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ENDEAVOUR OIL COMPANY U.L.
EXPLORATION REPORT ON DRILLING FOR OIL SHALE AT
CHINA FLAT AND CHURCHILL-KNIGHT AREAS: EXPLORATION
LICENCE 4/74: LAND DISTRICT OF DEVON, LOCALITY
IATROBE, NORTHERN TASMANIA.

BY

L.G.B. NIXON & ASSOCIATES

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PHOTO: Drilling with Mayhew 1000 plant at Drill Site No. 16
Northern end of China Flat Area.

- APPENDICES:**
- 1) Table I. Drilling Results in China Flat Area.
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L.G. NIXON
L.G.B. NIXON & ASSOCIATES

30th June, 1975

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ATTACHMENTS - CONTINUED

	<u>TITLE</u>	<u>SCALE</u>
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ENDEAVOUR OIL COMPANY, N.L.EXPLORATION REPORTONDRILLING FOR OIL SHALE AT CHINA FLATAND CHURCHILL - KNIGHT AREASEXPLORATION LICENCE 4/74LAND DISTRICT OF DEVONLOCALITY LATROBENORTHERN TASMANIASUMMARY

Work done prior to 1940 in the Latrobe-Sassafras and China Flat areas of the tasmantite oil shale field of Northern Tasmania indicated the possibility of 7.5 million tons of shale that could be won by open-cut mining methods.

From March to April, 1975, exploration drilling by Endeavour Oil Company N.L. tested the north-south continuity, depth and thickness of shale in these areas and cut core samples for oil extraction tests.

In the China Flat area, drilling indicates possibly 4,400,000 tons of shale, including two partly tested shallow shale areas, totalling 1,800,000 tons averaging 4.5 feet thick seam. The shale elsewhere has been eroded or is at depths too great for open-cut mining.

In the Latrobe-Sassafras district, the shale averages 5.5 feet. Partly indicated reserves of oil bearing shale amount to 1,800,000 tons with the rest of the previously inferred shale region representing a possible extension of 3,700,000 tons, but with the shale at considerable depth.

Further drilling within the above partly proved areas is necessary in order to outline the eastern and western boundaries of the

shale beds and to enable more accurate reserve estimates to be made.

In addition, these reserves may be substantially increased by exploration drilling in the region around the Adelaide Area and the area north and east of Goliath Mine. The combined potential open cut reserves for these areas may amount to 12 million tons.

Further work necessary may be summarised as follows:-

	<u>DOZING (M)</u>	<u>No. OF HOLES</u>	<u>No. OF FTs</u> <u>(MAX.)</u>
1) China Flat Area	4,800	60	3,000
2) Knight-Churchill Area	4,200	30	2,100
3) Goliath Mine Area	3,600	12	1,200
4) Adelaide Area	5,200	18	2,200

PREVIOUS WORK

a) General

From the beginning of this century until 1932 scattered prospecting, by boreholes, shafts and shallow pits, was carried out by several companies in the Latrobe-Quamby Bluff oil shale fields. Only 3 of the 13 separate shale areas in this region were prospected and tested to any extent, viz. at the 'Great Bend' of the Mersey River, west of the 'Great Bend' and the China Flat area. Mining from adits into the shale beds was carried out in the first two of these areas, and from a few small open cuts in the last.

Experimental and small-scale commercial retorting of the shale was undertaken, approximately 248,000 gallons of crude oil being obtained. A variety of products from the refining of this shale oil were marketed locally.

Following a detailed report to the government in 1932 by the Tasmanian Shale Oil Investigation Committee, all the existing companies

and individual shale owners and lessees, with one exception, were amalgamated as the Tasmanite Shale Oil Company Limited. A testing campaign involving mining, retesting and refining of the shale from the 'Great Bend' area was continued but no material advance was made and the existing operations were discontinued, proving uneconomical at the small scale of operation employed and under the prevailing prices for the petroleum products. Attention was then directed to an alternative scheme of exploiting the shale for its asphaltene content with by-products of fuel oil and siliceous residue. Laboratory research and pilot plant processing established that the oil spores could be extracted from the shale by flotation to produce a concentrate that could be converted into bitumen suitable, under test conditions, for road sealing and other purposes. A 1940/41 diamond drilling campaign in the area north of the 'Great Bend' proved an initial reserve of 516,000 tons for asphalt production but, due to insufficient government funds, the developed technique was not carried through to sub-commercial practise.

Exploration in the Knight-Churchill and China Flat areas had indicated the possibility that relatively large tonnages could be won by open cut mining methods.

Details of the earlier work done in the two areas investigated by the present drilling programme and other nearby shale areas, are given in Bull. Geol. Surv. Tas. 11 and Miner. Resour. Geol. Surv. Tas., 8 (1) and the Report of the Tasmanian Shale Oil Investigation Committee (1932) and are summarised below.

b) China Flat Area

This shale area, situated about 10 kilometers south-southeast of Latrobe, is illustrated on the geological maps as a northwest-trending

strip within the basal Permian beds and with a length of about 4 kilometres and a width varying from several hundred to a thousand metres. The inferred east-west limits and, to a lesser extent, the north-south limits are based on four lines ('A' to 'D') of boreholes and shafts sunk, by the Latrobe Shale and Oil Company, at well-spaced intervals across this area, the 'A' line being at the northwest end and the 'D' line at the southeast. Shale was intersected, at depths ranging from 72 to 149 feet (on line 'D') on all of these lines. A total of 10 boreholes and 8 shafts indicated a shale thickness varying from 2 to 4.5 feet, the thinner zone being at least partly due to core loss in boreholes, but averaging 3 to 3.5 feet. Significant areas of shale at generally less than 50 feet are suggested around the 'B' and 'C' lines, being further indicated by 2 additional shafts and an excavation in a surface outcrop near the 'B' line, and by Richard's quarry and two other shafts near the 'C' line. A sample from the 4 foot shale seam in Richard's quarry yielded 29.4 gallons per ton of crude oil. Southeast of line 'D', a borehole by the Adelaide Oil Exploration Company was sunk to 585 feet and proved no shale and just to the east and across the Mersey, on the Native Plains estate, three more boreholes sunk by this Company intersected shale deepening to the southeast, at depths ranging from 305 to 913 feet. Thus there does not appear to be any continuation of shallow shale occurrences in this direction. To the northwest of line 'A' and between it and the shale outcropping on Oliver's block, south of the 'Great Bend', the Latrobe Shale and Oil Company's line 'H' of boreholes which bottomed on conglomerate, proved barren, as did Hedditch's three shafts in this area. This, as indicated by Twelvrees, suggests a shallow basement and the absence of the shale in this area.

On the basis of the limited work described above, Twelvrees

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estimated a shale area of approximately 500 acres, with successive faulting bringing the shale seam generally to within 100 feet of the surface. He calculated the reserves to be 3,000,000 metric tons, assuming a shale seam averaging four feet in thickness. The 1932 report extended the area, on the basis of geological evidence only, to 776 acres and assumed a 3-foot average seam to obtain a tonnage of 3,492,000.

c) Knight-Churchill

This shale area is situated approximately 5 kilometres southeast of Latrobe. The area is shown on the old maps as a north-northwest trending strip within basal Permian beds and with a length of about three kilometres and a width of several hundred metres in the south, 'bulging out' to about 1,000 metres in the north. The inferred limits of this shale field are based mainly on geological evidence. However, the limits of possible extension of shale to the north, northeast and southwest are set by the Mersey Valley Oil Company's bores No. 1 to 6, with depths of 192 to 1,000 feet, none of which intersected shale. Within the shale field, an apparently continuous shale seam outcrops in creeks at three localities: (1) 'Churchill's Area', at the southeastern end; (2) approximately 1,000 metres northwest of Churchill's Area, on Carey's block; (3) 'Knight's Area', about 800 metres further northwest. The shale in Churchill's Area has been intersected by two shallow pits and a cut into the creek bank next to the outcrop, and that in Knight's Area by an 18 foot shaft (No. 6 of the Tasmanian Shale and Oil Company, N.L.). Two shallow shafts sunk between Churchill's Area and Carey's block did not intersect shale and nor did the Tasmanian Shale and Oil Company's shafts No. 7, 30 feet deep, and No. 8, a few feet deep, in Knight's Area, ^{but} all these shafts are considered to have been too shallow to cut the shale horizon. Nos. 3 and 5 of the five government

boreholes in Knight's Area intersected shale at depths of 200 feet 9 inches and 11 feet 5 inches, respectively, but their exact positions are not known.

Outcrops indicate a shale thickness of about 4 feet and this has been taken in the past as an average thickness for the calculation of reserves. From the scant evidence above, Twelvrees suggested that the shale occurred over an area of 330 acres, giving a reserve of 1,980,000 tons. Reid listed an 'actual' reserve of 1,620,000 tons over 270 acres, with an additional probable reserve of 378,000 tons over 63 acres. The Tasmanian Shale Oil Investigation Committee approximated the shale area to be 400 acres, giving a reserve of 2,400,000 tons.

OWNERSHIP

Exploration Licence No. 4/74 was issued to L.G.B. Nixon of Adelaide up to 1st November, 1974. On 17th September, 1974, Nixon signed a "Transfer of Lease or Licence" document in favour of Endeavour Oil Company N.L., of Melbourne. The application for transfer together with an extension until 1st May, 1975, was accepted by the Department of Mines, Tasmania. Exploration Licence 4/74 covers an area of about 460 square kilometres containing most of the known oil shale areas in the Latrobe-Quamby Bluff shale region and is defined precisely in the paragraph below.

LOCATION & ACCESS

Exploration Licence 4/74 is defined as follows:-

Commencing at a point which is the intersection of the metric co-ordinates 465,000 M.E. and 5,435,000 M.N., thence westerly to co-ordinates 439,000 M.E. and

5,435,000 M.N., thence southerly to co-ordinates 439,000 M.E. and 5,420,000 M.N., thence easterly to co-ordinates 458,000 M.E. and 5,420,000 M.N., thence southerly to co-ordinates 488,000 M.E. and 5,410,000 M.N., thence easterly to co-ordinates 485,000 M.E. and 5,410,000 M.N., thence northerly to the point of origin.

This area covers private land and state forest within the Mersey district of Northern Tasmania. The main oil shale occurrence lie within about 10 kilometres south from the town of Latrobe and on both sides of the Mersey River, which winds its present course northwards through generally north-trending hills of dolerite, basalt, conglomerate, and schist. The undulating China Flat Area, crossed by a number of south-west trending creeks, is bounded to the northwest by Bulverton Hill (Lower Palaeozoic conglomerate), to the northeast by a hill of Proterozoic schist and to the east and south by the Mersey River Valley. The Knight-Churchill Area is more hilly, with maximum relief of the order of 200 feet, and is bordered to the west by the flood-plain of the Mersey and to the east by a string of basalt hills, the largest being Sagers Hill.

The climate in the area is generally mild with a rainfall averaging 35 to 40 inches per year.

Both the areas investigated are covered by fairly dense secondary (logging having been carried out at some earlier time) eucalypt forest with a ground cover of bracken and grasses. Thick tree swamps generally surround the numerous creeks. Elsewhere, and in the northwestern corner of the Knight-Churchill Area, the ground is mainly cleared, for mixed farming.

Access to, but not within, the shale areas is generally good. Latrobe is only about 11 road kilometres south of Devonport, a major

air and shipping port and supply centre situated at the mouth of the Mersey. A railway line runs along the western side of the Mersey up to the north coast through Latrobe and Devenport and southerly to Deloraine. A first-class bitumen road follows a similar course, providing access to the three fairly good quality dirt roads running eastwards into the China Flat Area: the Hogg's Bridge road, past and just south of the shale area, and the Native Rock road, across the middle of it, and another road further north. On the east side of the Mersey the bitumen road from Latrobe south via Sassafras to Deloraine provides access to the good dirt road running into the northern tip of the Knight-Churchill shale Area, and to the old Deloraine coach road in the south of the area. After rain, due to the boggy conditions, this coach road is passable, with difficulty, only to four-wheel drive vehicles.

Tracks were bulldozed (by a local contractor) through the forest to provide access, from the above dirt roads, to drill sites. In the China Flat Area approximately 6,900 metres of track was bulldozed from a point about $1\frac{1}{2}$ kilometres south of Hogg's Bridge in a northwesterly direction, along the axis of the inferred shale area. In the Knight-Churchill Area a total of approximately 5,760 metres of track was bulldozed in four sections as described below. From the old Deloraine road one section extends about 420 metres northwest to Churchill's Area and then, after a short break, a further 1,800 metres, from the north bank of Bennett's creek along the western edge of the shale field to Knight's Area. From a point about 550 metres further west along the old coach road another section of track extends for about 360 metres to the southeast and 760 metres to the northwest. In the north of the area, a 600 metre track runs south-southwest to connect, in

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Knight's Area, with the eastern section off the Delorains road. A dirt road, of poor standard but accessible except after heavy rains to two-wheel drive vehicles, provides access to the final dozed section, which extends for 820-metre north-south through the central northern part of the inferred shale field. Due to heavy rains in the week prior to the commencement of drilling all these bulldozed tracks were generally boggy, the creek crossings swampy and in several cases inaccessible to even four-wheel drive vehicles. A bulldozer was thus required to be on permanent standby to assist in moving the rig and water tank between drill sites.

REGIONAL GEOLOGY

The oldest rocks in central Northern Tasmania are isolated 'nuclei' of Precambrian quartzites, pelites and amphibolites, varying from the strongly metamorphosed (up to garnet-amphibolite grade) Forth Nucleus to relatively unmetamorphosed regions such as that around Badger Head. Due to the intervening Penguin Orogeny, these rocks show unconformable contacts with a cyclic Cambrian sequence of marine siltstone, greywackes and conglomerates, and tuff, acid and basic volcanics. This sequence is, in turn, unconformably overlain by a generally shallow-water Ordovician sequence, consisting of up to several thousand feet of siliceous conglomerate, passing upward into interbedded grits, slates and fossiliferous sandstone and topped by up to 5,000 feet of massive bluish grey shelly Gordon Limestone, succeeded by Silurian-Lower Devonian sandstone and mudstone. A series of north-northwest to northwest trending folds, with superimposed thrust and wrench faults, were produced in these Lower Palaeozoic and Proterozoic rocks during the mid-Devonian Tabberabberan Orogeny, followed by the intrusion of granitic

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batholiths and stocks. The horizontal to gently dipping Permian sediments were laid down in the regional synclines resulting from this Tabberabberan folding.

