(PAGE 1 OF 71)

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909080 001

Santos

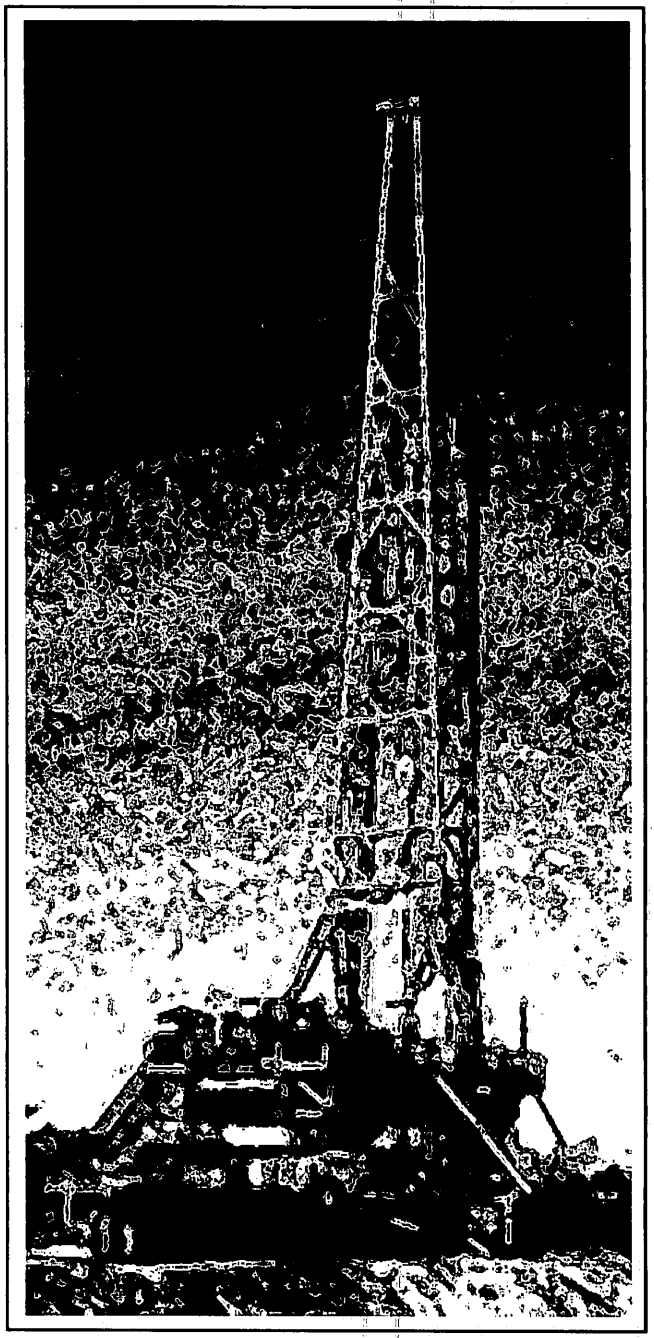
SANTOS LTD A.B.N. 80 007 550 923

NAYLOR 1

GAS EXPLORATION WELL

WELL PROPOSAL

DRILLING PROGRAM
COMPLETING & TESTING PROGRAM



P.E.P. 154, OTWAY BASIN

South Australian Business Unit
Exploration & Development

WP:01/003 Rev. 0

909080 002

Santos (BOL) Ltd

(A.C.N. 000 670 575)

EXPLORATION & DEVELOPMENT - SA

NAYLOR 1
WELL PROPOSAL

G Parsons / M Majedi
January 2001

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FIGURES, ENCLOSURES AND ATTACHMENTS

FIGURES

TABLES

ENCLOSURES

ATTACHMENTS

WP:01/003 Rev. 0

1. WELL DATA SUMMARY

WELL NAME: Naylor 1

LICENCE: PEP 154

EQUITY:

Voting (%)		BUDGET STATUS: 2001 Budget Item Investment ($mm)	
Santos	90%	Santos	$1.094mm
Beach Petroleum	10%	Beach Petroleum	$0.122mm
TOTAL	100.00%	TOTAL	$1.216 mm (P&A) **

WELL TYPE: Gas Exploration

Latitude:	38° 31' 56.77" S
Longitude:	142° 48' 29.29" E
Seismic Reference:	Inline 2200 Curdievale 3D CDP 10225
Ground Level:	46.0m (Preliminary)
Rotary Table:	50.7m (Preliminary)
Proposed Total Depth:	2191m RT (-2140m)
Rig:	OD&E 30
Nearby Facilities:	Heytesbury (12km)

Resource Estimate (Recoverable)

Mean Success Volume: 5.9 BCF
Mean Expected Volume: 2.5 BCF

Cost Estimates

P&A: $1.216 mm
C&S: $1.466 mm
Cost Code: 8EE-84D894

Objectives/Fluid Contacts

Primary

Waarre Sandstone (gas)

Secondary

Stratigraphic Prognosis

Formation	Depth (m-KB)	Depth (m-SS)
Clifton	457	-406
Mepunga	520	-469*
Dilwyn	560	-509*
Pember	830	-779*
Pebble Pt	956	-905
Paaratte	1039	-988
Skull Ck	1534	-1483
Belfast	1729	-1678
Flaxmans	2000	-1949*
WAARRE	2059	-2008
Eumeralla	2157	-2106
TD	2192	-2141

*Geological Picks

Formation Evaluation

Wireline Logging:

PEX-HRS	TD to Surface Casing to Surface
SDT (WFT)	TD to Surface Casing (WFT across Waarre Sst)
MCFL-CALI	TD to 10 m above top Pember
PEX-LDL-CNL	TD to 100' above Waarre Sst (dependent on shows and reservoir development)

SWC's:
20 programmed

MDT's / RFT's :
20 point pressure survey

Velocity Survey:

No

Mudlogging:
10m Samples from Surface Casing to approx 1000m
3m samples thereafter to TD
Samples as per well programme

Formation Testing:
None programmed

Coring:
None programmed

REMARKS/RECOMMENDATIONS:
South & West deviation is critical. Directional surveys to be taken every 150 m. Steering required

Hole Design/Drilling Issues

Well Class: Down size monobore/Exploration

Hole Type: Down size monobore

Hole Size	Casing Depth
9 7/8"	7 5/8" Surface to 475m
6 3/4"	3 1/2" Surface to TD

Drill Fluid:
KCll/PHPA/Polymer

Deviation
Sub-Surface Targets:
Naylor 1 is a vertical well. An accuracy of 25m radius from seismic reference at TD has been requested. The critical structural direction is to the south and west of the wellsite.

Other Information/Hazards:
No hazardous zones in offset wells
No shallow gas expected
Waarre Sandstone has excellent reservoir properties (porosity 20%, permeability up to 20 darcies)

Nearby Wells and Duration:

Flaxmans 189 days (TD 3514m)
Curdie 40 days (TD 2596m)
Penryn 10 days (TD 1823m)

Approved by::	Project Leader:	Team Leader:	Operations Geology	Drilling Engineer:

ALL COORDINATES WITHIN THIS DOCUMENT USE AN AGD84 DATUM

2. EXECUTIVE SUMMARY

Naylor 1 is proposed as an Otway Basin gas exploration well to be located in the PEP 154 licence, approximately 10 km north west of the town of Peterborough, 1.6 km south west of the Boggy Creek CO_2 field and 9.8 km west of the Wallaby Creek gas field. The Naylor structure is situated within the Port Campbell Embayment and the productive Waarre Sandstone play fairway, (Figure 1).

The PEP 154 Licence is held 90% Santos (operator) and 10% Beach Petroleum N.L. The Naylor Structure is a tilted-fault block closure defined by the Curdievale 3D seismic. The well is expected to intersect a Waarre Sandstone reservoir with mean average net pay of 39.4 m.

The prognosed stratigraphic succession for the Otway Basin and Naylor 1 are summarised in Figures 2 & 3 respectively.

Naylor 1 is contingent on the results of Croft 1. Given success at Croft 1, Naylor 1 is an attractive project with a mean prognosed success case of 5.86 BCF sales gas (13.78 BCF OGIP) and a current Pc (probability of commercial success) of 42%, resulting in expected mean reserves of 2.5 BCF sales gas. Pc would increase signficantly if hydrocarbons are discovered at Croft 1.

3. GEOLOGICAL RISK ASSESSMENT

3.1 Play Analysis

The Naylor Prospect is mapped as a tilted-fault block closure with the primary reservoir being the Waarre Sandstone; both vertical and cross-fault seal are provided by a thick Belfast Mudstone (Figure 4). Structures are charged from mature source beds located within the underlying Eumeralla and / or Crayfish Group, with migration directly into the reservoir or via fault conduits. The play has proven successful in the nearby Mylor, Fenton Creek, North Paaratte, Wallaby Creek and Iona gas fields as well as the Boggy Creek $C0_2$ field. Naylor as with each of these fields exhibits a strong amplitude anomaly at the Waarre Sandstone horizon, which is interpreted as being indicative of a well-developed, gas saturated reservoir.

3.2 Trap (Pcl = 95%)

Interpretation and mapping of the Naylor prospect was based on the Curdievale 3D survey, which was recorded in early 2000. The Curdievale 3D data quality is good over the Naylor structure.

Several migrated volumes including migrated stacks with and without spectral whitening and both near and far offset migrated stacks were generated and used for interpretation. Due to better horizon continuity and amplitude preservation the migrated stack volume without spectral whitening was used for horizon interpretation. Far and near offset volumes were used for amplitude extraction and AVO analysis.

A coherency cube (similarity volume) was also generated and used in conjunction with other volumes for fault interpretation.

Well ties were performed for Boggy Creek 1 (Figure 5), Callista 1 and Curdie 1 (Figure 6). The Curdie 1 ties however may not be valid for the Waarre, as the well appears to have penetrated a fault plane at this level.

Figure 9 shows an arbitrary line through Boggy Creek 1 to the proposed Naylor 1 and Croft 1 locations. Figures 10 and 11 are strike and dip lines respectively through the proposed Naylor 1 location.

Main mapping was carried out at near top Waarre Sandstone, which is the primary target reservoir (Enclosure 1 & Figure 12). The Waarre sand package has a distinctive characteristic and therefore a high degree of consistency was maintained on mapping this unit.

The top Belfast Mudstone was interpreted on a selected grid in order to evaluate adequately its seal efficiency over the Naylor structure.

The Naylor structure is a relatively complex tilted fault block structure located between Boggy Creek 1, Curdie 1 and the proposed Croft 1 (Figure 12 and Enclosure 1). The extended Naylor structural closure area partially relies on downthrown side fault seal where Waarre reservoir juxtaposes the Eumerella Formation. Similar seal potential has already proven to be efficient at Boggy Creek. A strong amplitude event is prominent within the Waarre sand unit over the Naylor prospect. Similar events over all gas fields within the Port Campbell region suggest that the amplitude anomaly is likely related to the presence of gas in these structures. Furthermore, near and far-offset volumes were also used to evaluate the AVO response over the Naylor structure. Figure 12 is a line over the Naylor structure from the near and far offset volume. It clearly shows that the amplitude within the Waarre sand unit is much brighter in the far offset compared to the near offset. Figures 14, 15 and 16 are displays of amplitudes extracted from within the Waarre sand unit. Figure 16 is particularly encouraging as amplitudes from far offset minus near offset clearly indicate an AVO anomaly coincident with the Naylor structure.

The location for the proposed Naylor 1 well was selected on inline 2200 CDP 10225. This location is at a near crestal position, and about 50 metres away from the main fault at the Waarre sand level.

Depth conversion for the prognosis was performed using Curdie 1 velocities. The results of this conversion are presented in Attachment 1.

3.3 Reservoir (Prs = 95%)

The Waarre Sandstone reservoir was deposited as the initial post-rift sequence at the commencement of the Turonian time under non-marine to marginal marine conditions. The section is sub-divided into three sub-units – Waarre "A", "B" & "C". The lower A unit represents a basal transgressive systems tract (TST) characterised by flooding of an incised valley with sediments deposited under marginal marine / estuarine conditions. The basal portion of Unit A is represented by either sand (as in Curdie 1) or shale (Boggy Creek 1 and Callista 1). This section is overlain by the widespread predominantly argillaceous Unit B, which was deposited under estuarine conditions. Unit C followed and is characterised by initial estuarine / deltaic conditions succeeded by high-energy sands. As the transgression develops the valley system is flooded with the Flaxmans Formation and Belfast Mudstone. Figure 17 illustrates this model.

The Waarre Sandstone thickens to the south in the Port Campbell Embayment. The proximity to the Boggy Creek Field where good reservoir is encountered provides high confidence that similar good reservoir will be found in Naylor 1. Nearby in the waterwet Curdie 1, the Waarre Sandstone has an average porosity of 12% and a maximum porosity of 17% from logs. This reduced porosity could be a result of the Waarre sands not having early hydrocarbon emplacement, and thus being subject to increased diagenesis from the nearby fault and greater depth of burial. The strong amplitude anomaly associated with the Naylor prospect is likely to be an indication of good porosity.

A review of the local wells shows some variability in Waarre sand quality. In Boggy Creek 1 a maximum core permeability of 10.1 Darcies and average core permeabilities of 4.5 Darcies were measured. Drill stem tests confirmed the potential of the reservoir with test rates of 4.5 MMCFD. Howmains 1 represents an interfluve environment where the Waarre sand appears to be shalier and did not develop the same reservoir quality as at many adjacent locations. No log porosity estimate can be generated for Flaxmans 1, due to the poor Waarre coverage by the sonic log and its spurious nature. Log displays for Boggy Creek 1, Curdie 1, Flaxmans 1 and Howmains 1 are presented in Figures 5, 6, 7 & 8 and as a stratigraphic cross section (Enclosure 2).

3.4 Seal (Psl = 95%)

All Otway Basin successes In the Port Campbell Embayment area have been from high-side, tilted fault or horst blocks. The ultimate top seal to Waarre reservoirs is the marine Belfast Mudstone. While a potential waste or " thief" zone (the Flaxmans Formation) exists between the Waarre sands and the Belfast seal, the unit was deposited under transitional marine conditions and generally acts as a seal.

A review of the cross-fault seal in proposed Naylor 1 suggests that leakage will not occur as the bounding fault displacement (~160ms) is considerably less than the thickness of the Belfast Mudstone (+260ms).

3.5 Charge (Pch = 50%)

Hydrocarbons are produced in the Port Campbell Embayment with the Eumeralla Formation and/or the Crayfish Group being the source beds. Analysis of the condensates and oils from the area suggest a non-marine origin with both algal and higher land plant components (Type III Kerogen). Maturation studies indicate that the top of the hydrocarbon window lies at about 2500m (SS). Thus mature Eumeralla source units which underlie the local gas fields are most likely to charge directly into the overlying structures through source-reservoir juxtaposition or via fault conduits. This model is proposed for Naylor 1, which is positioned in a similar setting to the nearby existing gas fields.

With many of the structures being present prior to the Belfast deposition, the timing of generation and migration does not appear to be a major issue. The change risk incorporates the risk of CO_2 displacement (see discussion below).

3.5 $C0_2$ Issues

The distribution of CO_2 within the Port Campbell area appears to be related to the introduction of a restricted CO_2 volume at a number of locations and its subsequent migration. The CO_2 is considered to be from a mantle source and is likely to have occurred in conjunction with the emplacement of an igneous body during the Miocene.

A review of the high-resolution aeromagnetic data has been undertaken in an effort to understand the distribution of deep-seated faulting, believed to be the conduit for CO_2 migration and the emplacement of igneous bodies. The results of the study indicate the presence of an intrusive marginal to the coast and proximal to a major NNE-SSW lineament. This lineament appears to be coincident with major

faulting identified on the seismic and is seen as a likely conduit for the Langley and Grumby CO_2. While an intrusive is not identified at nearby Boggy Creek, a similar trending lineament is mapped through the Boggy Creek well location.

Given the location of Naylor with respect to Boggy Creek (1.6km to NE) and the imprecision of the aeromagnetic tool, it is difficult to accurately predict whether CO_2 poses a major risk to the prospect. A factor (50%) has been included in the charge risk for the prospect with respect to CO_2. The drilling of Naylor 1 is contingent upon the success Croft 1 which would see considerably reduced the risk if CO_2 is present.

4. RESOURCE DISTRIBUTION AND ECONOMIC EVALUATION

4.1 Resource Distribution

Distributions for local gas field parameters are estimated primarily from those at Boggy Creek 1, Curdie 1 and Flaxmans 1 with data from other nearby wells reviewed to provide details of the upper and lower limits. These results are set forth in Table 1 and are used in the resource calculation sheets.

4.1.1 Area

The seismic mapping shows an independent closure of 340 acres (Enclosure 1) and this is used as the P1 area. A low side 75-acre area forms the basis of the P99 estimation and corresponds to the extent of the high amplitude anomaly associated with the prospect. The resultant mean area corresponds to the area covered by the strongest amplitude anomaly.

4.1.2 Porosity

In the adjacent Curdie and Boggy Creek wells, average porosity of about 12% and 17% are calculated from the respective logs. Spot core porosities of over 27% were measured in Boggy Creek 1. A range of 12% to 22% average porosity for P99 & P1 respectively calculates a mean porosity of 16.4% for the proposed Naylor 1.

