

WCR SEASPRAY-1

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**OIL and GAS DIVISION**

**ARCO LIMITED / WOODSIDE (LAKES ENTRANCE)**

**OIL CO. N. L.**

**SEASPRAY NO. 1 WELL**

**FINAL WELL REPORT**

**by**

**Frank T. Ingram**

**ARCO LIMITED**

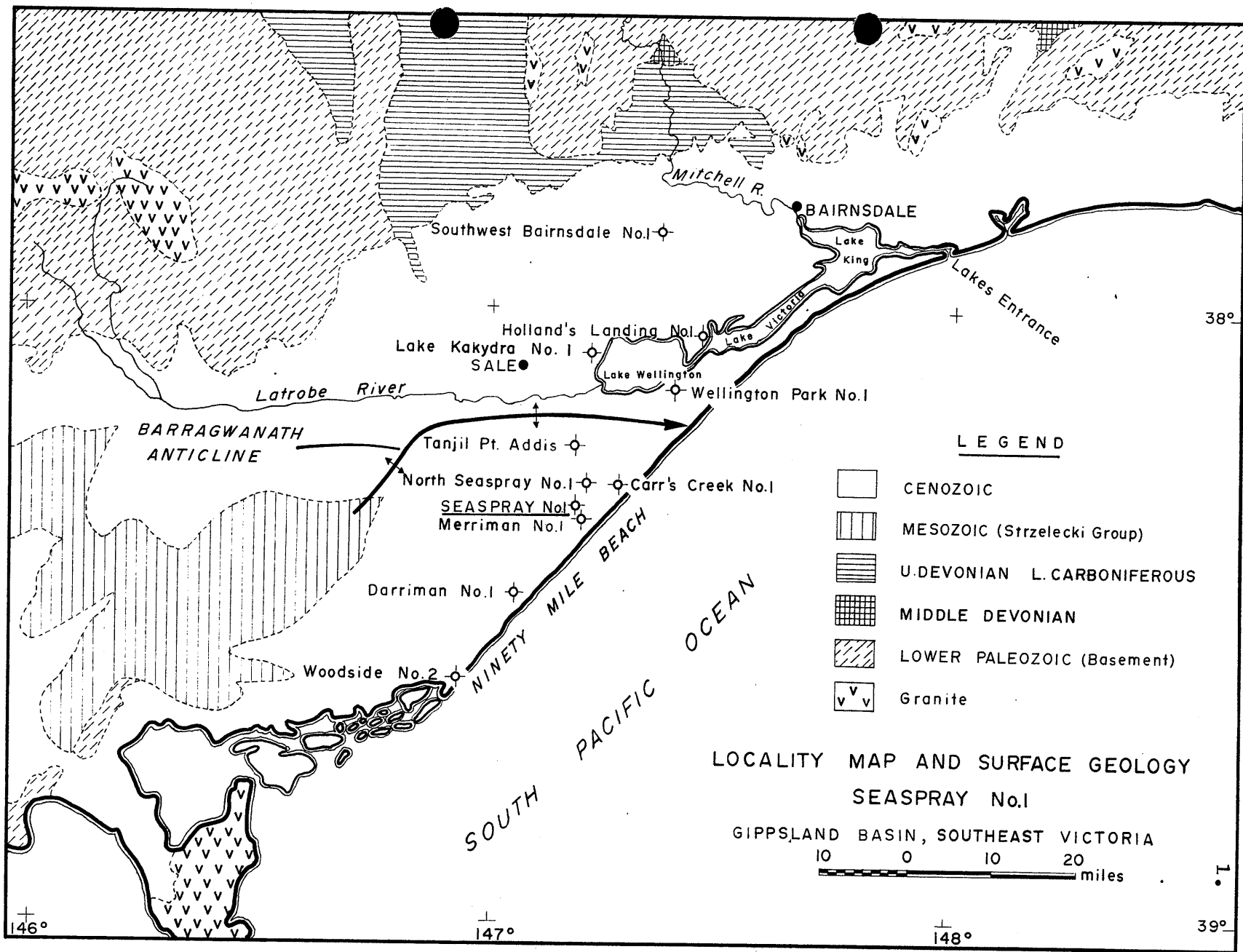
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The Seaspray No. 1 well was located 1.55 miles northwest of the Merriman No. 1 well and 3.2 miles southwest of the North Seaspray No. 1 well.

The objectives in this well were the porous beds of Lower Cretaceous age previously encountered in the Merriman No. 1 well. The Seaspray No. 1 was believed to be located structurally higher than the Merriman No. 1 on the basis of gravity and well data.

The well was spudded on January 20th, 1964 and was abandoned as a dry hole on February 7, 1964. The well was drilled to a total depth of 5,555 feet in 12 days. The remaining 6 days were spent plugging back, testing and fishing.

Tertiary sediments were present from the surface to 4542 feet, and Mesozoic sediments were encountered from 4542 feet to total depth. Several gas shows were recorded in the Tertiary section, two of which were tested and found to have originated in fresh water bearing sands. The Mesozoic section was lacking in porosity, and no gas shows were recorded from these sediments.

A formation test was made in the interval 3206-3260 feet by plugging back after reaching total depth. The test tool became stuck during this test, and after 24 hours of jarring on the fish with no success, the testing assembly below the safety joint was released and left in the hole.

Structurally the well appears to have been located on the north flank of a large anticlinal feature. The porous interval at 4675 - 5512 feet in the Merriman No. 1 was absent in the Seaspray No. 1. The porous subgraywacke, referred to as the "Seaspray Sand" in the Merriman No. 1 at 5940 - 6000 feet had very poor porosity in the Seaspray No. 1.

The well was plugged and abandoned.

## INTRODUCTION

In 1962 a seismic reflection survey was conducted in the Seaspray area of the Gippsland Basin. This survey revealed the presence of two closed anticlinal structures in the Tertiary sediments. No continuous reflections were obtained in the Mesozoic section beneath the Tertiary. It was assumed that Tertiary structural "highs" would correspond to structural "highs" in the Mesozoic.

The subsequent drilling of three wells, North Seaspray No. 1, Merriman No. 1 and Carr's Creek No. 1, revealed that the Tertiary structures were in part the result of draping and differential compaction of the Tertiary sediments over an irregular topographic surface developed in the Mesozoic sediments. The structural configuration of the Mesozoic rocks was found to be much more complicated than originally believed, and the Tertiary folds were seen to be only vaguely related to the older Mesozoic structural framework.

In the first of these three wells, North Seaspray No. 1, a thin sandstone in the Strzelecki Group, 145 feet below the Tertiary-Mesozoic unconformity, produced a small flow of petroliferous gas. In the Merriman No. 1, no shows of hydrocarbons were found in the Mesozoic section, but porosities and permeabilities in this well were much better than in the North Seaspray No. 1. In the Carr's Creek No. 1 no shows of hydrocarbons were found, and the Mesozoic section was found to be tight.

All of the above three wells were off-structure in the Mesozoic sequence. As no seismic information was available in the pre-Tertiary sediments it was decided to drill a fourth well, Seaspray No. 1, in an area where the porous Mesozoic beds found in the Merriman No. 1 could be expected in a structurally higher position. A location was picked 1.55 miles northwest of the Merriman No. 1 near the axis of gravity anticlinal anomaly. The Mesozoic subsurface structural interpretation on which the location was selected is shown on Plate 4.

WELL HISTORYGENERAL DATA

Well Name and Number : SEASPRAY NO. 1  
 Location : Latitude 38°19'39"S  
 Longitude 147° 9'43"E  
 Warragul 4 mile sheet

Name and Address of Tenement Holder : Woodside (Lakes Entrance) Oil Co. N. E.  
 792 Elizabeth Street,  
 Melbourne, Victoria

Details of Petroleum Tenement : PPL.160 Victoria

District Gippsland

Total Depth Driller 5,556 ft.  
 Schlumberger 5,555 ft.

