RB 44/78

DEPARTMENT OF MINES.

SOUTH AUSTRALIA.

# THE COAL RESOURCES OF SOUTH AUSTRALIA.

## I. HISTORY.

The discovery of coal in widely separated localities in South Australia resulted chiefly from boring operations in search of underground water supplies and oil.

Bituminous coal - similar to that mined at Wonthaggi in Victoria and of the same age - was found in a deep oil bore near Robe, drilled in 1916, at depths between 2830 and 3950 feet. The thickest seam pierced was one of 3 feet, but the coal is regarded as inaccessible owing to the great thickness of overlying Tertiary sediments which carry artesian water.

The first discovery of sub-bituminous "coal" was made at Leigh Creek in 1888 in rocks of Triassic age during the excavation of a Government dam, about ½ mile south-west of the Leigh Creek (now Copley) railway siding. H.Y.L. Brown, Government Geologist, shortly afterwards made an examination of the occurrence and, although it proved to be a coal-bearing shale, he reported favourably on the field and subsequent drilling operations, financed partly by the Government and partly by the Leigh Creek Coal Mining Company, led to the discovery in 1891 of the main seam of coal 47 ft. 10 ins. in thickness between 1496 ft. 6 ins. and 1544 ft. 6 ins. in the No. 2 bore west of the Telford Siding. A shaft, known as the "main shaft" was then sunk in 1892. It intersected the seam between 240 and 285 feet and sinking terminated at a depth of 300 feet. In the following year about 200 tons were raised and sent away chiefly for experimental purposes. Difficulties to secure a market prompted the Company to erect a briquetting plant with a capacity of 30-40 tons per day. This venture, however, proved a complete failure as the plant, which was essentially a second-hand brickmaking machine, was entirely unsuitable for the purpose and the mine closed down in 1894.

In 1906 a second, but short-lived, attempt to exploit this field was made by the Tasmanian Copper Company. 12,458 tons were raised and despatched to Adelaide, Port Augusta, Peterborough and other towns along the line, Marree and Broken Hill. It was tested in locomotives, both mixed with Newcastle coal and by itself, and was used for domestic purposes. In 1908 after this Company had abandoned all its properties including Leigh Creek in South Australia, in a futile search for profitable copper mines, the Government proclaimed the Leigh Creek field as a reserve from the operations of the Mining Act. It remained idle until 1918 when the shaft was dewatered by the Government and 713 tons were raised for further testing in the hope that it could be used profitably to alleviate

5

the fuel shortage resulting from industrial disturbances at that time. However, nothing further was done until 1941 when successful boring operations located sufficient reserves of shallow coal to justify production from open-cuts with mechanical equipment previously unknown. References will be made elsewhere to subsequent developments which have led to Leigh Creek now becoming a permanent producing field.

Sub-bituminous coal has also been found in South Australia in rocks of Cretaceous age at Kuntha Hill to the east of Lake Eyre and 110 miles north of Marree, where limited prospecting was undertaken by means of boreholes and shafts, No attempt has been made to find workable deposits.

Tertiary brown coal and lignite has been discovered in the course of water-boring operations, but no serious attempt has yet been made to exploit it. In 1922 an attempt was made by the Wallaroo and Moonta Copper Mining Company to explore the Clinton seam, but the presence of large quantities of saline water in the sediments overlying the coal led to the abanconment of the shaft before the seam was reached. Similar difficulties prevented the opening up a seam at Hope Valley and will hinder the development of other lignite areas where underground mining must be resorted to such as the Inkerman-Balaklava field which contains the largest known reserves and the best quality lignite yet found in South Australia. The known reserves of shallow lignite are limited to the Moorlands field, located about 86¾ miles by rail south-east of Adelaide. Reference will be made later to the problem of bringing this deposit to useful account. It has been extensively drilled, but other than a small tonnage raised from shallow shafts for experimental purposes, no continuous commercial production has yet been undertaken.

