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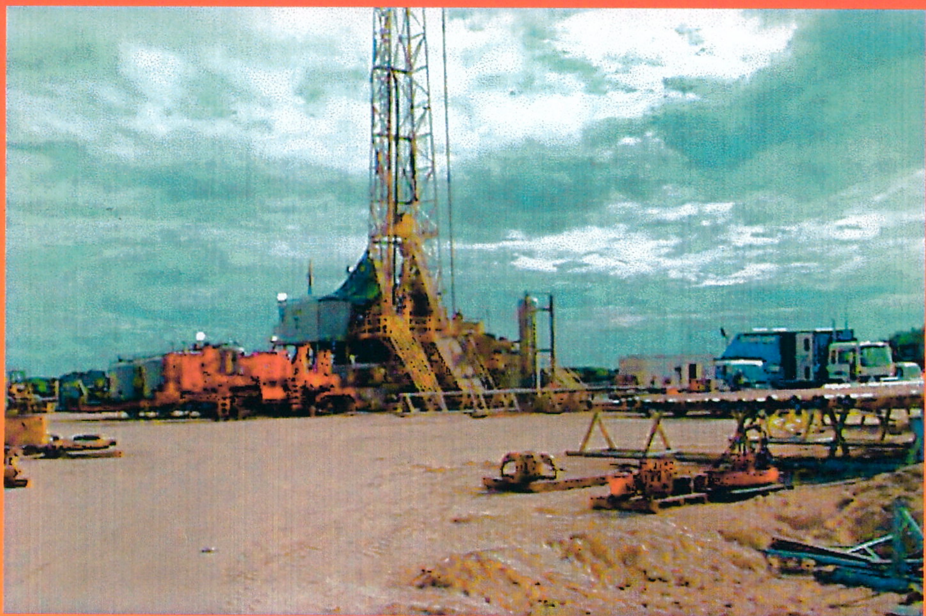
909110 001

DUNBAR 1 DW 1

DRILLING PROGRAMME



PPL 1

OTWAY BASIN
VICTORIA

Origin energy
ACN 007 845 338

ORIGIN ENERGY PETROLEUM PTY LTD

DRILLING PROGRAMME

PPL 1

DUNBAR 1 DW1

Origin Energy Petroleum Pty Ltd
A.B.N. 75 010 728 962
August, 2000

PREFACE

The drilling of this well is to be managed by Oil Company of Australia Limited (A.B.N. 68 001 646 331), an Origin Limited company, on behalf of the permit operator Origin Energy Petroleum Pty Ltd (OEPL).

909110 004

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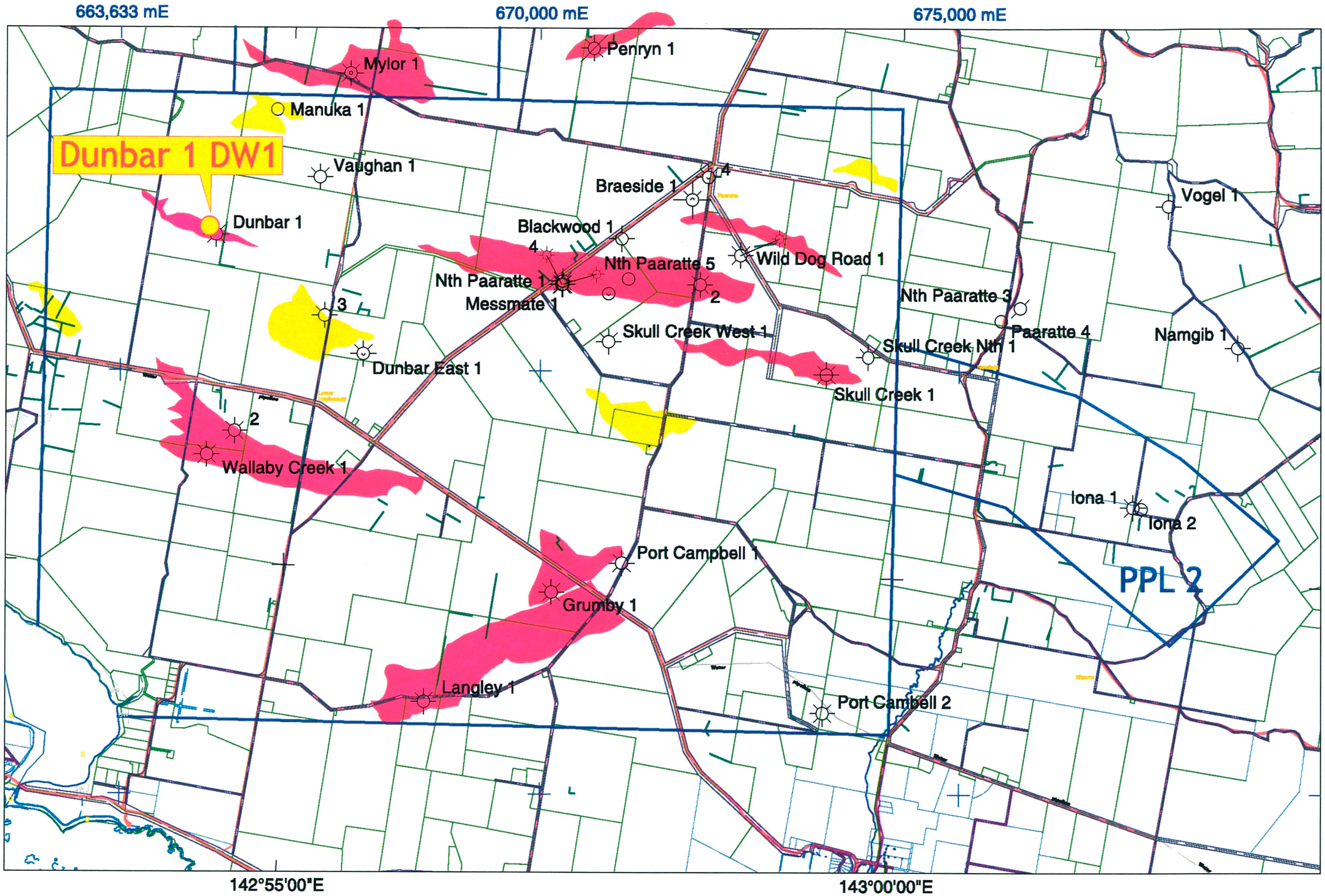
1. GENERAL INFORMATION

WELL NAME:	DUNBAR 1 DW1
DRILLING MANAGER:	OIL COMPANY OF AUSTRALIA LIMITED A.B.N. 68 001 646 331 1st Floor, North Court, John Oxley Centre, 339 Coronation Drive, MILTON Qld 4064 Tel: (07) 3858 0600
PERMIT OPERATOR:	ORIGIN ENERGY PETROLEUM PTY LTD A.B.N. 75 010 728 962 60 Hindmarsh Square, ADELAIDE SA 5000 Tel: (08) 8235 3737
PERMIT:	PPL 1
BASIN:	OTWAY BASIN, VICTORIA
SURFACE LOCATION:	Latitude: 38° 32' 53.79" S Longitude: 142° 54' 23.11" E AMG Co-ordinates (AMG Zone 54): Northing: 5 731 612.3 Easting: 666 133.3
TARGET LOCATION:	Latitude: 38° 32' 50.73" S Longitude: 142° 54' 19.78" E AMG Co-ordinates (AMG Zone 54): Northing: 5 731 708.3 Easting: 666053.7
SEISMIC LOCATION:	Inline: 6470 CDP: 2620
ELEVATION:	Ground Level: 77.2 m (resurveyed in 1999) Kelly Bushing: 81.8 m
PROPOSED T.D.:	1622 m MD RT
DRILLING CONTRACTOR:	Oil Drilling & Exploration Limited, 15 - 17 Westport Road Elizabeth West SA 5113
DRILLING RIG:	Rig 30
PRIMARY OBJECTIVES:	Waarre Fm Unit 'A' Sandstone: -1436.0 m TVD SS Waarre Fm Unit 'C' Sandstone: -1383.0 m TVD SS
ESTIMATED DURATION:	7 days
AFE CODE:	31-100-1000006-xxxxx-12-2



CPK

LOCATION MAP - Proposed Dunbar 1 DW1

16277.072000 Fig.1

Origin energy

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2. GEOLOGY

2.1. Summary

Dunbar 1 DW1 is proposed as a development well in PPL 1, onshore Otway Basin, Victoria. The well will develop the updip potential of the Dunbar structure. The primary objective for the well is the Waarre Sandstone member of the late Cretaceous Sherbrook Group.

The Dunbar structure is located approximately 8 km north north-west of Port Campbell in southeastern Victoria (Figure 1). The well will be directionally drilled from immediately below the existing 7" casing shoe in Dunbar 1, which is about 125 m to the southeast of the target subsurface Waarre "A" location. The Waarre "A" subsurface location for the well is located on Inline 6470 and CDP 2620 of the Waarre 3D seismic survey.

2.2. Previous Drilling

The Otway Basin has been recognized as a potential petroleum province since the 1860's. Salt Creek 1 in South Australia was the first exploration well in the Otway Basin in 1866 (Sprigg, 1986). Since then, over 150 wells have been drilled in the Otway Basin, both onshore and offshore.

The first hydrocarbon discovery was made in 1959, when Frome-Broken Hill drilled Port Campbell 1 and flowed gas from the Late Cretaceous Waarre Formation at an initial rate of 1.5 mmcfd. However it was deemed non-commercial as the rate declined rapidly. Shell initiated drilling offshore in the Victorian section of the Basin in 1967, followed closely by Esso, though there were no significant discoveries.

The first commerecial hydrocarbon discovery was in 1979 when North Paaratte 1 well was drilled by Beach Petroleum NL. The well was located on the southern flank of an elongate, east-west trending faulted anticline in the Port Campbell embayment of the Otway Basin and intersected gas in the Waarre Sandstone member of the Upper Cretaceous Sherbrook Group. Subsequent testing flowed GTS at rates up to 9.5 MMcfd and confirmed a new field discovery. North Paaratte 2 was drilled in 1981 approximately 1.6 km to the east and intersected a similar high-deliverability reservoir in the Waarre Sandstone. North Paaratte 3 was located further to the east but was drilled on a separate structure with no gas column.

Following the North Paaratte gas discovery, the Wallaby Creek and Grumby gas fields were discovered by Beach in 1981 (also Waarre Formation). Subsequent exploration resulted in the discovery, by Beach, of the Iona gas field in 1988, and the Boggy Creek CO2 field, by GFE Resources, in late 1991.

The first offshore success was with BHP Petroleum's Minerva 1, in 1993, offshore from Port Campbell.

The Mylor gas and oil field was discovered in 1994 by Bridge/GFE, yielding the first recovery of oil from the Waarre Formation (Foster and Hodgson, 1995). The Langley gas field was also discovered (GFE) in 1994.

Dunbar 1 was drilled in 1995 by GFE and discovered gas from the Waarre formation. In 1996 the Skull Creek gas field was discovered by Basin Oil. In 1999 two updip wells, North Paaratte 4 and 5, were drilled by Boral Energy, and both wells proved the continuity of the gas accumulation in the Waarre Formation. The most recent discovery in the area was by Boral Energy in 1999 with the Wild Dog Road gas field (Waarre Formation).

