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PEL 5 AND PEL 6, TOOLACHEE BLOCK

EROMANGA BASIN AND COOPER BASIN

MUNKARIE 5

TEST REPORTS

Submitted by

Delhi Petroleum Pty Ltd
1985

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MINES and ENERGY
RESOURCES SOUTH
AUSTRALIA



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ENVELOPE 5578

TENEMENT: PELs 5 and 6, Toolachee Block; Eromanga and Cooper Basins

TENEMENT HOLDER: Delhi Petroleum Pty Ltd (operator), Santos Ltd, Vamgas Ltd and South Australian Oil and Gas Corp. Pty Ltd

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VELOCITY SURVEY - TIME/DEPTH CALIBRATION

MUNKARIE 5

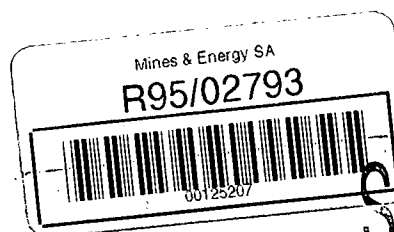
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SANTOS
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SAOME



by M. McKLERY
Geophysicist



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NORTHERN
TERRITORYQUEENSLAND
SOUTH AUSTRALIA

A.T.P. 259P.

26°

BIRDSVILLE TRACK RIDGE

PEDIRKA

27°

P.E.L. 586

PATCHAWARRA EAST

PATCHAWARRA CENT.