4.1.3 Gas Saturation

A gas saturation distribution of 60-90% (min/max) captures all of the discoveries in the Port Campbell Embayment. Based on a lognormal distribution this calculates a mean of 73.8%, which approximates the Boggy Creek 1 gas average of 71.5%.

4.1.4 Net Pay

Boggy Creek 1 has net CO_2 pay of 28m (93 ft) from a gross 45m (146ft) section. At Curdie 1 net sand was 63m (208ft) from a gross interval of 81m (265ft). The proposed Naylor lies on depositional strike with Curdie 1 and a gross Waarre section of 98m (322ft) is predicted. Net / Gross ratios of 68% & 78% are recorded in Boggy Creek 1 and Curdie 1 respectively with a range from 60% (P99) and 90% (P1) providing an 73.8% N/G for the proposed Naylor 1. The mean net pay estimate for Naylor 1 is 39m (129 ft).

4.1.5 Recovery Factor

The recovery factor for Santos' Mylor and Fenton Creek fields is estimated to be about 50%. The mean recovery factor of 49.6% is calculated for Naylor based on 40% and 60% P90 and P10 respectively. The mean RF reflects the best estimate from reservoir engineering. It is believed that gas production could be influenced by a strong aquifer and hence the low assigned recovery factor.

4.1.6 Gas Composition

The ranges of gas compositions utilised for Naylor are relatively narrow and reflect the variation between the Mylor 1 and Fenton Creek 1 gas compositions. No detailed information from other nearby fields is available although there is potential for the gas to be drier. The main risk in Naylor regarding this issue is the percentage of CO_2 and this is incorporated in the shrinkage factor low side of 80% and a charge factor of 50%.

4.1.7 Flow Rate

Flow rates used range between 3 MMCFD and 30 MMCFD. These estimates are based on the results of the Mylor and Fenton Creek extended production tests. Mylor 1 flowed at 25mmcfd on a ¾" choke, Fenton Creek 1 flowed 17mmcfd on a ½" choke and Boggy Creek 1 flowed at 4.5 MMCFD on a ½" choke on open hole DST. The 4.5mmcfd flow from the DST at Boggy Creek 1 doesn't reflect the multidarcy permeability of the reservoir.

4.2 Location

The proposed Naylor 1 is located about 10km north west of the town of Peterborough. The site is located in intensive farming land (dairy cattle / sheep) as well as reminant native bushland and utmost attention needs to be given to environmental and landholder issues.

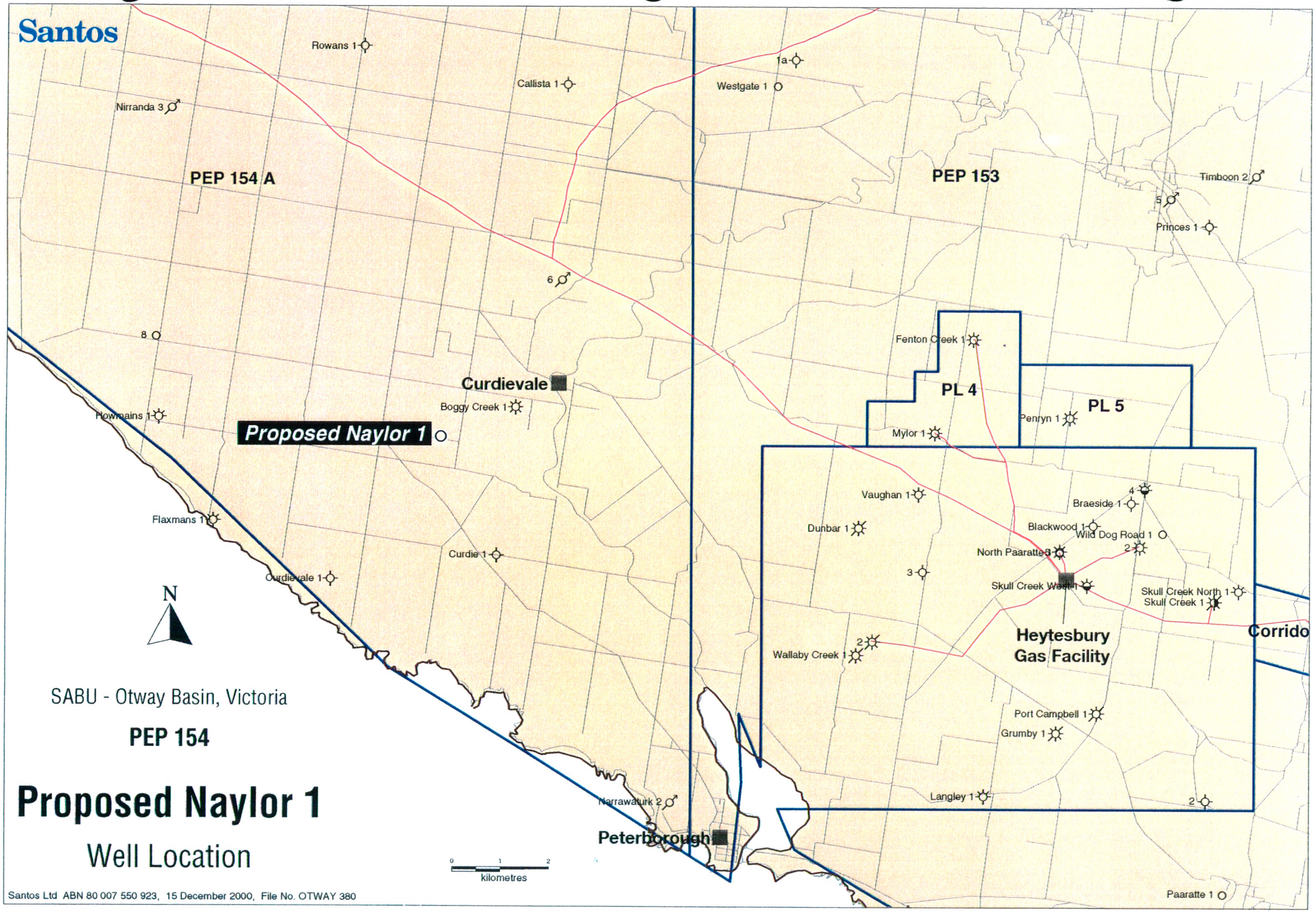

Santos
Rowans 1
Callista 1
Nirranda 3
1a
Westgate 1
PEP 154 A
PEP 153
Timboon 2
5
Princes 1
6
8
Fenton Creek 1
PL 4
PL 5
Curdievale
Boggy Creek 1
Penryn 1
Mylor 1
Howmains 1
Proposed Naylor 1
Vaughan 1
Braeside 1
4
Blackwood 1
Wild Dog Road 1
Dunbar 1
Flaxmans 1
2
North Paaratte 3
Curdie 1
3
Curdievale 1
Skull Creek West 1
Skull Creek North 1
Skull Creek 1
N
Heytesbury Gas Facility
Corrido
2
Wallaby Creek 1
SABU - Otway Basin, Victoria
PEP 154
Port Campbell 1
Grumby 1
Proposed Naylor 1
Langley 1
2
Narrawaturk 2
Well Location
Peterborough
0 1 2
kilometres
Paaratte 1
Santos Ltd ABN 80 007 550 923, 15 December 2000, File No. OTWAY 380

Figure 1

PE909080-color002

909080 012

OTWAY BASIN STRATIGRAPHIC COLUMN

Santos

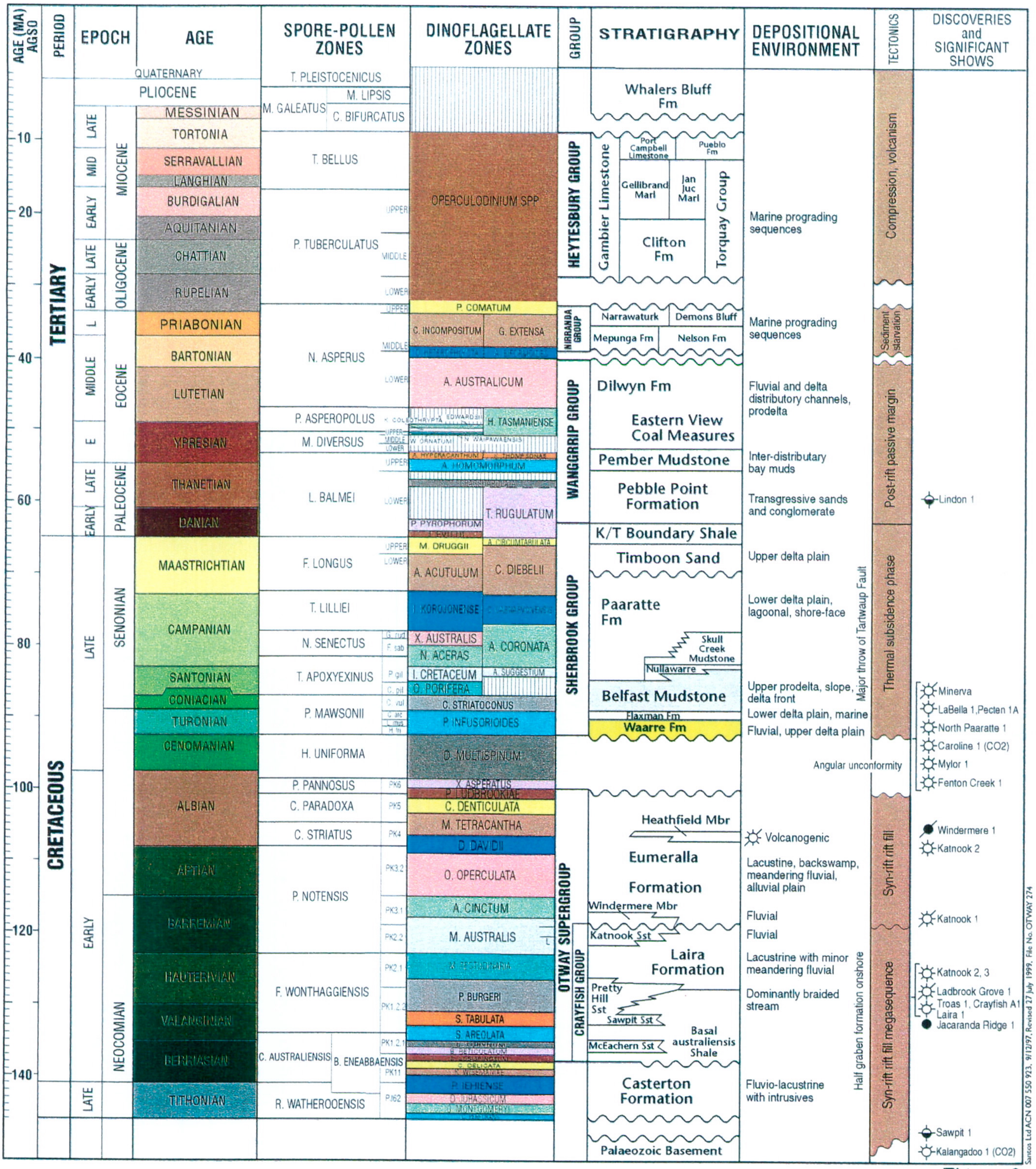


Figure 2

909080 013

Santos

NAYLOR 1
STRATIGRAPHIC COLUMN

Santos Ltd ABN 80 007 550 923, Sept 2000, File No. OTWAY 379

Lat.: **38° 31' 52.61"S (ANS)** Long.: **142° 48' 25.57"E (ANS)**
Seismic : **Curdievale 3D Inline 2206, CDP 10222**
G.L.: **46.0m(prelim)** R.T.: **50.7m (prelim)**

