

SOUTH AUSTRALIA

---

ANNUAL REPORT

OF

THE DIRECTOR OF MINES AND  
GOVERNMENT GEOLOGIST

FOR

1951

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By AUTHORITY: K. M. STEVENSON, Government Printer, Adelaide.

1952.

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# ANNUAL REPORT OF THE DIRECTOR OF MINES AND GOVERNMENT GEOLOGIST FOR 1951.

I have the honour to submit, for your information, the following report on the operations of the Department for the year ended 31st December, 1951.

## STAFF.

The following alterations in the departmental staff were made during the year :—

- Mr. D. B. Adamson, appointed Technician (Metallurgical Section) in March.
- Mr. A. F. Ahern, appointed Temporary Clerk in December.
- Mr. R. J. Andrew, appointed Temporary Timekeeper (Grade II.) in March.
- Mrs. P. J. Arnott, appointed Temporary Tracer in May and Temporary Draftsman's Assistant in November.
- Miss J. Avery, appointed Temporary Tracer in October and Temporary Draftsman's Assistant in November.
- Mr. C. S. Bachmann, Temporary Clerk, resigned in September.
- Mr. J. Bannerman, appointed Boring Overseer in August.
- Mr. J. Barrett, appointed Temporary Timekeeper (Grade I.) in March.
- Mr. B. M. Bartlett, B.Sc., Temporary Assistant Geophysicist, resigned in January.
- Miss M. G. Beggs, Temporary Shorthand Typiste, resigned in August.
- Miss J. L. Bermingham, Temporary Bookkeeping Machinist, resigned in March.
- Miss L. J. Blanchard, appointed Temporary Clerk in March.
- Miss B. C. Bourne, Temporary Tracer, appointed Temporary Draftsman's Assistant in November.
- Miss B. A. Bray, Temporary Shorthand Typiste, resigned in May.
- Mr. B. J. Brice, Temporary Junior Clerk, resigned in February.
- Mrs. A. J. Bristow, appointed Temporary Typiste in January.
- Mrs. V. Brougham, appointed Temporary Tracer in March and Temporary Draftsman's Assistant in November.
- Mr. D. K. Brown, appointed Temporary Junior Draftsman in July.
- Mr. G. N. Brown, appointed Temporary Clerk in March, resigned in October.
- Mr. W. Brown, B.Sc., Technical Information Officer, resigned in October.
- Miss J. L. Bussenschutt, appointed Temporary Typiste in June.
- Mr. J. C. Butcher, Boring Overseer, resigned in July.
- Mr. B. Carthew, B.E. (Mining), F.S.A.S.M., Temporary Assistant Mining Engineer, resigned in April.
- Mr. T. G. Childs, appointed Temporary Junior Clerk in February.
- Miss C. E. Church, Tracer, appointed Draftsman's Assistant in November.
- Miss P. A. L. Colley, appointed Temporary Tracer in January and Temporary Draftsman's Assistant in November.
- Miss M. R. Correll, appointed Temporary Tracer in February and Temporary Draftsman's Assistant in November.
- Mr. G. Dickson, appointed Temporary Mining Surveyor in August, resigned in December.
- Mr. A. G. Dixon, appointed Boring Overseer in August.
- Mr. E. E. Eager, B.Sc., appointed Temporary Boring Engineer in July.
- Mr. J. R. Eley, B.Sc., Assistant Geologist, resigned in March.
- Mr. B. F. Fitzpatrick, B.Sc., appointed Temporary Assistant Geologist in July, resigned in November.
- Mr. A. J. Frizzell, appointed Boring Overseer in April, resigned in November.
- Mr. R. D. Graham, B.E. (Mech.), F.S.A.S.M., Temporary Assistant Mining Engineer, resigned in March.
- Mr. D. O. Grant, appointed Temporary Clerk in March.
- Mr. D. W. Hall, appointed Temporary Clerk in March, resigned in April.
- Mr. J. R. Hands, appointed Temporary Clerk in June.
- Mr. F. J. Hockley, Temporary Boring Overseer, appointed Boring Overseer in May.
- Mr. A. P. Howe, appointed Temporary Timekeeper (Grade I.) in October.
- Mr. F. E. Hughes, B.Sc., appointed Temporary Assistant Geologist in March.
- Mr. L. B. Humby, Temporary Draftsman, appointed Draftsman in March.
- Mr. T. V. Kimber, Temporary Clerk, appointed Clerk in August.
- Miss L. King, Temporary Tracer, resigned in July.
- Mr. J. R. Kleeman, B.E., appointed Assistant Metallurgical Engineer in August.
- Mr. G. C. Knight, appointed Temporary Junior Draftsman in June.
- Mr. R. E. Leahy, appointed Temporary Clerk in October.
- Mr. D. P. E. Limb, Assistant Chief Mechanical and Boring Engineer, appointed Assistant Chief Boring Engineer in August.
- Mr. D. Luckett, appointed Technician (Petrological Section) in September.
- Mr. A. J. Margitich, Depot Supervisor, appointed Depot Supervisor and Transport Officer in November.
- Mr. J. B. S. McCahon, Temporary Draftsman, appointed Draftsman in March.
- Miss S. V. McCarthy, appointed Temporary Typiste in August, resigned in December.
- Mr. D. J. McGarry, B.Sc., Assistant Geologist, resigned in May.
- Mr. M. J. McKeough, Temporary Clerk, resigned in March.
- Mr. E. F. McMahon, Clerk, appointed Clerk and Deputy Registrar in February.
- Mr. F. A. Meier, Engineering Assistant, appointed Temporary Draftsman in January, resigned in May.
- Mr. W. J. Nicholas, appointed Temporary Engineering Assistant in February.
- Miss J. A. Parker, appointed Temporary Typiste in July.
- Mr. G. W. D. Peet, appointed Temporary Clerk in June, resigned in October.
- Mr. T. H. Phillips, A.F.I.A., Bookkeeper, appointed Assistant Accountant in February.
- Mr. J. L. Potter, Temporary Draftsman, appointed Draftsman in August.
- Mr. G. M. Ralph, Temporary Junior Draftsman, appointed Junior Draftsman in August.
- Mr. M. J. Reynolds, appointed Temporary Clerk in August.
- Mr. J. E. Ridgway, Geologist, resigned in November.
- Mr. E. L. Roberts, Draftsman, resigned in September.
- Mr. W. D. Rossini, appointed Temporary Junior Draftsman in January.

Mr. H. E. St. Pierre, Dip. Met., appointed Temporary Assistant Metallurgical Engineer in February.  
 Mr. K. R. Seedsman, B.Sc., appointed Temporary Assistant (Geophysical Section) in January.  
 Mr. S. G. Smith, appointed Temporary Timekeeper (Grade I.) in March, resigned in September.  
 Miss A. M. C. Swan, Temporary Tracer, appointed Temporary Draftsman's Assistant in November.  
 Mr. T. R. Sweatman, appointed Temporary Assistant in January, resigned in February.  
 Miss A. B. Taylor, appointed Temporary Bookkeeping Machiniste, in February.  
 Mr. A. C. Teasdale, B.Sc., appointed Temporary Assistant Mining Engineer in February.  
 Mr. R. J. Torpy, appointed Temporary Timekeeper (Grade I.) in September.  
 Mr. W. N. Trezise, appointed Technician (Geophysical Section) in March.  
 Mr. D. Truscott, Assistant Boring Engineer, appointed Boring Superintendent in July.  
 Mr. A. E. Tynan, appointed Clerk in January.  
 Mr. E. A. Vowles, Foreman Carpenter, appointed Temporary Works Inspector in August.  
 Mr. E. L. Vowles, Temporary Clerk, resigned in February.  
 Mr. M. L. Wade, B.Sc., Temporary Geologist, appointed Geologist in March.  
 Miss M. C. Wall, appointed Temporary Tracer in July, resigned in October.  
 Mr. J. Ward, appointed Temporary Clerk in February.  
 Mr. B. P. Webb, B.Sc. (Hons.), Temporary Assistant Geologist, appointed Assistant Geologist in June.  
 Mr. R. B. Wilson, B.Sc. (Hons.), appointed Assistant Geologist in July.  
 Mr. R. J. Wilson, Assistant Boring Engineer, appointed Boring Superintendent in July.  
 Mr. A. F. Witford, Temporary Junior Draftsman, appointed Junior Draftsman in August.

#### LEGISLATION.

The Uranium Mining Act, 1951 (No. 22) was passed during the year, and assented to 18th October, 1951.

The object of the amendment to the Uranium Mining Act, 1949, was for the purpose of exempting from the Public Works Standing Committee Act, 1927-1944, certain works such as the opening and working of uranium mines, the treatment of the ore won, experimental work on the uranium, the erection of buildings and plant, and the construction of waterworks within 25 miles of Radium Hill to supply water for the above work.

The Mining Act, 1930-1950, was amended by the passing of the Mining Act Amendment Act No. 36 of 1951, to which assent was given on 6th December, 1951.

This amendment to the Mining Act was made for the purpose of clarifying the position in regard to penalties chargeable on overdue mining lease rents and royalties.

#### WARDEN'S COURT.

*Plaint No. 360*—Roy Irvine Wall *v.* Donald Stephens and Myrtle Fernandez. Application for the forfeiture of Alluvial Gold Claims Nos. 1558 and 1559, situate in the hundred of Wallaroo, for non-compliance with the labour conditions and the contention that the land was exempt from the operations of the Mining Act, 1930-1950. Court held at Adelaide, 20th February, 1951. Verdict for the plaintiff. No order made as to costs.

*Plaint No. 361*—Fred Eaton *v.* Vera Matilda Margaret Lyford. Application for the forfeiture of Mineral Claim No. 490, situate near Mt. Serle, for non-compliance with the labour conditions. Court held at Adelaide, 18th April, 1951. Verdict for the plaintiff. Warden's Order to peg issued. No order made as to costs.

*Plaint No. 362*—William Hubert Sweetman *v.* John Flinders Pilgrim. Application for the forfeiture of Ordinary Gold Claims Nos. 1447 and 1448, situate in the Hundred of Para Wirra, for non-compliance with the labour conditions and the claims not properly pegged. Court held at Adelaide, 10th July, 1951. Verdict for the plaintiff after an inspection of the claims by the Court. No order made as to costs.

*Plaint No. 363*—Harold Henry Lively *v.* Herbert Hercules Baker. Application for the forfeiture of Mineral Claim No. 1307, situate on Boolcoomata Station, N.W. of Olary, for non-compliance with the labour conditions. Court held at Adelaide, 13th September, 1951. Verdict for the plaintiff. Warden's Order to peg issued. No order made as to costs.

*Plaint No. 364*—Ronald George Vinoy *v.* John William Brown. Application for the forfeiture of Mineral Claim No. 876, situate near old Boolcoomata Head Station, for non-compliance with the labour conditions. Court held at Adelaide, 21st September, 1951. Verdict for the plaintiff. Warden's Order to peg issued. No order made as to costs.

