightly dolomitic in part, trace of disseminated pyrite, slightly bentonitic in part.
- 718 - 723m Dolomite; medium to dark grey/brown, cryptocrystalline to microcrystalline, dolomite cement, trace of calcite cement, slightly argillaceous to very argillaceous, grades to dolomitic shale in part, tight, with abundant bands and partings of;
Shale; medium to dark grey/green, blocky, soft, slightly dolomitic in part, traces of disseminated pyrite, slightly bentonitic.
- SALINE RIVER FORMATION 723m (-287.78m)
- 723 - 727m Shale; as above
- 727 - 737m Shale red, red/brown, light to medium grey/green, green, blocky, moderately soft, slightly dolomitic, bentonitic in part; with common bands of
Dolomite; light to medium brown, cryptocrystalline to microcrystalline, dolomite cement, trace of calcite cement, slightly argillaceous, tight.
- 737 - 745m Interbeds of Shale; as above, and
Dolomite; as above with occasional fine crystalline texture and poor porosity (very poor samples after wiper trip).
- 745 - 750m Interbeds of mainly Dolomite; tan to light brown, cryptocrystalline, occasional micro to medium crystalline, subhedral, dolomite cement, trace of calcite cement, slightly argillaceous in part, tight to occasional poor vug and fracture porosity; and
Shale; dark red/brown, bright green, light grey/green, blocky, moderately soft, dolomitic in part, bentonitic in part.

- 750 - 760m Interbeds of Dolomite; as above and Shale; light grey/green, and greenish grey, dark brownish red, blocky, soft, dolomitic in part, bentonitic in part, trace of disseminated pyrite.
- 760 - 780m Interbeds and Interlamination of Dolomite; cream to light grey, medium brown, orange, cryptocrystalline to microcrystalline, occasionally fine crystalline, dolomite cement, minor anhydrite cement, slightly argillaceous to very argillaceous in part, grades to dolomitic shale in part, tight, and Shale; green, grey/green, chocolate brown, blocky, dolomitic in part, waxy in part, trace of salt casts in part, grades to argillaceous dolomite in part, possible thin bands of massive salt, occasional laminae of massive anhydrite.
- 780 - 787m Shale; light grey/green, green, sub fissile - fissile, dolomitic in part, common anhydrite cement, waxy in part, grades to argillaceous dolomite in part, with minor bands and laminae of Dolomite; cream to light brown, cryptocrystalline to microcrystalline, dolomite cement, anhydrite cement, salt cement (casts), slightly argillaceous to tight, with minor thin bands and laminae of Anhydrite; white to light grey, opaque to translucent, soft, fibrous texture in part, interlaminated with thin bands of salt.
- 787 - 795m Shale; grey/green, green, trace of red shale fissile, slightly dolomitic in part, slightly anhydritic in part, slightly disseminated with salt, waxy in part, trace of disseminated pyrite with minor laminae and bands of Dolomite; as above
Anhydrite as above, and salt
- 795 - 809m Shale; grey/green, light grey, red, fissile, soft, slightly bentonitic, slightly dolomitic, slightly anhydritic in part, common salt casts, waxy in part, common bands and pockets of anhydrite, dolomite, trace of salt.
- 809 - 813m Shale; as above, grading to occasional bands of Dolomite; cream to tan, cryptocrystalline, dolomite cement, anhydrite cement, trace of salt cement (casts), slightly argillaceous to argillaceous, grades to shale and anhydrite in part, tight with minor laminae and pockets of Anhydrite; and salt (halite).

813 - 833m Shale; as above with common laminae, bands and pockets of
Dolomite; as above; and common bands, laminae and pockets of
Anhydrite; light grey, tan, sucrosic texture in part, massive, soft, slightly dolomitic in part, slightly argillaceous, with common pockets and inclusions of salt

833 - 845m Shale; grey/green, green, red, fissile, soft, slightly dolomitic, slightly bentonitic, slightly anhydritic in part, waxy in part, occasional salt casts, grading to common bands and laminae of
Dolomite; cream to tan, cryptocrystalline, dolomite cement, anhydrite cement, trace of salt cement (casts), slightly argillaceous to argillaceous, tight; with common bands and laminae of
Anhydrite, as above and common laminae and pockets of salt.

SALINE RIVER SALT MEMBER 845m (-409.78)

845 - 850m Salt with abundant thin bands and laminae of
Shale; light grey, light grey/green, blocky to sub fissile, soft, slightly bentonitic, slightly dolomitic, commonly anhydritic, common salt casts, and common thin bands and laminae of
Anhydrite; cream to light grey/brown, argillaceous in part, dolomitic in part, sucrosic texture in part, salt casts, grading to thin bands and laminae of
Dolomite, cream to light grey/brown, cryptocrystalline, dolomite cement, abundant anhydrite cement, common salt casts, tight

850 - 855m MISSED SAMPLE (fast drilling)

855 - 866m Salt; laminated with abundant stringers of
Shale; cream, light grey/green, red, light green, sub fissile to soft, slightly dolomitic to very dolomitic, anhydritic in part, slightly bentonitic in part, with occasional salt casts, and common laminae of
Dolomite; as above and common laminae of
Anhydrite; as above

866 - 882m Salt (probably halite) with abundant laminations of
Shale; as above, and

- 866 - 882m
(cont'd) Anhydrite; cream to light grey/brown, slightly argillaceous in part, slightly dolomitic in part, sucrosic texture in part, fibrous texture in part, and common laminae and bands of Dolomite; cream to tan, cryptocrystalline, dolomite cement, abundant anhydrite cement, argillaceous to very argillaceous in part, grades to shale and/or anhydrite in part, trace of salt casts, tight.
- 882 - 892m Salt; with common laminae and stringers of Shale; grey/green, green, light grey, red, blocky to sub fissile, soft, dolomitic in part, anhydritic in part, trace of salt casts and occasional stringers of Anhydrite; cream to light brown, slightly dolomitic in part, argillaceous in part, fibrous texture in part, trace of salt casts; and rare thin bands or laminae of Dolomite; cream to tan, cryptocrystalline, dolomite cement, abundant anhydrite cement, argillaceous to very argillaceous, tight, trace of salt casts.
- 892 - 896m Anhydrite; as above interbedded with thin stringers of salt
Shale; as above and Dolomite, as above.
- 896 - 920m Salt; with occasional thin bands or laminae of Anhydrite; white, cream to light brown, soft, sucrosic texture in part, dolomitic in part, argillaceous in part, trace of salt casts; and occasional thin laminae of Shale; cream to light grey, light grey/green, light green, red, blocky to sub fissile, dolomitic to very dolomitic in part, anhydritic in part, trace of salt casts, and rare laminae of Dolomite; cream to tan, cryptocrystalline, dolomite cement, anhydrite cement, argillaceous to very argillaceous, (grades to dolomitic shale) tight, trace of salt casts.
- 920 - 935m Salt; with occasional laminae of Anhydrite; white, cream to light brown, soft, sucrosic texture in part, fibrous texture in part, trace of salt casts; and occasional laminae of Shale; tan, light grey, light grey/green, green, trace of red, blocky, soft, dolomitic in part, anhydritic in part, slightly bentonitic in part, trace of salt casts; and rare thin laminae of

- 920 - 935m (cont'd) Dolomite; cream to tan, cryptocrystalline, dolomite cement, abundant anhydrite cement, argillaceous, tight, trace of salt casts; common hexagonal depyramidal quartz crystals.
- 935m MUD SYSTEM BECOMES SATURATED WITH SALT. SALT FRAGMENTS DO NOT DISSOLVE IN DRILLING MUD
- 935 - 960m Salt; (halite); clear, trace yellow, with occasional thin laminae of Anhydrite; white to light brown, moderately hard, sucrosic texture in part, with rare thin laminae of Shale; grey/green, soft, blocky, slightly dolomitic, slightly anhydritic in part, trace dolomite.
- 960 - 983m Interbeds of Shale; Halite; clear, trace yellow, and Shale; cream, light grey/green, green, blocky, soft, slightly dolomitic, anhydritic in part, and; Anhydrite; white, cream to tan, soft, sucrosic texture in part, argillaceous in part, dolomitic in part, trace of gypsum, trace of cryptocrystalline, anhydritic dolomite.
- 983 - 1003m Interbeds of Salt: Halite; clear, slightly yellow, and; Shale; light to dark grey/green, light grey, dark brown, tan, trace red, blocky, soft, waxy in part, dolomitic in part, anhydritic in part, slightly bentonitic in part, and; Anhydrite; cream to tan, light grey, fibrous texture in part, dolomitic in part, argillaceous to very argillaceous in part, trace of cryptocrystalline anhydritic dolomite.
- 100 - 1003m As above
- 1003m MT CAP FORMATION (-567.78m)
- 1003 - 1013 Shale; tan, light grey, dark grey/brown, blocky, soft, dolomitic anhydritic in part, interbedded with Anhydrite; white cream, light grey, light brown, argillaceous to very argillaceous in part, dolomitic in part, fibrous texture in part with minor thin bands or stringers of Dolomite; cream to tan, cryptocrystalline, dolomite cement, anhydrite cement, slightly calcareous in part, argillaceous to very argillaceous, tight, grades to argillaceous shale, trace of salt.

