1895.

VICTORIA.

DEPARTMENT OF MINES.

SPECIAL REPORTS

ISSUED UNDER THE AUTHORITY OF

THE HON. H. FOSTER, M.P., MINISTER OF MINES,

BY

J. TRAVIS, ACTING SECRETARY FOR MINES.

REPORTS

ON

THE VICTORIAN COAL-FIELDS

(No. 4)

BY

JAMES STIRLING,

Assistant Government Geologist.

By Authority:

ROBT. S. BRAIN, GOVERNMENT PRINTER, MELBOURNE

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MUSEUM OF VICTORIA

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Portion of the COUNTY OF BULN BULN GEOLOGICALLY COLORED

SCALE. Two Miles to 1 inch.

MIRBOO DISTRICT.

TOPOGRAPHY.

The township of Mirboo is built upon a flat extension of the watershed line separating the streams flowing into the Tarwin on the south from those flowing into the Latrobe on the north. To the west of Mirboo this watershed line rises at Allambee to nearly 1,600 feet above sea level, and to the south-east to 1,000 feet. The height at Mirboo North is between 800 and 900 feet above sea level.

The spurs towards the Morwell valley on the north slope more gradually than those on the south towards Borri's Creek valley. Fault lines following approximately the course of the Little Morwell River to N.N.E. and Murray's Creek northerly—as well as south-westerly down the Berry's Creek valley—have influenced the surface contours, causing steeper slopes on the western sides of the valleys, as at Darlimurla, Murray's and Berry's Creeks (Searlett's selection).

The greater part of the area is still covered with virgin forest growths, the latter presenting a striking contrast where flourishing on the different formations, that on the Mesozoic and volcanic areas consisting of distinct and more vigorous growths of eucalyptus species than that on the areas covered by tertiary sedimentary grits, sandy clays, &c. Similarly the shrub vegetation is characteristic, the dense growth of arboreous shrubs giving place on the sandy areas to heath-like shrubs and cyperaceous plants.

GEOLOGICAL FEATURES.

Mesozoic.

The beds of sandstone and shale which are exposed at the surface in the area coloured brown on accompanying map or pierced by borings beneath the tertiary deposits, as at Mirboo North township, do not present any distinctive features which would separate them from the Mesozoic-Oolitic (?) (McCoy) beds of Korumburra or Hazlewood districts. There are no well-defined beds which could be relied on to establish an horizon. The seams of coal are of similar character to those disclosed in the borings at most of the localities bored upon within the Gippsland Mesozoic area. And at Berry's Creek, where the largest and most persistent coal seams occur in the Mirboo district, they are contained within a depth of 900 feet from the surface.

EXTENT AND CHARACTER OF THE COAL SEAMS AND OF BORING OPERATIONS.

During 1882 Mr. Searlett discovered an outcrop of coal 2ft. 6in. thick in allotment 26, parish of Mardan. Subsequently a shaft was sunk near the outcrop, cutting it at between 40 and 50 feet from the surface. According to Mr. Searlett, this seam, as proved by the shaft, was 5 feet thick at one end and 4ft. 8in. in the other, with a clay parting 1 inch to 1½ inches thick dividing the seam. As the drive was extended to south-east the clay band disappeared, and the coal seam was 3ft. 8in. of solid coal. Continuing the drive the seam thickened to 4ft. 6in.

In driving westerly, i.e., to the rise, the coal was found to be crushed and deteriorated, in consequence of which the drive was abandoned at about 40 feet to the west.

A distance of 60 feet was driven on the underlay. Two other small shafts to the east were put down in one. The seam 3ft. 6in. thick was cut at 180 feet from the surface.

During the visit of Coal Commission, 25th April, 1891, I measured the seam as exposed by drives in shaft sunk near the outcrop, as follows:—East end of drive 3ft. 11in. West end 4ft. 1in. Dipping 32° to S. 50 E. (See diagram of Searlett's seam No. 1.)

