

PETROLEUM DIVISION

26 OCT 1990

TOMMYRUFF-1

WELL COMPLETION REPORT

BASIC DATA

VOLUME 1

DEPT. NAT. RES & ENV



PE906426

A. CERNOVSKIS

JUNE, 1990



BHP
Petroleum

BHP Petroleum Pty. Ltd.
Incorporated in Victoria

TOMMYRUFF-1 WELL COMPLETION REPORT

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SECTION 1

WELL SUMMARY SHEET

Well: TOMMYRUFF-1

Permit: VIC/P25

District: Gippsland Basin

Planned Location: Latitude: 38 36' 47.62" South
Longitude: 147 08' 33.94" East

Actual Location: Latitude: 38 36' 47.4" South
Longitude: 147 08' 33.7" East
AMG: X = 512, 423mE Y = 5,726, 125 mN

Seismic Reference: GSE89A-18, SP 272

RKB to MSL: 21m

Water Depth: 33m

Total Depth: 1550m

Arrived Location: 19th May 1990

Spud Date: 20th May 1990

Total Depth Date: 28th May 1990

Rig Release: 3rd June 1990

Days from spud to
Total Depth: 10

Total Days on Well: 17

Operator: BHP Petroleum Pty Ltd.

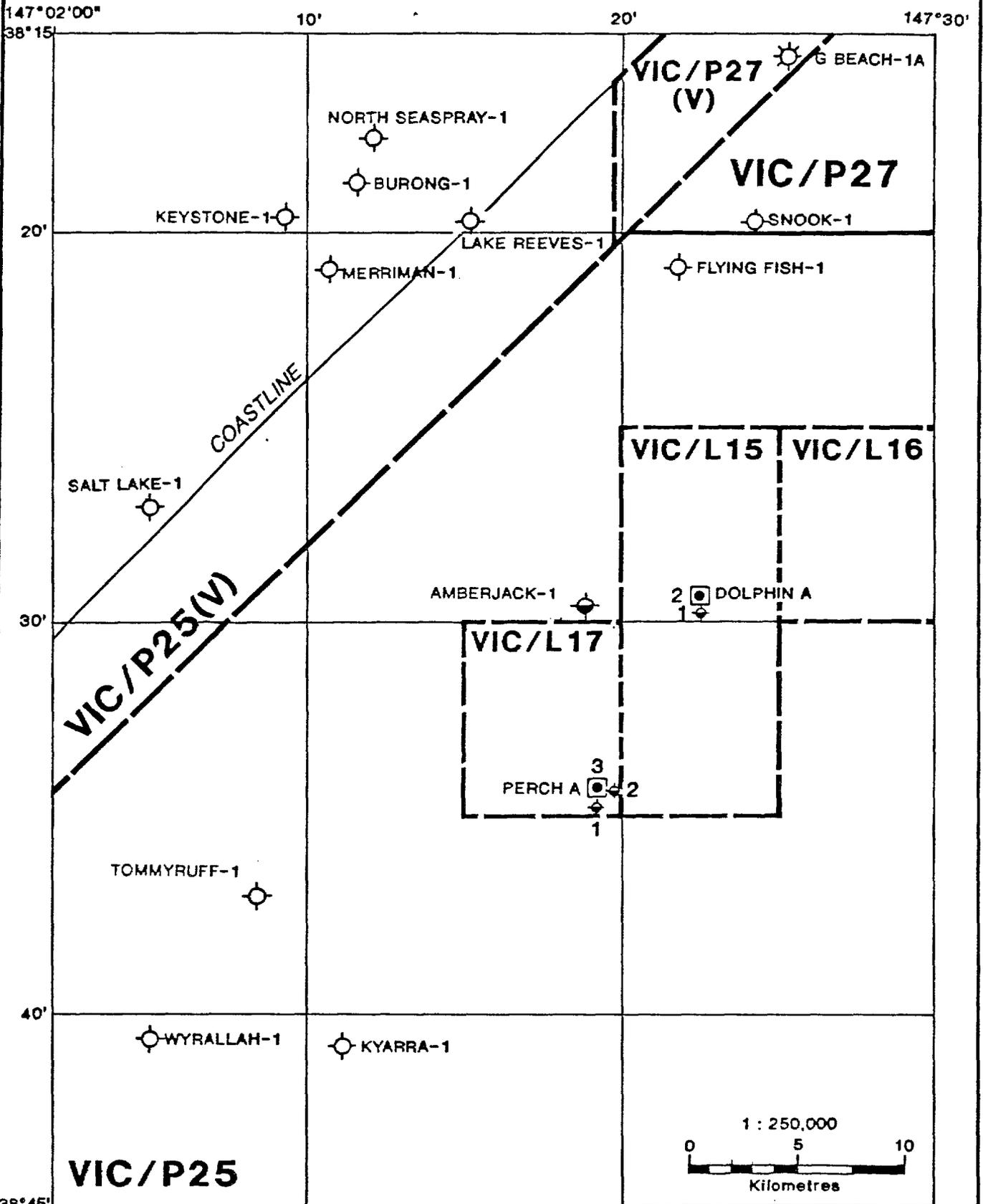
Drilling Contractor: South Seas Drilling Co.

Rig: Southern Cross

Status: Plugged and Abandoned

Total Cost (Preliminary): \$2,262,567 (Wellsite estimate)

Permit Interests:	Austin Oil Exploration N.L. 19th Floor 60 Albert Road South Melbourne VIC 3205	9.25%
	BHP Petroleum Pty Ltd Collins Tower 35 Collins Street Melbourne VIC 3000	56.50% (Operator)
	Peko Exploration Ltd. 476 St Kilda Road Melbourne VIC 3004	9.25%
	Pursuit Exploration Pty Ltd 27th Floor 12 Creek Street Brisbane QLD 4000	15.55%
	TMOC Exploration Pty Ltd AGL House 60 Edward Street Brisbane QLD 4000	9.25%




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 Petroleum
 GIPPSLAND BASIN
 VIC/P25
TOMMYRUFF-1
LOCATION MAP
 Figure 1

Author: L.Jordan

Date: July 1990
OG 22523

SECTION 2

BHP PETROLEUM PTY. LTD.
WELL COMPLETION REPORT

PERMIT: VIC/P25

WELL: TOMMYRUFF-1

JUNE 1990

Tommyruff No.1

Well Completion Report Contents

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16. Hydraulics Summary
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18. Casing And Cementing Reports
19. Abandonment Plugs
20. Electric Logs
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1.0

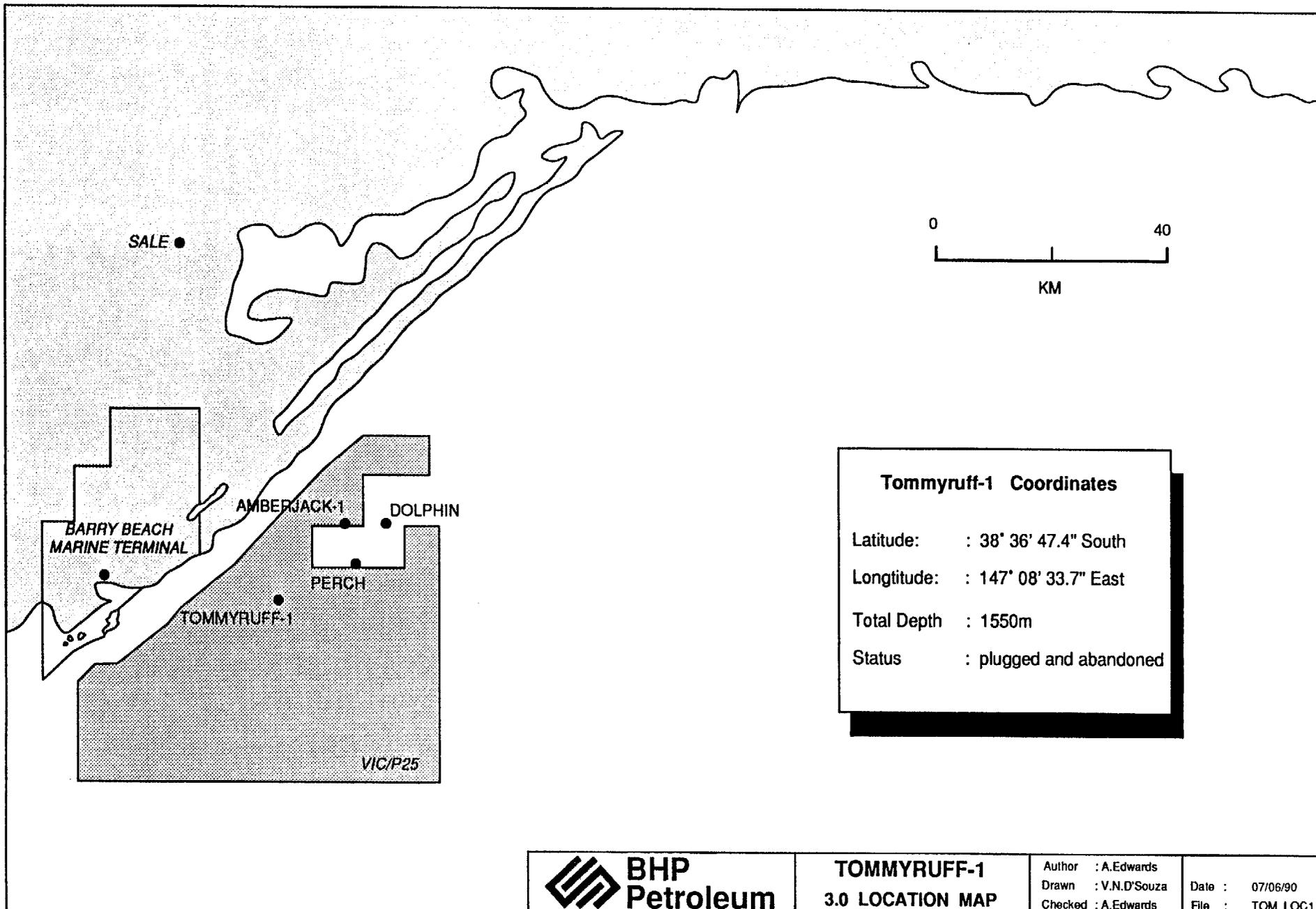
GENERAL WELL DATA

Well Name		: Tommyruff No.1
Permit		: Vic/P25
Classification		: Wildcat
Location	Latitude	: 38 degrees 36' 47.4" South
	Longitude	: 147 degrees 08' 33.7" East
Water Depth		: 33 Metres
Well Depth		: 1550 Metres
Drilling Rig		: Southern Cross
Objectives	Primary	: Top of Latrobe "Coarse Clastics" (855 mSS)
	Secondary	: Lower N-Asperus Sand (988 mSS)
Well Duration		: 18 days
Rig on contract		: 1700 hours May 17 1990
Rig Departed Location		: 0930 hours June 3 1990
Rig released from contract		: 1345 hours June 5 1990
Status		: Plugged and Abandoned.

2.0

CONTRACTORS AND SERVICE COMPANIES

Drilling	: South Seas Drilling Company
Supply Vessel	: Tidewater Marine
Helicopters	: Lloyd Aviation
Mud	: Baroid
Cementing	: Halliburton
Wireline Logging	: Schlumberger
Mud Logging	: Exlog
ROV	: Sonsub/Esso
Casing Running	: Frank's Casing Crew
Coring	: Eastman Christensen
Drilling Tools	: Austoil
Abandonment	: Austoil



OPERATIONS SUMMARY4.1 Prespud

The semisubmersible Southern Cross departed the Amberjack No.1 location at 1700 hours on May 17 1990. The rig was towed by the workboat Lady Caroline and arrived at the Tommyruff No.1 location at approximately 2100 hours. Bad weather prevented anchor handling until 1015 hours on May 18. The workboats Lady Caroline and Torungen Supplier ran anchors and the rig was deballasted and positioned as of 0415 May 19.

The coordinates of Tommyruff No.1 were as follows:

Latitude 38 degrees 36' 47.4" South
Longitude 147 degrees 08' 33.7" East

The final rig heading was 225 degrees and operating draft was 14.6 metres. (RKB-MSL 21 metres).

A standard Vetco temporary guide base was run and sea floor was tagged at 54 metres RKB. Water depth on location was 33 metres. The slope indicator mounted on the TGB read 2 degrees port forward.

4.2 26" Hole Section

26" hole was drilled to 182 metres. A Hughes R1 rerun bit was used to drill the 128 metres section. The bit was graded 1-1-I when pulled. Hole conditions were good whilst drilling and tripping. Hole angle at TD for the section was 0.5 degrees.

20" casing was run to 175.2 metres and landed in a standard Vetco permanent guide base and dummy 30" housing. A diagram of the guide base and pile joint is shown in Section 7.1. Cement was pumped to the sea floor without incident. Cementing details are included in Section 18.

The BOP was landed and tested to 2000 psi also without incident. Firm cement was tagged at 169.5 metres RKB inside 20" casing and drilled to 175 metres with 17-1/2" BHA. No cement was found in the rathole.

12-1/4" BHA was made up and run in hole to 182 metres to drill a pilot hole for the 17-1/2" hole section.

4.3 12-1/4" Pilot Hole And 17-1/2" Hole Section

A 12-1/4" pilot hole was drilled from 182 - 790 m RKB. The purpose of this was to improve logging conditions for this section of hole, where fluorescence had been observed in the previous well, Amberjack No.1. No indications of hydrocarbons were seen on either logs or cuttings over this interval in Tommyruff No.1.

Logs run over the section were as follows:

DLL-SDC-MSFL-GR-AMS-DLT

Formation changes and lithologies based on cuttings and logs run over the section are shown in the well schematic, found in Section 7. Bottom hole temperature from the AMS was 40 degrees C.

The hole was reamed out to 17-1/2" to a depth of 795 m RKB. Both the pilot hole and 17-1/2" hole were drilled with sea water gel and no drag was observed on connections or on tripping.

A multishot was run and indicated the maximum hole inclination to be 0.75 degrees. The caliper log indicated the 12-1/4" hole section to be in good shape.

13-3/8" casing was run in hole to a depth of 668 metres before becoming differentially stuck. Full circulation was maintained whilst pulling 200,000 lb over the string weight. The hole was displaced to sea water in order to reduce the hydrostatic at the point of differential sticking and the casing was freed.

Prior to rerunning casing, mud was conditioned to improve fluid loss properties. When this was achieved casing was run to a depth of 783 m RKB. Cement was pumped to 280 metres without incident. Details are included in Section 18. The 13-3/8" packoff was pressure tested to 2500 psi.

4.4 12-1/4" Hole

12-1/4" BHA was made up and run in hole to 756 m RKB. Hard cement was drilled to 783 m RKB. No cement was found in the rathole. The hole was displaced to KCL polymer mud and 5 metres of hole were drilled prior to running a leak off test. An equivalent mud weight of 1.69 SG was observed at the 13-3/8" casing shoe. Leak off test details appear in Section 17.

A further 750 metres of 12-1/4" hole were drilled to 1550 metres. Lithologies and formations drilled are shown in the well schematic found in Section 7. No indication of hydrocarbon was seen over either of the two zones of interest.

Logs run over the interval were as follows:

DLL-MSFL-SP-GR-LDL-CNL-CAL-AMS-SDT
VSP
CST
RFT

4.5 Abandonment

Tommyruff No.1 was plugged and abandoned on May 29 1990. Three plugs were set at the following depths:

Plug No.1	1025 - 860 metres
Plug No.2	735 - 815 metres
Plug No.3	87 - 175 metres

Anchors were pulled on June 2 by the Lady Caroline and Torunger Supplier. Approximately 24 hours were lost due to weather and the state of unpreparedness of the mooring system on the Southern Cross. The details of this issue are addressed in a memo from the Southern Cross drilling supervisor to the BHP Petroleum rig superintendant. At 0930 hours on June 3 the final anchor was bolstered and the Southern Cross was under tow to Beauty Point, Tasmania.

5.0

DAILY OPERATIONS

Date	Depth	Operation										
17/5/90	0 Metres	<p>On tow to Tommyruff No.1 location Vic/P25. Towboat Lady Caroline. 3 hours lost to bad weather. Conditions as follows:</p> <table><tr><td>Wind Speed</td><td>35 knots</td></tr><tr><td>Wind Direction</td><td>245</td></tr><tr><td>Swell</td><td>10 feet</td></tr><tr><td>Swell Direction</td><td>230</td></tr><tr><td>Swell Period</td><td>7 seconds</td></tr></table>	Wind Speed	35 knots	Wind Direction	245	Swell	10 feet	Swell Direction	230	Swell Period	7 seconds
Wind Speed	35 knots											
Wind Direction	245											
Swell	10 feet											
Swell Direction	230											
Swell Period	7 seconds											
18/5/90	0 Metres	<p>10.25 hours lost to bad weather conditions. Rig on tow until 1015 hours when anchor handling was begun.</p> <p>11:00 No.1 anchor on bottom 12:10 No.5 anchor on bottom 13:00 No.4 anchor on bottom 13:50 No.8 anchor on bottom 14:30 No.6 anchor on bottom 15:55 No.2 anchor on bottom 16:40 No.7 anchor on bottom 16:55 No.3 anchor on bottom</p> <p>Ballast rig to operation draft and position rig.</p>										
19/5/90	182 Metres	<p>Ballast and position rig. (Draft = 47 feet). Land TGB. Water depth 33 metres. Bullseye reading 2 degrees port forward. Make up 26" BHA and spud well. Drill 26" hole from 54 metres to 182 metres. Circulate hole clean with 100 bbl hi vis pill. Drop survey. Spot additional 100 bbl hi vis pill. POOH to 60 metres and retrieve survey. RIH to 182 metres. No fill. Displace hole with 350 bbl hi vis mud. POOH. Lay down 26" bit hole opener and bit sub. Rig up and run 20" casing.</p>										

Date	Depth	Operations
20/5/90	182 Metres	Continued running 20" casing to 175 metres. PGB bullseye 1 degree port aft. Rig up cement line and circulate for 15 minutes. Pressure test lines and pump cement around 20" casing. Backout running tool. POOH. Run and land stack (50,000 lb O/P). Rig up slip joint and diverter. RIH with test tool and test stack. POOH. RIH with nominal seat protector. POOH and lay down excess drill pipe. Make up 17-1/2" BHA and RIH. Tag T.O.C. at 169.5 metres Change out wash pipe packings. Drill out cement to 174 metres.
21/5/90	680 Metres	Drill out cement and shoe. Wash rathole to 182 metres. No cement in rathole. Circulate bottoms up. Displace hole to sea water gel polymer mud. Pump slug POOH. Lay down excess drill pipe. Make up 12-1/4" BHA. Pick up kelly. Break circulation and drill 12-1/4" hole from 182 metres - 408 metres. Circulate bottoms up. Drill 12-1/4" hole from 408 - 680 metres.
22/5/90	790 Metres	Drill 12-1/4" hole from 680 - 790 metres. Circulate bottoms up twice till shakers clean. Pump slug and POOH. Rig up Schlumberger and run log #1 DLL-SDC-MSFL-CR-AMS. Rig down Schlumberger. Make up 13-3/8" casing hanger, packoff and cementing kelly. Laid down HWDP and excess drill pipe from derrick. Make up 17-1/2" BHA, monel and stabiliser and RIH to 182 metres. Ream 17-1/2" hole from 182 metres to 190 metres. Change over EMD's. Reamed 17-1/2" hole from 190 - 344 metres.
23/5/90	795 Metres	Ream 17-1/2" hole to 790 metres. Drilled 17-1/2" hole to 795 metres. Circulate bottoms up. Drop multishot survey. Pump slug and POOH to shoe. Wiper trip. Pull back to shoe and retrieve survey. RIH to 795 metres. Circulate hole clean and pump slug. POOH and strap pipe. Lay down monel stabiliser and bit. RIH and retrieve wear bushing. Rig up and run 13-3/8" casing.

Date	Depth	Operations
24/5/90	795 Metres	Continued running 13-3/8" casing. Casing stuck at 668 metres. Rig up and circulate. Pull to 200,000 lb O/P. Unable to free pipe. Displace to sea water. Pipe free at 0600 hours. Lay out 13-3/8" casing and equipment. RIH and set wearing bushing POOH. Make up 17-1/2" BHA and RIH. Pick up kelly. Tag bottom 2 metres fill. Circulate and condition mud. Spot 100 bbl KCL on bottom. Pump slug and POOH.
25/5/90	795 Metres	Continued POOH. Pull wear bushing. Rig up and run 13-3/8" casing. Land and back off hanger 1/4 turn to the right. Circulate casing 3766 strokes. Test cement line to 2,000 psi. Mix and pump cement. Displace with 350 bbl sea water. Bump plug 1500 psi OK. Close annular and squeeze 10 bbls. Set pack off. Test pack off to 2500 psi. No test. POOH. RIH and wash well head and pack off area. POOH. RIH. Test plug leak in choke manifold McEvoy valve. Pressure test packoff 2500 psi OK. Test BOP stack 200/2000 psi on yellow pod, choke manifold 250/2000 psi. Function test blue pod. POOH test tool, RIH set wear bushing. Test kelly cocks, TIW valve and stand pipe manifold 200/2000 psi. OK. Lay out cement kelly cement head. Break down and lay out 9-3/4" DC and remaining 17-1/2" BHA.
26/5/90	993 Metres	Lay out 9-3/4" DC. Make up 12-1/4" BHA. RIH to tag cement at 756 metres. Drill out cement from 756 - 782 metres. Wash from 795 metres. Drill 5 metres new hole. Change over to KCL mud and circulate hole clean. Hang off on upper pipe ram. Perform LOT 1.69 SG. EMW. Take SCR's. Drill 12-1/4" hole from 800 metres - 902 metres reaming connections. Circulate sample for geologist. Drill from 902 - 905 metres circulate second sample. Drill 12-1/4" hole from 905 - 993 metres reaming connections.
27/5/90	1404 Metres	Drill from 993.6 - 1226. Circulate. Drop single shot survey. Pump slug and POOH to shoe. Wiper trip. Hole good. Retrieve survey 1 degree N 10E. RIH. No fill. Hole condition good. Drill 12-1/4" hole from 1226 - 1404 metres.

Date	Depth	Operations
28/5/90	1550 Metres	Drill from 1404 - 1550 metres. Circulate bottoms up. Pump slug. POOH to shoe. Hole condition good. RIH 4 metres fill. Pump 100 bbl hi vis and circulate hole clean. Drop single shot survey. Pump slug and POOH. Retrieve survey 1/2 degree S 85E. POOH. Lay out jars and monel collar. Lay out core barrel. Rig up and run Schlumberger.
29/5/90	1550 Metres	Run logs. #1 DLL-LDL-CNL-GR-MSFL-TCC-AMS-SONIC #2 SAT #3 CST Retrieve sidewall cores and rig down log #3. Run RFT. Rig down RFT. RIH with OEDP to cement. Circulate bottoms up. Rig up cement lines and attempt to pressure test surface lines. Pull back to shoe whilst preparing Haliburton unit.
30/5/90	1550 Metres	Continue repairing Haliburton unit. POOH to shoe. Slip and cut drilling line. RIH to 1025. Rig up and pump cement plug #1. POOH 8 stands. Circulate. POOH. Lay down excess drill pipe whilst WOC. RIH and tag cement at 862 metres. POOH to 815 metres. Circulate and pump cement plug #2. POOH 4 stands. Circulate bottoms up WOC and lay down excess drill pipe. Test plug #2 to 1500 psi OK. Retrieve wear bushing. Make up 13-3/8" casing cutting assembly and RIH. Cut casing at 133 metres. POOH and lay out cutting assembly. Pick up casing spear. RIH and pull casing with 70,000 O/P. POOH. Layout 13-3/8" hanger 6 joints and stub. RIH OEDP to 175 metres. Pump cement plug 3 at 175 metres.
31/5/90	1550 Metres	POOH to 75 metres. Circulate hole clean. Lay down excess drill pipe. RIH - Flush stack, choke and kill line, standpipe manifold. Function test hydrils and pump through diverter lines. RIH and tag cement at 87 metres. Lay down excess drill pipe. Rig up and pull BOP stack. Make up 20" casing cutting assembly. Cut casing POOH service break casing cutting assembly. Make up 20" running tool. Pull PGB and lay out pile joint. Make up J tool and stab into TGB and pull to surface.

Date	Depth	Operations																				
1/6/90	1550 Metres	<p>Wait on Esso supply boats on rest periods. Back load Canning Tide. Torungen Supplier pulled anchor #2 onto deck and hauled in chain whilst back loading and offloading supply vessel Lady Caroline. Work Torungen Supplier, with No.2 anchor and offload Lady Caroline. Work anchor chain No.1.</p> <p>Weather at 21:00</p> <table border="0"> <tr> <td>Wind</td> <td colspan="3">45 knots/290</td> </tr> <tr> <td>Waves</td> <td colspan="3">4'/290 /4 seconds</td> </tr> <tr> <td>Swell</td> <td colspan="3">12'/230 /8 seconds</td> </tr> </table>	Wind	45 knots/290			Waves	4'/290 /4 seconds			Swell	12'/230 /8 seconds										
Wind	45 knots/290																					
Waves	4'/290 /4 seconds																					
Swell	12'/230 /8 seconds																					
2/6/90	1550 Metres	<p>Work anchor chain No.1. Wait on weather.</p> <table border="0"> <tr> <td></td> <td>0100</td> <td>0400</td> <td>0500</td> </tr> <tr> <td>Winds</td> <td>40 knots</td> <td>30 knots</td> <td>30 knots</td> </tr> <tr> <td>Wind Direction</td> <td>300</td> <td>300</td> <td>300</td> </tr> <tr> <td>Swell</td> <td>14 feet</td> <td>10 feet</td> <td>10 feet</td> </tr> <tr> <td>Waves</td> <td>4'</td> <td>4'</td> <td>3'</td> </tr> </table> <p>Remove 4 x 500' lengths of No.2 anchor chain from Torungen Supplier to rig. Deballst rig.</p> <p>Pull anchors with work boats. Torungen Supplier and Lady Caroline. Torungen Supplier on tow bridle.</p>		0100	0400	0500	Winds	40 knots	30 knots	30 knots	Wind Direction	300	300	300	Swell	14 feet	10 feet	10 feet	Waves	4'	4'	3'
	0100	0400	0500																			
Winds	40 knots	30 knots	30 knots																			
Wind Direction	300	300	300																			
Swell	14 feet	10 feet	10 feet																			
Waves	4'	4'	3'																			
3/6/90		<p>Continued pulling anchors. Rig off location at 0930 hours.</p>																				

DISCUSSION BY INTERVAL6.1 26" Hole 54 - 182m

The 26" hole section of Tommyruff No.1 was drilled through the loosely consolidated sands and carbonates of the Seaspray Group. The BHA, consisted of a 26" bit followed by a 26" stabiliser in variance with the more normal pilot bit arrangement. No problems were encountered whilst drilling and neither item showed any sign of major work.