2.3. Dunbar 1 Well History (from WCR)

OPERATOR:	GFE Resources Ltd (100%)
ELEVATION:	Ground Level: 76.4 m Kelly Bushing: 82.1 m
PROPOSED T.D.:	1580 m MD RT
DRILLING CONTRACTOR:	Century Drilling Limited
DRILLING RIG:	Rig 11
PRIMARY OBJECTIVES:	Waarre Fm
TOTAL DEPTH:	1754 m
WELL SPUDDED:	9 March, 1995
REACHED TD:	19 March, 1995
WELL STATUS:	Suspended

2.3.1. Casing and Hole Data

Hole size	Depth (m RT)	Casing Size/WT/Grade	Casing Shoe Depth (m RT)
12.25"	317.0	9 5/8"/36 ppf/K55/BTC 9 5/8"/43.5 ppf/K55/BTC	311.93
8.5"	1758.0	7"/23 ppf/J55/STC 7"/26 ppf/N80/LTC 7"/26 ppf/K55/LTC	1209.83 (Unable to run casing to TD)

2.3.2. Suspension Plugs

Plug	Interval (m RT)	Cement	Method	Tested
1	1610 – 1440	240 sacks 'G'	Balanced	Tagged at 1437 m
2	1240 - 1180		Balanced	Tagged at 1178 m, Pressure tested to 500 psi
Surface	Top flange and bull plug installed on 7" casing			

2.3.3. Drill Stem Test Results

DST	Formation	Interval (m RT)	FSIP	Temp	Comments
1	Waarre 'A'	1526.0-1557.0			Plugged, recovered 3m of rathole mud.
2	Waarre 'A'	1526.0-1557.0			Partially plugged, GTS @ 750 Mcfd (unstabilised), Recovered 40 m of mud cut with condensate/light oil.

2.3.4. Reservoir Pressure Data from RFT

Depth (m KB)	Pressure (psia)
1534	2135.7
1536	2145.2
1540.5	2147.3
1535.5	2130.9
1536.5	2132.9
1542.3	2217
1483.8	2044.5
1486.5	2044.5
1488.5	2049.6
1491.5	2053.4
1515	2085.5
1510	2070.7
1488.3	2044.2

2.3.5. Formation Tops

Formation	Depth (m MD)	Depth (m TVD SS)
Port Campbell Limestone	4.8	+77.2
Gellibrand Marl	123.4	-41.3
Clifton Formation	414.4	-332.3
Narrawaturk Marl	425.4	-343.3
Mepunga Formation	511.4	-429.3
Dilwyn Formation	561.4	-479.3
Pember Mudstone	761.4	-679.3
Pebble Point Formation	821.4	-739.3
Paaratte Formation	878.4	-796.3
Skull Creek Member	1234.1	-1152.0
Nullawarre Greensand		Absent?
Belfast Formation	1405.5	-1323.4
Waarre Formation (Unit 'C' sand)	1478.0	-1395.9
Eumeralla Formation	1548.1	-1466.0
T.D.	1758.0	-1675.9

2.4. Regional Geology

The Otway Basin is approximately 500 km long and extends both onshore and offshore west-northwest from the Victorian Mornington Peninsula in the east to Cape Jaffa, South Australia, in the west. PPL 1 is located in the Victorian portion of the onshore Otway Basin approximately 50 km northwest of Cape Otway. PPL1 lies in the Port Campbell embayment, which is bounded to the east by erosion along the emergent Otway Ranges and to the north and west by erosional thinning and pinch-out.

The formation of the Otway Basin commenced in the late Jurassic with the initiation of rifting between Australia and Antarctica. Depositional growth occurred as superimposed sedimentary sequences were laid down during different phases of the separation of the Antarctic continental landmass from Australia's southern margin. The oldest strata comprise the Early Cretaceous Crayfish subgroup and overlying Eumeralla Formation, the latter comprising lithic-rich, volcanogenic sandstones with generally poor reservoir potential. Following deposition of the Eumeralla Formation widespread uplift and erosion occurred and this has been interpreted to be due to the onset of sea floor spreading.

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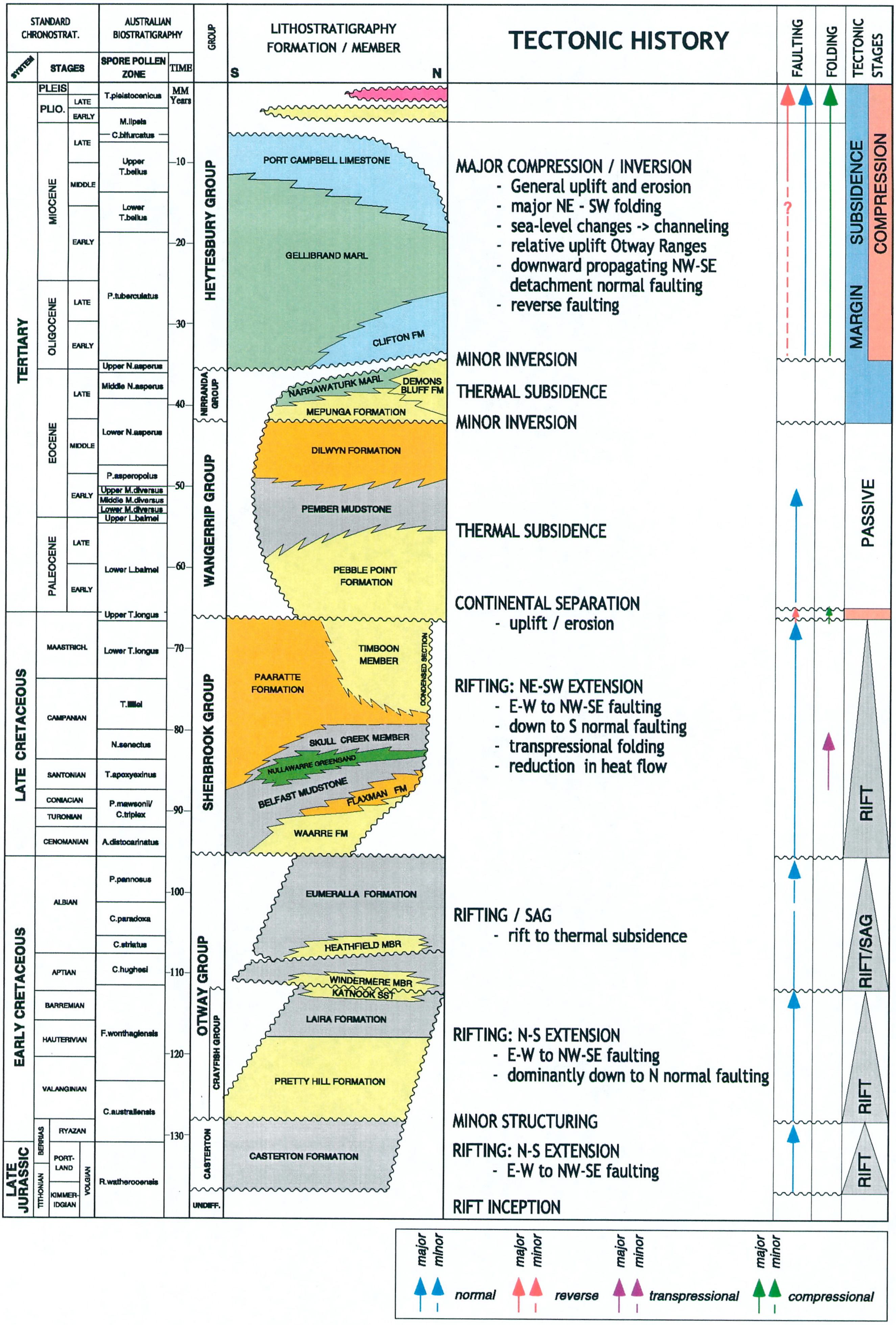

VICTORIAN OTWAY BASIN - STRATIGRAPHIC TABLE

REVISED October 1999 after ABELE et al 1995

Origin energy

16279.072000 Fig.2

The Sherbrook Group was deposited on the resulting unconformity as a condensed sandstone sequence further onshore, whilst offshore and near the coast it can be subdivided into formations representing the various facies of a delta system. The basal member, the Waarre Formation, comprises sands and shales with marine and shoreface facies. Buffin (1989) subdivided the Formation into four units and unit 'C' constitutes the main gas reservoir in the gas fields in PPL 1 and 2 with secondary gas occurring in the "A" unit. The Waarre Formation is overlain by the Belfast Mudstone, a sequence of massive siltstones interpreted to represent offshore pro-deltaic facies, and the time equivalent Nullawarre Greensand. The Skull Creek Mudstone and Paaratte Formation, an interbedded sand and shale sequence, comprise the upper members of the Sherbrook Group.

Fault movements during deposition of the Sherbrook Group are apparent in seismic sections but fault throws diminish above the Belfast Mudstone. The eventual large reduction in the number of faults by the top of the Paaratte Formation indicates relative quiescence by the end of the Cretaceous.

The earliest Tertiary section is defined by an unconformity with the Cretaceous and consists of sandstones and claystones of the Wangerrip Group probably deposited onshore in a fluvial-deltaic setting (Gravestock et al., 1986). The basal transgressive sandstone unit is the Pebble Point Formation that comprises conglomeratic and commonly ferruginous sands. Pro-delta muds and silts of the Pember Mudstone Member grade into the overlying sands and shales of the Dilwyn Formation, that represents a series of stacked transgressive-regressive deltaic cycles (Laing et al, 1989).

The rate of sea floor spreading appears to have increased markedly during the late Eocene resulting in a major marine transgression in the Otway Basin. The Tertiary sequence unconformably overlies the Dilwyn Formation, and is dominated by marine marls and limestones as a result of this inundation.

The tectonic framework of the Otway Basin is dominated by extensional processes that produced a series of normal fault blocks. Continued block faulting and subsidence during the early Cretaceous led to the development of an extensive rift valley system throughout southeast Australia. Pull-apart tectonics continued until the late Cretaceous and faulting, recognised as 'down to the basin' movement, represented reactivation of the initial rift system faults. By the Late Eocene drifting rates increased and a period of out-building occurred; subsidence was slow and tectonic activity became relatively quiet resulting in a relatively undeformed carbonate sequence.

During Late Cretaceous and possibly continuing to Early Tertiary times a right lateral couple was applied (Buffin 1989) resulting in the formation of a series of northeast-trending anticlines (e.g. Port Campbell Anticline). The structural grain generated as a result of this couple produced the combination fault and three-way dip closures targeted by drilling in the Port Campbell Embayment.

In the Middle Eocene, the rate of seafloor spreading south of Australia increased considerably. At this time there was also a strong pulse of northwest-southeast compression, resulting in northeasterly trending folds and faults, and reactivation of earlier structures in the Otway Ranges and nearby areas.

2.5. Structure

The Dunbar structure was remapped following the acquisition by Boral Energy of the Cultus interest in PPL 1. The seismic data base is the Waarre 3D seismic survey which was recorded in 1993.

The Dunbar structure is an elongate fault dependent closure. The main northern bounding fault of the prospect throws to the north thus juxtaposing the primary objective, the Waarre Sandstone, against the Belfast Mudstone (sealing formation) on the downthrown side of the fault. The closure to the south, east, and the west is by structural dip.

The Dunbar 1 well, which was suspended after failing to run the production casing to TD, will be re-entered and a sidetrack initiated below the 7" casing shoe, deviating to the northwest to hit an updip subsurface location at about 125 m offset from the surface location.

