

Pacific Oil & Gas Pty Limited

FRIENDSHIP-1

EP 5

McARTHUR BASIN, NORTHERN TERRITORY

WELL COMPLETION REPORT

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DATE: October, 1988

SUBMITTED BY: *I. Ledlie*

ACCEPTED BY: *E. D. Torkington*

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: CIS, Canberra
Pacific Oil & Gas Pty Ltd., Box Hill

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<u>PLAN NO.</u>	<u>TITLE</u>	<u>SCALE</u>
Pet NTcw 4040	Locality Diagram	1:1,000,000
Pet NTcw 4035	Time Depth Curve	
Pet NTcw 148	Stratigraphic Column	
Pet NTcw 4028	Composite Well Log	1:1,000
Pet NTcw 914	Magnetic Susceptibility	1:500



Pacific Oil & Gas Pty Limited

(INC. IN VICTORIA)

20 February 1990

MEMORANDUM

TO: C. Gumley
I. Clementson

FROM: Kevin Lanigan

RE: McARTHUR BASIN WELL LOCATIONS

ONSHORE

The following list of well locations is an update of John Torkington's February 1989 memo, revised to include Pacific's first three wells.

WELL	LATITUDE (S)	LONGITUDE (E)	A G M		HEIGHT (AMSL)
			EAST	NORTH	
Alexander-1	15°10'13.6"	134°51'17.5"	484408.00	8322810.0	62.0
Scarborough-1	15°10'59"	134°47'54"	478332.0	8321396	56.0
Supply-1	15°12'41.6"	134°45'59.0"	474910.39	8318254.48	78.0
Lady Penrhyn-1	15°04'45.4"	133°59'33.4"	391731.48	8332652.66	102.90
Broughton-1	14°21'41.0"	133°37'29.5"	351721.05	8411858.15	107.54
Borrowdale-2	15°07'23.5"	133°48'56.5"	372741.99	8327698.31	124.34
Friendship-1	14°52'33"	133°54'36.0"	382750	8355100	59.04
Prince of Wales-1	14°45'38.8"	133°56'40.7"	386409.22	8367861.72	60.41
Lawrence-1	14°58'28.79"	133°55'36.25"	384596.3	8344191.4	60.5
Golden Grove-1	14°50'35.80"	134°21'49.50"	431547.45	8358905.1	80.4
Altree-1	15°55'28.70"	133°47'07.98"	370006.7	8239016.6	212.8
Altree-2	15°55'30.31"	133°47'07.36"	369988.55	8238966.9	212.8

n.b. Alexander-1, Scarborough-1 and Supply-1 locations were interpreted from juxtaposition to shotpoints on the AMOCO 1983 St. Vidgeon Seismic Survey. Lady Penrhyn-1, Broughton-1, Borrowdale-2, Friendship-1 and Prince of Wales-1, were traversed during the Roper Valley seismic survey. Lawrence-1, Golden Grove-1, and Altree-1 & -2, were surveyed using GPS satellite fixing.

All heights are for ground level.

Kevin Lanigan
KEVIN LANIGAN



Status: PLUGGED AND ABANDONED

Hole Size: 6 1/2 inch to 52 metres
103mm to 394.7 metres

Casing & Tubing Details: 5 inch casing set at 51.47m
Cemented to surface with
24 bags Class A cement

Perforations: Nil

Plugs: 300-270 metres
60-30 metres
30 metres to surface

Operator: PACIFIC OIL & GAS PTY LIMITED

Participants: PACIFIC OIL & GAS PTY LIMITED 100%

Tenement: EP5

Location: Lat. 14°52'33" S
Long: 133°54'36" E

Basin: McArthur Basin
AMG: 382750 East 8355100 North Zone 53

Elevation: GL: 59.04m AHD

Spudded: June 11, 1988

Rig Released: June 25, 1988

Rig: Modified Mindrill 55 (Longyear 550)

Drilling Contractor: Rockdrill Contractors P/L (Rig 18)

Stratigraphy:

Age	Unit and Subunit	KB (m)	MSL (m)	Thickness (m)
PROTEROZOIC	Middle VELKERRI FORMATION	SURFACE		102
	Lower VELKERRI FORMATION	102	42.96	140
		242	182.96	20.5
	DOLERITE SILL	262.5	203.46	89.73
	BESSIE CREEK SANDSTONE	352.23	293.19	19.77 21.77
	CORCORAN FORMATION	374 372	314.96	21.77+
		<i>see core description RPL 30/3/90</i>		
		Total Depth (Driller) (m)		
		394.80	335.76	
		Total Depth (Logger) (m)		
		394.70	335.66	

Formation Tests:

Choke: N/A

TEST	TIMES (min)				PRESSURES (psi)									RESULT
	PF	FSI	F	SSI	IHH	IPP	FPP	BP	IFP	FFP	FBP	FHH		
DST #1 258.14-270.88m	15	45	60	180	404.1	22.1	25.8	369.9	47.0	33.2	370.9	393.0	39.97m mud	
DST #2 362.47-394.70m	10	30	90	180	568.5	63.5	73.1	559.8	91.3	178.9	562.7	564.7	80m water	
					575.3	74.7	83.9	562.3	98.7	182.7	562.3	564.1		

PF: Prewflow Period
FSI: First Sheet In
F: Flow Period
SSI: Second Sheet In

IHH: Initial Hydrostatic Head
IPP: Initial Prewflow Pressure
FPP: Final Prewflow Pressure
BP: Build Up Pressure

IFP: Initial Flow Pressure
FFP: Final Flow Pressure
FBP: Final Build Up Pressure
FHH: Hydrostatic Head

LOGS:

CORES:

Type Log	Run No	Interval (m)	Date	No	Interval (m)	Recovery	No	Interval (m)	Recovery
Suite 1 - SP	1	270 - 52.1	19/6/88						
- DFR	2	"	"						
- GR-D	3	"	"						
- CAL-NP	4	"	"						
- DSS	5	"	"						
Suite 2 - SP	6	394.7-270	23/6/88						
- DFR	7	"	"						
- GR-D	8	"	"						
- CAL-NP	9	"	"						
- DSS	10	"	"						

Chemical Analysis (water, oil, gas)

Standard water Analysis and liquid Chromotography of extracted Hydrocarbons conducted on fluids recovered from both drill stem tests. Results are included in Appendix 6.

Summary & Conclusions:

Friendship-1 was drilled in the Northern Territory Licence EP 5, approximately 90km east of Mataranka. The hole was drilled to test the Hydrocarbon potential of the Proterozoic Bessie Creek Sandstone at the culmination of a north south trending reverse faulted anticline.

The well was precollared to 52 metres by Bennetts Drilling Service. Rockdril Contractors Rig 18 was rigged up and drilling operations commenced on 12/06/88 with the cementing of the 5 inch surface casing at 51.47 metres. The hole was then fully cored using CHD101 to a total depth of 394.80 metres (Driller). In addition to the wireline logging run at TD an intermediate run was conducted from 270 metres to the surface casing.

Friendship-1 commenced drilling in sediments of the Middle Velkerri Formation and drilled a typical Roper Group Section down to the Corcoran Formation. A large dolerite sill was intersected in the upper portion of the Bessie Creek Sandstone. Poor to fair oil shows were noted in the upper part of the dolerite and fair to good shows in the Bessie Creek Sandstone immediately below the dolerite. Subsequently DST's failed to recover significant quantities of Hydrocarbons.

The hole was plugged with 30 metre cement plugs over the following intervals. 300-270 metres, 60-30 metres, 30 metres to surface.

The rig was released at 0900 Hours on June 25, 1988.

WELLSITE
GEOLOGIST : I. LEDLIE

CARD PREPARED
BY : J. TORKINGTON

APPROVED
BY :

DATE:
21/12/88

SECTION 1. ENGINEERING DATA

1.1 Engineering Summary

Friendship-1 is located in Northern Territory Exploration Permit (EP 5) approximately 90km east of Mataranka (Figure 1). The hole was drilled to test the hydrocarbon prospectivity of the Proterozoic Roper Group of the McArthur Basin and encountered good oil shows in the Bessie Creek Sandstone. The hole was drilled by Pacific Oil & Gas Pty Limited, as the sole permit holder and operator, using Rockdrill Contractors Pty Limited's Rig 18, a modified Mindrill 55 (Longyear 550).

Access to the location was via the Roper Valley Highway and a 2.5km access track. Drill site preparation involved clearing a drilling pad over an area of approximately 50m x 50m. Potable and drill water were obtained from a nearby water hole.

Well site supervision was provided by Ian Ledlie.

Drilling at Friendship-1 commenced with the drilling of a 6½ inch precollar hole to 52 metres by Bennetts' Drilling Service. Rockdrill Contractors arrived on location on June 11, 1988 and set a 5 inch surface casing string at 51.47 metres. The casing string was cemented to surface with 24 bags class "A" cement. The BOP system was installed while waiting for the cement to set.

A 4½" tricone rotary bit and bottom hole assembly was made up and cement and new formation drilled to 55.2 metres where a formation integrity test was conducted. The formation was found to leak at 180 PSI.

The CHD 101 core barrel was made up and the hole continuously cored from 55.2 metres to 270.88 metres which was reached at 1900 hours on June 18, 1988. Upon drilling the top of the Dolerite, fair oil shows were noted over the interval 262.6 to 267.9 metres. Evaluation of the show indicated that a Drill Stem Test (DST) was warranted. While waiting on the Drill Stem Test to be mobilized from Roma, wireline logs were run by BPB Instruments (Australia) Pty Limited.

The Drill Stem Test tools were then made up and were run in the hole commencing at 0000 hours on June 20. The test tools were pulled at 0851 hours and recovered 39.97 metres of mud. (Further details regarding this Drill Stem Test are given in Section 1.10). A CHD101 bottom hole assembly was then made up and the hole continuously cored from 270.88 metres to total depth of 394.7 metres which was reached at 0230 on June 23.

The hole was again logged and the rig placed on standby for approximately 15 hours while Australian Drill Stem Test were again mobilized. DST#2 was commenced at 1403 hours on June 24 and was pulled at 2030 hours recovering 80 metres of formation water in pipe.

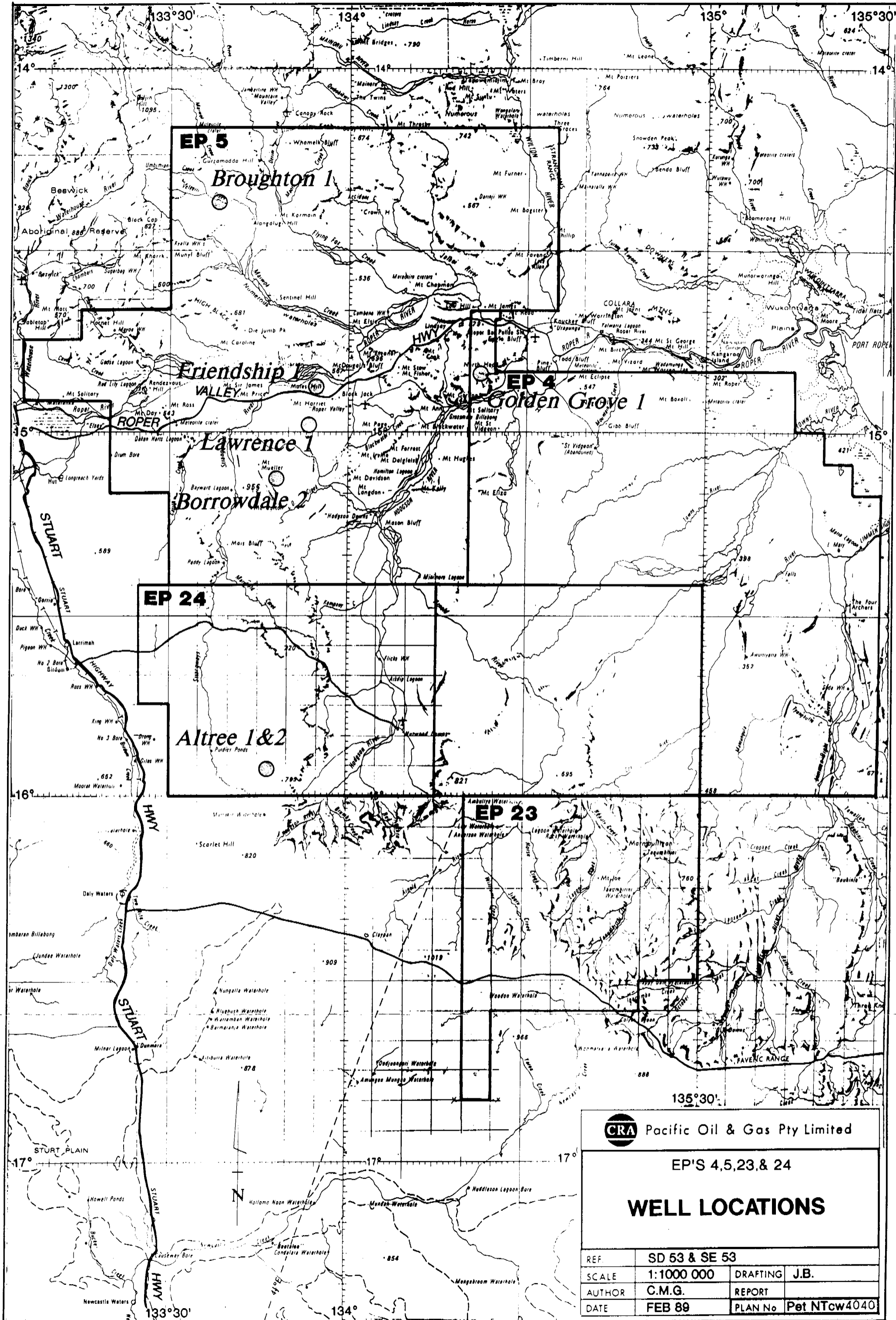


Figure 1

Following the evaluation of wireline logs and DST data the well was abandoned with the placing of cement plugs over the following intervals. 300-270 metres, 60-30 metres and 30 metres to surface. The rig was released at 0900 hours on June 25, 1988.

