JOHNSTON
Schlumberger

321 - 50TH AVENUE S.E. • CALGARY, ALBERTA T2G 2B3 • PH. (403) 255-1151

DRILL STEM TEST SPECIAL DATA ANALYSIS

Columbia Gas Limited DST #2
Columbia Gas et al Kotaneelee E15085
11,630 - 11,690' 11,690'
September 28, 1977

October 4, 1977

ATTENTION: RICK SMITH

Gentlemen:

The enclosed test appears to be a good mechanical drill stem test during which the tools functioned properly, and the formation produced enough reservoir fluid for proper identification. Reservoir pressure drawdown was sufficient and adequate shut-in build-ups occurred for reliable quantitative analysis.

1. Flow Rate: A flow rate of ~~1824~~ 2300 MCF/day of gas was noted during this test.

2. Reservoir Pressure: Mechanical Stabilization of the inital shut-in pressure build-up indicates a maximum reservoir pressure of 5689 psig at recorder depth. Mechanical stabilization of the final shut-in pressure build-up indicates a maximum reservoir pressure of 5691 psig at recorder depth.

3. Permeability: The calculated transmissibility factor of 4739 md.ft./cp. indicates an average effective permeability to gas of 2.37 md. for the reported 50 foot porous interval. The calculations were based on a slope of 505,000 psi^{2}/ log cycle obtained from the final shut-in build-up plot. It was assumed for these calculations: (A)gas gravity 0.70, (B)viscosity 0.025 cp., (C) and gas deviation factor 1.07. These figures were obtained from the available technical literature.

4. Well Bore Damage: The calculated estimated damage ratio of 12.32 indicates that high well bore damage is present at the time and conditions of this test. This value appears to be excessive and may be due to the partial penetration of the net production interval by the test interval. If subsequent information confirms this possibility then the value for D.R. should be discounted.

5. Radius of Investigation: The calculated radius of investigation of this test is 162.6 feet based on an assumed porosity of 7.5%, compressibility of 1.12 X 10^{-4} vol/vol/psi, and other assumptions made in number 3 above.

6. General Comments: The formation exhibits the characteristics of relatively low permeability effective to the reservoir fluid and well bore damage is indicated. No unusual characteristics were noted from the analysis of the test data presented. The main feature of this test is that an assumed horner plot slope was utilized to obtain reservoir calculations.

Yours truly,

Jose Cuesta
Technical Analyst

JC/jmh

WELL: CØLUMBIA GAS ET AL KØTANEELEE DST #2

FLØW RATE PRIØR TØ SHUT IN	(MCF/DAY)	1824.000
CØMPRESSIBILITY FACTØR Z		1.0700
HØRNER PLØT SLØPE	(PSI^2/LØG CYCLE)	505000.
VISCØSITY	(CP)	0.025
NET THICKNESS	(FT)	50.000
MAX RESERVØIR PRESSURE	(PSIG)	5691.0
FLØWING PRESSURE	(PSIG)	1672.0
FLØW TIME	(MIN)	135.0
PØRØSITY		0.075
CØMPRESSIBILITY	(1/PSI)	0.00011200
WELL BØRE RADIUS	(IN)	6.13
WELL ELEVATIØN	(FT)	2275.0
RECØRDER DEPTH	(FT)	11650.0
TEMPERATURE	(DF)	289.0

TRANSMISSIBILITY	(MD-FT/CP)	4738.57
FLØW CAPACITY	(MD-FT)	118.46
AVERAGE EFF. PERMEABILITY	(MD)	2.37
DAMAGE RATIØ		12.32
FLØW RATE WITH DAMAGE REMØVED	(MCF/DAY)	22471.092
PØTENTIØMETRIC SURFACE	(FT)	3765.5
RADIUS ØF INVESTIGATIØN	(FT)	162.6