2.6. Source and Migration

The discovery of gas in Dunbar 1 confirms that generation and migration of hydrocarbons has occurred. The gas is most likely to have been generated deeper in the section, probably from basal coals in the Eumeralla Formation, and migrated along faults and sandstone layers to the Waarre Formation.

2.7. Reservoir and Seal

The Waarre Sandstones are interpreted to be an open marine facies deposited in the highest energy, shallow marine upper to middle shoreface environment and comprise medium to coarse grain size. The sequence of interbedded sand and shale has led to an informal sub-division of the Formation into the A (basal), B, C and D (top) units.

The Belfast Mudstone is a competent seal providing both vertical and cross-fault seal for the Waarre Sandstone reservoir. The juxtaposition of reservoir sands against mudstones across the fault is providing an adequate sealing mechanism.

2.8. Objectives

The primary objectives for Dunbar 1 DW1 are unit "A" and unit "C" sandstones of the Waarre Formation. The well is prognosed to penetrate in excess of 31-37 m of Waarre "A" reservoir thickness, and 22-28 m of the Waarre "C" reservoir thickness above the gas water contacts. The proposed TD of –1500 m TVD SS will allow sufficient rathole to perforate the reservoir and junk the perforating subs at the bottom of the hole.

2.9. Predicted Stratigraphic Sequence

The depth prognosis for Dunbar 1 DW1 is derived from the Waarre 3D seismic data using Dunbar 1 well velocity data, and depth conversion results from the well average velocities. The following prognosis is for a deviated well path to the subsurface location.

Table 1: Prognosed Formation Tops

Formation	Depth (m MD)	Depth (m TVD)	Depth (m TVD SS)
Note: Dunbar 1 DW1 will commence from the 7" casing shoe in Dunbar 1			
Skull Creek Member	1233.8	1233.8	-1152.0
Nullawarre Greensand			Absent?
Belfast Formation	1373.3	1367.8	-1286.0
Waarre Formation (Unit 'C' sand)	1485.5	1464.8	-1383.0
Waarre Formation (Unit 'A' sand)	1547.2	1517.8	-1436.0
Eumeralla Formation	1565.3	1533.4	-1451.6
T.D.	1621.6	1581.8	-1500.0

3. FORMATION EVALUATION

3.1. Wellsite Geologist's Responsibilities

The Wellsite Geologist is responsible for geological supervision at the wellsite and for formation evaluation. He reports to the Drilling Supervisor at the wellsite and to the Operations Geologist in Brisbane. He will supervise the mud logging unit, mud loggers and wireline logging. He will prepare his own cuttings and core descriptions.

Additional samples may be collected at any time at his discretion. Significant drilling breaks will be penetrated by no more than 2 m then flow checked for fluid influx. If a sample of the new lithology is required for hydrocarbon show evaluation, then pull up at least 6 metres above and circulate out the break. If a PDC bit is in use, the drilling parameters (WOB etc) should be kept relatively constant as the primary objective is approached, and any significant change in drill rate (increase or decrease) investigated as above.

3.2. Ditch Cuttings

Table 2: Sample Requirements

Sets	Size	No	Type	In	For
A	500 g	1	Unwashed & air dried	Cloth bag	ORIGIN
B&C	250 g	2	Washed & air dried	Minigrip bag	DNRE
D	100 g	1	Washed & air dried	Minigrip bag	ORIGIN
E		1	Washed	Samplex tray	ORIGIN

Table 3: Sampling Intervals

Interval	From	To
10 m	7" casing shoe	50 m above Waarre Sst
3 m	50 m above Waarre Sst	Total Depth

Additional samples will be taken to evaluate shows and at any time deemed necessary by the Wellsite Geologist.

3.3. Mud Logging

Geoservices Overseas S.A. will provide mud-logging services from surface casing shoe to total depth. The unit will provide continuous 24-hour surveillance of drilling operations including:

- Total gas detection
- Chromatographic gas analysis
- Measured depth
- Rate of penetration
- Pump stroke rate
- Mud pit levels

A comprehensive 1:200 scale mud log will be maintained at all times from surface to total depth. An up-to-date log is to be submitted daily to the Wellsite Geologist in time for the daily report along with a ***.PDF** file for transmission to Brisbane. A complete **ASCII** file containing the metres drilled, rate of penetration, total gas and gas breakdown is to be transmitted to the Brisbane office on reaching Total Depth.

All instrument charts are to be annotated with: depth (in metres), attenuation changes, dates, times and sample collection intervals. Charts are to be submitted to the Company Representative prior to release of the mud-logging unit.

Gas detectors and chromatographs are to be calibrated with standard check gas blends each trip. Total gas detectors are to be calibrated so that 1% methane in air will produce a chart deflection of 50 units.

Calcium carbide lag checks will be run once per day or every 300 m, whichever occurs first (or at the discretion of the Wellsite Geologist). Total gas units and lag times (actual and calculated) are to be recorded on the mud log in minutes. No carbides are to be run whilst evaluating prospective hydrocarbon zones.

Formation Integrity Tests, pit losses/gains, tight-hole, bit data, mud information and survey data are to be recorded on the mud log. The mud loggers will be responsible for time lagging, collection and description of drill cutting from surface casing shoe to total depth. Routine microscopic and fluoroscopic examination of ditch cuttings for hydrocarbon shows will be undertaken.

Upon encountering a significant drilling break the interval is to be penetrated by no more than 2 m; drilling will be suspended and a flow check conducted. Bottoms up will be circulated if a sample of the new lithology is required for hydrocarbon show evaluation. Pull up at least 6 m above the top of the drilling break to minimise formation damage. If a PDC bit is in use, the drilling parameters (WOB etc) should be kept relatively constant as the primary objective is approached, and any significant change in drill rate (increase or decrease) investigated as above. If the Wellsite Geologist is not present, inform the Drilling Supervisor.

3.4. Coring

No cores are planned for this well.

3.5. Testing

No Drill Stem Tests are planned for this well.

3.6. Measurement While Drilling

An MWD tool will be included in the bottom hole assembly for Dunbar 1 DW1 from the 7" casing shoe in Dunbar 1 to the total depth of the well. The MWD tool will provide directional surveys to monitor hole deviation. An up-to-date listing of the survey data will be included in the daily reports. An 3½" diskette with the data in ASCII is required as soon as possible after the MWD tool is laid down.

3.7. Wireline Logging

216 mm (8½") Openhole:

Logs are to be displayed at 1:500 and 1:200 scales.

NB: A single copy of the logs is to be produced on site. This will be quality controlled in the OCA office and final prints are to be made from this edited copy.

RUN 1:	DLL-MSFL-GR-CAL-AMS	T.D. to casing shoe

Notes: Horizontal log scales:

GR	0 - 200 API
SP	-50 - +50 MV
HALS, MCFL	0.2 - 2000 ohmm
BHC/AS	140 - 40 u/sec
RHOB	1.85 - 2.85 g/cc
NPHI	0.45 - -0.15 pu

3.8. Sidewall Coring

No sidewall coring is programmed for the well.

3.9. Velocity Survey

No velocity survey is programmed for the well.

4. DRILLING

4.1. Introduction

The following sections outline the recommended drilling programme. Minor modifications to the programme may be made at the discretion of the wellsite personnel in consultation with the Company Representative. Any substantial changes in the programme require approval from the Brisbane Office.

After the rig has been rigged up, a pre-spud safety meeting will be held to outline the well programme and to reinforce the need for all personnel to be aware of and to work in a safe manner. Particular attention is to be given to the "Work Permit System". The mousehole and rathole will be drilled and cased. The rig will be put in a safe and good housekeeping order prior to spudding the well.

Correct drilling procedures are to be adhered to at all times – Refer to Appendix 3.

4.2. Rig

K.B. height above ground:- 4.9 metres

4.3. Hole Size and Casing Programme Summary

	EXISTING DUNBAR 1	DUNBAR 1 DW1 PRODUCTION HOLE
Hole Size	216 mm (8½")	152 mm (6")
Casing Size	178 mm (7")	73 mm (2$^{7}/_{8}$")
Setting Depth	1209.03 (Rig 30 RT)	1622 m MD

The 178 mm (7") casing was set at 1209.83 m in Dunbar 1, when the casing became stuck. The well was suspended with two cement plugs, at 1440 – 1610 m over the reservoir interval, and at 1180 – 1240 m over the casing shoe. The shoe plug was tagged at 1178 m. The cement will be drilled out to approximately 1215 m, before sidetracking the well. An FIT test will be conducted after drilling out the plug and no more than 5 m of new formation.

4.4. Summary of Drilling Programme

(i) Build access roads; rig and camp locations; dig and install cellar.

(ii) Move in rig and rig up, drill and case mousehole and rathole. Carry out Rig Safety and Environmental Audit Check. Hold pre-spud safety and environmental meeting.

(iii) Drill well as per the following programme:

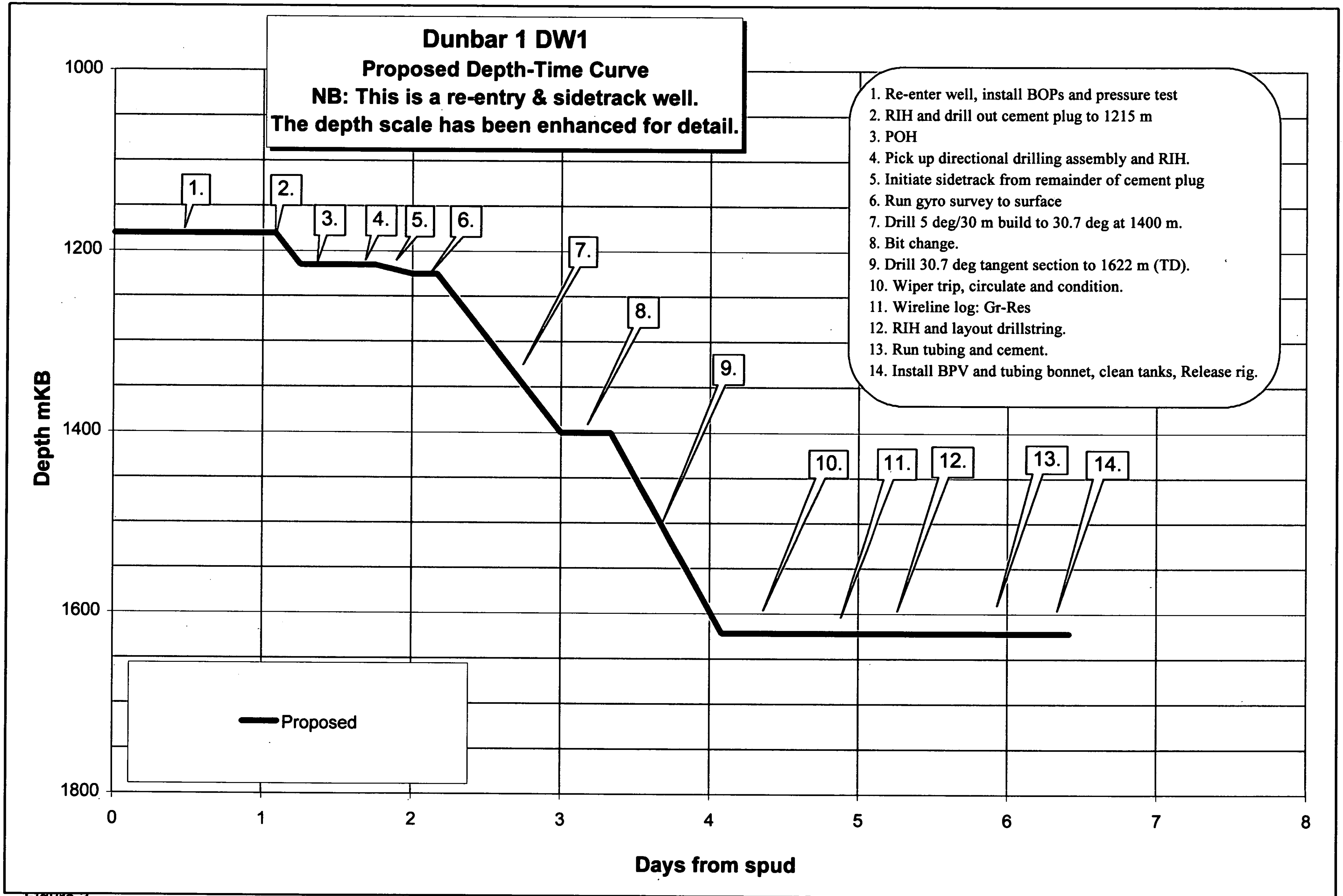
Dunbar 1 DW1
Proposed Depth-Time Curve
NB: This is a re-entry & sidetrack well.
The depth scale has been enhanced for detail.
1. Re-enter well, install BOPs and pressure test
2. RIH and drill out cement plug to 1215 m
3. POH
4. Pick up directional drilling assembly and RIH.
5. Initiate sidetrack from remainder of cement plug
6. Run gyro survey to surface
7. Drill 5 deg/30 m build to 30.7 deg at 1400 m.
8. Bit change.
9. Drill 30.7 deg tangent section to 1622 m (TD).
10. Wiper trip, circulate and condition.
11. Wireline log: Gr-Res
12. RIH and layout drillstring.
13. Run tubing and cement.
14. Install BPV and tubing bonnet, clean tanks, Release rig.
Depth mKB
1000
1200
1400
1600
1800
Days from spud
0
1
2
3
4
5
6
7
8
Proposed