In order to test the extension of the seam, a number of bores were put down to the east, south-east, and north-east, with the following results:—

No. 1 bore (surface level 420 feet below Mirboo).—To the east of outcrop about 15 chains (in allotment 26).

Cut 1 foot coal at 321 feet from surface.

„ 6 inches „	328 „	„
„ 1ft. 3in. „	365ft. 9in.	„
„ 3 feet „	457 feet	„
„ 4 „ „	895ft. 6in.	„
„ 1ft. 6in. „	970 feet	„

The bore was carried to a depth of 1,050 feet.

No. 2 bore, about 11½ chains to N.N.E. of No. 1 bore (allotment 26), and about 50 feet higher level.

Cut 1 foot of coal at 59 feet from surface.

„ 1 „ „	460 „	„
„ 8 inches „	837ft. 4in.	„
„ 2ft. 2in. „	932 feet	„

Total depth, 1,000 feet.

No. 3 bore (in allotment 27), about 20 chains south-west of No. 1 bore and 15 chains south of shaft, and about 80 feet lower level than No. 1 bore.

Cut 1 foot of coal at 64 feet from the surface.

„ 1 „ „	560 „	„
---------	-------	---

Total depth, 1,010 feet.

No. 4 bore, between Nos. 1 and 3 bores, about 12 chains south-west of No. 1, and 8 chains south-east of shaft. Surface level 90 feet lower than No. 1 bore site.

Cut 11 inches at 174ft. 1in. from surface.

„ 6 „ „	266 feet	„
„ 9 „ „	271 „	„
„ 2ft. 4in. „	286 „	„

Total depth bored, 1,000 feet.

No. 5 bore, $11\frac{1}{2}$ chains south-east of No. 1 bore. 110 feet higher level.

Cut 1ft. 3in. at 395ft. 9in. from surface.

„ 1 foot „ 1,012ft. 11in. „

„ 2 inches „ 1,201 feet „

Total depth bored, 1,543ft. 4in.

No. 6 bore, about 36 chains to north-east of No. 2 bore, and about 100 feet lower level.

Cut 6 inches of coal at 257ft. 7in. from surface.

„ 4 „ „ 696ft. 10in. „

„ 4ft. 6in. friable coal at 697ft. 4in. „

„ 3 inches of coal at 1,200 feet „

„ 2 „ „ 1,220ft. 8in. „

„ 3 „ „ 1,223 feet „

„ 2 „ „ 1,289 „ „

„ 2 „ „ 1,311ft. 10in. „

Total, 1,427ft. 5in.

No. 7 bore, 12 chains east of No. 6 bore, same level (allotment 28).

Cut 4 inches at 462ft. 6in. from surface.

Total depth bored, 653ft. 7in.

No. 8 bore, about $12\frac{1}{2}$ chains south-east of No. 7 bore (allotment 28), nearly same level (5 feet higher).

Cut 1ft. 3in. at 86ft. 2in. from surface.

No. 9 bore, about 18 chains to north-east of No. 2 bore, in allotment 26.

Cut 3ft. 6in. at 738 feet from surface.

„ 4 feet „ 864ft. 6in. „

Total depth, 913ft. 10in.

PROBABLE QUANTITY.

From the foregoing results of boring, it may be estimated that there is fully 1 square mile within which workable coal-seams occur. Estimating the specific gravity of the coal at 1.35, and assuming that two of the seams will contain on the average each 3 feet of workable coal, there cannot be less than 5,833,926 tons. In this estimate I assume also that the seams recorded as 1ft. 6in. thickness may be worked so as to equalize the lesser production from the attenuated portions of the larger seams, although the differences in level at which the seams of workable thickness were cut, and the evidences of faulting which the borings disclose, render it difficult to estimate the workable quantity of coal as available within the area.

QUALITY OF THE COAL.

