COLUMBIA GAS DEVELOPMENT OF CANADA LTD.

FINAL WELL REPORT

FOR

COLUMBIA ET AL KOTANEELEE YT I-48A

Prepared By:

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Drilling Engineer

Approved By: B.M. Jackson 91-10-09

B.M. Jackson
Chief Drilling and Production Engineer

October 1991

Columbia et al Kotaneelee YT I-48A

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SECTION A - INTRODUCTION

OPERATIONS SUMMARY

COLUMBIA ET AL KOTANEELEE YT I-48A

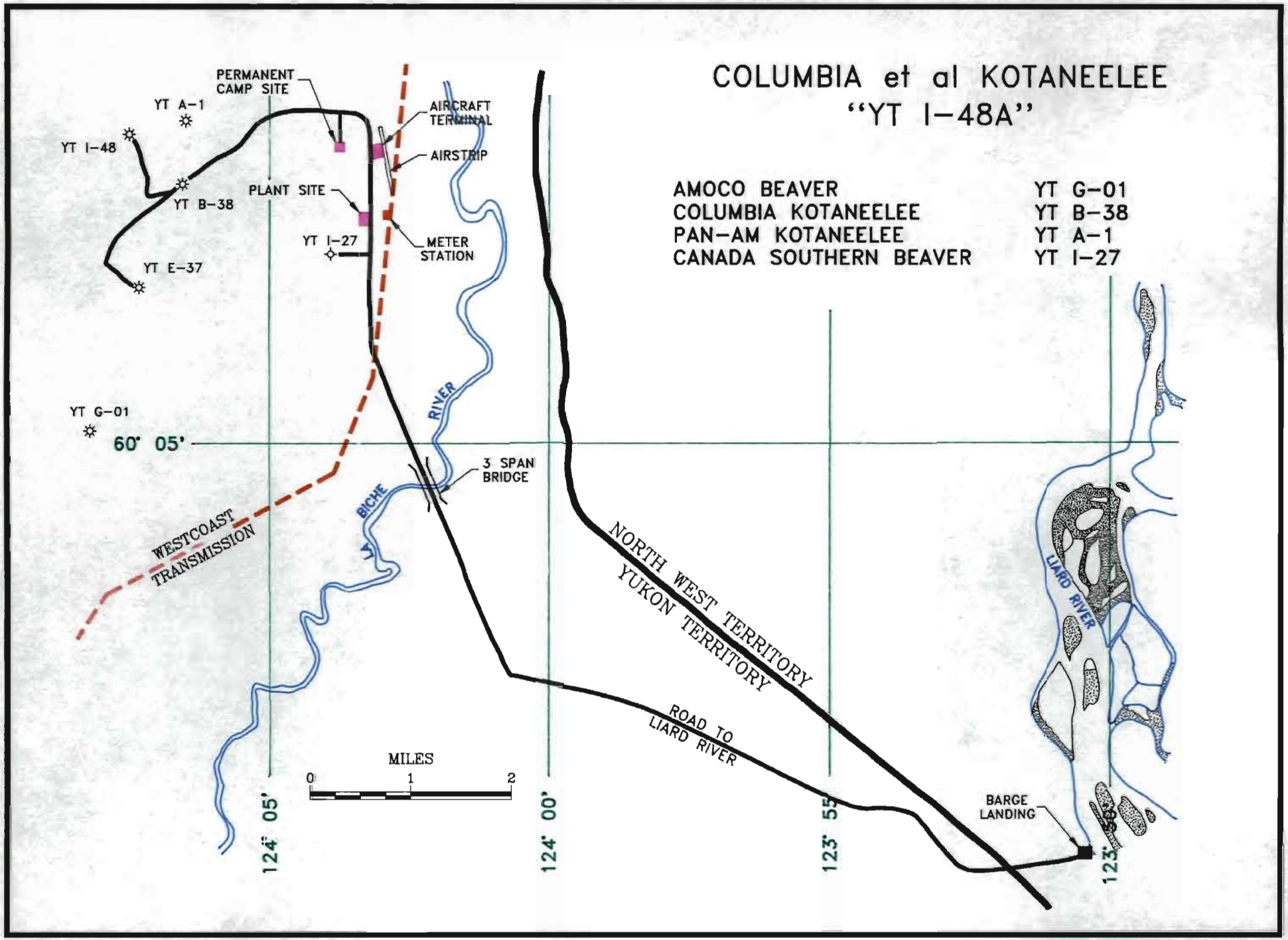
A workover of the Columbia et al Kotaneelee YT I-48 well in 1990 and 1991 showed the lower portion of the production casing to be unsuitable for production use. Excessive channelling of the production casing cement job in 1980 left the production casing without hydraulic isolation over the Nahanni pay interval. Extreme corrosion in combination with parted casing at 3600m deemed future workover operations impractical.

The YT I-48 well was abandoned by setting a 5.65m³ thermal cement plug from PBTD of 3753m to 3400m. With 0.62m³ of cement in the formation, a squeeze pressure of 8 MPa was maintained. A bridge plug was set at 3331m and pressure tested to 12 MPa. A whipstock packer was set at 3283m with the top of the whipstock at 3274m. The abandonment of Columbia et al Kotaneelee YT I-48 was complete.

Drilling operations commenced at Columbia et al Kotaneelee YT I-48A with the milling of the whipstock lug. A window was milled in the 177.8mm casing from 3273.70-3280.9m. A 152.4mm hole was directionally drilled from 3281m in the Besa River to 3915m, 68m into the Headless formation. The well was logged and a 127mm production liner run from 3915-2886m and cemented full length.

The production liner was cleaned out to PBTD of 3900m. The casing was displaced to inhibited water and cement bond logs run. The bond logs showed excellent bonding across the Nahanni pay zone and good isolation over the liner lap. A production packer was set at 3642m and 89mm tubing was run to surface. The wellhead was installed and all surface and downhole equipment pressure tested. The well was then perforated with through tubing perforating guns. A total of 135m was perforated over the gross interval 3658-3889m. The well was flowed on cleanup for 72 hours at which time a 56.6m³ acid wash/squeeze was performed. The well was flowed on cleanup after the acid wash at 968.5 x 10^3m³/d at 20,700 kPa (34.4 MMCF at 3000 psi). The drilling rig and support equipment was moved out and Columbia et al Kotaneelee YT I-48A was turned over to production operations 91-07-22. The well was put on production 91-07-25 and preliminary results indicate the well is capable of producing in excess of 1268 x 10^3m³/d (45 MMCFD).

ii) LOCALITY MAP


COLUMBIA et al KOTANEELEE
"YT I-48A"
AMOCO BEAVER YT G-01
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AIRSTRIP
YT I-48
PLANT SITE
YT B-38
YT I-27
METER STATION
YT E-37
YT G-01
60° 05'
RIVER
3 SPAN BRIDGE
BICHE
WESTCOAST TRANSMISSION
NORTH WEST TERRITORY
YUKON TERRITORY
ROAD TO LIARD RIVER
LIARD RIVER
BARGE LANDING
MILES
0 1 2
124° 05'
124° 00'
123° 55'
123° 50'

5081

B. GENERAL DATA

WELL NAME AND NUMBER: Columbia et al Kotaneelee Y.T. I-48A
ADW NUMBER: 1425

WELL LOCATION: Yukon Territory Unit I Section 48
Latitude: 60°07'35.917"
Longitude: 124°07'36.45"
Universal Well Location Reference:
Latitude: 60.12664
Longitude: 124.12679

UNIQUE WELL IDENTIFIER: 300I486010124001

OPERATOR: Columbia Gas Development Of Canada Ltd.
#1000, 639-5th Ave. S.W.
Calgary, Alta
T2P 0M9

DRILLING CONTRACTOR: Kenting Hi-Tower Drilling
P.O. Box 6650
Postal Station "D"
Calgary, Alta Canada
T2P 2V8

DRILLING UNIT: Kenting Hi-Tower Rig No. 7
Oilwell Model 66

WELL INFORMATION:

Ground Level Elevation:	827.34 m
K.B. Elevation:	832.70 m
Distance "H":	4.10 m
Ground to K.B.:	5.36 m
PBTD.:	3900 mKB
Total Depth:	3915 mKB
Sidetrack Initiated:	1991-05-19 @ 02:15 hr.
Drilling Commenced:	1991-05-24 @ 13:30 hr.
Rig Released:	1991-07-18 at 11:00 hr.
Casing Window:	3274 - 3280 mKB
Open Hole:	152.4mm from 3280-3915m KB
Drilling Authority:	D.A. 1425
Classification:	Development Well

PARTICIPATION:

(OP) Columbia Gas Development Of Canada Ltd.	33.15625%
Amoco Canada Resources Ltd.	31.21875%
Amoco Canada Petroleum Ltd.	18.75000%
Esso Resources Canada Limited	15.00000%
Mobil Oil Canada Ltd.	1.87500%

INTERMEDIATE CASING:

177.8 mm, 47.6 kg/m, MN-80, 8rd, LT&C, SS casing from 3280 - 2591 mkB and

177.8 mm, 43.2 kg/m, MN-80, 8rd, LT&C, SS casing from 2591-1118 mKB and

177.8 mm, 47.6 kg/m, L-80, 8rd, LT&C, SS casing from 1118 m to surface.

The casing is cemented to surface.

PRODUCTION LINER:

127 mm, 26.8 kg/m, L-80 Hydril SFJP, SS casing from 3914.5 - 2885.9 mKB.

Liner cemented with 2.3 tonnes Thermal 3F 1300 kg/m^3 scavenger slurry containing 0.80% CMHEC (fluid loss control additive) + 1.00% T-10 (cement dispersant) + 0.60% R-55 (retarder) + 14.0 tonnes Thermal 3F mixed to a density of 1877 kg/m^3 containing 0.80% CMHEC + 1.00% T-10 + 0.60% R-55. Cement top at 2886m KB

WELLHEAD (FMC):

279.4 mm, 34500 kPa x 179.4 mm, 79000 kPa tubing spool complete with 46 mm, 79000 Kpa SSO's and 46 mm x 79000 kPa WKM gate valve.

179.4 mm, 79000 kPa x 77.8 mm, 79000 kPa tubing head adapter complete with 89 mm CS Hydril thread and test port.

Two (2), 77.8 mm x 79000 kPa WKM master valves. (NACE trim).

One (1) studded cross (79000 kPa x 77.8 mm) with three (3) 76.2 mm x 34500 kPa SSO's.

One (1) 76.2 mm x 34500 kPa wing valve. (NACE trim) c/w 76.2 mm, 34500 kPa x 76.2 mm LP companion flange.

One (1) bottom hole test adapter, 76.2 mm, 34500 kPa x 89 mm EUE lift thread, metal lip seal, needle valve and gauge.

SIDETRACKED HOLE:

The I-48A well was sidetracked out of the 177.8mm production casing of the I48 well at 3273m utilizing a whipstock packer. Cement bond logs indicated adequate hydraulic isolation was provided in the 177.8mm casing/216mm hole and 177.8mm casing/244.5mm casing annulus from 3291m KB to surface. The presence of cement above and below the kick off point was necessary in order to minimize mechanical and well control problems. The small length of section between the 177.8mm cementing stage tool and the 244.5mm intermediate casing necessitated the use of a whipstock packer rather than conventional section milling. Although milling operations were more time consuming than anticipated, the whipstock packer provided a positive and rapid exit from the old wellbore and the sidetrack was considered an operational success.

C. GEOLOGICAL SUMMARY

HORN RIVER 3281-3657m

The Horn River consisted of dark drey to grey black fissile shale. It was micromicaeous in part with common dessiminated and nodular pyrite. At the bottom of the formation the shale became interbedded with a white to light grey, very fine to fine crystalline, dolomitic limestone.

The total gas readings over this formation ranged between 30 and 70 units of methane with trace ethane. There were no significant gas responses over this interval.

NAHANNI 3657-3847m

The Nahanni formation consisted primarily of dolomite with interbedded limestone. The dolomite was either light grey, very fine crystalline, dense, and tight, or medium to dak grey, fine crystalline, and tight. Most of the fracturing seemed to originate in the light grey dolomite as well as the better gas shows. At 3629 the penetration rate picked up from around 40 min/meter to around 20 min/meter. At this point the dolomite became less dense and hard.

The total background gas readings over this formation were between 30 and 90 units. The gas consisted of methane and traces of ethane. There were several good shows due to fractures over this formation:

3674.4-3677.0	180u/40u
3688.0-3693.0	189u/30u
3702.0-3703.0	176u/44u
3705.0-3706.0	251u/51u
3715.0-3716.0	114u/44u
3720.0-3729.0	914u peak at 3724m
	200-300u average over rest of show /50u
3736.0-3742.0	377u peak at 3739m
	100-120u average over rest of show /30u
3751.0-3754.0	173u/20u
3766.0-3772.0	358u peak at 3768m
	100-200u average over rest of show /40u
3817.6-3825.0	517u peak at 3818m
	200u average over rest of show /100u
3833.2-3836.6	340u/100u

It should be noted that the density of the mud was 15 to 20 points higher than the estimated formation pressures so that overbalancing occurred and may have masked some potential gas shows.

HEADLESS 3847-3920m

The Headless formation consisted of the same dolomite and limestone as the Nahanni but it becomes increasingly argillaceous and silty. The background gas readings over this interval were around 100 units of

methane with trace ethane. There were a few gas responses over this interval:

3859.0-3866.0	382u/100u
3866.2-3867.4	308u/50u
3875.0-3892.0	3789u peak at 3883m Note: gain 1 cubic meter in vol. 200u average over rest of show/50u
3904.0-3905.0	247u/90u

According to the gas shows there is at least 80 meters of potential pay over the Nahanni and Headless formations. Once again it should be noted that the mud weight was quite high and could have masked potential gas shows.

D. LOGGING SUMMARY

OPEN HOLE LOGS:

Run #1: Phasor Induction-SFL-SP-GR in combination with Borehole Compensated Sonic-GR-CAL. Logged from 3915-3274m KB. Log date: 25-June-1991.

Run #2: Formation Microscanner (FMS)-GR-CAL. Logged from 3913-3600m KB. Log date: 25-June-1991.

*TVD logs were prepared for each of the above logs.

CASED HOLE LOGS:

Completion Record: - 177.8mm bridge plug set at 3331.0m wireline KB.
- 177.8mm whipstock packer set at 3271.4m wireline KB. Log date: 17-May-1991

Compensated Bond-Variable Density-Cement Evaluation Log-GR-CCL. Logged from 3900-2880m KB. Log date: 01-July-1991. Cement Advisor (Processed Log) Log date: 01-July-1991.