Figure 3

Table 4: Drilling Programme and Estimated Activity Times

	Reference		Hrs	Cum days	Depth MD
	Section	Table			
Rig up over well, bleed pressure from wellhead			0	0	1180
Remove wellhead from B section			2	0.1	1180
Install BOPs on $7^{1}/_{16}$" spool			10	0.5	1180
Pressure test BOPs, casing and cement plug	13.4.1	Table 10:	2	0.6	1180
Pick up DP/HWDP, RIH			10	1.0	1180
Pressure test			2	1.1	1180
Drill out plug #2 to 1215 m, circulate to mud		Table 7	4	1.2	1215
POH			4	1.4	1215
Make up directional BHA and UBHO, RIH	5	Table 5	8	1.7	1215
Establish sidetrack from cement plug with gyro assistance, perform FIT	6 13.9 13.5	Table 6	6	2.0	1225
Run Gyro survey to surface			4	2.2	1225
Drill 5°/30 m build to 30.7° at 1400 m at 8 m/hr	6	Table 6	20	3.0	1400
Change bit	5.1		8	3.3	1400
Drill tangent section at 30.7° to TD at 12.5 m/hr	6	Table 6	18	4.1	1622
Wiper trip, circ, spot hi-vis, POH			8	4.4	1622
Log well (Gr-Res only)	3.7		6	4.7	1622
RIH, layout drillstring			16	5.3	1622
Run 2 $^{7}/_{8}$" tubing, land hanger in B section and tighten tie downs. Establish circulation through A section outlets, cement tubing	8 13.2-3 or 10	Tables 8 & 9 or Table 13	10	5.7	1622
Install BPV. Nipple down BOPs			6	6.0	1622
Install and pressure test tubing bonnet			2	6.1	1622
Install and pressure test $2^{9}/_{16}$" wellhead			4	6.3	1622
Clean tanks			4	6.4	1622
Release rig				6.4	1622

Note: The well will be perforated using a mast truck and wireline logging unit as a separate operation. A full procedure will be issued at the time.

4.5. Potential Hazards

The following potential hazards have been identified:

Potential Hazard	Potential Consequences	Actions Required/ Contingency Planning
Existing 7" casing (mixed J55, N80 and K55 string) in poor condition	Communication behind casing while drilling	Pressure test casing and shoe plug to required BOP test pressures before drilling out.
Pressure build up below existing shoe plug	Take kick on re-entering 8.5" hhole	Sidetrack well before drilling out shoe plug to maintain two barriers to reservoir (well was suspended with plug over reservoir section). Ensure casing integrity before starting to drill shoe plug. Maintain kill mud while drilling out shoe plug.
Permeable reservoir sand	Differential sticking	Mud density will be maintained as low as possible. The BHA will utilize only HWDP to minimize wall contact area, Flex Monels to be used. Drilling jars will be incorporated in the drill string.
Poor hole conditions while running production casing	Unable to run casing to TD	Lack of KCl in drilling fluids identified as major cause of similar problem in Dunbar 1. Drilling fluid design (KCl PHPA) for this well used successfully on North Paaratte 4, 5 and Wild Dog Road 1. Run production casing ASAP after reaching TD – minimal TD logging programmed.

5. BITS, HYDRAULICS AND BHA

5.1. 152mm (6") Hole

Drill out cement to 1215 m with Bit 1 and BHA 1, ensuring that the drill string is free of scale prior to pulling out and picking up BHA 2 to initiate the sidetrack off the remaining cement of plug #2. Continue to drill the build and tangent sections to TD using Bit 1, and Bit 2 if required. Due to the casing proximity, a gyro tool and steerable motor will be used to commence the sidetrack, with an MWD tool subsequently used to monitor survey data as angle is built and maintained (refer Section 6). These bits are detailed below:

BIT NO.	MAKE	TYPE	IADC	NOZZLES	PUMP GPM	WOB x1000 kg	RPM
1	Smith	XR10TP	437	3 x 13	275	4.5 – 7.0	Motor + 50 - 60
2	Smith	XR10TP	437	3 x 13	275	4.5 – 7.0	Motor + 50 - 60

The hydraulics are designed to maximise motor efficiency and bit HSI.

PUMP	No. 1	No. 2
Type	Gardner Denver PZ - 8	Gardner Denver PZ - 8
Stroke	203 mm (8")	203 mm (8")
Max. Speed Permitted	145 spm	145 spm
Liners Available	152 mm (6")	152 mm (6")
Max. Pressure Permitted	18750 kPa (2717 psi)	18750 kPa (2717 psi)
Pump Output (95% efficiency)	10.56 l/stk (2.79 gps)	10.56 l/stk (2.79 gps)

5.2. Bottom Hole Assemblies

Dunbar 1 was drilled as a vertical well. BHA #1 will be used to drill out cement to 1215 m, then BHA #2 will be used to sidetrack below the casing shoe and directionally drill Dunbar 1 DW1 in 152 mm hole (refer section 6). The bottom hole assemblies are listed below:

Table 5: Bottom Hole Assemblies

BHA No. 1: Rotary Drilling Assembly	
No.	**Tool**
1	152 mm Bit and bit sub
30	89 mm (3.5") Hevi-wate Drill Pipe
	89 mm (3.5") Grade "G" Drill Pipe (as required)

BHA No. 2: Directional Motor / Building Assembly	
1	152 mm bit
1	121 mm (4¾") SperryDrill Lobe 4/5 – 6.3 Stage Adjustable PD motor
1	Integral Blade Stabiliser
1	121 mm (4¾") DWD tool
1	Float Sub
1	Orienting Sub
21	89 mm (3.5") Hevi-wate Drill Pipe
1	121 mm (4¾") Drilling Jar
6	89 mm (3.5") Hevi-wate Drill Pipe
	89 mm (3.5") Grade "G" Drill Pipe (as required)

6. DEVIATION REQUIREMENTS

0 - 1215 m — A gyro survey will be run on wireline to provide a tie-in point for directional drilling.

1215 - 1235 m — Two gyro checkshots will be run on wireline to orient the directional drilling assembly until the MWD tool is no longer influenced by magnetic interference from the casing (wireline logging unit to remain rigged up between checkshots).

1235 m – T.D. — Survey at least once per single of drill pipe (on connections) using MWD equipment. The well path will be monitored by Sperry-Sun Drilling Services and alterations in angle and direction will be made as required, after consultation with the Drilling Supervisor (refer to Table 6). Location tolerance at the Waarre Sandstone is 25 m radius of target.

Table 6: Proposed Well Path

Measured Depth (m)	Inclination (°)	Azimuth (° Grid)	Vertical Depth (m)	Northing (m)		Easting (m)		Vertical Section (m)	Dogleg rate (°/30m)
1215.43	**0.000**	**0.000**	**1215.43**	**0.00**	**N**	**0.00**	**E**	**0.00**	**0**
1233.81	**3.063**	**320.646**	**1233.80**	**0.38**	**N**	**0.31**	**W**	**0.49**	**5**
1250.00	5.762	320.646	1249.94	1.34	N	1.10	W	1.74	5
1300.00	14.095	320.646	1299.15	8.00	N	6.56	W	10.35	5
1350.00	22.428	320.646	1346.59	20.11	N	16.49	W	26.00	5
1373.29	**26.310**	**320.646**	**1367.80**	**27.54**	**N**	**22.58**	**W**	**35.61**	**5**
1399.69	**30.710**	**320.646**	**1390.99**	**37.28**	**N**	**30.57**	**W**	**48.21**	**5**
1400.00	30.710	320.646	1391.26	37.40	N	30.67	W	48.37	0
1450.00	30.710	320.646	1434.25	57.14	N	46.86	W	73.90	0
1485.54	**30.710**	**320.646**	**1464.80**	**71.18**	**N**	**58.37**	**W**	**92.05**	**0**
1500.00	30.710	320.646	1477.24	76.89	N	63.05	W	99.44	0
1547.18	**30.710**	**320.646**	**1517.80**	**95.52**	**N**	**78.33**	**W**	**123.53**	**0**
1550.00	30.710	320.646	1520.22	96.63	N	79.25	W	124.97	0
1565.33	**30.710**	**320.646**	**1533.40**	**102.69**	**N**	**84.21**	**W**	**132.80**	**0**
1586.73	**30.710**	**320.646**	**1551.80**	**111.14**	**N**	**91.14**	**W**	**143.73**	**0**
1600.00	30.710	320.646	1563.21	116.38	N	95.44	W	150.51	0
1621.62	**30.710**	**320.646**	**1581.80**	**124.92**	**N**	**102.44**	**W**	**161.55**	**0**

The Dogleg Severity is in Degrees per 30 m. The vertical section was calculated along an azimuth of 320.646° (Grid). Based upon minimum curvature type calculations, at a measured depth of 1621.62 m, the bottom hole displacement is 161.55 m, in the direction of 320.646° (Grid).