1.2 General Data

Well Name:	Friendship-1
Well Type:	Exploration
Operator:	Pacific Oil & Gas Pty Limited
Licence Holders:	Pacific Oil & Gas Pty Limited 100%
Petroleum Title:	EP 5, Northern Territory
Location:	Latitude: 14°52'33"S Longitude: 133°54'36"E Moroak: 1:100,000 sheet AMG GR: 382750 East 8355100 North Zone 53
Elevation:	Ground level: 59.04 AMSL Rotary Table: 60.54 AMSL
Total Depth:	394.8m (Driller) b.g.l. 394.7m (Logger) b.g.l.
Commencement Date:	Precollar drilled June 11, 1988 Rig 18 commenced June 12, 1988
Total Depth Reached:	June 23, 1988
Rig Released:	June 25, 1988
Drilled by:	Rockdril Contractors Pty. Ltd.
Drilling Rig:	Rig 18, Modified Mindrill 55 (Longyear 550)
Hole Size:	103mm
Wireline Logs:	Spontaneous Potential Dual Focussed Resistivity Gamma Ray, Caliper Density Neutron Porosity Multichannel Sonic
Formation Tests:	DST#1 258.14 - 270.88 metres DST#2 362.47 - 394.70 metres

10.

Abandonment: Cement plugs over the following
Intervals:

300 - 270 metres
60 - 30 metres
30 metres to surface

1.3 Drilling Rig

ROCKDRIL RIG 18 - RIG AND EQUIPMENT DESCRIPTION

DRILLING RIG: Longyear-Model 550
Modified Mindrill 55)

1. Drawworks: Longyear single drum operation 3/4"
line up to 4 parts with lockhead disc
breaking system.

2. Power: One Caterpillar type 3304T diesel
engine, mechanically driving rotation
and drawworks (5 speeds) and
hydraulically driving holdback rams,
breakout and spinning tools and
chuck.

One Perkins 4.354 diesel engine
hydraulically driving two (2) triplex
pumps and wireline winch assembly.

3. Mast: Box section angle type mast

Working height above
sub-structure-50ft Static hook load
capacity (4 lines) 85,000 lbs..

Racking capacity - 9,600 ft of CHD 76
Drill pipe.

4. Substructure Allison low loader with box type
drill floor and support racking
capacity up to 40 tons.

5. Rig Machinery Longyear pipe breakout and spinning
tool to handle drill pipe and casing
up to 3.7".

6. Rig Pumps Two (2) Bean 435 triplex pumps
hydraulically driven. Capacity 37
gallons/minute Rating 1200 psi.

11.

7. Mud Systems: Two (2) steel tanks with a capacity of 40 barrels each operating on a settling basis.
- One (1) only 40 barrel mixing tank.
- One (1) CD62 mono pump for mixing and desilting.
- One (1) only two cone desilter bank.
- Two (2) only Honda centrifugal pumps for transfer, recirculating and mixing.
8. Kill mud/cement Mixing One (1) 40 barrel tank utilizing mono pump and hoppers for mixing kill mud and cement as required.
9. B.O.P. Equipment: One (1) Regan Torus annular type blow out preventor with a 7-1/16 bore and having a working pressure of 3,000 psi.
- One A.P.I. threaded wellhead and drilling spool to suite 5" A.P.I. casing.
- One (1) twin choke manifold with adjustable Cameron chokes and three (3) outlets rated at 3000 psi and two inch (2") 3000 psi valves.
- One (1) Hydril K80 accumulator with a storage capacity of eighty (80) gallons at 1500 psi pressure.
- One (1) Oilwell D 323 triplex plunger with a rating of 3000 psi for use as a kill pump.
- One (1) Guiberson type H wireline B.O.P. and oilsaver rated at 3000 psi for use as a kill pump.
- One (1) lower kelly cock (2.75") with a rating of 3000 psi.
10. Tubular Equipment CHD 101 drill pipe (800 metres) and barrels 4-3/4" Collars and Stabilizers.

11. Utility and Auxillary

Equipment: Two (2) Caterpillar power generating unit (output 75 k.v.a.)

One (1) fully equipped workshop container carrying tools and spare parts.

Two (2) Toyota Landcruiser utilities.

1.4 Hole Sizes and Depths

6 1/2 inch precollared hole to 52 metres.

CHD101 core to 394.7 metres TD. (Loggers Depths)

NB: The CHD101 bottom hole assembly includes a 103 mm reaming shell.

1.5 Casing & Cementing

5" Surface Casing: Weight: 13ppf
 Depth: 51.47 m
 Grade: K55
 Thread: FL4S
 No of Joints: 5
 Shoe Depth: 51.47 m
 Cement Used: 24 sack Class "A" Cement
 Additives:
 Remarks: Cemented to Surface

1.6 Drilling Mud

A Newdrill polymer mud system was used throughout the well. Details of drilling fluid properties, and mud consumed are given in Table 1.

TABLE 1

DRILLING FLUID SUMMARYFRIENDSHIP-1

<u>Date</u>	<u>Time</u>	<u>Depth(m)</u>	<u>WT (PPG)</u>	<u>FV (Sec)</u>	<u>Operation</u>	<u>Formation</u>	<u>Mud Used</u>
14/6	0600	53		62	Mix Mud	Middle Velk. Fm.	2xA 2xB 2xC
	1100	53		54	"		A B 2xC
15/6	0000	55		50	Coring		A
NR							
16/6	2100	139		34	Coring		A
17/6	0600	157		41	Coring		A C
	1230	173		36	Coring		
18/6	0000	197	8.6	36	Coring	Lower Velk.Fm	
	0730	216		36	Coring		
	1900	270.88	8.6	34	Wait on DST tools	Dolerite	
19/6	2100	270.88	8.6	32	DST #1		
20/6	1330	272	8.4	39	Coring		
21/6	0000	295	8.6	32	Coring		
	0830	312	8.6	32	Coring		
	1900	335		30	Coring		
22/6	0130	338		29	Coring		
	1200	356	8.6	39	Coring	Bessie Creek Sst	A B C
	2000	375		33	Coring	Corcoran Fm	
A = CMCLV (25kg) B = New Vis (20 Kg) C = New Drill (25 lt)							

1.7 Water Supply

Both drill water and potable water for use in the camp were obtained from a waterhole approximately 10 km from the drill site.

1.8 Bit & Deviation Record

1.8.1 Drilling Bits

A total of 4 bits were used in the drilling of Friendship-1.

Details of bit usage are given in Table 2.

TABLE 2

BIT SUMMARY

FRIENDSHIP-1

	Make/Type	Serial #	Depth In (m)	Depth Out (m)	WOB (kg)	RPM	Pump Pressure
1	Smith & Grunner, Tricone	P54905	52.1	55.2	2000	150	
2	Longyear, 3 Step	169-23-9750	55.2	277.5	2000	650	350
3	Longyear, Impregnated S6	L10457	277.5	337.7	2000	650	250
4	Longyear, Impregnated S2	L10349	337.7	394.7	2000	400	300

1.8.2 Deviation

The Friendship-1 well remained within allowable limits of deviation, over its entire length.

Deviation Survey details are given in Table 3.

TABLE 3

DEVIATION SURVEY RECORDS FRIENDSHIP 1	
DEPTH (M)	DEVIATION*
24	1
52	3

1.9 Fishing Operations

The failure of the drill pipe on 16 June, approximately 98 m from the bottom of the hole (hole was 132.1 metres deep) required the remaining drill pipe to be fished from the hole. The operation was successful and was achieved with minimal loss of drilling time.

1.10 Formation Testing

In response to shows encountered while drilling, two conventional bottom hole drill stem tests were conducted at Friendship-1. Further details regarding the drill stem tests can be found in Appendix 4.

The first drill stem test (DST #1) was run in response to live oilbleeds from vughy porosity in the top of the dolerite. A complete description of the shows encountered is given in Appendix 5. The drill stem test was conducted over the interval 258.14 metres to 270.88 metres and comprised a 15 minute pre flow, a 45 minute initial build up, a 60 minute flow period and a 180 minute final build up. The test recovered 39.97 metres of drilling fluid in the drill collars while pressure data indicated the formation to have extremely low permeability.

The second drill stem test (DST#2) was run in response to live oil shows in the top of the Bessie Creek Sandstone immediately below the dolerite. A show description for this interval is given in Appendix 5. The drill stem test was conducted over the interval 362.47 metres to 394.70 metres and comprised a 10 minute pre flow, a 30 minute initial build up, a 90 minute flow period and a 180 minute final build up. The test recovered 80 metres of water in the drill collars.

Representative fluid samples were collected from both tests and were analysed for standard water analysis and liquid chromatography of extracted hydrocarbons. The results of these analyses appears in Appendix 8.

1.11 Time Distribution

Time spent on the various phases of the drilling operation are given in Appendix 2 and a time-depth curve for Friendship-1 illustrated in figure 2.

Pacific Oil & Gas Pty Limited

FRIENDSHIP - TIME DEPTH CURVE

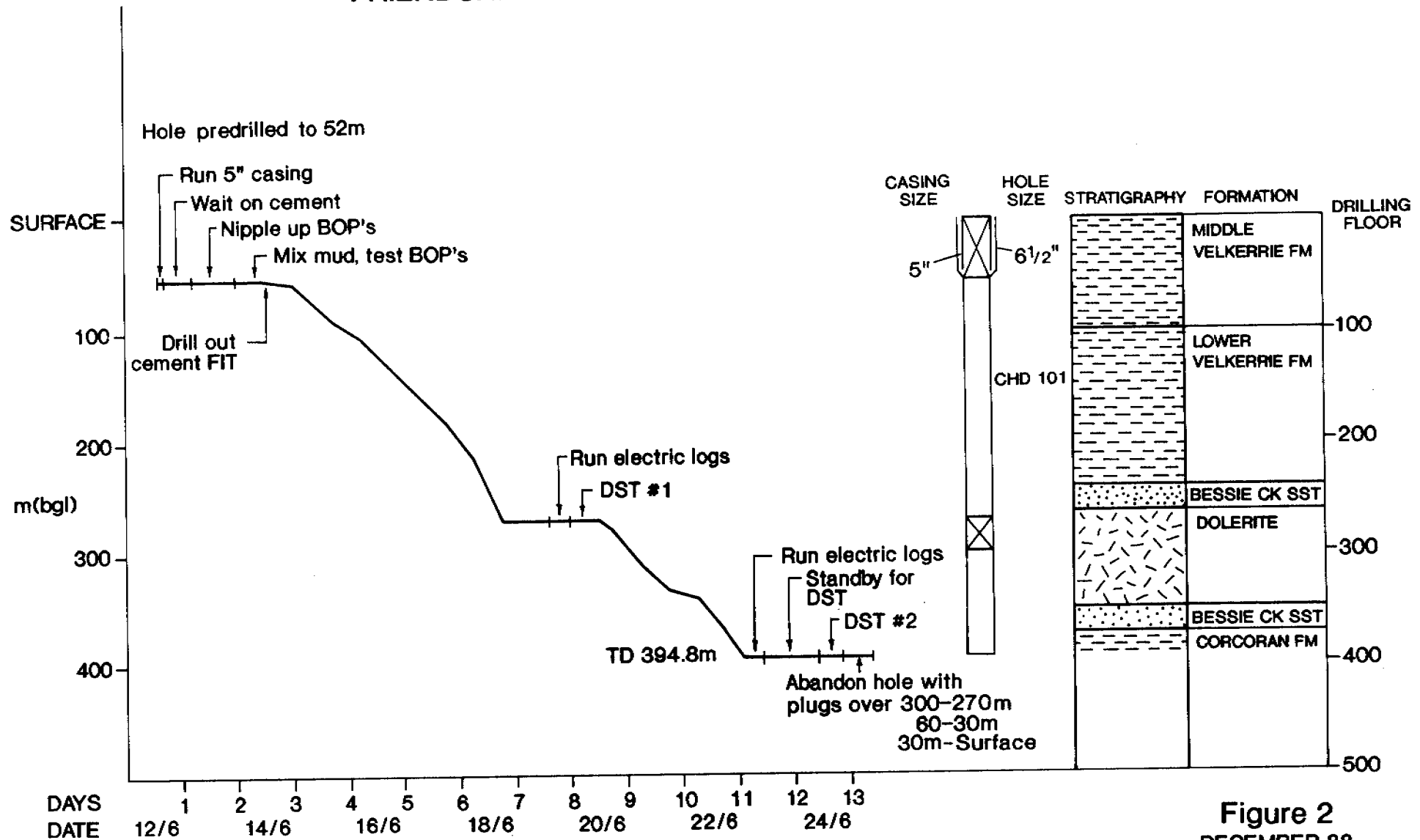


Figure 2
DECEMBER 88
J. Torkington

1.12 Well Costs

A detailed cost breakdown for Friendship-1 is given in Table 4.