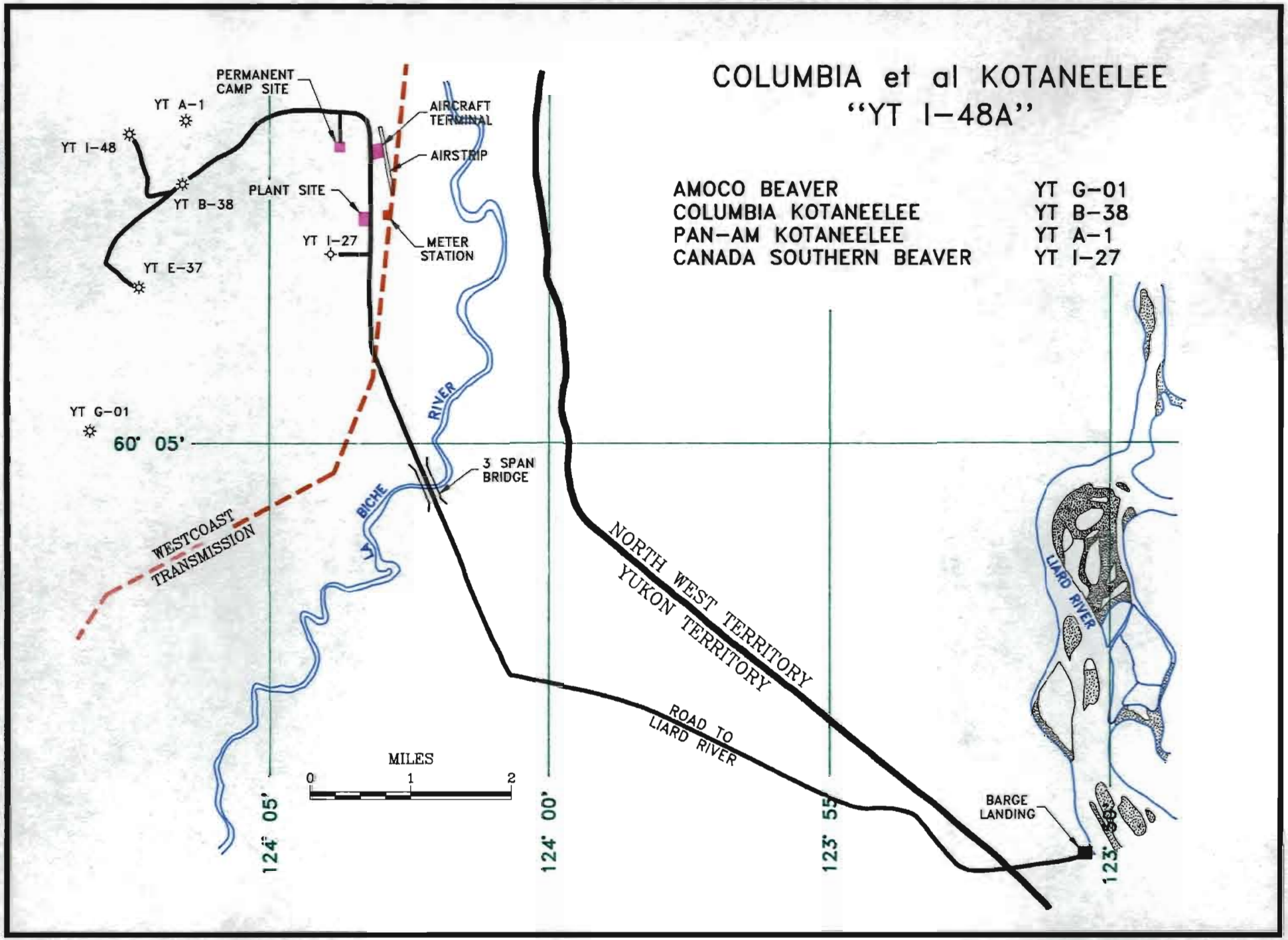
Completion Record: Setting of 127mm production packer c/w tailpipe assembly at 3642m KB. Log date: 04-July-1991. Summary of Perforating Operations. Log date: 11-July-1991.

PRODUCTION LOGS:

Production Logging Tool - Flow Analysis c/w Spinner Tool, Pressure and Temperature Recorder and Gradiomanometer Tool. Logged from 3880-3600m KB. Log run prior to stimulation. Log date: 15-July-1991.

NOTE: All logs run by Schlumberger.

E. DRILLING SUMMARY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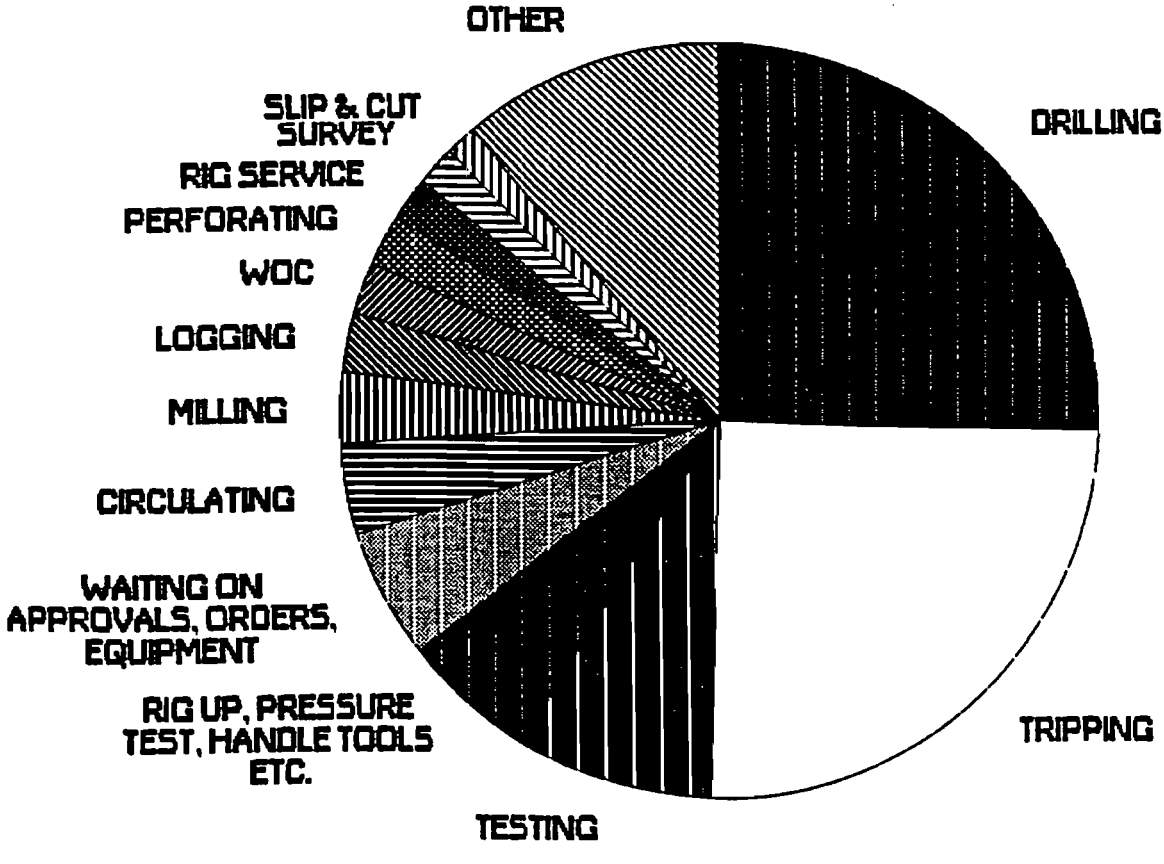
Time breakdown from the initial running in the hole of the whipstock at 06:00 hrs, 91-05-18 to rig release at 11:00 hrs, 91-07-18.

Operation	Hours	Operation	Hours
Drilling	366.5	Lay down drill string	22.5
Tripping	355.75	Tear out BOP's, Install Wellhead	21
Testing	115.75		
Handling Tools, Rigging Up, Pressure Testing etc.	81.25	Slip & cut	19.5
Waiting On Approvals, Orders, Equipment etc.	80.75	Ream	14.75
Circulating	54.75	Mix Mud	14.25
Milling	43	Clean Mud Tanks	12
Logging	37.5	Other	12.25
WOC	32.25	Run Casing	11
Perforating	30	Rig Repair	7.5
Rig Service	29.5	Polish Off/Drill Out Liner	7
Clean Up Tools And Lease, Load Out Equipment	26.5	Cementing	3
Survey	24	Stimulation	2.25
		Leak Off Test	1.75
		TOTAL	**1426.25**

COLUMBIA ET AL KOTANEELEE YT I48A



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BIT RECORD

WELL NAME Columbia et al Kotaneelee Y.T. I-48A

BIT No.	SIZE	SERIAL NUMBER	TYPE	JETS (mm)	IN	OUT	METERS DRILLED	HOURS	T-B-G	FORCE	RPM	
1	152.4	72040	R7	3x12.7	3277.3	3277.3	Attempt to exit window					
2	152.4	PR680	J33	3x12.7	3280	3334	54	25	6-5-I	10	70	
3	152.4	1102B	KDM33	3x22.2	3334	3402	68	31¼	5% wear	3-4	200	Motor
RR3	152.4	1102B	KDM33	3x22.2	3402	3414	12	4 3/4	very good	3-4	200	Motor
RR3	152.4	1102B	KDM33	3x22.2	3414	3426	12	15	worn out	3-4	200	Motor
4	152.4	H-69605	HP62	3x20	3426	3441	15	13¼	2-8-I	3-5	150	Motor
5	152.4	P5295	J33	3x20	3441	3455	14	13½	2-8-I	3-4	150	Motor
6	152.4	211K03	R4	3x20	3455	3461	6	6	3-3-I	8	65	
7	152.4	1254	KDM44	3x20	3 61	3495	34	33½	40% wear	1-5	75	
8	152.4	TW2968	HP53	3x20	3495	3550	55	23¼	2-3-I	5	80	
9	152.4	PH6315	HP53	3x15.9	3550	3593	43	29½	4-3-I	10	65	
10	152.4	TW2947	HP53	3x10.3	3593	3630	37	30	4-1-I	10	50	
11	152.4	215999	S88F	3x10.3	3630	3664.5	34.5	19 3/4	Lost cones	10	45/50	
	152.4	Flat Bottom Mill						4½		12-15	45	
12	152.4	PL603	J55	3x14.3	3664.5	3667	2.5	2 3/4	8-2-I	11	45	
13	152.4	28176	J55	3x14.3	3667	3672	5	3½	3-6-I	10	45	
14	152.4	526-PA	J55	3x14.3	3672	3681	9	6	4-1-I	8-10	45	
15	152.4	433-VL	J55	3x14.3	3681	3695	14	11½	8-8-I	7-9	45	
16	152.4	990SF	J55	3x14.3	3695	3733	38	17½	7-3-I	10	45	
17	152.4	137UL	J55	3x14.3	3733	3784	51	20 3/4	1-4-I	7-8	45	
18	152.4	232NK	J55	3x15.9	3784	3843	59	24 3/4	3-3-I	10	45	
19	152.4	140 VL	J55	3x15.9	3843	3915	72	27¼	4-4-I	10		
20	152.4	D98EF	J4	3x15.9	CLEAN OUT TO TOP OF LINER							
21	105.5	C10916	Klustrite Mill to drill out pack off bushing and clean out.									

COLUMBIA GAS DEVELOPMENT OF CANADA LTD.

CASING REPORT

WELL NAME: Columbia et al Kotaneelee YT I-48A DATE: June 27/91

2. COND. ___ SURF. ___ INTER ___ PROD. ___ LINER X CASING BOWL SIZE ___ SERIES ___ TYPE WELDED/SCRWD

FLOAT/GUIDE SHOE (MAKE Brown) FLOAT COLLAR (MAKE Davis Lynch) HANGER (TYPE Brown)

4. RAN 80 JTS. 26.97 mm OD CASING SET AT 3914.5 m BY PIPE TALLY) AS FOLLOWS:

SHOE JOINT(S) PLUS GUIDE SHOE AND FLOAT COLLARS: 14.48 m

	JOINTS		NO.	SIZE	LINEAR DENSITY	THD.	GRADE	CLASS	
6.	2 TO	80	79	127 mm OD	26.79 kg/m	SFJP	L-80	A	1008.56 m
	___ TO	___	___	___ mm OD	___ kg/m	___	___	___	___ m
8.	___ TO	___	___	___ mm OD	___ kg/m	___	___	___	___ m
	___ TO	___	___	___ mm OD	___ kg/m	___	___	___	___ m
10.	___ TO	___	___	___ mm OD	___ kg/m	___	___	___	___ m
	___ TO	___	___	___ mm OD	___ kg/m	___	___	___	___ m

12. TOTAL ___ TOTAL TALLY: ___ m

D.V. TOOL: ___ m

K.B. ELEVATION 832.7 m LINE HANGER AND PBR: 5.58 m

14. GROUND ELEVATION 827.34 m CHANGED ___ m CUT OFF: ___ m

DIST. GROUND TO K.B. 5.36 m DIST. "H" 4.10 m NET TALLY: 1028.62 m

(Surf. CSG. flange to K.B. = Dist. "H")

17. INSTALLED BAFFLE PLATE/CATCHER SUB .33 m ABOVE FLOAT COLLAR D.V. TOOL AT ___ m

CENTRALIZERS: NO. 76 INTERVAL(S) See remarks MAKE Gemco TYPE Turbo Collar & Belly spri

19. SCRATCHERS: NO. ___ INTERVAL(S) ___ MAKE ___ TYPE ___

WIPER PLUGS: FIRST Drillpipe plug SECOND Drill pipe plug & liner plug

21. CIRCULATED MUD ___ HRS. AFTER PIPE ON BOTTOM. CIRCULATING RATE 450 l/s. YP 5 Pa PV 20 mPa.s

MAXIMUM CIRCULATION USED WHILE DRILLING CASING INTERVAL 614 l/s.

23. RECIPROCATED CASING IN 1.5 m. STROKES 6½ MINS. PRIOR TO CEMENTING.

RECIPROCATED CASING IN ___ m. STROKES ___ MINS. WHILE CEMENTING.