The Basal Conglomerate which begins the Permian sequence is a siliceous conglomerate with a quartz sand matrix, granitic and gneissic glacial erratics and interbedded sandstone, and is overlain by the thick predominantly mudstone sequence in the Spreyton Beds of Lower Marine age. These are succeeded by the Mersey Coal Measures, including terrestrial, coastal plain, quartz sandstone and siltstone and carbonaceous siltstone and coal, followed by Upper Marine partly fossiliferous mudstone, siltstone and sandstone. Tertiary clay, sand and conglomerate and Quaternary talus and residual gravel are the only post-Palaeozoic sediments preserved to a significant extent in the area. The Permian beds are intruded extensively by Jurassic dolerite dykes and sills and cut off by Tertiary basalt flows.

Faulting, sometimes associated with this igneous activity, is widespread, varying from large-scale dislocations to intricate networks of minor faults, with displacements varying from a few to at least a hundred feet, ^{making} detailed stratigraphic correlation difficult.

LOCAL GEOLOGY

Most of the rock units described above, outcrop in the Latrobe-Railton area, as shown on the Sheffield one-mile sheet, published by the Tasmanian Mines Department Geological Survey in 1959. The main exceptions being the Cambrian and Silurian sequences and Devonian granite. A belt of Precambrian quartz-sericite and mica schist, possibly an outlier of the Forth Nucleus, extends along the course of the Mersey for about 8 kilometres from Bonusy's Creek, near Latrobe, south to the vicinity of

Hogg's Bridge. This belt is bordered to the east and west by Permian beds containing a number of oil shale areas and separated by faulting into a number of more or less separate blocks at different altitudes. The Permian beds east of the 'Great Bend' in the Mersey Valley unconformably overly Precambrian schist to the west and extend eastwards under the Tertiary basalt of Sassafras Plateau and contain the Knight-Churchill and Paramatta shale fields. The Knight-Churchill Area itself extends eastwards under the Tertiary basalt on Sagers Hill and Oppenheim Hill. It is limited to the north by a major east-northeast trending fault, which is associated with dolerite and basalt, and to the south by outcrop of basal Permian conglomerate. ^{west} East of the 'Great Bend' another northwest trending belt of lower Permian beds contains the China Flat and Oliver's block oil shale areas. These beds are faulted against Precambrian rocks to the east and underlain to the west by Ordovician Sandstone and conglomerate, where they overlie a belt of Railton Limestone, which is the Gordon Limestone equivalent, exposed in the Goliath and Blankhorn quarries, near Railton. To the north the Permian beds are separated from the shale area west of the 'Great Bend' by a major north-east trending fault, again associated with dolerite and basalt. Another major fault, of similar orientation and with downthrow to the southeast, passes through the middle of the China Flat area. Further, the occurrence of Upper Marine beds in a quarry near Hogg's Bridge and in the Mersey River bank south of the bridge suggests large scale down-faulting in these regions.

The Permian outcropping in the above areas consists mainly of Lower Marine Spreyton Beds. Previous drilling in the Knight-Churchill region has shown the beds in this area are composed of up to 611 feet of bluish grey mudstone, consisting of sandy, fossiliferous and pebbly

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mudstone and minor sandstone with thin (up to 10 feet) sandstone conglomerate interbeds and up to 50 feet of conglomerate near the base. The matrix of this latter conglomerate is not specified but it is referred to in several of the drilling logs as being underlain by mudstone and so it does not appear to be the basal Permian conglomerate, which may be absent in this area or at least thin and discontinuous, since 'quartz conglomerate' is recorded in one case as overlying the quartzite and quartzite schist basement. The present drilling, in the south of the area intersected up to 45 feet of conglomerate, drilling having been halted within the conglomerate since it was known to occur near the base of the Spreyton Beds, below the oil shale. This conglomerate generally consists of subangular to subrounded pebbles predominantly of quartz, pinkish-red quartzitic sandstone and grey quartzite in a bluish-grey mudstone matrix. Drill hole 23 bored through this mudstone conglomerate into possible Basal Conglomerate, containing foliated quartzite pebbles in a white quartz sandstone matrix. Since the present drilling stopped just below the shale horizon, a complete section of the Spreyton Beds was not obtained from any one drill hole but correlation, assuming no significant faults, between drill holes 25 to 27 and the shale outcrop in Bennett's Creek, near hole 26, suggests that the shale occurs in this area at a maximum of about 50 feet above the mudstone conglomerate described above. The shale is immediately overlain and underlain by beds varying, from soft mudstone to harder sandy mudstone, similar to the matrix of the shale itself, and to the rest of the Spreyton Beds. Pebbles, predominantly of white quartz sandstone, quartz and grey quartzite/and sometimes subelongated parallel to bedding. Aggregate and thin veins of fine grained sulphide (pyrite and/or marcasite)

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sometimes occur. Only occasional calcareous fossil fragments were seen in the Spreyton Beds except in drill hole 38, which intersected 45 feet of light grey muddy calcareous sandstone probably above the shale, containing fragments of crystalline calcite and fossils, some of which have been identified as bryozoan in origin. Further, sandy mudstone with pebbles and calcite, is recorded at about 300 feet above the base of the Spreyton Beds in two of the Mersey Valley Oil Company's bores in this region, in one case with associated marine fossils. North and northeast of the Knight-Churchill shale Area, the Spreyton Beds lie at some distance beneath the surface and are overlain by the Mersey Coal Measures which, from previous drilling, consists of a minimum of 497 feet of mudstone and sandstone, pebbly in places and or/fossiliferous, and containing a narrow coal seam near the base. The Mersey Coal Measures also outcrop to a limited extent, within the inferred shale field as shown by borehole 37 of the present testing campaign, which intersected 20 feet, from 30 to 50 feet below the collar of light grey, fine-medium grained sandstone including an approximately 2 foot thick coal seam near the top. The interbedded fine sandstone and blue-grey mudstone below this coal bearing unit probably represents the top of the Spreyton Beds. The base of the Mersey Coal Measures is also seen in borehole 36, where fine to coarse-grained quartz sand was intersected from the surface down to 65 feet.

In the China Flat Area 'ancient' conglomerate' is reported as underlying the shale-bearing mudstone at depths of 6.5ft. to 21.5ft. This conglomerate is probably equivalent to the mudstone conglomerate intersected, below barren mudstone, in boreholes 6, 9, 10 and 17 to 20, quite similar to that intersected in borehole 23. A thin bed of Basal mudstone conglomerate Conglomerate possibly underlies this, /although to the east and across the

Mersey, on Native Plain, oil-drill logs generally record only pebbly, sandy and fossiliferous mudstone, indicating a thickness of up to at least 570 feet for the Spreyton Beds in this area, above the quartzite basement, with apparently no significant extent of conglomerate of any type (except in one hole, where 29 feet of quartz conglomerate, immediately underlying the shale, was reported). The above remarks concerning the Spreyton Beds in the Knight-Churchill Area can also be applied, from the present drilling, to the China Flat Area. Correlation is again hindered by frequent faulting but the shale again appears to occur within 50 feet above a fairly thick mudstone conglomerate, apparently near the base of the Spreyton Beds, and is overlain, where the geography allows, by at least several hundred feet of variable mudstone. Two feet of grey pebbly sandstone, with numerous calcareous shell (including brachiopod) fragments was intersected at 80 feet in borehole 2, but similar fossiliferous horizons were not seen elsewhere.

ECONOMIC GEOLOGY

a) Distribution of the shale

Tasmanite oil shale is restricted to the central and north-western parts of Northern Tasmania occurring there mainly in the Latrobe-Quamby Bluff regions with an outlying field in the vicinity of Ganah, about 85 kilometres to the west. In the Latrobe-Quamby Bluff field, the shale occurs in 13 areas, separated by faulting, dolerite intrusions, and basalt flows, over a length of 45 kilometres and a width of 12 kilometres, along the margins of a narrow seaway inferred to have extended southeast from Latrobe in Lower Permian times. Eight of these shale areas occur between Latrobe and Merseylea and only the outlying areas further to the south and southwest, at Beulah, Kimberly, Chudleigh and Quamby

Bluff, are not covered by E.L. 4/74.

b) Nature of the shale

The shale consists of numerous disc-like spore cases, of an ancient plant termed Tasmanite punctatus, set in a matrix of ~~black~~-grey mudstone, varying in nature from soft and clayey to moderately hard and sandy. Predominantly siliceous pebbles are sporadically distributed throughout and minor pyrite and marcasite and marine shelly fossils are sometimes seen. The spore cases, 0.3 to 0.5 millimetres in diameter, are generally amber in colour, although sometimes deep red. The amber of these spore cases gives a characteristic light brown colour to the richer shale, which, owing to the fact that the spore cases are flattened parallel to bedding and welded together in overlapping layers, is also finely laminated and very fissile. Across the bedding planes, however, the shale breaks unevenly and with great difficulty.

The waxy organic substance, or 'kerogen', of the spore cases yields, a crude oil on heating. The richness of this oil is proportional to the amount of kerogen, that is, number of spore cases, it contains. Previous work has revealed a variation from 59.2 gallons per ton for the richest shale, with 35.9% kerogen, to 4.6 gallons per ton for the poorest, with only 7% kerogen. The oilyield is apparently not appreciably affected by weathering of the shale.

The thicknesses of shale indicated by previous work in the China Flat and Knight-Churchill Areas are given in an earlier section. In the China Flat Area, the drilling just completed has revealed a thickness varying from approximately 2 feet to 5 feet 5 inches, with an overall average of 4.5ft. (See Table 1). These thicknesses are approximate since coring was commenced below the top of the shale horizon in holes 7, 8, 11B, and core recovery was sometimes less than 100% in holes 7, 11B, 12B, consequently the true thicknesses may be up to 6 inches greater in

some cases.

There is a gradual increase in kerogen content in the overlying and underlying mudstone towards the oil shale beds, which are defined, for the purposes of this programme, as having been reached when the spore case density has increased to between 1 and 2%.

The richness of the oilshale, as determined by the density of oil producing spore cases, varies considerably within the horizon, both vertically and laterally (between boreholes).

It has been previously reported that the shale usually consists of 2 main seams, yielding greater than 30 gallons of oil per ton, separated by a band, generally a half to two feet thick, yielding less than 10 gallons per ton. In the present boreholes, a general pattern of two rich layers, up to 2 feet thick, separated by a poorer band, less than 1 foot thick, is evident in most cases but in borehole 128 two bands of low to moderate kerogen content are separated by a 17 inch very rich shale seam. Moreover the general pattern above is often partly obscured by a continuous smaller scale variation in kerogen content. In the Knight-Churchill Area the thickness of shale intersected varies from 4 feet to 5 feet 9 inches, with an overall average of about 5½ feet (See Table 2). The above remarks concerning core loss can also be applied here, the above maximum thickness of shale having been recorded in the only borehole in which core recovery was complete. Variation of kerogen content within the shale horizon is again significant and there is a moderately well defined vertical pattern of 3 rich seams separated by two poorer bands. The variation in richness between top, bottom and middle seams does not seem to be consistent from borehole to borehole, but there does appear to be a trend in thickness variation, the bottom seam generally being the thickest (12 to 14 inches),

followed by the middle seam (7 to 12 inches), and then the top one (less than 9 inches). The poorer bands which generally occur above and below all three rich seams, are 6 to 12 inches thick.

DRILLING

Objectives

Exploration drilling was carried out in the China Flat and Knight-Churchill shale Areas with the following objectives:-

- 1) To drill lines of holes along the inferred axes of the shale deposits in order to establish their continuity and, in the China Flat Area, also to test for extensions northwards to Oliver's block.
- 2) To test the depth of overburden and to determine if faulting has taken place, and if so what are the displacements on the faults.
- 3) To determine the thickness of the oil shale beds.
- 4) To obtain core for oil extraction tests to determine grades.

Operations

The drilling rig used was a Mayhew 1,000 (See photo attached).

It was initially planned to do only air-drilling but after caving led to the abandoning of the first hole drilled (borehole 4, in the China Flat area) ^{mud or water injection} drilling was used when problems were encountered with air-drilling such as for example, caving of poorly consolidated pebbly horizons, or clogging of the hole with sticky clayey soil. A water tank was hired locally and water was obtained from nearby streams, sometimes necessitating a short halt in drilling, since the drilling team consisted only of the driller and one off-sider. Open-hole drilling was carried out with 4 $\frac{1}{2}$ inch outer diameter tungsten-tipped blade bits, replaced by roller bits for drilling of the harder, pebbly and conglom-

erate, horizons. For coring of the shale horizon, tungsten-tipped rebuilt core bits and a 10 feet core barrel were used. Core recovery varied from 47 to 100 per cent but was generally greater than 80 per cent.

Initially, the open hole drilling rate averaged about 40 feet per hour, and 60 to 80 feet per hour in the softer alluvial material near the surface. Initially drilling was often kept below the maximum rate possible in order that only a little, of the oil shale horizon might be drilled before the shale became apparent in the cuttings and coring was commenced. After boreholes 4 to 10 had been drilled, however, it was found to be more economical, if the driller was paid on hourly rather than footage rates, to drill at a maximum speed until the shale was intersected and then, in order to obtain a complete shale core except for loss during coring, to drill an adjacent hole and commence coring a few feet above the depth at which the shale had become noticeable in the cuttings in the first hole. This practice had the additional advantage of allowing the whole oil shale horizon to be cored. Thus, from borehole 11 onwards, two holes (11 and 11B, 12 and 12B etc.) were drilled at the sites where the shale was intersected, unless this was at relatively great depth. Open-hole drilling rates ranged between 100 to 150 feet per hour, but reduced to between 40 to 60 feet per hour in harder (conglomerate) layers. The rates of coring was much slower, varying from 5 to 20 feet per hour.

CHINA FLAT AREA

Drilling began in the China Flat Area on the 21st March and continued until the 9th April. Surveying of the drill sites and the doped access track in this area was completed on the 21st March. Twenty-three boreholes, totalling 1,475 feet 3 inches, including 54 feet 3½ inches of coring, were drilled at 18 different sites as shown

on the map attached. The drill sites are spaced along the axis of the inferred shale field at an average of 375 metre intervals, except for borehole 6, drilled approximately 175 metres south of the proposed site because of the steep southern bank of Redwater Creek, which made it impossible to drill there. It was proposed to drill the five most northerly holes, boreholes 16 to 20, along a line displaced slightly to the west relative to that connecting the other boreholes in this area, in an attempt to avoid intersecting dolomite known to outcrop just north of drill site 14. However, the access track was mistakenly dozed to the north of drill site 16 before diverting to the west, and so borehole 15, placed west of 14 in the proposed programme, was not drilled. Borehole 1 also was not drilled, after boreholes 2, 3 and 4 failed to intersect the oil shale.