MERRIM
INNANSECTOR
SECTOR

PATCHAWARRA SW

MOOMBA

28°

LAKE
EYRE

WULKA

PEDIRKA
COOPER

L. EYRE

L. GREGORY

MUNKARIE 5

MURTA

TOOLACHEE

QUEENSLAND
NEW SOUTH
WALES

TINGA-TINGANA

L. BLANCHE

ARROWIE SECTOR

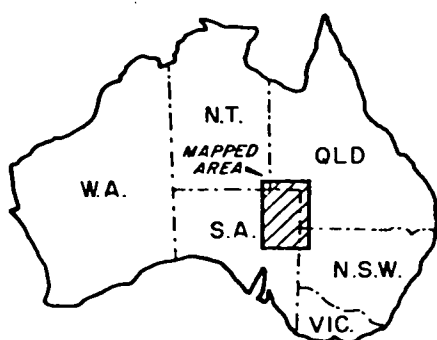
L. CALLABONNA

138°

139°

140°

141°



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LOCATION MAP

MUNKARIE 5

P.E.L. 586 SOUTH AUSTRALIA

SCALE 1:2000000
KILOMETRES 20 0 20 40 60 80 100 120 KILOMETRES

Author : R. HALL

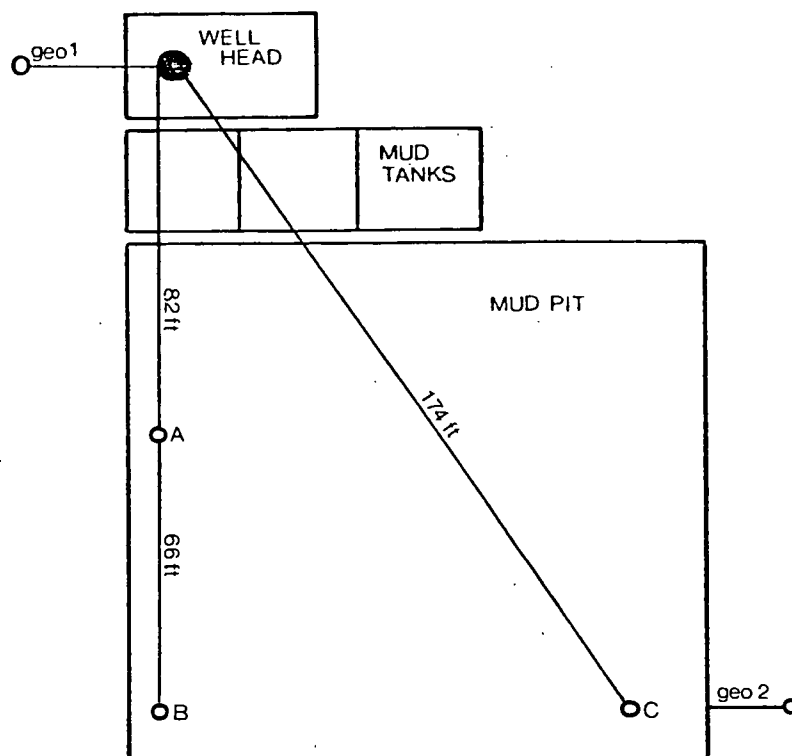
Date : JULY 1984

Drafted : W. ASPINALL

Dwg. No. : 84XG-3764

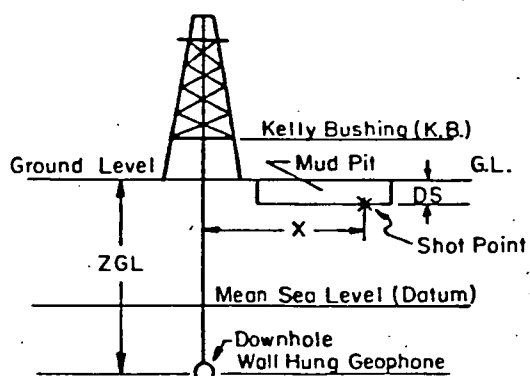
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Fig. 1



• SHOT POINT

◦ REFERENCE GEOPHONE



$$T = T_0 \cos \left[\tan^{-1} \left(\frac{X}{ZGL - DS} \right) \right]$$

T_0 $\equiv$ Time from Shot Point to downhole geophone. (record time)

T $\equiv$ Time for vertical ray path from shot point level of well-head to downhole geophone level.

SHOT POINT	A	B	C	D
Depth Relative to G.L. of K.B.	7	7	8	
Horizontal Distance from K.B.	82	148	174	

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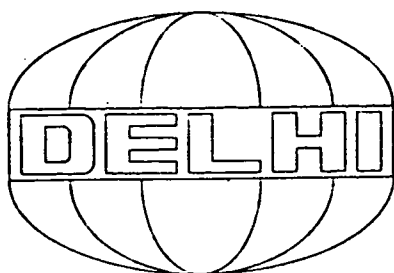
LOCATION DIAGRAM MUNKARIE 5 WELL VELOCITY SURVEY

DATE: 250884

DRAFTED: MKM

DWG. No.