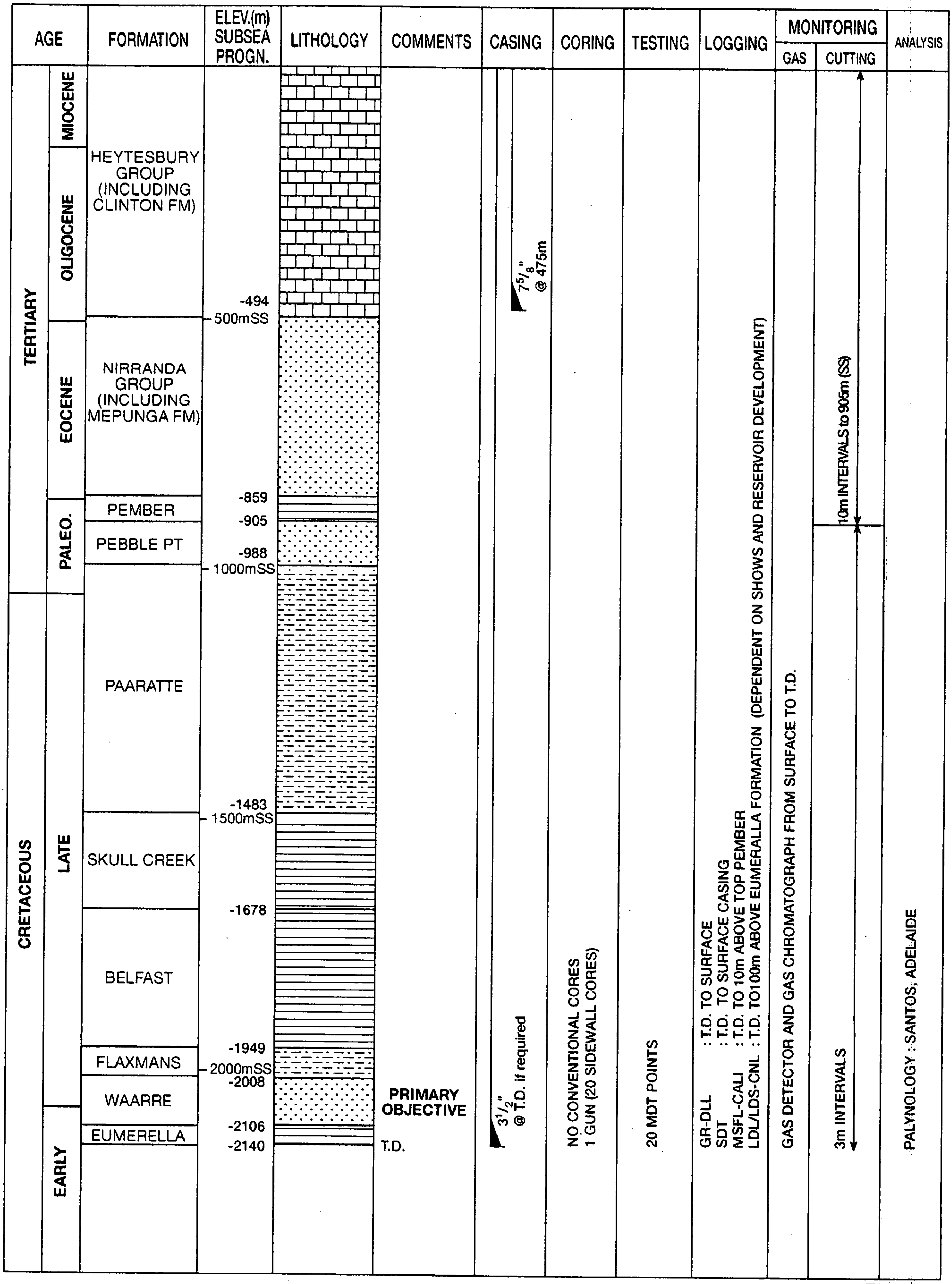


Figure 3

Santos

Otway Basin, Victoria - PEP 154 A

Proposed Naylor 1
Diagrammatic Structural Cross Section

approx vertical scale: 0 – 100 – 200m

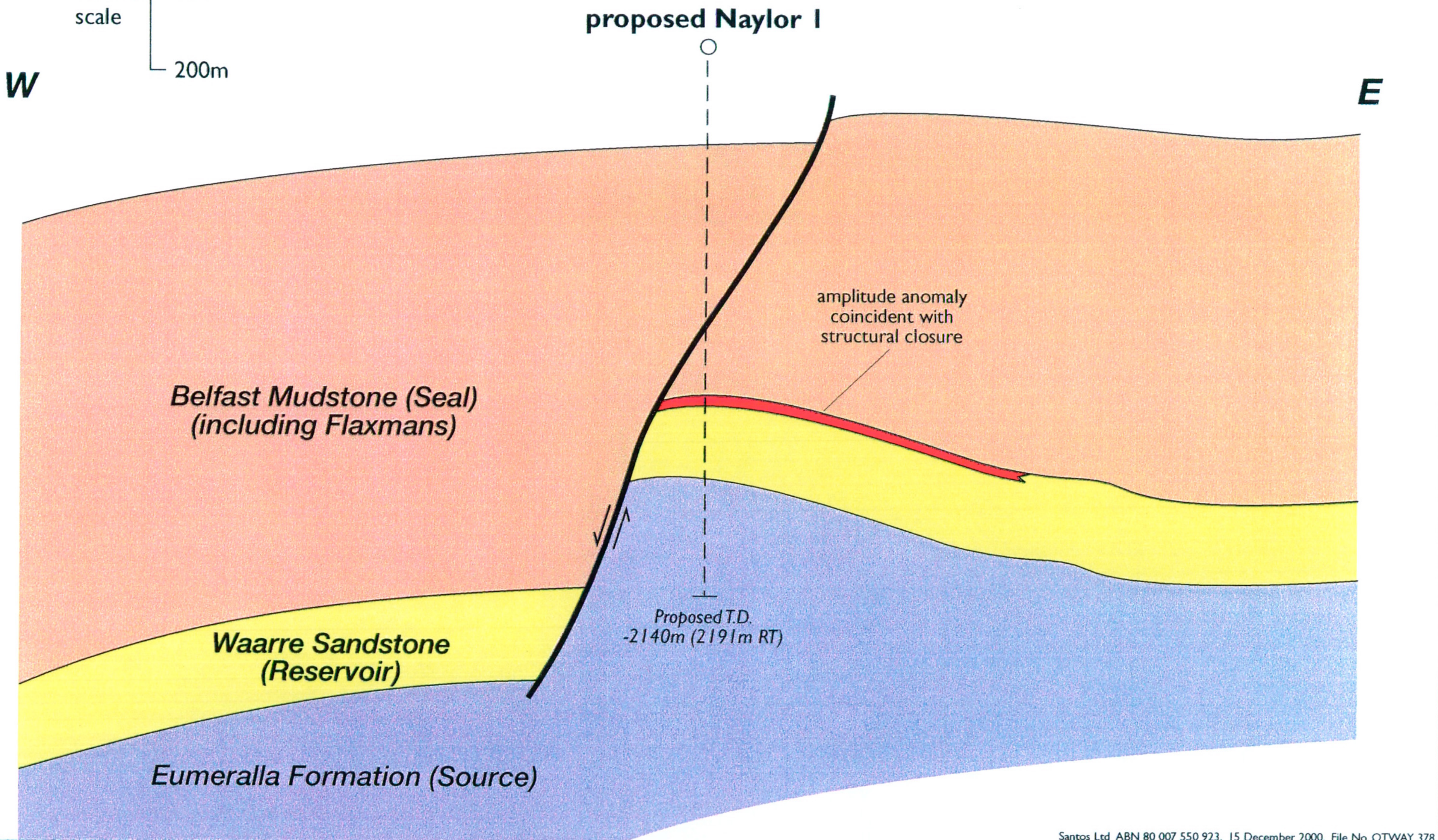


Figure 4

PE909080_color004

909080 015

Santos   SANTOS LIMITED   Santos

BOGGY_CREEK_1

RIG RELEASED : 12 JAN 1992   KB/RT (METRES) : 35.0   TOTAL DRILLED DEPTH (METRES) : 1900.0

Vertical Units : METRES

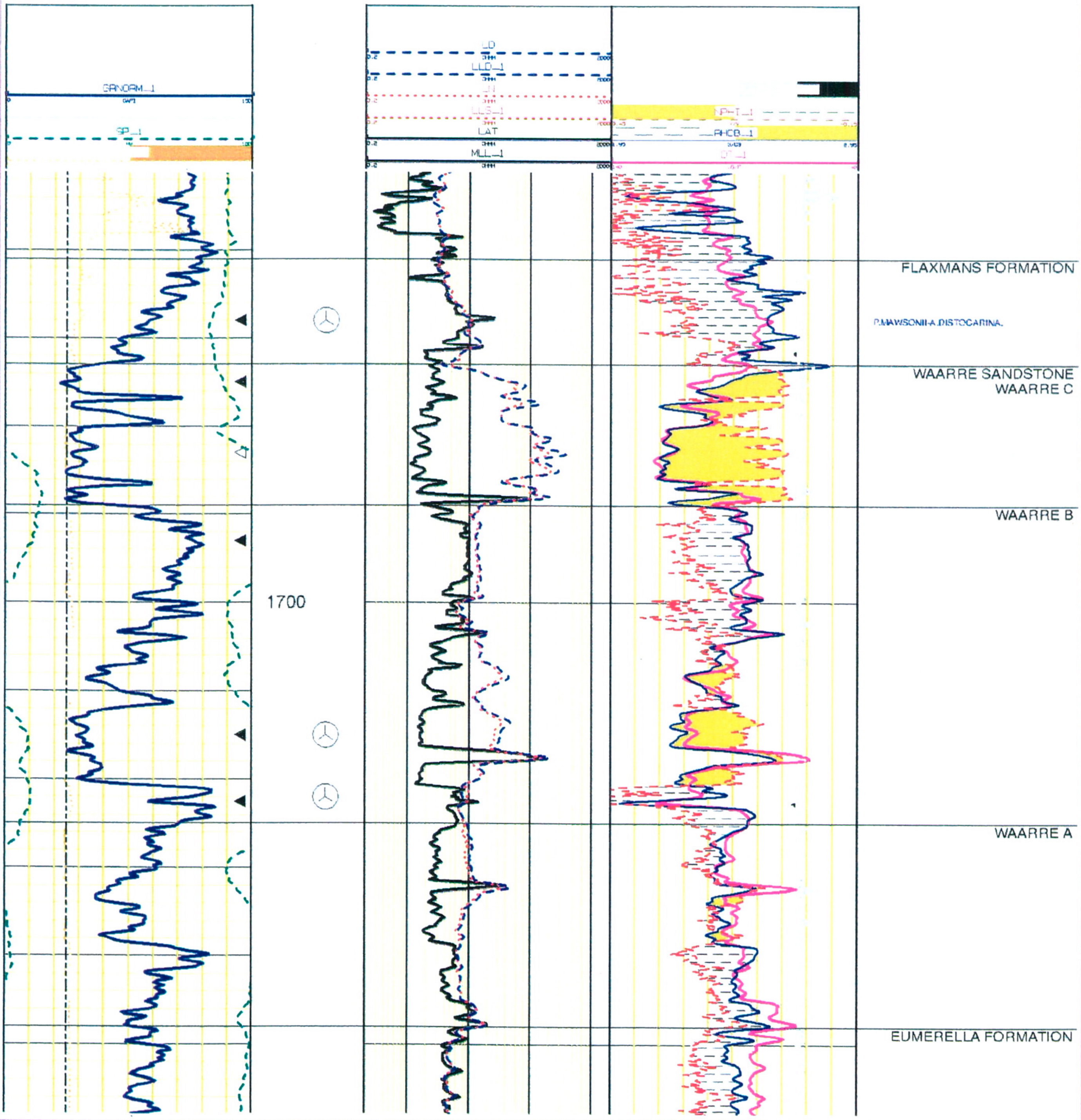


FIGURE 5

PE909080_color005

909080 016

SANTOS LIMITED

CURDIE_1

RIG RELEASED : 27 MAR 1982

KB/RT (METRES) : 43.0

TOTAL DRILLED DEPTH (METRES) : 2600.0

Vertical Units METRES

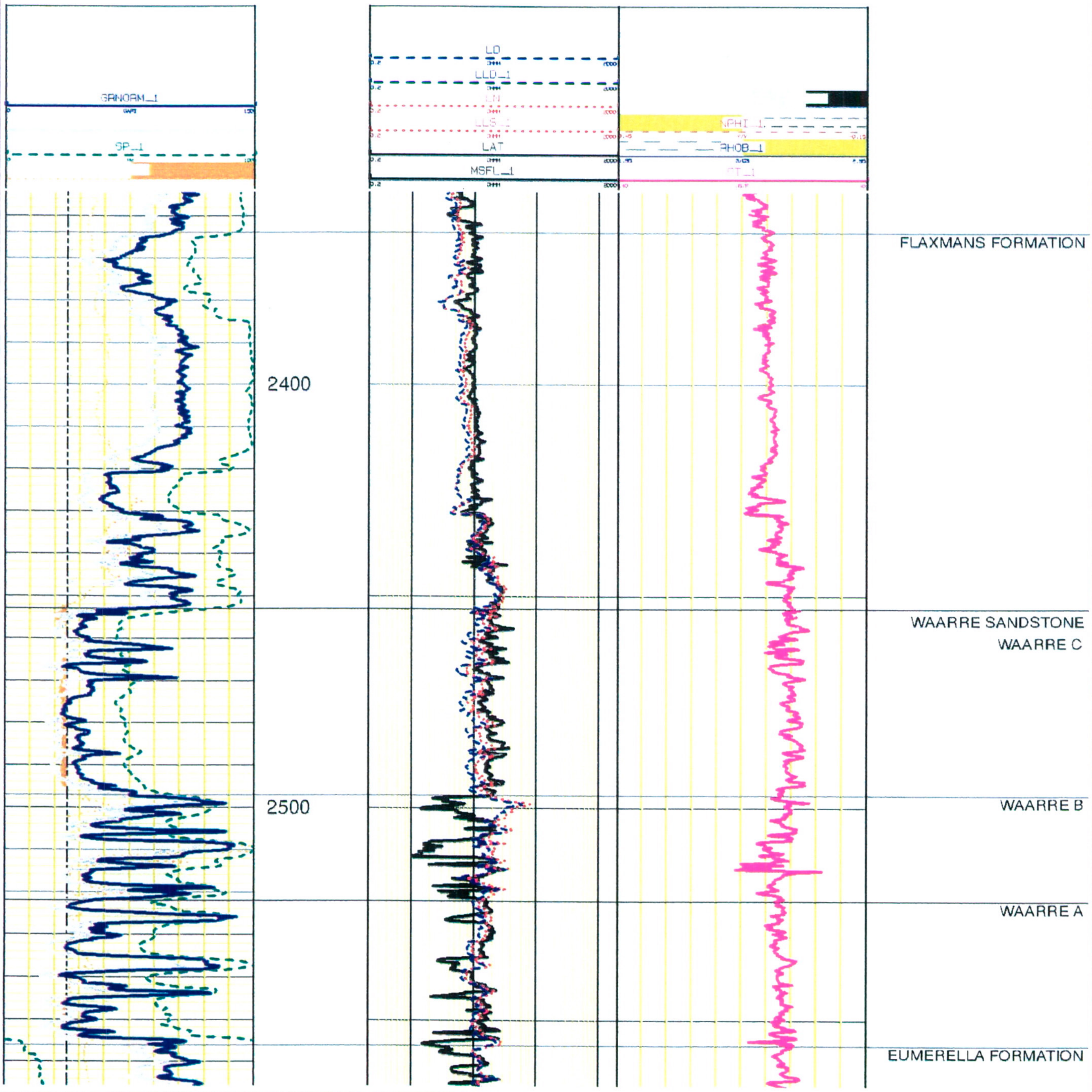


FIGURE 6

PE909080 - color 006

909080 017

Santos SANTOS LIMITED Santos

FLAXMANS_1

RIG RELEASED : 08-NOV-1981 KB/RT (METRES) : 67.36 TOTAL DRILLED DEPTH (METRES) : 3513.73

Vertical Units : METRES

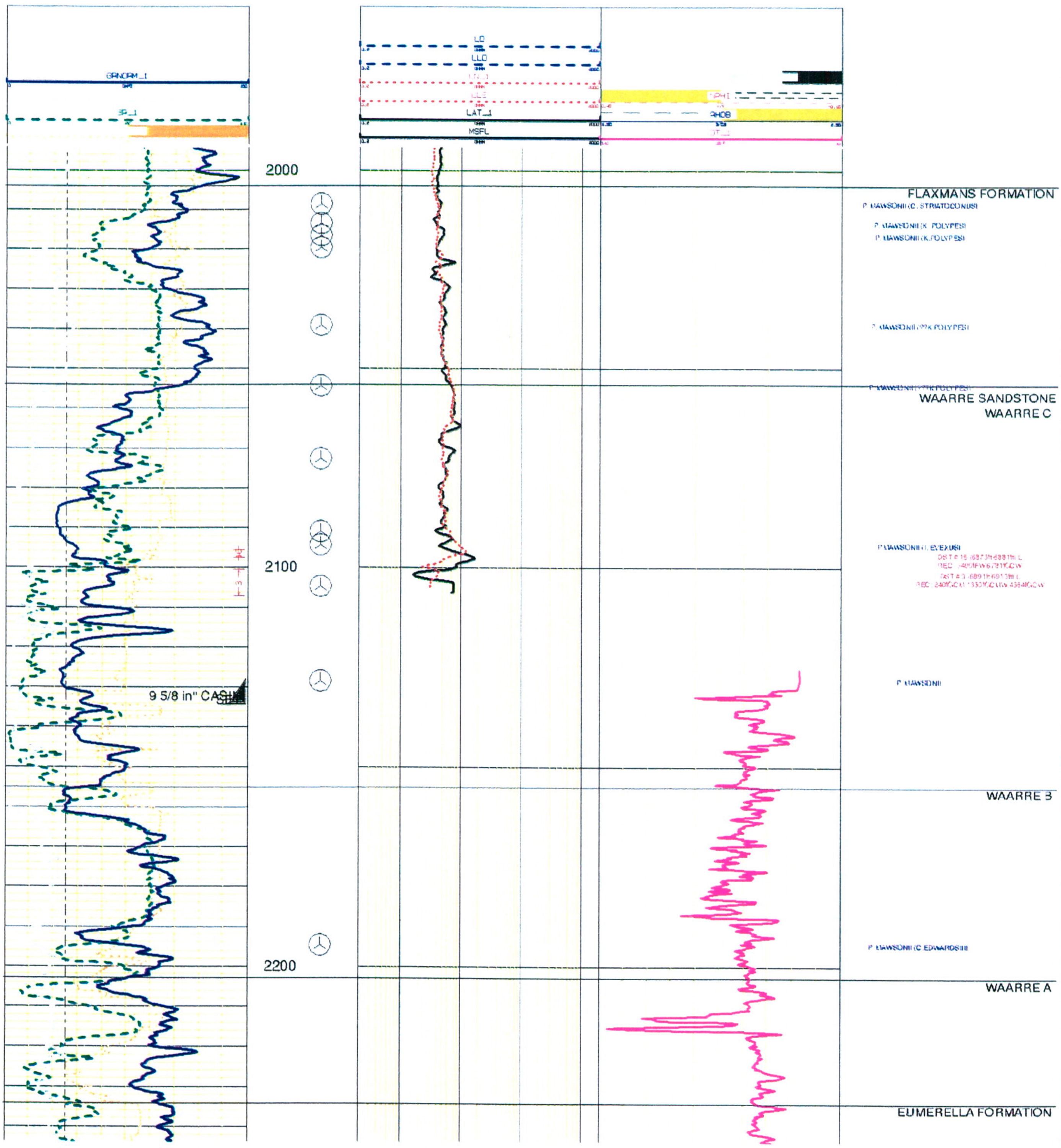