## II. GEOLOGY AND GEOGRAPHY.

So far as is known, the conditions favourable to the accumulation of coal measure did not exist in South Australia during the Palaeozoic era, when beds of coal were formed in Queensland, New South Wales, Tasmania and Western Australia. The only formations of supposed Permo-Carboniferous age found hitherto in South Australia are glacial deposits - sands and boulder clays. These beds have had their complete thickness penetrated at several places without the discovery of any coal measures or marine deposits. They rest upon Pre-Cambrian or Cambrian foundations and are overlain in some places by marine Tertiary beds.

The late Triassic sediments of Leigh Creek include thick seams of sub-bituminous coal in a comparatively restricted area. The basins within which the Mesozoic strata occur have been preserved by subsidence accompanied by some faulting, within a terrain occupied by Upper Pre-Cambrian rocks. The Leigh Creek coal measures

have been correlated stratigraphically, by means of the plant remains discovered in them, with the Ipswich coal measures of Queensland.

The Jurassic coal measures of Victoria extend westwards and probably underlie a large portion of South Australia to the south of latitude 37°S, although they do not outcrop. One very deep (4505 ft.) borehole near Robe penetrated a great thickness of sandstone, mudstones and shales which carry some thin seams of coal similar in composition to the Victorian Jurassic coal. The uppermost seam was cut at a depth of 2830 ft., and 10 other seams, the largest of which was 3 ft. thick, were cut between that depth and 3642 ft. The Jurassic coal measures are overlain by fossiliferous Tertiary strata.

The sub-bituminous coal that has been prospected to a limited extent by boreholes and shafts at Kuntha Hill, to the east of Lake Eyre and 110 miles north of Marree, occurs in Upper Cretaceous shales, which carry traces of carbonaceous matter in many other places within the Great Australian Artesian Basin. The artesian water does not present a difficulty that would hamper mining operations, since it is imprisoned by a great thickness of shales and cannot escape unless there are natural fractures such as give rise to mound springs or boreholes which penetrate the full thickness of the shales and enter the underlying Jurassic sands.

Tertiary lignite has been discovered in the course of boring operations at a number of places on the Adelaide Plains, at Noarlunga, near the head of Gulf St. Vincent; on the plains to the east of the Mt Lofty Range; on Eyre Peninsula; and on the eastern margin of the Nullarbor Plain. In most cases the lignite beds are found in close proximity to the bedrock on which Tertiary sediments have been deposited and are separated from the Palaeozoic or older formations by comparatively few feet of sands and clays. The lignite appears to have accumulated in shallow depressions on or close to the shore, and was buried subsequently through a rise of the sea relatively to the land. It is probable that the lignite was deposited in Oligocene time, and it was certainly covered with glauconitic clays and polyzoal limestone of Miocene age, and subsequently in some places by a thin layer of Lower Pliocene shell limestone. In some localities, notable at the head of Gulf St. Vincent, the limestone cover gives place to siliceous and argillaceous sediments with some calcareous beds rich in marine fossils. The sedimentary beds overlying the lignite carry porous layers which are known to contain water of variable salinity in different places, but the actual quantity of the water present at any particular spot is not known, with the single exception of Moorlands where it is negligible in amount in the portion of the field tested hitherto.

At two places - on Coffin's Bay Peninsula, and at Pidinga on the edge of the Nullarbor Plain - the lignite occurs within a few feet of the surface, but in all other localities there is an appreciable amount of cover. The close association of silt and lignite in these shallow deposits does not encourage the hope that useful deposits will be found in them.

## III. PRODUCTION AND RESERVES.

### Leigh Creek Coalfield.

The reserves at Leigh Creek are considerable if account is taken of all the coal available. From the viewpoint of development it is probably best to consider separately the coal available for mining by open-cut methods and that which must be worked by underground mining.

Recent mapping has modified the original delineation of the extent of the coal measures by H.Y.L. Brown in 1896, the chief modification being the isolation of three distinct basins called the Northern, Central and Southern areas which were shown previously as being connected with one another.

Insufficient is yet known of the Southern area (A) where coal was first discovered. Boring is at present in progress and has established over a limited area the presence of a 7' seam at 100' depth. The complete delineation of this seam is in hand. The coal appears to be of comparatively good quality.