*Plaint No. 365*—Arthur George Burford *v.* John Matthew Dwyer. Application for the forfeiture of Mineral Claims Nos. 1624 and 1625, situate in the Hundred of Waitpinga, for non-compliance with the labour conditions and claims not properly pegged. Plaintiff withdrawn.

The Senior Warden, Mr. Warden V. T. Geraghty, J.P., officiated.

#### GEOLOGICAL SURVEY OF SOUTH AUSTRALIA.

##### GEOLOGICAL AND GEOPHYSICAL INVESTIGATIONS.

The following schedule contains a summary of the principal work carried out by the geologists during the period under review.

##### A.—HYDROLOGICAL SECTION.

Senior Geologist—Vacant.

Geologist—A. A. C. Mason.

Shortage of assistant staff hampered some of the activities of the hydrological section during 1951. The main work undertaken is summarised as follows:—

##### (a) Detailed Hydrological Surveys.

##### 1. Soldier Settlement—

(i.) Hundred of Jeffries—Sites chosen and 24 bores sunk for stock water with following results:—	
Satisfactory sheep water .....	14
Poor sheep water .....	2
Too saline for sheep .....	3
Abandoned before cutting water .....	5

##### (ii.) Hundred of Strawbridge—Sites chosen for three bores.

2. Upper South-East (Counties Buckingham and lower Chandos)—Ten sites were selected and nine sites (including two private) were bored over an area of approximately 2,000 square miles in the Ninety Mile Desert regions with highly satisfactory results. Potable water and water suitable for all irrigation was encountered in good supply over the whole of the area at an average depth of 190ft.

### 3. South Australian Railways—

- (i.) Peterborough—Further geological investigation and drilling resulted in the development of additional supplies of suitable underground water at Yongala and Peterborough. The supply position at Peterborough is now satisfactory.
- (ii.) Adelaide Hills—Following an urgent enquiry for emergency supplies of underground water in the districts of Aldgate, Ambleside, and Nairne, surveys were conducted and sites were chosen for bores close to railway pipelines. Adequate supplies of suitable quality water were developed in the Aldgate and Ambleside areas between the surface and 200ft. Boring at Nairne had to be abandoned at 114ft. on account of hard drilling. This hole, however, yields a useful supply of suitable quality water.
- (iii.) Peterborough-Cockburn Line—Following a request for emergency supplies of underground water, investigations were carried out between Peterborough and Cockburn adjacent to railway establishments. Six sites have been chosen for test boring.

4. Sliding Rock-Leigh Creek Water Supply—Further investigation and advice regarding conservation and maintenance of this underground supply. Sites for test boring for additional sources of supply, away from the Sliding Rock mine area, have been selected.

### 5. Engineering and Water Supply Department—

- (i.) Site selection and geologic control metropolitan water bores Adelaide and Salisbury areas.
- (ii.) Survey of Preamima mine area, Hundred of Monarto, to determine underground water prospects on holdings of landowners in the district.
- (iii.) Selection of bore sites in Willunga Basin, Cape Jaffa and Port Lincoln.
- (iv.) Regular observations on behaviour of Adelaide Artesian Basin.

6. South-Eastern Drainage Board—Observations initiated for detailed study of groundwater movements and fluctuations under altering conditions of drainage.

7. Other Government Departments—Approximately six water inspections and six drainage problems for various Government and Municipal bodies were dealt with in various parts of the State.

8. Private Landholders—Thirty-eight inspections were made and reports furnished on prospects in various parts of the State.

### (b) Regional Hydrological Surveys.

1. Barossa Valley—Field work completed.
2. Eden Valley, Hundred of Jutland—Groundwater prospects delineated and classified.
3. Northern half of Pirie-Torrens Basin—Survey extended to northern end of Lake Torrens. Consolidated report on both southern and northern areas being prepared.
4. Central Murray Basin—
  - (i.) Field work in further areas completed, viz :—Hundreds Pinnaroo, Peebinga, Kingsford, Parilla, Billiatt, Bews, Auld, and Cotton.
  - (ii.) Additional field work commenced :—Hundreds Tatiara, Wirrega, and Peake.
5. Far West Coast—Counties Robinson, Way, Kintore, and Hopetoun. Field review of sites and results of recent boring by Mines Department plant in Penong and Streaky Bay areas.
6. Echunga Geological Sheet—Routine regional hydrological survey carried out in Aldgate-Stirling area.

### (c) Advice.

Advice has been freely given to a large number of enquirers on underground water problems and prospects. This aspect of the activities of the hydrological section of the survey is becoming ever more pronounced.

### (d) Examination and Logging of Sludge Samples.

The sludge samples from 418 water bores, representing 37,532 ft. of boring by Departmental plants were geologically examined and logged for record. Some sludges from privately drilled holes were also examined.

### (e) Artificial Recharge.

Experimental artificial recharge of the Adelaide Artesian Basin was carried out by means of passing water under pressure from the metropolitan mains down certain metropolitan bores which had been modified for the purpose. Observations from these experiments proved that, under certain conditions, this method of artificial recharge is quite practical.

## B.—ENGINEERING GEOLOGY AND MINERAL RESOURCES SECTION.

Senior Geologist—K. R. Miles, D.Sc.

Geologists—J. E. Ridgway, M. L. Wade, B.Sc.

Officers were engaged on the following projects involving both field work and the preparation of written reports :—

### (a) Engineering Geology.

1. Kangaroo Creek Dam site—Torrens Gorge—On completion of drilling tests at the site, a final report favouring the project was submitted.
2. Clarendon Dam Site—Field mapping of the proposed reservoir area was commenced in the early part of the year but is not yet completed.
3. Maldorky Dam Site, Radium Hill—Detailed Mapping of the proposed site for a retaining wall was carried out and a report prepared.
4. Miscellaneous Harbour Works, Bridge Sites, Foundations, etc.—Geological reports following test drilling were furnished to the Harbours Board (Old Port Reach dredging) and to the Woods and Forests Department (foundations for new saw mill at Mount Gambier) and to the Highways Department (bridge foundations Strathalbyn-Victor Harbor road at Currency Creek). In addition, inspections were made and advice rendered to officers of the Engineering and Water Supply Department in connection with the South Para Dam Project and the Summit Tank, Mannum-Adelaide pipeline at Tungkillo. A report on geological conditions at a proposed deviation of the Sturt Highway near Truro was furnished to the Highways Department.
5. Road Metal Deposits—Geological maps and sections and quantity surveys of deposits likely to be suitable for road metal in various localities were prepared and reports furnished to the Highways Department. In some instances diamond drilling was carried out to test the quality of the material. Deposits investigated were :—Amphibolite, Tungkillo; aeolianite, Willalooka; aeolianite and limestone, Naracoorte and Coonalpyn; quartzite, east of Parafield; quartzite, east of Smithfield; quartzite, Clare, Hundred of Munno Para and Norton Summit; quartzite, Undalya; dolomite, Kooringa; granite, Mt. Monster, near Keith; marble, Spalding.

(b) *Mineral Resources Surveys—*1. *Metallic Minerals—*

- (i) *Middleback Range Iron Ore Survey*—Much time was spent in the field on this project during the year. Detailed mapping of the Iron Duchess-Iron Duke leases and of the leases at Iron Monarch-Iron Knob area was completed and estimates of the reserves of high-grade iron ore throughout the range were computed. Structural mapping of the south end of the Middleback Range and the hills south of Iron Knob was completed, also the regional mapping of the Roopena and Corunna military sheets (south and north of Iron Knob).
- (ii) *Copper Survey*—Preliminary work for the assessment of the copper resources of the State included preparation of an index of all known copper occurrences. Brief inspections were made of alleged copper deposits in the following localities :—Kadina, Nairnè, Nuriootpa, Hundred Jellicoe, Truro, Castambul, Gulnare, Wirrabara, and Monarto. This section has collaborated with the geophysical branch in connection with selection of sites for drilling anomalies at Kadina and in geophysical testing at Burra. A detailed investigation of the Mutooroo Copper Mine, including drilling, was undertaken, and other copper mines examined during the course of regional surveys included the following :—
- |                                |   |
|--------------------------------|---|
| North Flinders Range . . . . . | Ajax Copper Mine, Copper King Mine, Mt. Bayley Mine, Mountain of Light Mine, Nichol's Nob, Mt. Burr, Paul's Consolidated, Mt. Rose Mine, Federal Mine, Weedna Mine. |
| Eyre Peninsula . . . . .       | Flinders Mine, Port Lincoln Mine, Mt. Liverpool Copper Mine, New Mt. Liverpool Mine, Lipson Cove Mine, Burrawing Mine.  |
| Radium Hill . . . . .          | Dalkey Copper Mine.   |
- (iii) *Nairne Pyrite*—Logging of all cores from drilling at Nairne, including the selection of core for assay.
- (iv) *Iron Ore—Maldorky near Radium Hill*—A brief inspection was made of several small deposits and a report furnished. A crystal magnetite deposit near Radium Hill was also examined.

2. *Non-metallic Minerals—*

- (i) *Barite*—A number of deposits of barite in the Flinders Ranges was inspected and mapped and reports issued. These were at Mr. Serle, Blinman, Oraparinna, Appealinna, Mt. Carey, and Moralana.
- (ii) *Clays*—Investigations of brick clay and shale deposits within the metropolitan area and elsewhere have been continued and, following drilling and laboratory tests, final reports have been furnished. Field investigations of a number of refractory clays and clays suitable for ceramic ware have also been carried out. Investigations completed are as follows :—
- Metropolitan area, brick clays and shales—Smithfield, One Tree Hill, Golden Grove ; brick clays outside metropolitan area—Lobethal, Noarlunga, Port Elliot ; ceramic and refractory clays—Birdwood, Port Augusta, Booleroo, Houghton, Golden Grove, Woodside, and Upper Hermitage.
- (iii) *Gypsum*—Reconnaissance surveys of gypsum deposits in the Middleback Range district, north-eastern Eyre Peninsula, and near Tickera and in the Berri-Renmark district have been carried out. Detailed sampling of a deposit north of Renmark was undertaken and beneficiation tests are in progress.
- (iv) *Building Stone*—Inspections have been made and reports furnished on deposits of limestone at Edithburgh-Coobowie, sandstone at Macclesfield, and shaley sandstone at Gumeracha.
- (v) *Building Materials—Sand*. Final report on Christies Beach sand deposit was issued after completion of test drilling, also on Krieg's sand deposit at Nuriootpa. An investigation of possible sand deposits suitable for cement brick manufacture in the metropolitan area included examination of local dune sands and the Salisbury sand deposits. Marble for lime burning. A deposit of high lime marble near Macclesfield was surveyed and a report furnished.

C.—*COAL AND URANIUM SECTION.*

Senior Geologists—L. W. Parkin, M.Sc., A.S.T. and R. C. Sprigg, M.Sc.