25. TOP OF LINER SET AT 2885.96 m (387 m ABOVE BOTTOM OF INTERMEDIATE CASING) 177.8mm XXXXXXXXX Window at 3273 taken as bottom

REMARKS:

2 - turbolizers per joint for first 21 joint (jts #1-21)

1 - turbolizer per joint for 8 joints (jts. #22-29)

1 - Belly spring centralizer per joint for 20 jts. (jts. #30-49)

1 - Belly spring centralizer every 5th jt to top of liner.

COLUMBIA GAS DEVELOPMENT OF CANADA LTD.

CEMENTING REPORT

WELL NAME Columbia et al Kotaneelee YT I-48A DATE June 27/91

FLUSHED WITH: 10 m³ OF water

AVERAGE RATE OF .5 m³/m CEMENTED BY: Nowsco

MENT: STAGE #1 2.3 tonnes Thermo 3 + .8% CMHEC + 1.0% T10 + .6% R-55 slurry wt.
1300 kg/m³ (scavenger cement)

RTED TO MIX CEMENT AT 11:41 (AM. PM) FINISHED MIXING CEMENT AT 11:49 (AM. PM)

TOTAL SLURRY MIXED 5 m³ MAXIMUM PUMPING PRESSURE 12000 kPa

GE #2 14 tonne Thermo 3 + .8% CMHEC + 1.0% T10 +.6% R-55 slurry wt.
1877 kg/m³ tail in cement.

STARTED TO MIX CEMENT AT 11:49 (AM. PM) FINISHED MIXING CEMENT AT 12:15 (AM. PM)

TAL SLURRY MIXED 10.9 m³ MAXIMUM PUMPING PRESSURE 12000 kPa

PLUG DOWN AT 1331 (AM. PM) DATE: June 27/91 BUMP PLUG WITH 26000 kPa

ATS HOLDING yes IF NOT, PRESSURE HELD ON PLUG _____ kPa FOR _____ HRS.

PUMPED PLUG 3905 mWITH 19.2 m³ OF drlg mud VOLUME TO FLOAT COLLAR 19.2 m³

RAGE SLURRY DENSITY 1887 kg/m³ AVERAGE DISPLACEMENT RATE 0.5/0.15 m³/m

TEMPERATURE: CEMENT 14 °C WATER 13 °C SLURRY 17 °C

CULATED _____ m³ OF CEMENT BACKWASHED 2.7 m³ OF CEMENT. scavenger

NO. OF SAMPLES TAKEN 6 WITNESSED BY: Ed Prohl FOR CONTRACTOR.

R. Toole/J. Anderson FOR COLUMBIA

SURPLUS: none

TRANSFER NO. _____

REMARKS: Good cement job. Did not lose any fluids to formation during cement job. Displaced last 4.1m³ of Thermal 3F in plug flow of 0.15m³/min Preflush water and scavenger slurry displaced past pay zone in turbulent flow.

INTERNATIONAL DRILLING FLUIDS CORPORATION
#300, 300 - 5th AVENUE S.W.
CALGARY, ALBERTA, CANADA T2P 3C4
TELEPHONE: (403) 266-0722
FAX: (403) 237-8331

WELL SUMMARY

FOR

COLUMBIA GAS DEVELOPMENT OF CANADA

COLUMBIA ET AL KOTANEELEE YT-I-48

COLUMBIA GAS DEVELOPMENT OF CANADA

COLUMBIA ET AL KOTANEELEE YT-I-48

DISCUSSION BY INTERVALS

HOLE SIZE: **178mm CASING**

MUD TYPE: **GEL/CHEMICAL (Weighted)**

Mixed 90m³ of kill mud at 1200kg/m³. Displaced the hole to mud and built volume increasing the yeild point to a level high enough to suspend the Barite. The possibility of H_2S required raising and controlling the pH at 11.0 with Caustic Soda. Also pre-treated with 1.6kg/m³ of Sulban (H_2S Scavenger). Mixed a Barite pill prior to each trip (45 sacks) which continued to increase the density. Controlled the density at 1200kg/m³ with water dilution at 20/L min. when circulating. Due to the high bottom hole temperature of approximately 350°F the viscosity at the shaker was 20 to 40 sec/L higher than at the suction. Set a bridge plug at 3331 metres. Whipstock packer at 3277 metres, logged and ran in with mill. Milled a window in the 178mm casing. Kicked off and drilled 152mm hole to 3290 metres.

HOLE SIZE: **152mm**

MUD TYPE: **POLYMER (Weighted)**

Pre-mixed a weighted Polymer system on May 25, 1991. Displaced the hole over to the Polymer system and built volume and condition the mud. Drilled ahead, mixing 1 jug of X-Cide and 3 pails PTS-200 daily to prevent the Polymers from breaking down due to the high bottom hole temperature (350°F+). Maintained the viscosity at 35-45 s/L using **IDVIS D** and ASP-721. Controlled pH at 10.5 using Caustic Soda. The Yield point was 10 (Pa) until 3435 metres and then started to climb to 14. Increased H_2O additions and added 27 sacks **IDF FCL** to lower the yield point. ASP-721 additions were stopped on June 8th at 3530 metres and resumed on June 17th at 3680. The fluid loss climbed from 10mL to 37mL. Used Drispac S. Lo and **IDF-FLR** to control the filtrate. Fluid loss was very unstable until additions of Flo Plex (3.7kg/m³) at 3800 metres. Fluid loss dropped below 8mL.

While drilling from 3784 metres - 3822 metres, the hole took approximately 8m³ fluid. Prior to a trip out with Bit #17, a 14m³ L.C.M. pill was spotted in the annulus. No further losses were encountered while drilling. TD was 3915 metres. Logged and ran 127mm liner. Lost approximately 21m³ while running liner. Pumped L.C.M. and by passed shaker screens while circulating prior to cementing.

COLUMBIA GAS DEVELOPMENT OF CANADA

COLUMBIA ET AL KOTANEELEE YT-I-48

CONCLUSIONS AND RECOMMENDATIONS

HOLE SIZE: **178mm CASING**

MUD TYPE: **GEL/CHEMICAL (Weighted)**

Pre-mixed a weighted Gel system prior to drilling out the bridge plug. The density was raised to 1200kg/m^3 due to expected gas pressures. Maintained the pH at 10.5-11.0 and pre-treated with .6kg/m^3 Sulban due to the possibility of H_2S. This mud system was used to cut a window in the casing at 3273 metres with no problems.

HOLE SIZE: **152mm**

MUD TYPE: **POLYMER**

Pre-mixed and displaced the hole with a weighted Polymer system after the window was cut in the casing. The Polymer system was used to prevent any damage to the producing formation. The density was controlled in the 1180-1210kg/m^3 range due to the possibility of high formation pressures. The hole was directionally drilled to stay away from the old hole. Fished for cones at 3664 metres and 3695 metres. The hole was in good shape and no problems were encountered other then the difficulty keeping the fluid loss down. Flo Plex was added to lower fluid loss below 12mL and no further problems were reported.

COLUMBIA GAS DEVELOPMENT OF CANADA

COLUMBIA ET AL KOTANEELEE YT-I-48

PROGRAMMED PRODUCT COST DISCUSSION

Programmed Product Cost	**$**	**82,380.00**
Actual Cost	**$**	**145,118.30**

PRODUCT COST SUMMARY vs PROGRAMMED COST

Product	Programmed Usage	Actual Usage	Cost Difference	Reason For Use
Bentonite	200	390	$ 1,900.00	viscosity
Barite	1800	3889	26,112.50	density
Bicarbonate	50	5	(1,800.00)	cement contamination
Caustic Soda	42	74	960.00	pH control
IDBOND (ASP 721)	50	56	810.00	shale control
IDF FCL	40	10	(960.00)	thinner
Soda Ash	5	40	700.00	water hardness control
X-Cide 207	20	40	2,800.00	Biocide
IDF-FLR (Drispac)	60	101	6,560.00	fluid loss
DFLC	30	31	178.00	thinner
IDVIS D	25	40	6,300.00	viscosity
PTS 200	80	69	(2,860.00)	temperature stability
Mica	–	20	317.80	LCM
Sulban	–	20	5,000.00	H_2S Scavenger
Sawdust	–	188	940.00	LCM
Lime	–	20	171.60	camp use
Kwik-Seal	–	56	1,950.00	LCM
Sodium Sulphite	–	30	1,470.00	polymer stability
DEFOAMER	–	19	2,850.00	gas entrapment
Glass Beads	–	36	2,880.00	torque reducer
VISPLEX	–	1	225.00	viscosity
FLOPLEX	–	21	2,625.00	fluid loss
Celloflake	–	40	924.00	LCM

COLUMBIA GAS DEVELOPMENT OF CANADA

COLUMBIA ET AL KOTANEELEE YT-I-48

PRODUCT USE DISCUSSION

WORKOVER

The product cost for the workover section of the re-entry was $15,000.00 over our estimated program cost. This overrun was due to the time spent on this section (estimated 4 days, actual 26 days) and the Barite used for trip pills during this time ($12,000.00). Extra Bentonite, Caustic Soda and four pails of Sulban accounted for the balance of the cost in excess of the estimate.

RE-DRILL

The re-drill section of the project was accomplished within the programmed time frame, but the product cost was $47,500.00 above the programmed estimate. Barite use was again the biggest reason as about $14,000.00 over the programmed estimate was used. Trip pills and lost circulation accounted for the use. The centrifuge was used to reduce the density as it climbed above levels required for pressure control due to the many trip pills used.

Fluid loss control was the only drilling fluid problem experienced on this well. The programmed combination of **IDF-FLR**, Drispac, PTS 200 and Sodium Sulphite could not stabilize the fluid loss once bottom hole temperatures climbed to the expected high levels. **FLOPLEX** was brought to location and used to stabilize the fluid loss. Fluid loss control contributed to $7,800.00 of the cost over programmed estimate.

Lost circulation while drilling and running liner accounted for $4,200.00 of lost circulation material and losses of $7,200.00 of mud. The mud was on standby in a premix tank on location, but the cost to build the additional volume had not been included in our estimate.

Glass Beads were used to reduce torque between the casing and drillstring when kicking off ($2,880.00). Scavenger to control hydrogen sulphide ($5,000.00), Biocide to ensure bacteria did not become a problem ($2,800.00 above estimate) and **DEFOAMER** to reduce gas entrapment ($2,850.00) accounted for the balance of the cost over programmed estimate.

COLUMBIA GAS DEVELOPMENT OF CANADA

COLUMBIA ET AL KOTANEELEE YT-I-48

FUTURE AREA WELLS or RE-ENTRIES

PROGRAM RECOMMENDATIONS

1. The Polymer system is the best system to use on main hole or on a re-entry section in this area. It provides shale stability if these sections are in open hole, does not flocculate due to the high bottom hole temperatures and provides even cleaning ability through the different annular sizes. In addition, it appears that no formation damage was done as the well cleaned up and is producing as expected.

2. Programs for fluid loss control in the area will have to include product equivalent to **FLOPLEX** in the Polymer system. Conventional fluid loss polymers along with polymer stabilizers could not control the fluid loss adequately.

3. The balance between losses or gains from the producing formation appear to be very close, whole mud loss occurred both drilling and when running the casing. Although the losses were not severe on this well potential for serious problems exist and should be planned for. High mud weight to fight pressure may contribute to losses that would cause a serious well control problem.

4. Use a storage shed for mud products on location. Product bags were on location for over three (3) months and the shrink wrap started to break down. Product loss could have been a greater problem if the weather turned worse.

WELL KICKS AND WELL CONTROL OPERATIONS: (See "Hydrocarbon Report")

Several gas shows were present in the Nahanni formation from 3657-3847m due to fractures. The density of the drilling fluid was higher than the formation mud weight equivalent, so despite high drilled gas units, gas kicks were not taken. A total of $8m^3$ of drilling mud was lost while drilling from 3822-3834m. The losses were of a slow seepage in to the fracture system and did not create a well control problem.

There were good gas responses while drilling the Headless formation from 3847-3920m. A $1m^3$ increase in pit volume was noted while drilling from 3883-3887m however the mud flow returned to normal in 30 minutes.

FORMATION LEAK OFF TESTING:

A leak off test was run after drilling 10m of hole outside the casing window.

Last Casing Depth:	3273m
Mud Density:	1210 kg/m^3
Surface Pressure:	20000kPa
Formation Gradient:	17.9 kPa/m

FISHING OPERATIONS:

Lost Cones: The cones of bit #11 were left in the hole after drilling from 3630-3664.5m KB. The Nahanni formation top came in at 3657m KB and the dense dolomite of the Nahanni top likely caused the excessive wear. The cones were milled up with a flat bottom mill.

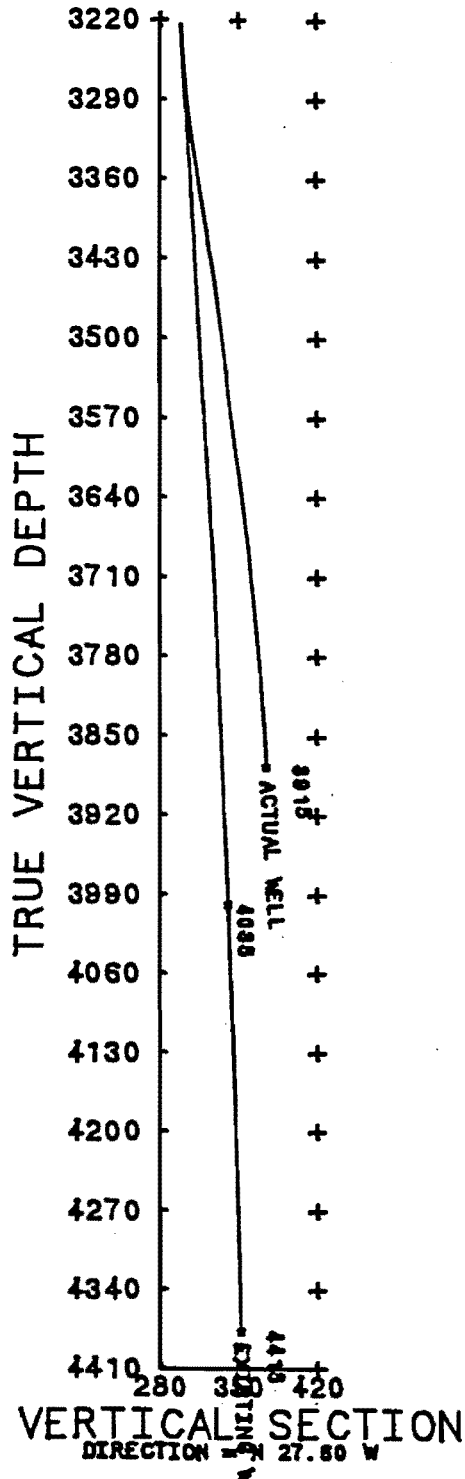
Lost Cones: The tips of the cones of bit #15 were left in the hole likely due to running excessive hours on the bit. The cone pieces were retrieved with a magnet.