USED 12.81 UNITS
PURGE PRESDAT
FILE NØT SAVED
READY
PURGE BLD2DATA

READY
BYE
00015.98 CRU 0000.05 TCH 0002.07 KC

ØFF AT 13:49MDT 10/04/77

RESERVOIR PRESSURE PLOT

JOHNSTON Schlumberger

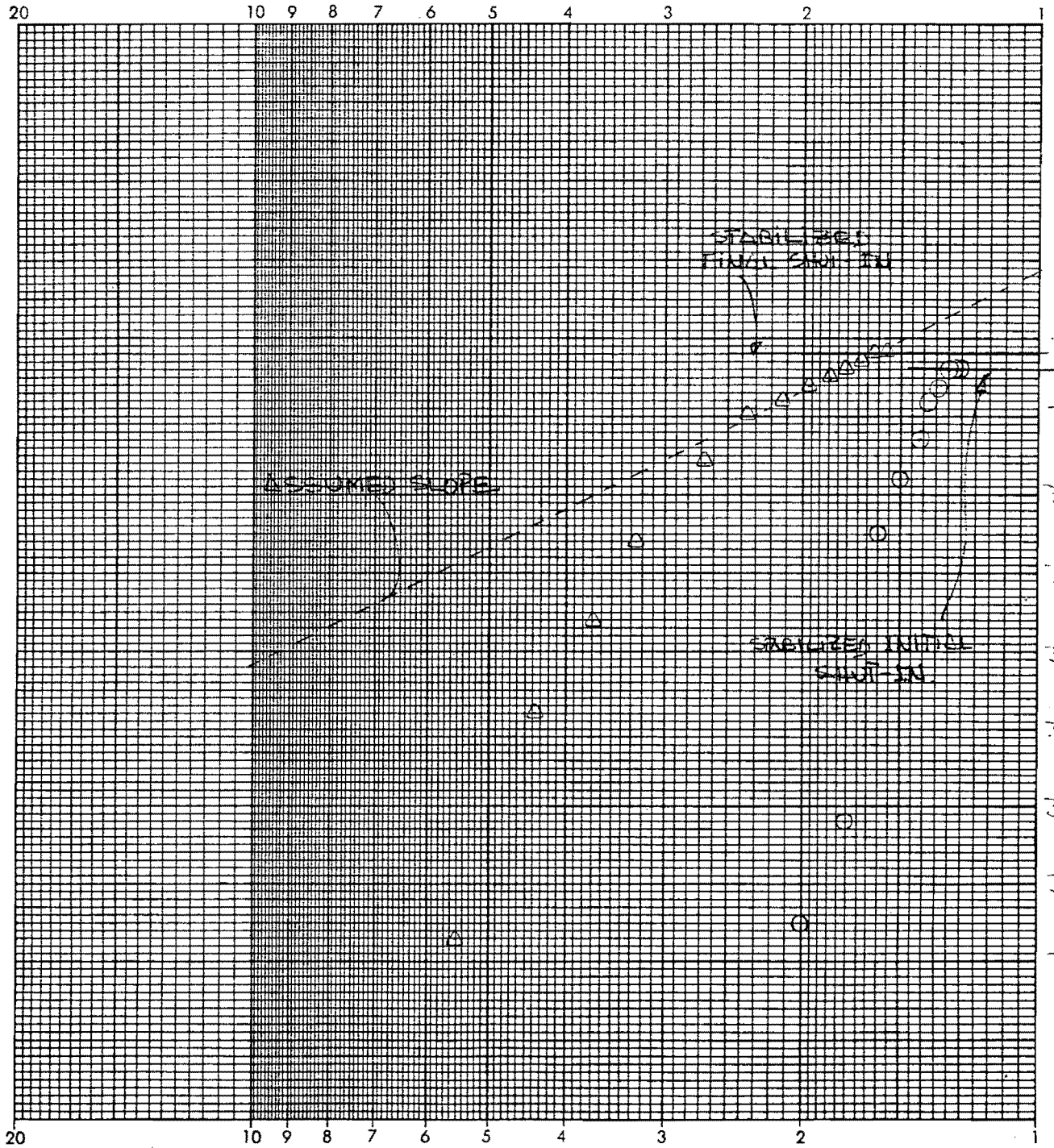
RECORDER No. 2M1 5012 CAPACITY 8650 FIELD REPORT No.