- 1013 - 1018m Shale; tan, emdium to dark green, trace of red, blocky to sub fissile, waxy, calcareous in part, slightly anhydritic in part, with occasional bands of
Anhydrite; tan, medium to dark brown, massive habit, satin lustre in part, and occasional bands of
Dolomite; tan to light brown, cryptocrystalline, dolomite cement, anhydrite cement in part, argillaceous, tight.
- 1018 - 1028m Shale; dark grey/brown, green to dark gren, blocky to sub fissile, waxy in part, soft to moderately hard, calcareous in part, with common bands of
Dolomite; tan to light brown, cryptocrystalline to microcrystalline, sucrosic texture in part, dolomite cement, trace of anydrite cement, slightly argillaceous to argillaceous, tight to a trace of intercrystalline porosity, and rare bands or laminae of
Anhydrite; white to light brown, soft, sucrosic texture in part, slightly dolomitic in part, slightly argillaceous in part.
- 1028 - 1032m Shale; medium to dark green, dark brown, blocky to subfissile, slightly calcareous in part, bituminous in part, moderately hard, with common bands of
Dolomite; as above and rare thin bands of
Limestone; medium brown, micritic, trace of dolomite cement, argillaceous, bituminous, tight, trace of reddish brown metasomatic chert.
- 1032 - 1041m Interbeds of Dolomite; tan to medium brown, cryprocrystalline to microcrystalline, dolomite cement, anhydrite cement in part, clear to argillaceous, vitreous lustre in part, sucrosic texture in part, tight race of intercrystalline porosity, and;
Shale; as above with minor bands of
Anhydrite; white to light brown, soft, socrosic texture in part, slightly dolomitic in part, slightly argillaceous, trace of chert.

- 1041 - 1056m Dolomite; cream to tan, medium brown, cryptocrystalline to microcrystalline, dolomite cement, minor anhydrite cement, calcite cement in part, slightly silty and sandy in part, slightly bitumen engrained, tight to a trace of intercrystalline porosity, with common bands of Shale; light grey/green, medium to dark brown, blocky to sub fissile, micromicaceous, slightly dolomitic in part, slightly bituminous in part, waxy lustre in part, trace of medium to dark brown metasomatic chert.
- 1056 - 1064m Shale; as above, with occasional bands of Dolomite; as above, with traces of dark brown metasomatic chert and anhydrite.
- 1064 - 1071m Shale; dark grey/green, dark brown, blocky to sub fissile, slightly calcareous, slightly bituminous in part, with occasional bands of Dolomite; cream to tan, occasionally medium brown, microcrystalline, dolomite cement, minor calcite cement, minor anhydrite cement, slightly argillaceous to argillaceous, tight to a trace of intercrystalline porosity, and occasional bands of Limestone; medium to dark brown, micritic to very fine granular, trace of dolomite cement, slightly bitumen engrained, slightly argillaceous, tight to trace of effective intergranular porosity, and rare laminae of Anhydrite; white to cream, sucrosic texture in part, slightly dolomitic in part, trace of dark brown chert.
- 1071 - 1082m Shale; as above with rare bands or laminae of Dolomite; and Limestone; as above
- 1082 - 1095m Shale; dark grey/green, dark grey/brown, dark brown, sub fissile, micromicaceous, slightly calcareous, slightly bitumen engrained in part, with rare bands of Limestone; light to dark brown, micritic to very fine granular, dolomitic in part, slightly argillaceous in part, slightly bitumen engrained in part, tight, trace of dolomite trace of anhydrite.

- 1095 - 1110m Shale; dark grey/green, dark brown, sub fissile, waxy in part, slightly calcareous, micromicaceous in part, slightly anhydritic in part, silty and sandy in part, with rare bands of Dolomite, tan to light brown, cryptocrystalline to microcrystalline, dolomite cement, anhydrite cement, slightly argillaceous, tight, and rare bands of Anhydrite, light brown, cream, soft, fibrous texture in part, satin lustre in part, dolomitic in part, argillaceous, trace of edium to dark brown chert.
- 1110 - 1125m Shale; medium to dark brown, dark grey, blocky, moderately hard, very sandy in part, very silty in part, slightly bituminous in part, trace of very slow weak green massive cut; with occasional bands of Limestone; tan to medium brown, micritic to very fine granular, calcite cement trace of dolomite cement, slightly argillaceous, slightly to very sandy and silty in part, tight, trace of dolomite trace of sandstone.
- 1125 - 1131m Interbeds of Shale; medium to dark grey/green, dark brown, blocky to sub fissile, slightly to very calcareous in part, moderately hard, sandy in part, bitumen engrained in part, trace weak green cut fluorescence, and; Limestone; light to dark brown, micritic, calcite cement, dolomite cement, slightly argillaceous to argillaceous, slightly bitumen engrained in part, slightly sandy in part, tight, trace of dolomite.
- 1131 - 1135m Dolomite; tan to light brown, cryptocrystalline to microcrystalline, dolomite cement, anhydrite cement, sandy to very sandy in part, argillaceous, slightly bitumen engrained, very poor intercrystalline porosity, grades to sandstone in part.
- 1135 - 1148m Shale; medium to dark grey, medium to dark brown, blocky to sub fissile, very micro-micaceous in part, slightly bitumen engrained in part, sandy in part, satiny lustre in part, (trace of weak green cut fluorescence), with occasional bands of Dolomite; as above, and occasional bands of Limestone; tan to dark brown, micritic, calcite cement, dolomite cement, slightly argillaceous to argillaceous, slightly bitumen engrained in part, slightly sandy in part, tight.

- 1148 - 1160m Shale; medium to dark grey/green, dark grey, blocky to sub fissile, very micromicaceous in part, calcareous in part, satiny lustre in part, with rare bands of Dolomite; as above and rare bands of Limestone; as above
- 1160 - 1161m Siltstone; white to cream, quartz, silt to very fine grained, sub angular, well sorted, silica cement, minor calcite cement, slightly argillaceous to very argillaceous, poor effective intergranular porosity, trace of slow weak green massive cut.
- 1161 - 1175m Interbeds of Shale; dark grey, dark grey/green, blocky to sub fissile, waxy lustre in part, calcareous in part, very micromicaceous in part, satiny lustre in part, and Siltstone; cream, white to light grey, medium grey, quartz, silt, sub angular, well sorted, silica cement, minor kaolin cement, slightly argillaceous in part, trace bitumen plugged, poor effective intergranular porosity, trace of weak yellow fluorescence, trace of fast weak green massive cut, (good gas show on hot wire at 1165 - 1169m).
- 1175 - 1187m Shale; medium to dark grey, blocky, micromicaceous, silt and sandy in part, calcareous in part, satiny lustre with rare thin bands or laminae of Siltstone; as above
- 1187 - 1194m Dolomite; medium to dark brown, fine to medium crystalline, dolomite cement, anhedral sandy in part, argillaceous, bitumen engrained, tight to very poor intercrystalline porosity, trace of pale green cut fluorescence with minor thin bands and stringers of Shale; medium to dark grey, grey/brown blocky to sub-fissile, calcareous, bitumen engrained.
- 1194 - 1195m Siltstone; cream, light to medium grey/brown, quartz, silt to very fine grained, sub-angular, well sorted, silica cement, slightly argillaceous to argillaceous matrix, trace of mica-flakes, fair effective intergranular porosity (up to 12%) trace weak green fluorescence, slow weak green massive cut.
- 1195 - 1198m Siltstone; as above finely interbedded with Dolomite; as above. (Good gas shows on hot wire).