FIGURE 7

PE909080_color007

909080 018

Santos   SANTOS LIMITED   Santos

HOWMAINS_1

RIG RELEASED : 22-JUL-1994   KB/RT (METRES) : 49.0   TOTAL DRILLED DEPTH (METRES) : 2150.0

Vertical Units : METRES

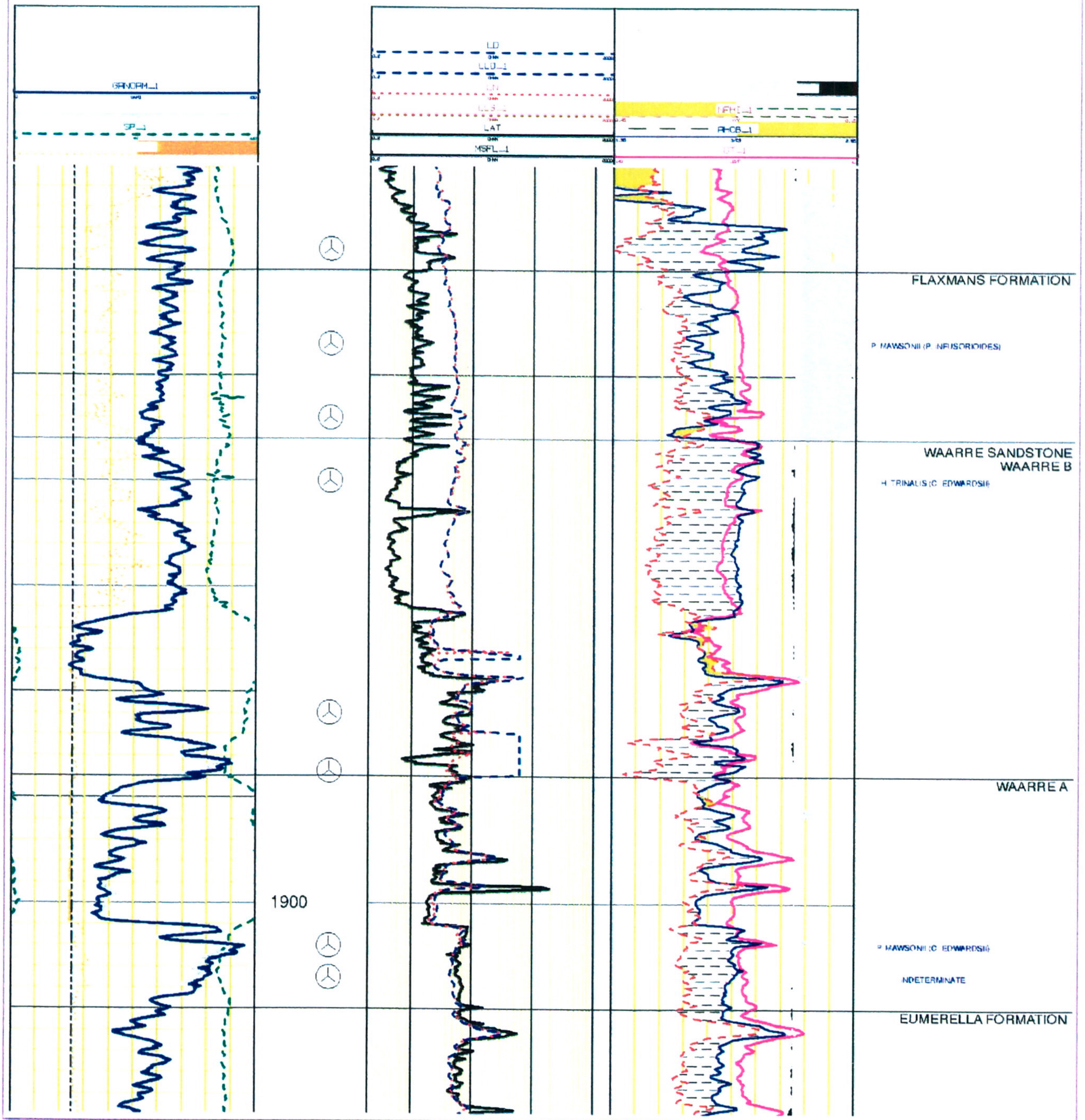


FIGURE 8

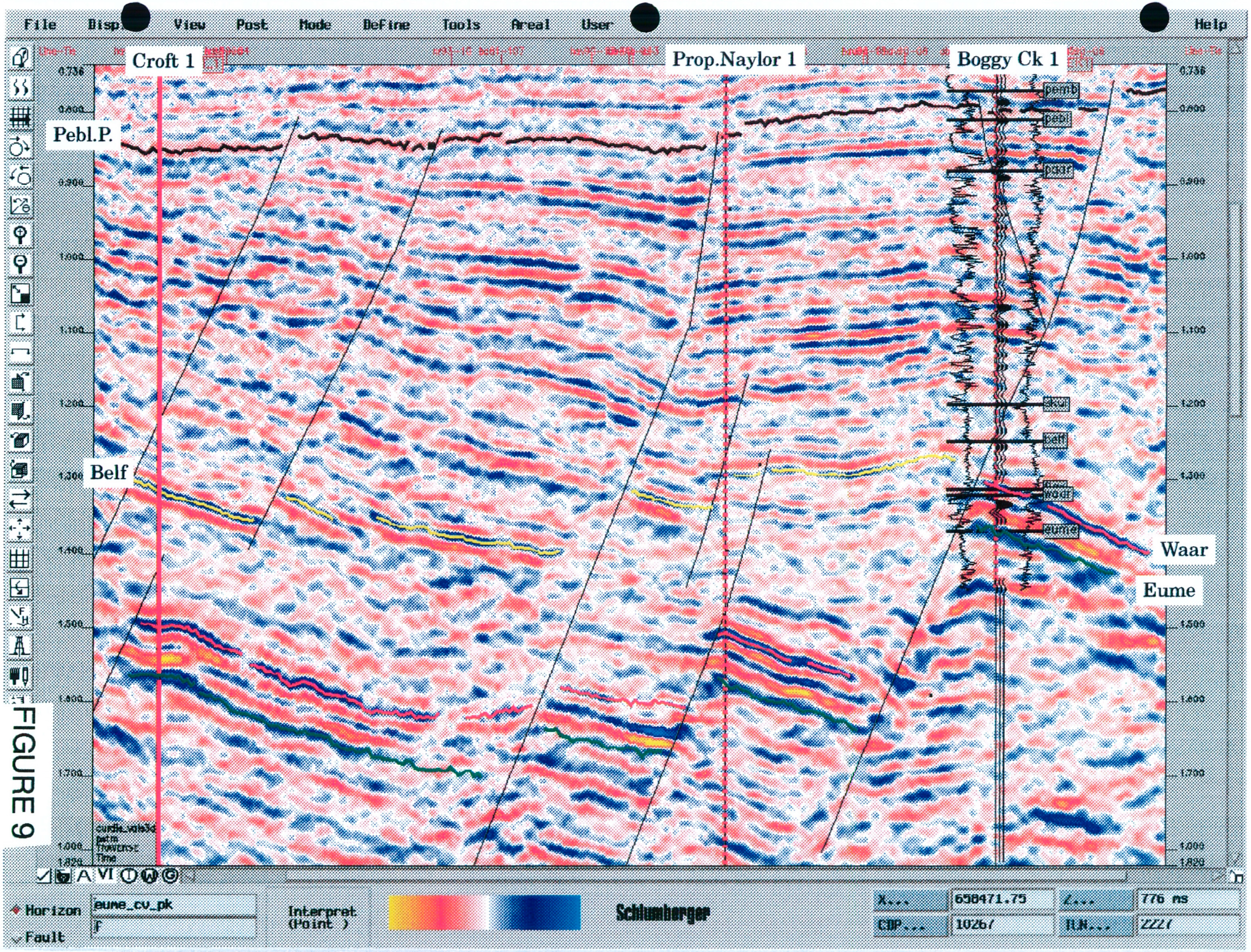


FIGURE 9

909080 019

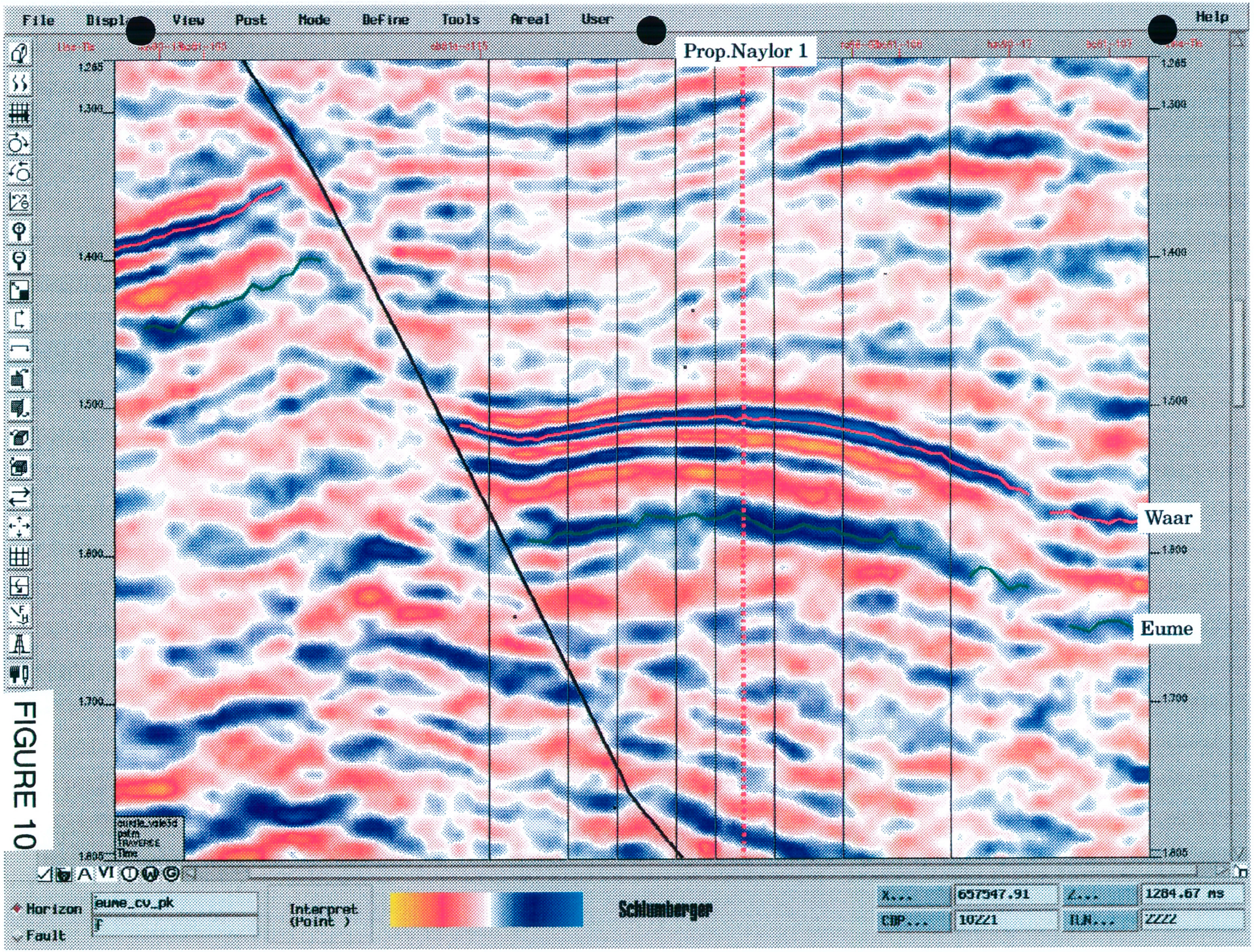


FIGURE 10

909080 020

PE909080-color 009

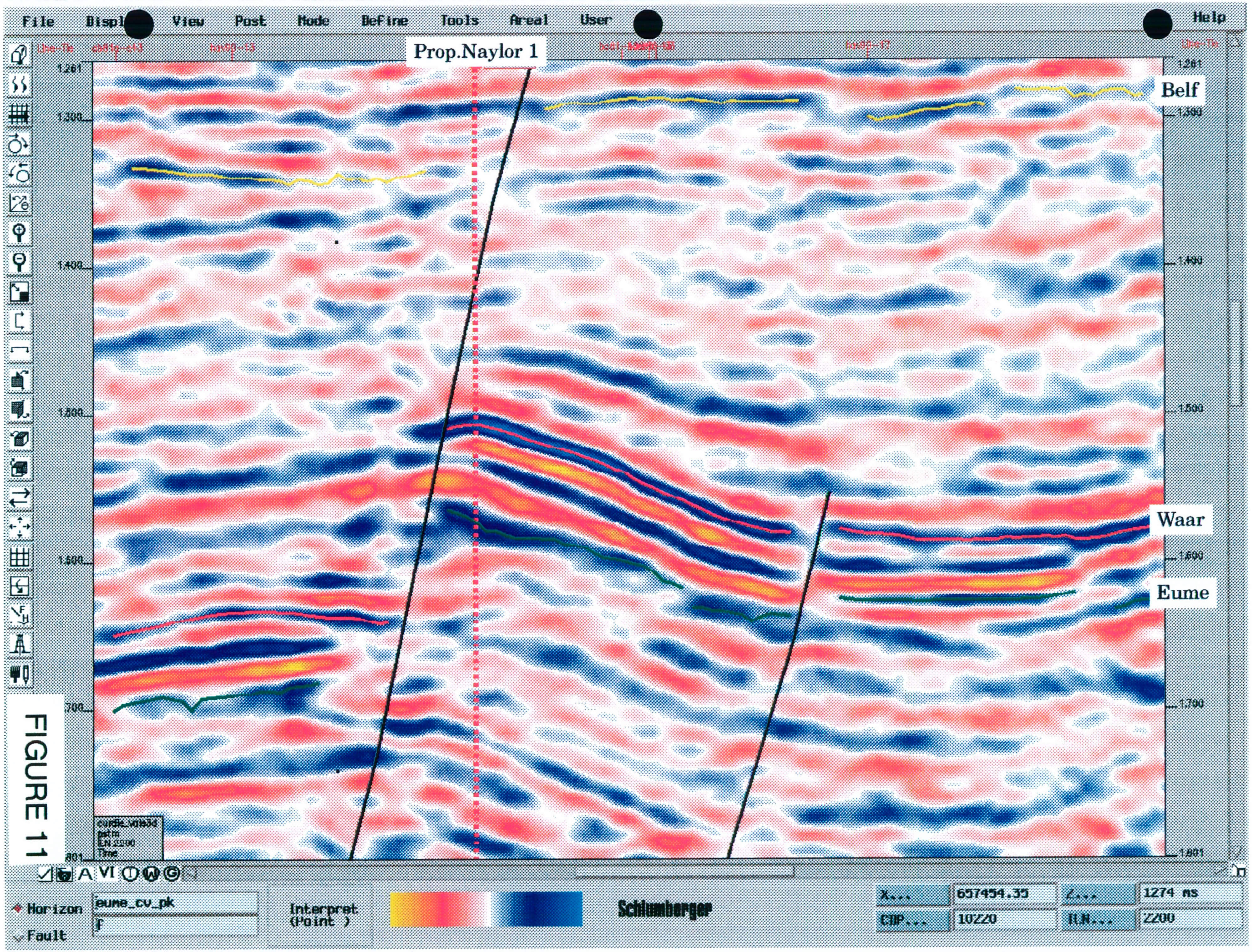


FIGURE 11

909080 021

PE909080-color 010

PE909010 - color010

NAYLOR

909080 022

55 S

25 S
142 47 10 E
142 50 05 E

1: 25000
0 1
KILOMETRES
0 0.50
MILES

UNIVERSAL TRANSVERSE MERCATOR PROJECTION
AUSTRALIAN NATIONAL SPHEROID
CENTRAL MERIDIAN 141 00 00 E
Mapsheet datum: "Unknown"

Santos

Near Top Waarre Sand

Nov. 2000

M.Majedi

(Horizon : cv_war_pk)

Date : December 18, 2000	Author :	ENCL
Contour Interval : 10	Drafted :	
Datum : AUSTRALIAN NATIONAL	File No. :	

