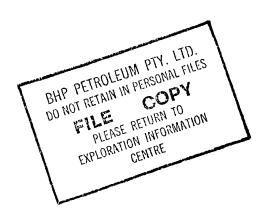


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# REPORT ON A STUDY OF MINERVA-1 and MINERVA-2

# CONVENTIONAL CORE, VIC/P31, OTWAY BASIN



PREPARED BY: P.A. ARDITTO

SEDIMENTOLOGIST, TECHNICAL

**CONSULTING GROUP** 

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#### 1 INTRODUCTION

This report is based on the detailed examination and description/interpretation of some 123 metres of conventional core cut in Minerva-1 and Minerva-2A in the BHP Petroleum operated permit VIC/P31 within the offshore eastern Otway Basin. The study was undertaken by Messrs P.A. Arditto and S. Horan initially on Minerva-2A core at the AMDEL laboratories in Adelaide (10-12 November, 1993) and later on Minerva-1 core at the Kestral warehouse in Melbourne (24 November, 1993). Minerva-1 had 20.67m of core recovered and Minerva-2A had 101.97m of core recovered for study.

Lithological description and environmental interpretation of each cored interval are followed by core description sheets at 1:25 scale, core gamma ray log data and a selection of wireline log data over and adjacent to the cored interval. A key to the symbols used on the core description sheets is given at the end of the report. Where available, depositional environment inferences from palynological data by Roger Morgan were used to augment environmental interpretation made from core observations.

The results and conclusions of this study form an integral part of the evaluation and characterisation of the reservoir section in the Minerva Gas Field as well as contributing to the regional geology of the basal portion of the Upper Shipwreck Group in the eastern Otway Basin.

#### 2 SUMMARY

The main reservoir interval cored in Minerva-1 and Minerva-2A comprises an overall upward shoaling estuarine to fluvial succession of medium to very coarse grained sandstone channel fill lithofacies with minor preserved finer grained estuary bay and fluvial overbank lithofacies. The depositional model for the reservoir interval is that of a high energy fluvial system dumping significant quantities of coarse quartz detritus as it encroached into a nearshore marine setting along an embayed coastline.

The reservoir quality of these multistorey high energy channel sandstone successions is excellent as they are commonly coarse grained and very well sorted. The depositional setting inferred for the reservoir interval predicts that individual sandstone channel units will be highly interconnected across the field. The minor thin overbank shales present within the high energy fluvial succession comprising the upper portion of the reservoir interval would not be individually extensive as these would be incised and breached by successive channel cuts.

#### 3 MINERVA-1

#### 3.1 Core 1

### 3.1.1 Description and Interpretation

#### **Lithological Description**

The interval 1821.00m to 1823.35m is sandstone, predominantly very coarse grained and poorly sorted, comprised of six upward fining units separated by scour surfaces with pebble lags. Internally it is homogeneous with minor trough cross bedding and sporadic shale rip up clast horizons. Abundant disseminated pyrite cement is present over the interval 1821.50m to 1822.75m. Unfortunately about one third of this part of the core is preserved as rubble which does not make more detailed observations possible.

The interval 1823.35m to 1824.04m is sandstone, medium grained and homogeneous with minor shale rip up clast horizons and pebble lags on scour surfaces. This entire interval is core rubble.

#### **Environmental Interpretation**

The relatively short length of core together with almost 50% of it preserved as rubble makes it difficult to be categoric on inferring depositional environments. The available evidence points to the cored section being cut in a succession of stacked lower point bar or braid bar channel units deposited during flood to early falling stage of a low sinuosity fluvial system. Core gamma ray and wireline log data are consistent with this interpretation.

#### 3.2 Cores 2 and 3

## 3.2.1 Description and Interpretation

#### Lithological Description

Core 2 was cut over the interval 1828.00m to 1841.27m and core 3 over the interval 1842.50m to 1846.87m. The interval 1828.00m to 1829.50m is sandstone, very coarse grained to granule at the base (scour surface) fining upwards to medium to coarse grained at the top. The sandstone is well sorted and predominantly homogeneous with minor trough cross bedding in the upper half. The interval 1829.50m to 1833.15m is sandstone, predominantly very coarse grained, pebbly and very poorly sorted, comprising seven units separated by scour surfaces. Internally the units are homogeneous with minor planar inclined laminations (? trough cross bedding). The basal portion of each unit contains a concentration of pebbles and sporadic shale rip up clasts.

The interval 1833.15m to 1836.90m is sandstone, predominantly medium to coarse up to very coarse grained and moderately well sorted, comprising eleven upward fining units separated by scour surfaces. Internally these units are trough cross bedded with minor current ripple and carbonaceous to shaly flaser laminations at the top. Rare pillow and flame features and dewatering features are evident over the interval 1835.15m to 1835.30m. The lowermost metre of sandstone is very well sorted.

The interval 1836.90m to 1837.06m is shale, highly carbonaceous, with sporadic resin blebs and pyrite cement near the top contact (scour surface). The interval 1837.06m to 1837.23m is coal, black, brittle and sub bituminous with pyrite cement. The interval 1837.23m to 1838.85m is shale, dark grey to black and highly carbonaceous with rootlets, plant stems

and abundant resin blebs in the upper third and dark grey and homogeneous with minor plant stems and sporadic resin blebs in the lower two thirds.

The interval 1838.85m to 1839.70m is siltstone to very fine grained sandstone comprising two upward fining units. Internally the siltstone is homogenised through rootlet bioturbation and dewatering. The interval 1839.70m to 1840.35m is predominantly shale, dark grey with a thin coal and resin blebs in the upper half and becoming silty with microfoundering features in the lower half. The base is wavy and gradational into the unit below.

The interval 1840.35m to 1841.27m (base of core 2) is sandstone, predominantly fine to medium grained, comprising two upward fining units separated by a scour surface. The units are planar bedded to current ripple laminated in the lower half and flaser bedded to rooted with dewatering features in the upper half.

Core 3 commences at 1842.50m and the entire interval to 1846.87m (base) is sandstone, predominantly medium to coarse grained up to very coarse grained and well sorted, comprised of multiple upward fining cycles separated by scour surfaces and pebble lags. Internally the units are trough cross bedded and some unusually high angle trough cross bed laminae may indicate slump rotation during initial compaction.

The sandstone throughout this core has a sucrosic texture and the sand grains sparkle through abundant overgrowth development. Several subhorizontal to near vertical fractures healed by silica cement are developed over the interval 1844.21m to 1844.40m and 1845.60m to 1846.30m.

## **Environmental Interpretation**

The interval 1828.00m to 1833.40m is interpreted as a stacked high energy channel succession deposited during late flood to early falling stage cycle in a low sinuosity fluvial system. The interval 1833.40m to 1836.90m is interpreted as a succession of lower point bar channel units deposited during the falling stage cycle in a low sinuosity fluvial system. The interval 1836.90m to 1838.85m represents deposition of overbank/abandoned channel fill during the low stage cycle of a low sinuosity fluvial system. The interval 1838.85m to 1840.35m is interpreted to represent deposition of distal crevasse splays and abandoned channel fill during a low stage cycle. The interval 1840.35m to 1841.27m (base of core 2) is interpreted to represent stacked middle point bar channel units deposited during a falling stage cycle.

The entire interval of core 3 (1842.50m to 1846.87m) is interpreted to be a succession of stacked channel units deposited during late flood to early falling stage cycle in a low sinuosity fluvial system.

#### 4 MINERVA-2A

#### 4.1 Core 1

## 4.1.1 Description and Interpretation

#### **Lithological Description**

The entire cored interval, 1728.50m to 1733.60m is sandstone, very fine grained and silty towards the base, grading upwards to very fine to fine grained muddy sandstone at the top. It is very poorly sorted through intensive bioturbation with sparse sand-filled dwelling burrows developed near the top of the interval. Faint subhorizontal disturbed laminations are developed throughout although primary sedimentary features are largely destroyed through biological churning of the original sediment. Sporadic sideritic nodular mudstone intervals are developed within some burrow features.

#### **Environmental Interpretation**

The relatively short length of core together with the homogeneity of lithology and structures make it difficult to be categoric in the discussion of depositional environment. The relatively fine grained and intensely bioturbated nature of the interval, combined with an absence of wave generated features, indicate a possible offshore open marine setting. Wireline log data indicates that core was taken from near the base of a grossly upward coarsening (progradational) cycle some 70 m thick. The

inferred environmental setting is that of a distal toe of a prograding shoreface (or ?deltaic) unit just below wavebase.

Samples for palynology taken at 1733.50m and 1733.60m had a high ratio and diversity of dinoflagellates and were inferred to be nearshore marine.

#### 4.2 Cores 2 and 3

### 4.2.1 Description and Interpretation

#### **Lithological Description**

The interval 1838.80m to 1839.67m is sandstone, medium up to coarse grained and granule, comprised of fining upward cycles 0.1m to 0.3m in thickness separated by scour surfaces and pebble lags. The sandstone is well sorted and trough cross bedded with minor flasers towards the top of each unit. The interval 1839.67m to 1840.77m is shale, medium grey, mottled with sparse carbonaceous rootlets. It is generally homogeneous with minor starved ripple and microfoundering features in the lower half. Sparse scattered resin blebs occur in the upper half of the interval. The interval 1840.77m to 1840.79m is coal, black and sub bituminous. The interval 1840.79 to 1841.15m comprises shale, silty, with starved ripples and microfoundering features. Rare resin blebs occur at the top of the unit.

The interval 1841.15m to 1841.82m is sandstone, very coarse grained to granule, moderately sorted and trough cross bedded to planar laminated with rip up clasts and flasers near the top which is transitional into the overlying unit. The base of the unit rests on a scour surface. The interval 1841.82m to 1842.80m is sandstone, coarse to very coarse grained and well sorted with minor granule trains along sporadic lamina. Internally it is trough

cross bedded with minor high angle carbonaceous flaser drapes. The base of the unit rests of a prominent scour surface.

The interval 1842.80m to the base of core 2 (1855.05m) is sandstone, predominantly coarse to very coarse grained and well sorted. This interval is comprised of stacked upward fining units, typically 0.2m to 0.5m in thickness, separated by scour surfaces. Internally the sandstone units are trough cross bedded and typically have basal pebble lags and minor carbonaceous flaser laminated tops.

Core 3 commences at 1855.60m and the interval 1855.75m comprises grey argillaceous siltstone core rubble. The interval 1855.75m to 1860.23m is sandstone, fine to medium up to very coarse grained and comprised of upward fining units 0.15m to 0.70m in thickness separated by scour surfaces and pebble or shale rip up clast lags. Internally these units are trough cross bedded with several containing flaser laminations or lenticular bedded sandstone near the top. Several units over the interval 1858.90m to 1857.55m contain sparse up to abundant ophiomorpha burrows along with an overall upward fining throughout.

The interval 1860.23m to 1861.75m is shale, highly carbonaceous with sparse rootlets and minor thin coals, black and sub bituminous. Small resin blebs occur within the shale adjacent to the coaly horizons. Internally the shale is homogeneous throughout.

The interval 1861.75m to 1865.30m is predominantly sandstone, medium up to coarse grained, comprised of upward fining units 0.4m to 0.7m in thickness capped by carbonaceous flaser laminations or, more rarely, flasered thin shale intervals. Internally these units are trough cross bedded and separated by scour surfaces with sporadic basal shale rip up clast lags.

The interval 1865.30m to 1866.00m is sandstone, coarse grained at the base and fining up to fine to medium grained at the top. The lower one third contains shale rip up clasts and pebbles overlain by a trough cross bedded zone grading upward to flaser to lenticular bedded sandstone with burrows at the very top. The interval 1866.00m to 1866.75m is sandstone, predominantly fine to medium grained and muddy, comprised of three upward fining units. Internally it is heavily burrowed to bioturbated with recognisable ophiomorpha burrows. The lower half is flaser to lenticular bedded.

The interval 1866.75m to 1869.55m is sandstone, predominantly fine to medium grained, trough cross bedded in the lower half and flaser to current ripple laminated in the upper half. The interval 1869.55m to 1871.70m is sandstone, medium up to coarse grained, comprised of three upward fining units separated by scour surfaces. Internally the bulk of each unit is trough cross bedded with the uppermost part flaser laminated. The interval 1871.70m to 1873.90m is sandstone, predominantly coarse to very coarse grained up to granule and pebbly, comprised of four upward fining units, around 0.55m in thickness, separated by prominent scour surfaces and pebble lags. Internally these units have well developed trough cross bedding. The interval 1873.90m to 1876.35m is sandstone, predominantly medium to coarse grained, comprised of six upward fining units separated by scour surfaces and pebble lags. Internally these units are trough cross bedded and some have thin flaser laminated tops.

The interval 1876.35m to 1876.58m is shale, black and carbonaceous with silty starved ripples. The interval 1876.58m to 1880.63m is predominantly sandstone comprised of a series of stacked units, separated by scour surfaces, ranging in thickness from 0.40m to 0.90m. This interval displays an overall upward fining stacked succession from coarse to very coarse grained at the base to fine to medium grained at the top. Internally the

basal 0.80m is trough cross bedded (basal 0.30m pyrite cemented) and well sorted and grades upwards into muddy poorly sorted burrowed to bioturbated finer grained sandstone for the remainder of the interval. Recognisable ophiomorpha burrows occur throughout.

The interval 1880.63m to 1881.05m is shale, black and highly carbonaceous with fine silty starved current ripple flasers. It is pyritic throughout with a layer of resin blebs at the very top. The remainder of the core (1881.05m to 1882.50m) is sandstone, predominantly medium to coarse grained and moderately well sorted, comprised of five upward fining units separated by scour surfaces. Internally the units are homogeneous to current ripple and flaser laminated with local development of ophiomorpha burrow horizons.

#### **Environmental Interpretation**

The interval 1838.80m to 1839.67m is interpreted to be a series of stacked basal channel fill units deposited during the late flood to early falling stage cycle within a low sinuosity fluvial system. The interval 1839.67m to 1841.80m is interpreted to represent a relatively complete accretionary point bar cycle deposited during low stage within a high sinuosity fluvial system. The cycle grades up from a lower through middle to upper point bar/abandoned channel fill succession. The interval 1841.80m to 1855.05m (base core 2) is interpreted to be a succession of stacked basal channel fill units deposited during late flood to early falling stage in a low sinuosity fluvial system. Palynological studies on shale samples from 1839.75m, 1841.00m and 1843.20m interpreted the environment to be that of a slightly brackish oxic to anoxic lake setting.

The interval 1855.75m (in situ top of core 3) to 1860.23m is interpreted to be a series of stacked basal channel fill units. Much of the succession is interpreted to be deposited in a low sinuosity fluvial dominated system

although the 1857.55m to 1858.90m contains good ophiomorpha burrows which indicate shallow water marine conditions. This latter interval is interpreted to be deposited as a series of channel units building out into a shallow water estuary at the mouth of a fluvial complex and represents a small transgressive pulse into a predominantly fluvial system. A palynological study of a shale sample from 1857.30m gave a slightly brackish anoxic lake setting.

The interval 1860.23m to 1862.45m is interpreted to represent a relatively complete accetionary point bar cycle deposited during low stage within a high sinuosity fluvial system. This cycle grades relatively abruptly from lower point bar channel fill to upper point bar/abandoned channel fill with very little middle point bar preserved. A palynological study of a shale sample from 1860.30m was interpreted to be a brackish lake (tidal influence) setting. The interval 1862.45m to 1864.60m is interpreted as a series of stacked basal channel fill units deposited during late flood to early falling stage in a low sinuosity fluvial system.

The interval 1864.69m to 1866.00m contains two upward fining, trough cross bedded, sandstone channel fill units with flasered and burrowed tops. These are interpreted as a stream mouth bar or proximal estuary channel succession deposited in a nearshore marine setting at the mouth of a low sinuosity fluvial system. The interval 1866.00m to 1866.75m a distal tidal (estuary) stacked channel succession as indicated by the intensity of burrowing and bioturbation throughout. This interval represents the maximum extent of a minor marine transgression into a predominantly fluvial dominated system. A palynological study on a shale sample from 1866.50m was interpreted to be marginal marine lagoon or estuary.

The interval 1866.75m to 1871.70m is interpreted as a succession of stacked tidal/estuarine channel units within the mouth of a fluvial system entering a

bay. Although no burrows are evident the entire interval is highly flasered indicative of episodic (?tidal) flow. The interval also demonstrates an overall upward fining pattern suggestive of a rise in base level (onset of a transgression).