FIGURE 2



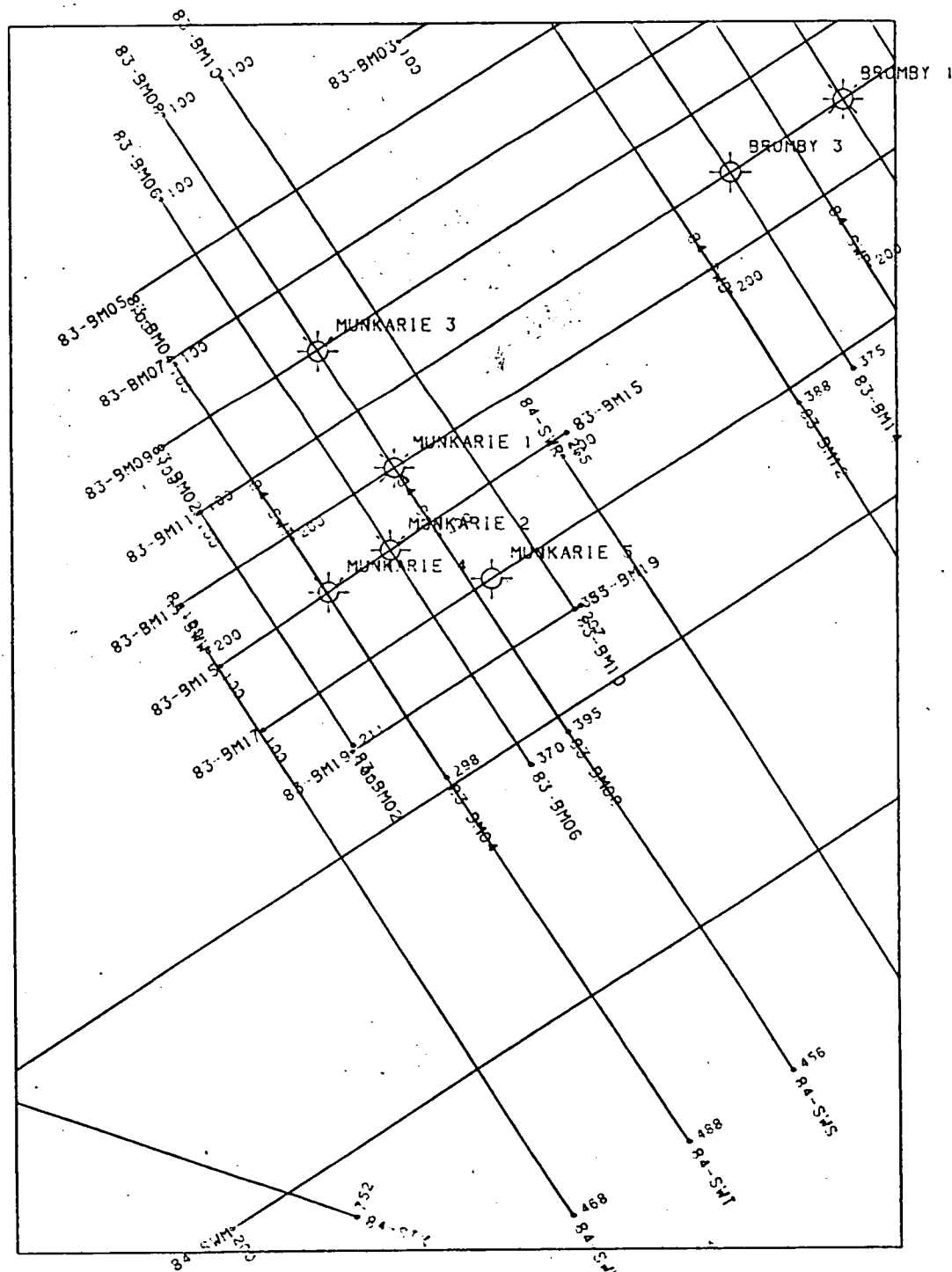
MUNKARIE 5

1 : 100000

SEISMIC LOCATION MAP

FIGURE 3

28 24 00S



28 34 00S

140 52 00E

141 00 00E

VELOCITY SURVEY-TIME/DEPTH CALIBRATIONMUNKARIE 51.0 INTRODUCTION

A well velocity survey was conducted by Delhi Petroleum Pty. Ltd. at the Munkarie 5 wellsite on Saturday 25 August 1984.

Velocity Data Pty. Ltd., of Brisbane were the recording contractors, providing the recording equipment and down-hole tool used in the survey.

Twenty five good quality records were obtained at twenty three different levels using ANZOMEX boosters detonated in the mud pit as the energy source. The down-hole tool was a wall-locking vertical motion geophone device.

Check shots at datum (248') were taken to confirm the static correction used in the processing of the line S83-MB17.

A Time/Depth curve was computed by fitting the integrated sonic time curve to the check-shot data by the least squares method.

* Note: all depths are below K.B. unless otherwise specified.

2.0 MUNKARIE 5 DEPTH PROGNoses

Prognoses of formation tops at Munkarie 5 were based on an interpretation of the S83-BM17 recorded in the Munkarie area.

TABLE 1

COMPARISON OF WELLTOP AND PROGNosed DEPTHS

DEPTH (feet below M.S.L.)