- 1198 - 1213m Interbeds of Siltstone; cream, light to medium grey, quartz, silt, subangular, well sorted, abundant calcite and silica cement, slightly argillaceous to argillaceous in part, poor effective intergranular porosity, trace of slow weak green cut fluorescence, and Dolomite, medium to dark brown, fine to medium crystalline, anhedral, dolomite cement, silty and sandy in part, argillaceous, bitumen engrained, tight to very poor intercrystalline and microvug porosity, trace of slow weak green massive cut fluorescence; and minor thin bands of Shale; medium to dark grey, blocky to sub fissile, slightly calcareous, moderately hard, waxy lustre in part, bituminous in part, satiny lustre in part.
- 1212m MOUNT CLARKE (-776.78m)
- 1213 - 1215m Sandstone; cream, light grey, light brown, quartz, very fine to fine grained, occasionally medium grained, sub angular, well sorted, silica cement, slightly argillaceous matrix, fair intergranular porosity, common live oil staining, common weak yellow fluorescence, fast pale green massive cut.
- 1215 - 1217m Sandstone; cream, quartz, very fine to fine grained, occasionally medium grained, subangular, well sorted, silica cement, argillaceous matrix in part, poor to good effective porosity, trace to common live oil staining, trace weak green fluorescence, fast pale green massive cut.
- 1217 - 1224m See Core Description - Core #1
- 1224 - 1228m Interbedded Sandstone: cream to medium brown, quartz, very fine to fine grained, occasionally medium grained, subangular to well rounded, moderately sorted, silica cement, slightly argillaceous matrix in part, trace bitumen plugged, poor to fair intergranular porosity trace of weak yellow fluorescence, trace of fast pale yellow/green cut, and Shale; dark grey/green, blocky, slightly micaceous, moderately hard, and Siltstone; cream to light brown, quartz, silt, well sorted, abundant silica cement, slightly argillaceous matrix, poor effective intergranular porosity, trace of weak yellow fluorescence trace of fast pale yellow/green massive cut.

- 1228 - 1231m Sandstone; light grey, light brown, quartz, very fine to coarse grained, well rounded, coarse grained in a matrix of sub angular, very fine to fine grained quartz, silica cement, slightly argillaceous to argillaceous matrix, trace bitumen plugged fair to occasional good intergranular porosity, trace of live oil staining, trace of weak yellow fluorescence, slow weak yellow green massive cut.
- 1231 - 1233m Shale; dark grey/green, blocky, slightly micromicaceous, moderately hard.
- 1233 - 1235m Sandstone; tan, light brown, quartz, very fine to fine grained, occasionally medium grained, sub angular, well sorted, silica cement, slightly argillaceous in part, bitumen plugged in part, poor to occasional good intergranular porosity, trace of weak yellow fluorescence, trace of slow, pale yellow/green massive cut.
- 1235m PROTEROZOIC (CLASTIC SEQUENCE) (-799.78)
- 1235 - 1245m Interbeds of Sandstone; dark brown/red, maroon, quartz, very fine to fine grained, subangular to subrounded, well sorted, silica cement, red argillaceous matrix, very poor to poor intergranular porosity, trace of slow weak yellow/green cut, trace of dolomite and
Shale, maroon, red/brown, blocky, very sandy, hard, slightly dolomitic in part, siliceous in part, grades to argillaceous sandstone.
- 1245 - 1261m Shale; maroon, blocky, hard, slightly dolomitic in part, siliceous, very sandy, grades to argillaceous sandstone, with occasional pockets and rhombs of dolomite.
- 1261 - 1269m Shale; as above, interbedded with Sandstone; maroon, quartz and lithic fragments, silt to fine grained, subangular to subrounded, moderately sorted, abundant silica cement, dolomite cement, ferrous cement, argillaceous to very argillaceous, tight to trace of intergranular porosity (sand may possibly be classed as a sub-greywacke or litharenite).
- 1269 - 1289m Interbeds of Shale; maroon, dark brown/red, blocky, hard, sandy to very sandy in part, slightly dolomitic, very siliceous, and;

Sandstone; maroon, quartz and lithic grains, silt to fine grained, subangular to subrounded, moderately sorted, abundant silica cement, minor dolomite cement, abundant ferrous cement, argillaceous to very argillaceous matrix tight, trace of microveining, trace of dolomite rhombs in argillaceous matrix.

- 1289 - 1308m Interbeds of Shale; maroon, dark brown, blocky, hard, very sandy in part, slightly dolomitic, trace anhydrite (?) very siliceous grades to sandstone, and
Sandstone, maroon, dark brown, quartz and lithic fragments, silt to fine grained, moderately sorted, hard, minor dolomite cement, trace of anhydrite cement, abundant silica cement, abundant ferrous cement, argillaceous to very argillaceous matrix, tight, trace of siltstone trace of microveining trace of dolomite rhombohedrons in matrix.
- 1308 - 1316m Interbeds of Shale; as above and
Sandstone; as above (abundant shale cavings).
- 1316 - 1328m Interbeds of Shale; maroon, dark grey/brown, blocky, slightly calcareous, hard, iron stained, sandy to very sandy in part, siliceous, and;
Sandstone dark brown, maroon, quartz and lithic grains, very fine to fine grained, sub angular to sub rounded, moderately sorted, silica cement, iron cement, dolomite cement, arillaceous to very argillaceous, tight.
- 1328 - 1343m Interbeds of Shale; dark brown, dark brown/black, blocky, hard, slightly dolomitic, minor iron stained, sandy to very sandy in part, siliceous, and
Sandstone; medium to dark brown, dark brown/black quartz and lithic grains, very fine to fine grained, sub angular to sub rounded, moderately sorted, silica cement, ferrous cement, minor dolomite cement, argillaceous to very argillaceous, tight.
- 1343 - 1358m Interbeds of Shale; dark brown/red, dark brown, blocky, dolomitic, hard, iron stained, sandy to very sandy in part, siliceous, and
Sandstone; medium to dark brown, quartz and lithic grains, silt to fine grained subangular to subrounded, moderately sorted, silica cement, iron cement, minor dolomite cement, argillaceous, tight.

- 1358 - 1370m Interbeds of Shale; dark brown/red, dark brown, blocky, dolomitic, hard, iron stained, sandy to very sandy in part, siliceous, and Sandstone; dark brown, dark brown/red, quartz and lithic grains, silt to fine grained, subangular to subrounded, moderately sorted, dolomite cement, iron cement, silica cement, very argillaceous matrix, tight, with common laminae and pockets of red dolomite.
- 1370 - 1385m Interbeds of Shale; medium to dark grey/brown, blocky, hard, slightly dolomitic, sandy to very sandy in part, siliceous, and Sandstone; medium to dark grey/brown, dark brown/red, quartz and lithic grains, silt to very fine grained, subangular to subrounded, moderately sorted, silica cement, dolomite cement, iron cement, very argillaceous, tight, trace of dolomite rhombs and thin laminae.
- 1385 - 1400m Interbeds of Shale; dark grey/brown, blocky, slightly dolomitic, very sandy, hard, siliceous, abundant iron cement, trace of siderite grains, and; Sandstone; medium to dark grey/brown, quartz and lithic grains, silt to fine grained, subangular to subrounded, moderately sorted, silica cement, dolomite cement, abundant ferrous cement, argillaceous to very argillaceous matrix, tight, trace of dolomite.
- 1400 - 1409m See detailed core description.
- 1409 - 1420m Shale; dark brown, dark red/brown, blocky, very hard, slightly dolomitic, siliceous, sandy in part, sideritic with minor bands of Sandstone, dark red/brown, dark grey, quartz and lithic grains, very fine to fine grained, subangular, moderately sorted, silica, dolomite, calcite and siderite cement, argillaceous matrix, tight trace of dolomite rhombs, calcite crystals.
- 1420m F.T.D.