The interval 1871.70m to 1876.35m is interpreted as a succession of stacked basal channel fill units deposited during a late flood stage cycle in a low sinuosity fluvial system. This interval gradually coarsens up through the successive stacking of coarser grained channel units to 1872.80m followed be a gradual fining upwards through the successive stacking of finer grained channel units. This vertical grainsize distribution is interpreted as initial prograding of the fluvial system over the underlying more marine units followed be a retreat of the fluvial system during a transgressive phase into the overlying more marine units.

The interval 1876.35m to 1882.50m is interpreted to be a succession of stacked tidal estuarine channel units deposited beyond the mouth of the feeding fluvial system. These channels typically have unidirectional current flow structures in the lower half with burrowed to bioturbated zones in the upper half. This estuary setting interpretation is further re-enforced by the presence of common ophiomorpha burrows within the channel sandstones.

Minor overbank/abandoned channel fill units occur over the interval 1876.35m to 1876.55m and 1880.63m to 1881.05m. These are interpreted to have been deposited during the low stage cycle of a high sinuosity tidal/estuary system and are preserved erosional remnants.

Palynological studies on shale samples taken over the above interval gave the following interpretations; 1876.50m (marginal marine lagoon or estuary), 1879.00m (nearshore ?tidal lagoon or estuary) and 1881.00m (very nearshore anoxic ?stagnant brackish lagoon or estuarine backwater).

#### 4.3 Cores 4 and 5

#### Lithological Description

The interval 1915.00m (top of core 4) to 1916.57m is sandstone, coarse grained up to very coarse grained and pebbly, comprised of several units separated by scour surfaces. Upward fining character is evident the upper units. Internally these units are trough cross bedded to flaser laminated with minor shale rip up clast horizons.

The interval 1916.57m to 1917.13m is sandstone, predominantly very coarse grained, muddy and poorly sorted, comprised of three units separated by scour surfaces. Internally the sandstone contains discontinuous flaser laminations and minor burrows. The interval 1917.13m to 1918.30m is sandstone, predominantly fine to medium grained, muddy and very poorly sorted. The upper 0.15m is pebbly and grades up to very coarse grained. Internally the interval is homogeneous and heavily burrowed with ophiomorpha burrows.

The interval 1918.30m to 1920.33m is sandstone, fine to medium grained up to medium to coarse grained, comprised of five units of variable thickness separated by scour surfaces. Internally these units are trough cross bedded with flaser laminated tops. The interval 1920.33m to 1921.75m is sandstone, predominantly fine to medium grained (ranging from very fine to coarse grained) muddy and very poorly sorted. Internally the sandstone contains minor trough cross bedding, flaser laminations and

burrows (including ophiomorpha) and can be divided into several units separated by scour surfaces.

The interval 1921.75m to 1926.20m is sandstone, predominantly medium to coarse grained and well sorted, comprised of nine upward fining units of variable thickness separated by scour surfaces. Internally these units are trough cross bedded with minor carbonaceous flaser laminations towards the top. Shale rip up clast horizons form basal lags in a few of these units.

The interval 1926.20m to 1926.75m is siltstone grading upwards to shale. The lower half is lenticular bedded with minor rootlets and the upper half is carbonaceous with common rootlets and minor resin blebs. The entire interval contains sparse nodular pyrite cement. The interval 1926.75m to 1928.90m is siltstone to very fine grained sandstone grading upwards into very fine grained sandstone. Internally the lower half of the interval contains abundant sandy microfoundering structures with minor current ripple to flaser laminations, rare wave oscillation ripple laminations, and minor pyrite cement. The upper half has better developed and common current ripple to flaser laminations and is burrowed to bioturbated. The topmost part contains carbonaceous rootlets.

The interval 1928.90m to 1930.35m is sandstone, comprised of three upward fining units fine to medium grained at the base grading upwards to very fine grained at the top and separated by scour surfaces. Internally they are current ripple to flaser laminated with minor microfoundering features and rare mud cracks. Rare burrows occur towards the base of the units. The interval 1930.35m to 1932.30m is sandstone, predominantly fine to medium up to coarse grained, comprised of eight units of variable thickness separated by scour surfaces. Overall the interval has an upward fining character developed through the stacking of successively finer grained units. Internally individual units are trough cross bedded or current ripple

laminated to flaser or lenticular bedded with burrows developed in the upper four units.

The interval 1932.30m to 1933.20m is sandstone, very fine grained and silty, lenticular bedded in the lower half and current ripple to flaser laminated in the upper half. The interval 1933.20m to 1933.97m is sandstone, fine to medium up to coarse grained and muddy, comprised of four upward fining units of varying thickness separated by scour surfaces. Internally these units are lenticular bedded and burrowed. The interval 1933.97m to 1934.50m is sandstone, coarse to very coarse grained and well sorted. Internally it is trough cross bedded with minor shale rip up clasts and flaser to lenticular bedded at the very top. The interval 1934.50m to 1935.55m is sandstone, fine up to fine to medium grained, muddy and poorly sorted. Internally it is flaser laminated to burrowed and bioturbated with a 15cm long sand-filled burrow projecting down from the top of the interval. Minor pyrite occurs throughout the interval.

The interval 1935.55m to 1937.25m is sandstone, predominantly medium to coarse grained, well sorted and trough cross bedded. The very top of the interval is burrowed. The basal 0.25m of this interval fines from very coarse grained, with a pebble lag above a scour surface upwards to medium to coarse grained. The interval 1937.25m to 1939.35m is sandstone, medium to coarse up to very coarse grained, comprised of five upward fining units separated by scour surfaces and basal pebble lags. Internally these units are homogeneous to trough cross bedded with rare flaser laminations and rip up clasts.

The interval 1939.35m to 1941.35m is sandstone, fine to medium towards the base fining upwards to very fine grained silty sandstone at the top through a succession of stacked progressively finer grained upward fining units. Internally the interval is flaser bedded and burrowed in the lower

half and burrowed to bioturbated with carbonaceous flasers and pyrite cemented towards the top. Overall the interval is muddy and very poorly sorted. The interval 1941.35m to 1942.70m (base of core 4) is sandstone, predominantly medium grained up to very coarse grained, comprised of seven upward fining units of variable thickness separated by scour surfaces. Internally these units and homogeneous to trough cross bedded with minor burrows and flaser laminations.

The interval 1943.00m (top of core 5) to 1943.20m is shale, dark grey with abundant silty microfoundering features. The interval 1943.20m to 1945.07m is sandstone, fine grained up to very coarse grained, comprised of a succession nine upward fining units of variable thickness separated by scour surfaces and pebble lags. Internally the units are homogeneous to trough cross bedded within the basal coarser grained part and are flaser to lenticular bedded in the finer grained upper part. The interval displays an overall upward fining character through the vertical stacking of successively finer sandstone units.

The interval 1945.07m to 1947.95m is sandstone, medium up to coarse grained and well sorted, comprised of six upward fining units separated by scour surfaces. The entire interval displays an overall upward fining through the stacking of successively finer units. Internally these units are trough cross bedded with flaser and lenticular bedding and dewatering features in the uppermost unit. The interval 1947.95m to 1949.25m is sandstone, medium to coarse grained at the base and grading upwards to very fine grained at the top. Internally the basal portion is trough cross bedded with the bulk of the interval current ripple to flaser laminated. The uppermost portion is lenticular bedded with microfoundering features. Sporadic pyrite cement is dispersed throughout the interval.

The interval 1949.25m to 1951.05m is sandstone, fine up to coarse grained, comprised of four upward fining units separated by scour surfaces. Internally these units are current ripple to flaser laminated or lenticular bedded with sporadic microfoundering features in the finer grained units. The interval 1951.05m to 1952.95m is sandstone, predominantly medium grained up to coarse grained and moderately well sorted, comprised of four upward fining units separated by scour surfaces. Internally these units are trough cross bedded in the lower half and current ripple to flaser laminated in the upper half. Shale rip up clasts occur as a basal lag in the lowest unit and the top of the uppermost unit is burrowed.

The interval 1952.95m to 1956.95m is sandstone, predominantly fine grained grading up to very coarse grained, comprised of a succession of upward fining units. The entire interval displays an upward fining character through the stacking of successively finer grained units. Internally the interval is muddy and very poorly sorted through intense bioturbation. Rare load (pillow) features, dewatering features and current ripple to flaser laminations occur towards the base. The basal 7 cm of the interval contains quartz pebble and shale rip up clast lag material. The interval 1956.95m to 1959.35m is a repeat of the above interval with coarse to very coarse grained sandstone at the base grading upwards, the stacking of successively finer units, to fine grained sandstone at the top. The basal half of the interval contains recognisable burrows and current ripple laminations while the upper half is bioturbated with thin lenticular bedded horizons and load cast (pillow) horizons.

The interval 1959.35m to 1960.60m is sandstone, predominantly coarse to very coarse grained and well sorted, comprised of four upward fining units separated by scour surfaces. Internally these units are trough cross bedded with thin flaser to lenticular bedded tops. The interval 1960.60m to 1960.78m is sandstone, coarse grained and heavily burrowed. The interval

1960.78m to 1962.24m is sandstone, predominantly medium grained, comprised of four upward fining units separated by scour surfaces.

Internally the basal unit is homogeneous to trough cross bedded with successive overlying units having flaser to lenticular bedding with burrows to finally becoming bioturbated towards the top.

The interval 1962.24m to 1964.32m is sandstone, predominantly fine grained, comprised of eight fining upward units separated by scour surfaces. Internally the interval is homogeneous to current ripple laminated to lenticular bedded with rare burrows and bioturbation. The interval 1964.32m to 1967.03m is sandstone, medium grained, comprised of at least seven units separated by scour surfaces or load and flame surfaces. Internally the interval is current ripple to flaser laminated with rare trough cross bedding. The basal unit contains inclined flaser draped accretionary surfaces. The uppermost 0.4m of the interval contains long dwelling burrows. The interval 1967.03m to 1969.00m (base of core 5) is sandstone, comprised of stacked upward fining units, (separated by scour surfaces), varying in grainsize from very coarse grained and pebbly to very fine to fine grained. Internally these units are trough cross bedded to current ripple and flaser laminated with sparse ophiomorpha burrows. Minor dewatering, load and flame features are locally developed.

#### **Environmental Interpretation**

The interval 1915.00m to 1917.13m is interpreted as a succession of stream mouth bar channel units deposited in a inner bay setting proximal to a fluvial system (only rare burrows are recognised). The interval 1917.13m to 1918.30m is interpreted to represent more distal tidal/estuary channel deposition as evidenced by the presence of abundant ophiomorpha burrows. This interval represents a small marine transgressive cycle into a

predominantly fluvially dominated system. A palynological study on a shale sample taken at 1917.35m gave a brackish swamp setting for the environment. The interval 1918.30m to 1920.33m is interpreted as a succession of stream mouth bar channel units deposited in an inner bay setting proximal to a fluvial setting (rare burrows preserved). The interval 1920.33m to 1921.75m is interpreted to represent more distal tidal/estuary channel deposition as evidenced by the presence of ophiomorpha and other non identifiable dwelling burrows.

The interval 1921.75m to 1926.20m is interpreted to represent a succession of stacked channel units deposited in a high energy low sinuosity fluvial system during the late flood stage cycle. The interval 1926.20m to 1926.75m is interpreted as deposition of overbank or abandoned channel fill during the low stage of a high sinuosity fluvial system. A palynological study of a shale sample taken at 1926.25m gave a non-marine (?levee bank or freshwater swamp) setting for the environment. The interval 1926.75m to 1930.35m is interpreted as a succession of proximal to distal crevasse splay units deposited during the falling stage cycle of a high sinuosity fluvial system.

The interval 1930.35m to 1932.30m is interpreted as a succession of stream mouth bar channels building into a proximal estuary setting. The interval 1932.30m to 1933.20m is interpreted to represent more distal deposition of the overlying channel units. A palynological study on a shale sample taken at 1933.10m gave a brackish swamp setting for the environment. The interval 1933.20m to 1934.50m is interpreted to be a succession of stacked stream mouth bar or tidal/estuary channel units building into a proximal bay setting. The interval 1934.50m to 1935.55m is interpreted as a succession of distal tidal/estuary channel units related to the overlying interval. A palynological study on a shale sample taken at 1935.50m gave a nearshore marine lagoon or estuary setting for the environment.

The interval 1935.55m to 1939.35m is interpreted as a succession of stacked channel units deposited in a high energy low sinuosity fluvial system during the late flood stage cycle. The interval 1939.35m to 1942.70m (base of core 4) is interpreted to represent a succession of stacked tidal/estuarine channel units deposited during an overall waning fluvial (early falling cycle grading upwards to late falling or low stage cycle). A palynological study made on shale samples taken at 1939.35m and 1941.65m gave a nearshore marine lagoon or estuary setting for the environment.

The interval 1943.00m (top of core 5) to 1945.07m is interpreted to be a succession of stacked channel units grading upwards from high energy basal channel fill to abandoned channel fill deposited during a flood to falling and low stage cycle within a low sinuosity fluvial system. A palynological study made on a shale sample taken at 1943.00 gave a non-marine (freshwater lake) setting for the environment. The interval 1945.07m to 1947.95m is interpreted to be a repeat of the above cycle. The interval 1947.95m to 1952.95m is interpreted to represent the deposition of three waning fluvial to estuary channel successions building into an inner bay setting. A palynological study made on a shale sample taken at 1948.00m gave a non-marine (freshwater lake or swamp) setting for the environment.

The interval 1952.95m to 1956.95m is interpreted to represent a succession of proximal to distal estuary channel units, which display an overall upward waning in energy, deposited in an inner to middle bay setting. A palynological study of shale samples over this interval made the following interpretation; 1953.00m (brackish lagoon or estuary) and 1955.60m (very nearshore - near normal salinity estuary). The interval 1956.95m to 1959.35m is a repeat of the above depositional setting. The interval 1959.35m to 1960.60m is interpreted to be a succession of stacked basal channel units deposited during the late flood stage of a low sinuosity fluvial system.

The interval 1960.60m to 1962.25m is interpreted to be a succession of stacked proximal estuary basal channel units deposited in an inner bay setting (good ophiomorpha and other dwelling burrows occur throughout). A palynological study made on a shale sample taken from 1961.25m inferred a very nearshore (?backbarrier tidal lagoon) setting for the environment. The interval 1962.25m to 1964.32m is interpreted as a succession of stacked middle to upper point bar tidal channel units deposited around the bay fringe near the mouth of a fluvial system. The interval 1964.32m to 1966.75m is interpreted as a succession of stacked middle point bar estuary channel units deposited at the mouth of a fluvial system. The interval 1966.75m to 1969.00m (base of core 5) is interpreted to be a succession of stacked proximal estuary basal channel units deposited at the mouth of a fluvial system. A palynological study made on a shale sample taken from 1968.25m inferred a very nearshore (?backbarrier tidal lagoon) setting for the environment and a study from a swc sample taken from 1996.50m inferred a nearshore marine setting for the environment.

## 5 REFERENCES

MORGAN, R., 1994: Minerva-2A interim palynology report.

- MORGAN PALAEO ASSOCIATES, January, 1994, report for BHP Petroleum (Unpubl.).

#### 6 FIGURES

Key to sedimentary structures Lithology modifier

### Minerva-1 Cores 1-3

Core graphic logs (1:25 scale)

Core gamma ray log (1:200)

DLL-MSFL-AS-GR-AMS-SP wireline logs (1:200)

LDT-CNL-GR-AMS- wireline logs (1:200)

#### Minerva-2A Core 1

Core graphic log (1:25 scale)

Core gamma ray log (1:200)

AS-MSFL-DLL-GR-AMS-SP wireline logs (1:200)

LDT-CNL-GR-AMS wireline logs (1:200)

## Minerva-2A Cores 2,3

Core graphic logs (1:25 scale)

Core gamma ray log (1:200)

AS-MSFL-DLL-GR-AMS-SP wireline logs (1:200)

LDT-CNL-GR-AMS wireline logs (1:200)

#### Minerva-2A Cores 4,5

Core graphic logs (1:25 scale)

Core gamma ray log (1:200)

AS-MSFL-DLL-GR-AMS-SP wireline logs (1:200)

LDT-CNL-GR-AMS wireline logs (1:200)



# KEY TO SEDIMENTARY STRUCTURES

homogenous Н 1-1 ? trough cross bedding hummocky cross stratification wave oscillation ripple current ripple lamination flaser bedding lenticular bedding dewatering feature 2 W M rip up clasts scour surface wavy inclined dwelling burrow bioturbation  $\approx$  $\approx$ ophiomorpha burrow gastropod shell debris brachiopod bivalve cephalopod load and flame structure microfoundering feature load casts  $\nabla$  $\mathcal{U}$ mud crack # # fracture plant stems  $\lambda$ rootlets

January, 1994 F955P1



# LITHOLOGY MODIFIER ONLY

· 633	concretions
00	
	siderite cement
<u> </u>	calcite cement
<u> </u>	dolomite cemen
5 5	glauconite
	carbonaceous
	coal
<b>* *</b>	pyrite
00000	pebble lag
	shale
	sand
	siltstone
	limestone

January 1994 F-955P?

