VOGEL #1
WELL COMPLETION REPORT
PEP-108, VICTOIRA
JOINT VENTURE PARTIES:
BRIDGE OIL LIMITED (OPERATOR)
AND
GAS & FUEL CORP. OF VICTORIA

Well Completion Report

Vogel - 1

(W 1023)

VOGEL #1
WELL COMPLETION REPORT
PEP-108, VICTOIRA

JOINT VENTURE PARTIES:
BRIDGE OIL LIMITED (OPERATOR)
AND
GAS & FUEL CORP. OF VICTORIA

Compiled by
BRIDGE OIL LIMITED
502/2032/92/SS/jgt
November 1990
JN200933, JN201135

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1) DRILLING SUMMARY

1.1 Well History

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1.1 Well History

Vogel #1 was drilled as an exploration well within PEP-108 to establish the presence of hydrocarbon bearing reservoirs of the Waarre Sandstone within an interpreted, faulted trap, 3.6km north of the Iona #1 gas discovery.

Both the primary objective of the Late Cretaceous Waarre Sandstone and the secondary objectives of the Nullawarre Member of the Paaratte Formation and the Pebble Point Formation were encountered high to prognosis. All exhibited well developed reservoirs, however, there were no significant shows. The lack of an effective across-fault lateral seal and/or effective source rocks and/or effective migration fairways to the Vogel structure are the most likely reasons for the lack of success with Vogel #1.

Vogel #1 is situated 2.4km NE of North Paaratte #3 and 3.6km west of Waarre #1, both of which encountered well developed reservoir quality sandstones.

Spudded on 9th March, 1990, and drilled to a total depth of 1394.3m, the well was plugged and abandoned.

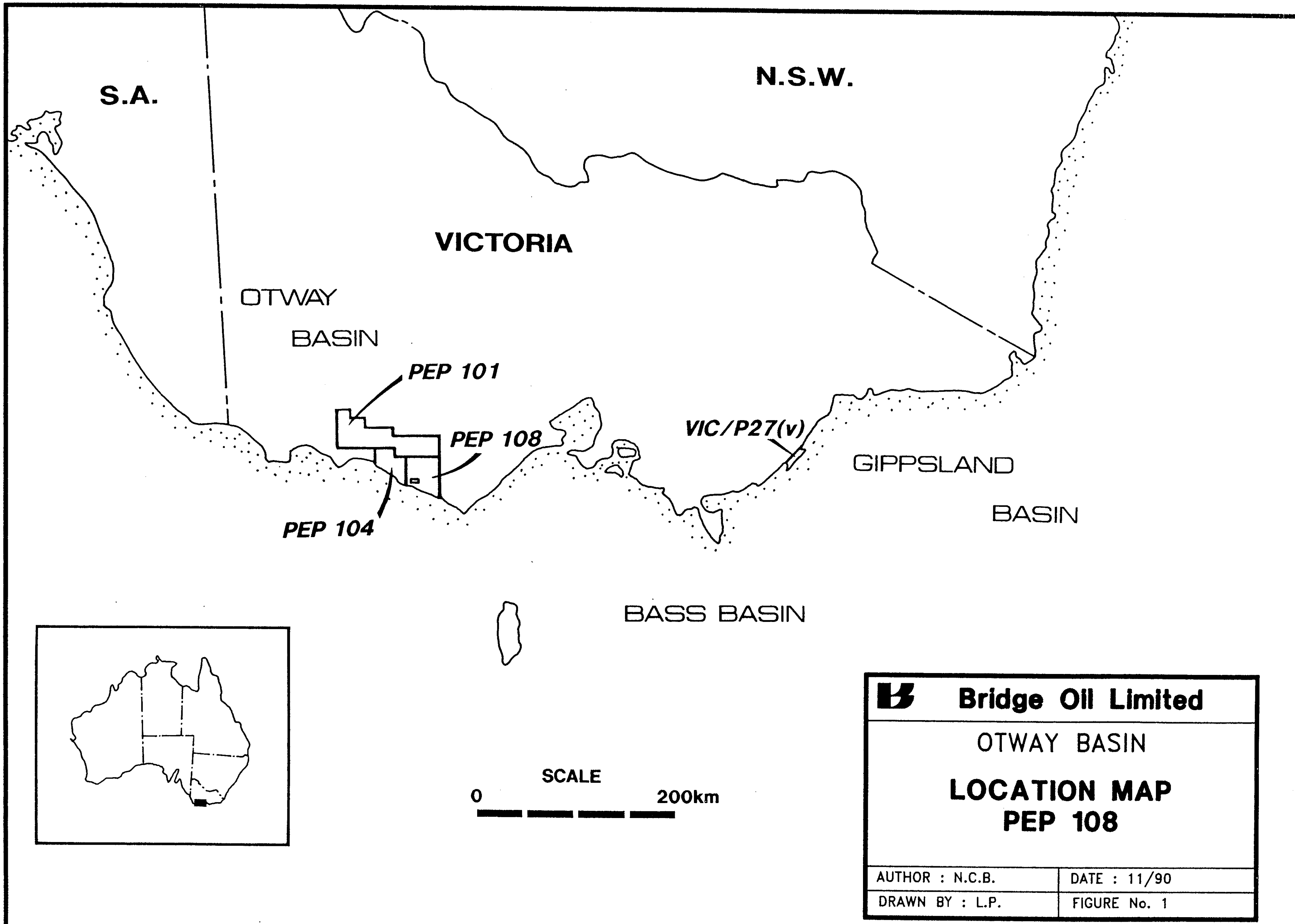
Vogel #1 intersected a stratigraphic sequence essentially as prognosed.

Log analysis indicates that both primary and secondary objectives are water saturated.

No cores or tests were run.

Working interests in the well are as follows:

Bridge Oil Limited (operator)	50%
Gas and Fuel Corporation of Victoria	50%



Bridge Oil Limited

OTWAY BASIN

LOCATION MAP
PEP 108

AUTHOR : N.C.B.	DATE : 11/90
DRAWN BY : L.P.	FIGURE No. 1

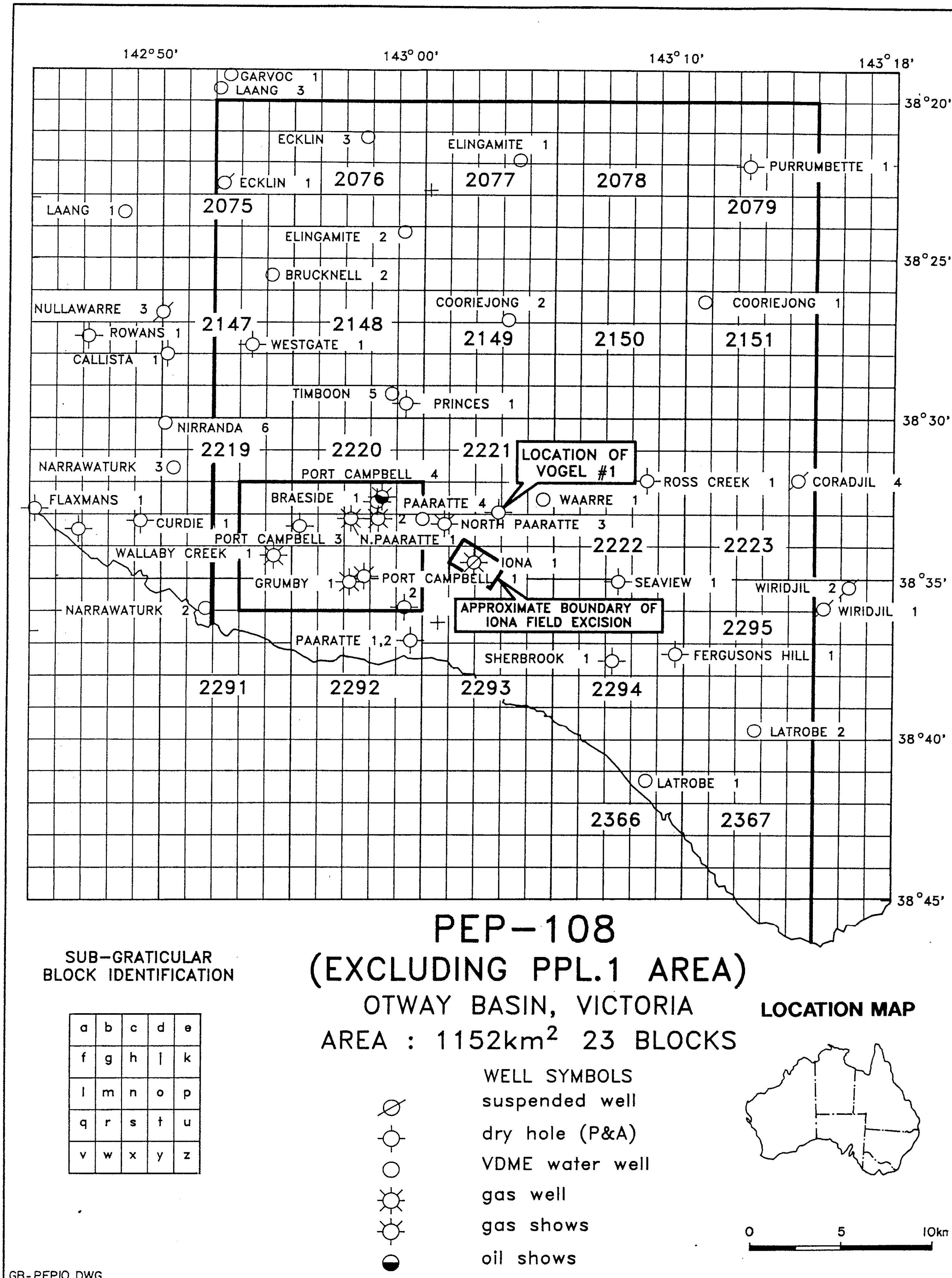
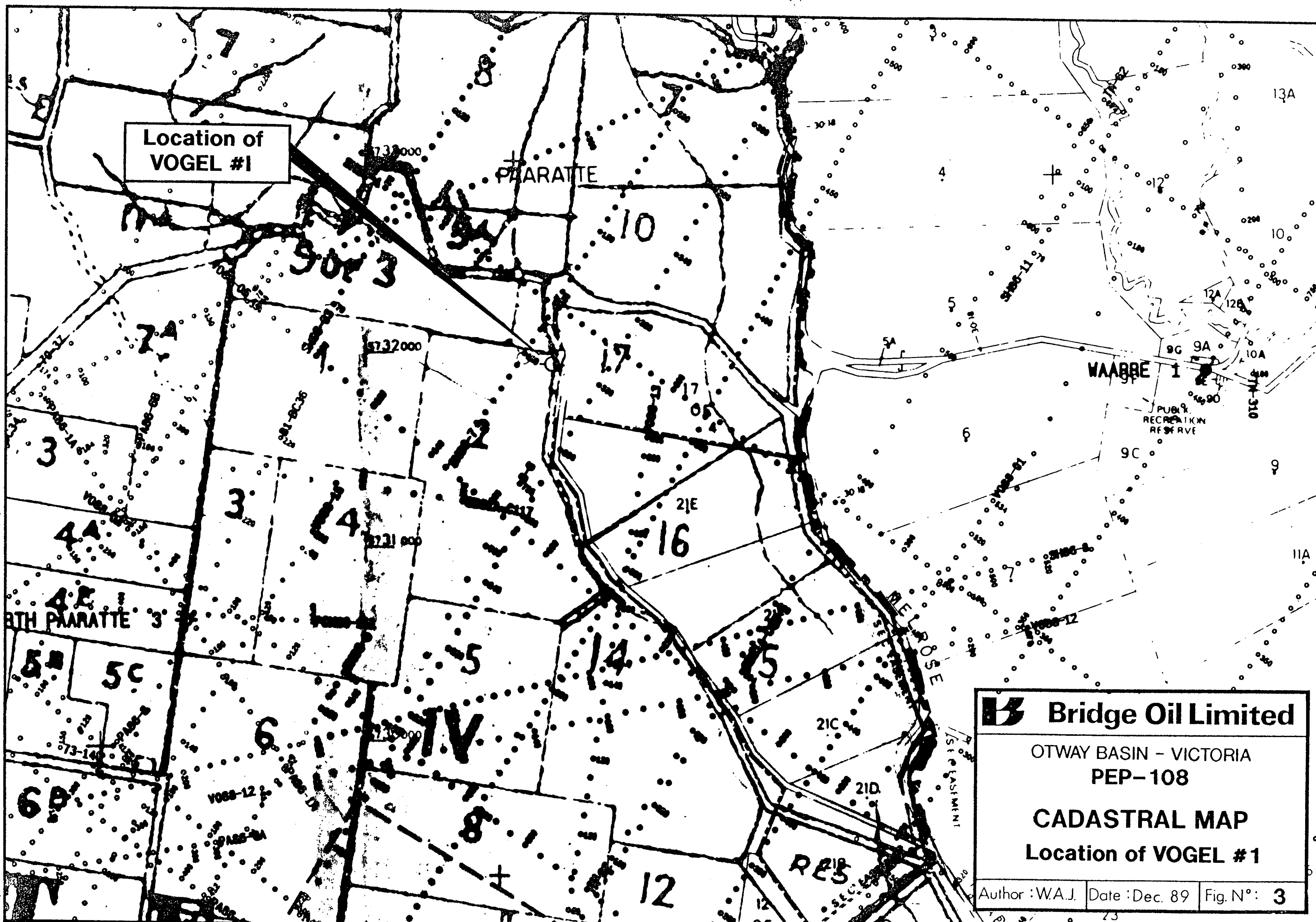

142°50'
143°00'
143°10'
143°18'
38°20'
38°25'
38°30'
38°35'
38°40'
38°45'
GARVOC 1
LAANG 3
ECKLIN 3
ELINGAMITE 1
PURRUMBETTE 1
ECKLIN 1
2076
2077
2078
LAANG 1
2075
2079
ELINGAMITE 2
BRUCKNELL 2
NULLAWARRE 3
COORIEJONG 2
COORIEJONG 1
2147
2148
ROWANS 1
WESTGATE 1
2149
2150
2151
CALLISTA 1
TIMBOON 5
PRINCES 1
NIRRANDA 6
2219
2220
2221
LOCATION OF VOGEL #1
NARRAWATURK 3
PORT CAMPBELL 4
ROSS CREEK 1
CORADJIL 4
FLAXMANS 1
BRAESIDE 1
PAARATTE 4
WAARRE 1
CURDIE 1
NORTH PAARATTE 3
PORT CAMPBELL 3
N.PAARATTE 1
2222
2223
WALLABY CREEK 1
IONA 1
GRUMBY 1
PORT CAMPBELL 1
SEAVIEW 1
WIRIDJIL 2
NARRAWATURK 2
APPROXIMATE BOUNDARY OF IONA FIELD EXCISION
WIRIDJIL 1
2295
PAARATTE 1,2
SHERBROOK 1
FERGUSONS HILL 1
2291
2292
2293
2294
LATROBE 2
LATROBE 1
2366
2367
PEP-108
(EXCLUDING PPL.1 AREA)
OTWAY BASIN, VICTORIA
AREA : 1152km² 23 BLOCKS
SUB-GRATICULAR BLOCK IDENTIFICATION
a b c d e
f g h j k
l m n o p
q r s t u
v w x y z
WELL SYMBOLS
suspended well
dry hole (P&A)
VDME water well
gas well
gas shows
oil shows
LOCATION MAP
0 5 10km
GB-PEPIO.DWG

FIGURE 2



Location of VOGEL #1
PAARATTE
NTH PAARATTE
WAARRE 1
PUBLIC RECREATION RESERVE
MELROSE
Bridge Oil Limited
OTWAY BASIN - VICTORIA
PEP-108
CADASTRAL MAP
Location of VOGEL #1
Author : W.A.J.
Date : Dec. 89
Fig. N°: 3

PE600628

This is an enclosure indicator page.
The enclosure PE600628 is enclosed within the container PE900816 at this location in this document.

The enclosure PE600628 has the following characteristics:

ITEM_BARCODE = PE600628
CONTAINER_BARCODE = PE900816
NAME = Summarized Well Log
BASIN = OTWAY
PERMIT = PEP 108
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = Summarized Well Log (enclosure from WCR) fromVogel-1
REMARKS =
DATE_CREATED = 4/04/90
DATE_RECEIVED = 8/11/90
W_NO = W1023
WELL_NAME = Vogel-1
CONTRACTOR = Bridge Oil Limited
CLIENT_OP_CO = Bridge Oil Limited

(Inserted by DNRE - Vic Govt Mines Dept)

1.3 Well Data Sheets

BRIDGE OIL LIMITED

SHEET #1

WELL: VOGEL #1

LATITUDE: 38°32'35.385"S
LONGITUDE: 143°02'13.312"E

K.B.: 147.6M
G.L.: 142.6M

SEISMIC LOCATION: MIDPOINT BETWEEN SP100 LINE SH86-7 & SP300 LINE V088-14

PROGRAMMED T.D.: 1388.7M
DRILLER'S T.D.: 1398.0M
LOGGER'S T.D.: 1394.3M

TARGET: PRIMARY OBJECTIVE: WAARRE FORMATION (LATE CRETACEOUS)
SECONDARY OBJECTIVE: NULLAWARRE MEMBER (PAARATTE FORMATION) (LATE CRETACEOUS)

SPUDDED: 09/03/90
RIG RELEASED: 17/03/90

RIG CONTRACTOR: GEARHART
RIG TYPE: SUPERIOR 700E SCR

STATUS: PLUGGED AND ABANDONED

MUD LOGGING: HALLIBURTON
ELECTRICAL LOGGING: HALLIBURTON

COMPLETION DETAILS: -

CASING size: 9 5/8" shoe depth: 221.02M driller, 222.0M logger.

SAMPLING PROGRAMME: WASHED, AIR DRIED AND UNWASHED DRIED CUTTINGS SAMPLES WERE CAUGHT AND BAGGED AT 10M INTERVALS FROM SURFACE TO 530M, THENCE AT 3M INTERVALS TO T.D.

FORMATION	ACTUAL KB (M)	ACTUAL SS (M)	H OR L (M)	THICKNESS (M)
Gellibrand Marl	SFC +147.6	-	172.5	
Clifton Fm	172.5	-24.9	12.8L	74.7
L. Mepunga Sst	247.2	-99.6	11.5L	71.6
Dilwyn Fm	318.8	-171.2	3.1L	190.7
Pember Mbr	509.5	-361.9	30.2H	76.4
Pebble Point Fm	585.9	-438.3	6.8H	48.7
Paaratte Fm	634.6	-487.0	8.1H	267.4
Skull Creek Mbr	902.0	-754.4	0.7H	125.2
Nullawarre Mbr	1027.2	-879.6	0.5H	125.5
Belfast Mdst Mbr	1152.7	-1005.1	9.0H	46.8
Flaxmans Mbr (Waarre Fm)	1199.5	-1051.9	7.2H	20.0
Waarre Sst	1219.5	-1071.9	1.2H	89.5
Eumeralla Fm	1309.0	-1161.4	20.3L	85.3+
T.D.	1394.3	-1246.7	-	-

BRIDGE OIL LIMITED

WELL: VOGEL #1

LOGGING SUITE

LOG TYPES	RUN NO.	INTERVALS	REMARKS
DLL-MSFL-SP-GR-CAL	1	1393.4-212.5M	
BCS-GR-CAL	1	1390.6-220.0M	GR TO 15.5M
WST & VSP	1	1394.0-SURFACE	
CDL-CNS-GR-CAL	1	1330.1-1009.3M	
SWC		1364.0-586.7M	SHOT 24/REC 15

FULL HOLE CORES - NO CONVENTIONAL CORES WERE TAKEN.

FORMATION TESTS - NO TESTS WERE DONE.

WELL: VOGEL #1

PRELIMINARY LOG ANALYSIS

INTERVAL	FORMATION (m)	Av.PHI (%)	Av.Sw. (%)	Av.Vsh (%)
1219.5-1309.0	WAARRE	25.1	98.0	10.0
1020.0-1155.0	NULLAWARRE	24.1	91.0	26.0
575.0-625.0	PEBBLE POINT	27.4	91.0	13.0

SERVICE COMPANY ANALYSES PERFORMED:

AMDEL - PETROGRAPHY, XRD, PALYNOLOGY, GEOCHEMICAL ANALYSES.

SUMMARY

Vogel #1 was an exploration well programmed to establish the presence of hydrocarbon-bearing reservoirs of the Waarre Sandstone, north of the Iona #1 gas discovery.

The primary objective, the Waarre Sandstone, is a well developed reservoir, exhibiting excellent porosity and permeability, with a net sandstone thickness of 59m. However, there is no net pay.

Similarly, the secondary targets of the Nullawarre Member of the Paaratte Formation and Pebble Point Formation display good reservoir character, and are interpreted to be water saturated.

The lack of an efffective across-fault lateral seal and/or effective source rocks and/or effective migration fairways to the Vogel structure are the most likely reasons for the lack of success with Vogel #1.

The well was plugged and abandoned.

Prepared By: Bridge Oil Limited

Date: November 1990

1.4 Well Location Survey

Note: The surveyed co-ordinates and ground level (G.L.) reported by Lehmann Brayley Land Surveyors are the ones that have been used throughout the text. The following pages are the survey data sheets.

5.11

TRANSFORMATION OF COORDINATES FROM GRID TO GEOGRAPHIC

AUSTRALIAN MAP GRID

ZONE 54 φ, λ STATION VOGEL No 1 CONDUCTOR.

Zone	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Central Meridian	87°	93°	99°	105°	111°	117°	123°	129°	135°	141°	147°	153°	159°	165°	171°	177°E

1	Easting E		677 527.8
2	False Origin	−	500 000 .000
3	E'	+	177 527.8
4	Northing N		5731 935.5
5	Southern Hemisphere		−10 000 000 .000
6	N'	−	4 268 064.5
7	(I) Tabular value		4 266 856.363
8	6 − 7		1 208.137
9	φ' for N'		38°33' 39.1959"
10	(VII) Tabular value		2.024.840
11	Increment		.785
12	(VII) for φ'		2025.625
13	(VIII) for φ'		28.525
14	(IX) Tabular value		41 313.836
15	Increment		6.233
16	Δ^2(IX)		.001
17	(IX) for φ'		41 320.070
18	(X) Tabular value		384.220
19	Increment		.225
20	(X) for φ'		384.445
21	(XV) Tabular value		25 746.67
22	Increment		10.03
23	(XV) for φ'		25 756.70
24	(XVI) for φ		343.7

25	$q = E' \cdot 10^{-6}$	+	.177527800
26	q^2	+	.031 516 120
27	q^3	+	.005 594 987
28	q^4		.000 993 266
29	φ	+	38° 33' 39.195
30	12 . 26	−	1' 03.839
31	13 . 28	+	.028
32	D_6 for q	−	.000
33	29+30+31+32 = φ ± Latitude		38° 32' 35.3844"
34	17 . 25	+	7335.4611
35	20 . 27	−	2.1510
36	E_5 for q	+	.0015
37	34+35+36 = ω"		7333.3117
38	ω	+	2°02'13.3117"
39	Central Meridian λ_0		141°
40	38+39 = λ Longitude		143°02'13.3117"
41	23 . 25	+	4572.5303
42	24 . 27	−	1.9230
43	F_5 for q	+	.0013
44	41+42+43 = γ"		4570.6086
45	Grid Convergence γ	+	1°16'10.6086"

$q = E' \cdot 10^{-6}$

$\phi = \phi' - VII.q^2 + VIII.q^4 - D_6$

$\omega = IX.q - X.q^3 + E_5$

$\lambda = \lambda_0 + \omega$

$\gamma = XV.q - XVI.q^3 + F_5$

SIGN CONVENTION

NOTE: 1. q & φ' are always taken positive

2. Δ^2(IX) is always negative

3. γ = −C used in US Army tables

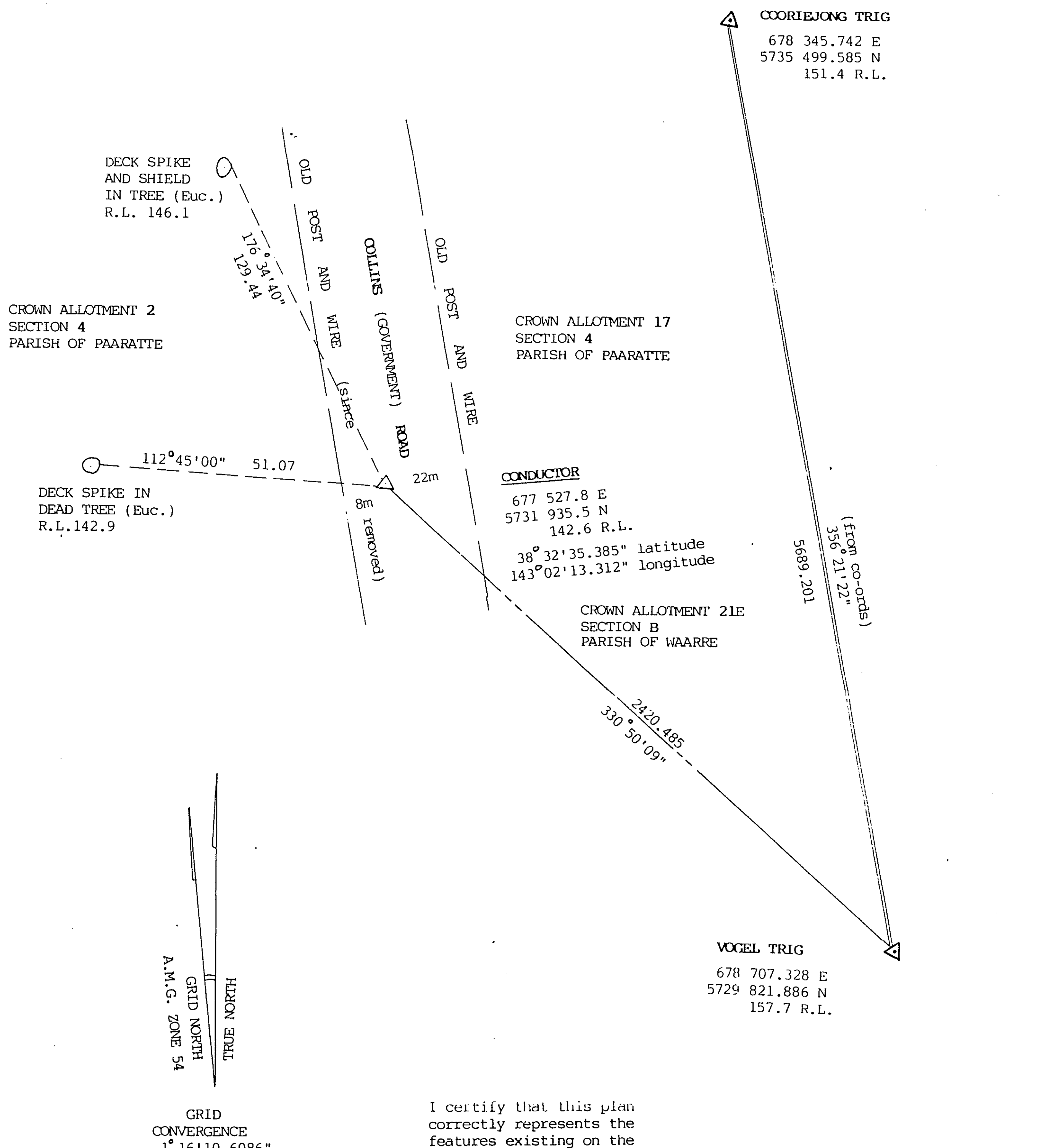
Grid Bearing = Azimuth + γ = Azimuth − C

NORTHERN HEMISPHERE λ_0			SOUTHERN HEMISPHERE λ_0	
−	+	E'	−	+
+	+	N'	−	−
−	+	ω	−	+
+	−	γ	−	+

Computed ________

Checked ________

Date ________



I certify that this plan correctly represents the features existing on the 14/3/1990

Russell J Douthat, SURVEYOR.

CO-ORDINATES ARE A.M.G.
BEARINGS RELATE TO GRID NORTH
LENGTHS ARE IN METRES

LEHMANN BRAYLEY
LAND SURVEYORS · WARRNAMBOOL
102 LAVA STREET, WARRNAMBOOL
• THE BRAID CORPORATION • OFFICES •

VOGEL No. 1 (DRILL SITE)
BRIDGE OIL LIMITED
COLLINS ROAD
Parish of PAARATTE
Shire of HEYTESBURY
Vic.

SURVEYED RJD	SCALE NOT TO SCALE
DESIGNED	LEVEL DATUM A.H.D. VIDE VOGEL TF
DRAWN RJD	DATE 14/03/1990
CHECKED	FIELD BOOK
TITLE REF	SHEET 1 OF ONE SHEETS
AMENDMENTS	REFERENCE No. W. 1181

2) GEOLOGICAL DATA

2.1 Table of Formations.

2.2 Lithological Descriptions.

2.3 SWC Descriptions.

2.4 Petrological and XRD Analyses.

2.5 Palynostratigraphic Analysis.

2.6 Geochemical Analysis.

2.1 Table of Formations and Post-Appraisal Mapping

Location: Mid-point of a line between SP100 Line SH86-7 and SP300 Line VO88-14
Latitude 38° 32' 35.385" S
Longitude 143° 02' 13.312" E

Elevation: Ground : 142.6m
Kelly Bushing : 147.6m

TABLE 1 : Formation Tops

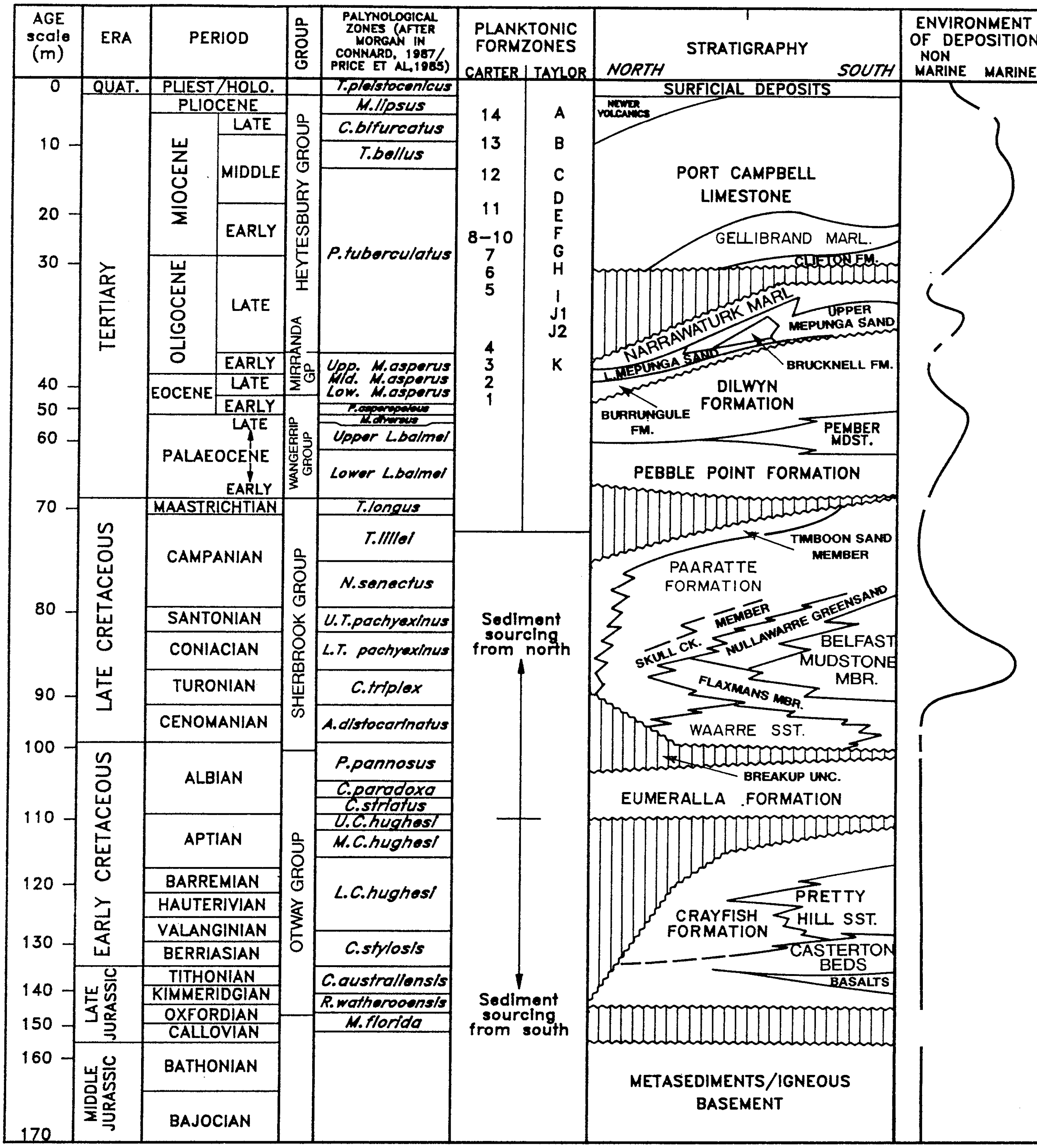
Age	Formation	Actual KB (m)	Depth Subsea (m)	Prognosed* Depth Subsea (m)
Early Miocene	Gellibrand Marl	Surface	+147.6	Surface
Early Miocene	Clifton Fm	172.5	- 24.9	159.7
Early Oligocene	L.Mepunga Sst	247.2	- 99.6	235.7
Early Oligocene to Late Paleocene	Dilwyn Fm	318.8	-171.2	315.7
Early Oligocene to Late Paleocene	Pember Mbr	509.5	-361.9	539.7
Early Paleocene	Pebble Point Fm	585.9	-438.3	592.7
Late Cretaceous	Paaratte Fm	634.6	-487.0	642.7
Late Cretaceous	Skull Ck Mbr	902.0	-754.4	902.7
Late Cretaceous	Nullawarre Mbr	1027.2	-879.6	1027.7
Late Cretaceous	Belfast Mdst Mbr	1152.7	-1005.1	1161.7
Late Cretaceous	Flaxmans Mbr (Waare Fm)	1199.5	-1051.9	1206.7
Late Cretaceous	Waarre Sst	1219.5	-1071.9	1220.7
Early Cretaceous	Eumeralla Fm	1309.0	-1161.4	1288.7
	T.D.	1394.3	-1246.7	1388.7

* Prognosis as per Well Programme, subsea depths.

A summary of the stratigraphic sequence of the central Otway Basin is provided in Figure 4.

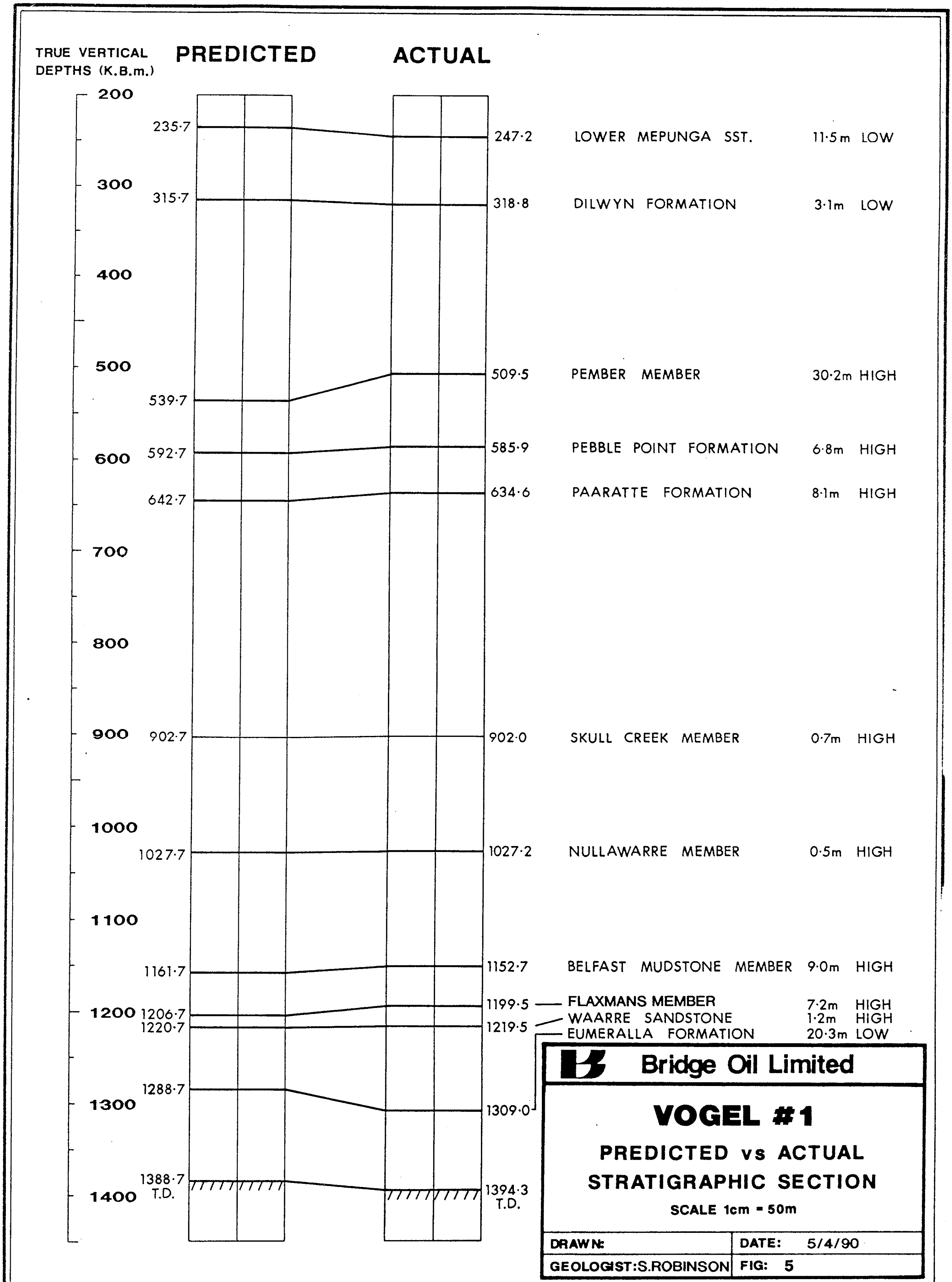
A predicted versus actual stratigraphic section is presented in Figure 5; it can be seen that horizons were encountered essentially as prognosed.

In PEP-108 horizons generally mapped from seismic data are the Waarre, Pebble Point and Clifton Formations (Figures 6, 7, 8). Results of Vogel #1 have not significantly altered seismic mapping.

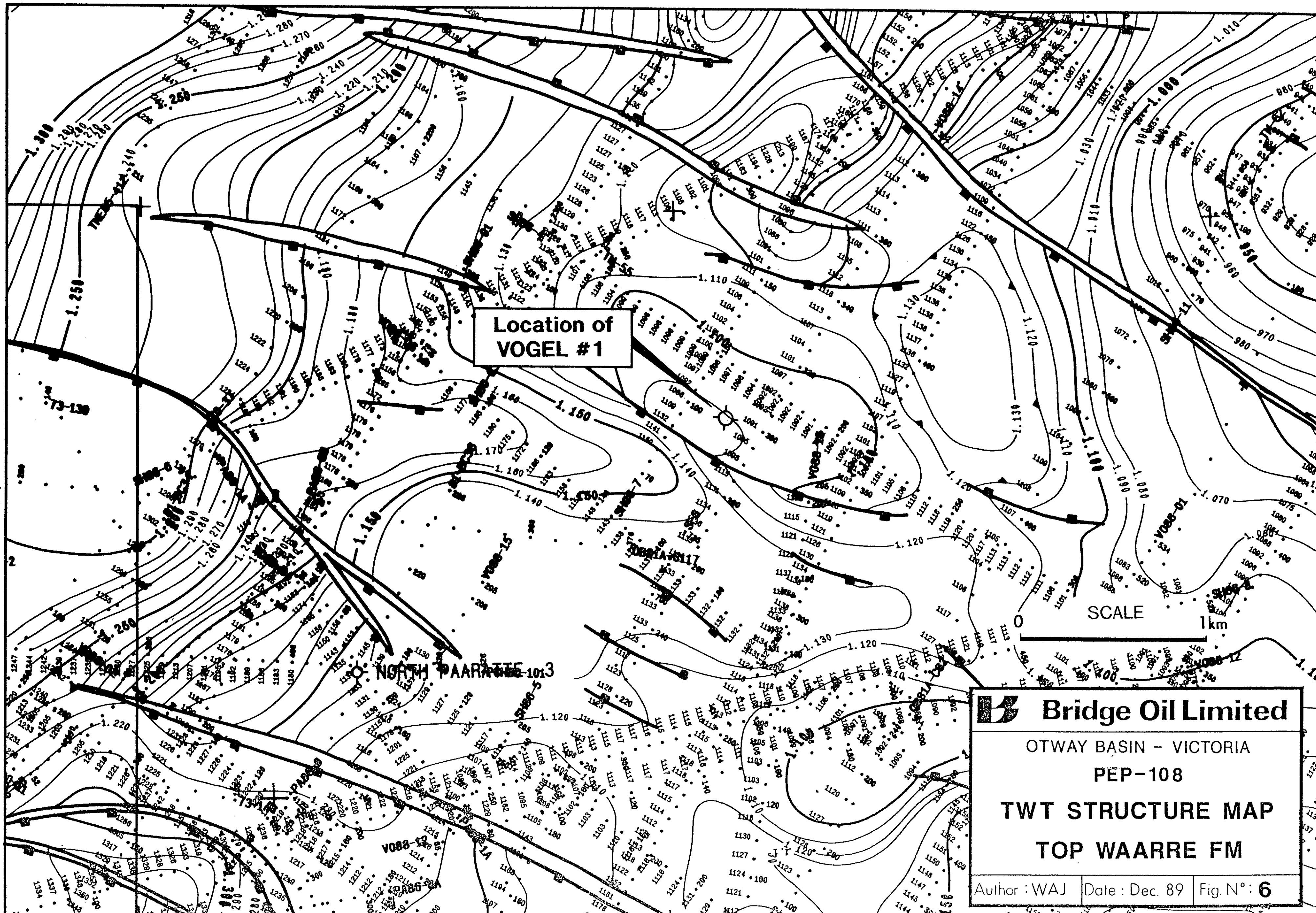


After
- Wopfner & Douglas (1971)
- Gausden (1983)
- Patchett (1983)
- Veevers et al (1983)
- Thompson in Fraser (1985)
- Duran (1986)
- Mitchell (1986)
- Dettmann (1986)

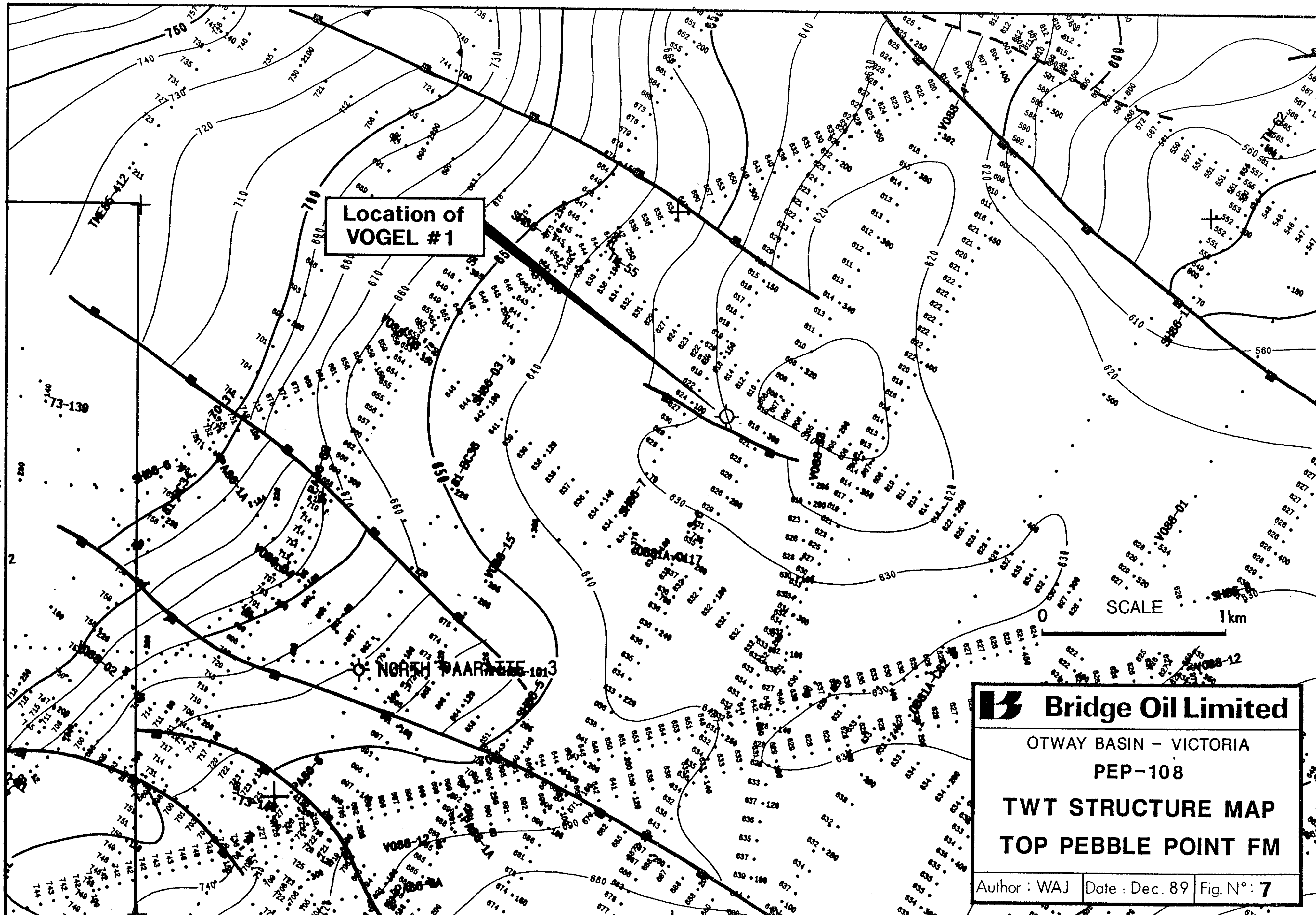
Bridge Oil Limited	
CENTRAL OTWAY BASIN **STRATIGRAPHIC TABLE**	
AUTHOR : N.C.BROWN	DATE : 3/87, 10/90
DRAFTED BY : B.O.L.	FIGURE 4



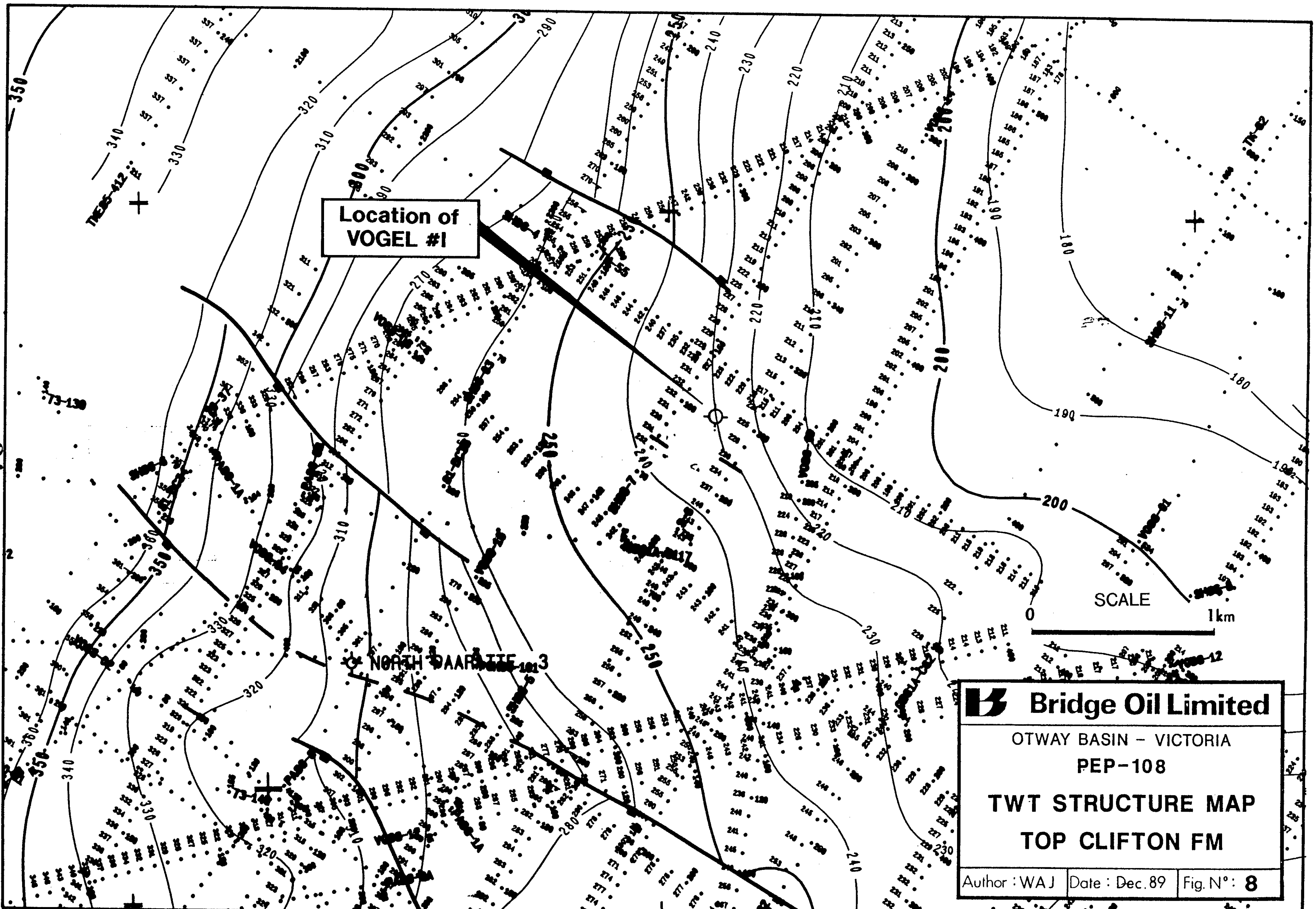
TRUE VERTICAL DEPTHS (K.B.m.)
PREDICTED
ACTUAL
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
235·7
315·7
539·7
592·7
642·7
902·7
1027·7
1161·7
1206·7
1220·7
1288·7
1388·7 T.D.
247·2
318·8
509·5
585·9
634·6
902·0
1027·2
1152·7
1199·5
1219·5
1309·0
1394·3 T.D.
LOWER MEPUNGA SST. 11·5m LOW
DILWYN FORMATION 3·1m LOW
PEMBER MEMBER 30·2m HIGH
PEBBLE POINT FORMATION 6·8m HIGH
PAARATTE FORMATION 8·1m HIGH
SKULL CREEK MEMBER 0·7m HIGH
NULLAWARRE MEMBER 0·5m HIGH
BELFAST MUDSTONE MEMBER 9·0m HIGH
FLAXMANS MEMBER 7·2m HIGH
WAARRE SANDSTONE 1·2m HIGH
EUMERALLA FORMATION 20·3m LOW
Bridge Oil Limited
VOGEL #1
PREDICTED vs ACTUAL
STRATIGRAPHIC SECTION
SCALE 1cm = 50m
DRAWN:
DATE: 5/4/90
GEOLOGIST:S.ROBINSON
FIG: 5



Location of VOGEL #1
NORTH PAARATTE
SCALE
0
1km
Bridge Oil Limited
OTWAY BASIN - VICTORIA
PEP-108
TWT STRUCTURE MAP
TOP WAARRE FM
Author : WAJ
Date : Dec. 89
Fig. N° : 6



Location of
VOGEL #1
NORTH PAARATTE
SCALE
0
1km
Bridge Oil Limited
OTWAY BASIN - VICTORIA
PEP-108
TWT STRUCTURE MAP
TOP PEBBLE POINT FM
Author : WAJ
Date : Dec. 89
Fig. N°: 7



Location of VOGEL #1
NORTH PAARATTE 3
SCALE
0 1km
Bridge Oil Limited
OTWAY BASIN - VICTORIA
PEP-108
TWT STRUCTURE MAP
TOP CLIFTON FM
Author : WAJ
Date : Dec.89
Fig. N°: 8

2.2 Lithological Descriptions - (see also Mudlog - Enclosure 1).

The descriptions in this section outline the general lithologies from surface to Total Depth (T.D.). All depths are quoted in logger's depths measured from K.B.