TABLE 4WELL COSTSFRIENDSHIP-1

ITEM	COST
Drilling General	52878.87
Diamond Drilling	0.00
Grading/Buldozing	15578.14
Drilling Materials	0.00
Drill Stem Testing	0.00
Geophysical Logging	12756.22
Wages and Office Costs	26447.18
Supplies & Communications Gen.	10924.55
Vehicle Operation General	173.64
Travel & Accommodation General	0.00
Hire of Camp Accom Facilities	0.00
Depreciation	0.00
Insurances	2128.50
Contractors/Consultants	0.00
Aircraft Hire	0.00
Geological Consultants	0.00
Laboratory Analysis General	12097.97
Mineralogical Determinations	0.00
Total	132985.07

SECTION 2 - GEOLOGICAL DATA2.1 Geological Summary

Friendship-1 was spudded in the middle Velkerri Formation of the Proterozoic upper Roper Group of the McArthur Basin. The hole was drilled with a down-hole hammer to 52 metres below ground level and fully cored from 55.2 metres to a total depth of 394.7 metres below ground level.

The Friendship-1 well encountered a typical Roper Group section approximately 10 to 20 metres low to prognosis. The presence of a dolerite sill in the upper part of the Bessie Creek Sandstone was not prognosed but as these sills are quite common in the upper Roper Group its occurrence was not unexpected.

Upon entering the dolerite, poor to fair oil shows were noted in vughy porosity over the uppermost five metres. Shows comprised 10-20% patchy green-yellow moderately bright fluorescence with an immediate bright yellow cut and an increase in total gas units from 1 unit background to 8 units. Although the Dolerite contained an estimated 10-15% vughy porosity no permeability was noted. Following evaluation of the shows DST 1 was conducted over the interval 258.14-27.88 metres and recovered 39.97 metres of drilling mud. Further details regarding DST 1 can be found in sections 1.10 and in Appendix 4.

The dolerite was then continuously cored to 352.23 metres where the Bessie Creek Sandstone was again intersected. Fair shows comprising 100% moderately bright yellow fluorescence with an immediate yellow cut was observed over the interval 352.23 to 374 metres. A minor increase in total gas readings was also noted. Coring continued to the Corcoran Formation which was intersected at 374 metres approximately 114 metres low to prognosis. The well was terminated at 394.7 metres, following which DST 2 was conducted over the interval 362.47 to 394.70 metres in order to test the shows observed in the upper part of the Bessie Creek Sandstone. The test recovered 80 metres of saline formation fluid. Further details regarding DST 2 are given in section 1.10 and Appendix 4. Table 5 lists actual versus prognosed formation tops for Friendship-1.

TABLE 5

ACTUAL Vs PROGNOSED FORMATION TOPSFRIENDSHIP-1

<u>AGE</u>	<u>FORMATION</u>	<u>ACTUAL DEPTH</u>	<u>PROG DEPTH</u>	<u>DIFF</u>
Proterozoic	Middle Velkerri	Surface	Surface	12 low
	Lower Velkerri	242.102	230	
	Dolerite	262.5		
	Bessie Creek Sst	352.23		
	Corcoran	374		

Wireline logs failed to indicate any anomalous zones other than those already observed in the core. The well was subsequently abandoned with the setting of plugs from 300-270 metres, 60-30 metres (casing shoe) and from 30 metres to surface.

2.2 Well Objectives and Performance

Friendship-1 was drilled to test the hydrocarbon potential of the Proterozoic Bessie Creek Sandstone at the culmination of a north south trending reverse faulted anticline. The hole was located on the western limb of the structure which is relatively free of faulting and was to locate the Bessie Creek Sandstone between 200 and 260 metres below ground level. The well would also provide valuable subsurface stratigraphic information on the upper portion of the Roper Group.

The well intersected the Bessie Creek Sandstone much as prognosed but after passing through an 89.73 m thick dolerite sill. Poor to fair oil shows were noted in vuggy porosity in the top several metres of the dolerite, but no fluid was recovered on a subsequent DST. The Bessie Creek Sandstone was penetrated below the dolerite and was found to possess fair oil shows over the uppermost several metres but only flowed water on test. While the shows in the Bessie Creek Sandstone and the dolerite are encouraging the limited hydrocarbon column intersected may indicate that this structure has been breached, possibly by crestal faulting. Hence some doubt exists as to the structural integrity of the test. Friendship-1 did however provide valuable stratigraphic information on the Velkerri Formation, Bessie Creek Sandstone and the upper part of the Corcoran Formation. The presence of a dolerite sill in the upper portion of the Bessie Creek Sandstone further highlights the valuable stratigraphic nature of the well.

2.3 Stratigraphy

The stratigraphic nomenclature used in the following discussion is that used by Pacific Oil & Gas Pty Ltd.

PROTEROZOIC

Middle Velkerri Formation

Surface to 102 metres (thickness: 102 metres).

Interlaminated and thinly bedded light grey and grey black claystone and occasional siltstone. Generally, the light grey units are slightly coarser. Grades into the underlying Lower Velkerri Formation.

Lower Velkerri Formation

102 metres to 242 metres (thickness: 140 metres).

102 - 102.68 metres. "Chert" marker unit, white to bluish white claystone, silicified, very hard, conchoidal fracture, becoming darker towards base.

102.68 - 214.42 metres. Greenish grey to medium light grey claystone, massive, abundant slumping and soft sediment deformation. Irregular layers of dark wispy claystone. Numerous pyrite nodules around 103 metres, common small flecks of organic matter throughout sequence.

214.42 - 242 metres. Grey black to black claystone, very organic rich with minor dark grey siltstone. Massive to very finely laminated. Grades into underlying unit over lower few metres.

Spotted Shale (contact metamorphic)

242 metres to 262.5 metres (thickness: 20.5 metres).

Spotted siltstone, light to dark grey, medium to fine grained well sorted, abundant claystone matrix.

Dolerite

262.5 metres to 352.23 metres (thickness: 89.73 metres).

Coarsely crystalline dolerite becoming finer grained over basal 2 - 3 metres. Comprised approximately 20% pink feldspar, 30% pale green feldspar, 30% illmenite/magnetite, and 20% dark green fine-grained matrix.

Bessie Creek Sandstone

352.23 metres to 374 metres (thickness: 21.77 metres).

Light grey, medium to coarse grained quartz sandstone, heavily silicified with abundant quartz overgrowths. Contains abundant sulphide mineralization between 368 and 368.8 metres.

STRATIGRAPHY – ROPER GROUP


CHAMBERS RIVER FORMATION		COBANBIRINI FORMATION
McMINN FORMATION	KYALLA MEMBER  MOROAK SANDSTONE MEMBER	
VELKERRI FORMATION		
BESSIE CREEK SANDSTONE		LANSEN CREEK SHALE
CORCORAN FORMATION		
ABNER SANDSTONE	HODGSON/MUNYI SANDSTONE MBR.	
	JALBOI MEMBER	
	ARNOLD SANDSTONE MEMBER	
CRAWFORD FORMATION		
MAINORU FORMATION		
LIMMEN SANDSTONE		

Figure 3



Corcoran Formation

374 metres to 394.7 metres (thickness in excess of 20.7 metres).

Thinly interbedded light grey to greenish grey to dark grey claystone and siltstone with minor very fine grained medium grey sandstone. Unit is strongly contorted as a result of soft sediment deformation.

2.4 Mud Logging

Mud logging services were provided by Gearhart Geodata Pty Ltd. Rate of penetration, total gas detection, fluorescence and H₂S detection services were provided, as well as lag monitoring, and the preparation of a continuous mud log at a scale of 1:100.

A copy of the mud log is enclosed with this report as Enclosure 1. In addition the mud logging personnel assisted Pacific Oil & Gas staff in the handling, marking and description of core.

2.5 Wireline Logging and other services

Table 6 displays the Downhole Electric logs run by BPB Instruments (Australia) Pty Ltd.

TABLE 6

WIRELINE LOGSFRIENDSHIP-1

Log	Run	Interval (m)	Date
Suite 1.			
Spontaneous Potential	1	270 - 52.1	19/6/88
Dual Focused Resistivity	2	270 - 52.1	"
Gamma Ray, Density	3	270 - 52.1, (GR to surface)	"
Caliper, Neutron Porosity	4	270 - 52.1	"
Dual Spaced Sonic	5	270 - 52.1	"
Suite 2.			
Spontaneous Potential	6	394.7 - 270	23/6/88
Dual Focussed Resistivity	7	394.7 - 270	"
Gamma Ray, Density	8	394.7 - 270	"
Caliper, Neutron Porosity	9	394.7 - 270	"
Dual Spaced Sonic	10	394.7 - 270	"

Copies of well logs are included with this report as Enclosure Nos. 2-4. A bottom hole temperature of 50°C was recorded at 394m.

2.6 Formation Sampling

2.6.1 Ditch Cuttings

Air hammer cuttings were collected at 2 metre intervals in the precollared hole from the surface to 52 metres. Rotary drill cuttings were then recovered between 52 and 54.2 metres. A washed sample was then described and a portion submitted to the Department of Mines and Energy.

2.6.2 Conventional Core

Friendship-1 was fully cored from 54.5 metres to its total depth of 394.7 metres below ground level. The core was logged and chip samples taken at 2 metre intervals for microscopic evaluation. A detailed description of the core is included in Appendix 3. The core from Friendship-1 is stored at the CRA Exploration Pty Limited yard in Darwin.

2.7 Hydrocarbon Shows

Hydrocarbon shows were recorded in the top of the dolerite and in the upper part of the Bessie Creek Sandstone immediately below the dolerite. Details of these shows are recorded in the Show Evaluation Reports given in Appendix 5.

2.8 Geochemistry

A total of 14 core samples from Friendship-1 were sent to AMDEL in South Australia for geochemical analyses. Samples were selected from the section 374m to 394m at approximately 2m intervals.

The analytical results from AMDEL are included as Appendix 6.

2.9 Core Analysis

A total of 28 core plugs were analysed from the Bessie Creek Sandstone in Friendship-1. Analyses were conducted for permeability, helium injected porosity, residual oil and water saturations and grain density. The results of these analyses are given in Table 7.

TABLE 7

Core Analysis

Bessie Creek Sandstone

Friendship-1

Sample No.	Depth Metres	Permeability Millidarcys K.A.	Porosity % He inj.	Residual Saturation % Pore		Grain Den-	Sample Descriptions and Remarks
				Oil	Water		
1	354.25	0.001	1.6	18.7	37.4	2.60	vertical infilled fractures
2	355.26	16	7.5	8.1	45.9	2.65	
3	356.23	89	10.1	9.1	63.4	2.65	
4	356.77	79	9.4	10.5	58.1	2.65	infilled horizontal & vertical fractures
5	357.72	34	8.6	11.7	68.7	2.64	infilled horizontal fractures
6	358.59	90	9.4	3.9	46.4	2.64	
7	359.84	77	9.8	5.4	63.0	2.64	
8	360.53	67	7.5	9.4	35.6	2.66	infilled horizontal fractures
9	361.64	7.9	5.9	8.3	46.4	2.64	infilled vertical fractures
10	362.53	3.9	5.1	6.2	53.5	2.64	
11	362.92	0.075	3.8	7.8	33.3	2.64	infilled horizontal & vertical fractures
12	363.12	0.009	1.7	18.4	43.0	2.60	infilled horizontal & vertical fractures
13	363.58	0.003	1.2	22.0	35.2	2.61	infilled horizontal & vertical fractures
14	364.13	0.017	1.9	2.1	43.0	2.65	infilled horizontal & vertical fractures
15	365.82	0.034	2.3	0.0	67.7	2.65	infilled horizontal & vertical fractures
16	367.66	0.005	1.9	20.5	34.2	2.65	vertical infilled fracture
17	368.25	0.007	3.5	0.5	55.6	2.65	vertical infilled fracture
18	368.43	0.003	2.6	0.6	57.7	2.63	vertical infilled fracture
19	368.83	0.288	4.6	1.2	59.5	2.65	vertical fracture
20	369.00	0.005	1.3	2.1	62.0	2.60	vertical infilled fracture
21	369.61	2.7	5.4	1.1	57.2	2.65	vertical infilled fracture
22	370.18	0.172	3.7	0.5	71.6	2.64	

2.10 Magnetic Susceptibility

Magnetic susceptibility measurements were made at 1 metre intervals along the entire length of core from Friendship-1. A magnetic susceptibility log is included as Enclosure 5.