In the Central or Telford area (B) close drilling of the shallow marginal coal is almost completed. To date, the workable (open cast) coal is confined to the northern and eastern periphery of the basin where approximately 8 million tons has been proved to an overburden limit of 120'. Current production is coming from these reserves. Elsewhere in the Central basin, exploratory drilling is proceeding and two coal seams have been established near the southern margin, the lower of which approximates 30' in thickness and the upper one 18'. The seams dip steeply and insufficient is known of them to allow of any assessment of their very extent or potentialities.

The Central basin as a whole carried very large reserves of coal the greater part of which it will be necessary to win by underground methods. Boring is shortly to be undertaken to test the extent of these underground reserves, and meanwhile it is not possible with present knowledge to make any significant quantitative estimate. From the information of a single deep bore, it appears that the main 40' seam may extend over at least the north eastern half of the basin but it is apparent that faulting and/or folding have affected the continuity to the south and west.

The Northern area of Triassic coal measures is composed of two lobes (C) and (D) joined together by a narrow neck. Lobe C is at present under detailed investigation by boring and appears capable of providing an area for opencast mining containing up to 3 million

tons. The coal is of rather high ash and high sulphur content. Lobe D on the other hand contains the cleanest coal yet discovered. Systematic boring on a skeleton grid has proved approximately 10 million tons in an upper seam and a further 10½ million tons in a lower seam, the whole of this tonnage being considered amenable to opencast mining. The upper seam ranges from 25' to 40' in thickness and the overburden from 15'9" to 143'6". The lower seam is 20' in thickness separated from the upper seam by 30' of shale. The upper seam contains coal of excellent quality but the lower is of higher ash content and also, except in certain areas, suffers the disability of a high sulphur content.

## Lignite Fields.

The main features of the lignite fields are summarised as follow:-

Noarlunga.

(1) Six (6) boreholes drilled mostly at wide intervals.
(2) Average thickness of main seam - 12.7 feet.
(3) Average depth of overburden - 322 feet.
(4) Area proved by drilling - 80 acres.
(5) Tonnage proved - 1,438,000 tons.

Probably a much larger area carries lignite, but close boring is wanted to give more data. Faulting has evidently taken place and much trouble with water was experienced in short-lived mining operations in shallow workings near the margin of the field. About 18,000 gallons per hour had to be pumped from the workings. A large proportion of this water is believed to have come from the Onkaparinga River which crosses the lignite measures and from which the water probably leaks into the coal beds through fault planes.

Clinton.

Situated on the western side of the head of Gulf St. Vincent, the field contains two to four seams which dip at a low angle towards the east. The upper seams overlap those which lie deeper, and extend further to the westward. Boreholes were spaced at intervals of 20 chains, and from the information they afford it is estimated that 32,384,000 tons of lignite have been proved to exist, with a probable additional tonnage of 40,476,000 in adjoining areas. The overburden is limestone and sandstone with flint concretions, clay, and sand, with more clay above the lignite and interstratified between the beds of lignite. The water contained in the sands is saline (4.75 oz. per gallon) but is not derived from the Gulf. It is present in serious quantities, but the actual amount is unknown, although it sufficed to prevent the opening up of the seams by a shaft.

Inkerman-Balaklava.

On the other side of Gulf St. Vincent and rather more distant from the coast than the Clinton field with which it probably is, to some extent at least, continuous, lies this area which is traversed by the railway to Bowmans. The exploration has been done by rather widely spaced boreholes, the distance between which is about half a mile. The overburden consists of sediments, mostly unconsolidated and comprising beds of clay and sand with a little limestone and sandstone. The amount of water present in the sands is unknown and there has been no attempt at shaft sinking. The deposit is evidently a very large one, far exceeding the 94 million tons regarded as proved hitherto. Further boring operations are now in progress with the object of locating shallower coal.

Whitwarta.