Gellibrand Marl
Surface-172.5m
Thickness 29.9m

Surface-10.0m	Calcareous **sandstone.** **Sandstone (100%)**: mottled pale yellow, clear to translucent, pale yellow-brown, unconsolidated, coarse, subangular, well sorted, very calcareous, common pale yellow-brown micritic limestone nodules, common calcareous matrix, clays washing out of sample, common calcitic crystal faces on sand grains, grading to calcarenite, fair visual porosity, poor inferred porosity, no show.
10.0-172.5m	**Marl** with minor **limestone** interbeds. **Marl (90%)**: dark green-grey, soft, sticky, very calcareous, abundant fossil fragments (30% increasing to 60% with depth): to foraminifera, ostracods, echinoid spines, gastropods, turretellids, pelecypods, sponges (both flat and cylindrical), minor coralline fragments, amorphous. No show. **Limestone (10%)**: yellow, grey-brown, hard to moderate hard, micocrystalline, cryptocrystalline in part, micritic, angular to blocky. No show.

Clifton Formation
172.5-247.2m
Thickness 74.7m

172.5-179.5m	**Sandstone** with interbedded **limestone** and **marl.** **Sandstone (50%)**: grey, white, clear to translucent, unconsolidated, fine to medium, subrounded, moderate sorted, predominately calcareous cement, occasional siliceous cement, occasionally argillaceous matrix, abundant fossil fragments as above, common medium glauconite grains, moderate pyrite nodules, poor to fair visual porosity, no show. **Limestone (30%)**: as above. **Marl (20%)**: as above.

179.5-220.0m	**Marl** with interbedded **limestone** and **sandstone.**

__Marl (60%)__: dark brown grey, soft, sticky, abundant fossil fragments as above, very calcareous, minor glauconite grains, amorphous. No show.
__Limestone (30%)__: medium grey, yellow-brown, moderate hard, micritic, angular to blocky. No show.
__Sandstone (20%)__: as above but predominately fine, poor visual porosity, no show.

220.0-247.2m	**Marl.**

__Marl (100%)__: very dark brown, soft, sticky, slightly calcareous, trace fossil fragments as above, trace to common medium green glauconite, trace black carbonaceous inclusions, rare pyrite nodules, amorphous to subblocky with depth. No show.

Lower Mepunga Formation
247.2-318.8m
Thickness 71.6m

247.2-253.5m	**Sandstone** with minor interbedded **claystone.**

__Sandstone (80%)__: orange-brown, unconsolidated, medium to coarse to very coarse, subrounded to rounded, moderate well sorted, abundant iron staining, common medium to coarse glauconite grains, occasional fossil fragments (turretellids, foraminifera, sponges, bivalves), trace pyrite nodules, good inferred porosity, no show.
__Claystone (20%)__: dark brown, dark brown-grey, soft, arenaceous in part, common glauconite, trace feldspar, grading to siltstone, subblocky to amorphous.

253.5-318.8m	**Sandstone** with minor interbedded **claystone.**

__Sandstone (90%)__: Type 1: orange-brown, unconsolidated, predominately medium to very coarse, predominately subrounded to rounded to occasionally subangular, poorly sorted, occasionally rounded crystal faces on very coarse grains, nil matrix, abundant iron staining becoming less at base of unit, common coarse grained black to very dark brown iron nodules, trace pyrite nodules, rare glauconite grains, rare fossil fragments (turretellids, foraminifera, sponges, bivalves), good inferred porosity, no show.
Minor type 2: off-white to light grey, friable, fine, subangular, well sorted,

common calcareous cement/matrix, trace feldspar lithics, poor visual porosity, no show.
Claystone (20%): medium to dark grey brown, soft to occasionally firm, arenaceous in part, moderate calcareous in part, trace feldspar, trace black lithics, grading to siltstone, subblocky to amorphous.

Dilwyn Formation
318.8-509.5m
Thickness 190.7m

318.8-343.4m

Sandstone with minor interbedded **claystone.**

Sandstone (90%): off-white, predominately clear to translucent, pale orange brown, unconsolidated, medium to predominately coarse to very coarse, subrounded to rounded to occasionally subangular, poorly sorted, occasional quartz overgrowths, trace calcareous matrix, common dark brown ?Fe nodules, rare medium glauconite grains, trace pyrite nodules and disseminated pyrite, rare fossil fragments inclusions trace coral and foraminifera, good inferred porosity, no show.
Claystone (10%): medium to dark grey brown, dark brown, soft to firm, arenaceous in part, trace carbonaceous inclusions, subblocky.

343.4-429.7m

Sandstone with minor interbedded **siltstone.**

Sandstone (90%): clear to translucent to opaque, predominately clean, occasionally with 10% iron staining, unconsolidated, predominately medium to occasionally coarse, subrounded to rounded, well sorted to moderate sorted, trace pyrite nodules, occasionally up to 20% pyrite nodules, occasional pyrite cement in part, rare fossil fragments and foraminifera, good inferred porosity, no show.
Siltstone (10%): very dark brown to black, grey-brown, firm to soft, arenaceous in part, grading to very fine sandstone in part, very carbonaceous in part, blocky.

429.7-461.0m

Sandstone with trace **siltstone** interbeds.

Sandstone (100%): clear to translucent, occasionally iron stained, rare milky, unconsolidated, medium to very coarse, subrounded to subangular, poorly sorted, trace to common pyrite nodules, rare fossil fragments, good inferred porosity, no show.
Siltstone (trace): medium brown grey, very dark brown to black, firm to soft,

	arenaceous in part, very carbonaceous in part, trace glauconite nodules, subblocky.
461.0-509.5m	Glauconitic **sandstone.**
	Sandstone (100%): clear to translucent, unconsolidated, predominately medium to occasionally coarse, subangular, moderate well sorted, abundant (20%) medium glauconite grains, trace pyrite nodules, good visual porosity, no show.
Pember Member 509.5-585.9m Thickness 76.4m	
509.5-538.5m	**Siltstone.**
	Siltstone (80%): dark brown, soft, very argillaceous grading to claystone, arenaceous in part, occasional glauconite, trace pyrite nodules, trace black lithics, amorphous.
538.5-576.0m	Interbedded **sandstone** and **siltstone.**
	Sandstone (60%): off-white, pale grey, pale orange-brown, unconsolidated, predominately medium to coarse to occasionally very coarse, subrounded to occasionally subangular, poorly sorted, occasional siliceous overgrowths, common pyrite nodules and disseminated pyrite, common medium glauconite grains, trace echinoid spines and bivalves, fair inferred porosity, no show. **Siltstone (40%):** Type 1: medium grey-brown, medium grey, firm, arenaceous in part, common glauconite, trace carbonaceous inclusions, blocky. Type 2: very dark brown to black, dark grey, firm, argillaceous, predominately arenaceous, common carbonaceous inclusions, trace micromicaceous, blocky to occasionally subfissile. N.B. - suspect clays washing out of sample.
576.0-585.9m	Interbedded **siltstone** and **sandstone.**
	Siltstone (50%): Type 1: medium grey brown as above but occasionally moderate hard, arenaceous, trace micromicaceous, trace carbonaceous. Type 2: as above brown black. Type 3: grey-green, soft, glauconite, grading to claystone, also forming matrix in sandstone in part, amorphous. **Sandstone (50%):** as above with grey-green argillaceous and glauconitic matrix, in part.

Pebble Point
585.9-634.6m
Thickness 48.7m

585.9-598.1m	**Sandstone** with minor interbedded **siltstone.**
	<u>**Sandstone (80%)**</u>: off-white, clear to opaque, medium to very coarse, angular to subangular, poorly sorted, common quartz overgrowths, trace glauconite inclusions increasing to 10% with depth, fair to good inferred porosity, no show. <u>**Siltstone (20%)**</u>: medium grey, medium grey-brown, firm to moderate hard, very arenaceous, slightly calcareous, common glauconite inclusions, trace disseminated and nodular pyrite, occasional carbonaceous inclusions, blocky.
598.1-613.9m	**Sandstone** with trace **siltstone** interbeds.
	<u>**Sandstone (100%)**</u>: clear to translucent, unconsolidated, medium to coarse to occasionally very coarse, predominately subrounded to rounded to occasionally subangular, moderate to poorly sorted, common light grey argillaceous matrix, trace pyrite, rare glauconite, poor to fair inferred porosity, no show. <u>**Siltstone (trace)**</u>: medium to dark grey, grey black, firm, arenaceous, micromicaceous, rare carbonaceous inclusions, blocky.
613.9-634.6m	**Sandstone**-with minor **siltstone**-interbeds.
	<u>**Sandstone (90%)**</u>: pale orange becoming predominately clear to translucent with depth, weak iron staining decreasing with depth, unconsolidated, medium to coarse to very coarse, rounded to subrounded to subangular, poorly sorted, trace argillaceous matrix, trace glauconite, trace pyrite nodules, rare fossil fragments, poor to fair inferred porosity increasing to fair to good inferred porosity with depth, no show. <u>**Siltstone (10%)**</u>: Type 1: medium to dark grey, medium to dark grey-brown, firm, arenaceous, common carbonaceous inclusions, trace pyrite nodules and disseminated pyrite, blocky. Minor type 2: light grey, firm, calcareous, arenaceous, micromicaceous, rare carbonaceous inclusions, blocky.

Paarratte Formation
634.6-902.0m
Thickness 267.4m

634.6-668.2m

Sandstone with trace **siltstone** and **coal.**

__Sandstone (100%)__: predominately clear to translucent, mottled brick red, yellow, black, blue green, speckled black and white, unconsolidated, medium to very coarse, predominately angular to subangular, very poorly sorted, common quartz overgrowths, common fractured quartz, abundant metamorphic clasts: brick red, light to dark grey, blue-grey, yellow-green, very hard, very siliceous, angular fracture.
__Siltstone (trace)__: dark brown to black, occasionally medium grey with depth, firm to moderate hard, arenaceous, trace carbonaceous inclusions, siliceous in part, blocky to subfissile.
__Coal (trace)__: black, very hard, trace disseminated pyrite, siliceous, blocky to angular fracture.

668.2-742.8m

Sandstone with trace **siltstone** interbeds.

__Sandstone (100%)__: predominately clean, clear to translucent, unconsolidated, coarse to very coarse, angular to subangular, moderate sorted, common grey, grey-blue, brick red metamorphic clasts, good inferred porosity, no show.
__Siltstone (trace)__: light to medium grey, firm to moderate hard, siliceous, angular fracture, subfissile.

742.8-763.1m

Sandstone with trace **siltstone** and **coal** interbeds.

__Sandstone (100%)__: off-white, clear to opaque, unconsolidated, medium to predominately very coarse, angular to subangular, poorly sorted, trace siliceous overgrowths, trace metamorphic clasts, trace to minor medium glauconite nodules, trace to minor pyrite nodules and occasional pyrite cement, occasional fossil fragments, fair to good inferred porosity, no show.
__Siltstone (trace)__: medium grey-brown, medium brown, soft to firm, argillaceous, grading to claystone, slightly calcareous, trace to common fragmented fossil, rare carbonaceous inclusions, trace glauconite, blocky.

Coal (trace): black, firm, brittle, bituminous, dull, occasionally pyritised, blocky.

763.1-812.2m

Sandstone with minor interbedded **siltstone** and trace **coal.**

Sandstone (90%): as above.
Siltstone (10%): medium grey-brown, medium grey, firm to moderate hard, very arenaceous, calcareous in part, occasionally common carbonaceous inclusions, blocky.
Coal (trace): as above.

812.2-849.9m

Sandstone-with minor interbedded **siltstone** and **coal.**

Sandstone (80%): clear to opaque, unconsolidated, medium to predominately coarse to occasionally very coarse, subangular to subrounded, moderate well sorted, trace glauconite, trace fossil fragments, trace pyrite nodules, good inferred porosity, no show.
Siltstone (10%): Type 1: as above. Type 2: dark grey-black, dark grey, firm, very carbonaceous, grading to silty coal, micromicaceous, brittle, fissile.
Coal (10%): black, dark grey-black, moderate hard, brittle, dull to subvitreous, trace pyrite replacement, hackly to blocky.

849.9-882.9m

Sandstone with minor interbedded **siltstone** and **coal.**

Sandstone (80%): clear to opaque, unconsolidated, medium to predominately coarse to occasionally very coarse, subangular to subrounded, moderate well sorted, trace glauconite, trace fossil fragments, trace pyrite nodules, good inferred porosity, no show.
Siltstone (10%): Type 1: as above. Type 2: dark grey-black, dark grey, firm, very carbonaceous, grading to silty coal, micromicaceous, brittle, fissile.
Coal (10%): black, dark grey-black, moderate hard, brittle, dull to subvitreous, trace pyrite replacement, hackly to blocky.

882.9-902.0m

Sandstone with minor interbedded **claystone** and trace **coal.**

Sandstone (90%): clear to opaque to off-white, unconsolidated, medium to predominately very coarse, subangular to angular, moderate to poorly sorted, common

pyrite nodules, good inferred porosity, no show.
Claystone (10%): dark grey, hard, homogeneous, blocky.
Coal (trace): as above with trace pyritised wood.

Skull Creek Member
902.0-1027.2m
Thickness 125.2m

902.0-943.2m

Sandstone with interbedded **siltstone** and minor **claystone.**

Sandstone (70%): clear to translucent, unconsolidated, medium to predominately coarse to very coarse, subangular, poorly sorted, trace metamorphic clasts, trace fossil fragments, trace to common pyrite nodules, good inferred porosity, no show.
Siltstone (20%): medium grey-brown, dark brown, dark grey-brown, firm to moderate hard, slightly calcareous to calcareous in part, predominately arenaceous grading to very fine sandstone, occasionally argillaceous grading to claystone, trace carbonaceous inclusions, predominately blocky to occasionally amorphous.
Claystone (10%): medium grey-brown, firm to soft, slightly sticky, trace carbonaceous inclusions silty in part, amorphous to subblocky.

943.2-959.7m

Sandstone with minor interbedded **siltstone.**

Sandstone (100%): Type 1: clear to opaque, unconsolidated, medium to predominately coarse to very coarse, subangular, poorly sorted, trace glauconite, trace hard black lithics, trace pyritised wood and coal fragments, good inferred porosity, no show.
Type 2: off-white, light grey, friable to firm, moderate siliceous cement, moderate off white argillaceous matrix, trace carbonaceous inclusions, poor visual porosity, no show.
Siltstone (trace): medium brown, medium grey, brown-grey, firm to soft, arenaceous grading to very fine sandstone in part, siliceous in part, trace carbonaceous inclusions, common pyrite, trace fossil, blocky.

959.7-1027.2m

Siltstone with interbedded **sandstone.**

Siltstone (70%): predominately medium grey, medium brown-grey, soft to firm, arenaceous, grading to very fine sandstone, trace carbonaceous inclusions, trace pyrite nodules, very carbonaceous in part grading to silty coal in part, calcareous in part, subblocky.
Sandstone (30%): off-white, translucent to opaque, trace iron stained, unconsolidated, trace glauconite, good inferred porosity, no show.

Nullawarre Member
1027.2-1152.7m
Thickness 125.5m

1027.2-1047.0m

Sandstone with minor **siltstone** interbeds.

Sandstone (90%): mottled light and dark green, occasionally yellow green, unconsolidated, predominately medium to occasionally coarse, rounded to subrounded, moderate well sorted, abundant glauconite grains and quartz with glauconite inclusions and coatings, trace fossil fragments to bryozoa, bivalves, foraminifera, trace pyrite nodules, very good inferred porosity, no show.
Siltstone (10%): predominately medium grey, medium brown-grey, soft to firm, arenaceous, grading to very fine sandstone, trace carbonaceous inclusions, trace pyrite nodules, calcareous in part, subblocky.

1047.0-1104.8m

Sandstone with trace **siltstone.**

Sandstone (100%): pale orange-brown, iron stained, unconsolidated, predominately medium to coarse to becoming very coarse with depth, subangular to subrounded, moderate well sorted, occasional glauconite, common dark brown rounded siltstone pellets, good inferred porosity, no show.
Siltstone (trace): Type 1: pellets in sandstone; dark brown, moderate hard to firm, rounded, pelletoid, metallic lustre in part, occurring as clasts in sandstone. Type 2: medium grey, medium grey brown, firm, arenaceous in part, carbonaceous in part, blocky.

1104.8-1135.9m

Sandstone.

Sandstone (100%): clear to translucent, weak pale orange-brown, less iron staining than above, unconsolidated, medium to predominately very coarse, angular to angular, poorly sorted, trace siltstone pellets, rare glauconite, good inferred porosity, no show.

1135.9-1152.7m **Sandstone.**

__Sandstone (100%)__: pale grey, pale green, clear to translucent, minor pale orange-brown, predominately medium to coarse, subrounded to subangular, moderate sorted, rare fossil fragments, rare glauconite, trace carbonaceous inclusions, good inferred porosity, no show.

Belfast Mudstone Member
1152.7-1199.5m
Thickness 46.8m

1152.7-1158.0m **Sandstone** with interbedded **siltstone.**

__Sandstone (70%)__: as above but predominately Fe stained with common glauconite grains and nodules, no show.
__Siltstone (30%)__: medium grey, predominately soft to firm, dispersive in part, arenaceous in part, common dark green glauconite grains and nodules, rare pyrite nodules, trace carbonaceous inclusions, subblocky.

1158.0-1199.5m **Siltstone** with interbedded **sandstone.**

__Siltstone (70%)__: medium grey to occasionally medium grey-brown to occasionally medium green, firm to soft, arenaceous becoming argillaceous with depth, suspect clays washing out of sample, trace carbonaceous inclusions, common becoming abundant (up to 70%) with depth glauconite grains and nodules, subblocky to blocky to occasionally subfissile.
__Sandstone (30%)__: light grey, pale orange-brown, iron stained, unconsolidated, medium to coarse, subangular, poorly sorted, trace glauconite, trace pyrite nodules, rare fossil fragments, fair inferred porosity, no show.

Flaxmans Member (Waarre Formation)
1199.5-1219.5m
Thickness 20.0m

1199.5-1219.5m Interbedded **sandstone** and **siltstone.**

__Sandstone (50%)__: clear to opaque, pale grey, occasionally very pale orange-brown, predominately unconsolidated but often matrix supported by siltstone, medium to predominately coarse and very coarse,

subangular, subrounded, moderate to poorly sorted, minor siliceous overgrowths, trace glauconite coating on quartz grains in part, trace pyrite, poor inferred porosity, no show.
Siltstone (50%): medium to dark grey, firm, arenaceous in part, very argillaceous in part, grading to claystone in part, common to abundant glauconite, common pyrite nodules, trace carbonaceous inclusions, blocky.
Siltstone forming matrix around quartz grains.

Waarre Sandstone
1219.5-1309.0m
Thickness 89.5m

1219.5-1235.1m

Sandstone with minor **siltstone** interbeds.

Sandstone (90%): clear to translucent to occasionally opaque, unconsolidated, very clean, medium to predominately coarse to very coarse, subangular becoming predominately angular with depth, common fractured grains with depth, trace pyrite cement, very good visual porosity, no show.
Siltstone (10%): as above.

1235.1-1257.8m

Sandstone with minor interbedded **siltstone.**

Sandstone (90%): clear to translucent to off-white, unconsolidated to occasionally friable, occasionally fine to predominately coarse to very coarse, subrounded to subangular, poorly sorted, minor calcareous cement, occasionally calcareous matrix, minor pyrite cement and nodules, trace carbonaceous inclusions, fair to good inferred porosity, no show.
Siltstone (10%): light to predominately medium to occasionally dark grey, soft to firm, arenaceous grading to very fine sandstone, argillaceous matrix, slightly calcareous, common microcarbonaceous inclusions, trace micromicaceous, subblocky to blocky.

1257.8-1286.1m

Interbedded **siltstone, sandstone** and minor **coal.**

Siltstone (50%): medium grey to medium grey-brown, soft, sticky, very argillaceous grading to claystone, arenaceous in part, microcarbonaceous, common matrix supported quartz grains, subblocky to blocky.
Sandstone (50%): Type 1: predominately opaque to translucent, predominately unconsolidated to friable, medium to predominately very coarse, angular to

subangular, poorly sorted, minor calcareous cement, trace pyrite, very poor visual porosity in aggregates, fair inferred porosity when unconsolidated, no show.
Minor type 2: off-white to very pale brown, soft, very fine to fine, subrounded to subangular, moderate well sorted, matrix supported, abundant off white to pale brown kaolinitic/silty matrix, trace carbonaceous inclusions, grading to sandy siltstone, nil visual porosity, no show.
Coal (trace): predominately black to brown black, moderate hard, brittle, dull to subvitreous, earthy, argillaceous, grading to very carbonaceous claystone in part, trace pyrite, hackly to subconchoidal fracture.

1286.1-1298.2m

Sandstone with minor interbedded **siltstone.**

Sandstone (80%): Type 1: pale grey, clear to translucent to opaque quartz, unconsolidated to occasionally friable, fine to predominately medium to occasionally coarse and very coarse becoming predominately fine with depth, subrounded to subangular, poorly sorted, minor calcareous cement/matrix, abundant dispersive clay matrix, trace lithics, trace carbonaceous inclusions, trace pyrite, very poor to poor inferred porosity, no show.
Type 2: off-white, matrix supported, soft, very fine to fine, subrounded, moderate well sorted, abundant kaolinitic matrix, trace lithics, trace carbonaceous inclusions, nil visual porosity, no show.
Siltstone (20%): predominately medium grey-brown, soft to firm, arenaceous, carbonaceous inclusions, trace lithics, blocky to subblocky.

1298.2-1309.0m

Sandstone with minor interbedded **siltstone.**

Sandstone (90%): Type 1: clear to translucent to opaque to occasionally pale yellow, unconsolidated, medium to predominately coarse to very coarse, subrounded to subangular to occasionally angular, poorly sorted, trace calcareous cement/matrix, trace pyrite, trace red brown lithics, trace blue-green lithics ?chamosite, common carbonaceous inclusions, good inferred porosity, no show.
Type 2: mottled off-white, pale blue-grey, pale blue-green, yellow-brown, pale brown, friable to moderate hard, predominately fine to medium, subangular, moderate sorted, abundant calcareous cement/matrix, common feldspar lithics, trace red-brown

lithics, trace green lithics, trace carbonaceous inclusions, very poor visual porosity, no show.
Type 3: pale blue-grey, pale blue-green, soft, sticky, very fine, subangular, well sorted, abundant pale blue-grey, pale blue-green argillaceous/calcareous matrix, matrix supported sandstone, common blue-grey and blue-green lithics, trace red brown lithics, trace carbonaceous inclusions, trace pyrite nodules, nil visual porosity, no show.
Siltstone (10%): medium grey, medium brown, firm, arenaceous grading to very fine sandstone in part, occasional very fine sandstone interlaminations, becoming more argillaceous with depth, common microcarbonaceous inclusions, trace lithics, rare micromicaceous, blocky.

Eumeralla Formation
1309.0-1394.3m
Thickness 85.3m+

1309.0-1325.8m — Lithic **sandstone** with minor **siltstone**.

Sandstone (90%): green-grey, blue-green, soft to unconsolidated, fine to predominately medium, subrounded, moderate well sorted, abundant pale blue green argillaceous and slightly calcareous matrix, abundant blue-green lithics, trace carbonaceous inclusions, trace pyrite nodules, nil visual porosity, no show.
Siltstone (10%): medium to dark grey, medium to dark brown, firm to soft, arenaceous, abundant carbonaceous inclusions, trace red lithics, trace feldspar, grading to very fine sandstone in part, argillaceous in part grading to claystone with depth, blocky.

1325.8-1345.1m — Lithic **sandstone** with trace **siltstone**.

Sandstone (100%): blue-grey, blue-green, mottled, unconsolidated to occasionally soft, 30% quartz, predominately 70% quartzite lithics, predominately blue-green, blue-grey, trace red, dark grey, medium, subangular, well sorted, trace pyrite nodules, minor blue-grey green argillaceous kaolinitic matrix, nil visual porosity in matrix supported sandstone, poor inferred porosity when unconsolidated, no show.
Siltstone (trace): medium to dark grey brown, firm, argillaceous, trace carbonaceous inclusions, blocky to subfissile.

1345.1-1366.8m	Interbedded **sandstone, siltstone** and **claystone.**
	Sandstone (50%): light blue-grey, friable, very fine to predominately fine, subangular, trace siliceous cement, abundant argillaceous kaolinitic matrix, predominately quartzite grains, trace feldspar, trace carbonaceous inclusions, poor visual porosity, no show. **Siltstone (30%)**: Type 1: light grey, light grey-brown, firm to soft, arenaceous, grading to very fine sandstone in part, argillaceous matrix, trace microcarbonaceous, trace feldspar, blocky. Type 2: dark brown, firm, argillaceous, trace carbonaceous inclusions, blocky. **Claystone (20%)**: Type 1: light grey, light grey brown, off-white, trace microcarbonaceous, subblocky. Type 2: pale green, firm, homogeneous, blocky.
1366.8-1394.3m (T.D.)	**Sandstone** with trace **siltstone** interbeds.
	Sandstone (100%): lithic sandstone as for interval 1325.8 to 1345.1m, predominately medium, minor argillaceous kaolinitic matrix, good visual porosity, poor inferred porosity, no show. **Siltstone (trace)**: as above type 1.

2.3 SWC Descriptions VOGEL 1

SIDEWALL CORE REPORT

SWC NO.	DEPTH (m)	DESCRIPTION
1	1364.0	LOST
2	1348.5	LOST
3	1311.0 28mm	SILTSTONE: DK GRY, FM, V.SLI VF AREN, TR CARB INCL, RR M-MIC, PRED HOMOG, NS.
4	1310.0 30mm	SILTSTONE: DK GRY, GRY BLK, VF AREN, TR CARB INCL, RR LITHS, GRAD TO VF SLTY SST, NS.
5.	1281.5 35mm	INTERLAM SANDSTONE & CLAYSTONE. SST: OFF WH, PA GRY, SFT-FRI, VF-F, SBANG, MOD SRTD, ABUND KAO MTX, COM LITHS, OCC BLU GN LITHS, RR RD LITHS, TR CARB INCL, N.S. CLYST: DK BRN, SFT, STKY, V.CARB W FINE SST INTERLAMS, NS.
6.	1280.5 35mm	INTERLAM SILTSTONE & SANDSTONE. SLTST: DK GRY FM, AREN I/P, COM CARB INCL, RR M-MIC, W TR INTERLAM SST, **TR EXINITE W TR BRI YELL WH FLU, TR CUT, TR RES RING.** SST: OFF WH-LT GRY, FRI, VF, COM KAO MTX, TR-COM LITHS, TR FELS, COM BLU GN F-MED QTZITE CLASTS, V.PR VIS POR, NS ASSOCIATED WITH MINERAL MATRIX.
7.	1265.5 34mm	SILTSTONE: DK BRN, FM, V.ARG GRAD TO CLYST, V.CARB, RR M-MIC, SBFISS-FISS, NS.
8.	1259.5	LOST
9.	1222.5	LOST
10.	1216.3 32mm	SILTSTONE: V.DK BRN, BRN BLK, FM, ARG, AREN I/P, ABUND DISSEM PYR, V.CARB, COM DULL COALY & WOODY INCL, BLKY-SBFISS, NS.
11.	1200.3 43mm	GLAUC CLAYSTONE: V.DK GN, GN BLK, FM-SFT, SLI STICKY, V. GLAUC, COM-ABUND PELLETOID GLAUC, RR M-MIC, HIGHLY TURBATED, NS.
12.	1196.0 42mm	GLAUC CLAYSTONE: A/A BUT OCC INTERSPERSED W VF--F SBANG QTZ, NS.
13.	1188.2 42mm	GLAUC CLAYSTONE: A/A, NS.
14.	1177.3 34mm	CLAYSTONE: DK GRY BRN, FM-MOD HD, V.ARG, COM MED GLAUC GRNS, COM CARB INCL, BLKY, NS.
15.	1153.2 35mm	CLAYSTONE: A/A, NS.

SWC NO.	DEPTH (m)	DESCRIPTION
16.	1140.5	LOST
17.	1075.4	LOST
18.	1028.7 40mm	GREENSAND: DK GN, SPKLED W CLR-TRNSL QTZ, FRI, VF-F-OCC MED-CRS SBANG-ANG QTZ, PRED MED SBRND-SBANG GLAUC GRNS, P.SRTD, ABUND ARG GLAUC MTX, COM KAO MTX, TR CARB INCL, TR PYR NODS, PR-FR VIS POR, NS.
19.	992.5	LOST
20.	934.5	LOST
21	908.0	LOST
22	600.7 43mm	SANDSTONE: DK BRN, SFT-UNCONS, VF-F, SBANG-ANG, MOD SRTD, ABUND DK BRN ARG MTX, TR CARB INCL, FR VIS POR, NS.
23.	591.7 40mm	SANDSTONE: MOTT PA-MED BRN, OFF-WH, SFT-UNCONS, VF-CRS, SBANG-ANG, P.SRTD, ABUND PA-MED BRN SLTY & CLAYEY MTX, ABUND KAO MTX I/P, COM CARB INCL, FR-OCC GD VIS POR, NS.
24.	586.7 35mm	SANDSTONE: DK BRN, SFT-UNCONS, F-MED, SBRND-SBANG, MOD SRTD, ABUND DK BRN ARG MTX, TR-COM CARB INCL, FR-GD VIS POR, NS.

2.4 Petrological and XRD Analyses

Petrological examinations and/or XRD analyses of eleven (11) sidewall cores were carried out by S.E. Phillips and D.L. Cathro of Amdel Pty Ltd.

The results are contained in the report that follows.

AMDEL CORE SERVICES

PETROLOGY REPORT

VOGEL #1

OTWAY BASIN

Report prepared for Bridge Oil Limited

by

S E PHILLIPS AND D L CATHRO

Amdel Core Services
PO Box 109
Eastwood
SA 5063

September 1990

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1. SUMMARY

Bridge Oil requested petrological descriptions and/or XRD analyses of 11 sidewall core from Vogel #1 in the Otway Basin. The study was designed to identify the factors controlling porosity and permeability, sediment provenance, depositional environments and the paragenetic sequence.

Sidewall cores range from mudstones to fine grained, moderately sorted sandstones. Two samples do not conform to this trend, swc 11 is an oolitic ironstone and swc 18 is a glaucony rich sandstone. Framework grains within the samples are very similar throughout the section, and consist of varying amounts of quartz, feldspar, mica, lithics, glaucony grains, zircon, tourmaline and rutile.

Evidence suggests a predominantly plutonic/granitic sediment provenance for the quartz, with minor metamorphic and sedimentary input.

The mudstones of the sequence are thought to have been deposited as tidal flat or offshore sediments whilst the oolitic ironstone may have developed due to diagenetic alteration in an oxic groundwater regime. Grainsize of the sandstones, suggests a quiet hydraulic regime and the presence of glaucony indicates that some samples were deposited in shallow marine environments.

The following diagenetic events have been recognised, but these stages are not apparent in all samples and the paragenetic sequence is uncertain;

- glauconite grains
- chloritic ooids
- mechanical compaction
- alteration of feldspars - kaolinization
- chloritization of micas & lithics, & precipitation from solution
- carbonate recrystallisation
- pyrite precipitation

The only samples with significant porosity and permeability were sidewall cores 22 and 24. The preservation of primary intergranular pore space in these samples is controlled by the lack of matrix and authigenic minerals and cements. Point contacts between grains are dominant. Sidewall core 23 is very similar to sidewall cores 22 and 24, except for the presence of matrix and siderite, which fills intergranular pore spaces, thus reducing porosity and permeability. Porosity in the other samples has been reduced in several ways. The porosity and permeability of the muds in sidewall cores 4, 6 ,7 and 10 is determined by grainsize and is predictably low. Porosity and permeability of sidewall cores 11 and 18 is controlled by diagenesis and grainsize. Trace amounts of secondary pore space exists due to the shrinkage of ooids (Swc 11) and glaucony (glauconite) grains (Swc 18), but they are not interconnected, resulting in negligible permeability. Primary intergranular pore space in sidewall core 18 is occluded by sparry carbonate (?siderite) cement and a glaucony rich matrix.

XRD analyses detected the presence of 18 Angstrom montmorillonite in sidewall cores 6, 14 and 24. This is a highly expansive, sodium rich variety, that may cause problems during production, due to swelling. There may also be minor swelling associated with the chlorite (clinochlore).

2. INTRODUCTION

This report contains brief petrological descriptions and/or XRD analyses of 11 sidewall core from Vogel #1 in the Otway Basin. The study was requested by Bridge Oil to identify; factors controlling porosity and permeability, sediment provenance, depositional environments and the paragenetic sequence.

The following sidewall core were examined:

Swc No.	Depth(m)	Thin section	XRD
4	1310.0	Yes	No
6	1280.5	Yes	Yes
7	1265.5	Yes	No
10	1216.3	Yes	No
11	1200.3	Yes	Yes
13	1188.2	No	Yes
14	1177.3	No	Yes
18	1028.7	Yes	Yes
22	600.7	Yes	No
23	591.7	Yes	No
24	586.7	Yes	Yes

3. METHODS

Sidewall core were described in hand specimen then impregnated with araldite prior to thin section preparation. Blue dye was used in the araldite to facilitate description of porosity and permeability. Thin sections were systematically scanned to determine lithology, composition, porosity and textural relationships. All percentages given in brief descriptions are based on visual estimates, not point counts.

To determine bulk mineralogy by X-ray diffraction, samples were prepared by hand grinding in acetone and then smeared onto a glass slide. Continuous scans were run from 3° to 75° 2 theta, at 1°/minute, using Co K alpha radiation, 50kV and 35mA, on a Philips PW1050 diffractometer. For detailed clay mineralogy a less than 10 micron size fraction was separated rather than the typical less than 2 micron fraction because of small sample sizes. Separation of the less than 10 micron fraction was achieved by hand crushing, addition of dispersion solution, mechanical shaking for 10 minutes and settling of the dispersed material in a water column according to Stokes' Law. The less than 10 micron fraction was pipetted off and prepared as an oriented sample on ceramic plates held under vacuum. Samples were saturated with Mg and treated with glycerol. Continuous scans of oriented clay samples were run from 3° to 35° 2 theta at 1°/minute. Peaks were identified by comparison with JCPDS files stored in a computer program called XPLOT.

4. SIDEWALL CORE PETROLOGY

4.1 Vogel #1, Swc 4, depth 1310.0m

Hand specimen description
Sample received consisted of 2.0cm of moderately consolidated, full diameter sidewall core, with a thick layer of drilling mud. It was an olive black (5Y 2/1) micaceous mudstone, with grains too fine to describe. There was no reaction with 10% HCl and no sedimentary features.

Thin section description
Damage to the mudstone due to sidewall core collection was minimal. Framework grains are dominantly quartz, with minor to trace amounts of feldspar, glaucony and ?rutile. Detrital quartz is monocrystalline, rarely polycrystalline and well rounded with good sphericity (rarely elongate). Monocrystalline quartz has straight to slightly undulose extinction and minor fluid and mineral (mica) inclusions. Polycrystalline quartz is unstrained with undulose extinction and minor fluid inclusions. Two forms of feldspar are present, very fine grained angular plagioclase (?andesine) with albite twinning and highly altered (sericitized) grains, which have also been chloritized. Mica flakes are up to 0.15mm long, consisting of aligned muscovite that is rarely bent. Glaucony grains consist of glauconite, they are less than 0.13mm in diameter, well rounded and concentrate within the matrix. Trace amounts of silt sized, well rounded, strongly coloured rutile is also present.

There is a high proportion of red-brown matrix, that contains poorly formed and weakly aligned illite. Opaque (?organic) material varies in shape from well rounded silt sized patches to stringers up to 0.65mm long. The stringers are aligned parallel to each other and the micas.

The only authigenic mineral present is fibrous chlorite which was derived from the alteration of mica.

The sample is matrix supported, with framework grains floating in mud and rare point contacts. Due to the large amount of fines, this sample would be expected to have very low porosity and permeability and could possibly act as a seal.

Composition		
Framework grains		%
Quartz		3
Feldspar		5
Mica		3
Glaucony grains		1
Others	- rutile	tr
Matrix		
Clay	- ?illite	82
Organic matter		5
Authigenic minerals and cements		
Clay	- Chlorite	tr
Porosity		0

X-ray diffraction
No XRD was performed as the palynology analysis was more important. XRD analysis is required to determine the mineralogy of the matrix.

4.2 Vogel #1, Swc 6, depth 1280.5m

Hand specimen description
Sample received consisted of 2.0cm of moderately consolidated, full diameter sidewall core and fragments. It was an olive black (5YR 2/1) mudstone, with discontinuous lenses (?starved ripples) of light grey (N7), very fine grained sand. Black (N1) stringers (organic matter) were observed in both the mudstone and the lenses. There was no reaction with 10% HCl in either the mudstone or the sand lenses. Trace amounts of Fe-staining, mica and pyrite were also noticed.

Thin section description
Fracturing from sidewall core collection is the only disruption to the sample. The sample is a mudstone containing very fine grained discontinuous, poorly sorted, texturally and mineralogically immature, quartzarenite and siltstone lenses (?starved ripples).

Framework grains in the mudstone are dominantly quartz, with minor amounts of lithic fragments and mica. Subangular to subrounded detrital quartz is monocrystalline and of the common granitic/plutonic variety. Aligned micas (muscovite) are up to 0.06mm long and rarely bent. Two types of lithics are present; well rounded and slightly elongate chert fragments and very fine sand sized lithics with aligned micas of possible metamorphic origin. Framework grains in the lenses are dominantly quartz, with minor amounts of feldspar, mica, lithics, tourmaline and zircon. Angular to well rounded detrital quartz is monocrystalline and polycrystalline. Monocrystalline quartz has minor fluid inclusions, and straight to slightly undulose extinction. Polycrystalline quartz is unstrained, contains minor mineral inclusions and has undulose extinction. Plagioclase and potassic feldspars are present. Rare plagioclase feldspar (?andesine) is fine grained, twinned, and commonly partially sericitized. Very fine grained potassic feldspar is subangular, with microcline twinning. Mica occurs as biotite and muscovite. Muscovite is up to 0.40mm long, although commonly much smaller and bent. Rare biotite flakes are up to 0.15mm long and commonly bent, splayed and associated with opaques. Two types of lithics are present; well rounded and slightly elongate chert fragments and very fine sand sized lithics with aligned micas of possible metamorphic origin. Tourmaline and zircon are silt sized, with the tourmaline commonly zoned.

There is a high proportion of aligned matrix which contains illite and other clay minerals that are too fine to identify. Matrix in the quartzarenite and siltstone lenses (?starved ripples) occurs as trace amounts of grain coating illite. Opaques (organics) occur in the mudstone and in the lenses where it forms stringers and isolated patches, rarely associated with pyrite. Organic matter is more abundant in the mudstone.

Authigenic minerals and cements in the lenses include chlorite, kaolin, pyrite and carbonate (?siderite). Green fibrous chlorite fills pore spaces and is the result of mica alteration. Very fine kaolin booklets fill oversized and intergranular pores. Carbonate (?siderite) and pyrite occur in both the lenses and the mudstone. Carbonate is in the form of micritic, iron rich blotches, commonly recrystallised to microspar rhombs. Pyrite is associated with organic matter.

The mudstone is matrix supported, with grains floating in the matrix and only rare point contacts. The lenses are grain supported, with common point and tangential contacts. Slight compaction is indicated by the bending of micas in the lenses. Porosity and permeability in this sample would be very low.

Composition

		% Mudstone	% Lenses
Framework grains			
Quartz		10	60
Mica		2	2
Lithics		4	12
Others	- Tourmaline	0	tr
	- Zircon	0	tr
Matrix			
Clay		72	2
Organic matter		10	3
Authigenic minerals and cements			
Carbonate	- ?Siderite	1	tr
Clay	- Kaolin	0	10
	- Chlorite	0	10
Pyrite		tr	tr
Porosity		0	0

X-ray diffraction
Bulk XRD (Fig. 1a) indicates that quartz is dominant in this sample, with minor to trace amounts of albite (low), siderite, kaolinite-1T and illite/muscovite-2M1. The clay XRD trace (Fig. 1b) indicates the presence of quartz, kaolinite-1T, illite-2M1, 18 Angstrom montmorillonite and clinochlore IIB (ferroan). The montmorillonite is a sodium rich variety, which is known to be very reactive.

4.3 Vogel #1, Swc 7, depth 1265.5m

Hand specimen description
Sample received consisted of moderately consolidated, sidewall core fragments, the longest was 3.0cm, with a thick coating of drilling mud. It was an olive black (5Y 2/1) mudstone. There was no reaction with 10% HCl and no sedimentary features. Trace amounts of opaques, mica, Fe-staining and pyrite were noted.

Thin section description
This sidewall core has been fractured due to the collection technique. The sample consists of a mudstone interbedded with a silty mudstone. Rare discontinuous silty lenses and a ?load cast occur within the silty mudstone. The mineralogy of both mudstones is very similar and will be described together.

Silt sized framework grains are dominantly feldspar and quartz, with trace amounts of mica. The feldspar is composed of silt sized, subrounded, highly altered (sericitized) grains, with no apparent twinning. Mica (muscovite) is up to 0.10mm long, with flakes aligned parallel to each other. Detrital quartz is monocrystalline and of the common granitic/plutonic variety. The framework grains in the ?load cast consist of silt sized quartz and tourmaline. Detrital quartz has the same characteristics as quartz in the mudstone. Tourmaline is well rounded and zoned.

There is a high proportion of aligned matrix in the sample. Illite and other clay minerals too fine to identify occur within the matrix. Illite fills pore spaces and coats grains in the ?load cast and lenses. Opaques (organic matter) occur in the mudstone as stringers aligned parallel to bedding.

Authigenic minerals and cements include carbonate (?siderite), chlorite and opaques. Carbonate (?siderite) is abundant throughout the entire sample as Fe-rich micritic patches that when elongate, are approximately parallel with the bedding. Brown and green chlorite occurs in the load cast and lenses as the result of the alteration of mica. Opaques (pyrite) are commonly associated with organic stringers. They occur as framboids and individual cubes.

The mudstone beds are matrix supported, with framework grains floating in the mud and rare point contacts between these grains. The ?load cast and lenses are grain supported, with common concavo-convex and tangential grain to grain contacts. No porosity or permeability was observed.

Composition

		% Mudstone	% Silty Mudstone	% Load Cast
Framework grains				
Quartz		2	5	75
Feldspar		5	10	0
Mica		2	4	0
Others	- Tourmaline	0	0	tr
Matrix				
Clay		78	69	20
Organic matter		7	8	tr
Authigenic minerals and cements				
Carbonate	- ?Siderite	5	3	2
Clay	- Chlorite	tr	0	2
Pyrite		tr	tr	tr
Porosity		0	0	0

X-ray diffraction
XRD analysis was not requested for this sample.

4.4 Vogel #1, Swc 10, depth 1216.3m

Hand specimen description
Sample received consisted of 2.5cm of full diameter, moderately consolidated sidewall core, with a thick coating of drilling mud. It was an olive black (5Y 2/1) mudstone. There was no reaction with 10% HCl and no sedimentary structures were observed. Trace amounts of opaques, mica, Fe-staining and pyrite were noted.

Thin section description
The sample is fractured due to sidewall collection. It consists of a silty mudstone with rare medium sized quartz grains. Within the mudstone are siltstone lenses (?starved ripples), with essentially the same framework grains.

Framework grains are dominantly quartz, with minor to trace amounts of feldspar, mica, glaucony grains and tourmaline. Subangular detrital quartz is monocrystalline and polycrystalline. Monocrystalline quartz has minor fluid and mineral (tourmaline) inclusions and straight to slightly undulose extinction. Polycrystalline quartz is unstrained with undulose extinction and minor fluid inclusions. K-feldspar is composed of highly altered grains containing abundant fluid inclusions and sericite. Micas (muscovite and biotite) are up to 0.25mm long, commonly bent and splayed, and aligned approximately parallel to each other. Silt to very fine glaucony grains are composed of glauconite, they are well rounded and commonly deformed. Silt sized tourmaline is well rounded and zoned.

There is a high proportion of red brown matrix, that is commonly fibrous due to the weak alignment of clay minerals. Matrix in the lenses consists of illite coatings on detrital grains and clay of indeterminate composition. Opaques (organic matter) in the form of stringers up to 0.70mm long are aligned approximately parallel to each other and associated with trace amounts of pyrite.

Authigenic minerals and cements include chlorite, siderite and opaques (pyrite). Chlorite is present as an alteration of some of the illite matrix and is green to brown and slightly fibrous. Carbonate (?siderite) exists as micritic blotches. Some of the carbonate has recrystallised into rhombic microspar that occurs throughout the entire sample. Opaques (pyrite) form large cubes and framboids which cement framework grains and/or are associated with organic matter.

The sample is matrix supported with framework grains floating in mud and only rare point contacts. The lenses are grain supported, with common tangential and point contacts. No porosity or permeability is evident.

Composition

		% Mudstone	% Lenses
Framework grains			
Quartz		29	63
Feldspar		4	2
Mica		1	1
Glaucony grains		1	tr
Others	- Tourmaline	tr	0
Matrix			
Clay		54	30
Organic matter		4	1
Authigenic minerals and cements			
Carbonate	- ?Siderite	2	1
Pyrite		3	1
Clay	- Chlorite	1	tr
Porosity		0	0

X-ray diffraction
XRD analysis was not requested for this sample.

4.5 <u>Vogel #1, Swc 11, depth 1200.3m</u>

Hand specimen description
Sample received consisted of 3.0cm of full diameter, moderately consolidated sidewall core and fragments, with a thick coating of drilling mud. It was an olive grey (5Y 3/2) mudstone. There was no reaction with 10% HCl and no sedimentary structures were observed. Significant amounts of very soft greenish black (5GY 2/1), well rounded grains and trace amounts of Fe-staining, mica, quartz and feldspar were noted.

Thin section description
The sample is an oolitic ironstone, containing rare discontinuous lenses of siderite spar (rhombs). Framework grains are dominantly ooids, with trace amounts of quartz, feldspar and lithics. The ooids (Fig. 2) are well rounded, slightly elongate, with an average length of 0.40mm and width of 0.25mm. Concentric, continuous laminae of chlorite and iron rich material, have developed around various nuclei to form the ooids. The thickness of the cortices and the extent of preservation of the concentric structure is variable, with from one to six laminae observed. Four varieties of nuclei

exist, quartz, Fe-rich material, opaques and altered lithics. Quartz grains and lithics form nuclei with characteristics similar to their detrital counterparts. Anhedral Fe-rich nuclei of indeterminate composition are dominant. Nuclei of very fine to fine grained, cubic and elongate opaques (pyrite) are rare. Silt to coarse grained, subangular to angular, slightly elongate detrital quartz is monocrystalline and rarely polycrystalline. Monocrystalline quartz is of the common granitic/plutonic variety. Polycrystalline quartz is unstrained and has undulose extinction. Fine grained, subangular, potassic feldspar displays microcline twinning. Lithics of indeterminate composition display various stages of chloritization.

A high proportion of chlorite rich matrix is present, filling intergranular pore spaces between the ooids and other framework grains. Opaque stringers (organic matter) are rare within the ironstone.

Authigenic minerals and cements include chlorite, carbonate (?siderite), and opaques (?pyrite). Chlorite is present as a grain replacement, but the composition of the replaced grains is unknown. Carbonate spar consists of euhedral rhombs floating in the chlorite rich matrix. These rhombs partially embay into some quartz grains. The carbonate has also formed rare discontinuous lenses of sparry euhedral rhombs, possibly recrystallising from a more micritic phase. Cubic and octahedral opaques (?pyrite) are fine sand sized.

The sample is grain supported with rare point contacts between framework grains. Some ooids appear to have been compacted. Traces of secondary porosity, caused by the shrinkage of ooids, is present as a narrow (less than 0.01mm) pore space completely surrounding some ooids.

Composition			
Framework grains			%
	Quartz		6
	Feldspar		tr
	Others	- Ooids	35
	Lithics		2
Matrix			
	Clay	- Chlorite	30
	Organic matter		1
Authigenic minerals and cements			
	Carbonate	- ?Siderite	23 (95% in lens)
	Pyrite		1
	Clay	- Chlorite	1
Porosity			
	Secondary		tr

X-ray diffraction

Bulk XRD (Fig. 3a) indicates that quartz is dominant, with a significant amount of siderite and minor to trace amounts of clinochlore IIB (ferrian), microcline (max) and hematite. The clay XRD trace (Fig. 3b) indicates the presence of quartz, clinochlore IIB (ferrian) and illite-2M1. The broad peaks and high background of both traces suggests that interstratified material or organic matter may have been detected.

4.6 Vogel #1, Swc 13, depth 1188.2m

Hand specimen description

Sample received consisted of 3.5cm of moderately consolidated, full diameter sidewall core and fragments, with a thick coating of drilling mud. It was a greenish black (5G 2/1) mudstone, with very fine grained ?feldspar and large granules of black (N1) material (?coal). There was no reaction with 10% HCl and no sedimentary features were observed. Trace amounts of mica were noticed.

Thin section description

A thin section description was not requested for this sample.

X-ray diffraction

Bulk XRD (Fig. 4a) indicates that quartz is dominant, with minor to trace amounts of siderite, clinochlore IIB (ferroan), illite/muscovite-2M1, hematite and ?biotite. Clay XRD (Fig. 4b) indicates the presence of quartz, clinochlore IIB (ferroan) and illite-2M1. The high background on both these traces, may be due to interstratified material or organic matter.

4.7 Vogel #1, Swc 14, depth 1177.3m

Hand specimen description

Sample received consisted of 3.0cm of well consolidated, full diameter sidewall core and fragments, with a thick coating of drilling mud. It was a brownish black (5YR 2/1) mudstone, with abundant black (N1) and greenish black (5GY 2/1) well rounded ?glaucony. There was no reaction with 10% HCl and no sedimentary features were noticed. Trace amounts of pyrite and mica were also observed.

Thin section description

A thin section description was not requested for this sample.

X-ray diffraction

Bulk XRD (Fig. 5a) indicates that quartz is dominant, with minor amounts of clinochlore IIB (ferroan), microcline (int) and pyrite. The very high background in the clay region suggests there are probably other clays present. Clay XRD (Fig. 5b) indicates the presence of quartz, 18 Angstrom montmorillonite, illite-2M1 and clinochlore IIB (ferroan). The montmorillonite is a very reactive, sodium rich variety.

4.8 Vogel #1, Swc 18, depth 1028.7m

Hand specimen description

Sample received consisted of 2.0cm of moderately consolidated, full diameter sidewall core and fragments, with a thick coating of drilling mud. It was a mottled, olive black (5Y 2/1) and reddish brown (10R 4/6), medium to coarse grained, muddy sandstone. Framework grains were subangular to well rounded with good sphericity. There was no reaction with 10% HCl and no sedimentary features were observed. Trace amounts of pyrite and mica were noted.

Thin section description

Fine to medium grained (average medium), moderately sorted, mineralogically mature, texturally immature, glaucony rich sandstone. Framework grains are dominantly quartz, with minor to trace amounts of glaucony grains(Fig. 6), <u>feldspar and lithics. Angular to subrounded detrital quartz is</u>

monocrystalline and rarely polycrystalline. Monocrystalline quartz has straight extinction and minor fluid and mineral inclusions. Unstrained polycrystalline quartz has minor mineral and fluid inclusions, with undulose extinction. Medium sized glaucony grains composed of glauconite are well rounded, commonly slightly elongate and iron enriched. Feldspars are highly altered, with both abundant fluid inclusions and sericite, but no twinning. Lithics are of indeterminate composition and are commonly partially replaced by glaucony (?chlorite) and carbonate.

Chlorite matrix lines and fills intergranular pore spaces. Where totally occluding pore space, the matrix is associated with microspar and sparry carbonate (?siderite).

Authigenic minerals and cements include carbonate (?siderite) (Fig. 6), chlorite and opaques. Iron rich carbonate is dominant with rhombic spar and scalenohedra filling intergranular pore spaces and replacing grains. Carbonate commonly embays into quartz, iron rich glaucony grains and rarely partially occludes shrinkage pore space. Chlorite commonly replaces grains including shale lithics. Some shale lithics are also partially replaced by carbonate. Rare, fine grained, well rounded opaques (pyrite) were also present.

The sample is grain supported with minor point contacts between framework grains. Shrinkage pores around the glaucony rich grains are up to 0.04mm thick and account for approximately 1% of the total composition. Primary pore space is totally occluded by chlorite matrix and carbonate cement.

