OR 1909/151-156

NORTH BRUNY OIL PROSPECTS.

INTRODUCTION.

Some years ago local residents reported indications of oil at Bruny Island and exhibited specimens of bitumen (?) in confirmation thereof. The discovery was brought under the notice of officers of the Mines Department and Dr. Loftus Hills was sent to investigate the area and report on its prospects. Dr. Hills described the bitumen (?) as a pitch and presented an adverse report. Later, Dr. Wade, Commonwealth Geological advisor was sent to carry out a survey and report to the Commonwealth Government. This report also was unfavourable.

Despite this those directly interested contended that oil indications had been definitely determined and they proceeded quietly with their prospecting operations.

Recently, as a result of further discoveries, a Syndicate was formed in Hobart for the more active prosecution of the search and appointed A. G. Black of Melbourne as advisor. Under Mr. Black's superintendence a considerable amount of prospecting work has been performed the results of which are described in this report.

TOPOGRAPHY

The topographic relief is not very striking. The highest point (530 feet) above sea level is at one of a series of four parallel ranges coursing a little west of north. These ranges vary in height from 100 to 530 feet and mark four lines of faulting.

Light scrub and widely spaced stringy bark trees subsist on the poor sandy soils of the area.

GEOLOGIC RELATIONS AND STRUCTURE.

The area under review is occupied by members of the Permo-Carboniferous formation which are intruded by sills and transgressive bodies of diabase.

The lowest member outcropping here is a pebbly calcareous mudstone overlain by a fossiliferous (fenestella predominating) mudstone intercalated with thin beds of fenestella limestone, shale and sandstone.

Resting on this is a calcareous mudstone with occasional pebbles of granite, quartz and quartzite, succeeded by beds of fenestella mudstone, quartz grits and sandstones, non-fossiliferous mudstone, shales, grits and sandstones.

Intrusive diabase in irregular sills appears along the east coast line under cover of Permo-Carboniferous strata and outcropping near Cape Frederick Henry, Barnes Bay, and along main road leading to Denne Point. It crops at other spots also in this area but not prominently.

At Variety Bay the disrupting effect of the diabase is well illustrated. At Cape Frederick Henry bedded structure has been given to gabbroid diabase as a result of the influence of the structure of the intruded mudstones.

The average dip of the Permo-Carboniferous rocks varies from 15° to 20° in an almost due west direction.

The examination reveals that the sedimentaries and the diabase have been subjected to block faulting. Four faults coursing a little west of north with downthrow to the east have been located. The extensions of these faults rather strikingly coincide with prominent sections of the coastline as illustrated on the accompanying map, the coincidence being the direct causal effect of erosion-resisting diabase projected above water-line. The accompanying section roughly illustrates the structure.

At no considerable depth sills and transgressive bodies of diabase underlie the sedimentary rocks of the whole area.

GEOLOGIC CONDITIONS.

As regards the formation of oil the rocks indicate shallow marine conditions of deposition, but whether under embayment or landlocked conditions is open to question. The beds are thin and are made up of materials apparently suitable for the formation and retention of oil. Since their deposition, however, they have been intruded and disrupted by diabase and have been subjected to faulting. The conditions at present therefore are not favourable for the accumulation of oil in natural reservoirs.

OIL INDICATIONS.

The following list of indications have been investigated :-

(1) Gas bubbles on water,

(2) Petroleum seepages,

(3) Oil scum on sea,

(4) "Bitumen" filling cracks in rocks,

(5) "Bitumen" (resin) in ploughed fields.

(1) Gas Bubbles from springs, creeks, or wells may be of two classes :-

(a) Inflammable consisting largely of marsh gas, and

(b) Non-inflammable consisting of carbon dioxide, sulphur dioxide, etc.

Marsh gas does not necessarily indicate the near presence of oil, because that gas is often given off by decaying vegetation from marshes, lakes, wells, and creeks.

Marsh gas is given off from well waters at Bruny at places where no oil showing appear, but also with the oil showings.

(2) Petroleum Seepages -

That seepages of oil may be regarded as valuable indications is generally admitted. In some cases films of iron and manganese oxides over pools of water have been mistaken by local residents for coatings of oil, because of the superficial resemblance. Such reports of "seepages" have led to much unnecessary work.

Oil showings have been examined at :-

(a) Johnson's well,

(b) Myles Creek,

(c) Andrew's wells,

(d) Great Bay.

(a) The showing at Johnson's well appears as a scum on the water, and when the bedrock (sandy mudstone) is struck with a heavy pole globules of oil rise to surface. These globules have the appearance of natural petroleum, the volatile portion soon disappearing leaving a heavy fraction which forms a scum. This well is only 6 feet deep and lies just outside the boundary fence of an orchard. Investigations were made to ascertain the possibilities of contamination and the following information was obtained :-

The orchard is not attached to a homestead,

No spray oil has been used on the trees,

No habitation lies on the up-hill side of the orchard,

The nearest habitation lies a quarter of a mile on the sea side,

When thoroughly cleared out oil showing continued to appear,

After firing several charges of gelegnite and allowing water to enter from the bottom the oil showings continued and an oil scum covered the water.

This apparently is a true showing.

(b) At Myles Creek an oily scum covers small backwaters and occasionally a showing of oil may be obtained by striking the bedrock. No habitation lies within a mile of Myles Creek nor has any milling plant or other works been erected in that quarter. The country rock (dolomitic mudstone) is faulted along the course of the valley.

(c) The wells near Andrew's bore give showings of oil but these could have become contaminated by reason of their situation.

(d) Oil showings are reported in a small creek flowing into Great Bay. The showings are not above high tide and the oil therefore might have been derived from floating material brought in by the tide.

