

LAKES ENTRANCE

OIL SHAFT

W434



* "Sandy clay" could probably equally well be referred to as "clayey sands".

Preliminary lith. log (basal Tertiary).

- 1223.5 - 1227.5 : Brown black sandy clay, very sticky. Oil.
* 1
- 1227.5 - 1256.6 : Light brown friable calcareous sand, micaceous. More greenish (glauconitic) in the upper portions. ^{look for glauconite fall-off}
* 2
- [1228-1253.6 (No samples)]
- 1256.6 - 1263.6 : Brown sandy clay
* 3
- 1263.6 - 1267.5 : Black sandy clay containing nodules of weathered pyrite.
* 4
- ~~1267.5 - 1273.6 : Brown green micaceous sandy clay~~
* 6 ^{not 1st.}
- ~~1267.5 - 1273.6 : Dense fine-grained limestone containing polyzoal fragments + brown green micaceous pyrite clay gravelly silty.~~
- 1273.6 - 1275.6 : Gravelly rubbish. Contains polyzoa, which along with the gravelly material may be contamination. ^{Appears to have low gr. clay associated.}
* 7
- 1276 : Relatively fresh granite core with pink feldspar.
- 1276 - 1320 : Granite material, mostly weathered. [Refer p. 2]

* Limestone : 51.0% $CaCO_3$
41.7% Sand
7.3% Clay silt.

Lakes Entr. Sh. : 1273.6 - 1275.6 : 2 ft. - 8 1/2 ft.
Colquhoun No. 11 : 1233'6" - 1235. 1 ft. 6 in.

A SUMMARY OF THE STRATIGRAPHY AND PALAEOLOGY OF THE
LAKES ENTRANCE OIL SHAFT, GIPPSLAND, VICTORIA

by I. Crespin

901552 003

The Lakes Entrance Oil Shaft is situated in allotment 31, Parish of Colquhoun, about 2 miles north-east of Lakes Entrance township, and at an elevation of 90 feet above sea level. The Shaft was sunk with the object of developing, by means of low pressure mining methods, the oil-bearing beds known to exist in the lower portion of the Tertiary basin in the Lakes Entrance area. It is a circular construction with a diameter of 10 feet at the surface. It is concreted down to the depth of 1,156 ft; a smaller timbered shaft carried it down to 1,204 ft, and a winze, 5 ft by 4 ft, was used down to 1,212 ft when operations were suspended as it was considered that this depth was the margin of safety allowed above the underlying artesian waters.

It is estimated that, during mining operations, approximately 12,000 tons of Tertiary sediments were excavated. Consequently a unique opportunity was afforded the palaeontologist and geologist to study the stratigraphic sequence of Tertiary beds in the Lakes Entrance area. The author was fortunate enough to pay frequent visits to the scene of operations where she made extensive collections of fossiliferous material. From time to time she observed the various stratigraphic stages and substages of the Tertiary sequence in situ on the walls of the Shaft. The brown, Micaceous marls and fine sandstones and the glauconitic sandstone of the Janjukian Stage have not yet been found exposed elsewhere in the Gippsland area.

SCOPE OF INVESTIGATION

The methods used in collecting the samples for micro-palaeontological examination and for studying the lithologic sequence were:

1. A sample of sediment averaging 4 lb. in weight was taken by the miners at every 4 ft from below the depth of 200 ft. Unfortunately, systematic sampling was not undertaken from the surface down to the depth of 200 ft. These samples were bagged and labelled to await the arrival of the author who divided each sample, one portion being brought to Canberra, the other being retained at the Shaft. Approximately 300 samples have been subjected to micro-palaeontological examination.

2. Samples taken over a wider interval and representing each change in lithology were laid out on the ground in proper sequence, thus giving an excellent view of the character of the sediments through which the Shaft passed.

3. The bulk of the 12,000 tons of sediments excavated was dumped from platforms 30 ft high and 80 ft long, which stretched across the valley west of the Shaft. Many excellently preserved megafossils were collected from these dumps. Because of the frequent visits of the author, it was possible to know the limiting depths to within a few feet of the material exposed at the time. Also the miners and other members of the staff were on constant watch for fossils in situ, and were instrumental in obtaining many beautiful specimens (Crespin 1945, 1946). Samples of sediments and fossils were also collected from the kibbles as they came up from underground. Exact depths could be assigned to these.

STRATIGRAPHIC NOTES

An important result of the palaeontological investigation of the sediments from the Shaft is that it confirms the stratigraphic sequence of the marine Tertiary deposits in Gippsland

as recently put forward (Crespin, 1943). There is little variation in the thicknesses of the Stages and Substages in the Shaft compared with those based on small cores from bores in the vicinity. The characteristic lithology of the sediments of each Stage is also confirmed.

Furthermore, the investigation of such large quantities of material revealed the extended stratigraphic range of fossils, both micro and mega-forms, previously regarded as restricted. Such a result is inevitable when it is considered that the range of certain species in the Victorian Tertiaries has been based on material collected from surface sections which are limited in vertical extent and form small bore cores.

A short account of the Stages and Substages with their characteristic lithology and fossils as developed in the Shaft is given below:

The stratigraphic sequence of the beds is as follows:

Recent to Pleistocene	Post Kalimnan	0 - 10 ft
Lower Pliocene	Kalimnan Stage	10 - 150 ft
Upper Miocene	Mitchellian Stage	150 - 208 ft
	(Balcombian Stage	208 - 952 ft
	(i. Bairnsdale Substage	208 - 524 ft
	(ii. Batesford Substage	524 - 728 ft
	(iii. Longford Substage	684 - 952 ft
Middle Miocene	(
	(Janjukian Stage	952 - 1,212 ft.
	(i. Micaceous Marls and	
	sandstones	952 - 1,197 ft.
	(ii. Glauconitic	
	sandstone	1,197 - 1,212 ft.
		(base of Shaft)

Recent to Pleistocene (Post Kalimnan)

Ten feet of sands referable to the above age cover the marine Tertiaries at the Shaft. The rostrum of a beaked whale (Mesoplodon longirostris) was discovered at the base of this bed, but Glaessner (1945) suggested that it had been weathered out of the upper Kalimnan (Lower Pleistocene) which directly underlies these sands.