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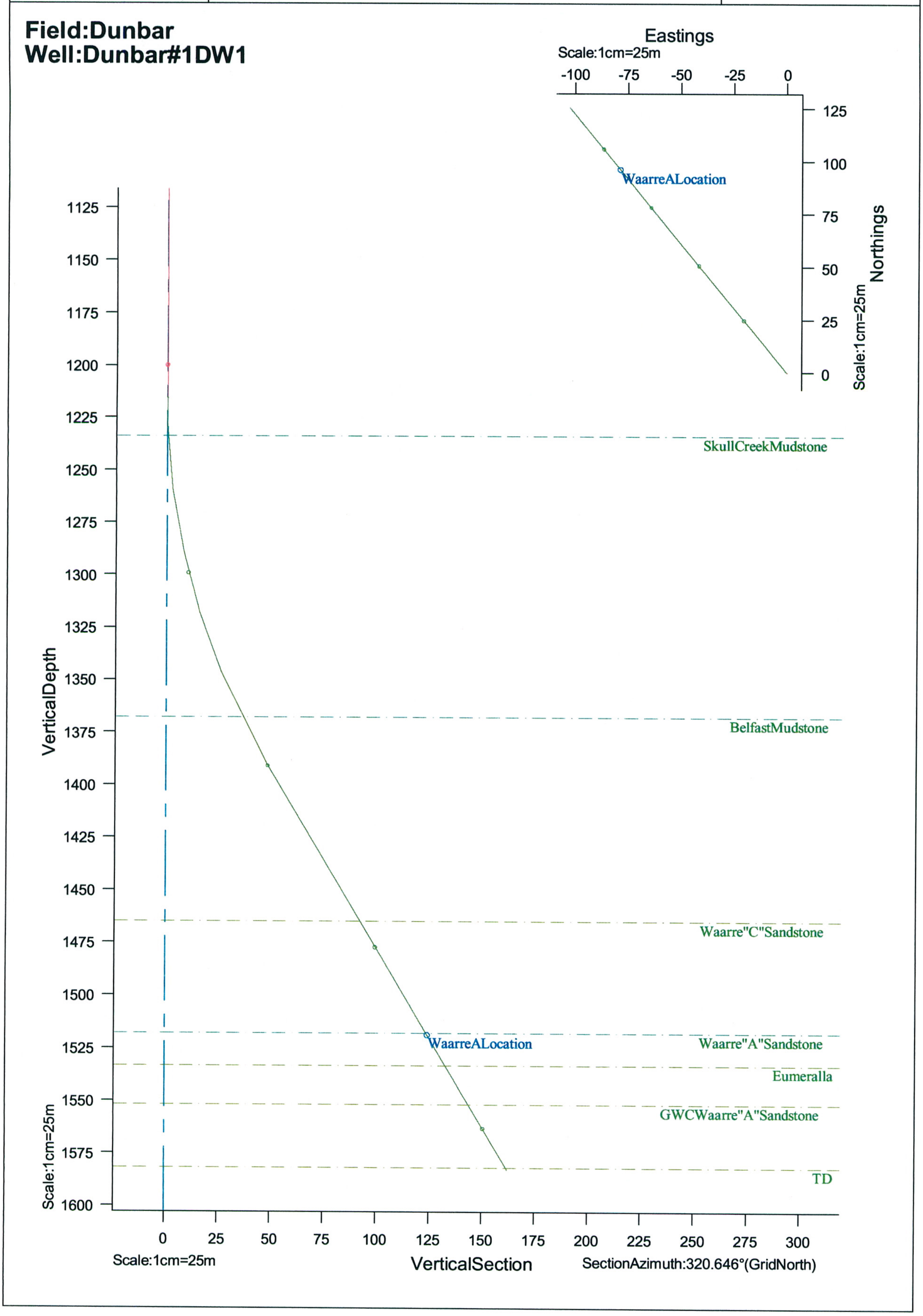


Figure 4

7. MUD PROGRAMME

7.1. 152 mm (6") Hole

Drill out the cement to the kick-off point with water, using only the pill tank for surface volume. Displace the hole to KCl - PHPA fluid, dumping the cement contaminated water to the sump. Run a FIT to an equivalent mud density of 1.50 S.G. (12.5 ppg) after drilling no more than 5 m of formation. The initial mud composition will include approximately 3 - 4% KCl, with a minimum of 1.5 ppb PHPA powder. The PAC level will be approximately 0.5 ppb and will be gradually increased to reduce the filtrate loss. The filtrate loss will be initially high but will reduce as mud solids increase. The filtration rate target will be less than 7 ccs / 30 min. As the initial mud begins to shear, the PHPA level can be raised to a minimum of 1.75 ppb on a dry powder basis. This will be achieved by adding at least 2 ppb PHPA into the premix additions. All volume additions to the system should be as pre-mixed KCl - PHPA fluid. The pH should be maintained at 9.0 - 9.5 with Soda Ash or Caustic Soda, the Sulphite level at 100 ppm to minimise corrosion and any excess Hardness may be treated out with Soda Ash or Sodium Bicarbonate. Biocide should be added as required, to preserve the system against bacterial degradation.

The mud rheology will be monitored closely to ensure good hole cleaning, as the possibility of fast ROPs could lead to a heavy cuttings loading in the annulus. XCD Polymer may be used to give initial rheology control. In the vertical section, a Yield Point of around 12-15 lbs / 100sq ft should give good hole cleaning, provided the annular velocities are adequate. Once the KOP is reached the rheology should be monitored to ensure the low end rheology is adequate for good hole cleaning in the deviated section. A 6 rpm rheometer reading of 4 – 8 is recommended. When using significant quantities of XCD Polymer, PAC LV may be substituted for filtration control so that the mud viscosity does not become excessive.

Solids control will be of prime importance in this section to keep drill solids to a minimum. This will entail running the finest possible shaker screens, dumping solids from the sand trap and running the desander and the desilter, providing fluid loss is not excessive. It is aimed to keep the MBT level below 15 ppb equivalent clay. The mud density will most likely be in the 1.08 - 1.12 SG range. The density may have to be raised, depending on the suspected formation pore pressures.

When running production casing, the mud left in the casing/open hole annulus should be treated with biocide to reduce bacteria and the pH should be increased to at least 10 to minimise corrosion. An oxygen scavenger or proprietary corrosion control additive may also be considered. The production casing may be displaced with brine and, if so, a corrosion inhibitor should be added.

Table 7: Mud Type by Interval

Interval (Hole Size)	Weight (SG)	Viscosity	API Fluid Loss (cc)	Mud Type
1209 m - TD 152 mm (6")	1.08 - 1.12 - or as required to control formation pressure	35 - 50	Initially high, reducing to <7 cc ASAP	Drill to kick off point with water. Displace to 3-4% KCl - PHPA fluid with adequate PHPA to provide good solids encapsulation (min. of 1.75ppb). PAC can be added to gradually reduce the filtrate loss. Initial viscosity and low end rheology may be supplemented with XCD Polymer. Run all solids control equipment to minimize density and drill solids build up. Control the pH at 9.0 - 9.5 with Caustic Soda or Soda Ash. Add oxygen scavenger and Biocide as required.

NB: Additions of any diesel or hydrocarbon based chemicals MUST be first discussed with the wellsite geologist. Subsequently, such additions must be fully documented.

8. CASING AND CEMENTING DETAILS AND DESIGN

Table 8: Casing Details and Design

STRING DETAILS	PRODUCTION CASING
Hole Size	152 mm (6")
Casing Size	73 mm (2.875")
Setting Depth	1622 m MD
Grade	J55
Weight	9.69 kg/m (6.5 lb/ft)
Strength • **Burst psi** • **Collapse psi** • **Tension lbs**	 7260 7680 99,000
Safety Factor • **Required** • **Actual Load** • **Design**	 1.25/1.125/1.8 2500/765/55826 2.90/10.043/1.78
Design Assumptions • **Burst** • **Collapse** • **Tension**	 2500 psi test pressure Cement w/ 1.0 SG displace fluid Bump plug 1730 psi w/ buoyed string
Connection	EUE
Optium Torque	1650
Float Equipment	Float shoe on bottom, float collar one joint off bottom
Wiper Plugs	Top
Centralising	At mid first joint and on 3rd and 5th joints, every joint from 30 m above and below pay zones
Accessories	73 mm (2.875") tubing hanger CIW type FBB-EN 6" x $2^7/_8$" EUE
Threadlock	Shoe through to both threads on float collar
BOP Test Pressure	17500 kPa (2500 psi)

Table 9: Cementing Details

	PRODUCTION CASING
Hole/Casing Size	216 mm / 178 mm (6" / 2.875")
Setting Depth	1622 m MD
Cement Type	Class G
Cement Top	Neat Class G to 50 m above 7" casing shoe
Excess	10% in O.H. (based on caliper)
Estimated Sacks **Basis of Calculation**	230 Class G Gauge + 15%
Slurry Density	15.8 ppg
Mix Water	Fresh
Additives	Class G + 1% Halad 322 in neat cement Final composition may alter with lab testing of make-up water
Bump Plug Pressure	7000 kPa (1000 psi) above final pumping pressure

9. PRESSURE TESTING AND KICK TOLERANCES

Table 10: Pressure Testing Requirements for BOPs

EQUIPMENT	PRESSURE (psi)	TIME (minutes)	PRESSURE (psi)	TIME (minutes)
INTERMEDIATE CASING				
Casing, Blind Rams, HCR	250	15	2500	15
Choke Manifold - All Valves	250		2500	5
Pipe Rams	250	15	2500	15
Annular Preventer	250	5	1500	5
Kelly Cocks/ Kill Line Valve	250	5	2500	5

A BOP Pressure Test Checklist should be completed and submitted to Brisbane office together with any relevant pressure recording charts.

Table 11: Kick Tolerance Calculations - Shoe

KICK TOLERANCE CALCULATION Weak Point @ shoe

WELL		
	NAME	Dunbar 1 DW1
	DEPTH	1622
	HOLE SIZE	6
SURFACE CASING		
	DEPTH (m)	1210
	ID	6.276
	BURST	4360
LEAK OFF		
	EMW (ppg)	15
	LOP (psi)	1218
	FG shoe	0.78
WEAK POINT		
	DEPTH (m)	1210
	FPwp	3096
	FGwp	0.78
MUD		
	OMW	9.1
	PGm	0.473
	KMW	
INFLUX		
	PGi	0.06
	Pbh	2288
HWDP		
	OD	3.5
	ID	2.062
	LENGTH (m)	200
DRILL PIPE		
	OD	3.5
	ID	2.76
	LENGTH (m)	1422

	D	d	CAP	L	V
DP	3.5	2.76	0.0243	1422	34.5
HW	3.5	2.062	0.0136	200	2.7
			PIPE	1622	37.2
HW-OH	6	3.5	0.0757	200	15.1
DP-OH	6	3.5	0.0757	212	16.1
DP-CSG	6.276	3.5	0.0865	1210	104.7
			ANN	1622	135.9
			TOTAL		173.1

Max Safe Casing Pressure (MSCP)

A **MSCP = LOP - Ann Friction - op error**

Ann frict (psi/100m) 10
Operator error 20

MSCP = 1077 psi

Maximum bottomhole pressure (BHPm)

B **BHPm = 2518 psi**

HSPdp 2518
FP 2288

Length of influx which can be handled (Li)

C Li = (MSCP + HSPdp - BHPm)/(PGm - PGi)

Li = 2606 ft
794 m

Volume bottomhole & weakpoint

D Vbh = CAPbh x Li, Vwp = CAPwp x Li

Vbh = 60.2 bbls
Vwp = 60.2 bbls

Convert to bottomhole volume

E Vbh1 = (Pwp x Vwp) / Pbh, assuming Pi = FP wp)