In the Knight-Churchill Area, surveying of drill sites and tracks began on the 6th April, and completed on 18th April. From the 10th to the 18th April, 21 boreholes, totalling 1,939 feet 1 inch, including 46 feet 8 inches of coring, were drilled, at 18 different sites. These sites are spaced at approximately 375 metres intervals. Boreholes 21 to 23 were drilled along a northwest trending line, several hundred metres southwest of the inferred shale field. Two drill sites further along this line to the northwest were not drilled when inspection of the area around them revealed pre Cambrian mica schist outcrop and float. Boreholes 24 to 30 were sited along a line extending from a few hundred metres south of the inferred shale field northwest past Churchill's Area, along the western edge of the field to Knight's Area. North of Knight's Area, the north-northeast trending line of boreholes designated 31 to 33 continue to follow the edge of the shale field. Approximately 375 metres east of hole 31, a north-

south line to boreholes designated 34, 35, 36 and 36, and a further 375 metres to the east, borehole 37 were drilled to test the inferred easterly bulge in the field in this region. Because of the failure to intersect shale in boreholes 32 to 37, it was decided to drill borehole 38, in a local topographic low down to 215 feet which was the maximum depth possible with the equipment available, in order to get more information about the stratigraphy at depth in the area and to assist in explaining the absence of shale near the surface.

Since the drilling programme was aimed primarily at investigating shale at depths shallow enough to allow open cut mining, boreholes passing through barren mudstone were abandoned at about 150 feet. When conglomerate was intersected drilling was generally discontinued at about 20 feet within it, since only very thin conglomerate beds are known to occur above the shale.

RESULTS

The results of the drilling carried out in the China Flat and ~~Engelhardt~~ Churchill Areas are shown in Tables 1 and 2, respectively, and in the sections attached.

China Flat Area

Oil shale was intersected by 10 holes, at 7 different sites, in this area, at depths varying from 4.5 to 70.6 feet, indicating the occurrence of a probably originally continuous but now completely faulted and partly eroded seam along a length of approximately 4.2 kilometres. Due to this faulting and erosion and to the shallow dip of the shale horizon, there are only two relatively small areas within this China Flat field where drilling has indicated a significant extent of shale at moderate depth, that is, less than 70 feet.

shale

The first of these shallow/areas is just south of the ~~North~~

Rock road and includes line 'C' of the Latrobe Shale and Oil Company's bores, Richard's Quarry, and boreholes 7 and 8 of the present drilling programme. The maximum depth at which shale has been intersected in this area is 27.5 feet, but, due to the probable shallow northeast dip, calculated to be $1\frac{1}{2}^{\circ}$ by early workers and to topographic variations, the shale may occur at depths in excess of 70 in some parts of the area. The average indicated thickness of oil shale in this area is about 4.5 feet.

A number of minor faults have been detected: a north-south fault, with displacement of the order of 20 feet, is indicated by Line 'C' of bores, an east-west fault is visible in Richard's Quarry, and another east-west fault, with displacement of probably less than 50 feet, is suggested by the fact that the shale occurs at about the same depth in boreholes 7 and 8.

To the southeast of the above area is the valley of Redwater Creek, where the shale has been eroded, unless faulting not detectable with the relatively large spacing of drill holes in the present programme has occurred. Borehole 6, which intersected interbedded conglomerate and mudstone, appears to be below the shale, as expected from the depth of shale in boreholes 7 and 8. The occurrence of shale at about 57 feet in borehole No. 5 indicates an easterly trending fault with a minimum downthrow of about 20 feet of the southeast block, between this borehole and No. 6. A little further south, at least 2 more faults are indicated by the failure of borehole 4B to intersect shale despite the occurrence of shale, at depths of 72 to 149 feet, in the old Line 'D' of bores, less than 100 metres south of borehole 4B. Since, as far as can be deduced with the frequent faulting, the

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shale is underlain by less than 50 feet of mudstone in this region, it is probable that drillholes 2 to 4 bottomed above the shale, which may occur in this part of the area at depths of up to several hundred feet as is known to be the case at Native Plain to the east. However, since the oil shale on Native Plain is recorded in drill logs as being underlain by up to 203 feet of mudstone, it is possible that the present boreholes were collared beneath the oil shale horizon, the shale having been eroded.

The second shallow shale area located within the China Flat field occurs about one kilometre northwest of the Native Rock road and has been explored by several small open cuts and the Latrobe Shale and Oil Company's line 'B' of bores and shafts, in addition to boreholes 11 and 12 of the present campaign. Shale has been intersected at depths of up to 71 feet in this region but generally seems to occur at less than 50 feet and has an average thickness of 4.5 to 5 feet. A dip of a few degrees in a northerly direction is indicated by a section drawn through drillholes 11 to 13 and supports calculations by earlier workers using data from old workings. Comparison of the depth of shale along line 'B', in old bores, and in boreholes 11, 12 and 13 (See Fig. 1), suggests the occurrence in this region of at least 2 minor easterly trending faults, with maximum vertical displacements of about 30 feet. Sections drawn through old bores and shafts in the area indicate two northwest trending faults, with maximum displacements of 13 feet and 85 feet respectively. A major east-west fault, indicated on the Sheffield one-mile sheet, occurs about 200 metres north of hole 10 and the occurrence of conglomerate with some interbedded mudstone in that borehole, suggests a maximum downthrow to the south, of about 100 feet. A topographic low occurs between this area and the

B

one further south and the intersection of conglomerates below the shale horizon in boreholes 9 and 10 in this area suggests that the shale has been removed by erosion.

In the northernmost area of the China Flat Shale field, the intersection of shale at 79.6 feet in boreholes 19, and at 21 and 70.5 feet in the Latrobe Shale and Oil Company's Line 'A' of borens, indicates that the shale occurs at greater depth, as is to be expected from the northeasterly dip (although faulting probably also plays a part). Allowing for topographic variations and assuming that no faulting brings the shale to the surface in untested parts of the area, it is probable that the shale generally occurs at a greater depth than 70 feet below the surface in this region. However, reserves are limited by occurrences of dolerite, which outcrops along the drill line for about 75 metres south from borehole 13, and again for at least 225 metres south from borehole 14, which intersected dolerite at about 5 feet. Several occurrences of dolerite a little further north-east are indicated on old geological sketch maps and it is possible that these connect with the dolerite outcrop on the drill line to form one or more northeast trending dykes, such as occur associated with faulting further north, in the vicinity of Oliver's block. At any rate, it is likely that the shale is intruded by this dolerite.

Oil shale beds possibly originally continuous with those to the south, do occur to the north of the above dolerite outcrops, having been intersected at 31 feet in borehole 16. However, the intersection of conglomerates but no shale in the adjacent borehole 16B indicates an east-west fault, with a minimum upthrow to the north of about 40 feet, cutting off the occurrence of shale in this region. The conglomerates which was intersected to the northwest, at depths ranging

from 27 to 46 feet in boreholes 17 to 20, is probably that underlying the oil shale, the shale itself having been eroded. Thus it seems that there is no connection in this region between the China Flat shale seam and that to the north on Oliver's block.

The Knight-Churchill Area (Latrobe-Sassafras area)

In this area oil shale was intersected at depths varying from 12.7 feet to 97 feet in 8 boreholes at 5 different sites, along a north-west trending line approximately 1,500 metres in length. This seam was intersected at less than 30 feet in all but the most northerly hole. Allowing for local topographic variations and the dip of the shale, it seems that an area of shale at generally less than 70 feet occurs along the western edge of the previously inferred shale field, from just south of borehole 25 to north of borehole 30. The shallow apparent northerly dip of the seam indicated by a section drawn through boreholes 27 to 31 agrees with the dip of 6° to 7° degrees, to the northeast indicated by outcrops in the area. In the eastern part of the previously inferred shale field the oil shale possibly occurs at depths of up to several hundred feet, assuming it is continuous with that in the drilled area. Within the shallow shale area, some faulting is indicated by comparing the level of the shale in boreholes. The occurrence of shale in borehole 27 at less than 20 feet above that in the next hole to the north, i.e. hole 28, suggests an intervening northeasterly trending fault, with the northwest block upthrown about 20 feet or else the dip of the shale is shallower here than further north. Another small-scale fault with upthrow to the northwest is indicated by the outcrop of shale in Bennett Creek just southeast of borehole 26 but at about the same level as in borehole 27.

The southern limit of the above shale area is indicated by

boreholes 24 to 26. Holes 25 and 26 bottomed on conglomerate, providing evidence that the shale has been eroded in the southeast, as expected from the combination of the northeasterly dip of the shale with the level in Bennett Creek. The interbedded conglomerate and mudstone, underlying mudstone intersected in borehole 24 probably lie below the shale, further indicating that the shale does not continue in this direction. The previously inferred limits of shale to the southwest and west, are confirmed by the intersection of only mudstone and conglomerate in boreholes 21 to 23 and the occurrence of Precambrian mica schist 1100' north of borehole 23. This occurrence of mica schist demonstrates that the Precambrian-Permian boundary in this region occurs farther east than indicated on the Sheffield one-mile sheet.

The northern limit of the area of shallow shale is placed between boreholes 30 and 31 since, due to the northerly dip of the shale, it occurs at 57 feet in borehole 31. The occurrence of mudstone to a depth of 151.5 feet in borehole 32 may be due only to the change in apparent dip because of the change in orientation of the drill line, but probably east-west faulting, with minimum downthrow of about 50 feet to the north, also occurs. Further north, in borehole 33, the intersection at 75 feet of conglomerate similar to that seen elsewhere underlying the shale suggests upthrow of the order of several hundred feet in this direction. However, it is possible that faulting has not occurred and the conglomerate intersected occurs within the upper part of the Sprayton Beds, or possibly even the lower part of the Moray Coal Measures, especially as a thin but distinctive conglomerate, with an impure quartz sandstone matrix, not seen elsewhere, was intersected at a higher level in this borehole.

Northeast of the old Knight Area of the shale field, boreholes

34 and 37 proved barren, the mudstone and sandy mudstone intersected in these boreholes representing part of the unit overlying the shale. From the depth of shale in hole 31 and the northeasterly dip indicated in the sections and assuming no faulting, the shale seam would be expected to occur within about 100 feet below the base of hole 34 and at a greater depth below hole 37. The occurrence of Hersey Coal Measures near the top of hole 37 indicates a thickness of mudstone of the order of several hundred feet above the projected extension of the oil shale in this region. North of borehole 34, boreholes 35, 36 and 38 intersected only the beds overlying the oil shale, as anticipated from the data on the holes discussed above. However, from the level of shale in borehole 31 and the dip indicated by the sections, the shale would be expected to occur near the base of borehole 38. However, the beds intersected at the base of this borehole and in particular the fossiliferous sandstone intersected from 40 to 185 feet, are different in character from those above and below the shale elsewhere and possibly belong to a higher stratigraphic level. Thus south of borehole 38 there may be an fault with downthrow to the north and possibly continuous with that inferred to exist between boreholes 31 and 32. In summary, the drilling just completed does not disprove the continuation of the shale seam to the north and northeast but it does indicate that the shale is unlikely to occur within 150 feet of the surface in this region.

RESERVES

In the past the estimates of reserves have been made largely upon geological evidence. This method of estimating was used by previous investigators because of the general lack of testing and developmental work and they stipulated that such a method should be regarded as indicating possible areal extents of deposits rather than actual

estimates of tonnages, particularly as thinning of the shale seams, faulting, poor quality of shale might result in part of the areas containing no economic reserves. It was for this reason that the report of the Tasmanian Shale Oil Investigation Committee put the reserves under headings of "partly proved," when mine openings, outcrops, boreholes, and/or shafts assisted in the determination, and "possible extensions," suggested by geological evidence but not prospected.

The present exploration drilling was aimed mainly at investigating the continuity of the shale along the axes of the previously inferred shale fields. Thus, the reserves given in the tables below are dependent to a significant degree on the previous rough estimates of the oil shale distribution, the "partly indicated" areas and "possible extensions" being marked off within the broad outlines of the two shale fields shown on old geological sketch maps. The term "partly proved" is not now officially designated for use in reserve classification. More detailed drilling, particularly to determine the east-west limits of the seams in the shallow shale areas described above, is needed before reserves can be regarded as "probable". Therefore, the shale areas described in the previous section are listed as "partly indicated", although generally more testing has been carried out within these areas than within the areas headed "partly proved" on previous reports. The "possible extensions" generally contain one or two boreholes intersecting the shale but are based mainly on interpretation of the stratigraphy from boreholes not intersecting the shale.

The methods of estimating tonnages of shale is that used by Twelvrees (1932), Reid (1934), and the Shale Oil Investigation Committee (1932). The calculations of Twelvrees and Reid were based

on an average specific gravity of the shale of 1.6, but subsequent systematic sampling and testing of the shale in the Goliath and Tasmantite mines indicated an average specific gravity of 2.0 and this was used in the final report of the Shale Oil Investigation Committee.

Thus the tonnage per acre-foot of seams:-

$$= 43,560 \times 2.0 \times 62.35$$

$$= 2,715.8$$

$$= 2,700$$

(62.35 lbs. = weight of a cubic foot of water at standard temperature)

In the report of the above committee about 30% of this estimate was deducted for loss in working, and faults, pinches etc., a figure of 1,875 tons per acre-foot being used in reserve estimations. Since open-cut mining is now proposed and faults where indicated have been allowed for in the area estimates and little evidence of significant pinching was obtained in boreholes, the figure of 2,700 metric tons per acre-foot of shale was retained for the present calculations. The average thicknesses used are those determined from the current drilling results in the partly indicated areas, except for an area of 11 acres around the Latrobe Shale and Oil Company's Line 'D' of bores in the China Flat Area and those inferred from previous work in the possible extensions.

TABLE 3

LOCALITY	PRESENT						TASMANIAN SHALE OIL INVESTIGATION COMMITTEE (1932)					
	PARTLY INDICATED			POSSIBLE EXTENSIONS			PARTLY PROVED			POSSIBLE EXTENSIONS		
	Area in acres	Average Thickness in feet	Tons	Area in acres	Average Thickness in feet	Tons	Area in acres	Average Thickness in feet	Tons	Area in acres	Average Thickness in feet	Tons
CHINA FLAT	147 ⁺ 11 [↔]	4.5 4	1,788,050 118,800	303 [↔] -	3 -	2,454,300 -	776	3	4,365,000			
KNIGHT-CHURCHILL	123 ⁺	5.5	1,826,550	465 [↔]	4	3,704,400	-	-	small	400	4	2,400,000

+ Shale mainly at depths of less than 70 feet.

↔ Shale mainly at depths of greater than 70 feet.