Date Drilling Commenced: January 20, 1964  
 Date Drilling Completed: February 1, 1964  
 Date Well Abandoned : February 7, 1964  
 Date Rig was Released : February 7, 1964

Drilling Time in Days to Total Depth : 12 days

Elevation : Ground Level 97'  
 Kelly Bushing 108'

Status : Dry, plugged and abandoned

Cost :

DRILLING DATA

Name and Address of Drilling Contractor : Reading and Bates (Australia) Pty. Ltd.  
 2 City Road,  
 Melbourne, Victoria

Drilling Plant : Make National  
 Type 50  
 Rated capacity 7500' with 4½" drill pipe  
 10,000' with 3½" drill pipe  
 Motors (2) General Motors 6-71  
 twin model diesel, 504  
 horsepower each

Mast : Make Lee C. Moore  
 Type 131 feet cantilever  
 Rated capacity 550,000 pounds

Pumps : Make National  
 Type 1-C250  
 1-C150-B  
 Size 7½" x 15" and 7¼" x 12"  
 Pump Motors -  
 Make General Motors (1)



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Type Twin diesel 6-71  
BHP 312

**Blowout Preventer Equipment :** Make Cameron (2)  
Size 12"  
Series 900

Make Hydril  
Size 12"  
Series 900

**Hole Sizes and Depths :** 16" 0-38'  
12 $\frac{1}{4}$ " 38' - 588'  
8 $\frac{1}{2}$ " 588' - 5555'

**Casing Details :** Size 13 $\frac{1}{2}$ "  
Weight 48 lbs/ft  
Grade H-40  
Range 2  
Setting Depth 36'

Size 9 $\frac{1}{2}$ "  
Weight 36 lbs/ft  
Grade J-55  
Range 2  
Setting Depth 578'

**Casing Cementing Details :** Size 13 $\frac{1}{2}$ "  
Setting Depth 38'  
Quantity cement used 25 sax  
Cemented to Surface  
Method used Poured from ready-mix truck

Size 9 $\frac{1}{2}$ "  
Setting Depth 578'  
Quantity used 240 sax (40% excess)  
Cemented to Surface (no returns)  
Method used Plug, filled annulus by pouring cement from surface

**Drilling Fluid :**

Surface hole was drilled with a fresh water bentonite mud thickened with a small amount of gypsum. A fresh water native mud was used from the base of the surface casing to 2800 feet. From 2800 feet to total depth the mud was conditioned by additions of bentonite, CMC, Lo-Vis and caustic soda.

The clays present in the formations from the base of the surface casing at 578 feet to the base of the Lakes Entrance Formation at 2665 feet produced an excellent native mud. Cavings in

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this interval were not serious while drilling with native mud, and the hole diameter, for the most part, varied from 8 $\frac{1}{2}$  to 11 inches.

No lost circulation or other unusual conditions were encountered regarding the drilling fluid.

The average weekly mud analysis, average weight per interval and the list of mud and chemicals used are given below :

AVERAGE WEEKLY ANALYSIS

Week ending	Weight lbs/gal	Viscosity sec/qt.	W.L. cc/30 min.	F.C.	pH
26/1/64	9.4	40	25	3/32	7.5
2/2/64	10.1	52	9.7	2/32	8.5
7/2/64	9.6	42	12.8	2/32	10.0

AVERAGE WEIGHT PER INTERVAL

Interval	Weight lbs/gal.
38' - 578'	9.2
578' - 1000'	No data
1000' - 2000'	"
2000' - 3000'	9.5
3000' - 4000'	9.6
4000' - 5000'	10.0
5000' - 6555'	10.2

LIST OF MUD AND CHEMICALS USED

<u>Material</u>	<u>Trade Name</u>	<u>Amount used</u>
Bentonite	(Supercol)	10,050 lbs.
Tannin	(Lo-Vis)	1,250 "
CMC	(Cellucol)	878 "
Caustic Soda		850 "
Gypsum		168 "
Soda Ash		100 "

**Water Supply :**

A water well was drilled near the edge of the location to a depth of 156 feet. A percussion type water bearing rig was used to drill the hole. A string of 6 inch water well casing was run while drilling. A 12 feet long section of sand screen was placed below the bottom of the 6 inch casing.

The well was fitted with a Pemona pump assembly powered by an electric motor. The output of the well was in excess of 600 barrels per day of fresh water containing approximately 200 ppm NaCl.

**Perforations and Shooting Record :**

No perforating or shooting was conducted.

**Plugging Back :**

After drilling to total depth a cement plug of 40 sacks was set across the Tertiary - Mesozoic unconformity at 4490-4590 ft.

A second plug of 60 sacks was set at 3226 - 3350 feet for use in making a formation test. The plug was drilled out to 3260 feet 24 hours later. After the formation test of the interval 3206 - 3260 feet a cement plug was set at 2615 - 2715 feet with 40 sacks cement. A fourth cement plug of 40 sacks was set across the base of the surface casing in the interval 525 - 625 feet. A final cement plug of 10 sacks was set in the top 25 feet of the 9 $\frac{1}{2}$ " casing.

**Fishing Operations :**

DST. No. 2 was made in the interval 3206 - 3260 feet above a cement plug set after reaching total depth. During this test unconsolidated sand packed around the tail pipe and the test tools became stuck in the hole. The jars on the fishing assembly were worked for 18 hours with no success.

The testing assembly was then backed off at the safety joint. The Halliburton jars were replaced by McCullough jars and by using a Bowen overshot and safety joint the fish was caught again. After jarring for 4 $\frac{1}{2}$  hours with no movement of the fish the overshot was released and the fish abandoned.

The portion of the testing assembly left in the hole is as follows : bottom half of safety joint, 7 $\frac{1}{2}$  inch packer assembly, 10 feet of perforated tail pipe, 4 cross-over subs, 1 - 6 inch drill collar 30 ft. long and 1 - BT pressure recorder and case. Top of the fish is at 3202 feet.

No other fishing operations were conducted.

**LOGGING AND TESTING****Ditch Cuttings :**

Cuttings were collected after passing over the shale shaker, then washed and placed in marked bags. The cuttings were collected at intervals of 10 feet while drilling and 5 feet while coring. Complete sets of cuttings were sent to the Bureau of Mineral Resources and the Department of Mines in Victoria.

**Coring :**

A total of 4 cores were originally planned in the Strzelecki Group. However, because of the lack of shows in the Strzelecki Group, the monotonous lithology and the poor porosity noted in cuttings, only two cores were taken in this section.

Because of a gas show in the upper part of the Latrobe Valley Coal Measures an unscheduled core was taken to investigate the presence of hydrocarbons.

A Hughes type "J" barrel with Hughes soft formation core heads was used for all coring. The total footage cored was 53 feet, and the total recovery was 32 feet, or 60%.

The following is a brief summary of the coring program :

Core No.	Interval	Length	Recovery
1	2762' - 2782'	20'	1'
2	4872' - 4885'	13'	11'
3	5536' - 5556'	20'	20'

**Side-Wall Sampling :**

A total of 10 side-wall cores were attempted and 7 were recovered. Recovery was fair to good. A Schlumberger 30 shot side-wall coring gun was used. Of the 7 side-wall cores recovered 5 were in the Tertiary section and 2 were in the Mesozoic section.

See Appendix 4 for detailed description of the side-wall cores.

**Electrical and Other Logging :**

The following is a table showing the type logs, intervals and scales run in the Seaspray No. 1 well :

Type Log	Run	Intervals	Scales
Electrical Log	1	578' - 4847'	2" = 100', and 5" = 100'
" "	2	4747' - 5554'	ditto
Microlog	1	577' - 4847'	ditto
"	2	4747' - 5551'	ditto
Gamma Ray - Sonic Log	1	2500' - 5542'	ditto
Continuous Dip-meter	1	2500' - 5545'	1" = 100', and 1' = 20'

See Appendix No.1 for details of logging.

**Drilling Time and Gas Log :**

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The drilling time was recorded by a geologist on the rig floor and also by a geologist used in conjunction with a portable gas detector supplied by Core Laboratories Inc.

The gas detector was of the hot wire type which continuously recorded the total gas in the drilling fluid. The total gas curve was recorded on the same chart with the drilling time.

The geological supervision of the well was performed by Arco Limited geologists, Frank Ingram and Gerald Fleit.

**Formation Testing :**

Two formation tests were made, both of which tested intervals in the Latrobe Valley Coal Measures where gas shows were recorded.

Listed below are brief descriptions of these two tests.

DST. NO. 1, 2654' - 2782' (128'), open hole, recovered 350' of drilling mud and 500' of drilling mud cut with fresh water, no oil or gas.

DST. NO. 2, 3206' - 3260' (54'), plugged back in open hole, recovered 100' of drilling mud, 1300' of muddy fresh water ( $R_w = 12.2$  ohm - m @ 68°F, 300 ppm NaCl) and 500' of fine sand, static pressure not established due to tool plugging with sand, no oil or gas.

See Appendix 2 for detailed information on formation testing.

**Deviation Surveys :**

Hole deviation was measured by dropping the "Totco" device down the drill pipe before making a trip, or run down the drill pipe on a wire line.

The deviation from surface to approximately 4,000 feet varied from  $\frac{1}{4}^{\circ}$  to  $1^{\circ}$ . From 4800 feet to 5264 feet the deviation increased from  $\frac{1}{4}^{\circ}$  to  $2^{\circ}$ . The deviation at total depth was also  $2^{\circ}$ .

No crooked hole or other hole problems were encountered.

**Temperature Surveys :**

No temperature surveys were made.

**Other Well Surveys :**

No well surveys other than those listed above were made.

G E O L O G YSUMMARY OF PREVIOUS WORK, GEOLOGICAL, GEOPHYSICAL AND DRILLING

Before conducting any drilling in the Seaspray area logs, cuttings, cores and reports of other wells in the area were studied. The most important of these wells were the Wellington Park No. 1, Darriman No. 1, Holland's Landing and Lake Kakydra. All of these wells went into the Strzelecki Group sediments of Mesozoic age. The depths of these wells range from 3486 feet for the Lake Kakydra to 12,011 feet at Wellington Park No. 1.