Pliocene

Lower Pliocene (Kalimnan Stage)

Unfortunately, no systematic collection of samples was made from the beds referable to the Kalimnan Stage, but the official log book showed that rich fossiliferous sediments occurred from 10 feet down to 150 feet. Material collected from the dump shortly after this depth had been passed, tended to confirm this.

The fossiliferous sandstone of the upper bed at Jemmy's Point was not recorded in the Shaft, which passed directly from the Post-Kalimnan sands into the lower fossiliferous horizon of that locality. The first fossiliferous beds exposed were ochreous sandstone which extended down to 50 feet. These overlay greenish grey sandy marls in which glauconite was common and mega-fossils fairly abundant. Many large molluscan shells were collected including Eucrassatella kingicoides, Venericardia gippslandica, Panopaea kalimnae, Chlamys

antiaustralis, Turritella conspicabilis, Fulcoraria fulgetroides and Rathytoma pritchardi. The microfossil assemblage was typical of the Kalimnan elsewhere.

Upper Miocene (Mitchellian Stage)

At 150 ft the Shaft passed into the Mitchellian Stage which persisted down to 208 ft. The upper portion of the Stage consisted of greenish grey marl with Balcombian species becoming common and with decomposed remains of molluscan shells chiefly referable to Kalimnan species. With progress downward the glauconite content gradually disappeared and Kalimnan molluscan species gave way to forms more characteristic of the upper part of the Miocene, such as Pteria (Melosarina) crassicardia and Lima (Limatula) joffroyana. The foraminifera exhibited a similar mixed Plio-Miocene assemblage.

Middle Miocene

Balcombian Stage

The Shaft afforded an excellent opportunity to study the Balcombian Stage as developed in Gippsland. It passed through 744 ft of sediments, from 208 ft down to 952 ft. The sediments consisted of bryozoal limestones, marly limestones and bryozoal marls, characteristic of the Gippsland Limestone ("Polyzoal Series"). The stratigraphic sequence of substages of the Balcombian described in Section 5 of the Bulletin (Crosby, 1943) has been substantiated by further evidence derived from the study of large quantities of sediments from the Shaft. The characteristic foraminiferal assemblage for the Balcombian was persistent throughout the 744 ft of sediments. New species have been found in the three substages which may prove of zonal value when the investigation of samples is finalised.

i. Bairnsdale Substage. This typical substage of the Gippsland Tertiaries was well developed. It extended from 208 ft down to 524 ft, and consisted of bryozoal limestones, frequently hard, and bryozoal marly limestones. The rich shelly horizon found at the top of the Substage at the type locality at Pound Swamp, Bairnsdale, at Teerloo Arm, Princes Highway and elsewhere east of Lakes Entrance, was encountered at 320 ft. Fossils such as Clypeaster gippslandicus, Stethothyris insolita, Austrolima bassi, Spondylus baileyanus, Mimites coriocensis and Serripeeten yahliensis were common. Specimens of the last named species together with the varietal form semilaevis were frequently present throughout the Substage. A band of large valves of Ostrea were exposed at 372 ft. Typical Balcombian species of foraminifera were recorded. Operculina victoriensis, as usual, made its first appearance, in downward sequence, towards the base of the Substage, at 472 ft. However, except for two occurrences, at 264 and 272 ft respectively, Amphistegina was not found elsewhere in the Bairnsdale Substage.

ii. Batesford Substage. The Shaft passed through the Batesford Substage from 524 ft down to 728 ft. The passage from the Bairnsdale into the Batesford could only be determined by the foraminiferal content. The lithology of the sediments in the Substage was white to grey, bryozoal limestone and marly limestone interbedded with bryozoal marls often green in colour and roughly bedded. The first typical Batesford Substage foraminifera to appear was Hofkerina semiornata at 524 ft. The first record of Lepidocyclina was at 580 ft and the last one at 684 ft. Cycloclpeus was not as abundant as anticipated, the only records being at 660 and 670 ft. Other species characteristic of the Batesford assemblage were usually present.

Bryozoa was abundant, but not well preserved in the marls. Amongst the larger fossils were Stethothyris insolita (common at 660 feet), Brissoopsis archeri (at 660 feet) and Nautilus cf. gealonsensis (660 feet).

111. Longford Substage. The Shaft penetrated the Longford Substage at 728 feet and continued in it down to 952 feet. The sediments were represented by bryozoal marls chiefly grey in colour. But at 852 to 860 feet a greenish, glauconitic, shelly, bryozoal limestone was exposed. It contained numerous specimens of echinoids (chiefly broken), Stethothyris, Limatula, and Serripeecten. This glauconitic bed passed down into grey bryozoal marls in which the bryozoa completely dominated the fauna. Towards the base of the Substage fragile molluscan shells began to appear. Batesford foraminifera such as Hofkerina semiornata, Cypaina howchini and Planorbulinella plana, were present in the upper portion of the Substage, but gradually disappeared as the lower limit was approached.

Janjukian Stage

Sediments referable to this Stage occurred from 952 feet down to the base of the Shaft at 1,212 feet. The two characteristic lithological units were represented:

- i. Micaceous marls and fine grained calcareous sandstones.
- ii. Glauconitic sandstone.

i. The micaceous marls and fine grained calcareous sandstones extended from 952 feet down to 1,197 feet. The top portion of this lithological unit was represented by brown micaceous marls which passed downwards into brown, fine grained calcareous sandstone. Towards the base of this unit glauconite became increasingly common and foraminifera and mollusca scarcer. The zonal foraminifera, Cyclammina incisa, Lamarckina glencensis and Vaginulina gippelandica were recorded and were associated with numerous smaller forms, including species which are of zonal importance in the overlying Balcombian. Small molluscan shells were common but the larger forms were distributed more sparingly, and were usually found in thin bands. The shells were fragile and consequently were difficult to collect intact. Amongst the commoner forms were Volutispina anticinulata, Turritella aldingae (very common), Limopsis chapmani (very common) and Venericardia janjukiensis. A well preserved specimen of Carcharodon megalodon was collected at 1,018 feet and remains of a crab, recently described as Harpactocarcinus victoriensis, at 1,000 feet, (Crespin, 1946).