FIGURE 12

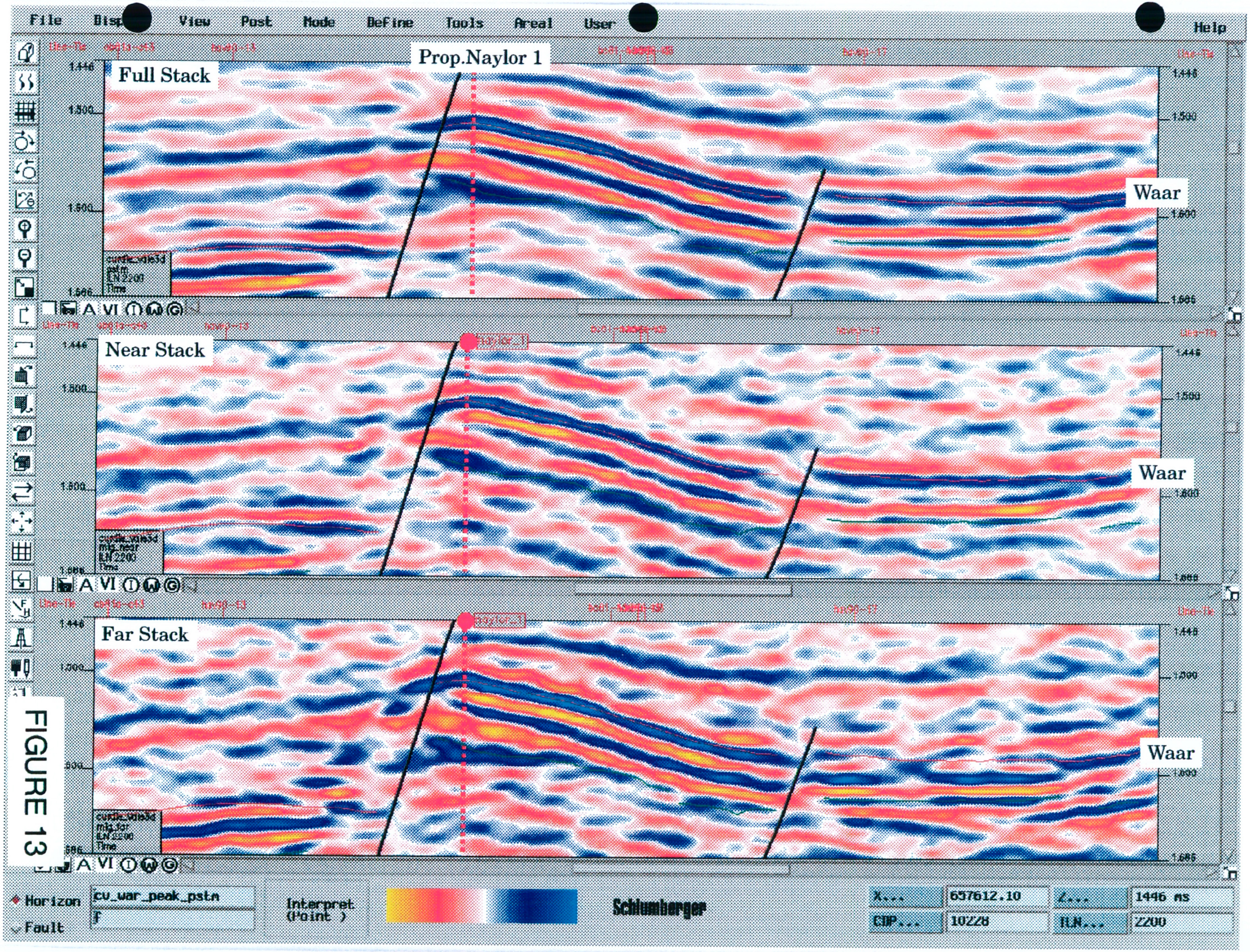


FIGURE 13

909080 023

PE909080 - color Ø11

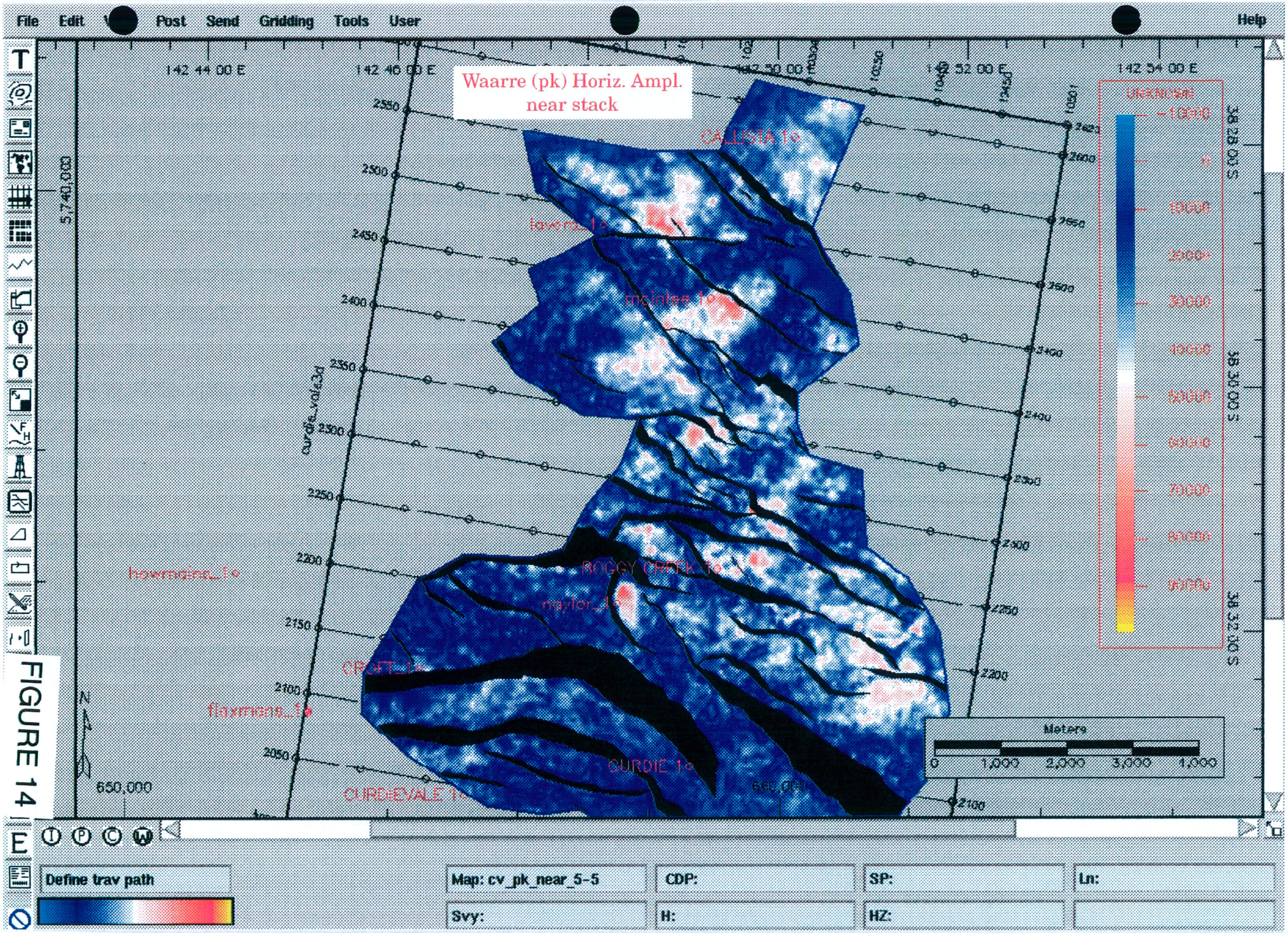


FIGURE 14

909660 024

PE909680 - color 12

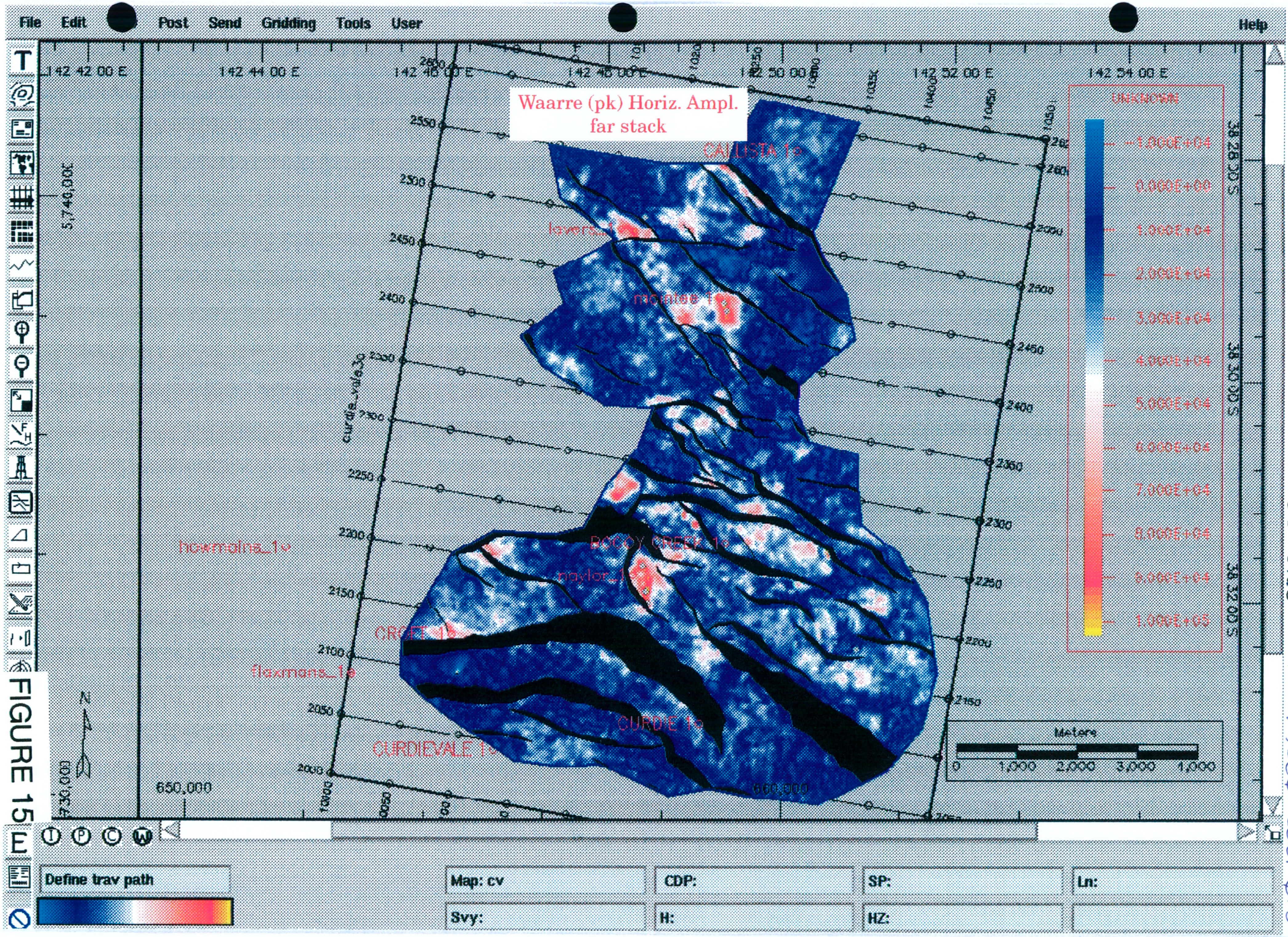


FIGURE 15

909080 025

PE909080_color015

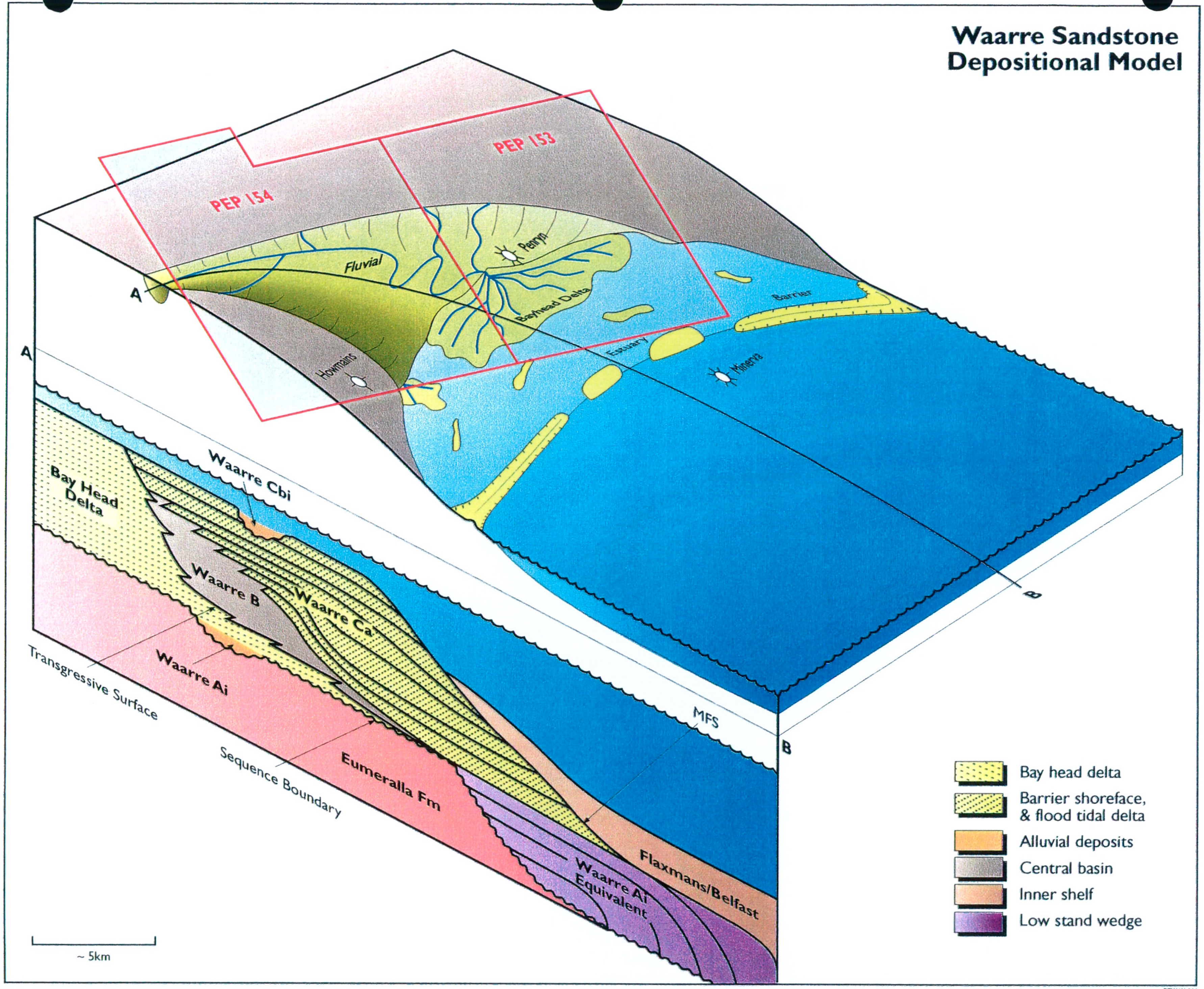


Figure 17

909080 026

PE909080-color014

ATTACHMENT 1

GEOPHYSICAL PROGNOSIS

ATTACHMENT 1
NAYLOR 1

GEOPHYSICAL PROGNOSIS

Latitude 38° 31' 56"S Longitude 142° 48' 27"E

	CURDIE 1					PROP.NAYLOR 1						BOGGY CK 1				
	TWT (ms)	DEPTH (m-ss)	Isopach (m)	VAV (m/s)	VINT* (m/s)	TWT (ms)	DEPTH (m-ss)	ERROR (+/-m)	Isopach (m)	VAV (m/s)	VINT* (m/s)	TWT (ms)	DEPTH (m-ss)	Isopach (m)	VAV (m/s)	VINT* (m/s)
CLIFF	458	428		1869		434	406			1869		435	406		1867	
			531		2642				499		2600			464		2529
PEB.P	860	959		2230		818	905			2212		802	870		2170	
			136		2519				83		2650			98		2800
PAAR	968	1095		2262		881	988			2243		872	968		2220	
			577		3476				494		3200			480		2927
SKUL	1300	1672		2572		1190	1483			2492		1200	1448		2413	
			180		3273				196		3400			83		3609
BELF	1410	1852		2627		1305	1678			2572		1246	1531		2457	
			558		3331				330		3250			107		3194
WAAR	1745	2410		2762		1508	2008	+/- 20m		2663		1313	1638		2495	
			103		3745				98		3000			77		2567
EUME	1800	2513		2792		1573	2106			2677		1373	1715		2498	
			44						35					150		
(TD)		2557					2141						1865			

ATTACHMENT 2

DRILLING PROGRAM

TABLE OF CONTENTS

1. GENERAL DRILLING PROCEDURES

1.1 INTRODUCTION

This document outlines the various steps in the drilling operation. A separate document, the "Santos DQMS Drilling Operations Manual", summarises the Santos General Operating and Well Control Procedures, drilling equipment and other procedures. This 'Drilling Program' is to be read in conjunction with the above 'Drilling Operations Manual'.

Naylor #1 is a gas exploration well drilled in PEP154 in the Victorian Otway Basin. The primary target is the Waarre Sandstone for gas. Anticipated spud date is May10, 2001.

1.2 SEQUENCE OF OPERATIONS

- Rig up, drill mousehole & rathole (Note 20" conductor pre-installed)
- Drill 9 7/8" hole to approx 480m (1575 ft).
- Wiper trip and laydown 6 ½" drill collars
- Run & cement 7 5/8" casing leaving 2m rathole
- NU & test Bradenhead & BOP's
- RIH PU 6 ¾" drilling assembly
- Drill out shoetrack & 3m (10') of new formation
  Perform LOT to fracture propagation
- Drill 6 ¾" hole to 35 m into Eumeralla (approx 2192 m TVD)
  Wireline log – 3 runs. GR-LCS-MRS-DLS-CAL. Run 2 CDS-CNS. Run 3 RFS (20 points)
- Run and cement 3 ½" tubing or P&A. Install seal adaptor flange and Xmas tree if C&S and pressure test.
- Release rig.

1.3 SECTIONAL SUMMARY

Pre-Spud

- A 20" conductor has been pre-installed by the lease preparation contractor
- Drill rat hole and mouse hole. Inspect rig and complete prespud rig inspection form.
- Hold pre-spud safety meeting.

9 7/8" Surface Hole

Hazards & General Notes
- Mud rings may be encountered on this well in the Gellibrand Marl. The section is to be drilled with a caustic spud mud system.
- Potential total lost circulation at very shallow depths.

Operation
- Spud well with 9 7/8" bit with spud mud.
- Drill with reduced flow rate (under 300 gpm) and parameters until 6 1/2" drill collars buried. Then increase to full drilling flowrate and drilling parameters for optimum ROP. Ensure vis at least 50 sec/qrt in the surface limestone prior to reaching the marl formations. If mud rings become a problem in the clay-rich formations then dilute with drill water as a first recourse.
- Take a MSS survey at approx 30m (100ft).
- Drill ahead surveying with MSS every 150m (500ft) to approximately 480m. Allow for apprimately 2m of rathole.
- Check bottoms up sample to confirm competent seat.
- Wiper trip back to old hole if required. Increase mud weight only if dictated by hole conditions.
- POOH. Laydown 6 1/2" Drill Collars.

Surface Hole Shallow Lost Circulation Contingency

On the recent "Wild Dog Road 1" well drilled by OCA/Boral nearby, total lost circulation was experienced from 14m to 16m below ground level. If uncontrollable losses are encountered on "Naylor #1", then a 13 3/8" second conductor string will be set to case off the entire limestone section. The decision to proceed with this plan will be at the discretion of the Santos representative, depending on the severity of losses experienced.