According to the evidence tendered by Mr. Scarlett to the Royal Commission on Coal, the quality for coking is similar to A.A. coal at Newcastle, N.S.W.; and also according to tests at Brighton equally as good for gas.

Analyses made by Mr. Cosmo Newbery gave—

Water.	Vol. Hydro.	Fixed Carbon.	Ash.	—
3.11	27.59	59.55	9.75	Caking coal
3.20	16.30	54.65	25.85	Part caking and part non-caking
3.00	25.95	54.45	16.60	Good quality
Mean 3.10	23.28	56.21	14.06	

Compared with that of Korumburra Coal Creek the Berry's Creek Coal contains less moisture, p. 256, Report Royal Commission Coal (Parliamentary Papers), less vol. hydro-carbon, similar p.c. of fixed carbon, and more ash, as under—

—	Water.	Vol. Hydro.	Fixed Carbon.	Ash.
Coal Creek Proprietary—average	6.39	31.83	56.28	5.46
Berry's Creek	3.10	23.28	56.21	14.06

In order to satisfy the local desire for additional boring to prove if the seams met with in the Berry's Creek valley at Scarlett's holdings extended to the west towards the Tarwin valley, a bore was put down on the Coast-road, near State School Reserve. This bore—No. 10 of the series—failed to cut any coal seams, although carried to a depth of 1,202 feet.

An outcrop of coal a few inches in thickness having been observed in allotment 52, a bore was put down to test the locality. The results were disappointing, as beyond several bands of dark shale containing some coaly matter at levels between 400 and 500 feet, no coal seams were met with to the depth bored of 878 feet.

MIRBOO TOWNSHIP.

In order to test the extension of the coal-bearing strata beneath the tertiary basalt and gritty sandy clays on the watershed line at Mirboo North, a bore was carried down to a depth of 2,759ft. 5in.—

Passing through 101ft. 11in. of drifts and clays,

227ft. 11in. of basalt,

9ft. 5in. of clay, representing tertiary deposits,

to the Mesozoic rocks.

N^o1
SCARLETT'S SEAM

BOOLARA TO MIRBOO

MIRBOO TO BERRY'S C^K

At 927ft. 7in. 10 inches of coal was cut, and between that level and 1,500 feet several smaller seams; one of 6 inches, another of 3 inches and 6 inches, at 1,569ft. 9in.

The bore was carried to a depth of 2,759ft. 5in.

BOOLARRA.

About 2 miles south of Boolarra township a seam of coal was found outcropping on the Morwell River. This was recorded as 3 feet in thickness. A tunnel was driven, and over 500 tons of coal obtained from the seam near the outcrop. In order to test the continuity of the seam to the west, several bores were put down.

No. 2 bore, after passing through surface clays and basaltic rocks, cut two small seams of coal in the underlying Mesozoic strata.

No. 3 bore, placed near the outcrop, was recorded as having cut—

1 foot of soft coaly matter at 361ft. 3in. from surface.
3 inches of coal, with 2ft. 9in. of coaly matter at 376 feet.
(?) 3ft. 5in. „ at 426ft. 6in.
1 foot „ „ 483ft. 3in.

Subsequent workings proved that the seam recorded as 3ft. 5in. was made up of a number of smaller seams separated by beds of soft shale, which became pulverized and carried away in the boring, leaving the several pieces of coal in the core-barrel to the thickness recorded. The measurements made by the Government Geologist from the face of the workings gave the following:—

Coal, 13 inches.
Shale, 10 feet.
Coal, 7 inches.
Shale, 1ft. 1in., with thin coal seams.
Coal, 1 foot, with shaly parting in middle.
Dark shale, 11 inches.
Shale, 2 feet.
Coal, 1 foot.

No. 4 bore, near railway, on east side of creek and outcrop.—This bore, put down where the sandstones were seen to outcrop—

Passed through 8 inches of coal at 412ft. 4in.,
„ 3ft. 2in. „ 696ft. 7in.,

and was carried to a depth of 1,163 feet without any other seams being pierced.