The Mesozoic rocks were studied in outcrop in the Strzelecki Ranges west of Seaspray. No surface geological work was attempted in the Seaspray area however, as the surface is covered with late Tertiary and Quaternary sediments which mask the underlying geology.

In 1962 a reflection seismic survey was conducted in the Seaspray area, and two anticlinal structures were mapped on horizons within the lower part of the Tertiary sequence.

The Gippsland Basin had previously been covered by a gravity survey in 1949 by the Robert H. Ray Co., and this was later complemented by additional gravity and aeromagnetic surveys by the Bureau of Mineral Resources, Geology and Geophysics.

In 1962 and early 1963 three wells, North Seaspray No. 1, Merriman No. 1 and Carr's Creek No. 1, were drilled in the Seaspray area to test the structures outlined by the seismic survey. Sub-surface structural interpretation made from the data on these three wells, coupled with the gravity data, led to the drilling of Seaspray No. 1.

SUMMARY OF THE REGIONAL GEOLOGY

The Gippsland Basin is one of several small basins along the southeast coast of Australia. The Basin, as it is known today, had its greatest areal extent during Tertiary time. The basin proper, on shore, can be considered that area lying west of the Lakes Entrance granite high, south of the Tertiary - Paleozoic contact on the north side of the basin and east of a line connecting Wilson's Promontory and the town of Warragul. The basin extends south-eastward offshore where it is believed to contain a much greater thickness of Tertiary and possibly older sediments.

The Paleozoic sequence in the subsurface is probably very similar to the Paleozoic outcrops on the north side of the basin. Ordovician and Silurian sediments, altered by dynamic metamorphism, probably underlie Mesozoic or Tertiary sediments around the margins of the basin. Highly folded marine strata of Middle Devonian age occur as erosional remnants northeast and southwest of the basin proper, and isolated remnants may exist in the subsurface. Overlying Middle Devonian and older rocks on the north side of the basin is a thick sequence of continental red shales, sandstones, conglomerates and volcanics of Upper Devonian - Carboniferous age. These beds are only slightly to moderately folded, and probably extend at least as far south as Lake Wellington, in the sub-surface.

Permian sediments are unknown in the subsurface of the Gippsland Basin. However conglomerate, exposed along a major fault south of the Carrajung Uplift, is thought to be tillite of Permian age. This may indicate the presence of substantial Permian sediments below Mesozoic sediments in the basin proper.

The Paleozoic rocks north of the Gippsland Basin constitute the southern extension of the Tasman Geosyncline where the predominant structural trend is north - south. This same structural alignment can be expected in the subsurface of the basin.

No sediments of Triassic age are known in the Gippsland Basin.

The Upper Jurassic and Lower Cretaceous periods are represented by the Strzelecki Group, a thick sequence of non-marine sediments deposited in an east - west trending trough or graben. The thickness of this sequence is not known, but the Wellington Park No. 1 penetrated 8,226 feet of it with no indication of reaching the base. Estimates of thickness in the Strzelecki Ranges, where it outcrops extensively, range from 5,000 to 20,000 feet.

In Eocene time downwarping resulted in widespread deposition of the Latrobe Valley Coal Measures over structurally complex rocks ranging in age from Ordovician to Mesozoic. In the Seaspray area the Mesozoic rocks were folded (or tilted), faulted and eroded before deposition of the coal measures resulting in a marked angular unconformity.

Further downwarping in Oligocene time produced a widespread transgression of the sea over the Gippsland Basin. Marine conditions existed until about Middle Pliocene time and the Lakes Entrance Formation, Gippsland Limestone, Tambo River Formation and

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Jemmy's Point Formation were deposited during this period.

From Upper Pliocene to recent time, non-marine conditions have prevailed, resulting in a cover of sand, clay and gravel, known as the Lake Wellington Formation and Haunted Hills Gravels, over most of the basin.

In the Seaspray area, and probably other areas as well, deposition of the Tertiary sediments took place over a topographically irregular surface developed in the folded and faulted sediments of the Strzelecki Group. This allowed for differential sedimentation and compaction of the sediments into gentle folds. These folds have been further complicated by uplift and faulting in Pliocene time.

#### STRATIGRAPHIC TABLE

The following is the stratigraphic sequence penetrated in the Seaspray No. 1.

TABLE I				
Age	Name	Depth (Ref KB)	Thick- ness	Lithology
U. Pliocene	Lake Wellington Fm. and/or Haunted Hills Gravels		359'	<u>Sand, Gravel</u> and <u>Clay.</u>
L. Pliocene	Jemmy's Point Formation	380'	60'	<u>Sand, Shells</u> and <u>minor Marl</u>
U. Miocene	Tambo River Formation	440'	170'	<u>Marl, with minor Limestone</u>
Miocene	Gippsland Limestone	610'	1540'	<u>Limestone</u> and <u>Marl</u>
Oligocene	Lakes Entrance Formation	2150'	515'	<u>Calcareous Shale</u> and <u>Marl</u>
L. Oligocene U. Eocene	Latrobe Valley Coal Measures	2665'	1877'	<u>Sand, Coal</u> and <u>Clay</u>
Lower Cretaceous	Strzelecki Group	4542'	1013'	<u>Graywacke, Mudstone,</u> <u>Claystone</u> and <u>Siltstone</u>
		5555'		



STRATIGRAPHY

0 - 380 feet

Lake Wellington Formation and/or Haunted Hills Gravels

Upper Pliocene - Pleistocene

Sand, gray to white, quartz and minor gray rock fragments, fine to coarse grained, sub-angular to sub-rounded; Clay, yellow to red, often ferruginous; Siltstone, gray to brown, argillaceous; and Lignite, black, brittle.

This unit is non-marine, but probably grades southward into marine sediments. In the Merriman No. 1 well, 1.5 miles southeast, a fossiliferous sand was present in the sequence.

380 - 440 feet

Jemmy's Point Formation

Lower Pliocene

Sand, gray, medium to very coarse grained with occasional small pebbles; Shells, mostly fine detrital material; and minor Marl, gray, silty, fossiliferous, friable.

440 - 610 feet

Tambo River Formation

Upper Miocene

Marl, gray to light green, very fossiliferous, partly silty; with Sand and Shells (possibly contamination).

610 - 2150 feet

Gippeland Limestone

Miocene

From 610 to 1440 feet Limestone, white, gray and cream, fine-grained, very fossiliferous, friable to medium hard, slightly glauconitic, becoming argillaceous in lower part. From 1440 to 1950 feet Marl, light to medium gray and gray green, partly silty, fossiliferous, slightly glauconitic, soft to friable and Limestone, as above. Grades downward into Shale. From 1950 to 2150 feet Shale, green to gray green and light gray, slightly calcareous, fossiliferous, soft, slightly to moderately glauconitic.

The base of the Gippeland Limestone is gradational into the underlying Lakes Entrance Formation. The top of the Lakes Entrance formation has been determined by identification of Foraminifera in a side-wall core at 2150 feet. No other side-wall cores were taken above 2150 feet, and the top may be slightly higher than this. Because of the badly contamin-

inated cuttings at this depth, no attempt was made to more precisely locate the top of the Lakes Entrance Formation on the basis of Foraminifera.

2150 - 2665 feet

Lakes Entrance Formation

Oligocene

Predominantly Shale, green to gray green and light gray, slightly calcareous, fossiliferous, soft, glauconitic throughout, becoming very glauconitic in bottom 10 feet; minor Limestone and Marl, as above; Dolomite, 2660 - 2665 feet, light gray to light brown, very fine grained, hard, glauconitic.

Foraminifera identified in side-wall cores indicate that the basal part of the Lakes Entrance Formation is older in the Seaspray No. 1 than in either the North Seaspray No. 1 or the Merriman No. 1. The marine transgression represented by the Lakes Entrance Formation was probably over an uneven surface, and low areas such as the Seaspray No. 1 site received the first and oldest of these sediments.

2665 - 4542 feet

Latrobe Valley Coal Measures

Upper Eocene - Lower Oligocene

Sand, mostly colorless quartz, fine to very coarse grained and occasionally pebbly, mostly sub-angular, clean to argillaceous, poor to very good porosity; Coal, brown to black, soft to brittle, dolomitic at 3105 to 3100 feet; Clay (or Claystone), light gray to white and brown, often carbonaceous. At 3210 to 3213 feet and 3412 to 3420 feet occur thin beds of Dolomite, brown, finely crystalline and slightly hard.

The top of the coal measures is in sharp contrast with the overlying Lakes Entrance Formation, and these may be separated by a minor unconformity.

The base of the coal measures overlies folded and eroded strata of the Strzelecki Group.

No marine fossils were found in the Latrobe Valley Coal Measures and the sequence is thought to be wholly non-marine.