20" swift left hand thread casing was run after drilling 26" hole. Neither deck crew had run LHT casing before and took 8-1/2 hours to run and cement 7 joints of casing.

6.2 17-1/2" Hole 182 - 790m

The 17-1/2" hole section was drilled from 182 - 790 metres initially using a 12-1/4" bit. This change to the original drilling programme was made to improve the quality of logs run over the section. Fluorescence had been seen in the upper section of this interval in the previous well drilled in the permit (Amberjack No.1) however the hole was badly washed out, making log interpretation difficult. No shows were seen over this interval in Tommyruff No.1.

After logging, the hole was reamed out to 17-1/2". No losses or drag on connections was observed, indicating the hole to be in good condition. The mud cleaning system on the Southern Cross consisted of a Brandt dual tandem shaker and Demco desilter and desander units. The system was inadequate and probably represents the weakest part of the drilling equipment on board the rig.

13-3/8" casing was run after reaming out the hole to 17-1/2". The casing became differentially stuck at 668 metres. Circulation was able to be maintained whilst pulling 200,000 lbs over the string weight. The hole was displaced to sea water to reduce the amount of overbalance at the point of sticking. This was successful and the casing was pulled back to surface.

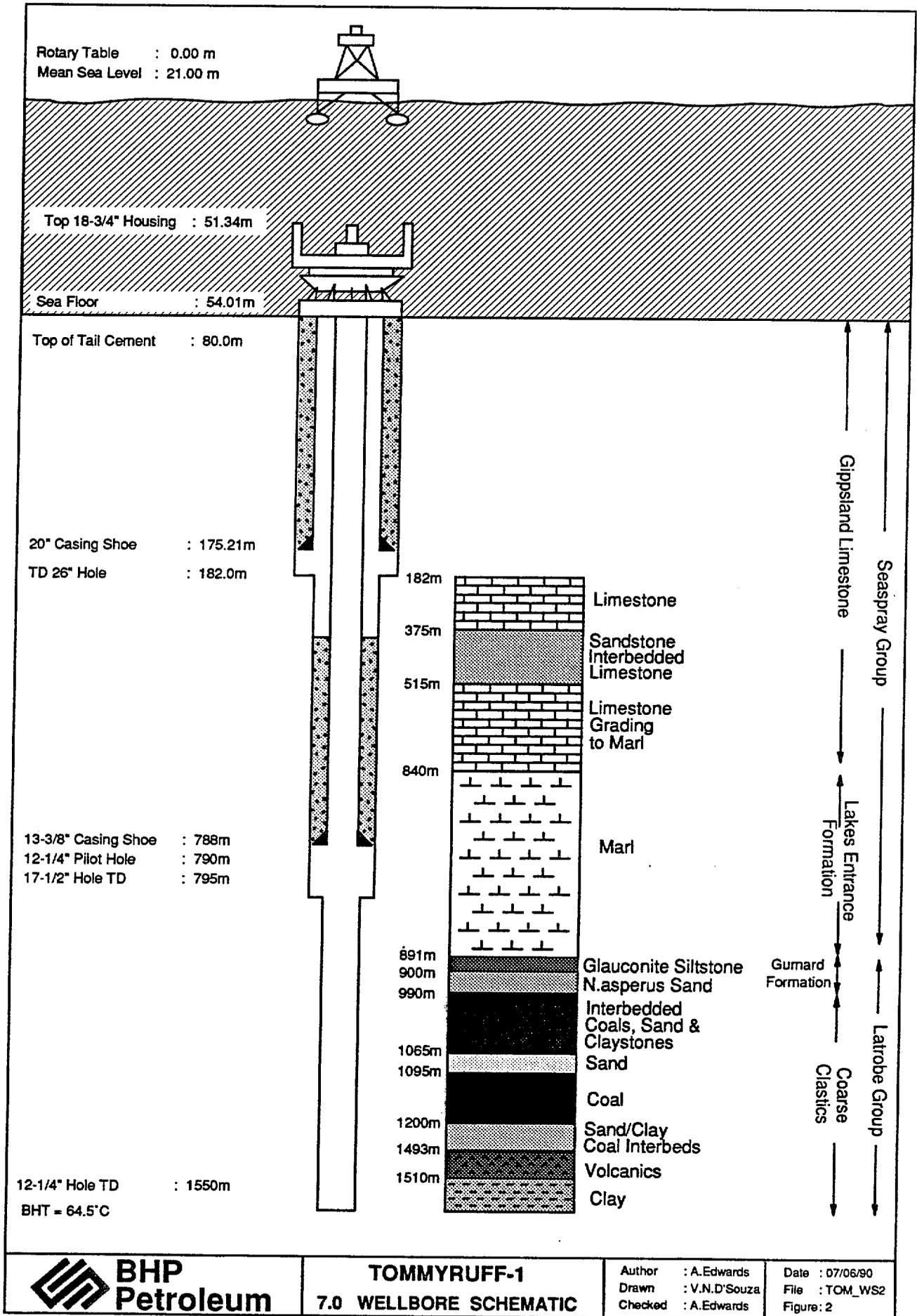
Prior to rerunning 13-3/8" casing a 100 bbl KCL pill was spotted on bottom and the mud system was circulated and conditioned. Fluid loss properties were improved by treating the mud with caustic. The casing stuck temporarily in 2 places when rerun, however was quickly freed with 200,000 lb overpull.

No further incidents occurred over this section of hole.

6.3 12-1/4" Hole 795 - 1550m

This section of hole intersected both target sands. The zones were of extremely high reservoir quality however did not contain any hydrocarbons. This was confirmed from lack of fluorescence on cuttings, resistivity logs, sidewall cores and RFT formation pressure measurements.

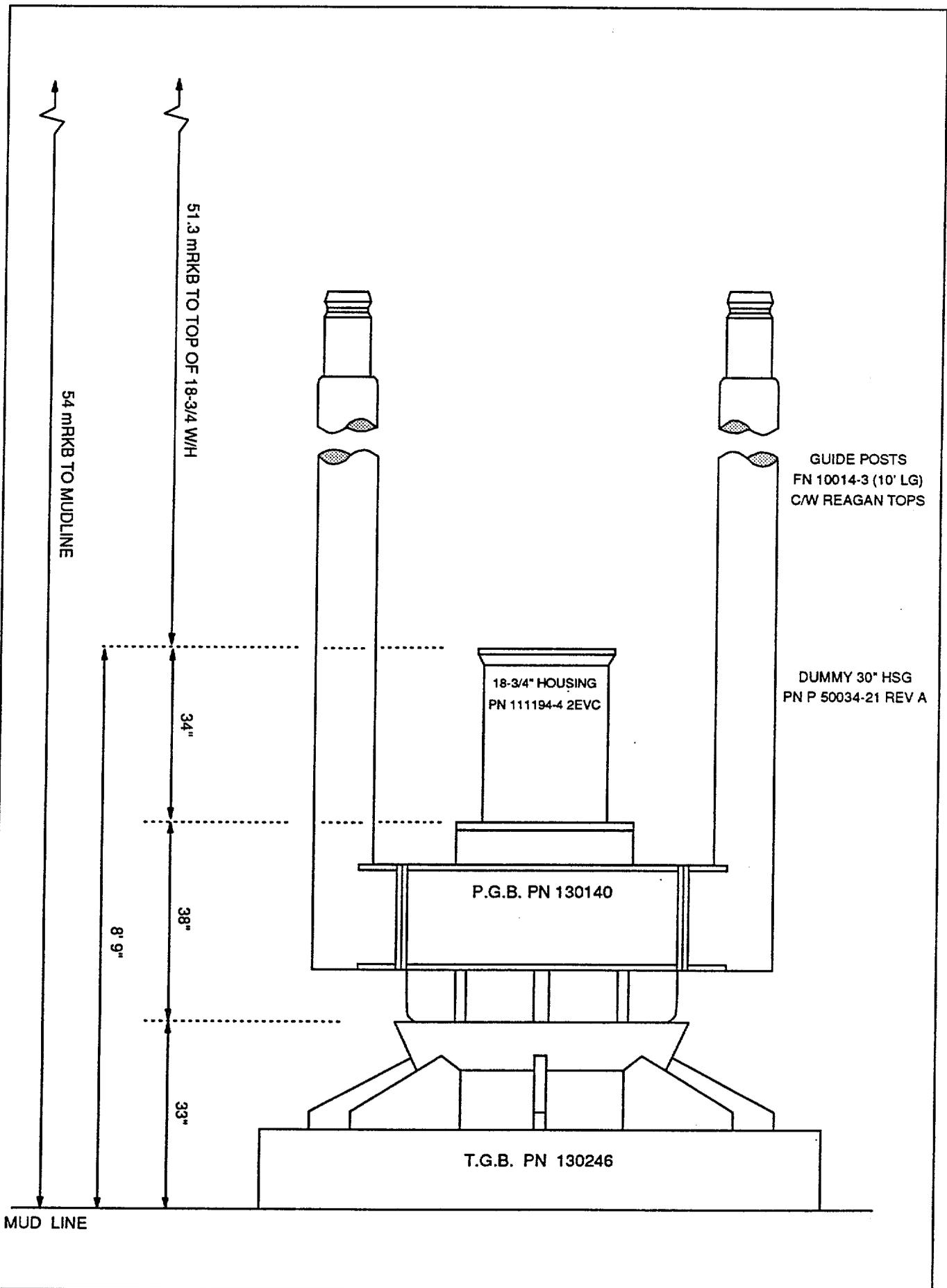
A single bit was used to drill the entire 755 metres interval. The bit was graded 8-3-3/16. Nothing of incident occurred whilst drilling 12-1/4" hole worthy of reporting.



TOMMYRUFF-1
7.0 WELLBORE SCHEMATIC

Author : A.Edwards
 Drawn : V.N.D'Souza
 Checked : A.Edwards

Date : 07/06/90
 File : TOM_WS2
 Figure : 2

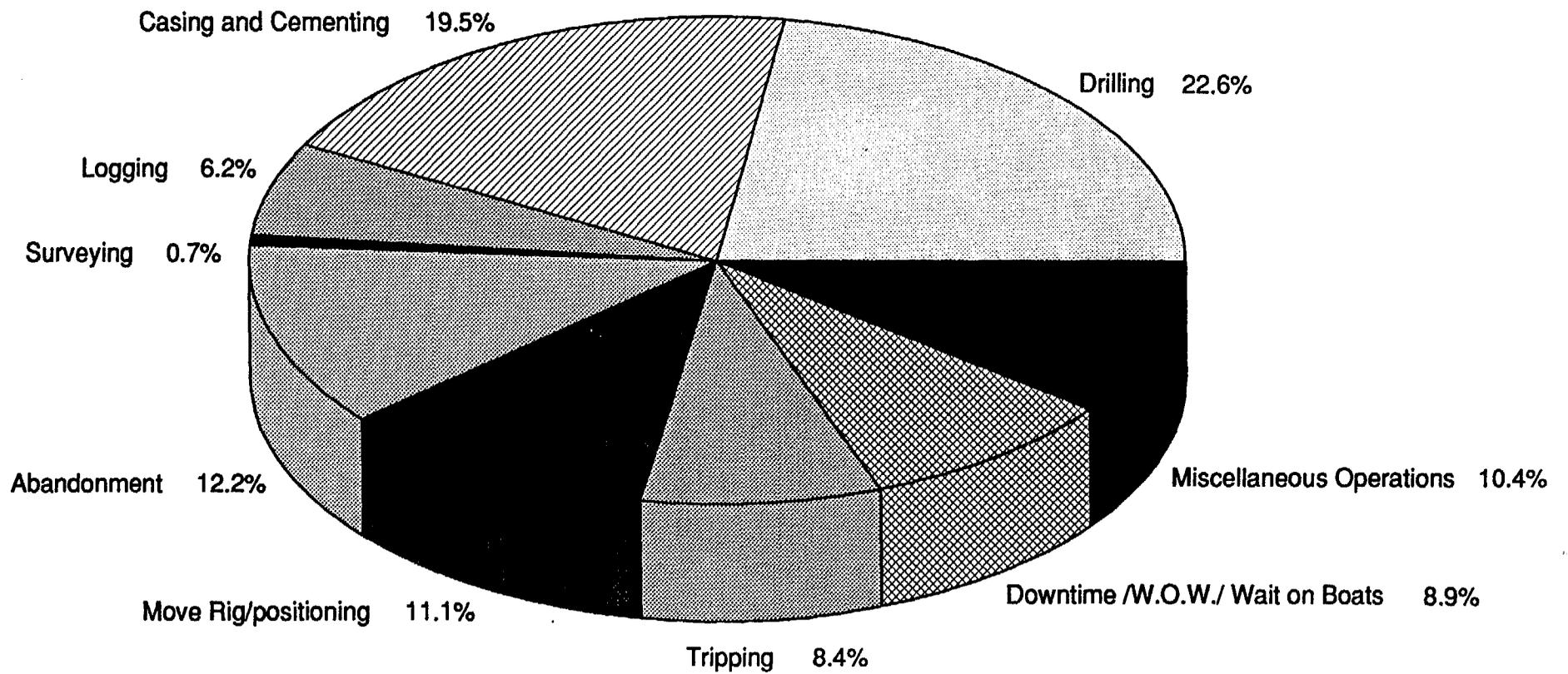


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Petroleum**

**TOMMYRUFF-1
7.1 GUIDE BASE SCHEMATIC**

Author : A.Edwards
Drawn : V.N.D'Souza
Checked : A.Edwards

Date : 18/06/90
File : TOM_GBS1

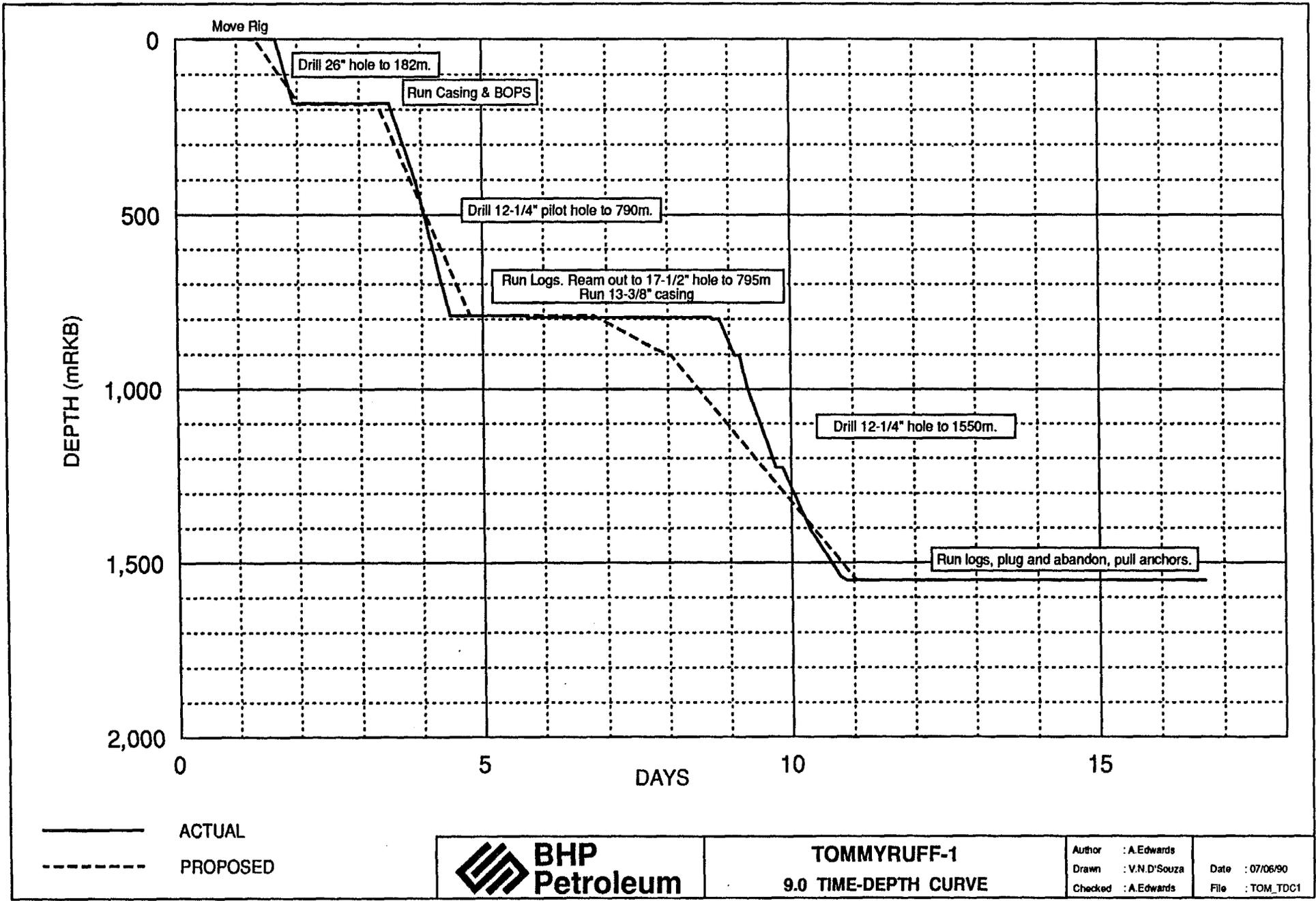


TOMMYRUFF-1
8.0 TIME BREAKDOWN

Author : A.Edwards	Date : 07/06/90
Drawn : V.N.D'Souza	File : TOM_TB1
Checked : A.Edwards	

8.1 TIME BREAKDOWN DATA

OPERATION \ DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	TOTALS	
MOVE RIG	4.00																		4.00	
WAIT ON WEATHER	3.00	10.25															4.25		17.50	
RUN ANCHORS		13.75	4.25																18.00	
DRILLING			7.00		19.25	4.00	0.25			9.25	21.50	14.25							75.50	
BIT TRIP			3.00		3.25	8.00	3.25			5.50		4.75		1.00					28.75	
WIPER TRIP			0.50				2.75					1.75							5.00	
SURVEY			0.50				0.25				2.00	0.25							3.00	
CASING & CEMENTING			7.75	9.50	0.50	3.25	4.50	24.00	24.00	4.75									78.25	
WELLHEAD			1.00	2.00			0.75												3.75	
BOP STACK				12.00															12.00	
REPAIR SURFACE				0.50		0.25													0.75	
REAM / WASH						4.25	10.25			0.25									14.75	
CIRCULATE & CONDITION					1.00	1.00	2.00			3.50	0.50	2.00							10.00	
LOGGING						3.25						1.00	20.75						25.00	
LEAK OFF TEST										0.75									0.75	
ABANDON													2.75	22.25	24.00				49.00	
MISCELLANEOUS													0.50	0.75		6.75	6.75		14.75	
WAIT ON ESSO WORKBOATS																17.25			17.25	
PULL ANCHORS																	13.00	9.50	22.50	
TOTALS	7.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	9.50	400.50



——— ACTUAL
 - - - - PROPOSED



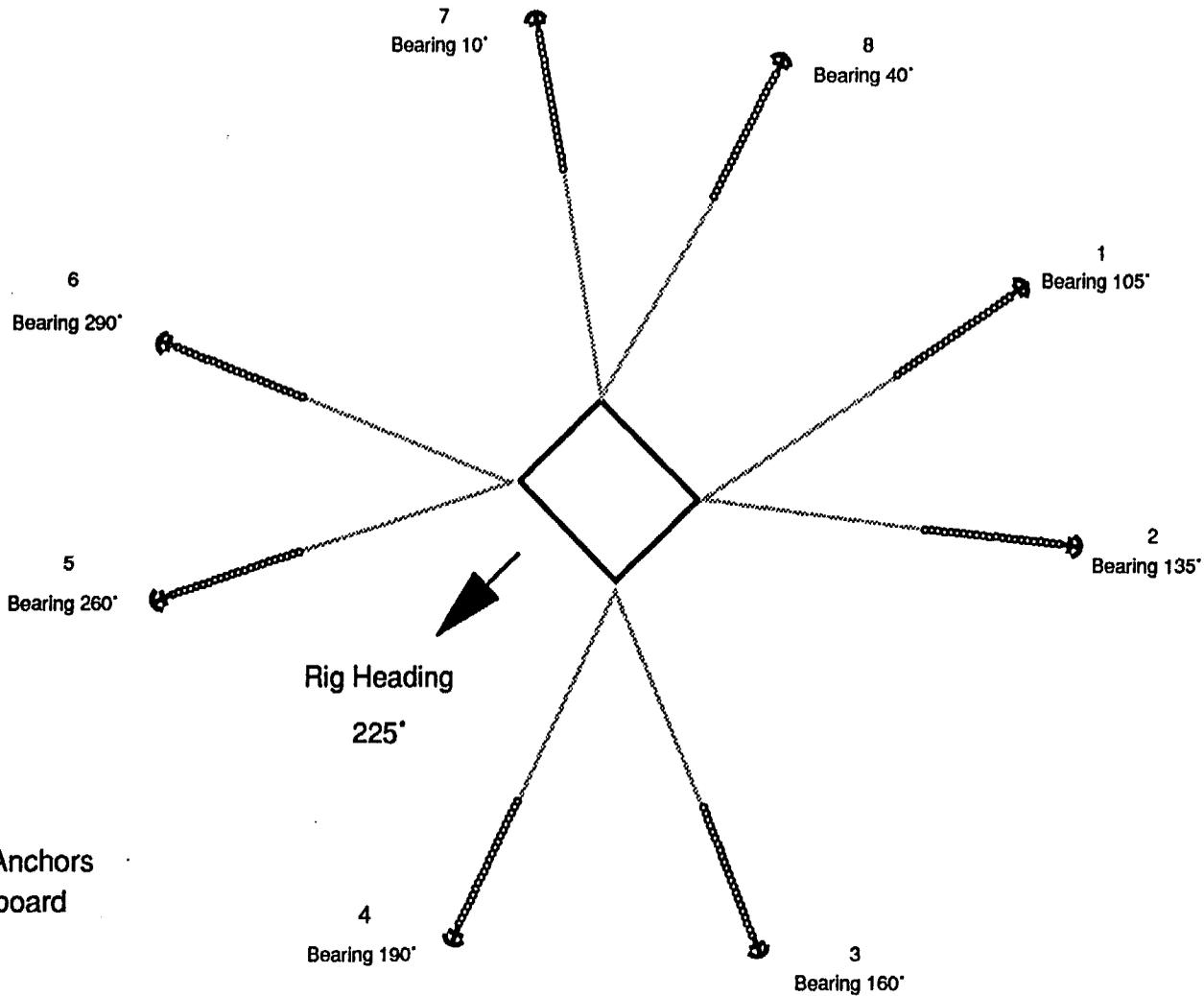
TOMMYRUFF-1
 9.0 TIME-DEPTH CURVE

Author : A.Edwards	Date : 07/06/90
Drawn : V.N.D'Souza	File : TOM_TDC1
Checked : A.Edwards	

10.0 DRILLING COSTS

DATE	DAY	FIXED DAILY COST COST [\$ AUS]	VARIABLE DRILLING COST [\$ AUS]	VARIABLE LOGISTIC COST [\$ AUS]	TOTAL DAILY COST [\$ AUS]	CUMULATIVE COST [\$ AUS]
17.5.90	1	29447	3268	386	33101	33101
18.5.90	2	100962	4070	0	105032	138133
19.5.90	3	100962	148835	898	250695	388828
20.5.90	4	100962	17725	988	119675	508503
21.5.90	5	100962	12370	808	114140	622643
22.5.90	6	100962	35161	0	136123	758766
23.5.90	7	100962	18034	1355	120351	879117
24.5.90	8	100962	10324	4414	115700	994817
25.5.90	9	100962	115491	1415	217868	1212685
26.5.90	10	100962	24683	0	125645	1338330
27.5.90	11	100962	12395	718	114075	1452405
28.5.90	12	100962	7731	3981	112674	1565079
29.5.90	13	100962	4367	718	106047	1671126
30.5.90	14	100962	138380	718	240060	1911186
31.5.90	15	100962	-105052	-3661	-7751	1903435
1.6.90	16	100962	4722	1616	107300	2010735
2.6.90	17	100962	2806	2155	105923	2116658
3.6.90	18	39964	2853	718	43535	2160193

TOTAL WELL COST \$2,160,193



Mooring System: 8 x 15T "Danforth" Anchors
610, pf 2" chain outboard
of wire



"SOUTHERN CROSS"
TOMMYRUFF-1
VIC/P25
11.0 MOORING DIAGRAM

Author	: A. Edwards	Date	: 07/06/90
Drawn	: V.N.D'Souza	File	: TOM_SMD1
Checked	: A. Edwards		

12.0 WEATHER AND SEA STATE DATA

DATE	DAY	WIND VELOCITY/DIR'N [KNOTS / DEG]	TEMPERATURE [DEG C]	VISIBILITY [NAUT. MILES]	WEATHER	SWELL HT/PER/DIR'N [M / SEC / DEG]	WAVES HT/PER/DIR'N [M / SEC / DEG]	HEAVE [DEG]	PITCH [DEG]	ROLL [DEG]	BAROMETER [MILLIBARS]
17.5.90	1	35 / 245	17	10	OVERCAST	3.0 / 7 / 230	1.2 / 3 / 240	-	1.5	2.5	1006
18.5.90	2	35 / 250	13	10	RAINY	3.6 / 7 / 220	1.2 / 3 / 245	-	2.6	2.3	1015
19.5.90	3	32 / 260	14	10	SQUALLS	3.6 / 7 / 230	0.9 / 3 / 260	-	2.2	2.0	1019
20.5.90	4	20 / 270	13	10	CLOUDY	3.6 / 7 / 200	0.9 / 2 / 270	0.5	1.3	2.2	1022
21.5.90	5	25 / 310	15	10	CLOUDY	2.4 / 6 / 180	0.6 / 1 / 290	1.0	0.8	1.2	1017
22.5.90	6	22 / 300	14	10	FINE	1.8 / 6 / 230	0.6 / 1 / 180	0.3	0.8	1.0	1019
23.5.90	7	18 / 120	15	10	FINE	1.8 / 6 / 200	0.3 / 1 / 200	0.9	0.6	0.1	1017
24.5.90	8	26 / 250	15	10	CLEAR	1.8 / 6 / 220	0.6 / 2 / 300	0.5	0.8	1.1	1010
25.5.90	9	30 / 270	14	10	CLEAR	2.4 / 6 / 220	2.0 / 3 / 270	0.5	0.9	2.0	1012
26.5.90	10	30 / 270	14	12	CLEAR	2.4 / 6 / 220	0.9 / 2 / 270	0.5	0.8	1.0	1022
27.5.90	11	20 / 270	14	10	FINE	2.4 / 6 / 220	0.6 / 2 / 270	0.5	0.7	0.9	1029
28.5.90	12	-	16	12	CLEAR	1.5 / 8 / 140	-	0.3	0.6	0.8	1027
29.5.90	13	14 / 50	15	12	FINE	1.2 / 10 / 140	0.3 / 1 / 005	0.2	0.5	0.8	1023
30.5.90	14	15 / 270	15	10	FINE	0.9 / 8 / 110	0.3 / 1 / 270	0.2	0.5	0.8	1016
31.5.90	15	25 / 270	12	10	SHOWERS	6.0 / 8 / 230	2.0 / 1 / 270	0.5	0.6	0.8	1006
1.6.90	16	50 / 290	12	10	STORMS	12 / 8 / 230	4.0 / 4 / 290	-	1.2	3.0	1003
2.6.90	17	25 / 300	12	10	CLEAR	8.0 / 8 / 210	3.0 / 3 / 300	-	1.0	1.0	1019
3.6.90	18	30 / 250	15	10	CLOUDY	2.4 / 8 / 210	0.9 / 3 / 300	-	1.8	1.0	1024

13.0 BIT RECORD

BIT No.	1	2	3	4	5
SIZE	26"	17 1/2"	12 1/4"	17 1/2"	12 1/4"
MAKE	HTC	FEED	HTC	FEED	HTC
TYPE	R1	S11J	ATJ1	S11J	ATJ22
SERIAL No.	VJ161	N15847	P35EB	N15847	PW627
JETS	20 / 20 / 20	18 / 18 / 16	18 / 18 / 18	18 / 18 / 16	16 / 16 / 14
DEPTH OUT [METRES]	182	182	790	795	1550
METRES DRILLED	128	0	608	613	755
HOURS	7	-	18.25	14.75	45.5
WEIGHT [LBS x 1000]	0-10	0-10	5-30	0-30	40-45
RPM	-	70-120	130	120-125	100-125
PUMP PRESS [PSI]	650	2250	1400	2200	1650-2500
MUD WEIGHT [LB/GAL]	8.5	8.5	9.0	9.1	9.2
VISCOSITY [SEC]	26	26	46	36	39
GRADING	-	-	-	-	8-3-3/16

14.0 B.H.A. SUMMARY

B.H.A. No. 1	54 - 182 mRKB	26" BIT , 26" HOLE OPENER , BITSUB , 2 x 9 3/4" D.C. , CROSSOVER , 4 x 8" D.C. , CROSSOVER , 9 x H.W.D.P.
B.H.A. No. 2	182 - 790 mRKB	12 1/4" BIT , BITSUB , 2 x 8" D.C. , 1 x 12 1/4" STABILISER , 8 x 8" D.C. , 1 x JAR , 2 x 8" D.C. , CROSSOVER , 9 x H.W.D.P.
B.H.A. No. 3	182 - 795 mRKB	17 1/2" BIT , FLOATSUB , 2 x 9 3/4" D.C. , CROSSOVER , 1 x 17 1/2" STABILISER , 1 x 8" MONEL COLLAR , 10 x 8" D.C. , CROSSOVER , 9 x H.W.D.P.
B.H.A. No. 4	795 - 1550 mRKB	12 1/4" BIT , BITSUB , 1 x 8" MONEL COLLAR , 1 x 8" D.C. , 1 x ROLLER REAMER , 13 x 8" D.C. , 1 x JAR , 2 x 8" D.C. , CROSSOVER , 9 x H.W.D.P.