SPERRY-SUN
DRILLING SERVICES
VERTICAL PROJECTION

COLUMBIA GAS DEVELOPMENT OF CANADA
REF.IS WELLHEAD
COLUMBIA ET AL KOTANEELEE I-48
DD-335

START MD. = 3253
FINISH MD. = 4415
SCALE IS 70 METERS/CM.
COURSE LENGTH = 0.00

PLOTTED VALUES SHOWN ARE MEASURED DEPTHS

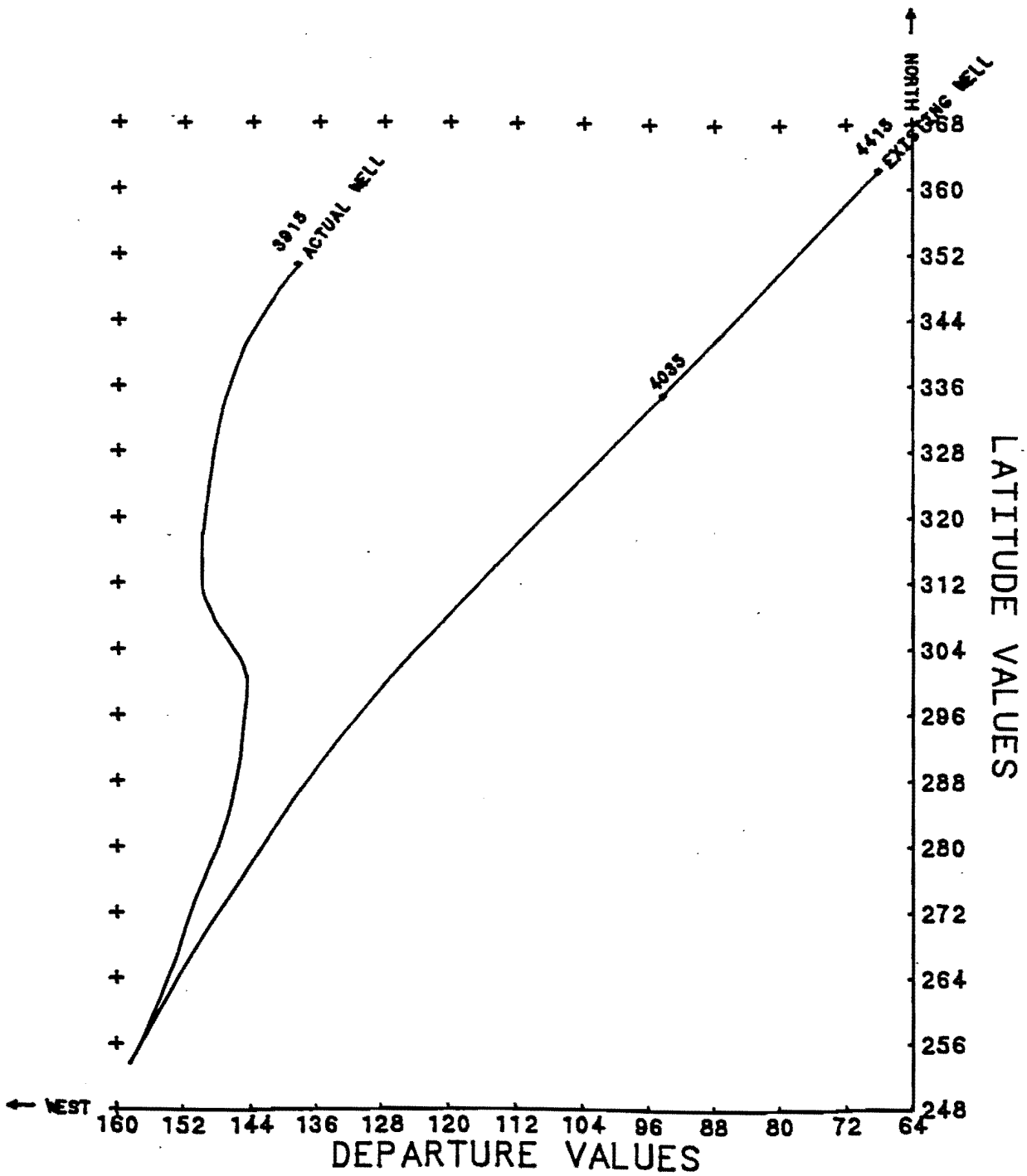


SPERRY-SUN
DRILLING SERVICES
HORIZONTAL PROJECTION

COLUMBIA GAS DEVELOPMENT OF CANADA
REF.IS WELLHEAD
COLUMBIA ET AL KOTANEELEE I-48
DD-335

START MD. = 3253
FINISH MD. = 4415
AXIS IS TRUE NORTH
SCALE IS 8 METERS/CM.
COURSE LENGTH = 0.00

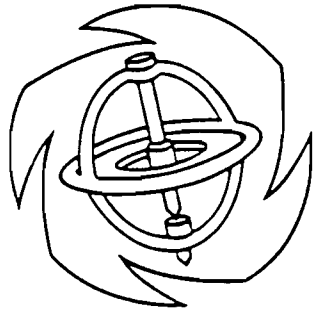
PLOTTED VALUES SHOWN ARE MEASURED DEPTHS



sperry-sun
DRILLING SERVICES
OF CANADA

COMPLETION PLAN
FOR

COLUMBIA ET AL KOTANEELEE I-48



WELL:	COLUMBIA ET AL KOTANEELEE I-48
L.S.D.:	I-48
FIELD:	KOTANEELEE
PROVINCE:	NORTHWEST TERRITORIES
JOB NO.:	DD-335
DATE:	1991 06 26

1406 - 5TH STREET NISKU, ALBERTA T0C 2G0 TELEPHONE (403) 955-7606

1991 06 26

COLUMBIA GAS DEVELOPMENT OF CANADA
COLUMBIA ET AL KOTANEELEE I-48
REFERENCE DIRECTION IS TRUE NORTH

DD-335
VERTICAL SECTION ALONG CLOSURE
DISTANCES ARE IN METERS

TOTAL MEAS DEPTH	ANGLE DEG.DEC	AZIMUTH DEG.DEC	TRUE VERTICAL DEPTH	TOTAL CO-ORDINATES NORTH	EAST	VERTICAL SECTION	DLS PER 30
0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
216.00	1.05	328.00	215.99	0.90	-0.56	1.05	0.27
224.00	2.08	313.00	223.99	1.06	-0.71	1.25	4.14
253.00	3.92	327.00	252.95	2.25	-1.63	2.70	2.03
282.00	4.00	325.00	281.88	3.91	-2.75	4.65	0.17
311.00	4.00	327.00	310.81	5.59	-3.88	6.62	0.14
339.00	4.00	326.00	338.74	7.22	-4.96	8.54	0.07
368.00	4.00	322.00	367.67	8.85	-6.15	10.49	0.29
396.00	3.92	324.00	395.60	10.40	-7.31	12.36	0.17
425.00	4.00	325.00	424.54	12.03	-8.48	14.30	0.11
454.00	4.00	325.00	453.46	13.68	-9.64	16.27	0.00
483.00	4.00	327.00	482.39	15.36	-10.77	18.24	0.14
511.00	4.00	324.00	510.33	16.97	-11.87	20.14	0.22
540.00	4.08	320.00	539.25	18.58	-13.13	22.10	0.30
569.00	4.42	321.00	568.17	20.24	-14.50	24.15	0.35
597.00	4.08	313.00	596.10	21.76	-15.91	26.08	0.73
626.00	4.00	311.00	625.03	23.12	-17.42	27.91	0.17
654.00	4.00	309.00	652.96	24.38	-18.92	29.62	0.15
683.00	4.08	308.00	681.88	25.65	-20.52	31.39	0.11
712.00	4.50	307.00	710.80	26.97	-22.24	33.25	0.44
740.00	4.42	304.00	738.72	28.23	-24.01	35.08	0.27
768.00	4.92	303.00	766.63	29.49	-25.91	36.95	0.54
797.00	5.00	300.00	795.52	30.80	-28.05	38.95	0.28
825.00	4.83	310.00	823.41	32.17	-30.01	40.94	0.93
854.00	5.00	309.00	852.31	33.75	-31.93	43.11	0.19
883.00	5.00	308.00	881.20	35.32	-33.91	45.30	0.09
911.00	6.00	307.00	909.07	36.95	-36.04	47.60	1.08
940.00	6.00	306.00	937.91	38.76	-38.47	50.18	0.11
969.00	6.42	306.00	966.74	40.60	-41.01	52.82	0.43
998.00	7.00	304.00	995.54	42.54	-43.79	55.65	0.65
1026.00	7.08	303.00	1023.33	44.44	-46.65	58.46	0.16
1036.00	6.92	296.00	1033.26	45.04	-47.71	59.41	2.61
1046.00	7.00	294.00	1043.18	45.55	-48.80	60.29	0.77
1050.00	7.00	295.00	1047.15	45.75	-49.25	60.64	0.91
1085.00	7.90	290.00	1081.86	47.47	-53.44	63.78	0.95
1113.00	8.50	289.00	1109.57	48.81	-57.21	66.40	0.66
1142.00	9.00	288.00	1138.23	50.20	-61.39	69.24	0.54
1170.00	9.80	286.00	1165.86	51.54	-65.76	72.08	0.93
1227.00	11.40	289.00	1221.88	54.71	-75.75	78.70	0.89

COLUMBIA GAS DEVELOPMENT OF CANADA
COLUMBIA ET AL KOTANEELEE I-48
REFERENCE DIRECTION IS TRUE NORTH

1991 06 26
DD-335
VERTICAL SECTION ALONG CLOSURE
DISTANCES ARE IN METERS

TOTAL MEAS DEPTH	ANGLE DEG.DEC	AZIMUTH DEG.DEC	TRUE VERTICAL DEPTH	TOTAL CO-ORDINATES NORTH	EAST	VERTICAL SECTION	DLS PER 30
1256.00	11.40	290.00	1250.31	56.62	-81.16	82.46	0.20
1284.00	12.00	289.00	1277.73	58.52	-86.51	86.19	0.68
1313.00	12.00	285.00	1306.10	60.28	-92.27	89.95	0.86
1341.00	11.30	290.00	1333.52	61.97	-97.66	93.50	1.32
1370.00	11.50	293.00	1361.95	64.07	-102.99	97.41	0.65
1398.00	10.80	298.00	1389.42	66.39	-107.88	101.36	1.28
1427.00	10.90	300.00	1417.90	69.04	-112.65	105.58	0.40
1455.00	11.10	301.00	1445.39	71.75	-117.26	109.79	0.30
1484.00	11.20	305.00	1473.84	74.80	-121.96	114.36	0.81
1513.00	11.30	304.00	1502.28	78.01	-126.62	119.05	0.23
1541.00	10.90	314.00	1529.76	81.38	-130.80	123.72	2.10
1570.00	11.20	303.00	1558.23	84.82	-135.13	128.51	2.20
1598.00	11.60	308.00	1585.67	88.04	-139.63	133.15	1.14
1627.00	10.90	308.00	1614.12	91.52	-144.09	138.03	0.72
1655.00	11.00	301.00	1641.61	94.52	-148.46	142.43	1.43
1684.00	10.90	303.00	1670.08	97.44	-153.14	146.86	0.41
1712.00	11.40	303.00	1697.55	100.39	-157.68	151.27	0.54
1741.00	11.70	305.00	1725.96	103.64	-162.49	156.06	0.52
1769.00	11.80	309.00	1753.38	107.07	-167.04	160.92	0.88
1798.00	11.60	310.00	1781.78	110.81	-171.58	166.07	0.29
1826.00	11.10	310.00	1809.23	114.35	-175.80	170.91	0.54
1855.00	11.90	314.00	1837.65	118.22	-180.09	176.09	1.17
1883.00	11.10	314.00	1865.08	122.10	-184.10	181.17	0.86
1912.00	11.10	310.00	1893.54	125.83	-188.25	186.16	0.80
1940.00	10.30	313.00	1921.06	129.27	-192.15	190.79	1.04
1970.00	10.10	314.00	1950.58	132.93	-196.00	195.61	0.27
1997.00	7.80	316.00	1977.25	135.89	-198.98	199.46	2.58
2026.00	7.80	320.00	2005.98	138.82	-201.61	203.14	0.56
2054.00	7.70	319.00	2033.73	141.69	-204.06	206.71	0.18
2083.00	7.20	323.00	2062.48	144.61	-206.43	210.30	0.74
2112.00	6.80	320.00	2091.27	147.37	-208.63	213.68	0.56
2140.00	6.00	328.00	2119.09	149.88	-210.47	216.69	1.28
2169.00	5.20	322.00	2147.95	152.20	-212.08	219.44	1.02
2197.00	5.10	328.00	2175.84	154.26	-213.52	221.88	0.59
2226.00	5.70	349.00	2204.71	156.77	-214.48	224.56	2.12
2254.00	5.20	5.00	2232.59	159.40	-214.63	227.07	1.71
2283.00	5.20	5.00	2261.47	162.01	-214.40	229.42	0.00
2311.00	6.30	6.00	2289.33	164.81	-214.13	231.92	1.18
2340.00	5.90	8.00	2318.16	167.86	-213.76	234.62	0.47
2368.00	5.90	7.00	2346.02	170.72	-213.38	237.14	0.11