Composition		
Framework grains		%
Quartz		40
Feldspar		2
Glaucony grains		20
Lithics		1
Matrix		
Clay		10
Authigenic minerals and cements		
Carbonate	- ?Siderite	24
Pyrite		tr
Clay	- Chlorite	1
Porosity		
Secondary		1

X-ray diffraction
Bulk XRD (Fig. 7a) indicates that quartz and siderite are co-dominant, with minor to trace amounts of microcline (max), clinochlore IIB (ferroan) and possibly glauconite. Clay XRD (Fig. 7b) indicates the presence of quartz, clinochlore IIB (ferroan) and illite-2M1. The apparent lack of glauconite in the clay trace is attributed to the poor response of this mineral when prepared as an oriented sample.

4.9 Vogel #1, Swc 22, depth 600.7m

Hand specimen description
Sample received consisted of 3.5cm of full diameter sidewall core, with a thick coating of drilling mud. It was a mottled olive black (5Y 2/1) and black (N1), medium grained muddy sandstone. Framework grains were subrounded with moderate sphericity. There was no reaction with 10% HCl and no sedimentary features were observed. Trace amounts of pyrite were noted.

Thin section description
The sample is significantly influenced by the infiltration of drilling mud (Fig. 8a) but grains have not been shattered. It is a silt to medium grained (average fine), moderately to well sorted, texturally and mineralogically mature sandstone.

Framework grains are dominantly quartz, with minor to trace amounts of feldspar, mica and tourmaline. Angular to subrounded detrital quartz is monocrystalline and rarely polycrystalline. Monocrystalline quartz with straight to slightly undulose extinction, contains Boehm lamellae and fluid and mineral inclusions. Polycrystalline quartz is unstrained, contains mineral inclusions and has slightly undulose extinction. Highly altered, angular feldspar has abundant fluid inclusions and a dusty appearance. Mica (muscovite) is up to 0.25mm long and is commonly bent or splayed. Very fine grained, well rounded tourmaline, is commonly zoned.

Clayey material in this sandstone is predominantly drilling mud.

The only authigenic mineral present is opaque material (pyrite) that forms framboids and individual cubes, and is associated with splayed mica.

The sample is grain supported, with considerable drilling mud infiltration suggesting that porosity and permeability was very high. Primary intergranular porosity (Figs. 8a and 8b) is preserved and represents up to 10% of the total rock content. When combined with the proportion of drilling mud this figure may have been significantly higher.

Composition		
Framework grains		%
Quartz		68
Feldspar		4
Mica		tr
Others	- Tourmaline	tr
Matrix		0
Authigenic minerals and cements		
Pyrite		2
Porosity		
Primary		10
Drilling mud		15

X-ray diffraction
XRD analysis was not requested for this sample.

4.10 Vogel #1, Swc 23, depth 591.7m

Hand specimen description
Sample received consisted of 3.0cm of poorly consolidated sidewall core and fragments. It was a mottled, olive grey (5Y 4/1), black (N1) and white (N9), very fine to coarse grained muddy sandstone. Framework grains were subrounded to subangular with moderate sphericity. There was no reaction with 10% HCl and no sedimentary structures were observed. Trace amounts of Fe-staining and pyrite were noted.

Thin section description
The sample is highly disrupted, with extensive grain shattering. It is a silt to coarse grained (average fine), poorly sorted, mineralogically submature and texturally immature sandstone.

Framework grains are dominantly quartz with minor to trace amounts of feldspar, mica, lithics, tourmaline and zircon. Subangular to subrounded detrital quartz is monocrystalline, has straight to slightly undulose extinction and contains minor fluid and mineral inclusions. Feldspar is present in two forms; rare, medium grained, well rounded potassic feldspars with microcline twinning and highly altered, untwinned feldspar grains containing abundant fluid inclusions, and commonly sericitized. Mica (muscovite) is up to 0.10mm long and is not bent or splayed. Rare, coarse grained, well rounded lithics are possibly shale. Very fine to fine grained, tourmaline and zircon are present, with the tourmaline zoned.

Matrix is Fe-rich and probably consists of illite with some siderite spar (Fig. 9). Alternatively there is abundant drilling mud that appears to be matrix.

Authigenic minerals and cements include iron rich carbonate, glaucony and opaques. The carbonate (?siderite) occurs as individual clusters of rhombic microspar. Glaucony is present in rare isolated patches, with distinction between glauconite and chlorite not possible. Opaques (?pyrite) occur as individual cubes and framboids, rarely cementing quartz grains together.

The sample is grain supported, with dominantly point contacts. Porosity cannot be determined, due to the large displacement of grains during sidewall core collection. In less disturbed areas, primary intergranular pore spaces are filled with matrix, resulting in low porosity.

Composition			
Framework grains			%
	Quartz		60
	Feldspar		6
	Mica		tr
	Lithics		tr
	Others	- Tourmaline	tr
		- Zircon	tr
Matrix			
	Clay		25
Authigenic minerals and cements			
	Carbonate		3
	Pyrite		3
	Glaucony		tr
Porosity			
	Primary		low

X-ray diffraction
XRD analysis was not requested on this sample.

4.11 Vogel #1, Swc 24, depth 586.7m

Hand specimen description
Sample received consisted of 2.5 cm of poorly consolidated sidewall core and fragments. It was a dusky yellowish brown (10YR 2/2), fine to granule sized, muddy sandstone. Framework grains were subrounded to well rounded (granules), with moderate to good sphericity. There was no reaction with 10% HCl and no sedimentary features were observed. Trace amounts of mica, pyrite and feldspar were noted.

Thin section description

The sample has been extensively infiltrated by drilling mud. A cluster of faecal pellets in a ?burrow (Fig. 10a), suggest that the framework grains are in situ despite the mud infiltration. It is a silt to medium grained (average fine), with rare coarse grains, moderately sorted, mineralogically and texturally submature sandstone.

Framework grains are dominantly quartz, with minor to trace amounts of feldspar, lithics, mica, faecal pellets, zircon and tourmaline. Very angular to rounded detrital quartz is monocrystalline and of the common granitic/plutonic variety. Two varieties of lithic fragments exist namely coarse grained, polycrystalline quartz, containing micas altered to chlorite, and fine grained lithics with aligned micas of probable metamorphic origin. Medium grained, highly altered (fluid inclusions and sericite), untwinned feldspar are found in minor amounts. Faecal pellets are slightly elongate, medium to coarse grained, well rounded and fractured, suggesting slight compression. The pellets are composed of illite, ?brown chlorite and quartz. Mica (muscovite and biotite) is up to 0.50mm long and commonly bent, splayed or broken. Silt to very fine grained tourmaline and zircon are well rounded, with tourmaline zoned.

No matrix was evident.

Authigenic minerals and cements include, chlorite and quartz. Green chlorite exists as an authigenic grain replacement and cement (Fig 10b). Grains of unidentifiable composition and micas within the lithics are replaced by chlorite. Brown chlorite is seen within the faecal pellets. Rare, well rounded quartz overgrowths are present. Using reflected light very fine sand sized opaques were identified as ?marcasite (white pyrite).

The sample is grain supported with little or no matrix or pore filling authigenic minerals. Framework grains only have point contacts and drilling mud has infiltrated into the centre of the sandstone. Porosity is primary and intergranular in nature (Fig. 10b). It represents up to 25% of the total rock content and may partially be the result of sidewall collection.

Composition			
Framework grains			%
	Quartz		60
	Feldspar		2
	Mica		1
	Lithics		4
	Others	- Pellets	2
		- Tourmaline	tr
		- Zircon	tr
Matrix			
	Clay		tr
Authigenic minerals and cements			
	Quartz		tr
	Clay		
	Illite		1
	Chlorite		3
	Opaques		1
Porosity			
	Primary		15
	Drilling mud		10

X-ray diffraction

Bulk XRD (Fig. 11a) indicates that quartz is dominant, with trace amounts of microcline (max) and clinochlore IIB (ferroan). Clay XRD (Fig. 11b) indicates the presence of quartz, clinochlore IIB (ferroan), illite-2M1 and ?montmorillonite.

5. TABLE 1 SUMMARY OF XRD RESULTS

BULK XRD

Swc No.	Qtz	Kaol	Ill/ Musc	Alb	Sid	Cli	Mic	Hem	Pyr	Gla
					Peak height in counts					
6	4782	755	514	519	353	-	-	-	-	-
11	2361	-	-	-	1565	1119	tr	544	-	-
13	2907	-	tr	-	964	1140	-	tr	-	-
14	3499	-	-	-	-	479	tr	-	tr	-
18	11614	-	-	-	2581	867	tr	-	-	?tr
24	18353	-	-	-	-	447	tr	-	-	-

(Mineralogy)

CLAY XRD

Swc No.	Quartz	Clino	Kaol	Ill	Mont
		Peak height in counts			
6	1023	*1787	*1787	642	1223
11	454	1431	-	479	-
13	615	1900	-	653	-
14	1077	1218	-	650	1756
18	1030	1398	-	539	-
24	1462	3762	-	976	tr

(Mineralogy)

* indicates that major peaks are coincident and cannot be separated.

Qtz	=	quartz
Kaol	=	kaolinite-1T
Ill/Musc	=	illite/muscovite-2M1
Ill	=	illite-2M1
Alb	=	albite
Sid	=	siderite
Cli(no)	=	clinochlore IIB (ferroan), ferrian in Swc 11
Mic	=	microcline
Hem	=	hematite
Pyr	=	pyrite
Gla	=	glauconite
Mont	=	18 Angstrom montmorillonite

All the XRD results are summarised in the table above. To facilitate between-sample comparisons of relative abundance for the same mineral, the results in Table 1 are given in counts of peak height. These figures are based on the strongest line for each mineral detected. Caution should be used in assessing relative abundance from these figures since peak height is also significantly affected by factors such as crystal size and crystallinity. For these reasons the figures are even more unreliable when comparing different minerals in the same sample. For example, based on peak height alone carbonate minerals will always appear less abundant than similar proportions of quartz because of differences in crystallinity. Clay minerals will also appear to be less abundant than quartz in a bulk XRD trace because of differences in crystal size.

Furthermore, comparison should not be made between peak heights given for bulk samples and those for the clay fractions because results have been influenced by the sampling and preparation methods. XRD will not detect minerals which represent less than approximately 5% of the total rock composition.

6. DISCUSSION AND CONCLUSIONS

Vogel #1 sidewall core samples range from mudstones to fine grained, moderately sorted sandstones. Two samples do not conform to this trend, sidewall core 11 is an oolitic ironstone and sidewall core 18 is a glaucony rich sandstone. Framework grains within the samples are very similar throughout the section and consist of varying amounts of quartz, feldspar, lithics, glaucony grains, mica, tourmaline, zircon and rutile.

Evidence suggests a predominantly plutonic/granitic sediment provenance for the quartz in all samples, with minor metamorphic and sedimentary input.

Differences in lithology and sedimentary structures within this suite of samples suggests variations in the depositional environment. Fine grained sediments and muds are likely to represent deposits in quiet water regimes. Starved ripples in some of the muds (Swc 6 and 10) may indicate a tidal flat or deeper water environment where there were pulses of sandy sediment deposited. Sidewall core 7 was probably deposited in a similar environment since the ?load cast suggests a minor influx of sandy sediment into an otherwise mud rich regime. Since glaucony grains composed of glauconite were recognised in sidewall cores 4, 10 and 18 a shallow marine environment is envisaged for these samples. Glauconite typically forms under mildly oxidising conditions at the sediment/water interface. Another possible indicator of a shallow water environment is the presence of faecal pellets (Swc 24). These may also be terrestrial features due to burrowing insects, but the relatively clean nature of the sand does not favour a pedogenic environment.

There are many environments of deposition ascribed to the formation of ooids (Swc 11), these include shelf platforms, pedogenic and ground water regimes. Diagenetic alteration in a ground water environment is favoured due to the high Fe content, which is not typical of shelf platforms, and the presence of continuous laminations, which are not found in pedogenic regimes. However, it is possible that the ooids formed in a marine environment which was strongly influenced by rivers bearing iron from a terrestrial source. These ooids are very similar to Phanerozoic ironstones described from many other localities. Chamosite is typically described as the major component of oolitic ironstones. Recent changes in terminology have now confirmed that chamosite is a 14 Angstrom chlorite and that berthierine, which is a 7 Angstrom glaucony mineral, is more characteristic of ironstones. In the Vogel ironstone, a 7 Angstrom glaucony mineral (clinochlore) was identified and this is probably equivalent to berthierine.

Diagenetic alteration of Vogel #1 samples is highly variable and in part controlled by the mineralogy and lithology determined in the primary depositional environment. Most of the sands have undergone very little alteration and lack any significant authigenic cements. In contrast, there appears to have been significant diagenetic alteration of sidewall core 11 with the formation of ooids, recrystallisation of micrite to microspar and precipitation of pyrite. This sequence suggests a gradual change from oxidising to reducing conditions, perhaps with increasing depths of burial. The following diagenetic events have been recognised but these stages are not apparent in all samples and the paragenetic sequence is uncertain;

glauconite grains
chloritic ooids
mechanical compaction
alteration of feldspars - kaolinization
chloritization of micas & lithics, & precipitation from solution
carbonate recrystallisation
pyrite precipitation

Excellent porosity and permeability is present in sidewall cores 22 and 24, as indicated by the extensive infiltration of drilling mud. The preservation of primary intergranular pore space is controlled by the lack of matrix and authigenic minerals and cements. Point contacts between grains are dominant in these samples. Sidewall core 23 is very similar to sidewall cores 22 and 24, except for the presence of matrix and siderite, which fills intergranular pore spaces and thus reduces porosity and permeability. Porosity in the other samples has been reduced in several ways. The porosity and permeability of the muds in sidewall cores 4, 6, 7 and 10 is determined by grainsize and is predictably low. Porosity and permeability of sidewall core 11 and 18 is controlled by diagenesis and grainsize. Trace amounts of secondary pore space exists due to the shrinkage of ooids (Swc 11) and glaucony (glauconite) grains (Swc 18), but they are not interconnected, resulting in negligible permeability. Primary intergranular pore space in sidewall core 18 is occluded by sparry carbonate (?siderite) cement and a glaucony rich matrix.

XRD analyses detected significant amounts of 18 Angstrom montmorillonite in sidewall cores 6, 14 and 24. This is a highly expansive, sodium rich variety, that may cause problems during production, due to swelling. There may also be minor swelling associated with the chlorite (clinochlore).

7. FIGURES AND CAPTIONS

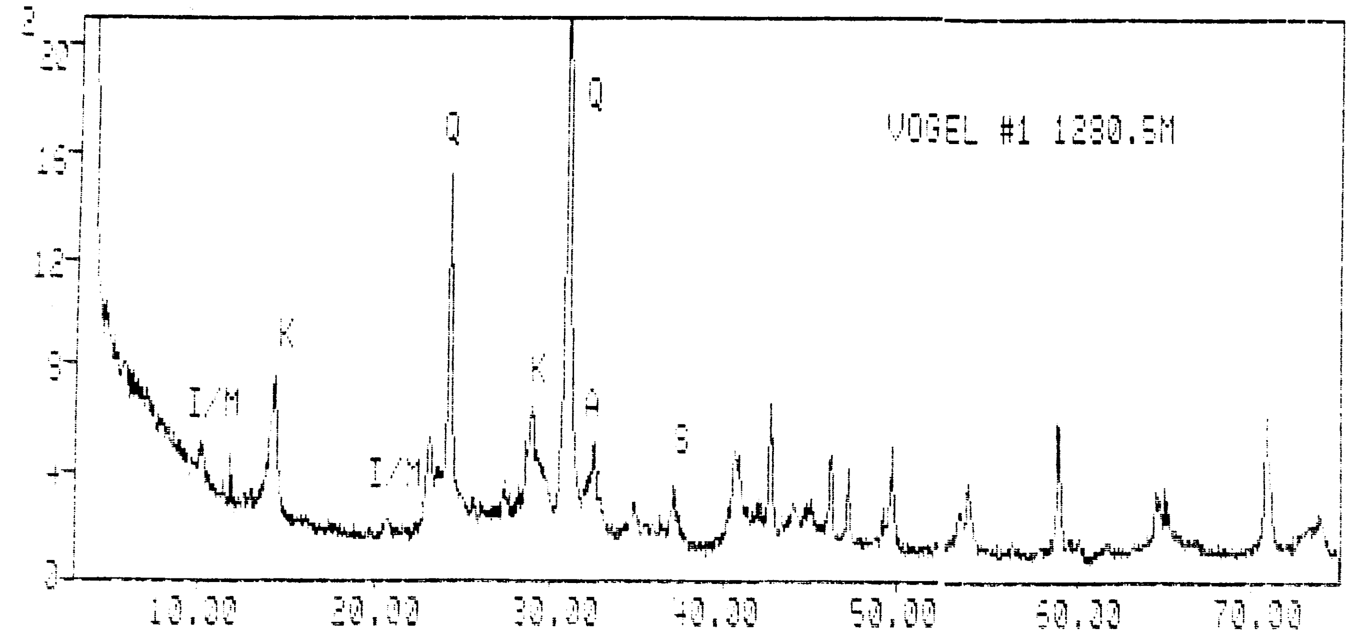

Figure 1a. Bulk XRD trace of sidewall core #6, Vogel #1, depth 1280.5m. Only the strongest peaks for each mineral identified have been labelled. Q=quartz, A=albite (low), S=siderite, K=kaolinite-1T and I/M=illite/muscovite-2M1.

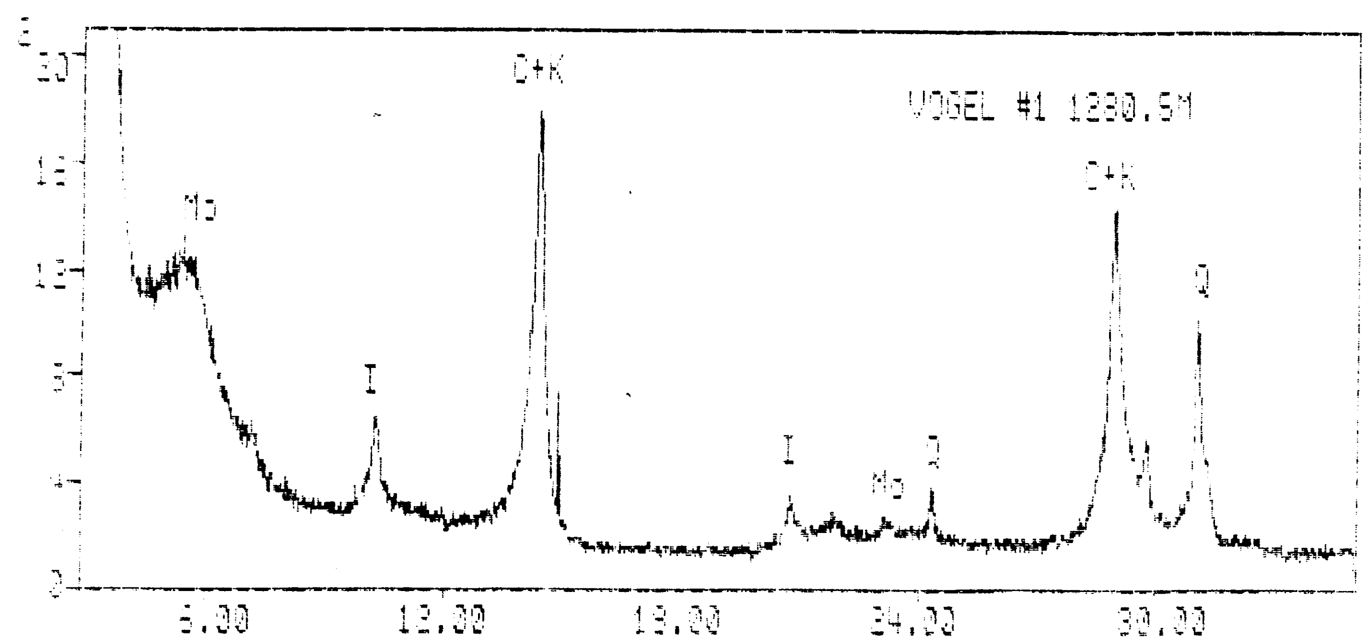

Figure 1b. Clay XRD trace of sidewall core #6, Vogel #1, depth 1280.5m. Q=quartz, K=kaolinite-1T, I=illite-2M1, Mo=18 Angstrom montmorillonite and C=clinochlore IIB.

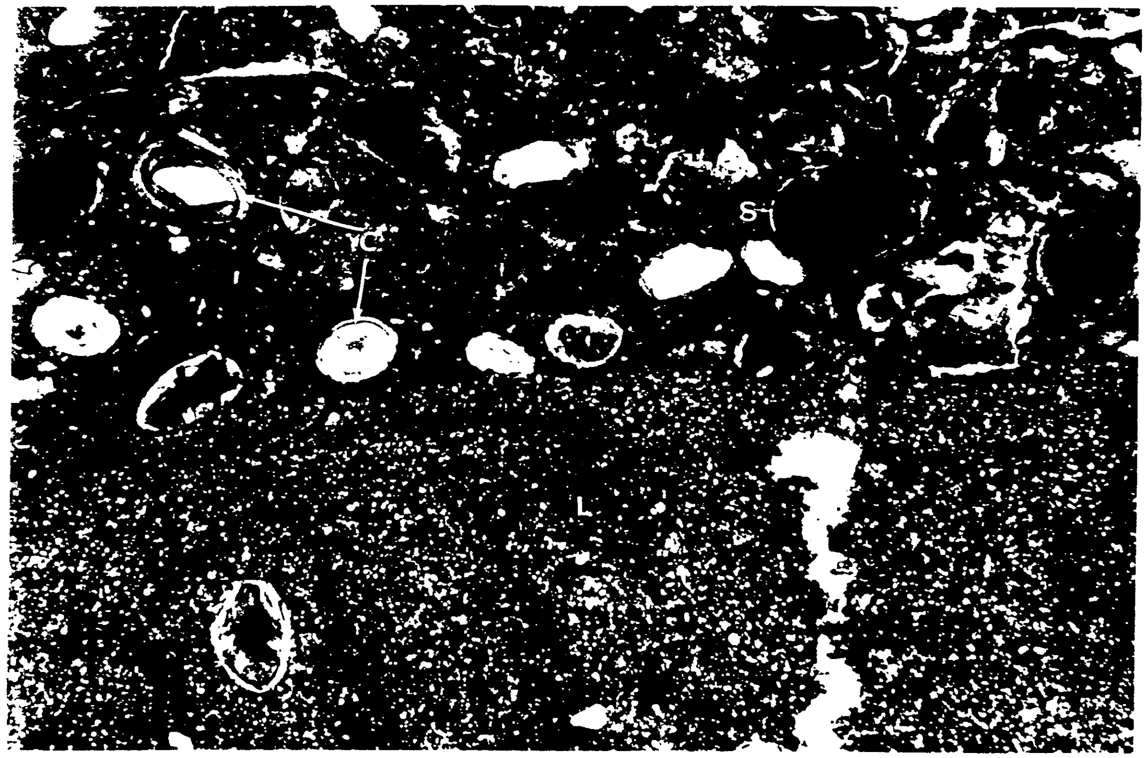

Figure 2. Photomicrograph of well formed ooids, with continuous concentric laminae (C). Siderite lens (L) contains ooids, and siderite spar (rhombs) which is also seen throughout the sample. Shrinkage pore space (S) exists around some of the ooids. Fracture pore space is probably collection induced. Vogel #1, Swc 11, depth 1200.3m. Plane light. Field of view 2.72mm.

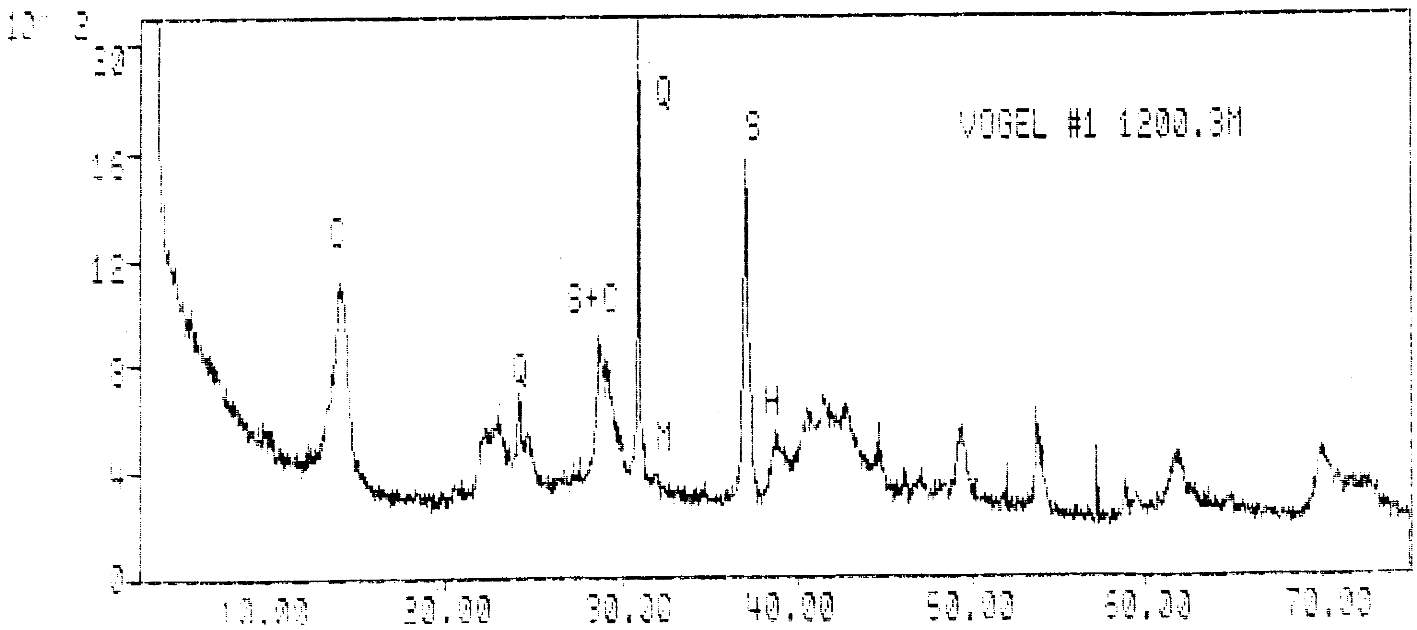

Figure 3a. Bulk XRD trace of sidewall core #11, Vogel #1, depth 1200.3m. Only the strongest peaks for each mineral identified have been labelled. Q=quartz, S=siderite, C=clinochlore IIB (ferrian), M=microcline (max) and H=hematite.

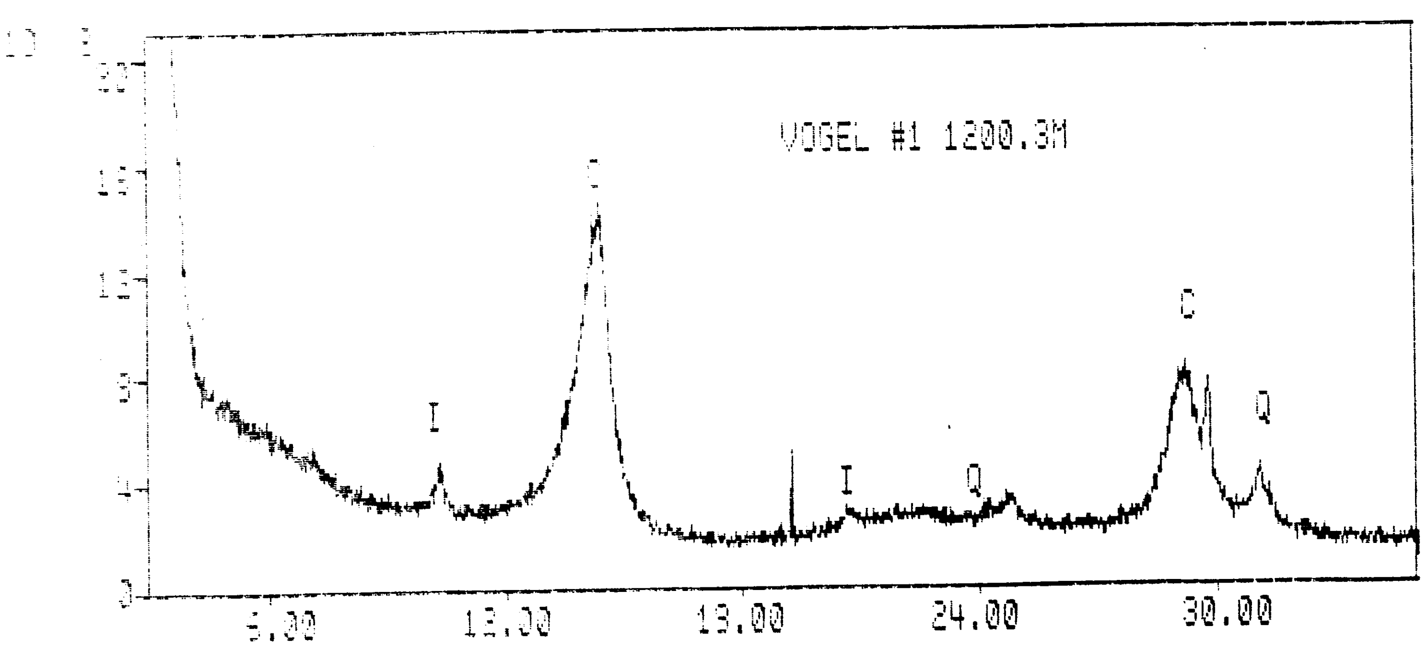

Figure 3b. Clay XRD trace of sidewall core #11, Vogel #1, depth 1200.3m. Q=quartz, I=illite-2M1 and C=clinochlore IIB.

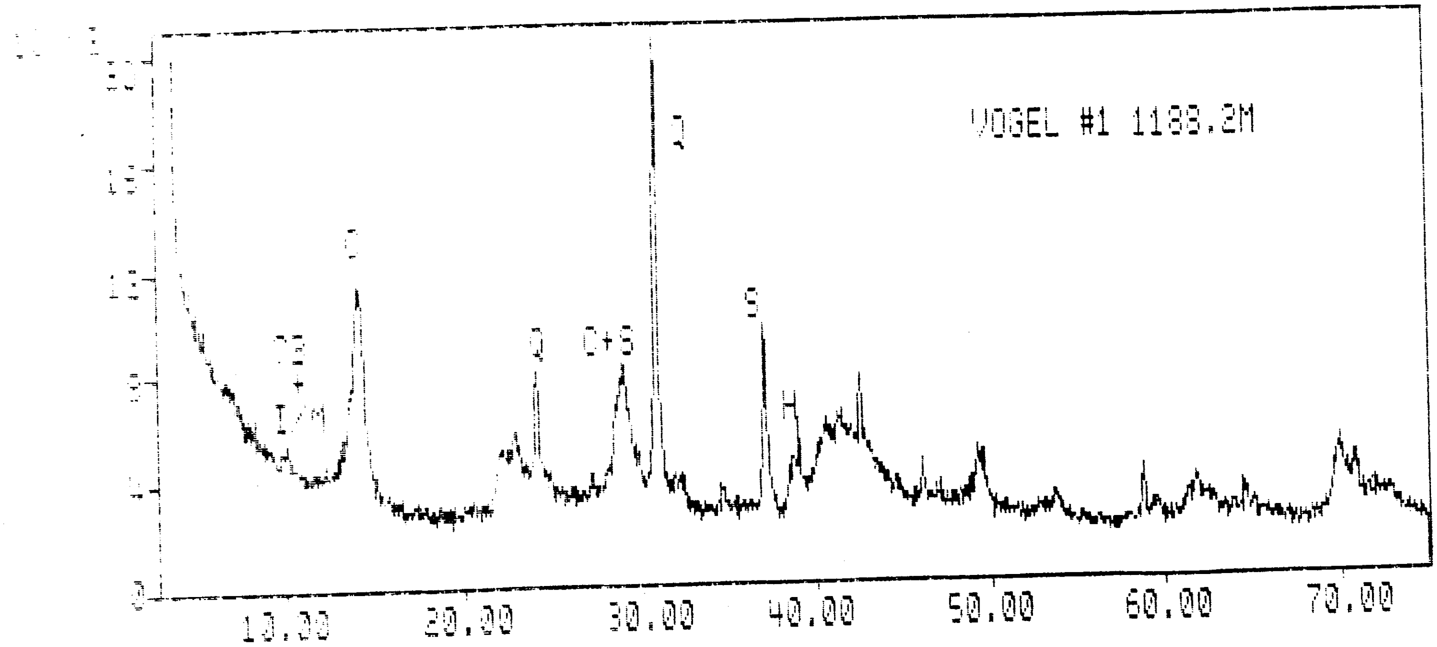

Figure 4a. Bulk XRD trace of sidewall core #13, Vogel #1, depth 1188.2m. Only the strongest peaks for each mineral identified have been labelled. Q=quartz, S=siderite, C=clinochlore IIB (ferroan), H=hematite, I/M=illite/muscovite and ?B=biotite.

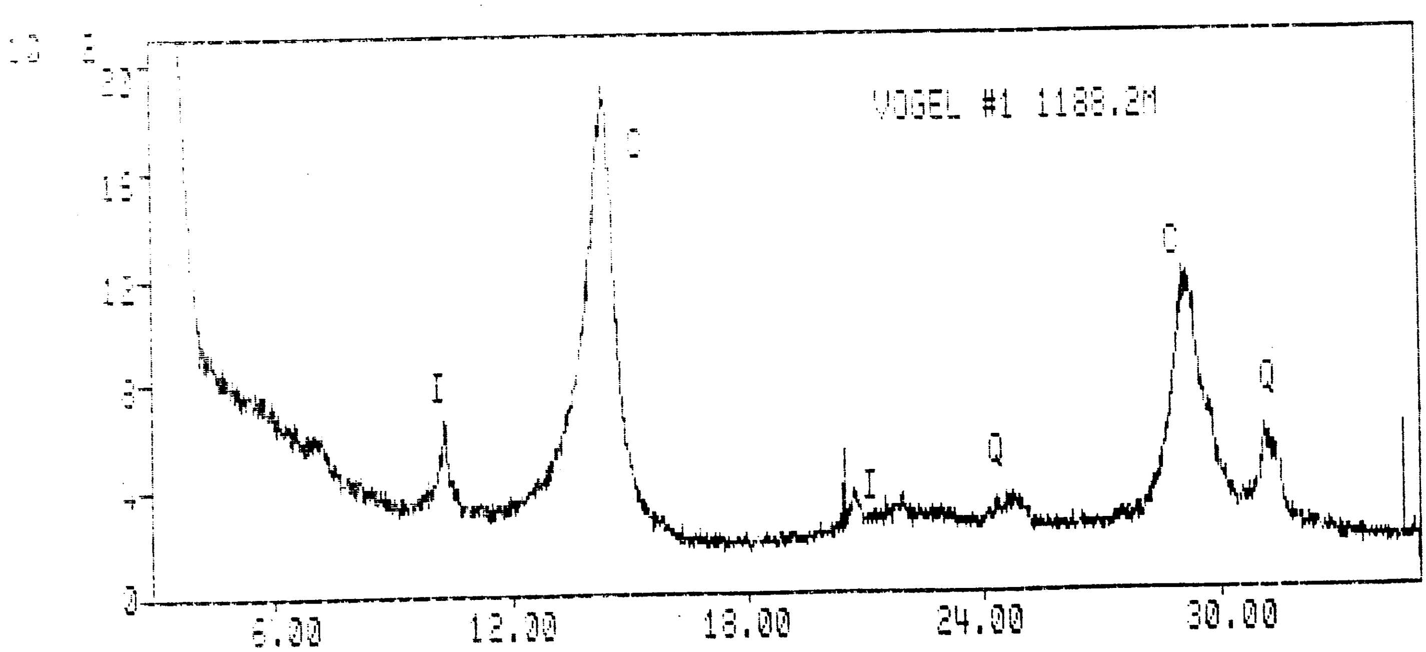

Figure 4b. Clay XRD trace of sidewall core #13, Vogel #1, depth 1188.2m. Q=quartz, I=illite-2M1, C=clinochlore IIB.

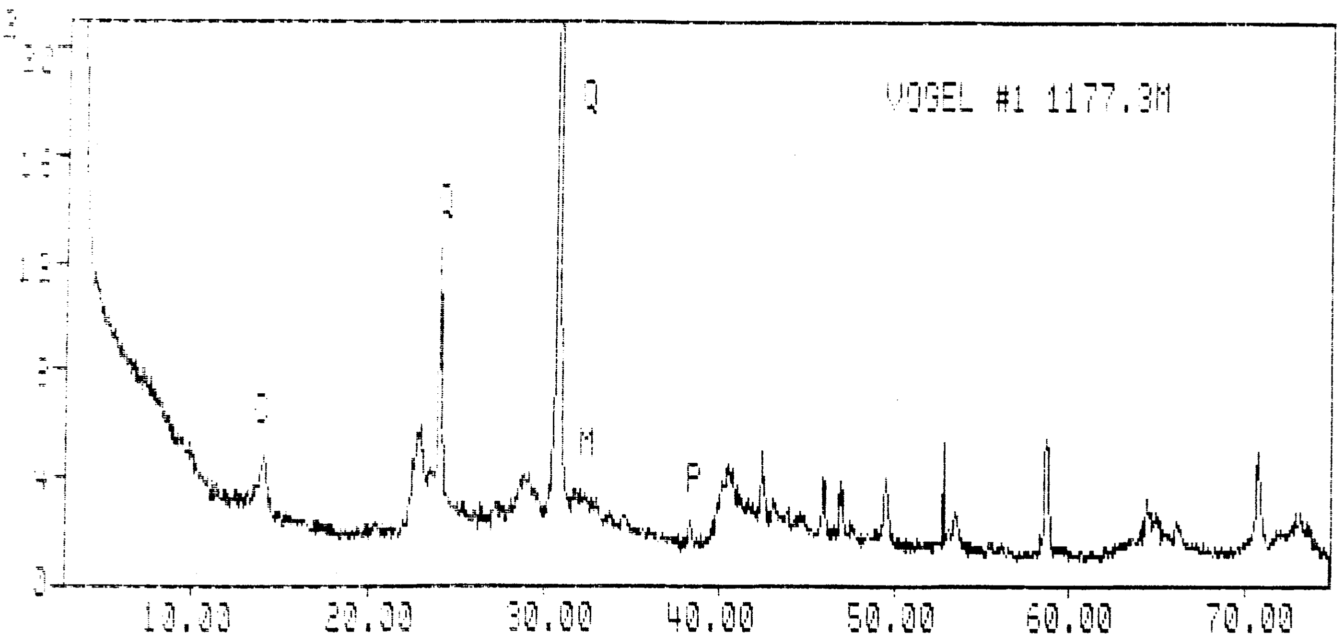

Figure 5a. Bulk XRD trace of sidewall core #14, Vogel #1, depth 1177.3m. Only the strongest peaks for each mineral identified have been labelled. Q=quartz, P=pyrite, C=clinochlore IIB (ferroan) and M=microcline (int).

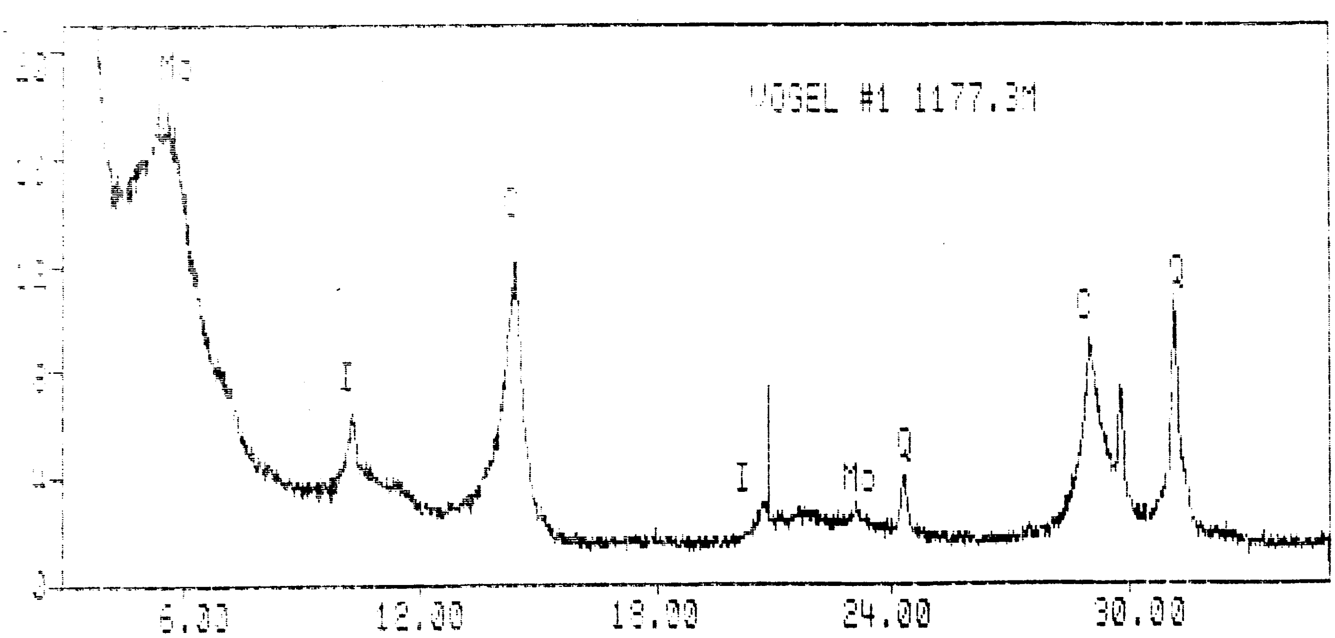

Figure 5b. Clay XRD trace of sidewall core #14, Vogel #1, depth 1177.3m. Q=quartz, I=illite-2M1, Mo=18 Angstrom montmorillonite and C=clinochlore IIB.

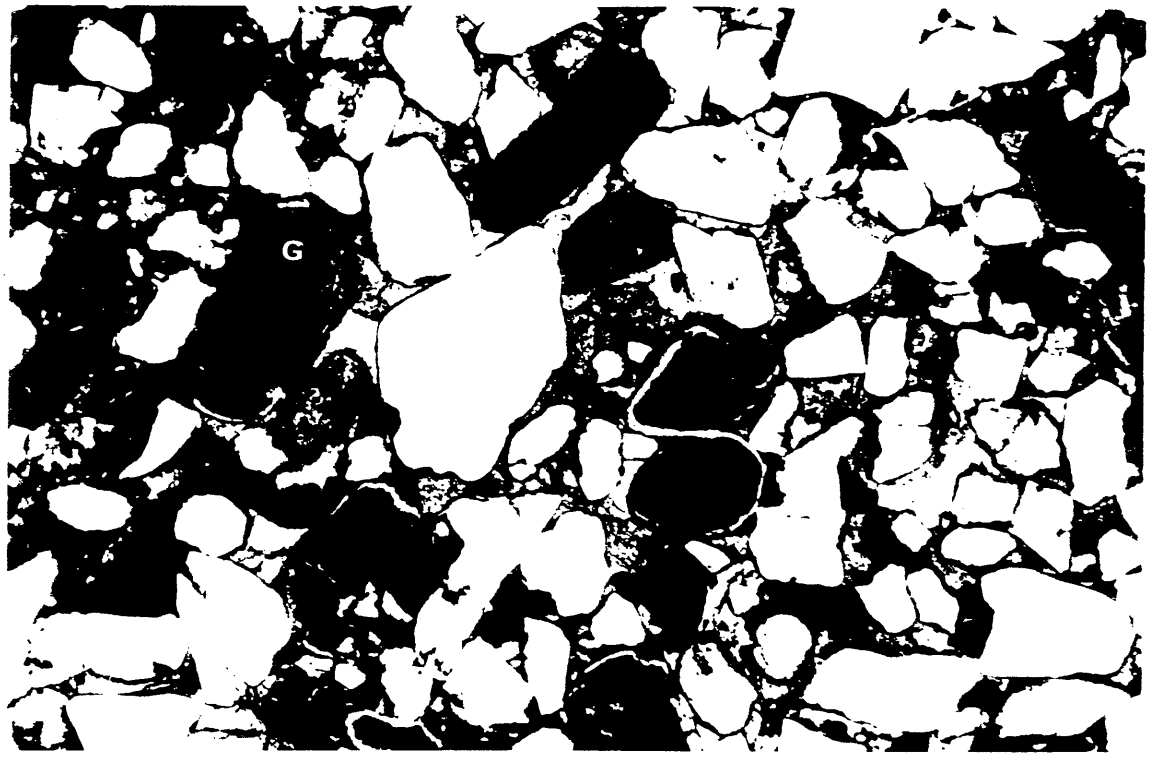

Figure 6. Glaucony (?glauconite) grains (G) in a carbonate (C) cemented sandstone. Vogel #1, Swc 18, depth 1028.7m. Plane light. Field of view 2.72mm.

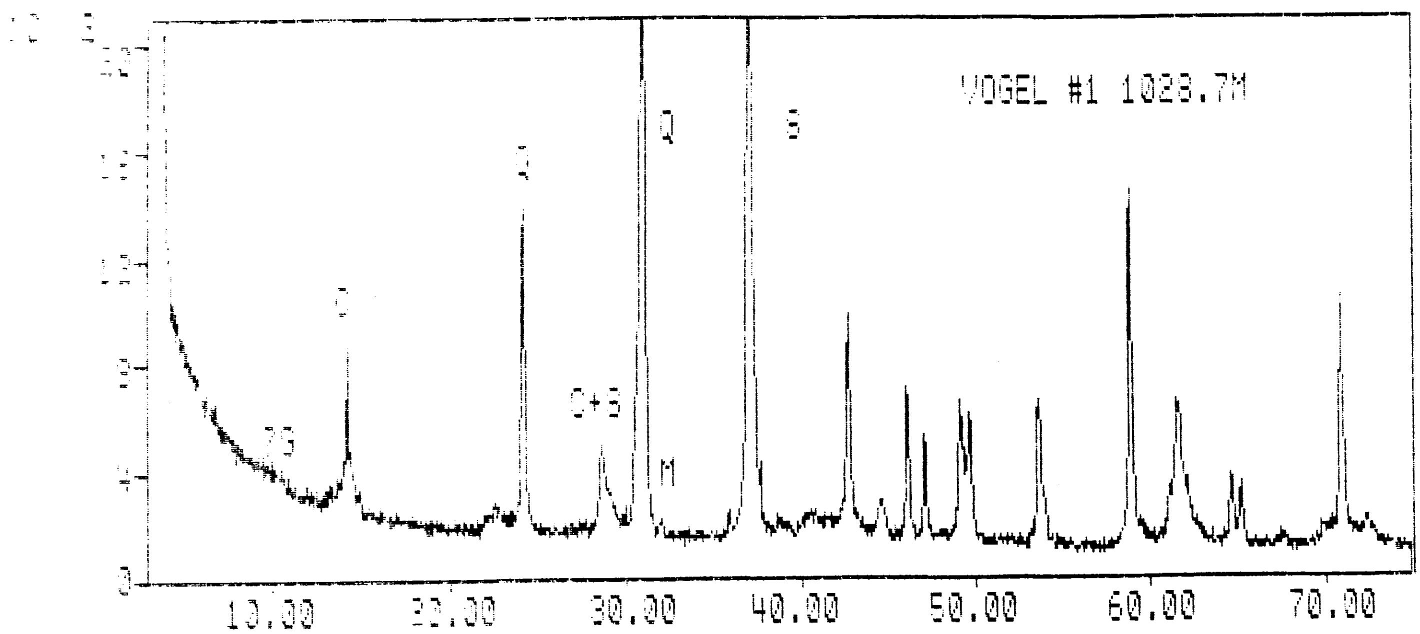

Figure 7a. Bulk XRD trace of sidewall core #18, Vogel #1, depth 1028.7m. Only the strongest peaks for each mineral identified have been labelled. Q=quartz, S=siderite, G=glauconite, C=clinochlore IIB (ferroan) and M=microcline (max).

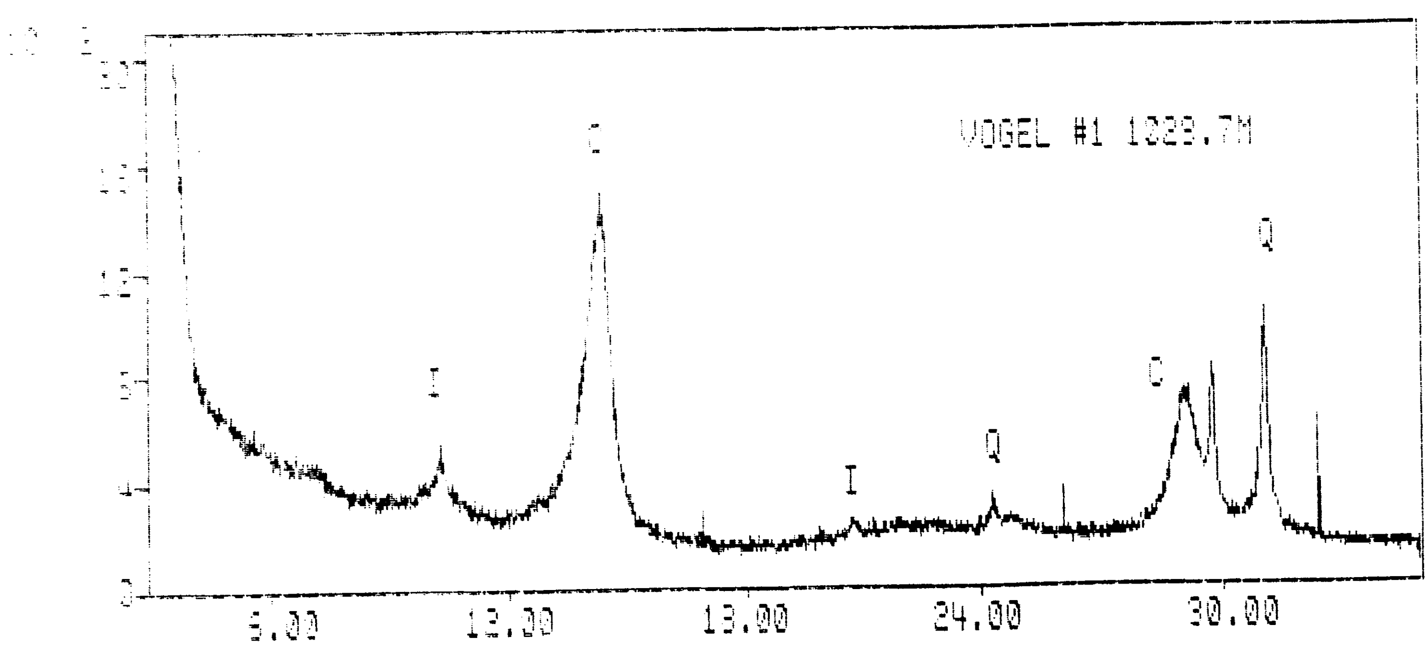

Figure 7b. Clay XRD trace of sidewall core #18, Vogel #1, depth 1028.7m. Q=quartz, I=illite-2M1 and C=clinochlore IIB.