Geologists—E. Anderson, B.Sc. and M. L. Wade, B.Sc.

Further investigations of the coal resources of the State were carried out, including regional surveys of new areas not previously examined for coal.

(a) *Coal Investigations.*

1. *Leigh Creek Coalfield*—Eleven percussion boring plants have been in continuous use both in the detailed proving of reserves and in the exploration of new seams.

- (i) *Telford Basin (Eastern Margin "K" Area)*—A block of coal has now been proved extending south from the original "K" cut. Working to a maximum depth of 110ft. of overburden, this block extends a further 1,500ft. south and contains 1,000,000 tons of coal with a ratio of overburden to recoverable coal of 1.78 : 1. Working plans and cross-sections, together with complete estimates were passed over to the mining authority of the Electricity Trust of South Australia. Boring has also been completed on a further block extending north from "K" cut for some 3,000ft. and estimates are in hand.
- (ii) *Telford Basin (Southern Margin)*—Exploration of a new (upper) seam of coal has been carried on, extending from near the southern margin across the centre of the Telford Basin in a north-westerly direction. Boring has so far been on a skeleton basis only, but it appears that further open-cut coal will be available here. The most important seam approximates 25ft. in thickness and has a southerly dip of 32 degrees.
- (iii) *Telford Basin Deep Drilling*—In order to provide a broad assessment of the potential reserves available for deep mining, a programme of deep drilling has been commenced. Three bores have been completed and a further three are in progress. Those completed have confirmed the extension of the main seam to a depth of 1,000ft.
- (iv) *Northern Basin—Lobe C*—Exploration of Lobe C has indicated a considerable reserve of potential open-cut coal in this basin. More detailed boring is necessary before estimates can be taken but it appears that, working to existing open-cut limits (110ft. overburden), at least 4,000,000 tons will be available. The coal is of high ash and sulphur content.
- (v) *Copley Basin*—Boring in the Copley Basin has disclosed a seam which averages 7ft. in thickness over an area of 60 acres. The average depth is in excess of 100ft. The limits have not yet been proved in a westerly direction.

(vi.) General—Regional geological mapping of an area of 1,000 square miles surrounding the coalfield has been completed and a preliminary geological plan of a further area of 500 square miles to the east has also been prepared. Detailed large-scale geological mapping of the coal measures themselves has been also completed.

2. Moorlands Coalfield—Two additional blocks of coal have been proved during the year. Estimates for Area E show 8,500,000 tons at an average depth of 98ft., bringing the total proved open cut reserves at Moorlands to over 29,000,000 tons. A further area of deep coal (Area F) containing 3,000,000 tons is not regarded as an open cut proposition.

Exploratory scout boring is continuing in the Moorlands area.

3. Upper South-East—A deep drill hole designed to test the coal possibilities in the Comaum area was commenced in the previous year. Operations have been in suspense for most of the current year on account of labour shortage, but were resumed towards the end of the year.

4. General Surveys—General investigations have been made and reports prepared on the coal possibilities of the following areas :—Eyre Peninsula (general), Wanilla area, Willunga basin, Hartley-Monarto area, Hope Valley area.

(b) *Uranium Investigations.*

The geological work on uranium comprised the detailed mine geology at Radium Hill Mine, associated with the exploration and development of the ore-bodies and the examination of prospects in other parts of the State. These activities were augmented by geophysical work, notably airborne scintillometer surveys.

1. Houghton Area—Regional mapping of the uranium-bearing Archaean rock province in the Houghton area, approximately 15 miles from Adelaide, was commenced and detailed plans were prepared of areas showing high radioactivity.

2. Mount Painter—Regional mapping was continued in the Mount Painter area, north and south of the East Painter workings, in search of new deposits and to elucidate the geological structure. Progress reports were furnished.

3. Other Activities—Some regional mapping was commenced in the Milang area on an old rock complex similar to that at Houghton. Examinations were made and reports furnished on anomalous areas in the Radium Hill, Wallaroo-Moonta and Adelaide Hills districts following the aerial scintillometer surveys.

D.—REGIONAL MAPPING SECTION.

Senior Geologist—R. C. Sprigg, M.Sc.

Geologist—B. Campana, D.Sc.

The work of the regional mapping section was handicapped by the absence of the Senior Geologist on investigations connected with the search for uranium and the mine geology at Radium Hill. The present programme calls for the production of 10 "1 mile to 1 in." scale and one "4 miles to 1 in." scale geological maps and the position as at December 31st, 1951, was as follows :—

(a) Maps printed :—Gambier-Northumberland (1 mile).

(b) Maps completed and in course of printing :—Adelaide, Robe, Kingston (1 mile). Penola (4 mile).

(c) Maps completed and in course of final drafting :—McGregor, Middleback, Copley, Myrtle (1 mile).

(d) Maps completed in preliminary map form :—Gawler, Kalabity (1 mile).

(e) Geological field work completed :—Corunna, Cariewerloo, Roopena, Ballara, Whyalla, Wilton, Millicent, Kalangadoo, Benara, Kennion, Beachport, Penola, Struan, Alexandrina (1 mile).

(f) Geological field work in progress :—Outalpa, Echunga, Angepena, Olary, Jervis, Cockburn, Yankalilla, Kapunda, Paralana, Moolawatana, Serle, Karoonda, Edithburgh, Pondalowie (1 mile).

The Senior Geologist completed a comprehensive study of the geology of the Mount Lofty-Flinders Ranges, including the stratigraphy and structure of Adelaide System rocks. It will be published shortly as a Geological Survey Bulletin.

E.—GEOPHYSICAL SECTION.

Senior Geophysicist—C. Kerr Grant, B.A., B.Sc.

Geophysicist—Vacant.

(a) *Regional Investigations.*

Regional gravity observations in the South-East were extended during March and April. The area already covered was extended to the coast at Kingston and Robe and indications of several major faults obtained, including one midway between Robe and Penola quite unrecognisable topographically. Further work is required in the area before an adequate structural picture of the whole region is possible.

(b) *Uranium.*

The major project undertaken during the year was in collaboration with Dr. W. H. Gross of the University of Toronto, and comprised an aerial scintillometer survey of some 3,000 square miles in the vicinity of Radium Hill. The area surveyed comprised almost all the exposed Archaean rocks in the north-eastern part of South Australia. A small area of Archaean exposures in the Adelaide Hills was also flown. Dr. Gross brought the equipment used in this work from Canada. An Avro Anson aircraft was chartered and used to fly the equipment systematically over the area in parallel traverses 500 yards apart at a height of approximately 200ft. The method was successful in discovering one new deposit of uraniferous ore and has indicated other "possible" areas yet to be investigated on the ground.

In addition to the aerial scintillometer surveys, some small ground scintillometer surveys have been carried out extending previous work.

(c) *Coal.*

In the early part of the year the magnetic survey in the vicinity of Moorlands brown-coal field was extended over an area to the north-west of the known coal basins. This work was curtailed on account of the aerial scintillometer survey and has not been resumed. No very promising indications were obtained. Some additional gravity observations were also carried out in this area.

(d) *Iron.*

Further magnetic traverses were measured in the vicinity of the Middleback Ranges. Most of this work was carried out with the object of tracing the continuity of the formations comprising the Camel Hill Range. Further magnetic traverses were run in the vicinity of Iron Knob and to the South-East of the Middleback Range. In October, at the request of the Hon. the Premier, an aerial magnetometer survey of the area covered by aerial photographs near the Middleback Ranges was commenced by the Bureau of Mineral Resources, Geology and Geophysics.

*(e) Copper.*

The aerial scintillometer was also used in an attempt to prospect for copper in the triangular area between Kadina, Wallaroo and Moonta. Because of the radioactivity of the known copper ores in this district, Dr. Gross suggested that more effective results might be obtained by mounting the aerial scintillometer head on a jeep about 12ft. above the ground and systematically covering the area by jeep. Two areas of radioactive anomaly were found.

A systematic geophysical survey was started, using gravity, magnetic, self-potential and resistivity methods in the Burra area, with the object of tracing extensions of the old copper lodes or investigating structurally favourable localities for new lodes.

*(f) Water.*

Some further radiometric surveys have been made in boreholes in the metropolitan area. Good correlations of radioactivity logs with geological boundaries were obtained.

*(g) Equipment.*

Various additional radiometric equipment was constructed for use in the laboratories and the field. A new resistivity and self-potential equipment was also brought into use.

## F.—MINERALOGICAL AND PETROLOGICAL SECTION.

Petrologist—A. W. G. Whittle, M.Sc.

The work carried out during 1951 may be considered in four major categories, which are as follows:—

*(a) Uranium Investigations.*

Regular routine work has continued from the previous year with the object of progressive understanding of the nature of the mineral complex as mining operations have advanced. Essentially this has involved mineragraphic and autoradiographic study of drill core intersections in conjunction with chemical assays. During the year, 121 lode intersections were examined and reported on in this manner.

A considerable amount of quantitative mineragraphic and petrographic work was carried out on concentrates and other mill products of Radium Hill ore for the Metallurgical Engineer.

The study of the paragenetic sequence of the minerals of the Radium Hill lodes was continued. An extensive petrological study of the basic and other igneous intrusives in the country round Radium Hill was completed and a report submitted.

Special mineragraphic information was supplied on the nature of mill products and chemical treatment residues in connection with investigations by the C.S.I.R.O. on the treatment of Radium Hill concentrates.

A study was made of the new Crocker's Well uranium mineral, tentatively called "absite," and reports on its optical and physical properties and mode of occurrence were issued.

*(b) Coal Investigations.*

At the end of November, 1950, by arrangement with Professor C. E. Marshall of the University of Sydney, studies were commenced on the petrology of South Australian coals. Assistance was also given by the C.S.I.R.O.'s Coal Research Section and Dr. A. B. Edwards of the University of Melbourne in the development of techniques. The applications of this work is to aid in solving problems of utilization, transport and storage of South Australian coals. Samples from different parts of the Leigh Creek coal seams are now being examined in detail.

Studies of the spores contained within the coal were commenced with the object of assisting field geologists in the correlation of the coal seams. The whole thickness of the main seam of the Telford open cut was sampled, and the spore distribution in both the main seam and the lower seam in Telford Basin has been worked out.

*(c) Petrology of the Middleback Ranges Iron Ore Deposits.*

This work is being undertaken as part of the Middleback Ranges iron ore survey. The endeavour of this section is to examine the rocks of the area in detail and note features which may help in understanding the genesis and nature of the deposits, as well as generally aiding the field geologists by giving them more accurate information about the rocks than can be obtained in the field. Well over 100 specimens were examined. The ore itself was examined in some detail and specific gravity determinations were made for estimating reserves.

*(d) General Petrological and Other Work.*

A great variety of rocks and mineral specimens has been examined during the year, both for the geologists of the survey and those submitted through the Technical Information Officer by persons and organizations outside the Department. Special attention was given to several groups of important and unusual rock types encountered by geologists in a survey of the Mount Painter area.