15.0 MUD PROPERTIES SUMMARY

15.1 FLUID PROPERTIES 17 1/2" HOLE SECTION SEAWATER GEL POLYMER

DATE		21.5.90	22.5.90	23.5.90	24.5.90	25.5.90
DAY		5	6	7	8	9
MUD TEMP	[DEG C]	29	29	29	29	29
WEIGHT	[S.G.]	1.08	1.07	1.10	1.08	1.03
VISCOSITY	[SEC]	45	37	43	42	50
P.V.	[C.P.]	11	5	11	11	13
Y.P.	[LB/100 SQFT]	20	19	26	20	27
GELSTRENGTH		14 / 25	14 / 22	18 / 25	14 / 26	18 / 30
SOLIDS CONTENT	[%]	4.0	3.0	5.0	3.5	3.5
LIQUID CONTENT	[o/w %]	- / 96	- / 97	- / 95	- / 96.5	- / 96.5
SAND CONTENT	[%]	TRACE	TRACE	TRACE	TRACE	TRACE
M.B.T	[LB/BBL EQ]	16	13	16	15	15
pH		9.5	9.0	9.0	10.5	10.5
CHLORIDES	[PPM]	10000	13500	13500	13000	13500
CALCIUM		250	700	600	80	-

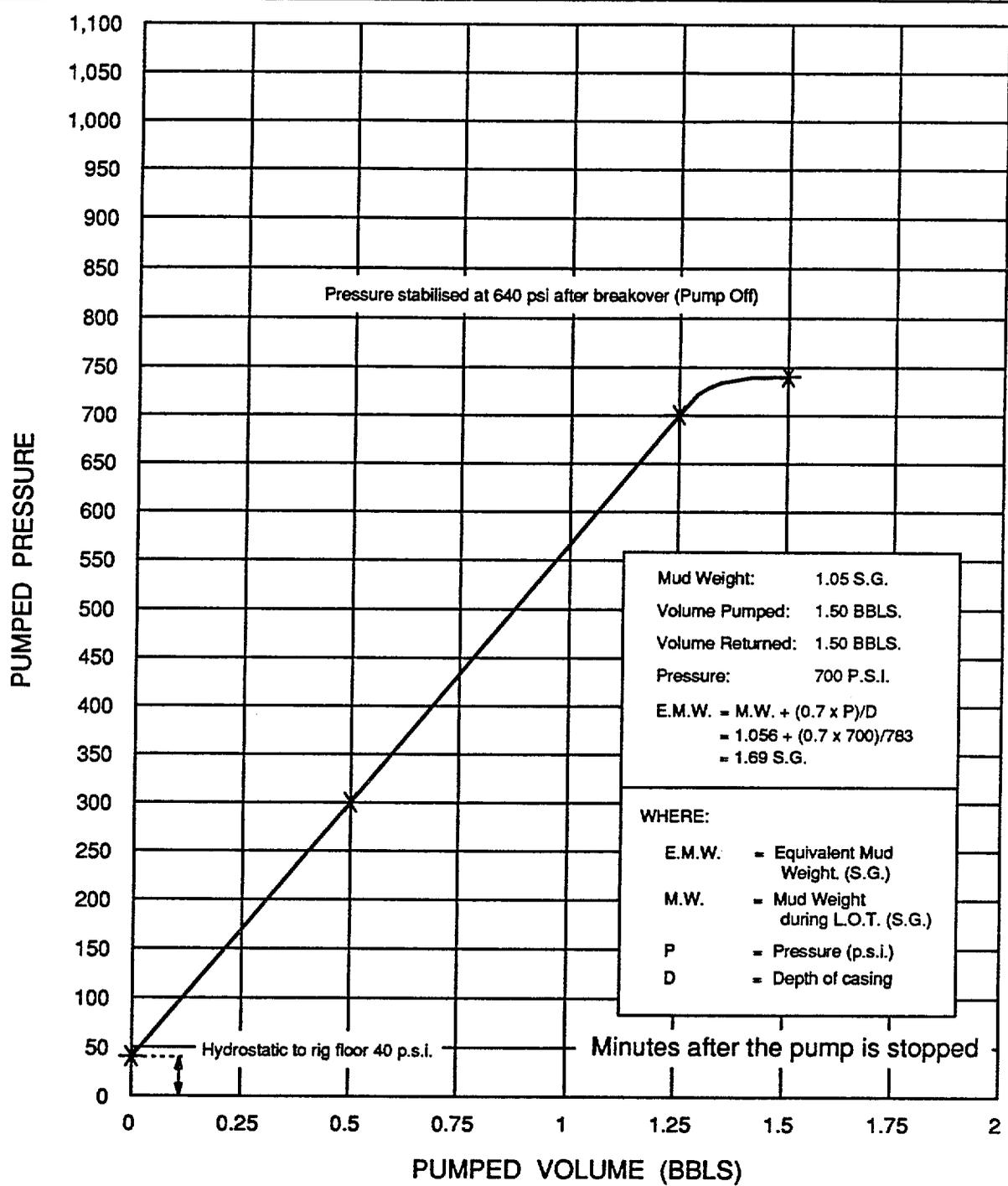
15.0 MUD PROPERTIES SUMMARY (CONT'D)

15.2 FLUID PROPERTIES
12 1/4" HOLE SECTION KCL POLYMER

DATE	26.5.90	27.5.90	28.5.90	29.5.90
DAY	10	11	12	13
MUD TEMP [DEG C]	29	34	34	34
WEIGHT [S.G.]	1.07	1.10	1.13	1.13
VISCOSITY [SEC]	40	38	39	38
P.V. [C.P.]	13	13	12	11
Y.P. [LB/100 SQFT]	16	15	15	14
GELSTRENGTH	3 / 5	3 / 5	3 / 6	3 / 5
SOLIDS CONTENT [%]	2.5	4	5	5
LIQUID CONTENT [o/w %]	- / 97.5	- / 96	- / 95	- / 95
SAND CONTENT [%]	0.2	0.1	TRACE	TRACE
M.B.T [LB/BBL EQ]	5	4	5	5
pH	8.5	8.5	9.0	9.0
CHLORIDES [PPM]	17000	20000	21000	21000
CALCIUM	280 / 3	300	300 / 3.5	300 / 3.5

16.0 HYDRAULICS SUMMARY

DATE	DEPTH [METERS]	CIRCULATING RATE [GAL/MIN]	PRESSURE [PSI]	SPM No 1	SPM No 2	NOZLE VELOCITY [FEET / SEC]	ANNULAR VELOCITY [FEET / MIN]	H.H.P. BIT	HOLE SIZE
19.5.90	182	1000	900	100	100	259	172	181	26"
20.5.90	182	1000	900	100	100	259	172	181	26"
21.5.90	680	700	1400	70	70	286	189 / 130	253	12 1/4"
22.5.90	344	830	1900	83	83	398	84	632	17 1/2"
23.5.90	795	811	2200	80	80	398	83	632	17 1/2"
24.5.90	795	811	2200	80	80	-	-	-	17 1/2"
25.5.90	795	500	500	100	-	-	-	-	17 1/2"
26.5.90	993	600	1550	60	60	366	121 / 176	386	12 1/4"
27.5.90	1404	600	1780	60	60	354	118 / 171	361	12 1/4"
28.5.90	1550	70	2550	70	70	-	-	-	12 1/4"



WELL	: Tommyruff-1
MEASURED DEPTH	: 800m
CASING DIAM.	: 13-3/8" 54.5 lbs/ft.
SHOE MEASURED DEPTH	: 783m.



18:0 CASING RUNNING AND CEMENTING REPORT

Well: TOMMYRUFF #1

Date: 20/5/1990

Casing Type: Swift LHT O.D.: 20"
Hanger Depth: 51.34 M I.D.: 19.12"

GENERAL

RKB-MSL 21 meters	HOLE - Size 26" - Depth (m) 182						
WATER DEPTH 33 meters	PREVIOUS CASING - Size Not - Depth (m) Applicable						

HOLE CONDITIONS

Mud: Type : Hi Vis Gel W. t. : M.F. Visc :
P.V. : YP : O/10 Gels :
Cake : Solids : Sand :
API Water Loss : Salinity :
Hole: Open Hole Time: 8.5 Hours Caliper Survey 26" Hole Max Deviation: 0.5 degrees

RUNNING

Total No. of Joints : No. of Joints Run : 10 No. of Joints Left :
Start Running Casing at : 1930 Finish Running Casing at : 0400 Total Time Taken : 8.5 hours
No. of Joints per Hour : 1.2 Fill-up Points : Casing Length : 123.87 M
Make Up Torque : 20,000 ft.lbs Thread Type : Swift LHT Lock Ring : Not Applicable
Pip Tag : None

CIRCULATING

Start : 0400 Finish : 0440 Time Circulating : 40 mins
Pressure : SPM : Circulating Rate :
% Returns : Good

CEMENTING

Start Mixing : 0440 Finish Mixing : 0513 Start Displacing : 0514
Finish Displacing : 0520 Total Time Taken : 40 mins WOC Time :
Bump Pressure : Pressure Held for :
Displaced with : Water of :
Pump Used : Halliburton Pump Efficiency :

LEAD

Type of Cement : Class "G" Volume Required : 258 ft³ Slurry Weight : 13.2
Mixing Water : 36 bbls Type Of Water : Fresh No. Sacks (1bs/sk): 148 Sx
Thickening Time : Not Available Spacer Before : 10 bbls Max Pump Pressure: 550 psi
Bottomhole Temp : Not Available Yield : 1.89 ft³/Sx Comp Strength :
Returns : Good Theoretical TOC : Sea Floor Actual TOC : Sea Floor
Additives : 2.2% prehydrated bentonite

TAIL

Type of Cement : Class "G" Volume Required : 972 ft³ Slurry Weight : 15.8
Mixing Water : 103 bbls Type Of Water : Sea Water No. Sacks (1bs/sk): 103 Sx
Thickening Time : Not Available Spacer Before : Nil Max Pump Pressure: 650 psi
Bottomhole Temp : Not Available Yield : 1.15 ft³/Sx Comp Strength :
Returns : Good Theoretical TOC : 80 m Actual TOC :
Additives : 1.5% CaCl₂

Release Dart: Delta P prior to Plug Bump: Total Pack Off Turns: Max Torque:

Comments:

18.0 CASING RUNNING AND CEMENTING REPORT



K55

Well: TOMMYRUFF #1

Date: 25/5/1990

Casing Type: 54.50 lb/ft O.D.: 13-3/8"

Hanger Depth: I.D.:

GENERAL

RKB-MSL 21 meters	HOLE - Size 26"	17-1/2"				
	- Depth (m) 182	795				
WATER DEPTH 33 meters	PREVIOUS - Size 20"	13-3/8"				
	CASING Depth (m) 175.2	782				

HOLE CONDITIONS

Mud: Type : Seawater Gel Polymer W. t. : 1.08 SG..... M.F. Visc :
 P.V. : 11..... YP : 20..... O/10 Gels : 14/26.....
 Cake : 2132..... Solids : 3.5%..... Sand : Trace.....
 API Water Loss : 9..... Salinity : 13,000.....
 Hole: Open Hole Time: Caliper Survey: Max Deviation: 0.75 degrees

RUNNING

Total No. of Joints : 72 Jt+Hanger No. of Joints Run : 62 Jt+Hanger No. of Joints Left : 10.....
 Start Running Casing at : 02:45..... Finish Running Casing at : 08:45..... Total Time Taken : 6.....
 No. of Joints per Hour : 10.5..... Fill-up Points : Each Joint Casing Length : 730 m.....
 Make Up Torque : 10,000..... Thread Type : Buttress... Lock Ring : Not Run.....
 Pip Tag : Not Run...

CIRCULATING

Start : 08:45..... Finish : 09:30..... Time Circulating : 45 min.....
 Pressure : 625 psi..... SPM : 100..... Circulating Rate : 12 bbl/min
 % Returns:

CEMENTING

Start Mixing : 10:10..... Finish Mixing : 10:56..... Start Displacing : 11:15.....
 Finish Displacing : 11:45..... Total Time Taken : 30 min..... WOC Time : None.....
 Bump Pressure : 1500 psi..... Pressure Held for : 5 min.....
 Displaced with : 360 bbl of sea water.....
 Pump Used : Rig Pumps Pump Efficiency : 97%.....
 A1700 PT

LEAD

Type of Cement: Class "G"..... Volume Required: 821 ft³..... Slurry Weight : 13.2 ppg.....
 Mixing Water : 106 bbl Type Of Water : Fresh water..... No. Sacks (1bs/sk): 460 Sx.....
 Thickening Time: 3 hrs 30 min Spacer Before : 10 bbl..... Max Pump Pressure: 500 psi.....
 Bottomhole Temp: 40 degrees C Yield : 1.79 ft³/Sx..... Comp Strength :
 Returns : Good Theoretical TOC : 283 m..... Actual TOC :
 Additives : Gel 2.2% by weight of water (7.7 lb/bbl).....

TAIL

Type of Cement: Class "G"..... Volume Required: 682 ft³..... Slurry Weight : 13.2 ppg.....
 Mixing Water : 70 bbl Type Of Water : Sea water..... No. Sacks (1bs/sk): 593 Sx.....
 Thickening Time: 3 hrs 45 min Spacer Before : None..... Max Pump Pressure: 600 psi.....
 Bottomhole Temp: 40 degrees C Yield : 1.15 ft³/Sx..... Comp Strength :
 Returns : Good Theoretical TOC : 583 m..... Actual TOC :
 Additives : None.....

Release Dart: 10.56..... Delta P prior to Plug Bump: Total Pack Off Turns: 8-1/4..... Max Torque: 18,000 ftlb
 Comments: From 700 - 783m Casing differentially stuck each time pipe was set in slips...
 - taking up to 200,000 lb to pull free.

PLUG-BACK & ABANDONMENT REPORT



Well	TOMMYRUFF NO.1	Total Depth	1550	m
⊖ B-MSL	21.0	m	Water Depth	33.0
				m

Plug-back string

Hole	Size (in)	26"	17-1/2"	12-1/4"		
	Depth (m)	182m	795m	1550m		
Casing	Size (in)	20"	13-3/8"			
	Depth (m)	175.2m	782m			

		Plug # 1	Plug # 2	Plug # 3	Plug # 4	Plug # 5
Hole/Casing Size		12-1/4"	12-1/4-13-3/8"	13-3/8-20"		
Caliper Hole Size		12.3"	12.6"	19.1"		
Interval	Top m	862	735	87		
	Bottom m	1025	815	175		
Slurry Volume	Cu. ft.	561	283	414		
	bbl	100	50.4	73.7		
Slurry Weight	SG	1.9	1.9	1.9		
Water Required	bbl	58	30	43		
Sacks of cement		488	246	360		
Additives	lb	-	-	225 CaCl ₂		
Spacer before	bbl	10	10	10		
Spacer after	bbl	1.5	1.5	1.5		
Displacement	bbl	45.5	40.5	4.3		
Final Pump Press	psi	800	700	500		
Returns						
Mixing Time	start	0223	0820	11:42		
	finish	0238	0830	11:54		
Displacing	start	0240	0830	11:55		
	finish	0247	0837	11:57		
Felt plug time	hrs	4		2.5		
Wt. on plug	lbs	10,000		10,000		
Date		30.5.90	30.5.90	30.5.90		

Remarks: Plug No.2 was pressure tested to 1500 psi.

RKB

MSL @ 21m.

SEAFLOOR @ 54m

20" Csg Cut @ 65m

13-3/8" CSG
Cut @ 133m

20" Csg @ 175m.

13-3/8" Csg @ 783m.

TOC @ seafloor

Plug No.3: 87-175m
Tag w/ 10 kips

26" Hole to 182m.

TOC @ 283m

PLUG No.2: 735-815m
Pressure test to 1500 psi

17-1/2 hole to 795m

PLUG No.1: 1025-860m
TAG w/ 10 kips

12-1/4" Hole to 1550m. (TD)

All depths are meters RKB



TOMMYRUFF - 1
19.0 ABANDONMENT PLUGS

Author : G.Weybury

Drawn : V.N.D'Souza

Checked : G.Weybury

Date : 28/05/90

File : TOM_AS1

20.0 WIRELINE LOGS

SUITE No. 1	LOG No. 1	: DLT , SDC , MSFL , GR , AMS	175 - 790 mRKB
		: GR	50 - 175 mRKB
SUITE No. 2	LOG No. 1	: DLT , LDT , CNT , MSFL , GR , AMS , SONIC , TCC	782 - 1545 mRKB
	LOG No. 2	: SAT	26 STATIONS
	LOG No. 3	: CST	60 SHOTS 59 RECOVERED
	LOG No. 4	: RFT	16 PRETESTS 11 SUCCESSFUL

APPROVALS:

PREPARED BY:

Tony Edwards
.....

DRILLING ENGINEER

APPROVED BY:

PP
.....

PP DRILLING SUPERINTENDENT

PP
.....

MANAGER DRILLING NEW VENTURES



SECTION 3

Section 3

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3.0 FORMATION SAMPLING

3.1 Ditch Cuttings

Two sets of unwashed cuttings and four sets of washed and air dried cuttings were collected from below the 20" casing shoe to Total Depth. Samples were collected at 10 m intervals from 190-799 m (13-3/8" casing point) and at 3 m intervals from 799-1550 m (Total Depth).

Circulation times were periodically checked with carbide-acetylene gas samples and pump stroke counters. Calculated lag times were refined accordingly.

Table 1 summarises the sampling program and cuttings distribution for Tommyruff-1.

TABLE 1
DITCH CUTTINGS AND SAMPLING SUMMARY

Depth Interval	Collection Interval	Treatment and Purpose	Distribution	
190-799	10m	Washed and split into 100g samples	BHPP DIEP BMR	(1 set) (1 set) (1 set)
190-799	10m	Washed and split into sample vials/samplex trays	BHPP Pursuit	(1 set) (1 set)
190-799	10m	Unwashed for bulk storage, palaeontological/palynological analysis and fission track analysis.	BHPP	(2 sets)
799-1550m	3m	Washed and split into 100g samples	BHPP DIEP BMR	(1 set) (1 set) (1 set)
799-1550	3m	Washed and split into sample vials/samplex trays	BHPP Pursuit	(1 set) (1 set)
799-1550	3m	Unwashed for bulk storage, palaeontological/palynological analysis and fission track analysis.	BHPP	(2 sets)

SUMMARY OF CUTTINGS DESCRIPTIONS

DEPTH	DESCRIPTION
54-190m	No samples, cuttings circulated to seafloor.
190-220m	<p>COQUINA LIMESTONE WITH INTERBEDDED CALCSILTITE AND CALCARENITE</p> <p>CALCSILTITE-CALCARENITE: light grey to brown, firm, very fine to medium grained, microcrystalline sparite with sucrosic texture in parts with abundant coarse to granular bioclasts, predominately bryzoa, bivalves, gastropods, echinoid spines, foraminifera.</p>
220-380m	<p>CALCSILTITE GRADING TO CALCARENITE</p> <p>CALCSILTITE: medium grey to brown, firm, fine grained, grading to CALCARENITE: light grey, moderately firm, medium grained, occasionally crystalline. Interval contains abundant bioclasts predominately bryzoa, foraminifera and Echinoid spines and trace loose quartz grains in part, and trace black chert.</p>
380-410m	<p>SANDSTONE INTERBEDDED WITH CALCARENITE</p> <p>SANDSTONE: light orange-brown to light brown, occasionally white, translucent, very hard, predominately coarse grained, well sorted, subrounded, loose, unconsolidated grains. CALCARENITE: grey to light grey, cream, firm, friable, very fine to medium grained, common calcareous micrite cement. Abundant bioclasts predominately bryzoa, bivalves, foraminifera and echinoid spines.</p> <p>FLUORESCENCE: trace to 3% dull pale yellow pinpoint hydrocarbon fluorescense from 375-385m on the sandstone grains, NO INSTANT/CRUSH CUT, NO RESIDUE</p>
410-535m	<p>CALCARENITE GRADING TO CALCSILTITE WITH OCCASIONAL SANDSTONE STRINGERS.</p> <p>CALCARENITE: cream, light orange-brown, firm, friable, medium to very coarse grained, poorly sorted grades to CALCSILTITE: light grey to dark grey, moderately soft, fine grained, dispersive, and minor interbeds of SANDSTONE: white translucent some grains with orange-brown staining, very hard, medium to coarse grained, subrounded, grains loose, unconsolidated.</p>
535-660m	<p>CALCARENITE WITH THIN INTERBEDS OF SANDSTONE</p> <p>CALCARENITE: light brown to cream, firm, medium grained, well sorted, sample contains abundant bioclasts: bryzoa, foraminifera, echinoid spines.</p> <p>SANDSTONE: white translucent, some grains with orange-brown staining, very hard, subrounded, grains unconsolidated, loose, no visible matrix, very good visual porosity.</p> <p>NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE</p>
660-770m	<p>CALCARENITE INTERBEDDED WITH CALCSILTITE</p> <p>CALCARENITE: grey-brown, firm, medium grained, well sorted. CALSILTITE: dark grey-light grey, predominately soft, fine grained, friable, dispersive. Bioclastic content has decreased significantly.</p>

- 770-796m **CALCARENITE GRADING TO MARL**
 CALCARENITE: cream, light grey-medium grey, firm, medium to coarse grained, poorly sorted grades to MARL: light grey, olive grey, soft occasionally firm, sticky, dispersive. Traces of GLAUCONITE: dark green, firm, crystalloid form. Few bioclasts.
- 796-840m **MARL WITH MINOR INTERBEDS OF CALCLUTITE AND SANDSTONE**
 MARL: light grey to olive grey, soft, occasionally firm, sticky, dispersive. CALCLUTITE: white, soft-moderately soft, very fine grained. SANDSTONE: white, translucent, some grains with orange-brown staining, very hard, medium to coarse grained, subangular to subround, moderate sorting, grains unconsolidated, loose. Traces of PYRITE: disseminated and occasional GLAUCONITE: dark green, firm to hard, crystalloid form.
- 840-900m **MARL WITH THIN INTERBEDS OF SILTSTONE AND SANDSTONE**
 MARL: dark grey-olive green, firm, sticky, dispersive, interbedded with SILTSTONE: grey-green, firm-hard, very fine grained, and SANDSTONE: white, translucent, very hard, subangular to subrounded, grain size appears to be bi-modal coarse grains and granular, poorly sorted with no apparent cement, grains unconsolidated, loose, excellent inferred porosity. Trace GLAUCONITE: dark green, hard, crystalloid form, becoming more pelletoidal towards the base of the unit.
 NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
- 900-990m **SANDSTONE WITH THIN INTERBEDS OF CALCAREOUS CLAYSTONE NEAR THE TOP OF THE UNIT, SILTSTONE AND COAL TOWARDS THE BASE OF THE UNIT**
 SANDSTONE: white, translucent, some grains with orange-brown staining, very hard, coarse-granular to medium grained, subangular to subrounded, moderate sphericity, well sorted, excellent inferred porosity, interbedded with thin layers of CALCAREOUS CLAYSTONE: light grey, firm, sticky, dispersive, SILTSTONE: light green-grey, firm to hard, very fine grained, fissile and COAL: dull black, hard, blocky to subblocky.
 NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
- 990-1023m **PREDOMINATELY CLAYSTONE INTERBEDDED WITH SANDSTONE, SILTSTONE AND COAL.**
 CLAYSTONE: dark brown- grey, firm, microcrystalline, micromicaceous, SANDSTONE: clear and white translucent, very hard, coarse to very coarse grained, subangular to subround, grains unconsolidated, loose, SILTSTONE: very dark grey, firm, very fine grained, argillaceous, COAL: dull black, dark brown, hard, blocky-subblocky.
 NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
- 1023-1040m **PREDOMINATELY SANDSTONE WITH MINOR INTERBEDDED SILTSTONE, CLAYSTONE AND COAL.**
 SANDSTONE: clear to white translucent, very hard, coarse to vert coarse grained, subangular to subround, grains unconsolidated, loose, well sorted, excellent inferred porosity, SILTSTONE: very dark grey, firm, fine grained, friable, argillaceous and CLAYSTONE: dark brown, firm, microcrystalline, dispersive, sticky. COAL: dull black, dark brown, blocky to subblocky.
 NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE

- 1040-1062m PREDOMINATELY CLAYSTONE WITH MINOR COAL INTERBEDS.
 CLAYSTONE: dark brown-grey, firm, microcrystalline, dispersive, sticky,
 COAL: dull black, dark brown, blocky to subblocky.
- 1062-1090 PREDOMINATELY SANDSTONE WITH MINOR CLAYSTONE AND
 SILTSTONE INTERBEDS.
 SANDSTONE: clear and white translucent, very hard, subangular to
 subround, grains unconsolidated, loose, excellent inferred porosity,
 SILTSTONE: light grey, firm, fine grained, dispersive in part, CLAYSTONE:
 dark grey-brown moderatley firm, dispersive, sticky.
 NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
- 1090-1201m PREDOMINATELY COAL INTERBEDDED WITH MINOR SANDSTONE,
 SILTSTONE AND CLAYSTONE.
 COAL: dull black, dark brown, hard, blocky to subblocky, interbedded with
 SANDSTONE: clear-translucent, very hard, coarse to very coarse grains,
 subangular-subround, grains unconsolidated, loose, excellent inferred
 porosity, with minor interbedded SILTSTONE: light grey, firm, argillaceous
 and CLAYSTONE: brown, firm, disseminated, sticky.
 NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
- 1201-1290m PREDOMINATELY SANDSTONE WITH MINOR INTERBEDS OF
 SILTSTONE,
 CLAYSTONE AND COAL.
 SANDSTONE: clear-translucent, very hard, coarse to very coarse grains,
 grains becoming more granular at base of the unit, excellent inferred
 pososity interbedded with SILTSTONE: light grey-green, firm, argillaceous
 and CLAYSTONE: light grey-cream, firm, sticky, disseminated with COAL
 stringers: dull black, dark brown, hard, blocky to subblocky.
- 1290-1300m PREDOMINATELY CLAYSTONE INTERBEDDED WITH MINOR STRINGERS
 OF COAL.
 CLAYSTONE: light grey-cream and dark brown, firm, sticky, with minor
 interbeds of COAL: dull black, dark brown, blocky to subblocky.
- 1300-1330m SANDSTONE INTERBEDDED WITH SILSTONE AND CLAYSTONE
 SANDSTONE: clear-translucent, very hard, medium grained, subangular,
 grains unconsolidated, loose, good inferred porosity, interbedded with
 SILTSTONE: light grey, firm, subfissile, and CLAYSTONE: 3 types
 olive-black, light grey-green and dark yellow-orange, firm, sticky.
- 1330-1360m PREDOMINATELY CLAYSTONE WITH MINOR INTERBEDS OF
 SANDSTONE AND SILTSTONE
 CLAYSTONE: 2 types, light grey-green, and dark olive-grey, firm, sticky,
 SILTSTONE: dark grey, soft, micromicaceous. SANDSTONE: white
 translucent, very hard, medium grained, subangular to subround, grains
 unconsolidated, loose, poor inferred pososity.
 NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE.

- 1360-1394m PREDOMINATELY SANDSTONE INTERBEDDED WITH SILTSTONE,
CLAYSTONE.
SANDSTONE: clear, white translucent, very hard, medium grained,
subangular, good inferred porosity, SILTSTONE: dark grey-light grey,
soft-moderately firm, micromicaceous, CLAYSTONE: dark olive-grey and
light grey-brown, firm, subfissile, sticky.
NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
- 1394-1470 INTERBEDDED SANDSTONE AND SILTSTONE, WITH TRACE OF
VOLCANIC LITHICS TOWARDS THE BASE OF THE UNIT
SANDSTONE: clear, white translucent, very hard, medium to coarse grains,
subangular, grains unconsolidated, loose, good inferred porosity,
SILTSTONE: grey, firm, micromicaceous, dispersive, argillaceous.
VOLCANICS: white, light yellow, light green, light pink, hard, coarse to very
coarse grains, occasional grains are granular, unconsolidated lithics, poorly
sorted.
NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
- 1470-1535m REPETITION OF INTERBEDDED CLAYSTONE, SILTSTONE AND
SANDSTONE
CLAYSTONE: dark olive-grey and light grey-brown, firm, sticky,
SILTSTONE: dark grey, soft, micromicaceous and SANDSTONE: bimodal,
clear-translucent, very hard, medium grained subround and very coarse
grained, subangular, loose unconsolidated grains, good inferred porosity.
NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
- 1510-1534 PREDOMINATELY SANDSTONE WITH THIN INTERBEDS OF SILTSTONE,
UNIT CONTAINS DISPERSED VOLCANIC LITHICS.
SANDSTONE: clear-translucent, very hard, medium to coarse grains,
subangular, grains unconsolidated, loose, good inferred porosity,
SILTSTONE: light grey-dark grey, firm, argillaceous and VOLCANICS: light
pink, light green, translucent yellow, blue-grey, coarse to very coarse
grains, subround, grains unconsolidated and dispersed.
NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
- 1534-1550m PREDOMINATELY CLAYSTONE WITH MINOR SANDSTONE INTERBEDS
CLAYSTONE: brown-grey, soft, micromicaceous, SANDSTONE:
clear-translucent, very hard, medium grained, subround, grains
unconsolidated, loose, good inferred porosity.
NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE.

3.2 SIDEWALL CORES

A 60 shot CST program was run in Tommyruff-1 in the 12-1/4" hole section from 799-1550m RKB. Of the 60 shots 59 cores were successfully recovered, unable to recover only one core.

Table 2 summarises the the sidewall core recoveries.

The remains of sidewall cores subsequent to palynological, geochemical and petrographic analysis are stored by BHP Petroleum Pty. Ltd., at Kestrel Management (Australia) Pty. Ltd., Unit 58, Slough Estate, 170 Forster Road, Mount Waverley, Victoria, 3149.

TABLE 2
SIDEWALL CORE SUMMARY

SAMPLE No.	DEPTH (mRKB)	RECOVERY (cm)	LITHOLOGY	SAMPLE No.	DEPTH (mRKB)	RECOVERY (cm)	LITHOLOGY
1	1545.1	3.7	CLST	31	1288.0	4.5	CLST
2	1542.9	3.2	CLST	32	1281.0	3.0	CLST, SLST
3	1530.1	0.1	SLST, CLST	33	1272.5	3.5	CLST
4	1515.1	2.5	SLST	34	1270.0	2.5	CLST
5	1513.4	2.4	IB SST, CLST	35	1252.6	3.0	CLST
6	1512.6	0.5	SLST, CLST	36	1251.5	3.0	CLST, COAL
7	1490.1	4.5	CLST	37	1220.0	3.5	CLST
8	1488.0	3.0	CLST	38	1218.0	4.0	CLST, SST
9	1487.0	3.0	CLST	39	1167.1	4.0	CLST, COAL
10	1486.5	3.5	SST	40	1112.5	4.0	SST
11	1471.1	4.0	SLST, CLST	41	1092.0	3.0	CLST, COAL
12	1469.9	4.5	CLST	42	922.4	3.5	SST
13	1468.0	3.0	CLST	43	917.1	4.5	SST
14	1466.0	2.5	CLST	44	910.0	3.0	SST
15	1465.0	4.7	CLST	45	907.5	2.5	SST
16	1456.1	2.5	CLST	46	906.5	2.0	SST
17	1455.1	4.0	CLST	47	902.0	3.0	SST
18	1451.9	3.8	CLST	48	900.0	3.5	CLST, SST
19	1451.0	3.5	CLST	49	897.0	4.5	MARL
20	1446.9	3.5	CLST	50	894.0	4.0	MARL
21	1438.0	4.0	CLST	51	885.0	4.5	MARL
22	1435.0	3.0	CLST	52	879.0	5.3	MARL
23	1431.6	3.5	SLST	53	872.0	5.0	MARL
24	1420.0	3.0	CLST	54	857.0	4.5	MARL
25	1417.0	3.5	CLST	55	852.0	4.0	MARL
26	1389.9	2.7	CLST	56	835.0	4.0	MARL
27	1387.0	3.4	CLST, SLST	57	830.0	4.0	MARL
28	1385.0	2.9	CLST	58	825.0	5.0	MARL
29	1335.0	3.4	IB SLST, CLST	59	815.0	5.3	MARL
30	1333.0	4.5	CLST	60	NO RECOVERY		

SIDEWALL CORE DESCRIPTIONS

SAMPLE No.	DEPTH (mRKB)	RECOVERY (cm)	DESCRIPTION
1	1545.1	3.7	CLAYSTONE: medium grey, soft, slightly argillaceous, non-calcareous, associated with very dark grey-black micaceous, carbonaceous SILTSTONE: soft, non-calcareous, slightly silty.
2	1542.9	3.2	CLAYSTONE: light grey, very soft, sticky, non-calcareous, slight "peppery" texture
3	1530.1	0.1	SILTSTONE: grey, firm, medium-coarse silt-size grains, associated with minor amounts of CLAYSTONE; light grey-dark grey, soft, carbonaceous. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
4	1515.1	2.5	SILTSTONE: dark grey, firm, grading to CLAYSTONE: dark grey, soft to firm, friable, argillaceous. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
5	1513.4	2.4	Interbedded SANDSTONE: light grey, hard, fine to medium grained and CLAYSTONE: black, soft, micromicaceous, dispersive. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
6	1512.6	0.5	SILTSTONE: grey, moderately hard, medium to coarse silt grains, friable, argillaceous, CLAYSTONE: brown-grey, firm, friable, argillaceous. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
7	1490.0	4.5	CLAYSTONE: light grey, firm, very sticky, slightly calcareous.
8	1488.1	3.0	CLAYSTONE: dark grey, firm, sticky, slightly dispersive.
9	1487.0	3.0	CLAYSTONE: dark grey, firm, sticky dispersive associated with minor amounts of SILTSTONE: clear to light brown, firm, friable. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE

10	1486.5	3.5	SANDSTONE: white-light grey, translucent,very hard, medium grained to granular, poorly sorted, excellent inferred porosity, interbedded with thin layers of CLAYSTONE: light grey-brown, firm, sticky, slightly calcareous. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE.
11	1471.1	4.0	SILTSTONE: grey, firm associated with CLAYSTONE:light grey-brown, firm, sticky, slightly calcareous. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
12	1469.9	4.5	CLAYSTONE: light grey-brown, firm, sticky,grading to SILSTONE: dark grey-light grey moderately firm, friable.
13	1468.0	3.0	CLAYSTONE: light grey, firm, sticky, grading to SILTSTONE: light grey, moderately firm, friable. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
14	1466.0	2.5	CLAYSTONE: medium grey, firm, sticky,associated with minor amounts of SILTSTONE: dark grey, soft, micromicaceous.
15	1465.0	4.7	CLAYSTONE: dark olive grey, firm, sticky.
16	1456.1	2.5	CLAYSTONE: dark olive grey, firm, sticky.
17	1455.1	4.0	CLAYSTONE: dark olive grey, firm, sticky.
18	1451.9	3.8	CLAYSTONE: dark olive grey, firm, sticky associated with SILTSTONE: dark grey, moderately firm, friable.
19	1451.0	3.5	CLAYSTONE: dark olive grey, firm, slightly silty.
20	1446.9	3.5	CLAYSTONE: dark olive grey, firm to hard,slightly silty.
21	1438.0	4.0	CLAYSTONE: predominately light grey, firm to hard, sticky, with minor amounts of associated siltstone.
22	1435.0	3.0	CLAYSTONE: dark olive grey, firm to hard,sticky, slightly calcareous.
23	1431.6	3.5	SILTSTONE: light grey, firm, friable associated with minor amounts of CLAYSTONE: light grey, moderately firm, dispersed and VOLCANICS: light green-grey, very hard, granular grain size, angular, grains unconsolidated. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
24	1420.0	3.0	CLAYSTONE: medium grey brown, firm but dispersive, non-calcareous, associated with minor amounts of SILTSTONE: grey, firm friable. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE

25	1417.0	3.5	CLAYSTONE: dark olive grey, firm to hard, sticky, subfissile associated with minor amounts of SILTSTONE: grey, firm, friable. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
26	1389.9	2.7	CLAYSTONE: dark olive grey, firm, very sticky, slightly silty.
27	1387.0	3.4	CLAYSTONE: light grey-brown, firm, finely laminated with more carbonaceous layers, interbedded with SILTSTONE: grey, firm, friable. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
28	1385.0	2.9	CLAYSTONE: dark olive grey, firm, sticky, trace calcareous.
29	1335.0	3.4	SILTSTONE: light grey, firm, very fine to fine grained, friable, finely interbedded with CLAYSTONE: dark grey, firm, sticky. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
30	1333.0	4.5	CLAYSTONE: dark olive grey, firm sticky, slightly silty.
31	1288.0	4.5	CLAYSTONE: dark grey-brown, firm, sticky, slightly silty.
32	1281.0	3.0	CLAYSTONE: dark grey-brown, firm, sticky, slightly silty, interbedded with stringers of COAL: dull black, dark brown, hard, blocky.
33	1272.5	3.5	CLAYSTONE: light grey, firm, slightly sticky and silty, with minor amounts of SANDSTONE: clear-translucent, very hard, coarse to very coarse grained, subangular-subround, unconsolidated. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
34	1270.0	2.5	CLAYSTONE: light grey, firm, sticky, silty.
35	1252.6	3.0	CLAYSTONE: light grey-cream, firm, sticky, slightly carbonaceous, non-calcareous.
36	1251.5	3.0	CLAYSTONE: light brown-grey, firm, sticky non-calcareous, interbedded with stringers of COAL: dull black, dark brown, hard, blocky.
37	1220.0	3.5	CLAYSTONE: light grey-cream, dispersive, slightly sticky, associated with minor amounts of silt.

38	1218.0	4.0	CLAYSTONE: light grey-cream, dispersive, firm, interbedded with SILTSTONE: light grey-green, firm, and SANDSTONE: clear,translucent, very hard, coarse to granular, subangular to subround, poorly sorted, good inferred porosity, unconsolidated. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, RESIDUAL RING: very faint pale yellow, thin rim.
39	1167.1	4.0	CLAYSTONE: brown, firm, disseminated, with thin stringers of COAL: dull black, dark brown, hard, blocky.
40	1112.5	4.0	SANDSTONE: clear,translucent, very hard, coarse to very coarse grains increasing to granular, subangular to subround, poorly sorted, good inferred porosity,with minor stringers of CLAYSTONE: light brown-grey, firm. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, RESIDUAL RING: very faint, very pale yellow, thin rim.
41	1092.0	3.0	CLAYSTONE: dark brown, moderately soft, very carbonaceous associated with dispersive, very soft, fibrous COAL: dull black, dark brown, hard, blocky.
42	922.4	3.5	SANDSTONE: white translucent, very hard medium grained, subangular-subround, friable, excellent inferred porosity, Faint hydrocarbon odour, associated with minor stringers of COAL: dull black, dark brown, hard, blocky and CLAYSTONE: light grey, firm. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
43	917.1	4.5	SANDSTONE: light grey, firm, fine-medium grained, subangular-subround, well sorted, unconsolidated, good inferred porosity, argillaceous. Faint hydrocarbon odour. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE
44	910.0	3.0	SANDSTONE: light grey, firm, medium-coarse grained, subangular-subround, well sorted, unconsolidated, excellent inferred porosity, argillaceous. Faint hydrocarbon odour. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, RESIDUAL RING: very pale fluorescent white, thin rim.
45	907.5	2.5	SANDSTONE: light grey, firm, coarse-very coarse grained, subangular-subround, well sorted, unconsolidated, excellent inferred porosity, slightly argillaceous. Faint hydrocarbon odour. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, RESIDUAL RING: very pale fluorescent white, thin rim.

46	906.5	2.0	SANDSTONE: light grey, hard, coarse to very coarse grained, subangular to subround, well sorted, unconsolidated, excellent inferred porosity, slightly argillaceous. Faint hydrocarbon odour. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, RESIDUAL RING: very pale fluorescent white, thin rim.
47	902.0	3.0	SANDSTONE: light grey-white translucent, coarse to very coarse grained, subangular to subround, well sorted, unconsolidated, excellent inferred porosity, slightly argillaceous. Faint hydrocarbon odour. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, RESIDUAL RING: very pale fluorescent white, thin rim.
48	900.0	3.5	CLAYSTONE: very dark brown, firm, dispersive, interbedded with SILTSTONE: light green-grey, firm, very fine grained, and minor amounts of SANDSTONE: white, translucent, fine to coarse grained, subround, poorly sorted, poor inferred porosity, and GLAUCONITE: dark green, hard, silt to medium grain size pelletoidal. NO HYDROCARBON FLU, NO INSTANT/CRUSH CUT, NO RESIDUE.
49	897.0	4.5	MARL: olive grey, soft, micromicaceous, calcareous associated with common GLAUCONITE: dark green, hard, crystalloid and pelletoidal form, and SILTSTONE: grey-green, firm-hard, very fine grained.
50	894.0	4.0	MARL: olive grey, soft micromicaceous, calcareous, slightly dispersive, interbedded with SILTSTONE: grey-green, firm, fine to coarse silt size grains and minor amounts of GLAUCONITE: dark green, hard, crystalloid form.
51	885	4.5	MARL: olive grey, firm, dispersive, calcareous, interbedded with SILTSTONE: grey-green, firm, fine grained and associated with minor amounts of GLAUCONITE: dark green, hard, crystalloid form.
52	879	5.3	MARL: olive grey, firm, dispersive calcareous, interbedded with minor SILTSTONE: grey-green, firm, fine grained, friable.
53	872	5.0	MARL: olive grey, firm, dispersive calcareous, interbedded with minor SILTSTONE: grey-green, firm fine to medium silt size grains and traces of GLAUCONITE: dark green, hard, crystalloid form.
54	857	4.5	MARL: light olive grey, firm-hard, friable, calcareous, sticky.
55	852	4.0	MARL: light olive grey, firm-hard, friable, calcareous, sticky.
56	835	4.0	MARL: light olive grey, firm-hard, friable, calcareous, sticky.

57	830	4.0	MARL: light olive grey, firm-hard, friable, calcareous, sticky.
58	825	4.0	MARL: light olive grey, firm-hard, friable, calcareous, sticky
59	815	5.3	MARL: light olive grey, soft-firm, dispersive, sticky, calcareous.
60	NO SAMPLE RECOVERY		

SUMMARY OF BASIC PALYNOLOGICAL DATA

SWC	DEPTH (m)	YIELD		DIVERSITY		PRES.	LITH.*
		S-P	DINO	S-P	DINO		
59	815.0	med.	high	low	med.	good	marl
56	835.0	med.	high	low	high	good	marl
55	852.0	med.	med.	low	low	good	marl
54	857.0	low	low	low	low	good	marl
51	885.0	low	high	high	low	poor	marl
50	894.0	high	high	high	low	mod.	marl
49	897.0	high	med.	high	low	good	marl
48	900.0	low	low	med.	low	good	marl
42	922.4	high	low	high	low	good	sst.
cta	1000	high	med.	high	med.	good	clst.,sst.
cta	1045	high	high	med.	low	mod.	clst.,sst.
cta	1051	med.	med.	med.	low	mod.	clst.,sst.
41	1092.0	high	high	high	med.	good	clst.,coal
39	1167.1	high	low	high	low	good	clst.
38	1218.0	low	caved	low	low	good	clst.
37	1220.0	low	caved	low	low	good	clst.
36	1251.5	high	-	med.	-	good	clst.
35	1252.6	low	caved	med.	-	poor	clst.
34	1270.0	high	-	high	-	good	clst.
33	1272.5	high	caved	high	-	good	clst.
32	1281.0	high	-	high	-	good	clst.
31	1288.0	high	caved	high	-	good	clst.
cta	1312	high	med.	med.	med.	good	clst.
30	1333.0	med.	low	med.	low	mod.	clst.
29	1335.0	low	low	low	low	mod.	clst.
27	1387.0	low	low	low	low	mod.	clst.
26	1389.9	med.	low	med.	low	mod.	clst.
25	1417.0	med.	low	med.	med.	good	clst.
28	1418.1	high	low	high	med.	good	clst.
24	1420.0	med.	low	high	low	good	clst.
20	1446.9	med.	low	high	low	good	clst.
19	1451.0	high	med.	low	low	mod.	clst.
16	1456.1	high	med.	med.	med.	good	clst.
14	1466.0	high	low	med.	low	good	clst.
07	1490.1	med.	med.	med.	med.	mod.	clst.
06	1512.6	low	low	low	low	mod.	clst.
05	1513.4	low	caved	low	low	mod.	clst.
03	1530.1	neql.	-	low	-	mod.	slst.,clst.
02	1542.9	caved	caved	high	med.	good	clst.
01	1545.1	caved	caved	high	med.	good	arg. clst.

* Lithological descriptions (main rock type only) taken from sidewall core sample description on transmittal sheets.

SAMPLE TYPE OR NO. *	DEPTH (m)																							
	815.0	835.0	852.0	857.0	885.0	894.0	897.0	900.0	922.4	1000.	1045	1051	1092.0	1167.1	1218.0	1220.0	1251.5	1252.6	1270.0	1272.5	1281.0	1288.0		
Aglaoreidia qualumis																								
Anacolosidites rotundus																								
A. sectus																								
Araucariacites australis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Australopollis obscurus																								
Baculatisporites disconformis					*									*			*		*		*		*	
Banksiaeidites arcuatus												*		*	*	*	*	*	*	*	*	*	*	*
B. elongatus		*																						
Basopollis otwayensis														*			*	*	*	*	*	*	*	*
Beaupreadites elegansiformis								*	*				*								*	*	*	*
B. orbiculatus																					*	*	*	*
B. verrucosus								*	*				*	*							*	*	*	*
Bluffopollis scabratus				C							*													
Clavifera triplex		C	C						*					*	*	*	*	*	*	*	*	*	*	*
Conbaculites apiculatus		C											*								*	*	*	*
Concolpites leptos								*																
Cupanioidites orthoteichus								*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
C. reticularis					*																			
Cyatheacidites annulatus		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Cyathidites australis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C. minor	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C. palaeospora	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C. splendens					*											*	*	*	*	*	*	*	*	
C. subtilis					*																			
Dicotetradites meridianus												*	*	*	*	*	*	*	*	*	*	*	*	*
Dacrycarpites australiensis								*	*															
Dilwynites granulatus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ericipites scabratus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Foveotriletes balteus													*						*		*	*	*	*
F. crater					*																			
F. lacunosus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Gambierina spp.														R	*	*	*	*	*	*	*	*	*	*
Gleichenioidites spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Granodiporites nebulosus					*																			
Haloragacidites Cainozoica								*					*											
H. haloragoides																								
H. harrisi	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Herkosporites elliotii	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ilexpollenites anguloclavatus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ischyosporites gremius	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
I. irregularis																	*							
I. tayloriensis											*													
Kuyliisporites waterbolkii								*		*					*									
Laevigatosporites spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Latrobosporites amplus																								
L. crassus								*	*				*	*	*	*	*	*	*	*	*	*	*	*
L. marginis																			*	*	*	*	*	*
Liliacidites lanceolatus								*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
L. spp.										*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Lygistepollenites balmei	R	R	R	R				R					R	R	R	*	*	*	*	*	*	*	*	
L. florinii	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Malvacipollis diversus				*																				
M. robustus					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
M. subtilis			C	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Matonisporites ornamentalis					*								*								*	*	*	*
Microalatioidites palaeogenicus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

* C= CORE S=SIDEWALL CORE
 T= CUTTINGS S= SACKET

R = REWORKED SP.
 C = CONTAMINANT

SAMPLE TYPE OR NO. *	DEPTH (m)																						
	815.0	835.0	852.0	857.0	885.0	894.0	897.0	900.0	922.4	1000	1045	1051	1092.0	1167.1	1218.0	1220.0	1251.5	1252.6	1270.0	1272.5	1281.0	1288.0	
Microcachrydites antarcticus																							
Milfordia homeopunctatus																							
Monogemmites uvatus ms																							
Myrtacoidites eucalyptoides																							
M. parvus-mesonesus																							
M. rhodanoides																							
Nothofagidites asperus																							
N. brachyspinulosus																							
N. deminutus-vansteeni																							
N. emarcidus-heterus																							
N. endurus																							
N. falcatus																							
N. flemingii																							
N. gonifatus																							
Paripollis orchesis																							
Parvisaccites catastus																							
Peninsulapollis gillii																							
Periporopollenites demarcatus																							
P. polyoratus																							
P. vesicus																							
Phyllocladidites mawsonii																							
P. reticulosaccatus																							
P. verrucosus																							
Podocarpidites exiguus																							
P. spp.																							
Podosporites microsaccatus																							
Polycolporopollenites esobalteus																							
Polypodiisporites spp.																							
Proteacidites adenanthoides																							
P. annularis																							
P. beddoesii																							
P. callosus																							
P. crassus																							
P. grandis																							
P. kopiensis																							
P. latrobensis																							
P. obscurus																							
P. pachypolus																							
P. recavus																							
P. reflexus																							
P. reticulatus																							
P. reticuloscabratus																							
P. retiformis																							
P. rugulatus																							
P. stipplatus																							
P. symphonemoides																							
P. tenutexinus																							
P. tuberculatus																							
P. tuberculotumulatus																							
Pseudointerapollis cranwellae																							
Quintinipollis psilatipora																							
Rhoipites alveolatus																							
Retitriletes spp.																							
Rugulatisporites mallatus																							
Santalumidites cainozoicus																							
Sapotaceipollenites rotundus																							