It must be kept in mind that though some of the seeps are apparently genuine, accumulations may never have been in sufficient quantities to yield paying amounts, or that the seep may have been so large and existed so long as to have totally depleted the reservoir. It must be remembered also that oil and gas may move laterally long distances before escaping to the surface. The seep is merely an indication that a horizon is oil or gas bearing and that under favourable structural conditions it may be worth prospecting.

Take the cases in point; both the seepages at Myles Creek and at Johnson's well are on lines of faulting, that is to say, lines of weakness where escape under ordinary conditions would be probable. However, that does not always follow because many faults are but broken anticlines and may act as a seal to the oil. Where escape has been long continued masses of asphaltum may be found along fault lines and extend a long distance, but light gravity oils do not leave an asphaltum residue.

The upthrow side of a fault acts in some cases like the higher part of an anticline and is in consequence the most favourable place on a faulted structure to drill for oil. Faulting here appears in normal form only, the displacements being fairly close but of no great extent. Although the faulting is close it must be borne in mind that most productive fields are cut by faults. It is not an uncommon feature of oil fields.

(3) Oil scum on sea -

A strong showing of oil appeared in an inlet north of Cape Frederick Henry and at the north end of Adventure Bay. Samples of this substance were obtained and tested. The material is a heavy residual product of petroleum. It is probably a waste substance discharged from vessels.

Reports of similar oil scums and flowings have been received from residents of the South Island. These were not investigated because those interested stated that owing to rough weather their examination would be impracticable.

(4) Bitumen (?)

At the north end of Myles Beach, a little west of Cape Frederick Henry a "bituminous" looking substance fills a number of cracks in diabase. It is found at this spot only and not higher than 20 feet above sea level. A joint plane coursing N. 74°E. into the hill is traversed by a number of cross fractures bearing N. 5°W., N. 15°W., and N. 20°W. The joint and the cross fractures contain a little of the "bitumen" which it is reported extends into the soil cover. At the time of visit no trace of "bitumen"could be found in the soil, nor had any been found by the prospectors in their recent trenchings up the hillside.

This "bituminous" substance does not lie above storm waters, nor has any been found at any other place in the neighbourhood. Its position, association with diabase, nature and composition is suggestive of flotsam. To that suggestion credence is given by the report that 70 years ago a vessel laden with barrels of coal tar was wrecked in the neighbourhood. Moreover asphaltum, specimens of which are found strewn along the West Coast of Tasmania, has not been found in the Derwent Estuary. Asphaltum is a natural petroleum product, and differs greatly from the "Bitumen" found near Cape Frederick Henry. The place where the so-called bitumen is found is known to local residents as "The Tar pot". Fishermen, according to report, have from time to time visited the spot and removed the tar for use in caulking their boats. Samples of this material were subjected to distillation processes with the following results:-

Melting started at	25°C
" completed at	46°C
Light Oil given off at	94°C
" " flowing "	125°C
Heavy oil flowing	284°C
Light Oil rapidly boiling at	180°C
Very thick oil	315°C

The crude oil is reddish brown and possesses a strong, not unpleasant odour of creosote. On the application of caustic soda violent action ensued, and after long agitation unsaturated hydrocarbons were absorbed leaving a cover of oil which in transmitted light appeared

deep red and in reflected light green. Digested in a bath of strong sulphuric acid the odour of creosote is removed almost entirely, and the solution becomes bluish-black and ultimately dark reddish brown. After long agitation and the introduction of caustic soda to neutralise the acid the oil loses its red hue and assumes the typical green and leaves a tar-like residue.

The cleansed crude oil was then divided into fractions by further distillation :-

Oil distillate	78%	sp. gr.	0.954
Residual carbon	18%		
Moisture	1%		
Loss	3%		

Spirit	105^{o}	to 150^{o}	- 5%
Kerosene	150^{o}	to 300^{o}	- 7%
Light lubricating	300^{o}	to 350^{o}	- 55%
Heavy "	350^{o}	to 360^{o}	- 28%
Loss			5%

This oil contains creosote, a substance obtained from wood and coal tars and not from natural petroleum.

(5) Resin -

Pellets of resin, tarnished black, are found in the work of ploughing. These are shed by the grass-tree which grows so luxuriantly in the sandy soils of the area. The resin has been mistaken for bitumen by local residents.

SUMMARY.

Reviewing the evidence given in the foregoing brief account it appears that :-

1. The conditions for oil formation are not unfavourable.
2. The conditions for oil accumulation are unfavourable.
3. Genuine seeps occur but are not necessarily indicative of the existence of reservoirs.
4. Geologic structure is unfavourable.
5. The so-called bitumen is a tar product.
6. The oil scum on the sea is probably a discharge from passing ships.

A. McIntosh Reid
DIRECTOR OF MINES.

Mines Department,
Hobart.

12th February, 1929.

APPENDIX

BRUNY ISLAND OIL PROSPECTS.

Since preparing the report the following particulars relating to the strata passed through by the bore near the Lagoon have been obtained from Mr. Guy Andrew, the Company's Superintendent :-

	Feet.
Top sand and clay	43
Quartz sand	8
Coarse aand	11
Running drift	39
Sand and water	11
Limestone conglomerate	27
Brown shale	8
Quartz sand	5
Limestone conglomerate	4
Very fine sand (dry)	14
Brown clay	6
Limestone conglomerate	3
Limestone	12
Hard brown limestone	3
grey "	54
Hard grit	1.5
Hard blue siliceous shale	3
Hard limestone	3
Hard grit	3
Very hard limestone with alternate bands of shale	171.5
TOTAL	430 feet

A. McIntosh Reid
DIRECTOR OF MINES.

Mines Department,
Hobart.

15th February, 1929.