DETAILED CORE DESCRIPTIONS

CORE #1 1217m to 1224m, cut 7m recovered 7m

Coring Times: 5,3,2,5,6/5,6,8,4,5/11,12,9,12,12/14,13,12,12,14/
15,15,19,19,17/23,22,17,18,21/14,15,20,23,24

- 1217.0-1218.55m Sandstone; cream to tan, light grey, quartz, silt to very fine grained, subangular, well sorted, silica cement, slightly argillaceous matrix, fair intergranular porosity, (7%) common live oil staining, common patchy weak golden fluorescence, slow weak yellow massive cut, common wavy sub parallel argillaceous laminae, lower 1 cm bioturbated.
- 1218.55-1219.14m Siltstone; cream to tan, quartz, silt, subangular, well sorted, silica cement, slightly argillaceous matrix, poor effective intergranular porosity (5%), minor weak patchy fluorescence, very slow bright yellow massive cut, abundantly bioturbated, common argillaceous laminae and bands (up to 1cm thick).
- 1219.14-1219.89m Shale; medium to dark grey, dark grey/brown, blocky, slightly silty, moderately hard, siliceous, with common blebs, bands and lenses of Siltstone; as above with no shows.
- 1219.80-1222.0m Shale; dark grey/green, blocky to sub fissile, slightly micro-micaceous, moderately hard, with occasional thin laminae, lenses and blebs of Siltstone; as above, no shows.
- 1222.0-1222.15m Shale; as above, interbedded with lenses and bands of Sandstone; salt and pepper, quartz and black grains (possibly glauconite), fine grained, subangular to subrounded, well sorted, silica cement, fair intergranular porosity (10%).
- 1222.15-1222.82m Shale; medium to dark grey, dark grey/brown, blocky, slightly silty, moderately hard, siliceous.

- 1222.82-1223.45m Sandstone; salt and pepper, quartz and black grains (possibly glauconite), fine grained, occasionally medium grained, subangular, moderately sorted, silica cement, argillaceous matrix in part, fair effective intergranular porosity (8%), interbedded with minor bands of
Shale; dark grey/green, blocky to sub fissile, slightly micromicaceous, moderately hard, structures of rip up clasts, ball and pillow structures, and bioturbation.
- 1223.45 - 1224.0m Shale; dark grey/green, sub fissile, slightly micro-micaceous, trace of pyrite, trace of siltstone lenses and laminae at top.

CORE #2 1400m - 1409m Cut 9.0m Recover 8.57m

Coring Times: 8,6,5,4,1/8,10,8,7,8/8,7,9,11,10/11,8,10,11,11/
12,10,10,9,11/10,9,10,10,10/11,10,14,10,11/
10,10,9,8,9/8,8,8,9,9

1400.0-1400.84m Shale; dark brown/red, dark brown, blocky, hard, sideritic, occasional calcite and dolomite veining in horizontal and vertical fractures, rare coarse grains and pebbles of soft green/black mineral (chlorite?).

1400.84-1402.20m Shale; dark red/brown to black, blocky, mottled with red and white blebs and veins of calcite and dolomite, blebs and pockets up to 2cm diameter dolomitic, sideritic, calcareous, and siliceous, occasional grains and pebbles of a soft green/black mineral (possibly chlorite)

1402.20-1402.80m Shale; same as interval 1400.00-1400.84m

1402.80-1404.80m Shale; dark red/brown, dark brown, blocky, very hard, dolomitic, siliceous, calcareous, sideritic, abundant veins and blebs of calcite and dolomite, brecciated appearance in part, possible slump features, vertical fracture from 1403.20-1404.20 infilled with calcite, occasional grains and pebbles of soft green/black mineral (chlorite?)

1404.80-1406.48m Shale; dark grey, blocky, very hard, dolomitic, siliceous, sideritic, occasional calcite blebs, occasional high angle slump features, rare vertical fractures lined with calcite and occasionally dolomite, occasional black mineral grains (chlorite?)

1406.48-1408.57m Shale; medium to dark grey, blocky, hard, abundant silica cement, very silty (silt grains obscured by abundance of cement, trace of small scale cross beds, common oblique and vertical fractures lined with calcite, vague slump features)

* The entire core seems to have been exposed to some degree of high grade diagenesis. Evidence of this consists of the possible chlorite grains within the shales; also some of the shales seem to have textures and structures common to sandstone however no sand grains are discernable.

SIDEWALL CORE DESCRIPTION

892.9m	<u>Anhydrite</u> ; white to cream, soft, slightly argillaceous, slightly dolomitic
893.5m	<u>Anhydrite</u> , as above
947.8m	<u>Halite</u> ; clear, white
948.7m	<u>Halite</u> ; clear, white
977.8m	<u>Anhydrite</u> ; white to cream, soft, slightly dolomitic
978.2m	<u>Shale</u> ; light green, blocky, soft, very dolomitic, slightly anhydritic.
1027.9m	<u>Dolomite</u> ; medium grey/brown, cryptocrystalline, dolomite cement, anhydrite cement, argillaceous, tight.
1028.0m	<u>Shale</u> ; medium grey/green, blocky, moderately hard, very dolomitic, slightly anhydritic.
1028.5m	<u>Dolomite</u> ; light gray, cryptocrystalline, dolomite cement, abundant anhydrite cement, very argillaceous, tight, possibly very dolomitic anhydrite.
1129.7m	<u>Shale</u> ; light grey/green, blocky, soft, very dolomitic, slightly anhydritic?
1129.9m	<u>Mud cake</u> ?
1130.2m	<u>Dolomite</u> ; light to medium grey, cryptocrystalline? dolomite cement, minor anhydrite cement, very argillaceous, tight, grading to very dolomitic shale.
1130.4m	<u>Dolomite</u> ; light grey, cryptocrystalline?, dolomite cement, anhydrite cement, very argillaceous, slightly silty, tight.
1130.6m	<u>Siltstone</u> ; medium grey, quartz, very fine silt, sub rounded, well sorted, abundant dolomite cement, slightly argillaceous matrix, fair intergranular porosity.
1161.0m	<u>Siltstone</u> ; light grey, quartz, very fine silt, subrounded, well sorted, abundant dolomite cement, very argillaceous matrix, poor effective intergranular porosity.
1164.0m	<u>Dolomite</u> ; light grey, cryptocrystalline? dolomite cement, argillaceous, slightly silty, tight.

- 1167.5m Dolomite; as above
- 1172.0m Shale; dark green, blocky to sub fissile, slightly micromicaceous, soft, waxy lustre, very slightly calcareous.
- 1185.0m Siltstone; medium to dark grey, quartz, silt, sub angular to subrounded, well sorted, minor dolomite cement, slightly argillaceous matrix, trace bitumen, poor to fair effective intergranular porosity, trace weak yellow fluorescence.
- 1192.5m Siltstone; cream to light grey, quartz, silt to very fine grained, sub angular, well sorted, very minor silica cement, very slightly argillaceous matrix, fair intergranular porosity, poor permeability?, trace of very weak yellow fluorescence, petroliferous odor.
- 1193.5m Sandstone; cream to light grey, quartz, silt to very fine grained, subangular, well sorted, very minor silica cement, very slight argillaceous matrix, fair intergranular porosity, poor permeability, common yellow fluorescence, petroliferous odor.
- 1200.0m Shale; medium grey/green, blocky to subfissile, very silty and sandy, soft, calcareous, slightly bentonitic, petroliferous odor.
- 1201.0m Siltstone; light grey, quartz, silt to very fine grained, sub angular, well sorted, calcite cement, slightly argillaceous matrix, fair effective intergranular porosity, trace of very weak yellow fluorescence, petroliferous odor.
- 1214.0m Sandstone; as above with abundant yellow fluorescence.
- 1214.5m Dolomite?; light grey, cryptocrystalline? dolomite cement, argillaceous, slightly silty, tight.
- 1223.5m Sandstone; medium grey, quartz, silt to fine grained, rarely medium grained, subangular to subrounded, poorly sorted, silica cement, very slight argillaceous laminae, fair to good effective intergranular porosity, trace of very weak yellow fluorescence, strong petroliferous odor.
- 1227.0m Sandstone; light grey, light grey/brown, quartz, very fine to fine grained, sub angular to sub rounded, moderately sorted, trace of calcite cement, very slight argillaceous matrix, poor to fair effective intergranular porosity, trace of very weak yellow fluorescence, slight petroliferous odor.

- 1229.0m Sandstone; medium grey/brown, quartz, very fine to fine grained, sub angular to sub rounded, well sorted, silica cement, very slight argillaceous matrix, fair to good effective intergranular porosity, slight petroliferous odor.
- 1231.0m Sandstone; light to medium grey/brown, quartz, very fine to fine grained, sub angular, well sorted, silica cement, slightly argillaceous matrix, fair to good intergranular porosity, slight argillaceous matrix, petroliferous odor.
- 1232.0m Sandstone; as above, petroliferous odor.
- 1233.0m Sandstone; medium grey/brown, sub angular, well sorted, silica cement, slightly argillaceous matrix, trace bitumen plugged, poor to fair intergranular porosity. Petroliferous odor.
- 1238.0m Shale; red, blocky, moderately hard, trace of dolomite veining, occasional soft green mineral grains (chlorite?)
- 1284.0m Sandstone; quartz, very fine grained, medium grey, sub angular to angular, well sorted, abundant dolomite cement, argillaceous matrix, very hard, tight, exposed to high grade diagenesis?