* C=CORE S=SIDEWALL CORE
T=TESTINGS

R = REWORKED SP.
C = CONTAMINANT

SAMPLE TYPE OR NO. *	DEPTH (m)																						
	815.0	835.0	852.0	857.0	885.0	894.0	897.0	900.0	922.4	1000	1045	1051	1092.0	1167.1	1218.0	1220.0	1251.5	1252.6	1270.0	1272.5	1281.0	1286.0	
Schizocolpus marlinensis																							
S. rarus																							
Simpsonipollis sp.																							
Stephanocolpites oblatius																							
Stereisporites australis f. crassa																							
S. (Tripunctisporis) sp.	R		R																				
S. regium																							
S. spp.																							
Symplocopollenites austellus																							
Tetracolporites multistrixis																							
Tricolpites confessus																							
T. durus ms																							
T. phillipsii																							
T. reticulatus																							
T. simatus																							
T. thomasii																							
Tricolporites adelaidensis																							
T. cf asperamarginis																							
T. angurium																							
T. leuros																							
T. sp. cf T. leuros																							
T. moultonii																							
T. paenestriatus																							
T. retequetrus																							
T. scabratus																							
Undescribed tricolpate/tricolporate spp																							
Undescribed trilete spores																							
Triletes tuberculiformis																							
Triorites magnificus																							
Tripopollenites ambiguus																							
T. cirrus ms																							
Verrucatosporites attinatus																							
Verrucosiporites kopukuensis																							
REWORKED MESOZOIC SPP.																							
Cleistosphaeridium epacrum																							
Glaphracysta retintexta																							
Hystichokolpoma rigaude																							
Schematophora speciosus																							
Deflandrea heterophylcta																							
D. phosporitica																							
Gippslandica extensa																							
Achomosphaera alaicornu																							
Aptodinium australiense																							
Impagidium spp.																							
Lingulodinium machaerophorum																							
Nematosphaeropsis balcombiana/labrynthus																							
Operculodinium centrocarpum																							
Pentadinium laticinctum																							
Spiniferites spp.																							
Tectadodinium pellitum																							
Thalassiphora flammae/peligica																							
Polysphaeridium zoharyi																							
Protoellipsodinium mammilatus																							
P. simplex																							
Tritonites sp. cf H. spinata																							

* C=CORE S=SIDEWALL CORE
T=CUTTINGS J=JUNK BASKET

R = REWORKED SP.
C = CONTAMINANT

SAMPLE TYPE OR NO. *	DEPTHS (m)																	
	T	S	S	S	S	S	S	S	S	S	S	S	S	S				
FOSSIL NAMES	1312	1332.0	1335.0	1387.0	1389.9	1417.0	1418.1	1420.0	1446.9	1451.0	1456.1	1466.0	1490.1	1512.6	1513.4	1530.1	1542.9	1545.1
Allisporites grandis			*			*												
A. similis											*	*	*	*	*			
Amosopollis cruciformis							*				*	*	*	*	*			
Araucariacites australis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Baculatisporites comaumensis	*				*		*	*	*	*	*	*	*	*	*	*	*	*
Camarozonosporites australiensis							*	*	*	*	*	*	*	*	*	*	*	*
Cicatricosisporites australiensis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C. ludbrookii						*												
Ceratosporites equalis						*		*		*	*	*	*	*	*	*	*	*
Clavifera triplex	*					*				*	*	*	*	*	*	*	*	*
C. vultuosus ms									*									
Concavissimisporites penolaensis										*								
Corollinia spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Cyathidites australis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Cyclosporites hughesii								*				*	*	*	*	*	*	*
Densoisporites vellatus			*							*								
Dictyophyllidites crenatus								*					*					
Dictyosporites speciosus				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Dilwynites granulatus [Cret. var.]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Foraminisporis dallyii								*										
Foveosporites canalis								*		*								
Foveotriletes balteus																		
F. parviretus							*	*										
Gleicheniidites spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Herkosporites elliotii	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Interulobites intraverrucatus					*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ischyosporites punctatus	*							*										
Klukisporites scaberis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Kraeuselisporites spp.					*												*	
Laevigatosporites musca ms						*	*	*	*	*	*	*	*	*	*	*	*	*
L. spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Leptolepidites major			*									*	*	*	*	*	*	*
L. verrucatus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Lygistepollenites balmei	C							C	C	C	C	C	C	C	C	C	C	C
Lycopodiocites asperatus							*											
L. varirugulatus ms.								*			*	*	*	*	*	*	*	*
Matonisporites cooksonae										*								
Microcachrydites antarcticus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Neoraistrickia truncata	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Nothofagidites spp. [caved]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Peninsulapollis gillii											*	*	*	*	*	*	*	*
Phimopollenites pannosus						*						*	*	*	*	*	*	*
Phyllocladidites mawsonii [in situ]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
" [caved]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Podocarpidites spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Podosporites microsaccatus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Polycingutrites pocockii			*							*	*	*	*	*	*	*	*	*
Polypodiisporites spp.	*											*	*	*	*	*	*	*
Proteacidites spp. [caved]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Reticulatisporites pudens											*	*	*	*	*	*	*	*
Retitriletes australoclavatidites	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
R. circolumenus						*	*	*	*	*	*	*	*	*	*	*	*	*
R. facetus						*												
R. nodosus						*	*	*	*	*	*	*	*	*	*	*	*	*
Rogalskisporites sp.			*						*	*	*	*	*	*	*	*	*	*
Stereisporites antiquisporites	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

* C=CORE S=SIDEWALL CORE
T=CUTTINGS H=LINK BASKET

R = REWORKED SP.
C = CONTAMINANT

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SECTION 4

LOGGING AND SURVEYS

4.1 MUDLOGGING UNIT

Exploration Logging of Australia (EXLOG), provided a Geological Engineering Monitoring and Data Acquisition System (GEMDAS) service, with Formation Logging and Pressure Evaluation services on Tommyruff-1 from the 20" casing shoe at 182 metres to total depth.

Surveillance of the potential abnormal pressure while drilling was assisted by the continuous computation of the D-exponent, formation fracture pressures were also calculated and recorded daily.

An FID total gas detector, FID chromatograph, CO₂ detector and H₂S sensors were used to analyse all formation gasses.

The EXLOG unit was operated continuously throughout the well. Once returns were achieved, routine analyses for hydrocarbon fluorescence and cut in organic solvent, were carried out on all ditch samples and sidewall cores

4.2 WIRELINE LOGS

Two suites of wireline logs were run in Tommyruff-1. A list of the logs run in the well is included in the following Table No. 3.

TABLE NO. 3

WIRELINE LOGS

Suite No.	Run No.	Hole Size	Log Type	Depth Interval (m)	Date Run
1	1	*12.25"	DLL-MSFL-GR-SDT-CAL-SP-AMS	786.0-175.5	22-5-90
2	1	12.25"	DLL-MSFL-GR-CNL-LDL-SDT-SP-CAL-AMS	1545.5-785.5	29-5-90
	2		SAT	1445.0- 75.0	29-5-90
	3		CST (60 shot)	1545.1-810.0	29-5-90
	4		RFT'S	965.0-901.5	29-5-90

* The hole was reamed out to 17.5".

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4.3 Velocity Survey

A check shot survey was carried out at Total Depth in Tommyruff-1, for the purpose of calibrating the sonic log, with geophone levels spaced at approximately 60 m (including significant formation and sonic log boundaries). A total of 26 levels were recorded, including one at only 21 m. below sea-bed, for which the first breaks were questionable.

Signals from all other levels gave good first breaks on the z-component geophone, with three records generally being stacked together (some levels required four or five). Schlumberger used a single 200 c³i airgun at a depth of 4.0 m, offset 40 m. from the wellhead.

The Schlumberger velocity survey processing report and time/depth listing follow; their drift-corrected sonic and seismic calibration logs are included as Enclosures

Schlumberger

BHP PETROLEUM
SONIC CALIBRATION
PROCESSING REPORT

TOMMYRUFF #1

FIELD : WILDCAT

STATE : VICTORIA

COUNTRY : AUSTRALIA

COORDINATES : 038° 36' 47.4" S
147° 08' 33.7" E

LOCATION : BASS STRAIT VIC/P25
512423 ME 5726125 MN

DATE OF SURVEY : 29 MAY 1990

REFERENCE NO. : SYJ-56594

INTERVAL : 1545.0 - 200.0 M

1. Introduction

A checkshot survey of the Tommyruff #1 well has been used to calibrate the sonic log and generate synthetic seismograms using 25,35 and 45 hertz zero phase Ricker wavelets. The final presentation includes synthetic seismograms at 10 and 20 cm/sec as well as a drift corrected sonic plot and a seismic calibration log.

2. Data Acquisition

The data was acquired with the SAT (Seismic Acquisition tool) tool. Recording was made on the Schlumberger Cyber Service Unit (CSU) using LIS format at a tape density of 800 BPI.

Table 1: Survey Parameters

Datum	MSL
Elevation KB	21.0 metres AMSL
Elevation DF	20.7 metres AMSL
Elevation GL	-33.0 metres below MSL
Total Depth	1545.0 metres below KB
Energy Source	Airgun
Source Offset	40 metres
Source Depth	4.0 metres below MSL
Hydrophone Offset	40 metres
Hydrophone Depth	9.0 metres below MSL

3. Sonic Calibration Processing

3.1 Sonic Calibration

A 'drift' curve is obtained using the sonic log and the vertical check level times. The term 'drift' is defined as the seismic time (from check shots) minus the sonic time (from integration of edited sonic). Commonly the word 'drift' is used to identify the above difference, or to identify the gradient of drift versus increasing depth, or to identify a difference of drift between two levels.

The gradient of drift, that is the slope of the drift curve, can be negative or positive.

For a negative drift $\frac{\Delta drift}{\Delta depth} < 0$, the sonic time is greater than the seismic time over a certain section of the log.

For a positive drift $\frac{\Delta drift}{\Delta depth} > 0$, the sonic time is less than the seismic time over a certain section of the log.

The drift curve, between two levels, is then an indication of the error on the integrated sonic or an indication of the amount of correction required on the sonic to have the TTI of the corrected sonic match the check shot times.

Two methods of correction to the sonic log are used.

1. **Uniform or block shift** This method applies a uniform correction to all the sonic values over the interval. This uniform correction is applied in the case of positive drift and is the average correction represented by the drift curve gradient expressed in $\mu\text{sec}/\text{ft}$.
2. **ΔT Minimum** In the case of negative drift a second method is used, called Δt minimum. This applies a differential correction to the sonic log, where it is assumed that the greatest amount of transit time error is caused by the lower velocity sections of the log. Over a given interval the method will correct only Δt values which are higher than a threshold, the Δt_{min} . Values of Δt which are lower than the threshold are not corrected. The correction is a reduction of the excess of Δt over Δt_{min} , $\Delta t - \Delta t_{min}$.

$\Delta t - \Delta t_{min}$ is reduced through multiplication by a reduction coefficient which remains constant over the interval. This reduction coefficient, named G , can be defined as:

$$G = 1 + \frac{\text{drift}}{\int (\Delta t - \Delta t_{min}) dZ}$$

Where drift is the drift over the interval to be corrected and the value $\int (\Delta t - \Delta t_{min}) dZ$ is the time difference between the integrals of the two curves Δt and Δt_{min} , only over the intervals where $\Delta t > \Delta t_{min}$.

Hence the corrected sonic: $\Delta t = G(\Delta t - \Delta t_{min}) + \Delta t_{min}$.

3.2 Correction to Datum

The corrected sonic log is indexed to true vertical depth and referenced to mean sea level (SRD).

3.3 Open Hole Logs

The sonic log has been recorded from 1545.0 to 203.0 metres below KB. The overall log quality is good with small zones of cycle skipping having been patched out. The density log was recorded over the interval 1545.0-795.0 metres.

The gamma ray and caliper curves are included as correlation curves.

3.4 Sonic Calibration Results

The top of the sonic log (200.0 metres below KB) is chosen as the origin for the calibration drift curve. The drift curve indicates a number of corrections to be made to the sonic log. The adjusted sonic curve is considered to be the best result using the available data. A list of shifts used on the sonic data is given in the geophysical listings section.

A Summary of Geophysical Listings

Six geophysical data listings are appended to this report. Following is a brief description of the format of each listing.

A1 Geophysical Airgun Report

1. Level number : the level number starting from the top level (includes any imposed shots).
2. Measured depth from KB : dkb , the depth in meters from kelly bushing .
3. Vertical depth from SRD : $dsrd$, the depth in meters from seismic reference datum.
4. Observed travel time HYD to GEO : $tim0$, the transit time picked from the stacked data by subtracting the surface sensor first break time from the downhole sensor first break time.
5. Vertical travel time SRC to GEO : $timv$, is corrected for source to hydrophone distance and for source offset.
6. Vertical travel time SRD to GEO : $shtm$, is $timv$ corrected for the vertical distance between source and datum.
7. Average velocity SRD to GEO : the average seismic velocity from datum to the corresponding checkshot level, $\frac{dsrd}{shtm}$.
8. Delta depth between shots : $\Delta depth$, the vertical distance between each level.
9. Delta time between shots : $\Delta time$, the difference in vertical travel time ($shtm$) between each level.
10. Interval velocity between shots : the average seismic velocity between each level, $\frac{\Delta depth}{\Delta time}$.

A2 Drift Computation Report

1. Level number : the level number starting from the top level (includes any imposed shots).
2. Vertical depth from KB : the depth in meters from kelly bushing .
3. Vertical depth from SRD : the depth in meters from seismic reference datum.
4. Vertical travel time SRD to GEO : the calculated vertical travel time from datum to downhole geophone (see column 7, Geophysical Airgun Report).

5. Integrated raw sonic time : the raw sonic log is integrated from top to bottom and listed at each level. An initial value at the top of the sonic log is set equal to the checkshot time at that level. This may be an imposed shot if a shot was not taken at the top of the sonic.
6. Computed drift at level : the checkshot time minus the integrated raw sonic time.
7. Computed blk-shft correction : the drift gradient between any two checkshot levels ($\frac{\Delta drift}{\Delta depth}$).

A3 Sonic Adjustment Parameter Report

1. Knee number : the knee number starting from the highest knee. (The first knees listed will generally be at SRD and the top of sonic. The drift imposed at these knees will normally be zero.)
2. Vertical depth from KB : the depth in meters from kelly bushing .
3. Vertical depth from SRD : the depth in meters from seismic reference datum.
4. Drift at knee : the value of drift imposed at each knee.
5. Blockshift used : the change in drift divided by the change in depth between any two levels.
6. Delta-T minimum used : see section 4 of report for an explanation of Δt_{min} .
7. Reduction factor : see section 4 of report.
8. Equivalent blockshift : the gradient of the imposed drift curve.

A4 Velocity Report

1. Level number : the level number starting from the top level (includes any imposed shots).
2. Vertical depth from KB : the depth in meters from kelly bushing .
3. Vertical depth from SRD : the depth in meters from seismic reference datum
4. Vertical travel time SRD to GEOPH : the vertical travel time from SRD to downhole geophone (see column 7, Geophysical Airgun Report)
5. Integrated adjusted sonic time : the adjusted sonic log is integrated from top to bottom. An initial value at the the top of the sonic is set equal the checkshot time at that level. (The adjusted sonic log is the drift corrected sonic log.)
6. Drift=shot time-raw sonic : the check shot time minus the raw integrated sonic time.

7. Residual=shot time-adj sonic : the check shot time minus the adjusted integrated sonic time. This is the difference between calculated drift and the imposed drift.
8. Adjusted interval velocity : the interval velocity calculated from the integrated adjusted sonic time at each level.

A5 Time Converted Velocity Report

The data in this listing has been resampled in time.

1. Two way travel time from SRD : This is the index for the data in this listing. The first value is at SRD (0 millisecs) and the sampling rate is 2 millisecs.
2. Measured depth from KB : the depth from KB at each corresponding value of two way time.
3. Vertical depth from SRD : the vertical depth from SRD at each corresponding value of two way time.
4. Average velocity SRD to GEO : the vertical depth from SRD divided by half the two way time.
5. RMS velocity : the root mean square velocity from datum to the corresponding value of two way time.

$$v_{rms} = \sqrt{\Sigma_1^n v_i^2 t_i / \Sigma_1^n t_i}$$

where v_i is the velocity between each 2 millisecs interval.

6. First normal moveout : the correction time in millisecs to be applied to the two way travel time for a specified moveout distance (default = 3000 feet).

$$\Delta t = \sqrt{t^2 + \left(\frac{X}{v_{rms}}\right)^2} - t$$

where:

$$\begin{aligned} \Delta t &= \text{normal moveout (secs)} \\ X &= \text{moveout distance (meters)} \\ t &= \text{two way time (secs)} \\ v_{rms} &= \text{rms velocity (meters /sec)} \end{aligned}$$

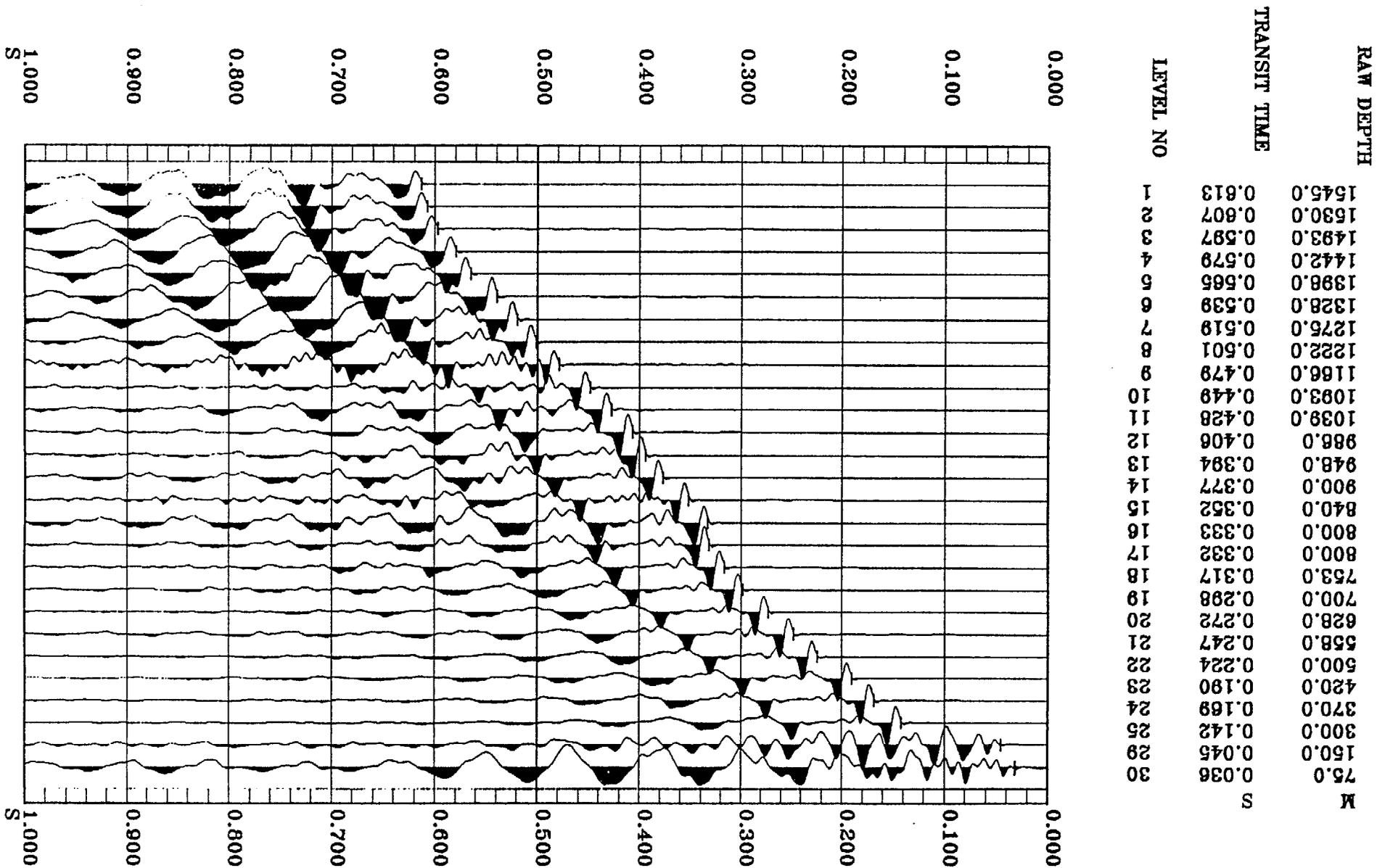
7. Second normal moveout : the correction time in millisecs to be applied to the two way travel time for a specified moveout distance (default = 4500 feet).
8. Third normal moveout : the correction time in millisecs to be applied to the two way travel time for a specified moveout distance (default = 6000 feet).
9. Interval velocity : the velocity between each sampled depth. Typically, the sampling rate is 2 millisecs two way time, (1 millisec one way time) therefore the interval velocity will be equal to the depth increment divided by 0.001. It is equivalent to column 9 from the the Velocity Report.

CLIENT = BHP PETROLEUM

FIELD = WILDCAT

WELL = TOMMYRUFF 1

FIG 2



ANALYST: Z.KATELIS

7-JUN-90 14:51:34

PROGRAM: GSHOT 007.E08

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* SCHLUMBERGER *  
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GEOPHYSICAL AIRGUN REPORT

COMPANY : BHP PETROLEUM
WELL : TOMMYRUFF #1
FIELD : WILDCAT
COUNTRY : AUSTRALIA
REFERENCE: SYJ-56594

LONG DEFINITIONS

GLOBAL

KB - ELEVATION OF THE KELLY-BUSHING ABOVE MSL OR MWL
 SRD - ELEVATION OF THE SEISMIC REFERENCE DATUM ABOVE MSL OR MWL
 EKB - ELEVATION OF KELLY BUSHING
 GL - ELEVATION OF USERS REFERENCE (GENERALLY GROUND LEVEL) ABOVE SRD
 VELHYD - VELOCITY OF THE MEDIUM BETWEEN THE SOURCE AND THE HYDROPHONE
 VELSUR - VELOCITY OF THE MEDIUM BETWEEN THE SOURCE AND THE SRD

MATRIX

GUNELZ - SOURCE ELEVATION ABOVE SRD (ONE FOR THE WHOLE JOB; OR ONE PER SHOT)
 GUNEWZ - SOURCE DISTANCE FROM THE BOREHOLE AXIS IN EW DIRECTION (CF. GUNELZ)
 GUNNSZ - SOURCE DISTANCE FROM THE BOREHOLE AXIS IN NS DIRECTION (CF. GUNELZ)
 HYDELZ - HYDROPHONE ELEVATION ABOVE SRD (CF. GUNELZ)
 HYDEWZ - HYDROPHONE DISTANCE FROM THE BOREHOLE AXIS IN EW DIRECTION (CF. GUNELZ)
 HYDNSZ - HYDROPHONE DISTANCE FROM THE BOREHOLE AXIS IN NS DIRECTION (CF. GUNELZ)
 TRTHYD - TRAVEL TIME FROM THE HYDROPHONE TO THE SOURCE
 TRTSRD - TRAVEL TIME FROM THE SOURCE TO THE SRD
 DEWVEL - DEVIATED WELL DATA PER SHOT : MEAS. DEPTH, VERT. DEPTH, EW, NS

SAMPLED

SHOT.GSH - SHOT NUMBER
 DKB.GSH - MEASURED DEPTH FROM KELLY-BUSHING
 DSRD.GSH - DEPTH FROM SRD
 DGL.GSH - VERTICAL DEPTH RELATIVE TO GROUND LEVEL (USERS REFERENCE)
 TIMO.GSH - MEASURED TRAVEL TIME FROM HYDROPHONE TO GEOPHONE
 TIMV.GSH - VERTICAL TRAVEL TIME FROM THE SOURCE TO THE GEOPHONE
 SHTM.GSH - SHOT TIME (WST)
 AVGV.GSH - AVERAGE SEISMIC VELOCITY
 DELZ.GSH - DEPTH INTERVAL BETWEEN SUCCESSIVE SHOTS
 DELT.GSH - TRAVEL TIME INTERVAL BETWEEN SUCCESSIVE SHOTS
 INTV.GSH - INTERNAL VELOCITY, AVERAGE

(GLOBAL PARAMETERS)

(VALUE)

ELEV OF KB AB. MSL (WST)	KB	:	21.0000	M
ELEV OF SRD AB. MSL (WST)	SRD	:	0	M
ELEVATION OF KELLY BUSHI	EKB	:	21.0000	M
ELEV OF GL AB. SRD (WST)	GL	:	-33.0000	M
VEL SOURCE-HYDRO (WST)	VELHYD	:	1480.00	M/S
VEL SOURCE-SRD (WST)	VELSUR	:	1480.00	M/S

(MATRIX PARAMETERS)

	SOURCE ELV M	SOURCE EW M	SOURCE NS M	HYDRO ELEV M	HYDRO EW M	HYDRO NS M
1	-4.00	0	40.00	-9.00	0	40.00

	TRT HYD-SC MS	TRT SC-SRD MS
1	3.38	2.70

	MD @ KB M	VD @ KB M	VD @ SRD M	E-W COORD M	N-S COORD M
1	54.00	54.00	33.00	0	0
2	75.01	75.01	54.01	0	0
3	200.01	200.01	179.01	0	0
4	300.01	300.01	279.01	0	0
5	370.00	370.00	349.00	0	0
6	420.01	420.01	399.01	0	0
7	499.99	499.99	478.99	0	0
8	558.00	558.00	537.00	0	0
9	628.00	628.00	607.00	0	0
10	700.00	700.00	679.00	0	0
11	753.01	753.01	732.01	0	0
12	800.00	800.00	779.00	0	0
13	840.00	840.00	819.00	0	0
14	900.01	900.01	879.01	0	0
15	947.99	947.99	926.99	0	0
16	986.00	986.00	965.00	0	0
17	1039.00	1039.00	1018.00	0	0
18	1093.01	1093.01	1072.01	0	0
19	1166.01	1166.01	1145.01	0	0
20	1222.00	1222.00	1201.00	0	0
21	1275.01	1275.01	1254.01	0	0
22	1328.00	1328.00	1307.00	0	0
23	1398.00	1398.00	1377.00	0	0
24	1442.01	1442.01	1421.01	0	0
25	1493.00	1493.00	1472.00	0	0
26	1530.00	1530.00	1509.00	0	0
27	1545.00	1545.00	1524.00	0	0