A prominent feature of this lithologic unit was the occurrence of hard bands of brown, calcareous sandstone. Similar bands had been encountered in all bores in Section 1, that had penetrated the Janjukian, but little was known of their mode of occurrence. The diameter of the Shaft was such that it permitted the study of the bands in situ. They proved to be "floaters" ranging up to 6 feet in length and varying in thickness from 2 inches up to 12 inches. Fourteen of these lenticular shaped floaters were encountered in the Shaft between the depths of 1,020 feet and 1,182 feet. The rock was richly fossiliferous, but the hard nature of the rock made extraction of the fossils difficult.

Whole
Glasgow
(see reference)

ii. The Shaft passed into the glauconitic sandstone at 1,197 feet. The thickness of this lithological unit was not proved as sinking operations were discontinued at 1,212 feet. The topmost samples consisted of fine angular, quartz grains with numerous ovoid pellets of brown and green glauconite. A few foraminifera such as Anomalina grossera-

gosa, Eponides scabriculus and Elphidium crassatum were noted. The typical glauconitic sandstone was reached at 1,198 feet. This rock was very fossiliferous. Many large specimens of mollusca were present, Venericardia janjukiensis a small species of Ostrea and Turritella aldinsae being particularly abundant. Cyclammina was recorded amongst the Foraminifera.

The glauconitic sandstone was oil-bearing, but the quantity of oil available was not large enough to warrant the continuance of mining operations.

REFERENCES

- Crespin, I., 1943 - The Stratigraphy of the Tertiary Marine Rocks in Gippsland, Victoria. Bur. Min. Res. Bull. No.9. Pal. Ser. No.4. (Mimeographed).
- Crespin, I., 1946 - A Fossil Crab from the Lakes Entrance Oil Shaft, Gippsland, Victoria. Proc. Roy. Soc. Vic. 59.
- Crespin, I., 1947 - Some Tertiary Polecypoda from the Lakes Entrance Oil Shaft, Gippsland, Victoria. Proc. Roy. Soc. Vic. 60.
- Glaessner, H.P., 1945 - A Fossil Beaked Whale from Lakes Entrance, Victoria. Proc. Roy. Soc. Vic. 58, (1-2) n.s. p.25.

CANBERRA
17th October, 1947.

I. Crespin
Commonwealth Palaeontologist.

Lake Enticore Oil Shaft

Oil + Gas shows reported by H. Cook.

Just above 560' H₂S gas evident.

± 560' - 576. H₂S gas in the ground. Not much in evidence.

about 616' Methane by Test.

about 636' - 665' Several showings of gas. On occasions bubbly
continuous from water in bottom + then ceases after
some hours.

682' 15" of very porous coal rock with water charged
with gas.

752' Small band of water with a little gas.

756' - 763' Contains 2 gas shows.

Oil films seen on ground excavation.

820' - 844 Gas evident.

907' " "

Just below 1021' " "

1046' Oil films showing in shaft plentifully

~~Wings at 1046'.~~

Wings for 1156'.

± 200' ~~at present~~: 1197' at present.

N^o 10000 Horizontal hole.

Lake Entrance Oil Shaft.

W434

901552 009

Lake Ent. Dec 13/9/48.

Since beginning of year drilled from work chamber - near horizontal

- 6 holes at angle of 18° below horizontal
- 6 other at steeper angle
- 1 other near vertical.

Pilot hole drilled by Lorts. to 1223'6"
Re-spudded by Lake Ent. on 15/5/46 & drilled
to 1322'6" T.D. reached on 3/6/47.

Cored 1223'6" - 1224'6"

1224'6" - 1225'6" - Glauconite.

1225'6" - 1226'6"

1226'6" - 1227'

1227' - 1227'6"

1227'6" - 1228' - Sandy green glauconite.

1228' - 1230'

at 1230' In green mud with fine sand (Mud just firm enough to hold together)

at 1237'6" Reasonably hard and dry mud (Sample sent to Min. Dept.)

at 1240'6" Last 4' in fine brown sandstone with mica, fairly soft & dry.

1240'6" - 1241'6" As for 1240'6" (Sample sent to Min. Dept.)

1241'6" - 1276' Last 4'6" variety of granitic material + fine sand.

1276' - 1277'6" Coarse granitic rock * 2 pieces of granite recovered.

1277'6" - 1293'6" Green mud + granitic material.

T.D. 1322'6" Granite below a hard band (Sample to Min. Dept.)

Rob Spence

REP 116

24/04/86

901552 010

Telephone Call from John Clarke, Arena
advising outline of Arena's letter to
Minister confirming their discussions:

1. High cost of drilling

- A disincentive to exploration
- No on shore rigs based in Victoria
- Of cost \$0.5M 50% represents mobilisation & demobilisation costs.

2. Suggestion that government
make rigs available to assist
with two strat. wells in REP 116.

3. Entry to Lake Tyers aboriginal
reserve for exploration

4. Problems of exploration in
National Parks
State reserves.

Peter Clark

Arena Petroleum Limited

Incorporated in Victoria

901552 011

10th February, 1985

The Department of Industry,
Technology and Resources,
Oil and Gas Division,
151 Flinders Street,
MELBOURNE. 3000. VIC.

Attention: Mr R.F. Hudson

Dear Sir,

PEP 116

We are now preparing our working base map for further geological and geophysical exploration within PEP116 in accordance with our agreed programme. As you know, the Lakes Entrance oil field is located within part of our exploration area and it is therefore necessary to know accurately the location and official nomenclature of each and every well which has been drilled in the area since exploration of the field began.

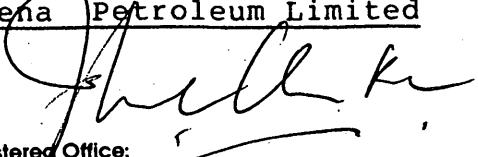
During our researches of old well files, it became apparent that there were inconsistencies between some locations and names marked on such files and the Division's official list. It is of course possible that some of these inconsistencies are due to map datum changes made subsequently. It would however be appreciated if you would confirm that we may fully rely on the list attached to your letter dated 26th January 1984, addressed to Hilditch Vine, and carrying the reference JD/ML. We are of course concerned only with those wells located within PEP 116.

While writing on this subject, we confirm the views we expressed during our meeting with Divisional officers on 30th January, to the effect that the present condition of many old Lakes Entrance wells is cause for some concern. Clearly, unless all old wells can be located and properly completed - at least all these in environmentally sensitive areas - our ability to eventually attempt to develop the field will be severely limited if not made impossible.