Minerals such as barite, gypsum, mica, sillimanite, tourmaline, xenotime and manganese have been examined and reported upon. Many samples of clays have been examined and tested for specific gravity, and reports issued.

Much detailed work has been carried out in conjunction with the Metallurgical Engineer on material from the Nairne pyrite deposits, and also on slags and tailings from dumps in the Wallaroo-Moonta copper area.

Several specimens of building stones have been examined and reported upon.

At the request of the Police Department samples in connection with a criminal investigation were examined.

Work for the Highways Department included the cutting of thin sections of materials intended for use as road metal, and advice on the weathering properties and suitability of certain rocks mineralogically for road construction.

The mineral content of seven soil samples was worked out for an officer of the C.S.I.R.O. working at the Waite Agricultural Research Institute. Details were finalized with the Soils Division of the C.S.I.R.O. regarding the setting up of an advisory service by the section on the suitability of soils for building foundations.

The examination of material from the deep artesian bores in the Lake Frome area, which has been a major project since June, 1950, was completed. In all, a total depth of 7,919ft. has been examined, and over 150 detailed examinations made.

## G.—SURVEY AND DRAFTING SECTION.

Chief Draftsman—B. S. Glasgow, L.S.

The year has been a memorable one for the drafting section in that it has seen the publication of the first detailed geological sheet of the South Australian Geological Survey. Many technical problems arising from the attempt to produce detailed coloured maps in accordance with overseas standards have been overcome, and several sheets were completed by the end of the period.

A drafting service has been maintained to all branches of the Department, viz.:—plans, sections, etc., to accompany reports; calculation of tonnages; charts and graphs for Departmental records; complete plans of all boring activities, including detailed plans and sections of coalfields; re-organization of the public plans deposited with the Registrar—these now afford complete coverage of the whole State with detailed enlargements over areas of particular mining interest; drawings for inclusion in Departmental publications, such as Reviews, Bulletins, brochures, etc.

Surveys have been completed for all technical branches carrying out field activities, including :—Traverses and levels preceding geophysical investigations ; stadia surveys for calculation of tonnages ; plane table surveys for geological inspections ; triangulation survey on Leigh Creek coalfields ; setting out and levelling bore sites ; preliminary surveys to investigate Radium Hill's water supply.

The year has been a busy one and has offered opportunities rare in the training of junior staff.

### MINING AND INSPECTION BRANCH.

#### INSPECTIONS AND INVESTIGATIONS IN MINES, QUARRIES, AND WORKS.

The State Mining Engineer and Chief Inspector of Mines, Mr. A. T. Armstrong, was engaged on the following work :—

Investigations were made into the quarrying of building stone in various parts of the State, particularly at Mount Gambier, Macclesfield, Edithburgh, Basket Range, Overland Corner, Birdwood, and Anstey's Hill.

In connection with the work at Mount Gambier and Basket Range, special attention was paid to the mechanization of quarrying operations and investigations were directed to the use of wire-saw, coal cutter and tungsten carbide tipped wheels.

Investigations were made into the use of a Konimeter for dust sampling in rock crushing plants and mines. A visit was paid to Victoria and New South Wales to look into the technique of dust sampling as practised in those States.

Samples were obtained from Moorlands and Leigh Creek coalfields for tests on gasification by the Lurgi process and for their use in gas turbine engines. A report was furnished on the working on the Moorlands field by open-cut methods.

Several visits were paid to the Williamstown clay deposit and reports furnished setting out the best method of working the deposit and giving estimates of the reserves of clay.

Supervision was maintained over the exploratory operations at the Nairne pyrite deposit. The exploration consisted of diamond drilling and contour benching.

A report was furnished on the operations of the South Australian Barytes Ltd. mine near Oraparinna.

An inspection was made and a report furnished on the mining operations at the Flinders Range talc mine at Mount Fitton.

A conference of Chief Inspectors of Mines of all the states of Australia was held in Adelaide. Mr. Armstrong was Chairman of this meeting. A revision of the Regulations connected with the safe working of mines and quarries is being undertaken throughout Australia. In this State also consideration is being given to special regulations for coal mining.

A special report was compiled concerning the cementmaking plants in South Australia.

An investigation was made into the protection of dangerous old working at Moonta.

A report was drawn up and a scheme outlined for the buying of ores from small companies and prospectors in South Australia.

Special advice was given on the working of a clay deposit at Golden Grove.

Supervision was maintained over the operations of the five (5) State batteries and cyanide works.

Supervision was exercised in the matter of hiring of mining equipment to small companies and syndicates for the exploration of mineral deposits. Special investigations were made when necessary into the circumstances connected with applications for the hire of machinery.

Quarries were inspected in various parts of the State and investigations were made into complaints regarding their safe working. Special visits were paid in this connection to Victor Harbour, Mount Gambier, and Murray Bridge.

An inspection was made of the Broken Hill Associated Smelters at Port Pirie and several visits were paid to the mine at Radium Hill.

The Assistant State Mining Engineer, Mr. F. N. Betheras, assisted the State Mining Engineer in the administration and general routine work of the Mining Branch.

In addition he was engaged on the following work :—

Completion of a report on the exploratory work carried out on the Mount Painter uranium deposits.

Investigation of barite deposits in the Hawker district and in the northern Flinders Range.

Investigations into future methods of working the Williamstown clay deposit and utilization of material in the old dumps.

Investigation of a potential salt producing area near Port Augusta.

Procurement of a 10-ton sample of clay for brickmaking from a deposit at Smithfield.

Consideration of applications received for the hire of Geiger-Müller counters to prospectors.

During the latter part of the year he supervised the re-organization of the Department's museum.

In collaboration with other Departmental officers a Handbook on Prospecting in South Australia was compiled.

He assisted the State Mining Engineer in the following work :—

Preparation of a report on the method of exploitation of the Moorlands coalfield.

Drawing up of a scheme for the purchase by the Department of ore from prospectors.

Investigation of building stone deposits at Birdwood and Anstey's Hill.

Investigation of a clay deposit at Birdwood.

Experimental work on the cutting of stone with a wire saw.

Supervision of the exploratory work carried out on the Nairne pyrite deposit.

The Inspector of Mines and Quarries, Mr. L. L. Mansfield, reports as follows :—

Supervision was exercised over the sinking of a new entrance to Kelly's Hill Caves, Kangaroo Island.

A report was furnished on a felspar occurrence in the Hundred of Para Wirra.

Jointly, with a Customs Officer, the packing of aluminium swarf for export was supervised. The material was sampled.

The activities at a barite mine, Hundred of Julia Creek, were reported on.

A report was written on the proposed I.C.I. Alkali (Australia) Proprietary Limited quarries and plant at Angaston.

A survey was carried out at a marble quarry near Angaston, plans drawn and recommendations made advising the owner on methods to be adopted to increase production.

A report was furnished on the operations of the Flinders Talc mine at Mount Fitton.

A survey of the underground workings of the South Australian Barytes Company's mine near Hawker was carried out and a report and plans furnished.

The suitability of a stone deposit near Birdwood for building purposes was investigated and a report submitted.

A report was made on the activities of the Flinders Ranges Silver-Lead Mining Company near Blinman.

Advice on mining was given to the owners of a barite mine at Noarlunga.

A visit was paid to the Stockyard Gully gold and copper mine and recommendations made in connection with an application for the hire of plant.

Methods of mining and timbering were recommended and estimates prepared for the establishment of underground water storage at Belalie North. Two alternative schemes were dealt with.

A further survey was carried out at the mine of the South Australian Barytes Company near Hawker. Ore reserve sections were drawn and calculated jointly with Mr. J. E. Ridgway, Geologist. A report was made on mining and transport problems.

Investigations were made on two cases of premature explosions in country quarries resulting in the injury of two men. Reports were furnished in both instances.

An investigation was made into the circumstances under which a man was fatally injured at a country quarry.

Complaints regarding the nuisance and/or danger from blasting were investigated at three metropolitan and one country quarry. Restrictions were placed on the latter.

A complaint regarding the disposal of overburden at a country sand pit was investigated and advice given.

Three owners of metropolitan brickpits and two employees were prosecuted and fined for undercutting clay faces. An employee of a country quarry was prosecuted and fined for smoking whilst handling explosives.

In connection with the Mines and Works Inspection Act, 426 routine visits were paid to metropolitan and country brickworks, quarries, and mines.

The acquisition by the Department of a Watson-Victor Konimeter has enabled dust sampling to be done in metropolitan crushing plants. One crushing plant with a high dust count was ordered to be closed until provision had been made to minimise the dust hazard.

The Regulations under the Mines and Works Inspection Act were fairly well observed.

## GOVERNMENT BATTERIES AND CYANIDE WORKS.

TABLE OF PRODUCTION FOR 1951.

Battery and cyanide works	No. of parcels treated	Weight of ore	Gold bullion recovered		Alluvial gold purchased and smelted	Value of gold bullion*	Total value of gold bullion (including premium)
			By amalgamation	By cyanidation			
		Tons. cwt. gr.	Oz. dwt. gr.	Oz. dwt. gr.	Oz. dwt. gr.	£ s. d.	£ s. d.
Mount Torrens .....	1	5 10 0	4 15 5	1 18 12	—	22 13 11	94 18 1
Peterborough .....	5	20 6 0	6 11 7	2 15 18	—	30 9 11	560 12 9
Mongolata .....	—	—	No ore	treated during	the year	—	—
Tarcoola .....	7	302 0 0	289 2 14	74 12 0	—	790 11 9	3,355 12 9
Glenloth .....	5	132 14 0	96 15 17	9 12 3	—	331 4 8	1,332 17 3
Total .....	18	460 10 0	397 4 19	88 18 9	—	1,175 0 3	5,344 0 10

\* Calculated on fine gold at £4 4s. 11½d. per ounce.

From this table it will be seen that 18 parcels of ore were treated, the total weight being 460 tons 10cwt. The total gold bullion recovered during the year was 486oz. 3dwt. 4gr. of the total bullion produced 397oz. 4dwt. 19gr., valued at £819 6s. 9d. were recovered by amalgamation. The remainder, 88oz. 18dwt. 9gr. of gold, valued at £355 13s. 6d., was recovered by the cyanide process from 310 tons 5cwt. of tailings.

The average value of bullion produced for each ton of ore treated during the year was £2 11s.

The work carried out at the State batteries and cyanide works during the year has enabled a return of £664 6s. to be made to the miners as proceeds of the treatment of the various parcels of ore, exclusive of the premium.

The total normal value of gold bullion recovered at the State batteries to the end of 1951 was £280,849 19s. 9d.

In the figures quoted, no addition has been made to the value of the bullion as a result of the premium payable on all gold produced. All values mentioned are given in relation to fine gold at £4 4s. 11½d. per oz., except in the table of battery returns where the full value of the gold recovered, including premium, is shown in the last column. The premium paid during the year has caused additions of 264·7048 per cent to the value based on the former fixed price. The premium is paid in full to the customers of the batteries.