1991 06 26

COLUMBIA GAS DEVELOPMENT OF CANADA
COLUMBIA ET AL KOTANEELEE I-48
REFERENCE DIRECTION IS TRUE NORTH

DD-335
VERTICAL SECTION ALONG CLOSURE
DISTANCES ARE IN METERS

TOTAL MEAS DEPTH	ANGLE DEG.DEC	AZIMUTH DEG.DEC	TRUE VERTICAL DEPTH	TOTAL CO-ORDINATES NORTH	EAST	VERTICAL SECTION	DLS PER 30
2397.00	5.10	2.00	2374.88	173.49	-213.16	239.63	0.96
2425.00	4.90	357.00	2402.78	175.92	-213.18	241.91	0.51
2454.00	4.90	359.00	2431.67	178.40	-213.26	244.24	0.18
2482.00	4.60	355.00	2459.57	180.71	-213.38	246.44	0.48
2511.00	4.60	12.00	2488.48	183.01	-213.24	248.52	1.41
2539.00	4.80	23.00	2516.39	185.19	-212.55	250.29	0.99
2568.00	5.10	30.00	2545.28	187.42	-211.43	251.96	0.70
2596.00	5.50	43.00	2573.16	189.48	-209.89	253.31	1.35
2625.00	6.00	47.00	2602.02	191.53	-207.84	254.46	0.66
2653.00	6.50	50.00	2629.85	193.55	-205.55	255.50	0.64
2682.00	7.00	43.00	2658.65	195.89	-203.09	256.78	1.00
2711.00	6.80	45.00	2687.44	198.40	-200.67	258.22	0.32
2739.00	6.90	46.00	2715.24	200.74	-198.29	259.52	0.17
2768.00	7.70	43.00	2744.00	203.37	-195.71	261.02	0.92
2796.00	9.20	41.00	2771.70	206.43	-192.96	262.86	1.64
2825.00	10.20	38.00	2800.28	210.21	-189.86	265.23	1.16
2853.00	9.60	40.00	2827.87	213.95	-186.83	267.60	0.74
2882.00	9.10	39.00	2856.48	217.58	-183.84	269.88	0.54
2910.00	10.10	43.00	2884.09	221.10	-180.77	272.03	1.29
2939.00	9.20	42.00	2912.68	224.68	-177.48	274.15	0.95
2967.00	8.50	43.00	2940.35	227.86	-174.57	276.04	0.77
2996.00	7.00	41.00	2969.08	230.76	-171.95	277.78	1.58
3024.00	6.50	33.00	2996.89	233.38	-169.97	279.48	1.14
3053.00	6.20	26.00	3025.71	236.16	-168.39	281.49	0.86
3081.00	5.90	34.00	3053.55	238.71	-166.92	283.33	0.96
3110.00	5.80	35.00	3082.40	241.15	-165.25	284.98	0.15
3138.00	6.00	36.00	3110.25	243.49	-163.58	286.54	0.24
3167.00	5.70	27.00	3139.10	246.00	-162.03	288.31	1.00
3195.00	5.70	35.00	3166.97	248.38	-160.60	290.00	0.85
3224.00	5.00	31.00	3195.84	250.64	-159.13	291.56	0.82
3253.00	5.20	27.00	3224.72	252.90	-157.88	293.20	0.42
3280.00	5.50	28.25	3251.61	255.13	-156.71	294.84	0.36
3325.00	11.20	19.50	3296.11	261.15	-154.23	299.54	3.88
3348.00	12.30	22.25	3318.63	265.52	-152.55	302.99	1.61
3357.00	12.80	14.25	3327.42	267.38	-151.95	304.49	6.02
3377.00	13.50	19.25	3346.89	271.73	-150.63	308.06	2.00
3397.00	14.00	24.25	3366.32	276.14	-148.87	311.51	1.93
3410.21	13.80	22.35	3379.14	279.05	-147.61	313.76	1.13
3427.00	12.40	13.25	3395.50	282.66	-146.44	316.68	4.45
3440.50	11.60	11.25	3408.70	285.40	-145.84	319.02	2.00

1991 06 26

COLUMBIA GAS DEVELOPMENT OF CANADA
COLUMBIA ET AL KOTANEELEE I-48
REFERENCE DIRECTION IS TRUE NORTH

DD-335
VERTICAL SECTION ALONG CLOSURE
DISTANCES ARE IN METERS

TOTAL MEAS DEPTH	ANGLE DEG.DEC	AZIMUTH DEG.DEC	TRUE VERTICAL DEPTH	TOTAL CO-ORDINATES NORTH	EAST	VERTICAL SECTION	DLS PER 30
3452.00	11.00	12.75	3419.98	287.61	-145.37	320.89	1.74
3464.00	10.50	5.00	3431.77	289.81	-145.02	322.82	3.82
3474.00	10.75	7.25	3441.60	291.64	-144.83	324.45	1.45
3493.00	9.50	3.50	3460.30	294.97	-144.51	327.42	2.23
3503.00	10.25	8.25	3470.15	296.67	-144.33	328.94	3.32
3520.00	7.30	358.25	3486.95	299.25	-144.15	331.27	5.84
3536.00	7.50	336.75	3502.82	301.23	-144.59	333.27	5.18
3561.00	7.25	322.75	3527.62	303.98	-146.19	336.42	2.17
3580.00	7.25	325.75	3546.47	305.93	-147.59	338.75	0.60
3610.00	8.00	345.25	3576.21	309.51	-149.19	342.67	2.68
3620.00	8.50	354.25	3586.10	310.92	-149.44	344.07	4.15
3652.00	9.00	2.75	3617.73	315.77	-149.55	348.63	1.30
3664.00	9.00	5.25	3629.58	317.64	-149.42	350.32	0.98
3720.00	8.00	9.25	3684.97	325.85	-148.40	357.58	0.62
3767.00	7.75	11.25	3731.53	332.19	-147.25	363.05	0.24
3825.00	7.75	25.25	3789.00	339.56	-144.82	369.02	0.97
3882.00	8.00	34.75	3845.47	346.30	-140.92	373.85	0.70
3915.00	8.00	40.25	3878.15	349.94	-138.13	376.21	0.70

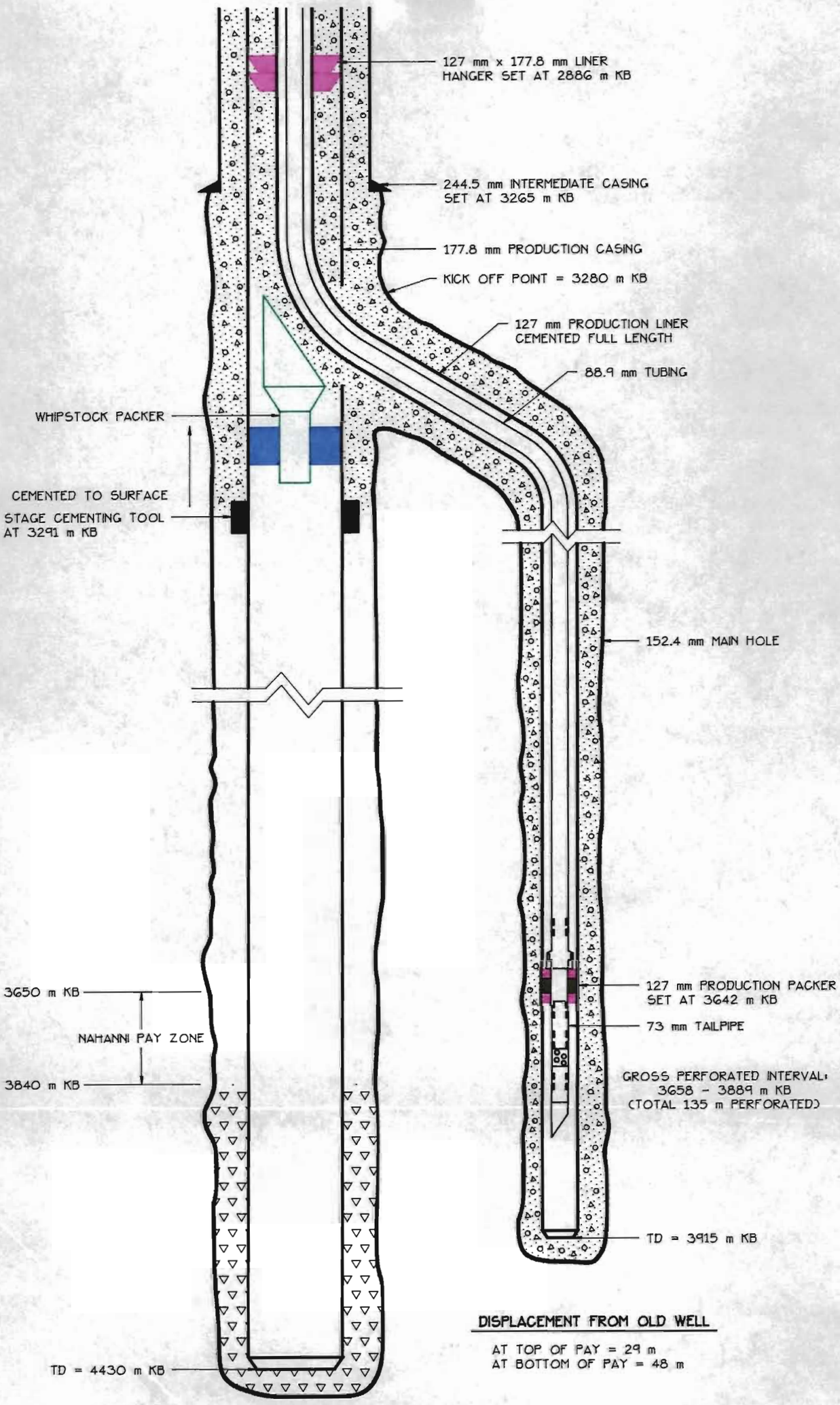
MINIMUM CURVATURE METHOD

HORIZONTAL DISPLACEMENT AT BOTTOM HOLE IS
376.21 METERS ALONG 338.46 DEG
RELATIVE TO WELL HEAD

VERTICAL SECTION RELATIVE TO WELL HEAD

F. COMPLETION SUMMARY

COLUMBIA ET AL KOTANEELEE
YT I-48A
SIDETRACK SCHEMATIC



DISPLACEMENT FROM OLD WELL

AT TOP OF PAY = 29 m
AT BOTTOM OF PAY = 48 m

COLUMBIA GAS DEVELOPMENT OF CANADA LTD.

STANDARD LIFE BUILDING
639 - 5TH AVENUE S.W.
CALGARY, ALBERTA, CANADA T2P 0M9
(403) 261-8680

TUBING SUMMARY

Well Columbia et al Kotaneelee YT I-48A — Date 91-07-07

KB Elevation 832.7m — KB to CSG FLG 5.58m — KB to TBG TOP 4.42m

Casing OD 177.8mm/127mm — WT 47.6/26.8 kg/m — MIN DIA 152.4mm/108.6mm

Set At 127mm @ 3914.5m — PBD 3900m KB — PERFS 3658-3889m KB

Tubing OD 89mm — WT 13.84 kg/m — Type L-80, CSH — Make Hydril

No. Joints on Location 399 — Tally 3788.65m

No. Joints Run 382 — Tally 3630.02m

PERMANENT STRING FROM BOTTOM UP

No. Joints	Description	Measured Length	KB Depth	Remarks
73mm	Wireline re-entry guide	0.15	3652.72	
73mm	CS Hydril pup joint	0.61		
73mm	Otis "XN" nipple	0.33	3651.63	58.7mm profile
73mm	CS Hydril pup joint	2.98		
73mm	Perforated pup	2.99		
73mm	Otis "X" nipple	0.32	3645.34	58.7mm profile
73mm	CS Hydril pup joint	1.78		
73mm	Otis "X" nipple	0.22	3643.34	58.7mm profile
Packer	20-144-510 Model SO	1.10	3642.24	
89mm	On-Off tool, ¼ turn	0.52		
	right hand release			
	Total String Length			
	KB to Tubing Top			
	String Depth KB			

Remarks Continued on page 2

Field Supervisor H. Rugg

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TUBING SUMMARY

Well Columbia et al Kotaneelee YT I-48A Date 91-07-07

KB Elevation _____ KB to CSG FLG _____ KB to TBG TOP _____

Casing OD _____ WT _____ MIN DIA _____

Set At _____ PBD _____ PERFS _____

Tubing OD _____ WT _____ Type _____ Make _____

No. Joints on Location _____ Tally _____

No. Joints Run _____ Tally _____

PERMANENT STRING FROM BOTTOM UP

No. Joints	Description	Measured Length	KB Depth	Remarks
89mm	CS Hydril pup	2.37		
89mm	Otis "X" nipple	0.31	3639.04	58.7mm profile
381	jts. 89mm CSH tubing	3620.65		
1	89mm pup	1.16		
1	89mm pup	1.70		
1	89mm pup	2.38		
1	89mm pup (double pin)	0.16		
1	jt. 89mm hydril tubing	9.37		
	squat on packer	-0.80		

Total String Length	3648.30
KB to Tubing Top	4.42
String Depth KB	3652.72

Remarks 7000 daN compression set on packer.

-177.8mm x 127mm casing and packer tested to 31 MPa for 15 mins.

- 89mm tubing, packer & 127mm casing tested to 35 MPa for 15 mins.

Field Supervisor _____

PERFORATION RECORD

COLUMBIA ET AL KOTANEELEE Y.T. I-48A

INTERVAL (m KB)	LENGTH (m)
3889.0-3859.0	30.0
3859.0-3844.0	15.0
3844.0-3837.5	6.5
3829.0-3814.0	15.0
3789.0-3774.0	15.0
3769.0-3758.5	10.5
3746.0-3739.0	7.0
3724.0-3709.0	15.0
3693.0-3687.0	6.0
3678.0-3668.0	10.0
3663.0-3658.0	5.0
	135.0

All perforations shot with a 54mm, DS gun loaded with 25A Ultrajet HMX high temperature charges at 13 jspm and 60 degree phasing.

An International Company

NOWSCO Well Service Ltd.

1300, 801 - 6th AVENUE S.W., CALGARY, ALBERTA, CANADA T2P 4E1 TELEPHONE (403) 261-2990 TELEX 03-825617 FACSIMILE (403) 254-7[illegible]

ACID TREATMENT TREATMENT REPORT

I-48A

T.R. Number : 012775 Rev : 01
Customer Name: COLUMBIA GAS DEVELOPMENT OF CANADA
1000 STANDARD LIFE BLDG.
639 - 5TH AVENUE S.W.
CALGARY AB
T2P 0M9
Contractor : KENTING 7
Customer Rep.: HAROLD RUGG

Customer Job #: 17368
Service order#: C5340
Province : YT
Well Location :
Well Name : COLUMBIA ET AL KOTANEELEE
Job Type : ACID TREATMENT
Nowsco Rep. : MILLER HENDREN

Well Data

	Size (mm)	Top (m)	Bottom (m)	Density (kg/m)	Volume (m3)	Allowable Pressure (MPa)
TUBING	89.0	0.00	3642.00	13.84	16.80	35.00
LINING	73.0	3642.00	3653.00	9.67		
CASING	127.0	0.00	3914.50	26.79	2.19	12.00

Total Volume : 18.99 m3

Perfs From 3658.0 m To 3889.0 m Density 13 shots/m

Arrived At Location: 91/07/17 08:00:00 Left Location : 91/07/17 15:30:00

Pressure

Instantaneous Shut In : 3.50 MPa Pressure Test : 41.50 MPa

Fluid Details

Fluid Description	Additive List			
56.50 m3 15% HCl acid	With 15% HCl acid	At	15.000	m3/m3 blended

continued...