Horizon	C	P	R	T	V
Prognosis	3920	5530	6060	6460	6895
Well top	4008	5604	6151	6586	7010
Difference	-88	-74	-91	-126	-115

3.0 DATUM STATIC DETERMINATION

Three shots at datum were taken at different shot locations (Figure 2) with the down-hole tool locked in casing at mean sea level, 298 ft below KB. Ground level was surveyed at 283 ft above mean sea level.

The mean vertical one-way time after geometrical offset correction was 71 ms (Enclosure 1). A shot depth corrections of 4 msec was added due to the shots being 8 ft below the seismic elevation of 283 ft. A LVL velocity of 2000 ft/sec was used in the correction calculation.

TABLE 2
DATUM STATIC DETERMINATION

SHOT No	SHOT LOC	SHOT DEPTH (ft)	SHOT OFFSET (ft)	ARRIVAL TIME (ms)	SHOT DATUM (ms)	SURFACE -DATUM (ms)
1	A	7	82	72	69	73
2	B	7	148	79	70	74
3	C	8	174	86	73	77
average					71	75

3.0

DATUM STATIC DETERMINATION (Cont.)

The seismic static and velocity survey static are compared below.

TABLE 3

COMPARISON OF SEISMIC AND VELOCITY SURVEY STATIC

	SEISMIC LINE	VELOCITY SURVEY	DIFFERENCE
GROUND AND SHOT ELEVATION (ft)	283	283	0
DATUM STATIC (ms)	77	75	2
INTERVAL VELOCITY GROUND LEVEL TO DATUM (ft/sec)	3675	3773	98

4.0 WELLSHOOT OPERATIONS

Shots were taken at 23 levels down the hole. 12 Levels were chosen to coincide with formation tops picked from electric logs by the well site geologist. Several intermediate shots were taken to ensure that subsurface sampling did not exceed 500 feet.

The hole condition was generally good, allowing the tool to couple satisfactorily thus keeping noise levels to a minimum. Record quality was good to excellent.

The explosive type used was ANZOMEX boosters. Various charge sizes were used according to the depth below the surface. These provided adequate energy returns.

5.0 TIME/DEPTH CALIBRATION

The digital sonic (SLS) was integrated, summed and plotted against depth to produce an uncalibrated sonic T/Z curve.

The checkshot times were corrected for geometric offset and shot-to-datum static. The uncalibrated sonic T/Z curve was initially tied to the C horizon checkshot to allow drift-curve calculation. The sonic T/Z curve was then bulk shifted in time so as to provide the least-square error between the checkshots and the sonic values below the C horizon. Inclusion of checkshots above the C horizon leads to a bias in the least-squares error due to the large negative drift which occur above this level.

Drift corrections were then calculated by fitting two linear functions to the check-sonic drift values. The two linear functions were calculated by the least-squares method.

The calibrated sonic T/Z curve was corrected for drift with the values derived from the drift curve.

Table 4 lists the travel time and drift values at the successive stages of the process as well as the final rms errors in time of the T/Z curve. An rms error in equivalent depth is calculated using the interval velocities shown in Enclosure 1. A "worst case" error in depth interpretation from the T/Z curve was computed.