We know that your Division is equally concerned about the situation and it is our hope that the responsible authorities will be able to take whatever steps are considered necessary to make the area safe for further development as soon as practicable.

In the meantime, we shall, of course, be continuing with our programme of exploration throughout the area.

Yours faithfully,
Arena Petroleum Limited



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Telex: 67-8329

RC
copy Murray file

The Oil and Gas Division

901552 012

Support for the maintenance of a deep drilling facility within the Office of Minerals and Energy.

The value of the stratigraphic data gathered during the 20 years of operations of the larger drilling units of the Office of Minerals and Energy has been consistently acknowledged by the on-shore oil exploration companies.

The Oil and Gas Division believe that this role can be expanded to more closely meet the needs of the petroleum industry and thus stimulate onshore exploration. In addition, the Division is confident that, provided the drilling unit meets the normal standards required for petroleum exploration, there will be a consistent demand for contract drilling within the onshore Petroleum Tenements over the next five years. Companies such as Beach P/L, Hartogen, Lasmo Energy Ltd, Phoenix Oil & Gas NL and others, have expressed interest in contracting a Departmental rig for some of their programs. It is reasonable to assume that a rig permanently stationed in Victoria could provide competitive drilling rates because of the reduced establishment costs and local infrastructure.

The Oil & Gas Division Requirements

The Division proposes that two wells should be drilled in the Murray Basin in the 1986/87 period to investigate the Permian/Lower Cretaceous grabens known to be present beneath the basically Tertiary Murray Basin sequences. A preliminary look in the Numerkah area has already been carried out by the Geological Survey (G Pettifer, Unpub. Report 1980/43) and R. Christ and others of this Division are undertaking detailed studies. We would hope to enlist the co-operation of the Survey in refining the structures so far delineated in this area and in other targets in the north west of the Murray Basin (Victoria). Since the whole of the basin in Victoria remains to be taken up under tenement in the latest round of applications, it is the aim of the Division to stimulate renewed interest in petroleum exploration by providing new structural and stratigraphic data obtained from such drilling.

The Division is confident that drilling targets at the rate of two a year within the Otway, Gippsland, and Murray Basin (depending on the results of the proposed wells) can be justified in the terms of stimulating exploration. For example almost nothing is known of the basal Early Cretaceous in both the Otway and Gippsland Basins. The elusive Pretty Hill Formation is still considered to be a prime target in the Otway Basin for example, but it has only been intersected in a few wells. Similarly, the basal Upper Cretaceous Waarre Formation has also proved to be difficult to map seismically (ie Fahley 1). Any added information on the distribution of either would be of great importance to future exploration programs.

It should also be stressed that access to a Departmental Rig will be of considerable importance if the use of geothermal energy is to be encouraged within the State since production wells can be provided by renovating abandoned oil wells, thus saving in excess of \$100,000 in casing costs; or new wells can be drilled at relatively low costs.

B.R. Thompson
13.6.85

SHAFT	Fluid level @	34.2 m	-	112.2'
"	Bottom located @	355.2 m	-	1165.3'
	Pilot bore	1228'	Glaucanite	assumed thickness 28'

J. B. Williams
30/1/86

051560228

901552 014 16/9/96

Don

① Several pits - did he plumb to the slab?
he said 7' deep with 3' of water

② Sundrups showed the pipe is dry? - What does this mean?

③ B.T. said "a number of holes (7) - the slab?"
(so how come water be retained?)

④ Any clues on thickness of slab?

16/9

D.R. Old maning suspected with him

thinks probably only timbered deck?
Halliburton? w/inside the pipe

The pipe was for pumping out the oil

There were ^{cat} doors etc etc in the sweeps of water.

He plumbed it to 7' with a string

The water filled area was about 12' square

(He thinks the top of shaft must have been square)

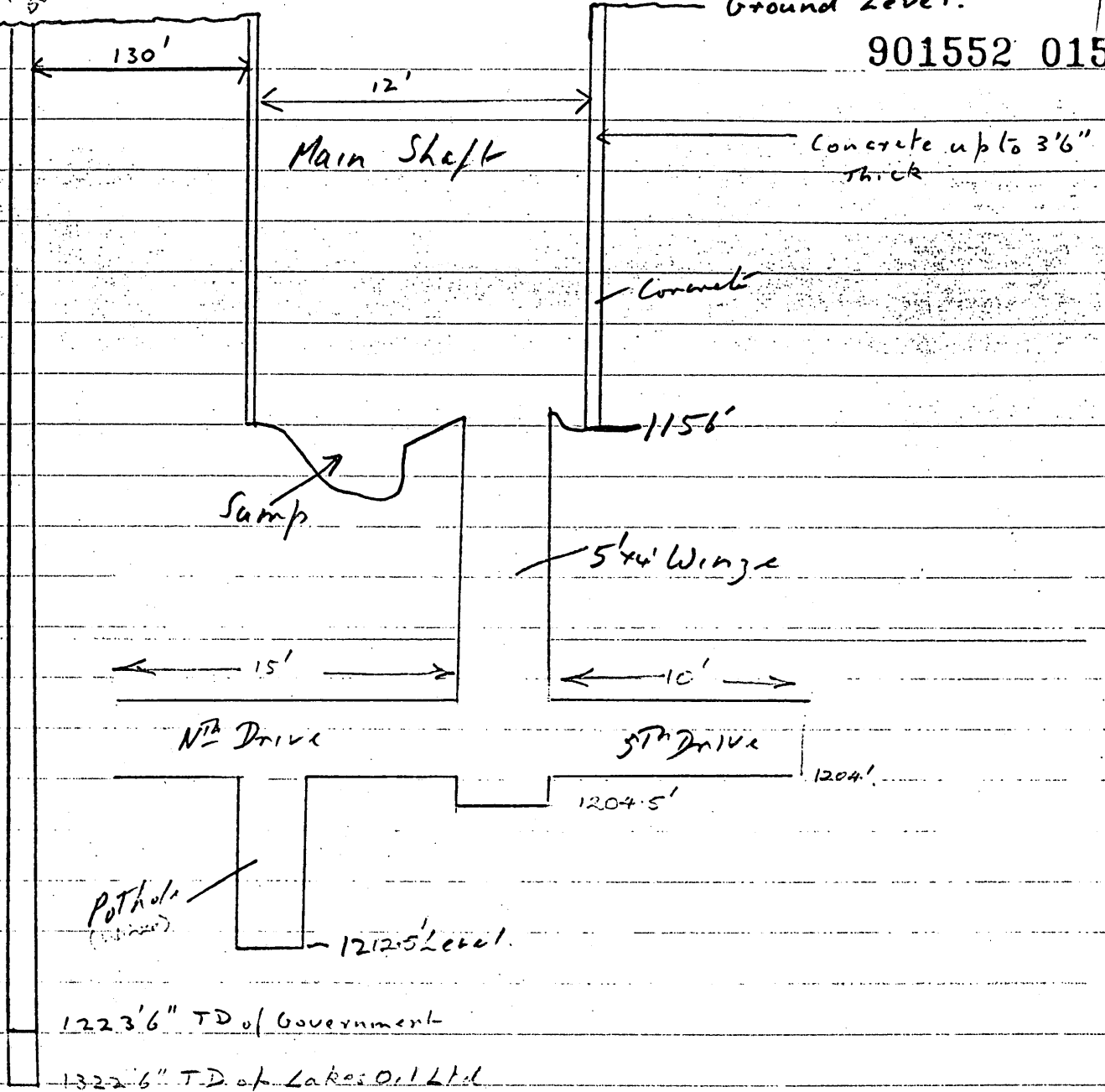
Fig 1.