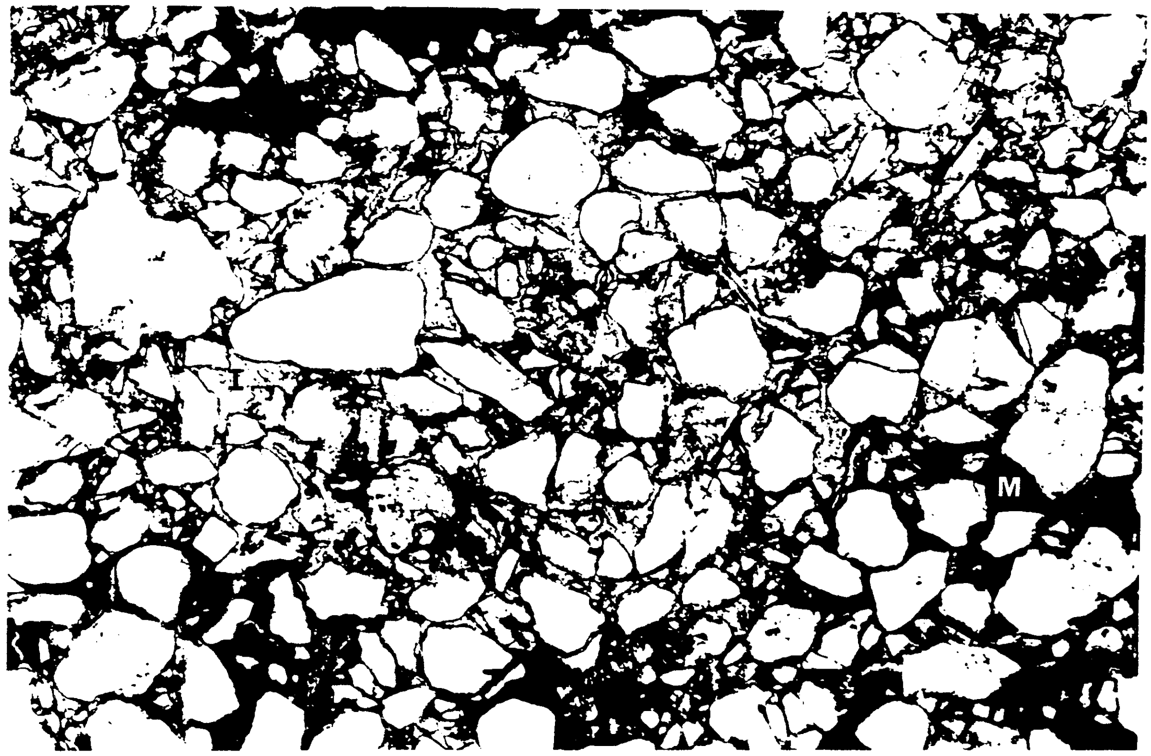

Figure 8a. Good primary intergranular (I) pore spaces preserved at centre of sample. Drilling mud (M) infiltration visible. Vogel #1, Swc 22, depth 600.7m. Plane light. Field of view 2.72mm.

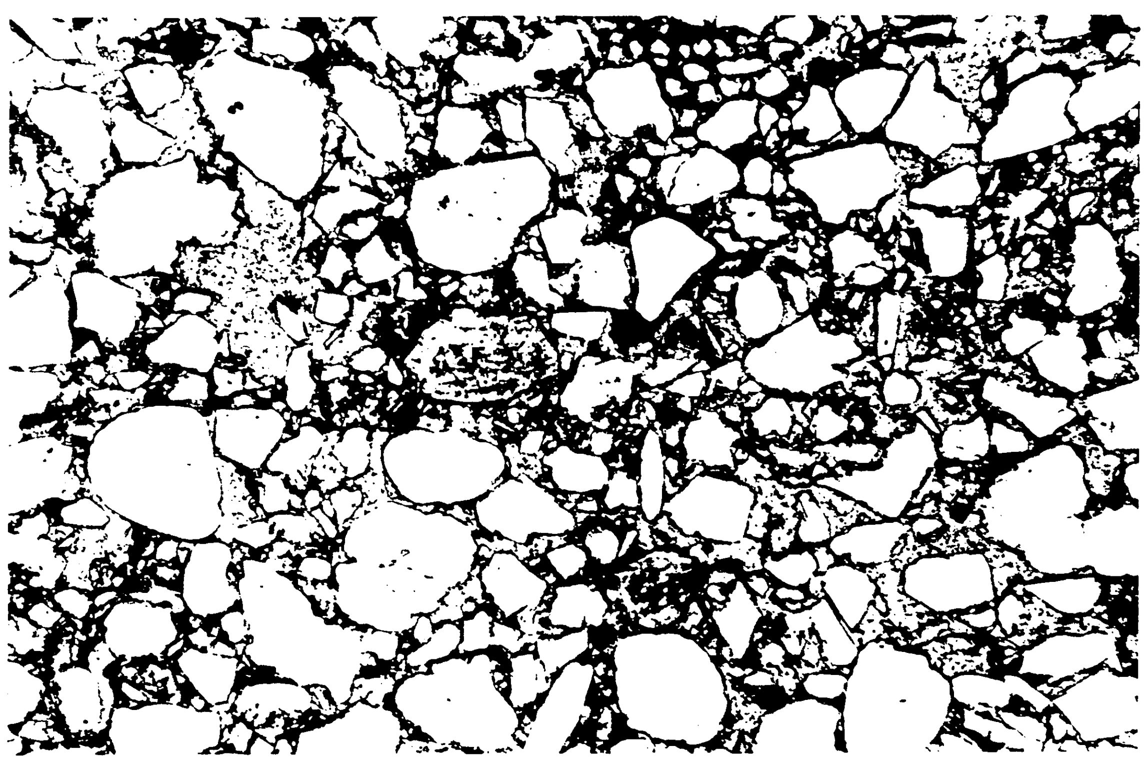

Figure 8b Same sample as Figure 8a, with less mud infiltration. Note angularity of some grains consisting of quartz and feldspar (F). Vogel #1, Swc 22, depth 600.7m. Plane light. Field of view 2.72mm.

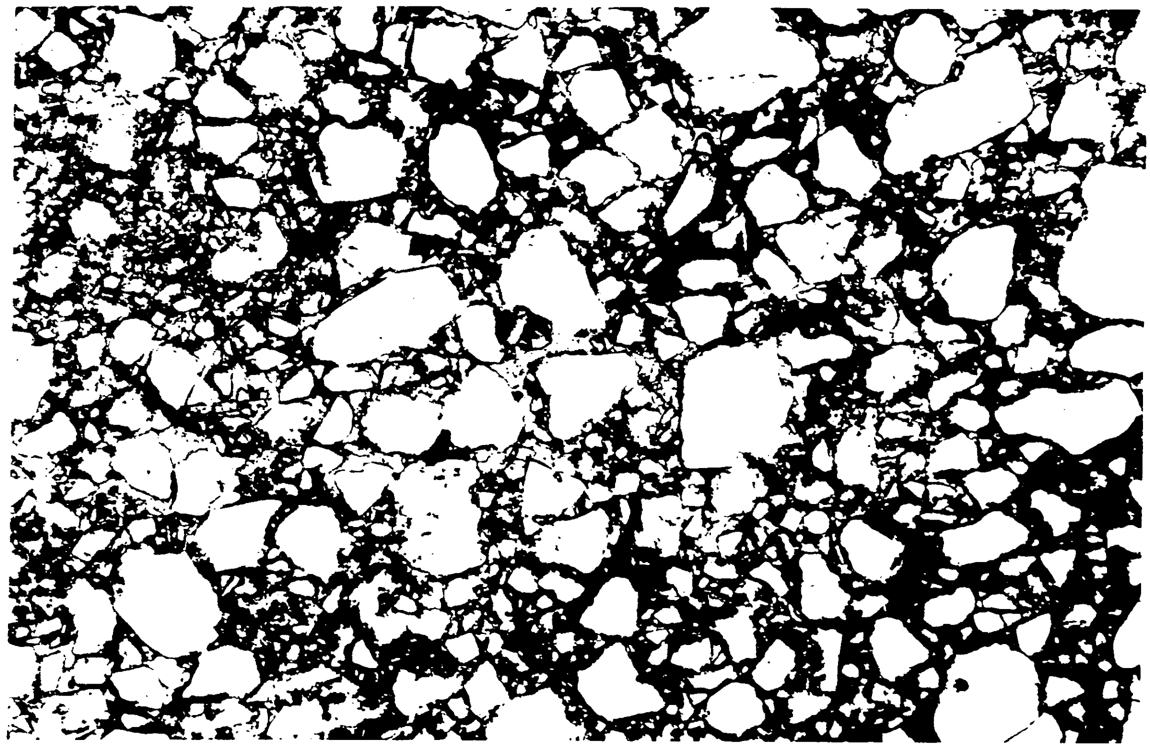

Figure 9. Sample highly disturbed by sidewall core collection, with grains shattered. Matrix consists possibly of illite and also contains siderite. Vogel #1, Swc 23, depth 591.7m. Plane light. Field of view 2.72mm.

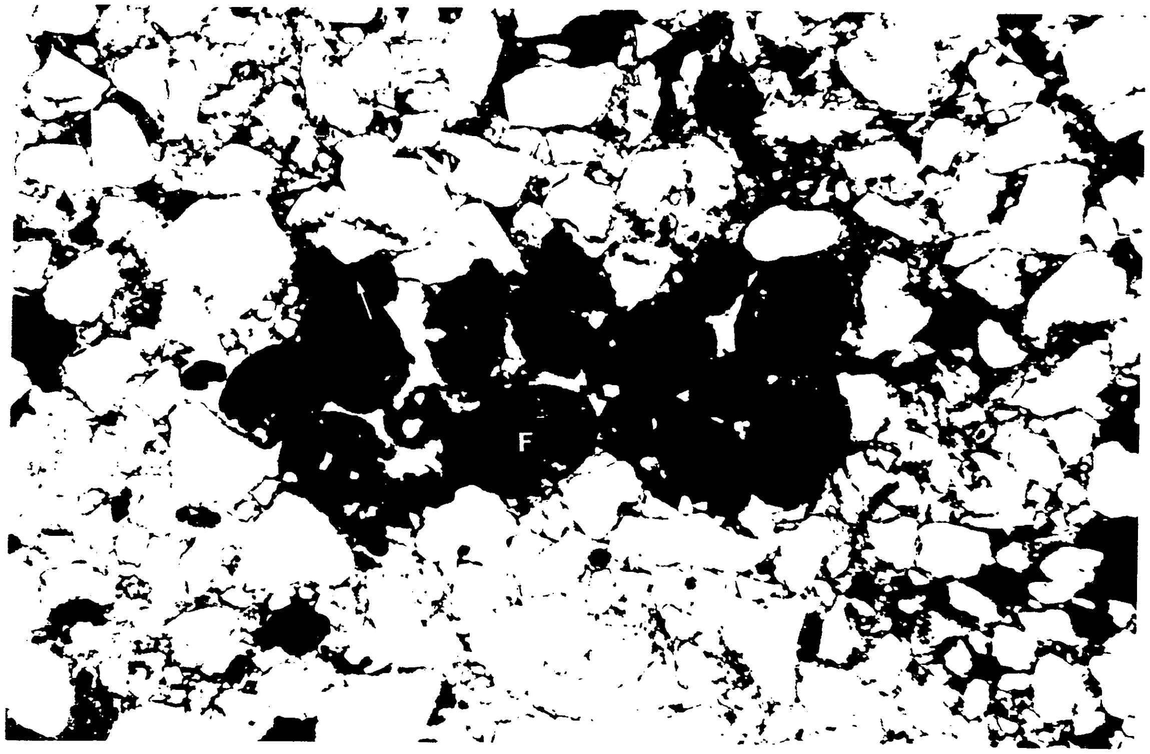

Figure 10a. Faecal pellets (F) in a ?burrow, indicating sample is not disturbed by swc collection, except for the infiltration of drilling mud. Note angularity of quartz grains and deformed chloritised mica (arrow) on edge of burrow. Vogel #1, Swc 24, depth 586.7m. Plane light. Field of view 2.72mm.

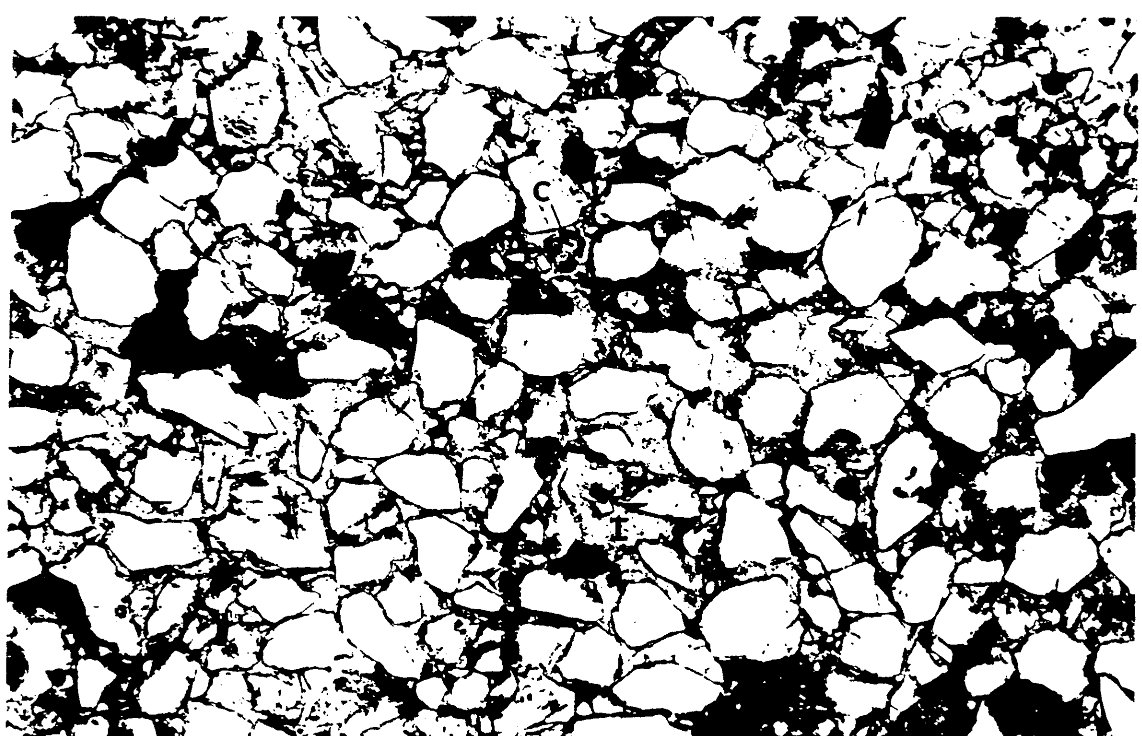

Figure 10b. Excellent intergranular porosity (I) and permeability. Most grains have a thin coating of drilling mud. Chlorite (C) grain replacement and cement also present. Quartz has rare inherited overgrowths (arrow). Vogel #1, Swc 24, depth 586.7. Plane light. Field of view 2.72mm.

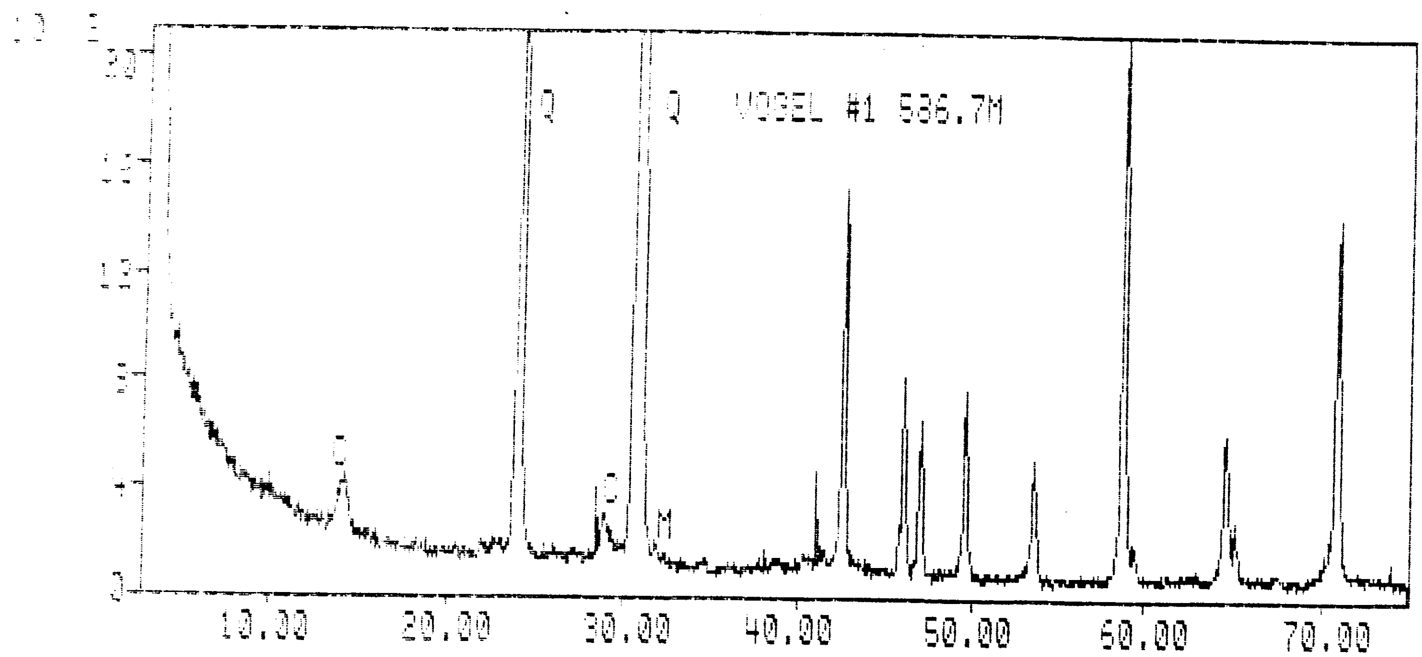

Figure 11a. Bulk XRD trace of sidewall core #24, Vogel #1, depth 586.7m. Only the strongest peaks for each mineral identified have been labelled. Q=quartz, C=clinochlore IIB (ferroan) and M=microcline (max).

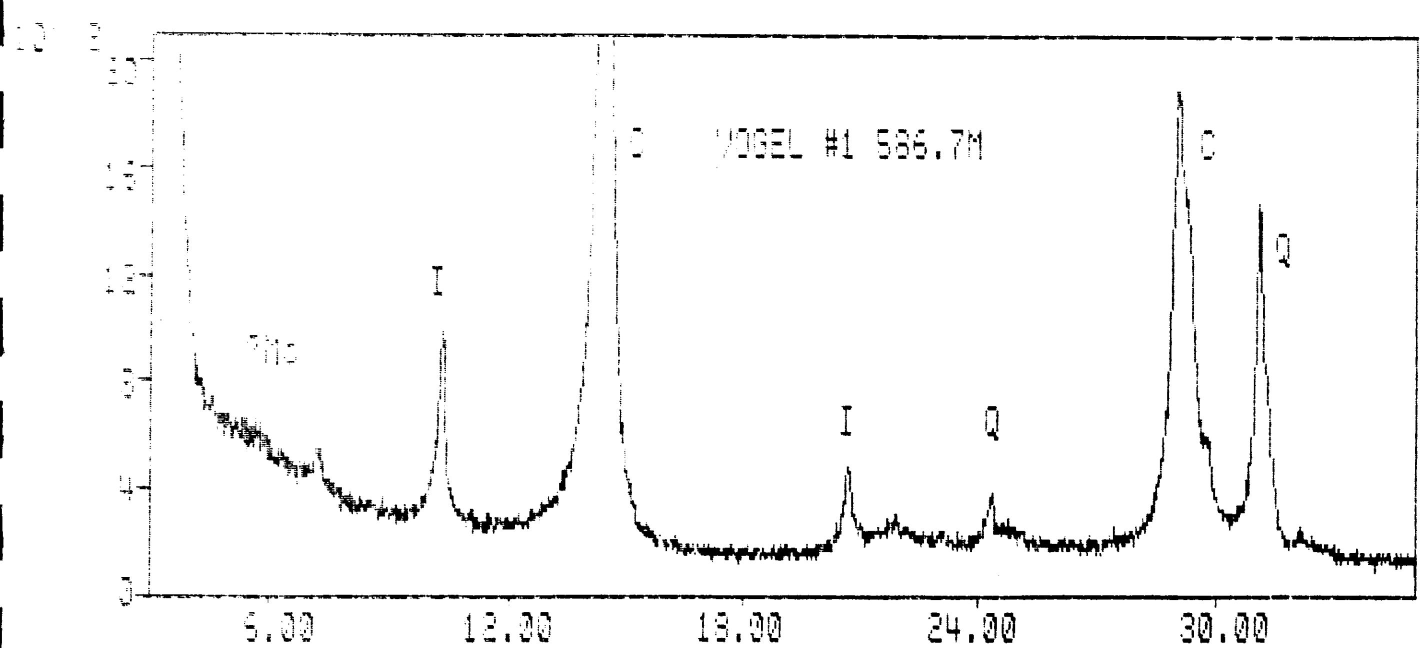

Figure 11b. Clay XRD trace of sidewall core #24, Vogel #1, depth 586.7m. Q=quartz, I=illite-2M1, C=clinochlore IIB and ?Mo=montmorillonite.

2.5 Palynostratigraphic Analysis

Seven (7) sidewall cores and one (1) cuttings sample were submitted to R. Morgan for analysis.

The final report follows.

PALYNOLOGY OF BRIDGE VOGEL-1

OTWAY BASIN, AUSTRALIA

BY

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REF:DW.OTW.VOGEL1

for BRIDGE OIL

SEPTEMBER 1990

PALYNOLOGY OF BRIDGE VOGEL-1

OTWAY BASIN, AUSTRALIA

BY

ROGER MORGAN

CONTENTS

I SUMMARY

591.7m (swc) : lower L. balmei Zone : Paleocene : nearshore marine : usually Pebble Point and correlatives

1028.7m (swc) : T. lillei Zone (I. korojonense Dinoflagellate Zone) : Campanian : offshsore marine : immature : usually Paaratte and correlatives

1196.0 (swc) - 1216.3m (swc) : T. pachyexinus Zone : Santonian : offshore to nearshore marine : immature : usually Belfast and correlative Paaratte/Flaxmans

1281.6 (swc) : C. triplex Zone : Coniacian - Turonian : nearshore marine : immature : usually Flaxmans

1310.0m (swc) : A. distocarinatus Zone : Cenomanian : nearshore marine : immature : usually Flaxmans/Waare

1362m (cutts) : P. pannosus Zone : late Albian : non-marine : immature : usually topmost Eumeralla.

II INTRODUCTION

Seven sidewall cores and one cuttings sample were processed, to provide information on age, environment and maturity for the completion report.

Palynomorph occurrence data are shown as Appendix I and form the basis for the assignment of the samples to six spore-pollen units of early Paleocene to late Albian age. The Cretaceous spore-pollen zonation is essentially that of Dettmann amd Playford (1969), but has been significantly modified and improved by various authors since, and most recently discussed in Helby et al (1987), as shown on figure 1 and modified by Morgan (1985) for application in the Otway Basin.

Maturity data was generated in the form of Spore Colour Index, and is plotted on figure 2 Maturity profile of Bridge Vogel-1. The oil and gas windows in figure 2 follow the general consensus of geochemical literature. The oil Window corresponds to spore colours of light-mid brown (Staplin Spore Cololur Index of 2.7) to dark brown (3.6). These correspond to vitrinite reflectance values of 0.6% to 1.3%.

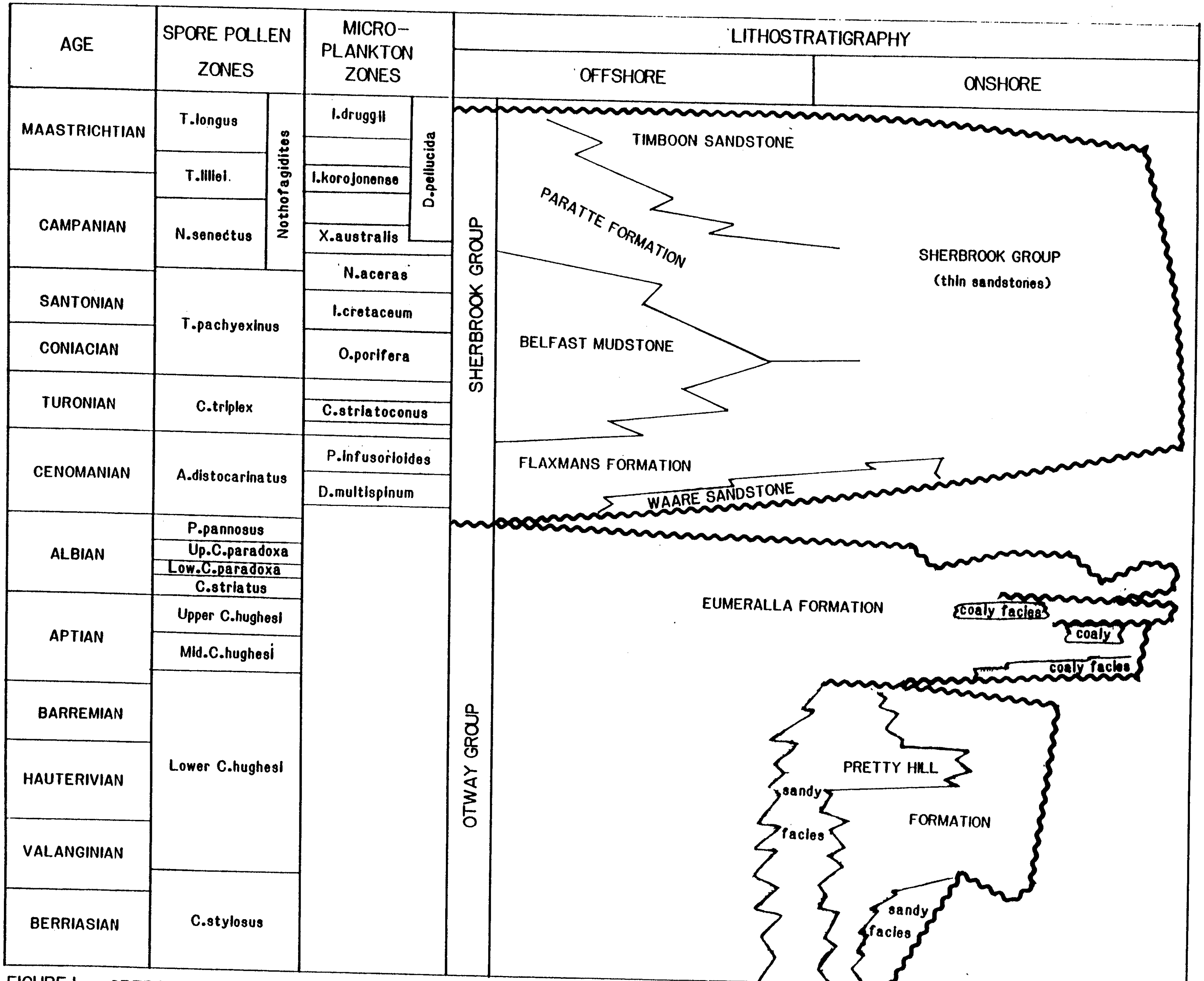

FIGURE I. CRETACEOUS REGIONAL FRAMEWORK, OTWAY BASIN

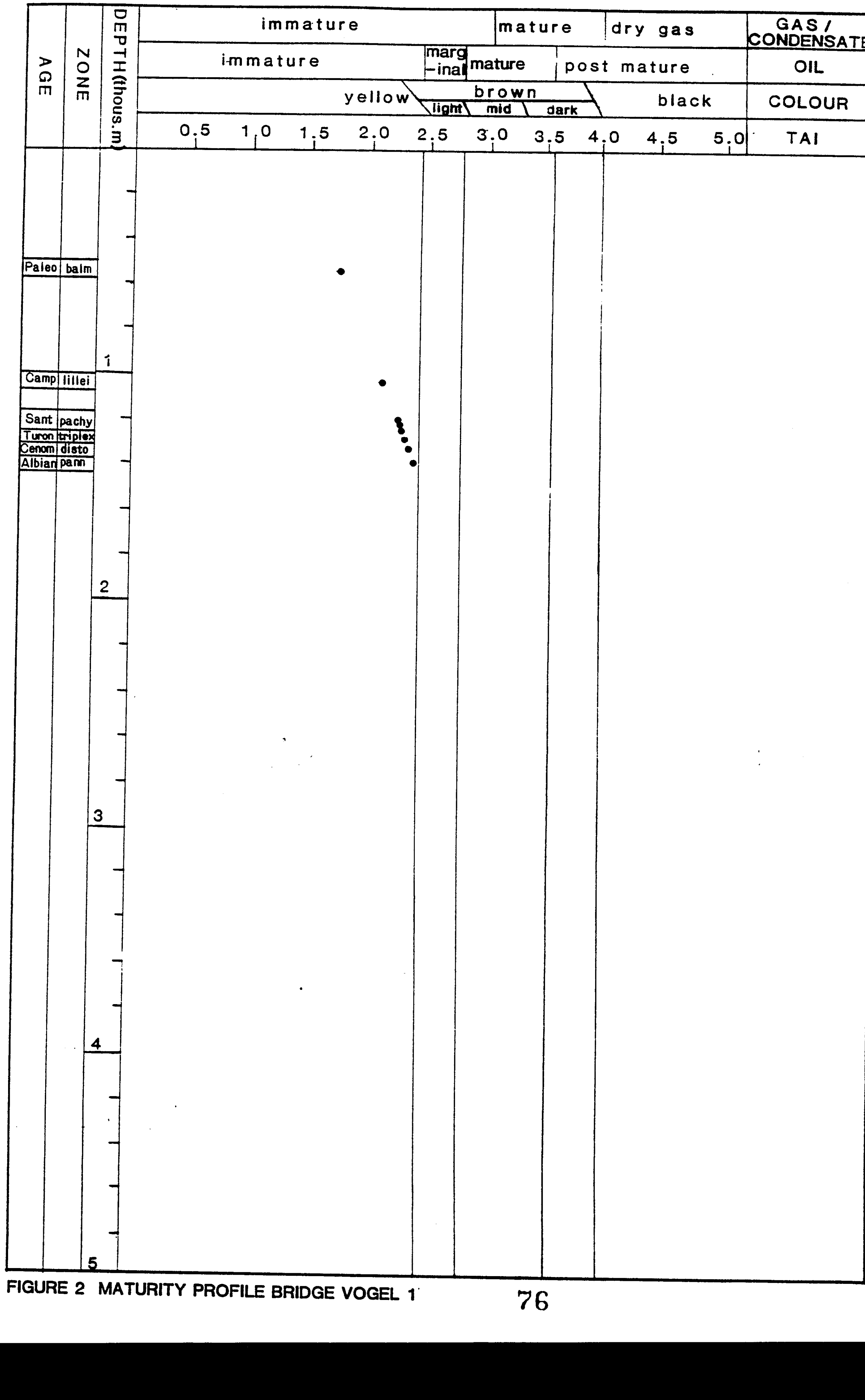

FIGURE 2 MATURITY PROFILE BRIDGE VOGEL 1

III PALYNOSTRATIGRAPHY

A 591.7m (swc) : lower L. balmei Zone

Assignment to the lower part of the Lygistepollenites balmei Zone is indicated at the top by youngest common L. balmei without younger indicators, and at the base by oldest L. balmei without older indicators, and is confirmed by the dinoflagellates. Proteacidites and L. balmei are common in a low diversity assemblage.

The dinoflagellates present include Deflandra spp (including D. speciosa and D. dartmooria) and Alisocysta rugolirata without more definite zonal indicators. The age is certainly Paleocene, probably in the poorly characterised interval between the circumtabulata and evitti zones.

The dominance of spores and pollen over the subordinate dinoflagellates indicates nearshore marine environments.

These features are normally seen in the Pebble Point Formation and correlatives.

Colourless palynomorphs indicate immaturity for hydrocarbon generation.

B 1028.7m (swc) : T. lillei Zone

Assignment to the Tricolporites lillei Zone is indicated on the dinoflagellate evidence. The spores and pollen are consistent, and the presence of Australopollis obscurus, Nothofagidites endurus and Tricolpites confessus in an extremely lean assemblage, indicates senectus or younger assignment. Proteacidites spp are common in a moderately diverse assemblage.

Dinoflagellates include the zonal index Isabelidinium korojonense indicating the korojonense dinoflagellate zone, correlative with the lillei spore-pollen zone. Heterosphaeridium spp dominate the moderate diversity assemblage.

Offshore marine environments are indicated by the dominance of the dinoflagellates, and the general starvation of palynomorphs far from shore.

These features are normally seen in the shaley interbeds of the Paaratte Formation and its equivalents.

light yellow palynomorphs indicate immaturity for hydrocarbon generation.

C 1196.0m (swc) - 1216.3m (swc) : T. pachyexinus Zone

Assignment to the Tricolpites pachyexinus (=Tricolporites apoxyexinus Zone) is indicated at the top by the absence of younger indicators, and at the base by oldest Tricolpites gillii and supported by the dinoflagellate data. Proteacidites and Phyllocladidites mawsonii dominate the spore pollen with Amosopollis cruciformis more common towards the top.

Dinoflagellates are mostly longranging, not age diagnostic. with Heterosphaeridium spp the most common. Trithyrodinium marshalli does occur dowm to 1200.3m (swc) and is not usually seen beneath the pachyexinus spore-pollen zone and the correlative porifera dinoflagellate zone.

Nearshore environments are indicated by the low dinoflagellate content (10-20% of palynomorphs) and their low to moderate diversity.

These features are normally seen in the Belfast Mudstone and the correlative parts of the Flaxmans and Paaratte Formations.

Light yellow spore colours indicate immaturity for hydrocarbon generation.

D 1281.6m (swc) : C. Triplex Zone

Assignment to the Clavifera triplex Zone (= P.mawsonii zone) is indicated at the top by the youngest Appendicisporites distocarinatus and by the absence of younger indicators, and at the base by oldest Phyllocladidites mawsonii and common P. eunuchus. Other common taxa include Corollina torosa and Cyathidites minor.

Dinoflagellates are extremely scarce and consist of long ranging forms. Their scarcity and the corresponding high dominance and diversity of the spores and pollen indicate nearshore environments.

These features are normally seen in the Flaxmans Formation and its correlatives.

Yellow spore colours indicate immaturity for hydrocarbon generation.

E 1310.0m (swc) : A. distocarinatus Zone

Assignment to the Appendicisporites distocarinatus spore-pollen zone is indicated at the top and base by A. distocarinatus without younger or older indicators. Saccate pollen including Falcisporites similis and

Microcachryidites antarcticus are dominant and minor Early Cretaceous reworking is indicated by the presence of Pilosisporites notensis and Dictyotosporites speciosus.

Dinoflagellates are extemely rare and longranging and so are not age diagnostic. Their scarcity and the dominant and diverse spores and pollen indicate nearshore marine environments.

These features are normally seen in the lower Flaxmans Formation and Waare Sandstone, if developed.

Yellow spore colours indicate immaturity for hydrocarbon generation.

F 1362m (cutts) : P. pannosus Zone

Assignment to the Phimopollenites pannosus Zone is indicated at the top by youngest Coptospora paradoxa and at the base by oldest P. pannosus. The top of spore dominated microfloras including Aequitriradites tilchaensis, Foraminisporis asymmetricus and F. wonthaggiensis also suggests the Early Cretaceous. The sample is only cuttings, and younger elements include Clavifera triplex, Nothgofagidites endurus and P. mawsonii but these are all presumed caved. The assemblage is dominated by Cyathidites minor and Cicatricosisporites australiensis is a significant component.

Dinoflagellates are absent except for Isabelidinium cretaceum which is clearly caved. Non-marine environments are indicated by the lack of "in situ" dinoflagellates and the dominance of cuticle and diverse and abundant spores and pollen.

These features are normally seen in the topmost Eumeralla Formation, although the fact that only cuttings are available must reduce confidence.

Yellow to yellow/light brown spore colours indicate immaturity but approaching marginal maturity for oil.

IV CONCLUSIONS

The sampled section appears to comprise a late Albian to Paleocene section, although the interval is fairly thin and may be incomplete. Sampling is too broad to locate or accurately define all the palynological units in the interval, and the Albian age in the deepest sample is only based on cuttings.

V REFERENCES

Dettmann, M.E. and Playford, G. (1969) Palynology of the Australian Cretaceous : a review In Stratigraphy and Palaeontology. Essays in honour of Dorothy Hill, KSW Campbell Ed. ANU Press, Canberra 174-210

Helby, R.J., Morgan R.P. and Partridge, A.D. (1987) A palynological zonation of the Australian Mesozoic In Studies in Australian mesozoic Palynology Assoc. Australas. Palaeontols. Mem 4 1-94

Morgan, R.P. (1985) Palynology review of selected oil drilling, Otway basin, South Australia unpubl. rept. for Ultramar Australia

VOGEL #1 palynological data

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Box 161, Maitland, South Australia, 5573.
phone (088) 32 2795.....fax (088) 32 2798.

C L I E N T: Bridge Oil
W E L L: Vogel #1
F I E L D / A R E A: Otway Basin

A N A L Y S T: Roger Morgan   D A T E : August '90
N O T E S: all sample depths are in metres

RANGE CHART OF GRAPHIC ABUNDANCES BY LOWEST APPEARANCE: dinos & s/p

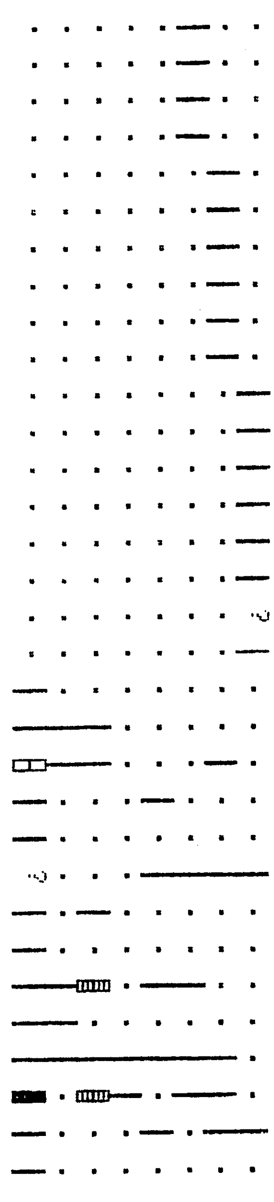
Key to Symbols

= Very Rare
= Rare
= Few
= Common
= Abundant
? = Questionably Present
. = Not Present

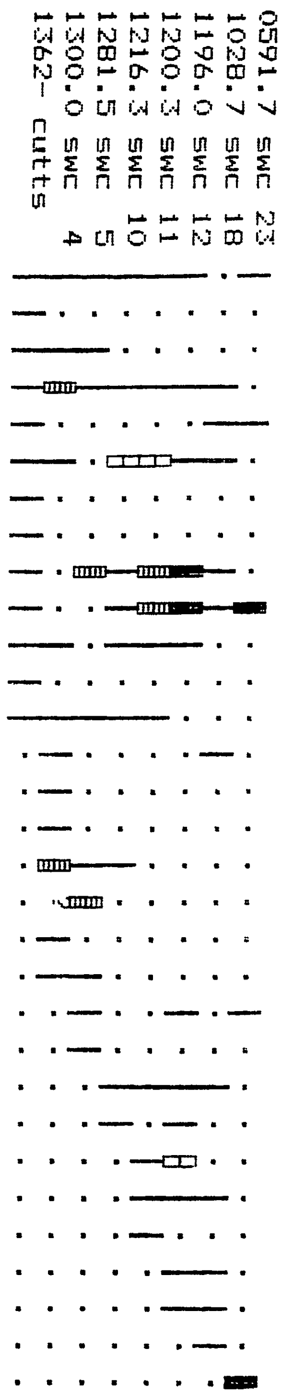
0591.7 SWC 23
1028.7 SWC 18
1196.0 SWC 12
1200.3 SWC 11
1216.3 SWC 10
1281.5 SWC 5
1300.0 SWC 4
1362- cutts

1 ISABELIDINIUM CRETACEUM
2 CALLOISPHAERIDIUM ASYMMETRICUM
3 CANNINGINOPSIS SP.
4 CIRCULODINIUM DEFLANDREI
5 CLEISTOSPHAERIDIUM SPP
6 CYCLONEPHELIUM COMPACTUM
7 CYCLONEPHELIUM MEMBRANIPHORUM
8 EXOCHOSPHAERIDIUM PHRAGMITES
9 KIOKANSIUM POLYPES
10 OLIGOSPHAERIDIUM COMPLEX
11 OLIGOSPHAERIDIUM PULCHERRIMUM
12 PALAEOPERIDINIUM CRETACEUM
13 VERYHACHIUM SP.
14 CRIBROPERIDINIUM EDWARDSII
15 CLEISTOSPHAERIDIUM ANCORIFERUM
16 HETEROSPHAERIDIUM HETEROCANTHUM
17 NUMMUS MONOCULATUS
18 ODONTOCHITINA COSTATA
19 PTEROSPERMELLA AUREOLATA
20 PTEROSPERMELLA AUSTRALIENSIS
21 CHLAMYDOPHORELLA NYEI
22 CRIBROPERIDINIUM APIONE
23 CRIBROPERIDINIUM PERFORANS
24 CYCLONEPHELIUM DISTINCTUM
25 HYSTRICHODINIUM PULCHRUM
26 SPINIFERITES FURCATUS/RAMOSUS
27 SYSTEMATOPHORA SP.
28 TANYOSPHAERIDIUM SALPYNX
29 TRITHYRODINIUM MARSHALLII
30 APTEODINIUM GRANULATUM
31 CHATANGIELLA COOKSONIAE
32 CHATANGIELLA SP
33 HETEROSPHAERIDIUM CONJUNCTUM

0591.7 SWC 23
1028.7 SWC 18
1196.0 SWC 12
1200.3 SWC 11
1216.3 SWC 10
1281.5 SWC 5
1300.0 SWC 4
1362- cutts



34	IMPAGIDINIUM SP
35	MICHRYTRIDIUM
36	SENONIASPHAERA SP.
37	TRITHYRODINIUM
38	ISABELIDINIUM BELFASTENSE
39	ISABELIDINIUM KOROJONENSE
40	ISABELIDINIUM SP.
41	ODONTOCHITINA
42	ODONTOCHITINA CF PROLATA
43	SPINIDINIUM SVERDRUPIANUM
44	ALISOCYSTA RUGOLIRATA
45	AREOLIGERA SENONENSIS
46	DEFLANDREA DARTMOORIA
47	DEFLANDREA MEDCALFII
48	DEFLANDREA SPECIOSA
49	PARALECANIELLA INDENTATA
50	SENEGALINIUM DILWYNENSE
51	SPINIDINIUM SP
52	AEQUITRIRADITES TILCHAENESIS
53	APPENDICISPORITES DISTOCARINATUS
54	CICATRICOSISPORITES AUSTRALIENSIS
55	CINGUTRILETES CLAVUS
56	CINGUTRILETES MEGACLAVUS
57	CLAVIFERA TRIPLEX
58	CONTIGNISPORITES COOKSONIAE
59	COPTOSPORA PARADOXA
60	COROLLINA TOROSUS
61	CRYBELOSPORITES STRIATUS
62	CYATHIDITES AUSTRALIS
63	CYATHIDITES MINOR
64	FALCISPORITES AUSTRALIS
65	FORAMINISPORIS ASYMMETRICUS
66	FORAMINISPORIS WONTHAGGIENSIS



67 GLEICHENIIDITES
68 LEPTOLEPIDITES MAJOR
69 LEPTOLEPIDITES VERRUCATUS
70 MICROCACHRYIDITES ANTARCTICUS
71 NOTHOFAGIDITES ENDURUS
72 OSMUDACIDITES WELLMANII
73 PEROTRILETES JUBATUS
74 PHIMOPOLLENITES PANNOSUS
75 PHYLLOCLADIDITES MAWSONII
76 PROTEACIDITES SP
77 RETITRILETES AUSTROCLAVATIDITES
78 RETITRILETES EMINULUS
79 STEREISPORITES ANTIQUISPORITES
80 AEQUITRIRADITES VERRUCOSUS
81 CYCLOSPORITES HUGHESI
82 DICTYOTOSPORITES SPECIOSUS
83 FALCISPORITES SIMILIS
84 PHYLLOCLADIDITES EUNUCHUS
85 PILOSISPORITES NOTENSIS
86 TRIPOROLETES RETICULATUS
87 CERATOSPORITES EQUALIS
88 TRIPOROLETES RADIATUS
89 PODOSPORITES MICROSACCATUS
90 TRICOLPITES GILLII
91 AMOSOPOLLIS CRUCIFORMIS
92 AUSTRALOPOLLIS OBSCURUS
93 FALCISPORITES GRANDIS
94 DILWYNITES GRANULATUS
95 TRICOLPITES CONFESSUS
96 LYGISTEPOLLENITES FLORINII
97 LYGISTEPOLLENITES BALMEI

SPECIES LOCATION INDEX

Index numbers are the columns in which species appear.

INDEX NUMBER	SPECIES
52	AEQUITRIRADITES TILCHAENESIS
80	AEQUITRIRADITES VERRUCOSUS
44	ALISOCYSTA RUGOLIRATA
91	AMOSOPOLLIS CRUCIFORMIS
53	APPENDICISPORITES DISTOCARINATUS
30	APTEODINIUM GRANULATUM
45	AREOLIGERA SENONENSIS
92	AUSTRALOPOLLIS OBSCURUS
2	CALLOISPHAERIDIUM ASYMMETRICUM
3	CANNINGINOPSIS SP.
87	CERATOSPORITES EQUALIS
31	CHATANGIELLA COOKSONIAE
32	CHATANGIELLA SP
21	CHLAMYDOPHORELLA NYEI
54	CICATRICOSISPORITES AUSTRALIENSIS
55	CINGUTRILETES CLAVUS
56	CINGUTRILETES MEGACLAVUS
4	CIRCULODINIUM DEFLANDREI
57	CLAVIFERA TRIPLEX
15	CLEISTOSPHAERIDIUM ANCORIFERUM
5	CLEISTOSPHAERIDIUM SPP
58	CONTIGNISPORITES COOKSONIAE
59	COPTOSPORA PARADOXA
60	COROLLINA TOROSUS
22	CRIBROPERIDINIUM APIONE
14	CRIBROPERIDINIUM EDWARDSII
23	CRIBROPERIDINIUM PERFORANS
61	CRYBELOSPORITES STRIATUS
62	CYATHIDITES AUSTRALIS
63	CYATHIDITES MINOR
6	CYCLONEPHELIUM COMPACTUM
24	CYCLONEPHELIUM DISTINCTUM
7	CYCLONEPHELIUM MEMBRANIPHORUM
81	CYCLOSPORITES HUGHESI
46	DEFLANDREA DARTMOORIA
47	DEFLANDREA MEDCALFII
48	DEFLANDREA SPECIOSA
82	DICTYOTOSPORITES SPECIOSUS
94	DILWYNITES GRANULATUS
8	EXOCHOSPHAERIDIUM PHRAGMITES
64	FALCISPORITES AUSTRALIS
93	FALCISPORITES GRANDIS
83	FALCISPORITES SIMILIS
65	FORAMINISPORIS ASYMMETRICUS
66	FORAMINISPORIS WONTHAGGIENSIS
67	GLEICHENIIDITES
33	HETEROSPHAERIDIUM CONJUNCTUM
16	HETEROSPHAERIDIUM HETEROCANTHUM
25	HYSTRICHODINIUM PULCHRUM
34	IMPAGIDINIUM SP
38	ISABELIDINIUM BELFASTENSE

1	ISABELIDINIUM CRETACEUM
39	ISABELIDINIUM KOROJONENSE
40	ISABELIDINIUM SP.
9	KIOKANSIUM POLYPES
68	LEPTOLEPIDITES MAJOR
69	LEPTOLEPIDITES VERRUCATUS
97	LYGISTEPOLLENITES BALMEI
96	LYGISTEPOLLENITES FLORINII
35	MICHRYTRIDIUM
70	MICROCACHRYIDITES ANTARCTICUS
71	NOTHOFAGIDITES ENDURUS
17	NUMMUS MONOCULATUS
41	ODONTOCHITINA
42	ODONTOCHITINA CF PROLATA
18	ODONTOCHITINA COSTATA
10	OLIGOSPHAERIDIUM COMPLEX
11	OLIGOSPHAERIDIUM PULCHERRIMUM
72	OSMUDACIDITES WELLMANII
12	PALAEOPERIDINIUM CRETACEUM
49	PARALECANIELLA INDENTATA
73	PEROTRILETES JUBATUS
74	PHIMOPOLLENITES PANNOSUS
84	PHYLLOCLADIDITES EUNUCHUS
75	PHYLLOCLADIDITES MAWSONII
85	PILOSISPORITES NOTENSIS
89	PODOSPORITES MICROSACCATUS
76	PROTEACIDITES SP
19	PTEROSPERMELLA AUREOLATA
20	PTEROSPERMELLA AUSTRALIENSIS
77	RETITRILETES AUSTROCLAVATIDITES
78	RETITRILETES EMINULUS
50	SENEGALINIUM DILWYNENSE
36	SENONIASPHAERA SP.
51	SPINIDINIUM SP
43	SPINIDINIUM SVERDRUPIANUM
26	SPINIFERITES FURCATUS/RAMOSUS
79	STEREISPORITES ANTIQUISPORITES
27	SYSTEMATOPHORA SP.
28	TANYOSPHAERIDIUM SALPYNX
95	TRICOLPITES CONFESSUS
90	TRICOLPITES GILLII
88	TRIPOROLETES RADIATUS
86	TRIPOROLETES RETICULATUS
37	TRITHYRODINIUM
29	TRITHYRODINIUM MARSHALLII
13	VERYHACHIUM SP.

2.6 Geochemical Analysis

Four (4) sidewall cores and one (1) cuttings sample from the Eumeralla Siltstone and the Belfast Claystone were submitted to B. Watson of Amdel Pty Ltd for source rock analysis.

The final report follows.

AMDEL CORE SERVICES

6 September 1990

Bridge Oil Limited
60 Margaret Street
SYDNEY NSW 2000

Attention: Sue Scrano

REPORT: 009/365

CLIENT REFERENCE:	PO 4223 and 4226
MATERIAL:	Sidewall Cores
LOCALITY:	Vogel -1
WORK REQUIRED:	TOC, Rock-Eval Pyrolysis and Organic Petrology

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out.

BRIAN L WATSON
Laboratory Supervisor
on behalf of Amdel Core Services Pty Ltd

Please Reply To: P.O. Box 109 Eastwood SA 5063 Australia
Telephone: 61-8-372 2834 Facsimile: 61-8-372 2861
Amdel Core Services Pty Ltd
(Incorporated in South Australia)

1. INTRODUCTION

Source rock analyses were requested on sidewall core samples from Vogel -1 with the aim of determining the source richness, source quality and maturity of the sediments intersected in this location.

2. ANALYTICAL PROCEDURES

2.1 Organic Petrology

Representative portions of each sample (crushed to -14+35 BSS mesh) were obtained with a sample splitter and then mounted in cold setting Glasscraft resin using a 2.5 cm diameter mould. Each block was ground flat using diamond impregnated laps and carborundum paper. The surface was then polished with aluminium oxide and finally magnesium oxide.

Reflectance measurements were made with a Leitz MPV1.1 microphotometer fitted to a Leitz Ortholux microscope and calibrated against synthetic standards. All measurements were taken using oil immersion (n = 1.518) and incident monochromatic light (wavelength 546 nm) at a temperature of 23±°C. Fluorescence observations were made on the same microscope utilising a 3 mm BG3 excitation filter, a TK400 dichroic mirror and a K510 suppression filter.

2.2 Sample Preparation

Cuttings samples (as received) were ground in a Siebtechnik mill for 20-30 seconds.

2.3 Total Organic Carbon (TOC)

Total organic carbon was determined by digestion of a known weight (approximately 0.2g) of powdered rock in 50% HCl to remove carbonates, followed by combustion in oxygen and measurement of the resultant CO_2 by infra-red detection.

2.4 Rock-Eval Analyses

A 100 mg portion of powdered rock was analysed by the rock-Eval pyrolysis technique (Girdel IFP-Fina Mark 2 instrument; operating mode, Cycle 1).

3. RESULTS

TOC and Rock-Eval data are presented in Table 1. Figure 1 is a plot of Rock-Eval Hydrogen Index and Tmax data illustrating kerogen Type and maturity for each of the samples analysed. Vitrinite Reflectance data is presented in Table 2. Histogram plots of vitrinite reflectance determinations are included in Appendix 1. Tables 3-5 present the descriptions of the dispersed organic matter identified in these samples.

4. INTERPRETATION

4.1 Maturity

Vitrinite reflectance values indicate that the sediments examined from this location are immature to marginally mature (VR = 0.36 - 0.52%). Rock-Eval Tmax and Hydrogen Index values (Table 1; Figure 1) indicate a similar maturity range.

This maturity data indicates that the sediments intersected in the Vogel -1 location are sufficiently mature for the generation of light oil and condensate from resinite and bituminite below approximately 1200 metres depth (VR = 0.45%).

Significant gas generation from woody-herbaceous kerogen commences at VR = 0.6%. Extrapolation of the available data indicates that this rank threshold may be reached at approximately 1500 metres depth in this location.

Oil generation from exinites other than resinite and bituminite commences at VR ~ 0.7%. This maturity may occur below approximately 1700 metres depth in Vogel -1.

4.2 Organic and Source Richness

Organic richness ranges from poor to fair in the interval studied (TOC = 0.39 - 1.99%). Samples in the 1310-1362 metres depth range have consistently fair organic richness.

Source richness for the generation of hydrocarbons is uniformly poor in the 1153-1311 metres depth interval but is fair in the sidewall core sample from 1362 metres depth.