TABLE 4

CHECK SHOT - SONIC TIME DIFFERENCES

DEPTH (ft)		TRAVEL-TIME to DATUM (ms)			CHECK - SONIC		
Below K.B. (ft)	Below M.S.L. (ft)	Check- Shot (ms)	Tied Sonic (ms)	Drift Corr. Sonic (ms)	Tied Sonic (ms)	Drift Corr. Sonic (ms)	Depth Diff. (ft)
800	502						
1300	1002	158	169	158	-11	0	0
1800	1502	235	241	237	-6	-2	-13
2300	2002	298	307	296	-9	2	16
3300	3002	429	431	431	-2	-2	-15
3800	3502	481	487	477	-6	4	38
4306	4008	541	541	541	0	0	0
4488	4190	557	559	555	-2	2	21
4670	4372	573	575	571	-2	2	23
4970	4672	599	600	598	-1	1	12
5422	5124	634	635	633	-1	1	13
5488	5190	639	640	638	-1	1	13
5716	5418	656	658	654	-2	2	27
5906	5608	669	672	666	-3	3	44
6450	6152	716	718	714	-2	2	23
6567	6269	726	727	725	-1	1	12
6896	6598	753	751	755	2	-2	-24
7085	6787	767	766	768	1	-1	-14
7313	7015	784	782	786	2	-2	-27
7930	7632	830	829	831	1	-1	-13
8070	7772	-	**BELOW LOWER LIMIT OF SONIC**				
8105	7807	-	" " " "				
rms values					4.1	3.5	21.2

* NOTE - All figures derived using the C Horizon as the tie point.

TABLE 5
SURVEY RESULTS

DEPTH (feet below M.S.L.)

Horizon	C	P	R	T	V
Prognosis	3920	5530	6060	6460	6895
Well top	4008	5604	6151	6586	7010
Difference	-88	-74	-91	-126	-115

TWO-WAY TIME* (msecs)

Horizon	C	P	R	T	V
Prognosis	1061	1330	1420	1500	1558
Well top	1082	1338	1432	1504	1567
Difference	-21	-8	-12	-4	-9

AVERAGE VELOCITY (ft/sec)

Horizon	C	P	R	T	V
Prognosis	7389	8316	8535	8613	8851
Well top	7409	8377	8591	8758	8947
Difference	-20	-61	-56	-145	-96

6.0 RESULTS

After calibration, the T/Z curve had a rms depth error of 21 ft and a rms time error of 3.5 ms. Table 5 indicates the results against prognoses. The prognoses were derived from the interpretation of the Munkarie 2 and 3 wells.

The datum static indicates a OWT difference of 2 ms.

Formation tops were intersected consistently shallow to prognosis varying from 74 ft at the P to 126 ft at the T level. The error in depth prognosis was due to a combination of timing discrepancies and the choice of average velocities. The prognosed times varied from the wellshoot by 4 ms shallow at the T to 21 ms shallow at the C. The datum static contributed 4msi TWT to take timing discrepancy. The average velocities used in the depth prognosis were consistently low.

TABLE 6

SURVEY DATA

Personnel Present

Observer - Well shoot
Shooter

T. Beale Velocity Data Pty. Ltd.

Recording Parameters

Energy Source
Shot Offset and Depth
(B.G.L.)

Explosive - BOOSTERS
Location A : 82 feet, 7 feet
Location B : 148 feet, 7 feet
Location C : 174 feet, 8 feet

Production Shooting:
Datum Shooting :

Location C
Location A, B, C.

Equipment

Recorder
Reference Geophone
Downhole Geophone

E.I.E. RS 44W
Hall Sears HS 1
Geospace WLS-100 Wall-locking type

Elements

6 HS 1 4.5 Hz 215 ohm
high temperature elements
series parallel connection
Frequency response: 8-300 Hz within 3db

Pre-amplifier - 48 db fixed gain
Frequency response: 5-200 Hz within 3db

Monitor Traces

- 1 Instrument time break
- 2-4 Analogue down-hole geophone signal - low, medium and high gain
- 5 Digital down-hole geophone signal IFP gain
- 6 Confirmation time break geophone signal

Munkar No. 5

25-02-84

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SHOT RECORD TABLE

DATUM SHOTS (DATUM=MSL)