2.11 Contributions to Geological Knowledge

The Friendship-1 well has added greatly to our understanding of the hydrocarbon potential of the Proterozoic McArthur Basin. In particular the core analysis from the Bessie Creek Oil zone, indicates that porosity and permeability can be preserved when oil is present and that economic porosities and permeabilities do exist. Unfortunately it appears that the Friendship structure has been breached, most likely by faulting and that only immovable hydrocarbon remains in the sandstone.

The results from Friendship-1 indicate that dip closed anticlines should be prospective at the Bessie Creek level, and that structures with associated faulting must represent a higher risk.

KEYWORDS

Moroak 1:100,000 Sheet 5668; Drill Rotary; Drill Coring; Drill Stratigraphic; Well Logs; Borehole Geophysics; Drill Stem Test; Hydrocarbon Potential.

LOCATION

Moroak 1:100,000, Sheet 5668, EP5, Friendship-1, McArthur Basin, Northern Territory.

APPENDIX 1

DRILLING SUMMARY

FRIENDSHIP 1

<u>DATE</u>	<u>HOUR</u>	
		Hole was precollared to 52 metres by Bennets Drilling Service.
12 June	1400	Set 5 inch casing at 51.47 metres and cement with 24 bags class "A" cement. Hole was precollared to 52metres using 6½ inch down hole hammer.
	1700	Wait on cement
13 June	0600	Nipple up BOP's make up flow line
	1400	Repair oil leaks in accumulator
	1800	Shift stand down
14 June	0000	Mix mud prior to drilling out cement
	0800	Rig up new generator set, rig up and run accumulator - charge to 10,000 kpa
	1100	Test BOP to 1000 psi and repair leaks
	1330	Run in hole bit#1, 4¼ inch tricone
	1600	Drill out cement, plug and float collar
	1800	Drill 4¼ inch hole to 55.2 metres
	2000	Circulate and condition hole
	2130	Pull out of hole, makeup CHD101 bottom hole assembly (Bit #2), 3 metre core barrel, run in hole.
	2300	Core with CHD101
15 June	1200	Recover dropped core
	1245	Core with CHD 101
	1400	Replace P.R.V. Drill Pump
	1430	Core with CHD 101
16 June	0330	Recover dropped core
	0400	Core with CHD 101
	1730	Pull out of hole, Broken Drill Pipe, run in hole.
	2000	Core with CHD 101
17 June	0200	Replace packing in swivel
	0230	Core with CHD 101
	0745	Repair chuck
	0830	Core with CHD 101
18 June	0730	Repair Chuck
	0830	Core with CHD 101 to 270.88 m.
	1900	Wait on DST Tools, BPB Logging Unit

<u>DATE</u>	<u>HOUR</u>	
19 June	1600	Run electric logs, spontaneous potential dual focused resistivity, sonic, density and neutron porosity. Porosity tool malfunctioned.
20 June	0000	Run in hole DST #1
	0351	Tool opened for preflow (15min) very weak air blow decreasing
	0406	Tool shut in (45 min)
	0451	Tool opened (60 min) no blow, then a small blow for the remainder of the flow period.
	0551	Tool shut in for final period (180 min)
	0851	Pull out of hole, DST Tools, recovered 39.97 metres of rat hole mud, Run in hole CHD 101 core assembly
	1230	Core with CHD 101
	1500	Pull out of hole for bit change (Bit #3), due to hard ground, Run in hole.
	1730	Core with CHD 101
21 June	0100	Fish for broken drill pipe
	0200	Core with CHD 101
	0600	Clean chuck jaws
	0630	Core with CHD 101
	1130	Clean chuck jaws
	1200	Core with CHD 101
	1430	Repair broken pipe fitting on BOP's
	1530	Core with CHD 101
	1900	Replace swivel
	2000	Core with CHD 101
	2100	Pull out of hole, Bit change (Bit#4), Run in hole.
22 June	0100	Core with CHD 101
	0130	Pressure test drill pipe
	0300	Core with CHD 101
	0330	Pressure test drill pipe
	0400	Pull out of hole to locate split rod
	0500	Core with CHD 101
	0700	Service rig
	0730	Core with CHD 101
	1000	Repair rig
	1030	Core with CHD101, slow rotation to prevent rod rattle
	1830	Recover dropped core
	1930	Core with CHD101 to T.D. 394.7metres
23 June	0230	Pull out of hole for logging
	0430	Run wireline logs, spontaneous potential, dual focused resistivity, gamma ray, density, neutron porosity, caliper and sonic.

<u>DATE</u>	<u>HOUR</u>	
	1330	Standby for DST tools
	1530	Run in hole
	1630	Circulate and condition
	1800	Standby for DST tools
	1530	Run in hole
	1630	Circulate and condition hole
	1800	Standby for DST tools
24 June	0915	Pull out of hole
	1100	Make up DST tools and run in hole for DST #2 362.47-394.70m
	1403	Tool opened for preflow (10 mins) Very weak air blow slowly increasing throughout
	1413	Tool shut in (30 min)
	1443	Tool opened (90 min) No blow, then weak air blow after 30 seconds slowly increasing
	1613	Tool shut in for pressure build up (180 mins)
	2030	Pull out of hole recovered 80m of water (60m in collars and 20m in drill pipe)
	2130	Run in hole with open ended drill pipe
	2230	Mix and pump bottom cement plug 300 - 270 metres
25 June	0130	Pull out of hole and lay down remaining drill pipe
	0400	Mix and pump 2nd plug 60 - 30 metres
	0500	Pull out of hole and lay down remaining drill pipe
	0600	Dismantle drill floor and BOP
	0800	Cement surface plug 30 metres to surface
	0900	Release rig

APPENDIX 2

TIME DISTRIBUTION

FRIENDSHIP 1

DATE	DRILLING REAMING	CORING	RECOVER DROPPED CORE	TRIPS	SERVICE RIG	CASING AND CEMENTING	WAIT ON CEMENT	TEST NIPPLE UP BOP'S	FIT	DST's	TEST DRILL STRING	CONDITION MUD	WIRELINE LOG	STANDBY	SET ABANDONMENT PLUGS	REPAIR RIG	FISHING
12/6						3	7	8									
13/6							6	2.5	0.5					6		4	
14/6	4	1	0.75	4												3	
15/6		22.75	0.5	0.5								9				0.5	
17/6		21															2
17/6		22.75															
18/6		18														1.25	
19/6														5		1	
20/6		9		6									8	16			
21/6		17		3	1					9							
22/6		18	1	2	0.5						2					2	1
23/6		2.5		2												0.5	
24/6				5									9	10.5			
25/6				3.5	2					6.5				11	1.5		
															3.5		
TTL HOUR	4	132	2.25	26	3.5	3	13	10.5	0.5	15.5	2	9	17	48.5	5	12.25	3
%	1.30	43.0	0.75	8.47	1.14	0.98	4.23	3.42	0.16	5.05	0.65	2.93	5.54	15.80	1.63	3.99	0.98

APPENDIX 3

CORE DESCRIPTION

FRIENDSHIP-1

<u>Interval</u>	<u>Core Description</u>
55.1m - 62.63m	<p>Interlaminated (thickly) and thinly bedded light grey and grey black shale with occasional siltstone in light grey and grey black shale. Light grey shale generally slightly coarser than grey black - both composed of claystone & minor very fine to fine siltstone.</p> <ol style="list-style-type: none">1. <u>Light Grey Claystone</u> - Dominantly claystone with some siltstone, thin beds and thick laminations interbedded with green-black shale, minor fining upward cycles, more organic rich towards base. Minor normal and reverse faults. Colour varies light grey - medium light grey to medium grey. Interbedded from 1-7m, interlaminated on sub-unit scale.2. <u>Grey Black Claystone</u> - Claystone grey black - dark black occasional brown black laminae. Occasionally regular grey striping. Beds become thicker towards base with approximately equal proportions of 1 & 2.
62.63m - 68.71m	<p>Thickly bedded grey black claystone with occasional laminated light grey claystone and thin beds approximately 1cm thick.</p> <p><u>Grey Black Claystone</u> - Dominantly Claystone 2, with thicker beds, 20-30cm. Organic-rich. Laminate but appears massive. Finely disseminated pyrite and pyrite nodules start to appear e.g. 67.05m solid pyrite nodule approximately 2cm x 1cm. Micro faults normal and reverse 0.5cm displacement. Thin carbonate (calcite) vuggy lens at 67.8m, 1cm thick.</p> <p><u>Light Grey Claystone</u> - Claystone 1 but thinner beds - generally less than 1cm, mostly laminated and interlaminated with 2. Approximately 10% of interval. Occasional upward fining cycles. Organic flecks and base bed structures. Occasional disseminated pyrite.</p>

<u>Interval</u>	<u>Core Description</u>
68.71m - 77.36m	<p>As for interval 55.1 - 62.63 becoming more thinly interbedded/interlaminated towards base. 2 dominant at top, 1 more common towards base.</p> <p>Abundant micro faulting, normal and occasional lystric. Minor current-laminae effects, thin glauconite/chlorite intervals, mm - 1cm at 69.7, 71.0, 71.2, 71.25, 71.7m. Thin 1½cm carbonate (calcite) lens at 74.25 Glauconite/Chlorite commonly associated. Pyrite nodules and discrete spherical bodies.</p>
77.36m - 99.90m	<p>Thick massive unit of "black shale" dark grey to black Claystone type 2. Minor Claystone 1. less than 2% of unit. Thin carbonate lenses and various nodular phenomena increase towards base of unit, dark grey black - dark black - black.</p>
99.9m - 102.04m	<p>Interbedded dark grey Mudstone and green grey silty Mudstone (Type 3), Mudstone 3 dominant. Common discordant calcite veins/vertical - sub vertical fracture fills. Abundant calcite-rich silty intervals, commonly have inverted disk-like sub horizon calcite veins. Glauconite/chlorite layers which may be volcanic-derived clasts but also siltstone intraclasts, mm scale. Distinctive unit grey and dark grey alternating beds thin/laminae.</p> <p><u>Dark Grey Mudstone</u> - Claystone similar to 2 but less organic rich.</p> <p>3. <u>Green grey Siltstone/Mudstone</u> - Distinctive in this unit comonly has organic flakes incorporated, finely laminate. Upward fining units especially in carbonate beds. Sub vertical normal micro-faulting. Occasional silty mudstone light bluish green. Mudstone Type 3.</p>
102.04m - 102.69m	<p>Distinctive "Chert" 'Marker unit' white-bluish white claystone, silicified and very hard. Conchoidal to sub-conchoidal fracture, darker with more organic material towards base.</p>
102.69m	<p>Greenish grey to medium light grey claystone. Generally massive, abundant slumping and organic wisps, irregular layers darker abundant soft sediment deformation. Pyrite nodules at 103m, 103.3m. Sub vertical fracture planes. Occasional upward fining in darker claystone. Greenish grey dominates in top 2-3m becomes darker toward base, more medium dark grey to dark grey.</p>

Interval

Core Description

102.69
(cont.)

Again carbonate veins common generally sub horizontal to sub vertical. Less slumping and soft sediment deformation more uniform massive and structureless. Medium grey - medium bluish grey claystone, common 'wisps' of organic matter, commonly randomly oriented.

102.69m
- 186.8m

Unit continues as above with uniform g' size i.e., claystone with irregular wispy or truncated beds of more organic rich claystone or small sub mm elongate flakes of organic matter, randomly oriented.

Mudstone 4. Medium grey - Medium Bluish grey
Medium Bluish grey - Greenish grey
Medium dark grey - Medium bluish grey

Uniformly claystone slight colour variation as above, degree of soft sediment deformation and slumping varies, diagnostic wispy organic matter, slumping and irregular darker beds attenuated and 'mobilized'.

Occasional dark grey laminae show up steep depositional dip (or slumping?). Contorted bedding and where disrupted can see organic-rich dark grey flakes distributed through greenish grey claystone. Typically in irregularly deformed layers with wispy vague bedding, discontinuous, often localised.

Fractured zone 1m thick at 180m. Occasional zones of green-grey claystone without dark green organic laminae. These appear massive. Quartz veins in crushed or fractured zones at 178.4m - 20cm thick. Fragments of black shale in green-grey claystone, ex-situ.

186.8m
- 214.42m

Claystone as above, dark grey to greenish grey. Below 186.8m is dark grey. Apart from the colour difference identical structures can be seen with regard to slumping and soft sediment deformation, microfractures, randomly oriented organic flakes and generally what appears to be "mobilized" units. Dark grey claystone also has minor very fine light grey sandstone stringers, often as deformed laminae. 2/3 unit contorted slumped and faulted, 1/3 regularly interlaminated and thinly bedded dark grey and grey black claystone rich in organic matter and medium grey siltstone to light grey very fine siltstone. Sedimentary dip less than 5°. Very fine siltstone often fragmented into blocks within the beds.