4.3 Organic matter Type and Source Quality

Rock-Eval Hydrogen Index and Tmax data indicate that sidewall cores examined from Vogel -1 contain organic matter which have bulk compositions ranging from that of Type III to Type IV. Organic petrological examination of these samples shows that this organic matter consists largely of inertinite (85-90% of dispersed organic matter (DOM)) with low to moderate quantities of vitrinite and exinite (5-10% of DOM).

Exinite macerals present in these samples are comprised largely of cutinite, sporinite and liptodetrinite and are therefore of terrestrial origin.

TABLE 1

AMDEL CORE SERVICES

Rock-Eval Pyrolysis

30/08/90

Client: BRIDGE OIL

Well: VOGEL-1

Depth (m)	T Max	S1	S2	S3	S1+S2	PI	S2/S3	PC	TOC	HI	OI
1153	440	0.07	0.87	2.05	0.94	0.07	0.43	0.05	0.62	54	127
1196	442	0.07	0.05	2.04	0.12	0.58	0.02	0.01	0.39	12	523
— 1310	437	0.08	0.79	0.64	0.87	0.09	1.23	0.07	1.62	48	39
1311	445	0.04	0.49	0.37	0.53	0.08	1.32	0.04	1.45	33	25
1362	437	0.12	3.22	1.32	3.34	0.04	2.43	0.27	1.99	161	66

TABLE 2

SUMMARY OF VITRINITE REFLECTANCE MEASUREMENTS, VOGEL -1

Depth (m)	Mean Maximum Reflectance (%)	Standard Deviation	Range	Number of Determinations
1153.0	0.36	0.02	0.33-0.40	16
1196.0	0.46	0.05	0.37-0.58	19
1311.0	0.51	0.01	0.49-0.52	4
1362.5	0.52	0.08	0.39-0.61	12

TABLE 3

PROPORTIONS OF VITRINITE EXINITE AND INERTINITE IN DISPERSED ORGANIC MATTER, VOGEL -1

Depth (m)	Percentage of		
	Vitrinite	Inertinite	Exinite
1153.0	10	85	5
1196.0	5	90	5
1311.0	10	85	5
1362.5	5-10	85	5-10

TABLE 4

ORGANIC MATTER TYPE AND ABUNDANCE, VOGEL -1

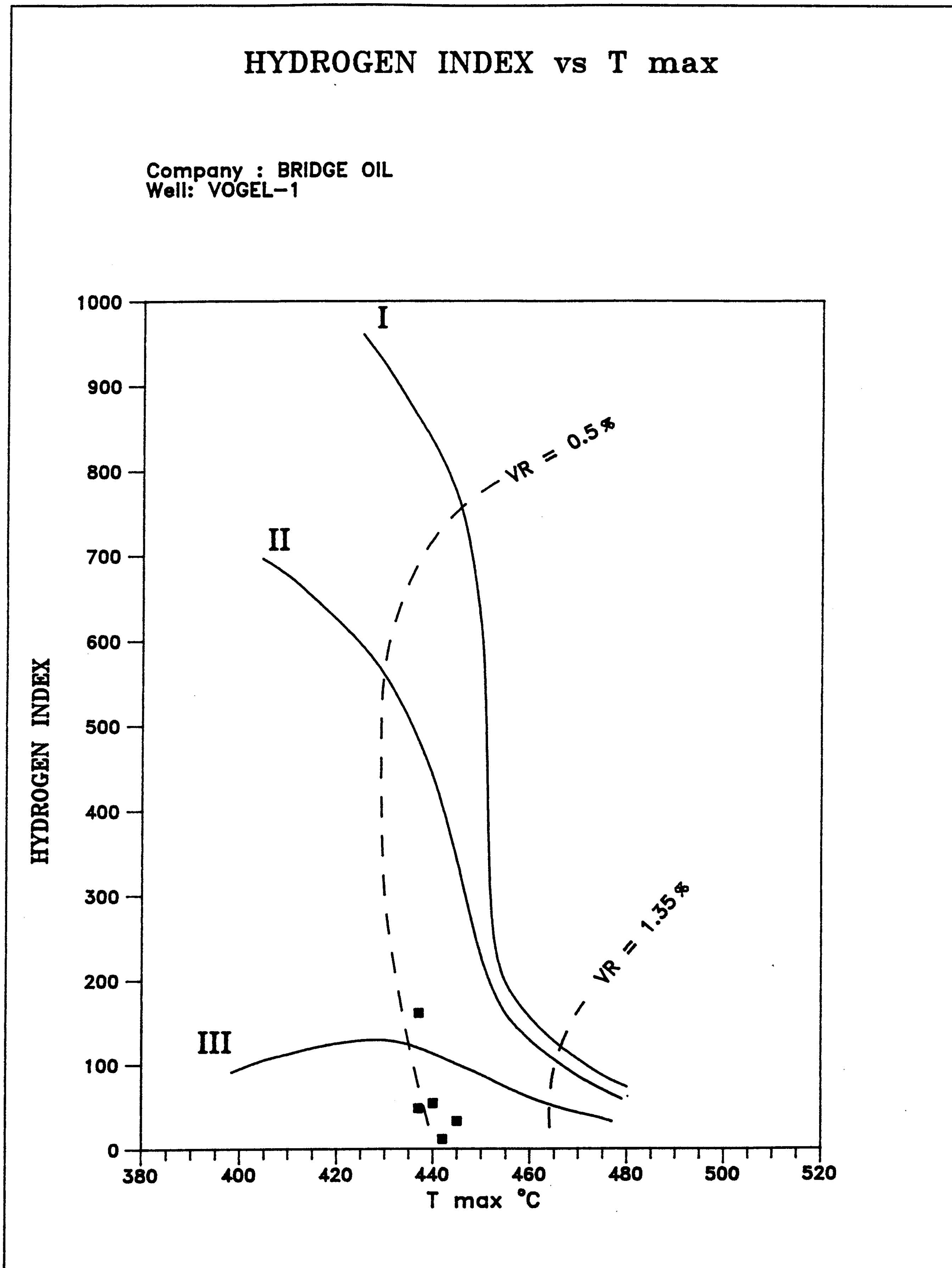
Depth (m)	Estimated Volume of DOM (%)	Estimated Volume of Exinites	Exinite Macerals
1153.0	0.5-1	Ra	cut, lipto, spo, bmite
1196.0	<0.5	Vr	lipto
1313	1-2	Ra	cut, lipto, spo
1362.5	1-2	Ra	lipto, spo, cut

TABLE 5

EXINITE MACERAL ABUNDANCE AND FLUORESCENCE CHARACTERISTICS, VOGEL -1

Depth (m)	Exinite Macerals	Lithology/Comments
1153.0	cut(Ra;mY-dO), lipto(Ra; mY-dO), spo(Ra-Vr;mY-dO), bmite(Vr;dBO	Shale; some exinites are slightly oxidised
1196.0	lipto (Vr;mO-dO)	Carbonate rich shale
1311.0	cut(Ra;mO-dO), lipto (Ra;mO-dO), spo(Ra-Vr;mO-dO)	Shale
1362.5	lipto(Ra;mO-dO), spo(Ra;mO-dO), cut(Ra;mO-dO)	Shale

FIGURE 1


HYDROGEN INDEX vs T max
Company : BRIDGE OIL
Well: VOGEL-1
HYDROGEN INDEX
T max °C
I
II
III
VR = 0.5%
VR = 1.35%
1000
900
800
700
600
500
400
300
200
100
0
380
400
420
440
460
480
500
520

APPENDIX 1

HISTOGRAM PLOTS OF VITRINITE REFLECTANCE VALUES

Amdel Core Services Pty Limited
Incorporated in South Australia

VITRINITE REFLECTANCE VALUES

Well Name: VOGEL-1
Depth: 1153.0 m

Sorted List

0.33	0.37
0.33	0.37
0.33	0.38
0.33	0.38
0.34	0.39
0.34	0.40
0.35	
0.35	
0.36	
0.37	

Number of values= 16

Mean of values 0.36
Standard Deviation 0.02

HISTOGRAM OF VALUES
Reflectance values multiplied by 100

```
33-35    ********
36-38    ******
39-41    **
```

VITRINITE REFLECTANCE VALUES

Well Name: VOGEL-1
Depth: 1196.0 m

Sorted List

0.37	0.46
0.41	0.47
0.41	0.48
0.41	0.49
0.42	0.50
0.43	0.51
0.44	0.51
0.44	0.52
0.45	0.58
0.46	

Number of values= 19

Mean of values 0.46
Standard Deviation 0.05

HISTOGRAM OF VALUES
Reflectance values multiplied by 100

37-39	*
40-42	****
43-45	****
46-48	****
49-51	****
52-54	*
55-57	
58-60	*

VITRINITE REFLECTANCE VALUES

Well Name:	VOGEL-1
Depth:	1311.0 m

Sorted List

0.49
0.51
0.51
0.52

Number of values=	4
Mean of values	0.51
Standard Deviation	0.01

HISTOGRAM OF VALUES
Reflectance values multiplied by 100

49-51	***
52-54	*

VITRINITE REFLECTANCE VALUES

Well Name: VOGEL-1
Depth: 1362.5 m

Sorted List

0.39	0.60
0.39	0.61
0.43	
0.47	
0.51	
0.52	
0.57	
0.57	
0.60	
0.60	

Number of values= 12

Mean of values 0.52
Standard Deviation 0.08

HISTOGRAM OF VALUES
Reflectance values multiplied by 100

39-41	**
42-44	*
45-47	*
48-50	
51-53	**
54-56	
57-59	**
60-62	****

3) LOG ANALYSIS

3.1 Introduction
3.2 Method of Calculation and Results
3.3 Conclusions
3.4 Petrophysical Listings

3.1 Introduction

The Vogel #1 basic logging suite was run by Halliburton as follows:

	Logged Top (m)	Interval Bottom (m)	Max. Temp (°F)	Time Since Circulation (hrs.)
Tool Combination 1				
DLL-MSFL-SP-GR-CAL	212.5	1393.4	118	3.95
Tool Combination 2				
BHC SONIC	220.0	1390.6	120	7.97
GR	15.5	1390.6		
Tool Combination 3				
WST & VSP	SURFACE	1394.0	NOT RECORDED	
Tool Combination 4				
CDL-CNS-GR-CAL	1009.3	1330.1	124	24.33
Tool Combination 5				
SWC	586.7	1364.0	NOT RECORDED	6.58

The mud properties at the time of logging were as follows:

Type : KCl Gel Polymer
Density : 9.4 lb/gal
Viscosity : 44 sec
pH : 9.0
Fluid Loss: 5.6cc

Rm : 0.28 @ 64°F
Rmf : 0.22 @ 66°F
Rmc : 0.30 @ 62°F
Rm @ BHT : 0.15 @ 125°F

Extrapolated B.H.T. : 125°F (See Fig. 9)

VOGEL #1

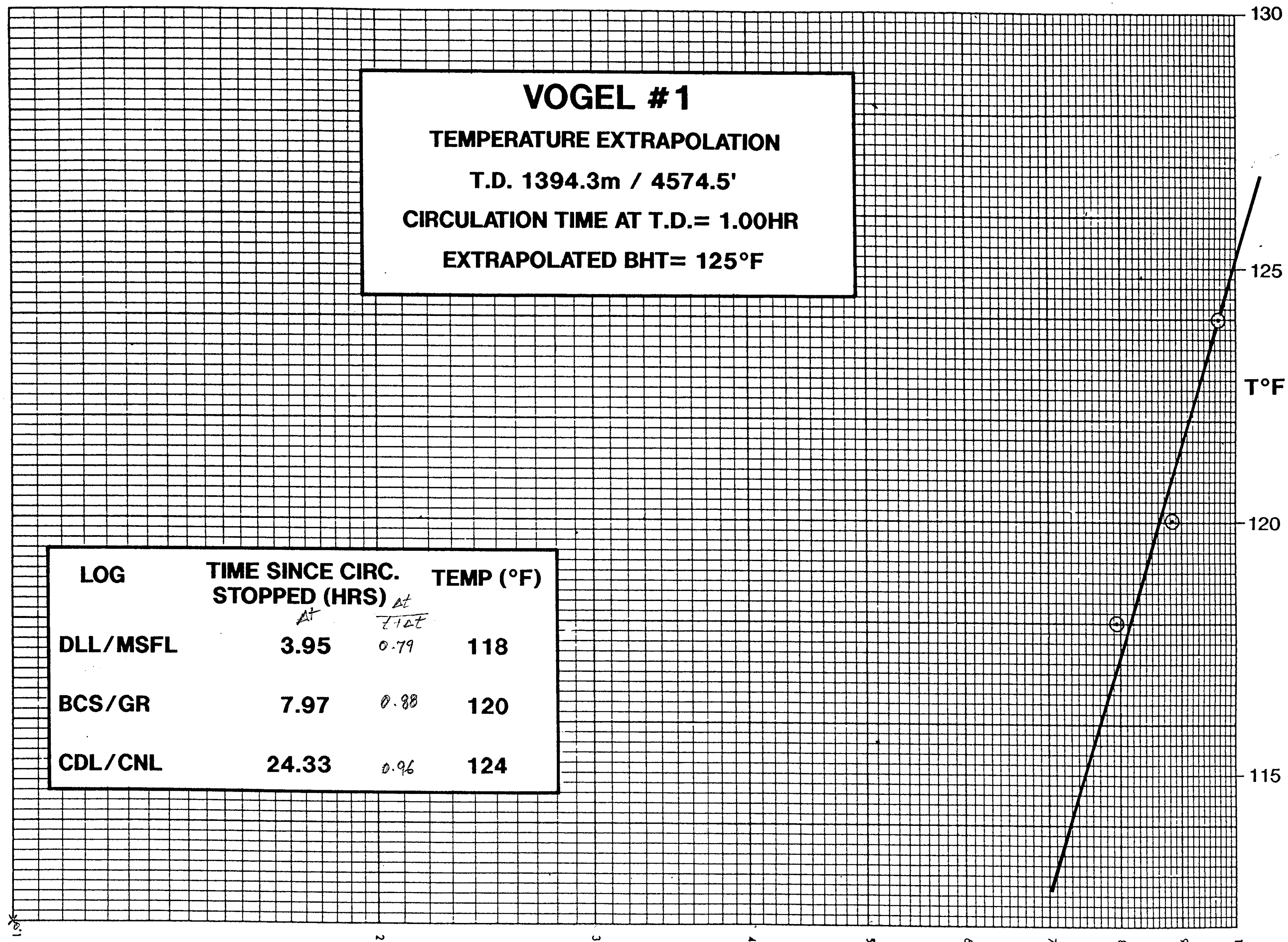
TEMPERATURE EXTRAPOLATION

T.D. 1394.3m / 4574.5'

CIRCULATION TIME AT T.D.= 1.00HR

EXTRAPOLATED BHT= 125°F

LOG	TIME SINCE CIRC. STOPPED (HRS) Δt	$\frac{\Delta t}{t+\Delta t}$	TEMP (°F)
DLL/MSFL	3.95	0.79	118
BCS/GR	7.97	0.88	120
CDL/CNL	24.33	0.96	124



T = 1 hrs.

Figure 9

3.2 Method of Calculation

(a) Main Zones of Interest

WAARRE SANDSTONE (1219.5-1309.0m analysed)

A petrophysical summary plot of the Waarre Sandstone is provided in Figure 10. Petrophysical listings are provided in Section 3.4, Table 2.

The following steps outline the detailed petrophysical analysis undertaken over the Waarre Sandstone using the log analysis package TERRALOG from Terrasciences.

i) Appropriate environmental corrections are made.

ii) Appropriate tornado plot corrections to resistvity logs are made.

iii) Vshale is calculated using corrected GR log and "linear" algorithm.

iv) Hydrocarbon corrections are made to the density and neutron logs. As there are no shows these corrections have nil effect, but are included to maintain a consistent method of analysis.

v) Shale corrections are applied to the hydrocarbon corrected density and neutron logs and a cross plot density/neutron porosity is derived.

vi) Porosity weighted water saturations were calculated using density/neutron cross plot porosity (shale corrected) as an accurate representation of effective porosity.

vii) Net reservoir is considered to be sandstones with porosity $\geq$15% and Vshale $\leq$25%.

Results:

Net sandstone thickness	58.98m
Net porosity-metres	14.83m
Net Pay	Nil

<u>Average Reservoir Properties</u>

Porosity (effective)	25.1%
Sw (Archie)	98.0%
Vshale	10.0%

Listed below are the relevant constant/parameters used in this analysis along with the source of the information and comments where appropriate.

CONSTANT/ PARAMETERS		**SOURCE**
a, m and n	:	1, 1.74 and 2.08 respectively. From Iona -1 special core analysis of the Waarre Formation.
Rw	:	0.363 ohm-m @ 70^{o}F. From Iona -1 log analysis.
Rshale	:	6.0 ohm-m. From overlying shale.
RHO matrix	:	2.65 gm/cc. From published data.
CNL Matrix	:	-0.03 (limestone matrix).
RHO Shale	:	2.35 gm/cc. From overlying shale.
CNL Shale	:	0.475 (limestone matrix). From overlying shale.
RHO Fluid	:	1.00 gm/cc. From published data.
CNL Fluid	:	1.00. From published data.
RHO Hydrocarbon	:	0.15 gm/cc.
BHT	:	125^{o}F. From extrapolation, Figure 9.
Mean T	:	70^{o}F. Assumed.
GRBHC Clean	:	10 API units.
GRBHC Shale	:	135 API units.

(b) Secondary Objectives

Procedures as outlined for the main objective [(Section 3.2 (a) steps (i)-(vii)] were applied to the analyses of the secondary objectives as follows:

NULLAWARRE MEMBER (PAARATTE FORMATION) (1020.0-1155.0m analysed)

The following constants were used in the analysis:

Rw	:	0.6 ohm-m @ 75°F (estimated from Pickett Plot)
GRBHC clean	:	20 API units
GRBHC shale	:	135 API units
RHO shale	:	2.26 gm/cc
CNL shale	:	0.48
R shale	:	4.5 ohm-m
a, m, n	:	1, 2 and 2 respectively

Vshale ("linear" algorithm), shale corrected neutron/density cross plot porosity and Archie Sw were calculated. These are displayed in Table 3, a constrained petrophysical listing through net sandstone zones.

Results: At net sandstone cut-offs of $\geq$ 15% porosity and $\leq$ 35% Vshale:

Total net sandstone:	83.21m
Net porosity-metres:	20.03m
Net pay:	Nil
Average Porosity (effective):	24.1%
Average Vshale:	26.0%
Average Sw (Archie):	91.0%

PEBBLE POINT FORMATION (575.0-625.0m analysed)

In this analysis, steps (iv) and (v) as outlined in Section 3.2 (a) were omitted, as density/neutron logs were not run over this interval.

The following constants were used in the analysis:

Rw	:	3.0 ohm-m @ 93.6°F (estimated from Pickett Plot)
GRBHC clean	:	30 API units
GRBHC shale	:	190 API units
DT shale	:	116 microseconds/foot
DT mtx	:	56 microseconds/foot
R shale	:	35 ohm-m
a,m,n	:	1, 2 and 2 respectively

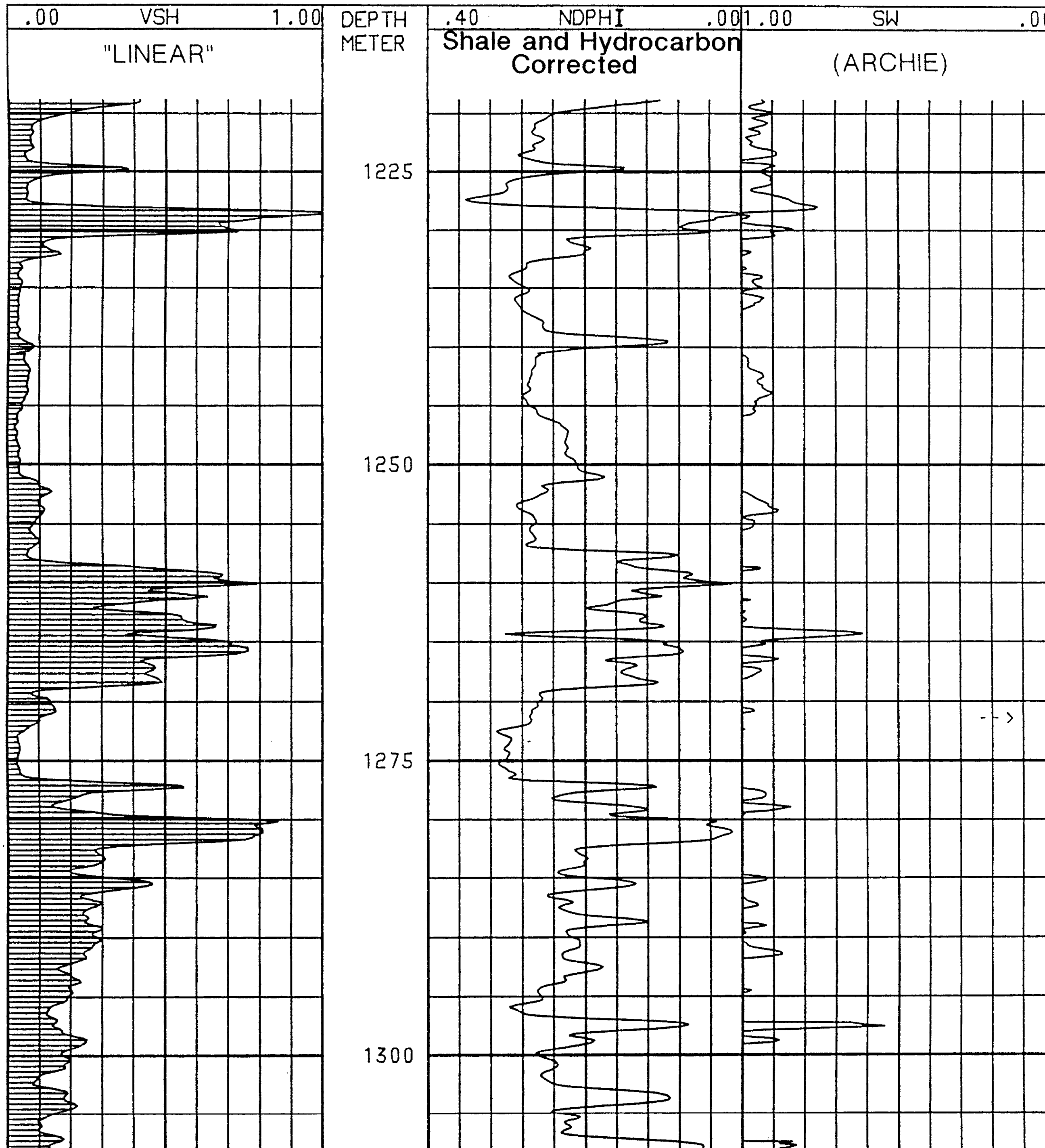
Vshale ("tertiary" algorithm), shale corrected and* compaction corrected sonic porosity and Archie Sw were calculated. These are displayed in Table 4, a constrained petrophysical listings through net sandstone zones.

* compacted corrected porosity = $\frac{O \times 100}{DT\ shale}$

Results: At net sandstone cut-offs of $\geq$ 15% porosity and $\leq$ 30% Vshale:

Total net sandstone:	27.13m
Net porosity-metres:	7.43m
Net pay:	Nil
Average porosity (effective):	27.4%
Average Vshale:	13.0%
Average Sw (Archie):	91.0%

WELL NAME: VOGEL #1



For constants/parameters used, refer to Section 3.2(a)

FIGURE 10 WAARRE SST LOG ANALYSIS PLOT

3.3 Conclusions

(1) Log quality is good.

(2) No log pay is recognised in the primary or secondary objectives.

(3) Results of petrophysical analysis of the Waarre Sandstone, Nullawarre Member of the Paaratte Formation and Pebble Point Formation have confirmed that net porous sandstone zones in these formations are water saturated.

(4) The Archie equation for calculating water saturations does a better job than the Indonesian equation of achieving realistic values. The Indonesian equation yields results in excess of 100%.

WAARRE SANDSTONE

WELL NAME: VOGEL #1
LOCATION: PEP108 DATE: RIG REL. 17.3.90
CONSTRAINTS: VSH NDPHISC

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1219.657	77.137	.2461	.2020	4.385	.9586
1219.810	73.371	.2216	.2193	4.326	.9212
1219.962	69.331	.1974	.2343	4.266	.8948
1220.114	64.813	.1726	.2423	4.124	.9064
1220.267	59.907	.1481	.2448	3.950	.9444
1220.419	55.114	.1264	.2476	3.879	.9655
1220.572	50.642	.1081	.2518	4.017	.9479
1220.724	46.710	.0933	.2576	4.125	.9250
1220.876	43.359	.0816	.2627	4.156	.9126
1221.029	41.453	.0752	.2641	4.066	.9248
1221.181	40.457	.0720	.2637	3.927	.9479
1221.334	40.245	.0714	.2630	3.760	.9756
1221.486	41.100	.0741	.2660	3.812	.9528
1221.638	41.946	.0769	.2677	3.852	.9377
1221.791	41.546	.0755	.2662	3.897	.9389
1221.943	39.881	.0702	.2611	3.873	.9680
1222.096	38.828	.0669	.2541	3.975	.9865
1222.248	39.041	.0676	.2510	4.128	.9783
1222.400	39.358	.0686	.2534	4.108	.9695
1222.553	39.191	.0681	.2596	3.968	.9628
1222.705	40.045	.0707	.2658	3.711	.9716
1222.858	41.560	.0756	.2660	3.745	.9608
1223.010	42.188	.0777	.2628	3.946	.9432
1223.162	40.311	.0716	.2635	4.255	.9060
1223.315	36.267	.0593	.2724	4.219	.8881
1223.467	32.937	.0499	.2820	4.029	.8846
1223.620	32.700	.0492	.2854	3.922	.8866
1223.772	33.540	.0515	.2811	3.835	.9120
1223.924	34.301	.0536	.2731	3.703	.9597
1224.077	35.369	.0567	.2641	3.589	1.012
1224.229	40.518	.0722	.2540	3.843	1.000
1224.382	54.493	.1238	.2384	4.598	.9133
1224.534	75.228	.2334	.1916	5.583	.8885
1225.144	72.866	.2185	.2260	4.053	.9316
1225.296	60.510	.1510	.2533	3.876	.9178
1225.448	52.042	.1137	.2709	3.751	.9049
1225.601	47.032	.0944	.2831	3.579	.9028
1225.753	43.104	.0807	.2918	3.430	.9061
1225.906	39.113	.0678	.2975	3.414	.8995
1226.058	36.669	.0605	.3005	3.381	.9005
1226.210	36.099	.0588	.3000	3.336	.9105
1226.363	35.572	.0573	.2985	3.177	.9430
1226.515	35.141	.0560	.2978	3.058	.9676
1226.668	35.326	.0566	.2992	3.026	.9676
1226.820	36.124	.0589	.3032	3.082	.9411
1226.972	36.262	.0593	.3125	3.111	.9041
1227.125	35.392	.0567	.3266	2.977	.8833
1227.277	34.686	.0547	.3428	2.844	.8591

TABLE 2

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1227.430	34.756	.0549	.3524	2.782	.8425
1227.582	36.262	.0593	.3456	2.913	.8364
1227.734	42.990	.0803	.3268	3.270	.8199
1227.887	58.840	.1431	.2958	3.895	.7830
1230.630	72.022	.2133	.2068	4.690	.9370
1230.782	59.653	.1469	.2232	4.145	1.010
1230.935	54.029	.1218	.2214	4.063	1.062
1231.087	51.040	.1096	.2169	4.274	1.070
1231.240	49.612	.1041	.2089	4.730	1.058
1231.392	50.779	.1086	.1981	5.170	1.057
1231.544	53.230	.1185	.1915	5.463	1.046
1231.697	55.009	.1260	.1951	5.574	1.004
1231.849	57.770	.1382	.2004	5.500	.9687
1232.002	62.155	.1590	.2001	5.207	.9744
1232.154	63.289	.1647	.2027	4.853	.9945
1232.306	58.224	.1402	.2168	4.466	1.005
1232.459	48.236	.0989	.2393	4.039	1.007
1232.611	37.908	.0641	.2586	3.630	1.020
1232.764	30.417	.0432	.2700	3.361	1.037
1232.916	26.767	.0341	.2748	3.352	1.027
1233.068	27.693	.0363	.2745	3.430	1.013
1233.221	30.036	.0422	.2739	3.573	.9860
1233.373	30.397	.0431	.2753	3.540	.9845
1233.526	28.261	.0377	.2804	3.296	1.009
1233.678	25.668	.0315	.2875	3.178	1.007
1233.830	24.629	.0291	.2940	3.320	.9587
1233.983	24.515	.0288	.2968	3.414	.9331
1234.135	25.066	.0301	.2958	3.428	.9337
1234.288	27.126	.0349	.2930	3.297	.9611
1234.440	29.509	.0409	.2898	3.306	.9669
1234.592	30.624	.0437	.2868	3.410	.9586
1234.745	29.830	.0417	.2829	3.547	.9539
1234.897	28.450	.0382	.2777	3.826	.9363
1235.050	27.920	.0369	.2718	3.823	.9613
1235.202	27.768	.0365	.2692	3.713	.9890
1235.354	27.522	.0359	.2718	3.533	1.007
1235.507	27.085	.0348	.2784	3.545	.9784
1235.659	26.726	.0340	.2848	3.577	.9486
1235.812	26.235	.0328	.2889	3.624	.9269
1235.964	25.833	.0319	.2896	3.543	.9371
1236.116	25.475	.0310	.2881	3.569	.9398
1236.269	25.816	.0318	.2861	3.477	.9608
1236.421	26.402	.0332	.2844	3.524	.9589
1236.574	26.498	.0334	.2827	3.455	.9763
1236.726	26.061	.0324	.2812	3.415	.9901
1236.878	25.492	.0311	.2795	3.362	1.007
1237.031	25.184	.0303	.2765	3.408	1.013
1237.183	24.923	.0297	.2724	3.475	1.020
1237.336	25.218	.0304	.2677	3.477	1.040

TABLE 2 (CONT

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1237.488	25.823	.0318	.2629	3.503	1.055
1237.640	25.989	.0322	.2576	3.499	1.081
1237.793	25.405	.0309	.2527	3.595	1.090
1237.945	24.172	.0280	.2520	3.688	1.081
1238.098	23.795	.0272	.2532	3.754	1.065
1238.250	24.830	.0295	.2532	3.762	1.061
1238.402	26.892	.0344	.2526	3.685	1.071
1238.555	28.199	.0376	.2497	3.523	1.110
1238.707	27.506	.0359	.2408	3.205	1.224
1238.860	25.951	.0321	.2219	2.848	1.447
1239.012	25.110	.0302	.1897	2.630	1.820
1239.926	43.703	.0827	.1577	8.502	1.049
1240.079	43.047	.0805	.1982	5.567	1.050
1240.231	40.937	.0736	.2261	4.453	1.042
1240.384	38.999	.0675	.2406	4.104	1.026
1240.536	23.310	.0261	.2603	3.069	1.158
1240.688	34.961	.0555	.2563	3.937	.9914
1240.841	33.708	.0520	.2614	3.840	.9867
1240.993	33.342	.0510	.2631	3.853	.9787
1241.146	33.570	.0516	.2629	3.836	.9812
1241.298	34.437	.0540	.2624	3.860	.9775
1241.450	35.673	.0576	.2628	3.812	.9793
1241.603	37.110	.0618	.2630	3.767	.9809
1241.755	38.823	.0669	.2645	3.708	.9784
1241.908	40.220	.0713	.2667	3.714	.9637
1242.060	40.421	.0719	.2681	3.768	.9495
1242.212	39.508	.0691	.2679	3.900	.9347
1242.365	38.911	.0672	.2678	3.938	.9315
1242.517	38.849	.0670	.2690	3.920	.9295
1242.670	38.568	.0662	.2701	3.800	.9427
1242.822	37.884	.0641	.2706	3.749	.9500
1242.974	37.706	.0635	.2708	3.737	.9512
1243.127	37.274	.0622	.2727	3.724	.9471
1243.279	36.792	.0608	.2733	3.822	.9318
1243.432	36.931	.0612	.2712	3.856	.9347
1243.584	37.592	.0632	.2689	3.952	.9288
1243.736	38.558	.0661	.2697	4.004	.9159
1243.889	38.303	.0653	.2739	3.989	.9027
1244.041	37.135	.0618	.2782	3.850	.9085
1244.194	35.421	.0568	.2802	3.689	.9280
1244.346	34.644	.0546	.2782	3.627	.9466
1244.498	34.439	.0540	.2754	3.686	.9493
1244.651	33.364	.0510	.2738	3.677	.9598
1244.803	31.671	.0465	.2733	3.764	.9530
1244.956	31.121	.0450	.2715	3.793	.9578
1245.108	31.922	.0471	.2667	3.914	.9578
1245.260	32.265	.0481	.2623	3.977	.9665
1245.413	30.111	.0424	.2610	4.128	.9572
1245.565	27.496	.0358	.2609	4.164	.9591

TABLE 2 (CONT.)

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1245.718	26.236	.0328	.2598	4.132	.9711
1245.870	25.646	.0314	.2561	4.005	1.007
1246.022	25.239	.0305	.2512	4.066	1.022
1246.175	25.519	.0311	.2448	4.237	1.027
1246.327	26.439	.0333	.2375	4.525	1.022
1246.480	26.289	.0329	.2322	4.757	1.020
1246.632	24.305	.0283	.2303	4.780	1.032
1246.784	22.555	.0244	.2285	4.731	1.053
1246.937	22.555	.0244	.2252	4.518	1.099
1247.089	24.174	.0280	.2218	4.469	1.121
1247.242	25.778	.0317	.2207	4.431	1.128
1247.394	26.333	.0330	.2213	4.608	1.098
1247.546	25.680	.0315	.2223	4.702	1.081
1247.699	24.632	.0291	.2227	4.699	1.083
1247.851	24.730	.0293	.2234	4.498	1.106
1248.004	25.531	.0311	.2244	4.445	1.105
1248.156	26.201	.0327	.2253	4.606	1.076
1248.308	26.887	.0344	.2241	4.697	1.068
1248.461	28.146	.0374	.2222	4.615	1.086
1248.613	28.871	.0392	.2212	4.441	1.113
1248.766	28.623	.0386	.2223	4.472	1.103
1248.918	27.821	.0366	.2241	4.527	1.088
1249.070	27.249	.0352	.2250	4.530	1.084
1249.223	26.923	.0345	.2235	4.426	1.108
1249.375	27.129	.0350	.2197	4.260	1.155
1249.528	28.489	.0383	.2148	4.164	1.196
1249.680	29.471	.0408	.2120	4.235	1.199
1249.832	29.279	.0403	.2112	4.454	1.170
1249.985	28.218	.0376	.2101	4.598	1.160
1250.137	27.409	.0356	.2088	4.627	1.167
1250.290	27.409	.0356	.2090	4.567	1.174
1250.442	27.659	.0362	.2074	4.445	1.203
1250.594	27.469	.0358	.2018	4.175	1.287
1250.747	27.437	.0357	.1927	3.761	1.441
1250.899	28.890	.0393	.1814	3.533	1.592
1251.052	33.202	.0506	.1741	3.413	1.673
1251.204	39.728	.0697	.1795	3.718	1.496
1251.356	45.315	.0883	.2016	3.980	1.235
1251.509	47.737	.0970	.2292	3.856	1.082
1251.661	47.475	.0961	.2494	3.644	1.021
1251.814	48.363	.0993	.2552	3.357	1.040
1251.966	51.854	.1129	.2508	3.454	1.028
1252.118	55.947	.1301	.2463	3.583	1.007
1252.271	57.781	.1382	.2470	3.595	.9929
1252.423	56.099	.1307	.2530	3.577	.9790
1252.576	52.728	.1164	.2584	3.578	.9713
1252.728	50.302	.1068	.2615	3.625	.9616
1252.880	49.167	.1024	.2670	3.576	.9515
1253.033	48.156	.0986	.2752	3.491	.9367
1253.185	47.619	.0966	.2827	3.417	.9226

TABLE 2 (CONT.)

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1253.338	47.820	.0973	.2869	3.379	.9129
1253.490	49.316	.1030	.2873	3.333	.9135
1253.642	51.499	.1115	.2854	3.386	.9046
1253.795	52.693	.1163	.2819	3.595	.8816
1253.947	52.074	.1138	.2756	3.753	.8835
1254.100	50.843	.1089	.2701	3.706	.9141
1254.252	49.793	.1048	.2657	3.435	.9764
1254.404	48.064	.0982	.2647	3.367	.9981
1254.557	45.905	.0904	.2638	3.499	.9881
1254.709	45.148	.0877	.2614	3.777	.9579
1254.862	44.513	.0855	.2613	3.791	.9584
1255.014	43.365	.0816	.2635	3.746	.9598
1255.166	41.175	.0743	.2681	3.662	.9608
1255.319	39.333	.0685	.2695	3.595	.9713
1255.471	38.771	.0668	.2707	3.442	.9925
1255.624	39.804	.0700	.2697	3.262	1.024
1255.776	41.521	.0755	.2670	3.178	1.046
1255.928	43.021	.0804	.2658	3.051	1.071
1256.081	44.657	.0860	.2639	2.961	1.092
1256.233	47.153	.0949	.2614	3.044	1.076
1256.386	48.388	.0994	.2633	3.170	1.038
1256.538	47.827	.0974	.2697	3.260	.9969
1256.690	46.251	.0916	.2759	3.153	.9968
1256.843	44.008	.0838	.2741	2.944	1.053
1256.995	41.010	.0738	.2565	2.804	1.178
1257.148	38.370	.0655	.2191	2.937	1.380
1257.300	37.586	.0632	.1636	4.067	1.586
1258.062	47.659	.0967	.1551	4.128	1.575
1258.214	60.933	.1530	.1609	3.392	1.551
1268.882	69.793	.2000	.2009	4.321	1.020
1269.035	54.466	.1237	.2337	3.447	1.093
1269.187	44.223	.0845	.2510	2.905	1.166
1269.340	40.301	.0716	.2575	2.704	1.197
1269.492	43.046	.0805	.2581	2.769	1.167
1269.644	49.698	.1044	.2557	2.836	1.134
1269.797	55.384	.1276	.2537	2.851	1.113
1269.949	57.167	.1355	.2565	2.842	1.093
1270.102	57.091	.1351	.2601	2.851	1.075
1270.254	57.850	.1385	.2605	2.932	1.052
1270.406	59.444	.1459	.2596	3.036	1.027
1270.559	60.429	.1506	.2621	3.135	.9937
1270.711	60.966	.1532	.2667	3.189	.9637
1270.864	61.080	.1537	.2682	3.182	.9588
1271.016	58.989	.1438	.2673	3.041	.9974
1271.168	53.937	.1214	.2694	2.932	1.033
1271.321	49.504	.1037	.2706	2.793	1.076
1271.473	48.952	.1016	.2697	2.962	1.046
1271.626	49.541	.1038	.2680	2.858	1.073

TABLE 2 (CONT.

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1271.778	47.711	.0969	.2687	3.277	.9957
1271.930	43.997	.0837	.2722	3.187	1.011
1272.083	40.490	.0722	.2809	3.005	1.021
1272.235	38.791	.0668	.2945	2.814	1.010
1272.388	36.850	.0610	.3080	2.692	.9893
1272.540	33.613	.0517	.3128	2.544	1.012
1272.692	29.833	.0417	.3094	2.471	1.052
1272.845	27.068	.0348	.3029	2.442	1.092
1272.997	26.395	.0332	.2978	2.300	1.154
1273.150	27.050	.0348	.2932	2.491	1.121
1273.302	27.322	.0354	.2933	2.479	1.123
1273.454	27.725	.0364	.2958	2.360	1.143
1273.607	28.776	.0390	.2965	2.259	1.166
1273.759	29.444	.0407	.2996	2.204	1.167
1273.912	29.618	.0411	.3023	2.237	1.144
1274.064	29.369	.0405	.3031	2.282	1.128
1274.216	29.274	.0403	.2995	2.295	1.141
1274.369	28.814	.0391	.2956	2.274	1.165
1274.521	27.496	.0358	.2964	2.338	1.146
1274.674	26.473	.0334	.2989	2.348	1.135
1274.826	26.465	.0334	.2988	2.342	1.137
1274.978	26.342	.0331	.3021	2.287	1.138
1275.131	25.502	.0311	.3090	2.236	1.125
1275.283	25.269	.0305	.3103	2.190	1.134
1275.436	26.447	.0333	.3072	2.076	1.180
1275.588	27.880	.0368	.3032	1.948	1.239
1275.740	28.564	.0385	.2996	1.950	1.253
1275.893	28.848	.0392	.2976	2.003	1.243
1276.045	29.243	.0402	.2902	2.056	1.260
1276.198	30.654	.0438	.2874	2.094	1.256
1276.350	34.414	.0540	.2925	2.142	1.204
1276.502	44.199	.0844	.2978	2.352	1.087
1276.655	61.176	.1542	.2758	2.736	1.014
1277.874	75.996	.2385	.2287	3.843	.9223
1278.026	74.313	.2276	.2365	3.693	.9246
1278.179	71.971	.2130	.2430	3.530	.9387
1278.331	68.190	.1909	.2382	3.534	.9792
1278.484	64.329	.1700	.2160	3.997	1.030
1278.636	60.546	.1511	.1869	5.889	.9752
1278.788	57.979	.1391	.1566	9.601	.8920
1284.122	74.026	.2257	.2131	3.129	1.124
1284.275	69.813	.2002	.2258	3.057	1.110
1284.427	68.511	.1927	.2335	3.028	1.088
1284.580	69.907	.2007	.2358	3.201	1.035
1284.732	74.519	.2289	.2293	3.438	.9901
1286.408	75.894	.2378	.2485	2.898	1.002
1286.561	74.576	.2292	.2483	2.965	.9980

TABLE 2 (CONT

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1286.713	76.247	.2401	.2373	3.171	.9919
1287.628	77.593	.2492	.2300	3.197	1.007
1287.780	76.401	.2411	.2238	3.390	1.007
1287.932	75.818	.2373	.2169	3.640	.9999
1288.085	76.338	.2407	.2043	3.402	1.094
1291.133	77.085	.2457	.2239	4.150	.8916
1291.285	76.326	.2407	.2284	4.211	.8724
1291.438	76.464	.2416	.2304	4.139	.8732
1291.590	77.603	.2492	.2297	3.823	.9094
1291.742	77.489	.2485	.2282	3.405	.9786
1291.895	75.033	.2322	.2233	3.033	1.086
1292.047	72.164	.2142	.2099	2.960	1.192
1292.200	69.128	.1962	.1953	3.409	1.203
1292.352	65.832	.1780	.1821	4.553	1.115
1292.504	62.439	.1604	.1777	5.613	1.038
1292.657	61.431	.1554	.1814	5.617	1.024
1292.809	64.156	.1691	.1907	4.605	1.072
1292.962	67.461	.1868	.2041	3.475	1.154
1293.114	69.352	.1975	.2186	2.943	1.173
1293.266	70.122	.2020	.2276	2.829	1.147
1293.419	71.695	.2113	.2274	2.824	1.137
1293.571	74.149	.2265	.2236	2.817	1.138
1293.724	74.868	.2311	.2264	2.731	1.139
1293.876	72.361	.2154	.2379	2.679	1.117
1294.028	69.419	.1979	.2500	2.719	1.074
1294.181	68.669	.1936	.2563	2.793	1.036
1294.333	69.486	.1983	.2591	2.921	.9944
1294.486	70.330	.2032	.2614	2.969	.9717
1294.638	70.699	.2054	.2608	2.905	.9841
1294.790	69.968	.2011	.2583	2.775	1.025
1294.943	68.281	.1914	.2564	2.742	1.049
1295.095	67.758	.1885	.2539	2.768	1.057
1295.248	67.644	.1878	.2546	2.774	1.054
1295.400	66.094	.1794	.2615	2.688	1.053
1295.552	62.375	.1601	.2759	2.546	1.047
1295.705	58.691	.1424	.2908	2.435	1.034
1295.857	56.635	.1331	.2971	2.330	1.045
1296.010	56.064	.1306	.2924	2.285	1.078
1296.162	55.299	.1272	.2860	2.298	1.103
1296.314	54.456	.1236	.2827	2.273	1.128
1296.467	54.649	.1245	.2769	2.273	1.153
1296.619	56.711	.1334	.2578	2.355	1.208
1296.772	59.610	.1467	.2189	2.851	1.265
1296.924	61.615	.1563	.1625	4.176	1.348
1297.991	64.813	.1726	.1877	5.115	1.020
1298.143	66.867	.1836	.2160	3.878	1.028
1298.296	71.108	.2078	.2209	3.563	1.027

TABLE 2 (CONT.

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1298.448	75.413	.2346	.2088	4.113	.9671
1298.753	77.583	.2491	.1879	5.555	.8805
1298.905	76.275	.2403	.1913	5.211	.9084
1299.058	75.197	.2332	.2007	4.132	1.002
1299.210	73.501	.2224	.2151	3.261	1.090
1299.362	70.491	.2041	.2307	2.800	1.135
1299.515	67.233	.1856	.2475	2.676	1.109
1299.667	64.857	.1728	.2601	2.648	1.074
1299.820	64.072	.1687	.2638	2.651	1.062
1299.972	64.829	.1726	.2619	2.736	1.047
1300.124	67.092	.1848	.2566	2.884	1.024
1300.277	69.289	.1971	.2496	2.996	1.018
1300.429	69.839	.2003	.2418	2.991	1.048
1300.582	68.076	.1903	.2367	2.903	1.100
1300.734	65.973	.1787	.2356	2.805	1.142
1300.886	66.061	.1792	.2348	2.731	1.163
1301.039	66.475	.1814	.2366	2.699	1.159
1301.191	63.542	.1660	.2412	2.670	1.163
1301.344	57.552	.1372	.2484	2.617	1.177
1301.496	51.854	.1129	.2545	2.565	1.191
1301.648	48.691	.1006	.2571	2.552	1.197
1301.801	47.546	.0963	.2567	2.529	1.210
1301.953	47.004	.0943	.2532	2.495	1.241
1302.106	45.376	.0885	.2498	2.408	1.293
1302.258	43.366	.0816	.2461	2.350	1.343
1302.410	43.164	.0809	.2418	2.327	1.379
1302.563	47.412	.0958	.2325	2.370	1.400
1302.715	55.222	.1269	.2126	2.546	1.424
1302.868	62.669	.1616	.1801	3.061	1.447
1304.239	73.062	.2197	.1626	3.371	1.386
1304.392	72.164	.2142	.1993	2.771	1.298
1304.544	69.699	.1995	.2266	2.625	1.204
1304.696	65.858	.1781	.2409	2.596	1.167
1304.849	61.555	.1560	.2437	2.687	1.158
1305.001	57.930	.1389	.2338	2.823	1.198
1305.154	56.063	.1306	.2160	2.910	1.291
1305.306	53.588	.1200	.2061	2.888	1.379
1305.458	50.046	.1058	.2106	2.753	1.411
1305.611	47.501	.0962	.2215	2.697	1.369
1305.763	47.843	.0974	.2273	2.746	1.315
1305.916	49.751	.1046	.2253	2.906	1.275
1306.068	50.376	.1070	.2199	3.018	1.276
1306.220	49.249	.1027	.2182	2.947	1.311
1306.373	47.788	.0972	.2230	2.735	1.346
1306.525	48.560	.1001	.2294	2.554	1.353
1306.678	52.728	.1164	.2313	2.475	1.340
1306.830	58.737	.1426	.2208	2.462	1.369
1306.982	63.900	.1678	.1943	2.854	1.386
1307.135	65.912	.1784	.1560	3.720	1.445

TABLE 2 (CONT.)

NULLAWARRE MEMBER (PAARATTE FORMATION)

WELL NAME: VOGEL #1
LOCATION: PEP108 DATE: RIG REL. 17.3.90
CONSTRAINTS: VSH NDPHISC

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1028.243	60.092	.3486	.1786	13.454	.9880
1028.700	60.247	.3500	.1856	15.595	.8827
1028.852	59.133	.3403	.1915	15.428	.8602
1029.005	59.400	.3426	.1908	14.722	.8841
1029.157	59.710	.3453	.1904	14.699	.8864
1029.310	58.092	.3312	.1994	15.199	.8325
1029.462	56.628	.3185	.2109	15.449	.7807
1029.614	57.011	.3218	.2167	15.204	.7658
1029.767	59.658	.3449	.2114	14.092	.8152
1032.662	60.245	.3500	.2024	10.645	.9791
1032.815	59.279	.3416	.1934	11.129	1.002
1032.967	59.077	.3398	.1872	11.757	1.007
1033.120	59.882	.3468	.1861	11.603	1.020
1037.996	59.082	.3398	.2541	6.978	.9627
1038.149	58.432	.3342	.2477	7.206	.9720
1038.301	58.777	.3372	.2349	7.288	1.019
1038.454	59.730	.3455	.2269	7.316	1.053
1039.368	58.239	.3325	.2445	8.577	.9024
1039.520	56.176	.3146	.2533	8.384	.8809
1039.673	56.328	.3159	.2415	7.888	.9526
1039.825	57.628	.3272	.2204	7.247	1.089
1039.978	58.279	.3329	.2056	6.962	1.190
1040.130	57.971	.3302	.2035	7.280	1.176
1040.282	57.896	.3295	.2069	7.552	1.136
1040.435	57.055	.3222	.2115	7.865	1.089
1040.587	56.099	.3139	.2137	7.834	1.080
1040.740	57.666	.3275	.2092	7.850	1.102
1042.721	58.927	.3385	.2183	9.730	.9480
1042.873	54.263	.2979	.2363	9.035	.9090
1043.026	52.313	.2810	.2398	8.614	.9172
1043.178	52.049	.2787	.2379	8.181	.9487
1043.330	52.701	.2844	.2371	8.387	.9401
1043.483	53.353	.2900	.2381	8.471	.9314
1043.635	53.961	.2953	.2391	8.704	.9150
1043.788	54.534	.3003	.2401	8.804	.9060
1043.940	55.336	.3073	.2443	8.863	.8875
1044.092	56.596	.3182	.2506	9.090	.8545
1044.245	58.662	.3362	.2502	9.506	.8369
1047.293	57.706	.3279	.2339	8.421	.9506
1047.445	57.284	.3242	.2423	8.133	.9337
1047.598	58.088	.3312	.2404	7.980	.9499
1047.750	58.511	.3349	.2348	8.399	.9480
1047.902	57.093	.3225	.2364	8.748	.9224

TABLE 3

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1048.055	54.717	.3019	.2435	9.056	.8803
1048.207	53.719	.2932	.2468	8.907	.8757
1048.360	54.869	.3032	.2447	8.611	.8985
1048.512	56.978	.3215	.2420	8.325	.9238
1048.664	58.129	.3316	.2403	8.046	.9462
1048.817	57.745	.3282	.2374	7.953	.9633
1048.969	56.174	.3146	.2342	8.001	.9735
1049.122	54.529	.3003	.2342	7.731	.9907
1049.274	54.106	.2966	.2383	7.273	1.004
1049.426	54.717	.3019	.2441	7.048	.9953
1049.579	55.562	.3092	.2480	7.321	.9612
1049.731	55.333	.3072	.2512	8.295	.8913
1049.884	53.575	.2920	.2594	9.026	.8276
1050.036	51.705	.2757	.2675	9.251	.7927
1050.188	50.741	.2673	.2671	9.004	.8046
1050.341	51.200	.2713	.2543	9.328	.8303
1050.493	52.542	.2830	.2383	10.650	.8291
1050.646	53.992	.2956	.2298	11.753	.8185
1050.798	55.677	.3102	.2285	11.895	.8180
1050.950	57.514	.3262	.2283	10.981	.8521
1051.103	58.931	.3385	.2248	10.358	.8913
1051.255	59.700	.3452	.2177	9.950	.9389
1051.408	59.391	.3425	.2141	9.698	.9668
1051.560	58.587	.3355	.2176	9.338	.9697
1051.712	57.093	.3225	.2250	9.170	.9463
1051.865	55.485	.3086	.2309	9.205	.9202
1052.017	54.988	.3042	.2318	9.138	.9199
1052.170	54.759	.3023	.2306	9.099	.9266
1052.322	54.185	.2973	.2293	9.377	.9180
1052.474	53.374	.2902	.2273	10.103	.8922
1052.627	52.498	.2826	.2258	10.853	.8664
1052.779	52.224	.2802	.2226	11.238	.8637
1052.932	52.294	.2808	.2188	11.074	.8851
1053.084	52.684	.2842	.2172	10.931	.8976
1053.236	52.639	.2838	.2206	10.939	.8833
1053.389	51.142	.2708	.2291	11.058	.8459
1053.541	50.302	.2635	.2325	10.989	.8361
1053.694	50.369	.2641	.2316	10.858	.8444
1053.846	50.417	.2645	.2338	10.796	.8390
1053.998	49.529	.2568	.2397	10.581	.8265
1054.151	48.179	.2450	.2434	10.231	.8276
1054.303	47.539	.2395	.2414	9.879	.8495
1054.456	47.603	.2400	.2392	9.643	.8676
1054.608	48.377	.2468	.2413	9.308	.8752
1054.760	48.920	.2515	.2476	8.952	.8698
1054.913	48.756	.2500	.2535	8.678	.8627
1055.065	49.184	.2538	.2519	8.558	.8742
1055.218	50.796	.2678	.2421	8.735	.9006
1055.370	53.215	.2888	.2291	9.353	.9197
1055.522	53.561	.2918	.2251	9.946	.9077

TABLE 3 (CONT.)