CONDITION OF SHAFT AT TIME of COMPLETION of Government operations.

901552 015

Pilot Bore

Ground Level.



1223.6" TD of Government

1322.6" TD of Lakes Oil Ltd

LE. Shaft 47

901552 016

Lakes Oil bought the shaft from Clouth in Nov '45
200 galls / day.

In 1986 the fluid level in it was at 34.2 m.

The concrete lining allowed water through it during production of the oil. Most of the water entered "from a high level" - 5 water bearing layers were encountered during sinking of the shaft.

There was a pilot bore ^{130' from} the shaft to 1322' (400m)
(Shaft was 1156' + 56' of deepening)
_{34.2m} (345m)

Don Radford / R. Christ's inspection in Dec '85 useful
(attached)

Project LAKES ENTRANCE OIL SHAFT		Project No	
Project Officer B R THOMPSON		Section OIL & GAS DIVISION	
Telephone No Ext 6539275			
Reason for drilling infill shaft. 901552 017			
<p>To investigate the possibility of infilling the top sump of the shaft with earth spoil. Provided that the concrete capping of the shaft is sufficiently strong this could be accomplished using the Department's equipment. It should be filled under the supervision of the Mining Division inspectors.</p>			
Drilling on behalf of Oil & Gas Division		Funded by	
No. of holes	Av. depth	Total metreage	Rig type
Location (parish, allotment etc, plan attached) Colquhoun		Land Tenure Private - Roy Kent (Owner) Permission to drill Obtained from Required from	
Geological Summary (include details of formation tops, mineral intersections, sampling requirements etc)			
<p>The shaft is concrete lined and ¹² ft diameter to a depth of 1198 ft deep. It is capped by a concrete layer at about ¹² ft from the surface. There are a number of holes (7) in this capping into the water filled shaft, these may need capping. The strength and security of the capping cannot be guaranteed. <i>See other records</i></p>			
Completion requirements			
Signed / /19 Project Officer			
Recommendation			
Section Head / /19 Director / /19			
Drilling report			
Drilling Engineer / /19			
Approved on following terms and conditions			
Secretary / /19			
Drilling Branch to Record			
Plant No Costing Card Advise Applicant			

Lakes Entrance Oil Shaft

copied from Report of Mines Board Reports.

For 1946. "During the year Austral Oil Drilling Syndicate took over the oil shaft at Lakes Entrance from the Commonwealth and State Governments, and is engaged in carrying out the work of deepening the large shaft, and the construction of a drilling and work chamber above the glauconite, at the 1147 foot level." G. Hadden - Chief Mining Inspector.

For 1947 "During 1947, the task of completing the work chamber of the Lakes Oil Limited shaft at Lakes Entrance was finalized. This drilling and work chamber is 20 feet in diameter and has the necessary piping let into the concrete walls and fitted with stop cocks and stuffing glands through which the horizontal boring will be carried out.

This precaution will allow any artesian water under pressure to be shut off from the shaft should it be inadvertently drilled into." G. Hadden. C.M.I.

For 1948 "Having completed the work chamber and sump, exploratory drilling has been carried out from the drilling platform. The holes drilled vary in length up to 200 feet and are mostly 1 1/2" in diameter. During the boring, cores have been taken and analyses carried out at the company's laboratory at the works. Pressure gradients have also been recorded, showing pressures within the glauconite of up to 520 lb. per square inch.

Rate of yield of fluid obtained is also noted. Three treatment tanks of 2,500 gallons capacity and one of 1,000 gallons have been erected where the separation of the oil and water is effected. The first of a series of 20,000-gallon storage tanks has just been completed. Experiments have been carried out to improve the ventilation of the shaft bottom where the humidity is high. A feature of interest is the use of oil from the shaft as a fuel for the boilers which are used for steam generation. Up to the present approximately 30,000 gallons of oil have been produced." G. Hadden C.M.I.

Jan 1949. "At the Lake Entrance Ad Shaft, operations of Lakes Oil Ltd., testing operations were carried out from 15 exploration holes drilled from the work chamber 1196 feet below the surface. The exploration holes extend nearly horizontally for distances of up to 200 feet, and the dry oil recovered from fluid pumped or bailed from the points to the separators amounted to 34,410 gallons. This should be regarded as a yield from tests only, & not in commercial output."

In December the first of the holes drilled by the directional drilling method was held within the glauconite for a distance of 702 feet, producing an average of 77% dry oil."

— G. Benson — Secretary for Mining.

"Operations were continuous for the year, work being mainly concentrated on the drilling of new holes and the deepening of existing ones."

In order to facilitate the transfer of fluid to the surface a new 40 h.p. three-blade pump with a capacity of 4,000 gallons per hour against a head of 1,200 feet has been installed in the shaft bottom. This pump will deliver from the work chamber to storage tanks on the surface. ^{grouting}Grouting of the walls of the shaft was carried out to prevent the seepage of moisture, and this has had a beneficial effect on the humidity of the air in the work chamber." G. Halton 1949.