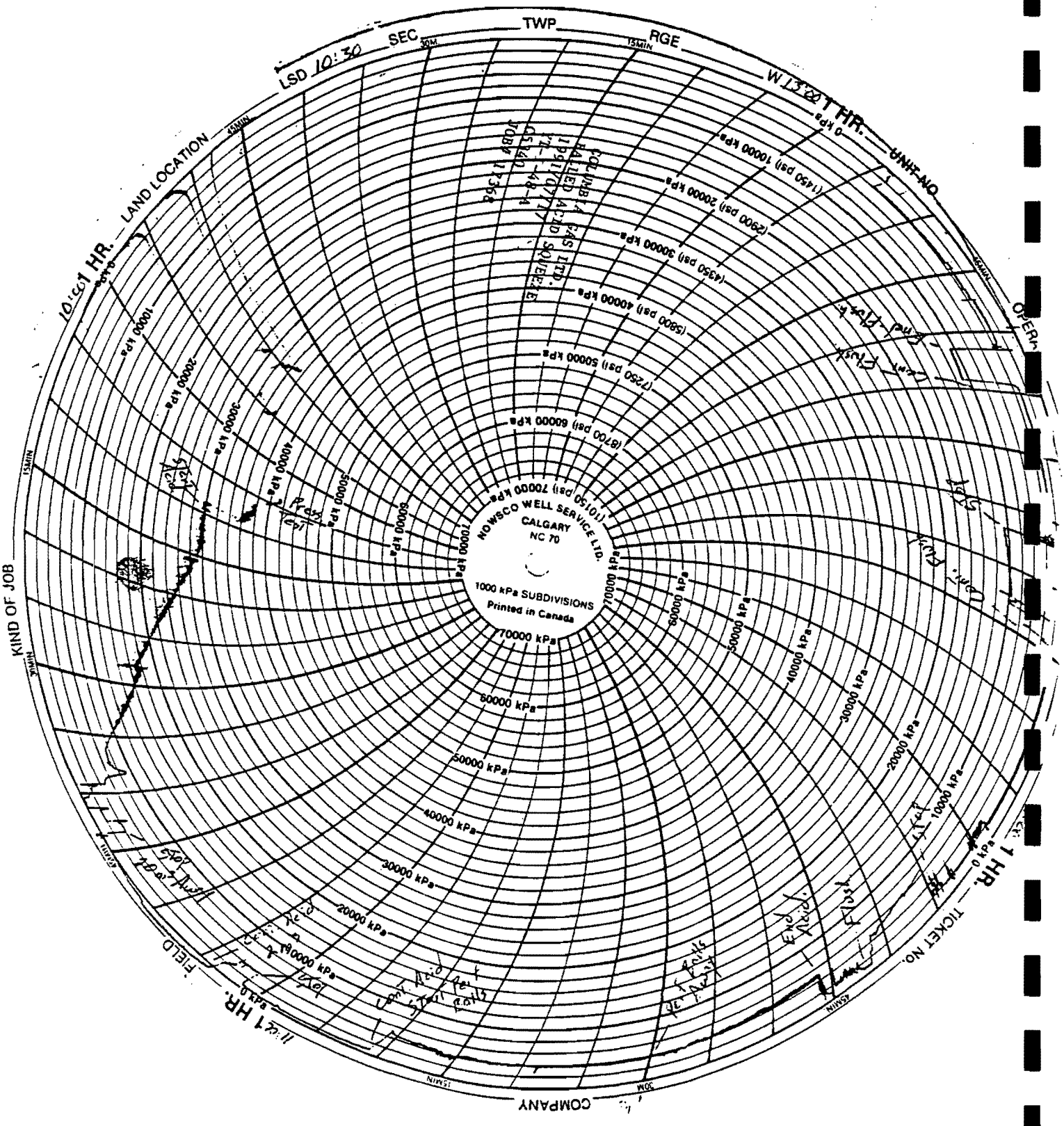
ACID TREATMENT TREATMENT REPORT

R. Number : 012775 Rev : 01
stomer Name: COLUMBIA GAS DEVELOPMENT OF CANADA
Location :
l Name : COLUMBIA ET AL KOTANEELEE

Service order#: C5340
Customer Job #: 17368
Job Type : ACID TREATMENT

Job Details

Remarks	Product	Time	Pressure(MPa) Casing	Tubing	<------ Gas or Fluid m3 ------> out of tanks	per Reading	in Form.	per minute
ig in		0920.0						
Safety Meeting		0929.0						
essure up		0936.0	11.80					
essure test to 41.500 MPa		1004.0	7.00	41.50				
Start	15% HCl acid	1009.0	10.40	30.00				
op Pump		1043.0	2.00	4.00	20.00	20.000	1.01	0.60
art		1056.0	2.00					
Stop Pump		1058.0	2.10	4.00	22.00	2.000	3.01	0.70
art		1109.0		0.80				
art		1130.0	4.50	4.00	42.00	20.000	23.01	0.95
Stop Pump		1144.0	8.60	4.90	56.50	14.500	37.51	1.00
art		1148.0	8.50	1.00				
p Pump		1155.0	9.00	6.80	64.50	8.000	45.51	1.10
tart		1216.0	11.00	2.00				
Stop Pump		1223.0	9.00	10.50	72.50	8.000	53.51	1.30
art		1236.0	9.50	3.00				
op Pump		1238.0	9.70	10.80	75.50	3.000	56.50	1.30


LSD 10:30
SEC
TWP
RGE
W1
1 HR.
UNIT NO.
OPER
TICKET NO.
1 HR.
COMPANY
1 HR.
FIELD
KIND OF JOB
LAND LOCATION
10:00 1 HR.
NOWSCO WELL SERVICE LTD.
CALGARY
NC 70
1000 kPa SUBDIVISIONS
Printed in Canada
0 kPa
10000 kPa
20000 kPa
30000 kPa
40000 kPa
50000 kPa
60000 kPa
70000 kPa
(1450 psi)
(2900 psi)
(4350 psi)
(5800 psi)
(7250 psi)
(8700 psi)
(10150 psi)
15MIN
30M
45MIN
60MIN

TWP.
SEC.
LSD
LAND LOCATION
KIND OF JOB
FIELD
COMPANY
OPERATOR
DATE
TICKET No.
1 HR.
(1450 psi) 10000 kPa
(2900 psi) 20000 kPa
(4350 psi) 30000 kPa
(5800 psi) 40000 kPa
(7250 psi) 50000 kPa
(8700 psi) 60000 kPa
(10150 psi) 70000 kPa
NOWSCO WELL SERVICE LTD.
CALGARY
NC 70
1000 kPa SUBDIVISIONS
Printed in Canada
70000 kPa
60000 kPa
50000 kPa
40000 kPa
30000 kPa
20000 kPa
10000 kPa
0 kPa
15MIN
30M
45MIN
60MIN
COLUMBIA GAS LTD.
BLOCKED ACID SQUEEZE
1991/07/17
FD-1-48-A
C3369
JOB# 17868

NORTHLAND
PRODUCTION TESTING LTD.

PRODUCTION SUMMARY

Customer: COLUMBIA GAS DEVELOPMENT OF CANADA LTD.
Test: CLEAN UP
Duration: 91/07/12 0330 hrs. to 91/07/21 1000 hrs.

Well: COLUMBIA et al KOTANEELEE
L.S.D. # Y-T-I-48 A
Formation: NAHANNI

DATE	TIME	FLOW TIME	WELLHEAD			Choke or Orif.	H2S	GAS		CONDENSATE OR OIL				WATER			
			Tbg. Press	Flow Temp	Csg. Press			Q	Cumm. Prod.	Avg. hourly	Cumm. Prod.	Sp.Gr 60°F	Grind Out	Avg. hourly	Cumm. Prod.	Salin.	PH
	Hrs	Hrs	kPa	°C	kPa	mm	%	10^3m^3	10^3m^3	m^3/hr	m^3	°API	$\%H_2O$	m^3/hr	m^3	ppm	
91/07/12	0600	2.5	7470	24		25.4	1.9	497.78	51.9988					2.71	20.76	104219	6.0
91/07/12	1400	10.5	7950	43		25.4		543.97	225.643					1.88	38.50	90625	5.0
91/07/12	2200	18.5	8690	52		25.4		569.78	411.249					1.25	50.71	81563	5.0
91/07/13	0600	26.5	8940	56		25.4	2.0	589.96	605.241					1.36	61.67	63438	5.0
91/07/13	1400	34.5	9120	60		25.4		609.87	805.852					1.25	73.14	58906	5.0
91/07/13	2200	42.5	9440	63		25.4		619.19	1010.64					1.25	83.58	63438	5.0
91/07/14	0600	50.5	9540	64		25.4	1.9	626.39	1218.55					1.25	93.49	58906	5.0
91/07/14	1400	58.5	9690	66		25.4		639.85	1429.85					1.25	103.93	63438	5.0
91/07/14	2200	66.5	10000	67		25.4		644.93	1644.29					1.15	113.84	58906	7.0
91/07/15	2200	4.0	9660	54		25.4		646.72	1927.35					1.25	127.19	58906	7.0
91/07/16	0600	12.0	9740	64		25.4	1.9	642.53	2141.81					1.15	137.21	58906	6.0
91/07/16	1400	20.0	9820	67		25.4		647.21	2356.97					1.25	147.44	54375	6.0
91/07/16	2200	0.8	12070	58		25.4		701.01	2513.91					0.97	154.01		
91/07/17	0600	8.8	11140	67		25.4	1.9	640.47	2729.69					1.04	163.30	58906	6.0
91/07/17	2200	5.3	20580	81		19.45		974.17	274.402					2.92	45.91	145000	4.0
91/07/18	0600	13.3	20910	89		19.45	1.7	987.31	601.123					1.88	63.65	108750	4.0
91/07/18	1400	21.3	20930	91		19.45		968.73	928.669					1.77	79.09	95156	5.0
91/07/18	2200	29.3	20800	91		19.45		986.31	1257.69					1.57	92.87	77031	4.0
91/07/19	0600	37.3	20660	92		19.45	1.9	990.24	1587.00					1.57	105.80	72500	4.0
91/07/19	1400	45.3	30110	73		7.94		309.99	1747.10					0.31	111.33	13590	3.0
91/07/19	2200	53.3	30030	65		7.94		312.61	1851.27					0.21	114.88	13590	3.0
91/07/20	0600	61.3	30000	61		7.94	1.9	317.84	1956.65					0.31	117.28	13590	3.0
91/07/20	1400	69.3	29970	60		7.94		322.43	2063.42					0.31	119.79	13590	3.0
91/07/20	2200	77.3	29950	60		7.94		325.32	2171.54					0.31	121.98	13590	3.0
91/07/21	0600	85.3	29940	59		7.94	1.9	327.79	2280.32					0.21	124.59	13590	3.0
91/07/21	0800	87.3	29930	59		7.94		328.40	2307.66					0.73	125.63		

	DATE	TIME	DESCRIPTION
Y-T-I-48 A	91/07/12	02:30	LAST RUN FOR PERFORATING COMPLETE
		02:40	RIG OUT SCHLUMBERGER
		03:30	OPEN WELL ON 12.70 mm CHOKE
		03:30	SP. GR. OF 0.711 USED FOR FLOW RATE CALCULATIONS
		03:30	pPc = 4996.0 kPa pTc = 206.3 DEG. K.
		03:30	LIQUID TO SURFACE
		03:30	CASINGS OPEN TO ATMOSPHERE
		03:35	INCREASE CHOKE TO 17.46 mm / GAS TO SURFACE
		03:37	METER IN SERVICE 66.68 mm ORIFICE PLATE
		03:50	INCREASE CHOKE TO 25.40 mm
		03:57	DECREASE BACK PRESSURE
		17:05	INCREASE BACK PRESSURE
		18:00	CO2 = 11% (GASTECH)
	91/07/13	06:00	CO2 = 14.5% (GASTECH)
		18:00	CO2 = 14%
		18:30	INCREASE BACK PRESSURE
	91/07/14	06:00	CO2 = 14% (GASTECH)
		18:00	CO2 = 14% (GASTECH)
		19:01	INCREASE BACK PRESSURE
	91/07/15	03:00	CO2 = 14% (GASTECH)
		03:30	METER OUT OF SERVICE / SHUT IN WELL FOR BUILDUPS

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	DATE	TIME	DESCRIPTION
Y-T-I-48 A	91/07/15	07:00	RIG UP SCHLUMBERGER TO DO SPINNER SURVEY
		08:25	OPEN WELL ON VARIOUS CHOKE SETTINGS FOR SPINNER
		08:25	SURVEY
		08:25	METER IN SERVICE 66.68 mm ORIFICE PLATE
		10:25	INCREASE CHOKE AS DIRECTED BY SCHLUMBERGER
		10:35	LIQUID TO SURFACE
		10:55	SHUT IN WELL / TOOLS MALFUNCTIONED
		11:25	PRESSURE UP TO CHOKE
		11:26	OPEN WELL ON 10.72 mm CHOKE
		11:26	METER IN SERVICE 66.68 mm ORIFICE PLATE
		11:35	SHUT IN WELL / TOOLS MALFUNCTIONED
		15:45	OPEN WELL ON 10.72 mm CHOKE
		15:45	METER IN SERVICE 66.68 mm ORIFICE PLATE
		16:04	INCREASE CHOKE TO 12.70 mm
		16:10	SHUT IN WELL / END OF SURVEY / SCHLUMBERGER RUN
		16:10	OUT OF HOLE
		17:30	RIG OUT SCHLUMBERGER
		17:59	PRESSURE UP TO CHOKE
		18:00	OPEN WELL ON 25.40 mm CHOKE
		18:05	LIQUID TO SURFACE
		18:10	METER IN SERVICE 66.68 mm ORIFICE PLATE