#### PE800189

This is an enclosure indicator page.

The enclosure PE800189 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800189 has the following characteristics:
    ITEM_BARCODE = PE800189
CONTAINER_BARCODE = PE800188
            NAME = Minerva-1 Core Graphic Log
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-1 Core 1 Graphic Log
                   Description Page 1 of 5
         REMARKS =
    DATE_WRITTEN = 30-NOV-1993
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-1
      CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
       TOP\_DEPTH = 0
     BOTTOM DEPTH = 0
   ROW_CREATED_BY = DN07_SW
```

(Inserted by DNRE - Vic Govt Mines Dept)

	BHP					C	OF	RE	Ξ	DI	ESCRIPTION	V		
	Petroleum						N	VIII	I	IE	RVA-1			
PERMIT:	VIC/P31										DATE:			CORE NO.: 1 Page: 1/5
AUTHOR:	P.Arditto / S.Hora	an					INTERVAL:							
RIG:			_		_	CUT:								
K.B.:		W	.D.:	_							CORE BARREL	& M	UD T	YPE:
DEPTH	LITHOLOGY		IOW	/S	(	aR/	AIN	SI	ZE W	RSE III	SEDIMENTARY STRUCTURE			LITHOLOGICAL DESCRIPTION
(m)		U	F	G	SILT	V.FINE	LINE	MEDIO	COAR	V.COA				
1821 —														TOP OF CORE 1
-											₩ ~~~~~~	core rubble	Inter horn cros	IDSTONE, coarse up to granule, rly sorted with common pebbles. rnally it is predominantly togeneous with minor trough the bedding and shale rule clasts.
1822 —									7		H ? H ?  Ay Ay  Ay Ay	core rubble core rubble	as s	ndant disseminated pyrite cement hown.
1823 — — —												core rubble	SAM poo up t SAM grai	pebbles up to 2 cm diameter NDSTONE, very coarse to granule, rly sorted with abundant pebbles o 2 cm diameter. Homogeneous. NDSTONE, predominantly medium ned (minor coarse grained), nogeneous with minor shale rip up its and pebbles on scour surfaces.
1824 —											⊢ ?			
1825													E	BOTTOM OF CORE 1



#### PE800190

This is an enclosure indicator page.

The enclosure PE800190 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800190 has the following characteristics:
    ITEM_BARCODE = PE800190
CONTAINER_BARCODE = PE800188
            NAME = Minerva-1 Core Graphic Log
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-1 Core 2 Graphic Log
                   Description Page 2 of 5
         REMARKS =
    DATE_WRITTEN = 30-NOV-1993
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-1
      CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH = 0
     BOTTOM_DEPTH = 0
  ROW_CREATED_BY = DN07_SW
```

(Inserted by DNRE - Vic Govt Mines Dept)

	DUD
6 A	BHP
	Petroleum

# CORE DESCRIPTION MINERVA-1

PERMIT:	VIC/P31		7777		DATE:	CORE NO.: 2 Page: 2/5									
UTHOR:		ın		-	-	INTERVAL:									
RIG:			17 (-12)				CUT:								
C.B.:		W.E	0.:				CORE BARREL & MUD TYPE:								
DEPTH LITHOLOGY (m)			ws G	SILT	V.FINE BY FINE BY WEDIUM COARSE BY COARSE					SEDIMENTARY STRUCTURE					
1825 —															
1828 —										I (( I () I	TOP OF CORE 2  SANDSTONE, medium up to granule grained, well sorted, predominantly homogeneous with minor trough cross bedding in upper half.				
1829 —									1		SANDSTONE, pebbly, very coarse grained to pebbly, very poorly sorted, homogeneous with rare shale rip up clasts. Lenticular bedded in upper 6 cm.				

#### PE800191

This is an enclosure indicator page.

The enclosure PE800191 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800191 has the following characteristics:
    ITEM_BARCODE = PE800191
CONTAINER_BARCODE = PE800188
            NAME = Minerva-1 Core Graphic Log
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
      DESCRIPTION = Minerva-1 Core 2 Graphic Log
                   Description Page 3 of 5
          REMARKS =
    DATE_WRITTEN = 30-NOV-1993
   DATE PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-1
      CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH = 0
     BOTTOM DEPTH = 0
   ROW_CREATED_BY = DN07_SW
```

(Inserted by DNRE - Vic Govt Mines Dept)

<b>*</b>	BHP Petroleum

# CORE DESCRIPTION MINERVA-1

							:HVA-1				
PERMIT:	VIC/P31					177	DATE:		CORE NO.: 2	Page: 3/5	
AUTHOR	: P.Arditto / S.Hore	ın			INTERVAL:						
RIG:					CUT:						
K.B.:	,	W.D.:		CORE BARREL	& MUD	TYPE:					
DEPTH (m)	LITHOLOGY	SHOWS U F G	SILT V.FINE D		MEDIUM S	, HS	SEDIMENTARY STRUCTURE		LITHOLOGIC		
1831 —								Planar near to	TONE, medium up n pebbles in basal p inclined to trough cro b. e trace current ripple	ortions. oss bedded	
1832 —							H 7	poorly s	STONE, very coarse sorted with planar in g to ? trough cross b	clined	
1833 —							H H H	commo	eTONE, very coarse n pebbles, poorly so p up clasts up to 3 c er.  As above.	rted with	
_	<u>• • • • • • • • • • • • • • • • • • • </u>							grained current	TONE, medium up , moderately sorted ripple to flaser lamir of each unit.	with minor	
1834 —					1						
1835 —								commo sorted, lower un features Plant ro SANDS well sor	TONE, coarse grain n pebble, poor to me trough cross beddee nit contains pillow ar s. of to burrow. TONE, medium to c ted, trough cross be arbonaceous flaser	oderately d, base of nd flame  oarse grained dded with	

PE800191

#### PE800192

This is an enclosure indicator page. The enclosure PE800192 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800192 has the following characteristics:
     ITEM_BARCODE = PE800192
CONTAINER_BARCODE = PE800188
            NAME = Minerva-1 Core Graphic Log
            BASIN = OTWAY
        OFFSHORE? = N
        DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-1 Core 2 Graphic Log
                    Description Page 4 of 5
          REMARKS =
    DATE_WRITTEN = 30-NOV-1993
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-1
      CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH = 0
     BOTTOM_DEPTH = 0
  ROW_CREATED_BY = DN07_SW
```

(Inserted by DNRE - Vic Govt Mines Dept)

BHP CORE DESCRIPTION MINERVA-1													
PERMIT:	VIC/P31					_			DATE:		CORE NO.:	2	Page: 4/5
AUTHOR:	P.Arditto / S.Hore	in							INTERVAL:				
RIG: K.B.:		W.D.:	-					_	CUT:				
N.D.			Т				of the second		CORE BARREL	& MUDT	TYPE:		
DEPTH (m)	LITHOLOGY	SHOWS U F G	SILT	V.FINE D	FINE	MEDIUM	COARSE	V.COARSE	SEDIMENTARY STRUCTURE		LITHOLOG		
1836 — — — — —										very we bedded		i cros	ss
1838 —	R-R R R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-								H X X I N I	pyrite of coal. SHALE with ab abundary SHALE minor of sporad sporad	black, brittle, st. cermented in upp def, dark grey, high bundant rootlets ant resin blebs. dark grey, hon carbonaceous pl ic pyrite nodule ic resin blebs, re- ing feature.	er pa	art of arbonaceous sterns nous with terns,
1839 —									マンド 人人 大人 ラスラス	Highly SILTS	carbonaceous s	hale.	
1840 —										half, up streaks pyrite n underly Wavy	of t, dark grey, sub- per half carbons and resin blebs sodules base gra ring unit.	ceou , with datio	us with coaly n minor nnal with
_											BOTTOM C	יפוכ	= 0

This is an enclosure indicator page.

The enclosure PE800193 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800193 has the following characteristics:
    ITEM_BARCODE = PE800193
CONTAINER_BARCODE = PE800188
            NAME = Minerva-1 Core Graphic Log
            BASIN = OTWAY
        OFFSHORE? = N
        DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-1 Core 2 Graphic Log
                   Description Page 5 of 5
         REMARKS =
    DATE_WRITTEN = 30-NOV-1993
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-1
      CONTRACTOR =
          AUTHOR =
      ORIGINATOR = BHP Petroleum Pty Ltd
        TOP DEPTH = 0
    BOTTOM DEPTH = 0
  ROW_CREATED_BY = DN07_SW
```

	BHP Petroleum				C			1		SCRIPTION	I
	retroledin					_	M	IL		RVA-1	
PERMIT:	VIC / P31									DATE:	CORE NO.: 2 Page: 5/5
AUTHOR:	P.Arditto / S.Hora	n	_		_		_		-	INTERVAL:	
K.B.:		W.I	n ·			-			_	CUT:	
K.b			-	T					_	CORE BARREL	& MUD TYPE:
DEPTH	LITHOLOGY	т	ows 		from I	RAII 	MEDIUM	COARSE	DARSE	SEDIMENTARY STRUCTURE	LITHOLOGICAL DESCRIPTION
(m)		U	FG	SILT	V.FINE	FINE	MEC	8	V.C		
1842 —											
_	· · · · · · · · · · · · · · · · · · ·						~			**************************************	TOP OF CORE 3  SANDSTONE, medium to coarse, up to very coarse to granule, moderately well sorted, trough cross bedded, separated by scours into fining upwards
1843 —								\	7	₩ ₩ ₩₩ ₩ ₩	units. Scours have pebble lags on top of surface. SANDSTONE, has sucrosic texture due to abundant development of quartz over- growths and several healed silica cemented
1844 —								K		)) )) ()) ()) ()) ())	fractures subhorizontal to near vertical. Some unusually high angle trough cross beds may indicate slump rotation. Overall sandstone appears extensively silica cemented.
_							7	1	1	SH ##	Heal fractures 1844.21-1844.40
1845 —							7				
1846										~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
-	·?									# # # # # # # # # # # # # # # # # # #	1846.20 - 1846.40 Siliceous mineral filled fractures.  SANDSTONE, coarse grained.
1847 —											BOTTOM CORE 3

This is an enclosure indicator page.

The enclosure PE800194 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800194 has the following characteristics:
    ITEM_BARCODE = PE800194
CONTAINER_BARCODE = PE800188
            NAME = Minerva-1 Core Plot
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-1 Core 1, 2, 3 Gamma Ray Plot
                    Scale 1:200
          REMARKS =
    DATE_WRITTEN =
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME =
      CONTRACTOR =
          AUTHOR =
      ORIGINATOR =
       TOP_DEPTH =
     BOTTOM_DEPTH =
   ROW_CREATED_BY = DN07_SW
(Inserted by DNRE - Vic Govt Mines Dept)
```



### CORE PLOT

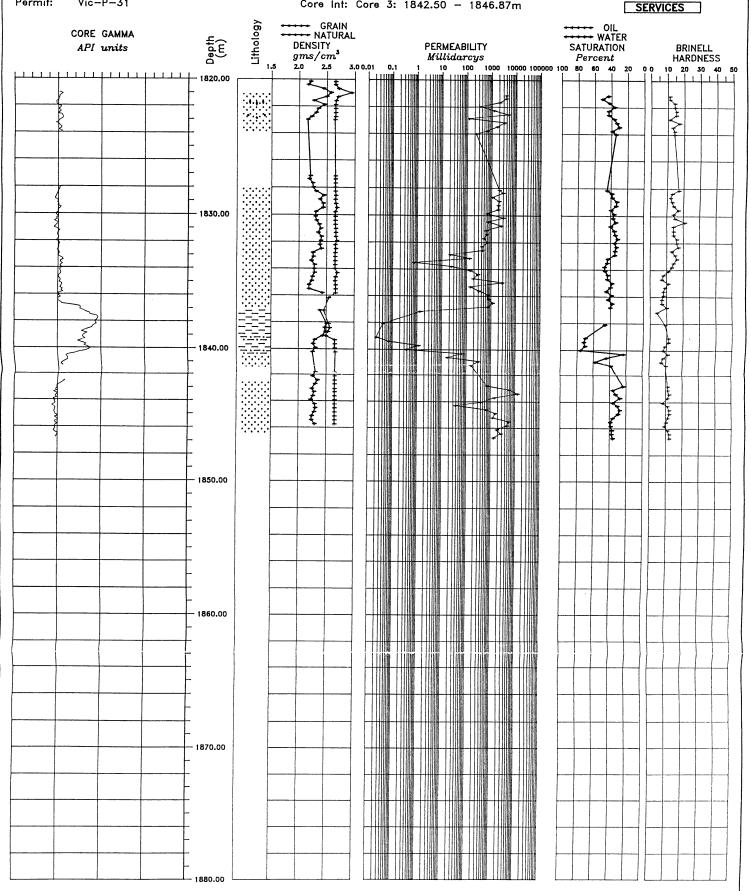
Scale 1 : 200

Company: BHP PETROLEUM PTY LTD Well: Minerva No.1

Well: Field: Wildcat Vic-P-31 Permit:

File No.: RG205 Core Int: Core 1: 1821.00 - 1824.04m Core Int: Core 2: 1828.00 - 1841.27m Core Int: Core 3: 1842.50 - 1846.87m





This is an enclosure indicator page. The enclosure PE800195 is enclosed within the container PE800188 at this location in this document.

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The enclosure PE800195 has the following characteristics:
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CONTAINER_BARCODE = PE800188
            NAME = Minerva-1 Core Plot
            BASIN = OTWAY
        OFFSHORE? = N
        DATA_TYPE = WELL
   DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-1 Core 1, 2, 3 Gamma Ray Plot
                    Scale 1:200
          REMARKS =
    DATE_WRITTEN =
   DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
        WELL_NAME = Minerva-1
       CONTRACTOR = PE800195
           AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH = 1820
     BOTTOM_DEPTH = 1880
   ROW_CREATED_BY = DN07_SW
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### CORE PLOT

Well:

Company: BHP PETROLEUM PTY LTD

Field: Permit:

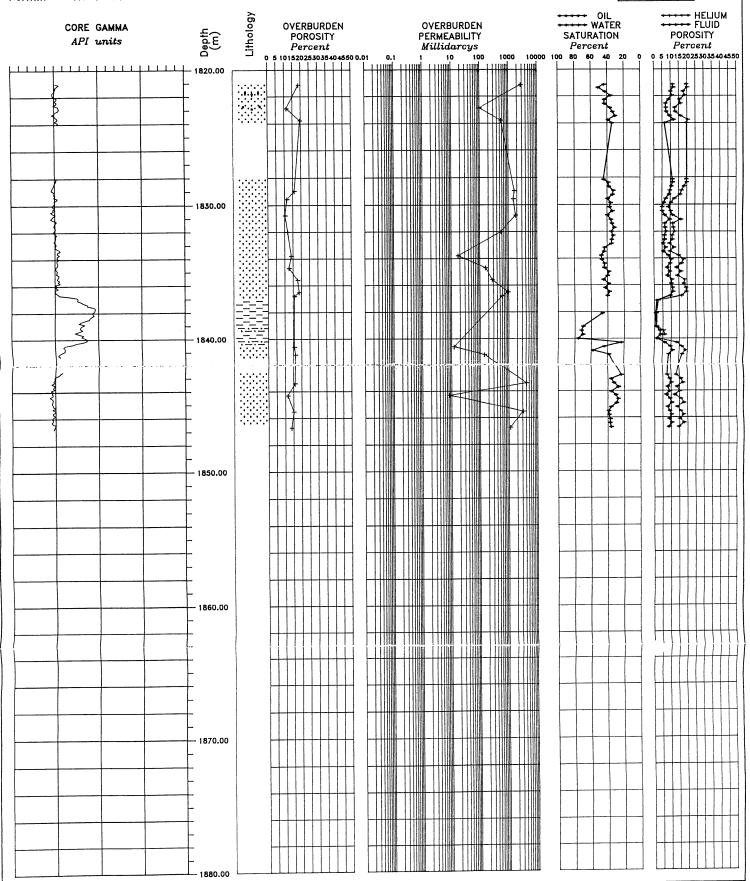
Minerva No.1

Wildcat Vic-P-31

File No.: RG205 Core Int: Core 1: 1821.00 - 1824.04m Core Int: Core 2: 1828.00 - 1841.27m Core Int: Core 3: 1842.50 - 1846.87m