Jan 1950.

"At Lake Entrance the pumping of crude oil was continued by Lakes Oil Ltd. from the work chamber at 1198 feet below the surface, where holes have been drilled radially into the oil-bearing strata. Production was not on a continuous basis, but comprised tests during which certain holes would be turned on, measured for flow for a fixed period, & then turned off again."

Altogether 40,000 gallons of crude oil were recovered from these tests." — R. West — Sec. for Mining.

In 1951 "Oil production in Victoria ceased toward the end of the year when Lakes Oil Ltd. suspended operations at Lakes Entrance shaft after 10 years of work. From the beginning of 1951 until the time of closing, 68,180 gallons of oil would not have been obtained from tests."
 R. Neal - Security of Minerals.

Statistics for 1951.

Crude oil 68,180 ^{galls,} produced in 1951
 287,873 gallons produced up to 31/12/1951.

April 62

COMMONWEALTH OF AUSTRALIA.

901552 021

Department of Supply and Development,
Century Building,
Swanston Street,
Melbourne, C.1.
8th April, 1942.

The Hon. J.A. Beasley, M.P.,
Minister for Supply and Development,
MELBOURNE.

The Hon. E.J. Hogan, M.L.A.,
Minister of Mines,
Treasury Gardens, MELBOURNE.

Dear Sirs,

1. In accordance with your request, your Committee has investigated the position of the Austral Oil Drilling Syndicate N.L. with a view to presenting to you factual information concerning the operations of this Company in connection with the Lakes Entrance oilfield, with particular reference to Petroleum Prospecting Licence No. 139, which it is understood the Governments of the Commonwealth now contemplate resuming under the powers conferred upon the Commonwealth under the National Security Act.
2. The Committee had preliminary discussions with Mr. C. S. Demaine, the Managing Director of the Austral Oil Drilling Syndicate N.L., and then arranged for Mr. G. G. Sutcliffe, Accountant, Department of Supply and Development, and Mr. W. J. Parr, one of its members, to make an investigation of the books of the Company with a view to furnishing an itemised list of its expenditure. This is presented as an appendix to this report.
3. Before presenting the statement of expenditure, the Committee feels that it is desirable that some historical information should be furnished concerning the operations of this Company and its predecessors, in relation to the Lakes Entrance field.
4. The search for oil on the Lakes Entrance field was first initiated by the Lakes Entrance Development Company in 1924. This Company's operations disclosed the presence of oil, but commercial development of the deposit was not then believed to be practicable. This Company abandoned its leases, and an area to the west was subsequently taken up by the South Australian Oil Corporation. The Corporation and other smaller interests such as the Midwest Company put down 38 bores altogether, of an average depth of 1200 feet, and are stated to have incurred capital expenditure of about £120,000. The cost of putting down these bores calculated on a basis of footage of boring plus cost of casing would represent about £100,000.
5. These operations proved that oil occurred in a sandstone layer approximately 30 feet thick, extending over an area of about 8 square miles.
6. As in the case of the pioneer company, commercial development of the oil was not then found to be practicable. Most of the leases of the South Australian Oil Corporation were eventually forfeited to the Crown.
7. The Austral Oil Drilling Syndicate N.L. came into the field in 1936 after operations of the South Australian Oil Corporation had proved unsuccessful. This Syndicate took up land in the vicinity of land held by the South Australian Oil Corporation, and immediately concluded agreements with the Corporation and with other interests, under which the Austral Oil Drilling Syndicate secured the benefit of geological data and other essential information, together with plant and freehold land formerly the property of the Corporation and the interests mentioned.

8. Immediately prior to the entry of the Austral Oil Drilling Syndicate into the field, the Mines Petroleum Act 1935 had been enacted. This Act liberalised conditions governing the tenure of mining titles for the search for oil. It is noteworthy that immediately this liberalisation occurred, the South Australian Oil Corporation and others repegged leases which had previously been forfeited.
9. The aforementioned agreements between the Austral Oil Drilling Syndicate and the South Australian Oil Corporation and other interests were concluded after this repegging had occurred.
10. These agreements involved certain cash considerations, which are dealt with in the statement previously referred to.
11. A good deal of bargaining centered round the conclusion of the culminating agreements, and at one stage the Department of Mines was forced to intervene in the interests of the development of the field. One important factor which gave rise to this bargaining and strengthened the hand of the predecessors of the Austral Oil Drilling Syndicate was that the Commonwealth Oil Advisory Committee had issued a report favoring the development of the field by a system of repressuring, provided the field were brought under what is known as unit control, i.e. that all the leases should be held in the one interest. A further point was that the report of Messrs. Ranney and Fairbank was presented prior to the conclusion of the agreements. These bargains were concluded in this atmosphere.
12. Apart from the cash considerations, the Austral Oil Drilling Syndicate has an obligation to pay the South Australian Oil Corporation 9% of the nett profits, and the Wiluna Ajax Company 4.5% of the nett profits accruing from operations in this area. A further factor which should be borne in mind is that the majority of the Directors of the Austral Oil Drilling Syndicate were formerly Directors of the South Australian Oil Corporation.
13. The Austral Oil Drilling Syndicate from its inception can fairly be said to have displayed an unwavering belief in the potentialities of the field, and to have conducted operations efficiently. The Company has taken great care to collect and preserve the records of past operators in the area, and to submit these to critical examination. In addition to this it has put down two bores each of a depth of about 1200 feet. These bores were put down under careful supervision and every step was taken to see that the maximum amount of information was obtained by the drilling carried out. The Company has conducted more or less continuous bailing and pumping tests on these two and other bores in the area over a period of more than four years.
14. In addition to all this, the Austral Oil Drilling Syndicate has carried out research and other work designed to show up the characteristics of the oil and its possible use. This work included research into the treatment of emulsion and demonstrated that a marketable product could be obtained therefrom.
15. The value of all this work came into particular prominence during investigations carried out on behalf of the Commonwealth Government by Messrs. Ranney and Fairbank. The work of these officers was greatly facilitated by the carefully compiled records of the Austral Oil Drilling Syndicate.
16. The Committee attaches hereto a report on the financial position of the Company, including a copy of the Balance Sheet as at 28th February, 1942, together with explanations of significant features.
17. The Committee has been specifically asked to confine its observations to factual matters, but it feels that it might usefully offer some comments which may be of assistance to you in the determination of future action.