[redacted]LY [redacted]RA [redacted]NS [redacted]MA

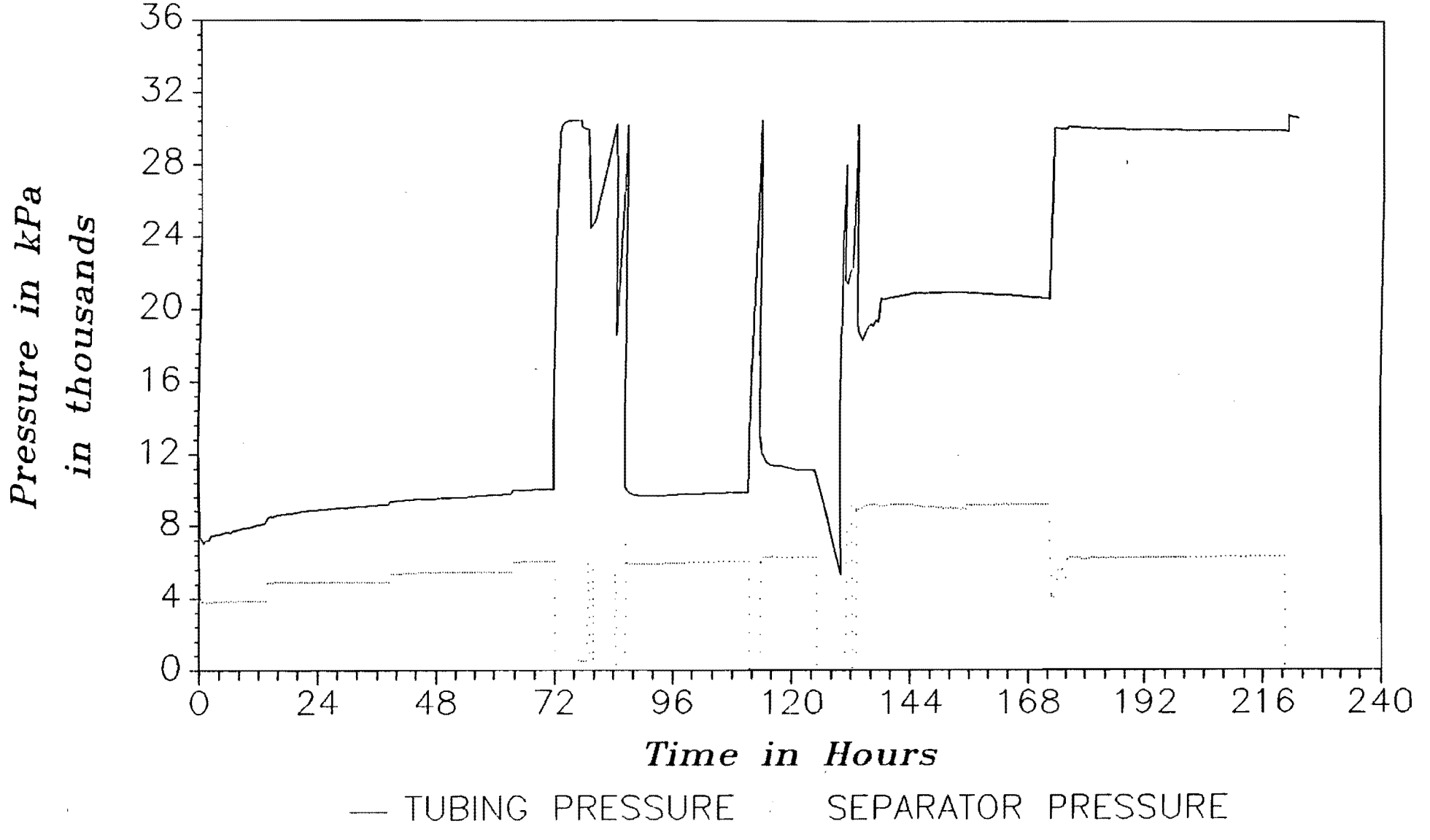
	DATE	TIME	DESCRIPTION
Y-T-I-48 A	91/07/16	06:00	CO2 = 14% (GASTECH)
		19:00	SHUT IN WELL / RIG UP NOWSCO AND PERF BALL CATCHER
		20:15	PRESSURE UP TO CHOKE
		20:17	DEPRESSURE FLOWLINE TO FIX LEAK AT BALL CATCHER
		21:15	OPEN WELL ON 25.40 mm CHOKE
		21:20	METER IN SERVICE 66.68 mm ORIFICE PLATE
		21:25	LIQUID TO SURFACE
		21:40	ADJUST BACK PRESSURE
	91/07/17	06:00	CO2 = 14% (GASTECH)
		08:40	SHUT IN WELL / RIG UP NOWSCO FOR ACID JOB
		08:40	PRESSURE TEST TO 31 mPA
		08:45	NEW LIQUID AND GAS CUMMULATIVE
		13:34	PRESSURE UP TO CHOKE
		13:35	OPEN WELL ON VARIOUS CHOKE SETTINGS / BOTH CASINGS
		13:35	OPEN TO ATMOSPHERE
		14:05	INCREASE CHOKE TO 17.46 mm
		14:11	INCREASE CHOKE TO 19.84 mm
		14:15	SHUT IN WELL / INSPECT BALL CATCHER
		14:24	PRESSURE UP TO CHOKE
		14:25	OPEN WELL ON 19.84 mm CHOKE
		14:45	METER IN SERVICE 66.68 mm ORIFICE PLATE

	DATE	TIME	DESCRIPTION
Y-T-I-48 A	91/07/17	15:17	INCREASE BACK PRESSURE
		16:00	SHUT IN WELL / RIG OUT PERF BALL CATCHER
		16:00	247 PERF BALLS RECOVERED
		16:44	PRESSURE UP TO CHOKE
		16:45	OPEN WELL ON 15.88 mm CHOKE
		16:50	METER IN SERVICE 69.85 mm ORIFICE PLATE
		16:55	INCREASE CHOKE TO 18.26 mm
		16:58	INCREASE CHOKE TO 19.45 mm
		17:05	INCREASE CHOKE TO 21.03 mm
		17:31	INCREASE CHOKE TO 21.83 mm
		20:01	DECREASE CHOKE TO 21.03 mm
		21:01	DECREASE CHOKE TO 19.45 mm
	91/07/18	06:00	CO2 = 14%
		14:10	LOSS OF SUPPLY GAS
		15:05	INCREASE BACK PRESSURE
	91/07/19	06:00	CO2 = 14%
		08:10	DECREASE CHOKE TO 7.94 mm AS DIRECTED
		09:03	METER OUT OF SERVICE
		09:10	METER IN SERVICE 50.80 mm ORIFICE PLATE
		09:11	INCREASE BACK PRESSURE
		09:25	METER OUT OF SERVICE

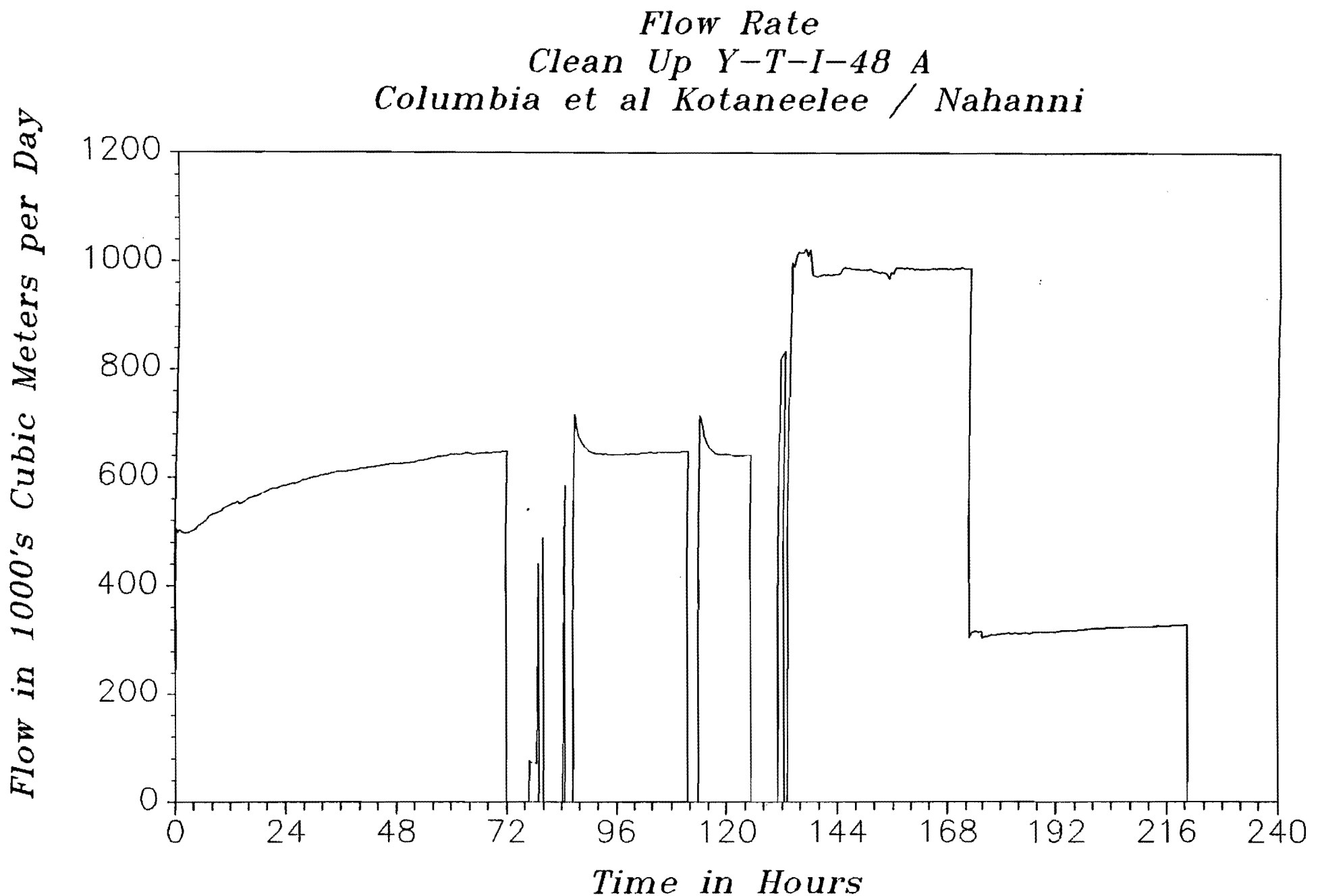
[redacted]

	DATE	TIME	DESCRIPTION
Y-T-I-48 A	91/07/19	09:35	ADJUST BACK PRESSURE
		09:50	METER IN SERVICE 50.80 mm ORIFICE PLATE
		11:03	DECREASE CHOKE TO 7.54 mm
		11:08	METER OUT OF SERVICE
		11:28	METER IN SERVICE 47.63 mm ORIFICE PLATE
		11:40	METER OUT OF SERVICE / ADJUST BACK PRESSURE
		11:50	INCREASE BACK PRESSURE
		11:50	METER IN SERVICE 47.63 mm ORIFICE PLATE
	91/07/20	06:00	CO2 = 14%
	91/07/21	04:00	C&G LABS HP GAS SAMPLES # 9423 # 3210
		06:00	CO2 = 14%
		08:00	SHUT IN WELL FOR BUILDUPS
		10:00	END OF TEST / RIG OUT EQUIPMENT

Tubing and Separator Pressure
Clean Up Y-T-I-48 A
Columbia et al Kotaneelee / Nahanni

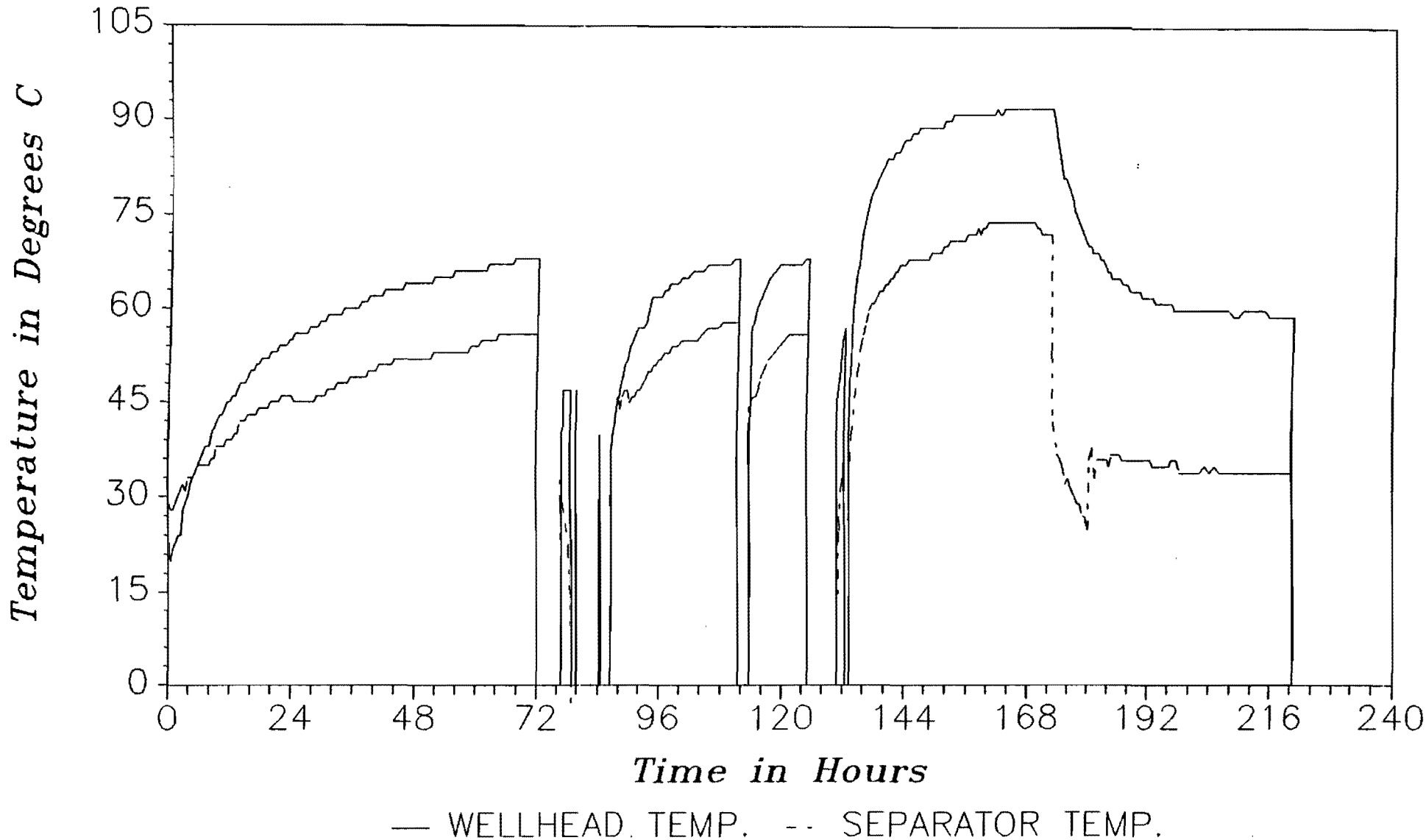


NORTHLAND
PRODUCTION TESTING LTD.