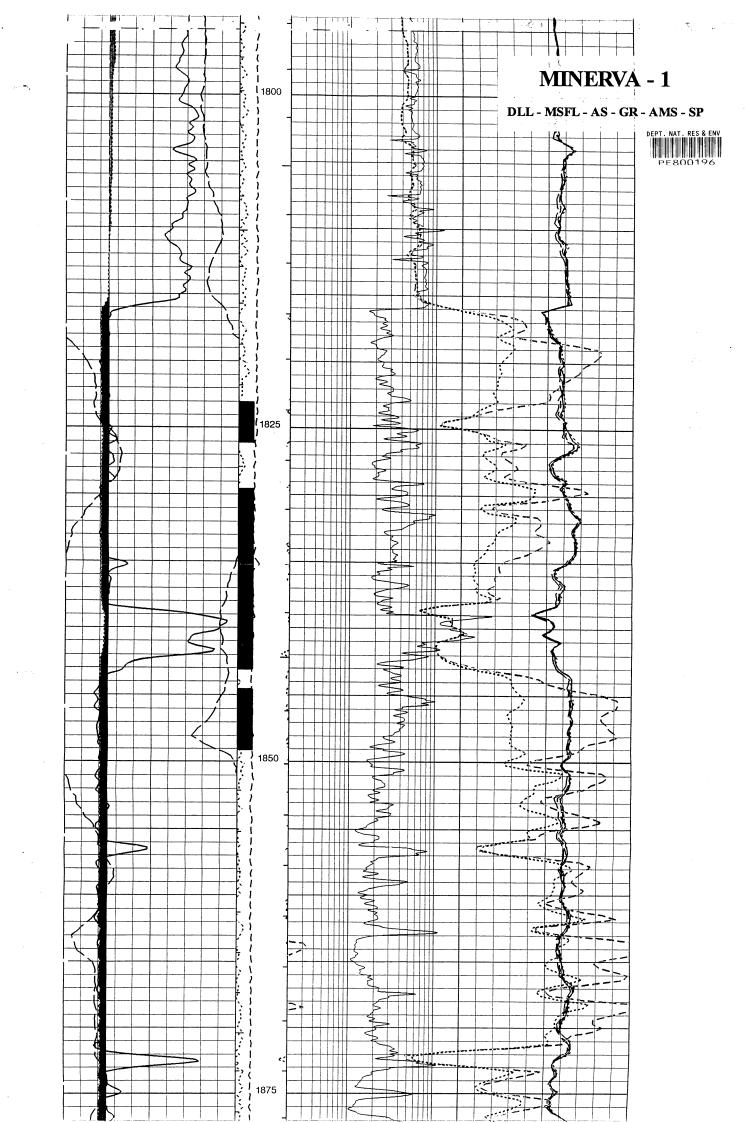
SERVICES



This is an enclosure indicator page.

The enclosure PE800196 is enclosed within the container PE800188 at this location in this document.

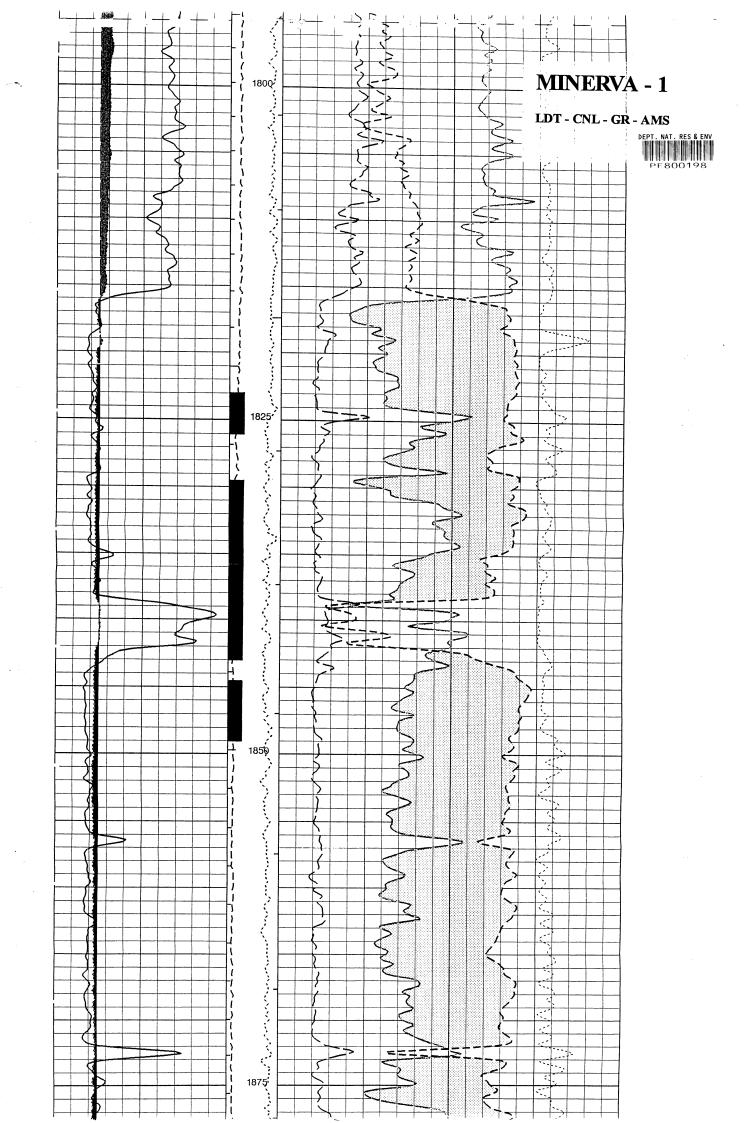
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The enclosure PE800196 has the following characteristics:
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CONTAINER_BARCODE = PE800188
            NAME = Minerva-1 Log Plot
            BASIN = OTWAY
        OFFSHORE? = N
        DATA_TYPE = WELL
    DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-1 DLL-MSFL-AS-GR-AMS-SP Log
                    Plot Scale 1:200
          REMARKS =
    DATE_WRITTEN =
   DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-1
       CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH =
     BOTTOM_DEPTH =
   ROW_CREATED_BY = DN07_SW
```



This is an enclosure indicator page.

The enclosure PE800198 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800198 has the following characteristics:
     ITEM_BARCODE = PE800198
CONTAINER_BARCODE = PE800188
            NAME = Minerva-1 Log Plot
            BASIN = OTWAY
        OFFSHORE? = N
        DATA_TYPE = WELL
    DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-1 LDT-CNL-GR-AMS Log Plot Scale
                    1:200
          REMARKS =
    DATE_WRITTEN =
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-1
       CONTRACTOR =
          AUTHOR =
      ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH =
     BOTTOM_DEPTH =
   ROW_CREATED_BY = DN07_SW
```



This is an enclosure indicator page.

The enclosure PE800197 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800197 has the following characteristics:
    ITEM_BARCODE = PE800197
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Log
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-2A Core 1 Graphic Log
                   Description Scale 1:200
         REMARKS =
    DATE_WRITTEN = 30-NOV-1993
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
      CONTRACTOR =
          AUTHOR =
      ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH =
    BOTTOM DEPTH =
  ROW_CREATED_BY = DN07_SW
(Inserted by DNRE - Vic Govt Mines Dept)
```



DEDINE.	V//O / DO4	_				_		-	$\neg$	DATE			CORE NO.:	Dogg
PERMIT:	VIC / P31	20	_	_		_	_		+	DATE:			COHE NO.:	Page:
AUTHOR: P.Arditto / S.Horan RIG: Byford Dolphin									+	INTERVAL:				
	nRT	W	.D.:					_	7	CUT:	DADDE	0 14115	D/DE-	
DEPTH (m)	LITHOLOGY	-	OW:	5	FINE	RAI	EDIUM N	COARSE N	COARSE	SEDIM	BARREL ENTARY CTURE	& MUD	LITHOLOG DESCRIP	
				U	>	E	M	0	>				TOP OF CO	RE 1
1729 —										s V	a S a	grading grained through Faint s lamina sedimed destroy	tone, very fine grag upwards to very d, muddy and ver h extensive bioturubhorizontal distritions throughout antary structured by through biotured by the structured by the structure of the structure	fine to fine y poorly sorted bation. urbated although prima argely rbation.
-										30	309	top of i	e sand filled dwell interval. dic sideritic nodula ils evident replaci	ar mudstone
_										-	<u></u>	feature		
										30				
1730 —											25			
	÷. ¯.÷.									705	0			
									-		25			
										70				
1731 —	÷. ; ÷.									700	300			
	 									_	200			
-	<b></b>									30				
-	<u>-</u> . ⊤. <u>÷</u> .									200	30			
1732 —											_			
	 : -									99	100			
-	 . <del>.</del> .									700	200			
1733										O N	705			
	· · · ·									26	700			
-	* * *			-		-	Н	+	-				BOTTOM OF	



This is an enclosure indicator page.

The enclosure PE800199 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800199 has the following characteristics:
     ITEM_BARCODE = PE800199
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Plot
            BASIN = OTWAY
        OFFSHORE? = N
       DATA_TYPE = WELL
    DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-2A Core 1, 2, 3, 4, 5 Gamma Ray
                    Plot Scale 1:200
          REMARKS =
    DATE_WRITTEN =
   DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR = PE800199
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
       TOP\_DEPTH = 1720
     BOTTOM_DEPTH = 1780
   ROW_CREATED_BY = DN07_SW
```



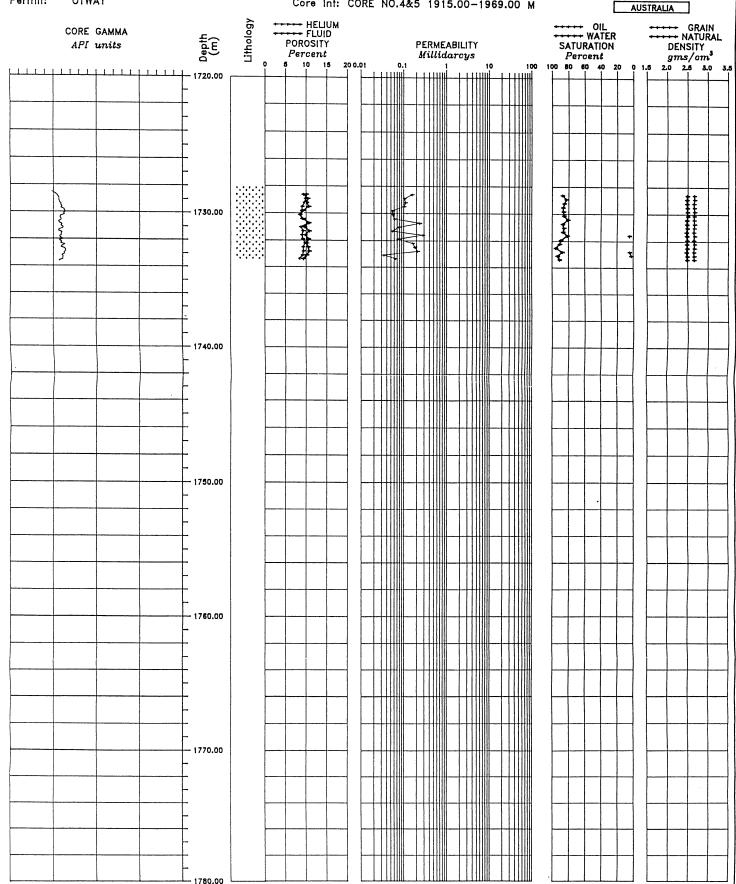
### CORE PLOT

Scale 1: 200

Company: BHP PETROLEUM PTY.LTD.
Well: MINERVA—2A
Field: MINERVA Well: Field: Permit: OTWAY

File No.: 5-207 Core Int: CORE NO.1 1728.50-1733.60 M Core Int: CORE NO.2&3 1838.80-1882.50 M Core Int: CORE NO.4&5 1915.00-1969.00 M

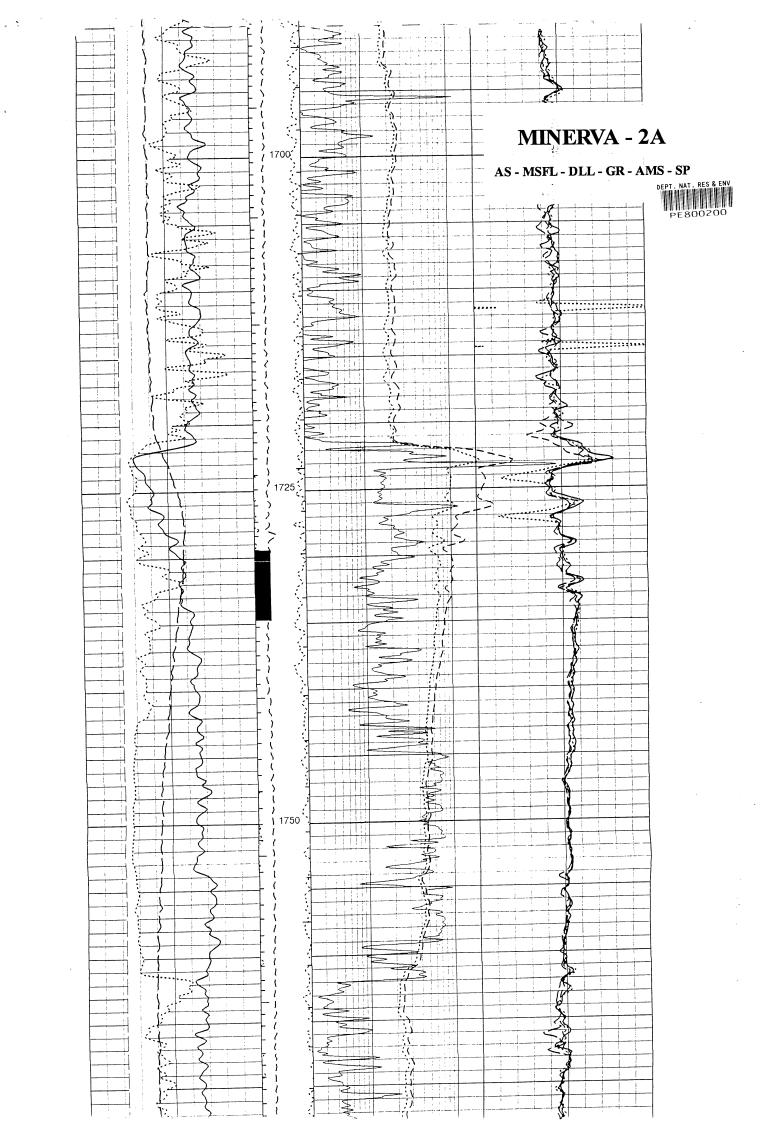
LABORATORIES



This is an enclosure indicator page.

The enclosure PE800200 is enclosed within the container PE800188 at this location in this document.