The results of this bore confirm the impression conveyed by an examination of the surface geology of the area, viz., that an extensive faulting has lowered the country in the Morwell valley. (See section Boolarra to Mirhoo.)

No. 5 bore, put down in the flat country near Boolarra, after passing through—

71ft. 5in. clays, cemented sand, and boulders, &c.
139ft. 4in. brown coal.
165ft. 6in. clays mixed with brown coal, and cemented sand.
105ft. 8in. clays mixed with brown coal and brown coal.
317ft. 10in. sandstone drift, conglomerates, cemented sands, and sandy clays.
123ft. 9in. basaltic rock.

Total depth bored, 933ft. 6in.

No. 6 bore.—This bore was put down about 100 feet north of No. 3 bore. It passed through—

At 422ft. 3in., 4 inches of coal.
„ 438ft. 8in., 2ft. 1in. „
„ 449ft. 1in., 10 inches „

Total depth, 572 feet.

No. 7 bore, 300 feet north-west of No. 6 bore.

After passing through 16ft. 8in. surface clay,
„ „ 88ft. 5in. basalt,
cut 4 inches of coal at 554ft. 5in. The bore was carried to a depth of 857ft. 7in.

ANALYSIS OF THE COAL.

Several analyses were made of this coal by the late Mr. Cosmo Newbery, as under:—

Thickness of Seam.	Water.	Vol. Matter.	Fixed Carbon.	Ash.	Remarks.
10 inches	3.80	13.35	47.72	35.12	} Good quality, but high ash p.c. Bituminous and caking, with light and dull bands.
1 foot	4.30	26.55	46.07	23.07	
(?) 3 ft. 5 in.	4.40	35.50	46.95	15.15	
Mean	4.18	25.13	46.91	24.44	

Another analysis from seam on east side of creek, known as Rall's, gave—

Water.	Vol. Matter.	Fixed Carbon.	Ash.	Remarks.
4.56	35.21	53.25	6.97	Seam black coal; gas gave good illuminating power; coke fairly dense.

DARLIMURLA.

In order to test the area near Darlimurla, where the coal-bearing sandstones outcropped, two bores were put down.

No. 1, after passing through—

224ft. 10in. sandstones,
24ft. 5in. clays,

entered basaltic rock, passing through 71ft. 11in. of the latter on to soft sandstone; after piercing 16ft. 10in. of the latter the bore was abandoned.

The occurrence of the broken basalt and clays underlying the sandstones can only be accounted for by supposing—

- 1st. That the basalt represents a volcanic dyke; or
- 2nd. That there is here a reversed fault.

The geological examinations of the locality lends support to the latter view. The features are accordingly represented as such on the accompanying section.

No. 2 bore, at a higher level to the west—

Passed through 23ft. 6in. sandy clay and coarse drift,
" 176ft. 9in. basalt and basaltic clays,
" 213ft. 9in. sandstones (Mesozoic),

without cutting any seams of coal.

MURRAY'S CREEK.

An outcrop of coal having been observed in a small gully running easterly into Murray's Creek, a tributary of the Little Morwell River, two bores were put down to test the area.

No. 1 bore, on spur to west of the creek—

Cut 3 inches coal at 310 feet.
" 1ft. 8in. " 325 feet.
" 2 inches " 366ft. 10in.
" 1 foot " 429 feet.

The bore was carried to a depth of 1,137ft. 2in.

No. 2 bore, about 30 chains north-east from No. 1 bore—

Passed through 10 feet clay and ironstone boulders.
" 20 feet decomposed sandstone. (?)
" 34ft. 1in. basaltic clay, ironstone, and basalt.
" 18ft. 4in. conglomerate. (?)
" 72ft. 8in. basaltic clays, ironstone, and basalt.
" 9ft. 11in. clay and soft sandstone. (?)
" 61ft. 10in. basalt and red clays into the Mesozoic sandstones.
At 405ft. 4in. from surface cut 3 inches of coal.
" 584ft. 8in. " " 6 " "
" 601ft. 5in. " " 10 " "

This bore was carried to a depth of 1,000ft. 4in.