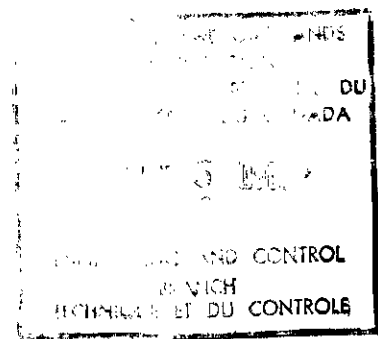
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CALGARY COPY

PETRO CANADA INCORPORATED

PCI ET AL TWEED LAKE M-47

Well History Report



Prepared by: R. Moscarello
1985-04-30

WELL HISTORY REPORT

a) INTRODUCTION

- i) Summary
- ii) Location Map

b) GENERAL DATA

- i) Well Name and Number
- ii) Well Location
- iii) Unique Well Identifier
- iv) Operator and Drilling Contractor
- v) Drilling Unit
- vi) Position Keeping
- vii) Support Craft
- viii) Drilling Unit Performance
- ix) Difficulties and Delays

c) SUMMARY OF DRILLING OPERATIONS

- i) Elevations
- ii) Total Depth
- iii) Date Spudded
- iv) Date Drilling Completed
- v) Date of Rig Release
- vi) Well Status
- vii) Hole Sizes and Depth
- viii) Casing and Cementing Record
- ix) Sidetracked Hole
- x) Drilling Fluids
- xi) Fishing Operation
- xii) Well Kicks
- xiii) Formation Leak-Off Tests

c) SUMMARY OF DRILLING OPERATIONS (cont'd)

- xiv) Time Breakdown
- xv) Deviation Survey
- xvi) Abandonment Plugs
- xvii) Composite Well Records

APPENDIX

Drilling Data

1. Deviation Records
2. Final Survey Plan

PCI ET AL TWEED LAKE M-47

a) INTRODUCTION

i) Summary:

PCI et al Tweed Lake M-47, located in the Colville Lake area of the Northwest Territories (Figure 1) was drilled to a total depth of 1420 m. It was the second well drilled in the 1984 - 85 Northern Interior Plains Project, and was completed in 44 days.

The location coordinates for this well are 66° 56' 47.11" North Latitude and 125° 54' 09.42" West Longitude. The ground elevation is 429.1 m above sea level.

Petro-Canada Incorporated of Calgary operated the well. ATCO Drilling Ltd. of Calgary, the contractor, used Atco/Equitak #76, a diesel mechanical rig built in 1983.

The primary objective of this exploratory well was the oil potential in the sandstones of the Lower Cambrian Mt. Clarke Formation.

PCI et al Tweed Lake M-47 was spudded on 1985-01-11 at 1300 hours. A 311 mm hole was drilled and reamed to 609 mm and 508 mm conductor pipe was set at 24 m. A 445 mm hole was then drilled and 340 mm conductor casing set at 64 m.

A 346 mm, 21,000 KPa, B.O.P. was nipples up and the 311 mm surface hole was drilled and 245 mm casing set at 760 m. Drilling mud was used when drilling from 64 to 321 m and a stable foam drilling fluid system was used from 321 to 760 m.

The 216 mm main hole was drilled with salt saturated drilling mud to 1420 m, logged and 178 mm casing set at 1418 m. Two cores were cut, one in the Mt. Clarke Formation and the other in the Proterozoic Formation. Penetration rates for the main hole averaged 4.5 m/hr.

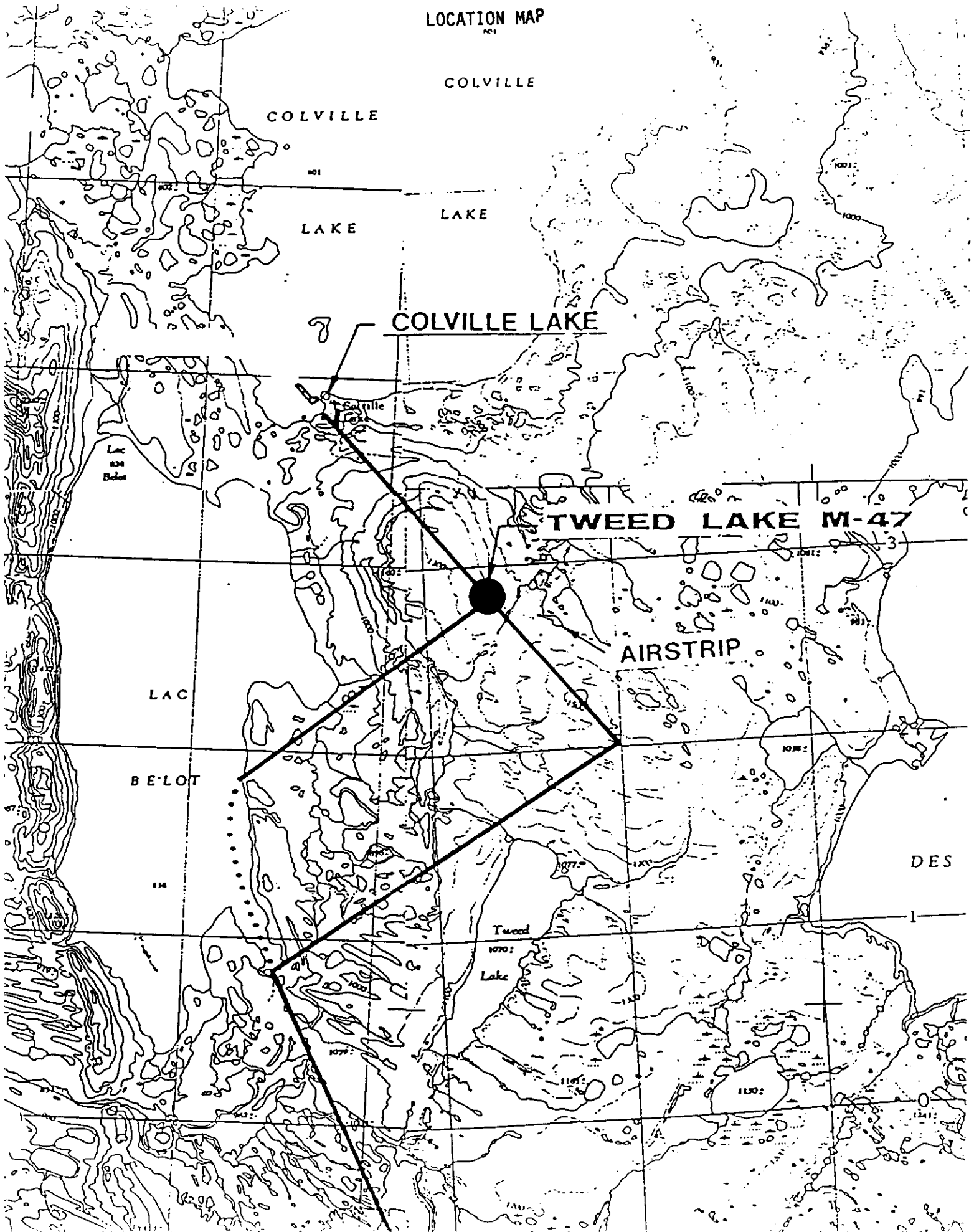
PCI ET AL TWEED LAKE M-47

Five mechanically successful drill stem tests were run on this well. The test intervals are summarized in the following table.

<u>Test No.</u>	<u>Interval (m)</u>
1	1212-1227
2	1188-1199
3	1155-1170
4	1221-1236
5	1206-1216.5

The well is presently a suspended gas well. The Atco/Equitak #76 Rig was released on 1985-02-24 at 1600 hours.

FIGURE 1
LOCATION MAP
NO 1



PCI ET AL TWEED LAKE M-47

b) GENERAL DATA

- i) Well Name and Number PCI et al Tweed Lake M-47
Grid Area: 67° 00', 125° 45'
- ii) Well Location: North Latitude 66° 56' 47.11"
West Longitude 125° 54' 09.42"
- iii) Unique Well Identifier: 300M4767000125450
- iv) Operator: Petro-Canada Incorporated
P.O. Box 2844
Calgary, Alberta
T2P 3E3
- Contractor: Atco Drilling Limited
700, 800 - 6th Avenue S.W.
Calgary, Alberta
- v) Drilling Unit: Name: Atco/Equitak Rig #76
Type: Triple diesel mechanical
Year built: 1983
Location: Nisku, Alberta
- vi) Position Keeping: N/A to this well
- vii) Support Craft: N/A to this well
- viii) Drilling Unit Performance: N/A to this well
- ix) Difficulties & Delays: No difficulties or delays were encountered while drilling this well that were not directly associated with downhole operations.