Interval

Core Description

Low angle thinly bedded, current cross lamination in light grey very fine sandstone.

As noted in previous holes - "Debris Flow" medium dark grey claystone with random organic flakes often occurs between regularly interlaminated organic rich claystone. Finely disseminated pyrite may be common. Unit appears more massive in top 3-4cm becoming more finely laminated towards middle and base.

214.42m
- 221.20m

Grey black to black claystone "black shale" very organic-rich with minor dark grey siltstone interbeds/interlaminae. Depositional dip approximately 2-3°. Black claystone massive to very finely laminated grey-black and dark grey claystone and siltstone thinly bedded generally but occasionally interlaminated. Occasionally base bed load casts. Occasional soft sediment deformation and disruption of siltstone/claystone. More siltstone towards top unit. Sharp transition to unit below with occasional light grey - medium grey, fine to very fine grained siltstone beds showing low angle current cross lamination.

221.20m
- 222.0m

Alternating thinly bedded 1-2m beds grey black to black claystone organic-rich as above and laminae fine to medium grained cross laminated quartz sandstone. Occasional incipient climbing ripples developed. Classic upward fining doublets sandstone/claystone with sharp transition between the two.

222.0m - 233.1m

Dark grey very fine siltstone-claystone and minor medium light grey siltstone to fine grained sandstone.

Siltstone and claystone generally massive, occasional laminae and occasionally thinly interbedded in siltstone. Colour change at base, medium grey - medium bluish grey. Occasional pyrite nodules. Graded bedding fine siltstone to claystone, lighter grey - dark grey, common.

Occasionally fine organic matter wisps in bluish-grey very fine grained siltstone. Thin beds siltstone light grey - medium light grey, upward fining, minor slumping, flame structures at base. Rare, finely disseminated pyrite in beds.

Light medium grey siltstone becomes more common towards base, dominates unit - 60%.

IntervalCore Description

Upward fining bedding common, flame structures, some slumping and contorted bedding just before 30cm of alternating upward fining couplets.

Siltstone/organic-rich claystone same as described in previous unit. This organic rich interval about 15cm before base.

233.1m
- 236.85m

Light grey - medium light grey siltstone-dominated unit with thin minor dark grey claystone beds with uneven flame structure - distorted contacts, large scale slumping and contortion of bedding common. Large 'Augen'-like siltstone slumped bodies with organic-rich laminae surrounding. Slumped intervals 10-30cm with massive, structureless medium dark grey siltstone intervals. Dark grey organic-rich claystone very fine grained siltstone flame structured etc. slumped towards base. Gradational into lower unit.

236.85m
- 240.5m

Dark grey - grey black claystone, silty claystone and siltstone thinly bedded and interbedded and occasional interlaminated with light grey - light bluish grey siltstone and fine grained sandstone.

Dark grey - grey black claystone/siltstone dominates, generally laminate and appears massive in thin beds. Evidence of slumping and soft sediment deformation in thicker beds. Upward fining common, planar laminated occasional angularly laminated - probably slumping. Low angle reverse faults.

Light grey siltstone - fine grained siltstone. 5% unit very thin beds to laminated - $\frac{1}{2}$ cm generally few mm. Quite often slumped. Ball and pillow and flame base bed structures into claystone. Boudin - type soft sediment deformation. Tee-pee water escape structures. Well developed upward fining cycles in fine grained sandstone and siltstone.

240.5m - 292.4m

Gradational from above unit to spotted siltstone interval below.

Dark grey siltstone and medium grey - light grey siltstone to fine sandstone? Dark grey siltstone dominates in top m, light grey in lower m. Well developed thin planar interbedded and planar interlaminated. Graded bedding, colour change towards basal 40m to dark grey - dark greenish grey.

Interval

Core Description

Fine to medium grained particles increasing in % in siltstone matrix. Matrix supported to becoming particle supported at base. Dirty sandstone (?), greywacke at base, well bedded.

242.6m
- 253.56m

Surface appearance looks like fine to medium grained quartz grains in light grey siltstone matrix - actually light grey siltstone with small dark grey spots - composition?

Interpretation correlates with basal Velkerri Formation seen in outcrop, red with dark red spots.

Light grey siltstone - dark grey spots giving siltstone a speckled or stippled appearance present throughout, not just at surface. Generally thickly to thinly bedded, uniform colour. Some boundaries defined by slightly darker colour. Soft sediment deformation, slumping minor. Occasional pyrite nodules. Occasional irregular bed boundaries, generally gradational and undulose, rarely sharp and planar. Colour lighter towards base with more speckled appearance. More thinly bedded with planar contacts - still difficult to see, hidden by speckling diagenetic effect. Gradational contact with unit below - greenish grey siltstone - claystone in same speckling.

253.56m
- 262.57m

Greenish grey - light greenish grey and occasional light grey siltstone, fine to very fine siltstone and minor claystone.

Same speckling noticeable - more common in light grey and greenish grey, coarser intervals. Planar laminated thin beds at top to soft sediment deformation, slumping and contorted bedding at middle of unit. "Augen" slumps; Graded beds, base-bed ball and pillows where fine sandstone atop claystone. Light grey - very light grey fine sandstone interbedded regularly with greenish grey claystone.

Some steeply inclined beds/contacts towards base, more claystone with common quartz grains(?) and very poorly sorted sandstone with siltstone - claystone matrix. Basal 1m common 'spots'. Basal 10cm greenish - grey claystone then sharp contact to unit below.

Interval

Core Description

262.57m
- 267.9m

1. 262.5m (samples) Altered dolerite, vesicles and heavy petroliferous odour
2. 263.5m
3. 264.2m High total gas odour cut fluorescence
4. 265.6m
5. 266.1m

267.9m
- 352.21m

6. 267.1m Dolerite Intrusive.

Interpretation above unit assimilated contact margin of Lower Velkerri Formation assimilated into dolerite - accounts for high gas and oil odour.

Chilled margin and dolerite with inclusions before main intrusive and again before going into Sandstone below another chilled margin effect.

267.9m - 272.9m - Initial fine grained dolerite, dark greenish - grey in pinkish matrix and darker inclusions 0.5cm diameter. Perhaps some yellow metallic sulphides, becomes more mottled towards base and is vertically faulted/fractured with quartz veining and oily substance on joints.

272.9m - 301m - Very coarse grained basic rock. Mottled texture - 30% pink feldspar mineral plagioclase or K feldspar - and also what looks like labradorite.

Dark green - black basic rock
20% pink feldspar
30% greenish pale feldspar
30% large black metallic plates - ilmenite
20% dark green fine grained matrix.

301m - 344m

Less coarse grained, less mottled, no pink feldspar mostly dark green matrix less ilmenite approximately 10% and rest mainly greenish feldspar.

344m - 352.23m

Fine to medium grained doleritic basic intrusive, finer grained, mottled leopard-like texture of above, now more of a speckled pepper/salt surface texture. Pink plagioclase/K-feldspar again evident, veins of quartz, pink feldspar, and black bituminous fibrous growths (actinolite?). Texture similar until basal 1m where it becomes cryptocrystalline. Light-medium light green basaltic "Chilled margin" (interp) semi conchoidal fracture. Light grey - Light greenish grey massive.

<u>Interval</u>	<u>Core Description</u>
352.23m	(See Show Evaluation-Report #2 + DST #2 Report) Light grey medium to coarse quartz sandstone heavily silicified, obvious crystalline authigenic quartz and quartz overgrowth. Abundant sub-vertical to vertical fractures with silicification. Low visible porosity. Upper part of unit heavily fractured with live oil bleeds. Lower part has visible porosity with oil staining along coarser cross beds.
353.7m	Medium grey - medium dark grey fine to medium grained quartz Sandstone heavily silicified no visible porosity, almost stylolitic yellow - brown calcareous looking substance along stylolite surface.
368.3m - 368.8m	<u>Towards Base</u> - Sulphide - rich sandstone zone. Abundant pyrite, chalco(?) and galena, in light grey - medium grey silicified fine to medium grained quartz sandstone host. <u>Interpretation</u> - probably marks oil/water contact.
372.0m	<u>Contact with Corcoran Formation</u> - Basal 2m no oil staining, no porous cross-bedded intervals, silicified fine quartz sandstone, quartz overgrowths abundant light grey to very light grey. Oil/water contact above - in water wet zone stylolites common, rare sub-vertical fractures. Basal contact very sharp, base 5cm very coarse to coarse quartz grains in medium dark grey sandstone matrix. One bedding plane transition, high angle contact.
372m - 383m	<u>Corcoran Formation</u> - Top 2m badly overdrilled and difficult to see. Medium dark grey - dark grey claystone - siltstone. Same unusual speckles as basal Velkerri Formation had. Thinly interbedded light grey - greenish grey - olive grey claystone and siltstone and minor light olive grey very fine siltstone - fine strangely contorted and soft sediment deformed light olive grey claystone, almost appears siliceous - may be partly calcareous. Low angle reverse microfaults, large contorted slump "Augen", speckles very common. Unusual looking unit haven't seen before becoming thinly interbedded and slightly darker grey with depth, less speckling, more classic Corcoran appearance.
383m - 394.7m	Speckled appearance dies out at roughly 383.0m, get more uniform thinly interbedded and interlaminated claystone and siltstone. Medium grey - dark grey and medium dark grey still some low angle reverse faults. Major slump and contorted structures no longer visible.

Interval

Core Description

Low angle faults start to become major faults i.e. at low angle completely across core. Claystone - different colours of grey and dark grey claystone dominant, thinly interbedded but mostly interlaminated. Dark grey claystone dominating towards base. Towards basal 1½m massive dark grey silty claystone interlaminated with grey and dark grey claystone. Massive unit towards base has siderite flecks throughout. Below this goes back into thinly interbedded dark grey claystone and light grey - light olive grey very fine sandstone - siltstone.

APPENDIX 4

AUSTRALIAN DST REPORTS

FRIENDSHIP 1

COMPANY NAME: Pacific Oil & Gas

WELL NAME : Friendship # 1
LOCATION : McArthur Basin
TICKET # : 1367
D.S.T. # : One

COMPANY NAME: Pacific Oil & Gas
 WELL NAME: Friendship # 1
 LOCATION McArthur Basin

KB ELV 203.41ft
 GR ELV 196.85ft

DATE: 88-06-21
 T# 1367 DST # One
 FORMATION: Bessie Creek St

INTERVAL 258.14m TO 270.88m TOTAL DEPTH 888.71ft TEST TYPE: Bottom Hole

RECORDER DATA ALL MEASUREMENTS ARE 'IMPERIAL'

TIME DATA [CONVENTIONAL]

REC.#		*Field	Computed			HR.	HR.	MIN.
RANGE		13781	13782			PF FR 03:51	TO 04:06	15
CLOCK	Hr.	3900	3775			IS FR 04:06	TO 04:51	45
DEPTH	Hr.	24 Hr.	24 Hr.	Hr.	Hr.	SF FR 04:51	TO 05:51	60
		888.71	888.71			FS FR 05:51	TO 08:51	180
A	Rec. # 13781.	404	404.1			TFL FR	TO	
B	These pressures	29	22.1			TSI FR	TO	
B1	were read in the	29	25.8			T STARTED		02:00 Hr.
C	field by the	375	369.9			T ON BOTTOM		03:00 Hr.
	tester. The	29	47.0			T OPEN		03:51 Hr.
E	original chart was	29	33.2			T PULLED		08:51 Hr.
F	retained by the	375	370.9			T OUT		10:30 Hr.
G	operator.	423	393.0					
D1								
E1								
F1								

TOOL DATA

TOOL WT.			Lb.
WT SET	20	000	Lb.
WT PULLED			Lb.
INITIAL STR. WT			Lb.
UNSEATED STR WT			Lb.
BTM. CHOKE SIZE		.75	In
HOLE SIZE		4.3	In
H.W.D. Pipe	3	17/32	In
D.P.I.P.E. ID	3	17/32	In
D.C. LENGTH		275.59	ft
D.P. LENGTH		553.26	ft

MUD DATA

MUD TYPE		Nu-Drill	
WEIGHT		8.4	Lb./ft
VISCOSITY		34	cp
WATER LOSS		-	
FILTER CAKE		-	In
MUD DROP		-	ft

GENERAL DATA

AMOUNT OF FILL		NII	ft
BTM HOLE TEMP		N/A	'F
NET PAY		-	ft
POROSITY		-	%
API GRAVITY		-	
HOLE CONDITION		Good	
PACKER SIZE	3.5x1.5x20		In
NO. OF PACKERS	1		
CUSHION AMOUNT	None		ft
CUSHION TYPE	None		
REVERSED OUT	No		
TOOL CHASED	No		
TESTER	R. Smith		
CO. REP.	I. Ledlie		
CONTRACTOR	Rock Drill		
RIG #	18		/G02

O/I INSIDE INSIDE OUTSIDE OUTSIDE OUTSIDE OUTSIDE
 RECOVERY FLUID
 TOTAL 131.12ft of 131.12ft In D.C. & ___ ft In D.P.
 39.97m of Rat hole mud.