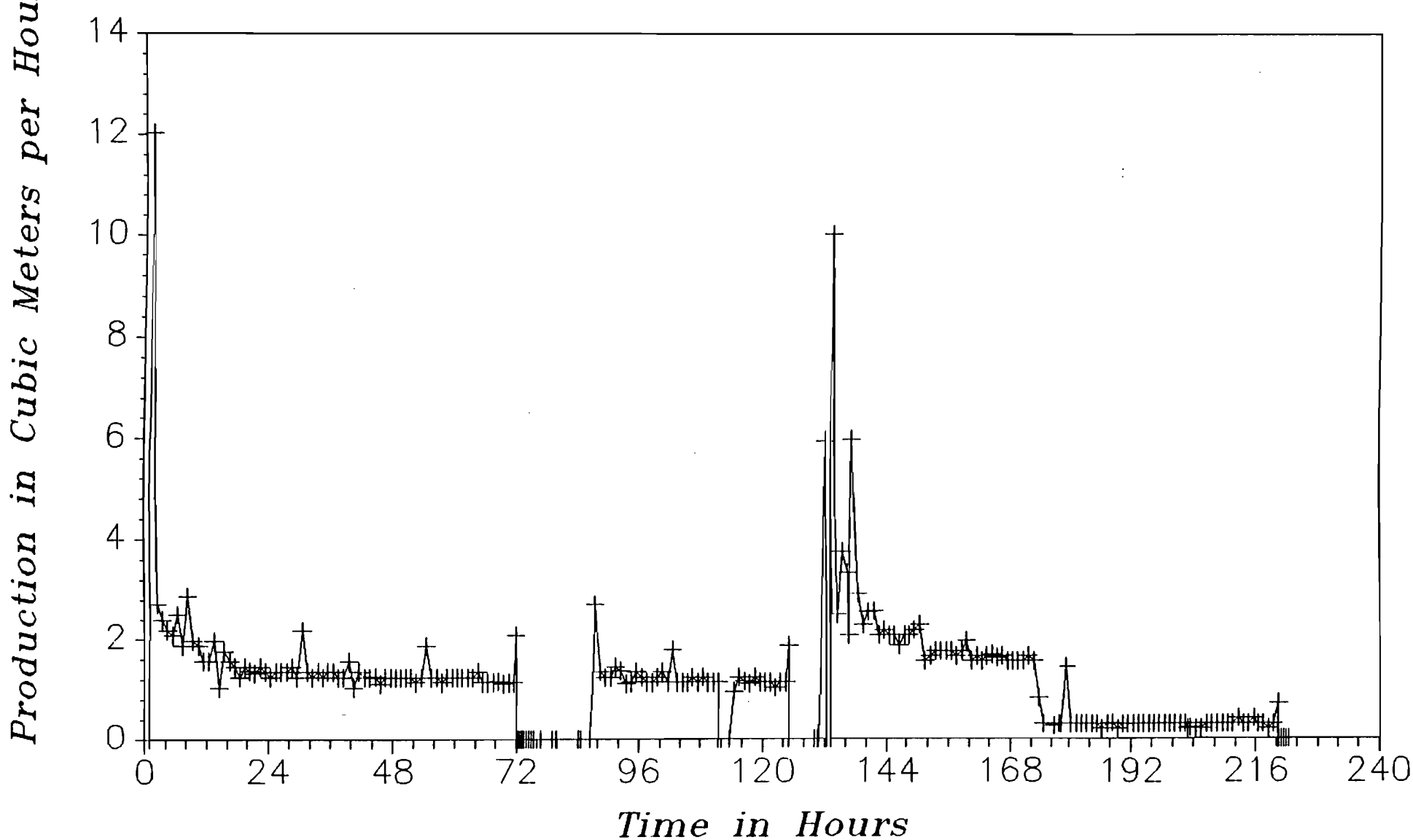
NORTHLAND
PRODUCTION TESTING LTD.

Wellhead and Separator Temperature
Clean Up Y-T-I-48 A
Columbia et al Kotaneelee / Nahanni



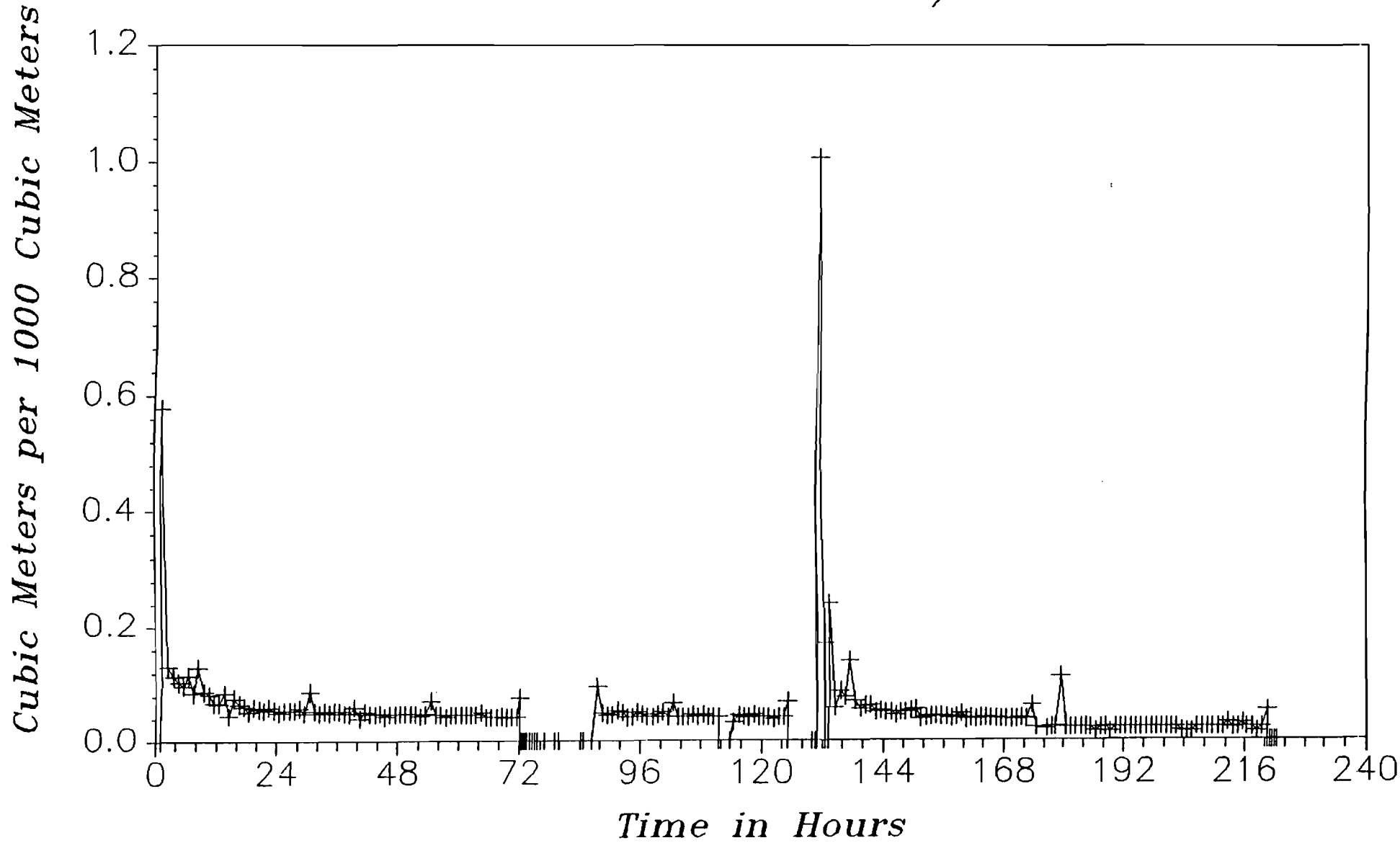
NORTHLAND
PRODUCTION TESTING LTD.

Hourly Water Rate
Clean Up Y-T-I-48 A
Columbia et al Kotaneelee / Nahanni



NORTHLAND
PRODUCTION TESTING LTD.

Water / Gas Ratio
Clean Up Y-T-I-48 A
Columbia et al Kotaneelee / Nahanni



NORTHLAND
PRODUCTION TESTING LTD.

CHEMICAL & GEOLOGICAL LABORATORIES LTD.

GAS ANALYSIS

CONTAINER IDENTITY: 3210, 9423

LABORATORY NUMBER: C91-1333

LICENCE NUMBER:

OPERATOR NAME: COLUMBIA GAS DEVELOPMENT OF CANADA LTD.

LOCATION: * SEE BELOW

WELL NAME: COLUMBIA ET AL KOTANEELEE YT I-48ST

ELEVATIONS (metres): K.B. 832.7, GRD. 827.3

FIELD OR AREA:

POOL OR ZONE: NAHANNI

NAME OF SAMPLER:

COMPANY: NORTHLAND

TEST TYPE:

NO.:

TEST RECOVERY: * 60-07-35.90-124 07 36.50

MULTIPLE RECOVERY: Y N

SAMPLING POINT: METER RUN

AMT & TYPE OF CUSHION:

MUD RESISTIVITY: @ 25°C

TEST INTERVAL (metres):

PERFORATIONS (metres): 3658 - 3889

TYPE OF PRODUCTION: PUMPING | FLOWING | GAS LIFT | SWAB

PRODUCTION RATES: WATER m³/d | OIL m³/d | GAS 10³m³/d

		SEPARATOR	TREATER	RESERVOIR	SOURCE	SAMPLED	RECEIVED
GAUGE PRESSURE	kPa	6260				6260	6400
TEMPERATURE	°C	34					23

DATE SAMPLED (Y-M-D): 91-07-21

DATE RECEIVED (Y-M-D): 91-07-26

DATE REPORTED (Y-M-D): 91-07-29

ANALYST: B. ANDERSON

OTHER INFORMATION:

COMP	MOLE FRACTION AIR FREE AS RECEIVED	MOLE FRACTION AIR FREE ACID GAS FREE	PETROLEUM LIQUID CONTENT ml/m³
H_2	0.0001	0.0001	
He	0.0008	0.0009	
N_2	0.0394	0.0464	
CO_2	0.1352	0.0000	
H_2S	0.0165	0.0000	
C_1	0.8077	0.9522	
C_2	0.0003	0.0004	
C_3	0.0000	0.0000	0.0
IC_4	0.0000	0.0000	0.0
NC_4	0.0000	0.0000	0.0
IC_5	0.0000	0.0000	0.0
NC_5	0.0000	0.0000	0.0
C_6	0.0000	0.0000	0.0
C_{7+}	0.0000	0.0000	0.0
C_8			
C_9			
C_{10+}			

GROSS HEATING VALUE MJ/m3 15°C AND 101.325 kPa

MOISTURE AND ACID GAS FREE — MEASURED: | CALCULATED: 35.99

DETERMINED DEW POINT: °C

VAPOUR PRESSURE PENTANES PLUS: 0. kPa

RELATIVE DENSITY

MOISTURE FREE AS SAMPLED MEASURED	MOISTURE FREE AS SAMPLED CALCULATED	MOISTURE AND ACID GAS FREE MEASURED	MOISTURE AND ACID GAS FREE CALCULATED
0.711	0.711		0.573

PSEUDO CRITICAL PROPERTIES (CALCULATED)

AS SAMPLED pPc(abs)	AS SAMPLED pTc	ACID GAS FREE pPc(abs)	ACID GAS FREE pTc
4996. kPa	206.3 K	4539. kPa	187.4 K

H_2S g/m³: 23.82

RELATIVE MOLECULAR MASS — TOTAL GAS: 20.58 — C_{7+}:

C5+ ML/MOL 0.000

GROSS HEATING VALUE AS PER AGA REPORT #5

30.94 MJ/M3 @ 15C AND 101.325 KPA

ALTECH

BOX 1357, GRANDE PRAIRIE, AB T8V 4Z1

24 HOUR ANSWERING SERVICE
(403) 532-5044
OR (403) 354-8312

ANALYSIS GAS ANALYSIS

GA 125
Container Identity — Lab. No.

COLUMBIA GAS DEVELOPMENT OF CANADA LTD.
Licence No. — Operator

I 48
CPA Number — Well Name — KB — GRD

-Elevations Meters-

Field or Area — Pool or Zone — Name of Sampler — ALTECH Company

Test Recovery

Sampling Point — AMT & Type of Cushion — Mud Resistivity

Pumping — Flowing — Gas Lift — Swab — Type of Production — Water (M3/d) — Oil (M3/d) — Gas (M3/d) — Prodution Rates

Separator — Treater — As Received — Gauge Pressure KPa — Separator — Treater — As Received — Temperature C — Test Interval — From: — To :

23/8/91 — Date Sampled
Date Received
23/8/91 — Date Reported
BILL — Analyst

Perforations — From: — To :

Comp	Mole Fraction Air Free As Rec'd	Mole Fraction Air Free Acid Free	Liquid Volume mL/M3 As Rec'd
N2	0.0306	0.0362	
CO2	0.1258	0.0000	
H2S	0.0294	0.0000	
C1	0.8140	0.9637	
C2	0.0001	0.0001	
C3	0.0000	0.0000	0.0
iC4	0.0000	0.0000	0.0
nC4	0.0000	0.0000	0.0
iC5	0.0000	0.0000	0.0
nC5	0.0000	0.0000	0.0
C6	0.0000	0.0000	0.0
C7+	0.0000	0.0000	0.0
C8			
C9			
C10			
C11			
C12			
TOTAL	1.0000	1.0000	0.0

GROSS HEATING VALUE
MJ/M3 @ 15 C & 101.325 KPa

Moisture Free As Sampled	Moisture & Acid Gas Free
30.69	36.34

RELATIVE DENSITY (Calculated)
air = 1 @ 15 C & 101.325 KPa

Moisture Free As Sampled	Moisture & Acid Gas Free
0.706	0.569

VAPOR PRESSURE PENTANES PLUS (Calculated)
KPa(abs) @ 40 C

0.0

PSUEDO CRITICAL PROPERTIES (Calculated)

As Sampled pPc	As Sampled pTc	Acid Gas Free pPc	Acid Gas Free pTc
5075.7 KPa	208.7 K	4595.7 KPa	188.8