PCI ET AL TWEED LAKE M-47

c) SUMMARY OF DRILLING OPERATIONS

- i) Elevations: Ground: 429.1 m
Kelly Bushing: 435.22 m
- ii) Total Depth: Drilled: 1420 m
Logged: 1420 m
- iii) Date and Hour Spudded: 1985-01-11 1300 hours
- iv) Date Drilling Completed: 1985-02-14 0625 hours
- v) Date of Rig Release: 1985-02-24 1600 hours
- vi) Well Status: Suspended gas well
- vii) Hole Sizes and Depths:

Classification	Bit Number	Size (mm)	Depth (m)		Metres Drilled	Remarks
			in	out		
Conductor	2B	444.5	24	47	23	
	3B	444.5	47	64	17	
Surface	4C	311	64	145	81	
	5C	311	145	231	86	
	6C	311	231	273	42	
	7C	311	273	515	242	
	8C	311	515	624	109	
	9C	311	624	760	136	
Main	10D	216	760	763	3	Drill out cement Ream 7 m rat hole Core point Clean out Ream rat hole
	11D	216	763	1217	454	
	12	171	1217	1224	7	
	13D	216	1224	1227	3	
	14D	216	1227	1400	173	
	15D	216	--	--	--	
	16	171	1400	1409	9	
	17D	216	1409	1420	11	

PCI ET AL TWEED LAKE M-47

viii) Casing and Cementing Details:

Hole Classification:	Conductor	Conductor	Surface		Main	
Hole Size:	609 mm	445 mm	311 mm		216 mm	
Casing Size:	508 mm	340 mm	245 mm		178 mm	
Weight:	140 kg/m	101 kg/m	60 kg/m 65 kg/m		43 kg/m	
Grade:	K-55	K-55	L-80 S00-95		N-80 S00-95	
Coupling:	BT&C	BT&C	LT&C		LT&C	
Number of Joints:	2	5	61		109	
Number of Centralizers:	-	2	11		56	
Date of Run:	85-01-13	85-01-16	85-01-30		85-02-23	
Shoe Depth:	24 m	64 m	760 m		1418 m	
Tonnes of Cement:	10.8	18	64	4	46	7 (Tail)
Type of Cement:	Arctic Set	Arctic Set	Class G	Class G	Class G	Class G
Additives:	none	none	none	2% CaCl ₂	none	2% CaCl ₂
Height of Cement:	Surface	Surface	350 m	Surface	Surface	
Based on:	Returns to surface	Returns to surface	Cement bond log	Returns to surface	Returns to surface	

PCI ET AL TWEED LAKE M-47

- ix) Sidetracked Hole: N/A to this well
- x) Drilling Fluid: The mud type used for the surface and main hole sections was VISGEL/KELZAN XC POLYMER MUD. A stable foam system was used while drilling from 321 - 760 m of the surface hole. A saturated salt mud (NaCl concentration 162,000 kg/l) was used for the main hole section.

Summary of Mud Properties:

Section	Interval (m)	Weight (kg/m ³)	Properties Funnel Vis (S/L)	Water Loss (average, cm ³)	PH (average)	Cl (10 ³ mg/l)
Conductor	0 - 24	Water	-	-	-	-
Conductor	24 - 64	Water	-	-	-	-
Surface	64 - 79	Water	-	-	-	-
Surface	79 - 321	1050-1120	33 - 40	13.9	9	-
Surface	321 - 760	Stable Foam	-	-	-	-
Main	760 -1420	1055-1275	34 - 63	17.6	10	155 - 175

- xi) Fishing Operation: One fishing operation occurred when the string twisted off at the jars. Fish in the hole was 31 m of jars, cross-over, drill collars, bit sub and bit. A 219 mm overshot with a flat guide shoe was made up and fish recovered.
- xii) Well Kicks: None
- xiii) Formation Leak-off Tests: A formation leak-off test was run on day 23 after drilling out the surface casing shoe at 760 m and drilling a 216 mm hole to 763 m. Water (density 1090 kg/m³) was used for the test and a pressure of 20,000 KPa at surface was reached (equivalent mud weight 3762 kg/m³). The formation did not breakdown. The pressure gradient was 36.9 KPa/m.

PCI ET AL TWEED LAKE M-47

xiv) Time Breakdown:

Operation	Time (Hours)				
	Conductor Hole	Conductor Hole	Surface Hole	Main Hole	Total
Drilling	15.00	19.00	176.75	145.50	356.25
Tripping	2.50	6.25	31.25	33.25	73.25
Ream/Clean	30.75	-	6.75	19.75	57.25
Conditioning	1.00	-	10.25	6.25	17.50
Rig Service	0.75	1.00	7.75	9.75	19.25
Mechanical Downtime	-	3.50	14.50	1.75	19.75
Deviation Survey	-	0.75	7.25	4.25	12.25
Csg-Cmt-WOC	33.00	25.25	26.25	21.75	106.25
Head Up/Pressure Test	-	34.00	35.25	-	69.25
DOC	-	1.25	26.50	-	27.75
DC Inspection	-	-	-	8.75	8.75
BOP Drill	-	-	1.00	0.75	1.75
Circulate Samples	-	-	-	4.00	4.00
W.O.O.	-	-	-	1.25	1.25
Fishing	-	-	10.00	-	10.00
Pull B.O.P.	-	-	0.50	-	0.50
PIT	-	-	1.00	-	1.00
Coring	-	-	-	44.50	44.50
Logging	-	-	10.00	50.75	60.75
DST	-	-	-	167.75	167.75
TOTAL	83.00	91.00	365.00	520.00	1059.00