Only three beds in the coal measures can be correlated with other wells to any degree of certainty. The uppermost of these is a thin stringer of dolomite occurring in the Seaspray No. 1 at

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3210 - 3213 feet. This bed appears to correlate with a dolomite stringer occurring at 2423 - 2428 feet in the North Seaspray No. 1 and at 2778 - 2782 feet in the Carr's Creek. It is apparently absent in the Merriman No. 1.

The second correlation is another thin dolomite bed in the interval 3412-3420 feet in the Seaspray No. 1. This appears to correlate with a similar bed at 2590 - 2595 feet in the North Seaspray No. 1 and at 3294 - 3298 feet in the Merriman No. 1. A similar dolomite bed at 3146 - 3155 feet in the Carr's Creek No. 1 appears to be a separate unit as it appears about 100 feet stratigraphically lower than in the other wells.

The third bed possible to correlate is the thick coal seam in the interval 3461 - 3550 feet in the Seaspray No. 1. This corresponds to the coal seam in the intervals 2708 - 2780 feet in North Seaspray No. 1, 3479 - 3550 feet in the Merriman No. 1 and 3200 - 3280 feet in the Carr's Creek No. 1.

There is a marked increase in thickness of the coal measures in a southwesterly direction. The thickness increases from 763 feet in the Holland's Landing Well, to 1400 feet in the Wellington Park No. 1, to 1701 feet in the North Seaspray No. 1, to 1877 feet in the Seaspray No. 1 and finally to 2387 feet in the Merriman No. 1. The thickening appears to take place throughout the sequence and is not confined to the basal part or to any single unit.

4542 - 5555 feet

### Strzelecki Group

#### Lower Cretaceous

Interbedded Graywacke, gray-green speckled black and white, very firm to medium-grained, comprised mainly of volcanic detrital fragments and quartz in a clay-chlorite matrix, traces of fine red shale fragments, poor to very poor porosity, carbonaceous Mudstone - Claystone, light gray, soft; Shale, gray to green, often carbonaceous, firm; and Siltstone, light gray to tan, firm to slightly hard, argillaceous.

The lithology of the Strzelecki Group in the Seaspray No. 1 is similar to that penetrated in the North Seaspray No. 1 in that the clastic material is predominantly fine grained, and the porosity is very poor due to the clay-chlorite matrix.

The correlation with other wells of individual beds within the Strzelecki Group is only fair to poor. The best correlation

is the graywacke bed known as the "Seaspray Sand" which occurs in the interval 5285 - 5387 feet. This probably correlates with the graywacke at 4400 - 4500 feet in the North Seaspray No. 1 and at 5940 - 6000 feet in the Merriman No. 1 (Plate 3). However, in the Merriman No. 1 the "Seaspray Sand" is coarse-grained with fair to good porosity and may possibly be older than the "Seaspray Sand" in the Seaspray No. 1 and the North Seaspray No. 1.

The thin gas sand present in the North Seaspray No. 1 was not present, or not recognizable due to "shaling out".

The source area for the Strzelecki Group was mostly of a volcanic- red bed nature and yielded a complex suite of minerals and rock fragments. The volcanic rock detritus is mainly responsible for the persistent green coloration of the graywackes, and the red beds have produced the fine flakes of red shale common in the graywackes.

Plant fossils and other carbonaceous material were present throughout the Strzelecki Group sediments. No marine fossils were found and the sequence penetrated is thought to be entirely non-marine in origin.

The sequence of shale and porous sands present in the Merriman No. 1 in the interval 4675 - 5512 feet was completely absent in the Seaspray No. 1. This means that 837 feet of section in the Merriman No. 1 pinches out, or has been removed by a combination of faulting and erosion. As this sequence has only been encountered in the one well, very little is known about its origin or extent of deposition.

## STRUCTURE

The Seaspray No. 1 was drilled with the hope of finding the porous Mesozoic beds in a structurally higher position than where they occur in the Merriman No. 1. A gravity anomaly, supported by well data, suggested the presence of an anticlinal structure oriented approximately east-west, just north of the Merriman No. 1. The Seaspray No. 1 was drilled near the axis of this gravity anomaly.

The North Seaspray No. 1 and Merriman No. 1 wells were drilled on anticlinal structures mapped from seismic reflections in the Tertiary strata. These wells proved to be on

## SEASPRAY-1

structure in the Tertiary, but off structure in the Mesozoic. As seismic methods have been unable to map horizons below the base of the Tertiary sequence the only structural control in the Mesozoic sequence has been derived from dipmeter surveys in previous wells, and from gravity or magnetic surveys.

From the continuous dipmeter survey in the Seaspray No. 1 it is evident that the well was drilled on the flank of a large Mesozoic structure. The average magnitude of dip in this section is  $16^{\circ}$  and the average direction of dip is  $N24^{\circ}E$ . This is approximately the same dip magnitude and direction as in the North Seaspray No. 1. The electrical log correlation of these two wells, if correct, require a large down to the south fault between the two wells. This fault would be of pre-Tertiary age as no large displacements in the Tertiary strata have been detected in this area by the seismic survey. There is, however, a small fault in this area having about 100 feet throw which affects only the lower part of the Latrobe Valley Coal Measures. This displacement in the Tertiary is assumed to reflect the much larger displacement in the Mesozoic (Plate 3).

Another pre-Tertiary down to the south normal fault is postulated between the Merriman No. 1 and Seaspray No. 1. It is believed that the shale and porous sands occurring at 4675 - 5512 feet in the Merriman No. 1 were deposited south of this fault. If the correlation of the "Seaspray Sand" is correct, this fault is necessary to compensate for the depths at which the "Seaspray Sand" is found in each well. Deposition of the Latrobe Valley Coal Measures took place over an irregular erosional surface developed in the Strzelecki Group. This surface developed a regional tilt down to the south which allowed a greater thickness of coal measures to accumulate in that direction.

The normal down to the north fault ( $F_3$ ) north of the Merriman No. 1 possibly had an initial movement at the beginning of the marine transgression in Oligocene time. The major movement, however, along this fault seems to have taken place in Middle Pliocene time.

The North Seaspray and Merriman anticlinal structures appear to be due to draping of sediments over an irregular Mesozoic surface, and to uneven subsidence and

deposition during Tertiary time. Contemporaneous faulting may have been partly responsible for the uneven subsidence. These structures have also probably been accentuated by drag along the faults and by differential compaction.

#### RELEVANCE TO OCCURRENCE OF PETROLEUM

No shows of hydrocarbons were found in the Strzelecki Group sediments. These beds had very poorly developed porosity.

The formation waters in the Strzelecki Group in the Seaspray No. 1 are similar to that found in the North Seaspray No. 1. Salinities calculated from the electrical log range from 8,000 - 12,000 ppm NaCl, while salinities in the equivalent section in the Merriman No. 1 are about 16,000 ppm NaCl (15,850 ppm measured on sample from DST at 5774 - 6000 feet).

Several gas shows were recorded in the Tertiary section. As no shows had been recorded in the Latrobe Valley Coal Measures in the three wells previously drilled in the Seaspray area it was decided to test the shows in this sequence.

The first test in the coal measures in the interval 2654 - 2782 feet was made immediately after two shows had been recorded in this interval. The test recovered only water cut drilling<sup>mud</sup> with no shows of oil or gas.

The second test in the coal measures was made in the interval 3206 - 3260 feet. This is in the upper part of a thick sand bed which has no correlation in either the North Seaspray No. 1 or the Merriman No. 1. On test this sand produced only muddy water with no shows of oil or gas.

The gas shows in the coal measures probably represent only minor quantities of gas generated by carbonaceous material. The coal measures in this well, as in the other areas of the Gippsland Basin, are completely flushed with fresh water. No shows of hydrocarbons were found above the coal measures.

#### POROSITY AND PERMEABILITY OF SEDIMENTS PENETRATED

Sand, clean and porous for the most part, is present from the surface down to 440 feet.

The limestones in the top of the Gippsland Limestone are highly porous from 600 to 1080 feet.

Sands in the Latrobe Valley Coal Measures have fair to very good porosity. Two formation tests in this section produced fresh water at high flowing rates until the perforations in the test

tool became plugged with sand.

The porosities in the Strzelecki Group are poor. Permeabilities are also probably very poor because of the clay-chlorite matrix. The only significant porosity is present in thin beds of graywacke between 4928 and 5185 feet. Porosities calculated from the sonic and microlog in this interval range from 10 - 25%, but permeabilities probably are lower than 2 millidarcies.

#### CONTRIBUTION TO GEOLOGICAL CONCEPTS RESULTING FROM DRILLING

1. The thin sandstone bed near the top of the Strzelecki Group which produced a small flow of petroliferous gas in the North Seaspray No. 1 was not present in the Seaspray No. 1.
2. The section of shale and porous sands present in the Merriman No. 1 at 4675 - 5512 feet is absent in the Seaspray No. 1.
3. Porosities and permeabilities in the Strzelecki Group are poor, resembling the section drilled in the North Seaspray No. 1.
4. No shows of hydrocarbons were found in the Strzelecki Group. Three gas shows recorded in the Latrobe Valley Coal Measures were tested, but no hydrocarbons were recovered on these tests.
5. The Strzelecki Group has an average dip direction of N24°E and an average dip magnitude of 16°. The well is believed to be located on the north flank of a large anticlinal structure.
6. The direction of dip and correlation of electric logs in the Strzelecki Group indicates pre-Tertiary folding (or tilting), faulting and erosion in the Seaspray area.