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 3

LEVEL NUMBER	MEASUR DEPTH FROM KB M	VERTIC DEPTH FROM SRD M	VERTIC DEPTH FROM GL M	OBSERV TRAVEL TIME HYD/GEO MS	VERTIC TRAVEL TIME SRC/GEO MS	VERTIC TRAVEL TIME SRD/GEO MS	AVERAGE VELOC SRD/GEO M/S	DELTA DEPTH BETWEEN SHOTS M	DELTA TIME BETWEEN SHOTS MS	INTERV VELOC BETWEEN SHOTS M/S
1	54.00	33.00	0	30.00	19.59	22.30	1480			
2	75.01	54.01	21.01	36.30	30.99	33.69	1603	21.01	11.39	1844
3	200.01	179.01	146.01	96.70	97.56	100.27	1785	125.00	66.53	1878
4	300.01	279.01	246.01	142.08	143.94	146.65	1903	100.00	46.38	2156
5	370.00	349.00	316.00	168.65	170.88	173.59	2011	69.99	26.94	2598
6	420.01	399.01	366.01	190.25	192.64	195.35	2043	50.01	21.76	2298
7	499.99	478.99	445.99	224.01	226.59	229.29	2089	79.98	33.94	2356
8	558.00	537.00	504.00	247.47	250.14	252.85	2124	58.01	23.56	2462
9	628.00	607.00	574.00	272.31	275.08	277.79	2185	70.00	24.94	2807
10	700.00	679.00	646.00	297.87	300.72	303.42	2233	72.00	25.64	2808
11	753.01	732.01	699.01	316.63	319.53	322.23	2272	53.01	18.81	2819
12	800.00	779.00	746.00	333.77	336.70	339.40	2295	46.99	17.17	2736
13	840.00	819.00	786.00	351.96	354.91	357.61	2290	40.00	18.21	2196
14	900.01	879.01	846.01	376.70	379.68	382.38	2299	60.01	24.77	2423
15	947.99	926.99	893.99	393.67	396.63	399.38	2321	47.98	16.99	2823
16	986.00	965.00	932.00	406.48	409.50	412.21	2341	38.01	12.83	2963
17	1039.00	1018.00	985.00	427.68	430.72	433.43	2349	53.00	21.22	2498
18	1093.01	1072.01	1039.01	448.65	451.71	454.41	2359	54.01	20.99	2573
19	1166.01	1145.01	1112.01	479.25	482.33	485.03	2361	73.00	30.62	2384
20	1222.00	1201.00	1168.00	501.48	504.58	507.28	2368	55.99	22.24	2517
21	1275.01	1254.01	1221.01	519.49	522.60	525.30	2387	53.01	18.02	2941
22	1328.00	1307.00	1274.00	539.14	542.26	544.97	2398	52.99	19.66	2695
23	1398.00	1377.00	1344.00	564.58	567.72	570.42	2414	70.00	25.45	2750
24	1442.01	1421.01	1388.01	579.04	582.19	584.89	2430	44.01	14.47	3042

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 4

LEVEL NUMBER	MEASUR DEPTH FROM KB M	VERTIC DEPTH FROM SRD M	VERTIC DEPTH FROM GL M	OBSERV TRAVEL TIME HYD/GEO MS	VERTIC TRAVEL TIME SRC/GEO MS	VERTIC TRAVEL TIME SRD/GEO MS	AVERAGE VELOC SRD/GEO M/S	DELTA DEPTH BETWEEN SHOTS M	DELTA TIME BETWEEN SHOTS MS	INTERV VELOC BETWEEN SHOTS M/S
25	1493.00	1472.00	1439.00	597.37	600.53	603.23	2440	50.99	18.34	2780
26	1530.00	1509.00	1476.00	607.34	610.50	613.21	2461	37.00	9.98	3708
27	1545.00	1524.00	1491.00	612.66	615.83	618.53	2464	15.00	5.32	2818

ANALYST: Z.KATELIS

7-JUN-90 14:53:02

PROGRAM: GDRIFT 007.E09

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*          SCHLUMBERGER          *  
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DRIFT COMPUTATION REPORT

COMPANY : BHP PETROLEUM
WELL : TOMMYRUFF #1
FIELD : WILDCAT
CCUNTRY : AUSTRALIA
REFERENCE: SYJ-56594

LONG DEFINITIONS

GLOBAL

KB - ELEVATION OF THE KELLY-BUSHING ABOVE MSL OR MWL
 SRD - ELEVATION OF THE SEISMIC REFERENCE DATUM ABOVE MSL OR MWL
 EKB - ELEVATION OF KELLY BUSHING
 GL - ELEVATION OF USERS REFERENCE (GENERALLY GROUND LEVEL) ABOVE SRD
 XSTART - TOP OF ZONE PROCESSED BY WST
 XSTOP - BOTTOM OF ZONE PROCESSED BY WST
 GAD001 - RAW SONIC CHANNEL NAME USED FOR WST SONIC ADJUSTMENT
 UNFDEN - UNIFORM DENSITY VALUE

ZONE

LOFDEN - LAYER OPTION FLAG FOR DENSITY : -1=NONE; 0=UNIFORM; 1=UNIFORM+LAYER
 LAYDEN - USER SUPPLIED DENSITY DATA

SAMPLED

SHOT - SHOT NUMBER
 DK2 - MEASURED DEPTH FROM KELLY-BUSHING
 DSRD - DEPTH FROM SRD
 DGL - VERTICAL DEPTH RELATIVE TO GROUND LEVEL (USERS REFERENCE)
 SHTM - SHOT TIME (WST)
 RAWS - RAW SONIC (WST)
 SHDR - DRIFT AT SHOT OR KNEE
 BLSH - BLOCK SHIFT BETWEEN SHOTS OR KNEE

(GLOBAL PARAMETERS)

(VALUE)

ELEV OF KB AB. MSL (WST)	KB	:	21.0000	M
ELEV OF SRD AB. MSL(WST)	SRD	:	0	M
ELEVATION OF KELLY BUSHI	EKB	:	21.0000	M
ELEV OF GL AB. SRD(WST)	GL	:	-33.0000	M
TOP OF ZONE PROCD (WST)	XSTART	:	0	M
BOT OF ZONE PROCD (WST)	XSTOP	:	0	M
RAW SONIC CH NAME (WST)	GAD001	:	DT.ATT.002.FLP.*	
UNIFORM DENSITY VALUE	UNFDEN	:	2.30000	G/C3

(ZONED PARAMETERS)

(VALUE)

(LIMITS)

LAYER OPTION FLAG DENS	LOFDEN	:	1.000000	30479.7	-	0	
USER SUPPLIED DENSITY DA	LAYDEN	:	0	G/C3	0	-	0

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 2

LEVEL NUMBER	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	VERTICAL DEPTH FROM GL M	VERTICAL TRAVEL TIME SRD/GEO MS	INTEGRATED RAW SONIC TIME MS	COMPUTED DRIFT AT LEVEL MS	COMPUTED BLK-SHFT CORRECTION US/F
1	54.00	33.00	0	22.30	22.30	0	0
2	75.01	54.01	21.01	33.69	33.69	0	0
3	200.01	179.01	146.01	100.27	100.27	0	0
4	300.01	279.01	246.01	146.65	145.68	.97	2.96
5	370.00	349.00	316.00	173.59	172.91	.67	-1.31
6	420.01	399.01	366.01	195.35	194.19	1.16	2.95
7	499.99	478.99	445.99	229.29	228.40	.89	-1.01
8	558.00	537.00	504.00	252.85	251.63	1.22	1.74
9	628.00	607.00	574.00	277.79	275.64	2.15	4.03
10	700.00	679.00	646.00	303.42	300.68	2.75	2.53
11	753.01	732.01	699.01	322.23	319.21	3.02	1.58
12	800.00	779.00	746.00	339.40	337.04	2.36	-4.27
13	840.00	819.00	786.00	357.61	355.04	2.58	1.64
14	900.01	879.01	846.01	382.38	379.06	3.32	3.80
15	947.99	926.99	893.99	399.38	396.23	3.15	-1.14
16	986.00	965.00	932.00	412.21	409.49	2.72	-3.43
17	1039.00	1018.00	985.00	433.43	430.08	3.34	3.59
18	1093.01	1072.01	1039.01	454.41	450.68	3.73	2.22
19	1166.01	1145.01	1112.01	485.03	481.00	4.03	1.25
20	1222.00	1201.00	1168.00	507.28	502.95	4.33	1.61
21	1275.01	1254.01	1221.01	525.30	521.81	3.49	-4.83
22	1328.00	1307.00	1274.00	544.97	539.89	5.07	9.10
23	1398.00	1377.00	1344.00	570.42	564.65	5.77	3.04
24	1442.01	1421.01	1388.01	584.89	579.66	5.23	-3.75

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 3

LEVEL NUMBER	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	VERTICAL DEPTH FROM GL M	VERTICAL TRAVEL TIME SRD/GEO MS	INTEGRATED RAW SONIC TIME MS	COMPUTED DRIFT AT LEVEL MS	COMPUTED BLK-SHFT CORRECTION US/F
25	1493.00	1472.00	1439.00	603.23	597.33	5.90	4.02
26	1530.00	1509.00	1476.00	613.21	607.56	5.64	-2.14

ANALYST: Z.KATELIS

7-JUN-90 15:16:39

PROGRAM: GADJST 008.E08

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*   SCHLUMBERGER   *  
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SONIC ADJUSTMENT PARAMETER REPORT

COMPANY : BHP PETROLEUM
WELL : TOMMYRUFF #1
FIELD : WILDCAT
COUNTRY : AUSTRALIA
REFERENCE: SYJ-56594

LONG DEFINITIONS

GLOBAL

SRCDRF - ORIGIN OF ADJUSTMENT DATA
 CONADJ - CONSTANT ADJUSTMENT TO AUTOMATIC DELTA-T MINIMUM = 7.5 US/F
 UNERTH - UNIFORM EARTH VELOCITY (GTRFRM)

ZONE

ZDRIFT - USER DRIFT AT BOTTOM OF THE ZONE
 ADJOPZ - TYPE OF ADJUSTMENT IN THE DRIFT ZONE : 0=DELTA-T MIN, 1=BLOCKSHIFT
 ADJUSZ - DELTA-T MINIMUM USED FOR ADJUSTMENT IN THE DRIFT ZONE
 _OFVEL - LAYER OPTION FLAG FOR VELOCITY: -1=NONE; 0=UNIFORM; 1=UNIFORM+LAYER
 _LAYVEL - USER SUPPLIED VELOCITY DATA

SAMPLED

SHOT - SHOT NUMBER
 VDKB - VERTICAL DEPTH RELATIVE TO KB
 DSRD - DEPTH FROM SRD
 DGL - VERTICAL DEPTH RELATIVE TO GROUND LEVEL (USERS REFERENCE)
 KNEE - KNEE
 BLSH - BLOCK SHIFT BETWEEN SHOTS OR KNEE
 DTMI - VALUE OF DELTA-T MINIMUM USED
 COEF - DELTA-T MIN COEFFICIENT USED IN THE DRIFT ZONE
 DRGR - GRADIENT OF DRIFT CURVE

(GLOBAL PARAMETERS)

(VALUE)

ORIG OF ADJ DATA (WST)	SRCDRF	:	2.00000	
CONS SONIC ADJST (WST)	CONADJ	:	7.50000	US/F
JNIFORM EARTH VELOCITY	UNERTH	:	1480.00	M/S

(ZONED PARAMETERS)

(VALUE)

(LIMITS)

JSER DRIFT ZONE (WST)	ZDRIFT	:	5.70000	MS	1530.00	-	200.010
			0		200.010		0
ADJUSMNT MODE (WST)	ADJOPZ	:	-999.2500		30479.7	-	0
JSER DELTA-T MIN (WST)	ADJUSZ	:	-999.2500	US/F	30479.7	-	0
_AYER OPTION FLAG VELOC	LOFVEL	:	1.00000		30479.7	-	0
JSER VELOC (WST)	LAYVEL	:	1878.000	M/S	200.010	-	75.0100
			1844.000		75.0100		54.0000
			1480.000		54.0000		0

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 2

KNEE NUMBER	VERTICAL DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	VERTICAL DEPTH FROM GL M	DRIFT AT KNEE MS	BLOCKSHIFT USED US/F	DELTA-T MINIMUM USED US/F	REDUCTION FACTOR G	EQUIVALENT BLOCKSHIFT US/F
2	200.01	179.01	146.01	0	0			0
3	1530.00	1509.00	1476.00	5.70	1.31			1.31

ANALYST: Z.KATELIS

7-JUN-90 15:16:48

PROGRAM: GADJST 008.E08

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*   SCHLUMBERGER                     *  
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VELOCITY REPORT

COMPANY : BHP PETROLEUM
WELL : TOMMYRUFF #1
FIELD : WILDCAT
COUNTRY : AUSTRALIA
REFERENCE: SYJ-56594

LONG DEFINITIONS

GLOBAL

<B - ELEVATION OF THE KELLY-BUSHING ABOVE MSL OR MWL
 SRD - ELEVATION OF THE SEISMIC REFERENCE DATUM ABOVE MSL OR MWL
 EKB - ELEVATION OF KELLY BUSHING
 GL - ELEVATION OF USERS REFERENCE (GENERALLY GROUND LEVEL) ABOVE SRD
 UNERTH - UNIFORM EARTH VELOCITY (GTRFRM)

ZONE

LOFVEL - LAYER OPTION FLAG FOR VELOCITY: -1=NONE; 0=UNIFORM; 1=UNIFORM+LAYER
 LAYVEL - USER SUPPLIED VELOCITY DATA

SAMPLED

SHOT - SHOT NUMBER
 DKB - MEASURED DEPTH FROM KELLY-BUSHING
 DSRD - DEPTH FROM SRD
 DGL - VERTICAL DEPTH RELATIVE TO GROUND LEVEL (USERS REFERENCE)
 SHTM - SHOT TIME (WST)
 ADJS - ADJUSTED SONIC TRAVEL TIME
 SHDR - DRIFT AT SHOT OR KNEE
 REST - RESIDUAL TRAVEL TIME AT KNEE
 INTV - INTERNAL VELOCITY, AVERAGE

(GLOBAL PARAMETERS)

(VALUE)

ELEV OF KB AB. MSL (WST)	KB	:	21.0000	M
ELEV OF SRD AB. MSL(WST)	SRD	:	0	M
ELEVATION OF KELLY BUSHI	EKB	:	21.0000	M
ELEV OF GL AB. SRD(WST)	GL	:	-33.0000	M
UNIFORM EARTH VELOCITY	UNERTH	:	1480.00	M/S

(ZONED PARAMETERS)

(VALUE)

(LIMITS)

LAYER OPTION FLAG VELOC	LOFVEL	:	1.000000		30479.7	-	0
USER VELOC (WST)	LAYVEL	:	1878.000	M/S	200.010	-	75.0100
			1844.000		75.0100		54.0000
			1480.000		54.0000		0

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 4

LEVEL NUMBER	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	VERTICAL DEPTH FROM GL M	VERTICAL TRAVEL TIME SRD/GEOPH MS	INTEGRATED ADJUSTED SONIC TIME MS	DRIFT = SHOT TIME - RAW SON MS	RESIDUAL = SHOT TIME - ADJ SON MS	ADJUSTED INTERVAL VELOCITY M/S
1	54.00	33.00	0	22.30	22.30	0	0	1480
2	75.01	54.01	21.01	33.69	33.69	0	0	1844
3	200.01	179.01	146.01	100.27	100.26	0	.01	1878
4	300.01	279.01	246.01	146.65	146.09	.97	.56	2132
5	370.00	349.00	316.00	173.59	173.63	.67	-.04	2541
6	420.01	399.01	366.01	195.35	195.12	1.16	.22	2327
7	499.99	478.99	445.99	229.29	229.67	.89	-.38	2315
8	558.00	537.00	504.00	252.85	253.15	1.22	-.30	2471
9	628.00	607.00	574.00	277.79	277.46	2.15	.33	2879
10	700.00	679.00	646.00	303.42	302.81	2.75	.62	2341
11	753.01	732.01	699.01	322.23	321.56	3.02	.66	2826
12	800.00	779.00	746.00	339.40	339.60	2.36	-.20	2605
13	840.00	819.00	786.00	357.61	357.77	2.58	-.15	2202
14	900.01	879.01	846.01	382.38	382.05	3.32	.34	2472
15	947.99	926.99	893.99	399.38	399.42	3.15	-.05	2761
16	986.00	965.00	932.00	412.21	412.84	2.72	-.64	2832
17	1039.00	1018.00	985.00	433.43	433.67	3.34	-.24	2545
18	1093.01	1072.01	1039.01	454.41	454.50	3.73	-.08	2593
19	1166.01	1145.01	1112.01	485.03	485.13	4.03	-.10	2333
20	1222.00	1201.00	1168.00	507.28	507.32	4.33	-.04	2524
21	1275.01	1254.01	1221.01	525.30	526.41	3.49	-1.10	2777
22	1328.00	1307.00	1274.00	544.97	544.71	5.07	.25	2895
23	1398.00	1377.00	1344.00	570.42	569.77	5.77	.65	2794
24	1442.01	1421.01	1388.01	584.89	584.97	5.23	-.08	2896

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 5

LEVEL NUMBER	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	VERTICAL DEPTH FROM GL M	VERTICAL TRAVEL TIME SRD/GEOPH MS	INTEGRATED ADJUSTED SONIC TIME MS	DRIFT = SHOT TIME - RAW SON MS	RESIDUAL = SHOT TIME - ADJ SON MS	ADJUSTED INTERVAL VELOCITY M/S
25	1493.00	1472.00	1439.00	603.23	602.85	5.90	.38	2851
26	1530.00	1509.00	1476.00	613.21	613.24	5.64	-.03	3562

ANALYST: Z.KATELIS

7-JUN-90 15:18:13

PROGRAM: GTRFRM 001.E12

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*                                     *  
*                                     *  
*                                     *  
*****  
*          SCHLUMBERGER              *  
*                                     *  
*                                     *  
*****
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TIME CONVERTED VELOCITY REPORT

COMPANY : BHP PETROLEUM
WELL : TOMMYRUFF #1
FIELD : WILDCAT
COUNTRY : AUSTRALIA
REFERENCE: SYJ-56594

LONG DEFINITIONS

GLOBAL

KB - ELEVATION OF THE KELLY-BUSHING ABOVE MSL OR MWL
 SRD - ELEVATION OF THE SEISMIC REFERENCE DATUM ABOVE MSL OR MWL
 GL - ELEVATION OF USERS REFERENCE (GENERALLY GROUND LEVEL) ABOVE SRD
 UNERTH - UNIFORM EARTH VELOCITY (GTRFRM)
 UNFDEN - UNIFORM DENSITY VALUE

MATRIX

MVODIS - MOVE-OUT DISTANCE FROM BOREHOLE

ZONE

LOFVEL - LAYER OPTION FLAG FOR VELOCITY: -1=NONE; 0=UNIFORM; 1=UNIFORM+LAYER
 LAYVEL - USER SUPPLIED VELOCITY DATA
 LOFDEN - LAYER OPTION FLAG FOR DENSITY : -1=NONE; 0=UNIFORM; 1=UNIFORM+LAYER
 LAYDEN - USER SUPPLIED DENSITY DATA

SAMPLED

TWOT - TWO WAY TRAVEL TIME (RELATIVE TO THE SEISMIC REFERENCE)
 DKE - MEASURED DEPTH FROM KELLY-BUSHING
 DSRD - DEPTH FROM SRD
 AVGV - AVERAGE SEISMIC VELOCITY
 RMSV - ROOT MEAN SQUARE VELOCITY (SEISMIC)
 MVOT - NORMAL MOVE-OUT
 MVOT - NORMAL MOVE-OUT
 MVOT - NORMAL MOVE-OUT
 INTV - INTERNAL VELOCITY, AVERAGE

(GLOBAL PARAMETERS)

(VALUE)

ELEV OF KB AB. MSL (WST)	KB	:	21.0000	M
ELEV OF SRD AB. MSL(WST)	SRD	:	0	M
ELEV OF GL AB. SRD(WST)	GL	:	-33.0000	M
JNIFORM EARTH VELOCITY	UNERTH	:	1480.00	M/S
JNIFORM DENSITY VALUE	UNFDEN	:	2.30000	G/C3

(MATRIX PARAMETERS)

MVCUT DIST
M

1	1000.0
2	1500.0
3	2000.0

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 2

(ZONED PARAMETERS)		(VALUE)	(LIMITS)
LAYER OPTION FLAG VELOC	LOFVEL	: 1.000000	30479.7 - 0
USER VELOC (WST)	LAYVEL	: 1878.000 M/S	200.010 - 75.0100
		1844.000	75.0100 54.0000
		1480.000	54.0000 0
LAYER OPTION FLAG DENS	LOFDEN	: 1.000000	30479.7 - 0
USER SUPPLIED DENSITY DA	LAYDEN	: 0 G/C3	0 - 0

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 3

TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
0	21.00	0						1480
2.00	22.48	1.48	1480	1480	673.68	1011.52	1349.35	1480
4.00	23.96	2.96	1480	1480	671.69	1009.52	1347.36	1480
6.00	25.44	4.44	1480	1480	669.70	1007.53	1345.36	1480
8.00	26.92	5.92	1480	1480	667.72	1005.55	1343.38	1480
10.00	28.40	7.40	1480	1480	665.75	1003.56	1341.39	1480
12.00	29.88	8.88	1480	1480	663.78	1001.58	1339.40	1480
14.00	31.36	10.36	1480	1480	661.82	999.61	1337.42	1480
16.00	32.84	11.84	1480	1480	659.87	997.64	1335.45	1480
18.00	34.32	13.32	1480	1480	657.92	995.67	1333.47	1480
20.00	35.80	14.80	1480	1480	655.97	993.71	1331.50	1480
22.00	37.28	16.28	1480	1480	654.03	991.75	1329.53	1480
24.00	38.76	17.76	1480	1480	652.10	989.80	1327.56	1480
26.00	40.24	19.24	1480	1480	650.18	987.85	1325.60	1480
28.00	41.72	20.72	1480	1480	648.26	985.90	1323.64	1480
30.00	43.20	22.20	1480	1480	646.34	983.96	1321.68	1480
32.00	44.68	23.68	1480	1480	644.43	982.02	1319.73	1480
34.00	46.16	25.16	1480	1480	642.53	980.08	1317.78	1480
36.00	47.64	26.64	1480	1480	640.63	978.15	1315.83	1480
38.00	49.12	28.12	1480	1480	638.74	976.23	1313.89	1480
40.00	50.60	29.60	1480	1480	636.86	974.30	1311.94	1480
42.00	52.08	31.08	1480	1480	634.98	972.38	1310.00	1480
44.00	53.56	32.56	1480	1480	633.11	970.47	1308.07	1480
46.00	55.32	34.32	1492	1493	625.34	959.70	1294.31	1756

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 4

TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
48.00	57.16	36.16	1507	1509	616.28	946.97	1277.96	1844
50.00	59.00	38.00	1520	1524	608.01	935.42	1263.16	1844
52.00	60.85	39.85	1533	1538	600.40	924.87	1249.68	1844
54.00	62.69	41.69	1544	1550	593.36	915.16	1237.34	1844
56.00	64.54	43.54	1555	1562	586.81	906.19	1225.96	1844
58.00	66.38	45.38	1565	1572	580.69	897.84	1215.43	1844
60.00	68.23	47.23	1574	1582	574.94	890.05	1205.63	1844
62.00	70.07	49.07	1583	1591	569.52	882.75	1196.47	1844
64.00	71.92	50.92	1591	1600	564.39	875.87	1187.89	1844
66.00	73.76	52.76	1599	1608	559.52	869.38	1179.81	1856
68.00	75.62	54.62	1606	1615	554.73	863.00	1171.88	1878
70.00	77.49	56.49	1614	1624	549.89	856.54	1163.84	1873
72.00	79.37	58.37	1621	1631	545.28	850.41	1156.24	1873
74.00	81.25	60.25	1628	1638	540.86	844.57	1149.02	1878
76.00	83.13	62.13	1635	1645	536.62	838.99	1142.15	1878
78.00	85.00	64.00	1641	1651	532.55	833.66	1135.59	1878
80.00	86.88	65.88	1647	1657	528.62	828.54	1129.33	1878
82.00	88.76	67.76	1653	1663	524.83	823.62	1123.33	1873
84.00	90.64	69.64	1658	1669	521.17	818.88	1117.56	1878
86.00	92.51	71.51	1663	1674	517.62	814.32	1112.02	1878
88.00	94.39	73.39	1668	1679	514.18	809.90	1106.68	1878
90.00	96.27	75.27	1673	1683	510.84	805.63	1101.53	1878
92.00	98.15	77.15	1677	1688	507.60	801.49	1096.56	1878
94.00	100.02	79.02	1681	1692	504.43	797.48	1091.74	1878

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 5

TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
96.00	101.90	80.90	1685	1696	501.35	793.57	1087.07	1378
98.00	103.78	82.78	1689	1700	498.34	789.78	1082.54	1878
100.00	105.66	84.66	1693	1704	495.40	786.08	1078.14	1873
102.00	107.53	86.53	1697	1707	492.53	782.47	1073.36	1873
104.00	109.41	88.41	1700	1711	489.72	778.96	1069.70	1878
106.00	111.29	90.29	1704	1714	486.97	775.52	1065.64	1878
108.00	113.17	92.17	1707	1717	484.27	772.16	1061.67	1873
110.00	115.04	94.04	1710	1720	481.62	768.87	1057.81	1873
112.00	116.92	95.92	1713	1723	479.03	765.65	1054.02	1878
114.00	118.80	97.80	1716	1726	476.48	762.49	1050.33	1873
116.00	120.68	99.68	1719	1729	473.97	759.40	1046.71	1873
118.00	122.55	101.55	1721	1731	471.51	756.36	1043.16	1873
120.00	124.43	103.43	1724	1734	469.08	753.38	1039.69	1878
122.00	126.31	105.31	1726	1736	466.70	750.45	1036.27	1878
124.00	128.19	107.19	1729	1739	464.35	747.56	1032.93	1873
126.00	130.06	109.06	1731	1741	462.03	744.73	1029.64	1378
128.00	131.94	110.94	1733	1743	459.75	741.94	1026.41	1873
130.00	133.82	112.82	1736	1745	457.50	739.19	1023.23	1878
132.00	135.70	114.70	1738	1747	455.29	736.48	1020.11	1878
134.00	137.57	116.57	1740	1749	453.10	733.81	1017.03	1873
136.00	139.45	118.45	1742	1751	450.94	731.18	1014.00	1873
138.00	141.33	120.33	1744	1753	448.81	728.58	1011.01	1873
140.00	143.21	122.21	1746	1755	446.70	726.02	1008.07	1873
142.00	145.08	124.08	1748	1757	444.62	723.49	1005.17	1378