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1055.675	51.176	.2711	.2317	10.320	.8657
1055.827	49.101	.2531	.2391	10.268	.8409
1055.980	49.332	.2551	.2398	10.064	.8468
1056.132	50.681	.2668	.2382	9.680	.8694
1056.284	50.566	.2658	.2422	9.568	.8598
1056.437	49.562	.2571	.2485	9.506	.8407
1056.589	48.575	.2485	.2528	9.303	.8353
1056.742	47.392	.2382	.2588	8.868	.8356
1056.894	46.189	.2277	.2689	8.636	.8151
1057.046	46.304	.2287	.2749	8.653	.7966
1057.199	47.967	.2432	.2704	8.740	.8057
1057.351	49.200	.2539	.2605	8.776	.8346
1057.504	49.775	.2589	.2510	8.821	.8638
1057.656	50.626	.2663	.2466	8.996	.8707
1057.808	51.763	.2762	.2483	9.192	.8555
1057.961	52.189	.2799	.2521	9.270	.8391
1058.113	51.579	.2746	.2517	9.368	.8361
1058.266	50.775	.2676	.2452	9.580	.8484
1058.418	51.085	.2703	.2343	9.773	.8792
1058.570	52.074	.2789	.2250	10.099	.9005
1058.723	52.719	.2845	.2188	10.300	.9168
1058.875	51.648	.2752	.2181	10.276	.9210
1059.028	49.019	.2523	.2232	9.985	.9130
1059.180	46.806	.2331	.2328	9.427	.9009
1059.332	45.942	.2256	.2457	9.040	.8715
1059.485	45.544	.2221	.2602	8.869	.8308
1059.637	44.572	.2137	.2740	9.122	.7781
1059.790	43.738	.2064	.2814	9.431	.7451
1059.942	44.372	.2119	.2787	9.655	.7434
1060.094	45.897	.2252	.2716	9.728	.7599
1060.247	47.852	.2422	.2637	9.879	.7768
1060.399	49.808	.2592	.2535	9.909	.8068
1060.552	50.349	.2639	.2454	9.791	.8382
1060.704	49.644	.2578	.2397	9.668	.8637
1060.856	48.525	.2480	.2374	9.496	.8798
1061.009	48.377	.2468	.2366	9.385	.8879
1061.161	49.316	.2549	.2372	9.429	.8837
1061.314	49.744	.2586	.2421	9.841	.8475
1061.466	48.756	.2500	.2510	10.402	.7950
1061.618	46.890	.2338	.2590	10.658	.7613
1061.771	45.328	.2202	.2610	10.296	.7685
1061.923	45.851	.2248	.2542	9.724	.8119
1062.076	46.659	.2318	.2471	9.332	.8526
1062.228	46.722	.2324	.2443	9.254	.8659
1062.380	45.851	.2248	.2440	9.074	.8755
1062.533	45.103	.2183	.2443	8.920	.8821
1062.685	44.521	.2132	.2505	8.602	.8759
1062.838	44.897	.2165	.2617	8.547	.8412
1062.990	45.989	.2260	.2710	8.584	.8104
1063.142	47.834	.2420	.2691	9.037	.7954

TABLE 3 (CONT.)

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1063.295	48.838	.2508	.2625	9.615	.7906
1063.447	47.635	.2403	.2611	9.827	.7860
1063.600	45.559	.2223	.2637	9.771	.7807
1063.752	43.971	.2084	.2654	9.389	.7910
1063.904	43.424	.2037	.2678	9.182	.7927
1064.057	43.915	.2080	.2723	8.979	.7885
1064.209	45.243	.2195	.2773	8.890	.7782
1064.362	47.289	.2373	.2780	8.882	.7766
1064.514	49.514	.2566	.2736	8.767	.7941
1064.666	51.267	.2719	.2671	8.807	.8117
1064.819	52.887	.2860	.2555	8.888	.8445
1064.971	54.501	.3000	.2416	9.119	.8816
1065.124	54.970	.3041	.2346	9.369	.8957
1065.276	53.510	.2914	.2409	9.555	.8639
1065.428	49.990	.2608	.2590	9.711	.7969
1065.581	47.099	.2356	.2754	9.308	.7656
1065.733	46.953	.2344	.2780	8.996	.7713
1065.886	48.707	.2496	.2672	8.587	.8215
1066.038	50.626	.2663	.2538	8.529	.8677
1066.190	51.924	.2776	.2462	8.655	.8880
1066.343	52.154	.2796	.2451	8.936	.8779
1066.495	51.774	.2763	.2459	9.342	.8557
1066.648	50.775	.2676	.2466	9.578	.8427
1066.800	49.052	.2526	.2484	9.596	.8356
1066.952	46.984	.2346	.2524	9.249	.8377
1067.105	45.690	.2234	.2557	8.635	.8558
1067.257	45.636	.2229	.2590	8.189	.8676
1067.410	45.782	.2242	.2643	8.176	.8507
1067.562	46.786	.2329	.2660	8.342	.8369
1067.714	48.460	.2475	.2623	8.387	.8466
1067.867	48.838	.2508	.2585	8.240	.8665
1068.019	46.880	.2337	.2601	8.141	.8665
1068.172	44.257	.2109	.2641	8.106	.8550
1068.324	43.596	.2052	.2640	8.204	.8502
1068.476	45.061	.2179	.2574	8.022	.8820
1068.629	47.820	.2419	.2444	7.976	.9315
1068.781	49.660	.2579	.2346	8.402	.9454
1068.934	48.789	.2503	.2391	9.480	.8768
1069.086	45.928	.2255	.2743	10.442	.7822
1069.238	43.941	.2082	.2702	10.507	7339
1069.391	44.717	.2149	.2750	9.611	7540
1069.543	46.493	.2304	.2739	8.585	.8008
1069.696	46.608	.2314	.2779	7.935	.8210
1069.848	45.291	.2199	.2873	7.861	.7980
1070.000	45.261	.2197	.2902	8.222	.7725
1070.153	46.639	.2316	.2806	8.731	.7753
1070.305	47.673	.2406	.2643	9.046	.8085
1070.458	47.705	.2409	.2504	9.029	.8541
1070.610	46.525	.2306	.2472	8.746	.8791
1070.762	44.771	.2154	.2552	8.704	.8537

TABLE 3 (CONT.)

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1070.915	43.623	.2054	.2659	9.091	.8015
1071.067	44.717	.2149	.2692	9.672	.7677
1071.220	46.671	.2319	.2683	9.851	.7631
1071.372	47.885	.2425	.2698	9.434	.7754
1071.524	47.917	.2428	.2746	8.726	.7923
1071.677	47.226	.2367	.2799	8.226	.8004
1071.829	46.304	.2287	.2861	8.191	.7848
1071.982	45.928	.2255	.2906	8.688	.7500
1072.134	46.744	.2326	.2885	9.294	.7304
1072.286	47.332	.2377	.2821	9.322	.7460
1072.439	47.280	.2372	.2760	8.507	.7980
1072.591	46.659	.2318	.2716	7.597	.8583
1072.744	46.587	.2312	.2652	7.311	.8960
1072.896	47.520	.2393	.2539	8.009	.8941
1073.048	48.147	.2448	.2432	9.120	.8746
1073.201	47.834	.2420	.2401	9.547	.8658
1073.353	46.158	.2275	.2482	9.444	.8421
1073.506	44.197	.2104	.2616	8.652	.8349
1073.658	44.397	.2121	.2679	8.423	.8261
1073.810	46.326	.2289	.2664	8.547	.8247
1073.963	47.214	.2366	.2665	8.894	.8080
1074.115	46.379	.2294	.2713	9.161	.7822
1074.268	45.376	.2207	.2756	9.265	.7657
1074.420	45.176	.2189	.2750	8.980	.7793
1074.572	44.632	.2142	.2727	8.605	.8028
1074.725	43.423	.2037	.2663	8.518	.8264
1074.877	43.452	.2039	.2536	8.933	.8474
1075.030	44.427	.2124	.2441	9.250	.8651
1075.182	45.406	.2209	.2424	9.134	.8764
1075.334	45.261	.2197	.2476	8.804	.8740
1075.487	43.650	.2057	.2588	8.380	.8572
1075.639	42.676	.1972	.2687	8.742	.8083
1075.792	42.992	.1999	.2722	9.140	.7803
1075.944	44.024	.2089	.2677	9.784	.7669
1076.096	44.367	.2119	.2612	10.027	.7762
1076.249	43.450	.2039	.2600	9.864	.7863
1076.401	42.734	.1977	.2601	9.556	.7987
1076.554	43.279	.2024	.2595	9.048	.8225
1076.706	44.542	.2134	.2613	8.653	.8354
1076.858	45.376	.2207	.2640	8.653	.8267
1077.011	44.916	.2167	.2656	8.864	.8120
1077.163	44.482	.2129	.2632	9.296	.8001
1077.316	45.889	.2251	.2563	9.721	.8034
1077.468	48.151	.2448	.2515	9.935	.8098
1077.620	49.445	.2560	.2512	10.110	.8037
1077.773	48.871	.2511	.2541	10.073	.7959
1077.925	47.724	.2411	.2539	9.827	.8063
1078.078	46.233	.2281	.2518	9.139	.8433
1078.230	44.856	.2161	.2516	8.105	.8963
1078.382	43.565	.2049	.2561	7.282	.9289

TABLE 3 (CONT.

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1078.535	42.562	.1962	.2623	7.009	.9243
1078.687	41.446	.1865	.2675	7.166	.8961
1078.840	41.015	.1827	.2662	7.942	.8556
1078.992	42.276	.1937	.2583	8.965	.8298
1079.144	44.283	.2112	.2541	9.720	.8101
1079.297	45.291	.2199	.2607	9.429	.8017
1079.449	44.971	.2171	.2714	8.391	.8162
1079.602	45.055	.2179	.2753	7.695	.8404
1079.754	45.224	.2193	.2756	7.437	.8537
1079.906	45.055	.2179	.2764	7.978	.8220
1080.059	44.711	.2149	.2748	8.478	.8018
1080.211	45.170	.2189	.2669	8.651	.8174
1080.364	46.140	.2273	.2588	8.220	.8648
1080.516	46.890	.2338	.2555	7.769	.9008
1080.668	47.399	.2383	.2548	7.622	.9120
1080.821	47.514	.2392	.2539	8.009	.8930
1080.973	46.254	.2283	.2573	8.763	.8424
1081.126	44.109	.2096	.2656	9.745	.7737
1081.278	42.276	.1937	.2738	10.327	.7290
1081.430	41.217	.1845	.2805	10.046	.7215
1081.583	40.813	.1810	.2862	9.381	.7319
1081.735	40.841	.1812	.2894	8.645	.7540
1081.888	41.501	.1870	.2867	8.162	.7832
1082.040	42.332	.1942	.2807	8.072	.8043
1082.192	43.221	.2019	.2751	8.161	.8163
1082.345	43.421	.2037	.2720	8.197	.8238
1082.497	42.820	.1984	.2697	8.034	.8392
1082.650	42.762	.1979	.2658	8.047	.8506
1082.802	43.392	.2034	.2650	8.056	.8526
1082.954	44.826	.2159	.2657	7.990	.8538
1083.107	45.743	.2239	.2665	8.040	.8487
1083.259	46.171	.2276	.2654	8.112	.8485
1083.412	46.515	.2306	.2654	8.625	.8227
1083.564	46.890	.2338	.2637	9.050	.8085
1083.716	47.578	.2398	.2544	9.106	.8355
1083.869	48.086	.2442	.2423	8.551	.9052
1084.021	48.183	.2451	.2357	7.765	.9763
1084.174	47.578	.2398	.2348	7.680	.9854
1084.326	47.348	.2378	.2340	8.314	.9503
1084.478	46.483	.2303	.2375	9.027	.8985
1084.631	44.197	.2104	.2525	8.861	.8530
1084.783	41.240	.1847	.2736	8.125	.8220
1084.936	39.579	.1703	.2865	7.399	.8228
1085.088	39.862	.1727	.2833	7.139	.8470
1085.240	41.387	.1860	.2715	7.382	.8691
1085.393	43.049	.2004	.2644	7.444	.8888
1085.545	43.765	.2067	.2667	7.623	.8705
1085.698	43.791	.2069	.2729	7.894	.8360
1085.850	44.736	.2151	.2717	8.066	.8308
1086.002	47.004	.2348	.2596	7.986	.8738

TABLE 3 (CONT.)

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1086.155	48.888	.2512	.2483	7.576	.9379
1086.307	49.427	.2559	.2469	7.665	.9376
1086.460	48.593	.2486	.2553	7.934	.8912
1086.612	47.857	.2422	.2623	8.298	.8483
1086.764	47.628	.2402	.2636	8.261	.8459
1086.917	47.972	.2432	.2632	7.962	.8632
1087.069	48.806	.2505	.2634	7.831	.8694
1087.222	49.117	.2532	.2622	7.972	.8656
1087.374	48.839	.2508	.2560	8.534	.8571
1087.526	48.430	.2472	.2470	8.749	.8771
1087.679	50.376	.2641	.2365	8.630	.9226
1087.831	53.467	.2910	.2313	8.220	.9663
1087.984	54.498	.3000	.2368	7.866	.9651
1088.136	53.467	.2910	.2482	7.607	.9363
1088.288	53.124	.2880	.2543	7.433	.9242
1088.441	54.919	.3036	.2481	7.268	.9580
1088.593	57.360	.3249	.2330	7.162	1.028
1088.746	57.740	.3282	.2226	7.224	1.071
1088.898	55.986	.3129	.2211	7.324	1.071
1089.050	53.009	.2870	.2239	7.976	1.013
1089.203	50.788	.2677	.2246	8.513	.9777
1089.355	49.804	.2592	.2253	8.914	.9527
1089.508	49.264	.2545	.2306	9.146	.9185
1089.660	47.807	.2418	.2412	9.337	.8693
1089.812	46.598	.2313	.2456	9.227	.8586
1089.965	47.380	.2381	.2376	8.766	.9105
1090.117	50.133	.2620	.2226	8.265	1.001
1090.270	52.014	.2784	.2129	8.374	1.040
1090.422	51.510	.2740	.2108	8.556	1.039
1090.574	50.214	.2627	.2092	8.828	1.030
1090.727	51.120	.2706	.2027	8.722	1.070
1090.879	53.259	.2892	.1955	8.190	1.145
1091.032	53.683	.2929	.1938	7.860	1.179
1091.184	52.578	.2833	.1956	7.768	1.175
1091.336	52.780	.2850	.1976	7.898	1.153
1091.489	54.727	.3020	.2029	7.722	1.136
1091.641	56.902	.3209	.2079	6.999	1.165
1091.794	57.818	.3289	.2062	6.328	1.234
1091.946	58.813	.3375	.1949	6.377	1.301
1092.403	58.777	.3372	.2017	9.635	1.023
1092.556	55.562	.3092	.2153	9.416	.9694
1092.708	53.532	.2916	.2201	8.535	.9958
1092.860	53.496	.2913	.2175	7.770	1.056
1093.013	54.070	.2963	.2149	7.240	1.107
1093.165	54.722	.3019	.2125	7.368	1.110
1093.318	54.915	.3036	.2121	7.653	1.091
1093.470	53.961	.2953	.2167	8.106	1.038
1093.622	52.322	.2811	.2252	8.205	.9927
1093.775	50.444	.2647	.2334	8.346	.9495

TABLE 3 (CONT.

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1093.927	49.165	.2536	.2360	8.439	.9338
1094.080	49.985	.2607	.2285	8.337	.9702
1094.232	51.944	.2778	.2187	8.038	1.032
1094.384	54.731	.3020	.2095	8.091	1.074
1094.537	57.742	.3282	.2007	8.818	1.074
1094.689	59.077	.3398	.1971	9.624	1.047
1094.842	59.077	.3398	.1971	10.317	1.011
1094.994	58.047	.3308	.1994	10.121	1.009
1095.146	56.673	.3189	.1986	9.758	1.032
1095.299	55.872	.3119	.1939	9.757	1.057
1095.451	55.029	.3046	.1928	9.994	1.050
1095.604	53.841	.2943	.1994	10.028	1.013
1095.756	53.453	.2909	.2069	9.699	.9931
1095.908	55.136	.3055	.2052	9.014	1.039
1096.061	57.399	.3252	.1970	8.769	1.097
1096.213	56.978	.3215	.1966	8.748	1.101
1096.366	53.919	.2949	.2065	9.197	1.022
1096.518	52.542	.2830	.2130	9.555	.9720
1096.670	53.424	.2906	.2123	9.118	.9982
1096.823	54.305	.2983	.2111	8.377	1.047
1096.975	52.560	.2831	.2181	7.632	1.062
1097.128	49.851	.2596	.2295	7.512	1.017
1097.280	47.190	.2364	.2425	7.866	.9408
1097.432	45.362	.2205	.2551	8.023	.8855
1097.585	45.247	.2195	.2580	8.055	.8737
1097.737	45.819	.2245	.2481	7.960	.9141
1097.890	44.965	.2171	.2399	8.137	.9349
1098.042	42.162	.1927	.2470	8.654	.8804
1098.194	40.106	.1748	.2621	8.553	.8347
1098.347	41.020	.1828	.2676	8.080	.8411
1098.499	44.105	.2096	.2596	7.268	.9139
1098.652	46.421	.2297	.2517	7.027	.9589
1098.804	47.056	.2353	.2503	7.443	.9369
1098.956	46.795	.2330	.2505	8.376	.8822
1099.109	46.223	.2280	.2496	8.856	.8611
1099.261	45.049	.2178	.2507	8.463	.8771
1099.414	42.762	.1979	.2593	7.643	.8921
1099.566	41.560	.1875	.2660	7.194	.8966
1099.718	41.761	.1892	.2658	7.240	.8944
1099.871	42.333	.1942	.2615	7.804	.8757
1100.023	43.507	.2044	.2583	8.268	.8612
1100.176	45.567	.2223	.2584	8.360	.8560
1100.328	48.201	.2452	.2553	8.087	.8808
1100.480	49.689	.2582	.2475	8.114	.9070
1100.633	49.622	.2576	.2411	8.127	.9305
1100.785	49.412	.2558	.2391	7.991	.9460
1100.938	48.479	.2476	.2417	7.540	.9635
1101.090	48.151	.2448	.2375	7.195	1.004
1101.242	48.773	.2502	.2252	7.175	1.060
1101.395	50.754	.2674	.2087	7.635	1.109

TABLE 3 (CONT.)

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1101.547	53.467	.2910	.1951	8.413	1.130
1101.700	55.947	.3126	.1877	9.462	1.107
1101.852	57.169	.3232	.1862	10.393	1.065
1102.004	57.208	.3235	.1914	10.575	1.027
1102.157	55.603	.3096	.2045	9.810	.9981
1102.309	53.389	.2903	.2189	8.603	.9958
1102.462	51.521	.2741	.2249	7.720	1.023
1102.614	51.326	.2724	.2163	7.347	1.091
1102.766	53.575	.2920	.1990	7.508	1.172
1102.919	56.672	.3189	.1850	7.608	1.253
1103.071	58.701	.3365	.1847	7.752	1.243
1103.224	58.088	.3312	.1989	7.641	1.163
1103.376	55.565	.3093	.2203	7.205	1.081
1103.528	53.804	.2940	.2365	6.636	1.049
1103.681	52.622	.2837	.2461	6.016	1.059
1103.833	51.934	.2777	.2477	5.868	1.065
1103.986	51.625	.2750	.2420	5.910	1.087
1104.138	51.625	.2750	.2353	6.129	1.097
1104.290	51.510	.2740	.2345	6.334	1.083
1104.443	50.477	.2650	.2418	6.326	1.051
1104.595	49.363	.2553	.2522	5.953	1.039
1104.748	48.380	.2468	.2586	5.596	1.045
1104.900	49.823	.2593	.2477	5.602	1.090
1105.052	54.336	.2986	.2178	6.115	1.186
1105.205	58.741	.3369	.1881	6.716	1.311
1110.082	60.032	.3481	.2152	6.601	1.155
1110.234	57.592	.3269	.2284	6.927	1.062
1110.386	57.938	.3299	.2294	7.536	1.014
1110.539	59.169	.3406	.2220	8.007	1.017
1110.691	59.439	.3430	.2120	8.028	1.063
1110.844	59.368	.3423	.2067	7.818	1.105
1110.996	59.599	.3443	.2067	7.607	1.120
1111.148	59.746	.3456	.2100	7.339	1.122
1111.301	58.583	.3355	.2148	7.178	1.109
1111.453	56.711	.3192	.2190	7.017	1.100
1111.606	54.727	.3020	.2245	6.774	1.092
1111.758	53.618	.2923	.2300	6.855	1.060
1111.910	53.654	.2926	.2318	7.001	1.041
1112.063	53.238	.2890	.2312	7.273	1.024
1112.215	50.788	.2677	.2337	7.433	1.002
1112.368	47.609	.2401	.2408	7.506	.9676
1112.520	46.577	.2311	.2451	7.490	.9515
1112.672	47.954	.2431	.2428	7.492	.9603
1112.825	49.363	.2553	.2387	7.548	.9734
1112.977	49.660	.2579	.2366	7.821	.9647
1113.130	49.626	.2576	.2343	7.742	.9791
1113.282	49.397	.2556	.2332	7.536	.9968
1113.434	48.642	.2491	.2379	7.097	1.007
1113.587	48.609	.2488	.2436	6.959	.9931

TABLE 3 (CONT.)

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1113.739	49.330	.2550	.2460	6.959	.9832
1113.892	50.477	.2650	.2425	7.299	.9741
1114.044	50.902	.2687	.2379	7.191	1.000
1114.196	50.868	.2684	.2357	7.121	1.015
1114.349	51.097	.2704	.2345	6.897	1.036
1114.501	52.278	.2807	.2310	7.157	1.033
1114.654	53.804	.2940	.2271	7.404	1.033
1114.806	53.187	.2886	.2301	7.549	1.009
1114.958	50.119	.2619	.2395	7.327	.9841
1115.111	47.558	.2396	.2468	6.813	.9905
1115.263	47.265	.2371	.2496	6.445	1.007
1115.416	48.183	.2451	.2507	6.621	.9891
1115.568	48.986	.2521	.2499	7.183	.9526
1115.720	49.904	.2600	.2453	7.344	.9598
1115.873	51.430	.2733	.2362	7.170	1.008
1116.025	52.843	.2856	.2267	6.870	1.074
1116.178	53.116	.2880	.2252	6.711	1.093
1116.330	52.313	.2810	.2355	6.772	1.041
1116.482	50.086	.2616	.2519	6.878	.9656
1116.635	47.202	.2365	.2619	6.936	.9249
1116.787	46.233	.2281	.2568	6.775	.9542
1116.940	47.151	.2361	.2449	6.853	.9948
1117.092	48.298	.2461	.2378	6.953	1.017
1117.244	47.724	.2411	.2385	7.394	.9834
1117.397	46.744	.2326	.2397	7.728	.9570
1117.549	46.546	.2308	.2420	7.979	.9329
1117.702	46.171	.2276	.2486	7.666	.9266
1117.854	45.774	.2241	.2520	6.968	.9589
1118.006	45.285	.2199	.2474	6.345	1.023
1118.159	44.796	.2156	.2388	6.027	1.088
1118.311	43.794	.2069	.2361	6.134	1.090
1118.464	42.963	.1997	.2383	6.362	1.061
1118.616	43.994	.2086	.2380	6.679	1.037
1118.768	46.316	.2288	.2362	6.823	1.034
1118.921	49.346	.2552	.2324	6.916	1.043
1119.073	52.393	.2817	.2266	7.184	1.050
1119.226	53.961	.2953	.2227	7.463	1.048
1119.378	52.666	.2840	.2280	7.985	.9895
1119.530	49.641	.2577	.2414	8.515	.9050
1119.683	47.234	.2368	.2508	8.841	.8548
1119.835	47.265	.2371	.2454	8.486	.8916
1119.988	50.066	.2614	.2269	7.489	1.027
1120.140	53.961	.2953	.2082	6.384	1.212
1120.292	56.214	.3149	.1988	6.063	1.302
1120.445	55.296	.3069	.2031	6.361	1.244
1120.597	52.428	.2820	.2144	6.784	1.141
1120.750	50.066	.2614	.2237	7.031	1.075
1120.902	49.593	.2573	.2230	7.041	1.077
1121.054	50.936	.2690	.2157	7.070	1.111
1121.207	53.460	.2910	.2066	7.085	1.159

TABLE 3 (CONT.)

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1121.359	56.328	.3159	.1979	7.201	1.200
1121.512	57.131	.3229	.1979	7.107	1.208
1121.664	55.600	.3096	.2103	6.734	1.168
1121.816	53.116	.2880	.2292	6.442	1.096
1121.969	52.418	.2819	.2362	6.304	1.075
1122.121	53.346	.2900	.2294	6.399	1.098
1122.274	53.001	.2870	.2253	6.601	1.101
1122.426	50.363	.2640	.2349	6.979	1.027
1122.578	47.641	.2404	.2503	7.431	.9338
1122.731	46.118	.2271	.2612	7.532	.8887
1122.883	45.376	.2207	.2670	7.501	.8713
1123.036	45.007	.2174	.2697	7.207	.8801
1123.188	45.521	.2219	.2669	6.972	.9042
1123.340	46.838	.2334	.2578	6.773	.9497
1123.493	47.475	.2389	.2502	6.741	.9808
1123.645	47.852	.2422	.2463	6.595	1.007
1123.798	49.478	.2563	.2394	6.214	1.068
1123.950	52.268	.2806	.2363	5.845	1.115
1124.102	54.336	.2986	.2314	5.794	1.144
1124.255	54.420	.2993	.2295	6.131	1.121
1124.407	53.267	.2893	.2298	6.860	1.059
1124.560	52.303	.2809	.2261	6.995	1.065
1124.712	51.694	.2756	.2198	6.807	1.111
1124.864	50.498	.2652	.2185	6.391	1.153
1125.017	48.215	.2454	.2257	6.398	1.116
1125.169	46.692	.2321	.2318	6.785	1.055
1125.322	46.953	.2344	.2299	7.242	1.030
1125.474	48.165	.2449	.2271	7.700	1.011
1125.626	48.050	.2439	.2332	7.623	.9892
1125.779	46.326	.2289	.2483	7.151	.9592
1125.931	44.627	.2141	.2583	6.772	.9474
1126.084	43.968	.2084	.2601	6.477	.9621
1126.236	43.826	.2072	.2580	6.186	.9925
1126.388	44.551	.2135	.2542	5.721	1.047
1126.541	45.237	.2195	.2492	5.492	1.090
1126.693	45.897	.2252	.2431	5.785	1.089
1126.846	46.472	.2302	.2420	6.152	1.061
1126.998	47.571	.2397	.2423	6.228	1.053
1127.150	48.969	.2519	.2459	5.916	1.065
1127.303	49.611	.2575	.2509	5.720	1.061
1127.455	49.545	.2569	.2503	5.819	1.055
1127.608	49.330	.2550	.2465	6.406	1.020
1127.760	48.625	.2489	.2465	7.028	.9744
1127.912	47.392	.2382	.2487	7.315	.9465
1128.065	46.964	.2345	.2458	6.927	.9843
1128.217	47.622	.2402	.2359	6.262	1.079
1128.370	49.578	.2572	.2187	5.958	1.193
1128.522	51.729	.2759	.2035	5.969	1.280
1128.674	53.223	.2889	.1946	6.081	1.326
1128.827	53.417	.2906	.1891	6.242	1.348

TABLE 3 (CONT.)

DEPTH	GR BHC	VSH	NDPHIS	RT	SW-AR
1128.979	52.878	.2859	.1866	6.257	1.363
1129.132	53.503	.2913	.1819	6.444	1.379
1129.284	56.099	.3139	.1728	6.635	1.430
1129.436	59.695	.3452	.1620	7.041	1.480
1131.570	59.879	.3468	.1676	7.788	1.360

TABLE 3 (CONT.)

PEBBLE POINT FORMATION

WELL NAME: VOGEL #1
LOCATION: PEP108 DATE: RIG REL. 17.3.90
CONSTRAINTS: VSH SPORCPC

DEPTH	CALRES	GR BHC	VSH	DT SC	SPORCP	RT	SW-AR
576.682	8.790	117.84	.2563	116.40	.3915	23.994	.9073
576.834	8.820	113.36	.2328	114.41	.3786	22.947	.9593
576.986	8.870	116.35	.2483	111.21	.3579	23.213	1.009
577.139	8.930	121.34	.2758	109.09	.3441	23.859	1.035
585.978	8.600	113.32	.2326	94.221	.2477	54.100	.9531
586.130	8.520	95.937	.1558	94.675	.2507	58.018	.9096
586.283	8.510	87.199	.1246	91.182	.2280	54.109	1.035
586.435	8.520	87.142	.1244	89.292	.2158	46.569	1.179
586.588	8.510	88.125	.1277	91.522	.2302	42.277	1.160
586.740	8.500	86.216	.1214	96.349	.2615	45.165	.9880
586.892	8.520	83.786	.1136	100.35	.2875	51.270	.8436
587.045	8.520	85.406	.1187	101.59	.2955	56.622	.7810
587.197	8.510	92.635	.1435	100.11	.2859	61.051	.7773
587.350	8.500	102.97	.1843	97.206	.2671	61.308	.8303
587.502	8.520	114.34	.2378	93.855	.2454	59.627	.9164
587.654	8.520	124.06	.2918	91.170	.2280	59.289	.9891
588.264	8.530	113.49	.2334	79.179	.1502	85.333	1.251
588.721	8.510	94.023	.1486	85.446	.1909	50.357	1.282
588.874	8.510	95.179	.1529	92.723	.2380	49.431	1.037
589.026	8.520	98.368	.1653	95.186	.2540	50.223	.9643
589.178	8.530	102.49	.1823	95.713	.2574	48.049	.9727
589.331	8.510	105.93	.1973	96.537	.2627	45.280	.9817
589.483	8.530	108.39	.2086	96.957	.2655	43.771	.9882
589.636	8.510	108.13	.2074	98.019	.2724	44.245	.9580
589.788	8.520	107.05	.2024	98.477	.2753	49.274	.8980
589.940	8.550	106.34	.1991	96.544	.2628	55.755	.8844
590.093	8.570	104.62	.1915	94.238	.2478	59.741	.9059
590.245	8.590	101.16	.1767	92.902	.2392	57.408	.9575
590.398	8.570	96.492	.1580	93.665	.2441	50.116	1.004
590.550	8.580	95.163	.1529	96.327	.2614	43.354	1.008
590.702	8.590	97.203	.1607	99.023	.2789	41.248	.9688
590.855	8.600	98.548	.1660	100.95	.2913	43.603	.9019
591.007	8.590	96.505	.1580	102.66	.3025	47.565	.8318
591.160	8.620	91.690	.1401	103.58	.3084	49.657	.7983
591.312	8.590	84.762	.1167	103.79	.3098	48.969	.8004
591.464	8.580	77.733	.0954	103.99	.3110	46.114	.8214
591.617	8.570	72.340	.0806	104.75	.3160	43.785	.8298
591.769	8.530	71.799	.0792	105.52	.3210	43.790	.8167
591.922	8.530	74.925	.0875	105.79	.3227	46.062	.7920
592.074	8.530	77.241	.0940	105.66	.3219	48.728	.7720
592.226	8.550	78.157	.0966	105.52	.3210	49.839	.7654
592.379	8.550	79.433	.1003	105.23	.3191	47.942	.7850
592.531	8.620	82.253	.1088	104.60	.3150	45.996	.8119
592.684	8.650	84.170	.1148	104.59	.3149	46.629	.8065
592.836	8.710	85.213	.1181	104.72	.3158	51.504	.7654
592.988	8.710	85.213	.1181	104.52	.3145	57.995	.7242

TABLE 4

DEPTH	CALRES	GR BHC	VSH	DT SC	SPORCP	RT	SW-AR
593.141	8.680	83.287	.1120	104.13	.3120	60.001	.7177
593.293	8.520	79.620	.1009	103.61	.3086	55.572	.7539
593.446	8.470	78.200	.0967	102.72	.3028	49.964	.8102
593.598	8.440	80.920	.1047	100.51	.2885	45.599	.8902
593.750	8.430	84.547	.1160	95.827	.2581	44.139	1.011
593.903	8.380	85.066	.1176	89.442	.2168	43.331	1.215
594.055	8.430	84.547	.1160	84.627	.1856	41.648	1.448
594.208	8.510	85.696	.1197	83.937	.1811	39.765	1.519
594.360	8.560	91.090	.1380	86.994	.2009	40.307	1.359
594.512	8.660	98.011	.1639	92.759	.2383	40.913	1.138
594.665	8.660	101.17	.1767	98.500	.2755	41.195	.9806
594.817	8.700	100.15	.1725	101.02	.2918	40.645	.9320
594.970	8.700	95.932	.1558	101.38	.2941	40.175	.9300
595.122	8.720	91.956	.1411	101.44	.2945	40.658	.9232
595.274	8.710	87.792	.1266	101.48	.2948	41.587	.9119
595.427	8.710	84.510	.1159	101.33	.2938	42.675	.9031
595.579	8.690	82.407	.1093	101.27	.2934	43.617	.8945
595.732	8.700	80.119	.1023	101.53	.2951	43.516	.8904
595.884	8.690	76.086	.0907	101.93	.2977	39.970	.9210
596.036	8.690	71.052	.0773	102.52	.3015	34.671	.9763
596.189	8.680	67.144	.0675	103.22	.3061	30.054	1.033
596.341	8.680	65.624	.0639	104.21	.3125	29.910	1.014
596.494	8.680	66.676	.0664	104.98	.3175	37.014	.8973
596.646	8.720	69.671	.0738	102.60	.3021	56.542	.7631
596.798	8.750	72.162	.0801	94.672	.2507	62.323	.8758
596.951	8.740	72.348	.0806	84.747	.1863	96.818	.9452
597.256	8.760	68.565	.0710	80.243	.1571	52.727	1.519
597.408	8.780	67.715	.0689	87.950	.2071	44.062	1.261
597.560	8.810	66.789	.0667	97.166	.2668	43.151	.9886
597.713	8.850	65.786	.0643	102.49	.3013	45.448	.8530
597.865	8.980	64.453	.0612	104.15	.3121	47.114	.8089
598.018	9.470	63.530	.0591	104.66	.3154	48.839	.7861
598.170	9.520	61.393	.0543	105.40	.3202	51.212	.7561
598.322	9.670	61.266	.0540	105.92	.3236	46.525	.7850
598.475	9.750	60.969	.0534	106.95	.3303	61.957	.6665
598.627	9.710	59.175	.0495	107.65	.3348	64.138	.6462
598.780	9.660	56.727	.0444	107.91	.3365	64.043	.6433
598.932	9.750	55.438	.0418	108.25	.3387	52.860	.7036
599.084	9.920	56.205	.0433	108.17	.3381	53.773	.6986
599.237	9.790	57.227	.0454	108.16	.3381	66.162	.6299
599.389	9.520	58.546	.0482	108.22	.3385	54.766	.6915
599.542	9.430	58.930	.0490	108.38	.3395	64.824	.6337
599.694	9.280	57.120	.0452	109.07	.3440	60.722	.6462
599.846	9.270	56.108	.0431	109.48	.3466	55.102	.6731
599.999	9.200	55.965	.0428	110.19	.3513	52.774	.6787
600.151	9.130	56.787	.0445	110.41	.3527	53.602	.6708
600.304	9.070	57.640	.0463	110.42	.3527	55.857	.6570
600.456	9.050	58.641	.0484	110.51	.3533	58.233	.6423
600.608	9.070	59.921	.0511	109.97	.3498	56.433	.6590

TABLE 4 (CONT.)

DEPTH	CALRES	GR BHC	VSH	DT SC	SPORCP	RT	SW-AR
600.761	9.200	60.447	.0522	109.81	.3488	51.695	.6906
600.913	9.340	59.430	.0500	109.12	.3443	49.184	.7171
601.066	9.450	58.270	.0476	107.65	.3348	47.825	.7479
601.218	9.370	58.080	.0472	108.67	.3414	47.015	.7397
601.370	9.130	58.596	.0483	110.81	.3553	46.422	.7153
601.523	9.120	60.002	.0513	110.06	.3504	44.326	.7422
601.675	8.980	60.872	.0531	107.46	.3336	44.599	.7772
601.828	8.840	63.377	.0587	105.88	.3233	44.074	.8067
601.980	8.790	68.467	.0708	104.96	.3173	41.846	.8435
602.132	8.750	74.630	.0867	103.53	.3081	39.350	.8958
602.285	8.750	80.506	.1035	101.77	.2967	36.725	.9630
602.437	8.770	86.381	.1219	100.02	.2853	36.956	.9980
602.590	8.820	93.048	.1450	97.731	.2705	40.313	1.008
602.742	8.860	100.40	.1735	95.262	.2545	45.302	1.011
602.894	8.910	107.16	.2029	92.852	.2389	50.300	1.022
603.047	8.980	112.44	.2281	90.852	.2259	53.902	1.044
603.199	9.050	115.48	.2437	89.849	.2194	55.588	1.058
603.352	9.100	114.79	.2401	88.735	.2122	57.643	1.074
603.504	9.140	111.24	.2222	87.156	.2019	56.186	1.143
603.656	9.150	105.40	.1949	85.761	.1929	57.606	1.182
603.809	9.130	97.901	.1635	85.281	.1898	65.732	1.125
603.961	9.130	90.305	.1352	86.536	.1979	71.863	1.031
604.114	9.090	83.930	.1140	87.928	.2069	71.064	.9920
604.266	9.020	81.621	.1069	87.897	.2067	63.908	1.047
604.418	8.970	83.971	.1141	87.221	.2024	62.242	1.084
604.571	8.950	88.385	.1286	85.477	.1911	68.599	1.094
604.723	8.940	91.183	.1383	81.977	.1684	58.837	1.340
605.180	8.940	82.017	.1081	80.835	.1610	40.981	1.679
605.333	8.940	86.540	.1224	85.695	.1925	37.775	1.463
605.485	8.950	95.532	.1543	90.254	.2220	41.633	1.208
605.638	8.920	103.90	.1883	92.201	.2346	47.473	1.070
605.790	8.890	109.15	.2122	92.874	.2390	51.286	1.011
605.942	8.850	109.68	.2147	93.543	.2433	49.912	1.006
606.095	8.810	104.79	.1922	94.500	.2495	45.319	1.030
606.247	8.760	97.378	.1614	95.387	.2553	39.599	1.077
606.400	8.750	91.084	.1380	95.895	.2586	35.036	1.130
606.552	8.730	87.088	.1242	96.501	.2625	33.488	1.139
606.704	8.760	85.029	.1175	97.248	.2674	34.865	1.096
606.857	8.770	84.380	.1154	97.755	.2706	38.143	1.035
607.009	8.800	84.787	.1167	97.988	.2722	41.570	.9857
607.162	8.830	84.367	.1154	97.657	.2700	46.069	.9438
607.314	8.840	83.832	.1137	96.844	.2647	50.016	.9237
607.466	8.870	84.594	.1161	95.620	.2568	52.951	.9255
607.619	8.870	86.963	.1238	94.123	.2471	54.491	.9481
607.771	8.870	88.622	.1294	92.836	.2388	53.371	.9915
607.924	8.870	87.200	.1246	92.282	.2352	53.232	1.008
608.076	8.860	83.708	.1133	92.164	.2344	52.321	1.020
608.228	8.870	80.447	.1033	92.879	.2390	50.826	1.015
608.381	8.880	80.264	.1028	94.207	.2476	48.227	1.005

TABLE 4 (CONT.)

DEPTH	CALRES	GR BHC	VSH	DT SC	SPORCP	RT	SW-AR
608.533	8.890	83.165	.1116	95.352	.2551	45.323	1.007
608.686	8.940	87.492	.1256	96.232	.2608	44.883	.9897
608.838	8.950	90.529	.1360	96.596	.2631	45.411	.9751
608.990	8.970	90.890	.1373	95.831	.2582	46.218	.9851
609.143	9.000	90.356	.1354	94.827	.2517	45.854	1.015
609.295	9.060	90.841	.1371	95.339	.2550	44.316	1.018
609.448	9.100	91.928	.1410	96.840	.2647	43.061	.9952
609.600	9.130	92.114	.1416	98.106	.2729	43.943	.9556
609.752	9.190	93.092	.1452	98.323	.2743	45.234	.9370
609.905	9.230	96.377	.1575	96.888	.2650	46.459	.9570
610.057	9.270	100.17	.1726	95.012	.2529	47.493	.9920
610.210	9.300	100.98	.1759	94.840	.2517	47.947	.9916
610.362	9.340	99.417	.1695	95.769	.2578	48.477	.9631
610.514	9.350	97.771	.1630	96.708	.2639	48.450	.9411
610.667	9.380	97.601	.1623	97.342	.2680	48.757	.9237
610.819	9.400	97.241	.1609	97.915	.2717	48.020	.9180
610.972	9.400	95.522	.1542	98.456	.2752	47.070	.9154
611.124	9.430	94.485	.1503	99.758	.2836	46.106	.8974
611.276	9.440	95.287	.1534	100.90	.2910	45.209	.8831
611.429	9.470	95.233	.1531	100.01	.2853	44.855	.9045
611.581	9.500	92.707	.1438	99.195	.2800	45.422	.9158
611.734	9.520	90.232	.1350	98.950	.2784	47.190	.9036
611.886	9.550	90.787	.1369	97.949	.2719	47.048	.9265
612.038	9.600	93.209	.1456	96.901	.2651	45.596	.9652
612.191	9.630	94.395	.1500	96.375	.2617	43.472	1.001
612.343	9.650	95.522	.1542	96.656	.2635	40.178	1.034
612.496	9.700	98.977	.1678	96.961	.2655	37.643	1.061
612.648	9.750	103.08	.1848	96.582	.2630	36.865	1.082
612.800	9.750	105.22	.1941	96.002	.2593	38.987	1.067
612.953	9.800	106.21	.1986	95.274	.2546	42.335	1.043
613.105	9.830	107.81	.2059	94.296	.2482	44.192	1.047
613.258	9.870	110.76	.2199	93.175	.2410	43.358	1.089
613.410	9.890	114.72	.2397	91.854	.2324	41.152	1.159
613.562	9.930	121.39	.2762	89.577	.2176	38.942	1.272

TABLE 4 (CONT.)

Engineering

4) DRILLING DATA

4.1 Drilling Diary and Mud Record

4.2 Time Allocation

4.3 Chemical Consumption

4.4 Mud Recap

4.5 Bit Record

4.6 Deviation Surveys

4.7 Casing & Cementing Data

4.8 Tubular Tally

4.9 General Rig Data

4.10 Operating Time-Depth Curve

4.11 Problem Summary

4.1 Drilling Diary and Mud Record

BRIDGE OIL LIMITED
DRILLING REPORT SUMMARY
WELL: VOGEL -1

DATE	DEPTH	MUD WT	MUD VIS	MUD WL	OPERATIONS SUMMARY
1990					
9-3	224	9.1	40	NC	Rigged up Gearhart -2 and spudded Vogel #1 at 0200 9.3.1990. Drilled 12.1/4" hole to 224m. Made wiper trip & circulated clean. POH. Ran 18 jnts 9./8" 36 ppf J55 STC casing to 221.02m. Circulated casing & cemented with 190sx class A cement + 2.5% prehydrated bentonite mixed at 13.1 ppg. Tailed in with 100 sx class A cement mixed at 15.6 ppg. Displaced with mud & bumped plug with 1500 psi. Approx 95 cu ft slurry returns.
10-3	224				Recemented through small diameter pipe at 12m with class A + 2% calcium chloride mixed at 15.6 ppg. WOC. Nippled up BOP & tested to 200 & 1500 psi.
11-3	707	9.0	41	NC	RIH & located plug at 206m. Drilled out shoetrack & drilled 8.1/2" hole to 229m. Circulated & conditioned mud. Ran FIT to equivalent 17.6 ppg. Drilled 8.1/2" hole.
12-3	1037	9.1	36	NC	Drilled to 1037m. Circulated samples at 1030m & 1037m. RT for bit change & picked up stabilizer. RIH & reamed 461-509m, 754-888m.
13-3	1285	9.3	40	6.2	Reamed 888-1037m. Drilled 8.1/2" hole. Circulated samples at 1207m, 1221m, 1223m.
14-3	1398	9.4	44	5.6	Drilled to 1294m. RT for bit change. Hole tight 1141-604m. RIH & reamed

					1244-1294m. Drilled 8.1/2" hole to 1398m. Made wiper trip to shoe. Cleaned fill 1385-1397m. Circulated clean & POH. Rigged up HLS.
15-3	1398	9.4	44	5.6	HLS ran DLL-MSFL-GR-SP BCS-GR CDL-CNS-GR Velocity Survey Sidewall samples
16-3	1398	9.4	44	5.6	Completed logging with HLS. Laid out BHA. RIH OEDP to 1200m & circulated bottoms up. Set plug No. 1 from 1200-1150 with 65sx class A cement mixed at 15.6 ppg. Pulled back & set plug No. 2 from 600-550m with 70sx class A cement mixed at 15.6 ppg. Pulled back & set plug No. 3 from 230-180m with 80sx class A cement + 2% calcium chloride mixed at 15.6 ppg. Pulled back and laid out excess DP while WOC. RIH to 276m without locating plug No. 3. Pulled back & set plug No. 4 from 230-180m with 80sx class A cement. WOC.
17-3	1398				RIH & located top plug No. 4 at 205m. Set plug no. 5 from 205-180m with 30sx class A cement mixed at 15.6 ppg. Pulled back & set plug no. 6 from 40-20m with 25sx class A cement. Laid out DP. Removed BOP & casing bowl. Cut 9.5/8" casing at cellar floor (± 1.5m BGL) & welded on plate. Installed marker plate. Rig released 1400 hrs 17.3.1990.

4.2 TIME ALLOCATION

	VOGEL #1
DRILL:	71.25
TRIP:	19.25
CIRCULATE:	8.50
REAM:	7.00
CASING/CEMENTING:	17.50
BOP:	17.50
LOG:	27.50
ABANDON:	35.50

TOTAL	204.0 HRS = 8.5 DAYS

4.3 CHEMICAL CONSUMPTION

	VOGEL #1
AQUAGEL:	8045 KG
CAUSTIC POTASH:	475 KG
LIME:	250 KG
PAC R:	568 KG
DEXTRID:	1818 KG
POTASSIUM CHLORIDE:	7425 KG
SODIUM CARBONATE:	150 KG
SODIUM NITRATE:	50 KG
BARYTES:	7050 KG
CLASS A CEMENT:	28050 KG
CALCIUM CHLORIDE:	75 KG
BARAFILM:	205 LTRS
EZYMUD:	25 KG

TABLE 5

WELL: VOGEL NO. 1 PEP 108 SPUD: 9 MARCH 1990

Date	Depth m	Density ppg	Vis sec	PV	YP	Gels		Fluid Loss ml	Nitrate ppm	Cake 32nds	Solids %	Sand %	MBC ppb	ph	pf	mf	cl ppm	ca ppm	Operations
						10 sec	10 min												
8.3	-	8.3	27																
8.3	-	8.8	30	4	7	3	5	-	-	-	3.0	TR	-	11.0	.45	.50	600	220	
9.3	180	9.0	32	5	11	5	7	-	-	-	4.0	TR	-	11.0	.45	.50	600	300	Drill 12-1/4"
9.3	224	9.1	40	8	25	8	15	-	-	-	5.0	TR	12	11.0	.40	.45	600	400	Drill 12-1/4"
10.3	229	8.8	24	5	15	7	12	-	-	-	3.0	TR	8	11.5	1.40	1.50	700	400	Run LOT
11.3	390	8.9	40	8	29	17	23	-	-	-	4.0	TR	16	11.0	.55	.60	600	60	Drill 8-1/2"
11.3	707	9.0	41	6	17	10	18	12.0	70	2	4.0	TR	12	9.5	.10	.12	13000	180	Drill 8-1/2"
12.3	-	9.0	35	5	8	1	3	8.5	150	2	4.0	TR	10	9.5	.12	.14	13000	150	Drill 8-1/2"
12.3	1037	9.1	36	6	10	1	4	7.5	100	1	4.0	TR	10	9.0	.05	.10	13000	220	Drill 8-1/2"
13.3	1150	9.3	36	7	6	1	3	7.0	100	2	5.0	TR	8	9.5	.15	.20	17000	80	Drill 8-1/2"
13.3	1256	9.3	40	10	10	1	4	6.2	100	1	5.0	TR	8	10.0	.25	.30	17000	100	Drill 8-1/2"
14.3	1330	9.3	40	10	10	1	4	6.4	100	1	5.0	TR	10	10.0	.15	.20	17000	40	Drill 8-1/2"
14.3	1397	9.4	44	15	15	3	8	5.6	100	1	5.5	TR	10	9.0	.05	.10	17000	120	Drill 8-1/2"
15.3	-	9.4	44	15	15	3	8	5.6	100	1	5.5	TR	10	9.0	.05	.10	17000	120	Log

HUGHES BIT RECORD HUGHES

COUNTRY	AREA (BLOCK)	FIELD		LOCATION	WELL NO.	DRILL COLLARS
AUSTRALIA	PEP 108	EXPLORATION	☐ IN FILL ☐ DEVELOPMENTAL ☒ EXPLORATORY	VOGEL	1	NO 2 OD 8" ID 3" / NO 18 OD 6¼" ID 2 13/16" / NO ___ OD ___ ID ___

OPERATOR	X(1)	OPERATOR REPRESENTATIVE(S)	CONTRACTOR	X(2)	TOOL PUSHER(S)	DRILL PIPE	
BRIDGE OIL LTD		K. SMITH	GEARHART RIG 2		T. DOHERTY	1 SIZE 4½ WT 16.6 GR E	2 SIZE ___ WT ___ GR ___

SALESMAN	PUMPS	LINER	TYPE RIG	COST/DAY (US$)	SPUD DATE	T.D. DATE	TOOL JOINTS	
	1. GD PZ-80 2. GD PZ-80	1. 6 2. 6	☒ LAND ☐ JU ☐ SHIP ☐ SS ☐ PL ☐ BARGE		9-3-90	14-3-90	1 TYPE XH OD 6¼ ID ___	2 TYPE ___ OD ___ ID ___

NO.	SIZE	MAKE	TYPE	NOZZLES 32nd IN	SERIAL NO.	DEPTH OUT [redacted] ☐ METERS	[redacted] ☐ METERS	HRS.	ROP [redacted] ☐ MT/HR	ACCUM DRLG HRS	WT ☐ KLB [redacted]	RPM	VERT DEV	☐ PSI [redacted]	☐ GPM [redacted]	MUD WT	MUD VIS	PV/YP	IADC DULL GRADE I	O	D	L	B	G	O	R
1	12¼	HTC	J1	3x16	Y96EF	224	224	9½	23.5	9½	5-15	80-100	¼	850	520	9.1	40		1	1	WT	A	E	O	NO	TD
2	8½	HTC	JG3	3x10	V67EF	1037	813	32½	25	42	15/25	100/120	1¼	1200	275	9.1	36	6/10	7	7	WT	A	E	O	NO	PR
3	8½	HTC	JG3	3x11	V66EF	1294	257	18¾	13.7	60¾	25/30	90/100	¾	1150	275	9.4	44	15/15	6	6	WT	A	E	O	NO	PR
4	8½	HTC	JG3	3x11	V70EF	1398	104	7	15	67¾	25/30	90/100	1	1175	275	9.4	44	15/15	2	2	WT	A	E	O	NO	TD

TABLE 6

4.6 Deviation Survey

Deviation Surveys - Table 7

DEPTH METRES KB	ANGLE DEGREES
0	0.00
50	0.50
105	0.25
155	0.25
213	0.00
421	0.50
707	1.00
900	1.25
1025	1.25
1256	0.75
1397	1.00

RADIUS OF UNCERTAINTY 18.27 METRES

4.7 CASING AND CEMENTING - Table 8

Hole size		- inches	12.1/4	
Hole depth		- m KB	224	
Casing	Size	- inches	9.5/8	
	Weight	- lb/ft	36	
	Grade		J55	
	Coupling		STC	
	Range		3	
	Shoe type		Float	
	Collar type		Float	
	Shoe depth	- m KB	221.6	
	Collar depth	- m KB	208.9	
Centralizer type			Spring	
Centralizer depth		- m KB	216, 195, 184, 30	
Cementing service			Halliburton	
Cement type			Class A	
Cement quantity		-42.5kg sx	190	100
% excess			100	-
Cement additives			Bentonite	-
Additive %			2.5	-
Slurry weight		- lb/gal	13.1	15.6
Slurry volume		- cu.ft	340	118
Preflush type			Water	
Preflush volume		- bbls	30	
Displacement fluid			Mud	
Displacing pressure		- psi	375	
Bumped plug with		- psi	1500	
Top of Cement		- m KB	Surface	
Plugs used			Top only	
Casing running time		- hrs	2	
Cement mixing time		- mins	16	
Displacement time		- mins	17	
Reciprocate during circulation			Yes	
+Reciprocate during displacement			Yes	

BRIDGE OIL LTD Tubular Tally Sheet

Well: VOGEL No 1 Field: EXPLORATION Date: 9-3-90

Pipe size: 9⅝" Threads: 8 RND

Jnt. No.	No. of Jnts.	Weight lb/ft.	Grade	Coupling	Length	Depth
1-18	18	36	J55	STC	215.6	Surface - 221.6

Centralizers: 216 m, 195 m, 184 m, 30 m

Cementing Accessories: Float shoe + float collar + top plug

Threadlocked Joints: Bottom two

Joint No.		Length		Total		Joint No.		Length		Total	
KB		5	940			SHOE		0	24	221	598
1		11	890								
2		11	665								
3		11	560								
4		12	115								
5		12	115								
6		11	955								
7		11	825								
8		12	305								
9		11	840								
Total		113	21	113	21	Total					
10		11	950								
11		11	940								
12		11	900								
13		11	950								
14		12	090								
15		11	880								
16		12	053								
17		11	980								
COLLAR		0	415								
18		11	990								
Total		108	148	221	358	Total					

TABLE 9

RIG #2

SUPERIOR MODEL 700E SCR

CAPACITY 11,000FT, 3,350M NOMINAL

DRAWWORKS

ONE SUPERIOR MODEL 700E SCR ELECTRIC DRIVEN DRAWWORKS COMPLETE WITH AUXILIARY BRAKE AND SANDREEL. MAXIMUM INPUT H.P. 1000. DRIVEN BY EMD MOTOR.