#### REFERENCES

- |                  |      |  |
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| INGRAM, Frank T. | 1962 | Wellington Park No. 1 Well, final well report, unpublished report for Arco Limited and Woodside (Lakes Entrance) Oil Co. N. L.           |
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and  
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SEASPRAY-1

APPENDIX ILIST AND INTERPRETATION OF ELECTRICAL  
AND OTHER LOGS

<u>Type Log</u>	<u>Run No.</u>	<u>Interval</u>	<u>Scales</u>
Electrical Log	1	578' - 4847'	2" = 100' and 5" = 100'
	2	4747' - 5554'	" "
Microcaliper - Microlog	1	577' - 4847'	" "
	2	4747' - 5551'	" "
Gamma Ray - Sonic	1	2500' - 5542'	" "
Continuous Dip- meter	1	2500' - 5545'	1" = 100' and 1' = 20'

For the most part the logs are self-explanatory. The SP curve on the electrical log is reversed in the Latrobe Valley Coal Measures because of formation waters more resistive than the mud filtrate.

The dolomite beds in the Latrobe Valley Coal Measures at 3210 - 3213 feet and 3412 - 3420 feet can best be seen on the sonic log.

A Core Laboratories Inc. portable hot wire type gas detector was used for continuous logging of the gas in the drilling fluid. The drilling time was also recorded on the same chart with the total gas curve. This unit performed satisfactorily throughout the drilling operation.

The sonic log was not run above 2500 feet. Consequently, no velocity computations have been made. Velocity control in the Seaspray area has been well established from sonic surveys in three nearby wells, and the additional expense of running the sonic log above 2500 feet was not warranted.

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APPENDIX 2FORMATION TESTING DETAILS

Data sheets by Halliburton have been prepared for the drill stem tests in the Seaspray No. 1, as follows :

Flow Time	1st	Min.	2nd	Min.	Date	1-25-64	Ticket Number	267541
Closed In Press. Time	1st	Min.	2nd	Min.	Kind of Job	Open Hole	Halliburton District	Brisbane
Pressure Readings	Field			Office Corrected	Tester	D. C. Payton	Witness	-
Depth Top Gauge	2637	Ft.	no	Blanked Off	Drilling Contractor	Reading & Bates Drlg Co.		
BT. P.R.D. No.	1908		24	Hour Clock	Elevation	108' KB	Top Packer	-
Initial Hydro Mud Pressure	1388		1300		Total Depth	2782'	Bottom Packer	2654'
Initial Closed in Pres.					Interval Tested	2654-2782'	Formation Tested	Latrobe valley
Initial Flow Pres.	-	1	2	-	Casing or Hole Size	8 3/4"	Casing Perfs.	Top Bot.
Final Flow Pres.	515	1	2	-	Surface Choke	1/8"	Bottom Choke	5/8"
Final Closed in Pres.					Size & Kind Drill Pipe	4 1/2"	Drill Collars Above Tester	I.D. - LENGTH 2 7/8" x 360'
Final Hydro Mud Pressure	1348		1300		Mud Weight	9.5	Mud Viscosity	45
Depth Cen. Gauge		Ft.		Blanked Off	Temperature	100	*F Est. Anchor Size & Length	ID 2 7/8" x 90' OD 6 1/4"
BT. P.R.D. No.				Hour Clock	Depths Mea. From	Kelly Bushing	Depth of Tester Valve	2635 Ft.
Initial Hydro Mud Pres.					Cushion		Depth Back Pres. Valve	Ft.
Initial Closed in Pres.					Recovered	850 Feet of	muddy fresh water	
Initial Flow Pres.		1			Recovered	30 Feet of	sand	
Final Flow Pres.		1			Recovered	Fest of		
Final Closed in Pres.					Recovered	Fest of		
Final Hydro Mud Pres.					Oil A.P.I. Gravity		Water Spec. Gravity	
Depth Bot. Gauge	2778	Ft.	yes	Blanked Off	Gas Gravity		Surface Pressure	psi
BT. P.R.D. No.	1907		24	Hour Clock	Tool Opened	9:17 PM	A.M. P.M. Tool Closed	9:37 PM A.M. P.M.
Initial Hydro Mud Pres.	1375		1365		Remarks	Misrun: Open tool with a strong blow,		
Initial Closed in Pres.						could not close c.i.p. valve. Jarred 30 mins		
Initial Flow Pres.	1055	1	2	-		to get loose. Tools were broke down and found		
Final Flow Pres.	850	1	2	-		packed with sand.		
Final Closed in Pres.						Bottom perforations were plugged.		
Final Hydro Mud Pres.	1375		1365					

FORMATION TEST DATA

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SEASPRAY

Lessee Name

Well No.

Test No.

Field Area

WILDCAT

County

A. R. C. O. LTD.  
Lessee Owner/Company Name

State

Owner's District

Flow Time	1st Min.	2nd Min.	Date	Ticket Number
			2-1-5-64	344150
Closed In Press. Time	1st Min.	2nd Min.	Kind of Job	Halliburton District
			Open hole	Melbourne
Pressure Readings	Field	Office Corrected	Tester	Witness
			B. Martin	-
Depth Top Gauge	3196 Ft.	Blanked Off	Drilling Contractor	Reading & Bates
BT. P.R.D. No.	1907	24 Hour Clock	Elevation	75'
Initial Hydro Mud Pressure	1620	1600	Total Depth	3260' cement plug
Initial Closed in Pres.			Interval Tested	3206-3260
Initial Flow Pres.		1	Casing or Hole Size	8 3/4"
Flow Pres.	1110	2 1090	Surface Choke	1"
Final Closed in Pres.			Size & Kind Drill Pipe	4 1/2" IF
Final Hydro Mud Pressure	1640	1600	Mud Weight	9.7
Depth Cen. Gauge		Blanked Off	Temperature	120 °F Est. °F Actual
BT. P.R.D. No.		Hour Clock	Depths Mea. From	Table
Initial Hydro Mud Pres.			TYPE AMOUNT	
Initial Closed in Pres.			Cushion	
Initial Flow Pres.		1	Recovered	100 Feet of rat hole mud
Final Flow Pres.		2	Recovered	1300 Feet of water
Final Closed in Pres.		1	Recovered	500 Feet of sand
Final Hydro Mud Pres.		2	Recovered	Feet of
Depth Bot. Gauge	3260 Ft.	yes Blanked Off	Oil A.P.I. Gravity	
BT. P.R.D. No.	1908	24 Hour Clock	Gas Gravity	
Initial Hydro Mud Pres.		Chart	Water Spec. Gravity	
Initial Closed in Pres.		left	Surface Pressure	psi
Initial Flow Pres.		1	Tool Opened	12:45 PM A.M. P.M.
Final Flow Pres.		2 in	Tool Closed	1:45 PM A.M. P.M.
Final Closed in Pres.		1	Remarks	SEE ATTACHED SHEET.
Final Hydro Mud Pres.		2 hole		

Legal Location  
Sec. - Twp. - Rng.

Lease Name

Well No.

Test No.

Field Area

WILDCAT

County

AUSTRALIA

State VIC

ARCO LTD.

Lease Owner/Company Name

Owner's District

## FORMATION TEST DATA

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SEASPRAY-1

NOTES ON D.S.T. NO. 2

After an initial flow period of 10 minutes an attempt to close the CIP valve was made, but without success due to sand in the tool. Blow continued for 30 minutes then died. Attempted to pull off bottom after 1 hour, but the tools were stuck in the hold. Worked jars for 18 hours with no success. Backed off at safety joint. Went back in hole with McCullough jars and Bowen overshot and safety joint. Jarred on fish for 4 hours with no success. Backed off at safety joint and left in the hole the bottom half of the safety joint, 7 1/2" packer assembly, 2 - 5 feet long joints of perforated tail pipe, 4 cross-over subs, BT pressure recorder and case and 1 - 6" x 30 feet drill collar.

PE906295

This is an enclosure indicator page.  
The enclosure PE906295 is enclosed within the  
container PE903984 at this location in this  
document.

The enclosure PE906295 has the following characteristics:

- ITEM\_BARCODE = PE906295
- CONTAINER\_BARCODE = PE903984
  - NAME = Drill Stem Test
  - BASIN = GIPPSLAND
  - PERMIT = PPL160
  - TYPE = WELL
  - SUBTYPE = DIAGRAM
- DESCRIPTION = Drill Stem Test Plots (enclosure from  
WCR) for Seaspray-1
- REMARKS =
- DATE\_CREATED =
- DATE\_RECEIVED =
  - W\_NO = W481
  - WELL\_NAME = SEASPRAY-1
  - CONTRACTOR =
  - CLIENT\_OP\_CO = ARCO LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE906296

This is an enclosure indicator page.  
The enclosure PE906296 is enclosed within the  
container PE903984 at this location in this  
document.