RECOVERY GAS MEASURED WITH

TIME	ORIFICE	PRESSURE	RATE
mins.	In	PSI	MCF/Day

REMARKS:

PREFLOW: Very weak air blow, decreasing.

SECONDFLOW: No blow, the well gave a small blow after 5 minutes, then no blow for the remainder of the flow period.

TEST SUCCESSFUL
Original Charts to Customer

[CONVENTIONAL]

WELL NAME Friendship # 1

LOCATION McArthur Basin

TICKET # 1367

D.S.T.# One

DATE 88-06-21

TOTAL TOOL TO BOTTOM OF TOP PACKER 18.96

INTERVAL TOOL 41.79

BOTTOM PACKERS and ANCHOR .

TOTAL TOOL 60.75

DRILL COLLAR IN INTERVAL .

D.C. ANCHOR _ STANDS _ SINGLES TOTAL .

D.P. ANCHOR _ STANDS _ SINGLES TOTAL .

TOTAL ASSEMBLY 60.75

D.C. ABOVE TOOLS 7 STANDS _ SINGLES TOTAL 275.59

D.P. ABOVE TOOLS 15 STANDS _ SINGLES TOTAL 553.26

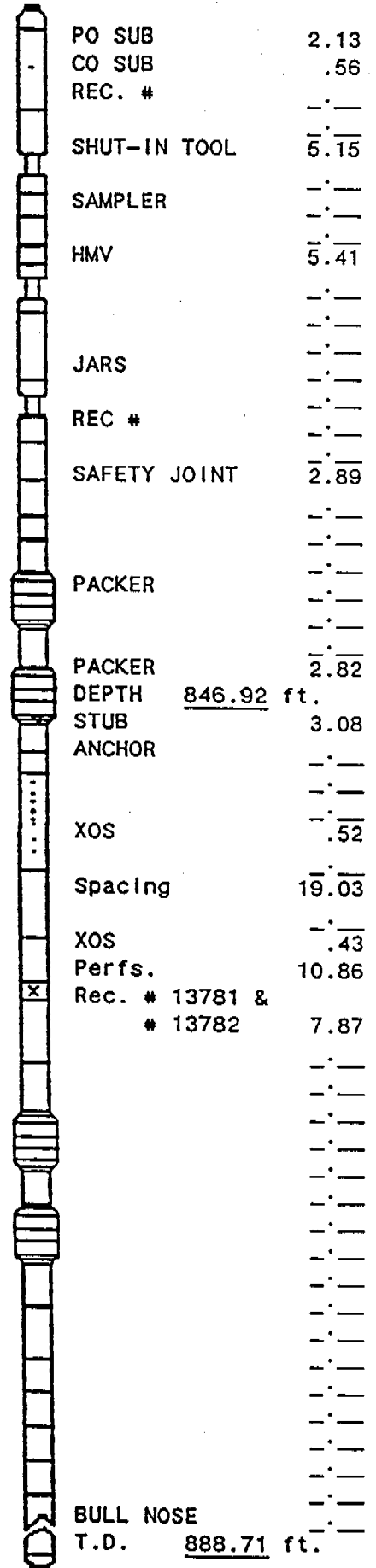
TOTAL DRILL COLLARS & DRILL PIPE & TOOLS 889.60

TOTAL DEPTH 888.71

TOTAL DRILL PIPE ABOVE K.B. 0.89

REMARKS:

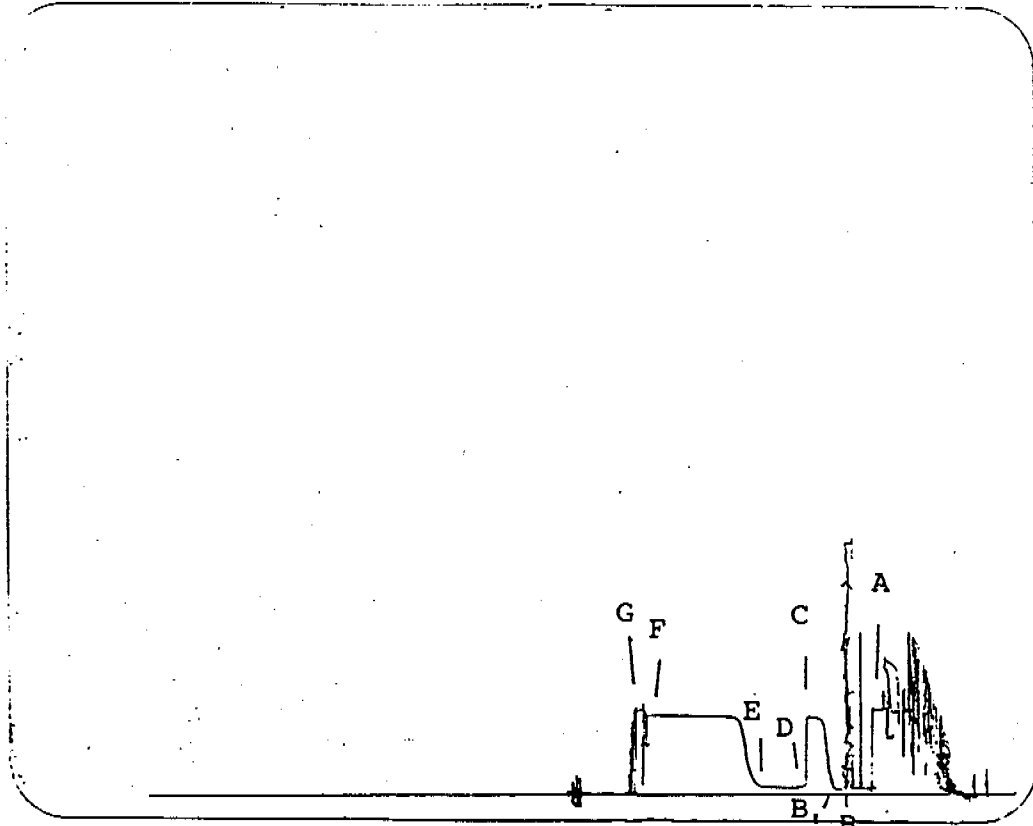
TEST SUCCESSFUL



Well Name :Pacific Friendship # 1
Location :McArther Basin

Ticket #:1367
DST # :One

Recorder :13782
Depth :888.71
Clock :24 hr.
A : 404.1
B : 22.1
B1 : 25.8
C : 369.9
D : 47.0
E : 33.2
F : 370.9
G : 393.0
D1 : 0.0
E1 : 0.0
F1 : 0.0



COMPANY NAME : Pacific Oil & Gas

WELL NAME : Friendship # 1

LOCATION : McArthur Basin

TICKET # : 1368

D.S.T. # : Two

COMPANY NAME: Pacific Oil & Gas
 WELL NAME: Friendship # 1
 LOCATION McArthur Basin
 INTERVAL 362.47m TO 394.70m

KB ELV 203.41ft
 GR ELV 196.85ft
 TOTAL DEPTH 1294.95ft

DATE: 88-06-25
 T# 1368 DST # Two
 FORMATION: L.Bessie Cr.Stn.
 TEST TYPE: Bottom Hole

RECORDER DATA ALL MEASUREMENTS ARE 'IMPERIAL'

REC.#	13781	13782				
RANGE	3900	3775				
CLOCK	Hr.	Hr.	24 Hr.	24 Hr.	Hr.	Hr.
DEPTH	1294.95		1294.95			
	PSI	PSI	PSI	PSI	PSI	PSI
A	568.5	575.5				
B	63.5	74.7				
B1	73.1	83.9				
C	559.8	562.3				
D	91.3	98.7				
	178.9	182.7				
F	562.7	562.3				
G	564.7	564.1				
D1						
E1						
F1						

TIME DATA [CONVENTIONAL]

	HR.	HR.	MIN.
PF FR	14:03	TO 14:13	10
IS FR	14:13	TO 14:43	30
SF FR	14:43	TO 16:13	90
FS FR	16:13	TO 19:13	180
TFL FR	___	TO ___	___
TSI FR	___	TO ___	___
T STARTED			11:00 Hr.
T ON BOTTOM			13:47 Hr.
T OPEN			14:03 Hr.
T PULLED			19:13 Hr.
T OUT			20:30 Hr.

TOOL DATA

TOOL WT.		Lb.
WT SET	20 000	Lb.
WT PULLED		Lb.
INITIAL STR. WT		Lb.
UNSEATED STR WT		Lb.
BTM. CHOKE SIZE	.75	In
HOLE SIZE	4.3	In
H.W.D. Pipe	3 17/32	In
D.P.I.P.E. ID	3 17/32	In
D.C. LENGTH	196.85	ft
D.P. LENGTH	978.24	ft

MUD DATA

MUD TYPE	Water
WEIGHT	___ Lb./ft
VISCOSITY	___ cp
WATER LOSS	___
FILTER CAKE	___ In
MUD DROP	___ ft

GENERAL DATA

AMOUNT OF FILL	NII	ft
BTM HOLE TEMP	N/A	'F
NET PAY		ft
POROSITY		%
API GRAVITY		
HOLE CONDITION	Good	
PACKER SIZE	3.5x1.5x20	In
NO. OF PACKERS	1	
CUSHION AMOUNT	None	ft
CUSHION TYPE	None	
REVERSED OUT	No	
TOOL CHASED	No	
TESTER	R. Smith	
CO. REP.	I. Ledlie	
CONTRACTOR	Rock Drill	
RIG #	18	/G02

O/I INSIDE INSIDE OUTSIDE OUTSIDE OUTSIDE OUTSIDE
 RECOVERY FLUID
 TOTAL 262.47ft of 196.85ft In D.C. & 65.62ft In D.P.
 89m of Water

BUBBLE PAIL MEASUREMENTS:

TIME	DEPTH	
10	5	Inches
20	7	Inches
40	9	Inches
50	9	Inches
70	9	Inches
80	7	Inches
90	5	Inches

REMARKS:

PREFLOW: Weak air blow slowly increasing throughout.

SECONDFLOW: No blow, weak air blow after 30 seconds slowly increasing.

TEST SUCCESSFUL
Original Charts to Customer

[CONVENTIONAL]

WELL NAME Friendship # 1

LOCATION McArthur Basin

TICKET # 1368

D.S.T.# Two

DATE 88-06-25

TOTAL TOOL TO BOTTOM OF TOP PACKER 18.96

INTERVAL TOOL 105.76

BOTTOM PACKERS and ANCHOR .-

TOTAL TOOL 124.72

DRILL COLLAR IN INTERVAL .-

D.C. ANCHOR _ STANDS _ SINGLES TOTAL .-

D.P. ANCHOR _ STANDS _ SINGLES TOTAL .-

TOTAL ASSEMBLY 124.72

D.C. ABOVE TOOLS 5 STANDS _ SINGLES TOTAL 196.85

D.P. ABOVE TOOLS 33 STANDS _ SINGLES TOTAL 978.24

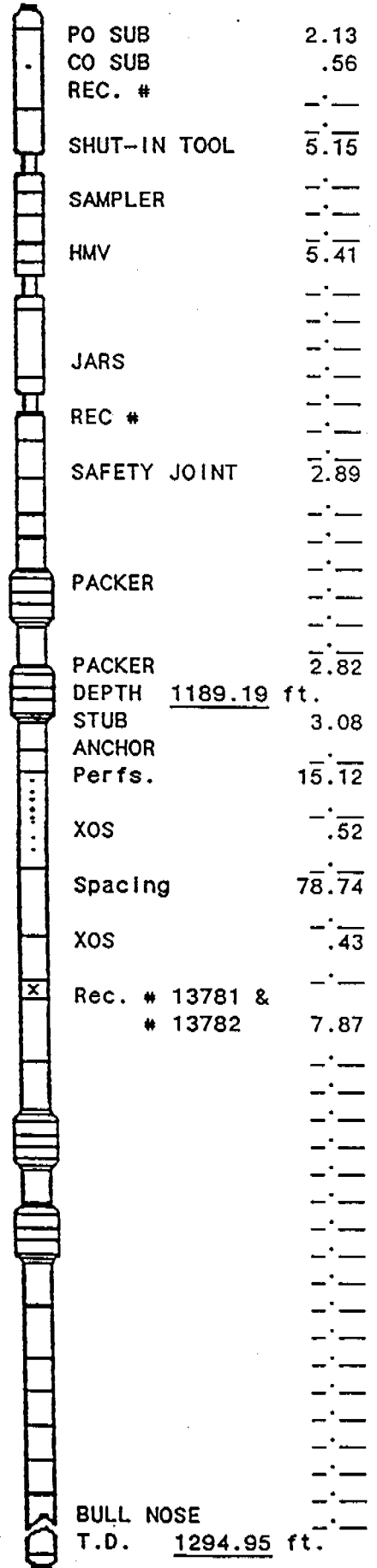
TOTAL DRILL COLLARS & DRILL PIPE & TOOLS 1299.81