ONE FOSTER MODEL 37 MAKE-UP SPINNING CATHEAD. MOUNTED ON DRILLERS SIDE.

ONE FOSTER MODEL 24 BREAK-OUT CATHEAD. MOUNTED OFF DRILLERS SIDE.

TRANSMISSION - 2 SPEED TRANSMISSION WITH HIGH CHAIN 1 1/4" TRIPLE 26T TO 24T. TWIN DISC PO218 AIR CLUTCH. LOW CHAIN 1 1/4" TRIPLE 20T TO 39T TWIN DISC PO218 AIR CLUTCH.

ENGINES

FOUR CATERPILLAR MODEL 3412 PCTA DIESEL ENGINES.

MAST

FLOOR MOUNTED CANTILEVER MAST DRECO - MODEL NO: M12713-510 DESIGNED IN ACCORDANCE WITH A.P.I. SPECIFICATION 4E 'DRILLING AND WELL SERVICING STRUCTURES'.

CLEAR WORKING HEIGHT - 127'
BASE WIDTH - 13' 6"
HOOK LOAD
GROSS NOMINAL CAPACITY - 510,000 LBS
HOOK LOAD CAPACITY WITH:

10 LINES STRUNG	410,000 LBS
8 LINES STRUNG	365,000 LBS
6 LINES STRUNG	340,000 LBS
4 LINES STRUNG	306,000 LBS

MAXIMUM WIND LOAD 100 MPH - NO SETBACK
MAXIMUM WIND LOAD 84 MPH - RATED SETBACK

ADJUSTABLE RACKING BOARD WITH CAPACITY FOR 108 STANDS OF 4 1/2" DRILL PIPE, 10 STANDS OF 6 1/2" DRILL COLLARS, 3 STANDS OF 8" DRILL COLLARS DESIGNED TO WITHSTAND AN A.P.I. WINDLOAD OF 84 MPH WITH PIPE RACKED.

CRANE BLOCK

215 TON WITH FIVE 36" SHEAVES, AND ONE 36" FASTLINE SHEAVE GROOVED 1 1/8".

SUBSTRUCTURE

ONE PIECE SUBSTRUCTURE. 14' H X 13' 6" W X 50' L W/ 12' BOP CLEARANCE.
SET-BACK - 200,000 LBS - CASING = 210,000 LBS.

RIG LIGHTING

EXPLOSION PROOF FLUORESCENT.

TRAVELLING BLOCK

ONE 667 CROSBY MCKISSICK 250 TONE COMBINATION BLOCK HOOK WEB WILSON 250 TON HYDRA - HOOK UNIT 5 - 36" SHEAVES.

KELLY DRIVE

ONE 20 HDP VARCO KELLY DRIVE BUSHING.

KELLY

ONE SQUARE KELLY DRIVE 4 1/4" X 40' COMPLETE WITH SCABBARD.

SWIVEL

ONE OILWELL PC-300 TON SWIVEL.

ROTARY TABLE

ONE OILWELL A 20 1/2" ROTARY TABLE TORQUE TUBE DRIVEN FROM DRAWWORKS.

AIR COMPRESSORS & RECEIVERS

TWO LEROI DRESSER MODEL 660A AIR COMPRESSOR PACKAGES C/W 10 H.P. MOTORS RATED AT 600 VOLT 60 HZ 3 PHASE. RECEIVERS EACH 120 GALLON CAPACITY AND FITTED WITH RELIEF VALVES.

INSTRUMENTATION

ONE (1) 6 PEN DRILL SENTRY RECORDER TO RECORD:
WEIGHT (D) 1-MARTIN DECKER SEALTITE
1-CAMERON DEADLINE TYPE
PENETRATION (FEET)
PUMP PRESSURE (0 - 6000 P.S.I.)
ELECTRIC ROTARY TORQUE
ROTARY SPEED (R.P.M.)
PUMP S.P.M. (WITH SELECTOR SWITCH)

INSTRUMENTATION
(Cont)

ONE (1) DRILLERS CONSOLE INCLUDING THE FOLLOWING EQUIPMENT:
MARTIN DECKER WEIGHT INDICATOR TYPE 'D' ELECTRIC ROTARY TORQUE GAUGE.
PIT SCAN.
S.P.M. GAUGE (2 PER CONSOLE).
ROTARY R.P.M. GAUGE.
ONE SET OF 'DOUBLE SHOT'
DEVIATION INSTRUMENT 'TOTCO'.
ONE SET OF MUD TESTING LABORATORY STANDARD KIT (BAROID).

DRILLING LINE

5000' OF 1 1/8" - TIGER BRAND.

MUD PUMPS

TWO GARDNER DENVER MUD PUMPS MODEL NO: PZHVE 750 EACH DRIVEN BY 800 HP EMD MOTOR.

GENERATOR

FOUR BROWN BOVERI 600 VOLT 3 PHASE 60 HZ AC GENERATORS. POWERED BY FOUR CAT 3412 PCTA DIESEL ENGINES.

B.O.P'S AND
ACCUMULATOR

ONE HYDRIL 13 5/8" X 3000 P.S.I. SPHERICAL ANNULAR B.O.P.,STUDDED TOP AND FLANGED BOTTOM. HEIGHT 14"
ONE HYDRIL 13 5/8" X 5000 P.S.I. FLANGED DOUBLE GATE B.O.P.
ONE GALAXIE 13 5/8" X 5000 P.S.I. 3000 DOUBLE STUDDED ADAPTOR FLANGES COMPLETE WITH STUDS AND NUTS.
ONE CUP TESTER. GRAY C/W TEST CUPS FOR 9-5/8" AND 13-3/8"
ONE WAGNER MODEL 130 - 160 3 BND 160 GALLON ACCUMULATOR CONSISTING OF:

SIXTEEN 11 GALLON BLADDER TYPE BOTTLES.
ONE 20 H.P. ELECTRIC DRIVEN TRIPLEX PUMP 600 VOLT 60 HZ 3 PHASE MOTOR AND CONTROLS.
ONE WAGNER MODEL A - 60 AUXILIARY AIR PUMP 4.5 GALS/MINUTE.
ONE WAGNER MODEL UM2SCB5S MOUNTED HYDRAULIC CONTROL PANEL WITH FIVE (5) 1" STAINLESS STEEL FITTED SELECTOR VALVES AND TWO (2) STRIPPING CONTROLS AND PRESSURE REDUCING VALVES. THREE (3) 4" HYDRAULIC READOUT GAUGES:

- ONE FOR ANNULAR PRESSURE
- ONE FOR ACCUMULATOR PRESSURE
- ONE FOR MANIFOLD PRESSURE

ONE WAGNER MODEL GMSB - 5A 5 STATION REMOTE DRILLERS CONTROL WITH THREE PRESSURE READBACK GAUGES, INCREASE AND DECREASE CONTROL FOR ANNULAR PRESSURE.

SPOOLS

ONE SET FLANGED ADAPTOR SPOOLS TO MATE 13 5/8" LOT X 5000 P.S.I. A.P.I. B.O.P. FLANGE TO FOLLOWING WELLHEAD FLANGES:

12" X 900 SERIES, HEIGHT 14"
10" X 900 SERIES " "
8" X 900 SERIES " "
B.O.P. SPACER. FLANGE 12" 3000 R57 STUDDED X 6" 3000 R45 FLANGE, HEIGHT 16"
B.O.P. SPACER SPOOL (DRILLING SPOOL) 12" 5000 X 12" 5000 BX160, HEIGHT 14"

KELLY COCKS

ONE GRIFFITH LOWER KELLY COCK 6 1/2" O.D. WITH 4 1/2" X H CONNECTIONS.
ONE GRIFFITH UPPER KELLY COCK 7 3/4" WITH 6 5/8" A.P.I. CONNECTIONS.

DRILL PIPE
SAFETY VALVE

ONE GRIFFITH 6 1/2" INSIDE BLOWOUT PREVENTORS (4 1/2" X H)
ONE GRIFFITH 6 1/2" STABBING VALVE (4 1/2" X H)

CHOKE MANIFOLD

ONE MCEVOY CHOKE AND KILL MANIFOLD 2"-3000 P.S.I.

MUD SYSTEM

ONE PILL TANK CAPACITY 25 BBLS.
TWO MIX TANKS CAPACITY 108 BBLS. (EACH)
ONE RESERVE TANK CAPACITY 120 BBLS.
ONE DESILT TANK CAPACITY 120 BBLS.
ONE DESAND TANK CAPACITY 120 BBLS.
ONE SHAKER TANK CAPACITY 130 BBLS.
ONE SAND TRAP CAPACITY 15 BBLS.

FUEL TANKS

ONE 140 BBLS.
ONE 6000 GALS - 30,000 LITRES.

WATER TANKS

ONE 400 BBLS

MIXING PUMPS

FIVE MISSION MAGNUM 5" X 6" X 14" CENTRIFUGAL PUMPS COMPLETE WITH 50 H.P. 600 VOLT HZ 3 PH EXPLOSION PROOF ELECTRIC MOTORS.

TRIP TANK PUMP

ONE MISSION MAGNUM 2" X 3" CENTRIFUGAL PUMP COMPLETE WITH 20 H.P. 600 VOLT 60 HZ 3 PH EXPLOSION PROOF MOTORS.

WATER TRANSFER PUMPS

THREE MISSION MAGNUM 2" X 3" CENTRIFUGAL PUMPS C/W 20 H.P. 600 VOLT 60 HZ 3 PH EXPLOSION PROOF MOTORS.

MUD AGITATORS

SIX GEOLOGRAPH/PIONEER 40 TD - 15" 'PITBULL' MUD AGITATORS WITH 15 H.P. 600 VOLT 60 HZ 3 PH ELECTRIC MOTORS.

SHALE SHAKER

ONE BRANDT - DUAL TANDEM SHALE SHAKER.

DESANDER

ONE PIONEER T8-6 'SANDMASTER' DESANDER.

DESILTER

ONE PIONEER T12-4 'SILTMASTER' DESILTER.

DRILL PIPE

10000 FT OF 4 1/2" GRADE 'E' 16.60 LBS/FT HARD BANDED DRILL PIPE 326 JOINTS.

DRILL COLLARS

1 - 6 1/2" OD DRILL COLLAR (SHORT) 15'
24 - 6 1/2" OD DRILL COLLARS.
3 ACTUAL 8" OD DRILL COLLARS.
9 ACTUAL JOINTS OF 4 1/2" HEVI-WATE DRILL PIPE.

TWO (2) BIT SUBS - 6-5/8" REG DBL BOX
TWO (2) BIT SUBS - 4-1/2" REG X 4-1/2" XH DBL BOX
ONE (1) XO SUB - 7-5/8" REG X 6-5/8" REG DBL BOX
ONE (1) XO SUB - 4-1/2" XH BOX X 4-1/2" IF PIN
ONE (1) XO SUB - 4-1/2" REG X 4-1/2" XH DBL PIN
TWO (2) XO SUB - 6-5/8" REG PIN X 4-1/2" XH BOX
ONE (1) JUNK SUB - 6-5/8" REG PIN X 6-5/8" REG BOX
ONE (1) JUNK SUB - 4-1/2" REG BOX X 4-1/2" REG PIN
ONE (1) JUNK SUB - 4-1/2" REG BOX X 4-1/2" XH BOX
TWO (2) KELLY SAVER SUB S/W RUBBER 4-1/2" XH PXB
TWO (2) CIRCULAR SUBS - 4-1/2" XH X 1502 HAMMR UNION
TWO (2) 12-1/4" EZI CHANGE S/STAB 6-5/8 REG PXB
TWO (2) 8-1/2" INTEGRAL BLADE STABILIZERS 4-1/2" XH PXB

ELEVATORS

ONE (1) 4-1/2" BJ 250 TON 18 DEGREE TAPER D/P ELEVATORS
ONE (1) 2-7/8" IUS 100 TON TUBING ELEVATORS
ONE (1) 2-7/8" EUI 100 TON TUBING ELEVATORS
ONE (1) 13-3/8" BAASH ROSS 150 TON S/DOOR ELEVATORS
ONE (1) 13-3/8" S/JOINT P.U. ELEVATORS
ONE (1) 9-5/8" WEBB WILSON 150 TON S/DOOR ELEVATORS
ONE (1) 9-5/8" S/JOINT P.U. ELEVATORS
ONE (1) 7" BJ 200 TON S/DOOR ELEVATORS
ONE (1) 7" S/JOINT P.U. ELEVATORS
ALL P.U. ELEVATORS C/W SLINGS & SWIVEL

ONE (1) 8" WEBB WILSON 150 TON S/DOOR ELEVATORS D/C
ONE (1) 5-3/4" WEBB WILSON 150 TON S/DOOR ELEVATORS D/C
ABOVE C/W LIFT NUBBING AND BAILS

ROTARY SLIPS D/P TUBING

TWO (2) 4-1/2" VARCO SDML D/P SLIPS
ONE (1) 3-1/2" VARCO SDML TUBING SLIPS
TWO (2) 8" - 6-1/2" DCS-R DRILL COLLAR SLLIPS

ROTARY TONGS

ONE (1) BJ TYPE 'B' C/W LATCH & LUG JAWS 13-3/8" - 3-1/2"

CASING SLIPS

THREE (3) 13-3/8" - 9-5/8" - 7" VARCO CSML CASING SLIPS

BIT BREAKERS

FOUR (4) 17-1/2" - 12-1/4" - 8-1/2" - 6"

FISHING TOOLS

ONE (1) 8-1/8" BOWEN SERIES 150 F.S. O/SHOT
ONE (1) 10-5/8" BOWEN SERIES 150 F.S. O/SHOT
C/W GRAPPLES & PACKOFFS TO FISH CONTRACTORS DOWN HOLE EQUIPMENT.
ONE (1) 8 O.D. FISHING MAGNET 4-1/2" REG PIN
ONE (1) REVERSE CIRC JUNK BASKET 4-1/2" XH BOX
ONE (1) JUNK BASKET MILL TYPE C/W MILL SHOE 4-1/2" REG PIN
ONE (1) JARS 6-1/2" O.D. GRIFFITHS FISHING 4-1/2" XH PXB
ONE (1) JAR ACCELERATOR GRIFFITHS FISHING 6-1/2" O.D. 4-1/2" XH PXB
ONE (1) BUMPER SUB 6-1/2" O.D. FISHING 4-1/2" XH PXB
ONE (1) 12" JUNK MILL - 6-5/8" REG PIN
ONE (1) 8" JUNK MILL 4-1/2" REG PIN

ROTARY REAMERS

ONE (1) 6-1/2" O.D. DRILCO N.B. ROLLER REAMER C/W TYPE K CUTTERS 8-1/2" HOLE

PUP JOINTS

THREE (3) 5' - 10; - 15; 4-1/2" O.D. GRADE 'G' PUP JOINTS

AUGER

ONE (1) 27-1/2" AUGER 4-1/2" XH BOX

RATHOLE DIGGER

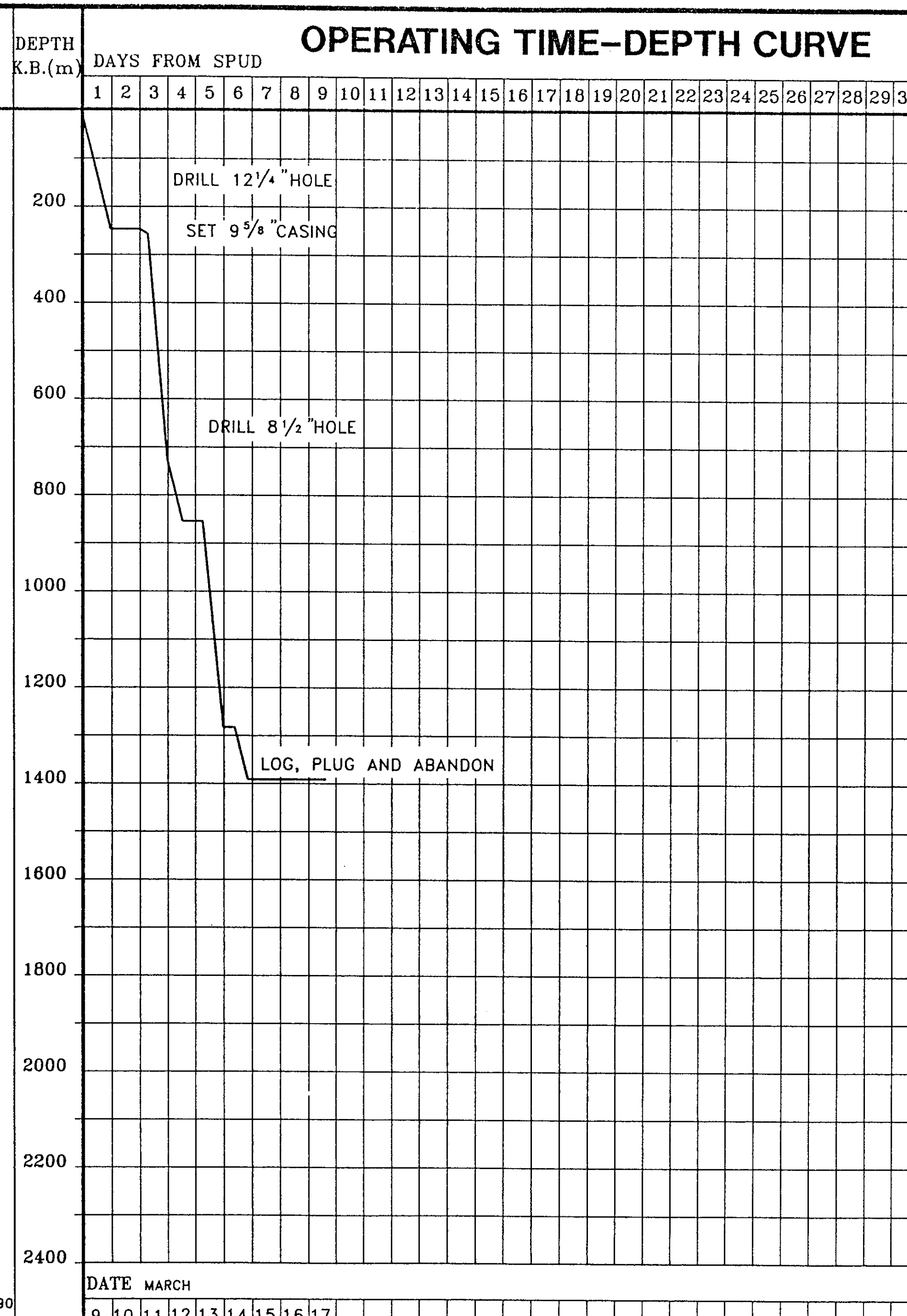
ONE (1) FABRICATED ROTARY TABLE CHAIN DRIVEN

POWER TONG

ONE (1) FARR 13-5/8" - 5-1/2" HYDRAULIC POWER TONS
C/W HYD. POWER PACK & HOSES & TORQUE GUAGE ASSY

OPERATING TIME-DEPTH CURVE

WELL SECTION (DIAMETER IN INCHES) 20" 10" 0"	LITHOLOGY FORMATION	K.B.(m)	REMARKS
	GELLIBRAND MARL		SPUDDED AT 0200hrs ON 9/3/90 9⅝"(244mm) CASING SET AT 221.02m
	CLIFTON FM	172.5	12.8mL
	L.MEPUNGA	247.2	11.5mL
	DILWYN FM	318.8	3.1mL
	PEMBER MBR	509.5	30.2mH
	PEBBLE POINT	585.9	6.8mH
	PAARATTE FORMATION	634.6	8.1mH
	SKULL CREEK MBR	902.0	0.7mH
	NULLAWARRE MBR	1027.2	0.5mH
	BELFAST MDST MBR	1152.7	9.0mH
	FLAXMANS MBR	1199.5	7.2mH
	WAARRE SANDSTONE	1219.5	1.2mH
	EUMERALLA FM	1309.0	20.3mL
8½"HOLE TO T.D.		1394.3	TOTAL DEPTH
			RIG RELEASED AT 1400hrs ON 17/3/90



Well : VOGEL # 1

K.B. : 147.6m	G.L. : 142.6m
LOCATION : MIDPOINT SP 100/SH86-7 & SP 300/V088-14	Contractor : GEARHART
	Rig : 2
Lat. : 38°32' 35.385"S	Type :SUPERIOR 700E SCR
Long. :143°02' 13.312"E	

DRILL STEM TESTS

No.	DETAILS
	NIL

CORES

No.	DETAILS
	NIL

LOG ANALYSIS

FORMATION	NET PAY	VSH	ø	S.W.
WAARRE	0	10%	25.1%	98%
NULLAWARRE	0	26%	24.1%	91%
PEBBLE POINT	0	13%	27.4%	91%

Bridge Oil Limited

AUTHOR : P.T.B. /S.S.	DATE : 12.6.90
DRAFTED BY : K.L.	REVISED :
FILING CODE :	FIGURE No. : 11

4.11 PROBLEM SUMMARY

Excessive Reaming

While RIH with bit no. 3, approximately 6 hours were spent in reaming back to bottom. Bit no. 2 was drilled with a slick BHA and experienced no problems when pulling out. Bit no. 3 was run with a pendulum BHA. It is likely that the reaming was due to the slightly stiffer BHA of bit no. 3. A future well will use a pendulum BHA to drill out the shoe.

Lost time approximately 6 hours. Cost approximately $3,800.

Lost Shoe Plug

The first shoe plug fell in excess of 96m and was not located.

The second shoe plug fell 25m and was close enough to the shoe to require topping up. The loss of the plugs was probably due to losses to the shallow, high permeability sandstones. Excessive mud seepage losses were experienced while drilling these sandstones.

In future wells, mica will be used to reduce mud seepage and assist in plug maintenance. In addition, a high viscosity pill will be spotted below the shoe plug.

Lost time approximately 19 hours. Cost approximately $10,500.

Geophysics

5) VELOCITY SURVEY REPORT

The velocity survey was carried out on March 15, 1990 by Velocity Data Pty Ltd using a dynamite source.

The final report follows.

Velocity Data

WELL VELOCITY SURVEY

VOGEL #1

PEP 108

VICTORIA

for

BRIDGE OIL LIMITED

recorded by

VELOCITY DATA PTY. LTD.

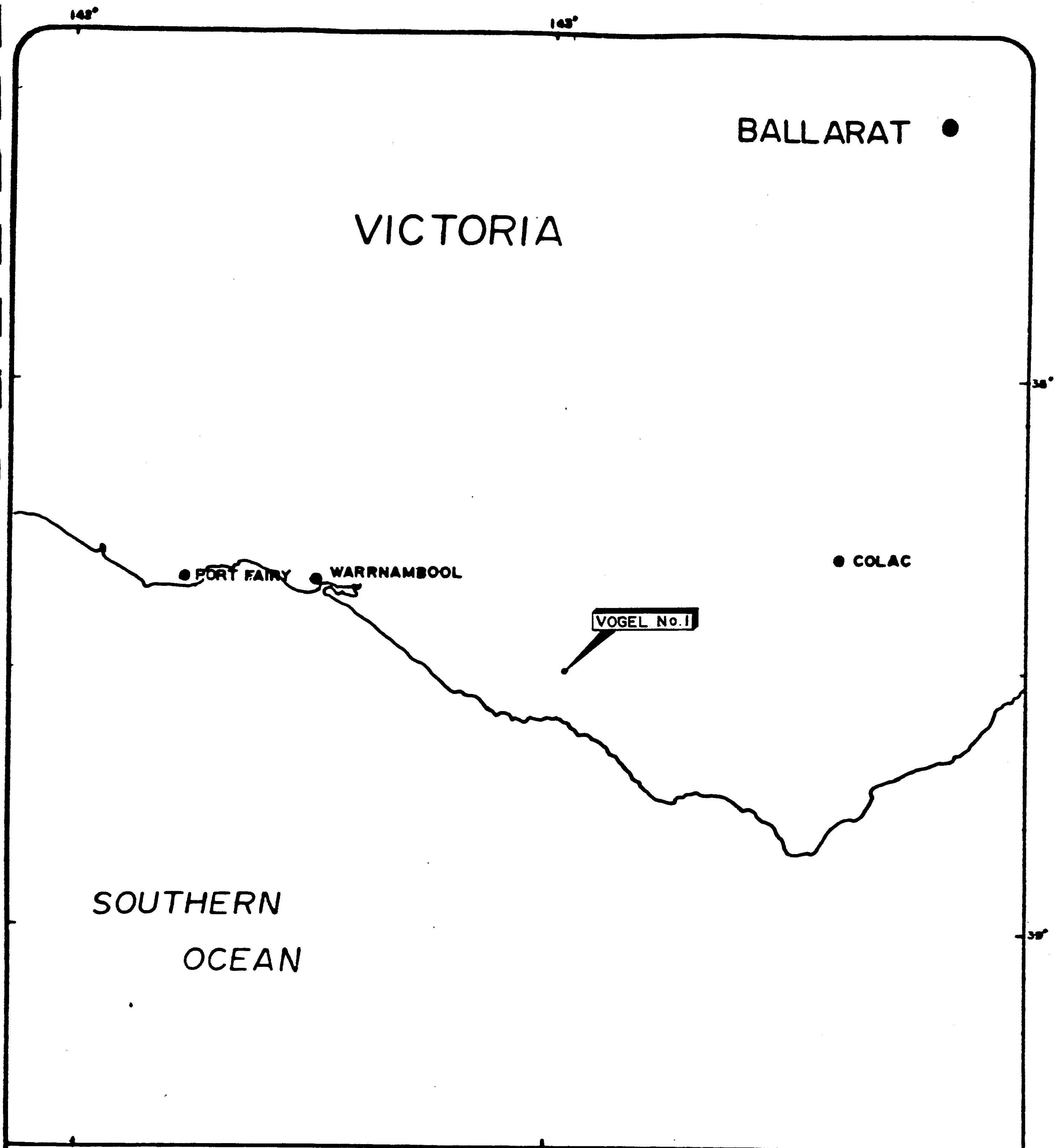
processed by

VELSEIS PTY LTD

Integrated Seismic Technologies

Brisbane, Australia
July 3, 1990

CONTENTS



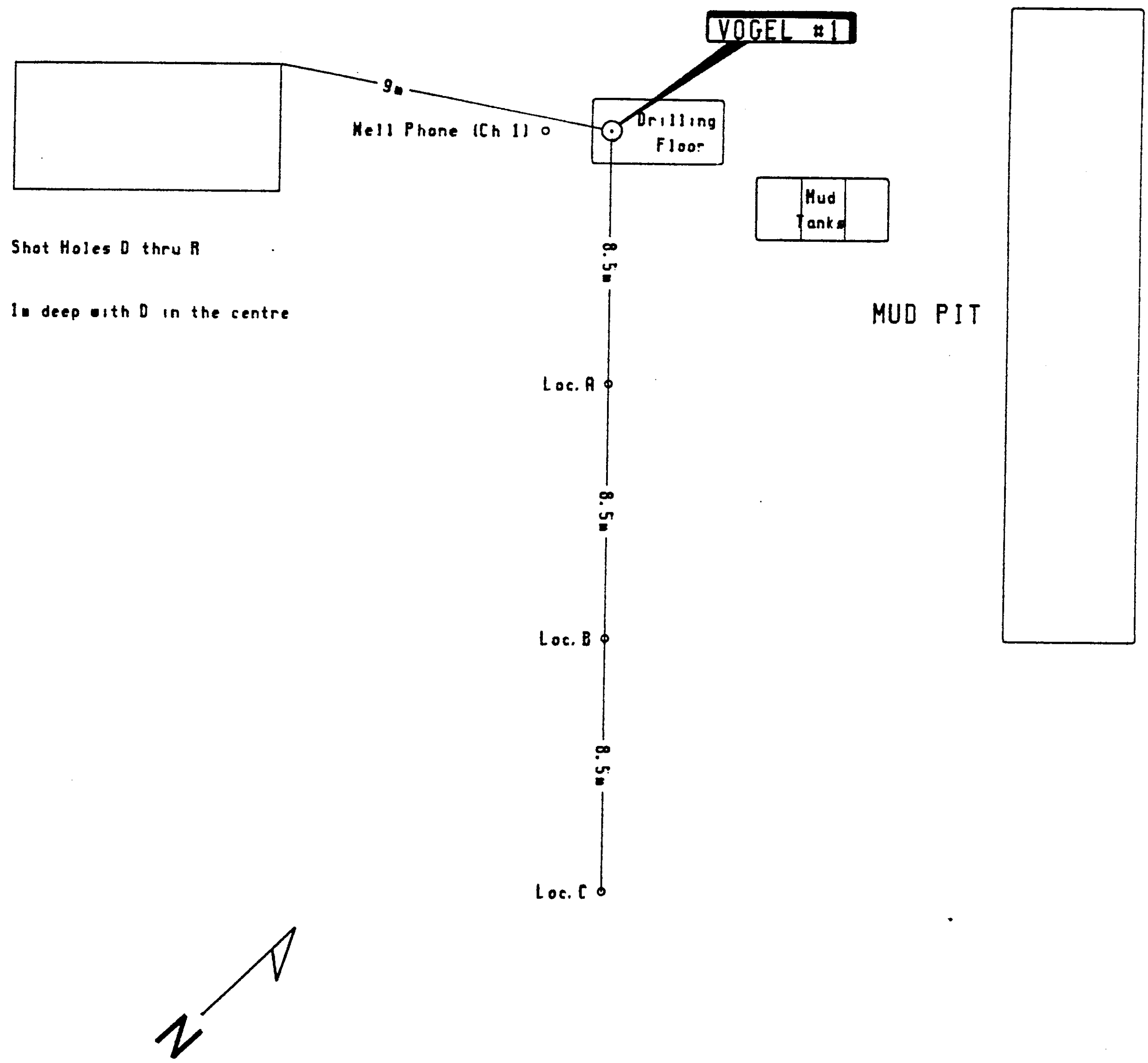
VOGEL No.1

BRIDGE OIL LIMITED

WELL LOCATION MAP

Scale 1:1000000

Figure 1



VOGEL #1

BRIDGE OIL LIMITED

SHOT POINT LOCATION SKETCH

Figure 2

SUMMARY

Velocity Data Pty Ltd conducted a velocity survey for Bridge Oil Limited in the Vogel #1 well PEP 108, Otway Basin Victoria . The date of the survey was 15th March 1990.

The results of the survey, which are considered to be reliable, have been used to calibrate the sonic log.

Explosives were used as an energy source with shots being fired in the mud pit.

GENERAL INFORMATION

Name of Well	:	Vogel #1
Location (Figure 1)	:	PEP 108
Coordinates	:	Latitude 038 32' 35"
	:	Longitude 143 02' 13"
Date of Survey	:	March 15th 1990
Wireline Logging	:	Gearhart #DDL007
Weather	:	Fine
Operational Base	:	Roma
Operator	:	N. Delfos
Shooter	:	J. Brown
Client Representative	:	Mr S. Robinson

EQUIPMENT

Downhole Tool

Veldata Camlock 100 (90 mm)

Sensors:

6 HSI 4.5 Hz 215 ohm, high temperature (300°F) detector connected in series parallel. Frequency response 8-300 Hz within 3db.

Preamplifier:

48 dB fixed gain.
Frequency response 5-200 Hz within 3 dB.

Reference Geophone

Mark Products L1 4.5 Hz

Recording Instrument

VDLS 11/10 software controlled digital recording system utilizing SIE OPA-10 floating point amplifiers for digital recording and SIE OPA-4 amplifiers for analog presentation. The system includes a DEC LSI-11 CPU, twin cassette tape unit and printer.

RECORDING

Energy Source	:	Explosive, AN-60
Shot Location	:	Drilled shot holes
Charge Size	:	0.5 to 1 (125 grm) sticks
Average Shot Depth	:	1.0 metres
Average Shot Offset	:	11.5 metres
Recording Geometry	:	Figure 2

Shots were recorded on digital cassette tape. Printouts of the shots used are included with this report.(Enclosure 2)

The sample rate was 1 ms with 0.5 ms sampling over a 200 ms window encompassing the first arrivals.

The scale of the graphic display varies with signal strength and is noted on each playout.

The times were picked from the printouts using the numerical value of the signal strength. (Enclosure 2)

PROCESSING

Elevation Data

Elevation of KB	:	147.6 metres above sea level
Elevation of Ground	:	142.6 metres above sea level
Elevation of Seismic Datum	:	150.0 metres above sea level
Depth Surveyed	:	1393.0 metres below KB
Total Depth	:	1394.3 metres below KB
Depth of Casing	:	221.0 metres below KB
Sonic Log Interval	:	15.5 to 1394.3 metres below KB

PROCESSING

Recorded Data

Number of Shots Used	:	22
Number of Levels Recorded	:	16
Data Quality	:	Good
Noise Level	:	Low
Rejected Shots	:	5 (4 misfired 1 noisy)

Correction for Instrument Delay and Shot Offset

The 'corrected' times shown on the calculation sheet have been obtained via:

(i) Subtraction of the instrument delay (4msec) from the recorded arrival times
(ii) geometric correction for non-verticality of ray paths resulting from shot offset.
(iii) shot static correction to correct for the depth of shot below ground level at the well head using a correction velocity of 630.0 metres/sec.
(iv) readdition of the instrument delay (4msec).

Correction to Datum

The datum has been specified as 150metres above sea level which is above the ground. A replacement velocity of 2400 m/sec has been used to resolve a datum correction time of 1msecs.For the algorithms used it is necessary to include the instrument delay within this value thus we get -3 msecs as appears on the calculation sheet.

PROCESSING

Four shots misfired and one shot was omitted due to noise.Consistent picks going both in and out of the hole indicated little shot fatigue this being confirmed from examination of the surface channel information. The displays showed a consistent wavelet shape was maintained throughout the survey.

Calibration of Sonic Log - Method

Sonic times were adjusted to checkshot times using a linear correction of the sonic transit times.

These differences arise as the sonic tool measures the local velocity characteristics of the formation with a high frequency signal, whereas the downhole geophone records the bulk velocity character using a signal of significantly lower frequency.

Calibration of Sonic Log - Results (Enclosure 1)

The discrepancies between shot and sonic interval velocities were generally small .

The largest adjustment was 30.92 μsecs/metre on the interval 1308.9 to 1393.0 metres below KB.

In aggregate, the shot and sonic interval times differed by 5.7 msec over the logged portion of the well.

PROCESSING

Trace Playouts (Figure 4)

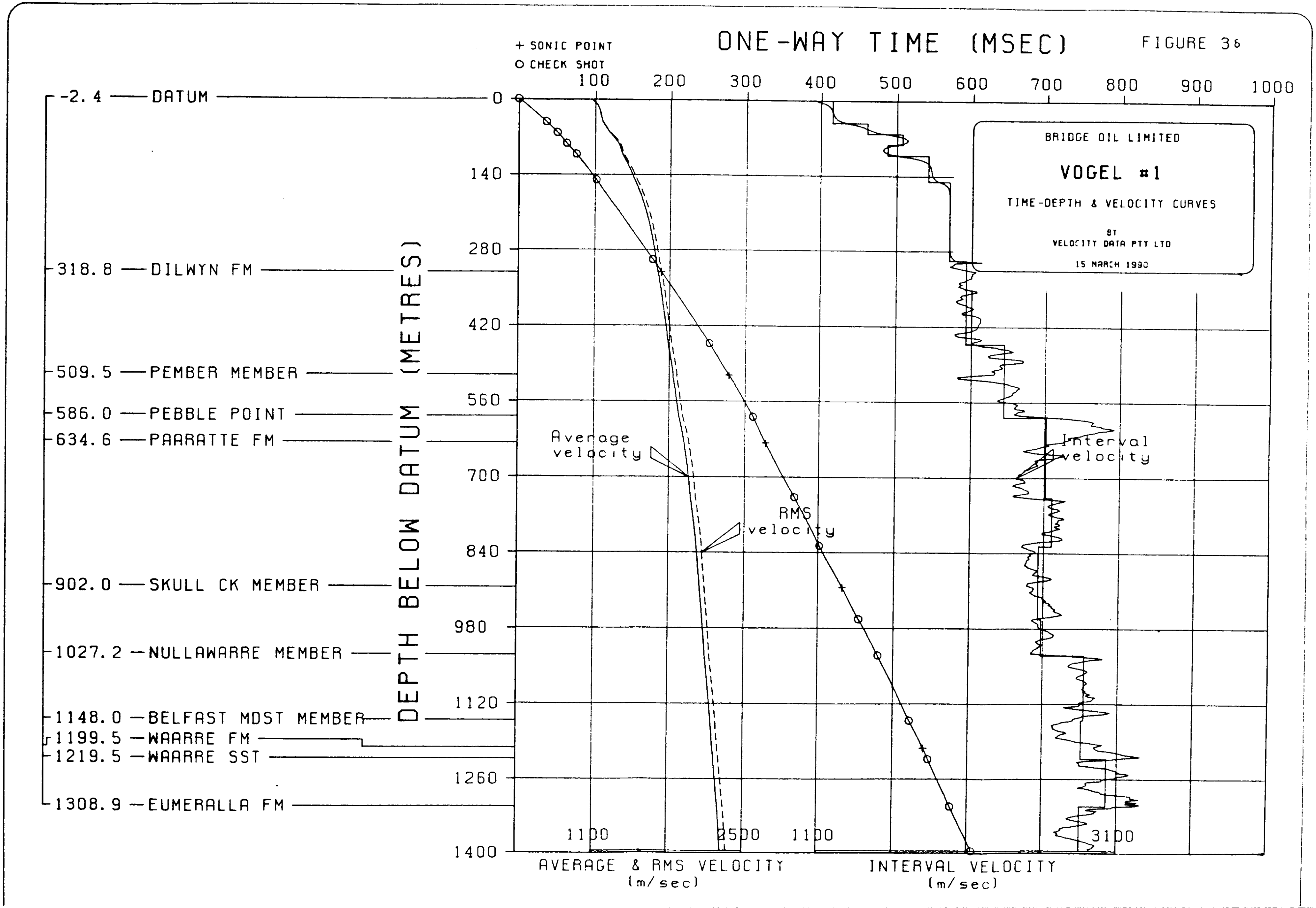
Figure 4A is a plot of all traces used. No filter or gain recovery has been applied.

Figure 4B is a plot to scale in depth and time of selected traces. No filter or gain recovery has been applied.

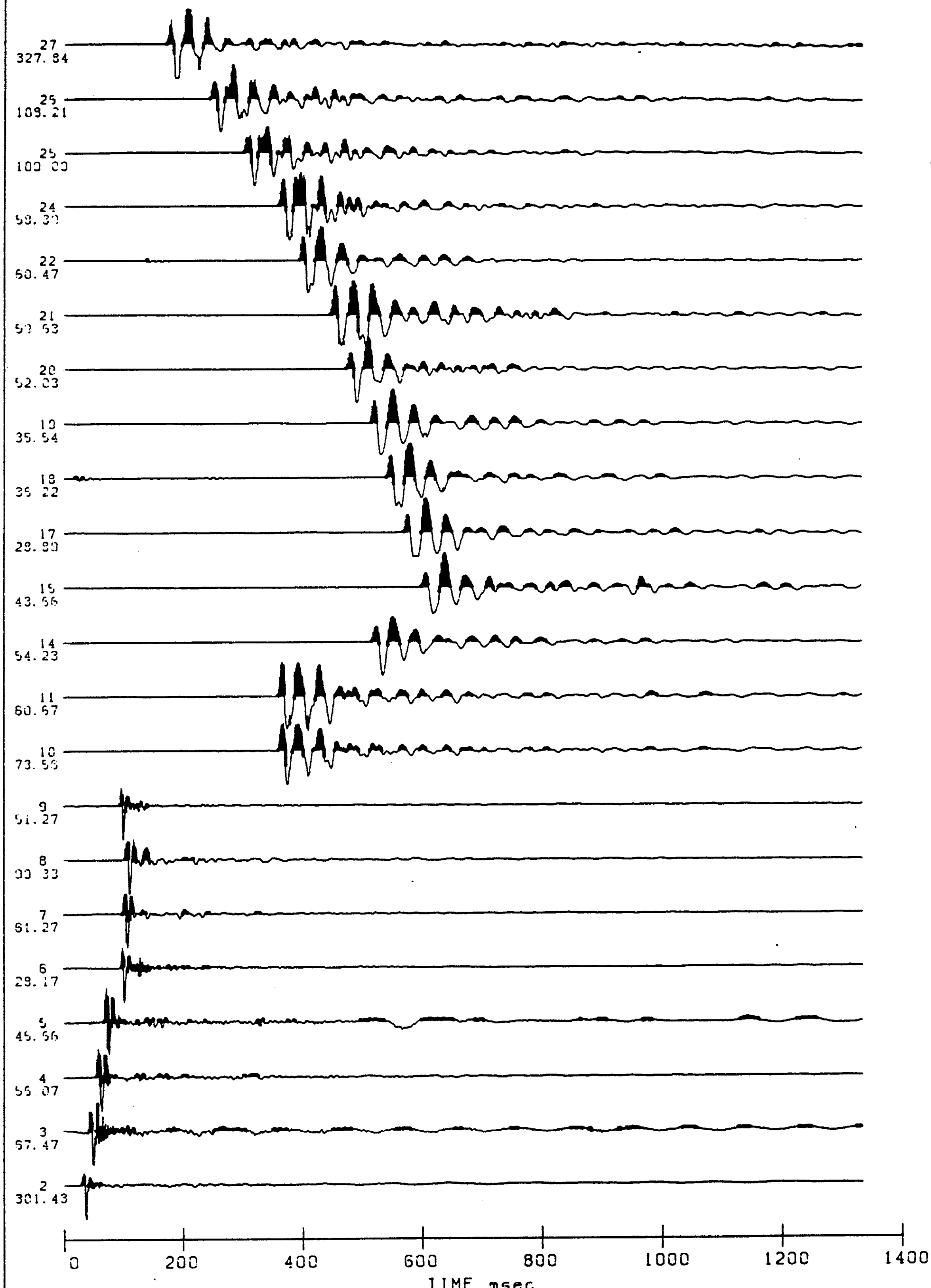
Figure 4C is a plot to scale in depth and time of selected traces with a 5 Hz - 40 Hz filter and again recovery function of t^2 applied.

Figure 4D is a plot of selected surface traces. No filter or gain recovery has been applied.

Geoffrey Bell
Geophysical Analyst.



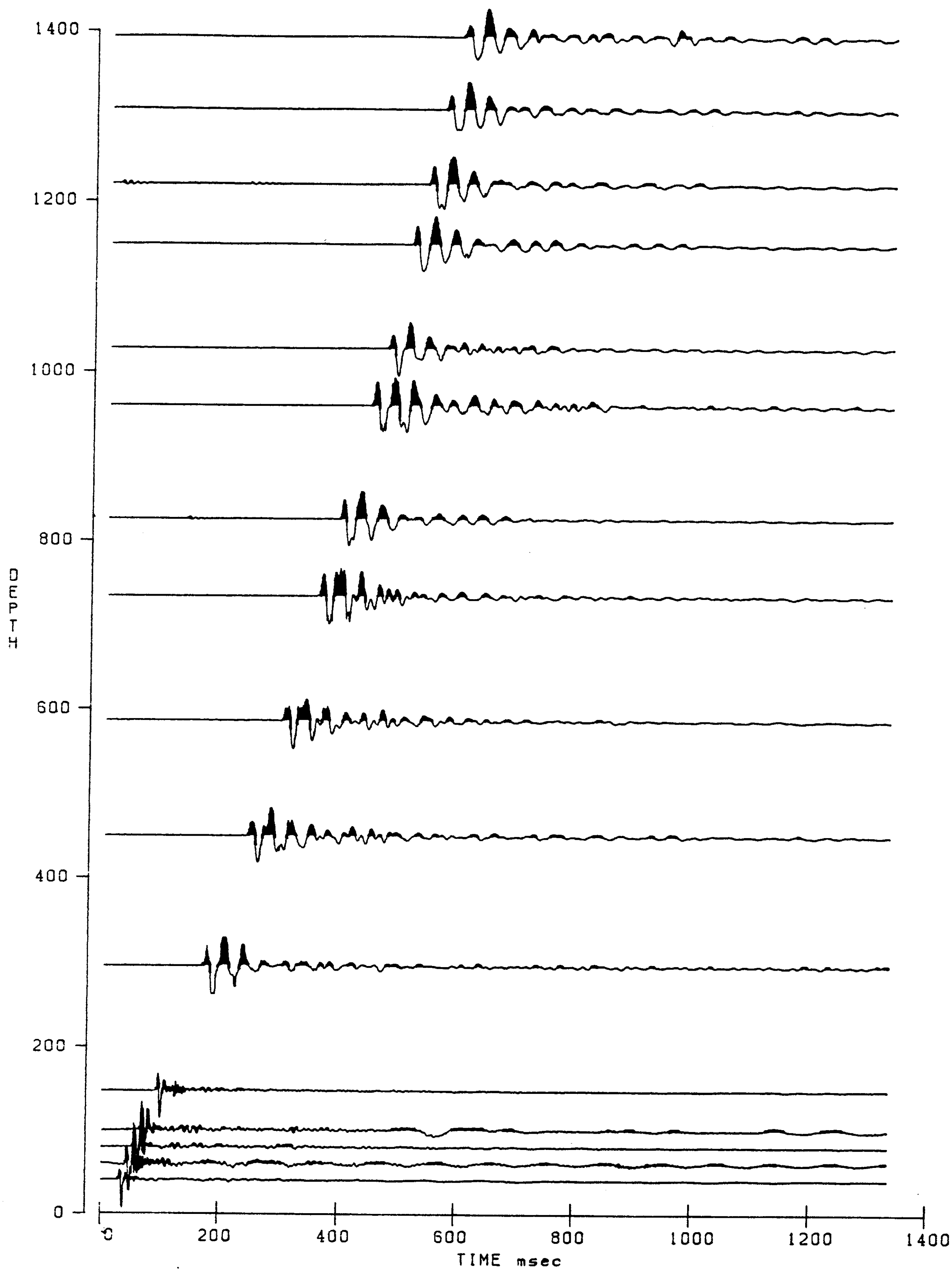
ONE-WAY TIME (MSEC)
FIGURE 36
+ SONIC POINT
O CHECK SHOT
BRIDGE OIL LIMITED
VOGEL #1
TIME-DEPTH & VELOCITY CURVES
BY
VELOCITY DATA PTY LTD
15 MARCH 1990
-2.4 — DATUM
318.8 — DILWYN FM
509.5 — PEMBER MEMBER
586.0 — PEBBLE POINT
634.6 — PAARATTE FM
902.0 — SKULL CK MEMBER
1027.2 — NULLAWARRE MEMBER
1148.0 — BELFAST MDST MEMBER
1199.5 — WAARRE FM
1219.5 — WAARRE SST
1308.9 — EUMERALLA FM
DEPTH BELOW DATUM (METRES)
Average velocity
RMS velocity
Interval velocity
AVERAGE & RMS VELOCITY (m/sec)
INTERVAL VELOCITY (m/sec)



VOGEL #1

VELOCITY SURVEY TRACE DISPLAY
Filter OUT-OUT
No gain recovery

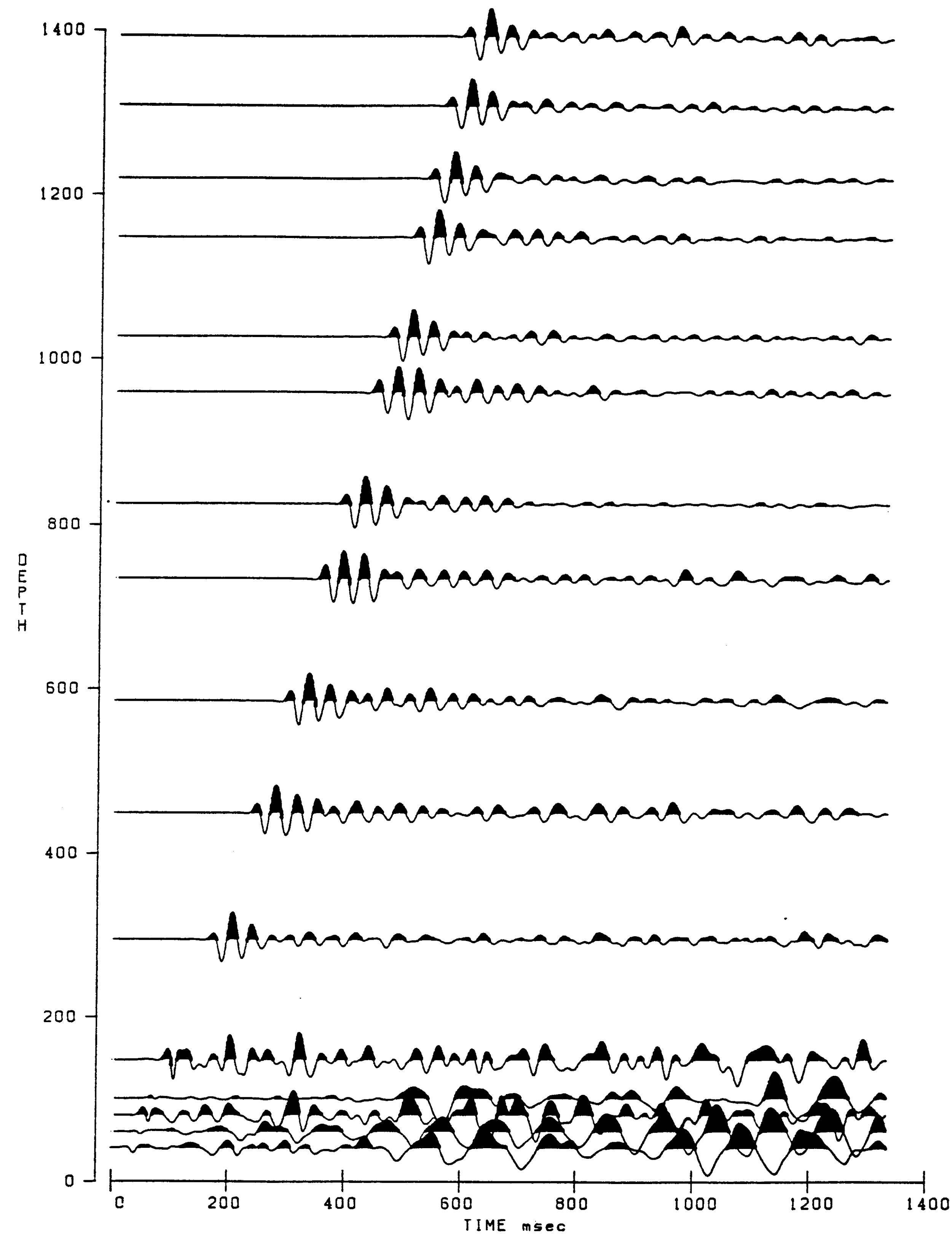
Figure 4A



VOGEL #1

VELOCITY SURVEY TRACE DISPLAY
Filter OUT-OUT
No gain recovery

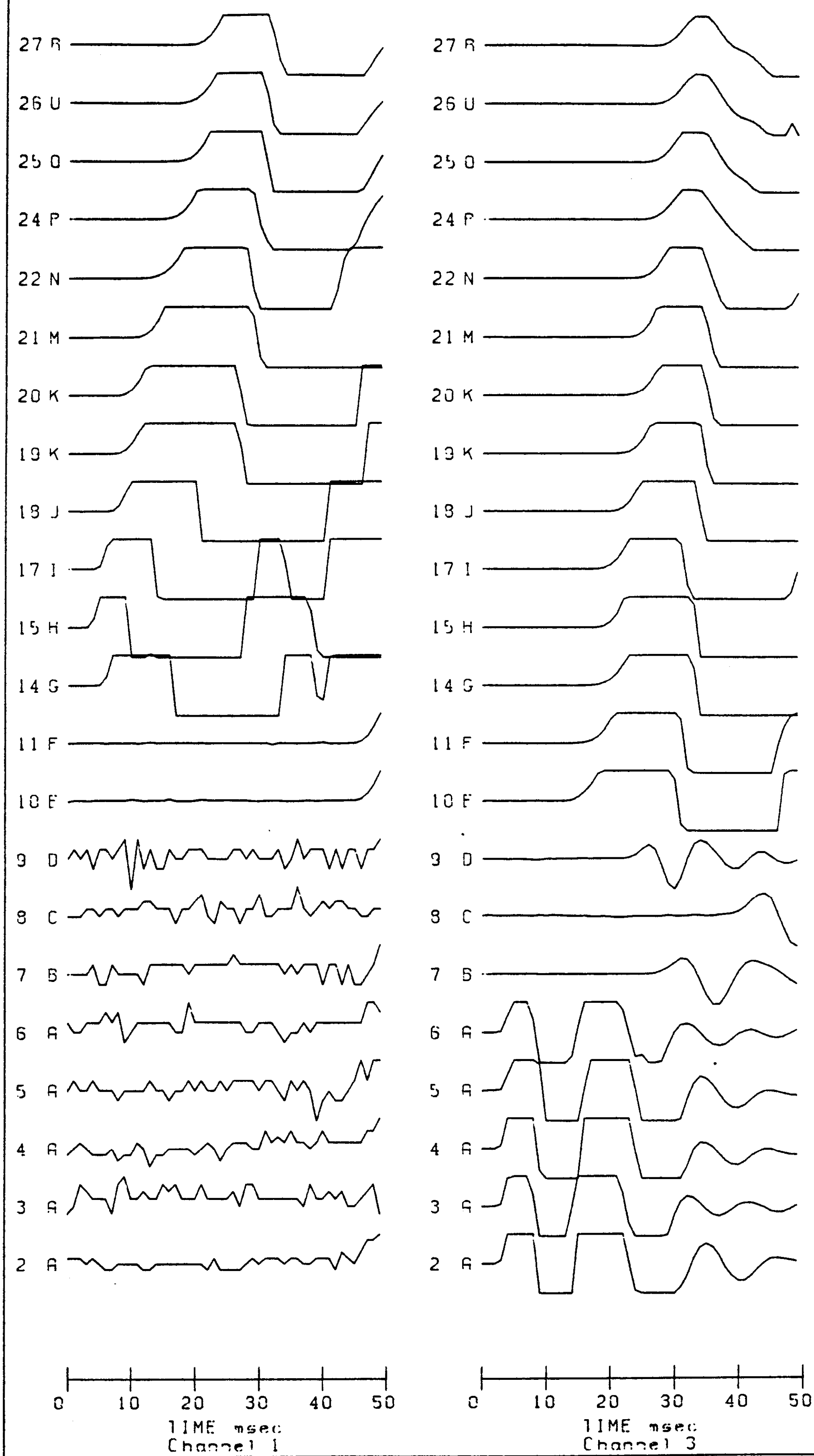
Figure 4B



VOGEL #1

VELOCITY SURVEY TRACE DISPLAY
Filter 5-40
Gain $T^{2.0}$

Figure 4C



VOGEL #1

VELOCITY SURVEY TRACE DISPLAY

Auxiliary channels

Filter OUT-OUT

Figure 4D

TABLE 1. Time-Depth curve values Page 1.