FURTHER WORK

Further drilling is needed, particularly in the China Flat Area, to outline more accurately areas of shale suitable for open cutting. In the China Flat area, it is suggested that the two main areas of shallow shale roughly outlined be further tested by drilling along 11 east-west lines spaced 375 metres apart, to determine the shale's east-west continuity and extent. In the area south of the Native Rock road, this information could be obtained from a total of 30 boreholes along a series of 6 lines, each with 5 holes, at 100 metre intervals; one drilled off the eastern edge of the Native Rock road, and the others parallel to this and 100, 200, 300, 400 and 500 metres, respectively, southeast of the road as shown on the map attached. The northern partly indicated shale area of the China Flat region is considerably larger than that further south but since there are several old open cuts as well as previous boreholes in this area, it is suggested that a minimum of 30 boreholes would again be necessary to indicate probable reserves: 5 holes at 200 metre intervals along a series of 6 east-west trending lines 100 metres apart.

In the Knight-Churchill Area, only a narrow strip along the western boundary of the previously inferred shale area appears worthy of further investigation for the purpose of open cutting. It is suggested that to accurately outline this shale area three northwest-trending lines of closely spaced boreholes, be drilled one along the line just completed and the others 100 metres to the west and east, respectively, of this line. Initially a spacing of 200 metres between holes is suggested since the present drilling has shown the shale to be fairly continuous in this area. The sites of some holes along the eastern line may have to be shifted some distance from the proposed positions shown on the map.

since the ground rises steeply in a number of places, in which drilling may be impractical. This proposal involves a total of about 30 boreholes. Thus an overall programme involving approximately 90 boreholes, is suggested in order to more accurately outline the areas of shallow shale partly indicated by the present drilling.

In addition to the above, there are two other shale regions, which may contain significant areas of shale at shallow depth, but were not investigated by the present programme.

One is of the area of upper Permian beds west of the 'Great Bend' in the Nerrey, in which Reid estimated a reserve of 210 acres of 4-foot thick shale, on the assumption that one-third of the area is shale-bearing. Later, the mine workings of the Australian Shale and Oil Corporation and that company's 30 boreholes, of which 27 intersected the shale, and several shafts proved a shale-bearing area, in the eastern part of the region, of 164 acres giving a reserve of 1,771,200 metric tons for a 4-foot seam with an average specific gravity of 2.0. The above boreholes intersected shale at depths varying from 14 to 273 feet. Six of the holes intersected the oil shale at less than 70 feet, but the location of these holes are not known, since they are unnumbered on the old sketch map showing drill sites. Mining of the seam is reported to have been made very difficult by a number of small faults. A considerable area in which Upper Permian beds are reported to outcrop and where a significant extent of shale may occur, possibly at shallow depth lies to the southwest, west and northwest of the proved area. This possible extension of shale is outlined on an old geological sketch map as an area of about 740 acres, giving a reserve of approximately 8,000,000 tons for a 4-foot seam. It is suggested that this area be explored by three north-south lines of holes, one along its axis and two shorter ones, in the northern part of the area, to the west and east of this main line.

A total of 18 boreholes would be required for a north-south spacing between holes of 400 metres.

In the Goliath Mine Area, north of the 'Great Bend', a 600 acre area of shale has been previously inferred from 14 boreholes, 10 of which intersected shale, the remainder being inconclusive, and the mine workings of the Goliath Portland Cement Company. This early work indicates that about 380 acres, forming the western part of the area, possibly has shale at depths suitable for open cutting, the eastern section being down-faulted by a north-south fault with a displacement of the order of several hundred feet. These 380-acres, giving a reserve of approximately 4,100,000 tons for a 4-foot seam, could be explored initially by drilling 12 boreholes along two lines trending northwest along the length of the area.

In summary, in addition to the possible 9,900,000 tons of which about 3,600,000 tons appears to be open-cuttable, indicated by the present drilling in the Knight-Churchill and China Flat Areas, there is a possible extension of shale totalling 16,300,000 tons of which about 12,100,000 may be open cuttable, in the area west of the 'Great Bend' and the Goliath Mine Area, north of the 'Great Bend'. An exploration drilling programme of about 30 boreholes is suggested in order to investigate the latter two areas.

M. D. Mooney

M.D. MOONEY

per [Signature]

L.G. NIXON

L.G.B. NIXON & ASSOCIATES

30th June, 1975

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Drilling with Mayhew 1000 plant at Drill Site
No. 16. Northern end of China Flat Area.

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DRILLING RESULTS IN CHINA FLAT AREA

520039

(TABLE I)

DATE DRILLED	BORE HOLE NO.	SHALE CUT AT (FEET)	THICKNESS (FEET)	DEPTH OF HOLE (FEET)	CORING (FEET)	CORE RECOVERED (%)	REMARKS
April 9th	2	-	-	140	-	-	Southeast end of line Abandoned, in mudstone.
April 8th	3	-	-	155	-	-	Abandoned in Mudstone.
March 21st	4	-	-	80.75	72.25-76.75	85	Abandoned because of caving.
March 22nd	4B	-	-	160	0	-	Abandoned in Mudstone.
March 23rd	5	56 (approx) -58 (approx)	2 (approx)	62	58.5-62	50	First hole in which shale was intersected, so that, due to speed of drilling and unfamiliarity of driller with its properties, shale horizon was apparently passed through before core was commenced.
April 8th	6	-	-	80	-	-	abandoned in Mudstone (Matrix) Conglomerate.
March 24th	7	22.5 (approx) -27	4.5 (approx)	31.2	23-25.5 26.2-31.2	47 87	Given shale thickness includes 25 inches core loss, and 8 inch middle band which was open-hole drilled because of its hardness.
March 24th	8	27.5 (approx) -32.1	4.5 (approx)	33.8	13.1-22.1 27.8-33.8	100 100	4.25 feet of shale core obtained.
March 25th	9	-	-	23	-	-	Abandoned in Mudstone Conglomerate.
March 25th	10	-	-	115	-	-	Abandoned in Mudstone Conglomerate.
April 4th	11	4.5 (approx)	-	5.2	-	-	Abandoned to core in an adjacent hole (11B)
April 4th	11B	4.5-6.4	1.9	9.7	4.5-7.2	70	Top of shale eroded. 1.3 feet of shale core recovered.

B

TABLE I
(Continued)

DATE DRILL- ED	BORE HOLE NO.	SHALE CUT AT (FEET)	THICK- NESS (FEET)	DEPTH OF HOLE (FEET)	CORING (FEET)	CORE RECOV- ERED (%)	REMARKS
April 4th	12	53 (approx)	-	57	-	-	Abandoned to core in an adjacent hole
April 4th	12B	50.3- 55.77	5.4	58.3	48.3- 58.3	87.5	5.4 feet of shale core recovered. 15 inches of core loss, ^{possibly} includes some of the very friable shale.
April 5th	13	68-73 (approx)	5 (approx)	73	-	-	Abandoned to core in an adjacent hole.
April 5th	13B	70.6 (approx) -74.6	4 (approx)	75.8	70.7- 75.8	100	3.9 feet of shale core.
April 5th	14	-	-	5.25	-	-	Abandoned in dolerite (?Dyke).
April 6th	16	31 (approx)	-	32.25	-	-	Abandoned to core in an adjacent hole.
April 6th	16B	-	-	72	30-35	80	No Oil Shale, suggesting faulting between here and Borehole 16 (only one metre southwest). Abandoned in mudstone conglomerate.
April 6th	17	-	-	58	-	-	Abandoned in mudstone conglomerate.
April 7th	18	-	-	47	-	-	Abandoned in mudstone conglomerate.
April 7th	19	-	-	35	-	-	Abandoned in mudstone conglomerate.
April 7th- 8th	20	-	-	65	-	-	Abandoned in mudstone conglomerate.

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DRILLING RESULTS IN LATROBE - SASSAFRAS AREA

520041

(TABLE 2)

DATE DRILLED	BORE-HOLE NO.	SHALE CUT AT (FEET)	THICKNESS (FEET)	DEPTH OF HOLE (FEET)	CORING (FEET)	CORE RECOVERED (%)	REMARKS
April 12th	21	-	-	80	-	-	Abandoned in mudstone/ ^{Matrix} conglomerate.
April 11th	22	-	-	110	-	-	Abandoned in quartz sandstone conglomerate & quartzite.
April 10th	23	-	-	95	-	-	Abandoned in mudstone conglomerate.
April 11th	24	-	-	135	-	-	Abandoned in mudstone conglomerate.
April 12th	25	-	-	57	-	-	Abandoned in mudstone conglomerate.
April 13th	26	-	-	50	-	-	Abandoned in mudstone conglomerate.
April 13th	27	23 (approx)	-	23.75	-	-	Abandoned to core in an adjacent hole.
April 13th	27B	23-28.75	5.75	31.4	21.2-31.4	100	5.75 feet (100%) of shale core recovered.
April 14th	28	12.7 (±0.1) -18.3	5.6	22.9	12.9-22.9	97.5	Slow drilling rate at time of intersection of shale enabled near complete (5.4 feet) core of shale to be obtained in this hole.
April 14th	29	24 (approx)	-	24.25	-	-	Abandoned to core in an adjacent hole.
April 14th	29B	23.25-28.25	> 5	32	22-32	69	5 feet of shale core recovered, but 2.1 feet of core loss may include some shale, (although probably mainly from soft mudstone below shale horizon).
April 14th	30	26-32 (approx)	6 (approx)	33.5	0	-	Abandoned to core in an adjacent hole.
April 14th	30B	26-31.6	> 5.6	34.1	25-34.1	89	5.6 feet of shale core recovered, but 1.2 feet of core loss may include some shale.
April 14-15th	31	97 (approx) -101	> 4	104.7	97.25-104.7	94	Coring carried out in this rather than an adjacent hole due to fairly great depth

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DATE DRILL- ED	BORE HOLE NO.	SHALE CUT AT (FEET)	THICK- NESS (FEET)	DEPTH OF HOLE (FEET)	CORING (FEET)	CORE RECOV- ERED (%)	REMARKS
April 14-15th	31	CONTINUED					of shale and average moderately slow drilling rate. About 2 inches of core lost probably from shale horizon.
April 15th	32	-	-	151- 5	-	-	Abandoned in mudstone.
April 17th	33	-	-	98	-	-	Abandoned in mudstone (Matrix) conglomerate.
April 15-16th	34	-	-	163.5	-	-	Abandoned in mudstone.
April 16th	35	-	-	154.5	-	-	Abandoned in sandy mudstone.
April 16th	36	-	-	155	-	-	Abandoned in mudstone.
April 16th	37	-	-	168.5	-	-	Coal seam (about one-foot thick) at 30 feet, underlain by thin (< 1mm) coal layers interbedded with sandstone. Abandoned in sandy mudstone.
April 18th	38	-	-	214.5	-	-	Drilled to maximum depth possible with the amount of drill stem available. Abandoned in mudstone.

B

ENDEAVOUR OIL COMPANY N.L.

520043

LOG OF: MAYHEW 1,000
PROJECT: TASMANITE OIL SHALE DRILLING
COLLAR CO-ORDINATES: 454451ME
 5422739MN

BOREHOLE No: 2
ESTIMATED DEPTH: 130'
COMPLETED DEPTH: 140'

DRILLING COMMENCED: 9.4.1975
CORING COMMENCED:
COMPANY: THOMPSON DRILLING CO.
HOLE LOGGED BY: M.D. MOONEY
ON: 9.4.1975

COMPLETED: 9.4.1975
COMPLETED:
DRILLER: R. THOMPSON
ASSISTANT: R. SCHUMACHER
HIRER: ENDEAVOUR OIL CO.N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale, and to obtain core of the shale (in this or an adjacent borehole).
RESULTS: No oil shale. Hole abandoned in mudstone at 140ft, although old bore holes record shale at depths up to several hundred feet in this area / ^{because} this programme is aimed primarily at outlining relatively shallow occurrences of shale.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0' 0"	45 0	Clay and alluvium.
45' 0'	57' 0"	Blue-grey clay and (? alluvial) pebbles.
57	80	Blue-grey mudstone.
80	82	Grey-coloured fine pebbly and fossiliferous sandstone; rich in calcareous shell fragments. Some identified as segments of brachiopods.
80	140	Blue-grey mudstone, some pebbly layers.

042

ENDEAVOUR OIL COMPANY N.L.

520044

LOG OF: MAYHEW 1,000

BOREHOLE NO: 3

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 150ft.

COLLAR CO-ORDINATES: 454267ME
5423076 MN

COMPLETED DEPTH: 155ft.

DRILLING COMMENCED: 8.4.1975

COMPLETED: 9.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COY.

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY

ASSISTANT: R. SCHUMACHER

ON: 8 - 9.4.1975

HIRER: ENDEAVOUR OIL CO. N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale,
and to obtain core of the shale (in this or an adjacent hole).

RESULTS: No oil shale. Hole abandoned in mudstone at 155' ; because old bore
holes record shale as occurring above this depth in this area and
because this programme is aimed primarily at outlining relatively
shallow shale occurrences.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	68'	Pale yellow clay and alluvium.
68	138	Blue-grey mudstone, with thin (less than 1 foot wide) pebbly mudstone interbeds.
138	155	Blue-grey mudstone.

ENDEAVOUR OIL COMPANY N.L.LOG OF: MAYHEW 1,000BORE HOLE NO: 4PROJECT: TASMANITE OILSHALE DRILLINGESTIMATED DEPTH 80FT:COLLAR CO-ORDINATES: 454096ME
5423405MNCOMPLETED DEPTH: 80ft. 9ins.DRILLING COMMENCED: 21.3.1975COMPLETED: 21.3.1975CORING COMMENCED: 72ft. 3ins.COMPLETED: 76ft. 9ins.COMPANY: THOMPSON DRILLING CO.CORE RECOVERY: 85%DRILLER: R. THOMPSONASSISTANT: R. SCHUMACHERHOLE LOGGED BY: M.D. MOONEYON: 21.3.1975HIRER: ENDEAVOUR OIL CO. N.L.OBJECT: To determine depth and thickness of the oil shale; if intersected, and obtain core of the shale.RESULT: No shale intersected. Hole abandoned due to caving; in order to try mud- (rather-than air) drilling of an adjacent hole.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	10'	Yellowish-brown clayey soil; alluvium; poorly sorted angular to subrounded quartz, sandstone, quartzite and (minor) grey mudstone fragments (up to several cms. diameter).
10	15	Reddish-pink gritty sandstone and (minor) grey mudstone gravel and pebbles; minor clay.
15	20	Yellow to red-brown clay; minor gritty sandstone and grey mudstone.
20	45	Blue-grey mudstone, some harder shaly interbeds.
45	50	Grey-brown mudstone. Minor quartz and gritty sandstone pebbles - probably contamination from above.
50	55	Sandy grey mudstone.
55	65	Blue-grey mudstone, with some sandy and some shaly interbeds
65	70	Blue-grey shaly mudstone.
70	72' 3"	Poorly sorted conglomerate; rounded, and sometimes faceted pebbles of quartz, white impure quartzite and quartz sandstone and minor (?) quartz-sericite schist and pyrite-bearing mudstone in a matrix of blue-grey mudstone.
72' 3"	72' 11"	Core lost - soft, probably mudstone, layer.
72' 11"	73' 3"	White quartzite pebble with minor (less than 1%) pyrite.
73' 3"	76' 9"	Blue-grey mudstone.
76' 9"	80' 9"	Blue-grey mudstone, with thin conglomerate interbeds.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 4B

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH 80' - 160'

COLLAR CO-ORDINATES: 454096ME
5423405MN

COMPLETED DEPTH: 160ft.