TOTAL DEPTH 1294.95

TOTAL DRILL PIPE ABOVE K.B. 4.86

REMARKS:

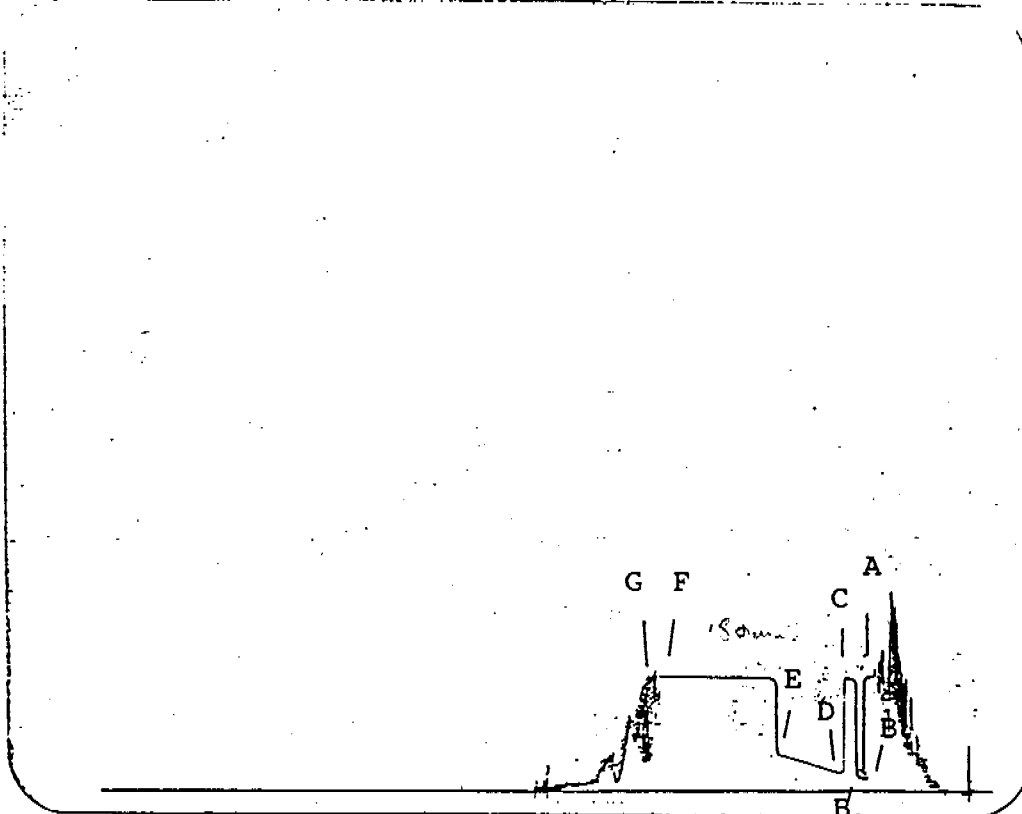
TEST SUCCESSFUL



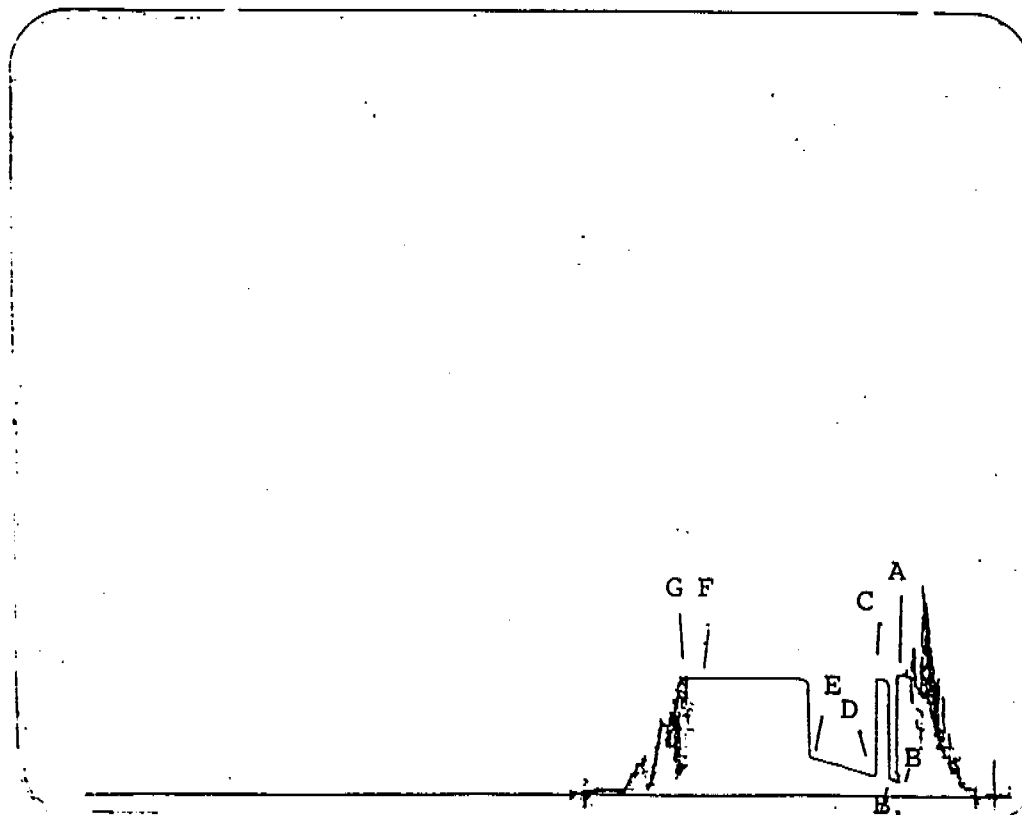
Well Name : Pacific Friendship # 1
Location : McArthur Basin

Ticket #: 1368
DST # : Two

Recorder : 13781
Depth : 1294.95
Clock : 24 hr.
A : 568.5
B : 63.5
B1 : 73.1
C : 559.8
D : 91.3
E : 178.9
F : 562.7
G : 564.7
D1 : 0.0
E1 : 0.0
F1 : 0.0



Recorder : 13782
Depth : 1294.95
Clock : 24 hr.
A : 575.3
B : 74.7
B1 : 83.9
C : 562.3
D : 98.7
E : 182.7
F : 562.3
G : 564.1
D1 : 0.0
E1 : 0.0
F1 : 0.0





Pacific Oil & Gas Pty Limited

Show Evaluation

No. 1COMPANY: PACIFIC OIL & GAS PTY. LTD.WELL : FRIENDSHIP 1.INTERVAL : Approximately 633m - 639mFORMATION : DoleriteSHOW VALUE : I-----I
Poor Fair Good V Good Excellent

SHOW DETAIL

GAS READINGS (MUD)						GAS COMPOSITION (%)	DEPTH	M/HR MIN/FT	GAS UNITS	DEPTH	MIN/FT	GAS UNITS			
HOT WIRE UNITS	GAS IN AIR MIXTURE (ppm)						C ₁	C ₂	C ₃	C ₄	C ₅	C ₁	C ₂	C ₃	C ₄
	CHROMATOGRAPH														
	C ₁	C ₂	C ₃	C ₄	C ₅										
BACKGROUND	0 - 1						663	8	8						
MAXIMUM GAS	25						665	10-12	25						
% INCREASE	2500%						668	12	12-15						
REMARKS: On entering unit hotwire reached 8 units from background 0-1,							670	12	12						
2 at most. Maximum 25 and reached 12 while circ. after.															
FLUORESCENCE															
COLOUR	TYPE	% OF SAMPLE													
green-yellow	mod-bright	10-20% and patchy													
CUT															
	COLOUR	SPEED													
NATURAL	bright yellow	immediate													
CRUSHED	-	-													
ACIDIZED	-	-													
BIT CONDITION															
Hrs															
MUD WEIGHT															
PERSON NOTIFIED															

SAMPLE DESCRIPTION: Vughy greenish-grey silicious rock with light brown powdery crystals in vughs and matrix. Very heavy petroliferous odour visible porosity established very low to 0.

REMARKS: Surface of core where vughy covered in speckled oil patches - 15% of surface. Extremely strong heavy odour of oil when core broken. Quickly evaporates. Cut immediate and bright yellow with thick ring residue. After drilling last 3m well flowed mud for 5 mins - mud invasion of formation. While POOH yellow-brown oil broke surface quite often oil cut mud: Yellow-brown oil scum on surface mud pit - contamination?

LOGGING ENGINEER/GEOLOGIST

COMPANY: PACIFIC OIL & GAS PTY LIMITEDINTERVAL : 352.23 - 374.0 mWELL : FRIENDSHIP - 1.FORMATION : Pre - Bessie Creek SandstoneSHOW VALUE : I-----I
Poor Fair Good V Good Excellent

SHOW DETAIL

GAS READINGS (MUD)							GAS COMPOSITION (%)	DEPTH	MIN/FT	GAS UNITS	DEPTH	MIN/FT	GAS UNITS
HOT WIRE UNITS	GAS IN AIR MIXTURE (ppm)					C ₁							
	CHROMATOGRAPH												
	C ₁	C ₂	C ₃	IC ₄	NC ₅	C ₃							
BACKGROUND	2 - 3						C ₄						
MAXIMUM GAS	8 - 10					C ₅₊							
% INCREASE	300%												
REMARKS: <u>Low gas reading although noticeably higher than background. Implies low gas in reservoir.</u>													
FLUORESCENCE													
COLOUR	TYPE	% OF SAMPLE											
Yellow	mod - bright	100% Uniformly throughout											
CUT													
	COLOUR	SPEED											
NATURAL	Immediate yellow	Streaming cut											
CRUSHED													
ACIDIZED													
BIT CONDITION													
Hrs													
MUD WEIGHT													
PERSON NOTIFIED													

SAMPLE DESCRIPTION: Medium to fine grained quartz sandstone, low visible K and porosity. Significant quartz cementing and authigenic overgrowths. Oil bleeds on fractures and blebs throughout sandstone.REMARKS: Low gas reading may imply low reservoir pressure, low porosity and low oil saturation may mean water wet. Live oil along fractures and 100% fluorescence however means that oil is present throughout the sandstone and coats most grains.

IAN LEDLIE

LOGGING ENGINEER/GEOLOGIST

APPENDIX 6

GEOCHEMICAL ANALYSES

BY AMDEL

FRIENDSHIP-1

C₁₂₊ BULK COMPOSITION AND ALKANE RATIOS OF OILS

Sample	EOM (ppm)	C ₁₂₊ Composition			Alkane Ratios				
		Sats %	Arom %	Res+Asph %	TMID/Pr	Np/Pr	Pr/Ph	Pr/n-C ₁₇	Ph/n-C ₁₈
1369595	37.86	45.33	8.00	46.67	0.60	0.66	1.03	0.33	0.27
1369596	7355	74.08	6.72	19.20	1.56	1.04	1.03	0.35	0.40
1369597	3356	77.99	7.37	14.64	1.91	1.15	1.11	0.24	0.26
1369598	7460	62.38	5.98	31.64	1.51	1.17	1.02	0.33	0.37
1369599	244.7	65.77	4.56	29.67	1.54	1.09	1.05	1.29	0.30
1369600	30.97	40.35	19.30	40.35	0.14	0.35	0.76	0.53	0.32

Sats = saturated hydrocarbons
 Arom = aromatic hydrocarbons
 Res = resins + polar compounds
 Asph = asphaltenes

TMID = 2,6,10-trimethyltridecane
 Np = norpristane
 Pr = pristane
 n-C₁₇ = n-heptadecane
 n-C₁₈ = n-octadecane

SAMPLE

1369595 ~~262.5~~ metres 267.35
 1369596 ~~263.5~~ metres 266.40
 1369597 ~~264.2~~ metres 265.60
 1369598 ~~265.6~~ metres 264.30
 1369599 ~~266.1~~ metres 263.70
 1369600 ~~267.2~~ metres 262.55

C₁₂₊ BULK COMPOSITION AND ALKANE RATIOS OF EXTRACTED OILS

Sample	DST	EOM (ppm)	C ₁₂₊ Sats %	Composition		TMD/Pr	Alkane Ratios			
				Arom %	Res+Asph %		Np/Pr	Pr/Ph	Pr/n-C ₁₇	Ph/n-C ₁₈
1369451	DST-1	2934*	0.51	0.65	98.84	0.67	0.55	2.02	0.37	0.19
1369452	DST-1	1.4	-	-	-	-	-	0.85	0.59	0.22
1369453	DST-1	0.3	-	-	-	0.45	0.65	0.88	0.59	0.68
1369454	DST-2	3.6	34.62	15.38	50.50	0.12	0.24	1.81	0.96	0.31
1369455	DST-2	2.9	23.81	4.76	71.43	0.15	0.30	2.02	0.76	0.25
1369456	DST-2	0.5	-	-	-	-	-	0.85	0.50	0.20
1369457	DST-2	2.4	61.11	22.22	16.67	0.16	0.32	2.80	0.50	0.14
1369458	DST-2	3.0	66.67	26.66	6.67	-	0.22	2.62	0.71	0.15

* Organic matter extracted from this sample is largely Newdrill. However alkane ratios calculated from the G.C. of the saturates fraction are of the indigenous oil in this sample.