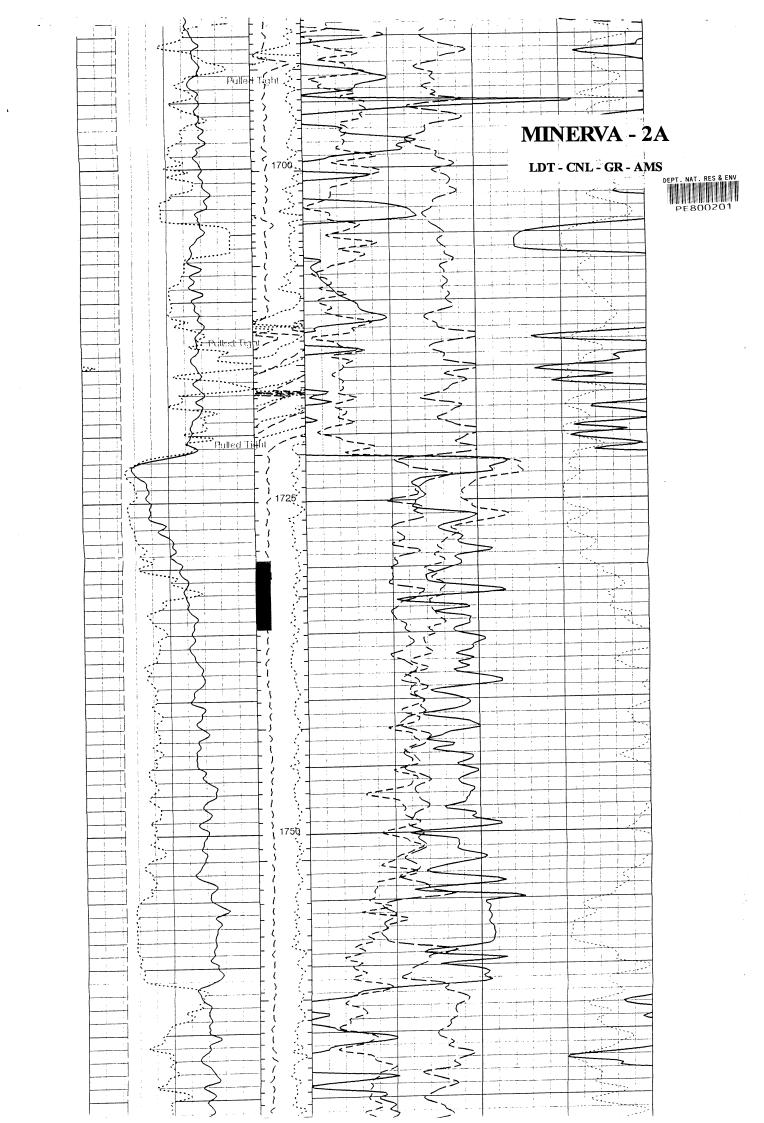
```
The enclosure PE800200 has the following characteristics:
     ITEM_BARCODE = PE800200
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Log Plot
            BASIN = OTWAY
        OFFSHORE? = N
       DATA_TYPE = WELL
    DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-2A AS-MSFL-DLL-GR-AMS-SP Log
                    Plot Scale 1:200
         REMARKS =
    DATE_WRITTEN =
   DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
      CONTRACTOR =
          AUTHOR =
      ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH =
     BOTTOM_DEPTH =
   ROW_CREATED_BY = DN07_SW
```



This is an enclosure indicator page.

The enclosure PE800201 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800201 has the following characteristics:
     ITEM_BARCODE = PE800201
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Log Plot
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-2A LDT-CNL-GR-AMS Log Plot
                    Scale 1:200
         REMARKS =
    DATE_WRITTEN =
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH =
     BOTTOM_DEPTH =
   ROW_CREATED_BY = DN07_SW
(Inserted by DNRE - Vic Govt Mines Dept)
```



This is an enclosure indicator page. The enclosure PE800202 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800202 has the following characteristics:
     ITEM_BARCODE = PE800202
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Log
            BASIN = OTWAY
        OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
      DESCRIPTION = Minerva-2A Core 2 Grahic Log
                   Description Scale 1:200 Page 3a
          REMARKS =
    DATE_WRITTEN = 30-NOV-1993
   DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH =
     BOTTOM DEPTH =
   ROW_CREATED_BY = DN07_SW
```



	Petroleum		MIINE	HVA- 2A	
PERMIT	: VIC/P31			DATE:	CORE NO.: 2 Page: 3
AUTHOR	R: P.Arditto / S.Hora	an		INTERVAL:	
	yford Dolphin	T		CUT:	
K.B.: 2	5mRT	W.D.:		CORE BARREL	& MUD TYPE:
DEPTH	LITHOLOGY	SHOWS	GRAIN SIZE	SEDIMENTARY STRUCTURE	LITHOLOGICAL DESCRIPTION
(m)		U F G	SILT V.FINE FINE COARSE V.COARSE		
_					
-					
-					
-					
-					
-					
-					
-					
-					
-					
_				-	
					<b>-6</b>
_					
-					- ! ;
-					, 1972
838 -					11:5-
-					
-	-				
_	)				TOP CORE 2
					SANDSTONE

PE800202

This is an enclosure indicator page.

The enclosure PE800203 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800203 has the following characteristics:
    ITEM_BARCODE = PE800203
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Log
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-2A Core 2 Grahic Log
                    Description Scale 1:200 Page 3
         REMARKS =
    DATE_WRITTEN = 30-NOV-1993
   DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
    RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
      CONTRACTOR =
          AUTHOR =
      ORIGINATOR = BHP Petroleum Pty Ltd
       TOP DEPTH =
     BOTTOM DEPTH =
   ROW_CREATED_BY = DN07_SW
```

<b>*</b>	BHP Petroleum
PERMIT:	VIC/P31
ALITHOD.	DArditto /C Us

	retroleum			IAI	IIAI	=	HVA- 2A			
PERMIT:	VIC/P31					$\neg$	DATE:		CORE NO.: 2	Page: 3
AUTHOR:		n					INTERVAL:			
	ford Dolphin	Version in the last				$\dashv$	CUT:			
K.B.: 25	mRT	W.D.:					CORE BARREL	& MUD T	TYPE:	
DEPTH (m)	LITHOLOGY	SHOWS T G	SILT V.FINE D		COARSE	V.COARSE	SEDIMENTARY STRUCTURE		LITHOLOGIC	
1839 —								grained bedded shale r SHALL with sp	ETONE, medium to vol., trace granule, tought with pyritized plant ip ups.  E, medium grey, moparse carbonaceous	titled
1841 —	- R -		Sec. 0.0000000000000000000000000000000000				A - A	and m	geneous with minor sicrofoundering featu , black, sub bituming , dark grey-black w , and microfoundering	re near base.  ous.  ith starved
-	- 0 - 0 -							moder to plar	STONE, very coars- ately sorted, trough har laminated with ri and flasers near top	cross bedded p up
1842 —								graine trains Troug	STONE, coarse to wed, well sorted with medialong sporadic crossing cross bedded with carbonaceous flase	ninor granule s bed lamina minor high
1843 —							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	graine	OSTONE, medium to	ar laminated.
-	- R -							SANI grani SANI pebbl	OSTONE, fine graine ular bedded.  DSTONE, very coanule, trough cross bed DSTONE, coarse graines, trough cross bed on acceous flasers.	se trace ided. anule, trace
1844 —	· · · · · · · · · · · · · · · · · · ·				T			cross	DSTONE, fine graine bedded, flaser to ri r carbonaceous ripp	pple laminate



This is an enclosure indicator page.

The enclosure PE800204 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800204 has the following characteristics:
     ITEM_BARCODE = PE800204
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Log
            BASIN = OTWAY
        OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-2A Core 2 Grahic Log
                   Description Scale 1:200 Page 4
         REMARKS =
    DATE_WRITTEN = 30-NOV-1993
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH =
     BOTTOM DEPTH =
   ROW_CREATED_BY = DN07_SW
```

	BHP					C	0	R	E	DI	SCRIPTION	1		
400	Petroleum						N		N	E	RVA-2A			
PERMIT:	VIC/P31				_						DATE:		CORE NO.: 2	Page: 4
AUTHOR		n						_			INTERVAL:			
	ford Dolphin		_	_		-	_	_	-	-	CUT:			
K.B.: 25	imRT	W.		_	_				_		CORE BARREL	& MUD	TYPE:	
DEPTH	LITHOLOGY	SH(	OV	vs	.	GR.	AIIA	NOW N	INSE N	V.COARSE <sup>III</sup>	SEDIMENTARY STRUCTURE		LITHOLOGIC DESCRIPTI	25 10 25 21
(m)		U	F	G	SILT	V.FI	FINE	MED	SOA	V.C				
1845 —											(		DSTONE: very coar h cross bedded to h	
1846 —									1			SAND	Izose pebbles up to OSTONE: coarse gr les, trough cross be / carbonaceous fla:	anule, scattere
1847 —										1		trace bedde	OSTONE: medium t granule, trough to p ed resin blebs, flase omogeneous in par	olanar r bedded
1848												plana	OSTONE: medium to trough cross be stand carbonaced	dded, trace rip
-		2										scatte	OSTONE: coarse to ered pebbles, plana bedded, trace shal	r to trough



1850

1849

This is an enclosure indicator page.

The enclosure PE800205 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800205 has the following characteristics:
     ITEM_BARCODE = PE800205
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Log
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
    DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-2A Core 2 Grahic Log
                   Description Scale 1:200 Page 5
          REMARKS =
    DATE_WRITTEN = 30-NOV-1993
   DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
    RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR =
           AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH =
     BOTTOM_DEPTH =
   ROW_CREATED_BY = DN07_SW
```

	BHP Petroleum
And address of the same	Table as even as all

							AV	///	IX		NVA- ZA			
PERMIT:										saen	DATE:		CORE NO.: 2	Page: 5
AUTHOR		n									INTERVAL:			
	ford Dolphin	_		_			_	_			CUT:			
K.B.: 25	5mRT	W	.D.	:							CORE BARREL	& MUD	TYPE:	
DEPTH (m)	LITHOLOGY	SH	F			GR JNI-N		MEDIUM	SOARSE N	V.COARSE <sup>M</sup>			LITHOLOGICA	
(m)  1850  1851 —  1852 —  1853 —  1854 —			F	G	SILT	V.FINE	FINE	MEDIU	A COAPE	N'CON		SANDS trace grant trace per with trace grant trace gra	STONE: mediun grand cross bedded homogon bedded homogon bedded homogon bedded, trace process bedded, trace process bedded, trace process bedded, trace granule and scattered process bedded, trace process bedded, trace granule granule bedded, trace granule gra	ule, enous  y coarse, nebbles,
1855 —	° <b>_</b> °     °										<b>)</b>		BOTTOM CORE	2



This is an enclosure indicator page.

The enclosure PE800206 is enclosed within the container PE800188 at this location in this document.

The enclosure PE800206 has the following characteristics:

ITEM\_BARCODE = PE800206
CONTAINER\_BARCODE = PE800188

NAME = Minerva-2A Core Graphic Log

BASIN = OTWAY

OFFSHORE? = N DATA\_TYPE = WELL

DATA\_SUB\_TYPE = LITHOLOGY\_RPT

REMARKS =

DATE\_WRITTEN = 30-NOV-1993

DATE\_PROCESSED =

DATE\_RECEIVED = 11-DEC-1997

RECEIVED\_FROM = BHP Petroleum Pty Ltd

WELL\_NAME = Minerva-2A

CONTRACTOR =

AUTHOR =

ORIGINATOR = BHP Petroleum Pty Ltd

TOP\_DEPTH =

BOTTOM\_DEPTH =

ROW\_CREATED\_BY = DN07\_SW

<b>*</b>	BHP Petroleum
DEDMIT	VIC / P21

•	Petroleum		MIN		RVA-2A	
PERMIT:	VIC / P31				DATE:	CORE NO.: 3 Page: 6
	: P.Arditto / S.Hora	n			INTERVAL:	
The state of the s	ford Dolphin			_	CUT:	
K.B.: 25	mRT	W.D.:			CORE BARREL	& MUD TYPE:
DEPTH (m)	LITHOLOGY	SHOWS T   U F G	SILT V.FINE BINE MEDIUM MEDIUM COARSE	NS.	SEDIMENTARY STRUCTURE	LITHOLOGICAL DESCRIPTION
			-			TOP CORE 3
1856 —						Grey arg siltstone core rubble.  SANDSTONE: medium granule, trough cross bedded with shale rip ups at the base.  SANDSTONE: very coarse grained,
1857 —						well sorted, common shale and carbonaceous rip up clasts, trough cross bedded, trace flasers,
1858 —						SANDSTONE: coarse grained, lenticular bedded wavy carbonaceous drape  SANDSTONE: coarse, poor to moderately sorted, scattered granule, slightly muddy, homogenised by abundant Ophiomorpha burrows.  Carbonaceous drape.  SANDSTONE: coarse to granule, trough cross bedded with flaser laminations in part, common Ophiomorpha.
1859 —	• • •				<b>⋄</b>	SANDSTONE: coarse to granule, trough cross bedded.
1860 —						SHALE: black highly carbonaceous - coaly with resin blebs, minor pyrite.  COAL: black, subbituminous, with
1861					Н	resin blebs.  SHALE: black, highly carbonaceous, minor rootlets.



This is an enclosure indicator page. The enclosure PE800207 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800207 has the following characteristics:
    ITEM_BARCODE = PE800207
```

CONTAINER\_BARCODE = PE800188

NAME = Minerva-2A Core Graphic Log

BASIN = OTWAY

OFFSHORE? = N

DATA\_TYPE = WELL

DATA\_SUB\_TYPE = LITHOLOGY\_RPT

DESCRIPTION = Minerva-2A Core 3 Grahic Log Description Scale 1:200 Page 7

REMARKS =

DATE\_WRITTEN = 30-NOV-1993

DATE\_PROCESSED =

DATE\_RECEIVED = 11-DEC-1997

RECEIVED\_FROM = BHP Petroleum Pty Ltd

WELL\_NAME = Minerva-2A

CONTRACTOR =

AUTHOR =

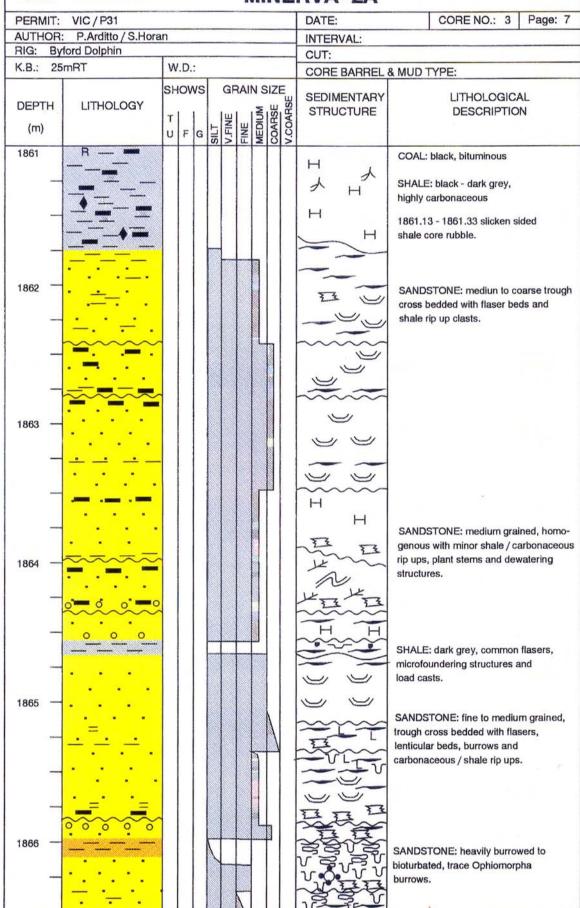
ORIGINATOR = BHP Petroleum Pty Ltd

TOP\_DEPTH =

BOTTOM\_DEPTH =

ROW\_CREATED\_BY = DN07\_SW





This is an enclosure indicator page.