Well : VOGEL #1 Client : BRIDGE OIL LIMITED
Survey units : METRES Datum : 150.0
Calibrated sonic interval velocities used from 298.0 to 1394.0

Datum Depth	One-way time(ms)	-----VELOCITIES----- Average	RMS	Interval
2.0	1.6	1276	1276	1276
4.0	3.1	1283	1283	1290
6.0	4.7	1289	1289	1300
8.0	6.2	1293	1293	1307
10.0	7.7	1297	1297	1313
12.0	9.2	1300	1300	1316
14.0	10.7	1303	1303	1319
16.0	12.3	1305	1305	1321
18.0	13.8	1307	1307	1322
20.0	15.3	1309	1309	1324
22.0	16.8	1310	1310	1324
24.0	18.3	1311	1311	1325
26.0	19.8	1312	1312	1326
28.0	21.3	1313	1314	1327
30.0	22.8	1314	1314	1328
32.0	24.3	1315	1315	1329
34.0	25.8	1316	1316	1331
36.0	27.3	1317	1317	1333
38.0	28.8	1318	1318	1336
40.0	30.3	1319	1319	1341
42.0	31.8	1321	1321	1348
44.0	33.3	1322	1322	1357
46.0	34.7	1324	1324	1366
48.0	36.2	1326	1326	1373
50.0	37.6	1328	1328	1381
52.0	39.1	1330	1331	1389
54.0	40.5	1333	1333	1399
56.0	41.9	1335	1336	1413
58.0	43.3	1339	1339	1432
60.0	44.7	1342	1343	1458
62.0	46.0	1347	1348	1496
64.0	47.3	1352	1353	1550
66.0	48.6	1359	1360	1598
68.0	49.8	1365	1368	1633
70.0	51.0	1372	1375	1657
72.0	52.2	1379	1383	1671
74.0	53.4	1386	1390	1677
76.0	54.6	1392	1397	1675
78.0	55.8	1398	1403	1665
80.0	57.0	1403	1409	1646

Datum Depth	One-way time(ms)	-----VELOCITIES----- Average	RMS	Interval
82.0	58.2	1408	1413	1617
84.0	59.5	1411	1417	1578
86.0	60.8	1414	1420	1546
88.0	62.1	1417	1422	1526
90.0	63.4	1419	1424	1514
92.0	64.8	1420	1426	1510
94.0	66.1	1422	1428	1511
96.0	67.4	1424	1430	1518
98.0	68.7	1426	1432	1532
100.0	70.0	1429	1434	1556
102.0	71.3	1432	1437	1593
104.0	72.5	1435	1441	1647
106.0	73.6	1439	1445	1696
108.0	74.8	1444	1450	1733
110.0	75.9	1449	1455	1760
112.0	77.1	1453	1461	1780
114.0	78.2	1458	1466	1795
116.0	79.3	1463	1471	1805
118.0	80.4	1468	1476	1812
120.0	81.5	1473	1481	1818
122.0	82.6	1477	1486	1822
124.0	83.7	1482	1491	1824
126.0	84.8	1486	1496	1826
128.0	85.9	1491	1501	1828
130.0	87.0	1495	1505	1829
132.0	88.1	1499	1510	1831
134.0	89.1	1503	1514	1832
136.0	90.2	1507	1519	1834
138.0	91.3	1511	1523	1836
140.0	92.4	1515	1527	1838
142.0	93.5	1519	1531	1842
144.0	94.6	1522	1535	1847
146.0	95.7	1526	1539	1854
148.0	96.7	1530	1543	1865
150.0	97.8	1534	1547	1879
152.0	98.9	1538	1551	1898
154.0	99.9	1542	1555	1913
156.0	100.9	1545	1559	1923
158.0	102.0	1549	1564	1931
160.0	103.0	1553	1568	1937

Well : VOGEL #1
Survey units : METRES
Calibrated sonic interval velocities used from 298.0 to 1394.0

Client : BRIDGE OIL LIMITED
Datum : 150.0

Datum Depth	One-way time(ms)	VELOCITIES Average	RMS	Interval
162.0	104.0	1557	1572	1941
164.0	105.1	1561	1576	1943
166.0	106.1	1565	1580	1945
168.0	107.1	1568	1584	1947
170.0	108.2	1572	1588	1948
172.0	109.2	1575	1592	1948
174.0	110.2	1579	1595	1949
176.0	111.2	1582	1599	1949
178.0	112.3	1586	1602	1950
180.0	113.3	1589	1606	1950
182.0	114.3	1592	1609	1950
184.0	115.3	1595	1613	1950
186.0	116.4	1599	1616	1950
188.0	117.4	1602	1619	1950
190.0	118.4	1605	1622	1950
192.0	119.4	1608	1625	1950
194.0	120.5	1610	1628	1950
196.0	121.5	1613	1631	1950
198.0	122.5	1616	1634	1950
200.0	123.5	1619	1637	1950
202.0	124.6	1622	1640	1950
204.0	125.6	1624	1643	1950
206.0	126.6	1627	1646	1950
208.0	127.6	1630	1648	1950
210.0	128.7	1632	1651	1950
212.0	129.7	1635	1653	1950
214.0	130.7	1637	1656	1950
216.0	131.7	1640	1658	1950
218.0	132.8	1642	1661	1950
220.0	133.8	1644	1663	1950
222.0	134.8	1647	1666	1950
224.0	135.8	1649	1668	1950
226.0	136.9	1651	1670	1950
228.0	137.9	1653	1673	1950
230.0	138.9	1656	1675	1950
232.0	139.9	1658	1677	1950
234.0	141.0	1660	1679	1950
236.0	142.0	1662	1681	1950
238.0	143.0	1664	1683	1950
240.0	144.0	1666	1685	1950

Datum Depth	One-way time(ms)	VELOCITIES Average	RMS	Interval
242.0	145.1	1668	1687	1950
244.0	146.1	1670	1689	1950
246.0	147.1	1672	1691	1950
248.0	148.1	1674	1693	1950
250.0	149.2	1676	1695	1950
252.0	150.2	1678	1697	1950
254.0	151.2	1680	1699	1950
256.0	152.3	1681	1701	1950
258.0	153.3	1683	1702	1950
260.0	154.3	1685	1704	1950
262.0	155.3	1687	1706	1950
264.0	156.4	1688	1708	1950
266.0	157.4	1690	1709	1950
268.0	158.4	1692	1711	1950
270.0	159.4	1694	1713	1951
272.0	160.5	1695	1714	1951
274.0	161.5	1697	1716	1951
276.0	162.5	1698	1718	1951
278.0	163.5	1700	1719	1952
280.0	164.6	1702	1721	1952
282.0	165.6	1703	1722	1953
284.0	166.6	1705	1724	1955
286.0	167.6	1706	1725	1957
288.0	168.6	1708	1727	1959
290.0	169.7	1709	1728	1963
292.0	170.7	1711	1730	1968
294.0	171.7	1712	1731	1975
296.0	172.7	1714	1733	1986
298.0	173.7	1715	1735	2001
300.0	174.8	1717	1736	1921
302.0	175.7	1719	1738	2052
304.0	176.8	1720	1739	1934
306.0	177.8	1721	1740	1969
308.0	178.8	1723	1742	1975
310.0	179.8	1724	1743	1928
312.0	180.8	1725	1745	2024
314.0	181.8	1727	1746	2042
316.0	182.7	1729	1749	2147
318.0	183.7	1731	1750	2019
320.0	184.7	1733	1752	2123

Well : VOGEL #1 Client : BRIDGE OIL LIMITED
Survey units : METRES Datum : 150.0
Calibrated sonic interval velocities used from 298.0 to 1394.0

Datum Depth	One-way time(ms)	VELOCITIES Average	RMS	Interval	Datum Depth	One-way time(ms)	VELOCITIES Average	RMS	Interval
322.0	185.6	1735	1754	2067	402.0	224.5	1790	1810	2203
324.0	186.6	1736	1756	2087	404.0	225.5	1792	1812	2163
326.0	187.6	1738	1758	2084	406.0	226.4	1793	1813	2112
328.0	188.5	1740	1759	2080	408.0	227.3	1795	1815	2118
330.0	189.5	1742	1762	2133	410.0	228.3	1796	1816	2200
332.0	190.4	1744	1763	2112	412.0	229.2	1797	1818	2071
334.0	191.4	1745	1765	2010	414.0	230.2	1799	1819	2112
336.0	192.5	1746	1766	1891	416.0	231.1	1800	1820	2127
338.0	193.4	1748	1767	2067	418.0	232.0	1801	1822	2164
340.0	194.4	1749	1768	1990	420.0	233.0	1803	1823	2123
342.0	195.4	1750	1770	2061	422.0	233.9	1804	1824	2050
344.0	196.3	1752	1772	2113	424.0	234.9	1805	1825	2101
346.0	197.3	1753	1773	1996	426.0	235.8	1806	1827	2146
348.0	198.4	1754	1774	1962	428.0	236.8	1808	1828	2154
350.0	199.3	1756	1776	2090	430.0	237.8	1809	1829	1999
352.0	200.3	1758	1778	2138	432.0	238.7	1810	1830	2124
354.0	201.2	1760	1779	2145	434.0	239.7	1810	1831	1923
356.0	202.1	1762	1781	2188	436.0	240.8	1811	1831	1916
358.0	203.0	1763	1783	2156	438.0	241.8	1812	1832	2057
360.0	204.0	1765	1785	2071	440.0	242.7	1813	1833	2088
362.0	205.0	1766	1786	1966	442.0	243.6	1814	1835	2223
364.0	206.0	1767	1787	2011	444.0	244.5	1816	1836	2236
366.0	207.0	1768	1788	2033	446.0	245.4	1817	1838	2201
368.0	208.0	1769	1789	1999	448.0	246.4	1818	1839	2064
370.0	209.0	1770	1790	2014	450.0	247.3	1819	1840	2132
372.0	210.0	1771	1791	1975	452.0	248.3	1820	1841	2047
374.0	211.1	1772	1792	1833	454.0	249.2	1822	1842	2297
376.0	212.1	1773	1793	2002	456.0	250.1	1823	1844	2228
378.0	213.0	1774	1794	2083	458.0	251.0	1825	1846	2249
380.0	214.0	1776	1796	2117	460.0	251.8	1826	1847	2248
382.0	215.0	1777	1797	2072	462.0	252.7	1828	1849	2354
384.0	216.0	1778	1798	2010	464.0	253.5	1830	1852	2548
386.0	216.9	1780	1799	2128	466.0	254.4	1832	1853	2308
388.0	217.8	1782	1802	2260	468.0	255.2	1834	1855	2301
390.0	218.7	1783	1803	2138	470.0	256.2	1835	1856	2143
392.0	219.8	1784	1803	1852	472.0	257.1	1836	1857	2150
394.0	220.8	1785	1804	2016	474.0	258.0	1837	1859	2168
396.0	221.7	1786	1806	2091	476.0	258.9	1838	1860	2128
398.0	222.7	1787	1807	2108	478.0	259.8	1840	1861	2219
400.0	223.6	1789	1809	2149	480.0	260.7	1841	1863	2321

Well : VOGEL #1 Client : BRIDGE OIL LIMITED
Survey units : METRES Datum : 150.0
Calibrated sonic interval velocities used from 298.0 to 1394.0

Datum Depth	One-way time(ms)	-----VELOCITIES----- Average	RMS	Interval
482.0	261.4	1844	1866	2839
484.0	262.2	1846	1868	2481
486.0	263.1	1847	1870	2357
488.0	263.9	1849	1872	2302
490.0	264.8	1850	1873	2272
492.0	265.7	1852	1874	2213
494.0	266.6	1853	1876	2264
496.0	267.5	1854	1877	2300
498.0	268.3	1856	1879	2379
500.0	269.2	1857	1880	2240
502.0	270.1	1858	1882	2207
504.0	271.1	1859	1882	2030
506.0	271.9	1861	1884	2505
508.0	272.6	1864	1888	2910
510.0	273.5	1865	1889	2176
512.0	274.7	1864	1888	1722
514.0	275.7	1864	1888	1921
516.0	276.7	1865	1889	2081
518.0	277.6	1866	1890	2107
520.0	278.5	1867	1891	2251
522.0	279.3	1869	1892	2381
524.0	280.2	1870	1894	2340
526.0	281.1	1871	1895	2282
528.0	281.9	1873	1897	2381
530.0	282.7	1874	1899	2403
532.0	283.6	1876	1900	2435
534.0	284.4	1878	1902	2421
536.0	285.2	1879	1904	2401
538.0	286.1	1881	1905	2370
540.0	286.9	1882	1907	2408
542.0	287.8	1884	1908	2351
544.0	288.6	1885	1910	2358
546.0	289.4	1886	1911	2357
548.0	290.3	1888	1913	2294
550.0	291.2	1889	1914	2391
552.0	292.0	1890	1916	2378
554.0	292.9	1892	1917	2328
556.0	293.7	1893	1918	2281
558.0	294.6	1894	1919	2246
560.0	295.5	1895	1921	2312

Datum Depth	One-way time(ms)	-----VELOCITIES----- Average	RMS	Interval
562.0	296.3	1897	1923	2629
564.0	297.1	1899	1924	2436
566.0	297.9	1900	1926	2361
568.0	298.8	1901	1927	2242
570.0	299.7	1902	1928	2380
572.0	300.4	1904	1930	2574
574.0	301.2	1905	1932	2472
576.0	302.0	1908	1934	2781
578.0	302.8	1909	1936	2494
580.0	303.6	1910	1937	2295
582.0	304.5	1911	1938	2261
584.0	305.4	1913	1939	2370
586.0	306.1	1914	1941	2593
588.0	306.9	1916	1944	2753
590.0	307.6	1918	1946	2876
592.0	308.2	1921	1949	2909
594.0	309.0	1923	1951	2805
596.0	309.6	1925	1955	3180
598.0	310.3	1927	1957	2957
600.0	311.0	1930	1960	2856
602.0	311.7	1931	1962	2754
604.0	312.4	1933	1964	2807
606.0	313.0	1936	1968	3180
608.0	313.7	1938	1970	3000
610.0	314.3	1941	1973	3082
612.0	315.0	1943	1976	2973
614.0	315.7	1945	1979	2940
616.0	316.4	1947	1981	2969
618.0	317.1	1949	1984	2877
620.0	317.8	1951	1986	2825
622.0	318.5	1953	1988	2810
624.0	319.2	1955	1990	2726
626.0	320.0	1956	1992	2673
628.0	320.7	1958	1994	2639
630.0	321.4	1960	1997	3078
632.0	322.1	1962	1999	2743
634.0	322.9	1964	2000	2666
636.0	323.6	1965	2002	2732
638.0	324.4	1967	2004	2608
640.0	325.1	1968	2005	2514

TABLE 1. Time-Depth curve values

Well : VOGEL #1
Survey units : METRES
Calibrated sonic interval velocities used from 298.0 to 1394.0

Client : BRIDGE OIL LIMITED
Datum : 150.0

Datum Depth	One-way time(ms)	-----VELOCITIES----- Average	RMS	Interval
642.0	325.9	1970	2007	2774
644.0	326.7	1971	2009	2466
646.0	327.5	1973	2010	2474
648.0	328.3	1974	2011	2448
650.0	329.1	1975	2012	2499
652.0	329.9	1976	2014	2498
654.0	330.6	1978	2016	2785
656.0	331.4	1980	2017	2645
658.0	332.1	1981	2019	2612
660.0	332.8	1983	2021	2969
662.0	333.5	1985	2023	2805
664.0	334.3	1986	2025	2476
666.0	335.1	1988	2026	2697
668.0	335.8	1989	2028	2629
670.0	336.6	1990	2029	2533
672.0	337.4	1992	2031	2510
674.0	338.2	1993	2032	2578
676.0	339.0	1994	2033	2535
678.0	339.8	1995	2035	2527
680.0	340.6	1997	2036	2579
682.0	341.4	1998	2037	2307
684.0	342.3	1998	2038	2356
686.0	343.1	2000	2039	2508
688.0	343.9	2001	2040	2568
690.0	344.7	2002	2041	2460
692.0	345.5	2003	2042	2373
694.0	346.3	2004	2043	2510
696.0	347.1	2005	2044	2427
698.0	347.9	2006	2045	2514
700.0	348.7	2007	2047	2486
702.0	349.6	2008	2047	2256
704.0	350.4	2009	2048	2417
706.0	351.2	2010	2049	2587
708.0	352.0	2011	2051	2480
710.0	352.9	2012	2051	2369
712.0	353.7	2013	2052	2372
714.0	354.5	2014	2053	2419
716.0	355.4	2015	2054	2438
718.0	356.1	2016	2055	2590
720.0	356.9	2017	2057	2594
722.0	357.7	2018	2058	2408
724.0	358.5	2019	2059	2438
726.0	359.4	2020	2060	2480
728.0	360.1	2021	2061	2535
730.0	360.9	2022	2062	2515
732.0	361.7	2024	2063	2488
734.0	362.7	2024	2063	2166
736.0	363.5	2025	2064	2282
738.0	364.3	2026	2065	2680
740.0	365.0	2027	2067	2823
742.0	365.7	2029	2068	2683
744.0	366.5	2030	2070	2713
746.0	367.2	2031	2071	2648
748.0	368.0	2033	2073	2627
750.0	368.8	2034	2074	2634
752.0	369.5	2035	2075	2632
754.0	370.3	2036	2076	2638
756.0	371.0	2038	2078	2699
758.0	371.8	2039	2079	2698
760.0	372.5	2040	2081	2725
762.0	373.2	2042	2082	2740
764.0	374.0	2043	2084	2651
766.0	374.7	2044	2085	2650
768.0	375.5	2045	2086	2548
770.0	376.3	2046	2087	2663
772.0	377.0	2048	2089	2808
774.0	377.7	2049	2090	2718
776.0	378.4	2051	2092	2773
778.0	379.1	2052	2093	2812
780.0	379.9	2053	2094	2549
782.0	380.7	2054	2095	2512
784.0	381.4	2056	2097	2950
786.0	382.1	2057	2099	2872
788.0	382.8	2058	2100	2695
790.0	383.6	2059	2101	2616
792.0	384.4	2061	2103	2626
794.0	385.1	2062	2104	2668
796.0	385.8	2063	2105	2766
798.0	386.6	2064	2107	2770
800.0	387.3	2065	2108	2580

TABLE 1. Time-Depth curve values Page 6.

Well : VOGEL #1
Survey units : METRES
Calibrated sonic interval velocities used from 298.0 to 1394.0

Client : BRIDGE OIL LIMITED
Datum : 150.0

Datum Depth	One-way time(ms)	VELOCITIES Average	RMS	Interval
802.0	388.1	2066	2109	2539
804.0	388.9	2067	2110	2592
806.0	389.7	2068	2111	2640
808.0	390.4	2070	2112	2659
810.0	391.2	2071	2113	2586
812.0	391.9	2072	2115	2823
814.0	392.6	2073	2116	2722
816.0	393.4	2074	2117	2705
818.0	394.1	2076	2118	2652
820.0	395.0	2076	2119	2350
822.0	395.9	2076	2119	2244
824.0	396.6	2077	2120	2553
826.0	397.4	2078	2121	2493
828.0	398.3	2079	2122	2438
830.0	399.1	2080	2122	2391
832.0	399.9	2080	2123	2462
834.0	400.7	2081	2124	2545
836.0	401.4	2082	2125	2688
838.0	402.2	2083	2126	2572
840.0	403.0	2084	2127	2535
842.0	403.8	2085	2128	2487
844.0	404.6	2086	2128	2410
846.0	405.4	2087	2129	2547
848.0	406.2	2087	2130	2490
850.0	407.0	2088	2131	2506
852.0	407.8	2089	2132	2518
854.0	408.6	2090	2132	2517
856.0	409.4	2091	2133	2500
858.0	410.2	2092	2134	2479
860.0	411.0	2092	2135	2491
862.0	411.9	2093	2135	2433
864.0	412.7	2094	2136	2450
866.0	413.5	2094	2137	2459
868.0	414.3	2095	2137	2469
870.0	415.1	2096	2138	2457
872.0	415.9	2097	2139	2548
874.0	416.6	2098	2140	2686
876.0	417.4	2099	2141	2570
878.0	418.2	2099	2142	2524
880.0	419.0	2100	2142	2484
882.0	419.8	2101	2143	2510
884.0	420.5	2102	2144	2733
886.0	421.3	2103	2145	2761
888.0	422.0	2104	2147	2740
890.0	422.8	2105	2148	2572
892.0	423.5	2106	2148	2603
894.0	424.3	2107	2149	2523
896.0	425.2	2107	2150	2452
898.0	426.0	2108	2150	2438
900.0	426.8	2109	2151	2458
902.0	427.6	2109	2152	2444
904.0	428.4	2110	2153	2635
906.0	429.1	2111	2153	2551
908.0	429.9	2112	2154	2558
910.0	430.7	2113	2155	2461
912.0	431.5	2113	2156	2518
914.0	432.3	2114	2156	2494
916.0	433.1	2115	2157	2513
918.0	433.9	2116	2158	2583
920.0	434.7	2116	2159	2583
922.0	435.5	2117	2159	2597
924.0	436.2	2118	2160	2677
926.0	437.0	2119	2161	2584
928.0	437.8	2120	2162	2511
930.0	438.5	2121	2163	2841
932.0	439.2	2122	2164	2589
934.0	440.0	2123	2165	2715
936.0	440.7	2124	2166	2672
938.0	441.5	2125	2167	2644
940.0	442.2	2126	2168	2789
942.0	442.9	2127	2169	2685
944.0	443.7	2128	2170	2626
946.0	444.5	2128	2171	2690
948.0	445.2	2129	2172	2640
950.0	446.0	2130	2173	2665
952.0	446.7	2131	2174	2693
954.0	447.4	2132	2175	2777
956.0	448.2	2133	2176	2687
958.0	449.0	2134	2176	2554
960.0	449.7	2135	2177	2560

Well : VOGEL #1
Survey units : METRES
Client : BRIDGE OIL LIMITED
Datum : 150.0
Calibrated sonic interval velocities used from 298.0 to 1394.0

Datum Depth	One-way time(ms)	-----VELOCITIES----- Average	RMS	Interval
962.0	450.5	2135	2178	2671
964.0	451.3	2136	2179	2542
966.0	452.1	2137	2179	2537
968.0	452.8	2138	2180	2569
970.0	453.6	2138	2181	2513
972.0	454.4	2139	2182	2579
974.0	455.2	2140	2182	2587
976.0	456.0	2141	2183	2554
978.0	456.8	2141	2184	2535
980.0	457.5	2142	2184	2567
982.0	458.3	2143	2185	2582
984.0	459.1	2144	2186	2651
986.0	459.8	2144	2187	2673
988.0	460.6	2145	2188	2649
990.0	461.3	2146	2188	2625
992.0	462.0	2147	2190	2788
994.0	462.8	2148	2190	2716
996.0	463.5	2149	2191	2621
998.0	464.3	2149	2192	2616
1000.0	465.1	2150	2193	2526
1002.0	465.9	2151	2193	2542
1004.0	466.7	2151	2194	2555
1006.0	467.5	2152	2195	2549
1008.0	468.2	2153	2195	2617
1010.0	469.0	2154	2196	2555
1012.0	469.7	2154	2197	2684
1014.0	470.5	2155	2197	2575
1016.0	471.3	2156	2198	2499
1018.0	472.1	2156	2199	2570
1020.0	472.9	2157	2199	2583
1022.0	473.6	2158	2200	2587
1024.0	474.4	2158	2201	2506
1026.0	475.2	2159	2201	2533
1028.0	476.0	2160	2202	2505
1030.0	476.7	2161	2203	2963
1032.0	477.4	2162	2204	3081
1034.0	478.0	2163	2206	2984
1036.0	478.7	2164	2207	3018
1038.0	479.3	2165	2208	3059
1040.0	480.1	2166	2209	2736
1042.0	480.8	2167	2210	2789
1044.0	481.5	2168	2211	2863
1046.0	482.2	2169	2212	2811
1048.0	483.0	2170	2213	2675
1050.0	483.7	2171	2214	2751
1052.0	484.4	2172	2215	2793
1054.0	485.1	2173	2216	2872
1056.0	485.8	2174	2217	2954
1058.0	486.5	2175	2218	2905
1060.0	487.2	2176	2220	2876
1062.0	487.8	2177	2221	2919
1064.0	488.5	2178	2222	2903
1066.0	489.2	2179	2223	2848
1068.0	489.9	2180	2224	2809
1070.0	490.7	2181	2225	2808
1072.0	491.4	2182	2226	2858
1074.0	492.1	2183	2227	2823
1076.0	492.8	2184	2228	2897
1078.0	493.4	2185	2229	2933
1080.0	494.1	2186	2230	2897
1082.0	494.8	2187	2231	2880
1084.0	495.5	2188	2232	2892
1086.0	496.2	2189	2233	2888
1088.0	496.9	2190	2234	2871
1090.0	497.6	2191	2235	2894
1092.0	498.3	2192	2236	2922
1094.0	499.0	2192	2237	2832
1096.0	499.7	2193	2238	2817
1098.0	500.4	2194	2239	2948
1100.0	501.1	2195	2240	2855
1102.0	501.8	2196	2241	2887
1104.0	502.4	2197	2243	3071
1106.0	503.1	2198	2244	2805
1108.0	503.8	2199	2245	2881
1110.0	504.5	2200	2246	3065
1112.0	505.2	2201	2247	2909
1114.0	505.9	2202	2248	2845
1116.0	506.6	2203	2249	2835
1118.0	507.3	2204	2250	2852
1120.0	508.0	2205	2251	2842

Well : VOGEL #1 Client : BRIDGE OIL LIMITED
Survey units : METRES Datum : 150.0
Calibrated sonic interval velocities used from 298.0 to 1394.0

Datum Depth	One-way time(ms)	Average	RMS	Interval	Datum Depth	One-way time(ms)	Average	RMS	Interval
		-----VELOCITIES-----					-----VELOCITIES-----		
1122.0	508.7	2206	2251	2823	1202.0	537.2	2238	2285	2911
1124.0	509.4	2207	2252	2858	1204.0	537.9	2238	2285	2938
1126.0	510.1	2207	2253	2831	1206.0	538.5	2239	2287	3054
1128.0	510.8	2208	2254	2690	1208.0	539.2	2240	2288	3012
1130.0	511.6	2209	2255	2727	1210.0	539.9	2241	2289	3021
1132.0	512.2	2210	2256	2995	1212.0	540.5	2242	2290	3050
1134.0	512.9	2211	2257	3189	1214.0	541.1	2243	2291	3209
1136.0	513.5	2212	2259	3235	1216.0	541.8	2244	2292	3154
1138.0	514.1	2213	2260	3097	1218.0	542.4	2246	2293	3221
1140.0	514.8	2214	2261	2909	1220.0	543.0	2247	2295	3413
1142.0	515.5	2215	2262	2847	1222.0	543.6	2248	2296	3023
1144.0	516.3	2216	2262	2660	1224.0	544.4	2249	2297	2837
1146.0	517.0	2217	2263	2762	1226.0	545.0	2249	2298	2872
1148.0	517.7	2218	2264	2863	1228.0	545.8	2250	2298	2772
1150.0	518.4	2218	2265	2642	1230.0	546.5	2251	2299	2779
1152.0	519.2	2219	2266	2785	1232.0	547.2	2252	2300	2880
1154.0	519.9	2220	2266	2768	1234.0	547.9	2252	2301	2982
1156.0	520.6	2220	2267	2688	1236.0	548.5	2253	2302	2905
1158.0	521.4	2221	2268	2639	1238.0	549.2	2254	2303	2934
1160.0	522.1	2222	2268	2626	1240.0	549.9	2255	2304	3032
1162.0	522.9	2222	2269	2649	1242.0	550.4	2256	2305	3619
1164.0	523.6	2223	2269	2719	1244.0	551.1	2257	2306	3071
1166.0	524.4	2223	2270	2575	1246.0	551.8	2258	2307	3001
1168.0	525.2	2224	2271	2659	1248.0	552.4	2259	2308	3074
1170.0	525.9	2225	2271	2675	1250.0	553.0	2260	2310	3246
1172.0	526.6	2225	2272	2776	1252.0	553.6	2261	2311	3343
1174.0	527.3	2226	2273	2842	1254.0	554.3	2262	2312	3078
1176.0	528.0	2227	2274	2867	1256.0	555.0	2263	2313	2917
1178.0	528.8	2228	2274	2638	1258.0	555.7	2264	2314	2867
1180.0	529.5	2228	2275	2661	1260.0	556.1	2266	2316	4256
1182.0	530.3	2229	2276	2735	1262.0	556.7	2267	2317	3186
1184.0	531.0	2230	2276	2731	1264.0	557.5	2267	2318	2806
1186.0	531.8	2230	2277	2689	1266.0	558.2	2268	2319	2845
1188.0	532.4	2231	2278	2895	1268.0	558.9	2269	2319	2863
1190.0	533.2	2232	2279	2837	1270.0	559.5	2270	2320	2981
1192.0	533.8	2233	2279	2862	1272.0	560.2	2271	2321	2885
1194.0	534.5	2234	2281	3047	1274.0	560.9	2271	2322	2871
1196.0	535.2	2235	2282	3059	1276.0	561.6	2272	2322	2822
1198.0	535.8	2236	2283	3018	1278.0	562.4	2273	2323	2762
1200.0	536.5	2237	2284	2889	1280.0	563.1	2273	2324	2881

TABLE 1. Time-Depth curve values

Well : VOGEL #1 Client : BRIDGE OIL LIMITED
Survey units : METRES Datum : 150.0
Calibrated sonic interval velocities used from 298.0 to 1394.0

Datum Depth	One-way time(ms)	VELOCITIES Average	RMS	Interval	Datum Depth	One-way time(ms)	VELOCITIES Average	RMS	Interval
1282.0	563.7	2274	2325	2904	1338.0	582.4	2297	2350	2828
1284.0	564.4	2275	2325	2860	1340.0	583.1	2298	2351	2899
1286.0	565.1	2276	2326	2918	1342.0	583.8	2299	2351	2909
1288.0	565.8	2276	2327	2994	1344.0	584.5	2300	2352	2891
1290.0	566.4	2277	2328	3077	1346.0	585.2	2300	2353	2953
1292.0	567.1	2278	2329	3025	1348.0	585.9	2301	2353	2809
1294.0	567.7	2279	2330	3134	1350.0	586.6	2301	2354	2741
1296.0	568.4	2280	2331	2960	1352.0	587.3	2302	2355	2905
1298.0	569.1	2281	2332	2869	1354.0	588.0	2303	2355	2775
1300.0	569.7	2282	2333	3383	1356.0	588.8	2303	2356	2634
1302.0	570.4	2283	2334	3026	1358.0	589.5	2304	2356	2707
1304.0	571.1	2283	2335	2774	1360.0	590.2	2304	2357	2805
1306.0	571.6	2285	2336	3992	1362.0	591.0	2304	2357	2477
1308.0	572.2	2286	2337	3042	1364.0	591.8	2305	2357	2679
1310.0	572.7	2287	2340	4266	1366.0	592.5	2306	2358	2763
1312.0	573.4	2288	2341	3108	1368.0	593.2	2306	2358	2737
1314.0	574.1	2289	2341	2694	1370.0	593.9	2307	2359	2795
1316.0	574.8	2290	2342	2902	1372.0	594.6	2307	2360	2827
1318.0	575.5	2290	2343	2867	1374.0	595.3	2308	2360	2853
1320.0	576.1	2291	2344	3140	1376.0	596.0	2309	2361	2958
1322.0	576.8	2292	2345	3031	1378.0	596.7	2309	2362	2925
1324.0	577.5	2293	2345	2917	1380.0	597.4	2310	2362	2950
1326.0	578.1	2294	2346	2995	1382.0	598.1	2311	2363	2971
1328.0	578.8	2294	2347	2927	1384.0	598.8	2311	2364	2877
1330.0	579.5	2295	2348	2793	1386.0	599.4	2312	2365	3010
1332.0	580.3	2296	2348	2777	1388.0	600.1	2313	2366	3013
1334.0	581.0	2296	2349	2730	1390.0	600.8	2314	2366	2853
1336.0	581.7	2297	2349	2824	1392.0	601.4	2314	2367	3081

VELSEIS PTY LTD

WELL SURVEY CALCULATIONS Page 1

Company : BRIDGE OIL LIMITED
Well : VOGEL #1
Elevations : Datum : 150.0 Ground : 142.6 Kelly : 147.6

Latitude : 038 32 35
Longitude : 143 02 13

Survey date : 15-MAR-90
Survey units : METRES
Times in milliseconds.

Rig identification :
Energy source : AN60
Logger : GEARHART DDL007
Near surface velocity
for shot statics: 630
Instrument delay: 4.0 ms

Shot data :

Location	Elevation	Offset
A	142.6	8.5
B	142.6	17.0
C	142.6	25.5
D	142.6	10.0
E	142.6	7.0
F	142.6	6.4
G	142.6	7.0
H	142.6	8.4
I	142.6	8.2
J	142.6	8.4
K	142.6	10.2
L	142.6	10.0
M	142.6	10.2
N	142.6	12.0
O	142.6	11.8
P	142.6	12.0
Q	142.6	13.8
R	142.6	13.6
S	142.6	13.8
T	142.6	13.8
U	142.6	13.8

SHOT CALCULATIONS

Shot No	Geophone depth Kelly	Geophone depth Datum	Shot Locn	Shot Depth	TIMES Record	TIMES Corr.	TIMES Avg.	TIMES Below datum	Check shot interval Distance	Check shot interval Time	Velocities Average	Velocities RMS	Velocities Interval
DATUM	-2.4	0.0					-3.0	0.0					
									42.4	32.1			1320.9
2	40.0	42.4	A	0.5	29.0	29.1	29.1	32.1			1320.9	1320.9	
									20.0	14.2			1408.5
3	60.0	62.4	A	0.5	43.0	43.3	43.3	46.3			1347.7	1348.3	
									20.0	12.2			1639.3
4	80.0	82.4	A	0.5	55.0	55.5	55.5	58.5			1408.5	1414.0	
									20.0	13.0			1538.5
5	100.0	102.4	A	0.5	68.0	68.5	68.5	71.5			1432.2	1437.4	
									47.6	26.3			1809.9
6	147.6	150.0	A	0.5	94.0	94.6							
7	147.6	150.0	B	0.5	96.0	96.1							
8	147.6	150.0	C	0.5	100.0	99.3 N/U							
9	147.6	150.0	D	0.5	93.0	93.6	94.8	97.8			1533.7	15[illegible].4	
									147.4	75.6			1949.7
27	295.0	297.4	R	1.0	169.0	170.4	170.4	173.4			1715.1	1733.8	
									155.0	75.1			2063.9
26	450.0	452.4	U	1.0	244.0	245.5	245.5	248.5			1820.5	1839.8	
									136.0	58.5			2324.8
PEBBLE POINT 25	586.0	588.4	Q	1.0	302.5	304.0	304.0	307.0			1916.6	1941.6	

VELSEIS PTY LTD **WELL SURVEY CALCULATIONS** **Page 2**

Company : BRIDGE OIL LIMITED
Well : VOGEL #1
Elevations : Datum : 150.0 Ground : 142.6 Kelly : 147.6
Shot data : Location Elevation Offset

Location	Elevation	Offset
A	142.6	8.5
B	142.6	17.0
C	142.6	25.5
D	142.6	10.0
E	142.6	7.0
F	142.6	6.4
G	142.6	7.0
H	142.6	8.4
I	142.6	8.2
J	142.6	8.4
K	142.6	10.2
L	142.6	10.0
M	142.6	10.2
N	142.6	12.0
O	142.6	11.8
P	142.6	12.0
Q	142.6	13.8
R	142.6	13.6
S	142.6	13.8
T	142.6	13.8
U	142.6	13.8

Latitude : 038 32 35
Longitude : 143 02 13
Rig identification :
Energy source : AN60
Logger : GEARHART DDL007
Near surface velocity
for shot statics: 630
Instrument delay: 4.0 ms

Survey date : 15-MAR-90
Survey units : METRES
Times in milliseconds.

SHOT CALCULATIONS

Shot No	Geophone depth Kelly	Geophone depth Datum	Shot Locn	Shot Depth	TIMES Record	TIMES Corr.	TIMES Avg.	TIMES Below datum	Check shot interval Distance	Check shot interval Time	Velocities Average	Velocities RMS	Velocities Interval
PEBBLE POINT													
25	586.0	588.4	Q	1.0	302.5	304.0	304.0	307.0			1916.6	1941.6	
									148.5	56.9			2609.8
10	734.5	736.9	E	1.0	359.0	360.6							
11	734.5	736.9	F	1.0	359.0	360.6							
24	734.5	736.9	P	1.0	360.0	361.5	360.9	363.9			2025.0	2060.4	
									90.5	34.1			2654.0
22	825.0	827.4	N	1.0	393.5	395.0	395.0	398.0			2078.9	2117.8	
									134.9	52.6			2564.6
21	959.9	962.3	M	1.0	446.0	447.6	447.6	450.6			2135.6	2174.7	
									67.3	26.0			2588.5
NULLAWARRE MEMBER													
20	1027.2	1029.6	K	1.0	472.0	473.6	473.6	476.6			2160.3	2199.3	
									120.8	42.0			2876.2
BELFAST MDST MEMBER													
14	1148.0	1150.4	G	1.0	514.5	516.1							
19	1148.0	1150.4	K	1.0	513.5	515.1	515.6	518.6			2218.3	2261.7	
									71.5	25.0			2860.0
WAARRE SST													
18	1219.5	1221.9	J	1.0	539.0	540.6	540.6	543.6			2247.8	2292.6	
									89.4	29.5			3030.5
EUMERALLA FM													
17	1308.9	1311.3	I	1.0	568.5	570.1	570.1	573.1			2288.1	2336.3	

VELSEIS PTY LTD

WELL SURVEY CALCULATIONS Page 3

Company : BRIDGE OIL LIMITED
Well : VOGEL #1
Elevations : Datum : 150.0 Ground : 142.6 Kelly : 147.6

Latitude : 038 32 35
Longitude : 143 02 13
Rig identification :
Energy source : AN60
Logger : GEARHART DDL007
Near surface velocity for shot statics: 630
Instrument delay: 4.0 ms

Survey date : 15-MAR-90
Survey units : METRES
Times in milliseconds.

Shot data :

Location	Elevation	Offset
A	142.6	8.5
B	142.6	17.0
C	142.6	25.5
D	142.6	10.0
E	142.6	7.0
F	142.6	6.4
G	142.6	7.0
H	142.6	8.4
I	142.6	8.2
J	142.6	8.4
K	142.6	10.2
L	142.6	10.0
M	142.6	10.2
N	142.6	12.0
O	142.6	11.8
P	142.6	12.0
Q	142.6	13.8
R	142.6	13.6
S	142.6	13.8
T	142.6	13.8
U	142.6	13.8

SHOT CALCULATIONS

Shot No	Geophone depth Kelly	Geophone depth Datum	Shot Locn	Shot Depth	TIMES Record	TIMES Corr.	TIMES Avg.	TIMES Below datum	Check shot interval Distance	Check shot interval Time	Velocities Average	Velocities RMS	Velocities Interval
EUMERALLA FM													
17	1308.9	1311.3	I	1.0	568.5	570.1	570.1	573.1			2288.1	2336.3	
									84.1	29.5			2850.8
15	1393.0	1395.4	H	1.0	598.0	599.6	599.6	602.6			2315.6	2364.1	

VELSEIS PTY LTD

WELL SURVEY CALCULATIONS

Company : BRIDGE OIL LIMITED
Well : VOGEL #1
Elevations : Datum : 150.0 Ground : 142.6 Kelly : 147.6

Latitude : 038 32 35
Longitude : 143 02 13

Survey date : 15-MAR-90
Survey units : METRES
Times in milliseconds.

SONIC DRIFT

	Geophone depth Kelly	---- Datum	Check shot times Average	- Below datum	Check shot interval Distance	-- Time	Sonic Int. time	Interval usec/m	sonic drift --- msec	Cumulative drift msec
DATUM										
	-2.4	0.0	-3.0	0.0						
					42.4	32.1				
	40.0	42.4	29.1	32.1						
					20.0	14.2				
	60.0	62.4	43.3	46.3						
					20.0	12.2				
	80.0	82.4	55.5	58.5						
					20.0	13.0				
	100.0	102.4	68.5	71.5						
					47.6	26.3				
	147.6	150.0	94.8	97.8						
					147.4	75.6				
	295.0	297.4	170.4	173.4						
					155.0	75.1	73.4	10.97	1.7	1.7
	450.0	452.4	245.5	248.5						
					136.0	58.5	56.9	11.76	1.6	3.3
PEBBLE POINT	586.0	588.4	304.0	307.0						
					148.5	56.9	57.4	-3.37	-0.5	2.8
	734.5	736.9	360.9	363.9						
					90.5	34.1	35.7	-17.68	-1.6	1.2
	825.0	827.4	395.0	398.0						
					134.9	52.6	51.9	5.19	0.7	1.9
	959.9	962.3	447.6	450.6						
					67.3	26.0	24.9	16.34	1.1	3.0
NULLAWARRE MEMBER	1027.2	1029.6	473.6	476.6						
					120.8	42.0	41.8	1.66	0.2	3.2
BELFAST MDST MEMBER	1148.0	1150.4	515.6	518.6						
					71.5	25.0	25.6	-8.39	-0.6	2.6
WAARRE SST	1219.5	1221.9	540.6	543.6						
					89.4	29.5	29.0	5.59	0.5	3.1
EUMERALLA FM	1308.9	1311.3	570.1	573.1						
					84.1	29.5	26.9	30.92	2.6	5.7
	1393.0	1395.4	599.6	602.6						

VELSEIS PTY LTD

WELL SURVEY CALCULATIONS

Company : BRIDGE OIL LIMITED
Well : VOGEL #1
Elevations : Datum : 150.0 Ground : 142.6 Kelly : 147.6

Latitude : 038 32 35
Longitude : 143 02 13

Survey date : 15-MAR-90
Survey units : METRES
Times in milliseconds.

SONIC CALIBRATION

	Geophone depth		Interval	Original sonic times		Adjusted sonic times		------- Velocities -------		
	Kelly	Datum	Distance	Interval	Cumulative	Interval	Calibrated	Average	RMS	Interval
DATUM										
	-2.4	0.0								
			42.4							1320.9
	40.0	42.4						1320.9	1320.9	
			20.0							1408.5
	60.0	62.4						1347.7	1348.3	
			20.0							1639.3
	80.0	82.4						1408.5	1414.0	
			20.0							1538.5
	100.0	102.4						1432.2	1437.4	
			47.6							1809.9
	147.6	150.0						1533.7	1546.4	
			99.6							1904.4
L MEPUNGA										
	247.2	249.6						1662.9	1679.8	
			47.8	21.7		21.7				2202.8
	295.0	297.4			21.7		173.4	1715.1	1754.5	
			23.8	11.6		11.9				2006.6
DILWYN FM										
	318.8	321.2			33.3		185.3	1733.8	1771.9	
			131.2	61.8		63.2				2074.7
	450.0	452.4			95.1		248.5	1820.5	1854.1	
			59.5	25.2		25.9				2297.3
PEMBER MEMBER										
	509.5	511.9			120.3		274.4	1865.5	1900.7	
			76.5	31.7		32.6				2346.6
PEBBLE POINT										
	586.0	588.4			152.0		307.0	1916.6	1953.1	
			48.6	17.1		16.9				2869.6
PAARATTE FM										
	634.6	637.0			169.1		323.9	1966.4	2011.7	
			99.9	40.3		40.0				2499.8
	734.5	736.9			209.4		363.9	2025.0	2071.2	
			90.5	35.7		34.1				2654.0
	825.0	827.4			245.1		398.0	2078.9	2127.6	
			77.0	30.1		30.5				2524.6
SKULL CK MEMBER										
	902.0	904.4			275.2		428.5	2110.6	2158.4	
			57.9	21.8		22.1				2619.9
	959.9	962.3			297.0		450.6	2135.6	2183.4	
			67.3	24.9		26.0				2588.5
NULLAWARRE MEMBER										
	1027.2	1029.6			321.9		476.6	2160.3	2207.5	
			120.8	41.8		42.0				2876.2
BELFAST MDST MEMBER										
	1148.0	1150.4			363.7		518.6	2218.3	2269.2	

VELSEIS PTY LTD

WELL SURVEY CALCULATIONS

Company : BRIDGE OIL LIMITED
Well : VOGEL #1
Elevations : Datum : 150.0 Ground : 142.6 Kelly : 147.6

Latitude : 038 32 35
Longitude : 143 02 13

Survey date : 15-MAR-90
Survey units : METRES
Times in milliseconds.

SONIC CALIBRATION

Geophone depth Kelly	Datum	Interval Distance	Original sonic times Interval	Cumulative	Adjusted sonic times Interval	Calibrated	Velocities Average	RMS	Interval
BELFAST MDST MEMBER									
1148.0	1150.4			363.7		518.6	2218.3	2269.2	
		51.5	19.0		18.6				2773.6
WAARRE FM									
1199.5	1201.9			382.7		537.2	2237.5	2288.5	
		20.0	6.6		6.4				3109.4
WAARRE SST									
1219.5	1221.9			389.3		543.6	2247.8	2300.0	
		89.4	29.0		29.5				3030.5
EUMERALLA FM									
1308.9	1311.3			418.3		573.1	2288.1	2343.3	
		84.1	26.9		29.5				2850.8
1393.0	1395.4			445.2		602.6	2315.6	2370.7	

PE600629

This is an enclosure indicator page.
The enclosure PE600629 is enclosed within the container PE900816 at this location in this document.

The enclosure PE600629 has the following characteristics:

ITEM_BARCODE =	PE600629
CONTAINER_BARCODE =	PE900816
NAME =	Mud Log
BASIN =	OTWAY
PERMIT =	PEP 108
TYPE =	WELL
SUBTYPE =	MUD_LOG
DESCRIPTION =	Mud Log, by Halliburton, (enclosure 1 from WCR) fromVogel-1
REMARKS =	
DATE_CREATED =	14/03/90
DATE_RECEIVED =	
W_NO =	W1023
WELL_NAME =	Vogel-1
CONTRACTOR =	Halliburton Geodata Services
CLIENT_OP_CO =	Bridge Oil Limited

(Inserted by DNRE - Vic Govt Mines Dept)

PE600630

This is an enclosure indicator page.
The enclosure PE600630 is enclosed within the container PE900816 at this location in this document.

The enclosure PE600630 has the following characteristics:

ITEM_BARCODE =	PE600630
CONTAINER_BARCODE =	PE900816
NAME =	Composite Log
BASIN =	OTWAY
PERMIT =	PEP 108
TYPE =	WELL
SUBTYPE =	COMPOSITE_LOG
DESCRIPTION =	Composite Log (enclosure 2 from WCR) for Vogel-1
REMARKS =	
DATE_CREATED =	17/03/90
DATE_RECEIVED =	
W_NO =	W1023
WELL_NAME =	Vogel-1
CONTRACTOR =	Bridge Oil Limited
CLIENT_OP_CO =	Bridge Oil Limited

(Inserted by DNRE - Vic Govt Mines Dept)