The price of gold during the year was £15 9s. 10d. per fine ounce (including premium).

## METALLURGICAL BRANCH.

Chief Metallurgist—Norton Jackson, B.E.

Metallurgist—C. J. Nelson.

### A.—ACCOMMODATION AND EQUIPMENT.

During the year the building used as a laboratory at West Thebarton was completed with the installation of air, power, and water services. Mineral dressing equipment with a treatment rate of approximately 200 pounds per hour was erected as portable units which could be assembled for semi-continuous testing. Equipment includes rock crushers, a ball mill with a spiral classifier, a rotary drum vacuum filter, a magnetic separator, and a Wilfley table. A small Dutch State Mines cyclone was built and licensed by the patentees.

A pilot plant for continuous treatment by flotation methods was erected on a block of land facing West Thebarton Road. A disused clay pit at the rear is available for tailings disposal. The equipment consists of a skip hoist for elevating ore to a primary bin, followed by a jaw crusher and roll crusher, and two fine-ore bins of approximately 35 tons capacity each. A ball mill 6ft. long by 2ft. diameter grinds the ore to a pulp suitable for flotation. A set of eight M.S. type cells is used to separate minerals. The concentrate is recovered by filtration. The residue is thickened for water recovery and then piped to the clay pit.

### B.—URANIUM ORES.

Almost the entire resources of the branch have been devoted to work with uranium ores. The Metallurgist has been responsible for the erection of the sample-mill at Radium Hill, and other officers were seconded to the C.S.I.R.O. for experimental work on the chemical treatment of the mineral concentrates.

Experiments with flotation methods have been satisfactory for treatment of the ore fines. The coarse ore is treated by heavy media separation, and this product can in turn be improved by flotation.

## C.—GYPSUM.

Further laboratory tests have been made on cleaning of impure gypsum from deposits closer to Adelaide than the high-grade deposits of Lake MacDonnell. Full-scale plaster-making tests were carried out in conjunction with the Department of Industry and plaster from two sources was shown to be satisfactory.

## D.—CLAY.

Drying tests on brickmaking clays were carried out for the Department of Industry. This work is not finished, but has demonstrated the extremely tender nature of clays from the Adelaide Plains.

The washing of clay from weathered aplite occurring at Ardrossan was shown to be a relatively simple operation, giving a 50 per cent yield of clay. This is a good proportion, and the deposit should be a valuable addition to the white clay resources of the State.

## E.—PYRITE.

A 700-ton parcel of Nairne pyrite ore has been received for treatment in the pilot plant. Approximately 25 tons of concentrate were produced, and a further 75 tons are required. The pyritic concentrate is to be used for storage tests and roasting tests by the associated fertilizer companies who propose to use the material for the manufacture of sulphuric acid.

## OTHER INVESTIGATIONS.

The Technical Information Branch continued the compilation of the record of mines and mineral occurrences, but shortage of staff has delayed publication of this bulletin. An increase was shown in the volume of public inquiries seeking information and advice on underground water supplies, mineral resources, and general information regarding old mines.

Details of the samples handled were as follows :—

*Water Samples.*

Regional surveys .....	1,230
Metropolitan bores .....	518
Public and others .....	1,060
<b>Total</b> .....	<b>2,808</b>

*Coal Samples.*

Leigh Creek .....	1,114
Moorlands .....	19
Whitwarta .....	1
Comaum .....	1
<b>Total</b> .....	<b>1,135</b>

These samples were passed to the analytical branch for assay purposes.

Samples handled for specialised examination were as follows :—

Examination	Government	Public	Total
Petrological .....	171	45	216
Palaeontological .....	88	—	88
Metallurgical .....	3	1	4
Geological .....	18	14	32
<b>Total</b> .....			<b>340</b>

Samples handled for examination or test by other organizations were :—

Organization	Government	Public	Total
C.S.I.R.O. Ceramic Laboratories .....	38	—	38
University of Adelaide, Engineering Laboratory ...	5	4	9
Miscellaneous .....	30	—	30
<b>Total</b> .....			<b>77</b>

*Table Showing Annual Comparison of Samples Handled.*

	1948.	1949.	1950.	1951.
Water samples .....	1,346	2,313	2,274	2,808
Coal samples .....	882	1,526	1,877	1,135
General samples .....	308	475	869	1,453
Palaeontological examination .....	—	99	207	88
Petrological examination .....	27	272	429	216
<b>Totals</b> .....	<b>2,563</b>	<b>4,685</b>	<b>5,656</b>	<b>5,700</b>

Mr. C. M. Willington, Mining Engineer and Technical Assistant to the Director of Mines, carried out state-wide surveys of the limestone resources and raw materials for the brick manufacturing industry, and a survey of the gypsum resources was completed.

Further boring and sampling work was undertaken on the copper dumps at Moonta, and an appraisal of the building sand deposits in the Penfield area made on behalf of the Commonwealth Government. In addition reports were furnished on the economics of a number of small mining enterprises and general technical investigations relating to mineral resources carried out.

The Analytical Laboratories, under the direction of Mr. T. W. Dalwood, carried out the chemical analytical work of the Department. This organization, hitherto a branch of the South Australian School of Mines, will be transferred to the Department of Mines.

## MECHANICAL AND BORING BRANCH.

Chief Mechanical and Boring Engineer—D. M. Watson.

Mechanical Engineer—F. E. Roberts.

Boring Engineers—E. E. Eager B.Sc., and D. P. Limb.

## A.—BORING OPERATIONS.

During the year 1951 a record footage amounting to 124,421ft. was drilled. This total footage represents an increase of 2,297ft. over the footage drilled during the previous year as shown :—

1951 .....	124,421
1950 .....	122,124
1949 .....	95,820
1948 .....	68,164

The number of bores drilled for various types of programme are as follows :—

Type of Programme	No. of Bores Drilled	Aggregate Footage
Percussion drilling for mineral exploration .....	665	75,919
Percussion drilling for underground water supply .....	418	37,532
Diamond drilling for mineral exploration .....	69	10,970

Slightly fewer bores were drilled during 1951 but the increased total footage denotes a higher figure for the average depth of each bore.

(a) *Percussion Drilling for Mineral Exploration.*

Drilling operations in this section include various types of projects carried out for both Government Departments and private enterprise.

During the year an average of 14 plants was maintained on this type of work, the majority being for the Department of Mines of South Australia.

1. Coal Testing—Operations embraced a wide variety of projects, including coal exploration at Leigh Creek, Moorlands and Whitwarta. At the former field, an average of 9 plants drilled 371 bores totalling 54,235ft. This figure shows a decrease on the previous year, due to :—

- (i.) Lack of trained personnel ; and
- (ii.) Transferring of plant and crews to deep boring programme.

Drilling at Leigh Creek will continue during 1952, using the same number of percussion plants together with one or two diamond rigs, and a new Failing 1500 rotary drill, which is expected to arrive in the near future.

Exploratory work was continued in the Moorlands area, and although only two plants were engaged on this work, 74 bores were drilled for an aggregate footage of 9,146ft. The present intentions are for one of these plants to engage in a series of scout bores in the outlying areas adjoining Moorlands.

The proving of the coal basin at Whitwarta near Balaklava was finalized during 1951, when the three remaining bores were drilled, with a total footage of 505ft.

2. Clay Investigations—Investigations undertaken by the Geological Survey in connection with the brick-clay and shale deposits in the metropolitan area, necessitated the drilling of 40 bores with an aggregate footage of 1,730ft.

The major portion of clay investigations was carried out on behalf of the South Australian Housing Trust, and consisted of two programmes. The larger scheme at Golden Grove involved the drilling of 19 bores, totalling 1,015ft.

The remainder of the work consisted of a programme of 16 bores drilled in the One Tree Hill area, with a total footage of 406 ft.

In response to a request from a private company, Earthenware Industries Limited, five bores were drilled near Tea Tree Gully in an attempt to prove deposits of white clay for pottery purposes. This programme necessitated the drilling of 309ft.

3. Testing for Building Sand—On behalf of a private contractor drilling operations were undertaken at Christies Beach to prove the extent and quality of an exceptionally good sharp sand deposit. This scheme involved the drilling of nine bores, totalling 716ft.

4. Foundation Testing—Several programmes of foundation test boring were carried out during the year and, with the exception of two small schemes, all were for Government Departments.

The underwater programme for the Electricity Trust at Port Augusta was completed during the year, when a further 17 bores were drilled totalling in depth 850ft. A new plant was obtained for this work, with a single tubular steel mast. With this new plant and an improved barge, excellent progress was made during the latter part of the programme.

With the exception of one period of delay, caused through the barge and plant capsizing, this project was carried out with a minimum of trouble and is considered to rank highly among foundation test programmes carried out by this Department.

Additional underwater drilling schemes were undertaken on behalf of the South Australian Harbors Board, including programmes at Port Adelaide, Osborne, and Glanville. In each case this work was necessary before Harbors Board engineers could proceed with their wharf reconstruction. Barges or pontoons were supplied by the Board, also launches or tugs for towing the rig to the various sites.

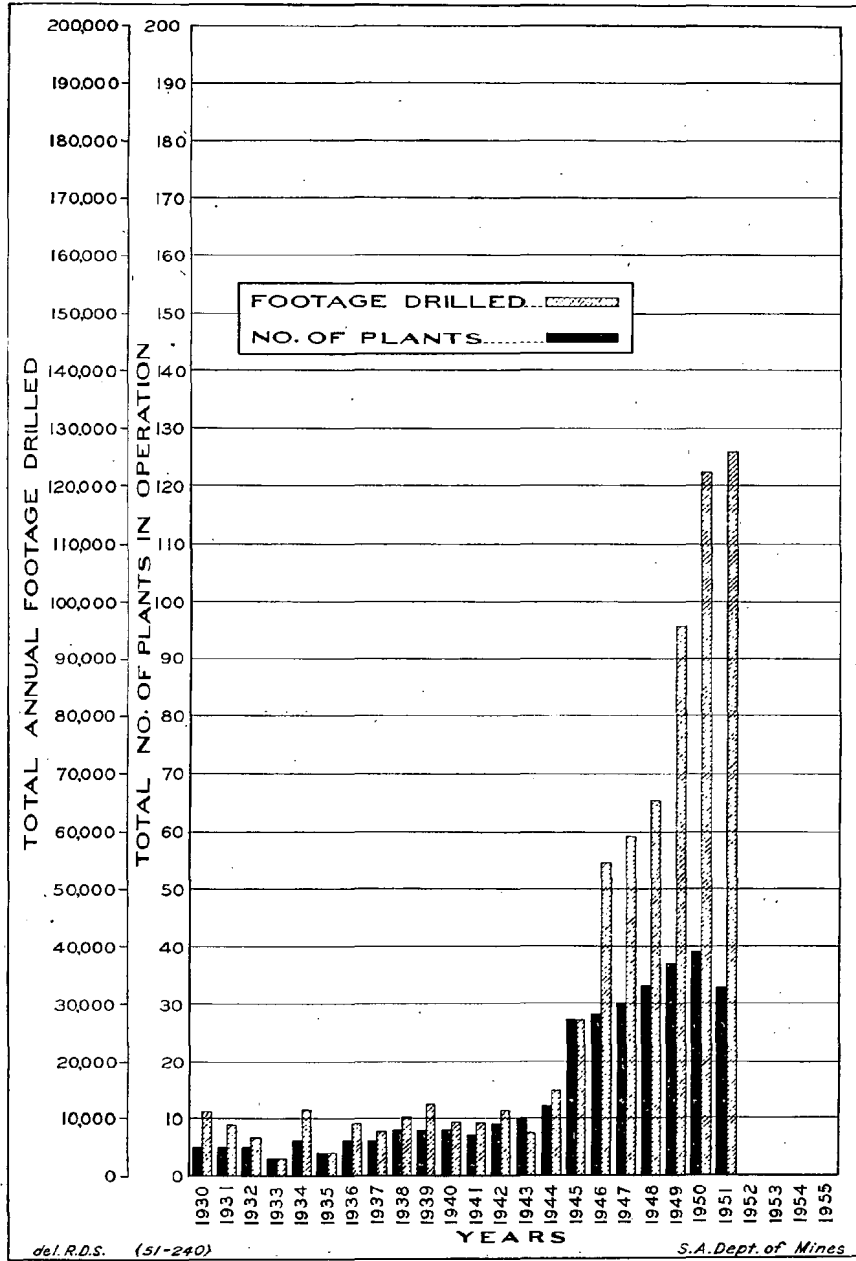
Foundation test bores for the Harbors Board were drilled in the following localities :—