The information supplied by these bores proves a considerable extent of faulting along Murray's Creek.

NOTES ON THE FAULT LINES.

The data afforded by the borings afford additional evidence of the extent and magnitude of the faultings in several of the southern valleys of the Latrobe River. Not alone in the Little Morwell and Morwell valleys, but in the Narracan and other tributaries to the west. The whole of the steep spurs which rise abruptly from the Latrobe valley on the south represent an original fault scarp with transverse fault lines approximating to the course of the existing southern affluents. I have already drawn attention to the importance of studying the nature and extent of such fault lines in the coal-mining districts and of the relations between the present topography and those dynamic movements which gave rise to the subsequent valley erosion along lines of faulting.* A recent observer, Mr. Jas. H. Wright, of Darlimurla, has, in an interesting description of some "Geological features in an area in South Gippsland," given valuable data as to the extent and character of the fault lines he had observed in portions of this district.† It is evident that the dynamic movements producing the faultings took place after the accumulation of a considerable portion of the tertiary deposits of ferruginous conglomerates, grits, clays, and deposits of brown coal, resting on the older basalt of the district, and, as stated by Mr. Wright, in most cases the lines of faulting cross the direction of the dip approximately at right angles, are marked by valleys running in that direction forming the drainage basins of the district. That they spring from a common source, viz., the western edge of what is a wide area of subsidence, viz., the Latrobe valley and Moe River valley.‡ And also that such faulting occurred in Post Miocene times.

TERTIARY.

The tertiary deposits within the area shown on the accompanying map, and disclosed in the boring operations, will be found to afford a clue to the order in which such accumulations have taken place over a large area in South Gippsland, so that a co-relation of the deposits over widely separated areas in the Latrobe valley may be established.

The following are characteristic features :—

Eocene. (?)

Resting directly on the abraded surface of the Mesozoic shales and sandstones are silicious conglomerates and quartzites with subordinate lenticular-shaped beds of shale, compact indurated claystone,

* Special Coal-field Report, No. 4, Victorian Coal-fields. —† Notes on the geological features of an area in South Gippsland, Geological Survey Progress Report, Vol. 8, pp. 32 to 34. J. H. Wright. —‡ Vide Report on Varragon, No. 1.

the latter containing inprints of leaves, which, so far as the venation, form, margin, &c., bear a striking resemblance to types elsewhere referred to—the later cretaceous or early tertiary-eocene.(?) This resemblance is not, however, a sufficient basis for establishing a definite geological horizon, as among the recent floras there are leaves whose form, venation, margin, &c., cannot be distinguished from such older tertiary types.

Older Brown Coal.

Although there are no outcrops of brown coal at Mirboo, yet it is improbable that such may be concealed beneath the wide-spread stretch of basalt in this locality. I have already drawn attention to their occurrence elsewhere, as at Thorpdale*, where they are either contemporaneous or younger than the silicious conglomerates; also at Calignee,† Carrajung, and south of Yarragon.‡

While Palaeobotany has been considered insufficient for the determination of geological divisions among tertiary deposits, yet it has elsewhere proved of undoubted value as a guide. Lesquereux has, in his Monograph on the Cretaceous Flora of Dakota group in the United States, offered some pregnant remarks on this point, as follows:—" . . . without the fossil leaves of Nebraska, the relation of the Dakota group, either to the Trias, the Jurassic, or the Cretaceous, would be still uncertain and subject to dispute, especially for the reason that the few animal remains recognised in the red sandstones of this group have been as yet too scant and of too little distinct characters to afford sufficient evidence on this point, &c. I am led to offer these remarks in consequence of recent contributions to Palaeontology by such distinguished experts as Prof. Tate, F.G.S., of S.A., § Messrs. Denant, Pritchard, and Hall, who have referred the molluscan fauna of the lower tertiary deposits which they have examined along the Victorian coast and in several inland localities to the Eocene age, in contradistinction to the Palaeontological determinations of our nestor of Palaeontological science, Sir F. McCoy, who recognises the deposits as Oligocene. And especially as a co-relation of the terrestrial tertiary deposits with the marine beds has been attempted by the younger of the above observers.¶