North of the Inkerman-Balaklava deposit, brown coal has been proved in the vicinity of Whitwarta, 12 miles east-north east of Port Wakefield. Thirty bores have been sunk in the area and established the existence of a deposit averaging 20' in thickness at a minimum depth of 120'. The boring has not achieved a complete delineation of the deposit but has eliminated the possibility of dinding coal any nearer the surface. With the limited information available it is not advisable to make tonnage estimates but it seems probable that an area of more than one square mile is underlain by the 20' seam. The coal is rather inferior in quality (ash and sulphur content) to that known elsewhere in the State.

Bower.

This field comprises two fairly compact areas on each side of the railway to Morgan. The boreholes are from 20 to 40 chains apart. The overburden is reasonably sound but contains some sand and sandy clay embedded with limestone. The amount of water present is considered to be small but there has been no underground development.

Anna.

The lignite is, in this case also, continuous and the drilling has been carried out at intervals of about 40 chains. The overburden is for the most part limestone and clay, but there are sandy beds just above the lignite. A little water is present, but the exact quantity is not known.

Moorlands.

Investigations of the Moorlands brown coal field, which are still in progress, have to date shown that the quantity of proved coal is approximately 29 million tons. The overburden is such that it is considered that practically the whole of this can be won by opencast methods. Five main occurrences have been located. (1) Area B, covers 28½ acres and contains 677,000 tons, average thickness 16.8 ft. average overburden 46.8 ft. and overburden - coal ratio 2.79:1. (2) Area A covers 406 acres and contains

9,580,000 tons of coal with average thickness 16.5 ft. average overburden 90 ft. and overburden-coal ratio 5.52:1. (3) Area C, covers 234 acres and contains 5,900,000 tons of coal with average thickness 17.9 ft., average overburden 74.5 ft. and overburden-coal ratio 4.41:1. (4) Area D, covers 181 acres, contains 4,319,000 tons of coal with average thickness 17.2 ft., average overburden 74.75 ft. and overburden-coal ratio 4.84:1. (5) Area E, covers 204 acres, contains 8,684,000 tons of coal of average thickness 29.9 ft. average overburden 98 ft. and overburden-coal ratio 3.46:1.

The overburden consists of dense and hard travertine limestone overlying softer limestone, sandy clay and clay. The maximum thickness of the hard crust is 13'6" but in general is less than 8'.

Exploratory boring in search of further basins is in progress and combustion tests are being carried out to determine the scope of utilisation of the coal as a power station fuel.

Hope Valley.

The lignite bearing area in this field is limited by faulting and cannot be large enough to justify the heavy expenditure required to master the water difficulty. Shaft sinking failed at water level through meeting quicksand and the lignite bed was reached only with the help of a concrete caisson. Insufficient data has been obtained for a tonnage estimate. The main seam averages 13 ft. in thickness at a mean depth of 184 ft.

The figures showing the total information obtained to date from the Government drilling operations on the various Tertiary lignitic fields of South Australia are given in the following tabulations. In the calculation of tonnages all lignitic matter containing 24 per cent or more ash in the undried samples has been excluded, as also all seams under 5 ft. thick save in a few places where a small parting of lower grade materials separates a seam of lignite into portions less than 5 ft. thick, which could, however, be mined as a whole with the rejection of the poor band.

OCCURRENCE, TONNAGE ETC.

| Field | Distance from Adelaide | Number of holes drilled. | Average thickness of Main Seam | Average depth of Main Seam from surface. | Area proved by boring to date. | Gross tonnage proved by boring to date. |
|---|---|---|---|---|---|---|
| | miles | | Ft. | Ft. | Acres | Tons |
| Hope Valley | 8 (road) | 15 | 13.0 | 164 | 200 | Not Estimated. |
| Noarlunga | 25 (rail) | 6 | 12.7 | 322 | 80 | 1,438,000 |
| Clinton | 55 (sea) | 19 | 21.8 | 292 | 620 | 32,384,000 |
| Inkerman-Balaklava | 58 (rail) | 27 | 18.8 | 233 | 3,520 | 94,012,000 |
| Bower [x] | 85 (rail) | 36 | 12.5 | 389 | 479 | 9,852,000 |
| Moorlands | 87 (rail) | 500 | 20.9 | 86.1 | 1,053 | 29,160,000 |
| Anna[x] | 94 (rail) + 9 (road) | 39 | 14.3 | 238 | 3,360 | 63,494,000 |
| Whitwarta | 90 (rail) | 30 | 20 | 130 | Not estimated | Not estimated |

[x] Note: Field fully delineated by boring.