Port Adelaide .....	Two bores, footage 149ft.
Osborne .....	Two bores, footage 130ft.
Glanville .....	Fourteen bores, footage 775ft.

Before proceeding with extensive additions and alterations to their round-house at Mile End, the South Australian Railways asked for a series of test bores to be drilled through the shallow clays. After two bores had been drilled, each to a depth of about 50ft., sufficient information was obtained for construction to commence.

Assistance was rendered to two private companies (South Australian Gas Company and Chrysler Dodge Australia Limited) by drilling two bores for each company to enable foundation plans to be drawn up for future building extensions. Both companies expressed their appreciation for the assistance and advice rendered them.

A major foundation test drilling project was carried out near Mount Gambier on behalf of the Woods and Forests Department. It is the intention of this latter Department to construct a large complete sawmill on this site and, in view of the uncertain nature of the country, it was necessary to thoroughly explore the ground before proceeding with engine and boiler foundations.



5. **Iron Ore Testing**—Drilling continued throughout the year for the Broken Hill Proprietary Company at Iron Knob, one percussion and one diamond drill being engaged for most of the time.

Satisfactory progress was made with the percussion machine, five bores being completed with the total footage for the year being 1,257ft. Information from this section of the programme was obtained through analyses of sludge samples, the Company being well satisfied with this method of testing.

Details of diamond drilling operations are referred to later in this report.

6. **Bridge Foundation Testing**—To fulfil a request from the Highways and Local Government Department a small programme of foundation test bores was drilled at Currency Creek, on the main Adelaide-Goolwa Highway. Seven bores were drilled, totalling 144ft., providing sufficient information to enable engineers from the Highways Department to prepare plans and specifications for a new bridge.

7. **Drainage Bores**—During the year 28 drainage bores were drilled, totalling 2,280ft., for Government Departments and one Municipal Council. The bulk of this work was a continuation of a programme for the South Australian Railways at Tailem Bend, 31 additional bores being drilled. This project necessitated the drilling and casing of a 60ft.-70ft. drainage bore adjoining each workman's cottage. A satisfactory drainage bore enables the installation of a septic tank system and at the end of 1951 it should be noted that 33 bores had been drilled, all giving satisfactory drainage up to 500gall. per hour.

A similar bore was drilled for the Architect-in-Chief's Department at Crystal Brook, when a satisfactory drainage bore was drilled at the local school.

During the winter months an urgent request was received from the Woodville Council asking that this Department drill an 8-in. drainage bore in an attempt to remove floodwaters from a low-lying road intersection. Although drilling continued to a depth of 220ft. it was not possible for this bore to cope with the stormwaters converging upon this area.

8. **Mineral Sampling**—In order to fully explore the possibilities of copper deposits in the Kadina-Wallaroo area the Department undertook an extensive sampling programme to test all major tailings dumps in this locality. A light percussion plant drilled 49 bores totalling 1,870ft., securing full samples in every bore.

9. **Swamp Drainage Testing**—The South Australian Harbors Board was further assisted during the year when a difficult programme of seven bores was drilled in the upper reaches of the Port River. Although the bores only averaged 20ft. in depth, many obstacles were encountered when moving the plant through the swamps and mangrove areas. The information sought was necessary for Harbors Board engineers to finalize their plans to dredge a canal through this waste land, from Port Adelaide to Grange.

10. **Methods of Testing**—In all programmes involving testing for foundations, sand and clay deposits, and the Harbors Board swamp programme, a special sliding type of sample tool was adopted. The main advantage in using this tool is that while the sample is being taken the cutting edge does not leave the bottom of the bore. This, naturally, prevents pollution of the sample by the cutting-tube scraping the walls of the bore.

*(b) Percussion Drilling for Underground Water Supplies.*

Drilling operations for underground water development compare more than favourably with the previous year. During 1951 an average of 14 plants was engaged on this work, producing the following results:—

No. of bores drilled	Total footage	Productive bores	Flowing bores	Non-productive bores	Bores in progress	Water developed Galls. per day
418	35,455	353	None	48	17	6,000,000

Of the 418 water bores drilled during the year 208 were for private hirers, the remaining 210 being drilled on behalf of this or other Government Departments.

1. **Town Supplies**—Several programmes were drilled at the request of the Engineering and Water Supply Department to provide new or supplementary supplies for the metropolitan area and country districts.

A further six bores were drilled in the Adelaide Plains to augment the city water supply. Five of these bores proved satisfactory, yielding a supply of 1,248,000gall. per day.

Operations were continued in the Salisbury basin, an additional four bores being drilled, giving a total supply of 734,000gall. per day. While operations have been temporarily discontinued in this area, it is anticipated that a major programme will be undertaken in the near future.

In order to augment existing supplies for the South Australian Railways at Peterborough, nine bores were drilled on sites selected by Departmental Geologists and, although some of the surrounding country did not appear promising, excellent results were achieved, a total yield of nearly 336,000gall. per day being obtained.

Many private landholders were assisted in the upper South-East districts where 23 bores were drilled, giving a total yield of 168,000gall. per day. Also in this area an extremely difficult project was handled on behalf of the Department of Lands. This necessitated the drilling of seven bores in most inaccessible country, some of which had rarely been traversed. After experiencing many difficulties with transport and personnel, this programme was eventually satisfactorily completed by our Drilling Superintendent and overseers. In view of the excellent quality and quantity of water proved by this scheme, it is anticipated that large tracts of this country will be opened up in the near future.

Operations continued in the lower South-East for the Lands Development Executive in connection with the Soldier Settlement Scheme. A further 126 bores were drilled during the year, with an aggregate footage of 3,777ft. Of the bores drilled in this area, with the exception of one, all were successful in supplying sufficient water for every block.

Plants operated continuously in the Streaky Bay and Penong areas, 52 bores being drilled in the former district and 40 in the latter. Of the 52 bores drilled at Streaky Bay, 37 were productive, yielding over 240,000gall. per day. Results in the Penong area were not as satisfactory, only 10 bores being productive, with an output of 65,000gall. per day.

2. **Observation Bores**—An interesting scheme, although not actually in the category of underground water development, is a programme of observation bores being drilled for the South-Eastern Drainage Board adjoining the Reedy Creek-Mount Hope drain. Fourteen bores have been drilled to date, the object being to observe variations in static level in relation to the draining of the surrounding country. This programme will be continued in 1952, when it is anticipated that a further 20 bores will be drilled.

Many smaller programmes were handled throughout the year, for both private and Governmental purposes, including operations at Thistle Island, Port Lincoln, lower South-East, and the mid-north.

*(c) Diamond-Drilling Operations.*

Diamond-drilling activities during the year were seriously curtailed due to the inability of the Department to procure competent operators; although an average of 15 plants was available for use it was not possible for more than five plants to be manned as a yearly average. Although this figure does not compare favourably with the average of nine plants maintained in the field during the previous year, the aggregate footage of 10,970ft. drilled shows a decrease of only 1,122ft.

1. Radium Hill—As in the previous year the major portion of diamond-drilling operations was carried out at Radium Hill on uranium ore investigations. A further 27 holes were drilled during 1951 for a total footage of 7,658ft. Operations in this area were controlled by the Radium Hill project, although senior officers of the boring branch visited this field several times during the year.

2. Kangaroo Creek—An exceedingly difficult programme of 12 bores was drilled at the junction of Kangaroo Creek and the River Torrens in the Torrens Gorge, approximately 13 miles from Adelaide. This project was handled on behalf of the Engineering and Water Supply Department, with the object of proving the suitability or otherwise of this area for a proposed reservoir dam site. Although the aggregate footage drilled in connection with this scheme totalled only 603ft., the steepness of the banks of the Gorge presented such difficulties that time spent moving and erecting plants was greater than the actual drilling hours.

3. Kadina—Operations continued in the Kadina-Wallaroo district when an additional four bores were drilled. Unfortunately, no worthwhile minerals were found in the 886ft. drilled during the year. This programme will be further continued in 1952.

4. Aroona Dam Site—To assist in the preparation of plans for a dam site in the Aroona Gorge, 12 bores were drilled to an average depth of 15ft. The object of this proposed reservoir dam is to provide the water supply for the rapidly growing township at Leigh Creek.

5. Iron Knob—This difficult programme was continued during 1951, a further two bores being drilled with an aggregate depth of 312ft. The lack of progress in this area was due to firstly, the difficulty in obtaining an operator capable of handling this exceptionally hard country and secondly, the fact that many weeks were lost when it became necessary to transfer the drilling machine to Adelaide for repairs.

6. Southern Districts—Two programmes were carried out in the South-East on behalf of the Highways and Local Government Department in an attempt to locate suitable deposits of hard rock for road construction. Five holes were drilled at Willalooka near Keith and an additional four at Mount Monster.

7. Leigh Creek.—Before planning for future extensions, the Electricity Trust of South Australia requested that this department prove the existence of deep coal measures at Leigh Creek.

It was originally intended to drill a series of deep bores, approximately 2,000ft., with a rotary plant which this department has on order. However, due to the non-delivery of this rig it was necessary to compromise and commence the programme using percussion plants and two diamond drills. For the latter purpose a diamond machine was purchased and a locally made "strait-line Drill Master" was hired from the Enterprise Exploration Company Limited.