Sats = saturated hydrocarbons
 Arom = aromatic hydrocarbons
 Res = resins + polar compounds
 Asph = asphaltenes

TMD = 2,6,10-trimethyltridecane
 Np = norpristane
 Pr = pristane
 n-C₁₇ = n-heptadecane
 n-C₁₈ = n-octadecane

APPENDIX 7
WATER ANALYSES
BY AMDEL
FRIENDSHIP-1

DST 1 Mud at top of sample chamber

Sample ID. 1369451

Chemical Composition				Derived Data			
		mg/L	me/L				mg/L
Cations				Total Dissolved Solids			
Calcium	(Ca)	177.0	8.832	A. Based on E.C.			4279
Magnesium	(Mg)	35.0	2.881	B. Calculated (HCO3=CO3)			3947
Sodium	(Na)	1142.0	49.674				
Potassium	(K)	84.0	2.148				
Anions				Total Hardness			
Hydroxide	(OH)			Carbonate Hardness			586
Carbonate	(CO3)			Non-Carbonate Hardness			586
Bi-Carbonate	(HCO3)	1303.7	21.373	Total Alkalinity			1384
Sulphate	(SO4)	503.0	10.473	(Each as CaCO3)			
Chloride	(Cl)	1355	38.157	Totals and Balance			
Nitrate	(NO3)	<0.1					
Other Analyses				Cations (me/L)	63.5	Diff=	6.47
				Anions (me/L)	70.0	Sum =	133.54
				ION BALANCE (Diff*100/Sum) =			4.84%
				Sodium / Total Cation Ratio			78.2%
				Remarks			
				IMBALANCE UNKNOWN ALL RESULTS CHECKED AND VERIFIED.			
Reaction - pH					7.6		
Conductivity (E.C)					7200		
(micro -S/cm at 25°C)							
Resistivity Ohm.M at 25°C					1.389		
				Note:		mg/L = Milligrams per litre	
						me/L = MilliEqvs. per litre	

DST 1 Composite mud sample from top of chamber

Sample ID. 1369452

Chemical Composition			Derived Data	
	mg/L	me/L	mg/L	
Cations			Total Dissolved Solids	
Calcium (Ca)	54.0	2.695	A. Based on E.C.	844
Magnesium (Mg)	40.0	3.292	B. Calculated (HCO ₃ =CO ₃)	753
Sodium (Na)	130.0	5.655		
Potassium (K)	6.3	0.161		
Anions			Total Hardness	
Hydroxide (OH)				299
Carbonate (CO ₃)			Carbonate Hardness	299
Bi-Carbonate (HCO ₃)	401.3	6.579	Non-Carbonate Hardness	
Sulphate (SO ₄)	130.0	2.707	Total Alkalinity	426
			(Each as CaCO ₃)	
Chloride (Cl)	192	5.402	Totals and Balance	
Nitrate (NO ₃)	<0.1			
			Cations (me/L)	11.8
			Diff=	2.88
			Anions (me/L)	14.7
			Sum =	26.49
			ION BALANCE (Diff*100/Sum) =	10.89%
			Sodium / Total Cation Ratio	47.9%
Other Analyses			Remarks	
			IMBALANCE UNKNOWN ALL RESULTS CHECKED AND VERIFIED.	
Reaction - pH		7.6		
Conductivity (E.C)		1500		
(micro -S/cm at 25°C)				
Resistivity Ohm.M at 25°C		6.667		
			Note: mg/L = Milligrams per litre	
			me/L = MilliEquivs.per litre	

DST 1 Mud recovered from base of sample chamber

Sample ID. 1369453

Chemical Composition				Derived Data			
		mg/L	me/L				mg/L
Cations				Total Dissolved Solids			
Calcium	(Ca)	433.0	21.607	A. Based on E.C.			7159
Magnesium	(Mg)	91.0	7.490	B. Calculated (HCO3=CO3)			7042
Sodium	(Na)	2135.0	92.866				
Potassium	(K)	157.0	4.015				
Anions				Total Hardness			
Hydroxide	(OH)			Carbonate Hardness			1219
Carbonate	(CO3)			Non-Carbonate Hardness			237
Bi-Carbonate	(HCO3)	1147.8	18.817	Total Alkalinity			1219
Sulphate	(SO4)	547.0	11.389	(Each as CaCO3)			
Chloride	(Cl)	3105	87.461	Totals and Balance			
Nitrate	(NO3)	<0.1		Cations (me/L)	126.0	Diff=	8.31
				Anions (me/L)	117.7	Sum =	243.65
Other Analyses				ION BALANCE (Diff*100/Sum) = 3.41%			
				Sodium / Total Cation Ratio 73.7%			
				Remarks			
				IMBALANCE UNKNOWN ALL RESULTS CHECKED AND VERIFIED.			
Reaction - pH			7.6				
Conductivity (E.C)			11600				
(micro -S/cm at 25°C)							
Resistivity Ohm.M at 25°C			0.862				
				Note: mg/L = Milligrams per litre			
				me/L = MilliEquivs. per litre			

DST 2 Water sample from top of column (80m)

Sample ID. 1369454

Chemical Composition				Derived Data			
		mg/L	me/L				mg/L
Cations				Total Dissolved Solids			
Calcium	(Ca)	1176.0	58.683	A. Based on E.C.			12074
Magnesium	(Mg)	281.0	23.128	B. Calculated (HCO3=CO3)			10525
Sodium	(Na)	2034.0	88.473				
Potassium	(K)	72.0	1.841				
Anions				Total Hardness			
Hydroxide	(OH)			Carbonate Hardness			416
Carbonate	(CO3)			Non-Carbonate Hardness			3676
Bi-Carbonate	(HCO3)	391.9	6.424	Total Alkalinity			416
Sulphate	(SO4)	151.0	3.144	(Each as CaCO3)			
Chloride	(Cl)	6615	186.330	Totals and Balance			
Nitrate	(NO3)	<0.1		Cations (me/L)	172.1	Diff=	23.77
				Anions (me/L)	195.9	Sum =	368.02
Other Analyses				ION BALANCE (Diff*100/Sum) = 6.46%			
				Sodium / Total Cation Ratio 51.4%			
				Remarks			
				IMBALANCE UNKNOWN ALL RESULTS CHECKED AND VERIFIED.			
Reaction - pH 6.3							
Conductivity (E.C) 18500							
(micro -S/cm at 25°C)							
Resistivity Ohm.M at 25°C 0.541							
				Note: mg/L = Milligrams per litre; me/L = MilliEqvs. per litre;			

DST 2 Water sample from middle of column

Sample ID. 1369455

Chemical Composition				Derived Data			
		mg/L	me/L				mg/L
Cations				Total Dissolved Solids			
Calcium	(Ca)	1167.0	58.234	A. Based on E.C.			12074
Magnesium	(Mg)	102.0	8.395	B. Calculated (HCO3=CO3)			10937
Sodium	(Na)	2090.0	90.909				
Potassium	(K)	726.0	18.568				
Anions				Total Hardness			
Hydroxide	(OH)			Carbonate Hardness			546
Carbonate	(CO3)			Non-Carbonate Hardness			2788
Bi-Carbonate	(HCO3)	514.3	8.432	Total Alkalinity			546
Sulphate	(SO4)	154.0	3.206	(Each as CaCO3)			
Chloride	(Cl)	6441	181.445	Totals and Balance			
Nitrate	(NO3)	<0.1		Cations (me/L)	176.1	Diff=	16.98
				Anions (me/L)	193.1	Sum =	369.19
Other Analyses				ION BALANCE (Diff*100/Sum) = 4.60%			
				Sodium / Total Cation Ratio 51.6%			
				Remarks			
				IMBALANCE UNKNOWN ALL RESULTS CHECKED AND VERIFIED.			
Reaction - pH			7.3				
Conductivity (E.C)			18500				
(micro -S/cm at 25°C)							
Resistivity Ohm.M at 25°C			0.541				
				Note: mg/L = Milligrams per litre			
				me/L = MilliEqvs.per litre			

DST 2 Water sample from bottom of water column immediately above sample chamber

Sample ID. 1369456

Chemical Composition				Derived Data			
		mg/L	me/L				mg/L
Cations				Total Dissolved Solids			
Calcium	(Ca)	7590.0	378.743	A. Based on E.C.			83010
Magnesium	(Mg)	1526.0	125.597	B. Calculated (HCO3=CO3)			58623
Sodium	(Na)	11500.0	500.217				
Potassium	(K)	389.0	9.949				
Anions				Total Hardness			
Hydroxide	(OH)			Carbonate Hardness			20
Carbonate	(CO3)			Non-Carbonate Hardness			25209
Bi-Carbonate	(HCO3)	18.4	0.301	Total Alkalinity			20
Sulphate	(SO4)	52.0	1.083	(Each as CaCO3)			
Chloride	(Cl)	37556	1057.927	Totals and Balance			
Nitrate	(NO3)	<0.1		Cations (me/L)	1014.5	Diff=	44.81
				Anions (me/L)	1059.3	Sum =	2073.82
Other Analyses				ION BALANCE (Diff*100/Sum) = 2.16%			
				Sodium / Total Cation Ratio 49.3%			
				Remarks			
				IMBALANCE UNKNOWN ALL RESULTS CHECKED AND VERIFIED.			
Reaction - pH			4.9				
Conductivity (E.C)			84000				
(micro -S/cm at 25°C)							
Resistivity Ohm.M at 25°C			0.119				
				Note: mg/L = Milligrams per litre			
				me/L = MilliEqvs. per litre			

DST 2 Top sample chamber slightly gas cut water

Sample ID. 1369457

Chemical Composition				Derived Data			
		mg/L	me/L				mg/L
Cations				Total Dissolved Solids			
Calcium	(Ca)	6907.0	344.661	A. Based on E.C.			51919
Magnesium	(Mg)	1418.0	116.708	B. Calculated (HCO3=CO3)			57365
Sodium	(Na)	10805.0	469.987				
Potassium	(K)	302.0	7.724				
Anions				Total Hardness			
Hydroxide	(OH)			Carbonate Hardness			45
Carbonate	(CO3)			Non-Carbonate Hardness			23035
Bi-Carbonate	(HCO3)	41.9	0.687	Total Alkalinity			45
Sulphate	(SO4)	29.0	0.604	(Each as CaCO3)			
Chloride	(Cl)	37883	1067.121	Totals and Balance			
Nitrate	(NO3)	<0.1		Cations (me/L)	939.1	Diff=	129.33
				Anions (me/L)	1068.4	Sum =	2007.49
Other Analyses				ION BALANCE (Diff*100/Sum) = 6.44%			
				Sodium / Total Cation Ratio 50.0%			
				Remarks			
				IMBALANCE UNKNOWN ALL RESULTS CHECKED AND VERIFIED.			
Reaction - pH			5.9				
Conductivity (E.C)			60000				
(micro -S/cm at 25°C)							
Resistivity Ohm.M at 25°C			0.167				
				Note: mg/L = Milligrams per litre; me/L = MilliEqivs.per litre			

DST 2 Sample chamber

Sample ID. 1369458

Chemical Composition				Derived Data	
		mg/L	me/L		mg/L
Cations				Total Dissolved Solids	
Calcium	(Ca)	7244.0	361.477	A. Based on E.C.	70660
Magnesium	(Mg)	1455.0	119.753	B. Calculated (HCO3=CO3)	57168
Sodium	(Na)	11263.0	489.909		
Potassium	(K)	319.0	8.159		
Anions				Total Hardness	
Hydroxide	(OH)			Carbonate Hardness	
Carbonate	(CO3)			Non-Carbonate Hardness	24073
Bi-Carbonate	(HCO3)			Total Alkalinity	
Sulphate	(SO4)	24.0	0.500	(Each as CaCO3)	
Chloride	(Cl)	36863	1038.389	<u>Totals and Balance</u>	
Nitrate	(NO3)	<0.1		Cations (me/L)	979.3
				Anions (me/L)	1038.9
				Diff=	59.59
				Sum =	2018.19
Other Analyses				ION BALANCE (Diff*100/Sum) =	
Reaction - pH			4.1		2.95%
Conductivity (E.C)			75000	Sodium / Total Cation Ratio	50.0%
(micro -S/cm at 25°C)					
Resistivity Ohm.M at 25°C			0.133		
				Remarks	
				IMBALANCE UNKNOWN ALL RESULTS CHECKED AND VERIFIED.	
				Note:	
				mg/L = Milligrams per litre	
				me/L = MilliEqivs.per litre	