## IV. CHARACTERISTICS AND REPRESENTATIVE ANALYSES.

South Australia has no high grade coal comparable with that of New South Wales, but has two types of low grade coal - sub-bituminous at Leigh Creek and lignite at Moorlands, Inkerman-Balaklava, Hope Valley, Noarlunga, Clinton, Bower and Anna.

Leigh Creek coal is best described as being sub-bituminous in character, that is to say intermediate between the woody or earthy brown-coloured lignites on the one hand and the harder bituminous coals that carry much less moisture on the other. Much of the coal is dull, but there are numerous narrow bands of bright lustrous coal in the seam, especially noticeable in the upper portions of the seam exposed by workings in the Telford basin and in the upper seam of the Northern field. The coal has a high ash content and is not amenable to treatment. Shaley matter incorporated with the coal is small in amount and does not occur in defined and continuous bands of sufficient thickness to enable them to be picked out and discarded during mining operations. Iron pyrites is small in amount, except in the lower seam of the northern field where it occurs as small lenticles and partly disseminated through the coal. Leigh Creek coal has no defined cleavage as occurs in many seams of hard coal and it breaks chiefly along the bedding planes.

The composition of Leigh Creek coal is expressed in the accompanying tables. Insufficient ultimate analyses have been made

to enable reliable average figures to be calculated, but the average proximate analyses and gross calorific values can be regarded as reliably determined. All the proximate analyses of Leigh Creek coal given are from boreholes, the coal substance after each pull of the rods or sample tube being placed immediately in air-tight containers. Sample lengths do not exceed 3 ft., the majority being about 2 ft. and corresponding to the coal required to fill each container. The tinned samples are grouped by visual inspection by the field geologist and each group crushed and sampled. Final samples are railed to Adelaide for analysis. Calorific value determinations with a Mahler Bomb Calorimeter are carried out on selected samples. An examination of Leigh Creek coal by the London Fuel Research Station has recently disclosed the presence of phosphorus and chlorine in the following quantities which are important in connection with its utilisation for steam raising.

| Phosphorus. | Main Basin | Upper Seam - Northern Basin. |
|---|---|---|
| i as $P_2O_5$ in ash% | 0.71 | 3.69 |
| ii as P in air-dried coal% | 0.057 | 0.110 |
| iii as P in dry coal% | 0.068 | 0.133 |
| Chlorine | | |
| i in air-dried coal% | 0.4 | 0.8 |
| ii in dry coal% | 0.5 | 1.0 |

The lignites are very similar in appearance from one field to another. When freshly broken the coal is dense and earthy in texture and of a dark reddish-brown colour which darkens rapidly to a blackish brown. As drying proceeds the colour lightens, finally changing to a light brown; at the same time the material gradually cracks and ultimately crumbles to a dusty powder. There is a small amount of woody substance in the coal, its presence becomes apparent after prolonged exposure when the wood commonly assumes a bright vitrainous lustre. They resemble the brown coal of Bacchus Marsh, Victoria, except that the Moorlands coal, in particular, contains a notable amount of a black resinous substance and leaf cuticle material and that they all contain a high ash and sulphur content.

So far no attempt has been made to use the South Australian lignites on a commercial scale, although there are reserves of commercial significance favourably situated for power generation purposes. In this connection it has been stated that the district in the vicinity of Moorlands and Tailem Bend would probably be served more advantageously from a brown coal power station, situated there, than from Port Adelaide. Generally speaking, lignite must be used near its source and this is particularly so in the case of Moorlands which on account of its sulphur content cannot make a satisfactory briquette for general industrial or domestic use.