To facilitate the handling of rods, special 50-ft. tubular steel derricks were constructed at the Works Depot and transported by road to Leigh Creek.

Although many attempts were made to work three shifts on the diamond rigs, results were most disappointing due to inexperienced personnel, who in turn caused many breakdowns to plant and equipment.

By the end of the year, four of the deep bores were drilled to depths sufficient to prove the existence of coal at depth, but as none has yet reached bedrock, each will be deepened when the programme is resumed.

8. Mutooroo—Copper Investigations.—A small programme of three bores was drilled in the Mutooroo area in a further search for copper. Details of the three bores are as follows :—

No. 1—Depressed 68 degrees ..... Final depth 408ft.

No. 2—Depressed 75 degrees ..... Final depth 384ft.

NOTE.—This bore was wedged at 256ft., further deflected and drilled again to 308ft.

No. 3—Depressed 75 degrees ..... Final depth 440ft.

9. Nairne—Pyrite Investigation.—Thirteen bores were drilled in this area on behalf of the Department of Mines, with an aggregate footage of 5,738ft. Later an additional two bores were drilled for the newly formed company, Nairne Pyrites Limited, totalling 213ft. in depth.

The aggregate footage for the 15 bores drilled at Nairne is 5,951ft.

10. Comaam—Coal Exploration.—Drilling operations were suspended during early parts of the year, but were resumed during November. A further 204ft. were drilled, advancing the depth to 435ft.

Considerable difficulty is being experienced through the presence of loose gravel which is continually rising in the 5-in. bore casing. It is most probable that early in the new year the diameter of the bore will be reduced to accommodate 4-in. casing.

Due to the inability of this department to provide suitable personnel and equipment, arrangements were made for the Enterprise Exploration Company Limited of Broken Hill to drill the above-mentioned programmes at Mutooroo, Nairne and Comaam.

## SUMMARY OF PERCUSSION DRILLING OPERATIONS FOR MINERAL EXPLORATION.

Locality	Name of hirer	No. of bores drilled	Aggregate footage		Purpose of project	Remarks
			ft.	in.		
Leigh Creek	Department of Mines	371	54,236	0	Coal	Exploration
Iron Knob	B.H.P. Co. Ltd.	5	1,257	6	Iron ore deposits	
Whitwarta	Department of Mines	3	505	0	Coal	Exploration
Port Adelaide	Harbors Board	2	149	0	Foundations	Harbor extensions
Osborne	Harbors Board	2	130	0	Foundations	Harbor extensions drilled under water
Glanville	Harbors Board	14	775	0	Foundations	Harbor extensions drilled under water
Port River	Harbors Board	7	140	0	Dredging purposes	River extensions
Mount Gambier	Woods and Forests Department	32	2,100	0	Foundations	New mill site
Port Noarlunga	D. K. Rosewall	9	716	0	Sand	Sand testing for building purposes
Port Pirie	S.A. Gas Company	2	92	0	Foundations	Boiler foundations
Tea Tree Gully	Earthenware Industries	5	309	6	Clay	Pottery clay
Port Augusta	E.T.S.A.	17	850	0	Foundations	Foundations for power house
Golden Grove	S.A. Housing Trust	19	1,015	0	Clay	Brickmaking clay
Moonta	Department of Mines	49	1,876	0	Copper	Investigations
Finsbury	Chrysler Dodge Australia, Ltd.	2	41	0	Foundations	Body press foundations
One Tree Hill	S.A. Housing Trust	16	406	0	Clay	Brickmaking clay
Mile End	S.A. Railways	2	99	0	Foundations	Round-house foundations
Currency Creek	Highways and Local Govt. Department	7	144	0	Foundations	Bridge foundations
Moorlands	Department of Mines	74	9,146	0	Coal	Exploration

## SUMMARY OF PERCUSSION DRILLING FOR UNDERGROUND WATER SUPPLY AND DRAINAGE.

Locality	Name of hirer	No. of bores drilled	Aggregate footage		Total output Galls. per hr.	Remarks
			ft.	in.		
Tallem Bend	S.A. Railways	26	1,935	0	15,600	Drainage for Railway cottages
Crystal Brook	Architect-in-Chief	1	125	0	300	Drainage for school
Woodville	Woodville District Council	1	220	0	1,200	Drainage from road
South-East	Dept. of Lands	126	3,777	0	56,300	
Murray Mallee	Private	32	7,294	0	12,700	
Penong Area	Private	40	2,931	6	2,570	
Wirrabara	Private	14	2,010	0	5,670	
Adelaide Hills	Private	4	943	0	1,500	
Adelaide Plains	Private	5	1,257	0	38,100	
Port Lincoln	Private	4	340	0	800	
Lower South-East	Private	23	915	0	32,700	
Thistle Island	C. & N. H. Wade	7	470	0	—	Salt
Radium Hill	Dept. of Mines	2	271	0	2,500	
Eurelia	Private	1	355	0	120	
Meningie	Dept. of Lands	29	5,136	0	—	Hand bores
Upper South-East	Dept. of Lands	7	1,708	0	5,000	
Upper South-East	Private	23	2,029	0	7,000	
Kangaroo Island	Private	1	25	0	60	Hand bore
Streaky Bay	Private	52	3,632	8	10,250	
Hatherleigh	South-Eastern Drainage Board	14	232	0	3,450	
Olary	S.A. Railways	1	70	6	—	in progress
Adelaide Hills	S.A. Railways	3	573	10	5,000	
Mt. Barker	E. & W.S.	3	273	0	2,200	1 in progress
Peterborough	S.A. Railways	9	894	0	13,560	
Port Lincoln	E. & W.S.	1	30	0	—	in progress
Wirrabara	E. & W.S.	1	62	0	150	
Osborne	E. & W.S.	2	350	0	20,000	1 in progress
Mount Gambier	E. & W.S.	3	422	0	8,500	
Adelaide	E. & W.S.	6	2,060	0	52,000	
Salisbury	E. & W.S.	4	1,770	0	30,600	

## SUMMARY OF DIAMOND DRILLING OPERATIONS.

Locality	Name of hirer	No. of holes drilled	Footage drilled		Nature of Work
			ft.	in.	
Aroona Dam Site	Electricity Trust of South Australia	10	152	0	Foundation test bores for reservoir site
Kangaroo Creek	Engineering and Water Supply Dept.	12	603	2	Foundation test bores for reservoir site
Kadina	Department of Mines	4	885	11	Copper investigation
Willalooka	Highways Department	5	214	8	Test bores for road metal
Iron Knob	Broken Hill Proprietary Co. Ltd.	2	311	6	Testing ironstone deposit
Mount Monster (Keith)	Highways Department	4	112	4	Test bores for road metal
Radium Hill	Department of Mines	27	7,658	6	Uranium search
Edithburgh	Department of Mines	1	24	0	Building sandstone deposit
Leigh Creek	Department of Mines	4	1,008	0	Exploration of deep coal deposit
Totals		69	10,970	0	

#### B. OTHER OPERATIONS.

To cope with the increased activities of the Department an extensive building programme was undertaken during the year to provide additional laboratory, office, and storage accommodation for several of the branches.

At Parkside good progress was made with the erection of the Geological Survey laboratories, a two-storied brick building of 8,000 sq. ft. floor space. This building, now almost ready for occupation, will be used for analytical, chemical research, petrological, and radiometric laboratories.

Extensive modifications were made to the eastern annexe of the Exhibition Building to provide office space for the Accounts, Drafting and Geological Survey Branches.

On land acquired adjacent to the Mines Department Works Depot at Thebarton a pilot metallurgical treatment plant of 3,000 sq. ft. floor area was erected and equipped with treatment plant to handle up to 50 tons of material per day if required. Extensions were also made to the metallurgical laboratories and core storage buildings.

Within the Works Depot a new galvanized iron building of 4,000 sq. ft. floor space was erected as a steel store.

At Leigh Creek an amenities block of 1,200 sq. ft. was erected for the use of departmental drilling personnel. Six portable cubicles were also fabricated for use in drilling camps.

#### RADIUM HILL PROJECT.

General Manager—T. A. Rodgers, A.O.S.M.

The exploratory and development work at Radium Hill was pushed on rapidly during the year to appraise as quickly as possible the extent and grade of the deposit. Exploratory diamond drilling totalled 9,791ft. and underground development 1,977ft.

The results of this work were transmitted to the United States Atomic Energy Commission and the British Ministry of Supply, and, as a consequence of their advice, the operations on the field were then directed towards equipping the mine for commercial production of uranium ore. A pilot metallurgical concentrating plant was erected and equipped to determine the most economical method of treatment. In addition, a diesel power-house, workshops, administrative, and community buildings were constructed to serve this further state of development. Results of this preliminary work using development ore for pilot plant production will be used for the design of the full-scale concentrating plant, now being designed, and to operate when mine development is completed.

Water supply, a major problem in this arid region, is at present depended upon from surface catchments but, as future large-scale operations will necessitate a much larger and assured supply, several alternative schemes are now being investigated by the Engineering and Water Supply Department.

## FINANCIAL STATEMENT OF THE DEPARTMENT OF MINES.

STATEMENT OF RECEIPTS AND PAYMENTS ON REVENUE ACCOUNT FOR YEAR ENDED 30TH JUNE, 1952.