The enclosure PE800208 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800208 has the following characteristics:
     ITEM_BARCODE = PE800208
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Log
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
    DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-2A Core 3 Grahic Log
                    Description Scale 1:200 Page 8
          REMARKS =
    DATE_WRITTEN = 30-NOV-1993
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
      CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
       TOP DEPTH =
     BOTTOM_DEPTH =
   ROW_CREATED_BY = DN07_SW
```

DUD
Petroleum

	1 ou oloum		IAIIIA	NVA-ZA	
PERMIT:	VIC / P31			DATE:	CORE NO.: 3 Page: 8
AUTHOR:	P.Arditto / S.Hora	n		INTERVAL:	
	ford Dolphin			CUT:	1154454
K.B.: 25	mRT	W.D.:		CORE BARREL	& MUD TYPE:
DEPTH (m)	LITHOLOGY	SHOWS T G G	V.FINE BY A COARSE IN V.COARSE IN V.COARSE	SEDIMENTARY	LITHOLOGICAL DESCRIPTION
1867 —					SANDSTONE: fine to medium, well sorted, trough cross bedded, with common high angle flaser drapes, rare carbonaceous / shale rip ups, flaser grading to current ripple laminations in places.  1867 - 1867.5m SANDSTONE:
1868 —	R				coarse rubble.
1869 —					
1870 — —					SABDSTONE: fine to coarse, trough cross bedded in inclined flaser laminations.
1871 — —					SANDSTONE: medium granule, scattered pebbles, trough cross bedded with shale / carbonaceous rip ups.
1872	<b>5115</b>			n ≈ n	Page drawing No E

This is an enclosure indicator page.

The enclosure PE800209 is enclosed within the container PE800188 at this location in this document.

The enclosure PE800209 has the following characteristics:

ITEM\_BARCODE = PE800209
CONTAINER\_BARCODE = PE800188

NAME = Minerva-2A Core Graphic Log

BASIN = OTWAY

OFFSHORE? = N DATA\_TYPE = WELL

DATA\_SUB\_TYPE = LITHOLOGY\_RPT

REMARKS =

DATE\_WRITTEN = 30-NOV-1993

DATE\_PROCESSED =

DATE\_RECEIVED = 11-DEC-1997

RECEIVED\_FROM = BHP Petroleum Pty Ltd

WELL\_NAME = Minerva-2A

CONTRACTOR =

AUTHOR =

ORIGINATOR = BHP Petroleum Pty Ltd

TOP\_DEPTH =

BOTTOM\_DEPTH =

ROW\_CREATED\_BY = DN07\_SW

BHP CORE DESCRIPTION Petroleum MINERVA- 2A													
PERMIT:												CORE NO.: 3	Page: 9
AUTHOR: P.Arditto / S.Horan										DATE: CORE NO.: 3 Page: 9 INTERVAL:			
RIG: Byford Dolphin										CUT:			
K.B.: 25mRT W.D.:										CORE BARREL & MUD TYPE:			
DEPTH (m)	LITHOLOGY	SILT	SILT V.FINE BEINE MEDIUM COARSE N.COARSE					SEDIMENTARY STRUCTURE	LITHOLOGICAL DESCRIPTION				
1872											with co Core ru	STONE: medium to o d, well sorted, trough d in units separated	coarse
1877	- R										SANDS grained dewate SANDS graine	E: black, carbonaceo arved ripples.  STONE: fine to media d, bioturbated with erating features. STONE: fine to media d, with ophiomorpha bated near top.	um



This is an enclosure indicator page. The enclosure PE800210 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800210 has the following characteristics:
     ITEM_BARCODE = PE800210
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Log
            BASIN = OTWAY
       OFFSHORE? = N
        DATA_TYPE = WELL
    DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-2A Core 3 Grahic Log
                   Description Scale 1:200 Page 10
          REMARKS =
    DATE_WRITTEN = 30-NOV-1993
   DATE_PROCESSED =
    DATE_RECEIVED = 11-DEC-1997
    RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
      CONTRACTOR =
          AUTHOR =
      ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH =
     BOTTOM DEPTH =
   ROW_CREATED_BY = DN07_SW
(Inserted by DNRE - Vic Govt Mines Dept)
```

	BHP Petroleun	1				(					ESCRIPTION RVA- 2A			
PERM									Taj.		age: 1			
	UTHOR: P.Arditto / S.Horan									• ***	INTERVAL:			
RIG:	Byford Dolphin	-			_			_	_		CUT:			
K.B.: 25mRT W.D.:											CORE BARREL & MUD TYPE:			
DEPTH LITHOLOGY			SHT SILT SILT SILT SILT SILT SILT SILT SIL							ARSE III	SEDIMENTARY LITHOLOGICAL DESCRIPTION			
(m)	)	10	UFG			V.FINE MEDIL			COAF	V.CO				
	- 1111									96) 301	SANDSTONE: medium grained, sorted, hornogenous to burrowed with ophiomorpha.			
1878		-								ad be	SANDSTONE: medium grained, in burrowed to bioturbated.	muddy		
		-								d	SANDSTONE: medium to coarse grained, muddy with common	ı		
1879		-						Ţ		22	ophiomorpha burrows.			
		0 0									* 7/ &			
	- <del>····</del>	•							L		₩			
1880	_ <mark></mark>										SANDSTONE: medium to coarse grained, well sorted and trough cross bedded.			
	- <del></del>								ſ					
1881	R R										SHALE: black, highly carbonaced with fine silty starved ripple flasers, pyritic.	ous		
1001											H & H			
	R										SANDSTONE: medium to coarse grained, moderately sorted,	,		



laminated with local ophiomorpha.

**BOTTOM CORE 3** 

1883

1882

This is an enclosure indicator page.

The enclosure PE800211 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800211 has the following characteristics:
     ITEM_BARCODE = PE800211
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Plot
            BASIN = OTWAY
        OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-2A Core 1, 2, 3, 4, 5 Gamma Ray
                    Plot Scale 1:200
         REMARKS =
    DATE_WRITTEN =
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR = PE800211
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH = 1830
     BOTTOM_DEPTH = 1890
   ROW_CREATED_BY = DN07_SW
```



## CORE PLOT

Scale 1 : 200

Company: BHP PETROLEUM PTY.LTD. Well: MINERVA—2A MINERVA

Permit:

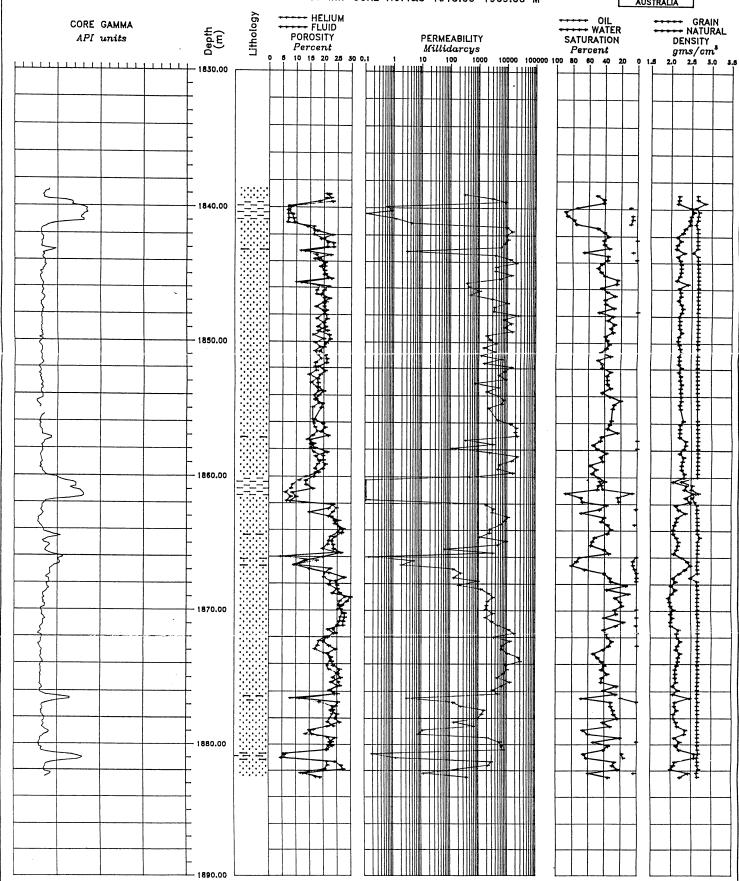
OTWAY

File No.: 5-207 Core Int: CORE NO.1 1728.50-1733.60 M Core Int: CORE NO.2&3 1838.80-1882.50 M Core Int: CORE NO.4&5 1915.00-1969.00 M



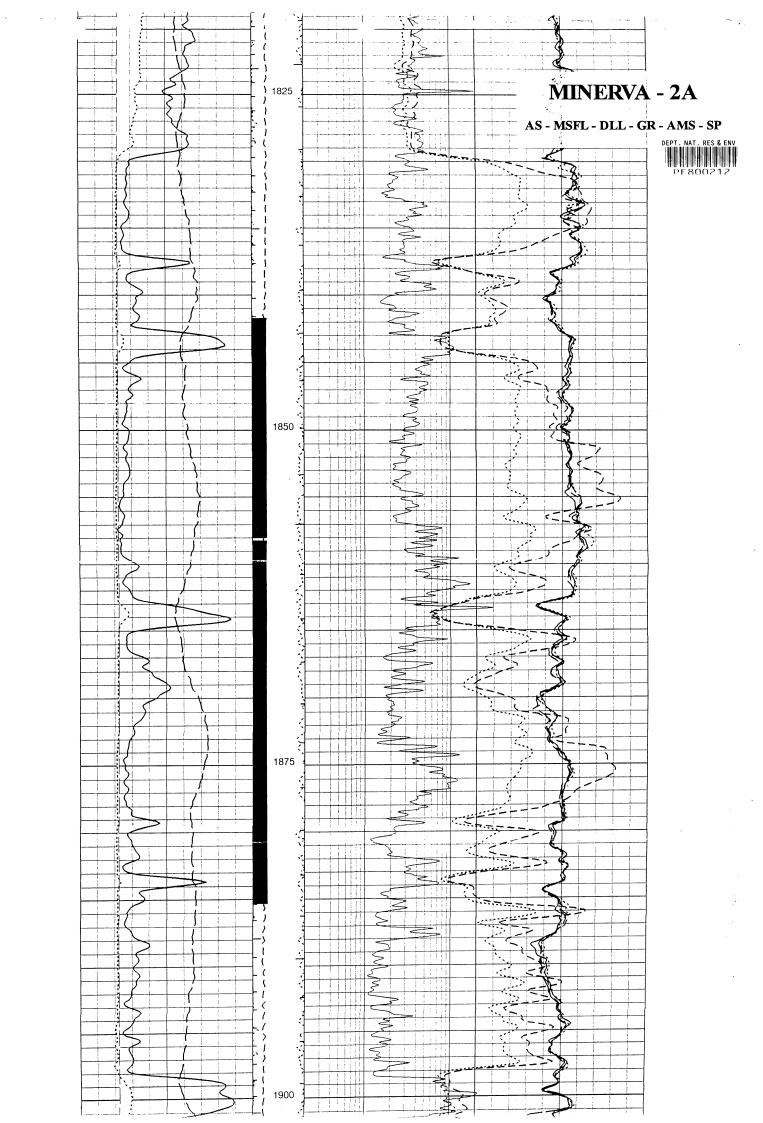
LABORATORIES

AUSTRALIA



This is an enclosure indicator page. The enclosure PE800212 is enclosed within the container PE800188 at this location in this document.

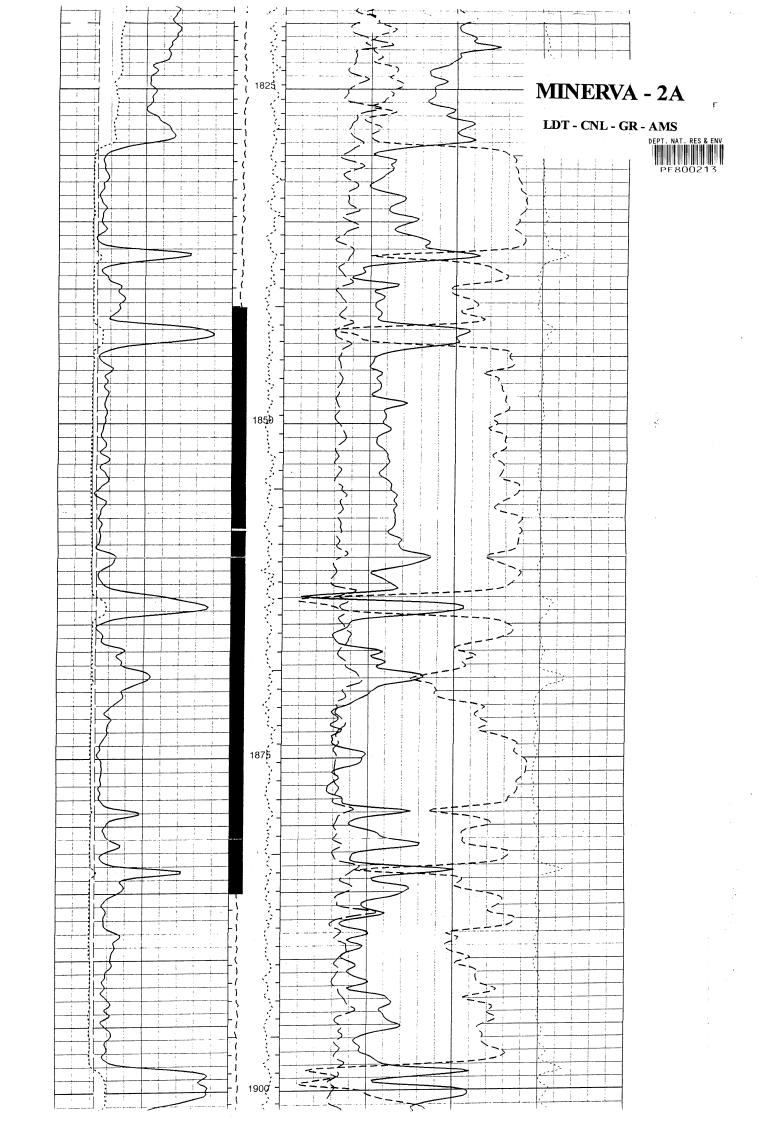
```
The enclosure PE800212 has the following characteristics:
    ITEM_BARCODE = PE800212
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Log Plot
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-2A AS-MSFL-DLL-GR-AMS-SP Log
                    Plot Scale 1:200
         REMARKS =
    DATE_WRITTEN =
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
      CONTRACTOR =
          AUTHOR =
      ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH =
     BOTTOM_DEPTH =
  ROW_CREATED_BY = DN07_SW
```



This is an enclosure indicator page.

The enclosure PE800213 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800213 has the following characteristics:
    ITEM_BARCODE = PE800213
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Log Plot
           BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-2A LDT-CNL-GR-AMS Log Plot
                   Scale 1:200
         REMARKS =
    DATE_WRITTEN =
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
      CONTRACTOR =
          AUTHOR =
      ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH =
    BOTTOM_DEPTH =
  ROW_CREATED_BY = DN07_SW
```



This is an enclosure indicator page.

The enclosure PE800214 is enclosed within the container PE800188 at this location in this document.

The enclosure PE800214 has the following characteristics:

ITEM\_BARCODE = PE800214
CONTAINER\_BARCODE = PE800188

NAME = Minerva-2A Core Graphic Plot

BASIN = OTWAY

OFFSHORE? = N

DATA\_TYPE = WELL

DATA\_SUB\_TYPE = LITHOLOGY\_RPT

DESCRIPTION = Minerva-2A Core 4 Graphic Log
Description Scale 1:200 Page 11

REMARKS =

DATE\_WRITTEN = 30-NOV-1993

DATE\_PROCESSED =

DATE\_RECEIVED = 11-DEC-1997

RECEIVED\_FROM = BHP Petroleum Pty Ltd

WELL\_NAME = Minerva-2A

CONTRACTOR =

AUTHOR =

ORIGINATOR = BHP Petroleum Pty Ltd

TOP\_DEPTH =

BOTTOM\_DEPTH =

ROW\_CREATED\_BY = DN07\_SW



# CORE DESCRIPTION MINERVA- 2A

AUTHOR: P.Arditto / S.Horan  RIG: Byford Dolphin  K.B.: 25mRT  W.D.:  CORE BARREL & MUD TYPE:  SHOWS GRAIN SIZE  SEDIMENTARY STRUCTURE  T U F G G G G G G G G G G G G G G G G G G	• • • • • • • • • • • • • • • • • • • •	WINERVA- ZA								
RIGE Byford Dolphin  K.B.: 25mRT W.D.:  DEPTH  LITHOLOGY  (m)  U F I G J J J J J J J J J J J J J J J J J J					DATE:	CORE NO.: 4 Page: 11				
K.B.: 25mRT W.D.:    CORE BARREL & MUD TYPE:   SEDIMENTARY   LITHOLOGICAL DESCRIPTION   DESCRIPTION			n		INTERVAL:					
SHOWS  GRAIN SIZE  T  U  F  G  GRAIN SIZE  SEDIMENTARY  STRUCTURE  SANDSTONE: medium grained, well sorted, trough cross bedded and shale rip up clasts and dissers.  H  Y?  SANDSTONE: coarse grained, trace pebbles, well sorted, trough cross bedded and shale rip up clasts and carbonaceous material.  SANDSTONE: very coarse grained, poor sorted, argiliaceous, discontinuous flasers and burrowed.  SANDSTONE: fine to medium with granule to pebble at top, poor to moderately sorted, trongonous bedding with abundant ophomorpha and trace flaser bedding.  SANDSTONE: medium applicaceous, discontinuous flasers and burrowed.  SANDSTONE: fine to medium with granule to pebble at top, poor to moderately sorted, homogenous bedding.  SANDSTONE: medium to coarse, trough cross bedded to flaser draped.  SANDSTONE: fine to coarse grained, trough cross bedded to flaser draped.					CUT:					
DEPTH (m)  1915  1916  1916  1917  1918  LITHOLOGY T	K.B.: 25	omR1	W.D.:		CORE BARREL	& MUD TYPE:				
SANDSTONE: medium grained, well sorted, trough cross bedded and shale rip up clasts and flasers.  SANDSTONE: coarse grained, trace pebbles, well sorted, trough cross bedded to flaser laminated, shale rip up clasts and carbonaceous material.  SANDSTONE: very coarse grained, poor sorted, argiflaceous, discontinuous flasers and burrowed.  SANDSTONE: the to medium with granule to pebble at top, poor to moderately sorted, homogenous bedding with abundant optiomorpha and trace flaser bedding.  SANDSTONE: medium to coarse, trough cross bedded to flaser draped.  SANDSTONE: medium to coarse, trough cross bedded to flaser draped.  SANDSTONE: fine to coarse grained, trough cross bedded to flaser taminated, homogenous in part with shale rip ups.		LITHOLOGY	т	N.SE. W.	SEDIMENTARY STRUCTURE	DESCRIPTION				
	1915			SILT V.FINE FINE FINE MEDIUM MEDIUM COAPS		SANDSTONE: medium grained, well sorted, trough cross bedded and shale rip up clasts and flasers.  SANDSTONE: coarse grained, trace pebbles, well sorted, trough cross bedded to flaser laminated, shale rip up clasts and carbonaceous material.  SANDSTONE: very coarse grained, poor sorted, argillaceous, discontinuous flasers and burrowed.  SANDSTONE: fine to medium with granule to pebble at top, poor to moderately sorted, homogenous bedding with abundant ophiomorpha and trace flaser bedding.  Escape burrow.  Saw cut surface.  SANDSTONE: medium to coarse, trough cross bedded to flaser draped.				
				SEDT NAT DEC 9		Rase drawing No FORR				