DRILLING COMMENCED: 22.3.1975

COMPLETED: 22.3.1975

CORING COMMENCED: --

COMPLETED: -- RECOVERY:

COMPANY: THOMPSON DRILLING CO.

DRILLER:R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 21.3.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and obtain core of the shale.

RESULTS: No shale intersected. Hole abandoned at 160 feet because old bore holes record shale as occurring above this depth, in this area, and because project is primarily aimed at outlining relatively shallow shale occurrences.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	20'	Yellow-to red-brown clayey soil, and alluvium (quartzite and quartz pebbles mainly), with increasing clay content downwards.
20	22	Pebbly pale yellowish-brown clay.
22	105	Blue-grey mudstone, with minor shaly interbeds.
105	123	Harder, shaly blue-grey mudstone.
123	125	Pebbly mudstone - mainly quartz and pale quartzite pebbles.
125	134	Blue-grey shaly mudstone.
134	136	Lighter grey sandy mudstone.
136	160	Blue-grey shaly mudstone.

045

520047

ENDEAVOUR OIL COMPANY N.L.

LOG OF: MAYHEW 1,000 BORE HOLE NO: 5
PROJECT: TASMANITE OIL SHALE DRILLING ESTIMATED DEPTH: 100' - 160'
COLLAR CO-ORDINATES: 453909ME COMPLETED DEPTH: 62ft,
5423715MN
DRILLING COMMENCED: 23,3,1975 COMPLETED: 23,3,1975
CORING COMMENCED: 58'6" COMPLETED: 62ft. RECOVERY: 50%
COMPANY: THOMPSON DRILLING COMPANY DRILLER: R. THOMPSON
HOLE LOGGED BY: M.D. MOONEY ON: 23.3.1975 ASSISTANT: R.SCHUMACHER
HIRER: ENDEAVOUR OIL COMPANY N.L.
OBJECT: To investigate the occurrence, depth and thickness of oil shale and obtain core of the shale.

RESULT: Approximately 2 feet of shale intersected, from approximately 56 feet to 58 feet. No core of shale obtained, the shale layer having been passed through, due to the speed of drilling, and the unfamiliarity of the driller with its properties, before coring was commenced.

FROM FT.INS.	DEPTH		GEOLOGICAL LOG
		TO FT. INS.	
0'	30'		Reddish-brown soil and alluvium, with proportion of pale yellow clay increasing to 100% at 30 feet.
30	56		Blue-grey mudstone.
56-57	58		Oil shale: grey shale, given a brownish colour and friable nature by the high content of amber-coloured spores, approximately 0.5 mm. in diameter.
58	58'6"		Blue-grey mudstone? Scant cuttings.
58'6"	58'8"		White quartzite (pebble).
58'8"	62		1'8" of core lost. Recovery: a few inches of relatively hard blue-grey pebbly mudstone, followed by soft blue-grey mudstone with harder sandy mudstone interbeds.

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ENDEAVOUR OIL COMPANY N.L.

520048

LOG OF: MAYHEW 1,000

BORE HOLE NO: 6

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 30ft.

COLLAR CO-ORDINATES: 453804ME
5423878MN

COMPLETED DEPTH: 80ft.

DRILLING COMMENCED: 8.4.1975

COMPLETED: 8.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING CO.

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 8.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence and, if present, the approximate depth of oil shale, in order to determine the depth at which coring should be commenced in an adjacent hole to obtain maximum core of shale.

RESULT: No oil shale. Hole abandoned in solid conglomerate, which is known to occur stratigraphically below the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	34'	Clay, fine sand and alluvium.
34	36	Blue-grey mudstone.
36	40	Blue-grey pebbly sandy mudstone.
40	42	Conglomerate: predominantly quartz, dark grey quartzite and pinkish red quartzitic sandstone pebbles in a blue-grey sandy mudstone matrix.
42	65	Pebbly sandy mudstone grading into conglomerate in places.
65	80	Conglomerate, similar to that above.

U47

ENDEAVOUR OIL COMPANY N.L.

520049

LOG OF: MAYHEW 1,000

BORE HOLE NO: 7

PROJECT: TASMANITE OILSHALE DRILLING

ESTIMATED DEPTH: 35ft.

COLLAR CO-ORDINATES: 453514ME
5424285MN

COMPLETED DEPTH: 31'2"

DRILLING COMMENCED: 24.3.1975

COMPLETED: 24.3.1975

CORING COMMENCED: 23'; 26'2"

COMPLETED: 25'6"; 31'2"

RECOVERY: 47%; 87%

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

ASSISTANT: R. SCHUMACHER

HOLE LOGGED BY: M.D. MOONEY ON: 24.3.1975

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and to obtain core of the shale.

RESULT: Approximately 4½ feet of shale intersected from 22'6" to 27'. Only 15" of shale core obtained, due to drilling several inches of it before commencement of coring, poor core recovery due probably to softness and friable nature of shale, and need to open-hole drill on 8" thick hard central band within the shale.

<u>DEPTH</u>		<u>GEOLOGICAL LOG</u>
<u>FROM</u>	<u>TO</u>	
<u>FT. INS.</u>	<u>FT.INS.</u>	
0'	12'	Yellowish-brown clayey soil and alluvium.
12	16	Blue-grey mudstone.
15	22'6" (approx)	Pale yellow fine pebbly sandstone.
22'6" (approx)	23	Oil shale.
23	24'7"	Rich oil shale, only 2 inches recovered.
24'7"	25'6"	More massive, moderately rich oil shale with a few (mainly quartz) pebbles.
25'6"	26'2"	(Drilled with roller bit because too hard to drill with coring bit). Oil shale - scant cuttings because of loss of circulation.
26'2"	26'10"	8 inches core lost probably from this region.
26'10"	27'1½"	Relatively massive (sandy mudstone) beds, grading in spore content from low at the top nil to the bottom.
27'1½"	27'5"	Pebbly mudstone (fragments up to 4 mm. in size) with 1-2% sulphide (?pyrite) as medium-grained coatings on fracture surfaces.
27'5"	28'8"	Blue-grey pebbly mudstone with rusty reddish brown coatings on fracture surfaces, possibly alteration product of sulphide.
28'8"	31'2"	Blue-grey pebbly mudstone - quartz, pale sandstone and quartzite pebbles, as above.

ENDEAVOUR OIL COMPANY N.L.

520050

LOG OF: MAYHEW 1,000

BORE HOLE NO: 8

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 5' - 30'

COLLAR CO-ORDINATES: 453294ME
5426688MN

COMPLETED DEPTH: 33'10"

DRILLING COMMENCED: 24.3.1975

COMPLETED: 24.3.1975

CORING COMMENCED: 13'1"
27'10"

COMPLETED: 22'1" 100%
33'10" 100%

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 24.3.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and to obtain core of the shale.

RESULT: Approximately 4½ feet of oil shale intersected, from approximately 27'6" to 32'1", 4'3" of shale core obtained, the upper few inches of the shale bed having been drilled before coring was commenced.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT.INS.	
0'	6'	Clay and alluvium.
6	13'1"	Blue-grey mudstone.
13'1"	14'3"	Relatively hard and pebbly blue-grey mudstone.
14'3"	20	Thin (several inches thick) soft muddy shale beds alternating with harder sandy mudstone and mudstone.
20	22'1"	Blue-grey mudstone.
22'1"	27'6" (approx)	Alternating thin mudstone and harder sandy mudstone beds.
27'6" (approx)	27'10"	Oil shale.
27'10"	29'5"	Oil shale, relatively hard sandy mudstone matrix and very rich in spores at top but with some softer beds and decreasing spore content downwards.
29'5"	29'9"	Moderately rich sandy oil 'shale'.
29'9"	30'7"	Blue-grey mudstone, relatively low spore content.
30'7"	32'1"	Rich oil shale grading to moderate near the bottom.
32'1"	33'10"	Blue-grey mudstone, none or very few spores.

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ENDEAVOUR OIL COMPANY N.L.

520051

LOG OF: MAYHEW 1,000

BORE HOLE NO: 9

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 20' - 40'

CO-ORDINATES: 453117ME
5424978MN

COMPLETED DEPTH: 23ft.

DRILLING COMMENCED: 25.3.1975

COMPLETED: 25.3.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY.

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 25.3.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and to obtain core of the shale.

known to occur *

RESULT: No shale. Abandoned due to intersection of solid conglomerate, /at a level stratigraphically lower than the oil shale horizon .

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	9'	Yellowish-brown clay and alluvium.
9	17	Blue-grey mudstone.
17	23	Hard conglomerate: mainly quartz, quartzite and pinkish-red quartzitic sandstone pebbles (subangular to subrounded) in a blue-grey sandy mudstone matrix.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 10

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 20' - 40'

COLLAR CO-ORDINATES: 452943ME
5425234MN

COMPLETED DEPTH: 115ft.

DRILLING COMMENCED: 25.3.1975

COMPLETED: 25.3.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 25.3.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and to obtain core of the shale.

RESULT: No shale. Abandoned due to intersection of solid conglomerate known to occur stratigraphically lower than the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	5'	Pale yellowish-brown clay and alluvium.
5	10	Pale reddish-brown clay.
10	15	Pale yellow clay.
15	20	Pebbly blue-grey mudstone - quartz and quartzite pebbles, probably alluvial.
20	27	Soft blue-grey mudstone.
27	43	Relatively hard blue-grey pebbly sandy mudstone - pinkish-red quartzitic sandstone, quartz and quartzite pebbles.
43	58	Soft blue-grey mudstone.
58	80	Relatively hard sandy mudstone with some soft mudstone interbeds.
80	100	Blue-grey mudstone.
100	115	Conglomerate: pinkish-red quartzitic sandstone and quartzite and quartz fragments in a blue-grey sandy mudstone matrix.

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ENDEAVOUR OIL COMPANY N.L.

520053

LOG OF: MAYHEW 1,000BORE HOLE NO: 11PROJECT: TASMANITE OILSHALE DRILLINGESTIMATED DEPTH: 25ft.COLLAR CO-ORDINATES: 452262ME
5425641MNCOMPLETED DEPTH: 5'2"DRILLING COMMENCED: 4.4.1975COMPLETED: 4.4.1975CORING COMMENCED: --COMPLETED: --COMPANY: THOMPSON DRILLING COMPANYDRILLER: R. THOMPSONHOLE LOGGED BY: M.D.MOONEY ON: 4.4.1975ASSISTANT: R. SCHUMACHERHIRER: ENDEAVOUR OIL COMPANY N.L.OBJECT: To investigate the occurrence, depth and thickness of oil shale and to obtain core of the shale.RESULT: Oil shale intersected at approximately 4'6", immediately below the soil horizon. Hole abandoned in order to drill an adjacent hole and commence coring above the known depth of oil shale, thus obtaining maximum core of the shale.

FROM FT. INS	DEPTH		GEOLOGICAL LOG
	TO FT.INS.		
0'	4'6"		Clay and alluvium.
4'6"	5'2"		Oil shale.

ENDEAVOUR OIL COMPANY N.L.LOG OF: MAYHEW 1,000BORE HOLE NO: 11BPROJECT: TASMANITE OIL SHALE DRILLINGESTIMATED DEPTH: 10ft.COLLAR CO-ORDINATES: 452262ME
5425641MNCOMPLETED DEPTH: 9'8"DRILLING COMMENCED: 4.4.1975COMPLETED: 4.4.1975CORING COMMENCED: 4'6"COMPLETED: 7'2" RECOVERY: 70%COMPANY: THOMPSON DRILLING COMPANY (DRILLER: R. THOMPSONHOLE LOGGED BY: M.D. MOONEY ON: 4.4.1975ASSISTANT: R.SCHUMACHERHIRER: ENDEAVOUR OIL COMPANY N.L.OBJECT: To determine the thickness of the oil shale intersected by borehole No. 11 and to obtain core of the shale.RESULT: 1'11" of oil shale intersected from 4'6" to 6'5", the top of the shale horizon having been eroded away. Only 15½" of shale core obtainable, due to poor core recovery and fact that, owing to the length of the core barrel, coring could not be commenced before a depth of 4'6".

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	4'6"	Pale yellow clayey soil.
4'6"	4'9"	½" recovery: rich oil shale.
4'9"	5'6"	100% recovery: shale rich in rusty red (?weathered) and amber-coloured spores.
5'6"	5'8"	½" lost; moderately rich oil shale.
5'8"	5'11"	½" recovery: soft blue-grey mudstone with low spore content (< 5%).
5'11"	6'2"	100% recovery: moderately high spore content with matrix alternating between soft mudstone and harder sandy mudstone.
6'2"	6'4"	Core lost.
6'4"	6'5"	Conglomerate, followed by sandy mudstone with moderately low (< 10%) spore content.
6'5"	6'7"	Blue-grey mudstone with very few spores (< 1%).
6'7"	6'9"	Core lost.
6'9"	7'2"	Blue-grey mudstone.
7'2"	9'8"	Pebbly sandy mudstone, with traces of whitish yellow sulphide (?marcasite) in fine-grained aggregates.

NOTE: Core was obtained in 2 to 3 inch segments because owing to the shallow depth, only the coring bit, and not the core barrel, was used for coring).

LOG OF: MAYHEW 1,000

BORE HOLE NO: 12

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 100ft.

COLLAR CO-ORDINATES: 452533 ME
5425985 MN

COMPLETED: DEPTH: 57ft.

DRILLING COMMENCED: 4.4.1975

COMPLETED: 4.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 4.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence and depth of oil shale to determine depth at which coring should commence in an adjacent hole to obtain maximum core of shale.

RESULT: Oil Shale intersected at approximately 53ft. Hole abandoned in order to core in an adjacent hole.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	15' (approx)	Clay and alluvium.
15 (approx)	53 (approx)	Blue-grey mudstone
53 (approx)	53'4"	Oil shale

LOG OF: MAYHEW 1,000

BOREHOLE NO: 12B

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 63ft.

COLLAR CO-ORDINATES: 452262ME
5425234MN

COMPLETED DEPTH: 58'4"

DRILLING COMMENCED: 4.4.1975

COMPLETED: 4.4.1975

CORING COMMENCED: 48'4"

COMPLETED: 58'4" RECOVERY: 87½%

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 4.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To determine the thickness of the oil shale intersected by borehole No. 12 and to obtain core of the shale.