Contingency Operation
- Continue drilling 9 7/8" hole blind or with limited returns to 50m below RT.
- POOH and change bit out to 17 ½" mill tooth with open jets
- Open 9 7/8" hole to 17 ½" to up to 160m below RT
- Set LCM pill on bottom or pump LCM sweep if partial returns and POOH, layout 17 ½" bit.
- Run 13 3/8" STC casing with float shoe, 2 x centralisers and landing joint, tag bottom, pick up 3m and attempt to circulate
- Rig up STC cement head with top plug installed, pump 5 bbls water spacer then pump neat cement with 2% CaCl2. Pump as slow as practical.
- Land casing on bottom
- Drop top plug and displace plug with mud to 5m above the float shoe. Pump as slow as practical.
- If no cement returns are observed, perform top up job with neat cement with 2% CaCl with 1" cement stinger.
- Remove cement head, cut casing and weld on flow-riser sleeve and fit flowline riser
- MU 9 7/8" bit and BHA and RIH. Drill out shoe and continue drilling 9 7/8" surface hole

7 5/8" Surface Casing

Hazards & General Notes

- No hazards are anticipated during this section

Operation

- Rig up and run 7 5/8" surface casing. Thread lock shoe track. Run 3m (10') BTC pup above float collar and thread lock to float collar.
- Run casing.
- Wash last joint to bottom and cement casing.
- Soft break collar on last joint below landing joint.
- Displace cement with old mud. Do not displace more than theoretical casing volume plus half the shoetrack volume. If bump observed, increase pressure to 2600 psi for 10 mins to test casing.
- Space out to set top flange of Bradenhead 4-6" above ground level (check space underneath rig floor. If not possible to set 4-6" above ground level, then set as high as possible).
- Perform 20m top-up job while WOC regardless of cement returns.
- WOC until surface samples have set (minimum of 4hrs).
- Nipple up 5k wellhead and BOP's and pressure test BOP's with rig pumps. Pressure test casing to 2600 psi for 10 mins with rig pumps **if plug did not bump**.
- Run wear bushing.
- RIH picking up 6 ¾" drilling assembly.
- Drill shoe track & 3m (10') of new formation.
- Perform leak-off test with pressure test unit (A 15.5 ppg leak off is expected, which would give the well a 14 bbl kick tolerance. Minimum required leakoff for 10 bbls kick tolerance is 14.4 ppg EMW. Notify the drilling engineer immediately if less than 14.4 ppg leakoff is achieved). Pump to fracture propagation or max allowable surface pressure.

6 ¾" Production Hole

Hazards & General Notes

- Differential sticking has been observed in the Paaratte Formation, and the Eumeralla Formation.
- Swelling clays in the Skull Creek and Belfast mudstones and filter cake build-up in the Nullawarre greensand may cause tight hole.

Operation

- Drill 6-3/4" hole with MSS surveys every 150 m (500 ft). The target tolerance is a 50 m radius around the surface location at the Waarre formation top.
- Drill in rotary as long as possible, but if the well trajectory indicates the target may be missed, drill no further than will allow for a correction run of no more than 30 degrees maximum inclination and no more than 8 degrees / 30m dogleg. If there is need for a correction run, use a rockbit and survey with MWD as necessary.
- Drill TD at 50m into Eumeralla (at approx 2192 m TVD).
- Make wiper trips as required.
- After TD, make a wiper trip back to old hole, take final survey and POOH to run logs.
- Rig up & run wireline logs: Run 1: GR-LCS-MRS-DLS-CAL, Run 2: CDS-CNS Run 3: RFS (20 points)
- Avoid a wiper trip between run 2 and 3 unless absolutely necessary. This is to avoid super charging of the formation.

3 ½" Production Casing

Hazards & General Notes

- The casing will require drifting with a 2.867" drift.
- Differential sticking of 7" casing in 8.5" hole has been observed in the Eumeralla in offset wells

- The slips will be set with buoyed casing string weight plus 40klbs against the **tail cement ONLY** WOC until tail cement sample set – lead cement samples should not have set.
- Once slip and seal assembly is in place, the annulus valve is to remain open while cement sets. Ensure this valve is closed once the lead surface cement samples have set.
- Mud left between 3-1/2" & 7-5/8" casing after cementing will contain biocide and the pH will be increased to more than 10 using caustic.

Operation

- If casing is to be run, RIH with bit (open nozzles and no stabilisers required).
- Condition hole and POOH laying down drill pipe and BHA.
- Rig up and run 3½" tubing. Threadlock the two joint shoe track. Monitor torque vs turns with JAM system provided by casing running contractor.
- Wash last joint to bottom and cement casing.
- Displace cement with 2% KCl brine. Ensure surface lines flushed from cement unit all the way to the cement head prior to displacing with the cementing unit. Use a ball below the top plug. Every attempt to bump the plug should be made. Do not displace more than 3 bbls over theoretical with the planned shoe depths and formation tops. This will be confirmed by the DE prior to the job. Pressure test casing to 2600 psi for 10 mins.
- Record string weight prior to cementing, at end of cement job and again prior to landing tubing.
- WOC until **tail cement** surface samples have set. Record string weight at start and then every 30 min. while WOC. Record these values on the Casing and Cementing report.
- Run slip and seal assembly. Set 3½" casing in tension with 40 klb overpull above buoyed string weight.
- Nipple down BOP's, install seal adaptor flange & 5k 3 1/8" Xmas Tree and pressure test (as per Section 7).
- Release rig.

Abandonment

Hazards &General Notes

- All plugs to be set on a 30 m (100ft) hi-vis pill (Min YP=50).
- Min plug length 60 m (30m above & 30m below formation top).
- Shoe plug to be 120 m (60m above and 60m below the shoe)
- All plugs 10% over calliper or 20% over gauge hole.
- Mud left in the surface casing will contain corrosion inhibitor and biocide.
- DE will confirm final depths from wireline logs.

Operation

- RIH 6 ¾" BHA and POOH laying down same.
- RIH with 2 7/8" EUE cement stinger and set balanced abandonment plugs as per program (Section 8).
- Tag shoe plug with 10klbs. Shut annular and pressure test to 500 psi above shoe leak-off pressure.
- POOH & LD DP.
- Pull wear bushing.
- Nipple down BOP's and remove Bradenhead.
- Set surface cement plug.
- Install identification plate and release rig.

2. PRELIMINARY BIT AND HYDRAULICS PROGRAMME

TBA

3. BOTTOM HOLE ASSEMBLIES

TBA

4. SURVEYING PROGRAMME

Hole section	9 7/8"	6 ¾"
Survey Type & frequency	MSS at 30m then every 150m	MWD or MSS surveys 150m minimum frequency

5. CASING PROGRAMME

5.1 CASING DESIGN SUMMARY

Casing String		Surface Casing	Production Casing
Casing size (in)		7-5/8	3 1/2"
Shoe depth (m MD/ft RT MD)		425 / 1395	1720 / 5643
Grade		L80	J55
Weight (lb/ft)		26.4	9.3
Burst rating (psi)		6020	6980
Collapse rating (psi)		3400	7400
Tensile rating (klb)		602	142
Connection		BTC	New NK3SB
Nominal Wall (in)		0.328	0.254
Inside diameter (in)		6.969	2.992
Drift Diameter (in)		6.844	2.867
Capacity (bbl/ft)		0.0472	.0087
Coupling OD (in)		8.5	4.25
Make-Up Torque (ft/lbs)	Minimum	To bottom	2160
	Optimum	Of triangle	2700
	Maximum		2970
FLOAT EQUIPMENT		Dowell	Dowell
Float Shoe		Non-Rotating	
Float Collar		Non-Rotating	
Shoe Track Length		2 Joints	1 Joint
Threadlock		Shoe Track	Shoe Track
Safety Factors			
Burst		3.0	3.5
Collapse		6.6	3.3
Tension - Running		5.2	1.9
- Pressure Test		5.6	2.3

Design based on deepest possible well depth of 1723m.

5.2 CENTRALISER & MARKER JOINT PROGRAMME

Casing Size	7 5/8"	3 ½"
Centraliser Placement	Middle 1st & 2nd jts 3rd,5th and 7th coupling 1st coupling below cellar	3m above shoe Next 2 couplings Every 2nd coupling from 15m above Flaxmans formation top to 15m below the Eumeralla formation top. 1st & 3rd coupling above 7 5/8" shoe
Centraliser Type	Bow spring	Bow spring
Marker Joints	Not req'd.	15m (50ft)above each pay zone separated by more than 60m 200ft Same weight & weight & grade as casing (higher grade is OK but not heavier weight).

NOTE:

7 5/8" Surface Casing

- Drift every joint using the 6.84" drift.
- The two joint shoe-track will be made up and a 10' BTC pup joint will be run immediately above the float collar (Threadlock the float/pup joint connection). This will allow the shoe track to be stood back in the derrick if necessary.

3 1/2" Production Casing

- Drift every joint using the 2.867" drift.
- The two joint shoe-track will be made-up of a two 9.3 J55 New NK3SB.
- Dowell will provide the 3 ½" circulating swedge.

6. WELLHEAD DETAILS

	Type	Flange size	Connection
Bradenhead	Wood 5k 7 5/8" BTC Box	11" 5000psi	7 5/8" BTC Box down
Slip & Seal Assy	Wood WG-22 11" x 3 ½" S&S	NA	
Seal Adaptor Flange	Wood WG-A4-P 11" x 3 1/8" 5k	11" 5000psi x 3 1/8" 5000psi	
X Mas Tree	Wood	3 1/8" 5000psi Blind Flange, ½" NPT pressure gauge	

Santos Petroleum Engineering require that the Xmas tree (5k 3 1/8") be installed by the drilling rig and tested. Test the Xmas tree valves and the slip and seal packoff to 5000 psi. When testing the slip and seal packoff from above, ensure the bradenhead wing valve is open in case the slip and seal passes and exposes the surface casing to 5000 psi.

7. PRESSURE TESTING SCHEDULE

Component	Pressure Test
7 5/8" Surface casing	2600 psi
Pipe rams, K&C lines, choke manifold, Standpipe, kelly & safety valves	2600 psi
Annular	2000psi
Bradenhead – casing connection	2600psi
3 ½" Production casing	2600psi
Packoff and Seal Assembly	5000 psi
7 5/8" x 3 ½" annulus	2600 psi
Xmas tree valves	5000 psi
LOT	Minimum allowable 14.4ppg EMW (to fracture propagation or max allowable surface pressure)

NOTE:

Pressure tests will be a 10 minute low pressure test to 200psi and a 10 minute high pressure test as above. Pressure test BOPs, choke line and manifold, casing and conduct leak off test with rig pumps.

8. Abandonment Program for Naylor #1

If production casing is not run, the well will be abandoned with cement plugs and the wellhead removed.

Plug No	Depth (m RT MD / ft RT MD)	Purpose
1	2090 – 2030 m RT 6855 – 6655 ft RT	Waarre Isolation
2	1760 – 1700 m RT 5775 – 5575 ft RT	Belfast Isolation
3	1070 – 1010 m RT 3510 – 3310 ft RT	Paaratte Isolation
4	860 – 800 m RT 2820 – 2620 ft RT	Pember Isolation
5	510 – 450 m RT 1675 – 1475 ft RT	Surface casing shoe
6	0 – 15 m 0 – 50 ft RT	Surface plug

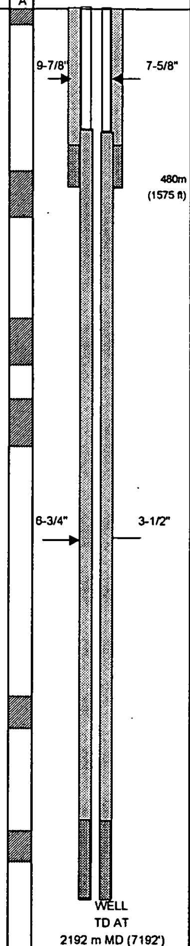
APPENDICIES

1. Directional Plots and Target Tolerance Description
2. Montage

WELL NAME:	NAYLOR #1	LATITUDE (SURFACE / TARGET):	38 deg 31' 56.77" S
WELL TYPE:	GAS EXPLORATION	LONGITUDE (SURFACE / TARGET):	142 deg 48' 27.29" E
WELL AREA:	PEP 154	SEISMIC REF TARGET:	CDP 10225 INLINE 2200
RIG	ODE 30	ELEVATION (prelim):	GL - 46.0 m (151 ft) RT - 50.7m (166 ft)

SANTOS Limited

(m) MD (RT)	LITHOLOGY	TOPS & TARGETS TVD (m)
	Limestone to 150 m (500 ft)	
200	Marl to 560 m 1837 ft	
400		
600	Dilwyn	560
800	Pember	830
	Pebble Point	956
1000	Paaratte	1039
1200		
1400		
1600	Skull Creek	1534
1800	Belfast	1729
2000	Flaxmans	2000
	Waare ●	2059
	Eumeralla	2157
2200	TD	2192



CASING WELLHEAD

SURFACE CASING
If necessary, make wiper trip with bit to conductor.
7 5/8"
26.4 ppf
L80
BT&C
Run Dowel non rotating float equipment.
Connection to be torqued to triangle
Set Shoe @ 480 m (1575 ft)
Run two joint shoe track

PRODUCTION CASING
3 1/2"
9.3 ppf
J55 New NK3SB
Make up a two joint shoe track
Run Dowell float equipment.
Use Kleepo type thread protectors and stabbing guide when handling premium threads.
Run centralisers and marker joints as per programme
Make up connections to optimum torque of 2,700ft.lbs (opt).
Use dump valve on power tongs and monitor torque vs turns with JAM system.

CEMENTATION

SURFACE CASING
Lead: Class G 11.8 ppg
W 6% PH Bentonite, 1% CaCl2 BWOC
0.07 gal/sx D080 and 0.01 gal/sx D047
Yield 2.92 cuft/sx
Tail: Class G 15.6 ppg 0.05 gal/sx D080 and 0.01 gal/sx D047 Yield 1.19 cuft/sx
Top Fill: Class G with 2% CaCl2
Lead to surface
Tail slurry 300 ft rise (1260', 384m).
Calculate mud and cement returns to surface.
Perform Top Fill Job using 1" stinger
Displace cement with old mud
Use 55% excess for lead and 20% excess for tail.

PRODUCTION CASING
Lead: G 11.8 ppg w/ 6% Bentonite
0.07 gal/sx D080 and 0.01 gal/sx D047
Yield 2.92 cuft/sx
Tail: G 15.6 ppg w/- 0.1 gal/sx D080
0.04 gal/sx D081 and 0.01 gal.sx D047
Yield 1.19 cuft/sx
The top of lead cement to go a minimum of 500 ft (150 m) inside the surface casing shoe (approx 1060 ft, 325m)
Top of tail to go to 200' (60 m) above top Waare (approx 6482 ft, 1976 m)
Use 10% excess over calliper
Condition the mud prior to cementing-circ. a min. 2 hole vols AV same as whilst drilling with low YP.
Hold safety meeting and pressure tests etc. prior to circulation ie. minimise delays.
Displace cement with 2% KCl brine.
Pump to bump on production casing.
(ensure top plug has fallen)
A 3 1/2" top plug above a the ball is to be run following the cement in the production casing
Reciprocate the production casing string during job.

DRILLING FLUID

SURFACE HOLE
Spud Mud
MW: ALAP
funnel viscosity 45 - 50 sec/qrt
YP 20 - 25
Use 84 / 110 mesh shaker screens
Use plenty of fresh water for dilution and SAAP if mud rings noted

MAIN HOLE
2% - 3% KCl/PHPA/Polymer
MW : 8.6 - 9.4 ppg
PV: ALAP
YP: > 8 - 12
6 rpm 5 - 8
PHPA 1 ppb at all times
API filtrate < 10 cc/30 mins at all times
API filtrate < 8 cc/30 mins below 1600m (5250 ft)
No requirement for tighter fluid loss unless operational conditions
2% KCl to 1600m (5250')
3% KCl 1600m - TD
Use finest possible shaker screens to 250 mesh
Ensure mud weight 9.1 ppg prior to Waare
Weight up to 9.4 ppg if required in Eumerella

EVALUATION

SURFACE HOLE
Mudlogging -
Samples every 15 m
Mudlogging Contractor Geoservices
(Equipment - Total Gas Detector and FID chromatograph)

MAIN HOLE
Mudlogging -
Samples every 15m to approx 1000 m
Samples every 3m to TD
Coring -
None
Wireline Logs
GR-LCS (TD to surface casing)
MRS-DLS-CAL (TD to surface casing)
MRS to 100 m above top Pember
CDS-CNS (TD to 20m above Flaxmans)
RFS (20 points)
Service Company Reeves

WELL DATA

20" Conductor set at 5 m below G.L.
Survey every 150 m, 500 ft (MSS)
Test casing to 2600 psi. when bump plug

MAIN SECTION
Install 5K Bradenhead and NU BOPs
run wear bushing when rotating
Pressure test BOPs to 200/2600 psi.
Hydril to 200/2000 psi using rig pumps
FIT 14.4 ppg EMW (min)

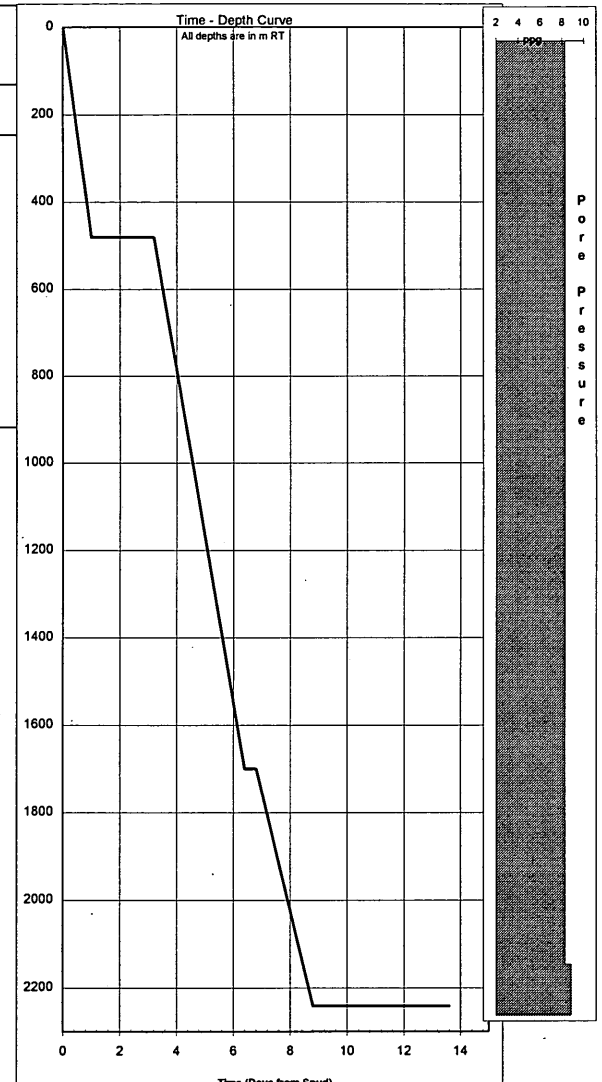
Target Tolerance
50m radius
Survey with MSS/MWD
Drop surveys where possible on bit trips

OFFSET WELL INFO.