Z (KB) = 298 FT Z (GL) = 283 FT

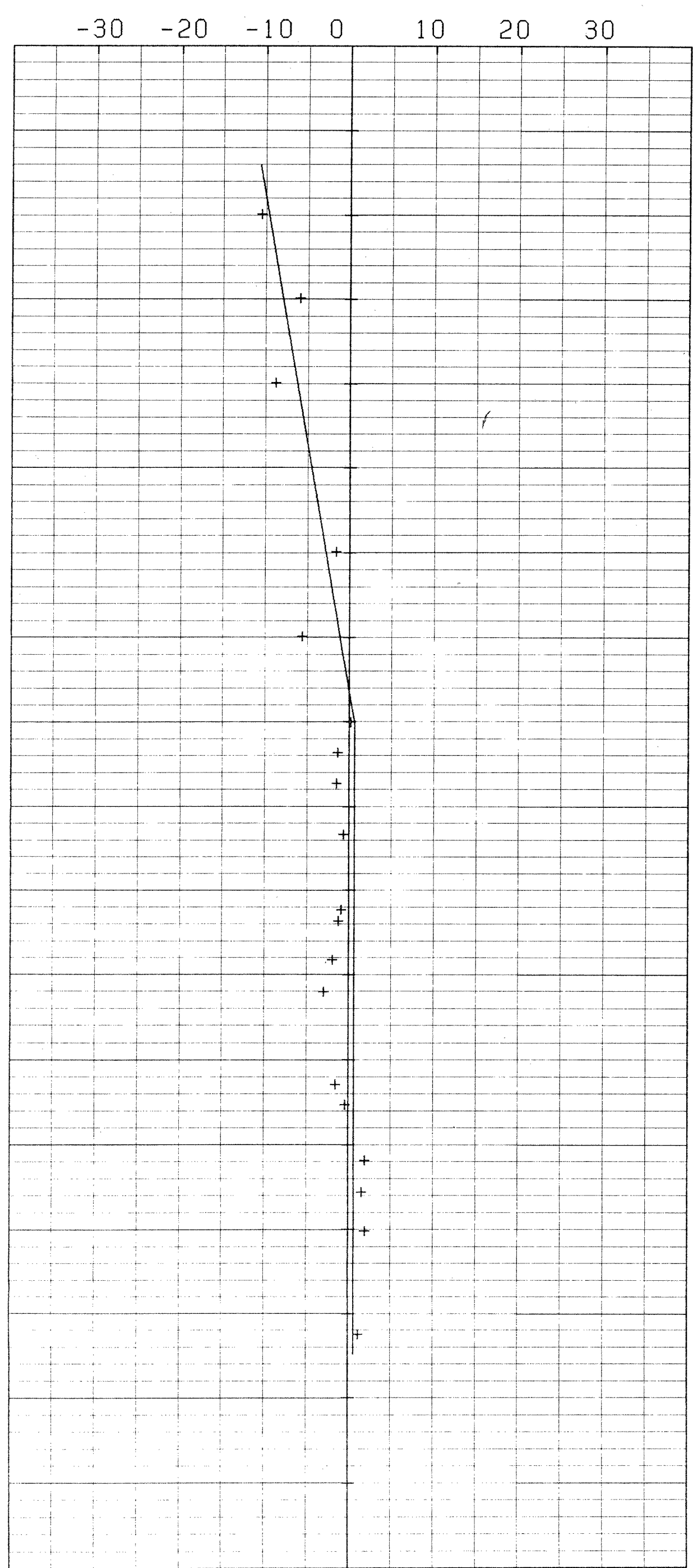
SHOT NUMBER	LOCAL TIME	SHOT LOCATION	AMP. GAIN	CHARGE SIZE	CHARGE DEPTH	OFFSET (ft)	ARRIVAL TIME ms	CORR. TIME ms	REMARKS
1		A	AGC	1XA	7	82	72	69	
2		B	AGC	1XA	7	148	79	70	
3		C	AGC	1XA	8	174	86	73	