The average analyses of the coals are set out in the accompanying tables and the most notable feature is the variation of the ash content from deposit to deposit. The ash content also varies considerably from point to point in each deposit due to the presence of small lenses of intercalated ligneous clay. The sulphur content on the other hand is remarkably uniform and at Moorlands marcasite is one of the chief impurities present, either as lumps or dispersed throughout the coal. In all cases special care must be taken in using it for power production purposes and it is suggested in a report by the London Fuel Research Station that it might best be used in the pulverised form.

## V. METHODS OF MINING AND PROCESSING.

The Leigh Creek coalfield is the only centre of coal mining activity in South Australia, and in February, 1948, the management of the field was placed in the hands of The Electricity Trust of South Australia.

Successful prospecting for shallow coal by drilling in 1941 led to the development of an open-cut mine which was equipped to produce 800 tons ofccoal per shift to safeguard continuity of supplies of coal to South Australian industry during the war period and to eke out the limited supplies of N.S.W. coal. This initial development was undertaken, when there was a very limited field of mechanical excavators to choose from, by four draglines, two small machines of the Engineering and Water Supply Department, and two larger 2-½ yard capacity machines purchased in the Eastern States.

The first excavation was a box-like hole, some 800 feet long by 350 feet in width, the material being all removed by the draglines operating on the natural ground level. The overburden material, which could not be satisfactorily recast was carted away in motot trucks and used to form protective embankments, roadways, etc. The machines were gradually moved down to commence a second cut and ultimately to uncover the coal. Great assistance was rendered by the use of a ripper pulled by a caterpillar tractor for breaking the shale overburden which was pushed subsequently into heaps for loading into motor trucks by the excavators. The accompanying sketch shows the altitude of the seam and the depth to which this initial cut was developed.

Coal production commenced in February 1944 and for the first 21 months it was supplied to consumers as run-of-mine coal, the only sizing being the breaking of large lumps so that the approximate maximum size piece was 6 inches in any dimension.

In November 1945 a temporary grading plant was constructed and put into operation. Pieces greater than 14 inches in any dimension were broken to pass through a grid of that size, thence to a single roll coal crusher producing a maximum size of 6 inches and finally

to shaking screens which graded into three sezes "large screened" or lump coal plus 1-¾ ins. "small screened" or "stoker" coal minus 1-¾ ins. plus 7/16 ins. and "fines". The grading plant discharged the large and small screened coal direct into railway trucks but the fines were loaded into motor trucks as portion had to be carted to a stock-pile for future use. The coal for Adelaide consumers is transported by 3 ft. 6 ins. gauge railway from Telford to Terowie where the narrow gauge trucks are elevated and discharged by a tippler into the trucks of the 5 ft. 3 in. railway system.

From time to time additional equipment has been purchased including a 7 cub. yd. walking dragline excavator. A new grading plant was brought into commission to cope with the increased output which now amounts to about 7000 tons weekly. Present plans call for the production of 20,000 tons per week. A steam boiler plant and power station has been erected and is fired with Leigh Creek coal "fines". The major output of the field will be raw coal for a power station under construction at Port Augusta.

The field is still in its development stage and it will be several years before a stable output is achieved. The following table shows the increase in coal consumption in the State during the last ten years and the contribution made by Leigh Creek coal.

DISTRIBUTION OF COAL CONSUMPTION IN SOUTH AUSTRALIA - YEARS 1943-1950.

(Year ending 30th June)