RESULT: A minimum of 5'5" of oil shale, of varying richness, intersected from 50'4" to 55'9". 5'5" core of shale obtained, with possibly some shale included in the 15" core loss.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	15' (approx)	Clay and alluvium.
15' (approx)	48'4"	Blue-grey mudstone.
48'4"	50'4"	Blue-grey pebbly mudstone; pebbles include fragments of white quartz sandstone sometimes associated with pale brass yellow-sulphide (?pyrite).
50'4"	51'6"	Blue-grey mudstone with scattered spores (< 5%) grading downwards, with increasing spore content, into moderately rich oil shale; oil shale contains 1-2% of a whitish yellow sulphide (? marcasite) in scattered fine-grained aggregates.
51'6"	53'10"	Rich oil shale with a striped appearance due to alternation of narrow (< 1") yellowish-brown spore-rich shale beds and less rich brownish-grey beds.
53'10"	55'5"	Very rich and friable light brown oil shale. 15" of core lost came possibly, owing to the friable nature of the shale, from this region but is included in the thickness given. not
55'5"	55'10"	Moderately rich oil shale grading downwards, with decreasing spore content, to barren blue-grey mudstone.
55'10"	57'1"	Pebbly blue-grey mudstone.
57'1"	58'4"	Core loss?

LOG OF: MAYHEW 1,000

BOREHOLE NO: 13

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 95ft.

COLLAR CO-ORDINATES: 452330ME
5426290MN

COMPLETED DEPTH: 73ft.

DRILLING COMMENCED: 5.4.1975

COMPLETED: 5.4.1975

CORING COMMENCED: --

COMPLETED: -- RECOVERY: --

COMPANY: THOMPSON DRILLING COMPANY.

DRILLER: R. THOMPSON

HOLE LOGGED BY : M.D. MOONEY ON: 5.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence and depth of oil shale in order to determine depth at which coring should commence in an adjacent hole to obtain maximum core of shale.

RESULT: Approximately 5 feet of oil shale intersected at approximately 68ft. to 73ft. Hole abandoned in order to core in an adjacent hole.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT.INS.	
0'	45'	Clay and alluvium.
45'	68' (approx)	Moderately hard blue-grey sandy mudstone, with some pebbly horizons.
68' (approx)	73'	Oil shale with hard middle band.

ENDEAVOUR OIL COMPANY N.L.LOG OF: MAYHEW 1,000BORE HOLE NO: 13BPROJECT: TASMANITE OIL SHALE DRILLINGESTIMATED DEPTH: 75ft.COLLAR CO-ORDINATES: 452128ME
5426610MNCOMPLETED DEPTH: 75'10"DRILLING COMMENCED: 5.4.1975COMPLETED: 5.4.1975CORING COMMENCED: 70'8½"COMPLETED: 75'10" RECOVERY: 100%COMPANY: THOMPSON DRILLING COMPANYDRILLER: R. THOMPSONHOLE LOGGED BY: M.D. MOONEY ON: 5.4.1975ASSISTANT: R. SCHUMACHERHIRER: ENDEAVOUR OIL COMPANY N.L.OBJECT: To determine the exact depth and thickness of the oil shale horizon intersected by borehole No. 13 and to obtain core of the shale.RESULT: Approximately (+ 2-3 inches) 4 feet of shale, with 2 rich bands separated by a middle poorer band, intersected from approximately 70'7" to 74'7" 3'11" of shale core obtained, coring having been commenced a few inches below the top of the shale horizon.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	36'	Yellowish-brown clay and alluvium.
36	38'6"	Dolerite boulder.
38'6"	42'	Yellowish-brown clay.
42	70'7" (approx)	Sandy blue-grey mudstone.
70'7" (approx)	70'8½"	Oil shale - coring could not be commenced above the shale horizon because of the hardness of the layer immediately above the shale.
70'8½"	72'7"	Moderately rich grey-brown oil shale, with some narrow (< ½" thick) richer yellowish-brown interbeds.
72'7"	72'11½"	More massive pebbly mudstone with low spore content; pebbles are subangular to subrounded and often lie with their long dimensions parallel to bedding.
72'11½"	74'7½"	Moderately rich 'striped' oil shale, pebbly particularly near the top, and with decreased spore content at the base.
74'7½"	74'11½"	Barren blue-grey mudstone.
74'11½"	75'10"	Thin conglomerate band, underlain by pebbly sandy mudstone.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 14

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 60ft.

COLLAR CO-ORDINATES: 452128ME
5426610MN

COMPLETED DEPTH: 5'3"

DRILLING COMMENCED: 5.4.1975

COMPLETED: 5.4.1975

CORING COMMENCED: --

COMPLETED: -- RECOVERY: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 5.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence and depth of oil shale in order to determine the depth that coring should be commenced in an adjacent hole to obtain maximum core of shale.

RESULT: Hole abandoned due to intersection of a dolerite (?) dyke.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	5'2" (approx)	Clay and alluvium.
5'2" (approx)	5'3"	Dolerite, resulting in extremely slow drilling rate making it impractical to continue drilling in order to determine whether this dolerite is an alluvial boulder, especially since extensive dolerite outcrops for several hundred metres southwest of this borehole suggest that this is not the case.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 16

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 90' - 120'

COLLAR CO-ORDINATES: 451923ME
5426940MN

COMPLETED DEPTH: 32'3"

DRILLING COMMENCED: 6.4.1975

COMPLETED: 6.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONEY ON: 6.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence and depth of oil shale in order to determine the depth at which coring should be commenced in an adjacent hole to obtain maximum core. of shale.

RESULT: At least one foot of oil shale intersected at approximately 3½ feet.
Hole abandoned in order to core in an adjacent hole.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT.INS.	
0'	5'	Clay and alluvium.
5'	31' (approx)	Blue-grey mudstone.
31' (approx)	32'3"	Moderately rich oil shale overlain by narrow conglomerate and pale green fine sandstone.

LOG OF: MAYHEW 1,000

PROJECT: TASMANITE OIL SHALE DRILLING

COLLAR CO-ORDINATES: 451923ME
542694OMN

DRILLING COMMENCED: 6.4.1975

CORING COMMENCED: 30ft.

COMPANY: THOMPSON DRILLING COMPANY

HOLE LOGGED BY: M.D. MOONEY, ON: 6.4.1975

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To determine the exact depth and thickness of the oil shale horizon intersected by borehole No. 16 and to obtain core of the shale.

RESULT: No oil shale, despite intersection of shale in borehole No. 16 only one metre to the southwest and this suggests the occurrence of a fault between these two boreholes, the displacement being probably upwards on the northwestern block since borehole 16B intersected conglomerate at 60 feet.

BORE HOLE NO: 16B

ESTIMATED DEPTH: 40ft.

COMPLETED DEPTH: 72ft.

COMPLETED: 6.4.1975

COMPLETED: 35ft. RECOVERY: 80%

DRILLER: R. THOMPSON

ASSISTANT: R. SCHUMACHER

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	5'	Clay and alluvium.
5	30	Blue-grey mudstone.
30	30'2"	Quartz conglomerate with pale green fine muddy sandstone matrix.
30'2"	33'8"	Pale green fine muddy sandstone with pebbly interbeds. Given thickness includes 1 foot core loss, thought to be from these relatively soft beds.
33'8"	34'	Quartz pebble.
34'	35	Moderately hard blue-grey mudstone.
35	60	Blue-grey pebbly mudstone.
60	72	Conglomerate with quartz (mainly), pinkish-red fine sandstone and foliated quartzite pebbles in a grey mudstone matrix.

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ENDEAVOUR OIL COMPANY N.L.

LOG OF: MAYHEW 1,000

Bore HOLE NO: 17

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 150ft.

COLLAR CO-ORDINATES: 451609ME
5427165MN

COMPLETED DEPTH: 58ft.

DRILLING COMMENCED: 6.4.1975

COMPLETED: 7.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY, ON:6.4.1975
and 7.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence and approximate depth of oil shale in order to determine the depth at which coring should be commenced in an adjacent hole to obtain maximum core of shale.

RESULT: No oil shale. Hole abandoned in solid conglomerate, which is known to occur stratigraphically below the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	10'	Clay and alluvium.
10	21	Orange-brown clay.
21	22	Blue-grey mudstone.
22	28	Conglomerate: quartz and pinkish quartzitic sandstone fragments in a blue-grey mudstone matrix.
28	33	Relatively hard blue-grey sandy mudstone.
33	35	Conglomerate, as above.
35	55	Pebbly sandy mudstone with conglomerate interbeds.
55	58	Conglomerate: subrounded quartz and quartzite pebbles in a blue-grey mudstone matrix.

ENDEAVOUR OIL COMPANY N.L.

520063

LOG OF: MAYHEW 1,000

BORE HOLE NO: 18

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 50ft.

COLLAR CO-ORDINATES: 451454ME
5427517MN

COMPLETED DEPTH: 47ft.

DRILLING COMMENCED: 7.4.1975

COMPLETED: 7.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: MCD. MOONEY ON: 7.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence and if present, the approximate depth of oil shale in order to determine the depth at which coring should be commenced in an adjacent hole to obtain maximum core of shale.

RESULT: No oil shale. Hole abandoned in solid conglomerate, known to occur stratigraphically below the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT.INS.	
0'	20'	Yellowish-brown clay and alluvium.
20	46	with Blue-grey pebbly sandy mudstone - quartz and pinkish red quartzitic sandstone pebbles - with conglomerate interbeds (less than one foot thick).
46	47	Conglomerate, with quartz, quartzitic sandstone and quartzite fragments in a hard grey sandy mudstone, matrix.

ENDEAVOUR OIL COMPANY N.L.

520064

LOG OF: MAYHEW 1,000

BORE HOLE NO: 19

PROJECT: TASMANITE OILSHALE DRILLING

ESTIMATED DEPTH: 30ft.

COLLAR CO-ORDINATES: 451305ME
5427858MN

COMPLETED DEPTH: 35ft.

DRILLING COMMENCED: 7.4.1975

COMPLETED: 7.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 7.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence and, if present, the approximate depth of oil shale, in order to determine the depth at which coring should be commenced in an adjacent hole to obtain maximum core of shale.

RESULT: No oil shale. Hole abandoned in solid conglomerate, known to occur stratigraphically below the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	27'	Clay and alluvium.
27	35	Conglomerate: predominantly quartz and quartzite fragments in a grey muddy sandstone or sandy mudstone, matrix.

LOG OF: MAYHEW 1,000
PROJECT: TASMANITE OIL SHALE DRILLING
COLLAR CO-ORDINATES: 451150ME
 5428195MN

BORE HOLE NO: 20
ESTIMATED DEPTH: 50ft.
COMPLETED DEPTH: 65ft.

DRILLING COMMENCED: 7.4.1975

COMPLETED: 8.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

LOGGED BY: M.D. MOONEY ON: 7-8.4.1975

ASSISTANT: R. SCHUMACHER

OBJECT: To investigate the occurrence and, if present, the approximate depth of oil shale, in order to determine the depth at which coring should be commenced in an adjacent hole to obtain maximum core of shale.

RESULT: No oil shale. Hole abandoned in solid conglomerate, known to occur stratigraphically below the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM FT. INS	TO FT.INS.	
0'	20'	Reddish-brown soil and alluvium.
20	38	Hard blue-grey sandy mudstone.
38	44	Softer blue-grey mudstone.
44	65	Conglomerate: predominantly quartz, quartzitic sandstone and dark grey quartzite, with minor green pebbly sandstone, in a matrix of blue-grey fine muddy sandstone, or sandy mudstone.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 21

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 150ft.

COLLAR CO-ORDINATES: 5429143MN
454546ME

COMPLETED DEPTH: 80ft.

DRILLING COMMENCED: 12.4.1975

COMPLETED: 12.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 12.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: No oil shale. Hole abandoned in solid conglomerate, thought to occur stratigraphically below the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	20'	Pale yellow clay and alluvium.
20	40	Yellow and blue-grey mudstone.
40	55	Relatively hard blue-grey sandy mudstone. or sandy mudstone
55	80	Conglomerate: blue-grey fine muddy sandstone/matrix with predominantly quartz, pinkish red quartzitic sandstone and dark grey quartzite pebbles.

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ENDEAVOUR OIL COMPANY N.L.

LOG OF: MAYHEW 1,000 BORE HOLE NO: 22
PROJECT: TASMANITE OILSHALE DRILLING ESTIMATED DEPTH: 150ft.
COLLAR CO-ORDINATES: 454397ME COMPLETED DEPTH: 110ft.
5429465MN
DRILLING COMMENCED: 10.4.1975 COMPLETED: 11.4.1975
CORING COMMENCED: -- COMPLETED: --
COMPANY: THOMPSON DRILLING COMPANY DRILLER: R. THOMPSON
HOLE LOGGED BY: M.D. MOONEY ON: 10-11.4.75 ASSISTANT: R. SCHUMACHER
HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and to obtain core of the shale, in this or an adjacent hole.

RESULT: No oil shale. Hole abandoned in solid conglomerate, thought to occur stratigraphically below the shale horizon.

FROM FT. INS.	DEPTH		GEOLOGICAL LOG
	TO FT. INS.		
0'	25'		Clay and alluvium.
25	42		Conglomerate: pink quartzitic sandstone, grey quartzite and quartz pebbles (generally subangular) in a blue-grey sandy mudstone matrix.
42	55		Conglomerate, with predominantly quartzite, white quartz and foliated quartzite pebbles in a grey sandy, mudstone, or muddy sandstone, matrix. Thin blue-grey mudstone interbeds.
55	85		Moderately hard blue-grey mudstone.
85	110		Conglomerate with a white quartz sandstone matrix and (?pebbles or layers of) green foliated quartzite.

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ENDEAVOUR OIL COMPANY N.L.

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LOG OF: MAYHEW 1,000

BORE HOLE NO: 23

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: < 100ft.

COLLAR CO-ORDINATES: 454250ME
5429796MN

COMPLETED DEPTH: 95ft.

DRILLING COMMENCED: 10.4.1975

COMPLETED: 10.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONEY ON: 10.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and to obtain core of the shale (in this or an adjacent borehole).

RESULT: No. oil shale. Hole abandoned in solid conglomerate, which is thought to occur stratigraphically lower than the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	15'	Soil and alluvium.
15	16	Quartzite boulder.
16	50	Hard blue-grey pebbly sandy mudstone.
50	65	Soft blue-grey mudstone.
65	78	Conglomerate: predominantly pinkish-red quartzitic sandstone, dark grey quartzite, quartz and green sandstone pebbles in a grey mudstone matrix.
78	95	Conglomerate: predominantly white quartz, grey quartzite and foliated quartzite, but variable, pebbles in a hard grey sandy mudstone matrix.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 24

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 50ft.