MAXIMUM RESERVOIR PRESSURE P_o = psig INITIAL SHUT-IN = 5689 PSIG

SLOPE OF SHUT-IN CURVE M 1 = psig/LOG CYCLE FINAL SHUT-IN = 5691 PSIG

SLOPE M 1 = P_1 3248.5 x 10^4 P_{10} 3198.0 x 10^4 = psig/LOG CYCLE 505000

SLOPE M 2 = P_1 P_{10} = psig/LOG CYCLE



$$\frac{T + \Delta t}{\Delta t}$$

JOHNSTON TESTERS

A DIVISION OF SCHLUMBERGER CANADA LIMITED
321 - 50th AVENUE S.E. CALGARY, ALBERTA T2G 2B3

District	Calgary	Ticket No.	E15085
Company	Columbia Gas Limited		
Address	1420 Standard Life Building, 639 - 5 Avenue S.W., Calgary, Alberta T2P 0M9	Test No.	2
J.T. No.	2		
Field	Kotaneelee	Well Name	Columbia Gas et al Kotaneelee
Province	Yukon Territory	Number	H-28-60-10-124
Co. Rep.	J. Dortch	Date	September 28, 1977
Technician	T. Thompson	Formation	
Interval	11,630 - 11,690'	Thickness TD	11,690'

TEST DATA

Type of Test	Open hole, Bottom hole.		
Time Started in Hole	0830 Hrs.	Tool Opened	1512 Hrs.
First Flow	15 Min.	Initial Shut-In	60 Min.
Second Flow	120 Min.	Second Shut In	240 Min.
Third Flow	Min.	Final Shut In	Min.
Pulled Loose @	2245 Hrs.	Out of Hole	0700 Hrs.
Wt. Set/on Packers	30,000 #	Pulled Loose Wt.	30,000 #

Description of Blow During Test: Fair initial aie puff on preflow. Fair air blow on final flow period with gas to surface in 25 minutes.

FLUID RECOVERY Was Test Reverse Circulated Yes XX No ☐

Total Fluid Recovered: 755 Ft.

Description of Fluid Recovered: 755' Gasified water.

GAS BLOW MEASUREMENT

Measured With Critical Flow Prover Gauge. 2" I.D. Riser

Time	Sfce. Choke	Reading psi	M Cubic Feet/Day
1735	64	180	5090
1745	64	170	4700
1755	54	170	2580
1805	54	160	2450
1815	54	155	2390
1825	54	150	2300

REMARKS: Test satisfactory.

	RESISTIVITY		SALT CONTENT
Recovery Water	@	°F.	ppm.
Mud Pit sample filtrate	@	°F.	ppm.

TOOL SEQUENCE

Tool	Length	O.D.
P.O. Sub	1.00	
D.P. Sub	.65	
MFE Tool	12.55	
Bypass Tool	2.85	
Recorder	4.40	
Safety Joint	1.75	
S.S. & Packer	9.30	7 1/2"
T.C. & Packer	6.55	7 1/2"
Total	39.05	
Packer Stub	1.00	
Perfs	15.00	
Recorder	4.40	
Recorder	4.40	
Perf	3.00	
Sub	1.00	
Drill Collar	28.55	
Sub	1.00	
Packer Stub	2.00	
Total Interval	60.35	
TOTAL LENGTH		

Elevation G.L. 2250 K.B. 2275

Bottom Hole Choke Size 1/2"

Fluid Cushion Type Water Amt. 3500'

MUD AND HOLE DATA

Mud Type KCL W.L.

Filter Cake 2/32 Visc. 70 Wt. 9,8

Time Taken 2400 hours

Contractor Nabours Drilling Rig No. 9

Drill Pipe Size 4 1/2" IF

Drill Collar Size 4 1/2" XH &

Drill Collar Length 605' &

Main Hole Size 12 1/4" Rat Hole

Distribution of Reports: 12 - Calgary

Attention: Rick Smith

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E15085

PRESSURE DATA

		AK1-4371	AK1-2095	AK1-5025	T-5365
INSTRUMENT No.		AK1-4371	AK1-2095	AK1-5025	T-5365
CAPACITY (psig)		7400	7450	8650	220 - 549 °F
INSTRUMENT DEPTH FT.		11608	11646	11650	11659
INSTRUMENT OPENING		Inside	Outside	Outside	Outside
WELL TEMP. °F.					
INITIAL HYDROSTATIC	A	5982#	6006#	6014#	
FIRST FLOW	B	1650#	1643#	1644#	
	B-1	1688#	1677#	1681#	
INITIAL SHUT-IN	C	5689#		5692#	
SECOND FLOW	D	1752#		1734#	
	D-1	650#		643#	
SECOND SHUT-IN	E		Clock		
THIRD FLOW	F		Stopped		
	F-1				
FINAL SHUT-IN	G	5689#		5692#	
FINAL HYDROSTATIC	H	5971#		6014#	

FLUID SAMPLE REPORT

Sample No. 103421 & 110267
Type 5"
Depth 11,593'
Volume 2500 cc

Sample Pressure:
psig. at Surface
Gravity API @ °F
Gas/Oil Ratio Cu.Ft./bbl.