| CLASSIFICATION | 1943 | 1944 | | 1945 | | 1946 | | 1947 | | 1948 | | 1949 | | 1950 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N.S.W. | Leigh Creek | N.S.W. | Leigh Creek | N.S.W. | Leigh Creek | N.S.W. | Leigh Creek | N.S.W. | Leigh Creek | N.S.W. | Leigh Creek | N.S.W. | Leigh Creek |
| | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons | Tons |
| Factories - | | | | | | | | | | | | | | | |
| Cement and cement goods | 19,487 | 17,418 | 2,179 | 14,510 | 4,590 | 13,689 | 6,479 | 13,243 | 12,147 | 16,783 | 10,510 | 18,991 | 10,521 | 21,440 | 12,479 |
| Bricks tiles and pottery | 7,357 | 6,681 | - | 6,953 | 65 | 8,664 | 339 | 9,976 | 1,182 | 12,639 | 681 | 14,675 | 542 | 14,756 | 1,391 |
| Chemicals | 31,744 | 30,114 | 1,895 | 35,496 | 6,789 | 32,514 | 6,961 | 38,260 | 2,265 | 36,854 | 4,146 | 37,289 | 4,428 | 27,238 | 1,431 |
| Metals, mabhinery and conveyances | 26,889 | 24,944 | - | 18,015 | 3,297 | 15,648 | 2,314 | 16,792 | 4,982 | 8,344 | 6,962 | 6,306 | 11,233 | 4,537 | 14,622 |
| Woolscouring, spinning and weaving | 9,352 | 9,290 | 46 | 9,208 | - | 8,325 | 1,758 | 3,181 | 10,922 | 2,639 | 11,047 | 1,828 | 18,443 | 1,657 | 19,963 |
| Food and drink | 30,784 | 29,096 | 255 | 28,098 | 815 | 23,706 | 5,780 | 20,648 | 18,280 | 19,553 | 22,060 | 13,694 | 31,770 | 12,610 | 38,792 |
| Other factories | 45,839 | 27,744 | 5,715 | 9,817 | 6,014 | 4,887 | 3,461 | 1,670 | 728 | 2,414 | 4,326 | 1,624 | 8,676 | 5,799 | 16,948 |
| Heat, light and power- | | | | | | | | | | | | | | | |
| Gas | 113,909 | 117,818 | - | 118,223 | - | 121,907 | - | 109,790 | - | 126,238 | - | 125,389 | - | 119,789 | 2,143 |
| Electricity | 246,763 | 234,646 | 8,730 | 253,441 | 12,638 | 237,207 | 32,614 | 246,647 | 45,695 | 250,274 | 85,069 | 245,260 | 145,849 | 270,938 | 141,174 |
| Railway locomotives | 409,067 | 408,346 | - | 390,281 | - | 365,055 | 7,952 | 323,974 | 31,582 | 352,550 | 31,171 | 374,537 | 32,207 | 309,182 | 37,372 |
| Shipping (bunker)- | | | | | | | | | | | | | | | |
| Overseas | 4,635 | 7,470 | - | 7,077 | - | 7,814 | - | 4,914 | - | 10,321 | - | 7,090 | - | 1,926 | - |
| Interstate and intrastate | 17,088 | 17,330 | - | 13,705 | - | 28,398 | - | 18,014 | - | 17,312 | - | 20,445 | - | 19,044 | - |
| Mining & Quarrying | 380 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Private domestic, hotels, theatres etc. | 1,110 | 904 | - | 844 | - | 200 | 1,267 | - | 680 | - | 818 | - | 4,275 | - | 4,547 |
| Commonwealth Govt. | | | | | | | | | | | | | | | |
| Pt. Augusta (Other purposes). | - | - | - | - | - | - | - | 1,456 | 500 | 1,061 | 345 | 1,131 | 426 | 478 | 716 |
| Total | 964,404 | 931,801 | 18,820 | 905,668 | 34,208 | 868,014 | 68,925 | 808,565 | 128,963 | 856,982 | 177,135 | 868,239 | 268,370 | 809,394 | 291,578 |

ANALYSES OF SOUTH AUSTRALIAN COAL SAMPLED IN SITU BY BOREHOLES.