Vwp(bh1) = 81.4 bbls

Select minimum of two volumes, Vbh or Vbh1

Kick tolerance = 60.2 bbls

Table 12: Kick Tolerance Calculations – Waarre 'C' Sand

KICK TOLERANCE CALCULATION Weak Point @ Waarre C

WELL		
	NAME	Dunbar 1 DW1
	DEPTH	1622
	HOLE SIZE	6
SURFACE CASING		
	DEPTH (m)	1210
	ID	6.276
	BURST	4360
LEAK OFF		
	EMW (ppg)	15
	LOP (psi)	1218
	FG shoe	0.78
WEAK POINT		
	DEPTH (m)	1485
	FPwp	2680
	FGwp	0.55
MUD		
	OMW	9.1
	PGm	0.473
	KMW	
INFLUX		
	PGi	0.06
	Pbh	2288
HWDP		
	OD	3.5
	ID	2.062
	LENGTH (m)	200
DRILL PIPE		
	OD	3.5
	ID	2.76
	LENGTH (m)	1422

	D	d	CAP	L	V
DP	3.5	2.76	0.0243	1422	34.5
HW	3.5	2.062	0.0136	200	2.7
			PIPE	1622	37.2
HW-OH	6	3.5	0.0757	200	15.1
DP-OH	6	3.5	0.0757	212	16.1
DP-CSG	6.276	3.5	0.0865	1210	104.7
			ANN	1622	135.9
			TOTAL		173.1

Max Safe Casing Pressure (MSCP)

A **MSCP = LOP - Ann Friction - op error**

Ann frict (psi/100m) 10
Operator error 20

MSCP = 1077 psi

Maximum bottomhole pressure (BHPm)

B **BHPm = 2518 psi**

HSPdp 2518
FP 2288

Length of influx which can be handled(Li)

C Li = (MSCP + HSPdp - BHPm)/(PGm - PGi)

Li = 2606 ft
794 m

Volume bottomhole & weakpoint

D Vbh = CAPbh x Li, Vwp = CAPwp x Li

Vbh = 60.2 bbls
Vwp = 60.2 bbls

Convert to bottomhole volume

E Vbh1 = (Pwp x Vwp) / Pbh, assuming Pi = FP wp)

Vwp(bh) = 70.4 bbls

Select minimum of two volumes, Vbh or Vbh1

Kick tolerance = 60.2 bbls

10. ABANDONMENT

(i) Should there be no significant hydrocarbon indications, the well will be abandoned by setting cement plugs in the open hole and at the surface, as required by The Petroleum Regulations.

Table 13: Abandonment Programme

Plug No.	Formation	Depth	Sacks of Cement
3	Surface	Surface to 10 m	15
2	Intermediate Casing Shoe ** test for position	1180 - 1240 m	30
1	Waarre Formation	1435 to 1550 m	60

The final plugging programme will be advised after wireline logs have been run and evaluated.

ABANDONMENT WILL NOT COMMENCE WITHOUT
APPROVAL FROM THE BRISBANE OFFICE

(ii) Should there be significant indications of hydrocarbons on wireline logs and it is decided to complete the well as a producer, the Production Department will issue an appropriate completion programme.

11. APPENDIX 1 - EXTRACTS FROM 'PETROLEUM REGULATIONS 1992'

723. Fluid Samples

1. The titleholder must ensure that all formation fluid recovered from tests or non-routine production tests are sampled in accordance with good oilfield practice.
2. The titleholder must ensure that the samples are labelled and analysed, and liquid samples preserved.
3. The titleholder must ensure that results obtained from the analysis of samples are provided to the Minister as soon as practicable but within 30 days of the date on which they are obtained.

725. Formation and water shut-off tests

1. A titleholder must take all reasonable steps to notify the Minister of a water shut-off test.
2. If a test results in the discovery of a new pool of petroleum, the titleholder must notify the Minister as soon as practicable after the discovery is made.
3. In addition to the requirements of subregulations (1) and (2), a titleholder must provide the Minister with -
   - (a) a copy of the relevant operational report; and
   - (b) a legible copy of the pressure recorder chart for each drill stem or other test taken at the well; and
   - (c) an interpretation of those tests.

727. Production or drill stem tests on exploration or production wells

1. The titleholder must not, in a title area, conduct a production or drill stem test in an exploration well or development well not yet producing, except with and in accordance with the approval of the Minister.
2. An application by the titleholder to the Minister for approval to conduct a production test in an exploration well or production well not yet producing in a title area must be accompanied by particulars of –
   - (a) The equipment proposed to be used for the test; and
   - (b) The proposed testing program; and
   - (c) The intervals in the well proposed to be tested; and
   - (d) The proposed duration of the test; and
   - (e) The maximum quantity of petroleum or water proposed to be produced; and
   - (f) The proposed method of disposal of the petroleum or water produced.
3. An approved test must not be conducted unless at least 24 hours notice of intention to conduct the test has been given to an inspector.

731. Disposal of produced oil and gas

The titleholder must ensure that any oil or gas that is circulated out of or produced from a well during a drilling, testing or repair operation, and that is not flowed through the well's flowline to a gathering facility, must be disposed of in accordance with good oilfield practice.

732. Disposal of waste fluids

The titleholder must ensure that all waste materials from work on a well or produced from a well as it cleans up (whether or not contaminated with oil) are disposed of in accordance with good oilfield practice.

12. APPENDIX 2 - SAFETY PRECAUTIONS

12.1. Safety

(1) Whenever drilling breaks are encountered, drill 2 metres into the break then conduct a flow check. The Wellsite Geologist will check the samples when circulated up for hydrocarbon indications and lithology.

(2) Subsequent to encountering a drilling break or the evidence of "trip" or "connection" gas, all "trips" will include a short wiper trip of ten stands out, circulating bottoms-up to check for any hydrocarbon influx before proceeding with the trip.

(3) A reduced hoisting and lowering speed technique, whereby speed is reduced to half normal rate is to be introduced when tripping the drill collars and bit over the interval of any successful DST.

(4) The kick control techniques in the Operations Manual and Emergency Response Manual are to be followed in the event of any kick being encountered when drilling, tripping or during any other operations.

(5) At all times, adherence to the OCA Operations and Safety Manual is mandatory.

12.2. Environmental

(1) At all times, adherence to the OCA Drilling Environmental Compliance Manual is mandatory.

(2) All solid waste (non-metallic) will be deposited in refuse skips and transported to a designated disposal area by a licensed refuse removal contractor.

(3) All metal waste material will be kept in a waste metal basket and removed to a recycling plant at the completion of the program.

(4) All reusable pallets will be stored and transported back to the suppliers.

(5) The Drilling Contractor will remove any worn tyres.

(6) All waste hydrocarbons, oils and greases, will be collected in designated waste drums and removed for recycling by the Drilling Contractor.

(7) Any soil contaminated by hydrocarbons will be collected and disposed off at a designated disposal area.

(8) Any camp refuse will be collected in a garbage skip and removed to a designated refuse site by a licensed refuse removal contractor.

ACCIDENT / INCIDENT REPORTING
All accidents, including environmental incidents, no matter the severity are to be reported to the Brisbane Offices immediately regardless of the time or day using the OCA Health Safety & Environmental Alert Form. OCA & Origin Incident / Accident Forms are to completed and sent by facsimile or modem to the Brisbane Offices at the earliest opportunity along with the relevant Contractor Reports.

13. APPENDIX 3 – OCA DRILLING PROCEDURES

13.1. Correct Drilling Procedures

(1) Daily safety meetings are to be held prior to the start of each tour and are to be recorded on the Tour Report.

(2) BOP's are to be operated daily or whenever out of hole and are to be recorded in the Tour Report.

(3) Each day, all drill pipe on location will be noted in the Tour Report as to being in hole, on rack, etc.

(4) Slow Pump Rate tests are to be carried out once per tour and are to be recorded in the Tour Report.

(5) A pump efficiency test should be conducted where possible.

(6) Emergency engine shut down equipment is to be tested and operated prior to drill out and then weekly on all engines, or more frequently if required, and noted on TOUR report. Safety Drills will be held weekly, or more frequently at the discretion of the Drilling Supervisor.

13.2. Casing

13.2.1. Production Casing - 152 mm (6") hole - 73 mm (2.875") tubing

Where a well is proved to be productive a 73 mm (2.875") tubing string will be run and cemented.

(1) After running wireline logs or testing, run a wiper trip to T.D., circulate hole clean, pull out of hole laying down pipe - strap out, change rams to suit the selected casing size.

(2) Install float shoe on bottom with float collar on top of 1st joint. Bakerlok these joints together.

(3) Centralisers: mid 1st joint and on 3rd and 5th couplings, and over each joint from 30 m below to 30 m above each potential pay zone. Ensure that a lock ring is used to locate the shoe joint centraliser.

(4) Where programmed, install three scratchers every joint, located securely with lock nails, from 20 m below the OWC to 20 m above, through each potential pay zone.

(5) Run casing, tag bottom, install cement head and circulate at least the total volume of the casing whilst slowly reciprocating through a 7 m stroke. Pressure test all lines and cement as per CEMENTING PROCEDURE.

NOTE: Casing is to be reciprocated continuously until the cement has been pumped.

13.3. Cementing Procedure

13.3.1. Production Casing - 152 mm (6") hole - 73 mm (2.875") tubing

(1) Pressure test all lines to 28,000 kPa (4000 psi) for 5 minutes.

(2) Mix sufficient preflush brine with 6 kg SAPP/bbl to fill 450 m annulus, calculated from DLL caliper, when displacing. The density of the brine must be at least equal to the mud weight equivalent of the permeable zones. Pump preflush.

(3) Mix and pump cement slurry reciprocating slowly through a 6 m stroke.

(4) Prior to displacing, disconnect the cement line to the well head and **flush clean** with water from the pump unit. Install a preloaded pup joint, release the top plug and displace with water or brine.

(5) Bump plug with 7000 kPa (1000 psi) over final displacing pressure. Hold for 15 minutes. If float does not hold, rebump plug and hold 3500 kPa (500 psi) on casing for 6 hours.

(6) Lift BOP's, drop and set slips, land casing with 20,000# set down. After nippling down BOPs the tubing can be pulled into tension. Brisbane office to advise **setting height of tubing collar and required tubing tension**.

13.4. BOP Pressure Testing

All the requirements of the BOP Test Procedures (Section 2) of the Operations and Safety Manual will be adhered to.

13.4.1. Casing Tests

The Contractor will test the BOPs following the setting of surface casing and / or intermediate casing and prior to drilling out. Use the cement pumping unit. All tests are to be conducted using water. The Cup Tester to be used as required. Test pressures are tabulated in the Drilling Program.

13.4.2. Below Casing Tests

Every seven days after drilling below the last casing shoe, a pressure check of the BOP and manifold equipment will be made using a suitable Cup tester as indicated below:

(1) Below surface casing test to a low pressure of 1750 kPa (250 psi) for 15 minutes, then to 14000 kPa (2000 psi) for 15 minutes.

(2) Below intermediate casing test to a low pressure of 1750 kPa (250 psi) for 15 minutes, then to 17500 kPa (2500 psi) for 15 minutes.

(3) Pipe Rams and Annular Preventer are to be operated on a daily basis with Blind Rams being operated on each trip out of the hole. Manual closing controls are to be checked on a daily basis.

(4) Emergency engine shut down equipment is to be tested and operated prior to drill out and then weekly on all engines, or more frequently if required, and noted on TOUR report. Safety Drills will be held weekly, or more frequently at the discretion of the Drilling Supervisor.