The enclosure PE906296 has the following characteristics:

- ITEM\_BARCODE = PE906296
- CONTAINER\_BARCODE = PE903984
  - NAME = Core Analysis Results
  - BASIN = GIPPSLAND
  - PERMIT = PPL160
  - TYPE = WELL
  - SUBTYPE = DIAGRAM
- DESCRIPTION = Core Analysis Results Table (enclosure  
from WCR) for Seaspray-1
- REMARKS =
- DATE\_CREATED = 28/07/65
- DATE\_RECEIVED =
  - W\_NO = W481
  - WELL\_NAME = SEASPRAY-1
  - CONTRACTOR = BUREAU OF MINERAL RESOURCES
  - CLIENT\_OP\_CO = ARCO LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 3REPORT ON TERTIARY STRATIGRAPHY IN SEASPRAY  
NO. 1 WELL

by

D. J. TAYLOR

Cores, side wall cores and rotary cuttings (to 4000 ft.) have been examined from Arco - Woodside's Seaspray No. 1 Well. Contamination of rotary cutting samples made foraminiferal determinations extremely difficult. No cores and only three side wall cores were taken in the marine Tertiary section. For these reasons, the designation of stratigraphic boundaries is unwarranted, so only general comments will be made.

The marine Tertiary section, in Seaspray No. 1., is directly comparable with other wells in the vicinity (SEE FIGURE ), although this section is apparently thicker. However, this thickening is partially due to a greater accumulation of the Plio-Pleistocene sands, gravels and lignites. The first appearance of Foraminifera was at 390 feet and this fauna was typical of the Kalimnan (-Jemmys Point Formation). There is a gradual thickening of these post-Kalimnan sediments from the Baragwanath Anticline to the Woodside area, where these sediments reach a thickness of the order of 1,000 feet.

The typical planktonic fauna of the Janjukian Stage was first encountered at 2150 feet. The sediment assignable to the Janjukian Stage is over 200 feet thicker than in other sections in the vicinity (see Figure). A careful examination of a side wall core from 2640 feet (15 feet above the brown coal) revealed a fauna which represents the base of Carter's (1959) Faunal Unit 5. Hocking & Taylor (1964) show that, in the Gippsland Basin, the initial marine Tertiary transgression was diachronous, commencing at the base of the Janjukian (- Carter's Faunal Unit 4). Thus the initial marine sediments in the Seaspray section was deposited later than that in structurally lower lying areas, but is older than the other wells in the Seaspray area and on the Baragwanath Anticline. The initial marine sediments in Seaspray are also of interest as they contain fragments of brown coal which are often associated with these sediments in the deeper parts of the basin, but not on the Baragwanath Anticline.



but not on the Baragwanath Anticline.

No Foraminifera were found below 2660 feet which suggest an older age than those above 2660 feet.

The accompanying diagram illustrates the biostratigraphic correlation of wells drilled by Arco in the Seaspray area. This diagram shows that the thickening of the Seaspray No. 1. section can be accounted for, in terms of:-

- (i) The thickening of post marine Tertiary sediments.
- (ii) The greater thickness of Janjukian sediments, which is partially due to an earlier initiation of marine sedimentation.

The above interpretation suggests that the initial marine transgression took place on pre-existing structures as is proposed by Hocking & Taylor (loc. cit.).

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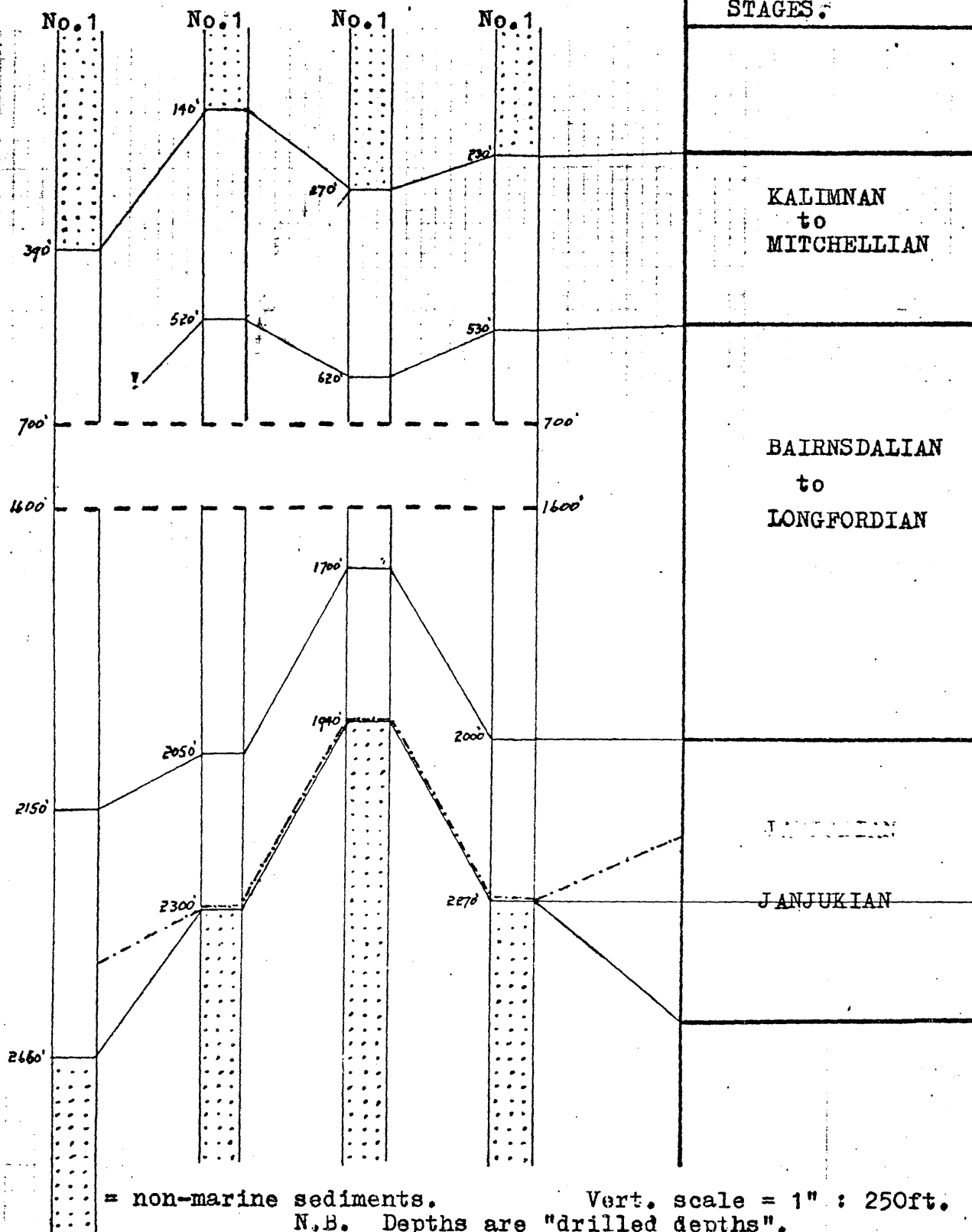
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A.P.E.A. Journ. 1964.

D.J. TAYLOR,  
Geologist

SEASPRAY MERRIMAN NORTH SEASPRAY CARRS CK.



BIOSTRATIGRAPHIC CORRELATION DIAGRAM OF WELLS IN SEASPRAY AREA.

APPENDIX 4CORE DESCRIPTIONSCONVENTIONAL CORES

CORE NO. 1, 2762' - 2782' (20'), recovered 1' of formation and 3' of  
 cavings - core barrel probably jammed with cavings.  
 2762' - 2763' (1'); Coal, brown to black, blocky, (produced  
 7 units of methane in blender).

CORE NO. 2, 4872' - 4885' (13'), recovered 11'  
 4872' - 4878' (6') Shale, dark gray, slightly carbonaceous, firm,  
 blocky, slightly fissile, reliable dips of 9 - 15°,  
 slightly fractured, with occasional Siltstone  
 laminations near the top, light gray.  
 4878' - 4880' (2') - Mudstone, light gray to light gray green,  
 blocky, occasional suspended fragments of mudstone  
 (mud chips), poor bedding, fair dips of 13°, slightly  
 fractured.  
 4880' - 4883' (3') - Graywacke, medium gray green, fine  
 grained, slightly hard, no visible bedding, occasional  
 vertical fractures, tight, no show.

CORE NO. 3, 5536' - 5556' (20'), recovered 20'.  
 5536' - 5544' (8'), Graywacke, gray green, fine to medium  
 grained, consists of quartz, dark green volcanic  
 fragments and gray rock fragments, chloritic - clay  
 matrix, friable to slightly hard, tight, fair dips of  
 40°, crossbedded, abundant vertical and oblique  
 fractures with slickensides, no show.  
 5544' - 5551' (7'), Mudstone, dark gray to gray green,  
 compact and brittle, slightly carbonaceous; Siltstone  
 laminations common, small scale faults common, highly  
 fractured and slickensided.  
 5551' - 5556' (5'), Graywacke, gray green, fine grained,  
 carbonaceous, slightly hard, micaceous, tight, dips of  
 30°, abundant vertical and oblique fractures, no show.  
 This core probably indicates close proximity to a major fault.