Recovery:
Cu. Ft. Gas
cc. Oil
cc. Water
cc. Mud
Total Liquid cc.

REMARKS: Temperature recorder #5365 - 0.101 Defl. = 289 °F
MFE samples #103421 & #110267 and fluid sample #6445 sent to C & G Labs, Calgary, Alberta.

PRESSURE INCREMENTS ON RECORDER

Initial Shut-in

POINT MINUTES	PRESSURE	$\frac{T + \Delta t}{\Delta t}$
0	1679	-----
5	3947	4.000
10	5485	2.500
15	5626	2.000
20	5637	1.750
25	5670	1.600
30	5676	1.500
35	5681	1.428
40	5685	1.375
45	5687	1.333
50	5689	1.300
55	5689	1.273
60	5689	1.250

Final Shut-in

POINT MINUTES	PRESSURE	$\frac{T + \Delta t}{\Delta t}$
0	1672	------
10	5029	14.500
20	5546	7.750
30	5624	5.500
40	5650	4.375
50	5661	3.700
60	5670	3.250
80	5678	2.687
100	5683	2.350
120	5685	2.125
140	5687	1.964
160	5688	1.843
180	5689	1.750
200	5690	1.675
220	5691	1.614
240	5691	1.562

POINT MINUTES	PRESSURE	$\frac{T + \Delta t}{\Delta t}$

JT-I&E-5B

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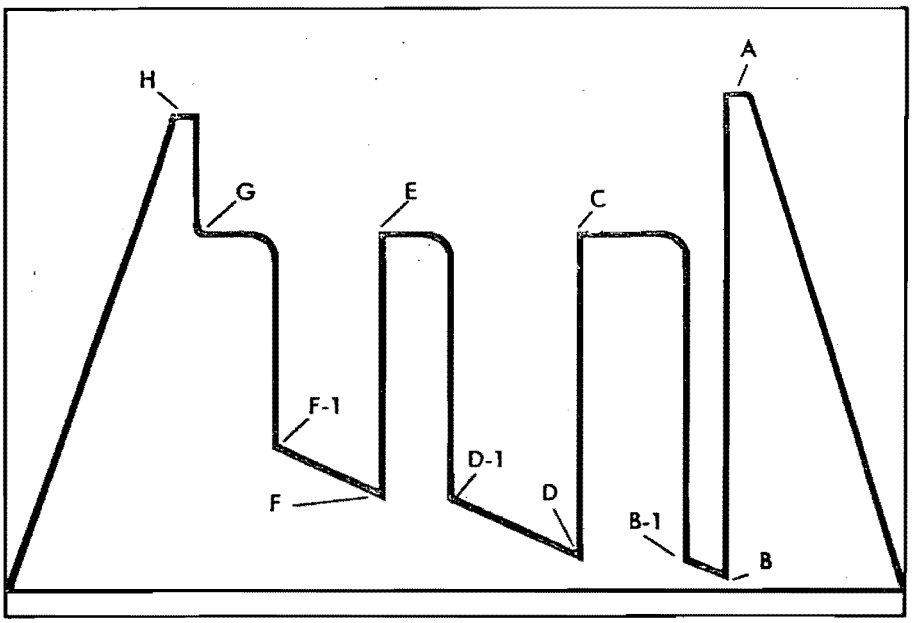
GUIDE TO IDENTIFICATION OF DRILL STEM TEST PRESSURE CHARTS

FIELD REPORT NO.	RECORDER NO.
E15085	AK1-4371



A. Initial Hyd. Mud
B. First Flow
C. Initial Shut-In
D. Second Flow
E. Second Shut-In
F. Third Flow
G. Final Shut-In
H. Final Hyd. Mud

The following points are either fluctuating pressures or points indicating other packer settings (testing different zones).

A-1, A-2, A-3, etc. Initial Hyd. Pressures
Z — Special pressure points such as pumping pressures recorded for formation breakdown.