Assumed Temp Grad
1.47 degrees / 100 ft
Boggy Creek #1: 1.55deg/100ft
Flaxmans #1: 1.39deg/100ft
Offsets include:
Boggy Creek 1: 1.6 km
Curdie #1: 2.7 km
Flaxmans #1 : 5.0 km
Potential lost circulation in surface limestones and mud rings in deeper marls

LOT Data:
Fenton Creek 13.6 ppg EMW at 404m near base Narrawaturk Marl
Mylor 1 16.5 ppg EMW at 293m middle Gellibrand Marl
Penryn #1 15.9 ppg EMW at 670m in top Pember Mudstone

Survey Data:
Fenton Creek 1 : 0.5 - 3.5 degrees
Mylor #1 : 0.5 - 2.5 degrees
Penryn #1:
0.25 - 3.5 deg 0 - 1428 m
3.5 - 5.5 deg 1428 - 1813m
Boggy Creek #1: 4 deg max at 1595 m
Flaxmans #1 2.5 deg max to 6800' built to 3 1/4" degrees by 7200 ft
Potential for 8.9 ppg reservoir pressure in Eumerella, may require weight up to 9.4 ppg
Swelling clays in the Skull Creek and Belfast mudstones may cause tight hole
Maximum possible surface pressure (gas filled pipe) is 2600 psi.



TARGETS:
Primary ●
Secondary ○

P & A PLUGS (if required) Minimum 300' in length. Tag plug across shoe

No changes to the drilling programme can be made without the Programme Change Controll form (DQMS-F207) first being signed and sent to the rig. Any changes to the scope of the work (eg extra DST's or logging runs) must be accompanied by DQMS Form-F208 (Change of Scope).

Well Objectives: Waare
Water Source: TBA
DRILLING HAZARDS:

WELL COST
C&S: $ 1,466,000
P&A: $ 1,216,000
Cost Code:
TBA

OPERATION	NOPE	ACTUAL
Rig Move	4 (4)	
Surface Hole - Drill 9 7/8" Hole to 480 m (1575')	1.0 (5.0)	
Run 7 5/8" casing & cement same	1.0 (6.0)	
Nipple up wellhead, BOPs & Test Same	1.2 (7.2)	
Main Hole - Drill to TD at 2192 m (7192')	5.6 (12.8)	
Logs, RFS	2.4 (15.2)	
P & A / C& S	2.4 (17.6)	
TOTAL (including rig move).	17.6	

Prepared by: Geoff Coker
Checked by: ....
Date: ....
VERSION 0
REVISION 0

909080 043

ATTACHMENT 3

COMPLETION AND TESTING PROGRAM

Santos Ltd

A.C.N. 007 550 923

Santos

Cost Code: **8ED – 83D*** - 813**

BCRs:

Contractor	Contract Number	Release no.	Comment
Ascots			
Slickline contractor			
Electric-line contractor			

Purpose of Program:

To complete and test Naylor #1 to determine well deliverability.
The program has been split into two parts to enable review/revision of the testing activities based on the results of the perforating. The testing equipment will be mobilised after the perforating has been completed, at a time determined by the Project Leader.

Part A
- drift and swab well
- slickline perforate Waarre Unit "C" sandstone underbalance
- clean up flow and wellhead samples

Part B
- 2 rate flow test complete with HP samples.

Current Well Status: 3-1/2" monobore cased and suspended as a future Waarre Unit "C" gas producer.

Block: PEP 154, Onshore Otway Basin, Victoria.

Location:

Latitude	38° 31' 56.77" S
Longitude:	142° 48' 27.29" E
Seismic line	CDP 10225 INLINE 2200

Elevation:

Ground Level	46.0m
Rotary Table:	50.7m

Elevations are Above Mean Sea Level.
All depths are m. RT unless otherwise noted.

Brief Well History:

Naylor #1 was drilled as a monobore in South Western Victoria in the Otway Basin. This well is planned to intersect high porosity, high permeability net pay in the Waarre Unit "C" formation. The 3-1/2" J55 production casing will be run (based on a well life of < 4 years) to 2192 m and the well suspended as a future Waarre Unit "C" gas producer.
The well is located approximately
1.6 km from Boggy Creek #1, 5.0 km from Flaxmans #1 and
2.7 km from Curdie #1

Wellhead Maintenance: A 3-1/8" x 5000# trim 2 wellhead installed & pressure tested.

Casing Details:

Surface Casing:

Plan to run 39 Joints 9-5/8" casing to 480m (1575') RT as follows:

Refer to attachment #1 - Surface Casing & Cementing report

Production Casing:

6-3/4" hole drilled to 2192m.
Plan to run 228 Jts of 3-1/2" 9.3 #/ft New NK3SB tubing to 2192m RT.

Refer to attachment #2 - Production Casing & Cementing report

TD: planned 2192m RT (7192' RT)

PBTD: planned 2181.5m RT (7157' RT)

Perforations: yet to be perforated

Reservoir Pressure & Temperature:

Formation	Pressure	Temperature	Source
Waarre Unit "C"	3275 psia @ 2157m RT (7077' RT)	174 F	Naylor #1 montage Dec 2001

Wellhead Equipment:

See Proposed Wellhead Schematic (Attachment 3.)

Downhole Equipment:

See Proposed Wellbore Schematic (Attachment 4.)

CONTENTS

PROCEDURE

ATTACHMENTS

KILL FLUID CALCULATION SHEET

Formation:	Waarre Unit "C"
Reservoir Depth (ft.)	7077
Reservoir Pressure (psi)	3275
Reservoir Temperature (°F)	174
Kill Fluid Weight :	3275 + 150 7077 x 0.052
	9.31 lb/gal
Temperature Correction:	Average Downhole Temp. = 174 + 70 2
	= 122 °F
	Density Correction: = 0.003 (122-70) lb/gal
	= 0.156 lb/gal
	Kill Fluid Weight at 70°F = 9.47 lb/gal

If required to kill well, then use 2% KCl fluid with a density of at least 9.47lb/gal

PROCEDURE

Note: Refer to the following SANPE procedures where necessary.

Note: Phone numbers for the site are 03 TBA & 03 TBA

Refer to the following SANPE procedures where necessary.

1-7 Wellsite Inspection for Downhole and Surface Completion Equipment.
1-10 Tubing Conveyed Perforating – Special Considerations.
1-11 Well Control Equipment Testing
1-13 Well Maintenance-Top Up and Pressure Testing
1-14 Installation of Flarelines.
2-1 Coiled Tubing Operations
5-1 Slick line rig up
7-1 Work Place Hazard Inspections
7-2 Chemical Handling and Transport
7-3 Manual Handling Task Assessment

PART A - PERFORATING

1. INSTALL WELLHEAD & DRIFT WELL

1.1. Conduct wellsite safety meeting.

1.2. Install suitable flareline to flare up to 10 MMscf/d complete with 2-1/16" choke to wing valve (2-1/16") to existing flare pit.

Note: **Ensure that the flare line is laid out taking into account the prevailing wind.**

Rig up wing valve, variable choke and flowlines according to the normal procedures ensuring that an appropriate spacing is allowed between each major item of equipment. Refer to attachments #6 for lease layout, and #7 for equipment requirements.

Flare pit must be bunded for flare containment.

1.3. Function test 3-1/8" 5000 psi Trim 2 wellhead.

1.4. Rig in slickline with 3000 psi lubricator and pressure test to 3000 psi for 10 mins. Pressure test wellhead to 3000 psi.

1.5. Pressure test surface casing string to 2000 then to 3000 and hold for minimum of 10 minutes. Record and report results of the pressure tests.

Note: **The maximum expected shutin surface pressure (full column of gas) is approximately 2600 psi.**

1.6. Make up and RIH 1.75" drift and tag PBTD @ 2181.5m RT.

1.7. Make up and RIH 2.867" API drift and tag PBTD.

1.8. Make up and RIH 2.80" x 20' dummy perforating drift and tag PBTD (for 2-1/8" perforating guns).

1.9. Break out toolstring and prepare to run Memory Production Logging Tool (MPLT).

2. CONDUCT SLICKLINE CORRELATION LOGS

Note: **If the cementing is problematic, or a successful pressure test is not obtained on the surface casing, then a Program Change Request (PCR) will be issued to mobilise electric-line to conduct a Cement Bond Log (CBL/VDL/GR/CCL). Refer to Attachment #11.**

2.1. Make up MPL toolstring to record Gamma Ray (GR), Casing Collar Locator (CCL) and Temperature (T).

2.2. RIH to PBTD and log up to at to approx. 2007m RT to record GR/CCL across the Waarre Unit "C" interval for correlation to open hole logs.

Note: **The pup joint (marker joint) above the Waarre Unit "C" must be logged.**

2.3. POOH to approx. 510m RT (30m below surface casing shoe).

2.4. Log across the surface casing shoe to 258m RT (70m above expected top of cement) to obtain a temperature pass.
Logging speed will be approximately 18m/min (60 ft/min).

2.5. RIH and repeat log from 510 to 258m RT at a logging speed of approximately 36m/min (120 ft/min).

2.6. POOH and download data for depth correlation purposes. Correlate to open-hole log GR-LCS, MRS-DLS-CAL, CDS-CNS, dated not run yet as provided in PRA:yy/###/Rev. # (attachment #5 in the original program).

Note: **If a suitable log has not been recorded, then the MPL will need to be re-run.**

2.7. Prepare to swab well.

3. SWAB WELL

3.1. Rig in swabbing equipment.

3.2. RIH and swab well down to at least 400m. This will provide an underbalance of approx. 500 psi. Swabbed fluids must be directed to the flare pit.

Note: **Brine in wellbore is 9.1 ppg.**

A fluid head of at least 300 psi is required on top of the firing head.

3.3. Rig down swabbing equipment.

4. RUN SLICKLINE PERFORATING SYSTEM

4.1. Upon arrival at the wellsite, and prior to rigging up, conduct an onsite safety meeting and job review.

Note: **Before commencing operations, report any wellhead pressures that may be present.**

Ensure that the full details of the tubing stop and other downhole components are recorded.

4.2. RIH Slickline contractor with G type tubing stop assembly to approx. 2177m RT (20m below Waarre Unit "C" to minimise spacer requirements) and perform setting procedure in accordance with standard procedures.

Note: **Ensure that the tubing stop setting depth does not interfere with the required perforation intervals given in PRA (Attachment #5).**
The lowest perforation is at *****m RT - TO BE CONFIRMED

5. DEPTH CORRELATION

5.1. Connect memory CCL/GR gauges to Slickline contractor slickline.

5.2. RIH and tag tubing stop. Log off and up to at least 1524m (5000') RT (ie include marker joint at ****m RT). POOH.

5.3. The perforating engineer will download the data so that a hard copy of the depth correlation is available for reference. Correlate to the open hole depth reference log GR-LCS, MRS-DLS-CAL, CDS-CNS, dated not run yet, and cased hole GR/CCL run previously.

6. PREPARE GUN MODULE

6.1. Hold safety meeting to discuss operations with explosives. Conduct "Job Safety Analysis" and "Step Back" to review operations.

6.2. Load 2-1/8" Owen Raptor guns @ 6 spf 6.4g HMX charges, 60° phasing to perforate the Waarre Unit "C" sands as outlined in PRA:yy/###/Rev. # (Attachment #5). Determine spacer requirements taking into account the setting depth of the tubing stop.

7. RUN PERFORATING GUN MODULE & FIRING HEAD

7.1. RU Slickline contractor slickline unit and 3-1/2" lubricator.

7.2. Connect running tool to Slickline contractor slickline.

7.3. Connect spacer gun/perforating gun module to tool string and RIH.

7.4. RIH gun module and firing head.

Note: The Santos representative is to double check perforation interval as marked on gun module.

7.5. Rig down Slickline contractor.

8. DROP BAR AND FLOW

8.1. Conduct WSSM & OB and record on both Santos Daily Report and Slickline contractor Job Logs.

Note: Ensure that there are not any fire restrictions (ie. total fire ban), and that the appropriate authorities (CFA, Police etc.) and local residents have been notified.
Refer to attachment #9.

If fire restrictions are in place then do not proceed with perforating of the well.
Refer to attachment #10.

Ensure that the DNRE have been notified 24 hours prior to perforating the well.

Monitor annulus pressure during all of the following operations. Maximum Allowable Annulus Pressure (MAAP) is 200 psi.

8.2. Drop detonating bar **WITH THE WELL OPEN** to detonate the guns. It will be approximately 500 psi underbalance.

8.3. Flow to flare to unload water cushion and any perforating debris.

8.4. Report flare status, rates, FTHP, SIPCP and choke setting. Bleed down SIPCP as required.

8.5. Shut in well.

8.6. Report results to GWS-Adelaide immediately.

9. RETRIEVE PERFORATING ASSEMBLY

9.1. RU ET with 3-1/2" lubricator in preparation to fish perforating assembly. Ensure sufficient length of lubricator is available to fish gun hanger system components.

Note: Perforating specialist MUST be on location during slickline operations fishing gun modules.

9.2. Pressure test lubricator to 3000 psi for ten minutes

9.3. Conduct safety meeting and review JSA for pulling perforating guns.

9.4. RIH and retrieve bar, firing head and gun/spacer modules.

9.5. RIH and pull tubing stop.

Note: **Advise GWS-Adelaide if any difficulties are encountered in recovering any of the perforating system components**

9.6. RDMO Slickline contractor.

9.7. Flow well on cleanup for a minimum of 2 hours.

9.8. Report flare status, rates, FTHP, SIPCP and choke setting. Bleed down SIPCP as required.

Note: **Obtain at least one hour of stable flowing tubing head pressure (1300 psi is the target).**

Just prior to shutting in the well, obtain 2 HP gas samples from the wellhead.

Ensure that the samples are despatched to Adelaide ASAP via the Santos representative at the wellsite.

9.9. Shut in well and secure.

9.10. Report results to GWS-Adelaide.

PART B - TESTING

10. RIG IN TESTING EQUIPMENT

10.1. Ensure that the flare line is laid out taking into account the prevailing wind.

10.2. Rig up wing valve, variable choke, flowlines, separator, heater, gauge tank and frac tank according to the normal procedures ensuring that an appropriate spacing is allowed between each major item of equipment. Refer to attachments #6 for lease layout, and #7 for equipment requirements.

Note: **Connect liquid flowlines to the riser of the test tank so that a constant head is maintained against the separator.**

Piping should allow flow to tank and a loading point of tanker trucks to remove condensate produced.

Tank, lines and loadout pump are to be earthed to eliminate EMF differentials.

Refer to Slickline contractor Job Safety Analysis.

11. PRE-FLOW & RUN BOTTOMHOLE GAUGES

Note: **Ensure that there are not any fire restrictions (ie. total fire ban), and that the appropriate authorities (CFA, Police etc.) and local residents have been notified.**
Refer to attachment #9.

If fire restrictions are in place then do not proceed with testing of the well.
Refer to attachment #10.

Ensure that the DNRE have been notified 24 hours prior to commencement of testing.

Do not run gauges until there is a clear indication that there will not be any fire bans for the next 2 days.

11.1. Pressure test all lines and equipment to full SITHP.

11.2. Open well to flare and determine appropriate choke settings. Warm separator and establish levels.

11.3. Shut in well to stabilise.

11.4. Rig up electronic gauge programmed as per Reservoir Development engineer's specifications. Connect battery, noting time and hang in lubricator. Pressure lubricator to full SITHP.

Note: **The well must have a stable SITHP and have been shutin for at least 6 hours.**

It is anticipated that the buildup will be less than 2 hours, so a high gauge rate of data sampling is required (refer to attachment #8).

11.5. After a 15 minute stop in the lubricator, RIH conducting a Static Gradient Survey with stops at each 305m (1000') (sufficient for gauge stabilisation). Hang gauges 15m (50') below the perforations at approximately 2157m RT (refer to attachment #4). Secure slickline and prepare for flow test.