SIDE-WALL CORES

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SEASPRAY-1

Attempted 10, recovered 7

<u>Core No.</u>	<u>Depth</u>	<u>Recovery</u>	<u>Description</u>
1	1650'	1-1/2"	<u>Marl</u> , light gray, fine grained, fossiliferous, slightly glauconitic, soft, no show.
2	2150'	1-1/2"	<u>Shale</u> , light green-gray, calcareous, fossiliferous, soft, no show.
3	2640'	2"	<u>Shale</u> , light brown, soft, fossiliferous, with 20% glauconite pellets.
4	3216'	Nil	
5	3233'	1"	<u>Sand</u> , light brown, fine to coarse grained, unconsolidated, angular to sub-angular, poorly sorted, slightly argillaceous, good porosity, no show.
6	3248'	1"	<u>Sand</u> , light brown, fine grained, well sorted, unconsolidated, slightly argillaceous, fair porosity, no show.
7	3885'	Nil	
8	4512'	Nil	
9	4590'	1-1/2"	<u>Siltstone</u> , light gray-green, argillaceous, firm, tight, slightly micaceous.
10	4636'	1-1/2"	<u>Graywacke</u> , gray green, very fine grained, very argillaceous, tight, slightly hard, no show.

APPENDIX 5

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WATER ANALYSIS

SEASPRAY-1.

by

VICTORIA STATE LABORATORIESReport on Sample No. 252/64

Sample .. Water from Oil Bore  
 Locality .. Parish  
 District : Seaspray  
 Sender .. Arco-Woodside (Lakes Entrance)  
 Oil Co. N. L.  
 792 Elizabeth Street  
 MELBOURNE.

Particulars

No. 252  
 Bore Oil Bore Seaspray No. 1  
 Sample Drill Stem Test No. 2  
 Depth (feet) 3206 - 3254  
 Remarks Rec. 100' Drilling Mud  
 1300' Muddy Water  
 500' Sand

<u>Results :</u>	<u>Parts per million</u>	<u>Me. per litre</u>
Total solids in solution (by evaporation) . . . . .	603	
Chloride (Cl)	182	5.1 <sub>3</sub>
Carbonate (CO <sub>3</sub> )	18	0.6 <sub>0</sub>
Bicarbonate (HCO <sub>3</sub> )	91	1.4 <sub>9</sub>
Sulphate (SO <sub>4</sub> )	67	1.3 <sub>9</sub>
Nitrate (NO <sub>3</sub> )	Nil	Nil
Sodium (Na)	170	7.3 <sub>9</sub>
Potassium (K)	10	0.2 <sub>6</sub>
Calcium (Ca)	18	0.9 <sub>0</sub>
Magnesium (Mg)	0.2	0.0 <sub>1</sub>
Iron-Soluble (Fe)	0.5	0.0 <sub>2</sub>
Silica-Soluble (SiO <sub>3</sub> )	4	0.1 <sub>1</sub>
Total Hardness (as CaCo )	61	

pH  
 Rw = 12.2 ohm-m at 68°F (measured) 8.2

Senior Chemist,  
Mines Department

APPENDIX - 6

PALYNOLOGICAL REPORT ON CORE  
SAMPLES FROM WELLS SUNK IN THE  
GIPPSLAND BASIN

(added by DNRE)

Seaspray No. 1

SEASPRAY-1

Page 1 of 3

PALYNOLOGICAL REPORT ON CORE SAMPLES FROM WELLS SUNK

IN THE GIPPSLAND BASIN by: M. E. Dettmann

For: Esso Expl. Dept.

14/11/1966

Core samples taken from seven wells sunk by Woodside and partners in the Gippsland Basin yielded microfloras (see Tables 1 and 2) that provide a basis for correlation of the well sequences, both with each other and with sequences from elsewhere in the Gippsland Basin. The wells and the intervals investigated comprise: Carrs Creek No.1 between 4522 and 5507 feet; North Seaspray No.1 between 3484 and 5771 feet; Duck Bay No.1 between 2831 and 3896 feet; Seaspray No.1 between 4872 and 5556 feet; Lake Reeve No.1 between 6080 and 6635 feet; Bellbird No.1 between 995 and 2245 feet; and Woodside South No.1 between 3279 and 5816 feet. The majority of the samples yielded identifiable spores and pollen grains, but the concentration and preservation of the plant microfossils ranged from good in some samples to poor in others. As outlined below the microfloras obtained from the sediments investigated conform with Lower Permian, Lower Cretaceous, and Lower Tertiary microfossil assemblages that have been described from Australian deposits by Balme (1964), Dettmann (1963), and Harris (1965).

Carrs Creek No.1 well

The samples from 5500-07 feet and 5360-80 feet yielded poor concentrations of poorly preserved spores and pollen. Species present in the lower samples include Cicatricosisporites australiensis (Cookson) and Aequitriradites spinulosus (Cookson & Dettmann) which indicate a Cretaceous age.

The uppermost sample examined (4522-32 feet) yielded a more diverse microflora in which Dictyotosporites speciosus Cookson & Dettmann is a component. This species indicates the presence of the Speciosus Assemblage that is Valanginian-Aptian in age (Dettmann 1963). The Speciosus Assemblage

be considered to be of a similar age.

A lower Cretaceous (Valanginian-Aptian) microflora was obtained from core no.3 (2851-51 feet). This microflora contains Dictyotosporites speciosus and thus conforms with the Speciosus Assemblage. Furthermore, Cooksonites variabilis Pocock indicates the presence of the older category of this assemblage and suggests correlation of the beds with those at 2567-72 feet in Tarwin Meadows No.1 well, at 6945 feet in Wellington Park No.1 well, and at 3977 feet in Bengworden South No.1 well (Dettmann 1965a, 1965b).

Seaspray No.1 well

Poorly preserved microfloras were obtained from the two core samples examined (4872-85 feet and 5536-56 feet). The lower sample yielded Coptospora paradoxa (Cookson & Dettmann), the index of Dettmann's (1963) Paradoxa Assemblage of Aptian-Albian age. The upper sample did not provide C. paradoxa but the combined presence of Reticulatisporites pudens Balme and Crybelosporites striatus and the absence of angiospermous grains suggests conformity of the microflora with the Paradoxa Assemblage. On this basis the sediments between 4872 and 5556 feet in Seaspray No.1 well may be correlated with beds in Woodside No.1 well at 5950-55 feet, Woodside No.2 well between 4114 and 4256 feet, and Woodside No.3 well at 5386 feet (see Dettmann 1959; 1963, p.121).

Lake Reeve No.1 well

The Aptian-Albian Paradoxa Assemblage was identified in the sample from 6080-96 feet and accordingly these horizons are correlated with those between 4872 and 5556 feet in Seaspray No.1 well.

Poorly preserved plant microfossils were obtained from core no.3 at 6620-35 feet. The only stratigraphically significant species identified is Aequitriradites spinulosus that provides evidence for a Lower Cretaceous age.



North Seaspray No.1 well

Only two samples were submitted for examination. The upper one (from 3484-504 feet) provided a meagre microflora composed of species that range from Jurassic to Tertiary times. The lower sample (from 3765-71 feet) contains a rich assemblage of spores and pollen grains. Species present include Triorites edwardsii Cookson & Pike, Tricolpites gillii Cookson, and Dacrydiumites ellipticus Harris. The combined occurrence of these three species provides evidence for the existence of Harris's (1965) Triorites edwardsii Assemblage which is considered to be of Middle Paleocene age but may extend into the Upper Cretaceous. Similar microfloras have been reported from sediments at 4705-22 feet in Merriman No.1 well, from 5415-25 feet in Golden Beach No.1 well and equivalents (see Dettmann 1966b).

Seaspray No.1	Duck Bay No.1	North Seaspray No.1	Carrs Creek No.1	
c.2 4872-85' 3 5536-56'	c.7 3380-96' c.6 3699-709' c.3 2831-51'	c.6 3765-71' c.5 3484-504'	c.8 5500-07' c.6 5360-80' c.4 4522-52'	
	+			Punctatisporites gretensis
	+			Calamospora diversiformis
	+			Leiotriletes directus
	+			Acanthotriletes ramosus
	+			Cirratriradites splendens
	+			Laevigatosporites vulgaris
	+			Nuskoisporites gondwanensis
	+			Nuskoisporites rotatus
	+			Vestigisporites rudis
			+	Aequitriradites spinulosus
			+	Dictyotosporites speciosus
			+	Cicatricosisporites australiensis
			+	Cooksonites variabilis
			+	Leptolepidites verrucatus
			+	Klukisporites scaberis
			+	Reticulatisporites pudens
			+	Foraminisporis wonthaggenensis
			+	Foraminisporis asymmetricus
			+	Rouseisporites reticulatus
			+	Crybelosporites striatus
			+	Coptospora paradoxa
			+	Laevigatosporites ovatus
			+	Trilites tuberculiformis
			+	Cyathidites splendens
			+	Verrucatosporites speciosus
			+	Dacrydiumites ellipticus
			+	Phyllocladidites mawsonii
			+	Nothofagidites emarcida
			+	Proteacidites subscabratus
			+	Proteacidites adenanthoides
			+	Tricolporites microreticulatus
			+	Tricolpites gillii
			+	Triorites edwardsii

Table 1. Distribution of selected spores and pollen grains in Carrs Creek No.1, North Seaspray No.1, Duck Bay No.1, and Seaspray No.1 wells.