The quartzites and conglomerates are identical in lithological character with beds occurring along the northern valley of the Latrobe, as at Neerim (Frenchman's Creek), Eaglehawk Creek, &c., &c., covering large areas in the Tarwin valley, extending also from Cape Liptrap over the Silurian at Waratah to the Hoddle ranges, so that they are extensively distributed. Hitherto they have been classed as Miocene. They appear to have undergone considerable erosion before the associated brown coals were deposited and the flows of basalt, known as the older volcanic, took place.

An analysis of the carbon percentage of these coals would show them to be older than the more extensive beds near Morwell, in the Latrobe valley, as follows:—

—				Water.	Vol. Hydro-carbon.	Fixed Carbon.	Ash.
Thorpdale	...	...	...	14.50	31.87	46.30	6.36
Calignee	...	...	...	19.00	28.70	48.20	4.10
Carrajung	...	...	...	25.09	26.34	45.27	3.72
Average	...	...	...	19.53	28.97	46.59	4.76

The average of the Morwell Brown Coals giving (for 32 samples) 24.08, 34.66, 40.18, 2.79.

The greatest recorded thickness of the silicious conglomerates and associated brown coal-beds does not exceed 200 feet.

Older Basalt.

The basalt classed as older volcanic covers a considerable area. The bore at Mirboo disclosed a thickness of 214ft. 2in., separated by two beds of clay 12ft. 10in. thick, at a depth of 280ft. 1in. from the surface.

The structure varies from coarse to fine, but it is mainly that of an Olivine dolerite. It occurs at various elevations along the Strezlecki ranges up to 1,200 feet above sea level. At Mirboo it covers a flat depression in the watershed line, at an elevation of between 600 and 800 feet above sea level.

This basalt has been hitherto classed as Miocene.

Older Pliocene. (?)

Overlying the basalt are ferruginous conglomerates, grits, sandy clays, clays, and lignite beds. The bore at Mirboo disclosed a thickness of such clays and drifts of 101 feet; but on the watershed line between the Little Morwell River and Delburn Creek, to the west of Darlimurla, borings disclosed a depth of 280 feet with interbedded lignites.

At Boolarra, near the station, they attain a thickness of 800 feet, with 139 feet of lignite. This great thickness of tertiary deposits is probably due to a lowering of the area by faulting. These ferruginous conglomerates, grits, and sandy clays are classed as older Pliocene, partly on the authority of the Government Botanist, who has determined some of the leaves and fruits to be similar to those of the Loddon valley. Yet in the absence of better material for examination than has yet been supplied, the above classification is merely provisional.

The beds are distributed all round the flanks of the Strezlecki ranges, from the Bass valley to the heads of the Lang Lang River, Bear Creek, Moe River, Narracan valley, Morewell and Traralgon, Flynn's Creek, and along the south-east flanks of the Hoddle ranges to the Albert and Yarra River, ranging from 200 to 600 feet above sea level, but are also met with at still higher elevations along the watershed line between the Tarwin and Latrobe.

* Vide Report on Darnum District. —† Vide Report on Calignee District. —‡ Vide Special Report Victorian Coal-fields, p. 15. —§ Vide Trans. Roy. Soc. S.A., Vol. XIX., p. 121. —¶ Trans. Roy. Soc. Victoria, Vol. VI., p. 19.

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