| Description | Proximate Analysis % | | | | Gross B.T.U. | Grind-ability | Ash Fusion C | Coling Index. | Ultimate Analysis % Dry Mineral-matter free. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M. | V. | F.C. | Ash | | | | | C. | H. | O. | N. | S. (Organic) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Leigh Creek Main Basin | 33.8 | 21.1 | 28.4 | 16.7 | 5960(raw) | N.D. | I.1130 C.1250 | N.D. | 70.77 | 4.59 | 23.03 | 1.46 | 0.15 |
| Leigh Creek, Northern Basin-Upper Seam | 36.10 | 23.40 | 33.07 | 7.43 | 6740 (raw) | N.D. | I.1180 C.1200 | N.D. | 72.78 | 4.18 | 20.84 | 1.08 | 1.12 |
| Leigh Creek, Northern Basin-Lower Seam | 30.84 | 24.15 | 31.45 | 13.56 | 6712 (raw) | N.D. | N.D. | N.D. | N.D. | Not determined | | | 2.4 (Total S) |
| Moorlands Area B | 53.78 | 20.02 | 15.14 | 11.06 | 4152(raw) | N.D. | N.D. | N.D. | N.D. | Not determined | | | 2.26 " |
| Moorlands Area A | 51.61 | 21.52 | 14.44 | 12.43 | 4264(raw) | N.D. | | N.D. | 69.3 | 5.3 | 19.4 | 0.6 | 2.1 (Total S) |
| Moorlands Area C | 51.4 | 21.8 | 13.4 | 13.4 | N.D. | N.D. | N.D. | N.D. | N.D. | Not determined | | | 2.45 " " |
| Moorlands Area D | 53.23 | 20.91 | 15.75 | 10.11 | 4332(raw) | N.D. | N.D. | N.D. | N.D. | Not determined | | | 2.25 " " |
| Moorlands Area E | 51.04 | 22.85 | 17.19 | 8.92 | 4770(raw) | N.D. | N.D. | N.D. | N.D. | Not determined | | | 2.30 " " |
| Inkerman-Balaklava | 55.0 | 21.9 | 16.3 | 6.8 | 4390(raw) | N.D. | N.D. | N.D. | N.D. | Not determined | | | |
| Clinton | 51.7 | 24.5 | 15.5 | 8.3 | N.D. | N.D. | N.D. | N.D. | 69.31 | 4.81 | 21.21 | 0.74 | 3.94 |
| Bower | 49.3 | 23.7 | 14.9 | 12.1 | 4620 | N.D. | N.D. | N.D. | N.D. | Not determined | | | |
| Anna | 54.1 | 21.5 | 13.7 | 10.7 | 4230(raw) | N.D. | N.D. | N.D. | N.D. | Not determined | | | |

## THE COAL RESERVES OF SOUTH AUSTRALIA.

Data supplied by the Department of Mines, Adelaide.

| Coalfield | District and Seam. | Proved Reserves Million tons. | Probable Reserves Million tons. | Average Annual Production Tons. | Average % extraction. | Class and normal ash range % | Notes on methods and depth of working and availability of reserves. |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | (1) | (2) | | | | (1) (2) |
| Leigh Creek | Telford Basin | 8 | 360 | 300,000 | | Sub-b 15-20 | Open-cut Underground |
| | Northern - | | | | | | |
| | Upper Seam | 10.3 | | | | Sub-b 6-10 | " " |
| | Lower Seam | 10.7 | | | | Sub-b 10-15 | " " |
| Moorlands | Area A | 9.6 | | | | Lignite 10-15 | Av. depth 96' |
| | B | 0.7 | | | | " 10-15 | " " 47' |
| | C | 5.9 | | | | " 10-15 | " " 75' |
| | D | 4.3 | | | | " 10-15 | " " 75' |
| | E | 8.7 | | | | " 10-15 | " " 98' |
| Inkerman-Balaklava | | 94 | | | | " 5-10 | " " 233' thickness 19' |
| Clinton | | 32 | | | | " 5-10 | " " 292' " 22' |
| Bower | | 10 | | | | " 10-15 | " " 389' " 12' |
| Anna | | 63 | | | | " 10-15 | " " 238' " 14' |

Col. 7 "Class" is the name by which the coal is normally described, e.g. Bituminous, Sub-bituminous, Lignite
"Grade" is the normal ash range, e.g. 6-10, 10-15, 15-20.

Col. 8 Any additional notes considered necessary should be given at the foot of this table.

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