IT IS A GOVERNMENT REGULATION THAT BOPs ARE OPERATIONAL AT ALL TIMES AFTER DRILL OUT OF ANY CASING STRING

13.5. Formation Leak-Off and Formation Integrity Tests

A formation Leak-Off Test (LOT) or Formation Integrity Test (FIT) is conducted to determine the strength of the open hole formation and to confirm the competency of the casing cement job. The leak-off value obtained is used to establish the maximum allowable casing pressure (MACP) for well control procedures and to calculate Kick Tolerance to be used as a guide for determining the maximum depth to be drilled prior to setting the next string of casing.

A LOT is defined as a test in which the pressure is taken to leak-off and the formation is fractured. A LOT should not be taken to a pressure higher than the calculated overburden pressure of 2.31 SG below seabed plus a seawater hydrostatic gradient. A FIT is defined as a test in which pumping is to be stopped at a predetermined maximum based on requirements for the hole section, or known fracture pressures for exposed formations.

LOT data is plotted on a volume pumped versus applied surface pressure plot to determine the leak-off pressure. As illustrated in Figure 10, the leak-off pressure is the pressure at which deviation from a straight line occurs. Pumping should stop when this deviation is clearly defined on the plot. The formation fracture pressure for a given depth is calculated as the sum of the mud hydrostatic pressure and the surface applied leak-off pressure.

Formation leak-off tests should be conducted at the following times:

(1) After drilling out every casing shoe once the BOP stack is run

(2) Prior to penetrating a suspected or known overpressure zone

(3) After drilling a suspected weak formation

(4) After any significant increase in mud weight

13.5.1. Procedure (Land Operations)

(1) Prepare a graph of pressure vs volume pumped. The estimated surface applied leak-off pressure (for LOT) and maximum applied surface pressure (for FIT) should be pre-plotted on the graph.

(2) Drill out casing shoe and drill 3-5 m of new hole below the original overhole.

(3) Circulate to ensure mud column is balanced and cuttings are circulated out.

(4) Pull bit inside casing shoe. If a slug has been pumped, as in the case when pulling back where a long open hole section has been drilled, ensure the slug is circulated out of the well prior to performing the leak-off test.

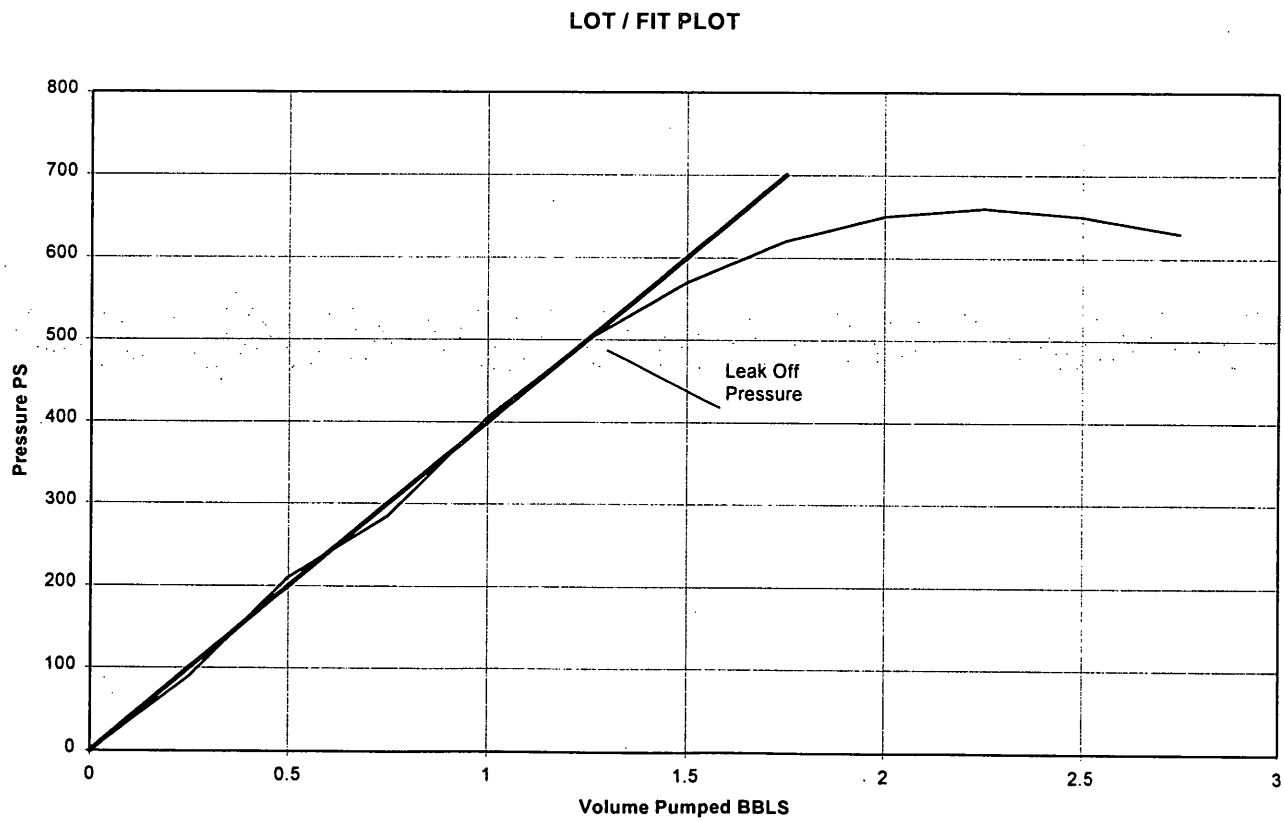
(5) Shut the well in using the designated pipe rams.

(6) Pump down the drillpipe and/or annulus at a constant rate with the cement unit or high pressure pumping unit. Suggested pump rate should be 0.25 bpm. For tests conducted with permeable formations exposed in the open hole, pump rates of 1 to 1.5 bpm may be required. Record and plot the applied pressure at increments of ¼ bbl (1 minute intervals).

(7) The point of departure of the data points from the straight line relationship is the leak-off pressure. For a LOT, stop pumping when the departure from the straight line is clearly defined. For a FIT, stop pumping when the present maximum required surface pressure is reached, or the formation leak-off is reached, whichever occurs first. Record and plot the pressures in one minute intervals after shutting down the pump until the pressure stabilises.

(8) Bleed off the pressure and record the volume of fluid recovered. Any difference between the volume bled back and the volume pumped is volume that has been lost to the hole.

FIGURE 10



13.5.2. Calculation and Interpretation

The leak-off pressure gradient is calculated as follows:

$$LOT = \frac{PS}{1.421\,D} + MW$$

Where:

LOT = leak-off pressure gradient (SG)

PS=applied surface pressure at leak-off (psi)

D =depth of suspected leak-off (m)

MW = mud weight (SG)

The depth used in this calculation should either be the casing shoe depth, drilled depth at which an open hole leak-off test is done, or the depth of the suspected weakest formation in the open hole section.

13.6. Testing Procedure

13.6.1. Drill Stem Testing Procedure

If a drill stem test is warranted, the following procedure will be adopted:

(1) Circulate until hole is clean.

(2) Pull out of hole.

(3) Make up testing assembly:

(4) Final test string configuration will be confirmed with testing contractor prior to test. Tools must include as a minimum, four (4) recorders (mechanical – inside, outside and recovery, electronic – inside) plus two independent reversing / pump-out subs, safety joint and jars. If possible, fax proposed tool string to the Brisbane office before make up.

(5) Check measurements with the testing operator to ensure that the desired interval is in fact tested. Write all measurements on the back of the Drill Stem Test Report Form.

(6) Check that the flare line is clear and all valves on this line downstream from the choke are open. Ensure that separator valves and dumps are in the operating position and that the entry and exit valves are closed.

(7) Ensure water sprays to all exhausts are in operation and that all sources of ignition have been suppressed.

(8) Set packers.

(9) Open valve - observe annulus to ascertain if the packers are holding.

(10) After a 5 minute initial flow, close tool.

IF THERE IS ONLY A SLIGHT AIR BLOW

(11) After 60 minutes shut-in, re-open the tool.

(12) Open for a further 60 minutes then shut-in tool

(13) After 120 minutes second shut-in, pull free and P.O.O.H.

IF THERE IS A STRONG AIR BLOW OR IF THERE IS GAS TO SURFACE DURING THE INITIAL FLOW PERIOD

(14) After 60 minutes shut-in, open tool.

(15) Flow gas until all mud has been cleared (the gas should be vented through the flare line and flared.

(16) Flow gas for at least 45 minutes or until pressures have stabilised. Observe pressures and temperatures every 5 minutes if recorders are not available. Two samples of gas will be collected from the floor manifold.

(17) If the gas flow during the clean-up is moderate and decreasing and if the flare has a smoky reddish colour, there is probably oil in the pipe. In this case, the flow period should be prolonged until oil reaches the surface.

(18) If there is no gas to surface but there is a continuing air blow, prolong flow period until either water reaches the surface or the air blow dies.

COLLECT FLUID SAMPLES AS PER SECTION 13.7

(19) Shut-in tools for at least 2 hours, then pull the packer free. Observe the mud level in the hole for any returns.

(20) If the contents of the drill pipe have not been reversed out, take samples of the fluid in the drill pipe and it is most important to take a sample from above the test valve.

(21) When pulling out of hole it is most important that the hole is kept full.

(22) Keep a full and accurate record of all operations during the test on the Drill Stem Test Report Form.

(23) If oil has been produced, reverse circulate out.

PULLING DRILLPIPE CONTAINING HYDROCARBONS
MUST NOT BE ATTEMPTED

13.6.2. Reverse Circulating Procedures

If it is considered that there could be significant liquid hydrocarbons in the string, it should be reverse circulated out prior to pulling the string.

The following procedure should be followed when reversing out:

(1) Closing the choke manifold when shearing the knock out sub or opening the DCIP valve will buffer the sudden drop of annular fluid. This reduces the commingling of produced fluids, and by manipulation of the choke, a controlled recovery can be made.

(2) Calculate the drill string capacity above the pump out sub or DCIP (which ever is used), and convert the volume to pump strokes at 95% efficiency.

(3) Zero the pump stroke counter or have two people on the pumps counting strokes. Line the pump to the kill line - DO NOT close the BOP's.

(4) Close the choke manifold. Drop the knock out bar or rotate the DCIP valve to the circulating position.

(5) Fill the hole as the annulus drops. Watch the annulus at all times, adjusting the pump rate to keep the annulus full, but not overflowing.

(6) Open the choke and commence recovery. Control the recovery rate using the choke and collect samples from the bubble hose.

(7) As the flow slows down due to hydrostatic balancing, shut-in the annular preventer and pump out the remaining recovery. Ensure the pump pressure, 1400 - 2100 kPa max (200 - 300 psi), does not exceed formation breakdown pressure. When the calculated capacity has been pumped, drilling mud returns should act as a final check to full recovery.

(8) Continue circulating for approximately 15 minutes to ensure a balanced system. Return fluids will normally be diverted into a holding tank where volumetric recovery is confirmed, and after a settling period, various fluid recoveries can be accurately determined.

(9) Pull out with test string.

13.7. Formation Fluid Samples

13.7.1. Crude Oil Samples

If crude oil is recovered, two 5 litre can samples will be taken for analysis. Preliminary analysis of the API gravity and pour point of the oil will be made at the wellsite. The samples will be labelled with: Well Name, Date, DST Number, DST Interval, Formation, Sample origin and Temperature.