This is an enclosure indicator page. The enclosure PE800215 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800215 has the following characteristics:
   ITEM_BARCODE = PE800215
```

CONTAINER\_BARCODE = PE800188

NAME = Minerva-2A Core Graphic Plot

BASIN = OTWAY

OFFSHORE? = NDATA\_TYPE = WELL

DATA\_SUB\_TYPE = LITHOLOGY\_RPT

DESCRIPTION = Minerva-2A Core 4 Graphic Log Description Scale 1:200 Page 12

REMARKS =

DATE\_WRITTEN = 30-NOV-1993

DATE\_PROCESSED =

DATE\_RECEIVED = 11-DEC-1997

RECEIVED\_FROM = BHP Petroleum Pty Ltd

WELL\_NAME = Minerva-2A

CONTRACTOR =

AUTHOR =

ORIGINATOR = BHP Petroleum Pty Ltd

TOP\_DEPTH = BOTTOM\_DEPTH =

ROW\_CREATED\_BY = DN07\_SW

	BHP Petroleum					ESCRIPTIO	N
PERMIT:	VIC / P31					DATE:	CORE NO.: 4 Page: 12
AUTHOR:	P.Arditto / S.Hora	an				INTERVAL:	
	ford Dolphin	1			_	CUT:	
K.B.: 25	mRT	W.D.:					_ & MUD TYPE:
DEPTH (m)	LITHOLOGY	SHOWS T   G	SILT SILT	MEDIUM S	COARSE N	SEDIMENTAR' STRUCTURE	LITHOLOGICAL DESCRIPTION
1921 —							SANDSTONE: very fine to fine, flaser laminated with ophiomorpha burrows.  SANDSTONE: very fine to coarse, with parallel to inclined flaser lamination, trace trough cross beds, burrows, and shale rip up clasts.
1922 —							SANDSTONE: coarse to very coarse, trace pebbles, trough cross bedded to flaser dropped.
1924 —	R - •						SANDSTONE: medium to coarse grained well sorted, trough cross bedded with carbonaceous flasers, current ripple lamination, load features (dewatering) and homogenous bedding.
_							



SANDSTONE: medium to very coarse, scattered pebbles, trough cross bedded with carbonaceous/shale flasers, plant sterns and shale rip up clasts.

1926

This is an enclosure indicator page.

The enclosure PE800216 is enclosed within the container PE800188 at this location in this document.

The enclosure PE800216 has the following characteristics:

ITEM\_BARCODE = PE800216
CONTAINER\_BARCODE = PE800188

NAME = Minerva-2A Core Graphic Plot

BASIN = OTWAY OFFSHORE? = N

DATA\_TYPE = WELL

DATA\_SUB\_TYPE = LITHOLOGY\_RPT

DESCRIPTION = Minerva-2A Core 4 Graphic Log
Description Scale 1:200 Page 13

REMARKS =

DATE\_WRITTEN = 30-NOV-1993

DATE\_PROCESSED =

DATE\_RECEIVED = 11-DEC-1997

RECEIVED\_FROM = BHP Petroleum Pty Ltd

WELL\_NAME = Minerva-2A

CONTRACTOR =

AUTHOR =

ORIGINATOR = BHP Petroleum Pty Ltd

TOP\_DEPTH =

BOTTOM\_DEPTH =

ROW\_CREATED\_BY = DN07\_SW

BHP Petroleum
Petroleum

## CORE DESCRIPTION MINERVA- 2A

	retroleum		IAIIIAE	:RVA- 2A			
	VIC/P31			DATE:		CORE NO.: 4	Page: 13
	P.Arditto / S.Hora	n		INTERVAL:			
	rd Dolphin	141.5		CUT:			
K.B.: 25m	HI	W.D.:		CORE BARREL	& MUD T	YPE:	
DEPTH (m)	LITHOLOGY	SHOWS T G	SILT V.FINE BB FINE NE MEDIUM COARSE COARSE NO V.COARSE	SEDIMENTARY STRUCTURE		LITHOLOGIC DESCRIPTION	
1926	R R			H	with abun	lark grey to black, dant coaly plant st s, sparse nodular	ems, sparse
1927 —					current rip burrowed	ONE: silty to very fople laminated to fluid to bioturbated, scand trace rootlet.	aser bedded
1928 —				~ √ V	grained, a microfoun	NDSTONE: silty to orgillaceous, abund dering structures, aser laminations, t	lant sandy rare current
1929					-		
1930				# ****	grained, c	ONE: very fine to ru urrent ripple lamin nud crack and mici t top.	ated to flase
-				V V	grained, fla	ONE: very fine to n	ole laminate
1931 —					trace troug	gh cross beds, bur d in part.	rowed to

This is an enclosure indicator page. The enclosure PE800217 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800217 has the following characteristics:
    ITEM_BARCODE = PE800217
```

CONTAINER\_BARCODE = PE800188

NAME = Minerva-2A Core Graphic Plot

BASIN = OTWAY

OFFSHORE? = N

DATA\_TYPE = WELL

DATA\_SUB\_TYPE = LITHOLOGY\_RPT

DESCRIPTION = Minerva-2A Core 4 Graphic Log Description Scale 1:200 Page 14

REMARKS =

DATE\_WRITTEN = 30-NOV-1993

DATE\_PROCESSED =

DATE\_RECEIVED = 11-DEC-1997

RECEIVED\_FROM = BHP Petroleum Pty Ltd

WELL\_NAME = Minerva-2A

CONTRACTOR =

AUTHOR =

ORIGINATOR = BHP Petroleum Pty Ltd

TOP\_DEPTH =

BOTTOM\_DEPTH =

ROW\_CREATED\_BY = DN07\_SW



## CORE DESCRIPTION MINERVA- 2A

Petroleum MINERVA- 2A								
PERMIT:	VIC / P31			DATE:	CORE NO.: 4 Page: 14			
AUTHOR:		n		INTERVAL:				
	ford Dolphin			CUT:				
K.B.: 25	mRT	W.D.:		CORE BARREL	& MUD TYPE:			
DEPTH (m)	LITHOLOGY	T G	SILT V.FINE BEFINE FINE COARSE N.COARSE	SEDIMENTARY STRUCTURE	LITHOLOGICAL DESCRIPTION			
1932 —					SANDSTONE: fine to coarse grained, flas lenticular bedded, trough to hor nous bedding in part.  SANDSTONE: silty to very fine grained, lenticular bedded, current rippled to flaser laminated, possible wave ripple laminated.			
1933 —					?, burrowed ?.  SANDSTONE: fine to coarse, trace silty, lenticular bedded, burrowed.			
1934 —					Saw cut. Saw cut boundary, burrow incures 15cm			
1935 —	····-			A SA	and is filled by coarse sand.  SANDSTONE: very fine to fine, carbonaceous/shale flasers, burrowed to bioturbated, plant stems, rootlets in burrows.			
1936 —					SANDSTONE: medium to coarse, trough cross bedded, trace homogenous beds, pyritised plant stems, burrows and carbonaceous flasers.			
1937				)) ))				

PE800217

This is an enclosure indicator page.

The enclosure PE800218 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800218 has the following characteristics:
    ITEM_BARCODE = PE800218
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Plot
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
    DATA_SUB_TYPE = LITHOLOGY_RPT
      DESCRIPTION = Minerva-2A Core 4 Graphic Log
                    Description Scale 1:200 Page 15
          REMARKS =
    DATE_WRITTEN = 30-NOV-1993
   DATE_PROCESSED =
    DATE_RECEIVED = 11-DEC-1997
    RECEIVED_FROM = BHP Petroleum Pty Ltd
        WELL_NAME = Minerva-2A
       CONTRACTOR =
           AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP DEPTH =
     BOTTOM_DEPTH =
   ROW_CREATED_BY = DN07_SW
```

<b>*</b>	BHP Petroleum
PERMIT:	VIC / P31
ALITHOD	D Arditto / C Ho

## CORE DESCRIPTION MINERVA- 2A

MINERVA- 2A							
PERMIT:	VIC / P31			DATE: CORE NO.: 4 Page: 15			
	P.Arditto / S.Hora	n		INTERVAL:			
	ford Dolphin	141.5		CUT:			
K.B.: 25	mRT	W.D.:		CORE BARREL	& MUD TYPE:		
DEPTH (m)	LITHOLOGY	SHOWS T G	SILT V.FINE BEINE MEDIUM COARSE N.COARSE	SEDIMENTARY STRUCTURE	LITHOLOGICAL DESCRIPTION		
1937 — 1938 — 1940 — 1941 — 1942 — 1942 —		U F G	SIS ALL AND		SANDSTONE: medium to very coarse grained, scattered granule, well sorted, trough to hornogenous bedded, trace carbonaceous flasers and shale rip ups.  SANDSTONE: medium to very coarse fining to silt, trace scattered pebbles, poor to moderately sorted, shale/ carbonaceous flasers, burrowed to bioturbated, trace resin blebs.  Transitional contact.  Saw cut boundary.  SANDSTONE: fine to medium, trough to flaser bedded, trace current ripple larnination, burrowed to bioturbated.		

This is an enclosure indicator page. The enclosure PE800219 is enclosed within the container PE800188 at this location in this document.

The enclosure PE800219 has the following characteristics:

ITEM\_BARCODE = PE800219
CONTAINER\_BARCODE = PE800188

NAME = Minerva-2A Core Graphic Plot

BASIN = OTWAY

OFFSHORE? = N

DATA\_TYPE = WELL

DATA\_SUB\_TYPE = LITHOLOGY\_RPT

DESCRIPTION = Minerva-2A Core 4 Graphic Log
Description Scale 1:200 Page 16

REMARKS =

DATE\_WRITTEN = 30-NOV-1993

DATE\_PROCESSED =

DATE\_RECEIVED = 11-DEC-1997

RECEIVED\_FROM = BHP Petroleum Pty Ltd

WELL\_NAME = Minerva-2A

CONTRACTOR =

AUTHOR =

ORIGINATOR = BHP Petroleum Pty Ltd

TOP\_DEPTH =

BOTTOM\_DEPTH =

ROW\_CREATED\_BY = DN07\_SW

BHP Petroleum
PERMIT: VIC/P31
AUTHOR: P.Arditto / S.Ho
RIG: Byford Dolphin
K.B.: 25mRT

## **CORE DESCRIPTION MINERVA-2A**

PERMIT:	VIC/P31			_	-					DATE:	CORE NO.: 4 Page: 16
AUTHOR: P.Arditto / S.Horan						INTERVAL:					
RIG: Byford Dolphin						CUT:					
K.B.: 25	mRT		D.:							CORE BARREL	& MUD TYPE:
DEPTH (m)	LITHOLOGY	SHO T U	F G	SILT	V.FINE D	FINE	MEDIUM	COARSE	V.COARSE"	SEDIMENTARY STRUCTURE	LITHOLOGICAL DESCRIPTION
	- '-'									$\sim$	
1943 —											BOTTOM CORE 4
_	_										
_											
_											
-											
_											
_											
_											- v .
_							The second state of the se				
_											
_											



This is an enclosure indicator page.

The enclosure PE800220 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800220 has the following characteristics:
     ITEM_BARCODE = PE800220
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Plot
            BASIN = OTWAY
        OFFSHORE? = N
        DATA_TYPE = WELL
    DATA_SUB_TYPE = LITHOLOGY_RPT
      DESCRIPTION = Minerva-2A Core 5 Graphic Log
                    Description Scale 1:200 Page 16
          REMARKS =
     DATE_WRITTEN = 30-NOV-1993
   DATE_PROCESSED =
    DATE_RECEIVED = 11-DEC-1997
    RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR =
           AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH =
     BOTTOM DEPTH =
   ROW_CREATED_BY = DN07_SW
```

<b>*</b>	BHP Petroleum
PERMIT:	VIC/P31
AUTHOR:	P.Arditto / S.Ho
RIG: Byfe	
K.B.: 25r	nRT

# CORE DESCRIPTION MINERVA- 2A

									NVA- ZA				
	PERMIT: VIC/P31						DATE: CORE NO.: 5 Page: 16						
AUTHOR	AUTHOR: P.Arditto / S.Horan						INTERVAL:						
RIG: Byford Dolphin  K.B.: 25mRT W.D.:							CUT:						
K.B.: 25	imRT			_					1	CORE BARREL	& MUD	TYPE:	
DEPTH (m)	LITHOLOGY	SHO T U	ows F G	SILT	GR.	LINE	MEDIUM	VCOARSE	1000	SEDIMENTARY STRUCTURE		LITHOLOGICA	
												TOP OF CORE	
1943 —									( ( ) ( ) ( )		? SHALE: microfoo SANDS grained, laminate	silty, with abundant undering features.  TONE: very coarse to flaser to current ripsed, commonly lenticular foundering structures.	o fine ble llar bedded,

DEPT. NAT. RES & ENV

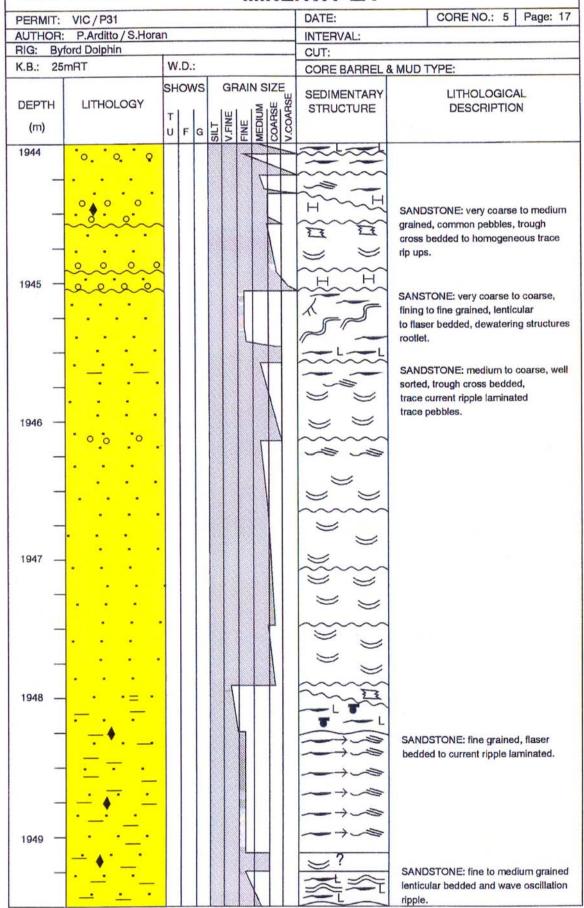
This is an enclosure indicator page.