COLLAR CO-ORDINATES: 454880ME

COMPLETED DEPTH: 135ft.

DRILLING COMMENCED: 11.4.1975

COMPLETED: 11.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONEY ON: 11.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: No oil shale. Hole abandoned in conglomerate and pebbly muddy sandstone, thought to occur stratigraphically below the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	12'	Yellowish-brown clay and alluvium.
12	80	Soft blue-grey mudstone.
80	135	Relatively hard blue-grey fine muddy sandstone, pebbly and in places grading into conglomerate. Mainly quartz and quartzite pebbles.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 25

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 60ft.

COLLAR CO-ORDINATES: 454672ME
5430462MN

COMPLETED DEPTH: 57ft.

DRILLING COMMENCED: 12.4.1975

COMPLETED: 12.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONEY ON: 12.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: No oil shale. Hole abandoned in solid conglomerate, thought to occur stratigraphically below the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	20'	Pale yellowish-brown clay and alluvium.
20'	25	Weathered conglomerate.
25	57	Conglomerate: quartz, pinkish-red quartzitic sandstone and quartzite fragments in a relatively hard blue-grey fine muddy sandstone/matrix. or sandy mudstone

LOG OF: MAYHEW 1,000

BORE HOLE NO: 26

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 20ft.

COLLAR CO-ORDINATES: 454585ME
542991OMN

COMPLETED DEPTH: 50ft.

DRILLING COMMENCED: 13.4.1975

COMPLETED: 13.4.1975

CORING COMMENCED: -

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONEY ON: 13.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: No oil shale. Hole abandoned in solid conglomerate, thought to occur stratigraphically below the oil shale horizon.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	5'	Clay and alluvium.
5	50	Conglomerate: quartz, pinkish-red quartzitic sandstone and quartzite pebbles in a blue-grey fine muddy sandstone or sandy mudstone matrix.

LOG OF: MAYHEW 1,000
PROJECT: TASMANITE OIL SHALE DRILLING
COLLAR CO-ORINDATES: 5430256MN
 454414ME

BORE HOLE NO: 27
ESTIMATED DEPTH: 50ft.
COMPLETED DEPTH: 23'9"

DRILLING COMMENCED: 13.4.1975

COMPLETED: 13.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONEY ON: 13.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: Oil shale intersected at approximately 23ft. Hole abandoned in order to obtain a maximum core of shale, in an adjacent borehole.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	1'6"	Clay and alluvium.
1'6"	23 (approx)	Moderately hard blue-grey mudstone.
23 (approx)	23'9"	Oilshale.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 27B

PROJECT: TASMANITE OILSHALE DRILLING

ESTIMATED DEPTH: 31ft.

COLLAR CO-ORDINATES: 5430256MN
454414ME

COMPLETED DEPTH: 31'5"

DRILLING COMMENCED: 13.4.1975

COMPLETED: 13.4.1975

CORING COMMENCED: 21'2"

COMPLETED: 31'5" RECOVERY: 100%

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONLEY ON: 13.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To determine the thickness of the oil shale horizon intersected by borehole 27 and to obtain core of the shale.

RESULT: 100% core recovery of 5ft. 9ins. of oil shale, with 3 rich bands separated by poorer bands, intersected from 23ft. to 28ft. 9 ins.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	21'2"	Blue-grey mudstone.
21'2"	23	Blue-grey (moderately) pebbly mudstone. Predominantly white quartz sandstone, quartz and grey quartzite pebbles, subangular to subrounded and often subelongated parallel to the plane of bedding.
23	23'6"	Pebbly mudstone with very low spore content, grading downwards into moderately rich oil shale.
23'6"	24'2"	Moderately rich oil shale, with thin yellowish-brown very rich interlayers.
24'2"	24'8"	Mudstone with low spore content.
24'8"	25'3"	Rich oil shale.
25'3"	26'4"	Mudstone with low spore content, grading into moderately rich beds near the bottom.
26'4"	28'1"	Rich oil shale.
28'1"	28'9"	Mudstone with spore content decreasing downwards from moderate to very low.
28'9"	31'4"	Blue-grey pebbly sandy mudstone.
31'4"	31'5"	Conglomerate: quartzite and pale green foliated quartzite pebbles in a blue-grey mudstone matrix.

ENDEAVOUR OIL COMPANY N.L.

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LOG OF: MAYHEW 1,000

BORE HOLE NO: 28

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 40ft.

DRILLING COMMENCED: 14.4.1975

COMPLETED: 14.4.1975

COLLAR CO-ORDINATES: 454233M
5430645MN

COMPLETED DEPTH: 22'11"

CORING COMMENCED: 12ft. 11ins.

COMPLETED: 22'11" RECOVERY: 97½%

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY, ON: 14.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: 5ft. 7ins. (+ an inch) of oil shale intersected from a depth of 12ft. 9 ins. (+ an inch) to 18ft. 4ins. 5ft. 5ins. of shale core, from 12ft. 11ins. to 18ft. 4ins., obtained.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	2'	Soil and alluvium.
2	12'9" (approx)	Hard blue-grey sandy mudstone.
12'9" (approx)	12'11"	Mudstone with low spore content.
12'11"	14'	Moderately rich oil shale grading downwards into mudstone with generally low spore content. Scattered quartzite, white quartz sandstone (with fine-grained sulphide (?pyrite) associated in one case) and quartzite pebbles.
14	14'5"	Rich oil shale.
14'5"	15'7"	Moderately rich oil shale, grading downwards into mudstone with low spore content.
15'7"	16'8"	Rich oil shale.
16'8"	18'4"	Moderately rich oil shale grading rapidly downwards into mudstone with very low spore content (< 1%).
18'4"	22'8"	Relatively hard blue-grey sandy mudstone with one soft mudstone interbed.
22'8"	22'11"	Core lost.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 29

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 60ft.

COLLAR CO-ORDINATES: 5431006MN
454009ME

COMPLETED DEPTH: 24'3"

DRILLING COMMENCED: 14.4.1975

COMPLETED: 14.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONEY ON: 14.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: Oil shale intersected at approximately 24ft. Hole abandoned in order to obtain maximum core of shale, by coring in an adjacent borehole.

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	6'	Clay and alluvium.
6	24 (approx)	Blue-grey sandy mudstone.
24 (approx)	24'3"	Oil shale.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 29B

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 32ft.

COLLAR CO-ORDINATES: 5431006MN
454009ME

COMPLETED DEPTH: 32ft.

DRILLING COMMENCED: 14.4.1975

COMPLETED: 14.4.1975

CORING COMMENCED: 22ft.

COMPLETED: 32ft. RECOVERY: 69%

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONEY ON: 14.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To determine the exact depth and thickness of the oil shale horizon intersected by borehole 29 and to obtain core of the shale.

RESULT: Five feet of oil shale, including 3 rich bands, intersected from a shaft of 23ft.3ins to 28ft.3ins. Possibly some (probably less than 1 foot) core lost from shale horizon, so that the shale's thickness may be greater than five feet.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	6'	Clay and alluvium.
6	22	Blue-grey sandy mudstone.
22	23'3"	Relatively hard blue-grey sandy and pebbly mudstone. Very low spore content-beds not included in shale thickness given above.
23'3"	23'8"	Soft blue-grey mudstone with increased, but still low, spore content.
23'8"	23'10"	Moderately rich to rich oil shale.
23'10"	23'10 $\frac{1}{2}$ "	Pale reddish-brown sandy mudstone layer, moderately rich to rich in spores which are a deep red colour, rather than the usual amber.
23'10 $\frac{1}{2}$ "	24'11"	Alternating layers of soft blue-grey mudstone and harder sandy mudstone. Low spore content.
24'11"	25'9"	Rich oil shale, with a matrix consisting of alternating layers (less than 2 inches thick) of soft mudstone and harder sandy mudstone.
25'9"	26'2"	Matrix as above, with spore content decreasing downwards from moderate to low.
26'2"	27'3"	As above, but low to very low spore content.
27'3"	28'3"	Very rich friable yellowish-brown oil shale.
28'3"	28'11"	Very few to no spores. Hard blue-grey sandy mudstone, with a few soft mudstone interbeds.
28'11"	32'	Core probably lost mainly from these beds, suggested by drilling properties to be soft mudstone.

ENDEAVOUR OIL COMPANY N.L.

520077

LOG OF: MAYHEW 1,000

BORE HOLE NO: 30

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 40ft.

COLLAR CO-ORDINATES: 453847ME
5431392MN

COMPLETED DEPTH: 33'6"

DRILLING COMMENCED: 14.4.1975

COMPLETED: 14.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONEY ON: 14.4.1975

ASSISTANT: R.SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: Oil shale intersected from approximately 25' to 32 feet. Hole abandoned in/core in an adjacent borehole.
order to

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	5'	Clay and alluvium.
5	26 (approx)	Moderately hard blue-grey sandy mudstone.
26 (approx)	32 (approx)	Oil shale.
32 (approx)	33'6"	Barren blue-grey mudstone.

LOG OF: MAYHEW 1,000
PROJECT: TASMANITE OILSHALE DRILLING
COLLAR CO-ORDINATES: 453847ME
 5431392MN
DRILLING COMMENCED: 14.4.1975
CORING COMMENCED: 25ft.
COMPANY: THOMPSON DRILLING COMPANY
HOLE LOGGED BY: M.D.MOONEY ON: 14.4.1975
HIRER: ENDEAVOUR OIL COMPANY N.L.

BORE HOLE NO: 30B
ESTIMATED DEPTH 34ft.
COMPLETED DEPTH: 34'1"
COMPLETED: 14.4.1975
COMPLETED: 34'1" RECOVERY: 89%
DRILLER: R. THOMPSON
ASSISTANT: R. SCHUMACHER

OBJECT: To determine the exact depth and thickness of the oil shale horizon intersected by borehole 30, and to obtain core of the shale.
RESULT: Five feet 7 inches of oil shale, including 3 rich bands, intersected from a depth of 28 feet to 31 feet 7 inches (assuming no core loss from shale horizon).

DEPTH		GEOLOGICAL LOG
FROM	TO	
FT. INS.	FT. INS.	
0'	25'6"	Blue-grey sandy mudstone, moderately hard.
25'6"	26	Soft blue-grey mudstone, with a few harder sandy interbeds. Very low spore content at the bottom.
26	27'1"	Harder mudstone with low spore content, increasing near the bottom to moderate.
27'1"	28'3"	Alternating soft mudstone and harder sandy mudstone layers with moderate to rich spore content:- rich shale decreasing downwards in spore content.
28'3"	29'	Rich oil shale: harder sandy mudstone matrix with thin layers of yellowish-brown very rich and fissile shale.
29	29'9"	Alternating hard and soft mudstone, with mainly low spore content.
29'9"	30'9"	Rich oil shale.
30'9"	31'7"	Predominantly hard sandy mudstone, with spore content decreasing downwards from moderate to very low.
31'7"	32'11"	Blue-grey mudstone.
32'11"	34'1"	? Core lost - thought to be mainly from these beds because of their softness in drilling, but possibly also from the soft 'crumbly' rich oil shale layers.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 31

PROJECT: TASMANITE OILSHALE DRILLING

ESTIMATED DEPTH: 70ft.

COLLAR CO-ORDINATES: 453810ME
5431700MN

COMPLETED DEPTH: 104'8"

DRILLING COMMENCED: 14.4.1975

COMPLETED: 15.4.1975

CORING COMMENCED: 97'3"

COMPLETED: 104'8" RECOVERY: 94%

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D.MOONEY ON:14-15.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: A minimum of 4 feet of oil-shale, including 3 rich bands, intersected from approximately 97 feet to 101 feet. 3 feet, 9 inches of core obtained from the shale horizon, at least a few inches of it having been passed through before coring was commenced and probably about 2 inches of shale core having been lost.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	54'	Soft blue-grey mudstone.
54	72	Harder blue-grey sandy mudstone.
72	96'6" to 97	Soft blue-grey mudstone.
96'6" to 97'	97'3"	Oil shale, rich for at least bottom few inches.
97'3"	97'9"	Moderately rich in spores. Matrix: hard blue-grey pebbly sandy mudstone.
97'9"	98'9"	Hard sandy mudstone of moderate spore content, with thin (less than half an inch thick) rich and, (therefore), very fissile layers.
98'9"	99'6"	Sandy mudstone with very low (less than 1%) to low spore content, increasing at the bottom to moderate.
99'6"	100'8"	Rich oil shale. Includes 2 inches of core loss, assumed to be probably from these very fissile beds.
100'8"	101'	Harder sandy mudstone, with spore content decreasing from moderate at the top to very low.
101'	102'6"	Hard sandy mudstone with no, or very few, spores.
102'6"	104'5"	Soft blue-grey mudstone.
104'5"	104'8"	Core lost.

LOG OF: MAYHEW 1,000

BORE HOLE NO: 32

PROJECT: TASMANITE OILSHALE DRILLING

ESTIMATED DEPTH: 60ft.

COLLAR CO-ORDINATES: 453904ME
5432087MN

COMPLETED DEPTH: 151'6"

DRILLING COMMENCED: 15.4.1975

COMPLETED: 15.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 15.4.1975

ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: No oil shale. Hole abandoned, in mudstone, at 151' 6" because this programme is aimed primarily at outlining relatively shallow shale occurrences.

<u>DEPTH</u>		<u>GEOLOGICAL LOG</u>
<u>FROM</u> <u>FT. INS.</u>	<u>TO</u> <u>FT. INS.</u>	
0'	151'6"	Blue-grey mudstone, generally moderately hard, with some pebbly mudstone interbeds containing mainly quartz and quartzite pebbles.

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ENDEAVOUR OIL COMPANY N.L.

520083

LOG OF: MATHEW 1,000 BOROHOLE NO. 33
PROJECT: TASMANITE OIL SHALE DRILLING ESTIMATED DEPTH: 140ft.
COLLAR CO-ORDINATES: 4542308E 5432147W COMPLETED DEPTH: 154ft. 6ins.
DATE DRILLING COMMENCED: 16.4.1975 COMPLETED: 16.4.1975
CORING COMMENCED: -- COMPLETED: --
COMPANY: THOMPSON DRILLING COMPANY DRILLER: R. THOMPSON
HOLE LOGGED BY: M.D. MOONEY ON: 16.4.1975 ASSISTANT: R. SCHUMACHER
HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.
RESULT: No oil shale. Hole abandoned, in sandstone, at 154ft. 6ins. because the programme aimed primarily at investigating, relatively shallow occurrences of shale.