18. The question of the equity of the Austral Oil Drilling Syndicate in this project will, of course, be determined in the light of the foregoing and of the financial statement attached. Assuming that it is accepted that the Company has an equity of substance, methods of satisfying this equity will require consideration. The Committee feels that this could be done in one of two ways - either by payment of a lump sum cash consideration, or by concluding some arrangement under which the Austral Oil Drilling Syndicate would participate in any profits derived from the enterprise, on a basis of the value of its equity in relation to the total capital invested, such total capital including value of plant supplied by the Commonwealth Government.

19. As the Austral Oil Drilling Syndicate would not have derived any return from its investment until and unless the venture became profit earning, the Committee therefore considers that it should not expect payment of any lump sum consideration in respect of its equity, and that it should be well satisfied with any arrangement which would provide only for a reasonable share of the profits.

Yours faithfully,

(Sgd.) J. MALCOLM NEWMAN.

" W. J. PARR

" H. G. RAGGATT

" A. C. SMITH

LAKES ENTRANCE OIL SHAFT.

Reports of Oil and Gas contained in H.Cook's weekly reports.

Just above 560'	H2S gas evident.
± 560' - 576'	H2S gas in the ground. Not much in evidence.
About 616'	Methane by test.
About 636' - 665'	Several showings of gas. On occasions bubbling continuously for some hours only from water in bottom.
682'	15" of very porous coral rock with water charged with gas.
752'	Small band of water with a little gas.
756' - 763'	Contains two gas shows. Oil films seen on ground excavated.
820' - 844'	Gas evident.
907'	" " "
Just below 1021'	" " "
1046'	Oil films showing in shaft plentifully.
1197'	Oil present.

(From this point on oil present and tests made by measuring amounts from pits and horizontal drill holes.)

Austral Oil Syndicate

Austral Oil Shaft

W434

901552 025

Page 1 of 2

(Lat. $37^{\circ}52'09''S$
Long. $147^{\circ}59'56''E$) Pt. Colquhoun.

Cordell

Shaft 1951

It was decided that P.P. Lease No. 139 held by Austral Oil Drilling Syndicate (subsequently taken over by the Commonwealth under the National Security (Minerals) Regulations. On this lease, recommended by Dr. H. G. Raggatt, Commonwealth Geological Adviser, as the most likely site, a shaft was to be sunk and horizontal drilling undertaken into the glauconitic reservoir rock, from a chamber situated at the bottom of the shaft.

On 11th June 1945 the shaft had reached a depth of 1,117'3". The base of the shaft was approaching the glauconitic sandstone, and from information gained by boring it was known that artesian water at the base of the sandstone was under a pressure of over 600 p.s.i.. It was considered that there was danger of pressure flooding and loss of life, so the Committee decided to send Mr H. J. Cook, Supervisor of the Project to the U.S.A. to investigate. Mr Cook's report recommended that all expenditure cease forthwith.

On 3rd Nov. 1945 the depth of the main shaft was 1156'4" from its bottom a wing had been sunk to 1204'6" at this depth a dive had been extended for a short distance & from it a small wing sunk to a depth of 8' the bottom of this wing being 1212'6" from surface. Drilling from the bottom of the main shaft had shown

that the glauconitic sandstone bottomed at 1223'. This left only 10'6" of ss between the high pressure ^{artesian} aquifer water and the shaft. The Chief Mining Inspector was not prepared to allow further excavation in view of the risk involved. It was therefore recommended that the enterprise be abandoned. The venture was subsequently taken over by the Austral Oil Syndicate & this body now known as Lakes Oil Ltd has for six years carried out semi-horizontal boring from the bottom of the shaft.

Details of work carried out by Lakes Oil Ltd. from the time they took over till 21st Oct. 1947. - See under file on Lakes Entrance Shaft.

7 Oct. 1951 at Conference between (Mr Demaine) Lakes Oil - B.M.R. -
 in Min. Dept.

Mr Demaine stated that total production to 11th Sept. 1951 was 145,364 gallons. The rate of recovery over the past 5 months being in the order 3,400 to 5600. This oil contains less than 0.25% water.

W433

901552 027

0	- 1'6"	Sandy Soil.
1'6"	- 12'	Yellowish Sandy Clay.
12'	- 14'	Water Sand.
14'	- 28'	Yellow-Brown Sandy Clay.
28'	- 30'	Gravel.
30'	- 65'	Yellow Sand Caves Badly.
65'	- 90'	Sand fine white
90'	- 131'	Grey fossiliferous marl.
131'	- 199'	Grey Marl Sandy
199'	- 240'	Polyzoal Limestone with Water
240'	- 242'	Shells
242'	- 250'	Limestone white with hard bands.
250'	- 265'	Grey Sticky Marl.
265'	- 290'	Grey Sticky Marl.
290'	- 380'	Grey Sticky Marl.
380'	- 420'	Grey Sticky Marl.
420'	- 490'	Blue Grey Sticky Marl Fossiliferous.
490'	- 500'	Sticky Grey Marl.
500'	- 510'	Soft limestone with fossils.
510'	- 580'	Sticky Grey Marl with fossils
580'	- 581'	Soft limestone with fossils.
581'	- 585'	Sticky grey Marl.
585'	- 607'	Sticky Grey Marl.
607'	- 611'	Greenish Marl.
611'	- 635'	Green and Grey Marl Very Sticky.
635'	- 685'	Greenish Marl with fossils. Very sticky.
685'	- 712'	Greenish Marl with fossils. Very Sticky.
712'	- 714'	Grey calcareous shale with fossils.
714'	- 731'	Dark green rotten shale with fossils. Caving badly. At 716', 6" of Sand.
731'	- 750'	Grey & green Sticky Marl with fossils. 6" of limestone at 748'.
750'	- 765'	Grey Sticky Marl.
765'	- 812'	Grey & Green Sticky Marl with fossils. Gas at 806'
812'	- 866'	Sticky dark grey and green marl with fossils; gas still showing from 806'.
866'	- 915'	Grey Sticky Marl with fossils. Some gas still showing.
915'	- 918'	Dark Grey Sticky Marl, with fossils.
918'	- 952'	Dark green marl with fossils & latter part with streaks of brown clay.
950'		More gas showing & when gas bubbles burst on the water there is an oily film.
952'	- 956'	Dark green marl with fossils.
956'	- 961'	Brown and grey rotten shale with fossils.
961'	- 987'	Brown clay.
987'	- 993'	Dark brown shale with fossils.
993'	- 1008'	Brown clay.
1008'		Brown clay.
1008'	- 1012'	Brown clay.
1012'	- 1022'	Dark brown shale with fossils.
1022'	- 1040'	Brown Clay with fossils.
1040'	- 1042'	Brown Shale.
1042'	- 1050'	Brown shale miaceous.
1050'	- 1055'	Brown clay with fossils.
1055'		Work suspended since 2.1.43 pending raising further capital.
6" Casing to 1007'.		