The enclosure PE800221 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800221 has the following characteristics:
    ITEM_BARCODE = PE800221
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Plot
            BASIN = OTWAY
        OFFSHORE? = N
        DATA_TYPE = WELL
    DATA_SUB_TYPE = LITHOLOGY_RPT
      DESCRIPTION = Minerva-2A Core 5 Graphic Log
                    Description Scale 1:200 Page 17
          REMARKS =
    DATE_WRITTEN = 30-NOV-1993
   DATE_PROCESSED =
    DATE_RECEIVED = 11-DEC-1997
    RECEIVED_FROM = BHP Petroleum Pty Ltd
        WELL_NAME = Minerva-2A
       CONTRACTOR =
           AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH =
     BOTTOM DEPTH =
   ROW_CREATED_BY = DN07_SW
```

BHP
Petroleum

## MINERVA- 2A



PE800221

This is an enclosure indicator page.

The enclosure PE800222 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800222 has the following characteristics:
     ITEM_BARCODE = PE800222
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Plot
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
    DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-2A Core 5 Graphic Log
                   Description Scale 1:200 Page 18
         REMARKS =
    DATE_WRITTEN = 30-NOV-1993
   DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
    RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR =
           AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH =
     BOTTOM DEPTH =
   ROW_CREATED_BY = DN07_SW
```

	BHP Petroleum	CORE DESCRIPTION MINERVA- 2A													
PERMIT:	VIC/P31							_		DATE	:		CORE NO.:	5	Page: 18
AUTHOR:		an								INTE	RVAL:				
	ford Dolphin mRT	Tva		2		_	_			CUT:	1				
K.B.: 25	MKI	W.D.:							V. U.	CORE	CORE BARREL & MUD TYPE:				
DEPTH	LITHOLOGY	SHOWS GRAIN SIZE								SEDII	MENTARY		LITHOLOG	alc/	AL
mente de la	LITHOLOGY	C T SILT SILT W.FINE FINE MEDIUM COARSE					5	AR AR	STRI	STRUCTURE		DESCRIPTION			
(m)	l'	U	F	G	SILT	V.FINE	FINE	MED	S S						
_	`. <b>*</b> . `.								_	))( )		flaser be	TONE: coarse to edded to current tro foundering fea	ripple	e laminated,
1950 —	·-· ㎡									~	÷ .				
_	_ · _ ·					-				~\\(\pi\)					
_	- :- <u>:</u>									-					
	· · - ·					1	1			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	****				
1951 —						7			7	<b>→</b> ~	F L T				
	<u></u>					J				V	T.				
	<del>-</del>						1	7			~~~~				
								4		~~	<b>→</b>	grained,	TONE: medium to trough cross beaminated to flaser	dded	and curren
1952 —										\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	<b>→</b>				
1902								A		~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		TONE: medium to		
	<del>-</del> ·									<b>&gt;</b>	$\rightarrow$	shale rip current r	fine to medium, of up clasts, trought ipple laminated to	n cro	ss beds,
								1			7	bedding.	•		
	0 0 0 0					k				E ~~	Ly Ly				
1953 —							7			30	200				
-	<del></del>						1			205	200	in units (	TONE: very fine to 0.2m thick, mudd half, lower half h	y and	d bioturbate
_										30	200	in upper	nan, lower nall f	OHIO	gancous.
_						4				8	200				



This is an enclosure indicator page.

The enclosure PE800223 is enclosed within the container PE800188 at this location in this document.

The enclosure PE800223 has the following characteristics:
 ITEM\_BARCODE = PE800223
CONTAINER\_BARCODE = PE800188

NAME = Minerva-2A Core Graphic Plot

BASIN = OTWAY OFFSHORE? = N

DATA\_TYPE = WELL

DATA\_SUB\_TYPE = LITHOLOGY\_RPT

DESCRIPTION = Minerva-2A Core 5 Graphic Log
Description Scale 1:200 Page 19

REMARKS =

DATE\_WRITTEN = 30-NOV-1993

DATE\_PROCESSED =

DATE\_RECEIVED = 11-DEC-1997

RECEIVED\_FROM = BHP Petroleum Pty Ltd

WELL\_NAME = Minerva-2A

CONTRACTOR =

AUTHOR =

ORIGINATOR = BHP Petroleum Pty Ltd

TOP\_DEPTH =

BOTTOM\_DEPTH =

ROW\_CREATED\_BY = DN07\_SW

	BHP Petroleum		Section of the section of	Water State of the	ESCRIPTION RVA- 2A	• • •			
PERMIT:	VIC/P31				DATE:	CORE NO.: 5 Page: 1			
	P.Arditto / S.Hora	ın			INTERVAL:				
	ford Dolphin imRT	W.D.:			CUT:				
N.D., 20	I I		07411		CORE BARREL & MUD TYPE:				
DEPTH (m)	LITHOLOGY	SHOWS U F G	GRAIN STATE	m	SEDIMENTAR STRUCTURE	LITHOLOGICAL DESCRIPTION			
1955 —					3 30 30 1/2 30 C 30 30 30 30 30 30 30 30 30 30 30 30 30	SANDSTONE: very fine to fine grained, bloturbated, minor load casts, flasers and current ripple lamination.  SANDSTONE: very coarse fining to fine grained, pebbles at base, rip up clasts, dewatering features, microfoundering features and bioturbated.			
1957 —					1 26	SANDSTONE: very fine to fine grained, burrowed and bioturbated, load casts at base, flaser-lenticular bedding at top.			
1959 —						SANDSTONE: very coarse to medium grained, trough cross bedded, flaser beds and minor burrows, trace current ripple lamination.			



1960

This is an enclosure indicator page.

The enclosure PE800224 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800224 has the following characteristics:
    ITEM_BARCODE = PE800224
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Plot
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-2A Core 5 Graphic Log
                    Description Scale 1:200 Page 20
          REMARKS =
    DATE_WRITTEN = 30-NOV-1993
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
    RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH =
     BOTTOM DEPTH =
   ROW_CREATED_BY = DN07_SW
```

	BHP Petroleum				ERVA-2A			
PERMIT:	VIC / P31			DATE: CORE NO.: 5 Page:				
AUTHOR:		n		INTERVAL:				
2/01	ford Dolphin	I		CUT:				
K.B.: 25	imRT	W.D.:			CORE BARRE	L & MUD TYPE:		
DEPTH (m)	LITHOLOGY	SHOWS  T   U   F   G	SILT V.FINE FINE	MEDIUM S COARSE N	SEDIMENTAR STRUCTURE			
1961 —					\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SANDSTONE: predominantly medium to fine grained trough crossbedded to current ripple laminated and flaser to lenticular bedded with burrowing to bioturbation. Units separated by scour surfaces.		
1962 —						Concretionary pyrite.		
1963 —					- L - N	SANDSTONE: very fine to fine grained lenticular bedded with siltstone/shale abundant starved ripples.  SANDSTONE: fine up to medium graine		
1964 —						thin lenticular bedded units separated by scour surfaces. Minor burrows.  Resin blebs.  SANDSTONE: medium grained, current ripple laminated to flaser laminated units separated by scour surfaces or load and flame surfaces. Uppermost 0.4m contailong dwelling burrows.		



1966

This is an enclosure indicator page. The enclosure PE800225 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800225 has the following characteristics:
    ITEM_BARCODE = PE800225
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Core Graphic Plot
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = LITHOLOGY_RPT
     DESCRIPTION = Minerva-2A Core 5 Graphic Log
                   Description Scale 1:200 Page 21
         REMARKS =
    DATE_WRITTEN = 30-NOV-1993
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
        TOP_DEPTH =
     BOTTOM_DEPTH =
   ROW_CREATED_BY = DN07_SW
```

<b>*</b>	BHP Petroleum		C	ALC: NAME	AVA STATE	ESCRIPTION RVA- 2A					
PERMIT:	VIC/P31				DATE:	DATE: CORE NO.: 5 Page: 21					
	P.Arditto / S.Hora	an			INTERVAL:	INTERVAL:					
RIG: Byford Dolphin  K.B.: 25mRT W.D.:							CUT:				
N.D., 23	I I		Tor	LAIL	CIZE	CORE BARREI	CORE BARREL & MUD TYPE:				
DEPTH (m)	LITHOLOGY	SHOWS T U F G	SILT V.FINE	FINE NEDITING	COARSE	SEDIMENTARY STRUCTURE	LITHOLOGICAL DESCRIPTION				
1966 — — — — — — — — — — — — — — — — — —							SANDSTONE: medium grained current ripple laminated to flaser laminated.  SANDSTONE: medium grained with a accretionary flaser draped inclined surfaces. Shale rip up clasts at base.  SANDSTONE: coarse to medium grained, trough cross bedded with minor shale rip up clasts.  SANDSTONE: very coarse to coarse grained with burrow.  SANDSTONE: medium to coarse grained trough cross bedded.  SANDSTONE: medium to coarse grained current ripple laminated, flasered in upper half, load cast/flame base.  SANDSTONE: medium to coarse grained current ripple laminated to flaser laminated, lenticular bedded at top.  SANDSTONE: fine to medium grained, bioturbated to fine grained lenticular and burrowed, shaley, pyrite nodules at base. Siderite nodules at top.  SANDSTONE: fining to medium coarse, trough cross bedding, burrowed, pebbles 0.5cm diameter.  SANDSTONE: coarse grained moderatel sorted, trough cross bedded, minor carbonaceous laminations.  BOTTOM CORE 5				



This is an enclosure indicator page. The enclosure PE800226 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800226 has the following characteristics:
    ITEM_BARCODE = PE800226

CONTAINER_BARCODE = PE800188

NAME = Minerva-2A Core Plot
```

NAME = Minerva-2A Core Plot BASIN = OTWAY

BASIN = OTWAY OFFSHORE? = N

DATA\_TYPE = WELL

DATA\_SUB\_TYPE = WELL\_LOG

DESCRIPTION = Minerva-2A Core 1, 2, 3, 4, 5 Gamma Ray

Plot Scale 1:200

REMARKS = DATE\_WRITTEN =

DATE\_PROCESSED =

DATE\_RECEIVED = 11-DEC-1997

RECEIVED\_FROM = BHP Petroleum Pty Ltd

WELL\_NAME = Minerva-2A
CONTRACTOR = PE800226

AUTHOR =

ORIGINATOR = BHP Petroleum Pty Ltd

TOP\_DEPTH = 1910 BOTTOM\_DEPTH = 1970 ROW\_CREATED\_BY = DN07\_SW

ACS LABORATORIES PTY. LTD. ACN 008 273 005



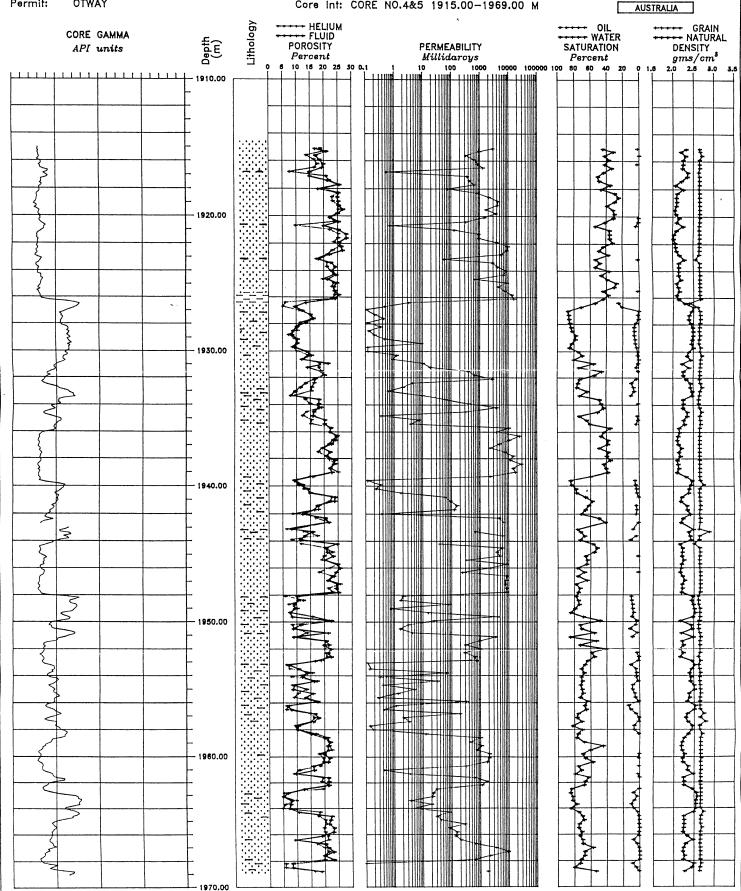
## CORE PLOT

Scale 1 : 200

Company: BHP PETROLEUM PTY.LTD. Well: MINERVA—2A MINERVA OTWAY Permit:

File No.: 5-207 Core Int: CORE NO.1 1728.50-1733.60 M Core Int: CORE NO.2&3 1838.80-1882.50 M Core Int: CORE NO.4&5 1915.00-1969.00 M

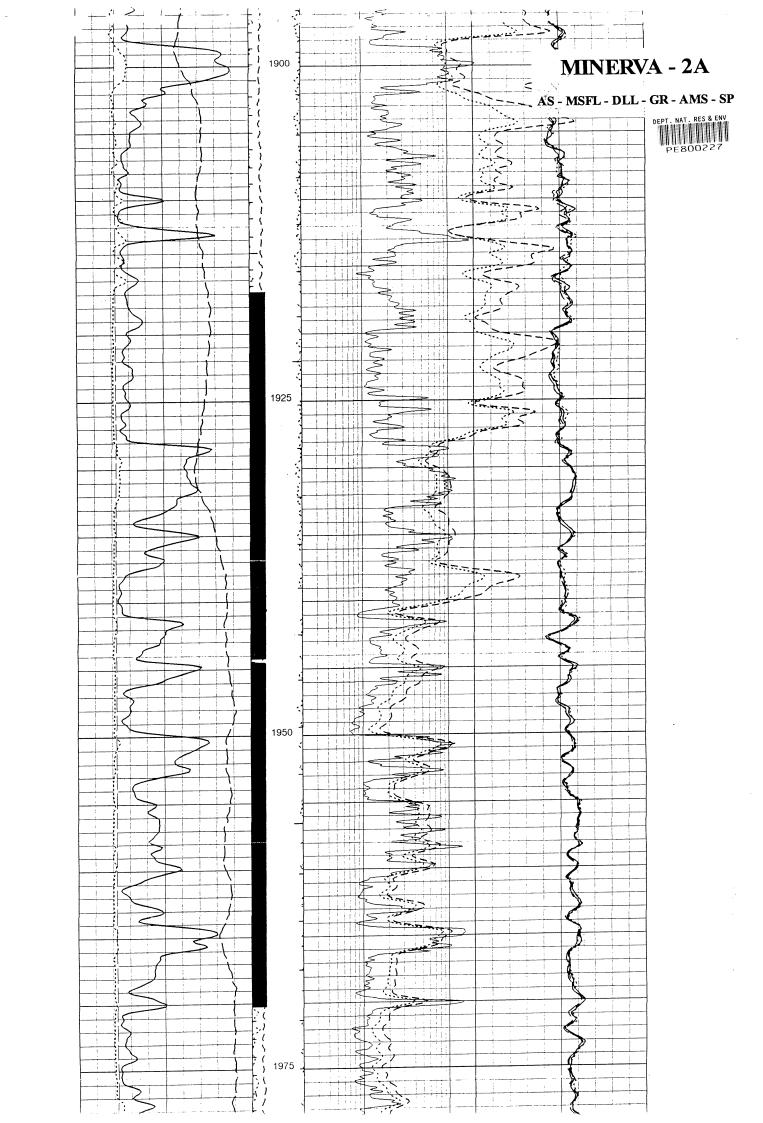




This is an enclosure indicator page.

The enclosure PE800227 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800227 has the following characteristics:
    ITEM_BARCODE = PE800227
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Log Plot
            BASIN = OTWAY
       OFFSHORE? = N
       DATA_TYPE = WELL
   DATA_SUB_TYPE = WELL_LOG
     DESCRIPTION = Minerva-2A AS-MSFL-DLL-GR-AMS-SP Plot
                    Scale 1:200
         REMARKS =
    DATE_WRITTEN =
  DATE_PROCESSED =
   DATE_RECEIVED = 11-DEC-1997
   RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
      CONTRACTOR =
          AUTHOR =
      ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH =
    BOTTOM_DEPTH =
  ROW_CREATED_BY = DN07_SW
```



This is an enclosure indicator page.

The enclosure PE800228 is enclosed within the container PE800188 at this location in this document.

```
The enclosure PE800228 has the following characteristics:
     ITEM_BARCODE = PE800228
CONTAINER_BARCODE = PE800188
            NAME = Minerva-2A Log Plot
            BASIN = OTWAY
        OFFSHORE? = N
        DATA_TYPE = WELL
    DATA_SUB_TYPE = WELL_LOG
      DESCRIPTION = Minerva-2A LDT-CNL-GR-AMS Plot Scale
                    1:200
          REMARKS =
    DATE_WRITTEN =
   DATE_PROCESSED =
    DATE_RECEIVED = 11-DEC-1997
    RECEIVED_FROM = BHP Petroleum Pty Ltd
       WELL_NAME = Minerva-2A
       CONTRACTOR =
          AUTHOR =
       ORIGINATOR = BHP Petroleum Pty Ltd
       TOP_DEPTH =
     BOTTOM_DEPTH =
   ROW_CREATED_BY = DN07_SW
```