12. TWO RATE FLOW TEST & SAMPLING

12.1. Prepare to flow well at pressure of 1000 psi **OR** at a rate of approximately 10 MMscf/d. During the flow periods, monitor all separator parameters every 15 minutes and calculate all flow rates every 30 minutes for the first 2 hours, then hourly thereafter. During the shutin, also monitor pressures.

Note: **Wellhead temperatures are important for flowline design.**

12.2. Gradually bring the well on line and trim through the separator to flare.

12.3. Commence flowing the well through the separator. Adjust the choke to maintain a FTHP of approximately 1000 psi **OR** at a rate of approximately 10 MMscf/d. Flow well for 8 to 12 hours. The flow duration will be determined based on pressure/flow stability.

Note: **Test gas for both H2S and CO2 by means of a Draeger test kit. If a positive H2S reading is registered, confirm and notify GWS Adelaide immediately. Full test equipment will then be mobilised in order to accurately ascertain the gas composition.**

12.4. At the end of the first flow period, adjust choke setting to obtain a flowing pressure of 1350 psi (anticipated flowline pressure) **OR** at a rate of approximately 5 MMscf/d. Flow well for 8 to 12 hours. The flow duration will be determined based on pressure/flow stability.

Note: **Refer to attachment #8 for approximate condensate (C5+) volumes expected to be produced. It is anticipated that the yield will be similar to nearby wells at approximately 12-18 bbls/MMscf.Condensate volumes will also depend on duration of the test.**

Scotts Transport (Colin Richardson, 08 83473449) need to be advised on timing for pickup of condensate from location.

Western District Pumping Service (Peter Kavanagh, 018 528549, fax 03 55611337) will be mobilised to transfer the condensate.

12.5. Near the end of the second rate (after stable flow has been reached), take 2 sets of high pressure samples (gas & liquid), ensuring that the flow rates and pressures are stable. All separator functions are to be monitored and recorded. Also take 2 x 20L stock tank samples of the produced condensate.

Note: **All samples should be taken under the same separator operating conditions and labelled accordingly.**

LGR conditions MUST be stable.

Duplicate samples should be taken approximately one hour apart.

It is required to ensure stable conditions for sampling. If necessary, extend the flow period. Use evacuated cylinders for gas and acidified saturated brine solution for condensate sampling by displacement.

During the sampling monitor all the flow parameters.

Clearly label all samples and report sample container numbers in morning and final report.

12.6. Flow the well for a sufficient period (1-2 hours) after taking the duplicate set of samples to ensure that stabilised conditions have existed after sampling.

12.7. Shut well in on build up for approximately 24 hours, or 6 hours after the surface pressure stabilises. Notify the Project Leader if there are any problems with the test, or if the shutin monitoring can be curtailed earlier.

13. STATIC GRADIENT & RIG DOWN

13.1. At the end of the shutin period with the well still shutin, POOH with gauges conducting a Static Gradient Survey at 305m (1000') intervals (stop duration dependent on gauge stabilisation time) on the way out. Stop in lubricator for 15 minutes prior to isolating and bleeding down the lubricator and retrieving the gauges. Download the data and forward to the Project Leader as soon as is practically possible.

Note: **The notice to end the test (or to rerun gauges) will be given by the on-site Reservoir Engineer.**

Rig down separator and all associated equipment and demobilise from location.

13.2. RDMO slickline equipment and secure the well. Wellhead valves are to be chained and padlocked, as is the cage surrounding the wellhead. One set of padlock keys are to be handed to the Supervisor at the Heytesbury Gas Plant and the duplicate set returned to SABU Petroleum Engineering in Adelaide.

13.3. Ensure that the total liquids production is recorded and trucked away from the well site as previously arranged. Any water can be drained to the flare pit (which must be securely fenced).

13.4. Ensure that the lease is left in a clean and tidy state and contact the Project Leader to notify Land owner that test is complete

Attachment #1

Surface Casing & Cementing Report

NOT YET AVAILABLE

Preliminary

Attachment #2

PRODUCTION CASING & CEMENTING REPORT

NOT YET AVAILABLE

Preliminary

Attachment #3

PROPOSED WELLHEAD SCHEMATIC

3-1/8" 5000 psi Trim 2 wellhead

NOT YET AVAILABLE

Attachment #4

PROPOSED DOWNHOLE SCHEMATIC

NOT YET AVAILABLE

Preliminary

Attachment #5

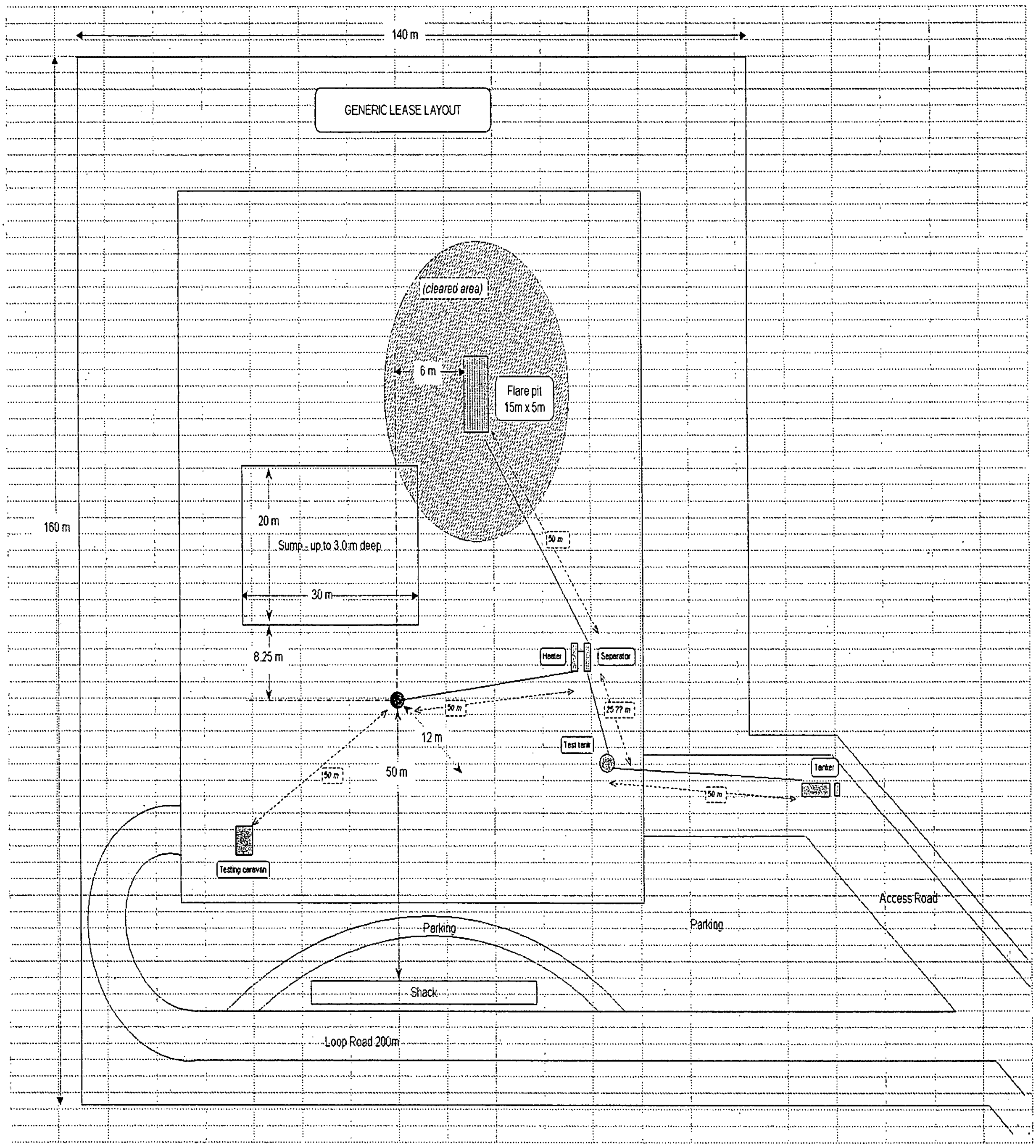
PERFORATION REQUEST ADVICE

NOT YET AVAILABLE

Preliminary

Attachment #6

PROPOSED LEASE LAYOUT



Attachment #7

EQUIPMENT REQUIREMENTS

1. Swab valve to fit 3-1/8" wellhead.

2. Flowline to separator
   frac tank/road tanker c/w static earth lines and unloading pump
   small gauge tank (2 x 55 bbl compartments)
   tank piping
   chiksans
   line heater
   choke manifold
   flare line
   methanol & injection equipment

3. Caravan & generator
   lighting equipment
   fire extinguishers

4. Slickline unit complete with:
   - running/pulling tools for perforating system
   - high rate electronic gauges
   – swabbing equipment for 3-1/2" monobore
   – dummy gun drifts.

5. Separator (1440 psi) & well test equipment

6. PVT sampling equipment, including
   3 x 20 litre HP gas sample bombs
   3 x 0.5 litre HP liquid sample bombs

7. Memory Production Logging tool for GR/CCL correlation & associated hard/software

Attachment #8

CONDENSATE PRODUCTION

Generic well	FTHP (psi)	Anticipated rate (MMscf/d)	Test duration (hours)	Gas produced (MMscf)	C5+, @ CGR = 12 (bbls)	C5+, @ CGR = 18 (bbls)
Cleanup flow	1300	5.0	6	1.3	15	23
Rate determination	various	2.0	2	0.2	2	3
Shut well in for stabilisation			6			
RIH gauges			2			
Flow 1	1000	9.5	8	3.2	38	57
Shutin 1			0			
Flow 2	1300	5.5	8	1.8	22	33
Flow 2 (after sampling)	1300	5.5	2	0.5	6	8
Buildup			6			
Buildup			18			
SGS while POOH			2			
TOTAL				**6.9 MMscf**	**83 bbls**	**124 bbls**

Preliminary

Minimum rate to lift liquids for 3-1/2" tubing

Q (MMscf/d)	FTHP (psi)
3.0	1600
2.8	1450
2.6	1300
2.4	1150
2.1	1000

909080 065

Attachment #9

EMERGENCY CONTACTS

OTWAY BASIN

POSITION	NAME	PHONE	FAX
Aboriginal Heritage	Lionel Harridine	03 5567 1236	
Aircraft Hire	Shipwreck Coast Flights	03 5598 5441	
Ambulance, Timboon		000	
Ambulance, Warrnambool		000	
Backhoe Hire	Ian White	03 5598 6376	
CFA, Colac Region 6 Headquarters Operations Officer	Brian Brady	03 5232 1923	03 5231 1370
CFA, Colac Region 6 Headquarters Operations Manager	Mark Gunning	03 5232 1923	03 5231 1370
CFA, Timboon	Bassett	03 5598 3386	03 5598 3060
D.N.R.E.	Kaurosh Mehin	(wk) 03 9412 5082 (ah) 03 9840 1079 0419 597 010	03 9412 5156
Drilling Conductor	Des Gladman	03 5562 0783	
Earth Moving	John Molan	03 5592 1261 0408 529 559	03 5592 2122
Exploration Field Service	Ray Willox	03 5598 5329 018 529 314	03 5598 5329
Fire Brigades (Fire Calls Only)	Timboon Port Campbell	03 5598 3386 03 5598 6243	
Heavy Haulage	Alan Spikin	03 5561 6111	
Helicopter Hire	Helicopter Operations Aust.	03 5561 5800 018 529 959	
Hospital, Timboon		03 5598 3000	
Hospital, Warrnambool		03 5563 1666	
Land Owner (Access)	Roland Stansfield	03 5598 5383	
Land Owner (Camp)	Wayne Thompson	03 5598 5286	
Land Owner (Penryn)	Garry Thompson Gus Thompson	03 5598 3333 03 5598 5385	
Medical Centre, Timboon		03 5598 3104	
O.D.E	Nic Hausburugh	0145 117 941	
Police, Port Campbell	B. Hair	03 5598 6310	
Police, Timboon	Russell Martin	03 5598 3026	
Police, Warrnambool		03 5562 1111	
Power Cor	Hutchins	03 5563 2512	03 5563 2511
Shire Council Corangamite	Paul Younis (Eng) Allan Kerr (Councilor)	03 5593 7100 03 5598 3240	03 5593 2695
South West Water	John Huff	03 5564 7600	
State Emergency Services Port Campbell		03 5598 6231	
Surveying	Paul Crowe	03 5561 1500 0419 515 422	03 5561 2935
Water Carting	John Molan	03 5592 1261 0408 529 559	03 5592 2122
Water Pumping	Exploration Field Service	03 5598 5329 018 529 314	03 5598 5329
Wreck Hire Warrnambool		03 5562 1411	

SANTOS

POSITION	NAME	PHONE	FAX
Gas Well Services Design Team Leader	Andrew DeGaris	(wk) 08 8224 7793 (ah) 08 8449 2610	08 8224 7755
Gas Well Services Operations Superintendent	Milt Gillies	(wk) 08 8224 7295 (ah) 08 8295 2414	08 8224 7755
Reservoir Development Eastern/Northern Gas Team Leader	John Hulme	(wk) 08 8224 7324 (ah) 08 8338 0169	08 8224 7755
Project Leader Staff Geologist	Graeme Parsons	(wk) 08 8224 7182 (ah) 08 8391 0967	
Environmental Dept.	Catriona McTaggart	(wk) 08 8224 7894 (ah) 08 8373 2961	08 8224 7141

SERVICE COMPANIES

POSITION	NAME	PHONE	FAX
Expertest Ltd	David Hawkes	08 8354 0488	08 8443 7408
Ascots Haulage	Colin Richardson David Jolley	08 8347 3449	08 8347 3414
Western District Pumping	Peter Kavanagh	018 528549	03 55611337

Attachment #10

CFA FIRE PERMITS Rz.zz.00/01

NOT YET AVAILABLE

Preliminary

Attachment #11

DETERMINATION OF CEMENT QUALITY

If the cementing of Naylor #1 was not problematic, and was pumped as per design to place the top of lead cement approximately 152m inside the surface casing shoe (ie. ~328m), the running of a Cement Bond Log (CBL/VDL/GR/CCL) will not be conducted for the following reasons:

- It is considered that a memory temperature log will be able to detect changes in geothermal gradient across the cement top.
- Due to the sensitivity of the location of Naylor #1, minimising the number of contractors on site will be beneficial in reducing the impact of operations on the local residents.
- A cost reduction will be realised, as mobilisation of the crews and equipment for the cement bond logging is substantial.
- Correlation to the open hole logs will be performed with the same Memory Production Logging Tool (MPLT) used for the temperature pass.
- A pressure test will be conducted on the Surface Casing to determine integrity of the pipe to withstand full shutin wellhead pressure.

PE909081

This is an enclosure indicator page.
The enclosure PE909081 is enclosed within the container PE909080 at this location in this document.

The enclosure PE909081 has the following characteristics:

ITEM_BARCODE =	PE909081
CONTAINER_BARCODE =	PE909080
NAME =	Enc.1 Curdie Vale 3D Depth Structure Map
BASIN =	OTWAY
ONSHORE? =	Y
DATA_TYPE =	SEISMIC
DATA_SUB_TYPE =	HRZN_CONTR_MAP
DESCRIPTION =	Encl.1 Naylor-1 Curdie Vale 3D Depth Structure Map, Near Top Waarre Sand, Scale 1:25000, C.I. 10m, Datum: AGD84, Santos [BOL] Ltd, W1318, PEP154. Enclosure 1 contained within "Naylor-1 Well Proposal Report" [PE909080].
REMARKS =	
DATE_WRITTEN =	02-FEB-2001
DATE_PROCESSED =	
DATE_RECEIVED =	
RECEIVED_FROM =	Santos (BOL) Pty Ltd
WELL_NAME =	Naylor-1
CONTRACTOR =	
AUTHOR =	
ORIGINATOR =	Santos Ltd
TOP_DEPTH =	
BOTTOM_DEPTH =	
ROW_CREATED_BY =	CD000_SW

(Inserted by DNRE - Vic Govt Mines Dept)

PE909082

This is an enclosure indicator page.
The enclosure PE909082 is enclosed within the container PE909080 at this location in this document.

The enclosure PE909082 has the following characteristics:

ITEM_BARCODE = PE909082
CONTAINER_BARCODE = PE909080
NAME = Encl.2 Naylor-1 Stratigraphic X-section
BASIN = OTWAY
ONSHORE? = Y
DATA_TYPE = WELL
DATA_SUB_TYPE = CROSS_SECTION
DESCRIPTION = Encl.2 Naylor-1 Otway Basin Stratigraphic Cross-Section, Howmains-1, Flaxmans-1, Curdie-1, Boggy Creek-1,, by Santos [BOL] Ltd, W1318, PEP154. Enclosure 2 contained within "Naylor-1 Well Proposal Report" [PE909080].
REMARKS =
DATE_WRITTEN = 26-SEP-2000
DATE_PROCESSED =
DATE_RECEIVED =
RECEIVED_FROM = Santos (BOL) Pty Ltd
WELL_NAME = Naylor-1
CONTRACTOR =
AUTHOR =
ORIGINATOR = Santos Ltd
TOP_DEPTH =
BOTTOM_DEPTH =
ROW_CREATED_BY = CD000_SW

(Inserted by DNRE - Vic Govt Mines Dept)