+ - species present

Woodside South No.1					Bellbird No.1	Lake Reeve No.1			
c.24	c.23	c.21	c.18	c.14	c.13	c.4	c.3	c.2	
5800-16'	5452-69'	4990-5010'	4332-52'	3489-509'	3279-99'	2235-45'	6620-35'	6080-96'	
									Aequitriradites spinulosus
									Dictyotosporites speciosus
									Cicatricosisporites australiensis
									Januasporites spinulosus
									Klukisporites scaberis
									Leptolepidites verrucatus
									Foraminisporis wonthaggiensis
									Foraminisporis dailyi
									Foraminisporis asymmetricus
									Reticulatisporites pudens
									Rouseisporites reticulatus
									Rouseisporites radiatus
									Rouseisporites simplex
									Cyathidites punctatus
									Crybelosporites striatus
									Pilosporites parvispinosus
									Coptospora paradoxa
									Trilobosporites trioreticulosus
									Trilites cf. T. tuberculiformis
									Cicatricosisporites hughesi
									Cicatricosisporites pseudotripartitus
									Laevigatosporites ovatus

Table 2. Distribution of selected spores in Lake Reeve No.1, Bellbird No.1, and Woodside South No.1 wells.

+ - species present

References

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- Evans, P.R. 1963. The application of palynology to stratigraphy in Australia. Proc. 2nd Symp. Dev. Pet. Resour. Asia and Far East., Min. Resour. Dev. Ser. 18(1), 285-290.
- Harris, W.K. 1965. Basal Tertiary microfloras from the Princetown area, Victoria, Australia. Palaeontographica, 115B, 75-106.

14th April, 1966.

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PE602056

This is an enclosure indicator page.  
The enclosure PE602056 is enclosed within the  
container PE903984 at this location in this  
document.

The enclosure PE602056 has the following characteristics:

ITEM\_BARCODE = PE602056  
CONTAINER\_BARCODE = PE903984  
NAME = Composite Well Log  
BASIN = OTWAY  
PERMIT = PPL/160  
TYPE = WELL  
SUBTYPE = COMPOSITE\_LOG  
DESCRIPTION = Composite Well log, sheet 2 of 2,  
(enclosure from WCR) for Seaspray-1  
REMARKS =  
DATE\_CREATED = 7/02/64  
DATE\_RECEIVED =  
W\_NO = W481  
WELL\_NAME = Seaspray-1  
CONTRACTOR = Arco Ltd/Woodside (Lakes Entrance) Oil  
Co.  
CLIENT\_OP\_CO = Arco Ltd/Woodside (Lakes Entrance) Oil  
Co.

(Inserted by DNRE - Vic Govt Mines Dept)

PE602701

This is an enclosure indicator page.  
The enclosure PE602701 is enclosed within the  
container PE903984 at this location in this  
document.

The enclosure PE602701 has the following characteristics:

ITEM\_BARCODE = PE602701  
CONTAINER\_BARCODE = PE903984  
    NAME = Composite well log sheet 1 of 2  
    BASIN = GIPPSLAND  
    PERMIT = PPL160  
    TYPE = WELL  
    SUBTYPE = COMPOSITE\_LOG  
DESCRIPTION = Composite well log sheet 1 of 2  
              (enclosure from WCR) for Seaspray-1  
REMARKS =  
DATE\_CREATED = 7/02/64  
DATE\_RECEIVED = 2/01/86  
    W\_NO = W481  
    WELL\_NAME = Seaspray-1  
CONTRACTOR = Schlumberger  
CLIENT\_OP\_CO = Arco Ltd / Woodside (Lakes Entrance)  
              Oil Co. N.L

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PE903899

This is an enclosure indicator page.  
The enclosure PE903899 is enclosed within the  
container PE903984 at this location in this  
document.

The enclosure PE903899 has the following characteristics:

ITEM\_BARCODE = PE903899  
CONTAINER\_BARCODE = PE903984  
NAME = Generalised stratigraphic column  
BASIN = GIPPSLAND  
PERMIT = PPL160  
TYPE = WELL  
SUBTYPE = STRAT\_COLUMN  
DESCRIPTION = Generalised stratigraphic column  
Gippsland Basin (enclosure from WCR)  
for Seaspray-1  
REMARKS =  
DATE\_CREATED =  
DATE\_RECEIVED =  
W\_NO = W481  
WELL\_NAME = Seaspray-1  
CONTRACTOR =  
CLIENT\_OP\_CO = Arco Ltd / Woodside (Lakes Entrance)  
Oil Co. N.L

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PE903985

This is an enclosure indicator page.  
The enclosure PE903985 is enclosed within the  
container PE903984 at this location in this  
document.

The enclosure PE903985 has the following characteristics:

- ITEM\_BARCODE = PE903985
- CONTAINER\_BARCODE = PE903984
- NAME = Geological Cross Section
- BASIN = OTWAY
- PERMIT = PPL/160
- TYPE = WELL
- SUBTYPE = CROSS\_SECTION
- DESCRIPTION = Geological Cross Section before & after  
drilling (enclosure from WCR) for  
Seaspray No 1
- REMARKS =
- DATE\_CREATED = 20/04/64
- DATE\_RECEIVED =
- W\_NO = W481
- WELL\_NAME = Seaspray-1
- CONTRACTOR = Arco Ltd
- CLIENT\_OP\_CO = Arco Ltd/Woodside (Lakes Entrance) Oil  
Co.

(Inserted by DNRE - Vic Govt Mines Dept)



PE903900

This is an enclosure indicator page.  
The enclosure PE903900 is enclosed within the  
container PE903984 at this location in this  
document.

The enclosure PE903900 has the following characteristics:

ITEM\_BARCODE = PE903900  
CONTAINER\_BARCODE = PE903984  
    NAME = Prospect Map/Control for Seaspray Sand  
    BASIN = GIPPSLAND  
    PERMIT = PPL160  
    TYPE = WELL  
    SUBTYPE = HRZN\_CNTR\_MAP  
DESCRIPTION = Control for Seaspray Sand - lower  
              Cretaceous/Prospect Map (enclosure from  
              WCR) for Seaspray-1  
REMARKS =  
DATE\_CREATED = 13/01/64  
DATE\_RECEIVED =  
    W\_NO = W481  
    WELL\_NAME = Seaspray-1  
CONTRACTOR =  
CLIENT\_OP\_CO = Arco Ltd

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PE604163

This is an enclosure indicator page.  
The enclosure PE604163 is enclosed within the  
container PE903984 at this location in this  
document.

The enclosure PE604163 has the following characteristics:

ITEM\_BARCODE = PE604163  
CONTAINER\_BARCODE = PE903984  
NAME = Lithological Log Seaspray-1  
BASIN = GIPPSLAND  
PERMIT = PPL 160  
TYPE = WELL  
SUBTYPE = WELL\_LOG  
DESCRIPTION = Lithological Log (enclosure from WCR)  
for Seaspray-1  
REMARKS =  
DATE\_CREATED = 20/01/1964  
DATE\_RECEIVED =  
W\_NO = W481  
WELL\_NAME = Seaspray-1  
CONTRACTOR = ARCO LTD  
CLIENT\_OP\_CO = Woodside (Lakes Entrance) Oil Co. N.L.

(Inserted by DNRE - Vic Govt Mines Dept)

PE906294

This is an enclosure indicator page.  
The enclosure PE906294 is enclosed within the  
container PE903984 at this location in this  
document.

The enclosure PE906294 has the following characteristics:

ITEM\_BARCODE = PE906294  
CONTAINER\_BARCODE = PE903984  
    NAME = Time-Depth Curve  
    BASIN = GIPPSLAND  
    PERMIT = PPL160  
    TYPE = WELL  
    SUBTYPE = VELOCITY\_CHART  
DESCRIPTION = Time-Depth Curve (interpretative,  
                  hand-drawn), enclosure from WCR, for  
                  Seaspray-1  
REMARKS =  
DATE\_CREATED =  
DATE\_RECEIVED =  
    W\_NO = W481  
    WELL\_NAME = SEASPRAY-1  
CONTRACTOR =  
CLIENT\_OP\_CO = ARCO LIMITED

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