xvi) Abandonment Plugs: None



PETRO-CANADA

PETRO-CANADA DIRECTIONAL DRILLING PROGRAM

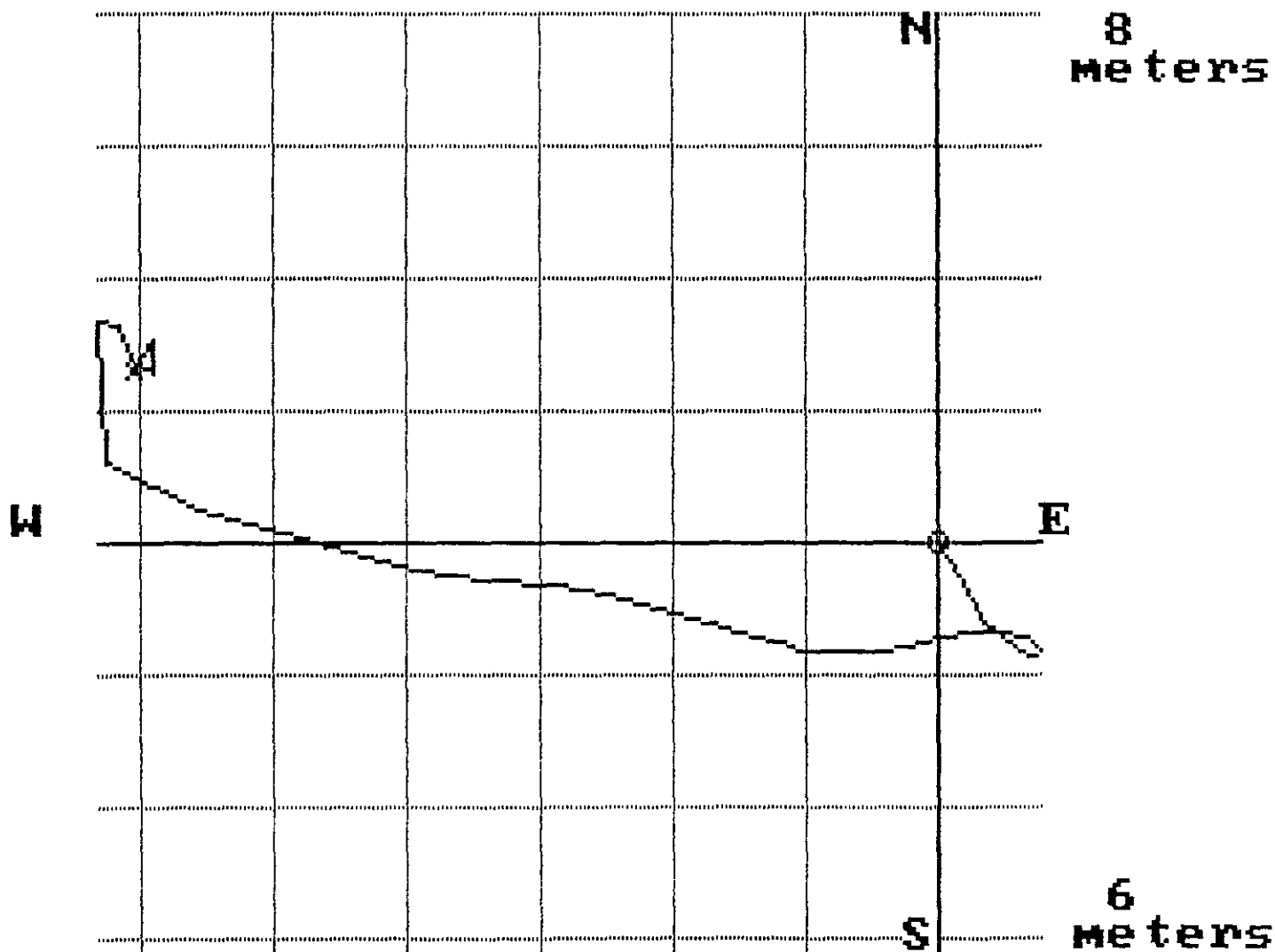
FCI et al TWEED LAKE 11-97

Single shot directional survey.

File: TWEED

FCI ET AL TWEED LAKE SURVEY PLAN

Horizontal Projection



Each grid = 2 meters.

Bottom Hole Co-ordinates: 2.67 metres North
12.11 metres West

Closure Distance: 12.40 metres

Closure Direction: North 77 Deg 35 Min West



PETRO-CANADA

PETRO-CANADA

DIRECTIONAL DRILLING PROGRAM

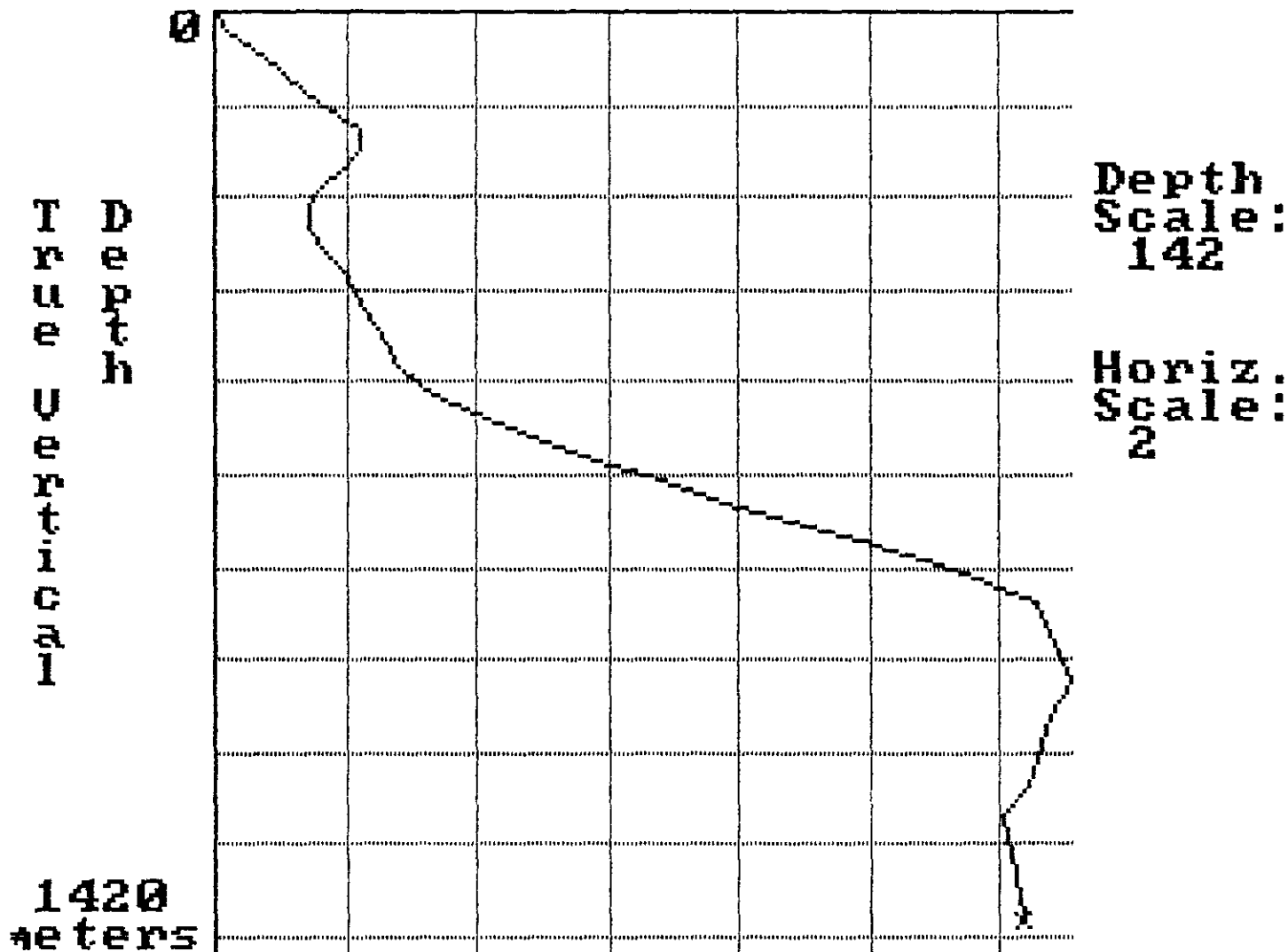
PCI et al TWEED LAKE H-42

Single shot directional survey.

File: TWEED

PCI ET AL TWEED LAKE SURVEY PLAN

Horizontal Displacement vs Depth.