The shot to datum static used is 71 msec

SURVEY SHOTS

SHOT NUMBER	LOCAL TIME	CHARGE SIZE	AMP. GAIN	OFFSET (ft)	CHARGE DEPTH	KB DEPTH	RECORD TIME	MSL DEPTH	CORR. TIME	INTERVAL VELOCITY	RMS VELOCITY	REMARKS
27		1XD	AGC	174	8	800	156	502	81	6198	6198	to true depth below KB.
26		1XD	AGC	174	8	1300	231	1002	158	6494	6344	••NOTE - () nos refer
25		1XD	AGC	174	8	1800	307	1502	235	6494	6393	
24		1XD	AGC	174	8	2300	370	2002	298	7937	6749	
22		1XD	AGC	174	8	3300	501	3002	429	7634	7031	
21		1XD	AGC	174	8	3800	553	3502	481	9615	7354	
20		1XD	AGC	174	8	4306	610	4008	538	8650	7505	Transition Beds
4		1XD	AGC	174	8	4306	613	4008	541	8650	7505	Transition Beds
19		1XD	AGC	174	8	4488	628	4190	557	10400	7613	Murta
17		1XD	AGC	174	8	4670	644	4372	573	11375	7743	Namur (4690)
18		1XD	AGC	174	8	4970	670	4672	599	11538	7946	
16		1XD	AGC	174	8	5422	705	5124	634	12914	8298	Birkhead (5424)
15		1XD	AGC	174	8	5488	710	5190	639	13200	8347	Hutton (5485)
14		1XD	AGC	174	8	5716	728	5418	657	12667	8495	
13		1XD	AGC	174	8	5906	740	5608	669	15833	8681	Toolachee (5902)
12		1XD	AGC	174	8	6450	787	6152	716	11574	8900	Daralingie (6449)
11		1XD	AGC	174	8	6567	797	6269	726	11700	8945	Roseneath
10		1XD	AGC	174	8	6896	824	6598	753	12185	9081	Epsilon (6884)
9		1XD	AGC	174	8	7085	838	6787	767	13500	9181	Munteree (7100)
8		1XD	AGC	174	8	7313	855	7015	784	13412	9293	Patchawarra (7308)
7		1XD	AGC	177	6	7930	901	7632	830	13413	9568	Pre-Permian (7919)
6		1XD	AGC	177	6	8070	911	7772	840	14000	9633	
5		1XD	AGC	174	8	8105	915	7807	844	8750	9629	TD (8107)

CHECKSHOT - SONIC
TIME DIFFERENCE. (MS)



5578-2

24-JAN-85



MUNKARIE 5 SYNTHETIC SEISMOGRAM



INTERVAL VELOCITY (FT/SEC)