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

PAGE 6

TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
144.00	146.96	125.96	1749	1759	442.56	720.99	1002.31	1878
146.00	148.84	127.84	1751	1760	440.53	718.52	999.48	1873
148.00	150.72	129.72	1753	1762	438.52	716.08	996.69	1878
150.00	152.59	131.59	1755	1764	436.53	713.67	993.94	1878
152.00	154.47	133.47	1756	1765	434.57	711.29	991.22	1878
154.00	156.35	135.35	1758	1767	432.62	708.93	988.53	1878
156.00	158.23	137.23	1759	1768	430.70	706.59	985.87	1873
158.00	160.10	139.10	1761	1770	428.80	704.29	983.24	1878
160.00	161.98	140.98	1762	1771	426.91	702.00	980.64	1878
162.00	163.86	142.86	1764	1772	425.04	699.74	978.07	1878
164.00	165.74	144.74	1765	1774	423.20	697.50	975.52	1878
166.00	167.61	146.61	1766	1775	421.36	695.28	973.00	1873
168.00	169.49	148.49	1768	1776	419.55	693.08	970.50	1873
170.00	171.37	150.37	1769	1777	417.75	690.90	968.03	1873
172.00	173.25	152.25	1770	1779	415.97	688.74	965.58	1878
174.00	175.13	154.13	1772	1780	414.21	686.60	963.16	1878
176.00	177.00	156.00	1773	1781	412.46	684.48	960.75	1878
178.00	178.88	157.88	1774	1782	410.73	682.37	958.37	1873
180.00	180.76	159.76	1775	1783	409.01	680.29	956.01	1878
182.00	182.64	161.64	1776	1784	407.30	678.21	953.67	1878
184.00	184.51	163.51	1777	1785	405.61	676.16	951.34	1873
186.00	186.39	165.39	1778	1786	403.94	674.12	949.04	1873
188.00	188.27	167.27	1779	1787	402.27	672.10	946.75	1873
190.00	190.15	169.15	1780	1788	400.63	670.09	944.48	1878

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
192.00	192.02	171.02	1781	1789	398.99	668.10	942.23	1873
194.00	193.90	172.90	1782	1790	397.37	666.12	940.00	1878
196.00	195.78	174.78	1783	1791	395.76	664.16	937.73	1878
198.00	197.66	176.66	1784	1792	394.16	662.21	935.58	1878
200.00	199.53	178.53	1785	1793	392.57	660.28	933.39	1878
202.00	201.50	180.50	1787	1795	390.74	657.94	930.66	1964
204.00	203.51	182.51	1789	1797	388.76	655.39	927.64	2013
206.00	205.54	184.54	1792	1799	386.76	652.79	924.55	2028
208.00	207.43	186.43	1793	1800	385.20	650.87	922.37	1890
210.00	209.36	188.36	1794	1801	383.54	648.79	919.97	1928
212.00	211.40	190.40	1796	1804	381.54	646.17	916.85	2047
214.00	213.41	192.41	1798	1806	379.69	643.79	914.05	2003
216.00	215.42	194.42	1800	1808	377.83	641.38	911.19	2015
218.00	217.47	196.47	1802	1810	375.90	638.86	908.19	2044
220.00	219.52	198.52	1805	1813	373.96	636.31	905.14	2059
222.00	221.61	200.61	1807	1815	371.95	633.65	901.94	2088
224.00	223.63	202.63	1809	1817	370.15	631.32	899.19	2020
226.00	225.73	204.73	1812	1820	368.16	628.67	896.00	2099
228.00	227.87	206.87	1815	1823	366.07	625.87	892.60	2140
230.00	230.00	209.00	1817	1826	364.06	623.18	889.34	2124
232.00	232.15	211.15	1820	1829	362.00	620.41	885.97	2149
234.00	234.29	213.29	1823	1832	359.99	617.70	882.70	2142
236.00	236.40	215.40	1825	1834	358.07	615.14	879.60	2117
238.00	238.54	217.54	1828	1837	356.11	612.51	876.41	2140

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
								2179
240.00	240.72	219.72	1831	1840	354.07	609.74	873.04	2191
242.00	242.91	221.91	1834	1843	352.02	606.96	869.65	2193
244.00	245.11	224.11	1837	1847	349.99	604.19	866.26	2194
246.00	247.31	226.31	1840	1850	347.99	601.47	862.94	2164
248.00	249.47	228.47	1843	1852	346.09	598.90	859.82	2212
250.00	251.68	230.68	1845	1856	344.10	596.18	856.43	2186
252.00	253.87	232.87	1848	1858	342.19	593.59	853.33	2194
254.00	256.06	235.06	1851	1861	340.29	590.99	850.16	2171
256.00	258.23	237.23	1853	1864	338.47	588.52	847.16	2178
258.00	260.41	239.41	1856	1866	336.65	586.04	844.15	2162
260.00	262.57	241.57	1858	1869	334.88	583.65	841.25	2245
262.00	264.82	243.82	1861	1872	332.95	580.98	837.97	2232
264.00	267.05	246.05	1864	1875	331.07	578.40	834.80	2275
266.00	269.32	248.32	1867	1878	329.12	575.68	831.45	2307
268.00	271.63	250.63	1870	1882	327.12	572.89	827.99	2321
270.00	273.95	252.95	1874	1886	325.11	570.07	824.50	2222
272.00	276.17	255.17	1876	1888	323.35	567.65	821.53	2247
274.00	278.42	257.42	1879	1891	321.55	565.16	818.47	2279
276.00	280.70	259.70	1882	1894	319.71	562.59	815.30	2317
278.00	283.02	262.02	1885	1898	317.81	559.92	812.00	2382
280.00	285.40	264.40	1889	1902	315.79	557.06	808.42	2371
282.00	287.77	266.77	1892	1905	313.82	554.28	804.95	2364
284.00	290.13	269.13	1895	1909	311.90	551.55	801.55	2401
286.00	292.53	271.53	1899	1913	309.92	548.73	798.02	

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
289.00	294.92	273.92	1902	1916	308.00	546.00	794.60	2388
290.00	297.34	276.34	1906	1920	306.04	543.19	791.08	2420
292.00	299.81	278.81	1910	1925	304.00	540.26	787.39	2469
294.00	302.17	281.17	1913	1928	302.20	537.71	784.20	2364
296.00	304.64	283.64	1917	1932	300.22	534.85	780.61	2468
298.00	307.06	286.06	1920	1936	298.37	532.20	777.28	2417
300.00	309.53	288.53	1924	1940	296.44	529.41	773.76	2470
302.00	311.98	290.98	1927	1944	294.57	526.71	770.37	2453
304.00	314.45	293.45	1931	1948	292.70	524.00	766.96	2466
306.00	316.94	295.94	1934	1952	290.81	521.26	763.49	2490
308.00	319.46	298.46	1938	1956	288.89	518.46	759.94	2522
310.00	321.93	300.93	1941	1960	287.09	515.86	756.67	2465
312.00	324.44	303.44	1945	1964	285.23	513.14	753.23	2517
314.00	326.96	305.96	1949	1968	283.40	510.47	749.84	2514
316.00	329.45	308.45	1952	1971	281.62	507.87	746.56	2499
318.00	331.96	310.96	1956	1975	279.85	505.28	743.28	2508
320.00	334.50	313.50	1959	1979	278.05	502.65	739.93	2535
322.00	337.05	316.05	1963	1983	276.24	499.98	736.55	2557
324.00	339.64	318.64	1967	1988	274.40	497.26	733.07	2590
326.00	342.21	321.21	1971	1992	272.62	494.64	729.74	2566
328.00	344.78	323.78	1974	1996	270.87	492.05	726.44	2566
330.00	347.37	326.37	1978	2000	269.10	489.41	723.08	2596
332.00	349.98	328.98	1982	2004	267.33	486.78	719.71	2607
334.00	352.57	331.57	1985	2008	265.60	484.22	716.44	2592

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
336.00	355.26	334.26	1990	2013	263.75	481.43	712.85	2692
338.00	357.92	336.92	1994	2017	261.97	478.76	709.43	2659
340.00	360.52	339.52	1997	2021	260.30	476.28	706.26	2600
342.00	363.15	342.15	2001	2025	258.61	473.75	703.01	2633
344.00	365.77	344.77	2004	2029	256.97	471.30	699.87	2614
346.00	368.40	347.40	2008	2033	255.33	468.82	696.70	2633
348.00	370.95	349.95	2011	2037	253.82	466.58	693.85	2548
350.00	373.31	352.31	2013	2039	252.58	464.78	691.60	2364
352.00	375.63	354.68	2015	2041	251.35	462.98	689.36	2369
354.00	378.08	357.08	2017	2043	250.09	461.14	687.04	2398
356.00	380.57	359.57	2020	2046	248.73	459.10	684.47	2492
358.00	383.04	362.04	2023	2048	247.41	457.14	681.99	2468
360.00	385.38	364.33	2024	2050	246.27	455.48	679.92	2334
362.00	387.74	366.74	2026	2052	245.10	453.76	677.78	2366
364.00	389.86	368.86	2027	2052	244.22	452.53	676.30	2121
366.00	392.06	371.06	2028	2053	243.26	451.15	674.63	2202
368.00	394.41	373.41	2029	2055	242.14	449.52	672.59	2342
370.00	396.89	375.89	2032	2057	240.86	447.60	670.15	2488
372.00	399.13	378.13	2033	2058	239.89	446.20	668.43	2232
374.00	401.34	380.34	2034	2059	238.95	444.84	666.77	2216
376.00	403.56	382.56	2035	2060	238.00	443.47	665.09	2222
378.00	405.72	384.72	2036	2061	237.13	442.23	663.59	2155
380.00	408.00	387.00	2037	2062	236.14	440.78	661.79	2277
382.00	410.37	389.37	2039	2064	235.06	439.16	659.76	2370

TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
384.00	412.65	391.65	2040	2065	234.07	437.72	657.97	2286
386.00	415.01	394.01	2041	2066	233.02	436.15	656.00	2357
388.00	417.52	396.52	2044	2069	231.81	434.31	653.65	2508
390.00	419.75	398.75	2045	2070	230.90	432.98	652.01	2236
392.00	422.00	401.00	2046	2071	229.99	431.64	650.35	2250
394.00	424.29	403.29	2047	2072	229.04	430.23	648.60	2289
396.00	426.48	405.48	2048	2073	228.20	429.01	647.10	2184
398.00	428.77	407.77	2049	2074	227.26	427.62	645.36	2293
400.00	431.07	410.07	2050	2075	226.32	426.22	643.61	2301
402.00	433.45	412.45	2052	2077	225.31	424.69	641.68	2380
404.00	435.66	414.66	2053	2077	224.47	423.46	640.16	2211
406.00	437.88	416.88	2054	2078	223.63	422.21	638.63	2220
408.00	440.15	419.15	2055	2079	222.75	420.89	636.98	2274
410.00	442.48	421.48	2056	2080	221.82	419.50	635.22	2322
412.00	444.84	423.84	2057	2082	220.87	418.05	633.39	2361
414.00	447.14	426.14	2059	2083	219.98	416.72	631.72	2298
416.00	449.38	428.38	2059	2084	219.15	415.48	630.18	2240
418.00	451.75	430.75	2061	2085	218.20	414.04	628.34	2377
420.00	454.07	433.07	2062	2086	217.32	412.70	626.66	2313
422.00	456.23	435.23	2063	2087	216.57	411.60	625.30	2166
424.00	458.53	437.53	2064	2088	215.71	410.30	623.67	2299
426.00	460.80	439.80	2065	2089	214.89	409.05	622.10	2270
428.00	463.11	442.11	2066	2090	214.03	407.75	620.45	2314
430.00	465.53	444.53	2068	2091	213.09	406.30	618.60	2411

COMPANY : BHP PETROLEUM

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
432.00	467.77	446.77	2068	2092	212.30	405.11	617.11	2248
434.00	470.05	449.05	2069	2093	211.50	403.89	615.57	2274
436.00	472.30	451.30	2070	2094	210.72	402.70	614.09	2249
438.00	474.58	453.58	2071	2094	209.92	401.48	612.55	2282
440.00	476.86	455.86	2072	2095	209.12	400.28	611.02	2278
442.00	479.17	458.17	2073	2096	208.30	399.02	609.42	2317
444.00	481.47	460.47	2074	2097	207.51	397.80	607.88	2296
446.00	483.77	462.77	2075	2098	206.72	396.58	606.34	2298
448.00	486.14	465.14	2077	2100	205.87	395.26	604.64	2375
450.00	488.53	467.53	2078	2101	204.98	393.87	602.84	2432
452.00	490.96	469.96	2079	2103	204.13	392.55	601.15	2386
454.00	493.41	472.41	2081	2104	203.24	391.14	599.33	2453
456.00	496.09	475.09	2084	2107	202.16	389.42	597.05	2671
458.00	498.40	477.40	2085	2108	201.40	388.23	595.54	2311
460.00	500.86	479.86	2086	2110	200.52	386.85	593.73	2461
462.00	503.07	482.07	2087	2110	199.84	385.81	592.43	2210
464.00	505.28	484.28	2087	2111	199.17	384.78	591.13	2211
466.00	507.53	486.53	2088	2111	198.47	383.69	589.75	2254
468.00	509.78	488.78	2089	2112	197.78	382.62	588.40	2247
470.00	512.21	491.21	2090	2113	196.95	381.31	586.69	2435
472.00	514.59	493.60	2092	2114	196.17	380.08	585.10	2382
474.00	517.20	496.20	2094	2117	195.22	378.54	583.06	2609
476.00	519.79	498.79	2096	2119	194.29	377.04	581.09	2585
478.00	522.31	501.31	2098	2121	193.43	375.66	579.26	2519

COMPANY : BHP PETROLEUM

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
480.00	524.64	503.64	2098	2122	192.71	374.53	577.81	2329
482.00	527.01	506.01	2100	2123	191.97	373.35	576.28	2373
484.00	529.51	508.51	2101	2125	191.14	372.01	574.53	2498
486.00	532.66	511.66	2106	2130	189.77	369.72	571.39	3151
488.00	535.22	514.22	2107	2132	188.91	368.32	569.54	2563
490.00	537.78	516.78	2109	2134	188.07	366.95	567.73	2555
492.00	540.22	519.22	2111	2135	187.31	365.74	566.14	2439
494.00	542.61	521.61	2112	2136	186.60	364.59	564.65	2391
496.00	545.01	524.01	2113	2137	185.88	363.44	563.14	2400
498.00	547.42	526.42	2114	2138	185.16	362.28	561.63	2412
500.00	549.91	528.91	2116	2140	184.39	361.03	559.97	2496
502.00	552.28	531.28	2117	2141	183.71	359.93	558.55	2370
504.00	554.72	533.72	2118	2142	182.99	358.77	557.02	2434
506.00	557.68	536.68	2121	2146	181.88	356.91	554.49	2965
508.00	560.06	539.06	2122	2147	181.22	355.84	553.08	2374
510.00	562.87	541.87	2125	2150	180.25	354.22	550.89	2816
512.00	565.73	544.73	2128	2153	179.26	352.56	548.63	2861
514.00	568.66	547.66	2131	2157	178.23	350.83	546.27	2923
516.00	571.76	550.76	2135	2161	177.08	348.87	543.57	3100
518.00	574.61	553.61	2137	2164	176.13	347.27	541.39	2853
520.00	577.69	556.69	2141	2168	175.02	345.38	538.79	3079
522.00	580.45	559.45	2143	2171	174.16	343.93	536.82	2761
524.00	583.57	562.57	2147	2176	173.04	342.01	534.18	3123
526.00	586.48	565.48	2150	2179	172.09	340.41	531.98	2909

COMPANY : BHP PETROLEUM

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
528.00	589.50	568.50	2153	2183	171.08	338.67	529.58	3023
530.00	592.45	571.45	2156	2186	170.12	337.05	527.35	2948
532.00	595.47	574.47	2160	2190	169.13	335.34	525.01	3022
534.00	598.41	577.41	2163	2193	168.21	333.77	522.84	2933
536.00	601.36	580.36	2166	2196	167.28	332.18	520.66	2958
538.00	604.32	583.32	2168	2200	166.37	330.61	518.50	2953
540.00	607.28	586.28	2171	2203	165.45	329.05	516.35	2962
542.00	609.72	588.72	2172	2204	164.86	328.07	515.04	2443
544.00	612.36	591.36	2174	2206	164.17	326.89	513.44	2640
546.00	615.27	594.27	2177	2209	163.31	325.42	511.42	2910
548.00	618.13	597.13	2179	2211	162.50	324.03	509.51	2857
550.00	620.93	599.93	2182	2214	161.73	322.71	507.70	2798
552.00	623.82	602.82	2184	2217	160.91	321.30	505.75	2894
554.00	626.73	605.73	2187	2219	160.09	319.89	503.81	2903
556.00	629.44	608.44	2189	2221	159.39	318.70	502.18	2712
558.00	632.09	611.09	2190	2223	158.73	317.58	500.65	2652
560.00	634.89	613.89	2192	2225	158.00	316.31	498.90	2803
562.00	637.67	616.67	2195	2228	157.28	315.08	497.21	2773
564.00	640.43	619.43	2197	2230	156.58	313.87	495.55	2764
566.00	643.13	622.13	2198	2232	155.92	312.73	493.99	2698
568.00	646.02	625.02	2201	2234	155.15	311.41	492.16	2893
570.00	649.01	628.01	2204	2237	154.34	309.99	490.19	2990
572.00	651.91	630.91	2206	2240	153.59	308.69	488.37	2899
574.00	654.84	633.84	2209	2243	152.83	307.36	486.52	2932

COMPANY : BHP PETROLEUM

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
576.00	657.71	636.71	2211	2245	152.11	306.10	484.78	2867
578.00	660.58	639.58	2213	2248	151.39	304.85	483.04	2875
580.00	663.60	642.60	2216	2251	150.60	303.46	481.10	3021
582.00	666.63	645.63	2219	2254	149.82	302.08	479.16	3027
584.00	669.52	648.52	2221	2256	149.12	300.85	477.44	2890
586.00	672.35	651.35	2223	2259	148.45	299.69	475.82	2830
588.00	675.12	654.12	2225	2261	147.82	298.59	474.30	2766
590.00	678.15	657.15	2228	2264	147.06	297.24	472.41	3035
592.00	680.96	659.96	2230	2266	146.42	296.13	470.86	2805
594.00	683.82	662.82	2232	2268	145.76	294.96	469.24	2868
596.00	686.69	665.69	2234	2270	145.11	293.81	467.63	2863
598.00	689.47	668.47	2236	2272	144.50	292.74	466.14	2784
600.00	692.23	671.23	2237	2274	143.90	291.70	464.69	2761
602.00	694.98	673.98	2239	2276	143.32	290.67	463.26	2749
604.00	697.73	676.73	2241	2277	142.74	289.65	461.84	2752
606.00	700.59	679.59	2243	2280	142.11	288.55	460.29	2855
608.00	703.39	682.39	2245	2282	141.52	287.49	458.82	2806
610.00	706.21	685.21	2247	2283	140.92	286.44	457.35	2811
612.00	708.98	687.98	2248	2285	140.35	285.43	455.93	2776
614.00	711.79	690.79	2250	2287	139.77	284.40	454.49	2806
616.00	714.66	693.66	2252	2289	139.16	283.33	452.93	2867
618.00	717.47	696.47	2254	2291	138.58	282.30	451.54	2817
620.00	720.34	699.34	2256	2293	137.99	281.24	450.05	2865
622.00	723.13	702.13	2258	2295	137.43	280.25	448.66	2792

COMPANY : BHP PETROLEUM

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
624.00	725.96	704.96	2259	2297	136.87	279.24	447.23	2829
626.00	728.81	707.81	2261	2299	136.29	278.21	445.79	2853
628.00	731.78	710.78	2264	2301	135.67	277.10	444.20	2971
630.00	734.71	713.71	2266	2304	135.07	276.03	442.68	2931
632.00	737.60	716.60	2268	2306	134.50	275.00	441.23	2883
634.00	740.39	719.39	2269	2307	133.97	274.05	439.89	2796
636.00	743.21	722.21	2271	2309	133.43	273.09	438.53	2818
638.00	745.94	724.94	2273	2311	132.94	272.20	437.28	2731
640.00	748.73	727.73	2274	2312	132.42	271.28	435.98	2786
642.00	751.47	730.47	2276	2314	131.92	270.39	434.73	2746
644.00	754.22	733.22	2277	2315	131.43	269.50	433.48	2747
646.00	756.94	735.94	2278	2317	130.95	268.64	432.27	2722
648.00	759.76	738.76	2280	2318	130.44	267.72	430.96	2816
650.00	762.53	741.53	2282	2320	129.95	266.83	429.70	2774
652.00	765.15	744.15	2283	2321	129.51	266.06	428.62	2617
654.00	767.87	746.87	2284	2322	129.05	265.23	427.44	2717
656.00	770.74	749.74	2286	2324	128.53	264.29	426.10	2871
658.00	773.55	752.55	2287	2326	128.04	263.40	424.84	2807
660.00	776.26	755.26	2289	2327	127.59	262.58	423.68	2709
662.00	779.09	758.09	2290	2329	127.09	261.63	422.40	2837
664.00	781.59	760.59	2291	2329	126.72	261.02	421.47	2499
666.00	784.16	763.16	2292	2330	126.32	260.31	420.47	2570
668.00	786.81	765.81	2293	2331	125.90	259.55	419.41	2648
670.00	789.54	768.54	2294	2332	125.46	258.74	418.26	2733

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
672.00	791.90	770.90	2294	2332	125.13	258.17	417.47	2357
674.00	793.94	772.94	2294	2331	124.90	257.78	416.94	2038
676.00	796.15	775.15	2293	2331	124.62	257.29	416.27	2213
678.00	798.61	777.61	2294	2332	124.28	256.66	415.40	2457
680.00	800.99	779.99	2294	2332	123.95	256.09	414.60	2379
682.00	803.35	782.35	2294	2332	123.64	255.53	413.82	2362
684.00	805.67	784.67	2294	2332	123.33	254.99	413.03	2319
686.00	807.85	786.85	2294	2331	123.07	254.53	412.45	2183
688.00	810.05	789.05	2294	2331	122.80	254.06	411.80	2199
690.00	812.28	791.28	2294	2331	122.53	253.57	411.14	2229
692.00	814.37	793.37	2293	2330	122.29	253.16	410.58	2091
694.00	816.69	795.69	2293	2330	121.99	252.63	409.85	2321
696.00	819.01	798.01	2293	2330	121.70	252.10	409.11	2325
698.00	821.36	800.36	2293	2330	121.40	251.56	408.36	2342
700.00	823.53	802.53	2293	2330	121.14	251.12	407.75	2172
702.00	825.58	804.58	2292	2329	120.92	250.73	407.22	2053
704.00	827.90	806.90	2292	2329	120.63	250.21	406.50	2316
706.00	830.05	809.05	2292	2328	120.38	249.77	405.90	2153
708.00	832.14	811.14	2291	2328	120.16	249.37	405.36	2085
710.00	834.21	813.21	2291	2327	119.93	248.98	404.83	2063
712.00	836.34	815.34	2290	2326	119.69	248.56	404.26	2130
714.00	838.45	817.45	2290	2326	119.46	248.15	403.70	2113
716.00	840.62	819.62	2289	2325	119.22	247.72	403.10	2168
718.00	843.19	822.19	2290	2326	118.86	247.07	402.17	2573

COMPANY : BHP PETROLEUM

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
720.00	845.67	824.67	2291	2327	118.54	246.47	401.33	2480
722.00	848.32	827.32	2292	2328	118.16	245.79	400.34	2652
724.00	850.89	829.89	2293	2328	117.82	245.15	399.43	2566
726.00	853.50	832.50	2293	2329	117.46	244.50	398.49	2611
728.00	855.91	834.91	2294	2329	117.16	243.95	397.72	2409
730.00	858.45	837.45	2294	2330	116.83	243.34	396.84	2546
732.00	861.02	840.02	2295	2331	116.49	242.72	395.95	2566
734.00	863.47	842.47	2296	2331	116.18	242.16	395.15	2447
736.00	865.89	844.89	2296	2331	115.89	241.62	394.38	2425
738.00	868.31	847.31	2296	2331	115.59	241.08	393.62	2421
740.00	870.71	849.71	2297	2332	115.31	240.55	392.87	2396
742.00	873.15	852.15	2297	2332	115.01	240.01	392.09	2444
744.00	875.53	854.53	2297	2332	114.73	239.50	391.37	2375
746.00	878.01	857.01	2298	2332	114.43	238.94	390.57	2481
748.00	880.52	859.52	2298	2333	114.12	238.37	389.75	2509
750.00	882.81	861.81	2298	2333	113.86	237.90	389.09	2292
752.00	885.29	864.29	2299	2333	113.56	237.35	388.29	2484
754.00	887.80	866.80	2299	2334	113.26	236.78	387.48	2506
756.00	890.12	869.12	2299	2334	113.00	236.32	386.82	2317
758.00	892.68	871.68	2300	2334	112.68	235.73	385.96	2566
760.00	895.12	874.12	2300	2335	112.40	235.20	385.21	2441
762.00	897.41	876.41	2300	2334	112.15	234.75	384.57	2287
764.00	899.92	878.92	2301	2335	111.85	234.20	383.78	2503
766.00	902.53	881.53	2302	2336	111.53	233.59	382.90	2611

TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
768.00	905.18	884.18	2303	2337	111.20	232.97	381.99	2657
770.00	907.81	886.81	2303	2337	110.87	232.37	381.11	2622
772.00	910.50	889.50	2304	2338	110.54	231.73	380.18	2691
774.00	913.15	892.15	2305	2339	110.21	231.12	379.29	2650
776.00	915.87	894.87	2306	2340	109.87	230.48	378.35	2719
778.00	918.52	897.52	2307	2341	109.55	229.87	377.47	2649
780.00	921.29	900.29	2308	2342	109.19	229.21	376.49	2770
782.00	924.16	903.16	2310	2344	108.82	228.49	375.43	2874
784.00	927.03	906.03	2311	2345	108.44	227.78	374.38	2876
786.00	929.75	908.75	2312	2346	108.11	227.16	373.47	2714
788.00	932.64	911.64	2314	2348	107.74	226.45	372.41	2892
790.00	935.40	914.40	2315	2349	107.40	225.81	371.47	2759
792.00	938.24	917.24	2316	2350	107.04	225.13	370.47	2839
794.00	941.06	920.06	2318	2352	106.70	224.47	369.49	2819
796.00	943.93	922.93	2319	2353	106.34	223.78	368.47	2872
798.00	946.82	925.82	2320	2355	105.97	223.09	367.44	2892
800.00	949.66	928.66	2322	2356	105.63	222.43	366.46	2841
802.00	952.62	931.62	2323	2358	105.25	221.71	365.39	2963
804.00	955.56	934.56	2325	2359	104.88	221.00	364.34	2937
806.00	958.41	937.41	2326	2361	104.54	220.35	363.37	2852
808.00	961.16	940.16	2327	2362	104.22	219.75	362.48	2744
810.00	963.87	942.87	2328	2363	103.92	219.17	361.62	2708
812.00	966.71	945.71	2329	2364	103.58	218.53	360.67	2848
814.00	969.09	948.09	2329	2364	103.36	218.10	360.04	2376

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
816.00	972.07	951.07	2331	2366	102.99	217.40	358.99	2979
818.00	975.11	954.11	2333	2368	102.61	216.66	357.90	3045
820.00	978.07	957.07	2334	2369	102.26	215.98	356.88	2956
822.00	981.04	960.04	2336	2371	101.90	215.30	355.85	2963
824.00	983.77	962.77	2337	2372	101.61	214.73	355.01	2737
826.00	986.44	965.44	2338	2373	101.33	214.19	354.21	2664
828.00	988.94	967.94	2338	2373	101.08	213.73	353.53	2500
830.00	991.45	970.45	2338	2373	100.84	213.27	352.85	2508
832.00	993.97	972.97	2339	2374	100.59	212.80	352.16	2520
834.00	996.63	975.63	2340	2374	100.32	212.28	351.39	2661
836.00	999.17	978.17	2340	2375	100.07	211.81	350.69	2540
838.00	1001.63	980.63	2340	2375	99.84	211.37	350.04	2465
840.00	1004.42	983.42	2341	2376	99.54	210.79	349.19	2791
842.00	1007.00	986.00	2342	2376	99.29	210.31	348.48	2574
844.00	1009.28	988.28	2342	2376	99.10	209.95	347.95	2278
846.00	1011.84	990.84	2342	2377	98.85	209.48	347.25	2563
848.00	1014.21	993.21	2342	2377	98.65	209.09	346.67	2374
850.00	1016.71	995.71	2343	2377	98.42	208.65	346.02	2496
852.00	1019.22	998.22	2343	2377	98.18	208.20	345.36	2510
854.00	1021.50	1000.50	2343	2377	97.99	207.84	344.84	2282
856.00	1024.07	1003.07	2344	2378	97.75	207.38	344.15	2568
858.00	1026.68	1005.68	2344	2378	97.50	206.90	343.44	2610
860.00	1029.26	1008.26	2345	2379	97.26	206.43	342.74	2584
862.00	1031.83	1010.83	2345	2379	97.02	205.98	342.06	2568

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
864.00	1034.44	1013.44	2346	2380	96.78	205.51	341.36	2605
866.00	1037.12	1016.12	2347	2380	96.52	205.01	340.61	2680
868.00	1039.81	1018.81	2347	2381	96.26	204.51	339.36	2695
870.00	1042.05	1021.05	2347	2381	96.09	204.18	339.38	2235
872.00	1044.45	1023.45	2347	2381	95.88	203.79	338.80	2404
874.00	1046.72	1025.72	2347	2381	95.71	203.45	338.31	2264
876.00	1049.01	1028.01	2347	2380	95.52	203.10	337.80	2293
878.00	1051.59	1030.59	2348	2381	95.29	202.65	337.13	2579
880.00	1054.11	1033.11	2348	2381	95.07	202.23	336.49	2523
882.00	1056.66	1035.66	2348	2382	94.85	201.79	335.84	2551
884.00	1059.37	1038.37	2349	2382	94.59	201.30	335.10	2708
886.00	1061.86	1040.86	2350	2383	94.38	200.89	334.49	2483
888.00	1064.73	1043.73	2351	2384	94.10	200.34	333.65	2873
890.00	1067.69	1046.69	2352	2385	93.80	199.75	332.76	2958
892.00	1070.46	1049.46	2353	2386	93.54	199.24	331.99	2772
894.00	1072.98	1051.98	2353	2387	93.33	198.83	331.37	2524
896.00	1075.71	1054.71	2354	2387	93.08	198.34	330.63	2731
898.00	1078.50	1057.50	2355	2388	92.82	197.84	329.87	2786
900.00	1081.18	1060.18	2356	2389	92.58	197.37	329.17	2680
902.00	1083.89	1062.89	2357	2390	92.34	196.90	328.45	2714
904.00	1086.64	1065.64	2358	2391	92.09	196.41	327.71	2752
906.00	1089.48	1068.48	2359	2392	91.82	195.90	326.92	2833
908.00	1091.91	1070.91	2359	2392	91.63	195.53	326.37	2430
910.00	1094.10	1073.10	2358	2391	91.48	195.24	325.95	2183

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KS M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
912.00	1096.16	1075.16	2358	2391	91.35	194.99	325.58	2061
914.00	1098.23	1077.23	2357	2390	91.21	194.73	325.21	2075
916.00	1100.29	1079.29	2357	2389	91.08	194.48	324.84	2057
918.00	1102.33	1081.33	2356	2389	90.95	194.23	324.49	2042
920.00	1105.10	1084.10	2357	2390	90.71	193.75	323.76	2766
922.00	1107.88	1086.88	2358	2390	90.46	193.27	323.02	2783
924.00	1110.86	1089.86	2359	2392	90.18	192.71	322.17	2977
926.00	1113.82	1092.82	2360	2393	89.91	192.17	321.33	2961
928.00	1116.80	1095.80	2362	2395	89.63	191.61	320.48	2985
930.00	1119.95	1098.95	2363	2397	89.32	191.00	319.53	3145
932.00	1122.91	1101.91	2365	2398	89.05	190.46	318.71	2962
934.00	1125.07	1104.07	2364	2397	88.91	190.19	318.31	2161
936.00	1127.88	1106.88	2365	2398	88.67	189.72	317.58	2808
938.00	1130.78	1109.78	2366	2400	88.41	189.21	316.80	2898
940.00	1133.51	1112.51	2367	2400	88.18	188.77	316.13	2732
942.00	1136.27	1115.27	2368	2401	87.96	188.32	315.43	2760
944.00	1138.89	1117.89	2368	2402	87.75	187.91	314.82	2619
946.00	1140.94	1119.94	2368	2401	87.63	187.68	314.48	2052
948.00	1143.03	1122.03	2367	2400	87.50	187.44	314.12	2090
950.00	1145.19	1124.19	2367	2400	87.37	187.18	313.74	2159
952.00	1147.25	1126.25	2366	2399	87.25	186.94	313.39	2060
954.00	1149.32	1128.32	2365	2399	87.12	186.71	313.04	2068
956.00	1151.38	1130.38	2365	2398	87.00	186.47	312.70	2067
958.00	1153.43	1132.43	2364	2397	86.88	186.25	312.36	2041

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
960.00	1155.43	1134.48	2364	2397	86.76	186.01	312.02	2058
962.00	1157.55	1136.55	2363	2396	86.64	185.78	311.68	2063
964.00	1159.60	1138.60	2362	2395	86.52	185.55	311.34	2055
966.00	1161.66	1140.66	2362	2395	86.40	185.32	311.00	2054
968.00	1163.71	1142.71	2361	2394	86.28	185.09	310.67	2057
970.00	1165.76	1144.76	2360	2393	86.17	184.87	310.33	2049
972.00	1168.43	1147.43	2361	2394	85.96	184.46	309.71	2671
974.00	1171.35	1150.35	2362	2395	85.72	183.97	308.95	2919
976.00	1174.06	1153.06	2363	2396	85.51	183.56	308.32	2713
978.00	1176.76	1155.76	2364	2396	85.30	183.15	307.69	2699
980.00	1179.40	1158.40	2364	2397	85.11	182.76	307.09	2636
982.00	1182.10	1161.10	2365	2398	84.90	182.36	306.47	2701
984.00	1184.71	1163.71	2365	2398	84.71	181.98	305.89	2605
986.00	1186.70	1165.70	2365	2397	84.61	181.78	305.59	1997
988.00	1188.69	1167.69	2364	2397	84.50	181.57	305.29	1988
990.00	1190.68	1169.68	2363	2396	84.39	181.37	304.99	1985
992.00	1192.68	1171.68	2362	2395	84.29	181.16	304.68	2002
994.00	1194.87	1173.87	2362	2395	84.16	180.90	304.30	2195
996.00	1197.28	1176.28	2362	2395	84.00	180.59	303.82	2407
998.00	1199.81	1178.81	2362	2395	83.82	180.25	303.30	2525
1000.00	1202.58	1181.58	2363	2396	83.62	179.83	302.65	2773
1002.00	1205.13	1184.13	2364	2396	83.44	179.48	302.11	2548
1004.00	1207.66	1186.66	2364	2396	83.27	179.14	301.59	2535
1006.00	1210.17	1189.17	2364	2397	83.10	178.81	301.07	2512

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
1003.00	1212.80	1191.80	2365	2397	82.91	178.44	300.51	2631
1010.00	1215.38	1194.38	2365	2397	82.74	178.09	299.97	2576
1012.00	1218.06	1197.06	2366	2398	82.55	177.71	299.38	2675
1014.00	1221.16	1200.16	2367	2400	82.29	177.19	298.57	3108
1016.00	1223.86	1202.86	2368	2400	82.10	176.81	297.98	2700
1018.00	1226.53	1205.53	2368	2401	81.92	176.44	297.40	2662
1020.00	1229.27	1208.27	2369	2402	81.72	176.04	296.79	2747
1022.00	1231.93	1210.93	2370	2402	81.54	175.68	296.23	2653
1024.00	1234.65	1213.65	2370	2403	81.35	175.30	295.64	2715
1026.00	1237.30	1216.30	2371	2403	81.17	174.93	295.07	2657
1028.00	1240.08	1219.08	2372	2404	80.97	174.54	294.46	2780
1030.00	1242.96	1221.96	2373	2405	80.76	174.11	293.79	2876
1032.00	1245.74	1224.74	2374	2406	80.56	173.72	293.18	2780
1034.00	1248.52	1227.52	2374	2407	80.37	173.32	292.57	2781
1036.00	1251.27	1230.27	2375	2407	80.18	172.94	291.97	2753
1038.00	1254.26	1233.26	2376	2409	79.95	172.49	291.27	2984
1040.00	1256.98	1235.98	2377	2409	79.77	172.12	290.69	2717
1042.00	1259.77	1238.77	2378	2410	79.58	171.73	290.08	2794
1044.00	1262.53	1241.53	2378	2411	79.39	171.36	289.50	2757
1046.00	1265.37	1244.37	2379	2412	79.19	170.96	288.87	2845
1048.00	1267.94	1246.94	2380	2412	79.03	170.63	288.37	2570
1050.00	1270.95	1249.95	2381	2413	78.81	170.19	287.67	3007
1052.00	1273.91	1252.91	2382	2414	78.60	169.76	286.99	2966
1054.00	1276.70	1255.70	2383	2415	78.41	169.38	286.40	2786

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
								2915
1056.00	1279.61	1258.61	2384	2416	78.21	168.97	285.75	3014
1058.00	1282.63	1261.63	2385	2417	77.99	168.53	285.06	2683
1060.00	1285.32	1264.32	2386	2418	77.82	168.18	284.52	2983
1062.00	1288.30	1267.30	2387	2419	77.61	167.75	283.85	2757
1064.00	1291.06	1270.06	2387	2420	77.43	167.39	283.29	2605
1066.00	1293.67	1272.67	2388	2420	77.27	167.08	282.79	2229
1068.00	1295.90	1274.90	2387	2420	77.16	166.85	282.44	2697
1070.00	1298.59	1277.59	2388	2420	76.99	166.51	281.91	3004
1072.00	1301.60	1280.60	2389	2422	76.78	166.08	281.24	2688
1074.00	1304.28	1283.28	2390	2422	76.62	165.75	280.72	2714
1076.00	1307.00	1286.00	2390	2423	76.45	165.41	280.13	3191
1078.00	1310.19	1289.19	2392	2424	76.22	164.93	279.43	2712
1080.00	1312.90	1291.90	2392	2425	76.05	164.60	278.90	2734
1082.00	1315.64	1294.64	2393	2426	75.88	164.26	278.37	3131
1084.00	1318.77	1297.77	2394	2427	75.66	163.80	277.65	3325
1086.00	1322.09	1301.09	2396	2429	75.41	163.30	276.84	3387
1088.00	1325.48	1304.48	2398	2431	75.16	162.77	276.01	3388
1090.00	1328.87	1307.87	2400	2433	74.90	162.25	275.18	2929
1092.00	1331.79	1310.79	2401	2434	74.72	161.87	274.57	2816
1094.00	1334.61	1313.61	2401	2435	74.54	161.51	274.02	2773
1096.00	1337.38	1316.38	2402	2436	74.38	161.18	273.43	2707
1098.00	1340.09	1319.09	2403	2436	74.22	160.85	272.98	2710
1100.00	1342.80	1321.80	2403	2437	74.06	160.53	272.47	2686
1102.00	1345.49	1324.49	2404	2437	73.91	160.22	271.98	

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
								2789
1104.00	1348.28	1327.28	2404	2438	73.74	159.88	271.45	2822
1106.00	1351.10	1330.10	2405	2439	73.57	159.54	270.91	2780
1108.00	1353.88	1332.88	2406	2439	73.41	159.21	270.38	2703
1110.00	1356.59	1335.59	2406	2440	73.26	158.89	269.89	2652
1112.00	1359.24	1338.24	2407	2440	73.11	158.60	269.42	2624
1114.00	1361.86	1340.86	2407	2441	72.97	158.30	268.96	2738
1116.00	1364.60	1343.60	2408	2441	72.81	157.99	268.46	2783
1118.00	1367.38	1346.38	2409	2442	72.65	157.66	267.94	2786
1120.00	1370.17	1349.17	2409	2442	72.49	157.33	267.42	2750
1122.00	1372.92	1351.92	2410	2443	72.34	157.02	266.92	2743
1124.00	1375.66	1354.66	2410	2444	72.18	156.70	266.43	2870
1126.00	1378.53	1357.53	2411	2444	72.02	156.36	265.88	2817
1128.00	1381.35	1360.35	2412	2445	71.86	156.03	265.36	2767
1130.00	1384.12	1363.12	2413	2446	71.70	155.72	264.86	2829
1132.00	1386.95	1365.95	2413	2446	71.54	155.39	264.34	2856
1134.00	1389.80	1368.80	2414	2447	71.38	155.05	263.81	3002
1136.00	1392.80	1371.80	2415	2448	71.20	154.68	263.22	2977
1138.00	1395.78	1374.78	2416	2449	71.02	154.32	262.65	2957
1140.00	1398.74	1377.74	2417	2450	70.85	153.97	262.03	3004
1142.00	1401.74	1380.74	2418	2451	70.67	153.60	261.50	2782
1144.00	1404.52	1383.52	2419	2452	70.52	153.29	261.01	2860
1146.00	1407.38	1386.38	2420	2453	70.36	152.97	260.49	2805
1148.00	1410.19	1389.19	2420	2453	70.21	152.65	259.99	2885
1150.00	1413.07	1392.07	2421	2454	70.05	152.33	259.46	

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
1152.00	1415.89	1394.89	2422	2455	69.90	152.01	258.97	2817
1154.00	1418.66	1397.66	2422	2455	69.75	151.71	258.49	2767
1156.00	1421.57	1400.57	2423	2456	69.59	151.38	257.96	2913
1158.00	1424.49	1403.49	2424	2457	69.43	151.05	257.43	2924
1160.00	1427.47	1406.47	2425	2458	69.26	150.70	256.87	2981
1162.00	1430.22	1409.23	2426	2459	69.12	150.41	256.41	2750
1164.00	1433.04	1412.04	2426	2459	68.97	150.10	255.92	2815
1166.00	1435.97	1414.97	2427	2460	68.81	149.77	255.40	2933
1168.00	1439.06	1418.06	2428	2462	68.63	149.41	254.81	3086
1170.00	1442.14	1421.14	2429	2463	68.46	149.05	254.23	3083
1172.00	1445.08	1424.08	2430	2464	68.30	148.72	253.70	2942
1174.00	1447.94	1426.94	2431	2464	68.15	148.41	253.21	2854
1176.00	1450.77	1429.77	2432	2465	68.01	148.11	252.73	2832
1178.00	1453.64	1432.64	2432	2466	67.86	147.80	252.24	2866
1180.00	1456.45	1435.45	2433	2466	67.71	147.51	251.77	2814
1182.00	1459.56	1438.56	2434	2468	67.54	147.15	251.19	3106
1184.00	1462.58	1441.58	2435	2469	67.38	146.81	250.65	3027
1186.00	1465.42	1444.42	2436	2469	67.23	146.51	250.17	2841
1188.00	1468.33	1447.33	2437	2470	67.08	146.21	249.68	2903
1190.00	1471.25	1450.25	2437	2471	66.93	145.89	249.18	2919
1192.00	1474.02	1453.02	2438	2471	66.80	145.62	248.74	2769
1194.00	1476.75	1455.75	2438	2472	66.67	145.35	248.31	2731
1196.00	1479.42	1458.42	2439	2472	66.55	145.09	247.90	2672
1198.00	1482.18	1461.18	2439	2473	66.41	144.82	247.47	2755

COMPANY : BHP PETROLEUM

WELL : TOMMYRUFF #1

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TWO-WAY TRAVEL TIME FROM SRD MS	MEASURED DEPTH FROM KB M	VERTICAL DEPTH FROM SRD M	AVERAGE VELOCITY SRD/GEO M/S	RMS VELOCITY M/S	FIRST NORMAL MOVEOUT MS	SECOND NORMAL MOVEOUT MS	THIRD NORMAL MOVEOUT MS	INTERVAL VELOCITY M/S
1200.00	1485.00	1464.00	2440	2473	66.28	144.54	247.01	2826
1202.00	1487.72	1466.72	2440	2474	66.15	144.28	246.59	2717
1204.00	1490.54	1469.54	2441	2474	66.01	143.99	246.14	2816
1206.00	1493.55	1472.55	2442	2475	65.86	143.67	245.62	3014
1208.00	1496.92	1475.92	2444	2477	65.67	143.27	244.96	3370
1210.00	1500.31	1479.31	2445	2479	65.47	142.86	244.30	3392
1212.00	1503.70	1482.70	2447	2481	65.28	142.46	243.65	3387
1214.00	1506.94	1485.94	2448	2482	65.10	142.09	243.05	3244
1216.00	1510.43	1489.43	2450	2484	64.90	141.66	242.36	3491
1218.00	1513.96	1492.96	2451	2486	64.69	141.23	241.66	3529
1220.00	1517.33	1496.33	2453	2488	64.50	140.84	241.03	3369
1222.00	1521.36	1500.36	2456	2491	64.24	140.28	240.12	4024
1224.00	1525.25	1504.25	2458	2494	63.99	139.76	239.27	3898
1226.00	1529.05	1508.05	2460	2497	63.76	139.27	238.47	3799

SECTION 5

**BHP ENGINEERING PTY LTD
LAND TECHNOLOGIES DIVISION**

**SURVEY REPORT
FOR
BHP PETROLEUM
TOMMYRUFF No 1
SOUTHERN CROSS**

WOLLONGONG

MAY 1990



H77/152

BHP ENGINEERING PTY LTD
LAND TECHNOLOGIES DIVISION

SURVEY REPORT
FOR
BHP PETROLEUM
TOMMYRUFF NO.1
SOUTHERN CROSS

Ref:JR:MB
Doc No: 0017s
May 1990

Prepared by:
BHP Engineering Pty Ltd
(Incorporated in ACT)
Australia

Postal Address:
PO Box 1794
Wollongong, NSW, 2500

Telephone: (042) 28 0411
Telex: 29176
Facsimile: (042) 28 0893

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 - 3.4 Confirmation of Results
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1.0 ABSTRACT

BHP Engineering Pty Ltd Land Technologies Division (LTD) were contacted by BHP Petroleum to act as survey representative during the positioning of the drillrig SOUTHERN CROSS on the location known as TOMMYRUFF #1 in the Bass Strait.

The intended location as given by BHP Petroleum was:

AGD 66

Latitude	38 deg 36 min 55.80 sec South
Longitude	147 deg 08 min 34.10 sec East

AMG Zone 51

Eastings	512 429m
Northings	5 725 868m
Heading	230 degrees

The survey vessel "Canning Tide", manned and equipped with Trisponder positioning equipment was utilised. Three Trisponder beacons were placed on surveyed stations along the coastline adjacent to the proposed drilling location. The "Canning Tide" was used to deploy buoys at the 4 primary anchor positions and 2 gate markers.

A Surveyor was mobilised onto the vessel at Barrys Beach on the 16th May 1990 with the BHPE LTD Survey Representative joining the "Southern Cross" on the 17th May 1990.

The drillrig "SOUTHERN CROSS" arrived on location on the 18th May and the final position was taken at 03.40 hrs on the 19th May.

The final position of the drillrig "SOUTHERN CROSS" drillstem on the Tommyruff #1 location as determined by Trisponder ranges was found to be as follows:-

AGD 66

Latitude 38 deg 36 min 47.40 sec South

Longitude 147 deg 08 min 33.70 sec East

AMG Zone 55

Easting 512 423m

Northing 5 726 125m

Rig Hdg 225 degrees

This places the drillstem a distance of 9 metres on a bearing of 320° from the proposed location.

The survey team demobilised from location on the 20/05/90.

2.0 CLIENT REQUIREMENTS

The scope of works required BHP Engineering Pty. Ltd. Land Technologies Division to carry out the following tasks :-

- a) To utilize the existing Trisponder network at the Tommyruff #1 location as a means of positioning the drill rig.
- b) Using the trisponder array, deploy buoys marking the intended location of the four primary anchors and in addition two gate buoys 100 metres either side of the proposed location.
- c) Use the trisponder array to position the drill rig on the proposed location within a 50 metre radius circle of tolerance.

3.0 SURVEY PROCEDURES

3.1 TRISPONDER POSITIONING SYSTEM

A network of Trisponder beacons were used for positioning purposes during the course of the survey. These beacons had been positioned to assist in previous surveys in the Bass Strait Oil Fields. The network is maintained by ESSO. For this survey, beacons at three locations were utilized:

BARRACOUTA PLATFORM
LONGFORD
CURRAJONG

3.2 MARKER BUOY DEPLOYMENT

The marker buoys were deployed on the 17th May using Trisponder ranges.

The marker buoys were made up with the length of rope, being the water depth +10% to allow for tide with a light, and flag being fitted to each marker buoy.

3.3 POSITIONING

Once the rig was anchored up and all anchors pre-tensioned and then set to their working tension a final acoustic position of the drillstem was computed and the results submitted to the BHPP company Representative, Mr John Dixon for approval.

The final trisponder position placed the rig on a bearing of 320 degrees for 9 metres from the intended location.

3.4 CONFIRMATION OF RESULTS

Due to problems experienced with ranges received from the trisponder mobile unit onboard the "Southern Cross", it was thought prudent to re-observe the trisponder ranges using another calibrated mobile unit. This was arranged for the 20th May. The following are the results of the re-observation of the ranges:

Position of drillstem:

Easting 512 425m

Northing 5 726 114m

placing the rig on a bearing of 223 degrees for a distance of 6 metres from the intended location of Tommyruff #1.

4. PERSONNEL

The following personnel were involved in this project:-

J Rutherford	Surveyor
C. Litteron	Surveyor

ENCLOSURES

Enclosures

PE603810

This is an enclosure indicator page.
The enclosure PE603810 is enclosed within the
container PE906426 at this location in this
document.

The enclosure PE603810 has the following characteristics:

ITEM_BARCODE = PE603810
CONTAINER_BARCODE = PE906426
NAME = Mud Log
BASIN = GIPPSLAND
PERMIT = VIC/P25
TYPE = WELL
SUBTYPE = MUD_LOG
DESCRIPTION = Mud Log (Exlog) for Tommyruff-1
REMARKS =
DATE_CREATED = 28/05/90
DATE_RECEIVED = 26/10/90
W_NO = W1030
WELL_NAME = TOMMYRUFF-1
CONTRACTOR = EXLOG
CLIENT_OP_CO = BHP PETROLEUM

(Inserted by DNRE - Vic Govt Mines Dept)

PE603811

This is an enclosure indicator page.
The enclosure PE603811 is enclosed within the
container PE906426 at this location in this
document.

The enclosure PE603811 has the following characteristics:

- ITEM_BARCODE = PE603811
- CONTAINER_BARCODE = PE906426
 - NAME = Drift Corrected Sonic Log
 - BASIN = GIPPSLAND
 - PERMIT = VIC/P25
 - TYPE = WELL
 - SUBTYPE = WELL_LOG
- DESCRIPTION = Drift Corrected Sonic Log for
Tommyruff-1
- REMARKS =
- DATE_CREATED = 29/05/90
- DATE_RECEIVED = 26/10/90
 - W_NO = W1030
 - WELL_NAME = TOMMYRUFF-1
 - CONTRACTOR = SCHLUMBERGER
 - CLIENT_OP_CO = BHP PETROLEUM

(Inserted by DNRE - Vic Govt Mines Dept)

PE603812

This is an enclosure indicator page.
The enclosure PE603812 is enclosed within the
container PE906426 at this location in this
document.

The enclosure PE603812 has the following characteristics:

- ITEM_BARCODE = PE603812
- CONTAINER_BARCODE = PE906426
- NAME = Seismic Calibration Log
- BASIN = GIPPSLAND
- PERMIT = VIC/P25
- TYPE = WELL
- SUBTYPE = VELOCITY_CHART
- DESCRIPTION = Seismic Calibration Log (Adjusted
continuous velocity log) for
Tommyruff-1
- REMARKS =
- DATE_CREATED = 29/05/90
- DATE_RECEIVED = 26/10/90
- W_NO = W1030
- WELL_NAME = TOMMYRUFF-1
- CONTRACTOR = SCHLUMBERGER
- CLIENT_OP_CO = BHP PETROLEUM

(Inserted by DNRE - Vic Govt Mines Dept)