1951. £		1952. £	£
	<b>PAYMENTS MADE FOR THE YEAR WERE :—</b>		
	<b>ADMINISTRATION—</b>		
	Salaries .....	29,830	
	Office and travelling expenses .....	6,964	
	Publications of mining reviews and bulletins, books, and periodicals .....	1,894	
	Portion of Superannuation Act pensions charged to department .....	1,816	
	Pay roll tax for child endowment .....	7,977	
	Compensation payable to L. K. Roberts & Son for damages following collision with departmental vehicle .....	1,250	
	Purchase and installation of inter-office telephones .....	618	
	Purchase of office machines .....	350	
	Advances to officers for purchase of motor cars .....	900	
	Payments to dependants and officers retiring or resigning, long service and recreation leave .....	1,493	
	Expenses of overseas visit by Director of Mines .....	3,529	
40,215			56,621
9,940	<b>BATTERIES AND CYANIDE WORKS—Operations and equipment .....</b>		9,767
	<b>INVESTIGATIONS—</b>		
	<b>Geological and Geophysical Survey—</b>		
	Salaries .....	42,107	
	Equipment, stores, and travelling expenses .....	39,459	
	Mount Painter area cost survey operations .....	503	
	<b>Boring and Mining—</b>		
	Salaries .....	56,347	
	Equipment, stores, and sundries .....	39,655	
	Leigh Creek Coalfield—Proving reserves and compiling data .....	68,015	
	Moorlands Coalfield—Investigating the extent of deposits .....	2,802	
	Inkerman Coalfield—Investigating the extent of deposits .....	13	
	South-East—Investigating coal deposits .....	2,080	
	Radium Hill and elsewhere—Testing and mining uranium deposits .....	323,705	
	Kadina, Wallaroo, and Moonta—Investigating copper lode .....	7,323	
	Mutooroo—Investigating copper deposits .....	4,356	
	Metropolitan and other areas—Test boring clay and shale deposits .....	181	
	Other localities .....	961	
	Combustion tests on South Australian coal—Freight and other expenses .....	1,119	
	Underground Water Investigations—Test boring in undeveloped areas .....	7,094	
	Nairne—Investigating testing and mining pyrite deposits .....	7,351	
	<b>Metallurgical and Analytical—</b>		
	Salaries .....	6,436	
	Equipment, stores, and sundries .....	28,148	
429,152			637,655
479,307	<b>TOTAL PAYMENTS FOR THE YEAR .....</b>		704,043
	<b>THE RECEIPTS FOR THE YEAR WERE :—</b>		
68,425	<b>RENTS AND ROYALTIES—Leases and licences .....</b>	68,049	
10,461	<b>RECOUP FOR SERVICES OF OFFICERS .....</b>	20,590	
	<b>FEEES—Lease, registration, and geological .....</b>	148	
	<b>MISCELLANEOUS RECEIPTS, including—</b>	£	
	Batteries and cyanide works—Treatment charges .....	495	
	Sale of plant and materials, and sundries .....	2,415	
	Commissions (postal, etc.), rents, etc. ....	639	
6,753		3,549	
£85,794	<b>TOTAL RECEIPTS FOR THE YEAR .....</b>		93,336
£393,513	<b>RESULTING IN AN EXCESS OF PAYMENTS OVER RECEIPTS FOR THE YEAR OF .....</b>		£610,707

STATEMENT OF BORING OPERATIONS, ETC., CARRIED OUT BY THE DEPARTMENT OF MINES  
FOR THE YEAR ENDED 30TH JUNE, 1952.

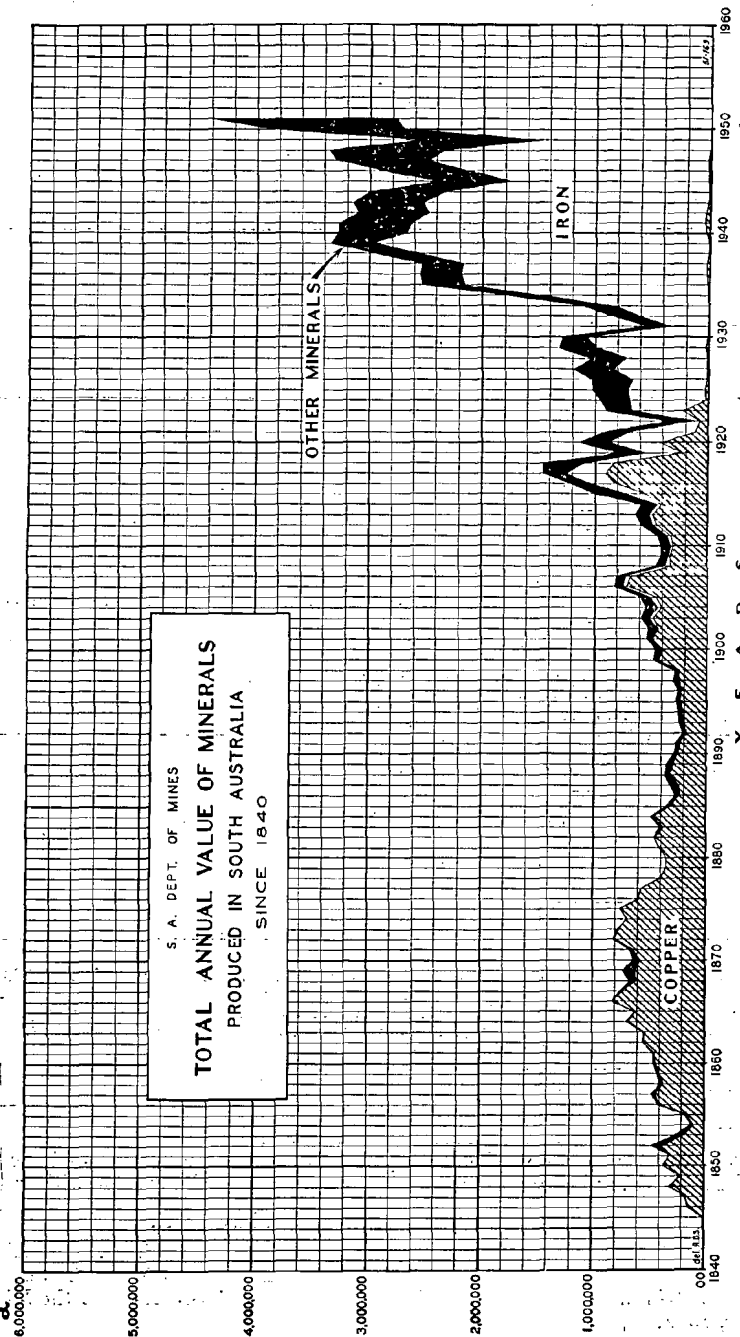
Total cost 1950-51	Nature of Work	Total cost 1951-52
£		£
75,628	Perussion drilling operations, etc., for private individuals, companies, and other Government departments, including land settlement (soldiers) .....	77,291
7,858	Diamond drilling operations for private individuals, companies and firms, and other Government departments	7,143
29,785	Erection of new buildings .....	35,819
11,552	Sundry jobs at the Works Depot, etc., for private individuals, companies and firms and other Government departments .....	16,871
£124,823		£137,124

MINERAL PRODUCTION OF SOUTH AUSTRALIA.

The following table shows the total value of the mineral production of the State to the end of 1951 (excluding building and road materials) and indicates the relative importance of the various metals and minerals produced and marketed.

The geographical distribution of mineral production for the year ended 31st December, 1951, is also published herein.

METAL OR MINERAL	Value 1841-1951 £
Iron .....	52,296,434
Copper .....	33,313,854
Salt (including use in chemical industry) .....	8,261,190
Limestone (agricultural, cement, chemical and flux) .....	3,174,555
Gypsum .....	2,322,108
Gold .....	2,203,774
Coal (sub-bituminous) .....	978,979
Opal .....	575,773
Clay (fireclay, kaolin, ball clay, pottery clay and cement clay) .....	496,316
Silver-lead .....	418,562
Barite .....	319,487
Talc and soapstone .....	313,612
Phosphate rock .....	213,093
Manganese .....	205,257
Silica (flux, glass-sand and tripoli) .....	115,699
Felspar and chinastone .....	65,484
Flint pebbles (including flint for pottery) .....	64,842
Other metals and minerals .....	397,550
	<b>£105,736,569</b>



GEOGRAPHICAL DISTRIBUTION OF MINERAL PRODUCTION, 1951.

Division and County	Value	Details
<b>I. Central—</b>		
Adelaide .....	£ 326,468	Gold, £282; iron, £1,565; barite, £4,324; clay, £50,142; damourite, £2,506; felspar and chinastone, £11,625; flint pebbles, £175; limestone, £28,703; salt, £182,522; silica, £13,033; sillimanite, £2,122; talc and soapstone, £29,406; slate (pigment), £63.
Carnarvon .....	2,624	Salt, £2,624.
Eyre .....	2,417	Gypsum, £2,417.
Fergusson .....	300,454	Gypsum, £80,627; limestone, £50,164; salt, £143,436; dolomite, £26,225; clay, £2.
Gawler .....	4,180	Limestone, £4,025; salt, £92; clay, £63.
Hindmarsh .....	244,592	Clay, £4,424; limestone, £239,245; silica, £923.
Light .....	101,187	Barite, £1,320; limestone, £87,167; phosphate rock, £12,700.
Sturt .....	7,094	Clay, £356; limestone, £370; salt, £4,308; pyrite, £2,060.
Total .....	£989,016	
<b>II. Lower North—</b>		
Burra .....	216	Asbestos, £216.
Daly .....	80,613	Gypsum, £2,383; salt, £78,230.
Kimberley .....	—	
Stanley .....	—	
Victoria .....	1,546	Silica, £65; limestone, £1,481.
Total .....	£82,375	
<b>III. Upper North—</b>		
Blachford .....	—	
Dalhousie .....	—	
Derby .....	128	Barite, £128.
Frome .....	637	Magnesite, £602; clay, £35.
Granville .....	—	
Hanson .....	2,984	Barite, £2,984.
Herbert .....	314	Gold, £314.
Lytton .....	—	
Newcastle .....	—	
Taunton .....	18,570	Copper, £68; silver, £41; lead, £6,574; manganese, £320; barite, £11,560; silica, £7.
Total .....	£22,633	
<b>IV. South-Eastern—</b>		
Buckingham .....	—	
Cardwell .....	776	Salt, £776.
Grey .....	6,493	Flint pebbles, £3,036; limestone, £3,457.
MacDonnell .....	—	
Robe .....	594	Salt, £594.
Total .....	£7,863	
<b>V. Western—</b>		
Bosanquet .....	—	
Buxton .....	—	
Dufferin .....	—	
Flinders .....	4,536	Graphite, £718; limestone, £6; salt, £6; talc, £3,806.
Hopetoun .....	—	
Hore-Ruthven .....	—	
Jervois .....	—	
Kintore .....	32,692	Gypsum, £12,498; salt, £20,194.
LeHunte .....	—	
Manchester .....	2,768,552	Iron, £2,759,099; clay, £2,976; silica, £1,597; salt, £4,880.
Musgrave .....	—	
Robinson .....	—	
Way .....	—	
York .....	5,468	Clay, £125; gypsum, £5,343.
Total .....	£2,811,248	
<b>VI. Murray Mallee—</b>		
Albert .....	188	Gypsum, £188.
Alfred .....	—	
Buccleuch .....	1,277	Gypsum, £1,277.
Chandos .....	158	Salt, £158.
Hamley .....	—	
Russell .....	6,046	Gypsum, £6,046.
Young .....	—	
Total .....	£7,669	
<b>VII. Out of Counties—</b>		
Northern Division .....	402,181	Lead, £112; silver, £64; barite, £860; coal, £399,628; ochre, £122; silica, £1; magnesite, £1,394.
North-Eastern Division .....	28,362	Felspar, £375; talc, £27,825; sillimanite, £142; carphosiderite, £20.
North-Western Division .....	68,267	Gold, £3,598; silver, £32; clay, £520; opal, £64,117.
Western Division .....	1,414	Gold, £1,414.
Total .....	£500,224	
Grand Total .....	£4,421,028	

The operations of the Department throughout the year have called for the energetic activity of all the officers, whose assistance, on behalf of the mining and other industries, I desire to acknowledge with appreciation.

I have, etc.,

S. B. DICKINSON,  
 Director of Mines, Government Geologist,  
 and Secretary to the Minister of Mines.

To the Hon. the Minister of Mines.  
 17th November, 1952.