REFLECTIVITY⁶ PRIMARIES ONLY⁶

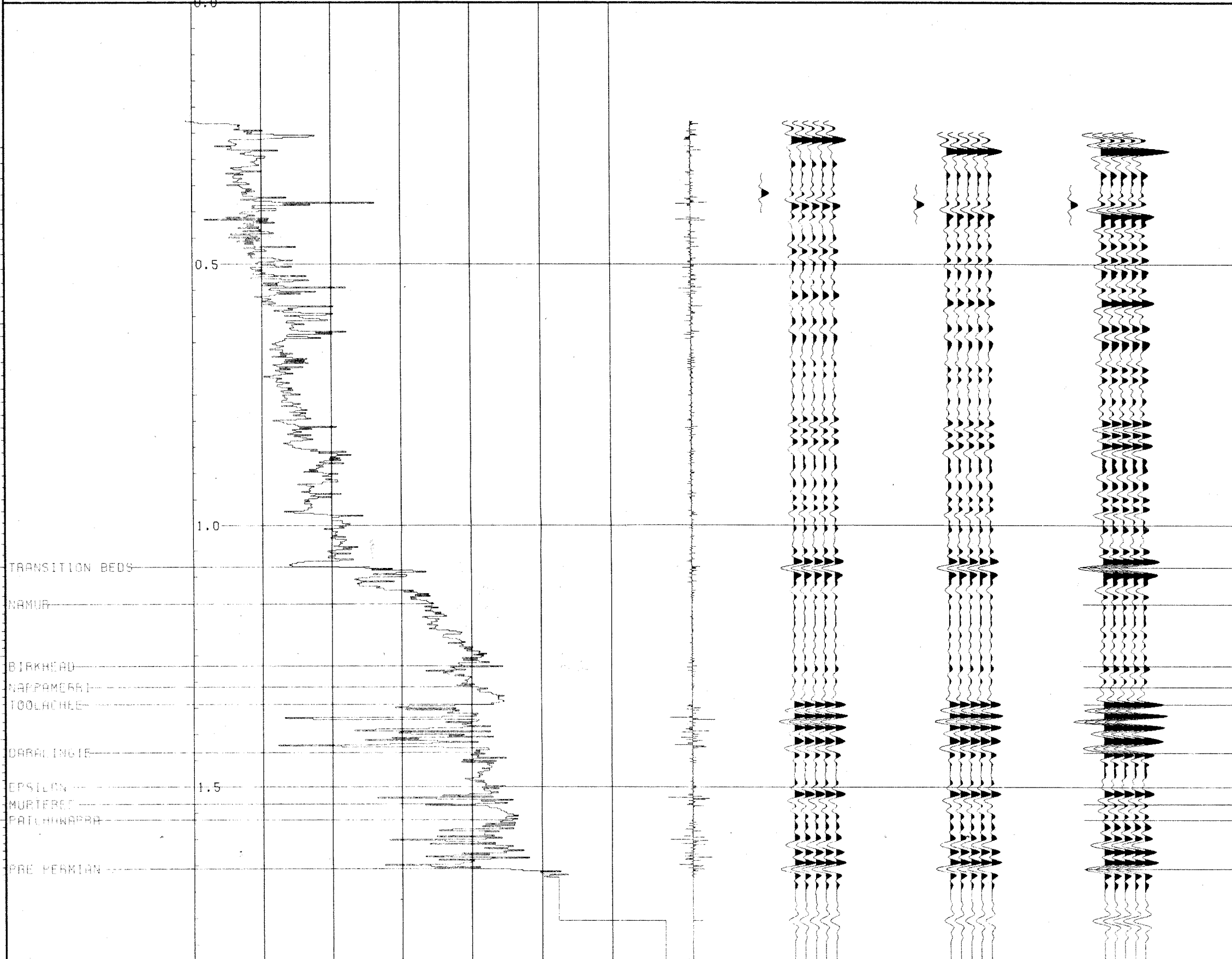
PRIMARIES ONLY²

PRIMARIES ONLY¹

5000 9000 13000 17000

1000
2000
3000
4000
5000
6000
7000
FT (SL)

1000
2000
3000
4000
5000
6000
7000
FT (SL)



REFLECTIVITY COMPUTED USING :

1. VELOCITY
2. VELOCITY AND DENSITY
3. VELOCITY AND CORRECTED DENSITY
4. SAME AS (1) WITH DRIFT APPLIED
5. SAME AS (2) WITH DRIFT APPLIED
6. SAME AS (3) WITH DRIFT APPLIED

BANDPASS WAVELET

NO. OF FILTER POINTS 39
LOW CUT FREQUENCY 10
HIGH CUT FREQUENCY 55
PHASE SHIFT 0
ZERO PHASE
NORMAL POLARITY

FORMATION TOP	DEPTH (SL)	TIME	VEL (INT)	VEL (AV)	VEL (RMS)
KB (FT) = 298					
TRANSITION BEDS	4008	1032	10971	7409	7409
NAMUR	4392	1152	12441	7625	7672
BIRKHEAD	5126	1270	12650	8072	8233
NAPPAMERRI	5379	1310	13636	8212	8402
TOOLACHEE	5604	1343	11891	8345	8569
DARALINGIE	6151	1435	13385	8573	8820
EPSILON	6586	1500	13091	8781	9065
MURTEREE	6802	1533	13867	8874	9170
PATCHAWARRA	7010	1563	13140	8970	9283
PRE PERMIAN	7621	1656		9204	9541