APPENDIX

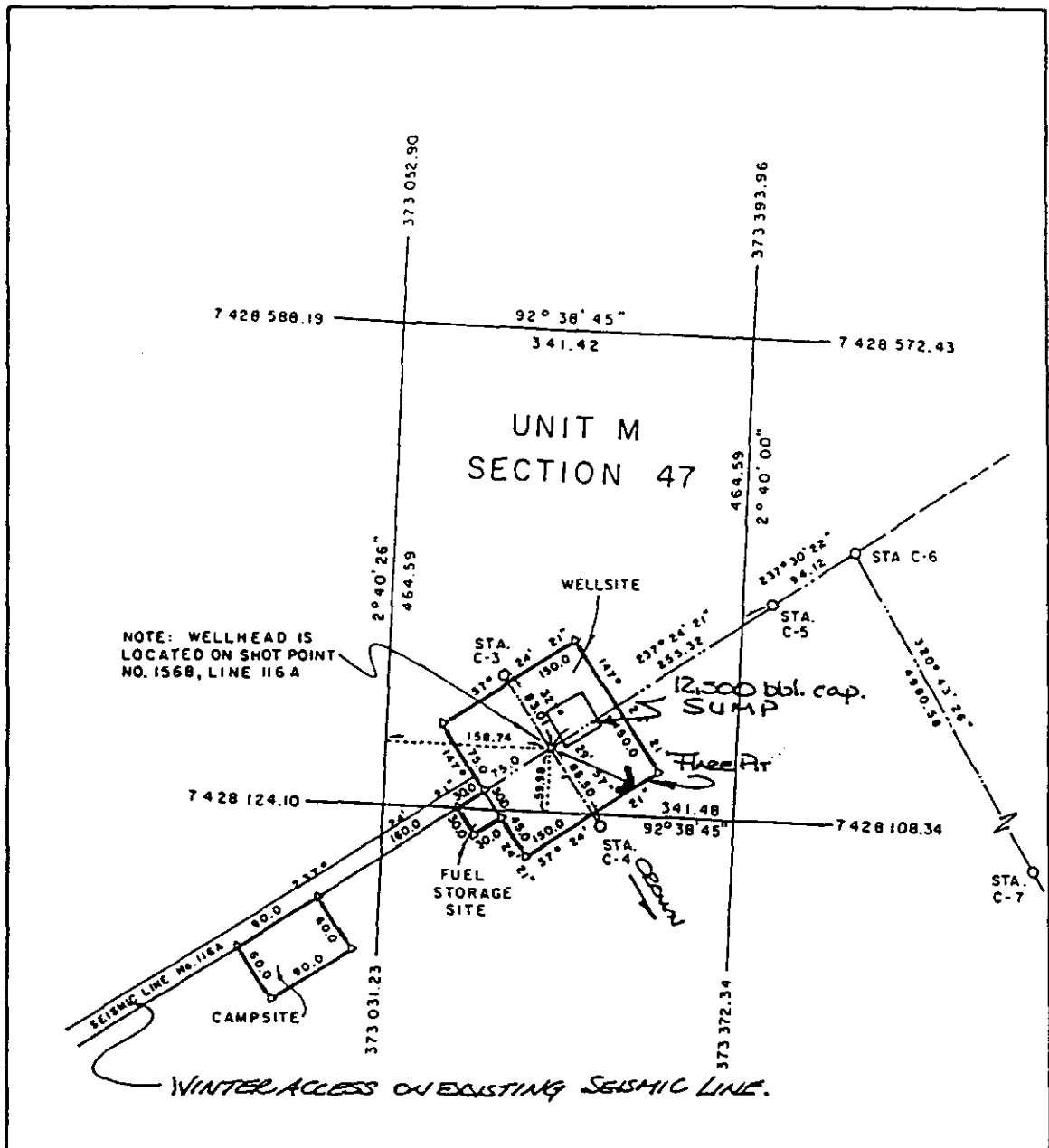


PETRO-CANADA DIRECTIONAL DRILLING PROGRAM

PCI et al TWEED LAKE M-47
Single shot directional survey.
PCI ET AL TWEED LAKE SURVEY PLAN

File: TWEED

Measured Depth (meters)	Drift Angle (deg min)	Drift Direction (deg)	Course Length (meters)	True Vertical Depth (meters)	Vertical Section (meters)	Rectangular Co-ordinates (meters)		Closure Distance (meters)	Closure Direction (deg min)	Dogleg Severity (deg/30 M)
0.0	0 0	0	0.0	0.00	0.00	0.00 N	0.00 E	0.00	N 0 0 E	0.00
30.0	0 45	S 22 E	30.0	30.00	0.00	0.18 S	0.07 E	0.20	S 21 60 E	0.75
60.0	0 45	S 50 E	30.0	60.00	0.00	0.50 S	0.30 E	0.58	S 31 19 E	0.36
90.0	0 45	S 9 E	30.0	89.99	0.00	0.83 S	0.49 E	0.97	S 30 35 E	0.53
120.0	0 45	S 42 E	30.0	119.99	0.00	1.18 S	0.66 E	1.35	S 29 8 E	0.43
160.0	1 0	S 58 E	40.0	159.99	0.00	1.57 S	1.12 E	1.93	S 35 34 E	0.26
180.0	0 45	S 55 E	20.0	179.98	0.00	1.74 S	1.38 E	2.22	S 38 23 E	0.38
210.0	0 15	N 26 W	30.0	209.98	0.00	1.62 S	1.52 E	2.22	S 43 21 E	0.98
240.0	0 45	N 73 W	30.0	239.98	0.00	1.45 S	1.33 E	1.97	S 42 34 E	0.61
270.0	0 45	N 71 W	30.0	269.98	0.00	1.33 S	0.96 E	1.64	S 35 48 E	0.02
300.0	1 0	S 74 W	30.0	299.98	0.00	1.32 S	0.51 E	1.41	S 21 4 E	0.58
330.0	1 0	S 80 W	30.0	329.97	0.00	1.43 S	0.00 W	1.43	S 0 6 W	0.10
360.0	1 0	S 72 W	30.0	359.97	0.00	1.56 S	0.51 W	1.64	S 18 6 W	0.14
390.0	0 45	S 87 W	30.0	389.96	0.00	1.64 S	0.96 W	1.90	S 30 16 W	0.34
420.0	0 30	N 88 W	30.0	419.96	0.00	1.65 S	1.29 W	2.09	S 37 59 W	0.26
450.0	0 30	S 87 W	30.0	449.96	0.00	1.65 S	1.55 W	2.26	S 43 11 W	0.04
480.0	0 30	N 84 W	30.0	479.96	0.00	1.64 S	1.81 W	2.44	S 47 46 W	0.08
510.0	0 30	N 78 W	30.0	509.96	0.00	1.60 S	2.07 W	2.62	S 52 15 W	0.05
540.0	0 45	N 72 W	30.0	539.96	0.00	1.52 S	2.38 W	2.82	S 57 32 W	0.26
570.0	1 0	N 75 W	30.0	569.95	0.00	1.39 S	2.82 W	3.14	S 63 50 W	0.25
600.0	1 30	N 73 W	30.0	599.95	0.00	1.21 S	3.45 W	3.66	S 70 44 W	0.50
630.0	1 30	N 76 W	30.0	629.94	0.00	1.00 S	4.21 W	4.32	S 76 41 W	0.07
660.0	1 30	N 77 W	30.0	659.92	0.00	0.81 S	4.97 W	5.04	S 80 43 W	0.00
690.0	1 45	N 83 W	30.0	689.91	0.00	0.67 S	5.81 W	5.85	S 83 28 W	0.30
720.0	2 0	N 84 W	30.0	719.90	0.00	0.55 S	6.79 W	6.81	S 85 20 W	0.25
750.0	2 0	N 78 W	30.0	749.88	0.00	0.39 S	7.82 W	7.83	S 87 8 W	0.21
797.0	2 0	N 73 W	47.0	796.85	0.00	0.02 N	9.41 W	9.41	N 89 53 W	0.11
851.0	1 45	N 73 W	54.0	850.82	0.00	0.54 N	11.10 W	11.11	N 87 14 W	0.14
908.0	1 30	N 55 W	57.0	907.80	0.00	1.24 N	12.54 W	12.61	N 84 21 W	0.30
1032.0	0 45	N 48 E	124.0	1031.77	0.00	3.36 N	12.67 W	13.11	N 75 10 W	0.44
1080.0	0 8	S 20 E	48.0	1079.77	0.00	3.28 N	12.37 W	12.80	N 75 8 W	0.50
1185.0	0 30	S 25 E	105.0	1184.77	0.00	2.75 N	12.15 W	12.46	N 77 14 W	0.11
1232.0	0 30	N 85 E	47.0	1231.77	0.00	2.56 N	11.82 W	12.09	N 77 47 W	0.37
1328.0	0 30	S 85 W	96.0	1327.76	0.00	3.09 N	11.86 W	12.26	N 75 24 W	0.31
1394.0	0 30	S 25 E	66.0	1393.76	0.00	2.67 N	12.11 W	12.40	N 77 35 W	0.37



N.T.S. MAP SHEET: 96 K 13

METRIC

NORTHWEST TERRITORIES

PETRO-CANADA INC.

PRELIMINARY SKETCH SHOWING WELL LOCATION

PCI TWEED LAKE 47-M

UNIT M, SECTION 47, GRID AREA 67° 00', 125° 45'

PETRO-CANADA INC.

[Signature]

CERTIFIED CORRECT:

THIS 12th. DAY OF DECEMBER, A.D. 1984.

[Signature]
CANADA LANDS SURVEYOR

ELEVATION

GEOGRAPHIC CO-ORD'S.

U.T.M. CO-ORDINATES

ON GROUND : 429.10
AT WELLHEAD

NORTH LATITUDE:
66° 56' 47.11" (66.9464185°)
WEST LONGITUDE:
125° 54' 09.42" (125.9026167°)

NORTHING: 7,428,176.69
EASTING: 373,192.60

CO-ORDINATES ARE COMPUTED FOR
ZONE 10, CENTRAL MERIDIAN 123° W.

LEGEND

AREAS REQUIRED

Survey Monument found
Survey Monument placed
Traverse Station

WELLSITE : 5.56 Acres 2.250 ha.
CAMPSITE : 1.33 Acres 0.540 ha.
FUEL SITE : 0.22 Acres 0.090 ha.

HOSFORD, IMPEY, WELTER
AND ASSOCIATES LTD.
P.O. BOX 1409, YELLOWKNIFE, X1A 2P1
NORTHWEST TERRITORIES

SCALE 1:5000

TOTAL : 7.11 Acres 2.880 ha

FILE NO. Y84011-R1 DATE: Dec. 12/84 CH'D