Commenced drilling at 1015'5" casing run in 1010.

W433

901552 028

1015'-1066'	Brown micaceous clay	
1066'-1067'	Hard band limestone	
1067'-1078'	Brown micaceous clay	
1078'-1079'	Hard band limestone	
1079'-1102'	Brown micaceous clays.	Casing to 1083' -8"
1102'-1126'	Brown micaceous clay	
1126'-1126'9"	Hard band limestone	
1126'9"-1206'6"	Brown micaceous clay	
1206'6"-1207'	Struck glauconite. Slight showing of oil.	

Casing to 1207'

Drilling ceased 1947.

765'-812' Small flow of inflammable gas at 806'
Gas from 806'-866'.

- CASING TO 862'

W433

LAKES ENTRANCE PURE OIL COMPANY

Bore No. 1. Drilling Commenced 8.7.1942. Licence Number 128.

901552 029

0	- 1'6"	Sandy Soil.
1'6"	- 12'	Yellowish Sandy Clay.
12'	- 14'	Water Sand.
14'	- 28'	Yellow-Brown Sandy Clay.
28'	- 30'	Gravel.
30'	- 65'	Yellow Sand Caves Badly.
65'	- 90'	Sand fine white
90'	- 131'	Grey fossiliferous marl.
131'	- 199'	Grey Marl Sandy
199'	- 240'	Polyzoal Limestone with Water
240'	- 242'	Shells
242'	- 250'	Limestone white with hard bands.
250'	- 265'	Grey Sticky Marl.
265'	- 290'	Grey Sticky Marl.
290'	- 380'	Grey Sticky Marl.
380'	- 420'	Grey Sticky Marl.
420'	- 490'	Blue Grey Sticky Marl Fossiliferous.
490'	- 500'	Sticky Grey Marl.
500'	- 510'	Soft limestone with fossils.
510'	- 580'	Sticky Grey Marl with fossils
580'	- 581'	Soft limestone with fossils.
581'	- 585'	Sticky grey Marl.
585'	- 607'	Sticky Grey Marl.
607'	- 611'	Greenish Marl.
611'	- 635'	Green and Grey Marl Very Sticky.
635'	- 685'	Greenish Marl with fossils. Very sticky.
685'	- 712'	Greenish Marl with fossils. Very Sticky.
712'	- 714'	Grey calcareous shale with fossils.
714'	- 731'	Dark green rotten shale with fossils. Caving badly at 716' 6" of Sand.
731'	- 750'	Grey & green Sticky Marl with fossils. 6" of limestone at 748'.
750'	- 765'	Grey Sticky Marl.
765'	- 812'	Grey & Green Sticky Marl with fossils. Gas at 806'
812'	- 866'	Sticky dark grey and green marl with fossils; gas still showing from 806'.
866'	- 915'	Grey Sticky Marl with fossils. Some gas still showing.
915'	- 918'	Dark Grey Sticky Marl, with fossils.
918'	- 952'	Dark green marl with fossils & latter part with streaks of brown clay.
950'		More gas showing & when gas bubbles burst on the water there is an oily film.
952'	- 956'	Dark green marl with fossils.
956'	- 961'	Brown and grey rotten shale with fossils.
961'	- 987'	Brown clay.
987'	- 993'	Dark brown shale with fossils.
993'	- 1008'	Brown clay.
1008'		Brown clay.
1008'	- 1012'	Brown clay.
1012'	- 1022'	Dark brown shale with fossils.
1022'	- 1040'	Brown Clay with fossils.
1040'	- 1042'	Brown Shale.
1042'	- 1050'	Brown shale miaceous.
1050'	- 1055'	Brown clay with fossils.
1055'		Work suspended since 2.1.43 pending raising further capital.
6" Casing to 1007'.		
Commenced drilling at 1015' 5" casing run in 1010.		
1015'	- 1066'	Brown micaceous clay.
1066'	- 1067'	Hard band limestone.
1067'	- 1078'	Brown micaceous clay.
1078'	- 1079'	Hard band limestone.
1079'	- 1102'	Brown micaceous clays. Casing to 1083' - 8".
1102'	- 1126'	Brown micaceous clay.

Contd:

1126' - 1126' 9" Hard band limestone.
1126' 9"- 1206' 6" Brown micaceous clay.
1206' 6"- 1207' Struck glauconite.
Slight showing of oil.
Casing to 1207'.

901552 030

*(Logging ceased)
1947.*

COMMENTS

765' - 812' Small flow of inflammable gas at 806'.
Gas from 806' - 866'. ~~Casing to 862'.~~

PE909603

This is an enclosure indicator page.
The enclosure PE909603 is enclosed within the
container PE901552 at this location in this
document.

The enclosure PE909603 has the following characteristics:

ITEM_BARCODE = PE909603
CONTAINER_BARCODE = PE901552
NAME = Columnar Section Lakes Entrance Shaft
BASIN = GIPPSLAND
OFFSHORE? = Y
DATA_TYPE = STRAT_COLUMN
DATA_SUB_TYPE = HARDCOPY-PAPER
DESCRIPTION =
REMARKS = 03-JUL-1945
DATE_WRITTEN =
DATE_PROCESSED = Bureau of Mineral Resources
DATE_RECEIVED =
RECEIVED_FROM =
WELL_NAME = 1220
CONTRACTOR =
AUTHOR =
ORIGINATOR = HW00_SW
TOP_DEPTH =
BOTTOM_DEPTH =
ROW_CREATED_BY =

(Inserted by DNRE - Vic Govt Mines Dept)