<u>FROM</u>	<u>DEPTH</u>		<u>GEOLOGICAL LOG</u>
	<u>FT.</u>	<u>TO</u>	
<u>INS.</u>	<u>FT.</u>	<u>INS.</u>	
0'	23'		Pale yellow sand and clay.
23	50		Soft blue-grey sandstone.
50	70		Soft blue-grey sandstone, with occasional interbeds, approximately one foot thick, of lighter grey fine sandstone.
70	154'6"		Soft blue-grey/sandy sandstone.

LOG OF: MAYHEW 1,000

BOREHOLE No. 36

PROJECT: TASMANITE OIL SHALE DRILLING
45423888

ESTIMATED DEPTH: 155ft.

COLLAR CO-ORDINATES: 5432514MN

COMPLETED: 155ft.

DATE DRILLING COMMENCED: 16.4.1975

COMPLETED: 16.4.1975

CORING COMMENCED: ---

COMPLETED: ---

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY ON: 16.4.1975 ASSISTANT: R. SCHUMACHER

HIRER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: No oil shale. Hole abandoned, in mudstone, at 155 feet, because the programme aimed primarily at investigating relatively shallow occurrences of shale.

DEPTH		GEOLOGICAL LOG
FROM FT.INS.	TO FT.INS.	
0'	40'	Pale yellow medium-coarse grained quartz sand.
40	65	Ochre-coloured fine-grained quartz sand.
65	80	Soft blue-grey mudstone.
60	155	Slightly harder blue-grey mudstone.

LOG OF: MAYHEW 1,000

BOREHOLE NO. 37

PROJECT: TASMANITE OIL SHALE DRILLING
454834NE

ESTIMATED DEPTH: 170ft.

COLLAR CO-ORDINATES: 5491800NE

COMPLETED DEPTH: 168ft. 6ins.

DATE DRILLING COMMENCED: 15.4.1975

COMPLETED: 15.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

HOLE LOGGED BY: M.D. MOONEY, ON: 15.4.1975 ASSISTANT: R. SCHUMACHER

HIREE: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale and, in this or an adjacent borehole, to obtain core of the shale.

RESULT: No oil shale. Hole abandoned, in sandstone, at 168 and a half feet, because the programme aimed primarily at investigating relatively shallow occurrences of shale.

DEPTH		GEOLOGICAL LOG
FROM FT. INS.	TO FT. INS.	
0'	30'	Yellow quartz sand, and alluvium.
30	50	Poorly consolidated (weathered) light grey fine-medium grained sandstone, with coal interbeds less than half an inch thick. One approximately one foot thick coal layer near the top.
50	115	Interbedded light-grey fine sandstone and blue-grey sandstone.
115	168'6"	Moderately hard blue-grey sandy sandstone,

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ENDEAVOUR OIL COMPANY N.L.

520086

LOG OF: MAYHEW 1,000

BOROHOLE NO. 38

PROJECT: TASMANITE OIL SHALE DRILLING

ESTIMATED DEPTH: 215ft.

CELLAR CO-ORDINATES: 4542830E
3431960W

COMPLETED DEPTH: 214ft. 6ins.

DATE DRILLING COMMENCED: 18.4.1975

COMPLETED: 18.4.1975

CORING COMMENCED: --

COMPLETED: --

COMPANY: THOMPSON DRILLING COMPANY

DRILLER: R. THOMPSON

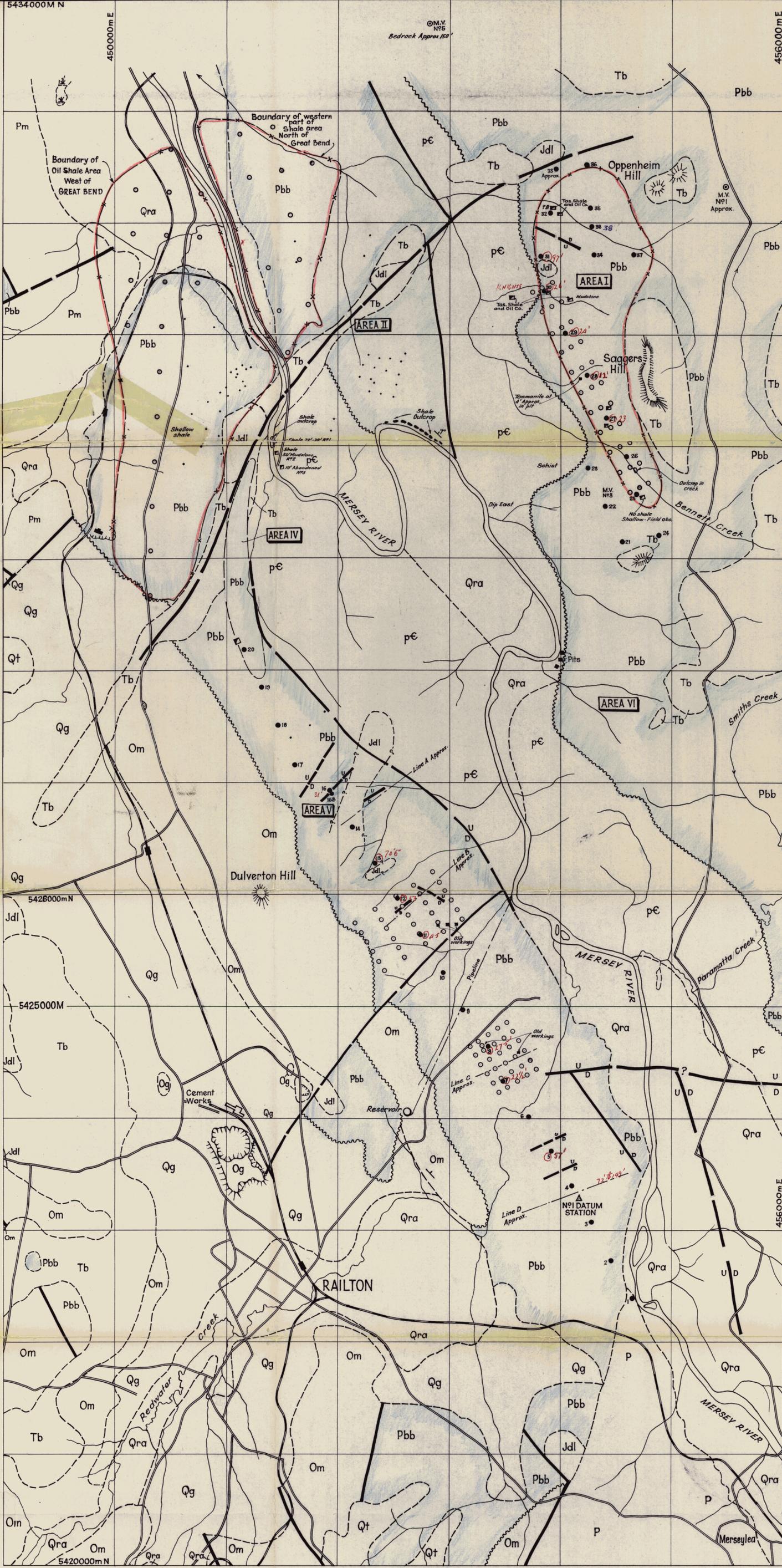
HOLE LOGGED BY: M.D. MOONEY ON: 18.4.1975 ASSISTANT: R. SCHUSACKER

OWNER: ENDEAVOUR OIL COMPANY N.L.

OBJECT: To investigate the occurrence, depth and thickness of oil shale; if intersected, but primarily to investigate the stratigraphy at depth, below the level at which the other boreholes in this area have been abandoned, in order to provide additional information to account for the absence of shale in those boreholes.

RESULT: No oil shale. Hole abandoned, in mudstone, at 215 feet, the maximum depth possible with the amount of drill stem available.

DEPTH		GEOLOGICAL LOG
FROM FT., DS.	TO FT., DS.	
0'	25'	Pale yellow clay.
25	80	Soft blue-grey sandy mudstone.
80	110	Interbedded blue-grey soft sandy mudstone and relatively hard fine sandy sandstone.
110	125	Pebbly and muddy fine sandstone with rounded and faceted quartz and quartzite pebbles.
125	134	Hard shaly mudstone.
134	140	Pebbly and muddy fine sandstone, as above.
140	185	Lighter grey muddy calcareous fine sandstone; up to 10% calcite, mainly crystalline but with probable organic structures visible in some fragments, one being identified as bryozoan; minor quartz and dark grey quartzite pebbles.
185	214'6"	Hard blue-grey slightly pebbly mudstone, with occasional thin interbeds of soft mudstone.



REFERENCE

QUATERNARY	Qra	Recent alluvium
	Qt	Basalt dolerite quartzite and conglomerate talus
	Qg	Sands clays and residual gravels
PERMIAN	Pf	Fernree group
	Pw	Woodbridge group
	Pm	Mersey coal measures
	Pbb	Basal beds including Tasmanite oil shale member
	P	
ORDOVICIAN	Og	Skarn and Gordon limestone
	Om	Moina sandstone including Caroline Creek beds
	Or	Roland and dial conglomerates
CAMBRIAN	Egg	Gog Range greywacke
	Eb	Bott conglomerate Sprent Formation
	Esf	
	Em	Motton Spilitite
PRE-CAMBRIAN	pE	Undifferentiated
IGNEOUS ROCKS	Tb	Tertiary Basalt
	Jdl	Jurassic Dolerite

LEGEND

Fault	
Unconformity	
Geological boundary	
Indefinite	
Approximate	
Strike and dip of bedding	
Strike of vertical bedding	
Mine - abandoned	
Cuttings	
River, creek, watercourse	
Railway line	
Road, track	
Shaft	
Borehole locations	
Previous	
Current	
Proposed	

SCALE 250 0 200 400 500 1000 1500 2000 METRES

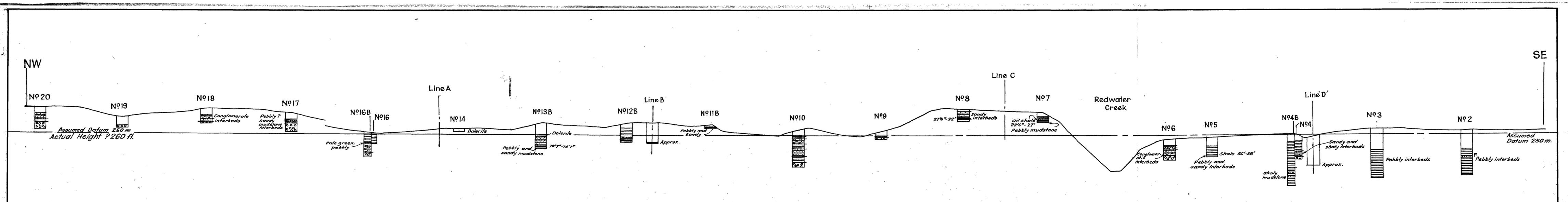
After Tasmanian Dept. of Mines map, 'Sheffield' 1:63360 and Tas. Dept. of Lands & Surveys map, 'Railton' 1:31680

L.G.B. NIXON & ASSOCIATES 75-1099

DRAWN L.G.B.N.
TRACED M.R.T.
SCALE 1:15000
DATE JULY '75

ENDEAVOUR OIL COMPANY N.L.
GEOLOGICAL MAP OF THE CENTRAL PORTION OF EXPLORATION LICENCE 4/74 SHOWING PREVIOUS CURRENT AND PROPOSED BOREHOLE LOCATIONS.
LAND DISTRICT OF DEVON
LOCALITY OF LATROBE 264

520037
5cm

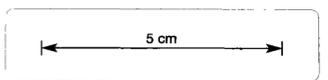


SCALES

HORIZONTAL 0 500 1000 1500 2000 2500 3000 3500 4000 FEET

VERTICAL 100 0 100 200 300 400 500 FEET

VERTICAL EXAGGERATION X 5

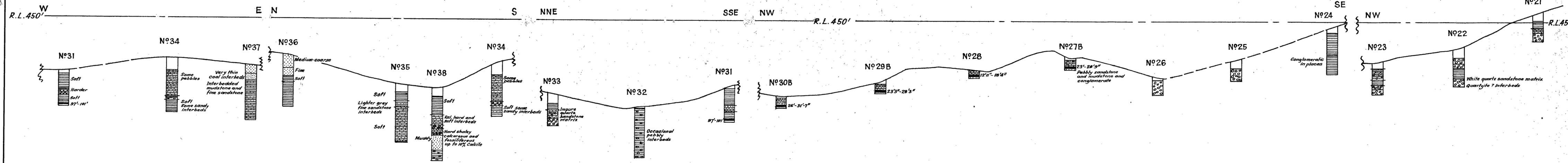


-  Mudstone
-  Sandy mudstone
-  Pebbly mudstone
-  Sandstone
-  Pebbly sandstone
-  Conglomerate (sandy mudstone matrix unless otherwise specified)
-  Oil shale
- F Fossiliferous
- C Coal bearing

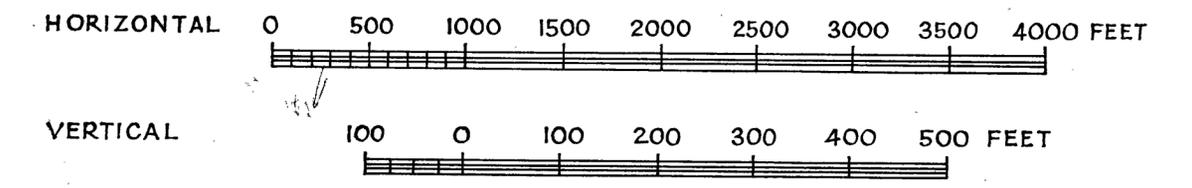
CHINA FLAT AREA

M.J.T.

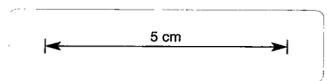
L.G.B. NIXON & ASSOCIATES		75-1099
DRAWN	ENDEAVOUR OIL COMPANY N.L.	
TRACED M.R.T.	GEOLOGICAL CROSS SECTIONS —	
CHECKED	EXPLORATION LICENCE 4/74	
DATE JUNE 75	LAND DISTRICT OF DEVON	
	LOCALITY OF LATROBE	
	FIG. 1	



SCALES



VERTICAL EXAGGERATION X5



- Quartz sand
- Mudstone (blue grey)
- Sandy mudstone
- Pebbly mudstone
- Sandstone
- Pebbly sandstone
- Conglomerate (sandy mudstone matrix unless otherwise specified)
- Oil shale
- Coal
- Fossiliferous

KNIGHT CHURCHILL AREA
SOUTH-EAST OF LATROBE.

520089	
L.G.B. NIXON & ASSOCIATES 75-1099	
DRAWN	ENDEAVOUR OIL COMPANY N.L. GEOLOGICAL CROSS SECTIONS - EXPLORATION LICENCE 4/74 LAND DISTRICT OF DEVON LOCALITY OF LATROBE.
TRACED MRT	
CHECKED	
DATE JUNE 75	
FIG. 2	