13.7.2. Gas Samples

Gas samples of 500 - 1000 ml are required for analysis. A minimum of two samples per test will be collected under pressure in an evacuated steel cylinder (minimum 1500 psi). The cylinder will be labelled with:- Well Name, Date, DST Number, DST Interval, Formation, pressure, sample origin, time sample was taken and the reservoir and surface temperatures.

Use the Drill Stem Test Report form to record all information about the samples collected. A sample of any gas to surface will be analysed at the wellsite using the chromatography in the mud logging unit. Avoid saturating the detector by diluting with air.

13.7.3. Water Samples

The following procedures for sampling drill stem test fluid for hydrogeochemical evaluation are recommended.

Collect the following types of samples for evaluation:-

(i)	Drilling mud sample	-	1 litre plastic bottle
(ii)	Make-up water	-	1 litre plastic bottle
(iii)	DST samples	-	1 sample from the top
		-	1 sample from the middle
		-	1 sample from the bottom
(iv)	Mud filtrate	-	20 ml sample

Collect each DST sample in a 1 litre plastic bottle. If an organic extraction of possible petroleum components from the water is required, then two, 1 litre GLASS bottles should be collected.

13.7.4. Sample Collection Methods

Rinse all containers thoroughly with the fluid to be sampled before collecting the actual sample.

If possible, obtain the Ph and resistivity of each sample immediately after collection. Measure and record chlorides by titration.

Fill all plastic containers to the brim with sample. Screw cap down and at the same time squeeze some of the liquid out then tighten the cap. Wrap the cap tightly with tape. This procedure will provide a good seal and reduce bacterial putrefaction and oxidation.

Fill bottles ¾ full, tap cork evenly into position, invert and store with bottom end upwards. This will trap gases against the bottom of the bottle. Check for leakage around the cork.

Label all containers clearly.

STORE SAMPLES IN A COOL PLACE AND SHIP
AS SOON AS POSSIBLE FOR ANALYSIS.

Water samples quickly change composition upon sitting, especially if they have been contaminated with mud. Thus for best results, samples should be sent for analysis immediately after collection.

13.8. Well Velocity Survey Procedures

Attachment A shows the geometry of the offset and flarepit locations. The offset shots (A = 5 m, B = 25 m and C = 50 m from the well head) are to estimate the well datum static and can be compared with the seismic datum static to determine if a static mistie exists. The flarepit is used for the deeper check shots for improved coupling and safety when larger charges are required.

In order to more accurately determine respective datum statics relative to offset and flarepit shot locations greater duplication of shot data is required. The following field acquisition procedures are proposed and the geometry is shown on Attachment A:

13.8.1. Offset Shots

(i) Offset shots to be not more than 0.5 metres in depth (as safety permits). This will minimise any error upon correcting to vertical travel paths.

(ii) All offset shots should be acquired at the same shot depth to enable direct comparison between successive shots.

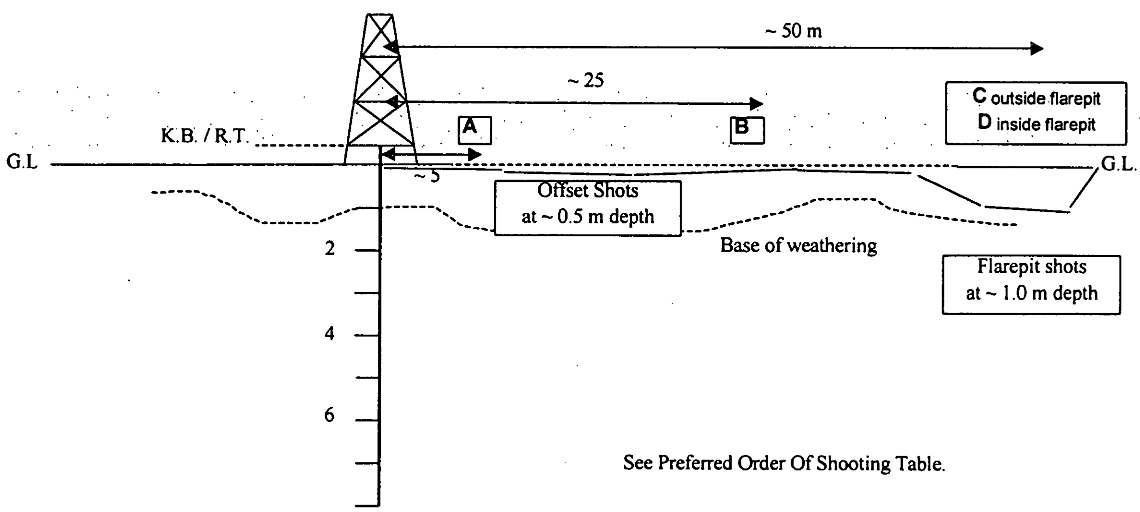
(iii) Datum shots should be acquired at a geophone depth equal to mean sea level.

13.8.2. Flarepit Shots

(i) all flarepit shots should be acquired at the same offset position and same shot depth to enable direct comparison between successive shots at different geophone depths.

(ii) at least three of the offset geophone depths (MSL) should be duplicated by shots from the flarepit so that a "flarepit datum static" can be determined and used to datum correct all subsequent flarepit shots at deeper horizons of interest.

ATTACHMENT A



13.9. Gyro Assisted Kick-off Procedure

(1) Drill out cement and polish off shoe plug to kick-off point. Pull out of hole.

(2) Rig up Sperry-Sun monitoring equipment for ROP and depth.

(3) Pick up build assembly and drill bit (refer Section 5).

(4) Orient the UBHO keyway to the motor bend. Ensure UBHO orientation is visually confirmed by Rig Manager, OCA Rig Supervisor, and Sperry-Sun representatives.

- The UBHO sub will be run immediately above the MWD tool.
- Accurately strap & gauge all components before make up.
- Confirm PVT system is working correctly (if conventional mudlogging is not being undertaken).

(5) RIH on 3½" OD x 15.5 ppf IF, G105 drill pipe to approximately 5 m above the casing shoe.

(6) Record the pick-up & slack-off weights of the BHA. Take SCR's.

(7) Rig up wireline unit & gyro service, suspending the wireline sheeve from the derrick.

(8) Make up gyro on wireline and RIH through drill pipe. Drill pipe to be suspended in elevators. Stab into UBHO sub. Obtain a constant azimuth reading (repeat if necessary). Using gyro orient the bit to the kick-off azimuth by rotating drill pipe (use ratchet mechanism with rotary table locked). Sperry-Sun and OCA personnel should witness the recorded reading. Mark surface pipe as required.

(9) POH with gyro tool.

(10) Suspend wireline operations.

(11) With the build assembly correctly oriented and rotary table locked, lower the assembly until it clears the casing shoe. Break circulation just prior to tagging bottom.

(12) Drill ahead in slide mode as directed by Sperry-Sun personnel until the first connection.

(13) Re-run gyro to check/adjust azimuth before drilling ahead.

(14) Rig down wireline unit and gyro service.

14. APPENDIX 4 - COMMUNICATIONS

14.1. OERL Phone Numbers

Office Telephone:	(08) 8235 3803
Office Facsimile:	(08) 8223 2263
Drilling Operations Mobile:	(04) 1773 1889
Geology Operations Mobile:	(04) 0904 5318

14.2. Daily Reports

Daily reports covering 0000 - 2400 hours transmitted by 0730 hours Eastern Standard Time, to the Brisbane Office.

14.3. OCA After Hours Contact Telephone Numbers

Ross NAUMANN:	(07) 3848 8618	(04) 1358 4661
Shane ROBBIE:	(07) 3285 6416	(04) 1773 1889
James DONLEY:	(08) 8358 2485	(04) 0904 5318
Richard SUTTILL:	(08) 8289 4006	(04) 1982 1520

14.4. Emergency Contact Numbers

Port Campbell

Ambulance:	000
Fire:	000
CFA: Colac	(03) 5232 1923
Hospital: Warnambool Base Hospital	(03) 5563 1666 (Ryot St)
Police:	(03) 5598 6310 (Lord St) – if unattended, call will divert to Warnambool Police
State Emergency Service:	(03) 5598 6363
Corangamite Shire Council:	(03) 5593 7100
(Camperdown) Peter Johnston	(03) 5593 2695 Fax

14.5. Contractors' Contact Numbers

Expertest Pty Ltd (Production Testing) 138 Richmond Road Marleston, SA 5033	(Dave Hawkes)	 Fax: A/H:	(08) 8354 0488 (08) 8443 7408 (08) 8381 3467
Geoservices Overseas SA (Mudlogging) Unit 3, 20 Endeavour Drive Port Adelaide SA 5015	(Trevor Packer)	 Fax: Mob.	(08) 8240-0655 (08) 8240-0933 (04) 1984-7734
Halliburton Australia Pty Ltd (Cementing) Level 12, 60 Edward St Brisbane, QLD 4000	(David Guglielmo)	 Fax:	(07) 3211 3950 (07) 3211 3952
Roma Base	(Paul Larkins)		(07) 4622 4588
K & S Freighters (Portland)	(David Whitehead)	 Fax: Mob:	(03) 5523 4144 (03) 5523 5647 (04) 1982 9792
M-I Australia Pty Ltd (Drilling Fluids) 11th Floor, 215 Adelaide Terrace Perth WA 6000	(Tim Monteath)	 Fax: Mob.	(08) 9325 4822 (08) 9325 1897 (04) 1891-3873
Nelsons Transport Service (Cobden)	(Ian Kerr)	 Fax: Mob:	(03) 5595 1320 (03) 5595 1883 (04) 0979 7223
Oil Drilling & Exploration Pty Ltd (Drilling Rig) 15 - 17 Westport Road Elizabeth West, SA 5113	(Steve Ford)	 Fax: Mob.	(08) 8255 3011 (08) 8252 0272 (04) 1903 0739
Petroleum Support Services (Landman)	(Chris Annear)	 Fax: Mob:	(08) 8723 2082 (08) 8724 9305 (04) 0733 8228
Schlumberger Oilfield Australia Pty Ltd (Wireline Logging) 59 Kremzow Road Brendale, QLD 4500	(Lee Swager)	 Fax: Mob:	(07) 3205 0110 (07) 3881 3173 (04) 1773 1905
Sperry-Sun Drilling Services (Directional Drilling) Level 2, 256 St Georges Terrace Perth WA 6000	(Mike Cunnington)	 Fax: Mob:	(08) 9278 4100 (08) 9278 4400 (04) 1891 3267

14.6. Government Contact Numbers

Communication with the Government will be through the Brisbane office only.

ORIGIN ENERGY PETROLEUM PTY LTD (Operator)
60 Hindmarsh Square
ADELAIDE SA 5000

Tel:	(08) 8235 3737	James Donley	(08) 8358 2485 (H)
Fax:	(08) 8223 1851	(Mob)	(04) 0904 5318
Log Fax:	(08) 8235 3627		

OIL COMPANY OF AUSTRALIA LIMITED (Drilling Manager)
2nd Floor, North Court, John Oxley Centre
339 Coronation Drive
MILTON Qld 4064

Tel:	(07) 3858 0600		
Fax:	(07) 3369 7840		
Log Fax:	(07) 3367 1019	Sev Simeone	(04) 1914 2896

DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENT
8th Floor
250 Victoria Parade
FITZROY VIC 3065

Tel:	(03) 9412 5082	Kourosh Mehin	(03) 9840 1079 (H)
Fax:	(03) 9412 5156		